PHASE III DRAINAGE REPORT

LOT 1B, BLOCK 9, CITADEL STATION FILING 6, FOURTH AMD
TOWN OF CASTLE ROCK

FRONT RANGE CONSTRUCTION
CASTLE ROCK, COLORADO

Town of Castle Rock Cases
SDP25-0020
CD25-0064

2N Civil Project No. 25005
August 1, 2025
Revised October 31, 2025

Owner:
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Engineer's Statement:

I affirm that this Phase II drainage design of **Front Range Construction** was prepared by me (or under my direct supervision) in accordance with the provisions of the Town of Castle Rock Drainage Design and Technical Criteria for the owners thereof. I understand that the Town of Castle Rock does not and will not assume liability for the drainage facilities designed by others.

_____

Todd Eric West, P.E.
Registered Professional Engineer
State of Colorado No. 37643

Owner's Statement:

Front Range Development Company LLC hereby certifies that the drainage facilities for **Front Range Construction** shall be constructed according to the design presented in this report. I understand that the Town of Castle Rock does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that the Town of Castle Rock reviews drainage plans pursuant to the Municipal Code; but cannot, on behalf of **Front Range Construction**, guarantee that final drainage design review will absolve **Front Range Development Company LLC** and/or their successors and/or assigns of future liability for improper design.

Front Range Development Company LLC
Name of Owner

_____

Authorized Signature
Jesse Gutowski, Owner

Town of Castle Rock Approvals:

_____ _____

Utilities Department Date

_____ _____

Development Services Date

II. GENERAL LOCATION AND DESCRIPTION

A. Site Location

1. Vicinity Map (refer to Appendix)

2. Township, Range, Section, and ¼ Section

The site is in the Northwest ¼ of Section 11, Township 8 South, Range 67 West of the 6th Principal Meridian, Town of Castle Rock, County of Douglas, State of Colorado. The site lies approximately 700 feet south of the intersection of Topeka Way and Prairie Hawk Drive.

3. Existing and Proposed Streets

The site address is 661 Prairie Hawk Drive, Castle Rock, Colorado, 80109, and is located west of I-25 and downtown Castle Rock. The site is bound by existing commercial development on the north and west, the Prairie Hawk Drive right-of-way on the east, and the Industrial Tributary drainageway on the south.

4. Names of Surrounding Developments

The Citadel Station Filing 6 industrial development surrounds the site on the north (Haulaway Storage and Automaster auto repair), and west (Kolbe Striping). Industrial Tributary drainageway borders the site on the south, adjacent to the proposed Brickyard mixed use development.

B. Description of Property

1. Area in Acres
The size of Lot B1 is 2.35 acres.

2. Ground Cover, vegetation, site topography and slopes

The site generally drains east to an existing roadside swale as shown in the Existing Drainage Map. A subtle ridge runs from east to west at the midpoint of the site, dividing flow to the north and south. Please refer to the Existing Basin Map included in the Appendix.

The lot has been previously graded for development and includes a gently sloping pad (2-4%) that sits about 3 feet above the pavement of Prairie Hawk Drive. The existing roadside swale of this roadway cuts an approximately 10’ deep swale between the pad and the roadway. Ground cover consists of a homogeneous blend of weeds and grasses, likely established when the lot was overlot graded.

A driveway was built in 2024 to provide vehicle access across the existing ditch and to the site (SDP23-0034 and CD23-0038).

3. NRCS Soils Classification Map and Discussion

The soils groups for this site are comprised of 100% of Type B soil [BrB Bresser sandy loam on the upland portion of the site, and NeE Newlin gravelly sandy loam closer to the existing drainageway]. According to the NRCS, Type B soils have a moderate infiltration rate when thoroughly wet. A detailed soil type map has been included in the Appendix.

4. Major and Minor Drainageways

The site is located within the Industrial Tributary watershed, which flows to East Plum Creek. The tributary flows from west to east approximately 50 feet south of the site and converges with East Plum Creek approximately 800 feet east of the site.

5. Floodplains delineated by FHAD studies or on FEMA Firm Maps

The *Omni, Industrial, and Westfield Watershed Master Plan* by CH2MHill was completed in January 2011 (Master Plan). This Master Plan provided a comprehensive drainage plan and flood plain analysis and served to establish strategies to mitigate impacts from future development. This Master Plan was combined with a Flood Hazard Area Delineation (FHAD) completed in April 2013 to define the floodplain boundaries and elevations, mapping the AE Flood Zones for the Industrial Tributary adjacent to this site.

The 100 year floodplain from the adjacent drainageway encroaches onto the site. According to FEMA Firm Map No. 08035C188G with an effective date of March 16, 2016, the Base Flood Elevation (BFE) of the major drainageway closest to the site is 6222.

The most recent analysis of the existing floodplain is being performed by Harris Kocher Smith Engineering (HKS) as a part of the Brickyard development CD25-0042. A new 72" RCP culvert and 12'x8' trail culvert are proposed as a part of the off-site improvements associated with that project. These conduits will provide increased capacity such that stormwater will no longer flood upstream of the Prairie Hawk Drive road embankment to the extent shown in the Master Plan. This analysis represents the best available data since the Master Plan was published and is currently pending approval as of the date of this report.

6. Existing irrigation canals or ditches

There are no known irrigation facilities or ditches on site.

7. Significant geologic features

Based on the United States Geological Survey (USGS) "Geologic Map of Colorado" by Ogden Tweto, 1979, the majority of the site is mapped as being underlain by the Upper Part of Dawson Arkose (Tdu) deposits that are described as including "arkosic sandstone, conglomerate, and shale."

8. Proposed land use

The project will consist of the construction of an approximately 5,000 square foot single-story steel building providing an office and shop for Front Range Construction Services. The site will include paved parking, a detention pond, and landscaping.

III. DRAINAGE BASINS AND SUB-BASINS

A. Major Basin Description

1. On-site and off-site major drainage basin characteristics and flow patterns and paths

The Industrial Tributary watershed extends from undeveloped land above the Miller Activity Complex to its confluence with East Plum Creek. According to the FHAD study, the average imperviousness of the watershed was analyzed to be approximately 18% under current conditions (as of April 2013), with an increase to 44% at based on proposed land uses.

East Plum Creek flows through the Town of Castle Rock to its confluence with West Plum Creek in Sedalia, and then to its final convergence with the South Platte River at Chatfield Reservoir.

2. Existing and proposed land uses within the basins if known

The Industrial Study Area defined in the FHAD is currently developed in the lower reaches and undeveloped in the upper reaches of the watershed. Future land use conditions show much of the upper reaches of the Industrial watershed becoming dedicated open space, in which the Miller Activity Complex has been constructed. The upper reaches of the Industrial Study Area change from agricultural land use to parks and open space. In the lower portion of the watershed, the land use changes from open space in the existing condition to commercial and industrial land uses in the future.

3. Discussion of all drainageway planning or floodplain delineation studies that affect the major drainageways, such as FHAD Studies and Master Planning Studies

As previously discussed, the *Omni, Industrial, and Westfield Watershed Master Plan* by CH2MHill was completed in January 2011 (Master Plan). This Master Plan was combined with a Flood Hazard Area Delineation (FHAD) completed in April 2013.

The *Stormwater Master Plan Update* prepared by Castle Rock Water Stormwater Division in 2017 presents findings and recommendations based on the stormwater program needs for the Town. The plan serves to outline stormwater and floodplain problem areas and recommend time frames and priorities based on an evaluation that included criteria such as property protection, public safety, flood risk and water quality enhancement for specific drainageway capital improvement projects.

4. Discussion of the condition of any channel within or adjacent to the development, including existing conditions, need for improvements, and impact on the proposed development

   Industrial Tributary runs along the south boundary of the site. The channel underwent significant changes in 2019 as part of the Industrial Tributary Channel Improvements project. The project involved the installation of a designed naturalized conveyance channel to emulate a natural meandering stream channel. The channel consists of an overbank conveyance for flood events and a bankfull channel for typical flow. Drop structures were installed, and the channel was redefined to consist of an improved gradient with alternating riffle, pool, and run complexes throughout.

5. Discussion of the impacts of the off-site flow patterns and paths, under fully developed conditions

   Off-site flow patterns are directed around the site by the existing roadside swale of Prairie Hawk Drive. The site to the west flows across the site to the swale.

B. Minor Drainage Basins

1. On-site and off-site minor drainage basin characteristics and flow patterns and paths under historic and developed conditions

   The site is located in an industrially developed area of Castle Rock and the surrounding off-site basins are fully developed. Off-site basins outfall to the Industrial Tributary, or are intercepted by the Town's roadside swales and storm sewer network within the public right-of-way and conveyed downstream. Under developed conditions, off site flows will continue to follow these historic paths, while the on-site basins will be conveyed to the existing roadside swales of the adjacent streets following historic flow patterns.

Prairie Hawk Drive will be rebuilt along the frontage of this site as part of the Brickyard development off-site improvements project (CD25-0042). Flows generated from the roadway will be captured in curb and gutter and conveyed downstream in a proposed storm sewer system, in place of draining to the existing roadside ditch as it does currently. The existing ditch that fronts the site will remain in place. This ditch conveys flow from the upstream basins that outfall to the existing roadside ditch of Topeka Way and Prairie Hawk Drive upstream of this site as shown in the Existing Basin Map included in Appendix E.

The Proposed Land Use Data Figure III-5 from the FHAD study includes sub-basin lines for Industrial Tributary. The site falls within Sub Basin 6, which is estimated to have a future developed impervious value of 82.4%. The Hydrologic analysis in this report utilizes an impervious value of 75% for the developed parcels within the Existing Basin, which is consistent with MHFD's impervious value from Table 6-2 for Industrial Areas (March 2024 update). Refer to the Composite Impervious calculations provided in the Appendix.

Existing Basins

The FHAD study includes a basin delineation *Figure III-2 Omni/Industrial Westfield FHAD Drainage Basin*s that includes the subject property. In addition to that study, the approved drainage reports for 704 Topeka Way (*Final Drainage Study for Lot 2, Block 9, Citadel Station No. 6,* Reference No. 5*)* and 550 Topeka Way (*Final Drainage Report for Kolbe Striping Office Building*, Reference No. 3) located upstream of the subject property have been used to define upstream basins and flow paths.

Based on the drainage report for 704 Topeka Way (Reference No. 5), flows from that site directed to a detention pond located at the southeast corner of the property that outfalls directly to Industrial Tributary and thus does not contribute flow to the subject property. The Drainage Map from the report is included in the Appendix C.

The portion of the Kolbe Striping site at 550 Topeka Way tributary to the subject property is defined as Basin OS-A2. The drainage map for Kolbe Striping site (Reference No. 3) shows that flows are directed to onsite detention ponds prior to releasing downstream. Pond A, located in the northwest corner of the site, outfalls to the roadside ditch where it combines with upstream flows at Design Point O-1. The upstream flow was reported as Q100 = 9.3 cfs from Sub-Basin D1 from the Storm Drainage System Evaluation for Citadel Station (Reference No. 4). Together with the Pond A discharge of 2.3 cfs during the major storm results in a combined flow of 12.2 cfs during the major storm. Pond B, located in the southeast corner of the site, releases directly to Industrial Tributary and does not contribute flow to the subject property.

Basin EX-1 encompasses 6.19 acres and has a calculated impervious value of

58.44%. The basin is comprised of off-site areas of industrial development including buildings, paved and gravel storage and parking, and minimal landscaping. Flow from this basin is collected in the roadside ditch of Topeka Way and Prairie Hawk Drive, converging at Design Point 1, where an existing 36" RCP conveys flow past the newly constructed driveway into this project site. According to the results from the Rational Method calculations, the runoff generated for this basin is 7.65 cfs during the 5-year minor storm, and 23.09 cfs during the 100-year major storm.

Basin EX-2 is 1.23 acres and drains across the southern portion of the site. The basin is comprised of on-site areas that are undeveloped. The basin has a calculated impervious value of 16.3%. According to the results from the Rational Method calculations, the runoff generated from this basin is 0.36 cfs during the 5-year minor storm, and 2.95 cfs during the 100-year major storm.

Flow from Design Point O-1, Sub-Basin D1, Basin EX-1, and EX-2 combine at Design Point 2, and sum to 38.24 cfs during the 100-year storm.

Proposed Basins

Following development of the subject property, the limits of Basin EX-1 will be redefined when swales are built to direct off-site flows from the west around the property. The resulting off-site basin, OS-1, is 4.91 acres and is comprised of industrial development. The basin has a calculated impervious value of 72.26%. According to the results from the Rational Method calculations, the runoff generated for this basin is 8.53 cfs during the 5-year minor storm, and 22.57 cfs during the 100-year major storm.

Basin OS-2 is a 0.16 acre off-site basin located along the west property line and contains a small area from the adjacent industrial property that outfalls directly onto this site. The basin has an impervious value of 75%. According to the results from the Rational Method calculations, the runoff generated from this basin is 0.37 cfs during the 5-year minor storm, and 0.97 cfs during the 100-year major storm.

Basin PR-1 is 0.53 acres and includes the proposed building, paved drive lanes and parking, and detention pond. This basin will outfall directly to the proposed detention pond. The basin has a calculated impervious value of 73.02%. According to the results from the Rational Method calculations, the runoff generated for this basin is 1.21 cfs during the 5-year minor storm, and 3.17 cfs during the 100-year major storm.

Basin PR-2 is 0.32 acres and includes on-site areas that will remain undeveloped. This basin will outfall to existing swale along Prairie Hawk Drive. The basin has an impervious value of 5.0%. According to the results from the Rational Method calculations, the runoff generated for this basin is 0.26 cfs during the 5-year minor storm, and 1.27 cfs during the 100-year major storm.

Basin PR-3 is 1.38 acres and includes on-site areas that will remain undeveloped. This basin will outfall to existing swale along Prairie Hawk Drive. The basin has an impervious value of 5.0%. According to the results from the Rational Method calculations, the runoff generated for this basin is 0.11 cfs during the 5-year minor storm, and 3.15 cfs during the 100-year major storm.

Basin PR-4 is 0.05 acres and includes a portion of the paved driveway that cannot drain to the proposed detention pond. This basin will outfall to existing swale along Prairie Hawk Drive. The basin has a calculated impervious value of 77.74%. According to the results from the Rational Method calculations, the runoff generated for this basin is 0.13 cfs during the 5-year minor storm, and 0.33 cfs during the 100-year major storm.

Basin PR-5 is 0.07 acres and includes a portion of the paved driveway that cannot drain to the proposed detention pond. This basin will outfall to existing swale along Prairie Hawk Drive. The basin has a calculated impervious value of 92.50%. According to the results from the Rational Method calculations, the runoff generated for this basin is 0.20 cfs during the 5-year minor storm, and 0.45 cfs during the 100-year major storm.

Flow from Basins OS-A2, Sub-Basin D1, OS-1, PR-1, PR-2, and PR-4 combine at Design Point 1, and sum to 37.37 cfs during the 100-year storm. Note that the flow values from Basin PR-1 represent discharge from the detention pond, and not direct runoff values.

In addition to the basins tributary to Design Point 1, Basins OS-2, PR-3, and PR-5 combine at Design Point 2 and sum to 41.94 cfs during the 100-year storm.

Design Point 3 is located at the end of the detention pond outfall pipe. According to the MHFD-Detention V4.07 spreadsheet calculations, the pond outflow generated from Basin PR-1 is 0.06 cfs during the 5-year minor storm, and 0.69 cfs during the 100-year major storm.

Proposed Basins – Future Development

A portion of the south side of the property has been planned for future telecommunication equipment. Basin PR-1a encompasses 0.23 acres and has been defined to include this telecom equipment, and includes buildings, generator pads, and a gravel yard. These improvements will require an amendment to the Site Development Plan and are not a part of this SDP25-0020. However, since this area is considered part of the common development, the pond has been designed to accommodate these future improvements. It is anticipated that an inlet and pipe will collect stormwater from the gravel yard and convey flow to the proposed pond. The basin has a calculated impervious value of 74.47%. According to the results from the Rational Method calculations, the runoff generated for this basin is

0.53 cfs during the 5-year minor storm, and 1.39 cfs during the 100-year major storm.

Basins PR-1 and PR-1a combine in the proposed Full Spectrum Detention (FSD) pond. The total area of these basins equals 0.76 acres, and the composite impervious value is 73.46%. These values were used to calculate the WQCV, EURV, and 100-Year volume requirements for the FSD pond. According to the MHFD-Detention V4.07 spreadsheet calculations, the pond outflow generated for these basins is 0.03 cfs during the 5-year minor storm, and 0.98 cfs during the 100-year major storm.

Following the development of the telecom equipment, the limits of Basin PR-3 will be redefined to exclude these improvements, resulting in Basin PR-3a. This basin is 1.15 acres and has an impervious value of 6.13%. According to the results from the Rational Method calculations, the runoff generated for this basin is .09 cfs during the 5-year minor storm, and 2.63 cfs during the 100-year major storm.

IV. DRAINAGE DESIGN CRITERIA

A. Regulations

1. Town criteria and optional provisions selected, when applicable

The project will comply with the applicable requirements of the Town of Castle Rock Storm Drainage and Technical Criteria Manual (TCR SDTCM) and any variances from the criteria that are granted by the Town.

2. MHFD Manual criteria and optional provisions selected, when applicable

The project will comply with the applicable requirements of the MHFD Manual.

B. Drainage Studies, Master Plans, Site Constraints

1. Discuss previous drainage studies or master plans for the site or project that influence the stormwater facility design

No drainage studies or master plans exist for the subject property.

2. Discuss drainage studies for adjacent developments and how those developments affect the stormwater facility design

No studies were available.

3. Discuss Town Master Plans and how recommendations in those studies affect the design

The Town Master plan presents guidelines related to land development, including measures for protection of the public, protection of water quality and mitigating impacts to receiving waters. Structural and nonstructural Best Management Practices implemented during and after construction will ensure compliance with this Plan.

C. Hydrology

1. Runoff calculation method

The Rational Method was selected to calculate runoff for the site.

2. Design storm recurrence intervals

The design storm recurrence intervals for this project will be the 5-year storm and the 100-year storm.

3. Design rainfall

The design rainfall will be from Table 6-1 1-HOUR POINT RAINFALL VALUES FOR THE TOWN OF CASTLE ROCK of the Town of Castle Rock Storm Drainage Design and Technical Criterial Manual. Table 6-1.

4. Detention storage calculation methods

The development will implement Full Spectrum Detention (FSD) utilizing an Extended Detention Basin (EDB) to capture and treat runoff prior to discharge downstream. The proposed detention pond is designed using the MHFD spreadsheet, UD-Detention v.4.06. This design considers the water quality capture volume (WQCV), excess urban runoff volume (EURV), and 100-year detention volume.

5. Detention storage release rate calculation methods

The EDB detention pond design spreadsheet serves to manage developed condition peak flows to levels similar to predevelopment conditions for a full range of return periods.

D. Hydraulics

1. Methods used to determine conveyance facility capacities

Design software utilizing Manning's Equation was used to determine these capacities.

E. Storage and Water Quality Enhancement

1. Discuss approach used for detention

The detention basin has been located downstream of the building and parking area to intercept flows from these hardscaped areas. The sideslopes of the pond have been limited to a 4:1 slope to reduce the potential for erosion and provide ease of maintenance.

Due to the topographic limitations inherent with the location of the pond in relation to the existing ditch, the emergency outlet will be in the form of a horizontal grate attached to the outlet structure. The grate will be set at the 100 Year + ½ WQCV water surface elevation (WSEL) and intercept flows in the event that the lower grate at the EURV WSEL becomes clogged. The emergency outlet has been designed with a minimum of 1 foot of freeboard above the water surface elevation when the emergency spillway is conveying the emergency overflow.

The overflow grate is designed to pass 200% of the Peak Inflow at a depth of 0.8" assuming the grate is 50% clogged (refer to Detention Pond – Emergency Overflow Capacity Calculations in the Appendix).

2. Discuss approach for achieving four step process

Step 1. Reduce Runoff Volume to the Maximum Extent Practicable

The amount of paved parking has been limited to the minimum number of stalls allowed by the Town's criteria. Impervious surfaces that cannot be hydraulically connected to the proposed detention pond, specifically a portion of the paved driveway, will be directed to roadside swales that will be stabilized with seeding and mulching and erosion mat to provide infiltration.

Step 2. Provide Water Quality Capture Volume and Flood Control Detention Via Full-Spectrum Detention

Per the Permanent Water Quality Determination Worksheet (Taken from 2019 SDDTCM Sections 13.1.4 and 13.1.5), this project is Development Site and permanent water quality is required. Water quality will be provided as a part of the Full Spectrum Detention (FSD) pond proposed for this project.

Basins PR-2 and PR-3 will remain undeveloped following construction and have been excluded from detention in accordance with Section 13.1.5.7.

Basins PR-4 and PR-5 include a portion of the paved driveway that cannot drain to the proposed detention pond. These basins sum to 0.14 acres (5.6% of the total

site) and have been excluded from detention in accordance with Section 13.1.4.

Basin PR-1a represents future development and is considered a Common Plan of Development or Sale consistent with Section 13.1.4 and has been accounted for in the calculations for the FSD pond.

Step 3. Utilize Stream Channel Stabilization Techniques

The newly constructed roadside swales will be seeded and mulched following construction to help establish vegetation. Together with erosion mat and buried riprap outfalls, the swales will be protected from erosion.

The receiving water from this site is Industrial Tributary. This reach was rebuilt in 2019 to improve flow conveyance through Industrial Tributary while reducing erosion and returning it to a more natural condition between Prairie Hawk Drive and West Plum Creek Parkway.

Step 4. Undertake Source Control

Storage and handling of fluids related to vehicle maintenance will be contained within the building. Trash and debris generated from the site will be disposed of within the designated trash receptacles which will be enclosed within solid fencing. Good housekeeping practices such as maintaining a clean and orderly work environment will help reduce the risk of accidental spills. Materials to be stored on site include items such as tool and equipment storage, concrete finishing tools, concrete blankets, hand and power tools, and general construction supplies such has lumber, screws, and safety devices. There is no intent to store fuel or fertilizers or flammables on this site.

V. STORMWATER MANAGEMENT FACILITY DESIGN

A. Stormwater Conveyance Facilities

1. Discuss general conveyance concepts and proposed drainage paths and patterns

Precipitation that falls onto the roof will be directed to the detention pond via a piped downspout system and/or conveyed via crosspans and curb and gutter to the pond.

2. Discuss storm sewer design

The proposed storm sewer design for the project will be limited to the roof downspout piping and detention pond structures.

3. Discuss storm sewer outfall locations and design, including energy dissipation

Scour resulting from turbulent, rapidly decelerating flow at the end of the pond outfall pipe will be mitigated by the construction of a low tailwater riprap basin designed per MFHD standards. The riprap will be soil riprap or void filled riprap to help establish vegetation to further protect against erosion. This feature consists of a riprap-lined depression that will dissipate the energy of the pond discharge. This design, together with the net decrease in flow from historic conditions, will serve to protect downstream drainageways.

4. Discuss open channel and swale designs

The capacity of the existing Prairie Hawk Drive roadside swale has been analyzed based on developed conditions. The swale depth of approximately 9' provides sufficient capacity to convey flow with freeboard greater than one foot.

Capacity calculations for this swale will be provided with the Phase III Final Drainage Report for this project.

5. Discuss maintenance aspects of the design

Maintenance of the overall site will be the responsibility of the property owner and will include weed removal, mowing of grasses, debris and litter removal, growing medium replacement, and sediment removal and/or erosion repair.

Detention pond maintenance will be the responsibility of the property owner and will include debris and litter removal, mosquito control, irrigation maintenance, sediment removal, and outlet structure repairs. General routine maintenance will be required for the pond infrastructure to work properly. According to MHFD criteria, significant maintenance may be required once every 15 – 25 years. However, sediment that collects in the trickle channel should be removed annually to prevent sediment from becoming resuspended.

Sediment and debris conveyed by stormwater to the pond should be removed as necessary to minimize clogging of the outlet structure. This is especially important as the site is undergoing revegetation following construction, since construction debris and straw mulch can easily clog the orifice plate contributing to standing water exceeding the prescribed drain times.

A 12' wide gravel maintenance path has been provided to allow a stabilized access path to the pond outlet structure. The outlet structure is located within 20 feet of the pathway to facilitate maintenance. A vac-truck can utilize the parking lot or maintenance path to remove sediment from the outlet structure micropool.

B. Floodplain Modification

A Floodplain Memo was prepared by 2N Civil to evaluate the impact of the proposed driveway on the existing floodplain of Industrial Tributary. Based on the analysis, there is no change in floodplain elevation as a result of this project.

A copy of the Memo is part of the *Phase III Drainage Report, Lot 1B, Block 9, Citadel Station Filing 6, Fourth Amd. Town of Castle Rock Front Range Construction*, CD23-0038, by 2N Civil, LLC. January 23, 2024. Encroachment into the 100-year floodplain is limited to the access drive, parking area, and detention basin. The building has been elevated to provide 2 feet of freeboard from the 100-year floodplain elevation of 6222.52. Refer to Section VI. Conclusions for discussion regarding the approved Variance related to encroachment into the floodplain.

C. Additional Permitting Requirements

There are no additional permitting requirements anticipated for this project.

D. General

1. Discuss all tables, figures, charts, drawings, etc. that were used in design of stormwater management facilities and describe materials that are included in the appendix of the report

Table 6-1 of the Town's rainfall criteria, together with Table 6-3, Recommended percentage impervious values, MHFD Volume 1 and Table 6-5, Runoff Coefficients [Type A & B Soils], MHFD Volume 1, and the Peak Runoff Prediction by the Rational Method – UD Rational 2.00 (rev. May 2017) from MHFD were used to calculate runoff for this project.

Following is a list of materials included in the Appendix:

Appendix A	Hydrologic Computations
	Vicinity Map
	FEMA Floodplain Map
	NRCS Soils Maps
	Peak Runoff Calculations – Existing and Proposed Basins
Appendix B	Hydraulic Computations *(for EDB Pond only; additional hydraulic calculations to be provided with the Final Drainage Report)*
Appendix C	Referenced Information
Appendix D	MS4 Compliance
	WQ Worksheet
	Variance Application
	Drainage Report Checklist
Appendix E	Drainage Maps

VI. CONCLUSIONS

A. Compliance with Standards

1. Town of Castle Rock Criteria

The proposed development will be prepared in conformance with the requirements set forth in the Town of Castle criteria.

2. Master Plans

The relevant guidelines from the Master Plan related to land development for protection of the public, protection of water quality and mitigating impacts to receiving waters, and providing for effective long-term operations and maintenance of stormwater facilities have been used in the design of the stormwater facilities outlined in this report.

3. Cherry Creek Reservoir Regulation No. 72

The site is not located within the Cherry Creek Reservoir watershed.

4. Chatfield Reservoir Control Regulation No. 73

The Chatfield Watershed Authority promotes the protection of water quality in the Chatfield Watershed for recreation, fisheries, drinking water supplies, and other beneficial uses. The project will implement construction erosion and sediment control BMPs in order to comply with this regulation.

B. Variances

1. Identify provisions by section number for which a variance will be requested, or has been approved by the Town (final version of Drainage Report). Additional information on variances is available in Chapter 1 General Provisions.

Variance TCV25-0046 from Section 5.4.6 Freeboard Requirements for Roadways has been approved to the Town. The existing public road, Prairie Hawk Drive, that provides access to this site is already within the 100-year floodplain.

The variance is to allow construction of the proposed commercial driveway that is within the existing 100 year floodplain, and parking area that is outside of the floodplain but does not provide 2-feet of freeboard. A copy of the approved Variance has been provided in Appendix D.

Please note that TCV23-0044 was previously approved for this site, allowing for construction of the driveway that was permitted with SDP23-0034 and CD23-0038.

C. Drainage Concept

1. Discuss overall effectiveness of stormwater management design to properly convey, store and treat stormwater

This drainage concept presented in this report has been prepared in accordance with the Town of Castle Rock Storm Drainage and Criterial Manual referenced herein. The drainage design provides for collection and conveyance of locally generated storm water runoff. The Extended Detention Basin will act to slow the release of stormwater to pre-development flows, while allowing sediment to fall out of suspension prior to being released downstream.

Best Management Practices, detailed in the TESC Plans and Report associated with this project, will be implemented during construction to manage stormwater runoff and remain in effect until final stabilization is attained.

VII. REFERENCES

1. *Town of Castle Rock Storm Drainage Design and Technical Criteria Manual*, Latest Edition, Town of Castle Rock, Colorado, Revised February 18, 2025.

2. *Drainage Criteria Manual, Volumes 1, 2, & 3, Mile High Flood District*, Volumes 1-3. Updated March 2024.

3. *Final Drainage Report for Kolbe Striping Office Building* by Rocky Mountain Consultants, Inc., Revised February 1995 RMC Ref No. 1622.002.00.

4. *Storm Drainage System Evaluation for Citadel Station*, Rocky Mountain Consultants, Inc., September 1994.

5. *Final Drainage Study for Lot 2, Block 9, Citadel Station No. 6* by Ackslan Industries, June 1987.

6. *Omni, Industrial, and Westfield Watershed Master Plan* by CH2MHill, January 2011.

7. *Omni, Industrial, and Westfield Watersheds FHAD* by CH2MHill, April 2013.

8. *Stormwater Master Plan Update* prepared by Castle Rock Water Engineering in March 2017.

9. *Phase III Drainage Report, Lot 1B, Block 9, Citadel Station Filing 6, Fourth Amd. Town of Castle Rock Front Range Construction*, CD23-0038, by 2N Civil, LLC., January 23, 2024.

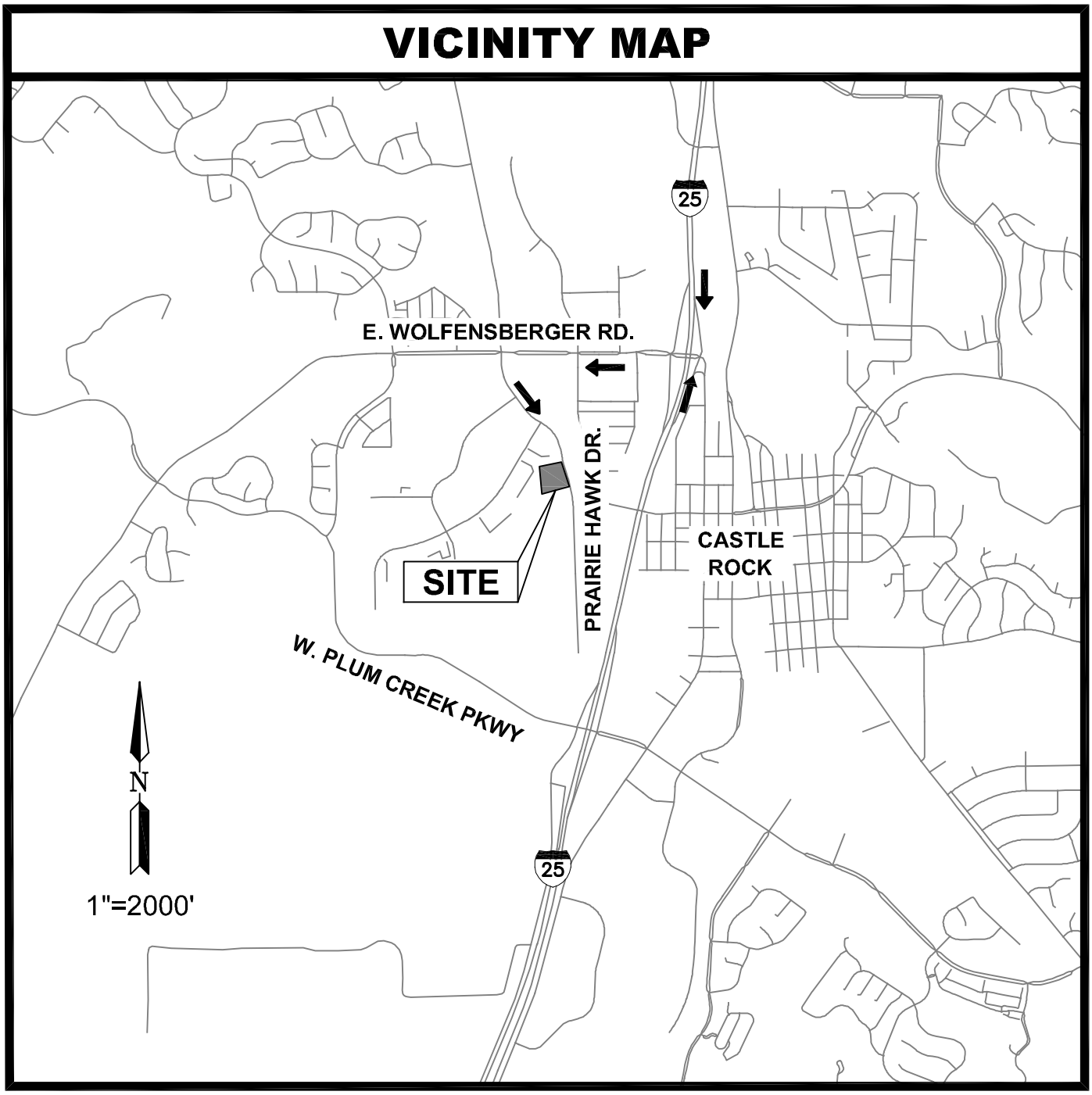
10. *Floodplain Modification Study for Front Range Construction*, FD23-0008, by 2N Civil, LLC., December 13, 2023.

11. *The Brickyard – Prairie Hawk Infrastructure*, Town of Castle Rock Project No. CD25-0042, Harris Kocher Smith, August 5, 2025.

APPENDIX A

HYDROLOGIC COMPUTATIONS

VICINITY MAP



Project Number: 23009

J:\Projects\23\23009\dwg\TESC\TESC Cover Sheet.dwg

2N Civil, LLC
6 Inverness Ct. E., Suite 125
Englewood, CO 80112
Phone 303-925-0544 Fax 303-925-0547
www.2NCivil.com

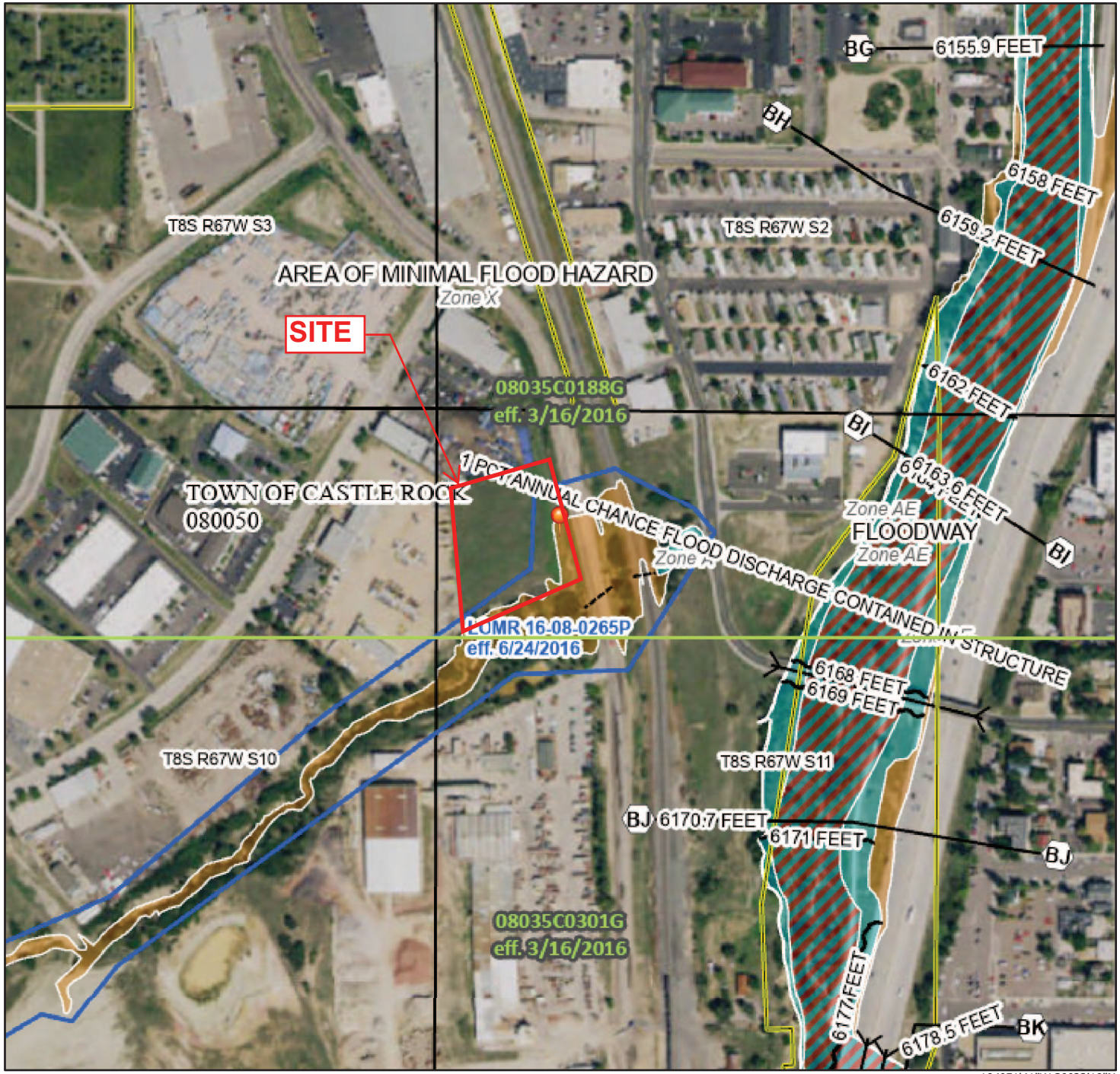
VICINITY MAP
Front Range Construction

Drawn By:
Checked By:
Revisions: 9-1-23

National Flood Hazard Layer FIRMette

FEMA

104°52'19"W 39°22'47"N



104°51'41"W 39°22'19"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

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

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 AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

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

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

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

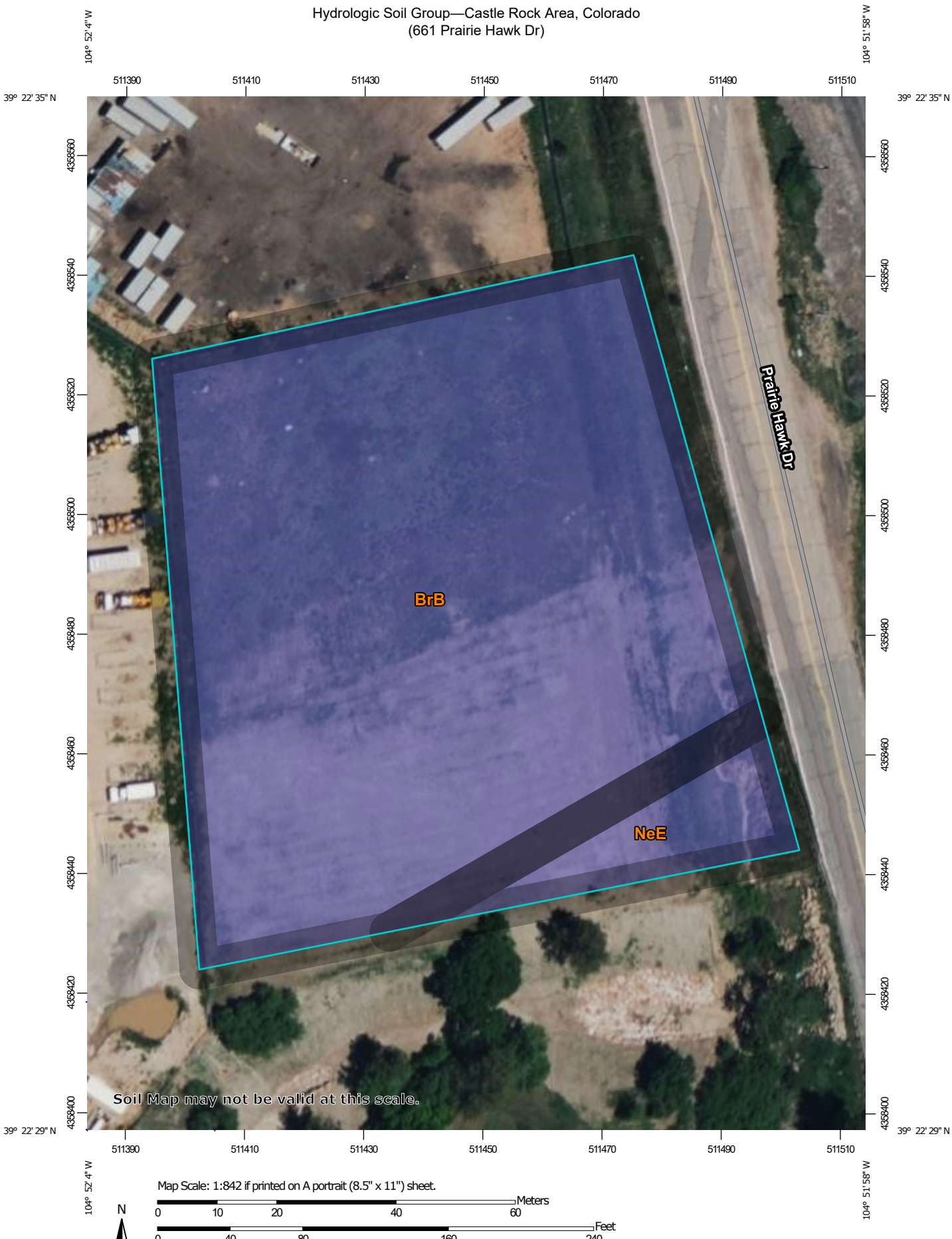
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/2/2023 at 12:53 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Hydrologic Soil Group—Castle Rock Area, Colorado
(661 Prairie Hawk Dr)



Map Scale: 1:842 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 10 20 40 60

Feet: 0 40 80 160 240

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 Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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 15, Sep 1, 2022

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

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BrB	Bresser sandy loam, cool, 1 to 3 percent slopes	B	2.2	91.5%
NeE	Newlin gravelly sandy loam, 8 to 30 percent slopes	B	0.2	8.5%
Totals for Area of Interest			**2.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

661 Prairie Hawk Dr - Stormwater Calculations

Existing Conditions - Composite % Impervious Value

Date: October 31, 2025

Basin EX-1

Land Use	Area	% I
Gen Industrial	3.79	75%
Streets	0.72	95%
Gravel	0.01	80%
Historic	1.67	5%
Sum Area =	6.19	
Composite % =		58.44%

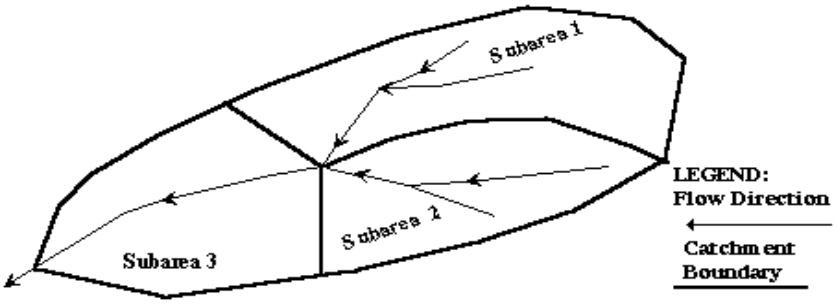
Basin EX-2

Land Use	Area	% I
Gen Industrial	0.08	75%
Streets	0.09	95%
Gravel	0.01	80%
Historic	1.06	5%
Sum Area =	1.23	
Composite % =		16.34%

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: TEW
Company: 2N Civil, LLC
Date: 10/23/2025
Project: Front Range Construction
Location: Castle Rock, Colorado



Subcatchment Name
EX_1

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

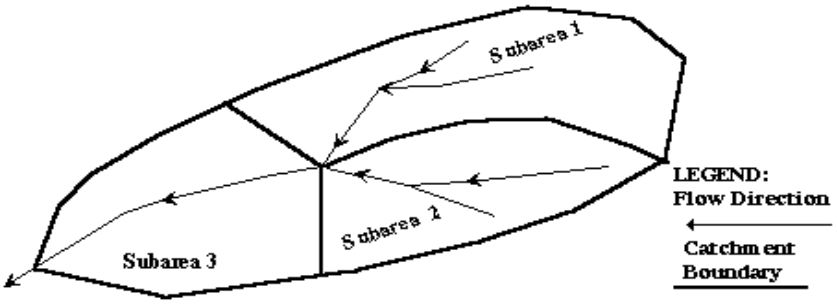
See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
Industrial	3.79	B	75.0	0.60	0.63	0.66	0.72	0.75	0.77	0.81
Streets	0.72	B	95.0	0.79	0.81	0.82	0.85	0.86	0.87	0.88
Gravel	0.01	B	80.0	0.64	0.67	0.70	0.75	0.77	0.80	0.83
Historic	1.67	B	5.0	0.03	0.03	0.10	0.28	0.36	0.45	0.55
Total Area (ac)	6.19		Area-Weighted C	0.46	0.49	0.53	0.62	0.65	0.70	0.75
			Area-Weighted Override C	0.46	0.49	0.53	0.62	0.65	0.70	0.75

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: TEW
Company: 2N Civil, LLC
Date: 10/23/2025
Project: Front Range Construction
Location: Castle Rock, Colorado



Subcatchment Name
EX_2

Cells of this color are for required user-input
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See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
Industrial	0.08	B	75.0	0.60	0.63	0.66	0.72	0.75	0.77	0.81
Streets	0.09	B	95.0	0.79	0.81	0.82	0.85	0.86	0.87	0.88
Gravel	0.01	B	80.0	0.64	0.67	0.70	0.75	0.77	0.80	0.83
Historic	1.06	B	5.0	0.03	0.03	0.10	0.28	0.36	0.45	0.55
Total Area (ac)	1.23		Area-Weighted C	0.12	0.13	0.19	0.35	0.42	0.50	0.60
			Area-Weighted Override C	0.12	0.13	0.19	0.35	0.42	0.50	0.60

Calculation of Peak Runoff using Rational Method

Designer: TEW
Company: 2N Civil, LLC
Date: 10/23/2025
Project: Front Range Construction
Location: Castle Rock, Colorado

Version 2.00 released May 2017

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

$$t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t}$$

$$\text{Computed } t_c = t_i + t_t$$

$$\text{Regional } t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

$t_{minimum}$ = 5 (urban)
$t_{minimum}$ = 10 (non-urban)

$$\text{Selected } t_c = \max\{t_{minimum}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$$

Select UDFCD location for NOAA Atlas 14 Rainfall Depths from the pulldown list OR enter your own depths obtained from the NOAA website (click this link)

	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
1-hour rainfall depth, P1 (in) =	0.83	1.09	1.33	1.69	1.99	2.31	3.14

	a	b	c
Rainfall Intensity Equation Coefficients =	28.50	10.00	0.786

$$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$$

$$Q(cfs) = CIA$$

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C 2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
EX-1	6.19	B	58.4	0.45	0.48	0.53	0.62	0.65	0.70	0.75
					0.49					
EX-2	1.23	B	16.3	0.10	0.12	0.19	0.35	0.42	0.50	0.60
					0.13					

Subcatchment Name	Overland (Initial) Flow Time: Overland Flow Length L_i (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Overland Flow Slope S_i (ft/ft)	Overland Flow Time t_i (min)	Channelized (Travel) Flow Time: Channelized Flow Length L_t (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V_t (ft/sec)	Channelized Flow Time t_t (min)	Time of Concentration: Computed t_c (min)	Regional t_c (min)	Selected t_c (min)
EX-1	28.00			0.100	2.78	1168.62	6224.00	6209.40	0.012	15	1.68	11.62	14.40	26.21	14.40
					2.73								14.34		
EX-2	332.00	6229.62	6208.80	0.063	17.60	88.58	6208.80	6205.58	0.036	15	2.86	0.52	18.12	23.91	18.12
					17.41								17.93		

Subcatchment Name	Rainfall Intensity, I (in/hr) 2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Peak Flow, Q (cfs) 2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
EX-1	1.92	2.52	3.08	3.91	4.61	5.35	7.27	5.30	7.46	10.07	14.91	18.65	23.09	33.73
									7.65					
EX-2	1.72	2.26	2.75	3.50	4.12	4.78	6.50	0.21	0.33	0.64	1.51	2.12	2.95	4.76
									0.36					

661 Prairie Hawk Dr - Stormwater Calculations

Proposed Conditions - Composite % Impervious Value

Date: October 31, 2025

Basin OS-1

Land Use	Area	% I
Gen Industrial	3.71	75%
Streets	0.79	95%
Gravel	0.00	80%
Historic	0.42	5%
Sum Area =	4.91	
Composite % =		72.26%

Basin OS-2

Land Use	Area	% I
Gen Industrial	0.16	75%
Streets	0.00	95%
Gravel	0.00	80%
Historic	0.00	5%
Sum Area =	0.16	
Composite % =		75.00%

Basin PR-1

Land Use	Area	% I
Roofs	0.110	95%
Concrete Driveways and Walks	0.019	95%
Roadways and Paved Streets	0.215	95%
Gravel (High-traffic Areas)	0.027	80%
Extended Detention Basins	0.130	25%
Disturbed Soil (Lawns)	0.028	20%
Sum Area =	0.529 ac	
	23,025 sf	
Composite % =		73.02%

Basin PR-2

Land Use	Area	% I
Roofs	0.00	95%
Concrete Driveways and Walks	0.00	95%
Roadways and Paved Streets	0.00	95%
Gravel (High-traffic Areas)	0.00	80%
Extended Detention Basins	0.00	25%
Undisturbed Areas / Native	0.32	5%
Sum Area =	0.32	
Composite % =		5.00%

661 Prairie Hawk Dr - Stormwater Calculations

Proposed Conditions - Composite % Impervious Value

Date: October 31, 2025

Basin PR-3

Land Use	Area	% I
Roofs	0.00	95%
Concrete Driveways and Walks	0.00	95%
Roadways and Paved Streets	0.00	95%
Gravel (High-traffic Areas)	0.00	80%
Extended Detention Basins	0.00	25%
Undisturbed Areas / Native	1.38	5%
Sum Area =	1.38	
Composite % =		5.00%

Basin PR-4

Land Use	Area	% I
Roofs	0.00	95%
Concrete Driveways and Walks	0.00	95%
Roadways and Paved Streets	0.03	95%
Gravel (High-traffic Areas)	0.01	80%
Extended Detention Basins	0.00	25%
Disturbed Soil (Lawns)	0.01	20%
Sum Area =	0.05	
Composite % =		77.74%

Basin PR-5

Land Use	Area	% I
Roofs	0.00	95%
Concrete Driveways and Walks	0.00	95%
Roadways and Paved Streets	0.06	95%
Gravel (High-traffic Areas)	0.01	80%
Extended Detention Basins	0.00	25%
Disturbed Soil (Lawns)	0.00	20%
Sum Area =	0.07	
Composite % =		92.50%

661 Prairie Hawk Dr - Stormwater Calculations

FUTURE Conditions - Composite % Impervious Value

Date: October 31, 2025

Date: October 31, 2025

Basin PR-1a (Future Condition)

Land Use	Area	% I
Roofs	0.044	95%
Concrete Driveways and Walks	0.000	95%
Roadways and Paved Streets	0.000	95%
Gravel (High-traffic Areas)	0.153	80%
Extended Detention Basins	0.000	25%
Disturbed Soil (Lawns)	0.032	20%
Undisturbed Soil	0.000	5%
Sum Area =	0.229 ac	
	9,967 sf	
Composite % =		74.47%

Basin PR-3a (Future Condition)

Land Use	Area	% I
Roofs	0.000	95%
Concrete Driveways and Walks	0.000	95%
Roadways and Paved Streets	0.000	95%
Gravel (High-traffic Areas)	0.017	80%
Extended Detention Basins	0.000	25%
Disturbed Soil (Lawns)	0.000	20%
Undisturbed Soil	1.136	5%
Sum Area =	1.154 ac	
	50,259 sf	
Composite % =		6.13%

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: TEW
Company: 2N Civil, LLC
Date: 10/23/2025
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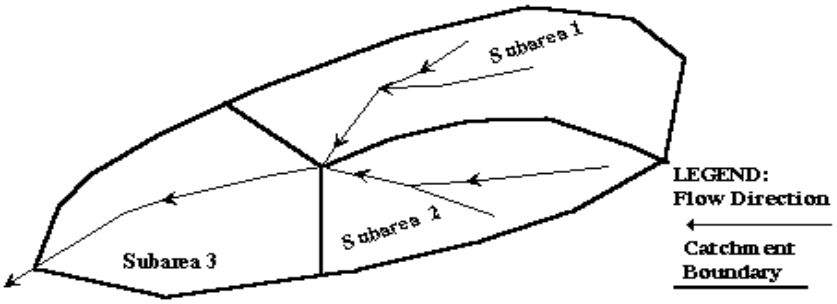


Subcatchment Name
OS-1

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

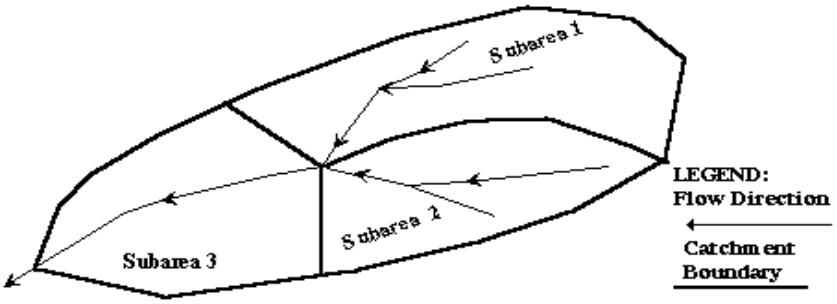
See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
Industrial	3.71	B	75.0	0.60	0.63	0.66	0.72	0.75	0.77	0.81
Streets	0.79	B	95.0	0.79	0.81	0.82	0.85	0.86	0.87	0.88
Historic	0.42	B	5.0	0.03	0.03	0.10	0.28	0.36	0.45	0.55
Total Area (ac)	4.91		Area-Weighted C	0.58	0.61	0.64	0.70	0.73	0.76	0.80
			Area-Weighted Override C	0.58	0.61	0.64	0.70	0.73	0.76	0.80

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: TEW
Company: 2N Civil, LLC
Date: 10/23/2025
Project: Front Range Construction
Location: Castle Rock, Colorado



Subcatchment Name
OS-2

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Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

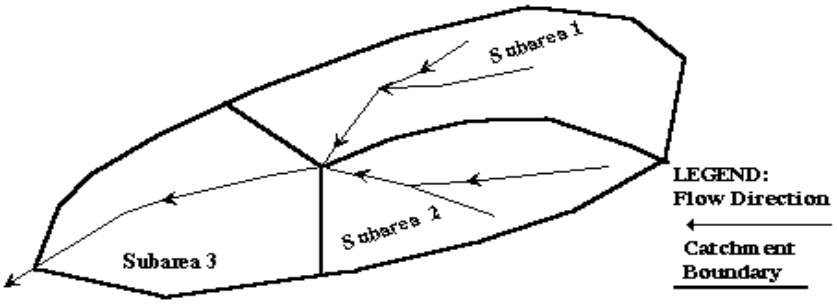
See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
Industrial	0.16	B	75.0	0.60	0.63	0.66	0.72	0.75	0.77	0.81
Total Area (ac)	0.16		Area-Weighted C	0.60	0.63	0.66	0.72	0.75	0.77	0.81
			Area-Weighted Override C	0.60	0.63	0.66	0.72	0.75	0.77	0.81

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: TEW
Company: 2N Civil, LLC
Date: 10/23/2025
Project: Front Range Construction
Location: Castle Rock, Colorado



Subcatchment Name
PR-1

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Cells of this color are for calculated results based on overrides

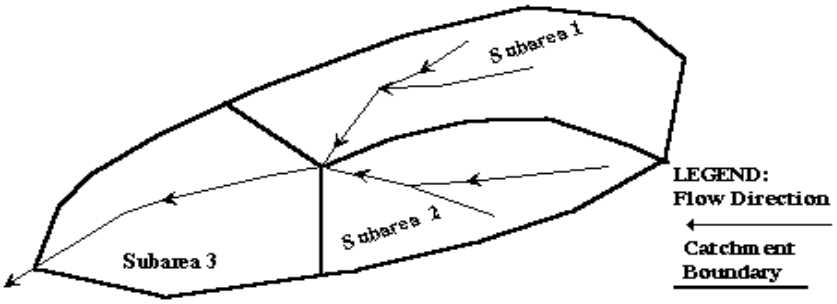
See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
Roofs	0.11	B	95.0	0.79	0.81	0.82	0.85	0.86	0.87	0.88
Drives/Walks	0.02	B	95.0	0.79	0.81	0.82	0.85	0.86	0.87	0.88
Streets	0.21	B	95.0	0.79	0.81	0.82	0.85	0.86	0.87	0.88
Gravel	0.03	B	80.0	0.64	0.67	0.70	0.75	0.77	0.80	0.83
Pond	0.13	B	25.0	0.17	0.19	0.26	0.41	0.47	0.54	0.63
Disturbed Soil	0.03	B	20.0	0.13	0.15	0.22	0.37	0.44	0.52	0.61
Total Area (ac)	**0.53**		**Area-Weighted C**	**0.59**	**0.62**	**0.65**	**0.71**	**0.74**	**0.77**	**0.80**
			Area-Weighted Override C	**0.59**	**0.62**	**0.65**	**0.71**	**0.74**	**0.77**	**0.80**

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: TEW
Company: 2N Civil, LLC
Date: 10/23/2025
Project: Front Range Construction
Location: Castle Rock, Colorado



Subcatchment Name
PR-4

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

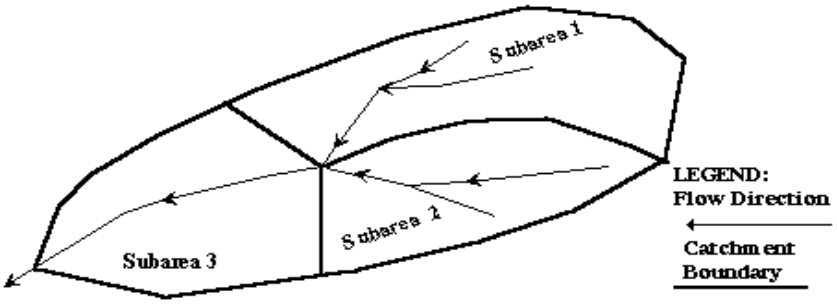
See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
Streets	0.03	B	95.0	0.79	0.81	0.82	0.85	0.86	0.87	0.88
Gravel	0.01	B	80.0	0.64	0.67	0.70	0.75	0.77	0.80	0.83
Disturbed Soil	0.01	B	20.0	0.13	0.15	0.22	0.37	0.44	0.52	0.61
Total Area (ac)	0.05		Area-Weighted C	0.63	0.66	0.68	0.74	0.76	0.79	0.82
			Area-Weighted Override C	0.63	0.66	0.68	0.74	0.76	0.79	0.82

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: TEW
Company: 2N Civil, LLC
Date: 10/23/2025
Project: Front Range Construction
Location: Castle Rock, Colorado



Subcatchment Name
PR-5

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Cells of this color are for calculated results based on overrides

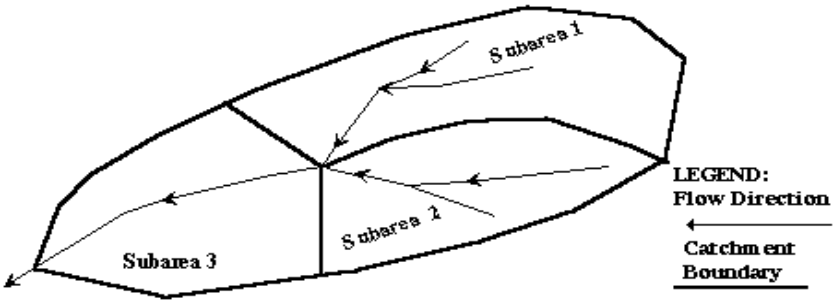
See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
Streets	0.06	B	95.0	0.79	0.81	0.82	0.85	0.86	0.87	0.88
Gravel	0.01	B	80.0	0.64	0.67	0.70	0.75	0.77	0.80	0.83
Total Area (ac)	0.07		Area-Weighted C	0.76	0.79	0.80	0.83	0.84	0.86	0.87
			Area-Weighted Override C	0.76	0.79	0.80	0.83	0.84	0.86	0.87

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: TEW
Company: 2N Civil, LLC
Date: 10/23/2025
Project: Front Range Construction
Location: Castle Rock, Colorado



Subcatchment Name
PR-1a

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
Roofs	0.04	B	95.0	0.79	0.81	0.82	0.85	0.86	0.87	0.88
Gravel	0.15	B	80.0	0.64	0.67	0.70	0.75	0.77	0.80	0.83
Disturbed Soil	0.03	B	20.0	0.13	0.15	0.22	0.37	0.44	0.52	0.61
Total Area (ac)	0.23		Area-Weighted C	0.60	0.63	0.66	0.72	0.74	0.77	0.81
			Area-Weighted Override C	0.60	0.63	0.66	0.72	0.74	0.77	0.81

Calculation of Peak Runoff using Rational Method

Designer: TEW
Company: 2N Civil, LLC
Date: 10/23/2025
Project: Front Range Construction
Location: Castle Rock, Colorado

Version 2.00 released May 2017

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

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

$$t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t}$$

Computed $t_c = t_i + t_t$

Regional $t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$

$t_{minimum} = 5$ (urban)
$t_{minimum} = 10$ (non-urban)

Selected $t_c = \max\{t_{minimum}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$

Select UDFCD location for NOAA Atlas 14 Rainfall Depths from the pulldown list OR enter your own depths obtained from the NOAA website (click this link)

	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
1-hour rainfall depth, P1 (in) =	0.83	1.09	1.33	1.69	1.99	2.31	3.14
	a	b	c				
Rainfall Intensity Equation Coefficients =	28.50	10.00	0.786				

$$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$$

$$Q(cfs) = CIA$$

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C							Overland (Initial) Flow Time					Channelized (Travel) Flow Time							Time of Concentration			Rainfall Intensity, I (in/hr)							Peak Flow, Q (cfs)						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Overland Flow Length L_i (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Overland Flow Slope S_i (ft/ft)	Overland Flow Time t_i (min)	Channelized Flow Length L_t (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V_t (ft/sec)	Channelized Flow Time t_t (min)	Computed t_c (min)	Regional t_c (min)	Selected t_c (min)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
OS-1	4.91	B	72.3	0.57	0.60	0.64	0.70	0.73	0.76	0.80	28.00			0.100	2.23	1168.62	6224.00	6209.40	0.012	20	2.24	8.71	10.94	22.83	10.94	2.15	2.84	3.47	4.41	5.19	6.03	8.19	6.04	8.41	10.92	15.23	18.66	22.57	32.23
					0.61										2.19								10.90																
OS-2	0.16	B	75.0	0.60	0.63	0.66	0.72	0.75	0.77	0.81															5.00	2.80	3.70	4.51	5.73	6.75	7.84	10.65	0.27	0.37	0.48	0.66	0.80	0.97	1.37
PR-1	0.53	B	73.0	0.58	0.61	0.65	0.71	0.74	0.77	0.80	12.00			0.020	2.44	212.37	6224.03	6217.20	0.032	20	3.59	0.99	3.43	14.61	5.00	2.80	3.70	4.51	5.73	6.75	7.84	10.65	0.86	1.19	1.54	2.15	2.63	3.17	4.53
					0.62										2.39								3.38																
PR-2	0.32	B	32.0	0.22	0.25	0.32	0.45	0.51	0.57	0.65	43.77	6230.50	6224.00	0.149	4.18	498.21	6224.00	6209.40	0.029	15	2.57	3.23	7.41	24.16	7.41	2.49	3.29	4.01	5.10	6.00	6.97	9.47	0.17	0.26	0.40	0.72	0.96	1.27	1.96
PR-3	1.38	B	5.0	0.03	0.03	0.10	0.28	0.36	0.45	0.55	159.65	6230.50	6223.00	0.047	14.61	317.26	6223.00	6205.72	0.054	15	3.50	1.51	16.12	27.49	16.12	1.81	2.39	2.92	3.71	4.36	5.07	6.89	0.06	0.11	0.39	1.44	2.15	3.15	5.28
PR-4	0.05	B	77.7	0.62	0.65	0.68	0.74	0.76	0.79	0.82															5.00	2.80	3.70	4.51	5.73	6.75	7.84	10.65	0.09	0.13	0.17	0.23	0.28	0.33	0.47
					0.66																																	
PR-5	0.07	B	92.5	0.76	0.79	0.80	0.83	0.84	0.86	0.87															5.00	2.80	3.70	4.51	5.73	6.75	7.84	10.65	0.14	0.20	0.24	0.32	0.38	0.45	0.62
PR-1a	0.23	B	74.5	0.59	0.62	0.66	0.72	0.74	0.77	0.81	10.00			0.020	2.17	74.58			0.020	20	2.83	0.44	2.61	13.79	5.00	2.80	3.70	4.51	5.73	6.75	7.84	10.65	0.38	0.53	0.68	0.94	1.15	1.39	1.97
					0.63										2.13								2.57										0.53						
PR-3a	1.15	B	5.0	0.03	0.03	0.10	0.28	0.36	0.45	0.55	159.65	6230.50	6223.00	0.047	14.61	317.26	6223.00	6205.72	0.054	15	3.50	1.51	16.12	27.49	16.12	1.81	2.39	2.92	3.71	4.36	5.07	6.89	0.05	0.09	0.33	1.20	1.79	2.63	4.41

APPENDIX B

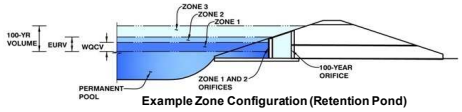
HYDRAULIC COMPUTATIONS

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

Project: **Front Range Construction**

Basin ID: **Basin PR-1**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected SCM Type =	**EDB**	
Watershed Area =	0.529	acres
Watershed Length =	206	ft
Watershed Length to Centroid =	124	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	73.02%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.013	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.043	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.06 in.) =	0.031	acre-feet	1.06	inches
5-yr Runoff Volume (P1 = 1.43 in.) =	0.045	acre-feet	1.43	inches
10-yr Runoff Volume (P1 = 1.66 in.) =	0.055	acre-feet	1.66	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	0.057	acre-feet		inches
50-yr Runoff Volume (P1 = 2.26 in.) =	0.081	acre-feet	2.26	inches
100-yr Runoff Volume (P1 = 2.6 in.) =	0.097	acre-feet	2.60	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	0.121	acre-feet		inches
Approximate 2-yr Detention Volume =	0.030	acre-feet		
Approximate 5-yr Detention Volume =	0.042	acre-feet		
Approximate 10-yr Detention Volume =	0.053	acre-feet		
Approximate 25-yr Detention Volume =	0.051	acre-feet		
Approximate 50-yr Detention Volume =	0.062	acre-feet		
Approximate 100-yr Detention Volume =	0.068	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.013	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.030	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	0.032	acre-feet
Total Detention Basin Volume =	0.075	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

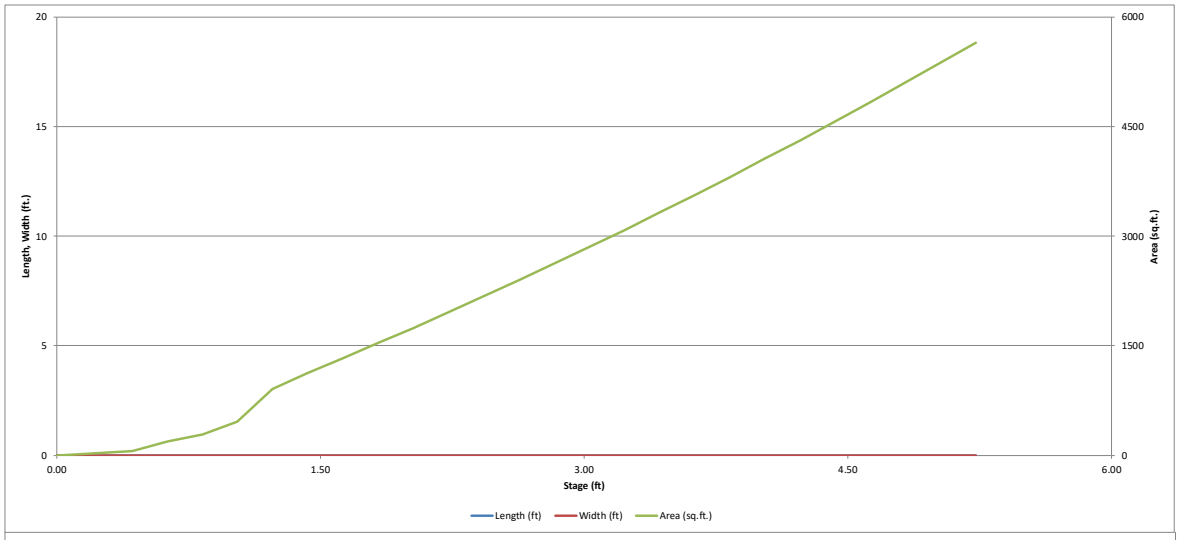
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

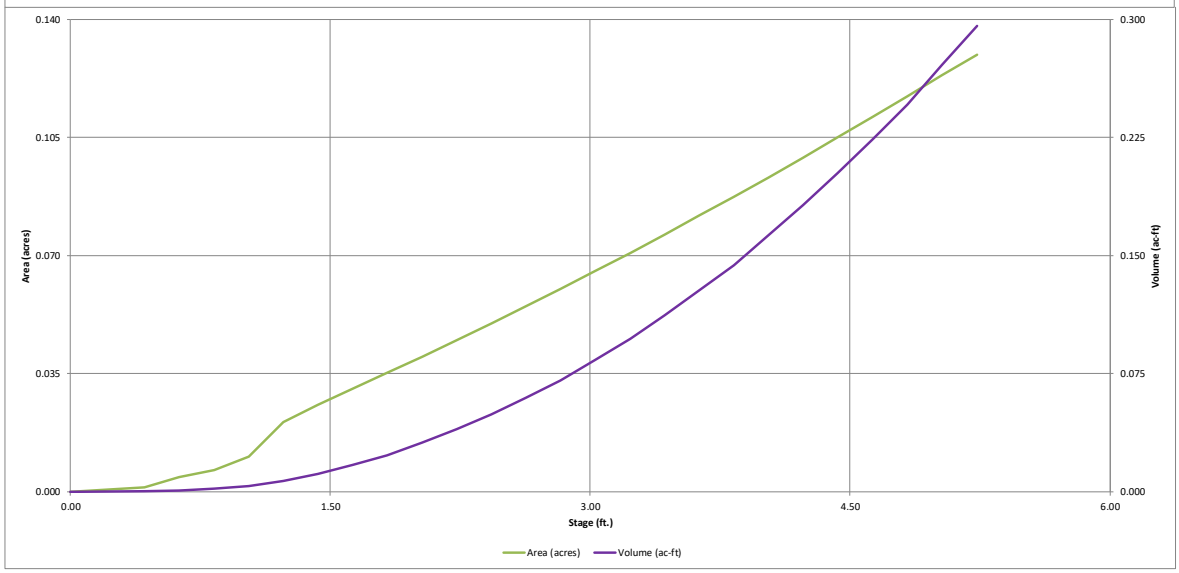
Depth Increment = 0.20 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
6217	--	0.43	--	--	--	58	0.001	12	0.000
6217.2	--	0.63	--	--	--	188	0.004	37	0.001
6217.4	--	0.83	--	--	--	284	0.007	81	0.002
6217.6	--	1.03	--	--	--	455	0.010	158	0.004
6217.8	--	1.23	--	--	--	903	0.021	294	0.007
6218	--	1.43	--	--	--	1,126	0.026	497	0.011
6218.2	--	1.63	--	--	--	1,327	0.030	742	0.017
6218.4	--	1.83	--	--	--	1,532	0.035	1,013	0.023
6218.6	--	2.03	--	--	--	1,742	0.040	1,356	0.031
6218.8	--	2.23	--	--	--	1,954	0.045	1,725	0.040
6219	--	2.43	--	--	--	2,173	0.050	2,138	0.049
6219.2	--	2.63	--	--	--	2,396	0.055	2,595	0.060
6219.4	--	2.83	--	--	--	2,621	0.060	3,070	0.070
6219.6	--	3.03	--	--	--	2,850	0.065	3,644	0.084
6219.8	--	3.23	--	--	--	3,083	0.071	4,237	0.097
6220	--	3.43	--	--	--	3,322	0.076	4,878	0.112
6220.2	--	3.63	--	--	--	3,565	0.082	5,566	0.128
6220.4	--	3.83	--	--	--	3,810	0.087	6,266	0.144
6220.6	--	4.03	--	--	--	4,059	0.093	7,091	0.163
6220.8	--	4.23	--	--	--	4,311	0.099	7,928	0.182
6221	--	4.43	--	--	--	4,572	0.105	8,816	0.202
6221.2	--	4.63	--	--	--	4,836	0.111	9,757	0.224
6221.4	--	4.83	--	--	--	5,104	0.117	10,700	0.246
6221.6	--	5.03	--	--	--	5,375	0.123	11,799	0.271
6221.8	--	5.23	--	--	--	5,649	0.130	12,901	0.296

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)



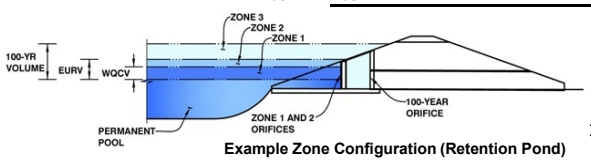


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Project: **Front Range Construction**

Basin ID: **Basin PR-1**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.49	0.013	Orifice Plate
Zone 2 (EURV)	2.30	0.030	Orifice Plate
3 (100+1/2WQCV)	2.89	0.032	Weir&Pipe (Restrict)
Total (all zones)		0.075	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration SCM)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)

Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft^2

Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation SCM)

Centroid of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)

Depth at top of Zone using Orifice Plate = 2.30 ft (relative to basin bottom at Stage = 0 ft)

Orifice Plate: Orifice Vertical Spacing = N/A inches

Orifice Plate: Orifice Area per Row = N/A sq. inches

Calculated Parameters for Plate

WQ Orifice Area per Row = N/A ft^2

Elliptical Half-Width = N/A feet

Elliptical Slot Centroid = N/A feet

Elliptical Slot Area = N/A ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.50	2.00					
Orifice Area (sq. inches)	0.11	0.15	3.00					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.30	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	2.50	N/A	feet
Overflow Grate Type =	Close Mesh Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	2.30	N/A	feet
Overflow Weir Slope Length =	2.50	N/A	feet
Grate Open Area / 100-yr Orifice Area =	93.38	N/A	
Overflow Grate Open Area w/o Debris =	5.93	N/A	ft^2
Overflow Grate Open Area w/ Debris =	2.97	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.67	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	1.40		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.06	N/A	ft^2
Outlet Orifice Centroid =	0.07	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	0.57	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage= 2.90 ft (relative to basin bottom at Stage = 0 ft)

Spillway Crest Length = 5.00 feet

Spillway End Slopes = 4.00 H:V

Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway

Spillway Design Flow Depth= 0.22 feet

Stage at Top of Freeboard = 4.12 feet

Basin Area at Top of Freeboard = 0.10 acres

Basin Volume at Top of Freeboard = 0.17 acre-ft

Routed Hydrograph Results

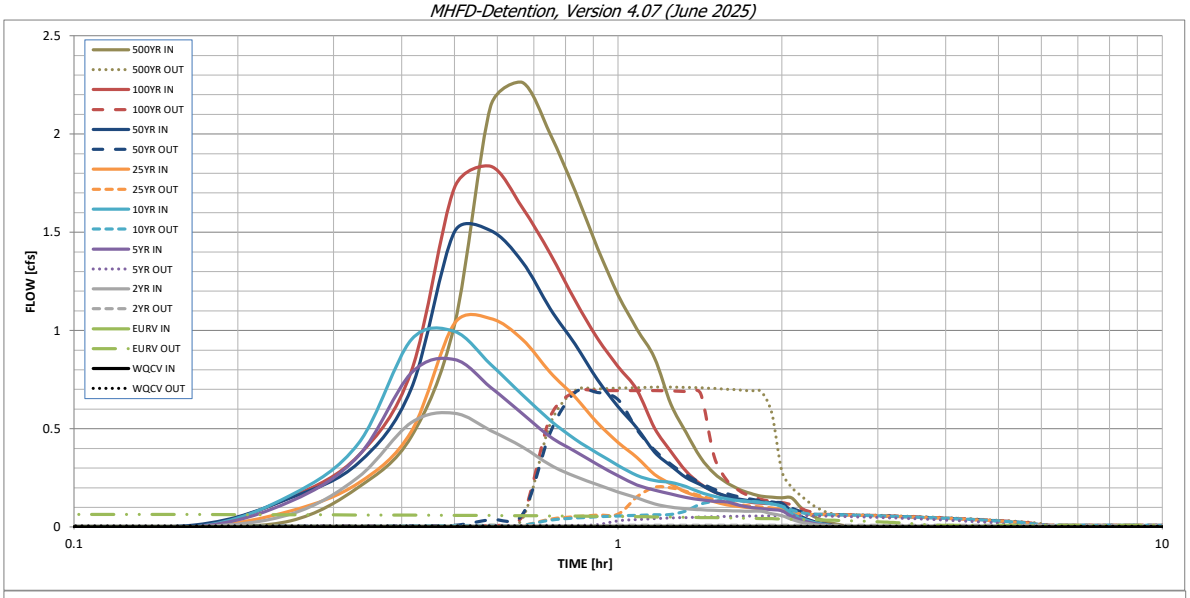
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

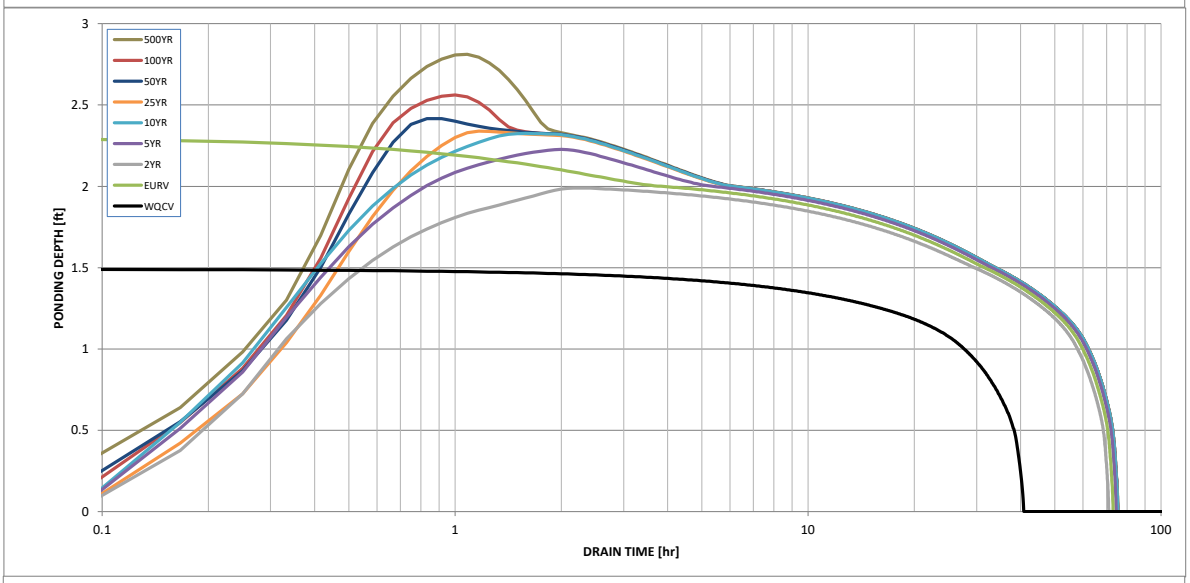
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.06	1.43	1.66	1.69	2.26	2.60	3.14
CUHP Runoff Volume (acre-ft) =	0.013	0.043	0.031	0.045	0.055	0.057	0.081	0.097	0.121
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.031	0.045	0.055	0.057	0.081	0.097	0.121
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.2	0.2	0.3	0.6	0.8	1.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.04	0.30	0.44	0.62	1.12	1.45	1.92
Peak Inflow Q (cfs) =	N/A	N/A	0.6	0.9	1.0	1.1	1.5	1.8	2.3
Peak Outflow Q (cfs) =	0.0	0.1	0.0	0.06	0.1	0.2	0.7	0.69	0.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.6	0.6	1.2	0.9	0.7
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	0.00	N/A	N/A	0.0	0.0	0.1	0.1	0.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	67	67	68	68	68	65	64	62
Time to Drain 99% of Inflow Volume (hours) =	**40**	71	69	72	72	72	71	71	70
Maximum Ponding Depth (ft) =	1.49	2.31	1.99	2.23	2.32	2.34	2.42	2.56	2.81
Area at Maximum Ponding Depth (acres) =	0.03	0.05	0.04	0.04	0.05	0.05	0.05	0.05	0.06
Maximum Volume Stored (acre-ft) =	0.013	0.043	0.029	0.039	0.044	0.044	0.048	0.056	0.070

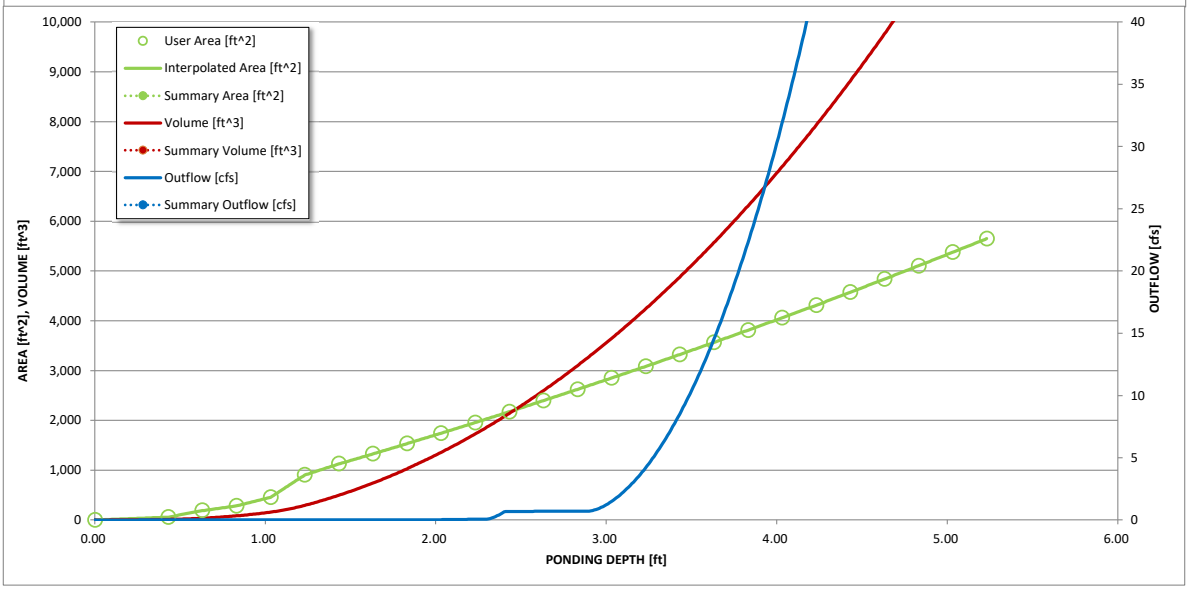
Default MHFD Emergency Spillway not practical based on existing topography. Refer to Emergency Overflow described in the report and calculations.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.03
	0:15:00	0	0.00	0.07	0.13	0.16	0.08	0.15	0.15	0.20
	0:20:00	0	0.00	0.25	0.36	0.43	0.22	0.33	0.36	0.46
	0:25:00	0	0.00	0.53	0.78	0.95	0.49	0.70	0.79	1.03
	0:30:00	0	0.00	0.58	0.85	0.99	1.04	1.50	1.73	2.14
	0:35:00	0	0.00	0.49	0.71	0.83	1.06	1.51	1.84	2.26
	0:40:00	0	0.00	0.41	0.58	0.67	0.95	1.35	1.63	2.00
	0:45:00	0	0.00	0.32	0.46	0.54	0.79	1.11	1.39	1.71
	0:50:00	0	0.00	0.26	0.39	0.45	0.66	0.93	1.15	1.42
	0:55:00	0	0.00	0.22	0.32	0.38	0.53	0.75	0.96	1.18
	1:00:00	0	0.00	0.18	0.26	0.31	0.43	0.61	0.82	1.01
	1:05:00	0	0.00	0.15	0.21	0.26	0.35	0.50	0.70	0.86
	1:10:00	0	0.00	0.12	0.19	0.24	0.27	0.38	0.50	0.63
	1:15:00	0	0.00	0.10	0.17	0.23	0.22	0.31	0.38	0.48
	1:20:00	0	0.00	0.09	0.15	0.20	0.18	0.25	0.28	0.35
	1:25:00	0	0.00	0.09	0.14	0.18	0.15	0.22	0.22	0.27
	1:30:00	0	0.00	0.09	0.13	0.16	0.13	0.18	0.18	0.23
	1:35:00	0	0.00	0.08	0.13	0.14	0.11	0.16	0.15	0.19
	1:40:00	0	0.00	0.08	0.11	0.13	0.10	0.14	0.14	0.17
	1:45:00	0	0.00	0.08	0.10	0.13	0.10	0.13	0.13	0.16
	1:50:00	0	0.00	0.08	0.09	0.12	0.09	0.13	0.12	0.15
	1:55:00	0	0.00	0.07	0.09	0.12	0.09	0.12	0.12	0.15
	2:00:00	0	0.00	0.06	0.08	0.10	0.09	0.12	0.12	0.15
	2:05:00	0	0.00	0.04	0.05	0.07	0.06	0.08	0.08	0.10
	2:10:00	0	0.00	0.03	0.04	0.05	0.04	0.05	0.05	0.07
	2:15:00	0	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.04
	2:20:00	0	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.03
	2:25:00	0	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	2:30:00	0	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
	2:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Elevation [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

661 Prairie Hawk Dr - Stormwater Calculations
Detention Pond - Emergency Overflow Capacity Calculations
Date: October 15, 2025

Objective: Determine Depth of Flow at Emergency Overflow

Given:	Q_{100}:	1.8	cfs	(Peak Inflow Q_{100} per MHFD Detention Basin Outlet Structure Spreadsheet)
	200% of Q_{100}:	3.6	cfs	(factor of safety = 2)
	Grate dimensions:	3' X 2.5'		
	Grate Area:	7.5	sf	
	Grate Area - assume 50% Clogging:	2.97	sf	(per MHFD Detention Basin Outlet Spreadsheet)
	Grate Slope:	0		
	Grate Length:	11	ft	

Check if grate opening behaves as a Weir or an Orifice:

Using Orifice Equation

$Q_i=C_0A_0(2gd)^{1/2}$ (MHFD Eqn 12-7)

where

Q_i = inlet capacity (cfs)
A_0 = orifice area (ft^2)
C_0 = 0.6 discharge coefficient
g = 32.2 ft/sec^2
d = flow depth (ft)

Assume d = 2'

Solve for Orifice Flow: $Q_i = (0.6 * 2.97 * (2 * 32.2 * 2')^{1/2}$

Q_i = 20 cfs

Using Weir Equation

$Q_i=C_wL_wd^{3/2}$

where

Q_i = inlet capacity (cfs)
C_w = 3.0 weir discharge coefficient
L_w = 11.00 weir length (ft)
d = flow depth (ft)

Assume d = 2'

Solve for Weir Flow: $Q_i = 3.0 * 11 * 2^{3/2}$

Q_i = 93 cfs

$Q_{WEIR} > Q_{ORIFICE}$ thus Orifice Equation controls.

Use Orifice equation to determine Depth of Flow at Emergency Overflow

$d = (Q_i / C_0 * A_o)^2 / (2 * g)$

$d = (3.6 / 0.6 * 2.97)^2 / (2 * 32.2)$

d = 0.06 ft

d =	0.8	in

Using a 50% clogging factor and 200% of Q_{100}, the Emergency Overflow inlet is capable of passing the flow at a depth of 0.8 inches.

$$H_a = \frac{(H + Y_n)}{2}$$ Equation 9-19

Where the maximum value of H_a shall not exceed H, and:

D_a = parameter to use in place of D in Figure 9-38 when flow is supercritical (ft)

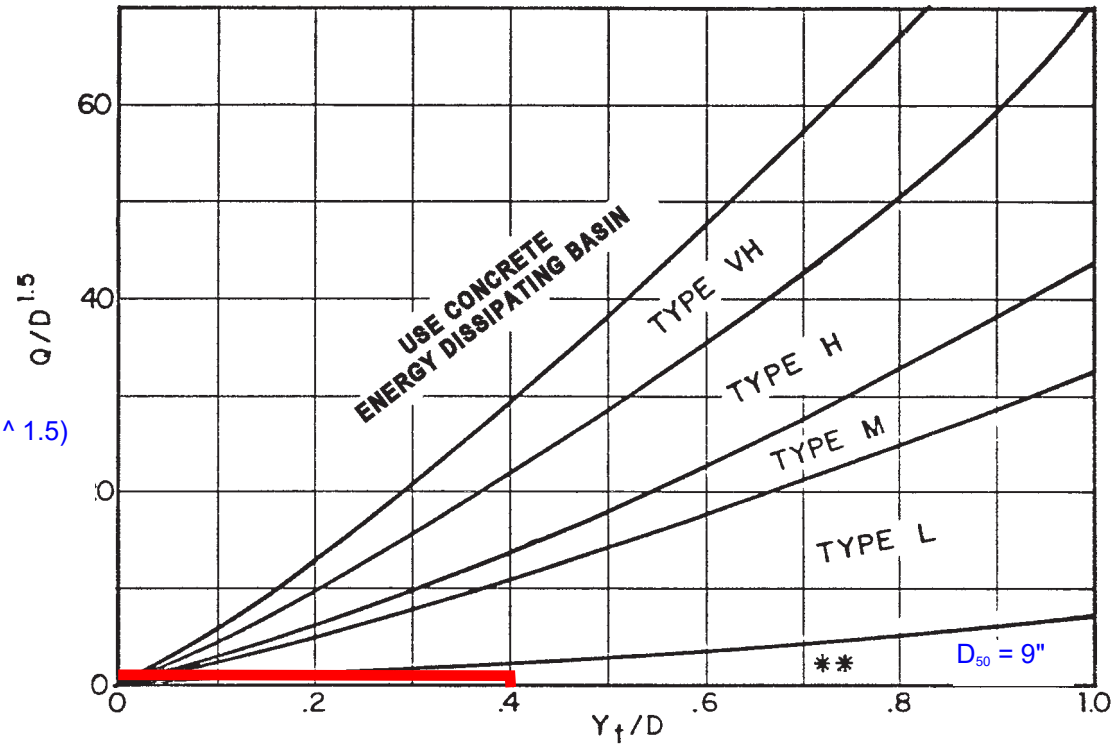
D_c = diameter of circular culvert (ft)

H_a = parameter to use in place of H in Figure 9-39 when flow is supercritical (ft)

H = height of rectangular culvert (ft)

Y_n = normal depth of supercritical flow in the culvert (ft)

Q100= 0.73 cfs
0.73 cfs / (1.5 ft ^ 1.5)
= 0.4



Use D_a instead of D whenever flow is supercritical in the barrel.
** Use Type L for a distance of 3D downstream

Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for Q/D2.5 ≤ 6.0)

661 Prairie Hawk Dr - Stormwater Calculations

Roof Drain Collection Pipe Sizing

Date: October 31, 2025

Roof Area =	2,880	sq ft (area of roof that connects to roof drain system)
Q100 =	0.031	gpm / sq ft (Table D101.1 Plumbing Code)
	89.28	gpm
	0.20	cfs

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Oct 20 2025

Roof Drain Pipe Capacity Q100

Circular

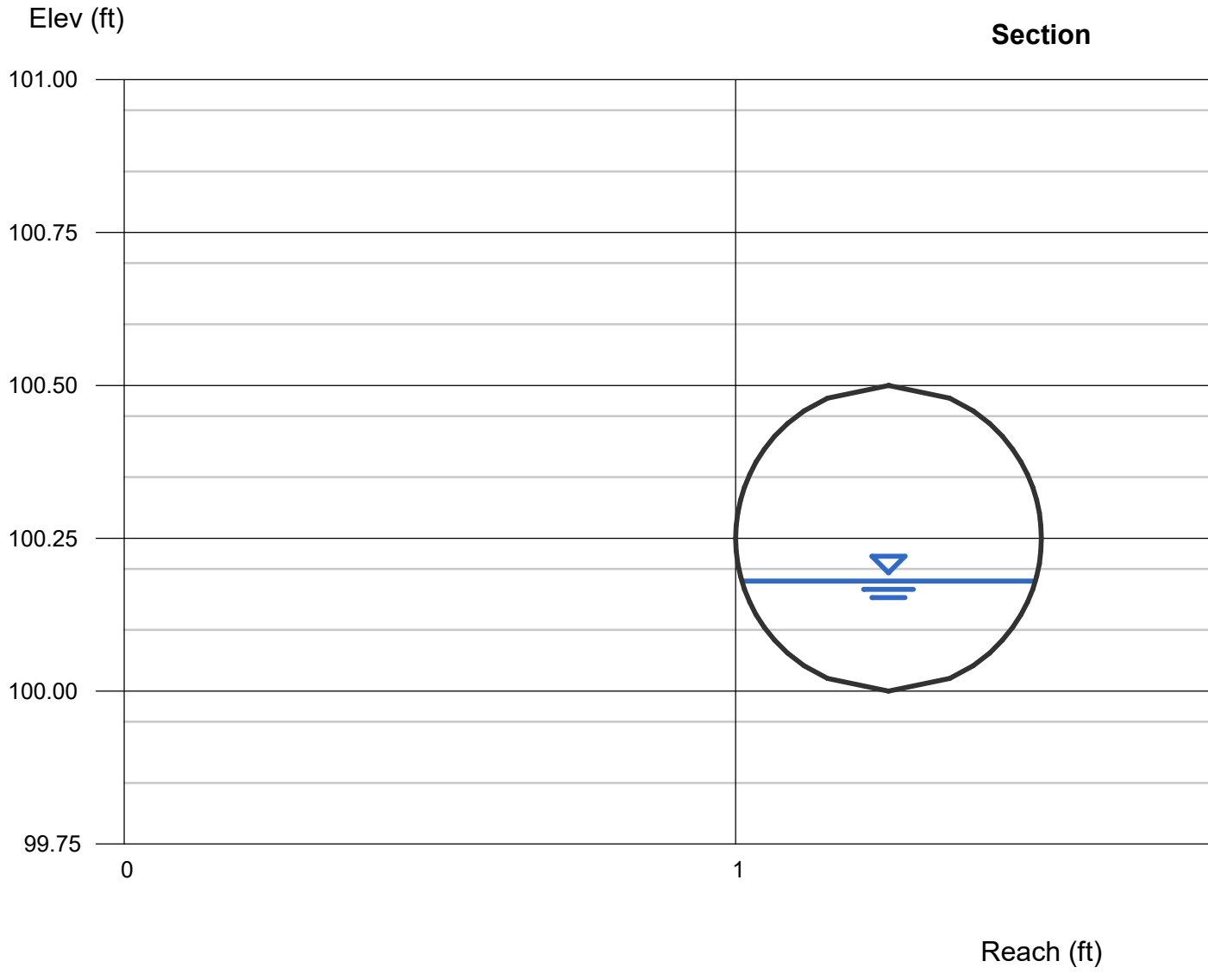
Diameter (ft)	= 0.50
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.010

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.20

Highlighted

Depth (ft)	= 0.18
Q (cfs)	= 0.200
Area (sqft)	= 0.06
Velocity (ft/s)	= 3.13
Wetted Perim (ft)	= 0.64
Crit Depth, Yc (ft)	= 0.23
Top Width (ft)	= 0.48
EGL (ft)	= 0.33



661 Prairie Hawk Dr - Stormwater Calculations

Proposed Conditions - Composite % Impervious Value & 100 Yr Detention

Date: October 15, 2025

Combined Basins PR-1 & PR-1a (Tributary to EDB Pond)

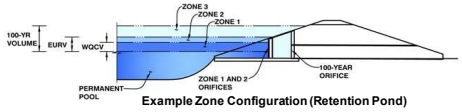
Land Use	Area		% I
Roofs	0.154		95%
Concrete Driveways and Walks	0.019		95%
Roadways and Paved Streets	0.215		95%
Gravel (High-traffic Areas)	0.180		80%
Extended Detention Basins	0.130		25%
Disturbed Soil (Lawns)	0.060		20%
Sum Area =	0.757	ac	
	32,992	sf	
Composite % =			73.46%

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

Project: **Front Range Construction**

Basin ID: **PR-1 and PR-1a (Future Condition)**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected SCM Type =	**EDB**	
Watershed Area =	0.757	acres
Watershed Length =	284	ft
Watershed Length to Centroid =	140	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	73.46%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.018	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.061	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.06 in.) =	0.045	acre-feet	1.06	inches
5-yr Runoff Volume (P1 = 1.43 in.) =	0.065	acre-feet	1.43	inches
10-yr Runoff Volume (P1 = 1.66 in.) =	0.079	acre-feet	1.66	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	0.082	acre-feet		inches
50-yr Runoff Volume (P1 = 2.26 in.) =	0.117	acre-feet	2.26	inches
100-yr Runoff Volume (P1 = 2.6 in.) =	0.140	acre-feet	2.60	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	0.174	acre-feet		inches
Approximate 2-yr Detention Volume =	0.043	acre-feet		
Approximate 5-yr Detention Volume =	0.061	acre-feet		
Approximate 10-yr Detention Volume =	0.076	acre-feet		
Approximate 25-yr Detention Volume =	0.073	acre-feet		
Approximate 50-yr Detention Volume =	0.090	acre-feet		
Approximate 100-yr Detention Volume =	0.098	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.018	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.043	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	0.046	acre-feet
Total Detention Basin Volume =	0.107	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

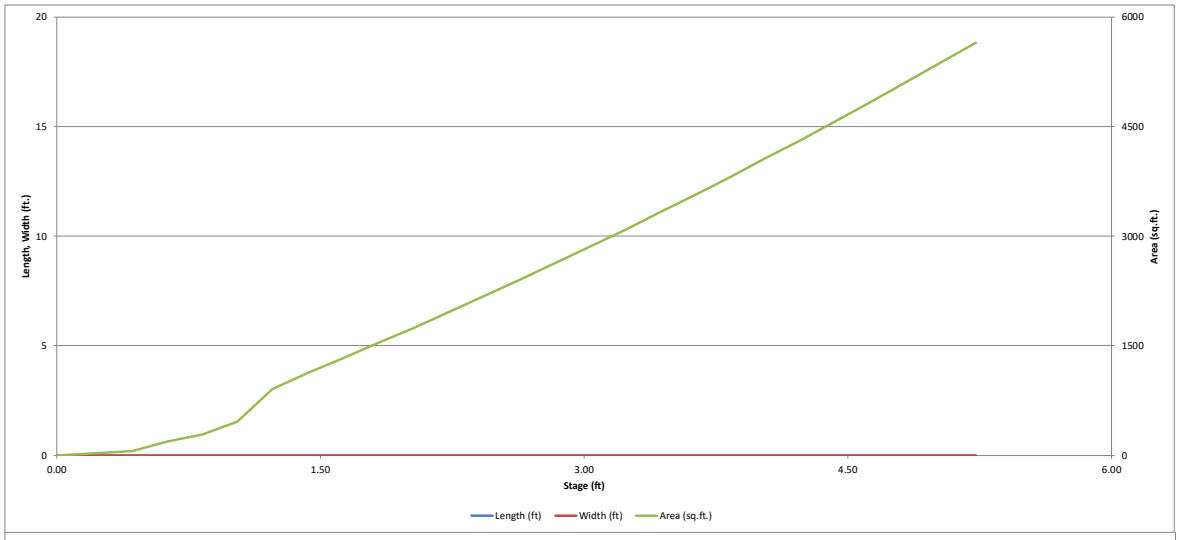
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

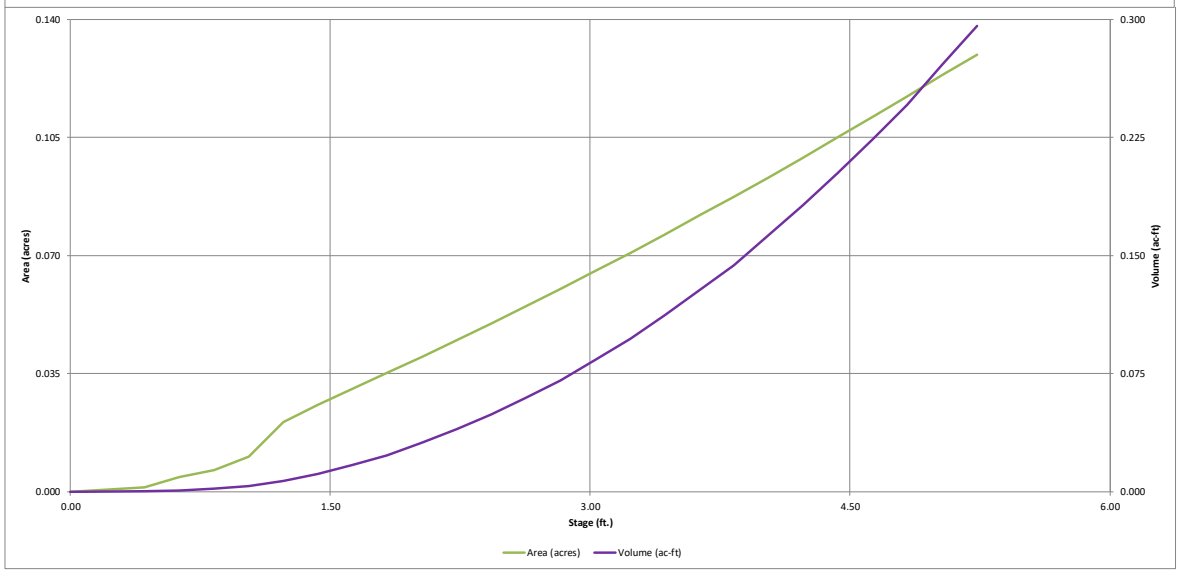
Depth Increment = 0.20 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
6217	--	0.43	--	--	--	58	0.001	12	0.000
6217.2	--	0.63	--	--	--	188	0.004	37	0.001
6217.4	--	0.83	--	--	--	284	0.007	81	0.002
6217.6	--	1.03	--	--	--	455	0.010	158	0.004
6217.8	--	1.23	--	--	--	903	0.021	294	0.007
6218	--	1.43	--	--	--	1,126	0.026	497	0.011
6218.2	--	1.63	--	--	--	1,327	0.030	742	0.017
6218.4	--	1.83	--	--	--	1,532	0.035	1,013	0.023
6218.6	--	2.03	--	--	--	1,742	0.040	1,356	0.031
6218.8	--	2.23	--	--	--	1,954	0.045	1,725	0.040
6219	--	2.43	--	--	--	2,173	0.050	2,138	0.049
6219.2	--	2.63	--	--	--	2,396	0.055	2,595	0.060
6219.4	--	2.83	--	--	--	2,621	0.060	3,070	0.070
6219.6	--	3.03	--	--	--	2,850	0.065	3,644	0.084
6219.8	--	3.23	--	--	--	3,083	0.071	4,237	0.097
6220	--	3.43	--	--	--	3,322	0.076	4,878	0.112
6220.2	--	3.63	--	--	--	3,565	0.082	5,566	0.128
6220.4	--	3.83	--	--	--	3,810	0.087	6,266	0.144
6220.6	--	4.03	--	--	--	4,059	0.093	7,091	0.163
6220.8	--	4.23	--	--	--	4,311	0.099	7,928	0.182
6221	--	4.43	--	--	--	4,572	0.105	8,816	0.202
6221.2	--	4.63	--	--	--	4,836	0.111	9,757	0.224
6221.4	--	4.83	--	--	--	5,104	0.117	10,700	0.246
6221.6	--	5.03	--	--	--	5,375	0.123	11,799	0.271
6221.8	--	5.23	--	--	--	5,649	0.130	12,901	0.296

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)



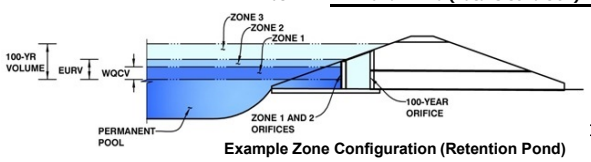


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Project: **Front Range Construction**

Basin ID: **PR-1 and PR-1a (Future Condition)**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.68	0.018	Orifice Plate
Zone 2 (EURV)	2.67	0.043	Orifice Plate
3 (100+1/2WQCV)	3.38	0.046	Weir&Pipe (Restrict)
Total (all zones)		0.107	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration SCM)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation SCM)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	2.67	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.20	1.70					
Orifice Area (sq. inches)	0.12	0.12	0.30					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.67	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	2.67	N/A	feet
Overflow Weir Front Edge Length =	3.00	N/A	feet	Overflow Weir Slope Length =	2.50	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	51.47	N/A	
Horiz. Length of Weir Sides =	2.50	N/A	feet	Overflow Grate Open Area w/o Debris =	5.93	N/A	ft^2
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	2.97	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.12	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.10	N/A	feet
Restrictor Plate Height Above Pipe Invert =	2.10		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.70	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.40	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.27	feet
Spillway Crest Length =	5.00	feet	Stage at Top of Freeboard =	4.67	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.11	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.23	acre-ft

Calculated Parameters for Spillway

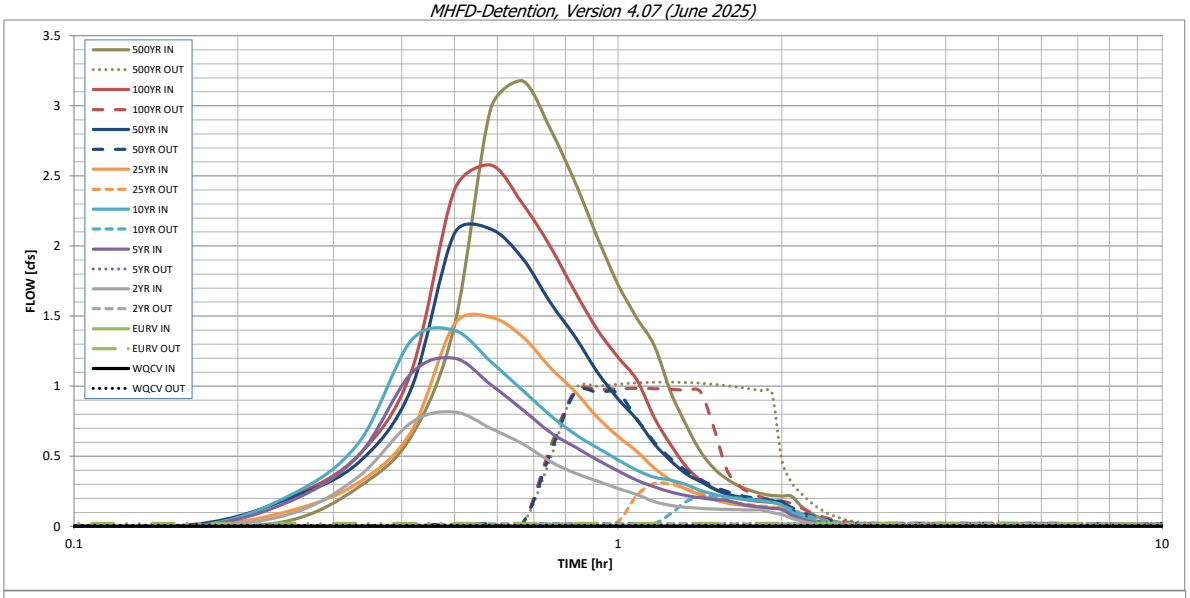
Routed Hydrograph Results

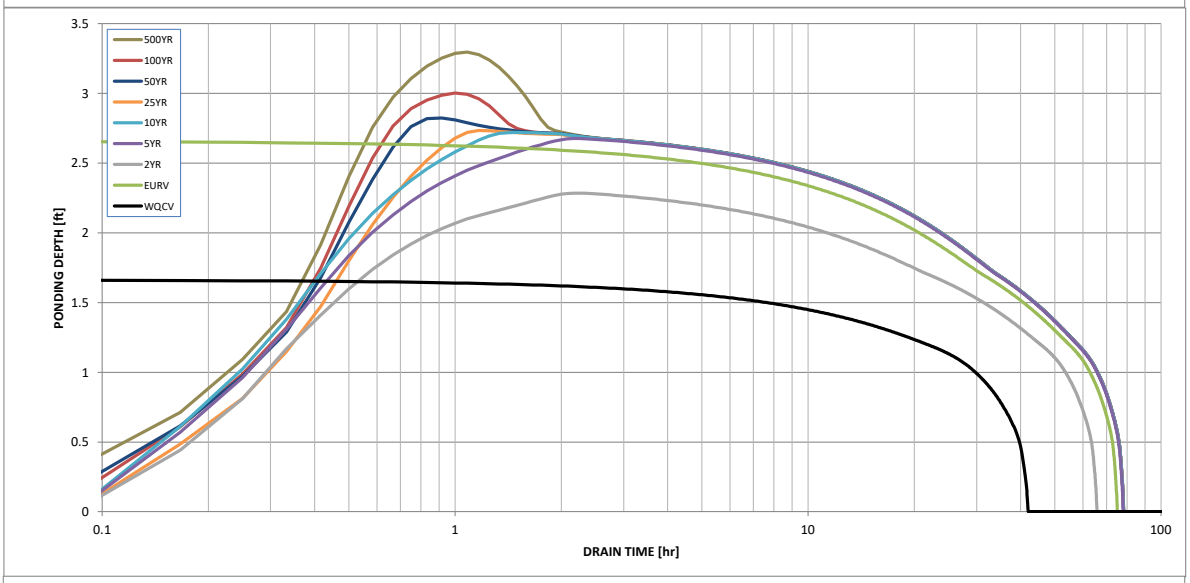
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

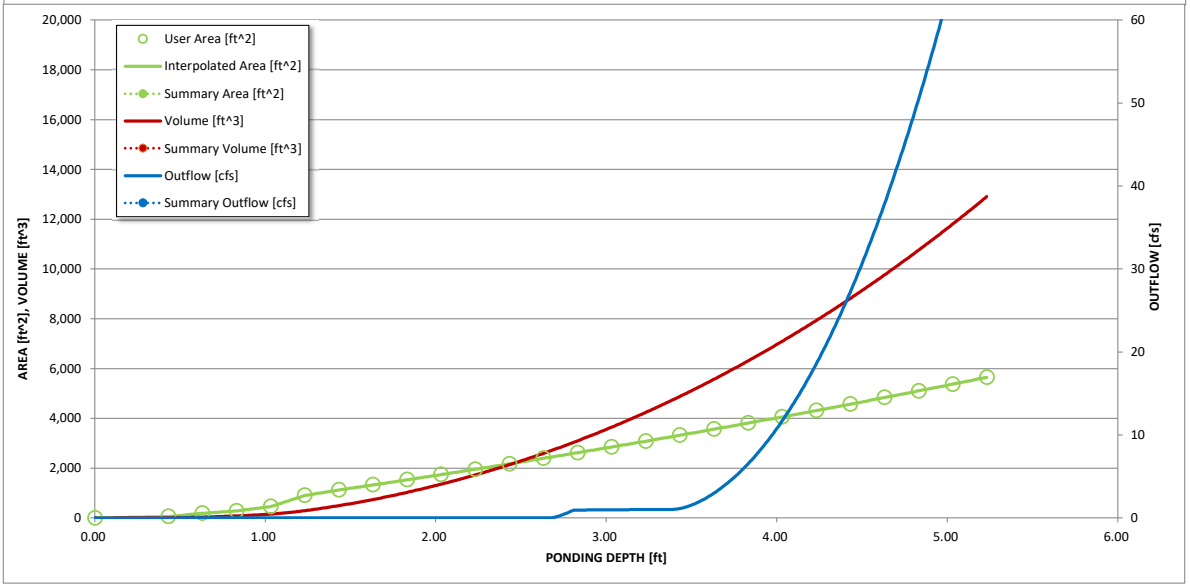
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.06	1.43	1.66	1.69	2.26	2.60	3.14
CUHP Runoff Volume (acre-ft) =	0.018	0.061	0.045	0.065	0.079	0.082	0.117	0.140	0.174
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.045	0.065	0.079	0.082	0.117	0.140	0.174
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.2	0.3	0.5	0.8	1.1	1.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.04	0.29	0.43	0.60	1.08	1.40	1.85
Peak Inflow Q (cfs) =	N/A	N/A	0.8	1.2	1.4	1.5	2.1	2.6	3.2
Peak Outflow Q (cfs) =	0.0	0.0	0.0	0.03	0.2	0.3	1.0	0.98	1.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.7	0.7	1.2	0.9	0.7
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.0	0.0	0.2	0.2	0.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	68	60	70	69	69	66	64	61
Time to Drain 99% of Inflow Volume (hours) =	**41**	72	63	75	75	74	73	72	71
Maximum Ponding Depth (ft) =	1.67	2.66	2.28	2.67	2.72	2.73	2.82	3.00	3.29
Area at Maximum Ponding Depth (acres) =	0.03	0.06	0.05	0.06	0.06	0.06	0.06	0.06	0.07
Maximum Volume Stored (acre-ft) =	0.018	0.061	0.042	0.062	0.064	0.065	0.070	0.082	0.102

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.04
	0:15:00	0	0.00	0.09	0.18	0.22	0.11	0.21	0.21	0.28
	0:20:00	0	0.00	0.35	0.50	0.59	0.31	0.46	0.51	0.64
	0:25:00	0	0.00	0.74	1.09	1.33	0.68	0.98	1.10	1.43
	0:30:00	0	0.00	0.82	1.20	1.40	1.44	2.09	2.40	2.98
	0:35:00	0	0.00	0.70	1.01	1.18	1.49	2.12	2.58	3.18
	0:40:00	0	0.00	0.59	0.83	0.97	1.36	1.91	2.30	2.84
	0:45:00	0	0.00	0.46	0.67	0.79	1.13	1.60	2.00	2.46
	0:50:00	0	0.00	0.38	0.57	0.66	0.96	1.35	1.67	2.06
	0:55:00	0	0.00	0.32	0.47	0.56	0.78	1.10	1.40	1.73
	1:00:00	0	0.00	0.27	0.40	0.47	0.64	0.91	1.21	1.49
	1:05:00	0	0.00	0.23	0.33	0.40	0.53	0.76	1.04	1.29
	1:10:00	0	0.00	0.18	0.28	0.35	0.41	0.59	0.77	0.96
	1:15:00	0	0.00	0.15	0.25	0.33	0.33	0.47	0.58	0.72
	1:20:00	0	0.00	0.14	0.22	0.30	0.26	0.38	0.43	0.53
	1:25:00	0	0.00	0.13	0.20	0.26	0.23	0.32	0.33	0.41
	1:30:00	0	0.00	0.12	0.19	0.23	0.19	0.27	0.27	0.34
	1:35:00	0	0.00	0.12	0.18	0.21	0.17	0.23	0.23	0.29
	1:40:00	0	0.00	0.12	0.16	0.20	0.15	0.21	0.20	0.26
	1:45:00	0	0.00	0.12	0.15	0.19	0.14	0.19	0.19	0.23
	1:50:00	0	0.00	0.12	0.14	0.18	0.14	0.19	0.18	0.22
	1:55:00	0	0.00	0.10	0.13	0.17	0.13	0.18	0.17	0.22
	2:00:00	0	0.00	0.09	0.12	0.15	0.13	0.18	0.17	0.21
	2:05:00	0	0.00	0.06	0.08	0.10	0.09	0.12	0.12	0.15
	2:10:00	0	0.00	0.04	0.05	0.07	0.06	0.08	0.08	0.10
	2:15:00	0	0.00	0.03	0.04	0.05	0.04	0.05	0.05	0.07
	2:20:00	0	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.04
	2:25:00	0	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.03
	2:30:00	0	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
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	2:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	4:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	5:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Elevation [ft]	Area [ft ^{2}]	Area [acres]	Volume [ft ^{3}]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

APPENDIX C

REFERENCED INFORMATION

62

FINAL DRAINAGE STUDY

FOR

LOT 2, BLOCK 9

CITADEL STATION NO. 6

JUNE, 1987

ACKSLAN INDUSTRIES

Consulting Engineers

site investigations - plans and specifications

grading - drainage - water - sewer

streets - soils - percolation - septic systems

management - inspection - construction

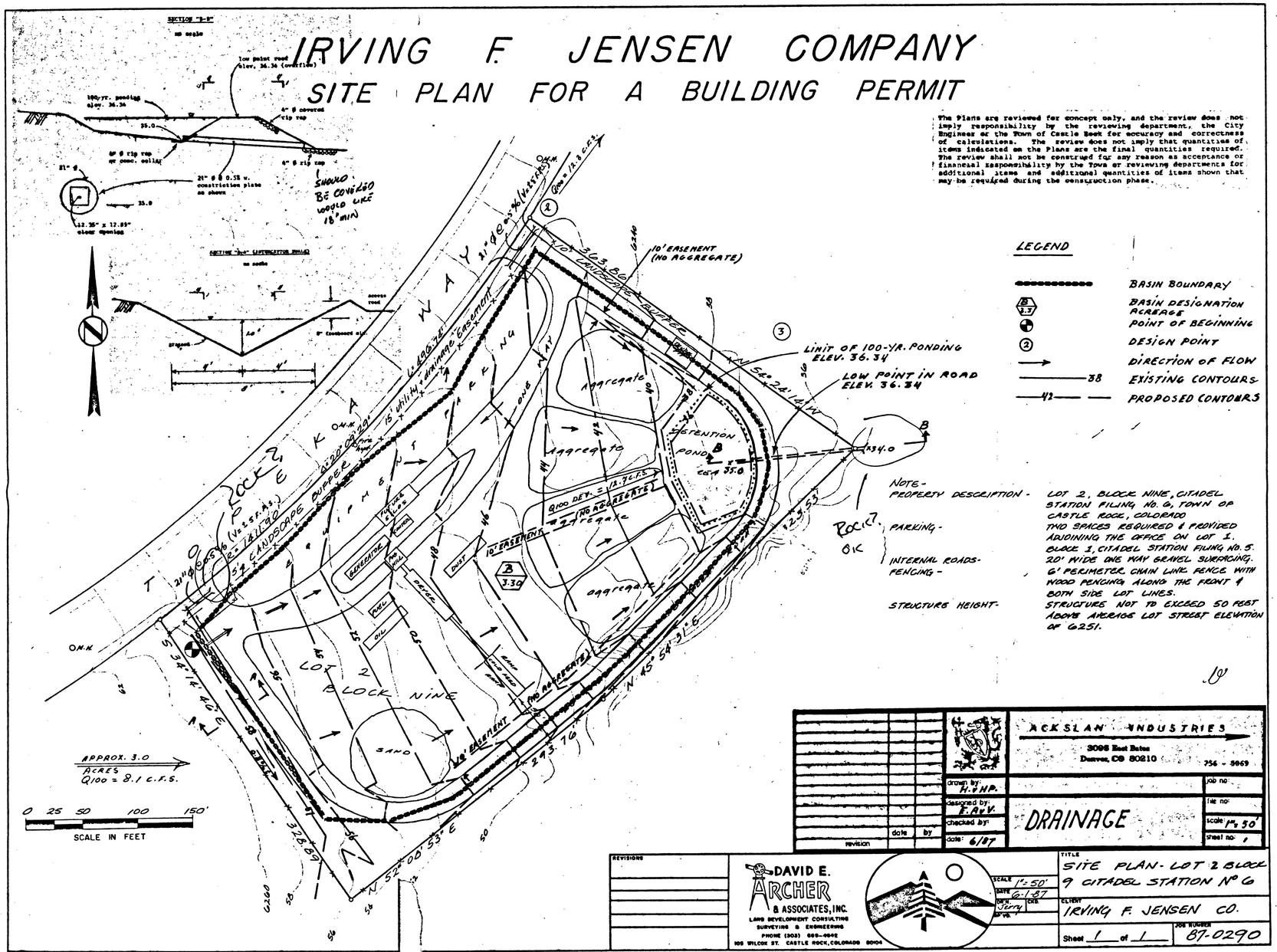
3095 East Bates, Denver, Colorado 80210

(303) 756-5069

IRVING F. JENSEN COMPANY

SITE PLAN FOR A BUILDING PERMIT

The Plans are reviewed for concept only, and the review does not imply responsibility by the reviewing department, the City Engineer or the Town of Castle Rock for accuracy and correctness of calculations. The review does not imply that quantities of items indicated on the Plans are the final quantities required. The review shall not be construed for any reason as acceptance or financial responsibility by the Town or reviewing departments for additional items and additional quantities of items shown that may be required during the construction phase.



LEGEND

- BASIN BOUNDARY
- BASIN DESIGNATION ACREAGE
- POINT OF BEGINNING
- DESIGN POINT
- DIRECTION OF FLOW
- 38 EXISTING CONTOURS
- 42 PROPOSED CONTOURS

NOTE-

PROPERTY DESCRIPTION - LOT 2, BLOCK NINE, CITADEL STATION FILING NO. 6, TOWN OF CASTLE ROCK, COLORADO

PARKING - TWO SPACES REQUIRED & PROVIDED ADJOINING THE OFFICE ON LOT 1. BLOCK 1, CITADEL STATION FILING NO. 5.

INTERNAL ROADS - 20' WIDE ONE WAY GRAVEL SURFACING.

FENCING - 6' PERIMETER CHAIN LINK FENCE WITH WOOD FENCING ALONG THE FRONT & BOTH SIDE LOT LINES.

STRUCTURE HEIGHT - STRUCTURE NOT TO EXCEED 50 FEET ABOVE AVERAGE LOT STREET ELEVATION OF 6251.

revision	date	by

ACKSLAN INDUSTRIES
3095 East Bates
Denver, CO 80210
756 - 5069

drawn by: H. & HP.
designed by: F. A. & V.
checked by:
date: 6/87

DRAINAGE

job no:
file no:
scale: 1" = 50'
sheet no: 1

REVISIONS

DAVID E. ARCHER & ASSOCIATES, INC.
LAND DEVELOPMENT CONSULTING
SURVEYING & ENGINEERING
PHONE (303) 688-4642
105 WILCOX ST. CASTLE ROCK, COLORADO 80104

SCALE 1" = 50'
DATE 6-1-87
DR'N. Jerry
CKD.
SP'VD.

TITLE: SITE PLAN - LOT 2 BLOCK 9 CITADEL STATION No 6

CLIENT: IRVING F. JENSEN CO.

Sheet 1 of 1

JOB NUMBER 87-0290

767D

FINAL DRAINAGE REPORT
FOR
KOLBE STRIPING OFFICE BUILDING

Prepared For:

NOLL & ASSOCIATES ARCHITECTS
210 Fifth Street
Castle Rock, CO 80104

Prepared By:

ROCKY MOUNTAIN CONSULTANTS, INC.
8301 E. Prentice Ave., Suite 101
Englewood, Colorado 80111

January 1995
Revised February 1995
RMC Reference No. 1622.002.00

DETENTION POND VOLUME
FAA METHOD
100-year event

KOLBE STRIPING , INC.
DETENTION POND A

CONTRIBUTING BASIN	Basin A2
Area	1.6 Acres
C-coeff.	0.6
C*A	0.96
Outflow	2.9 cfs

TIME	INTENSITY	INFLOW	CA	OUTFLOW	VOLUME	VOLUME
min.	inch/min	cu-ft		cu-ft	cu-ft	ac-ft
5	9.0	2592	0.96	870	1722	0.04
10	9.0	5184	0.96	1740	3444	0.08
15	7.0	6048	0.96	2610	3438	0.08
20	6.3	7258	0.96	3480	3778	0.09
25	5.6	8064	0.96	4350	3714	0.09
30	5.0	8640	0.96	5220	3420	0.08
35	4.6	9274	0.96	6090	3184	0.07
40	4.1	9446	0.96	6960	2486	0.06
45	3.8	9850	0.96	7830	2020	0.05
50	3.4	9792	0.96	8700	1092	0.03
55	3.1	9821	0.96	9570	251	0.01
60	3.0	10368	0.96	10440	-72	-0.00

ROCKY MOUNTAIN CONSULTANTS, INC.

•Professional Engineers•

CLIENT: Kolbe Striping JOB NO.: _____ SHEET____ OF____

DESCRIPTION: Topeka Way Borrow Ditch DESIGNED BY: _____ DATE: _____

CHECKED BY: _____ DATE: _____

Sub-basin D1, Design Point 7A (Ref. 4)

100yr:

t_c = 27.79, CA = 1.55, I = 5.35 in/hr

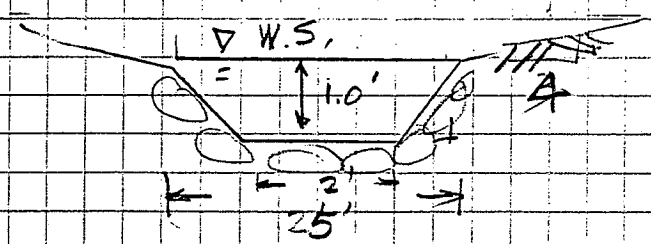
increase from A1 = 0.18

CA = 1.73

$Q_{100} = (1.73)(5.35) = 9.3$ cfs + 2.9 cfs (Pond A)

Q_{100} = 12.2 cfs

Ditch 1 Q_{CAP} slope = 3.3% $n = 0.095$



$A = 3.5\ ft^2$

$P = 5.1$ ft

$$V = \frac{1.49}{0.095}\left(\frac{A}{P}\right)^{2/3}\sqrt{0.033} = 4.7\ ft/s$$

Q_{CAP} = 16.5 cfs > 12.0 cfs

100 year flows will remain within the riprapped area.

FINAL DRAINAGE MAP

LOT 1C, BLOCK 9, CITADEL STATION, FILING NO. 6, FOURTH AMENDMENT

TOWN OF CASTLE ROCK, COLORADO

DETENTION POND SUMMARY

Pond	Storage Volume		Water Surface		Release Rate	
	5-year ac-ft	100-year ac-ft	5-year (ft)	100-year (ft)	5-year (cfs)	100-year (cfs)
Pond A	0.03	0.09	6,224.1	6,226.1	0.6	2.9
Pond B	0.05	0.16	6,225.9	6,227.0	1.3	9.5

LEGEND

- BASIN BOUNDARY
- SUB BASIN BOUNDARY
- HISTORIC BASIN: H1 — DESIGNATION; 4.8 — AREA IN ACRES
- DEVELOPED BASIN: A2 — DESIGNATION; 1.6 — AREA IN ACRES
- 1 — DESIGN POINT
- FLOW ARROW

NOTE: SEE CHANNEL IMPROVEMENTS FOR IMPROVEMENTS TO DRAINAGE DITCH

LOT 1A, I-2 ZONING

1 HISTORIC SHEET FLOW

2 POND INFLOW

2a POND A OUTFLOW

OUTLET A

POND A

18" R.C.P. CL III W/F.E.S.

10' WIDE, 15' LONG, 18" THICK, TYPE L RIP-RAP ON 12" LAYER TYPE II BEDDING

LOT 1C, 5.30 ACRES, I-2 ZONING, SERVICE YARD, GRAVEL

LOT 1B, I-2 ZONING

3 OFFSITE SHEET FLOW

4 POND INFLOW

4a POND OUTFLOW

10' WIDE, 15' LONG, 18" THICK, TYPE L RIP-RAP ON 12" LAYER TYPE II BEDDING

5 SHEET FLOW

6 HISTORIC SHEET FLOW

A2 1.6

A3 2.6

A4 0.5

H1 1.8

H2 3.0

01 1.2

POND B

OUTLET B

DETENTION AREA

FUTURE EXPANSION

DRAINAGEWAY OUTLOT A

TOPEKA WAY

WASH BAY

PARKING

FENCE

TRASH

STREET LIGHT EXISTING

5'x5' IREA EASEMENT

SEWER STUB

WATER STUB

FLOW INTO DITCH

N 30°45'56"E 434.39'

N 54°24'14"W 363.88'

S 59°14'30"E 260.00'

S 35°23'12"W 116.71'

S 76°12'54"W 121.19'

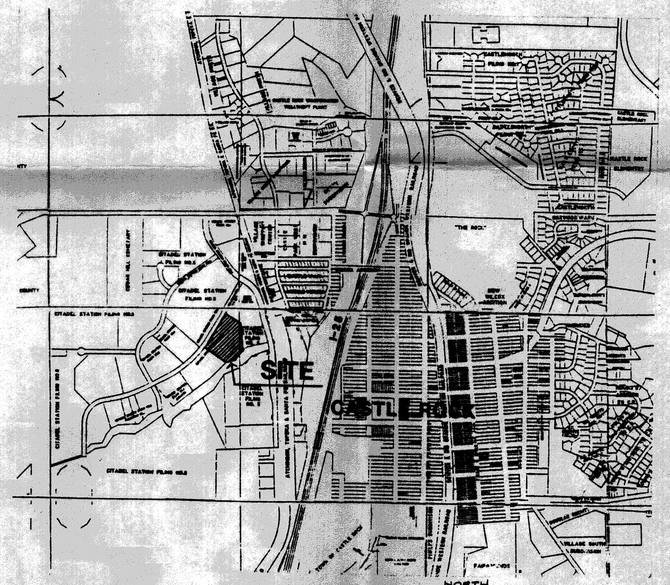
The plans are reviewed for concept only and the review does not imply responsibility by the reviewing department, the Town Engineer or the Town of Castle Rock for accuracy and correctness of the calculations. The review does not imply that quantities of items on the plans are the final quantities required. The review shall not be construed for any reason as acceptance of financial responsibility by the town or reviewing department for additional items and additional quantities of items shown that may be required during the construction phase.

ALL WORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE TOWN OF CASTLE ROCK STANDARD SPECIFICATIONS

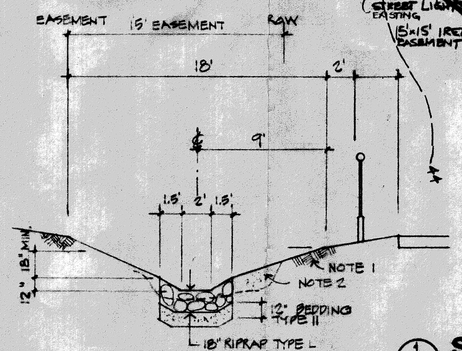
APPROVED FOR ONE YEAR FROM THIS DATE RECOMMENDED FOR APPROVAL.

ENGINEERING DEPT. DATE

PUBLIC WORKS DEPT. DATE



VICINITY MAP
1" = 1000'



NOTE 1: CONSTRUCT LOW FLOW CHANNEL AS SHOWN. STABLE BANKS WITH ESTABLISHED VEGETATION SHALL EITHER REMAIN UNDISTURBED OR THE NATIVE GRASSES MAY BE REPLACED BY SODDED GRASS.

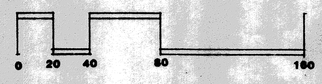
NOTE 2: ERODED BANKS SHALL BE REGRADED TO MATCH LOW FLOW CHANNEL. BANKS DISTURBED BY CONSTRUCTION SHALL EITHER BE SODDED OR RESEEDED ON IMPORTED TOPSOIL.

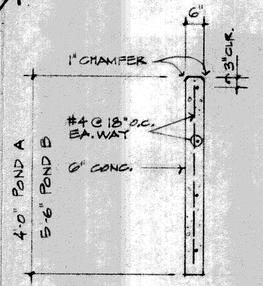
CHANNEL IMPROVEMENTS

SCALE: 1" = 5'

1 **SITE PLAN**

SCALE: 1" = 40'

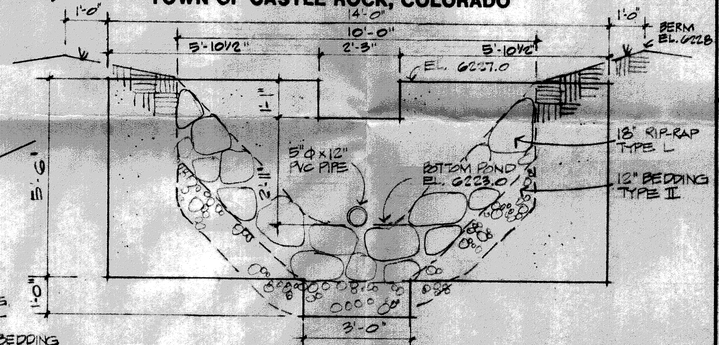




OUTLET SECTION

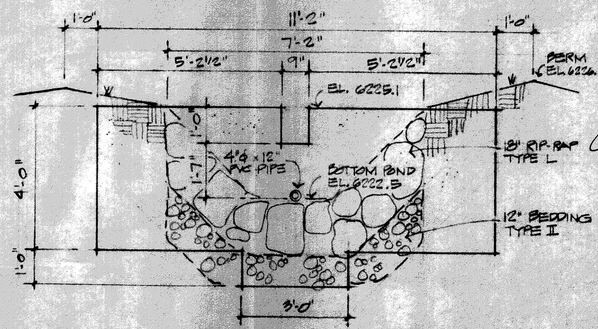
SCALE: 1/2" = 1'-0"

LOT 1C, BLOCK 9, CITADEL STATION FILING No. 6
FOURTH AMENDMENT
TOWN OF CASTLE ROCK, COLORADO



POND B OUTLET STRUCTURE

SCALE: 1/2" = 1'-0"



POND A OUTLET STRUCTURE

SCALE: 1/2" = 1'-0"

KOLBE STRIPING, INC.

OFFICE BUILDING

CITADEL STATION

FINAL DRAINAGE MAP
LOT 1C, BLOCK 9, CITADEL STATION FILING No. 6
FOURTH AMENDMENT, TOWN OF CASTLE ROCK, COLORADO

noll architects
810 fifth street, castle rock, CO 80104

COLORADO REGISTERED RICHARD R. WILLIAMS 18858 PROFESSIONAL ENGINEER 2-27-95

RMG
JOB Nº 1622.002

DRAWN BY:

DATE: JANUARY 3, 1995

REVISIONS: 2-22-95

SHEET Nº 1

TABLE 6-1
1-HOUR POINT RAINFALL VALUES FOR
THE TOWN OF CASTLE ROCK (INCHES)

2- YR	5-YR	10-YR	50-YR	100-YR
1.06	1.43	1.66	2.26	2.60

The one-hour rainfall depths are the basis of the Town's intensity-duration rainfall curves and are used to formulate design storm distributions.

6.1.2 Intensity-Duration Curves. Rainfall intensity based on storm duration for a variety of storm return periods can be found on Figure 6-1 at the end of this chapter. These curves were developed using distribution factors provided in the NOAA Atlas and also provided in Table RA-4 of the MHFD Manual. These Intensity-Duration curves are based on Equation RA-3 in the Rainfall Section of the MHFD Manual.

6.1.3 Six-hour Rainfall. In order to use the Colorado Urban Hydrograph Procedure (CUHP), two, three or six-hour rainfall distributions are required, depending on watershed area. Table RA-1 in the MHFD Manual summarizes storm durations, area adjustments, and incremental rainfall depths to be used in CUHP based on watershed area. The UD-Raincurve Spreadsheet included in the MHFD Manual shall be used to generate the rainfall distribution curves necessary for a CUHP model. In order to generate these distribution curves, the one-hour and six-hour rainfall depths for the design return periods are necessary. Since the Town of Castle Rock is not located within MHFD boundaries, the rainfall depth-duration-frequency curves provided in the MHFD Manual do not provide rainfall values for the entire Town. Therefore these values are provided in these Criteria. The 1-hour point values can be found in Table 6-1 of this chapter. The six-hour point values are as follows:

TABLE 6-2
6-HOUR POINT RAINFALL VALUES FOR
THE TOWN OF CASTLE ROCK (INCHES)

2- YR	5-YR	10-YR	50-YR	100-YR
1.5	2.0	2.2	3.0	3.4

The UD-Raincurve spreadsheet shall be used for all portions of the Town. Once the rainfall distribution curves are generated using the MHFD UD-Raincurve Spreadsheet, the CUHP model is to be set up following the procedures provided in the Runoff chapter in Volume 1 of the MHFD Manual.

6.2 Selecting a Method to Estimate Runoff

Two primary methods for estimating storm runoff, peak flow rates and total volumes are used in the Town.

- Rational Method

Site-specific conditions may vary from the representative values presented in this chapter. The engineer is responsible for assuring that the selected imperviousness values represent the imperviousness of the catchment or the proposed development. During master planning or in early stages of design, select imperviousness values that are unlikely to be exceeded as final design plans are developed to avoid the need to increase the size of infrastructure during later design stages.

TABLE 6-2. RECOMMENDED IMPERVIOUSNESS BY LAND USE

LAND USE/DENSITY	IMPERVIOUSNESS
Residential	
Single-family Housing (SFH) – Rural (0 – 3 du/ac)	35%
SFH – Low & Medium-density (3 – 5 du/ac)	55%
SFH – High-density (5 - 20 du/ac)	65%
Manufactured Housing (>= 10 du/ac)	65%
Multi-family Housing (MFH) – Medium-density (5 – 20 du/ac)	65%
MFH – High-density MFH (>20 du/ac)	70%
Commercial	
Commercial – Low-density	65%
Commercial – Medium- to High-density	80%
Commercial – Urban Core	90%
Industrial/Institutional	
Schools	55%
Office/institutional	65%
Industrial Areas	75%
Solar Fields, Gravel Cover[1,2]	60%
Solar Fields, Grass Cover[1,2]	45%
Parks and Open Space	
Open Space, Undisturbed Native Grasses	5%
Community Parks	25%
Neighborhood Parks	15%
Golf Courses	30%
Cemeteries	25%

Note: Recommended imperviousness values shown in the table are the minimum imperviousness values for a specific land use. It is the engineer's responsibility to select imperviousness values that appropriately reflect the actual density of the proposed development.

[1] Use these values at the master planning scale or when the specific layout of panels is not known. Use values from the surface type (Table 6-3) at the site planning and design stage when panel width, panel spacing, and panel orientation relative to contours are known.

[2] Assumes 1:1 ratio of panels to aisles. See MHFD's technical memorandum regarding *Determination of Solar Panel Field Runoff Coefficients and Imperviousness Values* for additional information on procedures to reflect other impervious areas such as roads and pads that may be part of a solar field and layouts with wider inter-panel spacing.

TABLE 6-3. RECOMMENDED IMPERVIOUSNESS BY SURFACE TYPES

SURFACE TYPES		IMPERVIOUSNESS
Roadways and Paved Streets		95%
Concrete Driveways and Walks		95%
Roofs		95%
Gravel	No Traffic (Pedestrian Use)	40%
	Low-traffic Areas (Maintenance Paths and Substations)	60%
	High-traffic Areas (Roadways and Parking)	80%
Disturbed Soil (Including Lawns, Managed/Active Turf, Landscaped Areas with Water-Wise Vegetation, and Uncompacted Gravel/Mulch Planting Beds)		20%
Undisturbed or Decompacted Soil (Native Grasses and Open Space Areas)		5%
Artificial Turfs[1]	Landscape Applications (without Subgrade Drainage Layer)	25% – 45%
	Sport Fields (with Underdrain Pipe System)	60% – 80%
Water Surfaces (Lakes/Reservoirs/Irrigation Ponds)		100%
Solar Fields[2]	Grass Cover (Varies with Panel Orientation Relative to Ground Contours)	10% – 45%
	Gravel Cover (Varies with Panel Orientation Relative to Ground Contours)	50% – 75%
Historic Flow Analysis, Greenbelts, Agricultural		5%
Newly Graded Areas		65%
Stormwater Control Measures[3]	Retention Ponds & Constructed Wetland Ponds	100%
	Rooftop Systems – Blue Roofs	95%
	Rooftop Systems – Green Roofs (extensive)	65%
	Rooftop Systems – Green Roofs (intensive)	50%
	Permeable Pavement – CGP/PGP/RGP	55%
	Permeable Pavement – PICP	45%
	Extended Detention Basins	25%
	Receiving Pervious Areas (incl. Grass Buffers & Grass Swales)	20%
	Bioretention & Sand Filters	10%

[1] Consult with the manufacturer to get a recommended value.

[2] Assumes 1:1 ratio of panels to aisles. See MHFD's technical memorandum regarding *Determination of Solar Panel Field Runoff Coefficients and Imperviousness Values* for additional information on procedures for determining percent imperviousness based on panel width, panel spacing, and panel orientation relative to ground contours and how to reflect other impervious areas such as roads and pads that may be part of a solar field and layouts with wider inter-panel spacing.

[3] See MHFD's technical memorandum regarding *Evaluation of Percent Imperviousness for Stormwater Control Measures* for background information.

APPENDIX D

MS4 COMPLIANCE, WQ WORKSHEET,
VARIANCE REQUEST, CHECKLIST

Summary of Water Quality Conformance to MS4 Permit

The purpose of this worksheet is to document conformance with the Town of Castle Rock's MS4 permit with regard to permanent water quality on land disturbance projects.

Project Name Front Range Construction

Project Owner Front Range Construction Services, LLC

Project Location 661 Prairie Hawk Drive, Castle Rock, Colorado 80109

ToCR Project Number SDP25-0020

Total Site Area 1.33 **acres**

Total Size of Common Plan of Development 2.35 **acres**

Check all that apply:

☐ **Project within Plum Creek Basin**

☐ **Project within Cherry Creek Basin**

Estimated construction completion date 6/2026

---

1. The water quality control measure(s) for applicable development sites shall meet one of the following base design standards as per the SDDTCM Section 14.4. Please select all design standards that were applied to meet conformance with the MS4 on this site.

☑ WQCV standard

❒ Pollutant removal standard

❒ Runoff reduction standard

❒ Applicable site draining to regional WQVC control measure (accepts drainage prior to discharging to WOTS)

❒ Applicable site draining to regional WQVC control facility (with receiving pervious area control measure upstream of WOTS)

❒ Constrained redevelopment sites standard

- Imperviousness of existing site _____/_____(Imp. Ac/Site Ac) =____%
- Variance required TCV No. _____

❒ Existing control measure with WQCV per previous criteria standards

- Reference Construction Permit No. _____

❒ Cherry Creek Basin only, choose one: ☐ Tier 1 ☐ Tier 2 ☐ Tier 3

❒ No control measures provided (See Permanent WQ Worksheet for applicability)

Summary of Water Quality Conformance to MS4 Permit

2. Was an exclusion to water quality applied as per SDDTCM Section 13.1.5? ☐ Yes ☐ No

   i. If yes, please select all that apply, provide total excluded impervious area(s) and submit variance, as applicable: TCV No. _____

- ❒ Pavement management site
  Excluded impervious area: _____ acres
- ❒ Excluded roadway redevelopment
  Excluded impervious area: _____ acres
- ❒ Excluded existing roadway areas
  Excluded impervious area: _____ acres
- ❒ Above ground and below ground utilities
- ❒ Large lot single family home
- ❒ Non-residential and non-commercial infiltration
  Excluded impervious area: _____ acres
- ☑ Land disturbance for land to remain undeveloped
  Excluded impervious area: 0 acres
- ❒ Stream Stabilization Sites
  Excluded impervious area: _____ acres
- ❒ Trails
  Excluded impervious area: _____ acres
- ❒ Oil and Gas Exploration

3. For Development and Redevelopment sites, following any exclusions claimed above, was any portion of the site excluded up to 20% of the site and not to exceed one acre? ☑ Yes ☐ No

   If yes, complete the following:

   Excluded area: 0.14 acres

   Total Site area: 2.35 acres, 5.6 % site excluded

4. For Constrained sites, was any portion of the site excluded up to 50% of the site and not to exceed 50% of the impervious area? ☐ Yes ☐ No

   If yes, complete the following:

   Excluded area: _____ acres

   Excluded impervious area: _____ acres

   Total Site area: _____ acres, _____ % site excluded

   Total Impervious area: _____ acres, _____ % impervious excluded

Permanent Water Quality Determination Worksheet (Taken from 2019 SDDTCM Sections 13.1.4 and 13.1.5)

Project: Front Range Construction **Project #:** SDP25-0020 **Applicant:** Front Range Construction Services, LLC

Section	Question	Response	Instructions
1	**Non-applicable Sites**		
1.1	Will the project result in a temporary disturbance of greater than one acre?	○ No ◉ Yes	Proceed to section 1.2. Proceed to section 2.
1.2	Is the project part of a larger common plan of development or sale where multiple separate and distinct construction activities may be taking place at different times on different schedules, but remain related and are within 1/4 mile of each other? (A common plan of development will generally be documented on a site development plan, master plan, or equivalent, for the property/project)	○ No ○ Yes	Proceed to section 1.3. Proceed to section 2.
1.3	Is the project within the Cherry Creek Watershed?	○ Yes ○ No	Permanent water quality control measures may be required. Refer to Water Qualtiy Control Regulation 72.7 for details and allowable exclusions. Permanent water quality control measures are not required.

Section	Question	Response	Instructions
2	**Applicable Site Types and Exclusions by Variance**		
2.1	Does the project have more than 35% impervious area on the existing site?	◉ No ○ Yes	Project is an applicable Development Site. Proceed to section 3. Proceed to 2.2.
2.2	Does the project have greater than 75% impervious area on the existing site?	○ No ○ Yes	Project is an applicable Redevelopment Site. Proceed to section 3. Project is an applicable Constrainted Redevelopment Site. Proceed to 2.3.
2.3	Will 100% of the runoff from the existing and proposed site be captured and treated using one or more of the allowable design standards for permanent water quality?	○ Yes ○ No	No further action required. Proceed to 2.4.
2.4	Do any other water quality exclusions apply to the site?	○ No ○ Yes	Portions of the project are excluded. Proceed with design in accordance with Constrained Redevelopment standards and apply for **variance** for Constrained Redevelopment Sites. Proceed to section 3. Following approval of other exclusions, design remaining site in accordance with Constrained Redevelopment standards and apply for **variance** for Constrained Redevelopment Sites.

Section	Question	Response	Instructions
3	**Applicable Sites with Other Exclusions by Variance**		
3.1	**Category 1: Roadways, bridges and trails only**		
3.1.1	Is the project a bike or pedestrian trail?	○ Yes ○ No	Proceed to next line. Proceed to 3.1.2.
	Is the trail for a roadway?	○ Yes ○ No	Proceed to 3.1.2. Project is excluded. Submit **variance** for Trails Excluded from Permanent Water Quality Requirements.
3.1.2	Is the project primarily used for parking or access to parking?	○ Yes ○ No	This exclusion does not apply. Permanent water quality is required. Proceed to 3.1.3.
3.1.3	Does the project add impervious area?	○ No ○ Yes	Project is excluded. Submit **variance** for Pavement Management Sites Excluded from Permanent Water Quality Requirements. Proceed to 3.1.4.
3.1.4	Does the project add more than 8.25 feet of paved width at any location to the existing roadway?	○ No ○ Yes	Project is excluded. Submit **variance** for Roadway Redevelopment Sites Excluded from Permanent Water Quality Requirements. Proceed to next line.
	Does the project add more than one acre of paved area per mile to an existing roadway?	○ No ○ Yes	Project is excluded. Submit **variance** for Roadway Redevelopment Sites Excluded from Permanent Water Quality Requirements. Proceed to next line.
	Does the project increase the width by two times or more, on average, of the original roadway area?	○ No ○ Yes	Existing areas of site are excluded only. Submit **variance** for Existing Roadway Surfaces Only Excluded from Permanent Water Quality Requirements. This exclusion does not apply. Permanent water quality is required.
3.2	**Category 2: Non-residential and non-commercial projects only**		
3.2.1	Is the project associated with oil and gas exploration, production, processing, or treatment operations or transmission facilities, including activities necessary to prepare a site for drilling and the movement and placement of drilling equipment?	○ Yes ○ No	Project is excluded. Submit **variance** for Oil and Gas Exploration Sites Excluded from Permanent Water Quality Requirements. Proceed to 3.2.2.
3.2.2	Is the project for stream stabilization?	○ Yes ○ No	Project is excluded. Submit **variance** for Stream Stabilization Sites Excluded from Permanent Water Quality Requirements. Proceed to 3.2.3.
3.2.3	Is the project for installation or maintenance of aboveground or underground utilities or infrastructure that does not permanently alter the terrain, ground cover, or drainage patterns from those present prior to the construction activity including activities to install, replace or maintain utilities under roadways or other paved areas that return the surface to the same condition?	○ Yes ○ No	Project is excluded. Submit **variance** for Aboveground and Underground Utilities Excluded from Permanent Water Quality Requirements. Proceed to 3.2.4.
3.2.4	Is the project on undeveloped land (land with no human-made structures such as buildings or pavement) that will remain undeveloped after the project?	○ Yes ○ No	Project is excluded. Submit **variance** for Sites with Land Disturbances to Undeveloped Land that will Remain Undeveloped Excluded from Permanent Water Quality Requirements. Proceed to 3.2.5.
3.2.5	Will the post-project condition result in surface water discharge during the 80th percentile storm runoff event?	○ No ○ Yes	Project is excluded. Submit **study** along with **variance** for Non-residential and Non-commercial Infiltration Conditions Excluded from Permanent Water Quality Requirements. This exclusion does not apply. Permanent water quality is required.

Section	Question	Response	Instructions
3.3	**Category 3: Residential, Agricultural and Commercial projects**		
3.3.1	Is the project a single-family residential lot, or agricultural zoned lands, greater than or equal to 2.5 acres in size per dwelling unit?	○ Yes ○ No	Proceed to next line. Proceed to 3.3.2.
	Is the project site greater than 10% impervious?	○ No ○ Yes	Project is excluded. Submit **variance** for Large Lot Single Family Sites Excluded from Permanent Water Quality Requirements. Proceed to next line.
	Is the project site greater than 20% impervious?	◉ Yes ○ No	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Will the post-project condition result in surface water discharge during the 80th percentile storm runoff event?	○ No ○ Yes	Project is excluded. Submit **study** along with **variance** for Large Lot Single Family Sites Excluded from Permanent Water Quality Requirements. This exclusion does not apply. Permanent water quality is required.
3.3.2	Will 100% of the runoff from the residential or commercial site be captured?	○ Yes ○ No	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Is all or a portion of the site undeveloped or will it remain undeveloped after construction?	◉ Yes ○ No	This portion of the project is excluded. Submit **variance** for Sites with Land Disturbance to Undeveloped Land that will Remain Undeveloped Excluded from Permanent Water Quality Requirements. Proceed to next line. Proceed to next line.
	Is the remaining untreated impervious area greater than 20% of the site?	○ Yes ○ No	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Is the remaining untreated impervious area greater than one acre?	○ Yes ○ No	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Is it practicable to capture runoff from portions of the site that will not drain to a control measure?	○ No ○ Yes	Document justification demonstrating that it is not practicable to capture runoff from this portion of the site in the **drainage report**. No further action is needed. This exclusion does not apply. Permanent water quality is required.

Docusign Envelope ID: F33C53BA-E011-4862-B74A-DB580AD09251

Development Services
100 N. Wilcox Street
Castle Rock, CO 80104
720-733-2200 FAX 720-733-2231

NO. TCV25-0046

DATE 8-1-25

TECHNICAL CRITERIA VARIANCE APPLICATION

DEVELOPMENT Front Range Construction

LEGAL DESCRIPTION OF SUBJECT PROPERTY
Lot 1B, Block 9, Citadel Station Filing 6, Fourth Amendment

VARIANCE REQUESTED:

Code Section(s) 2019 Storm Drainage Design and Technical Criteria Manual Section 5.4.6 Freeboard Requirements for roadways

Describe the Variance Requested
The purpose of this application is to request a variance from Section 5.4.6 that states that a minimum of 2-feet of freeboard is required for roadways. The variance is to allow construction of the proposed commercial driveway that is within the existing 100 year floodplain, and parking area that is outside of the floodplain but does not provide 2-feet of freeboard.

1. Describe the exceptional situation or condition that exists
The existing public road that provides access to the site, Prairie Hawk Drive, is within the 100-year floodplain at the location of the proposed driveway.

2. Describe the difficulty or hardship that would be created by a strict enforcement of the code
To comply with the code, the existing public road would need to be raised by approximately 6 feet to achieve 2-feet of freeboard above the 100 year floodplain.

3. Describe why there would not be any adverse impact on public health, safety and welfare
Construction of the driveway does not affect the existing condition where the public road is already inundated by the floodplain. This variance is for the driveway and parking area only - the proposed building on the site is not a part of this variance and will be subject to Section 5.4.6 related to the lowest finish floor elevations.

Additional Information:

Docusign Envelope ID: F33C53BA-E011-4862-B74A-DB580AD09251

1. *Attach an improvement survey.*
2. *Attach a drawing showing the intended uses.*
3. *Provide any other information helpful to discussion.*

PROPERTY OWNER

Name: Front Range Development Company LLC

Address: 5863 Kingsfield St.

Castle Rock, CO 80104

Phone #: 303.931.4669

Fax #: _____

APPLICANT'S REPRESENTATIVE (If applicable)

Name: 2N Civil LLC

Address: 6 Inverness Court East, #125

Englewood, CO 80112

Phone: 303.925.0544

Fax: _____

Jesse Jutowski

Signature of Applicant

For Staff Use Only

Staff Recommendation: Approved ☒ Yes ☐ No

Signed by:
Mark Marlowe
FFA6D2E651B241D...

Signature

☐ Public Works Director
☒ Director of Castle Rock Water
☐ Parks & Recreation Director
☐ Development Services Director

9/9/2025 | 9:20 AM MDT

Date

Comments

Conditions of Acceptance

Docusign Envelope ID: F33C53BA-E011-4862-B74A-DB580AD09251

ALTA/NSPS LAND TITLE SURVEY

LOT 1B, BLOCK 9, CITADEL FILING 6, FOURTH AMENDMENT
SECTION 11, TOWNSHIP 8 SOUTH, RANGE 67 WEST
COUNTY OF DOUGLAS, STATE OF COLORADO

SCHEDULE B-2 EXCEPTIONS TITLE COMMITMENT NO. ABJ70791462 DATED 11/08/2022:

EXCEPTIONS 1-8: STANDARD EXCEPTIONS

9. RIGHT OF THE PROPRIETOR OF A VEIN OR LODE TO EXTRACT AND REMOVE HIS ORE THEREFROM, SHOULD THE SAME BE FOUND TO PENETRATE OR INTERSECT THE PREMISES HEREBY GRANTED, AND A RIGHT OF WAY FOR DITCHES OR CANALS CONSTRUCTED BY THE AUTHORITY OF THE UNITED STATES, AS RESERVED IN UNITED STATES PATENTS RECORDED AUGUST 12, 1878 IN BOOK H AT PAGE 551, (AFFECTS THE W/2 NW/4 SECTION 11), AND RECORDED FEBRUARY 2, 1892 IN BOOK X AT PAGE 44, (AFFECTS THE NE/4 SECTION 10). *BOOK H AT PAGE 551 AFFECTS THE MMI PERMANENT EASEMENT AREA & ACCESS & UTILITY EASEMENT, BOOK X AT PAGE 44 DOES NOT AFFECT THE MMI PERMANENT EASEMENT AREA & ACCESS & UTILITY EASEMENT*

10. EASEMENT FOR INGRESS AND EGRESS AS SET FORTH AND GRANTED IN WARRANTY DEED RECORDED JANUARY 24, 1969 IN BOOK 190 AT PAGE 147.

    AGREEMENTS RECORDED SEPTEMBER 13, 1983 IN BOOK 490 AT PAGE 72 AND IN BOOK 490 AT PAGE 79 RELEASE PARCEL 2 FROM SAID EASEMENT. *DOES NOT AFFECT*

11. RESERVATION OF MINERAL AND WATER RIGHTS AS SET FORTH IN WARRANTY DEED RECORDED MARCH 01, 1982 IN BOOK 435 AT PAGE 485. *DOES NOT AFFECT*

    QUIT CLAIM DEED AS TO EASEMENT THEREIN RECORDED JANUARY 6, 1995 IN BOOK 1240 AT PAGE 2304. *BOOK 1240 AT PAGE 2304 TERMINTAED THE EASEMENT SET FORTH IN BOOK 435 AT PAGE 485*

12. ALL OIL, GAS, MINERALS AND OTHER MINERAL RIGHTS AS RESERVED IN INSTRUMENT RECORDED AUGUST 3, 1982, IN BOOK 447 AT PAGE 1136 AND ANY AND ALL ASSIGNMENTS THEREOF OR INTERESTS THEREIN.

    NOTE: SAID DOCUMENT SPECIFICALLY STATES, "GRANTOR SHALL NOT HAVE RIGHT TO GO UPON OR THE USE SURFACE OF SAID LAND." *DOES NOT AFFECT*

13. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN FINDINGS AND RULING OF THE REFEREE AND DECREE OF THE WATER COURT RECORDED SEPTEMBER 17, 1982 IN BOOK 451 AT PAGE 612, NOVEMBER 16, 1987 IN BOOK 759 AT PAGE 385 AND OCTOBER 26, 1989 IN BOOK 879 AT PAGE 30. *DOES NOT AFFECT*

14. EASEMENTS, CONDITIONS, COVENANTS, RESTRICTIONS, RESERVATIONS AND NOTES ON THE PLAT OF CITADEL STATION, FILING NO. 6 RECORDED MARCH 27, 1987 UNDER RECEPTION NO. 8708767. PERTINENT ITEMS SHOWN HEREON; HOWEVER, PERTINENT ITEMS SHOWN DO NOT AFFECT *MMI PERMANENT EASEMENT AREA OR ACCESS & UTILITY EASEMENT*

15. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN SEWER SYSTEM DEVELOPMENT FEE PAYMENT AGREEMENT RECORDED APRIL 06, 1990 IN BOOK 905 AT PAGE 1104.

    NOTE : UPON RECEIPT OF EVIDENCE SATISFACTORY TO LAND TITLE GUARANTEE COMPANY FROM THE TOWN OF CASTLE ROCK CONFIRMING THAT ALL OBLIGATIONS UNDER SAID AGREEMENT HAVE BEEN FULFILLED, THE FOREGOING EXCEPTION WILL BE DELETED. *IS INCLUDED IN THE DESCRIPTION WITHIN BOOK 905 AT PAGE 1104.*

16. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN DEVELOPMENT CONTRACT RECORDED FEBRUARY 13, 1991 IN BOOK 954 AT PAGE 525. *IS INCLUDED IN THE DESCRIPTION WITHIN BOOK 954 AT PAGE 525.*

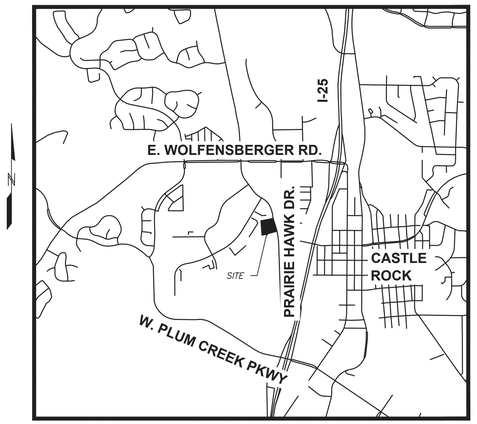
17. EASEMENTS ON THE PLAT OF CITADEL STATION FILING 6, FORTH AMENDMENT RECORDED JANUARY 17, 1995 UNDER RECEPTION NO. 9502941. *AS SHOWN HEREON:* AFFECTS *MMI PERMANENT EASEMENT AREA OR ACCESS & UTILITY EASEMENT*; PERTINENT ITEMS SHOWN HEREON

18. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN AGREEMENT RECORDED JANUARY 17, 1995 IN BOOK 1242 AT PAGE 1457. DOES NOT AFFECT *MMI PERMANENT EASEMENT AREA OR ACCESS & UTILITY EASEMENT* PER PLAT AND DESCRIPTION IN SECTION 2 OF THE AGREEMENT

19. DEED OF TRUST DATED JUNE 03, 2022, FROM FRONT RANGE CONSTRUCTION SERVICES, LLC, A COLORADO LIMITED LIABILITY COMPANY TO THE PUBLIC TRUSTEE OF DOUGLAS COUNTY, COLORADO FOR THE USE OF PB&T BANK TO SECURE THE SUM OF $266,002.00 RECORDED JUNE 07, 2022, UNDER RECEPTION NO. 2022040418. AFFECTS *MMI PERMANENT EASEMENT AREA OR ACCESS & UTILITY EASEMENT*; NOTHING TO PLOT

GENERAL NOTES:

1. THIS SURVEY DOES NOT CONSTITUTE A TITLE SEARCH BY ENCOMPASS SERVICES, LLC TO DETERMINE RIGHTS-OF-WAY, EASEMENTS, AND OR ENCUMBRANCES OF RECORD. FOR ALL INFORMATION REGARDING RIGHTS-OF-WAY, EASEMENTS, AND ENCUMBRANCES OF RECORD, ENCOMPASS SERVICES, LLC RELIED UPON A COMMITMENT FOR TITLE INSURANCE IN THE PREPARATION OF THIS SURVEY, ITEMD BY OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY, FILE NO. ABJ70791462, HAVING AN EFFECTIVE DATE OF NOVEMBER 08, 2022. THE PROPERTY SHOWN AND DESCRIBED HEREON IS THE PROPERTY INTENDED IN SAID TITLE COMMITMENT.
2. NOTICE: ACCORDING TO COLORADO LAW YOU MUST COMMENCE ANY LEGAL ACTION BASED UPON ANY DEFECT IN THIS SURVEY WITHIN THREE YEARS AFTER YOU FIRST DISCOVER SUCH DEFECT. IN NO EVENT MAY ANY ACTION BASED UPON ANY DEFECT IN THIS SURVEY BE COMMENCED MORE THAN TEN YEARS FROM THE DATE OF THE CERTIFICATION SHOWN HEREON. (C.R.S. 13-80-105)
3. THE FIELD WORK FOR THIS SURVEY WAS COMPLETED IN NOVEMBER, 2022.
4. THE BASIS OF BEARINGS FOR THIS SURVEY, MONUMENTED AND DESCRIBED AS SHOWN HEREON, THE SOUTH LINE OF LOT 1B TO HAVE AN ASSUMED BEARING OF N66°49'08"E, WITH ALL BEARINGS REFERENCED HEREIN RELATIVE THERETO.
5. ALL DISTANCES SHOWN HEREON ARE GROUND DISTANCES.
6. THE LINEAR UNITS FOR THIS SURVEY ARE U.S. SURVEY FEET (1200/3937 METER).
7. THERE WAS NO EVIDENCE OF SITE BEING USED AS A SOLID WASTE DUMP OR SANITARY LANDFILL AT THE TIME OF SURVEY.
8. THE MMI PERMANENT EASEMENT AREA IS CONTIGUOUS TO THE ACCESS & UTILITY EASEMENT.



VICINITY MAP SCALE N.T.S.

TABLE A "ALTA/NSPS LAND TITLE SURVEY" NOTES:

1. ALL PROPERTY CORNERS WERE FOUND OR SET, AS SHOWN HEREON.
2. 661 PRAIRIE HAWK DRIVE, CASTLE ROCK, CO 80109. AKA PARCEL #2505-112-23-007
3. PORTIONS OF THE SURVEYED PROPERTY FALLS WITHIN ZONE 'AE' OF THE FEDERAL EMERGENCY MANAGEMENT AGENCY FLOOD INSURANCE RATE MAP, COMMUNITY PANEL MAP NO.08123C0188G, DATED MARCH 16, 2016. ZONE 'AE' IS DEFINED AS AREAS WITH BASE FLOOD ELEVATIONS DETERMINED.
4. THE GROSS LAND AREA OF THE MMI PERMANENT EASEMENT AND THE ACCESS & UTILITY EASMENT TOTAL 20841 SQ. FT +/-
5. CONTOURS SHOW HEREON WERE DERIVED FROM A GROUND SURVEY PERFORMED ON 11/08/22. ALL ELEVATIONS ARE BASED OFF A PROCESSED OPUS SOLUTION.

6, (a,b). NO ZONING REPORT OR LETTER WAS PROVIDED BY THE CLIENT.

7(a). NO BUILDINGS ON SITE AT THE TIME OF THIS SURVEY.

8. THERE ARE NO OTHER SUBSTANTIAL FEATURES ON SITE THAT ARE NOT SHOWN ON THIS SURVEY.
9. NO PARKING SPACES ON SITE AT THE TIME OF THIS SURVEY.
11. SURFACE EVIDENCE OF EXISTING UTILITIES VISIBLE AT THE TIME OF THIS SURVEY ARE SHOWN HEREON, HOWEVER LACKING EXCAVATION, THE EXACT LOCATION OF UNDERGROUND UTILITIES CANNOT BE ACCURATELY, COMPLETELY, AND RELIABLY DEPICTED. ENCOMPASS SERVICES, LLC DOES NOT GUARANTEE THESE LOCATIONS, OR THAT THE UTILITIES SHOWN HEREON COMPRISE ALL UTILITIES IN THIS AREA, EITHER IN SERVICE OR ABANDONED. FOR THE EXACT LOCATION OF ALL UNDERGROUND UTILITIES, CONTACT THE APPROPRIATE UTILITY COMPANY OR AGENCY PRIOR TO ANY EXCAVATION. ALL UTILITY SERVICES TO THE LAND SHOWN HEREON EITHER ENTER TO SUCH LAND THROUGH ADJOINING PUBLIC RIGHT-OF-WAY AND OR THIS SURVEY SHOWS THE POINT OF ENTRY AND LOCATION OF ANY VISIBLE EVIDENCE OF UTILITIES WHICH PASS THROUGH OR ARE LOCATED ON ADJOINING PRIVATE LAND PER SCHEDULE B-2 EXCEPTIONS AND AS SHOWN HEREON.
13. NAMES OF ADJOINING OWNERS ARE SHOWN HEREON.
16. THERE WAS NO EVIDENCE OF EARTH MOVING WORK, BUILDING CONSTRUCTION OR BUILDING ADDITIONS AT THE TIME OF SURVEY.
17. THERE ARE NO KNOWN CHANGES IN STREET RIGHT OF WAY LINES, OR ANY RECENT STREET OR SIDEWALK CONSTRUCTION OR REPAIRS.
18. PROPOSED EASEMENT AREA SHOWN HEREON HAS INDIRECT ADDRESS TO PRAIRIE HAWK DRIVE, A PUBLIC RIGHT-OF-WAY V/A THE PROPOSED ACCESS AND UTILITY EASEMENT SHOWN HEREON AND GRANTED IN THAT CERTAIN OPTION FOR GRANT OF RIGHT-OF-WAY AND EASEMENT RECORDED DECEMBER 1, 2022 AS REF # 2022074790 IN THE DOUGLAS COUNTY, CO OFFICE OF CLERK AND RECORDER.

PROPERTY ADDRESS:

661 PRAIRIE HAWK DRIVE, CASTLE ROCK, CO. 80109

RECORD LEGAL DESCRIPTION (PARENT PARCEL):

LOT 1B, BLOCK 9, CITADEL STATION FILING 6, FOURTH AMENDMENT, COUNTY OF DOUGLAS , STATE OF COLORADO

MMI PERMANENT EASEMENT AREA:

A 120'X120' PERPETUAL EASEMENT LOCATED IN THE NORWEST QUARTER OF SECTION 11, TOWNSHIP 8 SOUTH, RANGE 67 WEST OF THE 6TH/ P.M., COUNTY OF DOUGLAS, STATE OF COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTHEAST CORNER OF LOT 1B, CITADEL STATION, FILING 6, FOURTH AMENDMENT, RECORDED AT RECEPTION NO. 9502941 OF THE DOUGLAS COUNTY RECORDS AND CONSIDERING THE SOUTH LINE OF SAID LOT 1B TO BEAR S66°49'08"W WITH ALL BEARINGS CONTAINED HEREIN, RELATIVE THERETO; THENCE S66°49'08"W ALONG SAID SOUTH LINE A DISTANCE OF 78.84 FEET TO THE POINT OF BEGINNING; THENCE N23°10'52"W A DISTANCE OF 120.00 FEET; THENCE S66°49'08"W PARALLEL WITH THE SOUTH LINE OF SAID LOT 1B A DISTANCE OF 120.00 FEET; THENCE S23°10'52"E A DISTANCE OF 120.00 FEET TO A POINT ON THE SOUTH LINE OF SAID LOT 1B; THENCE N66°49'08"E ALONG SAID SOUTH LINE A DISTANCE OF 120.00 FEET TO THE POINT OF BEGINNING.

CONTAINING 14,400 SQ. FT. +/-

ACCESS AND UTILITY EASEMENT:

AN ACCESS AND UTILITY EASEMENT LOCATED IN THE NORWEST QUARTER OF SECTION 11, TOWNSHIP 8 SOUTH, RANGE 67 WEST OF THE 6TH/ P.M., COUNTY OF DOUGLAS, STATE OF COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTHEAST CORNER OF LOT 1B, CITADEL STATION, FILING 6, FOURTH AMENDMENT, RECORDED AT RECEPTION NO. 9502941 OF THE DOUGLAS COUNTY RECORDS AND CONSIDERING THE SOUTH LINE OF SAID LOT 1B TO BEAR S66°49'08"W WITH ALL BEARINGS CONTAINED HEREIN, RELATIVE THERETO; THENCE ALONG THE EAST LINE OF SAID LOT 1B, ALONG A NON-TANGENT CURVE TO THE LEFT, HAVING A RADIUS OF 1754.86 FEET, AN INTERIOR ANGLE OF 03°46'05", AND AN ARC LENGTH OF 115.41 FEET, WHOSE CHORD BEARS N16°12'59"W A DISTANCE OF 115.39 FEET; THENCE CONTINUING ALONG SAID EAST LINE, N18°05'13"W A DISTANCE OF 5.49 FEET TO THE POINT OF BEGINNING; THENCE S66°49'08"W A DISTANCE OF 213.32 FEET; THENCE N23°10'52"W A DISTANCE OF 30.00 FEET; THENCE N66°49'08"E A DISTANCE OF 215.99 FEET TO A POINT ON THE EAST LINE OF SAID LOT 1-B; THENCE S18°05'13"E ALONG SAID EAST LINE A DISTANCE OF 30.12 FEET TO THE POINT OF BEGINNING;

CONTAINING 5990.00 SQ. FT. +/-

CERTIFICATION:

TO:
FIVE NINE DESIGN GROUP, MIDDLE MILE INFRASTRUCTURE, LLC, A DELAWARE LIMITED LIABILITY COMPANY, AND OLD REPUBLIC TITLE INSURANCE COMPANY, AND THEIR SUCCESSORS AND ASSIGNS.
THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2021 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/NSPS LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 1, 2, 3, 4, 5, 6 (a,b) 7(a, b-1,), 8, 9, 11, 13,16, 17, 18 AND 19 OF THE TABLE A THEREOF. THE FIELD WORK WAS COMPLETED ON NOVEMBER 16, 2022.

DATE OF PLAT OR MAP:___03/15/23____

ELIJAH FRANE, PLS 38376
FOR AND ON BEHALF OF
ENCOMPASS SERVICES, LLC
10901 W. 120TH AVE., STE. 400
BROOMFIELD, CO 80021

INDEXING STATEMENT:

DEPOSITED THIS _____ DAY OF _____, 20_____, AT _____, M., IN BOOK_____
OF THE DOUGLAS COUNTY SURVEYOR'S LAND SURVEY/ RIGHT-OF-WAY SURVEYS AT
PAGE(S)_____, RECEPTION NUMBER_____

_____
COUNTY SURVEYOR/ DEPUTY COUNTY SURVEYOR

BASIS OF BEARINGS:

CONSIDERING THE SOUTH LINE OF LOT 1B TO HAVE AN ASSUMED BEARING OF N66°49'08"E AND MONUMENTED AS SHOWN HEREON.

UNITS OF MEASUREMENT ARE US SURVEY FEET REFERENCED TO GROUND.

"NOTICE: ACCORDING TO COLORADO LAW YOU MUST COMMENCE ANY LEGAL ACTION BASED UPON ANY DEFECT IN THIS SURVEY WITHIN THREE YEARS AFTER YOU FIRST DISCOVER SUCH DEFECT. IN NO EVENT MAY ANY ACTION BASED UPON ANY DEFECT IN THIS SURVEY BE COMMENCED MORE THAN TEN YEARS FROM THE DATE OF THE CERTIFICATION SHOWN HEREON."

TABLE OF CONTENTS:

SHEET 1 – COVER SHEET
SHEET 2 – OVERALL BOUNDARY

LEGEND & ABBREVIATIONS:

SUBJECT PROPERTY LINE	5/8" RB FOUND (AS DESCRIBED)	R.O.W.	RIGHT-OF-WAY
ADJOINER PROPERTY LINE	FOUND CHISELED CROSS	RB	REBAR
EASEMENT	5/8" RB WITH CAP SET	AC.	ACRES
ROAD RIGHT OF WAY	FIBER OPTIC PEDESTAL	(M)	MEASURED VALUE
ROAD CENTER LINE	ELETRIC PEDESTAL /TRANSFORMER	(P)	PLATTED VALUE
FLOOD ZONE AE	GAS METER	O/S	OFFSET
WOOD FENCE	WATER METER	17	REFERS TO EXCEPTION NO.
CONCRETE	UTILITY POLE		
	SITE BENCHMARK		

CLIENT:
FIVE NINE DESIGN GROUP

REVISIONS:

NO.	DATE	DESCRIPTION
1	12/20/22	1ST COMMENTS
2	02/06/23	2ND COMMENTS
3	03/06/23	3RD COMMENTS
4	03/15/23	REVISE LEGALS

encompass
Providing Solutions
10901 W. 120TH AVE, SUITE 400
BROOMFIELD, COLORADO 80021
303-955-6080
WWW.ENCOMPASSSERVICES.COM

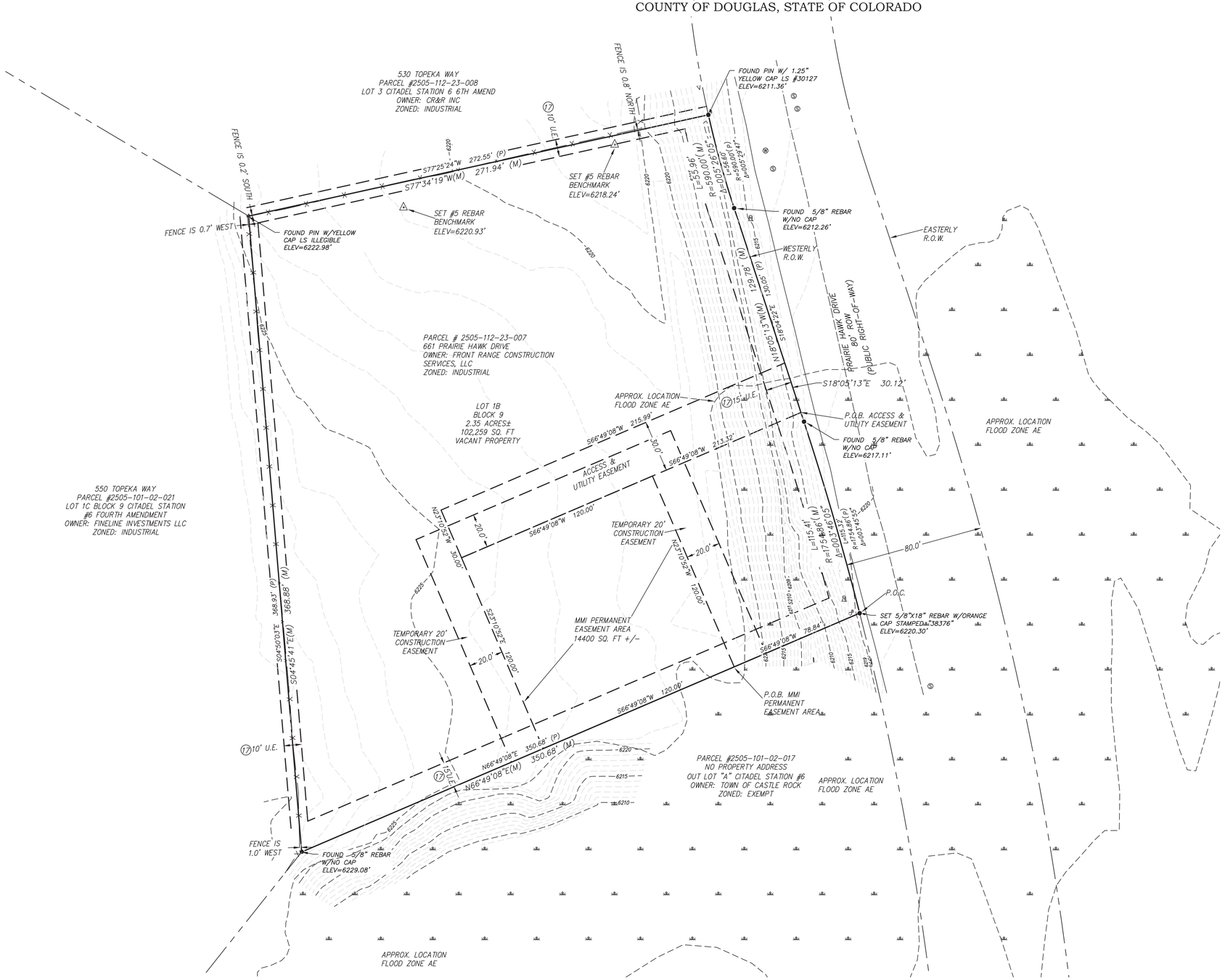
30' 0 30' 60'
HORIZONTAL SCALE IN FEET

DRAWN BY: MJJ	DATE:11/23/22 PROJECT NO. 6436 ALTA
CHECKED BY: EEF	DATE:11/23/22 SCALE: 1" = 30'
FIELD WORK COMPLETED: 11/08/2022	SHEET 1 OF 2

Docusign Envelope ID: F33C53BA-E011-4862-B74A-DB580AD09251

ALTA/NSPS LAND TITLE SURVEY

LOT 1B, BLOCK 9, CITADEL FILING 6, FOURTH AMENDMENT
SECTION 11, TOWNSHIP 8 SOUTH, RANGE 67 WEST
COUNTY OF DOUGLAS, STATE OF COLORADO



BASIS OF BEARINGS:

CONSIDERING THE SOUTH LINE OF LOT 1B TO HAVE AN ASSUMED BEARING OF N66°49'08"E AND MONUMENTED AS SHOWN HEREON.

UNITS OF MEASUREMENT ARE US SURVEY FEET REFERENCED TO GROUND.

"NOTICE: ACCORDING TO COLORADO LAW YOU MUST COMMENCE ANY LEGAL ACTION BASED UPON ANY DEFECT IN THIS SURVEY WITHIN THREE YEARS AFTER YOU FIRST DISCOVER SUCH DEFECT. IN NO EVENT MAY ANY ACTION BASED UPON ANY DEFECT IN THIS SURVEY BE COMMENCED MORE THAN TEN YEARS FROM THE DATE OF THE CERTIFICATION SHOWN HEREON."

LEGEND & ABBREVIATIONS:

SUBJECT PROPERTY LINE	5/8" RB FOUND (AS DESCRIBED)	R.O.W.	RIGHT-OF-WAY
ADJOINER PROPERTY LINE	FOUND CHISELED CROSS	RB	REBAR
EASEMENT	5/8" RB WITH CAP SET	AC.	ACRES
ROAD RIGHT OF WAY	FIBER OPTIC PEDESTAL	(M)	MEASURED VALUE
ROAD CENTER LINE	ELETRIC PEDESTAL /TRANSFORMER	(P)	PLATTED VALUE
FLOOD ZONE AE	GAS METER	O/S	OFFSET
WOOD FENCE	WATER METER	17	REFERS TO EXCEPTION NO.
CONCRETE	UTILITY POLE		
	SITE BENCHMARK		

CLIENT:
FIVE NINE DESIGN GROUP

REVISIONS:

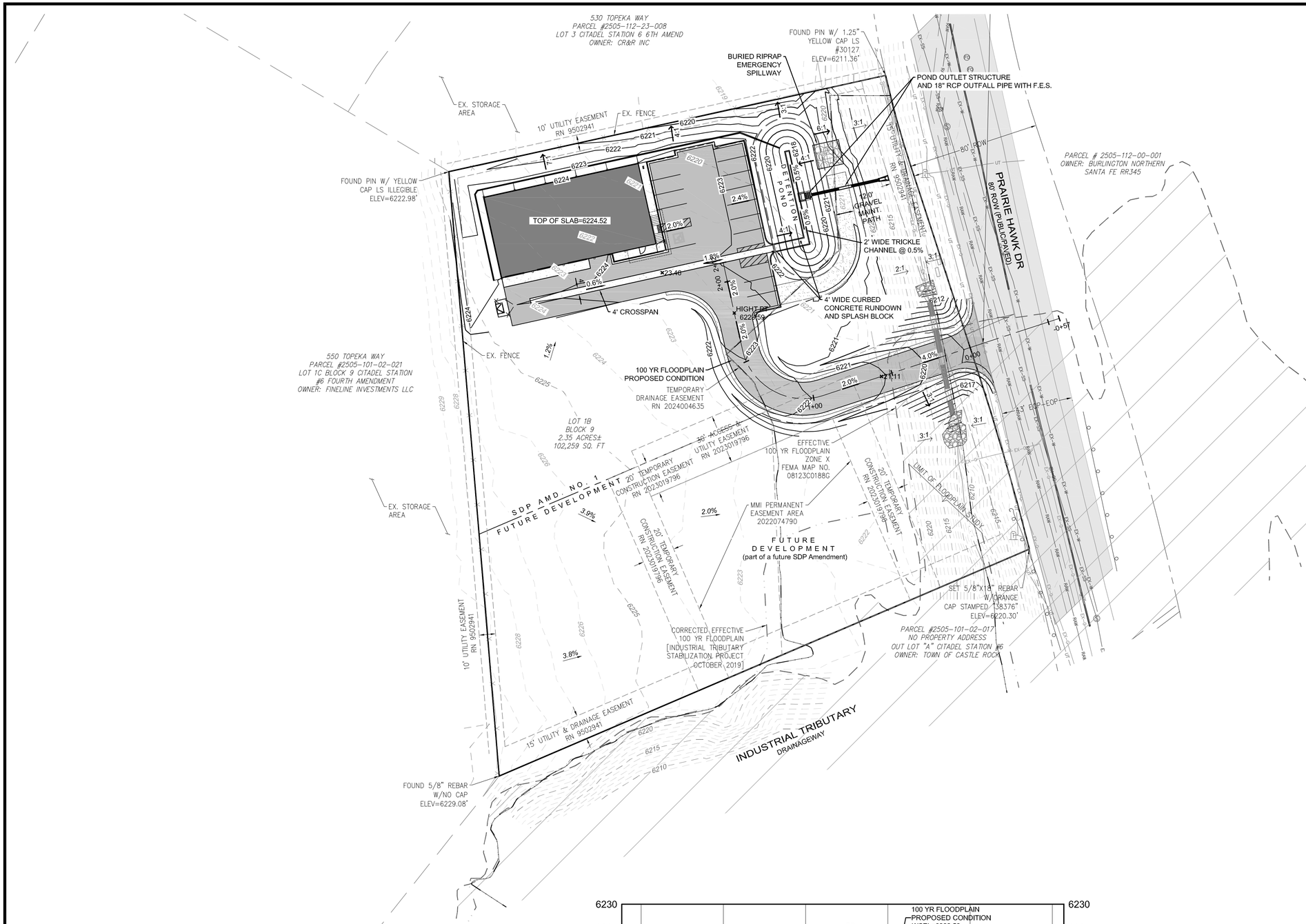
NO.	DATE	DESCRIPTION
1	12/20/22	1ST COMMENTS
2	02/06/23	2ND COMMENTS
3	03/06/23	3RD COMMENTS
4	03/15/23	REVISE LEGALS

encompass
Providing Solutions
10901 W. 120TH AVE, SUITE 400
BROOMFIELD, COLORADO 80021
303-955-6080
WWW.ENCOMPASSSERVICES.COM

30' 0 30' 60'
HORIZONTAL SCALE IN FEET

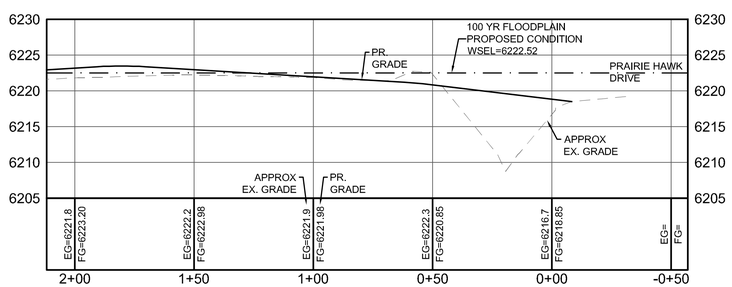
DRAWN BY: MJJ | DATE:11/23/22 | PROJECT NO. 64366 ALTA
CHECKED BY: EEF | DATE:11/23/22 | SCALE: 1" = 30'
FIELD WORK COMPLETED: 11/08/2022 | SHEET 2 OF 2

Docusign Envelope ID: F33C53BA-E011-4862-B74A-DB580AD09251



LEGEND

- AREA OUTSIDE OF LIMITS OF CONSTRUCTION
- PROPOSED ASPHALT
- PROPOSED GRAVEL
- PROPOSED RIPRAP
- EFFECTIVE 100-YR FLOODPLAIN
- CORRECTED 100-YR FLOODPLAIN [INDUSTRIAL TRIBUTARY STABILIZATION PROJECT]
- PROPOSED 100-YR FLOODPLAIN
- PROPERTY LINE
- RIGHT-OF-WAY
- ADJACENT PROPERTY LINE
- EXISTING EASEMENT
- PROPOSED EASEMENT
- EXISTING FENCE
- EXISTING GUARDRAIL
- EXISTING WATER MAIN
- EXISTING WATER MANHOLE
- EXISTING RAW WATER LINE
- EXISTING SANITARY SEWER & MANHOLE
- EXISTING GAS LINE
- EXISTING FIBER OPTIC LINE
- EXISTING FIBER OPTIC VAULT LID
- EXISTING COMM PEDESTAL
- LIMIT OF CONSTRUCTION



Driveway PROFILE
SCALE: (H) 1" = 30' (V) 1" = 10'
START STA: -0+57.00, END STA: 2+11.79

811 Know what's below. Call before you dig.

CAUTION: NOTICE TO CONTRACTOR

THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF THE VARIOUS UTILITY COMPANIES AND, WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE LOCAL UTILITY LOCATION CENTER AT LEAST 48 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATIONS OF THE UTILITIES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.

J:\Projects\25250505\dwg\SDP\SDP-C0 Grading Plan.dwg 7/29/2025

2N CIVIL
303.925.0544
www.2ncivil.com

PREPARED FOR:
FRONT RANGE CONSTRUCTION SERVICES, LLC
5863 KINGSFIELD ST
CASTLE ROCK, COLORADO 80104

Variance Exhibit
Driveway Plan & Profile
FRONT RANGE CONSTRUCTION
CASTLE ROCK, COLORADO

REVISIONS: BY: DATE:
1.
2.
3.
4.

PROJECT NUMBER: 25005
ISSUED DATE: XX-XX-XXXX
DESIGNED BY: TEW
REVIEWED BY: EPT

Variance Exhibit

1 of 1

Development Services
100 N. Wilcox Street
Castle Rock, CO 80104
720-733-2200 FAX 720-733-2231

NO. TCV25-00__

DATE 10-15-25

TECHNICAL CRITERIA VARIANCE APPLICATION

DEVELOPMENT Front Range Construction

LEGAL DESCRIPTION OF SUBJECT PROPERTY
Lot 1B, Block 9, Citadel Station Filing 6, Fourth Amendment

VARIANCE REQUESTED:

Code Section(s) 2019 Storm Drainage Design and Technical Criteria Manual Section 13.3.12 Trash Racks

Describe the Variance Requested
The purpose of this application is to request a variance from Section 13.3.12 that states that control orifices are to be 2.5 inches or greater in diameter or 2-inches square. The variance is to allow for smaller control orifices.

1. Describe the exceptional situation or condition that exists
The tributary area to the FSD pond is only 0.73 acres. Based on this small size, a 2-inch square orifice cannot control the release of the WQCV to 40 hours.

2. Describe the difficulty or hardship that would be created by a strict enforcement of the code
To comply with the code would result in non-compliance with the

3. Describe why there would not be any adverse impact on public health, safety and welfare
Utilizing smaller holes will require more frequent cleaning of the pond outlet structure to maintain its operation, but there will be no adverse impacts on public health, safety, or welfare.

Additional Information:

1. *Attach an improvement survey.*
2. *Attach a drawing showing the intended uses.*
3. *Provide any other information helpful to discussion.*

PROPERTY OWNER

Name: Front Range Development Company LLC

Address: 5863 Kingsfield St.

Castle Rock, CO 80104

Phone #: 303.931.4669

Fax #: _____

APPLICANT'S REPRESENTATIVE (If applicable)

Name: 2N Civil LLC

Address: 6 Inverness Court East, #125

Englewood, CO 80112

Phone: 303.925.0544

Fax: _____

Jesse Jutowski

Signature of Applicant

For Staff Use Only

Staff Recommendation: Approved ☐ Yes ☐ No

_____

Signature

- ☐ Public Works Director
- ☐ Director of Castle Rock Water
- ☐ Parks & Recreation Director
- ☐ Development Services Director

_____

Date

Comments

_____

_____

Conditions of Acceptance

_____

_____

Castle Rock Water
175 Kellogg Court, Castle Rock CO 80109
720-733-6000

Phase III Drainage Report Checklist

The Phase III Drainage Report must be in conformance with the latest Town of Castle Rock Storm Drainage Design and Technical Criteria Manual available on the Town's website.

The Phase III Drainage Report must be signed and sealed by a Professional Engineer licensed in the State of Colorado. The purpose of the Phase III Drainage Report is to update the concepts, and to present the design details on construction plans for the drainage facilities discussed in the Phase II Drainage Report.

The preparer should contact and work with the Town Stormwater Engineering Staff regarding any design, master planning and existing system questions (720-733-6000). The following outline sets forth the **required minimum** content to be provided in the Phase III Drainage Report that shall be submitted with the Planned Development Plan or Straight Zoning documents. A copy of this checklist must be submitted with the Phase III Drainage Report.

Please see Chapter 4 of the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual for additional details and information. Please check off the following items to assure your report is complete. Appropriate notations shall be provided with the checklist. For example, if a specific item is not addressed or not applicable, an explanation needs to be provided.

Included	N/A	
		I. COVER SHEET
✓		A. Name of Project, including legal name of development
✓		B. Address
✓		C. Owner
✓		D. Developer
✓		E. Engineer
✓		F. Submittal date and revision dates as applicable
✓		**II. GENERAL LOCATION AND DESCRIPTION**
✓		A. Site Location
✓		B. Description of Property and Land Use
✓		**III. DRAINAGE BASIN AND SUB-BASINS**
✓		A. Major Drainage Basins
✓		B. Minor Drainage Basins
✓		**IV. DRAINAGE DESIGN CRITERIA**
✓		A. Regulations
✓		B. Drainage Studies, Master Plans, Site Constraints
✓		C. Hydrology
✓		D. Hydraulics
✓		E. Water Quality Enhancement

Phase III Drainage Report Checklist

Included	N/A	
✓		**V. STORMWATER MANAGEMENT FACILITY DESIGN**
✓		A. Stormwater Conveyance Facilities
✓		B. Stormwater Storage Facilities
✓		C. Water Quality Enhancement Best Management Practices
✓		D. Floodplain Modification
✓		E. Additional Permitting Requirements
✓		F. General
✓		**VI. CONCLUSIONS**
✓		A. Compliance with Standards
✓		B. Variances
✓		C. Drainage Concept
✓		**VII. REFERENCES**
✓		**VIII. APPENDICES**
✓		A. Hydrologic Computations
✓		B. Hydraulic Computations
✓		C. Water Quality Enhancement Best Management Practices
✓		D. Referenced Information
✓		**OVERALL DRAINAGE PLAN (IN POCKET)**
		DETAILED DRAINAGE PLANS (IN POCKET)

Notes/Comments:

APPENDIX E

DRAINAGE MAPS

EXISTING DRAINAGE BASIN PLAN

LOT 1B, BLOCK 9, CITADEL STATION FILING 6, FOURTH AMENDMENT
LOCATED IN THE NORTHWEST ONE-QUARTER OF SECTION 11, TOWNSHIP 8 SOUTH, RANGE 67 WEST OF THE 6TH P.M.,
TOWN OF CASTLE ROCK, COUNTY OF DOUGLAS, STATE OF COLORADO

DRAINAGE LEGEND

EX-1 — BASIN NAME
0.0 ac — BASIN AREA
.00 — 5 YR RUNOFF COEFFICIENT
.00 — 100 YR RUNOFF COEFFICIENT
1 — BASIN DESIGN POINT
RUNOFF FLOW ARROW
POND OVERFLOW PATH
PROPOSED BASIN LIMIT
PR. SUB-BASIN LIMIT

LEGEND

- PROPOSED ASPHALT
- PROPOSED GRAVEL
- PROPOSED RIPRAP
- EFFECTIVE 100-YR FLOODPLAIN
- CORRECTED EFFECTIVE 100-YR FLOODPLAIN
- PROPOSED 100-YR FLOODPLAIN
- PROPERTY LINE
- RIGHT-OF-WAY
- ADJACENT PROPERTY LINE
- EXISTING EASEMENT
- PROPOSED EASEMENT
- EXISTING FENCE
- EXISTING GUARDRAIL
- 5280 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- 5280 PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED STORM SEWER PIPE
- PROPOSED FLOW LINE
- EX-W EXISTING WATER MAIN
- W EXISTING WATER MANHOLE
- RAW EXISTING RAW WATER LINE
- EX-SS EXISTING SANITARY SEWER & MANHOLE
- G EXISTING GAS LINE
- FO EXISTING FIBER OPTIC LINE
- FO EXISTING FIBER OPTIC VAULT LID
- F EXISTING COMM PEDESTAL

e **EXISTING CONDITIONS**

Design Point	Contributing Basin(s)	Area (ac)	Q_5 (cfs)	Q_{100} (cfs)
O-1	OS-A2, Sub-Basin D1*	29.39	-	12.20
1	EX-1, OS-A2, Sub-Basin D1*	35.58	-	35.29
2	EX-1, OS-A2, Sub-Basin D1*, EX-2	36.81	-	38.24

*Sub-Basin D1 defined in Reference No. 4

Minor storm flows not provided in referenced reports thus not tabulated.

0 80' 160'
SCALE: 1" = 80'

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303.925.0544
www.2ncivil.com

PREPARED FOR:
Front Range Development Company, LLC
5863 Kingsfield Street
Castle Rock, Colorado 80104

Existing Basin Plan
FRONT RANGE CONSTRUCTION
Castle Rock, Colorado

REVISIONS: BY: DATE:
1.
2.
3.
4.

PROJECT NUMBER: 25005
ISSUED DATE: 10-31-25
DESIGNED BY: TEW
REVIEWED BY: EPT

Existing Basin Plan

1

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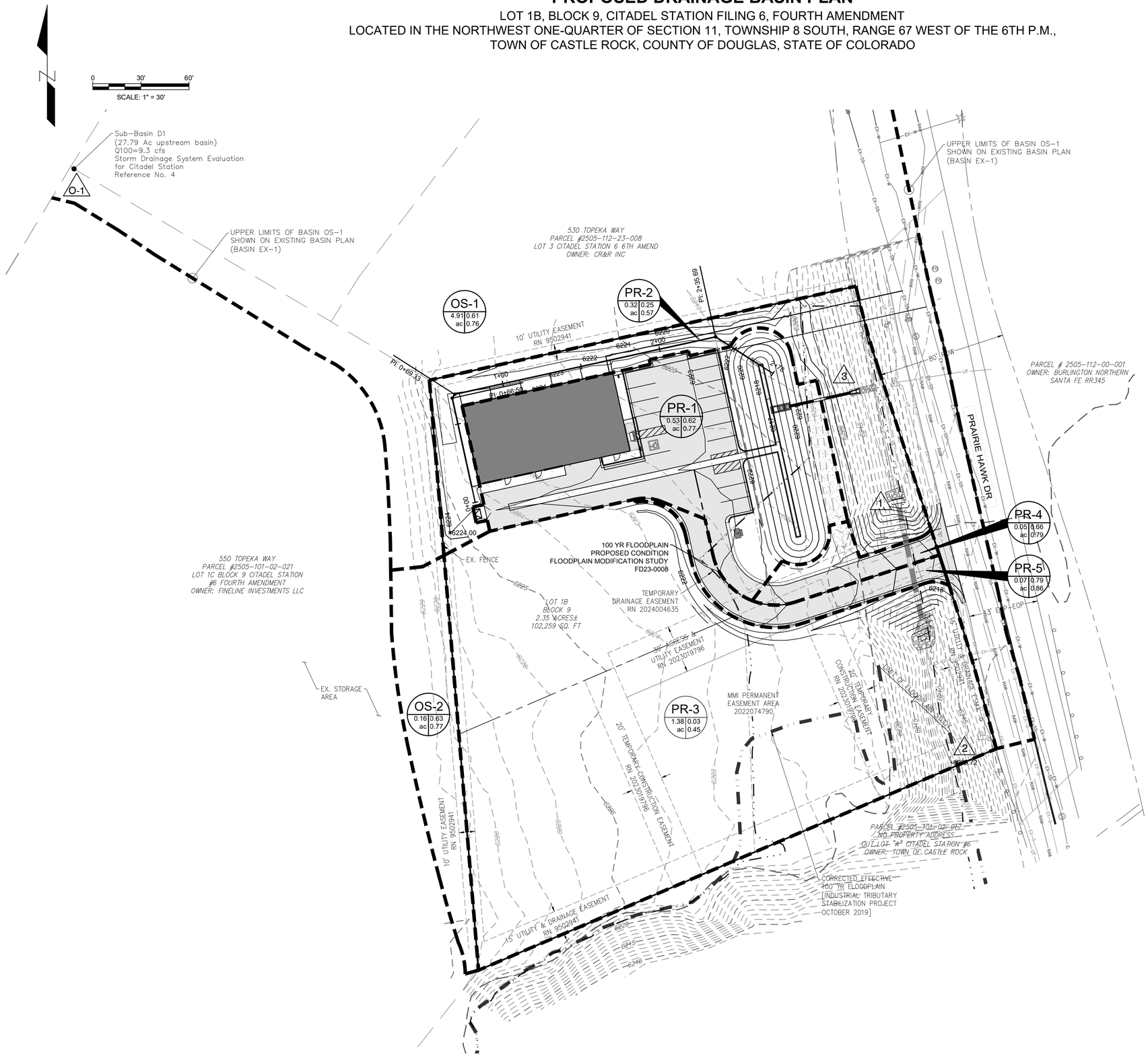
PROPOSED DRAINAGE BASIN PLAN

LOT 1B, BLOCK 9, CITADEL STATION FILING 6, FOURTH AMENDMENT
LOCATED IN THE NORTHWEST ONE-QUARTER OF SECTION 11, TOWNSHIP 8 SOUTH, RANGE 67 WEST OF THE 6TH P.M.,
TOWN OF CASTLE ROCK, COUNTY OF DOUGLAS, STATE OF COLORADO



DRAINAGE LEGEND

PR-1 — BASIN NAME
0.0 ac — BASIN AREA
.00 — 5 YR RUNOFF COEFFICIENT
.00 — 100 YR RUNOFF COEFFICIENT
1 — BASIN DESIGN POINT

RUNOFF FLOW ARROW
POND OVERFLOW PATH
PROPOSED BASIN LIMIT
PR. SUB-BASIN LIMIT

LEGEND

- PROPOSED ASPHALT
- PROPOSED GRAVEL
- PROPOSED RIPRAP
- EFFECTIVE 100-YR FLOODPLAIN
- CORRECTED EFFECTIVE 100-YR FLOODPLAIN
- PROPOSED 100-YR FLOODPLAIN
- PROPERTY LINE
- RIGHT-OF-WAY
- ADJACENT PROPERTY LINE
- EXISTING EASEMENT
- PROPOSED EASEMENT
- EXISTING FENCE
- EXISTING GUARDRAIL
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED STORM SEWER PIPE
- PROPOSED FLOW LINE
- EXISTING WATER MAIN
- EXISTING WATER MANHOLE
- EXISTING RAW WATER LINE
- EXISTING SANITARY SEWER & MANHOLE
- EXISTING GAS LINE
- EXISTING FIBER OPTIC LINE
- EXISTING FIBER OPTIC VAULT LID
- EXISTING COMM PEDESTAL

PROPOSED CONDITIONS

Design Point	Contributing Basin(s)	Area (ac)	Q_5 (cfs)	Q_{100} (cfs)
1	OS-A2, Sub-Basin D1, OS-1, PR-1*, PR-2, PR-4	35.20	-	37.06
2	OS-A2, Sub-Basin D1, OS-1, OS-2, PR-1*, PR-2, PR-3, PR-4, PR-5	36.81	-	41.63
3	PR-1*	0.53	-	0.69

*Peak Outflow from Basin PR-1 determined from MHFD-Detention V4.07 workbook pond outflow

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303.925.0544
www.2ncivil.com

PREPARED FOR:
Front Range Development Company, LLC
5863 Kingsfield Street
Castle Rock, Colorado 80104

Proposed Basin Plan
FRONT RANGE CONSTRUCTION
Castle Rock, Colorado

REVISIONS:
1.
2.
3.
4.

BY: DATE:

PROJECT NUMBER: 25005
ISSUED DATE: 10-31-25
DESIGNED BY: TEW
REVIEWED BY: EPT

Proposed Basin Plan

2

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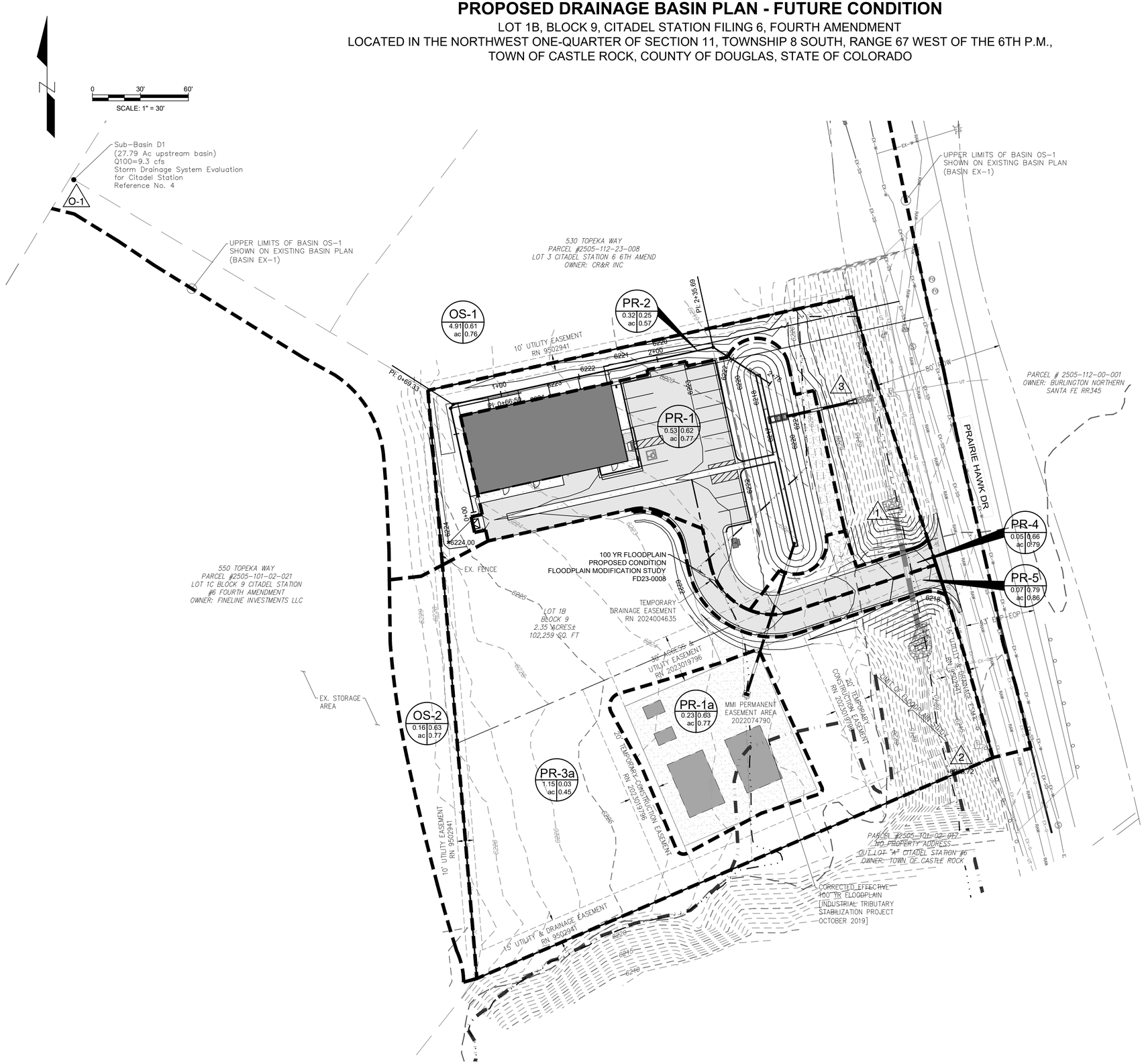
PROPOSED DRAINAGE BASIN PLAN - FUTURE CONDITION

LOT 1B, BLOCK 9, CITADEL STATION FILING 6, FOURTH AMENDMENT
LOCATED IN THE NORTHWEST ONE-QUARTER OF SECTION 11, TOWNSHIP 8 SOUTH, RANGE 67 WEST OF THE 6TH P.M.,
TOWN OF CASTLE ROCK, COUNTY OF DOUGLAS, STATE OF COLORADO



DRAINAGE LEGEND

- BASIN NAME (PR-1)
- 5 YR RUNOFF COEFFICIENT (0.0 ac, .00)
- 100 YR RUNOFF COEFFICIENT (.00)
- BASIN AREA
- BASIN DESIGN POINT (1)
- RUNOFF FLOW ARROW
- POND OVERFLOW PATH
- PROPOSED BASIN LIMIT
- PR. SUB-BASIN LIMIT

LEGEND

- PROPOSED ASPHALT
- PROPOSED GRAVEL
- PROPOSED RIPRAP
- EFFECTIVE 100-YR FLOODPLAIN
- CORRECTED EFFECTIVE 100-YR FLOODPLAIN
- PROPOSED 100-YR FLOODPLAIN
- PROPERTY LINE
- RIGHT-OF-WAY
- ADJACENT PROPERTY LINE
- EXISTING EASEMENT
- PROPOSED EASEMENT
- EXISTING FENCE
- EXISTING GUARDRAIL
- EXISTING MAJOR CONTOUR (5280)
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR (5280)
- PROPOSED MINOR CONTOUR
- PROPOSED STORM SEWER PIPE
- PROPOSED FLOW LINE
- EXISTING WATER MAIN (EX-W)
- EXISTING WATER MANHOLE (W)
- EXISTING RAW WATER LINE (RAW)
- EXISTING SANITARY SEWER & MANHOLE (EX-SS)
- EXISTING GAS LINE (G)
- EXISTING FIBER OPTIC LINE (FO)
- EXISTING FIBER OPTIC VAULT LID (FO)
- EXISTING COMM PEDESTAL (F)

PROPOSED FUTURE CONDITIONS

Design Point	Contributing Basin(s)	Area (ac)	Q_5 (cfs)	Q_{100} (cfs)
1	OS-A2, Sub-Basin D1, OS-1, PR-1*, PR-2, PR-4	35.43	-	37.35
2	OS-A2, Sub-Basin D1, OS-1, OS-2, PR-1*, PR-2, PR-3, PR-4, PR-5	36.81	-	41.40
3	PR-1*, PR-1a*	0.76	-	0.98

*Peak Outflow from Basins PR-1 & PR-1a determined from MHFD-Detention V4.07 workbook pond outflow

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www.2ncivil.com

PREPARED FOR:
Front Range Development Company, LLC
5863 Kingsfield Street
Castle Rock, Colorado 80104

Proposed Basin Plan - Future Condition

FRONT RANGE CONSTRUCTION
Castle Rock, Colorado

REVISIONS:
1.
2.
3.
4.

BY: DATE:

PROJECT NUMBER: 25005
ISSUED DATE: 10-31-25
DESIGNED BY: TEW
REVIEWED BY: EPT

Proposed Basin Plan - Future Condition

3

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