MIDDLE RIO GRANDE-ALBUQUERQUE REACH

WATERSHED RESTORATION ACTION STRATEGY (WRAS)

December, 2008

by

The Middle Rio Grande-Albuquerque Reach Watershed Group

Supported by Clean Water Act §319 Grant funding awarded to Ciudad Soil and Water Conservation District (FY04-G & FY06-G)

CONTACT INFORMATION

Please submit information requests or comments regarding this *WRAS* to:

Mike Matush
Surface Water Quality Bureau
NM Environment Department
1190 S. St. Francis Drive, N2060
(505) 827-0505
Mike.Matush@state.nm.us

This document can be freely downloaded from the Internet as an Adobe® Acrobat® file (saved as Adobe® v. 6) beginning at:

www.nmenv.state.nm.us/swqb/wps.

FREE additional copies of this document are also available upon request by e-mail to Gary.King@state.nm.us, by telephone at (505) 827-2928, or by fax at (505) 827-0160. Requests can also be mailed directly c/o Gary King, Surface Water Quality Bureau, Water & Waste Management Division, New Mexico Environment Department, Harold Runnels Building N2101, 1190 S. St. Francis Drive, Santa Fe, New Mexico USA 87502.

Please be sure to include the complete document title, your name, mailing address, and how many CD-ROM copies you are requesting in your message.

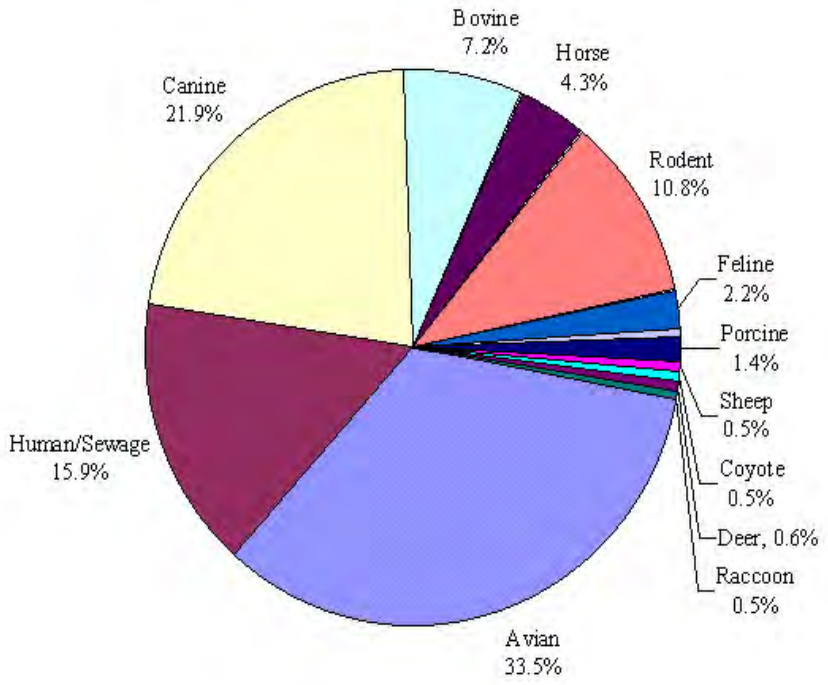
EXECUTIVE SUMMARY

The Middle Rio Grande-Albuquerque (MRG-A) is listed on the 2008-10 State of New Mexico Clean Water Act §303(d) list of impaired water bodies, with fecal coliform identified as a pollutant of concern. The presence of fecal coliform bacteria is an indicator of the possible presence of other microbial pathogens that may interfere with designated uses and potentially present human health concerns.

There are many potential surface water quality issues and problems due to a combination of urban and rural land uses in this watershed, but addressing the documented presence of fecal coliform will be the focus of this current pollution prevention effort. Fecal coliform is often used as an indicator of overall watershed health. Because transport mechanisms are similar, many Best Management Practices (BMPs) used to reduce the input of fecal coliform are also anticipated to result in the reduction of other pollutants that may enter the river.

Through the Clean Water Act §319 Program, the Environmental Protection Agency (EPA) and New Mexico Environment Department's (NMED) Surface Water Quality Bureau (SWQB) made grant funding available for the formation of a recognized local watershed Advisory Group to assist the state in formulating methods to protect surface waters and address documented water quality impacts.

A Watershed Group was formed consisting of technical experts, traditional, rural and urban water users, and members of surface water regulatory agencies. The Watershed Group utilized the *Middle Rio Grande Microbial Source Tracking Study* (MRG-MST), which was released in December 2004, as a key reference in the planning and writing of this Watershed Restoration Action Strategy (WRAS). The MRG-MST study results show migratory avian waterfowl, human beings and canines are the leading sources of fecal coliform in the MRG-A watershed, as seen below. Two other surface water quality studies utilized include the *Middle Rio Grande Total Maximum Daily Load (TMDL) for Fecal Coliform in Storm Water* released in May 2002, and the *City of Albuquerque Antibiotic Resistance Analysis of Contamination in Storm Water Final Report* released in June 2002.



Source: Middle Rio Grande Microbial Source Tracking Assessment Report, December 2004.

The Watershed Group, using these studies and input from a broad range of stakeholders, developed a multi-phased and multi-tiered approach to reduce non-point source storm water pollution. The approach consists of a framework of four goals, three major categories of strategies, and phased objectives for each strategy.

Goal Statements (To be achieved by 2016)

- The 2002 TMDL for fecal coliform in storm water for the Albuquerque reach of the Rio Grande is being addressed through education, engineering, and enforcement.
- There is increased public understanding of watershed approaches and increased participation in water quality improvement activities.
- Water quality data is shared across jurisdictions to facilitate project implementation.
- Regulations and local policies support watershed improvement initiatives.

Strategies

Strategies to be utilized will incorporate projects that are grouped under general categories, or themes, of *Education, Engineering*, and *Enforcement.* A combination of three strategies will be used to effectively improve the health of the watershed and meet the four goals of the WRAS. Table 1 details strategies, projects, and phased timeframe for WRAS project implementation.

Table 1: Phased Framework of Strategies & Activities

Phase One Objectives 2006-2008	Phase Two Objectives 2008-2011	Phase Three Objectives 2011-2016
Education and Outreach		
1.1 Strong relationships established with major media outlets—print, TV, radio, web—to assure regular and responsive dissemination of information.	2.1 Measurement of progress or lack of progress widely broadcast.	3.1 50% of area residents participate in pet cleanup.
1.2 Development of a multi-tiered approach to public outreach, balancing watershed-based, community-based, and network based contacts, programs and messages.	2.2 Watershed-based emphasis in primary and secondary science curricula.	3.2 Residential/commercial/industrial participation in on-site storm water retention (program).
1.3 Communication through established networks of agencies and non-profit organizations to educate members and the general public.	2.3 Cross-jurisdiction storm water management and cleanup coordination.	
1.4 Convenient placement of pet cleanup tools and aids.		
1.5 Alliances established with other river health initiatives.		
Engineering and Systems		
1.6 Partnership-based programs in each targeted sub-watershed.	2.4 Cross-jurisdictional water quality data sharing system in place.	3.3 Significant increase in retainage of storm water.
1.7 Research projects to answer key questions raised by the public outreach effort (e.g., septic tank inventory) to better pollutant migration.	2.5 All storm water-related communication in terms of *E.coli*.	3.4 Significant increase toward meeting numerical targets.
1.8 Begin expansion of urban forestry management programs.	2.6 Biological based storm water slowing/retention systems in place.	3.5 Reduction in the amount of impervious surfaces.
1.9 Numerical targets for monitoring established.	2.7 Model programs replicated in other subwatersheds, e.g., Bear Canyon, Sanchez Farm, etc.	3.6 Urban forestry practices broadly utilized.
Enforcement and Regulation		
1.9.1 Research and monitoring of septage haulers.	2.8 Neighborhood associations help encourage and enforce pet-cleanup.	3.7 New subdivision planning incorporates watershed improvement mechanisms.
	2.9 Septic tank permit/replacement program.	3.8 Performance zoning includes watershed improvement components.

Objectives

A framework of phased objectives for each strategy was developed to reach the short, medium, and long-term objectives of the WRAS.

- Phase One (2006-2008) will focus on broad public awareness, establishing partnerships with targeted stakeholders, identifying future research/data needs and identifying funding sources for future projects.
- Phase Two (2008-2011) will include implementation of education, engineering and enforcement projects based on data and studies developed during Phase One.
- Phase Three (2011-2016) projects will be based on the results of the previous work and evaluation.

This document focuses on Phase One of the Objectives.

Project Opportunities

The list of proposed projects in Table 2, particularly for Phase One, is offered as a set of potential opportunities for agencies to implement individually or jointly as resources become available. The list of potential projects is the result of brainstorming sessions, public outreach, advisory committee meetings and existing programs. At this time projects have not been prioritized. Criteria for project implementation will be decided upon in a future revision of this document.

The WRAS is explicitly intended as an evolving document that will be periodically updated. The set of potential projects will be expanded or modified as the Advisory Group and stakeholders obtain new information and resources, and refine priorities based on that new knowledge and available resources.

Table 2: Proposed Implementation Projects

Education and Outreach

Project	Management Goal/s or Intent of Project	Measurements or Indicators of Success	Milestones	Potential Agencies	Supported by	Estimated Cost
1. Continuation and expansion of "Scoop the Poop" campaign	Increased awareness by public of human and canine impacts on amount of fecal coliform in watershed	• # brochures • # TV ads • # radio spots • # web site hits • # Times video shown on TV or at events	Production of TV program by 12/31/2011	Storm Water Team (SWT): • AMAFCA • Bernalillo County • City of Albuquerque • UNM • NMDOT • SSCAFCA • Ciudad SWCD City of Rio Rancho KMNE KUNM GOV TV	• AMAFCA • SWT	$200,000
2. Campaign to mark all "drains directly to the river" outlets	Increased awareness by public on impacts of direct drain to river	# Drains marked			• Barelas CDC	$10,000

Table 2: Proposed Implementation Projects

Education and Outreach

Project	Management Goal/s or Intent of Project	Measurements or Indicators of Success	Milestones	Potential Agencies	Supported by	Estimated Cost
3. Conduct a coordinated public education campaign, emphasizing the need for action by the whole community to help keep the river/watershed clean by utilizing the following: • AHA newsletter list (with 19,000 on list); • Other focused environmental and animal welfare non-profit groups mail and email lists for distribution • Local newspapers op-ed and letters to the editor	Increased awareness and involvement of groups across entire watershed Increased knowledge of watershed concept	Hire a Watershed Coordinator (WC) # Groups/networks involved	Endorsements by key groups, ex. Albuquerque Public Schools, Animal Humane Association, coalitions	• EPA • NMED • AMAFCA • SSCAFCA • City of Albuquerque • City of Rio Rancho • Ciudad SWCD • Bernalillo County	• Animal Humane Association of New Mexico • Broadly supported by Neighborhood associations/ coalitions	$250,000
4. Pursue partnerships and sponsorship of "Doggie Doo-Doo Disposal" bags, bags placement and cleanup/cans • Rescue organizations and shelters • Dog food section of grocery stores • Vet offices • Animal supply stores • AHA • Neighborhood associations • Open Space • Animal Control	Increased convenience and accessibility for dog waste disposal Increased awareness by public of canine impacts on amount of fecal coliform in watershed	% or # lbs. Scooped and disposed of property/ public perception # Of times a year inserts in Albuquerque Journal Mail with AHA newsletter • # Times year • # Locations	# of neighborhood associations sponsor cans Placement of bags in: • Grocery stores • Veterinarians offices • Rescue organizations • Shelters • Inserts in papers • Animal adoption events	• Sandoval & Bernalillo Counties • City of Albuquerque Neighborhood Associations • Offices of Neighborhood Coordination • Grocery stores: (ex. Smith's, Albertson's, Rite Aide, La Montanita Co-op, Wild Oats) • Veterinarian offices • Pet Smart & Clark's	• Neighborhood associations/ coalitions • Animal Humane Association of New Mexico • Bill Fleming's Watershed Management course students • UNM Breakfast Club	$50,000

Table 2: Proposed Implementation Projects

Education and Outreach

Project	Management Goal/s or Intent of Project	Measurements or Indicators of Success	Milestones	Potential Agencies	Supported by	Estimated Cost
5. Develop new alliances and continue communication with current partners on river/watershed health initiatives and programs in the Middle Rio Grande region.	Information on watershed activities shared and relationships built for future work on regional/larger watershed issues.	Development of regional meeting of all watershed alliances and associations	Development of regional watershed association website	• Las Huertas Creek Watershed Project • Rio Puerco Management Committee (Rio Puerco) • Santa Fe River Watershed • Galisteo River Watershed • USEPA Watershed website • Ciudad SWCD	Broadly supported by: • Tree NM • MRG Workgroup • NRCS • USDA, et al.	$50,000
6. Tie in water quality education with home buying counseling programs, e.g., Sawmill Community Land Trust's Arbolera de Vida, mortgage lending agencies, etc.	Homeowners informed on impact of animal and sewage on river/watershed health/quality Increased awareness and education programs on BMPs for septic tanks, landscaping and storm water runoff.	Contact HUD and other governmental homebuyer lending agencies Comprehensive list of local lending agencies # Requests for brochures	Creation and distribution of BMP manual for homeowners	• Sawmill Community Land Trust • Housing and Urban Development • Mortgage lending agencies • First time buyers assistance agencies	• Sawmill Community Land Trust	$15,000
7. Work with homebuilders/developers and in major new development areas such as Mesa del Sol, to implement state-of-the-art technologies for reducing fecal coliform loads into the river.	Technologies utilized to reduce polluted storm water runoff for new housing developments	# Requests for manuals	Creation and distribution of BMP manual for developers and home builders	• Homebuilders Association • Chambers of Commerce • Planning and Zoning Departments • Ciudad SWCD	• MRG Workgroup • Sawmill Community Land Trust • Rio Grande Community Development Center • South Valley Coalition	$15,000

Table 2: Proposed Implementation Projects

Develop Engineering Studies and Improve Infrastructure

Project	Management Goal/s or Intent of Project	Measurements or Indicators of Success	Milestones	Potential Agencies	Supported By	Estimated Cost
8. Study to investigate viability of regional water quality data sharing database	Share water quality information across region to "provide real-time access to high quality data while saving time, resources, and money for partner states and tribes"	Agreement of entities in region to participate in study and share data	Meeting with National Environmental Information Exchange Network on MRG region	Federal, state, Tribal and local political subdivisions. Examples: • EPA • NMED • Pueblo of Santa Ana, • Pueblo of Sandia • Pueblo of Isleta • USGS • Ciudad SWCD • All sampling parties	• Bernalillo County Environmental Gross Receipts Tax Advisory Board • Ciudad SWCD • MRG Work Group	$15,000
9. Implement regional water quality data sharing database	Share water quality information across region to "provide real-time access to high quality data while saving time, resources, and money for partner states and tribes"	Agreement of entities in region to share data	National Environmental Information Exchange Network working with MRG region	Federal, state, Tribal and local political subdivisions. Examples: • EPA • NMED • Pueblo of Santa Ana, • Pueblo of Sandia • Pueblo of Isleta • USGS • Ciudad SWCD • All sampling parties	• Bernalillo County Environmental Gross Receipts Tax Advisory Board • Ciudad SWCD • MRG Work Group	$150,000
10. Investigate source of human bacteria in surface and shallow ground water (septic tanks, sewage, illegal dumping, and infrastructure, etc.)	Obtain quantitative understanding of human sources	Load estimate	Complete study	• Phase 1 and 2 MS4 permitees • NMED • EPA • State of New Mexico	• City of Albuquerque & permittees • Neighborhood groups • SWOP • Advocacy groups	$50,000

Table 2: Proposed Implementation Projects

Develop Engineering Studies and Improve Infrastructure

Project	Management Goal/s or Intent of Project	Measurements or Indicators of Success	Milestones	Potential Agencies	Supported By	Estimated Cost
11. Study to differentiate sources of human, sewage/septic *E. coli*	Appropriate targeted approach for future surface water quality pollution reduction		Funding for study granted	• NMED	• City of Albuquerque & permittees • Neighborhood groups • SWOP • Advocacy groups	$200,000
12. Coordinate with all upstream jurisdictions to assess what pollutants may be coming off contributing waters					• Water Assembly	
13. Begin urban forestry management program with Strategic tree planting.	Slow storm water flow in urbanized areas/areas with high % of impervious surfaces	• # Trees planted • Diversity of species • Expand urban forestry projects—slow down flows through expansion of wetlands and riparian zones.	Tree program in top priority hotspot watersheds (top 2)	• Tree NM • County/City Open Space • Parks and Recreation • Ciudad SWCD	• AMAFCA • SSCAFCA • SWT • Neighborhood groups • Barelas CDC	
14. Structural improvements in 'hotspots' subwatersheds • Apply the lessons learned in the Bear Canyon Arroyo, Sanchez farm and other biological storm water controls • Put filters in pipes that drain directly to river • Focus on conveyance—control the volume of storm water high up in the watershed. • Disconnect impervious surfaces or other low impact design mechanisms	Begin making substantive improvements in 'hotspots'	One project per hotspot with residents in subwatersheds aware of project, and present at completion ceremony	One project per hotspot implemented	• AMAFCA • SSCAFCA • Bernalillo County • City of Albuquerque • City of Rio Rancho • Bernalillo County		$1,000,000

Table 2: Proposed Implementation Projects

Enhance Enforcement and Improve Existing Regulations

Project	Management Goal/s or Intent of Project	Measurements or Indicators of Success	Milestones	Potential Agencies	Supported By	Estimated Cost
15. Research and monitoring of septage haulers.	Increased compliance of septic haulers disposal of waste	Reduction of illegal disposal of septic waste	Development of compliance program or Funding for research and monitoring attained	• Bernalillo & Sandoval County Environmental Health Departments • NMED	• North and South Valley Neighborhood Coalitions	$50,000
16. Septic tank removal and replacement for those out of compliance	Increased compliance with septic tank regulations -	# Upgraded and removed, *E.coli* not reaching river	Removal or replacement of # of malfunctioning septic tanks	• NMED • Bernalillo & Sandoval County Environmental Health Departments	• Neighborhood groups • SWOP • RGCDC	$500,000

TABLE OF CONTENTS

Section **Page**

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

The watershed draining to the Albuquerque reach of New Mexico's Middle Rio Grande (U.S. Geological Survey [USGS] Hydrologic Unit Code 13020203; referred to as the MRG-A throughout this document) is a sub-basin of the Rio Grande Basin, one of the largest river drainages in North America. The headwaters of the Rio Grande begin in the San Juan Mountains of Colorado. The Rio Grande River flows through New Mexico and Texas, forming the international boundary with Mexico.

Water quality in the MRG-A does not meet *State of New Mexico Standards for Interstate and Intrastate Surface Water* (20.6.4 NMAC) or the Pueblo of Sandia and the Pueblo of Isleta water quality standards for bacteria/disease-causing organisms. This reach was previously identified in New Mexico's Unified Watershed Assessment (UWA; 1998) as a Category I watershed—one of the state's watersheds most in need of restoration or protection.

Water quality and water quantity issues are important to residents within the Middle Rio Grande-Albuquerque (MRG-A) watershed, New Mexico and the West. There are ongoing public concerns in this watershed about the impacts to ground and surface water supply from municipal, agricultural and other uses. Concerns regarding surface water quality include known and suspected contamination from industry, rapidly escalating urbanization, agriculture and other potentially polluting activities upstream. Surface and ground water quality sampling programs are routinely carried out to identify compliance with standards and to identify new potential pollutants.

Recent studies indicate that runoff from frequent summer monsoon thunderstorms episodically transports large quantities of fecal coliform bacteria to the MRG-A through the urban area's network of arroyos/ditches and storm drains. Concentrated runoff carries pollutants to the Rio Grande, resulting in an excess of water quality numerical standards designed to protect the river's designated uses (NMED, 2002). The State's Total Maximum Daily Load study (TMDL) for this stream segment (New Mexico Environment Department [NMED], 2002) identified non-point source (NPS) runoff transported through storm water conveyances as the main source of fecal coliform bacteria to the MRG-A.

Development of the Watershed Restoration Action Strategy

This Clean Water Act Section 319 (CWA 319) Non-Point Source Implementation Project organized a local Watershed Group with the mission of addressing water quality impairments on the MRG-A river segment in central New Mexico, between Santa Ana Pueblo and Isleta Pueblo boundaries to the north and south, respectively (see Figure 1). The project area includes two counties, two cities, four tribes, and numerous towns, villages and unincorporated communities.

Through the CWA 319 Program, the U.S. Environmental Protection Agency (EPA) and the NMED Surface Water Quality Bureau (SWQB) made grant funding available for the formation of a recognized local Watershed Group to assist the state in formulating methods to protect surface waters and address the documented water quality impacts.

Under the state's Watershed Protection Program, a key element of the process is development of a Watershed Restoration Action Strategy (WRAS). The Strategy (1) identifies surface water quality impairment information necessary to build on, (2) lists non-point source management measures, including informational and educational components, that will need to be implemented to achieve load reductions, and (3) identifies monitoring and assessment methods to determine whether load reductions are actually being met.

The nine key elements of a WRAS include:

- A list of existing, specific water quality impairments specific to this WRAS and their potential causes or sources (Element 1)

- Planned management strategies aimed at reducing NPS loads and their locations (Element 2)
- Estimated NPS load reduction goals (Element 3)
- A schedule for implementation of restoration projects (Element 4)
- Descriptions of interim "milestones" by which success in implementing remediation projects can be evaluated (Element 5)
- A description of the monitoring programs via which water quality improvements will be evaluated (Element 6)
- The criteria used to measure progress in reducing NPS loads and attaining water quality standards (Element 7)
- Estimated funding and potential funding sources to support the implementation, maintenance, and monitoring of restoration measures (Element 8)
- A public outreach plan that outlines methods for engaging and maintaining involvement by local residents, visitors, and local, state, and federal agencies (Element 9)

The WRAS for the MRG-A Watershed is a first step in formulating specific effective measures in support of the long-term environmental health of the watershed, and will undergo periodic revision in response to public comment, internal reviews, and feedback from projects.

This document is organized in six major sections:

1. Introduction: A general overview of the regulatory framework, surface water quality standards, causes of impairment and process utilized to create a WRAS.
2. Watershed Assessment: Includes background information on watershed, including natural resources, land use, and storm water conveyance. The three studies utilized for this WRAS include:
    - Middle Rio Grande TMDL for Fecal Coliform in Storm Water (May 2002); New Mexico Environment Department, Surface Water Quality Bureau
    - City of Albuquerque Antibiotic Resistance Analysis of Contamination in Storm Water, Final Report (June 2002); City of Albuquerque and CDM
    - Middle Rio Grande Microbial Source Tracking Assessment Report (October 2005); New Mexico Environment Department, Albuquerque Metropolitan Arroyo Flood Control Authority, and Bernalillo County; prepared by Parsons Water and Infrastructure, Inc.
3. Identification of Causes and Sources of Fecal Coliform Pollution: Summarizes the three main technical reports utilized in the creation of this document and outlines MRG-A Watershed Advisory Group's prioritization of targeted subwatersheds for future project implementation.
4. Outreach Activities: Outlines MRG-A Advisory Group formation and stakeholder outreach methods. This section also describes stakeholder input on ways to reduce fecal coliform in the watershed, which resulted in the four WRAS goals, and the three strategies of *Engineering, Education,* and *Enforcement* to follow in future project implementation.
5. Potential Best Management Practices: Discusses structural, educational, and regulatory methods to reduce bacteria in general. The implementation strategy of the TMDL looks at two different ways that the effectiveness of BMPs can be measured, as an overall WRAS-watershed-wide reduction in the fecal coliform load, or as a higher reduction in specific, anthropogenic (including pets and livestock) load sources identified by the MST study or subwatersheds identified in the TMDL as higher producers of the bacteriological load. The WRAS will use five to ten percent as the overall load reduction target for fecal coliform in the MRG-A reach. Individual sub watersheds will not have

separate targets. However, projects will be identified, as they are proposed, that are intended to focus on the areas identified in the TMDL as contributing a higher amount of the combined wasteload allocation.

6. Proposed Implementation Opportunities: Outlines types of plans for future restoration projects in conjunction with anticipated cooperators' monitoring, assessment, and outreach activities; proposes an implementation schedule, management goals and success measures, along with identifying potential funding sources.

The MRG-A Watershed Advisory Group

The Watershed Group consists of technical experts, traditional, rural and urban water users, and members of surface water regulatory agencies. Many members of the Middle Rio Grande Water Quality Standards Work Group (Work Group), a multi-agency group originally formed in response to a joint concern regarding water quality standards (for arsenic, as well as specific discrepancies between state and tribal standards) in the Middle Rio Grande joined the Watershed Group. Members include personnel from Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA), the City of Albuquerque, Bernalillo County, Ciudad Soil and Water Conservation District (SWCD), and the Pueblos of Isleta and Sandia. A detailed list of invited and participating Watershed Advisory Group members is included in Appendix A.

The MRG-A Watershed Advisory Group's Mission Statement is as follows:

> *Create and implement an overall framework and plan for public education, dialogue and action to measurably improve surface water quality as measured by a reduction of bacteriological pollution in the Middle Rio Grande watershed by:*
>
> - *Creating a Watershed Restoration Action Strategy (WRAS) with measurable benchmarks*
> - *Seeking and inviting stakeholder participation*
> - *Elevating public awareness about the importance of watersheds*
> - *Providing citizens with practical ways to help improve water quality*
> - *Updating the WRAS as needed for continued long term improvement of watershed health*
> - *Achieving NM Water Quality Control Commission water quality criteria for the Rio Grande*
> - *Pursuing future funding sources for implementing Best Management Practice projects*
> - *Enhancing ecological function in the Middle Rio Grande*

WRAS Goals

With input from interviewed stakeholders, the MRG-A Watershed Advisory Group identified the following goal statements to guide the creation of the WRAS, including:

- The 2002 TMDL for fecal coliform in storm water for the Albuquerque reach of the Rio Grande is being addressed via education, engineering, and enforcement.
- There is increased public understanding of watershed approaches and increased participation in water quality improvement activities.
- Water quality data is shared across jurisdictions to facilitate project implementation.
- Regulations and local policies support watershed improvement initiatives.

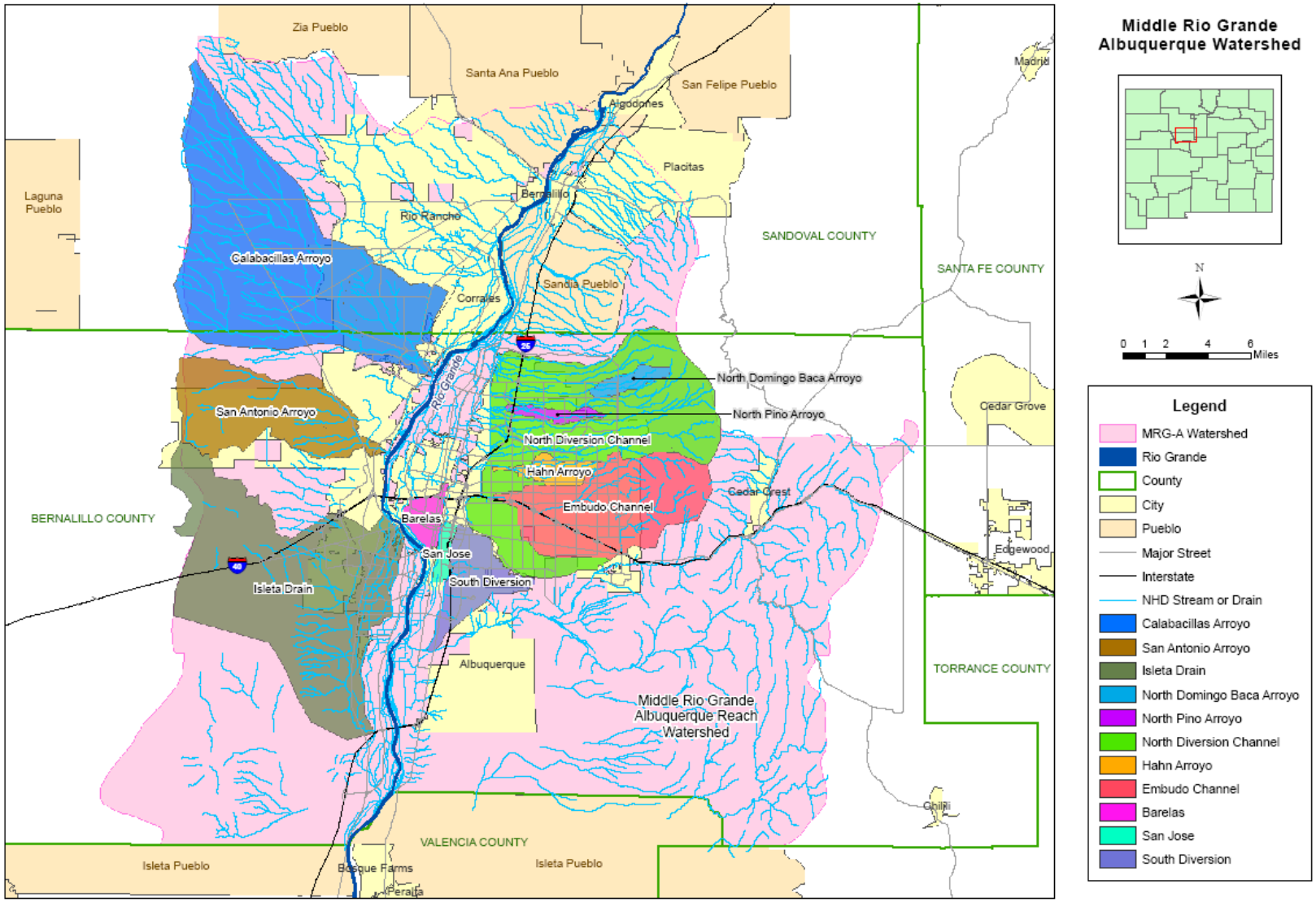


Figure 1: Map of MRG-A Watershed

2.0 WATERSHED ASSESSMENT

The MRG-A watershed is situated entirely in a semi-arid southwestern setting. The watershed is highly urbanized, containing approximately 50% of the population of the state of New Mexico (600,000+). The MRG-A is important to the residents of the Albuquerque metropolitan area and surrounding jurisdictions. The Rio Grande in this area is treasured as a riparian habitat, and includes some of the last vestiges of pristine, cottonwood-willow *bosque*.

A rapidly growing population is currently undergoing the transition from entirely under-ground to partial surface water as its primary drinking water source. The Albuquerque Bernalillo County Water Utility Authority transports water via the San Juan-Chama Diversion Project in the northwestern portion of the state to supply the metropolitan area with drinking water, after purification, and other municipal needs.

The WRAS is focused upon fecal coliform because of exceedences of this surface water quality criterion. Surface water quality of the river is a concern to residents in New Mexico. While there are other pollutants in the river, their levels have not exceeded standards established by the NM Water Quality Control Commission. Sampling programs continue to monitor surface water for pollutants, and additional pollutants of concern (such as pharmaceuticals) will be sampled by many agencies. A fundamental assumption of this WRAS is that by reducing the discharge of fecal coliform bacteria, primarily through controlling sediment in storm runoff, discharges of many other pollutants will also be reduced.

The river in this area is historically, socially, and culturally significant to Native American tribes, Hispanic communities, and the more recent settlers and residents. Irrigated agriculture via *acequias*, or ditches, is part of the way of life in New Mexico. Agricultural users hold most of the surface water rights in the region and must be included in actions that affect their flow or sources.

Rio Grande water flows through multiple jurisdictions, including tribal lands that have more stringent surface water quality standards than those adopted by the State of New Mexico. The MRG-A spans or borders multiple jurisdictions, including:

- Sandoval County
- Southern Sandoval County Arroyo Flood Control Authority (SSCAFCA)
- Zia Pueblo
- Santa Ana Pueblo
- Sandia Pueblo
- Town of Bernalillo
- City of Rio Rancho
- Village of Corrales
- Village of Los Ranchos de Albuquerque
- Bernalillo County
- Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA)
- City of Albuquerque
- Acequia Associations
- Middle Rio Grande Conservancy District (MRGCD)
- Mid-Region Council of Governments (MRCOG)
- Isleta Pueblo

Natural Resources

Topography is varied, with elevations ranging from 10,678 feet above sea level at Sandia Crest to 4,882 feet at the Isleta Diversion Dam. The watershed contains varying terrain, climate, geology, soils,

hydrology, vegetation, and wildlife, and the watershed area is approximately 959 square miles or 600,800 acres. Precipitation is typically scarce throughout the watershed. The total annual precipitation ranges from 8 to 10 inches at lower elevations and up to 20 inches in the mountains, including snow. On the average, approximately one-half of the total annual precipitation occurs as monsoon rainfall during the months of July through September. The heavy rains during the summer of 2006 are the exception rather than the rule.

Established by the State Legislature in 1983, the Rio Grande Valley State Park is managed cooperatively by the City of Albuquerque Open Space Division and the MRGCD. The 4,300-acre park extends along the banks of the Rio Grande from the southern boundary of Sandia Pueblo in the north through Albuquerque to the northern border of Isleta Pueblo *(Source: www.cabq.gov, accessed June 2005).*

Point and Non-Point Source Pollution Regulations

Within the MRG-A watershed are both small and large Municipal Separate Storm Sewer Systems (MS4s). The only large MS4 (greater than 100,000 population) comprises storm water systems managed by the City of Albuquerque/AMAFCA/UNM and the New Mexico Department of Transportation (NMDOT). These agencies operate under a joint storm water National Pollutant Discharge Elimination System (NPDES) permit issued by the Environmental Protection Agency (EPA). Large MS4s were regulated beginning in the early 1990s. Small MS4s are communities whose population exceeds 50,000, or whose land area is within an urbanized area where the population density exceeds 1,000 persons per square mile. Within the MRG-A watershed, the following communities are listed as small MS4s: Bernalillo County, Village of Corrales, Rio Rancho, Village of Los Ranchos de Albuquerque, and Sandoval County.

The EPA has proposed Minimum Control Measures and related best management practices for small MS4s. Although the general permit has not yet been issued, small MS4s in the watershed are concerned about storm water quality and seek to address water quality concerns without the permit, while anticipating permit requirements.

Storm Water Transport and Conveyance

The flow of surface water through the local watershed is regulated through an extensive and complex system of canals, drains, diversions, pump stations, and storm water detention basins, along with natural and channelized arroyos. The major mechanism of transport of fecal coliform is likely via arroyos, ditches and storm water conveyances. Roadways and parking lots in the urban area also contribute storm water runoff to the river. All roadside drains lead directly to the river. AMAFCA and the City of Albuquerque manage storm water in the Albuquerque metropolitan area, and the SSCAFCA manages storm water for areas in Sandoval County to the north. Both entities are State of New Mexico political subdivisions charged with protecting people and property in their jurisdictions from flooding.

AMAFCA plans, builds, operates, and maintains flood control facilities throughout the greater Albuquerque/Bernalillo County area. The agency establishes drainage policy within its defined boundaries. The U.S. Army Corps of Engineers (USACE) and AMAFCA built the North and South Diversion Channels. The North Diversion Channel drains northeast Albuquerque and the smaller South Diversion Channel drains the southeast valley via arroyos, including the Tijeras Arroyo. The North and South Diversion Channels are examples of traditional constructed channels—concrete-lined arroyos—that transport storm water runoff to the river. The Calabacillas Arroyo is one example of a mostly natural unlined arroyo channel that is utilized by AMAFCA's system. AMAFCA also maintains a system of dams, levees, and detention basins to collect and slow floodwater to prevent downstream damage and catch debris.

A similar system of arroyos and drainage canals is operated by SSCAFCA in the northwestern portion of the MRG-A watershed.

3.0 IDENTIFICATION OF CAUSES AND SOURCES OF FECAL COLIFORM POLLUTION

Water Quality Standards

Water quality standards consist of designated beneficial uses, narrative or numerical water quality criteria to protect those uses, and an anti-degradation policy. These standards serve dual purposes of establishing water quality goals for New Mexico's water bodies and providing the regulatory basis for implementing certain treatment controls and strategies. Both State of New Mexico and Pueblo of Sandia water quality standards apply to the MRG-A (see Appendix B for water quality standards). In addition, the federal Clean Water Act requires that water quality in the MRG-A reach be protective of the standards of the next downstream reach, so that Isleta Pueblo water quality standards must also be considered.

The State of New Mexico Water Quality Control Commission amended standards during the Triennial Review process in 2005. EPA approved the revised standards applicable to the MRG-A in December 2006. According to Subsection B of 20.6.4.13 and 20.6.4.14 NMAC, two reaches within the MRG-A watershed are impaired by bacterial loading. The new criteria adopted in by the NMWQCC in 2005 is a monthly geometric mean for *E. coli* bacteria not exceeding 126 colony-forming units (cfu)/100 milliliters (ml) of water sampled (126 cfu/100 ml) or less; and a single sample not exceeding 410 cfu/100 ml.

Surface Water Quality in the MRG-A

Technical studies conducted on the MRG-A identify impaired waters, along with the causes and sources of impairment. Three studies provided key reference information for the Strategy and are summarized below.

Middle Rio Grande TMDL for Fecal Coliform in Storm Water, May 2002, NMED.

Section 303(d) of the Clean Water Act requires states to develop total maximum daily load (TMDL) management plans for water bodies not in compliance with water quality standards. The EPA defines a TMDL as "a written plan and analysis established to ensure that a water body will attain and maintain water quality standards, including consideration of existing pollutant loads and reasonably foreseeable increases in pollutant loads."

Appendix B contains details of the MRG-A TMDL study, including state and tribal uses and standards, geographic location, scope and size of watershed, and land use and cover descriptions. It also identifies individual NPDES permitted point source discharges, watershed ownership and a summary of load capacity for known point sources and non-point sources. TMDLs for fecal coliform and permitted load allocations for arroyos and drains are also included in Appendix B. The TMDL can be found on-line at the NMED SWQB website (www.nmenv.state.nm.us/swqb).

The upper station of the SWQB's 1999 Intensive Water Quality Study was the Rio Grande below Angostura Diversion Works. The 30-day geometric mean for fecal coliform at this station was 110 cfu/100 ml. While this level currently meets the State of New Mexico's water quality standard of 200-cfu/100 ml for the immediate downstream segment, it is 10 cfu above Sandia Pueblo's fecal coliform standard of 100-cfu/100 ml. Therefore, Sandia Pueblo's standards are not being met as the Rio Grande exits Sandia Pueblo land and flows into the reach for which the TMDL was drafted. The MRG-A also must meet the water quality standards of the Pueblo of Isleta on the southern boundary of the WRAS, which are the same as Sandia for fecal coliform

The New Mexico Water Quality Control Commission adopted the MRG-A TMDL in 2002 as the result of a consent decree. The document identified several potential sources of fecal bacteria discharged to the MRG-A:

1. NPDES permitted discharges;
2. Periodic spills of incompletely treated sewage and end of pipe permit violations at permitted facilities;

3. Non-point source runoff of storm water contaminated by livestock, wildlife and pets, and discharge to the river through arroyos and storm drains;
4. Seasonally abundant migratory waterfowl in the river;
5. Failing or ill-sited septic systems;
6. Leaks, breaks, and overflows from sanitary sewer collection systems; and
7. Illicit connections between sanitary sewers and storm drains that allow sewage to enter storm drains.

City of Albuquerque Antibiotic Resistance Analysis (ARA) of Fecal Coliform Contamination in Storm Water, June 2002, CDM.

The City undertook this study to assess the sources of fecal contamination within their storm water system. Characterizing the sources of bacteria in the watershed may help bring resolution to the risks to human health associated with microorganisms for which fecal coliforms are indicators in the receiving water.

The ARA study was commissioned by the City to identify potential sources of fecal coliform in selected storm water drainage areas tributary to the Rio Grande in Albuquerque using the ARA methodology.

Characterizing the sources of fecal coliform assisted the City in assessing potential "hotspots" within its storm water system, to focus and guide any necessary corrective actions, and to assist the City in planning for potential storm water permit conditions that could result from the final Middle Rio Grande bacteria TMDL. Given that bacteriological water quality represents the most critical element of risk to recreational and ceremonial uses, source characterization is the first step in determining the feasibility for source control or best management practices and if feasible, developing a strategy for implementation.

The primary goal of this study was to characterize potential fecal coliform contributors in the subject storm drainage areas. As part of the study, nine potentially significant contributing sources were identified, including human, dog, cat, horse, cow, rabbit, rat, pigeon and bird sources, with fecal coliform loading from these groups investigated at each of 16 storm water collection sites.

The sixteen locations were chosen for storm water sampling throughout the Albuquerque area and samples were collected during two storm events, if possible, at each location. Sampling was performed in conjunction with the existing storm water sampling performed for the City of Albuquerque and AMAFCA by the USGS. During the study, antibiotic resistance patterns for fecal coliform bacteria isolated from storm water were compared against antibiotic resistance patterns for fecal coliform bacteria isolated from known sources. Fecal coliforms associated with dog and human feces were most common at eight of the 16 sites; bird feces were most common at six of the 16 sites; and cat and livestock feces were rare.

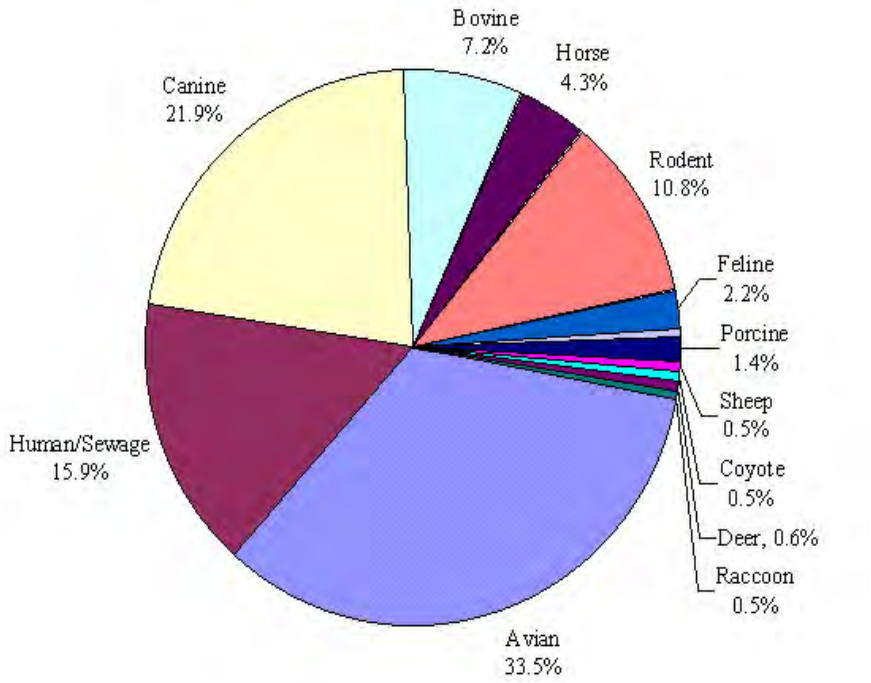
The authors of the study, CDM, recommend sampling sites over a longer time period (at least one year) to capture the range of conditions, and potentially, a range of sources. Continued sampling of storm water events will allow for better refinement of specific sources and eventually could be used to better assess the potential effectiveness of BMPs in a given sub-basin.

The Middle Rio Grande Microbial Source Tracking Study (MRG-MST), October 2005, NMED.

Like the ARA study, this jointly funded study was designed to identify sources of fecal coliform in the MRG-A reach watershed. This study is the most recent water quality study in the reach, released in October 2005. The technology employed in the MRG-MST study compared ribosomal RNA signatures for fecal coliforms isolated from storm water against ribosomal RNA signatures for fecal coliforms isolated from known sources.

Findings from the MRG-MST study indicate that non-point sources of fecal coliform bacteria may include: livestock rearing, and concentrated animal feeding operations (CAFOs), wildlife contributions, pet waste incorporated in urban runoff, the wastes or carcasses of other domestic animals that are

transported via side canals and can eventually make it to the river, as well as limited seasonal inputs from wild birds using the Rio Grande corridor as a migratory flyway. Sources contributing the greatest impacts identified by this study include waste produced by large avian populations, waste produced by human beings (possibly via improperly functioning or non-existent septic systems) and waste from domestic dogs (see Figure 2 below). Septic systems that are not functioning properly can cause both human health and environmental concerns. However, the TMDL document indicates that septic systems and failures in sanitary sewer systems are not suspected as being a large contributor to the elevated fecal coliform levels in the Middle Rio Grande.



Source: Middle Rio Grande Microbial Source Tracking Assessment Report, December 2004.

Figure 2: Sources of Fecal Coliform in Middle Rio Grande-Albuquerque Watershed

Anecdotal Information on Water Quality

Interviews with stakeholders indicate multiple eyewitness accounts of septic haulers illegally dumping waste into ditches and arroyos that drain directly to the river. Other personal contacts indicate the existence of houses in the North and South Valley that do not have any means of septic or sewage disposal, and that drain directly to the river or into open pits.

Watershed Group's First Phase Prioritization of Targeted Subwatersheds

Utilizing data from the ARA, TMDL, and MST studies, the Watershed Group identified subwatershed data that suggest specific geographic areas that may be the source of the highest amounts of fecal coliform transported to the Rio Grande. The following criteria were utilized as the basis for prioritizing a particular subset of the urban area's subwatersheds for future on-the-ground watershed implementation projects.

1. Concentration of fecal coliform per square mile, not only highest numbers of coliforms.
2. Maximum coliform counts observed at first flush, not the geometric mean, because sampling stations had different number of events during 30-day periods.

3. Land Use - urban watersheds in general have higher fecal coliform numbers compared to rural areas. Urban watersheds with large amounts of open space have high amounts of fecal coliform due to animals (primarily dogs).
4. Sites with comprehensive data availability.
5. Proximity and ease of sampling due to location.
6. Frequency of running storm water.

Subwatersheds can be grouped into three distinct regions within the MRG-A. The North Diversion Channel system drains five of the priority subwatersheds contained within the northeast area of the watershed. The Calabacillas and San Antonio Arroyo drainages are in the northwest portion of the study area. The South Diversion Channel drains the last six subwatersheds, all located in the southeastern area of the watershed. Figure 3 shows the location of the location and drainage area of priority subwatersheds identified by the Watershed Group. See the MRG-MST (2005) study for maps/locations of subwatersheds.

1. **North Diversion Channel at Roy—**The North Diversion Channel drains approximately 46% of the City of Albuquerque to the Sandia Mountains. Tributaries include the Embudo (I-40) Channel and Embudo Arroyo, Pino Arroyo, North Pino Arroyo, Hahn Arroyo, Bear Canyon Arroyo, Domingo Baca Arroyo, La Cueva Arroyo, and Grant Line Channel. Approximately 45% of the watershed area is developed land, and public sanitary sewers serve 98% of households. AMAFCA estimates this subwatershed to be 70 square miles, while the MST study defines this subwatershed as 100 square miles. Using the AMAFCA boundary, the North Diversion system drains 64,000 acres (CDM, 2002).
2. **North Domingo Baca Arroyo Dam at Primary Spillway—**This small (three square miles) watershed is just northeast of the City of Albuquerque in the Sandia Mountains foothills. Approximately 40% of the watershed is forested, and 7% is developed land. Only 34% of the households in the watershed were served by a public sewer system in 1990, and septic tank density is relatively high for this area (111 per square mile) (CDM, 2002).
3. **North Pino Arroyo above North Diversion Channel—**This small (two square miles) watershed in Albuquerque is densely populated, with over 4,000 persons per square mile. Over half of the land area is developed (CDM, 2002).
4. **Hahn Arroyo above North Diversion Channel at Carlisle—**This small watershed (five square miles) in Albuquerque is almost completely developed land. The population density is 5,282 persons per square mile, the highest of the watersheds investigated. Public sewers serve essentially all of the households in the watershed (CDM, 2002).
5. **Embudo Channel above confluence with North Diversion Channel—**Covers 30 square miles of Albuquerque and Sandia Mountain foothills. Approximately 60% of the land is developed. Public sanitary sewer serves majority of households in the watershed. Population over 96,000 (CDM, 2002).
6. **Calabacillas Arroyo at Coors Road—**This site, downstream of Swinburne Dam includes an additional 10 square miles that are more populated. At the time of the 2000 census, the population of the Calabacillas watershed at Coors Road was 38,843, compared to 5,257 at Swinburne Dam. The septic tank density was also much higher at Coors Road—19 per square mile (CDM, 2002).
7. **San Antonio Arroyo at Rio Grande (Montaño) Oxbow—**This arroyo also drains a portion (five square miles) of western Albuquerque, but this watershed is more densely populated than the watershed associated with Boca Negra Arroyo at Tesuque Road. Shrub land covers over 78% of the area (CDM, 2002).
8. **South Diversion Channel just above Tijeras Arroyo—**This nine square mile subwatershed drains primarily developed (63%) land in southern Albuquerque, just east of the Rio Grande (CDM, 2002).

9. **Barelas Pump Station—**Collects runoff from areas east of the river and west of the South Diversion Channel. Flows come primarily from downtown Albuquerque and areas south. Approximate size is 2,440 acres, or 3.8 square miles (CDM, 2002).
10. **San Jose at Woodward—**Drains the remainder of the southern portion of Downtown not serviced by Barelas. Watershed size is about 1,250 acres, or 2 square miles.
11. **Isleta Drain upstream of the confluence with Los Padillas Drain—**Draining an area of approximately 60 square miles, mostly southwest of Albuquerque and adjacent to Los Padillas Drain, this watershed is much less developed than that of Los Padillas. Cropland and developed lands are less abundant in the Isleta Drain watershed, and shrub land and grassland are the major land covers. Eighty percent of the households were attached to public sewer systems in 1990. Isleta Drain and Los Padillas Drain flow in the Rio Grande downstream of the Isleta Diversion Dam, (CDM, 2002).

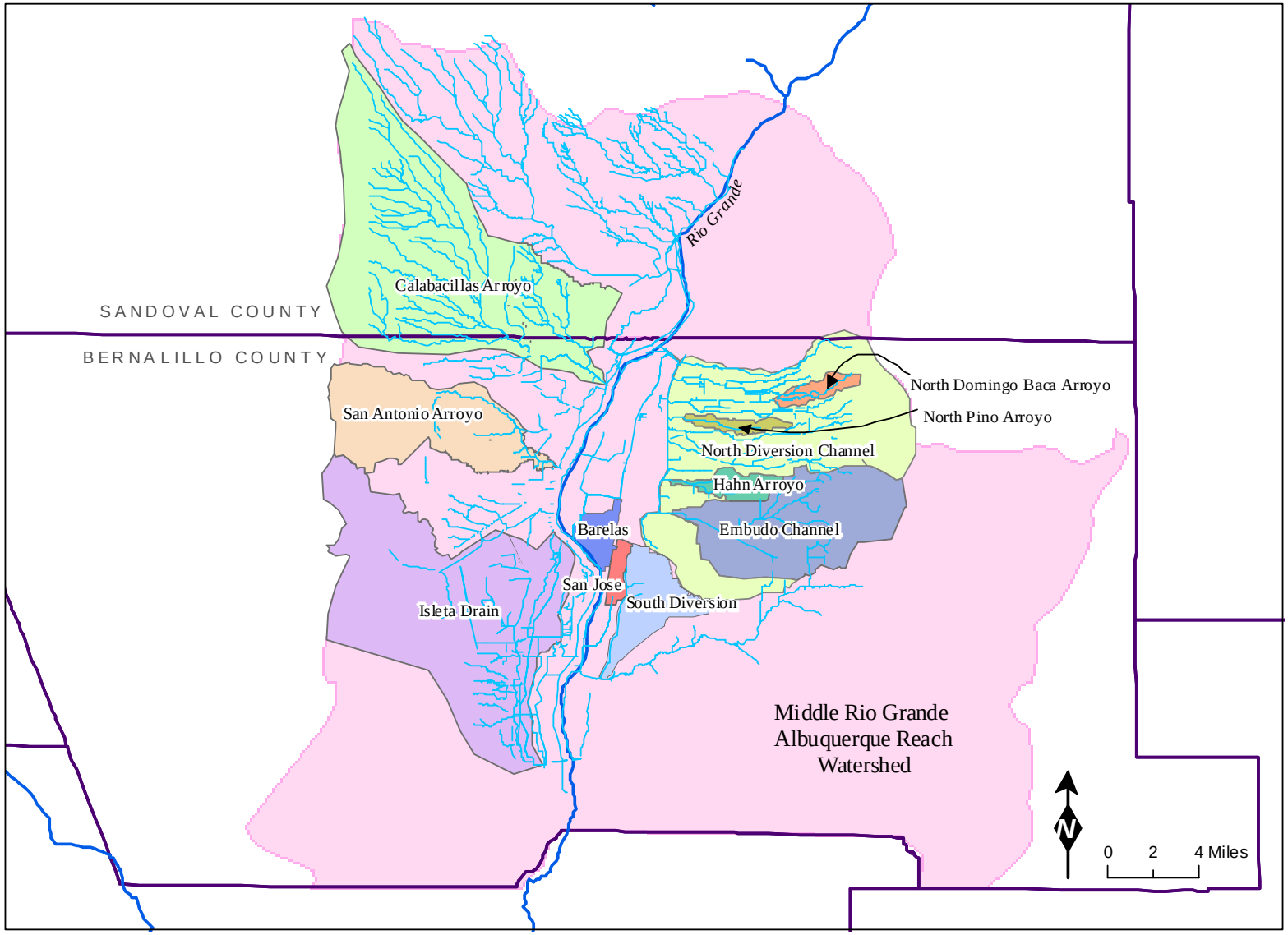


Figure 3: Map of MRG-A Subwatershed Hydrology

Summary of NMED Fecal Coliform Monitoring Activities

Water quality monitoring within the Middle Rio Grande has included sampling and analysis targeting bacteria over more than twenty years. Intensive surveys of various segments of the MRG-A in 1976, 1979, 1984, 1988, 1992 and 1996, as well as the defining intensive water quality survey of 1999, all included some analyses for fecal coliform. Throughout the years, the values have frequently exceeded water quality standards during storm water runoff events. The SWQB-Surveillance and Standards Section's 1999 data, collected at eight water quality monitoring stations over a three-season/six-month period, form the basis for the current (2002) TMDL.

The SWQB Monitoring and Assessment Section conduct three-season physical (habitat and geomorphology), chemical, and biological (fish and benthic macroinvertebrate) monitoring. The scientific basis for determining current and future TMDLs is provided through this recurring monitoring, scheduled on a five-to-seven year rotation basis. As this WRAS is being developed, the Monitoring and Assessment Section is completing another round of intensive water quality sampling and measurement of physical parameters in a broader segment of the Middle Rio Grande, between Cochiti Lake and Elephant Butte Reservoir. This round of investigation has added radionuclide and PCBs to the list of potential pollutants that are being examined.

The 2004 sampling effort that provided data for the *Middle Rio Grande Microbial Source Tracking Assessment Report* (2005) was accomplished by NMED-SWQB staff and its contractor. It differed markedly from previous main river stem surveys as it included additional sampling stations up in the urban area, bringing into focus the impacts of runoff as storm water is transported off the urban watershed and into the river. This sampling included both dry weather (river at base flow and drainage system not contributing flows) and rainfall-influenced (area-wide diversion system transporting flows to a rising river) sampling days. Levels of fecal coliform continue to be higher in storm water runoff following heavy rainfall and runoff events.

Other Sampling and Monitoring Activities

Storm water discharges are highly variable both in terms of flow and pollutant concentrations and the relationship between discharges and water quality can be complex. EPA's NPDES storm water permits use best management practices to provide for the attainment of water quality criteria through a combination of source reductions and structural controls.

The existing MS4 permit for the Albuquerque area requires coordinated monitoring efforts to gather necessary information to determine the extent to which the permit provides for attainment of applicable water quality standards and to determine the appropriate requirements of subsequent permits. This monitoring includes ambient receiving stream water assessments in addition to discharge monitoring to gather this information.

The USGS *WaterWatch* website (http://water.usgs.gov/waterwatch/) provides real-time data for Rio Grande flow rate at Alameda and Rio Grande at Albuquerque. Discharge and gage height in feet are available.

Isleta, Sandia, and Santa Ana Pueblos conduct water quality testing; however, these data may or may not be available to the public.

4.0 OUTREACH

Multiple outreach methods were utilized to engage stakeholders and incorporate their ideas into the creation of the WRAS. The Ciudad Soil and Water Conservation District (SWCD) Board of Directors guided the approach to stakeholder outreach and public participation. The Board emphasized the need to include historically underrepresented groups, such as land grant heirs and *acequia* associations. Presentations, interviews, and watershed mapping exercises were held to solicit input from stakeholder organizations including neighborhood coalitions, City Councilors, County Commissioners, County planners, *acequia* and land grant representatives, environmental justice organizations, and other environmental and community organizations. Interviews with other watershed groups in the state were conducted to gain knowledge about the process and lessons learned in watershed group formation and in the creation of watershed plans. Appendix F contains details on stakeholder outreach, including name of organization or person, number of attendees, date, the group's concerns/analyses, ideas for projects and other comments and referrals to additional stakeholders. The outreach team met with over 30 individuals and groups. The number of stakeholders that were interviewed and to whom presentations were made is estimated at over 150 persons, not counting people who viewed television stories on the project, and who read newspaper articles.

The TMDL, ARA and MST technical reports and data provided the initial sources of information utilized in the creation of this WRAS. The assembly of the Watershed Group and the discussions generated therein helped define the direction in which to progress, including the action of identifying and soliciting participation from key regional stakeholders. Interviewing local stakeholders assisted the Watershed Group in gaining additional perspective, revealing details regarding social and behavioral aspects that will have to be considered in effectively addressing the identified bacteria problems and reducing their sources. Key people and groups that were able to provide significant information were sought. During those discussions, the Watershed Coordinator and Facilitator requested contact information for potential additional groups with an interest in the watershed.

Current Activities

The "Storm Water Team" is a collaborative effort between representatives of AMAFCA, the City of Albuquerque, Bernalillo County, UNM, the NMDOT, SSCAFCA and Ciudad SWCD to develop a public education program for storm water quality. The goals of the program are to eliminate storm water pollution by reducing debris and trash in storm water that discharge to the Rio Grande, and to encourage people to clean up after their pets and properly dispose of waste. The current "Scoop the Poop" and "Keep the Rio Grand" slogans and bumper stickers are part of a public education campaign specifically focused on reducing impacts from pet/canine fecal matter.

Current Bernalillo County Animal Control regulations address pet owner responsibilities. Each year over 6,000 licenses are given to pet owners and at the time of licensing, Animal Control staff reminds pet owners that they are responsible for cleaning up after their pets. Information about pet waste and its impact on storm water is attached to each permit or license that is issued. Bernalillo County Parks and Recreation Department also distributes educational flyers at county parks and facilities.

The efforts of the Watershed Group have been recognized in the media. Several presentations to stakeholder groups were advertised in local newspapers and distributed through stakeholder email list serves. The release of the final MST report led to a television interview with the head of the Watershed Protection Section of the NMED Surface Water Quality Bureau. Two articles on the project in the Albuquerque Journal were based on interviews with members of the Advisory Group. An additional article on the project and other aspects of river health was printed in the free weekly newspaper, the Alibi. Copies of the articles are included in Appendix D.

Other Watershed Activities

Multiple watershed restoration efforts are currently functioning within the MRG-A Watershed. Many programs are focused on wildfire potential reduction in the bosque and mountainous areas of the watershed. Multiple jurisdictions coordinate on projects within the watershed, including the Ciudad Soil and Water Conservation District, the Bureau of Reclamation, the U.S. Army Corps of Engineers, the State of New Mexico, Bernalillo County, the City of Albuquerque, and the Middle Rio Grande Conservancy District.

In addition, the Middle Rio Grande Endangered Species Collaborative Program is a partnership involving 20 signatories organized to protect and improve the status of endangered species along the Middle Rio Grande of New Mexico while simultaneously protecting existing and future regional water uses. Two species of particular concern to the Program are the Rio Grande silvery minnow and the southwestern willow flycatcher. (http://www.fws.gov/mrgesacp/).

5.0 IDENTIFICATION OF BEST MANAGEMENT PRACTICES FOR STORM WATER RUNOFF

Applicable and effective Best Management Practices (BMPs) have been developed for storm water runoff in all climates. BMPs can include educational, structural, and regulatory activities. Typical costs associated with structural/engineering BMPs and regulatory enforcements vary greatly, as do the cost for educational programs. Engineering BMPs to reduce storm water runoff must be specific to site conditions and take into account many variables specific to the southwest region, such as drain inlet inserts, extended detention basins, biofilters, and media filters.

TMDL Load Reduction Targets

The implementation strategy of the TMDL looks at two different ways that the effectiveness of BMPs can be measured, as an overall WRAS watershed-wide reduction in the fecal coliform load, or as a higher reduction in specific, anthropogenic (including pets and livestock) load sources identified by the MST study or subwatersheds identified in the TMDL as higher producers of the bacteriological load. The WRAS has adopted both strategies and is implementing them through different methods (for example, city-wide education versus engineering BMPs).

The MRG-Albuquerque Reach TMDL distinguishes three subreaches for the purpose of allocating the loading limits. Segment 106 extends from the Angostura Diversion to the Alameda Bridge, Segment 105N runs from the bridge to the Albuquerque Waste Water Treatment Plant (WWTP) outlet, and 105S continues down river to the southern boundary of the WRAS at Isleta Pueblo. Segment 105N and 105S both have a state water quality standard for fecal coliform of 1000 colony-forming units (cfu)/ 100 ml (geometric mean), with a National Pollutant Discharge Elimination System permit discharge limit for the WWTP of 200 cfu/100 ml.

The State water quality criterion for segment 106 is 200 cfu/100 ml, (geometric mean). However, the Sandia Pueblo Tribal water quality criterion is 100 cfu/100 ml and this is the criterion used in the TMDL. These water quality standards have been used by NMED to define the fecal coliform loading that will allow attainment of water quality standards by stream segment.

There are several point sources within the study reach, including two WWTP discharge points for Rio Rancho and one for Bernalillo on segment 106 and the Albuquerque WWTP on Segment 105N. These plants and several concentrated storm water discharges define the point source waste load allocation defined in the TMDL, and the remainder falls within the non-point source load allocation. The North Diversion Channel is the primary storm water loading point within segment 106. The South Diversion Channel, San José Drain, and Tijeras Arroyo all drain into segment 105S. Segment 105N receives storm water from dispersed sources and minor drains and is not impacted by any large AMAFCA structures. Therefore, the majority of the urban non-point source load is directed to segments 106 and 105S by AMAFCA structures and improved drainages.

The MST results have suggested that about 150 million cfu/day of the urban runoff to the North Diversion Structure is from human and pet waste. A reduction of ten percent in the load through projects and programs conducted in only this part of the watershed would reduce the load into the river by 15,000,000 fecal coliform units per day. Applied over the entire watershed, a five to ten percent reduction in storm water pollutants is an effective and attainable reduction value.

Therefore, the WRAS will use five to ten percent as the overall load reduction target for fecal coliform in the MRG-A reach. Individual sub watersheds will not have separate targets. However, projects will be identified, as they are proposed, that are intended to focus on the areas identified in the TMDL as contributing a higher amount of the combined wasteload allocation.

NPDES Manual

The NPDES Manual for the City of Albuquerque, NMDOT, AMAFCA, and SSCAFCA, is a source of information on the applications, targeted constituents, and impact of specific BMPs. Descriptions of stabilization practices, structural controls, and housekeeping practices that are shown to reduce bacteria in storm water are available on-line (www.cabq.gov/flood/npdesm.html).

Structural BMPs in General

Examples of structural BMPs currently in use in the southwest include:

- Drain inlet inserts
- Extended detention basins
- Biofilters
- Media filters
- Infiltration

Other proprietary BMPs use the principles of settling and filtration to remove chemical constituents and gross pollutants. Some of the benefits and pitfalls for each type of BMP are discussed in the TMDL which is available at the NMED website (www.nmenv.state.nm.us).

This section highlights approaches associated with the implementation of certain BMPs. The following text is reprinted from an American Society of Civil Engineers (ASCE) (2000) newsletter:

> *Effectiveness of structural or treatment control BMPs is becoming the subject of increased interest as storm water dischargers face permit requirements that include "BMP ratcheting down" clauses and TMDL waste load allocations. Storm water's high volume, intermittent nature and variable quality make treatment a tremendous challenge. Conventional structural BMPs can be a useful element in the management of storm water quality but they are not a panacea to achieve water quality standards.*
>
> *Structural BMPs should be used when it is determined that they will be 'cost effective.' A cost effective application is one that accomplishes the project goals for the least cost while also providing a benefit that exceeds the cost.*
>
> *Most current conventional structural BMPs will not remove the dissolved fraction of a constituent-potential pollutant. In most instances it is the dissolved form of the constituent that can be responsible for beneficial use impairment in downstream receiving waters.*
>
> *Consequently, the conventional structural BMP 'tool kit' available to the storm water manager cannot independently achieve the goal of compliance with water quality standards.*
>
> *Storm water runoff water quality management programs must be a carefully crafted combination of non-structural and structural BMPs designed to address targeted constituents control requirements. Routine achievement of water quality standards will require more receiving water quality monitoring and evaluation to provide the basis for BMP development. Changes in urban planning and design will also be required to address peak flow and volume increases that occur with urbanization.*

Current Watershed Improvement Activities

All jurisdictions in the MRG-A watershed utilize structural and regulatory storm water BMPs to slow flow, protect property and plan for future growth. The following section mentions examples of existing projects deployed by AMAFCA, Bernalillo County, City of Albuquerque, and SSCAFCA that can be modeled in the future. This is not meant to be an exhaustive list, but rather a short list of local innovative projects. Information on specific storm water projects from small or unincorporated areas, such as Village of Corrales, and Town of Bernalillo, and City of Rio Rancho will be included in the next version of this document.

AMAFCA

All AMAFCA project details can be found on their website (www.amafca.com). The following is a description of a recent AMAFCA project, the Bear Canyon Arroyo Water Quality Retrofit Project, a storm water quality project to reduce the amount of trash and debris discharged to the Rio Grande. The project consists of a Water Quality Debris Removal Structure and Low Flow Water Quality Channel.

> *The structure will be concrete and riprap rock, and will be equipped with two metal structures to contain trash and debris. One structure is a coarse screening fence to retain large debris, the other structure is a series of screened containers for small debris. The screened containers are designed to be serviced with City Solid Waste trucks for debris removal.*
>
> *The channel will consist of two sections. The upstream section will be a constructed bio-treatment ponding channel to encourage infiltration and habitat for wildlife, and will be planted with special plants for water treatment. The downstream section will be a ponding channel to encourage sediment removal, and will be planted with native coyote willow for habitat cover. The existing low flow channel will remain for backwater ponding for bird habitat. (Source: amafca.org)*

Bernalillo County

The Bernalillo County NPDES Phase II Storm Water Quality Management Plan can be utilized in the next phase of this project. Appendix E includes details of selected potential projects, including best management practice, goal, measurement, comments, and associated costs. The MRG-A Watershed Group, in conjunction with other partners, can use these project outlines to reduce the amount of bacteria in storm water runoff.

City of Albuquerque

The following discussion highlights structural methods that have been successfully utilized to reduce storm water runoff in the Albuquerque metropolitan area.

The Albuquerque Menaul storm water detention pond was monitored for rainfall, inflow, and outflow, and maximum pond elevation for twelve storms from June 1996 to May 1997. Of these 12 storms, eight inflow and outflow composite samples were analyzed for about 130 constituents. This storm water infiltration pond served several functions: (1) reduce storm peaks since outflow is restricted to a 4.5-foot outfall pipe that discharges into an irrigation conveyance; (2) catch floatable debris in a rock wall filter gabion, since the outlet of the pond is either through the filter or through an inverted outlet pipe when the storm water in the pond reaches the design elevation; and (3) reduce pollutants that are attached to the suspended sediment on the filtered part of the runoff, since for larger storms only part of the outflow goes through the sand filter. An average of 95% of the suspended solids load was removed for the six storms that drained completely through the sand filter. Sixty-one percent of the Biological Oxygen Demand and 85% of the Chemical Oxygen Demand were removed from the outflow by the sand filter. For the total extractible metals for the six storms—an average of 71%, 95%, and 94% of the total copper, total lead,

and total zinc, respectively, were removed. Of the nutrients, 62% of the total phosphorus but only 23% of the total nitrogen were removed. Because of the longer residence time, the average dissolved solids, which are traditionally low in concentration in storm water, actually increased by 21% for the average of the six storm outflows. Although results are more variable for average fecal coliform, bacterial removal by the sand filter for four storms averaged 46%, although fecal coliform densities in the filter pond vary considerably with sampling location and time.

SSCAFCA

SSCAFCA has developed Watershed Management Plans (WMPs) for four drainage basins covering nearly 100 square miles. To develop these WMPs, technical information is collected to assess the hydrology and hydraulics of storm water events throughout the entire watershed. The historic, existing and future fully developed land use conditions are evaluated, and alternative protective solutions are identified for public review and approval. The WMPs take a big picture view, setting the basic parameters for all subsequent studies, engineered projects and plans. SSCAFCA and the local governments use the WMPs to help regulate individual development and assist public project management to ensure overall flood protection up to the 100-year storm event. Much effort and technical information is involved in producing a WMP, but it has proved a very valuable tool in planning flood control projects which will fully protect the health and welfare of the citizens and property in SSCAFCA's jurisdiction.

6.0 IMPLEMENTATION OPPORTUNITIES

The WRAS sets the stage for soliciting Request for Proposals (RFPs) for fundable Implementation Projects, at which time successful applicants develop 319 Project Workplans that must describe implementation. Funding for on-the-ground projects will be applied for via future "Watershed Implementation Request for Proposals" and requests to other funding sources.

Common Themes

Several themes that that emerged during targeted stakeholder outreach and Advisory Group meetings are: 1) we are growing as a community, the health of the overall community is at stake and we must become aware of increasing pollution; 2) the concept of "watershed" and ecological cycles is important, tying together activities upstream (or upland) that can have water quality impacts with potentially impacted areas downstream and in the river valley, and 3) changing community behavior is a key to improving watershed health. It was also noted that while short-term efforts to reduce storm water runoff are necessary, a long-term approach that addresses storm water pollution and overall watershed health is needed. Appendix F contains a summary of all stakeholder input into three categories.

Strategies for WRAS and Improving Watershed Health

The following strategies were noted as common themes throughout Advisory Group meetings, interviews with stakeholders, and in the literature on controlling storm water runoff/improving surface water quality during storm events. Different types of Best Management Practices will be necessary to achieve a reduction of fecal coliform levels in the MRG-A, including:

1.) Education and Outreach,

2.) Engineering and Structural, and

3.) Enforcement and Regulation.

A combination of these three strategies will be used to effectively improve the health of the watershed and meet the four goals of the WRAS.

A preliminary framework of phased objectives for each strategy was developed to reach the short, medium, and long-term objectives of the WRAS. As a general guideline, the following years represent the phased timeframe:

- Phase One 2006-2008: Outreach and Public Awareness
- Phase Two 2008-2011: Education, Engineering and Enforcement Projects
- Phase Three 2011-2016: Adaptive Program Management

Phase One focus is on broad public awareness, establishing partnerships with targeted stakeholders, identifying future research/data needs and identifying funding sources for future projects. Objectives for Phase Two include implementation of education, engineering and enforcement projects based on data and studies developed during Phase One. Phase Three projects will be based on the results of the previous work and evaluation (see Table 1).

Phase One: 2006-2008

Many of the program ideas contained in Phase One project implementation are the result of stakeholder input and research. Materials from the 4th National Conference on Non-Point Source and Storm Water Pollution Education Program (an annual conference sponsored by the EPA) will also be included in the future development of watershed curriculum, outreach activities and assessment of educational and on-the-ground programs. Ongoing research into effective outreach programs will support development of programs.

In all implementation Phases, BMPs outlined in Section 3.0, the list of resources (available at the end of this document), and the TMDL will be utilized for Engineering and Structures projects. Enforcement and Regulation projects will also utilize existing BMP documents and current NPDES Storm Water Phase 1 and Phase 2 project descriptions.

Milestones and Evaluation of Implementation Programs

Evaluation of implementation programs will require a two-tiered approach: First, individual projects will require individually tailored evaluation regimens that blend quantitative and qualitative measures. Our strategic approach recognizes that individual and community behavioral change is integral to the success of the WRAS. Therefore, the major strategies of education, engineering and enforcement will require not only good technical evaluations, but also creative assessments of how people's perceptions and behavior are changing. Qualitative approaches, such as surveys, interviews and case studies, will complement quantitative approaches such as periodic sampling regimens in subwatershed "hot spots."

Second, individual and overall efforts will be monitored and evaluated through ***ongoing communication*** among jurisdictional representatives. The success of any implementation program, and of the overall strategies, relies on the continued cooperation and participation of all agencies to stay involved in actively improving watershed health and reduce the incidence of fecal coliform in the Rio Grande. The Watershed Group, or other group, such as the Middle Rio Grande Water Quality Group or the Storm Water Team, will continue to meet several times a year to assess progress of individual projects and of the overall WRAS.

More specifically, a critical element of any watershed implementation plan is a well-designed water quality monitoring approach to evaluate the improvement in water quality conditions. It is recommended that fecal coliform sampling be continued at as many of the stations identified in this document as possible to allow verification of the effectiveness of the suite of management measures chosen to achieve fecal coliform reduction. It is also recommended that setting actual fecal coliform reduction goals follow the more intensive field surveys, which will identify the obvious problem areas (e.g., sewer overflows, effluent disinfection, and concentrated animal feeding operations) and will allow assessments of implementation programs successes. The goals may be set prior to this initial program implementation. The effectiveness of reducing fecal coliform at these "easier" sites can be measured though the routine fecal coliform sampling. This will allow a more experienced assessment of the effectiveness of more difficult implementations methods such as public education and ordinance enforcement. Milestones will be used for determining if control actions are being implemented and ultimately if water quality standards are attained. The milestones proposed in the MRG TMDL need to be refined and linked to the suite of management measures selected to address the controllable sources of fecal coliform. The milestones listed in the MRG TMDL included the following:

- Develop BMPs to reduce fecal coliform loading in storm water
- Implementation of BMPs
- Post-implementation monitoring of BMP effectiveness

- Re-assessment of BMP effectiveness
- New BMP approaches if original approach proves ineffective

Monitoring for BMP effectiveness and the revised milestones need to be integrated both spatially and temporally to provide water resource managers and the public the information needed to modify implementation strategies (NMED, 2002).

Proposed Project Implementation Opportunities

Projects under the major strategies of Education, Engineering and Enforcement will be implemented in three phases approach over the next ten years. Phase 1 projects will emphasize public education, focused research to answer critical unanswered questions, and pilot projects that can lead to broad replication in later phases. Examples include developing a storm water video for wide distribution on local television stations, developing partnership based watershed programs, septic tank inventory, and convenient placement of pet cleanup tools.

Phase 2 projects will emphasize replicating pilot projects, embedding public education on watershed health into school curricula and public media, and beginning substantive policy and regulatory changes. Examples include measurement of progress (or lack of) regarding broadcast of video, cross-jurisdictional water quality data sharing is in place, neighborhood associations sponsor cleanups, and watershed based curricula is in place in schools.

Phase 3 projects will emphasize making substantive and measurable improvements in water quality, particularly a reduction in fecal coliform in the Rio Grande, its tributaries and arroyos; in the public's involvement in water quality improvement efforts; and in obtaining sustainable policy support for water quality and watershed health improvements. Examples include widespread participation of residential, commercial, and industrial property owners in storm water retention programs. Other projects include utilization of biological methods, such as urban forestry and biofilters in new development/construction in conjunction with new subdivision planning mechanisms.

The success of all project implementation efforts, through all phases, hinges on jurisdictions and agencies perceiving the proposed projects as opportunities, and on voluntarily selecting individual projects, as well as entering into joint, cross-jurisdictional initiatives. This will require ongoing, substantive, positive communication between representatives of the various agencies and jurisdictions. The Watershed Group, or a similar group, such as the Middle Rio Grande Water Quality Work Group or the Storm Water Team, will continue to meet to maintain open dialogue about water quality challenges and successes, and to support proponents of various projects.

7.0 RESOURCES

The following projects, software, and models can be utilized as guides for effective watershed programs in future phases of watershed improvement:

- Project WILD is a wildlife focused conservation education program for Grades K through 12 educators and their students. The program is part of a network of State Wildlife Agency Sponsors, and a program of the Council for Environmental Education. Watershed Watch is a long-term program currently being utilized at the Bosque School in Albuquerque, and can be replicated in other schools within the watershed (http://www.wildlife.state.nm.us/education/project_wild.htm).
- The National Environmental Information Exchange Network is a partnership between state environmental departments and the U.S. Environmental Protection Agency. They assist in exchange of environmental information, specifically water quality data. Partners on the Exchange Network share data efficiently and securely over the Internet. This new approach is providing real-time access to higher quality data while saving time, resources, and money for partner states, tribes, and territories (http://www.exchangenetwork.net/).
- City of Austin, TX: *Watershed Protection Development Review, Scoop the Poop: Dogs for the Environment Campaign* (http://www.ci.austin.tx.us/watershed/ petwaste.htm).
- City of Boulder, CO, *Open Space and Mountain Parks "Leave No Trace" Dogs* (http://www.ci.boulder.co.us/openspace/visitor/dogs.htm#impact).
- Center for Watershed Protection (www.cwp.org).
- Pollution Prevention (www.storm watercenter.net).
- City of Los Angeles, CA. *Storm Water Public Education Program, Resident Population Telephone Survey 2001 Evaluation and Next Steps.*
- Snohomish County, WA. *Public Works, Surface Water Management Division: Pet Waste Management Plan, Public Involvement and Education Plan*.
- Enviroscape Model is an interactive Watershed/Nonpoint Source model that demonstrates how different land uses affect water quality (http://www.enviroscapes.com/).
- TreePeople, Los Angeles, CA (www.TreePeople.org).
- Center for Urban Forestry (CUFR) (http://cufr.ucdavis.edu/).
- STREAM Modules: Spreadsheet Tools for River Evaluation, Assessment and Monitoring can be used for future studies (http://streams.osu.edu/).
- Nonpoint Education for Municipal Officials NEMO (http://nemo.osu.edu/index.html), (thirty-one states are currently part of the NEMO network).
- Upper Rio Grande Water Operations Model (URGWOM) utilizes RiverWare modeling software (www.spa.usace.army.mil/urgwom/default.htm).
- Citizens Monitoring Bacteria (CMB), Building Capacity for *E.coli* Stream Monitoring by Volunteer Networks (www.usawaterquality.org/volunteer/ecoli).
- USDA Cooperative State Research Education, and Extension Service (CSREES) National Water Quality Program, Water Resources Southern Region (http://srwqis.tamu.edu/).
- Hydro CAD-7 (Computer Aided Design) Storm Water Modeling System is a program used for drainage calculations.

- National Management Measures to Control Nonpoint Source Pollution from Urban Areas (www.epa.gov/nps/urbanmm/)
- *Middle Rio Grande TMDL for Fecal Coliform in Storm Water* (May 2002);.
- *Middle Rio Grande Microbial Source Tracking Assessment Report* (Oct, 2005); New Mexico Environment Department, Albuquerque Metropolitan Arroyo Flood Control Authority, and Bernalillo County; prepared by Parsons Water and Infrastructure, Inc.
- *City of Albuquerque Antibiotic Resistance Analysis of Contamination in Storm Water*, Final Report (June 2002); City of Albuquerque and Camp, Dresser and McKee, Inc. (CDM).
- *ASCE, Storm Water Runoff Water Quality Science/Engineering Newsletter, Urban Storm Water Runoff Water Quality Management Issues*, Vol. 3, No. 2, May 19, 2000
- *Middle Rio Grande Public Health Study (2000)*, City of Albuquerque Public Works Department
- *Storm Water Pollution Prevention Plan (2003)*, Bernalillo County
- Albuquerque Area NPDES MS4 Permit (2004), USEPA

8.0 REFERENCES

- State of New Mexico Standards for Interstate and Intrastate Surface Water (20.6.4 NMAC)
- *Middle Rio Grande TMDL for Fecal Coliform in Storm Water* (May 2002); New Mexico Environment Department, Surface Water Quality Bureau.
- *Middle Rio Grande Microbial Source Tracking Assessment Report* (Oct, 2005); New Mexico Environment Department, Albuquerque Metropolitan Arroyo Flood Control Authority, and Bernalillo County; prepared by Parsons Water and Infrastructure, Inc.
- *City of Albuquerque Antibiotic Resistance Analysis of Contamination in Storm Water*, Final Report (June 2002); City of Albuquerque and Camp, Dresser and McKee, Inc. (CDM).
- *ASCE, Storm Water Runoff Water Quality Science/Engineering Newsletter, Urban Storm Water Runoff Water Quality Management Issues*, Vol. 3, No. 2, May 19, 2000
- *Middle Rio Grande Public Health Study (2000)*, New Mexico Environment Department
- *Storm Water Pollution Prevention Plan (2003)*, Bernalillo County
- Albuquerque Area NPDES MS4 Permit (2004), USEPA

9.0 ACRONYMS AND ABBREVIATIONS

AMAFCA	Albuquerque Metropolitan Arroyo Flood Control Authority
ARA	Antibiotic Resistance Analysis
ASCE	American Society of Civil Engineers
BMP	Best Management Practice
CAFOs	Concentrated animal feeding operations
cfu	colony-forming unit(s)
CWA	Clean Water Act
EPA	United States Environmental Protection Agency
MAS	Monitoring and Assessment Section
MRCOG	Mid-Region Council of Governments
MRG-A	Middle Rio Grande-Albuquerque Reach Watershed
MRGCD	Middle Rio Grande Conservancy District
MRG-MST	Middle Rio Grande Microbial Source Tracking Study
MS4	Municipal Separate Storm Sewer System
NMAC	*New Mexico Administrative Code*
NMDOT	State of New Mexico Department of Transportation
NMED	New Mexico Environment Department
NPDES	National Pollutant Discharge Elimination System
NPS	Non-Point Source
RFP	Request for Proposal
RGIS	New Mexico Resource Geographic Information System
SSCAFCA	Southern Sandoval County Arroyo Flood Control Authority
Strategy	Watershed Restoration Action Strategy (WRAS)
SWCD	Soil and Water Conservation District
SWQB	Surface Water Quality Bureau
TMDL	Total Maximum Daily Load
UNM	University of New Mexico
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
UWA	Unified Watershed Assessment
WMP	Watershed Management Plan
WRAS	Watershed Restoration Action Strategy
WWTP	Waste Water Treatment Plant

Appendix A

MRG-A Watershed Advisory Group

Vanessa Baca	URS Corporation
Richard Becker	Ciudad Soil and Water Conservation District
Chip Berglund	Bernalillo County Open Space
Dave Bervin	New Mexico State Forestry Division
Corinna Brooks	United States Department of Agriculture
Scott Bulgrin	Sandia Pueblo
Christie Burton	Albuquerque Metropolitan Flood Control Authority
Chuck Caruso	City of Albuquerque Storm Drain Division
Michael Coleman	New Mexico Environment Department
Tony Delfin	New Mexico State Forestry Division
Patricia Dominguez	Bernalillo County Public Works
Robert Garcia	Bernalillo County Environmental Health
Steve Glass	Ciudad Soil and Water Conservation District
Macario Griego	Cañon de Carnue Land Grant
Sterling Grogan	Middle Rio Grande Council of Governments
Todd Haines	New Mexico State Forestry Division
Maggie Hart	Middle Rio Grande Council of Governments
John Hassell	Conservation Technology Infromation Center
Elaine Hebard	Water Assembly
Tim Herfel	United States Environmental Protection Agency – Region 6
Marcia Fernandez	South Valley Coalition of Neighborhood Associations
David Hogge	New Mexico Environment Department
Rebecca Houtman	Pueblo of Santa Ana
Tim Karpoff	Karpoff & Associates
Donald Lopez, P.E.	URS Corporation
Jerry Lovato	Albuquerque Metropolitan Flood Control Authority
David Lujan	Ciudad Soil and Water Conservation District
Loren Meinz	Albuquerque Metropolitan Flood Control Authority
Patrick Montaño	Kirkland Air Force Base-Water Quality Environmental Mgmt.
Lynn Montgomery	Water Assembly
Mark Morales	Pueblo of Sandia
Mary Murnane	Bernalillo County Public Works
Mark Murphy, PhD	URS Corporation
Jennifer Nelson	URS Corporation
Sue Probart	Tree New Mexico
Joe Quintana	Mid Rio Grande Council of Governments
Fred Rael	Ciudad Soil and Water Conservation District
Russell Rhoades	New Mexico Environmental Gross Receipts Advisory Board
Susan Rich	Ciudad Soil and Water Conservation District
Matt Schmader	City of Albuquerque Open Space
David Stoliker	Southern Sandoval County Arroyo Flood Control Authority
Bruce Thomson	University of New Mexico-Civil Engineering Department
Jack Veenhuis	United States Geological Survey
Jennifer Wellman	Pueblo of Santa Ana
Bob Wessely	Water Assembly
Jean Witherspoon	City of Albuquerque

Appendix B
Water Quality Standards

New Mexico Environment Department Water Quality Control Commission

State of New Mexico

Environmental Protection Water Quality Standards for Interstate and Intrastate Surface Waters

OBJECTIVE:

A. The purpose of is to establish water quality standards that consist of the designated use or uses of surface waters of the state, the water quality criteria necessary to protect the use or uses, and an antidegradation policy.

B. The state of New Mexico is required under the New Mexico Water Quality Act and the federal Clean Water Act,

- to adopt water quality standards that protect the public health or welfare and enhance the quality of water.
- to restore and maintain the chemical, physical, and biological integrity of the nation's waters.
- Provide quality of water, which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water.
- Agricultural, municipal, domestic and industrial water supply are other essential uses of New Mexico's surface water; however, water contaminants resulting from these activities will not be permitted to lower the quality of surface waters (of the state below that which is required for recreation and maintenance of a fishery and protection of wildlife, where practicable)

C. The water quality control commission or any other entity is not granted the power to take away or modify property rights in water.

Antidegradation Policy: Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected in all surface waters of the state.

USE AND DESIGNATION STANDARDS

20.6.4.105 RIO GRANDE BASIN - The main stem of the Rio Grande from the headwaters of Elephant Butte reservoir upstream to Alameda bridge (Corrales bridge), the Jemez River from the Jemez pueblo boundary upstream to the Rio Guadalupe, and intermittent flow below the perennial reaches of the Rio Puerco and Jemez River which enters the main stem of the Rio Grande.

A. Designated Uses: irrigation, limited warmwater fishery, livestock watering, wildlife habitat, and secondary contact.

B. Standards:

(1) In any single sample: pH shall be within the range of 6.6 to 9.0, and temperature shall not exceed 32.2°C (90°F).

(2) The monthly geometric mean of fecal coliform bacteria shall not exceed l,000/100 ml; no single sample shall exceed 2,000/100 ml;

(3) At mean monthly flows above 100 cfs, the monthly average concentration for: TDS shall not exceed l,500 mg/L, sulfate shall not exceed 500 mg/L, and chloride shall not exceed 250 mg/L.

Appendix B

Water Quality Standards

20.6.4.106 RIO GRANDE BASIN - The main stem of the Rio Grande from Alameda bridge (Corrales bridge) upstream to the Angostura diversion works.

A. Designated Uses: irrigation, limited warmwater fishery, livestock watering, wildlife habitat, and secondary contact.

B. Standards:

(1) In any single sample: dissolved oxygen shall be greater than 5.0 mg/L, pH shall be within the range of 6.6 to 9.0, and temperature shall be less than 32.2°C (90°F).

(2) The monthly geometric mean of fecal coliform bacteria shall not exceed 200/100 ml; no single sample shall exceed 400/100 ml (see Subsection B of 20.6.4.13 NMAC).

(3) At mean monthly flows above 100 cfs, the monthly average concentration for: TDS shall be less than 1,500 mg/L, sulfate shall be less than 500 mg/L, and chloride shall be less than 250 mg/L.

Source: http://www.nmenv.state.nm.us/NMED_regs/swqb/20_6_4_nmac.html

2004-2006 State of New Mexico Integrated Clean Water Act 303(d)/305(b) Report. State of New Mexico WQCC

Segment NM-2105.1_00, from the Alameda Bridge to the Santa Ana Pueblo boundary and comprising 11.66 stream miles is critical habitat for the endangered Rio Grande silvery minnow. Designated uses for the segment (Subsection 20.6.4.106 of the New Mexico Standards for Interstate and Intrastate Surface Waters) are described as Partially Supporting includes irrigation and secondary contact recreation. The segment is moderately degraded because of high concentrations of fecal coliform bacteria, resulting from contributions from urban runoff and municipal point sources.

Segment NM-2105_50, from the Isleta Pueblo boundary to the Alameda Bridge and comprising 20.4 stream miles is critical habitat for the endangered Rio Grande silvery minnow. Designated uses for the segment (Subsection 20.6.4.105 of the New Mexico Standards for Interstate and Intrastate Surface Waters) are described as Partially Supporting, includes irrigation and secondary contact recreation. The segment is moderately degraded because of high concentrations of fecal coliform bacteria, resulting from contribution from urban runoff and municipal point sources.

Location	Designated Uses	Standard
MRG Segment 20.6.4.105 The main stem of the Rio Grande from the headwaters of Elephant Butte reservoir upstream to Alameda bridge (Corrales bridge), the Jemez river from the Jemez pueblo boundary upstream to the Rio Guadalupe, and intermittent flow below the perennial reaches of the Rio Puerco and	• Irrigation • Limited warm water fishery • Livestock watering • Wildlife habitat • Secondary contact	The monthly geometric mean of fecal coliform bacteria shall not exceed l,000/100 ml; no single sample shall exceed 2,000/100 ml

Appendix B

Water Quality Standards

Location	Designated Uses	Standard
Jemez river which enters the main stem of the Rio Grande.		
MRG Segment 20.6.4.106 The main stem of the Rio Grande from Alameda bridge (Corrales bridge) upstream to the Angostura diversion works.	• Irrigation • Limited warm water fishery • Livestock watering • Wildlife habitat • Secondary contact	The monthly geometric mean of fecal coliform bacteria shall not exceed 200/100 ml; no single sample shall exceed 400/100 ml (see Subsection B of 20.6.4.13 NMAC).

Pueblo of Sandia Applicable Tribal Surface Water Quality Standards and Designated Uses[1]

Designated uses: primary contact ceremonial, primary contact recreation, secondary contact recreation, warmwater fishery and agricultural water supply.

Tribal Fecal coliform standards:

Primary Contact Ceremonial: Geometric mean maximum of 100 colonies/100ml (geometric mean calculation based on a minimum of five samples taken over a maximum of 30 days).

Single sample maximum of 200 colonies/100ml.

Primary Contact Recreation:

a. April 1 to September 30
   1. **Geometric mean maximum** of 100 colonies/100ml (geometric mean calculation based on a minimum of five samples taken over a maximum of 30 days).
   2. **Single sample maximum** of 200 colonies/100ml.

b. October 1 to March 31

Fecal coliform standards for secondary contact recreation use apply.

Secondary Contact Recreation:

a. **Geometric mean maximum** of 200 colonies/100ml (geometric mean calculation based on a minimum of five samples taken over a maximum of 30 days.

b. **Single sample maximum** of 400 colonies/100ml.

Agricultural Water Supply:

a. **Geometric mean maximum** of 1000 colonies/100ml (geometric mean calculation based on a minimum of five samples taken over a maximum of 30 days.

b. **Single sample maximum** of 2000 colonies/100ml.

Warmwater Fishery:

a. **Geometric mean maximum** of 100 colonies/100ml (geometric mean calculation based on a minimum of five samples taken over a maximum of 30 days.

b. **Single sample maximum** of 200 colonies/100ml.

---

[1] These standards apply to all tribal surface waters, that is, all waters within the exterior boundaries of the Pueblo of Sandia Indian Reservation, including water situated wholly or partly within, or bordering upon, the Reservation, whether public or private, except for private waters that do not combine with other surface waters. (Pueblo of Sandia Water Quality Standards, August 10, 1993)

Appendix C

TMDL Summary of Load Capacity for Known Point Sources and Nonpoint Sources

Source: TMDL, NMED 2002

New Mexico Standards Segment	**Rio Grande, 20.6.4.105** **Rio Grande, 20.6.4.106**
Water Body Identifier	Rio Grande MRG3-30000
Parameters of Concern	**Fecal Coliform Bacteria/Pathogens**
State Uses Affected **Tribal Uses Affected**	**Secondary Contact Recreation, Irrigation** Primary Contact Ceremonial, Primary Contact Recreation, Secondary Contact Recreation, Warmwater Fishery, Agricultural Water Supply
State Priority	1
Threatened or Endangered Species	Silvery Minnow
Geographic Location	**Rio Grande River Basin**
Scope/size of watershed	3,204 mi^2
Land type	Arizona/New Mexico Plateau
Land use/cover	59% Rangeland 23% Forest 7% Agricultural 6% Urban 3% Barren 1% Wetlands <1% Water
Identified Individual NPDES Permitted Point Source Dischargers **City of Albuquerque NPDES Municipal Separate Storm Sewer (MS4) NPDES Permit Renewal is Pending**	Bernalillo WWTF (NM0023485) Rio Rancho #2 WWTF (NM0027987) Rio Rancho #3 WWTF (NM0029602) Albuquerque WWTF (NM0022250) PNM (Reeves Station) (NM0000124) Sandia Peak Ski Area WWTF (NM0027863) Delta Environmental/Diamond Shamrock (NM0029807) Wylie Corporation (NM0029009) Rio Grande Portland Cement Corp (NM0000116) Corrales Chevron (NM0029696) Duke City Distributing (DRT Consultants) (NM0029688) Rio Grande Resources, Inc. (NM0028100) Storm Water
Watershed Ownership	66% Private 13% Bureau of Land Management 10% Tribal 9% United States Forest Service 2% United States Military

Appendix C

TMDL Summary of Load Capacity for Known Point Sources and Nonpoint Sources

TMDLs for Fecal Coliform	**LA + WLA + MOS = TMDL**
Discharge is to Sandia Pueblo Tribal waters.	**Bernalillo WWTF** $0 + 3.030 \times 10^{9} + 0 = 3.030 \times 10^{9}$ cfu/day **North Diversion Channel** $0 + 6.438 \times 10^{11} + 0 = 6.438 \times 10^{11}$ cfu/day
Discharge is to Sandia Pueblo Tribal Waters.	**Rio Rancho #3 WWTF** $0 + 3.219 \times 10^{9} + 0 = 3.219 \times 10^{9}$ cfu/day **Rio Rancho #2 WWTF** $0 + 2.083 \times 10^{10} + 0 = 2.083 \times 10^{10}$ cfu/day **City of Albuquerque WWTF** $0 + 2.878 \times 10^{11} + 0 = 2.878 \times 10^{11}$ cfu/day **San Jose Drain** $0 + 1.068 \times 10^{10} + 0 = 1.068 \times 10^{10}$ cfu/day **South Diversion Channel** $0 + 1.444 \times 10^{11} + 0 = 1.444 \times 10^{11}$ cfu/day **Tijeras Arroyo** $0 + 1.199 \times 10^{11} + 0 = 1.199 \times 10^{11}$ cfu/day **Load Allocations for Arroyos and Drains** **La Cueva Arroyo** 6.435×10^{11}cfu/day **Pino Arroyo** 6.166×10^{11} cfu/day **Grant Line Arroyo** 6.156×10^{11} cfu/day **North Fork Hahn Arroyo** 6.146×10^{11} cfu/day **South Fork Hahn Arroyo** 5.729×10^{11} cfu/day **Hahn Arroyo** 3.453×10^{11} cfu/day **Embudo Arroyo** 3.450×10^{11} cfu/day **Academy Acres Drain** 3.421×10^{11} cfu/day **Tramway Floodway** 3.127×10^{11} cfu/day

Appendix D

MRG-A Watershed Improvement Plan • Stakeholder Input Comment/Idea Form

Name/Org./Date	Concerns/Analyses	Project Ideas	Other Comments/Referrals
Prof. Bill Fleming and Watershed Management Class 30 students April 7, 2005	Tim and Jen presented an overview of MRG Watershed Group formation and the WIP process. Students were asked for their assistance in creating a message, something that will get peoples attention, and make them want to participate and learn more about nonpoint source pollution controls. This presentation was a follow up to Steve Glass' presentation to the class on public participation in the Ciudad SWCD grant. Discussion about sources of human fecal coliform: transient population, incorrect disposal of diapers, and septic tanks. • Is it a socio-economic issue to discard diapers in public places - some say yes, some no. • Use fear and shame – or not • Pride or community ownership may be an effective message • Make it socially acceptable for people to always pick up after their animals.	• Dovetail with the efforts in Bosque restoration and current water quality efforts • Use scary signs to scare the public (feces in drinking water) • Use a media campaign consisting of comedy and education. • People like to jump on bandwagons – use this method. • Motivate people emotionally - • Use media for fear and shame – do not target with intelligence (public not so smart) • Put more garbage cans along ditches, people will not carry dog feces for miles - make trash more accessible. Color code. • Have more bag dispensers available. Make it physically feasible to discard canine feces. • Statewide campaign – be a socially good neighbor, to down stream communities (and up also). • Raise taxes for treating drinking water (difficult issue – hard to quantify) • Raise taxes to enforce existing ordinances (dog waste), and for more trash cans, and bag dispensers. • Localized campaigns – neighborhood wide. • Empower people emotionally • Calculate cost of detrimental health effects to animals that come in contact with feces. Post message in vet clinics. • "Villainous poop mascot" • Give people an option for poopy diapers - more trashcans– and add education.	• Registered pets – Animal Control – track dog registration – how many dogs are there? How many are or are not registered. • Look at other cities programs on septic tank issues and fecal coliform.

Appendix D

MRG-A Watershed Improvement Plan • Stakeholder Input Comment/Idea Form

Name/Org./Date	Concerns/Analyses	Project Ideas	Other Comments/Referrals
		• Give people incentives to repair or clean out outdated/leaking septic tanks. Maybe similar to City of Albuquerque Water Conservation campaign; matching funds, rebates, free audits etc. • Use ironic campaign messages – like "Truth" cigarette campaign second hand smoke and dirty fork example). Show a person throwing diaper in parking lot, then same family / kids playing at river with polluted runoff from their waste. • Utilize landscape architects and environmental engineers (students) to create new type of septic tank system. Existing design is 50-60 years old. • Look into bacteria that can be added to septic tanks to increase breakdown of pollutants. • Bill Fleming: Education is important – send out the message that we can control the amount of fecal coliform in water by changing our habits with dog feces. Prof Fleming coined a new term, Dogshed!	
Middle Rio Grande Water Quality Work Group April 20, 2005	Tim Karpoff and Jennifer Nelson facilitated a Mapping Exercise. Maps on land use, parks & open space, and (bacteria study) watersheds of interest. Small groups worked with maps of the reach to 1. Analyze "Good & Bad" places—sources/places of particular concern or potential, etc.; 2. Suggest "Utopia," what could be done, and where, if cost was not a major consideration; and 3. Propose "Actions," projects and best management practices that the WRAS/WIP	• Major themes included: • Conduct a coordinated public education campaign, emphasizing the need for action by the whole community to help keep the river clean. • Work in major new development areas, such as Mesa del Sol, to implement state-of-the-art technologies for reducing fecal coliform loads into the river. • Present the various jurisdictions in the Middle Rio Grande with a list of possible actions to take, including zoning, ordinances, and best management practices	

Appendix D

MRG-A Watershed Improvement Plan • Stakeholder Input Comment/Idea Form

Name/Org./Date	Concerns/Analyses	Project Ideas	Other Comments/Referrals
	should include for immediate implementation.		
Isleta Sector Corridor Plan Meeting in South Valley April 20, 2005	• Street flooding during storms • New development must be in accordance with semi-rural character • Septic tanks in need of repair	• Performance zoning • Permeable parking – infiltration materials to clean/ filter and recharge • Funding for septic tank repair/ sewer hookup	• Marcia Hernandez, South Valley Coalition • Sara Newton Juarez, South Valley Agricultural Preservation
Eloy Jaramillo Acequia Madre de Carnuel April 25, 2005	• All houses in area Tijeras/Carnuel are on septic tanks and drinking water wells. • Increasing development and denser septic tank concentration will affect future well water quality. • A few families still use acequia water for drinking – potential health hazard if dumping upstream. • Village of Carnuel wants to be exempt from new septic tank regulations. • No funding available now.	• Funding for a sewage treatment line/plant. • Have received funding from Heather Wilson and Governor in past, need $3 million. • Three groups work together, but get funded separately. o Acequia Madre o Land Grant o Mutual Domestic	
Martin Heinrich, Albuquerque City Councilor April 25, 2005	• Target people who already interact with river and are aware of problem	• Obtain City permission to post large signs at Bosque trails. • PSA and articles in newspaper.	
Rio Puerco Management Committee Albuquerque BLM Office April 21, 2005	• Lessons learned from 8 years as a watershed group • Must become conscious there is a problem • Albuquerque needs a sense of community – currently lacking. • Have more involvement at the beginning – it will be worth it. Need to structure our strategy, it is a mistake to just complete the WRAS, it won't be useful. • Who to involve? Two committees • WRAS • Public involvement	• Utilize trails and recreation groups • Behavior modification: need people to understand link between heights and River • What does the river represent to people? • Develop dialogue – get people (kids) to realize this is YOUR watershed. • Know what subwatershed you live in via maps • Provide opportunities for kids to do restoration in watershed • Provide opportunities for involvement • Utilize field trips and photography visual	• Use existing dog clubs • Sierra Club • Wildlife groups: • Richard Becker: • Gail & John Tunberg 842-3262 (NRCS) Mule/Donkey /Horse Carriage assn) • Turkey Assn – Dr. Ed Johnson • USFS – Wildlife section • Sue Probart – Tree NM - use projects to build community!

Appendix D

MRG-A Watershed Improvement Plan • Stakeholder Input Comment/Idea Form

Name/Org./Date	Concerns/Analyses	Project Ideas	Other Comments/Referrals
	• Important: our relationship to place – who we are and where we live. • Native American Program - Watershed Management Dept at Ft. Defiance (Navajo) has helped kids understand their environment and make improvements to land.	impacts, on the ground (40 ft. head cut – before & after photos of sediment load reduction) • Use Tri-Centennial opportunities • News media - reporters – get on radar screen. • Piggy back on existing efforts (bosque revitalization) • Newspaper – make people aware • WIDE outreach – must have far outreach	• Build group identity through projects and interaction. • Dan Shaw – Bosque School, Watershed watch, Van Buren Middle School war zone kids experience river
Sue Probart Tree New Mexico May 9. 2005	• Developing a sustainable urban watershed • Overall ecological health of the watershed and the community	• Strategic tree planting • Collaborative projects with Open Space and other organizations.	• Center for Urban Forestry Research • Bernalillo County and City of Albuquerque Open Space • *Mayor Martin Chavez*
Jean Witherspoon City of Albuquerque Environmental Health June 3, 2005	• Water Conservation program for City of Albuquerque • Lessons learned from Water Conservation Program • Outreach and education programs are similar	• City reached goal of 30% reduction in residential water use. Program brought water issue to the forefront of people's consciousness. People are now aware the aquifer is not as large as previously estimated and that water conservation is necessary. • Development of Green/Yellow/Red drop day on news/newspaper successful. • Rebates on City website very successful • Free/cheap retrofits and water audits are widely used	
Center for Urban Forestry Research Greg McPherson Jim Geiger Paula Peper Jeff Hart (Albuquerque Parks & Recreation) June 6, 2005	• Urban Forestry – tree plantings in urban watershed can reduce polluted storm water runoff in to river • Wildland Urban Interface (WUI) (reduction) software • Headwater health (including tree density) impacts downstream • Public/Private	• WUI study and thinning projects in key areas – Bosque and forest • Strategic studies that locate best areas to plant trees in urban areas to reduce storm water flow. • Software/database building for parks/open space tree inventory. i-Tree consists of: o STRATUM Street Tree Resource Analysis Tool for Urban Forest Managers	• Contact CUFR and apply for grants when on-the-ground projects start • Also USFS and NM Forestry for WUI reduction • Many informative PPT presentations on website http://cufr.ucdavis.edu

Appendix D

MRG-A Watershed Improvement Plan • Stakeholder Input Comment/Idea Form

Name/Org./Date	Concerns/Analyses	Project Ideas	Other Comments/Referrals
		o UFORE Urban Forest Effects Model -Urban Ecology	
Middle Rio Grande Water Quality Work Group June 15, 2005	• Discussed possible projects based on groups technical knowledge and previous Mapping Exercise	• Electronic data sharing among different jurisdictions (Environmental Services Gross Receipts Tax Advisory Board: Russ Rhoades) • Septic tank permits and/or septic tank replacement/repair • Research projects to understand of the migration of pollutants. Jurisdictions are organized now to not know how to do this. • A feasibility study about the regionalization of the water supply and/or wastewater treatment and reuse. This might include Rio Rancho, Corrales, the Water Utility Authority, and/or other jurisdictions • Organize the watershed improvement projects into “Deposition,” “Conveyance,” and ”Control. • Apply the lessons learned in the Bear Canyon Arroyo projects on a wider basis • Explore ways of storing and treating “concentrated” sources of pollution, such as local streets. Look at ways to use storm water as augmentation to normal flow. • Focus on conveyance—control the volume of storm water high up in the watershed. • Expand urban forestry principles and projects—slow down flows through expansion of wetlands and riparian zones. • Hire a program manager to communicate withy all groups/networks • Assess what pollutants may be coming off the Pueblo lands.	• Contact the NM Natural Resources Trust.

Appendix D

MRG-A Watershed Improvement Plan • Stakeholder Input Comment/Idea Form

Name/Org./Date	Concerns/Analyses	Project Ideas	Other Comments/Referrals
John Merritt & Ann Beyke Animal Humane Association of NM August 4, 2005	• AHA places 3000 dogs & cats per year; City of Albuquerque places 12,000 • Focus on accessibility and convenience for people to clean up • Focus on where people go already—stores, malls, etc. • Focus on projects that have less government expense • Make enforcement a collective agency responsibility—"enforcement in conjunction with opportunity" • "The volume is larger than we understand."	• Map septic tanks locations & history • Septic tank removal and/or rehab • Work with AHA youth group • Use AHA newsletter with 19,000 on list • Partner with AHA ongoing outreach—training 4X/year • Use Duke City Fix blog • "Bag of choice" inside the newspaper • Place bags in dog food section of grocery stores • Solicit sponsorships of cans/boxes in parks • Recycling coupons in water bills • Partnerships with Open Space and Animal Control (good publicity for Animal Control)	• Look to San Diego as a model for political and cultural ideas • "The educational value of enforcement." "Adults learn through pain (fines)." • *Alfredo Santistevan, CoA Environmental Health director* • *Trumbull Village Neighborhood Assn.*—bags at community center and the path to the Veterans Memorial • *Steve Stucker* program on TV
Julie Stephens Rio Grande Community Development Corporation August 11, 2005	• Environmental justice issues—including water quality in the MRGCD ditches and acequias • Has eyewitnesses of septic cleaning trucks dumping into arroyos and acequias.	• Enforce anti-dumping regulations	• Their principal investigator on the sampling project is *Lauro Silva* on the Ciudad Board • *Meeting at 2:30 p.m. at RGCDC offices August 17*
Al Valdez Barelas Community Development Corporation August 8, 2005	• How far north (what is the extent) do the system of direct drains to the river go? • Barelas a good community to implement and monitor progress, as the neighborhood is small scale, only 1 mile by 1 mile large.	• Interceptors, filters, etc. in the pipes that drain directly to the river.	• *Barelas CDC Board meeting, August 29, 5:30 p.m.* • Contact Mountainview Community/neighborhood association as they have strong EJ organization
Barelas Community Development Corporation Board August 29, 2005 6 board members 3 other attendees	• Questions about background bacteria • Septic tank hauler problems-need better enforcement6of state regulations • One member does not believe dogs are as large of a problem as stated – feces desiccation • Need public awareness • Need to look at long-term (20-25 years)	• Storm Water catchments – effective • Enforcement of septic tanks and haulers • Look at other pollutants too	• *TVI Course in Water Catchment* • *Paul Salazak*

Appendix D

MRG-A Watershed Improvement Plan • Stakeholder Input Comment/Idea Form

Name/Org./Date	Concerns/Analyses	Project Ideas	Other Comments/Referrals
	• Who decides on how 'we' use river/water, a finite resource		
Joaquin Lujan, 400-6545 SouthWest Organizing Project (SWOP) July 21 & August 12, 2005	• Community participation in planning	• Septic tank removal/replacement	• Visited SWOP on 7/21, then visited again at 8/12 Tardeada. Joaquin will set some gathering up in future
Sawmill Community Land Trust Max Ramirez Jason Mackenzie Paul Guevara August 12, 2005		• Conduct study to locate who is not on the sewage system • Construct wetlands • Construct holding/retention ponds • Enforce anti-dumping laws—oil, paint thinners as well as sewage • Use the Sanchez farm as a model, esp. in rural areas • Show all TV spots in Spanish and/or two languages • Focus education on mothers with kids and women's groups; show mothers with children, talking about "how it's going to affect my kids." • Campaign to mark all "drains directly to the river" outlets • Develop a logo to show everywhere • Make a bilingual documentary • Hold community picnics • Tie in water quality education with home buying counseling program	
Adrian Oglesby Santa Ana lawyer August 15, 2005			• Interested, wants to think about ideas. Encouraged us to call again.
Ciudad SWCD Board Meeting	• Board members discussed CSWCD Mission and emphasized the importance of including	• Include capacity building, training and education for traditionally under represented	• *Lauro Silva* 452-2188/720-4539 PI on new environmental study for

Appendix D

MRG-A Watershed Improvement Plan • Stakeholder Input Comment/Idea Form

Name/Org./Date	Concerns/Analyses	Project Ideas	Other Comments/Referrals
August 1, 2005	traditional stakeholders • Need to devise mechanisms to have actual input into plan (like Navajo Nation listening sessions)	communities (land grant, acequia, Native American's etc…) • Utilize this population to implement on-the-ground projects, education projects to their communities and local schools, specifically forest and bosque thinning and education	South Valley Partners in Environmental Justice • *Kitty Richards*, Bern Co Environmental Health Office • *Johnny Lewis* Community Health Environmental Project (CHEP)-UNM • *Kevin Holliday* – E Club and Watershed Watch, Environmental Education association of NM (EEANM)
Albuquerque Health Care for the Homeless Daryl Smith, Exec. Dir. Jennifer Metzler, Devt. Dir. August 15, 2005	• Homeless	• Organize education and enforcement programs/ideas through the neighborhood associations • Focus on filtration and treatment at the plant • Conduct studies to better understand the questions raised by the pie chart	
Julie Stevens, Rio Grande Community Development Center (RGCDC) & South Valley Economic Development Center (SVEDC) Julio Dominguez August 17, 2005	• Long term problems in South Valley, Environmental Justice • Look at connection between trash and community health – groundwater is a good example • RGCDC strategy: education- solid waste • Illegal dumping in drains and river especially by Septic pumping companies – discharge directly into river & acequias! First hand accounts and photos! • policy/environmental crime: new judges statewide enforcement • Dumping in Pajarito mesa – tires • WWTP problems – not up to standards • Auto shops dump oil, antifreeze • Have new grant to deal with problems with urbanization.	• Continue Ya Basta! Campaign (no dumping). Signs like neighborhood watch – no dumping in ditch/river • Look at other areas that have been successful: Arizona CAP, San Antonio, Arizona • Behavioral change & public shame • Solid waste legislation and policy at state level- >50 lbs. felony for commercial • N and S Valley-manure disposal program: Bio-digestor, byproducts (methane) very profitable and Parsons plant can use it, but say too small • Community bio-generation plant: tilt and dump regular trucks • Fuel regeneration (works in Algodones) • Compost – already have a contract with County - expand • Utilize traditional events:	• *Maceo Martinet & Jean Witherspoon* Groundwater Protection Agency Bureau*:* • *Mary Lou Leonard* CABQ Environmental Health • *Lucy Sanchez and Rachel Conn* Amigos Bravos: • *Silvia LaDezema 452*-9208 SVPEJ • South Valley Growers Assn (Contact: Rhonda Reinert, 877-4044. Email: RKReinert@aol.com • Westland Corp – 80,000 acre development • *Susan Gorman* Children's Water Festival at Convention Center 5th graders. • *Pat McCraw* South Valley Ink-

Appendix D

MRG-A Watershed Improvement Plan • Stakeholder Input Comment/Idea Form

Name/Org./Date	Concerns/Analyses	Project Ideas	Other Comments/Referrals
	• Agriculture: important, value green/open space, animals and water	• San Ysidro blessing of acequia • S. Valley Growers market • Visuals!!! Paint the picture, use Billboard – show what's actually in river • Theme song/logo: Toss no mass or Agua es vida	• State Fair Environment day
South Valley Coalition of Neighborhood Associations Marcia Fernandez September 8, 2005 ~15 attendees	• Illegal septic haulers dumping in acequias • Question regarding species (of dogs specifically) • How far out of compliance? Storm event or 30 day mean	• Septic tank replacement • Publicize water quality – in media due to hurricanes • Local TV station personalities highlight water quality • New developments should have catchment/retention basins on-site • Corps/Bern Co/AMAFCA doing drainage project in South Valley – avoid 'wetland' distinction, regulations and problems by designating drainage as a 'Biofilter' • Educate younger generation, they are the future • Look to effectiveness of 'Ditches are Deadly' and the 'Ditch Witch' campaigns have been • Is it a good idea to drink below N. Diversion drain? Learn what is in your water	• Stewart Dyson / Larry Barker for TV story on fecal coliform in our river • South Valley Flood Reduction Project • Danny Hernandez and Jerry Lovato of AMAFCA • Pete Doles of Corps
Claude Morelli North Valley Coalition	• Construction of parks/pathways system along the ditches. Sees possible tie-in	•	• Invitation to next Coalition meeting in late 2005
Bernalillo County Environmental Health Department Kitty Richards George Schroeder Matt Cross-Guillen September 2, 2005	• TMDL measured for wet years only—CFUs may be concentrated in drier years. • No regulations for septage haulers	• Testing of drinking water for viruses • Break down projects and approaches by geography, recognizing physical and cultural differences. • Focus on cryptosporidium. It is difficult to find/analyze for, difficult to treat—resists chlorine and some filtering, and humans have no natural immunity. Reliable tests in humans	• Maceo Martinet, GPPAP board; 573-3933 • Bart Farris, GWPB, NMED • Dave Simons, Dir. of State Parks, EMNR Dept. • Rachel Conn, Amigos Bravos • James Maestas, South Valley

Appendix D

MRG-A Watershed Improvement Plan • Stakeholder Input Comment/Idea Form

Name/Org./Date	Concerns/Analyses	Project Ideas	Other Comments/Referrals
		are blood tests. • Set dry year standards for TMDL. • Any number of education and outreach projects	• Ed Archuleta, Santa Fe • Earl James, Environmental Health Coalition • NM Public Health Association • Environmental Health Conference • Brian Schall, NMED, 222-9513 FOD or GWPB • Richard Rose, NMED, 827-9691—in charge of a draft set of regulations for septage haulers (required by 2007)
Ciudad SWCD Board Meeting September 6, 2005	• Urban-agricultural connection and debate about land use • Community health and agriculture are related • Eco-psychology, mental health and open spaces	• Utilize Farm Bill to deliver programs to those who need them, esp. S. Valley, Corrales • Connect producers with funding agencies/programs • Leak in high power-pressure line – sewer leaks happen-find them	• NRCS • USDA
Natural Resources Conservation Service— Arlen Rickey September 13, 2005	• Program-based services: Reward/incentivize conservation practices on private agricultural lands • Concerns: reaching out to all eligible landowners; wildlife habitat improvement • Required to have MOUs to work with other agencies	• Joint presentations and classes	• Invited to become part of the WRAS Advisory Group
USDA Cooperative Extension Service Jeff Bader September 13, 2005	• Education-based services: outreach on planned and request bases, providing information to private landowners • USDA Coop Ext. has knowledge in policy and science areas • Also, conduct research on various topics. • Concerned about getting their information out to various groups, e.g., tribal landholders, and to the wider public	• Joint presentations and classes • Possible research projects: -Natural silvery minnow refuge -Difference in pollutant load at north and south ends of the Reach -What to do about bird fecal coliform? • Sponsorship of educational and outreach events. • Map underground return flows/flows back to the	• Invited to become part of the WRAS Advisory Group • Referred us to the MRGOG Agricultural Committee for a presentation • Referred to the Rio Grande Basin Initiative—cryptosporidium work in El Paso reach of the river • Referred us to Joel Diemer at NMSU

Appendix D

MRG-A Watershed Improvement Plan • Stakeholder Input Comment/Idea Form

Name/Org./Date	Concerns/Analyses	Project Ideas	Other Comments/Referrals
	• Concerned about keeping land in agriculture • One goal—to have extension agents on every reservation	river	for feasibility study of an Agricultural High School • Referred us to Sam Fernald—re mapping return flows to the river around Alcalde
Presentation to the National Association of Environmental Professionals (NAEP) Sept. 22, 2005 7 attendees	• Jen made a presentation to environmental professionals at the monthly meeting. • Studies (BST & MST) were done during drought years!!! What effect does this have? Need to find out. • Studies did not allow sampling for rodent bat feces due to concerns regarding the Plague and the Hanta virus.	• Need another chart/graphic to indicate the standard and the amount of cfu's the river is in exceedance (100 cfu is standard and N. Div channel after storm event is 1,000,000 cfu's) • For kids use analogy of the standard is one roll of toilet paper, and the river has 800 rolls of toilet paper in it • Put info in monthly water bill • Reiterate the public health aspect and aesthetic aspect of picking up dog feces	• Project Wild at Rio Grande Nature Center

Appendix D

Media Coverage on MRG-A Project

River Pollution in Spotlight
Oct 26, 2005
By Carolyn Carlson
Journal Staff Writer

North Valley residents will have a chance today to learn what they can do to reduce the high levels of bird, dog and human fecal coliform bacteria in the river and ditches.

Jennifer Nelson, from the URS Corp., an Albuquerque engineering company hired to formulate a plan to improve watershed health, will talk about the Middle Rio Grande Watershed Improvement Plan at the North Valley Coalition's regular meeting scheduled at 6:45 p.m. today.

Nelson will lead a discussion on ways to reduce the amount of fecal coliform draining into the river and ditches.

Nelson cited three separate studies that have identified the sources of fecal bacteria in the Middle Rio Grande waterways and its stormwater tributaries.

According to the most recent study released by the state Environment Department, bird, dog and human fecal bacteria make up 71.3 percent of the fecal bacteria in the water.

"There is a public health problem in being in contact with the fecal coliform bacteria in the ditches and the river," Nelson said.

The data from the three studies come to the same conclusion— that fecal coliform levels are above water quality standards.

"There is not much we can do about the waterfowl feces," Nelson said. "But there are things we can do to decrease the amount of dog and human feces coming into the river."

When it rains, dog poop washes into the arroyos, drains and ditches that lead to the river.

Nelson said education, enforcement and engineering improvements could help restore the water quality levels.

According to the Environment Department, the study's data can be used to assist water resource managers and the public in developing strategies to restore water quality levels to recreational use standards established by the state and for ceremonial uses covered by tribal water quality standards.

Nelson said researchers don't really know for sure where the human feces is coming from but think it may be from leaking septic systems or from septic tank holdings being dumped into the arroyos, ditches or even into the river.

The dog feces, she said, comes from dog owners not picking up their dog's droppings and then disposing them in garbage containers.

"The city of Albuquerque alone has about 100,000 dogs that generate about 20 tons of feces a day," Nelson said.

It is a misdemeanor offense to let dogs defecate on any property, public or private, that doesn't belong to the dog owner unless it is thoroughly removed and disposed of, according to Bernalillo County and city ordinances.

The coalition will meet at the Los Griegos Multi-Service Center at 1231 Candelaria Road NW.

Appendix D

Media Coverage on MRG-A Project

Fecal Matter In Rio Grande Topic of Public Meeting
Tuesday, November 15, 2005
By Carolyn Carlson
Journal Staff Writer

Residents will have a chance Wednesday to discuss the high levels of bird, dog and human fecal coliform bacteria found in the Rio Grande and ditches.

The meeting is being held to discuss the findings of the Middle Rio Grande Microbial Source Tracking Final Report.

It is being hosted by the New Mexico Environment Department's Surface Water Quality Bureau, the Albuquerque Metropolitan Arroyo Flood Control Authority, Bernalillo County and the Parsons Engineering firm.

The report provides data necessary to assist water resource managers and the public in developing strategies that will restore water quality levels to recreational and ceremonial uses, established by the state and tribal water quality standards.

According to the report, the fecal coliform levels are above water quality standards. The study shows that bird, dog and human fecal bacteria make up 71.3 percent of the fecal bacteria in the water.

This report is the result of a three-year study conducted by Parsons to determine the sources of bacteria in the Middle Rio Grande and its storm-water tributaries.

Jennifer Nelson, from the URS Corp., an Albuquerque engineering company hired to formulate a plan to improve watershed health, has said there is not much that can be done about the waterfowl feces which makes up 33.5 percent of the bacteria. But, she said, there are things that can be done about the dog feces, which comprises 21.9 percent, and the human feces, which comprises 15.9 percent of the fecal bacteria.

Nelson said researchers don't know for sure where the human feces is coming from but thinks it may be from leaking septic systems or from septic tank holdings being dumped into the arroyos or even into the river.

The dog feces, she said, comes from dog owners not picking up their dog's droppings and disposing of them. When it rains, the feces are washed into the river.

Nelson has said the city of Albuquerque alone has about 100,000 dogs that generate about 20 tons of feces a day.

In both the city and Bernalillo County, it is a misdemeanor offense to let dogs defecate on any property, public or private, that doesn't belong to the dog owner unless it is thoroughly removed and disposed of, according the city and county ordinances.

The meeting will be held from 6:30 p.m. to 8:30 p.m. Wednesday at the New Mexico Museum of Natural History and Science at 1801 Mountain Road SW.

Appendix D

Media Coverage on MRG-A Project

Let's Pitch In to Keep River Clean
Wednesday, November 16, 2005

Improving the water quality in the Rio Grande needs to become a priority, not just for water resource experts, but for every citizen.

If you need to be shocked into action, attend tonight's water quality meeting hosted by the New Mexico Environment Department's Surface Water Quality Bureau, the Albuquerque Metropolitan Arroyo Flood Control Authority, Bernalillo County and Parsons Engineering firm. That's where a report, complete with data, will help water resource managers and the public develop ways of restoring water quality levels to recreational and ceremonial uses, established by state and tribal water quality standards.

The meeting will be held from 6:30 to 8:30 p.m. at the New Mexico Museum of Natural History and Science at 1801 Mountain Road SW.

What the meeting will do, most of all, is give residents practical ways to help the experts clean up the river.

Dog owners can start by picking up their pets' poop daily and disposing of it properly so it doesn't wash into the river after a rain. Dog feces make up about 22 percent of the fecal bacteria in the river.

According to the report, a total of 71.3 percent of the fecal bacteria comes from birds, dogs and humans. The rest comes from mice, vermin, fish and other wildlife.

Septic tanks are likely causing most of the 15.9 percent of the fecal matter from humans that is in the river. Routine checks to systems by residents will indicate whether or not the tanks are leaking. Fixing those can also help improve the river.

The 33.5 percent of fecal bacteria coming from water fowl is almost impossible to eliminate.

Jennifer Nelson, from the URS Corp., an Albuquerque engineering company hired to find ways to improve watershed health, has said the city alone has about 100,000 dogs that generate about 20 tons of feces a day. It's a misdemeanor to let dogs defecate on any property, public or private, unless it is thoroughly removed and disposed of.

Residents should be doing their part to improve the water quality in the river because there are people who continue to want to enjoy its uses. But recreational uses are not the only reason to improve the water. Several Native American tribes incorporate the river water in their ceremonies and traditions.

The river's importance should not be taken lightly by anyone, especially careless and lazy pet owners.

Cleanup Project Shifts to Outreach
Friday, November 18, 2005
By Carolyn Carlson
Journal Staff Writer

Public outreach is the next step in a multi-agency effort to clean up the Rio Grande and to lower the amounts of fecal coliform in the river.

A three-year study shows that fecal coliform levels are above water quality standards, and that bird, dog and human fecal bacteria make up 71.3 percent of the fecal bacteria in the water.

The study was conducted by the Parsons Engineering firm to determine the sources of bacteria in the Middle Rio Grande and its storm-water tributaries.

The Middle Rio Grande Microbial Source Tracking Assessment Report provides data necessary to assist water resource managers and the public in developing strategies that will restore water-quality levels to recreational and ceremonial uses, established by the state and tribal water quality standards.

Appendix D

Media Coverage on MRG-A Project

It was discussed at a public meeting hosted Wednesday by the New Mexico Environment Department's Surface Water Quality Bureau, the Albuquerque Metropolitan Arroyo Flood Control Authority, Bernalillo County and Parsons.

More public meetings, outreach in the schools and working with the septic-pumping industry to bring awareness to the problem are planned.

Jennifer Nelson, from the URS Corp., an Albuquerque engineering company hired to formulate a plan to improve watershed health, said there is not much that can be done about the waterfowl feces, which makes up 33.5 percent of the bacteria.

But, she said, there are things that can be done about the dog feces, which comprises 21.9 percent, and human feces, which comprises 15.9 percent of the fecal bacteria.

Nelson said researchers don't know for sure where the human feces is coming from but think it may be from leaking septic systems or from septic tank holdings being dumped into the arroyos or even into the river.

The dog feces, she said, comes from dog owners not picking up their dog's droppings and disposing of them. When it rains, the feces are washed into the river.

Nelson has said the city of Albuquerque alone has about 100,000 dogs that generate about 20 tons of feces a day.

In both the city and Bernalillo County, it is a misdemeanor offense to let dogs defecate on any property, public or private, that doesn't belong to the dog owner unless it is thoroughly removed and disposed of, according the city and county ordinances.

She said URS will coordinate the outreach efforts of about 50 agencies or individuals. URS is under contract to do this by Cuidad Soil and Water Conservation District.

Kirk Dean from Parsons Engineering talked about how the study was done. He said there were 30 sampling stations where either river water or runoff water was sampled. He said five to 10 samples were taken at each station. Samples were taken during storm events and during dry weather.

One of the study's findings showed there was less fecal coliform at the north end of the study than at the south end. The north end of the study is at the Angostura Diversion Dam, located five miles northwest of Bernalillo, the south end of the study is at the Isleta Diversion Dam.

That's due to the population in the middle stretch of the river. Several municipal systems dump treated water into the river, as well as contamination from runoff from the denser areas.

That finding was no surprise to the researchers.

Questions asked by those attending the meeting were technical in nature. One man wanted to know what the life span of fecal coliform is. Dean referred the question to Mansour Samadpour, an environmental health scientist who worked on the study. Samadpour said that was a hard question to answer since the life span is dependent on many factors such as water temperature, exposure to sunlight and nutrients available to the bacteria.
For more information, log on to the state Environment Department Web site at
www.nmenv.state.nm.us/swqb.

Appendix D

Media Coverage on MRG-A Project

You Gonna Drink That? A recent report shows that the Rio Grande is dirtier than we thought
Alibi, Newscity
December 1-7, 2005
By Laura Paskus

The main physical circumstances of the Rio Grande seem timeless and impersonal. They assume meaning only in terms of people who came to the river. —Paul Horgan in his 1955 book, Great River: The Rio Grande in North American History

Standing on the banks of the Rio Grande—even along its cluttered middle stretch here around Albuquerque—lends one a sense of peace, if not timelessness. The bosque ain't what it used to be, true. But it's still a treat to watch the gentle waters flow past tall cottonwoods, and this time of year, to hear sandhill cranes crooning over the urban buzz. Although the river begins as a clear stream at around 12,000 feet in Colorado's San Juan Mountains, by the time it slides into Albuquerque, it's carrying a pretty hefty sediment load. Winding through valleys and gouging out gorges will do that to a river: When those waters finally hit this middle stretch, they're flat and muddy. And full of crap. Mainly full of bird droppings and dog poop, but carrying a fair amount of human waste, too.

So says a new report paid for by the New Mexico Environment Department, Bernalillo County and the Ciudad Soil and Water Conservation District. The report, prepared by Austin-based Parsons Water and Infrastructure, Inc., is the result of two years of water sampling along 42 miles of the Rio Grande as well as in the arroyos and diversion channels that feed into it between Santa Ana and Isleta.

During flood events, as well as on average days, scientists tested the water for fecal coliform—bacterial microorganisms that live within the intestines of animals. Not surprisingly, they found that levels increased as they moved downstream. At Angostura Diversion, at the southern edge of the Santa Ana reservation in Sandoval County, the geometric mean was around 341 colony forming units (cfu) per 100 milliliters (ml), with the majority coming from canines, followed by livestock and birds.

Moving downstream, levels increased to 4,610 cfu per 100 mL at the I-25 bridge in Albuquerque. The main source was birds, followed closely by humans and then canines. And the biggest contributor of fecal coliform to the river, at least during storm events, is the North Diversion Channel, which had a mean of 100,000 cfu per 100 ml at runoff conditions. Other drainages with high concentrations included the Hahn, Embudo and North Domingo Baca arroyos. Human waste concentrations were highest below Rio Rancho Utilities 2 and 3, and below the Rio Bravo Bridge.

These levels exceed both state and tribal standards. State standards for this stretch of the river take into account that people really do swim, boat and fish in the middle Rio Grande; tribal standards are even more stringent, and require that the river's waters meet "ceremonial" standards.

Why is this happening? The big answer is that "we've paved over our watershed," according to Steve Glass, chairman of the Ciudad Soil and Water Conservation Commission at a recent presentation before the North Valley Coalition. On an average day, levels are about 20 to 30 times what they should be. On storm event days, when water runs through the streets and diversion channels, flushing unchecked into the river, the levels are off the charts.

"People need to have more awareness of what's happening to the river," said Lucy Sanchez with the river advocacy group Amigos Bravos. "What's in the Rio Grande feeds into the acequias and then people irrigate with it." She works with the local acequia associations, as well as with water quality groups, trying to build awareness of the state of the river. "Some families have been here in the South Valley (for centuries), and they have no clue about the contamination in there."

Along with fecal coliform, the report also notes that *E. coli*—bacteria that's usually harmless, but which can cause severe illness or death if ingested—was found. It's easy to blame the problem on the birds—after all, avian E. coli sources account for 33 percent of the total. Then there are the area's 137,000 dogs, which contribute to about 22 percent of the total. (The city is trying to combat the problem by running "Scoop the Poop" commercials on television.)

But, realistically, the waste that really shouldn't be in the river is ours, which accounts for about 16 percent of the total. (The next highest contributors include rodents: 10.8 percent; bovines: 7.2 percent; and horses: 4.3 percent.)

The report itself acknowledges that there's not much to be done about the bird waste and that it will be hard to change the behavior of pet owners. In fact, "human contributions are most easily reduced." That's done, the authors suggest, by reducing sewer system overflows and leaks, enforcing wastewater permits, and identifying and repairing failing septic systems.

Although the report doesn't lay out specific sources for the contamination, it does offer a few nonspecific suggestions, including "inadequately treated wastewater discharges and improperly disposed diapers." Typical sources of E. coli nationwide, according to the report's authors, include "broken underground sewer pipes that leak into the storm water collection system and sewer system overflows."

At the very end of the report's results section, the authors point out that human fecal matter sources appear to be highest in the vicinities of the two wastewater treatment facilities on the river in Rio Rancho and the Southside Water Reclamation Plant, indicating that these permitted facilities are contributing more waste to the river than leaking septic tanks and malfunctioning sewer pipes.

(By the way, the city released a similar report in 2000. Its basic conclusion was that since wastewater treatment plants are regulated by the state and federal governments, the waste must be coming from "non-point" sources such as "seepage and septage," runoff and illegal dumping.)

The Southside plant, the state's largest, treats about 55 million gallons of mixed residential and industrial water as well as sewage every day. Unfortunately, due to "homeland security" concerns, no one in Rio Rancho was able to say how much waste their facilities process each day. But some readers might remember how in 2000 there was a "mechanical malfunction" at one of the plants. While the city says 6,400 gallons of treated effluent ran into the river, the U.S. Environmental Protection Agency estimated the spill at 1 million gallons and slapped the city with a $27,500 fine.

Its one thing when contaminants in the river have unfamiliar names: Radioactive cesium-137 and the rocket fuel perchlorate, for instance, drain into the river from Los Alamos. Or sometimes it's easy for regular people to ignore the presence of things like chlorine and ammonia, selenium and mercury. But somehow the whole fecal coliform issue has a certain gross-out factor that seems more tangible to your average person. Poop seems more clear-cut, and, well, everyone can relate to it and visualize it.

Maybe that's a good thing. Perhaps people will finally start taking this stretch of the river—and its protection—seriously. "Along the whole middle Rio Grande, whether the issue is water quality or quantity, bosque or habitat restoration issues, there is a way that people can live beside it, along it and not feel connected to it that is a bit mysterious to me," said John Horning, executive director of the Santa Fe-based environmental group, Forest Guardians. "In a way, it's like there isn't any one dramatic source that is threatening the river—it's the classic death of a thousand cuts," he says. "It's diffuse, largely invisible and yet—hey!—it's coming to your tap."

Indeed, even if you're not a river rat and you've never enjoyed a stroll through the bosque, consider this: In about two and a half years, we're all going to be drinking water from the Rio Grande. Once the city

completes its San Juan Chama Drinking Water Project, the city will be mixing river water with groundwater to serve it up as drinking water. That diversion, by the way, is about six miles downstream of Rio Rancho's wastewater utility and a stone's throw downstream from the North Valley Diversion Channel.

Now that the study is done, state regulators will have the opportunity to decide whether to revise the fecal coliform standards—so that the river is not out of compliance with their standards—or figure out a way to control releases and clean up the river. Locally, the Ciudad Soil and Water Conservation District is working on a Watershed Restoration Action Strategy that will come up with ways to clean the watershed. The first and foremost goal of the conservation district is to educate people about the importance of the watershed. The health of the watershed, said Glass, affects everything: human health, the quality of the water in the river and the ground, the abundance of wildlife and recreational opportunities. "People who live in a paved watershed don't realize that," he said. "But the fundamental issue is not that complicated: The pollutants we dump are getting into our river."

If you're interested in getting a CD of the fecal coliform report, which, despite its 331 pages of tables, charts and descriptions of water sampling techniques, isn't as cumbersome to navigate as one might think (as an added bonus, it includes an entire appendix of "miscellaneous scat photos"), contact the state's Surface Water Quality Bureau at (505) 827-0187 or go to www.nmenv.state.nm.us/swqb.

Appendix D

Media Coverage on MRG-A Project

Alibi Newscity
Reading Comprehension Quiz

Whoever correctly answers the following multiple choice questions-and is the first to e-mail them to Christie@alibi.com along with their name and contact information-will win a copy of two fabulous books: Floyd Abrams' "Speak Freely: Trials of the First Amendment" and Edward Said's "From Oslo to Iraq and "The Road Map: Essays".

What's the definition of fecal coliform?
A. Animal excrement
B. Bacterial microorganisms that live in the intestines of animals
C. A brand of shampoo for dogs
D. A type of form-fitting hunters' cap

What's the biggest source of fecal coliform in the stretch of Rio Grande that flows through Albuquerque?
A. People
B. Dogs
C. Birds
D. Shellfish

One of the most intriguing aspects of the fecal coliform report discussed above is that it includes an index of "miscellaneous scat photos". What's the definition of scat?
A. Animal excrement
B. A style of jazz-singing involving the improvisation of meaningless syllables
C. All of the above
D. None of the above

Appendix E
Bernalillo County National Discharge Elimination System
Phase II Stormwater Quality Management Plan FY 04

Public Outreach, Education, Participation and Involvement

Department	Best Management Practice(s)	Goal	Measurement	Comments	Cost
PWD-WRS	Educate the general public on storm water issues via appropriate media, including brochures, flyers, pony panels, etc.	Promote better public awareness of storm water issues as part of the public education and outreach requirements of the permit.	Distribute information to the public via civic events, environmental fairs, office distribution, etc.	County has joined with City, AMAFCA, DOT and UNM to develop Public Relations program.	$10,000.00
PWD-SDS	Storm drains will be marked to indicate that they drain to the river.	Promote better public awareness of storm water issues as part of the public education and outreach requirements of the permit.	Affix approximately 1000 storm drain markers to county property over 5 year period.	Affixed 115 markers. Met 58% of goal.	$294.00 Labor $44.24 Equipment $230.00 Materials.
PSD-AC	Inform pet owners and pet related business of impact of pet waste on storm water.	Promote better public awareness of storm water issues as part of the public education and outreach requirements of the permit.	Approximately 6000 licenses/permits per year. The application will contain information on the impact of pet waste.	1450 permits/licenses dispensed with attached information regarding pet waste. Met 24% of goal.	$109.04Labor $58.00 equipment (paper)
CSD-EH	Training and Outreach regarding Septic System/Alternative Systems	Certification of all waste water evaluators in state (200).	Number of waste water evaluators receiving certification.	61 waste water evaluators certified. Met 31% of goal.	$4,350.00
CSD-EH	Training and Outreach regarding Septic System/Alternative Systems	Educate public on proper septic system maintenance.	Number of flyers/brochures distributed to public.	Put in FY 05 budget.	

Appendix E
Bernalillo County National Discharge Elimination System
Phase II Stormwater Quality Management Plan FY 04

Illicit Discharge Detection and Elimination

Department	Best Management Practice(s)	Goal	Measurement	Comments	Cost
PWD-TS	Valley Utilities Project – provide sewer connections to the South and North Valley.	Make sewer available to an average of 100 households per year.	Number of available connections provided.	850 connections made. Exceeded goal by 75%.	$237,675.00 Labor $11,263,571.00 Infrastructure
CSD-EH	Septic System/Alternative Systems.	400 waste water permits issued annually.	Number of waste water permits issued annually.	208 permits issued. Met 52% of goal.	$5,789.00 Labor

Post Construction Storm Water Management in New Development and Redevelopment

Department	Best Management Practice(s)	Goal	Measurement	Comments	Cost
CSD-ZBP	Promote/encourage development to reduce impervious cover.	Allow variances for certain roadway standards to reduce impervious cover.	Number of variances granted.	Reviewed 40 development plans.	$3,375.00 Labor
CSD-ZBP	Support/adopt low density residential planning areas where appropriate.	Adopt large lot zoning.	Evaluate level of development (dwelling units per acre).	Reviewed 20 development plans.	$3,375.00 Labor

Pollution Prevention/Good Housekeeping

Department	Best Management Practice(s)	Goal	Measurement	Comments	Cost
PWD-RMS	Mow the shoulders of the roads instead of grading.	Reduce the amount of disturbed area on roadways where vegetation exists by increasing the number of road miles mowed from 200 to 300.	Number of miles mowed.	Mowed 822 miles. Met 274% of goal.	$3,261.60 Labor $2,040.48 Equipment
CSD-PR	Put paths around perimeter of parks to reduce runoff to street.	Reduce water usage and runoff from irrigation systems.	Install paths at a total of seven parks, one facility every year.	Installed one path. Met goal by 100%.	$3,800.00 Labor
CSD - PR	Install signs reminding owners to pick up after their pets.	Add signs at one facility a year.	Number of signs installed.	Installed 13 signs reminding owners to pick up after their pets.	$8.00 Labor $10.00 Equipment

Appendix F
MRG-A Watershed Improvement-Stakeholder Input Ideas

Enforcement	Engineering	Education
• Focus on compliance with existing ordinances. • Present the various jurisdictions in the Middle Rio Grande with a list of possible actions to take, including zoning, ordinances, and best management practices. • Enforce anti-dumping laws—oil, paint thinners as well as sewage. • Enforce anti-dumping regulations.	• Focus on "hot spots," i.e., sub-watersheds with highest recorded amounts. *Studies* • Map septic tanks locations & history. • Conduct study to locate who is not on the sewage system. • Use the Sanchez farm as a model in rural areas. • Conduct studies to better understand the questions raised by the pie chart. • Work in major new development areas, such as Mesa del Sol, to implement state-of-the-art technologies for reducing fecal coliform loads into the river. • Research projects to understand of the migration of pollutants. Jurisdictions are organized now to not know how to do this. • A feasibility study about the regionalization of the water supply and/or wastewater treatment and reuse. This includes Rio Rancho, Corrales, the Water Utility Authority, and/or other jurisdictions. • Organize the watershed improvement projects into "Deposition," "Conveyance," and "Control." • Apply the lessons learned in the Bear Canyon Arroyo projects on a wider basis. • Explore ways of storing and treating "concentrated" sources of pollution, such as local streets. Look at ways to use stormwater as augmentation to normal flow. • Assess pollutants coming off tribal lands.	*Community Based* • Organize education and enforcement programs/ideas through the neighborhood associations. • Hold community picnics. • Solicit sponsorships of cans/boxes in parks for dog pick-ups. *Group Based* • Work with youth groups Animal Humane Association, Boy Scouts, et al. • Use Animal Humane Association newsletter list (with 19,000 on list); use other focused group lists for distribution. • Partner with various organizations for ongoing outreach, e.g., AHA has training events 4X/year. • Solicit sponsorships of cans/boxes in parks for dog pick-ups. • Tie in water quality education with home buying counseling programs, e.g., Sawmill Community Land Trust's Arbolera de Vida, mortgage lending agencies, etc. • Establish collaborative projects with Open Space and other organizations. • Establish partnerships with Open Space and Animal Control (good publicity for Animal Control). • Establish partnership with the NM Natural Resources Trust.

Appendix F
MRG-A Watershed Improvement-Stakeholder Input Ideas

Enforcement	Engineering	Education
	Infrastructure • Interceptors, filters, etc. in the pipes that drain directly to the river. • Construct wetlands. • Construct holding/retention ponds. • Focus on filtration and treatment at the plant. • Treat water in the arroyos directly. • Designate/construct "dog toilet" areas. • Electronic data sharing among different jurisdictions. • Septic tank removal and/or rehab. • Septic tank removal/replacement. • Septic tank replacement. • Septic tank permits and/or septic tank replacement/repair. • Focus on conveyance—control the volume of stormwater high up in the watershed. • Strategic tree planting. • Expand urban forestry projects—slow down flows through expansion of wetlands and riparian zones.	*Media Based* • Use Duke City Fix blog. • "Bag of choice" inside the newspaper. • Place bags in dog food section of grocery stores. • Recycling coupons in water bills. • Show all TV spots in Spanish and/or two languages. • Focus education on mothers with kids and women's groups; show mothers with children, talking about "how it's going to affect my kids." • Campaign to mark all "drains directly to the river" outlets. • Develop a logo to show everywhere. • Make a bilingual documentary. • Conduct a coordinated public education campaign, emphasizing the need for action by the whole community to help keep the river clean. • Hire a program manager to communicate will all groups/networks.

Appendix G: Materials on CD-ROM

WRAS Materials on CD

1. 2008 Middle Rio Grande-Albuquerque Reach Watershed Restoration Action Strategy (WRAS)
2. 2000 Middle Rio Grande Public Health Study
3. 2002 City of Albuquerque *E. Coli* Antibiotic Resistance Analysis (ARA) Report
4. 2002 Middle Rio Grande Fecal Coliform TMDL Report
5. 2003 Bernalillo County Storm Water Pollution Prevention Plan
6. 2004 Albuquerque NPDES MS4 Permit
7. 2005 Middle Rio Grande Microbial Source Tracking Assessment Report

Note: All CD files are in Adobe .PDF format.