

Development and Implementation of Innovative Storm Water Regional
Detention Facilities for Urban Water Quality Improvement in the Arroyo
Colorado
Quality Assurance Project Plan

Texas A&M University Kingsville
700 University Blvd. MSC 213
Kingsville, Texas 78363-8202

Funding Source:

Nonpoint Source Protection Program CWA §319(h)
Prepared in cooperation with the Texas Commission on Environmental Quality
and the U.S. Environmental Protection Agency
Federal ID # 99614613

Effective Period: One year from date of final approval

Questions concerning this quality assurance project plan should be directed to:

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Water Quality Improvement in the Arroyo Colorado

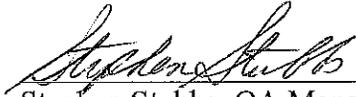
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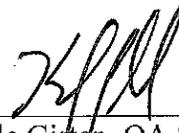
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A1 APPROVAL PAGE

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

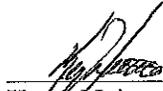
Field Operations Support Division


Stephen Stubbs, QA Manager 4-11-12 Date

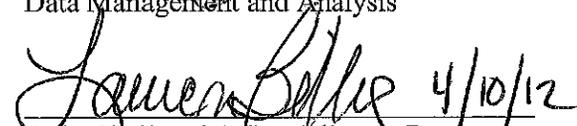

Kyle Ginton, QA Specialist
Quality Assurance Team 4/11/12 Date

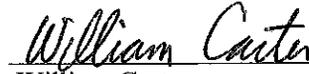
Water Quality Planning Division


Monica Harris, Manager Date
Water Quality Planning and Implementation Section


Kerry Neimann, Team Leader 4/11/12 Date
Nonpoint Source Program


Nancy Ragland, Team Leader 4/11/12 Date
Data Management and Analysis


for Anju Chalise, QA Specialist 4/10/12 Date
Nonpoint Source Program


William Carter 4/10/12 Date
Project Manager, Nonpoint Source Program

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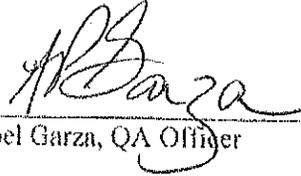
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Texas A&M University-Kingsville



Kim Jones, Contract Project Manager 4/9/12 Date

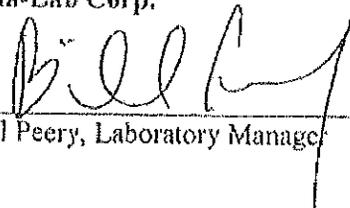


Abel Garza, QA Officer 4/9/12 Date

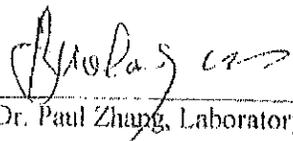


Javier Guerrero, Field Supervisor 4/9/12 Date

Ana-Lab Corp.

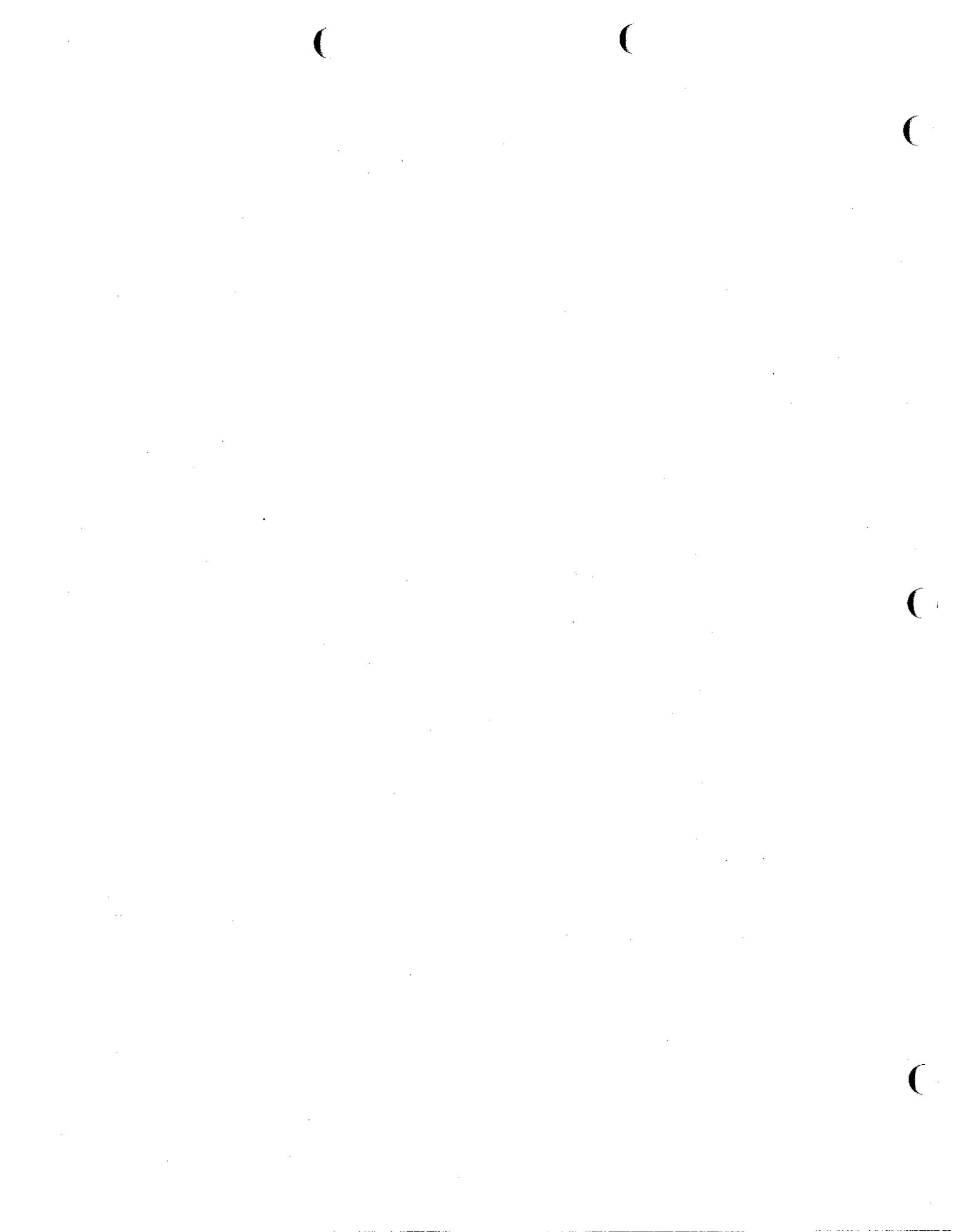


Bill Peery, Laboratory Manager 4/5/12 Date



Dr. Paul Zhang, Laboratory QA Officer 4/5/12 Date

The contractor, Kim D. Jones from Texas A & M University Kingsville, will secure written documentation from additional project participants (e.g., subcontractors, laboratories) stating the organization's awareness of and commitment to requirements contained in this quality assurance project plan and any amendments or revisions of this plan. The contractor, Kim D. Jones, will maintain this documentation as part of the project's quality assurance records. This documentation will be available for review (See sample letter in Attachment 1 of this document).



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Texas A&M University-Kingsville

Kim Jones, Date
Contract Project Manager

Abel Garza, QA Officer Date

Javier Guerrero, Field Supervisor Date

Ana-Lab Corp.

Bill Peery, Laboratory Manager Date

Dr. Paul Zhang, Laboratory QA Officer Date

The contractor, Kim D. Jones from Texas A & M University Kingsville, will secure written documentation from additional project participants (e.g., subcontractors, laboratories) stating the organization's awareness of and commitment to requirements contained in this quality assurance project plan and any amendments or revisions of this plan. The contractor, Kim D. Jones, will maintain this documentation as part of the project's quality assurance records. This documentation will be available for review (See sample letter in Attachment 1 of this document.).

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A3 DISTRIBUTION LIST

The TCEQ QA Specialist will provide original versions of this project plan and any amendments or revisions of this plan to the TCEQ Project Manager, William Carter, and the Contractor Project Manager, Kim D. Jones. The TCEQ Project Manager will provide copies to the TCEQ Data Management and Analysis Work Leader and EPA Project Officer within two weeks of approval. The TCEQ Project Manager will document receipt of the plan and maintain this documentation as part of the project's quality assurance records. This documentation will be available for review.

Nancy Ragland, Team Leader
Data Management and Analysis, MC-234
Texas Commission on Environmental Quality
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Suite # 1200
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Leslie Rauscher, Project Officer
(214) 665 2773

The Contractor, Kim D. Jones, will provide copies of this project plan and any amendments or revisions of this plan to each project participant defined in the list below. The Contractor, Kim D. Jones, will document receipt of the plan by each participant and maintain this documentation as part of the project's quality assurance records. This documentation will be available for review.

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List of Acronyms *Edit and/or expand this list as appropriate*

ACWPP	Arroyo Colorado Watershed Protection Plan
AWRL	Ambient Water Reporting Limit
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
CAP	Corrective Action Plan
CAR	Corrective Action Report
COC	Chain of Custody
CWA	Clean Water Act
DOC	Demonstration of Capability
DMP	Data Management Plan
DMRG	Data Management Reference Guide
DM&A	Data Management and Analysis
DQO	Data Quality Objective
ELO	Environmental Liaison Office
EPA	Environmental Protection Agency
EVEN	Environmental Engineering
GIS	Geographic Information System
GPS	Global Positioning System
IT	Information Technology Policy
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection
LOQ	Limit of Quantization
LRGV	Lower Rio Grande Valley
MS	Matrix Spike
MS4	Municipal Separate Storm Sewer System
NELAC	National Environmental Laboratory Accreditation Conference
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source

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PO	Project Officer
PM	NPS Project Manager
QA/QC	Quality Assurance/Quality Control
QAM	Quality Assurance Manual
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAS	Quality Assurance Specialist
QMP	Quality Management Plan
RPD	Relative Percent Difference
RDF	Stormwater Regional Detention Facilities
SLOC	Station Location
SOP	Standard Operating Procedure
SWQM	Surface Water Quality Monitoring
SWQMIS	Surface Water Quality Monitoring Information System
TCEQ	Texas Commission on Environmental Quality
TSS	Total Suspended Solids
TSWQS	Texas Surface Water Quality Standards
WQI	Water Quality Inventory

A4 PROJECT/TASK ORGANIZATION

TCEQ

Field Operations Support Division

Kyle Girten

Lead QA Specialist

Assists the TCEQ Project Manager in QA related issues. Serves on planning team for NPS projects. Participates in the planning, development, approval, implementation, and maintenance of the QAPP. Determines conformance with program quality system requirements. Coordinates or performs audits, as deemed necessary and using a wide variety of assessment guidelines and tools. Concurs with proposed corrective actions and verifications. Monitors corrective action. Provides technical expertise and/or consultation on quality services. Provides a point of contact at the TCEQ to resolve QA issues. Recommends to TCEQ management that work be stopped in order to safe guard project and programmatic objectives, worker safety, public health, or environmental protection.

Water Quality Planning Division

Kerry Niemann, Manager

NPS Program

Responsible for management and oversight of the TCEQ NPS Program. Oversees the development of QA guidance for the NPS program to be sure it is within pertinent frameworks of the TCEQ. Monitors the effectiveness of the program quality system. Reviews and approves all NPS projects, internal QA audits, corrective actions, reports, work plans, and contracts. Enforces corrective action, as required. Ensures NPS personnel are fully trained and adequately staffed.

William Carter

TCEQ NPS Project Manager

Maintains a thorough knowledge of work activities, commitments, deliverables, and time frames associated with projects. Develops lines of communication and working relationships between the contractor, the TCEQ, and the EPA. Tracks deliverables to ensure that tasks are completed as specified in the contract. Responsible for ensuring that the project deliverables are submitted on time and are of acceptable quality and quantity to achieve project objectives. Serves on planning team for NPS projects. Participates in the development, approval, implementation, and maintenance of the QAPP. Assists the TCEQ QAS in technical review of the QAPP. Responsible for verifying that the QAPP is followed by the contractor. Notifies the TCEQ QAS of particular circumstances which may adversely affect the quality of data derived from the collection and analysis of samples. Enforces corrective action.

Anju Chalise

TCEQ NPS Project Quality Assurance Specialist

Assists Lead QAS with NPS QA management. Serves as liaison between NPS management and Agency QA management. Responsible for NPS guidance development related to program quality assurance. Serves on planning team for NPS projects. Participates in the development, approval, implementation, and maintenance of the QAPP.

Rebecca Ross

TCEQ NPS Data Manager

Responsible for coordination and tracking of NPS data sets from initial submittal through NPS Project Manager review and approval. Ensures that data is reported following instructions in the Surface Water Quality Monitoring Data Management Reference Guide (January 2010, or most current version). Runs automated data validation checks in SWQMIS and coordinates data verification and error correction with NPS Project Managers' data review. Generates SWQMIS summary reports to assist NPS Project Managers' data reviews. Provides training and guidance to NPS and Planning Agencies on technical data issues. Reviews QAPPs for valid stream monitoring stations. Checks validity of parameter codes, submitting entity code(s), collecting entity code(s), and monitoring type code(s). Develops and maintains data management-related standard operating procedures for NPS data management. Serves on planning team for NPS projects.

Texas A&M University - Kingsville

Kim Jones

Project Manager

Responsible for ensuring tasks and other requirements in the contract are executed on time and are of acceptable quality. Monitors and assesses the quality of work. Coordinates attendance at conference calls, training, meetings, and related project activities with the TCEQ. Responsible for verifying the QAPP is followed and the project is producing data of known and acceptable quality. Ensures adequate training and supervision of all monitoring and data collection activities. Complies with corrective action requirements.

Abel Garza

QAO

Responsible for coordinating development and implementation of the QA program. Responsible for writing and maintaining the QAPP. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP. Responsible for identifying, receiving, and maintaining project quality assurance records. Responsible for coordinating with the TCEQ QAS to resolve QA-related issues. Notifies the contractor Project Manager and TCEQ Project Manager of particular circumstances which may adversely affect the quality of

data. Responsible for validation and verification of all data collected according with Table 4 procedures and acquired data procedures after each task is performed. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques. Conducts laboratory inspections. Develops, facilitates, and conducts monitoring systems audits.

Abel Garza

Data Manager

Responsible for the acquisition, verification, and transfer of data to the TCEQ. Oversees data management for the study. Performs data quality assurances prior to transfer of data to TCEQ. Responsible for transferring data to the TCEQ in the acceptable format. Ensures data are submitted according to workplan specifications. Provides the point of contact for the TCEQ Data Manager to resolve issues related to the data.

Javier Guerrero

Field Supervisor

Responsible for supervising all aspects of the sampling and measurement of surface waters and other parameters in the field. Responsible for the acquisition of water samples and field data measurements in a timely manner that meet the quality objectives specified in Section A7 (Table A.1), as well as the requirements of Sections B1 through B8. Responsible for field scheduling, staffing, and ensuring that staff is appropriately trained as specified in Sections A6 and A8.

Bill Peery

Laboratory (Ana-Lab) Manager

Responsible for oversight of laboratory operations and ensuring that quality-assurance control requirements are met regarding the TFS Project samples. Responsible for documentation related to laboratory analyses to include, ensuring adequate training and supervision of all activities involved in generating analytical data, the facilitation of audits and the implementation, documentation, verification and reporting of corrective actions. Enforces corrective action, as required. Conducts in-house audits in conjunction with the TFS QAO to ensure compliance with written SOPs and to identify potential problems.

Roy White

Laboratory (Ana-Lab) QAO

Monitors the implementation of the QAM and the QAPP within the laboratory to ensure complete compliance with QA objectives as defined by the contract and in the QAPP. Conducts internal audits to identify potential problems and ensure compliance with written SOPs. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory. Performs validation and verification of data before the report is sent to TAMUK. Insures that all QA reviews are conducted in a timely manner from real-time review at the bench during analysis to final pass-off of data to the QA officer.

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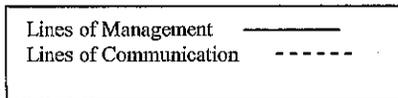
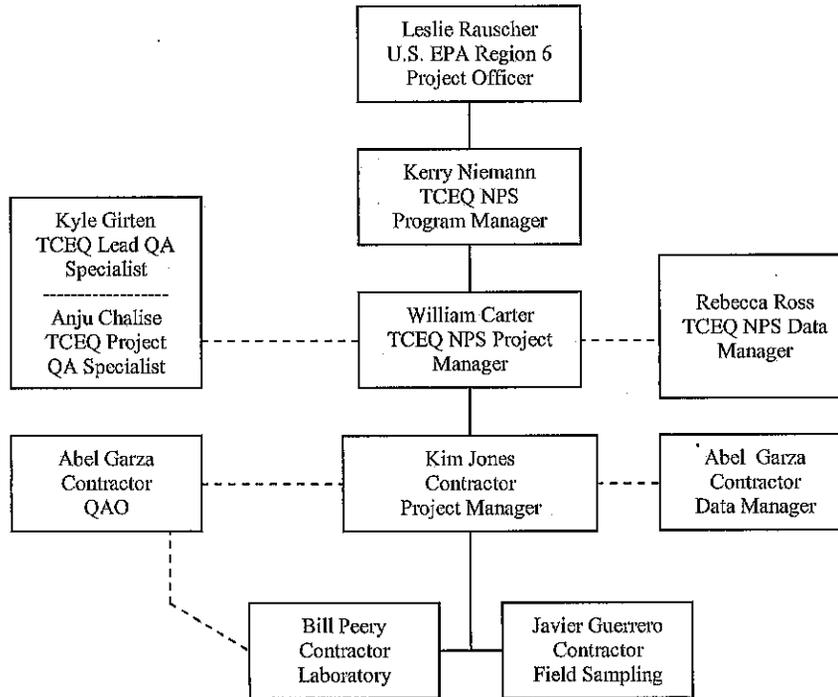
U.S. EPA Region 6

Leslie Rauscher

EPA Project Officer

Responsible for managing the CWA Section 319 funded grant on the behalf on EPA. Assists the TCEQ in approving projects that are consistent with the management goals designated under the State's NPS management plan and meet federal guidance. Coordinates the review of project workplans, draft deliverables, and works with the State in making these items approvable. Meets with the State at least semi-annually to evaluate the progress of each project and when conditions permit, participate in a site visit on the project. Fosters communication within EPA by updating management and others, both verbally and in writing, on the progress of the State's program and on other issues as they arise. Assists the regional NPS coordinator in tracking a State's annual progress in its management of the NPS program. Assists in grant close-out procedures ensuring all deliverables have been satisfied prior to closing a grant.

Figure A4.1. Organization Chart - Lines of Communication



A5 PROBLEM DEFINITION/BACKGROUND

The Arroyo Colorado flows through Hidalgo, Cameron and Willacy Counties and is a major source of fresh water to the Lower Laguna Madre. Rapid urbanization over the recent twenty years has resulted in increased nutrient and total solids concentrations in the Arroyo Colorado. An important contribution to this increase is storm water, a significant Nonpoint Source (NPS). This document addresses urban storm water runoff impairments and concerns identified in the 2008 Texas Water Quality Inventory and 303(d) List (March 19, 2008), a top priority goal for the Arroyo Colorado Water Protection Plan (ACWPP) within the area of Arroyo Colorado Segment 2201 and Segment 2202. This project will monitor Total Suspended Solids, total nitrogen, Biochemical Oxygen Demand, total phosphorous and *E-coli*.

Stormwater Regional Detention Facilities (RDFs) have been utilized to temporarily hold large amount of storm water and protect areas from flooding in the Arroyo Colorado; Best Management Practices (BMPs), such as debris microscreen and/or wetland/bio filter, are being developed and incorporated into RDFs designs to improve the storm water quality at 1) Morris Middle School, 2) McAuliffe Middle School and 3) the McAllen Dog Park near Jackson Elementary. Data to be collected as a result of the project will be used to demonstrate the effectiveness of the BMPs as required by EPA guidelines. This demonstration will be accomplished by evaluating the efficiency of pollutant removal by the BMPs. The load reduction estimates will be calculated based on the event mean concentration (estimated from the flow weighted composite samples) multiplied by the mass flow, or the mean concentration of three grab samples collected over the storm event multiplied by the mass flow for the event.

The data from these projects will be disseminated to the Lower Rio Grande Valley MS4 permit holders and communities as a model, which can be used to design BMPs that address storm water runoff pollution or to develop ordinances that prescribe storm water quality measures.

This QAPP is reviewed by the TCEQ to help insure the data generated for the purposes described above are scientifically valid and legally defensible. This process will ensure that any data submitted to SWQMIS have been collected and analyzed in a way that helps guaranty their reliability and therefore can be used in programs deemed appropriate by the TCEQ.

A6 PROJECT/TASK DESCRIPTION

The environmental project team will design and construct the BMPs (debris microscreen and/or wetland/bio filter) in the three locations at Arroyo Colorado and evaluate their effectiveness in removing pollutants from storm water run-off. The debris microscreen is designed to remove total solids and thus phosphorus and bacteria, which can be strongly adhered to solids. The wetland/biofilter component at Morris RDF and McAuliffe RDF is planned to remove phosphorus, total nitrogen, and TSS from storm water run-off, during both the dry and wet seasons. A "Riser" in the Dog Park has been constructed that captures all water flows (effluent)

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from the park into 18 inch outlet stormwater drain line. The bio-filter in the Dog Park is located immediately around the Riser. Storm water runoff from the park area flows into the bio-filter, into the Riser and is piped away into the city storm drain system. In order to quantify the reductions of pollutants, ~~automatic sampling devices with~~ flow meters will be installed at the inlet (baseline monitoring), and outlet (after the wetland/ bio filter) of each location. Auto-samplers will be installed at two RDFs.

Base line flows indicate Morris RDF has perennial flow while the McAuliffe RDF has almost year round flow with some dry days during the summer months. The Dog Park RDF has no flow except during storm events. Prior to installation of automated instruments flow measurements will be taken using the Marsh-McBirney FlowMate method per the Surface Water Quality Procedures, Volume 1:Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue (TCEQ Publications No.RG-415).

After the microscreen and/or wetland/ biofilter are constructed and flow transmitters are installed, water quality sampling is scheduled to begin and will continue for a period of at least 12 months. Construction of the microscreen and wetland/biofilter is scheduled to begin in fall 2010 and is anticipated to be completed by the end of March 1, 2011. Automated composite sampling monitoring frequency will be quarterly with priority on storm events. In the absence of qualifying storm events during a quarter, automated composite sampling of base flow (using the same equipment used in storm event sampling and compositing a minimum of four individual samples per sampling event) will be performed toward the end of the quarter. Storm water monitoring will be conducted for at least two additional storm events during the year, when possible. In the absence of such additional storm events for two consecutive quarters, automated composite sampling of base flow will be performed before the end of the two quarters without additional storm events.

This objective is intended to assess the urban run off storm water quality improvement to support EPA Performance Activity Measures under the Clean Water Act 319 grant program. Urban run off water samples from the inlet and outlet of the BMPs will be collected and analyzed quarterly at the two large RDF sites at the McAullife and Morris schools.

The Dog Park will be sampled during storm events and as notified by the City Parks and Recreation Department of any special watering/flushing events that would cause run-off. Samples will be collected within 24 to 48 hours of a storm event.

The results will be evaluated against comparable baseline and flow data to determine if there is an improvement in water quality. See Appendix B for the project-related work plan tasks related to data collection and schedule of deliverables for a description of work defined in this QAPP. See Section B1 (Table B1.1) for monitoring to be conducted under this QAPP. Water quality analysis results for suspended solids, nutrients and *E-coli* before and after BMP implementation will be compared for each RDF and standard tests of significance (t-test) will be used to evaluate

performance. The measured values for TSS and e-coli will be examined for a correlation or relationship between these parameters using standard regression techniques (goodness of fit tests and correlation coefficient). Such a relationship, if established, could be of value to the project team in subsequent data collection efforts.

After several years of searching with the City Drainage Engineer for hydraulic measurements for flows into and out of the McAuliffe, Morris and Dog Park regional detention facilities, it has been concluded that no relevant flow data collected prior to the onset of this project exists. Thus, Tasks 2.1, 2.2 and 2.3 have been completed to the best of our ability and documented in the quarterly reports.

The Dog Park has a flow sensor on the 18 inch outlet. It also has a flow sensor on the 6 inch line which drains into the riser from 2nd Street to account for this flow which does not flow through the biofilter. The design of the drain Riser does not allow for an auto sampler. The park does not have a flow unless it rains. The first grab samples were collected in December 2011.

In 2011-2012 the project team monitored the completion of the Dog Park biofilter, the new wetland at the Morris RDF, and the location and layout of a new stormwater wetland at McAuliffe RDF outlet. A design was developed and implemented for the purchase of instrumentation for stormwater monitoring which consists of monitoring flow data, auto-samplers, remote power design and telemetry to the servers at Texas A&M-Kingsville.

The city has committed to procure a wedge-wire screen technology screen and design and construction of the structure for housing the screen at McAuliffe RDF inlet drainage ditch to remove debris which is expected to also remove some nutrients. The city issued a Purchase Order to a vendor and the field construction design is being developed with startup estimated in March 2012.

Revisions to the QAPP

Until the work described is completed, this QAPP shall be revised as necessary and reissued annually on the anniversary date, or revised and reissued prior to making any substantive changes in procedure, whichever is sooner. Reissuances (i.e., annual updates) must be submitted to the TCEQ for approval at least 60 days before the last version has expired; once expired, the QAPP is not in force until reissued or updated. If the entire QAPP is current, valid, and accurately reflects the project goals and organization's policy, the annual reissuance may be done by a certification that the plan is current. This can be accomplished by submitting a cover letter stating the status of the QAPP and a copy of new, signed approval pages for the QAPP.

Amendments

Amendments to the QAPP may be necessary to reflect changes in project organization, tasks, schedules, objectives, and methods; address deficiencies and nonconformances; improve operational efficiency; and/or accommodate unique or unanticipated circumstances. Requests for amendments are directed from the contractor Project Manager to the TCEQ Project Manager in writing using the QAPP Amendment shell. The changes are effective immediately upon approval by the TCEQ NPS Project Manager and Quality Assurance Specialist, or their designees, and the EPA Project Officer.

Amendments to the QAPP and the reasons for the changes will be documented, and revised pages will be forwarded to all persons on the QAPP distribution list by the Contractor QAO. Amendments shall be reviewed, approved, and incorporated into a revised QAPP during the annual revision process or within 120 days of the initial approval in cases of significant changes.

A7 QUALITY OBJECTIVES AND CRITERIA

Quantitative and qualitative information regarding measurement data needed to measure debris microscreen, wetland/biofilter efficiency and water quality improvements are provided below. Only data collected that have a valid TCEQ parameter code assigned in Table A7.1 will be stored in SWQMIS. Any parameters listed in A7.1 that do not have a valid TCEQ parameter code assigned will not be stored in SWQMIS.

Table A7.1 Measurement Performance Specifications for BMPs Effectiveness Monitoring

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL*	Limit of Quantitation (LOQ)	Recovery at LOQ (%)	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	Completeness (%)
Residue, Nonfilterable (TSS) Auto-sampler	mg/L	Water	SM 2540D, 20th Ed	00530	4	4	NA	20	80-120	90
Residue, Nonfilterable (TSS) Grab sample	mg/L	Water	SM 2540D, 20th Ed	00530	4	4	NA	20	80-120	90
Total Kjeldahl Auto-sampler	mg/L	Water	EPA 351.2 Rev. 2.0	00625	0.02	0.05	70-130	20	80-120	90
Total Kjeldahl Grab	mg/L	Water	EPA 351.2 Rev. 2.0	00625	0.02	0.05	70-130	20	80-120	90
Nitrate/Nitrite Auto-sampler	mg/L	Water	EPA 300.0 Rev 2.1 (1993)	00630	0.05	0.05	70-130	20	80-120	90
Nitrate/Nitrite Grab sample	mg/L	Water	EPA 300.0 Rev 2.1 (1993)	00630	0.05	0.05	70-130	20	80-120	90
BOD Auto-sampler	mg/L	Water	SM 5210 B, 20th Ed	00310	2	2	84.6 - 115	20	70-130	90
BOD Grab sample	mg/L	Water	SM 5210 B, 20th Ed	00310	2	2	84.6 - 115	20	70-130	90
Total Phosphorus Auto-sampler	mg/L	Water	EPA 365.3	00665	0.06	0.05	70-130	20	80-120	90

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PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL*	Limit of Quantitation (LOQ)	Recovery at LOQ (%)	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	Completeness (%)
Residue, Nonfilterable (TSS) Auto-sampler	mg/L	Water	SM 2540D, 20th Ed	00530	4	4	NA	20	80-120	90
Total Phosphorus Grab sample	mg/L	Water	EPA 365.3	00665	0.06	0.05	70-130	20	80-120	90
<i>E-coli</i> Auto-sampler	MPN/100mL	Water	SM 9223-B***	31699	1	1	NA	0.5**	NA	
<i>E-coli</i> Grab	MPN/100mL	Water	SM 9223-B***	31699	1	1	NA	0.5**	NA	
Rainfall During Storm Event	inches	Water	TCEQ SOP	pending	NA	NA	NA	NA	NA	90
Storm Event Flow****	gallons	Water	doppler flow meter	pending	NA	NA	NA	NA	NA	NA

Each Parameter has two codes that distinguish samples collected via grab samples from samples collected via auto-samplers.

Footnotes:

**Based on range statistics as described in Standard Methods, 21st Ed. Section 9020-B, Quality Assurance/Quality Control – Interlaboratory Quality Control Guidelines. This criterion applies to bacteriological duplicates with concentrations >10 MPN/100mL or >10org/100mL.

***E. coli samples analyzed by SM 9223-B should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 48 hours.

****The volume of flow for each sampled storm event is estimated by the “totalizer” function of the ISCO sampler, which automatically calculates cumulative volume of flow (using instantaneous flow rate data collected every 5 minutes) from the triggering of the sampler to the final sample draw)..

*the most up-to-date AWRL is located at <http://www.tceq.state.tx.us/compliance/monitoring/nps/grants/NPS-QAPP.html>

References: US EPA Methods for Chemical Analysis of Water and Wastewater, Manual #EPA-600/4-79-020. American Public Health Association, American Water Works Association and Water Environment Federation, Standard Methods for the Examination of Water and Waste Water, 20th Ed., Texas Commission on Environmental Quality Surface Water Quality Monitoring Procedures, Volume 1, October 2008.

Precision

Precision is the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves. It is a measure of agreement among replicate measurements of the same property, under prescribed similar conditions, and is an indication of random error.

Field splits are used to assess the variability of sample handling, preservation, and storage, as well as the analytical process, and are prepared by splitting samples in the field. Control limits for field splits are defined in Section B5.

Laboratory precision is assessed by comparing replicate analyses of laboratory control samples in the sample matrix (e.g. deionized water, sand, commercially available tissue) or sample/duplicate pairs in the case of bacterial analysis. Precision results are compared against

measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for precision are defined in Table A7.1.

Bias

Bias is a statistical measurement of correctness and includes multiple components of systematic error. A measurement is considered unbiased when the value reported does not differ from the true value. Bias is determined through the analysis of laboratory control samples and LOQ Check Standards prepared with verified and known amounts of all target analyses in the sample matrix (e.g. deionized water, sand, commercially available tissue) and by calculating percent recovery. Results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for bias are specified in Table A7.1.

Representativeness

Site selection, the appropriate sampling regime, the sampling of all pertinent media according to TCEQ SOPs, and use of only approved analytical methods will assure that the measurement data represent the conditions at the site. Water quality data will be obtained for one storm event per fiscal quarter, and two additional storm events per year when possible. Each sampling event will consist of composite samples collected at each sampling station at equal flow intervals. In order to assess effectiveness of the BMPs, data will be collected for storms of varying size and intensity throughout the year, and the data sets will be biased toward conditions of flow and storm runoff. The goal for meeting total representation of storm flows at the sites will be tempered by the potential funding for complete representativeness.

Completeness

The completeness of the data is basically a relationship of how much of the data is available for use compared to the total potential data. Ideally, 100% of the data should be available. However, the possibility of unavailable data due to accidents, insufficient sample volume, broken or lost samples, etc. is to be expected. Therefore, it will be a general goal of the project(s) that 90% data completion is achieved.

Comparability

Confidence in the comparability of routine data sets for this project and for water quality assessments is based on the commitment of project staff to use only approved sampling and analysis methods and QA/QC protocols in accordance with quality system requirements and as described in this QAPP and in TCEQ SOPs. Comparability is also guaranteed by reporting data in standard units, by using accepted rules for rounding figures, and by reporting data in a standard format as specified in Section B9.

Limit of Quantitation

AWRLs (Table A7.1) are used in this project as the *limit of quantitation specification*, so data collected under this QAPP can be compared against the TSWQS. Laboratory *limits of quantitation* (Table A7.1) must be at or below the AWRL for each applicable parameter.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria are provided in Section B5.

Analytical Quantitation

To demonstrate the ability to recover at the limit of quantitation, the laboratory will analyze an LOQ check standard for each batch of samples run.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria are provided in Section B5

A8 SPECIAL TRAINING/CERTIFICATION

Staff responsible for operating the automated samplers and flow loggers will undergo a one day training event by the equipment manufacturer.

Field personnel will receive training in proper sampling and field analysis. Before actual sampling or field analysis occurs, they will demonstrate to the QA officer (in the field), their ability to properly operate the automatic samplers and retrieve the samples. The QA officer will sign off each field staff in their field logbooks.

Global Positioning System (GPS) equipment may be used as a component of the information required by the Station Location (SLOC) request process for creating the certified positional data that will ultimately be entered into the TCEQ's SWQMIS database. Any positional data obtained by Nonpoint Source Program grantees using a Global Positioning System will follow the TCEQ's OPP 8.11 and 8.12 policy regarding the collection and management of positional data.

Positional data entered into SWQMIS will be collected by a GPS certified individual with an agency approved GPS device to ensure that the agency receives reliable and accurate positional data. Certification can be obtained in any of three ways: completing a TCEQ training class, completing a suitable training class offered by an outside vendor, or by providing documentation of sufficient GPS expertise and experience. Contractors must agree to adhere to relevant TCEQ policies when entering GPS-collected data.

In lieu of entering certified GPS Coordinates, positional data may be acquired with a GPS and verified with photo interpolation using a certified source, such as Google Earth or Google Map. The verified coordinates and map interface can then be used to develop a new SLOC.

Contractors and subcontractors must ensure that laboratories analyzing samples under this QAPP meet the requirements contained in section 5.4.4 of the NELAC standards (concerning Review of Requests, Tenders, and Contracts).

A9 DOCUMENTS AND RECORDS

Laboratory Test Reports

Test/data reports from the laboratory must document the test results clearly and accurately. Data reports, when requested, should be consistent with the NELAC standards (Section 5.5.10) and include the information necessary for the interpretation and validation of data. The requirements for reporting data and the procedures are provided.

Electronic Data

Data will be submitted to the TCEQ in the event/result format specified in the TCEQ Data Management Reference Guide (DMRG; January 2010 or most recent version) for upload to the Surface Water Quality Monitoring Information System (SWQMIS). The Data Review Checklist and Summary as contained in Appendix C of this document will be submitted with the data.

A station location request (SLOC) will be submitted to the TCEQ Project Manager for each sampling site to obtain a station identification number.

All reported Events will have a unique TagID (see DMRG). A Tag Prefix must be requested from the TCEQ in accordance with the DMRG where the Submitting Entity does not already have one. TagIDs used in this project will be seven-character alphanumerics with the structure of the two-letter Tag prefix followed by a four digit number and ending with the character "N": for example - AK1234N, AK1235N, etc.

Submitting Entity, Collecting Entity, and Monitoring Type codes will reflect the project organization and monitoring type in accordance with the DMRG. The proper coding of Monitoring Type is essential to accurately capture any bias toward certain environmental condition (for example, high flow events). The Project Manager should be consulted to assure proper use of the Monitoring Type code.

Tag Prefix = AK

Submitting Entity = AK

Collecting Entity = AK

Records and Documents Retention Requirements

Document/Record	Location	Retention	Form
QAPP, amendments, and appendices	Org.	5 years	Paper
QAPP distribution documentation	Org.	5 years	Paper
Training records	Org.	5 years	Paper
Field notebooks or field data sheets	Org.	5 years	Paper
Field equipment calibration/maintenance 1	Org.	5 years	Paper
Chain of custody records	Org.	5 years	Paper
Field SOPs	Org.	5 years	Paper
Laboratory QA manuals	Lab	5 years	Paper
Laboratory SOPs	Lab	5 years	Paper
Laboratory procedures	Lab	5 years	Paper
Instrument raw data files	Lab	5 years	LIMS Electronic
Instrument readings/printouts	Lab	5 years	Paper
Laboratory data reports/results	Lab	5 years	Paper
Laboratory equipment maintenance logs	Lab	5 years	Paper
Laboratory calibration records	Lab	5 years	LIMS Electronic
Corrective action documentation	Lab	5 years	Paper

B1 SAMPLING PROCESS DESIGN (EXPERIMENTAL DESIGN)

Automated Sampling

The sample design rationale for this study is based on the intent to assess the removal efficiency of TSS, total nitrogen, BOD, T-Phosphorus and *E.coli* removal by the BMPs (riser biofilter, debris microscreen and wetland/ bio filter) installed at 1) Morris Middle School, 2) McAuliffe Middle School and 3) the McAllen Dog Park near Jackson Elementary. Monitoring sites are specified in Table B1.1. Monitoring stations with automatic samplers and flow transmitters will be installed at 1) the inlet and 2) outlet of Morris and McAuliffe RDFs. At the Dog Park flow monitoring will be automated at the outlet and sampling will be made via grab collection in the inlet and outlet to the biotrickling filter, corresponding to flow weighted intervals as much as practical.

Monitoring stations at Morris and McAuliffe RDFs will have an automatic sampler with a bottle and a flow transmitter installed to calculate flow. The Flow transmitter uses continuous wave Doppler technology to measure mean velocity. The sensor continuously transmits an ultrasonic signal, and measures the frequency shift of the returned signal reflected by air bubbles and particles in the flow. A differential pressure transducer in the sensor measures liquid depth to

determine flow area. Flow rate is then calculated by multiplying the area of the flow stream by its average velocity. The flow transmitter will be programmed to log the flow rate. The trigger points will be initially set to enable the sampler during qualifying storm events of at least 0.1" of rain with a 72-hour antecedent dry period that result in a water level increase of two inches within 30 minutes. When the ditch level rise on the Isco 2150 flow monitor triggers the Isco 6700 sampler to start compositing samples the Isco 2150 will calculate a flow reading every 5 minutes. The program uses this flow reading for each minute of 5 minutes and adds it to the totalizer. The program repeats this every 5 minutes and adds it to the totalizer until the sampler is deactivated. Initially the composite sample was collected by sampling every increment of 10,800 gallons until the end of the runoff event. The sampler trigger point, collection interval, and sample volume will likely require adjusting upon evaluating total flows, peak flow rates, total rain and runoff duration each of the 3-4 storm events in order to ensure samples are collected over the entire runoff event. Based on the analysis by the project team for 14 runoff events occurring at the McAuliffe RDF over an 8 month period (August 2011 – March 2012), the composite sampling flow interval needed to capture the full flow distribution for a mid-range event of moderate duration was determined to be every 150,000 gallons at the inlet, and 57,000 gallons at the outlet. These set points will be implemented at the McAuliffe and also Morris RDF location, until more complete data can be collected there (sensors were vandalized and are being replaced at Morris).

This sampling scheme will occur once a quarter during qualifying storm events and during two additional storm events assuming additional qualifying events occur. In the absence of qualifying storm events during a quarter, automated composite sampling of base flow (using the same equipment used in storm event sampling and compositing a minimum of four individual samples per sampling event) will be performed toward the end of the quarter if base flow exists, or at a later time as soon as possible after base flow resumes.

Samples will be removed within 24 to 48 hr of storm event events. Each sample will be split into two equal aliquots, appropriately acidified, iced and transported to the Ana-Labs NELAC certified lab where they will be stored at 4^o C prior to analysis.

In addition to the quarterly storm event automated composite sampling in Morris and McAuliffe RDFs there will be two same mode sampling events per year to determine a base line of non-storm conditions. These two non-storm event composite samples will be triggered manually at a time determined after observing the hydrograph profiles.

Grab Sampling

At the Dog Park the sample scheme will mimic the Morris and McAuliffe RDFs except sampling is to be via grab samples. There will be no composite sampling at the Dog Park. The Dog Park grab sampling will be initiated when the flows activate the sampling scheme at Morris and McAuliffe RDFs provided there is a flow at the Dog Park. The flow monitoring scheme at the

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Dog Park will be the same as the scheme at Morris and McAuliffe RDFs. The hydrograph will be recorded with the same scheme as the Morris and McAuliffe RDFs. Field data and samples will be collected following procedures detailed in the latest version of the TCEQ guidance document, *Surface Water Quality Monitoring Procedures, Volume 1 (RG-415)*.

In summary there will be samples from three locations with each location having an inlet and outlet sample collected for a total of four quarterly stormwater sampling events. Two other sampling events will be conducted at Morris and McAuliffe RDFs. If a significant storm event does not occur during the quarter, sampling will be conducted at the end of the quarter if a flow exists through the BMP, or as soon as possible after base flow resumes.

Rain events were sampled at McAuliffe RDF and Morris RDF in August 2011, December 2011 and early February 2012. The Dog Park was sampled in early February 2012. These results are being organized for submittal once a parameter code for continuous sampling is issued. The historic drought has delayed sampling events. All storm events will be sampled for the duration of the project so that an adequate set of sampling data will be collected if weather allows. Appendix F (Update on Sampling Activities) provides more detailed information on project sampling activities to date and how plans for the remaining project period have changed.

Table B1.1 Monitoring Sites

* code BF

Location	Site Description and Location Longitude	Start Date	End Date	Sample Matrix	Monitoring Frequencies (per year)				Comments	Number Samples Sets Analyzed and date of last analysis.
					Total Suspended Solids	Nutrients Nitrogen Phosphorous	BOD	E. coli		
Morris	Influent Point #1 26.27160 N -98.22716 W	03/01/11	8/1/12	Water	6	6	6	6	Automated composite sampling will be conducted quarterly for a significant storm event for that quarter. Two additional storm or base flow events will be sampled for a total of six sampling events per year.	3 Sets 2/08/12

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Location	Site Description and Location Longitude	Start Date	End Date	Sample Matrix	Monitoring Frequencies (per year)				Comments	Number Samples Sets Analyzed and date of last analysis.
					Total Suspended Solids	Nutrients Nitrogen Phosphorous	BOD	E. coli		
	Effluent Point #2 26.27703 N -98.21784 W	03/01/11	8/1/12	Water	6	6	6	6	Automated composite sampling will be conducted quarterly for a significant storm event for that quarter. Two additional storm or base flow events will be sampled for a total of six sampling events per year.	3 Sets 2/08/12
McAuliffe	Influent Point #1 26.233969 N -98.252680 W	03/01/11	8/1/12	Water	6	6	6	6	Automated composite sampling will be conducted quarterly for a significant storm event for that quarter. Two additional storm or base flow events will be sampled for a total of six sampling events per year.	5 Sets 2/08/12
McAuliffe	Effluent Point #2 26.23496 N -98.24872 W	03/01/11	8/1/12	Water	6	6	6	6	Automated composite sampling will be conducted quarterly for a significant storm event for that quarter. Two additional storm or base flow events will be sampled for a total of six sampling events per year.	5 Sets 2/08/12

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Location	Site Description and Location Longitude	Start Date	End Date	Sample Matrix	Monitoring Frequencies (per year)				Comments	Number of Sample Sets Analyzed and Date of Last Analysis
					Total Suspended Solids	Nutrients Nitrogen Phosphorus	BOD	<i>E. coli</i>		
Dog Park	Riser (bio-filter) Inlet/Outlet 26.22063 N -98.22101 W Inlet elevation 113 MSL Outlet elevation 110 MSL	03/01/11	8/1/12	Water	6	6	6	6	Grab sampling will be conducted quarterly for a significant storm event for that quarter. There is not a base flow on this site.	1 Set 2/08/21

B2 SAMPLING METHODS

Field Sampling Procedures

A SOP for the automated flow meter and automated sampler data collection is attached as Appendix E of this document.

All sample collection will follow the field sampling procedures for conventional and microbiological parameters documented in the TCEQ Surface Water Quality Monitoring Procedures Manual (October 2008 or most recent version).

The sample volumes, container types, minimum sample volume, preservation requirements, and holding time requirements are specified in Tables B2.1.

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Table B2.1 BMP Effectiveness Monitoring

Parameter	Matrix	Sample Type	Container	Preservation	Sample Volume	Holding Time
Total-N	Water	Composite	Pre-cleaned sampler	Cool to 4C, dark, pH<2 with H2SO4	250 mL	28 days
Total-N	Water	Grab	Pre-cleaned sampler	Cool to 4C, dark, pH<2 with H2SO4	250 mL	28 days
Total Phosphorus-P	Water	Composite	Pre-cleaned sampler	Cool to 4C, dark, pH<2 with H2SO4	250 mL	28 days
Total Phosphorus-P	Water	Grab	Pre-cleaned sampler	Cool to 4C, dark, pH<2 with H2SO4	250 mL	28 days
Total Suspended Solids	Water	Composite	Pre-cleaned sampler	Cool to 4C, dark	500 mL	7 days
Total Suspended Solids	Water	Grab	Pre-cleaned sampler	Cool to 4C, dark	500 mL	7 days
Biochemical Oxygen Demand	Water	Composite	Pre-cleaned sampler	Cool to 4C, dark	200 ml	48 hrs
Biochemical Oxygen Demand	Water	Grab	Pre-cleaned sampler	Cool to 4C, dark	200 ml	48 hrs
<i>E-Coli</i>	Water	Composite	Sterile, Pre-cleaned container	Cool to 4C, Na2S2O3	100 mL, 200mL for sample to be duplicated	48 hrs **
<i>E-Coli</i>	Water	Grab	Sterile, Pre-cleaned container	Cool to 4C, Na2S2O3	100 mL, 200mL for sample to be duplicated	48 hrs **

Footnotes other client uses with E. coli:

**Based on range statistics as described in Standard Methods, 21st Ed. Section 9020-B, Quality Assurance/Quality Control – Inter laboratory Quality Control Guidelines. This criterion applies to bacteriological duplicates with concentrations >10 MPN/100mL or >10org/100mL.

Processes to Prevent Cross Contamination

Procedures outlined in the TCEQ Surface Water Quality Procedures outline the necessary steps to prevent cross-contamination of samples. These include such things as direct collection into sample containers and the use of commercially pre-cleaned sample containers.

Documentation of Field Sampling Activities

Field sampling activities are documented on the Field Data Reporting Form as presented in Appendix F. For all visits, station ID, location, sampling time, sampling date, sampling depth, preservatives added to samples, and sample collector's name/signature are recorded. Values for all measured field parameters are recorded. Detailed observational data are recorded including water appearance, weather, biological activity, stream uses, unusual odors, specific sample information, missing parameters, days since last significant rainfall, and flow severity.

Recording Data

For the purposes of this section and subsequent sections, all personnel will follow the basic rules for recording information as documented below:

1. Legible writing in indelible, waterproof ink with no modifications, write-overs or cross-outs;
2. Changes should be made by crossing out original entries with a single line, entering the changes, and initialing and dating the corrections.
3. Close-outs on incomplete pages with an initialed and dated diagonal line.

Sampling Method Requirement or Sampling Process Design Deficiencies and Corrective Action

Examples of sampling method requirement or sample design deficiencies include but are not limited to such things as inadequate sample volume due to spillage or container leaks, failure to preserve samples appropriately, contamination of a sample bottle during collection, storage temperature and holding time exceedance, sampling at the wrong site, etc. Any deviations from the QAPP and appropriate sampling procedures may invalidate resulting data and may require corrective action. Corrective action may include for samples to be discarded and re-collected. It is the responsibility of the Contractor Project Manager, Kim Jones, in consultation with the Contractor QAO, Abel Garza, to ensure that the actions and resolutions to the problems are documented and that records are maintained in accordance with this QAPP. In addition, these actions and resolutions will be conveyed to the NPS Project Manager both verbally and in writing in the project progress reports and by completion of a corrective action plan (CAP).

The definition of and process for handling deficiencies and corrective actions are defined in Section C1.

B3 SAMPLE HANDLING AND CUSTODY

Sample Labeling

Samples from the field are labeled on the container (*or on a label; please specify*) with an indelible marker. Label information includes:

1. Site identification
2. Date and time of collection
3. Preservative added, if applicable
4. Designation of "field-filtered" (*for metals*) as applicable
5. Sample type (i.e., analyses) to be performed

Sample Handling

Proper sample handling and custody procedures ensure the custody and integrity of samples beginning at the time of sampling and continuing through transport, sample receipt, preparation, and analysis.

A sample is in custody if it is in actual physical possession or in a secured area that is restricted to authorized personnel. The COC form is used to document sample handling during transfer from the field to the laboratory and among contractors. The following information concerning the sample is recorded on the COC form (See Appendix G).

1. Date and time of collection
2. Site identification
3. Sample matrix
4. Number of containers
5. Preservative used
6. Was the sample filtered
7. Analyses required
8. Name of collector
9. Custody transfer signatures and dates and time of transfer
10. Bill of lading (*if applicable*)

Sample Tracking Procedure Deficiencies and Corrective Action

All deficiencies associated with chain-of-custody procedures as described in this QAPP will be immediately reported to the Contractor Project Manager, Kim Jones. These include such items as delays in transfer, resulting in holding time violations; violations of sample preservation

requirements; incomplete documentation, including signatures; possible tampering of samples; broken or spilled samples, etc. The Contractor Project Manager, Kim Jones, in consultation with the Contractor QAO, Abel Garza, will determine if the procedural violation may have compromised the validity of the resulting data. Any failures that have reasonable potential to compromise data validity will invalidate data, and the sampling event should be repeated. The resolution of the situation will be reported to the TCEQ NPS Project Manager in the project progress report. Corrective Action Plans will be prepared by the Contractor QAO and submitted to TCEQ NPS Project Manager along with project progress report.

The definition of and process for handling deficiencies and deficiencies, nonconformances, and corrective action are defined in Section C1.

B4 ANALYTICAL METHODS

The analytical methods are listed in Table A7.1 of Section A7. Laboratories collecting data under this QAPP are compliant with the NELAC Standards.

Copies of laboratory SOPs are retained by the contractor and are available for review by the TCEQ. Laboratory SOPs are consistent with EPA requirements as specified in the method.

Standards Traceability

All standards used in the field and laboratory are traceable to certified reference materials. Standards and reagent preparation is fully documented and maintained in a standards log book. Each documentation includes information concerning the standard or reagent identification, starting materials, including concentration, amount used and lot number; date prepared, expiration date and preparer's initials/signature. The bottle is labeled in a way that will trace the standard or reagent back to preparation. Standards or reagents used are documented each day samples are prepared or analyzed.

Analytical Method Deficiencies and Corrective Actions

Deficiencies in field and laboratory measurement systems involve, but are not limited to such things as instrument malfunctions, failures in calibration, blank contamination, quality control samples outside QAPP defined limits, etc. In many cases, the field technician or lab analyst will be able to correct the problem. If the problem is resolvable by the field technician or lab analyst, then they will document the problem on the field data sheet or laboratory record and complete the analysis. If the problem is not resolvable, then it is conveyed to the Contractor Laboratory Supervisor, Gregg Oliver (Ana-Lab), who will make the determination and notify the Contractor QAO, Abel Garza. If the analytical system failure may compromise the sample results, the resulting data will not be reported to the TCEQ. The nature and disposition of the problem is reported on the data report which is sent to the Contractor Manager. The Contractor Project Manager, Kim Jones, will include this information in the CAP and submit with the Progress Report which is sent to the TCEQ NPS Project Manager.

The definition of and process for handling deficiencies and deficiencies, nonconformances, and corrective action are defined in Section C1.

The TCEQ has determined that analyses associated with the qualifier codes may have unacceptable measurement uncertainty associated with them. This will immediately disqualify analyses from submittal to SWQMIS. Therefore, data with these types of problems should not be reported to the TCEQ. Additionally, any data collected or analyzed by means other than those stated in the QAPP, or data suspect for any reason should not be submitted for loading and storage in SWQMIS.

B5 QUALITY CONTROL

Sampling Quality Control Requirements and Acceptability Criteria

Field Split - A field split is a single sample subdivided by field staff immediately following collection and submitted to the laboratory as two separately identified samples according to procedures specified in the *SWQM Procedures*. Split samples are preserved, handled, shipped, and analyzed identically and are used to assess variability in all of these processes. Field splits apply to conventional samples only. *The frequency requirement for field splits is specified in the SWQM Procedures. Provide a statement as to the frequency in which these samples will be collected.*

The precision of field split results is calculated by relative percent difference (RPD) using the following equation:

$$RPD = [(X_1 - X_2) / \{(X_1 + X_2) / 2\}] * 100$$

A 30% RPD criteria will be used to screen field split results as a possible indicator of excessive variability in the sample handling and analytical system. If it is determined that elevated quantities of analyte (i.e., > 5 times the LOQ) were measured and analytical variability can be eliminated as a factor, then variability in field split results will primarily be used as a trigger for discussion with field staff to ensure samples are being handled in the field correctly. Some individual sample results may be invalidated based on the examination of all extenuating information. The information derived from field splits is generally considered to be event specific and would not normally be used to determine the validity of an entire batch; however, some batches of samples may be invalidated depending on the situation. Professional judgment during data validation will be relied upon to interpret the results and take appropriate action. The qualification (i.e., invalidation) of data will be documented on the Data Review Checklist and Summary. Deficiencies will be addressed as specified in this section under Quality Control or Acceptability Requirement Deficiencies and Corrective Actions.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

Batch – A batch is defined as environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same NELAC-defined matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 25 hours. An **analytical batch** is composed of prepared environmental samples (extract, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples.

Method Specific QC requirements – QC samples, other than those specified later this section, are run (e.g., sample duplicates, surrogates, internal standards, continuing calibration samples, interference check samples, positive control, negative control, and media blank) as specified in the methods. The requirements for these samples, their acceptance criteria or instructions for establishing criteria, and corrective actions are method-specific.

Detailed laboratory QC requirements and corrective action procedures are contained within the individual laboratory quality manuals (QMs). The minimum requirements that all participants abide by are stated below.

Limit of Quantitation (LOQ) – The laboratory will analyze a calibration standard (if applicable) at the LOQ on each day calibrations are performed. In addition, an LOQ check standard will be analyzed with each analytical batch. Calibrations including the standard at the LOQ will meet the calibration requirements of the analytical method or corrective action will be implemented.

LOQ Sediment and Tissue Samples – When considering LOQs for solid samples and how they apply to results, two aspects of the analysis are considered: (1) the LOQ of the sample, based on the real-world in which moisture content and interferences affect the result and (2) the LOQ in the QAPP which is a value less than or equal to the AWRL based on an idealized sample with zero % moisture.

The LOQ for a solid sample is based on the lowest non-zero calibration standard (as are those for water samples), the moisture content of the solid sample, and any sample concentration or dilution factors resulting from sample preparation or clean-up.

To establish solid-phase LOQs to be listed in Table A7.1 of the QAPP, the laboratory will adjust the concentration of the lowest non-zero calibration standard for the amount of sample extracted, the final extract volume, and moisture content (assumed to be zero % moisture). Each calculated LOQ will be less than or equal to the AWRL on the dry-weight basis to satisfy the AWRL requirement for sediment and tissue analyses. When data are reviewed for consistency with the QAPP, they are evaluated based on this requirement. Results may not appear to meet the AWRL requirement due to high

moisture content, high concentrations of non-target analytes necessitating sample dilution, etc. These sample results will be submitted to the TCEQ with an explanation on the Data Review Checklist and Summary as to why results do not appear to meet the AWRP requirement.

LOQ Check Standard – An LOQ check standard consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of the measurement system at the lower limits of analysis. The LOQ check standard is spiked into the sample matrix at a level less than or near the LOQ for each analyte for each analytical batch of samples run.

The LOQ check standard is carried through the complete preparation and analytical process. LOQ Check Standards are run at a rate of one per analytical batch.

The percent recovery of the LOQ check standard is calculated using the following equation in which %R is percent recovery, SR is the sample result, and SA is the reference concentration for the check standard:

$$\%R = SR/SA * 100$$

Measurement performance specifications are used to determine the acceptability of LOQ Check Standard analyses as specified in Table A7.1.

Laboratory Control Sample (LCS) – An LCS consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of the measurement system. The LCS is spiked into the sample matrix at a level less than or near the mid point of the calibration for each analyte. In cases of test methods with very long lists of analytes, LCSs are prepared with all the target analytes and not just a representative number, except in cases of organic analytes with multiplex responses.

The LCS is carried through the complete preparation and analytical process. LCSs are run at a rate of one per preparation batch.

Results of LCSs are calculated by percent recovery (%R), which is defined as 100 times the measured concentration, divided by the true concentration of the spiked sample.

The following formula is used to calculate percent recovery, where %R is percent recovery; SR is the measured result; and SA is the true result:

$$\%R = SR/SA * 100$$

Measurement performance specifications are used to determine the acceptability of LCS analyses as specified in Table A7.1.

Laboratory Duplicates – A laboratory duplicate is prepared by taking aliquots of a sample from the same container under laboratory conditions and processed and analyzed independently. A laboratory control sample duplicate (LCSD) is prepared in the laboratory by splitting aliquots of an LCS. Both samples are carried through the entire preparation and analytical process. LCSDs are used to assess precision and are performed at a rate of one per preparation batch.

For most parameters, precision is calculated by the relative percent difference (RPD) of LCS duplicate results as defined by 100 times the difference (range) of each duplicate set, divided by the average value (mean) of the set. For duplicate results, X_1 and X_2 , the RPD is calculated from the following equation: *(If other formulas apply, adjust appropriately.)*

$$RPD = [(X_1 - X_2) / \{(X_1 + X_2) / 2\}] * 100$$

A bacteriological duplicate is considered to be a special type of laboratory duplicate and applies when bacteriological samples are run in the field as well as in the lab. Bacteriological duplicate analyses are performed on samples from the sample bottle on a 10% basis. Results of bacteriological duplicates are evaluated by calculating the logarithm of each result and determining the range of each pair.

Measurement performance specifications are used to determine the acceptability of duplicate analyses-as specified in Table A7.1. The specifications for bacteriological duplicates in Table A7.1 apply to samples with concentrations > 10 org./100mL.

Laboratory equipment blank – Laboratory equipment blanks are prepared at the laboratory where collection materials for metals sampling equipment are cleaned between uses. These blanks document that the materials provided by the laboratory are free of contamination. The QC check is performed before the metals sampling equipment is sent to the field. The analysis of laboratory equipment blanks should yield values less than the LOQ. Otherwise, the equipment should not be used.

Matrix spike (MS) – Matrix spikes are prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

Percent recovery of the known concentration of added analyte is used to assess accuracy of the analytical process. The spiking occurs prior to sample preparation and analysis. Spiked samples

are routinely prepared and analyzed at a rate of 10% of samples processed, or one per preparation batch whichever is greater. The information from these controls is sample/matrix specific and is not used to determine the validity of the entire batch. The MS is spiked at a level less than or equal to the midpoint of the calibration or analysis range for each analyte. Percent recovery (%R) is defined as 100 times the observed concentration, minus the sample concentration, divided by the true concentration of the spike.

The results from matrix spikes are primarily designed to assess the validity of analytical results in a given matrix and are expressed as percent recovery (%R). The laboratory shall document the calculation for %R. The percent recovery of the matrix spike is calculated using the following equation in which %R is percent recovery, SSR is the observed spiked sample concentration, SR is the sample result, and SA is the reference concentration of the spike added:

$$\%R = (SSR - SR)/SA * 100$$

Measurement performance specifications for matrix spikes are not specified in this document.

The results are compared to the acceptance criteria as published in the mandated test method. Where there are no established criteria, the laboratory shall determine the internal criteria and document the method used to establish the limits. For matrix spike results outside established criteria, corrective action shall be documented or the data reported with appropriate data qualifying codes.

Method blank – A method blank is a sample of matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as the samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. The method blanks are performed at a rate of once per preparation batch. The method blank is used to document contamination from the analytical process. The analysis of method blanks should yield values less than the LOQ. For very high-level analyses, the blank value should be less than 5% of the lowest value of the batch, or corrective action will be implemented. Samples associated with a contaminated blank shall be evaluated as to the best corrective action for the samples (e.g. reprocessing or data qualifying codes). In all cases the corrective action must be documented.

The method blank shall be analyzed at a minimum of once per preparation batch. In those instances for which no separate preparation method is used (example: volatiles in water) the batch shall be defined as environmental samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.

Quality Control or Acceptability Requirement Deficiencies and Corrective Actions

Sampling QC excursions are evaluated by the Contractor Project Manager, in consultation with the Contractor QAO. In that differences in sample results are used to assess the entire sampling process, including environmental variability, the arbitrary rejection of results based on pre-determined limits is not practical. Therefore, the professional judgment of the Contractor Project Manager, Kim Jones and QAO, Abel Garza, will be relied upon in evaluating results. Rejecting sample results based on wide variability is a possibility. Field blanks for trace elements and trace organics are scrutinized very closely. Field blank values exceeding the acceptability criteria may automatically invalidate the sample, especially in cases where high blank values may be indicative of contamination which may be causal in putting a value above the standard. Notations of field split excursions and blank contamination are noted in the quarterly report and the final QC Report. Equipment blanks for metals analysis are also scrutinized very closely.

Laboratory measurement quality control failures are evaluated by the laboratory staff. The disposition of such failures and the nature and disposition of the problem is reported to the Contractor Laboratory QAO, Abel Garza. The Laboratory QAO will discuss with the Contractor Project Manager, Kim Jones. If applicable, the Contractor Project Manager will include this information in the CAP and submit with the Progress Report which is sent to the TCEQ NPS Project Manager, William Carter.

The definition of and process for handling deficiencies and deficiencies, nonconformances, and corrective action are defined in Section C1.

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

Automated sampler testing and maintenance requirements are contained with Appendix H of this document.

All field sampling equipment testing and maintenance requirements are detailed in the *TCEQ Surface Water Quality Monitoring Procedures, Volume 1*. Equipment records are kept on all field equipment and a supply of critical spare parts is maintained by the Contractor Field Supervisor.

All laboratory tools, gauges, instrument, and equipment testing and maintenance requirements are contained within laboratory QAM(s). Testing and maintenance records are maintained and are available for inspection by the TCEQ. Instruments requiring daily or in-use testing may include, but are not limited to, water baths, ovens, autoclaves, incubators, refrigerators, and laboratory pure water. Critical spare parts for essential equipment are maintained to prevent downtime. Maintenance records are available for inspection by the TCEQ.

B7 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Calibration requirements for the automated monitoring equipment are included in Appendix I of this document.

Field Equipment calibration requirements are contained in the TCEQ *Surface Water Quality Monitoring Procedures Manual*. Post calibration error limits and the disposition resulting from error are adhered to. Data not meeting post-error limit requirements invalidates associated data collected subsequent to the pre-calibration and are not submitted to the TCEQ.

Detailed laboratory calibrations are contained within the QAM(s).

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

New batches of supplies are tested before use to verify that they function properly and are not contaminated. The laboratory QAM provides additional details on acceptance requirements for laboratory supplies and consumables.

B9 DATA NON-DIRECT MEASUREMENTS

Section A4 lists responsibilities and lines of communication for data management personnel.

Non-direct Measurements

Water quality determinations at sampling sites will be based upon data collected during the time frame of the current FY 10-12 project and this project. In determining reductions in NPS pollution at sampling sites, data obtained by the City of McAllen prior to this project's initiation will be used for pre- and post-treatment comparisons.

Only data obtained directly under this QAPP will be submitted to the TCEQ for loading into SWQMIS. This project will not submit any acquired or non-direct measurement data to TCEQ that has been or is going to be collected under another QAPP. All data collected under this QAPP will comply with all requirements of the project.

B10 DATA MANAGEMENT

Data obtained by the City of McAllen prior to this project's initiation will be referred to as historical data. The data consists of watershed hydrology information to this project RDFs. Data will be obtained prior to the implementation of BMPs using this QAPP. This origin of any historical data and the locations stored previous to the implementation of this project will be identified in the reports to TCEQ.

Samples will be collected by field staff and transferred to Ana-Lab for analyses as described in Sections B1 and B2. Sampling information (e.g. site location, date, time, sampling depth, etc.) will be used to generate a unique sampling event in an interim database built on an auto generated alphanumeric key field. Results from both the field data reporting forms and the Ana-

Lab sample analyses reports will be manually entered by TAMUK into the interim database for their corresponding event. Customized field data reporting forms and laboratory results reports will facilitate accurate data entry. Following data verification and validation, the data will be exported from the interim database into the Event/Result format required for submission to TCEQ's SWQMIS (as described in the SWQM DMRG January 2010 or later version). Once TCEQ approval of the data is obtained, the interim data are appended to the primary database.

See Appendix K for the Data Management Process Flow Chart.

Record-keeping and Data Storage

Field staff will visit the sites on a monthly basis to access monitoring equipment, download data and collect grab samples when scheduled. Site identification, date and time, personnel, water depth and any comments concerning weather or conditions at the site are noted on a field data sheet. Field log book or field data sheet is filled out on site for each location visited. An example of a field data sheet is shown in Appendix A. If no flow is observed at a site information about the site visit is recorded on the field data sheet and the site is noted as pooled with no flow or dry.

Digital files will be stored on an Environmental Engineering server. Hard copies will be stored in the Engineering Liaison Officer office.

Archives/Data Retention

Complete original data sets are archived on permanent electronic media and retained on-site by the Contractor for a retention period specified in section A9.

Data Verification/Validation

The control mechanisms for detecting and correcting errors and for preventing loss of data during data reduction, data reporting, and data entry are contained in Sections D1, D2, and D3.

Forms and Checklists

See Appendix F for the Field and Laboratory Data Sheets.

See Appendix C for the Data Review Checklist and Summary.

Data Dictionary

Terminology and field descriptions are included in the SWQM DMRG (January 2010). For the purposes of verifying which entity codes are included in this QAPP, a table outlining the entities that will be used when submitting data under this QAPP is included below. Note that a new Monitoring Type Code for automatic samplers is under development by TCEQ and will be incorporated when available.

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Name of Monitoring Entity	Tag Prefix	Submitting Entity	Collecting Entity	Monitoring Type Code
<i>Texas A&M Univ. Kingsville, South Texas Environ. Institute</i>	<i>AK</i>	<i>AK</i>	<i>AK</i>	<i>BF</i>

Data Handling

Data are processed using the updated software of tools and applications. ISCO Flowlink Pro software will be used for retrieving flow, rainfall, and relevant sample data from Isco 2105 and 2150 Series Modules as well as the 6712 Sampler. The data will be exported in ASCII format to a server located at TAMUK College of Engineering for analysis by programs such as Microsoft Excel, HTML format for viewing in a web browser, and PDF format for viewing in Adobe Reader. Data integrity is maintained by the implementation of password protections which control access to the database and by limiting update rights to a select user group. No data from external sources are maintained in the database. The database administrator is responsible for assigning user rights and assuring database integrity.

Hardware and Software Requirements

Hardware configurations are sufficient to support the updated software in a networked environment. Information Resources staff are responsible for assuring hardware configurations meet the requirements for running current and future data management/database software as well as providing technical support. Software development and database administration are also the responsibility of the information resources department. Information Resources develops applications based on user requests and assures full system compatibility prior to implementation.

Information Resource Management Requirements

TAMUK information technology (IT) policy is contained in IT SOPs which are available for review at TAMUK offices.

Quality Assurance/Control

See Section D of this QAPP

C1 ASSESSMENTS AND RESPONSE ACTIONS

Table C1.1 Assessments and Response Requirements

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
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Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	Contractor Project Manager	Monitoring of the project status and records to ensure requirements are being fulfilled.	Report to TCEQ in Quarterly Report
Laboratory Inspections	Dates to be determined by the TCEQ lab inspector	TCEQ Lab Inspector	Analytical and quality control procedures employed at the laboratory and the contract laboratory	30 days to respond in writing to the TCEQ to address corrective actions
Monitoring Systems Audit	Dates to be determined by TCEQ	TCEQ QAS	The assessment will be tailored in accordance with objectives needed to assure compliance with the QAPP. Field sampling, handling and measurement; facility review; and data management as they relate to the NPS Project	30 days to respond in writing to the TCEQ to address corrective actions
Laboratory Inspection	Based on work plan and or discretion of contractor	Contractor QAO	Analytical and quality control procedures employed at the laboratory and the contract laboratory	30 days to respond in writing to the contractor QAO to address corrective actions
Monitoring Systems Audit	Based on work plan and or discretion of contractor	Contractor QAO	The assessment will be tailored in accordance with objectives needed to assure compliance with the QAPP. Field sampling, handling and measurement; facility review; and data management as they relate to the NPS Project	30 days to respond in writing to the contractor QAO to address corrective actions
Site Visit	Dates to be determined by TCEQ	TCEQ PM	Status of activities. Overall compliance with work plan and QAPP	As needed

Corrective Action Process for Deficiencies

Deficiencies are any deviation from the QAPP, SWQM Procedures Manual, SOPs, or Data Management Reference Guide. Deficiencies may invalidate resulting data and may require corrective action. Corrective action may include for samples to be discarded and re-collected. Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff. It is the responsibility of the Contractor Project Manager, Kim Jones, in consultation with the Contractor QAO, Abel P. Garza, to ensure that the NPS Rev 1.2

actions and resolutions to the problems are documented and that records are maintained in accordance with this QAPP. In addition, these actions and resolutions will be conveyed to the NPS Project Manager both verbally and in writing in the project progress reports and by completion of a corrective action plan (CAP).

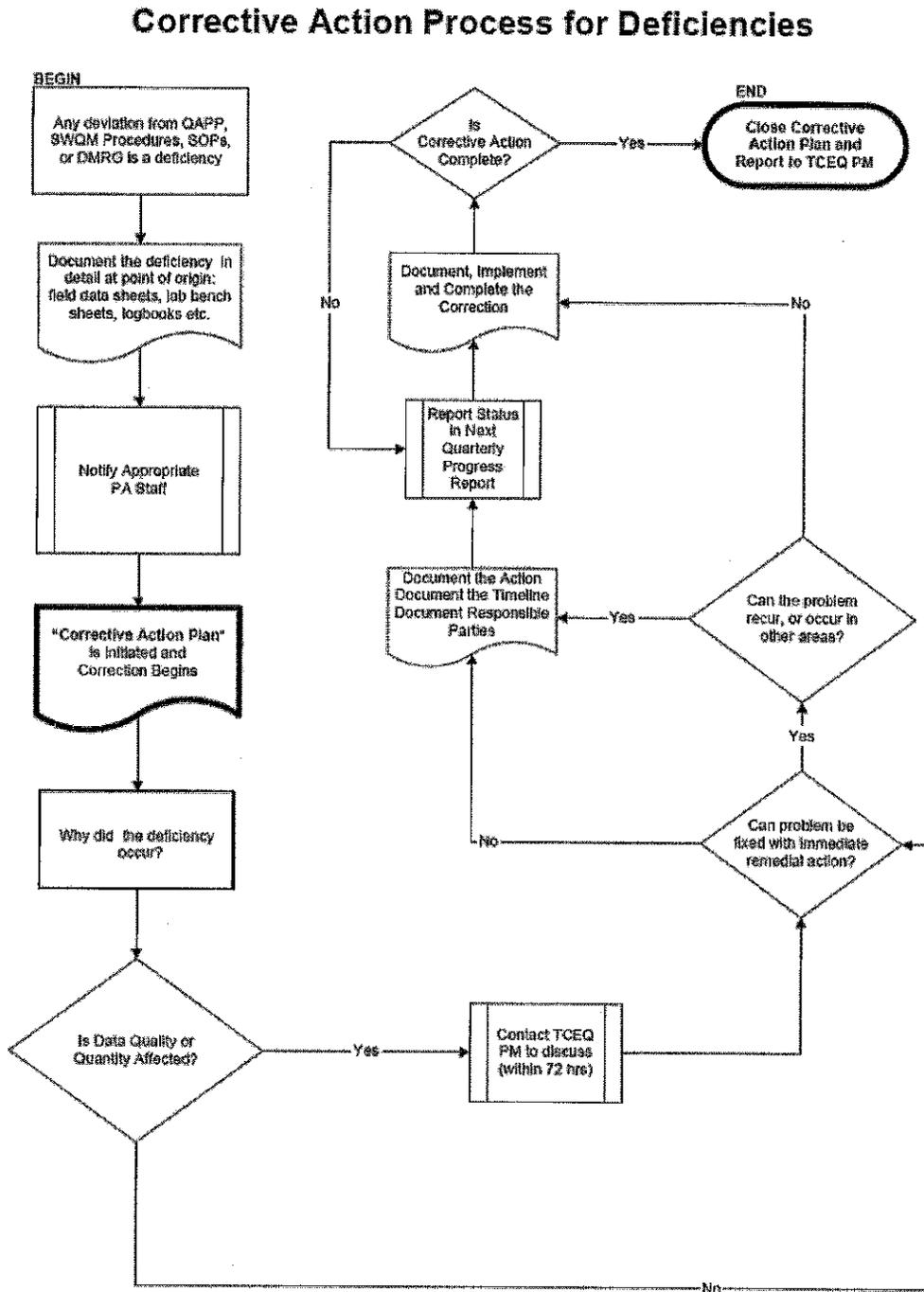
Corrective Action

CAPs should:

- Identify the problem, nonconformity, or undesirable situation
- Identify immediate remedial actions if possible
- Identify the underlying cause(s) of the problem
- Identify whether the problem is likely to recur, or occur in other areas
- Evaluate the need for Corrective Action
- Use problem-solving techniques to verify causes, determine solution, and develop an action plan
- Identify personnel responsible for action
- Establish timelines and provide a schedule
- Document the corrective action

To facilitate the process a flow chart has been developed (see figure C1.1: Corrective Action Process for Deficiencies). *Insert additional staff involved in the process if needed.*

Figure C1.1 Corrective Action Process for Deficiencies



Status of CAPs will be documented on the Corrective Action Status Table (See Appendix L) and included with Quarterly Progress Reports. In addition, significant conditions (i.e., situations which, if uncorrected, could have a serious effect on safety or on the validity or integrity of data) will be reported to the TCEQ immediately.

The Contractor Project Manager, Kim Jones, is responsible for implementing and tracking corrective actions. Corrective action plans will be documented on the Corrective Action Plan Form (See Appendix M) and submitted, when complete, to the TCEQ Project Manager. Records of audit findings and corrective actions are maintained by both the TCEQ and the Contractor QAO. Audit reports and corrective action documentation will be submitted to the TCEQ with the Quarterly Progress Report.

If audit findings and corrective actions cannot be resolved, then the authority and responsibility for terminating work are specified in the TCEQ QMP and in agreements in contracts between participating organizations.

C2 REPORTS TO MANAGEMENT

Reports to TCEQ Project Management

All reports detailed in this section are contract deliverables and are transferred to the TCEQ in accordance with contract requirements.

Monitoring Systems Audit Report and Response - Following any audit performed by the Basin Planning Agency, a report of findings, recommendations and response is sent to the TCEQ in the quarterly progress report.

Quarterly Progress Report - Summarizes the Contractor's activities for each task; reports monitoring status, problems, delays, and corrective actions; and outlines the status of each task's deliverables.

Monitoring System Audit Response - The contractor will respond in writing to the TCEQ within 30 days upon receipt of a monitoring system audit report to address corrective actions.

Contractor Evaluation - The Contractor participates in a Contractor Evaluation by the TCEQ annually for compliance with administrative and programmatic standards.

Final Project Report - Summarizes the Contractor's activities for the entire project period including a description and documentation of major project activities; evaluation of the project results and environmental benefits; and a conclusion.

Reports to Contractor Project Management

Quarterly progress reports will note activities conducted in connection with the water quality monitoring program, items or areas identified as potential problems, and any variations or supplements to the QAPP. Corrective action report forms will be utilized when necessary (Appendix A). CARs will be maintained in an accessible location for reference at Environmental Liaison office. CARs that result in any changes or variations from the QAPP will be made known to pertinent project personnel and documented in an update or amendment to the QAPP.

The field measurement and sampling for the project will be done according to the QAPP. However, if the procedures and guidelines established in this QAPP are not successful, corrective action is required to ensure that conditions adverse to quality data are identified promptly and corrected as soon as possible. Corrective actions include identification of root causes of problems and successful correction of identified problem. Corrective Action Reports will be filled out to document the problems and the remedial action taken. Copies of Corrective action reports are included with Environmental Liaison office annual Quality Assurance reports. They will also discuss any problems encountered and solutions made. These QA reports are the responsibility of the Quality Assurance Officer and the Laboratory Manager and are available for review upon request.

Reports by TCEQ Project Management

Contractor Evaluation - The Contractor participates in a Contractor Evaluation by the TCEQ annually for compliance with administrative and programmatic standards. Results of the evaluation are submitted to the TCEQ Financial Administration Division, Procurement and Contracts Section.

D1 DATA REVIEW, VERIFICATION, AND VALIDATION

For the purposes of this document, data verification is a systematic process for evaluating performance and compliance of a set of data to ascertain its completeness, correctness, and consistency using the methods and criteria defined in the QAPP. Validation means those processes taken independently of the data-generation processes to evaluate the technical usability of the verified data with respect to the planned objectives or intention of the project. Additionally, validation can provide a level of overall confidence in the reporting of the data based on the methods used.

All data obtained from field and laboratory measurements will be reviewed and verified for conformance to project requirements, and then validated against the data quality objectives which are listed in Section A7. Only those data which are supported by appropriate quality

control data and meet the measurement performance specification defined for this project will be considered acceptable and submitted to the TCEQ for entry into SWQMIS.

The procedures for verification and validation of data are described in Section D2, below. The Contractor Field Supervisor, Javier Guerrero, is responsible for ensuring that field data are properly reviewed and verified for integrity. The Laboratory Supervisor is responsible for ensuring that laboratory data are scientifically valid, defensible, of acceptable precision and bias, and reviewed for integrity. The Contractor QAO, Abel Garza, is responsible for validating a minimum of 10% of the data produced in each task. Finally, the Contractor Project Manager, Kim Jones, with the concurrence of the Contractor QAO, Abel Garza, is responsible for validating that all data to be reported meet the objectives of the project and are suitable for reporting to TCEQ.

D2 VERIFICATION AND VALIDATION METHODS

All data will be verified to ensure they are representative of the samples analyzed and locations where measurements were made, and that the data and associated quality control data conform to project specifications. The staff and management of the respective field, laboratory, and data management tasks are responsible for the integrity, validation and verification of the data each task generates or handles throughout each process. The field and laboratory tasks ensure the verification of raw data, electronically generated data, and data on chain-of-custody forms and hard copy output from instruments.

Verification, validation and integrity review of data will be performed using self-assessments and peer review, as appropriate to the project task, followed by technical review by the manager of the task. The data to be verified (listed in Table D2.1) are evaluated against project performance specifications (Section A7) and are checked for errors, especially errors in transcription, calculations, and data input. If a question arises or an error is identified, the manager of the task responsible for generating the data is contacted to resolve the issue. Issues which can be corrected are corrected and documented electronically or by initialing and dating the associated paperwork. If an issue cannot be corrected, the task manager consults with the higher level project management to establish the appropriate course of action, or the data associated with the issue are rejected and not reported to the TCEQ for storage in SWQMIS. The performance of these tasks is documented by completion of the Data Review Checklist and Summary (Appendix C).

The Contractor Project Manager, Kim Jones, and QAO, Abel Garza, are each responsible for validating that the verified data are scientifically valid, defensible, of known precision, bias, integrity, meet the data quality objectives of the project, and are reportable to TCEQ. One element of the validation process involves evaluating the data again for anomalies. Any

suspected errors or anomalous data must be addressed by the manager of the task associated with the data, before data validation can be completed.

A second element of the validation process is consideration of any findings identified during the monitoring systems audit conducted by the TCEQ QAS assigned to the project. Any issues requiring corrective action must be addressed, and the potential impact of these issues on previously collected data will be assessed. Finally, the Contractor Project Manager, Kim Jones, with the concurrence of the QAO, Abel Garza, validates that the data meet the data quality objectives of the project and are suitable for reporting to TCEQ.

Table D2.1. Data Verification Procedures

Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified	✓	✓	
Field QC samples collected for all analytes as prescribed in the TCEQ <i>SWQM Procedures Manual</i>	✓		
Standards and reagents traceable	✓	✓	
Chain of custody complete/acceptable	✓	✓	
Sample preservation and handling acceptable	✓	✓	
Holding times not exceeded	✓	✓	
Collection, preparation, and analysis consistent with SOPs and QAPP	✓	✓	✓
Field documentation (e.g., biological, stream habitat) complete	✓		
Instrument calibration data complete	✓	✓	
Bacteriological records complete	✓	✓	
QC samples analyzed at required frequency	✓	✓	✓
QC results meet performance and program specifications	✓	✓	✓
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP		✓	✓
Results, calculations, transcriptions checked	✓	✓	
Laboratory bench-level review performed		✓	
All laboratory samples analyzed for all parameters		✓	
Corollary data agree	✓	✓	✓
Nonconforming activities documented	✓	✓	✓
Outliers confirmed and documented; reasonableness check performed			✓

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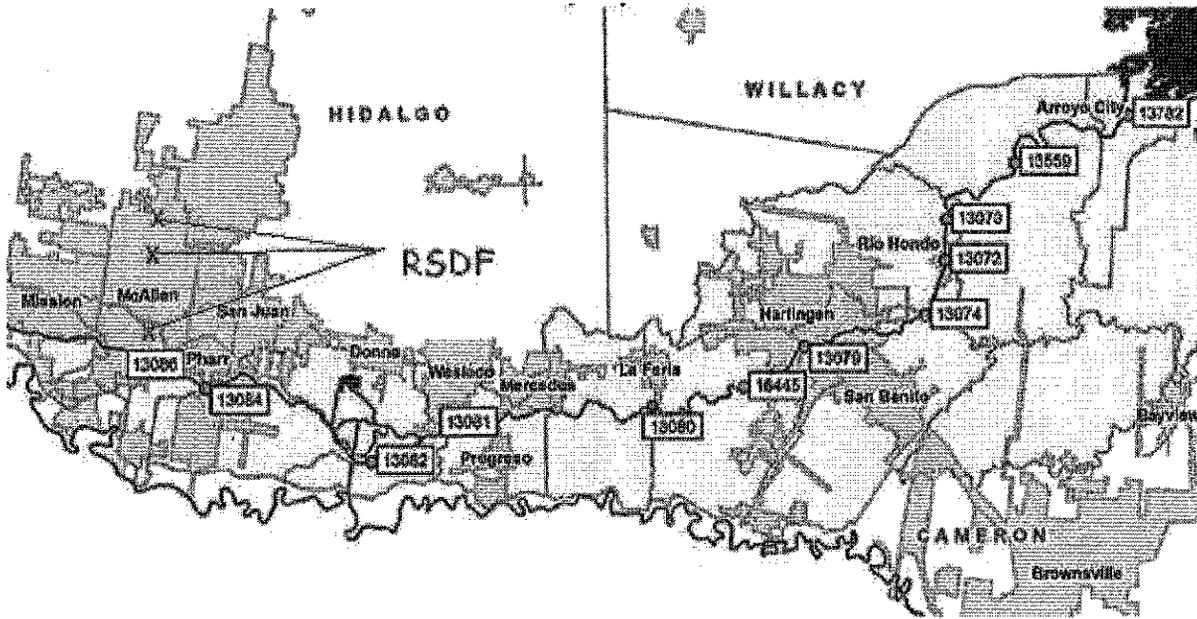
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Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Dates formatted correctly			✓
Depth reported correctly			✓
TAG IDs correct			✓
TCEQ ID number assigned			✓
Valid parameter codes			✓
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly			✓
Time based on 24-hour clock			✓
Absence of transcription error confirmed	✓	✓	✓
Absence of electronic errors confirmed	✓	✓	✓
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule)	✓	✓	✓
Field QC results attached to data review checklist			✓
Verified data log submitted			✓
10% of data manually reviewed			✓

D3 RECONCILIATION WITH USER REQUIREMENTS

Data collected from this project will be analyzed by the City and TAMUK to report the performance of the BMPs and the measured reductions in NPS loadings. The percentage of pollutant removal achieved as a result of the storm water RDFs' performance will be one of several criteria examined in the design and sizing of similar BMPs to be constructed in other segments of Arroyo Colorado Watershed. BMP monitoring data that do not meet requirements will not be used in the project or submitted to SWQMIS. The City of McAllen will be constructing the BMPs. The City of McAllen will not be directly involved in the monitoring aspects of the project. The city appropriate staff will be kept abreast of the project progress and monitoring information.

Appendix A. Area Location Map



Appendix B. Project Scope of Work

(Following is the currently complete scope of work for this project as expanded under Contract Amendment #2. This QAPP only addresses the following tasks: 2.1, 2.2, 2.3, 2.4, 2.5, and 2.6.)

Revised Scope of Work

Problem/Need Statement: The 2006 Texas Water Quality Inventory and 303(d) List identifies the Arroyo Colorado River (Segments 2201, 2202) as impaired for depressed dissolved oxygen and bacteria as well as having concerns for nutrients (nitrate, chlorophyll-a, ammonia, orthophosphorus, total phosphorus). The List also identifies the Laguna Madre (Segment 2491) as impaired for depressed dissolved oxygen and as a concern for chlorophyll-a.

The Texas Commission on Environmental Quality (TCEQ) planned to address the impairment of depressed dissolved oxygen in the Arroyo Colorado segments through a Total Maximum Daily Load (TMDL) study in 2002. Conclusions of the study led to the development of a watershed protection plan. The Arroyo Colorado Watershed Protection Plan (ACWPP) is a comprehensive watershed-based strategy to improve water quality and aquatic and riparian habitat in the Arroyo Colorado Watershed. The plan

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was developed by the Arroyo Colorado Watershed Partnership (ACWP), a coalition of public and private organizations. The implementation period for Phase I of the ACWPP is 2006-2015. In an effort to address the Phase I goals of the plan, Texas A&M University, Kingsville (TAMUK), in collaboration with the City of McAllen has proposed the development and implementation of innovative regional detention facility (RDF) systems for urban storm water runoff that would address the impairments and concerns in the Arroyo Colorado Watershed as well as the Laguna Madre water body.

The City of McAllen in Hidalgo County, Texas, is located near the headwaters of the Arroyo Colorado River. For several years, the city has been focusing on the development of a system of storm water RDFs to manage and direct urban storm water flows in order to mitigate flooding concerns and drainage issues. These facilities also hold potential to improve water quality in the tributaries and streams running into the Arroyo Colorado Watershed. While several efforts have been undertaken to reduce rural and agricultural Non-point Source (NPS) pollution in the region, the urban contribution to this problem has just begun to be addressed in limited areas. The integration of best management practices (BMPs), such as constructed wetlands for treatment and biofiltration swales within the RDF designs may prove to be a cost effective approach for urban storm water runoff control and water quality enhancement. However, a major design challenge exists in how a RDF can maintain wetland biota and microbial activity for nutrient uptake in a viable condition throughout drier periods, and yet still be effective for water treatment during storm events.

TAMUK, in association with the City of McAllen and the ACWP, proposes a three-phase project to develop and implement RDF designs that allow for treatment of urban NPS runoff during both wet and dry conditions. The RDF study and implementation are supportive of the mission of the ACWP to "Reduce the additions of pollutants to the Arroyo Colorado to the maximum extent possible in order to meet state water quality standards and improve the natural terrestrial, riparian, and aquatic habitat..." (ACWPP). This project also supports the ACWPP goal of "reducing the additions of the known primary pollutants (nitrogen, phosphorous, ammonia, sediment, bacteria, and biochemical oxygen demanding substances) by 10-20% over the next fifteen years". A major strategy in the Plan is the promotion and evaluation of urban BMPs that focus on water quality improvement. TAMUK, the ACWP, along with the cities of La Feria, Mercedes, San Benito and San Juan have received federal funding from the TCEQ through the Clean Water Act (CWA) Section 319 grant program to design and construct individual treatment wetland projects as identified in the ACWPP. The City of McAllen RDF project complements the wetlands project by designing RDFs that treat additional NPS runoff from urban areas that enter the Arroyo Colorado Watershed.

General Project Description:

Project activities will include the development and implementation of RDF designs that allow for treatment of urban NPS runoff during both wet and dry conditions. The goal of this project is to design multi-purpose RDF systems that provide drainage and serve as a water quality pollution prevention measure that will assist the ACWP in meeting the goals of the ACWPP. At least two RDFs will be implemented in this project.

Phase I of the project will examine the compilation of existing regional city storm water runoff water quality data and flows, the estimation of potential nutrient and organic loading to the proposed RDF system locations, and the identification of data gaps. Additional data collection to support the design phase will be collected for each RDF as necessary.

Phase II of the project calls for innovative RDF design and construction implementation within the Arroyo Colorado Watershed near the Jackson Elementary School, however, data collection and evaluation of local urban flows and pollutant loadings may reveal other eligible and cost-effective sites. Proposed funding for the Jackson Elementary School RDF utilizes CWA Section 319(h) incremental funds. A larger RDF proposed for construction near the Morris Elementary School, lies just outside of the Arroyo Colorado Watershed, but within the watershed of the impaired Lower Laguna Madre. The Lower Laguna Madre is a priority water body identified in the 2005 NPS Management Program. The Morris RDF location has significant value as a demonstration BMP to prove the effectiveness of the design RDF modifications on a larger scale area but with the identical climactic conditions, soils, nutrient, and organic loadings and hydraulics present in other Arroyo Colorado urban areas. Proposed funding for the Morris RDF demonstration project utilizes CWA Section 319(h) base funds. The Morris RDF location would serve to validate the larger designs for implementation in the fast growing urban centers within the Arroyo Colorado Watershed such as Harlingen, Pharr, and San Benito. Estimated annual load reductions for the implementation of innovative RDFs are:

- 310 lbs of Biological Oxygen Demand (BOD) removed (0.013% of watershed plan goal)
- 78 lbs of Total Nitrogen (TN) removed (0.017 % of watershed plan goal)
- 62 lbs of Total Phosphorus (TP) removed (0.18% of watershed plan goal)
- 776 lbs of Total Suspended Solids (TSS) removed (0.0048% of watershed plan goal)

In Phase III, the project team will perform water quality sampling in several locations during dry and wet weather events. Information gathered will provide the needed feedback to develop water quality models to optimize RDF nutrient and organic pollutant removal, and incorporate the findings into an enhanced RDF design. The study will be formulated to also demonstrate the effectiveness of the RDF system approach to urban water quality management and reinforce the City's commitment to water resource protection for the Arroyo Colorado Watershed and the Lower Rio Grande Valley. Additionally, the project team will assist the ACWP in delivering an educational component to present the results and innovations of this project in McAllen to other communities and municipal groups throughout the Rio Grande Valley. The project team will assist the ACWP in introducing the City of McAllen to the CWA State Revolving Fund as an option for future NPS project implementation.

Amendment 2 Problem/Need Statement –

Objective 6:

TAMUK, proposes to develop a detailed GIS-based information database of urban BMPs for the Lower Rio Grande Valley (LRGV) region. The database will be connected to an online interactive map to inform the public about the innovative urban NPS BMPs being utilized. The database will eventually be expanded further and used to develop detention volumes, fill informational gaps, and implement a database that researchers and modelers can utilize for regional watershed management studies.

Objective 7

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The Arroyo Colorado Watershed Protection Plan (WPP) was published in 2007. The WPP is lacking some of EPA's 9 Key Elements such as loading reductions. Objective 7 will complete some of the initial tasks necessary for an update of the WPP that meets EPA's requirements.

Amendment 2 General Project Description:

Objective 5:

Because of recent vandalism of monitoring equipment at the enhanced RDF sites funded under this project, TAMUK will install security equipment to deter potential vandalism. Following completion of this contract the equipment will be utilized for other 319-funded BMPs in the LRGV.

Objective 6

The BMP Inventory will be developed in 3 stages. For this amendment, the project team will complete stages 1 and 2, by designing a database and creating a website that will include a green infrastructure map for the LRGV. An initial inventory of urban BMPs will be conducted; however, this inventory will be limited in scope and a more detailed inventory will be conducted provided future funding. This initial inventory will include proposed and completed 319-funded BMP projects [i.e. proposed Low Impact Development (LID) BMPs, the three constructed wetlands, and the three McAllen RDFs] and additional BMPs like innovative/non-traditional urban stormwater BMPs, and other LID BMPs that the cities will assist in identifying. Stage 2 will consist of interfacing the startup database with GIS technology and developing a website with an interactive map for dissemination of information. Future funding will allow for a more detailed urban BMP inventory and calculation of load reductions for selected BMPs.

Objective 7

Work will also be conducted to support the planned update of the Arroyo Colorado Watershed Protection Plan. Quality Assurance Project Plans (QAPPs) will be developed. Additionally, a data review will be conducted to determine if adequate data is available for calibration and validation of a hydrodynamic/water quality (H/WQ) model. Sites will be selected for monitoring and will include a preference for existing TCEQ stations with historical data and longitudinal distribution of sites along the Arroyo Colorado Tidal with greater emphasis in the zone of impairment. A modeling system framework of the H/WQ model will be developed and linked to receive stream flows and pollutant loadings from the Soil and Water Assessment Tool (SWAT) model. Finally, the Texas Water Resources Institute (TWRI) will continue to maintain a clearinghouse for all data collected in the Arroyo on the current website. TWRI will also enhance the existing water quality database by standardizing the data and including spatially explicit location information that can be accessed through an interactive, online GIS map service which will include water quality summary statistics.

OBJECTIVE 1: PROJECT ADMINISTRATION

Goal: TAMUK will effectively coordinate and monitor all technical and financial activities performed under this contract, prepare progress reports, and maintain project files and data. TAMUK will be responsible for hiring and supervising of all project personnel.

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- Task 1.1** **Project Oversight** – TAMUK will provide technical and fiscal oversight of the staff and/or subgrantee(s)/subcontractor(s) to ensure Tasks and Deliverables are acceptable and completed as scheduled and within budget. TAMUK will participate in a post-award orientation meeting with TCEQ within 60 days of contract execution. With the TCEQ Project Lead authorization, TAMUK may secure the services of subgrantee(s)/subcontractor(s) as necessary for technical support, repairs and training. Project oversight status will be provided to the TCEQ with the Quarterly Progress Reports (QPRs).
- Task 1.2** **Progress Reports** – TAMUK will submit QPRs to TCEQ by the 15th of the month following each state fiscal quarter for incorporation into the Grant Reporting and Tracking System (GRTS). Progress reports will contain a level of detail sufficient to document the activities that occurred during the quarter, and contain a detailed tracking of deliverable status under each objective.
- Task 1.3** **Reimbursement Forms** – TAMUK will submit reimbursement forms to the TCEQ by the last day of the month following each state fiscal quarter.
- Task 1.4** **Conference Calls** – TAMUK will participate in monthly conference calls coordinated by TCEQ project staff to provide updates on the project, and will communicate status and issues to the TCEQ designated Project Manager (PM) as necessary. Matters that must be communicated to the TCEQ Project Manager in the interim between QPRs include:
- Requests for prior approval of activities or expenditures for which the contract requires advance approval or that are not specifically included in the scope of work
 - Notification in advance when GRANTEE has scheduled public meetings or events, initiation of construction, or other major task activities under this contract
 - Information regarding events or circumstances that may require changes to the budget, scope of work, or schedule of deliverables; such information must be reported within 48 hours of discovering these events or circumstances
- Task 1.5** **Contractor Evaluation** – TAMUK will participate in an annual Contractor Evaluation.
- Task 1.6** **Project Fact Sheet** – TAMUK will develop a one-page fact sheet of the project using the TCEQ NPS Projects Template. The fact sheet will briefly describe what the project is going to accomplish, give background information on why the project is being conducted and the current status of the project, and list who is involved in the project. The project fact sheet will be submitted to the TCEQ within 60 days after contract initiation. The fact sheet will be updated annually and submitted with the fourth quarter progress report. The fact sheet will be updated more often, as the project status changes. After approval from the TCEQ Project Manager, the fact sheet will be published on the Arroyo Colorado Watershed Partnership website (www.arroyocolorado.org), and also linked to the regional TAMUK South Texas Environmental Institute site (www.stormwater.stei.org).
- Task 1.7** **Annual Report Article** – TAMUK will provide an article for the Nonpoint Source Annual Report upon request by TCEQ. This report is produced annually in accordance with Section 319(h) of the CWA and is used to report Texas' progress toward meeting

the CWA § 319 goals and objectives and toward implementing its strategies as defined in the Texas Nonpoint Source Management Program. The article will include a brief summary of the project and describe the activities of the past fiscal year.

Measures of Success: Adherence to the TCEQ administrative requirements; timely completion and submittal of progress reports and deliverables.

Deliverables:

- Quarterly Progress Reports
- Reimbursement Forms
- Contractor Self-Evaluations
- Project Fact Sheets
- Annual Report Articles

OBJECTIVE 2: PHASE I – DATA EVALUATION

Goal: Evaluate existing urban flows and pollutant loadings to the existing RDFs and those planned for the City of McAllen. Establish baseline values for assessment of project water quality goals.

Task 2.1 Hydraulic Input Data Collection – Scientists at TAMUK and McAllen engineers will review urban flows and storm water runoff hydraulic inflows and outflows to several existing RDFs and all RDFs planned for construction in 2009. Data collected from historical storm water sampling locations will be identified and mapped on a spatial basis and the relevant analyses evaluated for both mean seasonal and annual flows and pollutant inputs into the proposed RDF locations.

Task 2.2 Pollutant Loadings Data Evaluation – TAMUK will evaluate and establish baseline loading values for the RDF drainage areas for nutrients and other pollutants causing impairments in the watershed for seasonal and dry weather and wet weather events. Seasonal and drought and wet weather event trends and associated standard errors will be used to determine baseline nutrient and pollutant concentration inputs from urban NPSs for RDF water quality improvement measurements and verification. Hydraulic conditions established by Task 2.1 for each area will be evaluated and modeled to estimate the loadings for each RDF and the approach for optimal water retention and treatment.

Task 2.3 Additional Data Collection and Evaluation – TAMUK will identify and evaluate areas without the necessary estimated flow and loading data for additional data collection with storm water sampling protocols and lab analyses. In some cases, new parameter estimation techniques and approaches will be applied to fill in data gaps. All hydrologic aspects of the potential biotreatment sites within the RDFs will be evaluated, including elevation mapping, estimated dredging volumes, site grading areas, and levees to channel water will be reviewed. The soil types at each location will be identified and infiltration rates estimated.

Task 2.4 Quality Assurance Project Plan (QAPP) – TAMUK will prepare a water quality monitoring conceptual plan summarizing the specific objectives of the project's monitoring effort, the data requirements of the model or other data analysis to be used in the project, and the preliminary locations, times, and other details of planned monitoring activities, demonstrating how the planned activities support the monitoring objectives. Upon TCEQ approval of this plan, they will develop and submit to the TCEQ a QAPP to address direct and indirect measurements with project specific data quality objectives consistent with the EPA QA/R5 format 120 days prior to the initiation of any sampling. The QAPP will be updated as needed with approvals from the TAMUK Project Manager and the TCEQ. Should mid-project revisions become necessary, they will be approved by the TAMUK Project Manager (PM) and TCEQ. Once a QAPP is updated or revised and approved, TAMUK will apply the new version number and distribute the new version to all project personnel. The data quality objectives of the data collection are as follows:

- Task 2.1, 2.2 - determine current water quality conditions of the RDF locations, data gaps, and best approach for optimal water retention and treatment
- Task 2.3 - identify areas without the necessary estimated flow and loading data, determine those areas needing additional data collection, and design and implement supplemental storm water sampling and lab analyses sufficient to provide needed evaluation data
- Task 4.2 - quantify the water quality improvement for each innovative RDF implementation

Task 2.5 Data Collection – TAMUK will conduct monitoring, as outlined in the QAPP, to achieve data quality objectives.

Task 2.6 Data Submittal – TAMUK will review, verify and validate data before submitting it to the TCEQ. The TAMUK Project Manager will submit data quarterly with progress reports to TCEQ whenever new data are available. He will submit data at least 1 month prior to presenting it to stakeholders, incorporating it into models, or otherwise using or distributing it.

Measures of Success: Baseline flows and pollutant loadings estimates completed for each existing and proposed RDFs for the City of McAllen.

Deliverables:

- Report on existing hydraulic input data
- Proposed pollutant concentration & loading estimates for RDFs, referencing data sources and estimation methods (Tasks 2.2 and 2.3)
- Water quality monitoring conceptual plan – 60 days after contract execution
- QAPP Planning Meeting with TCEQ – within 30 days after monitoring plan submitted
- Presentation of WQM conceptual plan to ACWPP stakeholder group – within 60 days after QAPP Planning Meeting
- Identification of RDFs to be developed/enhanced in this project – with final QAPP
- QAPP draft – 90 days after QAPP planning meeting
- QAPP final – 20 days after receiving TCEQ comments on Draft QAPP

- QAPP update submittal (annually) – 45 days prior to end of QAPP effective period
- Water quality data submittal with QA/QC information incorporated, to include the initial historic data acquisition for the RDF sites – quarterly with quarterly progress reports whenever new data are gathered
- Draft chapter one summarizing Phase I data collection, modeling and mapping, incorporating the following:
 - acquired data from previous monitoring
 - new sampling data through 2/28/10
 - presentation of simulation model selection and initial application of the model to derive estimates of **pre-implementation** inflow and outflow characteristics of selected RDFs

OBJECTIVE 3: PHASE II RDF MODELING, DESIGN ENHANCEMENT, AND IMPLEMENTATION

Goal: Design and enhance existing and new RDFs with wetland plantings and other hydraulic channeling modifications and incorporate new modeling results into a newly constructed RDF to improve water quality in the Arroyo Colorado Watershed by reducing pollutant load from parameters of concern.

Task 3.1 Biotreatment Model development and validation – TAMUK will develop and validate a Biotreatment Model. The current RDF area located at the Jackson Elementary School in McAllen or other candidate locations will be enhanced with wetland plantings and some bioretention modifications designed for water quality improvement and nutrient uptake. Plant species introduction to continuous flow wetland sections may include native bulrushes or mangroves. A critical path for RDF evaluation includes optimization of the system for water quality improvement. Some detailed small watershed scale model development will be required. Evaluation of models will determine the most optimal type for the RDF hydraulic and treatment efficiency modeling. Models currently proposed are the Soil and Water Assessment Tool (SWAT) and APEX edge-of-field model. The SWAT model may be used to predict the impacts of soil type, land use, weather, and land management on the flow of nutrients and their influence on water quality in the study areas. Geographical Information Systems (GIS) will be integrated into the developed model to estimate the amount of nitrogen, phosphorous and other pollutants running off into the Arroyo Colorado as well as surrounding water bodies like the Lower Laguna Madre. The effect of the implementation of a RDF and its impacts will be determined with a linkage of hypothetical filtration and uptake estimates from a constructed wetland or bioretention cell system inserted at critical sites in the spatial model for those locations determined to be most feasible.

Task 3.2 RDF design development and implementation – The City of McAllen and TAMUK will utilize the data collected and predictive models from the Jackson RDF BMP implementation or a similar site to improve the design of an additional RDF to be constructed in 2008 or 2009. The design improvements will include increased hydraulic

retention time and new approaches such as bioretention cells targeting denitrification and loading equalization during routine storm events. Design parameters such as system hydraulic retention time, allowable system water depth, vegetation management, and biofiltration materials will be optimized. To the extent practical, BMP designs will follow the general guidance provided in *EPA/600/R-04/121A, Stormwater Best Management Practice Design Guide, Volume 2, Vegetative Biofilters* (<http://www.epa.gov/nrmrl/pubs/600r04121/600r04121a.pdf>).

Measures of Success: Enhanced existing RDFs in operation for the City of McAllen. Newly constructed innovative RDFs incorporating new designs in operation.

Deliverables:

- Model documentation report summarizing data and assumptions to be used in the model, sources of data, and model design
- Report on proposed designs for enhanced RDFs, together with modeling analysis of expected loading reduction performance
- Completion of enhanced RDF construction
- Technical memo/report summarizing Phase II enhanced RDF design and construction
- Coordination of at least one TCEQ PM site visit during construction

OBJECTIVE 4: PHASE III – EFFECTIVENESS MONITORING AND EDUCATION

Goal: Verify the effectiveness of innovative RDFs in the City of McAllen to provide supporting information for similar implementation in other urban areas of the Arroyo Colorado Watershed. Use the RDF site modeling and the pre- and post-monitoring and evaluation findings for demonstration to other communities interested in urban BMPs to manage storm water runoff.

Task 4.1 Continuation of Monitoring – TAMUK will collect wet weather and dry weather flows and water sample collection and analysis in accordance with the QAPP at one enhanced existing and one newly constructed RDF in McAllen. The QAPP will be amended as necessary for the post-construction phase.

Task 4.2 Water Quality Improvement Effectiveness Evaluation – TAMUK will compile the analyses results collected in the sampling plan and utilize analytical and statistical tools to assess the effectiveness of the RDF modifications for the final project report.

Task 4.3 Education – TAMUK will work with the ACWP to disseminate knowledge and information gained from the RDF project through publication of the completed project on the websites: www.arroyocolorado.org and www.stormwater.stei.org and presentations to state watershed groups, local communities, and municipal groups. Further, TAMUK will work with the ACWP to introduce the City of McAllen to the CWA State Revolving Fund as an option for future NPS project implementation.

Measures of Success: The sampling plan will be implemented and nutrient loading and flow data will be collected. Techniques for water quality evaluation for these analyses will be selected and completed on a NPS Rev 1.2

periodic basis. Knowledge and information of the project will be presented to other cities in the Arroyo Colorado Watershed and future funding through the CWA State Revolving Fund for the City of McAllen will be discussed.

Deliverables:

- Water quality data submittal with QA/QC information incorporated – quarterly with quarterly progress reports whenever new data are gathered
- Technical memo/report presenting all project data collection through 3/15/11, the design evaluation and optimization process, and results of the monitoring and evaluation of BMP performance - as a component of, or attachment to, the draft final report

Documentation of education and outreach presentations and web postings, demonstrating numbers of people participating

OBJECTIVE 5: SECURITY SUPPORT FOR SAMPLING EQUIPMENT

Goal: TAMUK will provide security lighting, deterrent signage, and video support at the project site at various locations in McAllen to minimize vandalism, theft and damage to monitoring and sampling equipment.

Task 5.1 Design a theft deterrent scheme for the three RDFs that include five locations for stormwater monitoring equipment:

1. McAuliffe inlet
2. McAuliffe outlet
3. Morris inlet
4. Morris outlet
5. Dog Park

Lighting Equipment: Purchase security lighting with solar technology. Mount on a 4"x4"x13' foot post.

Camera Equipment: Purchase nine dummy cameras. Install two cameras facing opposite sides inside fenced Jobox area at McAuliffe inlet, McAuliffe outlet, Morris inlet, Morris outlet and one at the Dog Park

Replace Equipment: Replace stolen sensor/mounting plate on ditch bottom anchors and replace damaged sample tubing.

Signage Equipment: Upgrade the design deterrent signage.

Task 5.2 **Security Equipment Installation:** Work with the city Parks and Recreation Department and Public Works to install lighting and to construct improved signage design. Test all equipment for function and serviceability.

Measures of Success: Reduction of vandalism, theft and damage to project equipment.

Deliverables:

- Photo-documentation of the installation of the described security equipment at the five locations.

OBJECTIVE 6: BMP INVENTORY AND INTERACTIVE GREEN INFRASTRUCTURE MAP

Goal: To develop an inventory of current LID practices and other urban NPS BMPs in the LRGV and display the results in an online interactive map.

QAPP Coverage: This task will be covered under the Monitoring QAPP being developed under TAMUK contract 582-11-11100 of the 319 FY10 Grant or under another QAPP.

Task 6.1 **Stage 1:** TAMUK will develop a workplan and task project representatives from Task Force members to identify and describe lists of selected existing BMPs in their respective jurisdictional areas.

- Each Task Force member will assign a project manager for this project
- A project team (field and office staff) from each task force member will be assigned to work with ISEE and TAMUK.
- Task Force members and stakeholders that are equipped with GIS capability will be identified.
- ISEE will develop a schedule to meet with each project manager individually and develop a plan to identify structural BMPs, to develop a preliminary list of BMP types within their jurisdiction, and to identify a list of parameters and data that will be developed for each BMP

ISEE's preliminary list of structural BMPs to be included in this amendment:

- Project BMPs from TAMUK 319 projects (Grant years 2008, 2010, and 2011)
- Constructed wetlands at San Benito, La Feria, and San Juan.
- Additional LID BMPs, such as rain water harvesting systems, rain gardens, innovative structures, etc., identified by cities (Up to 20 LID sites will be identified, or as many as the budget permits).

ISEE's preliminary list of parameters to be included:

- Photograph
- GPS coordinates (x-y-z, where applicable)
- General descriptors

TAMUK will develop and ground truth GPS locations for identified BMPs and input descriptions and parameters for modeling into database similar to MS Access or other; provide Q&A for database; provide to key personnel, stakeholders and partners.

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Task 6.2 **Stage 2:** TAMUK will interface the database with GIS technology and build an interactive online map. The following tasks will be performed under Stage 2:

- ISEE and GIS-capable partners will develop a regional base map.
- Expand database and interface with GIS for selected BMPs
- Develop GIS map using database
- Prepare GIS files for ISEE
- ISEE will combine all information
- Hire consultant or other support entity for limited technical support in rural areas and non-GIS supported areas, if warranted.
- Hire consultant or other support entity for limited GIS technical support if needed

Task 6.3 **Outreach:** The partners will work together in developing a workshop to present findings, and a survey to evaluate the program.

Measures of Success: Design and development of a BMP database and an online interactive map that is an effective educational tool for the LRGV.

Deliverables:

- Database Electronic Files
- Map of identified BMPs
- BMP List (including descriptions of identified BMPs)
- Interactive map design proposal document
- Online Interactive Green Infrastructure Map
- Survey results of effectiveness

OBJECTIVE 7: QAPP DEVELOPMENT TO SUPPORT THE UPDATE OF THE ACWPP

Goal: To develop the QAPPs, develop the modeling system framework, determine sampling sites, complete the historical data review, and enhance and maintain the Arroyo Colorado Website in support of the WPP update.

Task 7.1 **Acquired Data QAPP** - The TWRI and the Texas Institute for Applied Environmental Research (TIAER) will develop and submit to TCEQ a QAPP with project-specific DQOs consistent with the EPA *QAPP Requirements for Secondary Data Research Projects* format. The QAPP will be developed by TWRI and TIAER, with technical assistance from the TCEQ Project Manager, Quality Assurance staff, technical staff, management, and contractors. The QAPP will be approved by TCEQ.

Activities covered under this QAPP:

- Data Review (Task 7.5)
- Website Maintenance and Enhancement (Task 7.8)
- Water Quality Analysis for WPP Update (FY12 Grant)
- Map Development for WPP Update (FY12 Grant)

- Task 7.2** **QAPP for Monitoring** - The TWRI and the University of Texas at Brownsville (UTB) will develop and submit to TCEQ a QAPP with project-specific DQOs consistent with *EPA Requirements for Quality Assurance Project Plans (QA/R5)* format and the TCEQ *NPS QAPP Shell* 120 days prior to the initiation of any data collection. All of the monitoring procedures and methods prescribed in the QAPP will be consistent with the guidelines detailed in the *TCEQ Surface Water Quality Monitoring Procedures, Volume 1 and 2*. TWRI and UTB will develop the QAPP with technical assistance from the TCEQ Project Manager, QA and technical staff, management, and contractors. TIAER will provide technical review to ensure that the activities described in the QAPP meet the needs for model calibration and validation. The QAPP must be approved by TCEQ. Activities covered under this QAPP:
- Site Selection (Task 7.6)
 - Water Monitoring for Model Calibration (FY12 Grant)
- Task 7.3** **QAPP for Modeling** - The TWRI and TIAER, in coordination with Texas AgriLife Blackland Research Center (BREC), will develop and submit to TCEQ a QAPP with project specific data quality objectives consistent with the *EPA Requirements for Quality Assurance Project Plans for Modeling QA/G-5M* format 120 days prior to the initiation of any modeling activities. The QAPP will be developed by TWRI, TIAER, and BREC, with technical assistance from TCEQ Project Manager, Quality Assurance staff, technical staff, management, and contractors. The QAPP will be approved by TCEQ. Activities covered under this QAPP:
- Modeling System Development (Task 7.7)
 - Additional Modeling Activities (FY12 Grant)
- Task 7.4** **Data Review** – The TIAER will continue a previous data review under FY2011 TMDL work order 582-6-70859-30. If any data gaps are identified additional monitoring will be required. A data review report will be submitted.
- Task 7.5** **Site Selection** – UTB will take the lead, with assistance from TIAER, in determining appropriate sites for water monitoring. Site selection will include a preference for existing TCEQ stations with historical data, longitudinal distribution of sites along the Arroyo Colorado Tidal with greater emphasis in the zone of dissolved oxygen impairment. One site will be located within the most downstream portion of the Arroyo Colorado Above Tidal, and one site in the vicinity of the Arroyo Colorado Tidal and Gulf Intercoastal Waterway. Sites will also be included at point sources (e.g., municipal wastewater treatment facility outfalls) and major tributaries into the Arroyo Colorado Above Tidal. Not including tributary and point source sites, the number of sites along the Arroyo Colorado will be approximately twelve. Site selection will include a reconnaissance trip by UTB, TIAER, and TWRI. A water monitoring plan will be developed prior to sampling. Also, a map of the sites will be submitted to TCEQ.
- Task 7.6** **Modeling System Development** – The TIAER will develop the framework of the hydrodynamic/water quality (H/WQ) modeling component upon completion of the modeling QAPP. The H/WQ modeling component for the Arroyo Colorado Tidal will be

linked to receive stream flows and pollutant loadings from SWAT.

Task 7.7 Website Maintenance and Enhancement - TWRI/Texas A&M Institute of Renewable Natural Resources (IRNR) will continue to maintain a clearinghouse for all data collected in the Arroyo on the current website. The existing water quality database will be enhanced by standardizing the data and including spatially explicit location information. This database will be accessed through an interactive, online GIS map service which will include water quality summary statistics.

Measures of Success: Completion of tasks supporting the update of the WPP by August 31, 2011. Successful completion of an interactive, online GIS map service with water quality summary statistics.

Deliverables:

- Acquired Data QAPP
- Monitoring QAPP
- Modeling QAPP
- Finalized Data Review Report
- Site Selection Map and Water Monitoring Plan
- Modeling System Framework (Digital Files)
- Standardized Water Quality Database and Interactive, Online GIS Map

OBJECTIVE : 8 FINAL REPORT

Goal: To provide TCEQ and EPA with a comprehensive Final Report on the activities conducted by TAMUK during the course of the project.

Task 8.1 Draft Final Report – TAMUK will summarize all project activities, findings, and the contents of all previous deliverables, referencing and/or attaching them as web links or appendices. This comprehensive, technical report will provide analysis of all activities and deliverables under this scope of work. The report will be organized as follows:

Title
Table of Contents
Executive Summary
Introduction
Project Significance and Background
Methods
Results and Observations
Discussion
Summary
References
Appendices

Task 8.2 Final Report – TAMUK will revise the Draft report to address comments provided by
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the TCEQ PM and to address project data gathering, RDF development, and education and outreach activities completed after the draft report was prepared.

Measure of Success: Acceptance of the Final Report by the TCEQ.

Deliverables:

- Draft Report
- Final Report

Appendix C. Data Review Checklist and Summary

NPS DATA REVIEW CHECKLIST AND SUMMARY

A completed checklist must accompany all data sets submitted to the TCEQ by the Contractor.

Data Format and Structure

Y, N, or N/A

- A. Are there any duplicate *Tag_Ids* in the *Events* file? _____
- B. Are all *StationIds* associated with assigned station location numbers? _____
- C. Are all dates in the correct format, MM/DD/YYYY? _____
- D. Are all times based on the 24 hour clock format, HH:MM? _____
- E. Is the *Comment* field filled in where appropriate (e.g. unusual occurrence, sampling problems)? _____
- F. Are *Submitting Entity*, *Collecting Entity*, and *Monitoring Type* codes used correctly? _____
- G. Do the *Enddates* in the *Results* file match those in the *Events* file for each *Tag_Id*? _____
- H. Are all measurements represented by a valid *parameter tcode* with the correct units? _____
- I. Are there any duplicate *parameter codes* for the same *Tag_Id*? _____
- J. Are there any invalid symbols in the Greater Than/Less Than (*Gt/Lt*) field? _____
- K. Are there any tag numbers in the *Result* file that are not in the *Event* file? _____
- L. Have verified outliers been identified with a "1" in the *Remark* field? _____

Data Quality Review

- A. Are all the "less-than" values reported at or below the specified reporting limit? _____
- B. Have checks on correctness of analysis or data reasonableness performed?
e.g.: Is ortho-phosphorus less than total phosphorus? _____
Are dissolved metal concentrations less than or equal to total metals? _____
- C. Have at least 10% of the data in the data set been reviewed against the field and laboratory data sheets? _____
- D. Are all *parameter codes* in the data set listed in the QAPP? _____

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E. Are all *StationIds* in the data set listed in the QAPP? _____

Documentation Review

- A. Are blank results acceptable as specified in the QAPP? _____
- B. Was documentation of any unusual occurrences that may affect water quality included in the *Event* table's *Comments* field? _____
- C. Were there any failures in sampling methods and/or deviations from sample design requirements that resulted in unreportable data? If yes, explain on next page.
- D. Were there any failures in field and laboratory measurement systems that were not resolvable and resulted in unreportable data? If yes, explain on next page.

Describe any data reporting inconsistencies with performance specifications. Explain failures in sampling methods and field and laboratory measurement systems that resulted in data that could not be reported to the TCEQ. (attach another page if necessary):

Date Submitted to TCEQ: _____

TAG Series: _____

Date Range: _____

Data Source: _____

Comments (attach file if necessary): _____

Contractor's Signature: _____

Date: _____

Appendix D. Detailed Site Location Map for RDFs

1. Dog Park



2. McAuliffe RDF



3. Morris RDF



Appendix E. Flow Logger and Automated Sampler SOP

Flow Logger

The bubbler flow meter has a device (typically a weir or doppler technology) or other open channel flow arrangement with a known relationship between level and flow rate. The level measuring device is a bubbler which measures the liquid level in the flow stream.

The built pressure from compressed air released slowly into a bubble line (a length of small diameter flexible tubing) is measured by differential pressure transducer. A bubble is formed when the built pressure is high enough to counteract the hydrostatic pressure of the flow stream, which is directly dependent on the hydrostatic pressure of the bubble line. The recorded pressure is converted into the flow rate and total flow, with the relationship between liquid level and dimension.

The flow meter electronically converts the level reading into a properly-scaled flow rate value. The flow meter has enough memory to store a high volume of data readings. The data logger can transmit stored data (liquid level and flow rate) over standard dial-up telephone lines, store the current program, and operate the display and the internal printer.

Automated Sampler

Certain external instruments can enable (start) or disable (stop) a sampler by sending a signal to the sampler's flow meter connector. Flow meters, flow loggers have a programmable sampler-enable feature that lets them enable or disable the sampler. A certain condition (such as level, flow rate, pH, temperature, percent, rainfall, and I/O) or combination of conditions can enable the sampler.

Sample pacing is controlled by the sampler's internal clock or by inputs received from connected instruments. In time-paced sampling, the interval between samples is a constant time interval. When the sampler is programmed for time pacing, the sampler is allowed to enter the time between sample events in hours and minutes. Flow paced sampling paces a sampler by sending an electronic signal to the sampler after measuring a specified volume of liquid. The stored sampling data can be collected with a computer running software.

Appendix F. Update on Sampling Activities

Samples have been collected and analyzed at the McAuliffe and Morris RDF locations and the Dog Park. Flows were also measured for all sampling duration times and for both inlet and outlets at all locations.

The June 2011 sampling event was during base flow conditions at the McAuliffe and Morris RDFs. In August 2011 samples collected at the McAuliffe and Morris RDFs were during one storm event. Both December 2011 sampling events were completed during storm events. On February 2012 McAuliffe and the Dog Park were sampled again during a storm event. These results are being quality assured and prepared for submittal once a flow parameter code for continuous sampling is issued from TCEQ. The historic drought has delayed more frequent sampling events.

Table 1 below presents location, date and sampling event details for the 20 sample sets collected thus far in the project and sent to the Certified Lab for analysis

Table 1. McAllen RDF project sampling event summary and descriptive information

	Location and Sample Event Date	Event Type	N+N, TKN, P, TSS, BOD	E-coli
	June 28, 2011	Base Flow		
1	McAuliffe Inlet		yes	yes
2	McAuliffe Outlet		yes	yes
3	Morris Inlet		yes	yes
4	Morris Outlet		yes	yes
	August 19, 2011	Storm Event		
5	McAuliffe Inlet		yes	yes
6	McAuliffe Outlet		yes	yes
7	Morris Inlet		yes	yes
8	Morris Outlet		yes	yes
	<i>Location and Sample Event Date</i>	<i>Event Type</i>	<i>N+N, TKN, P, TSS, BOD</i>	<i>E-coli</i>
	December 10, 2011	Storm Event		
9	McAuliffe Inlet		yes	no
10	McAuliffe Outlet		yes	no
	December 19, 2011	Storm Event		

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11	McAuliffe Inlet		yes	yes
12	McAuliffe Outlet		yes	yes
13	Morris Inlet		yes	yes
14	Morris Outlet		yes	yes
	December 20, 2011	Base Flow		
15	McAuliffe Inlet		no	yes
16	McAuliffe Outlet		no	yes
	February 8, 2012	Storm Event		
17	McAuliffe Inlet		yes	yes
18	McAuliffe Outlet		yes	yes
19	Dog Park Biofilter Inlet		yes	yes
20	Dog Park Biofilter Outlet		yes	yes

Additional sampling event details

- The flow sensors at Morris were vandalized early this year temporarily prohibiting more frequent flow sampling at that location. A Purchase Order has been issued by the City of McAllen for procurement of replacement sensors. A flow sensor was damaged by the dredging crew at the McAuliffe inlet and will be replaced with the same PO.
- The collection of Dog Park samples are not automated, hence the timing of sample collection is more challenging for the project team. The Dog Park e-coli samples have been exceptionally higher than the other sites and will need to be characterized with a different dilution by Ana Lab to develop more accurate results.
- The samples collected on December 10, 2011 had measureable nutrient concentrations but e.coli could not be quantified, so it was decided to re-sample McAuliffe for e-coli only on December 20, 2011.

Appendix G. Field Data Reporting Form

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FIELD DATA REPORTING FORM

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STATION ID

COLLECTOR (printed)

Station Description: _

M	M	D	D	Y	Y	Y	Y	H	H	M	M	0	.	M
DATE								TIME (24 HOUR)				DEPTH		M = meters

8996 6	CURRENT WEATHER 1- clear 2-partly cloudy 3-cloudy 4- rain	72053	DAYS SINCE LAST SIGNIFICANT PRECIPITATION
	5-other		

Measurement Comments and Field Observations:

Signature of Collector: _____

Appendix H. Chain-of-Custody Form



Ana-Lab Corp. P.O. Box 9000 Kilgore, TX 75663

Phone 903/984-0551 FAX 903/984-5914 e-Mail corp@ana-lab.com LELAP-accredited #02068

Employee Owned Integrity Caring Confirmed Improvement

COC Printed 02/08/2012

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Chain of Custody

TAMK -R
101

Lab Number _____
Phone 361/593-4326
Fax 361/593-2069
Storm Water

Report to
Abel P Garza
Texas A&M Kingsville
700 University Blvd.
MSC213
Dept of Environmental Eng.
Kingsville, TX 78363-6202

Monitor: *Liquid Agency*
Sample Collection Start

Date: _____ Time: _____

Sampler Printed Name: _____

Sampler Affiliation: _____

Sampler Signature: _____

0 Zr-Administrative use only; no bottle required

N

TNR Nitrogen

Calculation

3

H2SO4 to pH <2.50 ml Polyethylene

N

INNL Nitrate-Nitrite Nitrogen

EPA 300.0

N

NHAN Ammonia Nitrogen

EPA 350.1, Rev. 2.0

N

TKN Total Kjeldahl Nitrogen

EPA 351.2, Rev 2.0

N

TPWB Phosphorus

EPA 365.3

1 Polyethylene 1/2 gal (white)

N

TSS Total Suspended Solids

SM 2540 D, 20th Ed.

N

BOD Biochemical Oxygen Demand (BOD5)

SM 5210 B 20th Ed.

Ambient Conditions/Comments

Date	Time	Relinquished	Received
		Printed Name <i>Affiliation</i>	Printed Name <i>Affiliation</i>
		Signature <i>Affiliation</i>	Signature <i>Affiliation</i>
		Printed Name <i>Affiliation</i>	Printed Name <i>Affiliation</i>
		Signature <i>Affiliation</i>	Signature <i>Affiliation</i>
		Printed Name <i>Affiliation</i>	Printed Name <i>Affiliation</i>
		Signature <i>Affiliation</i>	Signature <i>Affiliation</i>

Appendix I. Automated Sampler Testing and Maintenance Requirements

Inspect parts as pump tube, suction line and pump tubing housing for wearing, replace them if necessary. Clean the bottles, suction line, strainer and pump tube. Check the humidity indicator. Check the controller's internal battery status and replace the battery every five years.

Clean sampling equipment is essential for valid laboratory analysis. Cleaning protocols need to be established in consultation with a laboratory analyst. The maintenance manual list multiple parameters, such as time and date, number of pump counts for the pump tube warning and battery warning for the internal battery. A set of diagnostic tests for troubleshooting purposes can be run with such above settings. Some error messages and pump tube warning need also to be addressed.

Appendix J. Automated Sampler Calibration Requirements

Calibration plays an important role in data collection. During the program updating or new program plugging, calibration will cover the three following areas, volume, parameter and pacing calibration.

❖ Volume calibration

The certain amount of volume to be pumped is programmed by the operator and the sample will then be taken to be placed into a container outside the sampler base. Subsequently, the amount actually delivered is entered into the system, the auto sampling amount calibration is accepted and the volume delivered event will be logged.

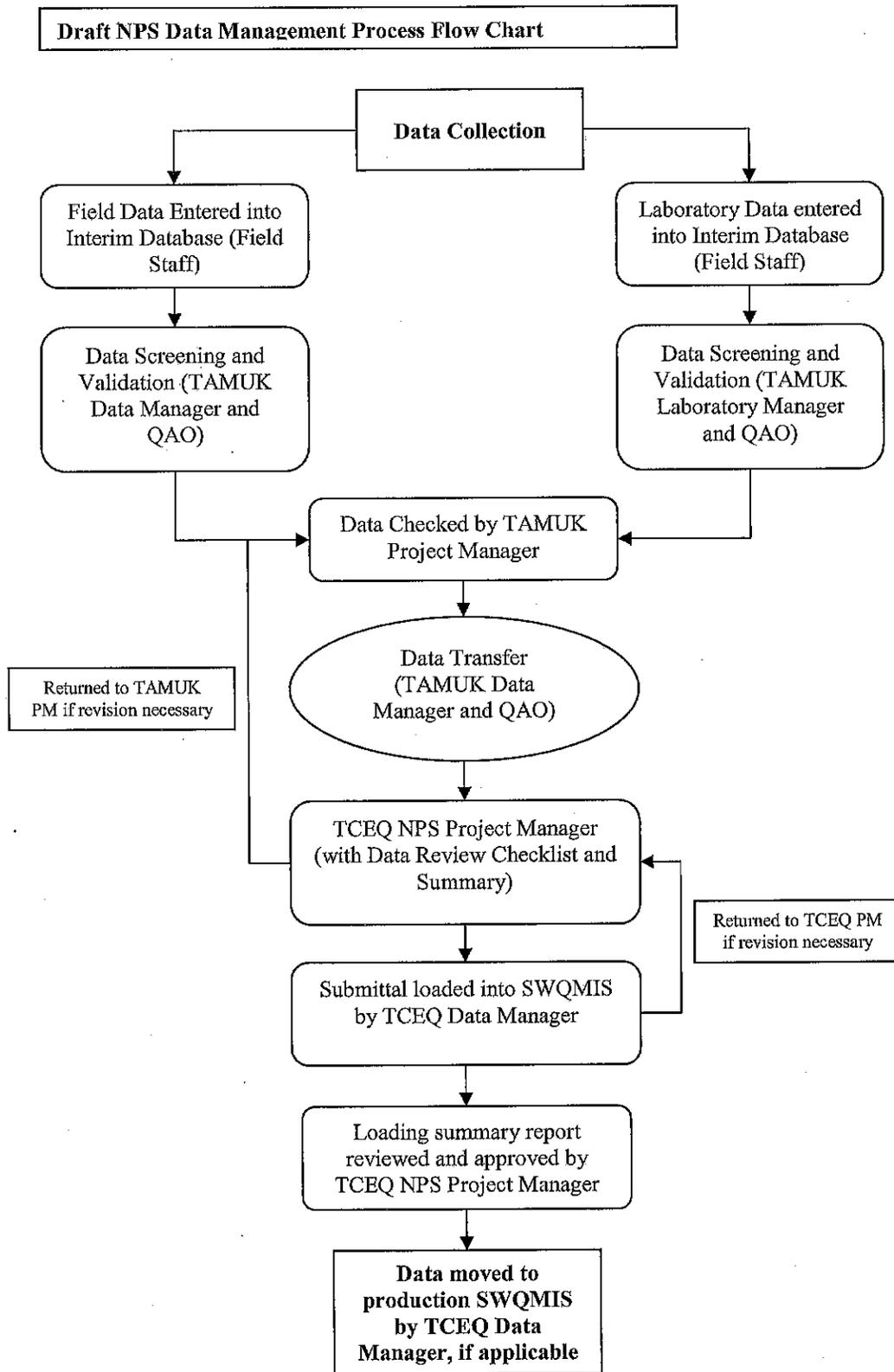
❖ Parameters

When the sampler is configured for operation with a module, this option displays the appropriate level adjustment screens and/or the calibration screens. If the level is adjusted, an adjusted level event is logged. If a parameter is calibrated, an appropriate event is logged. Calibrating a parameter probe will temporarily "turn off" the partition data storage and the sample enable/disable functions. These functions are disabled during the calibration and for five minutes after the program is resumed. During this time, parameter data normally collected at the data storage interval will be logged as an error message.

❖ Pacing

This option is available when the running program is paced by Time, Flow Pulses or Flow volume. A new pacing interval is asked to be entered and an interval changed event is recorded by the logger. If the original count remaining is less than the new pacing interval, the original count will continue to count down to the next sample event. Subsequent samples are then paced by the new interval.

Appendix L. Data Management Flow Chart



Appendix M: Corrective Action Status Table

Appendix N: Corrective Action Plan Form

Appendix N - Corrective Action Plan Form

Corrective Action Plan	
Issued by: _____	Date Issued _____
Report No. _____	
Description of deficiency	
Root Cause of deficiency	
Programmatic Impact of deficiency	
Does the seriousness of the deficiency require immediate reporting to the TCEQ? If so, when was it?	
Corrective Action to address the deficiency and prevent its recurrence	
Proposed Completion Date for Each Action	
Individual(s) Responsible for Each Action	
Method of Verification	
Date Corrective Action Plan Closed?	

ATTACHMENT 1
Example Letter to Document Adherence to the QAPP

TO: (name)
(organization)

FROM: Dr. K. Jones
Texas A&M University-Kingsville

RE: Contractor Name: Dr. K. Jones,
QAPP Title: Development and Implementation of Innovative Storm Water Regional Detention
Facilities for Urban Water Quality Improvement in the Arroyo Colorado

Please sign and return this form by (date) to:

(address)

I acknowledge receipt of the "Development and Implementation of Innovative Storm Water Regional Detention Facilities for Urban Water Quality Improvement in the Arroyo Colorado, Revision Date 1.26.10". I understand that the document describes quality assurance, quality control, data management and reporting, and other technical activities that must be implemented to ensure the results of work performed will satisfy stated performance criteria.

My signature on this document signifies that I have read and approved the document contents. Furthermore, I will ensure that all staff members participating in activities covered under this QAPP will be required to familiarize themselves with the document contents and adhere to the contents as well.

Signature

Date

Copies of the signed forms should be sent by the Contractor to the TCEQ NPS Project Manager within 60 days of TCEQ approval of the QAPP.

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Bryan W. Shaw, Ph.D, *Chairman*
Buddy Garcia, *Commissioner*
Carlos Rubinstein, *Commissioner*
Mark R. Vickery, P.G., *Executive Director*



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Protecting Texas by Reducing and Preventing Pollution

April 11, 2012

Kim Jones
Project Manager
Texas A&M University-Kingsville
700 University Blvd, MSC 213
Kingsville, TX 78363

Re: Development and Implementation of Innovative Storm Water Regional Detention Facilities for Urban Water Quality Improvement in the Arroyo Colorado Quality Assurance Project Plan (QAPP)

Approval Date: April 11, 2012 (Update Due: April 11, 2013)
QAPP Revision Date: April 4, 2012

Dear Dr. Jones:

The above named QAPP has been approved. The original QAPP and signature pages are enclosed as documentation of approval.

In accordance with the terms of the QAPP, **please ensure that copies of this document and any subsequent amendments are distributed to each sub-tier participant as noted in Section A3 of the QAPP.** This approval letter must be available for review during a monitoring systems audit.

Should an annual update to the QAPP be required, please submit this update to the TCEQ Project Manager by no later than 60 days in advance of April 11, 2013.

Should you have questions, please contact me at (512) 239-0425.

Sincerely,

A handwritten signature in black ink, appearing to read "Kyle Girten".

Kyle Girten
Quality Assurance Specialist

enclosure

cc: Sharon Coleman, Senior Quality Assurance Specialist, MC 165
Bill Carter, Project Manager, MC 203

