PUBLIC COMMENT DRAFT

TOTAL MAXIMUM DAILY LOADS

FOR THE

SAN JUAN RIVER & ANIMAS RIVER WATERSHEDS

JUNE 15, 2026

Prepared by

New Mexico Environment Department, Surface Water Quality Bureau

Monitoring, Assessments, and Standards Section

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For Additional Information please visit:

https://www.env.nm.gov/surface-water-quality/
~or~

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Cover Photo: San Juan River at Soaring Eagle Lodge

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Contents

List of Abbreviations

4Q3	4-Day, 3-year low-flow frequency
6T3	Temperature not to be exceeded for 6 or more consecutive hours on more than 3 consecutive days
AU	Assessment Unit
BMP	Best management practices
CFR	Code of Federal Regulations
cfs	Cubic feet per second
cfu	Colony forming units
CGP	Construction general storm water permit
CoolWAL	Cool Water Aquatic Life
CWA	Clean Water Act
^{o}C	Degrees Celsius
DMR	Discharge Monitoring Report
HQCWAL	High Quality Coldwater Aquatic Life
^{o}F	Degrees Fahrenheit
HUC	Hydrologic Unit Code
$j/m^2/s$	Joules per square meter per second
km^2	Square kilometers
LA	Load allocation
lb/day	Pounds per day
mgd	Million gallons per day
mg/L	Milligrams per Liter
mi^2	Square miles
mL	Milliliters
MOS	Margin of safety
MOU	Memorandum of Understanding
MS4	Municipal separate storm sewer system
MSGP	Multi-sector general storm water permit
NM	New Mexico
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint source
QAPP	Quality Assurance Project Plan
SSTEMP	Stream Segment Temperature Model
SWPPP	Storm water pollution prevention plan
SWQB	Surface Water Quality Bureau
TMDL	Total Maximum Daily Load
UAA	Use Attainability Analysis
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
WBP	Watershed-based plan
WLA	Waste load allocation

WQCC	Water Quality Control Commission
WQS	Water quality standards (20.6.4 NMAC as amended through 3/25/2026)

EXECUTIVE SUMMARY

Section 303(d), or 33 U.S.C. § 1313(d), of the Federal Water Pollution Control Act, also known as the Clean Water Act (CWA), 33 U.S.C. § 1251 *et seq*., requires states to develop Total Maximum Daily Load (TMDL) management plans for water bodies determined to be water quality limited. A TMDL is defined as "*a written plan and analysis established to ensure that a water body will attain and maintain water quality standards including consideration of existing pollutant loads and reasonably foreseeable increases in pollutant loads*" (USEPA, 1999). A TMDL defines the amount of a pollutant a water body can assimilate without violating a state's water quality standards (WQS). It also allocates that load capacity to known point sources and nonpoint sources at a given flow. It further identifies potential methods, actions, or limitations that could be implemented to achieve water quality standards. TMDLs are defined in the Code of Federal Regulations at Title 40, Part 130 (40 C.F.R. § 130.2(i)) as the sum of individual Waste Load Allocations (WLAs) for point sources and Load Allocations (LAs) for nonpoint source and natural background conditions. TMDLS are developed with a Margin of Safety (MOS) in acknowledgement of various sources of uncertainty in the analysis. 40 C.F.R. § 130.7(c).

The New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) conducted a water quality survey of the San Juan & Animas Watershed in 2017-2018 (with additional monitoring activities taking place in 2021). Water quality monitoring stations were located to evaluate the impact of tributary streams and ambient water quality conditions. Impairments addressed in this TMDL document, as well as existing approved TMDLs, are shown on Tables ES-1 to ES-11, below. Additional information regarding these impairments is available in the 2026-2028 Clean Water Act §303(d)/§305(b) Integrated Report and List (IR) (NMED/SWQB, 2026). This TMDL does not address all water quality impairments in the project area, only new listings based on 2017-2018 data. Previous TMDLs were developed for other impairments in these watersheds; those TMDLs are available online at: https://www.env.nm.gov/surface-water-quality/tmdl/. Information regarding all impairments is available in the 2026-2028 Clean Water Act §303(d)/§305(b) Integrated Report and List (IR) (NMED/SWQB, 2026). The SWQB interactive Mapper (https://gis.web.env.nm.gov/oem/?map=swqb) provides a convenient interface to see where impairments exist, and to search for information about water bodies of interest using the Identify Features tool.

The next water quality monitoring survey of this watershed is scheduled for 2026, at which time TMDL 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 indicates that the targets used in this analysis are not appropriate and/or if new standards are adopted, the TMDL will be adjusted accordingly. When water quality standards have been achieved, the reaches will be moved to the appropriate category in the IR.

Table ES-1 Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	
New Mexico Standard's Segment	20.6.4.404
Assessment Unit Identifier	NM-2404_00
NPDES Permit(s)	NM0028762 City of Aztec Water Treatment Plant
Segment Length (miles)	19.4
Parameters of Concern	Nutrients, Temperature, Total Phosphorus[a], Total Recoverable Aluminum
Designated Uses Affected	Coolwater aquatic life
USGS Hydrologic Unit Code	14080104
Scope/Size of Watershed (mi^2)	1281.0
Land Type / Ecoregions	20a Monticello-Cortez Uplands 7.32% 20c Semiarid Benchlands and Canyonlands 21.56% 21a Alpine Zone 17.65% 21b Crystalline Subalpine Forests 7.79% 21c Crystalline Mid-Elevation Forests 3.21% 21e Sedimentary Subalpine Forests 19.96% 21f Sedimentary Mid-Elevation Forests 18.67% 21g Volcanic Subalpine Forests 3.09% 22i San Juan/Chaco Tablelands and Mesas 0.75%
Land Use/Cover	48.47% forest, 19.01% herbaceous, 18.62% shrubland, 5.64% barren, 2.79% pasture, 2.67% developed, 1.36% wetlands, less than 1% each: cultivated and open water.
Land Ownership/Management	49.95% Forest Service, 26.14% private, 13.45% Bureau of Land Management, 6.32% tribal, 2.08% unknown, 1.45% state, 0.59% Bureau of Reclamation, 0.01% Department of Defense.
Geology	63.72% purely sedimentary, 16.38% purely igneous, 8.54% purely metamorphic, 8.40% purely unconsolidated, 2.31% metamorphic & sedimentary, 0.43% unconsolidated & sedimentary, 0.22% water.
Probable Sources[b]	Drought related impacts; Flow alterations from water diversions; Loss of riparian habitat; Municipal (urbanized high-density area); Municipal point source discharges; On-site treatment systems; Other recreational pollution sources; Rangeland grazing
IR Category	Nutrients, Temperature, Total Recoverable Aluminum: 5/5A Total Phosphorus: 4/4A
Priority Ranking	High
Existing TMDLs	Total Phosphorus TMDL (2013)
	WLA(s) + LA + MOS = TMDL
Total Recoverable Aluminum (lbs/day)	17.67 + 514.93 + 59.18 = 591.77

Total Nitrogen (lbs/day)	14.92 + 58.03 + 8.11 = 81.06
Total Phosphorus (lbs/day)	2.27 + 22.05 + 2.70 = 27.02
Temperature (kJ/day)	$2.61 \times 10^8 + 7.43 \times 10^9 + 1.92 \times 10^9 = 9.61 \times 10^9$

a) Updated TMDL – see Table 1.1 for full list.

b) Probable Sources are a qualitative, alphabetical list. See section 2.4, 4.4 and 7.4 for details.

Table ES-2 Animas River (San Juan River to Estes Arroyo)	
New Mexico Standard's Segment	20.6.4.403
Assessment Unit Identifier	NM-2403.A_00
NPDES Permit(s)	NM0020168 City of Aztec WWTP, NMR040000 MS4
Segment Length (miles)	16.73
Parameters of Concern	Total Recoverable Aluminum
Designated Uses Affected	Coolwater aquatic life
USGS Hydrologic Unit Code	14080104
Scope/Size of Watershed (mi^2)	1369.8
Land Type / Ecoregions	20a Monticello-Cortez Uplands 6.85% 20c Semiarid Benchlands and Canyonlands 22.38% 21a Alpine Zone 16.50% 21b Crystalline Subalpine Forests 7.28% 21c Crystalline Mid-Elevation Forests 3.01% 21e Sedimentary Subalpine Forests 18.67% 21f Sedimentary Mid-Elevation Forests 17.46% 21g Volcanic Subalpine Forests 2.89% 22i San Juan/Chaco Tablelands and Mesas 4.96%
Land Use/Cover	45.33% forest, 21.81% shrubland, 17.93% herbaceous, 5.28% barren, 3.81% developed, 2.96% pasture, 1.49% wetland, less than 1% each: cultivated and open water.
Land Ownership/Management	46.71% Forest Service, 28.54% private, 14.64% Bureau of Land Management, 5.91% tribal, 1.95% unknown, 1.69% state, 0.55% Bureau of Reclamation, 0.01% Department of Defense.
Geology	64.81% purely sedimentary, 15.32% purely igneous, 9.11% purely unconsolidated, 7.98% purely metamorphic, 2.16% metamorphic & sedimentary, 0.41% unconsolidated & sedimentary, 0.21% water.
Probable Sources[a]	Channelization; Drought-related impacts; Illegal Dumps or Other Inappropriate Waste Disposal; Other Recreational Pollution Sources; Pavement/Impervious Surfaces; Streambank Modifications/Destabilization; Site Clearance (Land Development); Urban Runoff/Storm Sewers; Water Diversions; Waterfowl
IR Category	5/5A
Priority Ranking	High
Existing TMDLs	Temperature (2013)
WLA(s) + LA + MOS = TMDL	

Total Recoverable Aluminum (lbs/day)	179.75 1252.75 + 159.17 = 1591.67

a) Probable Sources are a qualitative, alphabetical list. See section 2.4 for details.

Table ES-3 Gallegos Canyon (San Juan River to Navajo bnd)	
New Mexico Standard's Segment	20.6.4.99
Assessment Unit Identifier	NM-9000.A_060
NPDES Permit(s)	None
Segment Length (miles)	0.65
Parameters of Concern	*E. coli*, Total Recoverable Selenium[a]
Designated Uses Affected	Primary contact, Wildlife habitat
USGS Hydrologic Unit Code	14080101
Scope/Size of Watershed (mi^2)	304.4
Land Type / Ecoregions	22i San Juan/Chaco Tablelands and Mesas 100.00%
Land Use/Cover	83.98% shrubland, 11.02% cultivated, 2.65% herbaceous, 1.53% developed, less than 1% each: forest, wetland, barren, open water and pasture.
Land Ownership/Management	70.78% tribal, 22.49% Bureau of Land Management, 3.60% private, 3.13% state.
Geology	99.99% purely sedimentary, 0.01% purely unconsolidated.
Probable Sources[b]	Buildings/Culverts/RR crossings; Dams/Diversions; Dumping/Garbage/Trash/Litter; Flow alteration; Gravel or dirt roads; Highway/Road/Bridge runoff; Inappropriate waste disposal; Irrigated crop production (irrigation equipment); Irrigation return drains; Paved roads; Pavement/Impervious surfaces; Residences/Buildings; Site clearance (land development; Wildlife other than waterfowl
IR Category	*E. coli*: 5/5A Total Recoverable Selenium: 4/4A
Priority Ranking	High
Existing TMDLs	Total recoverable selenium (2005)
	WLA(s) + LA + MOS = TMDL
E. coli (cfu/day)	$0 + 2.81 \times 10^{7} + 3.12 \times 10^{6} = 3.12 \times 10^{7}$
Total Recoverable Selenium (lbs/day)	$0 + 1.50 \times 10^{-4} + 1.67 \times 10^{-5} = 1.67 \times 10^{-4}$

a) Updated TMDL - see Table 1.1 for full list.

b) Probable Sources are a qualitative, alphabetical list. See section 3.4 and 6.4 for details.

Table ES-4 La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)	
New Mexico Standard's Segment	20.6.4.402
Assessment Unit Identifier	NM-2402.A_01
NPDES Permit(s)	NMR040000 MS4
Segment Length (miles)	8.52
Parameters of Concern	*E. coli*[a], Nutrients
Designated Uses Affected	Marginal coldwater aquatic life, Marginal warmwater aquatic life, Primary contact
USGS Hydrologic Unit Code	14080105
Scope/Size of Watershed (mi^2)	340.11
Land Type / Ecoregions	20a Monticello-Cortez Uplands 37.82% 20c Semiarid Benchlands and Canyonlands 45.93% 21a Alpine Zone 2.76% 21e Sedimentary Subalpine Forests 7.31% 21f Sedimentary Mid-Elevation Forests 6.18%
Land Use/Cover	44.68% shrubland, 40.49% forest, 5.00% cultivated crops, 3.67% herbaceous, 2.21% pasture, 1.92% developed, 1.05% wetlands, 0.93% barren, 0.06% open water
Land Ownership/Management	65.39% private, 12.92% tribal, 11.64% forest service, 5.71% bureau of land management, 4.34% state.
Geology	81.04% purely sedimentary, 16.44% unconsolidated, 2.38% purely igneous, 0.13% igneous and sedimentary.
Probable Sources[b]	Flow alterations; Highways/Roads/Bridges; Loss of Riparian Habitat; On-site Treatment Systems (Septic Systems and Similar Decentralized Systems); Rangeland Grazing; Wildlife other than waterfowl; Waterfowl
IR Category	*E. coli*: 4/4A Nutrients: 5/5A
Priority Ranking	High
Existing TMDLs	E. coli (2005)

	WLA(s) + LA + MOS = TMDL
E. coli (cfu/day)	$1.70 \times 10^6 + 1.27 \times 10^8 + 1.43 \times 10^7 = 1.43 \times 10^8$
Total Nitrogen (lbs/day)	0.0015 + 0.1 + 0.01 = 0.11
Total Phosphorus (lbs/day)	0.0003 + 0.02 + 0.002 = 0.022

a) *Updated TMDL - see Table 1.1 for full list.*
b) *Probable Sources are a qualitative, alphabetical list. See section 3.4 and 4.4 for details.*

Table ES-5 Los Pinos River (Navajo Reservoir to CO border)		
New Mexico Standard's Segment	20.6.4.407	
Assessment Unit Identifier	NM-2407.A_10	
NPDES Permit(s)	None	
Segment Length (miles)	1.37	
Parameters of Concern	Temperature	
Designated Uses Affected	Coldwater aquatic life	
USGS Hydrologic Unit Code	14080101	
Scope/Size of Watershed (mi^2)	587.1	
Land Type / Ecoregions	20a Monticello-Cortez Uplands	20.11%
	20c Semiarid Benchlands and Canyonlands	8.38%
	21a Alpine Zone	16.74%
	21b Crystalline Subalpine Forests	15.87%
	21e Sedimentary Subalpine Forests	12.61%
	21f Sedimentary Mid-Elevation Forests	24.88%
	21g Volcanic Subalpine Forests	1.41%
Land Use/Cover	48.73% forest, 19.97% shrubland, 12.66% herbaceous, 7.96% pasture, 4.88% barren, 2.24% wetland, 1.89% developed, less than 1% each: open water and cultivated.	
Land Ownership/Management	55.83% Forest Service, 31.50% private, 9.54% tribal, 1.56% Bureau of Land Management, 0.98% Bureau of Reclamation, 0.53% state, 0.07% unknown.	
Geology	55.45% purely sedimentary, 17.94% purely igneous, 11.21% purely unconsolidated, 9.03% purely metamorphic, 5.54% metamorphic & sedimentary, 0.82 % water.	
Probable Sources[a]	Drought-related impacts; Gravel or dirt roads; Highways/Roads/Bridges; Loss of Riparian Habitat	
IR Category	5/5A	
Priority Ranking	High	
Existing TMDLs	None	
	WLA(s) + LA + MOS = TMDL	
Temperature (kJ/day)	$0 + 5.35 \times 10^9 + 1.34 \times 10^9 = 6.69 \times 10^9$	

a) Probable Sources are a qualitative, alphabetical list. See section 7.4 for details.

Table ES-6 Navajo River (Jicarilla Apache Nation to CO border)	
New Mexico Standard's Segment	20.6.4.407
Assessment Unit Identifier	NM-2407.A_00
NPDES Permit(s)	None
Segment Length (miles)	5.88
Parameters of Concern	*E. coli*, Total phosphorus
Designated Uses Affected	Coldwater aquatic life, Primary contact
USGS Hydrologic Unit Code	14080101
Scope/Size of Watershed (mi^2)	231.6
Land Type / Ecoregions	21a Alpine Zone 5.48% 21d Foothill Shrublands 0.78% 21e Sedimentary Subalpine Forests 13.78% 21f Sedimentary Mid-Elevation Forests 57.71% 21g Volcanic Subalpine Forests 22.26%
Land Use/Cover	52.02% forest, 33.91% shrubland, 8.05% herbaceous, 3.09% wetland, 1.37% barren, 1.10% pasture, less than 1% each: developed, open water and cultivated.
Land Ownership/Management	70.55% private, 22.48% Forest Service, 5.52% Bureau of Land Management, 1.36% state, 0.08% tribal.
Geology	47.94% purely sedimentary, 28.57% purely igneous, 23.11% purely unconsolidated, 0.21% igneous & sedimentary, 0.17% unconsolidated & sedimentary.
Probable Sources[a]	Bridges/Culverts/RR crossings; Dams/Diversions; Flow alteration; Gravel or dirt roads; Irrigated crop production (irrigation equip); Irrigation return drains; On-site treatment systems; Rangeland grazing (dispersed); Residences/Buildings; Site clearance (land development); Waterfowl; Wildlife other than waterfowl
IR Category	5/5A
Priority Ranking	High
Existing TMDLs	None
	WLA(s) + LA + MOS = TMDL
E. coli (cfu/day)	$0 + 2.98 \times 10^{10} + 3.31 \times 10^{9} = 3.31 \times 10^{10}$
Total Phosphorus (lbs/day)	0 + 5.21 + 0.58 = 5.79

a) Probable Sources are a qualitative, alphabetical list. See section 3.4 and 4.4 for details.

Table ES-7 San Juan River (Animas River to Canon Largo)	
New Mexico Standard's Segment	20.6.4.408
Assessment Unit Identifier	NM-2401_00
NPDES Permit(s)	NM0020770 City of Bloomfield Wastewater Treatment Plant NMR040000 MS4
Segment Length (miles)	26.5
Parameters of Concern	*E. coli*[a], Total Recoverable Aluminum
Designated Uses Affected	Marginal coldwater aquatic life, Primary contact
USGS Hydrologic Unit Code	14080101
Scope/Size of Watershed (mi^2)	5804.0
Land Type / Ecoregions	20a Monticello-Cortez Uplands 2.31% 20c Semiarid Benchlands and Canyonlands 13.48% 21a Alpine Zone 3.39% 21b Crystalline Subalpine Forests 2.08% 21d Foothill Shrublands 14.26% 21e Sedimentary Subalpine Forests 5.28% 21f Sedimentary Mid-Elevation Forests 25.11% 21g Volcanic Subalpine Forests 5.87% 22i San Juan/Chaco Tablelands and Mesas 14.46% 22n Near-Rockies Valleys and Mesas 13.76%
Land Use/Cover	55.02% shrubland, 35.04% forest, 3.88% herbaceous, 1.42% pasture, 1.20% developed, 1.17% wetlands, less than 1% each: barren, cultivated and open water.
Land Ownership/Management	27.11% Forest Service, 26.18% tribal, 22.79% Bureau of Land Management, 19.85% private, 3.07% state, 0.81% Bureau of Reclamation, 0.20% unknown.
Geology	81.58% purely sedimentary, 9.52% purely igneous, 5.22% purely unconsolidated, 1.92% igneous & sedimentary, 0.93% purely metamorphic, 0.58% metamorphic & sedimentary, 0.15% water, 0.10% unconsolidated & sedimentary.
Probable Sources[b]	Drought-related Impacts; Flow Alterations from Water Diversions; Highways/Roads/Bridges; Loss of Riparian Habitat; Onsite Treatment Systems (Septic Systems and Similar Decentralized Systems); Rangeland Grazing; Waste from pets; Wildlife other than waterfowl; Waterfowl
IR Category	*E. coli*: 4/4A Total Recoverable Aluminum: 5/5A
Priority Ranking	High
Existing TMDLs	E. coli (2010), Sedimentation (2005)

	WLA(s) + LA + MOS = TMDL
Total Recoverable Aluminum (lbs/day)	199.84 + 3137.82 + 370.85 = 3708.51
E. coli (cfu/day)	$5.15 \times 10^{10} + 8.09 \times 10^{11} + 9.56 \times 10^{10} = 9.56 \times 10^{11}$

a) *Updated TMDL - see Table 1.1 for full list.*
b) *Probable Sources are a qualitative, alphabetical list. See section 2.4 and 3.4 for details.*

Table ES-8 San Juan River (Navajo bnd at Hogback to Animas River)	
New Mexico Standard's Segment	20.6.4.401
Assessment Unit Identifier	NM-2401_10
NPDES Permit(s)	NM0020583 City of Farmington Wastewater Treatment Plant; NM0028746 West Moreland San Juan Mining, LLC/San Juan Mine; NN0020800 USDI/Nenahnezad Boarding NMR040000 MS4
Segment Length (miles)	22.8
Parameters of Concern	*E. coli*[a], Sedimentation, Total Recoverable Aluminum
Designated Uses Affected	Marginal coldwater aquatic life, Primary contact
USGS Hydrologic Unit Code	14080105
Scope/Size of Watershed (mi^2)	8132.4
Land Type / Ecoregions	20a Monticello-Cortez Uplands 4.39% 20c Semiarid Benchlands and Canyonlands 19.75% 21a Alpine Zone 5.31% 21b Crystalline Subalpine Forests 2.71% 21c Crystalline Mid-Elevation Forests 0.51% 21d Foothill Shrublands 10.18% 21e Sedimentary Subalpine Forests 7.22% 21f Sedimentary Mid-Elevation Forests 21.13% 21g Volcanic Subalpine Forests 4.68 22i San Juan/Chaco Tablelands and Mesas 14.30 22n Near-Rockies Valleys and Mesas 9.82
Land Use/Cover	50.43% shrubland, 34.90% forest, 6.16% herbaceous, 1.86% developed, 1.75% pasture, 1.63% barren, 1.57% cultivated, 1.21% wetland, less than 1% open water.
Land Ownership/Management	27.70% Forest Service, 24.57% tribal, 23.12% private, 20.56% Bureau of Land Management, 2.92% state, 0.69% Bureau of Reclamation, 0.47% unknown.
Geology	79.54% purely sedimentary, 9.47% purely igneous, 6.36% purely unconsolidated, 2.01% purely metamorphic, 1.56% igneous & sedimentary, 0.77% metamorphic & sedimentary, 0.14% unconsolidated & sedimentary, 0.14% water.
Probable Sources[b]	Drought-related Impacts; Flow Alterations from Water Diversions; Grazing in riparian zone; Highways/Roads/Bridges; Loss of Riparian Habitat; Onsite Treatment Systems (Septic Systems and Similar Decentralized Systems); Rangeland Grazing, Site clearance (new development or infill)
IR Category	*E.* coli: 4/4A Sedimentation: 5/5C Total Recoverable Aluminum: 5/5A

Priority Ranking	High
Existing TMDLs	E. coli (2005)
	WLA(s) + LA + MOS = TMDL
Total Recoverable Aluminum (lbs/day)	470.87 + 5201.28 + 630.24 = 6302.39
E. coli (cfu/day)	$8.61 \times 10^{10} + 9.60 \times 10^{11} + 1.16 \times 10^{11} = 1.16 \times 10^{12}$
Sediment (lbs/day)	10,072.04 + 87,815.71 + 24,471.94 = 122,359.69

a) Updated TMDL - see Table 1.1 for full list.

b) Probable Sources are a qualitative, alphabetical list. See section 2.4, 3.4 and 5.4 for details.

Table ES-9 San Juan River (NM reach upstream of Navajo Reservoir)	
New Mexico Standard's Segment	20.6.4.99
Assessment Unit Identifier	NM-2405_11
NPDES Permit(s)	None
Segment Length (miles)	0.56
Parameters of Concern	E. coli, Total recoverable aluminum
Designated Uses Affected	Primary contact, Warmwater aquatic life
USGS Hydrologic Unit Code	14080101
Scope/Size of Watershed (mi^2)	1241.0
Land Type / Ecoregions	21a Alpine Zone 4.68% 21d Foothill Shrublands 6.57% 21e Sedimentary Subalpine Forests 6.01% 21f Sedimentary Mid-Elevation Forests 60.79% 21g Volcanic Subalpine Forests 21.96%
Land Use/Cover	53.61% forest, 34.13% shrubland, 7.26% herbaceous, 2.04% wetland, 1.34% barren, less than 1% each: developed, pasture, open water and cultivated.
Land Ownership/Management	40.86% Forest Service, 34.09% private, 22.64% tribal, 1.18% state, 1.16% Bureau of Land Management, 0.07% unknown.
Geology	54.68% purely sedimentary, 26.44% purely igneous, 10.63% purely unconsolidated, 7.87% igneous & sedimentary, 0.39% unconsolidated & sedimentary.
Probable Sources[a]	Highways/Roads/Bridges; Irrigated crop production (irrigation equip); On-site treatment systems (septic, etc.); Rangeland grazing; Residences/Buildings; Site clearance (land development); Waterfowl; Wildlife other than waterfowl
IR Category	5/5A
Priority Ranking	High
Existing TMDLs	None
	WLA(s) + LA + MOS = TMDL
Total Recoverable Aluminum (lbs/day)	0 + 328.14 + 36.46 = 364.6
E. coli (cfu/day)	$0 + 3.53 \times 10^{11} + 3.92 \times 10^{10} = 3.92 \times 10^{11}$

a) Probable Sources are a qualitative, alphabetical list. See section 2.4 and 3.4 for details.

Table ES-10 Shumway Arroyo (San Juan River to Ute Mtn Ute bnd)		
New Mexico Standard's Segment	20.6.4.98	
Assessment Unit Identifier	NM-9000.A_021	
NPDES Permit(s)	NM0028746 West Moreland San Juan Mining, LLC/San Juan Mine	
Segment Length (miles)	13.35	
Parameters of Concern	*E. coli*	
Designated Uses Affected	Primary contact	
USGS Hydrologic Unit Code	14080105	
Scope/Size of Watershed (mi^2)	141.6	
Land Type / Ecoregions	20c Semiarid Benchlands and Canyonlands 62.16% 22i San Juan/Chaco Tablelands and Mesas 37.84%	
Land Use/Cover	87.86% shrubland, 7.96% herbaceous, 1.15% barren, less than 1% each: developed, pasture, wetland, open water and cultivated.	
Land Ownership/Management	62.83% tribal, 21.08% Bureau of Land Management, 13.68% private, 2.42% state.	
Geology	97.62% purely sedimentary, 1.54% igneous & sedimentary, 0.85% purely unconsolidated.	
Probable Sources[a]	Bridges/Culverts/RR Crossings; Dams/Diversions; Flow alteration; Highway/Road/Bridge runoff; Illegal Dumps or Other Inappropriate Waste Disposal; Irrigation return drains; Irrigated crop production (irrigation equip); On-Site treatment systems; Pavement/Impervious surfaces; Rangeland grazing (dispersed); Site clearance (land development); Urban Runoff/Storm Sewers; Wildlife other than waterfowl; Waterfowl	
IR Category	5/5A	
Priority Ranking	High	
Existing TMDLs	None	
		WLA(s) + LA + MOS = TMDL
E. coli (cfu/day)		$0 + 4.21 \times 10^7 + 4.68 \times 10^6 = 4.68 \times 10^7$

a) Probable Sources are a qualitative, alphabetical list. See section 3.4 for details.

Table ES-11 Stevens Arroyo (Perennial prts San Juan R to headwaters)		
New Mexico Standard's Segment	20.6.4.99	
Assessment Unit Identifier	NM-2401_11	
NPDES Permit(s)	NMR040000 MS4	
Segment Length (miles)	9.82	
Parameters of Concern	*E. coli*	
Designated Uses Affected	Primary contact	
USGS Hydrologic Unit Code	14080105	
Scope/Size of Watershed (mi^2)	9.5	
Land Type / Ecoregions	20c Semiarid Benchlands and Canyonlands 18.67% 22i San Juan/Chaco Tablelands and Mesas 81.33%	
Land Use/Cover	79.06% shrubland, 9.53% developed, 7.63% herbaceous, 2.92% pasture, less than 1% each: wetland, open water, barren and cultivated.	
Land Ownership/Management	55.47% Bureau of Land Management, 23.52% state, 21.01% private.	
Geology	93.52% purely sedimentary, 6.48% purely unconsolidated.	
Probable Sources[a]	Bridges/Culverts/RR crossings; Dams/Diversions; Flow alteration; Highway/Road/Bridge runoff; Illegal Dumps or Other Inappropriate Waste Disposal; Irrigated crop production (irrigation equip); Irrigation return drains; Pavement/Impervious surfaces; Rangeland grazing; Site clearance (land development); Urban Runoff/Storm Sewers; Waste from pets; Wildlife other than waterfowl	
IR Category	5/5A	
Priority Ranking	High	
Existing TMDLs	None	
		WLA(s) + LA + MOS = TMDL
E. coli (cfu/day)		$2.03 \times 10^6 + 4.71 \times 10^7 + 5.46 \times 10^6 = 5.46 \times 10^7$

a) Probable Sources are a qualitative, alphabetical list. See section 3.4 for details.

1.0 BACKGROUND

This document establishes TMDLs for 11 Assessment Units (AUs), in the San Juan and Animas River basins (**Figures 1.1** - **1.4**). Of these 11 AUs, 5 are also receiving updates to existing TMDLs. Assessments of impairment were based on data collected during the 2017-2018 SWQB water quality survey, the San Juan Multijurisdictional sampling from 2022-2025, and 2018-2021 USEPA sponsored San Juan and Animas monitoring. In December 2016, Congress enacted the Water Infrastructure Improvements for the Nation Act ("WIIN Act"). Both the 2022-2025 multijurisdictional monitoring, and the 2018-2021 EPA monitoring were conducted as a result of the 2015 Gold King Mine spill, and the Water Infrastructure Improvements for the Nation Act (WIIN Act). **Table 1.1** below outlines the assessment units, parameters of concern, and new or updated TMDL status.

Table 1.1 Assessment Units, Parameters of Concern, and TMDL Status

AU	Parameter of Concern	TMDL Status
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	Nutrients	New
	Temperature	New
	Total Phosphorus	Update
	Total Recoverable Aluminum	New
Animas River (San Juan River to Estes Arroyo)	Total Recoverable Aluminum	New
Gallegos Canyon (San Juan River to Navajo bnd)	*E. coli*	New
	Total Recoverable Selenium	Update
La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)	*E. coli*	Update
	Nutrients	New
Los Pinos River (Navajo Reservoir to CO border)	Temperature	New
Navajo River (Jicarilla Apache Nation to CO border)	*E. coli*	New
	Total Phosphorus	New
San Juan River (Animas River to Canon Largo)	*E. coli*	Update
	Total Recoverable Aluminum	New
San Juan River (Navajo bnd at Hogback to Animas River)	*E. coli*	Update
	Sediment	New
	Total Recoverable Aluminum	New
San Juan River (NM reach upstream of Navajo Reservoir)	*E. coli*	New
	Total Recoverable Aluminum	New
Shumway Arroyo (San Juan River to Ute Mtn Ute bnd)	*E. coli*	New
Stevens Arroyo (Perennial prts San Juan R to headwaters)	*E. coli*	New

1.1 Watershed Description

This document establishes TMDLs for 11 Assessment Units (AUs) in the San Juan and Animas watersheds, Hydrologic Unit Codes (HUC) 14080101, 14080104 and 14080105 (**Figure 1.1, Table 1.2**). Impairment determinations were based on data collected during the 2017-2018 SWQB water quality survey, 2018-2021 EPA sponsored San Juan monitoring, and the ongoing multijurisdictional San Juan and Animas monitoring project. The San Juan and Animas watersheds are in north-west New Mexico. All three HUCs discussed span the New Mexico/Colorado border and HUC 14080105 also has a portion in Arizona. SWQB only samples New Mexico State waters, so counties or areas in other states will not be discussed. HUC 14080101 is 3430.99 square miles spanning across San Juan and Rio Arriba Counties, HUC 14080104 is 1369.67 square miles in San Juan County, and HUC 14080105 is 1944.98 square miles in San Juan County. The San Juan basin lies on the Colorado Plateau, which is a significant geologic formation in the Four-Corners region. The surface geology (**Figure 1.2**) of the combined HUCs is as follows: 77.1% sedimentary, 9.8% igneous, 7.5% unconsolidated, 1.8% metamorphic and sedimentary, 1.8% igneous and sedimentary, 1.5% metamorphic, 0.15% unconsolidated and sedimentary, and 0.14% water.

Table 1.2 Assessment units and monitoring stations discussed in this TMDL

Map Point	Assessment Unit & ID	Station Name
1	Animas River (Estes Arroyo to So. Ute Indian Tribe bnd) - NM-2404_00	Animas River above Cedar Hill NM 550 bridge - 66Animas046.2
2	Animas River (Estes Arroyo to So. Ute Indian Tribe bnd) - NM-2404_00	Animas River at CR 2125 nr state line - 66Animas055.4
3	Animas River (Estes Arroyo to So. Ute Indian Tribe bnd) - NM-2404_00	Animas River above Estes Arroyo - 66Animas028.1
4	Animas River (Estes Arroyo to So. Ute Indian Tribe bnd) - NM-2404_00	Animas River 0.5 mi blw state line - 66Animas057.0
5	Animas River (Estes Arroyo to So. Ute Indian Tribe bnd) - NM-2404_00	Animas R ~3.6 miles u/s of Aztec - 66Animas034.4
6	Animas River (Estes Arroyo to So. Ute Indian Tribe bnd) - NM-2404_00	Animas R ~2 miles d/s of Cedar Hill Bridge - 66Animas042.3
7	Animas River (Estes Arroyo to So. Ute Indian Tribe bnd) - NM-2404_00	Animas River at Aztec - 66Animas027.8
8	Animas River (Estes Arroyo to So. Ute Indian Tribe bnd) - NM-2404_00	Aztec drinking water intake
9	Animas River (Estes Arroyo to So. Ute Indian Tribe bnd) - NM-2404_00	Animas River nr Cedar Hill, NM - 66Animas044.8
10	Animas River (San Juan River to Estes Arroyo) - NM-2403.A_00	Animas River at Ranchman's Ditch diversion - 66Animas17.3
11	Animas River (San Juan River to Estes Arroyo) - NM-2403.A_00	Animas River at Flora Vista - 66Animas018.0
12	Animas River (San Juan River to Estes Arroyo) - NM-2403.A_00	Aztec WWTP - NM0020168
13	Animas River (San Juan River to Estes Arroyo) - NM-2403.A_00	Drainage Ditch at mouth on Animas River
14	Animas River (San Juan River to Estes Arroyo) - NM-2403.A_00	ANIMAS R AT FARMINGTON - 66Animas001.7
15	Animas River (San Juan River to Estes Arroyo) - NM-2403.A_00	Animas River at CR 350 Bridge - 66Animas017.4
16	Animas River (San Juan River to Estes Arroyo) - NM-2403.A_00	Animas River at CR 5000 above Farmington - 66Animas009.8
17	Animas River (San Juan River to Estes Arroyo) - NM-2403.A_00	Animas River at Boyd Park in Farmington - 66Animas002.3

Map Point	Assessment Unit & ID	Station Name
18	Gallegos Canyon (San Juan River to Navajo bnd) - NM-9000.A_060	Gallegos Canyon at San Juan River - 64Galleg000.4
19	La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd) - NM-2402.A_01	LA PLATA RIVER AT NM-COLORDO STATE LINE - 67LaPlat033.8
20	La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd) - NM-2402.A_01	LA PLATA RIVER AT LA PLATA, NM - 67LaPlat024.8
21	La Plata River (San Juan River to McDermott Arroyo) - NM-2402.A_00	LA PLATA R NR FARMINGTON - 67LaPlat000.3
22	La Plata River (San Juan River to McDermott Arroyo) - NM-2402.A_00	La Plata at Farmington City Park - 67LaPlat002.3
23	Los Pinos River (Navajo Reservoir to CO border) - NM-2407.A_10	Los Pinos River above Navajo Reservoir - 64LosPin021.7
24	Navajo River (Jicarilla Apache Nation to CO border) - NM-2407.A_00	Navajo River upstream of Jicarilla Bnd - 64Navajo022.1
25	San Juan River (Animas River to Canon Largo) - NM-2401_00	BLOOMFIELD WWTP OUTFALL - NM0020770
26	San Juan River (Animas River to Canon Largo) - NM-2401_00	SAN JUAN RIVER AT BLOOMFIELD BRIDGE - 64SanJua126.2
27	San Juan River (Animas River to Canon Largo) - NM-2401_00	SAN JUAN RIVER AT BOLACK BRIDGE NEAR FARMINGTON - 64SanJua108.6
28	San Juan River (Animas River to Canon Largo) - NM-2401_00	San Juan River at Jeff Blagg property - 64SanJua119.3
29	San Juan River (Animas River to Canon Largo) - NM-2401_00	San Juan River at McGee Park - 64SanJua113.5
30	San Juan River (Animas River to Canon Largo) - NM-2401_00	SAN JUAN RIVER BELOW BLOOMFIELD WWTP - 64SanJua125.2
31	San Juan River (Animas River to Canon Largo) - NM-2401_00	San Juan River abv Animas - 64SanJua101.6
32	San Juan River (Navajo bnd at Hogback to Animas River) - NM-2401_10	SAN JUAN RIVER NEAR KIRTLAND - 67SanJua082.6
33	San Juan River (Navajo bnd at Hogback to Animas River) - NM-2401_10	FARMINGTON WASTEWATER PLANT - NM0020583
34	San Juan River (Navajo bnd at Hogback to Animas River) - NM-2401_10	SAN JUAN R ABV LA PLATA R CONFL - 67SanJua096.3
35	San Juan River (Navajo bnd at Hogback to Animas River) - NM-2401_10	San Juan River at Lions Park near Kirtland - 67SanJua088.1
36	San Juan River (Navajo bnd at Hogback to Animas River) - NM-2401_10	SAN JUAN R AT HOGBACK - 67SanJua065.3
37	San Juan River (Navajo bnd at Hogback to Animas River) - NM-2401_10	SAN JUAN RIVER AT BISTI BRIDGE - 67SanJua100.2
38	San Juan River (Navajo bnd at Hogback to Animas River) - NM-2401_10	Harper Valley Wastewater Treatment Plant - permit terminated
39	San Juan River (Navajo bnd at Hogback to Animas River) - NM-2401_10	SJR off N367 u/s of Fruitland (CR6755) bridge - 67SanJua084.9

Map Point	Assessment Unit & ID	Station Name
40	Shumway Arroyo (San Juan River to Ute Mtn Ute bnd) - NM-9000.A_021	Shumway above CR 6800 - 67Shumwa006.3
41	Shumway Arroyo (San Juan River to Ute Mtn Ute bnd) - NM-9000.A_021	Shumway at Hwy 64 bridge - 67Shumwa002.4
42	Shumway Arroyo (San Juan River to Ute Mtn Ute bnd) - NM-9000.A_021	San Juan Coal Company/San Juan Mine Outfall 011
43	Stevens Arroyo (Perennial prts San Juan R to headwaters) - NM-2401_11	Stevens Arroyo below CR 6100 - 67Steven000.7

The Middle San Juan River watershed (HUC 14080105) includes the La Plata River and San Juan River between the Navajo Nation boundary at the Hogback and the Animas River. The Navajo Nation boundary at Hogback forms the western bounds of the study area. The headwaters of the Animas River watershed (HUC 14080104) originate in Colorado, with the New Mexico area of the watershed ranging from Farmington at the southern end which flows into the lands of Navajo Nation, up to the Colorado border. The headwaters of the Upper San Juan watershed (HUC 14080101) originate in Colorado in the San Juan Mountains, and the most northern point of the New Mexican portion of this watershed is the Navajo Reservoir. Northeast of the boundary of lands of Jicarilla Apache Nation forms the most eastern bounds of the study area, with the most eastern AU being the Navajo River. Land cover in the combined watersheds is 47.64% Shrub/scrub, 31.44% Evergreen forest, 5.31% Grassland, 4.59% Deciduous forest, 2.93% developed or cultivated, 2.22% pasture, 2.17% barren or open water, and 1.5% wetlands, (**Figure 1.3**). The primary landowners (**Figure 1.4)** in the area are the U.S. Forest Service (29.29%), private owners (24.47%), Tribal ownership consisting of the lands of the Navajo Nation, Ute Mountain Ute Tribe, Southern Ute Indian Tribe, and Jicarilla Apache Nation(23.86%), and the Bureau of Land Management (18%).

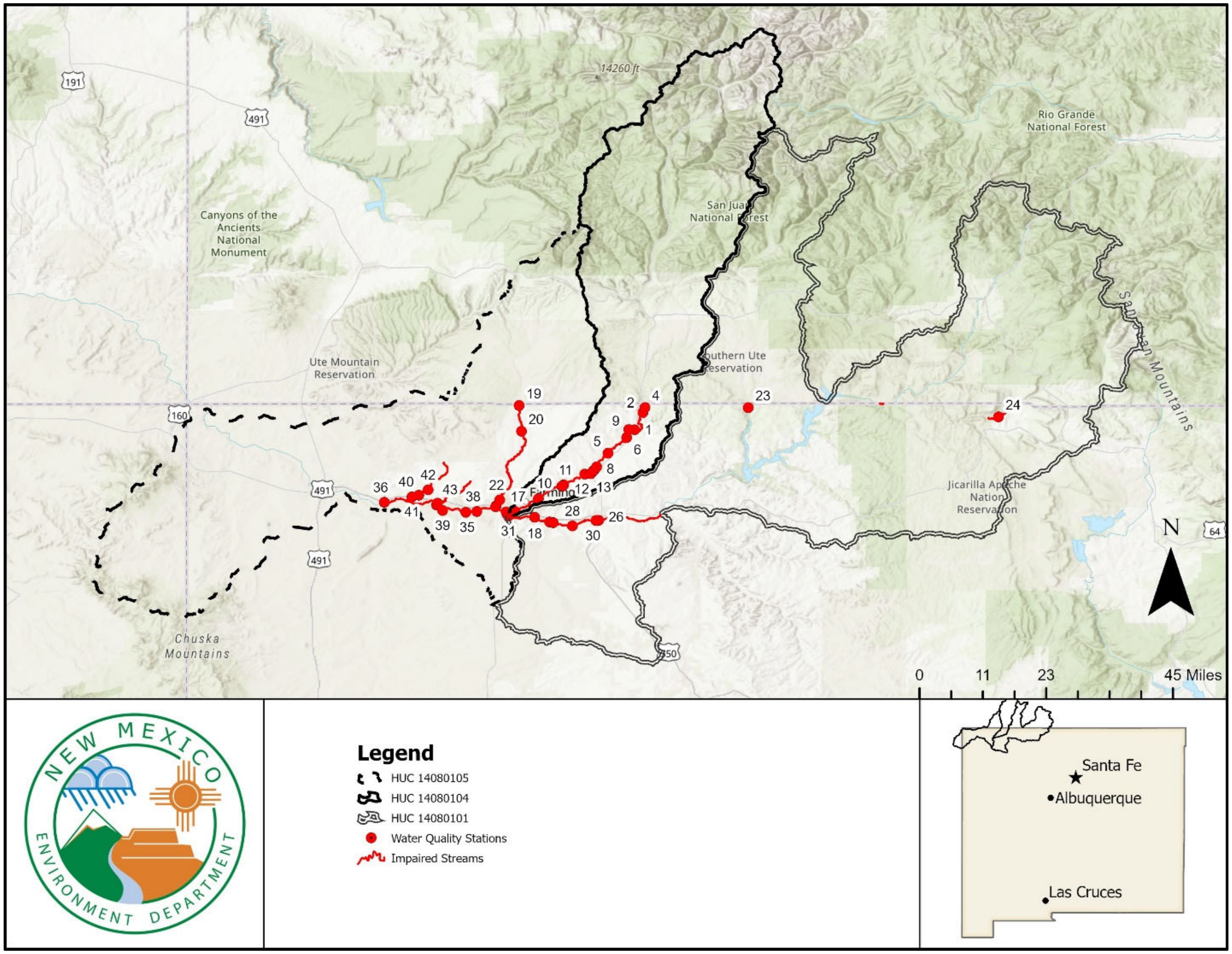

Figure 1.1 Overview of the New TMDLs for the San Juan an Animas Watersheds

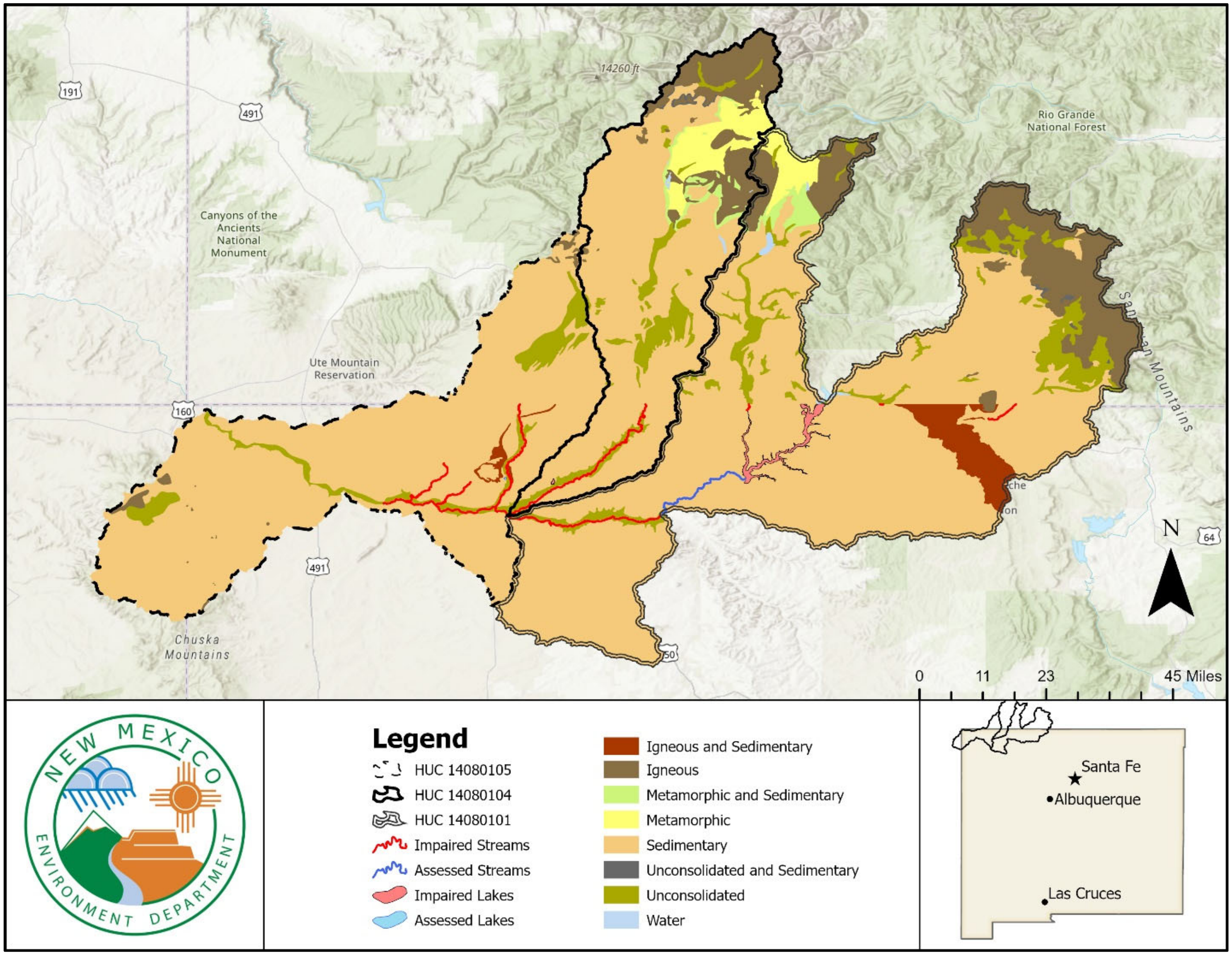

Figure 1.2 Surface Geology of the San Juan and Animas Watersheds

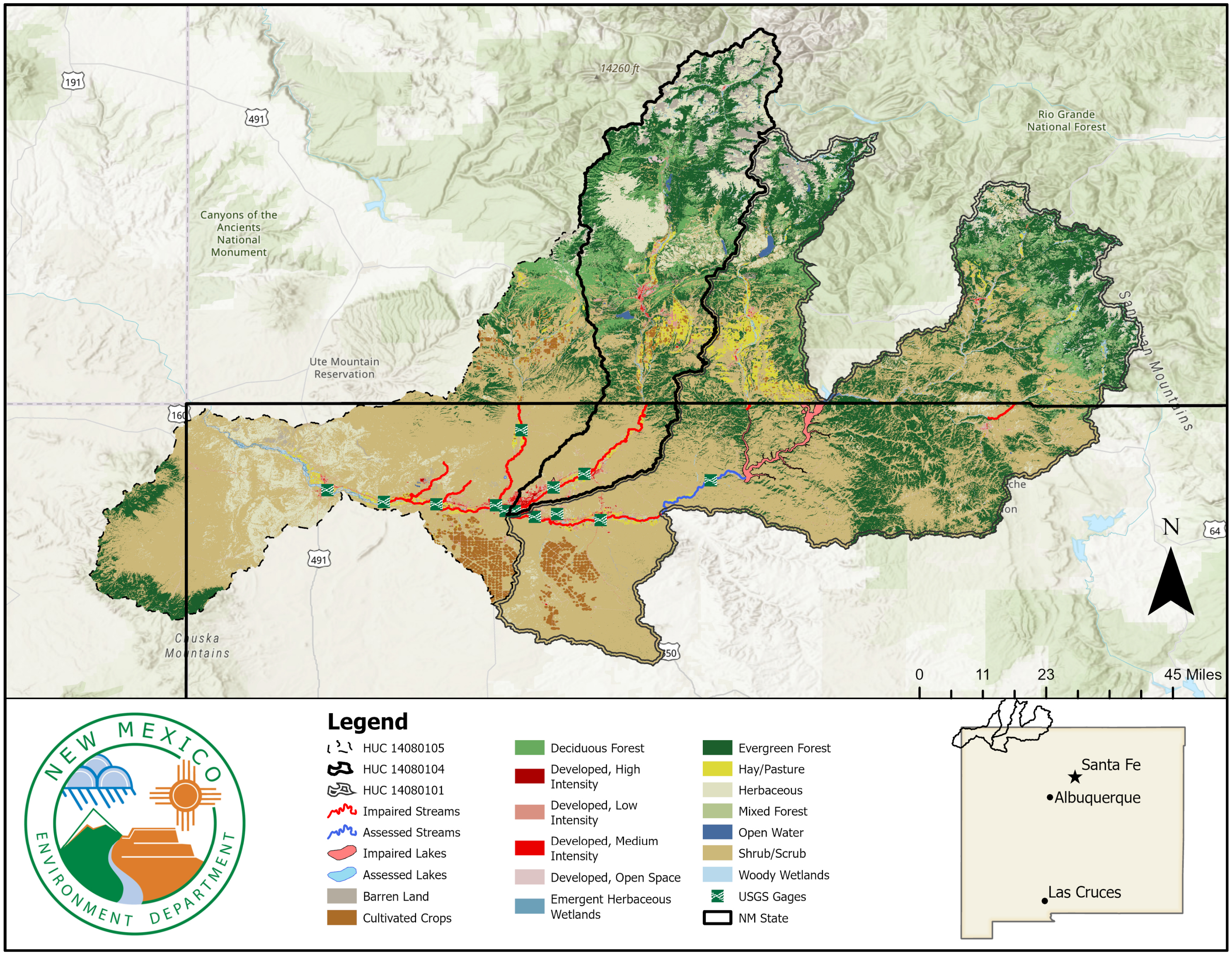

Figure 1.3 Land Cover of the San Juan and Animas Watersheds

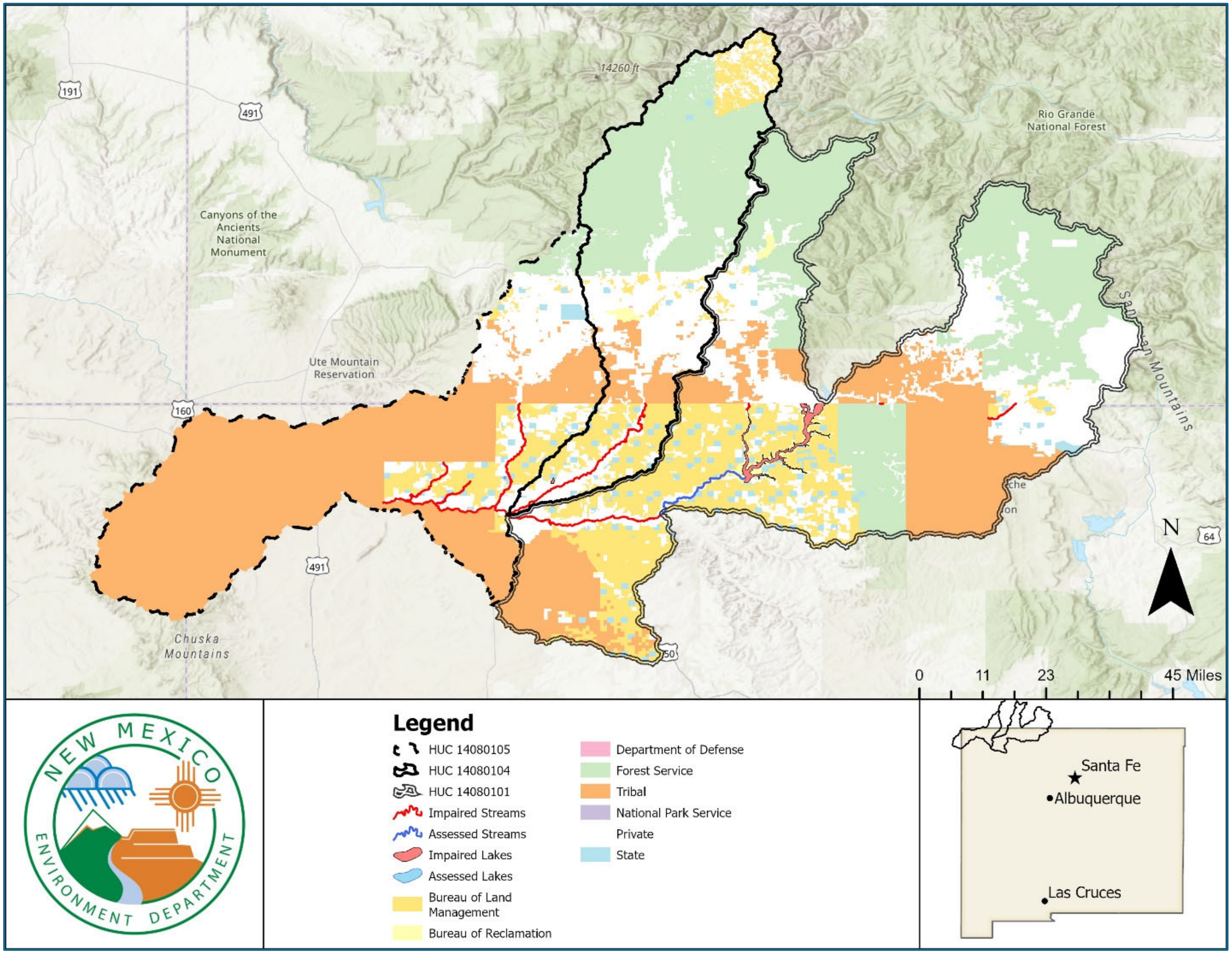

Figure 1.3 Land Ownership of the San Juan and Animas Watershe

1.2 Water Quality Standards

Water quality standards (WQS) for the assessment unit **Shumway Arroyo (San Juan River to Ute Mtn Ute bnd)** are set forth in the following sections of New Mexico's Standards for Interstate and Intrastate Surface Waters (20.6.4 New Mexico Administrative Code [NMAC], 2026, https://www.env.nm.gov/surface-water-quality/wqs/):

20.6.4.98 INTERMITTENT WATERS: All non-perennial surface waters of the state, except those ephemeral waters included under section 20.6.4.97 NMAC or classified in 20.6.4.101-899 NMAC.

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

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

[20.6.4.98 NMAC - N, 5/23/2005; A, 12/1/2010; A, 3/2/2017]

Water quality standards (WQS) for the following assessment units are set forth in the following sections of New Mexico Standards for Interstate and Intrastate Surface Waters (20.6.4 New Mexico Administrative Code [NMAC], 2025, https://www.env.nm.gov/surface-water-quality/wqs/):

Gallegos Canyon (San Juan River to Navajo bnd)

San Juan River (NM reach upstream of Navajo Reservoir)

Stevens Arroyo (Perennial prts San Juan R to headwaters)

20.6.4.99 PERENNIAL WATERS: All perennial surface waters of the state except those classified in 20.6.4.101-899 NMAC.

A. Designated uses: Warmwater aquatic life, livestock watering, wildlife habitat and primary contact.

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

[20.6.4.99 NMAC - N, 5/23/2005; A, 12/1/2010; A, 3/2/2017]

Water quality standards (WQS) for the assessment unit **San Juan River (Navajo bnd at Hogback to Animas River)** are set forth in the following sections of New Mexico Standards for Interstate and Intrastate Surface Waters (20.6.4 New Mexico Administrative Code [NMAC], 2025, https://www.env.nm.gov/surface-water-quality/wqs/):

20.6.4.401 SAN JUAN RIVER BASIN: The main stem of the San Juan river from the Navajo Nation boundary at the Hogback upstream to its confluence with the Animas river. Some waters in this segment are under the joint jurisdiction of the state and the Navajo Nation.

A. Designated uses: public water supply, industrial water supply, irrigation, livestock watering, wildlife habitat, primary contact, marginal coldwater aquatic life and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 32.2°C (90°F) or less.

[20.6.4.401 NMAC - Rp 20 NMAC 6.1.2401, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

[**NOTE:** The segment covered by this section was divided effective 5/23/2005. The standards for the additional segment are under 20.6.4.408 NMAC.]

Water quality standards (WQS) for the assessment units **La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)** and **La Plata River (San Juan River to McDermott Arroyo)** are set forth in the following sections of New Mexico Standards for Interstate and Intrastate Surface Waters (20.6.4 New Mexico Administrative Code [NMAC], 2025, https://www.env.nm.gov/surface-water-quality/wqs/):

20.6.4.402 SAN JUAN RIVER BASIN: La Plata river from its confluence with the San Juan river upstream to the New Mexico-Colorado line.

A. Designated uses: irrigation, marginal warmwater aquatic life, marginal coldwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 32.2°C (90°F) or less.

[20.6.4.402 NMAC - Rp 20 NMAC 6.1.2402, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

Water quality standards (WQS) for the assessment unit **Animas River (San Juan River to Estes Arroyo)** are set forth in the following sections of New Mexico Standards for Interstate and Intrastate Surface Waters (20.6.4 New Mexico Administrative Code [NMAC], 2025, https://www.env.nm.gov/surface-water-quality/wqs/):

20.6.4.403 SAN JUAN RIVER BASIN: The Animas river from its confluence with the San Juan river upstream to Estes arroyo.

A. Designated uses: Public water supply, industrial water supply, irrigation, livestock watering, wildlife habitat, coolwater aquatic life, and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 29°C (84.2°F) or less.

[20.6.4.403 NMAC - Rp 20 NMAC 6.1.2403, 10/12/2010; A, 5/23/2005; A, 12/1/2010; A, 3/2/2017]

Water quality standards (WQS) for the assessment unit **Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)** are set forth in the following sections of New Mexico Standards for Interstate and Intrastate Surface Waters (20.6.4 New Mexico Administrative Code [NMAC], 2025, https://www.env.nm.gov/surface-water-quality/wqs/):

20.6.4.404 SAN JUAN RIVER BASIN: The Animas river from Estes arroyo upstream to the Southern Ute Indian tribal boundary.

A. Designated uses: Coolwater aquatic life, irrigation, livestock watering, wildlife habitat, public water supply, industrial water supply and primary contact.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: phosphorus (unfiltered sample) 0.l mg/L or less.

[20.6.4.404 NMAC - Rp 20 NMAC 6.1.2404, 10/12/2010; A, 5/23/2005; A, 12/1/2010; A, 3/2/2017]

Water quality standards (WQS) for the assessment units **Los Pinos River (Navajo Reservoir to CO border)** and **Navajo River (Jicarilla Apache Nation to CO border)** are set forth in the following sections of New Mexico Standards for Interstate and Intrastate Surface Waters (20.6.4 New Mexico Administrative Code [NMAC], 2025, https://www.env.nm.gov/surface-water-quality/wqs/):

20.6.4.407 SAN JUAN RIVER BASIN: Perennial reaches of the Navajo river from the Jicarilla Apache reservation boundary to the Colorado border and perennial reaches of Los Pinos river in New Mexico.

A. Designated uses: coldwater aquatic life, irrigation, livestock watering, public water supply, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: phosphorus (unfiltered sample) 0.1 mg/L or less; the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.407 NMAC - Rp 20 NMAC 6.1.2407, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

Water quality standards (WQS) for the assessment unit **San Juan River (Animas River to Canon Largo)** are set forth in the following sections of New Mexico Standards for Interstate and Intrastate Surface Waters (20.6.4 New Mexico Administrative Code [NMAC], 2025, https://www.env.nm.gov/surface-water-quality/wqs/):

20.6.4.408 SAN JUAN RIVER BASIN: The main stem of the San Juan River from its confluence with the Animas river upstream to its confluence with Cañon Largo.

A. Designated uses: public water supply, industrial water supply, irrigation, livestock watering, wildlife habitat, primary contact, marginal coldwater aquatic life and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 32.2°C (90°F) or less.

[20.6.4.408 NMAC - N, 5/23/2005; A, 12/1/2010; A, 4/23/2022]

1.3 Antidegradation and TMDLs

New Mexico's antidegradation policy, found at 20.6.4.8(A) NMAC and required under 40 C.F.R. § 131.12, describes how waters are to be protected from degradation. At a minimum, the policy mandates that "the level of water quality necessary to protect the existing uses shall be maintained and protected in all surface waters of the state." Furthermore, the policy's requirements must be met whether or not a segment is impaired. TMDLs are consistent with this policy because implementation of a TMDL restores water quality so that existing uses (defined as the highest quality of water that has been attained since 1975) are protected and water quality criteria are achieved.

The Antidegradation Policy Implementation Procedure establishes the process for implementing the antidegradation policy (Appendix A of NMED/SWQB, 2020, https://www.env.nm.gov/surface-water-quality/wqmp-cpp/). However, certain specific requirements in the Antidegradation Policy Implementation Procedure do not apply to the Water Quality Control Commission's (WQCC) establishment of TMDLs because these types of water quality-related actions already are subject to extensive requirements for review and public participation, as well as various limitations on degradation imposed by state and federal law (NMED/SWQB, 2020).

1.4 Water Quality Monitoring Survey

In 2017-2018 SWQB surveyed the San Juan and Animas basins (NMED/SWQB, 2017, https://www.env.nm.gov/surface-water-quality/water-quality-monitoring/). The SWQB divides rivers and streams into AUs based on differing geological and hydrological properties, and each AU was assessed individually using data from one or more monitoring sites located within the AU. Based on a variety of factors, selected monitoring locations were sampled for water quality constituents several times over the two years. Reductions and alterations of monitoring sites in the implementation of the 2017-2018 San Juan and Animas Watershed Field Sampling Plan were necessary due to dry conditions, resource limitations, and weather/scouring events.

Geomorphology and continuously logged data were collected at least once for as many as possible of the perennial AUs. Geomorphology parameters were measured following the then-current revision of the SWQB Standard Operating Procedure 5.0, Physical Habitat Measurements (https://www.env.nm.gov/surface-water-quality/sop/). Data-logged parameters may include temperature, turbidity, dissolved oxygen, pH, and/or conductivity, and were measured following the then-current revision of the SWQB Standard Operating Procedures 6.1-6.4, Sondes and Thermographs (https://www.env.nm.gov/surface-water-quality/sop/). Impaired AUs addressed in this TMDL report, and the associated monitoring stations, are shown on **Figure 1.1**.

Monitoring occurs during the non-winter months (March through November); focuses on physical, chemical, and biological conditions in perennial waters; and includes sampling for most pollutants that have numeric and/or narrative criteria in the WQS. More detail about the 2017-2018 water quality survey can be found in the survey summary reports (NMED/SWQB, 2017, https://www.env.nm.gov/surface-water-quality/water-quality-monitoring/).

Following the Gold King Mine spill in 2015, and the establishment of the WIIN Act, EPA and partnering states, tribes, and local governments developed and implemented a long-term monitoring plan under the WIIN Act to establish a consistent, watershed-wide approach for evaluating surface water and sediment quality. The program includes quarterly monitoring across a range of hydrologic conditions, assessment of water quality trends relative to applicable standards, and public dissemination of monitoring results to support informed watershed management and future restoration efforts. These efforts are the basis for the 2018-2021 EPA Monitoring, and the 2022-2025 Multijurisdictional monitoring.

1.5 Hydrologic Conditions

There are 8 active, real-time U.S. Geological Survey (USGS) gaging stations in the San Juan and Animas watersheds associated with the reaches discussed in this document, three of which have only been active since December 2019. Daily stream flow for the gages which collected data in the years of the discussed SWQB monitoring efforts (2017-2018) are presented below (**Figures 1.5-1.9)**. Flows during the 2017 year were above average based on the period of record for each gage station. The area was in a condition of exceptional drought in 2018 whereas none of the area was in drought conditions during 2017 (https://droughtmonitor.unl.edu/Maps/MapArchive.aspx).

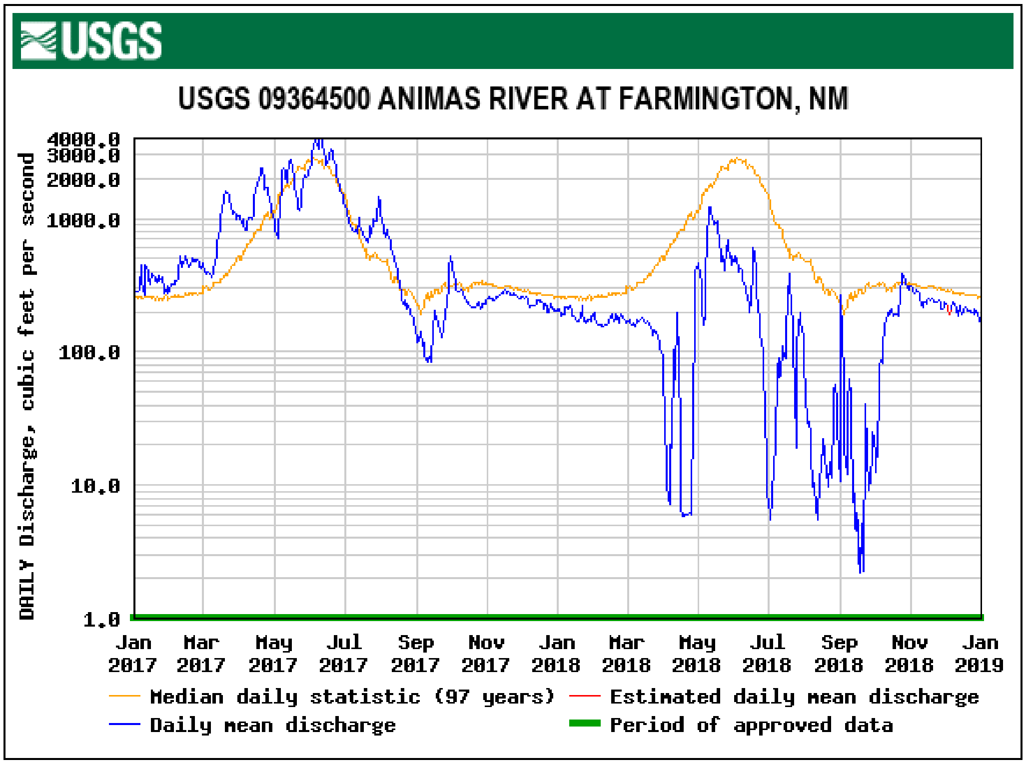

Figure 1.5 2017-2018 USGS Daily Discharge, Animas River near Farmington, NM

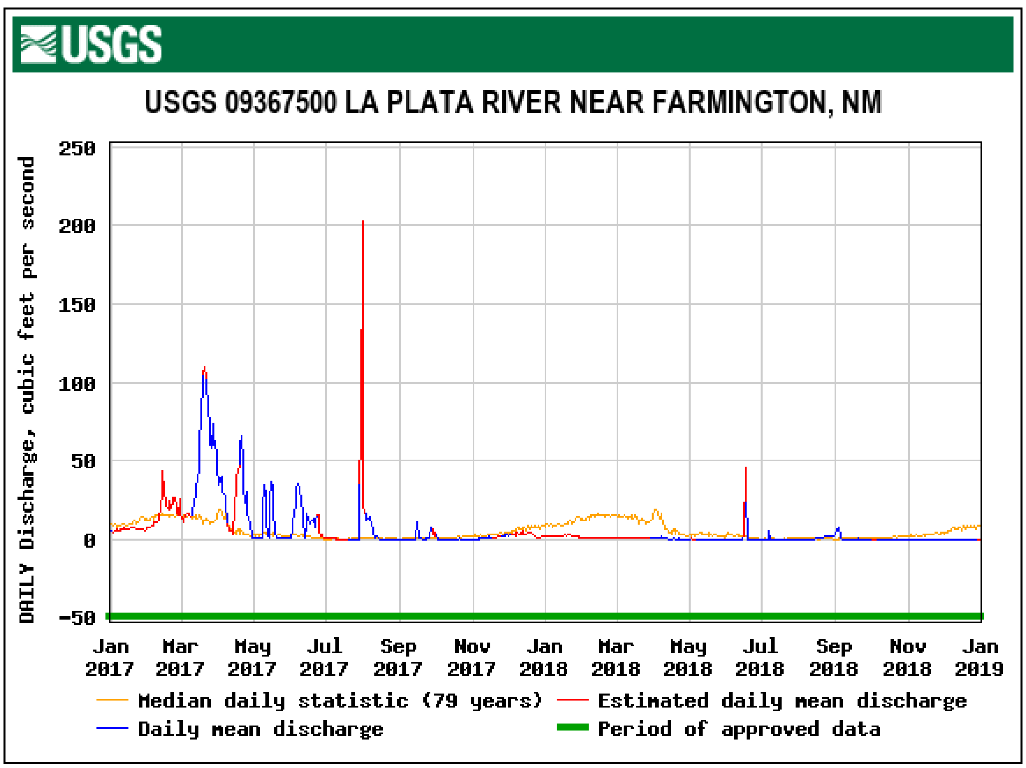

Figure 1.6 2017-2018 USGS Daily Discharge, La Plata River at Farmington, NM

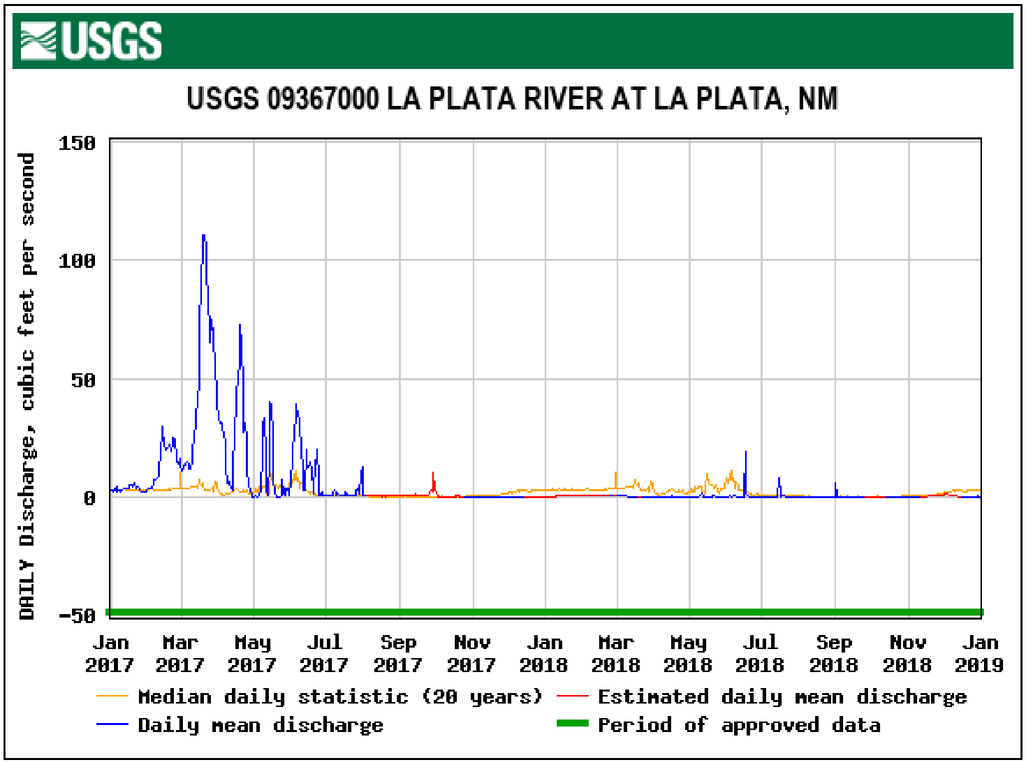

Figure 1.7 2017-2018 USGS Daily Discharge, La Plata River at La Plata, NM

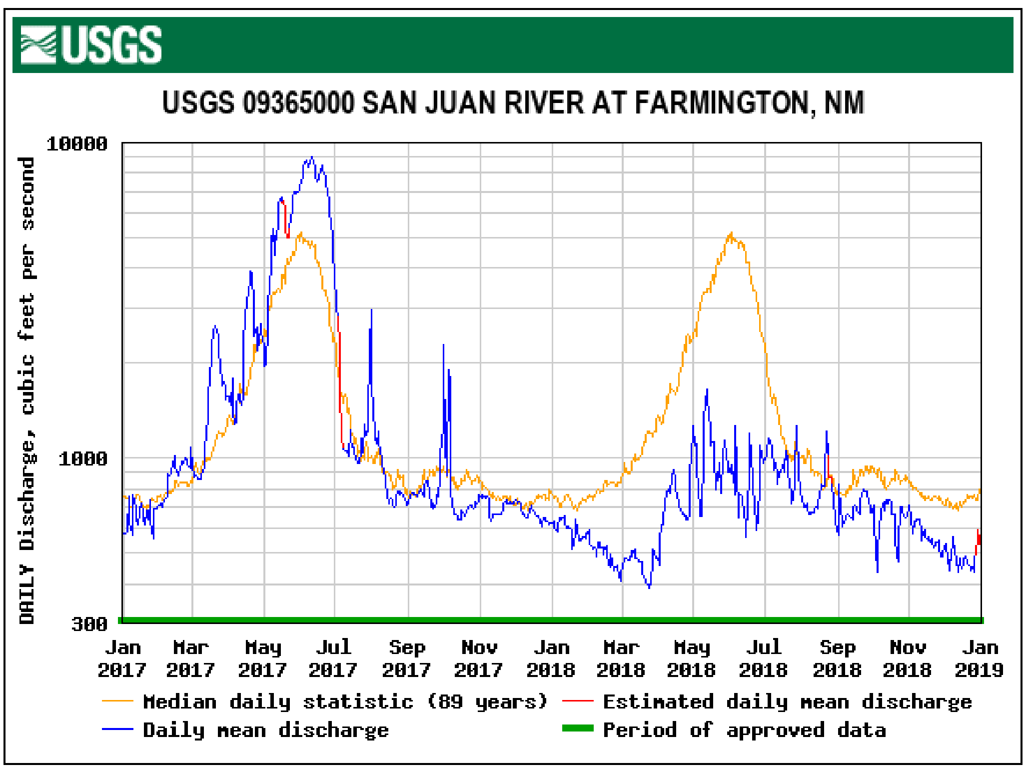

Figure 1.8 2017-2018 USGS Daily Discharge, San Juan River near Farmington, NM

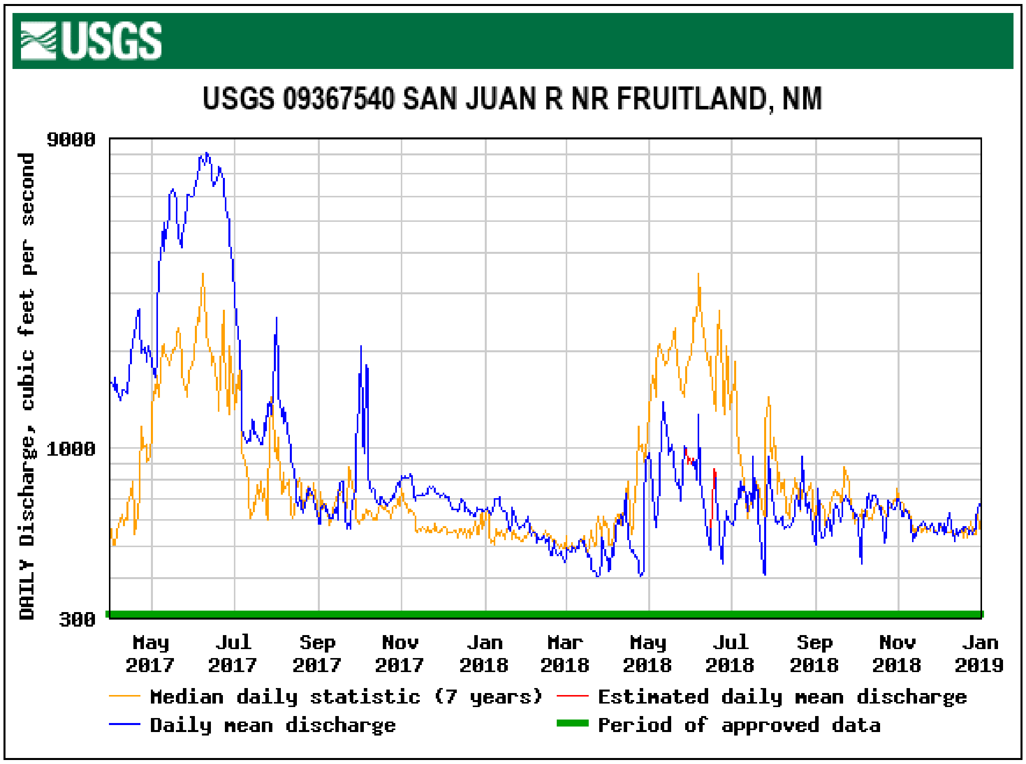

Figure 1.9 2017-2018 USGS Daily Discharge, San Juan River near Fruitland, NM

1.6 TMDL Uncertainties

Pursuant to EPA guidance (EPA, 2002), TMDLs "should contain documentation supporting the TMDL analysis, including the basis for any assumptions; a discussion of strengths and weaknesses in the analytical process; and results from any water quality modeling." Uncertainties and assumptions in the TMDL process are detailed in the individual Margin of Safety (MOS) subsections for each TMDL parameter. Uncertainties and assumptions related to the size of the available datasets and/or flow are detailed in the Target Loading Capacity and Flow subsections for each TMDL parameter. When modeling is used to develop a TMDL, water quality modeling results are summarized in the individual TMDL parameter sections and detailed in an appendix to the TMDL. In general, weaknesses in the TMDL analytical process include the limited availability of water quality data during the assessment process, limited flow and habitat measurements for TMDL development, and limited flow and water quality long-term gaging sites to be used during both the assessment and TMDL processes. Strengths in the TMDL analytical process include the robust assessment processes outlined in the Comprehensive Assessment and Listing Methodology (CALM; NMED/SWQB, 2025) especially related to assessments of narrative water quality standards, such as nutrients, sedimentation, and turbidity. Additional strengths include the use of regression equations to calculate TMDLs as well as the collection and subsequent discussion of NPDES permit effluent data as part of the TMDL development process.

2.0 ALUMINUM

Chronic high levels of aluminum (Al) can be toxic to fish, benthic invertebrates, and some single-celled plants. Aluminum concentrations from 0.1 to 0.3 mg/L (100 to 300 ug/L) increase mortality and retard growth, gonadal development, and egg production of fish. Information on the toxic forms of aluminum in natural waters suggests that soluble trivalent aluminum (Al3+) exerts a toxic effect on fish by binding to the negative charge of gill tissues, thereby disrupting ionoregulatory and respiratory balance (Exley et al.., 1991; Gensemer and Playle, 1999). This charge interaction is complicated by subsequent polymerization of insoluble, positive-charged Al oxyhydroxides to fish gill tissues and thus both soluble and insoluble forms are implicated in the toxic response of fish to Al (Gensemer and Playle, 1999).

In 2010, the WQCC updated the aquatic life use (ALU) criteria for aluminum from dissolved aluminum to hardness-dependent total recoverable aluminum (TR Al). In 2012, USEPA approved the change for use in waters where the pH is above 6.5. Aluminum-impaired waters of the San Juan and Animas Watershed were within the applicable pH range during the 2017-2018 sampling events. Those waters within the applicable pH range are listed in **Table 2.1** for total recoverable aluminum impairments. The term "total recoverable" refers to the analytical method used in laboratory analysis and is essentially interchangeable with the term "total". "Total recoverable" is used here to reflect the language in 20.6.4.900 (I) NMAC. Specifically, "For aluminum, the criteria are based on analysis of total recoverable aluminum in a sample that is filtered to minimize the mineral phase as specified by the department." Based on recommendations from an aluminum filtration study conducted by SWQB staff (NMED/SWQB, 2012), if the turbidity exceeds 30 NTU, samples that will be analyzed for TR Al are filtered using a filter of 10 µm pore size that minimizes mineral-phase aluminum without restricting amorphous or colloidal phases. The TR Al TMDLs are calculated to protect against exceedance of the chronic criterion, which is more stringent than the acute criterion.

2.1 Target Loading Capacity

To meet aquatic life designated uses, the SWQB Comprehensive Assessment and Listing Methodology (NMED SWQB, 2025) says that for any one chemical/physical pollutant, there shall be no exceedance of the acute criterion, and no more than one exceedance of the chronic criterion in three years. Total recoverable aluminum chronic criteria are assessment unit specific and hardness dependent, for more details see **Appendix B**. Exceedances of the WQS were identified by assessment of the data from the 2017-2018 San Juan intensive water quality survey, 2019-2021 EPA monitoring, and 2022-2025 multijurisdictional data, as shown on **Table 2.1**. Consequently, these AUs were listed on the 2026-2028 Integrated CWA §303(d)/§305(b) List (NMED/SWQB, 2026) for aluminum. Results of laboratory analyses of the samples are shown in **Appendix B**.

Table 2.1 Total Recoverable Aluminum Exceedances

Assessment Unit	Exceedances (Chronic)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	7/34
Animas River (San Juan River to Estes Arroyo)	7/16
San Juan River (Animas River to Canon Largo)	5/17
San Juan River (Navajo bnd at Hogback to Animas River)	11/18

Assessment Unit	Exceedances (Chronic)
San Juan River (NM reach upstream of Navajo Reservoir)	2/5

2.2 Flow

According to the New Mexico Water Quality Standards, the low flow critical condition for numeric criteria set in 20.6.4.97 through 20.6.4.900 NMAC and 20.6.4.13(F) NMAC is defined as the 4-day, 3-year low-flow frequency (4Q3, 20.6.4.11(B)(2)) NMAC. The 4Q3 is the annual lowest four (4) consecutive day flow that occurs with a frequency of at least once every three (3) years.

For AUs discussed in this section that are ungaged, an analysis method developed by USGS in partnership with NMED, authored by Bell and Tillery (Bell, 2023) was used to estimate the critical low flow. In the Bell & Tillery analysis, six regression equations for estimating 4Q3 were developed based on physiographic regions of New Mexico and stream basin characteristics (i.e., statewide and mountainous regions above 8,000 ft in elevation, or basins with less than 75 square mile drainage areas). The 4Q3-1b equation was used, which applies to elevations over 8,000ft that are the San Juan River or tributaries to the San Juan. The following regression equation is based on data from 23 gaging stations with non-zero discharge (Bell, 2023):

Equation 2.1: $4Q3 = DA^{1.38} \times P^{5.18} \times e^{-22.17}$

Where:

$4Q3$ = four-day, three-year low-flow frequency (cfs)

DA = drainage area (mi^2)

P = annual basin precipitation (in)

e = mathematical constant, Euler's number

The 4Q3 values calculated using Bell & Tillery's method are presented in **Table 2.2** Parameters used in the calculation were obtained using the StreamStats online GIS application developed by the USGS (https://streamstats.usgs.gov/ss/). The flow was converted from cfs to million gallons per day (mgd) using a conversion factor of 0.646. The TMDL itself is a value calculated at a defined critical condition as part of a planning process designed to achieve water quality standards. Since flows vary throughout the year in these systems, the actual load at any given time will vary based on the changing flow. Management of the load to improve instream water quality is the goal of SWQB efforts.

Critical flow for the remaining AUs discussed in this section was determined using USGS gage data with the USGS Hydrologic Toolbox software. USGS Gage 09364010 Animas River below Aztec, NM was used for Animas River (Estes Arroyo to So. Ute Indian Tribe bnd) with data from 2013 to 2025. USGS Gage 09364500 Animas River at Farmington, NM was used for Animas River (San Juan River to Estes Arroyo) with data from 2005-2025. USGS Gage 09365000 San Juan River at Farmington, NM was used for San Juan River (Animas River to Canon Largo) with data from 2002 to 2025. Critical flows are presented in **Table 2.2** in both cfs and mgd.

Table 2.2 Critical Flow for Total Recoverable Aluminum Impaired AUs

Assessment Unit	Drainage Area (mi^2)	Average Elevation (ft)	Annual Precipitation (in)	Avg. Basin Slope (ft/ft)	4Q3 (cfs)	4Q3 (mgd)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)*	--	--	--	--	50.15	32.40
Animas River (San Juan River to Estes Arroyo)*	--	--	--	--	77.33	49.96
San Juan River (Animas River to Canon Largo)*	--	--	--	--	309.9	200.3
San Juan River (Navajo bnd at Hogback to Animas River)*	--	--	--	--	377.1	243.6
San Juan River (NM reach upstream of Navajo Reservoir)	1240	8409	25.10	0.27	77.79	50.25

* *Basin characteristics omitted due to being calculated with gage data*

2.3 TMDL Calculation

The TMDL is defined as the mass of pollutants that can be carried under critical flow conditions without violating the target concentration for that constituent. A conversion factor is used to correct the TMDL units to lb/day. The TMDL is calculated based on simple dilution using **Equation 2.2**:

Equation 2.2: *WQS (mg/L) x Critical flow (mgd) x Conversion Factor (8.34) = TMDL (lb/day)*

TMDLs are presented on **Tables 2.3** for the critical flow condition. Chronic total recoverable aluminum criteria were calculated at the average hardness value that was measured during the survey sampling events that resulted in exceedances of the WQS (data shown in **Appendix B**).

Table 2.3 Total Recoverable Aluminum TMDL Calculations

Assessment Unit	Chronic criterion (mg/l)	Critical Flow (mgd)	Conversion Factor	TMDL (lb/day)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	2.19	32.4	8.34	591.77
Animas River (San Juan River to Estes Arroyo)	3.82	49.96	8.34	1591.67
San Juan River (Animas River to Canon Largo)	2.22	200.3	8.34	3708.51
San Juan River (Navajo bnd at Hogback to Animas River)	3.10	243.6	8.34	6302.39
San Juan River (NM reach upstream of Navajo Reservoir)	0.87	50.25	8.34	364.60

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 and meet water quality criteria at all times is the goal. The TMDL is further allocated to a MOS, WLA (permitted point sources), and LA (non-point sources), according to the formula:

Equation 2.3: *WLA + LA + MOS = TMDL*

2.3.1 Margin of Safety

The CWA requires that each TMDL be calculated with a MOS. This statutory requirement that TMDLs incorporate a MOS is intended to account for uncertainty in available data or in the actual effect controls will have on loading reductions and receiving water quality. A MOS may be expressed as unallocated assimilative capacity or conservative analytical assumptions used in establishing the TMDL (e.g., derivation of numeric targets, modeling assumptions or effectiveness of proposed management actions). The MOS may be implicit, utilizing conservative assumptions for calculation of the loading capacity, WLAs, and LAs. The MOS may also be explicitly stated as an added separate quantity in the TMDL calculation. For this aluminum TMDL, the MOS was developed using a combination of conservative assumptions and explicit allocations. Therefore, this MOS is the sum of the following elements:

- *Conservative assumptions:*
    - Treating aluminum as a conservative pollutant, meaning a pollutant that does not readily degrade in the environment, was used as a conservative assumption in developing these loading limits.
    - Using the average hardness value during exceedance events, rather than the average hardness of all samples. Hardness is often, though not always, lower at high flows, leading to a lower calculated chronic TR Al standard and smaller TMDL.
- *Explicit recognition of potential error:*
    - An explicit MOS of **10%** was assigned to the aluminum impaired AUs, to account for the low number of sampling events, and the inherent error in flow estimates.

The total MOS for this TMDL is **10%**.

2.3.2 Waste Load Allocation

There are National Pollutant Discharge Elimination System (NPDES) permits, and Municipal Separate Storm Sewer Systems (MS4s) permits that have potential to contribute aluminum on the following AUs:

Table 2.4 Permits on Aluminum Impaired AUs

Assessment Unit	Permit
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	NM0028762 City of Aztec Water Treatment Plant
	NMR040000 MS4
Animas River (San Juan River to Estes Arroyo)	NM0020168 City of Aztec Wastewater Treatment Plant

Assessment Unit	Permit
	NMR040000 MS4
San Juan River (Animas River to Canon Largo)	NM0020770 City of Bloomfield Wastewater Treatment Plant
	NMR040000 MS4
San Juan River (Navajo bnd at Hogback to Animas River)	NM0020583 City of Farmington Wastewater Treatment Plant
	NM0028746 West Moreland San Juan Mining, LLC/San Juan Mine
	NN0020800 USDI/Nenahnezad Boarding
	NMR040000 MS4

Individual National Pollutant Discharge Elimination System (NDPES) Permits

The City of Aztec WTP (NM0028762) permit was issued December 2, 2021, and expires December 31, 2026. The facility provides services for approximately 6,322 people and has one outfall discharging to the Animas River on the Animas River (Estes Arroyo to Southern Ute Indian Tribe bnd) AU. There are currently no limits in place for aluminum. There is no design capacity flow for the facility, so in its place the average of the maximum daily flow was used (flow data acquired from https://echo.epa.gov/ May 11, 2026).

The City of Aztec WWTP (NM0020168) permit was issued May 1, 2021, and expires April 30, 2026. The facility provides services for approximately 6,322 people and has one outfall discharging to the Animas River on the Animas River (San Juan River to Estes Arroyo) AU. There are currently no limits in place for aluminum, and the design capacity flow from the facility is 1.2 mgd.

The City of Bloomfield WWTP (NM0020770) permit was issued November 1, 2020, and expired October 31, 2025 – this permit is currently "administratively continued", with a potential expiration date in 2031, pending issuance of a new permit. There are currently no limits in place for aluminum. The design capacity flow from the facility is 0.93 mgd and there is one outfall discharging into the San Juan River in the mid-point of the AU San Juan River (Animas River to Canon Largo).

The City of Farmington WWTP (NM0020583) permit was issued October 1, 2021, and expires November 30, 2026. There are currently no limits in place for aluminum. The design capacity flow from the facility is 6.67 mgd and there is one outfall discharging into the San Juan River in the top of the AU San Juan River (Navajo bnd at Hogback to Animas River).

West Moreland San Juan Mining LLC holds a permit (NM0028746) issued February 1, 2024, set to expire January 31, 2029. The facility has a total of 11 outfalls, 1 of which is authorized discharges to the San Juan River (outfall 012), 3 outfalls are authorized to discharge to the Westwater Arroyo, and 7 outfalls are authorized to discharge to the Shumway Arroyo. The current aluminum limits for Outfall 012, discharging to the San Juan River, are a 30-day average of 6.11 mg/L and daily max of 6.11 mg/L. This facility has had zero discharge since its last permit period, nor does the permit provide any design capacity flow. DMR reports have been examined as far back as 2001. Only one discharge event has occurred in this time, with a flow of 0.01 mgd. In the absence of a design capacity flow, or regular flow measurements to generate a daily max or mean flow, this flow event will be used to calculate WLAs for this facility.

USDI/Nanahnezad Boarding (NM20020800) is permitted under the jurisdiction of USEPA Region 9 and Navajo Nation EPA. This permit is identified for information only, as this discharge and its regulation are not under New Mexico's nor EPA Region 6 jurisdiction. The NPDES waste load allocations for each AU are presented in **Table 2.5**. Any contributions from Navajo Nation lands and permitted facilities are captured in the Load Allocation of this TMDL.

Table 2.5 Individual NPDES Waste Load Allocations for Aluminum

Assessment Unit	Facility	Design Capacity Flow (mgd)	Aluminum Chronic Criterion (mg/L)	Conversion Factor	WLA (lbs/day)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	NM0028762 City of Aztec WTP	0.2	2.19	8.34	3.65
Animas River (San Juan River to Estes Arroyo)	NM0020168 City of Aztec WWTP	1.2	3.82	8.34	38.23
San Juan River (Animas River to Canon Largo)	NM0020770 City of Bloomfield WWTP	0.93	2.22	8.34	17.22
San Juan River (Navajo bnd at Hogback to Animas River)	NM0020583 City of Farmington WWTP	6.67	3.19	8.34	177.45
San Juan River (Navajo bnd at Hogback to Animas River)	NM0028746 West Moreland San Juan Mining, LLC/San Juan Mine	0.01	3.19	8.34	0.27

Municipal Separate Storm Sewer Systems (MS4s) Permits

MS4s are defined as a conveyance or system of conveyances owned by a state, city, town, or other public entity that discharges to waters of the United States and is designed or used for collecting or conveying storm water. Because this is a storm water permit, sMS4 permit and associated sMS4 WLAs are only applicable during storm (i.e., high) flow. Regulated conveyance systems include roads with drains, municipal streets, catch basins, curbs, gutters, storm drains, piping, channels, ditches, tunnels and conduits. It does not include combined sewer overflows and publicly-owned treatment works. The federal Clean Water Act requires storm water discharges from certain types of urbanized areas to be permitted under the NPDES program.

In 1990, Phase I of these requirements became effective, and municipalities with a population served by a MS4 of 100,000, or more, were regulated. Under Phase I federal storm water regulations, regulated MS4 entities were required to obtain individual permits. In 1999, Phase II became effective, and any entity responsible for an MS4 conveyance, regardless of population size, could potentially be regulated. To date, this designation has typically applied to areas that have been identified by the Bureau of the Census as an "urbanized area" (UA) but with populations less than 100,000 (USEPA 2005). In 2006, USEPA Region 6 issued general permits for discharges from "small" MS4s (sMS4s) in New Mexico and on Indian Country lands of tribal nations in New Mexico and Oklahoma. This permit became effective in 2007. EPA proposed to reissue this permit in 2015 within the boundaries of Census-designated 2000 and 2010 Farmington, Santa Fe, Los Lunas, Las Cruces and El Paso Urbanized Areas.

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

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

The Phase II sMS4 permit (NMR040000) reads:

> *"This permit may authorize stormwater discharges to waters of the United States from small MS4s within New Mexico provided the MS4… is located fully or partially within an urbanized area in New Mexico as determined by the 2000 and 2010 Decennial Census."*

There are four permittees identified in the Farmington urbanized area: the City of Farmington, San Juan County, the City of Aztec, and the New Mexico Department of Transportation (NMDOT) District 5. Stormwater covered by the sMS4 has the potential to impact all of the AUs discussed in this document. The sMS4 WLA for each AU has been determined based on the percent of jurisdictional (urban) area within the respective contributing watershed area. The percent and total jurisdictional area, per area aluminum loadings, and resultant sMS4 waste load allocations for each AU are presented in **Table 2.6**. For more information regarding the jurisdictional allocation of sMS4 loads and per area values, see **Appendix C.**

Table 2.6 NMR040000 MS4 Waste Load Allocations for Aluminum

Assessment Unit	TMDL - MOS - NPDES WLA (lbs/day) =	MS4 Jurisdictional Area (% of contributing watershed area)	WLA (lbs/day)	Per Area Loading (lbs/day/mi^2)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	528.94	2.65%	14.02	3.53
Animas River (San Juan River to Estes Arroyo)	1394.27	10.15%	141.52	7.07
San Juan River (Animas River to Canon Largo)	3320.44	5.50%	182.62	10.00
San Juan River (Navajo bnd at Hogback to Animas River)	5494.43	5.34%	293.40	23.52

Construction General Permit (CGP)

Stormwater discharges from construction activities are transient because they occur mainly during the construction itself, and then only during storm events. Coverage under the USEPA NPDES Construction General Permit (CGP) for construction sites of one or more acres, or smaller if part of a common plan of development, 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. The current CGP also includes state-specific requirements to implement site-specific interim and permanent stabilization, managerial, and structural solids, erosion, and sediment control Best Management Practices (BMPs), and/or other controls. BMPs are designed to prevent to the maximum extent practicable an increase in sediment load to the water body or an increase in a sediment-related parameter, such as total suspended solids, turbidity, siltation, stream bottom deposits, etc. BMPs also include measures to reduce flow velocity during and after construction compared to pre-construction conditions to ensure that waste load allocations and/or applicable water quality standards, including the antidegradation policy, are met. Compliance with a SWPPP that meets the requirements of the CGP is generally assumed to be consistent with this TMDL.

Stormwater discharges from industrial activities and facilities, based on industrial classification codes, may be eligible for coverage under the current NPDES Multi-Sector General Permit (MSGP). The MSGP also requires preparation of a SWPPP. Some of the industrial facilities and activities covered under the MSGP have technology based effluent limitation and/or benchmark monitoring for pollutants. The current MSGP includes state-specific requirements that the benchmark values be protective of State of New Mexico WQS.

It is not possible to calculate individual WLAs for facilities covered by the General Permits at this time using the available tools. The discharges from these permits are typically transitory as the activities are temporary. Loads that are in compliance with the General Permits are therefore currently included as part of the Load Allocation (LA). While these sources are not given individual allocations, they are addressed through other means, including BMPs, stormwater pollution prevention conditions, and other requirements.

2.3.3 Load Allocation

Load Allocation is pollution from any nonpoint source(s) or natural background and is addressed through Best Management Practices (BMPs). To calculate the LA, the WLA(s) and the MOS were subtracted from the TMDL using **Equation 2.3**, as shown on **Table 2.5**. The MOS was developed using a combination of conservative assumptions and explicit recognition of potential errors (see **Section 2.3.1** for details).

Table 2.7 TMDL Allocations for Total Recoverable Aluminum (units in lb/day)

Assessment Unit	Individual Permit WLA (lbs/day)	MS4 WLA (lbs/day)	LA (lbs/day)	10% MOS (lbs/day)	TMDL (lbs/day)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	3.65	14.02	514.93	59.18	591.77

Assessment Unit	Individual Permit WLA (lbs/day)	MS4 WLA (lbs/day)	LA (lbs/day)	10% MOS (lbs/day)	TMDL (lbs/day)
Animas River (San Juan River to Estes Arroyo)	38.23	141.52	1252.75	159.17	1591.67
San Juan River (Animas River to Canon Largo)	17.22	182.62	3137.82	370.85	3708.51
San Juan River (Navajo bnd at Hogback to Animas River)	177.72*	293.40	5201.03	630.24	6302.39
San Juan River (NM reach upstream of Navajo Reservoir)	0	0	328.14	36.46	364.60

Sum of NM0020583 and NM0028746 individual WLAs. See **Table 2.5 for details.*

2.3.4 Load Reduction

The extensive data collection and analysis necessary to determine background aluminum loads were 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 measured load for aluminum was calculated using concentrations found during exceedance events. In order to achieve comparability between the target and measured loads, the same flow value was used for both calculations, although the average measured flow was typically higher than the calculated 4Q3. The arithmetic mean of the collected data was substituted for the WQS in Equation 2.1. The same unit conversion factor was utilized.

Table 2.8 Load Reduction Estimated to Meet WQS for Total Recoverable Aluminum

Assessment Unit	Target Load (lb/day)[a]	Measured Load (lb/day)[b]	Load Reduction (lbs/day)	Load Reduction (%)[c]
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	514.93	799.07	284.14	35.56
Animas River (San Juan River to Estes Arroyo)	1252.75	3690.47	2437.72	66.05
San Juan River (Animas River to Canon Largo)	3137.82	8820.25	5682.43	64.42
San Juan River (Navajo bnd at Hogback to Animas River)	5201.03	11219.64	6018.62	53.64
San Juan River (NM reach upstream of Navajo Reservoir)	328.14	523.86	195.71	37.36

(a) Target Load = TMDL – MOS. The MOS is not included in the load reduction calculations because it is a set aside value, which accounts for any uncertainty or variability in TMDL calculations and therefore should not be subtracted from the measured load.

*(b) The measured load is the magnitude of point and nonpoint sources. It is calculated at the TMDL critical flow using the mean measured Al concentration from sampling events that resulted in exceedances of WQS criteria (**Appendix B**).*

(c) Percent reduction is the percent the existing measured load must be reduced to achieve the target load and is calculated as follows: ((Measured Load – Target Load) / Measured Load) x 100.

2.4 Identification and Description of Pollutant Sources

SWQB conducted an assessment of the probable sources of impairment in the AU drainage area, according to Standard Operating Procedure 4.1, Revision 2, Probable Source(s) Determination (https://www.env.nm.gov/surface-water-quality/sop/; see also **Appendix D**). Probable Source Sheets are filled out by SWQB monitoring staff during watershed surveys. The sheets are then reviewed by watershed protection staff familiar with the location, and the TMDL writer conducts a search of aerial imagery, GIS files, and other available resources. The list of probable sources is not intended to single out any particular landowner or land management activity and generally includes several sources per pollutant.

Table 2.9 displays probable pollutant sources that have the potential to contribute to aluminum impairment within each AU in the TMDL study areas, as determined by field reconnaissance and knowledge of watershed activities. The draft probable source list will be reviewed and modified as necessary, with watershed group/stakeholder input during the TMDL public meeting and comment period. Probable sources of impairment will be further evaluated, refined, and changed as necessary through the Watershed-Based Plan (WBP).

Table 2.9 Probable Sources of Excessive Aluminum for Aluminum Impaired AUs

Assessment Unit	Probable Source(s)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	Drought related impacts; Flow alterations from water diversions; Loss of riparian habitat; Municipal (urbanized high-density area); Municipal point source discharges; On-site treatment systems; Other recreational pollution sources; Rangeland grazing
Animas River (San Juan River to Estes Arroyo)	Channelization; Drought-related impacts; Illegal Dumps or Other Inappropriate Waste Disposal; Other Recreational Pollution Sources; Pavement/Impervious Surfaces; Streambank Modifications/Destabilization; Site Clearance (Land Development); Urban Runoff/Storm Sewers; Water Diversions; Waterfowl
San Juan River (Animas River to Canon Largo)	Drought-related Impacts; Flow Alterations from Water Diversions; Highways/Roads/Bridges; Loss of Riparian Habitat; Onsite Treatment Systems (Septic Systems and Similar Decentralized Systems); Rangeland Grazing; Waste from pets; Wildlife other than waterfowl; Waterfowl
San Juan River (Navajo bnd at Hogback to Animas River)	Drought-related Impacts; Flow Alterations from Water Diversions; Grazing in riparian zone; Highways/Roads/Bridges; Loss of Riparian Habitat; Municipal Point Source Discharges; Onsite Treatment Systems (Septic Systems and Similar Decentralized Systems); Rangeland

Assessment Unit	Probable Source(s)
	Grazing, Site clearance (new development or infill)
San Juan River (NM reach upstream of Navajo Reservoir)	Highways/Roads/Bridges; Irrigated crop production (irrigation equip); On-site treatment systems (septic, etc.); Rangeland grazing; Residences/Buildings; Site clearance (land development); Waterfowl; Wildlife other than waterfowl

2.5 Consideration of Seasonal Variation

Normal aqueous chemical processes, enhanced by the slight natural acidity of snow and rain, are capable of rendering some of the abundant naturally occurring aluminum available to a river system, and, as a result of snowmelt, one might expect to see higher aluminum concentrations during spring sampling events in mountainous AUs. While there are multiple exceedances in Spring, there are also exceedances from June to October. There was no apparent seasonal pattern to the exceedances documented.

2.6 Future Growth

Growth estimates by county are available from the University of New Mexico Geospatial and Population Studies (GPS) (https://gps.unm.edu/pop/population-projections.html, accessed 1/29/2026). The estimates project growth to the year 2050. The AU's discussed in this section are in San Juan and Rio Arriba Counties. GPS projects San Juan County population to decrease through to 2050, and GPS projects Rio Arriba County population to remain relatively similar through to 2050, as detailed in **Table 2.10**These projections account for the 2020 census results, also accessed through GPS (https://gps.unm.edu/pop/population-estimates.html, accessed 1/29/2026). TMDL implementation planners should seek out the most current projections, if the information is relevant to their project.

Table 2.10 Population Estimates

County	2020 (Census)[B]	2025	2030	2035	2040	2045	2050[A]	% Increase
San Juan	121,671	119,657	117,590	113,548	109,362	102,927	96,336	-21%
Rio Arriba	40,234	40,266	40,247	40,217	40,185	40,156	40,130	-0.3%

(a) % Increase: [(A – B) / B] × 100

Estimates of population change are not anticipated to lead to a significant increase in aluminum that cannot be controlled with BMP implementation. BMPs should be utilized and improved upon while continuing to improve watershed conditions and adhering to SWPPP requirements related to construction and industrial activities covered under the general permit.

3.0 *E. COLI*

Escherichia coli (E. coli) is a species of coliform bacteria that is present in the intestinal tracts and feces of warm-blooded animals. Most *E. coli* is harmless and is an important part of a healthy human intestinal tract. However, some strains of *E. coli* are pathogenic, meaning they can cause illness, either diarrhea or illness outside of the intestinal tract. It is also used as an indicator of the potential presence of other pathogens that may present human health concerns.

Bacterial data collected from the impaired AUs during the 2017-2018 SWQB water quality survey is shown in **Appendix B** and summarized on **Table 3.1**, below. Samples were assessed by comparing the *E. coli* results to the applicable single sample criterion. Assessment of the data identified exceedances of the New Mexico water quality standards for *E. coli* bacteria. As a result, these AUs are listed on the Integrated CWA § 303(d)/ § 305(b) List with *E. coli* as an impairment of the primary contact designated use (NMED/SWQB, 2026).

Table 3.1 *E. Coli* Exceedances

Assessment Unit	Monthly Geometric Mean Criterion (cfu/100mL)	Water Quality Criterion (single sample, cfu/100mL)	Number of Exceedances
Gallegos Canyon (San Juan River to Navajo bnd)	206	940	3/6
La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)	126	410	3/5
Navajo River (Jicarilla Apache Nation to CO border)	126	235	2/10
San Juan River (Animas River to Canon Largo)	126	410	12/54
San Juan River (Navajo bnd at Hogback to Animas River)	126	410	13/40
San Juan River (NM reach upstream of Navajo Reservoir)	206	940	2/5
Stevens Arroyo (Perennial prts San Juan R to headwaters)	206	940	3/7
Shumway Arroyo (San Juan River to Ute Mtn Ute bnd)	206	940	3/6

3.1 Target Loading Capacity

The TMDL is a value calculated at a defined critical flow condition as part of a planning process designed to achieve water quality standards. For these *E. coli* TMDLs, the appropriate critical flow condition is at low flow, to be protective when the assimilative capacity of a stream is at its lowest. For this TMDL document, target values for *E. coli* bacteria are based on achievement of the monthly geometric mean numeric criterion outlined in **Table 3.1** as a value not to be exceeded rather than a monthly geometric mean, to provide a conservative protective value. If the single sample criterion was used and achieved as a target, the geometric mean criterion may still not be achieved.

3.2 Flow

According to the New Mexico Water Quality Standards, the low flow critical condition for numeric criteria (excluding human health-organism only criteria) set in 20.6.4.97 through 20.6.4.900 NMAC and 20.6.4.13(F) NMAC is defined as the 4-day, 3-year low-flow frequency (4Q3, 20.6.4.11(B)(2) NMAC). The 4Q3 is the annual lowest four (4) consecutive day flow that occurs with a frequency of at least once every three (3) years.

For AUs discussed in this section that are ungaged, an analysis method developed by USGS in partnership with NMED, authored by Bell and Tillery (Bell, 2023) was used to estimate the critical low flow. In the Bell & Tillery analysis, six regression equations for estimating 4Q3 were developed based on physiographic regions of New Mexico and stream basin characteristics (i.e., statewide and mountainous regions above 8,000 ft in elevation, or basins with less than 75 square mile drainage areas). The 4Q3-1b (Equation 3.1) equation was used for the AUs Navajo River (Jicarilla Apache Nation to CO border) and San Juan River (NM reach upstream of Navajo Reservoir), which applies to elevations over 8,000ft that are the San Juan River or tributaries to the San Juan. The 4Q3-4 (Equation 3.2), elevation < 8,000ft and drainage area between 200 – 2,000mi^2, was used for the AU Gallegos Canyon (San Juan River to Navajo bnd). The 4Q3-3 (Equation 3.3) equation, elevation < 8,000ft and drainage area between 70 – 250mi^2, was used for the AU Shumway Arroyo (San Juan River to Ute Mtn Ute bnd). The 4Q3-2 (Equation 3.4) equation, elevation < 8,000ft and drainage area < 75mi^2, was used for the AU Stevens Arroyo (Perennial prts San Juan R to headwaters).

Equation 3.1 (4Q3-1b): $4Q3 = DA^{1.38} \times P^{5.18} \times e^{-22.17}$

Where:

$4Q3$ = four-day, three-year low-flow frequency (cfs)
DA = drainage area (mi^2)
P = annual basin precipitation (in)
e = mathematical constant, Euler's number

Equation 3.2 (4Q3-4): $4Q3 = DA^{1.24} \times P^{7.27} \times e^{-29.02}$

Where:

$4Q3$ = four-day, three-year low-flow frequency (cfs)
DA = drainage area (mi^2)
P = annual basin precipitation (in)
e = mathematical constant, Euler's number

Equation 3.3 (4Q3-3): $4Q3 = DA^{1.64} \times P^{6.72} \times e^{-28.80}$

Where:

$4Q3$ = four-day, three-year low-flow frequency (cfs)
DA = drainage area (mi^2)
P = annual basin precipitation (in)
e = mathematical constant, Euler's number

Equation 3.4 (4Q3-2): $4Q3 = DA^{1.51} \times S^{1.88} \times e^{-2.66}$

Where:

$4Q3$ = four-day, three-year low-flow frequency (cfs)
DA = drainage area (mi^2)
S = mean basin slope
e = mathematical constant, Euler's number

The 4Q3 values calculated using Bell & Tillery's method are presented in **Table 3.2**. Parameters used in the calculation were obtained using the StreamStats online GIS application developed by the USGS (https://streamstats.usgs.gov/ss/). The flow was converted from cfs to million gallons per day (mgd) using a conversion factor of 0.646. The TMDL itself is a value calculated at a defined critical condition as part of a planning process designed to achieve water quality standards. Since flows vary throughout the year in these systems, the actual load at any given time will vary based on the changing flow. Management of the load to improve instream water quality is the goal of SWQB efforts.

Critical flow for the AUs La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd), San Juan River (Animas River to Canon Largo) and San Juan River (Navajo bnd at Hogback to Animas River) was determined using daily discharge data from USGS gages 09367000 La Plata River at La Plata, NM for La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd), USGS 09365000 San Juan River at Farmington for San Juan River (Animas River to Canon Largo), and USGS 09367540 San Juan R NR Fruitland, NM for San Juan River (Navajo bnd at Hogback to Animas River). At least 20 years of continuous flow data, from 2002 to 2025, was used with the USGS Hydrologic Toolbox software to determine critical flow conditions. Calculated 4Q3 is presented in **Table 3.2** below in both cfs and mgd.

Table 3.2 Critical Flow for *E. Coli* Impaired AUs

Assessment Unit	Drainage Area (mi^2)	Average Elevation (ft)	Annual Precipitation (in)	Avg. Basin Slope (ft/ft)	4Q3 (cfs)	4Q3 (mgd)
Gallegos Canyon (San Juan River to Navajo bnd)	304	6230	10.0	0.04	0.006	0.004
La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)*	--	--	--	--	0.05	0.03

Assessment Unit	Drainage Area (mi^2)	Average Elevation (ft)	Annual Precipitation (in)	Avg. Basin Slope (ft/ft)	4Q3 (cfs)	4Q3 (mgd)
Navajo River (Jicarilla Apache Nation to CO border)	231	8838	26.8	0.27	10.7	6.9
San Juan River (Animas River to Canon Largo)*	--	--	--	--	309.9	200.3
San Juan River (Navajo bnd at Hogback to Animas River)*	--	--	--	--	377.1	243.6
San Juan River (NM reach upstream of Navajo Reservoir)	1240	8409	25.1	0.27	77.8	50.3
Stevens Arroyo (Perennial prts San Juan R to headwaters)	9.5	5393	8.7	0.06	0.011	0.007
Shumway Arroyo (San Juan River to Ute Mtn Ute bnd)	142	5754	10.9	0.11	0.010	0.006

* *Basin characteristics omitted due to being calculated with gage data*

3.3 TMDL Calculations

The WQS for bacteria are expressed as colony forming units (cfu) per unit volume. TMDLs for bacteria (**Table 3.3**) were calculated based on critical flow values (**Table 3.2**), water quality standards, and a conversion factor, using **Equation 3.5**.

Equation 3.5 $$C\ as\ \frac{cfu}{100mL} * 1000\frac{mL}{L} * \frac{L}{0.264\ gallons} * Q\ in\ 1{,}000{,}000\frac{gallons}{day} = cfu/day$$

Where C = water quality criterion for bacteria
Q = the critical stream flow in million gallons per day (MGD)

Table 3.3 ***E. Coli* TMDL Calculations**

Assessment Unit	Geometric Mean *E. coli* criterion (cfu/100 mL)	Critical Flow (mgd)	Conversion Factor	TMDL (cfu/day)
Gallegos Canyon (San Juan River to Navajo bnd)	206	0.004	3.79×10^7	3.12×10^7
La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)	126	0.03	3.79×10^7	1.43×10^8
Navajo River (Jicarilla Apache Nation to CO border)	126	6.9	3.79×10^7	3.31×10^{10}
San Juan River (Animas River to Canon Largo)	126	200.3	3.79×10^7	9.56×10^{11}

Assessment Unit	Geometric Mean *E. coli* criterion (cfu/100 mL)	Critical Flow (mgd)	Conversion Factor	TMDL (cfu/day)
San Juan River (Navajo bnd at Hogback to Animas River)	126	243.6	3.79×10^{7}	1.16×10^{12}
San Juan River (NM reach upstream of Navajo Reservoir)	206	50.3	3.79×10^{7}	3.92×10^{11}
Shumway Arroyo (San Juan River to Ute Mtn Ute bnd)	206	0.006	3.79×10^{7}	4.68×10^{7}
Stevens Arroyo (Perennial prts San Juan R to headwaters)	206	0.007	3.79×10^{7}	5.46×10^{7}

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 and meet water quality criteria at all times is the goal. The TMDL is further allocated to a MOS, WLA (permitted point sources), and LA (non-point sources), according to the formula:

Equation 3.6: *WLA + LA + MOS = TMDL*

3.3.1 Margin of Safety

The CWA requires that each TMDL be calculated with a MOS. This statutory requirement that TMDLs incorporate a MOS is intended to account for uncertainty in available data or in the actual effect controls will have on loading reductions and receiving water quality. A MOS may be expressed as unallocated assimilative capacity or conservative analytical assumptions used in establishing the TMDL (e.g., derivation of numeric targets, modeling assumptions or effectiveness of proposed management actions). The MOS may be implicit, utilizing conservative assumptions for calculation of the loading capacity, WLAs, and LAs. The MOS may also be explicitly stated as an added separate quantity in the TMDL calculation. For this bacteria TMDL, the MOS was developed using a combination of conservative assumptions and explicit allocations. Therefore, this MOS is the sum of the following elements:

- *Conservative assumptions:*
    - *E. coli* bacteria do not readily degrade in the environment; and,
    - Basing the target load capacity on the geometric mean criterion rather than the higher-concentration single sample criterion.
- *Explicit recognition of potential errors:*
    - There is inherent error in flow estimation, a conservative MOS for this element in ungaged streams is **10 %**.

The total MOS for this TMDL is **10%**.

3.3.2 Waste Load Allocation

There are National Pollutant Discharge Elimination System (NPDES) permits, and Municipal Separate Storm Sewer Systems (MS4s) permits that have potential to contribute *E. Coli* on the following AUs:

Assessment Unit	Permit
San Juan River (Animas River to Canon Largo)	NM0020770 City of Bloomfield Wastewater Treatment Plant
	NMR040000 MS4
San Juan River (Navajo bnd at Hogback to Animas River)	NM0020583 City of Farmington Wastewater Treatment Plant
	NM0028746 West Moreland San Juan Mining, LLC/San Juan Mine
	NM0020800 USDI/Nenahnezad Boarding*
	NMR040000 MS4
Shumway Arroyo (San Juan River to Ute Mtn Ute bnd)	NM0028746 West Moreland San Juan Mining, LLC/San Juan Mine
La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)	NMR040000 MS4
Stevens Arroyo (Perennial prts San Juan R to headwaters)	NMR040000 MS4

**Identified for information only; this discharge and its regulation are not under State of New Mexico's nor EPA Region 6 jurisdiction.*

Individual National Pollutant Discharge Elimination System (NDPES) Permits

The City of Bloomfield Wastewater Treatment Plant (WWTP; permit NM0020770) permit was issued November 1, 2020, and expires October 31, 2025 – this permit is currently "administratively continued", with a potential expiration date in 2031, pending issuance of a new permit. The current *E. Coli* bacteria limit is 4.3×10^9 cfu/day for a 30-day average and daily max, or 126 cfu/100mL. The design capacity flow from the facility is 0.93 mgd and there is one outfall discharging into the San Juan River in the mid-point of the AU San Juan River (Animas River to Canon Largo).

The City of Farmington WWTP (permit NM0020583) permit was issued December 1, 2021, and expires November 30, 2026. The current *E. Coli* bacteria limit for the City of Farmington WWTP is for 30-day average 31.9×10^9 cfu/day or 30-day average concentration of 126 cfu/100mL, with a daily maximum concentration of 235 cfu/100mL. The design capacity flow for the facility is 6.67 mgd and there is one outfall discharging to the San Juan River on the AU San Juan River (Navajo bnd at Hogback to Animas River).

West Moreland San Juan Mining LLC holds a permit issued February 1, 2024, set to expire January 31, 2029. The facility has a total of 11 outfalls, 1 of which is authorized discharges to the San Juan River, 3 outfalls are authorized to discharge to the Westwater Arroyo, and 7 outfalls are authorized to discharge to the Shumway Arroyo. They are not required to report *E. Coli* values, nor do they have a set limit on *E. Coli*. This facility has had zero discharge since its last permit period, nor does the permit provide any design capacity flow. DMR reports have been examined as far back as 2001. Only one discharge event has occurred in this time, with a flow of 0.01 mgd. In the absence of a design capacity flow, or regular flow measurements to generate a daily max or mean flow, this flow event will be used to calculate WLAs for this facility.

USDI/Nanahnezad Boarding (NM20020800) is permitted under the jurisdiction of USEPA Region 9 and Navajo Nation EPA. This permit is identified for information only, as this discharge and its regulation are not under New Mexico's nor EPA Region 6 jurisdiction. The NPDES waste load allocations for each AU are presented in **Table 3.4**. Any contributions from Navajo Nation lands and permitted facilities are captured in the Load Allocation of this TMDL.

Table 3.4 Individual NPDES Discharge Limits for *E. Coli*

Permit	Design Flow	*E. coli* Permit Limit (daily loading)		*E. coli* Permit Limit (concentration)	
NM0020770 City of Bloomfield WWTP	0.93 mgd	30-day average:	4.3×10^{9} cfu/day	30-day average:	126 cfu/100mL
		Daily max:	4.3×10^{9} cfu/day	Daily max:	126 cfu/100mL
NM0020583 City of Farmington WWTP	6.67 mgd	30-day average:	3.19×10^{10} cfu/day	30-day average:	126 cfu/100mL
		Daily max:	3.19×10^{10} cfu/day	Daily max:	235 cfu/100mL

Table 3.5 Individual NPDES Waste Load Allocations for *E. Coli*

Assessment Unit	Facility	Design Capacity Flow (mgd)	*E. Coli* Geometric Mean Criterion (cfu/100mL)	Conversion Factor	WLA* (cfu/day)
San Juan River (Animas River to Canon Largo)	NM0020770 City of Bloomfield WWTP	0.93	126	3.79×10^{7}	4.44×10^{9}
San Juan River (Navajo bnd at Hogback to Animas River)	NM0020583 City of Farmington WWTP	6.67	126	3.79×10^{7}	3.19×10^{10}
San Juan River (Navajo bnd at Hogback to Animas River)	NM0028746 West Moreland San Juan Mining, LLC/San Juan Mine	0.01	126	3.79×10^{7}	4.78×10^{7}

*Since the calculated WLA for the AU San Juan River (Animas River to Canon Largo) is higher than the current discharge limits (**Table 3.4**), **the WLA for this AU will be the current permitted 30-day avg. discharge limits: 4.3×10^{9} cfu/day.**

Municipal Separate Storm Sewer Systems (MS4s) Permits

MS4s are defined as a conveyance or system of conveyances owned by a state, city, town, or other public entity that discharges to waters of the United States and is designed or used for collecting or conveying storm water. Because this is a storm water permit, sMS4 permit and associated sMS4 WLAs are only applicable during storm (i.e., high) flow. Regulated conveyance systems include roads with drains, municipal streets, catch basins, curbs, gutters, storm drains, piping, channels, ditches, tunnels and conduits. It does not include combined sewer overflows and publicly-owned treatment works. The federal Clean Water Act requires storm water discharges from certain types of urbanized areas to be permitted under the NPDES program.

In 1990, Phase I of these requirements became effective, and municipalities with a population served by a MS4 of 100,000, or more, were regulated. Under Phase I federal storm water regulations, regulated MS4 entities were required to obtain individual permits. In 1999, Phase II became effective, and any entity responsible for an MS4 conveyance, regardless of population size, could potentially be regulated. To date, this designation has typically applied to areas that have been identified by the Bureau of the Census as an "urbanized area" (UA) but with populations less than 100,000 (USEPA 2005). In 2006, USEPA Region 6 issued general permits for discharges from "small" MS4s (sMS4s) in New Mexico and on lands of tribal nations in New Mexico and Oklahoma. This permit became effective in 2007. EPA proposed to reissue this permit in 2015 within the boundaries of Census-designated 2000 and 2010 Farmington, Santa Fe, Los Lunas, Las Cruces and El Paso Urbanized Areas.

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

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

MS4s can be significant sources of *E. coli* because they transport urban runoff that can be affected by pet waste, illicit sewer connections, and failing septic systems.

The Phase II sMS4 permit (NMR040000) reads:

> *"This permit may authorize stormwater discharges to waters of the United States from small MS4s within New Mexico provided the MS4… is located fully or partially within an urbanized area in New Mexico as determined by the 2000 and 2010 Decennial Census."*

There are four permittees identified in the Farmington urbanized area: the City of Farmington, San Juan County, the City of Aztec, and the New Mexico Department of Transportation (NMDOT) District 5. Stormwater covered by the sMS4 has the potential to impact all of the AUs discussed in this document. The sMS4 WLA for each AU has been determined based on the percent of jurisdictional (urban) area within the respective contributing watershed area. The percent and total jurisdictional area, per area *E. coli* loadings, and resultant sMS4 waste load allocations for each AU are presented in **Table 3.6**. For more information regarding the jurisdictional allocation of sMS4 loads and per area *E. coli* loading values, see **Appendix C.**

Table 3.6 NMR040000 MS4 Waste Load Allocations for *E. Coli*

Assessment Unit	TMDL - MOS - NPDES WLA (cfu/day) =	MS4 Jurisdictional Area (% of contributing watershed area)	WLA (cfu/day)	Per area E. coli loading (cfu/day/mi^2)
La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)	1.29×10^8	1.32%	1.70×10^6	2.25×10^6
San Juan River (Animas River to Canon Largo)	8.56×10^{11}	5.50%	4.71×10^{10}	2.58×10^9
San Juan River (Navajo bnd at Hogback to Animas River)	1.01×10^{12}	5.34%	5.42×10^{10}	4.32×10^9
Stevens Arroyo (Perennial prts San Juan R to headwaters)	4.92×10^7	4.13%	2.03×10^6	3.77×10^5

General Permits

Stormwater discharges from construction activities are transient because they occur mainly during the construction itself, and then only during storm events. Coverage under the USEPA NPDES Construction General Permit (CGP) for construction sites of one or more acres, or smaller if part of a common plan of development, 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. The current CGP also includes state-specific requirements to implement site-specific interim and permanent stabilization, managerial, and structural solids, erosion, and sediment control Best Management Practices (BMPs), and/or other controls. BMPs are designed to prevent to the maximum extent practicable an increase in sediment load to the water body or an increase in a sediment-related parameter, such as total suspended solids, turbidity, siltation, stream bottom deposits, etc. BMPs also include measures to reduce flow velocity during and after construction compared to pre-construction conditions to ensure that waste load allocations and/or applicable water quality standards, including the antidegradation policy, are met. Compliance with a SWPPP that meets the requirements of the CGP is generally assumed to be consistent with this TMDL.

Stormwater discharges from industrial activities and facilities, based on industrial classification codes, may be eligible for coverage under the current NPDES Multi-Sector General Permit (MSGP). The MSGP also requires preparation of a SWPPP. Some of the industrial facilities and activities covered under the MSGP have technology based effluent limitation and/or benchmark monitoring for pollutants. The current MSGP includes state-specific requirements that the benchmark values be protective of State of New Mexico WQS.

It is not possible to calculate individual WLAs for facilities covered by the General Permits at this time using the available tools. The discharges from these permits are typically transitory as the activities are temporary. Loads that are in compliance with the General Permits are therefore currently included as part of the Load Allocation (LA). While these sources are not given individual allocations, they are addressed through other means, including BMPs, stormwater pollution prevention conditions, and other requirements.

3.3.3 Load Allocation

Load Allocation is pollution from any nonpoint source(s) or natural background and is addressed through Best Management Practices (BMPs). To calculate the LA, the WLA and MOS are subtracted from the TMDL using **Equation 3.3**. Results of the load calculations are presented in **Table 3.7**. The extensive data collection and analyses necessary to determine background *E. coli* loads are beyond the resources available for this study. It is assumed that a portion of the LA is made up of natural background loads. It is important to note that WLAs and LAs are estimates based on a specific flow condition. Under differing hydrologic conditions, the loads will change. Successful implementation of this TMDL will be determined based on achievement of the *E. coli* standards under all flow conditions.

Table 3.7 TMDL allocations for *E. Coli* (units in cfu/day)

Assessment Unit	Individual Permit WLA (cfu/day)	MS4 WLA (cfu/day)	LA (cfu/day)	10% MOS (cfu/day)	TMDL (cfu/day)
Gallegos Canyon (San Juan River to Navajo bnd)	0	0	2.81×10^{7}	3.12×10^{6}	3.12×10^{7}
La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)	0	1.70×10^{6}	1.27×10^{8}	1.43×10^{7}	1.43×10^{8}
Navajo River (Jicarilla Apache Nation to CO border)	0	0	2.98×10^{10}	3.31×10^{9}	3.31×10^{10}
San Juan River (Animas River to Canon Largo)	4.30×10^{9}	4.71×10^{10}	8.09×10^{11}	9.56×10^{10}	9.56×10^{11}
San Juan River (Navajo bnd at Hogback to Animas River)	3.19×10^{10}	5.42×10^{10}	9.60×10^{11}	1.16×10^{11}	1.16×10^{12}
San Juan River (NM reach upstream of Navajo Reservoir)	0	0	3.53×10^{11}	3.92×10^{10}	3.92×10^{11}
Shumway Arroyo (San Juan River to Ute Mtn Ute bnd)	0	0	4.21×10^{7}	4.68×10^{6}	4.68×10^{7}
Stevens Arroyo (Perennial prts San Juan R to headwaters)	0	2.03×10^{6}	4.71×10^{7}	5.46×10^{6}	5.46×10^{7}

3.3.4 Load Reduction

E. Coli impairment determinations were based on exceedances of the State's single sample criteria and the TMDL is written to address the monthly geometric mean standard. As such, a simple comparison of the numbers would not necessarily represent an amount of contaminant reduction that would result in removing the impairment and would instead result in an overestimation of the actual reduction necessary. Neither Section 303 of the Clean Water Act nor 40 C.F.R. Part 130.7 requires states to include discussions of percent reductions in TMDL documents. Although NMED believes that it is often useful to discuss the magnitude of water quality exceedances in the TMDL report, the "percent reduction" value can be calculated in multiple ways and as a result is often misinterpreted. Therefore, a percent reduction value is not provided for *E. Coli* TMDLs.

3.4 Identification and Description of Pollutant Sources

SWQB fieldwork includes an assessment of the probable sources of impairment in the AU drainage area, according to Standard Operating Procedure 4.1, Probable Source(s) Determination (https://www.env.nm.gov/surface-water-quality/sop/; **Appendix D**). Probable Source Sheets are filled out by SWQB monitoring staff during watershed surveys. The sheets are then reviewed by watershed protection staff familiar with the location, and the TMDL writer conducts a search of aerial imagery, GIS files, and other available resources. The list of probable sources is not intended to single out any particular landowner or land management activity and generally includes several sources per pollutant. Pollutant sources that may contribute to each impairment were determined by field reconnaissance and evaluation (**Table 3.8**). Probable sources of bacteria impairments will be evaluated, refined, and changed as necessary through the Watershed Based Plans.

Table 3.8 Probable Sources of Excessive Coliform for E. Coli Impaired AUs

Assessment Unit	Probable Source(s)
Gallegos Canyon (San Juan River to Navajo bnd)	Buildings/Culverts/RR crossings; Dams/Diversions; Dumping/Garbage/Trash/Litter; Flow alteration; Gravel or dirt roads; Highway/Road/Bridge runoff; Inappropriate waste disposal; Irrigated crop production (irrigation equipment); Irrigation return drains; Paved roads; Pavement/Impervious surfaces; Residences/Buildings; Site clearance (land development; Wildlife other than waterfowl
La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)	Flow alterations; Highways/Roads/Bridges; Loss of Riparian Habitat; On-site Treatment Systems (Septic Systems and Similar Decentralized Systems); Rangeland Grazing; Wildlife other than waterfowl; Waterfowl
Navajo River (Jicarilla Apache Nation to CO border)	Bridges/Culverts/RR crossings; Dams/Diversions; Flow alteration; Gravel or dirt roads; Irrigated crop production (irrigation equip); Irrigation return drains; On-site treatment systems; Rangeland grazing (dispersed); Residences/Buildings; Site clearance (land development); Waterfowl; Wildlife other than waterfowl
San Juan River (Animas River to Canon Largo)	Drought-related Impacts; Flow Alterations from Water Diversions; Highways/Roads/Bridges; Loss of Riparian Habitat; Onsite Treatment Systems (Septic Systems and Similar Decentralized

Assessment Unit	Probable Source(s)
	Systems); Rangeland Grazing; Waste from pets; Wildlife other than waterfowl; Waterfowl
San Juan River (Navajo bnd at Hogback to Animas River)	Drought-related Impacts; Flow Alterations from Water Diversions; Grazing in riparian zone; Highways/Roads/Bridges; Loss of Riparian Habitat; Municipal Point Source Discharges; Onsite Treatment Systems (Septic Systems and Similar Decentralized Systems); Rangeland Grazing, Site clearance (new development or infill)
San Juan River (NM reach upstream of Navajo Reservoir)	Highways/Roads/Bridges; Irrigated crop production (irrigation equip); On-site treatment systems (septic, etc.); Rangeland grazing; Residences/Buildings; Site clearance (land development); Waterfowl; Wildlife other than waterfowl
Stevens Arroyo (Perennial prts San Juan R to headwaters)	Bridges/Culverts/RR crossings; Dams/Diversions; Flow alteration; Highway/Road/Bridge runoff; Illegal Dumps or Other Inappropriate Waste Disposal; Irrigated crop production (irrigation equip); Irrigation return drains; Pavement/Impervious surfaces; Rangeland grazing; Site clearance (land development); Urban Runoff/Storm Sewers; Waste from pets; Wildlife other than waterfowl
Shumway Arroyo (San Juan River to Ute Mtn Ute bnd)	Bridges/Culverts/RR Crossings; Dams/Diversions; Flow alteration; Highway/Road/Bridge runoff; Illegal Dumps or Other Inappropriate Waste Disposal; Irrigation return drains; Irrigated crop production (irrigation equip); On-Site treatment systems; Pavement/Impervious surfaces; Rangeland grazing (dispersed); Site clearance (land development); Urban Runoff/Storm Sewers; Wildlife other than waterfowl; Waterfowl

3.5 Consideration of Seasonal Variation

Federal regulations (40 C.F.R. § 130.7(c)(1)) require that TMDLs take into consideration seasonal variation in watershed conditions and pollutant loading. Data used in the calculation of these TMDLs were collected during the spring, summer, and fall of 2017-2018 to ensure coverage of potential seasonal variation in the system. In all AUs discussed in this TMDL, exceedances were recorded in summer through early fall (June to October). This pattern is consistent with the findings of Hulvey et al. (2021) that *E. coli* peaked in midsummer in Utah streams running through grazed or ungrazed grasslands, with higher peaks in the grazed meadows.

3.6 Future Growth

Growth estimates by county are available from the University of New Mexico Geospatial and Population Studies (GPS) (https://gps.unm.edu/pop/population-projections.html, accessed 1/29/2026). The estimates project growth to the year 2050. All AUs discussed in this section are in San Juan County. GPS projects San Juan County population to decrease through to 2050, as detailed in **Table 3.9**. These projections account for the 2020 census results, also accessed through GPS (https://gps.unm.edu/pop/population-estimates.html, accessed 1/29/2026). TMDL implementation planners should seek out the most current projections, if the information is relevant to their project.

Table 3.9 San Juan County Population Estimates

2020 (Census)[B]	2025	2030	2035	2040	2045	2050[A]	% Increase
121,671	119,657	117,590	113,548	109,362	102,927	96,336	-21%

% Increase: [(A – B) / B] × 100

Estimates of population change are not anticipated to lead to a significant increase in *E. coli* that cannot be controlled with BMP implementation. BMPs should be utilized and improved upon while continuing to improve watershed conditions and adhering to SWPPP requirements related to construction and industrial activities covered under the general permit.

4.0 PLANT NUTRIENTS & TOTAL PHOSPHORUS

Phosphorus and nitrogen are essential for proper functioning of ecosystems. However, excess nutrients cause conditions unfavorable for the proper functioning of aquatic ecosystems. Nuisance levels of algae and other aquatic vegetation (macrophytes) can develop rapidly in response to nutrient enrichment when other factors (e.g., light, temperature, substrate) are not limiting (**Figure 4.1**). However, the magnitude of nutrient concentration that constitutes an "excess" is difficult to determine and varies by ecoregion.

Phosphorus and nitrogen generally drive the productivity of algae and macrophytes in aquatic ecosystems, therefore they are regarded as the primary limiting nutrients in freshwater. The main reservoirs of natural phosphorus are rocks and natural phosphate deposits. Weathering, leaching, and erosion are all processes that break down rock and mineral deposits allowing phosphorus to be transported to aquatic systems via water or wind. The breakdown of mineral phosphorus produces inorganic phosphate ions ($H_2PO_4^-$, HPO_4^{2-}, and PO_4^{3-}) that can be absorbed by plants from soil or water (USEPA, 1999). Phosphorus primarily moves through the food web as organic phosphorus (after it has been incorporated into plant or algal tissue) where it may be released as phosphate in urine or other waste by heterotrophic consumers and reabsorbed by plants or algae to start another cycle (Nebel and Wright, 2000).

The largest global reservoir of nitrogen is the atmosphere. About 80% of the atmosphere by volume consists of nitrogen gas (N_2). Although nitrogen is plentiful in the environment, it is not readily available for biological uptake. Nitrogen gas must be converted to other forms, such as ammonia (NH_3 and NH_4^+), nitrate (NO_3^-), or nitrite (NO_2^-) before plants and animals can use it. Conversion of gaseous nitrogen into usable mineral forms occurs through three biologically mediated processes of the nitrogen cycle: nitrogen fixation, nitrification, and ammonification (USEPA, 1999). Mineral forms of nitrogen can be taken up by plants and algae and incorporated into their tissue. Nitrogen follows the same pattern of food web incorporation as phosphorus and is released in waste primarily as ammonium compounds. The ammonium compounds are usually converted to nitrates by nitrifying bacteria, making it available again for uptake, starting the cycle anew (Nebel and Wright, 2000).

Rain, overland runoff, groundwater, drainage networks, and industrial and residential waste effluents transport nutrients to receiving waterbodies. Once nutrients have been transported into a waterbody they can be taken up by algae, macrophytes, and microorganisms either in the water column or in the benthos; they can sorb to organic or inorganic particles in the water column and/or sediment; they can accumulate or be recycled in the sediment; or they can be transformed and released as a gas from the waterbody (**Figure 4.1**).

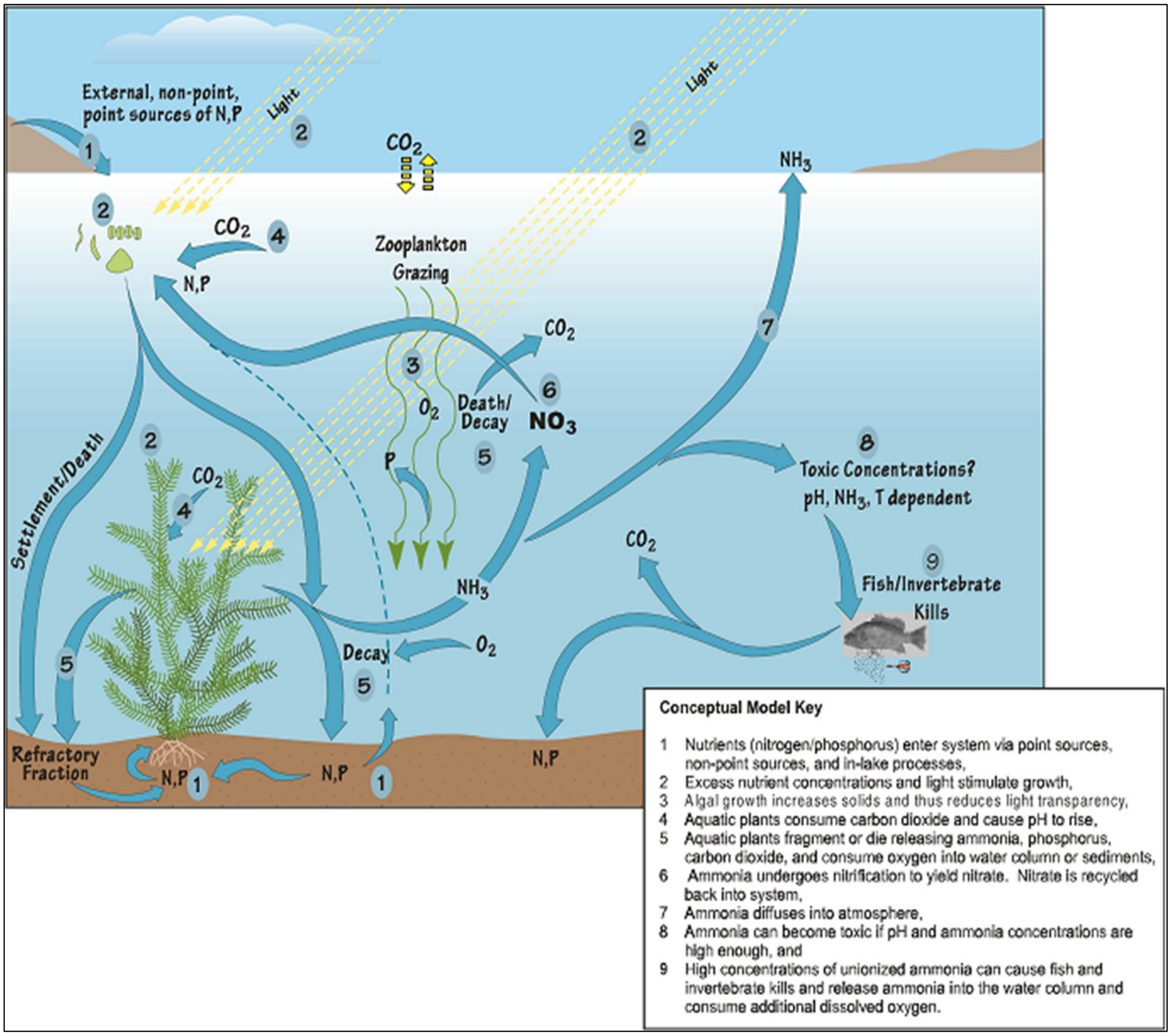

Figure 4.1 Nutrient Conceptual Model (USEPA 1999)

4.1 Target Loading Capacity

The intent of nutrient criteria, whether numeric or narrative, is to limit nutrient inputs to control the excessive growth of attached algae and higher aquatic plants. Controlling algae and plant growth preserves aesthetic and ecologic characteristics along the waterway. While conceptually there may be several possible combinations of total nitrogen (TN) and total phosphorus (TP) concentrations that are protective of water quality, the application of simple chemical limitation concepts to a complex biologic system to determine these combinations is challenging. One of the primary reasons for this is that different species of algae and higher aquatic plants will have different nutritional needs. Some species will thrive in nitrogen limited environments while others will thrive in phosphorous limited environments. Because of the diversity of nutritional needs amongst organisms, numeric thresholds for both TN and TP are required to preserve the aesthetic and ecologic characteristics along a waterway. Focusing on one nutrient or trading a decrease in one for an increase in the other may simply favor a particular species without achieving water quality standards.

New Mexico has a narrative criterion for plant nutrients set forth in 20.6.4.13(E) NMAC:

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

New Mexico has a segment specific numeric criteria for total phosphorus that applies to the AUs Animas River (Estes Arroyo to Southern Ute Indian Tribe bnd) and Navajo River (Jicarilla Apache Nation to CO border) set forth in 20.6.4.404(B) and 20.6.4.407(B) NMAC, respectively. The numeric target for both of these is 0.1 mg/L or less.

This narrative criterion can be challenging to assess because the relationships between nutrient levels and impairment of designated uses are not defined, and distinguishing nutrients from "other than natural causes" is difficult. Numeric thresholds are necessary to establish targets for TMDLs, to develop water quality-based permit limits and source control plans, and to support designated uses within the watershed.

In 2015 and 2016, SWQB collaborated with Tetra Tech, Inc., the EPA Region 6, and EPA's National Nutrient Criteria Program Nutrient Scientific Technical Exchange Partnership and Support (N-STEPS) program on a project to revise nutrient impairment thresholds for streams and rivers in New Mexico. This project follows EPA's nutrient criteria guidance (EPA, 2010) and Empirical Approaches for Nutrient Criteria Derivation (EPA, 2009). Statistical analyses of available state and regional data were conducted to refine nutrient thresholds using defined reference conditions, relationships between cause and response variables and a verified classification system. TN and TP candidate thresholds were derived for each site class using frequency distributions of nutrient conditions, defined as the median site value (Jessup et al. 2015), in least disturbed sites. Comparing site medians rather than individual sampling events to numeric thresholds is better aligned with the intention of identifying chronic excessive nutrients conditions. The resultant candidate thresholds were evaluated by SWQB staff, and the selected thresholds were used to revise this nutrient listing methodology, as found in Appendix C of the CALM (NMED, 2025). The 100+ page report (Jessup et al., 2015) detailing the N-STEPS effort is available at https://www.env.nm.gov/surface-water-quality/nutrients/. SWQB also generated and posted a shorter document which summarizes the steps taken to determine the candidate thresholds, and SWQB's logic regarding final threshold selection (NMED/SWQB, 2016 [https://www.env.nm.gov/wp-content/uploads/sites/25/2019/04/NewMexicoNutrientThresholdsSummary.pdf]).

Phosphorous is found in water primarily as orthophosphate. In contrast nitrogen may be found as several dissolved species, all of which must be considered in nutrient loading. Total nitrogen is defined by SWQB as the sum of nitrate + nitrite (N+N), and Total Kjeldahl Nitrogen (TKN) (NMED/SWQB, 2025). At the present time, there is no USEPA-approved method to test for total nitrogen, however adding the results of USEPA methods 351.2 (TKN) and 353.2 (N+N) is appropriate for estimating total nitrogen. While not an EPA-approved method, Method SM4500-N for Total Nitrogen using a persulfate digest, is an approved method in the SWQB QAPP (NMED/SWQB, 2024) and is used in cases where a lower detection limit is needed. Daily delta DO, a response variable, is defined as the difference between the maximum and minimum DO concentration within a 24-hour period. The applicable threshold values for this TMDL are shown on **Table 4.1**. These threshold values were used for water quality assessments and TMDL development.

Nutrient and total phosphorus assessments were conducted on data collected during the 2017-2018 water quality survey, 2018-2021 EPA sponsored San Juan monitoring data, and 2022-2025 multijurisdictional sampling. Detailed assessment of water quality parameters indicated plant nutrient impairments in the AUs listed in **Table 4.1**, and AUs which have a segment specific total phosphorus criteria are listed in **Table 4.2**. Data contributing to the impairment determination are shown in **Appendix B**.

Table 4.1 Causal and Response Variable Thresholds for Stream and River Plant Nutrients & Exceedances

Assessment Unit	Site Class	Criteria (mg/L)	No. of Exceedances	Delta DO (mg/L)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	TN: Steep TP: Segment Specific*	0.3 0.1	10/19 4/19	1.79
La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)	TN: Moderate TP: Flat-Moderate	0.42 0.061	6/9 1/9	4.08

**NMAC 20.6.4.404 segment-specific criterion applies: phosphorus (unfiltered sample) 0.l mg/L or less.*

Table 4.2 Segment Specific Total Phosphorus Numeric Criteria & Exceedances

Assessment Unit	Numeric Criteria (mg/L)	No. of Exceedances
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)[a]	0.1	4/19
Navajo River (Jicarilla Apache Nation to CO border)[b]	0.1	4/10

a) This AU is listed 5A for both Nutrients and Total Phosphorus – see Executive Summary Table ES-1.

b) This AU is only listed for total phosphorus – see Executive Summary Table ES-6.

4.2 Flow

According to the New Mexico Water Quality Standards, the low flow critical condition for numeric criteria (excluding human health-organism only criteria) set in 20.6.4.97 through 20.6.4.900 NMAC and 20.6.4.13(F) NMAC is defined as the 4-day, 3-year low-flow frequency (4Q3, 20.6.4.11(B)(2) NMAC). The 4Q3 is the annual lowest four (4) consecutive day flow that occurs with a frequency of at least once every three (3) years.

For AUs discussed in this section that are ungaged, an analysis method developed by USGS in partnership with NMED, authored by Bell and Tillery (Bell, 2023) was used to estimate the critical low flow. In the Bell & Tillery analysis, six regression equations for estimating 4Q3 were developed based on physiographic regions of New Mexico and stream basin characteristics (i.e., statewide and mountainous regions above 8,000 ft in elevation, or basins with less than 75 square mile drainage areas). The 4Q3-1b (**Equation 4.1)** equation applies to elevations over 8,000ft that are the San Juan River or tributaries to the San Juan.

Equation 4.1 (4Q3-1b): $4Q3 = DA^{1.38} \times P^{5.18} \times e^{-22.17}$

Where:

$4Q3$ = four-day, three-year low-flow frequency (cfs)

DA = drainage area (mi^2)

P = annual basin precipitation (in)

e = mathematical constant, Euler's number

Critical for the remaining AUs discussed in this section were determined using USGS gage data with the USGS Hydrologic Toolbox software. USGS Gage 09364010 Animas River below Aztec, NM was used for Animas River (Estes Arroyo to So. Ute Indian Tribe bnd) with data from 2013 to 2025. USGS Gage 9367000 La Plata River at La Plata, NM was used for La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd) with data from 2002-2022. Calculated 4Q3 is presented in **Table 4.3** below in both cfs and mgd.

Table 4.3 Critical Flow for Nutrient Impaired AUs

Assessment Unit	Average Elevation (ft)	Drainage Area (mi^2)	Average Basin Slope (ft/ft)	Annual Precipitation (inches)	4Q3 (cfs)	4Q3 (mgd)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)*	--	--	--	--	50.15	32.40
La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)*	--	--	--	--	0.05	0.03
Navajo River (Jicarilla Apache Nation to CO border)	8838	231	0.27	26.8	10.75	6.94

* *Basin characteristics omitted due to being calculated with gage data*

4.3 TMDL Calculations

As a river flows downstream it has a specific loading capacity for nutrients. This loading capacity, or TMDL, is defined as the mass of pollutant that can be carried under critical flow conditions without violating the target concentration for that constituent. These TMDLs were developed based on simple dilution calculations using critical flows, the numeric target, and a conversion factor used to convert the resulting TMDL to lb/day units. The specific loading capacity of a receiving water for a given pollutant was estimated using **Equation 4.2**. The calculated daily loading capacities (i.e., TMDLs) for TP and TN are summarized in **Table 4.6**.

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 and meet water quality criteria at all times is the goal. The TMDL is further allocated to a MOS, WLA (permitted point sources), and LA (non-point sources), according to the formula:

Equation 4.2: *Critical flow (4Q3) x WQS (mg/L) x Conversion Factor = TMDL (lb/day)*

Equation 4.3: *WLA + LA + MOS = TMDL*

Table 4.4 TMDL Calculations for TN/TP

Assessment Unit	Parameter	Critical Flow (mgd)	In-Stream Target (mg/L)	Conversion Factor	TMDL (lb/day)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	Total Nitrogen	32.40	0.3	8.34	81.06
	Total Phosphorus		0.1		27.01
La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)	Total Nitrogen	0.03	0.42	8.34	0.11
	Total Phosphorus		0.061		0.02
Navajo River (Jicarilla Apache Nation to CO border)	Total Phosphorus	6.94	0.1	8.34	5.79

4.3.1 Margin of Safety

TMDLs should reflect a MOS based on the uncertainty or variability in the data, the point and nonpoint source load estimates, and the modeling analysis. The MOS can be expressed either implicitly or explicitly. An implicit MOS is incorporated by making conservative assumptions in the TMDL analysis, such as allocating a conservative load to background sources. An explicit MOS is applied by reserving a portion of the TMDL and not allocating it to any other sources.

For this TMDL, the margin of safety was developed using a combination of conservative assumptions and explicit recognition of potential errors. Therefore, this margin of safety is the sum of the following elements:

- *Conservative assumptions*
  - Treating phosphorus and nitrogen as pollutants that do not readily degrade in the environment.
  - An implicit margin of safety is added by setting a TMDL that, if achieved, would not exceed the threshold at any time, whereas the WQS thresholds are based on the median measured concentration.
- *Explicit recognition of potential errors*
  - There is inherent error in flow estimation, a conservative MOS for this element in ungaged streams is **10%**.

The total MOS for this TMDL is **10%.**

4.3.2 Waste Load Allocation

Individual National Pollutant Discharge Elimination System (NDPES) Permits

There is one active National Pollution Discharge Elimination System (NPDES) permit for the City of Aztec water treatment plant (WTP) who is authorized to discharge wastewater into the Animas River (Estes Arroyo to So. Ute Indian Tribe bnd). The City of Aztec WTP (NM0028762) permit was issued December 2, 2021, and expires December 31, 2026. Nutrient waste load allocations will follow a phased approach, where an eventual n^{th} phase is based on the WQS of the receiving water. Waste load allocations for the City of Aztec WTP are presented in **Table 4.5**.

Table 4.5 NM0028762 City of Aztec WTP Nutrient Waste Load Allocation

<table>
<tr><th>Assessment Unit</th><th>Phase</th><th>Parameter</th><th>Water Quality Target (mg/L)</th><th>WLA (lbs/day)</th></tr>
<tr><td rowspan="6">Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)</td><td rowspan="2">1st (current limits)</td><td>Total Nitrogen</td><td>8.0</td><td>13.34</td></tr>
<tr><td>Total Phosphorus</td><td>1.0</td><td>1.67</td></tr>
<tr><td rowspan="2">2nd (TBD)</td><td>Total Nitrogen</td><td>TBD</td><td>TBD</td></tr>
<tr><td>Total Phosphorus</td><td>TBD</td><td>TBD</td></tr>
<tr><td rowspan="2">nth (water quality based)</td><td>Total Nitrogen</td><td>0.3</td><td>0.5</td></tr>
<tr><td>Total Phosphorus</td><td>0.1</td><td>0.17</td></tr>
</table>

Phased approach: Phase 1 determined using 85th percentile of DMR data, Phase 2 (proposed limits) was calculated using the mean of DMR data, phase n achieves WQS of receiving waters

*For more information regarding the Water Quality Target, see **Section 9.1.1(A)***

Municipal Separate Storm Sewer Systems (MS4s) Permits

MS4s are defined as a conveyance or system of conveyances owned by a state, city, town, or other public entity that discharges to waters of the United States and is designed or used for collecting or conveying storm water. Because this is a storm water permit, sMS4 permit and associated sMS4 WLAs are only applicable during storm (i.e., high) flow. Regulated conveyance systems include roads with drains, municipal streets, catch basins, curbs, gutters, storm drains, piping, channels, ditches, tunnels and conduits. It does not include combined sewer overflows and publicly-owned treatment works. The federal Clean Water Act requires storm water discharges from certain types of urbanized areas to be permitted under the NPDES program.

In 1990, Phase I of these requirements became effective, and municipalities with a population served by a MS4 of 100,000, or more, were regulated. Under Phase I federal storm water regulations, regulated MS4 entities were required to obtain individual permits. In 1999, Phase II became effective, and any entity responsible for an MS4 conveyance, regardless of population size, could potentially be regulated. To date, this designation has typically applied to areas that have been identified by the Bureau of the Census as an "urbanized area" (UA) but with populations less than 100,000 (USEPA 2005). In 2006, USEPA Region 6 issued general permits for discharges from “small” MS4s (sMS4s) in New Mexico and on lands of tribal nations in New Mexico and Oklahoma. This permit became effective in 2007. EPA proposed to reissue this permit in 2015 within the boundaries of Census-designated 2000 and 2010 Farmington, Santa Fe, Los Lunas, Las Cruces and El Paso Urbanized Areas.

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

> *“…urbanization alters the natural infiltration capacity of the land and generates...pollutants...causing an increase in storm water runoff volumes and pollutant loadings.”*

MS4s can be significant sources of nutrients because they transport urban and agricultural runoff that can be affected by fertilizers and manure.

The Phase II sMS4 permit (NMR040000) reads:

> *“This permit may authorize stormwater discharges to waters of the United States from small MS4s within New Mexico provided the MS4… is located fully or partially within an urbanized area in New Mexico as determined by the 2000 and 2010 Decennial Census.”*

There are four permittees identified in the Farmington urbanized area: the City of Farmington, San Juan County, the City of Aztec, and the New Mexico Department of Transportation (NMDOT) District 5. Stormwater covered by the sMS4 has the potential to impact all of the AUs discussed in this document. The sMS4 WLA for each AU has been determined based on the percent of jurisdictional (urban) area within the respective contributing watershed area. The percent and total jurisdictional area, per area nutrient loadings, and resultant sMS4 waste load allocations for each AU are presented in **Table 4.7**. For more information regarding the jurisdictional allocation of sMS4 loads and per area nutrient loading values, see **Appendix C.**

The Animas River (Estes Arroyo to So. Ute Indian Tribe bnd) received an MS4 WLA (0.8 lbs/day) in the 2013 Animas River Watershed TMDL. The newly proposed WLA is significantly reduced due to multiple factors, the greatest of which being the reduced flow since 2013; the 4Q3 is nearly half of what it was in 2013. There also are changes in the % jurisdictional area.

Table 4.7 NMR040000 MS4 Waste Load Allocations for Nutrients

Assessment Unit	Parameter	TMDL - MOS - NPDES WLA (lbs/day) =	MS4 Jurisdictional Area (% of contributing watershed area)	WLA (lbs/day)	Per area Nutrient loading (lbs/day/mi^2)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	Total Nitrogen	59.61	2.65%	1.58	2.51
	Total Phosphorus	22.65	2.65%	0.60	6.61
La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)	Total Nitrogen	0.099	1.32%	0.0013	1.72×10^{-3}
	Total Phosphorus	0.018	1.32	0.0002	3.13×10^{-4}

General Permits

Stormwater discharges from construction activities are transient because they occur mainly during the construction itself, and then only during storm events. Coverage under the USEPA NPDES Construction General Permit (CGP) for construction sites of one or more acres, or smaller if part of a common plan of development, 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. The current CGP also includes state-specific requirements to implement site-specific interim and permanent stabilization, managerial, and structural solids, erosion, and sediment control Best Management Practices (BMPs), and/or other controls. BMPs are designed to prevent to the maximum extent practicable an increase in sediment load to the water body or an increase in a sediment-related parameter, such as total suspended solids, turbidity, siltation, stream bottom deposits, etc. BMPs also include measures to reduce flow velocity during and after construction compared to pre-construction conditions to ensure that waste load allocations and/or applicable water quality standards, including the antidegradation policy, are met. Compliance with a SWPPP that meets the requirements of the CGP is generally assumed to be consistent with this TMDL.

Stormwater discharges from industrial activities and facilities, based on industrial classification codes, may be eligible for coverage under the current NPDES Multi-Sector General Permit (MSGP). The MSGP also requires preparation of a SWPPP. Some of the industrial facilities and activities covered under the MSGP have technology based effluent limitation and/or benchmark monitoring for pollutants. The current MSGP includes state-specific requirements that the benchmark values be protective of State of New Mexico WQS.

It is not possible to calculate individual WLAs for facilities covered by the General Permits at this time using the available tools. The discharges from these permits are typically transitory as the activities are temporary. Loads that are in compliance with the General Permits are therefore currently included as part of the Load Allocation (LA). While these sources are not given individual allocations, they are addressed through other means, including BMPs, stormwater pollution prevention conditions, and other requirements.

4.3.3 Load Allocation

Load Allocation is pollution from any nonpoint source(s) or natural background and is addressed through Best Management Practices (BMPs). To calculate the LA, the WLA and the MOS were subtracted from the TMDL using **Equation 4.3**, as shown on **Table 4.8**. The MOS was developed using a combination of conservative assumptions and explicit recognition of potential errors (see **Section 4.3.1** for details).

Table 4.8 TMDL Allocations for TP & TN

Assessment Unit	Parameter	Individual Permit WLA (lbs/day)	MS4 WLA (lbs/day)	LA (lbs/day)	10% MOS (lbs/day)	TMDL (lbs/day)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	Total Nitrogen	13.34	1.58	58.03	8.11	81.06
	Total Phosphorus	1.67	0.60	22.05	2.70	27.02

Assessment Unit	Parameter	Individual Permit WLA (lbs/day)	MS4 WLA (lbs/day)	LA (lbs/day)	10% MOS (lbs/day)	TMDL (lbs/day)
La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)	Total Nitrogen	0	0.0015	0.10	0.01	0.11
	Total Phosphorus	0	0.0003	0.02	0.002	0.02
Navajo River (Jicarilla Apache Nation to CO border)	Total Phosphorus	0	0	5.21	0.58	5.79

[TMDL] - [MOS] - [WLA] = [LA]

4.3.4 Load Reduction

The extensive data collection and analysis necessary to determine background nutrient loads were 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.

4.4 Identification and Description of Pollutant Sources

SWQB fieldwork includes an assessment of the probable sources of impairment in the AU drainage area, according to Standard Operating Procedure 4.1, Probable Source(s) Determination (https://www.env.nm.gov/surface-water-quality/sop/; **Appendix D**). Probable Source Sheets are filled out by SWQB monitoring staff during watershed surveys. The sheets are then reviewed by watershed protection staff familiar with the location, and the TMDL writer conducts a search of aerial imagery, GIS files, and other available resources. The list of probable sources is not intended to single out any particular landowner or land management activity and generally includes several sources per pollutant. Pollutant sources that may contribute to each impairment were determined by field reconnaissance and evaluation (**Table 4.9**). Probable sources of impairments will be evaluated, refined, and changed as necessary through the Watershed Based Plans.

Table 4.9 Probable Sources of Excessive Plant Nutrients for Nutrient Impaired AUs

Assessment Unit	Probable Source(s)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	Drought related impacts; Flow alterations from water diversions; Loss of riparian habitat; Municipal (urbanized high-density area); Municipal point source discharges; On-site treatment systems; Other recreational pollution sources; Rangeland grazing
La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)	Flow alterations; Highways/Roads/Bridges; Loss of Riparian Habitat; On-site Treatment Systems (Septic Systems and Similar Decentralized Systems); Rangeland Grazing; Wildlife other than waterfowl; Waterfowl

Assessment Unit	Probable Source(s)
Navajo River (Jicarilla Apache Nation to CO border)	Bridges/Culverts/RR crossings; Dams/Diversions; Flow alteration; Gravel or dirt roads; Irrigated crop production (irrigation equip); Irrigation return drains; On-site treatment systems; Rangeland grazing (dispersed); Residences/Buildings; Site clearance (land development); Waterfowl; Wildlife other than waterfowl

4.5 Consideration of Seasonal Variation

Section 303(d)(1) of the Clean Water Act requires TMDLs to be "established at a level necessary to implement the applicable WQS with seasonal variation." There seems to be consistent exceedances in March and May for all AUs, with a few occurring in August and September. The critical condition used for calculating the TMDL is considered conservative and protective of the water quality standard under all flow conditions. Calculations made at the critical flow, in addition to using other conservative assumptions as described in the previous section on MOS, should be protective of the water quality standards designed to preserve aquatic life in the stream. It was assumed that if critical conditions were met during this time, coverage of any potential seasonal variation would also be met.

4.6 Future Growth

Growth estimates by county are available from the University of New Mexico Geospatial and Population Studies (GPS) (https://gps.unm.edu/pop/population-projections.html, accessed 1/29/2026). The estimates project growth to the year 2050. All AUs discussed in this section are in San Juan County. GPS projects San Juan County population to decrease through to 2050, as detailed in **Table 4.10**. These projections account for the 2020 census results, also accessed through GPS (https://gps.unm.edu/pop/population-estimates.html, accessed 1/29/2026). TMDL implementation planners should seek out the most current projections, if the information is relevant to their project.

Table 4.10 San Juan County Population Estimates

2020 (Census)[B]	2025	2030	2035	2040	2045	2050[A]	% Increase
121,671	119,657	117,590	113,548	109,362	102,927	96,336	-21%

% Increase: [(A – B) / B] × 100

Estimates of population change are not anticipated to lead to a significant increase in *E. coli* that cannot be controlled with BMP implementation. BMPs should be utilized and improved upon while continuing to improve watershed conditions and adhering to SWPPP requirements related to construction and industrial activities covered under the general permit.

5.0 SEDIMENTATION

Stream bottom substrate provides optimum habitat for many fish and aquatic insect communities when it does not include excessive fine sediment filling the interstitial spaces. Excessive fine sediment occurs when biologically important habitat components such as spawning gravels and cobble surfaces are physically covered by fines (Chapman and McLeod, 1987). Substrate fining decreases intergravel oxygen and results in reduced or eliminated quality and quantity of habitat for fish, macroinvertebrates, and algae (Lisle, 1989; Waters, 1995). Chapman and Mcleod (1987) found that bed material size is related to habitat suitability for fish and macroinvertebrates and that excess fine sediment decreased both density and diversity of aquatic insects.

Sediment loads that exceed a stream's sediment transport capacity often trigger changes in stream morphology (Leopold et al., 1964). Streams that become overwhelmed with sediment often go through a period of accelerated channel widening and streambank erosion before returning to a stable form (Rosgen, 1996). These morphological changes can accelerate erosion, reduce habitat diversity (pools, riffles, etc.) and place additional stress on the designated aquatic life use.

5.1 Target Loading Capacity

The New Mexico WQS include a general narrative standard at 20.6.4.13(A)(1) NMAC for "bottom deposits and suspended or settleable solids", which reads:

> *"Surface waters of the state shall be free of water contaminants including fine sediment particles (less than two millimeters in diameter), precipitates or organic or inorganic solids from other than natural causes that have settled to form layers on or fill the interstices of the natural or dominant substrate in quantities that damage or impair the normal growth, function or reproduction of aquatic life or significantly alter the physical or chemical properties of the bottom."*

SWQB distinguishes rivers from streams by defining systems that cannot be monitored effectively with the biological and habitat methods developed for wadeable streams. These rivers generally do not meet the definition of great rivers as those having drainage areas greater than 2,300 mi^2 (Simon and Lyons, 1995). There are many systems in New Mexico that meet the great river definition but are usually suitable to wadeable stream monitoring methods due to the arid nature of the region. For sedimentation monitoring and assessment purposes, the San Juan River form below Navajo Reservoir to the Navajo Nation boundary near Four Corners is included in the "Large Rivers" water body type.

Fine sediment benchmarks in representative riffle areas were previously developed for the San Juan and Animas Rivers. In 2002, the SWQB received a grant to develop a protocol for the determination of sedimentation impairment in these rivers. The SWQB contracted with the U.S. Department of Agriculture (USDA) National Sedimentation Lab (NSL) to provide technical support on the project (Heins et al. 2004). The SWQB used the results of this study to develop a repeatable, quantitative assessment procedure for determining whether New Mexico's current narrative sedimentation standard is being attained in the San Juan and Animas rivers. The NSL study resulted in the determination of fine sediment benchmarks for representative riffles areas in Ecoregion 22 as well as various river reaches in the San Juan River basin. The SWQB used these benchmarks to establish one fine sediment threshold for the San Juan and Animas Rivers and compared the measured bed material characteristics of the stream reach of concern to this fine sediment threshold. This procedure was used to assess the San Juan and Animas rivers for development of the 2004-2006 Integrated List and was applied to subsequent data collected during non-wadeable conditions with comparable sampling methods to determine potential sedimentation impairment in these rivers. This document and the entire NSL report are available at: https://www.env.nm.gov/surface-water-quality/sedimentation/.

Reference values for coarse-material dominated sites for Ecoregion 22, the San Juan and Animas Rivers combined, the San Juan and Animas Rivers independently, and the San Juan River only were developed using % fines data determined from the pebble count and bulk sampling data. The NSL defined the reference value as the median percentage of bed sediment finer than 2 mm (i.e., % fines) at stable sites which had >50% coarse material (Heins et al. 2004). The median was selected instead of the mean because the data was log-normally distributed, so the median more accurately reflects the central tendency of the data. All data from stage I or VI sites within 5 km of dams were removed from the calculations, as was the case in other stations within Ecoregion 22. The values for the San Juan River are included in **Table 5.2**. All of these values are consistent with previous research in other parts of the country. In a study of 562 streams located in four northwestern states, Relyea et al. (2000) suggested that changes to invertebrate communities as a result of fine sediment (2mm or less) occur between 20-35% fines. In the impairment determination protocol, the fine sediment benchmark used to determine impairment was defined as the 75th percentile of the % fines measured at reference sites (NMED/SWQB 2004).

The assessment approach used to determine sedimentation impairments for waterbodies other than lakes or reservoirs, non-wadeable large rivers, and intermittent streams outlined under 20.6.4.98 or 20.6.4.128 NMAC and ephemeral streams outlined under 20.6.4.97 or 20.6.4.128 NMAC are described in detail in Appendix G of the SWQB Comprehensive Assessment and Listing Methodology (CALM; NMED/SWQB, 2025). Target values for these waterbodies were based on the numeric thresholds identified in the CALM. The CALM establishes a procedure for determining impairment due to excessive sedimentation/siltation in perennial, wadeable streams. Bedded sediments cannot be treated as introduced pollutants such as pesticides because they are not uniquely generated through human input or disturbance. Rather, bedded sediments are components of natural systems that are present even in pristine settings and to which stream organisms have evolved and adapted. Therefore, the detection of a sediment imbalance is more complicated than detecting an absolute concentration or percentage that represents a clear biological impact.

The SWQB and USEPA Region 6 contracted with Tetra Tech, Inc., to develop sediment translators or thresholds. The contractor generally followed the steps provided in USEPA's Framework for developing suspended and bedded sediment water quality criteria (USEPA, 2006). This effort included the identification of sediment characteristics that are expected under the range of environmental settings in New Mexico, especially in undisturbed or best available reference streams. Examining the relationships between biological measures and sediment indicators helped to identify where disturbance had caused sediment imbalance and biologically relevant habitat degradation. The analysis resulted in threshold recommendations for two bedded sediment indicators for New Mexico perennial streams (**Table 5.1**) – percent Sand & Fines (%SaFN) and log Relative Bed Stability calculated without bedrock (LRBS_NOR) -- for three different site classes, Mountains, Foothills, and Xeric. The site classes are defined by Level 3 and 4 ecoregions (Griffith et al., 2006) and distinguish sediment expectations across New Mexico. The report detailing this effort (Jessup et al., 2010) is available at https://www.env.nm.gov/surface-water-quality/sedimentation/.

The sedimentation impairment for San Juan River (Navajo bnd at Hogback to Animas River) was listed in the 2012 and 2014 IR. In 2014 the AU was re-assessed using both the NSL large river protocol and the sedimentation assessment protocol outlined for most other streams. In 2012 the median sand and fines percent was 56%, and in 2014 it was 34%. These are both above the threshold outlined in the San Juan and Animas Rivers specific NSL protocol (29.5% sand and fines), and below the Xeric site class threshold of 74% sand and fines. A hybrid method using the NSL threshold (29.5%) and the wadeable river/stream Xeric site class threshold (74%) was used to list the San Juan River in the 2014 Integrated Report. The San Juan River (Navajo bnd at Hogback to Animas River) is determined impaired based on the NSL sand and fines threshold, while the respective site class TSS indicator value is used to calculate a TMDL (**Table 5.4**).

Table 5.1 Bedded Sediment Indicators (from Jessup et al., 2010)

Sediment Indicator	Description
Percent Sand & Fines (%SaFN)	**The percentage of systematically selected streambed substrate particles that are ≤2.0 mm in diameter from reach-wide pebble count.**

Table 5.2 Sedimentation Indicator Thresholds Based on Biological Responses and Reference Distributions (Jessup et al., 2010; NMED, 2004)

Site Class	% Sand and Fines
Mountain	< 20
Foothill	< 37
Xeric	< 74
San Juan and Animas Rivers	< 29.5

Table 5.3 Numeric Thresholds Applied to Sediment Impaired AUs

Assessment Unit	Ecoregion/Site Class	% Sand and Fines Threshold	% Sand and Fines Observed
San Juan River (Navajo bnd at Hogback to Animas River)	22 Xeric / San Juan and Animas Rivers	74 / 29.5	56 / 34*

**56% sand and fines observed in 2012 integrated report; 34% sand and fines observed in 2014 integrated report.*
No data is available from the 2017-2018 monitoring survey.

A load-based indicator is needed to generate a TMDL based on mass balance. Turbidity is correlated with TSS for a given water body. Jessup et al. (2010) suggests an interpretation of the indicator value distributions for sites which fully support their designated uses, using the 90th percentile value for Mountain and Foothills sites and the 75th percentile value for Xeric sites (**Table 5.4**). Monitoring data for flow, TSS and turbidity are presented in **Appendix B**.

Table 5.4 Suspended Sediment Indicator Percentiles for Fully Supporting Sites and all Sites in Three Site Classes (applicable threshold in bold)

		Fully Supporting Sites			All Sites		
		Valid N	75th	90th	Valid N	25th	Median
Mountains	Turbidity (ntu)	68	4.88	9.50	217	1.25	3.10
	TSS (mg/L)	70	5.05	8.75	221	3.00	3.89
Foothills	Turbidity (ntu)	24	12.18	19.30	136	2.33	5.99
	TSS (mg/L)	24	9.88	16.12	138	3.71	6.71
Xeric	Turbidity (ntu)	83	68.50	191.76	289	5.60	16.00
	TSS (mg/L)	85	**60.23**	262.80	295	7.00	17.00

5.2 Flow

According to the New Mexico Water Quality Standards, the low flow critical condition for numeric criteria (excluding human health-organism only criteria) set in 20.6.4.97 through 20.6.4.900 NMAC and 20.6.4.13(F) NMAC is defined as the 4-day, 3-year low-flow frequency (4Q3, 20.6.4.11(B)(2) NMAC). The 4Q3 is the annual lowest four (4) consecutive day flow that occurs with a frequency of at least once every three (3) years. San Juan River (Navajo bnd at Hogback to Animas River) critical flow was determined using the USGS Hydrology Toolbox software with gage data from USGS Gage 09367540 San Juan R nr Fruitland, NM, with data with records from 2003 – 2024.

Table 5.5 Critical Flow for Sedimentation Impaired AUs

Assessment Unit	USGS Gage	4Q3 (cfs)	4Q3 (mgd)*
San Juan River (Navajo bnd at Hogback to Animas River)	09367540	377.08	243.59

5.3 TMDL Calculations

The TMDL is defined as the mass of pollutant that can be carried under critical flow conditions without violating the target concentration for that constituent. The TMDL is calculated based on simple dilution using critical flow, the numeric target, and a conversion factor to correct the units of measure, according to the formula:

Equation 5.1 *WQS (mg/L) x Critical flow (4Q3) x Conversion Factor (8.34) = TMDL (lb/day)*

The TSS TMDL concentration is presented on **Table 5.6** for the critical low flow condition.

Table 5.6 Sedimentation TMDL Calculations

Assessment Unit	TSS Indicator Value (mg/L)*	Critical Flow (mgd)	Conversion Factor	TMDL (lb/day)
San Juan River (Navajo bnd at Hogback to Animas River)	60.23	243.59	8.34	122,361.54

**See Table 5.4*

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 and meet water quality criteria at all times is the goal. The TMDL is further allocated to a MOS, WLA (permitted point sources), and LA (non-point sources), according to the formula:

Equation 5.2: *WLA(s) + LA + MOS = TMDL*

5.3.1 Margin of Safety

The CWA requires that each TMDL be calculated with a MOS. This statutory requirement that TMDLs incorporate a MOS is intended to account for uncertainty in available data or in the actual effect controls will have on loading reductions and receiving water quality. A MOS may be expressed as unallocated assimilative capacity or conservative analytical assumptions used in establishing the TMDL (e.g., derivation of numeric targets, modeling assumptions or effectiveness of proposed management actions). The MOS may be implicit, utilizing conservative assumptions for calculation of the loading capacity, WLAs, and LAs. The MOS may also be explicitly stated as an added separate quantity in the TMDL calculation. For this sediment TMDL, the MOS was developed using explicit allocations. Therefore, this MOS is the sum of the following elements:

- *Explicit recognition of potential errors:*
    - Uncertainty exists in the relationship between TSS and deposition of excess sediment. A conservative MOS for this element is **10%**.
    - There is inherent error in flow estimation, a conservative MOS for this element in ungaged streams is **10 %**.

Total MOS for this TMDL is **20%**.

5.3.2 Waste Load Allocation

Individual National Pollutant Discharge Elimination System (NDPES) Permits

There is an active National Pollution Discharge Elimination System (NPDES) permit for the City of Farmington waste-water treatment plant (WWTP) who is authorized to discharge wastewater into the San Juan River (Navajo bnd at Hogback to Animas River). **Table 5.7** outlines the permitted facility, design capacity flow, and effluent limits for total suspended solids. The City of Farmington WWTP (NM0020583) permit was issued December 1, 2021, and expires November 30, 2026. The current sediment limit for the City of Farmington WWTP is 1669 lbs/day or 30 mg/L for a 30-day average, and 2504 lbs/day or 45 mg/L for a 7-day average. The design capacity flow for the facility is 6.67 mgd and there is one outfall discharging to the San Juan River on the AU San Juan River (Navajo bnd at Hogback to Animas River).

There is also an NPDES permit for the West Moreland San Juan Mining LLC, which holds a permit issued February 1, 2024, set to expire January 31, 2029. The facility has a total of 11 outfalls, 1 of which is authorized discharges to the San Juan River, 3 outfalls are authorized to discharge to the Westwater Arroyo, and 7 outfalls are authorized to discharge to the Shumway Arroyo. They are not required to report TDS/sediment values, nor do they have a set limit. This facility has had zero discharge since its last permit period, nor does the permit provide any design capacity flow. DMR reports have been examined as far back as 2001. Only one discharge event has occurred in this time, with a flow of 0.01 mgd. In the absence of a design capacity flow, or regular flow measurements to generate a daily max or mean flow, this flow event will be used to calculate WLAs for this facility. Waste load allocations are presented in **Table 5.8**.

Table 5.7 NPDES Discharge Limits for TSS

Permit	Design Flow	TSS Permit Limit (concentration)	TSS Permit Limit (daily loading)
City of Farmington WWTP NM0020583	6.67 mgd	30 mg/L (30-day avg) 45 mg/L (7-day avg)	1669 lbs/day 2504 lbs/day

Table 5.8 Individual NPDES Waste Load Allocations for TSS

Permit	Design Flow	TSS Indicator Value (mg/L)	Conversion Factor	WLA (lbs/day)
City of Farmington WWTP NM0020583	6.67 mgd	60.23	8.34	3350.46*
NM0028746 West Moreland San Juan Mining, LLC/San Juan Mine	0.01 mgd	60.23	8.34	5.02

*Since the calculated WLA is higher than the current discharge limits (**Table 5.7**), **the WLA for the City of Farmington will be the current permitted 30-day avg. discharge limits: 1669 lbs/day.**

Municipal Separate Storm Sewer Systems (MS4s) Permits

MS4s are defined as a conveyance or system of conveyances owned by a state, city, town, or other public entity that discharges to waters of the United States and is designed or used for collecting or conveying storm water. Because this is a storm water permit, sMS4 permit and associated sMS4 WLAs are only applicable during storm (i.e., high) flow. Regulated conveyance systems include roads with drains, municipal streets, catch basins, curbs, gutters, storm drains, piping, channels, ditches, tunnels and conduits. It does not include combined sewer overflows and publicly-owned treatment works. The federal Clean Water Act requires storm water discharges from certain types of urbanized areas to be permitted under the NPDES program.

In 1990, Phase I of these requirements became effective, and municipalities with a population served by a MS4 of 100,000, or more, were regulated. Under Phase I federal storm water regulations, regulated MS4 entities were required to obtain individual permits. In 1999, Phase II became effective, and any entity responsible for an MS4 conveyance, regardless of population size, could potentially be regulated. To date, this designation has typically applied to areas that have been identified by the Bureau of the Census as an "urbanized area" (UA) but with populations less than 100,000 (USEPA 2005). In 2006, USEPA Region 6 issued general permits for discharges from "small" MS4s (sMS4s) in New Mexico and on lands of tribal nations in New Mexico and Oklahoma. This permit became effective in 2007. EPA proposed to reissue this permit in 2015 within the boundaries of Census-designated 2000 and 2010 Farmington, Santa Fe, Los Lunas, Las Cruces and El Paso Urbanized Areas.

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

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

MS4s can be significant sources of sediment because they can transport sediment runoff from construction sites which can be 10 to 20 times greater than agricultural land and can be 1,000 to 2,000 times greater than runoff from forest land.

The Phase II sMS4 permit (NMR040000) reads:

"This permit may authorize stormwater discharges to waters of the United States from small MS4s within New Mexico provided the MS4… is located fully or partially within an urbanized area in New Mexico as determined by the 2000 and 2010 Decennial Census."

There are four permittees identified in the Farmington urbanized area: the City of Farmington, San Juan County, the City of Aztec, and the New Mexico Department of Transportation (NMDOT) District 5. Stormwater covered by the sMS4 has the potential to impact all of the AUs discussed in this document. The sMS4 WLA for each AU has been determined based on the percent of jurisdictional (urban) area within the respective contributing watershed area. The percent and total jurisdictional area, per area sediment loadings, and resultant sMS4 waste load allocations for each AU are presented in **Table 5.9**. For more information regarding the jurisdictional allocation of sMS4 loads and per area sediment loading values, see **Appendix C.**

Table 5.9 NMR040000 MS4 Waste Load Allocations for TSS

Assessment Unit	TMDL - MOS - NPDES WLA (lbs/day) =	MS4 Jurisdictional Area (% of contributing watershed area)	WLA (lbs/day)	Per area sediment loading (lbs/day/mi^2)
San Juan River (Navajo bnd at Hogback to Animas River)	92,762.80	5.34%	4951.85	375.90

Bureau of Reclamation (BOR) Navajo-Gallup Water Supply Project

The Navajo-Gallup Water Supply Project is a municipal and industrial water supply project administered by the United States Bureau of Reclamation (USBOR), providing water to the eastern section of the Navajo Nation, southwest portion of the Jicarilla Apache Nation, and the city of Gallup, New Mexico. At full build-out, the project will divert 37,376 acre-feet (conversions to mgd are presented in **Equation 5.3** below) of water annually from two pipeline laterals – the Cutter Lateral (diverting water from the Cutter Reservoir) and the San Juan Lateral (diverting water from the San Juan River). The diversion from the San Juan River will occur on the AU San Juan River (Navajo bnd at Hogback to Animas River).

The U.S. Bureau of Reclamation (USBOR) has applied for an NPDES permit for two (2) new point source discharges associated with operation and maintenance activities under the Navajo-Gallup Water Supply Project (NGWSP). According to the application, USBOR proposes to discharge through Outfall 001 to the San Juan River and through Outfall 002 to Shumway Arroyo. These discharges will consist of concentrated sediment as a result of operational and maintenance activities. Outfall 001 will discharge to the San Juan

River (Navajo bnd at Hogback to Animas River). This discharge will consist of 76 mgd at ~800 mg/L TSS for approximately 33 hours, occurring twice monthly. Since this flow can be thought of as **76 mgd per event** occurring **twice a month**, a conversion to daily values is presented in **Equation 5.4**.

Equation 5.3 (water diverted from the San Juan Basin):

$$\frac{\mathbf{37,376}\ \boldsymbol{acre\ ft}}{\boldsymbol{yr}} \times \frac{\mathbf{0.32585}\ \boldsymbol{million\ gallons}}{\boldsymbol{acre\ ft}} \times \frac{\mathbf{1}\ \boldsymbol{yr}}{\mathbf{365}\ \boldsymbol{days}}$$
$$= \mathbf{33.37}\ \boldsymbol{mgd}$$

Equation 5.4 (water discharged into the San Juan River; note: 33 hrs = 1.375 days):

$$\frac{\mathbf{76}\ \boldsymbol{million\ gallons}}{\mathbf{1}\ \boldsymbol{day}} \times \frac{\mathbf{1.375}\ \boldsymbol{days}}{\boldsymbol{discharge\ event}} \times \frac{\mathbf{2}\ \boldsymbol{discharge\ events}}{\boldsymbol{month}} \times \frac{\mathbf{12}\ \boldsymbol{months}}{\mathbf{1}\ \boldsymbol{year}} \times \frac{\mathbf{1}\ \boldsymbol{year}}{\mathbf{365}\ \boldsymbol{days}}$$
$$= \mathbf{6.87}\ \boldsymbol{mgd}$$

The value derived from **Equation 5.3** (33.37 mgd) represents a net negative amount of flow on the San Juan River, and the value derived from **Equation 5.4** (6.87 mgd) represents a net positive. However, it is unclear at this time how much of the diverted water is coming from the San Juan River versus the Cutter Reservoir. Typically, any flow being added to an AU that is not captured by gage measurements or calculated 4Q3 would be added to the 4Q3 of the AU. In this case that would mean adding the BOR discharge (6.87 mgd) to the 4Q3 (243.59 mgd). However, there is also diversion from the AU. This project has not yet begun diverting water from the San Juan River, so it is not captured in the gage data, and it is unclear how much water is planned to be diverted from the San Juan River or the Cutter Reservoir. At this time, neither the diversion nor the discharge will be accounted for in the 4Q3. Since TMDLs/WLAs/LAs are presented in daily loading, the WLA for the BOR will use the discharge converted to daily values presented in **Equation 5.4**. When data becomes available, this WLA will be revised. See **Section 9.1.3** for more details.

Table 5.10 BOR Navajo-Gallup Water Supply Project Waste Load Allocation

Assessment Unit	TSS Indicator Value (mg/l)	Design Flow	Conversion Factor	WLA* (lbs/day)
San Juan River (Navajo bnd at Hogback to Animas River)	60.23	6.87	8.34	3450.93

This WLA represents a 30-day average loading, based on* ***Equation 5.4 & 5.5**.*

For more information regarding the BOR Navajo-Gallup Water Supply Project, see ***Section 9.1.3****.*

General Permits

Stormwater discharges from construction activities are transient because they occur mainly during the construction itself, and then only during storm events. Coverage under the USEPA NPDES Construction General Permit (CGP) for construction sites of one or more acres, or smaller if part of a common plan of development, 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. The current CGP also includes state-specific requirements to implement site-specific interim and permanent stabilization, managerial, and structural solids, erosion, and sediment control Best Management Practices (BMPs), and/or other controls. BMPs are designed to prevent to the maximum extent practicable an increase in sediment load to the water body or an increase in a sediment-related parameter, such as total suspended solids, turbidity, siltation, stream bottom deposits, etc. BMPs also include measures to reduce flow velocity during and after construction compared to pre-construction conditions to ensure that waste load allocations and/or applicable water quality standards, including the antidegradation policy, are met. Compliance with a SWPPP that meets the requirements of the CGP is generally assumed to be consistent with this TMDL.

Stormwater discharges from industrial activities and facilities, based on industrial classification codes, may be eligible for coverage under the current NPDES Multi-Sector General Permit (MSGP). The MSGP also requires preparation of a SWPPP. Some of the industrial facilities and activities covered under the MSGP have technology based effluent limitation and/or benchmark monitoring for pollutants. The current MSGP includes state-specific requirements that the benchmark values be protective of State of New Mexico WQS.

It is not possible to calculate individual WLAs for facilities covered by the General Permits at this time using the available tools. The discharges from these permits are typically transitory as the activities are temporary. Loads that are in compliance with the General Permits are therefore currently included as part of the Load Allocation (LA). While these sources are not given individual allocations, they are addressed through other means, including BMPs, stormwater pollution prevention conditions, and other requirements.

5.3.3 Load Allocation

Load Allocation is pollution from any nonpoint source(s) or natural background and is addressed through Best Management Practices (BMPs). To calculate the LA, the WLA and the MOS were subtracted from the TMDL using **Equation 5.3**, as shown on **Table 5.7**. The MOS was developed using a combination of conservative assumptions and explicit recognition of potential errors (see **Section 5.3.1** for details).

Table 5.11 TMDL Allocations for Total Suspended Solids as an Indicator for Sedimentation/Siltation

Assessment Unit	Individual Permit WLA (lbs/day)	MS4 WLA (lbs/day)	Future BOR WLA (lbs/day)	LA (lbs/day)	20% MOS (lbs/day)	TMDL (lbs/day)
San Juan River (Navajo bnd at Hogback to Animas River)	1674.02	4951.85	3450.93	87,810.95	24,471.94	122,359.69

5.3.4 Load Reduction

The extensive data collection and analyses necessary to determine background sediment loads were 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 target load for TSS is the TMDL minus the MOS, in this case equal to the LA. Because the relationship of stream bottom sediment to instantaneous TSS loads is complex and includes a temporal element, a measured load cannot be calculated from available data, so TSS load reduction estimates are not presented for sedimentation/siltation impairments. One indicator of implementation progress could be achievement of the % SaFN threshold indicator (**Table 5.8**). Since the most recent % sand and fines data for this AU was 2014, and 2014 was the re-assessment using the NSL large river protocol and the standard sediment assessment protocol, the 2014 % sand and fines observed value will be used for the load reduction.

Table 5.12 Reduction of % Sand and Fines Needed to fall Below the % Sand and Fines Threshold Indicator Value for Sedimentation/Siltation

Assessment Unit	Ecoregion/Site Class	% Sand and Fines Threshold	% Sand and Fines Observed	Percent Reduction
San Juan River (Navajo bnd at Hogback to Animas River)	San Juan and Animas Rivers	29.5	34	13.2

Percent reduction is the percent the existing measured load must be reduced to achieve the target load and is calculated as follows: ((Measured Load – Target Load) / Measured Load) x 100

5.4 Identification and Description of Pollutant Sources

SWQB fieldwork includes an assessment of the probable sources of impairment in the AU drainage area, according to Standard Operating Procedure 4.1, Probable Source(s) Determination (https://www.env.nm.gov/surface-water-quality/sop/; **Appendix D**). Probable Source Sheets are filled out by SWQB monitoring staff during watershed surveys. The sheets are then reviewed by watershed protection staff familiar with the location, and the TMDL writer conducts a search of aerial imagery, GIS files, and other available resources. The list of probable sources is not intended to single out any particular landowner or land management activity and generally includes several sources per pollutant. Pollutant sources that may contribute to each impairment were determined by field reconnaissance and evaluation (**Table 5.9**). Probable sources of bacteria impairments will be evaluated, refined, and changed as necessary through the Watershed Based Plans.

Table 5.13 Probable Sources of Excessive Sedimentation

Assessment Unit	Probable Source(s)
San Juan River (Navajo bnd at Hogback to Animas River)	Drought-related Impacts; Flow Alterations from Water Diversions; Grazing in riparian zone; Highways/Roads/Bridges; Loss of Riparian Habitat; Municipal Point Source Discharges; Onsite Treatment Systems (Septic Systems and Similar Decentralized Systems); Rangeland Grazing, Site clearance (new development or infill)

5.5 Consideration of Seasonal Variation

The sediment moving capacity of a stream is exponentially related to flow velocity and discharge. Therefore, most of the work of streams is accomplished during floods, when stream velocity and discharge (and therefore capacity) are many times their level during low flow conditions. This work is in the form of bed scouring (erosion), sediment transport (bed and suspended loads), and sediment deposition. It is likely that the excess fine sediment loading and deposition occur during periods of higher flow, which in New Mexico are most likely to occur during spring snowmelt and summer monsoon storms. TSS samples were collected between the months of March and October, capturing the summer and fall seasons. During the 2017-2018 survey, most exceedance events occurred during May and late summer from August to October.

5.6 Future Growth

Growth estimates by county are available from the University of New Mexico Geospatial and Population Studies (GPS) (https://gps.unm.edu/pop/population-projections.html, accessed 1/29/2026). The estimates project growth to the year 2050. All AUs discussed in this section are in San Juan County. GPS projects San Juan County population to decrease through to 2050, as detailed in **Table 5.10**. These projections account for the 2020 census results, also accessed through GPS (https://gps.unm.edu/pop/population-estimates.html, accessed 1/29/2026). TMDL implementation planners should seek out the most current projections, if the information is relevant to their project.

Table 5.14 San Juan County Population Estimates

2020 (Census)[B]	2025	2030	2035	2040	2045	2050[A]	% Increase
121,671	119,657	117,590	113,548	109,362	102,927	96,336	-21%

% Increase: [(A – B) / B] × 100

Estimates of population change are not anticipated to lead to a significant increase in *E. coli* that cannot be controlled with BMP implementation. BMPs should be utilized and improved upon while continuing to improve watershed conditions and adhering to SWPPP requirements related to construction and industrial activities covered under the general permit.

6.0 SELENIUM

Selenium is both an essential and detrimental naturally occurring trace element, predominantly found in black shale derived soils and landscapes. Selenium becomes bioavailable to aquatic biota through surface and groundwater interactions with surrounding geology. Chronic exposure in fish and aquatic invertebrates can cause reproductive impairments and adversely affect juvenile growth and mortality. In 2016, USEPA developed a national recommended aquatic life criterion for selenium with elements based on concentration of selenium in fish tissue and in the water-column. The elements of chronic selenium criterion exist in a hierarchy where fish tissue elements take precedence over the water column elements. However, in 2021 there was a revision stating, “When selenium inputs are increasing, water column values are the applicable criterion element in the absence of steady-state condition fish tissue data” (USEPA, 2021). The chronic criterion for selenium set in 20.6.4.900 NMAC is 0.005 mg/L, and the acute criterion is 0.02 mg/L. These criteria are water-column elements.

6.1 Target Loading Capacity

To meet aquatic life designated uses, the SWQB Comprehensive Assessment and Listing Methodology (NMED SWQB, 2025) says that for any one chemical/physical pollutant, there shall be no exceedance of the acute criterion, and no more than one exceedance of the chronic criterion in three years. Exceedances of the WQS were identified by assessment of the data from the 2017-2018 San Juan intensive water quality survey, as shown on **Table 6.1**. Consequently, these AUs were listed on the 2024-2026 Integrated CWA § 303(d)/§ 305(b) List (NMED/SWQB, 2026) for selenium. Results of laboratory analyses of the samples are shown in **Appendix B**. For this TMDL document, target values for selenium are based on achievement of the chronic criterion outlined in **Table 6.1** as a value not to be exceeded rather than the acute.

Table 6.1 Total Recoverable Selenium Exceedances

Assessment Unit	WWAL and WH Criteria (mg/L)	Number of Exceedances
Gallegos Canyon (San Juan River to Navajo bnd)	0.005	3/3

6.2 Flow

According to the New Mexico Water Quality Standards, the low flow critical condition for numeric criteria set in 20.6.4.97 NMAC through 20.6.4.900 NMAC and 20.6.4.13(F) NMAC is defined as the 4-day, 3-year low-flow frequency (4Q3, 20.6.4.11(B)(2) NMAC). The 4Q3 is the annual lowest four (4) consecutive day flow that occurs with a frequency of at least once every three (3) years.

Because the AU discussed in this section is ungaged, an analysis method developed by USGS in partnership with NMED, authored by Bell and Tillery (Bell, 2023) was used to estimate the critical low flow. In the Bell & Tillery analysis, six regression equations for estimating 4Q3 were developed based on physiographic regions of New Mexico and stream basin characteristics (i.e., statewide and mountainous regions above 8,000 ft in elevation, or basins with less than 75 square mile drainage areas). The 4Q3-4 equation was used, which applies to drainage areas between 200 and 2,000 ft. The following regression equation is based on data from 26 gaging stations with non-zero discharge (Bell, 2023):

Equation 6.1: $4Q3 = DA^{1.24} \times P^{7.27} \times e^{-29.02}$

Where:

$4Q3$ = four-day, three-year low-flow frequency (cfs)

DA = drainage area (mi^2)

P = annual basin precipitation (in)

e = mathematical constant, Euler's number

The 4Q3 values calculated using Bell & Tillery's method are presented in **Table 6.2** Parameters used in the calculation were obtained using the StreamStats online GIS application developed by the USGS (https://streamstats.usgs.gov/ss/). The flow was converted from cfs to million gallons per day (mgd) using a conversion factor of 0.646. The TMDL itself is a value calculated at a defined critical condition as part of a planning process designed to achieve water quality standards. Since flows vary throughout the year in these systems, the actual load at any given time will vary based on the changing flow. Management of the load to improve instream water quality is the goal of SWQB efforts.

Table 6.2 Critical Flow for Selenium Impaired AUs

Assessment Unit	Drainage Area (mi^2)	Annual Precipitation (in)	4Q3 (cfs)	4Q3 (mgd)
Gallegos Canyon (San Juan River to Navajo bnd)	304	10.0	5.57×10^{-3}	3.60×10^{-3}

6.3 TMDL Calculations

The TMDL is defined as the mass of pollutants that can be carried under critical flow conditions without violating the target concentration for that constituent. A conversion factor is used to correct the TMDL units to lb/day. The TMDL is calculated based on simple dilution using **Equation 2.2**. TMDLs are presented on **Tables 2.3** for the critical flow condition.

Equation 6.2: *WQS (mg/L) x Critical flow (mgd) x Conversion Factor (8.34) = TMDL (lb/day)*

Table 6.3 Selenium TMDL Calculation

Assessment Unit	Flow (mgd)	Total Recoverable Selenium Criterion (mg/L)	Conversion Factor	TMDL (lbs/day)
Gallegos Canyon (San Juan River to Navajo bnd)	3.60×10^{-3}	0.005	8.34	1.67×10^{-4}

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 and meet water quality criteria at all times is the goal. The TMDL is further allocated to a MOS, WLA (permitted point sources), and LA (non-point sources), according to the formula:

Equation 6.3: *WLA(s) + LA + MOS = TMDL*

6.3.1 Margin of Safety

The CWA requires that each TMDL be calculated with a MOS. This statutory requirement that TMDLs incorporate a MOS is intended to account for uncertainty in available data or in the actual effect controls will have on loading reductions and receiving water quality. A MOS may be expressed as unallocated assimilative capacity or conservative analytical assumptions used in establishing the TMDL (e.g., derivation of numeric targets, modeling assumptions or effectiveness of proposed management actions). The MOS may be implicit, utilizing conservative assumptions for calculation of the loading capacity, WLAs, and LAs. The MOS may also be explicitly stated as an added separate quantity in the TMDL calculation. For this sediment TMDL, the MOS was developed using explicit allocations. Therefore, this MOS is the sum of the following elements:

- *Conservative assumptions*
    - Treating selenium as a conservative pollutant, meaning a pollutant that does not readily degrade in the environment, was used as a conservative assumption in developing these loading limits.
    - Calculating the TMDL based on chronic rather than acute WQS.
- *Explicit recognition of potential errors*
    - There is inherent error in flow estimation, a conservative MOS for this element in ungaged streams is **10%**.

Total MOS for this TMDL is **10%**.

6.3.2 Waste Load Allocation

There are no National Pollutant Discharge Elimination System (NPDES) individual permits, or Municipal Separate Storm Sewer Systems (MS4s) permits that discharge to the selenium impaired TMDL drainages. Therefore, no WLA is assigned for this TMDL.

There may be storm water discharges from industrial, including construction, activities covered under the National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) or Multi-Sector General Permit (MSGP). Excess temperature loading may be a component of some storm water discharges covered under general NPDES permits. Stormwater discharges from industrial, including construction, activities are generally considered transient because they occur mainly during the construction itself and/or only during storm events.

Coverage under the USEPA NPDES CGP for construction sites one acre or greater or smaller if part of a common plan of development requires preparation of a Storm Water Pollution Prevention Plan (SWPPP) that includes identification and control of pollutants associated with the construction activities to minimize impacts to water quality. The current CGP also includes state-specific requirements to implement site-specific interim and permanent stabilization, managerial, and structural solids, erosion, and sediment control Best Management Practices (BMPs), and/or other controls. BMPs are designed to prevent to the maximum extent practicable an increase in sediment load to the water body or an increase in a sediment-related parameter, such as total suspended solids, turbidity, siltation, stream bottom deposits, etc. BMPs also include measures to reduce flow velocity during and after construction compared to pre-construction conditions. Stormwater discharges from industrial activities and facilities, based on industrial classification codes, may be eligible for coverage under the current NPDES MSGP. The MSGP also requires preparation of a SWPPP. Some of the industrial facilities and activities covered under the MSGP have technology based effluent limitation and/or benchmark monitoring for pollutants. The current MSGP includes state-specific requirements that the benchmark values reflect State of New Mexico WQS.

It is not possible to calculate individual WLAs for facilities covered by the General Permits at this time using the available tools. Loads that are in compliance with the General Permits are therefore currently included as part of the Load Allocation (LA). While these sources are not given individual allocations, they are addressed through other means, including BMPs, stormwater pollution prevention conditions, and other requirements. State certification of federal permits ensures that applicable water quality standards, including the antidegradation policy, are met. Compliance with a CGP or MSGP SWPPP that meets the requirements of the general permits is generally assumed to be consistent with this TMDL.

6.3.3 Load Allocation

Load Allocation is pollution from any nonpoint source(s) or natural background and is addressed through Best Management Practices (BMPs). To calculate the LA, the WLA and the MOS were subtracted from the TMDL using **Equation 6.3**, as shown on **Table 6.4**. The MOS was developed using a combination of conservative assumptions and explicit recognition of potential errors (see **Section 6.3.1** for details).

Table 6.4 TMDL Allocations for Total Recoverable Selenium

Assessment Unit	WLA (lbs/day)	LA (lbs/day)	MOS (10%) (lbs/day)	TMDL (lbs/day)
Gallegos Canyon (San Juan River to Navajo bnd)	0	1.50×10^{-4}	1.67×10^{-5}	1.67×10^{-4}

6.3.4 Load Reduction

The extensive data collection and analysis necessary to determine background aluminum loads were 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.

Table 6.5 Load Reduction Estimated to Meet WQS for Total Recoverable Selenium

Assessment Unit	Target Load (lb/day)[a]	Measured Load (lb/day)[b]	Load Reduction (%)[c]
Gallegos Canyon (San Juan River to Navajo bnd)	1.50×10^{-4}	0.009	98.33

(a) Target Load = TMDL – MOS. The MOS is not included in the load reduction calculations because it is a set aside value, which accounts for any uncertainty or variability in TMDL calculations and therefore should not be subtracted from the measured load.

*(b) The measured load is the magnitude of point and nonpoint sources. It is calculated at the TMDL critical flow using the mean measured selenium concentration from sampling events that resulted in exceedances of WQS criteria (**Appendix A**).*

(c) Percent reduction is the percent the existing measured load must be reduced to achieve the target load and is calculated as follows: ((Measured Load – Target Load) / Measured Load) x 100.

6.4 Identification and Description of Pollutant Sources

SWQB fieldwork includes an assessment of the probable sources of impairment in the AU drainage area, according to Standard Operating Procedure 4.1, Probable Source(s) Determination (https://www.env.nm.gov/surface-water-quality/sop/; **Appendix D**). Probable Source Sheets are filled out by SWQB monitoring staff during watershed surveys. The sheets are then reviewed by watershed protection staff familiar with the location, and the TMDL writer conducts a search of aerial imagery, GIS files, and other available resources. The list of probable sources is not intended to single out any particular landowner or land management activity and generally includes several sources per pollutant. Pollutant sources that may contribute to each impairment were determined by field reconnaissance and evaluation (**Table 6.6**). Probable sources of selenium impairments will be evaluated, refined, and changed as necessary through the Watershed Based Plans.

Table 6.6 Probable Sources of Excessive Total Recoverable Selenium

Assessment Unit	Probable Source(s)
Gallegos Canyon (San Juan River to Navajo bnd)	Buildings/Culverts/RR crossings; Dams/Diversions; Dumping/Garbage/Trash/Litter; Flow alteration; Gravel or dirt roads; Highway/Road/Bridge runoff; Inappropriate waste disposal; Irrigated crop production (irrigation equip); Irrigation return drains; Paved roads; Pavement/Impervious surfaces; Residences/Buildings; Site clearance (land development; Wildlife other than waterfowl

6.5 Consideration of Seasonal Variation

Federal regulations (40 CFR § 130.7(c)(1)) require that TMDLs take into consideration seasonal variation in watershed conditions and pollutant loading. During the 2017-2018 water quality survey, total recoverable selenium exceedances occurred across all sampling events. Higher flows may flush more nonpoint source runoff containing sediment and metals. It is possible the criterion may be exceeded under a low flow condition when there is insufficient dilution. Evaluation of seasonal variability for potential nonpoint sources is difficult due to limited available data. Data used in the calculation of this TMDL were collected during the spring, summer, and fall of 2017-2018.

6.6 Future Growth

Growth estimates by county are available from the University of New Mexico Geospatial and Population Studies (GPS) (https://gps.unm.edu/pop/population-projections.html, accessed 1/29/2026). The estimates project growth to the year 2050. The one AU discussed in this section is in San Juan County. GPS projects San Juan County population to decrease through to 2050, as detailed in **Table 6.7**. These projections account for the 2020 census results, also accessed through GPS (https://gps.unm.edu/pop/population-estimates.html, accessed 1/29/2026). TMDL implementation planners should seek out the most current projections, if the information is relevant to their project.

Table 6.7 San Juan County Population Estimates

2020 (Census)[B]	2025	2030	2035	2040	2045	2050[A]	% Pop. Change[a]
121,671	119,657	117,590	113,548	109,362	102,927	96,336	-21%

(a) % Increase: [(A – B) / B] × 100

Estimates of future growth are not anticipated to lead to a significant increase in aluminum that cannot be controlled with BMP implementation. BMPs should be utilized and improved upon while continuing to improve watershed conditions and adhering to SWPPP requirements related to construction and industrial activities covered under the general permit.

7.0 TEMPERATURE

Water temperature influences the metabolism, behavior, and mortality of fish and other aquatic organisms. Natural temperatures of a water body fluctuate daily and seasonally. These natural fluctuations do not eliminate indigenous populations but may affect existing community structure and geographical distribution of species. Anthropogenic impacts such as thermal pollution, deforestation, flow modification and climate change can modify these natural temperature cycles, often leading to deleterious impacts on aquatic life communities. Such modifications may contribute to changes in geographical distribution of species and their ability to persist in the presence of additional stressors such as introduced species. One mechanism by which temperature affects fish is that warmer water has a lower capacity for dissolved oxygen. Water temperature within the stream substrate can influence the growth of insects and salmon eggs, as well as accelerating the growth of algae and bacteria. In addition to direct effects, the toxicity of many chemical contaminants increases with temperature (Caissie, 2006).

7.1 Target Loading Capacity

Fish and other aquatic organisms have specific ranges of temperature tolerance and preference. Cold water fish such as salmonids (salmon and trout) are especially vulnerable to increased water temperature. For that reason, coldwater criteria are typically designed primarily to support reproducing populations of salmonids. A coolwater Aquatic Life Use (ALU) was approved by the WQCC in October 2010, to support aquatic life whose physiologic tolerances are intermediate between those of warmwater and coldwater aquatic life (NMED/SWQB, 2009). Acute temperature criteria (such as New Mexico's T_{MAX}) are intended to protect aquatic life from lethal exposures, whereas chronic criteria (the 4T3 or 6T3) protect from sub-lethal exposures sufficient to cause long-term detrimental effects (Todd et al., 2008). The acute and chronic criteria are established to protect the most sensitive members of fish communities, based on laboratory studies of the upper thermal limits of individual species.

For this TMDL document, target values for temperature are based on the reduction in thermal loading necessary to achieve numeric criteria. Temperature criteria for ALUs in New Mexico are shown on **Table 7.1**. New Mexico's aquatic life temperature criteria are expressed as $T_{MAX,}$ 4T3 and 6T3. T_{MAX} is the maximum recorded temperature, 4T3 means the temperature not to be exceeded for four or more consecutive hours in a 24-hour period on more than three consecutive days, and 6T3 means the temperature not to be exceeded for six or more consecutive hours in a 24-hour period on more than three consecutive days. To be conservative, in the event the chronic criterion (4T3 or 6T3 or segment specific) is exceeded, the chronic value is selected as the target temperature for the TMDL. Target temperatures and measured exceedances are outlined in **Table 7.2**.

Table 7.1 Aquatic Life Use Temperature (°C) Water Quality Criteria

Criterion	High Quality Coldwater	Coldwater	Marginal Coldwater	Coolwater	Warmwater	Marginal Warmwater
4T3	20	---	---	---	---	---
6T3	---	20	25	---	---	---
T_{MAX}	23	24	29	29	32.2	32.2

TMDLs were calculated for two AUs that exceeded the T_{MAX} for their designated ALU. All of those which have chronic standards also exceeded the applicable chronic standard. Thermograph data are presented in **Appendix B**.

Table 7.2 Aquatic Life Use designations of the temperature TMDL AU

Assessment Unit	Designated ALU	Target Temperature	Measured Chronic	Measued T_{MAX}
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	Coolwater	29°C (T_{MAX})	23.12°C (4T3)	27.94°C
Los Pinos River (Navajo Reservoir to CO border)	Coldwater	20°C (6T3)	26.74°C	28.87°C

7.2 Flow

According to the New Mexico Water Quality Standards, the low flow critical condition for numeric criteria (excluding human health-organism only criteria) set in 20.6.4.97 through 20.6.4.900 NMAC and 20.6.4.13(F) NMAC is defined as the 4-day, 3-year low-flow frequency (4Q3, 20.6.4.11(B)(2) NMAC). The 4Q3 is the annual lowest four (4) consecutive day flow that occurs with a frequency of at least once every three (3) years.

For AUs discussed in this section that are ungaged, an analysis method developed by USGS in partnership with NMED, authored by Bell and Tillery (Bell, 2023) was used to estimate the critical low flow. In the Bell & Tillery analysis, six regression equations for estimating 4Q3 were developed based on physiographic regions of New Mexico and stream basin characteristics (i.e., statewide and mountainous regions above 8,000 ft in elevation, or basins with less than 75 square mile drainage areas). The 4Q3-1b equation was used, which applies to elevations over 8,000ft that are the San Juan River or tributaries to the San Juan. The following regression equation is based on data from 23 gaging stations with non-zero discharge (Bell, 2023):

Equation 7.1: $4Q3 = DA^{1.38} \times P^{5.18} \times e^{-22.17}$

Where:

$4Q3$ = four-day, three-year low-flow frequency (cfs)

DA = drainage area (mi^2)

P = annual basin precipitation (in)

e = mathematical constant, Euler's number

The 4Q3 values calculated using Bell & Tillery's method are presented in **Table 7.3**. Parameters used in the calculation were obtained using the StreamStats online GIS application developed by the USGS (https://streamstats.usgs.gov/ss/). The flow was converted from cfs to million gallons per day (mgd) using a conversion factor of 0.646. The TMDL itself is a value calculated at a defined critical condition as part of a planning process designed to achieve water quality standards. Since flows vary throughout the year in these systems, the actual load at any given time will vary based on the changing flow. Management of the load to improve instream water quality is the goal of SWQB efforts.

Critical for the remaining AUs discussed in this section were determined using USGS gage data with the USGS Hydrologic Toolbox software. USGS Gage 09364010 Animas River below Aztec, NM was used for Animas River (Estes Arroyo to So. Ute Indian Tribe bnd) with data from 2013 to 2025.

Table 7.3 Critical Flow for Temperature Impaired AUs

Assessment Unit	Average Elevation (ft)	Drainage Area (mi^2)	Annual Precipitation (inches)	4Q3 (cfs)	4Q3 (mgd)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)*	--	--	--	50.15	32.4
Los Pinos River (Navajo Reservoir to CO border)	8732.03	587	28.19	50.6	32.69

* *Basin characteristics omitted due to being calculated with gage data*

7.3 TMDL Calculations

For temperature TMDLs, the WQS criterion is a temperature specified either by the designated ALU or segment-specific criteria, and it can be either a maximum temperature or time-duration temperature such as the 4T3 or 6T3. An AU is designated as not-supporting if maximum daily temperature measurements exceed the Aquatic Life Use maximum temperature (See **Tables 7.1 & 7.2**) on more than one day during the calendar year and are not confirmed outliers. The 4Q3 low-flow is generally used for the critical flow unless another flow statistic or multiple flow conditions are more appropriate for the situation. The conversion factor is a variable needed to convert units used by SWQB for temperature (in Celsius) and flow (in cfs) to units needed to balance the thermal energy equation. Substituting the appropriate unit conversion factors, the equation used for temperature is the following:

Equation 7.1 *WQS (°C) x Critical Flow (cfs) x Conversion Factor (1.023 x 10^7) = TMDL (kJ/day)*

Details of the derivation of the temperature TMDL equation are presented in **Appendix E**. **Table 7.4** shows the TMDL calculation values for each TMDL AU.

Table 7.4 Temperature TMDL Calculations

Assessment Unit Name	Target temperature (°C)	4Q3 critical flow (mgd)	Conversion factor	TMDL (kJ/day)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)*	29*	32.40	1.023×10^7	9.61×10^9
Los Pinos River (Navajo Reservoir to CO border)	20	32.69	1.023×10^7	6.69×10^9

**NMAC 20.6.4.404 segment specific criteria*

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 and meet water quality criteria at all times is the goal. The TMDL is further allocated to a MOS, WLA (permitted point sources), and LA (non-point sources), according to the formula:

Equation 7.3: *WLA + LA + MOS = TMDL*

7.3.1 Margin of Safety

The CWA requires that each TMDL be calculated with a MOS, intended to account for uncertainty in available data or in the actual effect controls will have on loading reductions and receiving water quality. A MOS may be expressed as unallocated assimilative capacity or conservative analytical assumptions used in establishing the TMDL (e.g., derivation of numeric targets, modeling assumptions or effectiveness of proposed management actions). The MOS may be implicit, utilizing conservative assumptions for calculation of the loading capacity, WLAs, and LAs. The MOS may also be explicitly stated as an added separate quantity in the TMDL calculation.

- *Explicit Recognition of Potential Errors:*
    - There is inherent error in flow estimation, a conservative MOS for this element in ungaged streams is **10 %**.
    - In recognition of the likelihood of future increases in air temperature and evaporative demand, an additional explicit **10%** MOS is added to each AU for climate change.

Total MOS for this TMDL is **20%**.

7.3.2 Waste Load Allocation

Individual National Pollutant Discharge Elimination System (NDPES) Permits

There is one active National Pollution Discharge Elimination System (NPDES) permit for the City of Aztec water treatment plant (WTP) who is authorized to discharge backwash into the Animas River (Estes Arroyo to So. Ute Indian Tribe bnd). The City of Aztec WTP (NM0028762) permit was issued December 2, 2021, and expires December 31, 2026. The facility provides services for approximately 6,322 people. There are currently no reporting requirement or permit limits for temperature for this facility. There is no design capacity flow for the facility, so in its place the average of the maximum daily flow was used (flow data acquired from https://echo.epa.gov/ May 11, 2026). WLAs are presented in **Table 7.5**.

Table 7.5 Individual NPDES Waste Load Allocations for Temperature

Permit	Flow	Target Temperature (°C)	Conversion Factor	WLA (lbs/day)
City of Aztec WTP NM0028762	0.2 mgd	29	1.023×10^7	5.93×10^7

Municipal Separate Storm Sewer Systems (MS4s) Permits

MS4s are defined as a conveyance or system of conveyances owned by a state, city, town, or other public entity that discharges to waters of the United States and is designed or used for collecting or conveying storm water. Because this is a storm water permit, sMS4 permit and associated sMS4 WLAs are only applicable during storm (i.e., high) flow. Regulated conveyance systems include roads with drains, municipal streets, catch basins, curbs, gutters, storm drains, piping, channels, ditches, tunnels and conduits. It does not include combined sewer overflows and publicly-owned treatment works. The federal Clean Water Act requires storm water discharges from certain types of urbanized areas to be permitted under the NPDES program.

In 1990, Phase I of these requirements became effective, and municipalities with a population served by a MS4 of 100,000, or more, were regulated. Under Phase I federal storm water regulations, regulated MS4 entities were required to obtain individual permits. In 1999, Phase II became effective, and any entity responsible for an MS4 conveyance, regardless of population size, could potentially be regulated. To date, this designation has typically applied to areas that have been identified by the Bureau of the Census as an "urbanized area" (UA) but with populations less than 100,000 (USEPA 2005). In 2006, USEPA Region 6 issued general permits for discharges from "small" MS4s (sMS4s) in New Mexico and on lands of tribal nations in New Mexico and Oklahoma. This permit became effective in 2007. EPA proposed to reissue this permit in 2015 within the boundaries of Census-designated 2000 and 2010 Farmington, Santa Fe, Los Lunas, Las Cruces and El Paso Urbanized Areas.

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

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

The Phase II sMS4 permit (NMR040000) reads:

> *"This permit may authorize stormwater discharges to waters of the United States from small MS4s within New Mexico provided the MS4… is located fully or partially within an urbanized area in New Mexico as determined by the 2000 and 2010 Decennial Census."*

There are four permittees identified in the Farmington urbanized area: the City of Farmington, San Juan County, the City of Aztec, and the New Mexico Department of Transportation (NMDOT) District 5. Stormwater covered by the sMS4 has the potential to impact all of the AUs discussed in this document. The sMS4 WLA for each AU has been determined based on the percent of jurisdictional (urban) area within the respective contributing watershed area. The percent and total jurisdictional area, per area sediment loadings, and resultant sMS4 waste load allocations for each AU are presented in **Table 7.6**. For more information regarding the jurisdictional allocation of sMS4 loads and per area sediment loading values, see **Appendix C.**

Table 7.6 NMR040000 MS4 Waste Load Allocations for Temperature

Assessment Unit Name	TMDL - MOS - NPDES WLA (kJ/day) =	MS4 Jurisdictional Area (% of contributing watershed area)	WLA (kJ/day)	Per area temperature loading (kJ/day/mi^2)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	7.63×10^9	2.65%	2.02×10^8	5.09×10^7

General Permits

Stormwater discharges from construction activities are transient because they occur mainly during the construction itself, and then only during storm events. Coverage under the USEPA NPDES Construction General Permit (CGP) for construction sites of one or more acres, or smaller if part of a common plan of development, 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. The current CGP also includes state-specific requirements to implement site-specific interim and permanent stabilization, managerial, and structural solids, erosion, and sediment control Best Management Practices (BMPs), and/or other controls. BMPs are designed to prevent to the maximum extent practicable an increase in sediment load to the water body or an increase in a sediment-related parameter, such as total suspended solids, turbidity, siltation, stream bottom deposits, etc. BMPs also include measures to reduce flow velocity during and after construction compared to pre-construction conditions to ensure that waste load allocations and/or applicable water quality standards, including the antidegradation policy, are met. Compliance with a SWPPP that meets the requirements of the CGP is generally assumed to be consistent with this TMDL.

Stormwater discharges from industrial activities and facilities, based on industrial classification codes, may be eligible for coverage under the current NPDES Multi-Sector General Permit (MSGP). The MSGP also requires preparation of a SWPPP. Some of the industrial facilities and activities covered under the MSGP have technology based effluent limitation and/or benchmark monitoring for pollutants. The current MSGP includes state-specific requirements that the benchmark values be protective of State of New Mexico WQS.

It is not possible to calculate individual WLAs for facilities covered by the General Permits at this time using the available tools. The discharges from these permits are typically transitory as the activities are temporary. Loads that are in compliance with the General Permits are therefore currently included as part of the Load Allocation (LA). While these sources are not given individual allocations, they are addressed through other means, including BMPs, stormwater pollution prevention conditions, and other requirements.

7.3.3 Load Allocation

Load Allocation is pollution from any nonpoint source(s) or natural background and is addressed through Best Management Practices (BMPs). To calculate the LA, the WLA and the MOS were subtracted from the TMDL using **Equation 7.3**, as shown on **Table 7.7**. The MOS was developed using a combination of conservative assumptions and explicit recognition of potential errors (see **Section 7.3.1** for details).

Table 7.7 Temperature TMDL Load Allocations

Assessment Unit	Individual Permit WLA (kJ/day)	MS4 WLA (kJ/day)	LA (kJ/day)	20% MOS (kJ/day)	TMDL (kJ/day)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	5.93×10^7	2.02×10^8	7.43×10^9	1.92×10^9	9.61×10^9
Los Pinos River (Navajo Reservoir to CO border)	0	0	5.35×10^9	1.34×10^9	6.69×10^9

7.4 Identification and Description of Pollutant Sources

SWQB fieldwork includes an assessment of the probable sources of impairment in the AU drainage area, according to Standard Operating Procedure 4.1, Probable Source(s) Determination (https://www.env.nm.gov/surface-water-quality/sop/; **Appendix D**). Probable Source Sheets are filled out by SWQB monitoring staff during watershed surveys. The sheets are then reviewed by watershed protection staff familiar with the location, and the TMDL writer conducts a search of aerial imagery, GIS files, and other available resources. The list of probable sources is not intended to single out any particular landowner or land management activity and generally includes several sources per pollutant. Pollutant sources that may contribute to each impairment were determined by field reconnaissance and evaluation (**Table 6.6**). Probable sources of temperature impairments will be evaluated, refined, and changed as necessary through the Watershed Based Plans.

Table 7.8 Probable Sources of Excessive Temperature

Assessment Unit	Probable Source(s)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	Drought related impacts; Flow alterations from water diversions; Loss of riparian habitat; Municipal (urbanized high-density area); Municipal point source discharges; On-site treatment systems; Other recreational pollution sources; Rangeland grazing
Los Pinos River (Navajo Reservoir to CO border)	Drought-related impacts; Gravel or dirt roads; Highways/Roads/Bridges; Loss of Riparian Habitat; Other recreational pollution sources

7.5 Consideration of Seasonal Variation

Section 303(d)(1) of the CWA requires TMDLs to be "established at a level necessary to implement the applicable WQS with seasonal variations." Both stream temperature and flow vary seasonally and from year to year. Water temperatures are coolest in the winter and early spring months. Future climate change is expected to increase air temperatures and decrease streamflow, potentially causing increases in maximum water temperature. The warmest stream temperatures correspond to prolonged solar radiation exposure, warmer air temperature, and low flow conditions. Maximum temperatures were recorded in the temperature impaired AUs in late summer – July and September.

7.6 Future Growth

SWQB acknowledges the projected impact of climate change on the state's water resources. Climate change will put additional stress on New Mexico's water resources and make attainment of water quality standards more difficult to achieve. In addition, shifting temperature and precipitation patterns affect vegetative composition and density and increase wildfire intensity and the propensity for wildfire in non-fire adapted ecosystems. In 2019, Governor Lujan Grisham signed Executive Order 2019-003 on Addressing Climate Change and Energy Waste Prevention. Executive Order 2019-003 directs all State agencies to evaluate the impacts of climate change on their programs and operations and integrate climate change mitigation and adaptation practices into their programs and operations.

In general, the strongest influence on in-stream water temperature is the ambient air temperature. Stakeholders should explore options to determine the most appropriate approach for each particular watershed or project, with the ultimate goal being that the stream meets the WQS. The SWQB encourages implementation practitioners to design projects to reduce water temperature well below the WQS, such that currently impaired AUs will be likely to meet WQS standards in the future with sufficient resiliency to warmer air temperatures and potentially lower flows.

Growth estimates by county are available from the University of New Mexico Geospatial and Population Studies (GPS) (https://gps.unm.edu/pop/population-projections.html, accessed 1/29/2026). The estimates project growth to the year 2050. The one AU discussed in this section is in San Juan County. GPS projects San Juan County population to decrease through to 2050, as detailed in **Table 7.7**. These projections account for the 2020 census results, also accessed through GPS (https://gps.unm.edu/pop/population-estimates.html, accessed 1/29/2026). TMDL implementation planners should seek out the most current projections, if the information is relevant to their project.

Table 7.9 San Juan County Population Estimates

2020 (Census)[B]	2025	2030	2035	2040	2045	2050[A]	% Pop. Change[a]
121,671	119,657	117,590	113,548	109,362	102,927	96,336	-21%

(a) % Increase: [(A – B) / B] × 100

Estimates of future growth are not anticipated to lead to a significant increase in aluminum that cannot be controlled with BMP implementation. BMPs should be utilized and improved upon while continuing to improve watershed conditions and adhering to SWPPP requirements related to construction and industrial activities covered under the general permit.

8.0 MONITORING PLAN

Pursuant to CWA Section 106(e)(1), 33 U.S.C. § 1256(e)(1), 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 New Mexico. In accordance with the New Mexico Water Quality Act, NMSA 1978, Sections 74-6-1 through -17, 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 revised its 10-year monitoring and assessment strategy (NMED/SWQB, 2016a) and submitted it to USEPA Region 6 for review in June of 2016. The strategy details both the extent of monitoring that can be accomplished with existing resources plus expanded monitoring strategies that could be implemented given additional resources. The SWQB utilizes a rotating basin approach to water quality monitoring. In this approach, a select number of watersheds are intensively monitored each year with an established return frequency of approximately every eight to ten years. The next scheduled monitoring date for the San Juan watershed is 2026.

The SWQB maintains current quality assurance and quality control plans to cover all monitoring activities. This document, called the Quality Assurance Project Plan (NMED/SWQB, 2024), is updated regularly and approved by USEPA Region 6. 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 or TMDL alternatives; water bodies identified as needing ALU verification; the need to monitor unassessed perennial waters; and water bodies receiving point source discharge(s).

Once assessment monitoring is completed, those reaches showing impairment 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 Standard Operating Procedures.

Long-term monitoring for assessments will be accomplished through the establishment of sampling sites that are representative of the water body, and which can be revisited approximately every eight 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.

A watershed would not be ignored during the years in between water quality surveys. The rotating basin program will be supplemented with other data collection efforts such as on-going studies being performed by the USGS and USEPA. These efforts are further supported by coordinated, multi-jurisdictional monitoring in the San Juan watershed that leverages the resources of state, tribal, and federal partners. This coordinated approach improves the spatial and temporal resolution of water quality data and supports more robust assessment, trend analysis, and TMDL development. 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.

9.0 IMPLEMENTATION OF TMDLs

When approving TMDL documents, USEPA takes action on the TMDL, LA, WLA, and other components of the TMDL as needed (e.g., MOS and future growth). USEPA does not take action on the implementation section of the TMDL, and USEPA is not bound to implement any recommendations found in this section, in particular if they are found to be inconsistent with CWA and NPDES regulations, guidance, or policy.

9.1 Point Sources

9.1.1 Individual NPDES Permits

There are three individual NPDES permits that discharge to the assessment units addressed in this document, shown in **Table 9.1**. Calculations of Waste Load Allocations for the point sources are shown in **Sections 2.3.2, 3.3.2, 4.3.2, 5.3.2,** and **7.3.2**. Any Discharge Monitoring Report (DMR) data was accessed from https://echo.epa.gov/, April 6, 2026. This data is publicly accessible and is maintained for 5 years from the current date, so the available data in this case spans from April 6, 2021, to April 6, 2026.

Table 9.1 Individual NPDES Permits

NPDES permit	Assessment Unit	Impairment
NM0028762 City of Aztec WTP, expires 12/31/2026	Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	Aluminum
		Nutrients
		Temperature
NM0020168 City of Aztec WWTP, expires 04/30/2026	Animas River (San Juan River to Estes Arroyo)	Aluminum
NM0020770 City of Bloomfield WWTP, expired 10/31/2025 – Administratively Continued	San Juan River (Animas River to Canon Largo)	Aluminum
		E. coli
NM0020583 City of Farmington WWTP, expires 11/30/2026	San Juan River (Navajo bnd at Hogback to Animas River)	Aluminum
		E. coli
		Sediment
NM0028746 West Moreland San Juan Mining, LLC/San Juan Mine	San Juan River (Navajo bnd at Hogback to Animas River)	Aluminum
		E. coli
		Sediment

9.1.1(A) NM0028762 City of Aztec WTP

The City of Aztec WTP is receiving WLAs for total recoverable aluminum, nutrients, and temperature. This is a water treatment plant that operates in Aztec, San Juan County, New Mexico, and provides services for approximately 6,300 people. The permits expiration date is December 31, 2026. They currently do not have permit limits, nor reporting requirements for aluminum, temperature, or nutrients in their discharge monitoring reports (DMRs). They do not have a design capacity flow outlined in their permit, and flow rates were determined using the average of the reported maximum daily flow. The phase 1 nutrient allocations are based on a 2019-2021 national study examining efficient and cost-effective approaches for nutrient removal at publicly owned treatment works by EPA (https://www.epa.gov/eg/national-study-nutrient-removal-and-secondary-technologies#fact-sheets). It is recommended that monitoring and reporting be included in future permits.

9.1.1(B) NM0020168 City of Aztec WWTP

The City of Aztec WWTP is receiving WLAs for total recoverable aluminum. This WWTP operates in Aztec, San Juan County, New Mexico, and provides sanitary services for approximately 6,300 people with no significant industrial users, and a design capacity flow of 1.2 mgd. The permits expiration date is April 30, 2026. They currently do not have permit limits, nor reporting requirements for aluminum in their discharge monitoring reports (DMRs).

9.1.1(C) NM0020770 City of Bloomfield WWTP

The City of Bloomfield WWTP is receiving WLAs for total recoverable aluminum and *E. coli*. This WWTP operates in Bloomfield, San Juan County, New Mexico, and provides sanitary services for approximately 7,400 people with one industrial user, and the design capacity flow for the facility is 0.93 mgd. The industrial user is Enterprise Field Services, whose principal products are cooling tower water and raw materials are water, salts and chlorides. The permit is currently administratively continued, with a potential expiration date in 2031, pending issuance of a new permit. They currently do not have permit limits, nor reporting requirements for aluminum in their discharge monitoring reports (DMRs). The current *E. Coli* bacteria limit is 4.3×10^9 cfu/day for a 30-day average and daily max, or 126 cfu/100mL. The average *E. coli* concentration from DMRs between April 6, 2021, to April 6, 2026, is 13.06 cfu/100mL with a maximum of 68.2 cfu/100mL.

9.1.1(D) NM0020583 City of Farmington WWTP

The City of Farmington WWTP is receiving WLAs for total recoverable aluminum, *E. coli*, and sedimentation. This WWTP operates in Farmington, San Juan County, New Mexico, and provides sanitary services for approximately 50,000 people with one industrial user, and the design capacity flow for the facility is 6.67 mgd. The permit expires November 30, 2026. They currently do not have permit limits, nor reporting requirements for aluminum in their discharge monitoring reports (DMRs). The current *E. Coli* bacteria limit is 31.9×10^9 cfu/day for a 30-day average and daily max, or 126 cfu/100mL. The average *E. coli* concentration from DMRs between April 6, 2021, to April 6, 2026, is 53.94 cfu/100mL with a maximum of 2420 cfu/100mL. The current TSS limit for the City of Farmington WWTP is 1669 lbs/day or 30 mg/L for a 30-day average, and 2504 lbs/day or 45 mg/L for a 7-day average. The average TSS concentration from DMRs between April 6, 2021, to April 6, 2026, is 8.81 mg/L with a maximum of 45 mg/L.

9.1.1(E) NM0028746 West Moreland San Juan Mining

West Moreland San Juan Mining is receiving WLAs for total recoverable aluminum, *E. coli*, and sedimentation. The facility is located on County Road 6800, about 16 miles west of Farmington, Waterflow in San Juan County, NM. West Moreland conducts surface coal mining activities. There has been 0 discharge since 2002, where flow was measured at 0.01mgd. With the lack of any other flow data, this flow event was used as the basis for WLAs for this facility. The WLAs presented in this document will apply to all outfalls, since the permit outlines 12 outfalls.

9.1.2 MS4 Permit

The National Pollutant Discharge Elimination System (NPDES) permitting program for stormwater discharges was established under the Clean Water Act as the result of the 1987 amendment. The Act specifies the level of control to be incorporated into the NPDES stormwater permitting program depending on the source (industrial versus municipal). These programs contain specific requirements for the regulated communities/facilities to establish a comprehensive stormwater management program (SWMP) or storm water pollution prevention plan (SWPPP) to implement any requirements of the total maximum daily load (TMDL) allocation. [See 40 CFR § 130.]

Storm water discharges are highly variable both in terms of flow and pollutant concentration, and the relationships between discharges and water quality can be complex. For municipal stormwater discharges in particular, the current use of system-wide permits and a variety of jurisdiction-wide BMPs, including 78 educational and programmatic BMPs, does not easily lend itself to the existing methodologies for deriving numeric water quality-based effluent limitations. These methodologies were designed primarily for process wastewater discharges which occur at predictable rates with predictable pollutant loadings under low flow conditions in receiving waters. EPA has recognized these problems and developed permitting guidance for stormwater permits (USEPA, 1996).

Due to the nature of storm water discharges, and the typical lack of information on which to base numeric water quality-based effluent limitations (expressed as concentration and mass), EPA recommends an interim permitting approach for NPDES storm water permits which is based on BMPs. "The interim permitting approach uses best management practices (BMPs) in first-round storm water permits and expanded or better-tailored BMPs in subsequent permits, where necessary, to provide for the attainment of water quality standards."

A monitoring component is also included in the recommended BMP approach. "Each storm water permit should include a coordinated and cost-effective monitoring program to gather necessary information to determine the extent to which the permit provides for attainment of applicable water quality standards and to determine the appropriate conditions or limitations for subsequent permits." (USEPA, 1996). This approach was further elaborated in an EPA guidance memo (USEPA, 2002): "The policy outlined in this memorandum affirms the appropriateness of an iterative, adaptive management BMP approach, whereby permits include effluent limits (e.g., a combination of structural and nonstructural BMPs) that address storm water discharges, implement mechanisms to evaluate the performance of such controls, and make adjustments (i.e., more stringent controls or specific BMPs) as necessary to protect water quality. …… If it is determined that a BMP approach (including an iterative BMP approach) is appropriate to meet the storm water component of the TMDL, EPA recommends that the TMDL reflect this." This BMP-based approach to stormwater sources in TMDLs is also recognized and described in the most recent EPA guidance (USEPA, 2008).

The EPA is proposing a renewed MS4 permit located in urbanized areas of New Mexico (https://www.federalregister.gov/documents/2026/03/04/2026-04322/new-mexico-statewide-municipal-separate-storm-sewer-system-ms4-general-permit-proposal). Comments for this proposal were due on May 4, 2026, and more info on participation is available at https://www.regulations.gov/ or https://www.epa.gov/publicnotices/notices-search. A copy of the permit is available from the EPA Public

Notice Site at the link above. The target issue date is late 2026 or early 2027. At this time, the MS4 WLAs are not expected to be affected by the proposed permit.

This TMDL adopts the EPA recommended approach and relies on appropriate BMPs for implementation. No numeric effluent limitations are required or anticipated for municipal stormwater discharge permits.

9.1.3 BOR Navajo-Gallup Water Supply Project

At this time, there is not enough data to accurately account for how this project will affect flow in the San Juan River. This WLA needs to be re-examined once the project starts diversion and discharge. Only a sediment WLA is presented in this document. In the event of future discharge, WLAs for any parameters can be addressed. The process for creating WLAs for a new or revised permit, without revision to a TMDL, is outlined in the WQMP, section V.C, "**Incorporating TMDL Waste Load Allocations into NPDES Permits"** (NMED, 2020). Aside from addressing potential WLAs, the sediment TMDL may be revised in the future – similarly to multiple AUs/impairments in this document (see **Table 1.1**).

9.2 Nonpoint Sources

9.2.1 WBP and BMP Coordination

Public awareness and involvement will be crucial to the successful implementation of these plans and improved water quality. A Watershed Based Plan (WBP) 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 nonpoint source impacts to water quality. This long-range strategy will become instrumental in coordinating efforts to achieve water quality standards in the watershed. The WBP is essentially the Implementation Plan, or Phase Two of the TMDL process. The completion of the TMDLs and WBP leads directly to the development of on-the-ground projects to address surface water impairments in the watershed. BMPs to be considered as part of on-the ground-projects to address temperature include establishment of additional woody riparian vegetation for shade and/or stream channel restoration work, particularly at road crossings. Additional information about the reduction of nonpoint source pollution can be found online at: https://www.epa.gov/polluted-runoff-nonpoint-source-pollution**.**

9.2.2 Clean Water Act Section 319(h) Funding

The Watershed Protection Section of the SWQB may potentially be able to provide CWA Section 319(h) funding to assist in implementation of BMPs to address water quality problems on reaches listed as category 4 or 5 waters on the Integrated § 303(d)/§ 305(b) list. 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 through a Request for Proposal (RFP) process. Selected projects require a non-federal match of 40% of the total project cost consisting of funds and/or in-kind services. Funding is potentially available, generally annually, for both watershed-based planning and on-the-ground projects to improve surface water quality and associated habitat. Further information on funding from the CWA Section 319(h), 33 U.S.C. § 1329, can be found at the SWQB website: https://www.env.nm.gov/surface-water-quality/.

9.2.3 Other Funding Opportunities and Restoration Efforts

Several other sources of funding exist to address impairments discussed in this TMDL document. NMED's Construction Programs Bureau assists communities in need of funding for WWTP upgrades and improvements to septic tank configurations. They can also provide matching funds for appropriate CWA Section 319(h) projects using state revolving fund monies. The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Environmental Quality Incentive Program (EQIP) program can provide assistance to private landowners in the basin. The USDA Forest Service aligns their mission to protect lands they manage with the TMDL process and are another source of assistance. The US Bureau of Land Management (BLM) has several programs in place to provide assistance to improve unpaved roads and grazing allotments.

The SWQB annually makes available CWA Section 604(b) funds through a Request for Quotes (RFQ) process. *See* 33 U.S.C. § 1384. The SWQB requests quotes from regional public comprehensive planning organizations to conduct water quality management planning as defined under Sections 205(j) and 303(e) and the CWA. *See* 33 U.S.C. §§ 1285 and 1313. The SWQB seeks proposals to conduct water quality management planning with a focus on projects that clearly address the State's water quality goals to preserve, protect and improve the water quality in New Mexico. The SWQB encourages proposals focused on TMDLs and UAAs or other water quality management planning activities that will directly address identified water quality impairments. The SWQB 604(b) RFQ is released annually in September.

The New Mexico Legislature appropriated $5,000,000 in state funds for the River Stewardship Program as of 2026. The River Stewardship Program has the overall goal of addressing the root causes of poor water quality and stream habitat. Objectives of the River Stewardship Program include: "restoring or maintaining hydrology of streams and rivers to better handle overbank flows and thus reduce flooding downstream; enhancing economic benefits of healthy river systems such as improved opportunities to hunt, fish, float or view wildlife; and providing state matching funds required for federal CWA grants." A competitive Request for Proposals (RFP) will be conducted to select projects for the funding at https://www.env.nm.gov/requests-for-proposals/. Responsibility for the program is assigned to NMED, and SWQB staff administer the projects. Additional funding sources for watershed protection and improvement projects are listed in Appendix C of the New Mexico Nonpoint Source Management Plan, available at https://www.env.nm.gov/surface-water-quality/nps-plan.

Information on additional watershed restoration funding resources is available on the SWQB website at-https://www.env.nm.gov/surface-water-quality/watershed-protection-section/.

10.0 APPLICABLE REGULATIONS AND REASONABLE ASSURANCES

New Mexico's Water Quality Act, NMSA 1978 §§ 74-6-1 through -17 (Act), authorizes the WQCC to "adopt rules to prevent or abate water pollution in the state" and to require permits. *See* NMSA 1978, § 74-6-4(E). The Act authorizes a constituent agency, such as NMED, to take enforcement action against any person who violates a water quality standard. *See* NMSA 1978, § 74-6-10. Several statutory provisions on nuisance law could also be applied to NPS water pollution. The Act also states in Section 74-6-12(a):

> *The Water Quality Act 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 Standards for Interstate and Intrastate Surface Waters at 20.6.4.6(C) NMAC state:

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

New Mexico policies are in accordance with the federal CWA Section 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.* 33 U.S.C. § 1251.

New Mexico's CWA Section 319 Program has been developed in a coordinated manner with the State's CWA Section 303(d) process. *See* 33 U.S.C. §§ 1329 and 1313. All watersheds that are targeted in the annual §319 request for proposal process coincide with the State's biennial impaired waters list as approved by USEPA. The State has given a high priority for funding, assessment, and restoration activities to these watersheds.

As a constituent agency, NMED has the authority under NMSA 1978, Section 74-6-10 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 an NPS. The NMED NPS water quality management program has historically strived for and will continue to promote voluntary compliance with NPS water pollution concerns by utilizing a voluntary, cooperative approach. The State provides technical support and grant money for implementation of BMPs and other NPS prevention mechanisms through Section 319 of the CWA. *See* 33 U.S.C. § 1329. 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 U.S. Forest Service and the BLM. MOUs have also been developed with other state agencies, such as the New Mexico Department of Transportation. These MOUs provide for coordination and consistency in dealing with NPS issues.

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

11.0 PUBLIC PARTICIPATION

Public participation was solicited in development of this TMDL. Pursuant to 40 C.F.R. § 130.7(a), public participation is conducted in accordance with Section XIV of the WQMP/CPP (NMED/SWQB, 2020b), and as outlined in Section IV.C of the WQMP/CPP. The draft TMDL was made available for a 30-day comment period beginning June 15, 2026 and ending on July 15, 2026. The draft document notice of availability included information on comment submittal and dates/times of the public meetings. It was advertised via email distribution lists and webpage postings. Public meetings were held using virtual meeting technology. A response to public comments has been added to this TMDL document as **Appendix E**. The TMDL document was approved by the NM WQCC on [DATE] and EPA Region 6 on [DATE].

Following WQCC and EPA approval, the next step for public participation will be development of WBPs and watershed protection projects, including those that may be funded by CWA Section 319(h) grants managed by SWQB.

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APPENDIX A
THREATENED AND ENDANGERED SPECIES KNOWN TO OCCUR IN THE PROJECT AREA

Federal or State Threatened/Endangered Species

Rio Arriba, San Juan

Taxonomic Group	# Species	Taxonomic Group	# Species
Amphibians	2	Lepidoptera; moths and butterflies	2
Birds	13	Mammals	4
Fish	3		

TOTAL SPECIES: 24

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Spotted Bat	Euderma maculatum	T			Y	View
Canada Lynx	Lynx canadensis		T			View
Pacific Marten	Martes caurina	T			Y	View
New Mexico Jumping Mouse	Zapus hudsonius luteus	E	E	Y	Y	View
White-tailed Ptarmigan	Lagopus leucura	E			Y	View
Yellow-billed Cuckoo (western pop)	Coccyzus americanus occidentalis		T	Y	Y	View
Broad-billed Hummingbird	Cynanthus latirostris	T			Y	View
Least Tern	Sternula antillarum	E			Y	View
Brown Pelican	Pelecanus occidentalis	E				View
Bald Eagle	Haliaeetus leucocephalus	T			Y	View
Common Black Hawk	Buteogallus anthracinus	T			Y	View
Mexican Spotted Owl	Strix occidentalis lucida		T	Y	Y	View
Boreal Owl	Aegolius funereus	T			Y	View
Peregrine Falcon	Falco peregrinus	T			Y	View
Southwestern Willow Flycatcher	Empidonax traillii extimus	E	E	Y	Y	View
Gray Vireo	Vireo vicinior	T			Y	View
Baird's Sparrow	Centronyx bairdii	T			Y	View
Jemez Mountains Salamander	Plethodon neomexicanus	E	E	Y	Y	View
Boreal Toad	Anaxyrus boreas boreas	E			Y	View
Roundtail Chub (upper basin populations)	Gila robusta	E			Y	View
Colorado Pikeminnow	Ptychocheilus lucius	E	E	Y	Y	View
Razorback Sucker	Xyrauchen texanus		E	Y	Y	View
Nokomis Silverspot	Speyeria (Argynnis) nokomis nokomis		T			View

Federal or State Threatened/Endangered Species

Rio Arriba, San Juan

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Monarch	Danaus plexippus		P			View

APPENDIX B
WATER QUALITY DATA

Total Recoverable Aluminum data

Exceedances of the applicable criteria are shown in **bold red** font. MDP indicates a missing data point.

Chronic Criterion = $\left(e^{1.3695\times\ln(hardness)+0.9161}\right) \div 1000$

AU Chronic criterion uses the average hardness at exceedances.

AU chronic criterion example:
San Juan River (NM reach upstream of Navajo Reservoir) hardness at exceedances: 81 and 63 mg/L
Average hardness at exceedances: 72 mg/L

San Juan River (NM reach upstream of Navajo Reservoir) chronic criterion
= $\left(e^{1.3695\times\ln(72)+0.9161}\right) \div 1000 = 0.87$

Arithmetic mean is the mean of **exceedances.**

Animas River (Estes Arroyo to So. Ute Indian Tribe bnd) – NM-2404_00
Monitoring station(s): Animas River 0.5 mi blw state line – 66Animas057.0
Animas River above Estes Arroyo – 66Animas028.1
Animas River nr Cedar Hill, NM – 66Animas044.8
USEPA_REGION8-66Animas055.8
USEPA_REGION8-ADW-022

Monitoring Site	Date	Hardness (mg/L)	Chronic Criterion (mg/L)	TR Al (mg/L)
66Animas057.0	3/22/2017	150	2.39	**3.2**
66Animas028.1	3/22/2017	160	2.61	**5.2**
66Animas057.0	5/2/2017	170	2.83	0.77
66Animas028.1	5/2/2017	170	2.83	0.94
66Animas028.1	9/6/2017	230	4.29	0.07
66Animas028.1	10/18/2017	280	5.61	0.35
66Animas028.1	3/13/2018	290	5.89	1.9
66Animas057.0	3/13/2018	290	5.89	0.09
66Animas028.1	5/8/2018	220	4.03	1.6
66Animas057.0	7/10/2018	260	5.07	0.48
66Animas028.1	7/10/2018	250	4.81	0.08
66Animas057.0	8/21/2018	340	7.32	0.37
66Animas057.0	10/24/2018	270	5.34	4.4
66Animas028.1	10/24/2018	320	6.74	**7**
66Animas055.8	2/23/2021	220	4.03	0.08
ADW-022	2/23/2021	220	4.03	0.15
66Animas055.8	5/4/2021	145	2.28	0.20
ADW-022	5/4/2021	154	2.48	0.21
66Animas055.8	5/24/2021	126	1.88	0.23
USEPA_REGION8-ADW-022	5/24/2021	131	1.98	0.19

Monitoring Site	Date	Hardness (mg/L)	Chronic Criterion (mg/L)	TR Al (mg/L)
USEPA_REGION8-66Animas055.8	9/18/2021	220	4.03	0.55
USEPA_REGION8-ADW-022	9/18/2021	220	4.03	0.30
66Animas028.1	6/13/2022	140	2.17	0.21
66Animas044.8	6/13/2022	140	2.17	0.19
66Animas028.1	10/12/2022	220	4.03	1.1
66Animas044.8	10/12/2022	220	4.03	0.49
66Animas028.1	4/5/2023	290	5.89	4
66Animas044.8	4/5/2023	280	5.61	2.4
66Animas028.1	6/7/2023	88	1.15	0.94
66Animas044.8	6/7/2023	85	1.10	**1.2**
66Animas028.1	10/3/2023	270	5.34	0.21
66Animas044.8	10/3/2023	260	5.07	0.42
66Animas028.1	4/1/2024	300	6.17	0.26
66Animas044.8	4/1/2024	310	6.45	0.26
66Animas028.1	6/3/2024	87	1.13	**1.2**
66Animas044.8	6/3/2024	88	1.15	**1.3**
66Animas028.1	4/2/2025	220	4.03	1.3
66Animas044.8	4/2/2025	200	3.54	0.57
66Animas028.1	6/9/2025	95	1.28	**1.6**
66Animas044.8	6/9/2025	96	1.30	0.98
66Animas028.1	10/1/2025	290	5.89	2.4
66Animas044.8	10/1/2025	260	5.07	1.9
AU Chronic Criterion:		2.19		
Arithmetic Mean TR Al:		2.96		

Animas River (San Juan River to Estes Arroyo) – NM-2403.A_00
Monitoring station(s): ANIMAS R AT FARMINGTON – 66Animas001.7
Animas River at Boyd Park in Farmington – 66Animas002.3
USEPA_REGION8 – 66Animas009.8

Monitoring Site	Date	Hardness (mg/L)	Chronic Criterion (mg/L)	TR Al (mg/L)
66Animas001.7	3/23/2017	160	2.61	**4.5**
66Animas001.7	5/2/2017	180	3.07	1.4
66Animas001.7	3/13/2018	320	6.74	0.32
66Animas001.7	7/10/2018	330	7.03	0.5
66Animas001.7	8/21/2018	420	9.78	0.08
66Animas001.7	10/24/2018	380	8.53	23
66Animas009.8	2/23/2021	220	4.03	0.15
66Animas009.8	5/4/2021	189	3.28	0.16
66Animas009.8	5/25/2021	146	2.30	0.19
66Animas009.8	9/18/2021	220	4.03	0.72
66Animas002.3	6/15/2022	170	2.83	0.28
66Animas002.3	10/12/2022	260	5.07	2.1

Monitoring Site	Date	Hardness (mg/L)	Chronic Criterion (mg/L)	TR Al (mg/L)
66Animas002.3	4/5/2023	330	7.03	**7.5**
66Animas002.3	6/7/2023	95	1.28	**1.8**
66Animas002.3	10/4/2023	300	6.17	0.25
66Animas002.3	4/2/2024	380	8.53	0.87
66Animas002.3	6/5/2024	95	1.28	**1.7**
66Animas002.3	4/2/2025	240	4.55	1.7
66Animas002.3	6/9/2025	100	1.37	**2.5**
66Animas002.3	9/30/2025	320	6.74	**21**
AU Chronic Criterion:		3.82		
Arithmetic Mean TR Al:		8.86		

San Juan River (Animas River to Canon Largo) – NM-2401_00

Monitoring station(s): SAN JUAN RIVER AT BLOOMFIELD BRIDGE – 64SanJua126.2
San Juan River abv Animas – 64SanJua101.6

Monitoring Site	Date	Hardness (mg/L)	Chronic Criterion (mg/L)	TR Al (mg/L)
64SanJua126.2	3/22/2017	120	1.76	1.2
64SanJua101.6	3/23/2017	130	1.96	0.62
64SanJua101.6	5/3/2017	120	1.76	0.36
64SanJua126.2	5/3/2017	110	1.56	0.36
64SanJua126.2	3/13/2018	130	1.96	0.65
64SanJua101.6	3/14/2018	150	2.39	1.1
64SanJua126.2	10/24/2018	110	1.56	0.88
64SanJua101.6	10/25/2018	130	1.96	0.35
64SanJua101.6	10/12/2022	160	2.61	**7.3**
64SanJua101.6	4/5/2023	160	2.61	**3.5**
64SanJua101.6	6/7/2023	100	1.37	**2**
64SanJua101.6	10/4/2023	110	1.56	1.2
64SanJua101.6	4/2/2024	170	2.83	1.4
64SanJua101.6	6/5/2024	160	2.61	0.47
64SanJua101.6	4/2/2025	140	2.17	1.1
64SanJua101.6	6/9/2025	160	2.61	**8.7**
64SanJua101.6	9/30/2025	130	1.96	**4.9**
AU Chronic Criterion:		2.22		
Arithmetic Mean TR Al:		5.28		

San Juan River (Navajo bnd at Hogback to Animas River)

Monitoring station(s): SAN JUAN R AT HOGBACK – 67SanJua065.3
San Juan River at Lions Park near Kirtland – 67SanJua088.1
USEPA_REGION8-LVW-020
USEPA_REGION8-SJFP

Monitoring Site	Date	Hardness (mg/L)	Chronic Criterion (mg/L)	TR Al (mg/L)
67SanJua065.3	3/23/2017	180	3.07	**6**
67SanJua065.3	5/3/2017	180	3.07	**3.8**

Monitoring Site	Date	Hardness (mg/L)	Chronic Criterion (mg/L)	TR Al (mg/L)
67SanJua065.3	9/7/2017	200	3.54	2.6
67SanJua065.3	10/18/2017	250	4.81	**6.2**
67SanJua065.3	3/14/2018	240	4.55	0.42
67SanJua065.3	5/9/2018	250	4.81	1.6
67SanJua065.3	7/11/2018	170	2.83	**3.5**
67SanJua065.3	10/25/2018	270	5.34	**11**
LVW-020	2/24/2021	210	3.79	0.12
LVW-020	5/4/2021	168	2.79	0.11
SJFP	5/5/2021	130	1.96	1.52
LVW-020	5/25/2021	158	2.56	0.13
SJFP	5/26/2021	156	2.52	2.27
LVW-020	9/19/2021	122	1.80	0.52
SJFP	9/20/2021	139	2.15	**4.57**
67SanJua088.1	6/15/2022	170	2.83	1.3
67SanJua088.1	10/12/2022	210	3.79	**6.7**
67SanJua088.1	4/5/2023	260	5.07	**8.1**
67SanJua088.1	6/7/2023	100	1.37	**2.3**
67SanJua088.1	10/4/2023	160	2.61	1.3
67SanJua088.1	4/2/2024	230	4.29	0.97
67SanJua088.1	6/5/2024	110	1.56	**2.1**
67SanJua088.1	4/2/2025	170	2.83	1.2
67SanJua088.1	6/9/2025	110	1.56	**2.8**
67SanJua088.1	9/30/2025	200	3.54	**9.2**
AU Chronic Criterion:		3.10		
Arithmetic Mean TR Al:		5.52		

San Juan River (NM reach upstream of Navajo Reservoir) – NM-2405_11
Monitoring station(s): San Juan River 0.5 mile above NM Border – 64SanJua226.2

Monitoring Site	Date	Hardness (mg/L)	Chronic Criterion (mg/L)	TR Al (mg/L)
64SanJua226.2	4/11/2017	81	1.03	**1.4**
64SanJua226.2	10/17/2017	160	2.61	0.16
64SanJua226.2	4/4/2018	83	1.06	0.84
64SanJua226.2	9/5/2018	150	2.39	1.5
64SanJua226.2	10/3/2018	63	0.73	**1.1**
AU Chronic Criterion:		0.87		
Arithmetic Mean TR Al:		1.25		

E. Coli data

Exceedances of the applicable indicator thresholds are shown in **bold red** font. MPN is the most probable number of colony forming units and is equivalent to cfu in the New Mexico WQS. MDP indicates a missing data point.

Gallegos Canyon (San Juan River to Navajo bnd) – NM-9000.A_060
Monitoring station(s): Gallegos Canyon at San Juan River – 64Galleg000.4
Water Quality Criterion (single sample, cfu/100mL): 940

Monitoring Site	Date	E. Coli (MPN/100mL)
64Galleg000.4	3/23/2017	90.49
64Galleg000.4	7/12/2017	38.25
64Galleg000.4	9/7/2017	**2419.6**
64Galleg000.4	10/17/2017	162.11
64Galleg000.4	7/11/2018	**2419.6**
64Galleg000.4	10/25/2018	**1553.12**

La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd) – NM-2402.A_01
Monitoring station(s): LA PLATA RIVER AT LA PLATA, NM – 67LaPlat024.8
Water Quality Criterion (single sample, cfu/100mL): 410

Monitoring Site	Date	E. Coli (MPN/100mL)
67LaPlat024.8	3/23/2017	111.9
67LaPlat024.8	5/3/2017	74.91
67LaPlat024.8	7/12/2017	79.36
67LaPlat024.8	9/7/2017	**980.39**
67LaPlat024.8	10/17/2017	93.35
67LaPlat024.8	3/14/2018	93.26
67LaPlat024.8	7/11/2018	**613.14**
67LaPlat024.8	8/22/2018	**1986.29**

Navajo River (Jicarilla Apache Nation to CO border) – NM-2407.A_00
Monitoring station(s): Navajo River upstream of Jicarilla Bnd – 64Navajo022.1
Water Quality Criterion (single sample, cfu/100mL): 235

Monitoring Site	Date	E. Coli (MPN/100mL)
64Navajo022.1	3/22/2017	29.17
64Navajo022.1	5/2/2017	24.05
64Navajo022.1	7/11/2017	**435.17**
64Navajo022.1	9/6/2017	218.72
64Navajo022.1	10/17/2017	6.32
64Navajo022.1	3/13/2018	17.12
64Navajo022.1	5/8/2018	35.89
64Navajo022.1	7/10/2018	**2419.6**
64Navajo022.1	8/21/2018	204.59

64Navajo022.1	9/4/2018	137.61

San Juan River (Animas River to Canon Largo) – NM-2401_00
Monitoring station(s): SAN JUAN RIVER AT BLOOMFIELD BRIDGE – 64SanJua126.2
San Juan River abv Animas – 64SanJua101.6
San Juan River at McGee Park – 64SanJua113.5
Water Quality Criterion (single sample, cfu/100mL): 410

Monitoring Site	Date	E. Coli (MPN/100mL)
64SanJua126.2	3/22/2017	48.74
64SanJua113.5	3/22/2017	27.51
64SanJua101.6	3/23/2017	43.47
64SanJua101.6	5/3/2017	64.37
64SanJua113.5	5/3/2017	25.01
64SanJua126.2	5/3/2017	80.88
64SanJua126.2	7/11/2017	57.31
64SanJua113.5	7/11/2017	63.14
64SanJua101.6	7/12/2017	11.99
64SanJua126.2	9/6/2017	93.31
64SanJua101.6	9/7/2017	209.82
64SanJua113.5	10/17/2017	109.01
64SanJua126.2	3/13/2018	31.84
64SanJua101.6	3/14/2018	3.06
64SanJua113.5	3/14/2018	2.01
64SanJua126.2	5/8/2018	290.93
64SanJua126.2	7/10/2018	33.1
64SanJua113.5	8/21/2018	39.86
64SanJua101.6	8/22/2018	**2419.57**
64SanJua126.2	10/24/2018	73.28
64SanJua101.6	10/25/2018	78.94
64SanJua113.5	10/25/2018	59.08

San Juan River (Navajo bnd at Hogback to Animas River) – NM-2401_10
Monitoring station(s): SAN JUAN R AT HOGBACK– 67SanJua065.3
San Juan River at Lions Park near Kirtland – 67SanJua088.1
Water Quality Criterion (single sample, cfu/100mL): 410

Monitoring Site	Date	E. Coli (MPN/100mL)
67SanJua065.3	3/23/2017	275.51
67SanJua065.3	5/3/2017	228.18
67SanJua088.1	5/3/2017	104.6
67SanJua065.3	7/12/2017	111.9
67SanJua088.1	7/12/2017	307.59
67SanJua065.3	9/7/2017	**579.43**
67SanJua065.3	10/18/2017	86.68
67SanJua088.1	10/18/2017	93.42
67SanJua065.3	3/14/2018	7.38

Monitoring Site	Date	E. Coli (MPN/100mL)
67SanJua088.1	3/14/2018	1
67SanJua088.1	5/9/2018	325.54
67SanJua065.3	7/11/2018	387.32
67SanJua065.3	8/22/2018	**2419.6**
67SanJua088.1	8/22/2018	**2419.6**
67SanJua088.1	10/25/2018	290.93

San Juan River (NM reach upstream of Navajo Reservoir) – NM-2405_11
Monitoring station(s): San Juan River 0.5 mile above NM Border – 64SanJua226.2
Water Quality Criterion (single sample, cfu/100mL): 940

Monitoring Site	Date	E. Coli (MPN/100mL)
64SanJua226.2	4/11/2017	8.52
64SanJua226.2	8/1/2017	**2419.57**
64SanJua226.2	10/17/2017	6.32
64SanJua226.2	9/5/2018	307.59
64SanJua226.2	10/3/2018	**2419.6**

Shumway Arroyo (San Juan River to Ute Mtn Ute bnd) – NM-9000.A_021
Monitoring station(s): Shumway at Hwy 64 bridge – 67Shumwa002.4
Water Quality Criterion (single sample, cfu/100mL): 940

Monitoring Site	Date	E. Coli (MPN/100mL)
67Shumwa002.4	3/23/2017	435.17
67Shumwa002.4	7/12/2017	**1413.61**
67Shumwa002.4	10/18/2017	141.7
67Shumwa002.4	3/14/2018	248.9
67Shumwa002.4	7/11/2018	**2419.6**
67Shumwa002.4	8/22/2018	**1986.29**

Stevens Arroyo (Perennial prts San Juan R to headwaters) – NM-2401_11
Monitoring station(s): Stevens Arroyo below CR 6100 – 67Steven000.7
Water Quality Criterion (single sample, cfu/100mL): 940

Monitoring Site	Date	E. Coli (MPN/100mL)
67Steven000.7	3/23/2017	**1732.89**
67Steven000.7	7/12/2017	920.84
67Steven000.7	9/7/2017	**1046.24**
67Steven000.7	10/18/2017	126.14
67Steven000.7	3/14/2018	30.51
67Steven000.7	7/11/2018	**1119.87**
67Steven000.7	8/22/2018	816.41

Plant Nutrients & Total Phosphorus data

Exceedances of the applicable indicator thresholds are shown in **bold red** font. Values reported as being below the minimum detection limit are shown in *italic blue* font. MDP indicates a missing data point.

Animas River (Estes Arroyo to So. Ute Indian Tribe bnd) – NM-2404_00
Monitoring Station(s): Animas River 0.5 mi blw state line – 66Animas057.0
Animas River above Estes Arroyo – 66Animas028.1
Animas River nr Cedar Hill, NM - 66Animas044.8
Applicable Thresholds: TN (Steep) 0.3 mg/L, TP (NMAC 20.6.4.404 Segment Specific) 0.1 mg/L, Delta DO 1.79 mg/L

Monitoring Station	Date	TN (mg/L)	TP (mg/L)
66Animas057.0	3/22/2017	**0.6**	MDP
66Animas028.1	3/22/2017	**0.6**	MDP
66Animas057.0	5/2/2017	0.28	0.033
66Animas028.1	5/2/2017	**0.32**	0.035
66Animas057.0	7/11/2017	*0.3*	0.013
66Animas028.1	7/11/2017	*0.3*	0.02
66Animas057.0	9/6/2017	*0.3*	0.01
66Animas028.1	9/6/2017	*0.3*	0.25
66Animas028.1	10/18/2017	*0.3*	0.11
66Animas028.1	3/13/2018	**0.39**	0.049
66Animas057.0	3/13/2018	**0.32**	0.017
66Animas057.0	5/8/2018	**0.51**	**0.133**
66Animas028.1	5/8/2018	**0.47**	**0.111**
66Animas057.0	7/10/2018	**0.32**	0.021
66Animas028.1	7/10/2018	*0.25*	0.011
66Animas057.0	8/21/2018	**0.35**	0.052
66Animas028.1	8/21/2018	**0.4**	0.011
66Animas057.0	10/24/2018	MDP	**0.188**
66Animas028.1	10/24/2018	MDP	**0.198**
66Animas028.1	6/13/2022	*0.25*	0.02
66Animas044.8	6/13/2022	*0.25*	0.019
66Animas028.1	10/12/2022	*0.25*	0.058
66Animas044.8	10/12/2022	0.29	0.036
66Animas028.1	4/5/2023	**0.93**	**0.173**
66Animas044.8	4/5/2023	**0.82**	**0.13**
66Animas028.1	6/7/2023	*0.3*	0.057
66Animas044.8	6/7/2023	**0.38**	0.057
66Animas028.1	10/3/2023	0.28	0.01
66Animas044.8	10/3/2023	0.28	0.022
66Animas028.1	4/1/2024	*0.25*	0.014
66Animas044.8	4/1/2024	*0.25*	0.015
66Animas028.1	6/3/2024	0.52	**0.112**
66Animas044.8	6/3/2024	0.43	0.08

Monitoring Station	Date	TN (mg/L)	TP (mg/L)
66Animas028.1	7/31/2024	0.28	0.024
66Animas028.1	10/2/2024	*0.25*	0.022
66Animas044.8	10/2/2024	*0.25*	0.026
66Animas028.1	4/2/2025	**0.34**	0.034
66Animas044.8	4/2/2025	**0.31**	0.025
66Animas028.1	6/9/2025	**0.43**	0.052
66Animas044.8	6/9/2025	*0.3*	0.045
66Animas028.1	10/1/2025	**0.36**	0.05
66Animas044.8	10/1/2025	**0.33**	0.043
Median TN:		0.39	
Median TP:		0.035	
Max Delta DO:		**7.51**	

La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd) – NM-2402.A_01
Monitoring Station(s): LA PLATA RIVER AT LA PLATA, NM – 67LaPlat024.8
Applicable Thresholds: TN (Moderate) 0.42 mg/L, TP (Flat-Moderate) 0.061 mg/L, Delta DO 4.08 mg/L

Monitoring Station	Date	TN (mg/L)	TP (mg/L)
67LaPlat024.8	3/23/2017	**0.82**	MDP
67LaPlat024.8	5/3/2017	**0.63**	0.022
67LaPlat024.8	7/12/2017	0.4	0.018
67LaPlat024.8	9/7/2017	**0.42**	0.035
67LaPlat024.8	10/17/2017	*0.3*	0.016
67LaPlat024.8	3/14/2018	**0.62**	0.052
67LaPlat024.8	5/9/2018	**0.49**	**0.07**
67LaPlat024.8	7/11/2018	0.39	0.026
67LaPlat024.8	8/22/2018	**0.63**	0.035
Median TN:		**0.49**	
Median TP:		0.031	
Max Delta DO:		**6.76**	

Navajo River (Jicarilla Apache Nation to CO border) – NM-2407.A_00
Monitoring Station(s): Navajo River upstream of Jicarilla Bnd – 64Navajo022.1
Applicable Thresholds: TP (NMAC 20.6.4.407 Site Specific) 0.1 mg/L

Monitoring Station	Date	TP (mg/L)
64Navajo022.1	3/22/2017	**0.298**
64Navajo022.1	5/2/2017	**0.123**
64Navajo022.1	7/11/2017	0.073
64Navajo022.1	9/6/2017	0.06
64Navajo022.1	10/17/2017	0.089
64Navajo022.1	3/13/2018	**0.11**
64Navajo022.1	5/8/2018	**0.101**
64Navajo022.1	7/10/2018	0.078
64Navajo022.1	8/21/2018	0.042

Monitoring Station	Date	TP (mg/L)
64Navajo022.1	9/4/2018	0.082

Sedimentation data

Exceedances of the applicable indicator thresholds are shown in **bold red** font.

San Juan River (Navajo bnd at Hogback to Animas River) – NM-2401_10
Monitoring Station(s): SAN JUAN R AT HOGBACK – 67SanJua065.3
San Juan River at Lions Park near Kirtland - 67SanJua088.1
Applicable TSS indicator threshold: 60.23 mg/L

Monitoring Site	Date	TSS (mg/L)	Turbidity (NTU)
67SanJua065.3	3/23/2017	**301**	213.6
67SanJua088.1	3/23/2017	**232**	132.7
67SanJua065.3	5/3/2017	**165**	82.1
67SanJua088.1	5/3/2017	**128**	56.5
67SanJua065.3	7/12/2017	33	16.6
67SanJua088.1	7/12/2017	10	5.3
67SanJua065.3	9/7/2017	**104**	63.9
67SanJua088.1	10/18/2017	27	154.6
67SanJua065.3	10/18/2017	**280**	158.1
67SanJua065.3	3/14/2018	27	18.8
67SanJua088.1	3/14/2018	41	21.1
67SanJua065.3	5/9/2018	**102**	63
67SanJua088.1	5/9/2018	**375**	161.9
67SanJua065.3	7/11/2018	**211**	161.9
67SanJua065.3	8/22/2018	**1580**	477.6
67SanJua088.1	8/22/2018	*26500**	1156.7
67SanJua065.3	10/25/2018	**591**	545
67SanJua088.1	10/25/2018	**235**	198.1
67SanJua088.1	6/15/2022	50	--
67SanJua088.1	10/12/2022	**230**	--
67SanJua088.1	4/5/2023	**462**	--
67SanJua088.1	6/7/2023	**113**	--
67SanJua088.1	10/4/2023	42	--
67SanJua088.1	4/2/2024	3	--
67SanJua088.1	6/5/2024	**92**	--
67SanJua065.3	8/1/2024	**177**	--
67SanJua088.1	9/30/2024	**171**	--
67SanJua065.3	10/3/2024	**102**	--
67SanJua088.1	4/2/2025	**67**	--
67SanJua088.1	6/9/2025	**137**	--
67SanJua088.1	9/30/2025	**384**	--

**This value was deemed to be an outlier due to a storm event and was not included in determining the TSS indicator value.*
-- Turbidity data was not collected during San Juan Multijurisdictional Monitoring (Dates 2022-2025)

Total Recoverable Selenium Data

Exceedances of the applicable criteria are shown in **bold red** font.

Gallegos Canyon (San Juan River to Navajo bnd) – NM-9000.A_060
Monitoring Station(s): Gallegos Canyon at San Juan River – 64Galleg000.4
Water Quality Criterion: 0.005 mg/L

Monitoring Site	Date	Total Recoverable Selenium (mg/L)
64Galleg000.4	3/23/2017	**0.009**
64Galleg000.4	7/11/2018	**0.01**
64Galleg000.4	10/25/2018	**0.008**

Temperature data

Exceedances of the applicable criteria are shown in **bold red** font.

Animas River (Estes Arroyo to So. Ute Indian Tribe bnd) – NM-2404_00

Thermograph Location	Designated ALU	Chronic Criterion (°C)	Measured Chronic (°C)	T_{MAX} Criterion (°C)	Date of Measured T_{MAX}	Measured T_{MAX} (°C)
Animas River above Estes Arroyo - 66Animas028.1	Coolwater Aquatic Life	N/A	23.12	29	9/5/2018	27.94

Los Pinos River (Navajo Reservoir to CO border) – NM-2407.A_10

Thermograph Location	Designated ALU	Chronic Criterion (°C)	Measured Chronic (°C)	T_{MAX} Criterion (°C)	Date of Measured T_{MAX}	Measured T_{MAX} (°C)
Los Pinos River above Navajo Reservoir - 64LosPin021.7	Coldwater Aquatic Life	20 (6T3)	**26.744**	24	7/21/2018	**28.87**
Los Pinos River above Navajo Reservoir - 64LosPin021.7	Coldwater Aquatic Life	20 (6T3)	**25.331**	24	7/19/2017	**27.19**

APPENDIX C
MS4 JURISDICTIONAL AREA APPROACH

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

> *"Jurisdictional area: loading capacity is allocated to permitted stormwater sources (and other land-based sources) on the basis of the portion of the drainage area included within their physical boundary. Without knowing the specific area draining to a stormwater conveyance system, the stormwater source area can be represented by the jurisdictional or operational area of the source (e.g., urbanized area for an MS4). For example, if the loading capacity is 100 lbs/day and the urbanized area of an MS4 represents 30 percent of the area draining to the assessment location, the MS4 WLA is specified as 30 lbs/day."*
>
> (TMDLs to Stormwater Permits Handbook, 2008, p. 80)

The excerpts from the TMDLs to Stormwater Handbook provide the framework from which SWQB developed the WLA for the Phase II sMS4 permittees for each impaired Assessment Unit. The following explanation provides additional detail on these jurisdictional area calculations.

Determination of Contributing Watershed and Urbanized Areas

For the purposes of the sMS4 WLA determinations, the total watershed area for each AU was first determined via USGS StreamStats v.4.31.1, using the most downstream point of the assessment unit (AU) as the watershed pour point. The contributing watershed area for each AU was then determined by subtracting out upstream AU(s) contributing watershed. The urbanized area per each AU was determined using the unionized 2000 and 2010 Census data GIS coverages and is the urbanized area within each resultant contributing watershed area. Both watershed and urbanized area determinations for the three AUs are presented in **Table C.1**.

Phase II Permit Jurisdictional Area Approach

The sMS4 permittees eligible for coverage under the general Phase II MS4 permit are discussed in **Sections Sections ALUMINUM § 2.3.2, *E. COLI* § 3.3.2, NUTRIENTS & TOTAL PHOSPHORUS § 4.3.2, SEDIMENTATION § 5.3.2 and TEMPERATURE § 7.3.2**. The Phase II sMS4 permit (NMR04000) reads:

> *"This permit may authorize stormwater discharges to waters of the United States from small MS4s within New Mexico provided the MS4… is located fully or partially within an urbanized area in New Mexico as determined by the 2000 and 2010 Decennial Census."*

Percent Jurisdictional area per AU is determined as follows:

> Urbanized Area ÷ Contributing Watershed Area = % Jurisdictional Area

Table C.1 MS4 Jurisdictional Areas

Assessment Unit	Urbanized Area (mi^2)	Contributing Watershed Area (mi^2)	Percent Jurisdictional Area
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	3.97	149.8	2.65%
Animas River (San Juan River to Estes Arroyo)	20.02	197.32	10.15%
La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)	0.76	57.45	1.32%
San Juan River (Animas River to Canon Largo)	18.26	332.04	5.50%
San Juan River (Navajo bnd at Hogback to Animas River)	12.47	233.6	5.34%
Stevens Arroyo (Perennial prts San Juan R to headwaters)	5.38	130.37	4.13%

These calculations are summarized in **Sections ALUMINUM § 2.3.2, *E. COLI* § 3.3.2, NUTRIENTS & TOTAL PHOSPHORUS § 4.3.2, SEDIMENTATION § 5.3.2 and TEMPERATURE § 7.3.2**. The Phase II sMS4 WLA values used in the TMDL document were calculated using these percentages. The remaining percentage was designated for nonpoint sources and natural background as the load allocation. The TMDLs were calculated as described in **Tables 2.3, 3.3, 4.4, 5.6 and 7.4**. From this calculated TMDL value, the Margin of Safety (MOS) and any NPDES permits were subtracted. In order to calculate the Phase II sMS4 permit WLAs, the percentages derived using the jurisdictional area approach were applied to the remaining TMDL quantity. The WLA values for NMR040000 (Phase II sMS4s) are listed in **Tables 2.6, 3.6, 4.7, 5.9 and 7.6**.

For example, the *E. coli* WLA for the San Juan River (Animas River to Canon Largo) AU was calculated as follows:

[TMDL] – [MOS] – [Individual NPDES WLA] = [available for LA and sMS4 WLA]

$(9.56 \times 10^{11}) - (9.56 \times 10^{10}) - (4.44 \times 10^{9}) = 8.56 \times 10^{11}$ cfu/day

The sMS4 WLAs were assigned as a percentage of the LA.

Phase II sMS4 WLA = 5.50%, therefore;

NMR04000 WLA = $0.055 \times 8.56 \times 10^{11}$ cfu/day = 4.71×10^{10} cfu/day

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

[TMDL] – [MOS] – [NPDES WLA] – [MS4 WLA] = [LA]

$(9.56 \times 10^{11}) - (9.56 \times 10^{10}) - (4.44 \times 10^{9}) - (4.71 \times 10^{10}) = 8.09 \times 10^{11}$ cfu/day

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

The loading factor was calculated by dividing the combined existing sMS4 allocation and load allocation by the contributing watershed area. The following equation was used for the calculation:

([sMS4 WLA] + [LA]) ÷ [Contributing Area] = Loading Factor

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

Assessment Unit	sMS4 WLA + LA (lbs/day)	Total Contributing Area (mi^2)	Per area aluminum loading (lbs/day/mi^2)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	528.94	149.80	3.53
Animas River (San Juan River to Estes Arroyo)	1394.27	197.32	7.07
San Juan River (Animas River to Canon Largo)	3320.44	332.04	10.00
San Juan River (Navajo bnd at Hogback to Animas River)	5494.70	233.60	23.52

Table C.3 *E. Coli* Loading Factors Based on Contributing Areas and sMS4 WLA+LA

Assessment Unit	sMS4 WLA + LA (cfu/day)	Total Contributing Area (mi^2)	Per area *E. coli* loading (cfu/day/mi^2)
La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)	1.29×10^{8}	57.45	2.25×10^{6}
San Juan River (Animas River to Canon Largo)	8.56×10^{11}	332.04	2.58×10^{9}

Assessment Unit	sMS4 WLA + LA (cfu/day)	Total Contributing Area (mi^2)	Per area *E. coli* loading (cfu/day/mi^2)
San Juan River (Navajo bnd at Hogback to Animas River)	1.01×10^{12}	233.60	4.32×10^{9}
Stevens Arroyo (Perennial prts San Juan R to headwaters)	4.92×10^{7}	130.37	3.77×10^{5}

Table C.4 Nutrient Loading Factors Based on Contributing Areas and sMS4 WLA+LA

Assessment Unit	Parameter	sMS4 WLA + LA (lbs/day)	Total Contributing Area (mi^2)	Per area Nutrient loading (lbs/day/mi^2)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	Total Nitrogen	59.61	149.80	2.51
	Total Phosphorus	22.65		6.61
La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)	Total Nitrogen	0.099	57.45	1.72×10^{-3}
	Total Phosphorus	0.018		3.13×10^{-4}

Table C.5 Sedimentation Loading Factors Based on Contributing Areas and sMS4 WLA+LA

Assessment Unit	sMS4 WLA + LA (lbs/day)	Total Contributing Area (mi^2)	Per area sediment loading (lbs/day/mi^2)
San Juan River (Navajo bnd at Hogback to Animas River)	87,810.95	233.60	375.90

Table C.6 Temperature Loading Factors Based on Contributing Areas and sMS4 WLA+LA

Assessment Unit	sMS4 WLA + LA (kJ/day)	Total Contributing Area (mi^2)	Per area aluminum loading (kJ/day/mi^2)
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	7.63×10^{9}	149.80	5.09×10^{7}

References:

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

______. 2008. TMDLs to Stormwater Permits Handbook (draft). Washington, D.C. Available online at https://www.epa.gov/tmdl/tmdls-stormwater-permits-draft-handbook.

APPENDIX D
SOURCE DOCUMENTATION

The approach for identifying probable sources of impairment is documented in SWQB Standard Operating Procedure (SOP) 4.1, Probable Source(s) Determination (https://www.env.nm.gov/surface-water-quality/sop/). "Sources" are defined as activities that may contribute pollutants or stressors to a water body (USEPA, 1997). The list of "Probable Sources of Impairment" in the Integrated 303(d)/305(b) List, Total Maximum Daily Load documents (TMDLs), and Watershed-Based Plans (WBPs) is intended to include any and all activities that could be contributing to the identified cause of impairment, which are supported by evidence strong enough to establish presumption but not proof. Probable Source categories are selected from Appendix A of SOP 4.1, which was adapted from the EPA ATTAINS database.

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

Any new impairment listing will be assigned a Probable Source of "Source Unknown." During sampling events, Monitoring Team staff select applicable Probable Sources from a drop-down menu on the Stream/River Field Data Form. Information gathered by the Monitoring Team is used to generate a draft Probable Source list in consequent TMDL planning documents. The TMDL writer then revises the list using aerial imagery, Geographic Information System data, and other available records. The list is also reviewed by Watershed Protection Section staff with knowledge of the AU and watershed. These draft Probable Source lists will be finalized with watershed group/stakeholder input during the pre-survey public meeting, TMDL public meeting, WBP development, and various public comment periods. The Probable Source list in the approved TMDL will be used to update the subsequent Integrated List.

Data on Probable Sources gathered by Monitoring and Assessment Section staff and Watershed Protection Section staff during water quality surveys and watershed restoration projects is housed in the NMED Surface Water Quality Information Database (SQUID). More specific information on Probable Sources of Impairment is provided in individual watershed planning documents (e.g., TMDLs, WBPs, etc.) as they are prepared to address individual impairments by AU.

Literature Cited:

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

APPENDIX E
CALCULATION OF TEMPERATURE TMDL

Calculation of Temperature TMDL

Problem Statement: Convert Temperature Criteria into a Daily Load

Background

The temperature of water is essential for proper metabolic regulation in the aquatic community. Water at a given temperature has a thermal mass that can be represented in units of energy (thermal energy). There are a variety of sources of temperature loading to a waterbody, including air temperature, solar radiation and point source discharge (if present). In addition, how the temperature loading to a stream is translated to the thermal mass of the stream is dependent on its hydrologic characteristics and condition of riparian area (i.e., shading).

The calculation of a TMDL target is governed by the basic equation,

Eq1. *WQS criterion * flow * conversion factor = TMDL target capacity*

For Temperature TMDLs, the WQS criterion is a temperature specified either by the designated Aquatic Life Use (ALU) or site-specific criteria and can be either a maximum temperature or time-duration temperature such as the 4T3 or 6T3.

Flow will generally use the 4Q3 low-flow for the critical flow unless another flow statistic or multiple flow conditions are more appropriate for the situation.

The conversion factor is a variable needed to 1) convert units used by SWQB for flow (in cfs) to cubic meters (m^3) and 2) convert change in water temperature (C) to a volumetric heat capacity (kJ/(m^3*C).

Calculation of Thermal Energy

The thermal loading capacity of a volume is governed by the following equation,

Eq2. *thermal energy = specific heat capacity * mass * change in temperature*

Specific heat capacity is the amount of energy needed to raise the temperature of one kilogram of a substance by 1 degree Celsius.

Mass can be replaced by volume via density.

Accepted Scientific Units for the variables above are:

thermal energy = kilojoule (kJ) (calories are less common and considered archaic)

specific heat capacity = kJ/(kg*C)

mass = kilograms (kg)

change in temperature = Celsius (C)

The specific heat capacity of water at 25^{o}C = 4.182 kJ/(kg*C). This is the isobaric (under constant pressure) value for heat capacity at an absolute atmospheric pressure of 585 mmHg. Note: varying water temperature and absolute pressure to minimum and maximum ambient values has negligible effect on the resulting heat capacity.

Calculation of Conversion Factor

Flow (cfs) to (m^3/day)

Eq3. 1 cf/s * 86,400 s/day * 0.0283 m^3/cf = 2445.12 m^3/day

Heat Capacity to Volumetric Heat Capacity

Eq4. 4.182 kJ/(kg*C) * 1000 kg/m^3 = 4,182 kJ/(m^3*C)

Note: water density varies with temperature but only by a fraction of a percent.

Conversion Factor = 2445.12 m^3/day * 4,182 kJ/(m^3*C) = 1.023E+07 kJ/(day*C)

Form of TMDL Equation

Eq5. Δ [**ºC**] x [**cfs]** x 1.023E+07 = TMDL (kJ/day)

Input variables in **bold**, Δ**ºC** = (WQC - 0**ºC)** and **cfs** = critical flow

The resulting value is the increase in kJ/day above 0º Celsius.

APPENDIX F
RESPONSE TO COMMENTS