

A Progress Report for the Arroyo Colorado Watershed Protection Plan

Prepared for the
Texas Commission on Environmental Quality

By
T. Allen Berthold and Jaime Flores
Texas Water Resources Institute
August 2011

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List of Acronyms

AC – Arroyo Colorado
ACW – Arroyo Colorado Watershed
ACWP – Arroyo Colorado Watershed Partnership
ACWPP – Arroyo Colorado Watershed Protection Plan
BOD-Biochemical Oxygen Demand
CWA – Clean Water Act
DO – Dissolved Oxygen
ERHWSC-East Rio Hondo Water Supply Corporation
LRGV-Lower Rio Grande Valley
MHWSC-Military Highway Water Supply Corporation
NH₃-N-Ammonia Nitrogen
NPS – Non Point Source Pollution
RMS – Resource Management System
SAFE-Sports Athletic Field Education
TAMUK-Texas A&M University Kingsville
TF-Task Force
TMDL – Total Maximum Daily Load
TPDES-Total Pollution Discharge Elimination System
TPWD-Texas Parks & Wildlife Department
TSS-Total Suspended Solids
WC-Watershed Coordinator
WQMP – Water Quality Management Plan

Background – The Arroyo Colorado

The Arroyo Colorado (AC) is located in the Lower Rio Grande Valley of South Texas and flows through the middle of Hidalgo and Cameron counties. The lower 16 miles of the AC form the boundary between Cameron and Willacy counties. The AC drainage area is a sub-watershed of the Nueces-Rio Grande Coastal Basin, also known as the Lower Laguna Madre Watershed.

The streams of the Nueces-Rio Grande Coastal Basin, including the AC, drain to the Laguna Madre, which is considered to be one of the most productive hyper-saline lagoon systems in the world. The Rio Grande is the largest fluvial system of the lower coast of Texas and forms the border between the United States and Mexico. The Lower Rio Grande Valley comprises the northern part of the Rio Grande Delta, a broad fluvio-deltaic plain laid down over tens of thousands of years by the ancestral Rio Grande.

The AC extends approximately 90 miles from its headwaters southwest of the city of Mission, to its confluence with the Lower Laguna Madre in the northeast portion of Cameron County. For much of its course, the AC is a floodway and a conduit used for wastewater conveyance. The lower third of the stream serves as an inland waterway for commercial barge traffic and as a recreational area for boating and fishing. Near the coast, the AC also serves as an important nursery and foraging area for numerous species of marine fish, shrimp and crab.

Water quality in the AC has been monitored and assessed by the State of Texas since 1974 to satisfy the requirements of Sections 305(b) and 303(d) of the Clean Water Act (CWA). Currently, water quality in the tidal segment of the AC does not support aquatic life because of occasional occurrences of low dissolved oxygen (DO). Water quality in the non-tidal segment of the AC does not support contact recreation because of high fecal bacteria concentrations. Nutrient concentrations (nitrogen and phosphorus compounds) are high in both segments of the AC. The concentration of nitrogen compounds such as ammonia and nitrate in the AC are among the highest in the state, exceeding the 85th percentile of all other tidal water bodies in the state, and historical water quality data indicate an increasing trend over time for these pollutants. Chlorophyll-*a* concentrations, a measure of the stream's algal productivity, consistently exceed the screening criteria in the tidal segment of the AC and have reached very high levels in years from 2000 – 2006, displaying a trend similar to that of nitrogen-containing compounds. Productivity overall is high in the tidal segment of the AC, and algal blooms, indicative of ecological imbalance, are common in the spring and summer months. Wide daily swings in DO often accompany periods of high algal productivity. A reduction in nutrients in the AC will help control excessive algal growth and will improve DO levels in the AC Zone of Impairment.

The Arroyo Colorado Watershed Partnership

The Arroyo Colorado Watershed Partnership (ACWP) is an organization of more than 715 individuals who share an interest in the welfare of the AC and the Lower Laguna Madre. The strategy to protect and restore the AC described in the Arroyo Colorado Watershed Protection Plan (ACWPP) was developed by the ACWP. The ACWP grew out of smaller groups of local stakeholders involved in the Total Maximum Daily Load (TMDL) process and is now the leading stewardship organization in the watershed.

The ACWP formed Workgroups to investigate and address topic-specific issues and develop recommendations for the ACWPP. The seven Workgroups originally formed were:

- Wastewater Infrastructure
- Agricultural Issues
- Habitat Restoration
- Further Study/Phase II TMDL Analysis
- Outreach and Education
- Land Use and Development
- Water Quality Monitoring

In addition to these seven workgroups, it has been proposed to create two additional workgroups but the motion was tabled until further meetings. The two workgroups will be: 1) Financial Development Workgroup; and 2) Urban Non Point Source (NPS) Workgroup. The first will serve as the financial arm of the ACWP to ensure long-term sustainability and the second will address urban NPS issues.

All of the above mentioned Workgroup members included technical experts in the various disciplines associated with the specific Workgroup topics as well as private individuals and representatives of organizations that are part of the ACWP. The Workgroups developed topic specific recommendations for consideration by the ACWP and for inclusion into the Plan. Further, all Workgroups continue to meet and discuss topics of concern, how to address these concerns, and provide input on further implementing the ACWPP.

Interim Goals, Indicators, and Milestones for Measuring Progress of the ACWPP

The ACWPP states that the ultimate measure of success will be to determine whether state water quality standards are achieved in the AC. Phase I of these efforts seek to reduce the loading of pollutants of concern into the AC to the maximum extent practicable through voluntary actions and existing regulatory controls and monitor water quality during and after implementation of the Plan. To determine the level of success of Phase I of the ACWPP, the ACWP measured a selected set of indicators over the 10 year implementation period of the Plan. The ACWP will use these measurements to assess the effectiveness of the Plan and to recommend modifications to Phase I of the Plan. Subsequent phases of the ACWPP will seek to reduce pollutant loading further, restore additional habitat and/or implement other measures if necessary to achieve state water quality standards.

One of the ultimate goals of the ACWPP is to achieve state water quality standards in the AC by lowering pollutant loadings and restoring aquatic and riparian habitat through voluntary measures and existing regulatory controls. The Plan seeks to meet the average 24-hour DO concentration of 4.0 mg/l or above and a daily minimum concentration of 2.0 mg/l or above during critical periods; especially in the Zone of Impairment (i.e., stations 13072 and 13073).

Interim Goals

The ACWP originally developed the following interim goals to mark the progress toward achieving the state water quality standards.

1. Reducing BOD, TSS, and nutrient loading to the AC by 7 – 19% through expanded coverage of centralized wastewater treatment, improved secondary wastewater treatment levels, enhanced biological treatment (i.e., polishing) of wastewater effluent and implementation of agricultural and urban BMPs.
2. Conserving and restoring aquatic and riparian habitat along the AC and with the AC watershed to the maximum extent possible
3. Reducing unauthorized releases of commercial fertilizer and raw sugar at and in the vicinity of, the Port of Harlingen
4. Increasing E&O efforts to the maximum extent possible

As the ACWPP has been implemented, some of these interim goals have been met, are in progress, or have not been started. This is explained later in the milestones section of the report. The Port of Harlingen Authority has upgraded the procedures loading/unloading raw sugar. They have constructed a raw sugar storage facility that keeps any sugar from running off during a storm event. They are also using a conveyor belt system to load the sugar onto the barges. Before

they used front end loaders that resulted in large amounts of raw sugar spilling directly into the Arroyo Colorado.

In an effort to achieve the above mentioned interim goals, the ACWP stated that the following actions and measures as part of Phase I of the ACWPP will be overseen. However, through the initial implementation phase, it was determined that some of the goals would not be able to be met. The interim goals and status are outlined in the following:

1. Original Interim Goal - Construction of two regional wetland systems (500 and 300 acres) capable of removing nutrients, BOD, suspended sediment and bacteria from the AC or from tributaries flowing into the AC
Status – It has been determined that the construction of 500 and 300 acre wetlands would not be as effective as smaller, more strategically placed wetlands. In addition to being less effective overall, it is more cost effective to acquire land in smaller tracts rather than large continuous tracts. This milestone will be updated to reflect more effective practices in the ACWPP Phase II.
2. Original Interim Goal - Stabilization of stream banks in the AC (undetermined amount)
Status – Stream bank stabilization has not been a huge focus for the ACWP; therefore, little effort has been put forth in this area. In addition, due to the flooding in 2010, anything that would have been stabilized would have been lost. Further discussion about this interim goal is needed.
3. Original Interim Goal - Conservation and/or restoration of riparian land and wetlands along the AC and within the ACW (undetermined amount)
Status – Conservation and/or restoration of riparian lands and wetlands along the AC is a current challenge that the ACWP is facing. Acquiring land, as mentioned above, is not an easy task. The ACWP is currently discussing new methods of meeting this interim goal.
4. Original Interim Goal - Construction of six new wastewater treatment facilities and expansion and/or upgrading of nine existing treatment facilities
Status – A great deal of attention has been put on constructing new wastewater treatment facilities and expanding existing facilities as a way to reduce the amount of sediment, nutrients and bacteria entering the Arroyo Colorado from the WWTP's. More detail can be read under the milestones section of this report but tremendous progress has been made.
5. Original Interim Goal - Reduction of permitted wastewater effluent limits for nine wastewater treatment facilities in the ACW where all facilities are to achieve 10/15/3 treatment levels (10 mg/l BOD5 /15 mg/l TSS /3 mg/l (NH3-N)). The TCEQ published a "Pollution Reduction Plan for the Arroyo Colorado" in 2006. A major component of the

Arroyo Colorado WPP is an effort to reduce pollutants entering the Arroyo Colorado from domestic and municipal wastewater flows. This document describes the regulatory and voluntary measures already taken and planned for the next ten years to reduce the loadings of nutrients, Biochemical Oxygen Demand (BOD), total suspended solids (TSS) and ammonia nitrogen (NH₃-N) from sanitary wastewater flowing into the Arroyo Colorado. The plan estimates the historical and projected reductions in loadings of pollutants of concern to the Arroyo Colorado from the 18 principal point source contributors of wastewater and from the mitigation of nonpoint sources of wastewater to the Arroyo Colorado in five year planning intervals beginning in the year 2000 and ending in the year 2015. The measures contained in the plan include institutional controls (i.e., changes in permit limits), wastewater infrastructure improvements designed to mitigate nonpoint sources of pollution and to improve current wastewater treatment levels, and enhanced biological treatment projects such as reuse via irrigation, polishing ponds and constructed wetland cells.

Status – Multiple wastewater effluent limits have been reduced and this is further reported in the milestones section of this document.

6. Original Interim Goal - Extension of centralized wastewater treatment and/or provision of adequate and sustainable onsite wastewater for 68,081 *colonia* residents (42% of all *colonia* residents currently living in the ACW)

Status – Quantifying the amount of *colonia* residents that have been hooked up to an existing wastewater municipal collection system is somewhat of a challenge due to an ever-changing population. However, 22 *colonias* (total number of residents unknown), 2,629 connections (total number of residents unknown) and over 175 residents have been connected to central wastewater systems. More can be read about specific *colonias* can be found in the milestones section of this report.

7. Original Interim Goal - Implementation of 12 enhanced wastewater treatment systems (including eight effluent polishing wetland systems, two effluent polishing ponds and two wastewater reuse projects)

Status – It has been more difficult to implement polishing wetlands in the ACW. Only three, San Juan, La Feria, and San Benito have constructed wetlands for “polishing ponds” at the facilities.

8. Original Interim Goal - Implementation of agricultural management practices on approximately 150,000. Acres of the agricultural land in the ACW (50% of all agricultural land in ACW)

Status – Agriculture seems to be somewhat on track with the milestones that were set in 2006. The goal is to incorporate 10,000 acres of irrigated cropland annually and it was projected to have 110,000 acres of irrigated cropland under management plans by 2011.

Currently, 109,000 acres are under Water Quality Management Plans (WQMPs) alone, provided by the Texas State Soil and Water Conservation Board. The Environmental Quality Incentives Program (EQIP) provided through NRCS was not taken into account for this result. These numbers however are total for the three counties within the watershed.

9. Original Interim Goal - Improvement of management practices at and in the vicinity of the Port of Harlingen
Status – The loading/unloading dock at the Port has been upgraded as reported earlier in this report.

10. Original Interim Goal - Education of stakeholders and the public on water quality and habitat issues associated with the AC (undetermined amount)
Status – The ACWPP O&E component of the plan is designed to educate the public on the impact that they have on the watershed. This is done by making presentations on the ACWPP to elected public officials, science teachers, school children from grades 3-12, AG producers, sportsmen associations, local environmental groups and volunteers. The ACWP has hosted 6 Stream Team Volunteer Monitor training workshops in the watershed, training over 120 volunteer monitors. The ACWP has also hosted educational workshops open to the public like the TX Watershed Stewards workshop and numerous workshops that deal with a target audience such as Ag producer field days and pesticide education workshops, SAFE workshops and a Wetlands Operations & Maintenance Workshop. The ACWP has two watershed models on permanent loan from the NRA. The ACWC uses the model to educate the public by displaying the model at various educational events and fairs throughout the watershed. When an ACWPP presentation is being given, the model is an important tool to help the listener visualize how point source and NPS pollution impact the watershed. These models are also available for science teachers in the watershed to check out use in their classroom to demonstrate a variety of watershed interactions. Over 30,000 watershed residents have been educated about the Arroyo Colorado through the various outreach activities.

11. Original Interim Goal - Expansion of stakeholder and public involvement in restoring and protecting habitat and water quality in the AC (undetermined amount)
Status – The ACWP has hosted educational workshops open to the public such as the TX Stream Team Volunteer Monitor Training, the TX Watershed Stewards workshop and a Wetlands Operations & Maintenance Workshop.

Indicators

In addition to the above interim goals, the ACWP identified three categories of indicators to measure the success of the ACWPP. The indicator categories are the following:

- Programmatic Indicators
- Environmental Indicators
- Social Indicators

Programmatic Indicators

As the ACWPP describes, the Programmatic indicators will measure the relative success achieved in implementing the individual actions and measures included in the Plan. They include estimates of the number of restored or created wetlands, miles of stream bank stabilized, number of wastewater treatment facilities upgraded, number of permitted wastewater effluent limits reduced, number of *colonia* residents provided with centralized wastewater services, number of enhanced wastewater treatment projects implemented, acres of agricultural land under WQMPs or RMSs, number of E&O strategies implemented and number of volunteer water quality monitors trained. See the below table for specific programmatic indicators. Also, more detail about indicators can be found in the milestones section of this report.

Table 1 Programmatic Indicators

Criteria for Assessing Programmatic Indicators	Numerical Target 2006 - 2010	Numerical Target 2011 - 2015
Acres of wetlands created or restored	386	538
Acres of land placed under conservation	NA	NA
Length of stream bank stabilized	NA	NA
Number of wastewater treatment facilities upgraded	6	3
Number of new wastewater treatment facilities built	5	1
Number of wastewater effluent limits reduced	7	2
Number of <i>colonia</i> residents provided with centralized wastewater treatment or adequate onsite wastewater treatment	58,610	9,471
Number of enhanced wastewater systems built or implemented	8	4
Acres of agricultural land in the watershed under WQMPs and RMSs	50,000	50,000
Pounds of commercial fertilizer spillage prevented at and near the Port of Harlingen	NA	NA
Pounds of raw sugar spillage prevented at and near the Port of Harlingen	NA	NA
NA - no target developed		

Social Indicators

Social indicators are measurements of the knowledge and attitudes of the general public or subsections of the public that generally result in positive action toward improving environmental conditions. Social indicators include the number of watershed residents who have gained knowledge of the water quality and/or habitat problems associated with the AC, the number of members and/or participants in the ACWP over time or the number of citizens volunteering to help monitor, restore or protect the AC.

Assessment criteria for social indicators have been established by the ACWP to determine progress. They are:

- Estimated percentage of watershed residents knowledgeable about water quality issues in the AC
- Number of watershed residents involved in restoring and protecting and water quality in the AC
- Number of volunteer water quality monitors trained in the watershed.

The ACWPP O&E component of the plan is designed to educate the public on the impact that they have on the watershed. This is done by making presentations on the ACWPP to elected public officials, science teachers, school children from grades 3-12, Agricultural producers, sportsmen associations, local environmental groups, civic groups and volunteers. The WC works with these various groups to schedule presentations and to attend various environmental, educational and agricultural events with the watershed model and educational material. The WC coordinates educational activities with the County Extension Agents, school district science coordinators, and TPWD parks and their employees. The ACWP has also partnered with The Lower Rio Grande Valley Texas Pollutant Discharge Elimination System Stormwater Taskforce. The TF is an alliance of several Lower Rio Grande Valley (LRGV) local governments and Texas A&M University-Kingsville (TAMUK), to comply with new federal and state rules regarding storm water runoff pollution prevention. At present, the TF includes 14 cities, the Cameron County Drainage District #1 and Cameron County. The Texas Pollutant Discharge Elimination System (TPDES) program is important to the protection of the Arroyo Colorado watershed. The TF was created and continues to function as an environmental medium for the stewardship of natural resources while also aiding these local communities to effectively respond to current and expected non-point source (NPS) pollution regulations. Urban NPS is a major component of the ACWPP and the partnership between the ACWP and the TF has enabled us to educate more watershed residents. Outreach and educational efforts have been successfully conveyed via all available media to include, newspaper, billboards, television.

Environmental Indicators

Environmental indicators are measurements of physical, chemical and/or biological attributes that can be used to gauge the overall health of the AC as the ACWPP is implemented. They

include scientific observations such as in-stream levels of DO, in-stream nutrient concentrations, in-stream suspended sediment concentrations, total documented load reductions by pollutant, number of occurrence of algal blooms, number of occurrence of fish kills and percent increase in the number, distribution and diversity of aquatic organisms.

NRA conducts quarterly monitoring at several sites along the Arroyo. Data has been analyzed and is available in the NRA Basin Highlights Report. Data through 2007 is currently available on the Arroyo Colorado Website and updated data will soon be available. Table 2 outlines the specific Environmental Indicators.

Table 2 Environmental Indicators

Environmental Indicators			
Criteria for Assessing Environmental Indicators	Numerical Target 2006-2010	Current Status	Numerical Target 2011-2015
Number of measurements at each monitoring station not meeting the DO criteria established	<8 out of 20*		<8 out of 20*
Average ammonia nitrogen concentrations measured at each monitoring station	<85th percentile of tidal streams in Texas		<85th percentile of tidal streams in Texas
Average nitrate and nitrite nitrogen concentrations measured at each monitoring station	<85th percentile of tidal streams in Texas		<85th percentile of tidal streams in Texas
Average orthophosphate concentrations measured at each monitoring station	<85th percentile of tidal streams in Texas		<85th percentile of tidal streams in Texas
Average total suspended solids concentrations measured at each monitoring station	NA		NA
Average biochemical oxygen demand concentrations measured at each monitoring station	NA		NA
Tons of five-day biochemical oxygen demand loading reduced	1,920		870
Tons of total nitrogen loading reduced	1,620		600
Tons of sediment lading reduced	76,750		75,210
Tons of total phosphorus loading reduced	220		90
Algal blooms reported	NA		NA
Fish kills reported	NA		NA
Abundance of aquatic species	NA		NA
Diversity of aquatic species	NA		NA
Distribution of aquatic species	NA		NA
NA - no target developed			
* Threshold of noncompliance under the, currently used, binomial method of assessment			

Milestones

In the ACWPP, table 27 shows the milestones selected by the ACWP to mark the progress of the ACWPP. In defining these milestones, the ACWP focused attention on actions and measures in the plan that could easily be quantified; however, challenges identified earlier in this document have come up. The milestones selected by the ACWP were thought to have the biggest impact on water quality and if implemented, would achieve the necessary loading reductions needed to restore water quality. These milestones fall in to three main categories:

- Wastewater Infrastructure
 - New wastewater connections for *colonia* residents
 - New wastewater treatment facilities
 - Wastewater facility upgrades
 - Enhanced wastewater treatment systems
- Habitat Restoration
 - Small and regional wetland systems
- Agricultural BMPs
 - Acres of agricultural land under Water Quality Management Plans (WQMPs) or Resource Management Systems (RMSs)

Specific milestones that have been met include the following:

In our efforts to update the milestones table, new tables have been created to list all of the Waste Water Infrastructure milestones completed by city/permit holder. In every case, whether it is building a new WWTP, expanding or upgrading a current WWTP or providing WWTP service to *colonias*, there is a long arduous process of amending the current permit, planning and design of the project, acquiring the monies necessary to complete the project, constructing the project and finally, completing the project and becoming fully operational. In most cases, this process lasts anywhere from 2-5 years before that particular project is complete. Additionally, many of the projects are at various stages of completion simultaneously.

WWTP Upgrades and Construction:

- Mercedes – Currently under construction for upgrades to existing plant, anticipated to be completed by the end of 2011
- Donna – WWTP upgraded will be completed in September 2011
- Hidalgo – last WWTP upgrade in 2003; no further plans to upgrade
- MHWSC-Progreso – New facility is currently under construction; it is converting from biological pond system to mechanical treatment system
- MHWSC-Balli Rd – No plans to upgrade facility
- ERWSC – Completed construction of new plant in 2006

- San Bentio – Construction of phase I upgrade completed in summer 2007 and construction of phase II completed in 2009
- La Feria – Construction of new WWTP completed in November 2009
- Pharr – Will complete upgrade of WWTP in fall 2011
- San Juan – No plans to upgrade
- Weslaco South – Completed construction of new WWTP in 2000; planning to upgrade in 2013
- Mission – Completed upgrade of WWTP in 2005; planning to upgrade in 2012
- Alamo – planning to upgrade from lagoon pond system to constructed wetland WWTP; to achieve compliance, one of the three aerators at the plant was repaired and installed, the polishing tank was drained and cleaned, new chlorinator and chemical feed units were purchased and installed and three. re-circulation pumps were repaired and installed

Completing the construction of new wastewater treatment facilities or upgrading/expanding existing facilities, 16 in total, is a major component in the milestones. Thus far, 10 facilities have either upgraded or constructed new facilities.

Table 3 outlines the total list of milestones and their current status

Table 3 WWTP Construction/Upgrades

Anticipated Completion Date	Milestone	Status	Actual/Anticipated Completion Date
January 1, 2007: Construction completed for 3 new wastewater treatment facilities			
1-Jan-07	South Rio Hondo	NA	NA
1-Jan-07	ERHWSC	Complete	New Plant in 2006
1-Jan-07	San Benito	NA	Upgrade complete 2009
1-Jan-07	La Feria	Complete	New Plant in 2009
January 1, 2009: Upgrades/expansions completed for 5 municipal wastewater treatment facilities			
1-Jan-09	Pharr	Upgrade: Currently Under Construction	Anticipated completion date: Fall 2011
1-Jan-09	Donna	Upgrade: Currently Under Construction	Anticipated completion date: September 2011
1-Jan-09	Hidalgo	Complete	Upgraded in 2003
1-Jan-09	San Benito	Complete	Upgraded in 2006 and Capacity Expanded in 2009
1-Jan-09	Rio Hondo	NA	NA
January 1, 2010: Construction completed for two new wastewater treatment facilities			
1-Jan-10	Alamo	Planned	2013 to Constructed Wetland System
1-Jan-10	MHWSC-Progreso	New Facility: Currently Under Construction	Anticipated completion date: End of calendar year 2012
1-Jan-10	NA	NA	upgrade completed for HWWS Plant #1 wastewater treatment facility
January 1, 2011: Upgrades/expansions completed for 2 municipal wastewater treatment facilities			
1-Jan-11	Rio Hondo	NA	NA
1-Jan-11	Mercedes	Upgrade: Currently Under Construction	Anticipated completion date: End of calendar year 2011
1-Jan-12	NA	NA	Construction completed for a new wastewater treatment facility in Arroyo City (e.g., ERHWSC)
31-Dec-15	Construction Complete	Completed in 2005 but does not include de-nitrification	Upgrade/expansion completed for Mission wastewater treatment facility to include de-nitrification
Not on Milestones List	New Facility: Complete	Complete in 2000, plan to upgrade existing facility in 2013 for WW Reuse	Weslaco WWTP

WWTP Capacity:

- Mercedes – Currently running at close to 100% capacity, receives 2.9 MGD, discharges 2.3 MGD, currently under construction making upgrades to existing plant, should be complete by end of 2011, operating at current discharge permit-10/15/3, new permit-7/15/2
- Donna – WWTP upgrade complete in September 2011, currently plant capacity 1.2 MGD, upgrade to 1.8 MGD, discharge permit-10/15/3.
- Hidalgo – Last upgrade to WWTP in 2003, operating at 80% capacity, receives 1.5 MGD, discharges .75 MGD, discharge permit 10/15/3, no plans to upgrade plant at this time.
- MHWSC-Progresso – current plant operating at 75% capacity, receives .35 MGD, discharges .3 MGD, new plant is currently under construction, converting from biological pond system to mechanical treatment and increasing capacity from .4 MGD to .75 MGD. Existing discharge permit-30/90, new plant discharge permit-10/15/3.
- MHWSC-Balli RD – current plant operating at 27% capacity, receives 140,000 GPD, discharges 140,000 GPD, no plans to upgrade plant at this time, no colonia hookups planned, existing discharge permit-10/15/3.
- ERWSC –Current plant operating at 55% capacity, total plant capacity is .25 MGD, receives 140,000 GPD, discharges 140,000 GPD, ERWSC currently provides service to 180 connections, all in colonias, existing discharge permit-10/15/3. Completed construction on new plant in 2006.
- Rio Hondo –Current plant capacity is .5 MGD, discharge permit is 20/20/35, no other information available at this time.
- San Benito – WWTP operating at 56% capacity, receives 2.2 MGD, discharges 2.1 MGD, construction of phase 1 upgrade to 2.5 MGD completed in summer 2007, construction of phase II upgrade to increase capacity by 1.2 MGD completed 2009, constructed wetland treatment pond completed summer 2010, 4.1 MDM reuse for wetland system, existing discharge permit-10/15/3.
- Harlingen –Currently operating at 65% capacity, WWTP design capacity is 9.96 MGD, receives 6.5 MGD, discharges 5.6 MGD, currently upgrading plant, discharge permit is 10/15/3
- La Feria – Currently operating at 35% capacity goes up to 50% in winter with winter Texans, receives 490,000 GPD, discharges 90,000 GPD, discharge permit-10/15/3. New WWTP and constructed wetland polishing ponds completed in November 2009. New WWTP has 1.25 MGD capacity.
- Pharr – Currently operating at 96% capacity, receives 4.8 MGD, discharges 4.1 MGD, completed upgrade to plant to increase capacity from 5 MGD to 8 MGD in fall 2011, operating with 10/15/3 discharge permit, will adopt 7/15/2 discharge permit once upgrade to plant is operational.
- San Juan – Currently operating at 50% capacity, receives 2.4 MGD, discharges 2.4 MGD.

- Weslaco South – Currently operating at 40%, design capacity 2.5 MGD, receives 1.99 MGD, discharges .8 MGD, discharge permit 10/15/3.
- Mission – Currently operating at 73% capacity, design capacity is 9 MGD, receives 6.3 MGD, discharges 6.3 MGD, discharge permit 10/15/3. Planning upgrade in 2012.
- Alamo – Currently operating at 75% capacity, Capacity of WWTP 2 MGD, receives 1.5 MGD, discharges 1 MGD, discharge permit-30/90
- McAllen – Currently operating at 70% capacity, Capacity of WWTP 10 MGD, receives 7 MGD, discharges 6.7 MGD, discharge permit-10/15/3. Planning upgrade in 3 years.

The capacities of WWTP's are used to determine when an upgrade to an existing plant is necessary. Once a WWTP begins to operate close to 75%, the city that operates that plant begins to plan for upgrades or might determine that they need to build a new plant. It is important that the operating entity begin planning because they must start by amending the existing discharge permit before any construction can begin. The whole process could take up to 2-5 years. In many cases a WWTP might be operating close to 100% capacity before an upgrade is complete.

Colonia Hookups:

- Mercedes – Provided services to 7 *colonias*, 744 residents
- Harlingen – 749 new sewer connections since 2007
- Donna - Plan to hook up 5 *colonias* by fall of 2012
- Hidalgo – No *colonia* hook ups planned
- MHWSC-Progresso – All *colonias* in the WWTP service area were hooked up prior to 2007; no additional hook ups are planned
- MHWSC-Balli Rd. – All *colonias* in the WWTP service area were hooked up prior to 2007; no additional hook ups are planned
- ERWSC – Currently provides service to 129 *colonia* connections; ready to make another 126 connections but not enough residents have agreed to have their homes hooked up
- San Benito – No *colonias* hooked up but connected to 179 residents in fall 2010
- La Feria – 8 *colonias* connected included approximately 1200 residents in 2009; also, will begin additional 81 hook ups in 3 subdivisions and 200 connections in 2 trailer parks and will be completed by fall 2012
- Pharr – hooked up 854 *colonia* residents
- San Juan – No *colonia* hook ups planned
- Weslaco South – 2 *colonias* hooked up in 2009; no additional hook ups planned
- Mission – Made 2,500 connections
- Alamo – No *colonia* hook ups planned

In total, 22 *colonias* (total number of residents unknown), 2,629 connections (total number of residents unknown) and over 175 residents have been connected to central wastewater systems.

This table outlines the total list of milestones and their current status

Table 4 Colonia Hookups

Anticipated Completion Date	Milestone	Status	Actual/Anticipated Completion Date
January 1, 2007: Connection of 13,547 colonia residents to existing wastewater municipal collection systems completed (e.g., Mercedes, Donna, Hidalgo, MHWSC and ERHWSC)			
1-Jan-07	Mercedes	Pending: Hook up 7 colonias, 744 residents	By end of 2011
1-Jan-07	Donna	Pending: Hook up 5 colonias	By Fall 2012
1-Jan-07	Hidalgo	NA	NA
1-Jan-07	MHWSC	All colonias within service area have been hooked up	prior to 2007
1-Jan-07	ERHWSC	129 current connections; ready to hook up 126 more but not enough residents have agreed	NA
January 1, 2008: Connection of 4,456 colonia residents to existing wastewater municipal collection systems completed (e.g., Pharr and La Feria)			
1-Jan-08	Pharr	Hooked up 854 colonia residents	2002
1-Jan-08	La Feria	Hooked up 8 colonias with approximately 1200 residents- 2005-2009; will begin additional 81 connections to be completed in Fall 2012	Nov-09
January 1, 2009: Connection of 37,450 colonia residents to existing wastewater municipal collection systems completed (e.g., Weslaco and Mission)			
1-Jan-09	Weslaco	Hooked up 2 colonias	2009
1-Jan-09	Mission	Hooked up 2500 connections	??
August 31, 2012: Connection of 1,636 colonia residents to existing wastewater municipal collection systems completed (e.g., ERHWSC and Mercedes)			
31-Aug-12	ERHWSC	129 current connections; ready to hook up 126 more but not enough residents have agreed	NA
31-Aug-12	Mercedes	Pending: Hook up 7 colonias, 744 residents	By end of 2011
December 31, 2015: Connection of 4,700 colonia residents to existing wastewater municipal collection systems completed (e.g., Rio Hondo, San Juan, and ERHWSC)			
31-Dec-15	Rio Hondo	NA	NA
31-Dec-15	San Juan	NA	NA
	ERHWSC	129 current connections; ready to hook up 126 more but not enough residents have agreed	NA

Agricultural Acres Under Management Plans:

- 2006 - 86,259 acres under WQMPs
- 2007 - 90,888 acres under WQMPs
- 2008 - 96,070 acres under WQMPs
- 2009 - 101,126 acres under WQMPs
- 2010 - 104,142 acres under WQMPs
- 2011 - 109,188 acres under WQMPs

Agriculture seems to be on track with the milestones that were set in 2006. The goal is to incorporate 10,000 acres of irrigated cropland annually and it was projected to have 110,000 acres of irrigated cropland under management plans by 2011. Currently, 109,000 acres are under Water Quality Management Plans (WQMPs) alone, provided by the Texas State Soil and Water Conservation Board. The Environmental Quality Incentives Program (EQIP) provided through NRCS was not taken into account for this result.

This table outlines the total list of milestones and their current status

Table 5 Arroyo Colorado Watershed Milestones: Agricultural Acres

Anticipated Completion Date	Milestone	Status	Actual/Anticipated Completion Date
31-Aug-06	20% of irrigated cropland (- 60,000 acres) under management plans	*86,259 acres under WQMPs	Calculated at end of Calendar Year
31-Aug-07	23% of irrigated cropland (- 70,000 acres) under management plan	*90,888 acres under WQMPs	Calculated at end of Calendar Year
31-Aug-08	27% of irrigated cropland (-80,000 acres) under management plan	*96,070 acres under WQMPs	Calculated at end of Calendar Year
31-Aug-09	30% of irrigated cropland (-90,000) under management plan	*101,126 acres under WQMPs	Calculated at end of Calendar Year
31-Aug-10	33% of irrigated cropland (-100,000 acres) under management plan	*104,142 acres under WQMPs	Calculated at end of Calendar Year
31-Aug-11	37% of irrigated cropland (-110,000) acres under management plan	*109,188 acres under WQMPs	Calculated to August 31, 2011
31-Aug-12	40% of irrigated cropland (-120,000) under management plan	NA	NA
31-Aug-13	43% of irrigated cropland (-130,000 acres) under management plan	NA	NA
31-Aug-14	47% of irrigated cropland (-140,000 acres) under management plan	NA	NA
31-Aug-15	50% of irrigated cropland (-150,000 acres) under management plan	NA	NA

* Acres are for the three counties within the watershed as a whole, only includes TSSWCB WQMPs

Wetland Development:

- San Benito – Completed wetland system for polishing water in summer 2010
- La Feria – Completed wetland system for polishing water in November 2009
- San Juan – Completed wetland system for polishing water in April 2010

Habitat restoration has been primarily met by constructing new wetlands at WWTPs. Only three, San Juan, La Feria, and San Benito have constructed wetlands for “polishing ponds” at the facilities. It was originally planned to construct a 500 and 300 acre regional wetland but it has been determined that smaller, more strategically placed wetlands would be more cost-effective as well as have a bigger impact on water quality.

This table outlines the total list of milestones and their current status

Table 6 Arroyo Colorado Watershed Milestones: Wetland Development

Anticipated Completion Date	Milestone	Status	Actual/Anticipated Completion Date
January 1, 2009: Construction completed for four enhanced wastewater treatment wetland systems			
1-Jan-09	La Feria	Complete	9-Nov
1-Jan-09	San Juan	Complete	10-Apr
1-Jan-09	Mercedes	NA	NA
1-Jan-09	Weslaco	NA	NA
1-Jan-09	San Benito	Complete	Summer 2010
January 1, 2010: Construction completed for one enhanced wastewater treatment wetland system and one pond system			
1-Jan-10	MHWSC-Progreso (Wetland)	NA	NA
1-Jan-10	Hidalgo (Pond)	NA	NA
1-Jan-10	Construction completed of a 500-acre wetland system near the Port of Harlingen	It was determined that smaller, more strategically placed wetland systems would be more effective	NA
August 31, 2012: Construction completed for enhanced wastewater pond treatment system (e.g., Pharr/McAllen)			
31-Aug-12	Pharr	NA	NA
31-Aug-12	McAllen	NA	NA
31-Aug-12	Construction completed of a 300 acre wetland system near Llano Grande	It was determined that smaller, more strategically placed wetland systems would be more effective	NA
1-Jan-14	Construction completed for an enhanced wastewater treatment wetland system for the City of Alamo	Anticipated to upgrade from lagoon system to constructed wetland WWTP system	2012

Water Reuse:

- San Benito - 4.1 million gallons monthly reuse for wetland system
- Harlingen– 16.1 million gallons monthly reuse for golf course and soccer complex
- La Feria – reuse of 60,000 gallons per day
- Pharr – reuse of 18 million gallons per month for golf course and 5 million gallons per month for irrigation at WWTP
- San Juan – Reuse of 6.2 million gallons per month for wetland and 74 million gallons per year for irrigation at WWTP
- Weslaco South – Reuse of 401 million gallons per year to irrigate Tierra Santa Golf Course

Waste water effluent reuse is being explored by more WWTP’s in the watershed. Mainly it is being used to irrigate city owned facilities and golf courses. The use of waste water effluent for irrigation will increase in the next five years according to the WWTP operators.

This table outlines the total list of milestones and their current status

Table 7 Arroyo Colorado Watershed Milestones: Wastewater Reuse

Anticipated Completion Date	Milestone	Status	Actual/Anticipated Completion Date
1-Jan-15	Wastewater irrigation reuse system expansion for McAllen	NA	NA
31-Dec-15	Wastewater irrigation reuse system expansion for Harlingen	NA	NA
Not on Milestones List	Wastewater irrigation reuse system planned for Weslaco	Planned: 401 MG/YR to irrigate Tierra Santa Golf Course	2013
Not on Milestones List	Wastewater irrigation reuse system planned for Pharr	Planned: Reuse at golf course and 18 mg/month and 5mg/month at WWTP	NA
Not on Milestones List	Wastewater irrigation reuse system planned for San Juan	Planned: Reuse 6.2 mg/month for wetland and 74 mg/month for irritation at WWTP	NA

The updated milestones tables will help the ACWP identify which milestones have been met and which ones have not. This will guide the ACWP future efforts in the watershed by focusing attention on the milestones that have not been met and the reasons why the milestones have not been implemented. Several factors can contribute to a milestone not being implemented, ranging

from lack of funding, lengthy permitting requirements and/or amendments, and lack of education on how implementing milestones will result in improved water quality. As the population in the watershed continues to grow and land use changes, new milestones will need to be identified for implementation. New WWTP's and upgrades, colonial hookups, urban stormwater runoff and agricultural irrigation return flows will continue to be the highest priorities of the WPP.

Sustainability of the Partnership

As the funding for the Arroyo Colorado WPP Implementation Project was approaching the last two years, the ACWP decided to form a 501(c) 3 non-profit organization, the Arroyo Colorado Conservancy and apply for another CWA 319 grant. These two actions were taken in an effort to sustain the ACWP. The formation of the Arroyo Colorado Conservancy has evolved as an essential step toward sustainability of the Arroyo Colorado Watershed Partnership. The Conservancy will engage volunteers, public and private corporations, Universities, Foundations, community leaders, and local civic and service organizations to raise money to support the Arroyo Colorado Watershed Partnership and the implementation of the Arroyo Colorado Watershed Protection Plan and continue its efforts to restore the water quality and Habitat of the Arroyo Colorado.

Conclusion

Taking into consideration the number of milestones and partners involved in implementing the WPP, the ACWP has reached 75% of the goals set in the WPP. This kind of success could only be achieved with help of the stakeholders and partners that make up the ACWP. Not only is tracking the milestones a challenge but accurately quantifying loading reductions has proven to be difficult. Despite these challenges, Phase I of the ACWPP have borne tangible results. Ag producers are implementing Ag BMP's, Waste Water Infrastructure in the watershed has been upgraded, numerous *colonias* have been brought on line to WWTP, and Urban Stormwater issues are being addressed by MS4 permit requirements. The number of stakeholders that are embracing the WPP continues to grow as the public becomes more educated on the impacts that they have on the watershed. The School Districts in the watershed have embraced the O&E component of the ACWPP as Environmental Education in the schools is becoming the norm and not the exception. The update of the ACWPP will aim to address these challenges learned during the initial implementation of the Plan as well as more clearly define milestones that are needed to be met to restore water quality.