EPA-APPROVED

TIJERAS ARROYO NUTRIENTS

TOTAL MAXIMUM DAILY LOAD (TMDL)

October 12, 2017

Prepared by

New Mexico Environment Department; NMED; Surface Water Quality Bureau; SWQB; Monitoring Assessment and Standards Section; MASS

Public Draft released: June 12, 2017

Final Draft released: August 29, 2017

Water Quality Control Commission Approval: September 12, 2017

EPA Approval: October 12, 2017

For additional information please visit:

https://www.env.nm.gov/swqb/

Harold Runnels Building
1190 St. Francis Dr. Suite N4050
Santa Fe, NM 87505

Cover Photo:
Tijeras Arroyo station at Cripple Creek Rd near Carnuel (03/31/2017).

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF EQUATIONS

LIST OF ABBREVIATIONS

4Q3	4-Day, 3-year low-flow frequency
AU	Assessment Unit
BLM	Bureau of Land Management
BMPs	Best management practices
CFR	Code of Federal Regulations
cfs	Cubic feet per second
cfu	Colony forming units
CGP	Construction general storm water permit
CoolWAL	Cool Water Aquatic Life
CWA	Clean Water Act
CWAL	Cold Water Aquatic Life
HUC	Hydrologic unit code
IR	Clean Water Act §303(d) / §305(b) Integrated Report and List
km^2	Square kilometers
LA	Load allocation
lbs/day	Pounds per day
mgd	Million gallons per day
mg/L	Milligrams per Liter
mi^2	Square miles
mL	Milliliters
MOS	Margin of safety
MOU	Memorandum of Understanding
MS4	Municipal separate storm sewer system
MSGP	Multi-sector general storm water permit
NM	New Mexico
NMAC	New Mexico Administrative Code
NMDOT	New Mexico Department of Transportation
NMED	New Mexico Environment Department
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint source
QAPP	Quality Assurance Project Plan
RFP	Request for proposal
sMS4	small Municipal separate storm sewer system
SQUID	Surface water QUality Information Database
SWPPP	Storm water pollution prevention plan
SWQB	Surface Water Quality Bureau
TMDL	Total Maximum Daily Load
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
WLA	Waste load allocation
WQCC	Water Quality Control Commission
WQS	Water quality standards (NMAC 20.6.4 as amended through June 5, 2013)
WBP	Watershed-based plan
WQX	Water Quality Exchange USEPA database
WWTP	Wastewater treatment plant

EXECUTIVE SUMMARY

The Total Maximum Daily Load (TMDL) is defined as: *"a written plan and analysis established to ensure that a waterbody will attain and maintain water quality standard including consideration of existing pollutant loads and reasonably foreseeable increases in pollutant loads*" (USEPA 1999). Per Section 303(d) of the Federal Clean Water Act (CWA), 33 U.S.C. §1313[1], states are required to develop a TMDL management program for any impaired waterbodies. An impairment is determined by the state's water quality standards associated with the waterbody's designated use. A TMDL applies these standards, defines the amount of a pollutant a water body can assimilate without violating a state's water quality standards, and allocates that load capacity to known point sources and nonpoint sources. A TMDL also identifies potential methods, actions, or limitations that could be implemented to achieve water quality standards. Per the definition in the Code of Federal Regulations, 40 C.F.R. §130.2(i)[2], TMDLs are considered the sum of the following three components: 1) the individual Waste Load Allocations (WLA) for point sources; 2) the Load Allocations (LA) for nonpoint source and background conditions; and 3) the Margin of Safety (MOS) that calculates uncertainty. The TMDL includes in its analysis the survey data, flow models, probable pollutants, and any impairments, and creates goals for water quality improvements.

The New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) Monitoring Assessment and Standards Section (MASS) conducted water quality surveys, in 2014 and 2016, of the Middle Rio Grande tributaries which included Tijeras Arroyo. The results of these surveys, and subsequent assessments per the New Mexico Water Quality Standards (WQS) for Tijeras Arroyo, determined that Tijeras Arroyo (Four Hills Bridge to headwaters) is impaired for nutrients. This TMDL document addresses the nutrient impairment as summarized in Table ES-1.

The next scheduled monitoring period for the Middle Rio Grande and tributaries is 2021-2022, at which time TMDL targets will be re-examined and potentially revised, as the TMDL is as an adaptive management document. In future surveys, if new data indicate that the targets used in this analysis are not appropriate and/or if new standards are adopted, the load capacity will be adjusted accordingly. Once water quality standards have been achieved, the reach will be moved to the appropriate category in New Mexico's CWA §303(d) / §305(b) Integrated Report (IR).

[1] https://www.epw.senate.gov/water.pdf
[2] http://www.gpo.gov/fdsys/pkg/CFR-2002-title40-vol18/pdf/CFR-2002-title40-vol18-part130.pdf

Table ES-1. Nutrient TMDL Summary for Tijeras Arroyo (Four Hills Bridge to Headwaters)

New Mexico Standards Segment	20.6.4.99 NMAC
Assessment Unit Name and ID	NM-9000.A_001 Tijeras Arroyo (Four Hills Bridge to Headwaters)
Sampling Station Name and ID	32Tijera026.0 Tijeras Arroyo (Cripple Creek Rd. near Carnuel)
Stream Reach Length	15.0 miles
Pollutant of Concern	Nutrients
Impaired Designated Use	Warmwater Aquatic Life
Geographic Location	Rio Grande – Albuquerque USGS HUC13020203
Size of Watershed	76.5 square miles
Land Use/Cover	grassland, shrubland, forested upland, and developed residential or commercial uses.
Probable Pollutant Sources	Channelization, Discharges from Municipal Separate Storm Sewer Systems (MS4), Drought-related Impacts, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Rangeland Grazing, Sources Unknown, Waste from Pets
Land Management	private, USFS, US Department of Defense (DOD), and state
Priority Ranking	High
IR Category	5/5A

WLA + LA + MOS (15%) = TMDL

TMDL for Nutrients for Low Flow Condition

Total Phosphorus	**0.003**	**+**	**0.125**	**+**	**0.022**	**=**	**0.15 lbs/day**
Total Nitrogen	**0.016**	**+**	**0.775**	**+**	**0.139**	**=**	**0.93 lbs/day**

TMDL for Nutrients for High Flow Condition

Total Phosphorus	**5**	**+**	**225**	**+**	**40**	**=**	**270 lbs/day**
Total Nitrogen	**28**	**+**	**1,365**	**+**	**246**	**=**	**1,639 lbs/day**

1.0 BACKGROUND

1.1 Watershed Description

Tijeras Arroyo is also known as Tijeras Creek or Tijeras Canyon. For the purposes of this TMDL the watershed will be addressed as "Tijeras Arroyo". Figure 1.1 is a map of the general location of upper Tijeras Arroyo and its watershed in relation to the Rio Grande. Tijeras Arroyo is located in eastern Bernalillo County, New Mexico. This waterbody originates from springs in the Sandia and Manzano Mountains that flow to Tijeras Canyon, then through Kirtland Air Force Base before entering the Middle Rio Grande where it flows southwest towards the southern portion of the city of Albuquerque.

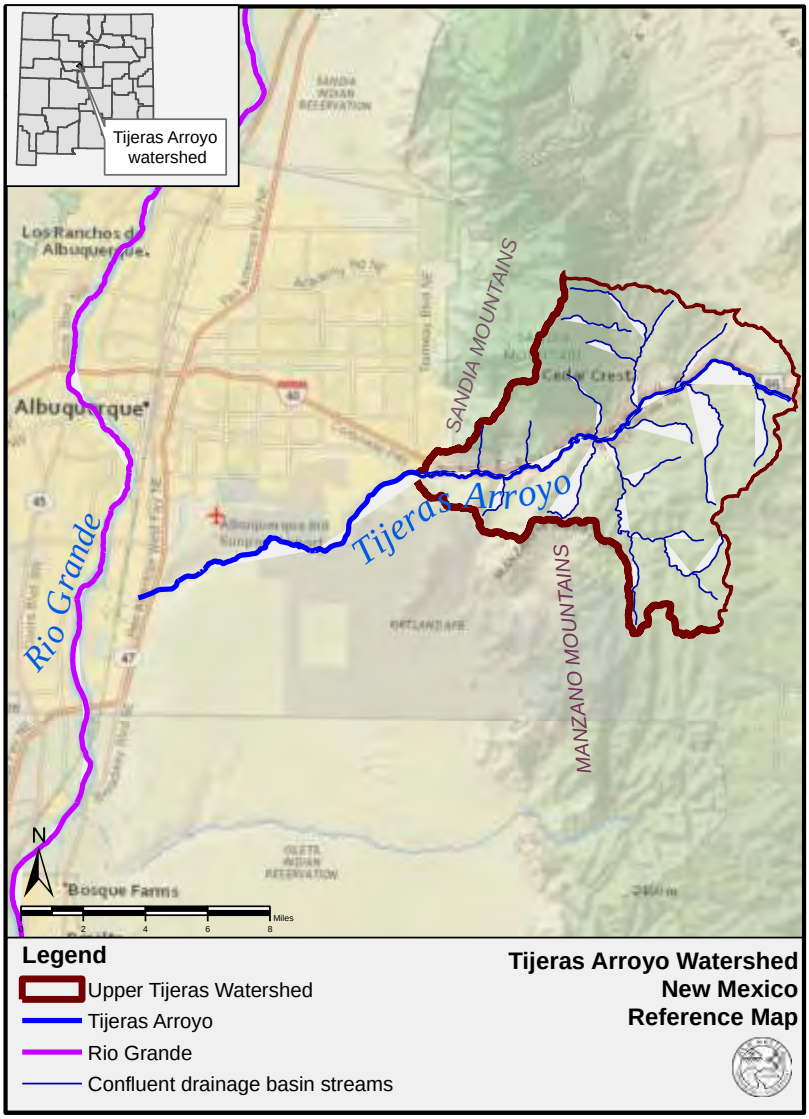
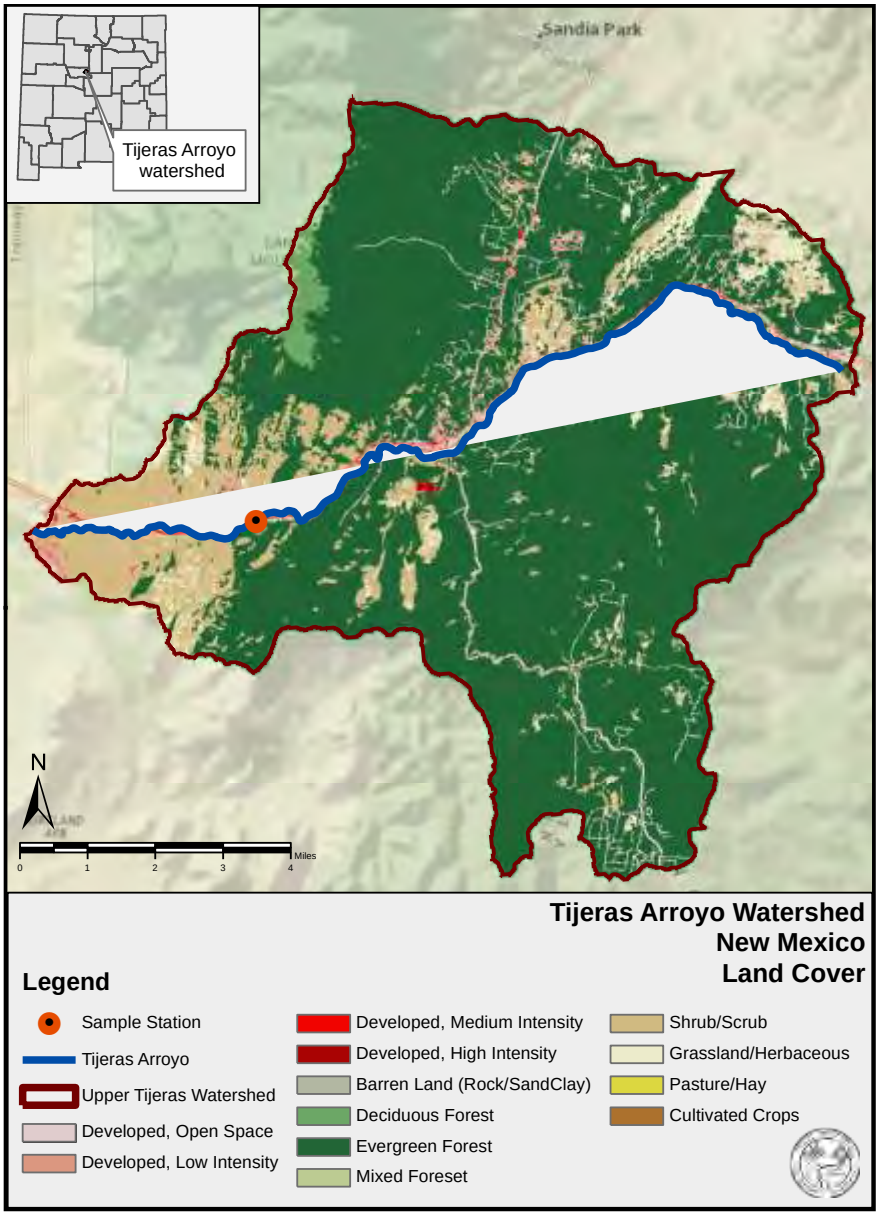


Figure 1.1. Reference Map of Tijeras Arroyo and the upper watershed study area.

The 2004 Watershed Restoration Action Strategy (WRAS) describes the Tijeras Arroyo as an interrupted stream that contains perennial reaches with intervening intermittent reaches (Ciudad SWCD 2004). Surface flows disappear into the alluvium of the arroyo bed between the foothills of the mountains and the Rio Grande, except during large storm events, and provides mountain front recharge to the Albuquerque aquifer. Water may re-surface in the arroyo within the inner valley, close to its junction with the main stem Rio Grande (Ciudad SWCD 2004). The watershed includes Cedro Creek, also called Cedro Canyon, which flows from the south to join Tijeras Arroyo, near the intersection of State Highways 333 and 337, and several small streams from the east flank of the Sandia Mountains located to the north (Ciudad SWCD 2004).



The Tijeras Arroyo watershed ranges from 1,518 to 2,982 meters (4,980 to 9,782 feet) in elevation, and covers approximately 342 km^2 (132 mi^2). Within the assessment unit (AU) from Four Hills Bridge to the headwaters, the average watershed elevation is 7,030 ft., with a drainage area of 76.5 mi^2 (USGS 2016). The AU's watershed is in the AZ/NM Mountains (23) Level III ecoregion (Omernik 2006). Land cover in the Tijeras Arroyo watershed is depicted in Figure 1.2. It includes grassland, shrub land, forested upland, and developed residential or commercial uses.

Figure 1.2 Land cover map of Upper Tijeras Arroyo watershed and sample station location.

The geological groups that are within the Tijeras Arroyo watershed are represented in Figure 1.3. The Sandia Mountains are composed of intrusive igneous rocks (exposed on the west face of the mountains in Tijeras Canyon and in some parts of the eastern slope), overlain by mixed sedimentary beds. Some scattered metamorphic sections exist, particularly in Tijeras Canyon.

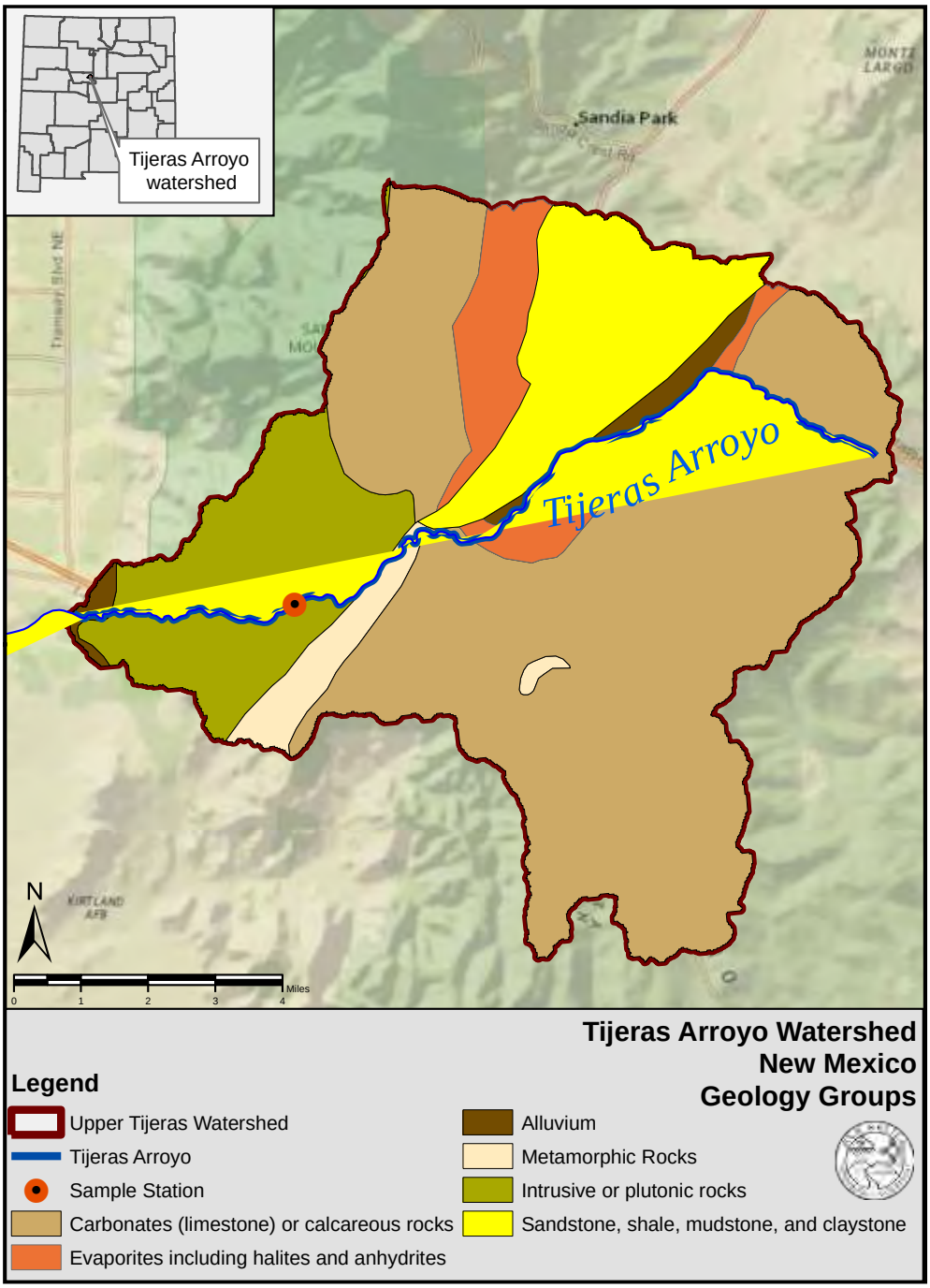


Figure 1.3 Geologic Map of the Upper Tijeras Arroyo watershed and sample station location.

In the Manzano Mountains, Madera limestone dominates the surface geology. At the mouth of the canyon, the geology changes drastically from uplifted granite to a 25,000-foot deep graben filled with unconsolidated sediments of the Santa Fe formation (Ciudad SWCD 2004). This drastic change in underlying geology contributes to a distinct change in the hydrologic character of the channel as it transitions out of the mountains and into the alluvium.

Historic and current land uses in this watershed include farming, ranching, forestry, and residential/commercial related activities. Land ownership within the watershed includes: private, United States Forest Service (USFS), Bureau of Land Management (BLM), and the State (Figure 1.4).

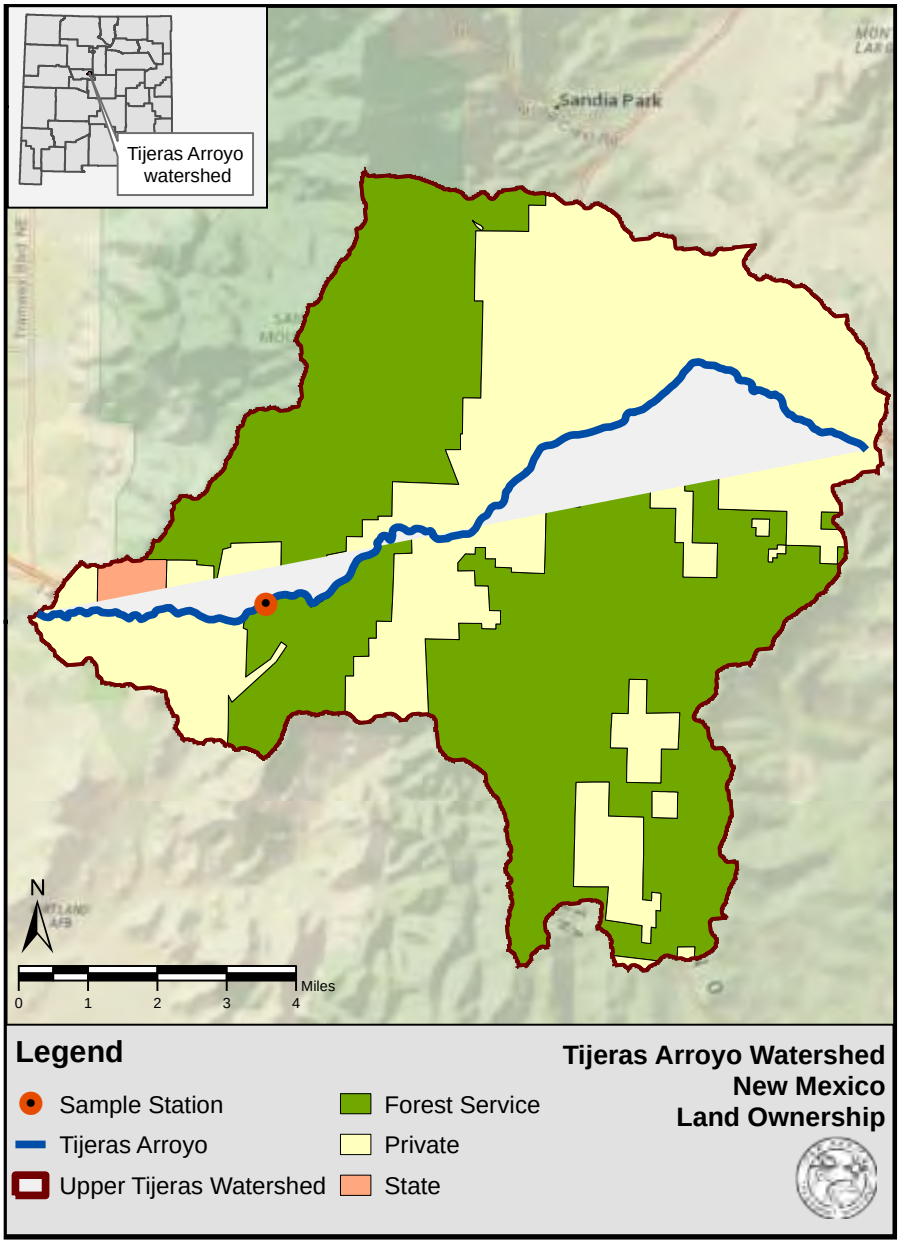


Figure 1.4 Land ownership in Upper Tijeras Arroyo watershed and sample station location.

1.2 Applicable Water Quality Standards

New Mexico's *Standards for Interstate and Intrastate Surface Waters* (20.6.4 NMAC) establish WQS that consist of designated uses of surface waters of the State, the water quality criteria necessary to protect the uses, and an antidegradation policy. The WQS for the AU in this document are set forth in the following sections of 20.6.4 NMAC as amended through June 5, 2013 (NMAC 2013).

20.6.4.99 PERENNIAL WATERS - All perennial unclassified waters of the state.

A. Designated Uses: warmwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific criteria in 20.6.4.900 NMAC are applicable to the designated uses, except that the following site-specific criteria apply: the monthly geometric mean of E. coli bacteria 206 cfu/100 mL or less, single sample 940 cfu/100 mL or less.

20.6.4.13 GENERAL CRITERIA: General criteria are established to sustain and protect existing or attainable uses of surface waters of the state. These general criteria apply to all surface waters of the state, unless a specified criterion is provided elsewhere in this part. Surface waters of the state shall be free of any water contaminant in such quantity and of such duration as may with reasonable probability injure human health, animal or plant life or property, or unreasonably interfere with the public welfare or the use of property.

E. Plant Nutrients: Plant nutrients from other than natural causes shall not be present in concentrations that will produce undesirable aquatic life or result in a dominance of nuisance species in surface waters of the state.

1.3 Antidegradation and TMDLs

New Mexico's antidegradation policy, which is based on the federal requirements found at 40 CFR § 131.12, describes how waters are to be protected from degradation (20.6.4.8.A NMAC). At a minimum, the policy mandates that "the level of water quality necessary to protect the existing uses shall be maintained and protected in all surface waters of the state." Furthermore, the policy's requirements must be met, whether or not a segment is impaired. TMDLs are consistent with the policy because implementation of a TMDL restores water quality so that designated uses are protected and water quality criteria are achieved.

The *Antidegradation Policy Implementation Procedure* establishes the process for implementing the antidegradation policy (NMED/SWQB 2011). However, specific requirements in the *Antidegradation Policy Implementation Procedure* do not apply to the New Mexico Water Quality Control Commission's (WQCC) establishment of TMDLs because these types of water quality-related actions

are already subject to extensive requirements for review and public participation, as well as various limitations on degradation imposed by state and federal law (NMED/SWQB 2011).

1.4 Water Quality Sampling

Surface water quality samples related to this document were collected during the 2014 Middle Rio Grande Tributary study, with additional data collection in 2016. The AU name is "Tijeras Arroyo (Four Hills Bridge to headwaters)", AU ID number NM-9000.A_001. Data were collected at station "Tijeras Arroyo at Cripple Creek Rd. near Carnuel," station ID 32Tijera026.0. Figure 1.5 is a picture of the site's sample station. Also, see Figure 1.6a and 16.b for a map of the location of the sample station and permit relevant to this TMDL document.

Figure 1.5 Tijeras Arroyo at Cripple Creek Rd near Carnuel, sampling station.

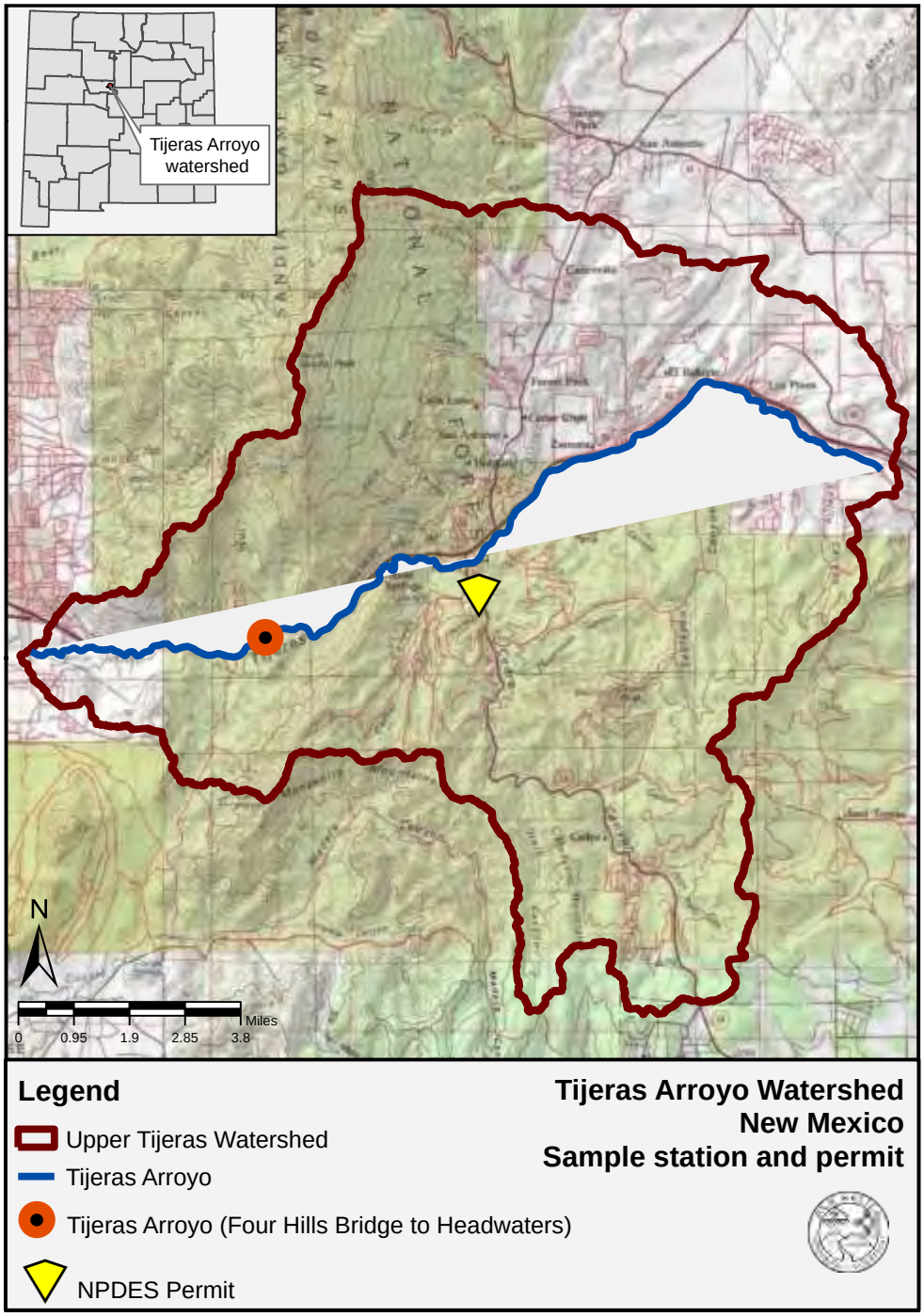


Figure 1.6a. Upper Tijeras Arroyo watershed sample station and permit.

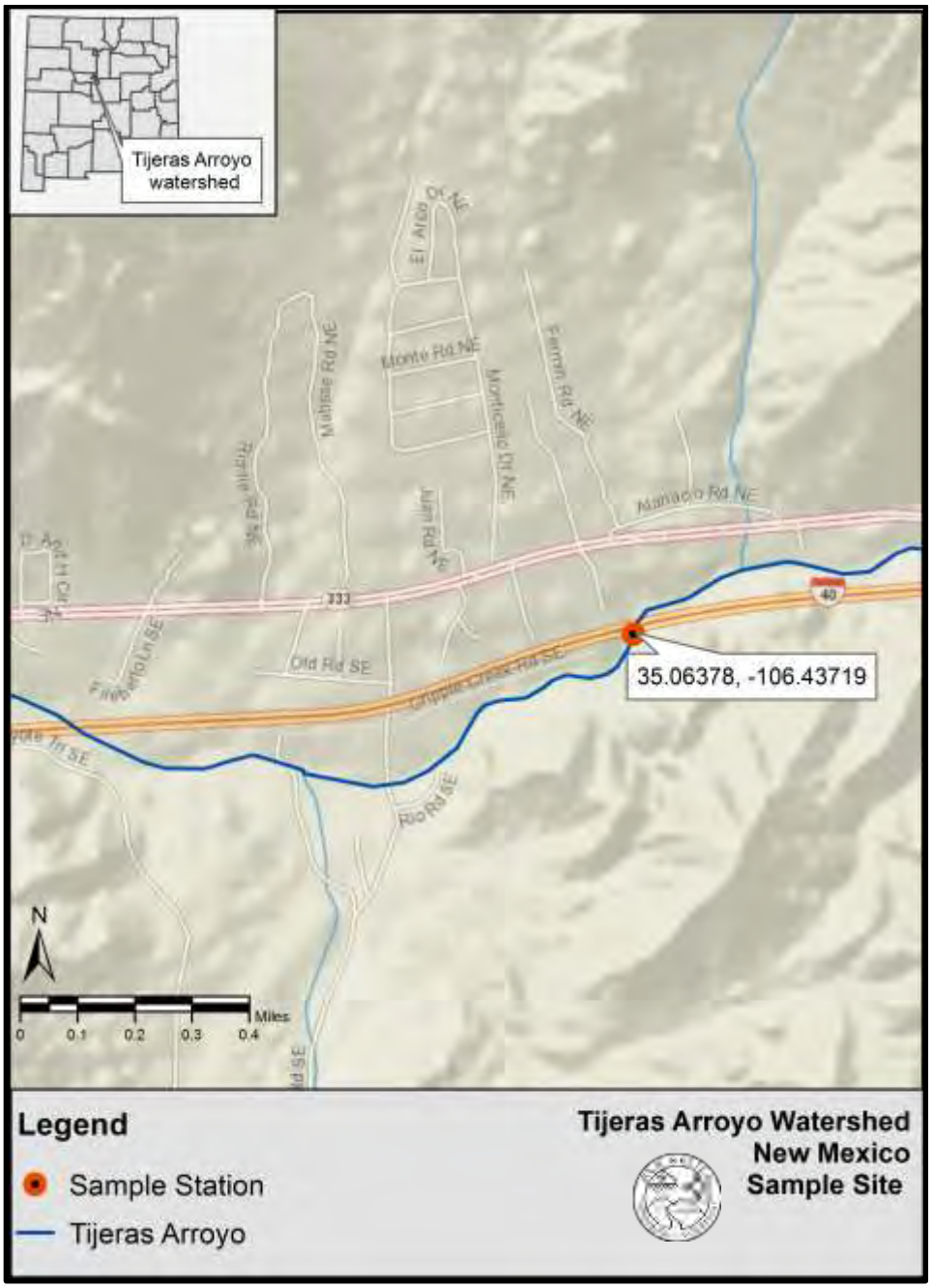


Figure 1.6.b. Upper Tijeras Arroyo watershed sample site.

1.5 Water Quality Sampling/Data

All sampling and assessment techniques used during the 2014 intensive survey and 2016 additional data collections are detailed in SWQB's Quality Assurance Project Plan (QAPP) (NMED/SWQB 2016a), Standard Operating Procedures (NMED/SWQB 2016b), and assessment protocols (NMED/SWQB 2017). Data results are housed in SWQB's water quality database (SQUID) and uploaded to USEPA's Water Quality Exchange (WQX) database. Nutrient data relevant to this TMDL document are provided in Appendix A.

1.6 Data Assessment

The 2014 and 2016 data were re-evaluated with the recently revised nutrient listing methodology to confirm the nutrient impairment (NMED/SWQB 2017). The applicable site class and numeric thresholds for causal parameters are listed in Table 1.1.

Table 1.1. Tijeras Arroyo Site Classes and Nutrient Impairment Thresholds.

Parameter	Site Class	Numeric Threshold
Total Nitrogen (TN)	Moderate	0.37 mg/L
Total Phosphorous (TP)	Flat-Moderate	0.061 mg/L
Delta dissolved oxygen (Δ DO)	Flat-Moderate	4.08 mg/L

For the nine total nitrogen (TN) samples taken, three were assessable and all three exceeded the applicable threshold. For the nine total phosphorous (TP) samples taken, nine were assessable and one exceeded the applicable threshold. The delta dissolved oxygen (Δ DO) threshold was also exceeded (max delta DO 5.78 mg/L) (See Appendix A for TN, TP, ΔDO sample data). Therefore, this assessment unit will continue to be listed on New Mexico's IR as impaired for nutrients.

2.0 PLANT NUTRIENTS TMDL

Nutrient assessment conclusions for the Tijeras Arroyo watershed were first included in the 2008-2010 Clean Water Act Integrated §303(d) / §305(b) List of Assessed Waters (NMED/SWQB 2008) and remains on the 2016-2018 List (NMED/SWQB 2016c). Assessment of water quality data indicated nutrient impairment through exceedences of both causal and response variables. Total Phosphorus and Total Nitrogen TMDLs were developed to work in parallel to affect water quality improvement.

2.1 Water Quality Numeric Thresholds

The target value for plant nutrients is based on numeric translators for the narrative criterion set forth in 20.6.4.13.E NMAC:

> ***Plant Nutrients:*** *Plant nutrients from other than natural causes shall not be present in concentrations which will produce undesirable aquatic life or result in the dominance of nuisance species in surface waters of the state.*

Due to exceedences of the thresholds for TN and ΔDO, the assessment determined that Tijeras Arroyo is impaired for plant nutrients. The establishment of numeric thresholds for TN and TP has the goal of developing water quality-based permit limits and source control plans. These thresholds support designated uses within the watershed.

2.2 Critical Stream Flow

The CWA requires that TMDLs consider critical conditions for stream flow, loading, and water quality parameters as part of the analysis for generating loading capacity values. Critical conditions often represent the combination of pollutant loading, waterbody conditions and other environmental conditions that result in an impairment and violation of water quality standards. Critical conditions for individual TMDLs typically depend on the water quality standards, characteristics of the observed impairments (i.e., when do exceedences occur?), source type and behavior (nonpoint versus point source), pollutant (physical, chemical, biological, conventional, nonconventional, toxic, etc.), and waterbody type (headwater, mainstem, perennial, intermittent, etc.).

The critical stream flow condition for control of a continuous point source discharge is usually a low flow condition. Point source pollution controls designed to meet water quality standards for low flow conditions can often ensure compliance with standards for other conditions. Conversely, the critical condition for wet weather-driven sources may be a specific rainfall event, resulting in high or storm flow conditions. Nutrient sources typically arise from a mixture of low-flow/continuous and storm flow driven sources. Accordingly, the presence of nutrients in surface water can and often does vary as a function of flow.

It is often easier to communicate information with a set of fixed targets. Critical points along the hydrograph can be used as an alternative method to quantify the loading capacity. For this TMDL, StreamStats was used to estimate two different flow conditions for this ungaged stream. The 4Q3 flow was used to characterize “low flow” conditions and the 2-year flood was used to characterize “high flow” conditions, as described in Sections 2.2.1 and 2.2.2. A unique loading capacity for each hydrologic zone allows the TMDL to reflect changes in dominant watershed processes that may occur under different flow regimes.

The values calculated by the low and high flow models are designed to achieve water quality standards at the defined critical stream flow condition. However, the hydrology of the Tijeras Arroyo watershed is complex and variable. As stated previously, Tijeras Arroyo contains perennial reaches with intervening intermittent reaches (Ciudad SWCD 2004). Tijeras Arroyo originates from springs in the Sandia and Manzano mountains, but surface flows completely disappear into the alluvium as the stream transitions out of the foothills and into the Rio Grande Valley to provide mountain front recharge for the Albuquerque aquifer. Since flows vary throughout the year in Tijeras Arroyo, the actual load at any given time will vary based on the changing flow. Therefore, management of the load to improve stream water quality should be the crucial goal to be attained.

2.2.1 Low Flow Condition

Limited flow observations (n=4) were collected in 2014 and 2016 (see Appendix A). The closest operational gage is located at the outlet of Tijeras Arroyo near the Rio Grande. Yet for this study it was deemed inappropriate for generating a flow model because the nature of flow at this station is ephemeral according to a 2009 SWQB Hydrology Protocol survey, coupled with a gage record that indicates 89% of days with zero flow. In the absence of appropriate gage data or adequate number of instantaneous flow measurements to calculate another flow statistic (e.g., median flow), the 4Q3 was chosen as the default low flow condition. The 4Q3 is defined as the lowest four consecutive day flow that occurs with a frequency of at least once every three years, and is often used to calculate waste load allocations and chronic criteria for aquatic life. For this TMDL, the 4Q3 was calculated based on analysis methods described by Waltemeyer (2002) for ungaged streams in New Mexico.

The appropriate Waltemeyer equation for the Four Hills Bridge to headwaters AU was chosen from one of two equations developed for the physiographic regions of NM (i.e., statewide and mountainous regions above 7,500 feet in elevation). The Tijeras Arroyo watershed mean basin elevation is 7,080 feet. Therefore, the statewide 4Q3 equation presented in Equation (Eq.) 2.1., was used (Waltemeyer 2002).

Eq. 2.1. Waltemeyer's Statewide 4Q3 (Low Flow) Equation for Regions Below 7,500 ft. Elevation.

$$4Q3 = 1.2856\times10^{-4}\, DA^{0.42}\, P_w^{3.16}$$

where, "DA" = drainage area in square miles and "P_w" = mean winter precipitation in inches.
See Appendix B for summary of calculations and equations.

For Eq. 2.1, the average standard error of estimates (SEE) and coefficient of determination are 126 and 48 percent, respectively (Waltemeyer 2002).

The input variables for Eq. 2.1 were obtained utilizing the USGS StreamStats v.3 software (USGS 2016). The StreamStats report determined average elevation, drainage area and mean winter precipitation for the watershed from its outlet at Four Hills Bridge. The calculated 4Q3 is 0.47 cubic feet per second (cfs), or 0.30 million gallons per day (mgd).

In comparison, SWQB measurements of stream flow in April 2014 and September 2016 were 0.33 cfs and 0.08 cfs respectively. In addition, SWQB reviewed old stream gage data from inactive USGS gages along Tijeras Arroyo: USGS 08330505 Tijeras Arroyo abv Four Hills bridge at Albq., NM and USGS 08330500 Tijeras Arroyo at Albuquerque, N. Mex. Stream flow data from the 1940's (08330500) and early 1990's (08330505) indicate similar values with average stream flows of 1.4 cfs and 0.19 cfs, respectively, and median flows of 0.6 cfs and 0 cfs, respectively. Overall, the trend from these two inactive gages indicates a relatively wetter period in the 1940's with flows decreasing throughout this decade (annual median flow of 1.3 cfs in 1943 versus annual median flow of 0.2 cfs in 1949) and a relatively drier period in the early 1990's with annual median flows hovering around zero. Table 2.2.1. summarizes the watershed characteristics and 4Q3 for this TMDL.

Table 2.2.1. Low Flow Condition Calculated Using Eq.2.1.

Assessment Unit	Average Elevation (ft.)	Drainage Area (DA) (mi^2)	Mean Winter Precipitation (Pw) (in.)	4Q3 (cfs)	4Q3 (mgd)
Tijeras Arroyo (Four Hills Bridge to headwaters)	7,030	76.5	7.55	0.47	0.30

2.2.2 High Flow Conditions

Estimates of peak discharge frequencies can be used to calculate high flow conditions and thus target loads. Because Tijeras Arroyo (Four Hills Bridge to Headwaters) is an ungaged stream, StreamStats (USGS 2016 and Waltemeyer 2008) was used to identify the appropriate high flow condition based on the available statistics and flow models. StreamStats implements regression equations for estimating instantaneous peak flows with probabilities of occurring in any given year of 50, 20, 10, 4, 2, 1, 0.5, and 0.2 percent. These statistics also are referred to as the 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year floods. The equations in New Mexico StreamStats, the methods used to develop them, and the limitations and errors associated with using them are documented in Waltemeyer (2008). For this TMDL, the 2-year flood was used to characterize the "high flow" condition, as represented in Equation (Eq.) 2.2. Table 2.2.1 shows the conversion from cfs to millions of gallons per day (mgd).

Eq. 2.2. Waltemeyer's Statewide 2-Year Flood (High Flow) Equation.

$$Q_2 = 1.328 \times 10^2 \times A^{0.420}$$

Where "Q_2"= (instantaneous) peak discharge in cubic feet per second with a recurrence interval of 2 years, and "A"= drainage area in square miles.
See Appendix B for summary of calculations and equations.

For Eq. 2.2, the average standard error of estimates (SEE) is 0.376 log units and 98 percent (Waltemeyer 2008). The calculated high flow condition is 821 cubic feet per second (cfs), or 531 million gallons per day (mgd). Table 2.2.2 summarizes the high flow, regional flood-frequency equation for this TMDL.

Table 2.2.2. High Flow Condition Calculated Using Eq. 2.2.

Assessment Unit	Drainage Area (mi^2)	High Flow (cfs)	High Flow (mgd)
Tijeras Arroyo (Four Hills Bridge to headwaters)	76.5	821	531

SWQB reviewed historical records from the closest active streamflow gaging station: *USGS 08330600 Tijeras Arroyo near Albuquerque, NM*, which is located approximately 14 miles southwest from the study site location. The historic annual peak flow values from USGS gage 08329700 Tijeras Arroyo near Albuquerque, NM (Figure 1.7), are comparable to the derived high flow, 2-year flood estimate of 821 cfs (red line in Figure 1.7).

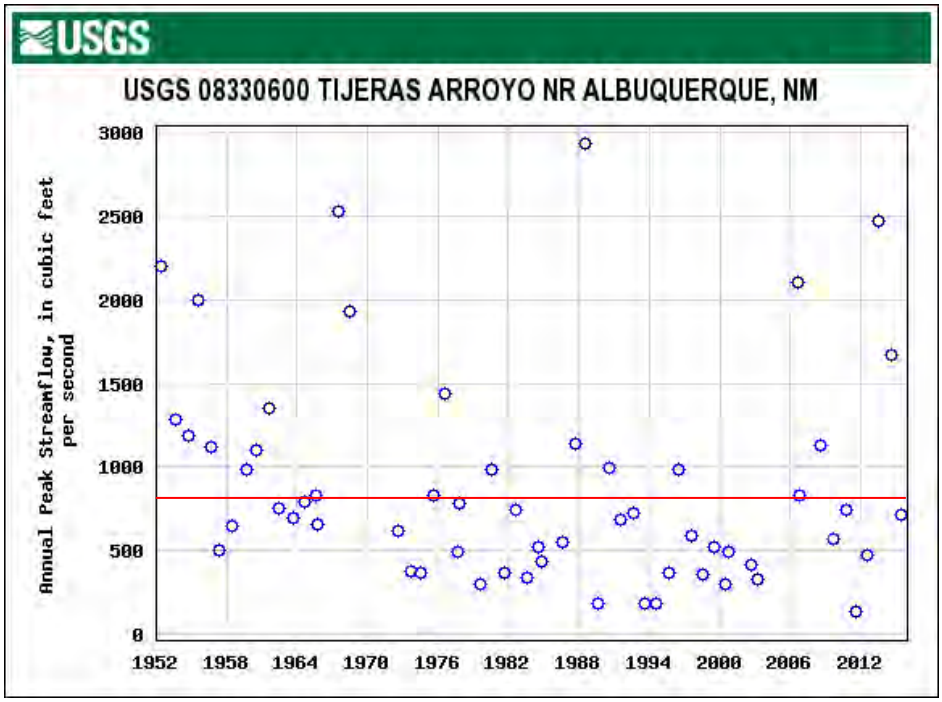


Figure 1.7. Historical (1952-2015) annual peak stream flow for USGS Gage 08330600 Tijeras Arroyo NR Albuquerque, NM (USGS 2016a).

2.3 Target Loading Capacity

This section describes the relationship between the numeric target concentration and the allowable pollutant load to determine the waterbody's total assimilative capacity, or loading capacity, for the pollutant. The loading capacity is the maximum amount of pollutant that a waterbody can receive while meeting its water quality objectives.

As a river flows downstream it has a specific carrying capacity for nutrients. This carrying capacity, or TMDL in pounds per day (lbs/day), is defined as the mass of pollutant that can be carried under critical flow conditions without violating the water quality standards. These TMDLs were developed based on 4Q3 flow, the numeric target, and a conversion factor (Appendix B). The specific carrying capacity of a receiving water for a given pollutant may be estimated using the following equation (Eq. 2.3):

Eq. 2.3. Target Load Capacity (lbs/day) calculation.

Target Load Capacity (lbs/day) = Critical Flow (mgd) x Numeric Target (mg/L) x 8.34
See Appendix B for summary of calculations and equations.

The TMDL calculation resulted in the following target loads in Tijeras Arroyo: for low flow, it calculated TP 0.15 lbs/day and for TN 0.93 lbs/day (Table 2.3.1), and for high flow, it calculated TP 270.14 lbs/day and for TN 1,639 lbs/day (Table 2.3.2).

Table 2.3.1. Target Loading Capacity for TP & TN at Low Flow.

Assessment Unit	Parameter	Low Flow (mgd)	Numeric Target (mg/L)	Conversion Factor	Target Load Capacity (lbs/day)
Tijeras Arroyo (Four Hills Bridge to headwaters)	Total Phosphorus	0.30	0.061	8.34	0.15
	Total Nitrogen	0.30	0.37	8.34	0.93

Table 2.3.2. Target Loading Capacity for TP & TN at High Flow.

Assessment Unit	Parameter	High Flow (mgd)	Numeric Target (mg/L)	Conversion Factor	Target Load Capacity (lbs/day)
Tijeras Arroyo (Four Hills Bridge to headwaters)	Total Phosphorus	531	0.061	8.34	270
	Total Nitrogen	531	0.37	8.34	1,639

2.4 Margin of Safety

The CWA requires that each TMDL be calculated with a Margin of Safety (MOS). This statutory requirement that TMDLs incorporate a MOS is intended to account for uncertainty in available data or in the actual effect controls will have on loading reductions and receiving water quality. A MOS may be expressed as unallocated assimilative capacity or conservative analytical assumptions used in establishing the TMDL (e.g., derivation of numeric targets, modeling assumptions or effectiveness of proposed management actions).

The MOS was developed using a combination of conservative assumptions and inputs and explicit recognition of potential errors in flow calculations that follow these assumptions:

- *Conservative Assumptions (Implicit):*
    - Treating phosphorus and nitrogen as pollutants that do not readily degrade in the environment.

- *Explicit recognition of potential errors:*
    - Critical flow for this TMDL was estimated utilizing the low-flow and high-flow models for ungaged streams (Waltemeyer 2002, 2008). A level of uncertainty is associated with flow measurement and modeling.
        - Accordingly, an explicit MOS of 5 percent for flow was assigned to this TMDL

    - A level of uncertainty exists in sampling nonpoint sources of pollution.
        - Accordingly, an explicit MOS of 10 percent for sampling was assigned to this TMDL.

Therefore, the total explicit MOS assigned to this nutrient TMDL is 15%.

2.5 Waste Load Allocations (WLA)

2.5.1 Individual NPDES Permits

The Tijeras Arroyo assessment unit watershed contains one individual permit issued to GCC Rio Grande, Inc. (NM0000116) by USEPA Region 6 under the National Pollutant Discharge Elimination System (NPDES). This permit was renewed on June 1, 2016 and expires May 31, 2021. The permit is classified under Standard Industrial Classification (SIC) [3241] which identifies the manufacture of hydraulic cement. The permit authorizes storm water discharge due to catastrophic or chronic precipitation from Outfall 001 onto the receiving waters of Corral Canyon, an ephemeral tributary of Tijeras Arroyo. This outfall is approximately 0.6 miles from the impaired AU of the Tijeras Arroyo.

GCC Rio Grande contains within its facility a retention pond called "Sediment Pond No. 1/Outfall 001," which holds process water effluent from the plant area and any storm water runoff. Discharges from Outfall 001 typically only occur during near flood conditions within the retention pond and from two documented controlled discharges which occurred June and September of 2015. Some of the potential pollutants associated with storm water from cement manufacturers include total suspended solids, aluminum, iron and other heavy metals, pH, chemical oxygen demand, potassium, sulfate, and oil and grease. Based on the fact sheet for the current NPDES permit, USEPA does not consider this industrial operation to be a probable contributor to the nutrient impairment due to the nature of the operation and frequency of storm events. Therefore, there is no WLA for nutrients included in this TMDL for this facility.

2.5.2 Municipal Separate Storm Sewer System (MS4) Permits

According to 40 CFR §122.26(b)(8) a Municipal Separate Storm Sewer System (MS4) is defined as a conveyance or system of conveyances owned by a state, city, town, or other public entity that discharges to waters of the United States and is designed or used for collecting or conveying storm water (USEPA 2000). Because this is a storm water permit, MS4 permits and associated MS4 WLAs are only applicable during storm (i.e., high) flow. Regulated conveyance systems include roads with drains, municipal streets, catch basins, curbs, gutters, storm drains, piping, channels, ditches, tunnels and conduits. Combined sewer overflows and publicly-owned treatment works are not regulated under MS4 permits. The federal CWA requires storm water discharges from certain types of urbanized areas to be permitted under the NPDES program. The contributing urban area for this TMDL is authorized to discharge under the NPDES General Permit No. NMR04A000.

This permit includes Special Conditions (Part I.C.2.b.ii.a) that requires the permittees to evaluate how their discharges affect the impaired waterbody. The Special Conditions for the NPDES MS4 General Permit No NMR04A000 (Permit), (Part I.C.2.b.ii.a) state the following:

> *"(a) Discharging a Pollutant of Concern: The permittee shall:*
>
> *A. Determine whether the MS4 may be a source of the pollutant(s) of concern by referring to the CWA §303(d) list and then determining if discharges from the MS4 would be likely to contain the pollutant(s) of concern at levels of concern. The evaluation of CWA §303(d) list parameters should be carried out based on an analysis of existing data (e.g., Illicit Discharge and Improper Disposal Program) conducted within the permittee's jurisdiction.*
>
> *B. Ensure that the SWMP includes focused BMPs, along with corresponding measurable goals, that the permittee will implement, to reduce, the discharge of pollutant(s) of concern that contribute to the impairment of the water body. (note: Only applicable if the permittee determines that the MS4 may discharge the pollutant(s) of concern to an impaired water body without a TMDL. The SWMP submitted with the first annual report must include a detailed description of proposed controls to be implemented along with corresponding measurable goals.*

C. Amend the SWMP to include any additional BMPs to address the pollutant(s) of concern."

The NPDES General Permit No. NMR04A000 area includes jurisdictional components for three co-permittees: Bernalillo County (County), City of Albuquerque (COA), and the New Mexico Department of Transportation (NMDOT). To address the Special Conditions of the General Permit, the permittees developed a "Pre-TMDL study" within the Tijeras Arroyo (Four Hills Bridge to headwaters) AU (Bernalillo et al 2016) for the following parameters: Total Nitrogen, Total Kjeldahl Nitrogen, Nitrite, Nitrate and Total Phosphorous. The results of the study did not alter the conclusion of impairment for nutrients.

The MS4 discharge WLA for this AU has been determined based on the percent of jurisdictional (urban) area within the respective contributing watershed area. The percent and total jurisdictional area, per area nutrient loadings, and resultant MS4 WLA for the AU are presented in Table 2.4. For more information regarding the jurisdictional allocation of MS4 loads and per area nutrient loading values, see Appendix C.

MS4s can be a significant source of nutrients because they transport urban runoff that can be affected by pet and wildlife waste, illicit sewer connections, failing septic systems, lawn and agricultural fertilizer, construction, and streambank erosion from hydrologic modifications. An increase in urban spread and population growth can increase the sources of nutrients.

MS4 conveyances within urbanized areas have one of the greatest potentials for polluted storm water runoff. The Federal Register Final Rule explains the reason as:

> *"…urbanization alters the natural infiltration capacity of the land and generates...pollutants...causing an increase in storm water runoff volumes and pollutant loadings."* (USEPA 2005)

A small percentage of the jurisdictional (urban) area falls within the Tijeras Arroyo (Four Hills Bridge to headwaters) AU (Figure 2.1). The MS4 WLA for this area was determined using the jurisdictional area approach discussed in Appendix C. The Albuquerque, NM urbanized area incorporated jurisdictional (urban) area in the Tijeras Arroyo (Four Hills Bridge to headwaters) contributing watershed is 1.5 mi^2, which is 2 percent of this 76.5 mi^2 contributing watershed area.

For the NPDES NMR04A000 Storm water permit, waste load allocations (WLA) were calculated per the 1.5 mi^2 of jurisdictional area. This calculation included the Urbanized Areas within the contributing watershed that were determined using GIS data associated with the 2000 and 2010 Census – 2010 TIGER Files (USCB 2016). Table 2.4 summarizes the MS4 information and wasteload allocations.

Table 2.4. MS4 Information Chart with Wasteload Allocations for TP and TN.

Assessment Unit: Tijeras Arroyo (Four Hills Bridge to headwaters) **Storm water permit #:** NPDES NMR04A000 **MS4 jurisdictional area:** 1.5 mi^2 **Jurisdictional Area Percentage in respect to watershed:** 2%		
Parameter	**Total Phosphorus (TP)**	**Total Nitrogen (TN)**
Target Load (lbs/day) at low flow	0.128[1]	0.791[1]
Target Load (lbs/day) at high flow	230[1]	1,393[1]
Wasteload Allocation (lbs/day) at low flow	0.003	0.016
Wasteload Allocation (lbs/day) at high flow	5	28

1 "Target Load" is the available allocation for point and nonpoint sources of pollution and is equal to the TMDL minus the 15% MOS (Target Load = TMDL – MOS).

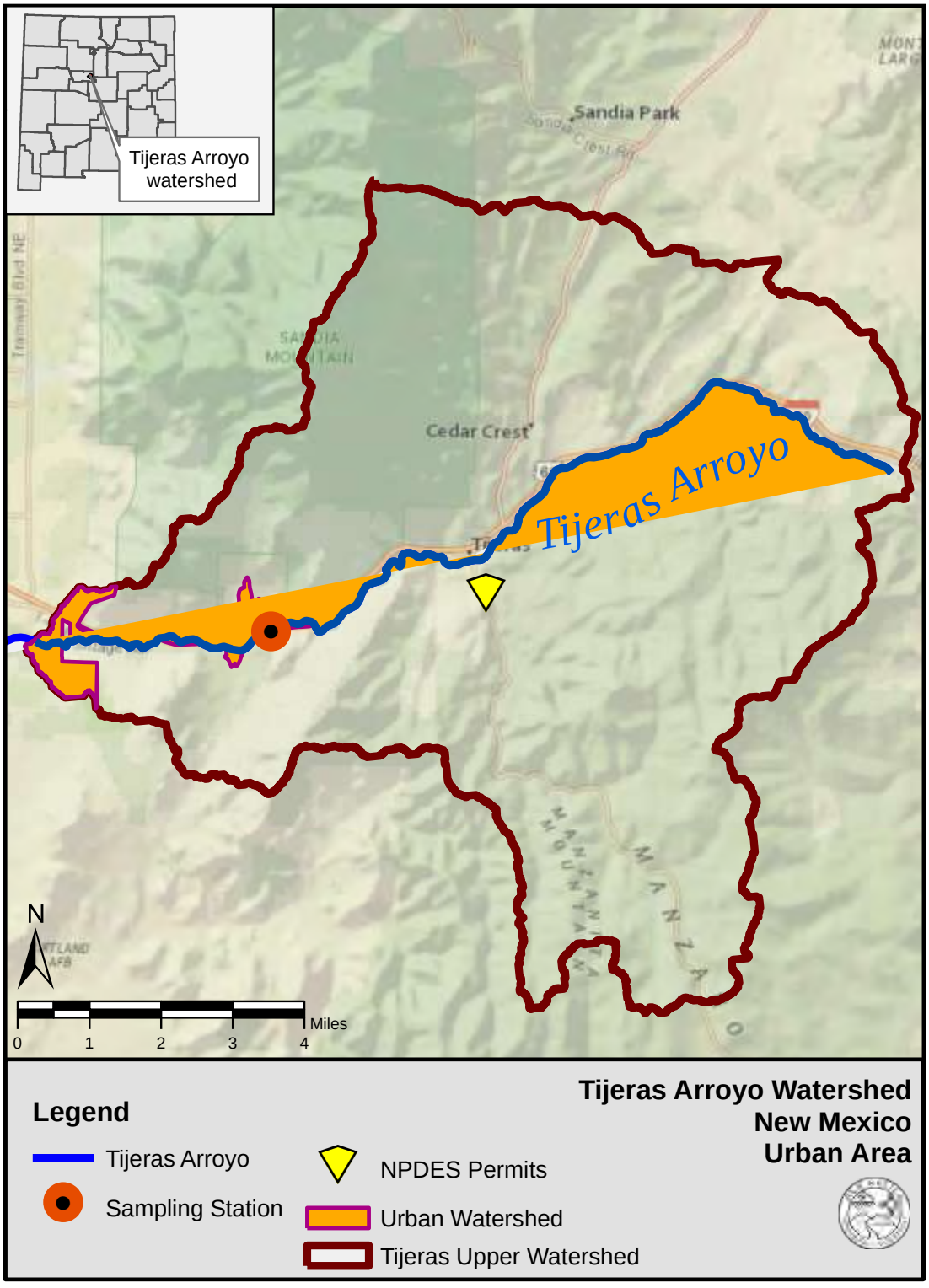


Figure 2.1. Upper Tijeras Arroyo watershed MS4 Urban Area.

If at some time in the future there is a change to the Tijeras Arroyo jurisdictional urbanized area, revised MS4 allocations in this TMDL document can be calculated using the applicable per area nutrient loading value in Table C.2 of Appendix C as follows:

$$\text{MS4 WLA (lbs/day)} = \text{Nutrient Loading Factor (lbs/day/mi}^2\text{)} \times \text{(jurisdictional area in mi}^2\text{)}$$

The load allocation would also be adjusted depending on changes to the urbanized area jurisdiction. This adjustment maintains the overall TMDL via a consistent per area watershed loading and transfers load between the LA and MS4 WLA. The change would be consistent with the overall goals of this TMDL. It would not require a formal revision to be implemented within an NPDES storm water permit. Future jurisdictional area changes can be adjusted utilizing a per area loading. Details of per area loading adjustments can be found in Appendix C.

2.5.3 NPDES CGP and MSGP Permits

Sediment and associated nutrients are considered components of industrial storm water discharges covered under National Pollutant Discharge Elimination System (NPDES) General Permits.

Storm water discharges from construction activities are transient—occurring mainly during the construction itself, and then only during storm events. Storm water discharges may also include other pollutants depending upon the industrial activity. Coverage under the NPDES Construction General Permit (CGP) for construction sites with disturbance of one or more acres, or smaller if part of a greater common plan of development, require the preparation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP includes identification and control of all pollutants associated with the construction activity to minimize impacts to water quality.

The current CGP, effective on February 16, 2017, includes New Mexico-specific requirements that the SWPPP must incorporate site-specific interim and permanent stabilization, managerial and structural solids, erosion, and sediment control best management practices (BMPs) and/or other controls that are designed to prevent to the maximum extent practicable an increase in the sediment yield and flow velocity from preconstruction, pre-development conditions to assure that applicable standards in 20.6.4 NMAC, including the antidegradation policy, or WLAs are met. This requirement applies to discharges both during construction and after construction operations have been completed.

Storm water discharges from other industrial activities and facilities (e.g., manufacturing; mining; oil and gas extraction activities that are not exempt; hazardous waste treatment, storage or disposal facilities; landfills; automobile salvage yards; scrap recycling, steam electric generating; transportation; warehousing; major waste water treatment works, etc.), based on certain industrial classification codes or systems, may be eligible to be covered under the current NPDES Multi-Sector General Permit (MSGP).

The MSGP also requires preparation of a SWPPP that includes identification and control of all pollutants associated with the industrial activities to minimize impacts to water quality. Some of the industrial facilities and activities covered under the MSGP have technology based effluent limits and/or benchmark monitoring for pollutants. The current MSGP, effective June 4, 2015, includes New Mexico-specific requirements that the benchmark values reflect State of New Mexico WQS.

Implementation of a SWPPP that meets the requirements of the CGP and/or MSGP is generally assumed to be consistent with this TMDL. Individual WLAs for the general permits are not possible to calculate at this time in this watershed using available tools. Loads from facilities that are in compliance with the CGP and/or MSGP are currently calculated as part of the Load Allocation. While these sources are not given individual allocations, they are addressed through other means, including best management practices (BMPs), SWPPPs, and other requirements. Table 2.5 provides a summary of all nutrient WLAs for the Tijeras Arroyo.

2.6 Load Allocations

Load allocations (LA) are calculated to determine the nonpoint source (NPS) contributions to the TMDL. Nonpoint sources include all other categories not classified as point sources (i.e., WLAs). Nonpoint sources can include pet waste, storm water runoff (originating from outside of the MS4 jurisdictional area), channelization, drought-related impacts, on-site treatment systems (Septic Systems and Similar Decentralized Systems), rangeland grazing, and unknown sources. In rural areas, nonpoint sources commonly include runoff from cropland, pastures and animal feeding operations, as well as inputs from streambank erosion, leaking or failing septic systems, and wildlife. When it comes to non-point source contributions, “nutrients, in particular, are always present, although in some aquatic systems their concentrations are very low” (Jarrell 2003).

The extensive data collection and analyses necessary to determine background nutrient loads for Tijeras Arroyo were beyond the resources available for this study. It is therefore assumed that a portion of the LA is made up of natural background loads.

To calculate the LA for TP and TN, the WLA and MOS were subtracted from the target capacity (TMDL) using Eq. 2.4. The LA for Tijeras Arroyo at low flow were 0.125 lbs/day for TP and 0.775 lbs/day for TN. The LA for Tijeras Arroyo at high flow were 225 lbs/day for TP 1,365 lbs/day for TN. See summary Table 2.5.1 and 2.5.2.

Eq. 2.4. LA calculation.

$\sum LA = TMDL - \sum WLA - MOS$
See Appendix B for summary of calculations and equations.

2.7 Total Maximum Daily Loads (TMDLs) for TN and TP in Tijeras Arroyo

Results of the allocation calculations are presented in Table 2.5.1 for low flow and 2.5.2 for high flow.

Table 2.5.1. TN and TP TMDLs for Tijeras Arroyo (Four Hills Bridge to Headwaters) for Low Flow Conditions.

Pollutant	WLA[1] (lbs/day)	LA (lbs/day)	MOS (15%) (lbs/day)	TMDL (lbs/day)
Total Phosphorus	0.003	0.125	0.022	0.15
Total Nitrogen	0.016	0.775	0.139	0.93

1 WLA is allocated to the Middle Rio Grande MS4 and sMS4, NPDES Permit No. NMR04A000

Table 2.5.2. TN and TP TMDLs for Tijeras Arroyo (Four Hills Bridge to Headwaters) for High Flow Conditions.

Pollutant	WLA[1] (lbs/day)	LA (lbs/day)	MOS (15%) (lbs/day)	TMDL (lbs/day)
Total Phosphorus	5	225	40	270
Total Nitrogen	28	1,365	246	1,639

1. WLA is allocated to the Middle Rio Grande MS4 and sMS4, NPDES Permit No. NMR04A000

2.8 Consideration of Seasonal Variation.

Federal regulations (40 CFR § 130.7(c)(1)) require that TMDLs take into consideration seasonal variation in watershed conditions and pollutant loading. Data used in the calculation of this TMDL were collected during spring, summer, and fall of 2014 and in the fall of 2016. In 2014, exceedences were observed from March through October, during all seasons, which captured flow alterations related to snowmelt, the growing season, and summer monsoonal rains. Calculations made during critical conditions, in addition to using other conservative assumptions as described in previous sections, should be protective of the water quality standards designed to preserve aquatic life in the stream. It was assumed that if WQS were met during this time, coverage of any potential seasonal variation would also be met.

2.9 Identification and Description of Pollutant Sources.

SWQB fieldwork includes an assessment of the probable sources of impairment. The approach for identifying these includes input from a variety of stakeholders including landowners, watershed groups, and local, state, tribal and federal agencies. Probable Source Sheets are filled out by SWQB

staff during watershed surveys and watershed restoration activities (Appendix D). The draft probable source list will be reviewed and modified, as necessary, with watershed group/ stakeholder input during the TMDL public meeting and comment period.

The Probable Source Identification Sheets in Appendix D provide an approach for a visual estimation of a pollutant source along an impaired reach. Although this procedure is subjective, SWQB believes that it provides the best available information for the identification of probable sources of impairment in a watershed. The list of "Probable Sources" is not intended to single out any particular land owner or land management activity, and generally includes several probable sources for each known impairment. Table 2.6 displays probable sources of impairment along the AU as determined by field reconnaissance and knowledge of watershed activities. Probable non-point sources of nutrient impairment are further evaluated and refined through SWQB Watershed Protection Section activities such as the Watershed-Based Plan (WBP) process and subsequent watershed restoration design process. Point sources are identified and regulated through the NPDES program.

Table 2.6. Pollutant Sources.

Assessment Unit	Probable Sources*
Tijeras Arroyo (Four Hills Bridge to headwaters)	Channelization, Drought-related Impacts, Natural sources, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Rangeland Grazing, Urban Runoff/Storm Sewers, Wastes from Pets

*Refer to Appendix D for additional information on probable sources.

2.10 Future Growth

The New Mexico Bureau of Business and Economic Research, the population growth estimates and projections for Bernalillo county project a 2.18 percent growth rate within the years 2015-2020 with a projected population of 905,393 by the year 2020 (Alcantara et al. 2008).

The largest concentrated populations in the Tijeras Arroyo watershed are Cedar Crest, Carnuel, and Tijeras Village, New Mexico. Tijeras Village population increased from an estimate of 494 in 1990 to 515 in 2009 (USCB 2003). Population estimates for Cedar Crest and Carnuel were 1,060 and 872, respectively, in 2000 (USCB 2003). These communities will likely experience marginal growth in population based on the projected growth for Bernalillo County.

These future projections are an indication that nutrient loading is likely to increase as the region continues to grow and develop, BMPs should continue to be utilized in this watershed to control pet wastes, properly install and maintain septic systems, manage livestock grazing, and adhere to SWPPP requirements related to construction and industrial activities covered under the general permit.

The existing Watershed Restoration Action Strategy (WRAS) for the Upper Tijeras Creek Watershed was prepared before the 2005 watershed survey which identified nutrients as a cause of impairment in these watersheds (Ciudad SWCD 2004). Several of the probable sources of pollutants noted in Table 2.6 were mentioned as stakeholder concerns in this document. Revisions should include a framework for design, implementation, and maintenance of BMPs that specifically address the watershed pollutants addressed by this TMDL.

In addition, the SWQB's Watershed Protection Section will continue to work with watershed groups to update and revise the existing WRAS to implement strategies that attempt to correct the water quality impairments detailed in this document. Implementation of items detailed in the WRAS/WBP will be done with participation of all interested and affected parties.

3.0 APPLICABLE REGULATIONS AND REASONABLE ASSURANCES

New Mexico's Water Quality Act (Act), NMSA 1978 §§ 74-6-1 to -17, authorizes the WQCC to "promulgate and publish regulations to prevent or abate water pollution in the state" and to require permits. The Act authorizes a constituent agency to take enforcement action against any person who violates a water quality standard. Several statutory provisions on nuisance law could also be applied to NPS water pollution. The Act also states in Section 74-6-12(A):

> *The Water Quality Act (this article) does not grant to the commission or to any other entity the power to take away or modify the property rights in water, nor is it the intention of the Water Quality Act to take away or modify such rights.*

In addition, the State of New Mexico Surface WQS (20.6.4.6.C NMAC) states:

> *Pursuant to Subsection A of Section 74-6-12 NMSA 1978, this part does not grant to the water quality control commission or to any other entity the power to take away or modify property rights in water.*

New Mexico policies are in accordance with the federal CWA §101(g):

> *It is the policy of Congress that the authority of each State to allocate quantities of water within its jurisdiction shall not be superseded, abrogated or otherwise impaired by this Act. It is the further policy of Congress that nothing in this Act shall be construed to supersede or abrogate rights to quantities of water which have been established by any State. Federal agencies shall co-operate with State and local agencies to develop comprehensive solutions to prevent, reduce and eliminate pollution in concert with programs for managing water resources.*

New Mexico's CWA §319 Program has been developed in a coordinated manner with the State's §303(d) process. All §319 watersheds that are targeted in the annual RFP process coincide with the

State's biennial impaired waters list as approved by USEPA. The State has given a high priority for funding, assessment, and restoration activities to these watersheds.

As a constituent agency, NMED has the authority under NMSA 1978, Section 74-6-10(A) to issue a compliance order or commence civil action in district court for appropriate relief if NMED determines that actions of a "person" (as defined in the Act) have resulted in a violation of a water quality standard including a violation caused by a NPS. The NMED NPS water quality management program has historically strived for and will continue to promote voluntary compliance to NPS water pollution concerns by utilizing a voluntary, cooperative approach. The State provides technical support and grant monies for implementation of BMPs and other NPS prevention mechanisms through §319 of the CWA. Since portions of this TMDL will be implemented through NPS control mechanisms, the New Mexico Nonpoint Source Management Program will target efforts to this and other watersheds with TMDLs.

To obtain reasonable assurances for implementation in watersheds with multiple landowners, including federal, state, and private land, NMED has established Memoranda of Understanding (MOUs) with various federal agencies, including the U.S. Forest Service (USFS) and the Bureau of Land Management (BLM). MOUs have also been developed with other state agencies, such as the New Mexico Department of Transportation. These MOUs provide for coordination and consistency in dealing with NPS issues.

The time required to attain standards for all reaches is estimated to be approximately 10-20 years. This estimate is based on a five-year time frame implementing several watershed projects that may not be starting immediately or may be in response to earlier projects. Stakeholders in this process will include SWQB, and other parties identified in the WBP. The cooperation of watershed stakeholders will be pivotal in the implementation of these TMDLs as well.

4.0 PUBLIC PARTICIATION

Public participation was solicited in development of this TMDL. The draft Tijeras Arroyo Nutrient TMDL was first made available for a 30-day public comment period beginning June 12, 2017 and ending on July 12, 2017. A public meeting was held in Tijeras Village Hall on June 20, 2017. NMED met with representatives from the City of Albuquerque, Ciudad Soil and Water Conservation District, NM Department of Transportation, and Bernalillo County in a MS4 stakeholders meeting on July 6, 2017 at the MRG-MS4 Technical Advisory Group meeting on August 2. NMED also met in person with representatives of GCC Rio Grande, Inc. on June 8, 2017. The draft document notice of availability was extensively advertised via email distribution list (1,453 addresses), webpage postings, and press releases to area newspapers (Albuquerque Journal: June 12 and Mountain View Telegraph (Tijeras local newspaper): June 15). Response to public comments is included as Appendix D this TMDL report.

The TMDL was approved by the WQCC on September 12, 2017 and EPA on October 12, 2017. The next step will be revision of the WRAS or development of a new WBP and implementation of watershed restoration projects, including those that may be funded by CWA §319(h) grants managed by SWQB.

5.0 REFERENCES

Alcantara, A.N., Ruan, X., Baker J., Frey, M.A., Croose, N., Morehouse J.L. and Rajbhandari R. (2008) New Mexico County Population Projections July 1, 2005 to July 1, 2035. <http://unmwest.unm.edu/common/docs/reports/B_Projections_Summary_Narrative.pdf>

Bernalillo County, City of Albuquerque and New Mexico Department of Transportation. 2016. Pre-TMDL Cooperative Nutrient Study For Tijeras Arroyo 2016. Albuquerque, NM.

Ciudad Soil and Water Conservation District (Ciudad SWCD). 2004. Watershed Restoration Action Strategy (WRAS) for the Upper Tijeras Creek Watershed. Albuquerque, NM. <http://www.nmenv.state.nm.us/swqb/wps/WRAS/Tijeras_Creek_13020203_WRAS_Jun_2004.pdf>

Jarrell M.W. (2003). Water monitoring for watershed planning and TMDLs; University of Illinois. Department of Natural Resources and Environmental Sciences.; YSI, Inc.

New Mexico Administrative Code (NMAC). 2013. State of New Mexico Standards for Interstate and Intrastate Streams. 20.6.4 NMAC. As amended through June 5, 2013. <http://164.64.110.239/nmac/parts/title20/20.006.0004.pdf>

New Mexico Environment Department/Surface Water Quality Bureau (NMED/SWQB). 2008. State of New Mexico 2008-2010 Clean Water Act Integrated §303(d) / §305(b) List of Assessed Waters. Santa Fe, NM. <https://www.env.nm.gov/swqb/303d-305b/>

_____. 2011. Statewide Water Quality Management Plan and Continuing Planning Process (WQMP/CPP). Santa Fe, NM. <https://www.env.nm.gov/swqb/Planning/WQMP-CPP/>

_____. 2015. Sampling Summary: Middle Rio Grande and Tributaries. Santa Fe, NM. <https://www.env.nm.gov/swqb/MAS/surveys/2014MRGTribsFINAL090315.pdf >

_____. 2016a. Quality Assurance Project Plan for Water Quality Management Programs. Surface Water Quality Bureau. Santa Fe, NM. <https://www.env.nm.gov/s2007wqb/QAPP>

_____. 2016b. Standard Operating Procedures for Data Collection. July 26, 2007. Santa Fe, NM.

_____. 2016c. State of New Mexico 2016-2018 Clean Water Act Integrated §303(d) / §305(b) List of Assessed Waters. Santa Fe, NM. <https://www.env.nm.gov/swqb/303d-305b/>

_____. 2017. 2018-2020 Comprehensive Assessment and Listing Methodology (CALM). Santa Fe, NM. <https://www.env.nm.gov/swqb/protocols/>

Omernik, J.M. 2006. Level III and IV Ecoregions of New Mexico (Version 1). U.S. Environmental Protection Agency, Washington, D.C.

U.S. Census Bureau (USCB). 2003. New Mexico: 2000 Census of Population and Housing Unit Counts. PHC-3-33. Washington, DC. <http://www.census.gov/prod/cen2000/phc-3-33.pdf.>

_____. 2016. Topologically Integrated Geographic Encoding and Referencing, 2016 TIGER/Line Shapefiles. <https://www.census.gov/geo/maps-data/data/tiger-line.html>

U.S. Environmental Protection Agency (USEPA). 1994. *Implementation Guidance for Water Quality Standards for Interstate and Intrastate Streams in New Mexico.* EPA Region 6, Water Management Division, Permits Branch, Washington, D.C.

_____. 1999. Draft Guidance for Water Quality-based Decisions: The TMDL Process (Second Edition). August. EPA 841-D-99-001. Office of Water, Washington, D.C.

_____. 2000. Storm Water Phase II Compliance Assistance Guide. EPA 833-R-00-002. March. Office of Water, Washington, D.C.

_____. 2005. *Stormwater Phase II Final Rule.* EPA 833-F-00-002. December. Office of Water, Washington, D.C.

U.S. Geologic Service (USGS). 2016. StreamStats, Version 3. Available at: http://water.usgs.gov/osw/streamstats/new_mexico.html

_____. 2016a. National Water Information System data available on the World Wide Web (USGS Water Data for the Nation). Accessed July 5, 2017. At URL: <https://waterdata.usgs.gov/nm/nwis/inventory/?site_no=08330600&agency_cd=USGS>

Waltemeyer, Scott D. 2002. Analysis of the Magnitude and Frequency of the 4-Day Annual Low Flow and Regression Equations for Estimating the 4-Day, 3-Year Low-Flow Frequency at Ungaged Sites on Unregulated Streams in New Mexico. USGS Water-Resources Investigations Report 01-4271. Albuquerque, New Mexico.

_____. 2008. Analysis of the Magnitude and Frequency of Peak Discharge and Maximum Observed Peak Discharge in New Mexico and Surrounding Areas. USGS Water-Resources Investigations Report 2008-5119. Albuquerque, New Mexico.

APPENDIX A Tijeras Arroyo Nutrient and Flow Data (2014-2016)

Table A1. Nutrient Sampling Data Results.

Total nitrogen data for station ID: Cripple Creek Rd. near Carnuel, 32Tijera026.0				
Sample date	**Sample Parameter**	**Sample Value mg/L**	**Total Nitrogen mg/L**	**Nitrogen numeric threshold more than 0.37 mg/L?**
3/27/2014	Total Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	0.30	*	not assessable data
4/23/2014	Total Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	0.13	*	not assessable data
5/29/2014	Total Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	0.11	*	not assessable data
7/24/2014	Total Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	0.24	*	not assessable data
8/21/2014	Total Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	0.46	0.46	YES Exceedence
9/26/2014	Total Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	0.21	*	not assessable data
10/23/2014	Total Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	0.18	*	not assessable data
9/8/2016	Total Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	0.39	0.39	YES Exceedence
9/16/2016	Total Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	0.43	0.43	YES Exceedence

***** *Sample data were not assessable due to minimum reported limits not meeting assessment acceptance criteria (NMED/SWQB 2017).*

Table A2. Flow Sampling Data Results.

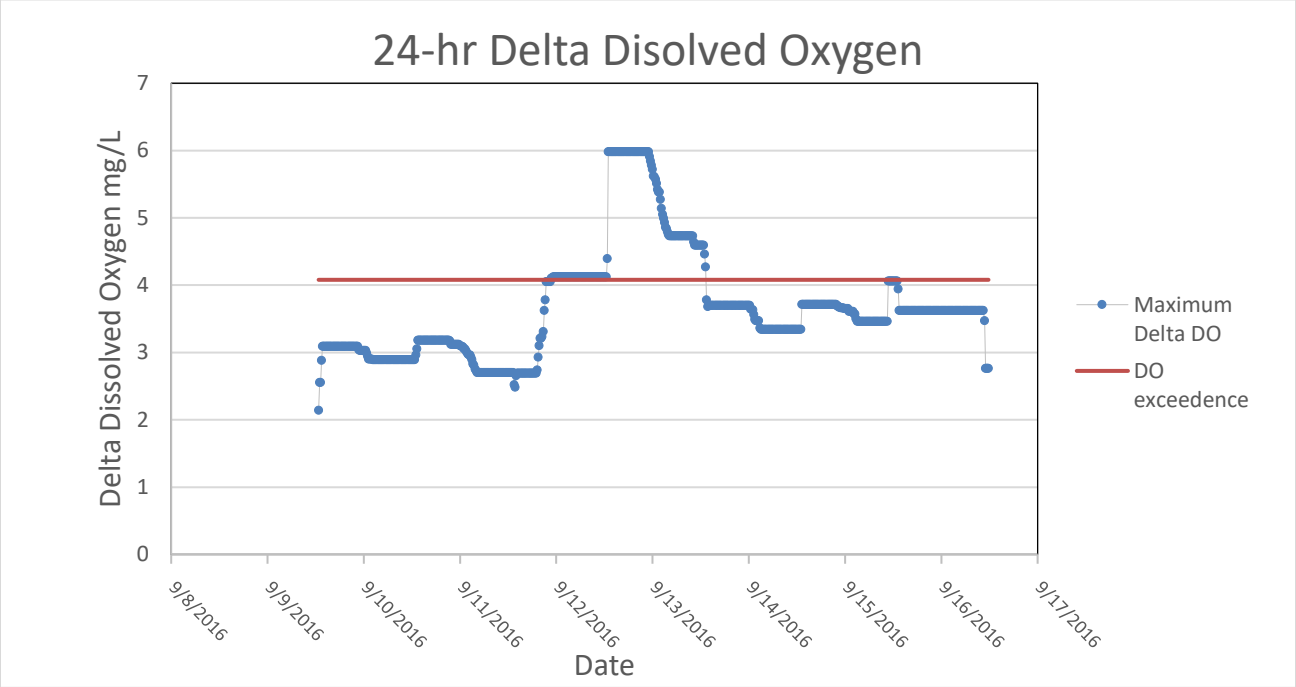
Sample date	Sample Parameter	Sample Value cfs	Sample method
4/23/2014	FLOW	0.33	flow meter
5/29/2014	FLOW	1.30	visual
9/8/2016	FLOW	0.08	flow meter
9/16/2016	FLOW	1.00	visual

Table A3. Max Delta Dissolved Oxygen Results.

Date	Max Delta DO*	Delta DO greater than impairment threshold? (> 4.08 mg/L?)
9/9/2016	3.09	No
9/10/2016	3.18	No
9/11/2016 (rain event)	4.12	YES Exceedence
9/12/2016 (rain event)	5.98	YES Exceedence
9/13/2016	5.72	YES Exceedence
9/14/2016	3.71	No
9/15/2016	4.06	No
9/16/2016	3.62	No

** Listing methodology for DO can be found (NMED/SWQB 2017).* The revisions to the values in Table A3 are a result of a change in the calculation of Delta DO consistent with the definition in the 2017 CALM. The previous values were based on the minimum-maximum difference during a calendar day instead of during a 24-hour period.

Figure A1. 24-hour Delta of Dissolved Oxygen Sample Results from 9/08/2016 – 9/17/2016.



APPENDIX B Tijeras Arroyo Calculations and Equations Summary

Descriptor	Units	Low Flow		High Flow	
Parameter	NA	TP	TN	TP	TN
Water Quality parameter (WQP) Numeric Target	mg/L	0.061	0.37	0.061	0.37
Conversion Factor	NA	8.34	8.34	8.34	8.34
1. Flow	mgd	0.30	0.30	531	531
2. TMDL	lbs/day	0.15	0.93	270	1,639
3. Margin of Safety (MOS)	%	15%	15%	15%	15%
4. MOS at 15%	lbs/day	0.022	0.139	40	246
5. Target Load (TL) = WLA + LA	lbs/day	0.128	0.791	230	1,393
6. Jurisdictional area	mi^2	1.5 mi^2 or 2%	1.5 mi^2 or 2%	1.5 mi^2 or 2%	1.5 mi^2 or 2%
7. Wasteload Allocation (WLA)	lbs/day	0.003	0.016	5	28
8. Load Allocation (LA)	lbs/day	0.125	0.775	225	1,365

1. Flow

Low Flow (mgd), Eq.2.1.

$$4Q3 = 1.2856\times10^{-4}\ DA^{0.42}\ P_w^{3.16}$$

4Q3 (cfs) = Four-day, three-year low-flow frequency (cfs)
4Q3 (mgd) = 4Q3 values were converted from cubic feet per second (cfs) to units of million gallons per day (mgd)
DA = Drainage area (mi^2)
P_w = Average basin mean winter precipitation (inches)

High Flow (mgd), Eq.2.2.

$$Q_2 = 1.328 \times 10^2 \times A^{0.420}$$

Q= instantaneous peak discharge, A= Drainage area

2. TMDL (lbs/day), Eq. 2.3.

TMDL (lbs/day) = Flow (mgd) x Numeric Target (mg/L) x 8.34
Low flow TP: 0.30 x 0.061 X 8.34= 0.15
Low flow TN:0.30 X 0.37 X 8.34= 0.93
High Flow TP: 531x0.061x8.31= 270
High Flow TN: 531x0.37x8.31= 1,639

3. Margin of Safety (MOS)

Flow model for ungaged streams: an explicit MOS of 5% was assigned to this TMDL.
Level of uncertainty exists in sampling nonpoint sources of pollution: an explicit MOS of 10 % was assigned to this TMDL. Equal to an MOS of 15%.

4. MOS at 15%

TMDL (lbs/day) × 15% = Explicit MOS
Low flow TP: 0.15 × 15% = 0.022
Low flow TN: 0.93 × 15% = 0.139
High Flow TP: 270.14 x 15%= 40
High Flow TN: 1638.56 x 15%= 246

5. Available allocations

Available for LA and MS4 WLA = TMDL–MOS (15%)
Low flow TP: 0.15 - 0.022 = 0.128
Low flow TN: 0.93 - 0.139 = 0.791
High Flow TP: 270 – 40 = 230
High Flow TN: 1639 – 246 = 1393

6. Jurisdictional area

MS4 jurisdictional area /Water shed area
1.46 mi^2/ 76.5 mi^2 ≈ 2%

7. Wasteload Allocation (WLA)

TL x Jurisdictional area
Low Flow TP: 0.13 x 0.02 = 0.003
Low Flow TN: 0.79 x 0.02 = 0.016
High Flow TP: 229.62 x 0.02 = 5
High Flow TN: 1392.78 x 0.02 = 28

8. Load Allocation (LA) Eq. 2.4.

LA = TMDL – WLA – MOS
Low Flow TP: 0.15 - 0.003 - 0.02 = 0.125
Low Flow TN: 0.93 - 0.016 - 0.14 = 0.775
High Flow TP: 270.14 - 4.6 - 40.52 = 225
High Flow TN: 1638.56 - 27.9 - 245.78 = 1,365

APPENDIX C Jurisdictional Area Approach

EPA released a memo entitled "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs" in November 2002 clarifying EPA regulations regarding Waste Load Allocations (WLA) and Municipal Separate Storm Sewer Systems (MS4s) in TMDLs; a revision to the memo was released in 2010. In November 2008, EPA released the draft TMDLs to Stormwater Handbook to provide guidance to states as to how to include WLAs for MS4s in TMDLs. The handbook provides a number of options for states to consider when developing TMDLs that include MS4 allocations. One of the waterbody-based approaches to TMDL development includes the jurisdictional area approach:

> *"Jurisdictional area: loading capacity is allocated to permitted stormwater sources (and other land-based sources) on the basis of the portion of the drainage area included within their physical boundary. Without knowing the specific area draining to a stormwater conveyance system, the stormwater source area can be represented by the jurisdictional or operational area of the source (e.g., urbanized area for an MS4). For example, if the loading capacity is 100 lbs/day and the urbanized area of an MS4 represents 30 percent of the area draining to the assessment location, the MS4 WLA is specified as 30 lbs/day."*

The excerpts from the TMDLs to Stormwater Handbook provide the framework from which SWQB developed the WLA for each impaired Assessment Unit.

Determination of Contributing Watershed and Urbanized Areas

For the purposes of the sMS4 WLA determinations, the total watershed area for each AU was first determined via USGS StreamStats v.3, using above the most downstream point of the assessment unit (AU) as the watershed pour point. The contributing watershed area for each AU was then determined by subtracting out upstream AU(s) contributing watershed. The urbanized area per each AU was determined using the union of the 2000 and 2010 Census data GIS coverages (Figure 2.1), and is the urbanized area within each resultant contributing watershed area.

Percent Jurisdictional area per AU is determined as follows:

Urbanized Area / Contributing Watershed Area = % Jurisdictional Area

The total Urbanized Areas (UA) within the Tijeras Arroyo watershed determined from the 2000 and 2010 Census data GIS coverages to be 1.5 mi^2. See Table B.1.

The Tijeras Arroyo UA percentage is calculated as follows:

1.5 mi^2 / 76.5 mi^2 = 0.019 × 100= 1.9%

The rounded percent jurisdictional areas per AU are presented in Table C.1.

Table C.1. Summary of Tijeras Arroyo Jurisdictional Area.

	Tijeras Arroyo
Urbanized Area*+	1.5 mi^2
Contributing Watershed Area+	76.5 mi^2
Percent Jurisdictional Area (rounded)	2%

NOTES: **Urbanized Areas within the contributing watershed area were determined using GIS data associated with the 2000 and 2010 Census – 2010 TIGER Files*

+ Both contributing watershed areas and urbanized areas do not include areas already accounted for in upstream AU's.

These calculations are summarized in waste load allocation in Section 2.5. The MS4 WLA values used in the TMDL document were calculated using these rounded percentages.

The remaining percentage was designated for nonpoint sources and natural background as the LA. The WLA values for NMR040000 are listed in Table 2.5.

The target loading capacities were calculated as described in Tables 2.4-2.6. From this calculated TMDL value, the Margin of Safety (MOS) and the NPDES permits were subtracted. To calculate the MS4 permit WLAs, the percentages derived using the jurisdictional area approach were applied to the remaining TMDL quantity (Table 2.5).

For example, the Total Nitrogen WLA for Tijeras Arroyo (Cripple Creek Rd. near Carnuel) AU was calculated as follows:

TMDL – MOS = available for LA and sMS4 WLA
0.93 – 0.139 = 0.791 lbs/day

The MS4 WLAs were assigned as a percentage of the LA.
MS4 WLA = 2%

The remaining available load is allocated to the LA. The final TMDL allocations are therefore as follows:

TMDL – MOS – WLA = LA
0.93 – 0.139 – 0.016 = 0.775 lbs/day

If at some time in the future there is a change to the jurisdictional area of a stormwater permittee, the allocation between the WLA and LA presented in the associated TMDL can be adjusted using a per area loading. This adjustment maintains the overall TMDL and a consistent per area watershed loading and transfers load between the LA and WLA. This change would be consistent with the overall goals of the TMDL and would not require a formal revision to be implemented within an NPDES stormwater permit.

The loading factor was calculated by dividing the combined existing MS4 allocation and load allocation by the contributing watershed area. The following equation was used for the calculation:

(MS4 WLA + LA) / Contributing Area = Loading Factor

The parameter values and resultant loading factors are in Table C.2.

Table C.2. Loading Factors based on Contributing Areas and sMS4 WLA+LA

Total contributing watershed Area (mi^2)	Parameter	Nutrient MS4 WLA + LA (lbs/day) Low Flow	Nutrient Loading factor (lbs/day/mi^2) Low Flow
76.5 mi^2	Total Nitrogen	0.791	0.0103
	Total Phosphorus	0.128	0.0017

Total contributing watershed Area (mi^2)	Parameter	Nutrient MS4 WLA + LA (lbs/day) High Flow	Nutrient Loading factor (lbs/day/mi^2) High Flow
76.5 mi^2	Total Nitrogen	1,393	18.2
	Total Phosphorus	230	3.01

References:

U.S. Environmental Protection Agency (USEPA). 2002. Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs. Washington, D.C. Available online at <http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/upload/final-wwtmdl.pdf. >

_____. 2008. TMDLs to Stormwater Permits Handbook (draft). Washington, D.C. <https://www.epa.gov/tmdl/tmdls-stormwater-permits-draft-handbook.>

APPENDIX D Source Documentation Sheet

"Sources" are defined as activities that may contribute pollutants or stressors to a water body (USEPA 1997). The list of "Probable Sources of Impairment" in the Integrated §303(d) / §305(b) List, Total Maximum Daily Load documents (TMDLs), and Watershed-Based Plans (WBPs) is intended to include all activities that could be contributing to the identified cause of impairment. Data on Probable Sources is routinely gathered by Monitoring and Assessment Section staff and Watershed Protection Section staff during water quality surveys and watershed restoration projects and is housed in the SWQB's in-house database (SQUID). More specific information on Probable Sources of Impairment is provided in individual watershed planning documents (e.g., TMDLs, WBPs, etc.) as they are prepared to address individual impairments by assessment unit.

USEPA through guidance documents encourages states to include a list of Probable Sources for each listed impairment. According to the 1998 305(b) report guidance, *"…, states must always provide aggregate source category totals…"* in the biennial submittal that fulfills CWA §305(b)(1)(C) through (E) (USEPA 1997). The list of "Probable Sources" is not intended to single out any particular land owner or single land management activity and has therefore been labeled "Probable" and generally includes several sources for each known impairment.

The approach for identifying "Probable Sources of Impairment" was recently modified by SWQB. Any new impairment listing will be assigned a Probable Source of "Source Unknown." Probable Source Sheets will continue to be filled out during watershed surveys and watershed restoration activities by SWQB staff. Information gathered from the Probable Source Sheets will be used to generate a draft Probable Source list in consequent TMDL planning documents. These draft Probable Source lists will be finalized with watershed group/stakeholder input during the pre-survey public meeting, TMDL public meeting, WBP development, and various public comment periods. The final Probable Source list in the approved TMDL will be used to update the subsequent Integrated List.

Literature Cited:

USEPA. 1997. Guidelines for preparation of the comprehensive state water quality assessments (305(b) reports) and electronic uptakes. EPA-841-B-97-002A. Washington, D.C.

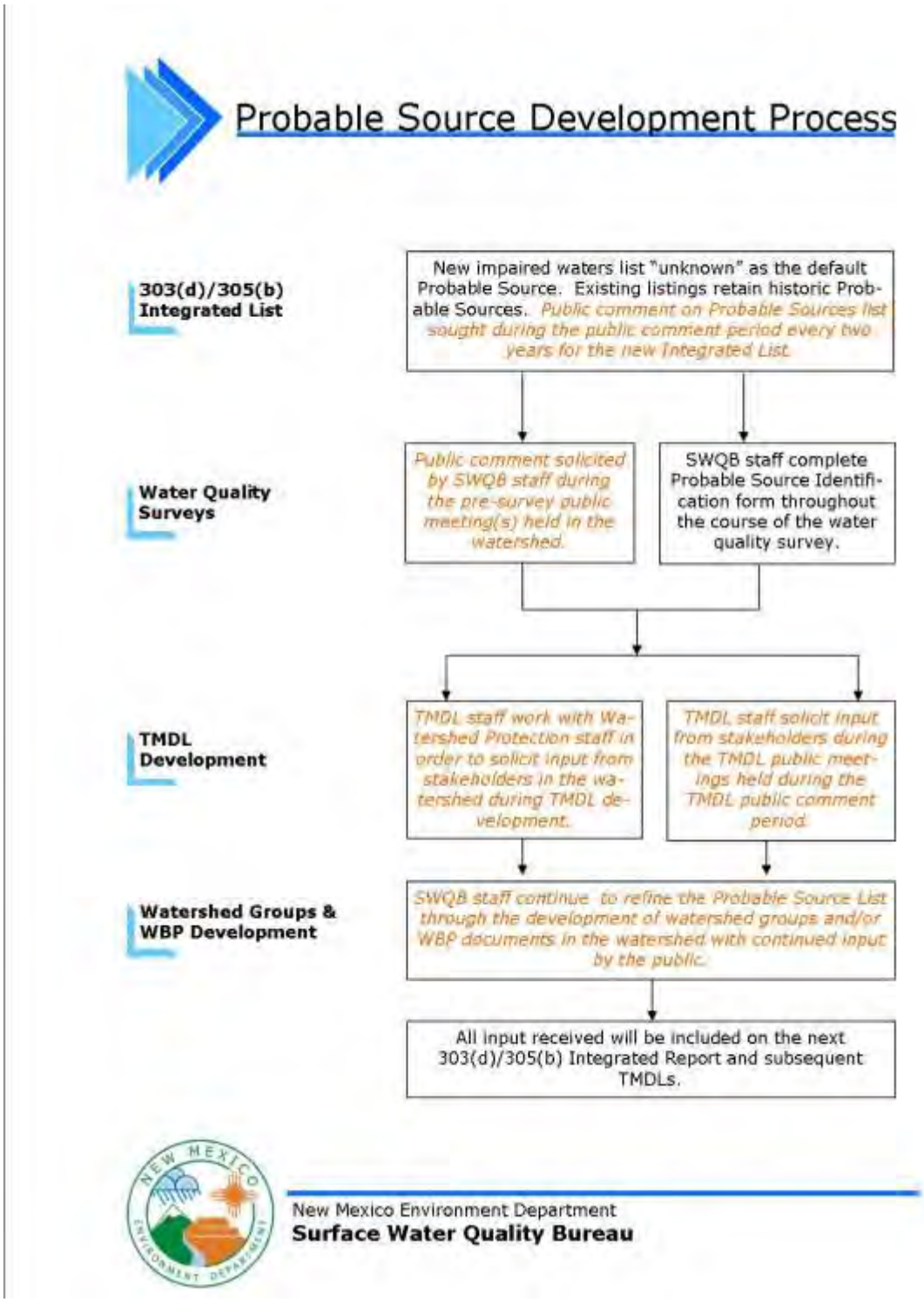


Figure D.1 Probable Source Development Process and Public Participation Flowchart

Help Us Identify Probable Sources of Impairment

Name:
Phone Number (optional):
Email or Mailing Address (optional):
Date:
Waterbody or site description (example - Fish Creek near HWY 34 crossing):

From the list below, please check activities known to exist that you are concerned may be contributing to surface water quality impairment. Please score items you check based on distance to or occurrence on or near the waterbody of concern.

(1 = Low occurrence or not near waterbody)
(3 = Moderate occurrence or within ½ mile of waterbody)
(5 = High occurrence or right next to water body)

✓	ACTIVITY	Score			✓	ACTIVITY	Score		
☐	Feedlots	1	3	5	☐	Pavement and Other Impervious Surfaces	1	3	5
☐	Livestock Grazing	1	3	5	☐	Roads/Bridges/Culverts	1	3	5
☐	Agriculture	1	3	5	☐	Habitat Modification(s)	1	3	5
☐	Flow Alterations (water withdrawal)	1	3	5	☐	Mining/Resource Extraction	1	3	5
☐	Stream/River Modification(s)	1	3	5	☐	Logging/Forestry Operations	1	3	5
☐	Storm Water Runoff	1	3	5	☐	Housing or Land Development	1	3	5
☐	Drought Related	1	3	5	☐	Habitat Modification	1	3	5
☐	Landfill(s)	1	3	5	☐	Waterfowl	1	3	5
☐	Industry/Wastewater Treatment Plant	1	3	5	☐	Wildlife other than Waterfowl	1	3	5
☐	Inappropriate Waste Disposal	1	3	5	☐	Recreational Use	1	3	5
☐	Improperly maintained Septic Systems	1	3	5	☐	Natural Sources	1	3	5
☐	Waste from Pets	1	3	5	☐	Other: *(please describe)*	1	3	5

Comments/additional information:

Revised 02Aug12

Figure D.2 Probable Source Identification Sheet for the Public

28 Jun 2011
Ver. 5

Probable Source(s) & Site Condition Class Field Form

Station ID:	Station Name/Description:	
AU ID:	AU Description:	
Field Crew:	Comments:	
Date:	Watershed protection staff reviewer:	Date of WPS review:

Score the proximity, intensity and/or certainty of occurrence of the following activities in the AU upstream of the site. Consult with the appropriate staff at NMED and other agencies to score "*" cells if needed.

Activity Checklist

Hydromodifications					Silviculture				
Channelization	0	1	3	5	* Logging Ops – Active Harvesting	0	1	3	5
Dams/Diversions	0	1	3	5	* Logging Ops – Legacy	0	1	3	5
Draining/Filling Wetlands	0	1	3	5	* Fire Suppression (Thinning/Chemicals)	0	1	3	5
Dredging	0	1	3	5	Other:	0	1	3	5
Irrigation Return Drains	0	1	3	5	**Rangeland**				
Riprap/Wall/Dike/Jetty Jack – circle	0	1	3	5	Livestock Grazing or Feeding Operation	0	1	3	5
Flow Alteration (from Water Diversions/Dam Ops – circle)	0	1	3	5	Rangeland Grazing (dispersed)	0	1	3	5
Highway/Road/Bridge Runoff	0	1	3	5	Other:	0	1	3	5
Other:	0	1	3	5	**Roads**				
Habitat Modification					Bridges/Culverts/RR Crossings	0	1	3	5
Active Exotics Removal	0	1	3	5	Low Water Crossing	0	1	3	5
Stream Channel Incision	0	1	3	5	Paved Roads	0	1	3	5
Mass Wasting	0	1	3	5	Gravel or Dirt Roads	0	1	3	5
Active Restoration	0	1	3	5	**Agriculture**				
Other:	0	1	3	5	Crop Production (Cropland or Dry Land)	0	1	3	5
Industrial/ Municipal					Irrigated Crop Production (Irrigation Equip)	0	1	3	5
Storm Water Runoff due to Construction	0	1	3	5	* Permitted CAFOs	0	1	3	5
Landfill	0	1	3	5	* Permitted Aquaculture	0	1	3	5
On-Site Treatment Systems (Septic, etc.)	0	1	3	5	Other:	0	1	3	5
Pavement/Impervious Surfaces	0	1	3	5	**Miscellaneous**				
Inappropriate Waste Disposal	0	1	3	5	Angling Pressure	0	1	3	5
Residences/Buildings	0	1	3	5	Dumping/Garbage/Trash/Litter	0	1	3	5
Site Clearance (Land Development)	0	1	3	5	Exotic Species (describe in comments)	0	1	3	5
Urban Runoff/Storm Sewers	0	1	3	5	Hiking Trails	0	1	3	5
Power Plants	0	1	3	5	Campgrounds (Dispersed/Defined – circle)	0	1	3	5
* Industrial Storm Water Discharge (permitted)	0	1	3	5	Surface Films/Odors	0	1	3	5
* Industrial Point Source Discharge	0	1	3	5	Pesticide Application (Algaecide/Insecticide)	0	1	3	5
* Municipal Point Source Discharge	0	1	3	5	Waste From Pets (high concentration)	0	1	3	5
* RCRA/Superfund Site	0	1	3	5	* Fish Stocking	0	1	3	5
Other:	0	1	3	5	Other:	0	1	3	5
Resource Extraction					**Natural Disturbance or Occurrence**				
* Abandoned Mines (Inactive)/Tailings	0	1	3	5	Waterfowl	0	1	3	5
* Acid Mine Drainage	0	1	3	5	Drought-related Impacts	0	1	3	5
* Active Mines (Placer/Potash/Other – circle)	0	1	3	5	Watershed Runoff Following Forest Fire	0	1	3	5
* Oil/Gas Activities (Permitted/Legacy – circle)	0	1	3	5	Recent Bankfull or Overbank Flows	0	1	3	5
* Active Mine Reclamation	0	1	3	5	Wildlife other than Waterfowl	0	1	3	5
Other:	0	1	3	5	Other Natural Sources (describe in	0	1	3	5

Figure D.3 Probable Source Identification Sheet for SWQB Field Use

APPENDIX E Response to Comments

Revisions in response to additional SWQB staff review and public comments.

Page 3: 2-year peak discharge magnitude (high flow) calculations were added.
Page 11: Figure 1.6b was added.
Page 15: Section 2.2.2 high flow was added.
Page 16: Table 2.2.2 was added.
Page 17: Table 2.3.2 was added to include high flow.
Page 21: Table 2.4 was expanded to include high flow.
Page 25: Table 2.5.2 was added to include high flow.
Page 26: Table 2.6 was modified to include additional pollution sources.
Page 32: Table A1 Total Kjeldahl nitrogen was below detection limit so it was deleted. Total Nitrogen values were corrected.
Page 33: Table A3 Do values were corrected. The revisions to the values in Table A3 are a result of a change in the calculation of Delta DO consistent with the definition in the 2017 CALM. The previous values were based on the minimum-maximum difference during a calendar day instead of during a 24-hour period. Figure A1 was added.
Page 35: Table of calculations now includes High Flow.
Page 39: Table C.2 was expanded to include High Flow.

Comment Set 1

John Vande Castle, President of Ramble Wood Neighborhood Association.
Received via email 6/17/2017

To whom it may concern,

Regarding comments to the "TIJERAS ARROYO NUTRIENTS TOTAL MAXIMUM DAILY LOAD (TMDL)" study dated June 12, 2017, and its conclusions:

I am bothered by the conclusion of "impairment" stated in the document "TIJERAS ARROYO NUTRIENTS TOTAL MAXIMUM DAILY LOAD (TMDL)" dated June 12, 2017. I disagree with the assessment that the Tijeras Arroyo is "impaired" because I feel the assessment itself, particularly the sample design, is seriously flawed. I do not feel it is possible to come to any conclusion from the limited sampling regime, in time and space for such a complex system. As an ephemeral input to the Rio Grande River, the study also ignores any impact of nutrient loading to River itself, since no sampling of flow or nutrient concentrations was ever preformed at the confluence of the Tijeras Arroyo and Rio Grande River.

The results of this survey determined that Tijeras Arroyo (Four Hills Bridge to headwaters) is impaired for nutrients based on ONE sample site measured only 9 times in two years. The study showed elevated levels of total nitrogen in THREE of the samples, and elevated levels of total phosphorus in ONE. Is this a statistically significant result representing "real world conditions? I think not. It is assumed that the sample design adequately represents targeted nutrient "loadings" of this ephemeral stream covering well over 76 square miles with a primary reach stated as 15 miles. I do not see how that is possible.

This "stream reach" calculation does not take into account all the tributaries which is stated as 132 square miles, that provide ephemeral flow into the primary Tijeras Arroyo. It also does NOT correctly describe what portion of the "15 miles" actually contains surface water, when it is present, or how the water sampling of the study itself represents actual conditions of the Tijeras Arroyo. The ONE sample station is one of the few places the Tijeras Arroyo commonly flows above the ground surface. It is also directly downstream from a horse stable/boarding operation and other potential local impacts which are not addressed in the study.

Perhaps most important is the fact that the Tijeras Arroyo is just that – a mostly ephemeral arroyo with limited surface flow. As stated in the study, "an interrupted stream that contains perennial reaches with intervening intermittent reaches" and

"surface flows completely disappear into the alluvium as the stream transitions out of the foothills and into the Rio Grande.

The study itself admits that "determination of the most representative critical flow is further complicated by the lack of active continuous stream gages operating for a relevant period of record within (or near) the impaired reach." The most important aspect of potential impairments to the Rio Grande River remain unknown since NO SAMPLING was ever performed where the Tijeras Arroyo flows into the Rio Grande River. The report states that there is a stream flow gauge but "it was deemed inappropriate for a flow model " or sampling because this station is ephemeral and only sees stream flow FORTY days of the year. If the Tijeras Arroyo only flows into the Rio Grande 11% of the year, it would seem the sample design, the results of this study, and its conclusion should take this into account.

SWQB Response: *This TMDL addresses only the Tijeras Creek AU extending from Four Hills Bridge to headwaters (ID# NM-9000.A_001). The downstream AU, Rio Grande to Four Hills Bridge (ID# NM-9000.A_070) is not included in this TMDL.*

Rivers and streams are divided into AUs based on differing geological and hydrological properties, and each AU is assessed individually using data from one or more monitoring sites located within the AU. Preferably, monitoring sites are located at the downstream end of the AU to represent the aggregate influences on water quality in the watershed. Results from the 2005 and 2014 surveys indicated nutrient impairment due to Total Nitrogen and Total Phosphorus as well as enrichment in chlorophyll a. Additional data collected in 2016 confirmed the nutrient impairment using the updated nutrient assessment protocol in the 2017 Consolidated Assessment and Listing Methodology (available online at: https://www.env.nm.gov/surface-water-quality/calm/)

For additional information regarding the history of monitoring and impairment determinations, please see the 2016 - 2018 State of New Mexico Clean Water Act Section 303(d)/Section 305(b) Integrated Report RECORD OF DECISION (https://www.env.nm.gov/swqb/303d-305b/2016-2018/index.html).

For additional information for the determination of a waterbody as impaired, see the Consolidated Assessment and Listing Methodology (https://www.env.nm.gov/surface-water-quality/calm/).

The USGS 4Q3 low flow and 2-year peak storm flows for ungaged streams provide the best available flow model data for the reach. Had there been available and sufficient gage data within the AU, it would have been used.

The completion of a TMDL can lead to opportunities for subsequent monitoring, watershed characterization, planning, and restoration activities to better address nutrient problems in the contributing watershed through an approved watershed based plan and implementation of the plan. For more information, please see the SWQB webpage for Watershed Based Planning at: https://www.env.nm.gov/surface-water-quality/wbp/.

Probable "pollutant" sources are described as "Channelization, Discharges from Municipal Separate Storm Sewer Systems (MS4), Drought-related Impacts, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Rangeland Grazing, Sources Unknown, Waste from Pets." There is no mention of contributions of "waste" from wildlife, natural mineral leaching, rainwater nutrient inputs, natural vegetation and vegetation decay inputs as well as fire runoff, including from prescribed burns. The sampling design does not consider the potential sources of nutrients and is not able to separate such naturally occurring inputs from anthropogenic sources.

SWQB Response: *Thank you for including and helping us identifying additional probable sources of impairment. The Pollutant Sources Table 2.6 has been modified to reflect contributions.*

Respectfully submitted as comment,

John Vande Castle, PhD
President, Ramble Wood Neighborhood Association
57 Ramble Wood Blvd
Tijeras, NM

Comment Set 2

Kali Bronson, Stormwater Program Compliance Manager
Received via email 7/11/2017

Comments for the NMED Tijeras Arroyo Nutrients Total Maximum Daily Load (TMDL), Headwaters to Four Hills Bridge
Public Draft
June 12, 2017
Bernalillo County
City of Albuquerque
New Mexico Department of Transportation
Ciudad Soil and Water Conservation District
Submitted July 11, 2017

1. If the TMDL is implemented as proposed in this document, and the MS4s are required to monitor flow/precipitation and collect stormwater quality samples (per the MS4 NPDES Permit), estimated costs would be approximately $110,000 for installation and monitoring of two flow gages (up and down stream) and a weather station to measure precipitation for the first year. Thereafter, annual maintenance and monitoring costs would be approximately $22,000. This is based on similar services provided by the U.S. Geological Service (USGS) in other areas. This does not include costs for stormwater quality sample collection and analysis, only for equipment for monitoring flow and precipitation.

SWQB Response: *The goal of a TMDL is to prescribe a pollutant quantity that would allow the management and restoration of an impaired system. Implementing best management practices and various pollutant control efforts will be necessary to achieve water quality standards.*

The TMDL does determine an aggregate waste load allocation for the MS4, however, the WLA does not affect the current permit that expires on December 19, 2019. As for future permit requirements, SWQB understands that TMDLs may have an impact on regulated entities within the TMDL area. However, there are many ways to include effective water quality based effluent limits into permits.

In 2014, USEPA published the results of a nationwide review of current practices used in MS4 permits. One such approach had the WLA translated into best management practices (BMPs), which were required to be implemented during the permit term to reflect reasonable further progress towards meeting the applicable water quality standard.

Consistent with previous MS4 permit negotiations, SWQB will work with the regulated entities and USEPA Region 6 to ensure the future permit is consistent with the TMDL and identifies reasonable and protective conditions to achieve water quality standards.

2. Based on the 4Q3 flow of 0.47 cubic feet per second (cfs) calculated in this document, the waste load allocation (WLA) of 0.016 lbs/day for total nitrogen (TN) and 0.003 lbs/day for total phosphorus (TP) equates to measured concentrations of approximately 0.006 mg/L for TN and 0.001 mg/L for TP. Following standard EPA analysis methods, it would be difficult to infeasible for laboratories to meet detection limits for concentrations this low.

   SWQB Response: *Since the MS4 jurisdictional area represents approximately 2% of the contributing watershed, the proportion of 4Q3 low-flow attributable to the UA is approximately 0.01 cfs. While this is a low number, its inclusion preserves the ability for permitted runoff during non-storm events. Converting the WLA to a concentration using the proportional 4Q3 flow results in the water quality numeric target of 0.061 mg/L TP and 0.37 mg/L TN. There are several analytical labs that can meet these thresholds.*

   Since nutrient sources typically arise from a mixture of low-flow/continuous and storm flow driven sources, SWQB added a "high flow" condition to reflect changes in dominant watershed processes that may occur under different flow regimes (e.g., storm flow versus baseflow) - See section 2.2.2. Similar to the low-flow condition, the in-stream target concentrations are 0.061 mg/L TP and 0.37 mg/L TN, which are measurable.

3. Measuring input from stormwater only within the urbanized area (UA) is not feasible. There are stormwater contributions from areas outside of the UA boundary that cannot be differentiated from those from within the UA boundary.

   SWQB Response: *The Department understands the difficultly associated with measuring stormwater flow in the UA. Consistent with previous MS4 permit negotiations, SWQB will work with the regulated entities and USEPA Region 6 to ensure the future permit is consistent with the TMDL and identifies reasonable and protective conditions to achieve water quality standards. Inputs from "non-point source" runoff is not part of the WLA, but is included in the load allocation (LA) portion of the TMDL. Implementation and promotion of best management practices (BMPs) to reduce/control non-point source nutrient inputs and improve overall water quality are encouraged and should be supported by a Watershed-Based Plan.*

4. No samples were collected by NMED for nutrient analysis during precipitation events. Potential stormwater input has not been evaluated for the TMDL, WL, or WLA calculations. NMED should have collected, evaluated, and incorporated stormwater data into the analysis for the TMDL, WL, and WLA calculations.

SWQB Response: *While the inclusion of data during runoff conditions would serve to better characterize the Tijeras Arroyo conditions under different weather events, the TMDL is based on the application of nutrient thresholds developed to attain the narrative nutrient standard in 20.6.4 NMAC. The data gathered for this TMDL (including the below referenced data provided by the MS4 permittee) corroborate the impaired designation. Due to concerns noted here and recognized by the SWQB as a needed component of the TMDL, a "high flow" condition using the calculated USGS 2-year peak flow has been added to the TMDL (see Section 2.2.2).*

5. Based on data collected by MS4s (BernCo, COA, NMDOT, see Pre-TMDL Study, Bernalillo County, et. al., 2016) with jurisdictional area within this AU, there appears to be minimal impact from stormwater. Data from the Pre-TMDL Study as well as from the data collected by NMED and presented in this draft TMDL document, show impacts are present during dry weather sampling events, indicating impacts may be due to other influences. Additionally, water quality improvements are shown when comparing the upstream sampling point to the downstream sampling point (Bernalillo County, et. al., 2016).

   SWQB Response*: The above referenced Pre-TMDL document provided by the MS4 permittees, contains data that show exceedences for nitrogen (10/21/2015: total nitrogen 4.1 mg/L; 4/8/2016: Nitrate 0.9 mg/L, 10/21/2015: total nitrogen 6.6 mg/L) and phosphorus (10/21/15: 0.25 mg/L) during wet weather sampling within the watershed area. Tijeras Arroyo impairment thresholds are 0.37 mg/L for Total Nitrogen and 0.061 mg/L for Total Phosphorus. These levels of exceedences further confirm the Department's TMDL nutrient impairment.*

   Due to a reporting limit of 1.0 mg/L TN, the remainder of the data points within the permittees' sampling regime are inconclusive (i.e., not assessable). While the wet weather results do indicate lower concentrations at the downstream sampling location relative to the upper station, the results are still above impairment thresholds designed to protect aquatic life.

6. In this document, the UA is used to calculate the WLA instead of the jurisdictional area within the watershed (calculation uses a ratio of the UA to the entire watershed area). There are many areas within the jurisdictional area for Bernalillo County, but outside of the UA (based on 2010 census report) that are impacted by development, roads, recreational activities, etc. These areas should be included in the calculation for the WLA.

   SWQB Response*: As defined in 40 C.F.R. Section 130.2(h), the WLA is applied to point source discharges. The TMDL calculations include load allocations for non-point sources which incorporate the jurisdictional areas identified above. Identification of nutrient*

sources and source control plans/best management practices are essential to water quality improvement and are fundamental to permitting and watershed-based planning to achieve standards.

7. The Village of Tijeras (Tijeras), the Carnuel Land Grant (Carnuel), and the U.S. Forest Service (USFS) have jurisdictional areas within the Upper Tijeras Watershed that contribute potentially impacted stormwater to the Tijeras Arroyo. What is their role in addressing impacts to the Tijeras Arroyo?

   SWQB Response: *Since the above referenced land areas are not considered "Urbanized Areas" in the 2010 US Census and are therefore not required to have an NPDES permit, their role is to implement and promote best management practices (BMPs) to improve water quality in the watershed. The contribution from "non-point source" runoff associated with these areas is included in the load allocation (LA) portion of the TMDL.*

8. The MS4 jurisdictional area is only 1.5% of entire watershed area for this assessment unit (AU), but the MS4s are the only entities within this watershed that have received a WLA and that will be required by permit to implement monitoring and watershed improvement activities (i.e. public education, development oversite and regulation for the jurisdictional area, stormwater quality monitoring, etc.)

   SWQB Response: *The NPDES regulations at 40 CFR 122.44(d)(1)(vii)(B) require that NPDES permits include effluent limitations developed consistent with the assumptions and requirements of any WLA that has been assigned to the discharge as part of an approved TMDL.*

   The WLA is specific to your MS4 permit. NPDES authorities have significant flexibility in how they express WQBELs in MS4 permits.

   "…where the State or EPA has established a TMDL, NPDES permits must contain effluent limits and conditions consistent with the assumptions and requirements of the WLAs in the TMDL… Where the TMDL includes WLAs for stormwater sources that provide numeric pollutant loads, the WLA should, where feasible, be translated into effective, measurable WQBELs that will achieve this objective. This could take the form of a numeric limit, or of a measurable, objective BMP-based limit that is projected to achieve the WLA…" (EPA 2014)

   References:

U.S. Environmental Protection Agency (EPA). 2014. Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs. Washington, D.C. Available at: https://www.epa.gov/tmdl/establishing-total-maximum-daily-load-tmdl-wasteload-allocations-wlas-storm-water-sources-and

9. Increased flows due to mining activities at the Rio Grande GCC that can cause increased sediment transport and hydromodifications should be addressed in this TMDL document. Hydromodification and sediment can contribute to nutrient issues. Requirements for Rio Grande GCC activities to address these issues should be included.

   SWQB Response: *It is unlikely that the operations at Rio Grande GCC contribute TN and TP in the discharge effluent. The Rio Grande GCC permittee, by not having a WLA in the TMDL, is limited to zero discharge of nutrients. The facility is included in the load allocation component of the TMDL where improvements to channel stability and sedimentation can be addressed through the implementation of BMPs.*

10. Per page 12 of the report, "In the absence of appropriate gage data or adequate number of field flow measurements to calculate another flow statistic (e.g., median flow), the 4Q3 was chosen as a default critical flow condition." Using estimated flows instead of flow data measured in the field can result in inaccurate calculations. Per this report, the coefficient of determination (R2) is 48%, meaning that this model is a poor fit for the data. Additionally, flow is variable in this AU of the Tijeras Arroyo, with perennial and intermittent reaches. In some reaches flow disappears completely, going underground. An average or median flow for this entire AU will not accurately describe this system. Additional flow data from more than one location (i.e. looking at different perennial reaches) needs to be collected and analyzed. Current data and model are not sufficient for calculation of the total maximum daily load (TMDL), waste load (WL), and waste load allocation (WLA).

    SWQB Response: *In this case, the USGS regional analyses of 4Q3 low-flows and (2-year) peak storm flows for ungaged streams in New Mexico provide the best available flow data for the reach. Had there been available gage data within the AU, it would have been used. However, in this watershed, the only available gages were historic and did not have a period of record sufficient for calculation of 4Q3 and peak flows. However, a review of inactive USGS gages 08330505 and 08330500 indicated values comparable to both the calculated 4Q3 and measured values (Appendix A) collected by SWQB monitoring staff.*

11. Perennial and intermittent reaches should be surveyed and mapped. A mean or median flow should not be assumed for this entire AU reach.

    SWQB Response: *Calculation of critical low-flow and high-flow conditions used USGS regression equations for 4Q3 low flow and two-year peak storm flows for high flow. SWQB has included a peak flow storm allocation. See section 2.2.2*

12. Too few samples were collected (9 samples from one location over a period of 2 years) by NMED to accurately determine impacts to the Tijeras Arroyo for nutrients. NMED should use a more complete data set when making a TMDL determination. A more complete data set should include collection of samples from more than one sampling point (at least 3), background data, monitoring during all seasons (including winter), and monitoring during storm events, so that the data can be used gain a better understanding of this watershed. Additional data and analysis and improved understanding of this system will better inform stakeholders about how best to address any needed watershed improvements.

SWQB Response: *For a more in-depth understanding of assessment of data utilized for TMDL by SWQB please refer to the following document:*

PROCEDURES FOR ASSESSING WATER QUALITY STANDARDS ATTAINMENT FOR THE STATE OF NEW MEXICO CWA §303(d) /§305(b) INTEGRATED REPORT: COMPREHENSIVE ASSESSMENT AND LISTING METHODOLOGY (CALM):
https://www.env.nm.gov/wp-content/uploads/2017/03/FINAL-2018-Main-CALM.pdf

The section of dataset management (size) can be found in Section 2.1.4 in the CALM document (NMED/SWQB 2017). Sampling size is addressed as follows:

"…*The EPA does not recommend the use of rigid, across the board, minimum sample size requirements in the assessment process (EPA 2009). Target sample sizes should not be applied in an assessment methodology as absolute exclusionary rules (EPA 2003, 2005). The use of limited datasets is acceptable to the EPA, as limited financial, field, and laboratory resources often dictate the number of samples that can be collected and analyzed (EPA 2002).*

Generally, a minimum of two data points for field and chemical parameters is necessary to apply the procedures in Section 3.0 in order to determine and confirm attainment status for an associated AU parameter pair. The primary purpose of requiring two data points is to protect against the occurrence of false positives. During the survey year, the SWQB monitoring staff review data as they are received from the laboratory. As needed, staff investigate questionable results by contacting laboratory personnel directly to confirm the results and/or scheduling appropriate modifications to survey sampling plans in order to acquire a minimum of four seasonally-distributed data points for each parameter sampled.

…Additional data will be collected as resources allow in order to determine attainment status…"

References:

U.S. Environmental Protection Agency (EPA). 2002. Comprehensive Assessment and Listing Methodology (CALM): Towards a compendium of best practices. Office of Wetlands, Oceans, and Watersheds. Washington, D.C. Available at: https://www.epa.gov/waterdata/consolidated-assessment-and-listingmethodology-calm

———. 2003. Guidance for 2004 assessment, listing and reporting requirements pursuant to sections 303(d) and 305(b) of the Clean Water Act. Watershed Branch, Assessment and Watershed Protection

Division, Office of Wetlands, Oceans, and Watersheds. Washington, D.C. Available at: Available at: https://www.epa.gov/tmdl/integrated-reporting-guidance

———. 2005. Guidance for 2006 assessment, listing and reporting requirements pursuant to sections 303(d), 305(b), and 314 of the Clean Water Act. Watershed Branch, Assessment and Watershed Protection Division, Office of Wetlands, Oceans, and Watersheds. Washington, D.C. Available at: https://www.epa.gov/tmdl/integrated-reporting-guidance.

2009. Information concerning 2010 Clean Water Act sections 303(d), 305(b), and 314 integrated reporting and listing decisions. Memorandum from the Office of Wetlands, Oceans, and Watersheds. May 5, 2009. Washington, D.C. Available at: https://www.epa.gov/tmdl/integrated-reporting-guidance.

New Mexico Environment Department/Surface Water Quality Bureau (NMED/SWQB). 2017. Procedures for Assessing Water Quality Standards Attainment for the State of New Mexico CWA §303(d) /§305(b) Integrated Report: Comprehensive Assessment and Listing Methodology (CALM). Santa Fe, NM. https://www.env.nm.gov/wp-content/uploads/2017/03/FINAL-2018-Main-CALM.pdf

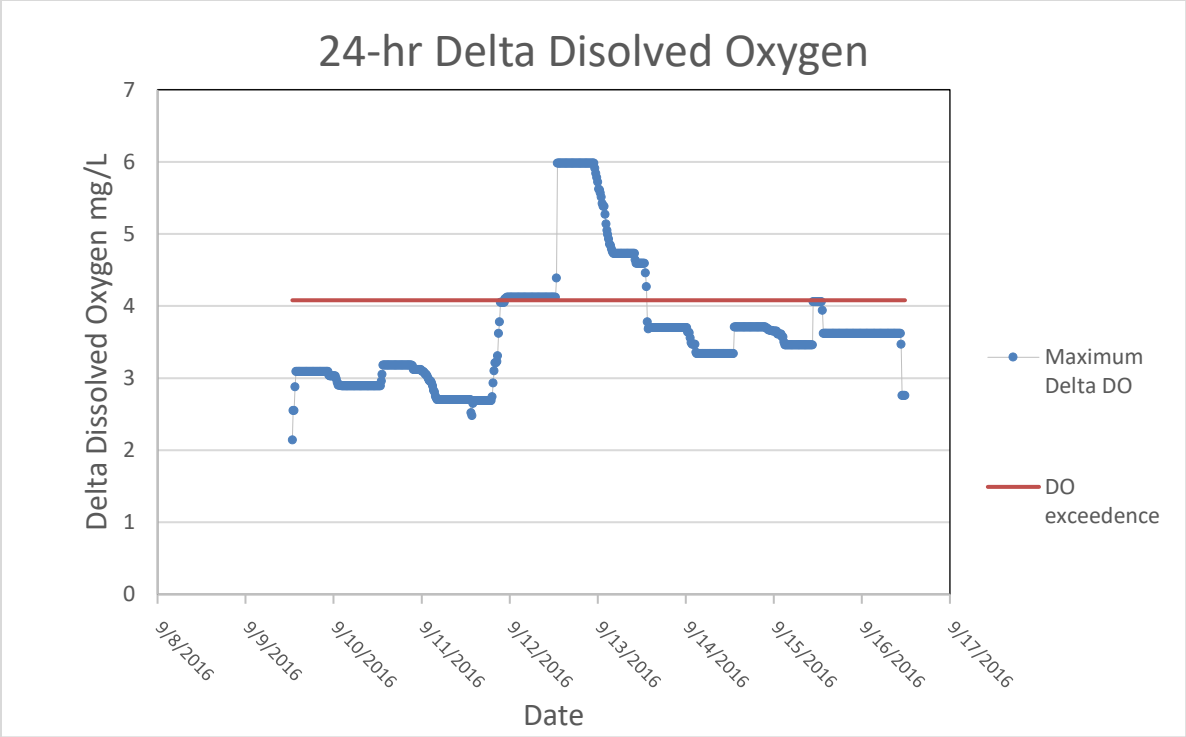
13. The dissolved oxygen (DO) data collected on 9/11/16 and 9/12/16, shown as exceedances on the delta DO table in Appendix A, were collected during and following a precipitation event which began at approximately 1700 on 9/11/16 and resulted in approximately 0.68" (www.weatherunderground.com, Carnuel-Silverhills KNMALBUQ149) of rain. This is not noted in the data table. The report should explain how a precipitation event can affect the DO measurements and calculation of delta DO. Delta DO should be defined in this document. Data collected to calculate the delta DO should be included in this document.

SWQB Response: *The label "rain event" has been added to the appropriate data sets in APPENDIX A Tijeras Arroyo Nutrient and Flow Data (2014-2016) Dissolved Oxygen table.*

Evaluation of the dissolved oxygen levels, much like the nutrient source tracking, can only tell us about concentrations, this TMDL cannot make conclusions regarding causalities.

The "Dissolved Oxygen Listing Methodology" reference has been added to the document to lead readers to the source for any clarification on methodologies. The 2008 conclusion of the nutrient impairment remains in place.

Due to the large size of the data logged for DO (763 data points), we are presenting a graph depicting a 24-hour Delta Dissolved Oxygen for the entire sample period.



14. This document should discuss the impacts of drought, reduced flows, groundwater depletion, and hydromodification and how these impacts affect nutrient concentrations.

SWQB Response *A TMDL identifies the maximum amount of pollutant that a waterbody can receive and still meet water quality standards. In other words, the TMDL identifies the water quality goals or targets. The next step in the process is implementation which starts with a Watershed Based Plan (WBP). Nine key elements help provide reasonable assurance that the WBP is successful over time. The elements are intended to ensure that the contributing causes and sources of nonpoint source pollution are identified, that key stakeholders are involved in the planning process and that restoration and protection strategies are identified that will address the water quality concerns. These plans identify and quantify sources of pollutants and describe the actions (best management practices) needed to achieve the reductions that will improve water quality. SWQB encourages the revision and update of the Watershed Restoration Action Strategy for the Upper Tijeras Creek Watershed (2004) to include the nine key elements and address confounding issues.*

15. The TMDL, WL, and WLA calculations do not take into account the relative contributions from different types of sources.

SWQB Response: *Source identification and relative contributions are most effectively addressed in a Watershed-Based Plan.*

16. From page 20 of the draft TMDL document, "The extensive data collection and analyses necessary to determine background nutrient loads for Tijeras Arroyo were beyond the resources available for this study. It is therefore assumed that a portion of the LA is made up of natural background loads." Without measured background data, how do you determine how much of the LA is made up of natural background loads? Background and baseline nutrient data should be collected and analyzed to better understand this watershed system. Development of a TMDL, WL, and WLA is inappropriate without sufficient baseline data.

    SWQB Response: *Source identification and relative contributions (including background) are most effectively addressed in a Watershed Based Plan. Background load identification is not a requirement in TMDL documents.*

17. The draft TMDL Table 2.6 should note that the probable sources listed are not documented sources specifically for the Tijeras Arroyo gathered by the NMED Monitoring and Assessment Section and Watershed Protection Section staff, but instead are inferred from general studies provided through guidance documents. Additionally, a note on Table 2.6 in this section should refer to Appendix D, which explains this in more detail.

    SWQB Response: *A reference to guide readers to Appendix D has been added to the footnote to Table 2.6.*

18. Who is going to update the WRAS and WBP? How is the stakeholder group (including watershed groups and entities with jurisdictional area within this watershed) going to be involved in the update? Explain how this process will work and how stakeholders will participate.

    SWQB Response: *For more information on WBPs please visit the SWQB watershed protection section website:* https://www.env.nm.gov/surface-water-quality/watershed-protection-section/ *and* https://www.env.nm.gov/surface-water-quality/wbp/

    For resources on developing watershed based plans please visit:
    https://www.env.nm.gov/swqb/wps/WBP/Submit/

    For updates on SWQB activities and potential SWQB funding opportunities, please sign up for the SWQB mailing list at:
    https://public.govdelivery.com/accounts/NMED/subscriber/new?topic_id=NMED_4

For a list of additional funding sources for watershed protection, please visit: https://www.env.nm.gov/swqb/Watershed_Protection/FundingSourcesforWatershedProtection.pdf

19. The method detection limit (MDL) value of 0.5 mg/L for total kjeldahl nitrogen (TKN) was added into the total nitrogen result. Although the 0.5 mg/L MDL can mean that the constituent *could* be present at levels below the MDL, it doesn't mean that it *is* present. The MDL of 0.5 mg/L for TKN should not be added to the total nitrogen result. Only a detection should be added to the total. Refer to the total nitrogen table in Appendix A.

    SWQB Response: *The table has been revised to remove values less than the measured detected limit.*

20. Page 17, first paragraph: incorrect reference to Table 2.5, should reference Table 2.4.

    SWQB Response: *It has been corrected.*

21. Page 31, row 8: The LA value for TN shown in the upper table (0.820) does not match the value in the lower table (0.775), which does not match the value shown on page 21, Table 2.5 (0.774).

    SWQB Response: *It has been corrected.*

22. Figures 1.2, 1.3, 1.4, and 1.6 should more accurately show the sample location (zoom in to show the actual sample location and provide lat/long coordinates).

    SWQB Response: *The sample location is correct. A close-up map of the sampling station and coordinates has been included. Please see Figure 1.6b in section 1.4.*

23. Figure 1.4 should show jurisdictional area for Bernalillo County, NMDOT, COA, Village of Tijeras, Carnuel Land Grant, USFS, and any other local, state, or federal lands within this watershed.

    SWQB Response: *Figure 1.4 only shows relevant ownership within the watershed area. The data of ownership that was used for the map included: Bureau of Land Management, Department of Agriculture, Forest Service, National Park Service, Private, Department of Defense, Department of Energy, Other Federal Agency, State, State Park, Bureau of Reclamation, Fish and Wildlife Service, Tribal and State Game and Fish.*

24. Page 17, paragraph 3, should read, "MS4 conveyances within urbanized areas can contribute to polluted storm water runoff."

SWQB Response: *It has been corrected.*

25. Page 17, paragraph 4: the sentence, "The city of Albuquerque incorporated jurisdictional (urban)…" should be changed to reference the MS4s with jurisdictional urbanized area within this AU instead of only referencing the COA.

SWQB Response: *It has been corrected according to the 2000 and 2010 Census bureau and now reads "Albuquerque NM urbanized area".*

26. It is understood that with development and urbanization, impacts to our waterways will occur. We would like to see sufficient and quality data collected and analyzed in order to better understand this watershed system and to better determine proper and effective strategies to implement watershed improvements. More data than what is in this document are needed to better understand this system and to determine the need for an appropriate TMDL. Additionally, other entities with jurisdictional area within this watershed who have the potential to contribute to impairments to this AU also need to participate in this process.

SWQB Response: *The development of a WBP will facilitate the planning process. In New Mexico, the TMDL is a required step for consideration of funds to develop the plan and implement improvements.*

Kali Bronson, *Stormwater Program Compliance Manager*, Bernalillo County.
Kevin Daggett, P.E., *Stormwater Drainage Section Manager,* City of Albuquerque. Timothy Trujillo, P.E., *Drainage Section,* New Mexico Department of Transportation, District 3.

Comment Set 2.a (related to Comment set 2)

J. Steven Glass, Board Chairman; Ciudad Soil and Water Conservation District.
Received via email July 24, 2017.

Dear Ms. Aranda:

During the July 17, 2017, public meeting of the Ciudad Soil and Water Conservation District Board of Supervisors, Board members voted unanimously to support joint comments about the Tijeras Arroyo TMDL submitted on July 11, 2017 by Bernalillo County, the City of Albuquerque and the NM Department of Transportation.

While we are aware that the deadline for submitting comments has expired, we nonetheless wish to express our concurrence with comments submitted by the previously mentioned agencies before the deadline. NM Open Meetings Act requirements dictated that the Ciudad SWCD Board make A decision regarding the agencies' comments in a properly advertised public meeting.

Best regards,
J. Steven Glass
Board Chairman

CC: Kali Bronson, Bernalillo County
Kevin Daggett, City of Albuquerque
Timothy Trujillo, NM Department of Transportation

SWQB Response: *Thank you for your participating in joint comments for Comment Set 2. Ciudad's letter of support for Comment set 2 has been added to this TMDL post public comment period.*

Comment Set 3

Katie Kruthaupt and Julie Maitland; New Mexico Department of Agriculture
Received via email, Wed 7/12/2017

Dear Ms. Aranda:
New Mexico Department of Agriculture (NMDA) submits the following comments regarding the Draft Total Maximum Daily Load (TMDL) document for Tijeras Arroyo recently published by New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB).

NMDA maintains a strategic goal to promote responsible and effective use and management of natural resources in support of agriculture. Our comments are specific to our mission within state government- dedication to the promotion and enhancement of New Mexico's agriculture, natural resources, and quality of life.

Section 2.9 of the Draft TMDL presents information on how the SWQB assesses the probable. sources of impairment. Based on the description of the development of the list of probable sources, it appears that SWQB staff diligently work with stakeholders to identify problems. While it is commendable to work with the public to develop these lists, the lists do not appear to be subject to scientific analysis.

The Draft TMDL states that it is beyond the scope of the SWQB's analysis to perform an extensive data collection and analyses of the nutrient loads in the Tijeras Arroyo. Some of the nonpoint source contributions to the Draft TMDL mentioned are: rangeland grazing, and runoff from cropland, pastures and animal feeding operations. The relative contribution of different potential sources contributing to the nutrient load cannot be determined and the list of probable sources is only a hypothesis without performing an extensive data collection and analyses of the nutrient loads. As currently written, there are no safeguards preventing a popular opinion from causing one or several categories being overrepresented. NMDA requests that SWQB provide the specific scientifically valid sources for nutrient loads in order for the public and end users of the forthcoming final TMDL to have accurate information.

NMDA appreciates the opportunity to provide comments on the Draft TMDL for Tijeras Arroyo. We request to be kept informed of future comment opportunities such as this one. Please contact Ms. Kathryn Kruthaupt at (575) 646-2006 or kkruthaupt@nmda.nmsu.edu with questions regarding these comments.

Sincerely,
Julie Maitland JM/kk

SWQB Response: *As stated in Section 2.9, probable non-point sources of nutrient impairment are further evaluated and refined through SWQB Watershed Protection Section activities such as Watershed Based Planning (WBP) and subsequent watershed restoration projects. Current available resources do not allow for quantitative source tracking prior to TMDL development, and it is not a requirement of TMDL development. In practice, the completion of TMDLs can lead to opportunities for subsequent source tracking efforts to better target and address sources of impairment in the contributing watershed through an approved watershed based plan. Section 2.9 and Appendix D both explain that the Probable Sources list is a starting point to be refined/revised as watershed based plans develop, and do not single out any specific source or land owner.*

Watershed Based Plans include nine key elements that provide reasonable assurance that the plan will be successful over time. The elements are intended to ensure that the contributing causes and sources of nonpoint source pollution are identified, that key stakeholders are involved in the planning process, and that restoration and protection strategies are identified that will address the water quality concerns. These plans identify and quantify sources of pollutants and describe the actions (best management practices) needed to achieve the reductions that will improve water quality. SWQB encourages the interested stakeholder to collaborate on the revision and update of the Watershed Restoration Action Strategy for the Upper Tijeras Creek Watershed (2004) to incorporate the nine key elements and provide a path to water quality standards attainment.