International Boundary and Water Commission

United States and Mexico

Report of Transboundary Bypass Flows into the Tijuana River

Prepared by:

Minute 320 Binational Technical Team

Water Quality Workgroup

Final Report

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BACKGROUND

Starting on February 6, 2017, and over a period of the next two weeks, the United States Section, International Boundary and Water Commission, (USIBWC) received complaints from various entities in the United States (U.S.), including Customs and Border Protection, City of Imperial Beach, California Regional Water Quality Control Board, San Diego Region (San Diego Water Board), San Diego County Air Pollution Control District, and local residents of strong wastewater odors in the Tijuana River Valley and adjoining neighborhoods as well as the beach areas of Imperial Beach, California. The odors were believed to be due to wastewater sourced in the Tijuana River. On February 7, 2017, and again on February 16, 2017, the USIBWC requested information from its counterpart, the Mexican Section (known in Spanish as Comisión Internacional de Limites y Aguas, Seccion Mexicana, MXIBWC), on the possible source of these odors. The strong odors were confirmed by U.S. Section personnel several times during the period, the last time being February 17, 2017. MXIBWC informed the USIBWC on February 23, 2017 that the Comisión Estatal de Servicios Publicos de Tijuana (CESPT), had bypassed wastewater flows into the Tijuana River during the repairs of a wastewater line in central Tijuana. The information initially received on February 23, 2017 included the area where the collector was located, the fact that the collector was large and buried at great depth, that the collector had been damaged for some time, and that the repairs had been completed as of February 23, 2017 (pavement repair and other civil work was completed on February 25). USIBWC was further informed by MXIBWC that they were awaiting additional details from CESPT. The USIBWC estimated the volume of the spill based on an assumed flow rate of 300 lps, based on the size of the collector, and an assumed duration of flow from February 6 (the date the odors were first reported) to February 23, 2017 (the date repairs were reported to have been completed in Mexico). Based on this, the USIBWC filed a spill report with California Office of Emergency Services and the San Diego Water Board on February 24, 2017 for an estimated volume of 143 million gallons.

The Tijuana River Watershed is a large binational watershed in southern California/ northern Baja California. The downstream portion of the watershed in Mexico encompasses the densely urbanized city of Tijuana, B.C., and includes two principal tributaries, the Tijuana River (Arroyo de las Palmas- the main tributary in Mexico), and the Rio Alamar (known as Cottonwood Creek in the U.S.) (Figure 1). Water is impounded in both the U.S. and Mexico for use by the communities. The Rio Alamar joins the Tijuana River just south of the U.S. – Mexico international boundary. The flows at this point are made up of primarily return flows from wastewater treatment plant effluent, runoff from urban drainage, and other non-point sources. The location of the broken sewer line is in the area just upstream of the confluence of the Alamar and Tijuana Rivers (Figure 2), approximately 6 miles (10 km) from the international boundary.

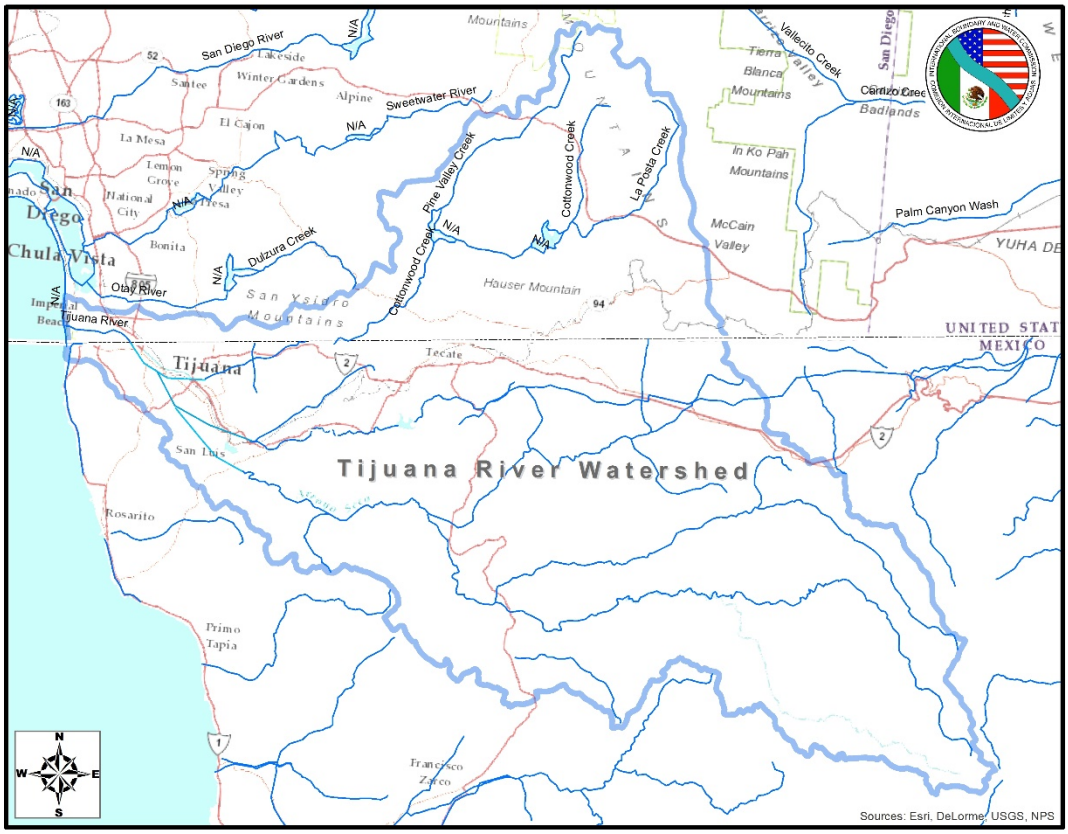


Figure 1 Map of Tijuana River Watershed. Map content- ESRI basemap

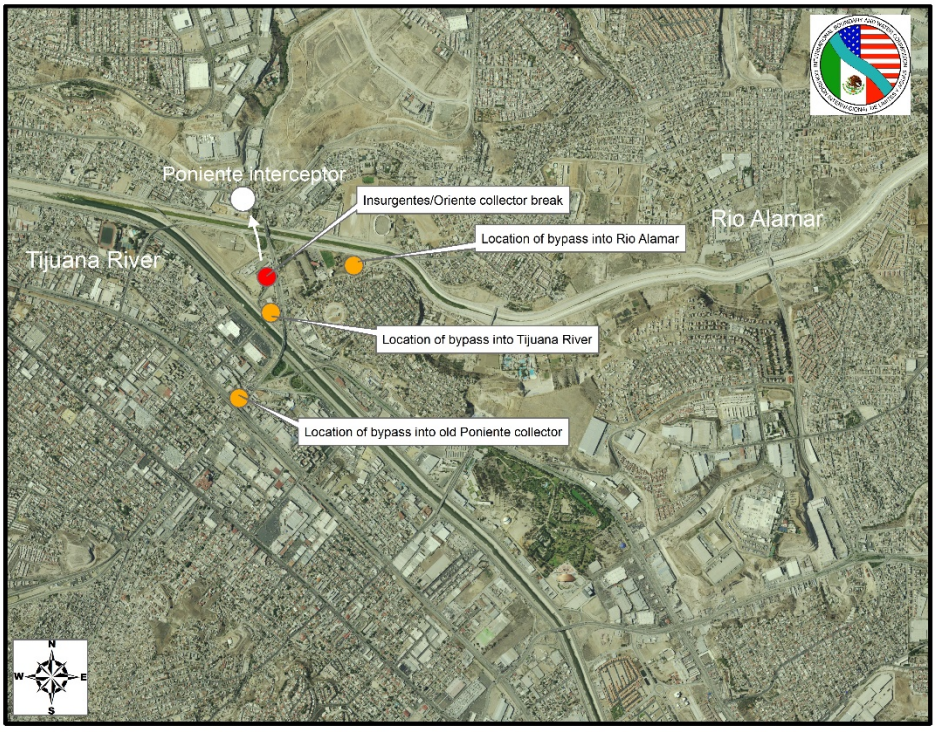


Figure 2 Location of 2017 collector break

The wastewater collection system of the City of Tijuana (City or Tijuana) has grown enormously over the past 30 years with the rapid growth of the city since the enactment of the North American Free Trade Agreement (NAFTA) in 1994. Flows of untreated wastewater in the river in the U.S. that were common in the late 1980s and early 1990s have been greatly reduced due to treatment facility construction projects in both countries that were addressed under IBWC Minutes Nos. 270, 283 and 298. Dry weather flows have been controlled to a great extent but not completely, by a river diversion and pump station (Pump Station CILA) constructed in 1991 and located just upstream of the international border. This pump station operates when river flows are less than 1000 liters per second (lps) (35 cubic feet per second (cfs) or 22.8 million gallons per day (MGD)), but is shut down when flow exceeds the pump station capacity due to submergence and clogging of the intake screen and wet well siltation. This normally occurs during the winter rainy season, when runoff from the watershed far exceeds the pumping capacity. At times the pump station experiences failures during which time flow enters the U.S. The backup generator for the pumping plant only allows one pump to operate. The flow from the pump station was originally conveyed through the sewer system to Pump Station No. 1, but in 2009-10 a new line was built from Pump Station CILA to Pump Station 1 that enables river flow to be maintained in a separate line. This flow is conveyed to a separate pump system at Pump Station 1 which pumps the flow to the surf discharge outfall of the San Antonio wastewater treatment plant, approximately 6 miles south of the border. Dry weather flows in the Tijuana River continue to increase at Pump Station CILA due to concrete channelization of the Rio Alamar and the discharge of secondary treated wastewater upstream.

At present, river flow during dry weather consists of secondary wastewater treatment plant effluent from three locations – Tecate, Arturo Herrera and La Morita wastewater treatment plants, as well as untreated urban runoff from drains entering the river channel. In wet weather, the flow also includes a watershed base flow that becomes greater during extremely wet winters. During rain events, the collection system receives infiltration from runoff that is sediment and trash laden, creating plugs at manholes that result in wastewater system overflows to low areas, and hence to the river. During these events, the flow in the river can have a significant untreated wastewater component, resulting in degradation of water quality. The water quality during wet weather flows normally exceeds safe human contact standards, even though highly diluted by rainfall volumes at times. In addition, the wastewater infrastructure in the City is aging and pipe collapses are becoming more common. Concrete pipe is typically used for construction of sewer pipes, and hydrogen sulfide corrosion results in eventual complete destruction of concrete pipes above the normal flow line. The following is an investigative report of a raw wastewater spill to the Tijuana River in February 2017 initiated by a collapse of a portion of a large wastewater collector in central Tijuana.

INITIAL INFORMATION

On February 28, 2017 officials from the U.S. Consulate met with the Resident Engineer of MXIBWC, Tijuana, Roberto Espinosa, and General Manager of CESPT, Miguel Lemus. The U.S. Consulate reported that they were informed the spill was much less severe than previously reported. It started as a collapse of a collector on the evening of February 1, 2017, that repairs were done as quickly as possible, with the spill contained within four days, and that the spill was a maximum of 300 lps for 96 hours as a worst case scenario, as it did not spill constantly. The Consulate reported that all water was treated, that it was grey water and not sewer water. All repair work was completed by February 23, 2017 with no further incident.

On March 1, Roberto Espinosa reported to USIBWC additional details made known at the meeting. On February 1, 2017, there was a collapse of the 48-inch diameter *Insurgentes/Oriente* Collector in the vicinity of the confluence of the Alamar River and Tijuana River. Emergency repairs were undertaken but they were compounded by rain, abandoned underground structures, the failure of a new bus shelter, and overhead and buried power lines. Base flow in the collector was diverted to other pipes, however peak flows were diverted to the river. The nature of the repairs and the expansion of the civil footprint led to a protracted period of repair. The repair work was completed on February 23, 2017. CESPT confirmed their failure to notify the MXIBWC of the emergency work and bypassing of wastewater flows to the river, for that reason, MXIBWC could not provide an estimate for the volume of bypassed wastewater. CESPT also noted that the failure points to the problem of aging infrastructure. CESPT spent $5 million pesos (MXN), approximately $260,000 (USD) on repairs, and estimates a need for replacement of approximately two km of 42-inch diameter collectors in the vicinity which will cost around $28 million MXN, approximately $1.5 million USD. An additional seven km of pipeline installed in the 1980s are in critical condition and in need of replacement. The Mexican Section stated that they will be coordinating with the State of Baja California to improve CESPT's notification and coordination process.

CESPT issued an informational paper on the discharge dated February 27, 2017, which USIBWC received on March 2, 2017. This paper indicated that the line had initially collapsed on January 1, 2017, after

heavy rains in the second half of December 2016, but no bypass flows to the river occurred. Hydraulic work was conducted between February 1, 2017 and February 4, 2017, and approximately 80 meters of concrete pipe was replaced. The CESPT statement indicated that while the work was being performed, it was necessary to divert up to 300 lps into the Tijuana River and that the work was completed on February 23, 2017. A separate estimate made by the United States Environmental Protection Agency (USEPA) using the date of January 1, 2017 indicated that a potential volume of 230 million gallons had been bypassed to the river. The USIBWC announced on March 2, 2017 via press release, that a joint binational investigation by the Minute 320 Water Quality Workgroup members would provide details as to what happened and the statistics of the event within 30 days.

U.S. SITE VISIT

USIBWC personnel visited sites along the Tijuana River in the U.S. on March 8, 2017 beginning at the mouth of the river and continuing upstream to the international boundary. Water in the river at the mouth was mostly clear and did not smell of wastewater. Odor was a slightly earthy to musty smell indicative of wetlands and organic decomposition. Large numbers of terns and gulls were present and there were no signs of any stressed wildlife.

Figure 3 Tijuana River at confluence with Pacific Ocean, dark material present -March 8, 2017

Figure 4 Close up of sand material – March 8, 2017

There was the presence of black organic material in the sands. USIBWC interviewed personnel at the Tijuana River National Estuarine Research Reserve and at Border Field State Park, located near the river's mouth. Those personnel noted that the odor of wastewater is consistent when there are flows in

the river and that odors were noticeably higher during early February. Park service personnel noted the increase in odors but they indicated the odors are normally present when the river is flowing. They did not associate the increase with increased wastewater discharges. Park personnel take water quality readings on a routine basis. The Tijuana River flow at Dairy Mart Road Bridge, San Diego California, was slow moving and contained litter but did not smell of wastewater nor have any dark discoloration.

Figure 5 Tijuana River at Dairy Mart Bridge

Figure 6 Tijuana River at IBWC gaging station, March 8, 2017

Further upstream at the USIBWC gaging station located in the pilot channel of the flood control project, immediately downstream of the international border, flow of the Tijuana River was fast moving and approximately two cubic meters per second (cms). The flood plain on either side of the pilot channel contained large amounts of trash and debris such as plastic bottles and tires. The water did not smell of wastewater but was slightly brown in color.

Water in the concrete lined portion of the channel was constant and did not have any smells or stagnant locations. The Tijuana River includes a 2-mile long concrete-lined channel near the international boundary as part of the IBWC's Tijuana River Flood Control Project.

Figure 7 Tijuana River at international boundary- March 8, 2017

BINATIONAL MEETING FINDINGS

On March 9, 2017 a binational meeting of the Minute 320 Binational Workgroup for Water Quality was convened at the CESPT offices in Tijuana to receive information on the event as reported by Mexico and to view the location of the collector break and bypass site.

In attendance were representatives from both countries and from several agencies and groups. From the U.S. attendees were present from the USIBWC Headquarters and San Diego Offices, the City of Imperial Beach, the San Diego Water Board, Surfrider Foundation, Wildcoast, the U.S. Consulate office in Tijuana, Scripps Institute of Oceanography, and the USEPA. Attendees from Mexico included the MXIBWC Headquarters and Tijuana Office, CESPT, Comision Nacional del Agua (CONAGUA), el Colegio de la Frontera Norte (COLEF), Comisión Estatal del Agua, Baja California (CEA), Secretaria de Proteccion Ambiental (SPA), and Proyecto Fronterizo de Educacion Ambiental (PFEA). Photographs were displayed in the front of the meeting room of the collapsed collector and the repair work. After introductions and opening remarks, CESPT provided a presentation and discussion on the timeline and statistics for the bypass.

In late December 2016, the region experienced significantly higher rainfall than normal. Data collected by CESPT for rainfall during January and February is provided (Tables 1 and 2). The rainfall data is collected from the Internet site "Wunderground" that is regional data, along with two monitoring stations that are operated by CONAGUA (Rodriguez and Carrizo). The difference between the information is due to the location of the weather stations between the Wunderground web sites (50 stations) and the two CONAGUA sites. Additional rainfall data at the USIBWC's Goat Canyon Pump Station is provided for the period of December 1, 2016 to February 28, 2017 (Table 3).

Table 1 Rainfall data collected by CESPT and CONAGUA for January 2017

Month	Day	Wunderground		CONAGUA Rodriguez		CONAGUA Carrizo	
		mm	in	mm	in	mm	in
January	1	0	0	0	0	0	0
	2	0	0	0	0	0	0
	3	0	0	0	0	0	0
	4	0	0	0	0	0	0
	5	30.48	1.20	0	0	0	0
	6	0	0	2.9	0.11	4.5	0.18
	7	0	0	0	0	0	0
	8	0	0	0	0	0	0
	9	52.07	2.05	0	0	0	0
	10	0	0	0.2	0.01	0	0
	11	1.27	0.05	1	0.04	0	0
	12	119.13	4.69	0.1	0.00	1.9	0.07
	13	0	0	17.8	0.70	11.8	0.46
	14	0	0	1	0.04	8.2	0.32
	15	0	0	0	0	0	0
	16	0	0	0	0	0	0
	17	0	0	0	0	0	0
	18	0	0	0	0	0	0
	19	62.23	2.45	2	0.08	0.7	0.03
	20	129.54	5.10	14.1	0.56	7.7	0.30
	21	0	0	29.3	1.15	29.5	1.16
	22	6.35	0.25	0.3	0.01	5.1	0.20
	23	82.55	3.25	12.2	0.48	6.8	0.27
	24	8.89	0.35	17.7	0.70	17.3	0.68
	25	0	0	7	0.28	8.5	0.33
	26	0	0	0	0	0	0
	27	0	0	0	0	0	0
	28	0	0	0	0	0	0
	29	0	0	0	0	0	0
	30	0	0	0	0	0	0
	31	0	0	0	0	0	0
	Average	15.89	0.63	3.41	0.13	3.29	0.13
	Total	492.51	19.39	105.60	4.16	102.00	4.02
	mm= millimeters			in= inches			

Table 2 Rainfall data collected by CESPT and CONAGUA for February 2017

Month	Day	Wunderground		CONAGUA Rodriguez		CONAGUA Carrizo	
		mm	in	mm	in	mm	in
February	1	0	0	0	0	0	0
	2	0	0	0	0	0	0
	3	0	0	0	0	0	0
	4	0	0	0	0	0	0
	5	0	0	0	0	0	0
	6	0	0	0	0	0	0
	7	8.89	0.35	0	0	5.5	0.22
	8	0	0	0	0	4.2	0.17
	9	0	0	0	0	0	0
	10	0	0	0	0	0	0
	11	3.81	0.15	0	0	0	0
	12	0	0	0	0	1.1	0.04
	13	0	0	0	0	0	0
	14	0	0	0	0	0	0
	15	0	0	0	0	0	0
	16	0	0	0	0	0	0
	17	109.22	4.30	0	0	0	0
	18	0	0	41.1	1.62	24.10	0.95
	19	10.16	0.40	4.3	0.17	6.6	0.26
	20	0	0	0.3	0.01	0.8	0.03
	21	0	0	0	0	0	0
	22	0	0	0	0	0	0
	23	0	0	0	0	0	0
	24	0	0	0	0	0	0
	25	0	0	0	0	0	0
	26	6.35	0.25	0	0	0	0
	27	147.32	5.80	7.8	0.31	4.60	0.18
	28	0	0	59.2	2.33	42.20	1.66
	29						
	30						
	31						
	Average	10.21	0.40	4.03	0.16	3.18	0.13
	Total	285.75	11.25	112.70	4.44	89.10	3.51
	mm= millimeters			in= inches			

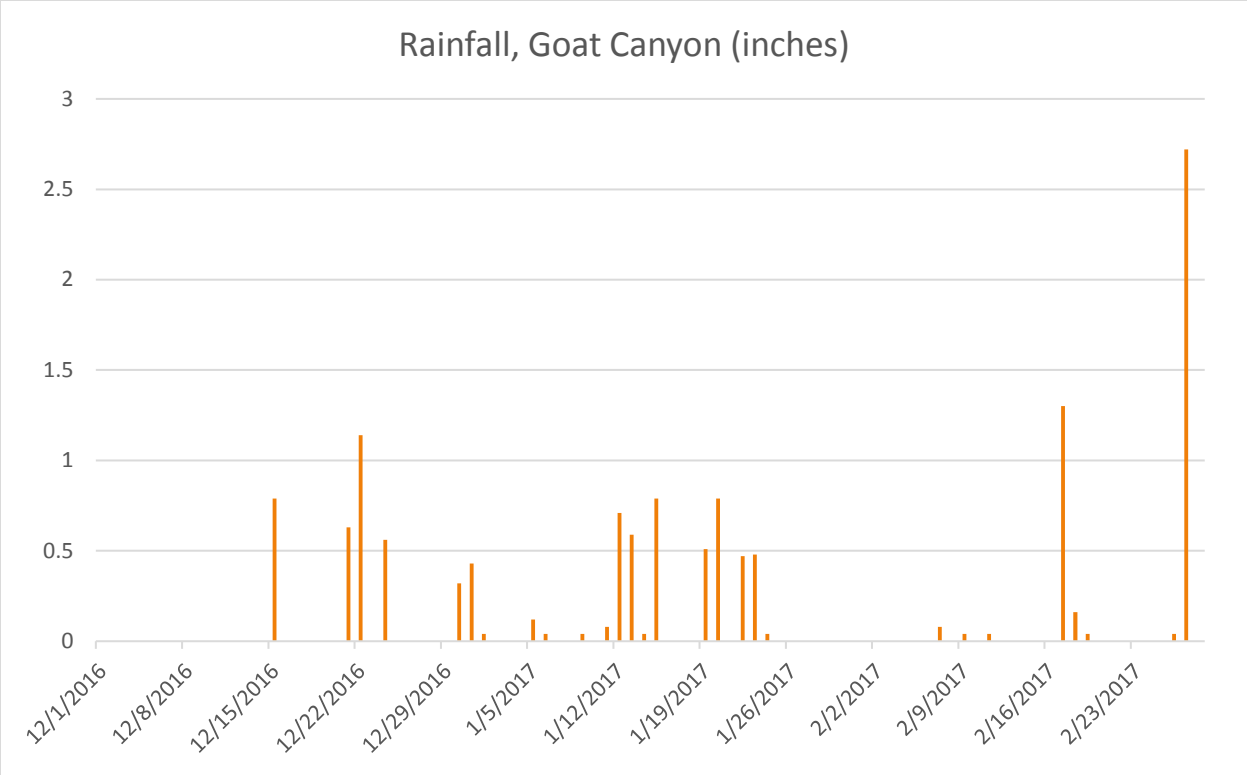


Figure 8 Rainfall data at Goat Canyon (inches)

Starting in mid-December, 2016, storm water flow saturated the area and a portion of the storm water flow entered the wastewater system causing wastewater system overflows in many areas, which flowed to the Tijuana River. Wastewater enters the sewer system through infiltration, and from manholes that are opened by people wanting to drain areas near their residences. CESPT identified seven areas in the wastewater collection system that sustained some degree of damage. Six were repaired and were operational and there had been no discharges of wastewater from these pipelines. The following table is a list of the six locations and the dates of occurrence.

Table 3 Damaged collectors January and February 2017

Description of the Problem	**Address**	**Neighborhood**	**District**	**Diameter**	**Date**	**Solution**
Collapse of Sanchez Taboada Collector 36”	Blvd. Sanchez Taboada Frente A Volks Wagen	Zona Rio	Paraiso	36”	01/20/2017	Repair of 20 linear meters
Collapse of Collector INV 18”	C. Senador Monzon Del La Col. Obrera	Obrera	Paraiso	18”	01/22/2017	Replacement of 175 linear meters

Collapse of 8" Line (caused by landslide on service road)	C. Estudiantes S/N	Madero Sur	Paraiso	8"	01/24/2017	Bypass Installed using flexible pipe and submersible pump
Gap in 8" line in La Sierra, due to landslide	Prolongacion Popocatepetl	La Sierra	Paraiso	8"	02/08/2017	150 linear meters of flexible 4" pipe were installed
Collapse of 18" diameter Collector Las Nieves	Ave. Paseo Pedregal, Secc. Terrazas de Mendoza, Playas de Tijuana	Playas de Tijuana	A. Esquer	18"	02/08/2017	Replacement of 275 linera meters (work in progress)
Collapse of Collector INV 18"	C. Caoba, Col. Jardin	Col. Jardin	A. Esquer	18"	02/16/2017	Replacement of 18.3 linear meters

For the seventh location, after the storm had stopped, around January 1, 2017, a sewer pipe that had cracked from the heavy rain flows, began to create a sinkhole that resulted in the collapse of a sidewalk and bus shelter. The size of the sinkhole and extent of nearby infrastructure damage suggest that a significant amount of wastewater had escaped from the pipe but the amount is unable to be quantified. The collector received additional flows due to the rain events causing a system that was constructed to operate via gravity to become pressurized. This caused the pipe to fail. Initial reports noted the collector name to be "Poniente", "Insurgentes", and "Oriente". To maintain consistency in this report, the collector will be called "Insurgentes/Oriente" since both lines join within this area. The *Insurgentes* and *Oriente* flow into the *Poniente* Collector.

January 2, 2017- Work to clear the area began shortly after with demolition of the pavement, testing to determine extent of damage, excavation, and then bypassing of flows to another collector until the section that collapsed could be operated as an open channel. CESPT personnel installed an inflatable plug, 24-48-inch diameter, to block flow from the *Insurgentes/Oriente* Collector and divert the wastewater flow to the old *Poniente* Collector or "Poniente Antiguo" in Spanish, located south of the Tijuana River. The goal was to eliminate 100% of the flows from the collector as a preventative measure and to avoid discharges into the Tijuana River due to the damage to the *Insurgentes/Oriente* Collector. The rest of the month was used to prepare for the repair that included preparing a contract to have the site and line repaired.

CESPT Standard Practices for managing emergency situations (such as collapses). This list is summarized from information provided by CESPT:

Emergency Situations

- Supervisor inspects the area to determine the extent of the damage;
- The proper authorities are notified (Civil Protection, Public Safety, Emergency [Management] and Municipal service agencies, etc.) using established channels (of communication), depending on the situation so that it may be properly evaluated, while simultaneously reporting the event internally according to established procedures, so that each entity can take the appropriate measures, in accordance with their jurisdiction and responsibilities;
- To not put at risk the well-being of the citizens and workers, restrict access to the affected site, by installing (plastic and/or concrete) barriers, safety barrels, caution tape, signage, and if near a roadway, placing a flashing arrow to detour traffic;
- Work to install bypass structures, that may consist of one or more coordinated measures, aimed at reducing flows to the site, in order to avoid, as much as possible, above-ground discharges, always trying as the first measure to divert it to a sanitary sewer structure, to prevent any impact to the environment;
- A preliminary survey is conducted to verify the degree of damage to the infrastructure and this is used to determine what heavy equipment, material, and personnel requirements are, to fix the problem, and what their availability is; in case any of these are not available, emergency arrangements are made for the purchase or rental [of equipment/services];
- Based on the geographic location of the affected area, a site is selected for the disposal of material that is contaminated with wastewater that is generated as part of the repairs;
- Work to replace the affected elements begins (pipes and/or system structures), according to established procedures and policy agreed to by the technical and executive departments, as appropriate for each case;
- Fill and compaction work is performed;
- Installed components are checked for water tightness [leakage tests], validating the success of the work. The affected line is placed back into service;
- Other elements that were affected during the repair are restored (roadways, public and/or private structures, etc.);
- Site control elements used to demarcate the work zone are removed and the site is cleaned;
- Notice is sent to the appropriate entities of completion of the work.

On February 1, 2017, CESPT personnel began the repair of the *Insurgentes/Oriente* collector, approximately 40 meters of 40-inch inch line, and 40 meters of 42-inch line. During this time, flow was bypassed from two 24-inch pipes; one into the Alamar River and one into the Tijuana River, just upstream of their confluence. These bypasses could have been made with pumping equipment to maintain the wastewater within the collection system, however CESPT lacked pumps of sufficient capacity to handle the flow. Repairs on the broken section of pipe concluded on February 4, 2017 and the bypasses were removed. The bypasses were estimated to total 300 lps or 7 million gallons per day (MGD) for an approximate total of up to 28 million gallons (MG) into the Tijuana River. Additional bypasses continued into the old *Poniente* Collector (about 300 lps) during this time as well. The *Insurgentes/Oriente* line was repaired using polyvinyl chloride (PVC) piping with a corrugated metal tube sheath to protect the PVC pipe inside.

All of the wastewater lines in the vicinity of the collapse convey flow to Pump Station No.1. Approximately half of the flow arriving at Pump Station No. 1 is conveyed to the South Bay International Wastewater Treatment Plant (SBIWTP), operated by the USIBWC in San Diego and the rest is pumped to San Antonio de los Buenos (SADLB) treatment plant in Mexico, located near the coast in southwestern Tijuana. The City of Imperial Beach noted at this point that if CESPT needs additional personnel and equipment during events such as this, the City of Imperial Beach can provide assistance when a request is made.

CESPT noted that they have prepared a proposal of emergency declaration to request assistance from the City of Tijuana and CONAGUA. CESPT does not currently have funds to address collector issues for the *Insurgentes/Oriente* collector as work on this is not scheduled to be funded until 2018. CESPT has ordered a set of two bypass pumps to allow manhole to manhole bypasses for future work. Each unit will be capable of pumping 150 lps and will cost 60 million pesos. Currently, CESPT has bypass equipment but only for smaller volumes. CEA as well, may be a source to provide pumping equipment for this purpose.

USIBWC noted that overflowing manholes during runoff events from rainfall can result in lower flow entering the sewer system for conveyance to Pump Station No. 1. During the last week in December, flows to the SBIWTP were significantly below average, and the USIBWC contractor at the SBIWTP received several requests from CESPT personnel at Pump Station No. 1 during this period to send more flow to Mexico as they were not receiving flow either. MXIBWC noted that it is difficult to determine the exact flow since it was not directly measured, that pumping operations at the Pump Station CILA and at Pump Station No. 1 are not exactly known and that some wastewater flow may have gone to the SADLB plant. Also, the above mentioned silt plugs diverted some wastewater out of the system.

The committee noted that from February 6, 2017 to February 17, 2017, the Tijuana River Valley in the U.S. experienced strong malodors. CESPT postulated that the odors may have come from the bypass water becoming trapped in the valley and remaining stagnant causing the odors to remain during that time, especially as the sun heats the water and surrounding surfaces. USIBWC noted that data collected in the Tijuana River at the Dairy Mart Road Bridge shows constant values of E. Coli contamination throughout the December 2016 through February 2017 period. The highest concentration of E. coli occurred on January 31, 2017, before the date CESPT indicated the spill began (when the high rainfall occurred). MXIBWC stated that the Tijuana River is not composed of only natural flow but also contains effluent discharges from the other treatment plants in Tijuana and flows from the city of Tecate. Some

wastewater from areas further south that do not have infrastructure could also be adding to the flow. These wastewater flows would normally be diverted from the Tijuana River by PB-CILA.

The Committee asked why there were different estimates for the volume of wastewater bypassed. EPA noted that the high value of 230 MG was based on a letter from CESPT stating that the initial collapse was on January 1, 2017, however, that figure was not confirmed and should not have been released by EPA. The 28 MG figure was based on a 4 day release of seven MG, the 143 MG was based on a longer duration.

The committee asked about the late notification of the bypass. CESPT noted that they should have notified MXIBWC so they in turn could notify the USIBWC but their focus was on dealing with the broken lines, the stoppages, repairs, and did not provide notification until they had completed addressing the infrastructure issues from the storm events. CESPT noted that notifications to MXIBWC will occur timely in the future. USIBWC noted that under the permit for the SBIWTP, they are required to notify the San Diego Water Board of wastewater spills.

Under Minute 320, the Water Quality Work Group is exploring issues of water quality contamination in the Tijuana River to determine and support solutions to protect human health and the environment. MXIBWC noted that this situation has opened their eyes to other important issues like odor, Tecate runoff and the need for more participants in the work groups. USIBWC requested a map showing the major collectors, pump stations, and treatment plants to better understand where and how the region's wastewater is conveyed, pumped, and treated.

CESPT noted that they have a 2012 master plan for infrastructure improvements however it needs to be updated as Tijuana has grown significantly. A CESPT consultant will provide the updated 2012 plan with actions and a schedule. CESPT is working with CONAGUA and the governor of Baja California to financially assist in replacing some of the wastewater lines. The following are a location map and two tables showing the immediate needs and near term needs for Tijuana sewerage:

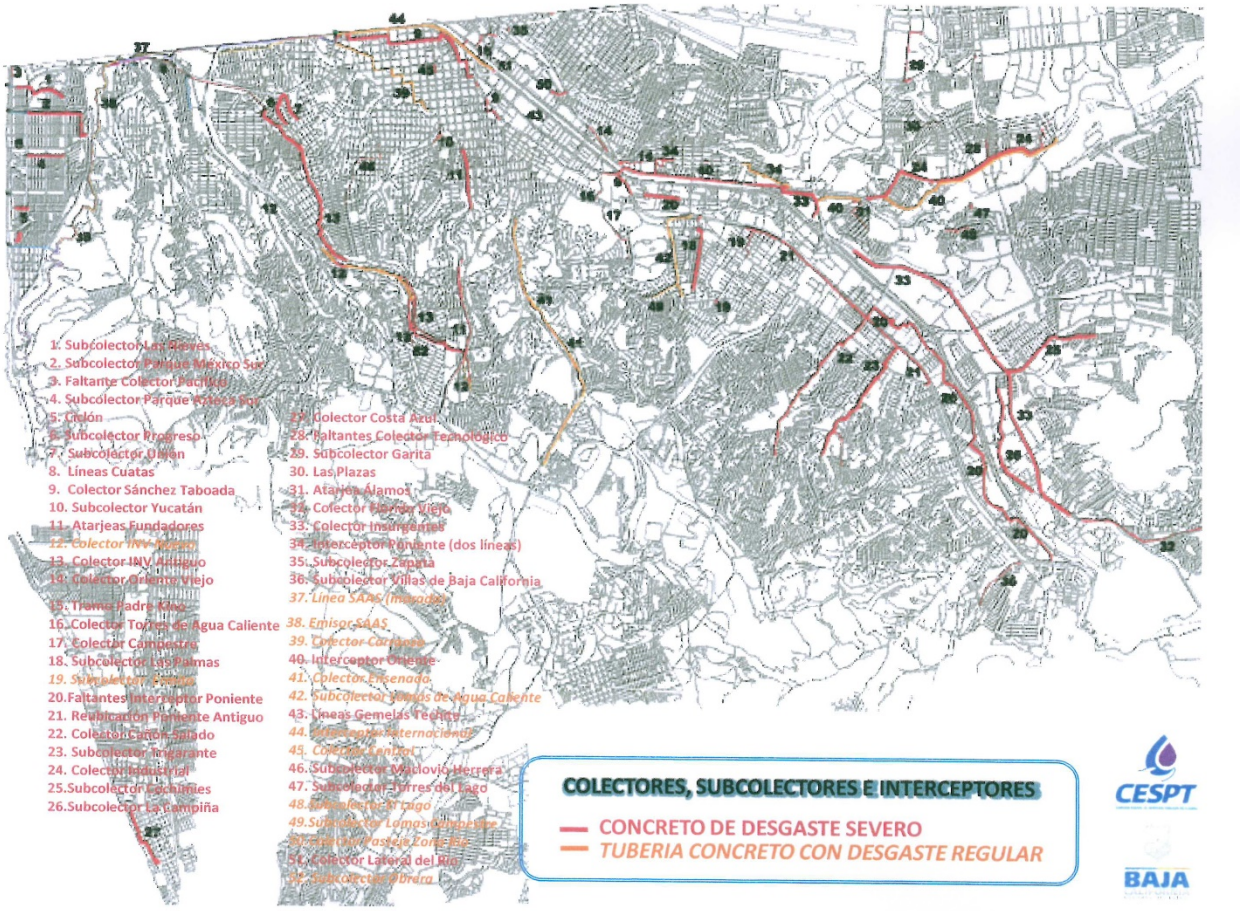


Figure 9 Location map of critical collectors

Table 4 Collectors in critical phase (immediate rehab required)

	Collectors and Subcollectors in Critical Status (currently collapsed)				
Map #	**Name**	**Year of Construction**	**Diameter (cm)**	**Length Required (m)**	**Cost, Index Price (pesos)**
33	Insurgentes	1992	152,107	1,920	**30,000,000**
12	INV Nuevo	1990	45,38	1,477	**10,800,000**
21	Poniente Antiguo	1969	61	955	**7,800,000**
53	San Martin-Canon del Sainz	2005	30,76	913	**3,500,000**
				Total	**52,100,000**

Table 5 Collectors in critical phase (near term rehab required)

	Concrete Collectors in Critical Status (could collapse again at any time)				
Map #	**Name**	**Year of Construction**	**Diameter (cm)**	**Length Required (m)**	**Cost, Index Price (pesos)**
20	Interceptor Poniente(tramos faltantes)	1991	107,91,76,45,38	5,834	125,180,138
9	Sanchez Taboada (tramos faltantes)	1976	107,91,76,30	189	4,055,373
33	Insurgentes (tramos faltantes)	1992	122,107,91,76,61	4,622	85,793,400
12	INV Nuevo	1990	53,45,38,30	3,021	24,311,388
21	Poniente Antiguo	1976	45,38	2,576	14,853,504
34	Oriente (Buena Vista)	1982	107	1,751	24,645,325
24	Industrial	1982	76,61,45	3,739	28,229,450
13	INV Viejo	1990	30,38,45,61	5,938	41,566,000
40	Colector Oriente	1992	122,107,91	6,946	24,263,000
35	Zapata (tramos faltantes)	1990	30	102	357,000
15	Padre Kino (aportacion local)	1976	61	167	1,169,000
16	Torres de Agua Caliente	1976	45	530	3,408,960
51	Lateral Zona Rio	1969	61	6	42,000
14	Oriente Viejo	1976	30	1,706	4,978,108
25	Cochimies	1988	45,38	3145	20,228,640
22	Rosario Salado	1988	45	3251	20,910,432
17	Campestre	1960	38	1302	8,853,600
1	De las Nieves (tramos faltantes)	1975	45,30	545	1,284,565
26	La Campina	1990	45	1862	11,976,384
23	Trigarante	1990	45,30	3284	21,122,688
18	Las Palmas	1977	30	1386	4,044,348
2	Parque Mexico Sur	1975	30	1554	4,534,572
4	Parque Azteca Sur	1975	38,30	715	4,862,000
6	Progreso	1970	25	670	1,955,060
7	Union	1970	20	542	964,760
10	Yucatan	1970	20	307	546,460
32	Florido	1989	76,61,53	2478	18,708,900
28	Tecnologico	1982	61	364	2,548,000
31	Alamos	1980	20	945	1,682,100
11	Fundadores	1989	25	5454	15,914,772
46	Maclovio Herrera	1970	25	1634	4,768,012

47	Torres del Lago	1981	30	125	375,000
3	Pacifico	1989	61	195	1,365,000
29	Garita	1993	30	1136	7,263,584
30	Plazas	1992	25	349	1,018,382
				Total	**537,779,905**

Photographs displayed during the March 9, 2017 meeting at CESPT offices are shown below:


CESPT
Oportunidad
ES BC
BAJACALIFORNIA
Colapso
Interceptor Oriente


CESPT
Oportunidad
ES BC
BAJACALIFORNIA
Colapso Interceptor Oriente


CESPT
Oportunidad
ES BC
BAJACALIFORNIA
Colapso
Interceptor Oriente


CESPT
Oportunidad
ES BC
BAJACALIFORNIA
Colapso Interceptor Oriente

VISIT TO INSURGENTES/ORIENTE COLLECTOR BREAK

Many of the meeting participants went to the site of where the sinkhole had formed due to the collector break. The site was covered and the bus stop that had fallen in to the sinkhole had been replaced. CESPT showed everyone where the break had occurred and where the bypass had sent water to the *Poniente* collector which runs along the north side of the Rio Alamar. CESPT noted that at that location there is a 40-inch line and a 42-inch line connecting to the junction box that sends the combined flow down a 60-inch line. The area downstream of the junction box has also collapsed and this 60-inch line will need to be repaired in the upcoming dry season. Below is a photo of that area.

Figure 10 Additional damage along roadway due to collector collapse downstream of junction box- Blvd Lazaro Cardenas, Colonia Los Pirules, Tijuana, B.C. - March 9, 2017

Figure 11 Final repairs to road and bus stop and location of Insurgentes/Oriente collector repair- - Blvd Lazaro Cardenas, Colonia Los Pirules, Tijuana, B.C. - March 9, 2017

During the site visit, USIBWC asked CESPT if there were any bypasses or discharges from breaks in the sewer lines or overflows from manholes occurring at that time and CESPT stated that there were none.

Summary

A wastewater collector, *Insurgentes/Oriente* collector, collapsed on January 1, 2017 due to heavy storms and flows entering the collection system. A sinkhole formed and caused damage to the roadway, Lazaro Cardenas, and a bus shelter. Efforts to contain and control the spill were made during that month that included blocking the line, excavation, and bypassing flows into other parts of the system. Uncontrolled flows, such as sanitary sewer overflows, and blockages also sent wastewater into the storm drains and into the Tijuana River. Repairs to the line were conducted February 1 through February 4, 2017. Due to lack of pumping equipment, a portion of the flow, 300 lps, was bypassed into the Tijuana and Alamar Rivers.

Initial estimates of wastewater reported entering the Tijuana River and flowing into the U.S. were between 143 to 230 MG. Information provided by CESPT and data collected by IBWC indicates that during the repair (February 1 through February 4, 2017), approximately 28 MG was bypassed into the Tijuana River and Alamar River. Flow records from the SBIWTP, bacteria data from IBWC, and data from CESPT indicate that wastewater, approximately 256 MG, was not pumped to the SBIWTP during the months of January and February 2017.

It is difficult to determine the exact flow since it was not directly measured. The only measurement of flow in the entire watershed is at the Tijuana River gage, and this flow is the summation of all flows from all sources. It is difficult to determine individual flows and all point sources, as well as the source of the strong odors that were noted in the river valley in the U.S. on February 6 through February 17, 2017 period.

RECOMMENDATIONS

The Minute 320 Water Quality Work Group believes there are specific areas of concern that were highlighted because of this event:

1. **Equipment needed to address emergency situations.**
    a. This spill highlighted the need for CESPT to have the appropriate equipment to divert and route flows within the collection system and not bypass into the river. CESPT reported that a request has been made to CONAGUA for the purchase of pumping equipment in order to be able to manage a spill of this magnitude and avoid bypasses into the Tijuana River.
    b. CESPT should report to the binational work group once the equipment has been acquired.
    c. Identify other entities or equipment that could be used.
        i. The City of Imperial Beach offered equipment that could have been used.
        ii. CEA as well, may be a source to provide pumping equipment for this purpose.
        iii. Develop an inventory list and contact information in case this type of event occurs again.
    d. Additional metering of flows and sampling and testing of river flows in Mexico and the United States at select locations. The USIBWC is installing a new meter at Pump Station 1 and one at Pump Station CILA to quantify volumes pumped. The meter at Pump

Station CILA will be equipped with an automatic notification process, in the event of shut down or start up, that will be sent via email.

2. CESPT Emergency Process
    a. The CESPT emergency protocol states that flows will be bypassed in a manner that would not cause impacts to the environment. This event was not administered according to the protocol of protecting the environment.
    b. The emergency protocol should be updated to include notification to the U.S. stakeholders should the event flow into the Tijuana or Alamar Rivers, which are transboundary in nature and could pose environmental or health problems in the U.S. Agencies in the U.S. may be available to help in the response.

3. **Communication**. Another area of concern that this situation raised is the lack of communication between the governmental agencies in Mexico and the U.S., as well as a lack of timely notification of the public in both countries when a situation like this occurs. A suggested binational protocol for notification in the case of spills to the Tijuana River that should be vetted through the Water Quality Workgroup under Minute 320 is as follows:
    a. MXIBWC advises USIBWC immediately when they have knowledge of a spill of wastewater to the rivers in Mexico. Information should include point of contact, phone numbers, date of occurrence, location, flowrates, type of break, collector information (diameter, extent of damage), estimated time to repair, and if assistance is needed, as long as the information is available.
    b. USIBWC immediately advises through a listserv that a wastewater spill has occurred and requests specific data from Mexico to file a wastewater spill report in accordance with the USIBWC's National Pollution Discharge Elimination System (NPDES) permit for the SBIWTP.
    c. In the event that the U.S. side becomes aware of significant wastewater contamination in the river through resident reports, or when E. coli testing confirms levels above 1,000 MPN/100 ml, (This value has been previously agreed to by both countries under Minute 270), the USIBWC will notify U.S. entities through listserv and request MXIBWC to investigate. MXIBWC will acknowledge within eight hours and make inquiry of CESPT. If no response is obtained from CESPT within 24 hours of official notification by the U.S., then IBWC personnel from both Sections will begin river inspection to locate the source of the contamination. Once the source has been located, MXIBWC will request that CESPT correct the problem. USIBWC will notify California Office of Emergency Services and file a spill report with the San Diego Water Board.
4. **Infrastructure Assessment**
    a. Request Mexico/CESPT to update the plan for addressing aging infrastructure in Tijuana. This assessment should be shared with the binational working group for water quality under Minute 320.
    b. Investigate the possibility of providing additional infrastructure on the U.S. side to handle contaminated flows crossing the border in the Tijuana River.
5. **Data collection**

a. Determine a baseline condition for water quality in the Tijuana River through additional water quality monitoring in the Tijuana River via an ambient water quality monitoring program or a special study in both the U.S. and Mexico

The following existing agreements recommended by the Minute 320 Binational Water Quality Workgroup are being implemented.

Exchange of wastewater treatment plant data

Development of a written protocol for operation and maintenance of Pump Station CILA.

Flow meter installation for Pump Station CILA to enable real time flow information and notification of on/off status via email.

Quarterly meetings and inspections of river and drains in Mexico by IBWC personnel.

APPENDIX A- CESPT- INVESTIGATION OF THE COLLAPSE OF THE ORIENTE COLLECTOR AND DISCHARGE OF WASTEWATER INTO THE TIJUANA RIVER

Comisión Estatal de Servicios Públicos de Tijuana

Reunión CILA

"Investigación respecto al colapso del Colector Oriente y Descarga de Aguas Residuales al Rio Tijuana".,
09 Marzo 2017

1. Antecedentes del Colapso (eventos de lluvia)

- El colapso se presentó en el colector donde la tubería tiene un diámetro de 60" el día 01 de enero del 2017, presentándose un hundimiento en aproximadamente 35 mts. de longitud.
- Con las aportaciones extraordinarias que recibió el colector y considerando la tubería se encontraba trabajando a gravedad, al presurizarse por la cantidad de agua en exceso que normalmente corre por este colector, se presentó dicho colapso.
- A partir del día 1ro de enero se inicia con los trabajos. Primero con demolición de pavimentos, excavaciones, sondeos, desvíos (by pass); hasta dejar trabajando la línea como canal.
- Todo el mes de enero se utilizó para habilitar los trabajos antes descritos y para elaborar el proyecto correspondiente para la contratación de un contratista que iniciara con los trabajos de reparación.
- A partir del día 01 al 04 de febrero, se inició con los trabajos de colocación de tubería, viéndose en la necesidad de proceder a hacer desvíos al sistema pluvial para que permitiera hacer la maniobra.
- A partir del día 05 de febrero se continúa con los trabajos de colado de estructuras, rellenos y reposición de pavimento, concluyendo los trabajos el día 25 de febrero del 2017.

Dentro de los diversos programas implementados por CESPT para garantizar el servicio, nos vemos en la necesidad de consultar la previsión climatológica para nuestra región, así también como sus datos históricos. Una página que siempre nos ha funcionado que se encuentra disponible en línea y en forma gratuita es www.wunderground.com, en la siguiente tabla se presentan los reportes precipitaciones registradas para la región de Tijuana de la página wunderground (resultante de un promedio de varias estaciones climatológicas disponible por día, por mes o por año) y de dos estaciones climáticas operadas por CONAGUA (Carrizo y Florido).

MES	DIA	WUNDERGROUND*	CONAGUA RODRIGUEZ*	CONAGUA CARRIZO*
ENERO	1			
	2			
	3			
	4			
	5	30.48		
	6		2.90	4.50
	7			
	8			
	9	52.07		
	10		0.20	
	11	1.27	1.00	
	12	119.13	0.10	1.90
	13		17.80	11.80
	14		1.00	8.20
	15			
	16			
	17			
	18			
	19	62.23	2.00	0.70
	20	129.54	14.10	7.70
	21		29.30	29.50
	22	6.35	0.30	5.10
	23	82.55	12.20	6.80
	24	8.89	17.70	17.30
	25		7.00	8.50
	26			
	27			
	28			
	29			
	30			
	31			
	DIA SIGUIENTE		0	0
PROMEDIO		15.89	3.41	3.29
TOTAL		492.51	105.60	102.00

*Las unidades están en mm de precipitación.
*Los Espacios en blanco no hay registro de lluvia

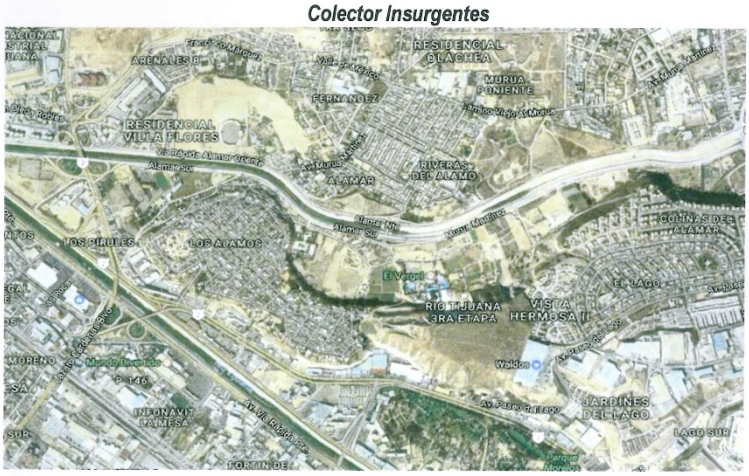
MES	DIA	WUNDERGROUND*	CONAGUA RODRIGUEZ*	CONAGUA CARRIZO*
FEBRERO	1			
	2			
	3			
	4			
	5			
	6			
	7	8.89		5.50
	8			4.20
	9			
	10			
	11	3.81		
	12			1.10
	13			
	14			
	15			
	16			
	17	109.22		
	18		41.10	24.10
	19	10.16	4.30	6.60
	20		0.30	0.80
	21			
	22			
	23			
	24			
	25			
	26	6.35		
	27	147.32	7.80	4.60
	28		59.20	42.20
	DIA SIGUIENTE		0	0
PROMEDIO		10.21	4.03	3.18
TOTAL		**285.75**	**112.70**	**89.10**

*Las unidades están en mm de precipitación.
*Los Espacios en blanco no hay registro de lluvia

- ***Como se puede observar las diferencias de los registros de precipitaciones entre la página de internet y los datos de CONAGUA es debido a:***
  - ***CONAGUA, solo tiene dos estaciones de monitoreo (Rodriguez y Carrizo)***
  - ***Wunderground, se deriva de varias estaciones las cuales están distribuidas en la cuenca hidrológica de Tijuana y San Diego.***

- ***Detalle de los desvíos de flujos – by pass***
-

Colector Insurgentes



SIMBOLOGIA:

COLAPSO EN COLECTOR INSURGENTES

DESVIOS TEMPORALES A PLUVIALES

***LA INSTALACION DE LOS TAPONES INFLABLES PARA DESVIO SE HACE DURANTE LA NOCHE Y/O MADRUGADA POR FACILIDAD DEBIDO A LAS APORTACIONES MINIMAS NOCTURNAS.**

DISTRITO PARAISO | 02 DE ENERO DEL 2017

COL LA MESA
BOULEVARD FEDERICO BENITEZ

DESVIOS AL COLECTOR PONIENTE

N

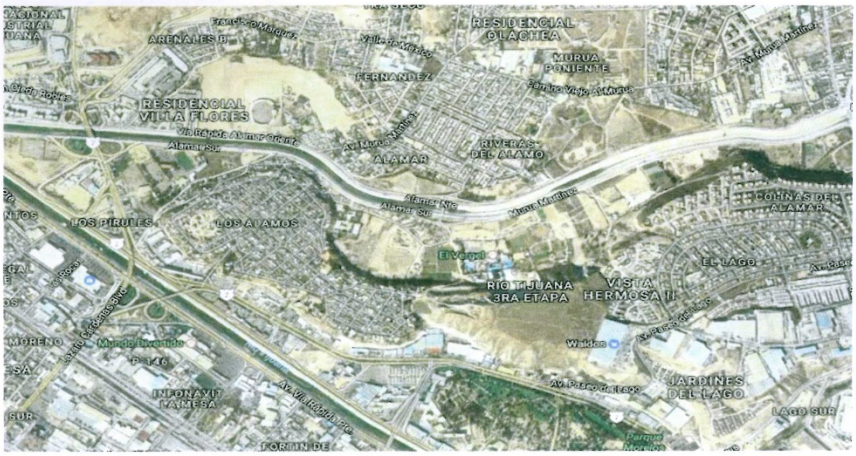
EL DIA 02 DE ENERO DEL 2017, SE TRABAJO EN LA INSTALACION DE UN TAPON INFLABLE DE 24'-48" DE DIAMETRO EN LA CAJA DERIVADORA DEL COLECTOR PONIENTE UBICADA SOBRE EL BOULEVARD FEDERICO BENITEZ ESQUINA CON EL BOULEVARD LAZARO CARDENAS, DE LA COL. LA MESA, EL CUAL SE REALIZO CON EL OBJETO DE ELIMINAR EL 100% DE LAS APORTACIONES CONDUCIDAS A TRAVES DEL COLECTOR PONIENTE HACIA EL COLECTOR ORIENTE. LO ANTERIOR COMO MEDIDA PREVENTIVA Y PARA EVITAR DERRAMES DE AGUAS NEGRAS HACIA LA CANALIZACION DEL RIO TIJUANA, ORIGINADAS POR EL APARENTE COLAPSO DE UN TRAMO DEL COLECTOR ORIENTE DE 60 PULGADAS DE DIAMETRO.

DISTRITO JUAN OJEDA | **17 DE ENERO DEL 2017** | **COL ALAMAR BLVD. LAZARO CARDENAS**

DESVIOS DE FLUJO BY-PASS PVC 6"

EL 17 DE ENERO, COMO PARTE DE LOS TRABAHJOS PRELIMINARES A LA REPOSICION DE LA TUBERIA COLAPSADA DEL COLECTOR INSURGENTES, SE INSTALO BY-PASS DE PCV DE 6" PARA ENCAUZAR EL FLUJO REMANENTE HACIA EL INTERCEPTOR ORIENTE

- ***Equipo o medidas empleadas para captura y manejo de flujos durante la reparación, para evitar descargas***



SIMBOLOGIA

COLAPSO EN COLECTOR INSURGENTES DE 60"

DESVIO PREVENTIVO A COLECTORES

***LA INSTALACION DE LOS TAPONES INFLABLES PARA DESVIO SE HACE DURANTE LA NOCHE Y/O MADRUGADA POR FACILIDAD DEBIDO A LAS APORTACIONES MINIMAS NOCTURNAS.**

DISTRITO PARAISO | 02 DE ENERO DEL 2017 | **COL LA MESA** BOULEVARD FEDERICO BENITEZ

DESVIOS AL COLECTOR PONIENTE

N

EL DIA 02 DE ENERO DEL 2017, SE TRABAJO EN LA INSTALACION DE UN TAPON INFLABLE DE 24'-48" DE DIAMETRO EN LA CAJA DERIVADORA DEL COLECTOR PONIENTE UBICADA SOBRE EL BOULEVARD FEDERICO BENITEZ ESQUINA CON EL BOULEVARD LAZARO CARDENAS, DE LA COL. LA MESA, EL CUAL SE REALIZO CON EL OBJETO DE ELIMINAR EL 100% DE LAS APORTACIONES CONDUCIDAS A TRAVES DEL COLECTOR PONIENTE HACIA EL COLECTOR ORIENTE. LO ANTERIOR COMO MEDIDA PREVENTIVA Y PARA EVITAR DERRAMES DE AGUAS NEGRAS HACIA LA CANALIZACION DEL RIO TIJUANA, ORIGINADAS POR EL APARENTE COLAPSO DE UN TRAMO DEL COLECTOR ORIENTE DE 60 PULGADAS DE DIAMETRO.

BAJA CALIFORNIA

50 Aniversario CESPT

DISTRITO JUAN OJEDA | 17 DE ENERO DEL 2017 | COL ALAMAR BLVD. LAZARO CARDENAS

DESVIOS DE FLUJO BY-PASS PVC 6"

EL 17 DE ENERO, COMO PARTE DE LOS TRABAHJOS PRELIMINARES A LA REPOSICION DE LA TUBERIA COLAPSADA DEL COLECTOR INSURGENTES, SE INSTALO BY-PASS DE PCV DE 6" PARA ENCAUZAR EL FLUJO REMANENTE HACIA EL INTERCEPTOR ORIENTE

- *Prácticas comunes (estándar) durante manejo de las situaciones de emergencia (tal como colapsos) vs reparaciones de rutina*

Existe un protocolo distinto para la atención de situaciones de emergencia en comparación con los trabajos programados, ya que estas últimas obedecen a las necesidades propias del sistema, las cuales se priorizan para su ejecución en base a un programa de reposición preestablecido. Dichos procedimientos se detallan a continuación:

Situaciones de emergencia

- Se realiza una inspección al lugar por parte de un supervisor, el cual evaluará el grado de afectación.
- Se da aviso a las autoridades correspondientes (Protección civil, Seguridad Pública, Emergencias, Municipio, Empresa de Servicios, etc.) mediante los canales establecidos, según sea el caso para su correcta evaluación y paralelamente se notifica dentro del Organismo de la situación, respetando la estructura orgánica, para que los distintos actores tomen las previsiones correspondientes que se tengan a lugar, de acuerdo a las competencias y responsabilidades de cada uno de ellos.
- Tomando como premisa el no poner en riesgo la integridad de los ciudadanos y la de los trabajadores, se restringe el acceso al lugar afectado, instalando barreras delimitadoras (plásticas y/o concreto), trafitambos, cinta de precaución, postes de señalamiento, y en caso de ser una vialidad se instala una flecha luminosa para el desvío del tráfico vehicular.
- Se trabaja en la habilitación de obras de desvío, las cuales pueden consistir en una o varias medidas coordinadas, encaminadas a la disminución de las aportaciones al sitio afectado, buscando eliminar en la medida de las posibilidades los derrames a cielo abierto, siempre buscando encauzarla en primer instancia a una instalación sanitaria, evitando con ello el impacto al medio ambiente.
- Se procede a realizar un sondeo preliminar para verificar el grado de afectación de la infraestructura y con ello se determinan los requerimientos en cuanto a maquinaria, materiales y personal a requerirse para la correcta solución del problema, así como la verificación de su disponibilidad; en caso de no contarse con alguno de ellos, se realizan las gestiones necesarias para la adquisición y/o renta con carácter de urgente.
- De acuerdo a la ubicación geográfica de la zona afectada, se determina un punto para la disposición de los materiales contaminados con las aguas negras, que se generen como parte de los trabajos.
- Se inicia con los trabajos de reposición de los elementos afectados (tubería y/o estructuras complementarias del sistema), de acuerdo a los procedimientos establecidos y la estrategia consensada con las áreas ejecutoras y técnicas, propias en cada uno de los casos.
- Se trabaja en los rellenos y compactaciones de la plaza abierta.
- Se verifica la hermeticidad de los componentes instalados, validando el éxito de los trabajos. Se pone de nueva cuenta en operación la línea afectada.
- Se procede a la reposición de los elementos afectados durante los trabajos de reparación (vialidades, estructuras de dominio público y/o privada, etc.)
- Se retiran los elementos de apoyo instalados para la delimitación de la zona de trabajo y se hace limpieza de lugar.
- Se notifica a las áreas correspondientes de la conclusión de los trabajos.

Trabajos Ordinarios

- De acuerdo al programa de reposiciones y rehabilitaciones de infraestructura sanitaria, y en base a un proyecto ejecutivo donde se incluyen los alcances del mismo, se realiza una inspección al lugar por parte del área ejecutora en coordinación con el área operativa, para la logística de la ejecución de los trabajos.
- Se tramitan los permisos correspondientes ante las autoridades pertinentes para la ejecución de la obra, donde se incluye un programa de obra, detallando los tiempos y alcances de la obra a ejecutarse, así como los actores que intervendrán para llevar el proyecto a buen término.
- Se prevé la disponibilidad de los requerimientos necesarios (maquinaria, materiales y personal) para la correcta ejecución de la obra, así como la verificación de su disponibilidad. En caso de no contarse con alguno de ellos, se realizan las gestiones necesarias para la adquisición y/o renta de los mismos, para estar en condiciones de iniciar la obra.
- De acuerdo a la ubicación geográfica del lugar de trabajo, se determina un punto para la disposición de los materiales contaminados con las aguas negras, que se generen como parte de los trabajos a realizarse.
- Al inicio de la obra se da aviso a las autoridades correspondientes mediante los canales establecidos y paralelamente se notifica dentro del Organismo, respetando la estructura orgánica, para que los distintos actores tomen las previsiones correspondientes, de acuerdo a las competencias y responsabilidades de cada uno de ellos.
- Tomando como premisa el no poner en riesgo la integridad de los ciudadanos y la de los trabajadores, se restringe el acceso al lugar afectado, instalando barreras delimitadoras (plásticas y/o concreto), trafitambos, cinta de precaución, postes de señalamiento, y en caso de ser una vialidad se instala una flecha luminosa para el desvío del tráfico vehicular.
- Se trabaja en la habilitación de obras de desvío, las cuales pueden consistir en una o varias medidas coordinadas, encaminadas a la disminución de las aportaciones al sitio afectado, buscando eliminar en la medida de las posibilidades los derrames a cielo abierto, siempre buscando encauzarla en primer instancia a una instalación sanitaria, evitando con ello el impacto al medio ambiente.
- Se inicia con los trabajos de reposición de los elementos a rehabilitarse (tubería y/o estructuras complementarias del sistema), de acuerdo a los procedimientos establecidos y la estrategia consensada con las áreas ejecutoras y técnicas, propias de cada uno de los casos.
- Se trabaja en los rellenos y compactaciones de la plaza abierta.
- Se verifica la hermeticidad de los componentes instalados, validando el éxito de los trabajos. Se pone de nueva cuenta en operación la línea repuesta.
- Se procede a la reposición de los elementos afectados durante los trabajos de reparación (vialidades, estructuras de dominio público y/o privada, etc.)
- Se retiran los elementos de apoyo instalados para la delimitación de la zona de trabajo y se hace limpieza de lugar.
- Se notifica a las áreas correspondientes de la conclusión de los trabajos.

- ***Fue un evento aislado o existieron manifestaciones previas al colapso***

Este fue un evento extraordinario, generado por la saturación del colector con agua de lluvia, debido principalmente a las tormentas atípicas en la zona, lo que provocó que la tubería de concreto (ya con vida útil avanzada) trabajara a presión, lo cual dañó en los costados. La tubería fallada tendió a compactarse, reduciendo su área hidráulica e iniciando el arrastre de sólidos del relleno.

- ***Otros problemas conocidos del sistema de alcantarillado que se hayan presentado durante Ene y Feb del 2017***

DESCRIPCION DEL PROBLEMA	DIRECCION	COLONIA	DISTRITO	DIAM.	FECHA	SOLUCION
COLAPSO DE COLECTOR SANCHEZ TABOADA DE 36"	BLVD. SANCHEZ TABOADA FRENTE A VOLKS WAGEN	ZONA RIO	PARAISO	36"	20/01/2017	REPARACION DE 20 M.L.
COLAPSO DE COLECTOR INV DE 18"	C. SENADOR MONZON DE LA COL. OBRERA	OBRERA	PARAISO	18"	22/01/2017	REPOSICION DE 175 M.L.
COLAPSO DE ATARJEA DE 8" (PROVOCADO POR DESLAVE DE TALUD EN CALLEJON DE SERVICIO	C. ESTUDIANTES S/N	MADERO SUR	PARAISO	8"	24/01/201	SE REALIZO BY-PASS CON MANGUERA FLEXIBLE Y BOMBA SUMERGIBLE
DESFASE DE ATARJEA DE 8" EN FRACC. LA SIERRA , POR DESLAVE DE TALUD	PROLONGACION POPOCATEPETL	LA SIERRA	PARAISO	8"	08/02/2017	SE INSTALARON 150 MTS DE TUBERIA FLEXIBLE DE 4"
COLPASO DE COLECTOR DE 18" DE DIAMETRO , LAS NIEVES	AVE. PASEO PEDREGAL , SECC. TERRAZAS DE MENDOZA, PLAYAS DE TIJUANA	PLAYAS DE TIJUANA	A. ESQUER	18"	08/02/2017	REPOSION DE 275 M.L. (OBRA EN PROCESO)
COLAPSO DE COLECTOR INV 18"	C. CAOBA, COL. JARDIN	COL. JARDIN	A. ESQUER	18"	16/02/2017	REPOSICION DE 18.3 M.L.

- **Resumen de los flujos encauzados hacia la PITAR y San Antonio de los Buenos "Punta Bandera" correspondientes al mes de Enero y Febrero 2017.**

Punta Bandera	PROG m^3	REAL m^3
	4,274,718	4,059,004

PITAR	PROG m^3	REAL m^3
	5,793,420	5,032,555

- **Entrega de información relevante: ubicación del sitio donde se originó el evento.**

UBICACIÓN DEL SITIO CON COORDENADAS.

UBICACION DEL SITIO DONDE SE ORIGINO EL COLAPSO COORDENADAS X=503' 583 Y= 3, 597 ,321

REPORTE FOTOGRAFICO

ANTES DEL INICIO DE LA OBRA

DURANTE LA OBRA






OBRA TERMINADA

2. **Descripción general del sistema de captación, conducción/alejamiento y tratamiento de aguas residuales de Cd. Tijuana B.C. Situación que guardan los otros colectores y riesgos principales de futuros derrames.**

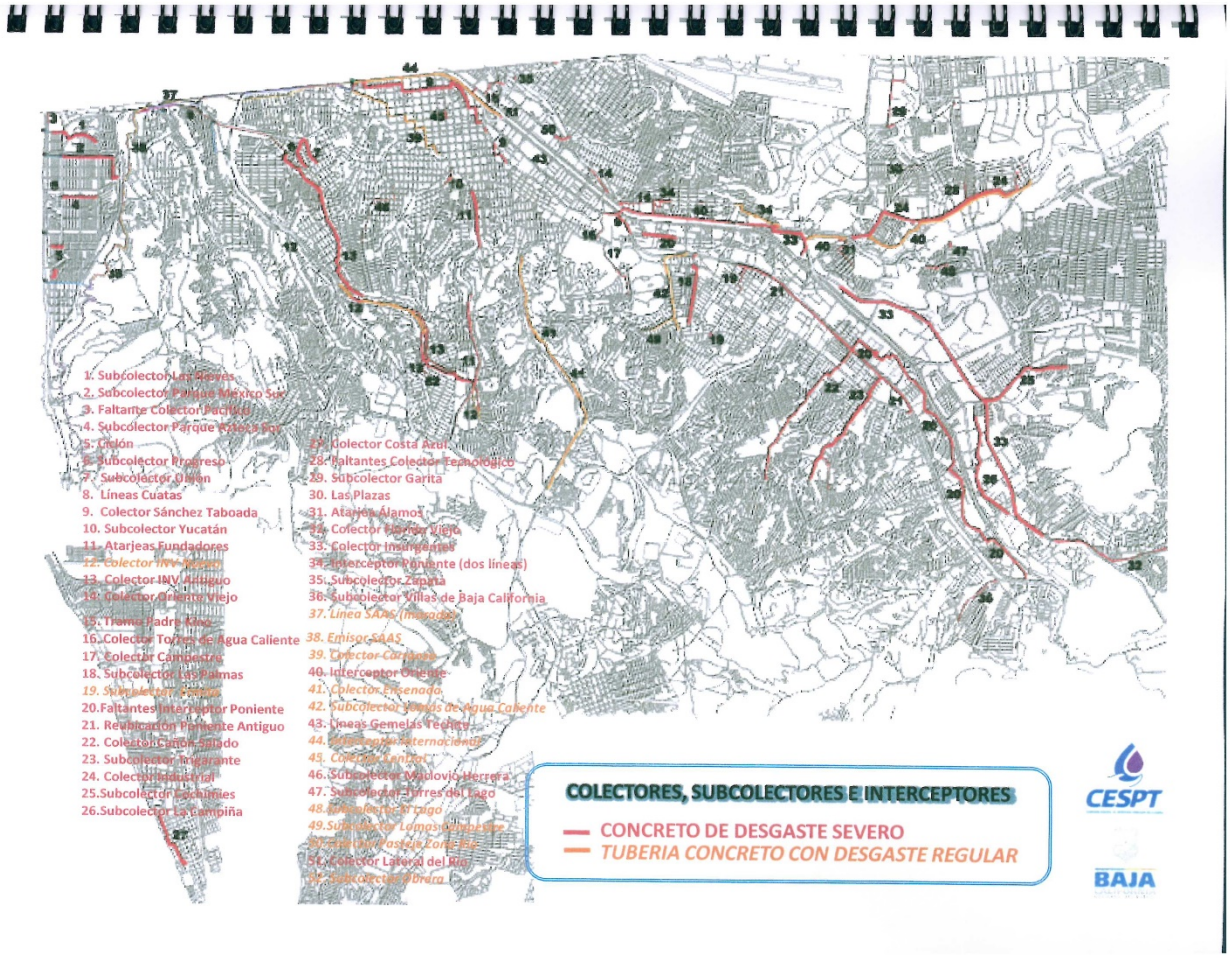
COLECTORES Y SUBCOLECTORES

	1. Colectores y Subcolectores en Fase Crítica (actualmente colapsado)				
# plano	Nombre	Año Construcción	Diámetros (cm)	Longitud Requerida (m)	Costo (precio indice)
33	Insurgentes	1992	152,107	1,920	**30,000,000**
12	INV Nuevo	1990	45,38	1,477	**10,800,000**
21	Poniente Antiguo	1969	61	955	**7,800,000**
53	San Martín-Cañón del Sainz	2005	30,76	913	**3,500,000**
				Sub Total 1	**52,100,000**

	2. Colectores de Concreto en Fase Crítica (Reincidencia de colapso en cualquier momento)				
# plano	Nombre	Año Construcción	Diámetros (cm)	Longitud Requerida (m)	Costo (precio indice)
20	Interceptor Poniente (tramos faltantes)	1991	107,91,76,45,38	5,834	125,180,138
9	Sánchez Taboada (tramos faltantes)	1976	107,91,76,30	189	4,055,373
33	Insurgentes (tramos faltantes)	1992	122,107,91,76,61	4,622	85,793,400
12	INV Nuevo	1990	53, 45,38, 30	3,021	24,311,388
21	Poniente Antiguo	1976	45, 38	2,567	14,853,504
34	Oriente (Buena Vista)	1982	107	1,751	24,645,325
24	Industrial	1982	76,61,45	3,739	28,229,450
13	INV viejo	1990	30,38,45,61	5,938	41,566,000
40	Colector Oriente	1992	122,107,91	6,946	24,263,000
35	Zapata (tramos faltantes)	1990	30	102	357,000
15	Padre Kino (aportación local)	1976	61	167	1,169,000
16	Torres de Agua Caliente	1976	45	530	3,408,960
51	Lateral Zona Río	1969	61	6	42,000
14	Oriente Viejo	1976	30	1,706	4,978,108
				Sub Total 2	382,852,646

	3. Subcolectores de concreto en Fase Crítica (Reincidencia de colapso en cualquier momento)				
# plano	Nombre	Año Construcción	Diámetros (cm)	Longitud Requerida (m)	Costo (precio indice)
25	Cochimies	1988	45,38	3145	20,228,640
22	Rosario Salado	1988	45	3251	20,910,432
17	Campestre	1960	38	1302	8,853,600
1	De las Nieves (tramos faltantes)	1975	45,30	545	1,284,565
26	La Campiña	1990	45	1862	11,976,384
23	Trigarante	1990	45,30	3284	21,122,688
18	Las Palmas	1977	30	1,386	4,044,348
2	Parque México Sur	1975	30	1,554	4,534,572
4	Parque Azteca Sur	1975	38,30	715	4,862,000
6	Progreso	1970	25	670	1,955,060
7	Unión	1970	20	542	964,760
10	Yucatan	1970	20	307	546,460
32	Florido	1989	76,61,53	2,478	18,708,900
28	Tecnológico	1982	61	364	2,548,000
31	Alamos	1980	20	945	1,682,100
11	Fundadores	1989	25	5,454	15,914,772
46	Maclovio Herrera	1970	25	1,634	4,768,012
47	Torres del Lago	1981	30	125	375,000
3	Pacifico	1989	61	195	1,365,000
29	Garita	1993	30	1136	7,263,584
30	Plazas	1992	25	349	1,018,382
				Sub Total 3	**154,927,259**

# plano	Nombre	Año Construcción	Diámetros (cm)	Longitud Requerida (m)	Costo (precio indice)
44	Colector Internacional	1992	183	3,153	35,100,000
37	Emisor Antiguo a presión	1985	107	4,234	38,000,000
38	Emisor SAAS (2da etapa) a gravedad	1985	152	4,136	53,581,500
45	Colector Central	1965	61	150	840,000
39	Colector Carranza	1968	45, 53, 61, 76	2,432	10,944,000
41	Colector Ensenada	1991	45,38,25	3,436	24,772,500
42	Subcolector Lomas de Agua Caliente	1975	38, 45	1,878	8,415,000
19	Subcolector Ermita (2da etapa)	1970	30, 38	716	1,218,000
48	Subcolector El Lago	1981	30	517	1,551,000
49	Subcolector Lomas Campestre	1975	30	1,070	2,019,000
50	Colector Pasteje (Tramo en Zona Río)	1976	61	355	2,130,000
52	Subcolector Obrera	1980	38	1,538	3,000,000
				Sub-Total 4	**181,571,000**
				Total	**771,450,905**

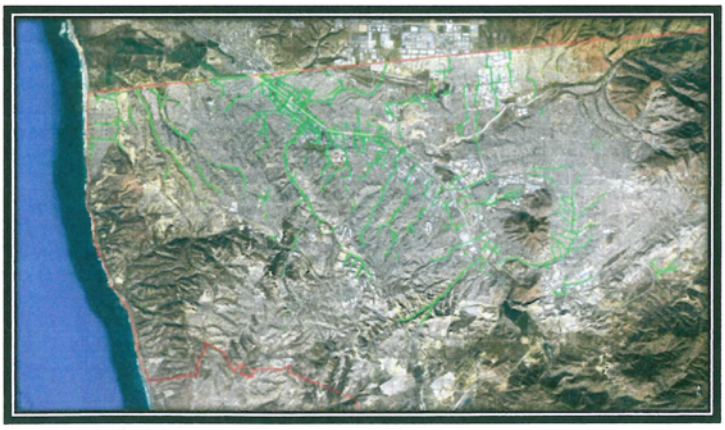

1. Subcolector Las Sierras
2. Subcolector Parque Mexico Sur
3. Faltante Colector Pacifico
4. Subcolector Parque Mexico Sur
5. Cirilón
6. Subcolector Progreso
7. Subcolector Dijon
8. Líneas Cuatas
9. Colector Sánchez Taboada
10. Subcolector Yucatán
11. Atarjeas Fundadores
12. Colector INV. Nuevo
13. Colector INV. Antiguo
14. Colector Oriente Viejo
15. Trama Padre Kino
16. Colector Torres de Agua Caliente
17. Colector Campestre
18. Subcolector Las Palmas
19. Subcolector Pacifico
20. Faltantes Interceptor Poniente
21. Revitalización Poniente Antiguo
22. Colector Cañon Salado
23. Subcolector Ingarante
24. Colector Industrial
25. Subcolector Facultades
26. Subcolector La Campiña
27. Colector Costa Azul
28. Faltantes Colector Tecnologico
29. Subcolector Garita
30. Las Plazas
31. Atarjea Alamos
32. Colector Diputado Viejo
33. Colector Insurgentes
34. Interceptor Poniente (dos lineas)
35. Subcolector Zapata
36. Subcolector Villas de Baja California
37. Linea SAAS (Impacto)
38. Emisor SAAS
39. Colector Carranza
40. Interceptor Oriente
41. Colector Ensenada
42. Subcolector Torres de Agua Caliente
43. Lineas Gemelas Tecnico
44. Interceptor Internacional
45. Colonia Xamler
46. Subcolector Maclovio Herrera
47. Subcolector Torres del Lago
48. Subcolector El Lago
49. Subcolector Lomas Hipodromo
50. Atarjea Del Pastejo Zona Rio
51. Colector Lateral del Rio
52. Subcolector Obrera
COLECTORES, SUBCOLECTORES E INTERCEPTORES
CONCRETO DE DESGASTE SEVERO
TUBERIA CONCRETO CON DESGASTE REGULAR
CESPT
BAJA

3. Manejo que se le da a las aguas de lluvia en la Ciudad de Tijuana – descripción / estimación de afectación al alcantarillado sanitaria durante las lluvias.

El proyecto, construcción y mantenimiento del sistema de alcantarillado pluvial es competencia del Ayuntamiento de Tijuana, la CESPT cuenta con el plano proporcionado por el Municipio que muestra la red de drenaje pluvial. La ciudad de Tijuana, dado los compromisos de cooperación que existen entre México y los Estados Unidos, cuenta con una muy aceptable cobertura infraestructura de conducción y alejamiento de las aguas residuales hasta los sitios de emplazamiento de las plantas de tratamiento. Los sistema de alcantarillado pluvial y sanitario se proyectan para que funcionen de forma independiente, sin embargo la red de colectores y subcolectores que conforman el sistema de alcantarillado, constituida por tuberías de pvc, concreto simple, concreto reforzado y polietileno, con diámetros que van desde 30 hasta 152 cm, funciona actualmente como un sistema combinado, que capta y conduce los caudales tanto de las aguas residuales como las pluviales en época de lluvias.

Existe en la ciudad un reducido sistema de drenaje pluvial que funciona de manera limitada, sin embargo donde no existe, es frecuente observar en situación de lluvia, a personas abriendo tapas de alcantarillado sanitario para desfogar los escurrimientos pluviales de las calles, introduciendo dicho caudal y sumarse al que conducen las líneas sanitarias. También es frecuente observar en las viviendas que las personas instalan rejilla y tubería para captar el escurrimiento pluvial de los patios hacia el drenaje sanitario interno. Adicionalmente, se han detectado conexiones de las alcantarillas o bocas de tormenta al sistema de drenaje sanitario. Todas estas conexiones consideradas indebidas ocasionan en época de lluvias severos problemas en la red, ocasionando desbordamientos en los sitios donde no se tiene la capacidad de conducción, ya que como se mencionó anteriormente los sistemas se proyectan para que funcionen en forma independiente. Las desbordamientos se manifiestan por el vertido del agua a través de las tapas de los pozos de visita sanitario. Es recurrente observar que es en las zonas bajas de la ciudad, donde se combina la poca pendiente de las tuberías, los desbordes mencionados. Aparte de la saturación de la tubería por el caudal que conduce al sumarse agua de lluvia como la propia residual, también se azolvan las tuberías y el mantenimiento que se requiere supera la capacidad de respuesta del Organismo.

A la fecha no ha sido posible cuantificar los desbordamientos de caudal en el sistema de alcantarillado, en tiempo de lluvias.



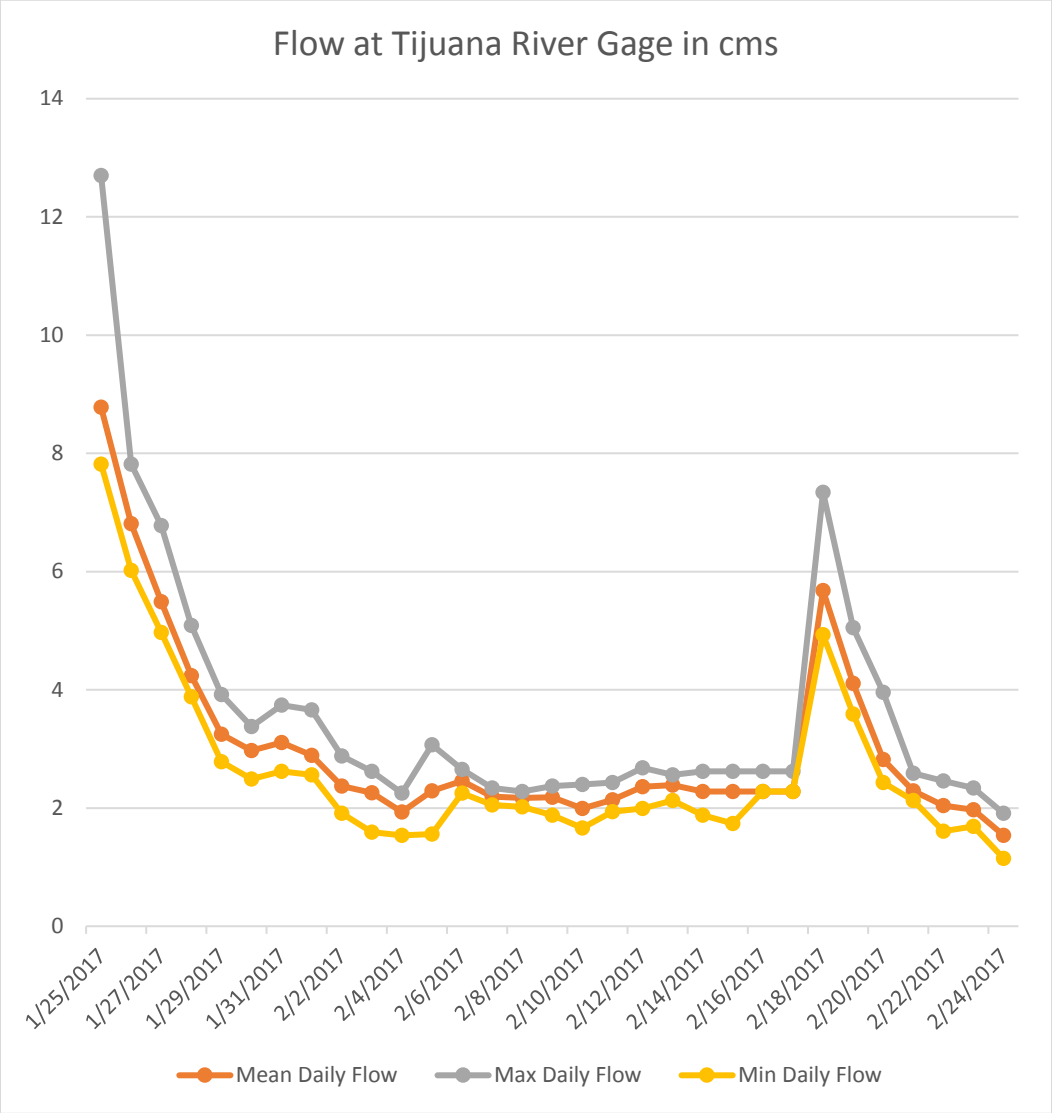
Distribución de la Red del Sistema Pluvial en la Ciudad de Tijuana 2008

APPENDIX B- ADDITIONAL INFORMATION

Flow Data from Tijuana River Gage, San Diego California, U.S.

Tijuana River gage information for late January and February 2017 obtained from the Yuma office of the IBWC. The Yuma office is responsible for digitizing the chart for the gauge and developing minimum, maximum and average daily flows for the official record. The gage is a standard bubbler gage with chart recorder, but is subject to trash and sediment deposition which can have an effect on reported gage height. The gage has an accuracy of +/- 5% and is not efficient to measure low flows, due to silt and solids. Below is a plot of the flow from January 19, 2017 to February 26, 2017 which includes the spill period in question. The February 1, 2017 to February 4, 2017 event is clearly indicated with an increase in flow during a dry period without rainfall. One large rain event occurred on February 18 (Data for February 17, 18 and 19, 2017 was changed to lower values to emphasize low flow data on the vertical scale of the graph. Flow in the river on February 18, 2017 peaked at 318 cms). Normally after a storm, the flows will gradually decrease and asymptotically reach an equilibrium level (or zero) without additional increases. The gauge information seems to indicate additional flow beyond the normal amount in the February 7 through 16, 2017 period, however this is coupled with a small rainfall event on February 7, 2017 (0.19 inches at Brown Field Municipal Airport in California, U.S.) From the graph it appears that after the large runoff event on February 18, 2017 the flow dropped below that seen during the February 7 through 16, 2017 period. One would expect the base flow to be higher after a major event such as that of February 18, 2017 than the base flow before the event, yet that does not appear to be the case.

Table 6 Flows in Tijuana River at USIBWC gage.



Water Quality Data for Tijuana River at Dairymart Road Bridge, California, U.S.

Since 2013, the City of San Diego under contract with the USIBWC, has been collecting samples for bacterial analysis in the Tijuana River weekly at the Dairymart Road Bridge during winter whenever there is flow in the river. The City of San Diego samples and performs analysis for total coliform, E. coli and enterococcus. All samples collected at Dairymart Bridge exceed USEPA acceptable receiving water quality standards. See table below for list of regulatory limits for bacteria in the United States.

USEPA BACTERIOLOGICAL CRITERIA FOR WATER CONTACT RECREATION [1,2]
(in colonies per 100 ml)

	Freshwater		Saltwater
	Enterococci	E.coli	Enterococci
Steady State			
All Areas	*33*	*126*	*35*
Maximum			
Designated Beach	*61*	*235*	*104*
Moderately or Lightly Used Area	*108*	*406*	*276*
Infrequently Used Area	*151*	*576*	*500*

The first plot (Table 7) is all the historical data since 2013 and the second plot (Table 8) shows the data for the December 2016 through February 2017 period. It appears from the data presented in Table 8 that there was a component of municipal wastewater in the river from December 15, 2016 on, with highest levels on January 31, 2017. This also indicates that untreated wastewater had entered the Tijuana River at high volumes prior to the February 1 to February 4, 2017 spill.

Table 7 E. coli levels and flow at Dairy Mart Road Bridge taken by USIBWC, period of record.

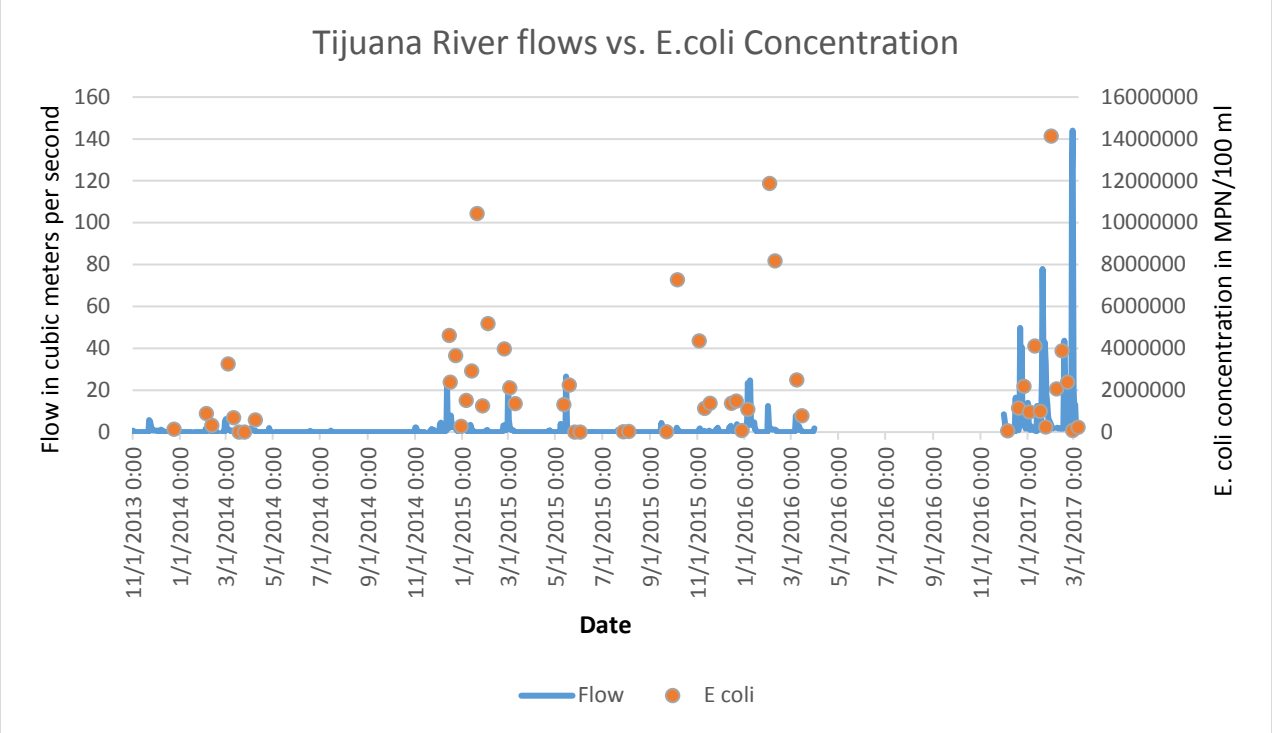
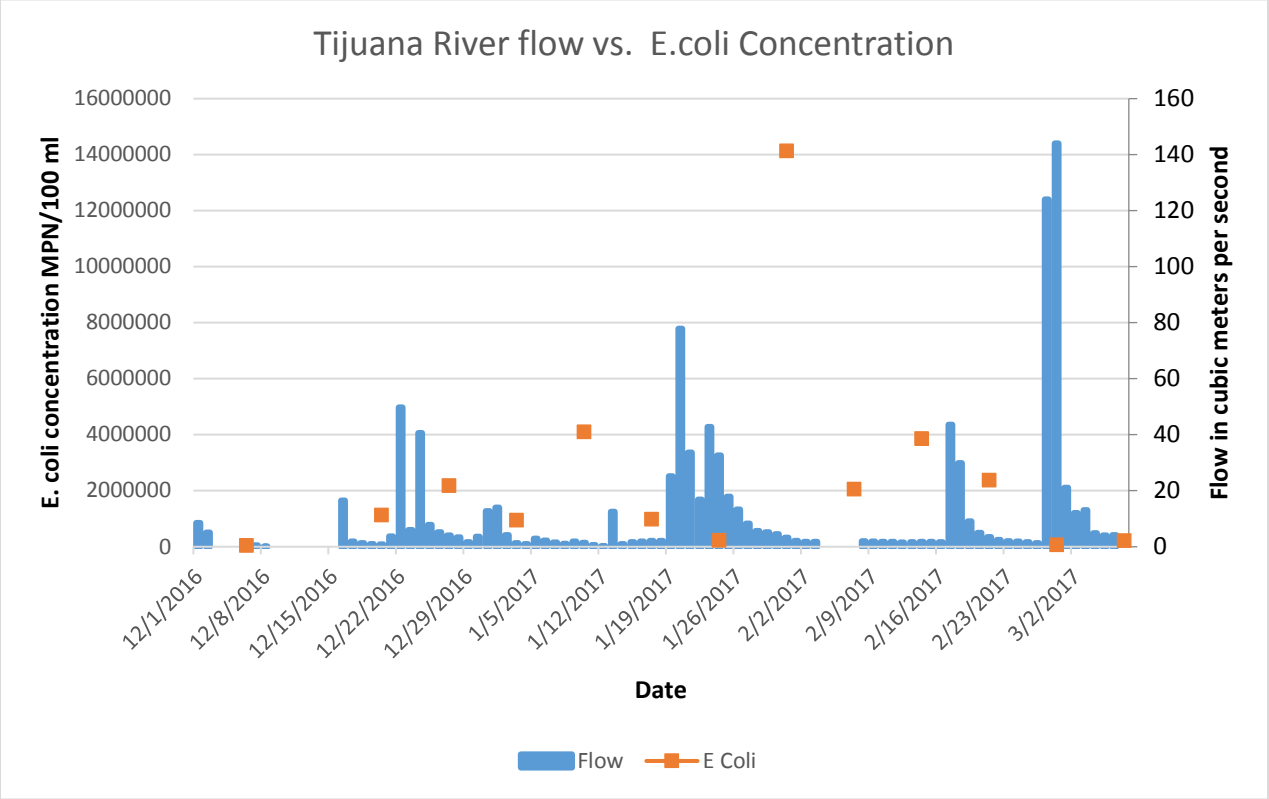


Table 8 2016-2017 flow and E. coli levels during a 3-month period (wet weather season)



SBIWTP Flow Data

Below is a graph showing wastewater flow to the SBIWTP. The plant strives to maximize treatment of a flow between 24-25 million gallons per day (mgd), averaged over a month. Below is a graph of the flow to the SBIWTP for December 2016 through February 2017. Average flow during the last week in December 2016 was 20.7 mgd, during January 2017, 22.5 mgd and during the period February 1 - 23, 2017, 21.2 mgd.

Table 9 2016-2017 flows treated at SBIWTP.