FINAL DRAFT

TOTAL MAXIMUM DAILY LOAD (TMDL)

FOR THE

UPPER RIO GRANDE WATERSHED (PART 2)

COCHITI RESERVOIR TO PILAR, NM

APRIL 12, 2005

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LIST OF ABBREVIATIONS

BLM	Bureau of Land Management
BMP	Best management practices
CFR	Code of Federal Regulations
cfs	Cubic feet per second
CGP	Construction general storm water permit
CWA	Clean Water Act
USEPA	U.S. Environmental Protection Agency
EPT	Ephemeroptera/Plecoptera/Tricoptera
HBI	Hilsenhoff's Biotic Index
HQCWF	High quality cold water fishery
HUC	Hydrologic unit code
IOWDM	Input and Output for Watershed Data Management
LA	Load allocation
lb/day	Pounds per Day
mgd	Million gallons per day
mg/L	Milligrams per Liter
mi^2	Square miles
mL	Milliliters
mm	Millimeters
MOS	Margin of safety
MOU	Memoranda of Understanding
MS4	Municipal Separate Storm Sewer System
MSGP	Multi Sector General Storm Water Permit
NM	New Mexico
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department

NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint source
NTU	Nephelometric turbidity units
°C	Degrees Celcius
°F	Degrees Farenheit
QAPP	Quality Assurance Project Plan
RBP	Rapid Bioassessment Protocol
RFP	Request for proposal
SC	Specific Conductance
SWPPP	Storm Water Pollution Prevention Plan
SWQB	Surface Water Quality Bureau
SWSTAT	Surface Water Statistics
TDS	Total Dissolved Solids
TMDL	Total maximum daily load
TSS	Total suspended sediment
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 October 11, 2002)
WRAS	Watershed Restoration Action Strategy
WWTP	Waste water treatment plant
μg/L	Micrograms per liter
μmhos	Micromhos
μmhos/cm	Micromhos per centimeter

EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to develop Total Maximum Daily Load (TMDL) management plans for water bodies determined to be water quality limited. A TMDL documents the amount of a pollutant a water body can assimilate without violating a state's water quality standards. It also allocates that load capacity to known point sources and nonpoint sources at a given flow. TMDLs are defined in 40 Code of Federal Regulations Part 130 as the sum of the individual Waste Load Allocations for point sources and Load Allocations for nonpoint sources and background conditions, and includes a margin of safety.

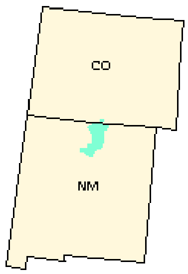
The Upper Rio Grande watershed is located in north central New Mexico. For practical purposes, the Upper Rio Grande watershed was divided into two investigations (i.e., Part 1 and Part 2). The Upper Rio Grande watershed between the Cochiti Reservoir and Pilar, NM, was Part 2 of the Upper Rio Grande investigation and is discussed in this document. Part 1 of the Upper Rio Grande investigation from Pilar, New Mexico to the New Mexico-Colorado border was previously discussed in the *Final Draft Total Maximum Daily Load (TMDL) for the Upper Rio Grande Watershed (Part 1)* (NMED/SWQB 2004a). Stations for the Upper Rio Grande Watershed (Part 2) were located throughout the Upper Rio Grande watershed during an intensive watershed survey performed by the New Mexico Environment Department Surface Water Quality Bureau in 2001 to evaluate the impact of tributary streams. As a result of this monitoring effort, exceedences of New Mexico water quality standards for turbidity were documented on Embudo Creek (Rio Grande to Canada de Ojo Sarco), the Rio Grande (non-pueblo Santa Clara to Embudo Creek), and Rio Santa Barbara (Picuris Pueblo bnd to USFS bnd). Exceedences of the chronic aluminum criterion were documented on Little Tesuque Creek (Rio Tesuque to headwaters) and conditions at Embudo Creek (Rio Grande to Canada de Ojo Sarco) were determined to be impaired due to sedimentation/siltation (i.e., did not meet the narrative stream bottom deposits standard). This TMDL document addresses the above noted impairments as summarized in the table below.

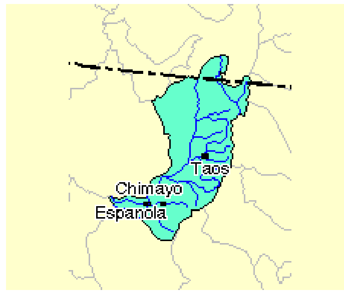
Additional impairments based on benthic macroinvertebrate bioassessments were documented on stream reaches based on 2001 data, but additional data is needed to determine the exact cause of these impairments. The effected stream reaches are: Rio Grande (non-pueblo Santa Clara to Embudo Creek); Embudo Creek (Canada de Ojo Sarco to Picuris Pueblo bnd); Rio Pueblo (Picuris Pueblo bnd to headwaters); and Rio Santa Barbara (Picuris Pueblo bnd to USFS bnd).

Additional water quality data will be collected by New Mexico Environment Department during the standard rotational period for intensive stream surveys. As a result, targets will be re-examined and potentially revised as this document is considered to be an evolving management plan. In the event that 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. When water quality standards have been achieved, the reach will be moved to the appropriate category on the Clean Water Act Integrated §303(d)/§305(b) list of waters.

The Surface Water Quality Bureau's Watershed Protection Section has and will continue to work with watershed groups to develop Watershed Restoration Action Strategies to develop and implement strategies to attempt to correct the water quality impairments detailed in this document. Implementation of items detailed in Watershed Restoration Action Strategies will be done with participation of all interested and affected parties.

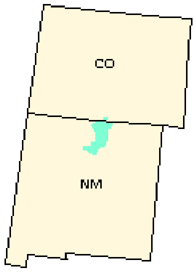
TOTAL MAXIMUM DAILY LOAD FOR TURBIDITY AND SEDIMENTATION/SILTATION (STREAM BOTTOM DEPOSITS) EMBUDO CREEK (RIO GRANDE TO CANADA DE OJO SARCO)





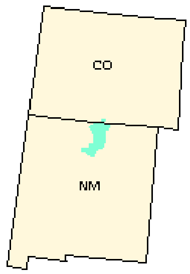
New Mexico Standards Segment	Rio Grande 20.6.4.114
Assessment Unit Identifier	Embudo Creek (Rio Grande to Canada de Ojo Sarco) NM-2111_41 (formerly NM-URG1-11000 [split])
Assessment Unit Length	6.2 miles
Parameters of Concern	Turbidity and Sedimentation/Siltation (Stream Bottom Deposits)
Uses Affected	Marginal Coldwater Fishery and Warmwater Fishery
Geographic Location	Rio Grande USGS Hydrologic Unit Code 13020101
Scope/size of Watershed	317 mi^2
Land Type	Arizona/New Mexico Plateau Ecoregion (22)
Land Use/Cover	Forest (89%), Agriculture (4%), Tundra (3%), Rangeland (2%), Built-up (1%), Barren (<1%), Water (<1%), Wetlands (<1%)
Identified Sources	Channelization, dredging (e.g. for navigational channels), loss of riparian habitat, natural sources, off-road vehicles, rangeland grazing, site clearance (site development or redevelopment), streambank modifications/destabilization.
Land Management	U.S. Forest Service (74%), Private (9%), Native Lands (8%), BLM (7%), State (2%)
Priority Ranking	High
TMDL for: Turbidity Stream Bottom Deposits	 **WLA (0) + LA (16,630) + MOS (5,543) = 22,173 lbs/day** **WLA (0) + LA (15) + MOS (5) = 20 percent fines**

TOTAL MAXIMUM DAILY LOAD FOR ALUMINUM (CHRONIC)
LITTLE TESUQUE CREEK (RIO TESUQUE TO HEADWATERS)



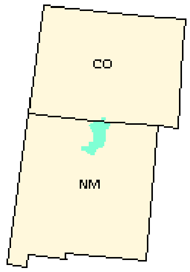
New Mexico Standards Segment	Rio Grande 20.6.4.121
Assessment Unit Identifier	Little Tesuque Creek (Rio Tesuque to headwaters) NM-2118.A_34 (formerly NM-URG1-10230)
Assessment Unit Length	8.26 miles
Parameters of Concern	Aluminum (Chronic)
Uses Affected	High Quality Coldwater Fishery
Geographic Location	Rio Grande USGS Hydrologic Unit Code 13020101
Scope/size of Watershed	78.4 mi^2
Land Type	Southern Rockies Ecoregion (21)
Land Use/Cover	Forest (91%), Rangeland (4%), Built-up (3%), Agriculture (<1%), Tundra (<1%)
Identified Sources	Natural sources
Land Management	Native Lands (40%), U.S. Forest Service (31%), Private (29%)
Priority Ranking	High
TMDL for: Aluminum (Chronic)	**WLA (0) + LA (0.48) + MOS (0.16) = 0.64 lbs/day**

TOTAL MAXIMUM DAILY LOAD FOR TURBIDITY
RIO GRANDE (NON-PUEBLO SANTA CLARA TO EMBUDO CREEK)



New Mexico Standards Segment	Rio Grande 20.6.4.114
Assessment Unit Identifier	Rio Grande (non-pueblo Santa Clara to Embudo Creek) NM-2111_12 (formerly NM-URG1-10000 [split])
Assessment Unit Length	14.8 miles
Parameters of Concern	Turbidity
Uses Affected	Marginal Coldwater Fishery and Warmwater Fishery
Geographic Location	Rio Grande USGS Hydrologic Unit Code 13020101
Scope/size of Watershed	13,669 mi^2
Land Type	Southern Rockies Ecoregion (21)
Land Use/Cover	Forest (55%), Rangeland (37%), Agriculture (5%), Built-up (1%), Tundra (1%), Water (<1%)
Identified Sources	Loss of riparian habitat, natural sources, Highway/Road/Bridge runoff (non-construction related), irrigated crop production, rangeland grazing
Land Management	U.S. Forest Service (51%), Private (18%), BLM (16%), Native Lands (8%), State (7%)
Priority Ranking	High
TMDL for: Turbidity	**WLA (0) + LA (332,544) + MOS (110,847) = 443,391 lbs/day**

**TOTAL MAXIMUM DAILY LOAD FOR TURBIDITY
RIO SANTA BARBARA (PICURIS PUEBLO BND TO USFS BND)**



New Mexico Standards Segment	Rio Grande 20.6.4.123
Assessment Unit Identifier	Rio Santa Barbara (Picuris Pueblo bnd to USFS bnd) NM-2120.A_419(formerly NM-URG1-11100)
Assessment Unit Length	7.39 miles
Parameters of Concern	Turbidity
Uses Affected	High Quality Coldwater Fishery
Geographic Location	Rio Grande USGS Hydrologic Unit Code 13020101
Scope/size of Watershed	13,669 mi^2
Land Type	Southern Rockies Ecoregion (21)
Land Use/Cover	Forest (73%), Tundra (16%), Agriculture (7%), Rangeland (4%), Built-up (<1%)
Identified Sources	Loss of riparian habitat, rangeland grazing, site clearance (land development/redevelopment), source unknown, streambank modification/stabilization
Land Management	Federal Wilderness (66%), U.S. Forest Service (26%), Private (8%)
Priority Ranking	High
TMDL for: Turbidity	**WLA (0) + LA (1,753) + MOS (584) = 2,337 lbs/day**

1.0 INTRODUCTION

Under Section 303 of the Clean Water Act (CWA), states establish water quality standards, which are submitted and subject to the approval of the U.S. Environmental Protection Agency (USEPA). Under Section 303(d)(1) of the CWA, states are required to develop a list of waters within a state that are impaired and establish a total maximum daily load (TMDL) for each pollutant. A 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). A TMDL documents the amount of a pollutant a waterbody can assimilate without violating a state's water quality standards. It also allocates that load capacity to known point sources and NPSs at a given flow. TMDLs are defined in 40 Code of Federal Regulations (CFR) Part 130 as the sum of the individual Waste Load Allocations (WLAs) for point sources and Load Allocations (LAs) for nonpoint sources (NPSs) and background conditions, and includes a margin of safety (MOS). This document provides TMDLs for assessment units within the Upper Rio Grande (Part 2) that have been determined to be impaired based on a comparison of measured concentrations and conditions with water quality criteria and numeric translators for narrative standards.

In addition to this introductory Section 1.0, this document is divided into twelve main sections. Section 2.0 provides background information on the location and history of the Upper Rio Grande watershed, provides applicable water quality standards for the assessment units addressed in this document, and briefly discusses the intensive water quality survey that was conducted in the Upper Rio Grande watershed (Part 2) in 2001. Section 3.0 provides detailed descriptions of the individual watersheds for which TMDLs were developed. Section 4.0 presents the TMDLs developed for aluminum (chronic) in the Upper Rio Grande watershed (Part 2). Section 5.0 presents the TMDL developed for stream bottom deposits in the Upper Rio Grande watershed (Part 2). Section 6.0 provides turbidity TMDLs. Pursuant to Section 106(e)(1) of the Federal CWA, Section 7.0 provides a monitoring plan in which methods, systems, and procedures for data collection and analysis are discussed. Section 8.0 discusses implementation of TMDLs (phase two) and the relationship with Watershed Restoration Action Strategies. Section 9.0 discusses assurance, section 10.0 public participation in the TMDL process, and Section 11.0 provides references.

2.0 UPPER RIO GRANDE (PART 2) BACKGROUND

For practical purposes, the Upper Rio Grande watershed was divided into two investigations (i.e., Parts 1 and 2). The Upper Rio Grande (Part 2) was intensively sampled by the New Mexico Environment Department/Surface Water Quality Bureau (NMED/SWQB) from May to October, 2001 and is addressed in this document. Surface water quality monitoring stations were selected to characterize water quality of the stream reaches (Table 2.1, Figure 2.1). Almost all of the perennial tributaries to the Rio Grande in New Mexico (NM) can be found within the Upper Rio Grande. The Rio Chama subwatershed and portions of the Santa Fe subwatershed were excluded from the 2001 investigation, because they were surveyed in separate studies.

As a result of the 2001 monitoring effort, exceedences of New Mexico water quality standards for turbidity were documented on Embudo Creek (Rio Grande to Canada de Ojo Sarco), the Rio Grande (non-pueblo Santa Clara to Embudo Creek), and Rio Santa Barbara (Picuris Pueblo bnd to USFS bnd). Exceedences of the chronic aluminum criterion were documented on Little Tesuque Creek (Rio Tesuque to headwaters) and conditions at Embudo Creek (Rio Grande to Canada de Ojo Sarco) were determined to be impaired due to sedimentation/siltation (i.e., did not meet the narrative stream bottom deposits standard).

During the development of this TMDL, it was noted that the assessment unit Rio Quemado (Santa Cruz River to headwaters) spanned two water quality standards. The assessment unit was split into Rio Quemado (Santa Cruz River to Rio Arriba Cnty bnd) NM-2118.A_52 and Rio Quemado (Rio Arriba Cnty bnd to headwaters) NM-2120.A_120 and reassessed. The 2001 sampling station was in the lower assessment unit, so this assessment unit should be listed for turbidity impairment based on the 2001 survey. The upper assessment unit should be noted as "Not Assessed" because there were no 2001 stations in this assessment unit. During November 2004, a sonde was deployed in the lower assessment unit to confirm the turbidity listing. There were only 6 of 216 exceedences of the turbidity criterion of 10 NTU. Based on assessment of the 2004 sonde data this assessment unit was delisted for turbidity.

Sonde data was also collected in November 2004 for the assessment units Tesuque Creek (Rio Tesuque to confl of forks) and Rio Chiquito (Picuris Pueblo bnd to headwaters). Both of these assessment units were originally included on the Integrated 2004-2006 CWA §303(d)/§305(b) list for turbidity impairments. The additional data collected in 2004 indicated these assessment units were meeting all of the designated uses, and therefore these assessment units were delisted for turbidity.

Additional impairments based on benthic macroinvertebrate bioassessments on other stream reaches (i.e., Rio Grande (non-pueblo Santa Clara to Embudo Creek); Embudo Creek (Canada de Ojo Sarco to Picuris Pueblo bnd); Rio Pueblo (Picuris Pueblo bnd to headwaters); and Rio Santa Barbara (Picuris Pueblo bnd to USFS bnd) and a sedimentation/siltation impairment for the Santa Cruz River (Santa Clara Pueblo to Santa Cruz Dam) were documented during the 2001 Upper Rio Grande Part 2 intensive study, but additional data is needed to determine the exact cause of these impairments and therefore will be discussed in future TMDLs. The impaired assessment units and TMDLs are summarized below.

2.1 Location Description and History

The Upper Rio Grande (Part 2) watershed (US Geological Survey [USGS] Hydrologic Unit Code [HUC] 13020101) is located in north central NM. The entire Upper Rio Grande watershed encompasses approximately 7,500 square miles (mi^2) and extends over portions of seven counties including Rio Arriba, Taos, Santa Fe, Los Alamos, Sandoval, Mora, and San Miguel. The Upper Rio Grande (Part 2) includes the geographic area draining into the Rio Grande between Cochiti Reservoir (approximately 31 river miles above Albuquerque, NM) and just north of Embudo Creek (approximately 87 river miles upstream of Albuquerque, NM), as well as tributaries that enter the Rio Grande in that reach.

Several land grants were established along the Upper Rio Grande and its tributaries because water for domestic and irrigation purposes was necessary to the early settlers. The establishment of land grants also protected Upper Rio Grande towns and Spanish missions from attack by nomadic tribes (Westphall 1983). Because the archives of NM were destroyed during the Pueblo Revolt, little information is available regarding land grants prior to 1680 (Ebright 1994). Several Spanish-Indian land grants within the Upper Rio Grande Part 2 watershed were signed in the late 1600s and were later confirmed by the United States government (DeBuys 1985). These land grants include the Picuris, San Juan, Santa Clara, San Ildefonso, Pojoaque, Nambe, and Tesuque Pueblos (Figure 2.1) which are still intact today. Additional Spanish land grants in the 1700s included the Santa Barbara (1796), Las Trampas (1751), Sebastian Martin (1712), Santa Cruz (1694-1706), Nuestra Senora del Rosaria San Fernando y Santiago (1754), Santa Domingo de Cundiyo (1743), Francisco Montes Vigil (1754), Juan de Gabaldon (1752), and Jacona (1702) (DeBuys 1985). The majority of these land grants are no longer in place because they were either sold or redistributed. Today, much of the land in the Upper Rio Grande Part 2 watershed is still used for agriculture and rangeland.

The geology of the Upper Rio Grande watershed consists of a complex distribution of Precambrian metamorphic rocks, Paleozoic sedimentary rocks and Tertiary volcanics (Table 2.2, Figure 2.1). Smaller deposits of intrusives, ash flows and unaltered igneous rocks are also present. The Upper Rio Grande river bisects the two distinct geologic areas. The area west of the Rio Grande mainly consists of late Quaternary to Tertiary basalts formed as a result of the Rio Grande Rift tectonic events. The Tertiary volcanics (mainly basalt flows) are interbedded with sands and gravels, which were deposited during periods of erosion between volcanic events. The Rio Grande River has incised a deep canyon through these basalt flows, which extends from the Colorado border to Velarde, NM. Immediately east of the Rio Grande recent alluvial deposits cover these basalt deposits. The source of this alluvial material is the Sangre de Cristo Mountains, which parallel the river in a north-south direction. The Sangre de Cristo mountains mainly consist of Precambrian metamorphic rocks (amphibolites, granite, gneiss, and mica schist) and granitic stocks. Dikes of rhyolite, monzonite porphyry, latite and andesite are also common. Not as common, but still notable, are the scattered deposits of Pennsylvanian sediments including conglomerates, sandstones, shales and limestones. This portion of the Sangre de Cristo range is highly mineralized and heavily mined, as a result.

As presented in Figure 2.2, land ownership for the Rio Grande (non-pueblo Santa Clara to Embudo Creek) watershed is 51% U.S. Forest Service (USFS), 18% private, 16% Bureau of Land Management (BLM), 8% Native Lands, and 7% State. Land use includes 55% forest, 37% rangeland, 5% agriculture, 1% barren tundra, 1% built-up land, and less than 1% water (Figure 2.3).

Three sampling stations were established in the assessment unit Rio Grande (non-pueblo Santa Clara to Embudo Creek) during the 2001 survey (Table 2.1, Figure 2.1). Surface water grab samples from all of the above stations were analyzed for a variety of chemical/physical parameters. The chemical data were collected, assessed, and summarized in a water quality survey report (NMED/SWQB 2004b). Data results from grab sampling will be uploaded to USEPA's STORET database. Based on the data from the 2001 survey a TMDL has been developed for the following impairment:

- ***Turbidity***: Rio Grande (non-pueblo Santa Clara to Embudo Creek)

Table 2.1 SWQB 2001 Upper Rio Grande (Part 2) Sampling Stations

Station	Latitude, decimal degrees	Longitude, decimal degrees	Elevation, feet	Station Location
1	35.7916667	-106.3513889	6860	Alamo Canyon above Ponderosa Trail Crossing
2	35.7750000	-106.3416667	6360	Capulin Creek
3	36.1709000	-105.7370000	7400	Chamisal Creek below Village of Chamisal
4	**36.2108330**	**-105.9130560**	**5873**	**Embudo Creek at Hwy 68 bridge near Dixon at USGS Gage**
5	**36.1969440**	**-105.7350030**	**7159**	**Embudo Creek below Santa Barbara/Pueblo confluence**
6	35.4033360	-106.0500310	6000	Galisteo Creek at Cathy Richardson property above Cerillos
7	35.4336530	-106.1215150	5668	Galisteo Creek at Hwy 14 near Cerillos
8	35.5291667	-105.8458333	—	Galisteo Creek at Jim Cumming's residence in Canoncito
9	35.3953350	-105.9434220	6026	Galisteo Creek in Galisteo
10	**35.7255600**	**-105.8866700**	**8000**	**Little Tesuque Creek at first crossing of Hyde Park Road (Hwy 475)**
11	**35.7419480**	**-105.8416700**	**8822**	**Little Tesuque Creek at Hyde Park Road above Hyde Park**
12	35.8279100	-106.1837900	6221	Mortandad below White Rock WWTP outfall
13	35.7694480	-105.8086160	9705	N Fork of Tesuque Creek above Hyde Park Road (Hwy 475)
14	35.8027810	-106.1922260	6611	Pajarito above Rio Grande
15	35.8909100	-106.0714600	5655	Pojoaque River at State Road 84D
16	35.8812300	-106.2354300	6473	Pueblo Canyon below Bayo WWTP outfall
17	36.1789000	-105.7030000	7500	Rio Chiquito near mouth
18	35.7856000	-105.8694000	8392	Rio Chupadero above summer homes
19	35.7884000	-105.8500000	8750	Rio Chupadero at Borrego Canyon
20	36.1014000	-105.3636000	7760	Rio del Pueblo 0.8 miles above Hwy 518/75 at USGS

Station	Latitude, decimal degrees	Longitude, decimal degrees	Elevation, feet	Station Location
				Gage 08277470
21	35.8205590	-105.8902810	7224	Rio en Medio at USFS boundary
22	35.9650000	-105.9038890	6500	Rio Frijoles above Rio Medio
23	36.2153000	-105.8970000	6500	Rio Grande above Embudo Creek
24	**36.0076150**	**-106.0721990**	**5584**	**Rio Grande above Espanola at Valdez Bridge**
25	**36.2055590**	**-105.9636150**	**5774**	**Rio Grande at Embudo Station**
26	**36.0661150**	**-106.0761150**	**5623**	**Rio Grande at Hwy 74 near San Juan Pueblo**
27	35.4441700	-106.4397270	5131	Rio Grande at San Felipe Pueblo (pueblo land, no AU)
28	35.6178970	-106.3234680	5229	Rio Grande at USGS gage below Cochiti Reservoir outlet
29	35.7846000	-106.2015000	6000	Rio Grande at USGS gage in White Rock Canyon (near Water Canyon)
30	36.0397000	-106.0880000	6000	Rio Grande below Rio Chama
31	36.3200000	-105.7538890	6076	Rio Grande below Rio Pueblo de Taos at USGS gage
32	35.9654000	-105.9040000	6500	Rio Medio above Santa Cruz River
33	35.8494480	-105.8963920	6863	Rio Nambe above Nambe Reservoir
34	36.2041667	-105.7250000	—	Rio Pueblo above Rio Santa Barbara
35	36.1986160	-105.7313930	7185	Rio Pueblo at Hwy 75 above Rio Santa Barbara
36	36.1545000	-105.5510000	8232	Rio Pueblo below Flechado campground, above Sipapu Ski Area
37	36.0666670	-105.9022220	6463	Rio Quemado near Chimayo
38	36.1152780	-105.6386110	8420	Rio Santa Barbara at Hodges Campground
39	**36.1972260**	**-105.7341700**	**7165**	**Rio Santa Barbara at mouth**
40	35.7891700	-106.2863930	6125	Rito Canon de los Frijoles below cave
41	35.7809000	-106.2730100	5873	Rito de los Frijoles above Upper Falls
42	35.7753000	-106.2684000	6079	Rito de los Frijoles at Bandelier Visitor Center
43	35.7941700	-106.2991710	7000	Rito de los Frijoles at Bridge ¾ miles above ceremonial cave
44	35.3855330	-105.9447150	6000	San Cristobal Creek at Hwy 41 south of Galisteo
45	35.9647260	-105.9038930	6453	Santa Cruz River at USGS gage 08291000
46	35.9647260	-105.9038930	6100	Santa Cruz River at Hwy 520 Bridge
47	35.7600040	-105.8113920	10500	Tesuque Creek (south fork) above Hyde Park Road (Hwy 475)
48	35.7708330	-105.9416670	7000	Tesuque Creek across from Tesuque Post Office
49	35.7388920	-105.9055600	7211	Tesuque Creek at USGS Gage 08302500 near Santa Fe
50	35.7402778	-105.9080556	7060	Tesuque Creek near Bishops Lodge
51	36.1308330	-105.7591670	7420	Trampas Creek above Hwy 76

Notes: Data from the sampling stations in bold were used to develop the TMDLs discussed in this document.

Table 2.2 Geologic Unit Definitions for the Upper Rio Grande (Part 2)

Geologic Unit Code	Definition
IP	Pennsylvanian (age) rocks
MD	Mississippian and Devonian rocks, undivided; includes the Lake Valley Limestone
pC	Precambrian
Q_{al}	Alluvium; upper and middle Quaternary
Q_b	Quaternary Basalt and andesite flows and locally vent deposits
QT_b	Basaltic and andesitic volcanics interbedded with Pleistocene and Pliocene sedimentary units
QT_p	Older piedmont alluvial deposits and shallow basin fill
QT_s	Upper Santa Fe Group
T_p	Tertiary pediment deposit
T_{pi}	Tertiary (age) pyroclastic and intrusive rocks (volcanic rocks of varying compositions)

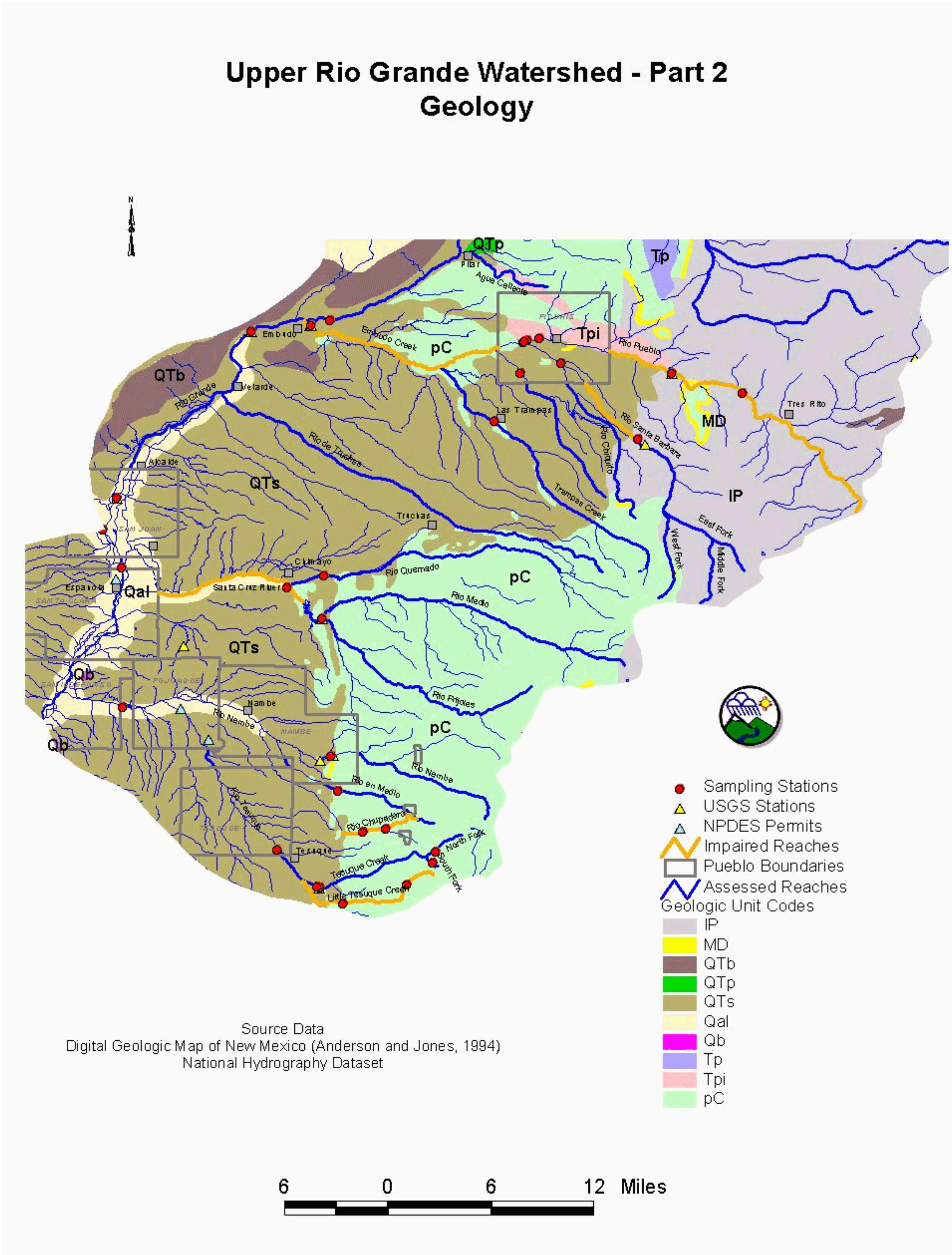


Figure 2.1 Upper Rio Grande (Part 2) Geology

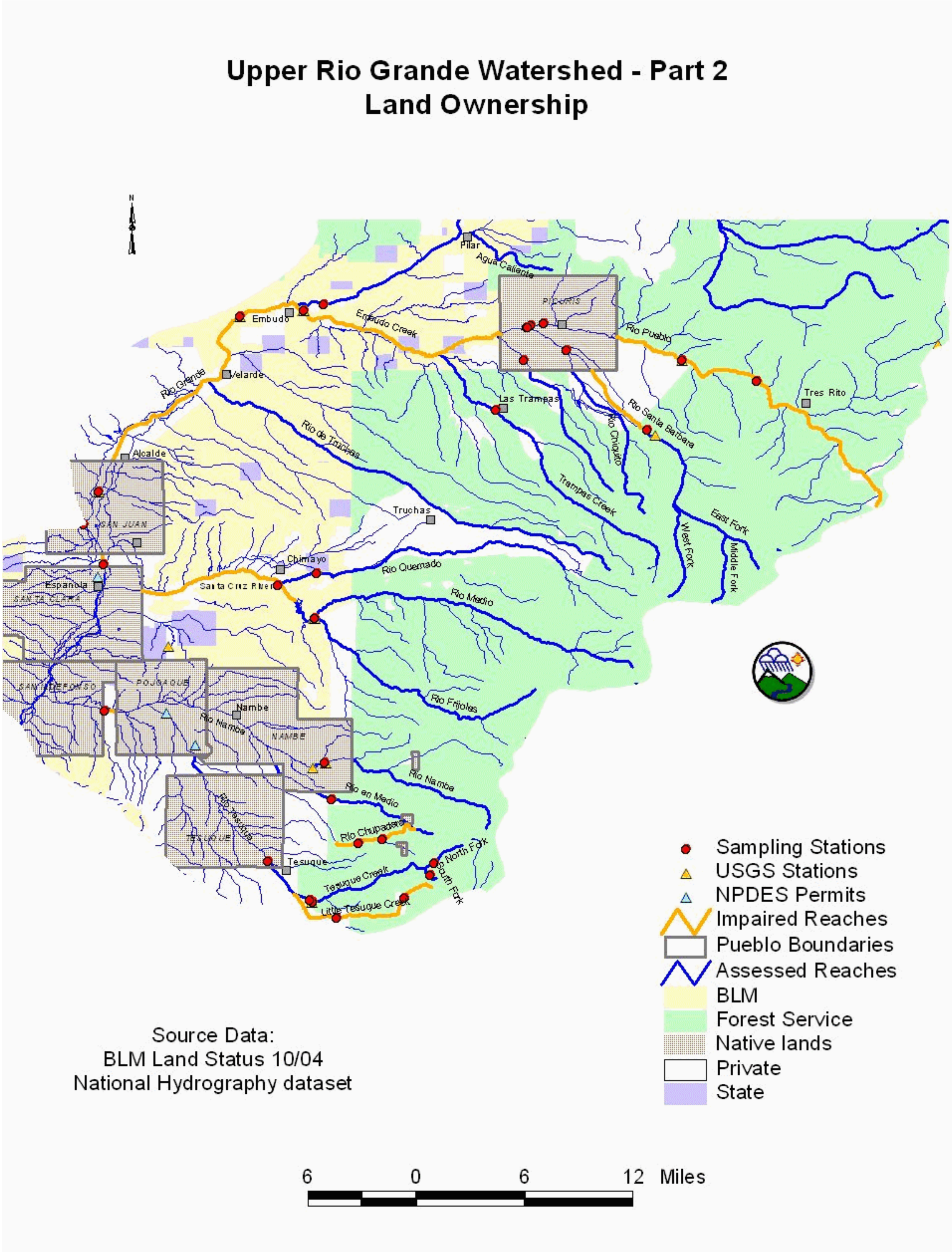


Figure 2.2 Upper Rio Grande (Part 2) Land Ownership and Sampling Stations

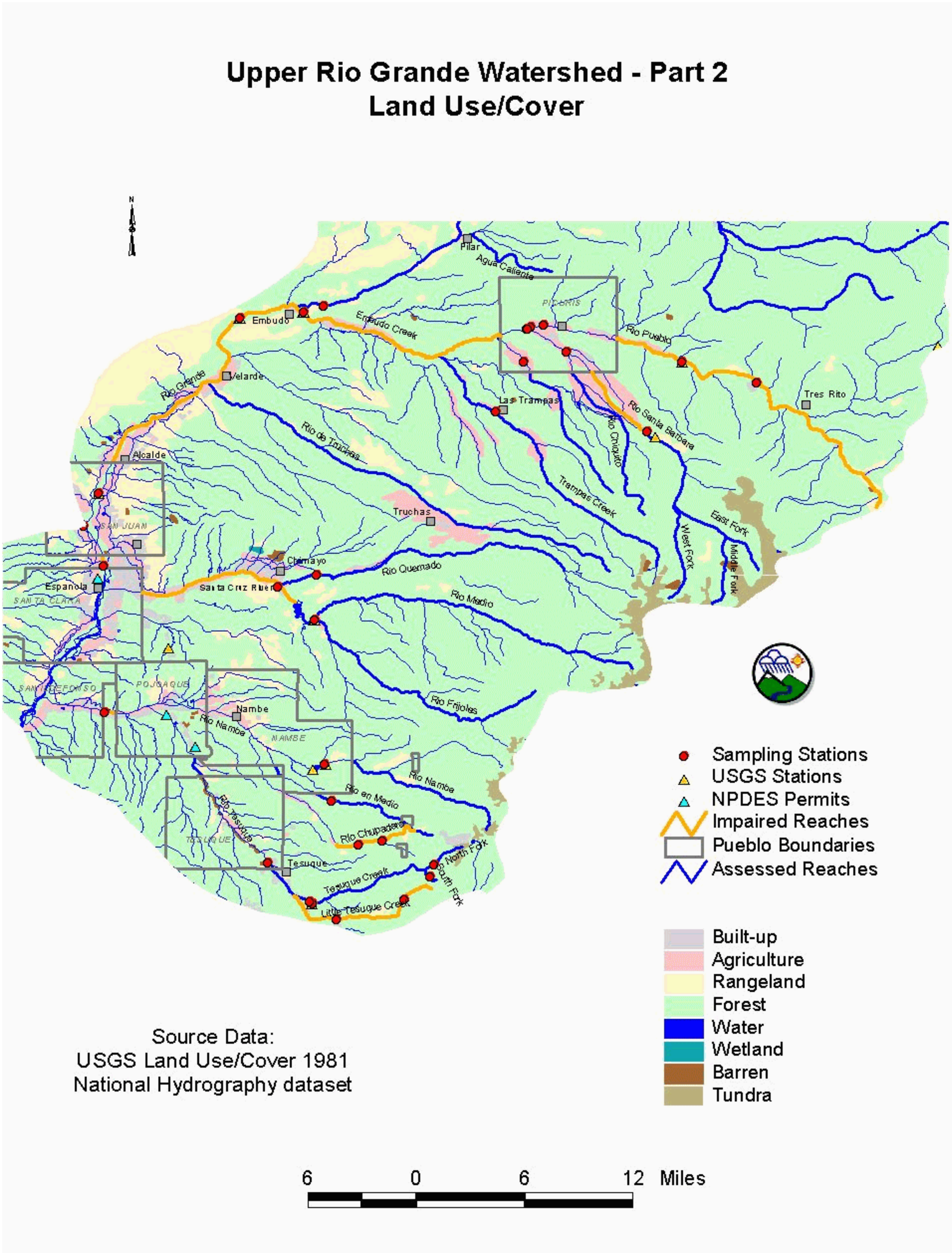


Figure 2.3 Upper Rio Grande (Part 2) Land Use/Cover and Sampling Stations

2.2 Water Quality Standards

Water quality standards (WQS) for all assessment units in this document are set forth in sections 20.6.4.114, 20.6.4.121, and 20.6.4.123 of the 2002 NM Standards for Interstate and Intrastate Surface Waters (NM Administrative Code [NMAC] 20.6.4). NMAC 20.6.4.114 reads as follows:

> **RIO GRANDE BASIN** - The main stem of the Rio Grande from the headwaters of Cochiti reservoir upstream to Taos Junction bridge, Embudo creek from its mouth on the Rio Grande upstream to the junction of the Rio Pueblo and the Rio Santa Barbara, the Santa Cruz river below Santa Cruz dam, the Rio Tesuque below the Santa Fe national forest and the Pojoaque river below Nambe dam.
>
> **A. Designated Uses**: irrigation, livestock watering, wildlife habitat, marginal coldwater fishery, primary contact, and warmwater fishery.
>
> **B. Standards**:
>
> (1) In any single sample: pH shall be within the range of 6.6 to 9.0, temperature shall not exceed 22°C (71.6°F), and turbidity shall not exceed 50 NTU. The use-specific numeric standards set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.
>
> (2) The monthly geometric mean of fecal coliform bacteria shall not exceed 200/100 mL; no single sample shall exceed 400/100 mL (see Subsection B of 20.6.4.13 NMAC).
>
> (3) At mean monthly flows above 100 cfs, the monthly average concentration for: TDS shall not exceed 500 mg/L, sulfate shall not exceed 150 mg/L, and chloride shall not exceed 25 mg/L.

NMAC 20.6.4.121 reads as follows:

> **RIO GRANDE BASIN** - Perennial tributaries to the Rio Grande in Bandelier national monument and their headwaters in Sandoval county, all perennial reaches of tributaries to the Rio Grande in Santa Fe county unless included in other segments.
>
> **A. Designated Uses**: domestic water supply, high quality coldwater fishery, irrigation, livestock watering, wildlife habitat, municipal and industrial water supply, secondary contact, and primary contact.
>
> **B. Standards**:
>
> (1) In any single sample: conductivity shall not exceed 300 µmhos, pH shall be within the range of 6.6 to 8.8, temperature shall not exceed 20°C (68°F), and turbidity shall not exceed l0 NTU. The use-specific numeric standards set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.
>
> (2) The monthly geometric mean of fecal coliform bacteria shall not exceed 100/100 mL; no single sample shall exceed 200/100 mL (see Subsection B of 20.6.4.13 NMAC).

NMAC 20.6.4.123 reads as follows:

> **RIO GRANDE BASIN -** The Red river upstream of the mouth of Placer creek, all tributaries to the Red river, and all other perennial reaches of tributaries to the Rio Grande in Taos and Rio Arriba counties unless included in other segments.
> **A.** **Designated Uses**: domestic water supply, fish culture, high quality coldwater fishery, irrigation, livestock watering, wildlife habitat, and secondary contact.
> **B.** **Standards**:
> (1) In any single sample: conductivity shall not exceed 400 µmhos (500 µmhos for the Rio Fernando de Taos), pH shall be within the range of 6.6 to 8.8, temperature shall not exceed 20°C (68°F), and turbidity shall not exceed 25 NTU. The use-specific numeric standards set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.
> (2) The monthly geometric mean of fecal coliform bacteria shall not exceed 100/100 mL; no single sample shall exceed 200/100 mL (see Subsection B of 20.6.4.13 NMAC).

NMAC 20.6.4.900 provides standards applicable to attainable or designated uses unless otherwise specified in 20.6.4.101 through 20.6.4.899. NMAC 20.6.4.12 lists general standards that apply to all surface waters of the state at all times, unless a specified standard is provided elsewhere in NMAC.

2.3 Intensive Water Quality Sampling

The Upper Rio Grande (Part 2) watershed was intensively sampled by the NMED/SWQB in 2001. A brief summary of the survey and the hydrologic conditions during the sampling events is provided in the following subsections.

2.3.1 Survey Design

Water quality samples were collected during three seasons (spring, summer, and fall) in 2001. Surface water quality monitoring stations were selected to characterize water quality of the stream reaches. Table 2.1 and Figure 2.1 present the SWQB water quality monitoring station locations sampled in 2001 in the portion of the Upper Rio Grande between the Pojoaque River and north of Embudo Creek. Stations were located to evaluate the impact of tributary streams and to determine ambient water quality conditions. The results of the entire Upper Rio Grande (Part 2) survey were summarized in a water quality survey report (NMED/SWQB 2004b).

All sampling and assessment techniques are detailed in the *Quality Assurance Project Plan* (QAPP, NMED/SWQB 2001) and the SWQB assessment protocols (NMED/SWQB 2004). As a result of the 2001 monitoring effort, several exceedences of NM WQS for several streams were documented. Accordingly, these impairments were added to NM's 2004-2006 CWA §303 (d) list (NMED/SWQB 2004c).

2.3.2 Hydrologic Conditions

There are two USGS gaging stations in the Upper Rio Grande (Part 2) watershed associated with the reaches presented in this document. USGS gage locations are presented in Figure 2.1. Daily streamflows for these USGS gages are presented graphically in Figures 2.3 and 2.4 for the 2001 calendar year.

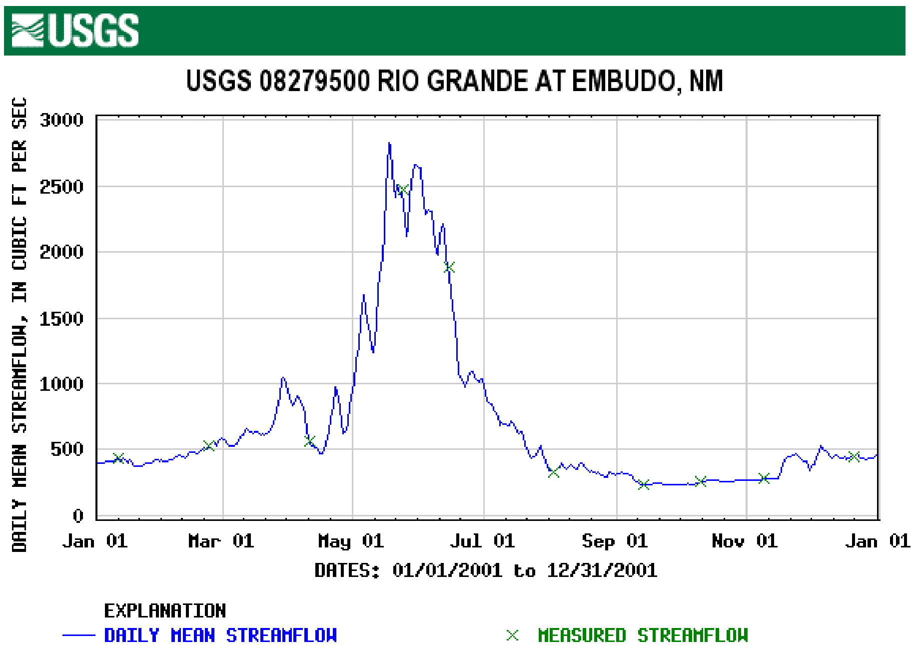


Figure 2.4 USGS Average Daily Streamflow, Rio Grande at Embudo, NM (2001)

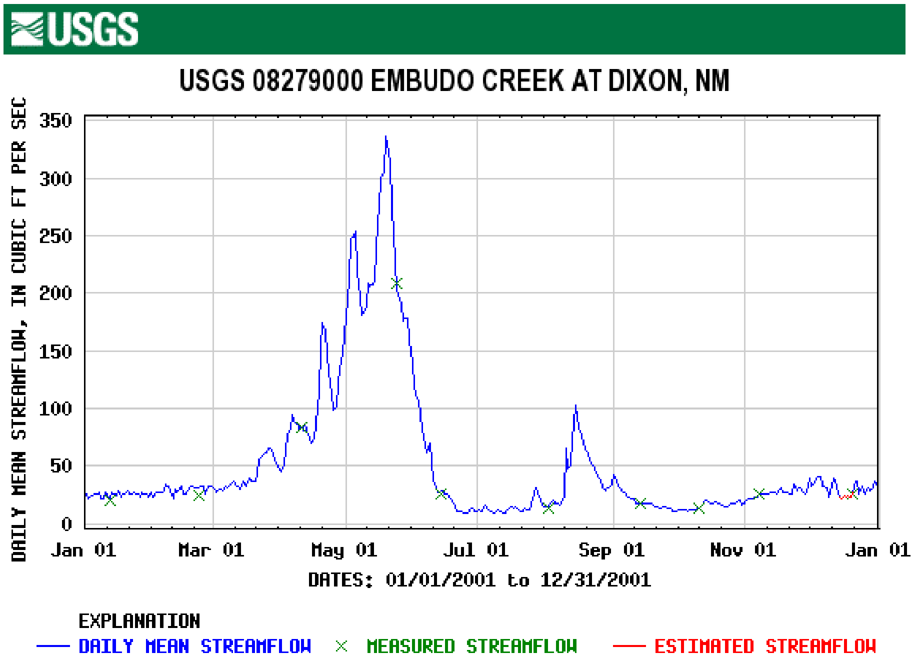


Figure 2.5 USGS Average Daily Streamflow, Embudo Creek at Dixon, NM (2001)

3.0 INDIVIDUAL WATERSHED DESCRIPTIONS

TMDLs will be developed for several assessment units for which constituent (or pollutant) concentrations measured during the 2001 water quality survey indicated impairment. Because characteristics of each watershed, such as geology, land use, and land ownership provide insight into probable sources of impairment, they are presented in this section for the individual watersheds within the Upper Rio Grande (Part 2) basin; except for the mainstem Rio Grande watershed which was previously describe in Section 2.1. In addition, the sampling stations established for the 2001 intensive water quality survey are presented in detail, and the 2004-2006 Integrated §303(d)/§305(b) listings within the Upper Rio Grande (Part 2) river/stream reaches are discussed.

3.1 Embudo Creek Watershed

The Embudo Creek watershed is approximately 317 mi^2 and includes Chamisal Creek, Rio Chiquito, Rio Pueblo, Rio Santa Barbara, and Trampas Creek tributaries. Embudo Creek originates at the confluence of the Rio Pueblo and Rio Santa Barbara within the boundaries of Picuris Pueblo. Embudo Creek then flows approximately 12.5 miles before it flows into the Rio Grande just upstream of Embudo, NM. The Rio Santa Barbara originates in the Sangre de Cristo mountains with the confluence of the east, west, and middle forks of the Rio Santa Barbara. The Rio Santa Barbara then flows approximately 12 miles before converging with the Rio Pueblo forming Embudo Creek. As presented in Figure 3.1, land ownership for the Embudo Creek watershed is 74% U.S. Forest Service (USFS), 9% private, 8% Native Lands (Picuris Pueblo), 7% Bureau of Land Management (BLM), and 2% State. Land use includes 89% forest, 4% agriculture, 3% barren tundra, 2% rangeland, 1% built-up land, less than 1% water, and less than 1% wetlands (Figure 3.2).

The geology of the Embudo Creek watershed consists of a complex distribution of Precambrian metamorphic rocks and Tertiary volcanics. The Embudo Creek watershed lies within the central Española Basin which consists of preserved Tertiary sedimentary rocks and several Pliocene and Pleistocene alluvial deposits (New Mexico Geologic Society, 1979). The eastern most boundary of the Española Basin is delineated by the Sangre de Cristo Mountains.

Eleven sampling stations were established in the Embudo Creek watershed during the 2001 survey (Table 2.1, Figure 3.1). Surface water grab samples from all of the above stations were analyzed for a variety of chemical/physical parameters. The chemical data were collected, assessed, and summarized in a water quality survey report (NMED/SWQB 2004b). Data results from grab sampling will be uploaded to USEPA's STORET database. Therefore, TMDLs were developed for the following assessment unit in the Embudo Creek watershed:

- ***Stream Bottom Deposits***: Embudo Creek (Rio Grande to Canada de Ojo Sarco)
- ***Turbidity***: Embudo Creek (Rio Grande to Canada de Ojo Sarco) and Rio Santa Barbara (Picuris Pueblo bnd to USFS bnd)

Photo 3.1 Embudo Creek at Highway 68 near Dixon

Photo 3.2 Rio Santa Barbara at Mouth

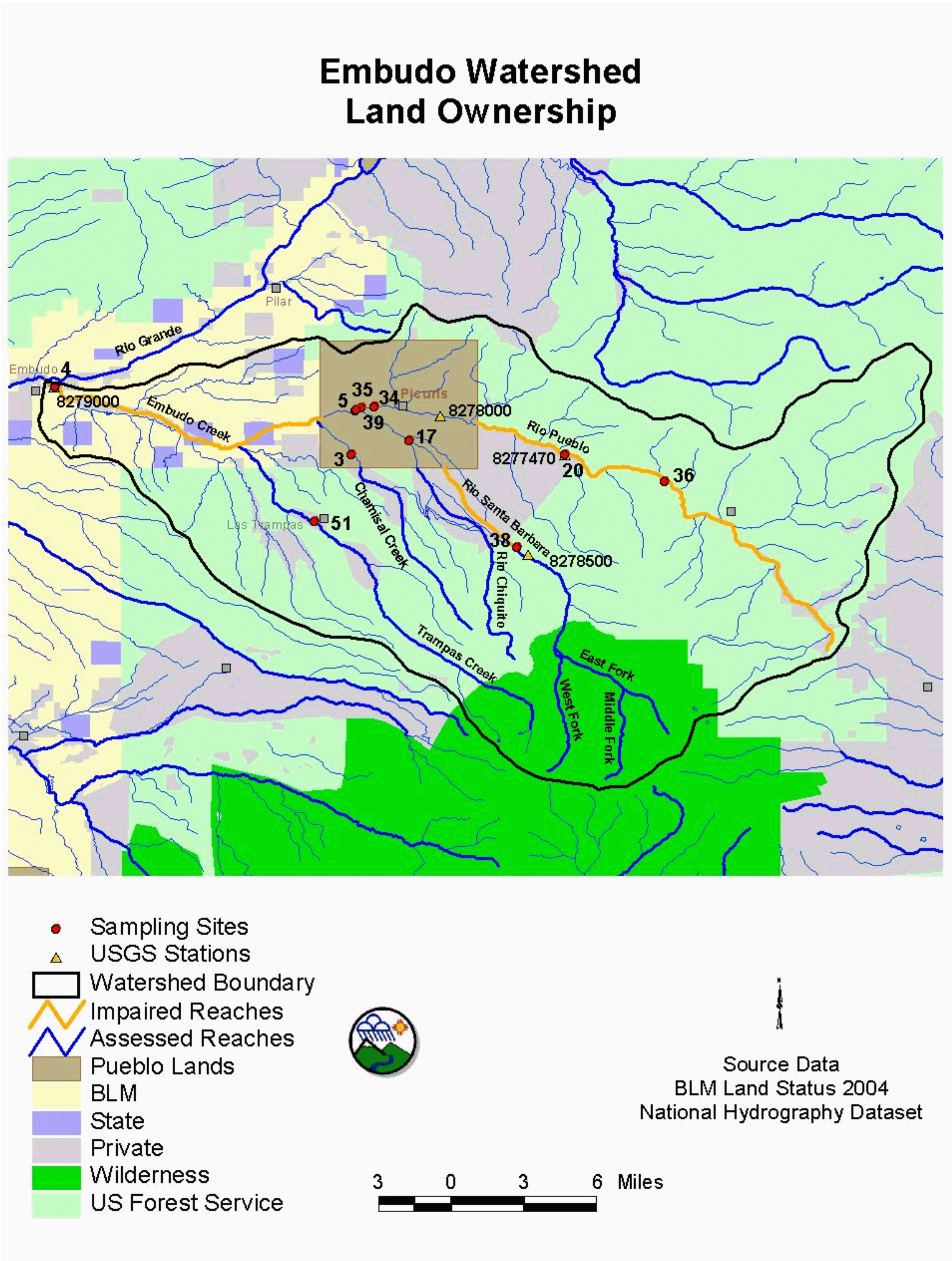


Figure 3.1 Embudo Creek Watershed Land Ownership and Sampling Stations

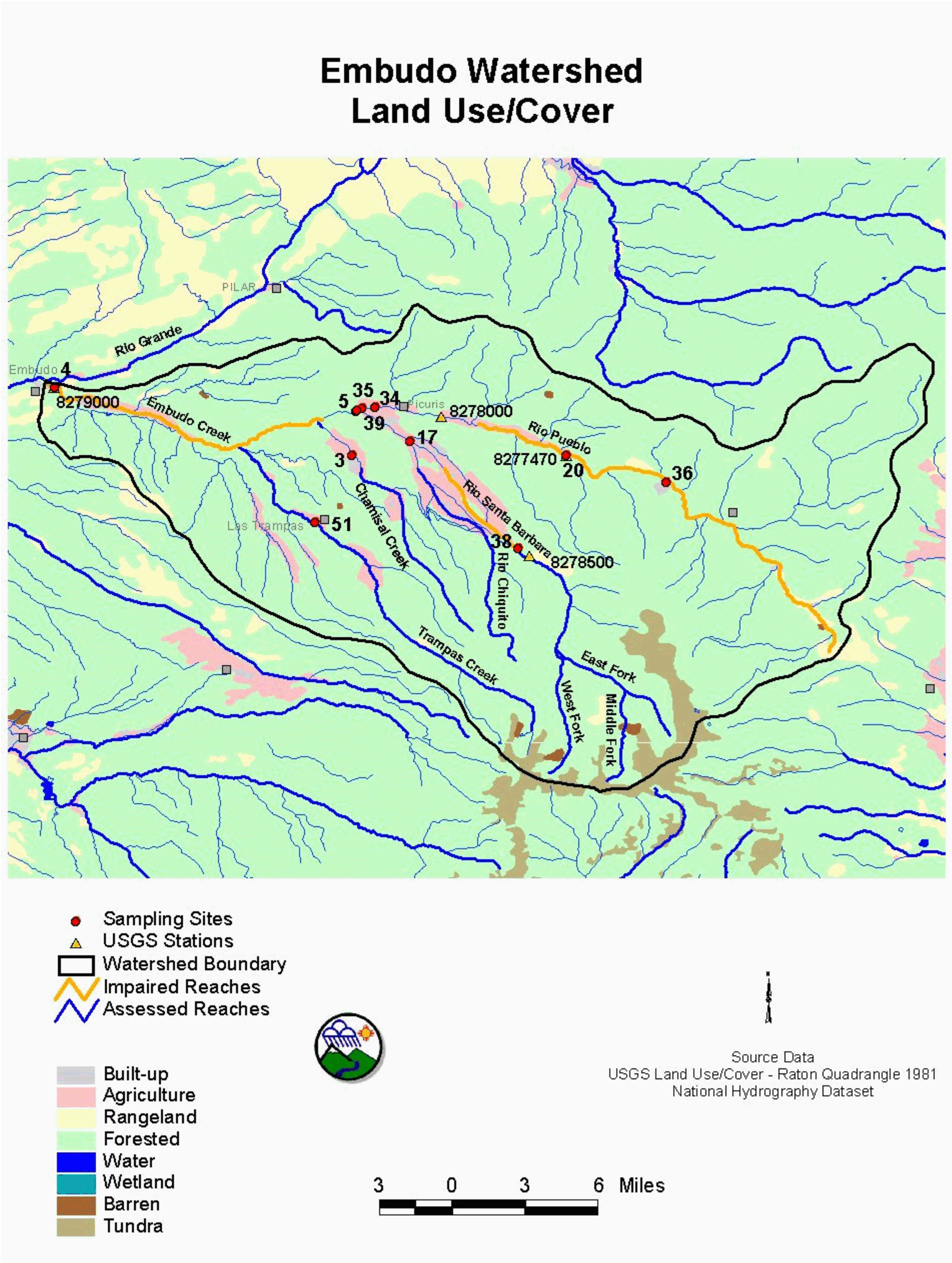


Figure 3.2 Embudo Creek Watershed Land Use and Sampling Stations

3.2 Rio Tesuque Watershed

The Rio Tesuque watershed is roughly 78.4 mi^2 and includes the Rio Tesuque, Tesuque Creek, the North and South Tesuque Forks, and Little Tesuque Creek. Tesuque Creek originates in the Sangre de Cristo Mountains and flows approximately 6 miles to its confluence with the Rio Tesuque. The Rio Tesuque then flows approximately 14 miles to its confluence with the Pojoaque River. Little Tesuque Creek also originates in the Sangre de Cristo Mountains and flows approximately 8.3 miles to the confluence with Tesuque Creek and Rio Tesuque. As shown in Figure 3.3, land ownership is 29% private, 40% Native lands (Tesuque and Pojoaque Pueblos), and 31% USFS. Figure 3.4 presents the land use in this watershed, which is predominately forest (91%), rangeland (4%), built-up lands (3%), agriculture (less than1%), and barren tundra (less than 1%).

The geology of the Rio Tesuque watershed consists of a complex distribution of Precambrian metamorphic rocks and Tertiary volcanics (Table 2.2, Figure 2.2). The Borrego Fault runs the length of the Santa Fe Range and divides the geology of the Rio Tesuque watershed area into two parts (New Mexico Geological Society, 1995). The lower portion west of Hyde State Park consist mainly of Proterozoic supracrustal rocks, felsic geniss, and amphibolite, intruded by granite and granitic pegmatite. This portion of the Santa Fe Range contains the only known outcrops of Paleozoic rocks. Hyde State Park lies within the trace of the Borrego Fault and to the east of Hyde State Park, the geology transitions into metasupracrustal and plutonic rocks that form the batholithic assemblages of the central and northern Santa Fe Range. This portion of the Sangre de Cristo range is highly mineralized and heavily mined, as a result.

Six sampling stations were established in the Rio Tesuque watershed during the 2001 survey (Table 2.1, Figure 3.5). Surface water grab samples from all of the above stations were analyzed for a variety of chemical/physical parameters. The chemical data were collected, assessed, and summarized in a water quality survey report (NMED/SWQB 2004b). Data results from grab sampling will be uploaded to USEPA’s STORET database. The following TMDLs were developed for this watershed:

- ***Aluminum (chronic)***: Little Tesuque Creek (Rio Tesuque to headwaters)

Photo 3.3 Little Tesuque Creek at first crossing of Hyde Park Road (Hwy 475)

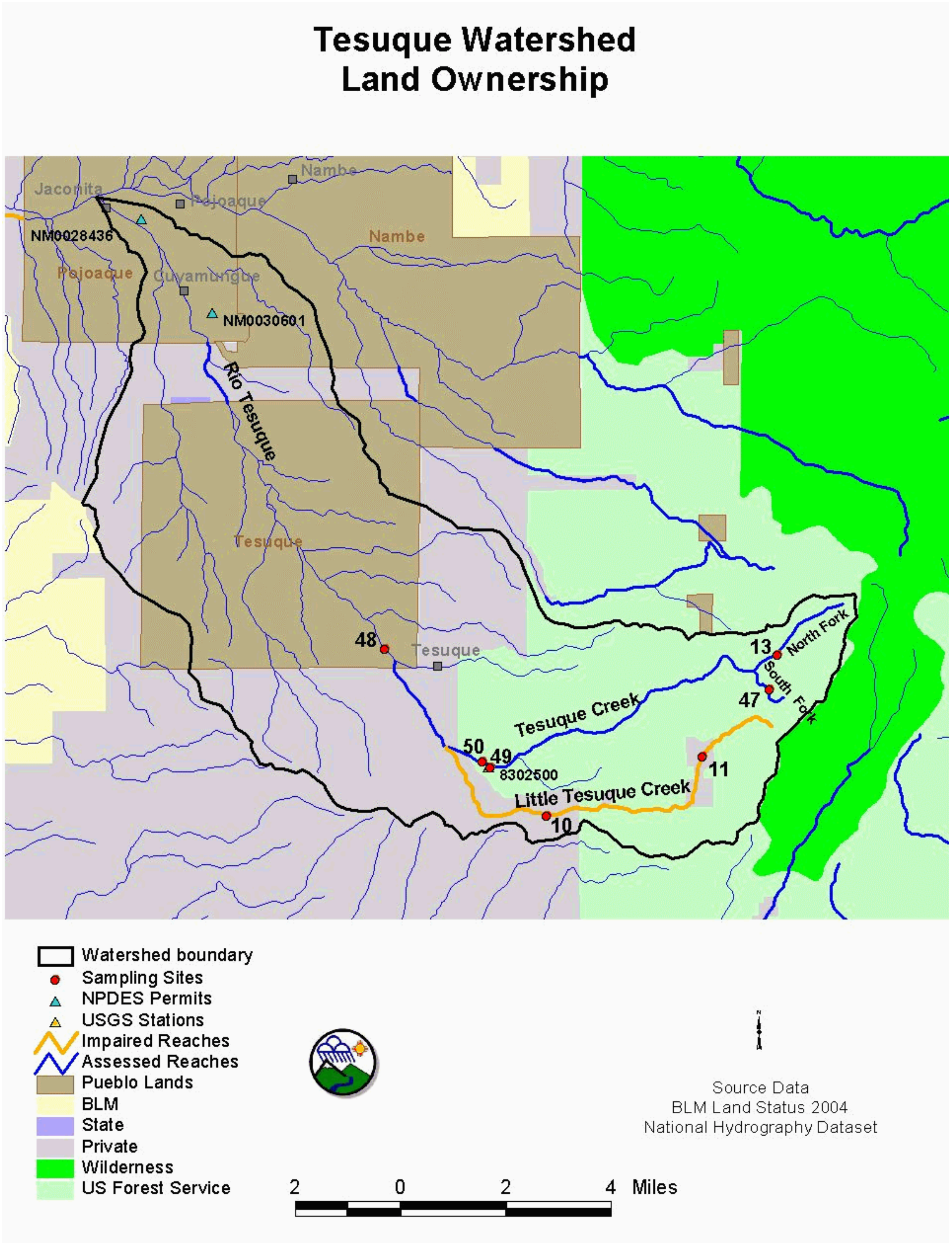


Figure 3.3 Rio Tesuque Watershed Land Ownership and Sampling Stations

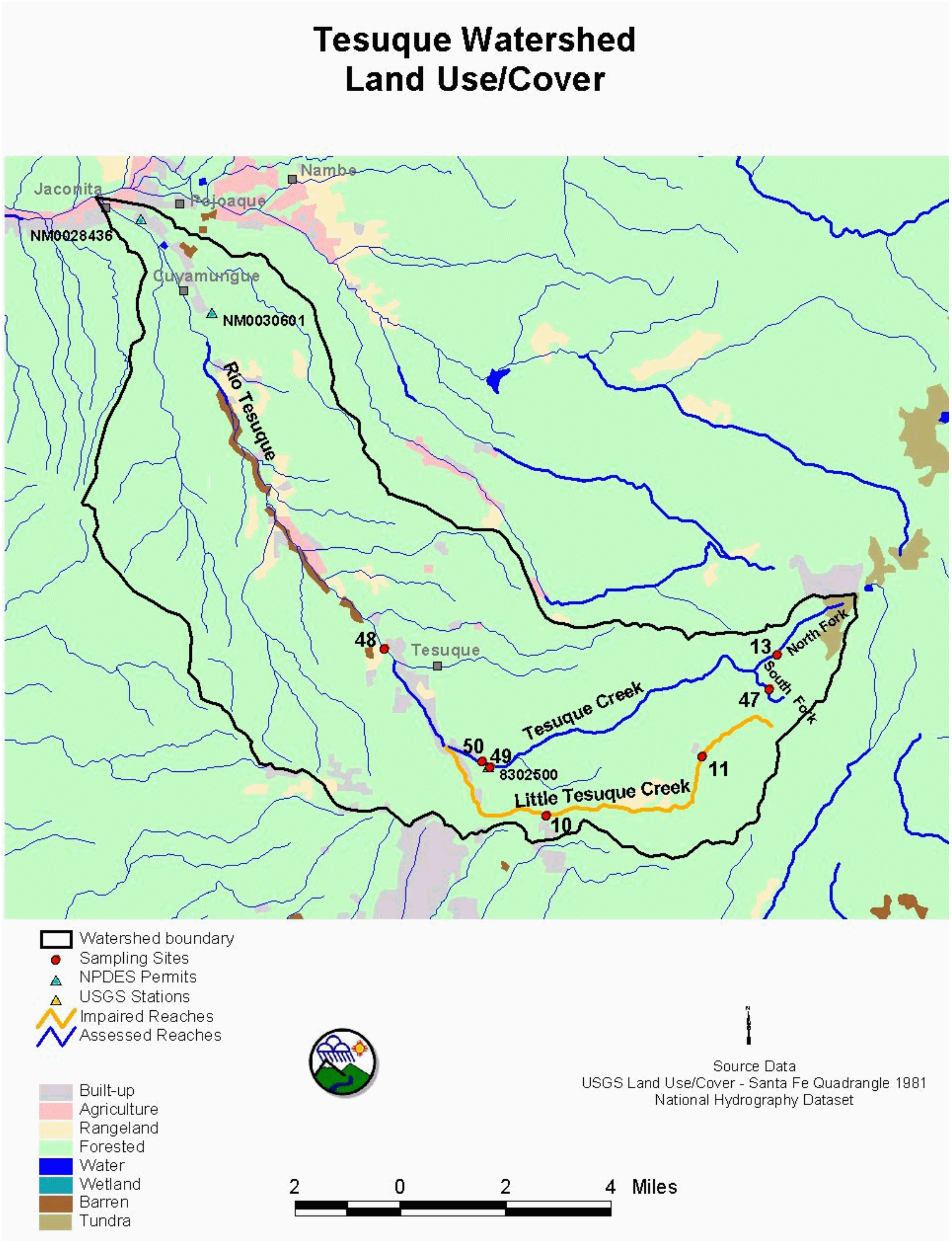


Figure 3.4 Rio Tesuque Watershed Land Use and Sampling Stations

4.0 ALUMINUM

During the 2001 SWQB intensive water quality survey in the Upper Rio Grande (Part 2) Watershed, exceedences of the New Mexico water quality standard for chronic aluminum were documented at two sampling stations on Little Tesuque Creek (SWQB Stations 10 and 11). Consequently, the Little Tesuque Creek from Rio Tesuque to headwaters was listed on the 2004-2006 Clean Water Act Integrated §303(d)/§305(b) list for aluminum.

4.1 Target Loading Capacity

Target values for this aluminum TMDL will be determined based on 1) the presence of numeric criteria, 2) the degree of experience in applying the indicator, and 3) the ability to easily monitor and produce quantifiable and reproducible results. For this TMDL document, target values for dissolved aluminum are based on numeric criteria. This TMDL is also consistent with New Mexico's antidegradation policy.

According to the New Mexico water quality standards (20.6.4.900.M NMAC), the dissolved aluminum chronic criterion is 87 µg/L and the dissolved aluminum acute criterion is 750 µg/L for aquatic life uses.

High chronic levels of dissolved aluminum can be toxic to fish, benthic invertebrates, and some single-celled plants. Aluminum concentrations from 100 to 300 µg/L increase mortality, retard growth, gonadal development and egg production of fish (http://h2osparc.wq.ncsu.edu). To be conservative, these TMDLs were drafted for chronic aluminum and, therefore, should also protect against any acute exceedences.

Data was collected from the Little Tesuque Creek at the first crossing of Hyde Park Road (Hwy 475) (SWQB station 10) and at Hyde Park Road above Hyde Park (SWQB station 11) eight times between May 22 and October 4, 2001 (Table 4.1). Dissolved aluminum concentrations exceeded the chronic criterion for aluminum at both stations during spring sampling. The calculated dissolved aluminum 4-day average during the spring sampling run was 500 µg/L at station 10 and 143 µg/L at station 11. Aluminum was also detected during the summer sampling at both stations, but at concentrations below the chronic aluminum criterion. Aluminum was not detected at these two stations during the fall season in 2001. Concurrently collected total suspended solids (TSS) data reported in Table 4.1 will be discussed in the Linkage(s) section below.

Table 4.1 Dissolved aluminum (Al) and TSS concentrations in the Little Tesuque Creek

Sample Date	SWQB Station 10[(a)]		SWQB Station 11[(b)]	
	Dissolved Al (µg /L)	TSS (mg/L)	Dissolved Al (µg /L)	TSS (mg/L)
5/22/2001	400*	3	110*	7
5/23/2001	500*	6	130*	7
5/24/2001	600*	7	190*	9
8/21/2001	20	4	70	3K
8/22/2001	20	3K	60	3K
10/2/2001	10K	3K	10K	3K
10/3/2001	10K	3K	10K	9
10/4/2001	10K	3K	10K	3K

(a) Little Tesuque Creek at the first crossing of Hyde Park Road (Hwy 475)
(b) Little Tesuque Creek at Hyde Park Road above Hyde Park
K = reported as "below detection limit"
* Exceedence of 87 µg /L dissolved aluminum chronic water quality criterion.

4.2 Flow

TMDLs are calculated for the Little Tesuque Creek at a specific flow. Metal concentrations in a stream vary as a function of flow. As flow increases the concentration of metals can increase. When available, USGS gages are used to estimate flow. Where gages are absent, geomorphologic cross section field data are collected at each site and flows are modeled or actual flow measurements are taken. In this case, flow was measured on the Little Tesuque Creek at SWQB station 10 during the spring sampling run using standard USGS procedures (NMED/SWQB 2001a). The measured flow value was 1.36 cubic feet per second (cfs). Therefore,

Little Tesuque Creek critical flow = 1.36 cfs

The flow value for Little Tesuque Creek was converted from cfs to units of million gallons per day (mgd) as follows:

$$1.36\,\frac{ft^3}{\sec}\times 1{,}728\frac{in^3}{ft^3}\times 0.004329\frac{gal}{in^3}\times 86{,}400\,\frac{\sec}{day}\times 10^{-6} = 0.88\,mgd$$

It is important to remember that the TMDL is a planning tool to be used to achieve water quality standards. Since flows vary throughout the year in these systems, the target load will vary based on the changing flow. Management of the load to improve stream water quality should be a goal to be attained. Meeting the calculated target load may be a difficult objective.

4.3 Calculations

A target load for aluminum is calculated based on a flow, the current water quality criterion, and a conversion factor (8.34) that is a used to convert milligrams per liter (mg/L) units to pounds per day (lbs/day) (see Appendix A for Conversion Factor Derivation). The target loading capacity is calculated using **Equation 1**. The results are shown in Table 4.2.

Critical Flow (mgd) x Standard (mg/L) x 8.34 = Target Loading Capacity (Eq. 1)

Table 4.2 Calculation of target loads for dissolved aluminum

Location	Flow+ (mgd)	Dissolved Al chronic criterion (mg/L)	Conversion Factor	Target Load Capacity (lbs/day)
Little Tesuque Creek	0.88	0.087	8.34	0.64

+ Since USGS gages were unavailable, flow was measured during the 2001 spring sampling run (NMED/SWQB 2001a).

The measured loads for dissolved aluminum were similarly calculated. The arithmetic mean of the data from the downstream sampling site (station 10) collected during the spring run was substituted for the standard in **Equation 1**. The calculated dissolved aluminum 4-day average during the spring sampling run was 500 µg /L (0.50 mg/L) at station 10. The same conversion factor of 8.34 was used. Results are presented in Table 4.3.

Table 4.3 Calculation of measured loads for dissolved aluminum

Pollutant sources	Flow (mgd)	Dissolved Al Arithmetic Mean* (mg/L)	Conversion Factor	Measured Load Capacity (lbs/day)
Little Tesuque Creek	0.88	0.5	8.34	3.67

Notes: * Arithmetic mean of dissolved aluminum concentration at station 10 during the spring sampling run (see Table 4.1).

4.4 Waste Load Allocations and Load Allocations

4.4.1 Waste Load Allocation

There are no point source contributions associated with this TMDL. The WLA is zero.

4.4.2 Load Allocation

In order to calculate the LA, the WLA, and MOS were subtracted from the target capacity (TMDL) following **Equation 2**.

$$WLA + LA + MOS = TMDL \qquad \text{(Eq. 2)}$$

The MOS is estimated to be 25% of the target load calculated in Table 4.2. Results are presented in Table 4.4. Additional details on the MOS chosen are presented in Section 4.7 below.

Table 4.4 Calculation of TMDL for dissolved aluminum

Location	WLA (lbs/day)	LA (lbs/day)	MOS (25%) (lbs/day)	TMDL (lbs/day)
Little Tesuque Creek	0	0.48	0.16	0.64

The extensive data collection and analyses necessary to determine background dissolved aluminum loads for the Little Tesuque Creek watershed was beyond the resources available for this study. It is therefore assumed that a portion of the load allocation is made up of natural background loads.

The NPS and background load reductions that would be necessary to meet the target loads were calculated to be the difference between the calculated target load allocation (Tables 4.4) and the measured load (Table 4.3), and are shown in Table 4.5.

Table 4.5 Calculation of load reduction for dissolved aluminum

Location	LA (lbs/day)	Measured Load (lbs/day)	Load Reduction (lb/day)
Little Tesuque Creek	0.48	3.67	3.19

4.5 Identification and Description of Pollutant Source(s)

Nonpoint pollutant sources that could contribute to the observed load include loss of riparian habitat, natural causes (including geology). There are no point sources in this assessment unit.

4.6 Link Between Water Quality and Pollutant Sources

Where data gaps exist or the level of uncertainty in the characterization of sources is large, the recommended approach to TMDL assignments requires the development of allocations based on estimates utilizing the best available information.

SWQB fieldwork includes an assessment of the potential sources of impairment (NMED/SWQB 1999). The completed *Pollutant Source(s) Documentation Protocol* forms in **Appendix B** provide documentation of a visual analysis of probable sources along an impaired reach. Although this procedure is subjective, SWQB feels that it provides the best available information for the identification of potential sources of impairment in this watershed. Staff completing these forms identify and quantify potential sources of NPS impairments along each reach as determined by field reconnaissance and assessment. It is important to consider not only the land directly adjacent to the stream, which is predominantly privately held, but also to consider upland and upstream areas in a more holistic watershed approach to implementing this TMDL.

Aluminum is the most common metal in the Earth's crust and the third most common element. Aluminum comprises, on average, about eight percent of the Earth's crust. In general, increased metals in the water column can commonly be linked to sediment transport and accumulation, where the metals are a constituent part of the sediment. This does not appear to be the case in the Little Tesuque Creek as evidenced by the fact that there is not a relationship between dissolved aluminum and TSS concentrations at either Station 10 or 11 according to the 2001 sampling data (Table 4.1, Figure 4.1).

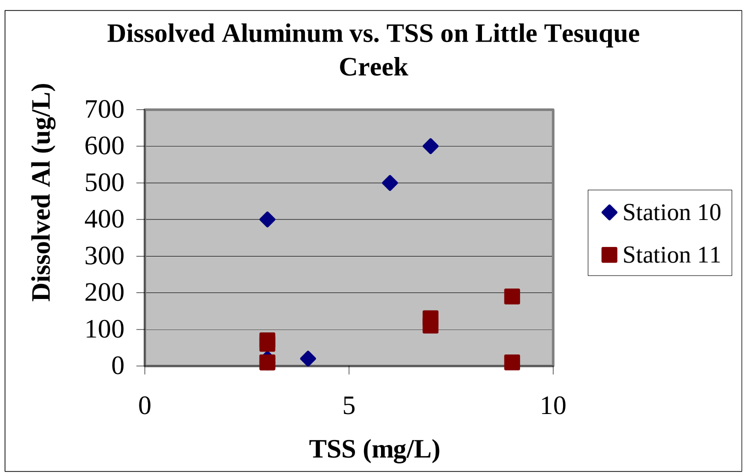


Figure 4.1 Relationship between Dissolved Aluminum and TSS in Little Tesuque Creek

High aluminum is characteristic of the spring snowmelt/runoff period and is not pronounced during baseflow conditions in the Little Tesuque Creek. Normal aqueous chemical processes, enhanced by the slight natural acidity of snow and rain, are capable of rendering some of this abundant, naturally-occurring aluminum available to the stream system. The fact that high dissolved aluminum concentrations were measured during the spring sampling run as opposed to below detection limit concentrations during fall sampling runs are indicative of a landscape source. Acidic anions as well as carbonic acid carried in snow are released into the soil as the snow melts and bring aluminum species into solution. Thus, aluminum concentrations are often high during spring runoff in many areas in New Mexico despite the expected diluting effects of high flow.

There are no known existing or historic aluminum mines in the watershed. In the absence of identifiable degraded uplands, anthropogenic sources of aluminum, poor streambank condition, or land use impacts to explain high levels of sedimentation that may have led to high aluminum concentrations, the largest probable source for high aluminum concentrations measured during snowmelt runoff appears to be local watershed bedrock and natural surface geology processes.

4.7 Margin of Safety

TMDLs should reflect a MOS based on the uncertainty or variability in the data, the point and NPS load estimates, and the modeling analysis. For this TMDL, there will be no MOS for point sources, since there are none. However, for NPSs the MOS is estimated to be an addition of **25%** for aluminum in this case, excluding background. This MOS incorporates several factors:

- Errors in calculating NPS loads

  A level of uncertainty exists in sampling NPSs of pollution. Techniques used for measuring metals concentrations in stream water can lead to inaccuracies in the data. Therefore, a conservative MOS for metals increases the TMDL by **15%.**

- Errors in calculating flow

  Flow estimates were based on one measurement during the spring sampling run. Instrument and operator error can lead to inaccuracy in flow measurements. Accordingly, a conservative MOS increases the TMDL by an additional **10%.**

4.8 Consideration of Seasonal Variation

Data used in the calculation of this TMDL were collected during the spring, summer, and fall of 2001 in order to ensure coverage of any potential seasonal variation in the system. Critical condition is set to high flow for dissolved aluminum because data exceedences were observed during high spring flows. A flow measurement taken during the spring sampling run was used in the calculations.

4.9 Future Growth

Estimations of future growth are not anticipated to lead to a significant increase for dissolved aluminum that cannot be controlled with BMP implementation in this watershed. Therefore, a growth allocation was not included in the waste load allocation for this TMDL.

5.0 SEDIMENTATION/SILTATION (STREAM BOTTOM DEPOSITS)

During the 2001 SWQB intensive water quality survey in the Upper Rio Grande Watershed (Part 2), impairment of the aquatic community due to excessive Sedimentation/Siltation (Stream Bottom Deposits) was documented at Embudo Creek (Rio Grande to Canada de Ojo Sarco) (SWQB Stations 4 and 5). Consequently, this assessment unit was listed on the 2004-2006 Integrated CWA §303(d)/§305(b) list for Sedimentation/Siltation.

5.1 Target Loading Capacity

Target values for this Sedimentation/Siltation TMDL will be determined based on 1) the presence of numeric criteria or appropriate numeric translator to a narrative standard, 2) the degree of experience in applying the indicator, and 3) the ability to easily monitor and produce quantifiable and reproducible results. This TMDL is also consistent with New Mexico's antidegradation policy.

The state of New Mexico has developed and adopted a narrative "bottom deposit" standard. The current general narrative standard for the deposition of material on the bottom of a stream channel is specifically found in Section 20.6.4.12(A) of the State of New Mexico Standards for Interstate and Intrastate Surface Waters (20.6.4 NMAC):

> ***Bottom Deposits:*** *Surface waters of the state shall be free of water contaminants from other than natural causes that will settle and damage or impair the normal growth, function, or reproduction of aquatic life or significantly alter the physical or chemical properties of the bottom.*

The impact of fine sediment deposits is well documented in the literature. An increased sediment load is often the most important adverse effect of activities on streams, according to a monitoring guidelines report (USEPA 1991). This impact is largely a mechanical action that severely reduces the available habitat for macroinvertebrates and fish species that utilize the streambed in various life stages. Minshall (1984) cited the importance of substratum size to aquatic insects and found that substratum is a primary factor influencing the abundance and distribution of insects. Aquatic detritivores also can be affected when their food supply either is buried under sediments or diluted by increased inorganic sediment load and by increasing search time for food (Relyea et al., 2000).

The SWQB Sediment Workgroup evaluated a number of methods described in the literature that would provide information allowing a direct assessment of the impacts to the stream bottom substrate. In order to address the narrative criteria for bottom deposits, SWQB compiled techniques to measure the level of sedimentation of a stream bottom. These procedures are presented in Appendix C of the *State of New Mexico Procedures for Assessing Standards Attainment for the Integrated §303(d)/§305(b) Water Quality Monitoring and Assessment Report* (NMED/SWQB 2004d), which is online at http://www.nmenv.state.nm.us/swqb/links.html. The purpose of the protocol is to provide a reproducible quantification of the narrative criteria for bottom deposits. A final set of monitoring procedures was implemented at a wide variety of sites during the 2001 monitoring season. These procedures included conducting pebble counts (to determine percent (%) fines), stream bottom cobble embeddedness, geomorphologic measurements, and the collection and enumeration of benthic macroinvertebrates.

The target levels involved the examination of developed relationships between % fines and biological score as compared to a reference site. Using existing data from NM, a strong relationship (r^2=0.75) was established between embeddedness and the biological scores using data collected in 1998 (NMED/SWQB 2004d). A strong correlation (r^2= 0.719) was also found when relating embeddedness to % fines. Although these correlations were based on a limited data set, TMDL studies on other reaches, including those in the Cimarron Basin, the Jemez Basin, and the Rio Guadalupe, have shown this relationship to be consistent. These relationships show that at the desired biological score of at least 70, the target embeddedness for fully supporting a designated use would be 45% and the target fines would be 20% (NMED/SWQB 2004d). Since this relationship is based on NM streams, 20% was chosen for the target value for % fines.

The Santa Cruz River at USGS gage 08291000 was chosen as the benthic macroinvertebrate reference station for the Embudo Creek at Hwy 68 bridge near Dixon at USGS gage (SWQB Station 4). They are both in ecoregion 22 and have similar geomorphic characteristics as displayed in Table 5.1. Benthic macroinvertebrate samples and pebble counts were collected at both stations (Barbour et al. 1999, Wohlman 1954).

Table 5.1 Geomorphic Characteristics of Benthic Macroinvertebrate Sampling Sites

Dimensions	Reference Site[(a)]	Study Site[(b)]
Cross-section Area (feet)	25.3	69.5
Width (feet)	23.0	31.6
Maximum Depth (feet)	1.60	3.10
Mean Depth (feet)	1.10	2.20
Width:Depth Ratio	20.9	14.4
Entrenchment Ratio	1.34	1.63

Notes:
[(a)] Reference Site = Santa Cruz River at USGS gage 08291000
[(b)] Study Site = Embudo Creek at Hwy 68 bridge near Dixon at USGS gage

Collection of benthic macroinvertebrates involved the compositing of three individual kick net samples taken from a riffle at each sampling location. Each kick involved the disturbance of approximately one-third of a square meter of substrate for one minute into a 500-micron mesh net. The rapid bioassessment protocol (RBP) metrics were applied to a 300-organism subsample of the composite sample at each site (Barbour et al. 1999). Selection of those metrics that are particularly suited to the delineation of sediment impacts highlights the degree of impairment. Ephemeroptera/Plecoptera/Tricoptera (EPT) taxa, the number of sediment adapted organisms, taxa richness, and Hilsenhoff's Biotic Index (HBI) all indicate some degree of impairment attributable to sedimentation (Table 5.2). Select results of the pebble count and benthic macroinvertebrate surveys are shown in Table 5.2.

Table 5.2 Pebble Count and Benthic Macroinvertebrate Results

Results	Reference Site[(a)]	Study Site[(b)]	Percent of Reference
Pebble count			
% Fines (< 2 mm)	25%	24%**	96%
D50	26.5 mm	57.3 mm	—
D84	331 mm	128 mm	—
Benthic metrics			
Standing Crop (number/square meter)	1,410	688	—
Ephemeroptera/ Plecoptera/ Tricoptera Taxa	15	6	—
Taxa Richness	25	18	—
Hilsenhoff's Biotic Index	4.17	4.60	—
Total Biologic Score	64	42	65%
Total Habitat Score (out of a possible 200)	179	137	77%

Notes:
[(a)] Reference Site = Santa Cruz River at USGS gage 08291000
[(b)] Study Site = Embudo Creek at Hwy 68 bridge near Dixon at USGS gage
mm = Millimeters
— = Not applicable
**This AU goes through episodes of heavy sedimentation followed by scouring. During previous surveys, the cobble was 100% embedded with sand.

5.2 Flow

No streamflow data are necessary because all loads are specified in % fines.

5.3 Calculations

No calculations were necessary because all loads are specified in % fines. The target loads for bottom deposits are shown in Table 5.3.

Measured load was determined by a pebble count as described in the Stream Bottom Deposit Assessment Protocol (NMED/SWQB 2004d). Fines are defined as particles less than 2 millimeters (mm) in diameter. Results are displayed in Table 5.4 and Figure 5.1.

Table 5.3 Calculation of Target Loads for Sedimentation/Siltation

Location	Sedimentation/ Siltation Standards[(a)] (% fines)	Sedimentation/ Siltation Target Load Capacity (% fines)
Embudo Creek (Rio Grande to Canada de Ojo Sarco)	20	20

Notes:
[(a)] This value is based on a narrative standard. The background values for bottom deposits were taken from the Stream Bottom Deposit Assessment Protocol (NMED/SWQB 2004d).

Table 5.4 Calculation of Measured Loads for Sedimentation/Siltation

Location	Sedimentation/ Siltation Measured Load (% fines)
Embudo Creek (Rio Grande to Canada de Ojo Sarco)	24

5.4 Waste Load Allocations and Load Allocations

5.4.1 Waste Load Allocation

There are no individually permitted point source facilities or Municipal Separate Storm Sewer System (MS4) storm water permits in this assessment unit. Sediment may be a component of some (primarily construction) storm water discharges so these discharges should be addressed.

In contrast to discharges from other industrial storm water and individual process wastewater permitted facilities, storm water discharges from construction activities are transient because they occur mainly during the construction itself, and then only during storm events. Coverage under the National Pollutant Discharge Elimination System (NPDES) construction general storm water permit (CGP) requires preparation of a Storm Water Pollution Prevention Plan (SWPPP) that includes identification and control of all pollutants associated with the construction activities to minimize impacts to water quality. In addition, the current CGP also includes state specific requirements to implement best management practices (BMPs) that are designed to prevent to the maximum extent practicable, an increase in sediment, or a parameter that addresses sediment (e.g., total suspended solids, turbidity, siltation, stream bottom deposits, etc.) and flow velocity during and after construction compared to pre-construction conditions. In this case, compliance with a SWPPP that meets the requirements of the CGP is generally assumed to be consistent with this TMDL.

Other industrial storm water facilities are generally covered under the current NPDES Multi Sector General Storm Water Permit (MSGP). This permit also requires preparation of an SWPPP that includes identification and control of all pollutants associated with the industrial activities to minimize impacts to water quality. In addition, the current MSGP also includes state specific requirements to further limit (or eliminate) pollutant loading to water quality impaired/water quality limited waters from facilities where there is a reasonable potential to contain pollutants for which the receiving water is impaired. In this case, compliance with a SWPPP that meets the requirements of the MSGP is generally assumed to be consistent with this TMDL.

Individual wasteload allocations for the General Permits were not possible to calculate at this time in this watershed using available tools. Loads that are in compliance with the General Permits from facilities covered are therefore currently calculated as part of the watershed load allocation.

5.4.2 Load Allocation

In order to calculate the LA, the WLA and MOS were subtracted from the target capacity TMDL following **Equation 2**:

$$WLA + LA + MOS = TMDL \qquad \text{(Eq. 2)}$$

The MOS is estimated to be 25 % of the target load calculated in Table 5.3. Results are presented in Table 5.5. Additional details on the MOS chosen are presented in Section 5.6.

Table 5.5 TMDL for Sedimentation/Siltation

Location	WLA (% fines)	LA (% fines)	MOS (25%) (% fines)	TMDL (% fines)
Embudo Creek (Rio Grande to Canada de Ojo Sarco)	0	15	5	20

The extensive data collection and analyses necessary to determine background sediment loads for the Embudo Creek watershed was beyond the resources available for this study. Therefore, it is assumed that a portion of the load allocation is made up of natural background loads. The load reduction necessary to meet the target load was estimated as the difference between the target load allocation (Table 5.5) and the measured load (Table 5.4), shown in Table 5.6.

5.5 Identification and Description of Pollutant Source(s)

Nonpoint pollutant sources that could contribute to the observed load include range grazing (riparian and/or upland); municipal point sources; land disposal; highway/road/bridge construction; highway maintenance and runoff; crop-related sources; construction. The point source contributions associated with this TMDL were not considered to be applicable.

Table 5.6 Calculation of Load Reduction for Sedimentation/Siltation

Location	LA (% fines)	Measured Load (% fines)	Load Reduction (% fines)
Embudo Creek (Rio Grande to Canada de Ojo Sarco)	15	24	9

5.6 Linkage of Water Quality and Pollutant Sources

Where data gaps exist or the level of uncertainty in the characterization of sources is large, the recommended approach to TMDL assignments requires the development of allocations based on estimates utilizing the best available information.

SWQB fieldwork includes an assessment of the potential sources of impairment (NMED/SWQB 1999). The completed *Pollutant Source(s) Documentation Protocol* forms in **Appendix B** provide documentation of a visual analysis of probable sources along an impaired reach. Although this procedure is subjective, SWQB feels that it provides the best available information for the identification of potential sources of impairment in this watershed. Staff completing these forms identify and quantify potential sources of NPS impairments along each reach as determined by field reconnaissance and assessment. It is important to consider not only the land directly adjacent to the stream, which is predominantly privately held, but also to consider upland and upstream areas in a more holistic watershed approach to implementing this TMDL.

The main sources of impairment along this lower reach appear to be from livestock grazing, channelization, removal of riparian vegetation, natural causes, and off-road vehicles. Agricultural practices such as grazing appear to have contributed to the removal of riparian vegetation and streambank destabilization. This assessment unit goes through episodes of heavy sedimentation and then scouring. During previous surveys, the cobble was 100% embedded with sand. Heavy sediment inputs in Dixon come from roads running perpendicular to the river. Also, dry watercourses in Dixon are used as roads.

5.7 Margin of Safety (MOS)

TMDLs should reflect a MOS based on the uncertainty or variability in the data, the point and NPS load estimates, and the modeling analysis. For this TMDL, there will be no MOS for point sources since none were documented in this reach. However, the MOS is estimated to be an addition of 25% for sediment caused by NPSs, excluding background. This MOS is based on the uncertainty in the relationship between embeddedness, % fines, and biological score. In this case, the % fines are based on a narrative standard and there are also potential errors in measurement of NPS loads due to equipment accuracy, time of sampling, and other factors. Accordingly, a conservative MOS for Sedimentation/Siltation increases the TMDL by **25%**.

Because flow estimates were not needed for the Sedimentation/Siltation TMDL, an additional MOS is not warranted.

5.8 Consideration of Seasonal Variation

Data used in the calculation of this TMDL were collected during the fall which is biological index period SWQB has determined is the best time to collect benthic macroinvertebrates in NM (NMED/SWQB 2004d). Fall is a critical time in the life cycle stages of benthic macroinvertebrates in NM. Fall is also generally the low-flow period of the mean annual hydrograph in NM when bottom deposits are most likely to settle and cause impairment, after the summer monsoon season but before annual spring runoff. It is assumed that if critical conditions are met during this time, coverage of any potential seasonal variation will also be met.

5.9 Future Growth

Estimations of future growth are not anticipated to lead to a significant increase for sedimentation that cannot be controlled with BMP implementation in this watershed.

6.0 TURBIDITY

During the 2001 SWQB intensive water quality survey in the Upper Rio Grande (Part 2) Watershed, several exceedences of the NM water quality criteria for turbidity were documented in the following assessment units:

- Embudo Creek (Rio Grande to Canada de Ojo Sarco) (20.6.4.114 NMAC)
- Rio Grande (non-pueblo Santa Clara to Embudo Creek) (20.6.4.114 NMAC)
- Rio Santa Barbara (Picuris Pueblo bnd to USFS bnd) (20.6.4.123)

According to the NM WQS the segment specific standards for turbidity reads:

> *20.6.4.114 NMAC: In any single sample: turbidity shall not exceed 50 NTU.*
> *20.6.4.123 NMAC: In any single sample: turbidity shall not exceed 25 NTU.*

The following subsections present the turbidity TMDLs for these assessment units.

6.1 Target Loading Capacity

Target values for this turbidity TMDL will be determined based on 1) the presence of numeric criteria, 2) the degree of experience in applying the indicator, and 3) the ability to easily monitor and produce quantifiable and reproducible results. For this TMDL document, target values for turbidity are based on numeric criteria. This TMDL is also consistent with New Mexico's antidegradation policy.

According to the New Mexico Water Quality Standards (20.6.4 NMAC), the general narrative standard for turbidity reads:

> *Turbidity: Turbidity attributable to other than natural causes shall not reduce light transmission to the point that the normal growth, function, or reproduction of aquatic life is impaired or that will cause substantial visible contrast with the natural appearance of the water.*

The total suspended solids (TSS) analytical method is a commonly used measurement of suspended material in surface water. This method was originally developed for use on wastewater samples, but has widely been used as a measure of suspended materials in stream samples because it is acceptable for regulatory purposes and is an inexpensive laboratory procedure. Since there are no wastewater treatment plants discharging into either Embudo Creek, the Rio Grande, or the Rio Santa Barbara in the impaired assessment units, it is assumed that TSS measurements in these ambient stream samples are representative of erosional activities and thus comprised primarily of suspended sediment vs. any potential biosolids from wastewater treatment plant effluent.

Turbidity levels can be inferred from studies that monitor suspended sediment concentrations. Extrapolation from these studies is possible when a site-specific relationship between concentrations of suspended sediments and turbidity is confirmed. Activities that generate varying amounts of suspended sediment will proportionally change or affect turbidity (USEPA 1991). The impacts of suspended sediment and turbidity are well documented in the literature. An increased sediment load is often the most important adverse effect of activities on streams, according to a monitoring guidelines report (USEPA 1991). This impact is largely a mechanical action that severely reduces the available habitat for macroinvertebrates and fish species that utilize the streambed in various life stages. An increase in suspended sediment concentration will reduce the penetration of light, decreases the ability of fish or fingerlings to capture prey, and reduce primary production (USEPA 1991). As stated in Relyea (2000) "increased turbidity by sediments can reduce stream primary production by reducing photosynthesis, physically abrading algae and other plants, and preventing attachment of autotroughs to substrate surfaces".

TSS and turbidity were measured in Embudo Creek (Table 6.1), the Rio Grande (Table 6.2), and the Rio Santa Barbara (Table 6.3) during the 2001 survey. The TSS target was derived using a regression equation developed using measured turbidity as the independent variable and measured TSS dependent variable. The equation and regression statistics are displayed below in Figures 6.1, 6.2, and 6.3. Correlations of r^2=0.99, 0.77, and 0.98 were found between TSS and turbidity for Embudo Creek, Rio Grande, and Rio Santa Barbara, respectively.

Table 6.1 TSS and Turbidity Data for Embudo Creek (Rio Grande to Canada de Ojo Sarco)

Sample Date	TSS (mg/L)	Turbidity (NTU)
Embudo Creek at Hwy 68 bridge near Dixon at USGS gage		
5/22/2001	27	30.1
5/23/2001	20	23.2
5/24/2001	15	20.6
8/14/2001	71	72*
8/15/2001	183	240*
10/2/2001	3	0.4
10/3/2001	5	0.01
10/4/2001	3	0.01

Notes:
*Exceedence of turbidity water quality criterion.
NTU = Nephelometric turbidity units

Table 6.2 TSS and Turbidity Data for Rio Grande (non-pueblo Santa Clara to Embudo Creek)

Sample Date	TSS (mg/L)	Turbidity (NTU)
Rio Grande at Embudo Station		
5/22/2001	76	73.2*
5/23/2001	79	72*
5/24/2001	81	77*
8/14/2001	60	72*
8/15/2001	399	295*
10/02/2001	14	17.4
10/03/2001	15	17.7
10/04/2001	8	14.7
Rio Grande at Hwy 74 near San Juan Pueblo		
5/22/2001	81	86.8*
5/23/2001	89	75.7*
5/24/2001	100	78*
8/14/2001	91	94*
8/15/2001	3450	999+
10/02/2001	3	28.3
10/03/2001	18	28.9
10/04/2001	24	24
Rio Grande above Espanola at Valdez Bridge		
5/22/2001	78	54.6*
5/23/2001	80	42.4
5/24/2001	91	51.1*
8/21/2001	144	119.8*
8/22/2001	115	133.4*
9/25/2001	131	146.2*
9/26/2001	41	138.9*
9/27/2001	56	133.5*

Notes: *Exceedence of turbidity water quality criterion.
+ This TSS and turbidity reading was excluded from TMDL calculations because the turbidity reading indicates that the actual turbidity measurement exceeded the range of the turbidity meter.

Table 6.3 TSS and Turbidity Data for Rio Santa Barbara (Picuris Pueblo bnd to USFS bnd)

Sample Date	TSS (mg/L)	Turbidity (NTU)
Rio Santa Barbara at mouth		
5/23/2001	16	14.2
5/24/2001	12	13.5
8/14/2001	32	36*
8/15/2001	29	37*
10/2/2001	3	0.4
10/3/2001	3	0.5
10/4/2001	3	1.5

Notes:
*Exceedence of turbidity water quality criterion.

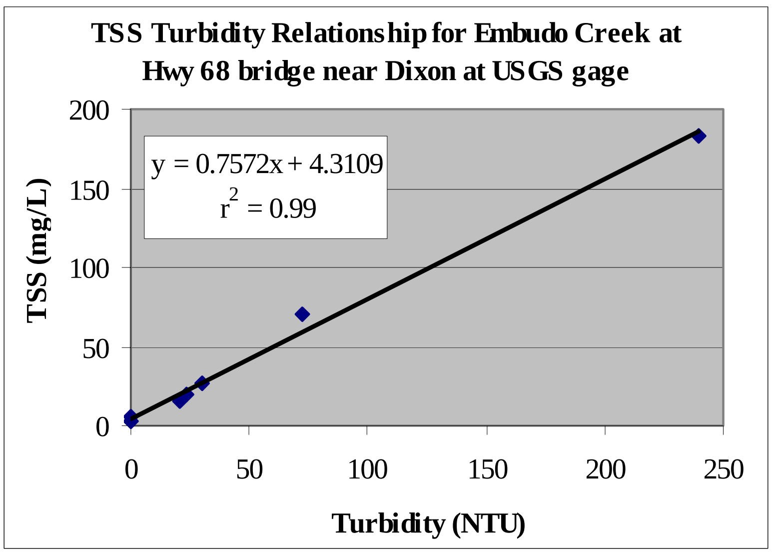


Figure 6.1 Relationship between TSS and Turbidity at Embudo Creek at Hwy 68 Bridge near Dixon at USGS Gage

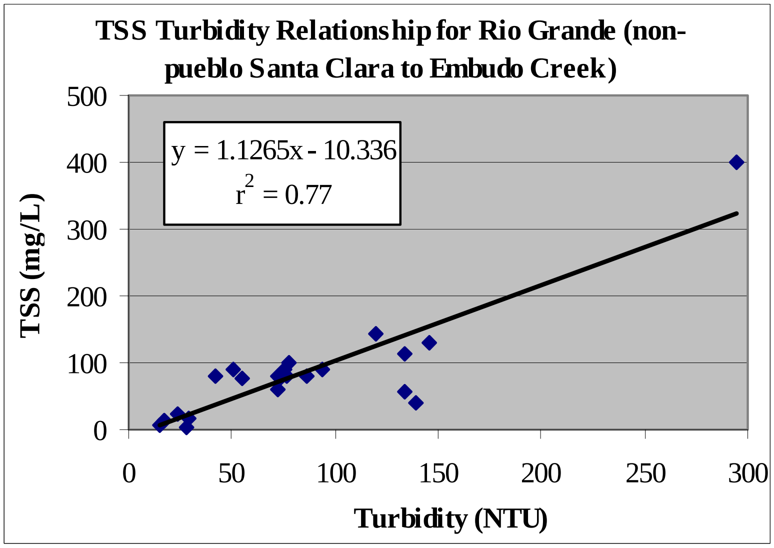


Figure 6.2 Relationship between TSS and Turbidity for the Rio Grande (non-pueblo Santa Clara to Embudo Creek)

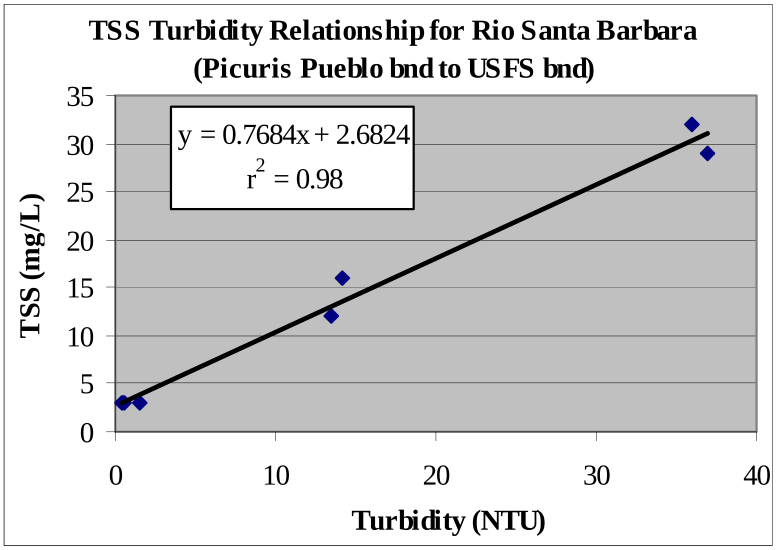


Figure 6.3 Relationship between TSS and Turbidity for the Rio Santa Barbara (Picuris Pueblo bnd to USFS bnd)

6.2 Flow

Sediment transport in a stream varies as a function of flow. As flow increases, the amount of sediment being transported increases. These TMDLs are calculated for each reach at specific flows. When available, USGS gages are used to estimate flow. Gaged streamflow data is available for both Embudo Creek and the Rio Grande, but not for the Rio Santa Barbara. Therefore, USGS gage data was used to determine the average flow when the turbidity water quality criterion was exceeded in Embudo Creek and the Rio Grande. Where gages are absent, geomorphologic cross section field data are collected at each site and flows are modeled or actual flow measurements are taken. In this case, flow was measured on the Rio Santa Barbara at SWQB station 39 during the each sampling run using standard USGS procedures (NMED/SWQB 2001a). For Embudo Creek exceedences were observed on 8/14/2001 and 8/15/2001 and discharge at USGS gage 0827900 (Embudo Creek at Dixon, NM) was recorded on these two days at 103 cfs and 92 cfs, respectively.

The turbidity water quality criterion at the Rio Grande (non-pueblo Santa Clara to Embudo Creek) was exceeded at least one sampling station during the majority of the sampling dates. A USGS gage is located at the upstream sampling location, “Rio Grande at Embudo Station”, and an average flow of 1,607 cfs was calculated for this location for the five days where turbidity exceedences were recorded at this location. Since no flow measurements were recorded at either of the downstream sampling locations in this reach, flow for these two locations was calculated using the following equation (Maidment 1993):

$$Q_{(u)} = Q_{(g)} \times (A_u/A_g)$$

Where,
$Q_{(u)}$ = discharge, in cubic feet per second, at ungaged site
$Q_{(g)}$ = discharge, in cubic feet per second, at gaged site
A_u = drainage area, in square miles, at ungaged site
A_g = drainage area, in square miles, at gaged site

Using this equation, a flow of 1,632 cfs was calculated at the Rio Grande at Hwy 74 near San Juan Pueblo station and 2,130 cfs at the Rio Grande above Espanola at Valdez Bridge station. These three flows were averaged to get a flow of 1,789 for the Rio Grande (non-pueblo Santa Clara to Embudo Creek) reach.

Turbidity exceedences in the Rio Santa Barbara were recorded on 8/14/2001 and 8/15/2001 and discharge was measured on these two days at 18.12 cfs and 21.5 cfs, respectively.

Therefore the critical flows for these TMDLs were:

- Embudo Creek critical flow = 97.5 cfs
- Rio Grande critical flow = 1,789 cfs
- Rio Santa Barbara critical flow = 19.81 cfs

The flow value for Embudo Creek was converted from cfs to units of mgd as follows:

$$97.5\ \frac{ft^3}{\sec} \times 1{,}728\,\frac{in^3}{ft^3} \times 0.004329\,\frac{gal}{in^3} \times 86{,}400\ \frac{\sec}{day} \times 10^{-6} = 63.0\,mgd$$

Using the above equation the flow value for the Rio Grande was converted from 1,789 cfs to 1,156 mgd and the flow value for the Rio Santa Barbara was converted from 19.81 cfs to 12.8 mgd.

6.3 Calculations

Target loads for turbidity (expressed as TSS) are calculated based on a flow, the current water quality standards, and a conversion factor (8.34) that is a used to convert mg/L units to lbs/day (see Appendix B for Conversion Factor Derivation). The target loading capacity is calculated using **Equation 1**. The results are shown in Table 6.4.

Critical Flow (mgd) x Standard (mg/L) x 8.34 = Target Loading Capacity (Eq. 1)

Table 6.4 Calculation of target loads for turbidity (expressed as TSS)

Location	Flow (mgd)	TSS (mg/L)	Conversion Factor	Target Load Capacity (lbs/day)
Embudo Creek (Rio Grande to Canada de Ojo Sarco)	63.0	42.2+	8.34	22,173
Rio Grande (non-pueblo Santa Clara to Embudo Creek)	1,156	45.99*	8.34	443,391
Rio Santa Barbara (Picuris Pueblo bnd to USFS bnd)	12.8	21.89±	8.34	2,337

Notes:
+ The TSS value was calculated using the relationship established between TSS and turbidity in Figure 6.1 (y=0.7572x + 4.3109, R^2=0.99) using the turbidity standard of 50 NTU for the X variable.
*The TSS value was calculated using the relationship established between TSS and turbidity in Figure 6.2 (y=1.1265x – 10.336, R^2=0.77) using the turbidity standard of 50 NTU for the X variable.
±The TSS value was calculated using the relationship established between TSS and turbidity in Figure 6.3 (y=0.7684x + 2.6824, R^2=0.98) using the turbidity standard of 25 NTU for the X variable.

It is important to remember that the TMDL is a planning tool to be used to achieve water quality standards. Since flows vary throughout the year in these systems the target load will vary based on the changing flow. Management of the load should set a goal at water quality standards attainment versus meeting the calculated target load.

The measured loads for turbidity (expressed as TSS) were similarly calculated. In order to achieve comparability between the target and measured loads, the flows used were the same for both calculations. The arithmetic mean of corresponding TSS values when turbidity exceeded the standard was substituted for the standard in **Equation 1**. The same conversion factor of 8.34 was used. Results are presented in Table 6.5.

Table 6.5 Calculation of measured loads for turbidity (expressed as TSS)

Location	Flow (mgd)	TSS Arithmetic Mean * (mg/L)	Conversion Factor	Measured Load Capacity (lbs/day)
Embudo Creek (Rio Grande to Canada de Ojo Sarco)	63.0	127	8.34	66,728
Rio Grande (non-pueblo Santa Clara to Embudo Creek)	1,156	107	8.34	1,031,591
Rio Santa Barbara (Picuris Pueblo bnd to USFS bnd)	12.8	30.5	8.34	3,256

Notes: * Arithmetic mean of TSS values when measured turbidity exceeded the standard (see Tables 6.1, 6.2, and 6.3).

6.4 Waste Load Allocations and Load Allocations

6.4.1 Waste Load Allocation

There are no individually permitted point source facilities or MS4 storm water permits in this assessment unit. Sediment may be a component of some (primarily construction) storm water discharges that contribute to suspended sediment impacts, and should be addressed.

In contrast to discharges from other industrial storm water and individual process wastewater permitted facilities, storm water discharges from construction activities are transient because they occur mainly during the construction itself, and then only during storm events. Coverage under the NPDES CGP requires preparation of a SWPPP that includes identification and control of all pollutants associated with the construction activities to minimize impacts to water quality. In addition, the current CGP also includes state specific requirements to implement BMPs that are designed to prevent to the maximum extent practicable, an increase in sediment, or a parameter that addresses sediment (e.g., total suspended solids, turbidity, siltation, stream bottom deposits, etc.) and flow velocity during and after construction compared to pre-construction conditions. In this case, compliance with a SWPPP that meets the requirements of the CGP is generally assumed to be consistent with this TMDL.

Other industrial storm water facilities are generally covered under the current NPDES MSGP. This permit also requires preparation of an SWPPP that includes identification and control of all pollutants associated with the industrial activities to minimize impacts to water quality. In addition, the current MSGP also includes state specific requirements to further limit (or eliminate) pollutant loading to water quality impaired/water quality limited waters from facilities where there is a reasonable potential to contain pollutants for which the receiving water is impaired. In this case, compliance with a SWPPP that meets the requirements of the MSGP is generally assumed to be consistent with this TMDL.

Individual wasteload allocations for the General Permits were not possible to calculate at this time in this watershed using available tools. Loads that are in compliance with the General Permits from facilities covered are therefore currently calculated as part of the watershed load allocation.

6.4.2 Load Allocation

In order to calculate the LA, the WLA and MOS were subtracted from the target capacity (TMDL) following **Equation 2**.

$$WLA + LA + MOS = TMDL \qquad \text{(Eq. 2)}$$

The MOS is estimated to be 25% of the target load calculated in Table 6.4. Results are presented in Table 6.6. Additional details on the MOS chosen are presented in Section 6.7 below.

Table 6.6 Calculation of TMDL for turbidity

Location	WLA (lbs/day)	LA (lbs/day)	MOS (25%) (lbs/day)	TMDL (lbs/day)
Embudo Creek (Rio Grande to Canada de Ojo Sarco)	0	16,630	5,543	22,173
Rio Grande (non-pueblo Santa Clara to Embudo Creek)	0	332,544	110,847	443,391
Rio Santa Barbara (Picuris Pueblo bnd to USFS bnd)	0	1,753	584	2,337

The extensive data collection and analyses necessary to determine background turbidity loads for the Embudo and Rio Grande watersheds was beyond the resources available for this study. It is therefore assumed that a portion of the load allocation is made up of natural background loads.

The NPS and background load reductions that would be necessary to meet the target loads were calculated to be the difference between the load allocation (Table 6.6) and the measured load (Table 6.5), and are shown in Table 6.7.

Table 6.7 Calculation of load reduction for turbidity (expressed as TSS)

Location	LA (lbs/day)	Measured Load (lbs/day)	Load Reduction (lb/day)
Embudo Creek (Rio Grande to Canada de Ojo Sarco)	16,630	66,728	50,098
Rio Grande (non-pueblo Santa Clara to Embudo Creek)	332,544	1,031,591	699,047
Rio Santa Barbara (Picuris Pueblo bnd to USFS bnd)	1,753	3,256	1,503

6.5 Identification and Description of pollutant source(s)

Pollutant sources that could contribute to each segment are listed in Table 6.8.

6.6 Linkage of Water Quality and Pollutant Sources

Turbidity is an expression of the optical property in water that causes incident light to be scattered of absorbed rather than transmitted in straight lines. It is the condition resulting from suspended solids in the water, including silts, clays, and plankton. Such particles absorb heat in the sunlight, thus raising water temperature, which in turn lowers dissolved oxygen levels. It also prevents sunlight from reaching plants below the surface. This decreases the rate of photosynthesis, so less oxygen is produced by plants. Turbidity may harm fish and their larvae. Turbidity exceedences, historically, are generally attributable to soil erosion, excess nutrients, various wastes and pollutants, and the stirring of sediments up into the water column during high flow events. Turbidity increases, as observed in SWQB monitoring data, show turbidity values along these reaches that exceed the State Standards for the protection of aquatic habitat, namely the marginal coldwater fishery and High Quality Coldwater Fishery (HQCWF) designed uses. Through monitoring, and pollutant source documentation, it has been observed that the most probable cause for these exceedences are due to the alteration of the stream’s hydrograph and grazing impacts. Alterations can be historical or current in nature.

Table 6.8 Pollutant source summary for turbidity

Pollutant Sources	**Magnitude** (Measured Load [lbs/day])	**Location**	**Potential Sources** (% from each)
Point: None	0	--------	0%
Nonpoint: Turbidity (expressed as TSS in lbs/day)	66,728	Embudo Creek	100% Range Grazing -- Riparian or Upland, Removal of Riparian Vegetation Road Maintenance and Runoff Flow Regulation/Modification Agriculture
	1,031,591	Rio Grande	100% Loss of Riparian Habitat Highway, road, bridge runoff (non-construction) Natural causes Irrigated crop production Rangeland grazing
	3,256	Rio Santa Barbara	100% Loss of Riparian Habitat Source unknown Rangeland grazing Streambank modifications/destabilization Site clearance (Land development or Redevelopment)

The components of a watershed continually change through natural ecological processes such as vegetation succession, erosion, and evolution of stream channels. Intrusive human activity often affects watershed function in ways that are inconsistent with the natural balance. These changes, often rapid and sometimes irreversible, occur when people:

- cut forests
- clear and cultivate land
- remove stream-side vegetation
- alter the drainage of the land
- channelize watercourses
- withdraw water for irrigation
- build towns and cities
- discharge pollutants into waterways.

Possible effects of these practices on aquatic ecosystems include:

1. Increased amount of sediment carried into water by soil erosion which may

- increase turbidity of the water
- reduce transmission of sunlight needed for photosynthesis
- interfere with animal behaviors dependent on sight (foraging, mating, and escape from predators)
- impede respiration (e.g., by gill abrasion in fish) and digestion
- reduce oxygen in the water
- cover bottom gravel and degrade spawning habitat cover eggs, which may suffocate or develop abnormally; fry may be unable to emerge from the buried gravel bed

2. Clearing of trees and shrubs from shorelines which may

   - destabilize banks and promote erosion
   - increase sedimentation and turbidity
   - reduce shade and increase water temperature which could disrupt fish metabolism
   - cause channels to widen and become more shallow

3. Land clearing, constructing drainage ditches, straightening natural water channels which may

   - create an obstacle to upstream movement of fish and suspend more sediment in the water due to increased flow
   - strand fish upstream and dry out recently spawned eggs due to subsequent low flows
   - reduce baseflows

Where data gaps exist or the level of uncertainty in the characterization of sources is large, the recommended approach to TMDL assignments requires the development of allocations based on estimates utilizing the best available information.

SWQB fieldwork includes an assessment of the potential sources of impairment (NMED/SWQB 1999). The completed *Pollutant Source(s) Documentation Protocol* forms in **Appendix B** provide documentation of a visual analysis of probable sources along an impaired reach. Although this procedure is subjective, SWQB feels that it provides the best available information for the identification of potential sources of impairment in this watershed. Staff completing these forms identify and quantify potential sources of NPS impairments along each reach as determined by field reconnaissance and assessment. It is important to consider not only the land directly adjacent to the stream, which is predominantly privately held, but also to consider upland and upstream areas in a more holistic watershed approach to implementing this TMDL.

The main sources of impairment along the Embudo Creek (Rio Grande to Canada de Ojo Sarco) reach appear to be from livestock grazing, channelization, removal of riparian vegetation, natural causes, and off-road vehicles. Agricultural practices such as grazing appear to have contributed to the removal of riparian vegetation and streambank destabilization. This assessment unit goes through episodes of heavy sedimentation and then scouring. During previous surveys, the cobble was 100% embedded with sand. Heavy sediment inputs in Dixon come from roads running perpendicular to the river. Also, dry watercourses in Dixon are used as roads.

The main sources of impairment to the Rio Grande (non-pueblo Santa Clara to Embudo Creek) reach are considered to be highway/road/bridge runoff (non-construction), loss of riparian habitat, natural causes, irrigated crop production, and rangeland grazing. The sources of impairment for the Rio Santa Barbara (Picuris Pueblo bnd to USFS bnd) are considered to be loss of riparian habitat, rangeland grazing, site clearance (land development or redevelopment), stream modification/stabilization, and unknown sources.

6.7 Margin of Safety (MOS)

TMDLs should reflect a MOS based on the uncertainty or variability in the data, the point and NPS load estimates, and the modeling analysis. For this TMDL, there will be no MOS for point sources since there are none in either Embudo Creek, Rio Santa Barbara, or this reach of the Rio Grande. However, for the NPS the MOS is estimated to be an addition of **25%** of the TMDL. This MOS incorporates several factors:

- Errors in calculating NPS loads

  A level of uncertainty does exist in the relationship between TSS and turbidity. In this case, the TSS measure does not include bedload and therefore does not account for a complete measure of sediment load. This does not influence the MOS because we need only be concerned with the turbidity portion of the sediment load, which is the basis for the standard. However, there is a potential to have errors in measurements of NPS loads due to equipment accuracy, time of sampling, etc. Accordingly, a conservative MOS increases the TMDL by **15%**.

- Errors in calculating flow

  Flow estimates were based on USGS gages on each of the reaches. There is a potential to have errors in measurements of flow due to equipment accuracy, time of sampling, etc. To be conservative, an additional MOS of **10%** will be included to account for accuracy of flow computations.

6.8 Consideration of Seasonal Variation

Data used in the calculation of this TMDL were collected during spring, summer, and fall in order to ensure coverage of any potential seasonal variation in the system. Since the critical condition is set to estimate high stream discharge, only data that exceeded the water quality criterion were used in determining the target capacities. Therefore, it is assumed that if critical conditions are met, coverage of any potential seasonal variation will also be met.

6.9 Future Growth

Estimations of future growth are not anticipated to lead to a significant increase for turbidity that cannot be controlled with best management practice implementation in this watershed.

7.0 MONITORING PLAN

Pursuant to Section 106(e)(1) of the Federal CWA, the SWQB has established appropriate monitoring methods, systems and procedures in order to compile and analyze data on the quality of the surface waters of NM. In accordance with the NM Water Quality Act, the SWQB has developed and implemented a comprehensive water quality monitoring strategy for the surface waters of the State.

The monitoring strategy establishes the methods of identifying and prioritizing water quality data needs, specifies procedures for acquiring and managing water quality data, and describes how these data are used to progress toward three basic monitoring objectives: to develop water quality-based controls, to evaluate the effectiveness of such controls, and to conduct water quality assessments.

The SWQB utilizes a rotating basin system approach to water quality monitoring. In this system, a select number of watersheds are intensively monitored each year with an established return frequency of approximately every seven years. The next scheduled monitoring date for the Upper Rio Grande watershed is 2008. The SWQB maintains current quality assurance and quality control plans to cover all monitoring activities. This document, called the QAPP, is updated and certified annually by USEPA Region 6 (NMED/SWQB 2001). In addition, the SWQB identifies the data quality objectives required to provide information of sufficient quality to meet the established goals of the program. Current priorities for monitoring in the SWQB are driven by the CWA Section 303(d) list of streams requiring TMDLs. Short-term efforts will be directed toward those waters that are on the USEPA TMDL consent decree list (U.S. District Court for the District of New Mexico 1997).

Once assessment monitoring is completed, those reaches showing impacts and requiring a TMDL will be targeted for more intensive monitoring. The methods of data acquisition include fixed-station monitoring, intensive surveys of priority assessment units (including biological assessments), and compliance monitoring of industrial, federal, and municipal dischargers, as specified in the SWQB Assessment Protocols (NMED/SWQB 2004d).

Long-term monitoring for assessments will be accomplished through the establishment of sampling sites that are representative of the waterbody and which can be revisited approximately every seven years. This information will provide time relevant information for use in CWA Section 303(d) listing and 305(b) report assessments and to support the need for developing TMDLs. The approach provides:

- a systematic, detailed review of water quality data which allows for a more efficient use of valuable monitoring resources;
- information at a scale where implementation of corrective activities is feasible;
- an established order of rotation and predictable sampling in each basin which allows for enhanced coordinated efforts with other programs; and
- program efficiency and improvements in the basis for management decisions.

SWQB recently developed a 10-year monitoring strategy submitted to USEPA on September 30, 2004. Once the 10-year monitoring plan is approved by the USEPA, it will be available at the SWQB website: http://www.nmenv.state.nm.us/swqb/swqb.html. The strategy will detail both the extent of monitoring that can be accomplished with existing resources plus expanded monitoring strategies that could be implemented given additional resources. According to the draft proposed 8-year rotational cycle, which assumes the existing level of resources, the next time SWQB will intensive sample the Upper Rio Grande watershed is the year 2008.

It should be noted that a watershed would not be ignored during the years in between intensive sampling. The rotating basin program will be supplemented with other data collection efforts such as the funding of long-term USGS water quality gaging stations for long-term trend data. Data will be analyzed and field studies will be conducted to further characterize acknowledged problems and TMDLs will be developed and implemented accordingly. Both long-term and intensive field studies can contribute to the State's Integrated §303(d)/§305(b) listing process for waters requiring TMDLs.

8.0 IMPLEMENTATION OF TMDLS

8.1 Coordination

In this watershed public awareness and involvement will be crucial to the successful implementation of these plans and improved water quality. Staff from the SWQB will work with stakeholders to provide the guidance in developing the Watershed Restoration Action Strategy (WRAS). The WRAS is a written plan intended to provide a long-range vision for various activities and management of resources in a watershed. It includes opportunities for private landowners and public agencies in reducing and preventing impacts to water quality. This long-range strategy will become instrumental in coordinating and achieving constituent levels consistent with the New Mexico State Standards, and will be used to prevent water quality impacts in the watershed. The WRAS is essentially the Implementation Plan, or Phase Two of the TMDL process.

SWQB staff will assist with any technical assistance such as selection and application of BMPs needed to meet WRAS goals. Stakeholder public outreach and involvement in the implementation of this TMDL will be ongoing. Stakeholders in this process will include SWQB, and other members of the WRAS.

Implementation of BMPs within the watershed to reduce pollutant loading from NPSs will be encouraged. Reductions from point sources will be addressed in revisions to discharge permits.

8.2 Time Line

The following table details the proposed implementation timeline (**Table 8.1**).

8.3 Clean Water Act §319(h) Funding Opportunities

The Watershed Protection Section of the SWQB provides USEPA §319(h) funding to assist in implementation of BMPs to address water quality problems on reaches listed on the §303(d) list or which are located within Category I Watersheds as identified under the Unified Watershed Assessment of the Clean Water Action Plan. These monies are available to all private, for profit and nonprofit organizations that are authenticated legal entities, or governmental jurisdictions including: cities, counties, tribal entities, Federal agencies, or agencies of the State. Proposals are submitted by applicants two times a year through a Request for Proposal (RFP) process and require a non-federal match of 40% of the total project cost consisting of funds and/or in-kind services. Funding is available for both watershed group formation (which includes WRAS development) and on-the-ground projects to improve surface water quality and associated habitat. Further information on funding from the CWA §319 (h) can be found at the NM Environment Department website: http://www.nmenv.state.nm.us/.

Table 8.1 Proposed Implementation Timeline

Implementation Actions	Year 1	Year 2	Year 3	Year 4	Year 5
Public Outreach and Involvement	X	X	X	X	X
Form watershed groups	X	X			
WRAS Development		X	X	X	
Establish Performance Targets		X			
Secure Funding		X	X		
Implement Management Measures (BMPs)		X	X	X	
Monitor BMPs		X	X	X	
Determine BMP Effectiveness				X	X
Re-evaluate Performance Targets				X	X

9.0 ASSURANCES

New Mexico's Water Quality Act (Act) does authorize the Water Quality Control Commission (WQCC) to "promulgate and publish regulation 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 Water Quality Act also states in §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 Water Quality Standards (see NMAC 20.6.4.10.C) (NMAC 2002) states:

> *These water quality standards do not grant the Commission or any other entity the power to create, take away or modify property rights in water.*

New Mexico policies are in accordance with the federal Clean Water Act §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 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 Chapter 74, Article 6-10 NMSA 1978 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 Clean Water Act. Since portions of this TMDL will be implemented through NPS control mechanisms, the New Mexico Watershed Protection Program will target efforts to this and other watersheds with TMDLs.

In order 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, in particular the Forest Service and the Bureau of Land Management. MOUs have also been developed with other State agencies, such as the New Mexico State Highway and Transportation Department. 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 members of the WRAS. The cooperation of watershed stakeholders will be pivotal in the implementation of these TMDLs as well.

10.0 PUBLIC PARTICIPATION

Public participation was solicited in development of this TMDL (see **Appendix C**). The draft TMDL was made available for a 30-day comment period on January 11, 2005. Response to comments are attached as **Appendix D** of this document. The draft document notice of availability was extensively advertised via newsletters, email distribution lists, webpage postings (http://www.nmenv.state.nm.us/), and press releases to area newspapers.

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APPENDIX A
CONVERSION FACTOR DERIVATION

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Flow (as million gallons per day [MGD]) and concentration values (milligrams per liter [mg/L]) must be multiplied by a conversion factor in order to express the load in units “pounds per day.” The following expressions detail how the conversion factor was determined:

TMDL Calculation:

$$Flow\,(MGD) \times Concentration\left(\frac{mg}{L}\right) \times CF\left(\frac{L-lb}{gal-mg}\right) = Load\left(\frac{lb}{day}\right)$$

Conversion Factor Derivation:

$$CF = 10^6 \times \frac{3.785\,L}{gal} \times \frac{1\,lb}{454{,}000\,mg} = 8.34\,\frac{L-lb}{gal-mg}$$

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APPENDIX B
POLLUTANT SOURCE(S) DOCUMENTATION PROTOCOL

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This protocol was designed to support federal regulations and guidance requiring states to document and include probable source(s) of pollutant(s) in their §303(d) Lists as well as the States §305(b) Report to Congress.

The following procedure should be used when sampling crews are in the field conducting water quality surveys or at any other time field staff are collecting data.

Pollutant Source Documentation Steps:

1). Obtain a copy of the most current §303(d) List.

2). Obtain copies of the ***Field Sheet for Assessing Designated Uses and Nonpoint Sources of Pollution***.

3). Obtain 35mm camera that has time/date photo stamp on it. **DO NOT USE A DIGITAL CAMERA FOR THIS PHOTODOCUMENTATION**

4). Identify the reach(s) and probable source(s) of pollutant in the §303(d) List associated with the project that you will be working on.

5). Verify if current source(s) listed in the §303(d) List are accurate.

6). Check the appropriate box(s) on the field sheet for source(s) of nonsupport and estimate percent contribution of each source.

7). Photodocument probable source(s) of pollutant.

8). Create a folder for the TMDL files, insert field sheet and photodocumentation into the file.

This information will be used to update §303(d) Lists and the States §305(b) Report to Congress.

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FIELD SHEET FOR ASSESSING DESIGNATED USES AND NONPOINT SOURCES OF POLLUTION

REACH NAME: Rio Grande (non-pueblo Santa Clara to Embudo Creek)
SEGMENT NUMBER:
BASIN:
PARAMETER: Turbidity
STAFF MAKING ASSESSMENT: J. Ickes
DATE: 11/17/04

CODES FOR USES NOT FULLY SUPPORTED

- ☐ HQCWF = HIGH QUALITY COLDWATER FISHERY
- ☐ CWF = COLDWATER FISHERY
- ☐ MCWF = MARGINAL COLDWATER FISHERY
- ☐ WWF = WARMWATER FISHERY
- ☐ LWWF = LIMITED WARMWATER FISHERY
- ☐ DWS = DOMESTIC WATER SUPPLY
- ☐ PC = PRIMARY CONTACT
- ☐ IRR = IRRIGATION
- ☐ LW = LIVESTOCK WATERING
- ☐ WH = WILDLIFE HABITAT

Fish culture, secondary contact and municipal and industrial water supply and storage are also designated in particular stream reaches where these uses are actually being realized. However, no numeric standards apply uniquely to these uses.

CODES FOR SOURCES OF NONSUPPORT (CHECK ALL THAT APPLY)

- ☐ 0100 INDUSTRIAL POINT SOURCES
- ☐ 0200 MUNICIPAL POINT SOURCES
- ☐ 0201 DOMESTIC POINT SOURCES
- ☐ 0400 COMBINED SEWER OVERFLOWS
- ☐ 1000 AGRICULTURE
- ☐ 1100 NONIRRIGATED CROP PRODUCTION
- ☒ 1200 IRRIGATED CROP PRODUCTION
- ☐ 1201 IRRIGATED RETURN FLOWS
- ☐ 1300 SPECIALTY CROP PRODUCTION (e.g., truck farming and orchards)
- ☐ 1400 PASTURELAND
- ☒ 1500 RANGELAND
- ☐ 1600 FEEDLOTS - ALL TYPES
- ☐ 1700 AQUACULTURE
- ☐ 1800 ANIMAL HOLDING/MANAGEMENT AREAS
- ☐ 1900 MANURE LAGOONS
- ☐ 2000 SILVICULTURE
- ☐ 2100 HARVESTING, RESTORATION, RESIDUE MANAGEMENT
- ☐ 2200 FOREST MANAGEMENT
- ☐ 2300 ROAD CONSTRUCTION or MAINTENANCE
- ☐ 3000 CONSTRUCTION
- ☐ 3100 HIGHWAY/ROAD/BRIDGE
- ☐ 3200 LAND DEVELOPMENT
- ☐ 3201 RESORT DEVELOPMENT
- ☐ 3300 HYDROELECTRIC
- ☐ 4000 URBAN RUNOFF/STORM SEWERS
- ☐ 5000 RESOURCES EXTRACTION
- ☐ 5100 SURFACE MINING
- ☐ 5200 SUBSURFACE MINING
- ☐ 5300 PLACER MINING
- ☐ 5400 DREDGE MINING
- ☐ 5500 PETROLEUM ACTIVITIES
- ☐ 5501 PIPELINES
- ☐ 5600 MILL TAILINGS
- ☐ 5700 MINE TAILINGS
- ☐ 5800 ROAD CONSTRUCTION/MAINTENANCE
- ☐ 5900 SPILLS
- ☐ 6000 LAND DISPOSAL
- ☐ 6100 SLUDGE
- ☐ 6200 WASTEWATER
- ☐ 6300 LANDFILLS
- ☐ 6400 INDUSTRIAL LAND TREATMENT
- ☐ 6500 ONSITE WASTEWATER SYSTEMS (septic tanks, etc.)
- ☐ 6600 HAZARDOUS WASTE
- ☐ 6700 SEPTAGE DISPOSAL
- ☐ 6800 UST LEAKS
- ☐ 7000 HYDROMODIFICATION
- ☐ 7100 CHANNELIZATION
- ☐ 7200 DREDGING
- ☐ 7300 DAM CONSTRUCTION/REPAIR
- ☐ 7400 FLOW REGULATION/MODIFICATION
- ☐ 7500 BRIDGE CONSTRUCTION
- ☒ 7600 REMOVAL OF RIPARIAN VEGETATION
- ☐ 7700 STREAMBANK MODIFICATION OR DESTABILIZATION
- ☐ 7800 DRAINING/FILLING OF WETLANDS
- ☐ 8000 OTHER
- ☐ 8010 VECTOR CONTROL ACTIVITIES
- ☐ 8100 ATMOSPHERIC DEPOSITION
- ☐ 8200 WASTE STORAGE/STORAGE TANK LEAKS
- ☒ 8300 ROAD MAINTENANCE or RUNOFF
- ☐ 8400 SPILLS
- ☐ 8500 IN-PLACE CONTAMINANTS
- ☒ 8600 NATURAL
- ☐ 8700 RECREATIONAL ACTIVITIES
- ☐ 8701 ROAD/PARKING LOT RUNOFF
- ☐ 8702 OFF-ROAD VEHICLES
- ☐ 8703 REFUSE DISPOSAL
- ☐ 8704 WILDLIFE IMPACTS
- ☐ 8705 SKI SLOPE RUNOFF
- ☐ 8800 UPSTREAM IMPOUNDMENT
- ☐ 8900 SALT STORAGE SITES
- ☐ 9000 SOURCE UNKNOWN

FIELD SHEET FOR ASSESSING DESIGNATED USES AND NONPOINT SOURCES OF POLLUTION

REACH NAME: Rio Santa Barbara (Picuris Pueblo bnd to USFS bnd)
SEGMENT NUMBER:
BASIN:
PARAMETER: Turbidity & Benthic
STAFF MAKING ASSESSMENT: J. Ickes
DATE: 11/17/04

CODES FOR USES NOT FULLY SUPPORTED

☒	HQCWF =	HIGH QUALITY COLDWATER FISHERY	☐	DWS	=	DOMESTIC WATER SUPPLY
☐	CWF =	COLDWATER FISHERY	☐	PC	=	PRIMARY CONTACT
☐	MCWF =	MARGINAL COLDWATER FISHERY	☐	IRR	=	IRRIGATION
☐	WWF =	WARMWATER FISHERY	☐	LW	=	LIVESTOCK WATERING
☐	LWWF =	LIMITED WARMWATER FISHERY	☐	WH	=	WILDLIFE HABITAT

Fish culture, secondary contact and municipal and industrial water supply and storage are also designated in particular stream reaches where these uses are actually being realized. However, no numeric standards apply uniquely to these uses.

CODES FOR SOURCES OF NONSUPPORT (CHECK ALL THAT APPLY)

☐	0100	INDUSTRIAL POINT SOURCES
☐	0200	MUNICIPAL POINT SOURCES
☐	0201	DOMESTIC POINT SOURCES
☐	0400	COMBINED SEWER OVERFLOWS
☐	1000	AGRICULTURE
☐	1100	NONIRRIGATED CROP PRODUCTION
☐	1200	IRRIGATED CROP PRODUCTION
☐	1201	IRRIGATED RETURN FLOWS
☐	1300	SPECIALTY CROP PRODUCTION (e.g., truck farming and orchards)
☐	1400	PASTURELAND
☒	1500	RANGELAND
☐	1600	FEEDLOTS - ALL TYPES
☐	1700	AQUACULTURE
☐	1800	ANIMAL HOLDING/MANAGEMENT AREAS
☐	1900	MANURE LAGOONS
☐	2000	SILVICULTURE
☐	2100	HARVESTING, RESTORATION, RESIDUE MANAGEMENT
☐	2200	FOREST MANAGEMENT
☐	2300	ROAD CONSTRUCTION or MAINTENANCE
☐	3000	CONSTRUCTION
☐	3100	HIGHWAY/ROAD/BRIDGE
☒	3200	LAND DEVELOPMENT
☐	3201	RESORT DEVELOPMENT
☐	3300	HYDROELECTRIC
☐	4000	URBAN RUNOFF/STORM SEWERS
☐	5000	RESOURCES EXTRACTION
☐	5100	SURFACE MINING
☐	5200	SUBSURFACE MINING
☐	5300	PLACER MINING
☐	5400	DREDGE MINING
☐	5500	PETROLEUM ACTIVITIES
☐	5501	PIPELINES
☐	5600	MILL TAILINGS
☐	5700	MINE TAILINGS
☐	5800	ROAD CONSTRUCTION/MAINTENANCE
☐	5900	SPILLS
☐	6000	LAND DISPOSAL
☐	6100	SLUDGE
☐	6200	WASTEWATER
☐	6300	LANDFILLS
☐	6400	INDUSTRIAL LAND TREATMENT
☐	6500	ONSITE WASTEWATER SYSTEMS (septic tanks, etc.)
☐	6600	HAZARDOUS WASTE
☐	6700	SEPTAGE DISPOSAL
☐	6800	UST LEAKS
☐	7000	HYDROMODIFICATION
☐	7100	CHANNELIZATION
☐	7200	DREDGING
☐	7300	DAM CONSTRUCTION/REPAIR
☐	7400	FLOW REGULATION/MODIFICATION
☐	7500	BRIDGE CONSTRUCTION
☒	7600	REMOVAL OF RIPARIAN VEGETATION
☒	7700	STREAMBANK MODIFICATION OR DESTABILIZATION
☐	7800	DRAINING/FILLING OF WETLANDS
☐	8000	OTHER
☐	8010	VECTOR CONTROL ACTIVITIES
☐	8100	ATMOSPHERIC DEPOSITION
☐	8200	WASTE STORAGE/STORAGE TANK LEAKS
☐	8300	ROAD MAINTENANCE or RUNOFF
☐	8400	SPILLS
☐	8500	IN-PLACE CONTAMINANTS
☐	8600	NATURAL
☐	8700	RECREATIONAL ACTIVITIES
☐	8701	ROAD/PARKING LOT RUNOFF
☐	8702	OFF-ROAD VEHICLES
☐	8703	REFUSE DISPOSAL
☐	8704	WILDLIFE IMPACTS
☐	8705	SKI SLOPE RUNOFF
☐	8800	UPSTREAM IMPOUNDMENT
☐	8900	SALT STORAGE SITES
☒	9000	SOURCE UNKNOWN

FIELD SHEET FOR ASSESSING DESIGNATED USES AND NONPOINT SOURCES OF POLLUTION

CODES FOR USES NOT FULLY SUPPORTED

☒	HQCWF =	HIGH QUALITY COLDWATER FISHERY	☐	DWS	=	DOMESTIC WATER SUPPLY
☐	CWF =	COLDWATER FISHERY	☐	PC	=	PRIMARY CONTACT
☐	MCWF =	MARGINAL COLDWATER FISHERY	☐	IRR	=	IRRIGATION
☐	WWF =	WARMWATER FISHERY	☐	LW	=	LIVESTOCK WATERING
☐	LWWF =	LIMITED WARMWATER FISHERY	☐	WH	=	WILDLIFE HABITAT

Fish culture, secondary contact and municipal and industrial water supply and storage are also designated in particular stream reaches where these uses are actually being realized. However, no numeric standards apply uniquely to these uses.

REACH NAME: Little Tesuque Creek (Rio Tesuque to headwaters)

SEGMENT NUMBER:

BASIN:

PARAMETER: Aluminum

STAFF MAKING ASSESSMENT: J. Ickes

DATE: 11/17/04

CODES FOR SOURCES OF NONSUPPORT (CHECK ALL THAT APPLY)

☐	0100	INDUSTRIAL POINT SOURCES
☐	0200	MUNICIPAL POINT SOURCES
☐	0201	DOMESTIC POINT SOURCES
☐	0400	COMBINED SEWER OVERFLOWS
☐	1000	AGRICULTURE
☐	1100	NONIRRIGATED CROP PRODUCTION
☐	1200	IRRIGATED CROP PRODUCTION
☐	1201	IRRIGATED RETURN FLOWS
☐	1300	SPECIALTY CROP PRODUCTION (e.g., truck farming and orchards)
☐	1400	PASTURELAND
☐	1500	RANGELAND
☐	1600	FEEDLOTS - ALL TYPES
☐	1700	AQUACULTURE
☐	1800	ANIMAL HOLDING/MANAGEMENT AREAS
☐	1900	MANURE LAGOONS
☐	2000	SILVICULTURE
☐	2100	HARVESTING, RESTORATION, RESIDUE MANAGEMENT
☐	2200	FOREST MANAGEMENT
☐	2300	ROAD CONSTRUCTION or MAINTENANCE
☐	3000	CONSTRUCTION
☐	3100	HIGHWAY/ROAD/BRIDGE
☐	3200	LAND DEVELOPMENT
☐	3201	RESORT DEVELOPMENT
☐	3300	HYDROELECTRIC
☐	4000	URBAN RUNOFF/STORM SEWERS
☐	5000	RESOURCES EXTRACTION
☐	5100	SURFACE MINING
☐	5200	SUBSURFACE MINING
☐	5300	PLACER MINING
☐	5400	DREDGE MINING
☐	5500	PETROLEUM ACTIVITIES
☐	5501	PIPELINES
☐	5600	MILL TAILINGS
☐	5700	MINE TAILINGS
☐	5800	ROAD CONSTRUCTION/MAINTENANCE
☐	5900	SPILLS
☐	6000	LAND DISPOSAL
☐	6100	SLUDGE
☐	6200	WASTEWATER
☐	6300	LANDFILLS
☐	6400	INDUSTRIAL LAND TREATMENT
☐	6500	ONSITE WASTEWATER SYSTEMS (septic tanks, etc.)
☐	6600	HAZARDOUS WASTE
☐	6700	SEPTAGE DISPOSAL
☐	6800	UST LEAKS
☐	7000	HYDROMODIFICATION
☐	7100	CHANNELIZATION
☐	7200	DREDGING
☐	7300	DAM CONSTRUCTION/REPAIR
☐	7400	FLOW REGULATION/MODIFICATION
☐	7500	BRIDGE CONSTRUCTION
☐	7600	REMOVAL OF RIPARIAN VEGETATION
☐	7700	STREAMBANK MODIFICATION OR DESTABILIZATION
☐	7800	DRAINING/FILLING OF WETLANDS
☐	8000	OTHER
☐	8010	VECTOR CONTROL ACTIVITIES
☐	8100	ATMOSPHERIC DEPOSITION
☐	8200	WASTE STORAGE/STORAGE TANK LEAKS
☐	8300	ROAD MAINTENANCE or RUNOFF
☐	8400	SPILLS
☐	8500	IN-PLACE CONTAMINANTS
☒	8600	NATURAL
☐	8700	RECREATIONAL ACTIVITIES
☐	8701	ROAD/PARKING LOT RUNOFF
☐	8702	OFF-ROAD VEHICLES
☐	8703	REFUSE DISPOSAL
☐	8704	WILDLIFE IMPACTS
☐	8705	SKI SLOPE RUNOFF
☐	8800	UPSTREAM IMPOUNDMENT
☐	8900	SALT STORAGE SITES
☐	9000	SOURCE UNKNOWN

FIELD SHEET FOR ASSESSING DESIGNATED USES AND NONPOINT SOURCES OF POLLUTION

CODES FOR USES NOT FULLY SUPPORTED

☐	HQCWF =	HIGH QUALITY COLDWATER FISHERY		☐	DWS =	DOMESTIC WATER SUPPLY
☐	CWF =	COLDWATER FISHERY		☐	PC =	PRIMARY CONTACT
☒	MCWF =	MARGINAL COLDWATER FISHERY		☐	IRR =	IRRIGATION
☒	WWF =	WARMWATER FISHERY		☐	LW =	LIVESTOCK WATERING
☐	LWWF =	LIMITED WARMWATER FISHERY		☐	WH =	WILDLIFE HABITAT

Fish culture, secondary contact and municipal and industrial water supply and storage are also designated in particular stream reaches where these uses are actually being realized. However, no numeric standards apply uniquely to these uses.

REACH NAME: Embudo Creek (Rio Grande to Canada de Ojo Sarco)
SEGMENT NUMBER:
BASIN:
PARAMETER: Turbidity & Stream Bottom Deposits
STAFF MAKING ASSESSMENT: J. Ickes
DATE: 11/17/04

CODES FOR SOURCES OF NONSUPPORT (CHECK ALL THAT APPLY)

☐	0100	INDUSTRIAL POINT SOURCES
☐	0200	MUNICIPAL POINT SOURCES
☐	0201	DOMESTIC POINT SOURCES
☐	0400	COMBINED SEWER OVERFLOWS
☐	1000	AGRICULTURE
☐	1100	NONIRRIGATED CROP PRODUCTION
☐	1200	IRRIGATED CROP PRODUCTION
☐	1201	IRRIGATED RETURN FLOWS
☐	1300	SPECIALTY CROP PRODUCTION (e.g., truck farming and orchards)
☐	1400	PASTURELAND
☒	1500	RANGELAND
☐	1600	FEEDLOTS - ALL TYPES
☐	1700	AQUACULTURE
☐	1800	ANIMAL HOLDING/MANAGEMENT AREAS
☐	1900	MANURE LAGOONS
☐	2000	SILVICULTURE
☐	2100	HARVESTING, RESTORATION, RESIDUE MANAGEMENT
☐	2200	FOREST MANAGEMENT
☐	2300	ROAD CONSTRUCTION or MAINTENANCE
☐	3000	CONSTRUCTION
☐	3100	HIGHWAY/ROAD/BRIDGE
☒	3200	LAND DEVELOPMENT
☐	3201	RESORT DEVELOPMENT
☐	3300	HYDROELECTRIC
☐	4000	URBAN RUNOFF/STORM SEWERS
☐	5000	RESOURCES EXTRACTION
☐	5100	SURFACE MINING
☐	5200	SUBSURFACE MINING
☐	5300	PLACER MINING
☐	5400	DREDGE MINING
☐	5500	PETROLEUM ACTIVITIES
☐	5501	PIPELINES
☐	5600	MILL TAILINGS
☐	5700	MINE TAILINGS
☐	5800	ROAD CONSTRUCTION/MAINTENANCE
☐	5900	SPILLS
☐	6000	LAND DISPOSAL
☐	6100	SLUDGE
☐	6200	WASTEWATER
☐	6300	LANDFILLS
☐	6400	INDUSTRIAL LAND TREATMENT
☐	6500	ONSITE WASTEWATER SYSTEMS (septic tanks, etc.)
☐	6600	HAZARDOUS WASTE
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☒	7100	CHANNELIZATION
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☐	7400	FLOW REGULATION/MODIFICATION
☐	7500	BRIDGE CONSTRUCTION
☒	7600	REMOVAL OF RIPARIAN VEGETATION
☒	7700	STREAMBANK MODIFICATION OR DESTABILIZATION
☐	7800	DRAINING/FILLING OF WETLANDS
☐	8000	OTHER
☐	8010	VECTOR CONTROL ACTIVITIES
☐	8100	ATMOSPHERIC DEPOSITION
☐	8200	WASTE STORAGE/STORAGE TANK LEAKS
☐	8300	ROAD MAINTENANCE or RUNOFF
☐	8400	SPILLS
☐	8500	IN-PLACE CONTAMINANTS
☒	8600	NATURAL
☐	8700	RECREATIONAL ACTIVITIES
☐	8701	ROAD/PARKING LOT RUNOFF
☒	8702	OFF-ROAD VEHICLES
☐	8703	REFUSE DISPOSAL
☐	8704	WILDLIFE IMPACTS
☐	8705	SKI SLOPE RUNOFF
☐	8800	UPSTREAM IMPOUNDMENT
☐	8900	SALT STORAGE SITES
☐	9000	SOURCE UNKNOWN

APPENDIX C
PUBLIC PARTICIPATION PROCESS FLOWCHART

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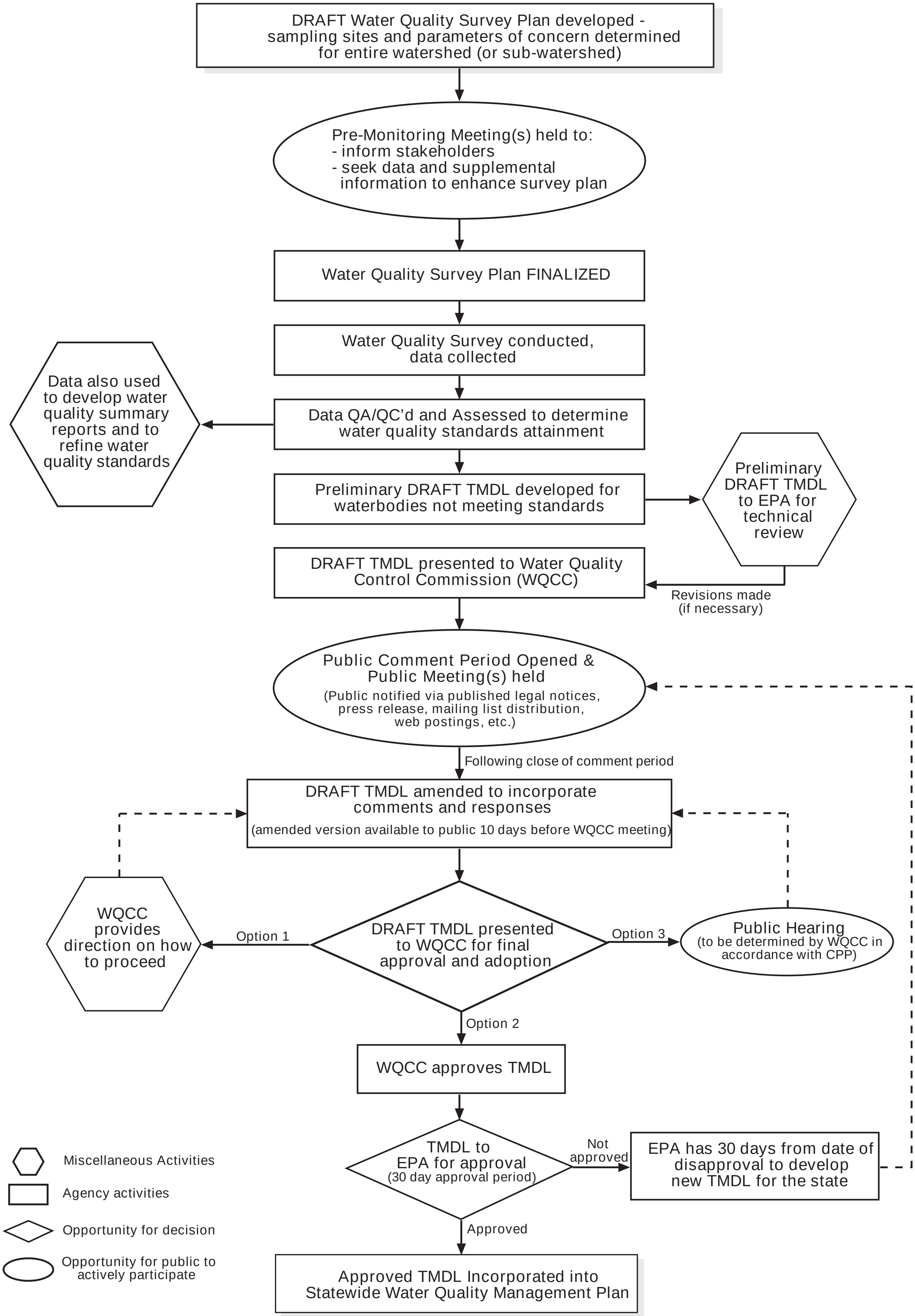
Appendix C: Public Participation Process Flowchart



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APPENDIX D
RESPONSES TO COMMENTS

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Comments on Upper Rio Grande – Part 2 TMDL

Sent via Email, February 10, 2005 1:27 PM

COMMENT: I am writing on behalf of the Rio Pueblo/Rio Embudo Watershed Protection Coalition (RP/REWPC) to comment on the Draft Total Maximum Daily Load for the Upper Rio Grande Watershed. We have both general and specific concerns.

First, we feel the document is overly technical and essentially undecipherable by a layman. If the New Mexico Environment Department (NMED) truly wants to engage the public, it must make a better effort to make its data and conclusions intelligible to a more general readership. Moreover, given the complexity of the document, a 30-day comment period is too short a time to digest and respond to the information.

NMED/SWQB Response: Thank you for commenting. NMED understands that TMDLs can be technically challenging for a layperson to read, but NMED is required by the Clean Water Act (CWA) and USEPA to include certain technical aspects in our TMDLs. NMED will continue to revise our TMDL format to try and make them more user friendly.

COMMENT: Second, we feel that NMED must be more comprehensive in collection of data upon which it bases its assessments. For instance, in its rationale for delisting the Rio Quemado for turbidity NMED cites data collected between November 8, 2004 and November 17, 2004. This is a period during which the river is at its lowest flow and the weather is often dry. By contrast, collection of data for the Rio Grande (non-pueblo Santa Clara to Embudo Creek) (Table 6.2, pg. 38) shows consistent exceedence of turbidity water quality criterion in May, during run-off, and August, during the summer monsoons, while in October, turbidity generally falls within acceptable standards. We strongly feel that the November surveys of the Rio Quemado are not comprehensive enough to warrant delisting and suggest that fully comprehensive data be collected for all streams under consideration.

NMED/SWQB Response: The original data used to list the Rio Quemado for turbidity was based on only three data points, with two minor exceedences of the turbidity criterion from samples collected during snowmelt runoff and the day after a large storm event. Minor, temporary exceedences of turbidity criteria during snowmelt runoff and after storm events are common and a natural component of the typical hydrograph in the southwest. In acknowledgement of this situation, WQS 20.6.4.12.J states "Turbidity attributable to other than natural causes shall not…". NMED believes the two minor exceedences noted above fall under this definition, and that the sonde data collected November 2004 more accurately represents turbidity conditions in the Rio Quemado at the sampling location. NMED agrees that comprehensive data should be collected for our assessments and would have preferred to collect and incorporate biological condition into this assessment, but because of time and budget constraints we must use available data in our assessments. The Upper Rio Grande watershed including the Rio Quemado is scheduled for another intensive survey in 2008 and NMED plans to more fully address issues such as the Rio Quemado turbidity listing during that intensive survey.

COMMENT: Third, in NMED's "Integrated List" of upper Rio Grande streams being considered for TMDLs, the listing for the Rio Pueblo (Picuris Pueblo bnd. to headwaters, pg. 106) suggests the "Probable Causes of Impairment" as Benthic-Macroinvertebrate Bioassessments. The survey offers no further information concerning these assessments and it is, therefore, impossible to draw any conclusions about the nature of the stream's impairment. We suggest that NMED must fully explain and substantiate all assessment information in order for the public to understand its rationales for causes and sources of impairment.

NMED/SWQB Response: "Benthic-Macroinvertebrate Bioassessments" is a placeholder Probable Cause of Impairment that NMED includes on the Integrated List when benthic macroinvertebrate data indicate impairment, but the exact cause of the impairment to the benthic macroinvertebrate community cannot be identified with existing data. In Section 2.0 of the TMDL it states that additional information is needed to determine the exact cause of the Benthic-Macroinvertebrate impairment in the Rio Pueblo as well as other reaches in the Upper Rio Grande Part 2 study. The additional data will be collected during the next intensive survey of this area scheduled for 2008.

Thank you for your consideration.

Mark Schiller, Board Member RP/REWPC
Box 6 El Valle Rt.
Chamisal, N.M. 87521
505-689-2200

Sent via Email and FAX, February 10, 2005 4:01 PM

BEFORE THE NEW MEXICO WATER QUALITY CONTROL COMMISSION

IN THE MATTER OF THE REQUEST	**)**
FOR FINAL APPROVAL BY THE	**)**
SURFACE WATER QUALITY BUREAU	**)**
OF THE FINAL DRAFT UPPER RIO	**)**
GRANDE PART 2 TMDL	**)**
	)

COMMENTS OF LAS CAMPANAS LIMITED PARTNERSHIP

Las Campanas Limited Partnership ("Las Campanas") appreciates the opportunity to comment on the final draft Upper Rio Grande part 2 TMDL ("Draft").[1] In accordance with the 30 – Day Public Comment period commencing January 11, 2005, Las Campanas respectfully submits the following comments. Please note that these comments focus on the issue of the turbidity standard set forth by the Draft for the upper Rio Grande. Regarding "[t]he main stem of the Rio Grande from the headwaters of Cochiti reservoir upstream to Taos Junction bridge," the Draft states: "In any single sample . . . turbidity shall not exceed 50 NTU [nephelometric turbidity units]." Draft at 2.2 (quoting NMAC 20.6.4.114).

After a careful analysis of the Draft, Las Campanas has determined that the New Mexico Environment Department ("NMED") should suspend the current standard of 50 NTU for the upper Rio Grande between non-pueblo Santa Clara and Embudo Creek, pending more information on that stretch of the River. Certainly protection of water qualify is of vital importance to New Mexico and to Las Campanas. Las Campanas realizes that the suspension of such a standard is not an action to be taken lightly. However, a thorough examination of the Draft unavoidably leads to the conclusion that every relevant piece of evidence supports such a suspension. The evidence is summarized below.

The Draft contains a table showing the total suspended sediment ("TSS") and the NTUs for the stretch of the Rio Grande area in question. Draft at 6.1 (Table 6.2). Significantly, the table shows the upper Rio Grande exceeding 50 NTU 71% of the time. That fact alone can be seen as dispositive of whether the 50 NTU standard ought to be maintained. If under the natural condition, a norm would be violated three-quarters of the time, it makes little sense to establish the norm at 50 NTU. Suspending the 50 NTU standard would thus represent an acknowledgement of the reality of the natural condition along this stretch of the Rio Grande.

Another reason for suspending the 50 NTU standard is the fact that the record demonstrates that the NMED lacks the resources to distinguish natural background turbidity from added turbidity. *See* Draft at 6.4.2. Finally, the NMED has no clear ratio demonstrating the sources for any added turbidity. *See* Draft at 6.6. Finally, even if the NMED were able to establish a background level for the upper Rio Grande, the fluctuations are so great that the very

[1] *Available at* http://www.nmenv.state.nm.us/swqb/Projects/RioGrande/Upper/TMDL2/index.html.

concept of a "background level" may be inherently meaningless for this stretch. *See* Draft at 6.1 (Table 6.2).

In short, the NMED:

a) has a turbidity standard which is being violated nearly three-quarters of the time;
b) is unable to determine whether an excess of turbidity causing a violation represents natural background or an additional source;
c) if it is an additional source, is unable to determine how much of that violation represents human-caused additions beyond the natural background; and
d) cannot presently disaggregate the source(s) of such additions.

Each of these factors points directly toward the suspension of the 50 NTU standard as unworkable until more data is obtained.

It is true that, as an alternative, the NMED could adopt an approach like that of the Pojoaque, Picuris and Nambe Pueblos, which limit increases in turbidity to no more than 10% when natural background turbidity is above 50 NTU. *See* 1999 *Revised* Pueblo of Pojoaque Water Quality Standards (PPWQS) at § 3(G);[2] Water quality Code for the Picuris Pueblo (Adopted May 11, 1995) (Revised May 2000) at § 3(G);[3] Water Quality Code for the Pueblo of Nambe (Adopted May 11, 1995) at § 3(G).[4] However, this approach is ultimately counterproductive because: a) anybody who wished to add to the river's turbidity would simply wait until it was at a high volume, for the obvious reason that 10% of a high volume is more than 10% of a low volume, and b) if people are going to put anything into the river, it is best to have them to do so when the river is at low turbidity no t based upon volume of flow; indeed, high flows as in floods may carry higher turbidity. Therefore, the percentage requirement gives people an incentive to invert that principle thereby making the situation worse rather than better.

CONCLUSION

In light of the above considerations, Las Campanas reluctantly concludes the 50 NTU standard for the Rio Grande between Cochiti reservoir north to Taos Junction bridge should be suspended. It is not viable as a standard under present or immediately foreseeable circumstances, and no likely alternative is to be had until sufficient financial resources are committed to develop adequate research data.

Dated: February 10, 2005

Respectfully submitted,
LAW & RESOURCE PLANNING ASSOCIATES,
A Professional Corporation

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[2] *Available at* http://www.epa.gov/ost/standards/wqslibrary/tribes/pojoaque_6_wqs.pdf.
[3] *Available at* http://www.epa.gov/ost/standards/wqslibrary/tribes/picuris_6_wqs.pdf.
[4] *Available at* http://www.epa.gov/ost/standards/wqslibrary/tribes/nambe_ween_6_wqs.pdf.

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NMED/SWQB Response: Thank you for commenting. During the February 2004 triennial review of New Mexico's Water Quality Standards, NMED proposed changes to the turbidity standards to recognize varying background conditions. The WQCC approved these recommended changes. NMED is in the process of submitting proposed changes to EPA Region 6 for review and approval. Your comments have been forwarded to the SWQB Water Quality Standards Coordinator.

Received at the Upper Rio Grande – Part 2, January 25, 2005 Public Meeting

Judy Chaddick
P.O. Box 3116
Espanola, NM 87533

1) Education is very important both with the youth and the stakeholders.

NMED/SWQB Response: The SWQB agrees with this comment. This is why the SWQB has very active public outreach and watershed protection sections that work with the public to promote education.

2) Mica sand that people have brought into Embudo for landscaping may be a problem for silting in the Rio Grande.

NMED/SWQB Response: The SWQB agrees with this comment and is aware of the building of a "beach" on private property along the Rio Grande near Embudo. This is a nonpoint source issue and therefore NMED does not have regulatory control over this activity, but the watershed protection group plans on working with the property owner to educate them of potential impacts of the Mica sand on the Rio Grande.

3) I'm concerned with cattle being buried near the river and pesticides being washed into the river.

NMED/SWQB Response: The SWQB agrees with this comment and the watershed protection group plans on working with the property owners to educate them of potential impacts of these types of activities.

4) After flash flooding, silt covers the aquatic plants. I'm interested in wetland restoration for wildlife as well as helping to prevent silting.

NMED/SWQB Response: The SWQB agrees with this comment.