Public Awareness

Industrial Facility

Public Participation

Construction

Illicit Discharge Detection & Elimination

County Facilities

15th Annual Report
Arizona Pollutant Discharge Elimination System
Stormwater Discharge Permit No. AZS000002
Pima County, Arizona

October 2012

Water and Wastewater Division

Stormwater Management Plan

Stormwater Management Program
Pima County Department of Environmental Quality
33 N. Stone Avenue, Suite 700
Tucson, Arizona 85701-1429

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Executive Summary

Introduction

This report describes activities performed and data collected for Pima County's Arizona Pollutant Discharge System (AZPDES) Permit No. AZS000002 between July 1, 2011 and June 30, 2012. This permit authorizes Pima County to discharge stormwater from a municipal separate storm sewer system (MS4) to waters of the United States.

This report is the first annual report prepared under the new state permit issued on June 16, 2011 and effective on July 18, 2011, herein referred to as the 2011 MS4 permit. The previous 14 annual reports were prepared under the Phase I MS4 stormwater permit issued by EPA Region 9 on February 14, 1997 with an effective date of March 19, 1997.

Certification

Pima County's principal executive officer signs and certifies this annual report was prepared by qualified personnel to properly gather and evaluate the information submitted (Part 2).

Stormwater Management Program (SWMP)

All best management practices (BMPs) were implemented in accordance with the SWMP during the reporting period. Information for the SWMP is found in the following parts: Narrative summary of SWMP activities (Part 3 and Part 13), Numeric summary of SWMP activities (Part 4), Evaluation of SWMP (Part 5), and Modifications to SWMP (Part 6).

Wet Weather Monitoring

Water quality samples were collected from the Monitoring Sites (Part 7). Storm event records were automatically recorded and summarized (Part 8). Analytical results for the water quality samples (Part 9), the water quality assessment (Part 10) and the estimate of annual pollutant loadings (Part 11) document the quality of surface water flows.

Expenditures and Proposed Budget

A summary of the annual expenditures and the proposed budget are summarized (Part 12).

Conclusions

Pima County implemented the SWMP and Wet Weather Monitoring Program. Activities included maintenance of the roadways and drainage systems. Inspections were performed at 9 outfalls, 46 construction sites and 10 industrial facilities. The public reported 1220 environmental complaints that were inspected. These inspections resulted in 511 Notices of Violation and 477 remediated sites. Eight stormwater samples were collected at five monitor sites. Analysis of the water quality results for 134 parameters shows copper and *E. Coli* are the only pollutants detected above Arizona's Surface Water Quality Standards indicating the surface waters in Pima County are fairly clean.

PART 1: GENERAL INFORMATION

A. Name of Permittee: Pima County

B. Permit Number: AZS000002

C. Reporting Period: July 1, 2011 - June 30, 2012

D. Name of Stormwater Management Program Contact: Marie Light

Title: Principal Hydrologist

Mailing Address: 33. N. Stone, Suite 700

City: Tucson

Zip: 85701-1429

Phone: 520-243-7400

Fax Number: 520-838-7432

Email Address: marie.light@deq.pima.gov

E. Name of Certifying Official: John M. Bernal

Title: Deputy County Administrator for Public Works

Mailing Address: 130 W. Congress

City: Tucson

Zip: 85701-1317

Phone: 520-740-8661

Fax Number: 520-740-8171

Email Address: john.bernal@pima.gov

F. Scope of Permit

The physical components within the permit area include 2,087 miles of roadway, 39 miles of storm drains and appurtenances that collect and convey runoff from precipitation events, with lengths reported by Pima County Department of Transportation (PDOT) and Regional Flood Control District (RFCD, respectively. The permit area is unincorporated Pima County within the Santa Cruz River watershed (Figure 1-1, blue area). In both rural areas and metropolitan areas, runoff collects in ephemeral stream channels and infiltrates into alluvial deposit in the valley (USGS, 1973). Flows in ephemeral stream channels occur in response to rainfall events that are larger than 0.2 inches. Most runoff infiltrates within Pima County.

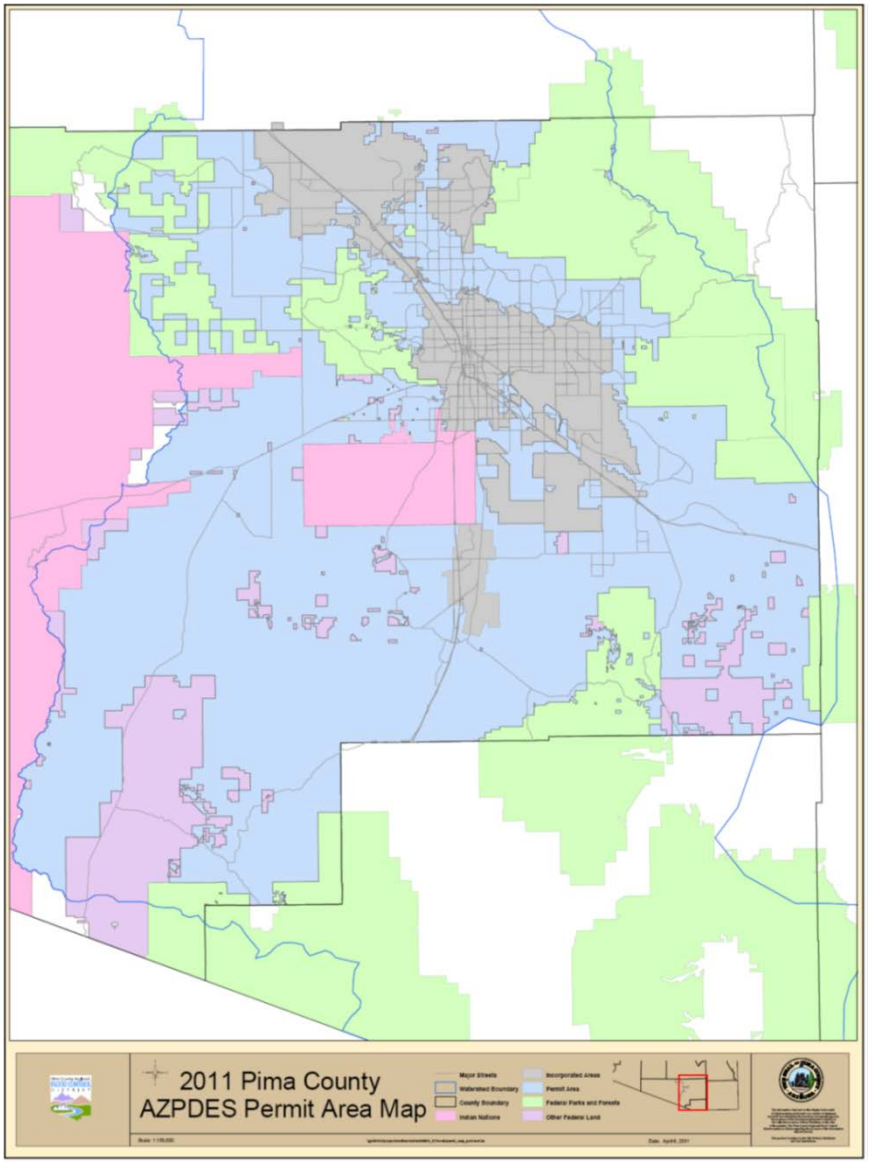

Figure 1-1. 2011 AZPDES Permit Area Map

Managements Activities

Management of the program includes coordinating with Pima County departments maintain roadways and drainageways, purchasing open space to conserve land and manage stormwater operations between five county departments. Pima County collaborates with local jurisdictions, businesses, educational institutions, and interested members of the public to engage the public in restoring and maintaining the integrity of surface waters in the county. Education and training include teaching techniques to keep water clean and using stormwater as a resource for landscape irrigation and other beneficial uses. Staff engages the novice to the profession as well as kids to great grandparents.

Field Activities

Pima County inspects outfalls, construction sites, industrial facilities, and reported environmental complaints that could lead to illicit discharge detection and elimination. To characterize water quality, Pima County collects water samples at five monitor sites representing low density residences, medium density residences, high density residences, commercial, and industrial land uses.

This report documents these activities and results.

References

USGS, 1973. *Geohydrology and Water Resources of the Tucson Basin, Arizona*, Geological Survey Water-Supply Paper 1939-E, 80 pp.

COUNTY ADMINISTRATORS OFFICE
PIMA COUNTY GOVERNMENTAL CENTER
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C.H. HUCKELBERRY
County Administrator

October 30, 2012

Christopher P. Henninger
Manager
Stormwater & General Permits Unit
Arizona Department of Environmental Quality
1110 W. Washington Street
Phoenix, Arizona 85007

Re: 2012 Annual Report for Pima County's AZPDES Municipal Separate Storm Sewer System Discharge Permit, NPDES Permit No. AZS000002

Dear Mr. Henninger:

Enclosed is the 2012 Annual Report for Pima County's Arizona Pollutant Discharge Elimination System (AZPDES) Municipal Separate Storm Sewer System (MS4) Discharge Permit. This report has been prepared in conformance with the requirements of the above referenced permit.

Sincerely,

John M. Bernal
Deputy County Administrator for Public Works

Attachment: Payment of Phase 1, MS4 Annual Fee Invoice #73374

Cc: C.H. Huckelberry, County Administrator
Ursula Kramer, Director, Pima County DEQ

Part 2: ANNUAL REPORT CERTIFICATION AND LEGAL AUTHORITY

I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

John M. Bernal
Deputy County Administrator for Public Works

October 30, 2012

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3. NARRATIVE SUMMARY OF STORMWATER MANAGEMENT PROGRAM

Pima County's municipal separate storm sewer storm drain system consists of 2,087 miles of roadways, 39 miles of stormdrains, and infrastructure collecting runoff into drainageways or discharging runoff to ephemeral stream channels. Pima County utilizes a Public Awareness Program and a Public Participation Program to invest in behaviors protecting the quality of stormwater as it flows through the county. The public is encouraged to report illegal dumping and unusual environmental conditions to remove materials in washes or on land that could be transported into a wash during rainfall events. Management of Pima County Facilities includes maintenance of infrastructure and acquisition of property to prevent stormwater pollution. Inspections of Industrial Facilities and Construction Sites also reduce stormwater pollution. Post Construction activities include inspections once construction is completed at a site as well as implementation of Green Infrastructure and Low Impact Development (GI/LID).

A. Public Awareness

The public awareness program involves on-going education of the public and businesses, participation in environmental education events and stormwater educational events. The methods of delivering the keep-stormwater-clean message are literature, handouts, presentations, and Pima County DEQ staff. The program was expanded to include distributing literature in Pima County libraries to children. The program is called EcoNook and was initiated in April 2012. A list of the outreach materials distributed and copies of the documents and webpages illustrate the messages Pima County is sending to the public (Appendix A).

<u>Conferences, Seminars and Presentations</u>
Pima County DEQ staff coordinated the 2012 Arid LID Conference held on March 27- 29, 2012. About 125 participants attended the conference from Arizona, California, New Mexico, Colorado, Nevada, Utah and Wisconsin. Conference topics were selected to identify the additional research needed to implement GI/LID, current policies, grass roots network approaches, review of case studies, and efforts to motivate participants to build effective and easily maintained GI/LID projects.

Pima County DEQ also participated in a multi-jurisdictional regional Stormwater Construction Seminar 2012 on February 22, 2012. There were 107 participants. Seminar presenters described stormwater regulations, how to apply for a Notice of Intent and prepare a Stormwater Pollution Prevention Plan, install and maintain control measures, final stabilization, and how to retrofit for GI/LID. The seminar was developed and sponsored by the Pima Association of Governments (PAG), Pima County DEQ staff, City of Tucson, Town of Marana, Town of Oro Valley, Town of Sahuarita, ADEQ, Watershed Management Group, and Arizona Department of Transportation.

Each fall semester, Pima Community College requests a three hour presentation on stormwater management for the lecture *Building/Construction Technology 265 Sustainability.* Class sizes range between 5 to 30 people, depending upon the number of people registered in a semester.

The first topic presented to the general public addressed the pollutant most frequently detected during wet weather monitoring, namely *Escherichia Coli*. The Stoppin' the Droppin' campaign was developed with a brochure and a PowerPoint presentation. Six presentations were made at Pima County Annual Meeting at Tucson Estates I & II Homeowners Association, Tucson Estates II HOA, Tucson Estates Pet Owner's Club, Environmental Quality Advisory Council, and Pima County Community Relations Group. Approximately 295 people attended these presentations.

Pima County DEQ also participated in numerous storm water-related meetings of the Storm Water Management Working Group hosted by the Pima Association of Governments (PAG). This group developed a multi-media outreach campaign designed to educate residents about stormwater pollution. The slogan "Clean Water Starts with Me" was used for the fourth consecutive year to increase familiarity with the successful message. Artwork and style matches the imagery used by the local jurisdictions in school programs. Public Service Announcements (PSAs), radio ads, billboards, magazine ads and social media ads were run through the monsoon season from July through September 2011. The PSAs developed in 2008 were screened on different television stations this fiscal year to reach additional audiences, including Spanish-speaking populations. PAG also developed a GIS layer showing all MS4s in Pima County. This is now a layer in the on-linen GIS Pima County MapGuide.

EcoNook for Desert Dwellers and Eco Kids Corner

In April, 2012, Pima County DEQ initiated a community outreach project with 27 libraries in the Pima County Public Library system. Librarians created special areas within each library where free environmental literature was available for patrons. "EcoNook for Desert Dwellers" targets teenagers and adults while "Eco Kids Corner" serves children 12 years and under. Educational materials cover stormwater quality topics including stormwater pollution prevention, water harvesting, desert gardening, GI/LID. Within the first three months,, 14 libraries requested additional supplies because the materials were so popular.

Business Assistance Program

Activities in the Business Assistance Programs help local businesses comply with applicable environmental requirements (Table 3-1). Pima County DEQ staff assists businesses in the completion of permit applications, clarifies the complex regulations, identifies potential violations, informs businesses about pollution prevention methods and makes suggestion to reducing stormwater discharges and stay in compliance. Free literature is provided.

Table 3-1. Summary of Business Assistance Program

Type of Assistance	Number
Telephone/E-mail inquiries	300
DEQ office assistance visits	15
Letters/information mailed	10
Educational brochures	18,133
Seminars/presentations given	7
Brochures that were updated	3

B. Public Participation

Engaging the public in substantive actions to reduce pollutants from entering stormwater is key to long-term success. Members of the public clean trash from roadways and drainageways, recycle or dispose of hazardous materials at the Household Hazardous Waste Facility and report environmental issues to Pima County DEQ.

Adopt-a-Roadway Program

Volunteers in Pima County's Adopt-a-Roadway program clean up roadways and public lands. The program has 240 adopted roads with a total length of 380 miles. Pima County tracks the amount of material cleaned up from each adopted road (Appendix B).

Environmental Complaints

The public and businesses are encouraged to fax, phone or e-mail information about environmental complaints to Pima County DEQ. Each complaint is inspected or, if the location of the complaint places it within another jurisdiction, the complaint is referred to the responsible jurisdiction. Additional information about the inspection and potential enforcement process is described in the next section.

Household Hazardous Waste Program

The Household Hazardous Waste Program, operated jointly by Pima County and the City of Tucson, provides a means for small businesses and the public to properly dispose of common household and automotive products. The public is encouraged to bring automotive fluids, batteries, drain openers, hobby chemicals, household cleaners, lawn and garden products, pesticides, paint products, medications, polishes, pool chemicals, solvents and items labeled acid, flammable, caustic, poison, caution, toxic, danger or warning. Program managers track the amount of waste collected from the public and small businesses as well as the number of participants and events (Appendix C).

Washup Program

Volunteers meet every other month during the cool months of the year and pick up trash in washes. The trash is bagged and transported the next business day to a landfill. This program was temporarily suspended during this fiscal year.

C. Illicit Discharge Detection and Elimination Activities

Pima County DEQ receives complaints from the general public, elected officials, regulators, and local governments identifying potential sources of pollutants that could endanger public health or the environment. Each complaint within Pima County's jurisdiction is inspected to determine if a pollutant has entered the environment and if so, the severity of the problem. The complaint is tracked until it is closed (Appendix D) or is escalated to the enforcement action of a Notice of Violation (NOV). NOVs are closed when the pollutant has been abated (Appendix E).

The number of complaints filed within Pima County's jurisdiction during this fiscal year was 1,220. Each complaint was inspected and the average time between filing the complaint and the inspection was 1.9 days. The number of inspections performed within three days was 1054 or 86% of all inspections. There are several possibilities for sites not being logged as inspected. Several complaints can be called in for the same issue and only one inspection is performed for the group of complaints. Other complaints are addressed by sending a information letter, such as how to remove buffelgrass or how to drain a pool properly.

These inspections and 45 other sources led to 511 NOVs. During the fiscal year 477 cases were closed, 17 remained open, one was rescinded, one was extended and twelve were elevated to a legal process. The enforcement phase has a closure rate of 93% and average closure tim is 41.2 days. Illicit discharges of solid wastes, such as wildcat dumping and improper disposal of solid wastes, comprise 52% of complaints received by Pima County DEQ and 77% of issued NOVs.

Illicit discharges of liquids to the MS4 are relatively rare due to the open nature of the system and the high likelihood that illicit discharges will be seen. Pima County has identified 39 outfalls within the permit area (Appendix F-1). 23 are major outfalls, all of which are not considered priority outfalls due to the lack of illicit liquid discharges. Pima County Regional Flood Control District (RFCD) inspected 9 major outfalls (Appendix F-2), or 39% of the major outfalls. This fulfills the permit requirement of inspecting 20% each year. In addition, both the Pima County Department of Transportation (PDOT) and Regional Wastewater Reclamation Department (RWRD) document when the public spills hazardous materials within the county (Table 3-2).

Table 3-2. Spills within Permit Area

Date	Location	Township Range Section	Description	Response
10/12/11	4751 S. Mesquite Ranch Rd	T14S R15E Sec 35	24 g diesel fuel spilled on pavement at fueling station	Cleaned up with absorbent. Tested. Disposed @ Los Reales Landfill.
02/09/12	Parcel #305-01-013A	T16S R15E Sec 22	Fluorescent bulbs dumped	Within Southeast Regional Park. Referred to Parks Dept.
02/15/12	Ina Rd @ Sonya Wy	T12S R13E Sec.36	50 g KleenupPro herbicide spilled on pavement	Cleaned up with absorbent. Disposed as hazardous waste.
03/28/12	5600 N Trisha Ln	T13S R13E Sec. 09	10 g oil sludge, 28 g used oil dumped in Right-of-Way	Sludge disposed in trash. Oil tested and recycled.
06/21/12	4353 E Illinois St	T14S R14E Sec. 34	Contaminated soil and debris in street	Cleaned up by property owner

g = gallon

D. County Facilities

Management of County Facilities includes preparing an inventory of county facilities, GIS mapping of the MS4 features, maintaining roadway and drainageway infrastructure, drainageways, acquiring land to conserve open spaces and training staff directly involved in stormwater activities. All activities are preventive measures to keep stormwater clean.

County Facility Inventory and Spill Prevention

The first phase of the permit requires Pima County prepare an inventory of county-owned or operated facilities with the potential to discharge pollutants to receiving waters (Appendix G). A completed inventory and prioritization is due in the next annual report. Included in the inventory are Publicly-Owned Treatment Works that are operated and maintained to prevent exfiltration and overflows of sewage. These facilities operate in compliance with Arizona Department of Environmental Quality water permits such as Aquifer Protection Permits (APP) and Arizona Pollutant Discharge Elimination System (AZPDES).

Proper use and storage of chemicals is regulated within Pima County through enforcement of local requirements (environmental nuisance, solid waste, and liquid waste requirements) established in Title 7 of the Pima County Code (Pima County, 2011b). Contractors hired to maintain Pima County landscaped areas and public right-of-ways are required to follow spraying protocols established by State of Arizona rules and manufacturer's recommendations.

GIS Mapping

Pima County is in the process of identifying the natural and man-made structures routing runoff during a storm event. The Geographic Information System (GIS) layers include points (storm drain inlets, catch basins, outfalls), lines (MS4 pipes, Impaired waters, Outstanding Arizona Water), and polygons (retention/detention basins, impaired waters, Outstanding Arizona Waters) (Appendix H).

Development within Pima County results in pockets of land with paved roads and stormdrains discharging to receiving waters. When developments fill-in portions of undeveloped open spaces, receiving waters flow through alternating natural open space and developed areas. This current state of partially filled-in urban areas complicates the identification of outfalls and the boundaries of the MS4.

Infrastructure Maintenance

Drainageways

Pima County RFCD maintains 450 miles of drainage, excluding the major water courses of the Santa Cruz River, Rillito River, Pantano Wash and Cañada Del Oro Wash. RFCD prioritizes 150 miles for inspection, and inspects the identified outfalls (Appendix F) and drainage reaches. They then follow up with cleaning and grading where needed.

Roadways
Pima County Department of Transportation (PDOT) maintains 2,087 miles of roads and the drainageways in the road right-of-ways. The types of roadway maintenance include sweeping, shoulder repairs, pothole repairs, grading and blading, sidewalk and curb repair, street surface repairs and litter and debris removal (Appendix I).

Land Conservation
Land has been purchased under the 1997 Open Space Bond Program (OSBP), the 2004 Conservation Acquisition Bond Program (CABP) and the Flood prone Land Acquisition Program (FLAP) to conserve land (Appendix J). The 1997 OSBP and 2004 CABP protect the region's most prized natural and cultural resources (Pima County, 2011d). The FLAP preserves land in floodways.

Training staff directly working on stormwater control measures
Pima County trains field personnel to recognize and report potential illicit discharges to Pima County DEQ by fax, phone or e-mail. Additionally, Pima County DEQ trained twelve staff members who inspect field conditions for the Air Quality Program, Water Quality Program, and Waste Program. The presentation introduced the Stormwater Management Program and described what elements to look for to file a stormwater complaint.

E. Industrial and Commercial Facilities

The Industrial Facilities Inventory is based on ADEQ's list of facilities that filed for the 2010 Multi-Sector General Permit (2010 MSGP) and facilities which need to file a Notice of Intent for the 2010 MSGP. Facilities located within the permit area and which have the potential to discharge to a Pima County roadway or drainageway were added to the inventory (Appendix K-1). Stormwater inspections are designed to evaluate consistency with the ADEQ's 2010 MSGP and compliance with Pima County ordinances. The Site Inspection Report form was modified to incorporate the 2010 MSGP and Pima County 2011 MS4 permit. Of the 49 industrial facilities, ten were inspected during this fiscal year (Appendix K-2). As the permit requires inspections of 20%, the permit requirement has been met.

Inspections for the industrial facilities started in early April. Eight required additional work to be consistent with either the 2010 MSGP or compliance with Pima County ordinances. By June 30, 2012, one of the facilities had fulfilled the recommended changes.

F. Construction Sites

Activities reducing pollutants to stream channels include plan reviews, issuance of air quality permits and Floodplain Use Permits, construction site inspections, and staff training.

Plan Reviews

Before grading permits or construction permits are issued, plans for development are first reviewed by Pima County Development Services Department (DSD). These plans must conform to requirements for Pima County Buffer Overlay Zone (BOZO), grading standards (GS), setback requirements for BOZO and GS, hydro seeding and revegetation, Hillside Development Overlay Zone and surface stabilization (Appendix L). Pima County DSD staff inspects the sites to verify the construction is proceeding according to approved plans.

Pima County Permits

Septic Systems

All new septic systems within Pima County must undergo pre-construction design approval, percolation testing, and post-construction installation approval. Septic system failure or exfiltration of water from these systems into the Pima County MS4 rarely occurs. If a surface discharge from a septic system were to occur, it would be regulated under Title 7 of the Pima County Code §7.21.025.A.

Floodplain Use Permit (FLUP)

Pima County RFCD issues FLUPs for specific improvements within the regulatory floodplain or erosion hazard area (Appendix M). The permits are required prior to beginning construction in areas were flows exceed 100 cubic feet per second or where sheet flooding occurs.

Pima County Air Quality Activity Permits

Pima County requires air quality activity permits, called fugitive dust activity permits, for trenching operations, road construction, and land stripping or earthmoving activities that disturb one acre or more. Each permit requires the construction site operator to take reasonable precautions to control fugitive dust emissions from the site. Proper dust suppression techniques prevent the deposition of windblown dust that may later become entrained in stormwater and reduces tracking from construction sites.

Construction Site Inventory and Inspections

Pima County DEQ prepares a construction site inventory based on ADEQ's list of operators filing for the 2008 Construction General Permit (CGP) as well as identification of sites that need to file an NOI for the 2008 CGP. Pima County inspected approximately 46 construction sites active during the reporting period, two of which are high priority projects requiring quarterly inspections. The remaining sites were inspected semi-annually. There were 64 Notices of Intent (NOIs) indicating several sites had multiple NOIs. The construction site inventory lists all the permitted sites and dates of the 162 inspections (Appendix N-1). The results of the site inspection reports show all have filed NOIs (Appendix N-2). There were varying degrees of application of the control measures identified in their Stormwater Pollution Prevention Plans (SWPPPs).

G. Post Construction

We are now tracking the effectiveness of construction projects after construction is complete. There is a post-construction inventory and copies of the site inspection reports (Appendix O).

H. References

Pima County, Arizona, 2011. *Municipal Separate Storm Sewer System AZPDES Permit No. AZS000002.*

Pima County, Arizona. 2011. *14th Annual Report for Pima County's National Pollutant Discharge Elimination System [NPDES] Storm Water Discharge Permit No. AZS000002*. Pima County Department of Environmental Quality. September.

Pima County, Arizona, 2011. Code of Ordinances, Title 7, Environmental Quality, http://library.municode.com/index.aspx?clientID=16119&stateID=3&statename=Arizon.

Pima County, Arizona, 2011. *Protecting Our Land, Water and Heritage, Pima County's Voter-supported conservation Efforts*, Pima County Sonoran Conservation Plan. February.

Schueler, Thomas R. 1987. *Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs*. Metropolitan Washington Council of Governments.

U.S. Environmental Protection Agency. 1992. *Guidance Manual For The Preparation Of Part 2 Of The NPDES Permit Applications For Discharges From Municipal Separate Storm Sewer Systems*. Office of Water (EN-336), EPA 833-B-92-002. November.

Table 4-1. Numeric Summary of Stormwater Management Program Activities

Control Measures (number, unless specified otherwise)	**11/12**	**12/13**	**13/14**	**14/15**	**15/16**
A. Public Awareness (See Part 13A for details)					
Conference, seminars, presentations	8				
Literature distrubuted	18,133				
B. Public Participation (See part 13B and 13C for details)					
Adopt-a-Roadway (bags collected)	2,624				
Household Hazardous Waste Collection (tons)	540				
Washup (bags collected)	0				
C. Illicit Discharge Detection and Elimination Program					
1. County Employee Training					
Training sessions (non-stormwater discharges, IDDE program)	1				
Employees attending training	15				
2. Spill Prevention					
County facilities identified with hazardous materials	9				
Spills in outside areas @ county facilities w/ hazardous materials	0				
Facility assessments completed [begins FY 12/13]	NA				
Site Specific Materials Handling & Spill Response Procedures (date)	11/12/11				
Environmental complaints	1220				
Environmental complaints inspected within 3 days	1054				
Notices of Violation for illicit liquid discharges	61				
Notices of Violation for illicit solid discharges	392				
Notices of Violation closed for illicit discharges, solid and liquid	425				
3. Outfall Inspections (See Part 13F for details)					
Outfalls inspected[2]	9				
Priority Outfalls identified to date	20				
Priority Outfalls inspected	9				
Dry weather flows detected	0				
Dry weather flows investigated	0				
Major outfalls sampled during dry weather flows	0				
Illicit discharges identified	0				
Illicit discharges eliminated	0				
Amount of stormwater drainage system inspected	53%				
Storm drain cross-connection investigations	0				
Illicit connections detected	0				
Illicit connections eliminated	NA				
Corrective/enforcement actions initiated w/ 60 days of identification	NA				
Cases resolved w/ 1 year of original enforcement action (%)	NA				
Illicit discharge reports received from public	1220				
Illicit discharge reports responded to (%)	100%				
Responses initiated within three (3) business days of receipt	1075				

Table 4-1. Numeric Summary of Stormwater Management Program Activities

Control Measures (number, unless specified otherwise)	**11/12**	**12/13**	**13/14**	**14/15**	**15/16**
D. County Facilities (See Part 13G - 13J for details)					
1. Employee Training					
Training events (Part 3 for dates & topics)	1				
Staff trained	15				
2. Inventory, Map, or Database of County Owned/Operated Facilities					
Facilities on inventory	46				
Date identification of Higher Risk facilities completed [begins 12/13]	NA				
Date prioritization of county facilities completed	NA				
3. Inspections					
Miles of MS4 drainage system prioritized for inspection	150				
Miles of MS4 drainage system visually inspected	238				
Higher Risk county facilities inspected [begins FY 12/13]	NA				
Higher Risk county facilities needing improved stormwater controls "	NA				
4. Infrastructure Maintenance					
Linear miles of MS4 drainage system cleaned each year	175				
Spot litter, debris, weed control (acres)	133.5				
Catch basins identified to date [begins FY12/13]	NA				
Catch basins cleaned	0				
Amount of waste collected from catch basin cleaning (tons)	0				
Roadway surface maintenance (CY)	2,925				
Street and intersection sweeping (miles)	4,208				
Shoulder repair sites (CY)	26,468				
Pothole repair (tons)	10,068				
Sidewalk & curb repair (LF)	3,306				
Roadway grading (miles)	965.35				
Drainageway grading (miles)	0.25				
E. Industrial & Commercial Sites Not Owned by the County (Part 13K)					
Training events for county staff	1				
County staff trained	15				
Facilities on priority list	49				
Industrial facilities inspected	10				
Corrective/enforcement actions initiated on industrial facilities	8				
Cases resolved w/ 1 year of original enforcement action (%)	1				
F. Construction Program Activities (See Part 14L for Details)					
Training events for county staff (Part 3.A for topics)	1				
County staff trained	80				
Construction/grading plans submitted for review	62				
Construction/grading plans reviewed	27				
Construction sites inspected	46				
Corrective/enforcement actions initiated on Construction Sites	16				
Corrective/enforcement actions resolved on Construction Sites	15				
Buffer overlay zone plan reviews	4				
Floodplain Use Permits issued	108				
Floodplain Use Permit violations	0				
Open Space land acquisition (acres)	473.03				
Flood-prone Acquistion Program (FLAP) (acres)	0				

Table 4-1. Numeric Summary of Stormwater Management Program Activities

Control Measures (number, unless specified otherwise)	**11/12**	**12/13**	**13/14**	**14/15**	**15/16**
Hillside development overlay zone plan reviews	0				
Hydroseeding and revegetation projects	0				
Set-back requirements	0				
Slope stabilization	0				
G. Post Construction Program Activities (See Part 13O)					
Post-construction inspections completed for Post Construction	32				
Corrective/enforcement actions initiated for Post Construction	0				

NA - Not applicable

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PART 5: EVALUATION OF STORMWATER MANAGEMENT PROGRAM

Activities of the Stormwater Management Program (SWMP) include control measures to reduce discharges in stormwater through public awareness and public involvement programs, illicit connection and illegal dumping to storm drain investigations, maintenance of roadways and drainage ways, new development and significant redevelopment programs, industrial facility inspections, construction site inspections, and enforcement actions. In addition, rainfall, runoff volumes, and water quality sampling of the runoff have steadily documented water quality at five land uses. Inspections at construction sites and industrial facilities effectively introduced stormwater pollution prevention practices to the construction business sector and industrial business sector.

The 1997 MS4 permit and the associated SWMP were effective February 14, 1997 through July 18, 2011. ADEQ issued the new 2011 MS4 permit on June 16, 2011 and the associated SWMP is being revised.

After reviewing the data and operational information tabulated in the report, the following activities were determined helpful to improving documentation, precision of data, and a wider range of analyses:

1. Assess status of enforcement cases by watershed.
2. Evaluate water quality and pollutant loadings by season
3. Tracking spills by County Facilities, not just by public in county property
4. Track drainage cleanup the way PDOT tracks roadway cleanup.
5. Track training in PDEQ, RWRD, PDOT, RFCD.
6. Arrange for analytical work with concentrations detection limits that are smaller that Surface Water Quality Standards, if laboratories are certified for the analytical method.
7. Calculate acres of five land uses within new permit area to facilitate evaluation of pollutant loading estimates by land use.
8. Track inspected sites coming back into compliance more rigorously.

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6. Stormwater Management Program Modifications

ADEQ issued the new 2011 MS4 permit on June 16, 2011. A new Stormwater Management Program was developed to meet the provisions of the 2011 MS4 permit. As this is the first year the new Stormwater Management Program has been in effect, there were no modifications to the control measures.

1. **Addition of New Control Measures**
   No new control measures were proposed.

2. **Addition of Temporary Control Measures**
   No temporary control measures were proposed.

3. **Increase of Existing Control Measures**
   Existing control measures were maintained during the fiscal year.

4. **Replacement of Existing Control Measures**
   None.

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Table 7-1. Monitor Site Location and Equipment Information

Site No.	Receiving Water	Monitor Site Location Information					
		Address/ Location	Latitude	Longitude	Elevation (feet above mean sea level)	Area (acres)	Dominant Land Use
1	Unnamed wash	Approximatly 180 feet N NE of Calle Esplendor and Calle Barril	32°17'46.1"	-110°54'30.6"	2642	2.8	Residential Low Density
2	Unnamed wash	Approximately 700 feet south of Ruthrauff Road and La Cholla Blvd.	32°17'32.6"	-111°00'42.6"	2275	56.8	Residential Medium Density
3	Valley View Wash	Approximately 650 feet south of Valley View Rd and Sunrise Drive	32°18'22.9"	-110°54'38.8"	2709	7.3	Residential High Density
4	Valley View Wash	Approximately 655 feet south of Valley View Rd and Sunrise Drive	32°18'23.0"	-110°54'38.8"	2710	41.6	Commercial
5	Unnamed wash	Southeastern corner of 3102 E. District St.	32°10'27.5"	-110°55'34.1"	2542	52.2	Industrial

Table 7-1. Monitor Site Location and Equipment Information

Site No.	Receiving Water	Monitoring Equipment Information		
		Rainfall	Flow	Water Quality Samples
1	Unnamed wash	Tipping bucket rain gauge with remote data collection	5-gallon bucket, stopwatch	Sample bottles, pH and temperature meter
2	Unnamed wash	Tipping bucket rain gauge with remote data collection	depth measured with meter graduated to millimeters, rating curve	Sample bottles, pH and temperature meter
3	Valley View Wash	Tipping bucket rain gauge with remote data collection	depth measured with meter graduated to millimeters, rating curve	Dipping pole, Sample bottles, pH and temperature meter
4	Valley View Wash	Tipping bucket rain gauge with remote data collection	depth measured with meter graduated to millimeters, rating curve	Dipping pole, Sample bottles, pH and temperature meter
5	Unnamed wash	Tipping bucket rain gauge with remote data collection	depth measured with meter graduated to millimeters, rating curve	Sample bottles, pH and temperature meter

Part 8: Storm Event Records

Summer storms in Pima County typically have a short duration and high intensity. Winter storms are generally longer in duration and less intense. The extended event duration in the winter may result in a delay from the time rainfall begins and runoff begins that is greater than one hour. Although permit and guidance documentation indicates the first sample is to be collected within an hour of the start of rainfall, storm runoff may not begin until several minutes or hours after the initial rainfall. In this case, first flush is collected when runoff begins.

During the reporting period there were 48 rainfall events (Table 8-1). The annual rainfall at the monitor sites ranged from 8.90 to 11.87 inches, which is lower than the annual normal rainfall of 11.55 inches (National Weather Service Forecast Office, Tucson, AZ, 2011).

A technical difficulty occurred within the month of November 2011. The technical difficulty involved a temporary interruption in the routine process used for stormwater sample analysis. The laboratory where samples are processed and analyzed was in the process of relocating to a new facility. Therefore the equipment and instruments needed to analyze the stormwater were not available at the laboratory during that time.

References

National Weather Service Forecast Office, Tucson, AZ. 2011. Monthly and Daily Normals (1981 – 2010) plus Daily Extremes (1895-2011) for TUCSON, ARIZONA. Downloaded from the National Weather Service, NOAA website on October 5, 2011 from http://www.wrh.noaa.gov/twc/climate/tus.php.

Season	Date	Site #1	Rainfall (in)	Site #2	Rainfall (in)	Site #3	Rainfall (in)	Site #4	Rainfall (in)	Site #5	Rainfall (in)
S	06/16/12									NR	0.08
W	04/14/12		0.2	-	0.12	-	0.2	-	0.2	-	0.16
W	03/19/12	NR	0.08	-	0.12	-	0.08	-	0.08	-	0.04
W	03/18/12		0.44	**SC**	0.56	**SC**	0.44	**SC**	0.44	-	0.32
W	02/14/12	IF	0.20	NR	0.08	IF	0.20	IF	0.20	-	0.12
W	01/16/12	NF	0.00	NR	0.08	NF	0.00	NF	0.00	NF	0.00
W	01/16/12	NR	0.04	IF	0.20	NR	0.04	NR	0.04	-	0.16
W	01/15/12		0.24	NF	0.00		0.24		0.24	NF	0.00
W	12/19/11	NR	0.12	NR	0.04	NR	0.12	NR	0.12	-	0.16
W	12/18/11	NR	0.16	IF	0.20	NR	0.16	NR	0.16	-	0.08
W	12/13/11	NR	1.16	NR	1.16	NR	1.16	NR	1.16	-	1.16
W	12/12/11		0.24		0.20	IF	0.24	IF	0.24	-	0.16
W	12/03/11		0.20		0.24		0.20		0.20	**SC**	**0.24**
W	12/02/11	NR	0.16	IF	0.24	NR	0.16	NR	0.16	NR	0.08
W	12/01/11	NF	0.00	NF	0.00	NF	0.00	NF	0.00	NR	0.12
W	11/25/11	TD	0.24	NR	0.08	TD	0.24	TD	0.24	NR	0.08
W	11/13/11	TD	0.64	TD	0.56	TD	0.64	TD	0.64	TD	0.32
W	11/07/11	TD	0.36	TD	0.36	TD	0.36	TD	0.36	TD	0.24
W	11/05/11	TD	0.24	NR	0.12	TD	0.24	TD	0.24	NR	0.08
S	10/02/11	NF	0.00	NR	0.04	NF	0.00	NF	0.00	NF	0.00
S	09/27/11		0.68	NF	0.00		0.68	**SC**	**0.68**	NF	0.00
S	09/15/11	NF	0.00	NF	0.00	NF	0.00	NF	0.00	-	1.36
S	09/14/11	NF	0.00	NR	0.16	NF	0.00	NF	0.00	-	0.28
S	09/13/11	-	0.20	NF	0.00	-	0.20	NR	0.20	-	0.04
S	09/12/11	-	0.32	NR	0.28	-	0.32	NR	0.32	-	0.28
S	09/10/11	-	1.19		2.09	**SC**	**1.19**	DC	1.19	-	2.05
S	09/09/11	-	0.04	NF	0.00	NR	0.04	NR	0.04	NF	0.00
S	08/27/11	NF	0.00	NF	0.00	NF	0.00	NF	0.00	-	0.04
S	08/24/11	-	0.19	NF	0.00	NR	0.19	NR	0.19	NF	0.00
S	08/18/11	-	1.10	IF	0.35	IF	1.10	IF	1.10	-	0.95
S	08/16/11	NF	0.00	NR	0.08	NF	0.00	NF	0.00	NF	0.00
S	08/15/11	NF	0.00	NF	0.00	NF	0.00	NF	0.00	-	0.08
S	08/14/11	-	0.36	NF	0.00		0.36		0.36	NF	0.00
S	08/04/11	-	0.27	NF	0.00		0.27		0.27	NF	0.00
S	08/03/11	-	0.08	NF	0.00	NR	0.08	NR	0.08	-	0.04
S	08/02/11	-	0.16		0.59	NR	0.16	NR	0.16	-	0.03
S	07/31/11	NF	0.00	NR	0.16	NF	0.00	NF	0.00	NF	0.00

Season	Date	Site #1	Rainfall (in)	Site #2	Rainfall (in)	Site #3	Rainfall (in)	Site #4	Rainfall (in)	Site #5	Rainfall (in)
S	07/29/11	-	0.04	NF	0.00	NR	0.04	NR	0.04	NF	0.00
S	07/24/11	-	0.04	NF	0.00	NR	0.04	NR	0.04	NF	0.00
S	07/21/11	NF	0.00	NF	0.00	NF	0.00	NF	0.00	-	0.16
S	07/20/11	NF	0.00	NF	0.00	NF	0.00	NF	0.00	-	0.04
S	07/19/11	-	0.59	NR	0.04	NR	0.59	NR	0.59	NF	0.00
S	07/17/11	-	0.20	NF	0.00	IF	0.20	IF	0.20	NF	0.00
S	07/07/11	-	0.31	NR	0.04	NR	0.31	NR	0.31	NF	0.00
S	07/05/11	-	0.16	NR	0.43	NR	0.16	NR	0.16	-	0.51
S	07/04/11	**SC**	**1.10**	IF	0.20	NR	1.10	NR	1.10	**SC**	**0.24**
S	07/03/11	NR	0.12	NR	0.04	NR	0.12	NR	0.12	NR	0.12
Winter total			4.72		4.36		4.72		4.72		3.36
Summer Total			7.15		4.54		7.15		7.15		6.22
Annual total			11.87		8.90		11.87		11.87		9.58

Seasons: Summer June 1 - October 31 Winter November 1 - May 31

DC - Dangerous Condition
IF - Insufficient flow to collect sample
IS - Insufficient sample for analytical method
NF - No flow
NR - Not Representative
SC - Sample collected
TD – Technical Difficulty
- = Sample already collected

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Part 9. Water Quality Data from Monitor Sites

Site	Summer	Winter
1	07/04/11	
2		03/18/12
3	09/10/11	03/18/12
4	09/27/11	03/18/12
5	07/04/11	12/03/11

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date		**07/04/11**	**-**				
Conventional Parameters							
Average Flow Rate[3] (m^3/s)	-	0.0003					
Ph	6.5-9.0	6.4					
Temperature (°Celcius)	-	29°C					
Hardness[4] (mg/L)[5]	67	67					
Total Dissolved Solids (TDS) (mg/L)	-	-					
Total Suspended Solids (TSS) (mg/L)	-	60					
Biological Oxygen Demand (BOD) (mg/L)	-	-					
Chemical Oxygen Demand (COD) (mg/L)	-	-					
Inorganics							
Cyanide, total (ug/L)[6]	84	-					
Nutrients							
Nitrate + Nitrite as N (mg/L)		-					
Ammonia as N (mg/L)		-					
TKN (mg/L)		-					
Total Phosphorus (mg/L)		-					
Total Orthophosphate (mg/L)		-					
Microbiological							
Escherichia coli (*E. coli*) (CFU/100 mg or MPN)[7]	126	48840					
Total Metals[8]							
$Antimony_T$ (µg/L)	747	-					
$Arsenic_T$ (µg/L)	200	-					
$Barium_T$ (µg/L)	98,000	-					
$Beryllium_T$ (µg/L)	1,867	-					
$Cadmium_D$ (µg/L)	5	-					
$Chromium_D$ (µg/L)	1,377	-					
$Copper_D$ (µg/L)	16	30.8					
$Lead_D$ (µg/L)	89	Trace					
$Mercury_T$ (µg/L)	10.00	-					
$Nickel_D$ (µg/L)	2,964	-					
$Selenium_T$ (µg/L)	33	-					
$Silver_D$ (µg/L)	1.7	-					
$Thallium_T$ (µg/L)	75	-					
$Zinc_D$ (µg/L)	792	70.9					
Organic Toxic Pollutants							
Total Petroleum Hydrocarbons (TPH) (mg/L)	-	-					
Total Oil & Grease (mg/L)	-	-					

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date		**07/04/11**	**-**				
VOCs[9], Semi-VOCs, and Pesticides							
Acrolein (µg/L)	467	-					
Acrylonitrile (µg/L)	37,333	-					
Benzene (µg/L)	3,733	-					
Bromoform (µg/L)	18,667	-					
Carbon tetrachloride (µg/L)	1,307	-					
Chlorobenzene (µg/L)	18,667	-					
Chlorodibromomethane (µg/L)	18,667	-					
Chloroethane (µg/L)	-	-					
2-chloroethylvinyl ether (µg/L)	-	-					
Chloroform (µg/L)	9,333	-					
Dichlorobromomethane (µg/L)	18,667	-					
1,2-dichlorobenzene (µg/L)	5,900	-					
1,3-dichlorobenzene (µg/L)	-	-					
1,4-dichlorobenzene (µg/L)	6,500.00	-					
1,1-dichloroethane (µg/L)	-	-					
1,2-dichloroethane (µg/L)	186,667	-					
1,1-dichloroethylene (µg/L)	46,667	-					
1,2-dichloropropane (µg/L)	84,000	-					
1,3-dichloropropylene (µg/L)	28,000	-					
Ethylbenzene (µg/L)	93,333	-					
Methyl bromide (µg/L)	-	-					
Methyl chloride (µg/L)	-	-					
Methylene chloride (µg/L)	-	-					
1,1,2,2-tetrachloroethane (µg/L)	93,333	-					
Tetrachloroethylene (µg/L)	9,333	-					
Toluene (µg/L)	373,333	-					
1,2-trans-dichloroethylene (µg/L)	18,667	-					
1,1,1-trichloroethane (µg/L)	########	-					
1,1,2-trichloroethane (µg/L)	3,733	-					
Trichloroethylene (µg/L)	280	-					
Trimethylbenzene (µg/L)	-	-					
Vinyl chloride (µg/L)	2,800	-					
Xylene (µg/L)	186,667	-					
SVOCs - Acid Extractables							
2-chlorophenol (µg/L)	4,667	-					
2,4-dichlorophenol (µg/L)	2,800	-					
2,4-dimethylphenol (µg/L)	18,667	-					
4,6-dinitro-o-cresol (µg/L)	3,733	-					
2,4-dinitrophenol (µg/L)	1,867	-					
2-nitrophenol (µg/L)	-	-					
4-nitrophenol (µg/L)	-	-					
p-chloro-m-cresol (µg/L)	48,000	-					
Pentachlorophenol (µg/L)	8.14	-					
Phenol (µg/L)	180,000	-					
2,4,6-trichlorophenol (µg/L)	130	-					

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date		**07/04/11**	**-**				
SVOCs - Bases/Neutrals							
Acenaphthene (µg/L)	56,000	-					
Acenaphthylene (µg/L)	-	-					
Anthracene (µg/L)	280,000	-					
Benzo(a)anthracene (µg/L)	0.20	-					
Benzo(a)pyrene (µg/L)	0.20	-					
Benzo(b)fluoranthene (µg/L)	-	-					
Benzo(g,h,i)perylene (µg/L)	-	-					
Benzo(k)fluoranthene (µg/L)	1.9	-					
Chrysene (µg/L)	19	-					
Dibenzo(a,h)anthracene (µg/L)	1.9	-					
3,3-dichlorobenzidine (µg/L)	3	-					
Diethyl phthalate (µg/L)	746,667	-					
Dimethyl phthalate (µg/L)	-	-					
Di-n-butyl phthalate (µg/L)	1,100	-					
2,4-dinitrotoluene (µg/L)	1,867	-					
2,6-dinitrotoluene (µg/L)	3,733	-					
Di-n-octyl phthalate (µg/L)	373,333	-					
1,2-diphenylhydrazine (as azobenzene) (µg/L)	1.8	-					
Fluroranthene (µg/L)	37,333	-					
Fluorene (µg/L)	37,333	-					
Hexachlorobenzene (µg/L)	747	-					
Hexachlorobutadiene (µg/L)	187	-					
Hexachlorocyclopentadiene (µg/L)	11,200	-					
Hexachloroethane (µg/L)	850	-					
Indeno(1,2,3-cd)pyrene (µg/L)	1.90	-					
Isophorone (µg/L)	186,667	-					
Naphthalene (µg/L)	18,667	-					
Nitrobenzene (µg/L)	467	-					
N-nitrosodimethylamine (µg/L)	0.03	-					
N-nitrosodi-n-propylamine (µg/L)	88,667	-					
N-nitrosodiphenylamine (µg/L)	290	-					
Phenanthrene (µg/L)	-	-					
Pyrene (µg/L)	28,000	-					
1,2,4-trichlorobenzene (µg/L)	9,333	-					

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date		**07/04/11**	**-**				
PCB/Pesticides							
Aldrin (µg/L)	0.00	-					
Alpha-BHC (µg/L)	1,600	-					
Beta-BHC (µg/L)	560	-					
Gamma-BHC (µg/L)	11	-					
Delta-BHC (µg/L)	1,600	-					
Chlordane (µg/L)	3.2	-					
4,4'-DDT (µg/L)	1.1	-					
4,4'-DDE (µg/L)	1.1	ND					
4,4'-DDD (µg/L)	1.1	-					
Dieldrin (µg/L)	0.00	-					
Alpha-endosulfan (µg/L)	3	-					
Beta-endosulfan (µg/L)	3	-					
Endosulfan sulfate (µg/L)	3	-					
Endrin (µg/L)	0.004	-					
Endrin aldehyde (µg/L)	0.7	-					
Heptachlor (µg/L)	0.9	-					
Heptachlor epoxide (µg/L)	0.9	-					
PCB-1242 (AROCLOR-1242) (µg/L)	0.001	-					
PCB-1254 (AROCLOR-1254) (µg/L)	0.001	-					
PCB-1221 (AROCLOR-1221) (µg/L)	0.001	-					
PCB-1232 (AROCLOR-1232) (µg/L)	0.001	-					
PCB-1248 (AROCLOR-1248) (µg/L)	0.001	-					
PCB-1260 (AROCLOR-1260) (µg/L)	0.001	-					
PCB-1016 (AROCLOR-1016) (µg/L)	0.001	-					
Toxaphene (µg/L)	0.005	-					

Note:Results higher than SWQ are shown in red font. Non-detectable results with the Method Detection Limit (MDL) above the SWQS are shown as ND with the MDL in parentheses.

1 - Partial Body Contact (PBC), Aquatic & Wildlife ephemeral (A&We) or Agricultural Livestock watering (AgL).
2 - Surface Water Quality Standards (A.A.C R18-11-101 through Appendix B) selected from lowest of PBC, A&We or AgL.
3 - Average flow rate during the sampling event. m^3/s = meters cubed per second.
4 - Hardness of sample event is used to calculate SWQS for Cadmium, Chromium, Copper, Lead, Nickel, Sliver, and Zinc.
5 - mg/l = milligram per liter
6 - µg/L = micrograms per liter
7 - CFU/100 ml = colony forming unit per 100 milliliters, MPN = Most probable number per 100 ml
8 - SWQS were selected for Total Metals and are denoted with "T". If a Total Metal standard is unavailable an acute water quality standard for dissolved metals (A&We) was selected and is denoted with "D".
9 - Volatile Organic Compounds
10 - Dash means information unavailable (ie. SWQS was not established or sample was not collected).
11 - Total of α-BHC, β-BHC, γ-BHC, δ-BHC.
12 - Refer to Appendix Part 13O for Analytical Laboratory Reports

Receiving Water: Rillito
Designiated Uses: AWe, PBC
Table 9-2. Water Quality Data Monitor Site #2

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date		-	03/18/12				
Conventional Parameters							
Average Flow Rate3 (m3/s)	-		0.0050				
Ph	6.5-9.0		7.5				
Temperature (°Celcius)	-		13.7°C				
Hardness4 (mg/L)5	50		Trace 50				
Total Dissolved Solids (TDS) (mg/L)	-		36				
Total Suspended Solids (TSS) (mg/L)	-		40.8				
Biological Oxygen Demand (BOD) (mg/L)	-		19				
Chemical Oxygen Demand (COD) (mg/L)	-		106				
Inorganics							
Cyanide, total (ug/L)6	84T		ND1.7				
Nutrients							
Nitrate + Nitrite as N (mg/L)			5.3				
Ammonia as N (mg/L)			1				
TKN (mg/L)			2.8				
Total Phosphorus (mg/L)			T0.06				
Total Orthophosphate (mg/L)			T0.02				
Microbiological							
Escherichia coli (E. coli) (CFU/100 mg or MPN)7	126		30				
Total Metals8							
AntimonyT (µg/L)	747		ND				
ArsenicT (µg/L)	200		1				
BariumT (µg/L)	98,000		35				
BerylliumT (µg/L)	1,867		ND				
CadmiumD (µg/L)	4		ND				
ChromiumD (µg/L)	1084		1.9				
CopperD (µg/L)	12		19				
LeadD (µg/L)	64.5		3.7				
MercuryT (µg/L)	5D						
NickelD (µg/L)	2314		2.1				
SeleniumT (µg/L)	33		ND				
SilverD (µg/L)	1.01		ND				
ThalliumT (µg/L)	75		ND				
ZincD (µg/L)	618		56				
Organic Toxic Pollutants							
Total Petroleum Hydrocarbons (TPH) (mg/L)	-		T0.745				
Total Oil & Grease (mg/L)	-		T0.829				

Receiving Water: Rillito
Designiated Uses: AWe, PBC
Table 9-2. Water Quality Data Monitor Site #2

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date		-	03/18/12				
VOCs9, Semi-VOCs, and Pesticides							
Acrolein (µg/L)	467		ND				
Acrylonitrile (µg/L)	37333		ND				
Benzene (µg/L)	3733		ND				
Bromoform (µg/L)	18667		ND				
Carbon tetrachloride (µg/L)	1307		ND				
Chlorobenzene (µg/L)	18667		ND				
Chlorodibromomethane (µg/L)	18667		ND				
Chloroethane (µg/L)	-		ND				
2-chloroethylvinyl ether (µg/L)	-		ND				
Chloroform (µg/L)	9333		ND				
Dichlorobromomethane (µg/L)	18667		ND				
1,2-dichlorobenzene (µg/L)	5,900		ND				
1,3-dichlorobenzene (µg/L)	-		ND				
1,4-dichlorobenzene (µg/L)	6,500		ND				
1,1-dichloroethane (µg/L)	-		ND				
1,2-dichloroethane (µg/L)	186,667		ND				
1,1-dichloroethylene (µg/L)	46,667		ND				
1,2-dichloropropane (µg/L)	84,000		ND				
1,3-dichloropropylene (µg/L)	28,000		ND				
Ethylbenzene (µg/L)	93,333		ND				
Methyl bromide (µg/L)	-		ND				
Methyl chloride (µg/L)	-		ND				
Methylene chloride (µg/L)	-		ND				
1,1,2,2-tetrachloroethane (µg/L)	93,333		ND				
Tetrachloroethylene (µg/L)	9,333		ND				
Toluene (µg/L)	373,333		ND				
1,2-trans-dichloroethylene (µg/L)	-		ND				
1,1,1-trichloroethane (µg/L)	1,866,667		ND				
1,1,2-trichloroethane (µg/L)	3,733		ND				
Trichloroethylene (µg/L)	280		ND				
Trimethylbenzene (µg/L)	-		-				
Vinyl chloride (µg/L)	2,800		ND				
Xylene (µg/L)	186,667		ND				
SVOCs - Acid Extractables							
2-chlorophenol (µg/L)	4,667		ND				
2,4-dichlorophenol (µg/L)	2,800		ND				
2,4-dimethylphenol (µg/L)	18,667		ND				
4,6-dinitro-o-cresol (µg/L)	3,733		-				
2,4-dinitrophenol (µg/L)	1,867		ND				
2-nitrophenol (µg/L)	-		ND				
4-nitrophenol (µg/L)	-		ND				
p-chloro-m-cresol (µg/L)	48,000		-				
Pentachlorophenol (µg/L)	8.141		ND				
Phenol (µg/L)	180,000		ND				
2,4,6-trichlorophenol (µg/L)	130		ND				

Receiving Water: Rillito
Designiated Uses: AWe, PBC
Table 9-2. Water Quality Data Monitor Site #2

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date		-	03/18/12				
SVOCs - Bases/Neutrals							
Acenaphthene (µg/L)	56,000		ND				
Acenaphthylene (µg/L)	-		ND				
Anthracene (µg/L)	280,000		ND				
Benzo(a)anthracene (µg/L)	0.2		ND (1.44)				
Benzo(a)pyrene (µg/L)	0.2		ND (1.55)				
Benzo(b)fluoranthene (µg/L)	-		ND				
Benzo(g,h,i)perylene (µg/L)	-		ND				
Benzo(k)fluoranthene (µg/L)	1.9		ND (2.28)				
Chrysene (µg/L)	19		ND				
Dibenzo(a,h)anthracene (µg/L)	1.9		ND				
3,3-dichlorobenzidine (µg/L)	3		ND				
Diethyl phthalate (µg/L)	746,667		ND				
Dimethyl phthalate (µg/L)	-		ND				
Di-n-butyl phthalate (µg/L)	1,100		56.79				
2,4-dinitrotoluene (µg/L)	1,867		ND				
2,6-dinitrotoluene (µg/L)	3,733		ND				
Di-n-octyl phthalate (µg/L)	373,333		ND				
1,2-diphenylhydrazine (as azobenzene) (µg/L)	1.8		ND				
Fluroranthene (µg/L)	37,333		ND				
Fluorene (µg/L)	37,333		ND				
Hexachlorobenzene (µg/L)	747		ND				
Hexachlorobutadiene (µg/L)	187		ND				
Hexachlorocyclopentadiene (µg/L)	11,200		ND				
Hexachloroethane (µg/L)	850		ND				
Indeno(1,2,3-cd)pyrene (µg/L)	1.9		ND (2.25)				
Isophorone (µg/L)	186,667		ND				
Naphthalene (µg/L)	18,667		ND				
Nitrobenzene (µg/L)	467		ND				
N-nitrosodimethylamine (µg/L)	0.03		ND (1.06)				
N-nitrosodi-n-propylamine (µg/L)	88,667		ND				
N-nitrosodiphenylamine (µg/L)	290		ND				
Phenanthrene (µg/L)	-		ND				
Pyrene (µg/L)	28,000		ND				
1,2,4-trichlorobenzene (µg/L)	9,333		ND				

Receiving Water: Rillito
Designiated Uses: AWe, PBC
Table 9-2. Water Quality Data Monitor Site #2

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date		-	03/18/12				
PCB/Pesticides							
Aldrin (µg/L)	0.003		ND (0.1)				
Alpha-BHC (µg/L)	1,600		ND				
Beta-BHC (µg/L)	560		ND				
Gamma-BHC (µg/L)	11		ND				
Delta-BHC (µg/L)	1600		ND				
Chlordane (µg/L)	3.2		ND				
4,4'-DDT (µg/L)	1.1		ND				
4,4'-DDE (µg/L)	1.1		ND				
4,4'-DDD (µg/L)	1.1		ND				
Dieldrin (µg/L)	0.003		ND (0.07)				
Alpha-endosulfan (µg/L)	3		ND				
Beta-endosulfan (µg/L)	3		ND				
Endosulfan sulfate (µg/L)	3		ND				
Endrin (µg/L)	0.004		ND (0.1)				
Endrin aldehyde (µg/L)	0.7		ND				
Heptachlor (µg/L)	0.9		ND				
Heptachlor epoxide (µg/L)	0.9		ND				
PCB-1242 (AROCLOR-1242) (µg/L)	0.001		ND (0.1)				
PCB-1254 (AROCLOR-1254) (µg/L)	0.001		ND (.07)				
PCB-1221 (AROCLOR-1221) (µg/L)	0.001		ND (.09)				
PCB-1232 (AROCLOR-1232) (µg/L)	0.001		ND (.16)				
PCB-1248 (AROCLOR-1248) (µg/L)	0.001		ND (.16)				
PCB-1260 (AROCLOR-1260) (µg/L)	0.001		ND (.25)				
PCB-1016 (AROCLOR-1016) (µg/L)	0.001		ND (0.1)				
Toxaphene (µg/L)	0.005		ND (5.08)				

Note:Results higher than SWQ are shown in red font. Non-detectable results with the Method Detection Limit (MDL) above the SWQS are shown as ND with the MDL in parentheses.

1 - Partial Body Contact (PBC), Aquatic & Wildlife ephemeral (A&We) or Agricultural Livestock watering (AgL).

2 - Surface Water Quality Standards (A.A.C R18-11-101 through Appendix B) selected from lowest of PBC, A&We or AgL.

3 - Average flow rate during the sampling event. m3/s = meters cubed per second.

4 - Hardness of sample event is used to calculate SWQS for Cadmium, Chromium, Copper, Lead, Nickel, Sliver, and Zinc.

5 - mg/l = milligram per liter

6 - µg/L = micrograms per liter

7 - CFU/100 ml = colony forming unit per 100 milliliters, MPN = Most probable number per 100 ml

8 - SWQS were selected for Total Metals and are denoted with "T". If a Total Metal standard is unavailable an acute water quality standard for dissolved metals (A&We) was selected and is denoted with "D".

9 - Volatile Organic Compounds

10 - Dash means information unavailable (ie. SWQS was not established or sample was not collected).

11 - Total of α-BHC, β-BHC, γ-BHC, δ-BHC.

12 - Refer to Appendix Part 13O for Analytical Laboratory Reports

Receiving Water: Rillito
Designated Uses: AWe, PBC
Table 9-3. Water Quality Data for Monitor Site #3

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date		09/10/11	03/18/12				
Conventional Parameters							
Average Flow Rate3 (m3/s)	-	0.4203	0.2280				
Ph	6.5-9.0	6.3	7.4				
Temperature (°Celcius)	-	47.4	12.4°C				
Hardness4 (mg/L)5	50	Trace 50	Trace 50				
Total Dissolved Solids (TDS) (mg/L)	-	-	57				
Total Suspended Solids (TSS) (mg/L)	-	21.5	55				
Biological Oxygen Demand (BOD) (mg/L)	-	-	10				
Chemical Oxygen Demand (COD) (mg/L)	-	-	140				
Inorganics		-					
Cyanide, total (ug/L)6	84T		ND				
Nutrients		-					
Nitrate + Nitrite as N (mg/L)		-	0.3				
Ammonia as N (mg/L)		-	0.5				
TKN (mg/L)		-	1.1				
Total Phosphorus (mg/L)		-	T0.06				
Total Orthophosphate (mg/L)		-	T0.02				
Microbiological							
Escherichia coli (E. coli) (CFU/100 mg or MPN)7	126	7701	10				
Total Metals8							
AntimonyT (µg/L)	747	-	ND				
ArsenicT (µg/L)	200	-	ND				
BariumT (µg/L)	98,000	-	8				
BeryllliumT (µg/L)	1,867	-	ND				
CadmiumD (µg/L)	4	-	ND				
ChromiumD (µg/L)	1084	-	ND				
CopperD (µg/L)	12	ND	20				
LeadD (µg/L)	64.5	ND	ND				
MercuryT (µg/L)	5D	-	ND				
NickelD (µg/L)	2314	-	1.2				
SeleniumT (µg/L)	33	-	ND				
SilverD (µg/L)	1.01	-	ND				
ThalliumT (µg/L)	75	-	ND				
ZincD (µg/L)	618	51.9	66				
Organic Toxic Pollutants		-					
Total Petroleum Hydrocarbons (TPH) (mg/L)	-	-	3.02				
Total Oil & Grease (mg/L)	-	-	86.63				

Receiving Water: Rillito
Designated Uses: AWe, PBC
Table 9-3. Water Quality Data for Monitor Site #3

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date		09/10/11	03/18/12				
VOCs9, Semi-VOCs, and Pesticides							
Acrolein (µg/L)	467	-	ND				
Acrylonitrile (µg/L)	37333	-	ND				
Benzene (µg/L)	3733	-	ND				
Bromoform (µg/L)	18667	-	ND				
Carbon tetrachloride (µg/L)	1307	-	ND				
Chlorobenzene (µg/L)	18667	-	ND				
Chlorodibromomethane (µg/L)	18667	-	ND				
Chloroethane (µg/L)	-	-	ND				
2-chloroethylvinyl ether (µg/L)	-	-	ND				
Chloroform (µg/L)	9333	-	ND				
Dichlorobromomethane (µg/L)	18667	-	ND				
1,2-dichlorobenzene (µg/L)	5,900	-	ND				
1,3-dichlorobenzene (µg/L)	-	-	ND				
1,4-dichlorobenzene (µg/L)	6,500	-	ND				
1,1-dichloroethane (µg/L)	-	-	ND				
1,2-dichloroethane (µg/L)	186,667	-	ND				
1,1-dichloroethylene (µg/L)	46,667	-	ND				
1,2-dichloropropane (µg/L)	84,000	-	ND				
1,3-dichloropropylene (µg/L)	28,000	-	ND				
Ethylbenzene (µg/L)	93,333	-	ND				
Methyl bromide (µg/L)	-	-	ND				
Methyl chloride (µg/L)	-	-	ND				
Methylene chloride (µg/L)	-	-	ND				
1,1,2,2-tetrachloroethane (µg/L)	93,333	-	ND				
Tetrachloroethylene (µg/L)	9,333	-	ND				
Toluene (µg/L)	373,333	-	ND				
1,2-trans-dichloroethylene (µg/L)	-	-	ND				
1,1,1-trichloroethane (µg/L)	1,866,667	-	ND				
1,1,2-trichloroethane (µg/L)	3,733	-	ND				
Trichloroethylene (µg/L)	280	-	ND				
Trimethylbenzene (µg/L)	-	-	-				
Vinyl chloride (µg/L)	2,800	-	ND				
Xylene (µg/L)	186,667	-	ND				
SVOCs - Acid Extractables							
2-chlorophenol (µg/L)	4,667	-	ND				
2,4-dichlorophenol (µg/L)	2,800	-	ND				
2,4-dimethylphenol (µg/L)	18,667	-	ND				
4,6-dinitro-o-cresol (µg/L)	3,733	-	-				
2,4-dinitrophenol (µg/L)	1,867	-	ND				
2-nitrophenol (µg/L)	-	-	ND				
4-nitrophenol (µg/L)	-	-	ND				
p-chloro-m-cresol (µg/L)	48,000	-	-				
Pentachlorophenol (µg/L)	8.141	-	ND				
Phenol (µg/L)	180,000	-	ND				
2,4,6-trichlorophenol (µg/L)	130	-	ND				

Receiving Water: Rillito
Designated Uses: AWe, PBC
Table 9-3. Water Quality Data for Monitor Site #3

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date		09/10/11	03/18/12				
SVOCs - Bases/Neutrals							
Acenaphthene (µg/L)	56,000	-	ND				
Acenaphthylene (µg/L)	-	-	ND				
Anthracene (µg/L)	280,000	-	ND				
Benzo(a)anthracene (µg/L)	0.2	-	ND				
Benzo(a)pyrene (µg/L)	0.2	-	ND1.44				
Benzo(b)fluoranthene (µg/L)	-	-	ND1.55				
Benzo(g,h,i)perylene (µg/L)	-	-	ND				
Benzo(k)fluoranthene (µg/L)	1.9	-	ND2.28				
Chrysene (µg/L)	19	-	ND				
Dibenzo(a,h)anthracene (µg/L)	1.9	-	ND				
3,3-dichlorobenzidine (µg/L)	3	-	ND				
Diethyl phthalate (µg/L)	746,667	-	ND				
Dimethyl phthalate (µg/L)	-	-	ND				
Di-n-butyl phthalate (µg/L)	1,100	-	65.86				
2,4-dinitrotoluene (µg/L)	1,867	-	ND				
2,6-dinitrotoluene (µg/L)	3,733	-	ND				
Di-n-octyl phthalate (µg/L)	373,333	-	ND				
1,2-diphenylhydrazine (as azobenzene) (µg/L)	1.8	-	ND				
Fluroranthene (µg/L)	37,333	-	ND				
Fluorene (µg/L)	37,333	-	ND				
Hexachlorobenzene (µg/L)	747	-	ND				
Hexachlorobutadiene (µg/L)	187	-	ND				
Hexachlorocyclopentadiene (µg/L)	11,200	-	ND				
Hexachloroethane (µg/L)	850	-	ND				
Indeno(1,2,3-cd)pyrene (µg/L)	1.9	-	ND2.25				
Isophorone (µg/L)	186,667	-	ND				
Naphthalene (µg/L)	18,667	-	ND				
Nitrobenzene (µg/L)	467	-	ND				
N-nitrosodimethylamine (µg/L)	0.03	-	ND1.06				
N-nitrosodi-n-propylamine (µg/L)	88,667	-	ND				
N-nitrosodiphenylamine (µg/L)	290	-	ND				
Phenanthrene (µg/L)	-	-	ND				
Pyrene (µg/L)	28,000	-	ND				
1,2,4-trichlorobenzene (µg/L)	9,333	-	ND				

Receiving Water: Rillito
Designated Uses: AWe, PBC
Table 9-3. Water Quality Data for Monitor Site #3

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date		09/10/11	03/18/12				
PCB/Pesticides							
Aldrin (µg/L)	0.003	-	ND0.1				
Alpha-BHC (µg/L)	1,600	-	ND				
Beta-BHC (µg/L)	560	-	ND				
Gamma-BHC (µg/L)	11	-	ND				
Delta-BHC (µg/L)	1600	-	ND				
Chlordane (µg/L)	3.2	-	ND				
4,4'-DDT (µg/L)	1.1	-	ND				
4,4'-DDE (µg/L)	1.1	ND	ND				
4,4'-DDD (µg/L)	1.1	-	ND				
Dieldrin (µg/L)	0.003	-	ND0.07				
Alpha-endosulfan (µg/L)	3	-	ND				
Beta-endosulfan (µg/L)	3	-	ND				
Endosulfan sulfate (µg/L)	3	-	ND				
Endrin (µg/L)	0.004	-	ND0.1				
Endrin aldehyde (µg/L)	0.7	-	ND				
Heptachlor (µg/L)	0.9	-	ND				
Heptachlor epoxide (µg/L)	0.9	-	ND				
PCB-1242 (AROCLOR-1242) (µg/L)	0.001	-	ND0.1				
PCB-1254 (AROCLOR-1254) (µg/L)	0.001	-	ND0.07				
PCB-1221 (AROCLOR-1221) (µg/L)	0.001	-	ND0.09				
PCB-1232 (AROCLOR-1232) (µg/L)	0.001	-	ND0.16				
PCB-1248 (AROCLOR-1248) (µg/L)	0.001	-	ND0.16				
PCB-1260 (AROCLOR-1260) (µg/L)	0.001	-	ND0.25				
PCB-1016 (AROCLOR-1016) (µg/L)	0.001	-	ND0.1				
Toxaphene (µg/L)	0.005	-	ND5.08				

Note:Results higher than SWQ are shown in red font. Non-detectable results with the Method Detection Limit (MDL) above the SWQS are shown as ND with the MDL in parentheses.

1 - Partial Body Contact (PBC), Aquatic & Wildlife ephemeral (A&We) or Agricultural Livestock watering (AgL).

2 - Surface Water Quality Standards (A.A.C R18-11-101 through Appendix B) selected from lowest of PBC, A&We or AgL.

3 - Average flow rate during the sampling event. m3/s = meters cubed per second.

4 - Hardness of sample event is used to calculate SWQS for Cadmium, Chromium, Copper, Lead, Nickel, Sliver, and Zinc.

5 - mg/l = milligram per liter

6 - µg/L = micrograms per liter

7 - CFU/100 ml = colony forming unit per 100 milliliters, MPN = Most probable number per 100 ml

8 - SWQS were selected for Total Metals and are denoted with "T". If a Total Metal standard is unavailable an acute water quality standard for dissolved metals (A&We) was selected and is denoted with "D".

9 - Volatile Organic Compounds

10 - Dash means information unavailable (ie. SWQS was not established or sample was not collected).

11 - Total of α-BHC, β-BHC, γ-BHC, δ-BHC.

12 - Refer to Appendix Part 13O for Analytical Laboratory Reports

Receiving Water: Rillito
Designated Uses: AWe, PBC
Part 9-4. Water Quality Data for Monitor Site #4

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date		9/27/11	3/18/12				
Conventional Parameters							
Average Flow Rate3 (m3/s)	-	0.65	0.46				
Ph	6.5-9.0	7.0	7.4				
Temperature (°Celcius)	-	26.6	11.8°C				
Hardness4 (mg/L)5	50	54	Trace 50				
Total Dissolved Solids (TDS) (mg/L)	-	-	51				
Total Suspended Solids (TSS) (mg/L)	-	44	37.3				
Biological Oxygen Demand (BOD) (mg/L)	-	-	15				
Chemical Oxygen Demand (COD) (mg/L)	-	-	100				
Inorganics							
Cyanide, total (ug/L)6	84T	-	ND				
Nutrients							
Nitrate + Nitrite as N (mg/L)		-	0.3				
Ammonia as N (mg/L)		-	0.7				
TKN (mg/L)		-	1.4				
Total Phosphorus (mg/L)		-	T0.06				
Total Orthophosphate (mg/L)		-	T0.02				
Microbiological							
Escherichia coli (E. coli) (CFU/100 mg or MPN)7	126	12997	697				
Total Metals8							
AntimonyT (µg/L)	747	-	ND				
ArsenicT (µg/L)	200	-	ND				
BariumT (µg/L)	98,000	-	56				
BerylliumT (µg/L)	1,867	-	ND				
CadmiumD (µg/L)	4	-	ND				
ChromiumD (µg/L)	1084	-	1.9				
CopperD (µg/L)	12	29.6	41				
LeadD (µg/L)	64.5	ND	4				
MercuryT (µg/L)	5D	-	ND				
NickelD (µg/L)	2314	-	2.2				
SeleniumT (µg/L)	33	-	ND				
SilverD (µg/L)	1.01	-	ND				
ThalliumT (µg/L)	75	-	ND				
ZincD (µg/L)	618	192	390				
Organic Toxic Pollutants							
Total Petroleum Hydrocarbons (TPH) (mg/L)	-	-	3.02				
Total Oil & Grease (mg/L)	-	-	5.47				

Receiving Water: Rillito
Designated Uses: AWe, PBC
Part 9-4. Water Quality Data for Monitor Site #4

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date		9/27/11	3/18/12				
VOCs9, Semi-VOCs, and Pesticides							
Acrolein (µg/L)	467	-	ND				
Acrylonitrile (µg/L)	37333	-	ND				
Benzene (µg/L)	3733	-	Trace 0.10				
Bromoform (µg/L)	18667	-	ND				
Carbon tetrachloride (µg/L)	1307	-	ND				
Chlorobenzene (µg/L)	18667	-	ND				
Chlorodibromomethane (µg/L)	18667	-	ND				
Chloroethane (µg/L)	-	-	ND				
2-chloroethylvinyl ether (µg/L)	-	-	ND				
Chloroform (µg/L)	9333	-	ND				
Dichlorobromomethane (µg/L)	18667	-	ND				
1,2-dichlorobenzene (µg/L)	5,900	-	ND				
1,3-dichlorobenzene (µg/L)	-	-	ND				
1,4-dichlorobenzene (µg/L)	6,500	-	ND				
1,1-dichloroethane (µg/L)	-	-	ND				
1,2-dichloroethane (µg/L)	186,667	-	ND				
1,1-dichloroethylene (µg/L)	46,667	-	ND				
1,2-dichloropropane (µg/L)	84,000	-	ND				
1,3-dichloropropylene (µg/L)	28,000	-	ND				
Ethylbenzene (µg/L)	93,333	-	Trace 0.08				
Methyl bromide (µg/L)	-	-	ND				
Methyl chloride (µg/L)	-	-	ND				
Methylene chloride (µg/L)	-	-	ND				
1,1,2,2-tetrachloroethane (µg/L)	93,333	-	ND				
Tetrachloroethylene (µg/L)	9,333	-	ND				
Toluene (µg/L)	373,333	-	1.06				
1,2-trans-dichloroethylene (µg/L)	-	-	ND				
1,1,1-trichloroethane (µg/L)	1,866,667	-	ND				
1,1,2-trichloroethane (µg/L)	3,733	-	ND				
Trichloroethylene (µg/L)	280	-	ND				
Trimethylbenzene (µg/L)	-	-	ND				
Vinyl chloride (µg/L)	2,800	-	ND				
Xylene (µg/L)	186,667	-	ND				
SVOCs - Acid Extractables							
2-chlorophenol (µg/L)	4,667	-	ND				
2,4-dichlorophenol (µg/L)	2,800	-	ND				
2,4-dimethylphenol (µg/L)	18,667	-	ND				
4,6-dinitro-o-cresol (µg/L)	3,733	-	-				
2,4-dinitrophenol (µg/L)	1,867	-	ND				
2-nitrophenol (µg/L)	-	-	ND				
4-nitrophenol (µg/L)	-	-	ND				
p-chloro-m-cresol (µg/L)	48,000	-	-				
Pentachlorophenol (µg/L)	8.141	-	ND				
Phenol (µg/L)	180,000	-	ND				
2,4,6-trichlorophenol (µg/L)	130	-	ND				

Receiving Water: Rillito
Designated Uses: AWe, PBC
Part 9-4. Water Quality Data for Monitor Site #4

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date		9/27/11	3/18/12				
SVOCs - Bases/Neutrals							
Acenaphthene (µg/L)	56,000	-	ND				
Acenaphthylene (µg/L)	-	-	ND				
Anthracene (µg/L)	280,000	-	ND				
Benzo(a)anthracene (µg/L)	0.2	-	ND1.44				
Benzo(a)pyrene (µg/L)	0.2	-	ND1.55				
Benzo(b)fluoranthene (µg/L)	-	-	ND				
Benzo(g,h,i)perylene (µg/L)	-	-	ND				
Benzo(k)fluoranthene (µg/L)	1.9	-	ND2.28				
Chrysene (µg/L)	19	-	ND				
Dibenzo(a,h)anthracene (µg/L)	1.9	-	ND				
3,3-dichlorobenzidine (µg/L)	3	-	ND				
Diethyl phthalate (µg/L)	746,667	-	ND				
Dimethyl phthalate (µg/L)	-	-	ND				
Di-n-butyl phthalate (µg/L)	1,100	-	88.44				
2,4-dinitrotoluene (µg/L)	1,867	-	ND				
2,6-dinitrotoluene (µg/L)	3,733	-	ND				
Di-n-octyl phthalate (µg/L)	373,333	-	ND				
1,2-diphenylhydrazine (as azobenzene) (µg/L)	1.8	-	ND				
Fluroranthene (µg/L)	37,333	-	ND				
Fluorene (µg/L)	37,333	-	ND				
Hexachlorobenzene (µg/L)	747	-	ND				
Hexachlorobutadiene (µg/L)	187	-	ND				
Hexachlorocyclopentadiene (µg/L)	11,200	-	ND				
Hexachloroethane (µg/L)	850	-	ND				
Indeno(1,2,3-cd)pyrene (µg/L)	1.9	-	ND2.25				
Isophorone (µg/L)	186,667	-	ND				
Naphthalene (µg/L)	18,667	-	ND				
Nitrobenzene (µg/L)	467	-	ND				
N-nitrosodimethylamine (µg/L)	0.03	-	ND				
N-nitrosodi-n-propylamine (µg/L)	88,667	-	ND1.06				
N-nitrosodiphenylamine (µg/L)	290	-	ND				
Phenanthrene (µg/L)	-	-	ND				
Pyrene (µg/L)	28,000	-	ND				
1,2,4-trichlorobenzene (µg/L)	9,333	-	0.00				

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date		9/27/11	3/18/12				
PCB/Pesticides							
Aldrin (µg/L)	0.003	-	ND0.1				
Alpha-BHC (µg/L)	1,600	-	ND				
Beta-BHC (µg/L)	560	-	ND				
Gamma-BHC (µg/L)	11	-	ND				
Delta-BHC (µg/L)	1600	-	ND				
Chlordane (µg/L)	3.2	-	ND				
4,4'-DDT (µg/L)	1.1	-	ND				
4,4'-DDE (µg/L)	1.1	ND	ND				
4,4'-DDD (µg/L)	1.1	-	ND				
Dieldrin (µg/L)	0.003	-	ND0.07				
Alpha-endosulfan (µg/L)	3	-	ND				
Beta-endosulfan (µg/L)	3	-	ND				
Endosulfan sulfate (µg/L)	3	-	ND				
Endrin (µg/L)	0.004	-	ND				
Endrin aldehyde (µg/L)	0.7	-	ND				
Heptachlor (µg/L)	0.9	-	ND				
Heptachlor epoxide (µg/L)	0.9	-	ND				
PCB-1242 (AROCLOR-1242) (µg/L)	0.001	-	ND0.1				
PCB-1254 (AROCLOR-1254) (µg/L)	0.001	-	ND0.07				
PCB-1221 (AROCLOR-1221) (µg/L)	0.001	-	ND0.09				
PCB-1232 (AROCLOR-1232) (µg/L)	0.001	-	ND0.16				
PCB-1248 (AROCLOR-1248) (µg/L)	0.001	-	ND0.16				
PCB-1260 (AROCLOR-1260) (µg/L)	0.001	-	ND0.25				
PCB-1016 (AROCLOR-1016) (µg/L)	0.001	-	ND0.1				
Toxaphene (µg/L)	0.005	-	ND5.08				

Note:Results higher than SWQ are shown in red font. Non-detectable results with the Method Detection Limit (MDL) above the SWQS are shown as ND with the MDL in parentheses.

1 - Partial Body Contact (PBC), Aquatic & Wildlife ephemeral (A&We) or Agricultural Livestock watering (AgL).

2 - Surface Water Quality Standards (A.A.C R18-11-101 through Appendix B) selected from lowest of PBC, A&We or AgL.

3 - Average flow rate during the sampling event. m3/s = meters cubed per second.

4 - Hardness of sample event is used to calculate SWQS for Cadmium, Chromium, Copper, Lead, Nickel, Sliver, and Zinc.

5 - mg/l = milligram per liter

6 - µg/L = micrograms per liter

7 - CFU/100 ml = colony forming unit per 100 milliliters, MPN = Most probable number per 100 ml

8 - SWQS were selected for Total Metals and are denoted with "T". If a Total Metal standard is unavailable an acute water quality standard for dissolved metals (A&We) was selected and is denoted with "D".

9 - Volatile Organic Compounds

10 - Dash means information unavailable (ie. SWQS was not established or sample was not collected).

11 - Total of α-BHC, β-BHC, γ-BHC, δ-BHC.

12 - Refer to Appendix Part 13O for Analytical Laboratory Reports

Receiving Water: Santa Cruz R.
Designated Uses: AWe, PBC
Part 9-5. Water Quality Data for Monitor Site #5

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date	DATE:	07/04/11	12/03/11				
Conventional Parameters							
Average Flow Rate3 (m3/s)	-	0.0411	0.0075				
Ph	6.5-9.0	6.5	8.5				
Temperature (°Celcius)	-	28.2	8.5°C				
Hardness4 (mg/L)5	80	105	80				
Total Dissolved Solids (TDS) (mg/L)	-	-	71				
Total Suspended Solids (TSS) (mg/L)	-	73	110				
Biological Oxygen Demand (BOD) (mg/L)	-	-	5				
Chemical Oxygen Demand (COD) (mg/L)	-	-	73				
Inorganics							
Cyanide, total (ug/L)6	84T	-	ND				
Nutrients							
Nitrate + Nitrite as N (mg/L)		-	2.553				
Ammonia as N (mg/L)		-	ND				
TKN (mg/L)		-	0.79				
Total Phosphorus (mg/L)		-	0.43				
Total Orthophosphate (mg/L)		-	0.12				
Microbiological							
Escherichia coli (E. coli) (CFU/100 mg or MPN)7	126	>241960	4611 MPN/100ml				
Total Metals8							
AntimonyT (µg/L)	747	-	ND				
ArsenicT (µg/L)	200	-	ND				
BariumT (µg/L)	98,000	-	76				
BeryllliumT (µg/L)	1,867	-	0.27				
CadmiumD (µg/L)	6	-	1.4				
ChromiumD (µg/L)	1593	-	6.2				
CopperD (µg/L)	80	35	33				
LeadD (µg/L)	107.2	Trace	20				
MercuryT (µg/L)	5D	-	ND				
NickelD (µg/L)	3444	-	ND				
SeleniumT (µg/L)	33	-	ND				
SilverD (µg/L)	2.27	-	ND				
ThalliumT (µg/L)	75	-	ND				
ZincD (µg/L)	920	77.5	110				
Organic Toxic Pollutants							
Total Petroleum Hydrocarbons (TPH) (mg/L)	-	-	Trace 0.75				
Total Oil & Grease (mg/L)	-	-	4.27				

Receiving Water: Santa Cruz R.
Designated Uses: AWe, PBC
Part 9-5. Water Quality Data for Monitor Site #5

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date	DATE:	07/04/11	12/03/11				
VOCs9, Semi-VOCs, and Pesticides							
Acrolein (µg/L)	467	-	ND				
Acrylonitrile (µg/L)	37333	-	ND				
Benzene (µg/L)	3733	-	11				
Bromoform (µg/L)	18667	-	ND				
Carbon tetrachloride (µg/L)	1307	-	ND				
Chlorobenzene (µg/L)	18667	-	ND				
Chlorodibromomethane (µg/L)	18667	-	ND				
Chloroethane (µg/L)	-	-	ND				
2-chloroethylvinyl ether (µg/L)	-	-	ND				
Chloroform (µg/L)	9333	-	ND				
Dichlorobromomethane (µg/L)	18667	-	ND				
1,2-dichlorobenzene (µg/L)	5,900	-	ND				
1,3-dichlorobenzene (µg/L)	-	-	ND				
1,4-dichlorobenzene (µg/L)	6,500	-	ND				
1,1-dichloroethane (µg/L)	-	-	ND				
1,2-dichloroethane (µg/L)	186,667	-	ND				
1,1-dichloroethylene (µg/L)	46,667	-	ND				
1,2-dichloropropane (µg/L)	84,000	-	ND				
1,3-dichloropropylene (µg/L)	28,000	-	ND				
Ethylbenzene (µg/L)	93,333	-	ND				
Methyl bromide (µg/L)	-	-	ND				
Methyl chloride (µg/L)	-	-	ND				
Methylene chloride (µg/L)	-	-	ND				
1,1,2,2-tetrachloroethane (µg/L)	93,333	-	ND				
Tetrachloroethylene (µg/L)	9,333	-	ND				
Toluene (µg/L)	373,333	-	ND				
1,2-trans-dichloroethylene (µg/L)	-	-	ND				
1,1,1-trichloroethane (µg/L)	1,866,667	-	ND				
1,1,2-trichloroethane (µg/L)	3,733	-	ND				
Trichloroethylene (µg/L)	280	-	ND				
Trimethylbenzene (µg/L)	-	-	ND				
Vinyl chloride (µg/L)	2,800	-	ND				
Xylene (µg/L)	186,667	-	ND				
SVOCs - Acid Extractables							
2-chlorophenol (µg/L)	4,667	-	ND				
2,4-dichlorophenol (µg/L)	2,800	-	ND				
2,4-dimethylphenol (µg/L)	18,667	-	ND				
4,6-dinitro-o-cresol (µg/L)	3,733	-	-				
2,4-dinitrophenol (µg/L)	1,867	-	ND				
2-nitrophenol (µg/L)	-	-	ND				
4-nitrophenol (µg/L)	-	-	ND				
p-chloro-m-cresol (µg/L)	48,000	-	-				
Pentachlorophenol (µg/L)	8.141	-	ND(14)				
Phenol (µg/L)	180,000	-	ND				
2,4,6-trichlorophenol (µg/L)	130	-	ND				

Receiving Water: Santa Cruz R.
Designated Uses: AWe, PBC
Part 9-5. Water Quality Data for Monitor Site #5

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date	DATE:	07/04/11	12/03/11				
SVOCs - Bases/Neutrals							
Acenaphthene (µg/L)	56,000	-	ND				
Acenaphthylene (µg/L)	-	-	ND				
Anthracene (µg/L)	280,000	-	ND				
Benzo(a)anthracene (µg/L)	0.2	-	-				
Benzo(a)pyrene (µg/L)	0.2	-	ND(2.2)				
Benzo(b)fluoranthene (µg/L)	-	-	ND				
Benzo(g,h,i)perylene (µg/L)	-	-	ND				
Benzo(k)fluoranthene (µg/L)	1.9	-	ND(2.6)				
Chrysene (µg/L)	19	-	ND				
Dibenzo(a,h)anthracene (µg/L)	1.9	-	ND(4.1)				
3,3-dichlorobenzidine (µg/L)	3	-	ND(3.1)				
Diethyl phthalate (µg/L)	746,667	-	ND				
Dimethyl phthalate (µg/L)	-	-	ND				
Di-n-butyl phthalate (µg/L)	1,100	-	ND				
2,4-dinitrotoluene (µg/L)	1,867	-	ND				
2,6-dinitrotoluene (µg/L)	3,733	-	ND				
Di-n-octyl phthalate (µg/L)	373,333	-	ND				
1,2-diphenylhydrazine (as azobenzene) (µg/L)	1.8	-	ND(2.2)				
Fluroranthene (µg/L)	37,333	-	ND				
Fluorene (µg/L)	37,333	-	ND				
Hexachlorobenzene (µg/L)	747	-	ND				
Hexachlorobutadiene (µg/L)	187	-	ND				
Hexachlorocyclopentadiene (µg/L)	11,200	-	ND				
Hexachloroethane (µg/L)	850	-	ND				
Indeno(1,2,3-cd)pyrene (µg/L)	1.9	-	ND(3.5)				
Isophorone (µg/L)	186,667	-	ND				
Naphthalene (µg/L)	18,667	-	ND				
Nitrobenzene (µg/L)	467	-	ND				
N-nitrosodimethylamine (µg/L)	0.03	-	ND(5.7)				
N-nitrosodi-n-propylamine (µg/L)	88,667	-	ND				
N-nitrosodiphenylamine (µg/L)	290	-	ND				
Phenanthrene (µg/L)	-	-	ND				
Pyrene (µg/L)	28,000	-	ND				
1,2,4-trichlorobenzene (µg/L)	9,333	-	ND				

Receiving Water: Santa Cruz R.
Designated Uses: AWe, PBC
Part 9-5. Water Quality Data for Monitor Site #5

PARAMETERS	SWQS[2]	Summer 2011	Winter 2011-12	Summer 2012	Winter 2012-13	Summer 2013	Winter 2013-14
Date	DATE:	07/04/11	12/03/11				
PCB/Pesticides							
Aldrin (µg/L)	0.003	-	ND(0.14)				
Alpha-BHC (µg/L)	1,600	-	ND				
Beta-BHC (µg/L)	560	-	ND				
Gamma-BHC (µg/L)	11	-	ND				
Delta-BHC (µg/L)	1600	-	ND				
Chlordane (µg/L)	3.2	-	ND				
4,4'-DDT (µg/L)	1.1	-	ND				
4,4'-DDE (µg/L)	1.1	ND	ND				
4,4'-DDD (µg/L)	1.1	-	ND				
Dieldrin (µg/L)	0.003	-	ND(0.13)				
Alpha-endosulfan (µg/L)	3	-	ND				
Beta-endosulfan (µg/L)	3	-	ND				
Endosulfan sulfate (µg/L)	3	-	ND				
Endrin (µg/L)	0.004	-	ND				
Endrin aldehyde (µg/L)	0.7	-	0.34				
Heptachlor (µg/L)	0.9	-	ND				
Heptachlor epoxide (µg/L)	0.9	-	ND				
PCB-1242 (AROCLOR-1242) (µg/L)	0.001	-	ND9.0				
PCB-1254 (AROCLOR-1254) (µg/L)	0.001	-	ND5.6				
PCB-1221 (AROCLOR-1221) (µg/L)	0.001	-	ND4.0				
PCB-1232 (AROCLOR-1232) (µg/L)	0.001	-	ND6.8				
PCB-1248 (AROCLOR-1248) (µg/L)	0.001	-	ND3.5				
PCB-1260 (AROCLOR-1260) (µg/L)	0.001	-	ND2.9				
PCB-1016 (AROCLOR-1016) (µg/L)	0.001	-	ND3.3				
Toxaphene (µg/L)	0.005	-	ND10				

Note:Results higher than SWQ are shown in red font. Non-detectable results with the Method Detection Limit (MDL) above the SWQS are shown as ND with the MDL in parentheses.

1 - Partial Body Contact (PBC), Aquatic & Wildlife ephemeral (A&We) or Agricultural Livestock watering (AgL).

2 - Surface Water Quality Standards (A.A.C R18-11-101 through Appendix B) selected from lowest of PBC, A&We or AgL.

3 - Average flow rate during the sampling event. m3/s = meters cubed per second.

4 - Hardness of sample event is used to calculate SWQS for Cadmium, Chromium, Copper, Lead, Nickel, Sliver, and Zinc.

5 - mg/l = milligram per liter

6 - µg/L = micrograms per liter

7 - CFU/100 ml = colony forming unit per 100 milliliters, MPN = Most probable number per 100 ml

8 - SWQS were selected for Total Metals and are denoted with "T". If a Total Metal standard is unavailable an acute water quality standard for dissolved metals (A&We) was selected and is denoted with "D".

9 - Volatile Organic Compounds

10 - Dash means information unavailable (ie. SWQS was not established or sample was not collected).

11 - Total of α-BHC, β-BHC, γ-BHC, δ-BHC.

12 - Refer to Appendix Part 13O for Analytical Laboratory Reports

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PART 10: ASSESSMENT OF MONITORING DATA

A. Stormwater Quality

Stormwater from all five sites were sampled in the fiscal year, with four site sampled for 134 compounds under the expanded list of parameters.

B. Surface Water Quality Standards (SWQS)

Analytical results from the sampling period were tabulated along with the applicable SWQS (Part 9). The results were compared with the SWQS and where the parameters had concentrations higher than SWQS the values have been reported (Table 10-1). The detection limit for Benzo(a)anthracene, Benzo(a)pyrene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, N-nitrosodi-methylamine, Aldrin, dieldrin, Endrin, PCBs and Tozaphene were higher than the surface water quality standards. As there were no other organic compounds detected for these samples, the concentrations are likely non-detectable at the SWQS.

C. Pollutant Concentration Greater than Applicable SWQS

The concentration of Copper was higher that the SWQS for Sites 1 through 4. Sources of copper in stormwater include architectural copper, copper pesticides, vehicle brake pads, industrial copper use, deposition of air-borne copper emissions, soil erosion, domestic water discharged to storm drains, vehicle fluid leaks and dumping (TDC Environmental, 2006).

The concentration of *E. coli* was higher than the SWQS for Sites 1, 3, 4 and 5. Sources of E. coli include wild animals and domestic pets. Wild animals have been sighted in urban areas traveling the washes.

D. References

TDC Environmental, 2006. Copper Management Strategy, Development Resources, Final, submitted to Clean Estuary Partnership, prepared by Larry Walker Associates, September, pp. 54.

Table 10-1. Parameters with Concentrations Greater than SWQS

Date	Site	Receiving Water	Parameter	SWQS	Result	Cause	Recurrence Action	Follow-up Schedule
07/04/11	1	Rillito River	*E. Coli* (CFU/100mL)	126	48,840	Likely wild animals in the area		
09/10/11	3	Rillito River	*E. Coli* (CFU/100mL)	126	7701	Likely urban animals, pets and wild animals		
09/27/11	4	Rillito River	*E. Coli* (CFU/100mL)	126	12,997	Likely urban animals, pets and wild animals		
03/18/12	4	Rillito River	*E. Coli* (CFU/100mL)	126	697	Likely urban animals, pets and wild animals		
12/03/11	5	Santa Cruz River	*E. Coli* (CFU/100 ml)	126	4611	Likely urban animals, pets and wild animals		
07/04/11	5	Santa Cruz River	*E. Coli* (CFU/100mL)	126	241,960	Likely urban animals, pets and wild animals		
07/04/11	1	Rillito River	Total Copper (µg/L)	16	30	Brake pads		
03/18/12	2	Rillito River	Total Copper (µg/L)	12	19	Brake pads		
03/18/12	3	Rillito River	Total Copper (µg/L)	12	20	Brake pads		
09/27/11	4	Rillito River	Total Copper (µg/L)	12	29.6	Brake pads		
03/18/12	4	Rillito River	Total Copper (µg/L)	12	41	Brake pads		

PART 11: ESTIMATE OF ANNUAL POLLUTANT LOAD

A. Method of estimating Pollutant Load

Estimates of the annual pollutant loadings were calculated using the "Simple Method" (SMRC, 2012). The Simple Method uses analytical water quality data, precipitation and percent impervious cover to estimate pollutant loadings in urban areas. The data collected at five monitor points represent five land uses within the MS4, namely low density residential, medium density residential, high density residential, commercial, and industrial. Pima County calculated the annual pollutant load estimate for each Monitor Site and each land use category within the permit area.

The following sections describe the methods Pima County used to calculate statistics and estimate the seasonal pollutant load. The results are presented and evaluated.

The amount of pollutants are estimated by multiplying the volume of water that runs off from a precipitation event and the concentration of the pollutants. Runoff is estimated as a fraction of the precipitation based on the type of land use permeability. Pollutant concentration is measured by collecting the stormwater samples after a representative precipitation event occurs. The pollutant load equation is as follows:

$$L = P * P_f * R_c * C * A * 0.0446$$

where

L = annual pollutant load (tons)
P = annual precipitation (inches)
P_f = annual precipitation fraction producing runoff (given a value of 0.9)
R_c = runoff coefficient (unitless)
C = concentration (event mean) of a pollutant (mg/L)
A = area of catchment draining to sample point (acres)
0.0446 = correction factor for measurement units

The parameters in the equation above are defined as follows:

- ***Pollutant load (L)*** is the estimate of total amount of a specific pollutant discharged per time period for the drainage area of each monitor site. Time periods employed for this report were annual and seasonal (winter and summer).

- ***Annual Precipitation***[1] ***(P)*** is the total inches of rainfall occurring during the reporting period July 1, 2011 to June 30, 2012. Anaylsis of available rainfall data for the Tucson metropolitan area shows approximately 52% (or 13.17 cm) of the annual rainfall occurs

[1] The use of average rainfall data for pollutant load calculations de-emphasizes the effect of spatial rainfall variability. This, in turn, makes aggregation of pollutant load estimates less reliable.

during the summer season and 48% (or 12.16 cm) of the annual rainfall occurs during the winter season.

- ***Annual Precipitation fraction***[2] ***(P_f)*** is an adjustment factor for the number of storm events producing measurable runoff. A typical value for this fraction is 0.9 (USEPA, 1992).

- ***Runoff coefficient (Rc)*** is a relative measure of imperviousness, or the percentage of rainfall that becomes surface runoff (EPA, 1992). The following equation was used to calculate "*R*" values for each representative land use category associated with an outfall (EPA, 1992):

$$R = 0.05 + 0.9*Ia$$

  where *Ia* is the percent impervious area within the drainage area of each monitor site.

- ***Event-mean concentration***[3] ***(C)*** of a pollutant is the flow-weighted average of the pollutant concentration for the summer monsoon sample and the winter rain sample.

$$C = Fs/(Fs+Fw)*Cs + Fw/(Fs +Fw)*Cw$$

  where
  Fs = Flow during summer sample
  Fw = Flow during winter sample
  Cs = Concentration of summer sample
  Cw = Concentration of winter sample

- ***Area (A)*** is the area of the catchment draining to the sample point.

Parameters specific to each catchment, namely *Ia*, *Rc* and *A* were previously derived during preparation of the Sample and Analysis Plan (PDEQ, 2012).

The "Simple Method" transforms a complex set of hydrological processes into an empirical equation. This equation is used to provide reasonable estimates of pollutant loads in storm water runoff (Ohrel, 2000). At the same time, by simplifying these processes, the level of uncertainty increases when attempting to distinguish the influences from runoff characteristics such as rainfall intensity, rainfall duration, runoff, first-flush effects concentrating pollutants, land use, and antecedent weather conditions.

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[2] A measured value is unavailable for the Sonoran Desert region so EPA's standard value (EPA, 1992) was employed.

[3] Analytical results for the monitored parameters ranged from one to five data points per pollutant. These limited data were used to calculate event-mean concentration ("emc") values. As a result, pollutant load estimates may not be representative of the rainfall events, pollutants, outfalls, seasons, and/or land use categories.

Specifically, Schiff (1996) states that "[A]ssumptions based upon extrapolations to un-sampled storms introduces uncertainty because of flow-related variability." For example, he notes the importance of capturing data from representative storm events. Collecting data from the largest storm of the year may result in disproportionately large event mean concentrations and would potentially overestimate un-sampled, smaller storms during the time period of interest. Similarly, capturing smaller storm events might underestimate the actual discharge for a given reporting period. Schiff asserts that "[T]he magnitude of bias associated with un-sampled storm events cannot be assessed" because monitoring programs do not often have sufficient temporal sampling procedures to adequately address the issue. Such is the case for Pima County's monitoring program. This is due, in part, to the fact that the County's program is not designed to measure annual pollutant loads at a specific site, or regional pollutant loads for a specific land use.

According to Dixon and Chiswell (1996), most monitoring programs are instead designed to address regulatory compliance, identify sources of pollutants, and evaluate management actions such as the effectiveness of best management practices. Pima County's program focuses on just such information needs.

Schiff identifies the need to better understand the relationships of water quality to antecedent dry periods and rainfall intensity or duration (pollutant transport). Concepts such as "first flush" and "seasonal flushing" are examples of interactions that have yet to be adequately quantified. The following subsections provide seasonal pollutant load estimates for Pima County's Monitoring sites and identified land use categories within the permit area.

B. Results of Calculations

Analytical results, annual rainfall, drainage area and imperviousness were used to calculate pollutant loads for the five monitor sites were tabulated (Table 11-1). No loadings were calculated for antimony, arsenic, mercury, selenium, silver and thallium as the concentrations were below the detection limits.

C. Evaluation of Results

The pollutant load estimates[4] should be used for comparative purposes only. For the reasons discussed in subsection 11.B, these values cannot be interpreted as representing actual pollutant loads for the watersheds within the permit area. Furthermore, it would be equally inappropriate to extrapolate these estimates in order to predict potential impacts to receiving water bodies.

[4] The term "pollutant load estimate" does not have the same meaning as the term "pollutant load." The Simple Method should only be used when *estimates* are desired and should not be used when *load* values are required (Ohrel, 2000).

	Site #1 Low Density Residential		Site #2 Med Density Residential		Site #3 High Density Residential		Site #4 Commercial		Site #5 Industrial	
Annual Precipitation (in)	11.9		8.9		11.9		11.9		9.6	
Area (acres)	3.0		12.4		2.3		59		56.9	
Imperviousness (%)	25%		65%		85%		95%		70%	
Parameter	**Flow-weighted Concen-tration**	**Load (tons)**	**Flow-weighted Concen-tration**	**Load (tons)**	**Flow-weighted Concen-tration**	**Load (tons)**	**Flow-weighted Concen-tration**	**Load (tons)**	**Flow-weighted Concen-tration**	**Load (tons)**
Conventional Parameters										
BOD (mg/L)			19	53.4	10	8.9	15	381.6	5	74.4
COD (mg/L)			106	298.2	140	125.0	100	2544.1	73	1086.1
TDS (mg/L)			36	101.3	57	50.9	51	1297.5	71	1056.4
TSS (mg/L)	60	23.6	40.8	114.8	33.3	29.7	41.2	1048.9	78.7	1171.1
Nutrients										
TN (mg/L)			2.8	7.9	0.3	0.3	0.3	7.6	2.6	38.0
NH4 (mg/L)			0.06	0.2	0.5	0.4	0.7	17.8	0	0
TKN (mg/L)			0.02	0.1	1.1	1.0	1.4	35.6	0.8	11.8
Total Metals										
Sb (µg/L)			0	0	0	0	0	0	0	0
As (µg/L)			1	0.00	0	0	0	0	0	0
Ba (µg/L)			35	0.10	8	0.01	56	1.42	76	1.13
Be (µg/L)			0	0	0	0	0	0	0.3	0
Cd (µg/L)			0	0	0	0	0	0	1.4	0
Cr (µg/L)			1.9	0.01	0	0.00	1.9	0.05	6.2	0.09
Cu (µg/L)	30.8	0.01	19	0.05	7.0	0.01	34.3	0.87	34.7	0.52
Pb (µg/L)	0	0.00	3.7	0.01	0	0	1.7	0.04	3.1	0.05
Hg (µg/L)					0	0	0	0	0	0
Ni (µg/L)			2.1	0.01	1.2	0.00	2.2	0.06	0	0.0
Se (µg/L)			0	0	0	0	0	0	0	0
Ag (µg/L)			0	0	0	0	0	0	0	0
Th (µg/L)			0	0	0	0	0	0	0	0
Zn (µg/L)	70.9	0.028	56	0.16	56.9	0.05	273.9	6.97	82.5	1.23

* Loading calculated with non-detectable and trace concentrations set to zero.

** Red font indicates parameters with concentrations above the Surface Water Quality Standard

Table 11-1. Pollutant Load Estimates for Monitor Sites

In this regard, qualitative comparisons may be made between outfalls and parameters. The largest load estimates are observed in catchments with larger areas, namely those draining to monitor sites #4 and #5. These catchments also have the largest Chemical Oxygen Demand (COD), Total Dissolved Solids (TDS), and Total Suspended Solids (TSS) compared to the other catchments. The smallest load estimates are observed in the smallest catchments, namely those draining to monitor sites #1 and #3. The smallest loading estimates are observed in the metals.

D. Limitations of Pollutant Load Estimation Results

The "Simple Method" is an arithmetic equation based on empirical relationships for complex hydrological processes and average pollutant concentrations in storm water runoff. This method can be used to obtain quick and reasonable storm water pollutant load estimates (Ohrel, 2000), but should only be used for planning-level calculations or identifying data-collection needs.

Numerical results presented in part 11.3 are pollutant load estimates. Employing event mean concentrations derived from limited data may result in calculated pollutant load estimates that are not representative of the monitored rainfall events, pollutants, outfalls and/or seasons.

This type of analysis can be misleading when evaluating potential environmental effects from non-point sources (Silverman et al, 1986). Rainfall events in southern Arizona are sporadic, with loads concentrated into limited periods of time during and after precipitation.

Specifically, flow-related variability may introduce uncertainties when extrapolating from sampled to un-sampled rainfall events. Schiff (1996) uses the example of overestimation for data collected from large storms, versus underestimation for data collected from smaller storm events. In the absence of a sufficient temporal sampling program, the error level associated with un-sampled storm events can be substantial.

Estimation errors may also be introduced when using average seasonal precipitation values to calculate pollutant loads. For example, smaller runoff volumes (due to low intensity or short duration rainfall events accompanied by extended antecedent dry periods) may produce disproportionately higher pollutant concentrations per sampling event.

Alternatively, dilution from large volume runoffs (accompanied by shorter antecedent dry periods) may produce lower pollutant concentrations per sampling event. Given that the average seasonal precipitation values might not be representative of a specific storm, calculated values for the estimated pollutant loads might in turn be questionable.

Additionally, the monitoring program was not specifically designed to measure pollutant loads. As a result, phenomena such as pollutant build-up, first flush of pollutants, rainfall intensity, duration, and seasonal flushing of pollutants are not adequately addressed by the County's current monitoring program. These phenomena are an unavoidable consequence of the weather conditions and climatology of southern Arizona.

E. References

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PART 12-1: ANNUAL EXPENDITURES

The itemized budget presents total expenditures for activities occurring within all of Pima County (Table 12-1). Pima County has reported the budget information in this manner because it has not yet fully developed procedures for tracking only those expenditures related to activities exclusively associated with the NPDES storm water permit area.

The May 2006 EPA Region 9 audit of the Pima county Stormwater Management Program identified several issues relating to Pima County's approach to reporting expenditures and budges. In response to these comments and as discussed in Pima County's response to the program audit, Pima county has been developing more precise procedures for tracking expenditures and budgets exclusively associated with County NPDES storm water program.

'Per Unit' costs for activities implemented within the stormwater permit are being identified by each department within Pima County.

A description of the funding sources used to support program expenditures will be provided in the 2012 Annual Report.

Table 12-1. Annual Expenditures and Future Budget

Activity	Fiscal Year 2011/2012		Fiscal Year 2012/2013	
	Actual Costs	Department Subtotal	Budgeted Costs	Department Subtotal
Environmental Quality		$ 228,973		$ 260,000
NPDES Stormwater	$ 228,973		$ 260,000	
Environmental Nuisances				
Regional Flood Control District		$ 2,426,984		$ 4,121,055
Floodplain Permittingc	$ 446,144			
Development Review	$ 294,509		$ 326,121	
Engineering Supportc	$ 279,858		$ 687,519	
Long Range Planningd	$ 98,262		$ 1,294,711	
Basin & Drainage Studiesd	$ 591,044			
FEMA/Mappingd	$ 171,374			
Drainage Way Maintenance	$ 545,793		$ 1,812,704	
Transportation		$ 8,186,443		$ 8,103,673
Environmental Planning & Compliance	$ 16,819		$ 92,197	
Maintenance Administration	$ 731,314		$ 1,173,191	
Maintenance District # 1	$ 1,638,514		$ 894,353	
Maintenance District # 4	$ 1,031,764		$ 1,197,191	
Maintenance District # 5	$ 1,513,885		$ 1,128,864	
Maintenance Support	$ 1,525,346		$ 1,588,191	
Contract Maintenance Dist. # 2	$ 957,992		$ 937,569	
Contract Maintenance Dist. # 3	$ 770,809		$ 1,092,117	
Development Services		$ 2,428,536		$ 2,200,289
Regional Comprehensive Plana	$ 1,280,827		$ 1,278,827	
Landscaping Review				
Development Review	$ 750,328		$ 514,828	
Rezoning	$ 397,381		$ 406,634	
Regional Wastewater Reclamation		$ 2,654,830		$ 2,481,693
Ina Road Laboratory Analysis	$ 2,405,294		$ 2,243,693	
Household Hazardous Waste Programb	$ 249,536		$ 238,000	
Stormwater Program Total		$ 15,925,766		$ 17,166,710

[a] Landscaping expenses incorporated

[b] Pima County and the City of Tucson share funding of the Household Hazardous Waste Program

[c] Permitting and Engineering Support are now Budgeted within FloodPlain Management

[d] FEMA/Mapping, Basin and Drainage Studies are now Budgeted within Planning and Development