DOUGLAS COUNTY
COLORADO

Location and Extent Staff Report

Date: September 10, 2025

To: Douglas County Planning Commission

From: Trevor Bedford, AICP, Senior Planner TB
Jeanette Bare, AICP, Planning Manager JB
Steven E. Koster, AICP, Assistant Director of Planning Services SK

Subject: **3663 Timber Mill Parkway – Location and Extent**

Project File: **LE2025-013**

Planning Commission Hearing: **September 22, 2025 @ 6:00 p.m.**

I. EXECUTIVE SUMMARY

CORE Electric Cooperative requests approval of a Location and Extent (L&E) for an electric substation and associated battery energy storage system (BESS) at the western terminus of Timber Mill Parkway, generally south of the intersection of Happy Canyon Road and N US Highway 85, in the Castle Rock area. The applicant states that the project is necessary to increase the capacity and reliability of service in the area.

The property is approximately 41 acres and is zoned Agricultural One (A-1). The property is located within the Castle Rock Municipal Planning Area as identified by the 2040 Comprehensive Master Plan.

II. APPLICATION INFORMATION

A. Applicant

CORE Electric Cooperative
5496 US-85
Sedalia, CO 80135

B. Applicant's Representative

Derek Holscher
Ulteig Operations LLC
5575 DTC Parkway #200
Greenwood Village, CO 80111

C. Request

The applicant requests approval of an L & E for the construction of an electric substation and associated battery energy storage system (BESS).

D. Location

The project is at the western terminus of Timber Mill Parkway, generally south of the intersection of Happy Canyon Road and N US Highway 85 in the Castle Rock area. The attached vicinity map, zoning map, and aerial map highlight site location and existing conditions.

E. Project Description

CORE proposes to construct and operate a new 115-12.47 kV electric substation and associated BESS. The substation is approximately 390 feet by 370 feet and will tie into an existing CORE 115 kV transmission line located on the southern edge of the property. The substation consists of a variety of electric equipment primarily between 16 feet and 24 feet in height with H-frame elements and lightning protection up to 60 feet in height. The BESS will measure approximately 370 feet by 360 feet and will contain battery enclosures similar in size to a Conex container. The subject property is zoned A-1, which allowed Utility Service Facilities, including Neighborhood Substations, as a use by right.

The project will be surrounded by a seven-foot chain link security fence. Two detention ponds are proposed on site to capture any storm runoff.

Access to the site will be provided through the Town of Castle Rock via Timber Mill Parkway. Currently, Timber Mill Parkway ends in a cul-de-sac approximately 200 feet east of the property. The applicant will extend the roadway and relocate the cul-de-sac on site. As Timber Mill Parkway is a Town of Castle Rock street, the applicant is working with the Town for the design and permitting for the roadway modifications.

Construction of the project is anticipated to begin in spring of 2026 with completion anticipated by spring of 2027. During construction, the applicant anticipates approximately 20 vehicles per day will enter the site. A traffic control plan will be developed as necessary. The applicant will truck water to the site for dust mitigation to limit additional impacts of construction. After construction, the facilities will be operated remotely and will only require 1-2 trips per month for maintenance and inspections.

The project is located within the Castle Rock Municipal Planning Area as identified by the Douglas County Comprehensive Master Plan 2040 (CMP) Section 2. The project is consistent with several goals, objectives, and policies. Goal 2-9 is to ensure development occurs concurrently with essential services and infrastructure. The proposed substation will provide essential services and infrastructure to existing and planned development in the area. Policy 2-16A.2 is to maintain open communication, build relationships, and address areas of mutual concern between the County and municipalities. This project has been referred to the Town of Castle Rock, and the applicant has stated they have worked with the Town to incorporate applicable Town standards into the project design. Objective 5-1A is to review existing and projected development to ensure that it does not overwhelm existing services. The proposed

substation provides additional capacity to reliably serve existing and future customers. Additionally, the applicant has provided a discussion of several CMP objectives and policies in the attached narrative and community impact report.

III. CONTEXT

A. Background

The subject property is approximately 41 acres in size. It is currently vacant and was purchased by CORE in 2024. The applicant explained that existing substations are operating above ideal capacity and there is not currently enough electric capacity for anticipated growth in the area. Due to physical site constraints on existing substations in the area, CORE is unable to expand utilizing an existing facility site. When the proposed substation is operational, CORE intends to decommission the existing Plum Creek and Sedalia substations.

B. Adjacent Land Uses and Zoning

Adjacent properties are primarily zoned A-1 and include large lot residential, vacant tracts, and a railroad. The property to the east is within the Town of Castle Rock's Meadows Planned Development and is used for industrial and commercial storage and warehousing.

Zoning and Land Use

Direction	Zoning	Land Use
North	Agricultural One	Residential
South	Agricultural One	Railroad and Residential
East	Town of Castle Rock – Meadows Planned Development	Industrial and Commercial
West	Agricultural One	Vacant

IV. PHYSICAL SITE CHARACTERISTICS

A. Site Characteristics and Constraints

The site is located between the BNSF railroad and East Plum Creek. East Plum Creek runs through the parcel directly to the north, which is also owned by CORE. The property generally slopes downwards towards East Plum Creek.

B. Access

Access to the site will be provided through the Town of Castle Rock via Timber Mill Parkway. Currently, Timber Mill Parkway ends in a cul-de-sac approximately 200 feet east of the property. The applicant will extend the roadway and relocate the cul-de-sac on site. As Timber Mill Parkway is a Town of Castle Rock right-of-way, the applicant is working with the Town for the design and permitting for the roadway modifications.

At the writing of this staff report, the Town of Castle Rock had not responded to the referral request.

D. Drainage and Erosion

The applicant provided a drainage report for review and has proposed two on-site detention ponds. Engineering had not yet responded to the referral request at the writing of this staff report. Approval of any necessary plans and permits including GESC and construction plans will be required prior to commencement of construction

E. Floodplain

The East Plum Creek floodplain runs through the northeastern portion of the parcel. The proposed development avoids the floodplain.

V. PROVISION OF SERVICES

A. Schools

This is a nonresidential project that will not impact school services.

B. Fire Protection

West Douglas Fire Department (WDFD) provides fire and emergency services for the site. At the writing of this staff report, WDFD had not provided a response to the application. The applicant stated in their narrative that they have had preliminary discussions with WDFD regarding the project. The applicant will be required to obtain any approvals or permits necessary from WDFD prior to commencement of construction.

Douglas County Wildfire Mitigation reviewed the referral request and responded with no objections, noting that the project and parcel have been assessed for wildfire hazards and that CORE has a comprehensive and detailed wildfire mitigation plan.

C. Sheriff Services

The Douglas County Sheriff's Office (DCSO) will provide police protection to the site. At the writing of this staff report, responses had not been received from E911. The Office of Emergency Management reviewed the request and had no comments on the project. DCSO responded with no comments or concerns at this time.

D. Water and Sanitation

The project does not have any water and sanitation demands.

E. Utilities

Area utility service providers were provided a referral on this application. The project is intended to increase capacity and reliability of CORE Electric Cooperative's infrastructure. Xcel Energy and AT&T responded to the referral request with no conflicts. CORE responded with no comment. At the writing of this staff report, no other utility provider issued comments on the application.

F. Other Required Processes and Permits

In addition to the L & E approval, the following permits and other approvals may be required prior to commencement of construction:

- Engineering: Construction Drawings approval, GESC report and plans approval, approval of any other necessary plans and permits.
- Town of Castle Rock: Access permits and any permits necessary for the extension of Timber Mill Parkway.
- Building Division: Building permits
- West Douglas Fire Department: Any necessary permits

VI. PUBLIC NOTICE AND INPUT

Courtesy notices of an application in progress were sent to adjacent property owners. At the preparation of the staff report, no members of the public had responded to the courtesy notices. Any comments received will be provided prior to the hearing. Referral response requests were sent to required referral agencies on August 28, 2025. Referral responses are due at the conclusion of the referral period on September 11, 2025, or prior to the Planning Commission Hearing.

Referral agency responses received to date are attached to the staff report for reference. Responses received through the end of the referral period will be provided to the Planning Commission prior to the hearing and added to the project record.

VII. STAFF ASSESSMENT

Staff evaluated the application in accordance with Section 32 of the DCZR. Should the Planning Commission approve the L & E request, the applicant will be required to receive approval of all necessary permits prior to commencement of the project.

ATTACHMENTS **PAGE**

LAND USE APPLICATION

Please complete, sign, and date this application. Return it with the required items listed on the Submittal Checklist to planningsubmittals@douglas.co.us. Submittals may also be mailed or submitted in person to Planning Services. *NOTE: The Planning Commission or the Board of County Commissioners should not be contacted regarding an open application*.

OFFICE USE ONLY
PROJECT TITLE:
PROJECT NUMBER:

PROJECT TYPE: Location & Extent

MARKETING NAME: CORE Electric Cooperative 23020606 Timber Mill Substation

PRESUBMITTAL REVIEW PROJECT NUMBER: PS2024-183

PROJECT SITE:

Address: TBD

State Parcel Number(s): 2351-204-00-004

Subdivision/Block#/Lot# *(if platted)*: N/A

PROPERTY OWNER(S):

Name(s): CORE Electric Cooperative

Address: 5496 N. US Highway 85, Sedalia, CO 80135

Phone: 720-733-5493

Email:

AUTHORIZED REPRESENTATIVE: *(Notarized Letter of Authorization is required from the property owner, unless the owner is acting as the representative)*

Name: Ulteig Operations LLC - Derek Holscher

Address: 5575 DTC Parkway #200, Greenwood Village, CO 80111

Phone: 720-873-5876

Email:

To the best of my knowledge, the information contained on this application is true and correct. I have received the County's information sheet regarding the *Preble's Meadow Jumping Mouse*.

Applicant Signature

8/19/2025
Date

PREBLE'S MEADOW JUMPING MOUSE

What is the Preble's Meadow Jumping Mouse?
The Preble's Meadow Jumping Mouse is a rare mouse designated by the United States Fish and Wildlife Service as a "threatened species" under the Endangered Species Act. The federal threatened species designation prohibits the unlawful "take" of the Preble's Meadow Jumping Mouse or its habitat.

Where does the mouse live?
The Preble's Meadow Jumping Mouse lives primarily in heavily vegetated riparian habitats. In Douglas County, the mouse has been located in or near many drainages, including tributaries and the mainstream reaches of East and West Plum Creek. However, any stream reach or potential habitat within Douglas County may be subject to the requirements of the Endangered Species Act. The mouse has also been found in Boulder, Elbert, El Paso, Jefferson, and Larimer counties and in parts of Wyoming.

What activities may be considered a violation of the Endangered Species Act?
In its listing decision, the United States Fish and Wildlife Service identified activities that may result in violation of the Endangered Species Act to include:

1. Unauthorized or unpermitted collection, handling, harassing, or taking of the species;

2. Activities that directly or indirectly result in the actual death or injury death of the mouse, or that modify the known habitat of the species, thereby significantly modifying essential behavioral patterns (e.g., plowing, mowing, or cutting; conversion of wet meadow or riparian habitats to residential, commercial, industrial, recreational areas, or cropland; overgrazing; road and trail construction; water development or impoundment; mineral extraction or processing; off-highway vehicle use; and, hazardous material cleanup or bioremediation); and;

3. The application or discharge of agrichemicals or other pollutants and pesticides onto plants, soil, ground water, or other surfaces in violation of label directions or any use following Service notification that such use, application or discharge is likely to harm the species; would be evidence of unauthorized use, application or discharge.

How to determine if a proposed activity would violate the Endangered Species Act.
Any questions regarding whether an activity will impact the Preble's Meadow Jumping Mouse or its habitat should be directed to:

Field Office Supervisor
USFWS Colorado ES Field Office (MS 65412)
Denver Federal Center
PO Box 25486
Denver, CO 80225-0486
303-236-4773
ColoradoES@fws.gov

Where to find more information on the Preble's Meadow Jumping Mouse.
More information can be found at the US Fish and Wildlife Service website at:
https://ecos.fws.gov/ecp/species/4090

Any approval given by Douglas County does not obviate the need to comply with applicable federal, state, or local laws and/or regulations.

CORE Electric Cooperative Timber Mill Substation
Location and Extent Application
Douglas County Zoning Resolution Section 32

Written Narrative & Location and Extent Report
Douglas County, Colorado

August 2025

Prepared for:

Prepared by:

We listen. We solve.®

3203.01.1 Land Use Application Form

See Appendix A

3203.01.2 Written Narrative

Name of Applicant
CORE Electric Cooperative (CORE)
Brooks Kaufman – Manager, Lands and Rights-of-Way
5496 N. US Highway 85
Sedalia, CO 80135

720-733-5493

Description of the Request
CORE is proposing to construct and operate their new Timber Mill 115-12.47 kV electric substation and associated battery energy storage system (BESS) in Douglas County, Colorado (Project). The Project site does not currently have an address assigned to it, but will be established as part of this Location & Extent process. The Project will be located at the western end of Timber Mill Parkway on a 41-acre parcel (2351-204-00-004) owned by CORE, which is currently zoned Agricultural One (A1); there are no plans to rezone the parcel.

The Project will tie into CORE's existing Plum Creek-Sedalia 115 kV overhead transmission line, which runs along the southern boundary of the subject parcel. The dimensions of the substation yard are 390 feet by 370 feet, and the dimensions for the BESS yard area are 360 feet by 370 feet. Both the substation and BESS will be encompassed by a 7-foot chain link security fence with a 1-foot outrigger of barbed wire, the same type of security fence will separate the substation from the BESS. Specifications for the security fence are included in Location & Extent Plan Exhibits; Appendix B.

The equipment for the ultimate buildout of the substation will include three (3) 115/12.47kV – 30/40/50MVA transformers, circuit breakers, disconnect switches, bus work, and two (2) Power Control Assembly enclosures. The BESS will consist of multiple battery enclosures, which are each approximately the size of a Conex box. Associated equipment will include HVAC, fire suppression, junction boxes, and a SCADA system.

The Project site will utilize two (2) different stormwater detention ponds, each with their own dedicated access. As part of this Location & Extent process, CORE will grant a Secondary Storm Drainage Easement to Douglas County for each detention pond access road for the purposes of maintenance and repair in the event of an emergency. A permanent, gated access road/cul-de-sac leading into the substation site will be located at the western end of Timber Mill Parkway and will be designed, permitted, and constructed according to applicable Town of Castle Rock design specifications. Since Timber Mill Parkway is Town of Castle Rock right-of-way (ROW), CORE has been in coordination with the Town to relocate the existing temporary cul-de-sac at the end of Timber Mill Parkway onto CORE's property and make it permanent, per the same design specifications as the existing Timber Mill Parkway. CORE will

dedicate to the Town the southeast corner of the site, via separate document, as road ROW - see enclosed Location & Extent Plan Exhibits. In conjunction with the Town of Castle Rock cul-de-sac, CORE has been in coordination with the Town to properly locate a proposed 30-foot sanitary sewer easement across CORE's property – see attached Location & Extent Plan Exhibits.

Construction of the Project will run concurrently with both the substation and BESS beginning in the spring of 2026 and completed by spring of 2027.

Substation Construction
A geotechnical study based on soil borings at the Project site will be conducted prior to construction. Engineers will use this study to determine the size and type of foundations needed to support the substation equipment. CORE will acquire and comply with required grading, stormwater, and erosion control permits needed for construction. CORE anticipates approximately 20 vehicles will enter and exit the site on an average workday during construction. Traffic Control Plans will be prepared and followed during construction, as needed.

Following grading of the substation site, concrete foundations will be installed. Concrete will be delivered via concrete trucks, and the concrete will be pumped or poured on site. There will be daily concrete truck deliveries made when the foundations and piers are constructed. There will be multiple deliveries of yard rock (up to 5 per day over a week period) and concrete (up to 4 per day over a two-month period) at certain stages of construction. Following foundation installation, steel support structures will be erected, and electrical equipment will be installed. Equipment used during substation construction includes a crane, drill rig, concrete truck, boom trucks, and trailers.

BESS Construction
The BESS will be comprised of a series of containers that house batteries, battery racks, wiring and climate control systems. The batteries will be connected in parallel and grouped into battery modules that will be loaded into racks. The battery racks will be placed inside standard 20' containers. The BESS will also employ inverter containers with pad mount transformers. The internal rack design are generally between 8-10 racks and between 8-10 modules per rack. These containers can hold between 4-5 MWh of energy. The modules can be removed for warranty claims, cell balancing, or other preventative maintenance items throughout the life of the Project.

Generally, multiple containers can fit behind one inverter and pad mount transformer that are used to convert between alternating and direct current and change the voltage to inverter operating levels. The container also has sensors, wiring, HVAC to cool the batteries and other miscellaneous equipment for effective and safe operation. The container is effectively, a shipping container/trailer that will serve to house the equipment. The container will be anchored to concrete slab foundations and removed at the end of the system life. The battery module and rack system in each container is designed to be simple to inspect, replace, and remove batteries during the BESS's life without destruction to property or equipment.

<u>Purpose of the Improvements</u>
Due to CORE's existing Plum Creek and Sedalia Substations running at near-maximum capacity, the Timber Mill Substation is needed to provide additional electrical capacity for existing and planned development in this part of CORE's service territory. The BESS will offset peak electric load time periods, keeping rates lower for CORE's customers by avoiding additional fees during peak loading. The Plum Creek and Sedalia Substations provide approximately 25 MW of capacity for the surrounding area but

cannot provide enough transformer capacity to support anticipated growth and development. Additional electrical infrastructure is needed to support this development. The existing Plum Creek Substation, located at 4263 N. US Highway 85 (Parcel #2351-213-01-010), occupies 0.89 acres. Due to the surrounding Plum Creek Regional Wastewater Treatment Facility, there is no additional land available to expand or rebuild the substation. The existing Sedalia Substation, located on Parcel #2353-231-00-003), occupies 0.89 acres. Due to the surrounding floodplain from West Plum Creek and the Critical Habitat for the Preble's Meadow Jumping Mouse, there is no suitable land available to expand or rebuild the substation. The map included in Appendix C depicts the locations of the Plum Creek and Sedalia Substations in relation to the proposed Timber Mill Substation, as well as their surrounding conditions. Therefore, CORE had to identify and purchase a site in the vicinity of these two (2) existing substations in order to construct a new substation. Once the Timber Mill Substation is constructed and in-service, the existing Plum Creek and Sedalia Substations will eventually be decommissioned.

Ideally, CORE can operate each of its substations at half of their available capacity. In the event a substation needs to be shut down for maintenance, the load can be transferred to another substation in the area so that service to CORE's members continues uninterrupted. However, the Plum Creek and Sedalia Substations are currently operating at over fifty percent of their available capacity (approximately 64 MW), due to increasing demand from existing members as well as new development in the area that is connecting to CORE's existing system. A substation operating at over fifty percent capacity creates a reliability issue for CORE members.

The Timber Mill Substation will take electrical loading off the Plum Creek and Sedalia Substations and double capacity with the addition of two transformers totaling 100 MW of capacity. The proposed location is ideal because it is in between the Plum Creek and Sedalia Substations and adjacent to CORE's existing Plum Creek-Sedalia 115kV overhead transmission line. The BESS is needed to offset peak electric load time periods, keeping rates lower for CORE's customers by avoiding additional fees during peak loading. BESS can balance load on the power system grid by moving energy when demands are low to times when demands are high. The technology also allows for a seamless switch between power sources and protects equipment by controlling voltage and frequency. By reducing the load on congested transmission and distribution systems, BESS may defer expensive upgrades. In some cases, storage may also reduce new investment in conventional resources, such as adding new substations to meet systemwide peak load.

Summary of the Potential Impacts and Proposed Mitigation Measures

Ground disturbance during construction is expected to be minor. To avoid potential indirect impacts from construction-related erosion and sediment movement, CORE will prepare a Grading, Erosion and Sediment Control (GESC) Report and Plan as outlined in Section 3 of the GESC Manual and adhere to the GESC permit issued by the Douglas County Engineering Division. CORE will also secure a Construction Stormwater Discharge Permit with the Colorado Department of Public Health & Environment (CDHPE) and adhere to the best management practices (BMPs) outlined in the Storm Water Management Plan (SWMP). These BMPs will include erosion control and revegetation measures.

In order to keep stormwater runoff from leaving the site, CORE is proposing to install two (2) different on-site detention ponds, which will follow the Stormwater Quality recommendations as outlined in Chapter 14 of Douglas County's Storm Drainage Design and Technical Criteria Manual. Construction activities will be performed by methods that prevent entrance or accidental spillage of contaminants, debris, and other pollutants and wastes into underground water sources. Vegetation clearing for

construction is anticipated to be minimal due to the dominant land cover of herbaceous growth. Measures will be implemented to minimize the spread of noxious weeds.

During construction, short-term noise will occur from construction vehicles and equipment. Construction vehicles and equipment will be maintained in proper operating condition and equipped with the manufacturer's standard noise control devices (e.g., mufflers or engine enclosures) to limit this noise to the extent practicable. Post construction, any noise produced by the transformers in the substation shall not exceed the levels spelled out in Title 25, Article 12 (25-12-103) of the Colorado Revised Statutes, Maximum Permissible Noise Levels. The statute identifies that sound levels of noise radiating from a property line at a distance of twenty-five feet or more does not exceed the db(A) levels assigned for each zone between the hours of 7am to 7pm and 7pm to 7am.

Residential: 7am-7pm - 55 db(A), 7pm-7am – 50 db(A)
Commercial: 7am-7pm - 60 db(A), 7pm-7am – 55 db(A)
Light Industrial: 7am-7pm - 70 dB(A), 7pm-7am – 65 db(A)
Industrial: 7am-7pm - 80 dB(A), 7pm-7am – 75 db(A)

With the zoning for site being Agricultural, a particular zone has not been established per the statute. The Residential zone threshold is the most stringent in any defined zone and it is anticipated that the noise emitted for the substation transformers at a distance of 25 feet beyond the property line will adhere to or be below these levels.

Construction activities associated with the Project would temporarily generate less than significant amounts of particulate matter from soil disturbances and diesel-powered equipment, and less than significant amounts of carbon monoxide and the precursor pollutants to ozone formation from tailpipe emissions. Any air pollutants generated would be widely dispersed across the Project area, short term in duration, and minimized by the small scale of construction operations for the Project. Air pollutants also would be minimized through implementation of dust suppression and proper vehicle maintenance. Upon completion of earth-disturbing activities, all disturbed areas will be revegetated or otherwise stabilized. Therefore, Project construction is not expected to contribute negatively to the air quality status in the area. There would be no long-term air quality effects associated with routine operation and maintenance of the Project. CORE will implement erosion control BMPs to reduce fugitive dust released during construction.

Enclosed containment will be provided for all trash. All construction waste, including trash and litter, garbage, other solid waste, petroleum products, and other potentially hazardous materials, will be removed from the site and transported to a disposal facility authorized to accept such materials. There will be no significant amount of hazardous materials stored in the Project area. Construction, operation, and maintenance activities will comply with all applicable federal, state, and local laws and regulations regarding the use of hazardous substances. The only hazardous chemicals expected to be used on site are those found in diesel fuel, gasoline, coolant (ethylene glycol), and lubricants in machinery. Hazardous materials will not be drained onto the ground or into streams or drainage areas. In its contract with the construction contractor, CORE can specify that it will hold a required pre-construction meeting with the contractor to ensure all applicable laws and CORE's procedures are followed.

Post-construction, there will be a battery back-up located inside the Power Control Assembly (PCA), which has built-in containment and exhaust in case of an accidental release; no liquids would escape the PCA. The transformers contain mineral oil, which is required for the operation of the equipment. The

mineral oil is contained within the equipment and secondary containment is designed which will confine the entire volume of oil should a vessel failure occur. There are no poly-chlorinated biphenyls (PCBs) in the mineral oil or transformers. All equipment will be located within an enclosed, secured facility. Spill control and prevention measures as well as procedures for contacting appropriate emergency offices and personnel are formulated and designed in accordance with federal, state, and local requirements.

CORE has developed situational awareness tools that provide fire warnings, watches and forecasts for their service territory. Most of these tools are driven by a geographic information system (GIS) that incorporates wildfire hazard potential maps generated by the U.S. Forest Service's Fire Modeling Institute overlaid with spatial data representing resources and assets such as power lines, substations, and communities. Daily fire risk is also monitored through fire warnings and watches from the National Weather Service, near real-time fire alerts from NASA FIRMS satellites, and social media notifications from fire and police agencies in CORE's service area.
CORE personnel can access this information to adapt CORE's daily operations, emergency preparedness and risk mitigation efforts to changes in fire conditions. It also allows CORE to conduct proactive and real-time operations that reduce the risk of fire ignition by their equipment, facilities and activity. CORE System Operators log weather conditions and send pertinent information and warnings to all Operations personnel and contractors, and GIS republishes these map services to the daily operation map service. This situational awareness allows CORE to adapt daily operations, emergency preparedness, and risk mitigation efforts to changes in fire conditions.

BESS, a technology that uses batteries to store and distribute electrical energy, are systems commonly used in electricity grids, renewable energy setups, and even electric vehicles. BESS technologies are designed to meet and exceed qualification standards. These systems are tested and vetted, certified, and ultimately built to comply with the nation's leading safety standard. The U.S. battery energy storage industry uses a suite of important certifications and standards that guide the safe design, installation, and operation of battery energy storage facilities. These documents are regularly updated based on the advice, applied lessons, and research from leading safety experts, fire professionals, fire protection engineers, and scientists.
The American Clean Power Association (ACP) has released a framework to enhance BESS safety, including compliance with standards like National Fire Protection Association (NFPA) 855 and better coordination with local fire departments. As the premier national standard for battery energy storage safety, NFPA 855 guides the collaboration between the battery energy storage industry and firefighters to maximize the safe and reliable performance of battery energy storage as critical grid infrastructure. NFPA 855 provides mandatory requirements for the design, installation, commissioning, operation, maintenance, and decommissioning of BESS facilities, distinguished by battery energy storage technology. NFPA 855 requires all battery energy storage systems be listed to UL 1973 and UL 9540. UL 1973 and UL 9540 are critical safety standards that ensure BESS operate reliably and securely. UL 1973 certifies the safety and performance of battery cells, modules, and packs, evaluating their ability to withstand thermal runaway, mechanical stress, and electrical faults. The UL 9540 certification builds on this by evaluating the entire BESS, verifying that it meets rigorous fire, electrical, and functional safety requirements. Together, these standards provide a robust framework that minimizes risks, protects facilities and communities, and instills confidence in the safety of BESS technology.
BESS fires are rare, 23 incidents in the last 10 years in the US, but can occur due to factors like thermal runaway, manufacturing defects, or improper system management. These incidents often involve lithium-ion batteries, which are prone to overheating if damaged or improperly maintained. Historical data shows that many fire incidents involved older systems that lacked modern safety features. CORE's use of battery technology is evolving. Lithium iron phosphate (LiFePO4) batteries are increasingly

popular for BESS due to their safety, durability, and environmental benefits. CORE plans to utilize lithium iron phosphate (LiFePO4) batteries at this site.

- Safety: LiFePO4 batteries are less prone to overheating and thermal runaway, making them ideal for large-scale energy storage.
- Longevity: They have a longer cycle life compared to other lithium-ion chemistries, which means they can be charged and discharged thousands of times without significant degradation.
- Environmental Impact: These batteries avoid the use of cobalt and nickel, making them more sustainable and ethically sourced.

Each battery is continuously monitored by an on-site system to automatically detect abnormal conditions and stop operations, if needed. An off-site, 24-hour control room with trained technicians also constantly monitors each site and can remotely shut down the facility, if needed. All of the battery module designs included undergo rigorous industry testing and certification related to fire safety, in order to minimize the risk that a failure of any single battery cell or module spreads to adjacent batteries or other equipment. Each storage facility is equipped with its own air conditioning or cooling system to ensure it operates within the ideal temperature range. Coordination with first responders and fire officials can take place to safely extinguish any fire and dispose of any damaged materials in compliance with local, state and federal regulations.

CORE engaged conversation about the Project with the Fire Chief for the West Douglas Fire Protection District (John Oravez), which is the district that will service the Project site. The purpose of the call was to introduce him to the project and see if he had any initial questions or concerns about the proposed Project. Initially he had no issues or concerns but suggested to keep the lines of communication going and would be looking forward to the review of the Project as a referral agency.

The Project's impacts on County services are expected to be minor. Water for dust suppression during construction will be trucked to the site. The Project will not require a permanent water supply, gas supply, or sewage system. It is not expected that the Project will impact services provided by Douglas County's emergency service districts. Given the relatively small size of the crews needed for construction, no impacts on law enforcement or emergency medical services are anticipated. The potential use of local fire department services during construction or operation of the proposed facilities will have a negligible effect on the overall capability of responders to provide services as the Project would only need services in the unlikely event of an emergency.

Timber Mill Parkway is owned by the Town of Castle Rock. The most significant demand for services will be associated with the use of existing roads during Project construction. Following construction, the Project will have a negligible effect on road use as the facilities will be operated remotely. Visits from personnel will be limited to maintenance and inspection activities (approximately 1-2 trips per month) or emergencies.

Glare from construction or maintenance vehicles may be visible from nearby roads, but the operation of these vehicles will be limited to the construction period and occasional inspections and maintenance work. Outdoor lights within the substation will only be used as necessary for emergency and routine maintenance critical for worker safety. All lights will be cast downward towards the interior of the substation yard. Table 1 lists the ownership and zoning of the adjacent parcels.
A visual simulation of the substation components that illustrate the design and materials to be used are included in Appendix D. For the BESS components, photographs are provided of a comparable site already in operation.

Table 1: Adjacent Parcel Information

Parcel Number	Owner	Jurisdiction	Zoning	Current Use
2351-204-00-003	CORE Electric Cooperative 5496 N US Highway 85 Sedalia, CO 80135	Douglas County	A1	Vacant
2351-200-00-012	CPV INC 858 Happy Canyon Rd Ste 200 Castle Rock, CO 80108	Douglas County	A1	Vacant
2351-203-00-001	Burlington Northern Santa Fe Property Tax Dept PO Box 961089 Fort Worth, TX 76161	Douglas County	A1	Railroad
2351-204-00-001	James & Tammy Klos, Norman & Jennifer Joslyn 4343 N US Highway 85 Castle Rock, CO 80108	Douglas County	A1	Residential
2351-281-00-001	Town of Castle Rock 100 Wilcox St. Castle Rock, CO 80104	Town of Castle Rock	POS-1	Open Space
2351-281-00-005	Castle Rock Development Co. 3033 E 1st Ave. Ste 305 Denver, CO 80206	Town of Castle Rock	PD	Meadows 4th Amend. - Vacant
2351-282-09-005	Castle Rock Development Co. 3033 E 1st Ave. Ste 305 Denver, CO 80206	Town of Castle Rock	PD	Meadows 4th Amend. - Vacant
2351-282-09-001	Crim Borrower LLC 86 Inverness Pl. N Englewood, CO 80112	Town of Castle Rock	PD	Meadows 4th Amend. - Commercial
2351-282-99-003	Town of Castle Rock 100 Wilcox St. Castle Rock, CO 80104	Town of Castle Rock	PD	Meadows 4th Amend. – Timber Mill Parkway ROW
2351-282-09-004	Meadows Metro Dist. No. 4 8390 E Crescent Pkwy Ste 300 Greenwood Village, CO 80111	Town of Castle Rock	PD	Meadows 4th Amend. - Vacant

Compliance with the 2040 Comprehensive Master Plan

This Project is located within the Castle Rock Municipal Planning Area and is in compliance with the Goals, Objectives, and Policies of Section 2 and Section 5 of the Douglas County 2040 Comprehensive Master Plan (CMP), as described below.

Policy 2-5A.2 ***Protect the integrity of urban areas by protecting, where appropriate, views to and from significant natural features.***

A visual simulation of the substation components that illustrate the design and materials to be used are included in Appendix D. For the BESS components, photographs are provided of a comparable site already in operation. The subject property was selected due to its proximity to an existing transmission line, overall location in relation to the existing Plum Creek and Sedalia Substations, and the need for interconnection, as well as the specific topographic features of this site. The site slopes up towards the south and provides a higher base elevation than East Plum Creek and US Highway 85 towards the northern boundary of the subject parcel. The sloping topography of the site will help reduce the visual impact of the Project.

Objective 2-6B ***Use design techniques and land use elements to provide compatibility between residential and nonresidential uses and create a sense of community identity.***
Land use compatibility is the principle of aiming for a harmonious community by ensuring that adjacent land uses do not cause unduly negative impacts. Factors that affect land use compatibility include considerations such as intensity and types of uses, patterns and context of surrounding land use, traffic patterns, noise levels, and many other variables. Mitigation strategies through design of the Project include the site's natural topography as a buffer and the physical distance from the nearest residents (approximately 1,100 feet). These natural and physical buffers provide security, visual screening of equipment, and a sound barrier to reduce impacts on surrounding properties.

Policy 2-6E.3 ***Locate and design intensive nonresidential land uses to minimize conflicts with residential developments, agricultural uses, wildlife areas, and environmentally or visually-sensitive areas.***
Douglas County is a successful and dynamic community that is experiencing growth and change in population, economy, and land uses as residents and businesses continue to move into the area. It has changed from a small rural county and grown into a mixed urban/nonurban county with a larger population. The Douglas County CMP helps guide development to appropriate areas of the county. Changes in technology such as artificial intelligence, electrification of vehicles and buildings, data centers, manufacturing, and remote work have changed demand and usage for vital services like electric utilities. For CORE to continue to effectively serve their customers, it is necessary to increase capacity, reliability, and supply. This requires new infrastructure like substations to continue to supply safe, reliable electricity. The location for this substation was specifically chosen to minimize potential conflicts with adjacent land uses and for its proximity to an existing transmission line and CORE's exiting Plum Creek and Sedalia Substations. The design of the substation and BESS has been thoughtfully undertaken to ensure compatibility with surrounding land uses.

Policy 2-9A.1 ***Evaluate the capacity of existing services and facilities to support development.***
As described in the preceding paragraph, planning for adequate delivery of electric services is important for sustainable growth and development, which is also detailed in the Douglas County CMP. Planning is critical to create supportive infrastructure for sustainable development as opportunities are growing and the market in Douglas County continues to grow and evolve. CORE's power studies and planning for utility capacity utilizing appropriate technologies and equipment such as the Timber Mill Substation are critical for supporting the community's continued development. The Plum Creek and Sedalia Substations are currently operating at over fifty percent of its available capacity (approximately 64 MW), due to increasing demand from existing members as well as new development in the area that is connecting to CORE's existing system. This Project will readily interconnect with the existing power grid for support and development of the energy grid and provide value for existing and future development in Douglas County as the existing Sedalia and Plum Creek Substations are decommissioned. Factors like the distance to viable points of interconnection, existing substation conditions, conditions of other existing

grid equipment, and design investments will provide a safe and reliable grid. Upgrading and ensuring viability of existing civil and structural facilities in Douglas County, such as this Project, is paramount to providing continued support for the community.

Objective 5-1A *Review existing and projected development to ensure that it does not overwhelm existing services.*
Additional capacity and ensuring grid stability requires new facilities to continue providing reliable electric services to existing customers and to meet future demand. The proposed substation provides essential grid capacity to accommodate existing demand from current residences, businesses, public facilities, and forecasted growth in Douglas County and Castle Rock.

Policy 5-1A.2 *Coordinate service needs with relevant special districts, authorities, and municipalities.*
CORE held a presubmittal meeting with Douglas County (PS2024-183) on August 26, 2024, and a pre-application with the Town of Castle Rock (PREAPP24-0061) on August 27, 2024. It is CORE's intention that adequate public facilities are provided prior to or concurrent with development. CORE will further satisfy these criteria by working closely with County divisions to meet pertinent County standards and planning objectives. This Project will increase availability and reliability of electrical service, thereby providing a direct benefit to residential, commercial, and industrial development approved by Douglas County.

Policy 5-5A.1 *Apply design standards to ensure compatibility.*
The proposed substation is an unmanned electric utility facility with a security fence enclosing the Project, securing essential substation and BESS equipment. Compatibility will be ensured by landscaping with a native seed mix and disturbance mitigation in accordance with the approved GESC plan. Night-sky compliant outdoor lighting fixtures at the substation would only be used during emergency situations by personnel, typically during outages. Any exterior lighting would comply with County and Town standards, including only illuminating exterior lighting while personnel are working on-site and utilizing full cut-off fixtures for night sky compliance. The substation will not generate fumes, odors, or particulates. A visual simulation of the substation components that illustrate the design and materials to be used are included in Appendix D. For the BESS components, photographs are provided of a comparable site already in operation.

Policy 5-5A.2 *Recognize the technological, operational, maintenance, and safety constraints of these uses while balancing community desires to mitigate impacts to the natural and built environment.*
CORE, through design and materials, works to minimize visibility as much as is reasonably possible. While substations are inherently visible, the substation will be partially screened by grade, topography, and existing buildings. Views are already impacted by the existing transmission line and adjacent commercial developments. The visual impact will not be significantly changed.

Policy 5-5A.3 *Encourage high tension power lines and electrical substations be located away from residential and visually significant areas, where feasible.*
Due to the existing transmission line and the requirement to replace the existing Plum Creek and Sedalia Substations, the proposed Timber Mill Substation will be located in an unincorporated area and will be adjacent to existing commercial developments. Separation distance to the nearest existing residences will be approximately 1,100 feet to the closest residential single-family home.

Policy 5-5A.5 *Encourage the joint use of utility corridors for new or upgraded major transmission lines.*

The substation will be constructed adjacent to an existing utility corridor encumbered by an existing electric transmission line and associated easements

Policy 5-5A.6 ***Provide adequate right-of-way or setbacks to dissipate electromagnetic fields and noise and to mitigate visual and other land use concerns.***
An electromagnetic field (EMF) is a form of energy created by a combination of electricity and magnetism. Some EMF is natural, such as sunlight, lightning, or the earth's magnetic field. Other sources are human made, such as power lines, substations, or any devices that run on power or send a wireless signal. The required setbacks for the A1 Zone District will be adhered to and in some instances, exceeded. The existing transmission line was in place and operational before any of the surrounding residential development. The EMF created by the Project are below the Colorado Public Utilities Commission limit for EMF and below levels created by most standard household appliances.

3203.01.3 Application Fee

The application fee of $325 and associated Engineering Review Fees will be paid by CORE at the time of filing, once the application has been accepted by Douglas County.

3203.01.4 Location and Extent Plan Exhibit (per Section 3205)

See Appendix B

3203.01.5 Location and Extent Report (per Section 3206)

3206.01 – Community Impact Report describing potential impacts to private and public interests and the project site, and how potential impacts are proposed to be mitigated.

The Project will have a positive impact on private and public interests in Douglas County and Town of Castle Rock. The Project will provide additional and more reliable electric service to properties in this part of CORE's service territory and allow for future growth. As described above, the Project is consistent with the 2040 Douglas County Comprehensive Master Plan.

The facility is strategically located along an existing transmission line corridor and in bewteen CORE's existing Plum Creek and Sedlaia Substations, which are planned to be decommissioned. To the south, the Project parcel borders a BNSF railroad, to the west and north borders are vacant parcels and on the east borders a commercial development. Natural vegetation and grades outside the substation and BESS security fence will be preserved, as practicable. A visual simulation of the substation components that illustrate the design and materials to be used are included in Appendix D. For the BESS components, photographs are provided of a comparable site already in operation. Once operational, lighting at the substation will be night-sky compliant, downcast, and only used in an emergency, such as when there is an unplanned outage. Therefore, substation lighting will not create a glare or nuisance to surrounding properties. During operations, the Project will not generate fumes, odors, or particulates.

A presubmittal meeting with Douglas County (PS2024-183) was held on August 26, 2024 and a pre-application meeting with the Town of Castle Rock (PREAPP24-0061) was held on August 27, 2024, to

introduce the Project and identify the approvals that would be needed prior to construction. CORE has incorporated the applicable Town and County standards into the Project design.

3206.02 – Phase III Drainage Report in accordance with the requirements of the Douglas County Storm Drainage and Design and Technical Criteria Manual, as required, or as required by a condition of approval.

See Appendix E for the Preliminary Phase III Drainage Report

3206.03 – A narrative or traffic study describing the transportation network establishing the availability and adequacy of the system in accordance with the Douglas County Roadway Design and Construction Standards, as required.

Access to and from the substation will be by way of Timber Mill Parkway from N. Meadows Drive and then State Highway 85. An existing exclusive northbound left turn lane, and an existing exclusive southbound right turn lane, separate turning vehicles from through traffic on N. Meadows Drive, coming off of State Highway 86. There is a shared westbound right turn lane and through lane coming off N. Meadows Drive onto Timber Mill Parkway via a roundabout.

Construction of the substation is anticipated to occur over six months. During this time, it is anticipated that an average of 20 vehicles will enter and exit the site on an average workday. Vehicle types will likely range from standard pick-up trucks, to oversized construction equipment and materials being delivered. It is expected most of this increased traffic will occur midday, outside of the AM or PM peak hours.

At the completion of construction, a CORE maintenance vehicle is anticipated to enter and exit the site on an average of twice every month. The maintenance vehicle would be similar to the design characteristic of the single-unit truck. The traffic volumes during and after construction of the substation, generated by the substation, is not anticipated to negatively impact traffic operations around the site.

3206.04 – A guarantee of public improvements, such as dedication of rights-of-way, sidewalk construction, and similar improvements, as required.

CORE will continue to coordinate with the Town of Castle Rock regarding street improvements for the cul-de-sac at the western end of Timber Mill Parkway, outside the substation parcel.

3206.05 – Additional information may be requested by the staff as appropriate to the request, and information required above may be waived by the Planning Services Director, when deemed to be inappropriate.

Any additional information will be provided to Douglas County staff upon request.

3203.01.6 Any additional information as requested by staff needed to thoroughly review the impacts of the location and extent application.

This information will be provided to Douglas County staff upon request.

LAND USE APPLICATION

Please complete, sign, and date this application. Return it with the required items listed on the Submittal Checklist to planningsubmittals@douglas.co.us. Submittals may also be mailed or submitted in person to Planning Services. *NOTE: The Planning Commission or the Board of County Commissioners should not be contacted regarding an open application*.

OFFICE USE ONLY
PROJECT TITLE:
PROJECT NUMBER:

PROJECT TYPE: Location & Extent

MARKETING NAME: CORE Electric Cooperative 23020606 Timber Mill Substation

PRESUBMITTAL REVIEW PROJECT NUMBER: PS2024-183

PROJECT SITE:

Address: TBD

State Parcel Number(s): 2351-204-00-004

Subdivision/Block#/Lot# *(if platted)*: N/A

PROPERTY OWNER(S):

Name(s): CORE Electric Cooperative

Address: 5496 N. US Highway 85, Sedalia, CO 80135

Phone: 720-733-5493

Email:

AUTHORIZED REPRESENTATIVE: *(Notarized Letter of Authorization is required from the property owner, unless the owner is acting as the representative)*

Name: Ulteig Operations LLC - Derek Holscher

Address: 5575 DTC Parkway #200, Greenwood Village, CO 80111

Phone: 720-873-5876

Email:

To the best of my knowledge, the information contained on this application is true and correct. I have received the County's information sheet regarding the *Preble's Meadow Jumping Mouse*.

Applicant Signature

8/19/2025
Date

PREBLE'S MEADOW JUMPING MOUSE

What is the Preble's Meadow Jumping Mouse?
The Preble's Meadow Jumping Mouse is a rare mouse designated by the United States Fish and Wildlife Service as a "threatened species" under the Endangered Species Act. The federal threatened species designation prohibits the unlawful "take" of the Preble's Meadow Jumping Mouse or its habitat.

Where does the mouse live?
The Preble's Meadow Jumping Mouse lives primarily in heavily vegetated riparian habitats. In Douglas County, the mouse has been located in or near many drainages, including tributaries and the mainstream reaches of East and West Plum Creek. However, any stream reach or potential habitat within Douglas County may be subject to the requirements of the Endangered Species Act. The mouse has also been found in Boulder, Elbert, El Paso, Jefferson, and Larimer counties and in parts of Wyoming.

What activities may be considered a violation of the Endangered Species Act?
In its listing decision, the United States Fish and Wildlife Service identified activities that may result in violation of the Endangered Species Act to include:

1. Unauthorized or unpermitted collection, handling, harassing, or taking of the species;

2. Activities that directly or indirectly result in the actual death or injury death of the mouse, or that modify the known habitat of the species, thereby significantly modifying essential behavioral patterns (e.g., plowing, mowing, or cutting; conversion of wet meadow or riparian habitats to residential, commercial, industrial, recreational areas, or cropland; overgrazing; road and trail construction; water development or impoundment; mineral extraction or processing; off-highway vehicle use; and, hazardous material cleanup or bioremediation); and;

3. The application or discharge of agrichemicals or other pollutants and pesticides onto plants, soil, ground water, or other surfaces in violation of label directions or any use following Service notification that such use, application or discharge is likely to harm the species; would be evidence of unauthorized use, application or discharge.

How to determine if a proposed activity would violate the Endangered Species Act.
Any questions regarding whether an activity will impact the Preble's Meadow Jumping Mouse or its habitat should be directed to:

Field Office Supervisor
USFWS Colorado ES Field Office (MS 65412)
Denver Federal Center
PO Box 25486
Denver, CO 80225-0486
303-236-4773
ColoradoES@fws.gov

Where to find more information on the Preble's Meadow Jumping Mouse.
More information can be found at the US Fish and Wildlife Service website at:
https://ecos.fws.gov/ecp/species/4090

Any approval given by Douglas County does not obviate the need to comply with applicable federal, state, or local laws and/or regulations.

GENERAL NOTES

1. THESE DESIGN DRAWINGS PRESENT THE CIVIL CONCEPTS FOR THIS PROJECT AND ARE NOT INTENDED TO SERVE AS CONSTRUCTION DRAWINGS. CERTAIN ITEMS MAY NOT BE COMPLETELY DETAILED ON THESE DRAWINGS. SUCH ITEMS SHALL BE DESIGNED TO THE CODES AND STANDARDS AS NOTED. THE GOVERNING JURISDICTION'S STANDARDS AND REQUIREMENTS AND APPROVED VARIANCES SHALL TAKE PRECEDENTS.

2. THE LOCATION OF PROPERTY LINES, EXISTING STRUCTURES, FIXTURES AND UNDERGROUND UTILITIES ARE DRAWN FROM BEST AVAILABLE SURVEYED INFORMATION. THIS DOES NOT GUARANTEE THAT THE LOCATION OF EXISTING ITEMS ARE EXACT OR COMPLETE.

3. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROTECT EXISTING UTILITY LINES SHOWN ON THE PLANS AND THOSE UTILITY LINES WHICH MAY NOT BE SHOWN. NOTIFY THE PROJECT ENGINEER IF ANY EXISTING UTILITY STRUCTURES (VAULTS, BOXES, RIMS, CLEANOUTS, ETC.) ARE IN CONFLICT WITH THE PROPOSED GRADING OR UTILITY PLAN.

4. CONTOURS SHOWN ARE TO FINISHED GRADE.

LEGEND

- EXISTING 2 FT CONTOUR
- EXISTING 10 FT CONTOUR
- PROPOSED 2 FT CONTOUR
- PROPOSED 10 FT CONTOUR
- FLOW LINE
- PROPOSED FENCELINE
- PROPOSED ROADWAY
- PROPERTY LINE
- FUTURE EASEMENT
- DETENTION POND ACCESS ROAD
- DETENTION POND BERM CREST
- EXISTING OVERHEAD UTILITY
- EXISTING UNDERGROUND WATER
- EXISTING FENCELINE
- EXISTING EASEMENT
- GRAVEL ROADWAY
- GRAVEL YARD
- CONCRETE
- ASPHALT

EXISTING GRAVEL ROADWAY
WEST DETENTION POND ACCESS ROAD
WEST DETENTION POND
POND CREST
RIPARIAN ZONE BOUNDARY
NEW FIELD FENCE
EXISTING FENCE TO BE REMOVED
SWALE
WEST DETENTION POND SPILLWAY
PROPOSED FUTURE POND OUTLET
EAST DETENTION POND SPILLWAY
PROPOSED EAST DETENTION POND
EXISTING 150'-0" CORE UTILITY EASEMENT
FUTURE SS EASEMENT
EXISTING WATERLINE
EXISTING TRANSMISSION POLE
EXISTING 75'-0" CORE EASEMENT
EXISTING 50'-0" UTILITY EASEMENT
BESS AREA
INTERCONNECTION AREA
PROPOSED TRANSMISSION POLE
EXISTING FENCE TO REMAIN
SUBSTATION YARD ACCESS GATE
360'-0"
PROPOSED SUBSTATION YARD
APPROXIMATE LOCATION OF FUTURE 40'-0" SS EASEMENT
EXISTING BNSF RAILROAD
SUBSTATION YARD ACCESS GATE
390'-0"
EAST DETENTION POND ACCESS ROAD
EXISTING DRAINAGE PATHWAY FROM PROPERTY TO THE EAST
PROPOSED GRAVEL ACCESS ROAD
CUL-DE-SAC PER TOWN OF CASTLE ROCK STANDARDS
EXISTING TRANSMISSION LINE (TO BE REMOVED)
EXISTING 58FT ROW
ASPHALT TO TIE INTO EXISTING TIMBER MILL PKWY
TIMBER MILL PKWY
TRUE NORTH

TIMBER MILL

CORE ELECTRICAL COOPERATIVE - TIMBER MILL SUBSTATION

A PART OF THE SE $\frac{1}{4}$ OF SECTION 20 TOWNSHIP 7 SOUTH, RANGE 67 WEST OF THE 6TH P.M

LOCATION AND EXTENT PLAN

PRELIMINARY
NOT FOR CONSTRUCTION

CD ENGINEERING, INC
www.cd-eng.com

NO	REVISIONS	DSGN	CHKD	APVD	DATE
A	ISSUED FOR COUNTY REVIEW	TSC	DWM	JBA	3/28/25
B	ISSUED FOR REVIEW	TSC	DWM	JBA	4/9/25
C	ISSUED FOR COUNTY REVIEW	TSC	DWM	JBA	8/22/25

CORE ELECTRIC COOPERATIVE

DRAWN	SCK
DESIGNED	TSC
CHECKED	DWM
APPROVED	JBA
PROJECT	-
DATE	3-28-2025

TIMBER MILL (SEDALIA)
115-12.47KV SUBSTATION
OVERALL SITE PLAN

SCALE	DRAWING NUMBER	REV
1' =60'	C101	C

PARCEL A
AREA=1,525,632 S.F.±
OR 35.024 ACRES±
OWNER:
CORE ELECTRIC COOPERATIVE
PARCEL A
REC. 2024019779

PARCEL B
AREA=1,785,811 S.F.±
OR 40.997 ACRES±
OWNER:
CORE ELECTRIC COOPERATIVE
REC. 2024015627

NEW 4-WIRE FIELD FENCE ON PROPERTY LINE BETWEEN PARCELS (ALL OTHER FIELD FENCE ON THE INSIDE OF PARCEL B TO BE REMOVED)

NORTH

PROPOSED DETENTION POND

250'-3"

PROPOSED DETENTION POND

750'

360'

390'

90'

PROPOSED DETENTION POND ACCESS ROAD

32' CATTLE GATE

NEW 4-WIRE FIELD FENCE ON PROPERTY LINE BETWEEN PARCELS (ALL OTHER FIELD FENCE ON THE INSIDE OF PARCEL B TO BE REMOVED)

24'

370'

(FUTURE)

T2

T1

840-36

840-32

840-29

840-46

INTERCONNECTION AREA

BESS AREA

ACCESS ROAD TO BE EXTENDED IN THE FUTURE NOT INSTALLED NOW

ACCESS ROAD TO BE EXTENDED IN THE FUTURE NOT INSTALLED NOW

15'-3"

40'-4"

221'-11"

161'-8"

53'-3"

24'

24'

23'-1"

40'

THIS ROAD TO BE INSTALLED NOW

50' PERMANENT EASEMENT REC. NO. 2020065910

PROPOSED SS EASEMENT

PROPOSED SS ALIGNMENT

123'

PROPERTY LINE

GRAVEL

PROPOSED SS TEMP CONSTRUCTION EASEMENT

PROPOSED SS EASMENT

37'-10"

50'

40'

15'

PROPOSED DETENTION POND ACCESS ROAD

204'

PROPERTY LINE

241'

NEW FIELD FENCE

10' CONCRETE SIDEWALK ACROSS APRON

10'

29'-6"

12'

32' CATTLE GATE/FIELD FENCE HERE ON THE WEST SIDE OF THE CUL-DE-SAC

12' CONCRETE APRON

REMOVE FIELD FENCE TO SE CORNER

CONCRETE PAN

ASPHALT CUL-DE-SAC

MOVE CUL-DE-SAC WEST AND EXTEND DOUGLAS COUNTY APPROVED ASPHALT/SIDEWALK/CURB/GUTTER

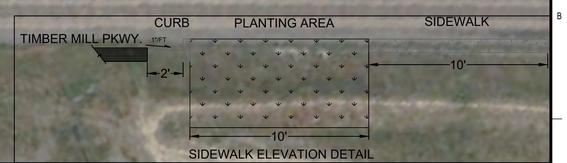
10' SIDEWALK

10' PLANTING AREA

CURB AND GUTTER

CURB AND GUTTER ONLY

REMOVE FIELD FENCE



SIDEWALK ELEVATION DETAIL

PRELIMINARY
NOT FOR CONSTRUCTION

CROSS CANYON engineering

NO	REVISIONS	DSGN	CHKD	APVD	DATE
J	ISSUE FOR COUNTY REVIEW	NRB	JBA	JBA	08-22-25

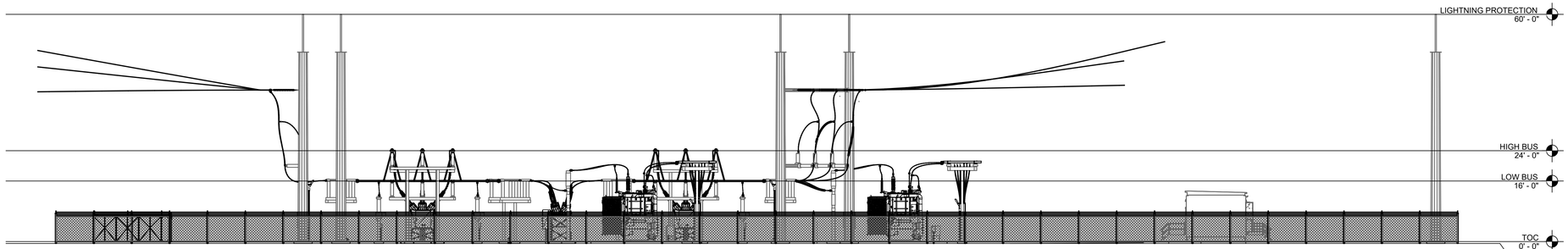
CORE ELECTRIC COOPERATIVE

DRAWN	LSL
DESIGNED	LSL
CHECKED	JBA
APPROVED	JBA
PROJECT	2024.307
DATE	01-14-24

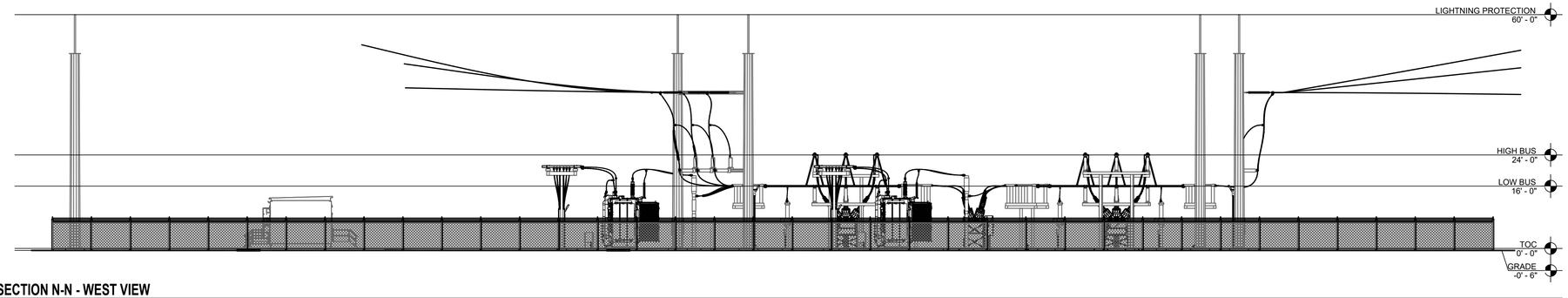
TIMBER MILL (323)
115-12.47KV SUBSTATION
GENERAL ARRANGEMENT

SCALE	DRAWING NUMBER	REV
1" = 50'-0"	GG02	J

C:\CORE\Timber Mill\323_GG02.DWG



1 **SECTION M-M - EAST VIEW**
Scale: 1/16" = 1'-0"



2 **SECTION N-N - WEST VIEW**
Scale: 1/16" = 1'-0"

NO	REVISIONS	DSGN	CHKD	APVD	DATE
A	PRE-DESIGN SUBMITTAL	NRB	JBA	JBA	04-17-25
B	ISSUE FOR REVIEW	LSL	JBA	JBA	07-31-25
C	ISSUE FOR REVIEW	NRB	JBA	JBA	08-15-25
D	ISSUE FOR COUNTY REVIEW	NRB	JBA	JBA	08-22-25

CROSS CANYON engineering

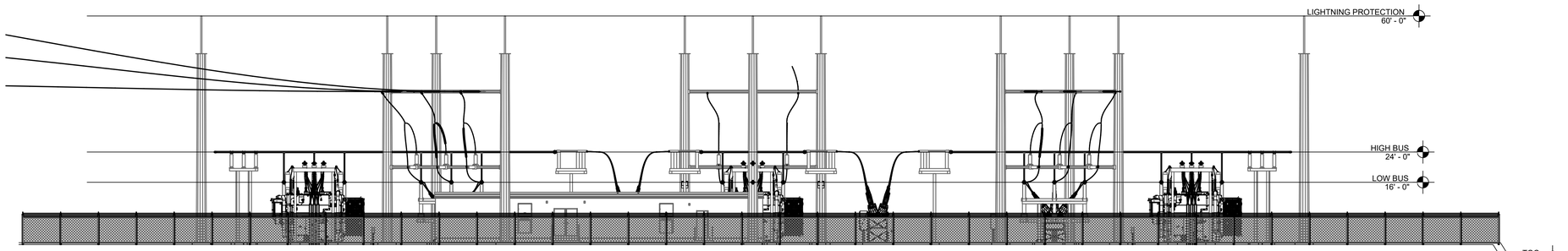
CORE ELECTRIC COOPERATIVE

DRAWN	LSL
DESIGNED	LSL
CHECKED	JBA
APPROVED	JBA
PROJECT	2024.323
DATE	7-25-25

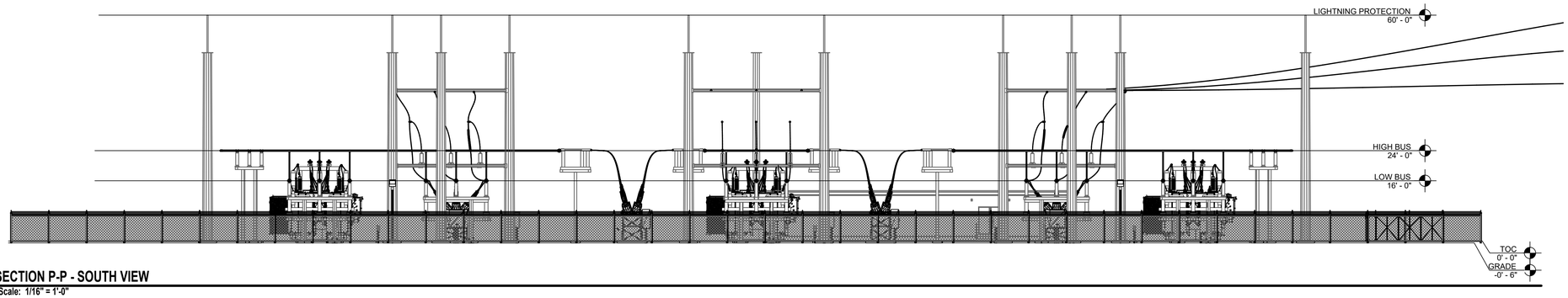
TIMBER MILL (323)
115-12.47KV SUBSTATION
PERIMETER VIEWS EAST & WEST

SCALE	DRAWING NUMBER	REV
NONE	E03E	D

C:\CORE\Timber Mill\323_E03E.dwg



1 **SECTION O-O - NORTH VIEW**
Scale: 1/16" = 1'-0"



2 **SECTION P-P - SOUTH VIEW**
Scale: 1/16" = 1'-0"

NO	REVISIONS	DSGN	CHKD	APVD	DATE
A	PRE-DESIGN SUBMITTAL	NRB	JBA	JBA	04-17-25
B	ISSUE FOR REVIEW	LSL	JBA	JBA	07-31-25
C	ISSUE FOR REVIEW	NRB	JBA	JBA	08-15-25
D	ISSUE FOR COUNTY REVIEW	NRB	JBA	JBA	08-22-25

CROSS CANYON engineering

CORE ELECTRIC COOPERATIVE

DRAWN	LSL
DESIGNED	LSL
CHECKED	JBA
APPROVED	JBA
PROJECT	2024.323
DATE	7-25-25

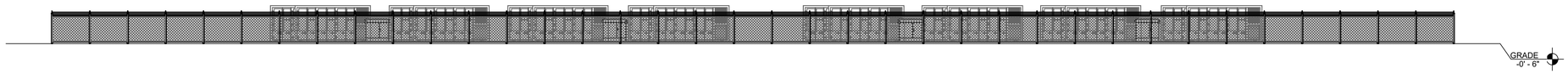
TIMBER MILL (323)
115-12.47KV SUBSTATION
PERIMETER VIEWS NORTH & SOUTH

SCALE	DRAWING NUMBER	REV
NONE	E03F	D

C:\CORE\Timber Mill\323_E03F.dwg

1 **SECTION T-T - SOUTH VIEW**
Scale: 1/16" = 1'-0"

NOTE: BESS EQUIPMENT IS APPROXIMATE AND FOR REPRESENTATION
ON VISIBILITY BEHIND THE FENCE ON THESE DRAWINGS



2 **SECTION U-U - WEST VIEW**
Scale: 1/16" = 1'-0"

NOTE: BESS EQUIPMENT IS APPROXIMATE AND FOR REPRESENTATION
ON VISIBILITY BEHIND THE FENCE ON THESE DRAWINGS

CROSS CANYON engineering

NO	REVISIONS	DSGN	CHKD	APVD	DATE
A	ISSUE FOR COUNTY REVIEW	NRB	JBA	JBA	08-22-25

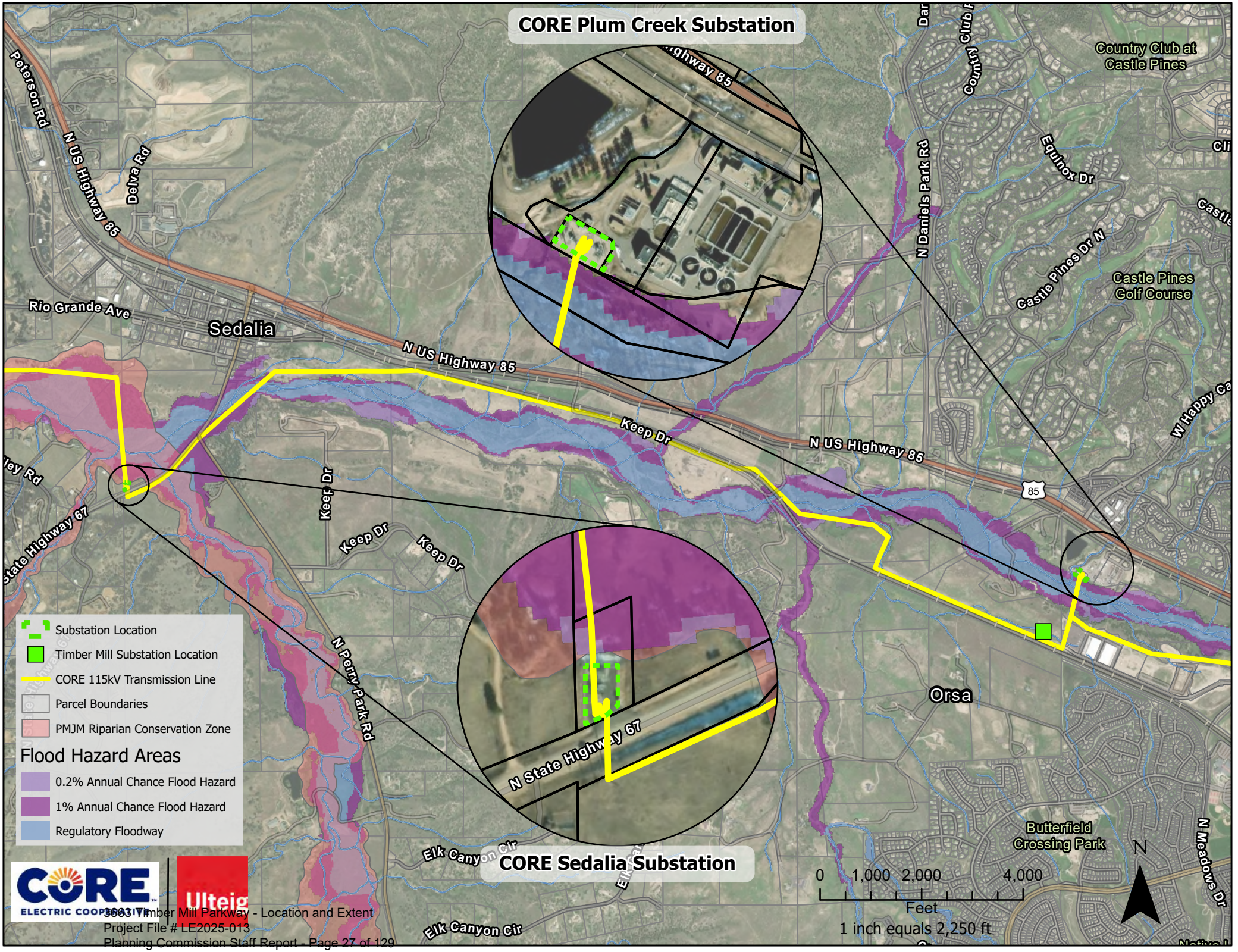
CORE ELECTRIC COOPERATIVE

DRAWN	LSL
DESIGNED	LSL
CHECKED	JBA
APPROVED	JBA
PROJECT	2024.323
DATE	7-25-25

TIMBER MILL (323)
115-12.47KV SUBSTATION
PERIMETER VIEWS BESS AREA

SCALE	DRAWING NUMBER	REV
NONE	E03G	A

C:\CORE\Timber Mill\323_E03G.dwg



3603 Timber Mill Parkway - Location and Extent
Project File # LE2025-013

VIEW LOOKING NORTHWEST AT THE NEW TIMBER MILL SUBSTATION

CORE ELECTRIC COOPERATIVE™

CROSS CANYON engineering

3663 Timber Mill Parkway - Location and Extent
Project File # LE2025-013

Drainage Report
for
Timber Mill Substation
Douglas County, CO

July 9, 2025

FRONT RANGE
Stormwater & Floodplain Consulting
www.frstormflood.com

PO Box 1561 | Cheyenne, WY 82003 | (970) 690-0493

Drainage Report

for

Timber Mill Substation

Douglas County, CO

Prepared for:

CD Engineering

3101 Silverthorne Drive

Fort Collins, CO 80526

July 9, 2025

Drainage Report

for

Timber Mill Substation

Douglas County, CO

July 9, 2025

1.0 INTRODUCTION

1.1 Objective

This drainage report serves to summarize results of drainage analysis for both existing and developed conditions for the proposed development site, the Timber Mill Substation, located in Douglas County, Colorado. Drainage analysis and design conforms Douglas County Drainage Design Criteria. All calculations herein conform to these standards.

1.2 Mapping and Surveying

Survey was provided to Front Range Stormwater & Floodplain Consulting by CD Engineering in February of 2025. Topographic mapping of existing conditions and features with a contour interval of one (1) foot for the overall development site was provided at this time. Elevations provided in this survey were referenced to the NAVD 88.

2.0 SITE LOCATION AND DESCRIPTION

2.1 Site Location

The project site is located northwest of the Town of Castle Rock, and is just south of the intersection of State Highway 85 and County Road 33. There is an existing major drainageway located just to the north of the site, East Plum Creek. It is noted that there is an approximate 30-foot elevation difference between the project site and the flowline of East Plum Creek, as identified on USGS Quadrangle mapping. As shown on the Flood Insurance Rate mapping for the area, no FEMA defined flood zones encroach the project area. The 100-Year floodplain and floodway of East Plum Creek are located to the north of the project site. Minor offsite basins located east of the project area contribute flow to the project site, and will be safely routed through or around the project site.

2.2 Existing Site Description

The proposed new substation yard will result in an approximate 12 acres of disturbance and is to be developed with an electric substation, gravel drives, and drainage infrastructure. General drainage patterns direct historic surface flows from southwest to northeast at slopes of 1.0% to 8.0%. Drainage historically discharges from the site as sheet flow to the east and collects along the southwest side of the project area and conveys into an existing unnamed drainageway

located just southwest of the project site, which is marked on USGS Quadrangle mapping as shown in Figure1, below.

There is an existing gravel parking/storage area located just to the east of the project site, which currently drains west through the site. We are proposing to redirect this flow to the north in order to mitigate any issues with this offsite drainage that has been directed onto the current development. The eastern detention pond is primarily to serve the purpose of detaining runoff from these offsite areas to the east as well as a portion of Right of Way and newly paved asphalt area from Timber Mill Parkway. We propose to detain and release at a historic 2-year rate of 0.79 cfs, in order to ensure that the redirected flows from the gravel parking lot to the east of the project site do not create an erosion issue with the receiving drainage swale, which drains into East Plum Creek.

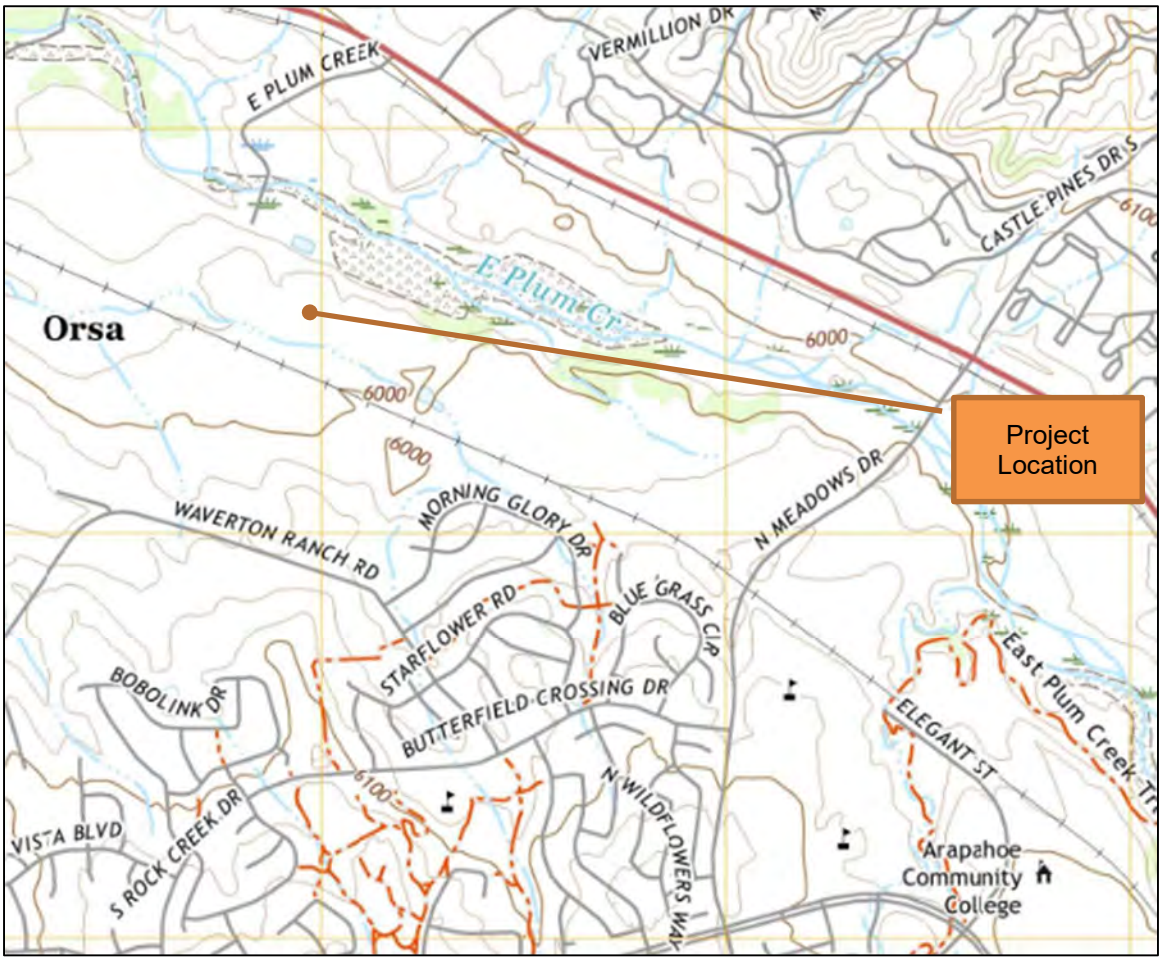
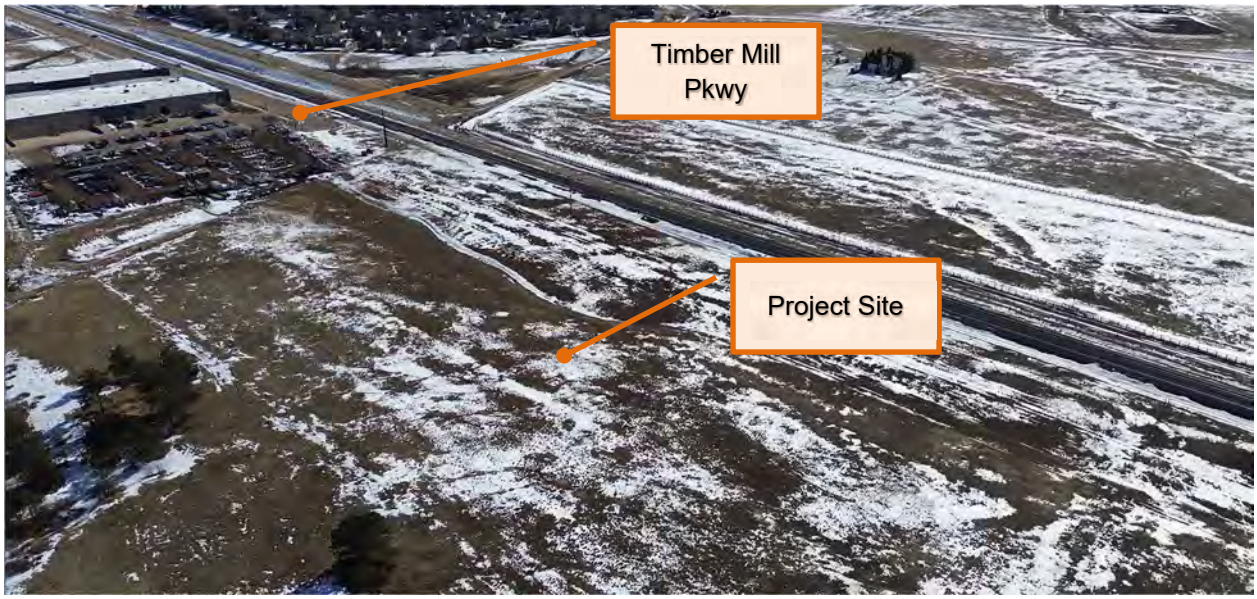


FIGURE 1 – Vicinity Map
USGS Quadrangle Mapping at 20-ft Interval



Aerial Photo 1
Photo Perspective: Looking South from Above Approx. Northwest Corner of Site

Aerial Photo 2
Photo Perspective: Looking Southeast from Above Approx. Middle of Site

Aerial Photo 3
Photo Perspective: Looking Northeast from Above Approx. Middle of Site

Aerial Photo 4
Photo Perspective: Looking Northwest from Above Approx. Middle of Site

2.3 NRCS Soil Mapping

According the Natural Resources Conservation Service soil mapping of the area the predominant site soils within the project area consist of "Sampson Loam" (hydrologic group B) and "Bresser Sandy Loam" (hydrologic group B). Please refer to Figure 2, below, as well as the full soils report provided in **Appendix 3**.

FIGURE 2 – USDA Soil Mapping
(Source: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)

2.4 FEMA Floodplain Mapping

According to the Firm Panels 08035C0166G and 08035C0167G (March 16, 2016), no FEMA special flood hazard areas encroach the project site. East Plum Creek is located north of the site. The channel flowline of East Plum Creek is shown on USGS Quadrangle mapping to be roughly 30-feet in elevation below the site location.

FIGURE 3 – Flood Mapping
NFIP Flood Mapping shows no FEMA flood zones in vicinity of development site
(Source: https://msc.fema.gov/portal/)

3.0 POST-DEVELOPMENT CONDITIONS

3.1 Proposed Development

The proposed development will involve the creation of a new electric substation. The substation will include gravel surfacing of an electric substation yard and new access drives. The substation yard area and drives will be gravel surfaced, and no asphalt or concrete surfacing will occur. Based on Table 1 (from the Urban Storm Drainage Criteria Manual) this surface treatment will result in an increase in imperviousness from historic condition of grassland (2% impervious) to 40% impervious. Stormwater detention will be required to mitigate the increase in site runoff due to the increase in site imperviousness**.**

The design of the western detention pond utilizes a 2-year historic release rate for the area of the yard which drains directly into the proposed pond (8.02 Acres). We have computed a historic runoff value of 0.08 cfs from the 8.02 acres draining into the pond, based on Rational Method Calculations provided in **Appendix 1**. The eastern detention pond is primarily to serve the purpose of detaining runoff from offsite areas to the east and a portion of Right of Way and newly paved asphalt area from Timber Mill Parkway. We propose to detain and release at a historic 2-year rate of 0.79 cfs, in order to ensure that the redirected flows from the gravel parking lot to the east of the project site do not create an erosion issue with the receiving drainage swale, which drains into East Plum Creek.

3.2 Hydrologic Analysis

Rational Method Modeling criteria contained in the Urban Storm Drainage Criteria Manual, (Runoff "RO") by the Urban Drainage and Flood Control District (UDFCD) has been followed for sub-basin analysis. The Rational Method has been used to model peak stormwater runoff within the developed site for the 2-year, and 5-year (initial) design storms, and the 100-year (major) design storm. Rainfall data from the Douglas County Storm Drainage Design and Technical Criteria Manual (Ref. 1) has been utilized for all runoff computations as well as detention calculations.

The overall study site has been broken into 4 basins for the purposes of calculating flows utilizing the Rational Method and analyzing the proposed storm conveyance system. Analysis of the proposed detention pond has been done utilizing the FAA Method.

One offsite basin, identified as Basin OS1 has been provided in the Rational Method Computations, have been analyzed in addition to the onsite basins identified in this study. Calculated peak flows in the 100-year event will be safely routed via surface flow and concentrated swale flow, or around the site and into the eastern detention pond, as discussed in Section 3.1, above.

DESIGN POINT	BASIN(S)	AREA (AC)	Q2	Q5	Q100
OS-1	OS-1	3.25	0.79	1.23	7.04

TABLE 1 – Offsite Runoff Summary

A small portion of the site will be conveyed undetained as sheet flow and will be released to the north as sheet flow. This is due to grading constraints; however, this small area represents a reduction in acreage that historically conveyed as sheet flow to the north and west, and there will be no appreciable increase in runoff from the site traveling to the north or west.

Please see Rational Method computations provided in **Appendix 1**.

3.3 Detention Analysis

The FAA Method utilized to model required detention volume. Rainfall data from the Douglas County Storm Drainage Design and Technical Criteria Manual (Ref. 1) has been utilized for detention calculations. Please see FAA Method output provided in **Appendix 2**. Basin imperviousness and C-Values have been computed based upon Table 4, below.

3.4 Detention Results

FAA Method Output, provided in **Appendix 2** shows the results of developed conditions 100-year analysis of the proposed detention pond. A summary of pond performance is provided in Table 2, below.

Pond ID	Vol. (Ac-Ft)	100-Yr WSEL (Ft)	WQ Capture Vol. (Ac-Ft)	WQ WSEL (Ft)	Peak Release Rate (2-Yr Historic, cfs)
West Pond	1.31	5977.59	0.12	TBD	0.08
East Pond	0.40	5987.70	N/A	N/A	0.79

TABLE 2- Pond Summary Table

Per Douglas County Criteria, Water Quality Capture Volume has been calculated using methodology outlined in the Urban Storm Drainage Criteria Manual, Volume 3 (Ref. 2). All computations are based on criteria for a 40-hour dry extended detention basin, and we have determined a required Water Quality Capture Volume (WQCV) of 0.12 Ac-Ft. Water Surface Elevation (WSEL) is based on current preliminary grading by CD Engineering and is to be determined at Final Design, along with outlet structure design, including control orifice(s).

Land Use or Surface Characteristics	Percentage Imperviousness (%)
Business:	
Downtown Areas	95
Suburban Areas	75
Residential lots (lot area only)**:**	
Single-family	
2.5 acres or larger	12
0.75 – 2.5 acres	20
0.25 – 0.75 acres	30
0.25 acres or less	45
Apartments	75
Industrial:	
Light areas	80
Heavy areas	90
Parks, cemeteries	10
Playgrounds	25
Schools	55
Railroad yard areas	50
Undeveloped Areas:	
Historic flow analysis	2
Greenbelts, agricultural	2
Off-site flow analysis (when land use not defined)	45
Streets:	
Paved	100
Gravel (packed)	40
Drive and walks	90
Roofs	90
Lawns, sandy soil	2
Lawns, clayey soil	2

TABLE 3 – Percent Imperviousness and C-Values
Urban Storm Drainage Criteria Manual, Volume 1 (Ref. 2)

3.5 Swale Calculations and Modeling

Swales sections have been modeled utilizing Express Tools within Civil 3D. Swale capacity has been analyzed for both onsite 100-year flows and combined onsite and offsite 100-year flows. Offsite flows which are directed along swale flowlines will be conveyed into the detention pond and safely pass the pond via the pond emergency spillway. Please see swale computations provided in **Appendix 4**.

4.0 WATER QUALITY

4.1 Water Quality Measures and Criteria

Water quality capture volume is to be provided in the lower stage of the proposed pond as shown in Table 3, above. The pond will provide treatment for the majority of the site with design based on criteria for a 40-hour dry extended detention basin as outlined in the Urban Storm Drainage Criteria Manual, Volume 3 – Best Management Practices by the Urban Drainage and Flood Control District. Please see **Appendix 2** for calculation of water quality capture volume.

4.2 Temporary Erosion Control Plan

The temporary erosion control plan during construction will consist of temporary structural erosion control measures. Sediment Control Logs will be placed at the upstream ends of all inlets to storm lines and culverts. Silt fence will be along the downstream perimeter of the property. Riprap Outlet Protection will be placed at the downstream ends and outlets of all culverts and storm lines. Vehicle tracking pads will be placed on roads exiting the site onto adjacent public roadways.

A Temporary Erosion Control Plan will be provided at Final Design int the Construction Plan Set by CD Engineering. Per State of Colorado requirements, a Stormwater Management Plan (SWMP) must be completed prior to the beginning of construction.

5.0 CONCLUSIONS

5.1 Compliance with Standards

All drainage design conforms to Douglas County standards as well as the Mile High Flood District's Urban Storm Drainage Criteria Manual. No variance requests are currently being made for this project.

6.0 REFERENCES

1. Storm Drainage Design and Technical Criteria Manual, Douglas County Department of Public Works-Engineering Division, Douglas County, Colorado, July 8, 2008.

2. Urban Storm Drainage Criteria Manual, Mile High Flood District, Wright Water Engineers, Inc., Denver, Colorado.

3. Soils Resource Report for Castle Rock Area, Colorado, Natural Resources Conservation Service, United States Department of Agriculture.

4. National Flood Insurance Rate Map (FIRM) 08035C0166G (March 16, 2016).

5. National Flood Insurance Rate Map (FIRM) 08035C0167G (March 16, 2016).

Appendix 1

Rational Method Peak Runoff Computations and Supporting Documentation

C-VALUE CALCULATION
DEVELOPED CONDITIONS

Surface Treatment	Percent Imp	C2	C5	C100
Concrete Pavement	90%	0.74	0.76	0.84
Asphalt Pavement	100%	0.84	0.86	0.89
Rooftop	90%	0.74	0.76	0.84
Gravel Surfacing	40%	0.29	0.32	0.61
Open Space/Landscaping	2%	0.01	0.01	0.44

Project: CDEng-018
By: A.Cvar
Date: 7/1/2025

Notes/Assumptions:
Urban Storm Drainage Criteria Manual, Mile High Flood District, utilized for C-Value Computations as referenced in the Douglas County Storm Drainage Design and Technical Criteria Manual. Per USDA Soil Report, overall soil type is Hydrologic Group B.

BASIN ID	BASIN AREA (SF)	BASIN AREA (AC)	CONCRETE AREA (AC)	ASPHALT AREA (AC)	ROOFTOP AREA (AC)	GRAVEL AREA (AC)	OPEN SPACE/ LANDSCAPE (AC)	CALCULATED AVE. BASINS IMP. (%)	CALCULATED C_2	CALCULATED C_5	CALCULATED DC_{100}
1	93218	2.14	0.000	0.000	0.000	1.830	0.31	34.50%	0.24	0.27	0.59
2	256133	5.88	0.000	0.046	0.000	5.510	0.32	38.38%	0.27	0.30	0.60
OS-1	141570	3.25	0.000	0.360	0.000	0.820	2.07	22.44%	0.15	0.17	0.53
H1	349351	8.02	0.000	0.000	0.000	0.000	8.02	2.00%	0.01	0.01	0.44

TIME OF CONCENTRATION CALCULATION
DEVELOPED CONDITIONS

Equations:

Initial Flow Time:

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}}$$

C5 = 5-Yr C-Value
L = length of overland flow (ft)
S = average basin slope

Channelized Flow Time:

$$V = C_v S_w^{0.5}$$

V = velocity (ft/sec)
C_v = conveyance coefficient (from Table RO-2)
S_w = watercourse slope (ft/ft)

Urbanized Tc Check:

$$t_c = \frac{L}{180} + 10$$

L = waterway length (ft)

Project: CDEng-018
By: A.Cvar
Date: 7/12025

Notes/Assumptions:
USDCM Vol. 1 utilized for Time of Concentration Computations. Slope values utilized for initial and channelized flow times are based on Final grading surface and surveyed topographic mapping in areas where no grading is proposed.

Basin ID	Initial Flow Time				Channelized Flow Time				Total Flow Time (Min.)	Tc Check (Urbanized)	Selected Tc (Min.)
	C5	L	S	Ti	L	Cv	S	Tt			
1	0.15	360.00	0.009	33.70	384.00	7.00	0.006	11.80	45.50	14.13	14.13
2	0.15	387.00	0.009	34.94	310.00	7.00	0.007	8.82	43.76	13.87	43.76
OS-1	0.15	174.00	0.017	18.99	410.00	7.00	0.008	10.91	29.91	N/A	29.91
H1	0.15	420.00	0.007	39.54	495.00	7.00	0.007	14.09	53.63	N/A	53.63

RUNOFF CALCULATION
DEVELOPED CONDITIONS

Equation:

Q = CIA Where: C=Runoff Coefficient
I = Rainfall Intensity (In/Hr.)
A = Basin Area (Ac.)
Q = Peak Flow (CFS)

Project: CDEng-018
By: A.Cvar
Date: 7/1/2025

Notes/Assumptions:
USDCM Vol. 1 utilized for all runoff equations, Rainfall Intensity Values from Douglas County Storm Drainage Design and Technical Criteria Manual.

DESIGN POINT	BASIN(S)	AREA (AC)	C2	C5	C100	Tc	I2	I5	I100	Q2	Q5	Q100	100-YR CFS/AC
1	1	2.14	0.24	0.27	0.59	14.13	2.48	3.33	6.04	1.28	1.92	7.58	3.54
2	2	5.88	0.27	0.30	0.60	43.76	1.33	1.77	3.25	2.13	3.15	11.55	1.96
OS-1	OS-1	3.25	0.15	0.17	0.53	29.91	1.68	2.24	4.09	0.79	1.23	7.04	2.17
H1	H1	8.02	0.01	0.01	0.44	53.63	1.16	1.55	2.86	0.08	0.15	9.97	1.24

4.5 RAINFALL INTENSITY

The calculated rainfall intensity, I, is the average rainfall rate in inches per hour over a duration equal to t_c. Obtain 1-hour point precipitation depths from National Oceanic and Atmospheric Administration (NOAA) Atlas 14 for the average return periods of interest and apply Equation 5-1 in the *Rainfall* chapter using t_c as the storm duration, t_d. Use the centroid of the catchment to determine the 1-hour point precipitation depths. The MHFD-Rational and MHFD-Inlet Excel workbooks automatically calculate rainfall intensity based on 1-hour point precipitation depths for a specified location.

4.6 RUNOFF COEFFICIENTS

Any watershed can be conceptualized as a combination of pervious and impervious surfaces. Pervious surfaces allow water to infiltrate into the ground, while impervious surfaces do not allow for infiltration. In urban hydrology, the relationships between pervious and impervious surfaces is important. Urbanization increases impervious area, causing rainfall-runoff relationships to change significantly. In the absence of stormwater management controls that infiltrate or detain runoff, urbanization increases peak runoff rates, volumes, and frequency of runoff and decreases the time to peak.

When analyzing a catchment for planning or design purposes, estimates of the existing and probable future imperviousness of the drainage area are needed. In some cases, the pre-development (i.e., historic) condition also must be analyzed. Table 6-2 provides recommended imperviousness values based on land use types and is appropriate for master planning analysis and conceptual design. Note that the land use classifications in Table 6-2 incorporate roads that are included within the land use. Table 6-3 provides recommended imperviousness values for different surface types and is appropriate for use during later stages of design when the layout of different types of impervious and pervious areas on the site is known and the area of each surface type can be quantified.

The runoff coefficient, C, represents the integrated effects of infiltration, evaporation, depression storage, and interception, all of which affect the rate and volume of runoff. Determining representative runoff coefficients requires judgment based on the experience and expertise of the engineer.

Volume-based runoff coefficients were derived to improve consistency between CUHP and the Rational Method for peak flow predictions (Guo 2013; Guo and Urbonas 2013). The coefficients developed by Dr. Guo were recalibrated using CUHP Version 2.0.0 (Rapp et al. 2017). Using imperviousness, expressed as a decimal, and the Natural Resources Conservation Service (NRCS) Hydrologic Soil Group (HSG), the equations in Table 6-5 can be used to calculate runoff coefficients for design storm return periods for the Rational Method.

TABLE 6-5. RUNOFF COEFFICIENT EQUATIONS BASED ON NRCS HSG AND STORM RETURN PERIOD

NRCS HSG	STORM RETURN PERIOD						
	WQE & 2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
A	$C_A = 0.840I^{1.302}$	$C_A = 0.861I^{1.276}$	$C_A = 0.873I^{1.232}$	$C_A = 0.884I^{1.124}$	$C_A = 0.854I + 0.025$	$C_A = 0.779I + 0.110$	$C_A = 0.645I + 0.254$
B	$C_B = 0.835I^{1.169}$	$C_B = 0.857I^{1.088}$	$C_B = 0.807I + 0.057$	$C_B = 0.628I + 0.249$	$C_B = 0.558I + 0.328$	$C_B = 0.465I + 0.426$	$C_B = 0.366I + 0.536$
C/D	$C_{C/D} = 0.834I^{1.122}$	$C_{C/D} = 0.815I + 0.035$	$C_{C/D} = 0.735I + 0.132$	$C_{C/D} = 0.560I + 0.319$	$C_{C/D} = 0.494I + 0.393$	$C_{C/D} = 0.409I + 0.484$	$C_{C/D} = 0.315I + 0.588$

Where:

I = Weighted imperviousness of catchment **expressed as a decimal**

C_A = Runoff coefficient for NRCS HSG A soils

C_B = Runoff coefficient for NRCS HSG B soils

$C_{C/D}$ = Runoff coefficient for NRCS HSG C and D soils

The values for various catchment imperviousness and storm return periods are tabulated in Tables 6-6 through 6-8 and presented graphically in Figures 6-1 through 6-3. These coefficients were developed for the Denver region to work in conjunction with the t_c criteria in Section 4.4. Use of these coefficients and this procedure outside of the semi-arid climate found in the Denver region may not be valid. The MHFD-Rational Excel workbook performs calculations to determine the runoff coefficient based on the HSG, the design storm return period, and imperviousness and is available at www.mhfd.org.

See Examples 13.1 and 13.2 for application of the Rational Method.

TABLE 6-6. RUNOFF COEFFICIENTS, *C*, NRCS HSG A

TOTAL OR EFFECTIVE % IMPERVIOUS	NRCS HSG A						
	WQE & 2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
2%	0.01	0.01	0.01	0.01	0.04	0.13	0.27
5%	0.02	0.02	0.02	0.03	0.07	0.15	0.29
10%	0.04	0.05	0.05	0.07	0.11	0.19	0.32
15%	0.07	0.08	0.08	0.10	0.15	0.23	0.35
20%	0.10	0.11	0.12	0.14	0.20	0.26	0.38
25%	0.14	0.15	0.16	0.19	0.24	0.30	0.42
30%	0.18	0.19	0.20	0.23	0.28	0.34	0.45
35%	0.21	0.23	0.24	0.27	0.32	0.38	0.48
40%	0.25	0.27	0.28	0.32	0.37	0.42	0.51
45%	0.30	0.31	0.33	0.36	0.41	0.46	0.54
50%	0.34	0.36	0.37	0.41	0.45	0.50	0.58
55%	0.39	0.40	0.42	0.45	0.49	0.53	0.61
60%	0.43	0.45	0.47	0.50	0.54	0.57	0.64
65%	0.48	0.50	0.51	0.54	0.58	0.61	0.67
70%	0.53	0.55	0.56	0.59	0.62	0.65	0.71
75%	0.58	0.60	0.61	0.64	0.67	0.69	0.74
80%	0.63	0.65	0.66	0.69	0.71	0.73	0.77
85%	0.68	0.70	0.71	0.74	0.75	0.76	0.80
90%	0.73	0.75	0.77	0.79	0.79	0.80	0.83
95%	0.79	0.81	0.82	0.83	0.84	0.84	0.87
100%	0.84	0.86	0.87	0.88	0.88	0.88	0.90

TABLE 6-7. RUNOFF COEFFICIENTS, *C*, NRCS HSG B

TOTAL OR EFFECTIVE % IMPERVIOUS	NRCS HSG B						
	WQE & 2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
2%	0.01	0.01	0.07	0.26	0.34	0.44	0.54
5%	0.03	0.03	0.10	0.28	0.36	0.45	0.55
10%	0.06	0.07	0.14	0.31	0.38	0.47	0.57
15%	0.09	0.11	0.18	0.34	0.41	0.50	0.59
20%	0.13	0.15	0.22	0.37	0.44	0.52	0.61
25%	0.17	0.19	0.26	0.41	0.47	0.54	0.63
30%	0.20	0.23	0.30	0.44	0.50	0.57	0.65
35%	0.24	0.27	0.34	0.47	0.52	0.59	0.66
40%	0.29	0.32	0.38	0.50	0.55	0.61	0.68
45%	0.33	0.36	0.42	0.53	0.58	0.64	0.70
50%	0.37	0.40	0.46	0.56	0.61	0.66	0.72
55%	0.42	0.45	0.50	0.59	0.63	0.68	0.74
60%	0.46	0.49	0.54	0.63	0.66	0.71	0.76
65%	0.50	0.54	0.58	0.66	0.69	0.73	0.77
70%	0.55	0.58	0.62	0.69	0.72	0.75	0.79
75%	0.60	0.63	0.66	0.72	0.75	0.77	0.81
80%	0.64	0.67	0.70	0.75	0.77	0.80	0.83
85%	0.69	0.72	0.74	0.78	0.80	0.82	0.85
90%	0.74	0.76	0.78	0.81	0.83	0.84	0.87
95%	0.79	0.81	0.82	0.85	0.86	0.87	0.88
100%	0.84	0.86	0.86	0.88	0.89	0.89	0.90

TABLE 6-8. RUNOFF COEFFICIENTS, *C*, NRCS HSG C/D

TOTAL OR EFFECTIVE % IMPERVIOUS	NRCS HSG C/D						
	WQE & 2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
2%	0.01	0.05	0.15	0.33	0.40	0.49	0.59
5%	0.03	0.08	0.17	0.35	0.42	0.50	0.60
10%	0.06	0.12	0.21	0.38	0.44	0.52	0.62
15%	0.10	0.16	0.24	0.40	0.47	0.55	0.64
20%	0.14	0.20	0.28	0.43	0.49	0.57	0.65
25%	0.18	0.24	0.32	0.46	0.52	0.59	0.67
30%	0.22	0.28	0.35	0.49	0.54	0.61	0.68
35%	0.26	0.32	0.39	0.52	0.57	0.63	0.70
40%	0.30	0.36	0.43	0.54	0.59	0.65	0.71
45%	0.34	0.40	0.46	0.57	0.62	0.67	0.73
50%	0.38	0.44	0.50	0.60	0.64	0.69	0.75
55%	0.43	0.48	0.54	0.63	0.66	0.71	0.76
60%	0.47	0.52	0.57	0.66	0.69	0.73	0.78
65%	0.51	0.56	0.61	0.68	0.71	0.75	0.79
70%	0.56	0.61	0.65	0.71	0.74	0.77	0.81
75%	0.60	0.65	0.68	0.74	0.76	0.79	0.82
80%	0.65	0.69	0.72	0.77	0.79	0.81	0.84
85%	0.69	0.73	0.76	0.80	0.81	0.83	0.86
90%	0.74	0.77	0.79	0.82	0.84	0.85	0.87
95%	0.79	0.81	0.83	0.85	0.86	0.87	0.89
100%	0.84	0.86	0.87	0.88	0.89	0.89	0.90

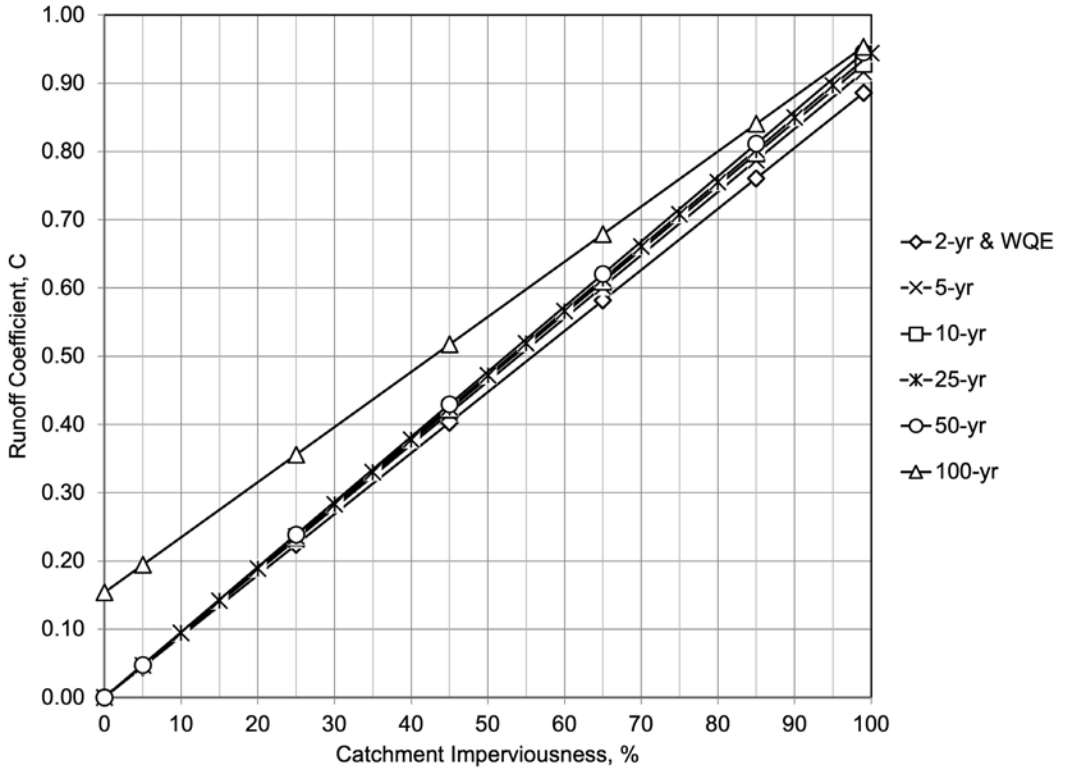


FIGURE 6-1. RUNOFF COEFFICIENT VS. CATCHMENT IMPERVIOUSNESS NRCS HSG A

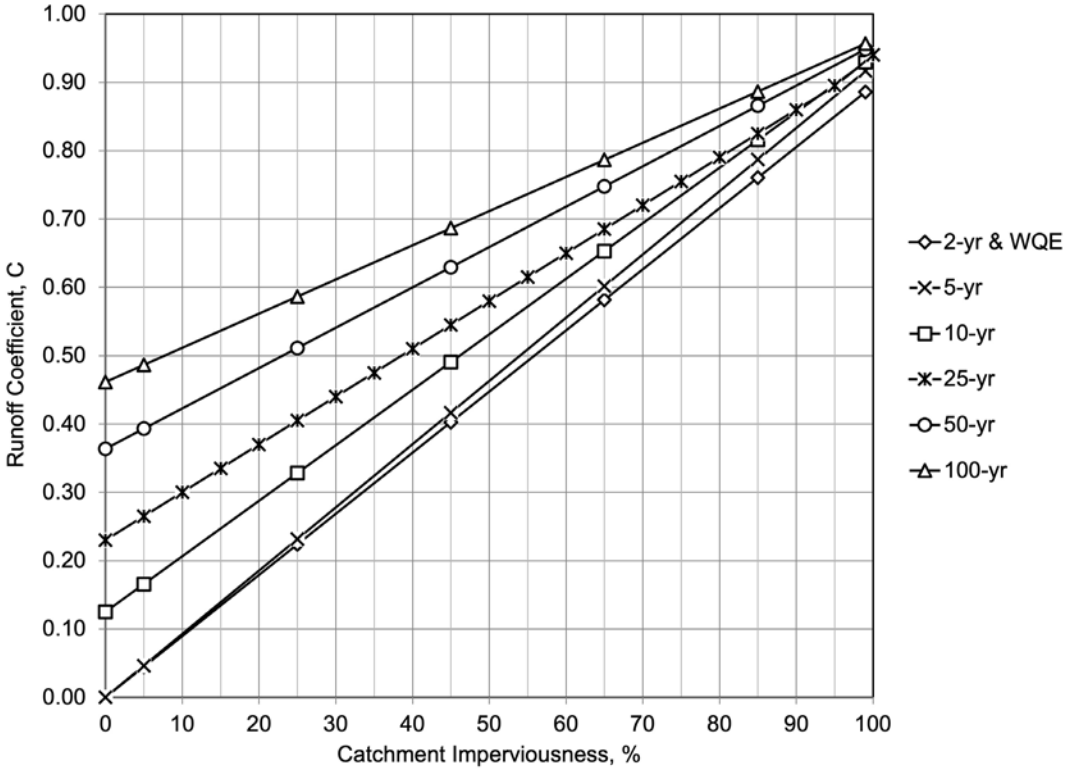


FIGURE 6-2. RUNOFF COEFFICIENT VS. CATCHMENT IMPERVIOUSNESS NRCS HSG B

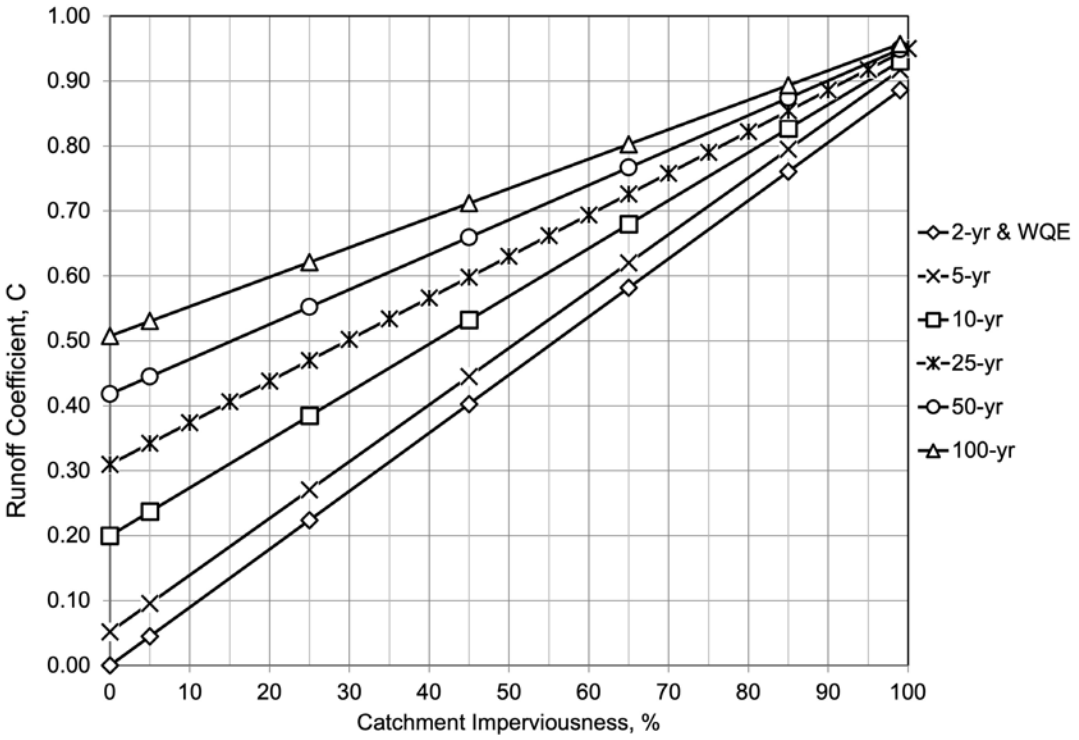


FIGURE 6-3. RUNOFF COEFFICIENT VS. CATCHMENT IMPERVIOUSNESS NRCS HSG C/D

FIGURE 6-1
DOUGLAS COUNTY RAINFALL ZONES

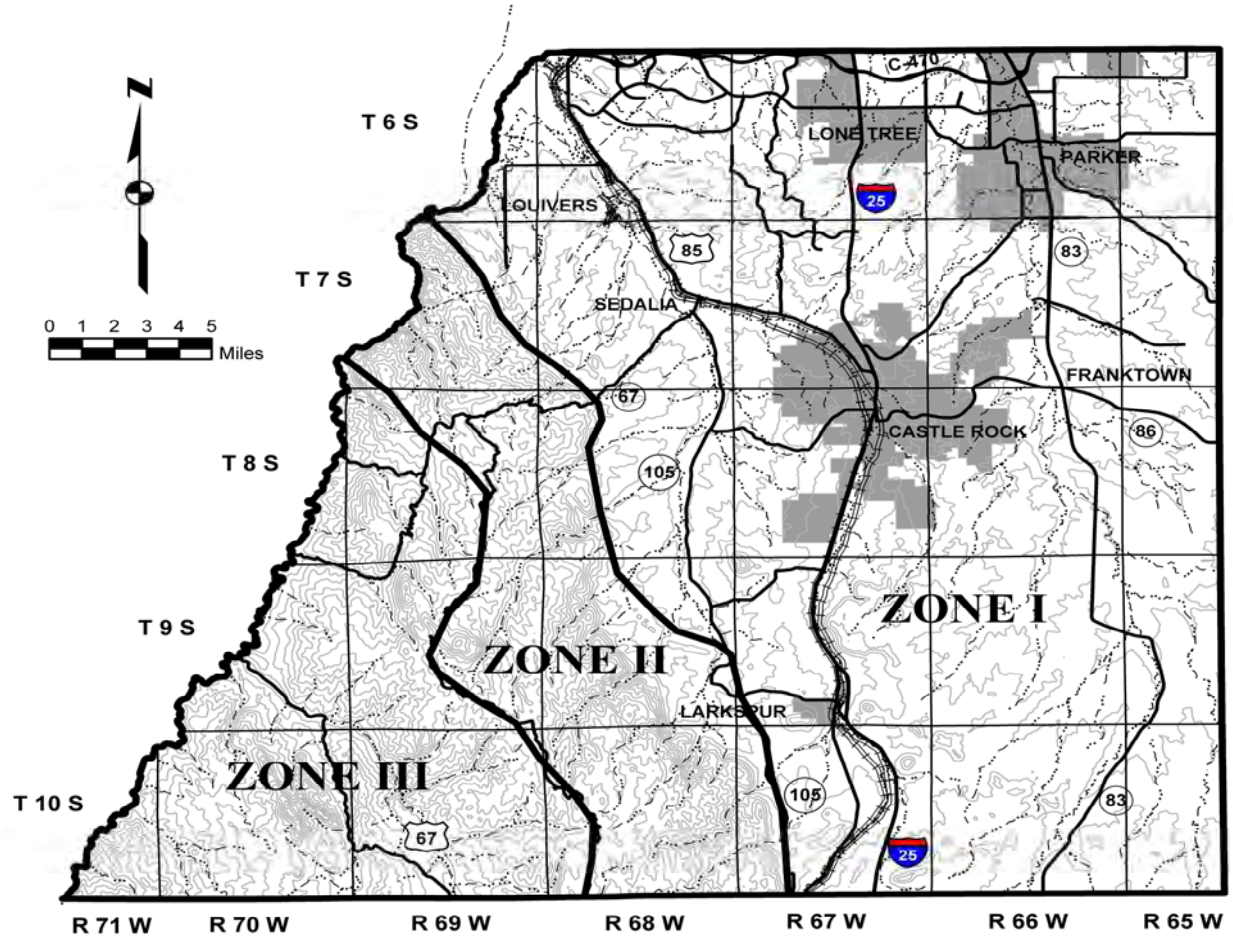


FIGURE 6-2
RAINFALL INTENSITY-DURATION CURVE
DOUGLAS COUNTY *ZONE I*

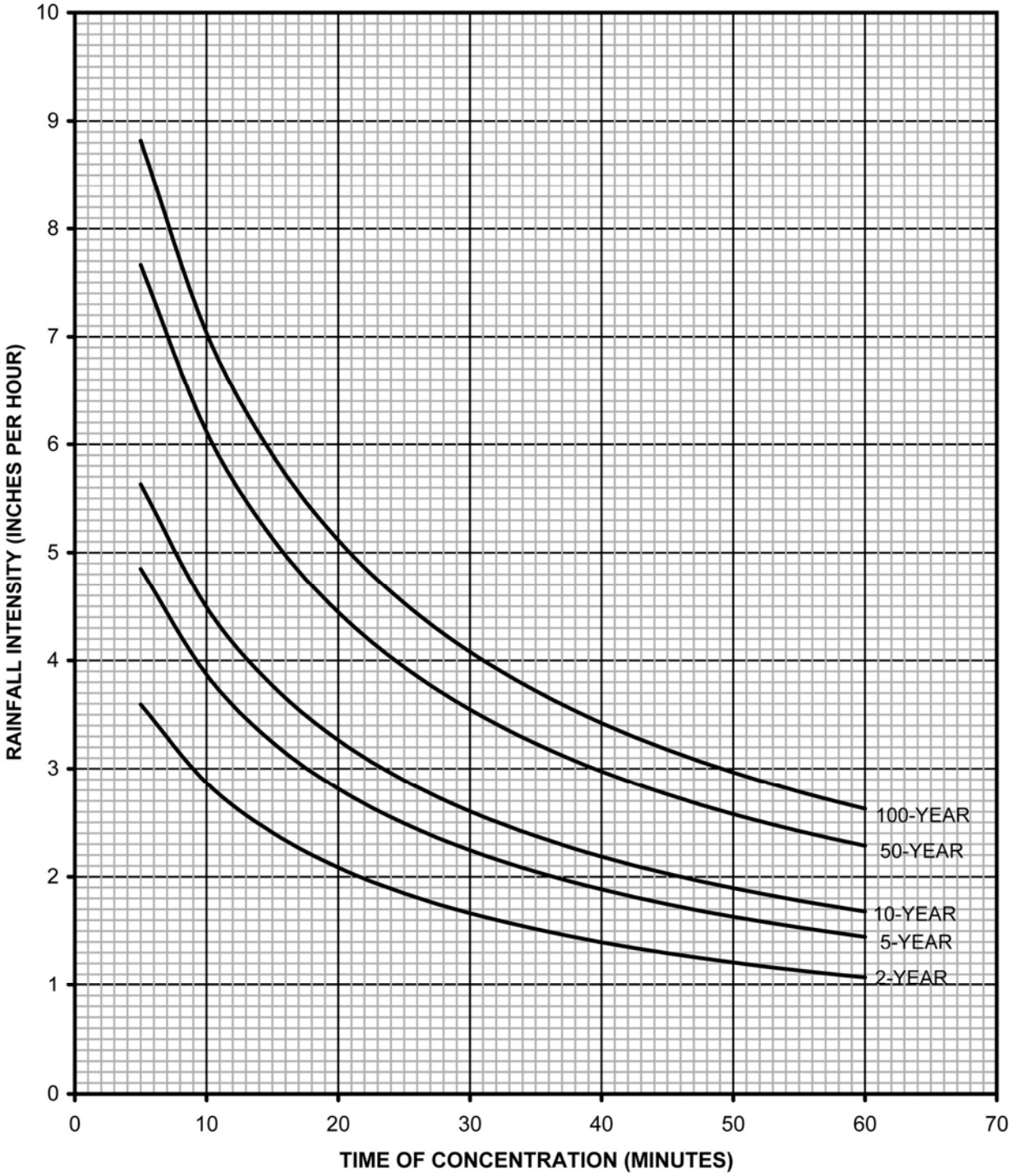


FIGURE 6-3
RAINFALL INTENSITY-DURATION CURVE
DOUGLAS COUNTY *ZONE II*

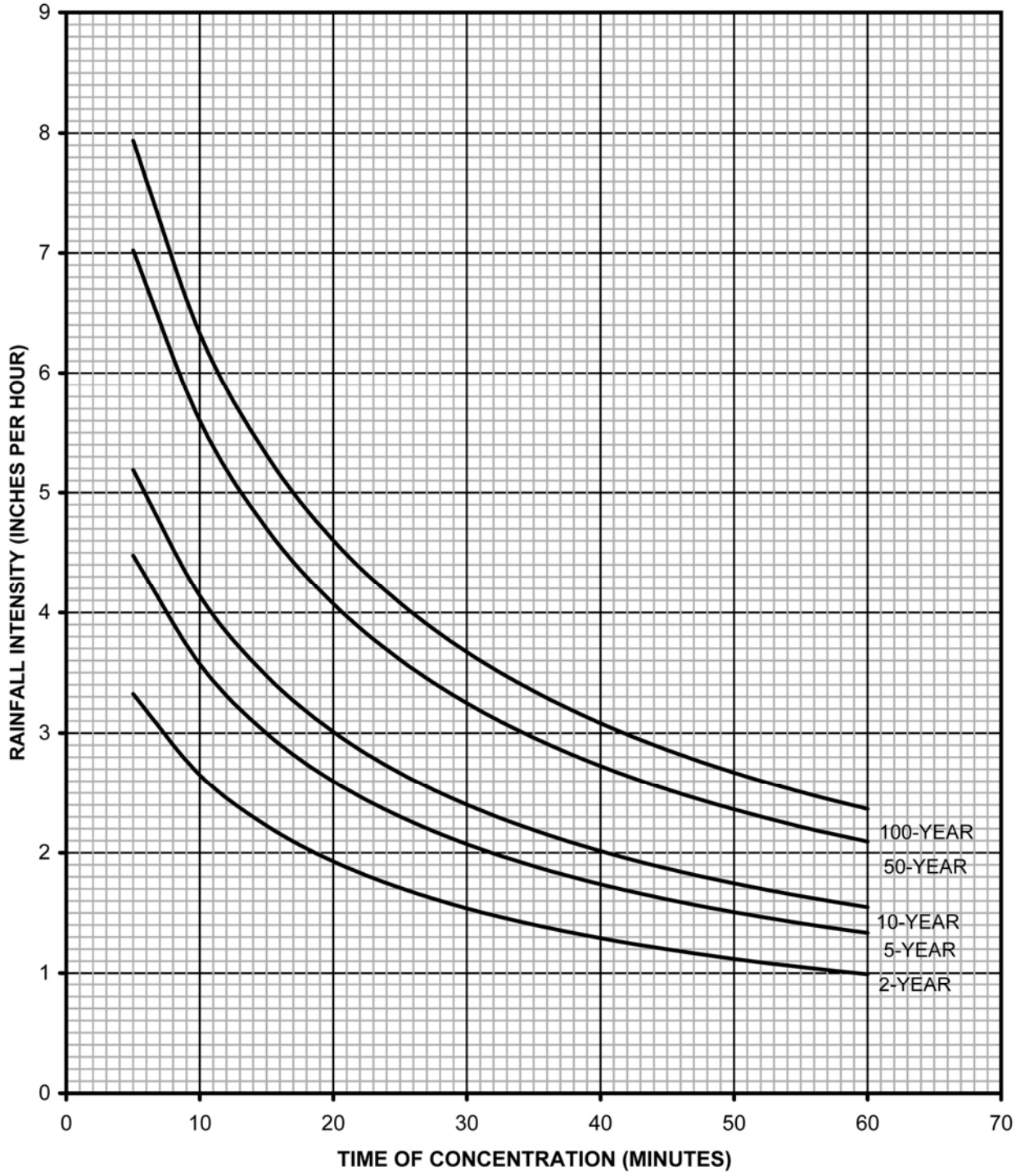
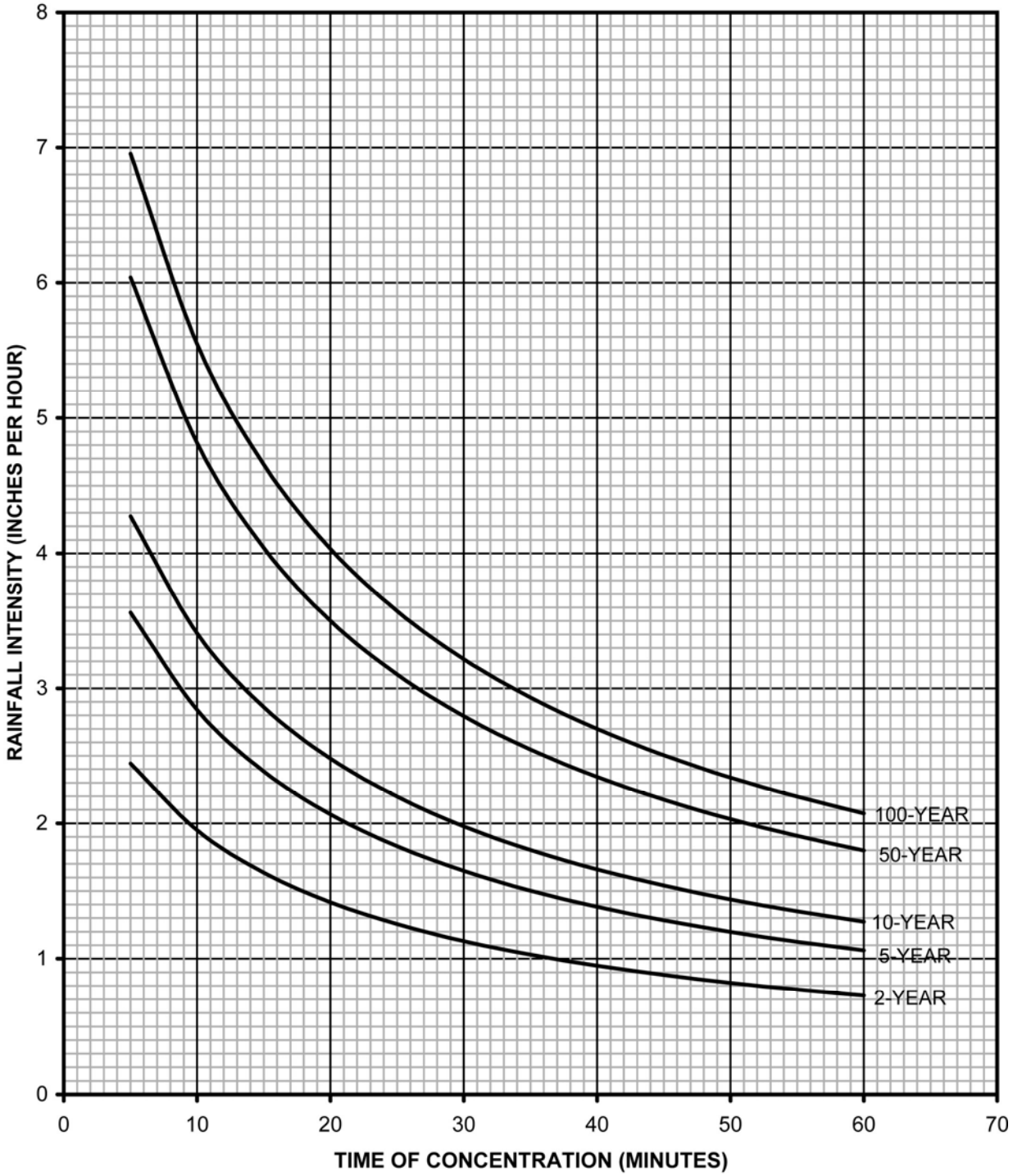


FIGURE 6-4
RAINFALL INTENSITY-DURATION CURVE
DOUGLAS COUNTY *ZONE III*



2.4 Time of Concentration

One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations. The time of concentration relationships recommended in this *Manual* are based in part on the rainfall-runoff data collected in the Denver metropolitan area and are designed to work with the runoff coefficients also recommended in this *Manual*. As a result, these recommendations need to be used with a great deal of caution whenever working in areas that may differ significantly from the climate or topography found in the Denver region.

For urban areas, the time of concentration, t_c, consists of an initial time or overland flow time, t_i, plus the travel time, t_t, in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time, t_i, plus the time of travel in a defined form, such as a swale, channel, or drainageway. The travel portion, t_t, of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation RO-2 for both urban and non-urban areas:

$$t_c = t_i + t_t \qquad \text{(RO-2)}$$

in which:

t_c = time of concentration (minutes)

t_i = initial or overland flow time (minutes)

t_t = travel time in the ditch, channel, gutter, storm sewer, etc. (minutes)

2.4.1 Initial Flow Time

The initial or overland flow time, t_i, may be calculated using equation RO-3:

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad \text{(RO-3)}$$

in which:

t_i = initial or overland flow time (minutes)

C_5 = runoff coefficient for 5-year frequency (from Table RO-5)

L = length of overland flow (500 ft maximum for non-urban land uses, 300 ft maximum for urban land uses)

S = average basin slope (ft/ft)

Equation RO-3 is adequate for distances up to 500 feet. Note that, in some urban watersheds, the overland flow time may be very small because flows quickly channelize.

2.4.2 Overland Travel Time

For catchments with overland and channelized flow, the time of concentration needs to be considered in combination with the overland travel time, t_t, which is calculated using the hydraulic properties of the swale, ditch, or channel. For preliminary work, the overland travel time, t_t, can be estimated with the help of Figure RO-1 or the following equation (Guo 1999):

$$V = C_v S_w^{0.5} \qquad \text{(RO-4)}$$

in which:

V = velocity (ft/sec)

C_v = conveyance coefficient (from Table RO-2)

S_w = watercourse slope (ft/ft)

Table RO-2—Conveyance Coefficient, C_v

Type of Land Surface	Conveyance Coefficient, C_v
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

The time of concentration, t_c, is then the sum of the initial flow time, t_i, and the travel time, t_t, as per Equation RO-2.

2.4.3 First Design Point Time of Concentration in Urban Catchments

Using this procedure, the time of concentration at the first design point (i.e., initial flow time, t_i) in an urbanized catchment should not exceed the time of concentration calculated using Equation RO-5.

$$t_c = \frac{L}{180} + 10 \qquad \text{(RO-5)}$$

in which:

t_c = maximum time of concentration at the first design point in an urban watershed (minutes)

Appendix 2

Detention Computations, Water Quality Capture Volume Computations

DETENTION POND SUMMARY

PROJECT: Timber Mill
DATE: 7/9/2025
BY: ATC

Pond ID	Vol. (Ac-Ft)	100-Yr WSEL (Ft)	WQ Capture Vol. (Ac-Ft)	WQ WSEL (Ft)	Peak Release Rate (2-Yr Historic, cfs)
West Pond	1.31	5977.59	0.12	TBD	0.08
East Pond	0.40	5987.70	N/A	N/A	0.79

FAA Method Detention Volume Calculations

Project: Timber Mill
Pond ID: West Pond
By: A.Cvar
Date: 7/1/2025

Allowable Release Rate, Q =	0.08	cfs
Drainage Area, A =	8.02	acres
Rational Method C =	0.60	

Time (min)	Rainfall Intensity (inches / hr)	Inflow Volume (cubic feet)	Adjustment Factor "m"	Average Outflow (cfs)	Outflow Volume (cubic feet)	Storage Volume (cubic feet)
0	0	0	0	0	0	0
5.000	8.83	12,750	1.00	0.08	24	12,726
10.000	7.01	20,244	1.00	0.08	48	20,196
15.000	5.88	25,460	0.83	0.07	60	25,400
20.000	5.10	29,437	0.75	0.06	72	29,365
25.000	4.52	32,643	0.70	0.06	84	32,559
30.000	4.08	35,331	0.67	0.05	96	35,235
35.000	3.73	37,645	0.64	0.05	108	37,537
40.000	3.44	39,679	0.63	0.05	120	39,559
45.000	3.19	41,495	0.61	0.05	132	41,363
50.000	2.99	43,138	0.60	0.05	144	42,994
55.000	2.81	44,639	0.59	0.05	156	44,483
60.000	2.66	46,022	0.58	0.05	168	45,854
65.000	2.52	47,306	0.58	0.05	180	47,126
70.000	2.40	48,504	0.57	0.05	192	48,312
75.000	2.29	49,628	0.57	0.05	204	49,424
80.000	2.19	50,688	0.56	0.05	216	50,472
85.000	2.11	51,691	0.56	0.04	228	51,463
90.000	2.03	52,644	0.56	0.04	240	52,404
95.000	1.95	53,551	0.55	0.04	252	53,299
100.000	1.88	54,418	0.55	0.04	264	54,154
105.000	1.82	55,247	0.55	0.04	276	54,971
110.000	1.76	56,044	0.55	0.04	288	55,756
115.000	1.71	56,809	0.54	0.04	300	56,509
120.000	1.66	57,547	0.54	0.04	312	**57,235**

Storage, cubic feet =	57,235
acre feet =	1.314

FAA Method Detention Volume Calculations

Project: Timber Mill
Pond ID: East Pond
By: A.Cvar
Date: 7/1/2025

Allowable Release Rate, Q =	0.79	cfs
Drainage Area, A =	3.25	acres
Rational Method C =	0.53	

Time (min)	Rainfall Intensity (inches / hr)	Inflow Volume (cubic feet)	Adjustment Factor "m"	Average Outflow (cfs)	Outflow Volume (cubic feet)	Storage Volume (cubic feet)
0	0	0	0	0	0	0
5.000	8.83	4,564	1.00	0.79	237	4,327
10.000	7.01	7,247	1.00	0.79	474	6,773
15.000	5.88	9,114	0.83	0.66	593	8,521
20.000	5.10	10,537	0.75	0.59	711	9,826
25.000	4.52	11,685	0.70	0.55	830	10,856
30.000	4.08	12,647	0.67	0.53	948	11,699
35.000	3.73	13,475	0.64	0.51	1,067	12,409
40.000	3.44	14,203	0.63	0.49	1,185	13,018
45.000	3.19	14,854	0.61	0.48	1,304	13,550
50.000	2.99	15,442	0.60	0.47	1,422	14,020
55.000	2.81	15,979	0.59	0.47	1,541	14,438
60.000	2.66	16,474	0.58	0.46	1,659	14,815
65.000	2.52	16,933	0.58	0.46	1,778	15,156
70.000	2.40	17,362	0.57	0.45	1,896	15,466
75.000	2.29	17,765	0.57	0.45	2,015	15,750
80.000	2.19	18,144	0.56	0.44	2,133	16,011
85.000	2.11	18,503	0.56	0.44	2,252	16,252
90.000	2.03	18,844	0.56	0.44	2,370	16,474
95.000	1.95	19,169	0.55	0.44	2,489	16,681
100.000	1.88	19,479	0.55	0.43	2,607	16,872
105.000	1.82	19,776	0.55	0.43	2,726	17,051
110.000	1.76	20,061	0.55	0.43	2,844	17,217
115.000	1.71	20,335	0.54	0.43	2,963	17,373
120.000	1.66	20,599	0.54	0.43	3,081	**17,518**

Storage, cubic feet =	17,518
acre feet =	0.402

Pond Stage-Storage Curve

Project: Timber Mill
Pond ID: West Pond
By: ATC
Date: 7/1/2025

Stage (FT)	Contour Area (SF)	Volume (CU.FT.)	Volume (AC-FT)	Comments
5,974.00	10,615.42	0	0	
5,976.00	16,225.91	26643.7	0.611655188	
5,978.00	22,210.24	64923.61	1.490441001	**100-Yr Detention WSEL=5977.59
5,980.00	33,578.45	120322.12	2.762215794	

Pond Stage-Storage Curve

Project: Timber Mill
Pond ID: East Pond
By: ATC
Date: 7/1/2025

Stage (FT)	Contour Area (SF)	Volume (CU.FT.)	Volume (AC-FT)	Comments
5,983.00	1,627.09	0	0	
5,984.00	2,385.90	1994.43	0.045785813	
5,986.00	4,191.88	8487.96	0.194856749	**100-Yr Detention WSEL=5987.70
5,988.00	6,382.32	18985.69	0.435851469	
5,990.00	9,260.94	34539.91	0.792927227	

WATER QUALITY CAPTURE VOLUME DESIGN CALCULATIONS
40-Hour Extended Detention (West Pond)

Project: Timber Mill
By: ATC
Date: 7/9/25

REQUIRED STORAGE & OUTLET WORKS:

BASIN AREA =	8.020	<-- INPUT from impervious calcs
BASIN IMPERVIOUSNESS PERCENT =	40.00	<-- INPUT from impervious calcs
BASIN IMPERVIOUSNESS RATIO =	0.4000	<-- CALCULATED
WQCV (watershed inches) =	0.180	<-- CALCULATED from USDCM Vol.3, Ch.3, EQ3-1
WQCV (ac-ft) =	0.120	<-- CALCULATED from USDCM Vol.3, Ch.3, EQ3-2
WQ Depth (ft) =	TBD	<-- INPUT from stage-storage table
AREA REQUIRED PER ROW, a (in^2) =	TBD	<-- CALCULATED from Figure EDB-3

CIRCULAR PERFORATION SIZING:

dia (in) =	TBD	<-- INPUT from Figure 5
n =	TBD	<-- INPUT from Figure 5
t (in) =	TBD	<-- INPUT from Figure 5
number of rows =	1	<-- CALCULATED from WQ Depth and row spacing

Extended Detention Basin (EDB) T-5

Description

An extended detention basin (EDB) is a sedimentation basin designed to detain stormwater for many hours after storm runoff ends. This BMP is similar to a detention basin used for flood control, however; the EDB uses a much smaller outlet that extends the emptying time of the more frequently occurring runoff events to facilitate pollutant removal. The EDB's 40-hour drain time for the water quality capture volume (WQCV) is recommended to remove a significant portion of total suspended solids (TSS). Soluble pollutant removal is enhanced by providing a small wetland marsh or "micropool" at the outlet to promote biological uptake. The basins are sometimes called "dry ponds" because they are designed not to have a significant permanent pool of water remaining between storm runoff events.

Photograph EDB-1: This EDB includes a concrete trickle channel and a micropool with a concrete bottom and grouted boulder sideslopes. The vegetation growing in the sediment of the micropool adds to the natural look of this facility and ties into the surrounding landscape.

Site Selection

EDBs are well suited for watersheds with at least five impervious acres up to approximately one square mile of watershed. Smaller watersheds can result in an orifice size prone to clogging. Larger watersheds and watersheds with baseflows can complicate the design and reduce the level of treatment provided. EDBs are also well suited where flood detention is incorporated into the same basin. The depth of groundwater should be investigated. Groundwater depth should be 2 or more feet below the bottom of the basin in order to keep this area dry and maintainable.

Extended Detention Basin	
Functions	
LID/Volume Red.	Somewhat
WQCV Capture	Yes
WQCV+Flood Control	Yes
Fact Sheet Includes EURV Guidance	Yes
Typical Effectiveness for Targeted Pollutants[3]	
Sediment/Solids	Good
Nutrients	Moderate
Total Metals	Moderate
Bacteria	Poor
Other Considerations	
Life-cycle Costs[4]	Moderate

[3] Based primarily on data from the International Stormwater BMP Database (www.bmpdatabase.org).

[4] Based primarily on BMP-REALCOST available at www.udfcd.org. Analysis based on a single installation (not based on the maximum recommended watershed tributary to each BMP).

Designing for Maintenance

Recommended maintenance practices for all BMPs are provided in the BMP Maintenance chapter of this manual. During design, the following should be considered to ensure ease of maintenance over the long-term:

- Always provide a micropool (see step 7).
- Provide a design slope of at least 3% in the vegetated bottom of the basin (either toward the trickle channel or toward the micropool). This will help maintain the appearance of the turf grass in the bottom of the basin and reduce the possibility of saturated areas that may produce unwanted species of vegetation and mosquito breeding conditions. Verify slopes during construction, prior to vegetation.
- Follow trash rack sizing recommendations to determine the minimum area for the trash rack (see design step 9).
- Provide adequate initial surcharge volume for frequent inundation (see design step 3).
- Provide stabilized access to the forebay, outlet, spillway, and micropool for maintenance purposes.
- Provide access to the well screen. The well screen requires maintenance more often than any other EDB component. Ensure that the screen can be reached from a point outside of the micropool. When the well screen is located inside the outlet structure, provide an access port within the trash rack or use a sloped trash rack that consists of bearing bars (not horizontal) that create openings no more than five inches clear.
- Provide a hard-bottom forebay that allows for removal of sediment.
- Where baseflows are anticipated, consider providing a flow-measuring device (e.g. weir or flume with staff gage and rating curve) at the forebay to assist with future modifications of the water quality plate. Typically, the baseflow will increase as the watershed develops. It is important that the water quality plate continue to function, passing the baseflow while draining the WQCV over approximately 40 hours. Measuring the actual baseflow can be helpful in determining if and when the orifice place should be replaced.

Benefits

- The relatively simple design can make EDBs less expensive to construct than other BMPs, especially for larger basins.
- Maintenance requirements are straightforward.
- The facility can be designed for multiple uses.

Limitations

- Ponding time and depths may generate safety concerns.
- Best suited for tributary areas of 5 impervious acres or more. EDBs are not recommended for sites less than 2 impervious acres.
- Although ponds do not require more total area compared to other BMPs, they typically require a relatively large continuous area.

EDBs providing combined water quality and flood control functions can serve multiple uses such as playing fields or picnic areas. These uses are best located at higher elevation within the basin, above the WQCV pool level.

Design Procedure and Criteria

The following steps outline the design procedure and criteria for an EDB and Figure EDB-3 shows a typical configuration. UD-BMP, available at www.udfcd.org, is an Excel based workbook that can be used to perform some of the below calculations and ensure conformance to these criteria. UD-Detention, another workbook developed by UDFCD can be used to develop and route a storm hydrograph through an EDB and design the outlet structure.

1. **Basin Storage Volume**: Provide a design volume equal to the WQCV or the EURV. This volume begins at the lowest orifice in the outlet structure.

   - Determine the imperviousness of the watershed (or effective imperviousness where LID elements are used upstream).
   - Find the required storage volume. Determine the required WQCV or EURV (watershed inches of runoff) using Figure 3-2 located in Chapter 3 of this manual (for WQCV) or equations provided in the *Storage* chapter of Volume 2 (for EURV).
   - Calculate the design volume as follows:

   For WQCV:

   $$V = \left[\frac{\text{WQCV}}{12}\right] A \qquad \text{Equation EDB-1}$$

   For EURV:

   $$V = \left[\frac{\text{EURV}}{12}\right] A \qquad \text{Equation EDB-2}$$

   Where:

   V = design volume (acre ft)

   A = watershed area tributary to the extended detention basin (acres)

2. **Basin Shape**: Always maximize the distance between the inlet and the outlet. It is best to have a basin length (measured along the flow path from inlet to outlet) to width ratio of at least 2:1. A longer flow path from inlet to outlet will minimize short circuiting and improve reduction of TSS. To achieve this ratio, it may be necessary to modify the inlet and outlet points through the use of pipes or swales.

3. **Basin Side Slopes**: Basin side slopes should be stable and gentle to facilitate maintenance and access. Slopes that are 4:1or flatter should be used to allow for conventional maintenance equipment and for improved safety, maintenance, and aesthetics. Side slopes should be no steeper than 3:1. The use of walls is highly discouraged due to maintenance constraints.

4. **Inlet**: Dissipate flow energy at concentrated points of inflow. This will limit erosion and promote particle sedimentation. Inlets should be designed in accordance with UDFCD drop structure criteria for inlets above the invert of the forebay, impact basin outlet details for at grade inlets, or other types of energy dissipating structures.

5. **Forebay Design**: The forebay provides an opportunity for larger particles to settle out in an area that can be easily maintained. The length of the flow path through the forebay should be maximized, and the slope minimized to encourage settling. The appropriate size of the forebay may be as much a function of the level of development in the tributary area as it is a percentage of the WQCV. When portions of the watershed may remain disturbed for an extended period of time, the forebay size will need to be increased due to the potentially high sediment load. Refer to Table EDB-4 for a design criteria summary. When using this table, the designer should consider increasing the size of the forebay if the watershed is not fully developed.

   The forebay outlet should be sized to release 2% of the undetained peak 100-year discharge. A soil riprap berm with 3:1 sideslopes (or flatter) and a pipe outlet or a concrete wall with a notch outlet should be constructed between the forebay and the main EDB. It is recommended that the berm/pipe configuration be reserved for watersheds in excess of 20 impervious acres to accommodate the minimum recommended pipe diameter of 8 inches. When using the berm/pipe configuration, round up to the nearest standard pipe size and use a minimum diameter of 8 inches. The floor of the forebay should be concrete or lined with grouted boulders to define sediment removal limits. With either configuration, soil riprap should also be provided on the downstream side of the forebay berm or wall if the downstream grade is lower than the top of the berm or wall. The forebay will overtop frequently so this protection is necessary for erosion control. All soil riprap in the area of the forebay should be seeded and erosion control fabric should be placed to retain the seed in this high flow area.

6. **Trickle Channel:** Convey low flows from the forebay to the micropool with a trickle channel. The trickle channel should have a minimum flow capacity equal to the maximum release from the forebay outlet.

   - **Concrete Trickle Channels:** A concrete trickle channel will help to establish the bottom of the basin long-term and may also facilitate regular sediment removal. It can be a "V" shaped concrete drain pan or a concrete channel with curbs. A flat-bottom channel facilitates maintenance. A slope between 0.4% - 1% is recommended to encourage settling while reducing the potential for low points within the pan.

   - **Soft-bottom Trickle Channels**: When designed and maintained properly, soft-bottom trickle channels can allow for an attractive alternative to concrete. They can also improve water quality. However, they are not appropriate for all sites. Be aware, maintenance of soft bottom trickle channels requires mechanical removal of sediment and vegetation. Additionally, this option provides mosquito habitat. For this reason, UDFCD recommends that they be considered on a case-by-case basis and with the approval of the local jurisdiction. It is recommended that soft bottom trickle channels be designed with a consistent longitudinal slope from forebay to micropool and that they not meander. This geometry will allow for reconstruction of the original design when sediment removal in the trickle channel is necessary. The trickle channel may also be located along the toe of the slope if a straight channel is not desired. The recommended minimum depth of a soft bottom trickle channel is 1.5 feet. This depth will help limit potential wetland growth to the trickle channel, preserving the bottom of the basin.

     Riprap and soil riprap lined trickle channels are not recommended due to past maintenance experiences, where the riprap was inadvertently removed along with the sediment during maintenance.

7. **Micropool and Outlet Structure**: Locate the outlet structure in the embankment of the EDB and provide a permanent micropool directly in front of the structure. Submerge the well screen to the bottom of the micropool. This will reduce clogging of the well screen because it allows water to flow though the well screen below the elevation of the lowest orifice even when the screen above the water surface is plugged. This will prevent shallow ponding in front of the structure, which provides a breeding ground for mosquitoes (large shallow puddles tend to produce more mosquitoes than a smaller, deeper permanent pond).

   Basins with micropools have fewer mosquitoes. Micropools reduce shallow wet areas where breeding is most favorable.

   Micropool side slopes may be vertical walls or stabilized slopes of 3:1 (horizontal:vertical). For watersheds with less than 5 impervious acres, the micropool can be located inside the outlet structure (refer to Figures OS-7 and OS-8 provided in Fact Sheet T-12). The micropool should be at least 2.5 feet in depth with a minimum surface area of 10 square feet. The bottom should be concrete unless a baseflow is present or anticipated or if groundwater is anticipated. Riprap is not recommended because it complicates maintenance operations.

   Where possible, place the outlet in an inconspicuous location as shown in Photo EDB-3. This urban EDB utilizes landscaped parking lot islands connected by a series of culverts (shown in Photo EDB-4) to provide the required water quality and flood control volumes.

   The outlet should be designed to release the WQCV over a 40-hour period. Draining a volume of water over a specified time can be done through an orifice plate as detailed in Fact Sheet T-12. Use reservoir routing calculations as discussed in the *Storage* Chapter of Volume 2 to assist in the design. Two workbooks tools have been developed by UDFCD for this purpose, UD-FSD and UD-Detention. Both are available at www.udfcd.org. UD-FSD is recommended for a typical EDB full spectrum detention design. UD-Detention uses the same methodology and can be used for a full spectrum detention basin or a WQCV only design. It also allows for a wider range of outlet controls should the user want to specify something beyond what is shown in Fact Sheet T-12.

   Refer to BMP Fact Sheet T-12 for schematics pertaining to structure geometry, grates, trash racks, orifice plate, and all other necessary components.

   The outlet may have flared or parallel wing walls as shown in Figures EDB-1 and EDB-2, respectively. Either configuration should be recessed into the embankment to minimize its profile. Additionally, the trash rack should be sloped with the basin side-slopes.

8. **Initial Surcharge Volume**: Providing a surcharge volume above the micropool for frequently occurring runoff minimizes standing water and sediment deposition in the remainder of the basin. This is critical to turf maintenance and mosquito abatement in the basin bottom. The initial surcharge volume is not provided in the micropool nor does it include the micropool volume. It is the available storage volume that begins at the water surface elevation of the micropool and extends upward to a grade break within the basin (typically the invert of the trickle channel).

Photograph EDB-2. The initial surcharge volume of this EDB is contained within the boulders that surround the micropool.

Photograph EDB-3. Although walls may complicate maintenance access, this outlet structure is relatively hidden from public view. This photo was taken shortly following a storm event.

The area of the initial surcharge volume, when full, is typically the same or slightly larger than that of the micropool. The initial surcharge volume should have a depth of at least 4 inches. For watersheds of at least 5 impervious acres, the initial surcharge volume should also be at least 0.3% of the WQCV. The initial surcharge volume is considered a part of the WQCV and does not need to be provided in addition to the WQCV. It is recommended that this area be shown on the grading plan or in a profile for the EDB. When baseflows are anticipated, it is recommended that the initial surcharge volume be increased. See the inset on page EDB-9 for additional guidelines for designing for baseflows.

Photograph EDB-4. A series of landscape islands connected by culverts provide water quality and flood control for this site.

9. **Trash Rack**: Provide a trash rack (or screen) of sufficient size at the outlet to provide hydraulic capacity while the rack is partially clogged. Openings should be small enough to limit clogging of the individual orifices. Size any overflow safety grate so it does not interfere with the hydraulic capacity of the outlet pipe. See BMP Fact Sheet T-12 for detailed trash rack and safety grate design guidance.

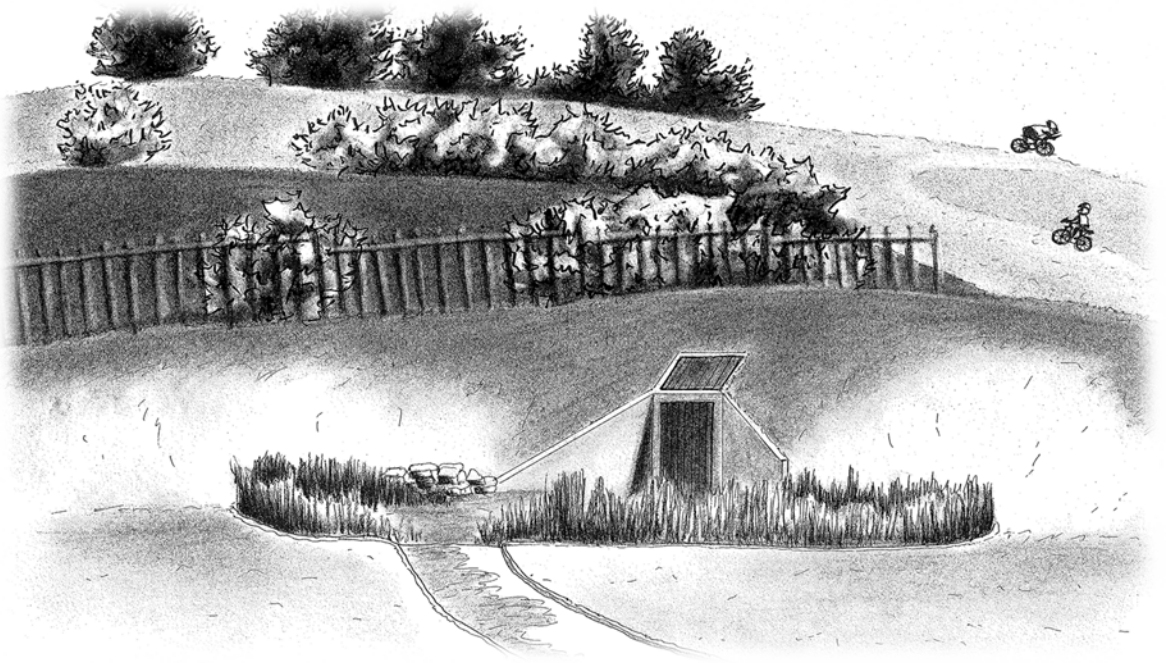


Figure EDB-1. Flared wall outlet structure configuration. Graphic by Adia Davis.

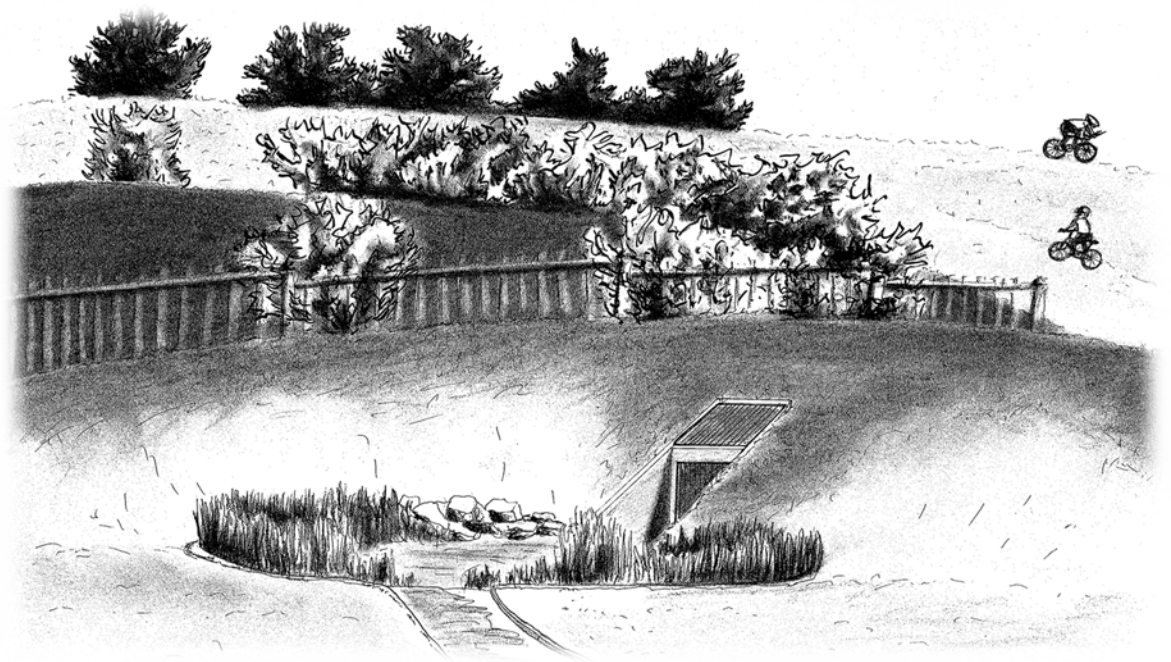


Figure EDB-2. Parallel wall outlet structure configuration. Graphic by Adia Davis.

10. **Overflow Embankment:** Design the embankment to withstand the 100-year storm at a minimum. If the embankment falls under the jurisdiction of the State Engineer's Office, it must be designed to meet the requirements of the State Engineer's Office. The overflow should be located at a point where waters can best be conveyed downstream. Slopes that are 4:1 or flatter should be used to allow for conventional maintenance equipment and for improved safety, maintenance, and aesthetics. Side slopes should be no steeper than 3:1 and should be planted with turf forming grasses. Poorly compacted native soils should be excavated and replaced. Embankment soils should be compacted to 95% of maximum dry density for ASTM D698 (Standard Proctor) or 90% for ASTM D1557 (Modified Proctor). Spillway structures and overflows should be designed in accordance with the *Storage* Chapter of Volume 2 as well as any local drainage criteria. Buried soil riprap or reinforced turf mats installed per manufacturer's recommendations can provide an attractive and less expensive alternative to concrete.

11. **Vegetation:** Vegetation provides erosion control and sediment entrapment. Basin bottom, berms, and side slopes should be planted with turf grass, which is a general term for any grasses that will form a turf or mat, as opposed to bunch grass which will grow in clumplike fashion. Xeric grasses with temporary irrigation are recommended to reduce maintenance requirements, including maintenance of the irrigation system as well as frequency of mowing. Where possible, place irrigation heads outside the basin bottom because irrigation heads in an EDB can become buried with sediment over time.

12. **Access:** Provide appropriate maintenance access to the forebay and outlet works. For larger basins, this means stabilized access for maintenance vehicles. If stabilized access is not provided, the maintenance plan should provide detail, including recommended equipment, on how sediment and trash will be removed from the outlet structure and micropool. Some communities may require

Designing for Baseflows

Baseflows should be anticipated for large tributary areas and can be accommodated in a variety of ways. Consider the following:

- If water rights are available, consider alternate BMPs such as a constructed wetland pond or retention pond.
- Anticipate future modifications to the outlet structure. Following construction, baseflows should be monitored periodically. Intermittent flows can become perennial and perennial flows can increase over time. It may be determined that outlet modifications are necessary long after construction of the BMP is complete.
- Design foundation drains and other groundwater drains to bypass the water quality plate directing these drains to a conveyance element downstream of the EDB. This will reduce baseflows and help preserve storage for the WQCV.
- When the basin is fully developed and an existing baseflow can be approximated prior to design, the water quality orifices should be increased to drain the WQCV in 40 hours while also draining the baseflow. This requires reservoir routing using an inflow hydrograph that includes the baseflow. The *UD-Detention* workbook available at www.udfcd.org may be used for this purpose.
- Increase the initial surcharge volume of the pond to provide some flexibility when baseflows are known or anticipated. Baseflows are difficult to approximate and will continue to increase as the watershed develops. Increasing the initial surcharge volume will accommodate a broader range of flows.

vehicle access to the bottom of the basin regardless of the size of the watershed. Grades should not exceed 10% for haul road surfaces and 20% for skid-loader and backhoe access. Stabilized access includes concrete, articulated concrete block, concrete grid pavement, or reinforced grass pavement. The recommended cross slope is 2%.

Aesthetic Design

Since all land owners and managers wish to use land in the most efficient manner possible, it is important that EDBs become part of a multi-use system. This encourages the design of EDBs as an aesthetic part of a naturalized environment or to include passive and/or active open space. Within each scenario, the EDB can begin to define itself as more than just a drainage facility. When this happens, the basin becomes a public amenity. This combination of public amenity and drainage facility is of much greater value to a landowner. Softened and varied slopes, interspersed irrigated fields, planting areas and wetlands can all be part of an EDB.

The design should be aesthetic whether it is considered to be an architectural or naturalized basin. Architectural basins incorporate design borrowed or reflective of the surrounding architecture or urban forms. An architectural basin is intended to appear as part of the built environment, rather than hiding the cues that identify it as a stormwater structure. A naturalized basin is designed to appear as though it is a natural part of the landscape. This section provides suggestions for designing a naturalized basin. The built environment, in contrast to the natural environment, does not typically contain the randomness of form inherent in nature. Constructed slopes typically remain consistent, as do slope transitions. Even dissipation structures are usually a hard form and have edges seldom seen in nature. If the EDB is to appear as though it is a natural part of the landscape, it is important to minimize shapes that provide visual cues indicating the presence of a drainage structure. For example, the side sides should be shaped more naturally and with varying slopes for a naturalized basin.

Suggested Methods for a Naturalized Basin

- Create a flowing form that looks like it was shaped by water.
- Extend one side of the basin higher than the other. This may require a berm.
- Shape the bottom of the basin differently than the top.
- Slope of one side of the basin more mildly than the opposing side.
- Vary slope transitions both at the top of the bank and at the toe.
- Use a soft-surface trickle channel if appropriate and approved.
- When using rock for energy dissipation, the rock should graduate away from the area of hard edge into the surrounding landscape. Other non-functional matching rock should occur in other areas of the basin to prevent the actual energy dissipation from appearing out of context.
- Design ground cover to reflect the type of water regime expected for their location within the basin.

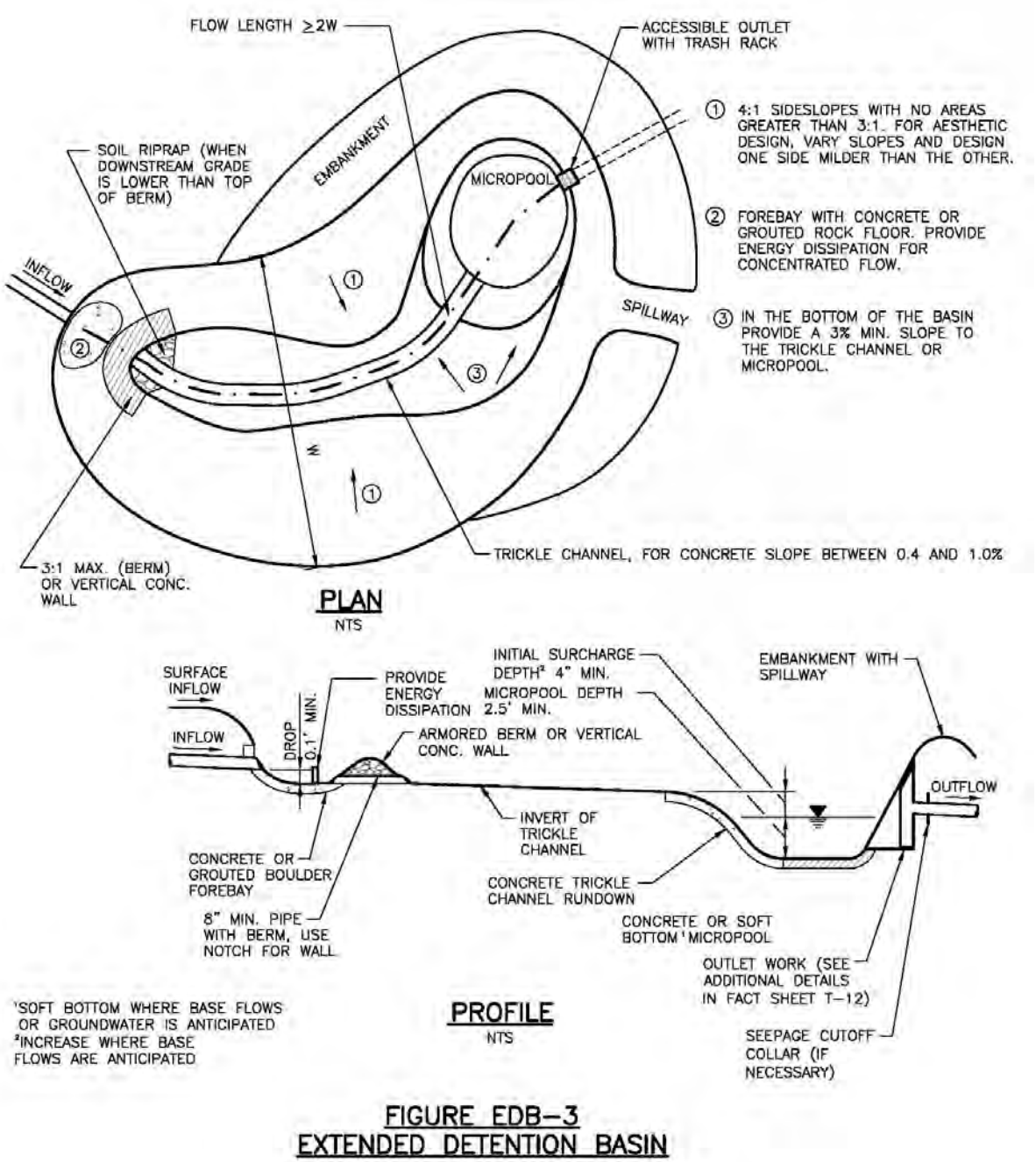


Figure EDB-3. Extended Detention Basin (EDB) Plan and Profile

Additional Details are provided in BMP Fact Sheet T-12. This includes outlet structure details including orifice plates and trash racks.

Table EDB-4. EDB component criteria

	On-Site EDBs for Watersheds up to 1 Impervious Acre[1]	EDBs with Watersheds between 1 and 2 Impervious Acres[1]	EDBs with Watersheds up to 5 Impervious Acres	EDBs with Watersheds over 5 Impervious Acres	EDBs with Watersheds over 20 Impervious Acres
Forebay Release and Configuration	EDBs should not be used for watersheds with less than 1 impervious acre.	Release 2% of the undetained 100-year peak discharge by way of a wall/notch configuration	Release 2% of the undetained 100-year peak discharge by way of a wall/notch configuration	Release 2% of the undetained 100-year peak discharge by way of a wall/notch configuration	Release 2% of the undetained 100-year peak discharge by way of a wall/notch or berm/pipe[2] configuration
Minimum Forebay Volume		1% of the WQCV	2% of the WQCV	3% of the WQCV	3% of the WQCV
Maximum Forebay Depth		12 inches	18 inches	18 inches	30 inches
Trickle Channel Capacity		≥ the maximum possible forebay outlet capacity	≥ the maximum possible forebay outlet capacity	≥ the maximum possible forebay outlet capacity	≥ the maximum possible forebay outlet capacity
Micropool		Area ≥ 10 ft^2	Area ≥ 10 ft^2	Area ≥ 10 ft^2	Area ≥ 10 ft^2
Initial Surcharge Volume		Depth ≥ 4 inches	Depth ≥ 4 inches	Depth ≥ 4 in. Volume ≥ 0.3% WQCV	Depth ≥ 4 in. Volume ≥ 0.3% WQCV

[1] EDBs are not recommended for sites with less than 2 impervious acres. Consider a sand filter or rain garden.

[2] Round up to the first standard pipe size (minimum 8 inches).

Appendix 3

USDA Soil Information

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Castle Rock Area, Colorado

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,650 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Castle Rock Area, Colorado
Survey Area Data: Version 17, Aug 29, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BrB	Bresser sandy loam, cool, 1 to 3 percent slopes	2.7	18.2%
NeE	Newlin gravelly sandy loam, 8 to 30 percent slopes	1.1	7.6%
Sa	Sampson loam	11.0	74.2%
Totals for Area of Interest		**14.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The

delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Castle Rock Area, Colorado

BrB—Bresser sandy loam, cool, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tlpj
Elevation: 5,500 to 6,500 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 100 to 130 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Bresser, cool, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bresser, Cool

Setting

Landform: Terraces, hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Tertiary aged alluvium derived from arkose

Typical profile

Ap - 0 to 5 inches: sandy loam
Bt1 - 5 to 8 inches: sandy loam
Bt2 - 8 to 27 inches: sandy clay loam
Bt3 - 27 to 36 inches: sandy loam
C - 36 to 80 inches: loamy coarse sand

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: B
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Truckton

Percent of map unit: 5 percent
Landform: Terraces, hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Sampson

Percent of map unit: 5 percent
Landform: Alluvial fans, terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R049XC202CO - Loamy Foothill Palmer Divide
Hydric soil rating: No

NeE—Newlin gravelly sandy loam, 8 to 30 percent slopes

Map Unit Setting

National map unit symbol: jqzg
Elevation: 5,500 to 6,600 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 49 to 51 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Newlin and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Newlin

Setting

Landform: Plateaus, mesas, terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Unconformable sandy and gravelly and/or mixed source alluvium

Typical profile

H1 - 0 to 8 inches: gravelly sandy loam
H2 - 8 to 17 inches: gravelly sandy clay loam
H3 - 17 to 22 inches: gravelly sandy loam

H4 - 22 to 60 inches: very gravelly sand

Properties and qualities

Slope: 8 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R049XY214CO - Gravelly Foothill
Hydric soil rating: No

Minor Components

Bresser

Percent of map unit: 5 percent
Hydric soil rating: No

Stapleton

Percent of map unit: 4 percent
Hydric soil rating: No

Satanta

Percent of map unit: 4 percent
Hydric soil rating: No

Aquic haplustolls

Percent of map unit: 2 percent
Landform: Swales
Hydric soil rating: Yes

Sa—Sampson loam

Map Unit Setting

National map unit symbol: jr02
Elevation: 5,500 to 6,600 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Sampson and similar soils: 80 percent

Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sampson

Setting

Landform: Stream terraces on drainageways
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Weathered alluvium derived from arkose

Typical profile

H1 - 0 to 9 inches: loam
H2 - 9 to 28 inches: clay loam
H3 - 28 to 38 inches: loam
H4 - 38 to 60 inches: silt loam

Properties and qualities

Slope: 1 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R049XC202CO - Loamy Foothill Palmer Divide
Hydric soil rating: No

Minor Components

Englewood

Percent of map unit: 8 percent
Hydric soil rating: No

Bresser

Percent of map unit: 7 percent
Hydric soil rating: No

Loamy alluvial land

Percent of map unit: 4 percent
Hydric soil rating: No

Aquic haplustolls

Percent of map unit: 1 percent
Landform: Swales
Hydric soil rating: Yes

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Appendix 4

Swale Computations

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Apr 11 2025

West Swale

Triangular

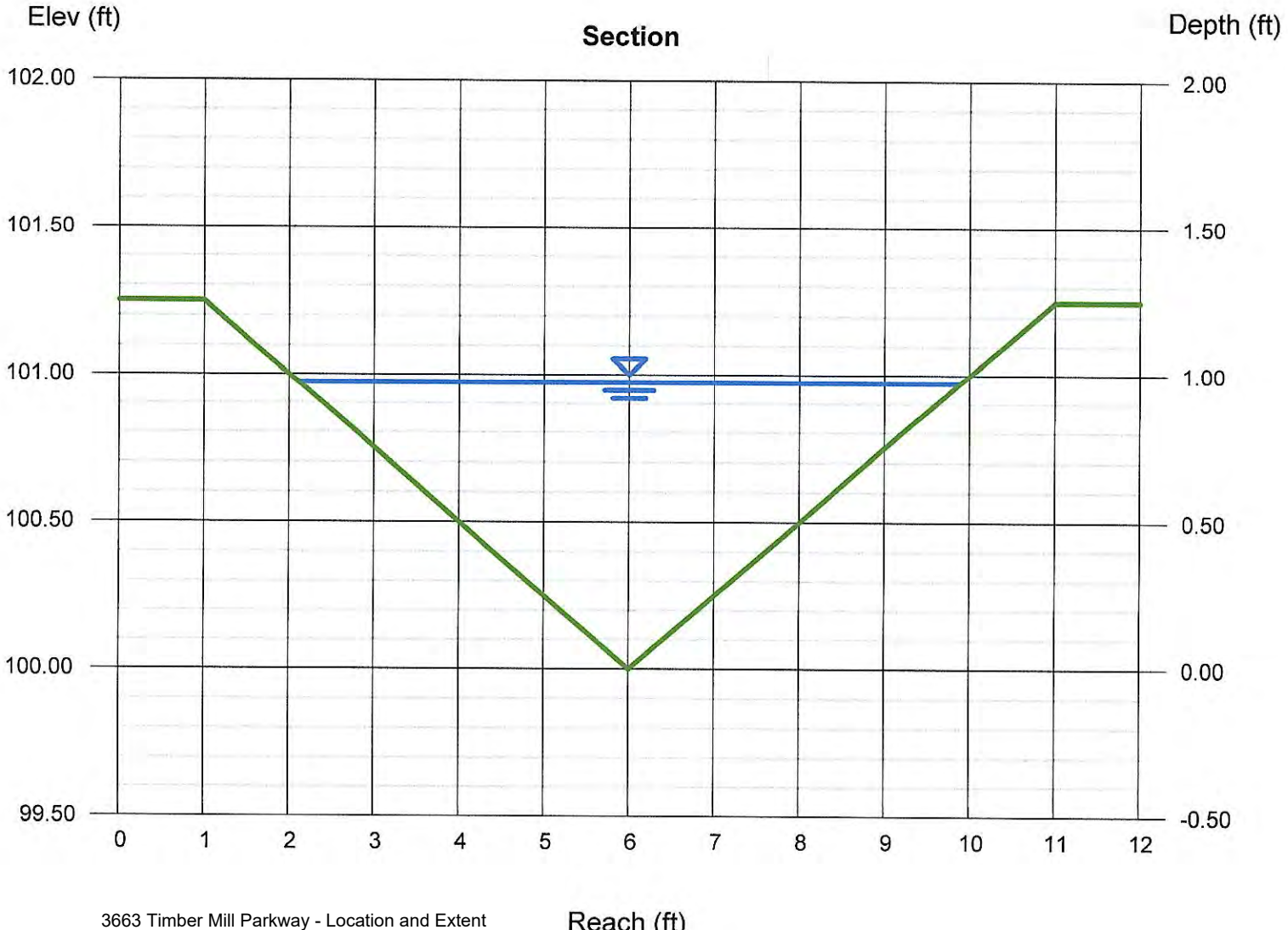
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.25
Invert Elev (ft)	= 100.00
Slope (%)	= 0.60
N-Value	= 0.035

Calculations

Compute by:	Q vs Depth
No. Increments	= 18

Highlighted

Depth (ft)	= 0.97
Q (cfs)	= 7.532
Area (sqft)	= 3.78
Velocity (ft/s)	= 1.99
Wetted Perim (ft)	= 8.02
Crit Depth, Yc (ft)	= 0.74
Top Width (ft)	= 7.78
EGL (ft)	= 1.03



Depth	Q	Area	Veloc	Wp
(ft)	(cfs)	(sqft)	(ft/s)	(ft)
0.07	0.007	0.019	0.34	0.57
0.14	0.042	0.077	0.54	1.15
0.21	0.124	0.174	0.71	1.72
0.28	0.267	0.309	0.86	2.29
0.35	0.483	0.482	1.00	2.86
0.42	0.786	0.694	1.13	3.44
0.49	1.186	0.945	1.25	4.01
0.56	1.693	1.235	1.37	4.58
0.63	2.318	1.563	1.48	5.15
0.69	3.070	1.929	1.59	5.73
0.76	3.959	2.334	1.70	6.30
0.83	4.993	2.778	1.80	6.87
0.90	6.181	3.260	1.90	7.44
0.97	7.532	3.781	1.99	8.02
1.04	9.053	4.340	2.09	8.59
1.11	10.75	4.938	2.18	9.16
1.18	12.64	5.575	2.27	9.74
1.25	14.72	6.250	2.36	10.31

Yc	TopWidth	Energy
(ft)	(ft)	(ft)
0.05	0.56	0.07
0.10	1.11	0.14
0.15	1.67	0.22
0.20	2.22	0.29
0.25	2.78	0.36
0.30	3.33	0.44
0.36	3.89	0.51
0.41	4.44	0.58
0.47	5.00	0.66
0.52	5.56	0.73
0.58	6.11	0.81
0.63	6.67	0.88
0.69	7.22	0.96
0.74	7.78	1.03
0.80	8.33	1.11
0.86	8.89	1.18
0.91	9.44	1.26
0.97	10.00	1.34

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Apr 11 2025

East Swale

Triangular

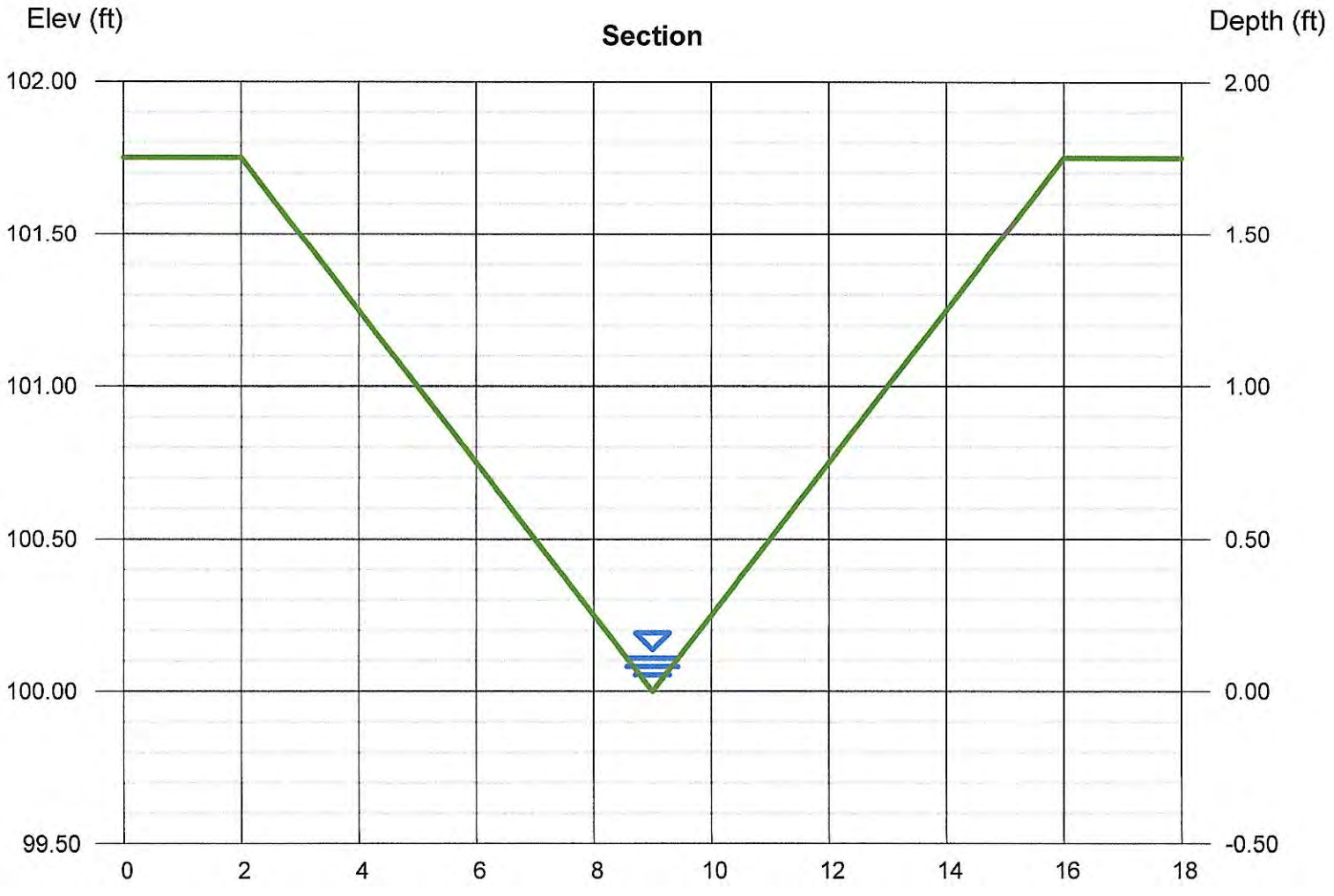
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.75
Invert Elev (ft)	= 100.00
Slope (%)	= 0.80
N-Value	= 0.035

Calculations

Compute by:	Q vs Depth
No. Increments	= 16

Highlighted

Depth (ft)	= 0.11
Q (cfs)	= 0.026
Area (sqft)	= 0.05
Velocity (ft/s)	= 0.54
Wetted Perim (ft)	= 0.90
Crit Depth, Yc (ft)	= 0.08
Top Width (ft)	= 0.88
EGL (ft)	= 0.11



Depth	Q	Area	Veloc	Wp
(ft)	(cfs)	(sqft)	(ft/s)	(ft)
0.11	0.026	0.048	0.54	0.90
0.22	0.163	0.191	0.85	1.80
0.33	0.480	0.431	1.11	2.71
0.44	1.034	0.766	1.35	3.61
0.55	1.875	1.196	1.57	4.51
0.66	3.049	1.723	1.77	5.41
0.77	4.599	2.345	1.96	6.31
0.88	6.566	3.063	2.14	7.22
0.98	8.990	3.876	2.32	8.12
1.09	11.91	4.785	2.49	9.02
1.20	15.35	5.790	2.65	9.92
1.31	19.36	6.891	2.81	10.82
1.42	23.97	8.087	2.96	11.73
1.53	29.21	9.379	3.11	12.63
1.64	35.11	10.77	3.26	13.53
1.75	41.70	12.25	3.40	14.43

Yc	TopWidth	Energy
(ft)	(ft)	(ft)
0.08	0.88	0.11
0.16	1.75	0.23
0.25	2.63	0.35
0.34	3.50	0.47
0.43	4.38	0.59
0.52	5.25	0.70
0.61	6.13	0.83
0.70	7.00	0.95
0.80	7.88	1.07
0.89	8.75	1.19
0.99	9.63	1.31
1.08	10.50	1.44
1.18	11.38	1.56
1.28	12.25	1.68
1.37	13.13	1.81
1.47	14.00	1.93

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Apr 11 2025

Offsite Swale

Triangular

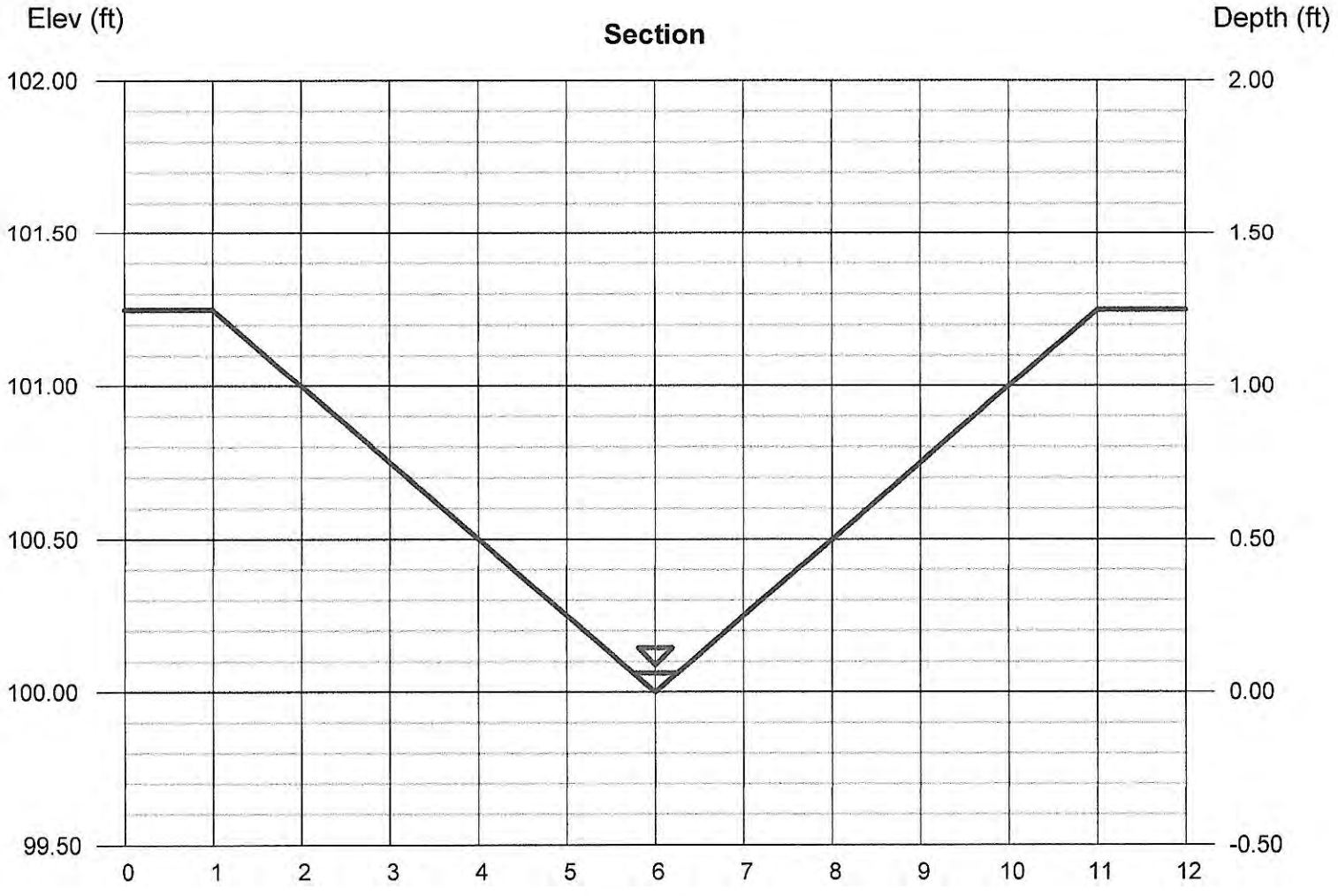
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.25
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.035

Calculations

Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.06
Q (cfs)	= 0.005
Area (sqft)	= 0.02
Velocity (ft/s)	= 0.29
Wetted Perim (ft)	= 0.52
Crit Depth, Yc (ft)	= 0.04
Top Width (ft)	= 0.50
EGL (ft)	= 0.06



Depth	Q	Area	Veloc	Wp
(ft)	(cfs)	(sqft)	(ft/s)	(ft)
0.06	0.005	0.016	0.29	0.52
0.13	0.029	0.063	0.46	1.03
0.19	0.085	0.141	0.61	1.55
0.25	0.184	0.250	0.74	2.06
0.31	0.333	0.391	0.85	2.58
0.38	0.542	0.563	0.96	3.09
0.44	0.817	0.766	1.07	3.61
0.50	1.167	1.000	1.17	4.12
0.56	1.598	1.266	1.26	4.64
0.63	2.116	1.563	1.35	5.15
0.69	2.729	1.891	1.44	5.67
0.75	3.441	2.250	1.53	6.18
0.81	4.260	2.641	1.61	6.70
0.88	5.191	3.063	1.70	7.22
0.94	6.240	3.516	1.77	7.73
1.00	7.412	4.000	1.85	8.25
1.06	8.713	4.516	1.93	8.76
1.13	10.15	5.063	2.00	9.28
1.19	11.72	5.641	2.08	9.79
1.25	13.44	6.250	2.15	10.31

Yc	TopWidth	Energy
(ft)	(ft)	(ft)
0.04	0.50	0.06
0.08	1.00	0.13
0.13	1.50	0.19
0.17	2.00	0.26
0.22	2.50	0.32
0.26	3.00	0.39
0.31	3.50	0.46
0.36	4.00	0.52
0.40	4.50	0.59
0.45	5.00	0.65
0.50	5.50	0.72
0.55	6.00	0.79
0.59	6.50	0.85
0.64	7.00	0.92
0.69	7.50	0.99
0.74	8.00	1.05
0.79	8.50	1.12
0.84	9.00	1.19
0.89	9.50	1.25
0.94	10.00	1.32

Appendix 5

Drainage Exhibit

NORTH

0' 75' 150'

SCALE: 1"=150'

NOTES:

1. PROPERTY LINES SHOWN FROM COUNTY GIS DATA AND ARE SHOWN FOR REFERENCE PURPOSES ONLY – NOT FOR DESIGN.
2. ANY AERIAL IMAGERY SHOWN IS FROM CNES (2020) DISTRIBUTION AIRBUS DS.
3. ANY OFFSITE TOPOGRAPHIC CONTOURS SHOWN PER LIDAR DATA FROM COLORADO WATER CONSERVATION BOARD LIDAR DATA. ANY CONTOURS SHOWN ARE FOR REFERENCE PURPOSES ONLY – NOT FOR DESIGN.

REVISION # / DESCRIPTION	DATE:

FRONT RANGE
Stormwater & Floodplain Consulting

DRAINAGE EXHIBIT
TIMBER MILL SUBSTATION

DATE:
2025-07-01
BY: A.CVAR
PROJECT #:
CDENG-018

SHEET 1 OF 1

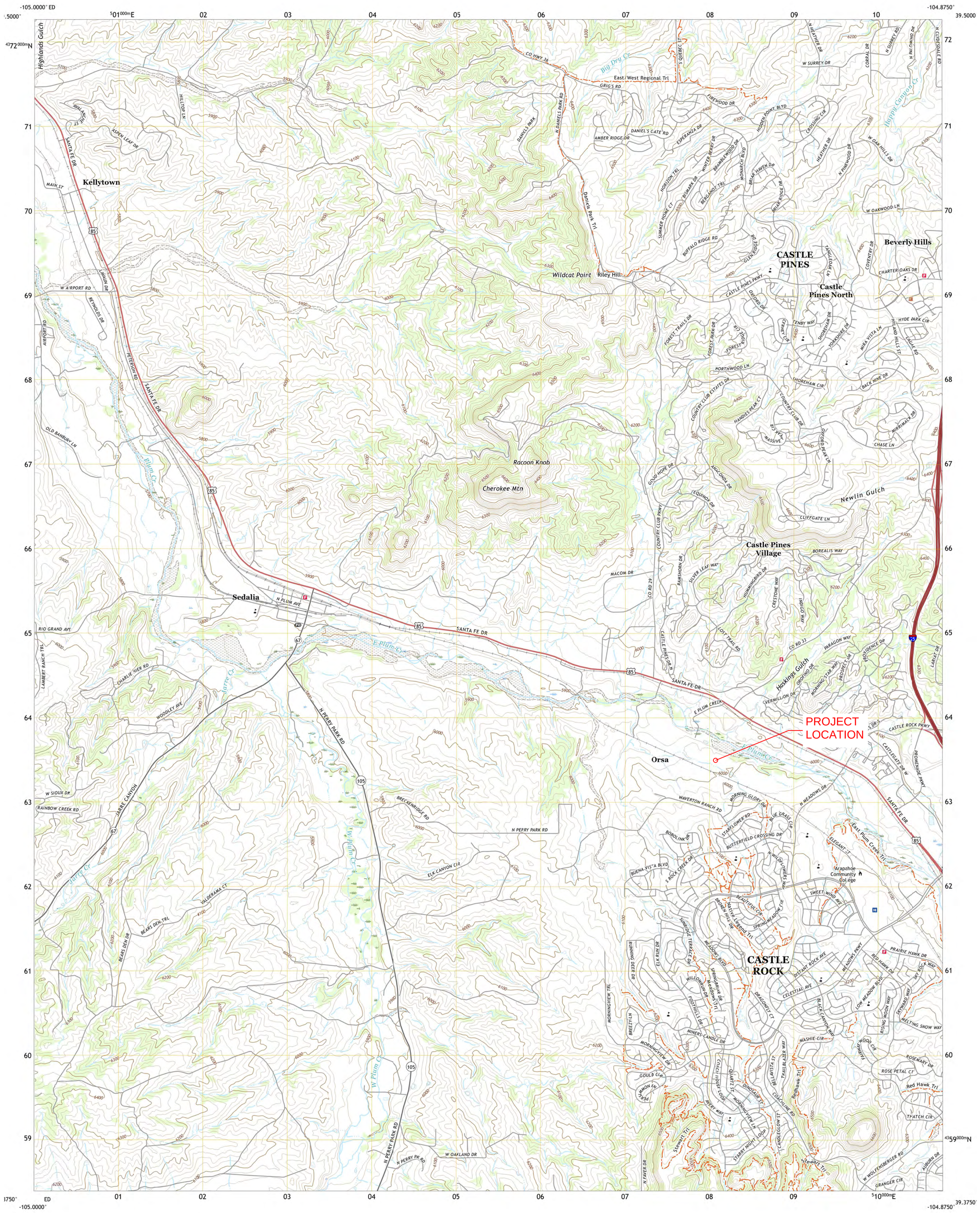
Appendix 6

USGS Quadrangle Mapping

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map US Topo

SEDALIA QUADRANGLE
COLORADO - DOUGLAS COUNTY
7.5-MINUTE SERIES



Produced by the United States Geological Survey

North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid:Universal Transverse Mercator, Zone 13S

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery	NAIP, September 2017 - January 2018	
Roads	U.S. Census Bureau,	2016
Names	GNIS, 1978 -	2021
Hydrography	National Hydrography Dataset, 2003 -	2019
Contours	National Elevation Dataset,	2022
Boundaries	Multiple sources; see metadata file 2019 -	2021
Public Land Survey System	BLM,	2021
Wetlands	FWS National Wetlands Inventory	1984

MN
GN
8°3' 143 MILS
0°2' 1 MILS
UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
ED
Grid Zone Designation 13S

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1
MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard.

COLORADO
QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES
1 Littleton
2 Highlands Ranch
3 Parker
4 Kassler
5 Castle Rock North
6 Devils Head
7 Dawson Butte
8 Castle Rock South

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

SEDALIA, CO
2022

Appendix 7

FEMA Floodplain Mapping

PIN
- Approximate location based on user input and does not represent an authoritative property location

MAP PANELS
- Selected FloodMap Boundary
- Digital Data Available
- No Digital Data Available
- Unmapped

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard Zone X
- Effective LOMRs
- Area of Undetermined Flood Hazard Zone D
- Otherwise Protected Area
- Coastal Barrier Resource System Area

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) Zone A, V, A99
- With BFE or Depth
- Regulatory Floodway Zone AE, AO, AH, VE, AR

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee. See Notes. Zone X
- Area with Flood Risk due to Levee Zone D

OTHER FEATURES
- 20.2 / 17.5 — Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

3663 Timber Mill Parkway - Location and Extent
Project File # LE2025-013

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables shown on this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Floodway Data table shown on this FIRM.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided by the Douglas County GIS Department and the Town of Castle Rock GIS Department. Additional input was provided by the City of Lone Tree and Town of Parker. These data are current as of 2010.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

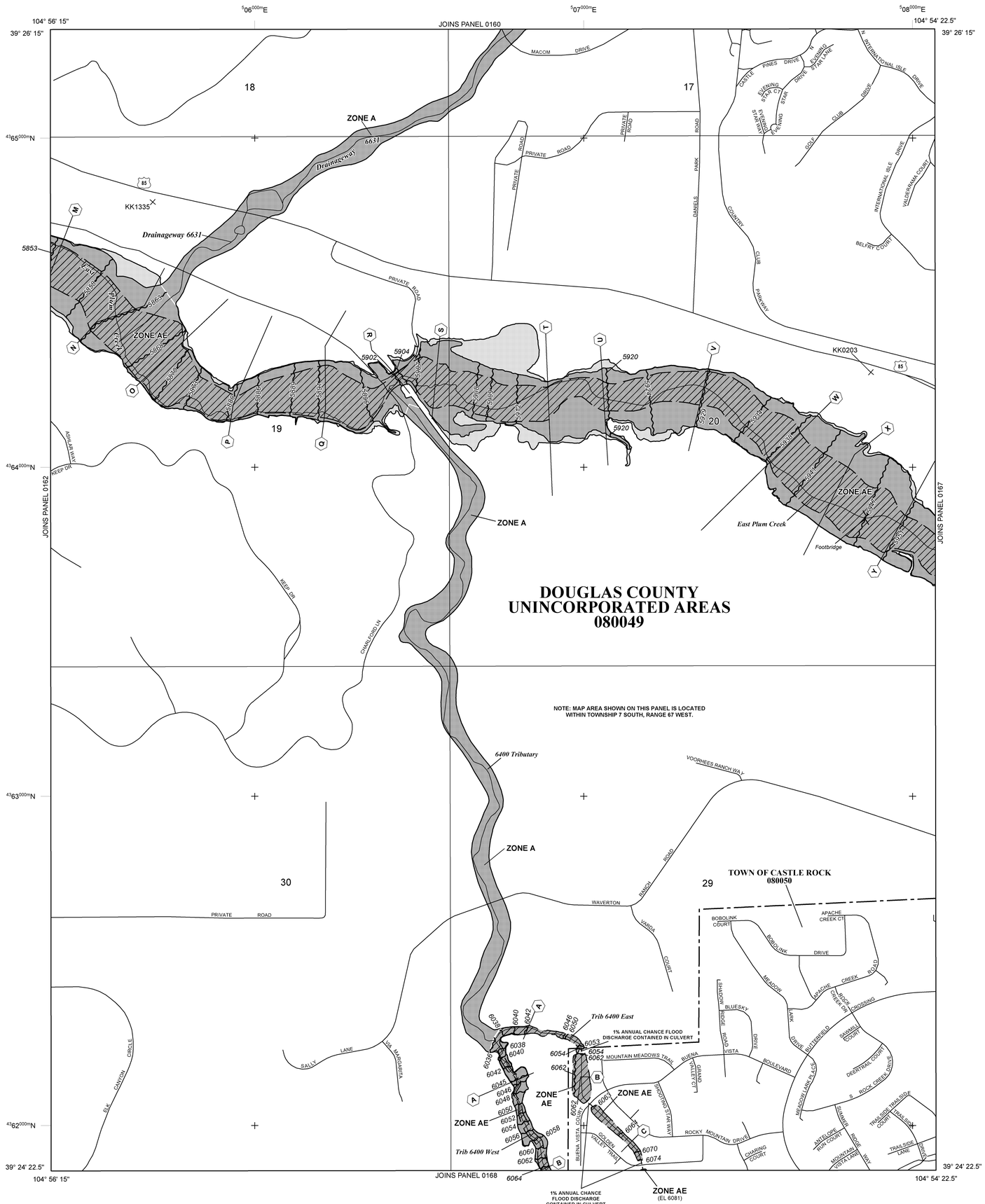
Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% Annual Chance Floodplain Boundary
- 0.2% Annual Chance Floodplain Boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- (A)–(A) — Cross section line
- (23)–(23) — Transect line
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 4988'000mN — 1000-meter Universal Transverse Mercator grid values, zone 13
- DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 • — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP

SEPTEMBER 30, 2005

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

MARCH 16, 2016: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to update map format, to add roads and road names, to reflect updated topographic information, to incorporate previously issued letters of map revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0166G

FIRM

FLOOD INSURANCE RATE MAP

DOUGLAS COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 166 OF 495
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CASTLE ROCK, TOWN OF	080050	0166	G
DOUGLAS COUNTY	080049	0166	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08035C0166G
MAP REVISED
MARCH 16, 2016

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables shown on this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Floodway Data table shown on this FIRM.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided by the Douglas County GIS Department and the Town of Castle Rock GIS Department. Additional input was provided by the City of Lone Tree and Town of Parker. These data are current as of 2010.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

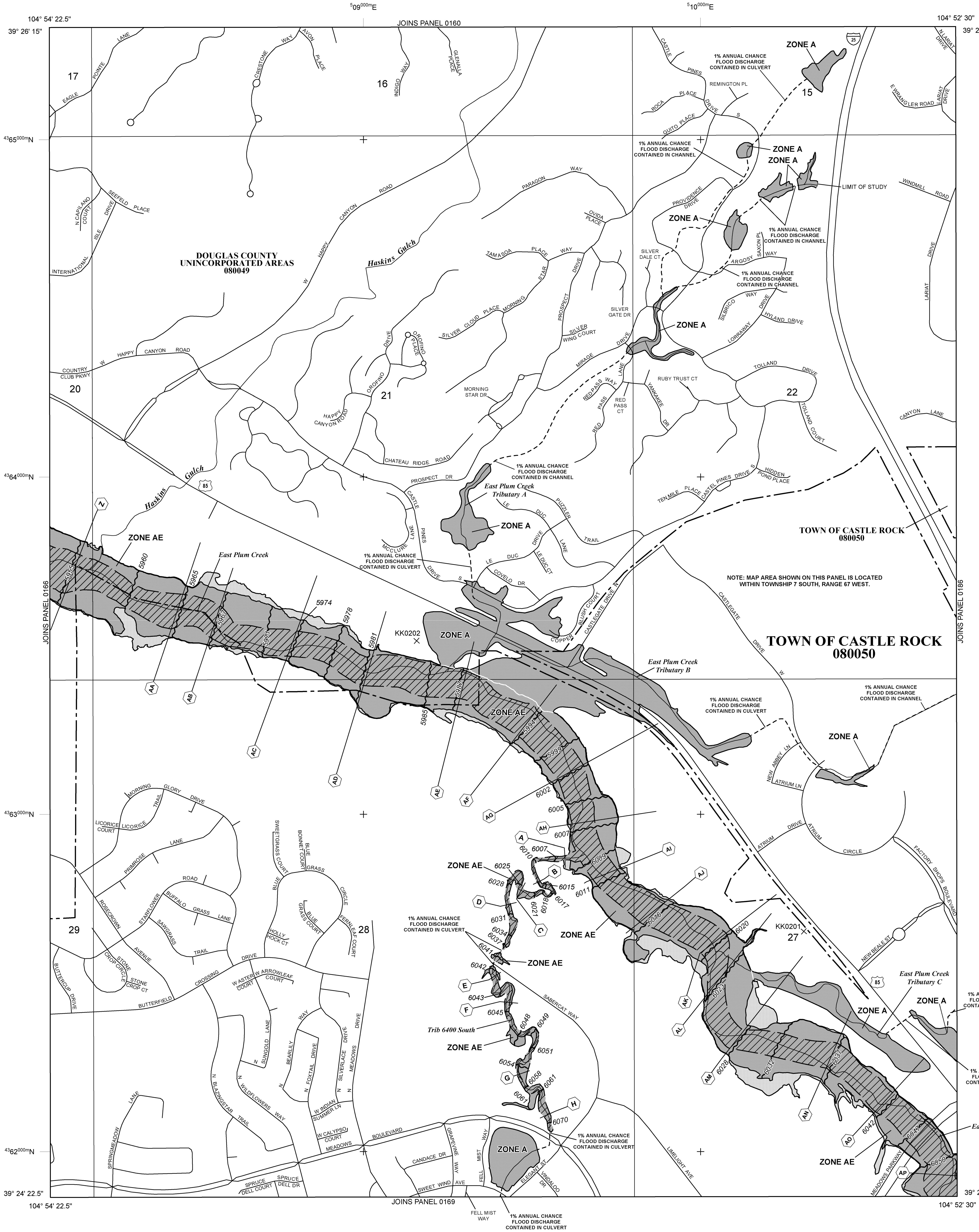
Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% Annual Chance Floodplain Boundary
	0.2% Annual Chance Floodplain Boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 - - - 23	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
4989000m N	1000-meter Universal Transverse Mercator grid values, zone 13
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP

SEPTEMBER 30, 2005

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

MARCH 16, 2016: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to update map format, to add roads and road names, to reflect updated topographic information, to incorporate previously issued letters of map revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0167G

FIRM

FLOOD INSURANCE RATE MAP

DOUGLAS COUNTY, COLORADO

AND INCORPORATED AREAS

PANEL 167 OF 495
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

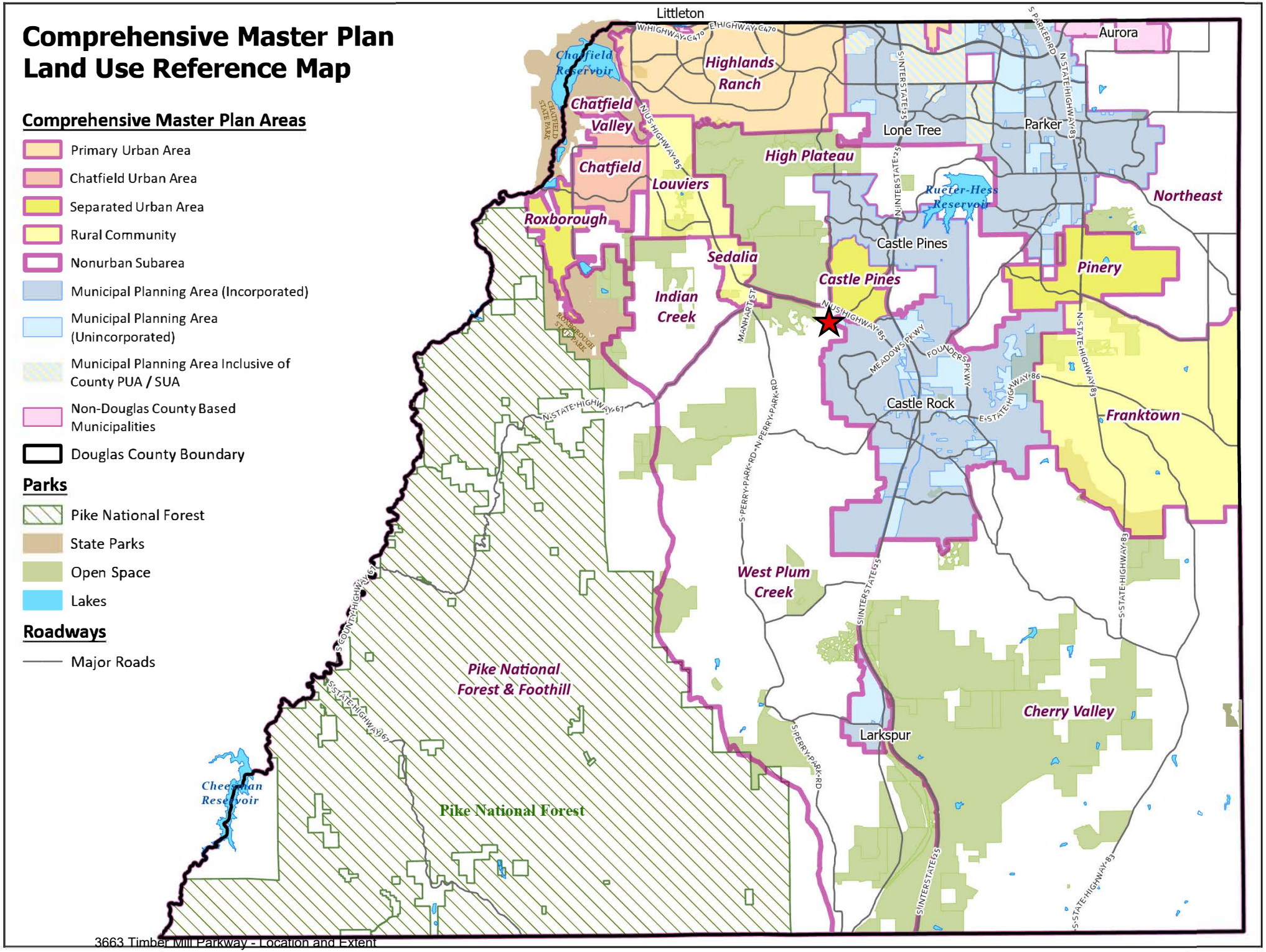
COMMUNITY	NUMBER	PANEL	SUFFIX
CASTLE ROCK, TOWN OF	080050	0167	G
DOUGLAS COUNTY	080049	0167	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08035C0167G
MAP REVISED
MARCH 16, 2016

Federal Emergency Management Agency

Comprehensive Master Plan Land Use Reference Map



Comprehensive Master Plan Areas

- Primary Urban Area
- Chatfield Urban Area
- Separated Urban Area
- Rural Community
- Nonurban Subarea
- Municipal Planning Area (Incorporated)
- Municipal Planning Area (Unincorporated)
- Municipal Planning Area Inclusive of County PUA / SUA
- Non-Douglas County Based Municipalities
- Douglas County Boundary

Parks

- Pike National Forest
- State Parks
- Open Space
- Lakes

Roadways

- Major Roads

3663 Timber Mill Parkway

LE2024-013
Zoning Map

N

LEGEND
- Roads
- Major Roads
- Parcels - PARCELS
- A1 - AGRICULTURAL ONE
- CTY
- PD - PLANNED DEVELOPMENT

3663 Timber Mill Parkway - Location and Extent
Date Saved: 9/8/2025 2:43 PM
Source: https://apps.douglas.co.us/gisportal/apps/webappviewer/index.html?id=9cd173c692b7436891bd0bd025cbcc2c

3663 Timber Mill Parkway

LE2024-013
Aerial Map

N

LEGEND
- Roads
- Major Roads
- Parcels - PARCELS

3663 Timber Mill Parkway - Location and Extent
Project File# LE2025-013
Date Saved: 9/8/2025 2:44 PM
Source: https://apps.douglas.co.us/gisportal/apps/webappviewer/index.html?id=9cd173c692b7436891bd0bd025cbcc2c

Project Name: 3663 Timber Mill Parkway
Project File #: LE2025-013
Date Sent: 08/28/2025 **Date Due:** 09/11/2025

Agency	Date Received	Agency Response	Response Resolution
AT&T Long Distance - ROW	09/03/2025	This is in response to your eReferral with a utility map showing any buried AT&T Long Line Fiber Optics near 3663 Timber Mill Pkwy Castle Rock, Colorado. The Earth map shows the project area in red. Based on the address and/or map you provided, there should be NO conflicts with the AT&T Long Lines, as we do not have facilities in that area.	No response necessary
Addressing Analyst	09/02/2025	The proposed address for this facility is 3663 TIMBER MILL PKWY. This address is not to be used for any purpose other than for plan review until after this project is approved. Proposed addresses are subject to changes as necessary for 911 dispatch and life safety purposes. Addresses are recorded by Douglas County following all necessary approvals. Contact DCAddressing@douglas.co.us or 303.660.7411 with questions.	Information forwarded to applicant
Assessor	08/28/2025	please be aware of the following comments: None	No response necessary
Black Hills Energy		Awaiting referral response	Awaiting referral response
Building Services	08/29/2025	Permit is required, please visit Douglas County's web site for requirements and contact 303-660-7497 if you have any questions.	Information forwarded to applicant. All necessary permits will be required prior to construction
Comcast		Awaiting referral response	Awaiting referral response
Engineering Services		Awaiting referral response	Awaiting referral response
CORE Electric Cooperative	08/28/2025	No Comment	No response necessary
West Douglas County FD		Awaiting referral response	Awaiting referral response
Office of Emergency Management	08/28/2025	No Comment	No response necessary
Town of Castle Rock		Awaiting referral response	Awaiting referral response
City of Castle Pines	09/02/2025	No Comment	No response necessary
CenturyLink		Awaiting referral response	Awaiting referral response
Sheriff's Office	09/08/2025	Deputy Jeff Pelle reviewed this request regarding security, keeping Crime Prevention Through Environmental Design (CEPTD) concepts in mind; no comments or concerns were noted at this time.	No response necessary
Sheriff's Office E911		Awaiting referral response	Awaiting referral response

Project Name: 3663 Timber Mill Parkway
Project File #: LE2025-013
Date Sent: 08/28/2025 **Date Due:** 09/11/2025

Wildfire Mitigation	09/02/2025	This project and parcel was assessed for wildfire hazards. CORE has a comprehensive and detailed wildfire mitigation program. and completes hazardous fuels work where necessary to protect infrastructure and the public. DC Wildfire mitigations has no objections to the project.	No response necessary
Xcel Energy-Right of Way & Permits	03/17/2025	Public Service Company of Colorado's (PSCo) Right of Way & Permits Referral Desk has reviewed the plans for **43663 Timber Mill Parkway** and currently has **no apparent conflict**. As a safety precaution, PSCo would like to remind the developer to call the Utility Notification Center by dialing 811 for utility locates prior to construction.	No response necessary

Right of Way & Permits

1123 West 3rd Avenue
Denver, Colorado 80223
Telephone: 303.285.6612
violeta.ciocanu@xcelenergy.com

September 4, 2025

Douglas County Planning Services
100 Third Street
Castle Rock, CO 80104

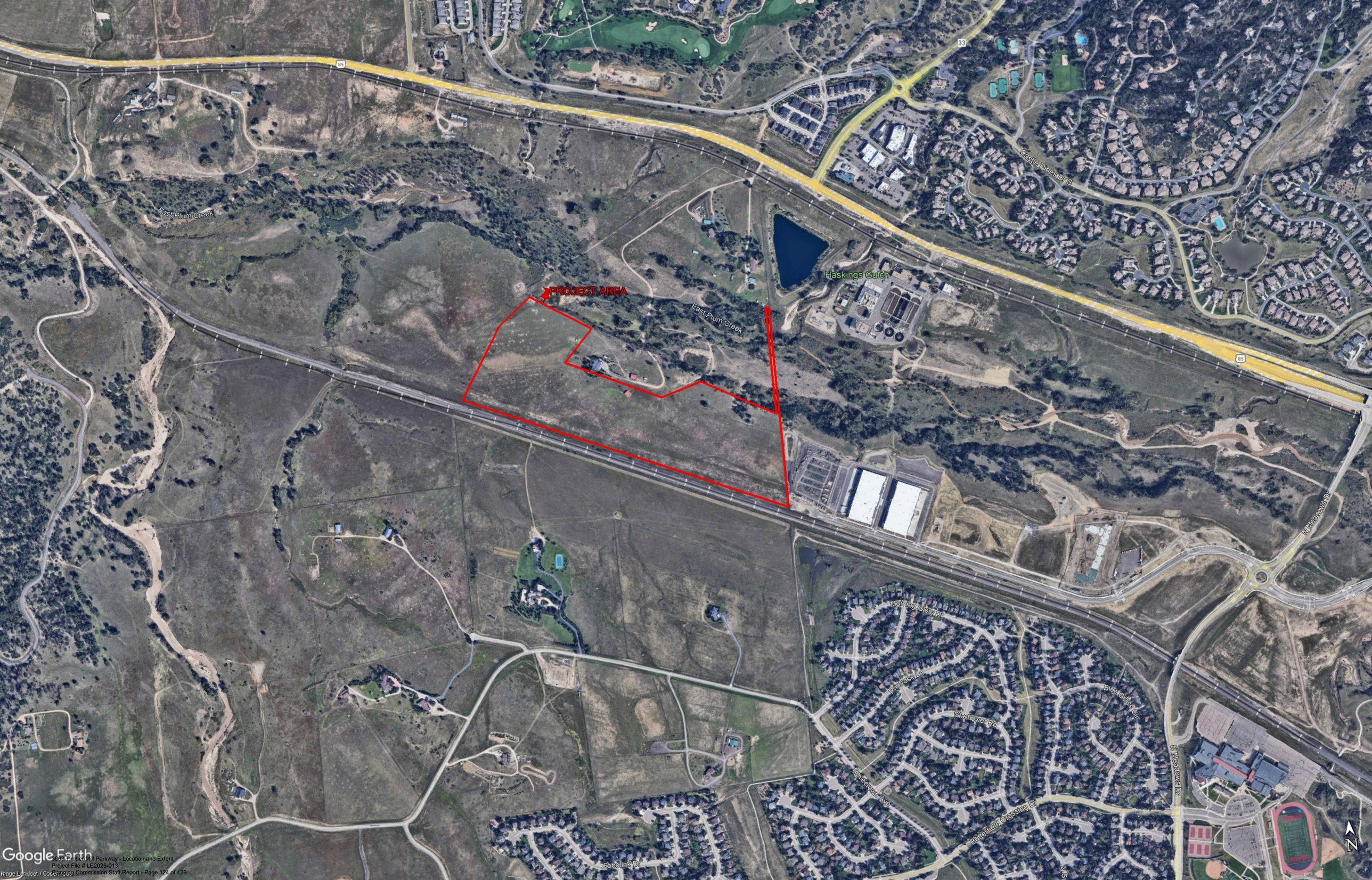
Attn: Trevor Bedford

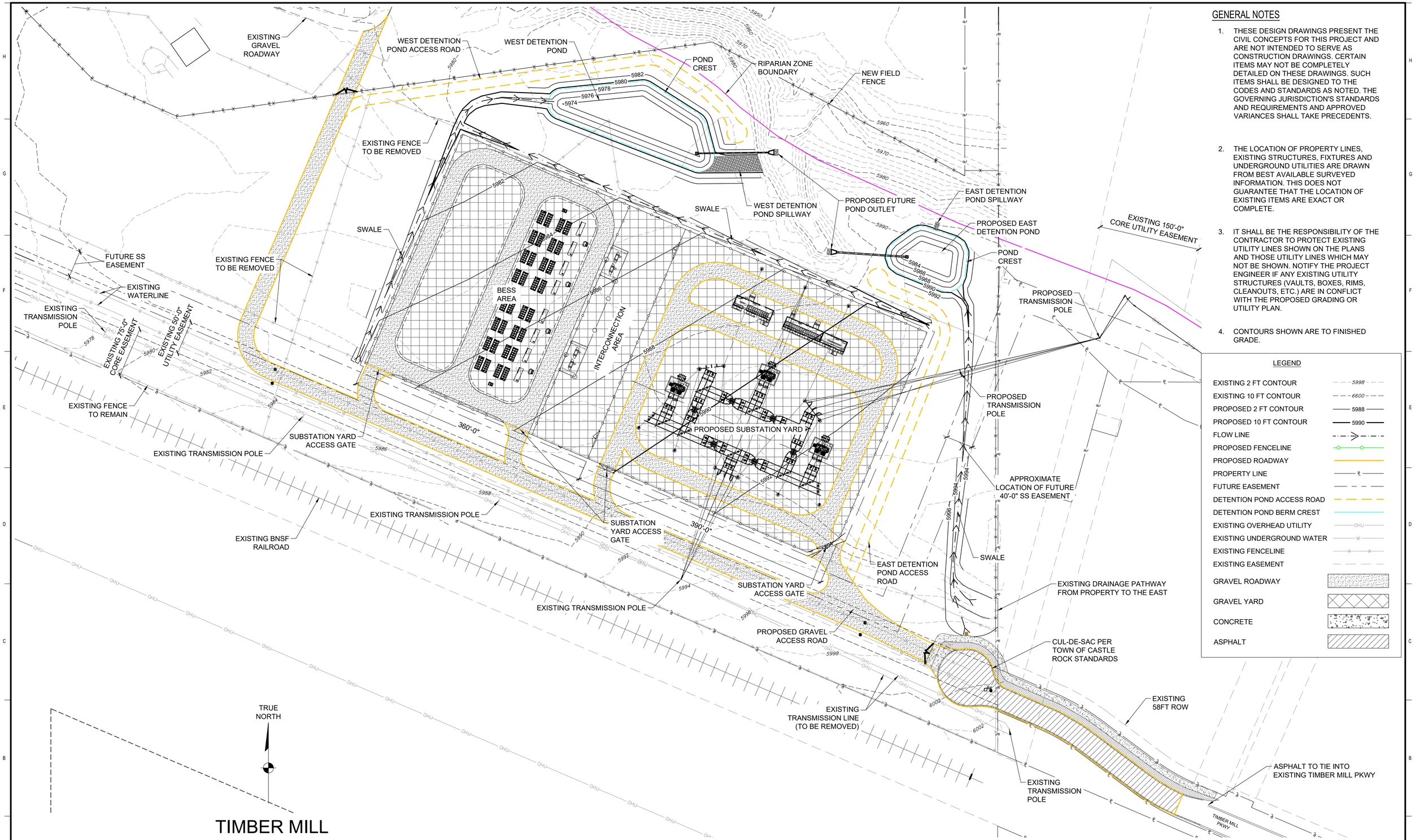
Re: 43663 Timber Mill Parkway, Case # LE2025-013

Public Service Company of Colorado's (PSCo) Right of Way & Permits Referral Desk has reviewed the plans for **43663 Timber Mill Parkway** and currently has **no apparent conflict**.

As a safety precaution, PSCo would like to remind the developer to call the Utility Notification Center by dialing 811 for utility locates prior to construction.

Violeta Ciocanu (Chokanu)
Right of Way and Permits
Public Service Company of Colorado dba Xcel Energy
Office: 303-285-6612 – Email: violeta.ciocanu@xcelenergy.com





GENERAL NOTES

1. THESE DESIGN DRAWINGS PRESENT THE CIVIL CONCEPTS FOR THIS PROJECT AND ARE NOT INTENDED TO SERVE AS CONSTRUCTION DRAWINGS. CERTAIN ITEMS MAY NOT BE COMPLETELY DETAILED ON THESE DRAWINGS. SUCH ITEMS SHALL BE DESIGNED TO THE CODES AND STANDARDS AS NOTED. THE GOVERNING JURISDICTION'S STANDARDS AND REQUIREMENTS AND APPROVED VARIANCES SHALL TAKE PRECEDENTS.
2. THE LOCATION OF PROPERTY LINES, EXISTING STRUCTURES, FIXTURES AND UNDERGROUND UTILITIES ARE DRAWN FROM BEST AVAILABLE SURVEYED INFORMATION. THIS DOES NOT GUARANTEE THAT THE LOCATION OF EXISTING ITEMS ARE EXACT OR COMPLETE.
3. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROTECT EXISTING UTILITY LINES SHOWN ON THE PLANS AND THOSE UTILITY LINES WHICH MAY NOT BE SHOWN. NOTIFY THE PROJECT ENGINEER IF ANY EXISTING UTILITY STRUCTURES (VAULTS, BOXES, RIMS, CLEANOUTS, ETC.) ARE IN CONFLICT WITH THE PROPOSED GRADING OR UTILITY PLAN.
4. CONTOURS SHOWN ARE TO FINISHED GRADE.

LEGEND

- EXISTING 2 FT CONTOUR
- EXISTING 10 FT CONTOUR
- PROPOSED 2 FT CONTOUR
- PROPOSED 10 FT CONTOUR
- FLOW LINE
- PROPOSED FENCELINE
- PROPOSED ROADWAY
- PROPERTY LINE
- FUTURE EASEMENT
- DETENTION POND ACCESS ROAD
- DETENTION POND BERM CREST
- EXISTING OVERHEAD UTILITY
- EXISTING UNDERGROUND WATER
- EXISTING FENCELINE
- EXISTING EASEMENT
- GRAVEL ROADWAY
- GRAVEL YARD
- CONCRETE
- ASPHALT

TIMBER MILL

CORE ELECTRICAL COOPERATIVE - TIMBER MILL SUBSTATION

A PART OF THE SE $\frac{1}{4}$ OF SECTION 20 TOWNSHIP 7 SOUTH, RANGE 67 WEST OF THE 6TH P.M

LOCATION AND EXTENT PLAN

PRELIMINARY
NOT FOR CONSTRUCTION

CD ENGINEERING, INC
www.cd-eng.com

NO	REVISIONS	DSGN	CHKD	APVD	DATE
A	ISSUED FOR COUNTY REVIEW	TSC	DWM	JBA	3/28/25
B	ISSUED FOR REVIEW	TSC	DWM	JBA	4/9/25
C	ISSUED FOR COUNTY REVIEW	TSC	DWM	JBA	8/22/25

CORE ELECTRIC COOPERATIVE

DRAWN	SCK
DESIGNED	TSC
CHECKED	DWM
APPROVED	JBA
PROJECT	-
DATE	3-28-2025

TIMBER MILL (SEDALIA)
115-12.47KV SUBSTATION
OVERALL SITE PLAN

SCALE	DRAWING NUMBER	REV
1' =60'	C101	C

PARCEL A
AREA=1,525,632 S.F.±
OR 35.024 ACRES±
OWNER:
CORE ELECTRIC COOPERATIVE
PARCEL A
REC. 2024019779

PARCEL B
AREA=1,785,811 S.F.±
OR 40.997 ACRES±
OWNER:
CORE ELECTRIC COOPERATIVE
REC. 2024015627

NEW 4-WIRE FIELD FENCE ON PROPERTY LINE BETWEEN PARCELS (ALL OTHER FIELD FENCE ON THE INSIDE OF PARCEL B TO BE REMOVED)

PROPOSED DETENTION POND

PROPOSED DETENTION POND

250'-3"

NORTH

750'

360'

390'

90'

PROPOSED DETENTION POND ACCESS ROAD

32' CATTLE GATE

NEW 4-WIRE FIELD FENCE ON PROPERTY LINE BETWEEN PARCELS (ALL OTHER FIELD FENCE ON THE INSIDE OF PARCEL B TO BE REMOVED)

24'

370'

(FUTURE) T3

T2

T1

840-36

840-32

840-29

840-46

INTERCONNECTION AREA

BESS AREA

ACCESS ROAD TO BE EXTENDED IN THE FUTURE NOT INSTALLED NOW

ACCESS ROAD TO BE EXTENDED IN THE FUTURE NOT INSTALLED NOW

15'-3"

40'-4"

221'-11"

161'-8"

53'-3"

24'

24'

23'-1"

40'

THIS ROAD TO BE INSTALLED NOW

50' PERMANENT EASEMENT REC. NO. 2020065910

PROPOSED SS EASEMENT

PROPOSED SS ALIGNMENT

123'

PROPERTY LINE

37'-10"

50'

40'

15'

PROPOSED SS TEMP CONSTRUCTION EASEMENT

PROPOSED SS EASMENT

PROPOSED DETENTION POND ACCESS ROAD

204'

PROPERTY LINE

241'

NEW FIELD FENCE

10' CONCRETE SIDEWALK ACROSS APRON

10'

29'-6"

12'

GRAVEL

REMOVE FIELD FENCE TO SE CORNER

CONCRETE PAN

ASPHALT CUL-DE-SAC

MOVE CUL-DE-SAC WEST AND EXTEND DOUGLAS COUNTY APPROVED ASPHALT/SIDEWALK/CURB/GUTTER

10' SIDEWALK

10' PLANTING AREA

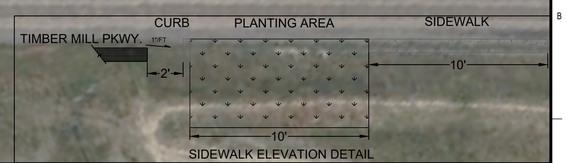
CURB AND GUTTER

32' CATTLE GATE/FIELD FENCE HERE ON THE WEST SIDE OF THE CUL-DE-SAC

12' CONCRETE APRON

CURB AND GUTTER ONLY

REMOVE FIELD FENCE



SIDEWALK ELEVATION DETAIL

PRELIMINARY
NOT FOR CONSTRUCTION

CROSS CANYON engineering

NO	REVISIONS	DSGN	CHKD	APVD	DATE
J	ISSUE FOR COUNTY REVIEW	NRB	JBA	JBA	08-22-25

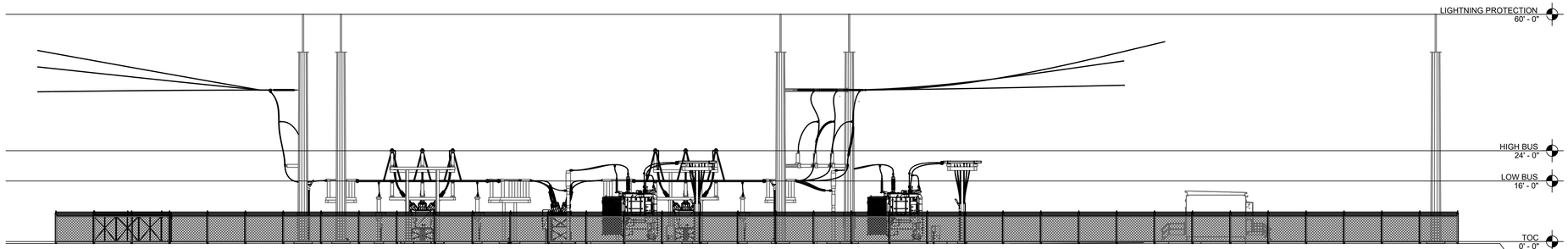
CORE ELECTRIC COOPERATIVE

DRAWN	LSL
DESIGNED	LSL
CHECKED	JBA
APPROVED	JBA
PROJECT	2024.307
DATE	01-14-24

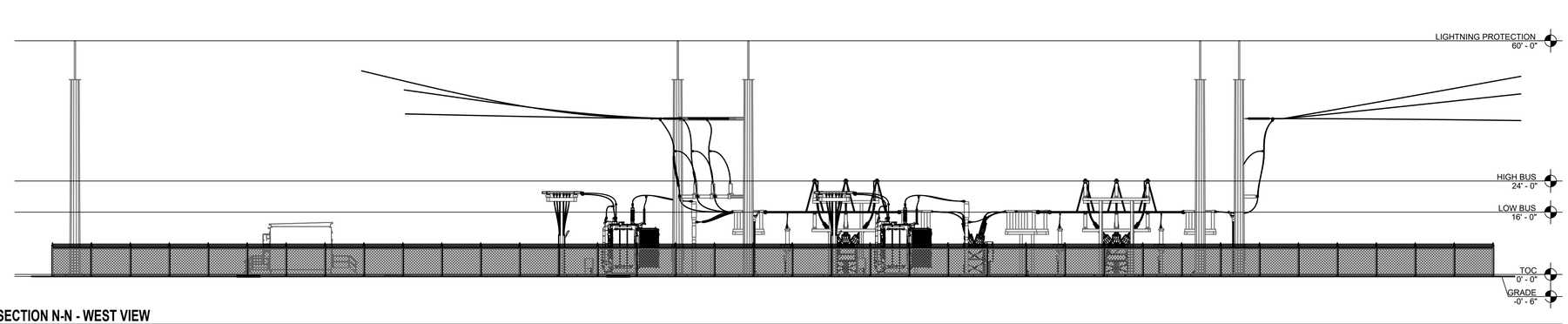
TIMBER MILL (323)
115-12.47KV SUBSTATION
GENERAL ARRANGEMENT

SCALE	DRAWING NUMBER	REV
1" = 50'-0"	GG02	J

C:\CORE\Timber Mill\323_GG02.DWG



1 **SECTION M-M - EAST VIEW**
Scale: 1/16" = 1'-0"



2 **SECTION N-N - WEST VIEW**
Scale: 1/16" = 1'-0"

CROSS CANYON engineering

NO	REVISIONS	DSGN	CHKD	APVD	DATE
A	PRE-DESIGN SUBMITTAL	NRB	JBA	JBA	04-17-25
B	ISSUE FOR REVIEW	LSL	JBA	JBA	07-31-25
C	ISSUE FOR REVIEW	NRB	JBA	JBA	08-15-25
D	ISSUE FOR COUNTY REVIEW	NRB	JBA	JBA	08-22-25

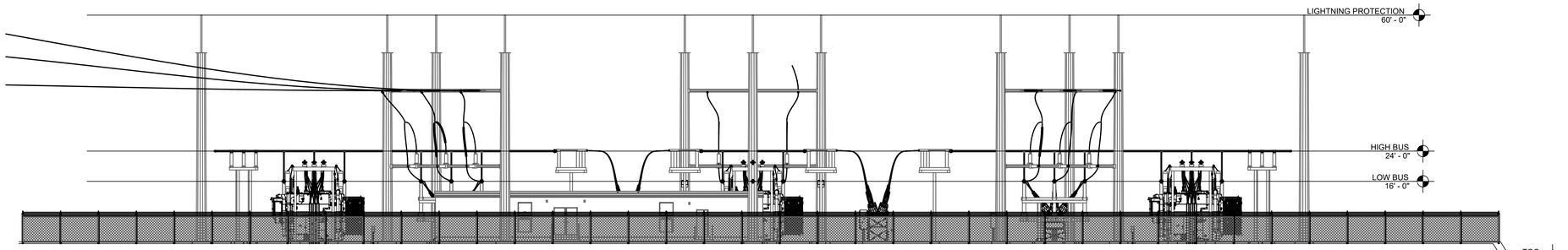
CORE ELECTRIC COOPERATIVE

DRAWN	LSL
DESIGNED	LSL
CHECKED	JBA
APPROVED	JBA
PROJECT	2024.323
DATE	7-25-25

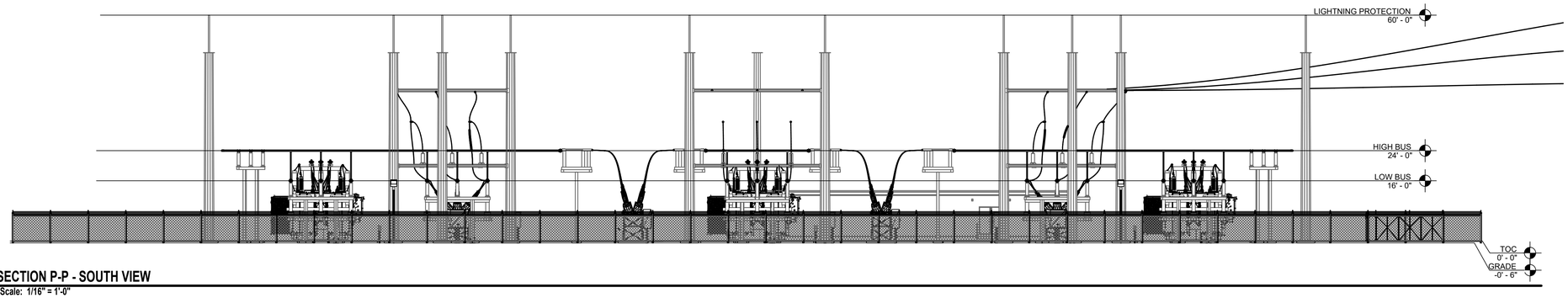
TIMBER MILL (323)
115-12.47KV SUBSTATION
PERIMETER VIEWS EAST & WEST

SCALE	DRAWING NUMBER	REV
NONE	E03E	D

C:\CORE\Timber Mill\323_E03E.dwg



1 **SECTION O-O - NORTH VIEW**
Scale: 1/16" = 1'-0"



2 **SECTION P-P - SOUTH VIEW**
Scale: 1/16" = 1'-0"

CROSS CANYON engineering

NO	REVISIONS	DSGN	CHKD	APVD	DATE
A	PRE-DESIGN SUBMITTAL	NRB	JBA	JBA	04-17-25
B	ISSUE FOR REVIEW	LSL	JBA	JBA	07-31-25
C	ISSUE FOR REVIEW	NRB	JBA	JBA	08-15-25
D	ISSUE FOR COUNTY REVIEW	NRB	JBA	JBA	08-22-25

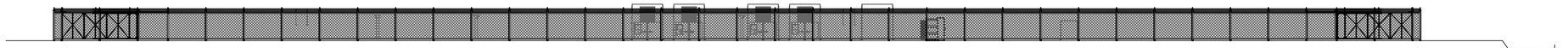
CORE ELECTRIC COOPERATIVE

DRAWN	LSL
DESIGNED	LSL
CHECKED	JBA
APPROVED	JBA
PROJECT	2024.323
DATE	7-25-25

TIMBER MILL (323)
115-12.47KV SUBSTATION
PERIMETER VIEWS NORTH & SOUTH

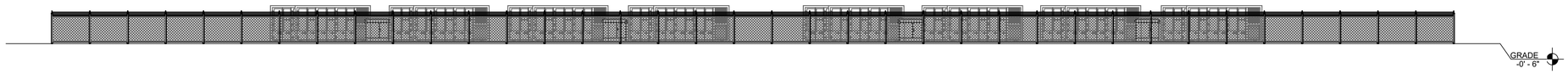
SCALE	DRAWING NUMBER	REV
NONE	E03F	D

C:\CORE\Timber Mill\323_E03F.dwg



1 **SECTION T-T - SOUTH VIEW**
Scale: 1/16" = 1'-0"

NOTE: BESS EQUIPMENT IS APPROXIMATE AND FOR REPRESENTATION
ON VISIBILITY BEHIND THE FENCE ON THESE DRAWINGS



2 **SECTION U-U - WEST VIEW**
Scale: 1/16" = 1'-0"

NOTE: BESS EQUIPMENT IS APPROXIMATE AND FOR REPRESENTATION
ON VISIBILITY BEHIND THE FENCE ON THESE DRAWINGS

CROSS CANYON engineering

NO	REVISIONS	DSGN	CHKD	APVD	DATE
A	ISSUE FOR COUNTY REVIEW	NRB	JBA	JBA	08-22-25

CORE ELECTRIC COOPERATIVE

DRAWN	LSL
DESIGNED	LSL
CHECKED	JBA
APPROVED	JBA
PROJECT	2024.323
DATE	7-25-25

TIMBER MILL (323)
115-12.47KV SUBSTATION
PERIMETER VIEWS BESS AREA

SCALE	DRAWING NUMBER	REV
NONE	E03G	A

C:\CORE\Timber Mill\323_E03G.dwg