

# AMAFCA Technical Standards Manual

*Prepared for*  
Albuquerque Metropolitan Arroyo  
Flood Control Authority



October 2024

# AMAFCA Technical Standards Manual

*Prepared for*

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Flood Control Authority**  
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October 2024 | 564-6279-002

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# Acronyms and Abbreviations

AHYMO	Arid Lands HYdrology MOdel
AMAFCA	Albuquerque Metropolitan Arroyo Flood Control Authority
BMPs	Best Management Practices
CABQ	City of Albuquerque
CM	Construction Management
CO-NM	Colorado-New Mexico
CWA	Clean Water Act
DBE	Disadvantaged Business Enterprise
DMP	Drainage Management Plan
DPM	Development Process Manual
EEO	Equal Employment Opportunity
EGL	Energy Grade Line
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FF	Finished Floor
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
fps	feet per second
HEC-HMS	Hydrologic Engineering Center - Hydrologic Modeling System
HEC-RAS	Hydrologic Engineering Center River Analysis System
NFIP	National Flood Insurance Program
NMDOT	New Mexico Department of Transportation
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
OSE-DSB	Office of the State Engineer-Dam Safety Bureau
PMP	Probable Maximum Precipitation
REPS	Regional Extreme Precipitation Study
RFI	Request for Information

## Acronyms and Abbreviations (continued)

ROW	right-of-way
SCS	Soil Conservation Service
SPF	standard project flood
STS	Supplemental Technical Specifications
SWMM	Stormwater Management Model
SWMP	Stormwater Management Program
SWPPP	Stormwater Pollution Prevention Plan
SWQV	Stormwater Quality Volume
USACE	U.S. Army Corps of Engineers
WSE	water surface elevation

# 1. Introduction

## 1.1 Purpose

This Technical Standards Manual provides policies, standard practices, criteria, guidance, and references for use in carrying out drainage designs, studies, and analysis for the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA). This information serves as a supplement to the engineering analysis and judgement that should be applied to all drainage projects.

This manual is not intended to replace the technical manuals referenced or to be a textbook for hydrology, hydraulics, scour, etc. It is intended to guide users and designers with the goal of standardizing the analysis and design process for AMAFCA projects and projects that discharge to or are adjacent to AMAFCA's flood control facilities.

## 1.2 Intended Users

This Technical Standards Manual is intended to be used by AMAFCA employees, partner agencies, consultants, developers, and property owners involved with the planning and design of AMAFCA projects and projects that discharge to or are adjacent to AMAFCA's flood control facilities.

### 1.2.1 Development-Specific Requirements

AMAFCA has developed specific requirements for projects that are developed by private entities. These requirements are described below.

AMAFCA must review and approve drainage reports and/or grading and drainage plans for private developments, as follows:

- The property being developed is located adjacent to an AMAFCA facility.
- The property is proposing to discharge stormwater to an AMAFCA facility.
- The property contains an AMAFCA easement within the property limits.
- The property lies within a Drainage Management Plan (DMP) (see [Section 3.3.5](#)).
- The property may have a regional impact that may affect AMAFCA facilities.

For structures being constructed within a Federal Emergency Management Agency (FEMA) floodplain, the structures must be in compliance with the respective National Flood Insurance Program (NFIP) Community flood ordinance (i.e., City of Albuquerque [CABQ] or Bernalillo County). Per CABQ and Bernalillo County ordinance, the Finished Floor (FF) elevation must be at least 1 foot above the 100-year water surface elevation (WSE) taken at the most upstream section of the structure based on the required hydraulic analysis. The minimum elevation for any electrical or mechanical equipment is the house FF elevation. Nonhabitable structures such as garages or sheds are not held to this same standard as long as they remain nonhabitable.



## 1.3 Description of Chapters

Each chapter of this Technical Standards Manual covers a major category of anticipated project work.

Federal and state laws, codes, and external design guidance are presented up front in each chapter as they relate to the specific subject matter.

Hyperlinks to other chapters are provided to make users aware of related information in a different category of work. Also, where appropriate, references and web links to outside resources are provided.

Where applicable, the chapters conclude with a list of the documentation and references that accompanies the design process for that category of work.

## 1.4 Updates

This Technical Standards Manual was prepared and reviewed by a team of AMAFCA engineers and consultant staff, and first released for use in October 2024. AMAFCA encourages each user of this Technical Standards Manual to contribute to its continuing improvement by submitting suggestions to make it more useful and practical. Comments on this Technical Standards Manual should be sent to:

AMAFCA  
2600 Prospect Avenue  
Albuquerque, NM 87107  
licensing@amafca.org

Approved changes will be incorporated into future updates as needed. As changes in policies, standards and/or criteria occur, modifications will be made electronically and the revised manual posted on the AMAFCA website. The most recent electronic version of the Technical Standards Manual available online will be considered the official document upon beginning contracts with consultants.

Adding new or modifying criteria to this Technical Standards Manual through the revision process does not imply that existing features are deficient or mandate immediate engineering review or initiation of new projects.

## 2. Applicable Policies and References

### 2.1 Federal

- Clean Water Act (CWA):

- General Permit for MS4s in the Middle Rio Grande Watershed in New Mexico (NMR04A000).

This National Pollutant Discharge Elimination System (NPDES) general permit offers discharge authorization to regulated MS4s within the boundaries of the Census-designated Albuquerque Urbanized Areas. The MS4 permit requires the development and implementation of a Stormwater Management Program (SWMP). This SWMP should include the testing, monitoring, cleaning, and treatment of stormwater. Other requirements include the planning of legal authority and pollution prevention in the stormwater discharge. AMAFCA is authorized to discharge stormwater under this permit.

- Environmental Protection Agency (EPA) NPDES Construction General Permit.

This permit is a NPDES permit issued under the authority of the CWA for those areas where EPA is the NPDES permitting authority. The permit requires operators of construction sites to implement stormwater controls and develop a Stormwater Pollution Prevention Plan (SWPPP) to minimize the amount of sediment and other pollutants from being discharged in stormwater runoff. Additional requirements include a Notice of Intent (NOI) and various testing and documentation of site conditions during the various construction phases.

- FEMA:

FEMA is the official source for flood hazard information produced in support of the NFIP. FEMA maps are continually updated and the most recent information can be found at the FEMA Flood Map Service Center. There are two NFIP communities within AMAFCA's jurisdiction: The City of Albuquerque and Bernalillo County.

- U.S. Army Corps of Engineers:

The U.S. Army Corps of Engineers (USACE) designed and constructed the North Diversion Channel, South Diversion Channel, and certain facilities in the Southwest Valley that AMAFCA now maintains. Projects within AMAFCA's jurisdiction may need to comply with all or some of the following regulations:

- Section 404 of the CWA – This program regulates the discharge of dredged or fill material into waters of the United States, including wetlands. For most discharges that will have only minimal adverse effects, a general permit may be suitable. General permits are issued on a nationwide, regional, or state basis for particular categories of activities.
- Section 408 program – This program allows another party, such as a local government, company, or individual, to alter a USACE Civil Works project.
- Public Law-84-99, Emergency Response to Natural Disasters – This provides authority to USACE to provide emergency activities in support of state and local governments prior to, during, and after a flood event.

## 2.2 New Mexico State

- Office of the State Engineer-Dam Safety Bureau (OSE-DSB) requirements for jurisdictional dams:

→ “96-hour rule” for detention facilities.

This rule states that if a flood control dam does not drain within the 96-hour period, a water right to permanently store the water not drained is required unless a waiver is obtained.

→ Rules and Regulations Governing Dam Design, Construction and Dam Safety, December 2010.

This regulation identifies standard designs and construction for all jurisdictional dams in the state of New Mexico, as well as operation and maintenance guidance. This regulation also identifies guidance for alteration, construction, repair, removal, security, and emergencies regarding jurisdictional dams.

→ Guidelines for Hydrologic Analysis for Dams, June 2021.

This guidance document provides a technical guide for dam safety engineers. It contains considerations and guidelines that are intended to establish consistency in the analysis and review of hydrologic studies for dam safety projects in New Mexico.

- Initial and Interim Use of Regional Extreme Precipitation Study (REPS) Tools for Probable Maximum Precipitation (PMP) and Annual Exceedance Probability Rainfall Estimate.

This document was prepared by the NM OSE-DSB for the determination of PMP frequency estimates.

- Minimum Standards for Surveying in New Mexico as adopted by the Board of Licensure for Professional Engineers and Professional Surveyors.

This document establishes a minimum standard of professional competency regarding the performance of surveying and survey-related services by licensed professional surveyors in New Mexico.

## 2.3 New Mexico Department of Transportation

- Drainage Design Manual July 2018.

This manual identifies standard methods of hydrologic and hydraulic analysis that should be used for all projects within New Mexico Department of Transportation’s (NMDOT) jurisdiction. A brief description of each analysis method is included in the Drainage Design Manual, followed by a step-by-step procedure that explains how to apply the method. Example problems and limitations on the use of each analysis method are included to assist the drainage designer.

- NMDOT Standard Specifications for Highway and Bridge Construction (as accepted or amended by AMAFCA).

These specifications define procedures for the construction of highways and bridges that are under NMDOT jurisdiction.

- NMDOT Standard Drawings for Highway and Bridge Construction (as accepted or amended by AMAFCA).

These are detailed drawings developed and approved for specific items for use on NMDOT projects.

## 2.4 AMAFCA

- AMAFCA Drainage Policy, as currently adopted by the AMAFCA Board of Directors.

This document defines the design and construction of drainage facilities in AMAFCA's jurisdiction. The document also highlights the role of AMAFCA in the design process.

- AMAFCA Sediment and Erosion Design Guide, November 1994.

This manual provides guidance for drainage design in the Albuquerque area, specifically regarding arroyos and other sediment features. This manual also provides guidance for establishing erosion limit lines (prudent line) and where erosion barriers should be built to maintain naturalistic arroyos while protecting adjacent property.

- AMAFCA Design Guide for Riprap-Lined Channels, December 1983.

This guide includes criteria and standards for the design and construction of dumped riprap-lined channels in the Albuquerque metropolitan area. The design guide is intended to provide general guidance.

- AMAFCA Design and Policy Guide for Utility Crossings of Flood Control Channels, as currently updated.

This guide was developed in 1983 as a resource for local governmental agencies, utility companies, developers, and consultants who desire to construct utility facilities within the limits of an AMAFCA facility right-of-way (ROW). This guide provides uniform policies and design criteria under which existing, proposed, adjusted, or relocated utilities may be accommodated. The guide applies to all public, private, and cooperative utilities, including electric power, telephone, cable, water, gas, oil, petroleum products, steam, chemicals, sewer, drainage, irrigation, or similar lines.

- Facility Usage and Reimbursement Schedule, as currently adopted by the AMAFCA Board of Directors.

This resolution allows usage of AMAFCA facilities by members of the public, private businesses, government entities, and others if authorized by the AMAFCA Executive Engineer or Board of Directors. In addition, it provides a schedule and guidance for reimbursement related to the use of those facilities.

## 2.5 Bernalillo County

- Drainage County Code, Chapter 38 - Floods.

Chapter 38 of the Drainage County Code defines storm drainage and storm runoff and provides standards for the design of stormwater control infrastructure in Bernalillo County.

- Bernalillo County Technical Standards, as currently updated by Bernalillo County.

These standards provide guidance for transportation and drainage design in the Bernalillo County area. This document includes green stormwater infrastructure standards, transportation network requirements, grading and drainage requirements, and public works submittal requirements.

- Effective Drainage Master Plans/Facility Plans.

Local drainage authorities have adopted regional drainage master plans to manage runoff in existing and developed conditions. In addition, the regional drainage master plans identify the need for drainage infrastructure as the watershed develops. A list of Drainage Master Plans/Facility Plans can be requested from any of the agencies.

## 2.6 City of Albuquerque

- Flood Hazard and Drainage Control Ordinance.

The purpose of this ordinance is to promote public health, safety, and welfare by minimizing public and private losses due to flood conditions. It includes methods and provisions for protecting facilities against flood damage; controlling the alteration of natural floodplains and stream channels; controlling filling, grading, dredging or other development which may increase flood damage; and regulating the construction of flood barriers which divert flood waters.

- CABQ Development Process Manual (DPM)., as currently updated by the City of Albuquerque.

→ Chapter 4, Construction Plan Standards, provides standards for drafting and plan production.

→ Chapter 6, Drainage, Flood Control, and Erosion Control, provides standards, guidelines, and criteria to facilitate the planning, design, construction, and operation of both public and private drainage control, flood control, stormwater quality, and erosion control facilities within the CABQ.

- Effective Drainage Master Plans/Facility Plans.

Local drainage authorities have adopted regional drainage master plans to manage runoff in existing and developed conditions. In addition, the regional drainage master plans identify the need for drainage infrastructure as the watershed develops. A list of Drainage Master Plans/Facility Plans can be requested from any of the agencies.

- The City of Albuquerque Standard Specifications for Public Works Construction, as currently updated by the City of Albuquerque.

These specifications are for construction projects within CABQ.

## 3. Hydrology

### 3.1 Introduction

Hydrologic analysis considers the physical processes in a watershed that convert precipitation to runoff. Hydrologic analyses are required for the evaluation of the hydraulic capacity of existing and proposed facilities (see Chapter 4).

#### 3.1.1 References

The following documents should be used for reference regarding hydrologic analysis for AMAFCA projects. These documents may be updated over time. Designers should use or reference the most recent version when following these design documents. See Chapter 2 for more detailed reference information.

- NMDOT Drainage Design Manual.
- Bernalillo County Technical Standards, Chapter 4, Drainage.
- CABQ DPM, Chapter 6, Drainage, Flood Control, and Erosion Control.
- Initial and Interim Use of REPS Tools for PMP and Annual Exceedance Probability Rainfall Estimate.

### 3.2 Approach

Designers need to first determine which jurisdiction their project is located within (CABQ, Bernalillo County, NMDOT, other others). Projects located within the CABQ or Bernalillo County will use the design standards associated with that jurisdiction (see [Section 3.1.1, References](#)). Projects on NMDOT-owned or maintained roadways will use the NMDOT design standards described in the NMDOT Drainage Design Manual.

AMAFCA may require more stringent criteria than the NMDOT, CABQ, or Bernalillo County based on their engineering judgement. See [Section 3.3, AMAFCA-Specific Requirements](#), for more information.

### 3.3 AMAFCA-Specific Requirements

This section details AMAFCA-specific requirements that may differ from the design standards of CABQ, Bernalillo County, NMDOT, or others. It is the responsibility of the designer to determine which standards are appropriate. A discussion with AMAFCA staff may be prudent before starting the drainage design process to ensure that the correct design criteria and standards will be met.

#### 3.3.1 Acceptable Programs

Several programs are available for hydrologic analysis. Designers should establish which version of the program they are using to ensure they are using the same version as AMAFCA to ensure compatibility with results. The following are acceptable to AMAFCA:

- Hydrologic Modeling System (HEC-HMS) – This program was developed by the USACE and is designed to simulate the complete hydrologic processes of dendritic watershed systems. It is widely used, in the public domain, and well-documented and supported. In addition, the program, the User’s Manual, and instructional materials such as tutorials and guides are available as free downloads from the USACE Hydrology Engineering Center.

- AutoCAD – AutoCAD tools can be used for watershed basin delineation. In addition, Autodesk Storm and Sanitary Analysis is a software modeling package for analyzing and designing urban drainage systems, stormwater sewers, and sanitary sewers that is available as an add-on component in the Civil 3D software package. Storm drain systems must be compliant with CABQ DPM; see [Section 4.3.5, Storm Drain](#), for more information.
- ArcGIS – There are various ArcGIS tools available for watershed and basin delineation.
- Spreadsheet tools – The CABQ and the NMDOT both have methods for hydrologic modeling for smaller basins that can be completed without using a specialized hydrologic modeling program. Spreadsheets are the standard tool for tabulating and completing calculations for those methods.
- Arid Lands HYdrology MOdel (AHYMO) is no longer acceptable to AMAFCA. For analysis that previously used AHYMO models, a comparison of peak discharge and discharge volumes is required to compare between AHYMO and the current analysis.

### 3.3.2 Storm Frequency

The minimum requirement for all AMAFCA impacted projects, as well as any FEMA analyses, is the 24-hour, 100-year-design storm. The 6-hour, 100-year storm (or other storm frequencies or durations) may be used only as required by other agencies, such as the CABQ or NMDOT, as it relates to closed conduit and/or street drainage analysis.

When using hydrologic software programs such as HEC-HMS, the rainfall distribution must be the 25% Frequency Distribution (required for Soil Conservation Service (SCS) Unit Hydrograph analysis). Rainfall data should be obtained from the National Oceanic and Atmospheric Administration (NOAA) Precipitation Frequency Data Server for the specified flood frequency and watershed under investigation. Point precipitation frequency data should be taken at the centroid of the watershed unless the size of the watershed necessitates the need for additional point precipitation locations to accurately determine the rainfall for the watershed.

### 3.3.3 500-Year or Standard Project Flood Facilities

Several AMAFCA facilities were initially analyzed using less-frequent or higher-risk standards than the 100-year storm. The 500-year storm or standard project flood (SPF) must be used for any design that modifies the following facilities; this can include crossing structures, armoring, culvert connections, etc.:

- Boca Negra Arroyo.
- Calabacillas Arroyo (Main Branch).
- North and South Diversion Channels.
- Tijeras Arroyo.

When these facilities are identified in the project, designers should have a discussion with AMAFCA prior to undergoing analyses.

### 3.3.4 Jurisdictional Dams

The OSE-DSB ensures that dams in New Mexico are designed, constructed, operated, and maintained as safely as possible. Dams that equal or exceed 25 feet in height, which exceed 15 acre-feet of storage, or dams that equal or exceed 50 acre-feet of storage which equal or exceed 6 feet in height are under the jurisdiction of the State Engineer.

Detention and retention ponds frequently meet the OSE definitions of a dam. Designers should check the OSE requirements when designing ponds to verify whether additional design considerations may apply to their project.

The OSE-DSB has developed Colorado-New Mexico (CO-NM) Regional Extreme Precipitation tool for PMP storm that must be used when designing facilities that meet the definition of a jurisdictional dam. This tool and the associated report can be found on the OSE website (<https://www.ose.nm.gov/dams/conmpf.php>).

### **3.3.5 Applicable Regional Drainage Management Plans**

DMPs serve as a high-level starting point for site-specific analysis. Users should determine whether their project is within a DMP before starting any analysis. Projects within a DMP frequently require more detailed hydrologic analysis as stated in the DMP. The DMP requirements may be more stringent than CABQ, NMDOT, or Bernalillo County requirements.



## 4. Hydraulics

### 4.1 Introduction

Hydraulic analysis refers to designing the hydraulic structures used to convey, guide, and control water flow. A hydrologic analysis (see Chapter 3) should first be performed to ensure the proper flows are used in the hydraulic analysis discussed in this chapter.

#### 4.1.1 References

The following documents should be used for reference regarding hydraulic analysis for AMAFCA projects. These documents may be updated over time. Designers should use or reference the most recent version when following these design documents. See Chapter 2 for more detailed reference information.

- NMDOT Drainage Design Manual.
- Bernalillo County Technical Standards, Chapter 4, Drainage.
- CABQ DPM, Chapter 6, Drainage, Flood Control, and Erosion Control.

### 4.2 Approach

Designers need to first determine which jurisdiction their project is located within (CABQ, Bernalillo County, NMDOT, and others). Projects located within the CABQ or Bernalillo County will use the design standards associated with that jurisdiction (see [Section 3.1.1, References](#)). Projects on NMDOT-owned or maintained roadways will use the NMDOT design standards described in the NMDOT Drainage Design Manual.

AMAFCA may require more stringent criteria than the NMDOT, CABQ, or Bernalillo County based on their engineering judgement. See [Section 4.3, AMAFCA Specific Requirements](#), for more information.

Comprehensive data collection minimizes the assumptions required for hydraulic analysis. Field surveys, site visits, as-builts, and past reports are all important information that should be collected and reviewed prior to starting the hydraulics design for a project.

### 4.3 AMAFCA Specific Requirements

#### 4.3.1 Acceptable Programs

- Hydrologic Engineering Center River Analysis System (HEC-RAS). This program is designed to perform one- and two-dimensional hydraulic calculations for a full network of natural and constructed channels. It was developed for the USACE but is available to the public without charge.
- SRH-2D – A two-dimensional flow hydraulic and mobile-bed sediment transport model for river systems. It was developed at the U.S. Bureau of Reclamation. Designers should discuss with AMAFCA staff before using this program as others may be preferable.

- Federal Highway Administration’s (FHWA) HY-8 – This program automates hydraulic computations for culvert analysis and design. The program is free to download from FHWA’s website and includes a user manual.
- FHWA’s Hydraulic Toolbox – This is a stand-alone suite of calculators that performs routine hydrologic and hydraulic analysis and design computations. The program is free to download from FHWA’s website and includes a reference guide. Specific calculators address Rational Method hydrology, channels, channel linings, weirs, curb and gutter sections, storm drain inlets, detention basins, bridge scour, riprap countermeasures, sediment gradations, and culvert assessments.
- StormCAD (or equivalent) – Gravity storm drain systems only. Must also comply with CABQ or Bernalillo County standards for storm drain design.
- EPA Stormwater Management Model (SWMM) – SWMM is used for planning, analysis, and design related to stormwater runoff, combined and sanitary sewers and other drainage systems such as pipes and storm drains. It is used for single-event or long-term simulations of water runoff quantity and quality in primarily urban areas. SWMM is an open-source public software and is free to download and use, though commercial versions are also available. Commercial versions of SWMM may be used for model development, but all submittals to AMAFCA must be down-saved to the publicly available version.

## 4.3.2 Open Channels

### 4.3.2.1 Flow Regimes

#### Subcritical Flows

Subcritical flow is required for the design of all arroyos with natural, riprap, geogrid, and other semi-permeable linings. Supercritical flows are not allowed for these lining types. Subcritical flows are used to determine flood depths within concrete channels. FEMA analysis must use subcritical flow for WSE and mapping.

#### Supercritical Flows

Supercritical flows are used for scour analysis in natural channels and for transitions from natural to lined channels (or vice versa). In addition, supercritical flows are necessary for the calculation of velocities and the determination of concrete erosivity to design thickened layers in concrete channels.

### 4.3.2.2 Freeboard

Freeboard refers to the additional channel depth above the calculated WSE. For open channels, designers shall use the requirements of the respective jurisdiction (CABQ, NMDOT, or Bernalillo County).

### 4.3.2.3 1-D versus 2-D Hydraulic Modeling

A two-dimensional hydraulic analysis (HEC-RAS 2D or SRH-2D) is required for any reach of an arroyo or channel with no defined primary flow path. This includes braided channels, alluvial conditions, or other areas where a one-dimensional analysis may not accurately represent the hydraulic conditions of the channel or area of flood water accumulation. AMAFCA prefers HEC-RAS 2D for these models but will consider SRH-2D on a case-by-case basis. SRH-2D has capabilities, such as scour analysis, that may make it a better alternative in certain instances. Hydraulic analysis using Flo-2D is not accepted by AMAFCA.

### 4.3.3 Bridges and Crossing Structures

AMAFCA requires that the bridge low-chord elevation be a minimum of 2 feet above the 100-year WSE. If the project is in an area that requires the 500-year flood or SPF be used for the hydraulic analysis, then the requirement is that the low-chord elevation be 2 feet above that WSE.

No driven pile foundations are allowed adjacent to AMAFCA facilities. Drilled shaft or spread footing foundations are acceptable depending on the application.

The excavation prism for abutments, retaining walls, etc. shall be a minimum of 1:1 slope projection from the top of the channel. The slope may be flatter than 1:1 but shall not be steeper. AMAFCA may consider steeper slopes on a case-by-case basis if adequate protections and stabilization are provided. The design shall consider site geotechnical conditions and OSHA trenching requirements.

Piers are allowable if the designer can show that they will have minimal hydraulic impact to the channel conveyance. If piers are proposed in an unlined channel, the design must be analyzed for pier scour per the AMAFCA Sediment and Erosion Design Guide and NMDOT Drainage Manual.

Access must be maintained to all sides of the facility being crossed by the bridge structure. AMAFCA may require additional improvements, such as road surfacing, to ensure access is provided to facility control or maintenance features. Access to the AMAFCA facility must not be adversely affected by road safety requirements such as guard rails or bridge railing. A minimum clearance of 25 feet must be maintained for bridges or crossing structures that cross over an AMAFCA facility or maintenance road.

### 4.3.4 Culverts

Proposed culvert crossings should be designed to maintain the existing drainage pattern and characteristics of the area such as location of the inlet and outlet of the culvert, historic flow depths, velocities, etc. All culverts must have either a pipe end section or headwall. Projecting ends are not permitted.

#### 4.3.4.1 Culvert or Pipe Penetrations

Culverts that discharge to an AMAFCA facility need to have inverts that outfall above the channel 100-year WSE. Inverts below the WSE need to be discussed with AMAFCA and may be approved on a case-by-case basis. An analysis of backwater effects will be required in such cases.

Refer to AMAFCA Standard Details (see Chapter 8) for information and requirements on how and where culverts should connect to AMAFCA channels. In addition, culvert connections to unlined channels are required to have appropriate erosion control (see Chapter 5). Care should be taken in placing culvert connections to ensure access to AMAFCA's facility is not impeded.

### 4.3.5 Storm Drain

AMAFCA does not own or maintain storm drain facilities except in very special circumstances. Storm drains for CABQ, Bernalillo County, or NMDOT facilities should use the respective agency design and analysis requirements.

### **4.3.6 Stormwater Storage Facilities**

The required freeboard for any stormwater storage facility is 2 feet above the 100-year WSE. In lieu of the 2-foot requirement, AMAFCA will consider 1 foot of freeboard above the 500-year WSE if a 500-year analysis is required for the project.

Detention or retention pond facilities that meet the OSE-DSB definition of a jurisdictional dam must meet the OSE-DSB requirements for freeboard. This freeboard does not include wave run up considerations, and additional analysis may be required if applicable.

## 5. Sediment and Erosion Countermeasures

### 5.1 Introduction

Sediment and erosion control is necessary to maintain drainage structures and channels in good condition while also protecting adjacent property and infrastructure.

#### 5.1.1 References

The following documents should be used for reference regarding sediment and erosion control for AMAFCA projects. These documents may be updated over time. Designers should use or reference the most recent version when following these design documents. See Chapter 2 for more detailed reference information.

- NMDOT Drainage Design Manual.
- AMAFCA Design Guide for Riprap-Lined Channels.
- AMAFCA Sediment and Erosion Design Guide.

### 5.2 Approach

Designers need to first determine which jurisdiction their project is located within (CABQ, Bernalillo County, and/or NMDOT). Projects located within CABQ or Bernalillo County will use the design standards associated with that jurisdiction (see [Section 3.1.1, References](#)). Projects on NMDOT-owned or maintained roadways will use the NMDOT design standards described in the NMDOT Drainage Design Manual.

AMAFCA may require more stringent criteria than the NMDOT, CABQ, or Bernalillo County based on their engineering judgement. See [Section 4.3, AMAFCA Specific Requirements](#), for more information.

### 5.3 AMAFCA Specific Requirements

#### 5.3.1 Armoring

Channel armoring to reduce scour and erosion is required if the velocities in the channel or the outlet of the channel are above 5 feet per second (fps). Several options are available for channel armoring such as channel lining with riprap, concrete, or shotcrete. If channel armoring is necessary, the designer should coordinate with AMAFCA early in the design process to ensure the best option is chosen that takes into account the surrounding environment, risk to adjacent properties, space limitations, etc.

#### 5.3.2 Scour Protection

Structures that are proposed within a calculated prudent line or erosion setback are required to have scour protection. This includes all critical facilities, habitable structures, wells, and septic systems.

The minimum depth of scour protection must be calculated to a depth below the thalweg and extend vertically at minimum to the calculated WSE and must extend laterally to the limits of the calculated erosion setback or prudent line. Refer to the AMAFCA Sediment and Erosion Guide for scour calculation methodology.

## 6. Stormwater Quality

### 6.1 Introduction

All new development and redevelopment projects must apply best management practices (BMPs) to manage the stormwater quality volume (SWQV) and discharge of debris by management on-site.

#### 6.1.1 References

The following documents should be used for reference regarding stormwater quality for AMAFCA projects. These documents may be updated over time. Designers should use or reference the most recent version when following these design documents. See Chapter 2 for more detailed reference information.

- EPA NPDES Construction General Permit.
- General Permit for MS4s in the Middle Rio Grande Watershed in New Mexico (NMR04A000).
- NMDOT Drainage Design Manual.

### 6.2 Approach

Retention of the SWQV is required on all projects disturbing more than 1 acre; however, this requirement can vary by jurisdiction and should be verified. AMAFCA defers to the appropriate jurisdiction for methods and requirements for calculating the SWQV.

### 6.3 AMAFCA-Specific Requirements

#### 6.3.1 Best Management Practices

All properties proposing to discharge stormwater to an AMAFCA system must provide floatable capture on-site. The AMAFCA standard details provide an example of a water quality manhole. At minimum, one manhole in the system is required to be a water quality manhole. The water quality manhole must be the most downstream manhole of the system before the discharge point to AMAFCA's facility. AMAFCA will review other options for water quality structures on a case-by-case basis. Unless otherwise agreed to in writing by AMAFCA, the individual proposing the BMP is responsible for maintenance of said BMP and may be subject to covenant agreements requiring such maintenance.

The required SWQV must be contained on-site. AMAFCA does not accept payment in lieu of SWQV. In addition, AMAFCA will not consider a downstream AMAFCA facility as a substitute for the required on-site SWQV.

## 7. Right-of-Way and Easements

### 7.1 Introduction

This chapter describes the resources and procedures that AMAFCA has developed related to ROW dedication and acquisition.

#### 7.1.1 References

The following documents should be used for reference regarding ROW and easements for AMAFCA projects. These documents may be updated over time. Designers should use or reference the most recent version when following these design documents. See Chapter 2 for more detailed reference information.

- AMAFCA Design and Policy Guide for Utility Crossings of Flood Control Channels.
- Facility Usage and Reimbursement Schedule.
- Minimum Standards for Surveying in New Mexico as adopted by the Board of Licensure for Professional Engineers and Professional Surveyors.

### 7.2 Approach

All surveying and mapping will adhere to the Minimum Standards for Surveying in New Mexico as adopted by the Board of Licensure for Professional Engineers and Professional Surveyors, as currently updated. The sections listed below specifically relate to easement and ROW surveying.

- Section 12.8.2.12, Easement Surveying.
- Section 12.8.2.13, Right Of Way Surveying.

All platting actions which involve AMAFCA must adhere to the CABQ Development Hearing Officer platting process or the Bernalillo County Development Review Authority platting process.

Property descriptions, plats, or exhibits to grant easements will adhere to the Minimum Standards for Surveying in New Mexico, Section 12.8.2.12, Easement Surveying requirements.

Any property with an AMAFCA easement, new or existing, proposing new improvements on the property must complete an AMAFCA Specific Foundation Certification. This certification document can be found on the AMAFCA website or by request.

### 7.3 AMAFCA Specific Requirements

#### 7.3.1 Drainage Right-of-Way

AMAFCA does not allow structures to be constructed in a Drainage ROW. Exceptions to this may be allowed on a case-by-case basis following a review by AMAFCA to determine if an encroachment may be allowed.

### 7.3.1.1 Drainage Easement Limits

Per AMAFCA's Drainage policy, a drainage easement is required to be dedicated to a public authority on any lot encumbered by a FEMA floodplain per the effective Flood Insurance Rate Maps (FIRM). In general, no structures are allowed in drainage easements, although exceptions can be allowed following a review of the encroachment by AMAFCA. AMAFCA may require other easements (access, slope, etc.) on a case-by-case basis as a condition of approval for a project design or development. Acceptance of all easements is subject to approval by the AMAFCA Board of Directors.

- The minimum limits of drainage easements dedicated to AMAFCA are based on the required hydraulic analysis; this easement limit is to extend to (at minimum) the Energy Grade Line (EGL) and/or FEMA floodplain (greater of two):
  - If 1-D Hydraulic Analysis: EGL = as calculated.
  - If 2-D Hydraulic Analysis EGL as defined below:
    - ▶ Max Velocity 0-5 fps = WSE + 0.38 feet.
    - ▶ Max Velocity 5-8 fps = WSE + 1.0 feet.
    - ▶ Max Velocity 8-15 fps = WSE + 1.5 feet.
    - ▶ Max Velocity > 15 fps = WSE + 2.0 feet.
- Septic systems and/or wells may be allowed within drainage easements dedicated to AMAFCA with a variance issued by the applicable regulatory authority and adequate scour protection.

#### **Exceptions**

- Per the Calabacillas West Branch DMP, drainage easements are to be granted to the analyzed prudent line at a minimum, rather than the EGL and/or FEMA floodplain.

### 7.3.2 Encroachment and/or Maintenance Agreements

All encroachments must be reviewed by AMAFCA and coordinated for licensing. Other types of agreements or licenses may be required by AMAFCA on a case-by-case basis. Fees for these agreements are set by AMAFCA's Facility Use Reimbursement Schedule.

In general, these agreements include:

- Encroachment and Maintenance Agreements – These are intended to identify private encroachments into AMAFCA ROW or easements to be maintained by the private owner/developer. The maximum duration of these agreements is 25 years.
- Utility Agreements – These are intended to identify public or utility encroachments into AMAFCA ROW or easements to be maintained by another public agency or utility company. The maximum duration of these agreements is 50 years.
- Temporary Construction and Access License – These are intended to allow temporary encroachments into AMAFCA ROW for the construction of more permanent infrastructure. The typical license duration is 1 year or less.



### 7.3.3 Turnkey Agreements

Turnkey agreements are executed when a property owner proposes to construct any drainage improvement within an easement granted to AMAFCA or within AMAFCA property and intends to turn over maintenance of such improvements to AMAFCA. This agreement is subject to comments, direction, and approval by the AMAFCA Board of Directors and includes a fee.

The Turnkey Agreement fee is a percentage of the estimated construction costs of the improvements within the AMAFCA easement/property. The estimated construction costs of the improvements shall be approved by AMAFCA prior to finalization of the Turnkey Agreement fee. Seventy-five percent (75%) of the finalized Turnkey Agreement fee shall be paid to AMAFCA upon approval of the turnkey agreement by the AMAFCA Board of Directors. The remaining twenty-five percent (25%) of the finalized Turnkey Agreement fee shall be paid to AMAFCA at the time of signature for construction approval of the improvements.

For drainage facilities where AMAFCA will be the primary agency responsible for maintenance, the facility and its appurtenances must be contained within dedicated ROW to AMAFCA, with limited exceptions.

## 8. Construction Details and Specifications

### 8.1 Introduction

This chapter details the construction details and specifications for designing AMAFCA projects to ensure quality and consistency.

#### 8.1.1 References

The following documents should be used for reference regarding construction details and specifications for AMAFCA projects. These documents may be updated over time. Designers should use or reference the most recent version when following these design documents. See Chapter 2 for more detailed reference information.

- NMDOT Standard Specifications for Highway and Bridge Construction (as accepted or amended by AMAFCA).
- NMDOT Standard Drawings for Highway and Bridge Construction (as accepted or amended by AMAFCA).
- The City of Albuquerque Standard Specifications for Public Works Construction.

### 8.2 Approach

AMAFCA has developed specifications and standard details that should be used on all AMAFCA projects as applicable. Lacking an appropriate AMAFCA standard drawing, designers should refer to NMDOT Specifications and Standard Details. CABQ standards may be referenced if there is no equivalent NMDOT specification or detail.

AutoCAD must be used for the development of construction plans. All local jurisdictions specify AutoCAD/Civil 3D as the software required for all consultant design projects. AMAFCA does not have CADD standards and accepts plans developed using the CADD standards of the NMDOT or CABQ. The NMDOT website has links to their General CADD Standards Manual and templates that are regularly updated. The CABQ website has a list of AutoCAD files that are available for download.

### 8.3 AMAFCA Specific Specifications and Details

Users shall contact AMAFCA for the most current version of the following specifications and standard details.

#### 8.3.1 Supplemental Technical Specifications

AMAFCA has many supplemental technical specifications (STS) for AMAFCA drainage infrastructure available for use. AMAFCA STS are available upon request from AMAFCA.

#### 8.3.2 Standard Details

AMAFCA has many standard drawings for drainage infrastructure available for use. All standard AMAFCA drawings are available for download on the AMAFCA website.

## 9. Construction Activities

### 9.1 Introduction

The purpose of this section differs slightly from the previous sections in this Manual. This section is intended to provide information on policies, standard practices, criteria, guidance, and references for construction activities for AMAFCA-led projects or projects that affect AMAFCA facilities and how they are managed and overseen by AMAFCA or AMAFCA's representative.

There is a moratorium for construction activities on AMAFCA facilities between May 15 and October 15 of each year for monsoon season. During this period, the risk of flooding and storm events is higher, and for safety reasons, construction activities and equipment are restricted in or near AMAFCA facilities.

#### 9.1.1 References

The following documents should be used for reference regarding construction activities for AMAFCA projects. These documents may be updated over time. Designers should use or reference the most recent version when following these design documents. See Chapter 2 for more detailed reference information.

- AMAFCA General Provisions, STS, and Standard Drawings (refer to Chapter 8).
- EPA Construction General Permit.

### 9.2 Approach

Before starting construction on any AMAFCA-led projects, a Notice to Proceed with Permitting and Procurement and a Notice to Proceed with Construction must be obtained from AMAFCA unless otherwise in compliance with the EPA Construction General Permit.

AMAFCA supports a Disadvantaged Business Enterprise (DBE) program to ensure small businesses from socially and economically-disadvantaged persons have an opportunity to grow.

AMAFCA will ensure all Labor Compliance with the US Department of Labor, the Office of Federal Contract Compliance Programs, and the NM Department of Workforce Solutions. A designated inspector from AMAFCA may conduct Labor and equal employment opportunity (EEO) Compliance Interviews to verify contractor and subcontractor compliance with labor and EEO requirements of the contract.

### 9.3 AMAFCA-Specific Requirements

#### 9.3.1 Preconstruction Conference

A preconstruction conference is required for AMAFCA-led projects or projects that affect AMAFCA facilities and shall be scheduled and coordinated with the AMAFCA project manager. Project team members such as subcontractors, suppliers, utility owners and stakeholders may be invited to the preconstruction conference.

## 9.3.2 Inspections

### 9.3.2.1 General

Construction inspections are handled by AMAFCA personnel or their representative as it relates to AMAFCA's facilities. Construction inspections by others may still be required depending on the nature of work.

During construction, inspections include but are not limited to the following:

- Inspect the work.
- Inspect the preparation, fabrication, or manufacture of materials.
- Notify the contractor of nonconforming work or reject nonconforming materials.

### 9.3.2.2 Materials

All materials testing for AMAFCA-led projects or projects that affect AMAFCA facilities will be in accordance with NMDOT Standard Specifications Section 900 along with Special Provision for Section 906, Minimum Testing Requirements, as accepted by AMAFCA. In addition, Certificates of Compliance may also be required for all material incorporated into the project.

### 9.3.2.3 Documentation

Daily work reports will be completed documenting construction activities. Quantities associated with daily work activities may also be documented with location of installation.

### 9.3.2.4 Project Closure and Final Inspection

The contractor must notify AMAFCA of substantial completion and final completion so that inspections can be scheduled. During each inspection, punch list items will be documented and formally presented to the contractor. Once all punch list items have been addressed, as-builts have been collected and accepted by AMAFCA, and any other conditions of final approval met, AMAFCA may issue final acceptance or releases.

## 9.3.3 Construction Management Consultant Expectations

AMAFCA may, at their discretion, hire a Construction Management (CM) Consultant to manage the construction of a project rather than using AMAFCA personnel. Some expectations for that consultant are listed below. The amount of attention a project may require will depend on the size and anticipated complexity of the project.

- Inspections and daily reports.
- Material testing (or coordination thereof).
- Log and track the status of Requests for Information (RFI).
- Log and track the status of submittals.
- Review change orders for acceptability and provide comments to AMAFCA.
- Attend weekly construction meetings.

- Prepare Pay Applications.
- Attend the final inspection and make observations and recommendations concerning the acceptability of the work.

### **9.3.4 As-Builts and Record Drawings**

The contractor must provide all as-built information to AMAFCA or their CM consultant. As-builts are to be maintained and updated throughout construction. The CM consultant is responsible for preparing as-built record drawings when the construction is complete and providing copies to AMAFCA. As-builts will be submitted electronically to AMAFCA unless a different form is required by a partner or other reviewing agency.