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May 8, 2017 8685

Stephanie Bracci
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City of San Diego
Transportation and Storm Water Department, Operations and Maintenance
2781 Caminito Chollas, MS 44
San Diego, CA 92105

Subject: Master Storm Water System Maintenance Program- Tijuana River Valley Channel Maintenance Project Individual Water Quality Assessment

Dear Ms. Bracci:

In conformance with the City of San Diego (City) modified Master Storm Water System Maintenance Program's (Master Maintenance Program or MMP) amended Site Development Permit (SDP) No. 1134892 and Program Environmental Impact Report (PEIR) Project No. 42891/SCH No. 2004101032, the attached *Individual Water Quality Assessment (IWQA) Report* (2013 IWQA) document is submitted as part of the Substantial Conformance Review (SCR) package for the Tijuana River Valley Channel Maintenance Project.

Maintenance activities associated with the Tijuana River Valley Channel Maintenance Project have occurred periodically since 2013. Maintenance activities have generally been conducted between September 15 and March 15 each year to avoid potential impacts to nesting birds. Formal regulatory approval and implementation of detailed protocol survey mitigation measures have allowed the City to conduct maintenance activities as-needed and weather permitting throughout the calendar year for the Tijuana River Valley Channel Maintenance Project. Accordingly, this 2017 SCR submittal package (2017 SCR) is intended to address maintenance activities that will be conducted in the 2017-2018 maintenance period, which begins September 15, 2017 and ends September 14, 2018 (2017-2018 maintenance period).

Maintenance activities conducted under the MMP as part of the Tijuana River Valley Channel Maintenance Project were first conducted in 2013. An SCR package containing an Individual Maintenance Plan (IMP), IWQA, and other associated Individual Assessments (IAs) was approved in January 2013 (2013 SCR) for maintenance conducted in the 2013-2014 maintenance period. A second SCR package for maintenance conducted in the 2015-2016 maintenance period (2015 SCR) included an updated IMP (2015 IMP) and receiving water monitoring data and information for water quality monitoring activities conducted in May 2015, and was approved in July 2015. Site conditions and potential maintenance impacts were re-evaluated and documented in an IWQA summary technical review, included as part of the 2015 SCR package.

A third SCR package, for maintenance in the 2016-2017 maintenance period (2016 SCR), included an updated IMP, and was approved in August 2016. Site conditions, available water quality data, and potential maintenance impacts were re-evaluated in June 2016 as part of the 2016 SCR. The 2016 SCR included a new Water Pollution Control Plan (WPCP), and specific updates to the Construction Plans, Master List of BMPs, and the Maintenance Methodology. An updated WPCP and Maintenance Methodology have been prepared for the 2017-2018 maintenance period. The Construction Plans and Master List of BMPs from the previous SCR have been determined to be applicable for the 2017-2018 maintenance period.

In order to assess conditions related to water quality resources in advance of the 2017-2018 maintenance period, existing conditions, available water quality data and information, and potential maintenance impacts, were re-evaluated in May 2017 as part of the 2017 SCR. Review of available water quality data included a review of the Tijuana River Valley Channel Maintenance Project Receiving Water Monitoring Report- Year Four Annual Maintenance Event (Attachment B, City of San Diego, October 2016). This report was submitted by the City to the San Diego Regional Water Quality Control Board (RWQCB), as required under the amendment to the Clean Water Act Section 401 Water Quality Certification (401 Certification) and enrollment under State Water Resources Control Board (SWRCB) Order No. 2003-17-DWQ for Statewide General Waste Discharge Requirements for Dredged or Fill Discharges for the Tijuana River Valley Channel Maintenance Project 09C-077 (Project) (RWQCB, 2012).

Water quality resource conditions remain substantially similar to those described in the IWQA summary technical review for the 2016 SCR, and those described in the water quality-related portions of the 2013 and 2015 SCR. Accordingly, this letter provides a summary technical review performed by a Professional Engineer, of the 2013 IWQA as it applies to current conditions in the Tijuana River Valley Channel Maintenance Project area. This letter and attachments serve as the basis for SCR determination for maintenance work to be conducted during the 2017-2018 maintenance period as part of the Tijuana River Valley Channel Maintenance Project.

PROJECT HISTORY AND BACKGROUND

The Tijuana River Valley Channel Maintenance Project includes maintenance of the Pilot Channel and Smuggler's Gulch Channel as part of the MMP. The Pilot Channel is included on MMP Maps 138a through 138c and the Smuggler's Gulch Channel is included on MMP Maps 138 and 139 (City of San Diego 2011). Environmental permits were issued by the California Department of Fish and Wildlife (CDFW), Regional Water Quality Control Board (RWQCB), United States Fish and Wildlife Service (USFWS), Army Corps of Engineers (ACOE), and the California Coastal Commission (CCC) in 2012 and 2013 based on the project scope, impacts, and mitigation. The RWQCB 401 Certification (No. 09C-077) issued for this maintenance expired on April 17, 2017. In December 2016, an extension of this permit was requested and the RWQCB issued an amendment to the existing Certification, making it valid through October 30, 2017 (which coincides with the existing project ACOE 404 Permit term). In addition, the project's CDFW Streambed Alteration Agreement (1600-2011-0271-R5) expired on November 30, 2016. An extension of this permit was also requested and was granted, extending the permit term through November 30, 2021. Maintenance activities in the Pilot Channel and Smuggler's Gulch Channel have been conducted in the 2013 – 2014, 2015-2016 and 2016-2017 maintenance periods. Appropriate construction-related Best Management Practices and concurrent wetland compensatory mitigation have been implemented as part of the comprehensive channel maintenance project. The City is also working with federal, state and local agencies to address bi-national sources of sediment and trash that regularly discharge to the Pilot Channel and Smuggler's Gulch Channel.

PROJECT DESCRIPTION

Maintenance of the Pilot Channel and the Smuggler's Gulch Channel includes the mechanized removal of sediment, vegetation and trash and debris from the channels. Proposed maintenance procedures for Tijuana River Valley Channel Maintenance Project channel clearing activities in the 2017-2018 maintenance period remain substantially similar to procedures incorporated as part of the IMP included in the 2013, 2015 and 2016 SCR packages.

The periodic maintenance of both channels is needed to restore the channels' flood conveyance capacity to original design condition and reduce flood risk. The maintenance activities also reduce impacts to the Tijuana River National Estuarine Research Reserve from transport of sediment and trash and debris derived from sources upstream of the project area. The project incorporates removal of approximately 10,000–30,000 cubic yards of material per maintenance period, occupying a total of 4.31 acres.

CURRENT CONDITIONS

Since the most recent maintenance activities, natural and anthropogenic processes in the upstream watershed have resulted in additional sediment, trash and debris accumulation in the channel maintenance areas. A Professional Engineer conducted a survey of the project area on May 4, 2017. Survey results indicate that site and water quality resource conditions are substantially similar to conditions evaluated as part of the 2013 IWQA. Accordingly, the 2013 IWQA findings have been determined to be generally applicable to the maintenance activities for the 2017-2018 maintenance period. Specific to the Tijuana River Valley Channel Maintenance Project, the following conditions should be noted:

- Based on historical sediment accumulation rates within the Tijuana River Valley maintenance channels, it is expected that maintenance activities and SCR submittals will be necessary for the future of this maintenance program.
- The 2013 IWQA and other water quality-related portions of the 2013, 2015, and 2016 SCR were reviewed in May 2017 by Dudek.
- Through the IWQA, the MMP PEIR provides a quantitative framework for assessing maintenance-related water quality impacts by evaluating the potential pollutant removal capacity of a channel (in the pre-maintenance condition) with the potential benefits or impacts resulting from channel maintenance (i.e., removal of sediment and vegetation).

It should be noted that this quantitative framework was subject to legal challenge, and while it provides information regarding water quality impacts/benefits of maintenance, it can no longer be utilized as the basis to evaluate maintenance impacts. A lawsuit was filed regarding the MMP (San Diegans for Open Government et al v. City of San Diego, San Diego Superior Court Case No. 37-2011-00101571), and the City entered into a settlement agreement (Settlement Agreement), which requires the City to implement specific pollution prevention, source control, and water quality treatment activities as outlined in special conditions contained in the project Coastal Development Permit (CDP) issued by the CCC. The City has implemented the special conditions-required activities for each maintenance period.

- The 2013 IWQA identifies that the channel maintenance areas are generally dry during dry weather conditions. The channels are temporarily inundated with storm water for short periods after major storm events. Dry weather diversions in the upstream channel areas near the international border continue to prevent significant dry weather flows to the maintenance area and leads to persistent dry conditions. The Pilot Channel currently has stagnant water ponded throughout the maintenance area.

- Review of available water quality data included a review of the Tijuana River Valley Channel Maintenance Project Receiving Water Monitoring Report- Year Four Annual Maintenance Event (Attachment B, City of San Diego, October 2016). The report documents water quality, California Rapid Assessment Method for Wetlands and Riparian Areas (CRAM), and benthic biological monitoring for the 2015-2016 monitoring season (July 2015 – June 2016). Due to delays in maintenance activities caused by wet weather events, only two of the three planned monitoring events (pre-maintenance and during-maintenance) were conducted in the 2015-2016 monitoring period. The final Year-Four monitoring event was conducted during the 2016-2017 monitoring period. As a result of continual maintenance operations, the final event was categorized as a "during-maintenance" event. The three monitoring events performed were therefore comprised of a pre-maintenance survey on August 25, 2015, a during-maintenance survey on October 13-14, 2015, and a continuation of the during-maintenance survey on August 10, 2016.

  Data from the Year-Four monitoring report show that water quality analytical results have been consistently elevated in samples collected upstream of the Pilot Channel maintenance area when compared to downstream samples. Across the three sampling events, the Pilot Channel upstream station had consistently higher concentrations of ammonia, TKN, orthophosphate, and total phosphorus in comparison to the downstream station. Chlorophyll-a concentrations at the upstream station were also consistently higher than the downstream station. During the pre-maintenance sampling event, the upstream station exhibited nitrite and nitrate concentrations several times higher as compared to the downstream station. The during-maintenance sampling events showed similar concentrations for nitrite and nitrate between the two stations. Total suspended solids (TSS) concentrations in the upstream station were higher during the pre-maintenance event and one of the during-maintenance events (August 2016), but was slightly lower (i.e., 9 mg/l vs 17 mg/L) than downstream concentrations for the other during-maintenance event (October 2015). Turbidity results were higher at the upstream site compared to the downstream site for both during-maintenance sampling events (turbidity was not sampled for the pre-maintenance event).

The overall CRAM score at the upstream and downstream Pilot Channel locations are relatively similar across all monitoring events, both pre- and during-maintenance. CRAM scores at all sites were similar for the first two field surveys, ranging from 61 to 64. A significant decrease in overall CRAM score was observed at the Smuggler's Gulch upstream site for the final during-maintenance survey. The Smuggler's Gulch CRAM site is located upstream of the maintenance project area. The decrease in overall CRAM score was largely due to differences in the hydrologic connectivity, topographical complexity, and horizontal/vertical plant structure. This decrease in score could be a result of maintenance performed by others between the October 2015 and August 2016 surveys, or other upstream watershed processes. Benthic biological monitoring is conducted at the downstream Pilot Channel site only. All events indicate low taxa richness and diversity scores and signify a benthic community comprised of generally tolerant organisms, and no intolerant individuals present. The limited community, with few taxa, and high average scores for very tolerant organisms observed at this station may be indicative of stress due to fluctuations in salinity known to occur at the tidally-influenced location, anthropogenic stressors, or a combination of both. Continued biological monitoring in association with maintenance activities may provide an assessment of the biological community and how it is changing in response to the ongoing maintenance, however it may be difficult to distinguish natural versus anthropogenic impacts to ambient conditions at this location.

- The limited available water quality data, benthic biological monitoring, and CRAM results, do not indicate that the Tijuana River Valley Channel Maintenance Project is resulting in significant water quality impacts. This conclusion supports the findings of the 2013 IWQA. Additional water quality data will be collected over the 5-year duration of the maintenance project in accordance with 401 Certification requirements. The collection of additional data may provide more information to identify meaningful water quality trends over the course of the maintenance project.

- As required by the Regional MS4 Permit (Order No. R9-2013-001), a Water Quality Improvement Plan (WQIP) for the Tijuana River Watershed Management Area was developed by the City and other watershed stakeholders, and was accepted by the San Diego RWQCB in March 2016 (http://www.waterboards.ca.gov/sandiego/water_issues/programs/stormwater/wqip.shtml). The first year of monitoring for the WQIP has been completed, and the Annual Report including the water quality monitoring data was submitted in January 2016. The water quality data collected under the WQIP has limited applicability to the maintenance project as the data is from monitoring locations well outside the maintenance project area.

- On February 23, 2017, the U.S. International Boundary and Water Commission (IBWC) submitted a transboundary spill report to the RWQCB, reporting that a raw sewage spill of approximately 143 million gallons to the Alamar River (in Mexico) occurred, upstream of its confluence with the Tijuana River. The report estimated that the spill started on February 6, 2017 and was ongoing until February 23, 2017. After submitting the report, IBWC discovered that the release was due to a rupture in the sewage collection system, caused by excessive inflow and infiltration from a storm event. Flows from the Tijuana River, including the raw sewage release, crossed into the Tijuana River valley, estuary, and the ocean, and had unknown/unquantifiable impacts to water quality in the Tijuana River Valley and potentially the maintenance area.

- As described in the 2016 IMP, pre-maintenance pumping may be necessary to dry ponded water in the channel areas to allow mechanized equipment use. As necessary for the 2017-2018 maintenance period, protocol surveys to identify nearby critical occupied nests will be utilized to guide noise-related and other mitigation measures to comply with regulatory requirements. These measures were documented in the 2016 SCR.

In summary, evaluation of current conditions and review of the 2013 IWQA, and the 2013, 2015, and 2016 SCR packages, as well as review of 401 Certification-required monitoring components, did not identify new significant environmental impacts to water quality resources that have not already been identified, addressed, and/or mitigated by the required conditions set forth in the associated SDP and PEIR. Therefore the proposed maintenance would substantially conform to the existing permit and environmental document.

Please contact me by phone (310.780.2959) or by e-mail (hlamberson@dudek.com) with questions or requests for clarification.

Respectfully,

Heather Lamberson, PE
Senior Engineer
DUDEK

Attachment A - 2013 Individual Water Quality Assessment
Attachment B – Tijuana River Valley Channel Maintenance Project Receiving Water Monitoring Report- Year Four Annual Maintenance Event (City of San Diego, 2016)

INDIVIDUAL WATER QUALITY ASSESSMENT REPORT

Site Name/Facility:	Tijuana River Pilot Channel and Smuggler's Gulch Channel
Master Program Map No.:	138a, 138b, 138c (Tijuana River Pilot Channel) and 138 and 139 (Smuggler's Gulch Channel)
Date:	December 21, 2012
Civil Engineer: (name, company, phone number):	Matt Moore URS Corporation 858-812-9292
Registered Civil Engineer Number & Expiration Date (place stamp here):	RCE No. 56780, Exp. 6/30/2013

***Instructions:** This form must be completed for each target facility following the completion of the Individual Maintenance Plan (IMP) report form and prior to any work being conducted at the facility. Attach additional sheets if needed.

EXISTING CONDITIONS

The City of San Diego (City) has developed the Master Storm Water System Maintenance Program (MMP) (City of San Diego 2011a) to govern channel operation and maintenance activities in an efficient, economic, environmentally and aesthetically acceptable manner to provide flood control for the protection of life and property. This document provides a summary of the Individual Water Quality Assessment (IWQA) components conducted within the Tijuana River Pilot (Pilot) Channel and the Smuggler's Gulch (SG) Channel to comply with the MMP's Programmatic Environmental Impact Report (PEIR) (City of San Diego 2011b).

IWQA procedures under the MMP provide a methodology for a water quality management model to evaluate potential water quality benefits and impacts associated with channel maintenance activities. The site-specific field measurements and conditions provides the analytical data to determine a storm water facility's pollutant reduction potential and water quality benefits due to sediment removal; and compare it to the estimated loss of temporary pollutant sorption/retention capacity as a result of channel maintenance. The IWQA procedures are documented in the *Standard Operating Procedure (SOP) To Conduct Water Quality Assessment and Quantification Model for Flood Channel Maintenance* found in Appendix A of the Water Quality Assessment - White Paper (Appendix F of the PEIR). The SOP identifies two specific criteria for IWQA component implementation, including; 1) facility must have fairly consistent dry weather (low) flows, and 2) have vegetation capable of assimilation of pollutants. As described below, current conditions in the Pilot and SG Channels do not meet these

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criteria. Accordingly, the City has implemented modified sampling and analysis procedures in order to quantify the potential water quality benefits and impacts of channel maintenance activities.

Project Description:

The channels associated with this assessment report are located in the Tijuana River Valley (Valley), within the jurisdiction of the City of San Diego (City) (Figure 1). The Tijuana River watershed covers an area of approximately 1,725 square miles, of which 73 percent is located in Mexico and 27 percent in the United States. The main Tijuana River flows in a northwesterly direction from the international border into the Valley and City jurisdiction. Approximately 21.9 square miles of the watershed (~1% of the total watershed area) is within City jurisdiction.

The Tijuana River National Estuarine Research Reserve (TRNERR) and a portion of the City of Imperial Beach are generally west of the project area located adjacent to the Tijuana River's discharge to the Pacific Ocean. The Otay-Nestor community and the United States Naval Outlying Landing Field Imperial Beach are located north of the project area; and the community of San Ysidro is located to the east.

The Pilot Channel is included on MMP Maps 138a through 138c and the SG Channel is included on MMP Maps 138 and 139 (City of San Diego 2011a). The Pilot and SG Channels are generally located in the Valley roughly bordered by Hollister Street to the east and Monument Road to the south. The Tijuana River low flow channel splits into what are commonly referred to as the Tijuana River's Northern and Southern Channels approximately 800 feet east of Hollister Street. The Pilot Channel follows the Southern Channel.

The Valley, including the project area, is within the Federal Emergency Management Agency's (FEMA) Special Flood Hazard Areas Subject to Inundation by the 1-percent Annual Chance Flood (100-year floodplain). The project areas are zoned OF-1-1 (Open Space-Floodplain) and AR-1-1 (Agricultural/Residential); and are designated for Open Space and Agricultural land uses in the Tijuana River Valley Land Use Plan. In addition, the project area is within the boundaries of the County of San Diego's 2.7 square mile Tijuana River Valley Regional Park (Regional Park). The project area is also within the City's Multiple Species Conservation Program's Multi-Habitat Planning Area (MHPA).

The project consists of maintenance and dredging of the Pilot and SG channels to remove anthropogenic-derived sediment and trash that accumulates as a result of development and other practices in the upstream watershed. The removal of sediment and trash is conducted to maintain flow conveyance capacities and reduce the risk of flooding to public and private infrastructure in the Valley.

EXISTING CONDITIONS

Description of creek/channel geometry(length, width, and depth):

Pilot Channel

The Pilot Channel was originally excavated in 1993 within the Southern Channel. It is has been irregularly maintained since that time as an earthen trapezoidal channel that is approximately 5 feet deep, with a 23-foot top width, and a 15-foot streambed width. According to the MMP, the Pilot Channel was constructed to divert wet-weather flows from 2- to 5-year storm events into the Southern Channel (City of San Diego 2011b). The Pilot Channel stretches from 100 feet east to 5,300 feet west of Hollister Street for a total length of 5,400 feet and it flows roughly in an east-west direction.

SG Channel

The SG Channel is an existing historical agricultural channel with manufactured berms. The contributing sub-watershed area is approximately 6.7 square miles, primarily located south of the international border within Canon de los Mataderos. The SG Channel, as originally constructed, is an earthen channel approximately 20 feet wide and 15 feet deep. The SG Channel is tributary to the South Channel and flows in a northerly direction, from the international border past Monument Road until it confluences with the Pilot Channel. The portion of the SG Channel maintained by the City extends for a distance of approximately 3,040 feet.

Existing Conditions:

The Tijuana River Watershed Management Area (WMA) is located in the southern portion of San Diego County. Surface waters in the Tijuana River WMA are subject to comply with the Water Quality Control Plan for the San Diego Basin (Basin Plan) that designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for receiving waters. Based on water quality data collected within the Tijuana WMA, the Tijuana River is classified as a Category I (impaired) watershed due to a wide variety of water quality problems. Stormwater flows in the Tijuana River contain high concentrations of sediment, trash, coliform bacteria, trace metals (copper, lead, zinc, chromium, nickel, and cadmium), PCBs, and other urban, agricultural, and industrial pollutants. Sources of pollutants include non-point agricultural sources on the U.S. side of the border and a large variety of point and non-point sources on the Mexican side of the border.

During the site visit and sediment sampling activities conducted on November 14, 2012, it was observed that the SG Channel streambed was generally dry, unvegetated, and filled with sediment intermixed with trash and waste tires. The Pilot Channel was similarly dry

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along most of its length and filled with sediment containing trash and waste tires along the majority of the length. In some areas near the eastern and western ends of the Pilot Channel there were fallen trees and invasive plant species such as castor bean and arundo. Ponded water was observed in the Pilot Channel immediately east and west of the Hollister Bridge. In March 2009, United States Customs and Border Protection engineers completed a dry weather diversion structure at the SG Channel crossing at the international border. The purpose of this structure is to divert up to 21.5 cubic feet per second or 14 million gallons per day of dry weather flows from Mexico to the sanitary sewer. This infrastructure prevents dry weather flows from entering the SG Channel and essentially eliminates direct dry weather input to the Pilot Channel. Within the context of the IWQA components, this elimination of dry weather flow, combined with the fact that much of the SG Channel is void of vegetation and the Pilot Channel harbors primarily non-native and invasive plant species, there is little potential for water quality impacts from channel maintenance resulting from the loss of pollutant assimilative capacity through vegetation removal.
Description of Sediment Sampling Activities (locations (s), depth, shipment/delivery to laboratory(s)):
Given the relatively unique existing conditions of the SG Channel and Pilot Channel where dry weather flows are generally diverted to the sanitary sewer, the City employed a sediment characterization-based sampling strategy. The purpose of the sampling activities was to characterize site-specific conditions to evaluate potential water quality benefits of channel maintenance. Five locations as indicated on Attachment 1 were selected for sediment sampling activities. These locations were deemed representative of the sediment characteristics within the SG and Pilot Channels. The locations were selected based on visual observation of the sediment characteristics and channel features including vegetation, hydrosoil, and hydroperiod. Further, sampling and analyses activities conducted during previous channel clearing activities have indicated that accumulated sediment in these channels generally does not have levels of potential pollutants that exceed human health or ecological risk screening criteria (City of San Diego 2010). Based on these results and the existing conditions, five samples were deemed appropriate for characterization of sediments channel for the purpose of the IWQA. It should be noted that this sample strategy resulted in collection of fewer samples than described in the SOP. The five soil borings were advanced on November 14, 2012 (Attachment 1). Three borings (SG-1, TJ-1, and TJ-2) were advanced by Tri-County Drilling using a limited

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access, rubber-tracked, hollow-stem auger drill rig. Two boring locations (SG-2 and TJ-3) were not accessible with the drill rig and were advanced using a stainless-steel hand auger. The borings were advanced to a depth of between two and five feet. The depth of each boring was estimated in the field based on best professional judgment of sediment accumulation in the channel relative to design dimensions. Borings SG-1 and SG-2 were drilled along the SG Channel north and south, respectively of the Disney Crossing. Borings TJ-1 and TJ-2 were drilled along the Pilot Channel. Boring TJ-1 was located approximately 250 feet east and boring TJ-2 was located approximately 350 feet west of the confluence with the SG Channel. Boring TJ-3 was located approximately 1,000 feet west of the confluence. Sediment samples from this boring were archived for possible analyses. A photo log of the November 14, 2012 site visit is included in Attachment 2. The borings were logged by a URS geologist under the oversight of a California Professional Geologist in accordance with the Unified Soil Classification System (USCS). Sediment samples were collected continuously from each of the borings using a standard penetration sampler fitted with stainless-steel tubes to the total depth drilled. Boring logs can be found in Attachment 3. Bulk sediment samples were collected prior to drilling at the location of borings SG-1 and TJ-2 for grain-size analyses in accordance with ASTM-D6913-04. These samples were collected using a shovel from the ground surface to 1.5 feet below ground surface and placing the soil into two 5-gallon buckets per location. Lids were placed on the buckets and each was labeled with a sample ID and sample depth. Grain-size gradation curves are provided in Attachment 4. The sediment from each sample interval was placed into a clean stainless steel bowl and then homogenized using a clean wooden spoon. After the sediment was homogenized it was split into two, laboratory-supplied, clean 8-ounce glass jars that were labeled with the sample ID. The samples were placed in an insulated cooler with ice and maintained at 4 degrees C and transported under chain-of-custody (COC) procedures. COC documentation can be found in Attachment 5. Some sediment was placed into a resealable plastic bag, disaggregated and then monitored for the presence of organic vapors using a Photo Ionization Detector (PID). Sampling equipment was decontaminated before and after each sample was collected by rinsing with an Alconox (non-phosphate) detergent solution followed by twice rinsing with distilled water. Rinse water was collected and disposed of in accordance with applicable local, state and federal guidelines. Sediment chemical analyses were conducted by Pat-Chem Laboratories, Inc. of Moorpark, California, a state-accredited laboratory. The samples were analyzed for the constituents identified in the SOP. In addition, the samples were also analyzed for organochlorine pesticides by EPA Method 8081. The laboratory analytical and tabulated results of indicated constituents can be found in Attachment 6.

EXISTING CONDITIONS
Description of Flow Measurement Activities (location(s) and equipment):
As described above, the SG Channel and Pilot Channel generally do not experience dry weather flows as a result of dry weather diversion structures adjacent to the international border. There was no flowing water, nor evidence of recently flowing water in the SG Channel and Pilot Channel during the sediment sampling activity visit on November 14, 2012. Accordingly, flow measurement activities were not conducted as part of this IWQA.
Description of Volume Measurement Activities (interval, total number, equipment):
The SG and Pilot channels do not behave like natural treatment systems as described in the PEIR's Water Quality Assessment - White Paper. As mentioned above, the SG and Pilot Channels generally do not experience dry weather flows as a result of dry weather diversion structures adjacent to the international border. There was no flowing water, nor evidence of recently flowing water in the SG Channel or Pilot Channel during the sediment sampling activity visit on November 14, 2012. Accordingly, volume measurement activities were not conducted as part of this IWQA.
Description of Water Quality Sampling Activities (location(s), shipment/delivery to laboratory(s)):
As described above, the SG Channel and Pilot Channel generally do not experience dry weather flows as a result of dry weather diversion structures adjacent to the international border. There was no flowing water, nor evidence of recently flowing water in the SG Channel or Pilot Channel during the sediment sampling activity visit on November 14, 2012. Standing water is present in a limited area of the Pilot Channel during dry weather conditions. Sampling from these locations is not representative of water quality conditions consistent with the criteria outlined in the SOP. The purpose of water quality sampling in storm water facilities is to evaluate potential to improve water quality through sequestration of pollutants by vegetation within the channel. This is accomplished by collecting water quality samples at the upstream and downstream edges of the facility. Water quality samples collected from ponded water only provide data on the water quality for each specific pool. This data will not be an accurate representation of the pollutant removal capacity of the SG and Pilot Channels. Accordingly, water quality sampling activities were not conducted as part of this IWQA.

EXISTING CONDITIONS

Description of Wetland Assessment (Existing) Activities (personnel, general conditions):

Using the results of the IBA site survey, both the SG and Pilot Channels were assessed according to the scoring system laid in the SOP. Three macrofeatures of wetland treatment systems were assessed: existing vegetation, hydrosoil, and hydroperiod. Scores for these features are presented in Table 1. Scoring criteria definitions are found in Attachment 7.

Table 1. Existing Wetland Macrofeature Assessment Matrix

Wetland Macrofeature	SG Channel	Tijuana Pilot Channel
Existing Vegetation	0	1
Hydrosoil	2	1
Hydroperiod	0	1
Total Score	**2**	**3**

<u>SG Channel</u>

Due to lack of vegetation, high sediment deposition, and lack of flow in the SG Channel during dry weather conditions, the overall rating for the SG Channel is two. According the SOP, this equals a "poor" rating and does not provide evidence that the existing conditions provide adequate conditions for sorption and deposition of suspended solids and associated constituents of concern.

<u>Pilot Channel</u>

Due to the presence of highly invasive non-native vegetation, high sediment deposition, and lack of flow in the Pilot Channel during dry weather conditions, the overall rating for the SG Channel is three. According the SOP, this equals a "fair" rating and does not provide evidence that the existing conditions provide adequate conditions for significant sorption and deposition of suspended solids and associated constituents of concern.

EXISTING CONDITIONS
Description of Wetland Assessment (Recovery) Activities (personnel, general conditions):
The City has been responsible for maintaining the SG and Pilot Channels for nearly two decades. During this period, the City has irregularly maintained portions of each channel. In recent years, stormwater flow and associated sediment deposition dynamics have resulted in rapid sedimentation of the SG and Pilot Channels. As an example, in October through November 2009 the City removed a combined 30,000 cubic yards of accumulated sediment, trash and non-native vegetation, from a significant portion of the SG and Pilot Channel project footprint. Subsequent storm events in November and December 2009 deposited a significant amount of sediment in the two channels, reducing channel capacity and demonstrating that the SG and Pilot Channels generally aggrade sediment and trash during storm events (Figure 1).

EXISTING CONDITIONS

Notes:

Photos were taken approximately 200 feet south of the confluence of the SG and Pilot Channels.

Clockwise from upper right:

a) Before excavation (October 16, 2009
b) After excavation (October 16, 2009
c) After storm events[1] (December 21, 2009)

[1] It should be noted that approximately 2.6" of precipitation was measured at the National Weather Service weather station in Chula Vista (station KCACHULA3) between November 1, 2009 and December 22, 2009. The majority of this precipitation occurred during an event on December 7, 2010 when approximately 1.5" of rain was recorded.

Figure 1. Example of the sediment accumulation cycle in the SG Channel.

Accordingly, some aspects of the SOP-based Existing Maintenance Storm Water Facility- Recovery Scoring System are not applicable to the SG and Pilot Channels (Table 2). Specifically, the existing vegetation recovery score is primarily based on the recovery potential for existing terrestrial and/or wetland vegetation. The scoring system does not adequately provide characterization guidance for situations where existing vegetation is not present or is primarily composed of invasive non-native vegetation.

EXISTING CONDITIONS

Table 2. Recovery Wetland Macrofeature Assessment Matrix

Wetland Macrofeature	SG Channel	Tijuana Pilot Channel
Existing Vegetation	NA[1]	NA[2]
Hydrosoil	1	1
Hydroperiod	1	1
Total Score	--	--

[1] The SOP does not identify a score for recovery to a non-vegetated state.

[2] The SOP does not identify a score for recovery to a vegetated state primarily composed invasive non-native vegetation.

Based on these scores, it is estimated that the total recovery score for the SG and Pilot Channels is between two and four, or a "poor" to "fair" rating. These scores provide evidence that the recovery conditions will not provide adequate conditions for significant sorption and deposition of suspended solids and associated constituents of concern.

Sediment Pollutant Loading Estimates:

Four of the five sediment samples were analyzed for the constituents identified in the SOP. Based on analytical results of previous City sampling activities in the area, pesticides were also added to the constituent list.

The analytical results generally indicate that the sampled sediment in the SG and Pilot Channels do not contain constituents in concentrations greater than the screening criteria for human health. The metal Arsenic does appear to be present in the accumulated soil in concentrations that exceed the California and Regional Screening Levels (RSL) (Attachment 6). It should be noted that background soil in many areas of the U.S., including California, contains arsenic at concentrations above the California Human Health Screening Level (CHHSL). The concentrations of arsenic detected in the samples ranged from 1.9 to 4.8 mg/kg. The Department of Toxic Substances Control (DTSC) conducted a background study of arsenic at school sites in the Los Angeles Unified School District that found that concentrations generally below approximately 6 mg/kg represent background conditions (DTSC 2005). In San Diego County, background arsenic concentrations can be as high as 11 mg/kg (URS, 2010). DTSC typically requires further action if arsenic concentrations are generally above 15 to 20 mg/kg. Attachment 8 provides the calculation sheet for the removal volumes and sediment pollutant loading estimates.

It should be noted that due to the lack of dry weather flow and presence of only limited existing vegetation in the SG and Pilot Channels, the general outcome of the activities

EXISTING CONDITIONS
conducted for this IWQA provide an estimate of the benefit of sediment removal. Loss of temporary sorption/retention capacity (impact) of vegetation and sediment removal by the proposed maintenance activity is not present. The current channel conditions do not allow for significant natural pollutant load removal in dry weather. Accordingly, based on evaluation of the criteria outlined in the SOP, evaluation of existing and estimated recovery conditions, and using best professional judgment, the proposed maintenance activities will provide an overall pollutant reduction benefit. This outcome is based on the fact that sediment (and associated pollutant) removal is greater than the estimated loss of temporary sorption/retention capacity (benefit>impact) in the SG and Pilot Channels.

MAINTENANCE IMPACTS				
Evaluation of Benefits/Impacts: **Are there constituents that have potential impacts greater than benefits?**				
YES	☐	NO	☒	
If so, identify constituents here and compare measured concentrations to thresholds.				
As described above, the IWQA is intended to serve as a framework for evaluating pollutant reduction potential and water quality benefits due to sediment removal (potential water quality benefit for implementing channel maintenance activities) in comparison with the estimated loss of temporary pollutant sorption/retention capacity as a result of channel maintenance (potential water quality impacts associated with channel maintenance activities). Given the presence of the dry weather diversion upstream of the SG Channel and general lack of flowing water within the SG and Pilot Channels, there is no estimated loss of temporary pollutant sorption/retention capacity as a result of channel maintenance activities in these channels. Additionally, there is pollutant reduction benefit due to sediment (and associated pollutant) removal as a result of the proposed maintenance activities.				

MITIGATION
Conclusion/Recommendations (Describe the limits of recommended maintenance, degree to which native vegetation within the facility can be retained, and capacity of maintained channel):
IWQA procedures under the MMP provide a methodology for a water quality management model to evaluate potential water quality benefits and impacts associated with channel maintenance activities. Current site conditions (lack of dry weather low flows) in the Pilot Channel and SG Channel do not meet the implementation criteria set forth in the PEIR's Water Quality Assessment –White Paper. Accordingly, the City modified sampling and analysis procedures to quantify the potential water quality benefits of channel maintenance activities related to sediment and non-native vegetation removal. The results of the IWQA process shows there is no estimated loss of temporary pollutant sorption/retention capacity and there is pollutant reduction benefit due to sediment removal as a result of the proposed maintenance activities. Even given this conclusion, the City has agreed to implement a suite of water quality improvement activities in the Coastal Zone to offset potential effects associated with the proposed project. These activities were required as part of the California Coastal Commission Coastal Development Permit (CDP No. A-6-NOC-11-086). The City proposes to utilize a suite of pollution prevention, source control, and treatment BMPs to address sediment and other pollutant inputs to the SG and Pilot Channel area drainages within the coastal zone (Table 3). The selected activity suite was derived from evaluation of current water quality improvement activities in each drainage area and synthesis of City-wide programmatic findings.

MITIGATION

Table 3. Proposed Water Quality Improvement Activities in the SG and Pilot Channel Drainages.

Priority Channel Area Drainage	Water Quality Activity Type	Description	Implementation Frequency	Duration
Tijuana River	Pollution Prevention	Commercial and residential property sediment reduction outreach distribution.	250 parcels	Approximately one month prior to maintenance initiation.
	Source Control	Street sweeping improvements-targeted vacuum-assisted/regenerative air machine usage.	5.0 -curb miles	One year subsequent to sediment removal maintenance events.
	Source Control	Municipal and bi-national agency collaboration through Tijuana River Valley Recovery Team to address sediment and trash.	Ongoing	Five years.
	Treatment	Enhanced catch basin inspection and as-needed cleaning implementation.	10 inlet locations	One year subsequent to sediment removal maintenance events.
City-wide	Special Study	Evaluate the need and potential effectiveness of implementing slope stabilization measures and small scale water quality basin BMPs on City-owned parcels within the priority channel drainage areas.	To be determined	One year subsequent to sediment removal maintenance event for each priority channel segment.

MITIGATION

Table 3. Proposed Water Quality Improvement Activities in the SG and Pilot Channel Drainages (Continued)

Priority Channel Area Drainage	Water Quality Activity Type	Description	Implementation Frequency	Duration
City-wide	Special Study	Degraded canyon area municipal separate storm sewer (MS4) outfall evaluation and improvement process.	To be determined	One year subsequent to sediment removal maintenance event for one priority channel segment
City-wide	Pilot Implementation Study	Conduct repairs on a prioritized representative degraded outfall to determine the relative level of planning, engineering and implementation effort needed to address identified canyon-area outfall problems.	1 outfall location	Five years.

In addition, the City will be implementing a five year receiving water monitoring plan in accordance with its Clean Water Act Section 401 Water Quality Certification (RWQCB 2012) for the project area. Applicable PEIR mitigation measures can be found in their entirety in Attachment 9. No water quality impacts were identified as a result of maintenance, therefore there are no additional mitigation efforts required by this IWQA.

Attachment 2 of the IMP includes all additional permits and their conditions which must be incorporated.

ADDITIONAL COMMENTS OR RECOMMENDATIONS

The PEIR Water Quality Assessment – White Paper's Standard *Operating Procedures to Conduct Water Quality Assessment and Quantification Model* acknowledges that site conditions may require modifications to the procedures. The procedures described in this document were modified from the original SOP based on existing site-specific conditions found in the SG and Pilot Channels.

REFERENCES
California Coastal Commission. 2012. Permit Number A-6-NOC-11-086. San Diego, California.
City of San Diego. 2010. Pilot Channel Borings and Sediment Characterization Report. Document ID# CSD-TM-09-URS09-01.D1.
City of San Diego. 2011a. Master Storm Water Maintenance Program. San Diego, California: October 2011
City of San Diego. 2011b. Final Recirculated Master Storm Water System Maintenance Program PEIR. San Diego, California: October 2011.
California Regional Water Quality Control Board San Diego Region (RWQCB). 2012. Tijuana River Valley Channel Maintenance, Water Quality Certification 09C-077 WDID Number 9000001976.
California Regional Water Quality Control Board San Diego Region (RWQCB). 1994. Water Quality Control Plan for the San Diego Basin (9).
URS Corporation for: California Department of Resources Recycling and Recovery. 2010. Report of Trash, Waste Tire and Sediment Characterization Tijuana River Valley. San Diego, California.

ATTACHMENTS	
Attachment 1	Project Overview Map
Attachment 2	Site Visit Photo Log
Attachment 3	Sediment Sample Boring Logs
Attachment 4	Sediment Sample Grain Size Distribution Curve and Sieve Analyses
Attachment 5	Sediment Sample Chain of Custody Form
Attachment 6	Sediment Sample Constituent List and Results
Attachment 7	Wetland Assessment Scoring Criteria
Attachment 8	Sediment Pollutant Loading Calculations
Attachment 9	Applicable PEIR Mitigation Measures

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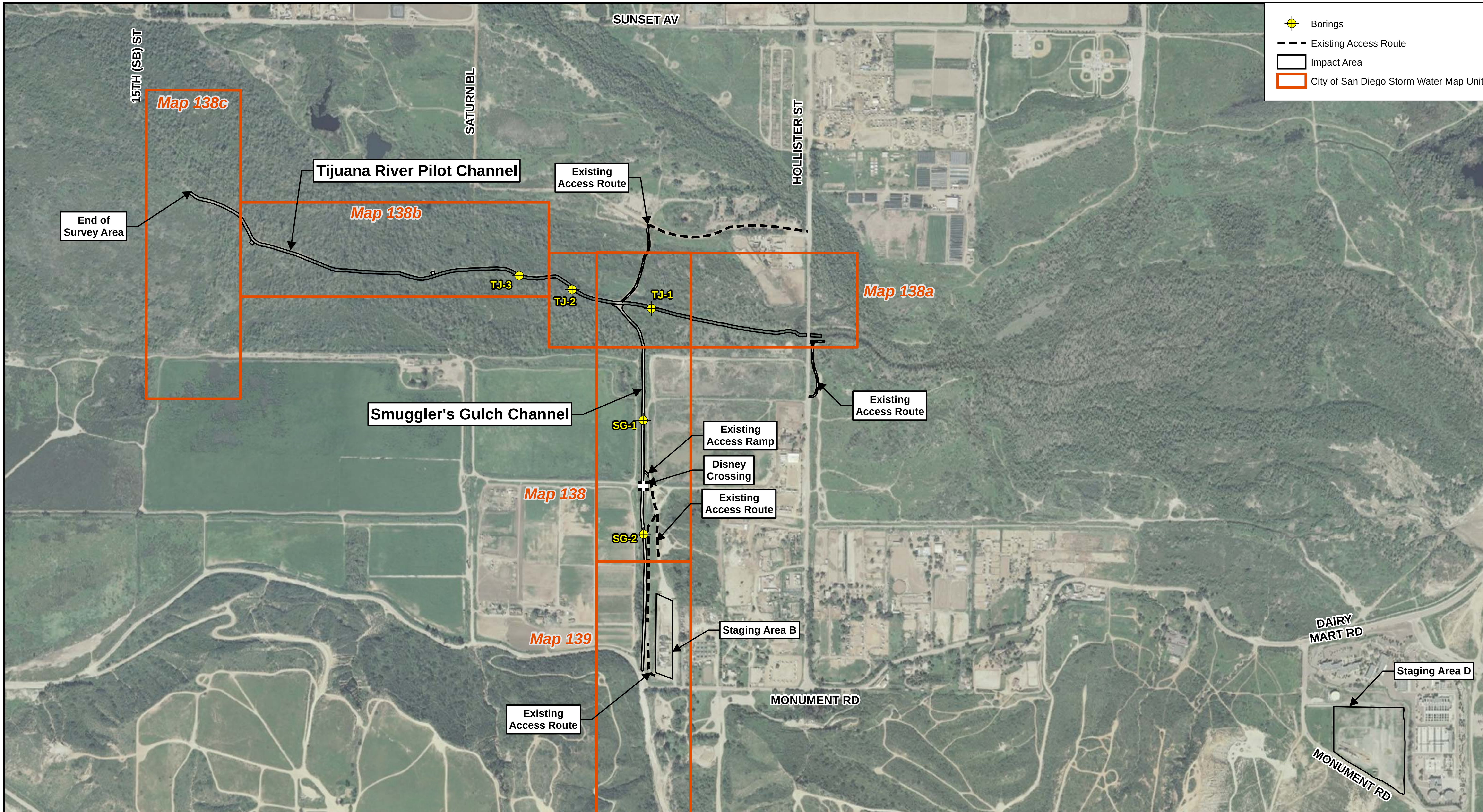

SOURCES:
CAD (City of San Diego, 2012)
Parcels (SanGIS, 2011)
Aerial (Aerials Express, 2010).

PROJECT OVERVIEW MAP
TIJUANA RIVER PILOT & SMUGGLER'S GULCH CHANNELS
MASTER STORM WATER SYSTEM MAINTENANCE PROGRAM
CITY OF SAN DIEGO

URS

CREATED BY: PM	DATE: 12/10/2012	FIG. NO: 1
PM: BE	PROJ. NO: 27679051.02000	

Path: G:\gis\projects\1577\27679051\map_docs\mxd\Tijuana\IWQA\Tijuana_River_Channel_Borings_Overview.mxd, paul_moreno, 12/10/2012, 1:08:13 PM

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URS

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
City of San Diego, O &M	Tijuana Pilot and Smuggler's Gulch Channels	27679954

Photo No. 1 | **Date:** 11/14/12

Direction Photo Taken:

South

Description:

Existing access route leading South from unnamed road west of Hollister Street to the confluence.

Photo No. 2 | **Date:** 11/14/12

Direction Photo Taken:

South

Description:

SG-1 limited access rig sample location. North of Disney Crossing.

URS

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
City of San Diego, O &M	Tijuana Pilot and Smuggler's Gulch Channels	27679954

Photo No. 3	Date: 11/14/12

Direction Photo Taken:

East

Description:

TJ-1 limited access rig sample location. East of the confluence.

Photo No. 4	Date: 11/14/12

Direction Photo Taken:

West

Description:

TJ-2 limited access rig sample location. West of the confluence.

URS

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
City of San Diego, O &M	Tijuana Pilot and Smuggler's Gulch Channels	27679954

Photo No. 5 **Date:** 11/14/12

Direction Photo Taken:

West

Description:

TJ-3 hand auger sample. West of the confluence.

Photo No. 6 **Date:** 11/14/12

Direction Photo Taken:

Description:
SG-2 sample location. South of Disney Crossing.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
City of San Diego, O &M	Tijuana Pilot and Smuggler's Gulch Channels	27679954

Photo No. 7 | **Date:** 11/14/12

Direction Photo Taken:

North

Description:

Confluence after sampling activities were conducted.

Photo No. 8 | **Date:** 11/14/12

Direction Photo Taken:

West

Description:

Drum filled with decon water from sampling activities.

Project: TJ River Remediation Project Location: TJ River Valley, San Diego Project Number: 27679954-04000	**Log of Boring** SG-1 Sheet 1 of 1

Date(s) Drilled 11/14/12	Logged By A. Avakian	Checked By
Drilling Method Hollow Stem Auger	Drill Bit Size/Type 8" Hollow Stem Auger	Total Depth of Borehole 3.5 feet
Drill Rig Type ASV	Drilling Contractor TCA	Approximate Surface Elevation
Water Level Depth (Feet) N/A	Sampling Method(s) SPT (Composite) / Bulk	Hammer Data 140 lb / 30" Auto
Borehole Backfill Cuttings	Location 32.54942 / 117.08838	

SG-1 Bulk

Elevation, feet	Depth, feet	SAMPLES Type	Number	Blows per foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
	0					→ Composite Sample ⇒ SG-1			
				3/2/4		Loose, moist, pale brown, F-c Sand, w/ trace F gravel, F-c. SAND (SP) No odor			955
				8/4/7		PID = 0.0 ppm			1013
	5					TD = 2.5'			
						· Bulk Sample Taken From 0' to 1.5'			
	10					PID = 0.0 ppm			
	15					◫ = SPT drive sample ☒ = Bulk Sample (Hand Dug)			
	20					· Walls of channel are about 6' to 8' high above middle of channel.			
	25								
	30								

Project: TJ River Remediation **Project Location:** TJ-River Valley, San Diego **Project Number:** 27679954.04000	**Log of Boring** SG-2 Sheet 1 of 1

Date(s) Drilled 11/14/12	Logged By A. Avalos	Checked By
Drilling Method Hand Auger	Drill Bit Size/Type Hand Auger	Total Depth of Borehole 2 feet
Drill Rig Type N/A	Drilling Contractor TZA	Approximate Surface Elevation
Water Level Depth (Feet) N/A	Sampling Method(s) Composite Grab Sample	Hammer Data N/A
Borehole Backfill Cuttings	Location 32.54707/117.08835	

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Number	SAMPLES: Blows per foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
	0	☒	SG-2			Moist, pale brown, f-m Sand (SP) Trace trash — — — 1.0' — — — PID = 0.0 ppm → Moist, pale brown, f-m. Sand, w/ some Silt, soil tightens up at 1' depth. (SP)			1245
	5					TD: 2'			
	10					PID = 0.0 ppm • Channel walls are about 10' +/- 2' high above middle of channel.			
	15					☒ = Composite Grab Sample Taken From Hand Auger.			
	20								
	25								
	30								

Project: TJ River Remediation Project Location: TJ River Valley, San Diego Project Number: 27679954.04000	**Log of Boring** TJ-1 Sheet 1 of 1

Date(s) Drilled: 11/14/12	Logged By: D. Avalica	Checked By:
Drilling Method: Hollow Stem Auger	Drill Bit Size/Type: 8" Hollow Stem Auger	Total Depth of Borehole: 5 feet
Drill Rig Type: ASV	Drilling Contractor: TCD	Approximate Surface Elevation:
Water Level Depth (Feet): N/A	Sampling Method(s): SPT	Hammer Data: 140lb/30" Auto
Borehole Backfill: Cuttings	Location: 32.55209 / 117.08838	

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
	0			1/2/3/3		Loose, moist, pale brown, Silty v.f. SAND (SM)			1320
				2/2/3/3		→ Trace trash PID = 0.0 ppm			
				2/4		→ Thin clay layer in end of shoe			1350
	5								
						→ TJ-1 (Composite Sample) TD = 5'			
	10					PID = 0.0 ppm			
						Channel walls are about 2' to 3' above middle of channel.			
	15								
						[ ] = SPT Drive Sample			
	20								
	25								
	30								

URS

Project: TJ River Remediation
Project Location: TJ River Valley, San Diego
Project Number: 27675554.04000

Log of Boring TJ-2

Sheet 1 of 1

Date(s) Drilled	11/14/12	Logged By	A. Avakian	Checked By	
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	8" Hollow Stem Auger	Total Depth of Borehole	5.0 feet
Drill Rig Type	ASV	Drilling Contractor	TCA	Approximate Surface Elevation	
Water Level Depth (Feet)	N/A	Sampling Method(s)	SPT	Hammer Data	140 lb/30" Auto
Borehole Backfill	Cuttings	Location	32.55238 / 117.09019		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Blows per foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
TJ-2 Bulk	0			1/2/2	3	→ TJ-2 (Composite Sample) Loose, moist, pale brown, Silty vf. Sand, trace organic fragments, Silty SAND (SM)			1100
				3/1/3	2	PID = 0.0 ppm			
				3/2					
	5								1125
	10					- Bulk Sample Collected From 0' to 1.5' depth.			
	15					[SPT symbol] = SPT Drive Sample [Bulk symbol] = Bulk Sample (Hand Dug)			
	20					• Channel Walls are 5' to 6' high above middle of channel.			
	25								
	30								

Report: GEO_10_SNA; File: TEMP2.GPJ; 6/3/2008 B-

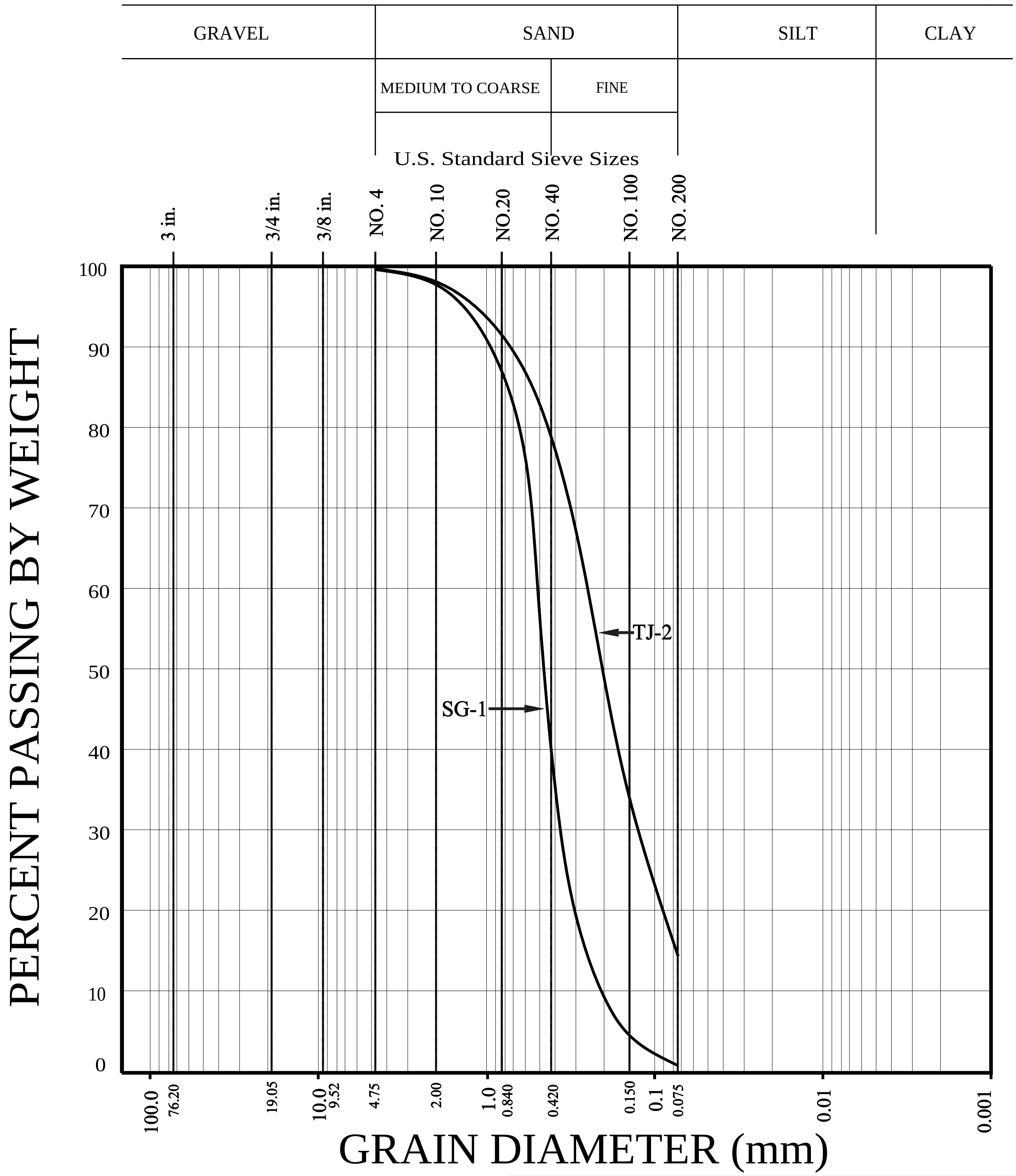
Project: TJ River Remediation **Project Location:** TJ River Valley, San Diego **Project Number:** 27679954.04000	**Log of Boring** TJ-3 Sheet 1 of 1

Date(s) Drilled 11/14/12	Logged By A. Avetian	Checked By
Drilling Method Hand Auger	Drill Bit Size/Type N/A	Total Depth of Borehole 5 feet
Drill Rig Type N/A	Drilling Contractor TZD	Approximate Surface Elevation
Water Level Depth (Feet) N/A	Sampling Method(s)	Hammer Data N/A
Borehole Backfill Cuttings	Location 32.55264 / 117.09156	

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Blows per foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
	0	X	TJ-3			0-1" Mud Moist, light olive brown, Silty vf. Sand (SM) → Organic odor at 2.5' 3.5' w/ grey/black stain Moist, pale brown, f-m Sand, w/ some interbedded zones of silty/clay and moderate organic odor + dark grey stain			PID=0.0 ppm 1415
	5					TD= 5'			
	10					PID=0.1 ppm			
	15					☒ = Composite Grab Sample Take From Hand Auger			
	20					· Channel walls are about 4' above middle of channel.			
	25								
	30								

Report: GEO_10_SNA; File: TEMP2.GPJ; 6/3/2008 B-

URS



SAMPLE	UNIFIED SOIL CLASSIFICATION
1- SG-1	SILTY SAND (SM) WITH GRAVEL
2- TJ-2	SILTY SAND (SM) WITH GRAVEL

SAMPLE	UNIFIED SOIL CLASSIFICATION

GEOCON WEST, INC.

ENVIRONMENTAL GEOTECHNICAL MATERIALS

3303 N. SAN FERNANDO BLVD. - SUITE 100 - BURBANK, CA 91504

PHONE (818) 841-8388 - FAX (818) 841-1704

RG		8000

GRAIN SIZE DISTRIBUTION

PAT-CHEM LABORATORIES
TJ RIVER VALLEY

NOV. 19, 2012	PROJECT NO. A8798-06-01	FIG. 1

GEOCON WEST, INC.

Project Name:	Pat-Chem Laboratories	Sampled By:	-	Date:	11/15/12
Project No.:	A8798-06-01	Tested By:	CC	Date:	11/16/2012
Location:	-	Engineer/ Geologist:	Gerry		
Sample No.:	SG-1	Depth:	-		
Soil Description:	Light Yellowish Brown Silty Sand with Gravel				

Total Wet Weight in Use with Tare	441.8
Total Dry Weight in Use with Tare	432.90
Moisture Content	2.64%
Container Number	Pan 5
Container Weight	95.6
Dry Weight After 200 Washed with Tare	430.5
Total Dry Weight of Sample	337.30

U.S. SIEVE SIZE	CUMULATIVE WEIGHT RETAINED			
	Accumulative	Wegiht	% Retained	% Passing
3"	0.0		0.00%	100.00%
2"	0.0		0.00%	100.00%
1½"	0.0		0.00%	100.00%
1"	0.0		0.00%	100.00%
¾"	0.0		0.00%	100.00%
½"	0.0		0.00%	100.00%
⅜"	0.0		0.00%	100.00%
No. 4 ✓	1.2		0.36%	99.64%
No. 10 ✓	5.0		1.48%	98.52%
No. 20 ✓	36.5		10.82%	89.18%
No. 40 ✓	191.6		56.80%	43.20%
No. 60	288.0		85.38%	14.62%
No. 100 ✓	321.9		95.43%	4.57%
No. 140	329.8		97.78%	2.22%
No. 200 ✓	334.8		99.26%	0.74%
Pan	334.9		99.29%	0.71%

GEOCON WEST, INC.

Project Name:	Pat-Chem Laboratories	Sampled By:	-	Date:	11/15/12
Project No.:	A8798-06-01	Tested By:	CC	Date:	11/16/2012
Location:	-	Engineer/ Geologist:	Gerry		
Sample No.:	TJ-2	Depth:	-		
Soil Description:	Yellowish Brown Silty Sand with Gravel and Organic				

Total Wet Weight in Use with Tare	329.2
Total Dry Weight in Use with Tare	311.83
Moisture Content	8.04%
Container Number	Pan 14
Container Weight	95.9
Dry Weight After 200 Washed with Tare	281.1
Total Dry Weight of Sample	215.93

U.S. SIEVE SIZE	CUMULATIVE WEIGHT RETAINED			
	Accumulative	Wegiht	% Retained	% Passing
3"	0.0		0.00%	100.00%
2"	0.0		0.00%	100.00%
1½"	0.0		0.00%	100.00%
1"	0.0		0.00%	100.00%
¾"	0.0		0.00%	100.00%
½"	0.0		0.00%	100.00%
⅜"	0.7		0.32%	99.68%
No. 4	4.1		1.90%	98.10%
No. 10	13.8		6.39%	93.61%
No. 20	20.1		9.31%	90.69%
No. 40	45.6		21.12%	78.88%
No. 60	101.5		47.01%	52.99%
No. 100	142.0		65.76%	34.24%
No. 140	169.1		78.31%	21.69%
No. 200	185.0		85.68%	14.32%
Pan	185.2		85.77%	14.23%

Pat-Chem Laboratories

11990 Discovery Court
Moorpark, CA 93021

CHAIN OF CUSTODY RECORD

Phone (805) 532-0012
Fax (805) 532-0016

Sample I.D.#: ____________

Customer Name: URS corporation	P.O.#: 27679954	Project Location: TJ River Valley
Address: 4225 Executive Square	Phone #: 858-[redacted] 812-9292	Sampled by: Adam Avakian
City, State, Zip: La Jolla 92037	Report Attention: bryn.evans@urs.com, elizabeth.chilman@urs.com, adam.avakian@urs.com	

Lab #	Date Sampled	Time Sampled	Comp or Grab	Type **see below	SAMPLE DESCRIPTION	No. Rec.	Required Tests	Preservatives	Bottle Type
	11/14/12	1013	Comp	So	SG-1	2	See Work Order	None	Glass Jar
	↓	1245	Comp	↓	SG-2	↓	or Contact Liz	↓	↓
	↓	1350	Comp	↓	TJ-1	↓	Chilman or Bryn	↓	↓
	↓	1125	Comp	↓	TJ-2	↓	Evans at 858-812-9292	↓	↓
	↓	1415	Comp	↓	TJ-3	↓		↓	↓
*	Samples are going to different lab for sieve analysis.								
	11/14/12	1430	Comp	So	TJ-2 Bulk	2		None	Soil bucket
	11/14/12	1450	Comp	So	SG-1 Bulk	2		None	Soil bucket

Signature	Print Name	Company	Date	Time
Relinquished by: [signature]	Adam Avakian	URS	11/15/12	920
Received by: [signature]	[illegible]	[illegible]	[illegible]	[illegible]
Relinquished by				
Received by				
Relinquished by				
Received by				

pH: ____________

Temperature: ____________

Initial Flow: ____________

Final Flow: ____________

** Type: AQ = aqueous NA = Nonaqueous SL = Sludge
SO = Soil PE = Petroleum OT = Other

Note: Samples are discarded 30 days after results are reported, unless other arrangements are made. Hazardous samples will be returned to client, or disposed at the CLIENTS expense.

Composite Sampler Setup Date: ___/___/___ Composite Sampler Setup Time: ___:___

Analytical Results for Sediment Sampling Activities

									Human Health		
		Detection	Reporting	Result					CHHSL/RSL		
Constituent	EPA Method	Limit	Limit	SG-1	SG-2	TJ-1	TJ-2	Units	Residential	Commercial/Industrial	Units
General Physical											
% Solids	% calculation	-	-	97.0	97.0	94.0	96.0	%	-	-	-
Inorganic Non-Metals											
Nitrate as N	EPA 300.0	0.2	0.5	10.7	0.9	23.7	21.2	mg/kg	130,000	1,600,000	mg/kg
Nitrite as N	EPA 300.0	0.2	0.5	<0.5	<0.5	<0.5	<0.5	mg/kg	7,800	100,000	mg/kg
Total Kjeldahl Nitrogen	EPA 351.2	0.9	1.0	31	210	220	130	mg/kg	-	-	-
Phosphorus, Total as P	EPA 365.4	0.5	1.0	103	165	363	316	mg/kg	-	-	-
Organics											
Chlorpyrifos	EPA 8141	24.4	50.0	<50.0	<50.0	<50.0	<50.0	ug/kg	61	620	mg/kg
Diazinon	EPA 8141	29.8	50.0	<50.0	<50.0	<50.0	<50.0	ug/kg	43	430	mg/kg
Malathion	EPA 8141	22.6	50.0	<50.0	<50.0	<50.0	<50.0	ug/kg	1,200	12,000	mg/kg
Metals											
Antimony	EPA 6010B	0.4	1.0	<1.0	<1.0	<1.0	<1.0	mg/kg	30	3,800	mg/kg
Arsenic	EPA 6010B	0.8	1.0	1.9	2.9	4.8	3.5	mg/kg	0.07	0.24	mg/kg
Cadmium	EPA 6010B	0.4	1.0	<1.0	<1.0	<1.0	<1.0	mg/kg	1.7	7.5	mg/kg
Chromium	EPA 6010B	0.3	1.0	4.1	13	9.2	8.9	mg/kg	100,000	100,000	mg/kg
Copper	EPA 6010B	0.4	1.0	2.9	10	7.5	7.1	mg/kg	3,000	38,000	mg/kg
Lead	EPA 6010B	0.4	1.0	15	2.8	3.1	5.0	mg/kg	80	320	mg/kg
Manganese	EPA 6010B	0.5	1.0	65	55	110	99	mg/kg	1,800	18,000	mg/kg
Nickel	EPA 6010B	0.4	1.0	2.8	4.7	6.0	5.8	mg/kg	1,600	16,000	mg/kg
Selenium	EPA 6010B	1.0	1.0	<1.0	<1.0	<1.0	<1.0	mg/kg	380	4,800	mg/kg
Zinc	EPA 6010B	0.6	1.0	14	23	38	31	mg/kg	23,000	100,000	mg/kg
OCP											
Tetrachloro-m-xylene	EPA 8081A	-	-	312	228	288	230	ug/kg	-	-	-
Decachlorobiphenyl	EPA 8081A	-	-	360	258	318	225	ug/kg	-	-	-
1,3-Dimethyl-2-nitrobenzene	EPA 8141	-	-	1920	1820	1660	1850	ug/kg	-	-	-

PAT-CHEM LABORATORIES

11990 Discovery Ct. • Moorpark, CA 93021 • Ph. (805) 532-0012 • Fax (805) 532-0016

Customer: **URS Corporation (San Diego) - Vendor # 112052**
4225 Executive Square, Suite 1600
La Jolla CA, 92037

Attention: Elizabeth Chilman
Project/P.O.#: 27679954
Report Date: 19-Nov-12 13:54
Subject: Sediment - TJ River Valley

PARAMETER	METHOD	QC BATCH	REPORTING LIMIT	ANALYZED (ANALYST)		RESULT	NOTE
SG-1 (Sample I.D.# : 1211169-01) Collected: 14-Nov-12 By A.Avakian							
Arsenic	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		1.9 mg/kg	
Cadmium	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)	<	1.0 mg/kg	
Chromium	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		4.1 mg/kg	
Copper	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		2.9 mg/kg	
Manganese	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		65 mg/kg	
Nickel	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		2.8 mg/kg	
Lead	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		15 mg/kg	
Antimony	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)	<	1.0 mg/kg	
Selenium	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)	<	1.0 mg/kg	
Zinc	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		14 mg/kg	
Alpha-BHC	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Beta-BHC	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Gamma-BHC(Lindane)	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Delta-BHC	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Heptachlor	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Aldrin	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Heptachlor Epoxide	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Gamma-Chlordane	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endosulfan I	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Alpha-Chlordane	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
4,4´-DDE	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Dieldrin	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endrin	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endosulfan II	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
4,4´-DDD	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endrin Aldehyde	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endosulfan Sulfate	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
4,4´-DDT	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endrin Ketone	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Methoxychlor	EPA 8081A	AK21623	16.7	17-Nov-12 (SM)	<	16.7 ug/kg	
Chlordane	EPA 8081A	AK21623	167	17-Nov-12 (SM)	<	167 ug/kg	

Respectfully Submitted,

Pat Brueckner 11/19/2012
Laboratory Director

PAT-CHEM LABORATORIES
11990 Discovery Ct. • Moorpark, CA 93021 • Ph. (805) 532-0012 • Fax (805) 532-0016

Customer: **URS Corporation (San Diego) - Vendor # 112052**
4225 Executive Square, Suite 1600
La Jolla CA, 92037

Attention: Elizabeth Chilman
Project/P.O.#: 27679954
Report Date: 19-Nov-12 13:54
Subject: Sediment - TJ River Valley

PARAMETER	METHOD	QC BATCH	REPORTING LIMIT	ANALYZED (ANALYST)		RESULT	NOTE
SG-1 (Sample I.D.# : 1211169-01) Collected: 14-Nov-12 By A.Avakian							
Toxaphene	EPA 8081A	AK21623	167	17-Nov-12 (SM)	<	167 ug/kg	
Surrogate: Tetrachloro-m-xylene	*EPA 8081A*	*AK21623*		*17-Nov-12 (SM)*		*93.5 % (22-120)*	
Surrogate: Decachlorobiphenyl	*EPA 8081A*	*AK21623*		*17-Nov-12 (SM)*		*108 % (27-103)*	
Azinphos methyl	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Bolstar	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Chlorpyrifos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Coumaphos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Demeton-o	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Demeton-s	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Diazinon	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Dichlorvos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Dimethoate	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Disulfoton	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
EPN	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Ethoprop	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Fensulfothion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Fenthion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Malathion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Merphos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Mevinphos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Naled	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Parathion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Methyl parathion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Phorate	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Ronnel	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Stirophos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Sulfotep	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
TEPP	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Tokuthion (Prothiofos)	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Trichloronate	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Surrogate: 1,3-Dimethyl-2-nitrobenze	*EPA 8141*	*AK21625*		*17-Nov-12 (SJ)*		*57.7 % (30-120)*	

Respectfully Submitted,

Pat Brueckner 11/19/2012
Laboratory Director

PAT-CHEM LABORATORIES

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Customer: **URS Corporation (San Diego) - Vendor # 112052**
4225 Executive Square, Suite 1600
La Jolla CA, 92037

Attention: Elizabeth Chilman
Project/P.O.#: 27679954
Report Date: 19-Nov-12 13:54
Subject: Sediment - TJ River Valley

PARAMETER	METHOD	QC BATCH	REPORTING LIMIT	ANALYZED (ANALYST)		RESULT	NOTE
SG-1 (Sample I.D.# : 1211169-01) Collected: 14-Nov-12 By A.Avakian							
Phosphorus, Total as P	EPA 365.4	AK21613	1.0	16-Nov-12 (CS)		103 mg/kg	
% Solids	% calculation	AK21620		16-Nov-12 (EA)		97.0 %	
Total Kjeldahl Nitrogen	EPA 351.2	AK21603	1.0	16-Nov-12 (JG)		31 mg/kg	
Nitrate as N	EPA 300.0	AK21621	0.5	16-Nov-12 (JG)		10.7 mg/kg	
Nitrite as N	EPA 300.0	AK21621	0.5	16-Nov-12 (JG)	<	0.5 mg/kg	
SG-2 (Sample I.D.# : 1211169-02) Collected: 14-Nov-12 By A.Avakian							
Arsenic	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		2.9 mg/kg	
Cadmium	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)	<	1.0 mg/kg	
Chromium	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		13 mg/kg	
Copper	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		10 mg/kg	
Manganese	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		55 mg/kg	
Nickel	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		4.7 mg/kg	
Lead	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		2.8 mg/kg	
Antimony	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)	<	1.0 mg/kg	
Selenium	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)	<	1.0 mg/kg	
Zinc	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		23 mg/kg	
Alpha-BHC	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Beta-BHC	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Gamma-BHC(Lindane)	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Delta-BHC	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Heptachlor	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Aldrin	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Heptachlor Epoxide	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Gamma-Chlordane	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endosulfan I	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Alpha-Chlordane	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
4,4´-DDE	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Dieldrin	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endrin	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endosulfan II	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
4,4´-DDD	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	

Respectfully Submitted,

Pat Brueckner — 11/19/2012
Laboratory Director

PAT-CHEM LABORATORIES

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Customer: **URS Corporation (San Diego) - Vendor # 112052**
4225 Executive Square, Suite 1600
La Jolla CA, 92037

Attention: Elizabeth Chilman   Project/P.O.#: 27679954
Report Date: 19-Nov-12 13:54
Subject: Sediment - TJ River Valley

PARAMETER	METHOD	QC BATCH	REPORTING LIMIT	ANALYZED (ANALYST)		RESULT	NOTE
SG-2 (Sample I.D.# : 1211169-02) Collected: 14-Nov-12 By A.Avakian							
Endrin Aldehyde	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endosulfan Sulfate	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
4,4´-DDT	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endrin Ketone	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Methoxychlor	EPA 8081A	AK21623	16.7	17-Nov-12 (SM)	<	16.7 ug/kg	
Chlordane	EPA 8081A	AK21623	167	17-Nov-12 (SM)	<	167 ug/kg	
Toxaphene	EPA 8081A	AK21623	167	17-Nov-12 (SM)	<	167 ug/kg	
Surrogate: Tetrachloro-m-xylene	*EPA 8081A*	*AK21623*		*17-Nov-12 (SM)*		*68.5 % (22-120)*	
Surrogate: Decachlorobiphenyl	*EPA 8081A*	*AK21623*		*17-Nov-12 (SM)*		*77.5 % (27-103)*	
Azinphos methyl	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Bolstar	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Chlorpyrifos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Coumaphos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Demeton-o	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Demeton-s	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Diazinon	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Dichlorvos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Dimethoate	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Disulfoton	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
EPN	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Ethoprop	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Fensulfothion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Fenthion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Malathion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Merphos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Mevinphos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Naled	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Parathion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Methyl parathion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Phorate	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Ronnel	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	

Respectfully Submitted,

Pat Brueckner   11/19/2012
Laboratory Director

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La Jolla CA, 92037

Attention: Elizabeth Chilman
Project/P.O.#: 27679954
Report Date: 19-Nov-12 13:54
Subject: Sediment - TJ River Valley

PARAMETER	METHOD	QC BATCH	REPORTING LIMIT	ANALYZED (ANALYST)		RESULT	NOTE
SG-2 (Sample I.D.# : 1211169-02) Collected: 14-Nov-12 By A.Avakian							
Stirophos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Sulfotep	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
TEPP	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Tokuthion (Prothiofos)	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Trichloronate	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Surrogate: 1,3-Dimethyl-2-nitrobenze	*EPA 8141*	*AK21625*		*17-Nov-12 (SJ)*		*54.5 % (30-120)*	
Phosphorus, Total as P	EPA 365.4	AK21613	1.0	16-Nov-12 (CS)		165 mg/kg	
% Solids	% calculation	AK21620		16-Nov-12 (EA)		97.0 %	
Total Kjeldahl Nitrogen	EPA 351.2	AK21603	1.0	16-Nov-12 (JG)		210 mg/kg	
Nitrate as N	EPA 300.0	AK21621	0.5	16-Nov-12 (JG)		0.9 mg/kg	
Nitrite as N	EPA 300.0	AK21621	0.5	16-Nov-12 (JG)	<	0.5 mg/kg	
TJ-1 (Sample I.D.# : 1211169-03) Collected: 14-Nov-12 By A.Avakian							
Arsenic	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		4.8 mg/kg	
Cadmium	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)	<	1.0 mg/kg	
Chromium	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		9.2 mg/kg	
Copper	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		7.5 mg/kg	
Manganese	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		110 mg/kg	
Nickel	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		6.0 mg/kg	
Lead	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		3.1 mg/kg	
Antimony	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)	<	1.0 mg/kg	
Selenium	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)	<	1.0 mg/kg	
Zinc	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		38 mg/kg	
Alpha-BHC	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Beta-BHC	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Gamma-BHC(Lindane)	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Delta-BHC	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Heptachlor	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Aldrin	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Heptachlor Epoxide	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Gamma-Chlordane	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endosulfan I	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	

Respectfully Submitted,

Pat Brueckner 11/19/2012
Laboratory Director

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PARAMETER	METHOD	QC BATCH	REPORTING LIMIT	ANALYZED (ANALYST)		RESULT	NOTE
TJ-1 (Sample I.D.# : 1211169-03) Collected: 14-Nov-12 By A.Avakian							
Alpha-Chlordane	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
4,4´-DDE	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Dieldrin	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endrin	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endosulfan II	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
4,4´-DDD	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endrin Aldehyde	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endosulfan Sulfate	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
4,4´-DDT	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endrin Ketone	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Methoxychlor	EPA 8081A	AK21623	16.7	17-Nov-12 (SM)	<	16.7 ug/kg	
Chlordane	EPA 8081A	AK21623	167	17-Nov-12 (SM)	<	167 ug/kg	
Toxaphene	EPA 8081A	AK21623	167	17-Nov-12 (SM)	<	167 ug/kg	
Surrogate: Tetrachloro-m-xylene	*EPA 8081A*	*AK21623*		*17-Nov-12 (SM)*		*86.5 % (22-120)*	
Surrogate: Decachlorobiphenyl	*EPA 8081A*	*AK21623*		*17-Nov-12 (SM)*		*95.5 % (27-103)*	
Azinphos methyl	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Bolstar	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Chlorpyrifos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Coumaphos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Demeton-o	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Demeton-s	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Diazinon	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Dichlorvos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Dimethoate	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Disulfoton	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
EPN	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Ethoprop	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Fensulfothion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Fenthion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Malathion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Merphos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	

Respectfully Submitted,

Pat Brueckner 11/19/2012
Laboratory Director

PAT-CHEM LABORATORIES
11990 Discovery Ct. • Moorpark, CA 93021 • Ph. (805) 532-0012 • Fax (805) 532-0016

Customer: **URS Corporation (San Diego) - Vendor # 112052**
4225 Executive Square, Suite 1600
La Jolla CA, 92037

Attention: Elizabeth Chilman
Project/P.O.#: 27679954
Report Date: 19-Nov-12 13:54
Subject: Sediment - TJ River Valley

PARAMETER	METHOD	QC BATCH	REPORTING LIMIT	ANALYZED (ANALYST)		RESULT	NOTE
TJ-1 (Sample I.D.# : 1211169-03) Collected: 14-Nov-12 By A.Avakian							
Mevinphos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Naled	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Parathion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Methyl parathion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Phorate	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Ronnel	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Stirophos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Sulfotep	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
TEPP	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Tokuthion (Prothiofos)	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Trichloronate	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Surrogate: 1,3-Dimethyl-2-nitrobenze	*EPA 8141*	*AK21625*		*17-Nov-12 (SJ)*		*49.9 % (30-120)*	
Phosphorus, Total as P	EPA 365.4	AK21613	1.0	16-Nov-12 (CS)		363 mg/kg	
% Solids	% calculation	AK21620		16-Nov-12 (EA)		94.0 %	
Total Kjeldahl Nitrogen	EPA 351.2	AK21603	1.0	16-Nov-12 (JG)		220 mg/kg	
Nitrate as N	EPA 300.0	AK21621	0.5	16-Nov-12 (JG)		23.7 mg/kg	
Nitrite as N	EPA 300.0	AK21621	0.5	16-Nov-12 (JG)	<	0.5 mg/kg	
TJ-2 (Sample I.D.# : 1211169-04) Collected: 14-Nov-12 By A.Avakian							
Arsenic	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		3.5 mg/kg	
Cadmium	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)	<	1.0 mg/kg	
Chromium	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		8.9 mg/kg	
Copper	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		7.1 mg/kg	
Manganese	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		99 mg/kg	
Nickel	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		5.8 mg/kg	
Lead	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		5.0 mg/kg	
Antimony	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)	<	1.0 mg/kg	
Selenium	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)	<	1.0 mg/kg	
Zinc	EPA 6010B	AK21606	1.0	16-Nov-12 (AF)		31 mg/kg	

Respectfully Submitted,

Pat Brueckner 11/19/2012
Laboratory Director

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Customer: **URS Corporation (San Diego) - Vendor # 112052**
4225 Executive Square, Suite 1600
La Jolla CA, 92037

Attention: Elizabeth Chilman
Project/P.O.#: 27679954
Report Date: 19-Nov-12 13:54
Subject: Sediment - TJ River Valley

PARAMETER	METHOD	QC BATCH	REPORTING LIMIT	ANALYZED (ANALYST)		RESULT	NOTE
TJ-2 (Sample I.D.# : 1211169-04) Collected: 14-Nov-12 By A.Avakian							
Alpha-BHC	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Beta-BHC	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Gamma-BHC(Lindane)	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Delta-BHC	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Heptachlor	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Aldrin	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Heptachlor Epoxide	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Gamma-Chlordane	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endosulfan I	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Alpha-Chlordane	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
4,4´-DDE	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Dieldrin	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endrin	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endosulfan II	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
4,4´-DDD	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endrin Aldehyde	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endosulfan Sulfate	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
4,4´-DDT	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Endrin Ketone	EPA 8081A	AK21623	3.3	17-Nov-12 (SM)	<	3.3 ug/kg	
Methoxychlor	EPA 8081A	AK21623	16.7	17-Nov-12 (SM)	<	16.7 ug/kg	
Chlordane	EPA 8081A	AK21623	167	17-Nov-12 (SM)	<	167 ug/kg	
Toxaphene	EPA 8081A	AK21623	167	17-Nov-12 (SM)	<	167 ug/kg	
Surrogate: Tetrachloro-m-xylene	*EPA 8081A*	*AK21623*		*17-Nov-12 (SM)*		*69.0 % (22-120)*	
Surrogate: Decachlorobiphenyl	*EPA 8081A*	*AK21623*		*17-Nov-12 (SM)*		*67.5 % (27-103)*	
Azinphos methyl	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Bolstar	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Chlorpyrifos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Coumaphos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Demeton-o	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Demeton-s	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Diazinon	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	

Respectfully Submitted,

Pat Brueckner 11/19/2012
Laboratory Director

PAT-CHEM LABORATORIES
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Customer: **URS Corporation (San Diego) - Vendor # 112052**
4225 Executive Square, Suite 1600
La Jolla CA, 92037

Attention: Elizabeth Chilman
Project/P.O.#: 27679954
Report Date: 19-Nov-12 13:54
Subject: Sediment - TJ River Valley

PARAMETER	METHOD	QC BATCH	REPORTING LIMIT	ANALYZED (ANALYST)		RESULT	NOTE
TJ-2 (Sample I.D.# : 1211169-04) Collected: 14-Nov-12 By A.Avakian							
Dichlorvos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Dimethoate	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Disulfoton	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
EPN	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Ethoprop	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Fensulfothion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Fenthion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Malathion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Merphos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Mevinphos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Naled	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Parathion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Methyl parathion	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Phorate	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Ronnel	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Stirophos	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Sulfotep	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
TEPP	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Tokuthion (Prothiofos)	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Trichloronate	EPA 8141	AK21625	50.0	17-Nov-12 (SJ)	<	50.0 ug/kg	
Surrogate: 1,3-Dimethyl-2-nitrobenze	*EPA 8141*	*AK21625*		*17-Nov-12 (SJ)*		*55.6 % (30-120)*	
Phosphorus, Total as P	EPA 365.4	AK21613	1.0	16-Nov-12 (CS)		316 mg/kg	
% Solids	% calculation	AK21620		16-Nov-12 (EA)		96.0 %	
Total Kjeldahl Nitrogen	EPA 351.2	AK21603	1.0	16-Nov-12 (JG)		130 mg/kg	
Nitrate as N	EPA 300.0	AK21621	0.5	16-Nov-12 (JG)		21.2 mg/kg	
Nitrite as N	EPA 300.0	AK21621	0.5	16-Nov-12 (JG)	<	0.5 mg/kg	

Respectfully Submitted,

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Customer: **URS Corporation (San Diego) - Vendor # 112052**
4225 Executive Square, Suite 1600
La Jolla CA, 92037

Attention: Elizabeth Chilman
Project/P.O.#: 27679954
Report Date: 19-Nov-12 13:54
Subject: Sediment - TJ River Valley

Metals by EPA 6000/7000 Series Methods - Quality Control

Parameter	Result	Rep. Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Note
Batch AK21606 - EPA 3050B										
Blank (AK21606-BLK1)				Prepared & Analyzed: 16-Nov-12						
Nickel	ND	1.0	mg/kg							
Chromium	ND	1.0	"							
Manganese	ND	1.0	"							
Lead	ND	1.0	"							
Antimony	ND	1.0	"							
Copper	ND	1.0	"							
Cadmium	ND	1.0	"							
Selenium	ND	1.0	"							
Zinc	ND	1.0	"							
Arsenic	ND	1.0	"							
LCS (AK21606-BS1)				Prepared & Analyzed: 16-Nov-12						
Nickel	25.1	1.0	mg/kg	25.0		100	80-120			
Selenium	21.4	1.0	"	25.0		85.6	80-120			
Cadmium	25.2	1.0	"	25.0		101	80-120			
Lead	24.9	1.0	"	25.0		99.6	80-120			
Manganese	25.1	1.0	"	25.0		100	80-120			
Zinc	23.7	1.0	"	25.0		94.7	80-120			
Copper	25.8	1.0	"	25.0		103	80-120			
Chromium	24.7	1.0	"	25.0		98.7	80-120			
Antimony	24.3	1.0	"	25.0		97.0	80-120			
Arsenic	22.5	1.0	"	25.0		89.9	80-120			
LCS Dup (AK21606-BSD1)				Prepared & Analyzed: 16-Nov-12						
Selenium	22.0	1.0	mg/kg	25.0		88.1	80-120	2.89	20	
Zinc	23.3	1.0	"	25.0		93.2	80-120	1.54	20	
Arsenic	23.0	1.0	"	25.0		91.8	80-120	2.16	20	

Respectfully Submitted,

Pat Brueckner

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Laboratory Director

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Attention: Elizabeth Chilman Project/P.O.#: 27679954
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Subject: Sediment - TJ River Valley

Metals by EPA 6000/7000 Series Methods - Quality Control

Parameter	Result	Rep. Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Note
Batch AK21606 - EPA 3050B										
LCS Dup (AK21606-BSD1)				Prepared & Analyzed: 16-Nov-12						
Cadmium	25.1	1.0	"	25.0		101	80-120	0.170	20	
Manganese	24.8	1.0	"	25.0		99.1	80-120	1.33	20	
Copper	26.0	1.0	"	25.0		104	80-120	0.716	20	
Antimony	24.0	1.0	"	25.0		95.8	80-120	1.25	20	
Lead	24.5	1.0	"	25.0		98.1	80-120	1.55	20	
Nickel	24.6	1.0	"	25.0		98.5	80-120	1.96	20	
Chromium	24.5	1.0	"	25.0		98.2	80-120	0.595	20	
Duplicate (AK21606-DUP1)		**Source: 1211169-01**		Prepared & Analyzed: 16-Nov-12						
Chromium	4.34	1.0	mg/kg		4.07			6.48	20	
Copper	2.85	1.0	"		2.87			0.907	20	
Cadmium	ND	1.0	"		ND				20	
Antimony	ND	1.0	"		ND				20	
Selenium	ND	1.0	"		ND				20	
Manganese	61.0	1.0	"		65.1			6.54	20	
Nickel	2.97	1.0	"		2.77			6.99	20	
Lead	16.0	1.0	"		15.0			6.19	20	
Arsenic	1.08	1.0	"		1.88			54.1	20	QR-04
Zinc	15.0	1.0	"		14.4			4.17	20	
Matrix Spike (AK21606-MS1)		**Source: 1211169-01**		Prepared & Analyzed: 16-Nov-12						
Nickel	120	1.0	mg/kg	125	2.77	94.1	75-125			
Lead	119	1.0	"	125	15.0	82.9	75-125			
Manganese	162	1.0	"	125	65.1	77.7	75-125			
Antimony	113	1.0	"	125	ND	90.3	75-125			
Arsenic	106	1.0	"	125	1.88	82.9	75-125			
Copper	122	1.0	"	125	2.87	95.0	75-125			

Respectfully Submitted,

Pat Brueckner

Pat Brueckner 11/19/2012
Laboratory Director

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Customer: **URS Corporation (San Diego) - Vendor # 112052**
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La Jolla CA, 92037

Attention: Elizabeth Chilman
Project/P.O.#: 27679954
Report Date: 19-Nov-12 13:54
Subject: Sediment - TJ River Valley

Metals by EPA 6000/7000 Series Methods - Quality Control

Parameter	Result	Rep. Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Note
Batch AK21606 - EPA 3050B										
Matrix Spike (AK21606-MS1)	**Source: 1211169-01**		Prepared & Analyzed: 16-Nov-12							
Chromium	123	1.0	"	125	4.07	94.8	75-125			
Zinc	128	1.0	"	125	14.4	91.0	75-125			
Selenium	87.1	1.0	"	125	ND	69.7	75-125			QM-05
Cadmium	120	1.0	"	125	ND	95.7	75-125			
Matrix Spike Dup (AK21606-MSD1)	**Source: 1211169-01**		Prepared & Analyzed: 16-Nov-12							
Nickel	118	1.0	mg/kg	125	2.77	92.2	75-125	1.97	20	
Chromium	121	1.0	"	125	4.07	93.3	75-125	1.53	20	
Zinc	128	1.0	"	125	14.4	90.9	75-125	0.0793	20	
Selenium	86.0	1.0	"	125	ND	68.8	75-125	1.29	20	QM-05
Cadmium	117	1.0	"	125	ND	93.9	75-125	1.91	20	
Copper	122	1.0	"	125	2.87	95.1	75-125	0.101	20	
Lead	117	1.0	"	125	15.0	81.2	75-125	1.78	20	
Antimony	111	1.0	"	125	ND	88.4	75-125	2.07	20	
Manganese	169	1.0	"	125	65.1	82.9	75-125	3.96	20	
Arsenic	104	1.0	"	125	1.88	81.8	75-125	1.42	20	

Respectfully Submitted,

Pat Brueckner 11/19/2012
Laboratory Director

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Attention: Elizabeth Chilman
Project/P.O.#: 27679954
Report Date: 19-Nov-12 13:54
Subject: Sediment - TJ River Valley

Organochlorine Pesticides by EPA Method 8081 - Quality Control

Parameter	Result	Rep. Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Note
Batch AK21623 - Solvent Extraction										
Blank (AK21623-BLK1)				Prepared: 16-Nov-12 Analyzed: 17-Nov-12						
Surrogate: Tetrachloro-m-xylene	*31.8*		*ug/kg*	*50.0*		*63.5*	*22-120*			
Surrogate: Decachlorobiphenyl	*32.5*		*"*	*50.0*		*65.0*	*27-103*			
Alpha-BHC	ND	0.5	"							
Beta-BHC	ND	0.5	"							
Gamma-BHC(Lindane)	ND	0.5	"							
Delta-BHC	ND	0.5	"							
Heptachlor	ND	0.5	"							
Aldrin	ND	0.5	"							
Heptachlor Epoxide	ND	0.5	"							
Gamma-Chlordane	ND	0.5	"							
Endosulfan I	ND	0.5	"							
Alpha-Chlordane	ND	0.5	"							
4,4´-DDE	ND	0.5	"							
Dieldrin	ND	0.5	"							
Endrin	ND	0.5	"							
Endosulfan II	ND	0.5	"							
4,4´-DDD	ND	0.5	"							
Endrin Aldehyde	ND	0.5	"							
Endosulfan Sulfate	ND	0.5	"							
4,4´-DDT	ND	0.5	"							
Endrin Ketone	ND	0.5	"							
Methoxychlor	ND	2.5	"							
Chlordane	ND	25.0	"							
Toxaphene	ND	25.0	"							
LCS (AK21623-BS1)				Prepared: 16-Nov-12 Analyzed: 17-Nov-12						

Respectfully Submitted,

Pat Brueckner 11/19/2012
Laboratory Director

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Subject: Sediment - TJ River Valley

Organochlorine Pesticides by EPA Method 8081 - Quality Control

Parameter	Result	Rep. Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Note
Batch AK21623 - Solvent Extraction										
LCS (AK21623-BS1)				Prepared: 16-Nov-12 Analyzed: 17-Nov-12						
Surrogate: Tetrachloro-m-xylene	*36.2*		*ug/kg*	*50.0*		*72.5*	*22-120*			
Surrogate: Decachlorobiphenyl	*40.5*		*"*	*50.0*		*81.0*	*27-103*			
Gamma-BHC(Lindane)	3.50	0.5	"	5.00		70.0	37-146			
Heptachlor	3.75	0.5	"	5.00		75.0	26-143			
Aldrin	3.75	0.5	"	5.00		75.0	30-143			
Dieldrin	9.75	0.5	"	12.5		78.0	23-145			
Endrin	10.5	0.5	"	12.5		84.0	50-142			
4,4´-DDT	9.50	0.5	"	12.5		76.0	48-95			
Aroclor 1248	ND	25.0	"				60-140			
LCS Dup (AK21623-BSD1)				Prepared: 16-Nov-12 Analyzed: 17-Nov-12						
Surrogate: Tetrachloro-m-xylene	*30.2*		*ug/kg*	*50.0*		*60.5*	*22-120*			
Surrogate: Decachlorobiphenyl	*32.0*		*"*	*50.0*		*64.0*	*27-103*			
Gamma-BHC(Lindane)	3.00	0.5	"	5.00		60.0	37-146	15.4	40	
Heptachlor	3.00	0.5	"	5.00		60.0	26-143	22.2	40	
Aldrin	3.00	0.5	"	5.00		60.0	30-143	22.2	40	
Dieldrin	8.00	0.5	"	12.5		64.0	23-145	19.7	40	
Endrin	8.50	0.5	"	12.5		68.0	50-142	21.1	40	
4,4´-DDT	7.50	0.5	"	12.5		60.0	48-95	23.5	40	
Aroclor 1248	ND	25.0	"				60-140		40	
Matrix Spike (AK21623-MS1)	**Source: 1211022-21**			Prepared: 16-Nov-12 Analyzed: 19-Nov-12						
Surrogate: Tetrachloro-m-xylene	*30.2*		*ug/kg*	*50.0*		*60.5*	*22-120*			
Surrogate: Decachlorobiphenyl	*31.2*		*"*	*50.0*		*62.5*	*27-103*			
Gamma-BHC(Lindane)	3.00	0.5	"	5.00	ND	60.0	60-140			
Heptachlor	3.00	0.5	"	5.00	ND	60.0	60-140			

Respectfully Submitted,

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Laboratory Director

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Customer: **URS Corporation (San Diego) - Vendor # 112052**
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La Jolla CA, 92037

Attention: Elizabeth Chilman
Project/P.O.#: 27679954
Report Date: 19-Nov-12 13:54
Subject: Sediment - TJ River Valley

Organochlorine Pesticides by EPA Method 8081 - Quality Control

Parameter	Result	Rep. Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Note
Batch AK21623 - Solvent Extraction										
Matrix Spike (AK21623-MS1)		**Source: 1211022-21**		Prepared: 16-Nov-12 Analyzed: 19-Nov-12						
Aldrin	3.25	0.5	"	5.00	ND	65.0	60-140			
Dieldrin	8.25	0.5	"	12.5	ND	66.0	60-140			
Endrin	8.75	0.5	"	12.5	ND	70.0	60-140			
4,4´-DDT	7.75	0.5	"	12.5	ND	62.0	60-140			
Aroclor 1248	ND	25.0	"		ND		60-140			
Matrix Spike Dup (AK21623-MSD1)		**Source: 1211022-21**		Prepared: 16-Nov-12 Analyzed: 17-Nov-12						
Surrogate: Tetrachloro-m-xylene	*34.2*		*ug/kg*	*50.0*		*68.5*	*22-120*			
Surrogate: Decachlorobiphenyl	*38.2*		*"*	*50.0*		*76.5*	*27-103*			
Gamma-BHC(Lindane)	3.75	0.5	"	5.00	ND	75.0	60-140	22.2	40	
Heptachlor	3.75	0.5	"	5.00	ND	75.0	60-140	22.2	40	
Aldrin	3.75	0.5	"	5.00	ND	75.0	60-140	14.3	40	
Dieldrin	9.75	0.5	"	12.5	ND	78.0	60-140	16.7	40	
Endrin	10.5	0.5	"	12.5	ND	84.0	60-140	18.2	40	
4,4´-DDT	9.50	0.5	"	12.5	ND	76.0	60-140	20.3	40	
Aroclor 1248	ND	25.0	"		ND		60-140		40	

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Report Date: 19-Nov-12 13:54
Subject: Sediment - TJ River Valley

Organophosphorus Pesticides by EPA Method 8141A - Quality Control

Parameter	Result	Rep. Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Note
Batch AK21625 - Solvent Extraction										
Blank (AK21625-BLK1)				Prepared: 16-Nov-12 Analyzed: 17-Nov-12						
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1400*		*ug/kg*	*2000*		*70.0*	*30-120*			
Azinphos methyl	ND	50.0	"							
Bolstar	ND	50.0	"							
Chlorpyrifos	ND	50.0	"							
Coumaphos	ND	50.0	"							
Demeton-o	ND	50.0	"							
Demeton-s	ND	50.0	"							
Diazinon	ND	50.0	"							
Dichlorvos	ND	50.0	"							
Dimethoate	ND	50.0	"							
Disulfoton	ND	50.0	"							
EPN	ND	50.0	"							
Ethoprop	ND	50.0	"							
Fensulfothion	ND	50.0	"							
Fenthion	ND	50.0	"							
Malathion	ND	50.0	"							
Merphos	ND	50.0	"							
Mevinphos	ND	50.0	"							
Naled	ND	50.0	"							
Parathion	ND	50.0	"							
Methyl parathion	ND	50.0	"							
Phorate	ND	50.0	"							
Ronnel	ND	50.0	"							
Stirophos	ND	50.0	"							
Sulfotep	ND	50.0	"							

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Subject: Sediment - TJ River Valley

Organophosphorus Pesticides by EPA Method 8141A - Quality Control

Parameter	Result	Rep. Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Note
Batch AK21625 - Solvent Extraction										
Blank (AK21625-BLK1)				Prepared: 16-Nov-12 Analyzed: 17-Nov-12						
TEPP	ND	50.0	"							
Tokuthion (Prothiofos)	ND	50.0	"							
Trichloronate	ND	50.0	"							
LCS (AK21625-BS1)				Prepared: 16-Nov-12 Analyzed: 17-Nov-12						
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1440*		*ug/kg*	*2000*		*72.0*	*30-120*			
Malathion	974	50.0	"	1000		97.4	60-130			
LCS Dup (AK21625-BSD1)				Prepared: 16-Nov-12 Analyzed: 17-Nov-12						
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1250*		*ug/kg*	*2000*		*62.3*	*30-120*			
Malathion	870	50.0	"	1000		87.0	60-130	11.3	30	
Matrix Spike (AK21625-MS1)	**Source: 1211022-21**			Prepared: 16-Nov-12 Analyzed: 17-Nov-12						
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1310*		*ug/kg*	*2000*		*65.4*	*30-120*			
Malathion	926	50.0	"	1000	ND	92.6	40-130			
Matrix Spike Dup (AK21625-MSD1)	**Source: 1211022-21**			Prepared: 16-Nov-12 Analyzed: 17-Nov-12						
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1280*		*ug/kg*	*2000*		*63.9*	*30-120*			
Malathion	913	50.0	"	1000	ND	91.3	40-130	1.41	40	

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Attention: Elizabeth Chilman — Project/P.O.#: 27679954
Report Date: 19-Nov-12 13:54
Subject: Sediment - TJ River Valley

General Inorganic Nonmetallic Chemistry by Standard Methods/EPA Methods - Quality Control

Parameter	Result	Rep. Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Note
Batch AK21603 - General Preparation										
Blank (AK21603-BLK1)				Prepared & Analyzed: 16-Nov-12						
Total Kjeldahl Nitrogen	ND	1.0	mg/kg							
LCS (AK21603-BS1)				Prepared & Analyzed: 16-Nov-12						
Total Kjeldahl Nitrogen	99	1.0	mg/kg	100		99.0	85-115			
LCS Dup (AK21603-BSD1)				Prepared & Analyzed: 16-Nov-12						
Total Kjeldahl Nitrogen	99	1.0	mg/kg	100		99.3	85-115	0.303	15	
Duplicate (AK21603-DUP1)		**Source: 1211169-01**		Prepared & Analyzed: 16-Nov-12						
Total Kjeldahl Nitrogen	30	1.0	mg/kg		31			2.63	20	
Matrix Spike (AK21603-MS1)		**Source: 1211169-01**		Prepared & Analyzed: 16-Nov-12						
Total Kjeldahl Nitrogen	140	1.0	mg/kg	100	31	108	75-125			
Matrix Spike Dup (AK21603-MSD1)		**Source: 1211169-01**		Prepared & Analyzed: 16-Nov-12						
Total Kjeldahl Nitrogen	140	1.0	mg/kg	100	31	109	75-125	0.717	35	
Batch AK21613 - General Preparation										
Blank (AK21613-BLK1)				Prepared & Analyzed: 16-Nov-12						
Phosphorus, Total as P	ND	1.0	mg/kg							
LCS (AK21613-BS1)				Prepared & Analyzed: 16-Nov-12						
Phosphorus, Total as P	32.3	1.0	mg/kg	33.4		96.9	85-115			
LCS Dup (AK21613-BSD1)				Prepared & Analyzed: 16-Nov-12						
Phosphorus, Total as P	33.7	1.0	mg/kg	33.4		101	85-115	4.04	15	

Respectfully Submitted,

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Attention: Elizabeth Chilman
Project/P.O.#: 27679954
Report Date: 19-Nov-12 13:54
Subject: Sediment - TJ River Valley

General Inorganic Nonmetallic Chemistry by Standard Methods/EPA Methods - Quality Control

Parameter	Result	Rep. Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Note
Batch AK21613 - General Preparation										
Duplicate (AK21613-DUP1)		**Source: 1211169-01**		Prepared & Analyzed: 16-Nov-12						
Phosphorus, Total as P	101	1.0	mg/kg		103			2.45	20	
Matrix Spike (AK21613-MS1)		**Source: 1211169-01**		Prepared & Analyzed: 16-Nov-12						
Phosphorus, Total as P	247	1.0	mg/kg	167	103	85.9	75-125			
Matrix Spike Dup (AK21613-MSD1)		**Source: 1211169-01**		Prepared & Analyzed: 16-Nov-12						
Phosphorus, Total as P	248	1.0	mg/kg	167	103	86.9	75-125	0.673	80	
Batch AK21620 - General Preparation										
Blank (AK21620-BLK1)				Prepared & Analyzed: 16-Nov-12						
% Solids	0.00		%							
Duplicate (AK21620-DUP1)		**Source: 1211169-01**		Prepared & Analyzed: 16-Nov-12						
% Solids	97.0		%		97.0			0.00	15	

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Attention: Elizabeth Chilman
Project/P.O.#: 27679954
Report Date: 19-Nov-12 13:54
Subject: Sediment - TJ River Valley

Anions by EPA Method 300.0 - Quality Control

Parameter	Result	Rep. Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Note
Batch AK21621 - General Preparation										
Blank (AK21621-BLK1)				Prepared & Analyzed: 16-Nov-12						
Nitrite as N	ND	0.5	mg/kg							
Nitrate as N	ND	0.5	"							
LCS (AK21621-BS1)				Prepared & Analyzed: 16-Nov-12						
Nitrite as N	16.0	0.5	mg/kg	16.7		96.2	85-115			
Nitrate as N	14.3	0.5	"	16.7		85.8	85-115			
LCS Dup (AK21621-BSD1)				Prepared & Analyzed: 16-Nov-12						
Nitrate as N	14.3	0.5	mg/kg	16.7		86.0	85-115	0.233	15	
Nitrite as N	16.1	0.5	"	16.7		96.6	85-115	0.415	15	
Duplicate (AK21621-DUP1)	**Source: 1211169-01**			Prepared & Analyzed: 16-Nov-12						
Nitrate as N	10.3	0.5	mg/kg		10.7			3.17	20	
Nitrite as N	ND	0.5	"		ND				20	
Matrix Spike (AK21621-MS1)	**Source: 1211169-01**			Prepared & Analyzed: 16-Nov-12						
Nitrite as N	16.1	0.5	mg/kg	16.7	ND	96.8	80-120			
Nitrate as N	24.0	0.5	"	16.7	10.7	80.0	80-120			
Matrix Spike Dup (AK21621-MSD1)	**Source: 1211169-01**			Prepared & Analyzed: 16-Nov-12						
Nitrite as N	16.0	0.5	mg/kg	16.7	ND	96.2	80-120	0.622	20	
Nitrate as N	24.0	0.5	"	16.7	10.7	80.0	80-120	0.00	20	

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Attention: Elizabeth Chilman
Project/P.O.#: 27679954
Report Date: 19-Nov-12 13:54
Subject: Sediment - TJ River Valley

Notes and Definitions

QR-04	The RPD value for the sample duplicate was outside of QC acceptance limits due to analyte concentration being below 3 - 5x the reporting limit. QC batch accepted based on LCS and/or LCSD recovery and/or RPD values; and MS/MSD RPD values.
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis

Respectfully Submitted,

Pat Brueckner 11/19/2012
Laboratory Director

IWQA Attachment 7 - Wetland Assessment Criteria

Wetland Assessment (Existing) Value Scoring System

Vegetation		Hydrosoil		Hydroperiod	
Score	**Description**	**Score**	**Description**	**Score**	**Description**
0	No visible vegetation	**0**	Storm water facility reach with little to no sediment and storm water facility is lined with concrete or other impermeable substrate	**0**	No visible surface water within the storm water facility reach
1	Very young population of woody, terrestrial species with an overall low surface area coverage	**1**	Hydrosoil consists of sand and cobble, with not visible deposition of fines, sediment pH is less than 6 or greater than 8, and redox within reach is positive (+100 mV)	**1**	Very deep (>2 feet) or very shallow (<0.5 feet) areas, fast flowing water and/or no deposition of fines and organic carbon in the storm water facility
2	Mature wetland population near carrying capacity, overgrown with both submerged and emergent wetland species	**2**	Heterogenous mixture of sand and fines with hydrosoil, visible sedimentation, organics, neutral pH, and redox from (-100 mV to +100 mV)	**2**	Moderate water flow, intermittent/pulsed flow depending on inputs and effects of storm water events, a moderate HRT* (less than 12 hours), shallow (0.5-1 foot deep), redox ranging from -100 to +100 mV, and some deposition of fines
3	Young population of emergent and submerged wetland species which reproduce through tubers and/or rhizomes (Spartina, Typha, Scirpus, Phragmites)	**3**	System consisting of primarily fines and organic carbon, very little sand, and areas of high solids deposition, neutral pH, and redox less than -100 mV.	**3**	Water 1-2 feet deep, slow flow, with no evidence of scouring and/or channeling, a preferential HRT (>12 Hours), and measureable/observable deposition of fines.

*HRT-Hydraulic Retention Time

Wetland Assessment (Recovery) Value Scoring System

Vegetation		Hydrosoil		Hydroperiod	
Score	**Description**	**Score**	**Description**	**Score**	**Description**
0	Assumption that the current population will not recover to its current density after removal of the standing crop	**0**	High flow or no flow area with little to no deposition likely	**0**	No sediment deposition within the reach due to channel flow.
1	The current population is comprised of trees and woody species and recovery would take greater than 5 years.	**1**	Primarily sand deposition in the short-term. The likelihood of fines and/or organic carbon accumulating within the reach is low within a 5 year period	**1**	Flow within the reach and thus some deposition of sand and other coarse grain materials

IWQA Attachment 7 - Wetland Assessment Criteria

Vegetation		Hydrosoil		Hydroperiod	
Score	**Description**	**Score**	**Description**	**Score**	**Description**
2	The current population is mature habitat with mix of woody and leafy vegetation. (Terrestrial and wetland species) Recovery would take 1 – 5 years	**2**	Heterogeneous mix of sand, organics, and fines depositing and accumulating in the next 1-5 years	**2**	Wide spot in the storm water facility after maintenance, resulting in some deposition of fines, and an overlying water depth of less than 0.5-feet.
3	Population comprised of primarily emergent and submerged wetland species and re-growth to the current density would take approximately 1 year.	**3**	Heterogeneous mix of sand, organics, and fines depositing and accumulating within the reach in the next year	**3**	Flood control reach with an overlying water depth greater than 1-foot, typically a wide spot in the storm water facility after maintenance, and associated deposition of fines and organics.

SG and Pilot Channel Sediment Pollutant Loading Calculations

Sediment

Equations:

$$\rho_{dry\ insitu} = \frac{\%_{solid} * \rho_{water} * \rho_{solid}}{\rho_{solid} - (\%_{solid} * \rho_{solid}) + (\%_{solid} * \rho_{water})}$$

$$Sediment\ Mass = Removal\ Volume * \rho_{dry\ insitu}$$

Parameters:

$\rho_{solid} =$ 165.4 lbs/ft^3 $\rho_{water} =$ 62.4 lbs/ft^3

The approximated removal volume for the entire maintenance project is expected to be 30,000 cyd. Using after maintenance geometery of the SG Channel and Pilot Channel, the 30,000 cyd was distrubuted amongst the four analyzed sediment sample locations.

Sample ID	Removal Volume (cyd)	% Solid	$\rho_{dry\ insitu}$ lbs/ft^3	Sediment Mass (lbs)
SG-1:	8,040	97%	152.87	33,180,000
SG-2:	3,310	97%	152.87	13,660,000
TJ-1:	13,370	94%	141.47	51,070,000
TJ-2:	5,280	96%	148.95	21,230,000
Total:	**30,000**			**119,140,000**

Sediment Pollutant Loading

Analyte	SG-1		SG-2		TJ-1		TJ-2		TOTALS
	mg/kg	lbs	mg/kg	lbs	mg/kg	lbs	mg/kg	lbs	
Nitrate as N	10.7	3.55E+08	0.9	1.23E+07	23.7	1.21E+09	21.2	4.50E+08	**2.03E+09**
Nitrite as N	<0.5	-	<0.5	-	<0.5	-	<0.5	-	**-**
Total Kjeldahl Nitrogen	31	1.03E+09	210	2.87E+09	220	1.12E+10	130	2.76E+09	**1.79E+10**
Phosphorus, Total as P	103	3.42E+09	165	2.25E+09	363	1.85E+10	316	6.71E+09	**3.09E+10**
Chlorpyrifos	<.05	-	<.05	-	<.05	-	<.05	-	**-**
Diazinon	<.05	-	<.05	-	<.05	-	<.05	-	**-**
Malathion	<.05	-	<.05	-	<.05	-	<.05	-	**-**
Antimony	<1.0	-	<1.0	-	<1.0	-	<1.0	-	**-**
Arsenic	1.9	6.30E+07	2.9	3.96E+07	4.8	2.45E+08	3.5	7.43E+07	**4.22E+08**
Cadmium	<1.0	-	<1.0	-	<1.0	-	<1.0	-	**-**
Chromium	4.1	1.36E+08	13	1.78E+08	9.2	4.70E+08	8.9	1.89E+08	**9.72E+08**
Copper	2.9	9.62E+07	10	1.37E+08	7.5	3.83E+08	7.1	1.51E+08	**7.67E+08**
Lead	15	4.98E+08	2.8	3.82E+07	3.1	1.58E+08	5.0	1.06E+08	**8.00E+08**
Manganese	65	2.16E+09	55	7.51E+08	110	5.62E+09	99	2.10E+09	**1.06E+10**
Nickel	2.8	9.29E+07	4.7	6.42E+07	6.0	3.06E+08	5.8	1.23E+08	**5.87E+08**
Selenium	<1.0	-	<1.0	-	<1.0	-	<1.0	-	**-**
Zinc	14	4.65E+08	23	3.14E+08	38	1.94E+09	31	6.58E+08	**3.38E+09**
Tetrachloro-m-xylene	0.312	1.04E+07	0.228	3.11E+06	0.288	1.47E+07	0.230	4.88E+06	**3.31E+07**
Decachlorobiphenyl	0.360	1.19E+07	0.258	3.52E+06	0.318	1.62E+07	0.225	4.78E+06	**3.65E+07**
1,3-Dimethyl-2-nitrobenzene	1.920	6.37E+07	1.820	2.49E+07	1.660	8.48E+07	1.850	3.93E+07	**2.13E+08**

Attachment 9

Applicable PEIR Mitigation Measures

<u>GENERAL</u>

General Mitigation 1: Prior to commencement of work, the Assistant Deputy Director (ADD) Environmental Designee of the Entitlements Division shall verify that mitigation measures for impacts to biological resources (Mitigation Measures 4.3.1 through 4.3.20), historical resources (Mitigation Measures 4.4.1 and 4.4.2), land use policy (Mitigation Measures 4.1.1 through 4.1.13), paleontological resources (Mitigation Measure 4.7.1), and water quality (Mitigation Measures 4.8.1 through 4.8.3) have been included in entirety on the submitted maintenance documents and contract specifications, and included under the heading, "Environmental Mitigation Requirements." In addition, the requirements for a Pre-maintenance Meeting shall be noted on all maintenance documents.

General Mitigation 2: Prior to the commencement of work, a Pre-maintenance Meeting shall be conducted and include, as appropriate, the MMC, SWD Project Manager, Biological Monitor, Historical Monitor, Paleontological Monitor, Water Quality Specialist, and Maintenance Contractor, and other parties of interest.

General Mitigation 3*:* Prior to the commencement of work, evidence of compliance with other permitting authorities is required, if applicable. Evidence shall include either copies of permits issued, letters of resolution issued by the Responsible Agency documenting compliance, or other evidence documenting compliance and deemed acceptable by the ADD Environmental Designee.

General Mitigation 4: Prior to commencement of work and pursuant to Section 1600 et seq. of the State of California Fish & Game Code, evidence of compliance with Section 1605 is required, if applicable. Evidence shall include either copies of permits issued, letters of resolution issued by the Responsible Agency documenting compliance, or other evidence documenting compliance and deemed acceptable by the ADD Environmental Designee.

<u>WATER QUALITY</u>

Potential impacts to water quality would be reduced to below a level of significance through implementation of the following mitigation measures.

Mitigation Measure 4.8.1: Prior to commencement of any activity within a specific annual maintenance program, a qualified water quality specialist shall prepare an IWQA for each area proposed to be maintained. The IWQA shall be prepared in accordance with the specifications included in the Master Program. If the IWQA indicates that maintenance would impact a water pollutant where the existing level for that pollutant exceeds or is within 25 percent of the standard established by the San Diego Basin Plan, mitigation measures identified in Table 4.8-8 shall be incorporated into the IMP to reduce the impact to within the established standard for that pollutant.

Table 4.8-8
MITIGATION MEASURES FOR REDUCED POLLUTANT REMOVAL CAPACITY

Mitigation Measure	Pollutant Type						
	Bacteria	Metals	Nutrients	Pesticides	Sediment	TDS/Chloride Sulfates	Trash
Remove kelp on beaches					•	•	
Sweep streets	•	•	•	•	•	•	•
Retrofit residential landscaping to reduce runoff	•	•	•		•		
Install artificial turf	•	•	•	•	•		•
Install inlet devices on storm drains		•	•		•		
Replace impermeable surfaces with permeable surfaces		•	•		•		•
Install modular storm water filtration systems		•	•	•	•	•	•
Install storm water retention basins		•	•	•	•	•	•
Install catch basin media filters		•	•		•	•	•
Create vegetated swales	•	•	•	•	•	•	•
Restore wetlands	•	•	•	•	•	•	•
Install check dams		•			•		•

Mitigation Measure 4.8.2: No maintenance activities within a proposed annual maintenance program shall be initiated before the City's ADD Environmental Designee and state and federal agencies with jurisdiction over maintenance activities have approved the IMPs and IWQAs including proposed mitigation and BMPs for each of the proposed activities. In their review, the ADD Environmental Designee and agencies shall also confirm that the appropriate maintenance protocols have been incorporated into each IMP.

THE CITY OF SAN DIEGO

June 17, 2015

Executive Officer
California Regional Water Quality Control Board
San Diego Region
Attn: 401 Certification Section; Project 09C-077
2375 Northside Drive Ste. 100
San Diego, CA 92108

Subject: Clean Water Act Section 401 Water Quality Certification for Tijuana River Valley Channel Maintenance Project, 09C-077 (reference 745397: lhonma)

Dear Executive Officer:

Pursuant to the Tijuana River Valley Channel Maintenance Project 401 certification, Project No. 09C-077, section IV, the City submits the Tijuana River Valley Channel Maintenance Project Receiving Water Monitoring Report.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Please feel free to contact Jamie Kennedy, Associate Planner, by phone at (619) 527-3495 or e-mail at JMKennedy@sandiego.gov, with questions or comments.

Respectfully,

Gene Matter
Assistant Deputy Director

GM/jk

Enclosure: Tijuana River Valley Channel Maintenance Project Receiving Water Monitoring Report, June 2015, prepared by Amec Foster Wheeler Environment & Infrastructure, Inc

Operations and Maintenance • Storm Water
Chollas Operations Station
2781 Caminito Chollas • San Diego, CA 92105

TIJUANA RIVER VALLEY CHANNEL MAINTENANCE PROJECT
RECEIVING WATER MONITORING REPORT - DRAFT

Year 2- 2015 MONITORING EVENT

Prepared for:

City of San Diego
Transportation and Storm Water Department
2781 Caminito Chollas, MS 44
San Diego, California 92105

Submitted by:
Amec Foster Wheeler Environment & Infrastructure, Inc.
9210 Sky Park Court, Suite 200
San Diego, California 92123
(858) 300-4300

10 June 2015

Project No. 5025141106

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ACRONYMS AND ABBREVIATIONS

Symbol	Description
%	percent
AA	assessment area(s)
Amec Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure, Inc.
ºC	degrees Celsius
CDFW	California Department of Fish & Wildlife
cm	centimeter
City	City of San Diego
CRAM	California Rapid Assessment Method
DO	dissolved Oxygen
EPA	Environmental Protection Agency
EPT	Ephemeroptera, Plecoptera, and Trichoptera
ID	identification
In-situ	Measurements taken at the station
HBI	Hilsenhoff Biotic Index
km	kilometers
L	liter
MDL	method detection limit
m	meter(s)
mg	milligrams
N	nitrogen
NOLF	Naval Outlying Landing Field
NTU	Nephelometric turbidity units
ppt	part(s) per thousand
Project	Tijuana River Valley Channel Maintenance Project 09C-077
RWQCB	Regional Water Quality Control Board
RL	reporting limit
SBIWTP	South Bay International Wastewater Treatment Plant
SD	San Diego
SM	standard method
SWAMP	Surface Water Ambient Monitoring Program

Symbol	**Description**
SWI	Shannon Weiner Index
SWRCB	State Water Resources Control Board
TJ-PC-D	Downstream Tijuana River Pilot Channel station
TJ-PC-U	Upstream Tijuana River Pilot Channel station
TJ-SG-U	Upstream Smuggler's Gulch station
TKN	total Kjeldahl nitrogen
TSS	total suspended solids
TSWD	Transportation and Storm Water Department
µS	microSiemens

1.0 INTRODUCTION

The City of San Diego (City) has implemented a maintenance dredging program within the Tijuana River Valley to restore storm water conveyance capabilities of selected channels and reduce the potential for flooding of nearby properties. The dredging removes between 10,000 and 30,000 cubic yards of dredge material each maintenance event from the Tijuana River Pilot Channel (Pilot Channel) and Smuggler's Gulch. In addition, the City is eradicating non-native plant species (e.g., Arundo (*Arundo donax*), Castor Bean (*Ricinus communis*), and Tamarisk (*Tamarix aphylla*)) in an 8.62 acre area within and adjacent to the maintenance area footprint.

The San Diego Regional Water Quality Control Board (RWQCB) issued an amendment to the Clean Water Act Section 401 Water Quality Certification (Certification) and acknowledged enrollment under State Water Resources Control Board (SWRCB) Order No. 2003-17-DWQ for Statewide General Waste Discharge Requirements for Dredged or Fill Discharges for the Tijuana River Valley Channel Maintenance Project 09C-077 (Project). The Certification required the Project to include the following three monitoring components to help quantify the potential impacts to the Tijuana River from the maintenance dredging of the Pilot Channel and Smuggler's Gulch:

1. Benthic Biological Monitoring (Section VI.C.1): Assessment of the effects of the project on the biological integrity of the Pilot Channel and Smuggler's Gulch by analyzing the benthic macroinvertebrate community.
2. Water Quality Assessment (Section VI.C.2): Analysis of the water quality through the collection of grab samples, which are to be analyzed for the constituents listed in the Certification.
3. California Rapid Assessment Method (CRAM) (Section VI.C.3): Quantitative function-based health assessment of the wetland and riparian habitat.

Each of the three components are to be implemented before maintenance begins, during the five-year maintenance period (before/during/after each annual maintenance event), and after maintenance is concluded at the completion of the five-year permit cycle. To quantify impacts, results of the three monitoring components will be compared over time and between locations. The data will be reviewed to determine whether there are discernible differences between initial-maintenance assessment, during-maintenance assessments, and final-maintenance assessment results.

This current report documents water quality, CRAM, and benthic biological monitoring for the 2014-2015 season (July 2014 – June 2015) performed on May 12, 2015. No maintenance dredging was performed during the 2014-2015 season; therefore, this report describes ambient conditions surrounding the dredge footprint.

This current monitoring effort follows four previous monitoring events: one pre-project event on January 31, 2013, and three events in association with the first maintenance dredging which occurred between September 2013 and February 2014. These three maintenance dredging monitoring efforts took place September 16, 2013 (pre-dredge), October 17, 2013 (during-dredge), and February 25, 2014 (post-dredge).

2.0 METHODS

2.1 Monitoring Stations

The monitoring locations were based on requirements outlined in the Certification which state that monitoring must occur both upstream and downstream of the maintenance area. Three locations in the immediate vicinity of the maintenance footprint were selected for water quality and CRAM monitoring (Table 2-1, Figure 2-1). The upstream Pilot Channel location (TJ-PC-U) is located approximately 170 meters (m) upstream of the Hollister Street Bridge (Figure 2-2). The downstream Pilot Channel (TJ-PC-D) location is located approximately 1,000 m west of the intersection of Sunset Avenue and Saturn Boulevard (Figure 2-3). The upstream Smuggler's Gulch location (TJ-SG-U) is located approximately 70 m upstream of the Monument Road crossing (Figure 2-4).

An October 2012 pre-project reconnaissance of the three bioassessment monitoring stations detailed in the Certification concluded that the upstream and downstream locations immediately surrounding the Project area were not viable locations for standard freshwater bioassessment sampling using SWAMP bioassessment protocols due to the following site conditions:

- The area immediately upstream of the dredge footprint on the Pilot Channel presented unsafe sampling conditions with deep water and soft fine sediment.
- The downstream location on the Pilot Channel consisted of saline conditions due to tidal influence.
- The upstream location on Smuggler's Gulch is dry for the vast majority of the year, only flowing briefly after a rain event.

In an effort to remain within the parameters and intent outlined in the Certification, it was determined that the downstream Pilot Channel location (see Table 2-1, Figure 2-3) which appeared to remain wetted year-round would be solely utilized for biological collections, as this would represent the location most influenced by dredging activities. However, given that this location occurs in a tidally influenced area, standard freshwater bioassessment methods and metrics would no longer apply at the downstream Pilot Channel location. Thus, a sediment biota sampling method similar to the Water Quality Control Plan for Enclosed Bays and Estuaries - Part 1 Sediment Quality promulgated by the SWRCB (SWRCB, 2009) and the Sediment Quality Objectives (SQO) Technical Support Manual (SCCWRP, 2014) used in estuarine and marine environments was employed for the benthic biota collections. This method is further outlined in Section 2.4.

Table 2-1. Locations of Monitoring Stations

Station	Location	Monitoring Type	Latitude[(a)]	Longitude[(a)]
TJ-PC-U	Pilot Channel upstream of dredge footprint	Water quality & CRAM	32.550664	-117.081135
TJ-SG-U	Smuggler's Gulch upstream of dredge footprint	Water quality & CRAM	32.542451	-117.088147
TJ-PC-D	Pilot Channel downstream of dredge footprint	Water quality, CRAM, & Benthic biology	32.557994	-117.103539

Notes:
- NAD_1983_StatePlane_California_V_FIPS_0405_Feet WKID: 2229 Authority: EPSG

2.2 Water Quality Monitoring

Water was observed and collected at the upstream and downstream Pilot Channel locations. Water was not observed at the TJ-SG-U; therefore, no samples were collected there. Pre-cleaned sample bottles were obtained from the analytical laboratory for collection of water quality samples. The following sample handling protocols were utilized when collecting samples to minimize the possibility of contamination:

4. When the analytical methods did not require a chemical preservative, the sample bottle was used directly to collect the sample.
5. If the analytical method required preservation, a pre-cleaned bottle was used as a secondary container to collect the sample which was then transferred to the laboratory-provided analytical container.

Manual grab samples were collected by inserting the pre-cleaned bottle upside-down into the channel and then inverting at the approximate midway point in the water column with the container opening facing upstream. A grab pole was used as necessary to collect water samples from as close to the horizontal center of the channel as site conditions allowed. Samples were analyzed for the constituents stipulated in the Certification (Table 2-2). Parameters measured in the field include: pH, temperature, dissolved oxygen (DO), turbidity, and specific conductance.

Sample containers were labeled with a unique sample ID, date, time, project, analyses, and collector's initials. The samples were then packed on ice and transported to Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler). Samples were held on ice until transferred to a laboratory-provided courier.

Table 2-2.
Summary of Water Quality Analytes

Analytical Parameter	Analytical Method	Container	Preservation	Maximum Holding Time (Days)	Amount Needed
Alkalinity, Total	SM 2320B	250 mL Poly	<6°C	14	250 mL
Ammonia as Nitrogen (N)	EPA 350.1	250 mL Poly	<6°C, H_2SO_4	28	250 mL
Chloride	EPA 300.0	250 mL Poly	<6°C	28	250 mL
Nitrate-Nitrogen as N	EPA 353.2	250 mL Poly	<6°C	2	250 mL
Nitrite-Nitrogen as N	EPA 353.2	250 mL Poly	<6°C	2	250 mL
Total Kjeldahl Nitrogen (TKN)	EPA 351.2	250 mL Poly	<6°C, H_2SO_4	28	250 mL
Ortho-Phosphate Phosphorous	EPA 365.3/ EPA 365.1	250 mL Poly	<6°C, filtered	2	250 mL
Total Phosphorous	EPA 365.1	250 mL Poly	<6°C, H_2SO_4	28	250 mL
Total Suspended Solids (TSS)	SM 2540D	500 mL Poly	<6°C	7	500 mL
Chlorophyll a	SM 10200H	1 L Amber Poly	<6°C	2	100 mL

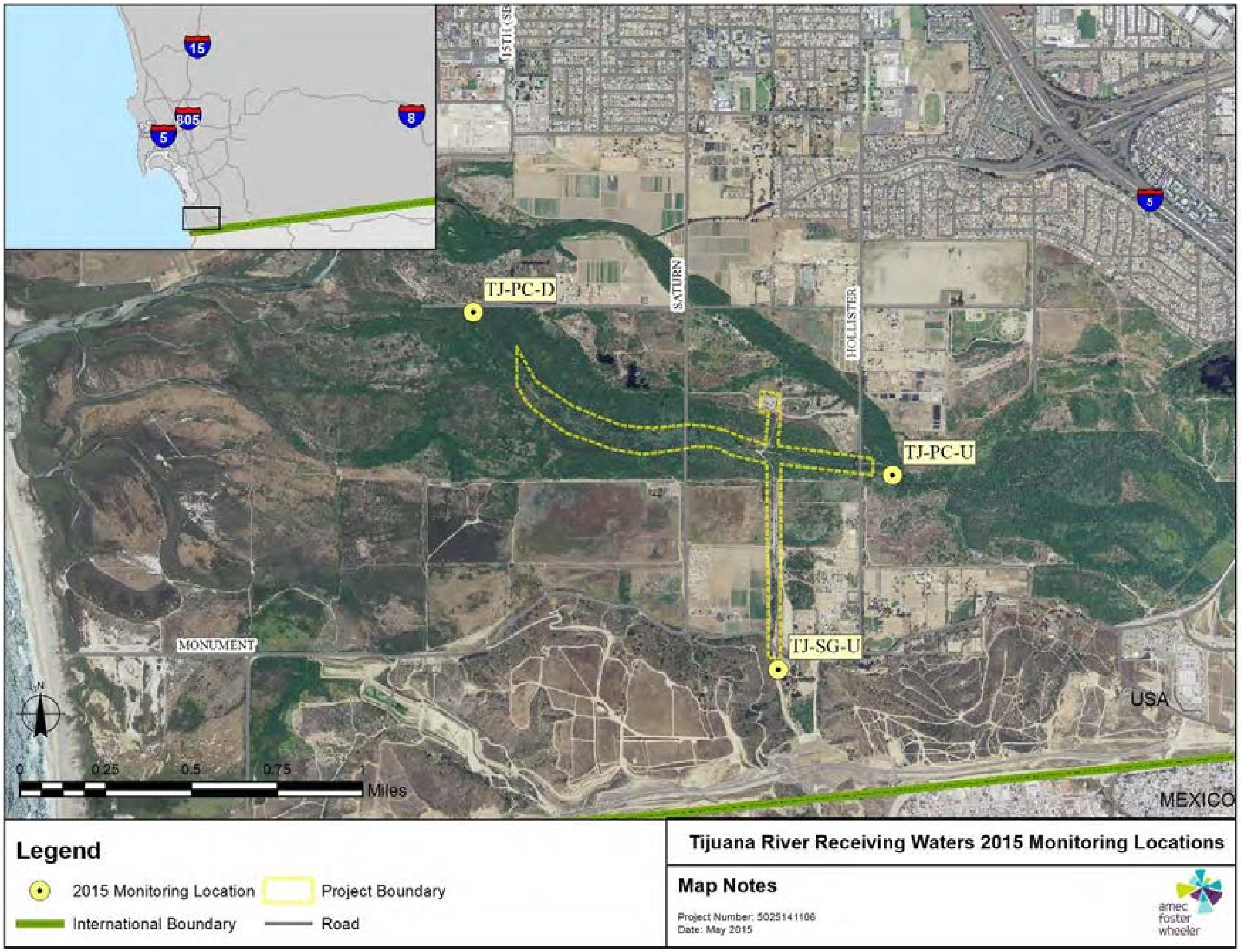

Figure 2-1. Overview of Tijuana River Receiving Water Monitoring Stations

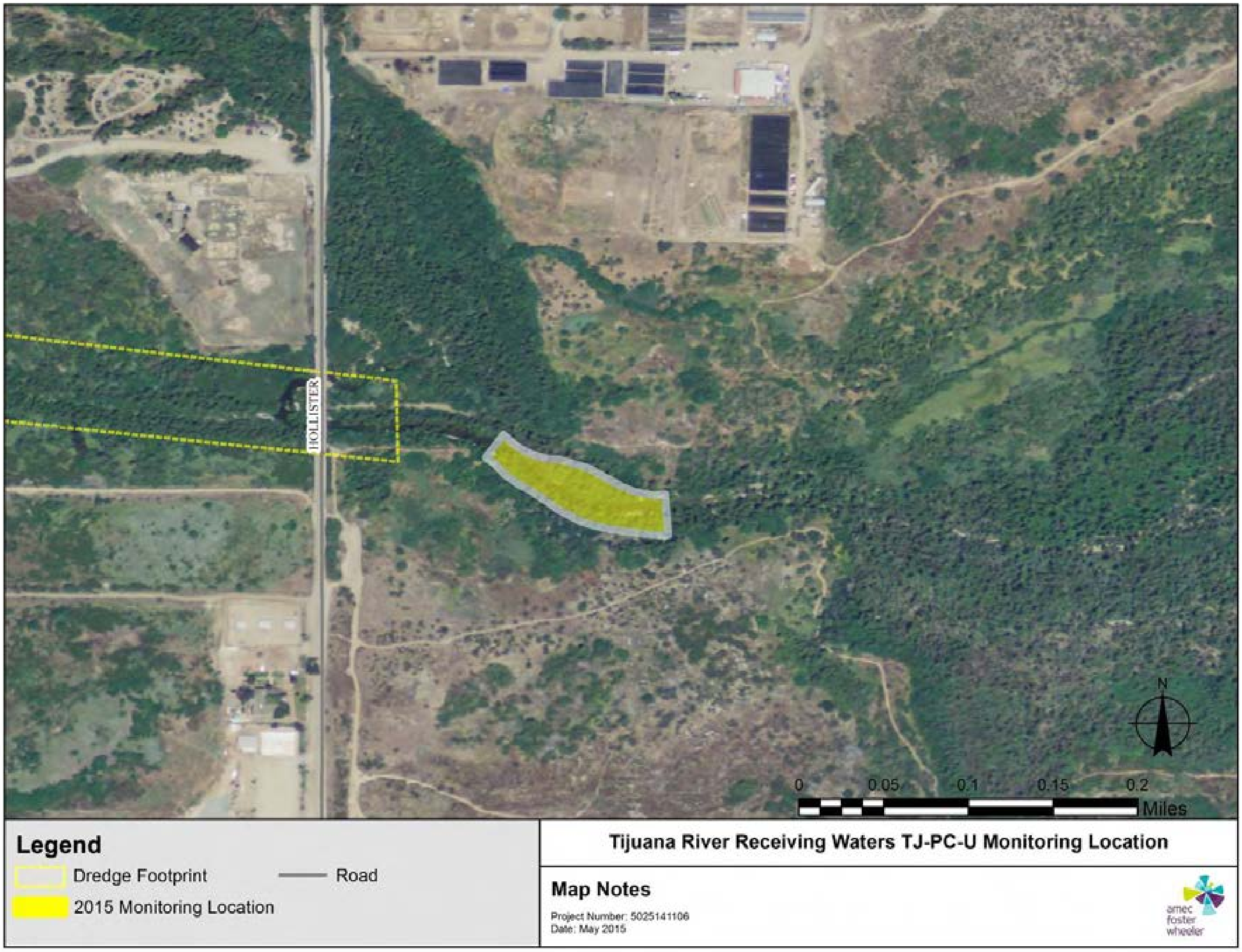

Figure 2-2. TJ-PC-U Monitoring Station

Water quality samples and CRAM data were collected at this location.

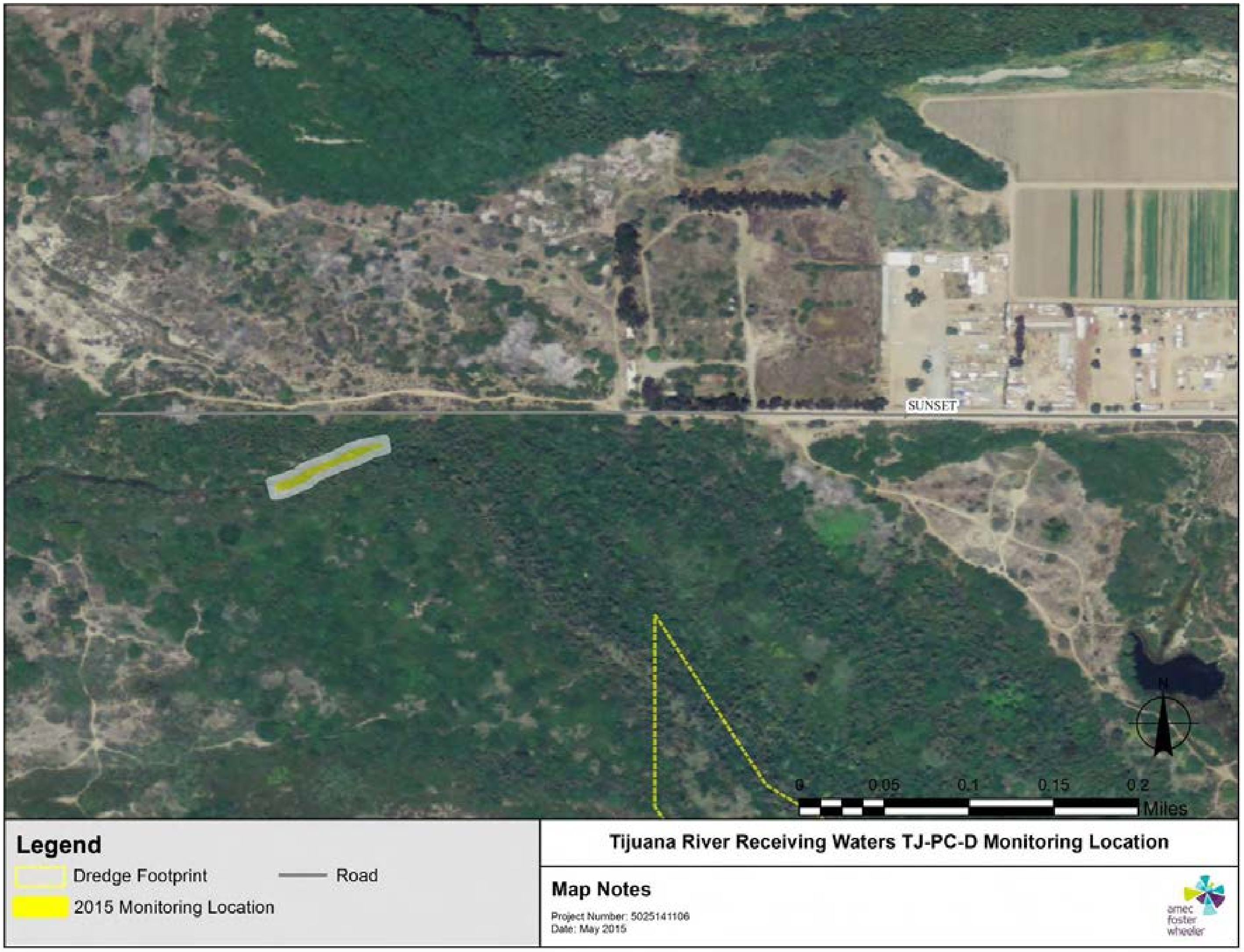

Figure 2-3. TJ-PC-D Monitoring Station

Water quality samples, benthic biological samples, and CRAM data were collected at this location.

Figure 2-4. TJ-SG-U Monitoring Station
Only CRAM data were collected at this location

2.3 CRAM Monitoring

During CRAM analysis, an Assessment Area (AA) polygon is established around the wetland and the functionality of the wetland within is evaluated. An AA is established by starting at a hydrologic or geomorphic break in structure of the channel, and extends longitudinally ten times the average bankfull width or a minimum of 100 m and for a distance no longer than 200 m. If no break in structure is present, then the AA can begin at a selected point within the wetland area in order to accomplish project goals. The AA extends laterally to include the riparian zone and floodplain areas that receive direct input from the surrounding area (i.e., organic debris such as leaves, limbs, insects, etc.). For the purposes of this CRAM analysis, both sections of the Tijuana River (TJ-PC-U and TJ-PC-D) were classified as a perennial, non-confined riverine system, while TJ-SG-U was classified as an ephemeral, non-confined system. Although the Tijuana River is largely an ephemeral stream, the survey areas in the lower portion of the river, located near the estuary, appear to receive perennial flow, but this may be dependent upon the annual rainfall received in the current and previous years. All of the AA's established for this CRAM analysis were either upstream or downstream of the maintenance area, and do not necessarily include sections of the channel in which maintenance dredging occurred or invasive plants were removed as required in the 401 Certification as wetlands mitigation.

CRAM analysis requires the evaluation of the AAs on four attributes that include buffer and landscape context, hydrology, physical structure, and biotic structure. Each of these attributes is further described below:

- Buffer and landscape context – Assesses a riverine system in terms of the continuity of the buffer within 500 m upstream and downstream and the quality of the buffer immediately surrounding the AA. This attribute measures the ability of wildlife to enter the riparian corridor buffer and easily move within it along the wetland area within 500 m of the AA. Buffer is defined as an area in a natural or semi-natural state that is not currently dedicated to anthropogenic uses which would detract from its ability to protect the AA from stress or disturbance.
- Hydrology – Assesses the water source and quality, as well as the channel stability and its connection to the surrounding flood plain.
- Physical structure – Assesses the availability of various habitat patch types and topographical complexity of the channel that indicate the capacity of the riverine system to support characteristic flora and fauna.
- Biotic structure – Assesses horizontal and vertical plant structure, which measures the number of distinct plant zones in plan-view and the amount of vertical overlap of plant canopy layers. In addition, the species dominance and composition of the plant community within the AA is assessed.

Each attribute has sub-metrics that are scored with a letter that indicates its status, with an "A" score indicating good condition and a "D" score indicating poor condition. The letter score is then converted to a numerical value (i.e., A=12, B=9, C=6, and D=3) and a final attribute score is calculated. The final overall CRAM score is the average of the four individual attribute scores received. The purpose of using the CRAM scoring system is to provide a context for comparison of the Project efforts over a period of time.

Finally, a number of physical, hydrological, biotic and landscape scale stressors are evaluated to assess their potential for impacting the riverine ecological function. Each are assessed to be present or absent and their likelihood of significantly affecting the AA. These stressor assessments are based on visual site inspections, satellite imagery of nearby landscape, and publically information available for the water body or watershed in question. They are not based on analytical measurements or other samples taken at the time of the survey.

2.4 Benthic Biological Monitoring

Methods similar to the Water Quality Control Plan for Enclosed Bays and Estuaries - Part 1 Sediment Quality promulgated by the SWRCB (SWRCB, 2009) and the Sediment Quality Objectives (SQO) Technical Support Manual (SCCWRP, 2014) were used to collect benthic macroinvertebrates at the downstream Pilot Channel location.

Three field replicates were collected approximately 8 m apart, starting downstream and moving upstream with each successive collection. A 0.2 m x 0.2 m Eckman grab was used for collection of the sediment samples. The grab was pushed by hand down into the undisturbed sediment approximately six to eight centimeters (cm). The grab jaws were then triggered and closed. The grab device was removed from the substrate and placed unopened into a large plastic tray. The depth of sediment penetration was measured and an assessment of the acceptability of the grab was made (i.e. >5cm penetration, >90% of the sediment surface intact, no washing or canting). Observations of sediment type, color, and odor were recorded. The entire contents of each sediment grab was then emptied into the plastic tray and systematically sieved through a 1.0-millimeter (mm) metal sieve. The material and organisms from each replicate retained on the sieve were placed separately into 1-liter (L) Nalgene bottles and preserved with 95% ethanol. These three samples were then analyzed for taxonomic identification.

3.0 RESULTS

3.1 Water Quality Results

The reported results from the water quality grab samples collected at the TJ-PC-U and the TJ-PC-D stations are presented in Table 3-1. TJ-SG-U was dry and therefore no water quality results are reported for that location during this sampling event. The water quality samples were collected on May 12, 2015.

A log containing representative photos of each sampling location is presented in Appendix A. Analytical MDLs and RLs are provided in Table 3-1 and Appendix B. Dilution factors required for several constituents are also included in Appendix B for reference. Copies of field data sheets are presented in Appendix C. Analytical laboratory reports are contained in Appendix D.

The reported water quality results are summarized as follows:

- Nutrient concentrations (i.e. ammonia, TKN, dissolved orthophosphate, nitrite, nitrate, and total phosphorus) at the upstream Pilot Channel station were all higher than measured at the downstream Pilot Channel station.
- Chlorophyll-a, alkalinity, and chloride concentrations were elevated at the downstream stream Pilot Channel. One might expect higher alkalinity and chloride concentrations at the downstream location due to the tidal influence.
- The TSS concentration at the upstream Pilot Channel was 2.8 times that of the downstream location.

Recorded *in-situ* water quality measurements are summarized in Table 3-1. TJ-SG-U was dry during the monitoring event and therefore could not be sampled. The *in-situ* water quality results are summarized as follows:

- pH measurements at the two sites with water were fairly similar and ranged from 7.62 to 8.07.
- Specific conductance was greater at TJ-PC-U. While this site has been shown to be tidally influenced, the field measurements at TJ-PC-D were taken at a low 0.2-foot tide when water at the site was more likely dominated by upstream groundwater sources.
- Turbidity was slightly greater at TJ-PC-U.
- DO was depressed at both Pilot Channel stations, with the upstream station having much lower values than the downstream station.

Table 3-1. Water Quality Results Summary for May 12, 2015 Field Survey

Analyte	Method	Units	MDL	RL	TJ-PC-U	TJ-PC-D	TJ-SG-U
Alkalinity as $CaCO_3$	SM 2320 B	milligrams per liter (mg/L)	0.56	10	360	550	NA
Ammonia as N[a]	EPA 350.1	mg/L	0.048-2.4	0.1-5.0	15	0.19	NA
Chloride[a]	EPA 300.0	mg/L	1.0-2.5	5.0-12	360	430	NA
Chlorophyll *a*	SM 10200 H-2b	micrograms per liter (µg/L)	8.3	10	<8.3	21	NA
Nitrate as N	EPA 353.2	mg/L	0.041	0.10	2.6	0.057[J]	NA
Nitrite as N	EPA 353.2	mg/L	0.010	0.10	0.93	0.010[J]	NA
Total Kjeldahl Nitrogen (TKN)[a]	EPA 351.2	mg/L	0.05-0.25	0.1-0.5	19	0.63	NA
Dissolved Orthophosphate as P (Reactive P)[a]	EPA 365.1M	mg/L	0.0002-0.011	0.002-0.01	5.4	0.76	NA
Total Phosphorus as P (Total P)[a]	EPA 365.3	mg/L	0.007-0.07	0.02-0.5	6.2	0.23	NA
Total Suspended Solids (TSS)	SM 2540 D	mg/L	5	5	22	8.0	NA
pH	Field Meter	pH units	NA	NA	8.07	7.62	NA
DO	Field Meter	mg/L	NA	NA	0.8	4.4	NA
Specific Conductance	Field Meter	microSiemens per centimeter (µS/cm)	NA	NA	2354	1491	NA
Temperature	Field Meter	degrees Celsius (°C)	NA	NA	18.2	18.9	NA
Turbidity	Field Meter	Nephelometric turbidity units (NTU)	NA	NA	9.05	4.28	NA

Notes:

RL - reporting limit
MDL - method detection limit
NA - Not applicable, or sampling location was dry and therefore could not be sampled.
SM - Standard Method
EPA - Environmental Protection Agency
< - Not detected above MDL. Concentration is reported as less than MDL.
J - Concentration detected below the reporting limit, but above method detection limit, and as such is an estimate.
a - Sample was diluted by laboratory and therefore has an elevated MDL and RL. These values are provided in Appendix B.

3.2 CRAM Results

Table 3-2 provides a summary of the CRAM scoring for the three AAs with extended details on each AA provided in Sections 3.2.1 through 3.2.3.

3.2.1 TJ-PC-U Site Assessment Area

The delineated AA for TJ-PC-U is depicted on Figure 2-2. This location was characterized by perennial flow in a non-confined setting. Very slow flowing deep water was present at the time of the survey. A summary of CRAM scores for TJ-PC-U is presented in Table 3-2. The western end of the AA begins approximately 170 m east of Hollister Street Bridge and extends 160 m upstream from that point. The AA includes the bankfull width of the Pilot Channel and the lateral floodplain benches present. The approximate width of the AA ranged from 25 m to 46 m, with an average bankfull width of approximately 17.3 m.

Buffer and Landscape Context

The riparian corridor continuity attribute extending 500 m upstream and downstream of AA is in good condition. Both upstream and downstream riparian corridors were uninterrupted, with the only exception being the Hollister Street bridge crossing providing a small break in the buffer on the downstream end. The buffer immediately surrounding the AA scored high in all three submetrics. The AA is surrounded by one-hundred percent riparian buffer, which is in fair to good condition, with an average width of 225 m. Small unpaved hiking trails are present, but do not appear to impede wildlife movement or to be heavily utilized.

Hydrology

The water source was in fair condition as defined in the CRAM guidance. The freshwater sources consist primarily of infiltrated local residential and agricultural irrigation rising as groundwater. The immediate drainage basin (i.e. within 2 km) is comprised of more than twenty percent residential and artificially irrigated land. The international Mexican border is approximately 4km upstream of the AA and is heavily urbanized beyond that point. However, dry season flows are diverted at the international border by South Bay International Wastewater Treatment Plant (SBIWTP) and do not reach the estuary. The majority of channel stability characteristics suggested equilibrium conditions with some limited evidence of degradation and aggradation, including some willow trees declining in stature with some leaning or falling into the channel (evidence of degradation) and fine sediment accumulated on the flood plain partially burying tree trunks (evidence of aggradation). Hydrologic connectivity to the surrounding landscape was in fair condition with an average entrenchment ratio of 1.6, indicating that the river is somewhat limited in its ability to spread laterally into its floodplain during times of high flow. The entrenchment ratio is calculated by dividing the flood prone width (the area water would laterally inundate during high storm flows) by the bankfull width (the area water typically inundates during base flow or small <0.3 inch storms). It measures how well the stream is connected to its riparian floodplain. Entrenchment ratios range from 1.0 at the low end (i.e. flood prone width = bankfull width), and do not have an upper bound. CRAM scoring criteria for entrenchment ratios in a non-confined wetland are divided into four categories: Excellent (>2.2), Good (2.2 - 1.9), Fair (1.8 – 1.5), and Poor (<1.5).

Table 3-2. Assessment Area CRAM Scoring Summary for May 12, 2015 Field Survey

		Site		
		TJ-PC-U	**TJ-PC-D**	**TJ-SG-U**
Approx. Length (m)		160	100	120
Average Bankfull Width (m)		17.3	5.3	5.7
Wetland Sub-type		Non-confined	Non-confined	Non-confined
Buffer Coverage (%)		100	100	100
Average Buffer Width (m)		225	250	188
CRAM Riverine Wetlands Scoring				
Landscape and Buffer Context	Riparian Continuity (Aquatic Area Abundance)	A	A	A
	Percent of AA with Buffer	A	A	A
	Average Buffer Width	A	A	B
	Buffer Condition	B	B	C
	Final Attribute Score	**91.7**	**91.7**	**83.3**
Hydrology	Water Source	C	C	C
	Channel Stability	B	B	C
	Hydrologic Connectivity	C	D	A
	Final Attribute Score	**58.3**	**50.0**	**66.7**
Physical Structure	Structural Patch Richness	D	D	D
	Topographic Complexity	C	C	B
	Final Attribute Score	**37.5**	**37.5**	**37.5**
Biotic Structure	Number of Plant Layers	A	A	A
	Number of Co-dominant Species	D	C	C
	Percent Invasion	C	C	D
	Horizontal Interspersion	C	B	B
	Vertical Biotic Structure	C	B	D
	Final Attribute Score	**52.8**	**72.2**	**61.1**
Overall AA Score		**60.1**	**62.9**	**65.3**

Notes:
% - percent
AA - assessment area
m - meter

Physical Structure

Low habitat patch diversity was observed within the river and its floodplain. The channel and its floodplain substrate consisted almost exclusively of fine-grained material (i.e. silt and sand). Of the seventeen patch types possible in a non-confined riverine wetland, two were present during the first two monitoring events (i.e., wrackline and large woody debris), for only twelve percent of the expected number of classes.

In terms of the cross sectional topographic complexity of the site, gently sloping banks were present on both sides of the river, with minimal benching and almost no micro-topography. The south side of the river yielded a single bench and had a much broader floodplain than the north side, allowing for high flows and floodwaters to extend out further laterally along the south side of the river channel.

Biotic Structure

The overall biotic structure was fair. The number of plant layers was good, with four of the five possible plant layers present: short (<0.5 m), medium (0.5-1.5 m), tall (1.5 m – 3.0 m) and very tall (>3.0m). However, the number of codominants was poor with only five present: Castor Bean (*Ricinus communis*), Arroyo Willow (*Salix lasiolepis*), Black Willow (*Salix gooddingii*), Mulefat (*Baccharis salicifolia*), and Nasturtium (*Tropaeolum majus*). Additionally, the percent of co-dominant species considered invasive was relatively high at 40 percent. The vertical biotic structure is fair with moderate overlap of two canopy layers, as the site is dominantly shaded with very tall tree canopy. The understory supports limited herbaceous plants, dominated by Castor Bean. The horizontal interspersion attribute score was rated as fair, due primarily to the relative homogeneous distribution of the plant groups.

Potential Stressors

There was one primary hydrological stressor that was identified for the TJ-PC-U AA; non-point source discharges may affect the riverine wetland, and it was determined that this impact could be a significant negative impact on the water quality of the AA. There were five water quality stressors that were identified for the AA; bacterial pathogens , nutrients , heavy metals, pesticides, and trash or refuse. While bacterial pathogens, heavy metals, and pesticides were not measured analytically as part of this study, the Tijuana River is considered impaired (303(d) listed) for all of these stressors, including nutrients and trash. These water quality stressors were present and may have a significant negative effect on the AA. Of the biotic stressors assessed as part of the CRAM protocol, only lack of treatment of invasive plant species was observed. This segment of the Tijuana River was upstream of the dredge area footprint where invasives were actively being removed, and contained a significant presence of Castor Bean (*Ricinus communis*). Land use stressors identified include urban residential development, orchards/nurseries, commercial feedlots, ranching (equestrian boarding lots), and passive recreation; however, none were determined likely to have a significant effect on the AA.

3.2.2 TJ-PC-D Site Assessment Area

The delineated area for the TJ-PC-D AA is depicted on Figure 2-3. The TJ-PC-D location was characterized as a perennial system in a non-confined setting. Flowing water was present at the time of the three surveys. A summary of CRAM scores for TJ-PC-D is presented in Table 3-2. The eastern end of the AA starts approximately 1,000 m west of the Sunset Avenue and Saturn Boulevard intersection and extends 100 m downstream from that point. The AA includes the bankfull width of the Pilot Channel and the lateral floodplain benches present. The approximate width of the AA ranged from 12 m to 16 m, with an average bankfull width of approximately 5.3 m.

Buffer and Landscape Context

The riparian corridor continuity attribute extending 500 meters upstream and downstream of AA was in good condition. Both upstream and downstream riparian corridors were uninterrupted, providing a continuous buffer for wildlife movement and protection from anthropogenic influences. The buffer immediately surrounding the AA scored high in all three submetrics. The AA was surrounded by one-hundred percent riparian buffer, which is in good condition, with an average width of 250 m. While the maximum buffer assessed as part of CRAM is 250 meters, the actual buffer for this location extended well beyond 250 meters. Small unpaved recreational hiking and horse trails are present to the north of the AA, but do not appear to impede wildlife movement or be heavily utilized.

Hydrology

The water source was in fair condition as defined in the CRAM guidance. Similar to the upstream location, the natural freshwater sources consist primarily of groundwater from local irrigation, with the immediate drainage basin (i.e. within 2km), being comprised of more than twenty percent residential and artificially irrigated land. The international Mexican border is approximately 6km upstream of the AA and is heavily urbanized beyond that point. However, dry season flows are diverted at the international border by SBIWTP and do not reach the estuary. During the survey, the TJ-PC-D sampling location was hydrologically disconnected from the TJ-PC-U location. Channel stability is characterized by a mixture of equilibrium and degradation conditions. Equilibrium conditions were characterized by a well-defined bankfull contour throughout most of the AA, with leaf litter, wrack, and woody debris consistent with that available in the surrounding riparian area. Perennial riparian vegetation was well established above the bankfull contour, but not below it. Degradation was evidenced by some riparian vegetation declining in stature and leaning into the channel. The lower banks were absent of vegetation and throughout a major portion of the AA, steep walled banks were present, with evidence of bank slumps. Some portions of the channel were undercut with roots being exposed. Overall the river bed was planar, with no observations of increased habitat complexity (e.g., pools, riffles). Due to the steep walled banks, the hydrologic connectivity to the surrounding landscape was in poor condition with an average entrenchment ratio of 1.4, indicating that the river has limited ability to spread laterally into its floodplain during times of high flow.

Physical Structure

Low habitat patch diversity was observed within the river and its floodplain. The channel and its floodplain substrate consisted primarily of fines. Of the seventeen patch types possible in a non-confined riverine wetland, only four were present (i.e., large woody debris, bank slumps, secondary channels, and organic debris on the floodplain), for only twenty-four percent of the expected number of classes. The cross sectional topographic complexity of the site identified steep banks present on both sides of the river, with minimal benching and some micro-topography on the downstream end of the AA.

Biotic Structure

The overall biotic structure at this location is of fair quality. The number of plant layers scored high, with four of the five possible plant layers present: short (<0.5 m), medium (0.5 m – 1.5 m), tall (1.5 m – 3.0 m), and very tall (>3.0 m). Eight co-dominant species were observed among all layers, including Mulefat (*Baccharis salicifolia*), California bulrush (*Scirpus californicus*), Arroyo willow (*Salix lasiolepis*), Black Willow (*Salix gooddingii*), Tamarisk (*Tamarix aphylla*), Giant Reed (*Arundo donax*), Nasturtium (*Tropaeolum majus*), and Elderberry (*Sambucus mexicana*). The tall and very tall strata dominated the site, with limited understory consisting primarily of small patches of Mulefat and Nasturtium. Of co-dominant species present, Salt Cedar, Giant Reed*, and* Nasturtium are considered invasive comprising thirty-eight percent of the plants present. The vertical biotic structure was fair, with approximately fifty percent overlap of two plant layers (Tall and Very Tall). The horizontal interspersion of plant zones is fair. The area was dominated by a homogeneous mixture of mulefat and willows, with no strong zoning pattern evident.

Potential Stressors

There was one hydrological stressor identified for TJ-PC-D AA: non-point source discharges; however, it was determined that this was not a significant negative impact on the water quality of the AA. The same five water quality stressors were identified as for the TJ-PC-U AA: bacterial pathogens, nutrients, heavy metals, and trash or refuse. While bacterial pathogens, heavy metals, and pesticides were not measured analytically as part of this study, the Tijuana River is considered impaired (303(d) listed) for all of these stressors, including nutrients and trash. Although these physical stressors were present, they were not considered to have a significant negative effect on the AA. The one biotic structure stressors identified was the lack of treatment of invasive plants. Potential landscape stressors within 500 m of the AA included helicopter traffic from the Naval Outlying Landing Field (NOLF) to the north, some horse paddocks to the northeast, nearby urban residential areas, dryland farming, and passive recreation in the form of hiking, none of which appeared likely to have a significant effect on the AA.

3.2.3 TJ-SG-U Site Assessment Area

The delineated area for the TJ-SG-U AA is depicted on Figure 2-4. A summary of CRAM scores for TJ-SG-U is presented in Table 3-2. The northern edge of the AA began approximately 10 m south of Monument Road and extended southward approximately 120 m. The location was characterized as an ephemeral stream in a non-confined setting. Water was not present within the AA at the time of the survey. The AA included the bankfull width of TJ-

SG-U and the lateral floodplain benches present. The approximate width of the AA ranged from 27 m to 44 m, with an average bankfull width of approximately 5.7 m.

Buffer and Landscape Context

The riparian continuity attribute extending 500 meters upstream and downstream of AA is in good condition. Both upstream and downstream riparian corridors provided good connectivity, with the only exception being Monument Road traversing the buffer downstream of the AA. There is a flow control structure 500 m south of the AA at the international border. The AA is bordered by one-hundred percent buffer, with the average buffer width being 188 m. The buffer condition was in poor to fair condition, primarily being driven by one side of the AA. The west side of the AA was bordered by undisturbed natural riparian scrub, while the buffer to the east consisted of a large open cleared and compacted lot. It appeared that this lot is not utilized often and wildlife would likely be able to move freely through it; however the quality of that habitat was subpar.

Hydrology

The water source was in fair to poor condition. The natural freshwater sources are substantially controlled by diversions upstream and a large portion of the watershed within 2 km upstream is in Mexico, dominated by commercial and residential land use. Channel stability was dominated by aggradation conditions, with the only sign of equilibrium being a well-defined bankfull contour. It appeared that large amounts of sediment likely inundate this area during storm events. The channel was filled with deep sand with the base of some vegetation covered along the bankfull contour. The overall stream bed is planar, with riparian vegetation encroaching into the channel, and the culvert at the downstream end of the AA is choked with sediment. Hydrologic connectivity to the surrounding landscape was good with an average entrenchment ratio of 2.3, indicating that the stream had some ability to access its surrounding floodplain during times of high flow.

Physical Structure

Habitat patch types were in poor condition. Of the seventeen habitat patch types possible in a non-confined riverine wetland, none were present within the channel or its floodplain. Topographic complexity of the site was fair with a flat stream channel, one bench, and some micro-topography present on the eastern floodplain in the form of vegetation and organic debris. Approximately 5 m beyond the eastern bank was a relatively steep sloping earthen berm (approx. 2.0 m high). The western bank consisted of a naturally steep hillside rising up to a mesa, with some micro-topography present.

Biotic Structure

The biotic structure at this location was mixed. The number of plant layers scored high with four of the five potential plant layers present: short (<0.5 m), medium (0.5 m – 1.5 m), tall (1.5 m – 3.0 m), and very tall (>3.0 m). Eight co-dominant species across the strata were observed, including Garland chrysanthemum (*Chrysanthemum coronarium*), Castor Bean (*Ricinis communis*), Black Willow (*Salix gooddingii*), Mulefat (*Baccharis salicifolia*), Giant Reed (*Arundo donax,* Eucalyptus (*Eucalyptus camaldulensis*), Tamarisk (*Tamarix aphylla*), and cocklebur (*Xanthium strumarium*). Of the eight co-dominant species identified, six (seventy-five percent) are considered invasives.

Horizontal interspersion was fair and vertical structure was poor. There was not much interspersion between the zones, and with the exception of Castor Bean which was found throughout, each generally occurred in only one area of the AA. Vertical biotic structure was considered poor. While four plant layers were present, there was little overlap among them.

Potential Stressors

There were three hydrological stressors identified for the TJ-SG-U AA; non-point source discharges, flow obstructions in the form of the culvert running underneath Monument Road, and the earthen berm on the right bank. There were four physical structure stressors that were identified for the AA: grading/compaction, excessive sediment or organic debris, excessive runoff from watershed, and trash or refuse. In addition, four water quality stressors (nutrients, heavy metals, pesticides or trace organics, and bacteria or pathogens) were presumed, as the primary water source for Smuggler's Gulch is runoff from Tijuana residential areas. ,These were all deemed to have a significant effect on the AA with the exception of grading/compaction. There was one biotic structure stressor identified; lack of treatment of invasive plants adjacent to AA or buffer and was determined to have a significant negative effect on the AA, due to the overwhelming presence of Castor Bean. Land use stressors include urban residential development, ranching (equestrian boarding lot), dryland farming, and active off-road vehicle usage (i.e., border patrol vehicles). Urban development was observed to likely have a significant effect due to the intense urbanization within the watershed south of the international border.

3.3 Benthic Biological Results

A list of taxa present in samples collected May 12, 2015 is presented in Table 3-3. Tables 3-4 and 3-5 present a summary of selected biological metrics.

3.3.1 BMI Community Composition

Total abundance of organisms among the three field replicates ranged from 370 to 405 individuals. In all three field replicates, *Chironomus* sp. was the dominant taxa observed, comprising 60 to 82 percent of the samples. This was followed by the gastropod *Tryonia* sp., Oligochaetes, and Ostracods. The top three taxa at each replicate were dominant, comprising 94 to 99 percent of the samples. The Chironomidae family is generally considered an insensitive group to anthropogenic influences (although a few species in this Family are considered sensitive), able to tolerate moderate to highly impacted locations. Some species within this group are able to tolerate high conductivity and can be found in estuarine locations (i.e. *Chironomus salinarius* and *Chironomus halophilus*). Dipteran Chironomids, or non-biting midge flies, are the most common aquatic insect and cover a range of feeding strategies from the construction of filtering nets, to simple grazing, to active predation. Most species are bottom-dwelling and many live within tubes or loosely constructed cases in the substrate. Some occur in highly polluted waters, others are restricted to cool clear water. Chironomidae are important indicator organisms, because the presence, absence, or quantities of various species within this Family can be a very good indicator of water quality. Oligochaetes are segmented aquatic worms, generally found in silty substrate and detritus of streams and rivers. While Oligochaetes can be found in both good quality and highly impacted streams, a stream population dominated by members of this Family is generally an indicator of poor conditions. An overabundance of

Oligochaeta can also be an indicator of sedimentation. Ostracods can be found in many different substrate types where they eat bacteria, mold, algae and detritus. Similar to Oligochaetes, Ostracods can be found across a full spectrum of water or habitat conditions; however, dominance by this group is generally an indicator of degraded conditions. These three taxa (*Chironomus*, Oligochaetes, and Ostracods) are generally considered tolerant taxa (Tolerance Value (TV) between 8 and 10), meaning they are relatively insensitive to anthropogenic stressors and are typically found in higher abundances at disturbed sites.

The genus *Tryonia* is a group of gastropods (snails) with a wide distribution. The genus contains 23 species and can be found across the southern United States. Although most *Tryonia* species are restricted to springs, which are generally thermal and highly mineralized, some also live in lakes (Thompson, 1968), and two species (*T. imitator* and *T. porrecta*) can be found in brackish, coastal waters (Kellogg, 1985; Hershler, 2007). Under SAFIT Level 2 standard taxonomic effort, *Tryonia* is generally left at the genus level, however further investigation was able to identify these individuals to *Tryonia imitator*, the California Brackish Water Snail. *Tryonia imitator* is a gastropod that inhabits coastal lagoons, estuaries and salt marshes, from Sonoma County south to San Diego County. While the California Natural Diversity Database (CNDDB) supported by the California Department of Fish & Wildlife (CDFW), does not list *Tryonia imitator* as a species of special concern, threatened, or endangered; it is designated as vulnerable due to its restricted range and relatively few populations.

Table 3-3. Raw Abundance of Individual Sorted Taxa for May 12, 2015 Field Survey

Taxonomic Group	Taxon	TJ-PC-D-051215-01	TJ-PC-D-051215-02	TJ-PC-D-051215-03
Diptera-Chironomidae	Chironomus sp.	239	320	244
Diptera-Tipuidae	*Molophilus* sp	1	1	1
	Ormosia sp	0	0	1
Mollusca-Cochliopidae	*Tryonia imitator*	70	64	142
Annelida-Oligochaeta	Oligochaeta	22	5	17
Crustacea-Ostracoda	Ostracoda	38	0	0
	TOTAL	370	390	405

Table 3-4. Select Biological Metrics for May 12, 2015 Field Survey

Biological Metric	TJ-PC-D-051215-01	TJ-PC-D-051215-02	TJ-PC-D-051215-03
# Organisms Sorted	370	390	405
# Organisms in the sample	370	390	405
Taxa Richness	5	4	5
1st Dominant Taxa	*Chironomus* sp.	*Chironomus* sp.	*Chironomus* sp.
% Top Dominant Taxa	64.6	82.1	60.2
% 3 Top Dominant Taxa	93.8	99.7	99.5
% Tolerant Individuals (TV = 8 to 10)	74.9	82.1	60.2
% Intolerant Individuals (TV = 0 to 2)	0.0	0.0	0.0
% Sensitive EPT Taxa	0.0	0.0	0.0
Dominant FFG	Collector-Gatherer	Collector-Gatherer	Collector-Gatherer
Shannon Weaver Diversity Index (log10)	1.01	0.53	0.84
Mean Hilsenhoff Biotic Index	9.36	9.90	9.63

3.3.2 Diversity Metrics

Diversity metrics provide information regarding the number of taxa observed and the evenness of the distribution of individuals among those taxa (Washington 1984). Pristine ecosystems are typically expected to have a high diversity of invertebrate species with a relatively even distribution of organisms between those species. In contrast, degraded systems may consist of high numbers of individuals, but few taxa. A summary of the diversity metrics is presented in Table 3-4. The Shannon-Weaver Index (SWI) is a measure of diversity that evaluates the number of taxa and the evenness of distribution among them. Typically this index score is used to compare differences in diversity between several sites along a condition gradient, a potentially impacted site versus reference location, or temporal changes at a single location. While somewhat less informative when evaluated without context, the SWI can range from 0 to 4.6, with a score greater than 2.0 typically indicating a more diverse community. Diversity index scores calculated for the TJ-PC-D monitoring station, ranging from 0.53 to 1.01, indicate a benthic community with very low diversity and dominance by few species.

3.3.3 Sensitivity Metrics

The tolerance of many BMI taxa to habitat impairment and water quality has been determined through prior studies (Hilsenhoff, 1987). The Hilsenhoff Biotic Index (HBI) ranks BMI taxa on a scale of 0 to 10 regarding their sensitivity to impairment, with a TV of 0 being given to taxa that are highly sensitive to habitat or water quality impairment and a TV of 10 to those that are very insensitive. While organisms with a high TV can be found in streams with good water and habitat quality, they tend to be a lesser proportion of the community. Conversely, taxa with low TVs (i.e. sensitive organisms) will very rarely be found at sites with poor water or habitat quality. Although originally developed to assess low DO caused by organic loading (Hilsenhoff 1977, 1982, 1987), the HBI may also be sensitive to the effects of impoundment, thermal pollution, and some types of chemical pollution (Hilsenhoff 1988, Hooper 1993).

The average HBI score for taxa within the three field replicates ranged from 9.36 to 9.90, indicating very tolerant, insensitive organisms (Table 3-4). A high percentage of the individuals (range = 60.2 to 82.1%) were considered tolerant organisms (TV score 8 to 10), while no individuals considered intolerant to disturbance (TV score 0 to 2) were collected at this site.

Ephemeroptera, Plecoptera, and Trichoptera (EPT) taxa comprise a group of sensitive organisms, commonly known as EPT taxa, which are found worldwide and provide a good estimate of the water and habitat quality in a stream. While some of the taxa from this group are moderately insensitive to impairment, the majority are good indicators of community health. No EPT taxa were found at this site (Table 3-4).

3.3.4 Functional Feeding Groups

BMI may be grouped according to mode of feeding, referred to as Functional Feeding Groups (FFG). A healthy assemblage will typically contain a variety of FFGs, while dominance of the community by few FFGs suggests the stream may not support a diversity of ecological niches and may be general indicator of poor community health. The type and relative abundance of groups present can provide valuable insight with regard to ecological integrity, especially when considered with other assessment data.

A summary of the various FFG distributions obtained is presented in Table 3-5. The distribution of FFGs at the TJ-PC-D location was rather disproportionate. The collector-gatherer FFG contained the majority of taxa present, ranging from 65 to 83 percent among replicates. The collector-gatherer FFG is a subset of a larger collector group, comprised of collector-gatherers and collector-filterers. The collector-gatherers typically acquire fine particulate organic matter from the bottom by ingesting fine sediments, while the collector-filterers use mucous nets or fans to filter out fine particulate organic matter suspended in the passing water column. Both of these collectors are typically found in higher numbers in streams containing a high proportion of fines and sands.

Table 3-5. Percentages of Functional Feeding Groups for May 12, 2015 Field Survey

FFG	Field Replicate		
	TJ-PC-D-051215-01	TJ-PC-D-051215-02	TJ-PC-D-051215-03
Collectors FFG	80.9	83.3	64.7
Collector-Filterers subgroup	0.0	0.0	0.0
Collector-Gatherers subgroup	80.9	83.3	64.7
Predators FFG	0.0	0.0	0.0
Scrapers FFG	0.0	0.0	0.0
Shredders FFG	<0.1	<0.1	<0.1
Piercer-Herbivores FFG	0.0	0.0	0.0
Unclassified FFG	18.9	16.5	35.2

4.0 QUALITY ASSURANCE/QUALITY CONTROL

The data presented has been reviewed in accordance with the Amec Foster Wheeler internal quality assurance program and are deemed acceptable for reporting. Identified deviations from the protocol are discussed below, or are otherwise considered minor with no likely effect upon the assessment.

4.1 Analytical Water Chemistry

Due to elevated concentrations of several chemical constituents observed at the Tijuana River Pilot Channel sampling locations, dilutions were performed by the analytical laboratory in several instances, which then increased the MDL and RL for the diluted analytes. The elevated MDLs and RLs for the diluted samples are provided in Table 3-1 and Appendix Table B-1.

4.2 CRAM Monitoring

No QA/QC issues were encountered.

4.3 Benthic Macroinvertebrate Identification

Taxonomic identification and biotic metric calculations were performed by Amec Foster Wheeler. Quality Assurance measures included re-sorting a minimum of 20 percent of each sample to determine sorting efficacy. In addition, 10 percent of samples were completely re-sorted. Surface Water Ambient Monitoring Program (SWAMP) methods under the Standard Taxonomic Effort Level 2 requires sorting random aliquots of a sample until a minimum of 600 ± 10% individuals are obtained, or sorting the entire sample if <600 individuals are acquired. None of the samples reached the 600 individuals goal, and therefore the entire sample was sorted for each replicate.

5.0 SUMMARY

5.1 Summary

This report summarizes water quality, CRAM, and benthic biological results at three riverine wetland areas surrounding the annual dredge maintenance footprint for the Tijuana River Valley Channel Maintenance Project 09C-077. Two of the AAs were located upstream (TJ-PC-U and TJ-SG-U) of the dredging impact area and one AA was located downstream (TJ-PC-D) of the dredging impact area. Sampling was conducted on May 12, 2015.

5.1.1 Water Quality Monitoring

Water quality samples were collected at the upstream and downstream Pilot Channel locations only, as TJ-SG-U was dry for this monitoring event. The reported water quality results are summarized as follows:

- Nutrient concentrations were consistently higher at the upstream Pilot Channel location.
- Alkalinity and chloride were higher at the downstream Pilot Channel location, likely due to the tidal influence in this area.
- The chlorophyll-a concentration was higher at the downstream Pilot Channel location.
- The TSS concentration and turbidity at the upstream Pilot Channel location were 2.8 and 2.1 times higher, relative to the downstream location, respectively.
- DO was depressed at both Pilot Channel stations, however the upstream station had a severely depressed concentration.

5.1.2 CRAM Monitoring

CRAM was performed at all three monitoring locations. While there was some slight variability (one letter grade difference) among the individual attributes between sites, the overall AA scores for all three AAs monitored were relatively similar. The largest discrepancy among attributes was related to hydrologic connectivity, the only attribute with greater than 1 letter grade difference between sites. This was largely due to the improved hydrologic connectivity score at TJ-SG-U (see historical comparison section below) relative to prior monitoring events.

5.1.3 Sediment Infauna Biological Monitoring

Results from the sediment biological monitoring event indicate a benthic community that is highly tolerant to disturbance. The low diversity, high HBI scores, and overwhelming dominance of a single FFG point to a biological community that may be responding to one or more stressors. A location on the Tijuana River in close proximity to the downstream Pilot Channel station (Tijuana River at Saturn Blvd.) and at approximately the same elevation was monitored for freshwater invertebrates in May 2010 and May 2012 by the County of San Diego's copermittee receiving waters monitoring program (County of San Diego, 2011 and 2013). Taxa collected at this site showed a similar community structure, with tolerant Chironomid and

Oligochaete taxa together comprising 99 and 95 percent of the community, for those two monitoring events respectively.

The tidal influence present at the downstream Pilot Channel location likely affects the types of organisms that can survive there. Increased TDS/Conductivity is one of the factors used in generating the Hilsenhoff Tolerance Values (HBI scores). The limited community, with few taxa, and high average HBI score observed at this station may be indicative of stress due to fluctuations in salinity known to occur at that location (0.4 to 18 ppt) (see AMEC 2013), anthropogenic stressors, or a combination of both. While it is difficult to tease apart natural versus anthropogenic impacts to ambient conditions at a station with physical characteristics such as this, continued biological monitoring at this location in association with dredging operations will provide an assessment of the biological community and how it is changing in response to the ongoing maintenance dredging.

5.2 Historical comparison to prior monitoring events

Due to the limited amount of data collected thus far, it is difficult to make clear determinations of representative mean biological metrics, CRAM characteristics, or analytical concentrations at each station, trends in data, or whether meaningful statistical differences exist between the monitoring stations over time. As more data is collected, statistical analyses will become more meaningful in identifying trends over the course of the project. The following figures present current data along with data from the previous monitoring events to provide some context with which to view the various lines of data over the course of the project thus far, but are not meant to identify definitive trends. Any observed tendencies in the data at this point are purely observational.

<u>Water Quality</u>

The concentration of nutrients TKN, ortho-phosphate, total phosphorus, ammonia, nitrate, and nitrite have all been consistently elevated at the upstream Pilot Channel location across all monitoring events (Figures 4-1 and 4-2). Similarly, total suspended solids concentrations were greater at the upstream Pilot Channel for each monitoring event (Figure 4-3). When detected at the upstream Pilot Channel location (MDL >8.3 mg/L), chlorophyll-a concentrations have also been higher than those observed in the lower Pilot Channel (Figure 4-4). The two instances in which the chlorophyll-a concentration was higher at the downstream Pilot Channel location, pre-project (1/31/13) and annual ambient (5/12/15), occurred when it was not detected at the upstream Pilot Channel. However, in both of these cases the highest chlorophyll-a concentration at the downstream site was lower than any detected instance at the upstream Pilot Channel site.

During the one instance when upstream Smuggler's Gulch had water present (1/31/13), this location had a higher concentration of all nutrients than any other downstream Pilot Channel monitoring event. The only exception to this was nitrate and nitrite, which were observed at similar concentrations to the downstream Pilot Channel location. Total suspended solids concentration at Smuggler's Gulch were greater than or equal to four of the five monitoring events at the downstream Pilot Channel location. Chlorophyll-a was not detected (MDL <8.3 mg/L) at Smuggler's Gulch.

For in-situ water quality parameters measured in the field, turbidity at both upstream Pilot Channel and Smuggler's Gulch were consistently elevated relative to that at the downstream Pilot Channel location (Figures 4-5 and 4-6). No other parameter exhibited any distinct pattern.

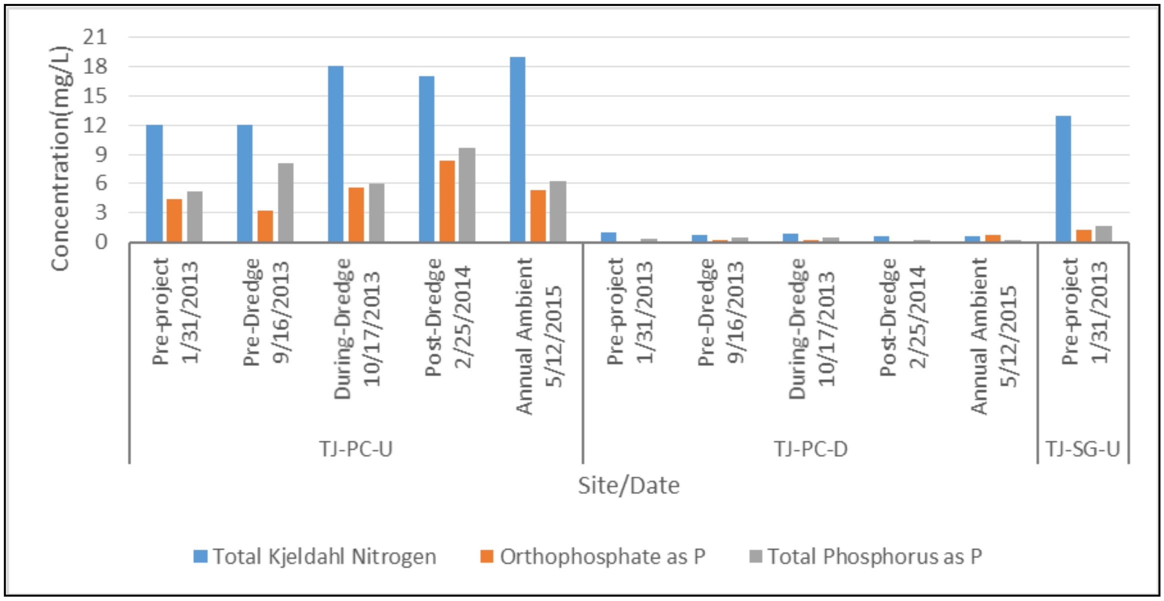

Figure 4-1. TKN, orthophosphate and total phosphorus concentrations across all stations and monitoring events.

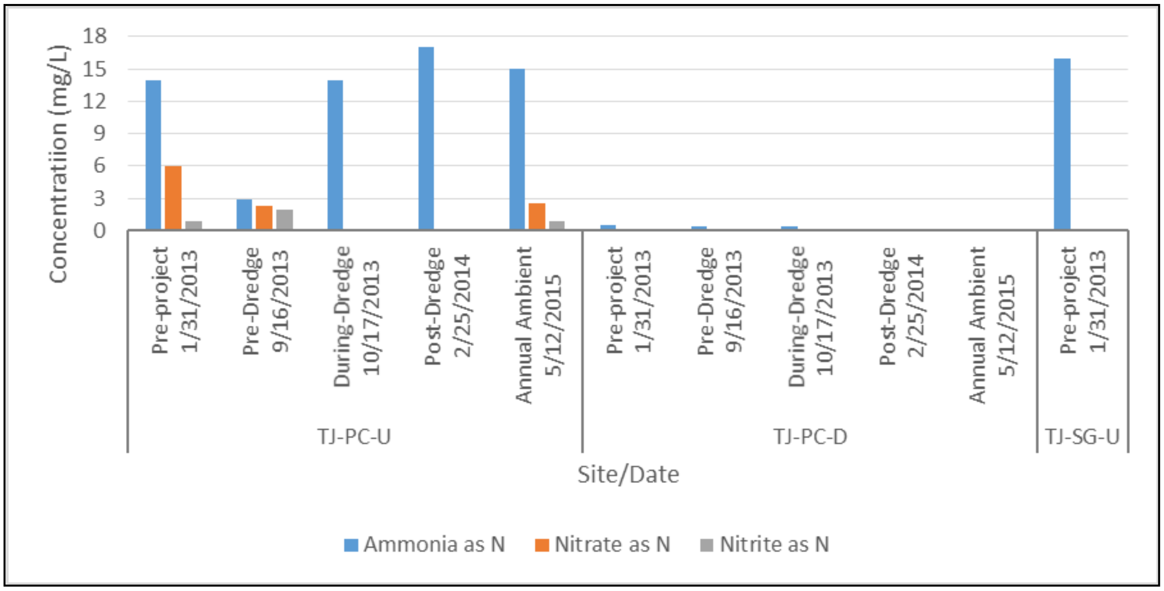

Figure 4-2. Ammonia, nitrate and nitrite concentrations across all stations and monitoring events.

Nitrite at TJ-SG-U (1/31/13) was non-detect. This was depicted as half of the method detection limit (i.e. 0.005 mg/L)

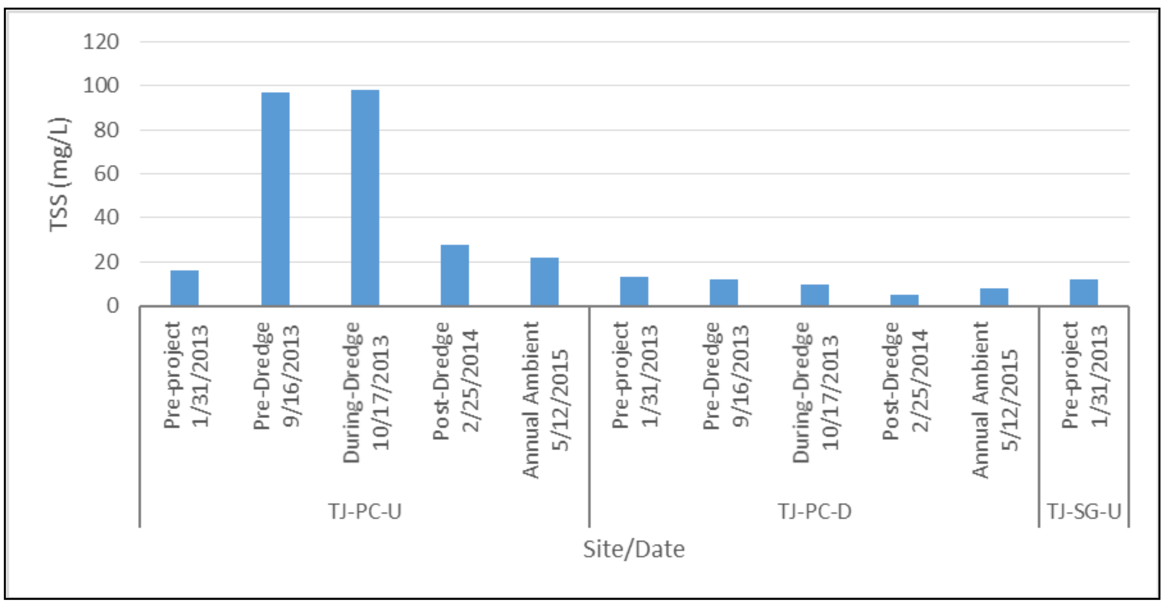

Figure 4-3. Total suspended solids concentrations across all stations and monitoring events.

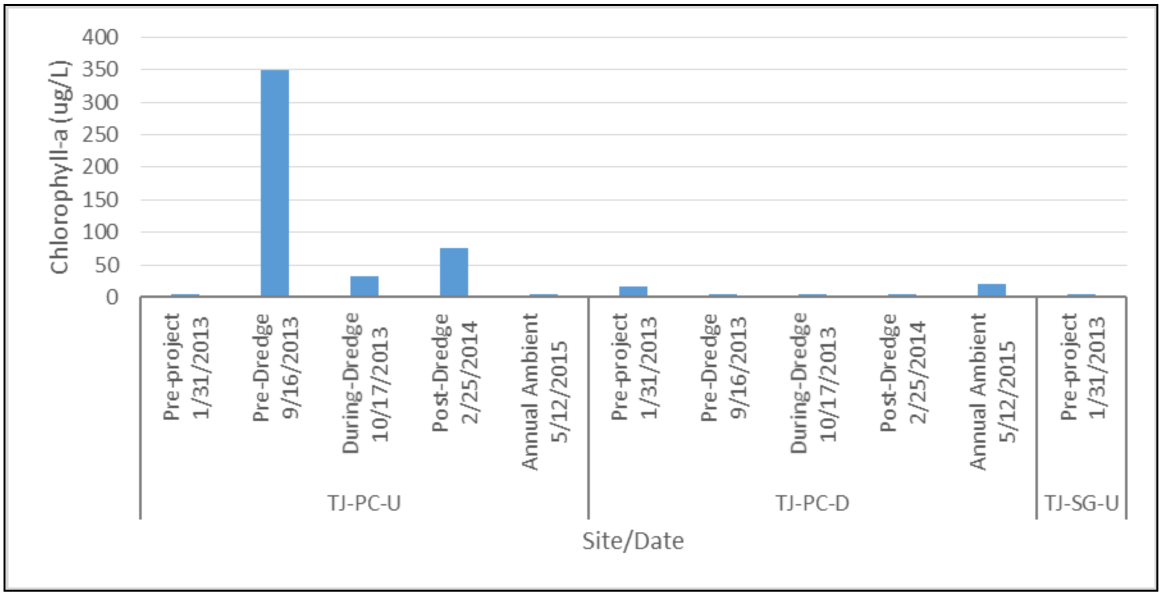

Figure 4-4. Chlorophyll-a concentrations across all stations and monitoring events.

TJ-PC-U (1/31/13, 5/12/15); TJ-PC-D (9/16/13, 10/17/13, 2/25/14); TJ-SG-U (1/31/13) were all non-detect. These are depicted as half of the method detection limit (i.e. 4.15 mg/L)

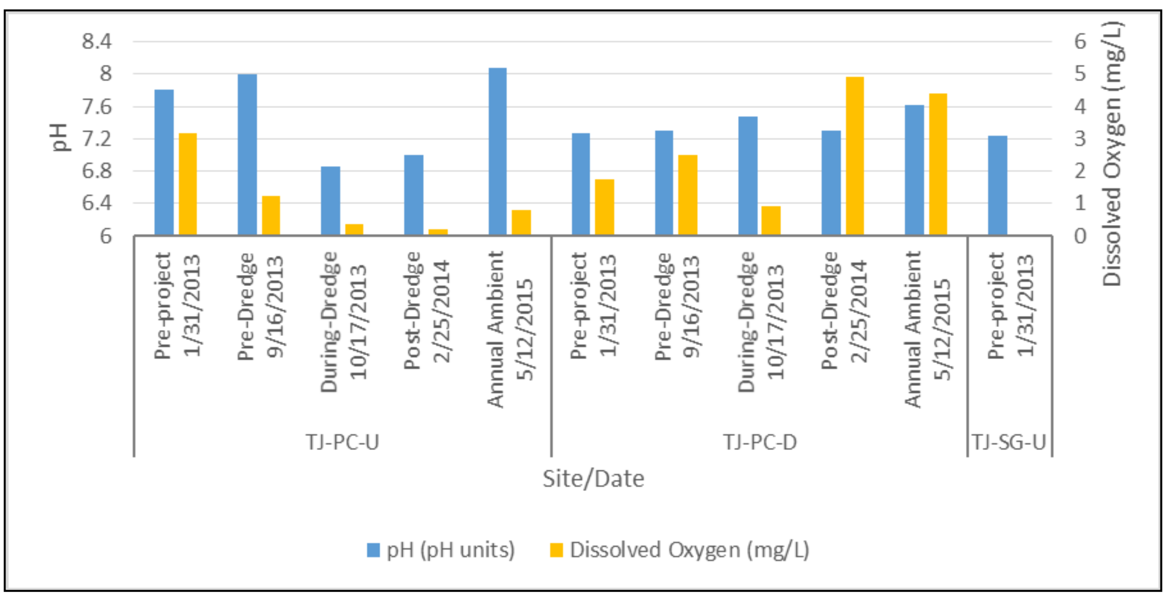

Figure 4-5. In-situ field water quality pH & DO measured across all stations and monitoring events.

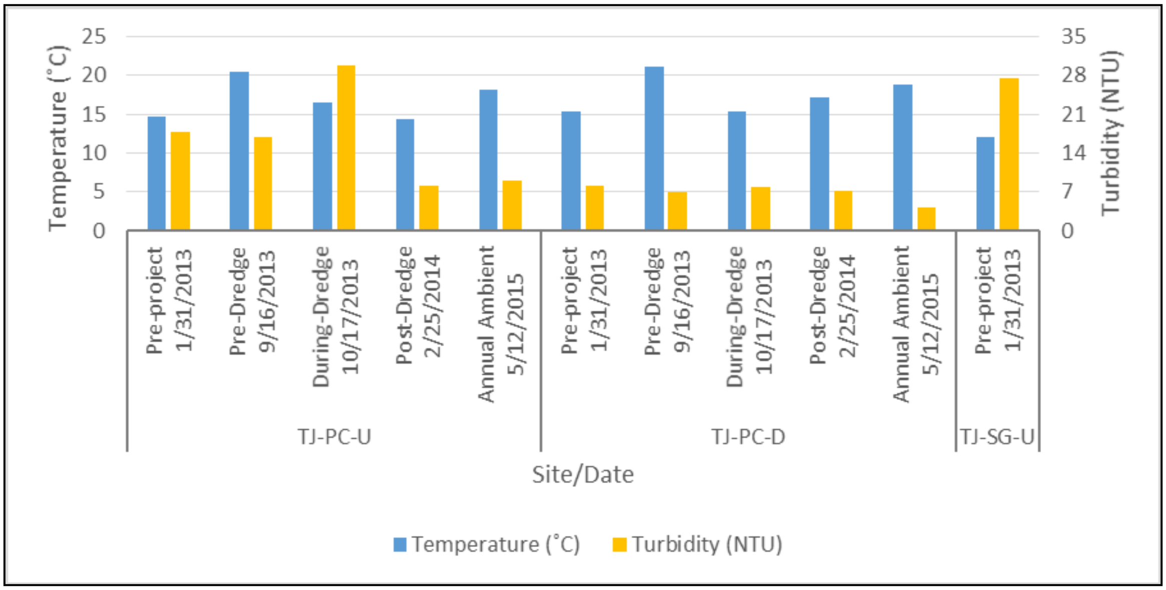

Figure 4-6. In-situ field water quality temperature & turbidity measured across all stations and monitoring events.

CRAM

The overall CRAM score at the upstream and downstream Pilot Channel locations were relatively similar across all monitoring events, and with the exception of the last event, were consistently elevated relative to that at the upstream Smuggler's Gulch location (Figure 4-7). The primary reason for the increased CRAM score at Smuggler's Gulch during the latest survey was an increase in the hydrology attribute score. This hydrology attribute score increased from a constant 41.7 over the previous four monitoring events, to 66.7 during the current survey. This increase in hydrology attribute score was primarily due to a larger entrenchment ratio, meaning the water had a greater ability to spread laterally outside of its bankfull width and into the floodplain than it had in previous events. The area for higher flows to spread laterally (i.e. the floodplain) is somewhat fixed at this site between a hillside to the west and an earthen berm to the east. The larger entrenchment ratio was a result of the bankfull width decreasing by over 50 percent from the previous three monitoring events, thereby increasing the entrenchment ratio.

Biological Infaunal Community

No discernable change in the benthic biological community was observed across monitoring events at the downstream Pilot Channel location (Figure 4-8). All events indicated low taxa richness and diversity scores, high HBI scores signifying a benthic community comprised of generally tolerant organisms, and no intolerant individuals present.

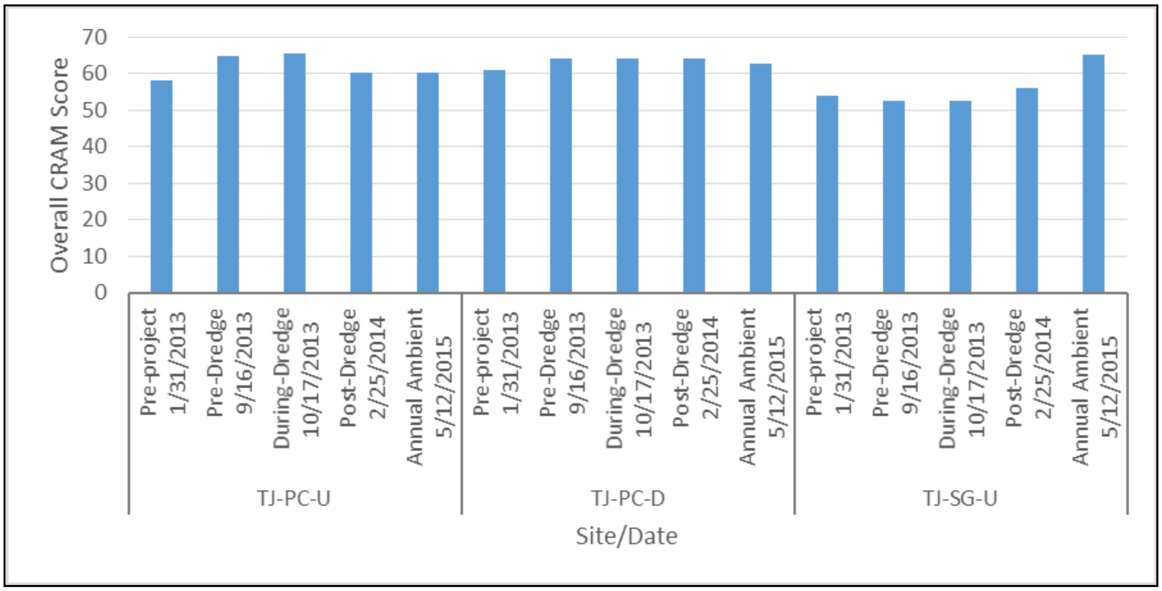

Figure 4-7. Overall CRAM scores across all stations and monitoring events.

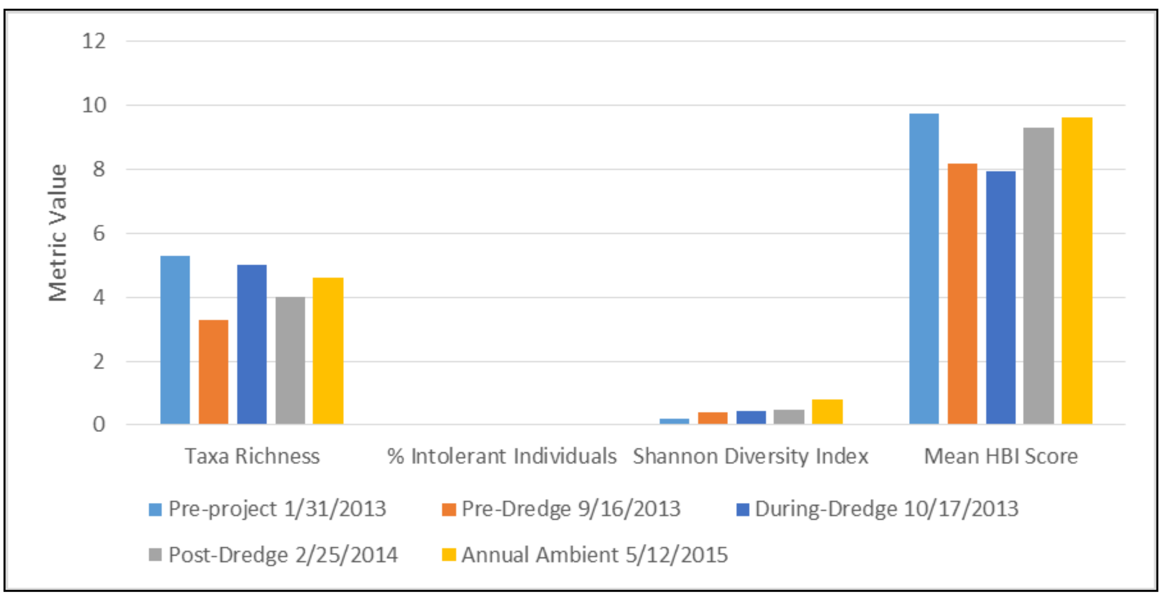

Figure 4-8. Selected biological metrics describing benthic the invertebrate community across all monitoring events of the downstream Pilot Channel location.

5.3 Next Steps

The monitoring program will begin again when the maintenance dredging program resumes, which is anticipated to occur in September 2015. Monitoring will continue to be performed in accordance with the provisions outlined in 401 Certification.

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APPENDIX A

PHOTO LOG

Photo 1

Tijuana River Pilot Channel Upstream Station – western end of AA looking downstream

Photo 2

Tijuana River Pilot Channel Upstream Station – western end of AA looking upstream

Photo 3

Tijuana River Pilot Channel Upstream Station – eastern end of AA looking upstream

Photo 4

Tijuana River Pilot Channel Upstream Station – eastern end of AA looking downstream

Photo 5

Tijuana River Pilot Channel Downstream Station – eastern end of AA looking upstream

Photo 6

Tijuana River Pilot Channel Downstream Station – eastern end of AA looking downstream

Photo 7

Tijuana River Pilot Channel Downstream Station – western end of AA looking downstream

Photo 8

Tijuana River Pilot Channel Downstream Station – western end of AA looking upstream

Photo 9

Smuggler’s Gulch Upstream Station – northern end of AA looking upstream

Photo 10

Smuggler's Gulch Upstream Station – northern end of AA looking downstream

Photo 11

Smuggler's Gulch Upstream Station – southern end of AA looking downstream

Photo 12

Smuggler's Gulch Upstream Station – southern end of AA looking upstream

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APPENDIX B

DILUTED SAMPLE METHOD DETECTION LIMITS AND REPORTING LIMITS

Table B-1. Ambient Monitoring Diluted Samples

Analyte	Units	Site							
		TJ-PC-U				TJ-PC-D			
		DF	MDL	RL	Result	DF	MDL	RL	Result
Chloride	mg/L	25	2.5	12	360	10	1.0	5.0	430
Ammonia as N	mg/L	50	2.4	5.0	15	-	-	-	-
OrthoPhosphate as P	µg/L	50	0.011	0.10	5.4	-	-	-	-
Nitrogen, Total Kjeldahl	mg/L	5	0.25	0.50	19	-	-	-	-
Total Phosphorus as P	mg/L	2	0.070	0.50	6.2	2	0.0028	0.020	0.23

Notes:
DF - dilution factor
RL - reporting limit
MDL - method detection limit
“-“ - sample was not diluted

APPENDIX C

CRAM & FIELD SHEETS

May 12, 2015 SAMPLING EVENT

Basic Information Sheet: Riverine Wetlands

Assessment Area Name: Smugglers Gulch Upstream	
Project Name: Tijuana River Dredge Monitoring	
Assessment Area ID #:	
Project ID #:	Date: 5/12/15
Assessment Team Members for This AA: JR, TH	

Average Bankfull Width: 5.7

Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m): 150m

Upstream Point Latitude: 32.5425 **Longitude:** -117.0882

Downstream Point Latitude: 32.5436 **Longitude:** -117.0884

Wetland Sub-type:

☐ Confined ☒ Non-confined

AA Category:

☐ Restoration ☐ Mitigation ☐ Impacted ☒ Ambient ☐ Reference ☐ Training

☒ Other: Dredge Material Monitoring

Did the river/stream have flowing water at the time of the assessment? ☐ yes ☒ no

What is the apparent hydrologic flow regime of the reach you are assessing?

The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source.

☐ perennial ☐ intermittent ☒ ephemeral

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1	59 60	Upstream			
2	57 58	Middle Left			
3		Middle Right			
4	55 56	Downstream			
5	↓ ↓				
6	looking				
7	down looking				
8	up				
9					
10					

Site Location Description:

Comments:

Scoring Sheet: Riverine Wetlands

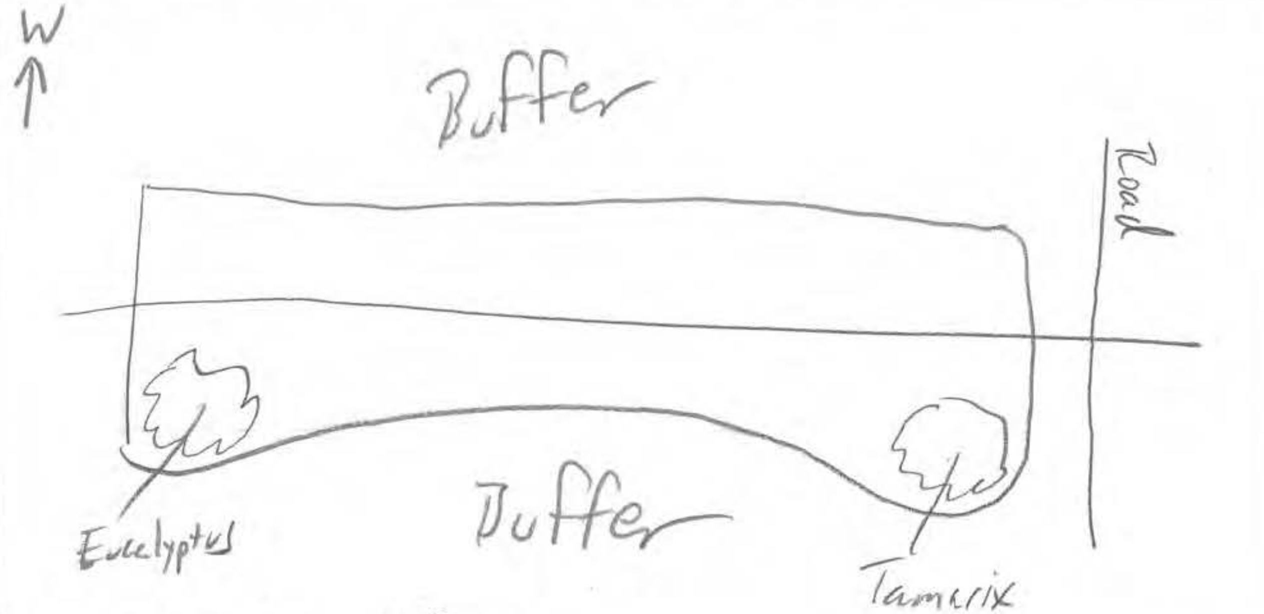
AA Name: Smugglers Gultch Upstream					Date: 5/12/15	
Attribute 1: Buffer and Landscape Context (pp. 11-19)					**Comments**	
			Alpha.	Numeric		
Stream Corridor Continuity (D)			A	12		
Buffer:						
	Alpha.	Numeric				
Buffer submetric A: Percent of AA with Buffer	A	12				
Buffer submetric B: Average Buffer Width	B	9				
Buffer submetric C: Buffer Condition	C	6				
Raw Attribute Score = $D+[C \times (A \times B)^{1/2}]^{1/2}$				20.0	**Final Attribute Score = (Raw Score/24) x 100**	83.3
Attribute 2: Hydrology (pp. 20-26)						
			Alpha.	Numeric		
Water Source			C	6		
Channel Stability			C	6		
Hydrologic Connectivity			A	12		
Raw Attribute Score = sum of numeric scores				24	**Final Attribute Score = (Raw Score/36) x 100**	66.7
Attribute 3: Physical Structure (pp. 27-33)						
			Alpha.	Numeric		
Structural Patch Richness			D	3		
Topographic Complexity			B	9		
Raw Attribute Score = sum of numeric scores				12	**Final Attribute Score = (Raw Score/24) x 100**	50.0
Attribute 4: Biotic Structure (pp. 34-41)						
Plant Community Composition (based on sub-metrics A-C)						
	Alpha.	Numeric				
Plant Community submetric A: Number of plant layers	A	12				
Plant Community submetric B: Number of Co-dominant species	C	6				
Plant Community submetric C: Percent Invasion	D	3				
Plant Community Composition Metric *(numeric average of submetrics A-C)*				7		
Horizontal Interspersion			B	9		
Vertical Biotic Structure			C	6		
Raw Attribute Score = sum of numeric scores				22	**Final Attribute Score = (Raw Score/36) x 100**	61.1
Overall AA Score (average of four final Attribute Scores)					65.3	

Worksheet for Stream Corridor Continuity Metric for Riverine Wetlands

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA	
Segment No.	Length (m)	Segment No.	Length (m)
1	0	1	10
2		2	10
3		3	
4		4	
5		5	
Upstream Total Length		Downstream Total Length	20

Percent of AA with Buffer Worksheet

In the space provided below make a quick sketch of the AA, or perform the assessment directly on the aerial imagery; indicate where buffer is present, estimate the percentage of the AA perimeter providing buffer functions, and record the estimate amount in the space provided.



Percent of AA with Buffer: 100 %

Worksheet for calculating average buffer width of AA

Line	Buffer Width (m)
A	75
B	150
C	150
D	145
E	250
F	↓
G	
H	
Average Buffer Width *Round to the nearest integer*	188

Worksheet for Assessing Channel Stability for Riverine Wetlands

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium	☒ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA.
	☐ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it.
	☐ There is leaf litter, thatch, or wrack in most pools (if pools are present).
	☐ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area.
	☐ There is little or no active undercutting or burial of riparian vegetation.
	☐ If mid-channel bars and/or point bars are present, they are not densely vegetated with perennial vegetation.
	☐ Channel bars consist of well-sorted bed material (smaller grain size on the top and downstream end of the bar, larger grain size along the margins and upstream end of the bar).
	☐ There are channel pools, the spacing between pools tends to be regular and the bed is not planar throughout the AA
	☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation	☐ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs.
	☐ There are abundant bank slides or slumps.
	☐ The lower banks are uniformly scoured and not vegetated.
	☐ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel.
	☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation.
	☐ The channel bed appears scoured to bedrock or dense clay.
	☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided).
	☐ The channel has one or more knickpoints indicating headward erosion of the bed.
Indicators of Active Aggradation	☒ There is an active floodplain with fresh splays of coarse sediment (sand and larger that is not vegetated) deposited in the current or previous year.
	☒ There are partially buried living tree trunks or shrubs along the banks.
	☒ The bed is planar (flat or uniform gradient) overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced.
	☒ There are partially buried, or sediment-choked, culverts.
	☒ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour.
	☐ There are avulsion channels on the floodplain or adjacent valley floor.
Overall	☐ **Equilibrium** ☐ **Degradation** ☒ **Aggradation**

Riverine Wetland Entrenchment Ratio Calculation Worksheet

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate midpoints along straight riffles or glides, away from deep pools or meander bends. An attempt should be made to place them at the top, middle, and bottom of the AA.

	Steps	Replicate Cross-sections ⟶	TOP	MID	BOT
m	1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	4.5	6.5	6.0
cm	2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	50	50	50
cm	3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	100	100	100
m	4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	17.0	10.0	10.0
	5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	3.8	1.5	1.7
	6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections. Enter the average result here and use it in Table 13a or 13b.			2.3

Structural Patch Type Worksheet for Riverine wetlands

Circle each type of patch that is observed in the AA and enter the total number of observed patches in Table below. In the case of riverine wetlands, their status as confined or non-confined must first be determined (see page 6) to determine with patches are expected in the system (indicated by a "1" in the table below). Any feature onsite should only be counted once as a patch type. If a feature appears to meet the definition of more than one patch type (i.e. swale and secondary channel) the practitioner should choose which patch type best illustrates the feature. Not all features at a site will be patch types.

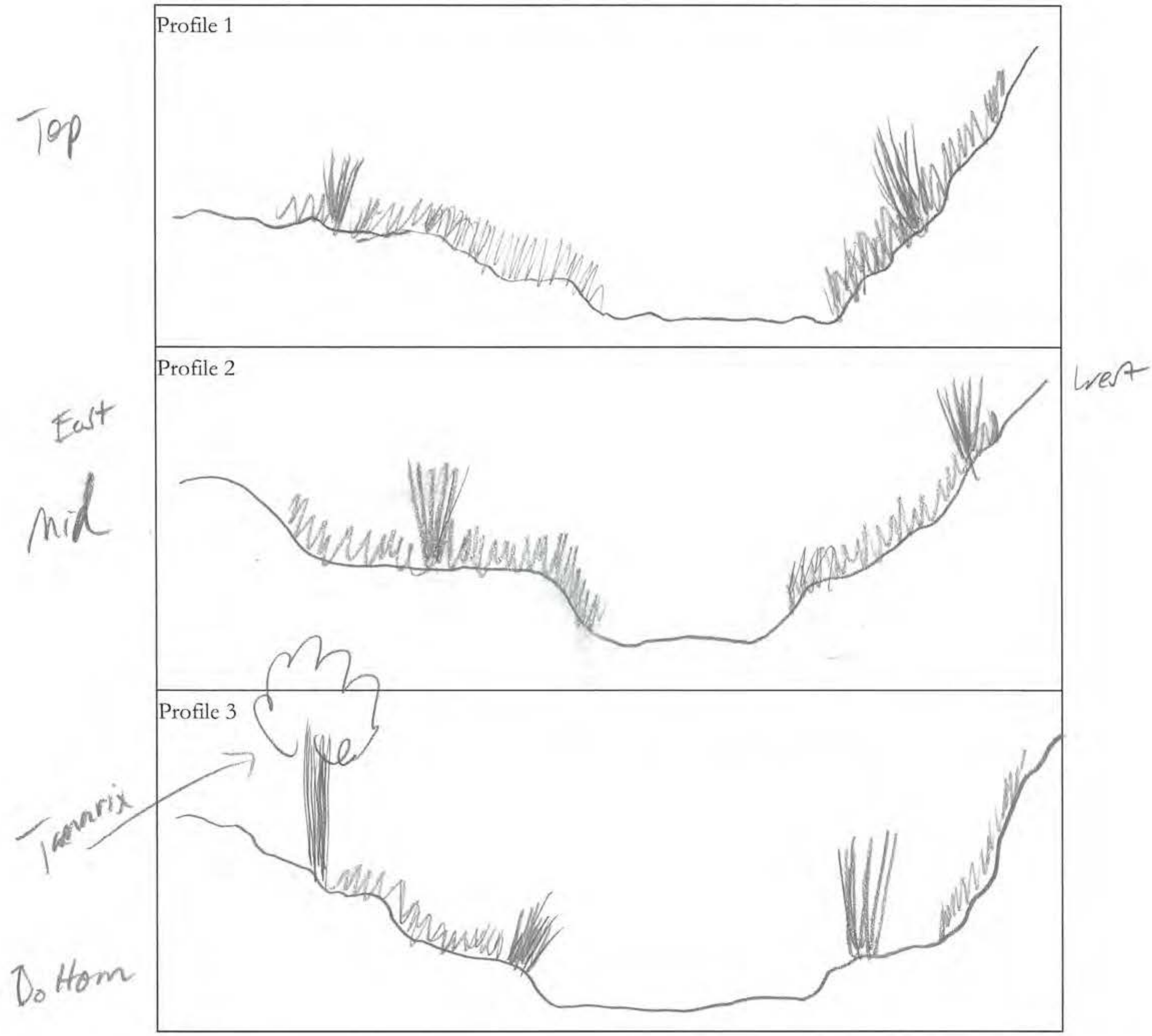
**Please refer to the CRAM Photo Dictionary at www.cramwetlands.org for photos of each of the following patch types.*

STRUCTURAL PATCH TYPE (circle for presence)	Riverine (Non-confined)	Riverine (Confined)
Minimum Patch Size	$3\ m^2$	$3\ m^2$
Abundant wrackline or organic debris in channel, on floodplain	1	1
Bank slumps or undercut banks in channels or along shoreline	1	1
Cobbles and/or Boulders	1	1
Debris jams	1	1
Filamentous macroalgae or algal mats	1	1
Large woody debris	1	1
Pannes or pools on floodplain	1	N/A
Plant hummocks and/or sediment mounds	1	1
Point bars and in-channel bars	1	1
Pools or depressions in channels (wet or dry channels)	1	1
Riffles or rapids (wet or dry channels)	1	1
Secondary channels on floodplains or along shorelines	1	N/A
Standing snags (at least 3 m tall)	1	1
Submerged vegetation	1	N/A
Swales on floodplain or along shoreline	1	N/A
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	1	1
Vegetated islands (mostly above high-water)	1	N/A
Total Possible	17	12
No. Observed Patch Types (enter here and use in Table 14 below)	0	

none present

Worksheet for AA Topographic Complexity

At three locations along the AA, make a sketch of the profile of the stream from the AA boundary down to its deepest area then back out to the other AA boundary. Try to capture the benches and the intervening micro-topographic relief. To maintain consistency, make drawings at each of the stream hydrologic connectivity measurements, always facing downstream. Include the water level, an arrow at the bankfull contour, and label the benches. Based on these sketches and the profiles in Figure 10, choose a description in Table 16 that best describes the overall topographic complexity of the AA.



Plant Community Metric Worksheet: Co-dominant species richness for Riverine wetlands

(A dominant species represents ≥10% *relative* cover)

Special Note:

** Combine the counts of co-dominant species from all layers to identify the total species count. Each plant species is only counted once when calculating the Number of Co-dominant Species and Percent Invasion submetric scores, regardless of the numbers of layers in which it occurs.*

Floating or Canopy-forming (non-confined only)	Invasive?	Short (<0.5 m)	Invasive?
		Bermuda Grass	Y

Cynodon dactylon

Medium (0.5-1.5 m)	Invasive?	Tall (1.5-3.0 m)	Invasive?
Cocklebur	N	Mulefat	N
Garland Chrysanthemum	Y		

Xanthium strumarium

Chrysanthemum coronarium

Baccharis salicifolia

Very Tall (>3.0 m)	Invasive?		
Castor Bean	Y	Total number of co-dominant species for all layers combined (enter here and use in Table 18)	8
Tamarix	Y		
Ecualyptus	Y	Percent Invasion *Round to the nearest integer* (enter here and use in Table 18)	75
Black Willow	N		
Arundo	Y		

Ricinis communis

Tamarix aphylla

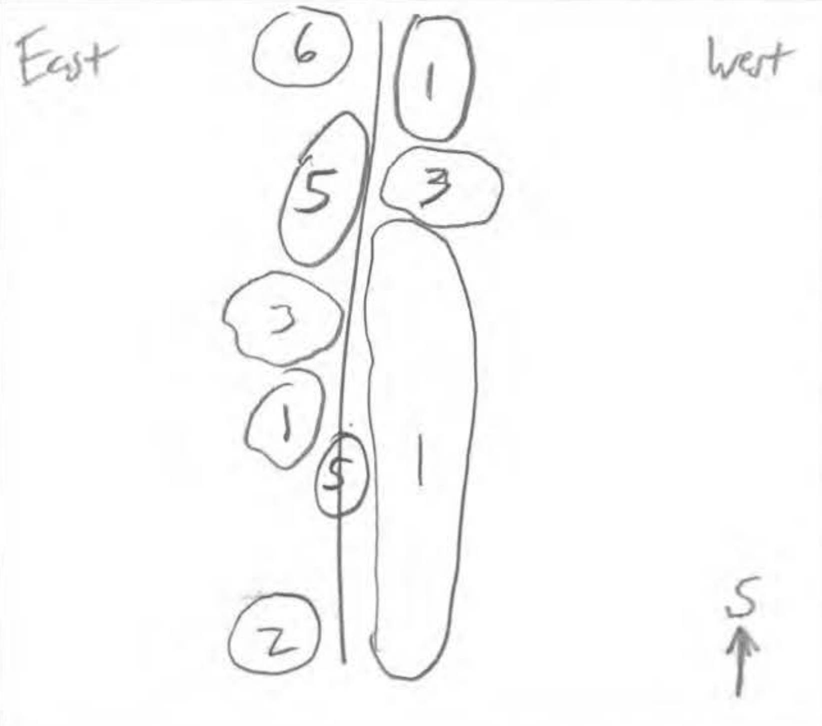
Arundo donax

Salix gooddingii

Eucalyptus camaldulensis

Horizontal Interspersion Worksheet.

Use the spaces below to make a quick sketch of the AA in plan view, outlining the major plant zones (this should take no longer than 10 minutes). Assign the zones names and record them on the right. Based on the sketch, choose a single profile from Figure 12 that best represents the AA overall.



Assigned zones:

1) Castor Bean
2) Tamarix
3) Willow
4) Chyrsanthemum
5) Arundo
6) Ecualyptus

Worksheet for Wetland disturbances and conversions

Has a major disturbance occurred at this wetland?	Yes	No (circled)		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type?	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

Stressor Checklist Worksheet

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)	X	X
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)	X	X
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees	X	X
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		

Comments

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**	X	
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed	X	X
Excessive runoff from watershed	X	X
Nutrient impaired (PS or Non-PS pollution)	X	X
Heavy metal impaired (PS or Non-PS pollution)	X	X
Pesticides or trace organics impaired (PS or Non-PS pollution)	X	X
Bacteria and pathogens impaired (PS or Non-PS pollution)	X	X
Trash or refuse	X	X

Comments

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of treatment of invasive plants adjacent to AA or buffer	X	X
Comments		

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present	Significant negative effect on AA
Urban residential	X	
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming		
Intensive row-crop agriculture	X	
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)	X	
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	X	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

5/12/15

Saturn Blvd
Monument Rd
Hollister St
TJ SG-U
©2013 Google
©2013 INEGI
Image U.S. Geological Survey
Google earth
150 m
Imagery Date: 6/25/2008
1994
lat 32.542960° lon -117.088564° elev 28 m
Eye alt 774 m


N
Saturn Blvd
Monument Rd
Hollister St
TJ-SG-U
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
Google earth
251 m
Imagery Date: 6/25/2008
1994
lat 32.542642° lon -117.088502° elev 29 m
Eye alt 1.20 km

Saturn Blvd
TJ-PC-U
Tijuana River Valley
500m
Hollister St
TJ-SG-U
500m
Internacional
Esperanza
2 de Junio
Gral Ramon Arnaiz
Remigio Soler
Padre Kino
Mazatlan
Misión del Sol
Art. 27
Canon del Matadero Norte
Periférico
Via Isla Creta
Mirador
Los Laureles
Segunda
Pradera
Vista Hermosa
Canal
500 m
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
Google earth
Culiacan
Imagery Date 6/25/2008
1994
lat 32.542437 lon -117.088070 elev 14 m
Eye alt 2.43 km

TJ-SG-U
2 Km
Saturn Blvd
Hollister St
Monument Rd
Internacional
Segunda Benito Juarez
Segundo
Via Isla Cea
Av Bahia San Quintin
Paseo Costa del Pacifico
Paseo Coronado
Mirador
Paseo de La Montaña
5to. Batallon
Pradera
P. Vista Hermosa
Sanchez Tapia
Angela Peralta
Silva
Carlota Sosa
Baja Mar
Av Bella Vista
Ruben Amaya
Venustiano Carranza
Canon Ruben Amaya
Agustin Perez Rivero
Manuel M. Dieguez
Rafael Buelna
Gildardo Magaña
Emiliano Zapata
Nueva Generacion
18 de Marzo
Jazmines
San Telmo
Bahia Sta Ines
de La Paz
Escuela Pavo
Cuauhtemoc
Huitzilac
Periferico
Esperanza
Mazatlan
De Los Misioneros
Art. 123
Art. 27
Padre Kino
Remigio Soler
Gral Juan Carrasco
Gral Ramón Arnaiz
Braulio Maldonado
De la Rivera
Sta Maria del Mar
Acueducto
Salvador Alvarado
Transpeninsular
Linda Vista
Vista Dorada
Emilio Zola
Manuel Flores
Pensador Mexicano
Sor Juana Ines de La Cruz
Ruben Dario
Jorge Isaac
Mar de Cortes
Del Agua
Image U.S. Geological Survey
© 2013 INEGI
© 2013 Google
Google earth
729 m
Imagery Date: 6/25/2008
1994
lat 32.533782° lon -117.087917° elev 97 m
Eye alt 3.23 km

Basic Information Sheet: Riverine Wetlands

Assessment Area Name: Tijuana River Upstream	
Project Name: TJ River Dredge	
Assessment Area ID #: AC - TJRLU - 051215	
Project ID #:	**Date:** 05/12/15
Assessment Team Members for This AA:	
JR, TH	
Average Bankfull Width: 17.3 m	
Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m): 160 m	
Upstream Point Latitude: 32.5507 **Longitude:** -117.0811	
Downstream Point Latitude: 32.5512 **Longitude:** -117.0826	
Wetland Sub-type: ☐ Confined ☒ Non-confined	
AA Category: ☐ Restoration ☐ Mitigation ☐ Impacted ☒ Ambient ☐ Reference ☐ Training ☒ Other: Dredge Monitoring Impacts	
Did the river/stream have flowing water at the time of the assessment? ☒ yes ☐ no	
What is the apparent hydrologic flow regime of the reach you are assessing? The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source. ☒ perennial ☐ intermittent ☐ ephemeral	

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1	53 54	Upstream			
2	51	Middle Left			
3	52	Middle Right			
4	49, 50	Downstream			
5	↓ ↓				
6	looking looking				
7	down up				
8					
9					
10					

Site Location Description:

Comments:

After small rain event, about 96 hrs.
Sewage smell.

Scoring Sheet: Riverine Wetlands

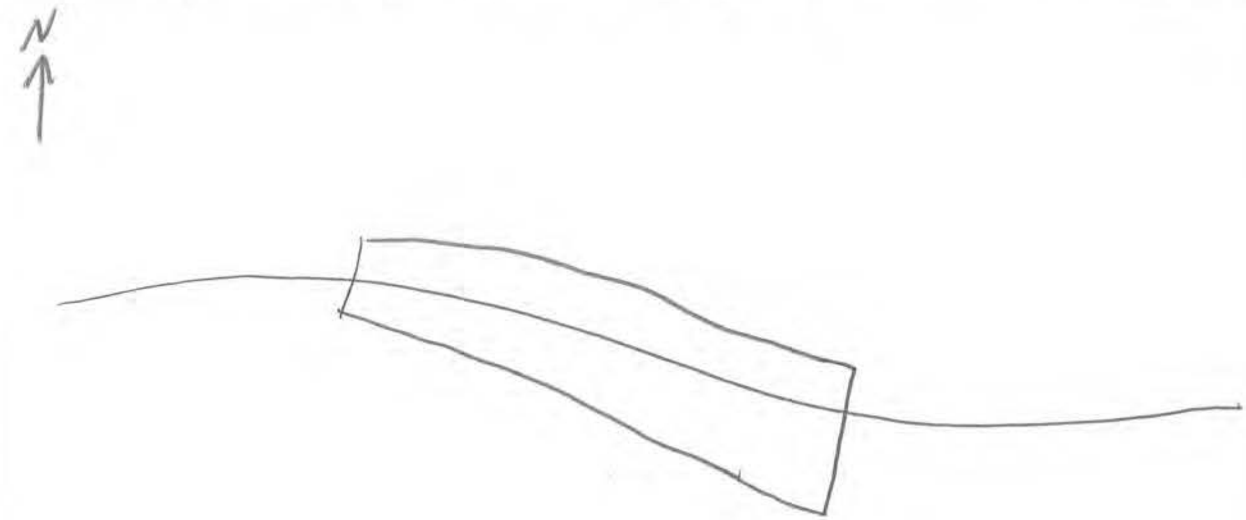
AA Name: TJ River Upstream					**Date:** 5/12/15
Attribute 1: Buffer and Landscape Context (pp. 11-19)					**Comments**
Stream Corridor Continuity (D)			Alpha. A	Numeric 12	
Buffer:					
	Alpha.	Numeric			
Buffer submetric A: Percent of AA with Buffer	A	A			
Buffer submetric B: Average Buffer Width	A	12			
Buffer submetric C: Buffer Condition	B	9			Some trails, evidence of human visitation, trash
Raw Attribute Score = D+[C x (A x B)$^{1/2}$]$^{1/2}$				22.0	**Final Attribute Score = (Raw Score/24) x 100** 91.7
Attribute 2: Hydrology (pp. 20-26)					
			Alpha.	Numeric	
Water Source			C	6	
Channel Stability			B	9	
Hydrologic Connectivity			C	6	
Raw Attribute Score = sum of numeric scores				21.0	**Final Attribute Score = (Raw Score/36) x 100** 58.3
Attribute 3: Physical Structure (pp. 27-33)					
			Alpha.	Numeric	
Structural Patch Richness			D	3	
Topographic Complexity			C	6	
Raw Attribute Score = sum of numeric scores				9.0	**Final Attribute Score = (Raw Score/24) x 100** 37.5
Attribute 4: Biotic Structure (pp. 34-41)					
Plant Community Composition (based on sub-metrics A-C)					
	Alpha.	Numeric			
Plant Community submetric A: Number of plant layers	A	12			
Plant Community submetric B: Number of Co-dominant species	D	3			
Plant Community submetric C: Percent Invasion	C	6			
Plant Community Composition Metric *(numeric average of submetrics A-C)*				7	
Horizontal Interspersion			C	6	
Vertical Biotic Structure			C	6	
Raw Attribute Score = sum of numeric scores				19	**Final Attribute Score = (Raw Score/36) x 100** 52.8
Overall AA Score (average of four final Attribute Scores)					60.1

Worksheet for Stream Corridor Continuity Metric for Riverine Wetlands

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA	
Segment No.	Length (m)	Segment No.	Length (m)
1	0	1	10
2		2	10
3		3	
4		4	
5		5	
Upstream Total Length	0	Downstream Total Length	20

Percent of AA with Buffer Worksheet

In the space provided below make a quick sketch of the AA, or perform the assessment directly on the aerial imagery; indicate where buffer is present, estimate the percentage of the AA perimeter providing buffer functions, and record the estimate amount in the space provided.



Percent of AA with Buffer: 100 %

Worksheet for calculating average buffer width of AA

Line	Buffer Width (m)
A	250
B	250
C	250
D	250
E	180
F	195
G	200
H	225
Average Buffer Width *Round to the nearest integer*	225

Worksheet for Assessing Channel Stability for Riverine Wetlands

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium (4)	☒ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA. ☒ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it. ☒ There is leaf litter, thatch, or wrack in most pools (if pools are present). ☒ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area. ☐ There is little or no active undercutting or burial of riparian vegetation. ☐ If mid-channel bars and/or point bars are present, they are not densely vegetated with perennial vegetation. ☐ Channel bars consist of well-sorted bed material (smaller grain size on the top and downstream end of the bar, larger grain size along the margins and upstream end of the bar). ☐ There are channel pools, the spacing between pools tends to be regular and the bed is not planar throughout the AA (One big pool) ☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation (1)	☐ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs. ☐ There are abundant bank slides or slumps. ☐ The lower banks are uniformly scoured and not vegetated. ☒ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel. (→ more trees down than previous effort) ☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation. ☐ The channel bed appears scoured to bedrock or dense clay. ☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided). ☐ The channel has one or more knickpoints indicating headward erosion of the bed.
Indicators of Active Aggradation (2)	☐ There is an active floodplain with fresh splays of coarse sediment (sand and larger that is not vegetated) deposited in the current or previous year. ☒ There are partially buried living tree trunks or shrubs along the banks. ☒ The bed is planar (flat or uniform gradient) overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced. (one big pool) ☐ There are partially buried, or sediment-choked, culverts. ☐ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour. ☐ There are avulsion channels on the floodplain or adjacent valley floor.
Overall	☒ **Equilibrium** ☐ **Degradation** ☐ **Aggradation**

Riverine Wetland Entrenchment Ratio Calculation Worksheet

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate midpoints along straight riffles or glides, away from deep pools or meander bends. An attempt should be made to place them at the top, middle, and bottom of the AA.

Steps	Replicate Cross-sections ⟶	TOP	MID	BOT	
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	18	17	17	m
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	2.5	2.0	2.5	m estimate too deep and soft to see middle
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	5.0	4.0	5.0	m
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	28	25	29	m
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	1.6	1.5	1.7	
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections. Enter the average result here and use it in Table 13a or 13b.			1.6	

Structural Patch Type Worksheet for Riverine wetlands

Circle each type of patch that is observed in the AA and enter the total number of observed patches in Table below. In the case of riverine wetlands, their status as confined or non-confined must first be determined (see page 6) to determine with patches are expected in the system (indicated by a "1" in the table below). Any feature onsite should only be counted once as a patch type. If a feature appears to meet the definition of more than one patch type (i.e. swale and secondary channel) the practitioner should choose which patch type best illustrates the feature. Not all features at a site will be patch types.

Please refer to the CRAM Photo Dictionary at** *www.cramwetlands.org* ***for photos of each of the following patch types.

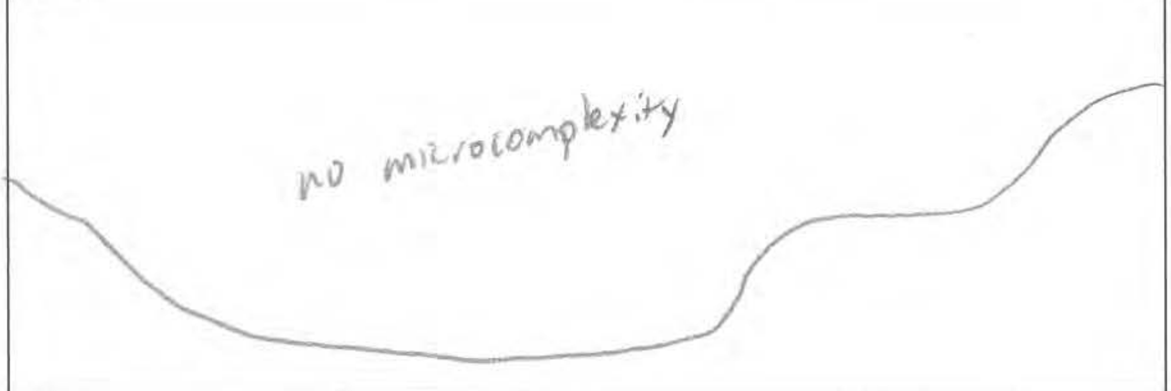
STRUCTURAL PATCH TYPE (circle for presence)	**Riverine (Non-confined)**	**Riverine (Confined)**
Minimum Patch Size	**$3\ m^2$**	**$3\ m^2$**
Abundant wrackline or organic debris in channel, on floodplain	(1)	1
Bank slumps or undercut banks in channels or along shoreline	1	1
Cobbles and/or Boulders	1	1
Debris jams	1	1
Filamentous macroalgae or algal mats	1	1
Large woody debris	(1)	1
Pannes or pools on floodplain	1	N/A
Plant hummocks and/or sediment mounds	1	1
Point bars and in-channel bars	1	1
Pools or depressions in channels (wet or dry channels)	1	1
Riffles or rapids (wet or dry channels)	1	1
Secondary channels on floodplains or along shorelines	1	N/A
Standing snags (at least 3 m tall)	1	1
Submerged vegetation	1	N/A
Swales on floodplain or along shoreline	1	N/A
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	1	1
Vegetated islands (mostly above high-water)	1	N/A
Total Possible	**17**	**12**
No. Observed Patch Types (enter here and use in Table 14 below)	2	

Worksheet for AA Topographic Complexity

At three locations along the AA, make a sketch of the profile of the stream from the AA boundary down to its deepest area then back out to the other AA boundary. Try to capture the benches and the intervening micro-topographic relief. To maintain consistency, make drawings at each of the stream hydrologic connectivity measurements, always facing downstream. Include the water level, an arrow at the bankfull contour, and label the benches. Based on these sketches and the profiles in Figure 10, choose a description in Table 16 that best describes the overall topographic complexity of the AA.

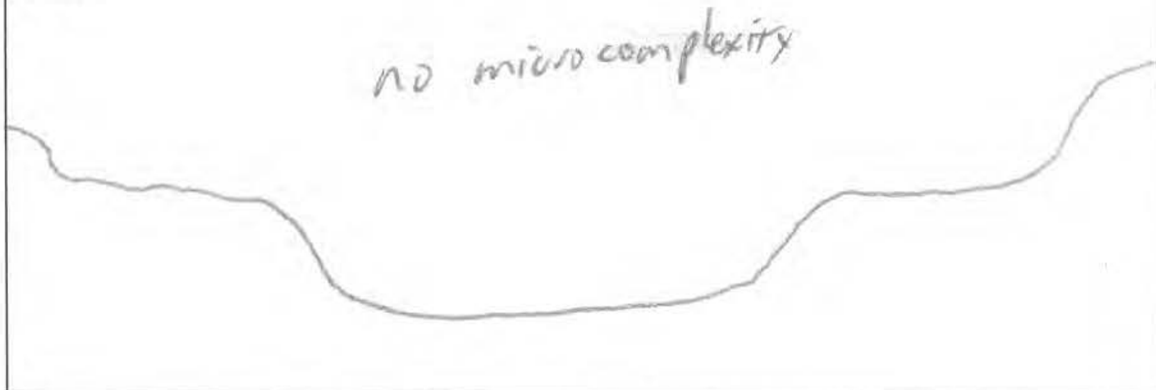
North — South

Profile 1

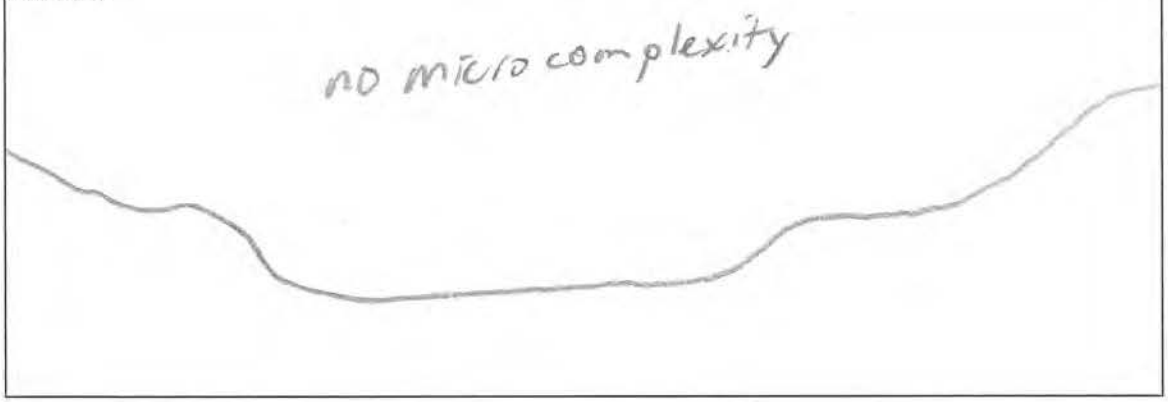


Top

Profile 2



Profile 3



Bottom

Plant Community Metric Worksheet: Co-dominant species richness for Riverine wetlands
(A dominant species represents ≥10% *relative* cover)

Special Note:

** Combine the counts of co-dominant species from all layers to identify the total species count. Each plant species is only counted once when calculating the Number of Co-dominant Species and Percent Invasion submetric scores, regardless of the numbers of layers in which it occurs.*

Floating or Canopy-forming (non-confined only)	Invasive?	Short (<0.5 m)	Invasive?
none		Nastutium (Tropaeolum majus)	Y
		Castor Bean (Ricinus communis)	Y

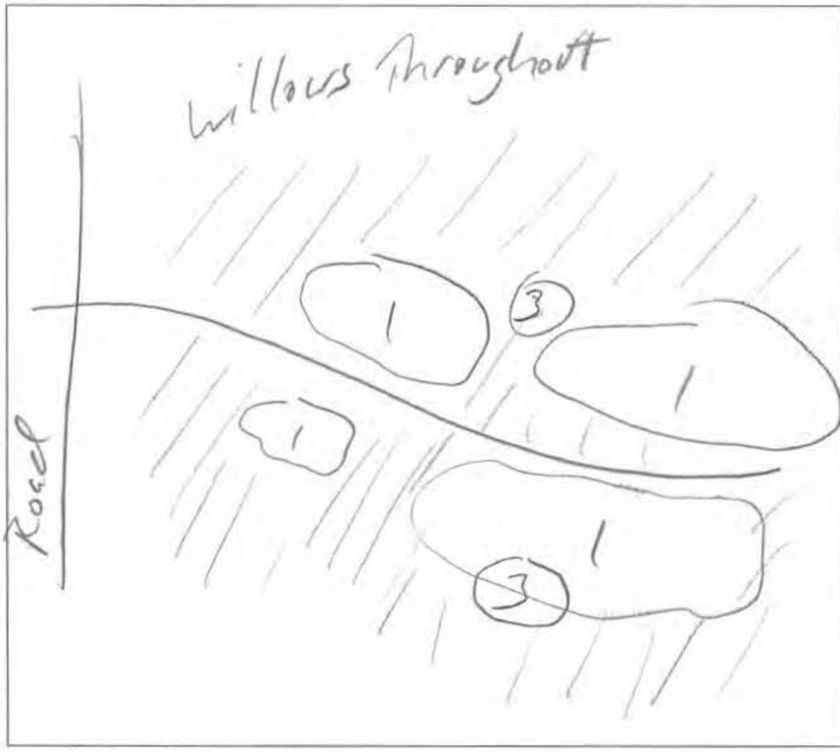
Medium (0.5-1.5 m)	Invasive?	Tall (1.5-3.0 m)	Invasive?
Mulefat	N	Castor Bean	Y
		Mulefat (Baccharis salicifolia)	N

Very Tall (>3.0 m)	Invasive?		
Black Willow (Salix gooddingii)	N	Total number of co-dominant species for all layers combined (enter here and use in Table 18)	5
Arroyo Willow (Salix lasiolepis)	N		
Castor Bean	Y	Percent Invasion *Round to the nearest integer* (enter here and use in Table 18)	40

- lots of very young castorbean < 6"

Horizontal Interspersion Worksheet.

Use the spaces below to make a quick sketch of the AA in plan view, outlining the major plant zones (this should take no longer than 10 minutes). Assign the zones names and record them on the right. Based on the sketch, choose a single profile from Figure 12 that best represents the AA overall.



Assigned zones:

1) Castor Bean

2) Willows

3) Mulefat

4)

5)

6)

Worksheet for Wetland disturbances and conversions

Has a major disturbance occurred at this wetland?	Yes	No (circled)		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type?	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

Stressor Checklist Worksheet

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)	X	X
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees		
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)	X	X
Heavy metal impaired (PS or Non-PS pollution)	X	X
Pesticides or trace organics impaired (PS or Non-PS pollution)	X	X
Bacteria and pathogens impaired (PS or Non-PS pollution)	X	X
Trash or refuse	X	X
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of treatment of invasive plants adjacent to AA or buffer	X	X

Comments

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present	Significant negative effect on AA
Urban residential	X	
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries	X	
Commercial feedlots	X	
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)	X	
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	X	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		

Comments


Saturn Blvd
Hollister St
TJ-PC-U
N
© 2013 Google
Image U.S. Geological Survey
© 2013 INEGI
Google earth
150 m
Imagery Date 2/29/2008
1994
lat 32.551003
-117.082326 elev 6 m
Eye alt 664 m

5/12/15

Saturn Blvd
TJ-PC-U
Tijuana River Valley
© 2013 Google
Image U.S. Geological Survey
© 2013 INEGI
Google earth
250 m
Imagery Date 2/29/2008
1994
lat 32.551060 lon -117.082195 elev 6 m
Eye alt 1.11 km


N
Wardlow Ave
Chavez Rd
Arbodar Rd
Brando Dr
Sunset Ave
Saturn Blvd
TJ-PC-U
Tijuana River Valley
Hollister St
Old Dairy Mart Rd
TJ-SG-U
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
Google earth
499 m
Imagery Date: 6/25/2008
1994
lat 32.550924° lon -117.081387° elev 8 m
Eye alt 2.37 km

Alosta St
Dalisay St
Wardlow Ave
Valance St
Chavez Rd
Arbodar Rd
Brando Dr
Corte Amalia
Blackshaw Ln
Sunset Ln
W San Ysidro Blvd
5
Sunset Ave
Servando Ave
Camino De La Plaza
TJ-PC-U
Tijuana River Valley
2 Km
Old Dairy Mart Rd
Dairy Mart Rd
Hollister St
Monument Rd
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
593 m
Google earth
Escobedo
1
Imagery Date: 6/25/2008
1994
lat 32.550515° lon -117.070384° elev 1.1 m
Eye alt 2.55 km

Basic Information Sheet: Riverine Wetlands

Assessment Area Name: Tijuana River - Downstream	
Project Name: Tijuana River Dredge	
Assessment Area ID #: AC - TJPCD - 051215	
Project ID #:	**Date:** 5/12/15
Assessment Team Members for This AA: JR, TH	
Average Bankfull Width: 5.3 m	
Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m): 100m	
Upstream Point Latitude: 32.5579	**Longitude:** -117.1035
Downstream Point Latitude: 32.5576	**Longitude:** -117.1045
Wetland Sub-type: ☐ Confined ☒ Non-confined	
AA Category: ☐ Restoration ☐ Mitigation ☐ Impacted ☒ Ambient ☐ Reference ☐ Training ☒ Other: Dredge Monitoring	
Did the river/stream have flowing water at the time of the assessment? ☒ yes ☐ no	
What is the apparent hydrologic flow regime of the reach you are assessing? The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source. ☒ perennial ☐ intermittent ☐ ephemeral	

Tidal Influence

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1	69 70	Upstream			
2		Middle Left			
3		Middle Right			
4	71 72	Downstream			
5					
6					
7					
8					
9					
10					

Site Location Description:

looking down   looking up

Comments:

Falling tide

Scoring Sheet: Riverine Wetlands

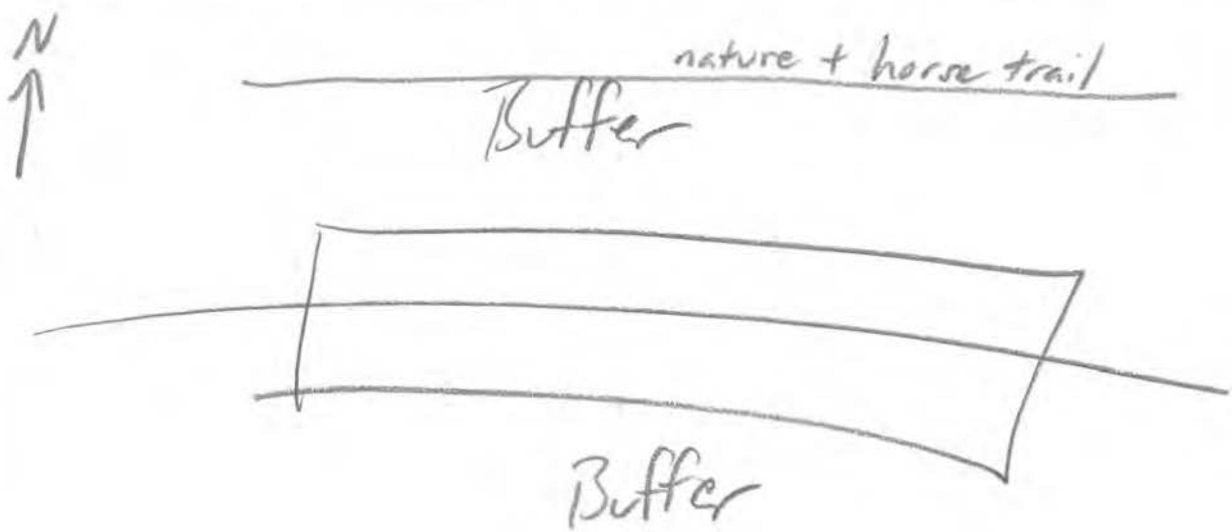
AA Name: TJ River downstream					Date: 5/12/15	
Attribute 1: Buffer and Landscape Context (pp. 11-19)					**Comments**	
			Alpha.	Numeric		
Stream Corridor Continuity (D)			A	12		
Buffer:						
	Alpha.	Numeric				
Buffer submetric A: Percent of AA with Buffer	A	12				
Buffer submetric B: Average Buffer Width	A	12				
Buffer submetric C: Buffer Condition	B	9				
Raw Attribute Score = D+[C x (A x B)^{½}]^{½}				22.0	**Final Attribute Score = (Raw Score/24) x 100**	91.7
Attribute 2: Hydrology (pp. 20-26)						
			Alpha.	Numeric		
Water Source			C	6		
Channel Stability			B	9		
Hydrologic Connectivity			D	3		
Raw Attribute Score = sum of numeric scores				18	**Final Attribute Score = (Raw Score/36) x 100**	50.0
Attribute 3: Physical Structure (pp. 27-33)						
			Alpha.	Numeric		
Structural Patch Richness			D	3		
Topographic Complexity			C	6		
Raw Attribute Score = sum of numeric scores				9	**Final Attribute Score = (Raw Score/24) x 100**	37.5
Attribute 4: Biotic Structure (pp. 34-41)						
Plant Community Composition (based on sub-metrics A-C)						
	Alpha.	Numeric				
Plant Community submetric A: Number of plant layers	A	12				
Plant Community submetric B: Number of Co-dominant species	C	6				
Plant Community submetric C: Percent Invasion	C	6				
Plant Community Composition Metric *(numeric average of submetrics A-C)*				8		
Horizontal Interspersion			B	9		
Vertical Biotic Structure			B	9		
Raw Attribute Score = sum of numeric scores				26	**Final Attribute Score = (Raw Score/36) x 100**	72.2
Overall AA Score (average of four final Attribute Scores)					62.8	

Worksheet for Stream Corridor Continuity Metric for Riverine Wetlands

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA	
Segment No.	Length (m)	Segment No.	Length (m)
1	0	1	0
2		2	
3		3	
4		4	
5		5	
Upstream Total Length	0	Downstream Total Length	0

Percent of AA with Buffer Worksheet

In the space provided below make a quick sketch of the AA, or perform the assessment directly on the aerial imagery; indicate where buffer is present, estimate the percentage of the AA perimeter providing buffer functions, and record the estimate amount in the space provided.



Percent of AA with Buffer: 100 %

Worksheet for calculating average buffer width of AA

Line	Buffer Width (m)
A	250
B	
C	
D	
E	
F	
G	
H	
Average Buffer Width *Round to the nearest integer*	250

Worksheet for Assessing Channel Stability for Riverine Wetlands

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium	☒ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA.
	☒ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it.
	☒ There is leaf litter, thatch, or wrack in most pools (if pools are present).
	☒ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area.
	☐ There is little or no active undercutting or burial of riparian vegetation.
	☐ If mid-channel bars and/or point bars are present, they are not densely vegetated with perennial vegetation.
	☐ Channel bars consist of well-sorted bed material (smaller grain size on the top and downstream end of the bar, larger grain size along the margins and upstream end of the bar).
	☐ There are channel pools, the spacing between pools tends to be regular and the bed is not planar throughout the AA
	☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation	☒ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs.
	☒ There are abundant bank slides or slumps.
	☒ The lower banks are uniformly scoured and not vegetated.
	☒ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel.
	☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation.
	☐ The channel bed appears scoured to bedrock or dense clay.
	☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided).
	☐ The channel has one or more knickpoints indicating headward erosion of the bed.
Indicators of Active Aggradation	☐ There is an active floodplain with fresh splays of coarse sediment (sand and larger that is not vegetated) deposited in the current or previous year.
	☐ There are partially buried living tree trunks or shrubs along the banks.
	☒ The bed is planar (flat or uniform gradient) overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced.
	☐ There are partially buried, or sediment-choked, culverts.
	☐ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour.
	☐ There are avulsion channels on the floodplain or adjacent valley floor.
Overall	☒ **Equilibrium** ☒ **Degradation** ☐ **Aggradation**

Riverine Wetland Entrenchment Ratio Calculation Worksheet

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate midpoints along straight riffles or glides, away from deep pools or meander bends. An attempt should be made to place them at the top, middle, and bottom of the AA.

Steps	Replicate Cross-sections ⟶	TOP	MID	BOT	
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	3.0	7.0	6.0	m
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	0.6	08	0.8	m
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	1.2	1.6	1.6	m
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	5.2	8.5	8.0	m
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	1.7	1.2	1.3	
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections. Enter the average result here and use it in Table 13a or 13b.			1.4	

Structural Patch Type Worksheet for Riverine wetlands

Circle each type of patch that is observed in the AA and enter the total number of observed patches in Table below. In the case of riverine wetlands, their status as confined or non-confined must first be determined (see page 6) to determine with patches are expected in the system (indicated by a "1" in the table below). Any feature onsite should only be counted once as a patch type. If a feature appears to meet the definition of more than one patch type (i.e. swale and secondary channel) the practitioner should choose which patch type best illustrates the feature. Not all features at a site will be patch types.

Please refer to the CRAM Photo Dictionary at** *www.cramwetlands.org* ***for photos of each of the following patch types.

STRUCTURAL PATCH TYPE (circle for presence)	Riverine (Non-confined)	Riverine (Confined)
Minimum Patch Size	$3\ m^2$	$3\ m^2$
Abundant wrackline or organic debris in channel, on floodplain	(1)	1
Bank slumps or undercut banks in channels or along shoreline	(1)	1
Cobbles and/or Boulders	1	1
Debris jams	1	1
Filamentous macroalgae or algal mats	1	1
Large woody debris	(1)	1
Pannes or pools on floodplain	1	N/A
Plant hummocks and/or sediment mounds	1	1
Point bars and in-channel bars	1	1
Pools or depressions in channels (wet or dry channels)	1	1
Riffles or rapids (wet or dry channels)	1	1
Secondary channels on floodplains or along shorelines	(1)	N/A
Standing snags (at least 3 m tall)	1	1
Submerged vegetation	1	N/A
Swales on floodplain or along shoreline	1	N/A
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	1	1
Vegetated islands (mostly above high-water)	1	N/A
Total Possible	**17**	**12**
No. Observed Patch Types (enter here and use in Table 14 below)	4	

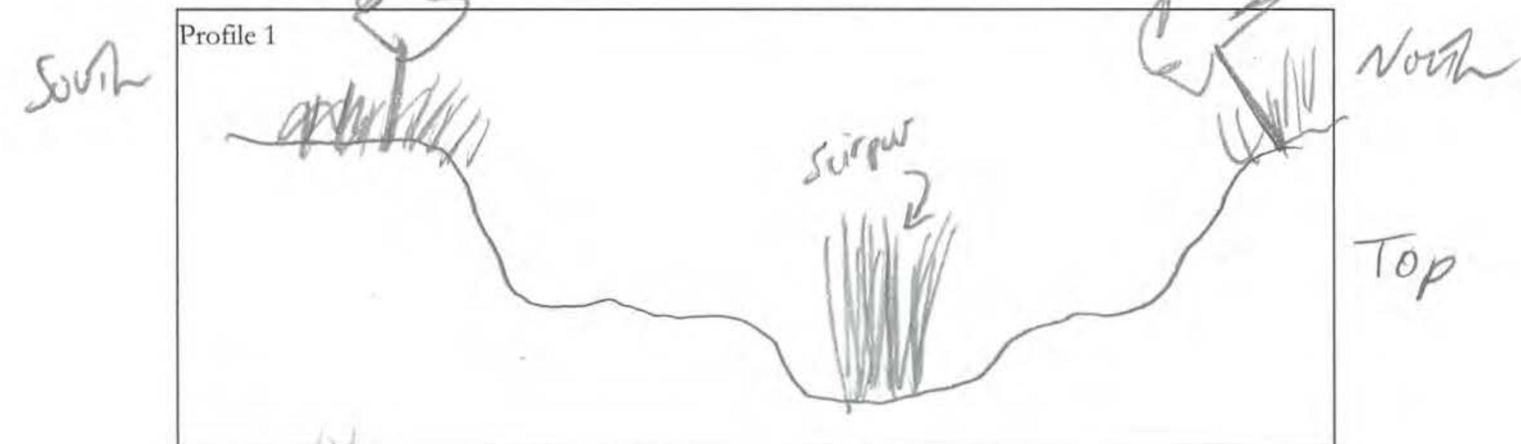
← new tree fall

← one large pool, whole thing

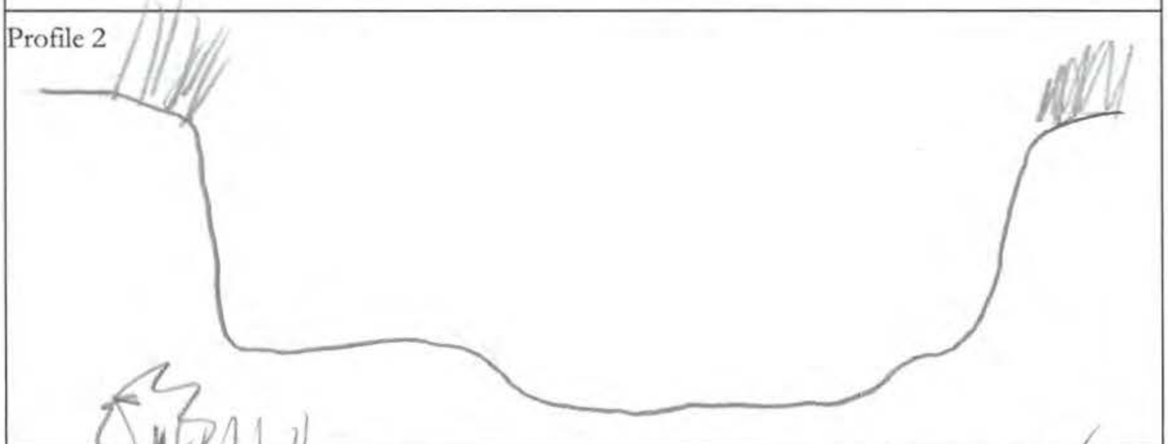
Worksheet for AA Topographic Complexity

At three locations along the AA, make a sketch of the profile of the stream from the AA boundary down to its deepest area then back out to the other AA boundary. Try to capture the benches and the intervening micro-topographic relief. To maintain consistency, make drawings at each of the stream hydrologic connectivity measurements, always facing downstream. Include the water level, an arrow at the bankfull contour, and label the benches. Based on these sketches and the profiles in Figure 10, choose a description in Table 16 that best describes the overall topographic complexity of the AA.

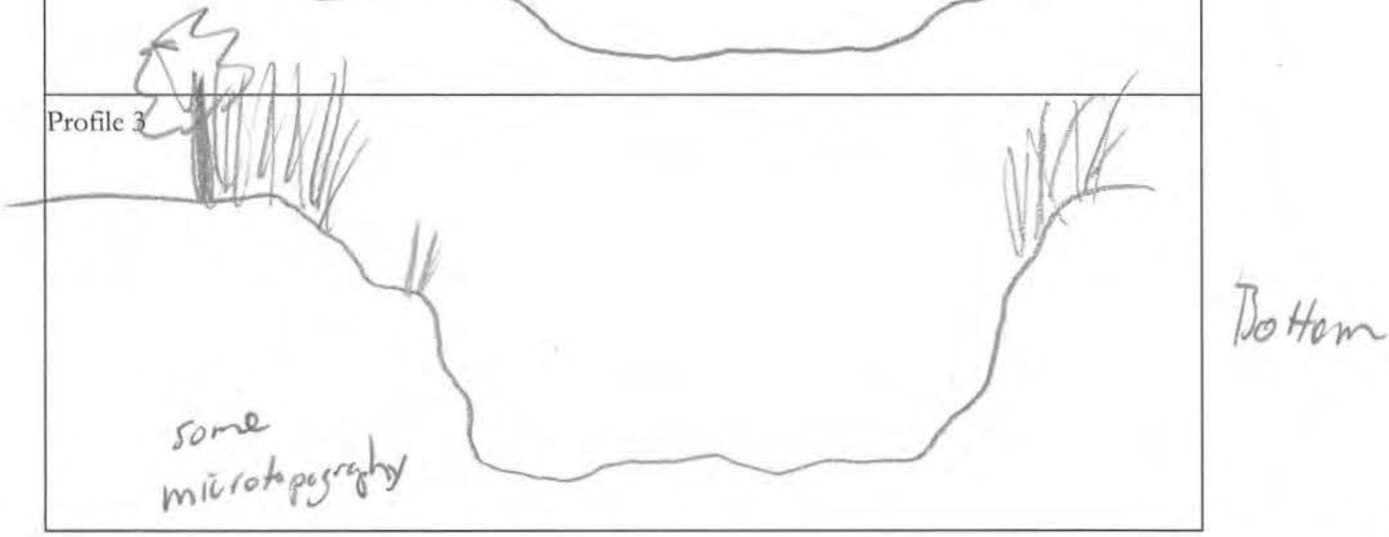
Profile 1



Profile 2



Profile 3



Plant Community Metric Worksheet: Co-dominant species richness for Riverine wetlands
(A dominant species represents ≥10% *relative* cover)

Special Note:

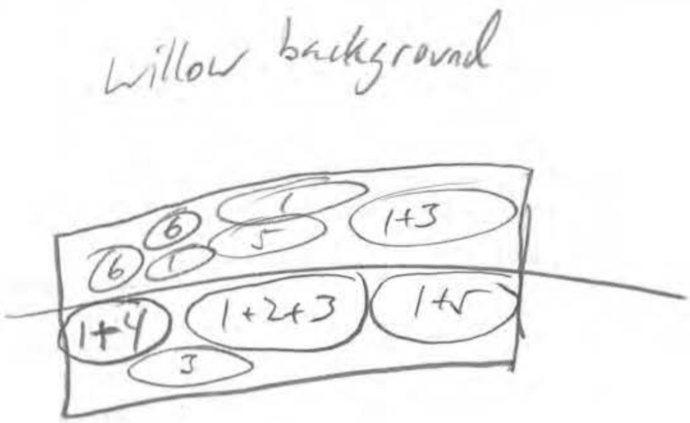
** Combine the counts of co-dominant species from all layers to identify the total species count. Each plant species is only counted once when calculating the Number of Co-dominant Species and Percent Invasion submetric scores, regardless of the numbers of layers in which it occurs.*

Floating or Canopy-forming (non-confined only)	Invasive?	Short (<0.5 m)	Invasive?
none		Nasturtium	Y
Medium (0.5-1.5 m)	**Invasive?**	**Tall (1.5-3.0 m)**	**Invasive?**
Mulefat	N	Scirpus californicus	N
		Mulefat	N
Very Tall (>3.0 m)	**Invasive?**	**Total number of co-dominant species for all layers combined (enter here and use in Table 18)**	8
Arroyo Willow	N		
Tamarix	Y		
Arrundo	Y	**Percent Invasion *Round to the nearest integer* (enter here and use in Table 18)**	38
Elderberry	N		
Black Willow	N		

Margin notes: Tropaeolum majus (Nasturtium); Bacharis salicifolia (Mulefat); Salix lasiolepis (Arroyo Willow); Tamarix aphylla (Tamarix); Arrundo donax (Arrundo); Sambucus mexicana (Elderberry); Salix gooddingii (Black Willow)

Horizontal Interspersion Worksheet.

Use the spaces below to make a quick sketch of the AA in plan view, outlining the major plant zones (this should take no longer than 10 minutes). Assign the zones names and record them on the right. Based on the sketch, choose a single profile from Figure 12 that best represents the AA overall.



Assigned zones:

1) Willow
2) Tamarix
3) Mulfat
4) Arundo
5) Nasturtium
6) Elderberry

Worksheet for Wetland disturbances and conversions

Has a major disturbance occurred at this wetland?	Yes	No		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type?	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

Stressor Checklist Worksheet

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)	X	
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees		
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		

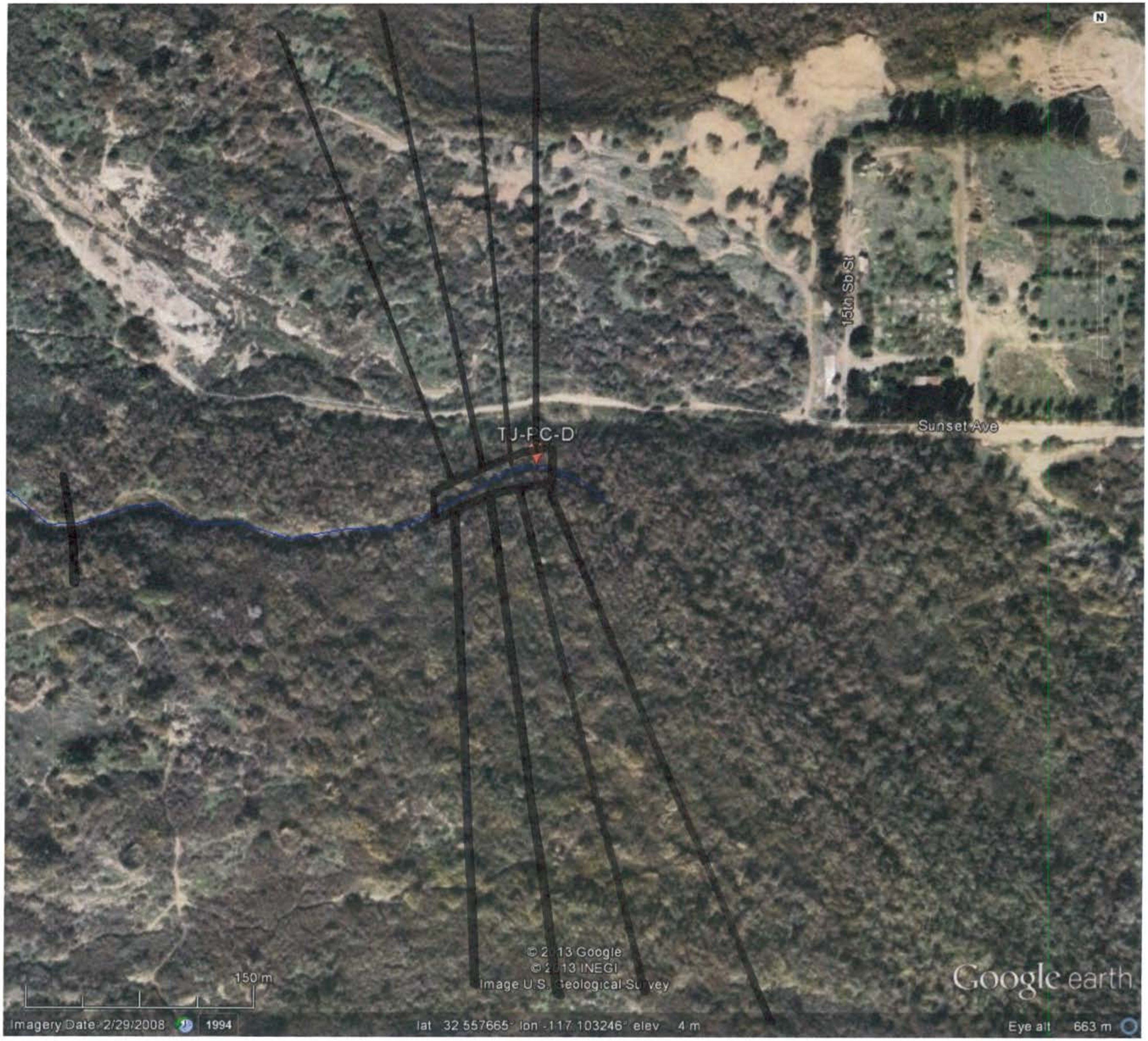
PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)	X	
Heavy metal impaired (PS or Non-PS pollution)	X	
Pesticides or trace organics impaired (PS or Non-PS pollution)	X	
Bacteria and pathogens impaired (PS or Non-PS pollution)	X	
Trash or refuse	X	
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of treatment of invasive plants adjacent to AA or buffer	X	

Comments

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present	Significant negative effect on AA
Urban residential	X	
Industrial/commercial		
Military training/Air traffic	X	
Dams (or other major flow regulation or disruption)		
Dryland farming	X	
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)	X	
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	X	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		

Comments

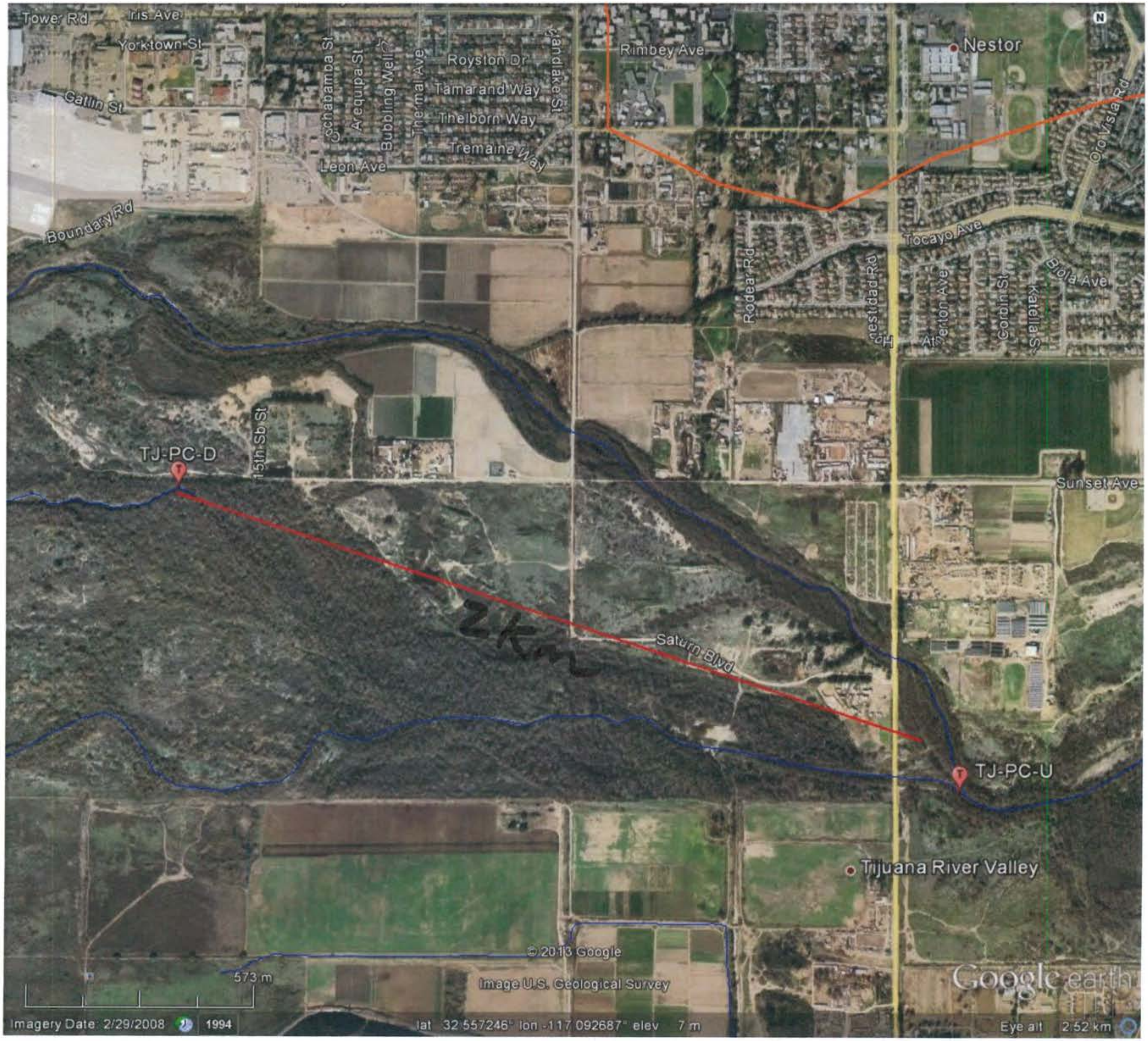


N
15th Sb St
Sunset Ave
TJ-FC-D
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
Google earth
150 m
Imagery Date: 2/29/2008
1994
lat 32.557665° lon -117.103246° elev 4 m
Eye alt 663 m

5/12/14


N
TJ-PC-D
Sunset Ave
15th Sb St
500m
500m
253 m
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
Google earth
Imagery Date: 2/29/2008
1994
lat 32.557604° lon -117.103599° elev 5 m
Eye alt 1.12 km


Wolviston Way
Royston Dr
Tamarand Way
Thelborn Way
Tremaine Way
Standlake St
Bubbling Well Dr
Thermal Ave
Leon Ave
Saratoga St
Lexington St
Yorktown
Gatlin St
Boundary Rd
TJ-PC-D
15th St
Sunset Ave
Saturn Blvd
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
Google earth
501 m
Imagery Date: 2/29/2008
1994
lat 32.558347° lon -117.103440° elev 5 m
Eye alt 2.20 km


Tower Rd
Iris Ave
Yorktown St
Gatlin St
Boundary Rd
Cochabamba St
Arequipa St
Bubbling Well
Thermal Ave
Royston Dr
Tamarand Way
Thelborn Way
Tremaine Way
Leon Ave
Rimbey Ave
Nestor
Oro Vista Rd
Tocayo Ave
Biola Ave
Rodear Rd
Corbin St
Katella St
15th Sb St
TJ-PC-D
Sunset Ave
Saturn Blvd
2km
TJ-PC-U
Tijuana River Valley
© 2013 Google
Image U.S. Geological Survey
573 m
Google earth
Imagery Date: 2/29/2008
1994
lat 32.557246° lon -117.092687° elev 7 m
Eye alt 2.52 km

Field Data Log Sheet

Site ID TJPC-U **Watershed** Tijuana **Field Crew** JR, TH **Date** 5/12/15

Site-Specific Event # Wet Weather [ ] Dry Weather [X] **Time** 0815

ATMOSPHERIC & OCEANIC CONDITIONS

Weather	Sunny	(Partly Cloudy)	Overcast	Fog	Raining	Drizzle	
Last Rain	(>72 Hours)	< 72 Hours	**Rainfall**	None	< 0.1"	> 0.1"	
Tide	High	(Mid)	Low	Rising ↑	(Falling ↓)		
Flow	(Flowing)	Ponded					

SAMPLE CHARACTERISTICS

Odor	None	Musty	Rotten Eggs	Chemical	(Sewage)	Other____		
Color	None	Yellow	(Brown)	White	Gray	Other____		
Clarity	Clear	Slightly Cloudy	(Opaque)	Other____				
Floatables	None	Trash	(Bubbles/Foam)	Sheen	Other____			
Deposits	None	Sediment/Gravel	(Fine Particles)	Stains	Oily Deposits	Other____		
Vegetation	None	Limited	(Normal)	Excessive	Other____			
Biology	(None)	Insects	Algae	Snail	Seaweed	Mollusk	Crustacean	Other____

FIELD MEASUREMENTS

Temp(°C) 18.2 **Sp Conduct (µS/cm)** 2354 **pH** 8.07

Turbidity (NTU) 9.05 **Salinity (ppt)** 1.2 ppt **DO (mg/L)** 0.8

SAMPLE COLLECTION

Sample Type	Date	Time	Sample ID
Water	5/12/15	0840	TJPCU-051215-01

NOTES/COMMENTS

Fallen trees on path in to site

Field Data Log Sheet

Site ID	TJPCD	Watershed	Tijuana	Field Crew	JR, TH	Date	5/12/15
Site-Specific Event #		Wet Weather		Dry Weather	X	Time	1150

ATMOSPHERIC & OCEANIC CONDITIONS

Weather	(Sunny)	Partly Cloudy	Overcast	Fog	Raining	Drizzle	
Last Rain	(> 72 Hours)	< 72 Hours	Rainfall	None	< 0.1"	> 0.1"	
Tide	High	(Mid)	Low	Rising ↑	(Falling ↓)		
Flow	(Flowing)	Ponded					

SAMPLE CHARACTERISTICS

Odor	None	(Musty)	Rotten Eggs	Chemical	Sewage	Other____		
Color	None	(Yellow)	Brown	White	Gray	Other____		
Clarity	Clear	(Slightly Cloudy)	Opaque	Other____				
Floatables	(None)	Trash	Bubbles/Foam	Sheen	Other____			
Deposits	None	Sediment/Gravel	(Fine Particles)	Stains	Oily Deposits	Other____		
Vegetation	(None)	Limited	Normal	Excessive	Other____			
Biology	(None)	Insects	Algae	Snail	Seaweed	Mollusk	Crustacean	Other____

FIELD MEASUREMENTS

Temp(°C)	18.9	Sp Conduct (µS/cm)	1491	pH	7.62
Turbidity (NTU)	4.28	Salinity (ppt)	0.75	DO (mg/L)	4.4

SAMPLE COLLECTION

Sample Type	Date	Time	Sample ID
Water	5/12/15	1200	TJPCD-051215-01
Water	5/12/15	1205	TJPCD-051215-02 Dup

NOTES/COMMENTS

Outgoing tide, high tide @ 4:41 am +4.4 ft

Sediment Sampling Fieldsheet for Tijuana River Estuary

amec

Date: 5/12/2015
Personnel: JR, TH
Weather: Clear
Time / Height low tide: 11:22am : +0.2 feet
Time / Height high tide: 04:41 am : +4.4 feet

Station ID	Time	Grab #	Water Depth (m)	Penetration Depth (cm)	% Surface Intact	Overlying Water (Y/N)?	Acceptable (Y/N)?*	Sed Type	Color	Odor	Photo ID
TJPCD	1213	1	0.08	7	100	Y	Y	Sand	Grey	Sulfide	61, 62
TJRCD	1230	2	0.08m	6cm	100%	y	y	Sand	Grey	Sulfide	63, 64 65, 66
TJRCD	1245	3	0.08m	6cm	100%	y	y	Sand	~~Grey~~ Blk	sulfide	67, 68

* Acceptability criteria: minimum 5-cm penetration, even sample surface, minimal disturbance/high % surface intact, overlying water present

** Record all grab attempts

Notes: Eckman Box Core

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Appendix D

Analytical Laboratory Report

CERTIFICATE OF ANALYSIS

Client:	AMEC Environment & Infrastructure 9177 Sky Park Court, Ste A San Diego CA, 92123	**Report Date:**	05/22/15 16:07
		Received Date:	05/13/15 11:10
		Turn Around:	Normal
Attention:	Kristina Schneider	**Client Project:**	Tijuana River Receiver WatersMonitoring
Phone:	(858) 278-3600		
Fax:	(858) 278-5300	**PO Number:**	5025121037
Work Order(s):	5E13023		

NELAP #04229CA ELAP#1132 NEVADA #CA211 HAWAII LACSD #10143

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. Weck Laboratories, Inc. certifies that the test results meet all NELAC requirements unless noted in the case narrative. This analytical report is confidential and is only intended for the use of Weck Laboratories, Inc. and its client. This report contains the Chain of Custody document, which is an integral part of it, and can only be reproduced in full with the authorization of Weck Laboratories, Inc.

Dear Kristina Schneider :

Enclosed are the results of analyses for samples received 05/13/ 15 11:10 with the Chain of Custody document. The samples were received in good condition, at 2.9 °C and on ice. All analysis met the method criteria except as noted below or in the report with data qualifiers.

Case Narrative:

Reviewed by:

haivannguyen

Hai Van Nguyen
Project Manager

Weck Laboratories, Inc 14859 East Clark Avenue, City of Industry, California 91745-1396 (626) 336-2139 FAX (626) 336-2634

AMEC Environment & Infrastructure
9177 Sky Park Court, Ste A
San Diego CA, 92123

Date Received: 05/13/15 11:10
Date Reported: 05/22/15 16:07

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Sampled by:	Lab ID	Matrix	Date Sampled
AC-TJPCD-051215-01	JR	5E13023-01	Water	05/12/15 12:00
AC-TJPCU-051215-01	JR	5E13023-02	Water	05/12/15 08:40
AC-TJPCD-051215-02	JR	5E13023-03	Water	05/12/15 12:05

ANALYSES

Anions by IC, EPA Method 300.0

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

AMEC Environment & Infrastructure
9177 Sky Park Court, Ste A
San Diego CA, 92123

Date Received: 05/13/15 11:10
Date Reported: 05/22/15 16:07

5E13023-01 **AC-TJPCD-051215-01**

Sampled: 05/12/15 12:00 **Sampled By:** JR **Matrix:** Water

Anions by IC, EPA Method 300.0

Method: EPA 300.0 Batch: W5E0648 Prepared: 05/13/15 12:00 Analyst: Alice T. Lee

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chloride, Total	**430**	1.0	5.0	mg/l	10	05/13/15 16:06	

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: EPA 350.1 Batch: W5E0815 Prepared: 05/15/15 08:19 Analyst: Rebecca Juea Song

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Ammonia as N	**0.19**	0.048	0.10	mg/l	1	05/15/15 16:06	

Method: EPA 351.2 Batch: W5E0941 Prepared: 05/18/15 10:35 Analyst: Nina Katrina Reyes Aranas

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
TKN	**0.63**	0.050	0.10	mg/l	1	05/19/15 12:38	

Method: EPA 353.2 Batch: W5E0664 Prepared: 05/13/15 12:35 Analyst: Angela J Whittington

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrate as N	**0.057**	0.041	0.10	mg/l	1	05/13/15 15:42	J
Nitrite as N	**0.010**	0.010	0.10	mg/l	1	05/13/15 20:31	J

Method: EPA 365.1 Batch: W5E0690 Prepared: 05/13/15 17:17 Analyst: Marilyn B Christian

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
o-Phosphate as P	**0.076**	0.00022	0.0020	mg/l	1	05/13/15 18:40	

Method: EPA 365.1 Batch: W5E1227 Prepared: 05/21/15 10:21 Analyst: Lin Chai

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Phosphorus as P, Total	**0.23**	0.0028	0.020	mg/l	2	05/22/15 10:47	

Method: SM 10200H Batch: W5E0660 Prepared: 05/13/15 11:56 Analyst: Marilyn B Christian

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chlorophyll-A	**21**	8.3	10	ug/l	1	05/22/15 12:19	

Method: SM 2320B Batch: W5E0722 Prepared: 05/14/15 09:14 Analyst: Ashley J Partridge

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Alkalinity as CaCO3	**550**	0.56	10	mg/l	1	05/15/15 13:59	

Method: SM 2540D Batch: W5E0824 Prepared: 05/15/15 10:16 Analyst: Lin Chai

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Suspended Solids	**8**		5	mg/l	1	05/15/15 12:01	

Weck Laboratories, Inc 14859 East Clark Avenue, City of Industry, California 91745-1396 (626) 336-2139 FAX (626) 336-2634

AMEC Environment & Infrastructure
9177 Sky Park Court, Ste A
San Diego CA, 92123

Date Received: 05/13/15 11:10
Date Reported: 05/22/15 16:07

5E13023-02 **AC-TJPCU-051215-01**

Sampled: 05/12/15 08:40 **Sampled By:** JR **Matrix:** Water

Anions by IC, EPA Method 300.0

Method: EPA 300.0 Batch: W5E0648 Prepared: 05/13/15 12:00 Analyst: Alice T. Lee

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chloride, Total	**360**	2.5	12	mg/l	25	05/13/15 16:24	

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: EPA 350.1 Batch: W5E0815 Prepared: 05/15/15 08:19 Analyst: Rebecca Juea Song

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Ammonia as N	**15**	2.4	5.0	mg/l	50	05/15/15 16:18	

Method: EPA 351.2 Batch: W5E0941 Prepared: 05/18/15 10:35 Analyst: Nina Katrina Reyes Aranas

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
TKN	**19**	0.25	0.50	mg/l	5	05/19/15 16:27	

Method: EPA 353.2 Batch: W5E0664 Prepared: 05/13/15 12:35 Analyst: Angela J Whittington

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrate as N	**2.6**	0.041	0.10	mg/l	1	05/13/15 15:44	
Nitrite as N	**0.93**	0.010	0.10	mg/l	1	05/13/15 20:32	

Method: EPA 365.1 Batch: W5E0690 Prepared: 05/13/15 17:17 Analyst: Marilyn B Christian

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
o-Phosphate as P	**5.4**	0.011	0.10	mg/l	50	05/13/15 18:50	

Method: EPA 365.1 Batch: W5E1227 Prepared: 05/21/15 10:21 Analyst: Lin Chai

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Phosphorus as P, Total	**6.2**	0.070	0.50	mg/l	2	05/22/15 10:51	M-06

Method: SM 10200H Batch: W5E0660 Prepared: 05/13/15 11:56 Analyst: Marilyn B Christian

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chlorophyll-A	ND	8.3	10	ug/l	1	05/22/15 12:19	

Method: SM 2320B Batch: W5E0722 Prepared: 05/14/15 09:14 Analyst: Ashley J Partridge

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Alkalinity as CaCO3	**360**	0.56	10	mg/l	1	05/15/15 13:59	

Method: SM 2540D Batch: W5E0824 Prepared: 05/15/15 10:16 Analyst: Lin Chai

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Suspended Solids	**22**		5	mg/l	1	05/15/15 12:01	

AMEC Environment & Infrastructure
9177 Sky Park Court, Ste A
San Diego CA, 92123

Date Received: 05/13/15 11:10
Date Reported: 05/22/15 16:07

5E13023-03 **AC-TJPCD-051215-02**

Sampled: 05/12/15 12:05 **Sampled By:** JR **Matrix:** Water

Anions by IC, EPA Method 300.0

Method: EPA 300.0 Batch: W5E0648 Prepared: 05/13/15 12:00 Analyst: Alice T. Lee

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chloride, Total	**410**	2.5	12	mg/l	25	05/13/15 16:43	

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: EPA 350.1 Batch: W5E0815 Prepared: 05/15/15 08:19 Analyst: Rebecca Juea Song

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Ammonia as N	**0.17**	0.048	0.10	mg/l	1	05/15/15 16:18	

Method: EPA 351.2 Batch: W5E0941 Prepared: 05/18/15 10:35 Analyst: Nina Katrina Reyes Aranas

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
TKN	**0.74**	0.050	0.10	mg/l	1	05/19/15 12:42	

Method: EPA 353.2 Batch: W5E0664 Prepared: 05/13/15 12:35 Analyst: Angela J Whittington

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrate as N	**0.050**	0.041	0.10	mg/l	1	05/13/15 15:46	J
Nitrite as N	**0.016**	0.010	0.10	mg/l	1	05/13/15 20:32	J

Method: EPA 365.1 Batch: W5E0690 Prepared: 05/13/15 17:17 Analyst: Marilyn B Christian

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
o-Phosphate as P	**0.076**	0.00022	0.0020	mg/l	1	05/13/15 18:46	

Method: EPA 365.1 Batch: W5E1227 Prepared: 05/21/15 10:21 Analyst: Lin Chai

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Phosphorus as P, Total	**0.37**	0.0070	0.050	mg/l	5	05/22/15 10:53	

Method: SM 10200H Batch: W5E0660 Prepared: 05/13/15 11:56 Analyst: Marilyn B Christian

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chlorophyll-A	**28**	8.3	10	ug/l	1	05/22/15 12:19	

Method: SM 2320B Batch: W5E0722 Prepared: 05/14/15 09:14 Analyst: Ashley J Partridge

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Alkalinity as CaCO3	**530**	0.56	10	mg/l	1	05/15/15 13:59	

Method: SM 2540D Batch: W5E0824 Prepared: 05/15/15 10:16 Analyst: Lin Chai

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Suspended Solids	**35**		5	mg/l	1	05/15/15 12:01	

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QUALITY CONTROL SECTION

AMEC Environment & Infrastructure
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Anions by IC, EPA Method 300.0 - Quality Control

Batch W5E0648 - EPA 300.0

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E0648-BLK1)					Analyzed: 05/13/15 11:01						
Chloride, Total	ND	0.10	0.50	mg/l							
LCS (W5E0648-BS1)					Analyzed: 05/13/15 11:19						
Chloride, Total	3.83	0.10	0.50	mg/l	4.00		96	90-110			
Duplicate (W5E0648-DUP1)		**Source: 5E11004-02**			Analyzed: 05/13/15 12:17						
Chloride, Total	24.3	0.25	1.2	mg/l		24.1			0.7	20	
Duplicate (W5E0648-DUP2)		**Source: 5E11004-03**			Analyzed: 05/13/15 13:13						
Chloride, Total	21.2	0.50	2.5	mg/l		23.6			11	20	
Matrix Spike (W5E0648-MS1)		**Source: 5E11004-02**			Analyzed: 05/13/15 12:36						
Chloride, Total	62.0	1.0	5.0	mg/l	40.0	24.1	95	76-118			
Matrix Spike (W5E0648-MS2)		**Source: 5E11005-01**			Analyzed: 05/13/15 14:13						
Chloride, Total	5480	50	250	mg/l	2000	3750	86	76-118			
Matrix Spike Dup (W5E0648-MSD1)		**Source: 5E11004-02**			Analyzed: 05/13/15 12:54						
Chloride, Total	60.6	1.0	5.0	mg/l	40.0	24.1	91	76-118	2	20	
Matrix Spike Dup (W5E0648-MSD2)		**Source: 5E11005-01**			Analyzed: 05/13/15 14:32						
Chloride, Total	5480	50	250	mg/l	2000	3750	86	76-118	0.1	20	

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods - Quality Control

Batch W5E0660 - SM 10200H

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E0660-BLK1)					Analyzed: 05/22/15 12:19						
Chlorophyll-A	ND	8.3	10	ug/l							
LCS (W5E0660-BS1)					Analyzed: 05/22/15 12:19						
Chlorophyll-A	45.9	8.3	10	ug/l	50.0		92	70-112			

Batch W5E0664 - EPA 353.2

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E0664-BLK1)					Analyzed: 05/13/15 15:27						
Nitrate as N	ND	0.041	0.10	mg/l							
Nitrite as N	ND	0.010	0.10	mg/l							
Blank (W5E0664-BLK2)					Analyzed: 05/13/15 15:27						
Nitrate as N	ND	0.041	0.10	mg/l							
Nitrite as N	ND	0.010	0.10	mg/l							
LCS (W5E0664-BS1)					Analyzed: 05/13/15 15:29						
Nitrate as N	0.985	0.041	0.10	mg/l	1.00		98	90-110			
Nitrite as N	1.04	0.010	0.10	mg/l	1.00		104	90-110			
LCS (W5E0664-BS2)					Analyzed: 05/13/15 15:29						
Nitrate as N	0.985	0.041	0.10	mg/l	1.00		98	90-110			
Nitrite as N	0.983	0.010	0.10	mg/l	1.00		98	90-110			

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Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods - Quality Control

Batch W5E0664 - EPA 353.2

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Matrix Spike (W5E0664-MS1)		**Source: 5E12067-07**			Analyzed: 05/13/15 15:34						
Nitrate as N	2.32	0.041	0.10	mg/l	2.00	0.393	96	90-110			
Nitrite as N	1.86	0.020	0.20	mg/l	2.00	ND	93	90-110			
Matrix Spike Dup (W5E0664-MSD1)		**Source: 5E12067-07**			Analyzed: 05/13/15 15:36						
Nitrate as N	2.36	0.041	0.10	mg/l	2.00	0.393	99	90-110	2	20	
Nitrite as N	1.92	0.020	0.20	mg/l	2.00	ND	96	90-110	3	20	

Batch W5E0690 - EPA 365.1

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E0690-BLK1)					Analyzed: 05/13/15 18:36						
o-Phosphate as P	0.000685	0.00022	0.0020	mg/l							J
LCS (W5E0690-BS1)					Analyzed: 05/13/15 18:33						
o-Phosphate as P	0.0493	0.00022	0.0020	mg/l	0.0500		99	90-110			
Matrix Spike (W5E0690-MS1)		**Source: 5E13023-01**			Analyzed: 05/13/15 18:41						
o-Phosphate as P	0.126	0.00022	0.0020	mg/l	0.0500	0.0763	99	90-110			
Matrix Spike Dup (W5E0690-MSD1)		**Source: 5E13023-01**			Analyzed: 05/13/15 18:43						
o-Phosphate as P	0.128	0.00022	0.0020	mg/l	0.0500	0.0763	103	90-110	2	20	

Batch W5E0722 - SM 2320B

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E0722-BLK1)					Analyzed: 05/15/15 13:59						
Alkalinity as CaCO3	4.31	0.56	10	mg/l							J
LCS (W5E0722-BS1)					Analyzed: 05/15/15 13:59						
Alkalinity as CaCO3	254	0.56	10	mg/l	250		102	94-108			
Duplicate (W5E0722-DUP1)		**Source: 5E11071-01**			Analyzed: 05/15/15 13:59						
Alkalinity as CaCO3	155	0.56	10	mg/l		155			0.2	15	

Batch W5E0815 - EPA 350.1

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E0815-BLK1)					Analyzed: 05/15/15 17:03						
Ammonia as N	ND	0.048	0.10	mg/l							
LCS (W5E0815-BS1)					Analyzed: 05/15/15 17:03						
Ammonia as N	0.255	0.048	0.10	mg/l	0.250		102	90-110			
Matrix Spike (W5E0815-MS1)		**Source: 5E13023-02**			Analyzed: 05/15/15 17:03						
Ammonia as N	27.4	2.4	5.0	mg/l	12.5	14.9	100	90-110			
Matrix Spike Dup (W5E0815-MSD1)		**Source: 5E13023-02**			Analyzed: 05/15/15 17:03						
Ammonia as N	27.3	2.4	5.0	mg/l	12.5	14.9	99	90-110	0.4	15	

Batch W5E0824 - SM 2540D

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E0824-BLK1)					Analyzed: 05/15/15 12:01						

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Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods - Quality Control

Batch W5E0824 - SM 2540D

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E0824-BLK1)					Analyzed: 05/15/15 12:01						
Total Suspended Solids	ND		5	mg/l							
Duplicate (W5E0824-DUP1)		**Source: 5E13082-01**			Analyzed: 05/15/15 12:01						
Total Suspended Solids	11.0		5	mg/l		12.0			9	20	
Duplicate (W5E0824-DUP2)		**Source: 5E13086-01**			Analyzed: 05/15/15 12:01						
Total Suspended Solids	37.0		5	mg/l		37.0			NR	20	

Batch W5E0941 - EPA 351.2

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E0941-BLK1)					Analyzed: 05/19/15 14:30						
TKN	ND	0.050	0.10	mg/l							
Blank (W5E0941-BLK2)					Analyzed: 05/19/15 14:30						
TKN	ND	0.050	0.10	mg/l							
LCS (W5E0941-BS1)					Analyzed: 05/19/15 14:30						
TKN	1.02	0.050	0.10	mg/l	1.00		102	90-110			
LCS (W5E0941-BS2)					Analyzed: 05/19/15 14:30						
TKN	1.00	0.050	0.10	mg/l	1.00		100	90-110			
Duplicate (W5E0941-DUP1)		**Source: 5E11004-02**			Analyzed: 05/19/15 14:30						
TKN	1.85	0.050	0.10	mg/l		1.83			0.6	10	
Matrix Spike (W5E0941-MS1)		**Source: 5E11005-01**			Analyzed: 05/19/15 14:30						
TKN	3.13	0.050	0.10	mg/l	1.00	2.21	92	90-110			
Matrix Spike (W5E0941-MS2)		**Source: 5E15107-08**			Analyzed: 05/19/15 14:30						
TKN	1.34	0.050	0.10	mg/l	1.00	0.327	101	90-110			
Matrix Spike Dup (W5E0941-MSD1)		**Source: 5E11005-01**			Analyzed: 05/19/15 14:30						
TKN	3.19	0.050	0.10	mg/l	1.00	2.21	99	90-110	2	10	
Matrix Spike Dup (W5E0941-MSD2)		**Source: 5E15107-08**			Analyzed: 05/19/15 14:30						
TKN	1.36	0.050	0.10	mg/l	1.00	0.327	104	90-110	2	10	

Batch W5E1227 - EPA 365.1

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E1227-BLK1)					Analyzed: 05/22/15 10:37						
Phosphorus as P, Total	0.00225	0.0014	0.010	mg/l							J
LCS (W5E1227-BS1)					Analyzed: 05/22/15 10:38						
Phosphorus as P, Total	0.0515	0.0014	0.010	mg/l	0.0500		103	90-110			
Matrix Spike (W5E1227-MS1)		**Source: 5E13023-01**			Analyzed: 05/22/15 10:48						
Phosphorus as P, Total	0.276	0.0028	0.020	mg/l	0.0500	0.226	100	90-110			
Matrix Spike Dup (W5E1227-MSD1)		**Source: 5E13023-01**			Analyzed: 05/22/15 10:50						
Phosphorus as P, Total	0.280	0.0028	0.020	mg/l	0.0500	0.226	108	90-110	1	20	

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Notes and Definitions

M-06	Due to the high concentration of analyte inherent in the sample, sample was diluted prior to preparation. The MDL and MRL were raised due to this dilution.
J	Estimated conc. detected <MRL and >MDL.
ND	NOT DETECTED at or above the Reporting Limit. If J-value reported, then NOT DETECTED at or above the Method Detection Limit (MDL)
NR	Not Reportable
Dil	Dilution
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
% Rec	Percent Recovery
Sub	Subcontracted analysis, original report available upon request
MDL	Method Detection Limit
MDA	Minimum Detectable Activity
MRL	Method Reporting Limit

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

An Absence of Total Coliform meets the drinking water standards as established by the California Department of Health Services.

The Reporting Limit (RL) is referenced as the Laboratory's Practical Quantitation Limit (PQL) or the Detection Limit for Reporting Purposes (DLR).

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

Analysis Request and Chain of Custody

From:
AMEC Environment & Infrastructure
Attn: Kristina Schneider
9177 Sky Park Court
San Diego, CA 92123
Phone: (858) 278-3600 Fax: (858) 278-5300

City of San Diego
Tijuana River Receiver Waters Monitoring 2012-2013
Project No.: 5025121037

To: 5E13023
Weck Laboratories, Inc.
14859 East Clark Avenue
City of Industry, CA 91745
Phone: (626) 336-2139
Fax: (626) 336-2634

SampleID	Date	Time	Analyses	Bottle Type	Preservative	Bottle Count
AC-TJPCU-051215-01	5/12/15	0840	Alkalinity, Total [SM 2320B] Chloride [EPA 300.0] Nitrate-N [EPA 353.2] Nitrite-N [EPA 353.2]	2L - Polyethylene	6 °C	1
AC-TJPCU-051215-01	↓	↓	Ammonia-N [EPA 350.1] Total Kjedahl Nitrogen [EPA 351.2]	1L - Polyethylene	H2SO4	1
AC-TJPCU-051215-01	↓	↓	Chlorophyll a [SM 10200H]	1L - Amber Polyethylene	6 °C	1
AC-TJPCU-051215-01	↓	↓	Orthophosphate-P [EPA 365.3/365.1]	250mL - Polyethylene	6 °C, Filtered	1
AC-TJPCU-051215-01	↓	↓	Total Phosphorous [EPA 365.1]	500mL - Polyethylene	H2SO4	1
AC-TJPCU-051215-01	↓	↓	Total Suspended Solids [SM 2540D]	250mL - Polyethylene	6 °C	1

Sampler's Initials: JR

Relinquished By: Brenda Stevens BS Date/Time: 5/13/15 09:15 Received By: Hector Sancha Date/Time: 5/13/15 0915

Relinquished By: Hector Sancha Date/Time: 5/13/15 11:10AM Received By: Jamie Imon Date/Time: 5/13/15 1110

2.9°c

5E13023

Analysis Request and Chain of Custody

City of San Diego

Tijuana River Receiver Waters Monitoring 2012-2013

Project No.: 5025121037

From:
AMEC Environment & Infrastructure
Attn: Kristina Schneider
9177 Sky Park Court
San Diego, CA 92123
Phone: (858) 278-3600 Fax: (858) 278-5300

To:
Weck Laboratories, Inc.
14859 East Clark Avenue
City of Industry, CA 91745
Phone: (626) 336-2139
Fax: (626) 336-2634

SampleID	Date	Time	Analyses	Bottle Type	Preservative	Bottle Count
AC-TJPCD-051215-01	5/12/15	1200	Alkalinity, Total [SM 2320B] Chloride [EPA 300.0] Nitrate-N [EPA 353.2] Nitrite-N [EPA 353.2]	2L - Polyethylene	6 °C	1
AC-TJPCD-051215-01	↓	↓	Ammonia-N [EPA 350.1] Total Kjedahl Nitrogen [EPA 351.2]	1L - Polyethylene	H2SO4	1
AC-TJPCD-051215-01	↓	↓	Chlorophyll a [SM 10200H]	1L - Amber Polyethylene	6 °C	1
AC-TJPCD-051215-01	↓	↓	Orthophosphate-P [EPA 365.3/365.1]	250mL - Polyethylene	6 °C, Filtered	1
AC-TJPCD-051215-01	↓	↓	Total Phosphorous [EPA 365.1]	500mL - Polyethylene	H2SO4	1
AC-TJPCD-051215-01	↓	↓	Total Suspended Solids [SM 2540D]	250mL - Polyethylene	6 °C	1

Sampler's Initials: JR

Relinquished By: Brenda Stevens Date/Time: 5/13/15 09:15 Received By: Hector Sanchez Date/Time: 5/13/15 0915

Relinquished By: Hector Sanchez Date/Time: 5/13/15 11:10 Received By: Jama [illegible] Date/Time: 5/13/15 1110

Page: 1 of 3 2.9°c

TIJUANA RIVER VALLEY CHANNEL MAINTENANCE PROJECT
RECEIVING WATER MONITORING REPORT

YEAR FOUR ANNUAL MAINTENANCE EVENT

Prepared for:

City of San Diego
Transportation and Storm Water Department
2781 Caminito Chollas, MS 44
San Diego, California 92105

Submitted by:
Amec Foster Wheeler Environment & Infrastructure, Inc.
9210 Sky Park Court, Suite 200
San Diego, California 92123
(858) 300-4300

October 2016

Amec Foster Wheeler Project No. 502516C058

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ACRONYMS AND ABBREVIATIONS

%	percent
AA	assessment area(s)
Amec Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure, Inc.
^{o}C	Degrees Celsius
cm	centimeter
City	City of San Diego
CRAM	California Rapid Assessment Method
EPA	Environmental Protection Agency
In-situ	Measurements taken at the station
km	kilometers
L	liter
MDL	method detection limit
m	meter(s)
mg	milligrams
N	Nitrogen
NTU	Nephelometric turbidity units
ppt	part(s) per thousand
Project	Tijuana River Valley Channel Maintenance Project 09C-077
RWQCB	San Diego Regional Water Quality Control Board
RL	reporting limit
SBIWTP	South Bay International Wastewater Treatment Plant
SM	standard method
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Resources Control Board
TJ-PC-D	Downstream Tijuana River Pilot Channel station
TJ-PC-U	Upstream Tijuana River Pilot Channel station
TJ-SG-U	Upstream Smuggler’s Gulch station
TKN	total Kjeldahl nitrogen
TSS	total suspended solids
µS	microSiemens

1.0 INTRODUCTION

The City of San Diego (City) has implemented a maintenance dredging program within the Tijuana River Valley to restore storm water conveyance capabilities of selected channels and reduce the potential for flooding of nearby properties. The dredging removes between 10,000 and 30,000 cubic yards of dredge material each maintenance event from the Tijuana River Pilot Channel (Pilot Channel) and Smuggler's Gulch. In addition, the City is eradicating non-native plant species (e.g., Arundo (*Arundo donax*), Castor Bean (*Ricinus communis*), and Tamarisk (*Tamarix aphylla*)) in an 8.62 acre area within and adjacent to the maintenance area footprint.

The San Diego Regional Water Quality Control Board (RWQCB) issued an amendment to the Clean Water Act Section 401 Water Quality Certification (Certification) and acknowledged enrollment under State Water Resources Control Board (SWRCB) Order No. 2003-17-DWQ for Statewide General Waste Discharge Requirements for Dredged or Fill Discharges for the Tijuana River Valley Channel Maintenance Project 09C-077 (Project) (RWQCB, 2012). The Certification required the Project to include the following three monitoring components to quantify potential impacts to the Tijuana River from the maintenance dredging of the Pilot Channel and Smuggler's Gulch:

1. Benthic Biological Monitoring (Section VI.C.1): Assessment of the effects of the project on the biological integrity of the Pilot Channel and Smuggler's Gulch by analyzing the benthic macroinvertebrate community.
2. Water Quality Assessment (Section VI.C.2): Analysis of the water quality through the collection of grab samples, which are to be analyzed for the constituents listed in the Certification.
3. California Rapid Assessment Method (CRAM) (Section VI.C.3): Quantitative function-based health assessment of the wetland and riparian habitat.

Each of the three components are to be implemented before maintenance begins, during the five-year maintenance period (before/during/after each annual maintenance event), and after maintenance is concluded at the completion of the five-year permit cycle. To quantify impacts, results of the three monitoring components will be compared over time and between locations. The data will be reviewed to determine whether there are discernible differences between initial-maintenance assessment, during-maintenance assessments, and final-maintenance assessment results.

This current report documents water quality, CRAM, and benthic biological monitoring for the 2015-2016 season (July 2015 – June 2016). Due to delays in the dredge operations caused by wet weather events, only two of the three events (pre-dredge and during-dredge) were conducted in FY2015/2016. Amec Foster Wheeler Environment & Infrastructure Inc. (Amec Foster Wheeler) conducted the final year four monitoring event in FY2016/2017. As a result of the continual dredging operations, this final event was categorized as a "during-dredge" event. The three events performed were: a pre-maintenance survey on August 25, 2015, a during-maintenance survey on October 13-14, 2015, and a continuation of the during-maintenance survey on August 10, 2016.

2.0 METHODS

2.1 Monitoring Stations

The monitoring locations were based on requirements outlined in the Certification which state that monitoring must occur both upstream and downstream of the maintenance area. Three locations in the immediate vicinity of the maintenance footprint were selected for water quality and CRAM monitoring (Table 2-1, Figure 2-1). The upstream Pilot Channel location (TJ-PC-U) is located approximately 170 meters (m) upstream of the Hollister Street Bridge (Figure 2-2). The downstream Pilot Channel (TJ-PC-D) location is located approximately 1,000m west of the intersection of Sunset Avenue and Saturn Boulevard (Figure 2-3). The upstream Smuggler's Gulch location (TJ-SG-U) is located approximately 70m upstream of the Monument Road crossing (Figure 2-4).

An October 2012 pre-project reconnaissance of the three bioassessment monitoring stations detailed in the Certification concluded that the upstream and downstream locations immediately surrounding the Project area were not viable locations for standard freshwater bioassessment sampling using SWAMP bioassessment protocols due to the following site conditions:

- The area immediately upstream of the dredge footprint on the Pilot Channel presented unsafe sampling conditions with deep water and soft fine sediment.
- The downstream location on the Pilot Channel consisted of saline conditions due to tidal influence.
- The upstream location on Smuggler's Gulch is dry for the vast majority of the year, only flowing briefly after a rain event.

In an effort to remain within the intent outlined in the Certification, it was determined that the downstream Pilot Channel location (see Figure 2-3) which appeared to remain wetted year-round would be solely utilized for biological collections, as this would represent the location most influenced by dredging activities. However, given that this location occurs in a tidally influenced area, standard freshwater bioassessment methods and metrics would no longer apply at this location. Thus, a sediment biota sampling method similar to the Water Quality Control Plan for Enclosed Bays and Estuaries - Part 1 Sediment Quality promulgated by the SWRCB (SWRCB, 2009) and the Sediment Quality Objectives (SQO) Technical Support Manual (SCCWRP, 2014) used in estuarine and marine environments was employed for the benthic biota collections. This method is further outlined in Section 2.4.

Table 2-1. Locations of Monitoring Stations

Station	Location	Monitoring Type	Latitude[(a)]	Longitude[(a)]
TJ-PC-U	Pilot Channel upstream of dredge footprint	Water Quality & CRAM	32.550664	-117.081135
TJ-SG-U	Smuggler's Gulch upstream of dredge footprint	Water Quality & CRAM	32.542451	-117.088147
TJ-PC-D	Pilot Channel downstream of dredge footprint	Water Quality & CRAM	32.557994	-117.103539

Notes:
- NAD_1983_StatePlane_California_V_FIPS_0405_Feet WKID: 2229 Authority: EPSG

2.2 Water Quality Monitoring

Water was observed and collected at the TJ-PC-U and TJ-PC-D locations for each of the three monitoring events. Water was not observed at the TJ-SG-U location during the three water quality sampling events, therefore no samples were collected at that site. Pre-cleaned sample bottles were obtained from the analytical laboratory for collection of water quality samples. The following sample handling protocols were utilized when collecting samples to minimize the possibility of contamination:

- When the analytical methods did not require a chemical preservative, the sample bottle was used directly to collect the sample.
- If the analytical method required preservation, a pre-cleaned bottle was used as a secondary container to collect the sample which was then transferred to the laboratory-provided analytical container.

Manual grab samples were collected by inserting the pre-cleaned bottle upside-down into the channel and then inverting at the approximate midway point in the water column with the container opening facing upstream. A grab pole was used as necessary to collect water samples from as close to the horizontal center of the channel as site conditions allowed. Samples were analyzed for the constituents stipulated in the Certification (Table 2-2). Parameters measured in the field include: Hydrogen Ion Activity (pH), temperature, dissolved oxygen, turbidity, and specific conductance.

Sample containers were labeled with a unique sample ID, date, time, project, analyses, and collector's initials. The samples were then packed on ice and transported to Amec Foster Wheeler. Samples were held on ice until transferred to a laboratory provided courier.

Table 2-2.
Summary of Water Quality Analytes

Analytical Parameter	Analytical Method	Container	Preservation	Maximum Holding Time (Days)	Amount Needed
Alkalinity, Total	SM 2320B	250 mL Poly	<6°C	14	250mL
Ammonia as Nitrogen (N)	EPA 350.1	250 mL Poly	<6°C, H2SO4	28	250 mL
Chloride	EPA 300.0	250 mL Poly	<6°C	28	250 mL
Nitrate-Nitrogen as N	EPA 353.2	250 mL Poly	<6°C	2	250 mL
Nitrite-Nitrogen as N	EPA 353.2	250 mL Poly	<6°C	2	250 mL
Total Kjeldahl Nitrogen (TKN)	EPA 351.2	250 mL Poly	<6°C, H2SO4	28	250 mL
Ortho-Phosphate Phosphorous	EPA 365.3/ EPA 365.1	250 mL Poly	<6°C, filtered	2	250 mL
Total Phosphorous	EPA 365.1	250 mL Poly	<6°C, H2SO4	28	250 mL
Total Suspended Solids (TSS)	SM 2540D	500 mL Poly	<6°C	7	500 mL
Chlorophyll a	SM 10200H	1 L Amber Poly	<6°C	2	100 mL

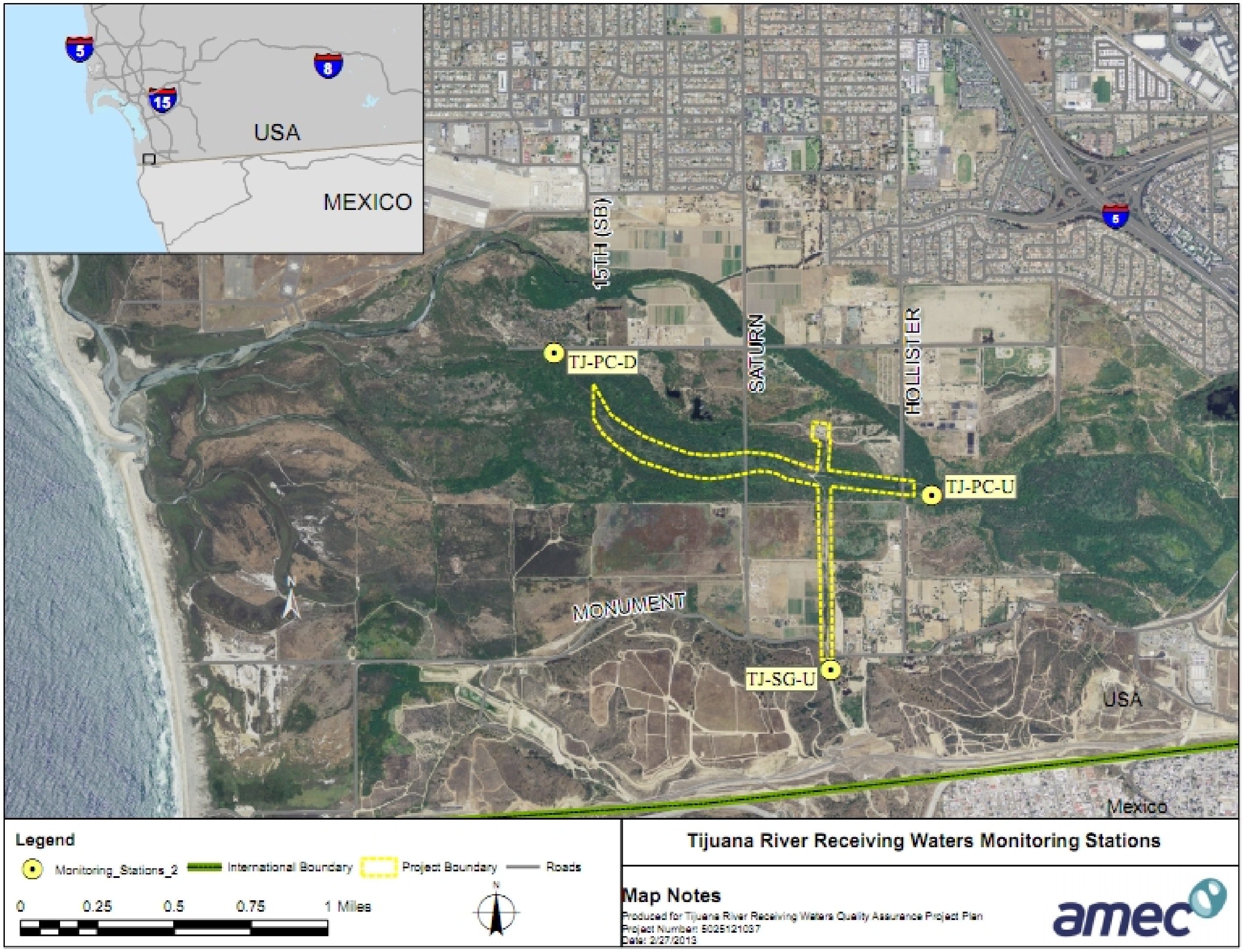

Figure 2-1. Overview of Tijuana River Receiving Water Monitoring Stations

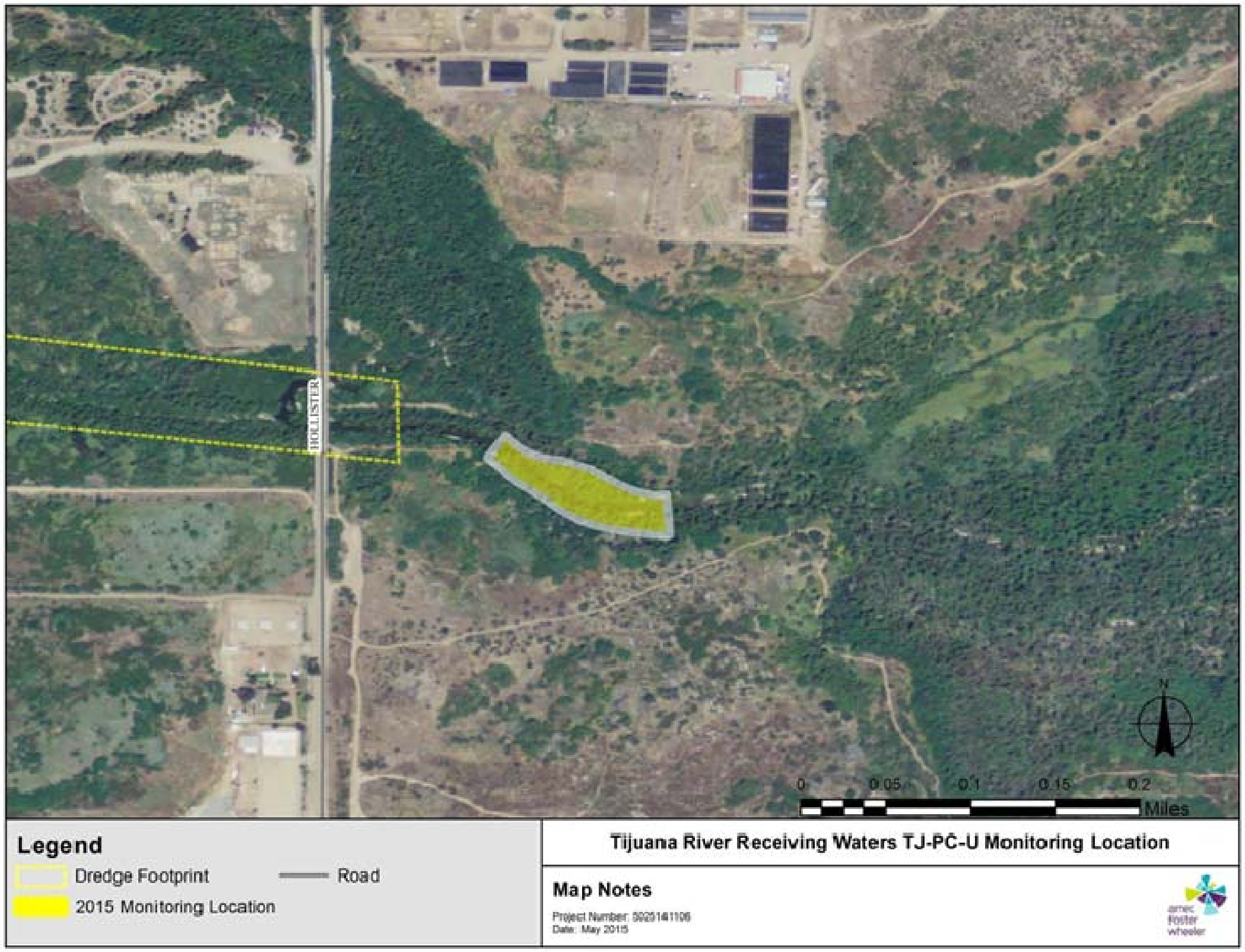

Figure 2-2. TJ-PC-U CRAM and Water Quality Monitoring Station

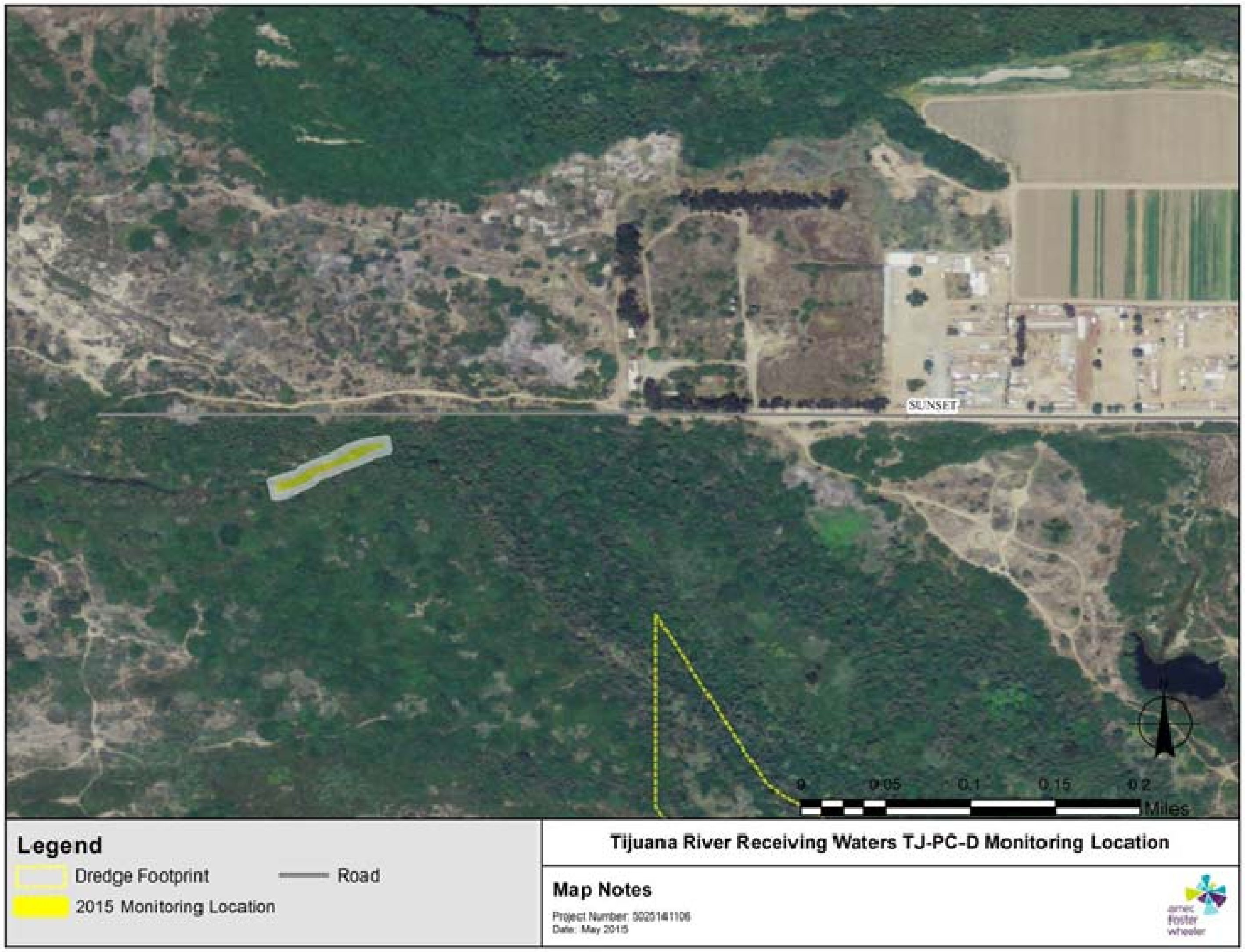

Figure 2-3. TJ-PC-D CRAM, Water Quality, and Benthic Community Monitoring Station

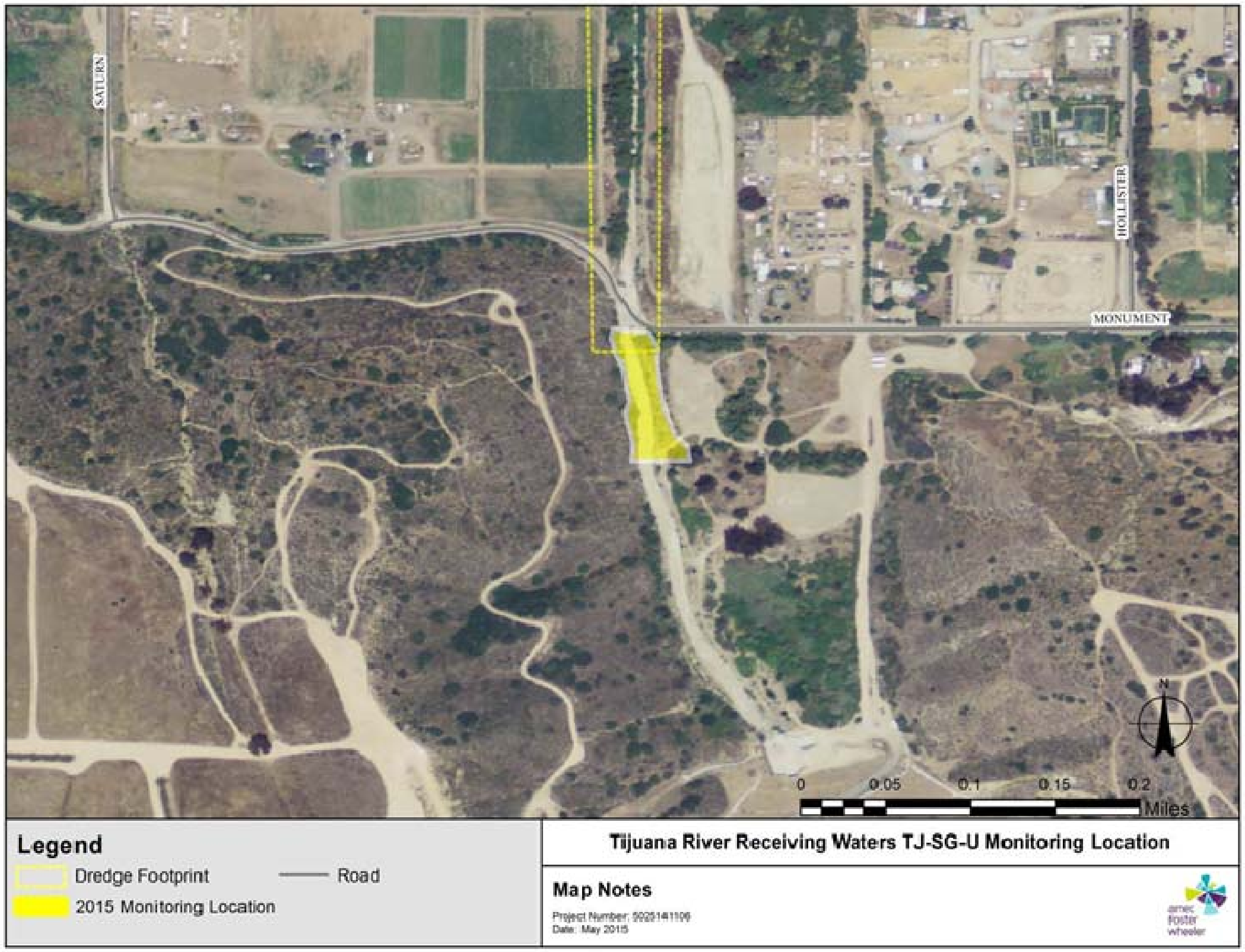

Figure 2-4. TJ-SG-U CRAM and Water Quality Monitoring Station

2.3 CRAM Monitoring

During CRAM analysis, an Assessment Area (AA) polygon is established around the wetland and the functionality of the wetland within is evaluated. An AA is established by starting at a hydrologic or geomorphic break in structure of the channel, and extends longitudinally ten times the average bankfull width or a minimum of 100m and for a distance no longer than 200m. If no break in structure is present, then the AA can begin at a selected point within the wetland area in order to accomplish project goals. The AA extends laterally to include the riparian zone and floodplain areas that directly contribute organic debris such as leaves, limbs, insects, etc. to the channel. For the purposes of this CRAM analysis, both sections of the Tijuana River (TJ-PC-U and TJ-PC-D) were classified as a perennial, non-confined riverine system, while TJ-SG-U was classified as an ephemeral, non-confined system. Although the Tijuana River is largely an ephemeral stream, the survey areas in the lower portion of the river, located near the estuary, appear to receive perennial flow, but this may be dependent upon the annual rainfall received in the current and previous years.

CRAM analysis requires the evaluation of the AAs on four attributes that include buffer and landscape context, hydrology, physical structure, and biotic structure. Each of these attributes is further described below:

- Buffer and landscape context – Assesses a riverine system in terms of the continuity of the buffer within 500m upstream and downstream and the quality of the buffer immediately surrounding the AA. This attribute measures the ability of wildlife to enter the riparian corridor buffer and easily move within it along the wetland area within 500m of the AA. Buffer is defined as an area in a natural or semi-natural state that is not currently dedicated to anthropogenic uses which would detract from its ability to protect the AA from stress or disturbance.
- Hydrology – Assesses the water source and quality, as well as the channel stability and its connection to the surrounding flood plain.
- Physical structure – Assesses the availability of various habitat patch types and topographical complexity of the channel that indicate the capacity of the riverine system to support characteristic flora and fauna.
- Biotic structure – Assesses horizontal and vertical plant structure, which measures the number of distinct plant zones in plan-view and the amount of vertical overlap of plant canopy layers. In addition, the species dominance and composition of the plant community within the AA is assessed.

Each attribute has sub-metrics that are scored with a letter that indicates its status, with an “A” score indicating good condition and a “D” score indicating poor condition. The letter score is then converted to a numerical value (i.e., A=12, B=9, C=6, and D=3) and a final attribute score is calculated. The final overall CRAM score is the average of the four individual attribute scores received. The purpose of using the CRAM scoring system is to provide a context for comparison of the Project effects over a period of time. The CRAM scores from the three current surveys will be used to assess impacts to the wetland functionality of the Tijuana River and Smuggler’s Gulch over the course of the maintenance period.

2.4 Benthic Biological Monitoring

Methods similar to the Water Quality Control Plan for Enclosed Bays and Estuaries - Part 1 Sediment Quality promulgated by the SWRCB (SWRCB, 2009) and the Sediment Quality Objectives (SQO) Technical Support Manual (SCCWRP, 2014) were used to collect benthic macroinvertebrates at the downstream Pilot Channel location.

Three field replicates were collected approximately 8 m apart, starting downstream and moving upstream with each successive collection. A 0.2 m x 0.2 m Eckman grab was used for collection of the sediment samples. The grab was pushed by hand down into the undisturbed sediment approximately six to eight centimeters (cm). The grab jaws were then triggered and closed. The grab device was removed from the substrate and placed unopened into a large plastic tray. The depth of sediment penetration was measured and an assessment of the acceptability of the grab was made (i.e. >5cm penetration, >90 percent (%) of the sediment surface intact, no washing or canting). Observations of sediment type, color, and odor were recorded. The entire contents of each sediment grab was then emptied into the plastic tray and systematically sieved through a 1.0-millimeter (mm) metal sieve. The material and organisms from each replicate retained on the sieve were placed separately into 1-liter (L) Nalgene bottles and preserved with 95% ethanol. These three samples were then analyzed for taxonomic identification.

2.5 Quality Assurance/Quality Control

2.5.1 Analytical Water Chemistry

QA/QC for sampling processes included proper collection of the samples to minimize the possibility of contamination. All samples were collected in laboratory-supplied, manufacturer-certified, contaminant-free sample bottles. Field staff wore powder-free nitrile gloves at all times during sample collection and changed into a fresh pair of gloves at each sample station. Standard operating procedures were provided to each member of the sampling team to ensure all sampling personnel were trained accordingly.

All data received from the analytical laboratory was reviewed by the project manager, including lab blanks, matrix spikes, and matric spike duplicates to assure results fell within proper ranges for accuracy and precision estimates as accepted by the Surface Water Ambient Monitoring Program (SWAMP) standards.

2.5.2 CRAM Monitoring

CRAM field efforts were performed by staff members who have undergone training by California State recognized trainers, and who have had significant experience performing these protocols in the southern California region. All plants which were not immediately recognized in the field were subsampled and brought back to the Amec Foster Wheeler office for verification by a certified botanist.

2.5.3 Benthic Macroinvertebrate Identification

Taxonomic identification and biotic metric calculations were performed by Amec Foster Wheeler. Quality Assurance measures included re-sorting a minimum of 20 percent of each sample to determine sorting efficacy. In addition, 10 percent of samples were completely re-sorted. SWAMP methods under the Standard Taxonomic Effort Level 2 requires sorting random aliquots of a sample until a minimum of 600 ± 10% individuals are obtained, or sorting the entire sample if <600 individuals are acquired. None of the samples reached the 600 individuals goal, and therefore the entire sample was sorted for each replicate.

3.0 RESULTS

A photo log containing representative photos of each sampling location is presented in Appendix A. Full analytical lab reports are included in Appendix B. Complete benthic taxonomy tables are presented in Appendix C. Copies of field data sheets are presented in Appendix D.

3.1 Water Quality Results

The reported results from the analytical water grab samples collected at the TJ-PC-U and TJ-PC-D stations are presented in Table 3-1. The corresponding *in-situ* field measurements are provided in Table 3-2. TJ-SG-U was dry for each of the three monitoring events and therefore no water quality results are reported for that location. The water quality samples were collected on the following dates:

- August 25, 2015 (Pre-dredge event)
- October 13-14, 2015 (During-dredge event)
- August 10, 2016 (Continued During-dredge event)

A graphical summary of results are presented in Figures 3-1 to 3-3. The reported water quality results are summarized as follows:

- Across the three sampling events, the TJ-PC-U station had consistently higher concentrations of ammonia, TKN, orthophosphate, and total phosphorus in comparison to TJ-PC-D. A substantial decrease in ammonia, TKN total phosphorus, and orthophosphate was observed at the upstream Pilot Channel location during the August 2016 event. These higher values during the October 2015 collection event may have been the result of a 0.25 inch storm which occurred 8 days prior to the collection event potentially bringing nutrients in from upstream sources.
- Chlorophyll-*a* concentrations at the TJ-PC-D station were consistently lower than the upstream TJ-PC-U station. A notable increase in chlorophyll-a was observed at the upstream Pilot Channel location during the August 2016 event, indicating an increased phytoplankton concentration. This increased chlorophyll-a (i.e. phytoplankton) at the upstream Pilot Channel location may be the result of reduced shading over the river upstream of Hollister Road. As further discussed in Section 3.2.1, the Shot Borer Beetle has dramatically reduced the upper riparian willow and cottonwood canopy in this section of the river, allowing increased solar radiation to reach the water surface. The phytoplankton may be taking advantage of this increased exposure.
- During the pre-dredge sampling event, the TJ-PC-U station exhibited 9.2 times higher concentration of nitrite and 2.9 times higher nitrate concentration relative to the TJ-PC-D station. However, both subsequent sampling events yielded similar concentrations between the two stations.
- Chloride concentrations at the two stations were similar for two of the three sampling events. Station TJ-PC-D exhibited a chloride concentration approximately four times higher than TJ-PC-U during the October 2015 event. The TJ-PC-D location is within the area known to be influenced by marine tides, as documented in the technical memo submitted to the City of San Diego dated June 14, 2013 (Amec Foster Wheeler 2013). While this location was sampled 4 hours after low tide in October 2015, allowing for the

tidal offset common in upper estuaries, marine water was still draining from the estuary at this location.

Additional water quality data will be collected over the 5-year span of the Project in accordance with specifications outlined in the RWQCB issued amendment to the Clean Water Act Section 401 Water Quality Certification. As more data are collected, statistical analyses will become more meaningful in identifying trends over the course of the project.

Table 3-1. Analytical Water Results Summary

Analyte	Method Number	Units	Pre-Dredge (8/25/2015)			During Dredge (10/13-14/2015)			Continued During Dredge (8/10/2016)		
			PC-U	PC-D	SG-U	PC-U	PC-D	SG-U	PC-U	PC-D	SG-U
Alkalinity as $CaCO_3$	SM 2320 B	milligrams per liter (mg/L)	710	520	NA	590	510	NA	720	530	NA
Ammonia as N	EPA 350.1	mg/L	4.5[a]	0.28	NA	9.2[a]	0.47	NA	0.062	0.36	NA
Chloride	EPA 300.0	mg/L	450[a]	500[a]	NA	420[a]	1700[a]	NA	390[a]	350[a]	NA
Chlorophyll *a*	SM 10200 H-2b	micrograms per liter (µg/L)	18	16	NA	14	<8.3	NA	27	13	NA
Nitrate as N	EPA 353.2	mg/L	0.24	0.083J	NA	<0.041	<0.041	NA	<0.041	<0.041	NA
Nitrite as N	EPA 353.2	mg/L	0.24	0.026J	NA	0.015J	0.012J	NA	0.011J	0.011J	NA
Total Kjeldahl Nitrogen (TKN)	EPA 351.2	mg/L	5.6[a]	0.75	NA	11[a]	1.2	NA	2.1	0.76	NA
Dissolved Orthophosphate as P (Reactive P)	EPA 365.1M	mg/L	3.8[a]	0.07	NA	5.2[a]	0.5[a]	NA	1.7[a]	0.1	NA
Total Phosphorus as P (Total P)	EPA 365.3	mg/L	4.2	0.28[a]	NA	6.3	0.78	NA	1.9	0.41	NA
Total Suspended Solids (TSS)	SM 2540 D	mg/L	8	6	NA	9	17	NA	16	12	NA

Notes:
RL - reporting limit
mg - milligram
MDL - method detection limit
NA - Not applicable, sampling location was dry and therefore could not be sampled.
SM - Standard Method
EPA - Environmental Protection Agency
< - Not detected above MDL. Concentration is reported as less than MDL.
J - Concentration detected below the reporting limit, but above method detection limit, and as such is an estimate.
[a] - Sample was diluted by laboratory and therefore has an elevated MDL and RL. These values are provided in Appendix B.

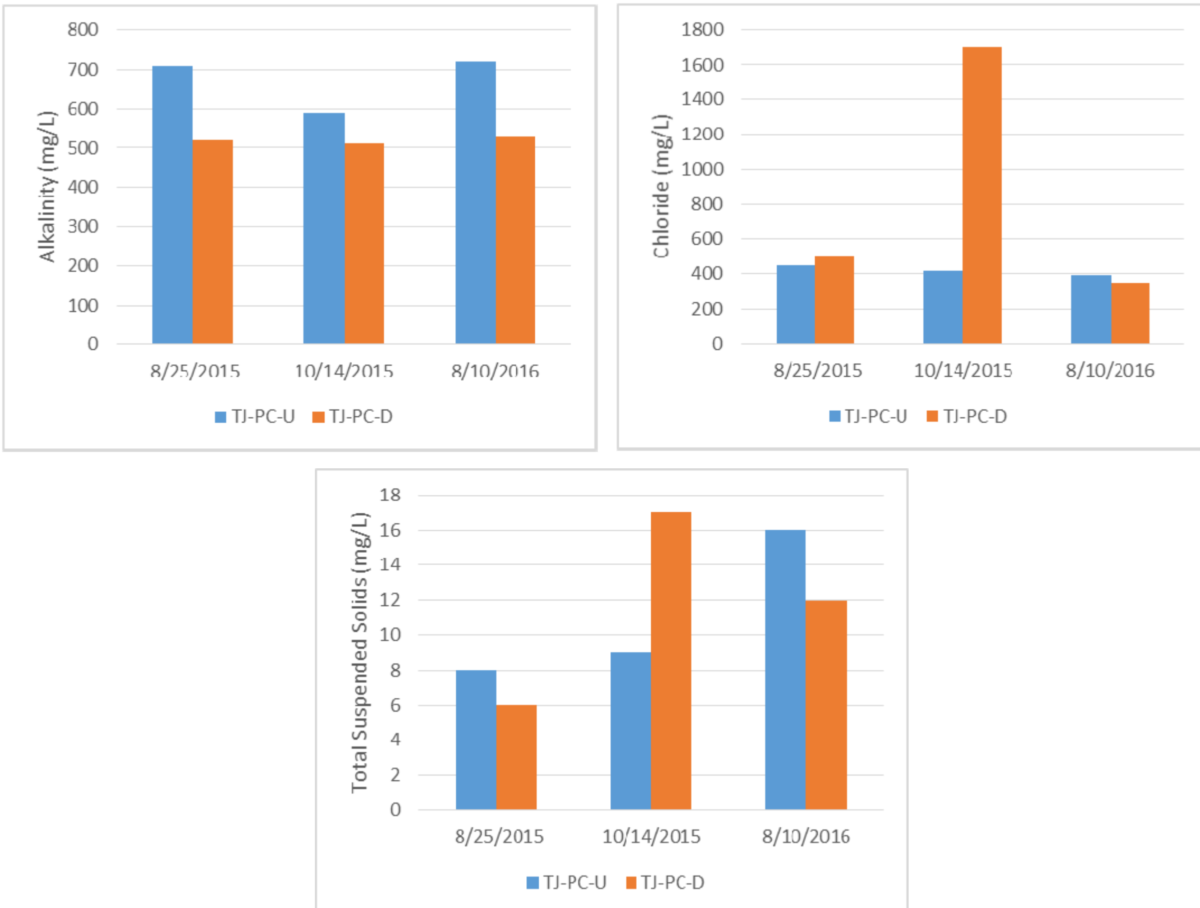

Figure 3-1: General Chemistry Analytical Results

Non-detects are treated as half the method detection limit for graphical purposes

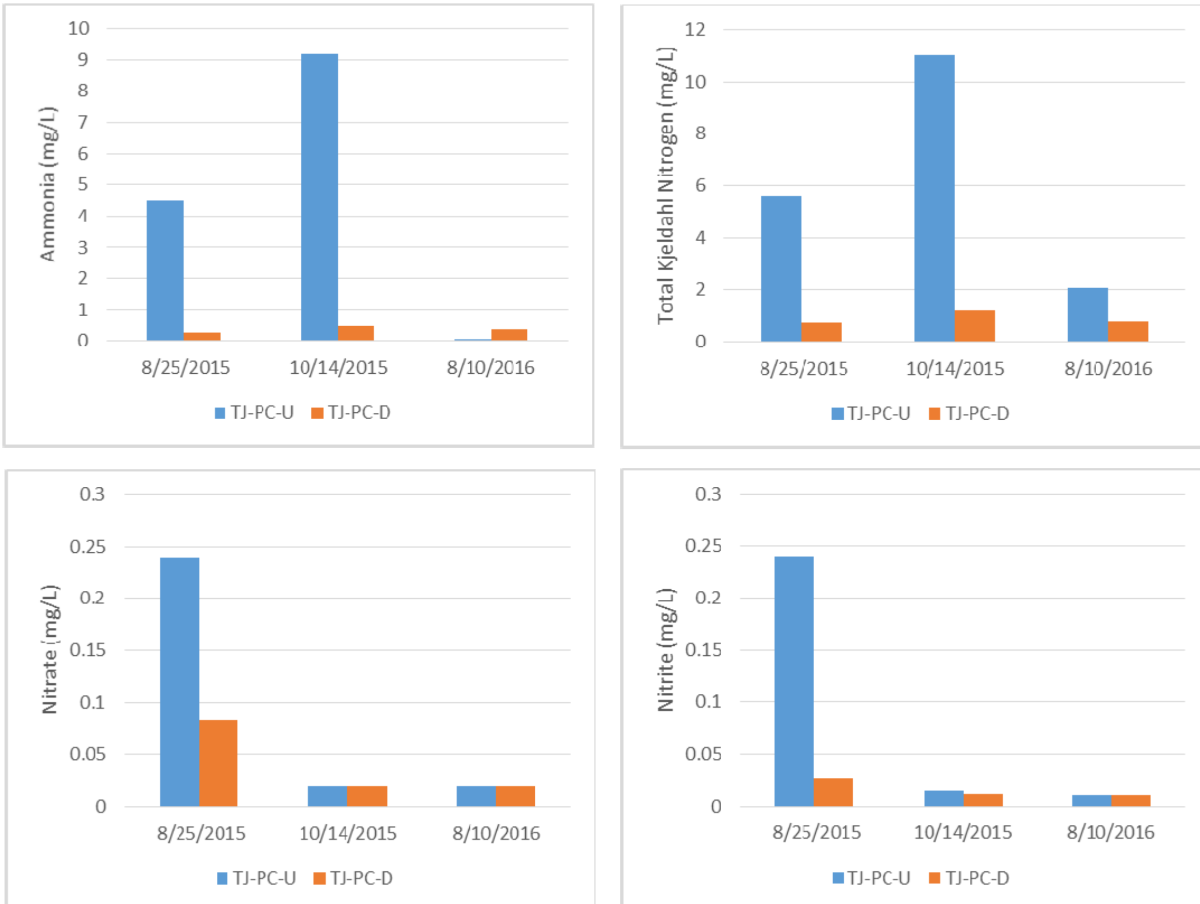

Figure 3-2: Nitrogenous Analytical Results

Non-detects are treated as half the method detection limit for graphical purposes

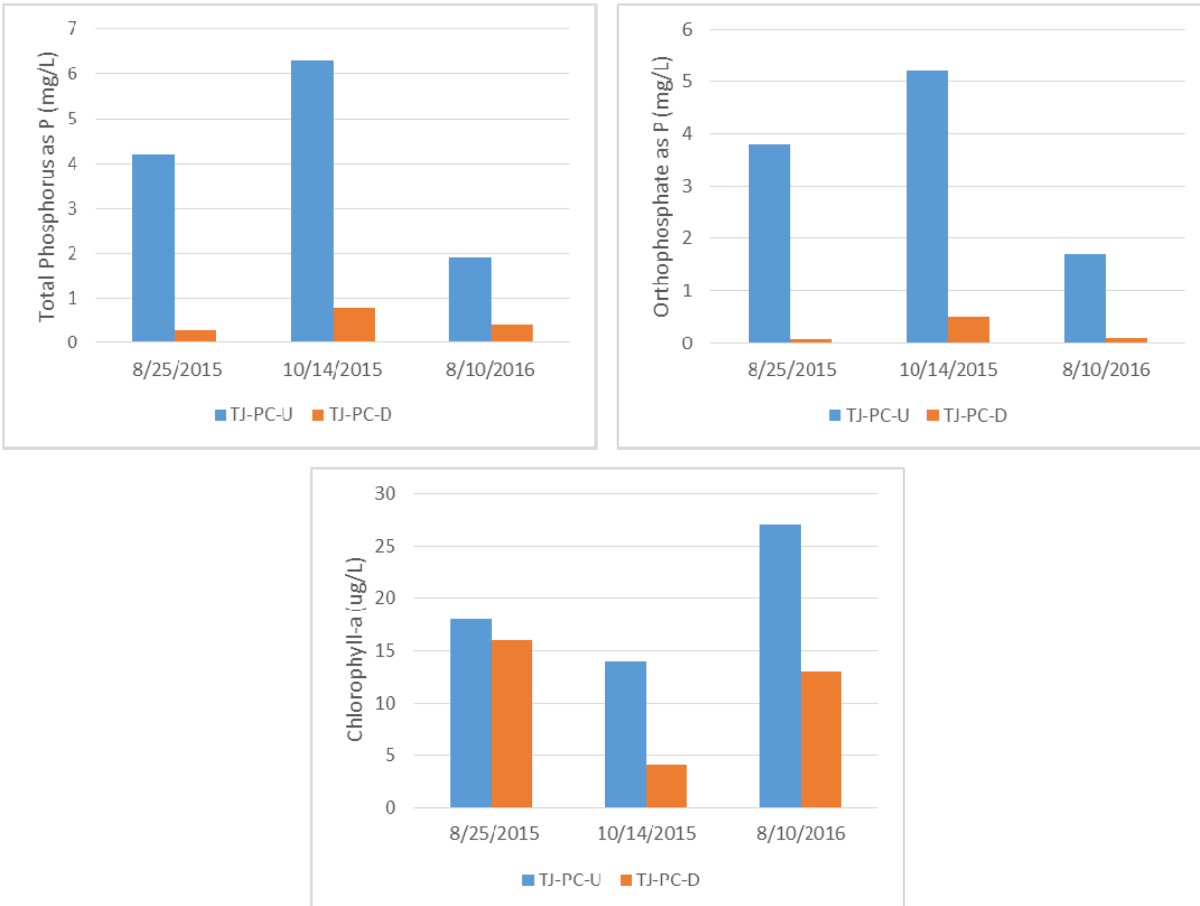

Figure 3-3: Phosphorus and Chlorophyll-*a* Results

Non-detects are treated as half the method detection limit for graphical purposes

Recorded *in-situ* water quality measurements are summarized in Table 3-2 and Figure 3-4. TJ-SG-U was dry during the three monitoring events and therefore was not sampled. A summary of the *in-situ* water quality results are summarized as follows:

- pH measurements at the two sites for the first two events were similar. A larger difference between the two sites was observed during the final event, largely due to an increase in pH at TJ-PC-U. This is likely due to the increased algal activity at the upstream Pilot Channel location, as can be seen in the chlorophyll-a analytical results.
- Specific conductance at TJ-PC-U varied somewhat across the three monitored events, potentially in relation to rain events. The lowest conductance measured at TJ-PC-U was observed in October 2015 following a storm event 10 days prior. The large fluctuations in conductance observed at TJ-PC-D is likely a result of the marine tidal influence. Chloride concentrations observed at TJ-PC-D mirrored the conductance measures.
- Turbidity was greater at TJ-PC-U for the three monitored events, and did show some variability between sampling events. Turbidity at the TJ-PC-D location remained relatively consistent during the three sampling events.

- Dissolved oxygen was similar between the two sites during the first two monitoring events. A substantial increase in dissolved oxygen was observed at the upstream Pilot Channel location during the August 2016 event. This is likely due to the increased algal activity at the upstream Pilot Channel location, as can be seen in the chlorophyll-a analytical results. Algae produce oxygen during the daylight hours as a bi-product of photosynthesis. Dissolved oxygen at the downstream TJ-PC-D location was consistent across sampling events.

Table 3-2. *In-situ* Field Measurements

			Pre-Dredge (8/25/2015)			During Dredge (10/13-14/2015)			Continued During Dredge (8/10/2016)		
Analyte	**Method**	**Units**	**PC-U**	**PC-D**	**SG-U**	**PC-U**	**PC-D**	**SG-U**	**PC-U**	**PC-D**	**SG-U**
pH	Field Meter	pH units	7.99	7.47	NA	7.71	7.21	NA	8.49	7.29	NA
Dissolved Oxygen	Field Meter	mg/L	1.1	2.3	NA	1.4	1.1	NA	13.0	2.2	NA
Specific Conductance	Field Meter	microSiemens per centimeter (µS/cm)	3227	57.4	NA	1348	6304	NA	2600	2060	NA
Salinity	Field Meter	Parts per thousand (ppt)	1.7	0.03	NA	0.67	3.4	NA	1.3	1.1	NA
Temperature	Field Meter	° Celsius (°C)	22.7	19.8	NA	23.8	19.9	NA	29.1	19.7	NA
Turbidity	Field Meter	Nephelometric turbidity units (NTU)	NS	NS	NA	8.3	6.2	NA	13.1	8.5	NA

NA - Not applicable, sampling location was dry and therefore could not be sampled.
NS - Not sampled.

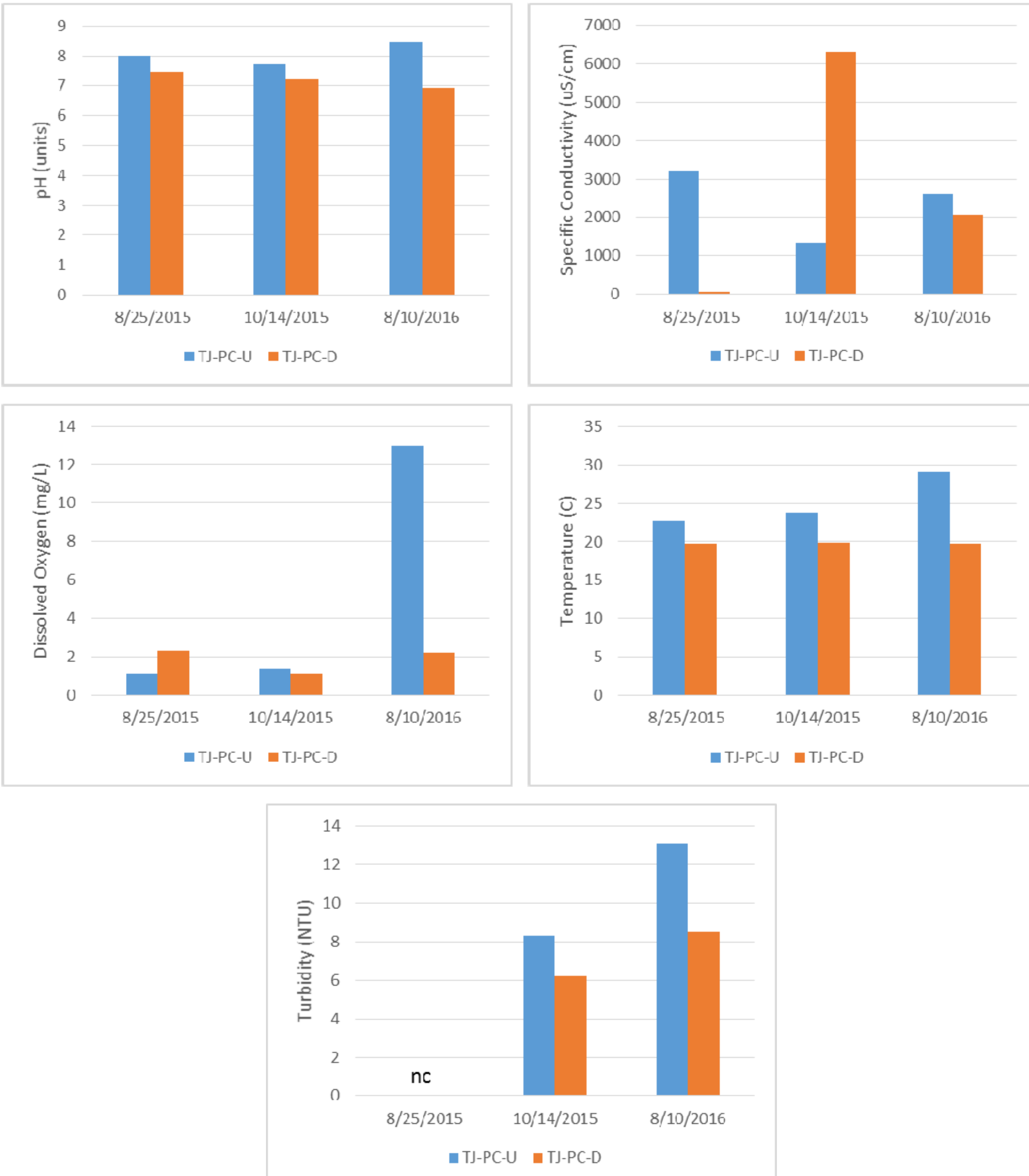

Figure 3-4: In-situ Water Quality Results

nc – not collected due to meter malfunction

3.2 CRAM Results

Table 3-3 and Figure 3-5 provide a summary of the CRAM scoring for the three AAs with extended details on each AA provided in Sections 3.2.1 through 3.2.3.

3.2.1 TJ-PC-U Site Assessment Area

The delineated AA for TJ-PC-U is depicted on Figure 2-2. This location was characterized by perennial flow in a non-confined setting. Very slow flowing deep water was present at the time of the three surveys. A summary of scoring for TJ-PC-U is presented in Table 3-3. The western end of the AA begins approximately 170m east of Hollister Street Bridge and extends 160m upstream from that point. The AA includes the bankfull width of the Pilot Channel and the lateral floodplain present.

Buffer and Landscape Context
The stream corridor continuity attribute extending 500m upstream and downstream of AA is in good condition. Both upstream and downstream riparian corridors were uninterrupted, with the only exception being the Hollister Street bridge crossing providing a small break in the buffer. The buffer immediately surrounding the AA scored high in the three submetrics. The AA is surrounded by one-hundred percent riparian buffer, which is in fair to good condition, with an average width of 225 meters. Small unpaved hiking trails are present, but do not appear to impede wildlife movement or to be heavily utilized. None of the buffer and landscape context attribute submetric scores changed during the three survey events.

Hydrology
The water source was in poor to fair condition as defined in the CRAM guidance. The freshwater sources consist primarily of infiltrated local residential and agricultural irrigation rising as groundwater, with the immediate drainage basin (i.e. within 2 kilometers (km)) being comprised of more than twenty percent residential and artificially irrigated land. The international Mexican border is approximately 4km upstream of the AA and is heavily urbanized beyond that point. However, dry season flows are diverted at the international border by South Bay International Wastewater Treatment Plant (SBIWTP) and do not reach the estuary. The majority of channel stability characteristics suggested equilibrium conditions with some limited evidence of degradation and aggradation. Many upper canopy trees were declining in stature, with some trees leaning/falling into the channel, however this was not the result of hydrology, as is discussed further in the Biotic Structure section below. Overall the river bed was planar with limited variability in structure and contained some buried living tree trunks. Hydrologic connectivity to the surrounding landscape is in poor to fair condition with an average entrenchment ratio of 1.67, indicating that the river has limited ability to spread laterally into its floodplain during times of high flow. None of the hydrology attribute submetric scores changed during the three survey events.

Table 3-3. Assessment Area CRAM Scoring Summary

		Pre-Dredge 8/25/2015			During Dredge 10/13-14/2015			Continued During Dredge 8/10/2016		
		TJ-PC-U	**TJ-PC-D**	**TJ-SG-U**	**TJ-PC-U**	**TJ-PC-D**	**TJ-SG-U**	**TJ-PC-U**	**TJ-PC-D**	**TJ-SG-U**
Approx. Length (m)		160	100	150	160	100	150	160	100	150
Average Bankfull Width (m)		17.0	5.5	5.8	17.0	5.5	5.8	17.0	5.5	8.3
Wetland Sub-type		Non-confined	Non-confined	Non-confined	Non-confined	Non-confined	Non-confined	Non-confined	Non-confined	Non-confined
Buffer Coverage (%)		100	100	100	100	100	100	100	100	100
Average Buffer Width (m)		225	250	188	225	250	188	225	250	188
CRAM Riverine Wetlands Scoring										
Landscape and Buffer Context	Riparian Continuity (Aquatic Area Abundance)	A	A	A	A	A	A	A	A	A
	Percent of AA with Buffer	A	A	A	A	A	A	A	A	A
	Average Buffer Width	A	A	B	A	A	B	A	A	B
	Buffer Condition	B	B	C	B	B	C	B	B	C
	Final Attribute Score	**93.3**	**93.3**	**82.9**	**93.3**	**93.3**	**82.9**	**93.3**	**93.3**	**82.9**
Hydrology	Water Source	C	C	C	C	C	C	C	C	C
	Channel Stability	B	B	C	B	B	C	B	B	C
	Hydrologic Connectivity	C	D	B	C	D	B	C	D	D
	Final Attribute Score	**58.3**	**50.0**	**58.3**	**58.3**	**50.0**	**58.3**	**58.3**	**50.0**	**41.7**
Physical Structure	Structural Patch Richness	D	D	D	D	D	D	D	D	D
	Topographic Complexity	C	C	B	C	C	B	C	C	C
	Final Attribute Score	**37.5**	**37.5**	**50.0**	**37.5**	**37.5**	**50.0**	**37.5**	**37.5**	**37.5**
Biotic Structure	Number of Plant Layers	A	A	A	A	A	A	B	A	A
	Number of Co-dominant Species	D	B	B	D	B	B	C	B	B
	Percent Invasion	B	B	D	B	B	D	C	B	D

		Pre-Dredge 8/25/2015			During Dredge 10/13-14/2015			Continued During Dredge 8/10/2016		
		TJ-PC-U	**TJ-PC-D**	**TJ-SG-U**	**TJ-PC-U**	**TJ-PC-D**	**TJ-SG-U**	**TJ-PC-U**	**TJ-PC-D**	**TJ-SG-U**
	Horizontal Interspersion	C	C	B	C	C	B	C	C	C
	Vertical Biotic Structure	C	B	C	C	B	C	D	B	D
	Final Attribute Score	**55.6**	**69.4**	**63.9**	**55.6**	**69.4**	**63.9**	**44.4**	**69.4**	**47.2**
Overall AA Score		**61.2**	**62.6**	**63.8**	**61.2**	**62.6**	**63.8**	**58.4**	**62.6**	**52.3**

Notes:
% - percent
AA - assessment area
m - meter

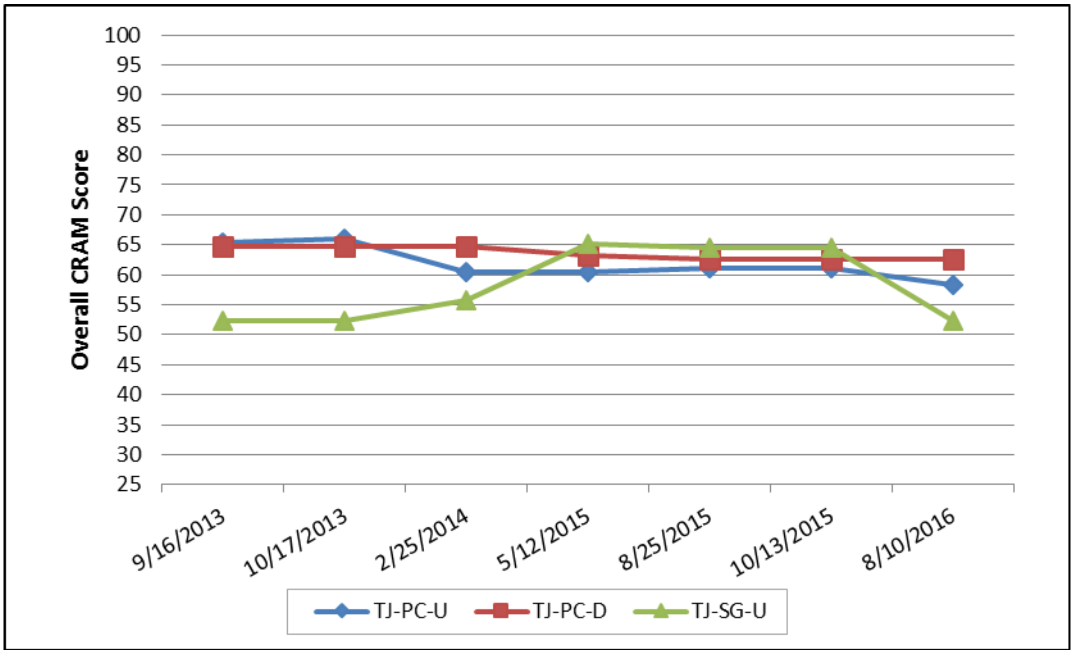

Figure 3-5: CRAM Overall AA Scores, 2013-2016

Physical Structure

Low habitat patch diversity was observed within the river and its floodplain. The channel and its floodplain substrate consisted primarily of fine-grained material (i.e. silt and sand). During the first two surveys, 4 patch types were observed (i.e. wrackline, large woody debris, secondary channels on floodplain, and variegated foreshore). The additional patch type of standing snags was added in the final survey, primarily as a result of the numerous dead willows that had broken off mid-trunk.

The cross sectional topographic complexity of the site is defined by gently sloping banks present on both sides of the river, with minimal benching and micro-topography. The south side of the river yielded a single bench and had a much broader floodplain than the north side, allowing for high flows and floodwaters to extend out further laterally along the south side of the river channel. None of the physical structure attribute submetric scores changed during the three survey events.

Biotic Structure

The overall biotic structure was generally fair to poor. Four of the five possible plant layers were present during the first two monitoring events: short (<0.5m), medium (0.5-1.5m), tall (1.5m – 3.0m) and very tall (>3.0m). The third event exhibited a notable change in both the number of layers (decreased to three) and composition of them. There was a significant decrease in the Very Tall canopy coverage and increase in Medium understory vegetation layers. The Very Tall layer previously dominated by the Arroyo Willow (*Salix lasiolepis*) and Black Willow (*Salix gooddingii*), was now almost non-existent, these willow trees having been infested with the Kuroshio Shot Hole Borer beetle. Most of the existing mature willows were dead, with a large number of them having fallen. Stands of Castor Bean (*Ricinus communis*) and Giant Reed (*Arundo donax*) now comprised the Very Tall layer. In addition to those co-dominants already mentioned, Mulefat (*Baccharis salicifolia*) was present during all surveys, and Garden Nasturtium (*Tropaeolum majus*) was observed as a co-dominant during the third event. Of the co-dominant species present, twenty percent were considered invasives during the first two monitoring events, while this increased to thirty-three percent during final monitoring. The vertical biotic structure is poor to fair with moderate overlap of canopy layers during the first two events, being dominantly shaded with very tall tree canopy, with relatively limited herbaceous understory. The third event exhibited a decrease in vertical biotic structure score, due to the substantial decrease in upper canopy coverage. The limited number of species present and the homogeneous distribution of those species lead to a “Fair” horizontal interspersion attribute score.

Potential Stressors

There was one primary hydrological stressor that was identified for TJ-PC-U, non-point source discharges, and it was determined that this impact could affect the riverine wetland and be a significant negative impact on the water quality of the AA. There were six physical structure stressors that were identified for the AA: bacterial pathogen impaired (as Tijuana River is 303(d) listed for fecal coliform bacteria), nutrient impaired (as Tijuana River is 303(d) listed for total nitrogen and phosphorus), heavy metal impaired (as Tijuana River is 303(d) listed for selenium and trace elements), pesticides (as Tijuana River is 303(d) listed for pesticides), trash or refuse (as Tijuana River is 303(d) listed for trash), and excessive runoff from watershed. Of the biotic stressors assessed as part of the CRAM protocol, lack of treatment of invasive plant species was observed. While not an official CRAM biotic stressor category, habitat destruction by non-native invertebrates (i.e. shot borer beetle) was extensive in the riparian area upstream of Hollister Road, and was determined to impose significant negative effect on the AA.. Land use stressors identified include urban residential development, orchards/nurseries, commercial feedlots, ranching (equestrian boarding lots), and passive recreation; however, none were determined likely to have a significant effect on the AA.

3.2.2 TJ-PC-D Site Assessment Area

The delineated area for the TJ-PC-D AA is depicted on Figure 2-3. The TJ-PC-D location was characterized as a perennial system in a non-confined setting. Flowing water was present at the time of the three surveys. A summary of scoring for TJ-PC-D is presented in Table 3-3. The eastern end of the AA starts approximately 1,000 m west of the Sunset Avenue and Saturn Boulevard intersection and extends 100 m downstream from that point. The AA includes the bankfull width of the Pilot Channel and the lateral floodplain benches present.

Buffer and Landscape Context

The riparian corridor continuity attribute extending 500 meters upstream and downstream of AA was in good condition. Both upstream and downstream riparian corridors were uninterrupted, providing a continuous buffer for wildlife movement and protection from anthropogenic influences. The buffer immediately surrounding the AA scored high in all three submetrics during all three events. The AA was surrounded by one-hundred percent riparian buffer, which is in good condition, with an average width of 250 m. While the maximum buffer assessed as part of CRAM is 250 meters, the actual buffer for this location extended well beyond 250 meters. Small unpaved recreational hiking trails are present to the north of the AA, but do not appear to impede wildlife movement or be heavily utilized. None of the buffer and landscape context attribute submetric scores changed during the three survey events.

Hydrology

The water source was in poor to fair condition as defined in the CRAM guidance. Similar to the upstream location, the natural freshwater sources consist primarily of groundwater from local irrigation, with the immediate drainage basin (i.e. within 2 km), being comprised of more than twenty percent residential and artificially irrigated land. The international Mexican border is approximately 6km upstream of the AA and is heavily urbanized beyond that point. However, dry season flows are diverted at the international border by SBIWTP and do not reach the estuary. During the three events, the TJ-PC-D sampling location was hydrologically disconnected from the TJ-PC-U location. Channel stability for all three events was characterized by a mixture of equilibrium and degradation conditions with limited evidence of aggradation. Equilibrium conditions were defined by a well-defined bankfull contour throughout most of the AA, with leaf litter, wrack, and woody debris consistent with that available in the surrounding riparian area. Degradation was evidenced by some riparian vegetation declining in stature and leaning into the channel. The lower banks were absent of vegetation and throughout a major portion of the AA, steep walled banks were present, with some evidence of bank slumps. Overall the river bed was planar, with no observations of increased habitat complexity (e.g., pools, riffles). Due to the steep walled banks, the hydrologic connectivity to the surrounding landscape was in poor to fair condition for all three events, with the entrenchment ratio ranging from 1.3 to 1.4, indicating that the river has a limited ability to spread laterally into its floodplain during times of high flow. None of the hydrology attribute submetric scores changed during the three survey events.

Physical Structure

Low habitat patch diversity was observed within the river and its floodplain. The channel and its floodplain substrate consisted primarily of fines. Of the sixteen patch types possible in a non-confined riverine wetland, five were present during all three events (i.e., bank slumps, secondary channels, organic debris on the floodplain, filamentous algae, and large woody debris), for thirty-one percent of the expected number of classes. The cross sectional topographic complexity of the site identified steep banks present on both sides of the river, with minimal benching and micro-topography. None of the physical structure attribute submetric scores changed during the three survey events.

Biotic Structure

The biotic structure is of fair to good quality, and did not change across the three events. There were four of the five possible plant layers present: short (<0.5m), medium (0.5m – 1.5m), tall (1.5m – 3.0m), and very tall (>3.0m). There were nine observed co-dominant species among all layers, including Mulefat (*Baccharis salicifolia*), California bulrush (*Scirpus californicus*), Arroyo willow (*Salix lasiolepis*), Black Willow (*Salix gooddingii*), Salt Cedar (*Tamarix aphylla*), Giant Reed (*Arundo donax*), Celery (*Apium graveolens*), Spearscale (*Atriplex triangularis*), and Elderberry (*Sambucus mexicanca*). Of co-dominant species present, *Tamarix aphylla* and *Arundo donax* are considered invasive comprising twenty-two percent of the co-dominant taxa present. The vertical biotic structure was fair, with limited overlap primarily of two plant layers (Tall and Very Tall). The horizontal interspersion of plant zones is fair. The area was dominated by a homogeneous mixture of mulefat and willows, with no strong zoning pattern evident. None of the biotic structure attribute submetric scores changed during the three survey events.

Potential Stressors

There was one hydrological stressor identified for TJ-PC-D AA, non-point source discharges; however, it was determined that this would not have a significant negative impact on the water quality of the AA. Five physical structure stressors were identified: bacterial pathogen impaired (as Tijuana River is 303(d) listed for fecal coliform bacteria), nutrient impaired (as Tijuana River is 303(d) listed for total nitrogen and phosphorus), heavy metal impaired (as Tijuana River is 303(d) listed for selenium and trace elements), pesticides (as Tijuana River is 303(d) listed for pesticides), and trash or refuse (as Tijuana River is 303(d) listed for trash). Although these physical stressors were present they were not considered to have a significant negative effect on the AA. The one biotic structure stressors identified was the lack of treatment of invasive plants. Potential landscape stressors within 500m of the AA included helicopter traffic from the Naval Outlying Landing Field to the north, some horse paddocks to the northeast, nearby urban residential areas, dryland farming, and passive recreation in the form of hiking, none of which appeared likely to have a significant effect on the AA.

3.2.3 TJ-SG-U Site Assessment Area

The delineated area for the TJ-SG-U AA is depicted on Figure 2-4. A summary of scoring for TJ-SG-U is presented in Table 3-3. The northern edge of the AA began approximately 10m south of Monument Road and extended southward approximately 120m. The location was characterized as an ephemeral stream in a non-confined setting. Water was not present within the AA during any of the three surveys. The AA included the bankfull width of TJ-SG-U and the lateral floodplain benches present. It was communicated by on-site City of San Diego staff that the portion of the Smuggler’s Gulch channel that had been surveyed in previous years has been cleared by the County of San Diego, removing both accumulated sand and instream vegetation. This was evidenced by a channel which was at grade with Monument Road, now being several feet below grade, and an AA with much less in-channel vegetation.

Buffer and Landscape Context

The riparian continuity attribute extending 500 meters upstream and downstream of AA is in good condition. Both upstream and downstream riparian corridors provided good connectivity, with the only exception being Monument Road traversing the buffer downstream of the AA. The AA is bordered by one-hundred percent buffer, with the average buffer width being 188 m. The buffer condition was in poor to fair condition, primarily being driven by one side of the AA. The west side of the AA was bordered by undisturbed natural riparian scrub, while the buffer to the east consisted of a large, cleared and compacted lot. It appeared that this lot is not utilized often and wildlife would likely be able to move freely through it, however the quality of that habitat was subpar.

Hydrology

The water source was in fair to poor condition. The natural freshwater sources are substantially controlled by diversions upstream and a large portion of the watershed within 2 km upstream is in Mexico, dominated by commercial and residential land use. Channel stability was characterized by aggradation conditions, with the only sign of equilibrium conditions being a clearly demarcated bankfull width. It appeared that large amounts of sediment likely inundate this area during storm events. The channel was filled with deep sand during all three visits with the base of some vegetation being buried along the bankfull contour. Hydrologic connectivity to the surrounding landscape changed over the course of the three surveys. The entrenchment ratio during the first two surveys in August and October 2015 was good at 2.2, but decreased to 1.2 in August 2016, indicating much less ability for the creek to spread to the surrounding landscape during times of high flow. This was primarily due to an increased bankfull width, without a proportionate increase in flood-prone width.

Physical Structure

Of the sixteen habitat patch types possible in a non-confined riverine wetland, one was present (i.e. wrackline consisting of trash) within the channel or its floodplain. Topographic complexity of the site was moderate to low during the first two surveys with a large flat stream channel and a relatively steep sloping earthen berm on the eastern bank (approx. 2.0m – 2.5m) with one bench. During the third survey, the topographic complexity was somewhat reduced with no consistent benching present on the eastern side of the channel. The western bank for all surveys, consisted of a naturally steep hillside rising up to a mesa, with some micro-topography present.

Biotic Structure

The biotic structure across the three surveys was mixed. The number of plant layers (4) and co-dominants (10) scored consistently well during all three surveys. While the number of co-dominants remained consistent, the composition of co-dominants changed somewhat from the first two surveys to the third. August and October 2015 co-dominants consisted of: cocklebur (*Xanthium strumarium*), Castor bean (*Ricinis communis*), Black Willow (*Salix gooddingii*), Tamarix (*Tamarix aphylla*), Eucalyptus (*Eucalyptus camaldulersis*), Laurel Sumac (*Malosma laurina*), Western Ragweed (*Ambrosia confertifolia*), Bermuda Grass (*Cynodon dactylon*), Giant Reed (*Arundo donax),* and Mulefat (*Baccharis salicifolia*). Of these ten co-dominant taxa, five (fifty percent) were considered invasives. During the third monitoring event the ten co-dominants observed were, Castor bean (*Ricinis communis*), Black Willow (*Salix gooddingii*), Cocklebur (*Xanthium strumarium*), Goosefoot (*Chenopodium* sp), Common Sunflower (*Helianthus annuus*), Needlegrass (*Achnatherum* sp.), Tamarix (*Tamarix aphylla*), Eucalyptus (*Eucalyptus camaldulersis*), Giant Reed (*Arundo donax),* and Mulefat (*Baccharis salicifolia*). Of these ten co-dominant taxa, five (fifty percent) were considered invasives.

During the first two events horizontal interspersion remained consistent with moderate plant zonation, generally spaced into four groupings: grass zone, mulefat zone, Arundo zone, and the Castor Bean zone. There was moderate vertical overlap of the tall and very tall layers, comprising about fifty percent of the area. During the third visit horizontal interspersion had decreased, with a homogenization of vegetation dominated by castor bean. Vertical biotic structure also decreased during the final event primarily due to the clearing of the channel. Many of the larger instream and streamside plants (e.g. Arundo and Castor Bean) had been removed, reducing the amount of plant overlap to approximately 20 percent of the vegetated area containing moderate overlap of two plant layers.

Potential Stressors

There were three hydrological stressors identified for the TJ-SG-U AA during all surveys: non-point source discharges, flow obstructions in the form of the culvert running underneath Monument Road, and the earthen berm on the right bank. All three were identified as having a significant negative effect on the AA. There were eight physical structure stressors that were identified for the AA: grading/compaction, excessive sediment or organic debris, excessive runoff from watershed, nutrient impaired, heavy metal impaired, pesticides or trace organics impaired, bacteria and pathogens impaired, and trash or refuse. These were deemed to have a significant effect on the AA with the exception of grading/compaction. There was one biotic structure stressor identified; lack of treatment of invasive plants adjacent to AA or buffer and was determined to have a significant negative effect on the AA, due to the overwhelming presence of Castor Bean (despite some Arundo and Castor bean having been removed). Land use stressors include urban residential development, ranching (equestrian boarding lot), dryland farming, and active off-road vehicle usage (i.e., border patrol vehicles). Urban development was observed to likely have a significant effect due to the intense urbanization within the watershed south of the international border.

3.3 Benthic Biological Results

A full list of taxa identified in each field replicate collected is presented in Table 3-4. Table 3-5 presents a summary of selected biological metrics.

3.3.1 BMI Community Composition

Total abundance of organisms and taxa richness among all samples ranged from 36 to 180 individuals and 1 to 6 taxa, respectively. No distinct pattern in abundance or taxa richness was observed among collection events. The gastropod *Tryonia* sp. was the dominant taxa in all three sampling events, having the most abundant number of individuals in 8 of the 9 samples collected. Ostracods were the most abundant taxa in one of the August 2016 field replicates. Other taxa of note in samples was Trichocorixa reticulate (Family Corixidae), *Chironomus* sp., and Oligochaetes. All of these taxa are generally considered tolerant taxa, meaning they are relatively insensitive to anthropogenic stressors and are typically found in higher abundances at disturbed or stressed sites. The genus *Tryonia* is a group of gastropods (snails) with a wide distribution. Although most *Tryonia* species are restricted to springs, which are generally thermal and highly mineralized, some also live in lakes (Thompson, 1968), and two species (*T. imitator* and *T. porrecta*) can be found in brackish, coastal waters (Kellogg, 1985; Hershler, 2007). Under SAFIT Level 2 standard taxonomic effort, *Tryonia* is left at genus, however our taxonomist was able to identify these individuals to *Tryonia imitator*, the California Brackish Water Snail. *Tryonia imitator* is a gastropod that inhabits coastal lagoons, estuaries and salt marshes, from Sonoma County to San Diego County. *Tryonia* sp. does not have a specific tolerance value (TV), however the Class Gastropoda is generally considered tolerant of stressors.

Ostracods, sometimes called seed shrimp, can be found in many different substrate types where they eat bacteria, mold, algae and detritus. While Ostracods can be found in both good quality and highly impacted streams, a population dominated by members of this group is generally an indicator of stressed conditions. Members of the *Chironomus* genus are generally bottom-dwelling and many live within tubes constructed of silt and fines. Some species within this group are able to tolerate high conductivity water and can be found in estuarine locations (i.e. *Chironomus salinarius* and *Chironomus halophilus*). Some occur in highly polluted waters, others are restricted to cool clear water. Chironomidae are important indicator organisms, because the presence, absence, or quantities of various species within this Family can be a very good indicator of water quality. Oligochaetes are segmented aquatic worms, generally found in silty substrate and detritus. Similar to Ostracods, Oligochaetes can be found across a full spectrum of water or habitat conditions; however, dominance by this group is generally an indicator of degraded conditions.

Table 3-4. Summary of Identified Taxa

	August 2015			October 2015			August 2016		
Taxon	**TJ-PC-D-1**	**TJ-PC-D-2**	**TJ-PC-D-3**	**TJ-PC-D-1**	**TJ-PC-D-2**	**TJ-PC-D-3**	**TJ-PC-D-1**	**TJ-PC-D-2**	**TJ-PC-D-3**
ocorixa reticulata	6				20	12	4	2	
Corixidae	1						4	4	
ironomus sp.							12	18	4
sychoda sp.	1			13	2				
asyhelea sp.								2	
Oligochaeta				6	29		12		8
Tryonia sp.	114	105	43	84	63	24	124	26	68
arina taeniolatus	1								
Ostracoda	3						24	106	48
TOTAL	**126**	**105**	**43**	**103**	**114**	**36**	**180**	**158**	**128**

3.3.2 Diversity Metrics

Diversity metrics provide information regarding the number of taxa observed and the evenness of the distribution of individuals among those taxa (Washington 1984). Pristine ecosystems are typically expected to have a high diversity of invertebrate taxa with a relatively even distribution of organisms between them. In contrast, degraded systems may consist of high numbers of individuals, but few taxa. A summary of diversity metrics is presented in Table 3-5. The method used to measure invertebrate diversity was the Shannon-Weaver Diversity Index (SWI). The SWI evaluates the number of taxa and the evenness of distribution among them. Typically this index is used to compare differences in diversity between several sites along a condition gradient, a potentially impacted site versus reference location, or temporal changes at a single location. The SWI can range from 0 to 4.6, with a score approaching 2.5 typically indicating a more diverse community. The SWI index across all sampling events ranged from 0.0 (only one taxa observed) to 1.06, with a mean index score across all events of 0.64, indicating a benthic community with very low diversity and dominance by a few species.

3.3.3 Sensitivity Metrics

A summary of sensitivity metrics is provided in Table 3-3. The tolerance of many BMI taxa to habitat impairment and water quality has been determined through prior studies (Hilsenhoff, 1987). The Hilsenhoff Biotic Index (HBI) ranks BMI taxa on a scale of 0 to 10 regarding their sensitivity to impairment, with a TV of 0 being given to taxa that are highly sensitive to habitat impairment, water quality degradation, or other stressor, and a TV of 10 to those that are very tolerant. While organisms with a high TV can be found in streams with good water and habitat quality, they tend to be a lesser proportion of the community. Conversely, taxa with low TVs (i.e. sensitive organisms) will very rarely be found at sites with poor water or habitat quality. Although originally developed to assess low dissolved oxygen caused by organic loading (Hilsenhoff 1977, 1982, 1987), the HBI may also be sensitive to the effects of impoundment, thermal pollution, and some types of chemical pollution (Hilsenhoff 1988, Hooper 1993).

The mean HBI score among field replicates across all three events ranged from 6.37 to 8.42, indicating that the benthic community generally consisted of organisms tolerant to stressors. No individuals considered intolerant to disturbance or stressors (TV score 0 to 2) were reported for any of the three collection events.

3.3.4 Functional Feeding Groups

BMI may be grouped according to mode of feeding, referred to as Functional Feeding Groups (FFG). A healthy assemblage will typically contain a variety of FFG, while dominance of the community by few FFG suggests the water body may not support a diversity of ecological niches and may be general indicator of poor community health. The type and relative abundance of groups present can provide valuable insight with regard to ecological integrity, especially when considered with other assessment data.

A summary of the FFG distribution obtained is presented in Table 3-5. The distribution of FFGs at the TJ-PC-D location was rather disproportionate, generally as a result of the benthic community being dominated by one or two taxa. Two FFGs dominated the taxa present:

collector-gatherers and scrapers. The collector-gatherer FFG is a subset of a larger collector group, comprised of collector-gatherers and collector-filterers. The collector-gatherers typically acquire fine particulate organic matter from the bottom by ingesting fine sediments, while the collector-filterers use mucous nets or fans to filter out fine particulate organic matter suspended in the passing water column. Both of these collector types are typically found in higher numbers in streams containing a high proportion of silts and fines. Oligochaetes, Chironomids, and Ostracods are all considered collector-gatherers, consuming detritus and bacteria from the sediment.

Scrapers are those taxa that generally scrape soft algae and/or diatoms from hard surfaces (e.g. cobble or gravel) or directly off the surface of the sediment. Members of the Class Gastropoda (i.e. *Tryonia* sp.) are scrapers, with a feeding structure called a radula, which is very efficient at grazing algae from surfaces.

Table 3-5. Select Biological Metrics

Date	August 2015			October 2015			August 2016		
Biological Metric	**TJ-PC-D-1**	**TJ-PC-D-2**	**TJ-PC-D-3**	**TJ-PC-D-1**	**TJ-PC-D-2**	**TJ-PC-D-3**	**TJ-PC-D-1**	**TJ-PC-D-2**	**TJ-PC-D-3**
# Organisms in the sample	126	105	43	103	114	36	180	158	128
Taxa Richness	6	1	1	3	4	2	6	6	4
1st Dominant Taxa	Tryonia imitator	Tryonia imitator	Tryonia imitator	Tryonia imitator	Tryonia imitator	Tryonia imitator	Tryonia imitator	Ostracoda	Tryonia imitator
% Top Dominant Taxa	90.5	100	100	81.6	55.3	66.7	68.9	67.1	53.1
% Intolerant Individuals	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dominant FFG	Scraper	Scraper	Scraper	Scraper	Scraper	Scraper	Scraper	Collector Gatherer	Scraper
Shannon Weaver Diversity Index (log10)	0.44	0.0	0.0	0.59	1.05	0.64	1.06	1.02	0.99
Mean Hilsenhoff Biotic Index	8.18	na	na	8.42	6.37	8.00	7.79	8.24	7.73

na - not applicable; only taxa present (i.e. *Tryonia*) does not have an assigned tolerance value

4.0 QUALITY ASSURANCE/QUALITY CONTROL

The data presented has been reviewed in accordance with the Amec Foster Wheeler internal quality assurance program and are deemed acceptable for reporting. Identified deviations from the protocol are discussed below, or are otherwise considered minor with no likely effect upon the assessment.

4.1 Analytical Water Chemistry

Due to elevated concentrations of several chemical constituents observed at the Tijuana River Pilot Channel sampling locations, dilutions were performed by the analytical laboratory in several instances, which then increased the MDL and RL for the diluted analytes. The elevated MDLs and RLs for the diluted samples are provided in laboratory reports of Appendix B.

4.2 CRAM Monitoring

No QA/QC issues were encountered.

4.3 Benthic Macroinvertebrate Identification

No QA/QC issues were encountered.

5.0 SUMMARY

5.1 Summary

This report summarizes water quality, CRAM, and benthic community results at three riverine wetland areas surrounding the annual dredge maintenance footprint for the Tijuana River Valley Channel Maintenance Project 09C-077. Two of the AAs were located upstream (TJ-PC-U and TJ-SG-U) of the dredging impact area and one AA was located downstream (TJ-PC-D) of the dredging impact area. Sampling was conducted for pre-dredging conditions (August 25, 2015), during dredge conditions (October 13-14, 2015), and continuing during-dredge conditions (August 10, 2016).

5.1.1 Biological Monitoring

Results from the biological monitoring events indicate a benthic community that is highly tolerant to disturbance. The low diversity, high HBI scores, and high dominance of a single FFG point to a biological community that may be responding to one or more stressors. A location on the Tijuana River in close proximity to the downstream Pilot Channel station (Tijuana River at Saturn Blvd.) and at approximately the same elevation was monitored for freshwater invertebrates in May 2010 and May 2012 by the County of San Diego's copermittee receiving waters monitoring program (County of San Diego, 2011 and 2013). Taxa collected at this site showed a similar community structure, with tolerant Chironomid and Oligochaete taxa together comprising 99 and 95 percent of the community, for those two monitoring events respectively.

The tidal influence present at the downstream Pilot Channel location likely affects the types of organisms that can survive there. Increased TDS/Conductivity is one of the factors used in generating HBI scores. The limited community, with few taxa, and high average HBI score observed at this station may be indicative of stress due to fluctuations in salinity known to occur at that location (0.4 to 18 ppt) (see Amec Foster Wheeler 2013), anthropogenic stressors, or a combination of both. While it is difficult to tease apart natural versus anthropogenic impacts to ambient conditions at a station with physical characteristics such as this, continued biological monitoring at this location in association with dredging operations will provide an assessment of the biological community and how it is changing in response to the ongoing maintenance dredging.

5.1.2 Water Quality Monitoring

Water quality samples were collected at the upstream and downstream Pilot Channel locations for the pre-dredge, during-dredge, and post-dredge conditions. No samples were collected at TJ-SG-U due to no-flow conditions during each monitoring event. The reported water quality results are summarized as follows:

- TJ-PC-U had consistently higher nutrient concentrations relative to TJ-PC-D.
- Chlorophyll concentrations were consistently elevated at TJ-PC-U relative to TJ-PC-D.
- During the pre-dredge sampling event, concentrations of nitrate and nitrite at TJ-PC-U were significantly elevated in comparison to the TJ-PC-D station. However, during both subsequent sampling events these analyte concentrations decreased at the TJ-PC-U station resulting in similar concentrations between the two stations.

- Chloride concentrations and *in-situ* conductivity measurements were periodically elevated at TJ-PC-D, likely as a result of the tidal influence at the downstream station.
- Dissolved oxygen concentrations were depressed at both Pilot Channel stations, with the exception of the August 2016 event at TJ-PC-U. Concentrations of dissolved oxygen were exceptionally high (13.0 mg/L) at TJ-PC-U during this final event, likely as a result of the high temperatures and increased algal activity (as evidenced by increased chlorophyll concentrations).

5.1.3 CRAM Monitoring

CRAM was performed at the TJ-SG-U as well as the upstream and downstream Pilot Channel locations for the pre-dredge, during-dredge, and continued during-dredge conditions. Overall CRAM scores at all sites were similar for the first two field surveys, ranging from 61 to 64. CRAM scores at TJ-PC-U and TJ-PC-D remained relatively consistent across the three surveys, however an 11.5 point decrease in overall CRAM score was observed at TJ-SG-U during the final survey.

The decrease in overall CRAM score at TJ-SG-U was largely due to differences in the hydrologic connectivity, topographical complexity, and horizontal/vertical plant structure. The hydrologic connectivity score dropped from a “B” to “D” due to an increase in bankfull width without the proportional increase in flood-prone width. Topographical complexity score decreased from “B” to “C” due to a lack of benching at the stream banks. Both horizontal and vertical plant structure each dropped one letter grade as a result of instream and stream-side vegetation clearing performed between the October 2015 and August 2016 surveys.

5.2 Next Steps

The next scheduled monitoring event is Spring 2017 after completion of this season’s maintenance program. Monitoring will continue to be done in accordance with the provisions outlined in Certification.

6.0 REFERENCES

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Field Data Log Sheet

Site ID TJ-PC-U **Watershed** Tijuana **Field Crew** JR / KS **Date** 8/25/15

Site-Specific Event # Wet Weather [ ] Dry Weather [X] **Time** 0830

ATMOSPHERIC & OCEANIC CONDITIONS

Weather	Sunny, Partly Cloudy, (Overcast), Fog, Raining, Drizzle
Last Rain	(> 72 Hours), < 72 Hours — **Rainfall** None, < 0.1", > 0.1"
Tide	High, (Mid), Low, Rising ↑, (Falling ↓)
Flow	Flowing, (Ponded)

SAMPLE CHARACTERISTICS

Odor	None, Musty, Rotten Eggs, Chemical, (Sewage), Other______
Color	None, Yellow, (Brown), White, Gray, Other______
Clarity	Clear, (Slightly Cloudy), Opaque, Other______
Floatables	(None), Trash, Bubbles/Foam, Sheen, Other______
Deposits	(None), Sediment/Gravel, Fine Particles, Stains, Oily Deposits, Other______
Vegetation	None, Limited, (Normal), Excessive, Other______
Biology	(None), Insects, Algae, Snail, Seaweed, Mollusk, Crustacean, Other______

FIELD MEASUREMENTS

Temp(°C) 22.7 **Sp Conduct (µS/cm)** 3227 **pH** 7.99

Turbidity (NTU) ______ **Salinity (ppt)** 1.7 **DO (mg/L)** 1.1

SAMPLE COLLECTION

Sample Type	Date	Time	Sample ID
Water	8/25/15	0845	TJ-PC-U-082515

NOTES/COMMENTS

Sediment Sampling Fieldsheet for Tijuana River Estuary

amec foster wheeler

Date: 8/25/2015
Personnel: JR, KS
Weather: Clear
Time / Height low tide: 12:14pm : +2.4 feet
Time / Height high tide: 07:25am : +3.7 feet

Station ID	Time	Grab #	Water Depth (m)	Penetration Depth (cm)	% Surface Intact	Overlying Water (Y/N)?	Acceptable (Y/N)?*	Sed Type	Color	Odor	Photo ID
TJ-PC-D-01	1230	1	0.1	7	100	Y	Y	Sand	Brn/Blk	Humic	868
TJ-PC-D-02	1244	2	0.15	8	100	Y	Y	Silt	Blk	HS	869
TJ-PC-D-03	1311	3	0.15	7	100	Y	Y	Silt	Blk	HS	870

* Acceptability criteria: minimum 5-cm penetration, even sample surface, minimal disturbance/high % surface intact, overlying water present

** Record all grab attempts

Notes:

October 13, 2015 Event

Basic Information Sheet: Riverine Wetlands

Assessment Area Name: TJ-S6-U	
Project Name: Tijuana River 401 Cert Dredge	
Assessment Area ID #:	
Project ID #:	**Date:** 10/13/15
Assessment Team Members for This AA:	
JR, TH	
Average Bankfull Width: 5.8	
Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m): 150	
Upstream Point Latitude: 32.5455	**Longitude:** -117.0882
Downstream Point Latitude: 32.5436	**Longitude:** -117.0884
Wetland Sub-type: ☐ Confined ☒ Non-confined	
AA Category: ☐ Restoration ☐ Mitigation ☐ Impacted ☐ Ambient ☐ Reference ☐ Training ☒ Other: Dredge Impact Monitoring	
Did the river/stream have flowing water at the time of the assessment? ☐ yes ☒ no	
What is the apparent hydrologic flow regime of the reach you are assessing? The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source. ☐ perennial ☐ intermittent ☒ ephemeral	

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1		Upstream			
2		Middle Left			
3		Middle Right			
4		Downstream			
5					
6					
7					
8					
9					
10					

Site Location Description:

Comments:

none

Scoring Sheet: Riverine Wetlands

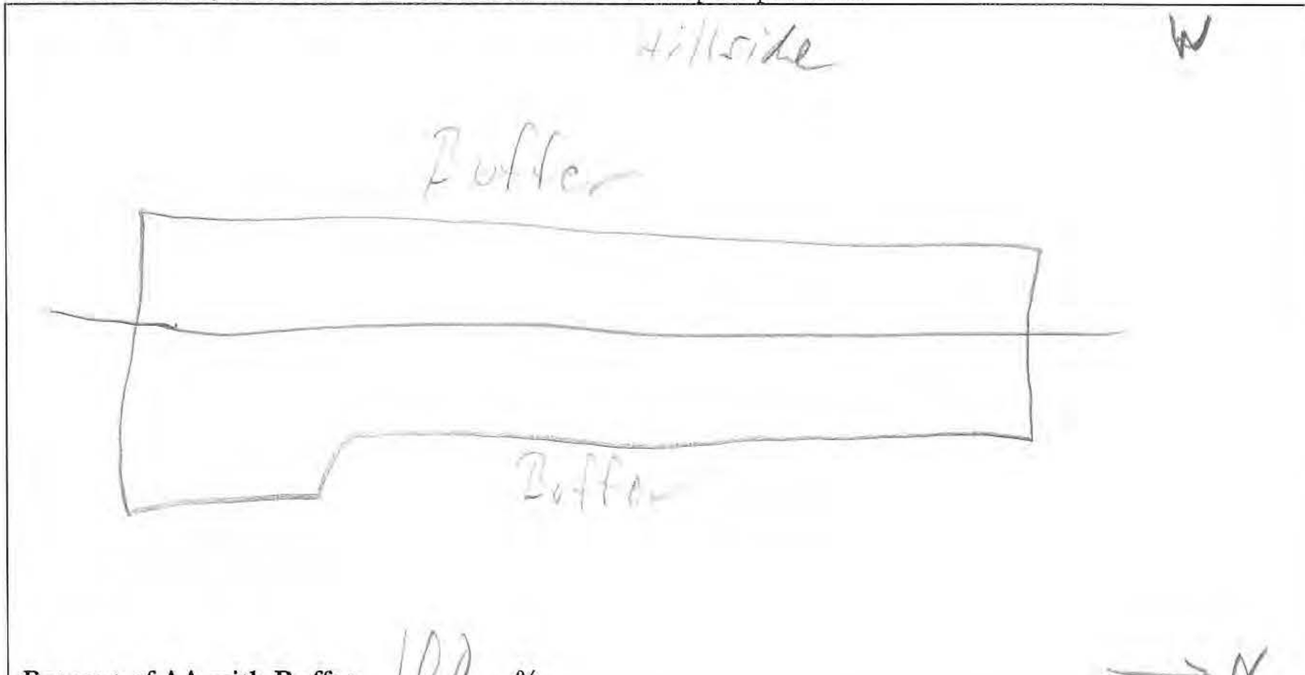
AA Name: Smugglers Gulch Upstream			Date: 10/13/15	
Attribute 1: Buffer and Landscape Context (pp. 11-19)			**Comments**	
	Alpha.	Numeric		
Stream Corridor Continuity (D)	A	12		
Buffer:				
	Alpha.	Numeric		
Buffer submetric A: Percent of AA with Buffer	A	12		
Buffer submetric B: Average Buffer Width	B	9		
Buffer submetric C: Buffer Condition	C	6		
Raw Attribute Score = D+[C x (A x B)$^{1/2}$]$^{1/2}$		19.9	**Final Attribute Score = (Raw Score/24) x 100**	82.9
Attribute 2: Hydrology (pp. 20-26)				
	Alpha.	Numeric		
Water Source	C	6		
Channel Stability	C	6		
Hydrologic Connectivity	B	9		
Raw Attribute Score = sum of numeric scores		21.0	**Final Attribute Score = (Raw Score/36) x 100**	58.3
Attribute 3: Physical Structure (pp. 27-33)				
	Alpha.	Numeric		
Structural Patch Richness	D	3		
Topographic Complexity	B	9		
Raw Attribute Score = sum of numeric scores		12	**Final Attribute Score = (Raw Score/24) x 100**	50
Attribute 4: Biotic Structure (pp. 34-41)				
Plant Community Composition (based on sub-metrics A-C)				
	Alpha.	Numeric		
Plant Community submetric A: Number of plant layers	A	12		
Plant Community submetric B: Number of Co-dominant species	B	9		
Plant Community submetric C: Percent Invasion	C	6		
Plant Community Composition Metric *(numeric average of submetrics A-C)*		9		
Horizontal Interspersion	B	9		
Vertical Biotic Structure	C	6		
Raw Attribute Score = sum of numeric scores		24	**Final Attribute Score = (Raw Score/36) x 100**	66.7
Overall AA Score (average of four final Attribute Scores)			64.5	

Worksheet for Stream Corridor Continuity Metric for Riverine Wetlands

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA	
Segment No.	Length (m)	Segment No.	Length (m)
1	0	1	20 Road
2	↓	2	↓
3		3	
4		4	
5		5	
Upstream Total Length	0	Downstream Total Length	20

Percent of AA with Buffer Worksheet

In the space provided below make a quick sketch of the AA, or perform the assessment directly on the aerial imagery; indicate where buffer is present, estimate the percentage of the AA perimeter providing buffer functions, and record the estimate amount in the space provided.



Percent of AA with Buffer: 100 %

Worksheet for calculating average buffer width of AA

Line	Buffer Width (m)
A	75
B	150
C	150
D	145
E	250
F	↓
G	
H	
Average Buffer Width *Round to the nearest integer*	188

Worksheet for Assessing Channel Stability for Riverine Wetlands

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium	☒ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA.
	☐ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it.
	☐ There is leaf litter, thatch, or wrack in most pools (if pools are present).
	☐ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area.
	☐ There is little or no active undercutting or burial of riparian vegetation.
	☐ If mid-channel bars and/or point bars are present, they are not densely vegetated with perennial vegetation.
	☐ Channel bars consist of well-sorted bed material (smaller grain size on the top and downstream end of the bar, larger grain size along the margins and upstream end of the bar).
	☐ There are channel pools, the spacing between pools tends to be regular and the bed is not planar throughout the AA
	☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation	☐ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs.
	☐ There are abundant bank slides or slumps.
	☐ The lower banks are uniformly scoured and not vegetated.
	☐ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel.
	☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation.
	☐ The channel bed appears scoured to bedrock or dense clay.
	☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided).
	☐ The channel has one or more knickpoints indicating headward erosion of the bed.
Indicators of Active Aggradation	☒ There is an active floodplain with fresh splays of coarse sediment (sand and larger that is not vegetated) deposited in the current or previous year.
	☒ There are partially buried living tree trunks or shrubs along the banks.
	☒ The bed is planar (flat or uniform gradient) overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced.
	☒ There are partially buried, or sediment-choked, culverts.
	☒ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour.
	☐ There are avulsion channels on the floodplain or adjacent valley floor.
Overall	☐ **Equilibrium** ☐ **Degradation** ☒ **Aggradation**

Riverine Wetland Entrenchment Ratio Calculation Worksheet

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate midpoints along straight riffles or glides, away from deep pools or meander bends. An attempt should be made to place them at the top, middle, and bottom of the AA.

Steps	Replicate Cross-sections ⟶	TOP	MID	BOT	
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	5.0	4.5	5.5	m
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	0.5	0.5	0.5	m
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	1.0	1.0	1.0	m
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	17.0	7.5	9.0	m
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	3.4	1.6	1.6	
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections. Enter the average result here and use it in Table 13a or 13b.			2.2	

Structural Patch Type Worksheet for Riverine wetlands

Circle each type of patch that is observed in the AA and enter the total number of observed patches in Table below. In the case of riverine wetlands, their status as confined or non-confined must first be determined (see page 6) to determine with patches are expected in the system (indicated by a "1" in the table below). Any feature onsite should only be counted once as a patch type. If a feature appears to meet the definition of more than one patch type (i.e. swale and secondary channel) the practitioner should choose which patch type best illustrates the feature. Not all features at a site will be patch types.

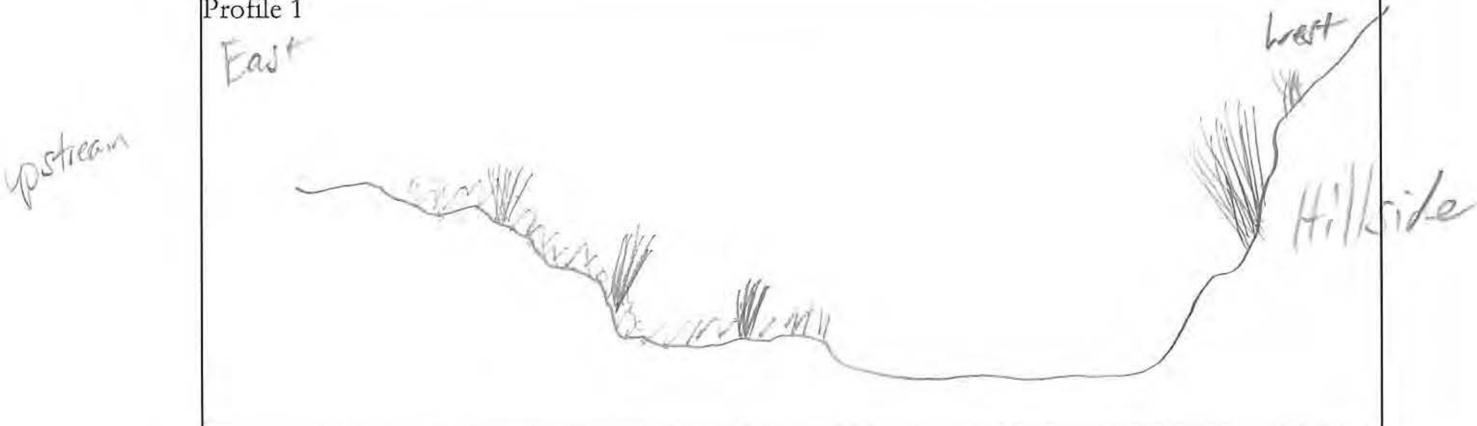
**Please refer to the CRAM Photo Dictionary at www.cramwetlands.org for photos of each of the following patch types.*

STRUCTURAL PATCH TYPE (circle for presence)	**Riverine (Non-confined)**	**Riverine (Confined)**
Minimum Patch Size	**$3\ m^2$**	**$3\ m^2$**
Abundant wrackline or organic debris in channel, on floodplain	**1**	**1**
Bank slumps or undercut banks in channels or along shoreline	**1**	**1**
Cobbles and/or Boulders	**1**	**1**
Debris jams	**1**	**1**
Filamentous macroalgae or algal mats	**1**	**1**
Large woody debris	**1**	**1**
Pannes or pools on floodplain	**1**	**N/A**
Plant hummocks and/or sediment mounds	**1**	**1**
Point bars and in-channel bars	**1**	**1**
Pools or depressions in channels (wet or dry channels)	**1**	**1**
Riffles or rapids (wet or dry channels)	**1**	**1**
Secondary channels on floodplains or along shorelines	**1**	**N/A**
Standing snags (at least 3 m tall)	**1**	**1**
Submerged vegetation	**1**	**N/A**
Swales on floodplain or along shoreline	**1**	**N/A**
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	**1**	**1**
Vegetated islands (mostly above high-water)	**1**	**N/A**
Total Possible	**17**	**12**
No. Observed Patch Types (enter here and use in Table 14 below)		

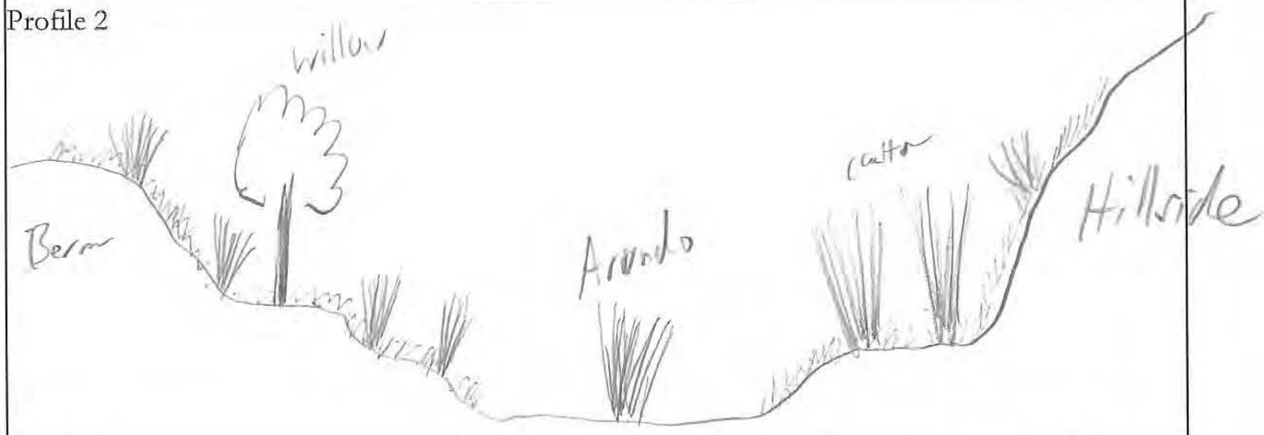
Worksheet for AA Topographic Complexity

At three locations along the AA, make a sketch of the profile of the stream from the AA boundary down to its deepest area then back out to the other AA boundary. Try to capture the benches and the intervening micro-topographic relief. To maintain consistency, make drawings at each of the stream hydrologic connectivity measurements, always facing downstream. Include the water level, an arrow at the bankfull contour, and label the benches. Based on these sketches and the profiles in Figure 10, choose a description in Table 16 that best describes the overall topographic complexity of the AA.

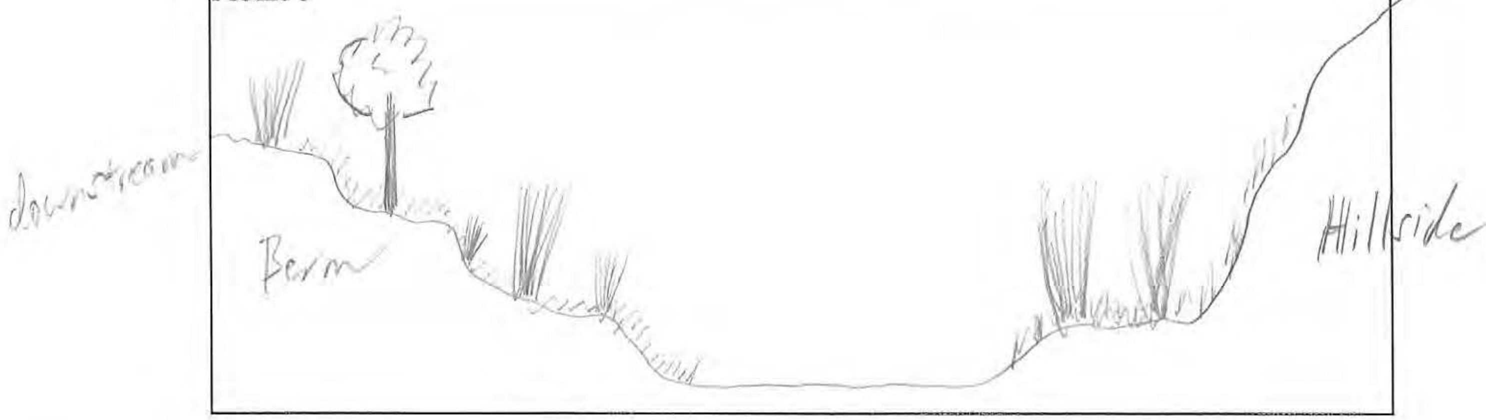
Profile 1



Profile 2



Profile 3



Plant Community Metric Worksheet: Co-dominant species richness for Riverine wetlands
(A dominant species represents ≥10% *relative* cover)

Special Note:

** Combine the counts of co-dominant species from all layers to identify the total species count. Each plant species is only counted once when calculating the Number of Co-dominant Species and Percent Invasion submetric scores, regardless of the numbers of layers in which it occurs.*

Floating or Canopy-forming (non-confined only)	Invasive?	Short (<0.5 m)	Invasive?
None		Bermuda Grass	Y
		Cocklebur	N
		Castor Bean	Y

Medium (0.5-1.5 m)	Invasive?	Tall (1.5-3.0 m)	Invasive?
Ambrosia confertifolia	N	Laurel Sumac	N
Cocklebur	N	Castor Bean	Y
		Mulefat	N

Very Tall (>3.0 m)	Invasive?		
Eucalyptus	Y	Total number of co-dominant species for all layers combined (enter here and use in Table 18)	10
Arundo	Y		
Castor Bean	Y	Percent Invasion *Round to the nearest integer* (enter here and use in Table 18)	50
Tamarix	Y		
Black Willow	N		

Cynodon dactylon

Ricinus communis

Ragweed

Malosma laurina

Xanthium strumarium

Baccharis salicifolia

Eucalyptus camaldulensis

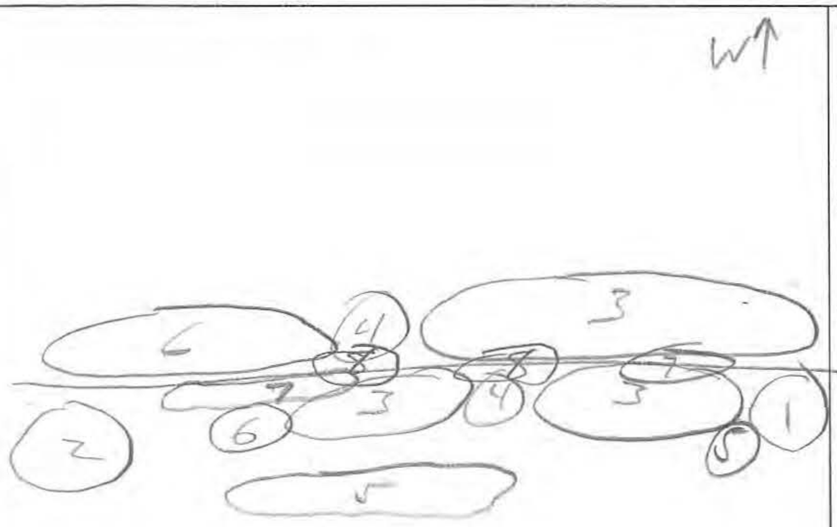
Arundo donax

Tamarix aphylla

Salix gooddingii

Horizontal Interspersion Worksheet.

Use the spaces below to make a quick sketch of the AA in plan view, outlining the major plant zones (this should take no longer than 10 minutes). Assign the zones names and record them on the right. Based on the sketch, choose a single profile from Figure 12 that best represents the AA overall.



Assigned zones:

1) Tamarix

2) Eucalyptus

3) Castor Bean

4) Willow

5) Ragweed

6) Mulefat

7) Bermuda Grass

8) Arundo

Worksheet for Wetland disturbances and conversions

Has a major disturbance occurred at this wetland?	Yes	No (circled)		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type? NA	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

Stressor Checklist Worksheet

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)	X	X
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)	X	X
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees	X	X
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**	X	
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed	X	X
Excessive runoff from watershed	X	X
Nutrient impaired (PS or Non-PS pollution)	X	X
Heavy metal impaired (PS or Non-PS pollution)	X	X
Pesticides or trace organics impaired (PS or Non-PS pollution)	X	X
Bacteria and pathogens impaired (PS or Non-PS pollution)	X	X
Trash or refuse	X	X
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of treatment of invasive plants adjacent to AA or buffer	X	X
Comments		

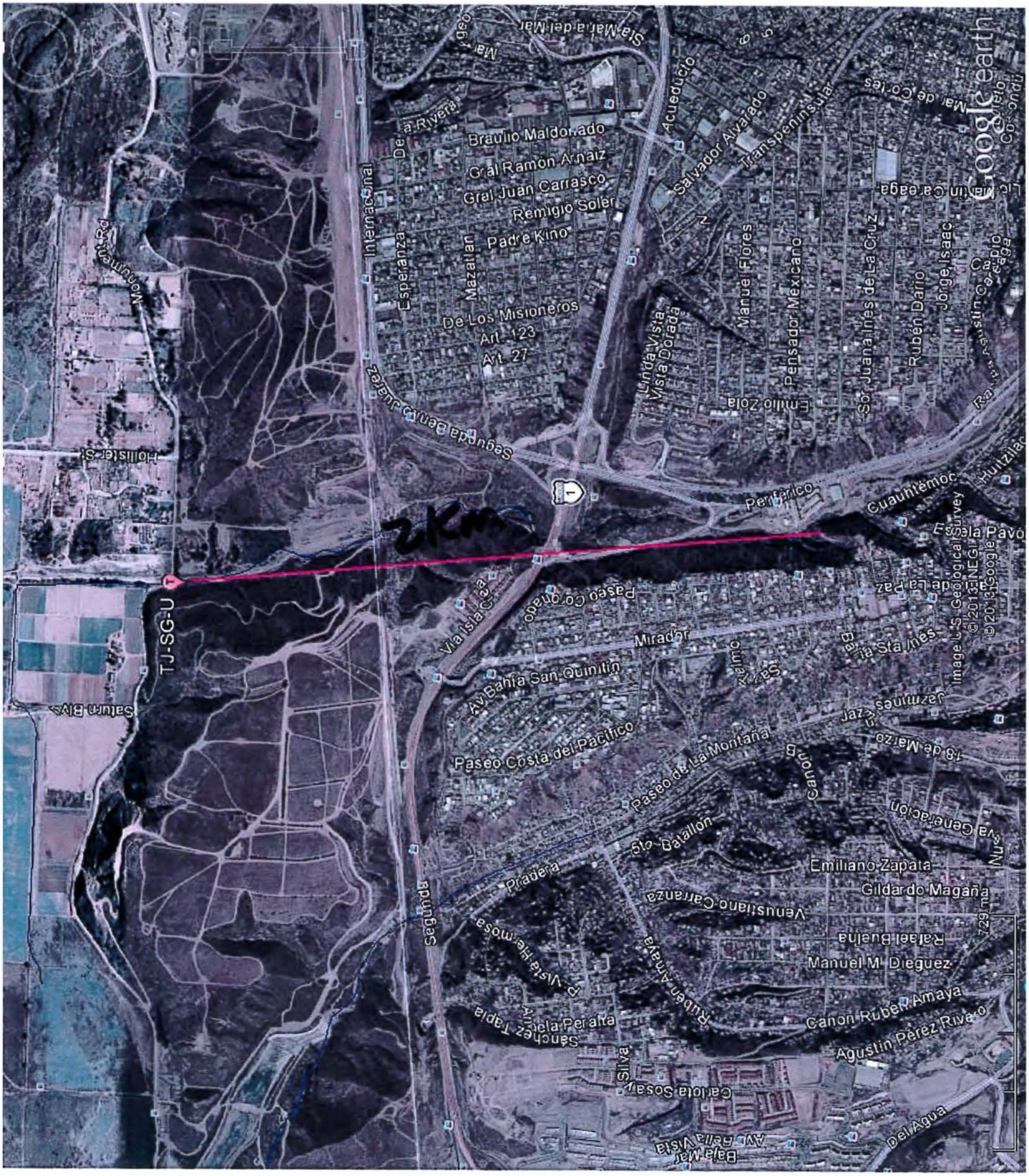
BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present	Significant negative effect on AA
Urban residential	X	X
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming		
Intensive row-crop agriculture	X	
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)	X	
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	X	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

10/13/15


Hollister St
Monument Rd
Saturn Blvd
TJ-SG-J
Google earth
©2013 Google
©2013 INEGI
Image U.S. Geological Survey
150 m


Saturn Blvd
Monument Rd
Hollister St
TJ-SG-U
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
251 m
Google earth

TJ-PC-U
500m
Tijuana River Valley
Hollister St
TJ-SG-U
500m
Internacional
Gral Ramón Arnaiz
Esperanza
2 de Junio
Remigio Soler
Segunda
Los Laureles
Canon del Matadero Norte
Mazatlan
Via Isla Cela
Pradera
Vista Hermosa
Periférico
Art. 27
Misión del Sol
Padre Kino
Mirador
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
500 m
Google earth
Culiacan


2Km
TJ-SG-U
Monument Rd
Hollister St
Saturn Blvd
Internacional
Segunda Benito Juarez
Periférico
Cuauhtémoc
Braulio Maldonado
Gral Ramón Arnaiz
Gral Juan Carrasco
Remigio Soler
Padre Kino
De Los Misioneros
Art. 123
Art. 27
Esperanza
Mazatlán
De la Rivera
Acueducto
Salvador Alvarado
Transpeninsular
Linda Vista
Vista Dorada
Manuel Flores
Pensador Mexicano
Sor Juana Inés de La Cruz
Rubén Darío
Jorge Isaac
Agustín Caregaga
Emilio Zola
Mar de Cortes
Sta María del Mar
Paseo Coronado
Vía Isla Coronado
Mirador
Av Bahía San Quintín
Paseo Costa del Pacífico
Paseo de La Montaña
5to Batallón
Pradera
Segunda
Jazmines
18 de Marzo
Emiliano Zapata
Gildardo Magaña
Venustiano Carranza
Rafael Buelna
Manuel M. Dieguez
Cañón Rubén Amaya
Agustín Pérez Rivero
Rubén Amaya
P. Vista Hermosa
Ángela Peralta
Sánchez Tapia
Silva
Carlota Sosa
Av. Bella Vista
Baja Mar
Del Agua
Huitzilac
Image U.S. Geological Survey
© 2013 INEGI
© 2013 Google
729 m
Google earth

Basic Information Sheet: Riverine Wetlands

Assessment Area Name: TJ PC-D	
Project Name: Tijuana River 401 Cert Dredge	
Assessment Area ID #:	
Project ID #:	**Date:** 10/14/15
Assessment Team Members for This AA:	
JR, TH	
Average Bankfull Width: 5.5	
Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m): 100 m	
Upstream Point Latitude: 32.5579 **Longitude::** -117.1035 **Datum:**	
Downstream Point Latitude: 32.5576 **Longitude:** -117.1045	
Wetland Sub-type: ☐ Confined ☒ Non-confined	
AA Category: ☐ Restoration ☐ Mitigation ☐ Impacted ☐ Ambient ☐ Reference ☐ Training ☒ Other: Dredge Impact Monitoring	
Did the river/stream have flowing water at the time of the assessment? ☒ yes ☐ no	
What is the apparent hydrologic flow regime of the reach you are assessing? The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source. ☒ perennial ☐ intermittent ☐ ephemeral	

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1		Upstream			
2		Middle Left			
3		Middle Right			
4		Downstream			
5					
6					
7					
8					
9					
10					

Site Location Description:

Comments:

4 hrs past low tide

Scoring Sheet: Riverine Wetlands

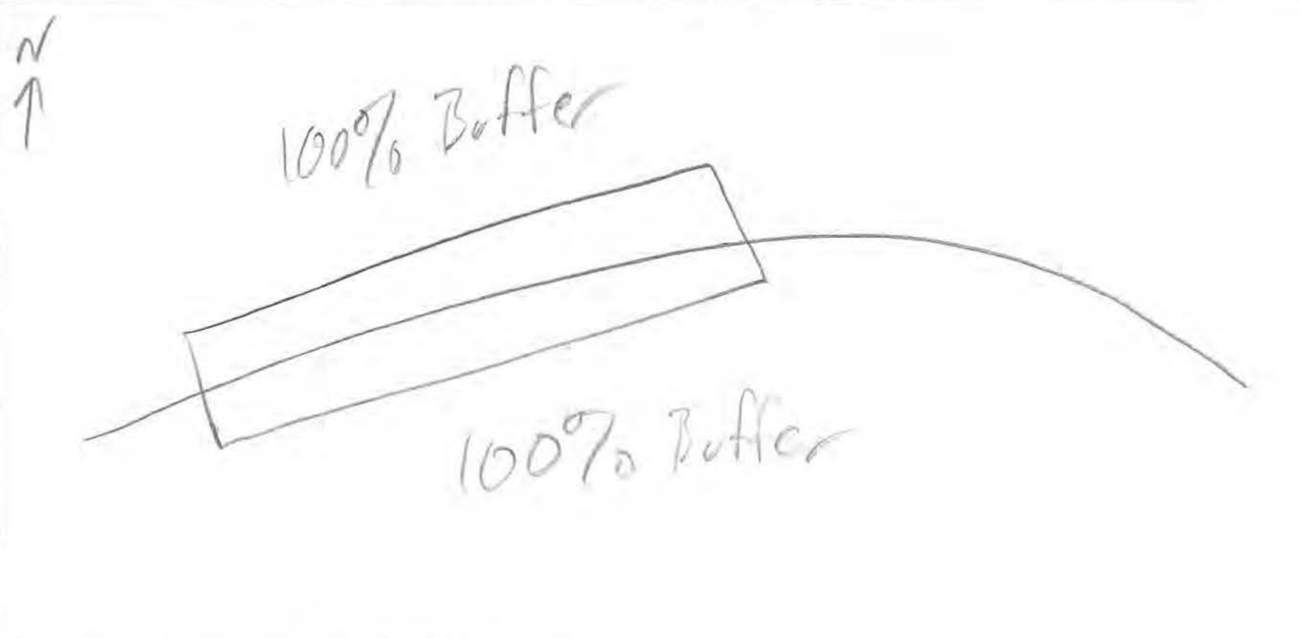
AA Name: TJ-PC-D					**Date:** 10/14/15
Attribute 1: Buffer and Landscape Context (pp. 11-19)					**Comments**
Stream Corridor Continuity (D)			Alpha. A	Numeric 12	
Buffer:					
Buffer submetric A: Percent of AA with Buffer	Alpha. A	Numeric 12			
Buffer submetric B: Average Buffer Width	A	12			
Buffer submetric C: Buffer Condition	B	9			
Raw Attribute Score = D+[C x (A x B)$^{1/2}$]$^{1/2}$				22.4	**Final Attribute Score = (Raw Score/24) x 100** 93.3
Attribute 2: Hydrology (pp. 20-26)					
			Alpha.	Numeric	
Water Source			C	6	
Channel Stability			B	9	
Hydrologic Connectivity			D	3	
Raw Attribute Score = sum of numeric scores				18	**Final Attribute Score = (Raw Score/36) x 100** 50
Attribute 3: Physical Structure (pp. 27-33)					
			Alpha.	Numeric	
Structural Patch Richness			D	3	
Topographic Complexity			C	6	
Raw Attribute Score = sum of numeric scores				9	**Final Attribute Score = (Raw Score/24) x 100** 37.5
Attribute 4: Biotic Structure (pp. 34-41)					
Plant Community Composition (based on sub-metrics A-C)					
Plant Community submetric A: Number of plant layers	Alpha. A	Numeric 12			
Plant Community submetric B: Number of Co-dominant species	B	9			
Plant Community submetric C: Percent Invasion	B	9			
Plant Community Composition Metric *(numeric average of submetrics A-C)*				10	
Horizontal Interspersion			C	6	
Vertical Biotic Structure			B	9	
Raw Attribute Score = sum of numeric scores				25	**Final Attribute Score = (Raw Score/36) x 100** 69.4
Overall AA Score (average of four final Attribute Scores)					62.6

Worksheet for Stream Corridor Continuity Metric for Riverine Wetlands

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA	
Segment No.	Length (m)	Segment No.	Length (m)
1	0	1	0
2		2	
3		3	
4		4	
5		5	
Upstream Total Length	0	Downstream Total Length	0

Percent of AA with Buffer Worksheet

In the space provided below make a quick sketch of the AA, or perform the assessment directly on the aerial imagery; indicate where buffer is present, estimate the percentage of the AA perimeter providing buffer functions, and record the estimate amount in the space provided.



Percent of AA with Buffer: 100 %

Worksheet for calculating average buffer width of AA

Line	Buffer Width (m)
A	250
B	
C	
D	
E	
F	
G	
H	
Average Buffer Width *Round to the nearest integer*	250

Worksheet for Assessing Channel Stability for Riverine Wetlands

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium (4)	☒ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA.
	☒ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it.
	☒ There is leaf litter, thatch, or wrack in most pools (if pools are present).
	☒ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area.
	☐ There is little or no active undercutting or burial of riparian vegetation.
	☐ If mid-channel bars and/or point bars are present, they are not densely vegetated with perennial vegetation.
	☐ Channel bars consist of well-sorted bed material (smaller grain size on the top and downstream end of the bar, larger grain size along the margins and upstream end of the bar).
	☐ There are channel pools, the spacing between pools tends to be regular and the bed is not planar throughout the AA
	☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation (4)	☒ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs.
	☒ There are abundant bank slides or slumps.
	☒ The lower banks are uniformly scoured and not vegetated.
	☒ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel.
	☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation.
	☐ The channel bed appears scoured to bedrock or dense clay.
	☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided).
	☐ The channel has one or more knickpoints indicating headward erosion of the bed.
Indicators of Active Aggradation (1)	☐ There is an active floodplain with fresh splays of coarse sediment (sand and larger that is not vegetated) deposited in the current or previous year.
	☐ There are partially buried living tree trunks or shrubs along the banks.
	☒ The bed is planar (flat or uniform gradient) overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced.
	☐ There are partially buried, or sediment-choked, culverts.
	☐ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour.
	☐ There are avulsion channels on the floodplain or adjacent valley floor.
Overall	☒ **Equilibrium** ☒ **Degradation** ☐ **Aggradation**

Riverine Wetland Entrenchment Ratio Calculation Worksheet

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate midpoints along straight riffles or glides, away from deep pools or meander bends. An attempt should be made to place them at the top, middle, and bottom of the AA.

Steps	Replicate Cross-sections ⟶	TOP	MID	BOT	
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	3.5	7.0	6.0	m
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	0.5	1.0	1.0	m
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	1.0	2.0	2.0	m
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	5.0	9.2	8.0	m
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	1.4	1.3	1.3	
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections. Enter the average result here and use it in Table 13a or 13b.			1.3	

Structural Patch Type Worksheet for Riverine wetlands

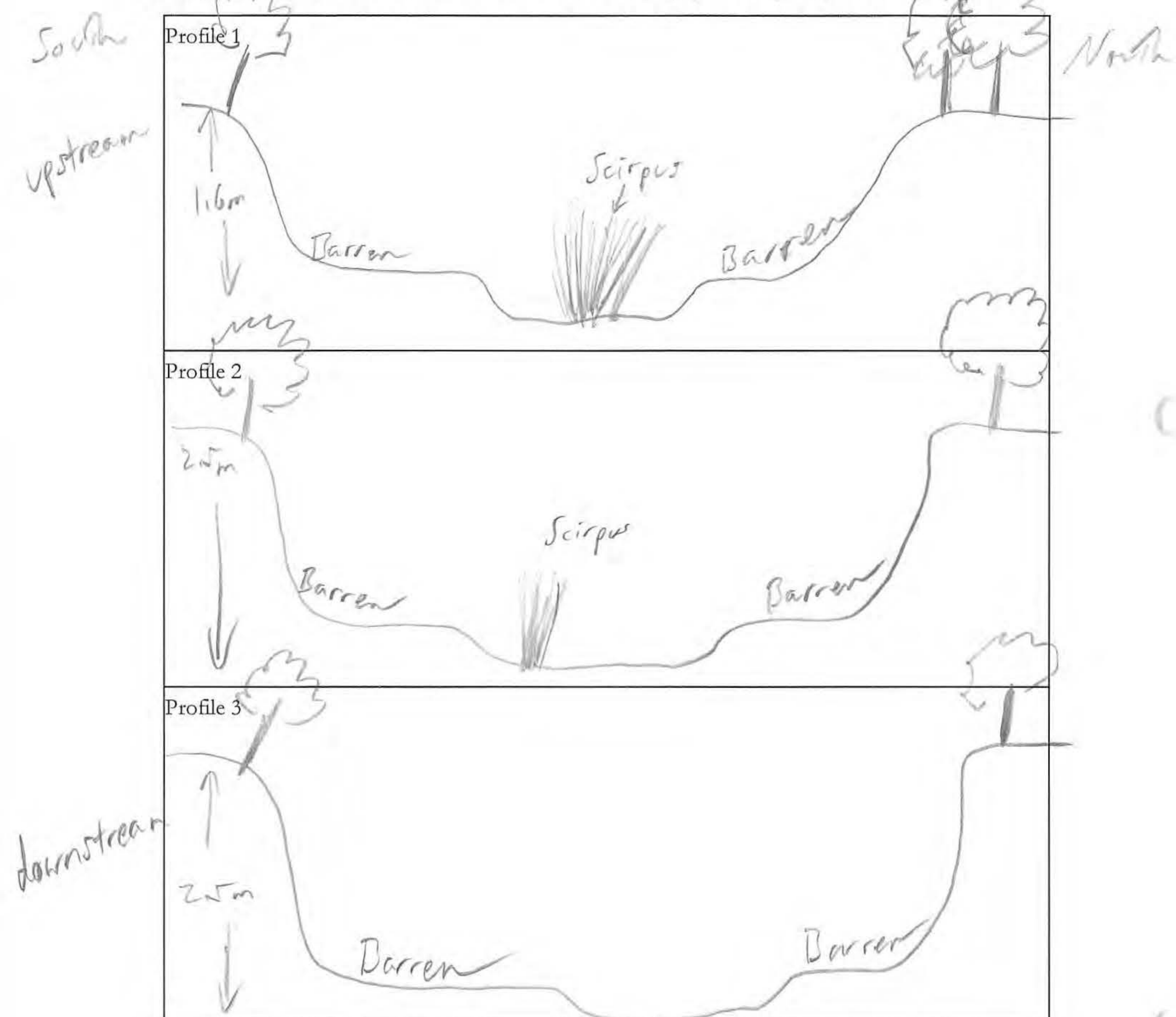
Circle each type of patch that is observed in the AA and enter the total number of observed patches in Table below. In the case of riverine wetlands, their status as confined or non-confined must first be determined (see page 6) to determine with patches are expected in the system (indicated by a "1" in the table below). Any feature onsite should only be counted once as a patch type. If a feature appears to meet the definition of more than one patch type (i.e. swale and secondary channel) the practitioner should choose which patch type best illustrates the feature. Not all features at a site will be patch types.

**Please refer to the CRAM Photo Dictionary at www.cramwetlands.org for photos of each of the following patch types.*

STRUCTURAL PATCH TYPE (circle for presence)	Riverine (Non-confined)	Riverine (Confined)
Minimum Patch Size	**3 m^2**	**3 m^2**
Abundant wrackline or organic debris in channel, on floodplain	1 (circled)	1
Bank slumps or undercut banks in channels or along shoreline	1 (circled)	1
Cobbles and/or Boulders	1	1
Debris jams	1	1
Filamentous macroalgae or algal mats	1 (circled)	1
Large woody debris	1 (circled)	1
Pannes or pools on floodplain	1	N/A
Plant hummocks and/or sediment mounds	1	1
Point bars and in-channel bars	1	1
Pools or depressions in channels (wet or dry channels)	1	1
Riffles or rapids (wet or dry channels)	1	1
Secondary channels on floodplains or along shorelines	1 (circled)	N/A
Standing snags (at least 3 m tall)	1	1
Submerged vegetation	1	N/A
Swales on floodplain or along shoreline	1	N/A
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	1	1
Vegetated islands (mostly above high-water)	1	N/A
Total Possible	**17**	**12**
No. Observed Patch Types (enter here and use in Table 14 below)	5	

Worksheet for AA Topographic Complexity

At three locations along the AA, make a sketch of the profile of the stream from the AA boundary down to its deepest area then back out to the other AA boundary. Try to capture the benches and the intervening micro-topographic relief. To maintain consistency, make drawings at each of the stream hydrologic connectivity measurements, always facing downstream. Include the water level, an arrow at the bankfull contour, and label the benches. Based on these sketches and the profiles in Figure 10, choose a description in Table 16 that best describes the overall topographic complexity of the AA.



Plant Community Metric Worksheet: Co-dominant species richness for Riverine wetlands
(A dominant species represents ≥10% *relative* cover)

Special Note:

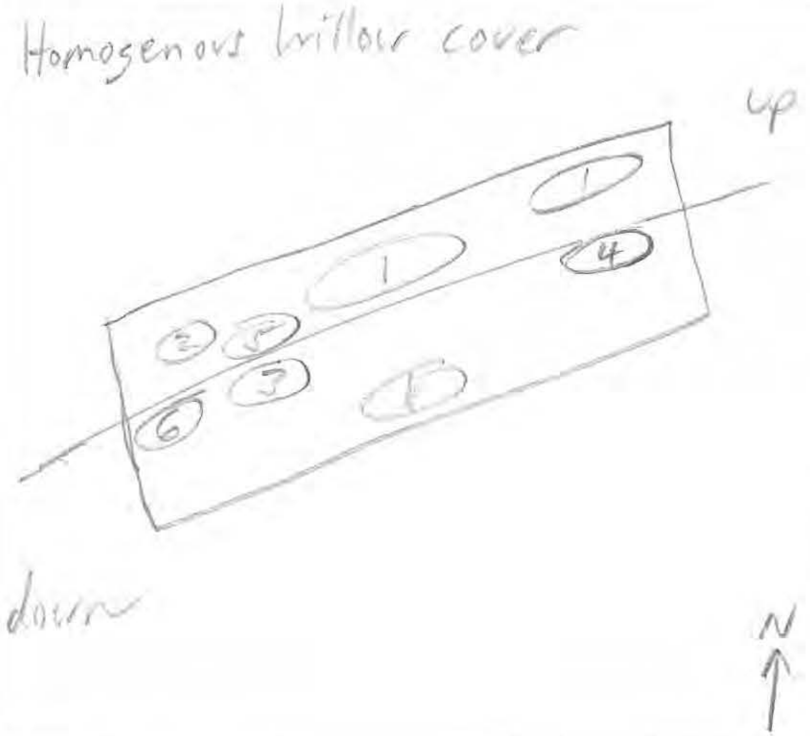
* *Combine the counts of co-dominant species from all layers to identify the total species count. Each plant species is only counted once when calculating the Number of Co-dominant Species and Percent Invasion submetric scores, regardless of the numbers of layers in which it occurs.*

Floating or Canopy-forming (non-confined only)	Invasive?	Short (<0.5 m)	Invasive?
		Celery	N
		Spearscale	N
Medium (0.5-1.5 m)	**Invasive?**	**Tall (1.5-3.0 m)**	**Invasive?**
mulefat	N	Scirpus californica	N
		Mulefat	N
		Elderberry	N
Very Tall (>3.0 m)	**Invasive?**	**Total number of co-dominant species for all layers combined (enter here and use in Table 18)**	9
Arroyo willow	N		
Black willow	N		
Tamarix	Y	**Percent Invasion *Round to the nearest integer* (enter here and use in Table 18)**	22
Arrundo	Y		

Apium graveolens (Celery)
Atriplex triangularis (Spearscale)
Baccharis salicifolia (mulefat)
Sambucus mexicana (Elderberry)
Salix lasiolepis (Arroyo willow)
Salix gooddingii (Black willow)
Tamarix aphylla (Tamarix)
Arundo donax (Arrundo)

Horizontal Interspersion Worksheet.

Use the spaces below to make a quick sketch of the AA in plan view, outlining the major plant zones (this should take no longer than 10 minutes). Assign the zones names and record them on the right. Based on the sketch, choose a single profile from Figure 12 that best represents the AA overall.



Assigned zones:

1) Mulefat
2) Elderberry
3) Tamarix
4) Celery
5) Spearscale
6) Arundo

Worksheet for Wetland disturbances and conversions

Has a major disturbance occurred at this wetland?	Yes	No (circled)		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type? N/A	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

Stressor Checklist Worksheet

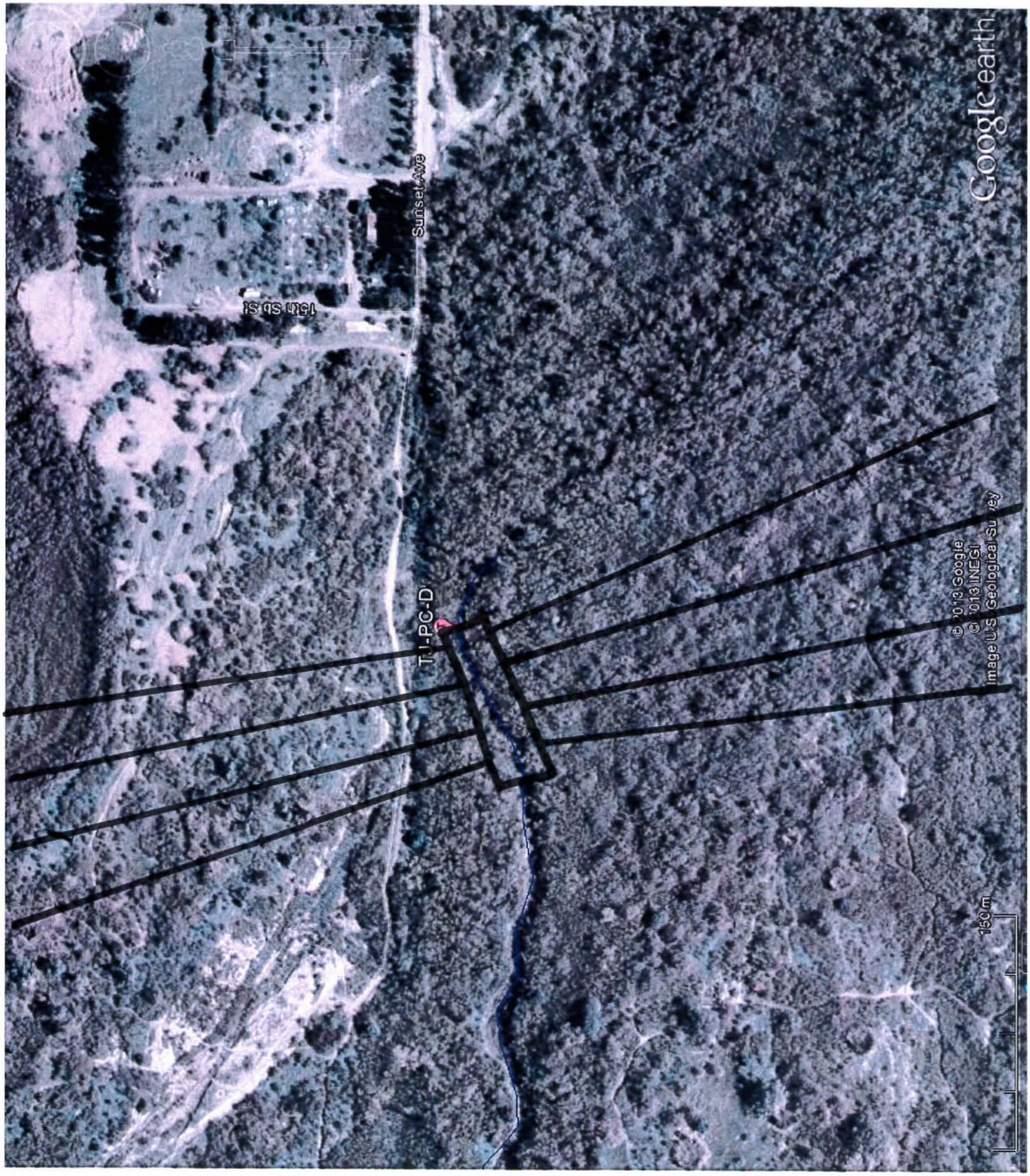
HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)	X	
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees		
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)	X	
Heavy metal impaired (PS or Non-PS pollution)	X	
Pesticides or trace organics impaired (PS or Non-PS pollution)	X	
Bacteria and pathogens impaired (PS or Non-PS pollution)	X	
Trash or refuse	X	
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of treatment of invasive plants adjacent to AA or buffer	X	
Comments		

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present	Significant negative effect on AA
Urban residential	X	
Industrial/commercial		
Military training/Air traffic	X	
Dams (or other major flow regulation or disruption)		
Dryland farming	X	
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)	X	
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	X	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

10/13/15


Sunset Ave
Google earth
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
150 m

500m
TJ-PC-D
15th Sb St
Sunset Ave
500m
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
253 m
Google earth


TJ-PC-D
Sunset Ave
15th Sb St
Saturn Blvd
Boundary Rd
Gatlin St
Saratoga
Leon Ave
Royston Dr
Tamarand Way
Thelborn Way
Tremaine Way
Bubbling Well Dr
Thermal Ave
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© 2013 INEGI
Image U.S. Geological Survey
501 m
Google earth


Nestor
Rimbey Ave
Yorktown St
Catlin St
Cochabamba St
Arequipa St
Bubbling Well
Thermal Ave
Royston Dr
Tamarand Way
Thelborn Way
Tremaine Way
Leon Ave
Boundary Rd
Tocayo Ave
Rodear Rd
Atherton Ave
Corbin St
Katella St
Biola Ave
Otis Vista Rd
15th Sb St
Sunset Ave
Saturn Blvd
TJ-PC-D
TJ-PC-U
2km
Tijuana River Valley
573 m
© 2013 Google
Image U.S. Geological Survey
Google earth

Basic Information Sheet: Riverine Wetlands

Assessment Area Name: TJ - PC - U	
Project Name: Tijuana River 401 Cert Monitoring	
Assessment Area ID #:	
Project ID #:	**Date:** 10/13/15
Assessment Team Members for This AA:	
JR, TH	
Average Bankfull Width: 17.0 m	
Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m): 160 m	
Upstream Point Latitude: 32.5507 **Longitude:** -117.0811	
Downstream Point Latitude: 32.5512 **Longitude:** -117.0826	
Wetland Sub-type: ☐ Confined ☒ Non-confined	
AA Category: ☐ Restoration ☐ Mitigation ☐ Impacted ☐ Ambient ☐ Reference ☐ Training ☒ Other: Dredge Impact Monitoring	
Did the river/stream have flowing water at the time of the assessment? ☒ yes ☐ no	
What is the apparent hydrologic flow regime of the reach you are assessing? The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source. ☒ perennial ☐ intermittent ☐ ephemeral	

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1		Upstream			
2		Middle Left			
3		Middle Right			
4		Downstream			
5					
6					
7					
8					
9					
10					

Site Location Description:

Comments:

Photo order LU, LD, UU, UD, MU, MD

Scoring Sheet: Riverine Wetlands

AA Name: TJ River Pilot Upstream					Date: 10/13/15	
Attribute 1: Buffer and Landscape Context (pp. 11-19)					**Comments**	
			Alpha.	Numeric		
Stream Corridor Continuity (D)			A	12		
Buffer:						
	Alpha.	Numeric				
Buffer submetric A: Percent of AA with Buffer	A	12				
Buffer submetric B: Average Buffer Width	A	12				
Buffer submetric C: Buffer Condition	B	9				
Raw Attribute Score = D+[C x (A x B)^{½}]^{½}				22.4	**Final Attribute Score = (Raw Score/24) x 100**	93.3
Attribute 2: Hydrology (pp. 20-26)						
			Alpha.	Numeric		
Water Source			C	6		
Channel Stability			B	9		
Hydrologic Connectivity			C	6		
Raw Attribute Score = sum of numeric scores				21	**Final Attribute Score = (Raw Score/36) x 100**	58.3
Attribute 3: Physical Structure (pp. 27-33)						
			Alpha.	Numeric		
Structural Patch Richness			D	3		
Topographic Complexity			C	6		
Raw Attribute Score = sum of numeric scores				9	**Final Attribute Score = (Raw Score/24) x 100**	37.5
Attribute 4: Biotic Structure (pp. 34-41)						
Plant Community Composition (based on sub-metrics A-C)						
	Alpha.	Numeric				
Plant Community submetric A: Number of plant layers	A	12				
Plant Community submetric B: Number of Co-dominant species	D	3				
Plant Community submetric C: Percent Invasion	B	6				
Plant Community Composition Metric *(numeric average of submetrics A-C)*				8		
Horizontal Interspersion			C	6		
Vertical Biotic Structure			C	6		
Raw Attribute Score = sum of numeric scores				20	**Final Attribute Score = (Raw Score/36) x 100**	55.6
Overall AA Score (average of four final Attribute Scores)					61.2	

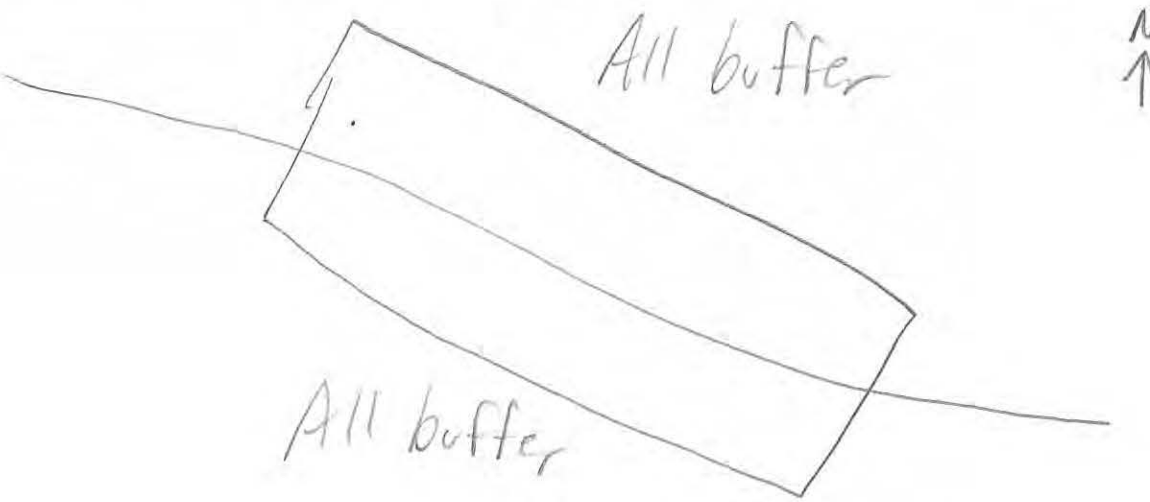
Worksheet for Stream Corridor Continuity Metric for Riverine Wetlands

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA	
Segment No.	Length (m)	Segment No.	Length (m)
1	0	1	20
2		2	
3	↓	3	↓
4		4	
5		5	
Upstream Total Length	0	Downstream Total Length	20

Road

Percent of AA with Buffer Worksheet

In the space provided below make a quick sketch of the AA, or perform the assessment directly on the aerial imagery; indicate where buffer is present, estimate the percentage of the AA perimeter providing buffer functions, and record the estimate amount in the space provided.



Percent of AA with Buffer: 100 %

Worksheet for calculating average buffer width of AA

Line	Buffer Width (m)
A	250
B	250
C	250
D	250
E	180
F	195
G	200
H	225
Average Buffer Width *Round to the nearest integer*	225

Worksheet for Assessing Channel Stability for Riverine Wetlands

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium (4)	☒ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA.
	☒ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it.
	☒ There is leaf litter, thatch, or wrack in most pools (if pools are present).
	☒ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area.
	☐ There is little or no active undercutting or burial of riparian vegetation.
	☐ If mid-channel bars and/or point bars are present, they are not densely vegetated with perennial vegetation.
	☐ Channel bars consist of well-sorted bed material (smaller grain size on the top and downstream end of the bar, larger grain size along the margins and upstream end of the bar).
	☐ There are channel pools, the spacing between pools tends to be regular and the bed is not planar throughout the AA
	☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation (1)	☐ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs.
	☐ There are abundant bank slides or slumps.
	☐ The lower banks are uniformly scoured and not vegetated.
	☒ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel.
	☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation.
	☐ The channel bed appears scoured to bedrock or dense clay.
	☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided).
	☐ The channel has one or more knickpoints indicating headward erosion of the bed.
Indicators of Active Aggradation (2)	☐ There is an active floodplain with fresh splays of coarse sediment (sand and larger that is not vegetated) deposited in the current or previous year.
	☒ There are partially buried living tree trunks or shrubs along the banks.
	☒ The bed is planar (flat or uniform gradient) overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced.
	☐ There are partially buried, or sediment-choked, culverts.
	☐ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour.
	☐ There are avulsion channels on the floodplain or adjacent valley floor.
Overall	☒ **Equilibrium** ☐ **Degradation** ☐ **Aggradation**

Riverine Wetland Entrenchment Ratio Calculation Worksheet

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate midpoints along straight riffles or glides, away from deep pools or meander bends. An attempt should be made to place them at the top, middle, and bottom of the AA.

Steps	Replicate Cross-sections ⟶	TOP	MID	BOT	
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	18	17	17	m
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	2.5	2.0	2.5	m *
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	5.0	4.0	5.0	m
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	28	25	29	m
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	1.6	1.5	1.7	
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections. Enter the average result here and use it in Table 13a or 13b.			1.6	

* estimate. too deep, soft bottom to determine depth

Structural Patch Type Worksheet for Riverine wetlands

Circle each type of patch that is observed in the AA and enter the total number of observed patches in Table below. In the case of riverine wetlands, their status as confined or non-confined must first be determined (see page 6) to determine with patches are expected in the system (indicated by a "1" in the table below). Any feature onsite should only be counted once as a patch type. If a feature appears to meet the definition of more than one patch type (i.e. swale and secondary channel) the practitioner should choose which patch type best illustrates the feature. Not all features at a site will be patch types.

**Please refer to the CRAM Photo Dictionary at www.cramwetlands.org for photos of each of the following patch types.*

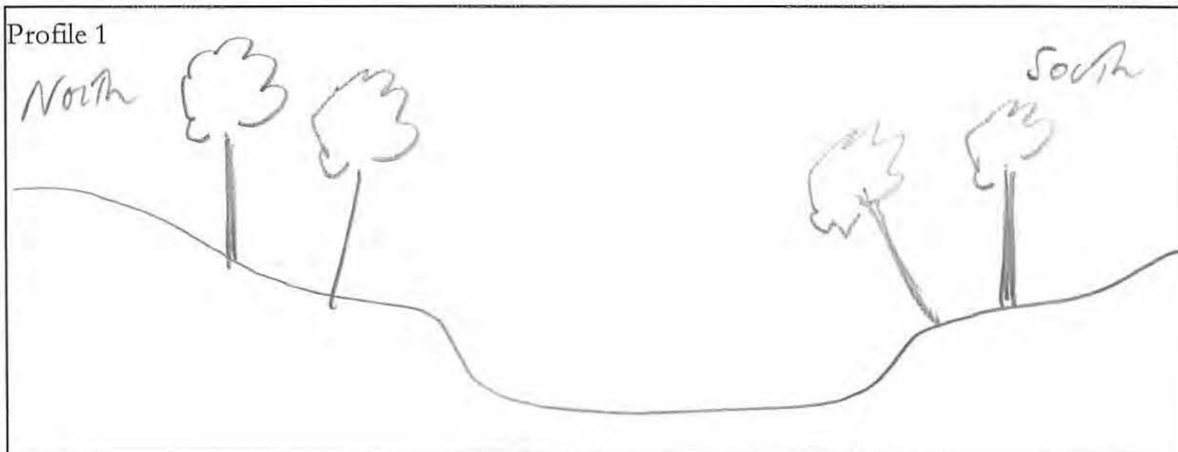
STRUCTURAL PATCH TYPE (circle for presence)	**Riverine (Non-confined)**	**Riverine (Confined)**
Minimum Patch Size	**3 m^2**	**3 m^2**
Abundant wrackline or organic debris in channel, on floodplain	1	1
Bank slumps or undercut banks in channels or along shoreline	1	1
Cobbles and/or Boulders	1	1
Debris jams	1	1
Filamentous macroalgae or algal mats	1	1
Large woody debris	1	1
Pannes or pools on floodplain	1	N/A
Plant hummocks and/or sediment mounds	1	1
Point bars and in-channel bars	1	1
Pools or depressions in channels (wet or dry channels)	1	1
Riffles or rapids (wet or dry channels)	1	1
Secondary channels on floodplains or along shorelines	1	N/A
Standing snags (at least 3 m tall)	1	1
Submerged vegetation	1	N/A
Swales on floodplain or along shoreline	1	N/A
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	1	1
Vegetated islands (mostly above high-water)	1	N/A
Total Possible	**17**	**12**
No. Observed Patch Types (enter here and use in Table 14 below)	4	

Worksheet for AA Topographic Complexity

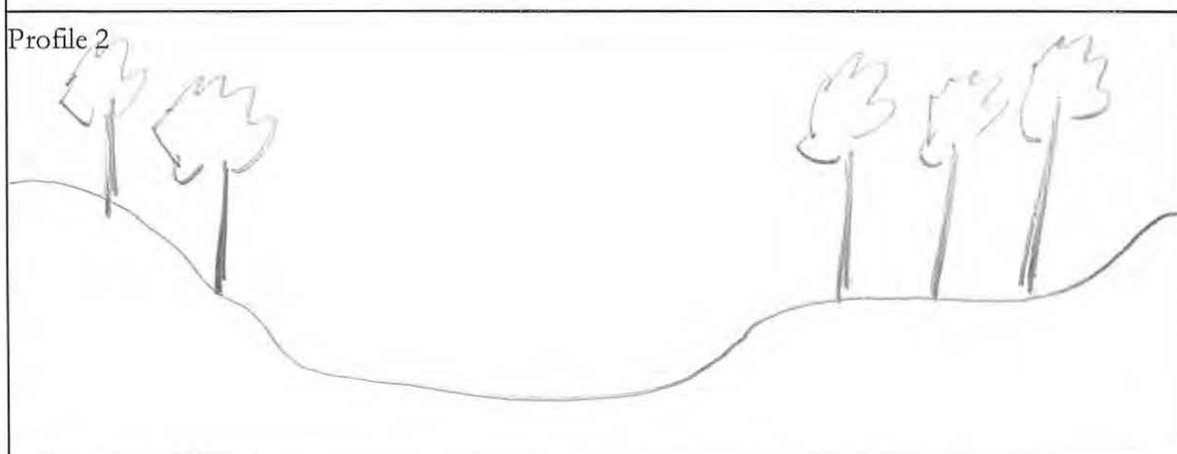
At three locations along the AA, make a sketch of the profile of the stream from the AA boundary down to its deepest area then back out to the other AA boundary. Try to capture the benches and the intervening micro-topographic relief. To maintain consistency, make drawings at each of the stream hydrologic connectivity measurements, always facing downstream. Include the water level, an arrow at the bankfull contour, and label the benches. Based on these sketches and the profiles in Figure 10, choose a description in Table 16 that best describes the overall topographic complexity of the AA.

upstream

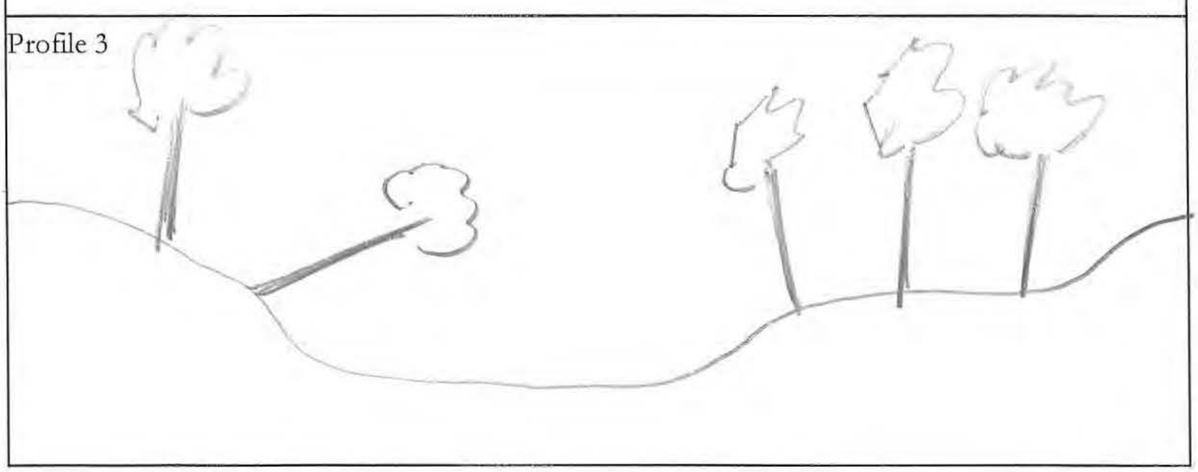
Profile 1



Profile 2



Profile 3



down stream

Plant Community Metric Worksheet: Co-dominant species richness for Riverine wetlands
(A dominant species represents ≥10% *relative* cover)

Special Note:

** Combine the counts of co-dominant species from all layers to identify the total species count. Each plant species is only counted once when calculating the Number of Co-dominant Species and Percent Invasion submetric scores, regardless of the numbers of layers in which it occurs.*

Floating or Canopy-forming (non-confined only)	Invasive?	Short (<0.5 m)	Invasive?
		Castor Bean (Ricinus communis)	Y

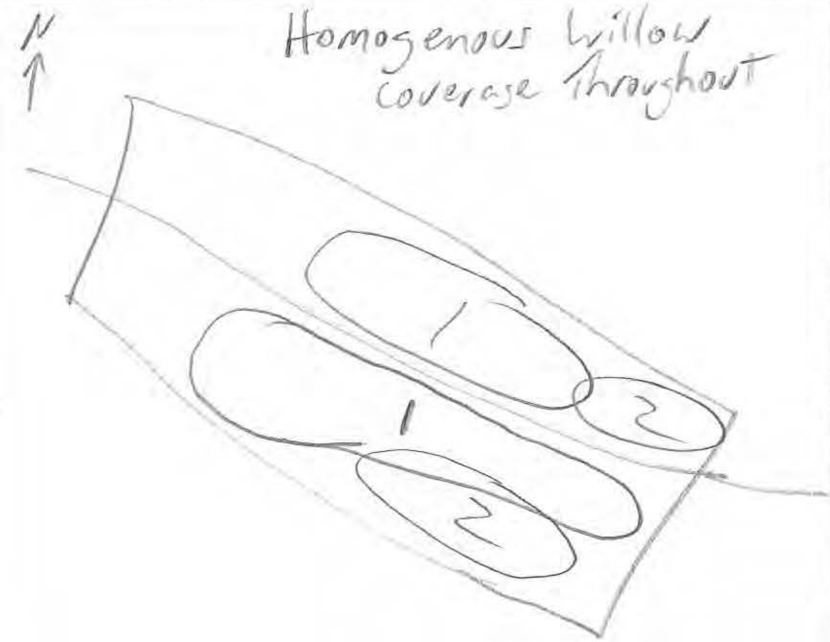
Medium (0.5-1.5 m)	Invasive?	Tall (1.5-3.0 m)	Invasive?
Castor Bean	Y	Castor Bean	Y
mulefat (Baccharis salicifolia)	N	mulefat	N

Very Tall (>3.0 m)	Invasive?		
Black willow (Salix gooddingii)	N	Total number of co-dominant species for all layers combined (enter here and use in Table 18)	5
Arroyo willow (Salix lasiolepis)	N		
Castor Bean	Y	Percent Invasion *Round to the nearest integer* (enter here and use in Table 18)	20
Arundo donax	Y		

Many young (< 6in) Castor Bean

Horizontal Interspersion Worksheet.

Use the spaces below to make a quick sketch of the AA in plan view, outlining the major plant zones (this should take no longer than 10 minutes). Assign the zones names and record them on the right. Based on the sketch, choose a single profile from Figure 12 that best represents the AA overall.



Assigned zones:

1) Carter Beam

2) Mulefat

3)

4)

5)

6)

Worksheet for Wetland disturbances and conversions

Has a major disturbance occurred at this wetland?	Yes	No (circled)		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type? N/A	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

Stressor Checklist Worksheet

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)	X	X
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees		
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		

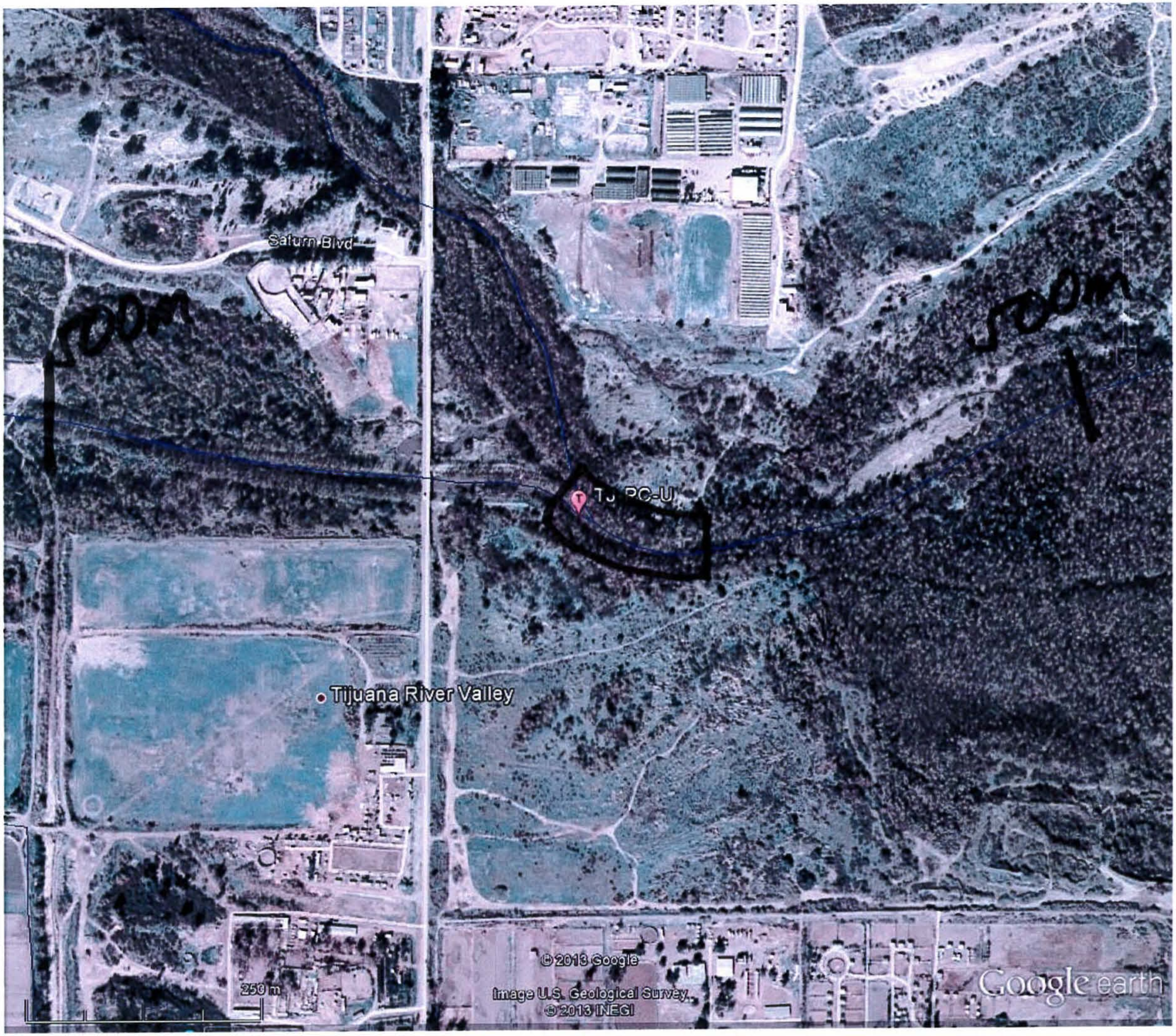
PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed	X	
Nutrient impaired (PS or Non-PS pollution)	X	X
Heavy metal impaired (PS or Non-PS pollution)	X	X
Pesticides or trace organics impaired (PS or Non-PS pollution)	X	X
Bacteria and pathogens impaired (PS or Non-PS pollution)	X	X
Trash or refuse	X	X
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of treatment of invasive plants adjacent to AA or buffer	X	X
Comments		

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present	Significant negative effect on AA
Urban residential	X	
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries	X	
Commercial feedlots	X	
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)	X	
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	X	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

10/13/15

Google earth
TJ-FC-U
© 2013 Google
Image U.S. Geological Survey
© 2013 INEGI
Hollister St
Saturn Blvd
150 m



500m
500m
Saturn Blvd
Tijuana River Valley
250 m
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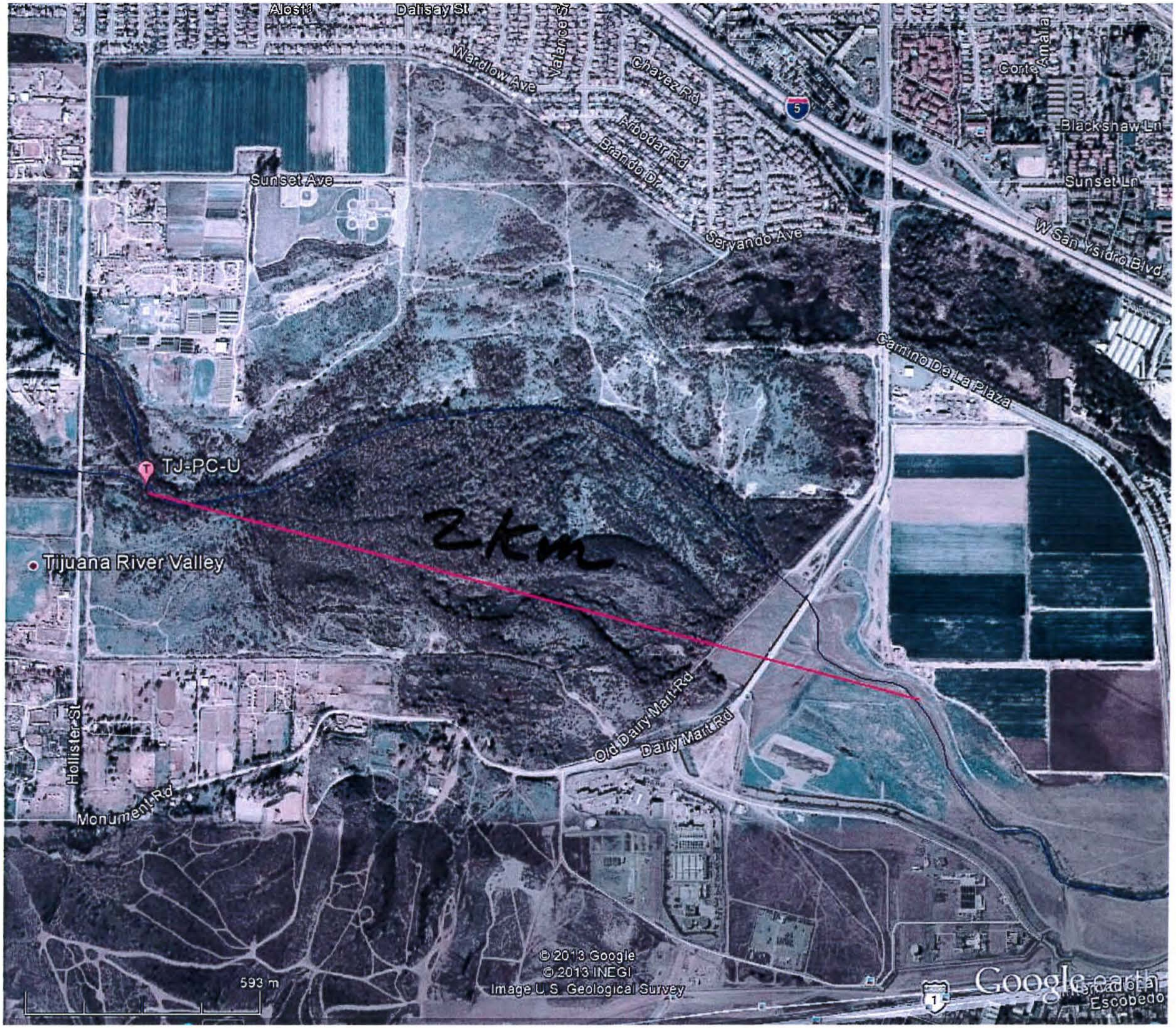
Image U.S. Geological Survey
© 2013 INEGI
Google earth


Wardlow Ave
Chavez Rd
Arbodar Rd
Brando Dr
Sunset Ave
Saturn Blvd
TJ-PC-U
Tijuana River Valley
Hollister St
Old Dairy Mart Rd
TJ-SG-U
499 m
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
Google earth


Alosta
Dalisay St
Wardlow Ave
Valance St
Chavez Rd
Arbodar Rd
Brando Dr
Corte Amala
Blackshaw Ln
Sunset Ln
W San Ysidro Blvd
5
Sunset Ave
Servando Ave
Camino De La Plaza
TJ-PC-U
2km
Tijuana River Valley
Old Dairy Mart Rd
Dairy Mart Rd
Hollister St
Monument Rd
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
593 m
1
Google earth
Escobedo

Field Data Log Sheet

Site ID TJ-S6-U **Watershed** Tijuana **Field Crew** JR / TH **Date** 10/13/15

Site-Specific Event # Wet Weather [ ] Dry Weather [X] **Time** [ ]

ATMOSPHERIC & OCEANIC CONDITIONS

Weather	(Sunny)	Partly Cloudy	Overcast	Fog	Raining	Drizzle
Last Rain	(> 72 Hours)	< 72 Hours	**Rainfall**	None	< 0.1"	> 0.1"
Tide	High	Mid	Low	Rising ↑	Falling ↓	
Flow	Flowing	Ponded	(DRY)			

NA (Tide)

SAMPLE CHARACTERISTICS

N/A

Odor	None	Musty	Rotten Eggs	Chemical	Sewage	Other_____		
Color	None	Yellow	Brown	White	Gray	Other_____		
Clarity	Clear	Slightly Cloudy	Opaque	Other_____				
Floatables	None	Trash	Bubbles/Foam	Sheen	Other_____			
Deposits	None	Sediment/Gravel	Fine Particles	Stains	Oily Deposits	Other_____		
Vegetation	None	Limited	Normal	Excessive	Other_____			
Biology	None	Insects	Algae	Snail	Seaweed	Mollusk	Crustacean	Other_____

FIELD MEASUREMENTS

NA

Temp(°C) [ ] **Sp Conduct (µS/cm)** [ ] **pH** [ ]

Turbidity (NTU) [ ] **Salinity (ppt)** [ ] **DO (mg/L)** [ ]

SAMPLE COLLECTION

Sample Type	Date	Time	Sample ID
Water			

NOTES/COMMENTS

Channel was dry. No samples taken.

Field Data Log Sheet

Site ID TJPCD **Watershed** Tijuana **Field Crew** JR, TV **Date** 10/14/15

Site-Specific Event # Wet Weather [ ] Dry Weather [X] **Time** 0635

ATMOSPHERIC & OCEANIC CONDITIONS

Weather	Sunny, (Partly Cloudy), Overcast, Fog, Raining, Drizzle
Last Rain	(> 72 Hours), < 72 Hours — **Rainfall** None, < 0.1", > 0.1"
Tide	High, Mid, (Low), (Rising ↑), Falling ↓
Flow	(Flowing), Ponded

SAMPLE CHARACTERISTICS

Odor	(None), Musty, Rotten Eggs, Chemical, Sewage, Other____
Color	None, (Yellow), Brown, White, Gray, Other____
Clarity	Clear, (Slightly Cloudy), Opaque, Other____
Floatables	(None), Trash, Bubbles/Foam, Sheen, Other____
Deposits	(None), Sediment/Gravel, Fine Particles, Stains, Oily Deposits, Other____
Vegetation	None, Limited, (Normal), Excessive, Other____
Biology	(None), Insects, Algae, Snail, Seaweed, Mollusk, Crustacean, Other____

FIELD MEASUREMENTS

Temp(°C) 19.9 **Sp Conduct (µS/cm)** 6304 **pH** 7.21

Turbidity (NTU) 6.22 **Salinity (ppt)** 3.4 **DO (mg/L)** 1.1

SAMPLE COLLECTION

Sample Type	Date	Time	Sample ID
Water			
TJPCD1014I5	10/14/15	0630	

NOTES/COMMENTS

Although low tide at water still moving out of channel

Field Data Log Sheet

Site ID TJ-PC-U **Watershed** Tijuana **Field Crew** JR, TH **Date** 10/13/15

Site-Specific Event # Wet Weather [ ] Dry Weather [X] **Time** 1215

ATMOSPHERIC & OCEANIC CONDITIONS

Weather	(Sunny)	Partly Cloudy	Overcast	Fog	Raining	Drizzle
Last Rain	(> 72 Hours)	< 72 Hours	**Rainfall**	None	< 0.1"	> 0.1"
Tide	High	(Mid)	Low	Rising ↑	Falling ↓	
Flow	Flowing	(Ponded)				

SAMPLE CHARACTERISTICS

Odor	None	Musty	(Rotten Eggs)	Chemical	Sewage	Other___		
Color	None	Yellow	(Brown)	White	Gray	Other___		
Clarity	Clear	Slightly Cloudy	(Opaque)	Other___				
Floatables	None	Trash	Bubbles/Foam	Sheen	Other Algae/Duckweed			
Deposits	(None)	Sediment/Gravel	Fine Particles	Stains	Oily Deposits	Other___		
Vegetation	None	Limited	(Normal)	Excessive	Other___			
Biology	(None)	Insects	Algae	Snail	Seaweed	Mollusk	Crustacean	Other___

FIELD MEASUREMENTS

Temp(°C) 23.8 **Sp Conduct (µS/cm)** 1348 **pH** 7.71

Turbidity (NTU) 8.33 **Salinity (ppt)** 0.67 **DO (mg/L)** 1.4

SAMPLE COLLECTION

Sample Type	Date	Time	Sample ID
Water	10/13/15	1215	TJPCU 101315

NOTES/COMMENTS

Sediment Sampling Fieldsheet for Tijuana River Estuary

Date: ~~10/12/2015~~ 10/14/15
Personnel: JR, TH
Weather: Clear
Time / Height low tide: 15:39pm : +0.4 feet
Time / Height high tide: 09:20am : +5.5 feet

Station ID	Time	Grab #	Water Depth (m)	Penetration Depth (cm)	% Surface Intact	Overlying Water (Y/N)?	Acceptable (Y/N)?*	Sed Type	Color	Odor	Photo ID
TJPCD-01	0650	1	10cm	10cm	[illegible]	[illegible]	y	[illegible]	blk	[illegible]	yes
TJ PCD-02	0710	1	10cm	9cm	[illegible]	[illegible]	y	silt w/ sed	[illegible]	[illegible]	[illegible]
TJ PCD-03	[illegible]	1	[illegible]	7cm	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

* Acceptability criteria: minimum 5-cm penetration, even sample surface, minimal disturbance/high % surface intact, overlying water present

** Record all grab attempts

Notes: Even at 0745, water still [illegible] w/ [illegible] [illegible] [illegible]

August 10, 2016 Event

Basic Information Sheet: Riverine Wetlands

Assessment Area Name: Smugglers Gulch
Project Name: TJ 401C
Assessment Area ID #:
Project ID #: | **Date:** 8/10/16
Assessment Team Members for This AA: JR, TA

Average Bankfull Width: 8.3

Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m): 150

Upstream Point Latitude: 32.5455 **Longitude:** -117.0882

Downstream Point Latitude: 32.5436 **Longitude:** -117.0884

Wetland Sub-type:

☐ Confined [x] Non-confined

AA Category:

☐ Restoration ☐ Mitigation ☐ Impacted ☐ Ambient ☐ Reference ☐ Training

[x] Other: Dredge Impact Monitoring

Did the river/stream have flowing water at the time of the assessment? ☐ yes [x] no

What is the apparent hydrologic flow regime of the reach you are assessing?

The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source.

☐ perennial ☐ intermittent [x] ephemeral.

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1		Upstream			
2		Middle Left			
3		Middle Right			
4		Downstream			
5					
6					
7					
8					
9					
10					

Site Location Description:

Comments:

Notified by City That The County had come Through The site and cleared channel of sediment and vegetation

Scoring Sheet: Riverine Wetlands

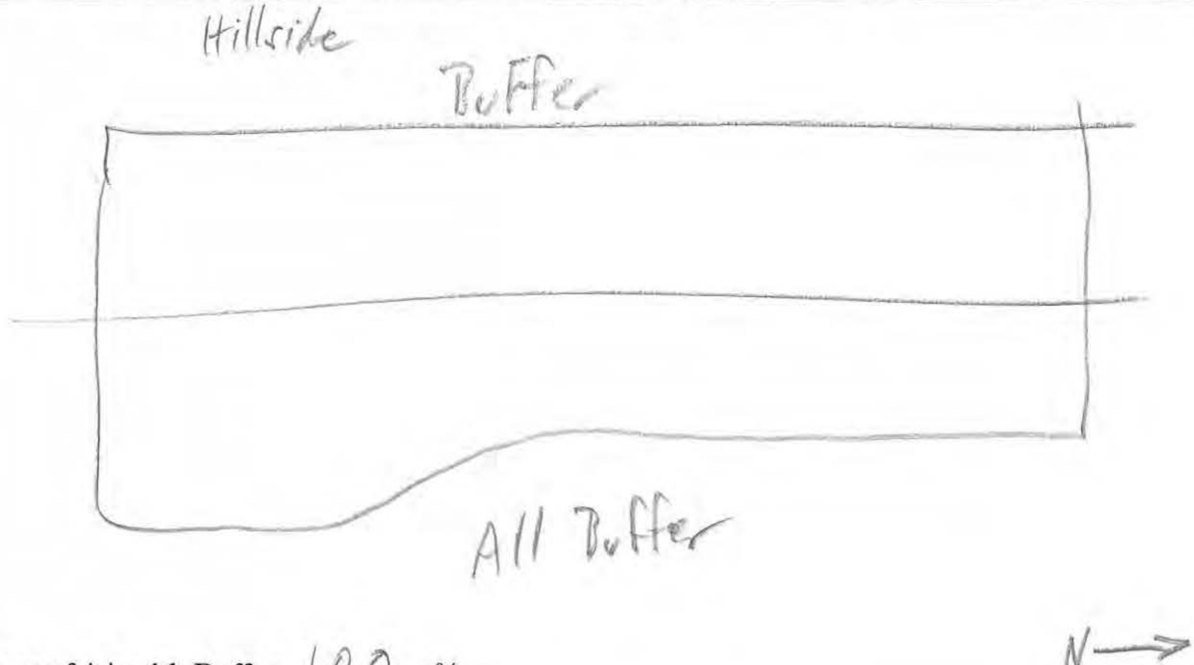
AA Name: Smugglers Gulch Upstream				Date: 8/10/16	
Attribute 1: Buffer and Landscape Context (pp. 11-19)				**Comments**	
		Alpha.	Numeric		
Stream Corridor Continuity (D)		A	12		
Buffer:					
Buffer submetric A: Percent of AA with Buffer	Alpha. A	Numeric 12			
Buffer submetric B: Average Buffer Width	B	9			
Buffer submetric C: Buffer Condition	C	6			
Raw Attribute Score = D+[C x (A x B)$^{1/2}$]$^{1/2}$			19.9	**Final Attribute Score = (Raw Score/24) x 100**	82.9
Attribute 2: Hydrology (pp. 20-26)					
		Alpha.	Numeric		
Water Source		C	6		
Channel Stability		C	6		
Hydrologic Connectivity		D	3		
Raw Attribute Score = sum of numeric scores			15	**Final Attribute Score = (Raw Score/36) x 100**	41.7
Attribute 3: Physical Structure (pp. 27-33)					
		Alpha.	Numeric		
Structural Patch Richness		D	3		
Topographic Complexity		C	6		
Raw Attribute Score = sum of numeric scores			9	**Final Attribute Score = (Raw Score/24) x 100**	37.5
Attribute 4: Biotic Structure (pp. 34-41)					
Plant Community Composition (based on sub-metrics A-C)					
Plant Community submetric A: Number of plant layers	Alpha. A	Numeric 12			
Plant Community submetric B: Number of Co-dominant species	B	9			
Plant Community submetric C: Percent Invasion	D	3			
Plant Community Composition Metric *(numeric average of submetrics A-C)*			8		
Horizontal Interspersion		C	6		
Vertical Biotic Structure		D	3		
Raw Attribute Score = sum of numeric scores			17	**Final Attribute Score = (Raw Score/36) x 100**	47.2
Overall AA Score (average of four final Attribute Scores)				52.3	

Worksheet for Stream Corridor Continuity Metric for Riverine Wetlands

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA	
Segment No.	Length (m)	Segment No.	Length (m)
1	0	1	20
2	↓	2	↓
3		3	
4		4	
5		5	
Upstream Total Length	0	Downstream Total Length	20

Percent of AA with Buffer Worksheet

In the space provided below make a quick sketch of the AA, or perform the assessment directly on the aerial imagery; indicate where buffer is present, estimate the percentage of the AA perimeter providing buffer functions, and record the estimate amount in the space provided.



Percent of AA with Buffer: 100 %

Worksheet for calculating average buffer width of AA

Line	Buffer Width (m)
A	75
B	150
C	150
D	145
E	250
F	↓
G	
H	
Average Buffer Width *Round to the nearest integer*	188

Worksheet for Assessing Channel Stability for Riverine Wetlands

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium	☒ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA. ☐ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it. ☐ There is leaf litter, thatch, or wrack in most pools (if pools are present). ☐ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area. ☐ There is little or no active undercutting or burial of riparian vegetation. ☐ If mid-channel bars and/or point bars are present, they are not densely vegetated with perennial vegetation. ☐ Channel bars consist of well-sorted bed material (smaller grain size on the top and downstream end of the bar, larger grain size along the margins and upstream end of the bar). ☐ There are channel pools, the spacing between pools tends to be regular and the bed is not planar throughout the AA ☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation	☐ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs. ☐ There are abundant bank slides or slumps. ☐ The lower banks are uniformly scoured and not vegetated. ☐ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel. ☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation. ☐ The channel bed appears scoured to bedrock or dense clay. ☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided). ☐ The channel has one or more knickpoints indicating headward erosion of the bed.
Indicators of Active Aggradation	☒ There is an active floodplain with fresh splays of coarse sediment (sand and larger that is not vegetated) deposited in the current or previous year. ☒ There are partially buried living tree trunks or shrubs along the banks. ☒ The bed is planar (flat or uniform gradient) overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced. ☒ There are partially buried, or sediment-choked, culverts. ☒ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour. ☐ There are avulsion channels on the floodplain or adjacent valley floor.
Overall	☐ **Equilibrium** ☐ **Degradation** ☒ **Aggradation**

Riverine Wetland Entrenchment Ratio Calculation Worksheet

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate midpoints along straight riffles or glides, away from deep pools or meander bends. An attempt should be made to place them at the top, middle, and bottom of the AA.

Steps	Replicate Cross-sections ⟶	TOP	MID	BOT
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	9.1	9.1	6.7
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	0.2	0.2	0.2
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	0.4	0.4	0.4
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	10.6	10.8	8.1
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	1.16	1.19	1.21
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections. Enter the average result here and use it in Table 13a or 13b.			1.19

Structural Patch Type Worksheet for Riverine wetlands

Circle each type of patch that is observed in the AA and enter the total number of observed patches in Table below. In the case of riverine wetlands, their status as confined or non-confined must first be determined (see page 6) to determine with patches are expected in the system (indicated by a "1" in the table below). Any feature onsite should only be counted once as a patch type. If a feature appears to meet the definition of more than one patch type (i.e. swale and secondary channel) the practitioner should choose which patch type best illustrates the feature. Not all features at a site will be patch types.

**Please refer to the CRAM Photo Dictionary at www.cramwetlands.org for photos of each of the following patch types.*

STRUCTURAL PATCH TYPE (circle for presence)	Riverine (Non-confined)	Riverine (Confined)
Minimum Patch Size	**3 m^2**	**3 m^2**
Abundant wrackline or organic debris in channel, on floodplain	1	1
Bank slumps or undercut banks in channels or along shoreline	1	1
Cobbles and/or Boulders	1	1
Debris jams	1	1
Filamentous macroalgae or algal mats	1	1
Large woody debris	1	1
Pannes or pools on floodplain	1	N/A
Plant hummocks and/or sediment mounds	1	1
Point bars and in-channel bars	1	1
Pools or depressions in channels (wet or dry channels)	1	1
Riffles or rapids (wet or dry channels)	1	1
Secondary channels on floodplains or along shorelines	1	N/A
Standing snags (at least 3 m tall)	1	1
Submerged vegetation	1	N/A
Swales on floodplain or along shoreline	1	N/A
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	1	1
Vegetated islands (mostly above high-water)	1	N/A
Total Possible	17	12
No. Observed Patch Types (enter here and use in Table 14 below)	1	

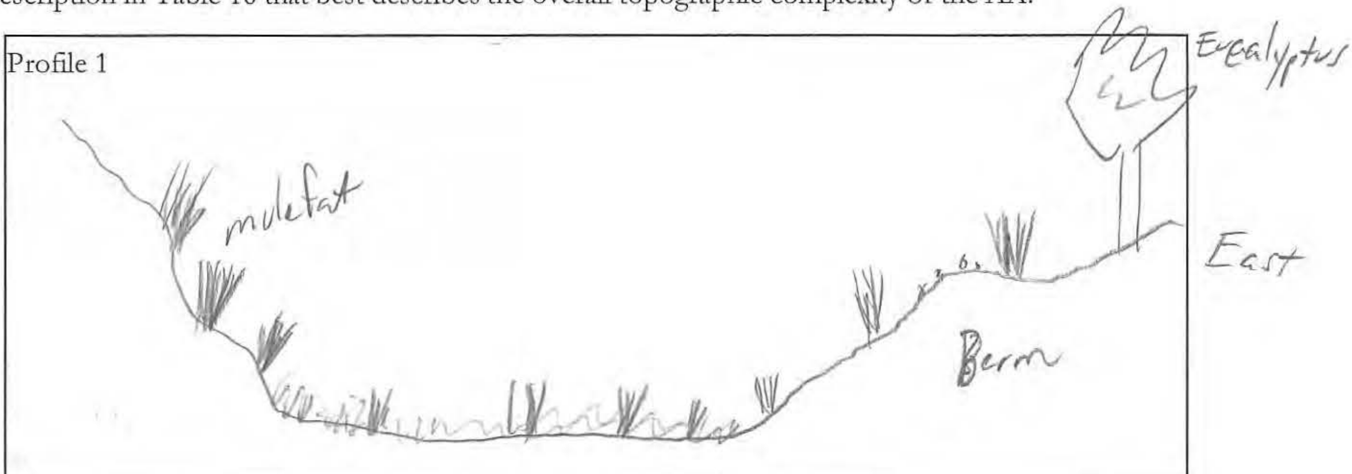
→ Trash

Worksheet for AA Topographic Complexity

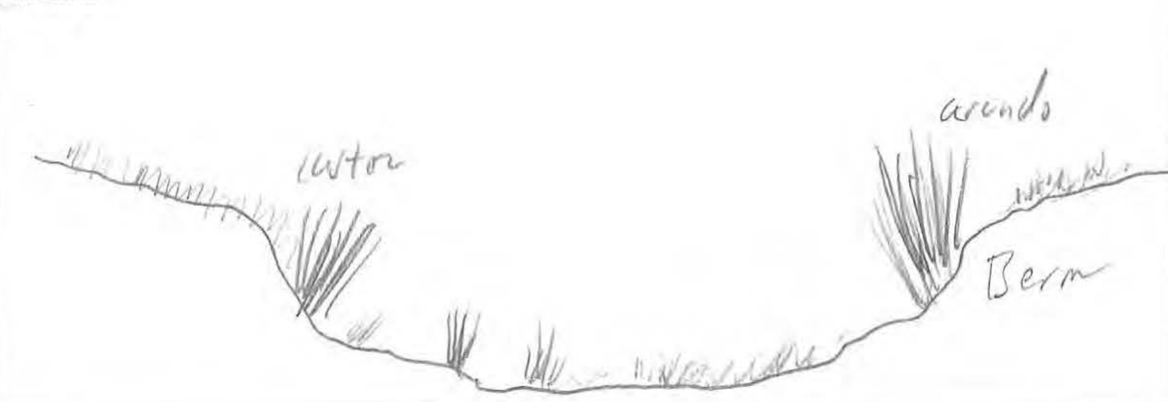
At three locations along the AA, make a sketch of the profile of the stream from the AA boundary down to its deepest area then back out to the other AA boundary. Try to capture the benches and the intervening micro-topographic relief. To maintain consistency, make drawings at each of the stream hydrologic connectivity measurements, always facing downstream. Include the water level, an arrow at the bankfull contour, and label the benches. Based on these sketches and the profiles in Figure 10, choose a description in Table 16 that best describes the overall topographic complexity of the AA.

Top
west

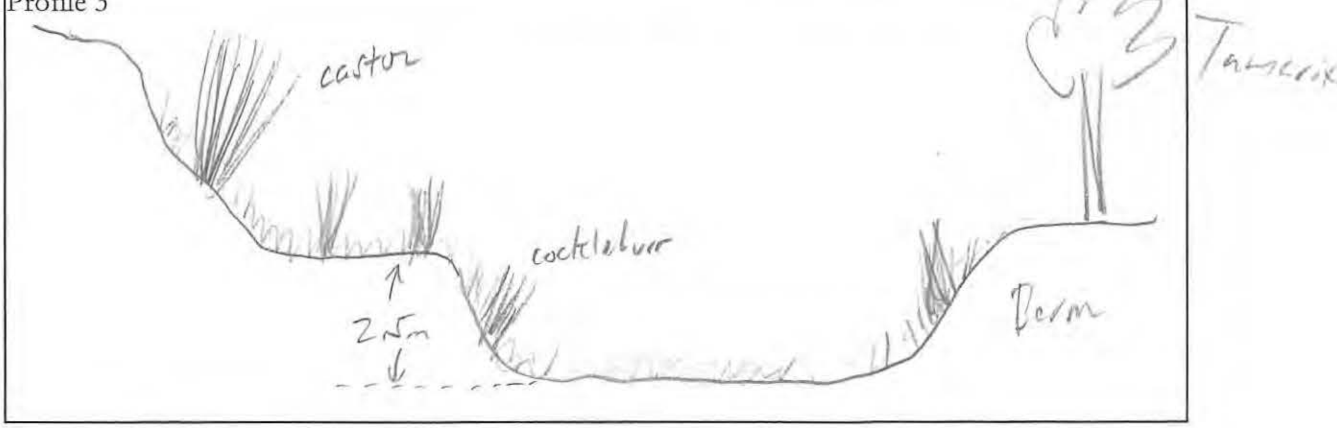
Profile 1



Profile 2



Profile 3



bottom

Plant Community Metric Worksheet: Co-dominant species richness for Riverine wetlands
(A dominant species represents ≥10% *relative* cover)

Special Note:

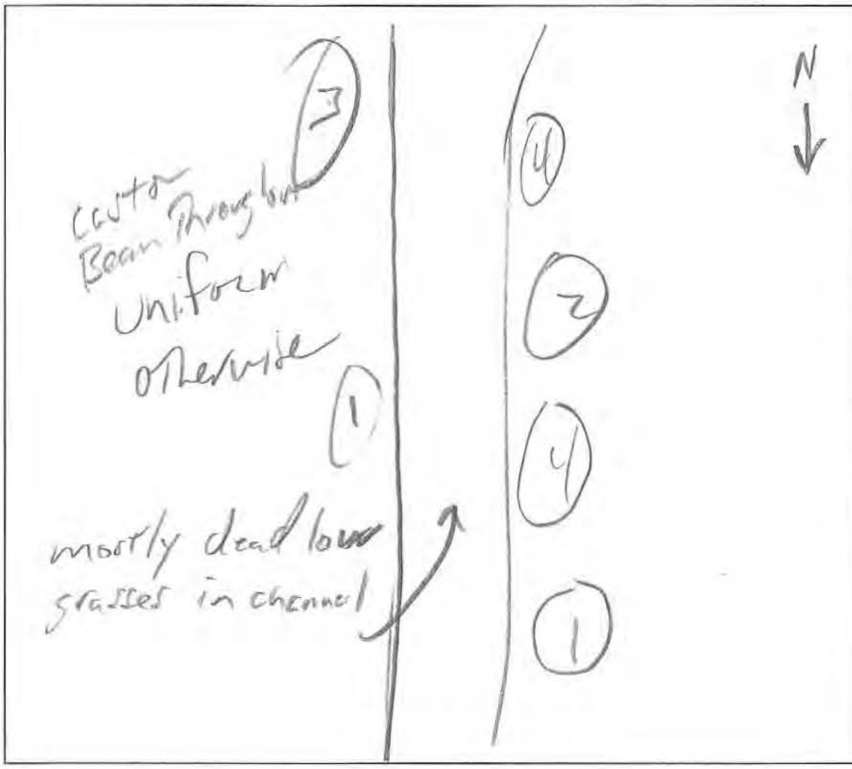
** Combine the counts of co-dominant species from all layers to identify the total species count. Each plant species is only counted once when calculating the Number of Co-dominant Species and Percent Invasion submetric scores, regardless of the numbers of layers in which it occurs.*

Floating or Canopy-forming (non-confined only)	Invasive?	Short (<0.5 m)	Invasive?
		Goose foot	N
Medium (0.5-1.5 m)	**Invasive?**	**Tall (1.5-3.0 m)**	**Invasive?**
Cocklebur	N	Arundo	Y
Grass	Y	Goose foot	N
Mulefat	N	Castor bean	Y
		Sunflower	N
Very Tall (>3.0 m)	**Invasive?**	**Total number of co-dominant species for all layers combined (enter here and use in Table 18)**	10
Eucalyptus	Y		
Black Willow	N		
Tamarix	Y	**Percent Invasion *Round to the nearest integer* (enter here and use in Table 18)**	50

Handwritten annotations: chenopodium sp. (Goose foot); Xanthium strumarium (Cocklebur); Achnatherum sp (Grass); Baccharis salicifolia (Mulefat); Arundo donax (Arundo); Ricinus communis (Castor bean); Eucalyptus camaldulensis (Eucalyptus); Salix gooddingii (Black Willow); Tamarix aphylla (Tamarix)

Horizontal Interspersion Worksheet.

Use the spaces below to make a quick sketch of the AA in plan view, outlining the major plant zones (this should take no longer than 10 minutes). Assign the zones names and record them on the right. Based on the sketch, choose a single profile from Figure 12 that best represents the AA overall.



Assigned zones:

1) Arundo
2) Willow
3) Eucalyptus
4) Sunflower
5)
6)

Worksheet for Wetland disturbances and conversions

Has a major disturbance occurred at this wetland?	Yes (circled)	No		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other (circled)
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years (circled)	
Has this wetland been converted from another type? If yes, then what was the previous type?	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

Dredging occurred at site

Stressor Checklist Worksheet

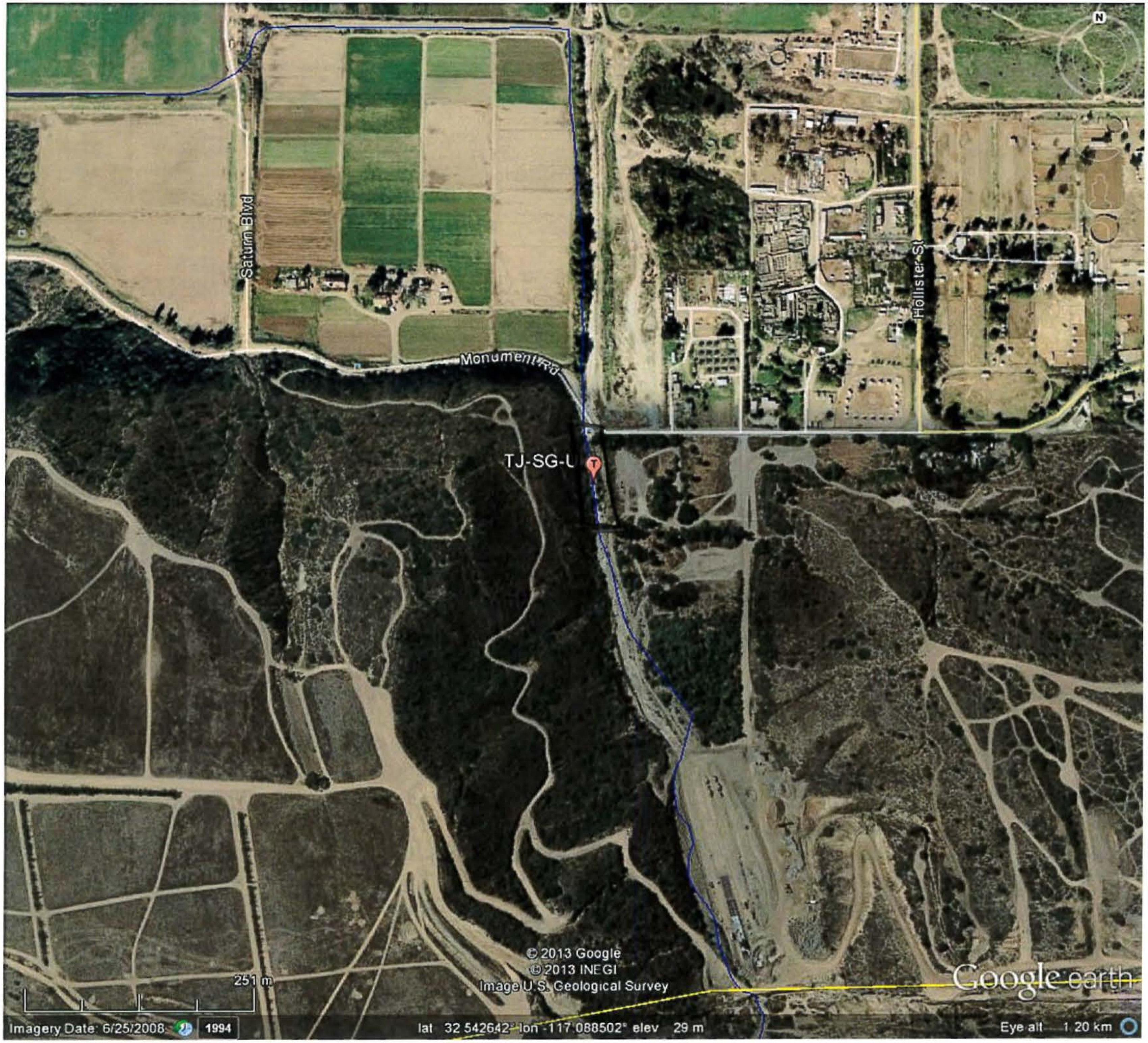
HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)	X	X
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)	X	X
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees	X	X
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**	X	
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed	X	X
Excessive runoff from watershed	X	X
Nutrient impaired (PS or Non-PS pollution)	X	X
Heavy metal impaired (PS or Non-PS pollution)	X	X
Pesticides or trace organics impaired (PS or Non-PS pollution)	X	X
Bacteria and pathogens impaired (PS or Non-PS pollution)	X	X
Trash or refuse	X	X
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of treatment of invasive plants adjacent to AA or buffer	X	X
Comments		

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present	Significant negative effect on AA
Urban residential	X	X
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming		
Intensive row-crop agriculture	X	
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)	X	
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	X	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

Saturn Blvd
Monument Rd
Hollister St
N
TJ-SG-U
©2013 Google
©2013 INEGI
Image U.S. Geological Survey
150 m
Google earth
Imagery Date: 6/25/2008
1994
lat 32.542960° lon -117.088564° elev 28 m
Eye alt 774 m



N
Saturn Blvd
Monument Rd
Hollister St
TJ-SG-U
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
Google earth
251 m
Imagery Date: 6/25/2008
1994
lat 32.542642° lon -117.088502° elev 29 m
Eye alt 1.20 km

Saturn Blvd
TJ-PC-U
Tijuana River Valley
Hollister St
TJ-SG-U
Internacional
Cal Ramón Arnaiz
Esperanza
2-de-Junio
Remigio Soler
Mazatlan
Canon del Matadero Norte
Via Isla Cela
Segunda
Los Laureles
Pradera
Vista Hermosa
Mirador
Periférico
Art. 27
Misión del Sol
Padre Kino
Culiacan
© 2013 Google
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Image U.S. Geological Survey
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1994
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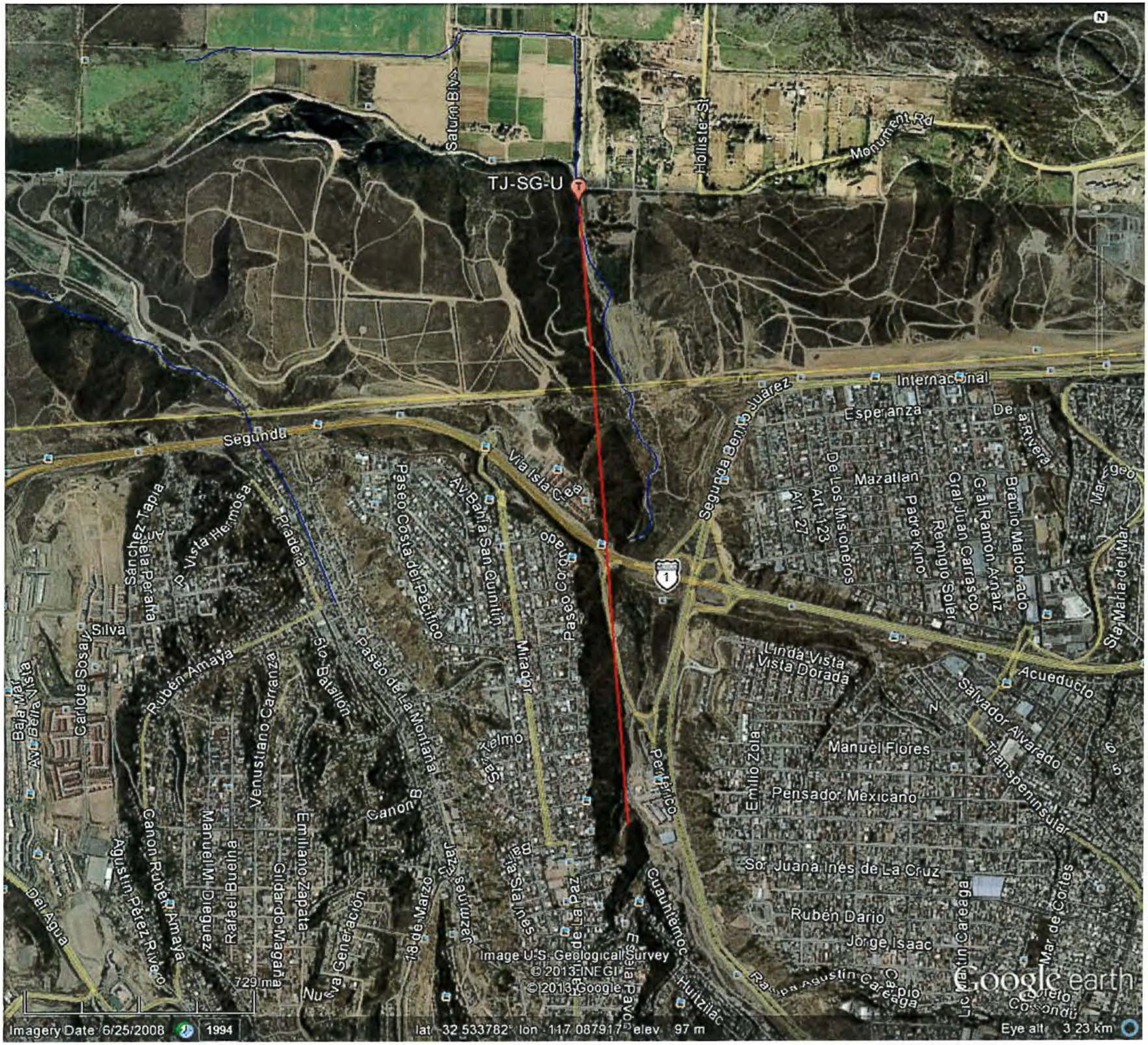
Google earth


TJ-SG-U
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Hollister St
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Internacional
Segunda
Segunda Benito Juárez
Esperanza
Mazatlan
De Los Misioneros
Art. 123
Art. 27
Padre Kino
Remigio Soler
Gral Juan Carrasco
Gral Ramon Arnaiz
Braulio Maldonado
Sta Maria del Mar
Via Isla Cea
Paseo Coronado
Paseo Costa del Pacifico
Av Bahia San Quintin
Mirador
Linda Vista
Vista Dorada
Acueducto
Salvador Alvarado
Transpeninsular
Manuel Flores
Pensador Mexicano
Emilio Zola
Periférico
Sor Juana Ines de La Cruz
Rubén Dario
Jorge Isaac
Mar de Cortes
Cuauhtémoc
Huitzilac
Sánchez Tapia
Angela Peralta
P. Vista Hermosa
Pradera
Silva
Carlota Sosa
Baja Mar
Av Bella Vista
Rubén Amaya
Venustiano Carranza
5to Batallón
Paseo de La Montaña
Canon B
Emiliano Zapata
Gildardo Magaña
Rafael Buelna
Manuel M. Dieguez
Canon Rubén Amaya
Agustin Pérez Rivero
Del Agua
18 de Marzo
Jazmines
Baja Sta Ines
de La Paz
Nueva Generación
729 m
Image U.S. Geological Survey
© 2013 INEGI
© 2013 Google
Google earth
Imagery Date: 6/25/2008
1994
lat 32.533782° lon -117.087917° elev 97 m
Eye alt 3.23 km

Basic Information Sheet: Riverine Wetlands

Assessment Area Name: TJ-PC-D	
Project Name: TJ 401C	
Assessment Area ID #:	
Project ID #:	**Date:** 8/10/16
Assessment Team Members for This AA: JR, TA	
Average Bankfull Width: 5.5	
Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m): 100m	
Upstream Point Latitude: 32.5579	**Longitude:** -117.1035
Downstream Point Latitude: 32.5576	**Longitude:** -117.1045
Wetland Sub-type: ☐ Confined ☒ Non-confined	
AA Category: ☐ Restoration ☐ Mitigation ☐ Impacted ☐ Ambient ☐ Reference ☐ Training ☒ Other: Dredge Impact Monitoring	
Did the river/stream have flowing water at the time of the assessment? ☒ yes ☐ no	
What is the apparent hydrologic flow regime of the reach you are assessing? The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source. ☒ perennial ☐ intermittent ☐ ephemeral	

tidally influenced

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1		Upstream			
2		Middle Left			
3		Middle Right			
4		Downstream			
5					
6					
7					
8					
9					
10					

Site Location Description:

Comments:

Scoring Sheet: Riverine Wetlands

AA Name: TJ-PC-D				Date: 8/10/16
Attribute 1: Buffer and Landscape Context (pp. 11-19)				**Comments**
		Alpha.	Numeric	
Stream Corridor Continuity (D)		A	12	
Buffer:				
	Alpha.	Numeric		
Buffer submetric A: Percent of AA with Buffer	A	12		
Buffer submetric B: Average Buffer Width	A	12		
Buffer submetric C: Buffer Condition	B	9		
Raw Attribute Score = D+[C x (A x B)^{½}]^{½}			22.4	**Final Attribute Score = (Raw Score/24) x 100** 93.3
Attribute 2: Hydrology (pp. 20-26)				
		Alpha.	Numeric	
Water Source		C	6	
Channel Stability		B	9	
Hydrologic Connectivity		D	3	
Raw Attribute Score = sum of numeric scores			18	**Final Attribute Score = (Raw Score/36) x 100** 50
Attribute 3: Physical Structure (pp. 27-33)				
		Alpha.	Numeric	
Structural Patch Richness		D	3	
Topographic Complexity		C	6	
Raw Attribute Score = sum of numeric scores			9	**Final Attribute Score = (Raw Score/24) x 100** 37.5
Attribute 4: Biotic Structure (pp. 34-41)				
Plant Community Composition (based on sub-metrics A-C)				
	Alpha.	Numeric		
Plant Community submetric A: Number of plant layers	A	12		
Plant Community submetric B: Number of Co-dominant species	B	9		
Plant Community submetric C: Percent Invasion	B	9		
Plant Community Composition Metric *(numeric average of submetrics A-C)*			10	
Horizontal Interspersion		C	6	
Vertical Biotic Structure		B	9	
Raw Attribute Score = sum of numeric scores			25	**Final Attribute Score = (Raw Score/36) x 100** 69.4
Overall AA Score (average of four final Attribute Scores)				62.6

Worksheet for Stream Corridor Continuity Metric for Riverine Wetlands

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA	
Segment No.	Length (m)	Segment No.	Length (m)
1	0	1	0
2	↓	2	↓
3		3	
4		4	
5		5	
Upstream Total Length	0	Downstream Total Length	0

Percent of AA with Buffer Worksheet

In the space provided below make a quick sketch of the AA, or perform the assessment directly on the aerial imagery; indicate where buffer is present, estimate the percentage of the AA perimeter providing buffer functions, and record the estimate amount in the space provided.

Percent of AA with Buffer: 100 %

Worksheet for calculating average buffer width of AA

Line	Buffer Width (m)
A	250
B	↓
C	
D	
E	
F	
G	
H	
Average Buffer Width *Round to the nearest integer*	250

Worksheet for Assessing Channel Stability for Riverine Wetlands

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium (4)	☒ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA. ☒ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it. ☒ There is leaf litter, thatch, or wrack in most pools (if pools are present). ☒ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area. ☐ There is little or no active undercutting or burial of riparian vegetation. ☐ If mid-channel bars and/or point bars are present, they are not densely vegetated with perennial vegetation. ☐ Channel bars consist of well-sorted bed material (smaller grain size on the top and downstream end of the bar, larger grain size along the margins and upstream end of the bar). ☐ There are channel pools, the spacing between pools tends to be regular and the bed is not planar throughout the AA ☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation (4)	☒ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs. ☒ There are abundant bank slides or slumps. ☒ The lower banks are uniformly scoured and not vegetated. ☒ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel. ☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation. ☐ The channel bed appears scoured to bedrock or dense clay. ☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided). ☐ The channel has one or more knickpoints indicating headward erosion of the bed.
Indicators of Active Aggradation (1)	☐ There is an active floodplain with fresh splays of coarse sediment (sand and larger that is not vegetated) deposited in the current or previous year. ☐ There are partially buried living tree trunks or shrubs along the banks. ☒ The bed is planar (flat or uniform gradient) overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced. ☐ There are partially buried, or sediment-choked, culverts. ☐ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour. ☐ There are avulsion channels on the floodplain or adjacent valley floor.
Overall	☒ **Equilibrium** ☒ **Degradation** ☐ **Aggradation**

Riverine Wetland Entrenchment Ratio Calculation Worksheet

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate midpoints along straight riffles or glides, away from deep pools or meander bends. An attempt should be made to place them at the top, middle, and bottom of the AA.

Steps	Replicate Cross-sections ⟶	TOP	MID	BOT
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	3.8	7.5	5.8
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	0.5	1.0	1.0
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	1.0	2.0	2.0
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	5.0	9.0	7.8
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	1.32	1.20	1.35
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections. Enter the average result here and use it in Table 13a or 13b.			1.29

Structural Patch Type Worksheet for Riverine wetlands

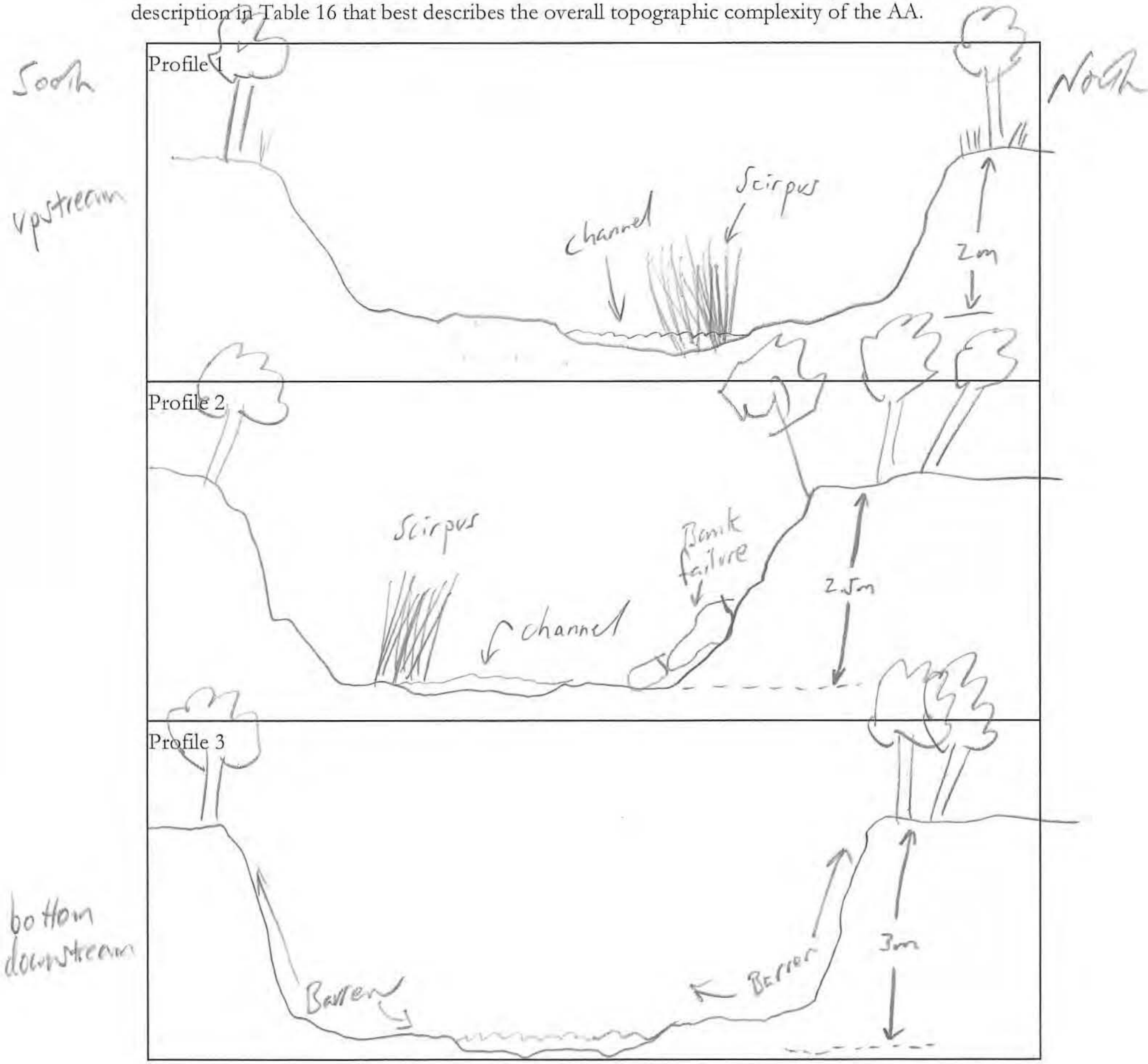
Circle each type of patch that is observed in the AA and enter the total number of observed patches in Table below. In the case of riverine wetlands, their status as confined or non-confined must first be determined (see page 6) to determine with patches are expected in the system (indicated by a "1" in the table below). Any feature onsite should only be counted once as a patch type. If a feature appears to meet the definition of more than one patch type (i.e. swale and secondary channel) the practitioner should choose which patch type best illustrates the feature. Not all features at a site will be patch types.

**Please refer to the CRAM Photo Dictionary at www.cramwetlands.org for photos of each of the following patch types.*

STRUCTURAL PATCH TYPE (circle for presence)	**Riverine (Non-confined)**	**Riverine (Confined)**
Minimum Patch Size	**3 m^2**	**3 m^2**
Abundant wrackline or organic debris in channel, on floodplain	1 (circled)	1
Bank slumps or undercut banks in channels or along shoreline	1 (circled)	1
Cobbles and/or Boulders	1	1
Debris jams	1	1
Filamentous macroalgae or algal mats	1 (circled)	1
Large woody debris	1 (circled)	1
Pannes or pools on floodplain	1	N/A
Plant hummocks and/or sediment mounds	1	1
Point bars and in-channel bars	1	1
Pools or depressions in channels (wet or dry channels)	1	1
Riffles or rapids (wet or dry channels)	1	1
Secondary channels on floodplains or along shorelines	1 (circled)	N/A
Standing snags (at least 3 m tall)	1	1
Submerged vegetation	1	N/A
Swales on floodplain or along shoreline	1	N/A
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	1	1
Vegetated islands (mostly above high-water)	1	N/A
Total Possible	17	12
No. Observed Patch Types (enter here and use in Table 14 below)	5	

Worksheet for AA Topographic Complexity

At three locations along the AA, make a sketch of the profile of the stream from the AA boundary down to its deepest area then back out to the other AA boundary. Try to capture the benches and the intervening micro-topographic relief. To maintain consistency, make drawings at each of the stream hydrologic connectivity measurements, always facing downstream. Include the water level, an arrow at the bankfull contour, and label the benches. Based on these sketches and the profiles in Figure 10, choose a description in Table 16 that best describes the overall topographic complexity of the AA.



Plant Community Metric Worksheet: Co-dominant species richness for Riverine wetlands

(A dominant species represents ≥10% *relative* cover)

Special Note:

** Combine the counts of co-dominant species from all layers to identify the total species count. Each plant species is only counted once when calculating the Number of Co-dominant Species and Percent Invasion submetric scores, regardless of the numbers of layers in which it occurs.*

Floating or Canopy-forming (non-confined only)	Invasive?	Short (<0.5 m)	Invasive?
		Wild Celery	N
		Spearscale	N

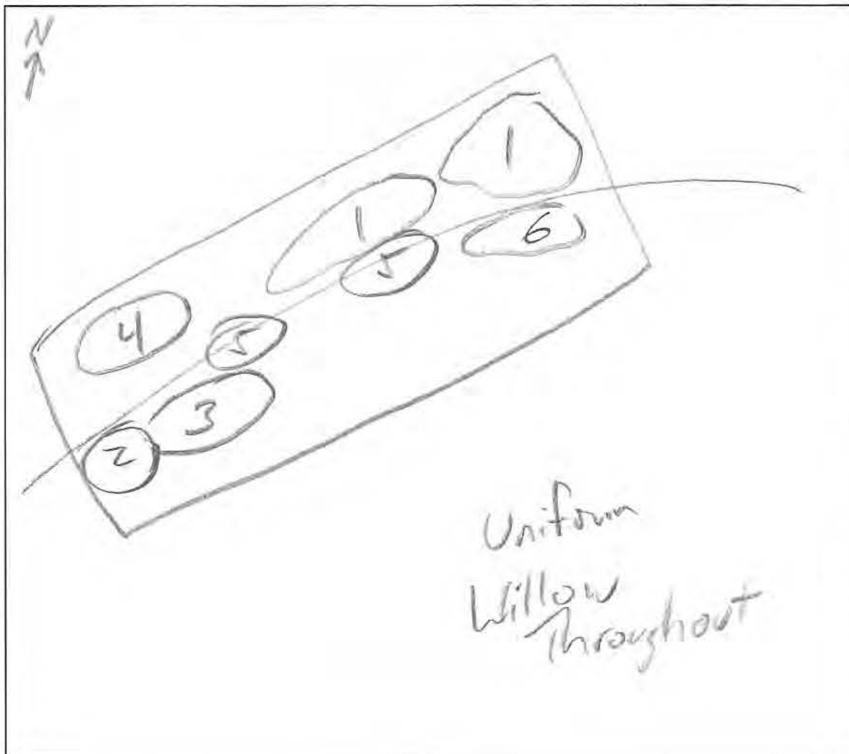
Medium (0.5-1.5 m)	Invasive?	Tall (1.5-3.0 m)	Invasive?
Mulefat	N	Elderberry	N
		Mulefat	N
		Scirpus californica	N

Very Tall (>3.0 m)	Invasive?		
Arundo	Y	Total number of co-dominant species for all layers combined (enter here and use in Table 18)	9
Tamarix	Y		
Black Willow	N	Percent Invasion *Round to the nearest integer* (enter here and use in Table 18)	22
Arroyo Willow	N		

Margin notes (handwritten): Apium graveolens; Atriplex triangularis; Sambucus mexicana; Baccharis salicifolia; Arundo donax; Tamarix aphylla; Salix gooddingii; Salix lesiolepis

Horizontal Interspersion Worksheet.

Use the spaces below to make a quick sketch of the AA in plan view, outlining the major plant zones (this should take no longer than 10 minutes). Assign the zones names and record them on the right. Based on the sketch, choose a single profile from Figure 12 that best represents the AA overall.



Assigned zones:

1) Mulefat
2) Arundo
3) Tamarix
4) Elderberry
5) Scirpus
6) Celery

Worksheet for Wetland disturbances and conversions

Has a major disturbance occurred at this wetland?	Yes	No (circled)		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type? (handwritten: N/A)	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

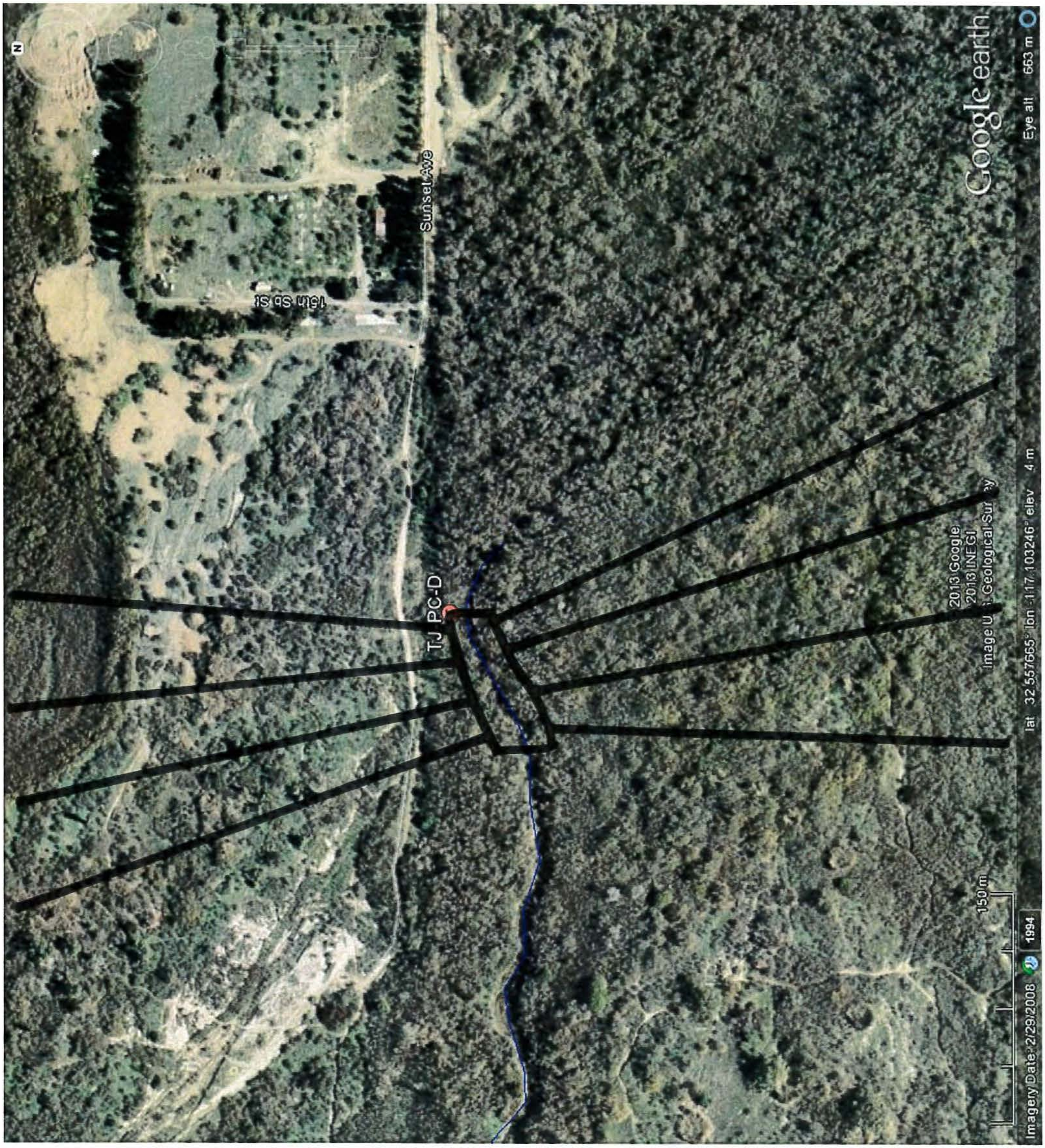
Stressor Checklist Worksheet

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)	X	
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees		
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)	X	
Heavy metal impaired (PS or Non-PS pollution)	X	
Pesticides or trace organics impaired (PS or Non-PS pollution)	X	
Bacteria and pathogens impaired (PS or Non-PS pollution)	X	
Trash or refuse	X	
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of treatment of invasive plants adjacent to AA or buffer	X	
Comments		

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present	Significant negative effect on AA
Urban residential	X	
Industrial/commercial		
Military training/Air traffic	X	
Dams (or other major flow regulation or disruption)		
Dryland farming	X	
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)	X	
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	X	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		


Sunset Ave
15th Sb St
TJ_PC-D
2013 Google
2013 INEGI
lat 32.557665° lon -117.103246° elev 4 m
Google earth
Eye alt 663 m
150 m
1994
Imagery Date: 2/29/2008

8/10/16


N
TJ-PC-D
15th Sb St
Sunset Ave
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
253 m
Google earth
Imagery Date 2/29/2008
1994
lat 32.557604° lon -117.103599° elev 5 m
Eye alt 1.12 km


Wolviston Way
Royston Dr
Tamarand Way
Thelborn Way
Tremaine Way
Standlake St
Bubbling Well Dr
Thermal Ave
Leon Ave
Saratoga St
Lexington St
Yorktown St
Gatlin St
Boundary Rd
15th St
TJ-PC-D
Sunset Ave
Saturn Blvd
© 2013 Google
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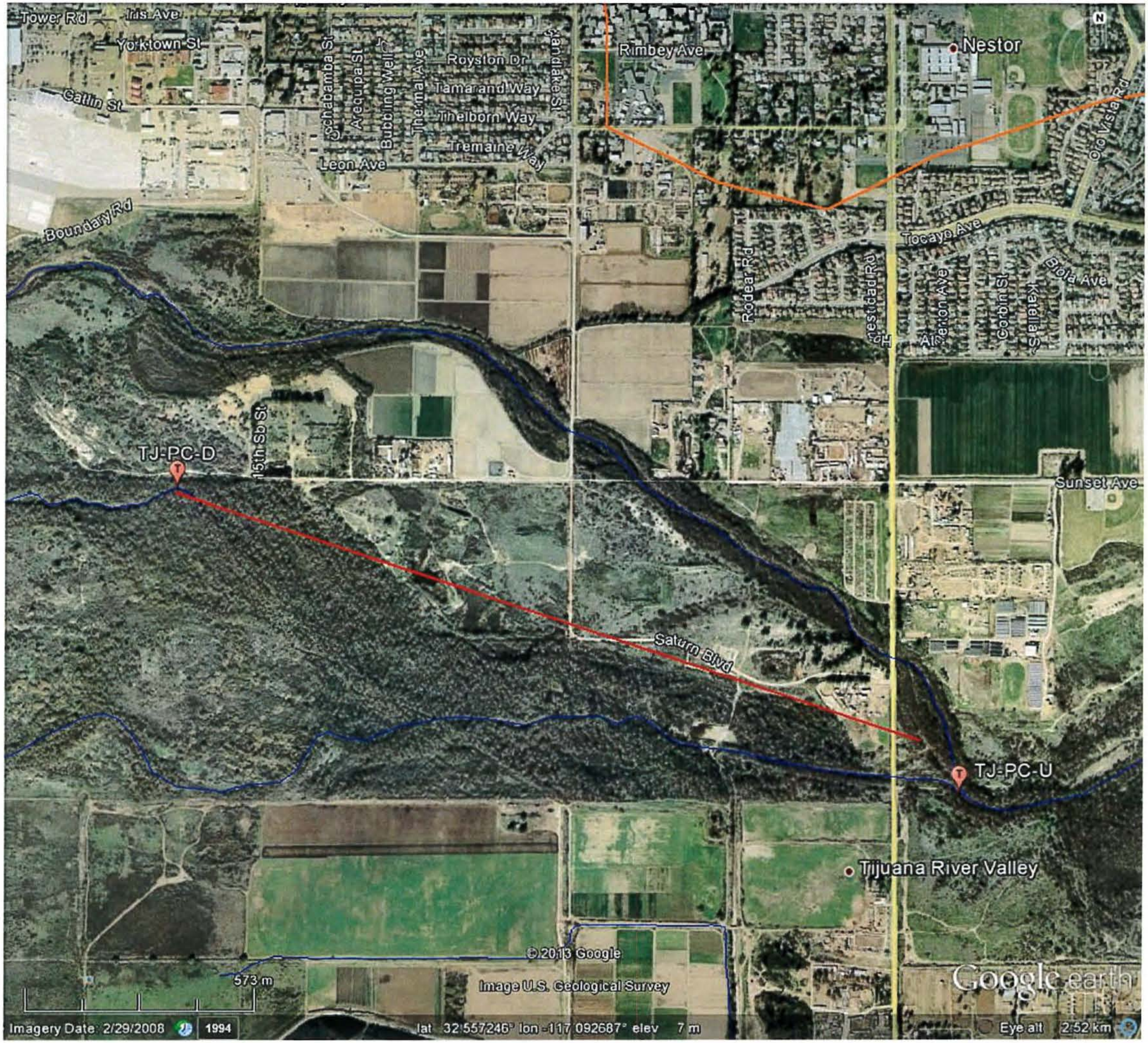

TJ-PC-D
TJ-PC-U
Nestor
Tijuana River Valley
Saturn Blvd
Sunset Ave
Tocayo Ave
Boundary Rd
Rimbey Ave
Rodear Rd
Leon Ave
© 2013 Google
Image U.S. Geological Survey
573 m
Imagery Date: 2/29/2008
1994
lat 32.557246° lon -117.092687° elev 7 m
Eye alt 2.52 km

Basic Information Sheet: Riverine Wetlands

Assessment Area Name: TJ-PC-U	
Project Name: TJ 401C Monitoring	
Assessment Area ID #:	
Project ID #:	**Date:** 8/10/16
Assessment Team Members for This AA: JR, TA	
Average Bankfull Width: 17.0m	
Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m): 160m	
Upstream Point Latitude: 32.5507	**Longitude:** -117.0811
Downstream Point Latitude: 32.5512	**Longitude:** -117.0826
Wetland Sub-type: ☐ Confined ☒ Non-confined	
AA Category: ☐ Restoration ☐ Mitigation ☐ Impacted ☐ Ambient ☐ Reference ☐ Training ☒ Other: Dredge Impact Monitoring	
Did the river/stream have flowing water at the time of the assessment? ☒ yes ☐ no ponded	
What is the apparent hydrologic flow regime of the reach you are assessing? The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source. ☒ perennial ☐ intermittent ☐ ephemeral	

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1		Upstream			
2		Middle Left			
3		Middle Right			
4		Downstream			
5					
6					
7					
8					
9					
10					

Site Location Description:

Much of the upper canopy is gone. Only a few remaining trees. Beetle infestation: Kuroshio shot borer beetle.

Mid-lower canopy much thicker (castor bean willow saplings)

Comments:

Scoring Sheet: Riverine Wetlands

AA Name: TJ-PC-1					Date: 8/10/16	
Attribute 1: Buffer and Landscape Context (pp. 11-19)					**Comments**	
Stream Corridor Continuity (D)			Alpha. A	Numeric 12		
Buffer:						
Buffer submetric A: Percent of AA with Buffer	Alpha. A	Numeric 12				
Buffer submetric B: Average Buffer Width	A	12				
Buffer submetric C: Buffer Condition	B	9				
Raw Attribute Score = $D+[C \times (A \times B)^{1/2}]^{1/2}$				22.4	**Final Attribute Score = (Raw Score/24) x 100**	93.3
Attribute 2: Hydrology (pp. 20-26)						
Water Source			Alpha. C	Numeric 6		
Channel Stability			B	9		
Hydrologic Connectivity			C	6		
Raw Attribute Score = sum of numeric scores				21.0	**Final Attribute Score = (Raw Score/36) x 100**	58.3
Attribute 3: Physical Structure (pp. 27-33)						
Structural Patch Richness			Alpha. D	Numeric 3		
Topographic Complexity			C	6		
Raw Attribute Score = sum of numeric scores				9	**Final Attribute Score = (Raw Score/24) x 100**	37.5
Attribute 4: Biotic Structure (pp. 34-41)						
Plant Community Composition (based on sub-metrics A-C)						
Plant Community submetric A: Number of plant layers	Alpha. B	Numeric 9				
Plant Community submetric B: Number of Co-dominant species	C	6				
Plant Community submetric C: Percent Invasion	C	6				
Plant Community Composition Metric *(numeric average of submetrics A-C)*				7		
Horizontal Interspersion			C	6		
Vertical Biotic Structure			D	3		
Raw Attribute Score = sum of numeric scores				16.0	**Final Attribute Score = (Raw Score/36) x 100**	44.4
Overall AA Score (average of four final Attribute Scores)					58.4	

Worksheet for Stream Corridor Continuity Metric for Riverine Wetlands

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA	
Segment No.	Length (m)	Segment No.	Length (m)
1	0	1	20
2	↓	2	↓
3	↓	3	↓
4	↓	4	↓
5	↓	5	↓
Upstream Total Length	0	Downstream Total Length	20

Percent of AA with Buffer Worksheet

In the space provided below make a quick sketch of the AA, or perform the assessment directly on the aerial imagery; indicate where buffer is present, estimate the percentage of the AA perimeter providing buffer functions, and record the estimate amount in the space provided.

Percent of AA with Buffer: 100 %

Worksheet for calculating average buffer width of AA

Line	Buffer Width (m)
A	180
B	195
C	200
D	225
E	250
F	↓
G	↓
H	↓
Average Buffer Width *Round to the nearest integer*	225

Worksheet for Assessing Channel Stability for Riverine Wetlands

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium (4)	☒ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA. ☒ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it. ☒ There is leaf litter, thatch, or wrack in most pools (if pools are present). ☒ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area. ☐ There is little or no active undercutting or burial of riparian vegetation. ☐ If mid-channel bars and/or point bars are present, they are not densely vegetated with perennial vegetation. ☐ Channel bars consist of well-sorted bed material (smaller grain size on the top and downstream end of the bar, larger grain size along the margins and upstream end of the bar). ☐ There are channel pools, the spacing between pools tends to be regular and the bed is not planar throughout the AA — One large pooled area ☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation (1)	☐ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs. ☐ There are abundant bank slides or slumps. ☐ The lower banks are uniformly scoured and not vegetated. ☒ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel. ☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation. ☐ The channel bed appears scoured to bedrock or dense clay. ☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided). ☐ The channel has one or more knickpoints indicating headward erosion of the bed.
Indicators of Active Aggradation (2)	☐ There is an active floodplain with fresh splays of coarse sediment (sand and larger that is not vegetated) deposited in the current or previous year. ☒ There are partially buried living tree trunks or shrubs along the banks. ☒ The bed is planar (flat or uniform gradient) overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced. ☐ There are partially buried, or sediment-choked, culverts. ☐ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour. ☐ There are avulsion channels on the floodplain or adjacent valley floor.
Overall	☒ **Equilibrium** ☐ **Degradation** ☐ **Aggradation**

Riverine Wetland Entrenchment Ratio Calculation Worksheet

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate midpoints along straight riffles or glides, away from deep pools or meander bends. An attempt should be made to place them at the top, middle, and bottom of the AA.

Steps	Replicate Cross-sections ⟶	TOP	MID	BOT
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	18	17	17
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	2.5	2.0	2.5 *
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	5.0	4.0	5.0
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	28	25	29
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	1.6	1.5	1.7
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections. Enter the average result here and use it in Table 13a or 13b.			1.6

* estimate. too deep, soft to enter river

Structural Patch Type Worksheet for Riverine wetlands

Circle each type of patch that is observed in the AA and enter the total number of observed patches in Table below. In the case of riverine wetlands, their status as confined or non-confined must first be determined (see page 6) to determine with patches are expected in the system (indicated by a "1" in the table below). Any feature onsite should only be counted once as a patch type. If a feature appears to meet the definition of more than one patch type (i.e. swale and secondary channel) the practitioner should choose which patch type best illustrates the feature. Not all features at a site will be patch types.

**Please refer to the CRAM Photo Dictionary at www.cramwetlands.org for photos of each of the following patch types.*

STRUCTURAL PATCH TYPE (circle for presence)	**Riverine (Non-confined)**	**Riverine (Confined)**
Minimum Patch Size	**3 m^2**	**3 m^2**
Abundant wrackline or organic debris in channel, on floodplain	(1)	1
Bank slumps or undercut banks in channels or along shoreline	1	1
Cobbles and/or Boulders	1	1
Debris jams	1	1
Filamentous macroalgae or algal mats	1	1
Large woody debris	(1)	1
Pannes or pools on floodplain	1	N/A
Plant hummocks and/or sediment mounds	1	1
Point bars and in-channel bars	1	1
Pools or depressions in channels (wet or dry channels)	1	1
Riffles or rapids (wet or dry channels)	1	1
Secondary channels on floodplains or along shorelines	(1)	N/A
Standing snags (at least 3 m tall)	(1)	1
Submerged vegetation	1	N/A
Swales on floodplain or along shoreline	1	N/A
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	(1)	1
Vegetated islands (mostly above high-water)	1	N/A
Total Possible	**17**	**12**
No. Observed Patch Types (enter here and use in Table 14 below)	5	

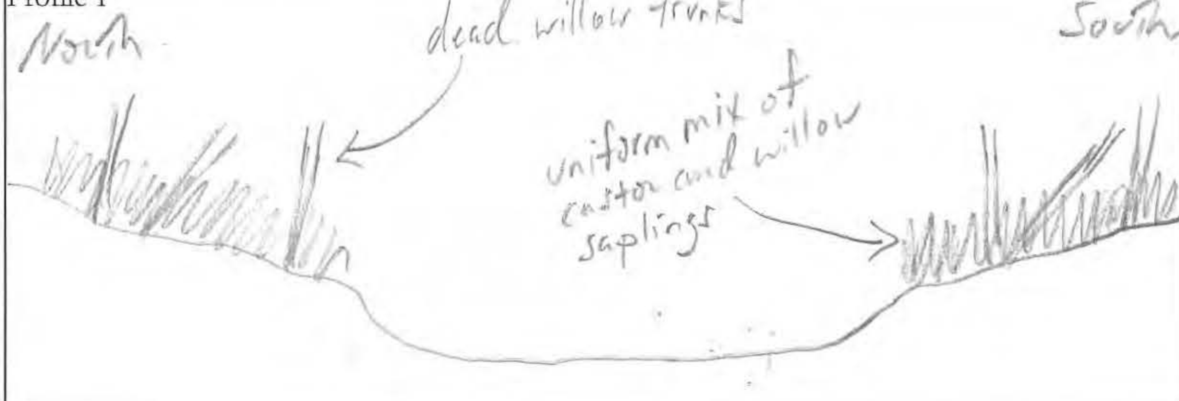
— many large dead trees broken off

Worksheet for AA Topographic Complexity

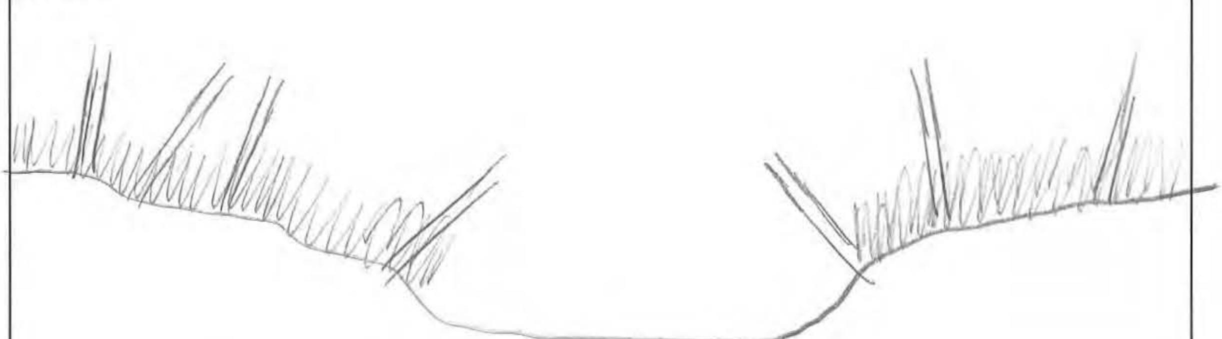
At three locations along the AA, make a sketch of the profile of the stream from the AA boundary down to its deepest area then back out to the other AA boundary. Try to capture the benches and the intervening micro-topographic relief. To maintain consistency, make drawings at each of the stream hydrologic connectivity measurements, always facing downstream. Include the water level, an arrow at the bankfull contour, and label the benches. Based on these sketches and the profiles in Figure 10, choose a description in Table 16 that best describes the overall topographic complexity of the AA.

up

Profile 1



Profile 2



down

Profile 3

- no upper canopy

Plant Community Metric Worksheet: Co-dominant species richness for Riverine wetlands
(A dominant species represents ≥10% *relative* cover)

Special Note:

** Combine the counts of co-dominant species from all layers to identify the total species count. Each plant species is only counted once when calculating the Number of Co-dominant Species and Percent Invasion submetric scores, regardless of the numbers of layers in which it occurs.*

Floating or Canopy-forming (non-confined only)	Invasive?	Short (<0.5 m)	Invasive?
		Nastortium, Garden	Y

Tropaeolum majus

Medium (0.5-1.5 m)	Invasive?	Tall (1.5-3.0 m)	Invasive?
		Castor Bean	Y
	Saplings {	Arroyo Willow	N
		Black Willow	N
		Mulefat	N

Ricinus communis

Salix lasiolepis

Salix gooddingii

Very Tall (>3.0 m)	Invasive?
Castor Bean	Y
Arundo	Y

Total number of co-dominant species for all layers combined (enter here and use in Table 18)	6
Percent Invasion *Round to the nearest integer* (enter here and use in Table 18)	33

Arundo donax

Baccharis salicifolia

Many dead willows broken off tops.

Horizontal Interspersion Worksheet.

Use the spaces below to make a quick sketch of the AA in plan view, outlining the major plant zones (this should take no longer than 10 minutes). Assign the zones names and record them on the right. Based on the sketch, choose a single profile from Figure 12 that best represents the AA overall.

Assigned zones:

1) Castor Bean

2) Mulefat

3) Willows

4) Nasturtium

5)

6)

Worksheet for Wetland disturbances and conversions

Has a major disturbance occurred at this wetland?	(Yes) [circled]	No		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	(other) [circled]
If yes, then how severe is the disturbance?	(likely to affect site next 5 or more years) [circled]	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type? N/A	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

– Kuroshio shot beetle infestation

Stressor Checklist Worksheet

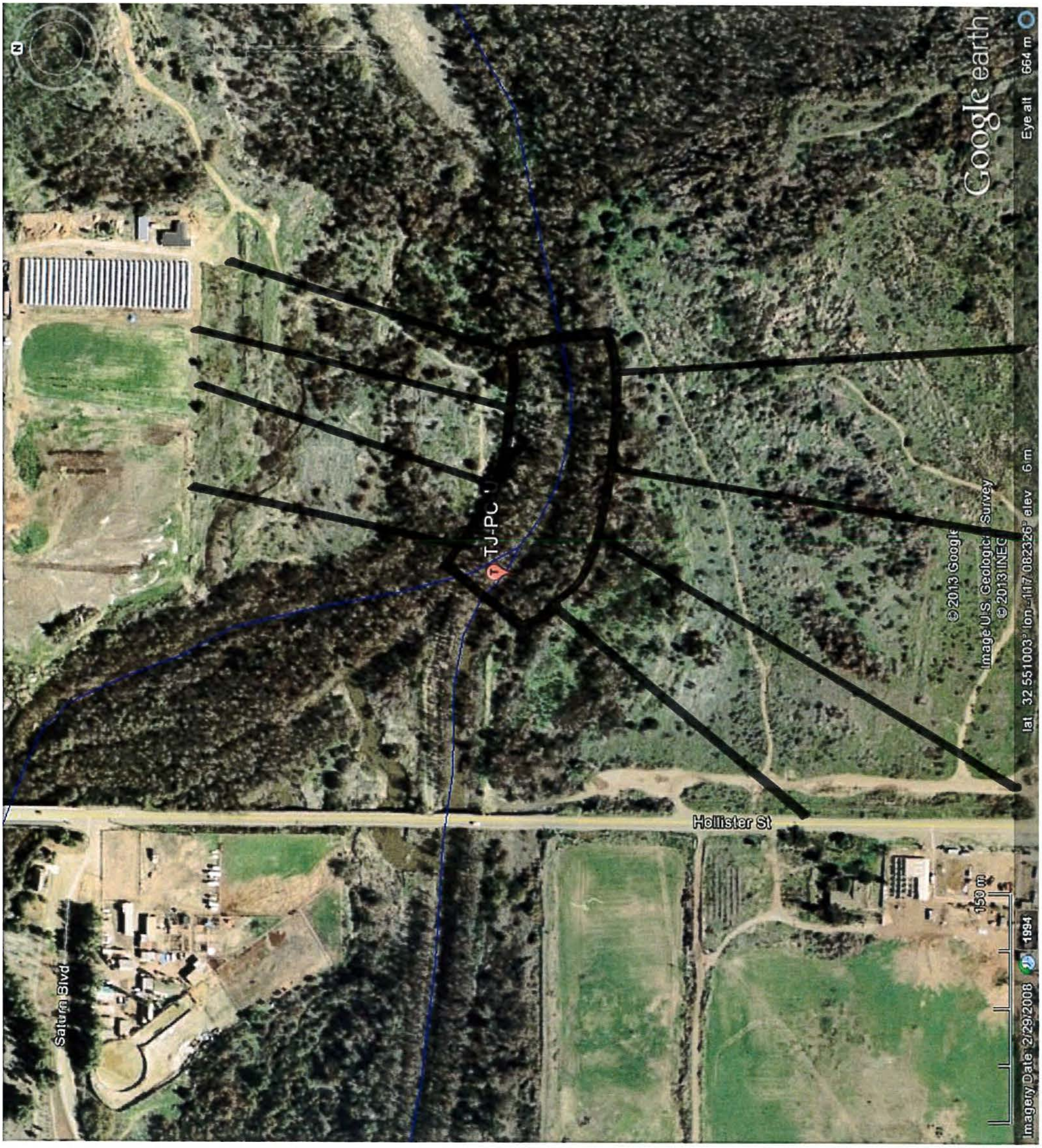
HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)	X	X
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees		
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed	X	
Nutrient impaired (PS or Non-PS pollution)	X	X
Heavy metal impaired (PS or Non-PS pollution)	X	X
Pesticides or trace organics impaired (PS or Non-PS pollution)	X	X
Bacteria and pathogens impaired (PS or Non-PS pollution)	X	X
Trash or refuse	X	X
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native ~~vertebrates~~ invertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets) shot borer bettle		X
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of treatment of invasive plants adjacent to AA or buffer	X	X
Comments		

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present	Significant negative effect on AA
Urban residential	X	
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries	X	
Commercial feedlots	X	
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)	X	
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	X	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

8/10/16



N
TJ-PC
Hollister St
Saturn Blvd
© 2013 Google
Image U.S. Geological Survey
© 2013 INEGI
Google earth
150 m
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1994
lat 32.551003° lon -117.082326° elev 6 m
Eye alt 664 m


N
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TJ-PC-U
Tijuana River Valley
© 2013 Google
Image U.S. Geological Survey
© 2013 INEGI
Google earth
250 m
Imagery Date: 2/29/2008
1994
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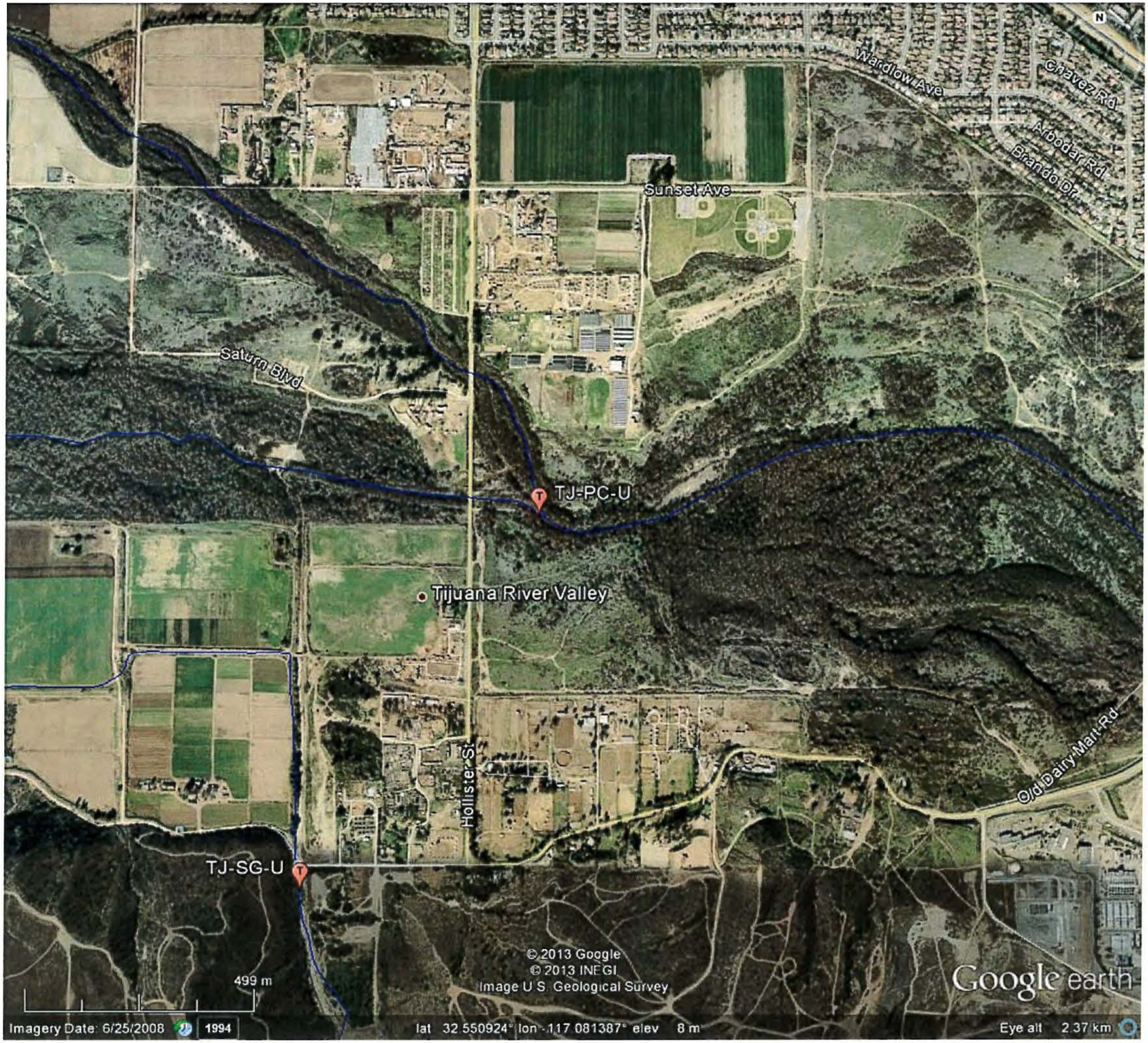
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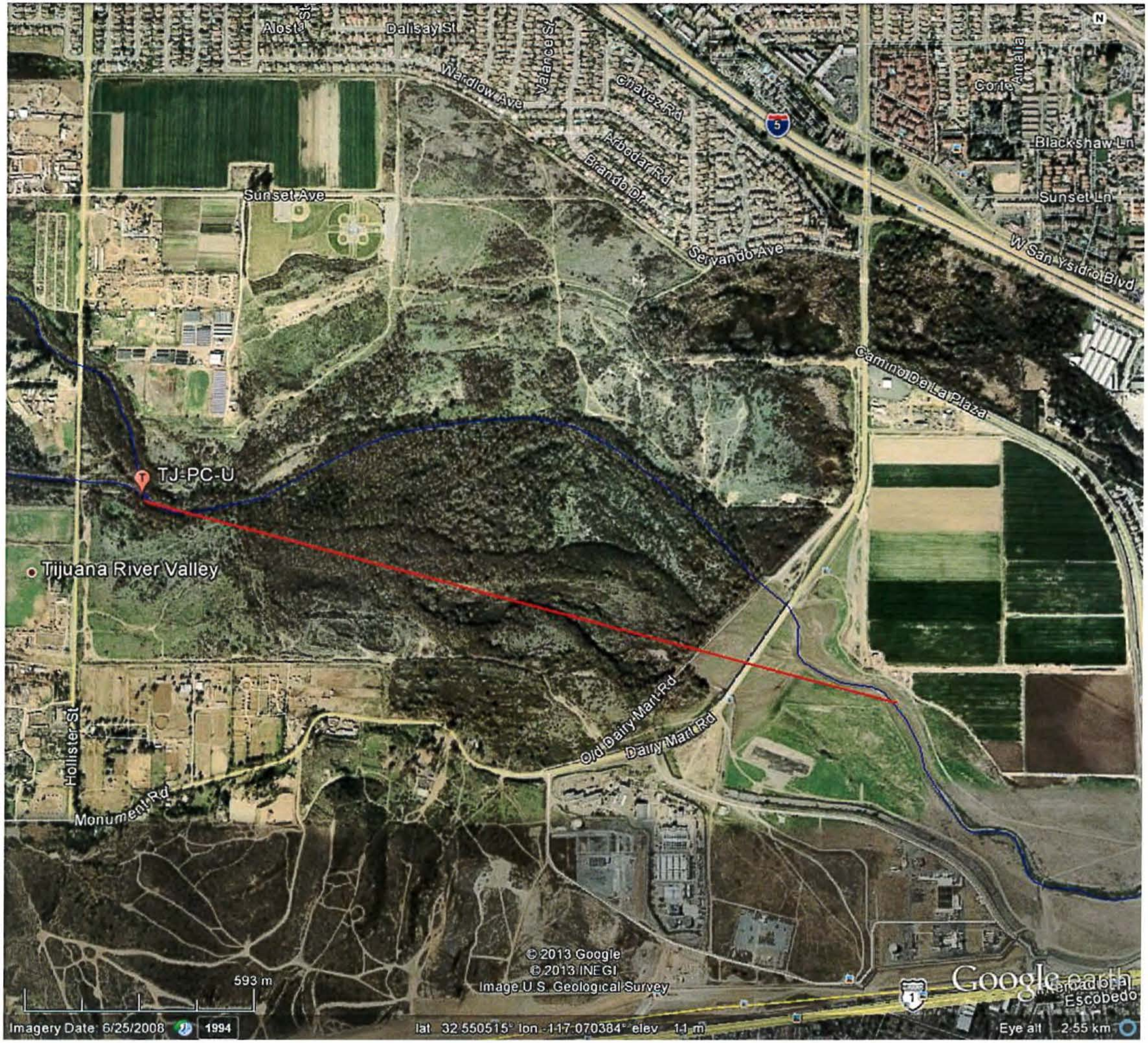
Chavez Rd
Arbodar Rd
Brando Dr
Sunset Ave
Saturn Blvd
TJ-PC-U
Tijuana River Valley
Hollister St
Old Dairy Mart Rd
TJ-SG-U
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
Google earth
499 m
Imagery Date: 6/25/2008
1994
lat 32.550924° lon -117.081387° elev 8 m
Eye alt 2.37 km


Alosta St
Dalisay St
Wardlow Ave
Valance St
Chavez Rd
Arbodar Rd
Brando Dr
Corte Amalia
Blackshaw Ln
Sunset Ln
Sunset Ave
Servando Ave
W San Ysidro Blvd
Camino De La Plaza
TJ-PC-U
Tijuana River Valley
Hollister St
Monument Rd
Old Dairy Mart Rd
Dairy Mart Rd
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
593 m
Imagery Date: 6/25/2008
1994
lat 32.550515° lon -117.070384° elev 11 m
Eye alt 2.55 km
Google earth
Escobedo

Field Data Log Sheet

Site ID TJ-PC-D **Watershed** Tijuana **Field Crew** JR, TA **Date** 8/10/16

Site-Specific Event # Wet Weather [ ] Dry Weather [X] **Time** 1112

ATMOSPHERIC & OCEANIC CONDITIONS

Weather	**Sunny** Partly Cloudy Overcast Fog Raining Drizzle
Last Rain	**> 72 Hours** < 72 Hours — Rainfall: None < 0.1" > 0.1"
Tide	High Mid **Low** Rising ↑ **Falling ↓**
Flow	**Flowing** Ponded

SAMPLE CHARACTERISTICS

Odor	None **Musty** Rotten Eggs Chemical Sewage Other___
Color	None **Yellow** **Brown** White Gray Other___
Clarity	Clear **Slightly Cloudy** Opaque Other___
Floatables	**None** Trash Bubbles/Foam Sheen Other___
Deposits	None Sediment/Gravel **Fine Particles** Stains Oily Deposits Other___
Vegetation	**None** Limited Normal Excessive Other___
Biology	**None** Insects Algae Snail Seaweed Mollusk Crustacean Other___

FIELD MEASUREMENTS

Temp(°C) 19.7 Sp Conduct (µS/cm) 2060 pH 7.29

Turbidity (NTU) 8.48 Salinity (ppt) 1.05 DO (mg/L) 2.2

SAMPLE COLLECTION

Sample Type	Date	Time	Sample ID
Water			
TJ PC-D	8/10/16		

NOTES/COMMENTS

Field Data Log Sheet

Site ID TJ-SG-U **Watershed** Tijuana **Field Crew** JR, TA **Date** 8/10/16

Site-Specific Event # Wet Weather [ ] Dry Weather [X] **Time** 0900

ATMOSPHERIC & OCEANIC CONDITIONS

Weather	Sunny	(Partly Cloudy)	Overcast	Fog	Raining	Drizzle	
Last Rain	(> 72 Hours)	< 72 Hours		**Rainfall**	None	< 0.1"	> 0.1"
Tide	High	Mid	Low	Rising ↑	Falling ↓		
Flow	Flowing	Ponded	(Dry)				

SAMPLE CHARACTERISTICS (NA)

Odor	None	Musty	Rotten Eggs	Chemical	Sewage	Other______		
Color	None	Yellow	Brown	White	Gray	Other______		
Clarity	Clear	Slightly Cloudy	Opaque	Other______				
Floatables	None	Trash	Bubbles/Foam	Sheen	Other______			
Deposits	None	Sediment/Gravel	Fine Particles	Stains	Oily Deposits	Other______		
Vegetation	None	Limited	Normal	Excessive	Other______			
Biology	None	Insects	Algae	Snail	Seaweed	Mollusk	Crustacean	Other______

FIELD MEASUREMENTS (NA)

Temp(°C)		**Sp Conduct (µS/cm)**		**pH**	
Turbidity (NTU)		**Salinity (ppt)**		**DO (mg/L)**	

SAMPLE COLLECTION

Sample Type	Date	Time	Sample ID
Water			

NOTES/COMMENTS

No water. Dry.

Field Data Log Sheet

Site ID TJPC-U **Watershed** Tijuana **Field Crew** JR, TA **Date** 8/10/16

Site-Specific Event # Wet Weather [ ] Dry Weather [X] **Time** 1315

ATMOSPHERIC & OCEANIC CONDITIONS

Weather	**Sunny**	Partly Cloudy	Overcast	Fog	Raining	Drizzle
Last Rain	**> 72 Hours**	< 72 Hours	**Rainfall**	None	< 0.1"	> 0.1"
Tide	High	Mid	**Low**	Rising ↑	Falling ↓	
Flow	Flowing	**Ponded**				

SAMPLE CHARACTERISTICS

Odor	None	**Musty**	Rotten Eggs	Chemical	Sewage	Other______		
Color	None	**Yellow**	**Brown**	White	Gray	Other______		
Clarity	Clear	**Slightly Cloudy**	Opaque	Other______				
Floatables	**None**	Trash	Bubbles/Foam	Sheen	Other______			
Deposits	None	Sediment/Gravel	**Fine Particles**	Stains	Oily Deposits	Other______		
Vegetation	**None**	Limited	Normal	Excessive	Other______			
Biology	**None**	Insects	Algae	Snail	Seaweed	Mollusk	Crustacean	Other______

FIELD MEASUREMENTS

Temp(°C) 29.1 **Sp Conduct (µS/cm)** 2600 **pH** 8.49

Turbidity (NTU) 13.1 **Salinity (ppt)** 1.3 **DO (mg/L)** 13.0

SAMPLE COLLECTION

Sample Type	Date	Time	Sample ID
Water			
TJPC-U	8/10/16	1358	

NOTES/COMMENTS

Sediment Sampling Fieldsheet for Tijuana River Estuary

amec foster wheeler

Date: 8/10/16
Personnel: JR, TA
Weather: Clear
Time / Height low tide:
Time / Height high tide:

Station ID	Time	Grab #	Water Depth (m)	Penetration Depth (cm)	% Surface Intact	Overlying Water (Y/N)?	Acceptable (Y/N)?*	Sed Type	Color	Odor	Photo ID
	11:40	1	10cm	9	100	Yes	Yes	Silt	Black	Musty	9
	1207	2	10cm	8	100	Y	Y	Silt	Black	Musty	13
	1220	3	9cm	9cm	90	Y	Y	"	"	"	14

* Acceptability criteria: minimum 5-cm penetration, even sample surface, minimal disturbance/high % surface intact, overlying water present

** Record all grab attempts

Notes: