# FINAL DRAINAGE REPORT
## FOR
# CENTERRA SOUTH
**PZ# 24-00131**

**July 2025**

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## CITY OF LOVELAND CERTIFICATION STATEMENT

"I hereby certify that this report for the final drainage design of Centerra South was prepared by me (or under my direct supervision) in accordance with the provisions of the *City of Loveland Storm Drainage Criteria* for the owners thereof."

SIGNATURE: _____

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# I. INTRODUCTION

The following report shall act as a guide for the City of Loveland (hereafter called the "City") and the developer to use for the final drainage design of Centerra South (hereafter called the "Site"). The report narrative will include a summary of existing Site conditions to provide insight into project constraints/considerations, followed by a comprehensive view of proposed facilities. The discussion of proposed drainage plans shall focus on conformance to existing drainage reports and governing design codes, as well as on the Site's approach to stormwater quality.

Centerra South resides in the southwest corner of the HWY 34 / I-25 interchange. This area is generally untouched but rapidly developing; the Site and its associated improvements to adjacent roads are anticipated to become highly trafficked and centric to surrounding attractions. Major development and infrastructure improvements have occurred directly north of the Site and development is currently taking place directly west of the Site. Undeveloped land remains directly to the east and south, but the land to the east is predicted to feature future development soon. The general surrounding area is host to varied land uses including: a high school, a major recreational park, a railroad, business and commercial areas (restaurants, car dealerships, shopping, etc.), an airport, a medical center, irrigation facilities, residential subdivisions, an RV Resort, and I-25.

The following report will propose a full drainage plan that accounts for surrounding runoff patterns and full build-out conditions, detains and treats on-site runoff, and conveys flows off-site in manner that does not affect downstream conditions within the watershed. Due to the area currently being developed and planned, there is very little detail provided on the Master drainage planning level to guide design; understanding historic conditions and designing proposed infrastructure to maintain these conditions will be a key aspect of this study.

Some issues raised by the drainage study indicate that Storm system 04 may be taking too much flow by future developments, it is likely that the D basins may need to be conveyed south when future developments occur via pipe system or open channel, rather than tie into the upstream portions of Storm 04 as indicated by this study.

Current design of the RAB on the west side of the site is showing grading to occur and fill in part of the pond developed by the Chilson-Stroh Farms development. The proposed grading is shown to remove approximately 58.08 cubic yards of volume from the existing pond (or 0.036 acre-ft). This combined with the removal of roughly 0.4 acres of roadway that was previously tributary to their pond, it is a negligible difference. The pond was also constructed with an extra foot of freeboard in between their 100-year WSEL and the invert of the spillway, in the event that the removal of volume does make an impact.

# II. GENERAL LOCATION AND DESCRIPTION

## A. Location

Centerra South is located in the Northeast corner of Section 16, Township 5 North, Range 68 West of the 6th P.M., City of Loveland, County of Larimer, State of Colorado.

The Site is bordered to the north by East Eisenhower Boulevard, to the south by East County Road 20 E, to the west by Loveland Sports Park and the Chilson-Stroh Farms development, and to the east by undeveloped land.

A shopping center and business area is located north/northeast of the Site but will not be relevant to this study because runoff from this development is conveyed east before reaching the Site. To the northwest of the Site is the Loveland RV Resort—runoff from this area has already been accounted for with the Chilson-Stroh Farms development and will not be relevant to this study except when discussing the drainage patterns of the adjacent development. Loveland Sports Park to the west is a large open-space area with soccer/football fields, a skate park, basketball courts, etc. and does not hold any significance to the Site's drainage.

The Chilson-Stroh Farms development is located north of Loveland Sports Park and features commercial development (on the north half of the property) and residential development (on the south half of the property). The drainage design of this development will interact with the Site's drainage design, therefore this study must adhere to the intent of the existing Chilson-Stroh Farms report. The undeveloped land to the south is also meaningful to this study as detained flows from the Site will drain through this space in a general southeast direction toward the Site's final outfall point. This area must be analyzed to ensure alignment with any planned improvements and to ensure downstream conditions are maintained. Similarly, the undeveloped land to the east may be a part of detained runoff's flow path as it leaves the Site, both in its current condition and in its potential developed condition. The following proposed drainage plan will suggest that flows be conveyed across E County Road 20E to drain southeast at an existing crossing that is located on this property. Not only is it ideal to utilize an existing crossing due to Site constraints, but this leaves the opportunity to coordinate a regional detention pond with this property's developer in the future, should it be developed.

Planned development of the Site includes improvements to East Eisenhower Boulevard, extensions of Mountain Lion Drive and Rocky Mountain Avenue, and improvements to/extension of Hans Peak Drive. E County Road 20E will be improved at an unknown time in the future and this work/design will be provided by CDOT. Improvements within East Eisenhower Boulevard will feature intersections that connect to the northern portions of Hans Peak Drive and Rocky Mountain Avenue in addition to a one-way exit/entrance point between the two intersections.

The Site is not located within a floodplain, both a FEMA National Floodplain Insurance Program FIRM and FIRMette exhibit are provided in Appendix A.

A Vicinity Map is provided in Appendix A and depicts the general location of the project Site and the surrounding areas. An approximate latitude and longitude for the center of the project is N40°24'12.07" and W105°0'25.25". A Google Earth image is provided following the Vicinity Map for a more specific visual representation of the area, this image is also provided below for quick reference.




## B. Description of Property

The Centerra South Development property boundary encompasses 150.91-acres of area. The property is currently all farmland apart from an existing residence and oil/gas infrastructure along the northern edge. A dirt road originates at the residence (located at the midpoint of the property's northern edge) and runs directly south to the other end of the property. This road slightly affects drainage patterns as it has slight berms on each side. Another dirt road is present to provide access to the oil/gas facility located in the northeast portion of the Site but does not extend the length of the property. A concrete-lined irrigation ditch runs parallel to East Eisenhower Boulevard just north of the residence and utility infrastructure, and there is evidence of minor irrigation

drainageways throughout the rest of the property.

The southeast corner of the Site acts as the low-point of the entire property, making it the historic design point utilized to analyze existing conditions. Across from this on-site low point is a detention area located within the adjacent property; it is unknown whether this space was intended to detain runoff or if it inadvertently provides detention. Running parallel to E County Road 20E on the northern side is the Great Western Railroad—runoff that drains from both the Centerra South Property and the property to the east must cross the tracks in order to travel south/southeast according to historic patterns. The only existing railroad pipe crossing that is known at this time is located within the aforementioned detention area, just east of the Site's southeast corner.

Groundcover on-site is a mixture of native grasses and cultivated crop as the land is irrigated farmland. The property is actively maintained and used for agriculture; as per aerial imagery, the property is separated into different fields so that at different times of the year areas may be vegetated or tilled. Neither trees/larger vegetation nor shrubbery/overgrowth are present on the Site. There is exposed soil throughout the property and sparse native grasses.

The existing topography on-site is characterized by slopes ranging from 0% to 3% throughout the majority of the Site. Slopes tend to be more shallow within the northern portion of the Site and gradually become steeper towards the south, the steepest slopes may be seen within the southeast corner. The Site as a whole follows a general northwest to the southeast drainage pattern. Soils for the Site are shown on the *USDA NRCS Custom Soil Resource Report for Larimer County Area* (Reference 3) located in Appendix A. Soil classifications within the Site include Nunn Clay Loam with 0 to 1 percent slopes (73) and Nunn Clay Loam with 1 to 3 percent slopes (74). The Site's soils are entirely Hydrologic Soil Group (HSG) Type C. A brief description of the HSG based on the Natural Resources Conservation Service (Reference 3) is provided below:

- **Type A:** Soils are identified as having a high infiltration rate when thoroughly wetted, low runoff potential and a high rate of water transmission. Typically, these soils consist of deep, well drained to excessively drained sands or gravelly sands.
- **Type B:** Soils are identified as having moderate infiltration rates when thoroughly wetted, moderate runoff, and moderate to severe erosion hazard. Typically, these soils consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture.
- **Type C:** Soils are identified as having slow infiltration rates when thoroughly wet and a slow rate of water transmission. Typically, these soils consist of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture.

- **Type D:** Soils are identified as having a very slow infiltration rate when thoroughly wet, high runoff potential and a very slow rate of water transmission.

A wind erodibility group (WEG) consists of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. Please refer to Table 1 below for a more comprehensive description of the soils found on-Site.

**Table 1: Soils Located within the Project Site**

| Soil | Description | HSG | % Area on Site | WEG |
|---|---|---|---|---|
| 73 | Nunn Clay Loam, 0 to 3 percent slopes | C | 90.0% | 6 |
| 74 | Nunn Clay Loam, 1 to 3 percent slopes | C | 10.0% | 6 |

## III. DRAINAGE BASINS AND SUB-BASINS

### A. Major Basin Description

There are FOUR major basins on site, A, B, C, and D. Basins B and C are in-line. The pond location at the south end of the proposed site is provided here during the interim condition between phases of construction. It has been fully designed to provide water quality until ultimate detention in the southeast corner of the site is planned and developed. Caution was taken with setting the invert of the pond too low so that it could be later tied-in further south without major issues.

The site lies within the Outlet Mall master drainage basin and ultimately will end up in the Big Thompson River. There are large improvements currently underway and planned for the future in the area of the Big Thompson River south of E County Road 20 E. Coordination is being had with the City on certain improvements that will be triggered with the development of the Centerra South project. The pond being designed with this phase of the development is providing permanent water quality, albeit in a temporary location so that discharging water may infiltrate on-site without crossing over into territory that would trigger the downstream improvements prematurely.

### A. Sub-Basin Description

Sub-basins across the site are generally very small. This is largely due to the flat, dense nature of the commercial areas that make up the majority of the site. Building frontages needed to be kept as flat as possible and ADA slopes achieved throughout the commercial area, which produced a large amount of curb inlets separating drainage basins. This, in conjunction with having to pick up Offsite basins to the North of HWY 34, created larger pipe sizes as drainage approached the pond to the south end of the site.

Some of the sub-basins within the site are being left empty during this phase of development, but will be developed at a later date. For the purposes of pipe sizing, these basins were analyzed at their ultimate imperviousness values using the rational method. For the purposes of inlet capacity, the basins were split up so that inlets were not sized to take more flow than they ultimately would receive. In the interim condition, the area will be studied to ensure that inlets are accurately sized for the interim areas they are picking up until full site development has occurred.

## IV. DRAINAGE DESIGN CRITERIA

### A. Regulations

This study was prepared in accordance with the *City of Loveland Storm Drainage Criteria* (hereafter called "Manual") and presents the 2-year (minor) and 100-year (major) storm events. This drainage report/plan for the Site is based on the specifications and design methodology outlined in the Manual and in Mile High Flood District's *Urban Storm Drainage Criteria Manual* (hereafter called "USDCM") where City of Loveland criteria defers to the Mile High Flood District.

### B. Hydrologic Criteria

Hydrologic analysis was performed and calculations were made using the Rational Method. Rainfall intensities were taken from Figure 502 of the Loveland Storm Drainage Criteria Manual (March 1986).

The proposed sub-basin characteristics were developed and used for the computation of peak flow rates and for the hydraulic design. The time of concentration and peak flow rate calculations for each sub-basin are presented in the Appendix. The design frequencies analyzed were the 2-year (minor) and the 100-year (major) storm events. The Rational Method procedures and methodology follow Urban Drainage criterions outlined in the USDCM. The percent impervious was determined using Table 6-2 and 6-3 from *USDCM Volume 1*.

### C. Hydraulic Criteria

Analysis of curb and gutter flow was computed using the Mile High Flood District street capacity / inlet capacity spreadsheet for the specific street cross-sections developed for

the Site (per City of Loveland criteria). Inlets were added where street capacities would be exceeded or in areas of sump conditions (typically Type R inlets). Inlet capacities were calculated using the Mile High Flood District street capacity / inlet capacity spreadsheet. All capacities were evaluated for the minor (2-Year) and major (100-Year) storm events. A spreadsheet depicting maximum allowable street flow versus maximum anticipated street flow at design points is included in the appendix. Autodesk Storm and Sanitary Analysis 2024 was used to size proposed storm sewers and determine 100-yr Hydraulic Grade Line (HGL).

Per City Criteria, inlets were analyzed to account for a resultant 10-ft wide open emergency lane in all roads in the case of the major storm event. Clogging factors for Type R inlets in either or a sump or on-grade are 12% for a 5-foot inlet, 8% for a 10-foot inlet and 5% for a 15-foot inlet.

Drainage basins were routed using respective travel times and the routed flows were utilized in the storm sewer analysis.

## V. DRAINAGE FACILITY DESIGN

### A. General Concept

The site will ultimately be developed in multiple phases. This being phase 1, the main drainage infrastructure will be set up to account for proposed conditions while simultaneously planning ahead to account for ultimate conditions when the rest of the site is built-out.

The most important detail of this planning aspect will be when considering the location and nature of the pond. The Pond is located in a way that makes it easy for all the Phase 1 infrastructure to outfall into a shared location which can then be picked up at a later date and continued to the ultimate detention location.

The pipes currently proposed within this phase of development are sized based on MHFD suggested imperviousness values based on planning zones (Medium-High Density Commercial, Multifamily, Residential, etc.) and conservatively accounted for using the rational method. When future developments eventually tie into this spine infrastructure system it will have already been built to account for their flows.

For all of the Type R inlets on-site, Table 7-1 of the LSDC was followed for allowable flowline depths. In parking lot areas where not adjacent to buildings, 12” flowline depth was used. Where inlets are placed in front of buildings in the dense commercial areas, 6” flowline depth was used in the case of major events so that ponding did not occur above the curb and threaten buildings with flooding issues.

There is a multifamily parcel being developed *simultaneously* with this drainage report, right in the middle of the site. For cohesiveness, the drainage basin labels and boundaries provided by that third party engineer are being shown with this report

exactly as they were received. All areas and imperviousness from their site will be accounted for within the calculations of this report.

### B. Specific Details

All hydrologic calculations, as well as associated times of concentrations and routings, are located in Appendix C of this report. All flow is picked up via Type C or Type R inlets, or roof drains.

All flows generated with this proposed site will flow to the Pond proposed on the south side of the site, except for offsite flows that fall within the City of Loveland criteria of untreated offsite flows.

## *Major Basin A / Sub-basin OS-101 / Sub-basin OS-104*

**Basin A:** (13.8-acres, 76.7% impervious) includes all the proposed Rocky Mountain Ave extension, part of the HWY 34 improvements as well as proposed commercial and multifamily areas on-site.

The anticipated peak runoff for the minor (2-year) and major (100-year) storm events at Basin A's outfall, JP-9, is 25.21-cfs and 89.14-cfs, respectively.

**Basin OS-101:** (3.37-acres, 53% impervious) consists of open space and trail, as well as minor park and pedestrian elements. It is an existing area on the north side of HWY 34 that had previously drained to the farmers ditch. With the widening improvements occurring on HWY 34 and the associated inlets being put into the new curb, that system was required to tie into the proposed storm sewer of this development.

The anticipated peak runoff for the minor (2-year) and major (100-year) storm events generated within Basin OS-101 is 4.97-cfs and 21.79-cfs, respectively.

**Basin OS-104:** (3.34-acres, 75.5% impervious) consists of HWY-34 roadway, open space and trail, as well as minor park and pedestrian elements. It is an existing area on the north side of HWY 34 that had previously drained to the farmer's ditch. With the widening improvements occurring on HWY 34 and previous FES into the old farmer's ditch being covered up, that system was required to tie into the proposed storm sewer of this development.

The anticipated peak runoff for the minor (2-year) and major (100-year) storm events generated within Basin OS-104 is 7.20-cfs and 21.79-cfs, respectively.

## *Major Basin B / Sub-basin OS-102*

**Basin B:** (13.67-acres, 76.9% impervious) includes the majority of the parking lot to the north of the commercial buildings, as well as a good portion of Main Street and other commercial/parking to the south.

The anticipated peak runoff for the minor (2-year) and major (100-year) storm events at Basin B's outfall, JP-27, is 23.08-cfs and 77.74-cfs, respectively.

**Basin OS-102:** (3.37-acres, 83% impervious) is an existing median area within HWY 34. It had previously been contained within the bounds of the median area and discharged into a flared end section that eventually drained to the farmers ditch. With the widening improvements occurring on HWY 34 and the associated inlets being put into the new curb, that system was required to tie into the proposed storm sewer of this development.

The anticipated peak runoff for the minor (2-year) and major (100-year) storm events generated within Basin OS-102 is 1.13-cfs and 3.60-cfs, respectively.

## *Major Basin C / Multifamily Drainage Design by others*

**Basin C:** (2.43-acres, 61.8% impervious) includes the roof basin of the large above-ground parking garage. It also includes the area directly south and east of the garage that will drain to an area inlet marked by design point C2.

The anticipated peak runoff for the minor (2-year) and major (100-year) from Basins C1 and C2, is 4.15-cfs and 15.79-cfs, respectively.

**Multifamily Drainage Design:** includes the simultaneously proposed multifamily site adjacent to the parking garage, bound between Sunfield St, Morello St, Rocky Mountain Ave, and Fall River Dr. The basins from the report titled "Final Drainage Report – Avenue South Multifamily" by Kimley-Horn dated April 25th, 2025 were put directly into the drainage report for this Site as they were given. It is shown in Hydrology calculations in the appendix that corresponding values from their report were directly inserted into this report's calculations to ensure cohesiveness between proposed drainage facilities. All areas and imperviousness values from this site and the adjacent multifamily are being accounted for in detention and pipe sizing calculations for the overall Site.

Total areas and imperviousness were taken from excerpts of the drainage report titled above and can be found in Appendix A.

## *Major Basin D / Sub-basin OS-103*

**Basin D:** (65.31-acres, 71.9% impervious) includes the Hahn's Peak Ave extension on the west side of the site as well as the large future basins dedicated to high-density commercial and multifamily housing along the open space park corridor.

The anticipated peak runoff for the minor (2-year) and major (100-year) storm events at Basin D's outfall, JP-53, is 76.08-cfs and 271.74-cfs, respectively.

**Basin OS-103:** (2.27-acres, 53% impervious) consists of open space and trail, as well as minor park and pedestrian elements. It is an existing area on the north side of HWY 34 that had previously drained to the farmers ditch. With the widening improvements occurring on HWY 34 and the associated inlets being put into the new curb, that system was required to tie into the proposed storm sewer of this development.

The anticipated peak runoff for the minor (2-year) and major (100-year) storm events generated within Basin OS3 is 4.10-cfs and 17.96-cfs, respectively.

## C. Proposed Swales and Existing Channels

There are no proposed channels on-site.

## D. Detention Ponds

There is one pond being proposed with this development, on the south side of Mountain Lion Drive. This location was selected to contain the pond after discussion with City staff due to its ability to detain runoff and resume historic flow patterns to the south as it approaches the railroad.

At the direction of the City, it was requested that the pond be pumped to the surface and sheet flow southward. A storm lift station is proposed in the southwest corner of the pond. The pond volume was determined by the FAA method modeling a zero release and obtaining the 2 hour 100-yr resultant volume. The volume required is 19.1 acre-ft and 20.8 acre-ft is provided at the 100 yr elevation of 4914.3 and 23.2 acre-ft is provided at the spillover elevation of 4916. No spillway is provided since there is no berm for the pond. When stormwater in the pond reaches an elevation of 4916.00, a spillover route is provided to direct the spillover flows away from the nearby sanitary lift station and towards the south near the railroad.

In order to determine the release rate from the pond (pump discharge) the MHFD Detention program was utilized to ensure that the pond drain times correspond to the allowable drain times set forth in State Code 37-92-602 (8). The result yielded that the storm lift station should discharge 0.7 cfs (275 gpm) up to the water quality depth and 2.79 cfs (1,250 gpm) above the water quality depth. The 100-yr water surface is at an elevation of 4914.30. An alarm will be provided when the water level reaches 4915.00. The lift station will be detailed further after the City has a chance to review this concept.

It should be noted that the pond release/pump discharge rate is not based on meeting historic drainage flows. The historic 100 yr flows for the over 100 acre tributary basin are nearly 128 cfs, so the 2.79 cfs 100-yr pump discharge is much less. This occurs due to the City's wishes to minimize the flow leaving the property. In order to help achieve that, a 100 foot long level spreader will be provided which will discharge in a

sheet flow pattern at 0.03 cfs/foot to promote infiltration into the lands downstream of the level spreader.

Hydrologic calculations and pond spreadsheets can be found in Appendix C of this report.

## VI. SEDIMENT, EROSION CONTROL AND STORMWATER QUALITY

### Section One - Sediment/Erosion Control

The Sediment and Erosion control will be performed in 4 development phases as recommended by the State of Colorado. More detailed information may be found in the Stormwater Management Plan associated with this project and ultimately the entire Stormwater Discharge Associated with Construction Activities permit package obtained through the State of Colorado. Phase 1 is the Grading Phase and will depict initial installation of perimeter Control Measures. Perimeter control will ensure that no sediment laden runoff leaves the site. Phase 2 is the Infrastructure Phase. Phase 2 Control Measures will be installed for utility, paving and flatwork installation. Phase 3 Control Measures will protect the site during the vertical construction phase. The vertical construction will primarily be the construction of the individual homes which will be required to implement and maintain individual lot Control Measures. Phase 4 is permanent Control Measures and final stabilization for areas within the Limits of Construction (LOC).

Phase 1 Control Measures will be installed to protect the site during the Grading Phase. The contractor shall install a Vehicle Tracking Control pad (VTC) prior to equipment and Control Measures delivery. The plans depict two Vehicle Tracking Control pads but it is acceptable for the contractor to install only one Vehicle Tracking Control pad (VTC) as long as it's installed at the primary access point and is not bypassed in any way to access the site. Additional Tracking Control can be implemented as permanent site entrances to existing roads are defined. The contractor shall install a Wheel Wash (WW) in conjunction with the Vehicle Tracking Control pad (VTC). The Wheel Wash (WW) will be used to clean construction equipment tires prior to entering a public right-of-way. The contractor may utilize a mobile washout container service at their discretion. The contractor shall maintain the mobile washout container in accordance with the service providers guidelines.

A Stabilized Staging Area (SSA) will be installed near the Vehicle Tracking Control to provide a centralized location for deliveries, equipment and materials storage and an area to provide a centralized meeting are or place a construction trailer. Silt Fence (SF) shall be installed on the downhill side of the Stabilized Staging Area (SSA). It is often necessary to relocate and disturb Vehicle Tracking Control and Stabilized Staging Areas in order to perform grading and utility construction, which is acceptable as long as temporary or permanent replacement locations are installed prior to removal.

The contractor shall install Construction Markers (CM) delineating the work area for the project. Construction Markers (CM) will provide limits of work for a particular phase of the overall development. Compacted Earth Berms (CEB), Sediment Traps (ST) and Silt Fence (SF) will be installed prior to grading in order to intercept flow, collect and withhold sediment and release runoff. Inlet protection and curb socks shall also be installed at existing inlets along the perimeter to filter out sediment prior to runoff entering the storm sewer system. It is anticipated that the borrow area and the ponds/sediment basins are graded first in order to generate the import material required to balance the site.

A top soil Stockpile Area (SP) will be installed near the Stabilized Staging Area (SSA). The Stockpile Area (SP) will be used to stockpile topsoil during construction activities and should be limited to 10 feet in height. Stockpiling should be considered temporary and if stockpiled material is stored for more than 30 days it shall be seeded and mulched to prevent wind erosion. Silt Fence (SF) shall be installed on the downhill side of the Stockpile Area (SP). The Stockpile Area (SP) is shown on the plans but may be relocated as approved by the City of Loveland Representative.

As mass grading operations occur, additional Control Measures to provide point source erosion control, temporary stabilization and strategic runoff control will be installed, maintained and relocated as necessary to complete the earthwork. Such operations may include installation of measures including, but not limited to: straw wattles, dikes, diversion ditches, compacted earth berms, slope protection, temporary seeding and mulching, sediment traps and surface roughening. Sediment traps can be phased out when the grading is completed in a such a manner that allows for runoff to drain and collect within sediment basins. These measures will provide the contractor an opportunity to identify and remediate problem areas, establish phases of disturbance and progress through the grading Phase 1 and into Phase 2

Phase 2 Control Measures will be implemented for Utility, Paving and Flatwork installation. Phase 1 Control Measures such as the Stabilized Staging Area (SSA), Topsoil Stockpile Area (SP), Vehicle Tracking Control pad (VTC), Wheel Wash (WW) and Compacted Earth Berm (CEB) and Silt Fence (SF) shall be maintained until the proposed developments and improvements are installed, but may be relocated on a temporary or permanent basis.

The utilities will be installed utilizing standard practices such as material storage and handling, limiting the amount of open trench and placing spoils on the uphill side of the trench. If groundwater is encountered, the contractor is required to provide dewatering utilizing acceptable methods after obtaining necessary permitting.

As the streets are rough cut graded, runoff will be collected along the future curb flowline. Curbside Check Dams (W4) will be installed using the pervious method in order to collect sediment prior to paving. Curb Inlet Protection (CIP-1) shall be used for the proposed curb inlets found within the site and shall be adjusted as necessary for curb installation and paving. After paving has occurred, Curbside Check Dams Setup

(W4) shall be changed to the impervious installation method and maintained through Phase 2.

Phase 3 Control Measures will be installed to protect the area during the Vertical Construction of the individual residential lots. Each lot will be required to implement Control Measures in conformance with the Residential Lot Stormwater Management Plan (SWMP) and Chapter 1320 of the Loveland Municipal Code. During this time, which is variable depending on sales, all of the other previous Erosion Control phase Control Measures will be monitored and Phase 4 will begin, and possibly end at the discretion of the City for areas outside of the individual residential lots.

Phase 4 Control Measures are installed to establish Final Stabilization and Permanent Control Measures. Phase 4 Control Measures will reclaim surface disturbance and remove earlier phased Control Measures prior to project completion. Phase 4 shall not formally begin until Phases 1 and 2 are complete. Phase 3 may be ongoing, depending on the development schedule, but individual residential lots will be stabilized if they are not sold within the allowable permit period. The contractor shall remove the Curbside Inlet Protection (CIP-1), The Concrete Washout Area (CWA), Vehicle Tracking Control pad (VTC), Wheel Wash (WW), Stockpile Area (SP), Curbside Checkdams Setup (W4), Silt Fence (SF), Drainage Swale (DS), Construction Markers (CM), Wattle Dike (WD), Stabilized Staging Area (SSA) and any other measures that were incorporated in prior to Phase 4. The contractor shall install proposed permanent landscaping and install Seeding & Mulching (SM) in any other disturbed area. Seeding & Mulching (SM) may be replaced with Permanent Landscaping as depicted in the plans. The contractor shall be responsible for all growth within the warranty period. Although not anticipated, slopes greater than 12% or experience rutting or gullying shall receive Erosion Control Blanket (ECB) as directed by the City of Loveland Representative.

Phase 4 Permanent Control Measures will be discussed in Section Two of this section.

## Section Two – Stormwater Quality

Stormwater Quality will be achieved within the proposed, single CWP on-site.

The Water Quality Pond falls within Urban Drainage Four-Step process for Stormwater Quality Management:

Step 1 is to Employ Runoff Reduction Practices is achieved by providing numerous vegetated open space areas and draining impervious areas to vegetated channels and thereby lengthening travel times over conventional piped conduit conveyances and reducing the total peak flows.

Step 2 calls for Implementing Control Measures that Provide a Water Quality Capture Volume (WQCV) with a slow release. The engineered outlet structure in the Centerra South CWP is designed with water-release plates that discharges captured runoff at predetermined rates. By capturing and releasing at these rates, water quality can be

improved and reduced runoff benefits can be attained. The WQCV is designed with and release rates to provide a 40-hr drain time is included within

Step 3 Identifies Stabilized Drainageways as a method to reduce bed and bank erosion due to increased flow rates, flow volumes, durations and frequencies. No major drainageways are present on this site. Minor drainageways include minor and intermediate swales vegetated with native seed mixes. Conduits contain low tailwater basins and riprap pads at outlets to decrease velocities and minimize the chances for erosion to occur.

Step 4 Implements Site Specific and Other Source Control Measures. The construction period contains obligations to be met by the contractor to ensure safe handling and storage of materials to minimize the chances of point source pollutants. These practices are part of the Stormwater Management Plan for the project.

## VII. CONCLUSIONS

The primary purpose of this drainage study is to prove that proposed drainage infrastructure is in conformance with the intentions of the City of Loveland Stormwater Standards and Criteria. With the site being phased for future developments to occur and share / tie into the infrastructure proposed within this development, this report will account for all future conditions to ensure that there are no issues down the road when the storm system has to take in flows from developing areas (commercial, multifamily, planned open space, etc.).

While ultimate detention is not provided within this report, temporary conditions are being made to adequately serve the infrastructure to be put in place now, while providing permanent water quality measures. These temporary conditions are being planned in a way that they may properly serve the ultimate conditions in the future, so that future sites are not constrained by lack of depth or inadequate sizing provided by the main infrastructure being proposed herein.

Coordination efforts are constantly being made with simultaneous developments in other phase areas of the site to ensure all needs are being met, drainage-wise, utility-wise, or otherwise so that there are seamless connections between all phases of development, present and future.

## VIII. REFERENCES


1. City of Loveland. Storm Drainage Criteria (Addendum to the Urban Storm Drainage Criteria Manual Volumes 1, 2 and 3. July, 2020.

2. LandOne Engineering. Chilson-Stroh Farms Third Subdivision Final Drainage Report. May, 2020.

3. United States Department of Agriculture Natural Resources Conservation Service. Custom Soil Resource Report for Larimer County Area, Colorado, Kinston Subdivision. May, 2022.

4. Mile High Flood Control District. Urban Storm Drainage Criteria Manual Volumes 1 (March 2024) ,2 (January 2016) and 3 (March 2024).

5. SEH. Final (FOR) Drainage Report – Segment 1 US Hwy 34 Roadway Widening. November, 2022.

6. Kimley Horn. Final Drainage Report – Avenue South Multifamily. April, 2025

## 1. CONTRIBUTORS:

| Contribution | Name, Title | Initials |
|---|---|---|
| Report Prepared By: | Dylan Lektorich, Civil Designer | _____ |
| Report Reviewed By: | Bryan Clerico, P.E., Project Manager | _____ |

Note: Contributors to initial each prepared report prior to submittal.

# APPENDIX – Supporting Material

# APPENDIX A – SUPPORTING DOCUMENTS

Vicinity Map
USGS Soils Map and Properties
UDFCD Table 6-2
UDFCD Table 6-3
Loveland Storm Drainage Criteria Manual Table 502
Kimley Horn Drainage Report Excerpts – Ave South Multifamily


McDonough
Site Location
Legend
Boyd Lake Ave
UCHealth Medical Ctr of the Rockies
Centerra Pkwy
Chapungu Sculpture Park at Centerra
Rocky Mountain Avenue
Hans Peak Drive
McWhinney Blvd
Target
Foxtrail Office Park
25
34
E US-34
E Eisenhower Blvd
Loveland Ford
McDonough
Mountain Lion Drive
Loveland Sports Park
E County Rd 20 E
Big Thompson River
Google Earth
Image Landsat / Copernicus
N
4000 ft

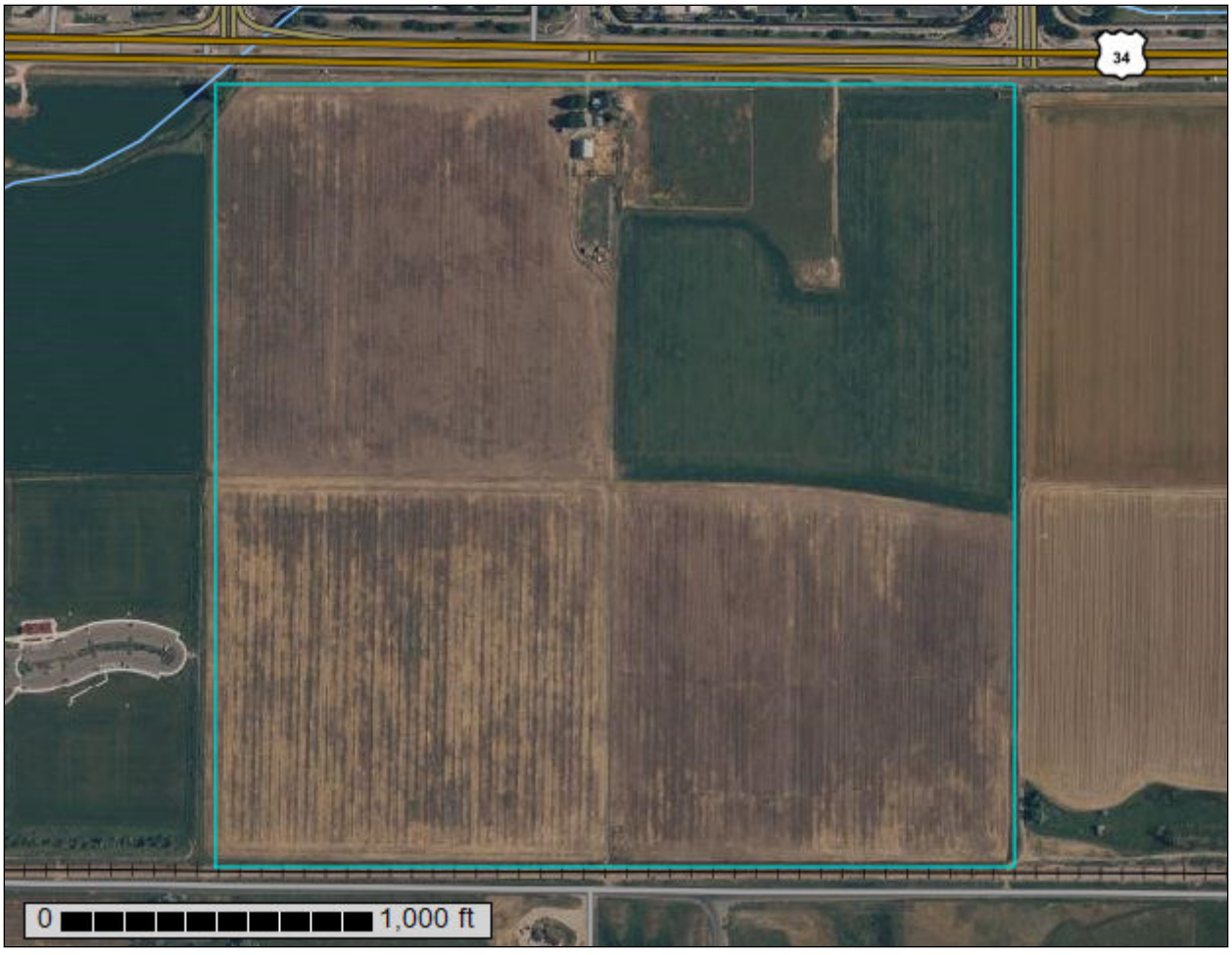
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

# Custom Soil Resource Report for Larimer County Area, Colorado




November 16, 2022

# Preface

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

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

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

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

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

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

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# How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

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

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

# Soil Map

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

# Custom Soil Resource Report
## Soil Map




Map Scale: 1:6,470 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 300 600 1200 1800

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

## MAP LEGEND

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

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

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

**Water Features**
- Streams and Canals

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

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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: Larimer County Area, Colorado
Survey Area Data: Version 17, Sep 7, 2022

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

Date(s) aerial images were photographed: Jul 2, 2021—Aug 25, 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.

# Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| 73 | Nunn clay loam, 0 to 1 percent slopes | 133.6 | 90.0% |
| 74 | Nunn clay loam, 1 to 3 percent slopes | 14.8 | 10.0% |
| **Totals for Area of Interest** | | **148.4** | **100.0%** |

# Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

# Larimer County Area, Colorado

## 73—Nunn clay loam, 0 to 1 percent slopes

### Map Unit Setting

*National map unit symbol:* 2tlng
*Elevation:* 4,100 to 5,700 feet
*Mean annual precipitation:* 14 to 15 inches
*Mean annual air temperature:* 48 to 52 degrees F
*Frost-free period:* 135 to 152 days
*Farmland classification:* Prime farmland if irrigated

### Map Unit Composition

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

### Description of Nunn

#### Setting

*Landform:* Terraces
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Pleistocene aged alluvium and/or eolian deposits

#### Typical profile

*Ap - 0 to 6 inches:* clay loam
*Bt1 - 6 to 10 inches:* clay loam
*Bt2 - 10 to 26 inches:* clay loam
*Btk - 26 to 31 inches:* clay loam
*Bk1 - 31 to 47 inches:* loam
*Bk2 - 47 to 80 inches:* loam

#### Properties and qualities

*Slope:* 0 to 1 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Well drained
*Runoff class:* Medium
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum content:* 7 percent
*Maximum salinity:* Nonsaline (0.1 to 1.0 mmhos/cm)
*Sodium adsorption ratio, maximum:* 0.5
*Available water supply, 0 to 60 inches:* High (about 9.1 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 3e
*Land capability classification (nonirrigated):* 4e
*Hydrologic Soil Group:* C
*Ecological site:* R067BY042CO - Clayey Plains
*Hydric soil rating:* No

**Minor Components**

**Heldt**

*Percent of map unit:* 10 percent
*Landform:* Terraces
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Ecological site:* R067BY042CO - Clayey Plains
*Hydric soil rating:* No

**Wages**

*Percent of map unit:* 5 percent
*Landform:* Terraces
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Ecological site:* R067BY002CO - Loamy Plains
*Hydric soil rating:* No

## 74—Nunn clay loam, 1 to 3 percent slopes

**Map Unit Setting**

*National map unit symbol:* 2tlpl
*Elevation:* 3,900 to 5,840 feet
*Mean annual precipitation:* 13 to 17 inches
*Mean annual air temperature:* 50 to 54 degrees F
*Frost-free period:* 135 to 160 days
*Farmland classification:* Prime farmland if irrigated

**Map Unit Composition**

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

**Description of Nunn**

**Setting**

*Landform:* Terraces
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Pleistocene aged alluvium and/or eolian deposits

**Typical profile**

*Ap - 0 to 9 inches:* clay loam
*Bt - 9 to 13 inches:* clay loam
*Btk - 13 to 25 inches:* clay loam
*Bk1 - 25 to 38 inches:* clay loam
*Bk2 - 38 to 80 inches:* clay loam

**Properties and qualities**

*Slope:* 1 to 3 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Well drained
*Runoff class:* Medium
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum content:* 7 percent
*Maximum salinity:* Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
*Sodium adsorption ratio, maximum:* 0.5
*Available water supply, 0 to 60 inches:* High (about 9.9 inches)

**Interpretive groups**

*Land capability classification (irrigated):* 2e
*Land capability classification (nonirrigated):* 3e
*Hydrologic Soil Group:* C
*Ecological site:* R067BY042CO - Clayey Plains
*Hydric soil rating:* No

**Minor Components**

**Heldt**

*Percent of map unit:* 10 percent
*Landform:* Terraces
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Ecological site:* R067BY042CO - Clayey Plains
*Hydric soil rating:* No

**Satanta**

*Percent of map unit:* 5 percent
*Landform:* Terraces
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Ecological site:* R067BY002CO - Loamy Plains
*Hydric soil rating:* No

# Soil Information for All Uses

## Soil Properties and Qualities

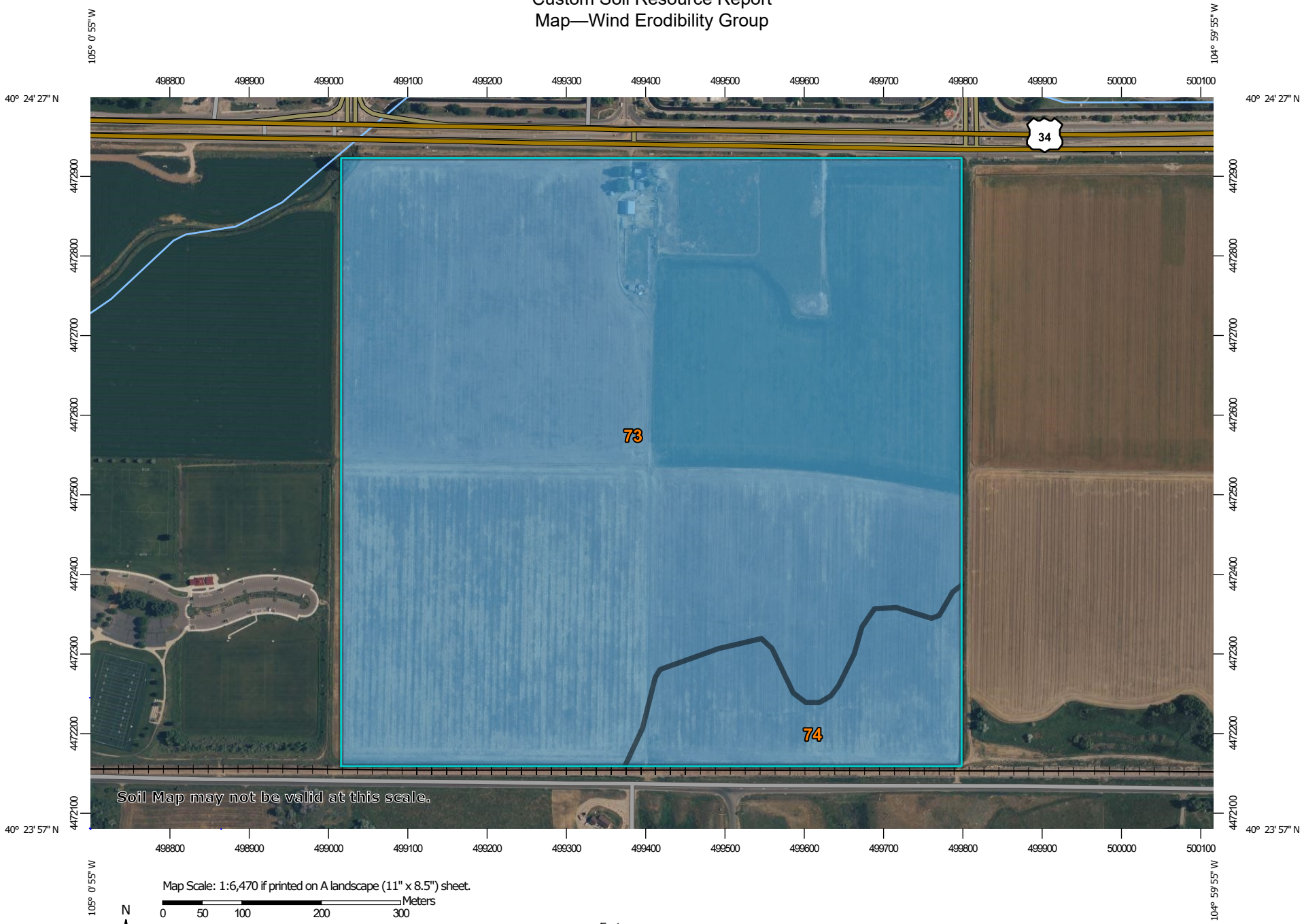
The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

## Soil Erosion Factors

Soil Erosion Factors are soil properties and interpretations used in evaluating the soil for potential erosion. Example soil erosion factors can include K factor for the whole soil or on a rock free basis, T factor, wind erodibility group and wind erodibility index.

### Wind Erodibility Group

A wind erodibility group (WEG) consists of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible.




Map Scale: 1:6,470 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 300 600 1200 1800

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**

1
2
3
4
4L
5
6
7
8
Not rated or not available

**Soil Rating Lines**

1
2
3
4
4L
5
6
7
8
Not rated or not available

**Soil Rating Points**

1
2
3
4
4L
5
6
7
8
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 1:24,000.

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: Larimer County Area, Colorado
Survey Area Data: Version 17, Sep 7, 2022

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

Date(s) aerial images were photographed: Jul 2, 2021—Aug 25, 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.

## Table—Wind Erodibility Group

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 73 | Nunn clay loam, 0 to 1 percent slopes | 6 | 133.6 | 90.0% |
| 74 | Nunn clay loam, 1 to 3 percent slopes | 6 | 14.8 | 10.0% |
| **Totals for Area of Interest** | | | **148.4** | **100.0%** |

## Rating Options—Wind Erodibility Group

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Lower

# References

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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.

# DESIGN TOTAL RAINFALL
# AREA II - LOVELAND

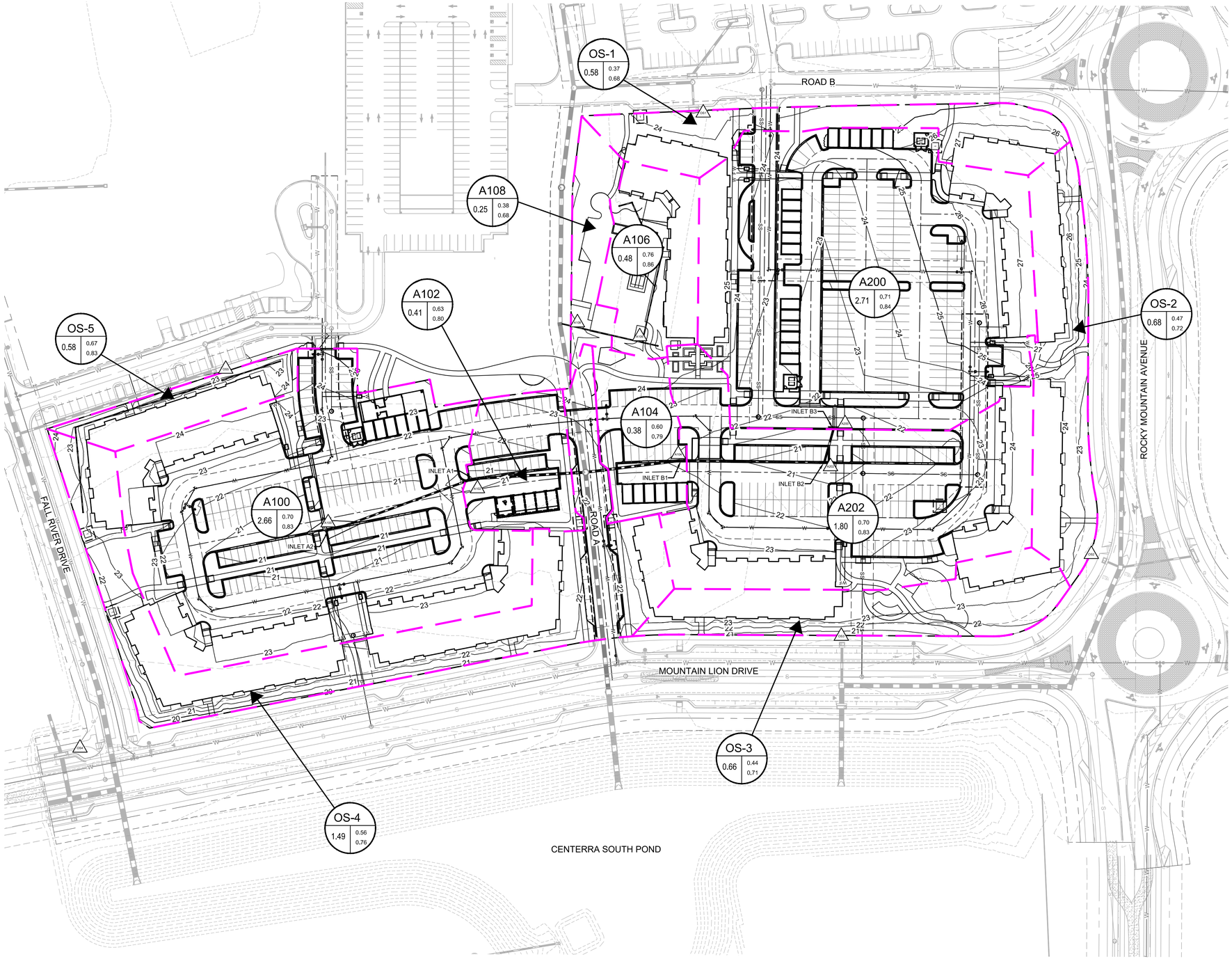
**2hr-5min Storms**

NOTE: All Rainfall Values are in Inches

| TIME | 2-YR | 5-YR | 10-YR | 25-YR | 50-YR | 100-YR |
|---|---|---|---|---|---|---|
| 5 | 0.29 | 0.41 | 0.49 | 0.59 | 0.68 | 0.77 |
| 10 | 0.45 | 0.64 | 0.76 | 0.92 | 1.06 | 1.20 |
| 15 | 0.57 | 0.81 | 0.96 | 1.16 | 1.34 | 1.52 |
| 20 | 0.66 | 0.94 | 1.12 | 1.36 | 1.54 | 1.78 |
| 25 | 0.73 | 1.04 | 1.24 | 1.50 | 1.71 | 1.98 |
| 30 | 0.79 | 1.12 | 1.33 | 1.61 | 1.86 | 2.10 |
| 35 | 0.83 | 1.19 | 1.41 | 1.70 | 2.00 | 2.30 |
| 40 | 0.87 | 1.25 | 1.48 | 1.78 | 2.10 | 2.39 |
| 45 | 0.91 | 1.30 | 1.54 | 1.85 | 2.18 | 2.47 |
| 50 | 0.94 | 1.34 | 1.60 | 1.91 | 2.25 | 2.54 |
| 55 | 0.97 | 1.38 | 1.65 | 1.97 | 2.31 | 2.60 |
| 60 | 1.00 | 1.41 | 1.69 | 2.03 | 2.36 | 2.66 |
| 65 | 1.03 | 1.44 | 1.73 | 2.08 | 2.40 | 2.71 |
| 70 | 1.06 | 1.47 | 1.76 | 2.12 | 2.44 | 2.75 |
| 75 | 1.08 | 1.50 | 1.79 | 2.16 | 2.48 | 2.79 |
| 80 | 1.10 | 1.52 | 1.81 | 2.18 | 2.52 | 2.82 |
| 85 | 1.11 | 1.54 | 1.83 | 2.22 | 2.55 | 2.85 |
| 90 | 1.12 | 1.55 | 1.85 | 2.25 | 2.58 | 2.88 |
| 95 | 1.13 | 1.56 | 1.87 | 2.27 | 2.60 | 2.91 |
| 100 | 1.14 | 1.57 | 1.89 | 2.29 | 2.61 | 2.93 |
| 105 | 1.15 | 1.58 | 1.91 | 2.30 | 2.62 | 2.95 |
| 110 | 1.16 | 1.59 | 1.92 | 2.31 | 2.63 | 2.97 |
| 115 | 1.17 | 1.60 | 1.93 | 2.32 | 2.64 | 2.99 |
| 120 | 1.18 | 1.61 | 1.94 | 2.33 | 2.65 | 3.01 |

WRC ENG.

REFERENCE: Larimer County Storm Water Management Manual, FEBRUARY 1979




## LEGEND:

- PROPERTY LINE
- EXISTING EASEMENT
- PROPOSED EASEMENT
- PROPOSED STORM LINE
- PROPOSED CURB AND GUTTER
- # = BASIN DESIGNATION
- AC = AREA IN ACRES
- I = % IMPERVIOUSNESS
- # = DESIGN POINT
- PROPOSED BASIN BOUNDARY
- EXISTING FLOW ARROW
- PROPOSED FLOW ARROW

Kimley»Horn

PROJECT NAME: Avenue South Multifamily
PROJECT NUMBER: 93943001
CALCULATED BY: BAW
CHECKED BY: AGR
DATE: 5/8/2025

**RATIONAL CALCULATIONS SUMMARY**

| TRIBUTARY BASINS | DESIGN POINT | TRIBUTARY AREA (AC) | IMPERVIOUSNESS % | PEAK FLOWS (CFS) Q2 | PEAK FLOWS (CFS) Q100 |
|---|---|---|---|---|---|
| **On-Site Basins Flowing On-Site** | | | | | |
| A100 | A100 | 2.66 | 84.9% | 6.52 | 22.13 |
| A102 | A102 | 0.41 | 76.6% | 0.90 | 3.25 |
| A104 | A104 | 0.38 | 73.7% | 0.80 | 2.98 |
| A106 | A106 | 0.48 | 92.1% | 1.28 | 4.12 |
| A108 | A108 | 0.25 | 47.4% | 0.33 | 1.72 |
| A200 | A200 | 2.71 | 86.6% | 6.77 | 22.69 |
| A202 | A202 | 1.80 | 84.4% | 4.37 | 14.89 |
| **BASIN SUBTOTAL** | | **8.69** | **83.7%** | **20.97** | **71.78** |
| **On-Site Basins Flowing Off-Site** | | | | | |
| OS-1 | OS1 | 0.58 | 47.1% | 0.76 | 3.95 |
| OS-2 | OS2 | 0.68 | 58.7% | 1.12 | 4.92 |
| OS-3 | OS3 | 0.66 | 54.8% | 1.01 | 4.66 |
| OS-4 | OS4 | 1.49 | 68.3% | 2.90 | 11.39 |
| OS-5 | OS5 | 0.28 | 81.7% | 0.66 | 2.31 |
| **BASIN SUBTOTAL** | | **3.70** | **61.8%** | **6.46** | **27.23** |

NORTH

GRAPHIC SCALE IN FEET
0 30 60 120

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

| NO. | REVISION | BY | DATE |
|---|---|---|---|

Kimley»Horn

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3325 SOUTH TIMBERLINE ROAD, SUITE 150
FORT COLLINS, COLORADO 80525 (970) 822-7311

DESIGNED BY: BAW
DRAWN BY: MKL
CHECKED BY: AGR
DATE: 05/08/25

AVENUE SOUTH MULTIFAMILY

# FINAL DRAINAGE PLAN

PRELIMINARY
FOR REVIEW ONLY
NOT FOR CONSTRUCTION
Kimley»Horn and Associates, Inc.

PROJECT NO.
093943001

SHEET
C8.0
45 OF 45

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G:\NCO_Shared\CAD\Project Template\########_NewProject\CADD\PlanSheets

Kimley»Horn

## RUNOFF COEFFICIENTS - IMPERVIOUS CALCULATION

PROJECT NAME: Avenue South Multifamily
PROJECT NUMBER: 93943001
CALCULATED BY: BAW
CHECKED BY: AGR

DATE: 5/15/2025

SOIL: GROUP C/D

| LAND USE: | Roofs | Paved Streets/Roadway | Concrete Driveways and Walks | Gravel (pedestrian use) | Disturbed Soil (Landscape) |
|---|---|---|---|---|---|
| 2-YEAR COEFF. | 0.79 | 0.79 | 0.79 | 0.30 | 0.14 |
| 5-YEAR COEFF. | 0.81 | 0.81 | 0.81 | 0.36 | 0.20 |
| 10-YEAR COEFF. | 0.83 | 0.83 | 0.83 | 0.43 | 0.28 |
| 100-YEAR COEFF. | 0.87 | 0.87 | 0.87 | 0.65 | 0.57 |
| IMPERVIOUS % | 95% | 95% | 95% | 40% | 20% |

| DESIGN BASIN | DESIGN POINT | Roofs AREA (AC) | Paved Streets/Roadway AREA (AC) | Concrete Driveways and Walks AREA (AC) | Gravel (pedestrian use) AREA (AC) | Disturbed Soil (Landscape) AREA (AC) | TOTAL AREA (AC) | C(2) | C(5) | C(10) | C(100) | Imp % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **On-Site Basins Flowing On-site** | | | | | | | | | | | | |
| A100 | A100 | 0.64 | 1.54 | 0.12 | 0.00 | 0.36 | **2.66** | 0.70 | 0.73 | 0.76 | 0.83 | 85% |
| A102 | A102 | 0.04 | 0.24 | 0.03 | 0.00 | 0.10 | **0.41** | 0.63 | 0.66 | 0.69 | 0.80 | 77% |
| A104 | A104 | 0.04 | 0.19 | 0.04 | 0.00 | 0.11 | **0.38** | 0.60 | 0.64 | 0.67 | 0.79 | 74% |
| A106 | A106 | 0.19 | 0.00 | 0.27 | 0.00 | 0.02 | **0.48** | 0.76 | 0.79 | 0.81 | 0.86 | 92% |
| A108 | A108 | 0.00 | 0.00 | 0.09 | 0.00 | 0.16 | **0.25** | 0.38 | 0.42 | 0.48 | 0.68 | 47% |
| A200 | A200 | 0.46 | 1.81 | 0.13 | 0.00 | 0.30 | **2.71** | 0.71 | 0.74 | 0.77 | 0.84 | 87% |
| A202 | A202 | 0.37 | 1.00 | 0.17 | 0.00 | 0.25 | **1.80** | 0.70 | 0.72 | 0.75 | 0.83 | 84% |
| **BASIN SUBTOTAL** | | **1.74** | **4.78** | **0.87** | **0.00** | **1.30** | **8.69** | **0.69** | **0.72** | **0.75** | **0.83** | **84%** |
| | | **20%** | **55%** | **10%** | **0%** | **15%** | | | | | | |
| **On-Site Basins Flowing Off-site** | | | | | | | | | | | | |
| OS-1 | OS1 | 0.17 | 0.01 | 0.03 | 0.00 | 0.37 | **0.58** | 0.37 | 0.42 | 0.48 | 0.68 | 47% |
| OS-2 | OS2 | 0.32 | 0.00 | 0.03 | 0.00 | 0.33 | **0.68** | 0.47 | 0.51 | 0.56 | 0.72 | 59% |
| OS-3 | OS3 | 0.24 | 0.00 | 0.06 | 0.00 | 0.35 | **0.66** | 0.44 | 0.48 | 0.53 | 0.71 | 55% |
| OS-4 | OS4 | 0.62 | 0.21 | 0.13 | 0.00 | 0.53 | **1.49** | 0.56 | 0.59 | 0.63 | 0.76 | 68% |
| OS-5 | OS5 | 0.17 | 0.01 | 0.06 | 0.00 | 0.05 | **0.28** | 0.67 | 0.70 | 0.73 | 0.82 | 82% |
| **BASIN SUBTOTAL** | | **1.52** | **0.23** | **0.31** | **0.00** | **1.63** | **3.70** | **0.50** | **0.54** | **0.59** | **0.74** | **62%** |
| | | **41%** | **6%** | **8%** | **0%** | **44%** | | | | | | |

Notes:
1. Imperviousness, I, values per Table 6-3 of MHFD Criteria Manual Volume 1.
2. Runoff Coefficient values are per MHFD Criteria Manual Volume 1.

# APPENDIX B – PREVIOUS STUDIES

Final (FOR) Drainage Report – Segment 1 US Hwy 34 Roadway Widening, November 2022, by SEH.

Chilson-Stroh Farms Third Subdivision Final Drainage Report, July 2022, by LandOne Engineering.

# Final (FOR) Drainage Report

## Segment 1 US Hwy 34 Roadway Widening

Loveland, CO

141432 | Novmeber 7, 2022

SEH

Building a Better World for All of Us®

Engineers | Architects | Planners | Scientists

# Final (FOR Design) Drainage Report

## Segment 1 US Hwy 34 Roadway Widening

Prepared for City of Loveland, CO

# 1 Introduction

## 1.1 Scope and Purpose

This report presents the results of the final drainage analysis for Segment 1 of the U.S. Highway 34 Widening Project between Rocky Mountain Avenue and Boyd Lake Avenue. The purpose of this report is to describe the overall drainage characteristics of the project area, including flows entering and exiting the project site.

### 1.1.1 Project Location

The project follows U.S. Highway 34 in east Loveland, Colorado. More specifically, it is the 1–mile stretch of the highway west-bound lanes bounded by Boyd Lake Avenue on the west, Rocky Mountain Avenue on the east, highway right-of-way to the north, and the Hwy 34 center median to the south. It is located within sections 9 and 16, Township 5 North, Range 68 West. Along its reach, the project is bordered on the north by multiple commercial and residential developments. South of the east-bound lanes of Hwy 34 are undeveloped agricultural field that receive runoff from the Hwy 34 storm sewer. One major open channel, the Farmer's Ditch, crosses the project site.




Figure 1 – Project Vicinity Map

### 1.1.2 Project Description

The proposed project consists of improvements and expansion of the existing roadway as well as the addition of storm water infrastructure. Portions of this infrastructure will receive runoff from various developments. Pertinent pages of the drainage reports for these developments are included in the Appendices of this report.

# 2 Drainage Basins and Subbasins

## 2.1 Major Basin Description

The project site is located within the Boyd Outlet Drainage Basin. The overall basin is a nearly fully developed urban area.

## 2.2 Subbasin Description

### 2.2.1 Design Points

For the purposes comparing pre- and post-development conditions and determination of compliance with various requirements, eight design points were identified. These points are situated at locations where runoff from affected drainage subbasins leaves the area of study. For clarity, existing storm structures are identified by the designated structure number in the subsurface utilities location report included in the Appendices.

| DP | Location | |
|---|---|---|
| 1 | 193+67, 7L | North Side of Existing Catch Basin (#870) in Center Median Approx. 620ft East of McWhinney Blvd. |
| 2 | 196+50, 57R | Existing CMP Culvert Discharge End (#874) in Undeveloped Field South of Hwy 34 Near Cupid Drive |
| 3 | 200+34, 13L | West Side Existing Manhole (#908) in Hwy 34 Center Median West of Hahn's Peak Dr. |
| 4 | 200+34, 13L | North Side Existing Manhole (#908) in Hwy 34 Center Median West of Hahn's Peak Dr. |
| 5 | 204+25, 140L | In Farmer's Ditch Approx. 237ft East of Hahn's Peak Dr. |
| 6 | 212+23, 11L | North Side Manhole (#910) in Hwy 34 Center on West Side of Fall River Dr. |
| 7 | 224+94, 58R | Existing CMP Culvert Discharge End (#901) in Undeveloped Field South of Hwy 34 Near Rocky Mountain Ave. |
| 8 | 226+92, 105L | Existing Catch Basin (#808) in Curb at Intersection of Hwy 34 and Rocky Mountain Ave. |

Table 1 – Design Points

### 2.2.2 Existing Subbasins

Twenty subbasins were delineated and analyzed to describe the existing condition. These basins are shown in Figures 2-4 and described in the following paragraphs.

#### Subbasin CCWW

This subbasin is located in the north-bound lanes of Boyd Lake Avenue (BLA) just north of Highway 34. The subbasin consists entirely of paved street and drains via the existing gutter to an existing curb cut. This curb cut is located along the north edge of Hwy 34 and directs runoff through a concrete channel to the east. This channel empties into the existing detention pond created as part of the development of Rocky Mountain Village 14th Subdivision (RMV14).

### Subbasin CAN

This subbasin is located in the north-east quadrant of the intersection of Hahn's Peak Place and Hwy 34 and consists of a mix of sidewalk along with grassy area and a portion of the Farmer's Ditch. This basin represents the area draining directly to the ditch only and does not include any flows from the ditch upstream nor discharges from storm sewer in Hahn's Peak Place.

### Subbasin FES918

This subbasin is located in the center median of Hwy 34 between Hahn's Peak Place and Fall River Drive. It consists solely of grassed median. While the proposed project does not impact any of the characteristics of this subbasin, it was included in analysis to ensure that storm sewer piping is adequately sized. Runoff from this subbasin drains to an existing flared end section connected to storm sewer piping draining to the east.

### Subbasin CCE

This subbasin is located in the west-bound lanes of Hwy 34 approximately between Stations 204+20 209+30. This subbasin consists of area moved from existing Subbasin IN818 by the addition of curb and gutter, sidewalk, and associated grading. Runoff from this area drains via the proposed curb and gutter to a curb cut discharging to proposed Subbasin FES05.

### Subbasin FES918

This subbasin is located in the left turn lane from east-bound Hwy 34 to north-bound Fall River Drive. It consists entirely of paved street. While the proposed project does not impact any of the characteristics of this subbasin, it was included in analysis to ensure that storm sewer piping is adequately sized. Runoff from this subbasin drains to an existing inlet connected to storm sewer piping draining to the east.

### Subbasin IN912

This subbasin is located in the left turn lane from east-bound Hwy 34 to north-bound Fall River Drive. It consists entirely of paved street. While the proposed project does not impact any of the characteristics of this subbasin, it was included in analysis to ensure that storm sewer piping is adequately sized. Runoff from this subbasin drains to an existing inlet connected to storm sewer piping draining to the east.

### Subbasin IN03

This subbasin is located in the west-bound lanes of Hwy 34 from approximately Station 209+30 to Fall River Drive. The subbasin consists of area moved from existing Subbasin IN818 by the addition of curb and gutter, sidewalk, and associated grading. Runoff from this area drains via the proposed curb and gutter to a proposed inlet discharging to proposed Subbasin FES05.

### Subbasin FES05

This subbasin is located between the Farmer's Ditch and proposed Subbasins FES918 and IN03 and consists of area of existing Subbasin IN818 not moved as noted above. This subbasin consists of sidewalk and open grassy area. Runoff from this basin drains to the east to the proposed flared end section connecting to piping to the south.

### Subbasin IN811

This subbasin is located in the west-bound lanes of Hwy 34 between Fall River Drive and approximately Hwy 34 Station 225+60 along with the abutting grassed drainage ditch and open area as well as the south-bound lanes of Fall River Drive. This subbasin is the same as existing Subbasin IN811 with the addition of sidewalk and associated grading. This subbasin is bounded on the north by

the Farmer's Ditch. Runoff from this area drains to an existing flared end section discharging to the south.

### Subbasin IN808

This subbasin is located in the north-west quadrant of the intersection of Rocky Mountain Avenue and Hwy 34 and consists of a mix of paved street and sidewalk along with grassy area. The basin is nearly identical to existing Subbasin IN808 with the addition of sidewalk and associated grading. Runoff from this basin drains to an existing inlet that drains to the east.

| Design Point | Subbasin | Area (AC) | % Impervious |
|---|---|---|---|
| 1* | FES01 | 0.75 | 29 |
| 1* | CCWW | 0.73 | 100 |
| 1* | CCWE | 0.36 | 100 |
| 1* | P856 | 1.27 | 5 |
| 1* | IN01 | 1.49 | 75 |
| 1* | P852 | 2.17 | 2 |
| 1* | IN850 | 1.40 | 74 |
| 1 | IN849 | 1.97 | 80 |
| 3 | IN02 | 1.65 | 79 |
| 2 | FES04 | 0.07 | 50 |
| 3 | IN838 | 0.17 | 19 |
| 4 | IN826 | 0.63 | 81 |
| 5 | CCC | 0.45 | 100 |
| 5 | CAN | 0.32 | 38 |
| 6 | CCE | 0.61 | 100 |
| 6 | FES05 | 1.01 | 18 |
| 6 | IN03 | 0.74 | 100 |
| 6 | FES918 | 0.41 | 2 |
| 6 | IN912 | 0.08 | 100 |
| 7 | IN811 | 2.92 | 70 |
| 8 | IN808 | 0.84 | 74 |

* Routed Through One or More Detention Ponds Before DP

Table 3 – Proposed Subbasin Characteristics

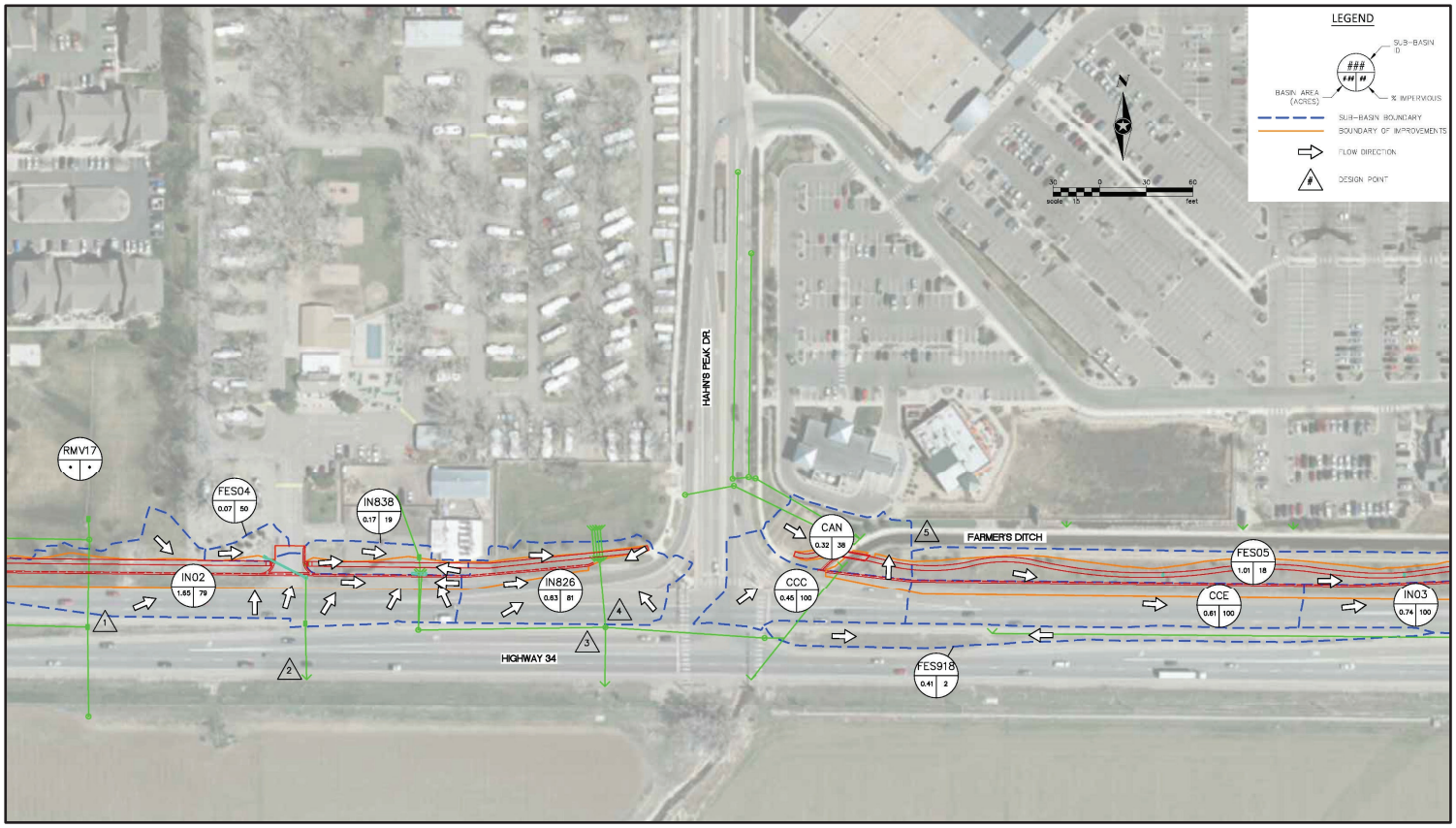



Figure 6 – Proposed Drainage Subbasin Map

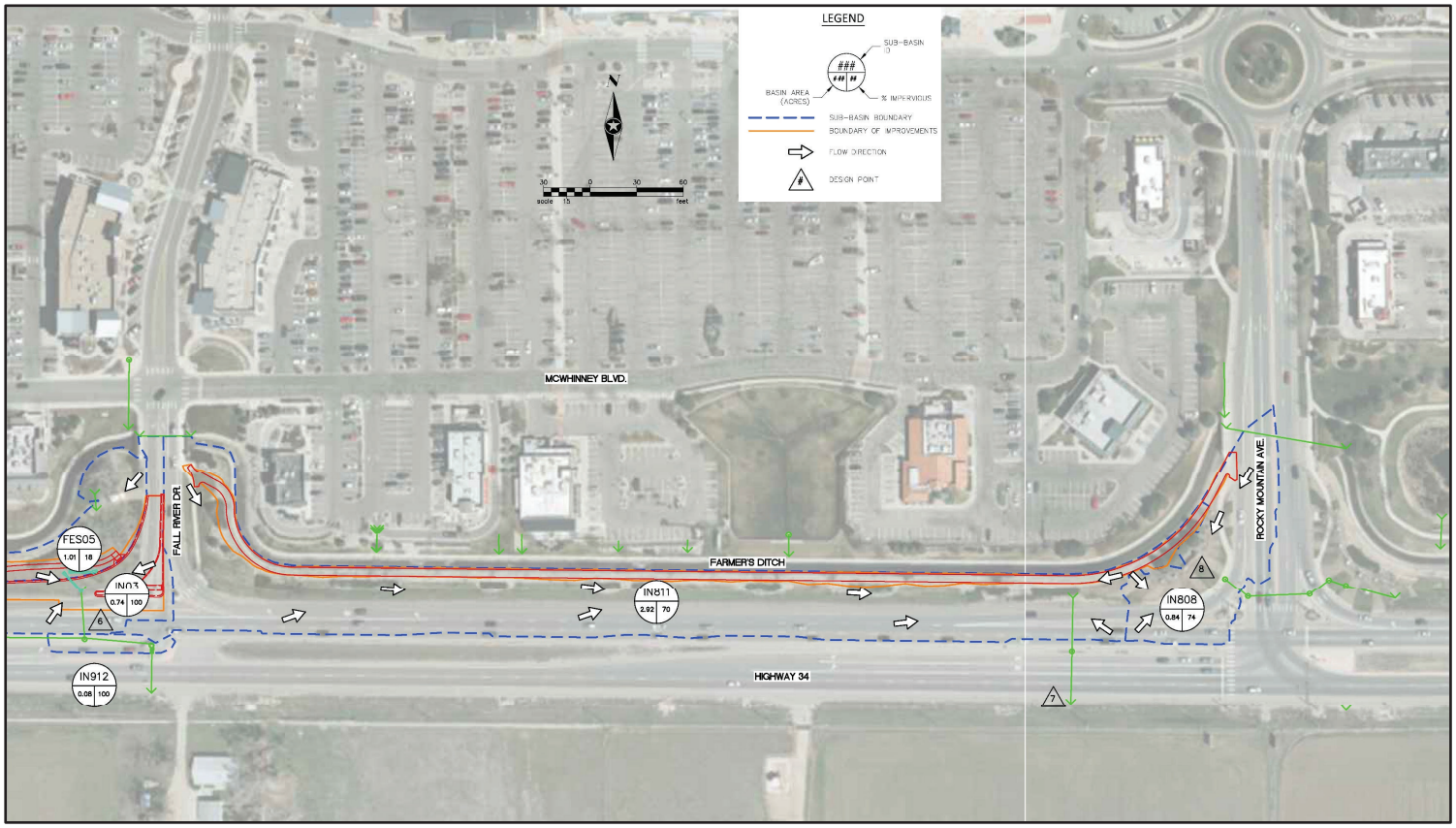



Figure 7 – Proposed Drainage Subbasin Map

# 3 Hydrologic and Hydraulic Analysis

## 3.1 Hydrological Criteria

### 3.1.1 Design Rainfall

The design rainfall amounts used for this study are those required by the City of Loveland Storm Drainage Criteria (LSDC).

| Time | 2-yr | | 10-yr | | 100-yr | |
|---|---|---|---|---|---|---|
| | Incr. Depth (in)[1] | Intensity (in/hr.)[2] | Incr. Depth (in)[1] | Intensity (in/hr.)[2] | Incr. Depth (in)[1] | Intensity (in/hr.)[2] |
| 5 | 0.29 | 3.480 | 0.49 | 5.880 | 0.77 | 9.240 |
| 10 | 0.45 | 2.700 | 0.76 | 4.560 | 1.20 | 7.200 |
| 15 | 0.57 | 2.280 | 0.96 | 3.840 | 1.52 | 6.080 |
| 20 | 0.66 | 1.980 | 1.12 | 3.360 | 1.78 | 5.340 |
| 25 | 0.73 | 1.752 | 1.24 | 2.976 | 1.98 | 4.752 |
| 30 | 0.79 | 1.580 | 1.33 | 2.660 | 2.10 | 4.200 |
| [1] From LSCDM - Design Total Rainfall - Area II Loveland | | | | | | |
| [2] Incremental Depth / Time | | | | | | |

Table 4 – Design Rainfall Data

### 3.1.2 Runoff Calculations Method

Runoff calculations were performed for the existing and condition subbasins and are included in Appendices. For the subbasins representing the Rocky Mountain Village (RMV) 14th and 17th subdivisions, areas and runoff C values were taken from their respective drainage reports and then hydrographs prepared using the Modified Rational Method. These calculations are located in the Appendices. For the remaining subbasins, Denver's Urban Drainage and Flood Control District's CUHP tool was utilized for this analysis. The inputs for this analysis are located in the Appendices.

| Subbasin | Peak Flow (cfs) | | Subbasin | Peak Flow (cfs) | |
|---|---|---|---|---|---|
| | Existing | Proposed | | Existing | Proposed |
| FES01 | --- | 0.53 | IN838 | 0.78 | 0.16 |
| CCWW | 3.17 | 2.53 | IN835 | 0.65 | --- |
| CCWE | --- | 1.91 | IN826 | 2.74 | 2.99 |
| P856 | 1.11 | 0.53 | CCC | --- | 2.21 |
| FES855 | 2.37 | --- | CAN | 2.40 | 0.50 |
| IN01 | --- | 2.15 | CCE | --- | 1.43 |
| P852 | 1.54 | 1.48 | FES05 | --- | 0.16 |
| IN850 | 4.44 | 4.78 | IN818 | 3.54 | --- |
| IN849 | 3.10 | 4.73 | IN03 | --- | 3.25 |
| IN02 | --- | 2.88 | FES918 | 0.04 | 0.04 |
| FES04 | --- | 0.21 | IN912 | 0.28 | 0.28 |
| IN844 | 2.00 | --- | IN811 | 3.72 | 4.33 |
| IN841 | 1.25 | --- | IN808 | 1.46 | 4.70 |
| IN839 | 0.48 | --- | | | |

Table 5 – Peak Flow Results - 100yr Storm

| Subbasin | Peak Flow (cfs) | | Subbasin | Peak Flow (cfs) | |
|---|---|---|---|---|---|
| | Existing | Proposed | | Existing | Proposed |
| FES01 | --- | 0.06 | IN838 | 0.25 | 0.01 |
| CCWW | 1.14 | 0.90 | IN835 | 0.24 | --- |
| CCWE | --- | 0.69 | IN826 | 0.91 | 1.02 |
| P856 | 0.08 | 0.00 | CCC | --- | |
| FES855 | 0.66 | --- | CAN | 0.77 | 0.10 |
| IN01 | --- | 0.64 | CCE | --- | 0.50 |
| P852 | 0.00 | 0.00 | FES05 | --- | 0.03 |
| IN850 | 1.42 | 1.57 | IN818 | 0.88 | --- |
| IN849 | 0.97 | 1.53 | IN03 | --- | 1.16 |
| IN02 | --- | 0.89 | FES918 | 0.00 | 0.00 |
| FES04 | --- | 0.08 | IN912 | 0.10 | 0.10 |
| IN844 | 0.57 | --- | IN811 | 1.01 | 1.26 |
| IN841 | 0.36 | --- | IN808 | 0.18 | 1.58 |
| IN839 | 0.16 | --- | | | |

Table 6 – Peak Flow Results - 2yr Storm

## 3.2 Hydraulic Analysis and Modeling

### 3.2.1 Inlets and Curb Cuts

A total of nine existing and proposed inlets and curb cuts will be affected by the proposed widening project. The inlets were analyzed for the Minor (2yr) and Major (100-yr) storms utilizing UDFCD's Inlet spreadsheet software. The curb cuts were analyzed using procedures for curb inlets in Urban Storm Drainage Criteria Manual Volume 1 (USDCM1). Details of this analysis are included in the Appendices. Existing inlets that will be removed as a part of the project or that will experience a decrease in peak flow to them in the proposed condition were not analyzed.

### 3.2.2 Detention Ponds

Three existing detention ponds will be affected by the proposed Hwy 34 widening project. These ponds are Ponds 1 and 4 of the Rocky Mountain Village 14th Subdivision (RMV14) and an unnumbered pond for the Rocky Mountain Village 17th Subdivision (RMV17). Information for the ponds and outlet structures was taken from the respective drainage reports for these developments for use in modeling the proposed pond routing. ***SEH takes no responsibility in the accuracy of the data presented in the RMV14 and RMV17 plans nor for the methodology utilized in calculating said data.***

### 3.2.3 Modeling

HydroCAD Software Solutions LLC's HydroCAD software (v 10.00-15) was utilized to perform modeling of the detention ponds and storm sewers in the project study area. Data for the proposed storm sewer piping was taken from the final design plans included in the Appendices. Data for the existing storm sewer piping was taken from the subsurface utilities location report included in the Appendices.

# 5 Modeling Results

## 5.1 West Area

The following table presents the results of the modeling for this portion of the project.

| Design Point | Existing | | | Proposed | | |
|---|---|---|---|---|---|---|
| | Area (Ac) | Discharge (cfs) | Discharge Rate (cfs/Ac) | Area (Ac) | Discharge (cfs) | Discharge Rate (cfs/Ac) |
| 1 | 44.54 | 1.70 | 0.038 | 45.91 | 1.19 | 0.026 |
| 2 | 1.69 | 1.73 | 1.024 | 0.07 | 0.21 | 3.000 |
| 3 | 0.37 | 1.43 | 3.865 | 1.82 | 3.04 | 1.670 |
| 4 | 0.65 | 2.74 | 4.215 | 0.63 | 2.99 | 4.746 |
| 5 | 0.77 | 2.40 | 3.117 | 0.77 | 2.71 | 3.519 |
| Total | 48.02 | 10.00 | 0.208 | 49.20 | 10.14 | 0.206 |

Table 7 – 100Yr West Area Discharges

## 5.2 East Area

Flows to Design Point 6 are partially controlled by a small proposed detention pond. The following tables present the results of the modeling for the east area of the project.

| Design Point | Peak Flow (cfs) | |
|---|---|---|
| | Existing | Proposed |
| 6 | 3.54 | 2.95 |
| 7 | 3.72 | 4.33 |
| 8 | 1.46 | 4.70 |

Table 8 – 100Yr East Area Discharges

| Location | Allowed Water Elevation (*) | Peak Water Elevation |
|---|---|---|
| Pond FES05 | 4936.54 | 4935.78 |
| Inlet 3 | 4936.06 | 4935.82 |
| Manhole 2 | 4936.31 | 4935.54 |
| Pond FES918 | 4939.10 | 4937.39 |
| Manhole 910 | 4937.43 | 4934.98 |
| Manhole 911 | 4936.85 | 4934.49 |
| Inlet 912 | 4936.47 | 4934.34 |

* Top of Ponded Area or 6" Below Rim for Inlets and Manholes

Table 9 – 100Yr East Area Water Elevations

# 6 Conclusions

## 6.1 Limitations of Report

Conclusions and analyses presented in this drainage report are final. Analyses for the proposed condition are based on SEH's FOR design for the highway improvements. Analyses for the future condition rely on data and information presented in and interpreted from the Rocky Mountain Village 14th and 17th Subdivision (RMV) plans. SEH takes no responsibility for the RMV data and information. This drainage report should only be used for final review of the proposed improvements.

## 6.2 Compliance with Regulations

### 6.2.1 Inlets

All inlets and curb cuts are sufficient to meet regulations.

### 6.2.2 West Area

This area is governed by a requirement to restrict discharge to 0.036 cfs/Ac. As shown in the results table, this restriction is not met. The existing combined discharge rate is 0.208 cfs/Ac and the proposed combined discharge rate is 0.206 cfs/AF. Therefore, because the overall combined discharge rate is improved in the proposed condition, it is requested that the 0.036cfs/Ac requirement be waived.

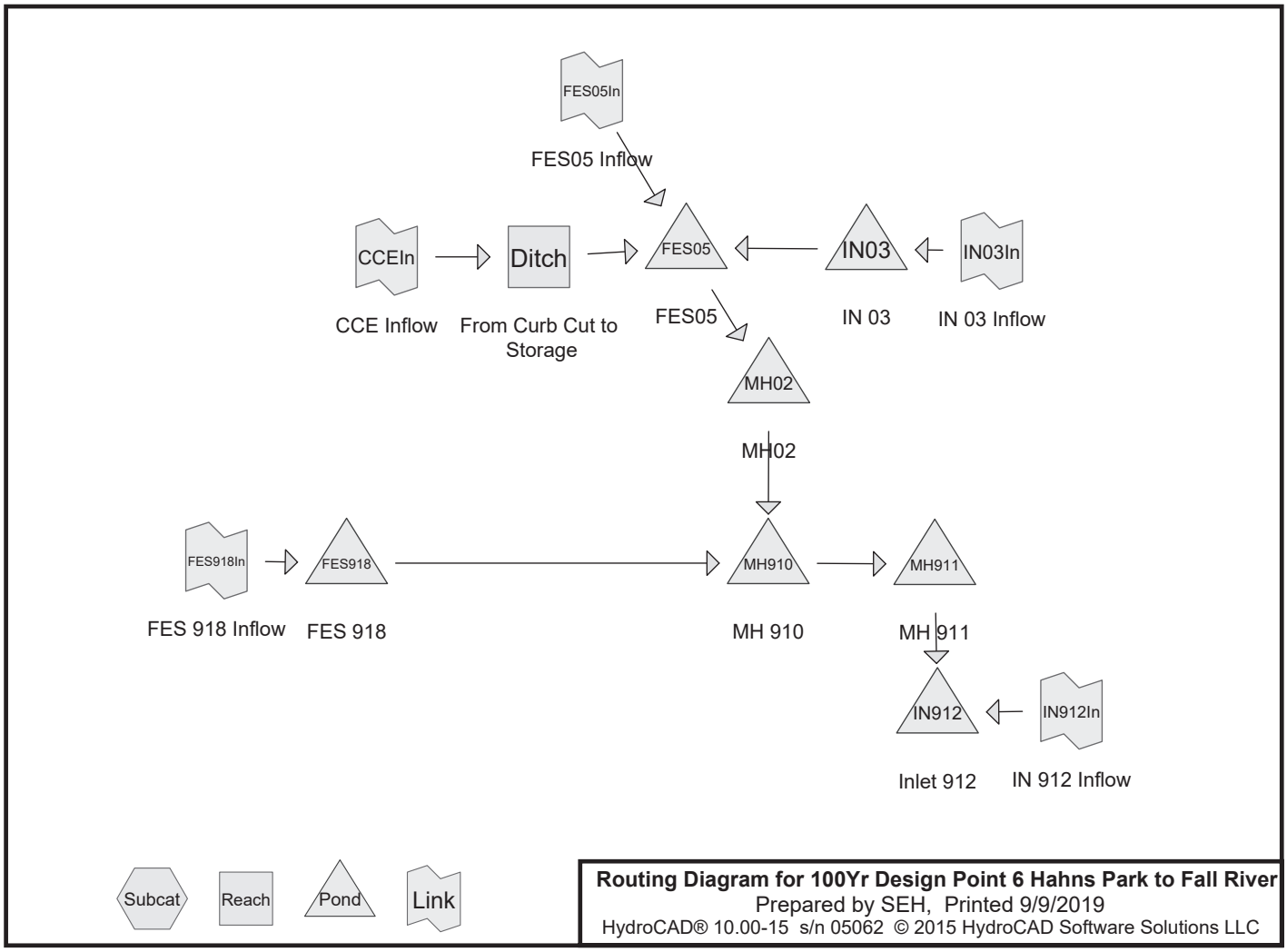
### 6.2.3 East Area

Design Point 6 meets regulations. Design Point 7 and 8 have increases in peak outflows. Design Point 7 discharges to an open agricultural field. Therefore, a waiver of the requirement to not increase peak flows is requested; the open field will attenuate peak flows before they reach any structure. Design Point 8 discharges to the south in an existing sewer pipe in Rocky Mountain Avenue. It is unknown where this pipe discharges. More information regarding this pipe will be obtained for the Final Drainage Report

### 6.2.4 Water Quality Control

The site of proposed development is exempt from Water Quality Control requirements as regulated by the Colorado Discharge Permit System (CDPS) General Permit for Discharges from Municipal Separate Storm Sewer Systems (MS4s). Under Section I.E(4)(a)(i)(B), a roadway project is exempt from Water Quality Control requirements if the improvements add less than one acre of impervious area per mile of roadway and do increase the capacity of the roadway. The proposed project site conditions only increase the impervious cover by approximately 0.57 acres over one mile of roadway or an average of about 4.8 feet of widened roadway for that same one mile of roadway. The proposed roadway improvement also only includes improvements to existing turn lanes and does not propose to increase the capacity of the roadway.

# Appendix D – Modeling Results




**Routing Diagram for 100Yr Design Point 6 Hahns Park to Fall River**

Prepared by SEH, Printed 9/9/2019

HydroCAD® 10.00-15 s/n 05062 © 2015 HydroCAD Software Solutions LLC

## Summary for Pond FES05: FES05

Inflow = 4.5551 cfs @ 0.57 hrs, Volume= 14,863 cf
Outflow = 2.8957 cfs @ 0.95 hrs, Volume= 14,864 cf, Atten= 36%, Lag= 23.1 min
Primary = 2.8957 cfs @ 0.95 hrs, Volume= 14,864 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.0100 min
Peak Elev= 4,935.78' @ 0.95 hrs Surf.Area= 5,499 sf Storage= 2,849 cf

Plug-Flow detention time= 10.5 min calculated for 14,863 cf (100% of inflow)
Center-of-Mass det. time= 10.6 min ( 75.8 - 65.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 4,934.10' | 9,688 cf | **Custom Stage Data (Prismatic)**Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 4,934.10 | 0 | 0 | 0 |
| 4,935.02 | 1,043 | 480 | 480 |
| 4,935.52 | 3,682 | 1,181 | 1,661 |
| 4,935.77 | 5,429 | 1,139 | 2,800 |
| 4,936.02 | 7,360 | 1,599 | 4,399 |
| 4,936.27 | 10,003 | 2,170 | 6,569 |
| 4,936.52 | 12,869 | 2,859 | 9,428 |
| 4,936.54 | 13,115 | 260 | 9,688 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 4,934.10' | **15.0" Round Culvert** L= 34.0' Ke= 0.500<br>Inlet / Outlet Invert= 4,934.10' / 4,933.93' S= 0.0050 '/' Cc= 0.900<br>n= 0.013, Flow Area= 1.23 sf |

**Primary OutFlow** Max=2.8957 cfs @ 0.95 hrs HW=4,935.78' TW=4,935.54' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 2.8957 cfs @ 2.36 fps)

## Summary for Pond FES918: FES 918

Inflow = 0.0400 cfs @ 0.83 hrs, Volume= 832 cf
Outflow = 0.0400 cfs @ 1.72 hrs, Volume= 832 cf, Atten= 0%, Lag= 53.1 min
Primary = 0.0400 cfs @ 1.72 hrs, Volume= 832 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.0100 min
Peak Elev= 4,937.39' @ 0.93 hrs Surf.Area= 7 sf Storage= 1 cf

Plug-Flow detention time= 0.6 min calculated for 832 cf (100% of inflow)
Center-of-Mass det. time= 0.6 min ( 282.2 - 281.6 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 4,937.24' | 17 cf | **3.00'D x 2.36'H Vertical Cone/Cylinder** |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 4,937.24' | **18.0" Round 18"CMP** L= 694.0' Ke= 0.500 |

Inlet / Outlet Invert= 4,937.24' / 4,933.73' S= 0.0051 '/' Cc= 0.900
n= 0.024, Flow Area= 1.77 sf

**Primary OutFlow** Max=0.0400 cfs @ 1.72 hrs HW=4,937.39' TW=4,934.55' (Dynamic Tailwater)
**1=18"CMP** (Outlet Controls 0.0400 cfs @ 0.68 fps)

## Summary for Pond IN03: IN 03

| | | | | | |
|---|---|---|---|---|---|
| Inflow | = | 3.2500 cfs @ | 0.50 hrs, Volume= | 7,387 cf | |
| Outflow | = | 3.2457 cfs @ | 0.50 hrs, Volume= | 7,387 cf, Atten= 0%, Lag= 0.0 min | |
| Primary | = | 3.2457 cfs @ | 0.50 hrs, Volume= | 7,387 cf | |

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.0100 min
Peak Elev= 4,935.82' @ 0.89 hrs Surf.Area= 7 sf Storage= 11 cf

Plug-Flow detention time= 0.1 min calculated for 7,387 cf (100% of inflow)
Center-of-Mass det. time= 0.1 min ( 48.1 - 48.0 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 4,934.30' | 16 cf | **3.00'D x 2.26'H Vertical Cone/Cylinder** |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 4,934.30' | **18.0" Round Culvert** L= 33.0' Ke= 0.500<br>Inlet / Outlet Invert= 4,934.30' / 4,934.10' S= 0.0061 '/' Cc= 0.900<br>n= 0.013, Flow Area= 1.77 sf |

**Primary OutFlow** Max=3.2422 cfs @ 0.50 hrs HW=4,935.54' TW=4,935.29' (Dynamic Tailwater)
**1=Culvert** (Outlet Controls 3.2422 cfs @ 2.83 fps)

## Summary for Pond IN912: Inlet 912

| | | | | | |
|---|---|---|---|---|---|
| Inflow | = | 3.1184 cfs @ | 0.87 hrs, Volume= | 16,479 cf | |
| Outflow | = | 3.1184 cfs @ | 0.87 hrs, Volume= | 16,475 cf, Atten= 0%, Lag= 0.0 min | |
| Primary | = | 3.1184 cfs @ | 0.87 hrs, Volume= | 16,475 cf | |

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.0100 min
Peak Elev= 4,934.34' @ 0.87 hrs Surf.Area= 7 sf Storage= 10 cf

Plug-Flow detention time= 0.3 min calculated for 16,474 cf (100% of inflow)
Center-of-Mass det. time= 0.1 min ( 85.7 - 85.6 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 4,932.86' | 29 cf | **3.00'D x 4.11'H Vertical Cone/Cylinder** |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 4,933.51' | **18.0" Round 18"** L= 53.5' Ke= 0.500<br>Inlet / Outlet Invert= 4,932.86' / 4,933.51' S= -0.0121 '/' Cc= 0.900<br>n= 0.024, Flow Area= 1.77 sf |

**Primary OutFlow** Max=3.1184 cfs @ 0.87 hrs HW=4,934.34' (Free Discharge)
**1=18"** (Inlet Controls 3.1184 cfs @ 3.10 fps)

## Summary for Pond MH02: MH02

Inflow = 2.8957 cfs @ 0.95 hrs, Volume= 14,864 cf
Outflow = 2.8958 cfs @ 0.95 hrs, Volume= 14,864 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.8958 cfs @ 0.95 hrs, Volume= 14,864 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.0100 min
Peak Elev= 4,935.54' @ 0.94 hrs Surf.Area= 20 sf Storage= 34 cf

Plug-Flow detention time= 0.3 min calculated for 14,864 cf (100% of inflow)
Center-of-Mass det. time= 0.3 min ( 76.0 - 75.8 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 4,933.83' | 59 cf | **5.00'D x 2.98'H Vertical Cone/Cylinder** |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 4,933.83' | **15.0" Round Culvert** L= 62.7' Ke= 0.500<br>Inlet / Outlet Invert= 4,933.83' / 4,933.68' S= 0.0024 '/' Cc= 0.900<br>n= 0.024, Flow Area= 1.23 sf |

**Primary OutFlow** Max=2.8958 cfs @ 0.95 hrs HW=4,935.54' TW=4,934.98' (Dynamic Tailwater)
**1=Culvert** (Outlet Controls 2.8958 cfs @ 2.36 fps)

## Summary for Pond MH910: MH 910

Inflow = 2.9358 cfs @ 0.95 hrs, Volume= 15,695 cf
Outflow = 2.9360 cfs @ 0.95 hrs, Volume= 15,695 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.9360 cfs @ 0.95 hrs, Volume= 15,695 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.0100 min
Peak Elev= 4,934.98' @ 0.93 hrs Surf.Area= 20 sf Storage= 26 cf

Plug-Flow detention time= 0.3 min calculated for 15,695 cf (100% of inflow)
Center-of-Mass det. time= 0.3 min ( 87.2 - 86.9 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 4,933.63' | 84 cf | **5.00'D x 4.30'H Vertical Cone/Cylinder** |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 4,933.63' | **18.0" Round Culvert** L= 86.4' Ke= 0.500<br>Inlet / Outlet Invert= 4,933.63' / 4,933.21' S= 0.0049 '/' Cc= 0.900<br>n= 0.024, Flow Area= 1.77 sf |

**Primary OutFlow** Max=2.9360 cfs @ 0.95 hrs HW=4,934.98' TW=4,934.49' (Dynamic Tailwater)
**1=Culvert** (Outlet Controls 2.9360 cfs @ 2.32 fps)

## Summary for Pond MH911: MH 911

| | | | | | |
|---|---|---|---|---|---|
| Inflow | = | 2.9360 cfs @ | 0.95 hrs, Volume= | 15,695 cf | |
| Outflow | = | 2.9361 cfs @ | 0.95 hrs, Volume= | 15,693 cf, | Atten= 0%, Lag= 0.0 min |
| Primary | = | 2.9361 cfs @ | 0.95 hrs, Volume= | 15,693 cf | |

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.0100 min
Peak Elev= 4,934.49' @ 0.92 hrs Surf.Area= 7 sf Storage= 9 cf

Plug-Flow detention time= 0.2 min calculated for 15,693 cf (100% of inflow)
Center-of-Mass det. time= 0.1 min ( 87.3 - 87.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 4,933.21' | 29 cf | **3.00'D x 4.14'H Vertical Cone/Cylinder** |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 4,933.21' | **18.0" Round Culvert** L= 7.3' Ke= 0.500<br>Inlet / Outlet Invert= 4,933.21' / 4,933.18' S= 0.0041 '/' Cc= 0.900<br>n= 0.013, Flow Area= 1.77 sf |

**Primary OutFlow** Max=2.9362 cfs @ 0.95 hrs HW=4,934.49' TW=4,934.34' (Dynamic Tailwater)
**1=Culvert** (Outlet Controls 2.9362 cfs @ 2.46 fps)

# Chilson-Stroh Farms Third Subdivision

# Final Drainage Report

**July 2022**

**Project 20-028**

STORMWATER
Accepted - No Exception Taken
July 13, 2022
By: SLS

**Prepared For**

LV 34 Holdings, LLC

7251 West 20th Street, L-200

Greeley, Colorado 80634

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07/08/2022
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**Prepared By**

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LANDONE engineering

# II. Drainage Basins and Sub-Basins

## C. Existing Major Basin Description

The project falls within the Outlet Mall drainage basin as denoted on the City of Loveland Master Drainage Plan. The project fall is in the south portion of the Outlet Mall Basin. See The site general flows from north to south to the Loveland Sports Park from the sports park, the drainage is routed ultimately to the Big Thomson River. Three major drainage basins were delineated as part of the Sports Park Final Drainage Report: Basin 24, Basin 25, and Basin 26. See Exhibit B1 – Existing Drainage Basins Map and Exhibit B3 – Existing Basin Overlay. The site falls with these three basins.

## D. Proposed Major Basin Description

For the purpose of the pond analysis, seven major basins were delineated: one basin for each of the three ponds, and three offsite basins. The southernmost basins (Basins A and B) correspond to Ponds A and B, and are bounded by the property lines, Mountain Lion Drive, which is the main drive through the middle of the subdivision. Basins C and D correspond to Pond C and were delineated from the existing basins used in the Loveland Sports Park Final Drainage Report, Mountain Lion Drive, and the property lines. The three off site basins were delineated from the offsite flow received from the Reserve at Centerra Apartment Townhomes, Mattress Firm store, State Highway 34, and drainage from the future section of Hahn's Peak Drive. These major basins were utilized as the CUHP (Colorado Urban Hydrograph Procedure) Basins to determine the discharge from each basin. See Exhibit E1 – CUHP Basin Map.

*Table 1: Major Basin Parameters*

| Basin | Land Use | Routed to Pond | Basin Area | Basin % Impervious | 100-Year Runoff |
|---|---|---|---|---|---|
| | | | acres | | cfs |
| Basin A | Residential | A | 11.65 | 64% | 33 |
| Basin B | Residential | B | 8.62 | 66% | 25 |
| Basin C | Commercial | C | 20.71 | 14%* | 24 |
| Basin D | Offsite Flows | C | 7.1 | 87% | 15 |

*The Commercial Basin % Impervious shown is the interim condition (not developed condition)

## E. Sub-Basin Description

For the purpose of designing the stormwater system, 36 sub-basins were delineated. The sub-basins were delineated from the proposed grading based on inlet locations. Each basin's characteristics were analyzed to determine the area and percent impervious (See Exhibit C1 – Basin Percent Impervious Calculations) along with the slope, overland flow length, and channelized flow length from the proposed grading (See Exhibit B4 – Drainage Plan). That information was then put into the Urban Drainage Rational Method Spreadsheet to calculate the runoff coefficient and time of concentration for each basin. See Exhibit C2 – Basin Variables.

*Table 4: Pond Design and Elevations*

| Variable | Pond A | Pond B | Pond C |
|---|---|---|---|
| Pond Bottom, ft | 4923.0 | 4923.8 | 4925.4 |
| Top of WQCV, ft | 4925.0 | 4926.3 | 4927.4 |
| Spillway, ft | 4929.0 | 4929.0 | 4931.5 |
| Top of Pond, ft | 4930.0 | 4930.0 | 4932.5 |
| Spillway Width, ft | 15 | 30 | 25 |

## L. Off-Site Flows

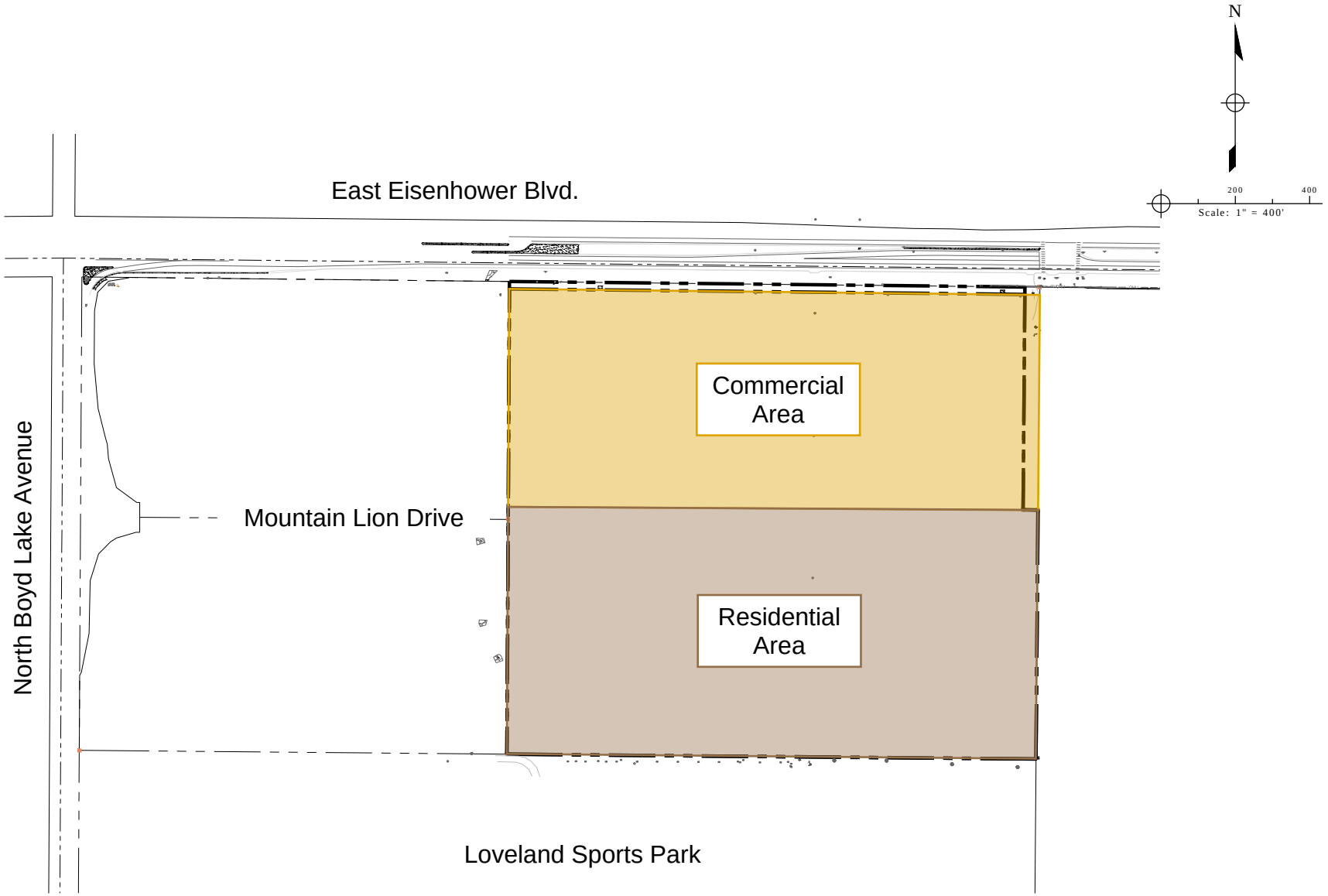
Generally, offsite flows from US Hwy 34 will continue to be conveyed to the existing Farmers Ditch via pipe and inlets. Offsite flow from the Reserve at Centerra Apartment Complex and Mattress Firm located north of US Hwy 34 will be conveyed into Pond C, along with flow from Hahn's Peak Drive. From the Reserve at Rocky Mountain Village Final Drainage Report, the offsite flow received from the Reserve at Centerra Apartment Townhomes detention pond reaches a maximum of 0.57cfs as the pond is constrained to release at that rate. From Rocky Mountain Village Final Drainage Report, it was determined that the Mattress Firm detention pond is constrained to release at a maximum of 1.04cfs and an additional 16.08cfs of flow is diverted to the south which will be detained in Pond C. Offsite flows from the East and West are not anticipated.

## M. Un-Detained Flows

Small amounts of flow on the southern and eastern edges of the project boundary are not being detained and are being graded to flow south to the Loveland Sports Park. Pond 203 can receive 42.6 cfs from existing Basins 25 and 26. Pond 202 can receive one cfs per acre from existing Basin 24. The un-detained flow from the project is being considered and the pond outlet structures have been designed so the total flow, detained and un-detained, is less than the allowed once cfs per acre for existing Basin 24 and 42.6cfs for existing Basin 25 and 26.

## N. Inlet Design

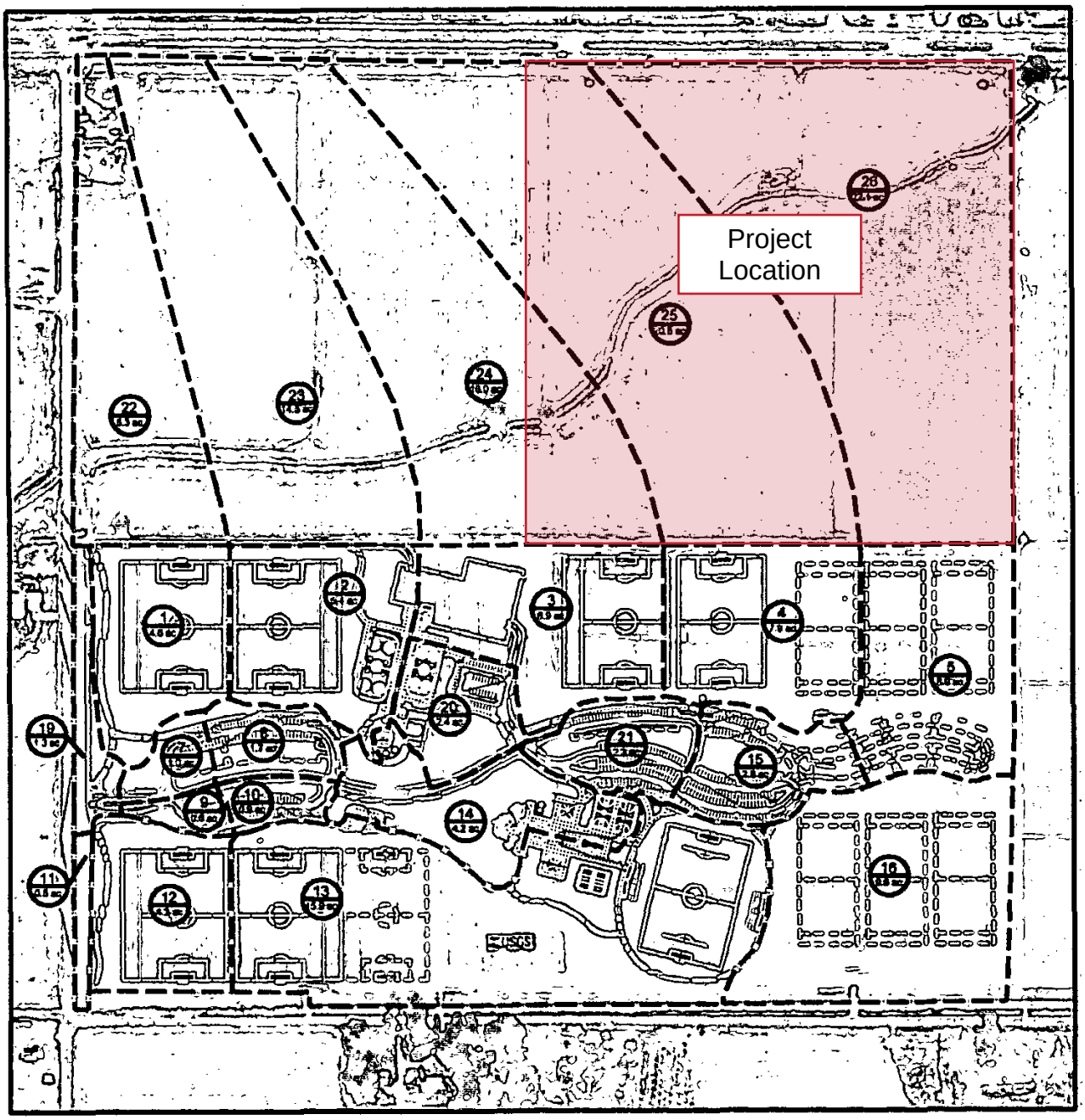
The project features two types of inlets: Type R curb inlets and Type C area inlets. The Type R curb inlets were designed using the Urban Drainage and Flood Control District Version 4.05 Street and Inlet Hydraulics Spreadsheet. The Type C area inlets were designed using calculations in FlowMaster, assessing the drive as an inverted crown and limiting the ponding to the edge of the drive. See Exhibit D2 – Inlet and Street Capacity Calculations. A summary of the inlet results is in Table 5.




**Chilson-Stroh Subdivision**

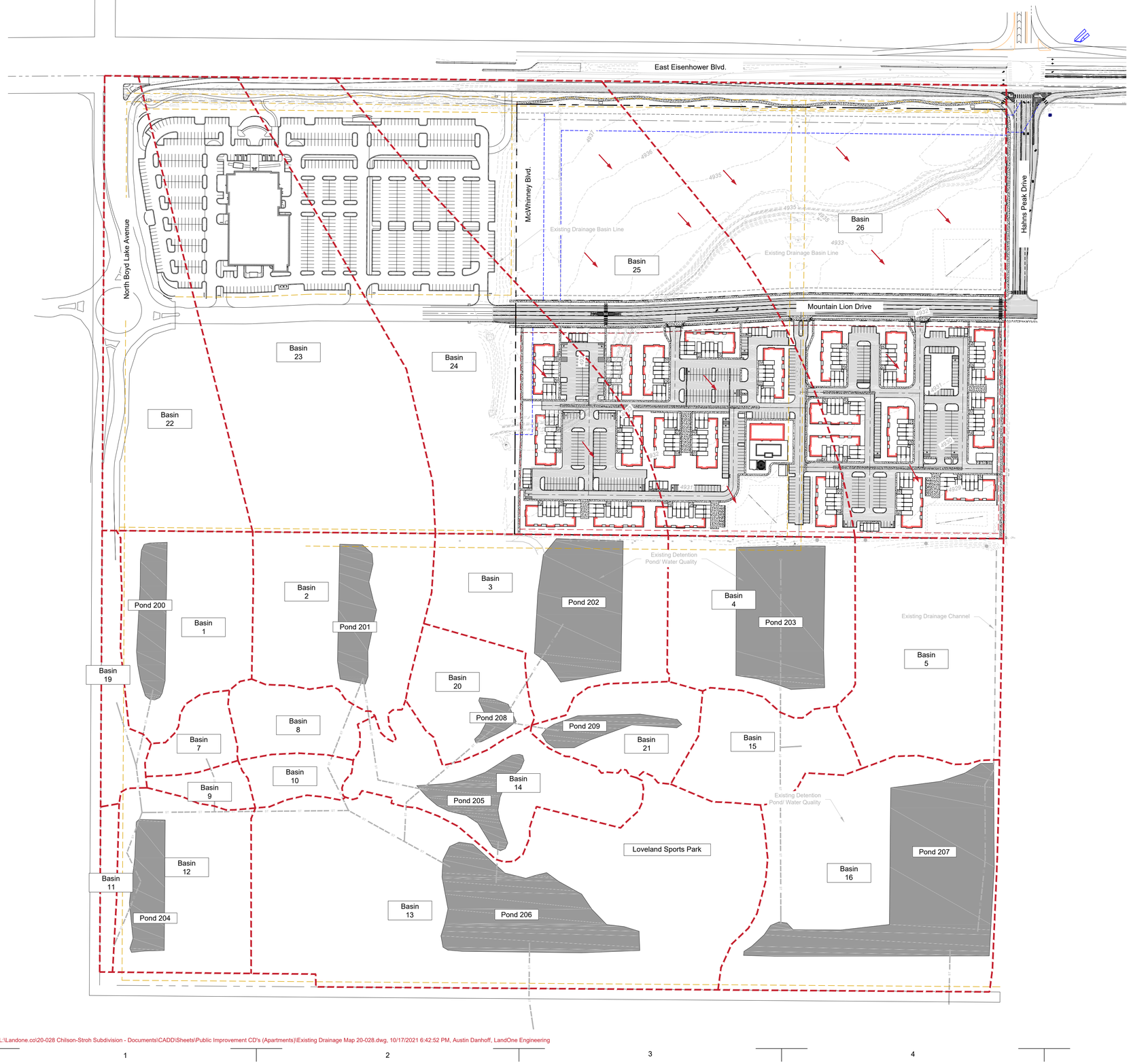
**Exhibit A4 - Development Areas**

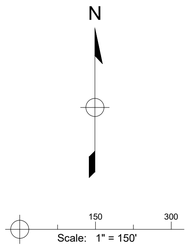
LAND ONE engineering
970-632-2311




Reference: Figure 5 - Proposed Conditions Basin Map
Final Drainage Report for the City of Loveland Sports Park, dated August 2005,
prepared by Ayres Associates, Project No. 32-0812.02

| | | |
|---|---|---|
| **Chilson-Stroh Subdivision** | **Exhibit B1 - Existing Drainage Basin Map** | LAND ONE engineering<br>970-632-2311 |




## Legend

| Existing | | Proposed |
|---|---|---|
| | Property Line | |
| | Right of Way | |
| | Easement | |
| 4800 | Major Contour | 4800 |
| 4801 | Minor Contour | 4801 |
| | Concrete | |
| | Pavement | |
| | Drainage Arrow | |
| | Drainage Basin Boundary | |
| | Detention Pond | |

## Notes

1. *Reference Final Drainage Report for the City of Loveland Sports Park*, dated August 2005, prepared by Ayres Associates, Project No. 32-0812.02

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Job Number 20-028
Checked By DH
Date 10/18/2021

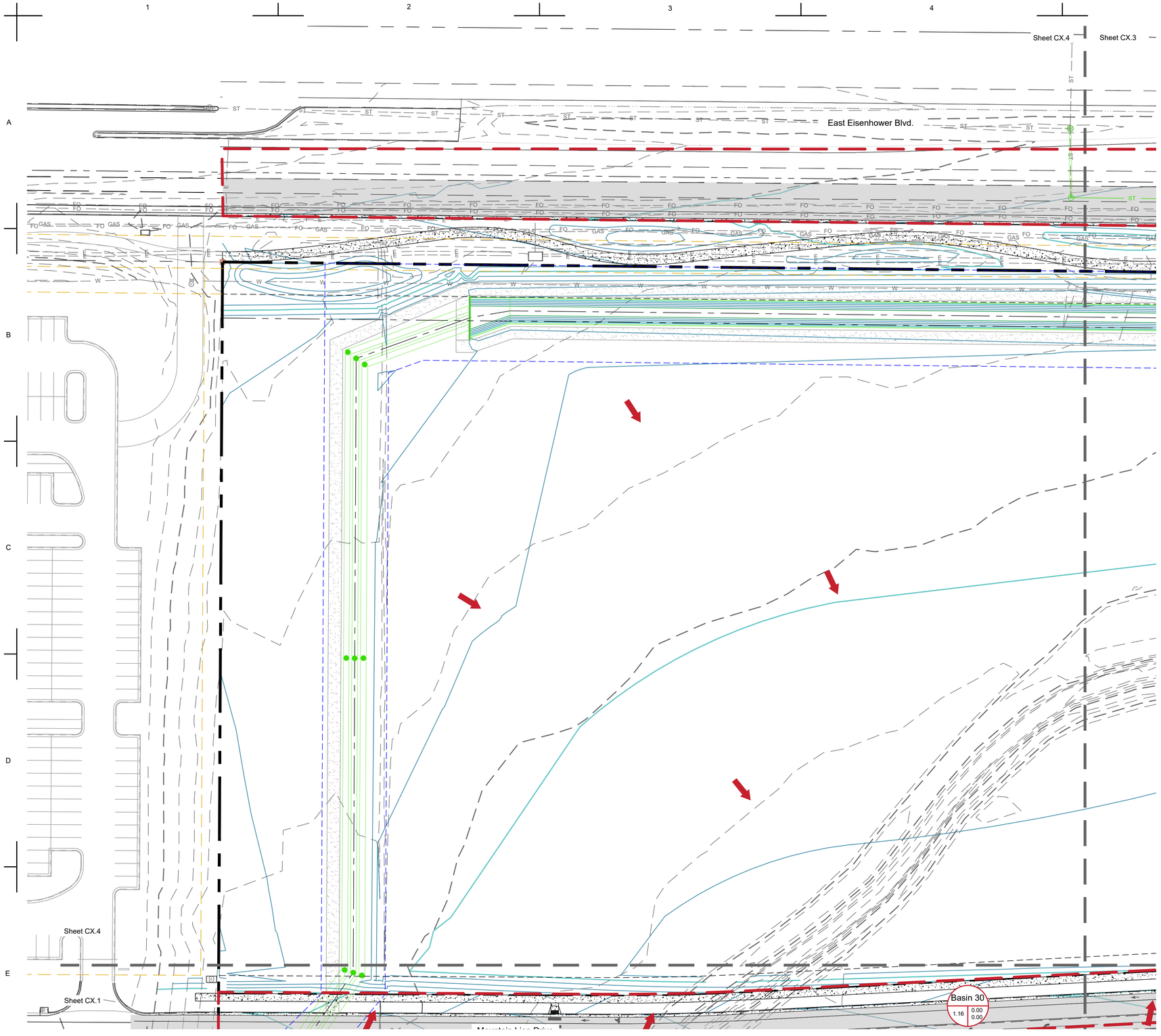
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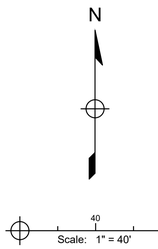
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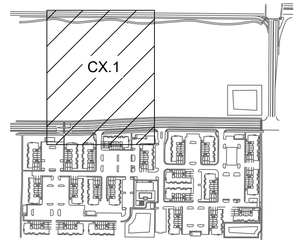
| Rev. No. | Date | Revision Description |
|---|---|---|
| B | 10/18/2021 | 2nd Submittal to City |

Chilson-Stroh Farms Third Subdivision
Civil Construction Plans
Existing Basin Overlay
Loveland, CO

Sheet
Exhibit B3




## Legend

| Existing | Proposed |
|---|---|
| Property Line | |
| Right of Way | |
| Easement | |
| Potable Water | W |
| Non-Potable Water | NPW |
| Sanitary Sewer | SS |
| Storm | ST |
| Major Contour | 4800 |
| Minor Contour | 4801 |
| Curb and Gutter | |

Basin Name
XXX
XX XX
Basin Area
Percent Impervious

X
Design Point Designation

Drainage Arrow

## Summary Runoff Table

| Design Point | Contributing Basin | 100-yr Peak Runoff (cfs) | Inlet/Manhole Type |
|---|---|---|---|
| DP-1 | Basin 1 | 1.78 | 2' Type C |
| DP-2 | Basin 2 | 1.26 | 2' Type C |
| DP-3 | Basin 3,4,5 | 8.81 | 2' Type C |
| DP-4 | Basin 35 | 2.73 | 2' Type C |
| DP-5 | Basin 6 | 7.86 | 5' Type R |
| DP-6 | Basin 9 | 1.38 | 2' Type C |
| DP-7 | Basin 11 | 1.43 | 2' Type C |
| DP-8 | Basin 7, 10 | 15.34 | 2' Type C |
| DP-9 | Basin 12 | 7.12 | 5' Type R |
| DP-10 | Basin 14, 15, 17 | 8.88 | 5' Type R |
| DP-11 | Basin 18 | 7.36 | 2' Type C |
| DP-12 | Basin 19, 20, 21 | 8.69 | 2' Type C |
| DP-14 | Basin 23, 25 | 7.97 | 5' Type R |
| DP-15 | Basin 26 | 8.89 | 5' Type R |

## Notes

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Date 06/14/2022


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|---|---|---|
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| C | 02/22/2022 | 3rd Submittal to City |
| D | 05/03/2022 | 4th Submittal to City |
| E | 06/14/2022 | 5th Submittal to City |

Chilson-Stroh Farms Third Subdivision
Civil Construction Plans
Drainage Plan
Loveland, CO

Sheet
Exhibit B4

Sheet CX.4

Sheet CX.3

East Eisenhower Blvd.

Basin 36
2.16 | 0.00 | 0.00

Basin 37
0.04 | 0.00 | 0.00

Basin 35
1.08 | 0.00 | 0.00

Basin 34
0.58 | 0.00 | 0.00

Basin 32
0.18 | 0.00 | 0.00

Detention Pond C

Hahns Peak Drive

Mountain Lion Drive

Sheet CX.3

Sheet CX.2

CX.2

N

Scale: 1" = 40'

## Legend

| Existing | Proposed |
|---|---|
| Property Line | |
| Right of Way | |
| Easement | |
| Potable Water | W |
| Non-Potable Water | NPW |
| Sanitary Sewer | SS |
| Storm | ST |
| Major Contour | 4800 |
| Minor Contour | 4801 |
| Curb and Gutter | |

Basin Name
XXX
XX | XX
Basin Area | Percent Impervious

X Design Point Designation

Drainage Arrow

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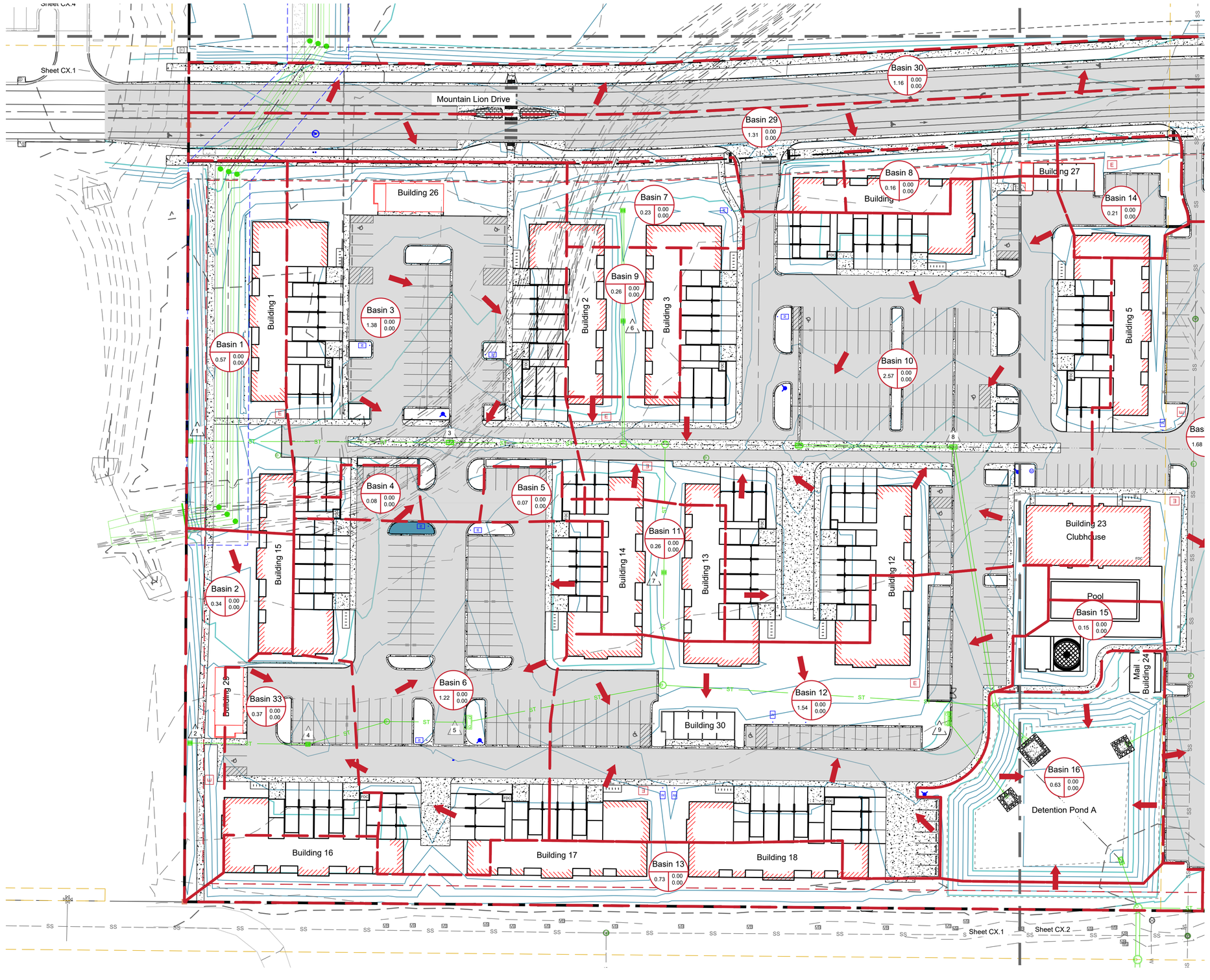
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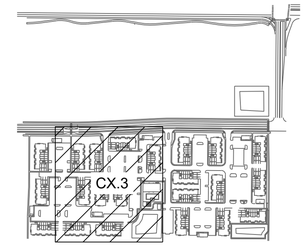
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Chilson-Stroh Farms Third Subdivision
Civil Construction Plans
Drainage Plan
Loveland, CO

Sheet
Exhibit B4



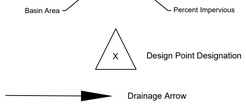




N

40 80
Scale: 1" = 40'

## Legend

| Existing | Proposed |
|---|---|
| Property Line | |
| Right of Way | |
| Easement | |
| W Potable Water | W |
| Non-Potable Water | NPW |
| SS Sanitary Sewer | SS |
| Storm | ST |
| Major Contour | 4800 |
| 4800 Minor Contour | 4801 |
| 4801 Curb and Gutter | |




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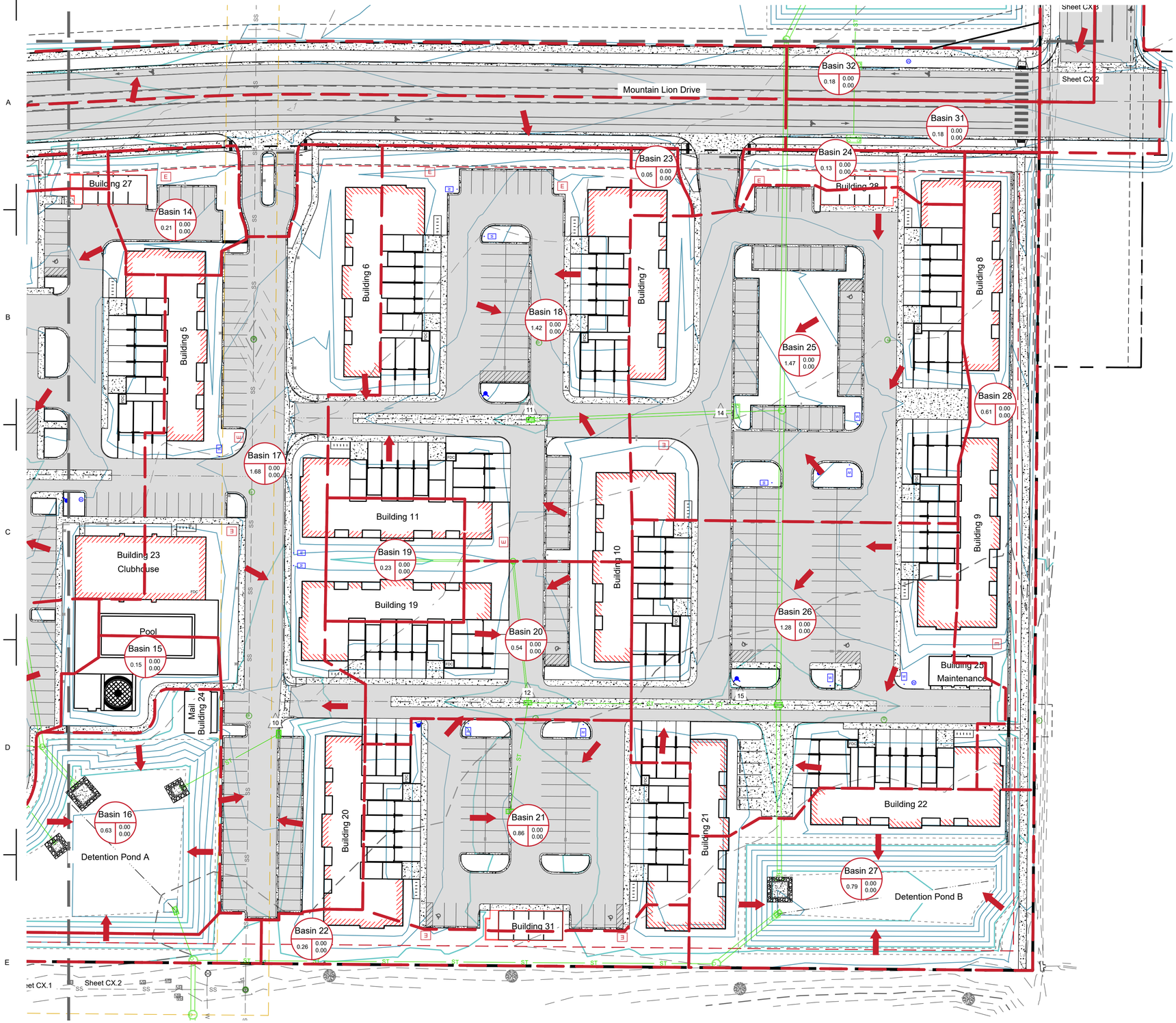
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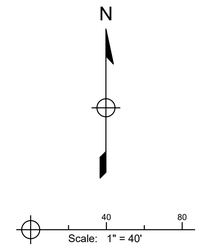
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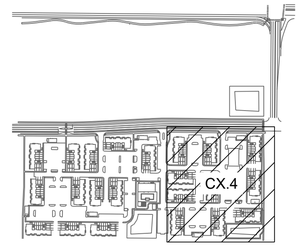
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Chilson-Stroh Farms Third Subdivision
Civil Construction Plans
Drainage Plan
Loveland, CO

Sheet
Exhibit B4

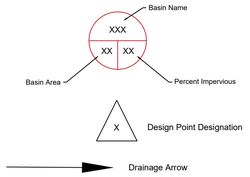



## Legend

| Existing | Proposed |
|---|---|
| Property Line | |
| Right of Way | |
| Easement | |
| Potable Water | W |
| Non-Potable Water | NPW |
| Sanitary Sewer | SS |
| Storm | ST |
| Major Contour | 4800 |
| Minor Contour | 4801 |
| Curb and Gutter | |




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| | |
|---|---|
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| Checked By | DH |
| Date | 06/14/2022 |

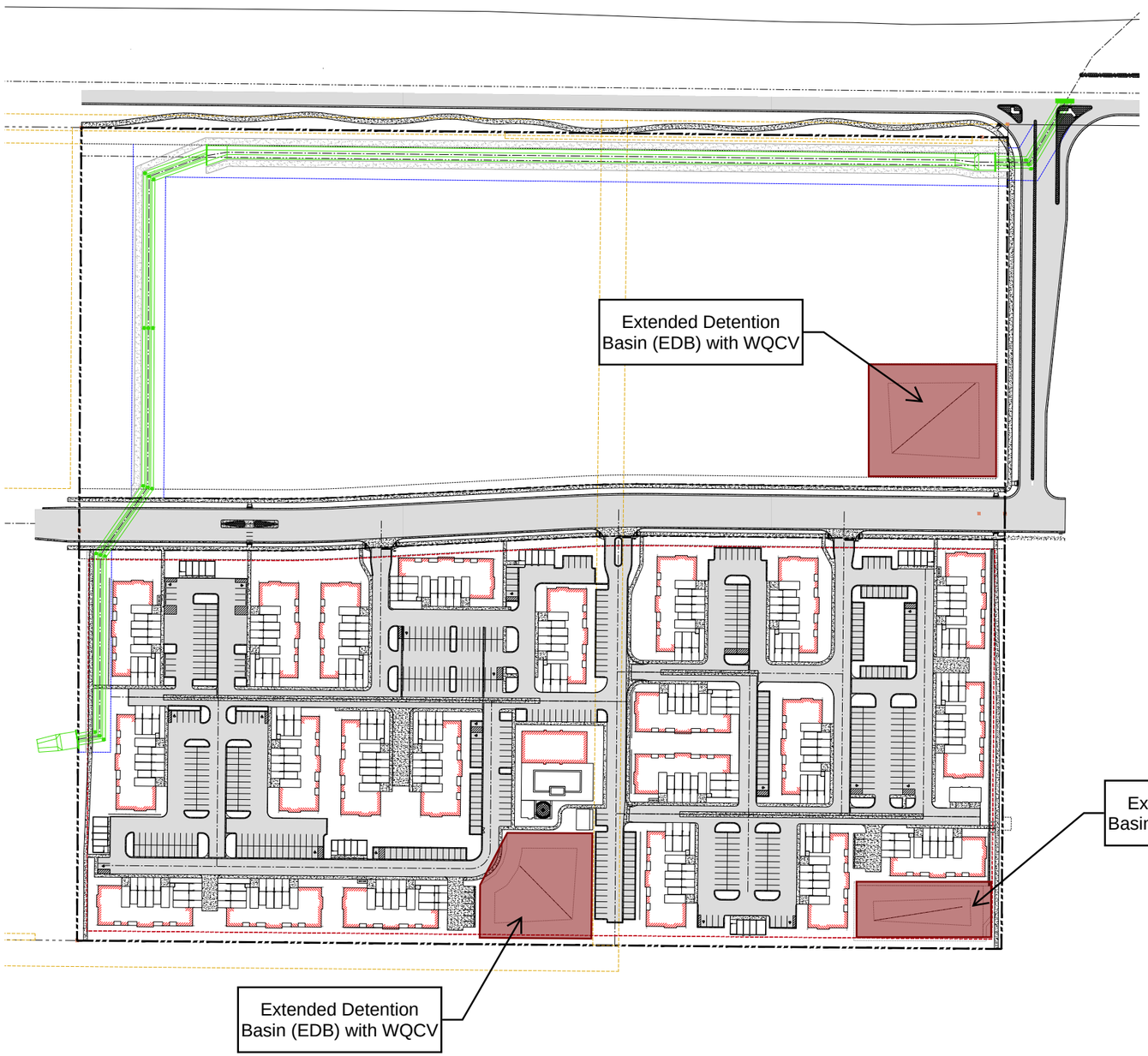
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Chilson-Stroh Farms Third Subdivision
Civil Construction Plans
Drainage Plan
Loveland, CO

Sheet
Exhibit B4




N

100 200

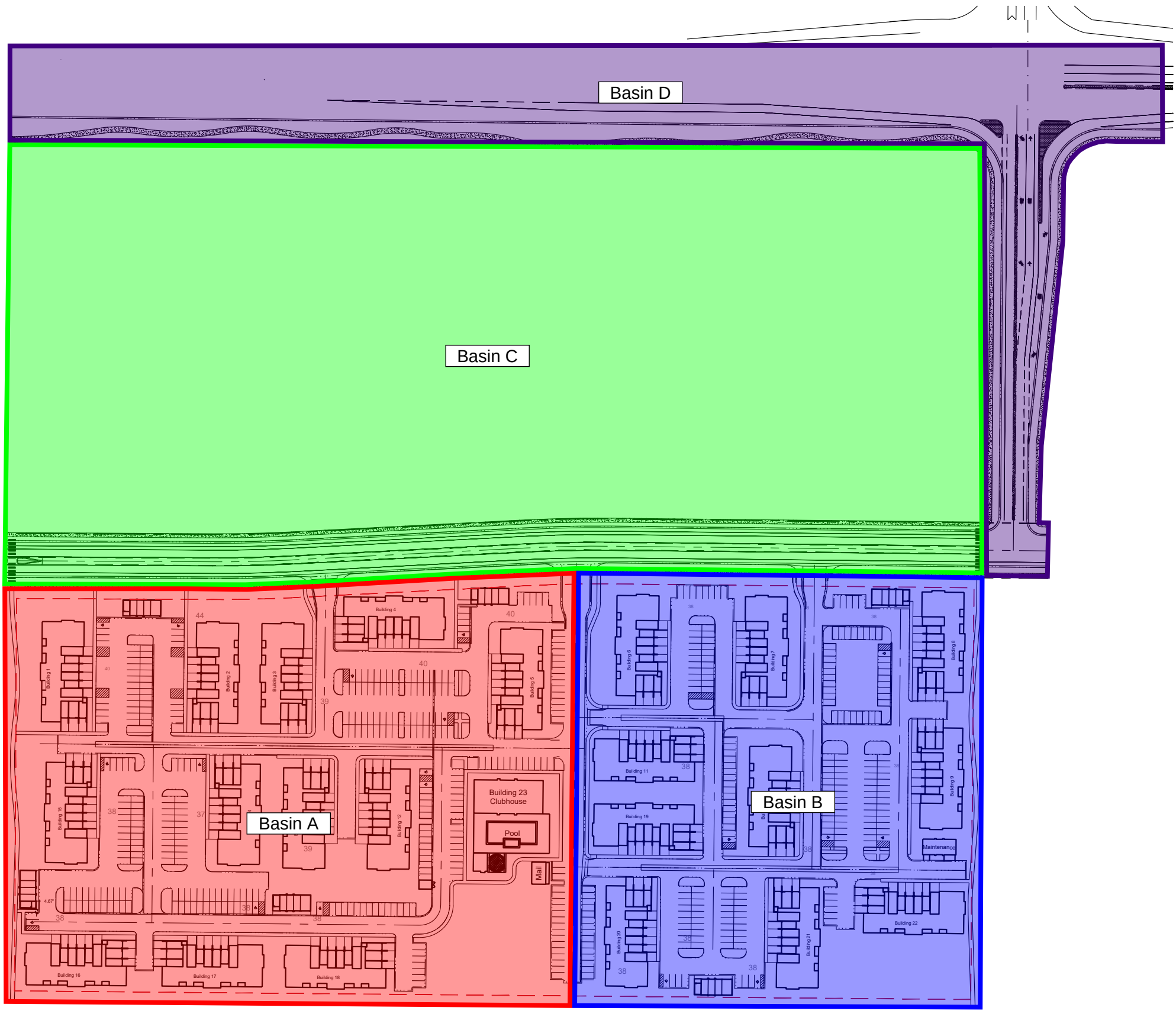
Scale: 1" = 200'

Permanent Storm Water Quality BMPs

**Chilson-Stoh Subdivision**

**Exhibit B5**
**Permanent Storm Water Quality BMPs**

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**Chilson-Stroh Subdivision**

**Exhibit E1 - CUHP Basin Map**

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# APPENDIX C – PROPOSED HYDROLOGIC CALCULATIONS

Imperviousness Calculations
Composite “C” Coefficient Calculations
Time of Concentration Calculations
Routing Calculations (2-year and 100-year)

Pond Spreadsheet – Modified FAA
Pond Spreadsheet – Basin Geometry

## Composite Imperviousness Calculations

Developed Conditions

**CENTERRA SOUTH**

Loveland, Colorado

Job No. 130-00201
Date 05/17/25
Calculated By DFL
Checked By BEC

| Basin | Sub-Basin | Area (acres) | Parcel Imperviousness | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Multi-family Housing (MFH) - Medium Density (5-20 du/ac) 65 | MFH - High Density (>20 du/ac) 70 | Commercial - Medium to High Density 80 | Commercial - Urban Core 90 | Disturbed Soil 20 | Undisturbed Soil 5 | Roadways & Paved Streets 95 | Roofs 95 | Detention Facilities 25 | Composite Imperviousness |
| A | A1 | 1.27 | | | | | | | 1.27 | | | 95.0 |
| | A2 | 0.85 | | | | | | | | 0.85 | | 95.0 |
| | A3 | 1.84 | | | | | 0.35 | | 1.49 | | | 80.7 |
| | A4 | 1.24 | | | 0.37 | | 0.12 | | 0.75 | | | 83.0 |
| | A5 | 1.69 | | | 0.17 | | 0.17 | | 1.35 | | | 86.0 |
| | A6 | 0.52 | | | | | 0.23 | | 0.29 | | | 61.3 |
| | A7 | 2.05 | | | | | 0.31 | | 1.74 | | | 83.8 |
| | OS-2 | 0.68 | | | | | 0.33 | | 0.03 | 0.32 | | 58.7 |
| | A8 | 0.76 | | | | | 0.19 | | 0.57 | | | 76.3 |
| | A9 | 0.94 | | | | | 0.19 | | 0.75 | | | 80.0 |
| | OS-3 | 0.66 | | | | | 0.35 | | 0.06 | 0.24 | | 54.8 |
| | A10 | 0.64 | | | | | 0.16 | | 0.48 | | | 76.3 |
| | A11 | 0.73 | | | | | 0.22 | | 0.51 | | | 72.5 |
| | **Sum** | **13.87** | | | **0.54** | | **2.62** | | **9.29** | **1.41** | | **80.2** |
| B | B1 | 0.49 | | | | | | | 0.49 | | | 95.0 |
| | B2 | 0.17 | | | | | 0.03 | | 0.14 | | | 80.0 |
| | B3 | 0.09 | | | | | 0.03 | | 0.05 | | | 65.0 |
| | B4 | 0.21 | | | | | | | | 0.21 | | 95.0 |
| | B5 | 2.52 | | | | | 0.75 | | 1.76 | | | 72.5 |
| | B6 | 0.19 | | | | | | | | 0.19 | | 95.0 |
| | B7 | 2.58 | | | 0.26 | | 0.26 | | 2.07 | | | 86.0 |
| | B8 | 0.38 | | | | | | | | 0.38 | | 95.0 |
| | B9 | 0.30 | | | 0.15 | | | | 0.15 | | | 87.5 |
| | B10 | 0.22 | | | 0.11 | | | | 0.11 | | | 87.5 |
| | B11 | 0.17 | | | | | | | | 0.17 | | 95.0 |
| | B12 | 0.25 | | | 0.15 | | | | 0.10 | | | 86.0 |
| | B13 | 0.34 | | | 0.27 | | | | 0.07 | | | 83.0 |
| | B14 | 0.12 | | | 0.06 | | | | 0.06 | | | 87.5 |
| | B15 | 0.27 | | | | | | | | 0.27 | | 95.0 |
| | B16 | 0.67 | | | 0.40 | | | | 0.27 | | | 86.0 |
| | B17 | 0.29 | | | | | | | | 0.29 | | 95.0 |
| | B18 | 0.59 | | | 0.29 | | | | 0.29 | | | 87.5 |
| | B19 | 1.75 | | | | | 0.35 | | 1.40 | | | 80.0 |
| | B20 | 0.15 | | | 0.03 | | 0.03 | | 0.09 | | | 77.0 |
| | OS-1 | 0.58 | | | | | 0.37 | | 0.04 | 0.17 | | 47.1 |
| | B21 | 0.42 | | 0.21 | | | 0.10 | | 0.10 | | | 63.8 |
| | **Sum** | **12.73** | | **0.21** | **1.72** | | **1.94** | | **7.19** | **1.67** | | **81.2** |

| Basin | Sub-Basin | Area (acres) | Parcel Imperviousness | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Multi-family Housing (MFH) - Medium Density (5-20 du/ac) 65 | MFH - High Density (>20 du/ac) 70 | Commercial - Medium to High Density 80 | Commercial - Urban Core 90 | Disturbed Soil 20 | Undisturbed Soil 5 | Roadways & Paved Streets 95 | Roofs 95 | Detention Facilities 25 | Composite Imperviousness |
| C | C1 | 1.36 | | | | | | | | 1.36 | | 95.0 |
| | A106 | 0.48 | | | | | 0.02 | | 0.27 | 0.19 | | 92.1 |
| | A108 | 0.25 | | | | | 0.16 | | 0.09 | | | 47.4 |
| | C2 | 1.07 | | | | | 1.07 | | | | | 20.0 |
| | A200 | 2.71 | | | | | 0.30 | | 1.94 | 0.46 | | 86.6 |
| | A202 | 1.80 | | | | | 0.25 | | 1.17 | 0.37 | | 84.4 |
| | A104 | 0.38 | | | | | 0.11 | | 0.23 | 0.04 | | 73.7 |
| | A100 | 2.66 | | | | | 0.36 | | 1.66 | 0.64 | | 84.9 |
| | A102 | 0.41 | | | | | 0.10 | | 0.27 | 0.04 | | 76.6 |
| | **Sum** | **11.12** | | | | | **2.37** | | **5.63** | **3.10** | | **78.8** |
| D | D1 | 3.15 | | | | | 0.63 | | 2.52 | | | 80.0 |
| | D2 | 0.35 | | | | | | | | 0.35 | | 95.0 |
| | D3 | 2.87 | | | 1.15 | | | | 1.72 | | | 89.0 |
| | D4 | 2.98 | | | 0.90 | | 0.30 | | 1.79 | | | 83.0 |
| | D5 | 3.47 | | | 1.04 | | 0.52 | | 1.91 | | | 79.3 |
| | D6 | 0.11 | | | 0.07 | | | | 0.05 | | | 86.0 |
| | D7 | 0.33 | | | 0.25 | | | | 0.08 | | | 83.8 |
| | D8 | 0.26 | | | 0.17 | | | | 0.09 | | | 85.1 |
| | D9 | 0.46 | | | 0.31 | | | | 0.16 | | | 85.1 |
| | D10 | 6.51 | | | 6.51 | | | | | | | 80.0 |
| | D11 | 0.39 | | | 0.12 | | | | 0.27 | | | 90.5 |
| | D12 | 0.16 | | | 0.05 | | | | 0.11 | | | 90.5 |
| | D13 | 1.59 | | | 0.48 | | | | 1.11 | | | 90.5 |
| | D14 | 0.27 | | | 0.20 | | | | 0.07 | | | 83.8 |
| | D15 | 0.72 | | | | | 0.07 | | 0.64 | | | 87.5 |
| | D16 | 0.37 | | | 0.22 | | | | 0.15 | | | 86.0 |
| | D17 | 0.24 | | 0.06 | | | 0.06 | | 0.12 | | | 70.0 |
| | D18 | 0.34 | | | | | | | | 0.34 | | 95.0 |
| | D19 | 0.44 | | | 0.18 | | | | 0.26 | | | 89.0 |
| | D20 | 1.20 | | 0.90 | | | 0.06 | | 0.24 | | | 72.5 |
| | D21 | 0.35 | | | 0.28 | | | | | 0.07 | | 83.0 |
| | D22 | 0.25 | | | 0.24 | | | | 0.01 | | | 80.8 |
| | D23 | 0.26 | | | 0.24 | | | | 0.03 | | | 81.5 |
| | D24 | 0.12 | | | 0.12 | | | | | | | 80.0 |
| | D25 | 0.15 | | | 0.15 | | | | | | | 80.0 |
| | D26 | 0.45 | | | | | | | | 0.45 | | 95.0 |
| | D27 | 0.59 | | | | | | | | 0.59 | | 95.0 |
| | D28 | 0.19 | | | 0.09 | | | | 0.10 | | | 88.1 |
| | D29 | 0.11 | | | | | 0.01 | | 0.10 | | | 85.4 |
| | D30 | 0.43 | | | | | | | | 0.43 | | 95.0 |
| | D31 | 0.41 | | | 0.16 | | | | 0.24 | | | 89.0 |
| | OS-5 | 0.28 | | | | | 0.05 | | 0.07 | 0.17 | | 81.7 |
| | D32 | 0.73 | | | 0.33 | | | | 0.40 | | | 88.3 |
| | D33 | 1.55 | | | | | 0.78 | | 0.78 | | | 57.5 |
| | D34 | 1.53 | | | | | 0.76 | | 0.76 | | | 57.5 |
| | D35 | 12.51 | | 11.88 | | | | | 0.63 | | | 71.3 |
| | D36 | 1.08 | | | | | 0.16 | | 0.92 | | | 83.8 |
| | D37 | 1.22 | | | | | 0.61 | | 0.61 | | | 57.5 |
| | D38 | 13.09 | | 13.09 | | | | | | | | 70.0 |
| | OS-4 | 1.53 | | | | | 0.54 | | 0.36 | 0.62 | | 68.4 |
| | D39 | 1.81 | | | | | 0.45 | | 1.36 | | | 76.3 |
| | D40 | 1.35 | | | | | 0.34 | | 1.01 | | | 76.3 |
| | **Sum** | **66.22** | | **25.93** | **13.23** | | **5.35** | | **18.69** | **3.01** | | **76.2** |

| Basin | Sub-Basin | Area (acres) | Parcel Imperviousness | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Multi-family Housing (MFH) - Medium Density (5-20 du/ac) 65 | MFH - High Density (>20 du/ac) 70 | Commercial - Medium to High Density 80 | Commercial - Urban Core 90 | Disturbed Soil 20 | Undisturbed Soil 5 | Roadways & Paved Streets 95 | Roofs 95 | Detention Facilities 25 | Composite Imperviousness |
| OS | OS-101 | 3.37 | | | | | 1.68 | 0.17 | 1.51 | | | 53.0 |
| | OS-102 | 0.47 | | | | | 0.05 | 0.02 | 0.40 | | | 83.0 |
| | OS-103 | 2.77 | | | | | 1.39 | 0.14 | 1.25 | | | 53.0 |
| | OS-104 | 3.34 | | | | | 0.67 | 0.17 | 2.51 | | | 75.5 |
| | E-1 | 0.33 | | | | | 0.10 | | 0.23 | | | 73.0 |
| | E-2 | 0.28 | | | | | 0.07 | | 0.21 | | | 75.6 |
| | E-3 | 0.20 | | | | | 0.06 | | 0.14 | | | 71.9 |
| | E-4 | 0.21 | | | | | 0.07 | | 0.15 | | | 71.8 |
| | UD-1 | 0.84 | | | | | 0.31 | | 0.53 | | | 67.6 |
| | **Sum** | **6.61** | | | | | **3.12** | **0.33** | **3.16** | | | **55.14** |
| POND | POND | 5.00 | | | | | | | | | 5.00 | 25.0 |
| TOTAL TO POND #1 | **Sum** | **108.93** | | **26.14** | **15.49** | | **12.28** | **0.00** | **40.79** | **9.19** | **5.00** | **75.2** |

T:\JOBS\McWhinney\McDonough\Engineering\Drainage\3rd Submittal\Hydrology\[MCD-HYDROLOGY.xls]Composite C

Orange highlight notes values were retrieved from third party report - "FINAL DRAINAGE REPORT, AVENUE SOUTH MULTIFAMILY" By Kimley Horn Dated April 25, 2025

## Composite "C" Calculations

Developed Conditions

**CENTERRA SOUTH**

Loveland, Colorado

Job No. 130-00201
Date 05/17/25
Calculated By DFL
Checked By BEC

| Basin | Sub-Basin | Area (acres) | 2 Year Calculation — Area Type: Multi-family Housing (MFH) - Medi | MFH - High Density (>20 du/ac) | Commercial - Medium to High Dens | Commercial - Urban Core | Disturbed Soil | Undisturbed Soil | Roadways & Paved Streets | Roofs | Detention Facilities | C2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.51 | 0.56 | 0.65 | 0.74 | 0.14 | 0.03 | 0.79 | 0.79 | 0.83 | |
| A | A1 | 1.27 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.27 | 0.00 | 0.00 | 0.79 |
| | A2 | 0.85 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.85 | 0.00 | 0.79 |
| | A3 | 1.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.35 | 0.00 | 1.49 | 0.00 | 0.00 | 0.66 |
| | A4 | 1.24 | 0.00 | 0.00 | 0.37 | 0.00 | 0.12 | 0.00 | 0.75 | 0.00 | 0.00 | 0.68 |
| | A5 | 1.69 | 0.00 | 0.00 | 0.17 | 0.00 | 0.17 | 0.00 | 1.35 | 0.00 | 0.00 | 0.71 |
| | A6 | 0.52 | 0.00 | 0.00 | 0.00 | 0.00 | 0.23 | 0.00 | 0.29 | 0.00 | 0.00 | 0.49 |
| | A7 | 2.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.31 | 0.00 | 1.74 | 0.00 | 0.00 | 0.69 |
| | OS-2 | 0.68 | | | | | | | | | | 0.47 |
| | A8 | 0.76 | 0.00 | 0.00 | 0.00 | 0.00 | 0.19 | 0.00 | 0.57 | 0.00 | 0.00 | 0.62 |
| | A9 | 0.94 | 0.00 | 0.00 | 0.00 | 0.00 | 0.19 | 0.00 | 0.75 | 0.00 | 0.00 | 0.66 |
| | OS-3 | 0.66 | | | | | | | | | | 0.44 |
| | A10 | 0.64 | 0.00 | 0.00 | 0.00 | 0.00 | 0.16 | 0.00 | 0.48 | 0.00 | 0.00 | 0.62 |
| | A11 | 0.73 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.00 | 0.51 | 0.00 | 0.00 | 0.59 |
| B | B1 | 0.49 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.49 | 0.00 | 0.00 | 0.79 |
| | B2 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.14 | 0.00 | 0.00 | 0.66 |
| | B3 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.05 | 0.00 | 0.00 | 0.53 |
| | B4 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.21 | 0.00 | 0.79 |
| | B5 | 2.52 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 1.76 | 0.00 | 0.00 | 0.59 |
| | B6 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.19 | 0.00 | 0.79 |
| | B7 | 2.58 | 0.00 | 0.00 | 0.26 | 0.00 | 0.26 | 0.00 | 2.07 | 0.00 | 0.00 | 0.71 |
| | B8 | 0.38 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.38 | 0.00 | 0.79 |
| | B9 | 0.30 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.72 |
| | B10 | 0.22 | 0.00 | 0.00 | 0.11 | 0.00 | 0.00 | 0.00 | 0.11 | 0.00 | 0.00 | 0.72 |
| | B11 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.17 | 0.00 | 0.79 |
| | B12 | 0.25 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.70 |
| | B13 | 0.34 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 | 0.68 |
| | B14 | 0.12 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.72 |
| | B15 | 0.27 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 | 0.79 |
| | B16 | 0.67 | 0.00 | 0.00 | 0.40 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 | 0.70 |
| | B17 | 0.29 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.29 | 0.00 | 0.79 |
| | B18 | 0.59 | 0.00 | 0.00 | 0.29 | 0.00 | 0.00 | 0.00 | 0.29 | 0.00 | 0.00 | 0.72 |
| | B19 | 1.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.35 | 0.00 | 1.40 | 0.00 | 0.00 | 0.66 |
| | B20 | 0.15 | 0.00 | 0.00 | 0.03 | 0.00 | 0.03 | 0.00 | 0.09 | 0.00 | 0.00 | 0.63 |
| | OS-1 | 0.58 | | | | | | | | | | 0.37 |
| | B21 | 0.42 | 0.00 | 0.21 | 0.00 | 0.00 | 0.10 | 0.00 | 0.10 | 0.00 | 0.00 | 0.51 |
| | C1 | 1.36 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.36 | 0.00 | 0.79 |
| | A106 | 0.48 | | | | | | | | | | 0.76 |
| | A108 | 0.25 | | | | | | | | | | 0.38 |
| | C2 | 1.07 | 0.00 | 0.00 | 0.00 | 0.00 | 1.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.14 |
| | A200 | 2.71 | | | | | | | | | | 0.71 |
| | A202 | 1.80 | | | | | | | | | | 0.70 |
| | A104 | 0.38 | | | | | | | | | | 0.60 |
| | A100 | 2.66 | | | | | | | | | | 0.70 |
| | A102 | 0.41 | | | | | | | | | | 0.63 |
| D | D1 | 3.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.63 | 0.00 | 2.52 | 0.00 | 0.00 | 0.66 |
| | D2 | 0.35 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.35 | 0.00 | 0.79 |
| | D3 | 2.87 | 0.00 | 0.00 | 1.15 | 0.00 | 0.00 | 0.00 | 1.72 | 0.00 | 0.00 | 0.73 |
| | D4 | 2.98 | 0.00 | 0.00 | 0.90 | 0.00 | 0.30 | 0.00 | 1.79 | 0.00 | 0.00 | 0.68 |
| | D5 | 3.47 | 0.00 | 0.00 | 1.04 | 0.00 | 0.52 | 0.00 | 1.91 | 0.00 | 0.00 | 0.65 |
| | D6 | 0.11 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.70 |
| | D7 | 0.33 | 0.00 | 0.00 | 0.25 | 0.00 | 0.00 | 0.00 | 0.08 | 0.00 | 0.00 | 0.68 |
| | D8 | 0.26 | 0.00 | 0.00 | 0.17 | 0.00 | 0.00 | 0.00 | 0.09 | 0.00 | 0.00 | 0.70 |
| | D9 | 0.46 | 0.00 | 0.00 | 0.31 | 0.00 | 0.00 | 0.00 | 0.16 | 0.00 | 0.00 | 0.70 |
| | D10 | 6.51 | 0.00 | 0.00 | 6.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.65 |
| | D11 | 0.39 | 0.00 | 0.00 | 0.12 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 | 0.75 |
| | D12 | 0.16 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.11 | 0.00 | 0.00 | 0.75 |
| | D13 | 1.59 | 0.00 | 0.00 | 0.48 | 0.00 | 0.00 | 0.00 | 1.11 | 0.00 | 0.00 | 0.75 |
| | D14 | 0.27 | 0.00 | 0.00 | 0.20 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 | 0.68 |
| | D15 | 0.72 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.64 | 0.00 | 0.00 | 0.72 |
| | D16 | 0.37 | 0.00 | 0.00 | 0.22 | 0.00 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.70 |
| | D17 | 0.24 | 0.00 | 0.06 | 0.00 | 0.00 | 0.06 | 0.00 | 0.12 | 0.00 | 0.00 | 0.57 |
| | D18 | 0.34 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.34 | 0.00 | 0.79 |
| | D19 | 0.44 | 0.00 | 0.00 | 0.18 | 0.00 | 0.00 | 0.00 | 0.26 | 0.00 | 0.00 | 0.73 |
| | D20 | 1.20 | 0.00 | 0.90 | 0.00 | 0.00 | 0.06 | 0.00 | 0.24 | 0.00 | 0.00 | 0.58 |
| | D21 | 0.35 | 0.00 | 0.00 | 0.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.68 |
| | D22 | 0.25 | 0.00 | 0.00 | 0.24 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.66 |
| | D23 | 0.26 | 0.00 | 0.00 | 0.24 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 | 0.66 |
| | D24 | 0.12 | 0.00 | 0.00 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.65 |
| | D25 | 0.15 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.65 |
| | D26 | 0.45 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.45 | 0.00 | 0.79 |
| | D27 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.59 | 0.00 | 0.79 |
| | D28 | 0.19 | 0.00 | 0.00 | 0.09 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.72 |
| | D29 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.10 | 0.00 | 0.00 | 0.70 |
| | D30 | 0.43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.43 | 0.00 | 0.79 |
| | D31 | 0.41 | 0.00 | 0.00 | 0.16 | 0.00 | 0.00 | 0.00 | 0.24 | 0.00 | 0.00 | 0.73 |
| | OS-5 | 0.28 | | | | | | | | | | 0.67 |
| | D32 | 0.73 | 0.00 | 0.00 | 0.33 | 0.00 | 0.00 | 0.00 | 0.40 | 0.00 | 0.00 | 0.73 |
| | D33 | 1.55 | 0.00 | 0.00 | 0.00 | 0.00 | 0.78 | 0.00 | 0.78 | 0.00 | 0.00 | 0.46 |
| | D34 | 1.53 | 0.00 | 0.00 | 0.00 | 0.00 | 0.76 | 0.00 | 0.76 | 0.00 | 0.00 | 0.46 |
| | D35 | 12.51 | 0.00 | 11.88 | 0.00 | 0.00 | 0.00 | 0.00 | 0.63 | 0.00 | 0.00 | 0.57 |
| | D36 | 1.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.16 | 0.00 | 0.92 | 0.00 | 0.00 | 0.69 |
| | D37 | 1.22 | 0.00 | 0.00 | 0.00 | 0.00 | 0.61 | 0.00 | 0.61 | 0.00 | 0.00 | 0.46 |
| | D38 | 13.09 | 0.00 | 13.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.56 |
| | OS-4 | 1.53 | | | | | | | | | | 0.56 |
| | D39 | 1.81 | 0.00 | 0.00 | 0.00 | 0.00 | 0.45 | 0.00 | 1.36 | 0.00 | 0.00 | 0.62 |
| | D40 | 1.35 | 0.00 | 0.00 | 0.00 | 0.00 | 0.34 | 0.00 | 1.01 | 0.00 | 0.00 | 0.62 |
| OS | OS-101 | 3.37 | 0.00 | 0.00 | 0.00 | 0.00 | 1.68 | 0.17 | 1.51 | 0.00 | 0.00 | 0.42 |
| | OS-102 | 0.47 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.02 | 0.40 | 0.00 | 0.00 | 0.68 |
| | OS-103 | 2.77 | 0.00 | 0.00 | 0.00 | 0.00 | 1.39 | 0.14 | 1.25 | 0.00 | 0.00 | 0.42 |
| | OS-104 | 3.34 | 0.00 | 0.00 | 0.00 | 0.00 | 0.67 | 0.17 | 2.51 | 0.00 | 0.00 | 0.62 |
| | E-1 | 0.33 | 0.00 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.23 | 0.00 | 0.00 | 0.60 |
| | E-2 | 0.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.21 | 0.00 | 0.00 | 0.62 |
| | E-3 | 0.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.14 | 0.00 | 0.00 | 0.59 |
| | E-4 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.15 | 0.00 | 0.00 | 0.59 |
| | UD-1 | 0.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.31 | 0.00 | 0.53 | 0.00 | 0.00 | 0.55 |

| Basin | Sub-Basin | Area (acres) | 5 Year Calculation — Area Type: Multi-family Housing (MFH) - Medi | MFH - High Density (>20 du/ac) | Commercial - Medium to High Dens | Commercial - Urban Core | Disturbed Soil | Undisturbed Soil | Roadways & Paved Streets | Roofs | Detention Facilities | C5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.55 | 0.60 | 0.68 | 0.76 | 0.19 | 0.07 | 0.80 | 0.80 | 0.84 | |
| A | A1 | 1.27 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.27 | 0.00 | 0.00 | 0.80 |
| | A2 | 0.85 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.85 | 0.00 | 0.80 |
| | A3 | 1.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.35 | 0.00 | 1.49 | 0.00 | 0.00 | 0.68 |
| | A4 | 1.24 | 0.00 | 0.00 | 0.37 | 0.00 | 0.12 | 0.00 | 0.75 | 0.00 | 0.00 | 0.70 |
| | A5 | 1.69 | 0.00 | 0.00 | 0.17 | 0.00 | 0.17 | 0.00 | 1.35 | 0.00 | 0.00 | 0.73 |
| | A6 | 0.52 | 0.00 | 0.00 | 0.00 | 0.00 | 0.23 | 0.00 | 0.29 | 0.00 | 0.00 | 0.52 |
| | A7 | 2.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.31 | 0.00 | 1.74 | 0.00 | 0.00 | 0.71 |
| | OS-2 | 0.68 | | | | | | | | | | 0.51 |
| | A8 | 0.76 | 0.00 | 0.00 | 0.00 | 0.00 | 0.19 | 0.00 | 0.57 | 0.00 | 0.00 | 0.65 |
| | A9 | 0.94 | 0.00 | 0.00 | 0.00 | 0.00 | 0.19 | 0.00 | 0.75 | 0.00 | 0.00 | 0.68 |
| | OS-3 | 0.66 | | | | | | | | | | 0.48 |
| | A10 | 0.64 | 0.00 | 0.00 | 0.00 | 0.00 | 0.16 | 0.00 | 0.48 | 0.00 | 0.00 | 0.65 |
| | A11 | 0.73 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.00 | 0.51 | 0.00 | 0.00 | 0.62 |
| B | B1 | 0.49 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.49 | 0.00 | 0.00 | 0.80 |
| | B2 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.14 | 0.00 | 0.00 | 0.68 |
| | B3 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.05 | 0.00 | 0.00 | 0.55 |
| | B4 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.21 | 0.00 | 0.80 |
| | B5 | 2.52 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 1.76 | 0.00 | 0.00 | 0.62 |
| | B6 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.19 | 0.00 | 0.80 |
| | B7 | 2.58 | 0.00 | 0.00 | 0.26 | 0.00 | 0.26 | 0.00 | 2.07 | 0.00 | 0.00 | 0.73 |
| | B8 | 0.38 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.38 | 0.00 | 0.80 |
| | B9 | 0.30 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.74 |
| | B10 | 0.22 | 0.00 | 0.00 | 0.11 | 0.00 | 0.00 | 0.00 | 0.11 | 0.00 | 0.00 | 0.74 |
| | B11 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.17 | 0.00 | 0.80 |
| | B12 | 0.25 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.73 |
| | B13 | 0.34 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 | 0.70 |
| | B14 | 0.12 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.74 |
| | B15 | 0.27 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 | 0.80 |
| | B16 | 0.67 | 0.00 | 0.00 | 0.40 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 | 0.73 |
| | B17 | 0.29 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.29 | 0.00 | 0.80 |
| | B18 | 0.59 | 0.00 | 0.00 | 0.29 | 0.00 | 0.00 | 0.00 | 0.29 | 0.00 | 0.00 | 0.74 |
| | B19 | 1.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.35 | 0.00 | 1.40 | 0.00 | 0.00 | 0.68 |
| | B20 | 0.15 | 0.00 | 0.00 | 0.03 | 0.00 | 0.03 | 0.00 | 0.09 | 0.00 | 0.00 | 0.65 |
| | OS-1 | 0.58 | | | | | | | | | | 0.42 |
| | B21 | 0.42 | 0.00 | 0.21 | 0.00 | 0.00 | 0.10 | 0.00 | 0.10 | 0.00 | 0.00 | 0.54 |
| | C1 | 1.36 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.36 | 0.00 | 0.80 |
| | A106 | 0.48 | | | | | | | | | | 0.79 |
| | A108 | 0.25 | | | | | | | | | | 0.42 |
| | C2 | 1.07 | 0.00 | 0.00 | 0.00 | 0.00 | 1.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.19 |
| | A200 | 2.71 | | | | | | | | | | 0.74 |
| | A202 | 1.80 | | | | | | | | | | 0.72 |
| | A104 | 0.38 | | | | | | | | | | 0.63 |
| | A100 | 2.66 | | | | | | | | | | 0.73 |
| | A102 | 0.41 | | | | | | | | | | 0.66 |
| D | D1 | 3.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.63 | 0.00 | 2.52 | 0.00 | 0.00 | 0.68 |
| | D2 | 0.35 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.35 | 0.00 | 0.80 |
| | D3 | 2.87 | 0.00 | 0.00 | 1.15 | 0.00 | 0.00 | 0.00 | 1.72 | 0.00 | 0.00 | 0.75 |
| | D4 | 2.98 | 0.00 | 0.00 | 0.90 | 0.00 | 0.30 | 0.00 | 1.79 | 0.00 | 0.00 | 0.70 |
| | D5 | 3.47 | 0.00 | 0.00 | 1.04 | 0.00 | 0.52 | 0.00 | 1.91 | 0.00 | 0.00 | 0.67 |
| | D6 | 0.11 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.73 |
| | D7 | 0.33 | 0.00 | 0.00 | 0.25 | 0.00 | 0.00 | 0.00 | 0.08 | 0.00 | 0.00 | 0.71 |
| | D8 | 0.26 | 0.00 | 0.00 | 0.17 | 0.00 | 0.00 | 0.00 | 0.09 | 0.00 | 0.00 | 0.72 |
| | D9 | 0.46 | 0.00 | 0.00 | 0.31 | 0.00 | 0.00 | 0.00 | 0.16 | 0.00 | 0.00 | 0.72 |
| | D10 | 6.51 | 0.00 | 0.00 | 6.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.68 |
| | D11 | 0.39 | 0.00 | 0.00 | 0.12 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 | 0.76 |
| | D12 | 0.16 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.11 | 0.00 | 0.00 | 0.76 |
| | D13 | 1.59 | 0.00 | 0.00 | 0.48 | 0.00 | 0.00 | 0.00 | 1.11 | 0.00 | 0.00 | 0.76 |
| | D14 | 0.27 | 0.00 | 0.00 | 0.20 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 | 0.71 |
| | D15 | 0.72 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.64 | 0.00 | 0.00 | 0.74 |
| | D16 | 0.37 | 0.00 | 0.00 | 0.22 | 0.00 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.73 |
| | D17 | 0.24 | 0.00 | 0.06 | 0.00 | 0.00 | 0.06 | 0.00 | 0.12 | 0.00 | 0.00 | 0.60 |
| | D18 | 0.34 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.34 | 0.00 | 0.80 |
| | D19 | 0.44 | 0.00 | 0.00 | 0.18 | 0.00 | 0.00 | 0.00 | 0.26 | 0.00 | 0.00 | 0.75 |
| | D20 | 1.20 | 0.00 | 0.90 | 0.00 | 0.00 | 0.06 | 0.00 | 0.24 | 0.00 | 0.00 | 0.62 |
| | D21 | 0.35 | 0.00 | 0.00 | 0.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.70 |
| | D22 | 0.25 | 0.00 | 0.00 | 0.24 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.68 |
| | D23 | 0.26 | 0.00 | 0.00 | 0.24 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 | 0.69 |
| | D24 | 0.12 | 0.00 | 0.00 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.68 |
| | D25 | 0.15 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.68 |
| | D26 | 0.45 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.45 | 0.00 | 0.80 |
| | D27 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.59 | 0.00 | 0.80 |
| | D28 | 0.19 | 0.00 | 0.00 | 0.09 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.74 |
| | D29 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.10 | 0.00 | 0.00 | 0.72 |
| | D30 | 0.43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.43 | 0.00 | 0.80 |
| | D31 | 0.41 | 0.00 | 0.00 | 0.16 | 0.00 | 0.00 | 0.00 | 0.24 | 0.00 | 0.00 | 0.75 |
| | OS-5 | 0.28 | | | | | | | | | | 0.70 |
| | D32 | 0.73 | 0.00 | 0.00 | 0.33 | 0.00 | 0.00 | 0.00 | 0.40 | 0.00 | 0.00 | 0.74 |
| | D33 | 1.55 | 0.00 | 0.00 | 0.00 | 0.00 | 0.78 | 0.00 | 0.78 | 0.00 | 0.00 | 0.49 |
| | D34 | 1.53 | 0.00 | 0.00 | 0.00 | 0.00 | 0.76 | 0.00 | 0.76 | 0.00 | 0.00 | 0.49 |
| | D35 | 12.51 | 0.00 | 11.88 | 0.00 | 0.00 | 0.00 | 0.00 | 0.63 | 0.00 | 0.00 | 0.61 |
| | D36 | 1.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.16 | 0.00 | 0.92 | 0.00 | 0.00 | 0.71 |
| | D37 | 1.22 | 0.00 | 0.00 | 0.00 | 0.00 | 0.61 | 0.00 | 0.61 | 0.00 | 0.00 | 0.49 |
| | D38 | 13.09 | 0.00 | 13.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.60 |
| | OS-4 | 1.53 | | | | | | | | | | 0.59 |
| | D39 | 1.81 | 0.00 | 0.00 | 0.00 | 0.00 | 0.45 | 0.00 | 1.36 | 0.00 | 0.00 | 0.65 |
| | D40 | 1.35 | 0.00 | 0.00 | 0.00 | 0.00 | 0.34 | 0.00 | 1.01 | 0.00 | 0.00 | 0.65 |
| OS | OS-101 | 3.37 | 0.00 | 0.00 | 0.00 | 0.00 | 1.68 | 0.17 | 1.51 | 0.00 | 0.00 | 0.46 |
| | OS-102 | 0.47 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.02 | 0.40 | 0.00 | 0.00 | 0.70 |
| | OS-103 | 2.77 | 0.00 | 0.00 | 0.00 | 0.00 | 1.39 | 0.14 | 1.25 | 0.00 | 0.00 | 0.46 |
| | OS-104 | 3.34 | 0.00 | 0.00 | 0.00 | 0.00 | 0.67 | 0.17 | 2.51 | 0.00 | 0.00 | 0.64 |
| | E-1 | 0.33 | 0.00 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.23 | 0.00 | 0.00 | 0.62 |
| | E-2 | 0.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.21 | 0.00 | 0.00 | 0.64 |
| | E-3 | 0.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.14 | 0.00 | 0.00 | 0.61 |
| | E-4 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.15 | 0.00 | 0.00 | 0.61 |
| | UD-1 | 0.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.31 | 0.00 | 0.53 | 0.00 | 0.00 | 0.58 |

| Basin | Sub-Basin | Area (acres) | 10 Year Calculation — Area Type: Multi-family Housing (MFH) - Medi | MFH - High Density (>20 du/ac) | Commercial - Medium to High Dens | Commercial - Urban Core | Disturbed Soil | Undisturbed Soil | Roadways & Paved Streets | Roofs | Detention Facilities | C10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.61 | 0.65 | 0.72 | 0.79 | 0.28 | 0.17 | 0.83 | 0.83 | 0.87 | |
| A | A1 | 1.27 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.27 | 0.00 | 0.00 | 0.83 |
| | A2 | 0.85 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.85 | 0.00 | 0.83 |
| | A3 | 1.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.35 | 0.00 | 1.49 | 0.00 | 0.00 | 0.73 |
| | A4 | 1.24 | 0.00 | 0.00 | 0.37 | 0.00 | 0.12 | 0.00 | 0.75 | 0.00 | 0.00 | 0.74 |
| | A5 | 1.69 | 0.00 | 0.00 | 0.17 | 0.00 | 0.17 | 0.00 | 1.35 | 0.00 | 0.00 | 0.76 |
| | A6 | 0.52 | 0.00 | 0.00 | 0.00 | 0.00 | 0.23 | 0.00 | 0.29 | 0.00 | 0.00 | 0.58 |
| | A7 | 2.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.31 | 0.00 | 1.74 | 0.00 | 0.00 | 0.75 |
| | OS-2 | 0.68 | | | | | | | | | | 0.56 |
| | A8 | 0.76 | 0.00 | 0.00 | 0.00 | 0.00 | 0.19 | 0.00 | 0.57 | 0.00 | 0.00 | 0.69 |
| | A9 | 0.94 | 0.00 | 0.00 | 0.00 | 0.00 | 0.19 | 0.00 | 0.75 | 0.00 | 0.00 | 0.72 |
| | OS-3 | 0.66 | | | | | | | | | | 0.53 |
| | A10 | 0.64 | 0.00 | 0.00 | 0.00 | 0.00 | 0.16 | 0.00 | 0.48 | 0.00 | 0.00 | 0.69 |
| | A11 | 0.73 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.00 | 0.51 | 0.00 | 0.00 | 0.66 |
| B | B1 | 0.49 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.49 | 0.00 | 0.00 | 0.83 |
| | B2 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.14 | 0.00 | 0.00 | 0.72 |
| | B3 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.05 | 0.00 | 0.00 | 0.61 |
| | B4 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.21 | 0.00 | 0.83 |
| | B5 | 2.52 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 1.76 | 0.00 | 0.00 | 0.66 |
| | B6 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.19 | 0.00 | 0.83 |
| | B7 | 2.58 | 0.00 | 0.00 | 0.26 | 0.00 | 0.26 | 0.00 | 2.07 | 0.00 | 0.00 | 0.76 |
| | B8 | 0.38 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.38 | 0.00 | 0.83 |
| | B9 | 0.30 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.78 |
| | B10 | 0.22 | 0.00 | 0.00 | 0.11 | 0.00 | 0.00 | 0.00 | 0.11 | 0.00 | 0.00 | 0.78 |
| | B11 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.17 | 0.00 | 0.83 |
| | B12 | 0.25 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.76 |
| | B13 | 0.34 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 | 0.74 |
| | B14 | 0.12 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.78 |
| | B15 | 0.27 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 | 0.83 |
| | B16 | 0.67 | 0.00 | 0.00 | 0.40 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 | 0.76 |
| | B17 | 0.29 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.29 | 0.00 | 0.83 |
| | B18 | 0.59 | 0.00 | 0.00 | 0.29 | 0.00 | 0.00 | 0.00 | 0.29 | 0.00 | 0.00 | 0.78 |
| | B19 | 1.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.35 | 0.00 | 1.40 | 0.00 | 0.00 | 0.72 |
| | B20 | 0.15 | 0.00 | 0.00 | 0.03 | 0.00 | 0.03 | 0.00 | 0.09 | 0.00 | 0.00 | 0.70 |
| | OS-1 | 0.58 | | | | | | | | | | 0.48 |
| | B21 | 0.

## TIME OF CONCENTRATION

**Developed Conditions**

**CENTERRA SOUTH**

Job No. 130-00201
Date 5/17/25
Calculated By DFL
Checked By BEC

| SUB-BASIN DATA | | | INITIAL/OVERLAND TIME (Tc) | | | TRAVEL TIME (Tt) | | | | | | Rational Tc | Imperviousness | First Design Point Time of Concentration<br>The Final Tc shall be the lesser of the Comp Tc and the First Design Point Tc | FINAL Tc | CONVEYANCE REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DESIG: | AREA (acres) | $C_5$ | LENGTH (ft) | SLOPE (ft/ft) | Ti (min) | LENGTH (ft) | AVG. SLOPE DY | (%) | Conv. Type* | VEL (fps) | Tt (min) | COMP Tc (min) | % | $Tc=(26-17i)+(L_t/(60*(14i+9)*\sqrt{S_t})$ (min) | (min) | |
| A1 | 1.27 | 0.80 | | | | 615 | 3.6 | 0.6 | 6 | 1.5 | 6.7 | 6.7 | 95.0 | 15.9 | **6.7** | Paved Gutter |
| A2 | 0.85 | 0.80 | | | | 330 | | 0.5 | 6 | 1.4 | 3.9 | 3.9 | 95.0 | 13.3 | **5.0** | Paved Gutter |
| A3 | 1.84 | 0.68 | | | | 487 | 7.7 | 1.6 | 6 | 2.5 | 3.2 | 3.2 | 80.7 | 15.5 | **5.0** | Paved Gutter |
| A4 | 1.24 | 0.70 | | | | 385 | 2.3 | 0.6 | 6 | 1.5 | 4.2 | 4.2 | 83.0 | 15.9 | **5.0** | Paved Gutter |
| A5 | 1.69 | 0.73 | | | | | | | 6 | | | | 86.0 | | **5.0** | Paved Gutter |
| A6 | 0.52 | 0.52 | | | | | | | 6 | | | | 61.3 | | **5.0** | Paved Gutter |
| A7 | 2.05 | 0.71 | | | | 919 | 10.2 | 1.1 | 6 | 2.1 | 7.3 | 7.3 | 83.8 | 18.8 | **7.3** | Paved Gutter |
| OS-2 | 0.68 | 0.51 | | | 1.4 | | | | | | 4.2 | 5.6 | | | **5.6** | |
| A8 | 0.76 | 0.65 | | | | 577 | 5.3 | 0.9 | 6 | 1.9 | 5.0 | 5.0 | 76.3 | 18.1 | **5.0** | Paved Gutter |
| A9 | 0.94 | 0.68 | | | | | | | 6 | | | | 80.0 | | **5.0** | Paved Gutter |
| OS-3 | 0.66 | 0.48 | | | 1.4 | | | | | | 2.4 | 3.7 | | | **5.0** | |
| A10 | 0.64 | 0.65 | | | | 551 | 4.8 | 0.9 | 6 | 1.9 | 4.9 | 4.9 | 76.3 | 18.0 | **5.0** | Paved Gutter |
| A11 | 0.73 | 0.62 | | | | | | | 6 | | | | 72.5 | | **5.0** | Paved Gutter |
| | | | | | | | | | | | | | | | | |
| B1 | 0.49 | 0.80 | | | | | | | 6 | | | | 95.0 | | **5.0** | Paved Gutter |
| B2 | 0.17 | 0.68 | | | | | | | 6 | | | | 80.0 | | **5.0** | Paved Gutter |
| B3 | 0.09 | 0.55 | | | | | | | 6 | | | | 65.0 | | **5.0** | Paved Gutter |
| B4 | 0.21 | 0.80 | | | | | | | 6 | | | | 95.0 | | **5.0** | Paved Gutter |
| B5 | 2.52 | 0.62 | | | | | | | 6 | | | | 72.5 | | **5.0** | Paved Gutter |
| B6 | 0.19 | 0.80 | | | | | | | 6 | | | | 95.0 | | **5.0** | Paved Gutter |
| B7 | 2.58 | 0.73 | 143 | 0.011 | 7.8 | 304 | 6.7 | 2.2 | 6 | 3.0 | 1.7 | 9.5 | 86.0 | 13.0 | **9.5** | Paved Gutter |
| B8 | 0.38 | 0.80 | | | | | | | 6 | | | | 95.0 | | **5.0** | Paved Gutter |
| B9 | 0.30 | 0.74 | | | | | | | 6 | | | | 87.5 | | **5.0** | Paved Gutter |
| B10 | 0.22 | 0.74 | | | | | | | 6 | | | | 87.5 | | **5.0** | Paved Gutter |
| B11 | 0.17 | 0.80 | | | | | | | 6 | | | | 95.0 | | **5.0** | Paved Gutter |
| B12 | 0.25 | 0.73 | | | | | | | 6 | | | | 86.0 | | **5.0** | Paved Gutter |
| B13 | 0.34 | 0.70 | | | | | | | 6 | | | | 83.0 | | **5.0** | Paved Gutter |
| B14 | 0.12 | 0.74 | | | | | | | 6 | | | | 87.5 | | **5.0** | Paved Gutter |
| B15 | 0.27 | 0.80 | | | | | | | 6 | | | | 95.0 | | **5.0** | Paved Gutter |
| B16 | 0.67 | 0.73 | | | | | | | 6 | | | | 86.0 | | **5.0** | Paved Gutter |
| B17 | 0.29 | 0.80 | | | | | | | 6 | | | | 95.0 | | **5.0** | Paved Gutter |
| B18 | 0.59 | 0.74 | | | | | | | 6 | | | | 87.5 | | **5.0** | Paved Gutter |
| B19 | 1.75 | 0.68 | | | | 562 | 3.8 | 0.7 | 6 | 1.7 | 5.7 | 5.7 | 80.0 | 18.0 | **5.7** | Paved Gutter |
| B20 | 0.15 | 0.65 | | | | | | | 6 | | | | 77.0 | | **5.0** | Paved Gutter |
| OS-1 | 0.58 | 0.42 | | | 1.3 | | | | | | 4.1 | 5.4 | | | **5.4** | |
| B21 | 0.42 | 0.54 | | | | 554 | 3.8 | 0.7 | 6 | 1.7 | 5.5 | 5.5 | 63.8 | 21.3 | **5.5** | Paved Gutter |
| | | | | | | | | | | | | | | | | |
| C1 | 1.36 | 0.80 | | | | | | | 6 | | | | 95.0 | | **5.0** | Paved Gutter |
| A106 | 0.48 | | | | | | | | | | | | | | **5.0** | |
| A108 | 0.25 | | | | | | | | | | | | | | **5.0** | |
| C2 | 1.07 | 0.19 | | | | 720 | 5.0 | 0.7 | 6 | 1.7 | 7.2 | 7.2 | 20.0 | 34.8 | **7.2** | Paved Gutter |
| A200 | 2.71 | 0.74 | | | 0.7 | | | | | | 4.5 | 5.2 | | | **5.2** | |
| A202 | 1.80 | 0.72 | | | 1.6 | | | | | | 1.7 | 3.2 | | | **5.0** | |
| A104 | 0.38 | 0.63 | | | 2.3 | | | | | | 1.1 | 3.4 | | | **5.0** | |
| A100 | 2.66 | 0.73 | | | 0.6 | | | | | | 1.2 | 1.8 | | | **5.0** | |
| A102 | 0.41 | 0.66 | | | 1.3 | | | | | | 0.7 | 2.0 | | | **5.0** | |
| | | | | | | | | | | | | | | | | |

## TIME OF CONCENTRATION

**CENTERRA SOUTH**

**Developed Conditions**

Job No. 130-00201
Date 5/17/25
Calculated By DFL
Checked By BEC

| SUB-BASIN DATA | | | INITIAL/OVERLAND TIME (Tc) | | | TRAVEL TIME (Tt) | | | | | | Rational Tc | Imperviousness | First Design Point Time of Concentration<br>The Final Tc shall be the lesser of the Comp Tc and the First Design Point Tc | FINAL Tc | CONVEYANCE REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DESIG: | AREA (acres) | $C_5$ | LENGTH (ft) | SLOPE (ft/ft) | Ti (min) | LENGTH (ft) | AVG. SLOPE DY | (%) | Conv. Type* | VEL (fps) | Tt (min) | COMP Tc (min) | % | $Tc=(26-17i)+(L_t/(60*(14i+9)*\sqrt{S_t})$ (min) | (min) | |
| D1 | 3.15 | 0.68 | | | | 1245 | 7.2 | 0.6 | 6 | 1.5 | 13.6 | 13.6 | 80.0 | 25.9 | **13.6** | Paved Gutter |
| D2 | 0.35 | 0.80 | 125 | 0.020 | 4.8 | 312 | 5.1 | 1.6 | 6 | 2.5 | 2.0 | 6.9 | 95.0 | 11.7 | **6.9** | Paved Gutter |
| D3 | 2.87 | 0.75 | 125 | 0.020 | 5.6 | 312 | 5.1 | 1.6 | 6 | 2.5 | 2.0 | 7.7 | 89.0 | 12.8 | **7.7** | Paved Gutter |
| D4 | 2.98 | 0.70 | | | | 735 | 10.6 | 1.4 | 6 | 2.4 | 5.1 | 5.1 | 83.0 | 16.8 | **5.1** | Paved Gutter |
| D5 | 3.47 | 0.67 | | | | 687 | 10.5 | 1.5 | 6 | 2.5 | 4.6 | 4.6 | 79.3 | 17.1 | **5.0** | Paved Gutter |
| D6 | 0.11 | 0.73 | | | | | | | 6 | | | | 86.0 | | **5.0** | Paved Gutter |
| D7 | 0.33 | 0.71 | | | | | | | 6 | | | | 83.8 | | **5.0** | Paved Gutter |
| D8 | 0.26 | 0.72 | | | | | | | 6 | | | | 85.1 | | **5.0** | Paved Gutter |
| D9 | 0.46 | 0.72 | | | | | | | 6 | | | | 85.1 | | **5.0** | Paved Gutter |
| D10 | 6.51 | 0.68 | | | | 930 | | 1.0 | 6 | 2.0 | 7.8 | 7.8 | 80.0 | 20.1 | **7.8** | Paved Gutter |
| D11 | 0.39 | 0.76 | | | | | | | 6 | | | | 90.5 | | **5.0** | Paved Gutter |
| D12 | 0.16 | 0.76 | | | | | | | 6 | | | | 90.5 | | **5.0** | Paved Gutter |
| D13 | 1.59 | 0.76 | | | | 1135 | 13.2 | 1.2 | 6 | 2.2 | 8.8 | 8.8 | 90.5 | 18.7 | **8.8** | Paved Gutter |
| D14 | 0.27 | 0.71 | | | | | | | 6 | | | | 83.8 | | **5.0** | Paved Gutter |
| D15 | 0.72 | 0.74 | | | | 865 | 9.8 | 1.1 | 6 | 2.1 | 6.8 | 6.8 | 87.5 | 17.5 | **6.8** | Paved Gutter |
| D16 | 0.37 | 0.73 | | | | | | | 6 | | | | 86.0 | | **5.0** | Paved Gutter |
| D17 | 0.24 | 0.60 | | | | | | | 6 | | | | 70.0 | | **5.0** | Paved Gutter |
| D18 | 0.34 | 0.80 | | | | | | | 6 | | | | 95.0 | | **5.0** | Paved Gutter |
| D19 | 0.44 | 0.75 | | | | | | | 6 | | | | 89.0 | | **5.0** | Paved Gutter |
| D20 | 1.20 | 0.62 | | | | | | | 6 | | | | 72.5 | | **5.0** | Paved Gutter |
| D21 | 0.35 | 0.70 | | | | | | | 6 | | | | 83.0 | | **5.0** | Paved Gutter |
| D22 | 0.25 | 0.68 | | | | | | | 6 | | | | 80.8 | | **5.0** | Paved Gutter |
| D23 | 0.26 | 0.69 | | | | | | | 6 | | | | 81.5 | | **5.0** | Paved Gutter |
| D24 | 0.12 | 0.68 | | | | | | | 6 | | | | 80.0 | | **5.0** | Paved Gutter |
| D25 | 0.15 | 0.68 | | | | | | | 6 | | | | 80.0 | | **5.0** | Paved Gutter |
| D26 | 0.45 | 0.80 | | | | | | | 6 | | | | 95.0 | | **5.0** | Paved Gutter |
| D27 | 0.59 | 0.80 | | | | | | | 6 | | | | 95.0 | | **5.0** | Paved Gutter |
| D28 | 0.19 | 0.74 | | | | | | | 6 | | | | 88.1 | | **5.0** | Paved Gutter |
| D29 | 0.11 | 0.72 | | | | | | | 6 | | | | 85.4 | | **5.0** | Paved Gutter |
| D30 | 0.43 | 0.80 | | | | | | | 6 | | | | 95.0 | | **5.0** | Paved Gutter |
| D31 | 0.41 | 0.75 | | | | | | | 6 | | | | 89.0 | | **5.0** | Paved Gutter |
| OS-5 | 0.28 | 0.70 | | | 2.1 | | | | | | 2.4 | 4.4 | | | **5.0** | |
| D32 | 0.73 | 0.74 | | | | | | | 6 | | | | 88.3 | | **5.0** | Paved Gutter |
| D33 | 1.55 | 0.49 | | | | 953 | 11.7 | 1.2 | 6 | 2.2 | 7.2 | 7.2 | 57.5 | 24.6 | **7.2** | Paved Gutter |
| D34 | 1.53 | 0.49 | | | | 953 | 11.7 | 1.2 | 6 | 2.2 | 7.2 | 7.2 | 57.5 | 24.6 | **7.2** | Paved Gutter |
| D35 | 12.51 | 0.61 | | | | 1246 | 11.2 | 0.9 | 6 | 1.9 | 11.0 | 11.0 | 71.3 | 25.5 | **11.0** | Paved Gutter |
| D36 | 1.08 | 0.71 | | | | 690 | | 0.7 | 6 | 1.7 | 6.9 | 6.9 | 83.8 | 18.4 | **6.9** | Paved Gutter |
| D37 | 1.22 | 0.49 | | | | 756 | 5.1 | 0.7 | 6 | 1.6 | 7.7 | 7.7 | 57.5 | 25.2 | **7.7** | Paved Gutter |
| D38 | 13.09 | 0.60 | | | | 1420 | | 0.9 | 6 | 1.9 | 12.5 | 12.5 | 70.0 | 27.4 | **12.5** | Paved Gutter |
| OS-4 | 1.53 | 0.59 | | | 1.1 | | | | | | 2.4 | 3.5 | | | **5.0** | |
| D39 | 1.81 | 0.65 | | | | 1050 | | 0.9 | 6 | 1.9 | 9.2 | 9.2 | 76.3 | 22.4 | **9.2** | Paved Gutter |
| D40 | 1.35 | 0.65 | | | | 640 | | 0.5 | 6 | 1.4 | 7.5 | 7.5 | 76.3 | 20.7 | **7.5** | Paved Gutter |
| | | | | | | | | | | | | | | | | |
| OS-101 | 3.37 | 0.46 | | | | | | | 5 | | | | 53.0 | | **5.0** | Grass Swale |
| OS-102 | 0.47 | 0.70 | | | | | | | 5 | | | | 83.0 | | **5.0** | Grass Swale |
| OS-103 | 2.77 | 0.46 | | | | | | | 5 | | | | 53.0 | | **5.0** | Grass Swale |
| OS-104 | 3.34 | 0.64 | | | | | | | 6 | | | | 75.5 | | **5.0** | Paved Gutter |
| | | | | | | | | | | | | | | | | |

Note: Conveyance Coefficients - Type 1-Heavy Meadow, Type 2-Tillage/field, Type 3-Short Pasture & Lawn, Type 4-Bare Soil, Type 5-Grass Swale, Type 6-Paved Gutter
Type 4-Nearly Bare Ground, Type 5-Grassed Waterway, Type 6-Paved Areas & Shallow Paved Swales.

Note: C Orange highlight notes values were retrieved from third party report - "FINAL DRAINAGE REPORT, AVENUE SOUTH MULTIFAMILY" By Kimley Horn Dated April 25, 2025

T:\JOBS\McWhinney\McDonough\Engineering\Drainage\3rd Submittal\Hydrology\[MCD-HYDROLOGY.xls]Composite C

# STANDARD FORM SF-2
## STORM DRAINAGE SYSTEM DESIGN
## (RATIONAL METHOD PROCEDURE)

**2-year P1 =** **1.00**
100-year P1 = 2.66

CALCULATED BY: DFL
CHECKED BY: BEC

PROJECT: CENTERRA SOUTH
BASIN: Minor

DESIGN STORM: **2-YEAR (Minor Storm)**
JOB NO: 130-00201
LOCATION: Loveland, Colorado

| | | DIRECT RUNOFF | | | | | | | TOTAL RUNOFF | | | | STREET | | PIPE | | | TRAVEL TIME | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOCATION | DESIGN POINT | AREA DESIG. | AREA (Acres) | RUNOFF COEFF | Tc (min) | C A (Acres) | I (in/hour) | Q (cfs) | Tc (min) | (C A) (Acres) | I (in/hour) | Q (cfs) | SLOPE (%) | STREET FLOW (cfs) | DESIGN FLOW (cfs) | SLOPE (%) | PIPE SIZE | LENGTH (ft) | VELOCITY (fps) | Tt (min) | REMARKS |
| A | A1 | A1 | 1.27 | 0.79 | 6.7 | 1.00 | 3.09 | 3.08 | | | | | | 3.08 | | | | | | | |
| | | | | | | | | | | | | | | | 3.08 | 0.50 | 18 | 58 | 4.1 | 0.2 | Surface Flow to Inlet 01_14 at DP A1, Inlet Capture<br>Pipe Flow to JP-1 |
| OS-101 | OS-101 | OS-101 | 3.37 | 0.42 | 5.0 | 1.43 | 3.48 | 4.97 | | | | | | 4.97 | | | | | | | |
| | | | | | | | | | | | | | | | 4.97 | 0.53 | 24 | 64 | 5.0 | 0.2 | Surface Flow to ex. offsite inlet at DP OS-101, Inlet Capture<br>Pipe Flow to JP-1 |
| | JP-1 | Sum A1, OS-101 | 4.63 | 0.52 | | | | | 7.0 | 2.42 | 3.03 | 7.34 | | | | | | | | | Combined Flow at JP-1 |
| | | | | | | | | | | | | | | | 4.97 | 0.50 | 30 | 270 | 5.6 | 0.8 | Pipe Flow to JP-2 |
| OS-104 | OS-104 | OS-104 | 3.34 | 0.62 | 5.0 | 2.07 | 3.48 | 7.20 | | | | | | 7.20 | | | | | | | |
| | | | | | | | | | | | | | | | 7.20 | 0.85 | 24 | 360 | 6.5 | 0.9 | Surface Flow to ex. offsite inlet at DP OS-104, Inlet Capture<br>Pipe Flow to JP-2 |
| | JP-2 | Sum JP-1, OS-104 | 7.97 | 0.56 | | | | | 7.8 | 4.49 | 2.92 | 13.12 | | | | | | | | | Combined Flow at JP-2 |
| | | | | | | | | | | | | | | | 13.12 | 1.00 | 30 | 118 | 8.2 | 0.2 | Pipe Flow to JP-4 |
| | A2 | A2 | 0.85 | 0.79 | 5.0 | 0.67 | 3.48 | 2.33 | | | | | | 2.33 | | | | | | | Roof Drain Flow to DP A2 |
| | | | | | | | | | | | | | | | 2.33 | 1.00 | 8 | 60 | 3.5 | 0.3 | Pipe Flow to JP-3 |
| | A3 | A3 | 1.84 | 0.66 | 5.0 | 1.22 | 3.48 | 4.25 | | | | | | | | | | | | | Surface Flow to Inlet 01E_01 at DP A3, Inlet Capture |
| | JP-3 | Sum A2, A3 | 2.69 | 0.70 | | | | | 5.3 | 1.89 | 3.40 | 6.43 | | | | | | | | | Combined Flow at JP-3 |
| | | | | | | | | | | | | | | | | | | | | | Pipe Flow to JP-4 |
| | JP-4 | Sum JP-2, JP-3 | 10.66 | 0.60 | | | | | 8.0 | 6.38 | 2.90 | 18.52 | | | | | | | | | Combined Flow at JP-4 |
| | | | | | | | | | | | | | | | 6.43 | 0.50 | 36 | 161 | 6.3 | 0.4 | Pipe Flow to JP-6 |
| | A4 | A4 | 1.24 | 0.68 | 5.0 | 0.85 | 3.48 | 2.94 | | | | | | 2.94 | | | | | | | Surface Flow to Inlet 01D_02 at DP A4, Inlet Capture |
| | | | | | | | | | | | | | | | 2.94 | 0.50 | 24 | 14 | 4.9 | 0.0 | Pipe Flow to JP-5 |
| | A5 | A5 | 1.69 | 0.71 | 5.0 | 1.20 | 3.48 | 4.16 | | | | | | | | | | | | | Surface Flow to Inlet 01D_01 at DP A5, Inlet Capture |
| | JP-5 | Sum A4, A5 | 2.93 | 0.70 | | | | | 5.0 | 2.04 | 3.48 | 7.10 | | | | | | | | | Combined Flow at JP-5 |
| | | | | | | | | | | | | | | | 7.10 | 0.50 | 30 | 255 | 5.6 | 0.8 | Pipe Flow to JP-6 |
| | JP-6 | Sum JP-2, JP-3 | 13.59 | 0.62 | | | | | 8.5 | 8.43 | 2.84 | 23.93 | | | | | | | | | Combined Flow at JP-6 |
| | | | | | | | | | | | | | | | 23.93 | 0.50 | 42 | 204 | 6.9 | 0.5 | Pipe Flow to JP-7 |
| | A6 | A6 | 0.52 | 0.49 | 5.0 | 0.26 | 3.48 | 0.90 | | | | | | 0.90 | | | | | | | Surface Flow to Inlet 01C_02 at DP A6, Inlet Capture |
| | | | | | | | | | | | | | | | 0.90 | 0.50 | 18 | 28 | 4.1 | 0.1 | Pipe Flow to JP-7 |
| | A7 | A7 | 2.05 | 0.69 | 7.3 | 1.41 | 2.99 | 4.22 | | | | | | 4.22 | | | | | | | Surface Flow to Inlet 01C_01 at DP A7, Inlet Capture |
| | | | | | | | | | | | | | | | 4.22 | 0.50 | 18 | 76 | 4.1 | 0.3 | Pipe Flow to JP-7 |
| | JP-7 | Sum JP-6, A6, A7 | 16.16 | 0.62 | | | | | 8.9 | 10.10 | 2.80 | 28.27 | | | | | | | | | Combined Flow at JP-7 |
| | | | | | | | | | | | | | | | 28.27 | 0.50 | 42 | 686 | 6.9 | 1.6 | Pipe Flow to JP-8 |
| | OS-2 | OS-2 | 0.68 | 0.47 | 5.6 | 0.32 | 3.32 | 1.12 | | | | | | | | | | | | | Surface Flow from Offsite Basin OS-2<br>Combines with Surface Flow from Basin A8 at DP A8, Inlet Capture |
| | A8 | A8 | 0.76 | 0.62 | 5.0 | 0.48 | 3.48 | 1.66 | | | | | | 2.78 | | | | | | | Surface Flow to Inlet 01B_02 at DP A8, Inlet Capture |
| | | | | | | | | | | | | | | | 2.78 | 0.50 | 18 | 10 | 4.1 | 0.0 | Pipe Flow to JP-8 |
| | A9 | A9 | 0.94 | 0.66 | 5.0 | 0.62 | 3.48 | 2.16 | | | | | | 2.16 | | | | | | | Surface Flow to Inlet 01B_01 at DP A9, Inlet Capture |
| | | | | | | | | | | | | | | | 2.16 | 0.50 | 18 | 33 | 4.1 | 0.1 | Pipe Flow to JP-8 |
| | JP-8 | Sum JP-7, OS-2, A8, A9 | 18.55 | 0.62 | | | | | 10.6 | 11.51 | 2.63 | 30.28 | | | | | | | | | Combined Flow at JP-8 |
| | | | | | | | | | | | | | | | 30.28 | 0.50 | 48 | 407 | 7.5 | 0.9 | Pipe Flow to JP-9 |
| | OS-3 | OS-3 | 0.66 | 0.44 | 5.0 | 0.29 | 3.48 | 1.01 | | | | | | | | | | | | | Surface Flow from Offsite Basin OS-3<br>Combines with Surface Flow from Basin A10 at DP A10, Inlet Capture |
| | A10 | A10 | 0.64 | 0.62 | 5.0 | 0.40 | 3.48 | 1.39 | | | | | | 2.40 | | | | | | | Surface Flow to Inlet 01A_01 at DP A10, Inlet Capture |
| | | | | | | | | | | | | | | | 2.40 | 0.50 | 18 | 44 | 4.1 | 0.2 | Pipe Flow to JP-9 |
| | JP-9 | Sum JP-8, OS-3, A10 | 19.85 | 0.61 | | | | | 11.5 | 12.20 | 2.54 | 30.99 | | | | | | | | | Combined Flow at JP-9 |
| | | | | | | | | | | | | | | | 30.99 | 0.50 | 48 | 25 | 7.5 | 0.1 | Pipe Flow to JP-10 |
| | A11 | A11 | 0.73 | 0.59 | 5.0 | 0.43 | 3.48 | 1.51 | | | | | | | | | | | | | Surface Flow to Inlet 01_02 at DP A11, Inlet Capture |
| | JP-10 | Sum JP-9, A11 | 20.58 | 0.61 | | | | | 11.5 | 12.63 | 2.54 | 32.09 | | | | | | | | | Combined Flow at JP-10 |
| | | | | | | | | | | | | | | | 32.09 | 0.50 | 48 | 62 | 7.5 | 0.1 | Pipe Flow to POND |
| POND | JP-11 | Sum JP-10, Travel time | 20.58 | 0.61 | | | | | 11.7 | 12.63 | 2.52 | 31.84 | | | | | | | | | |
| B | B1 | B1 | 0.49 | 0.79 | 5.0 | 0.39 | 3.48 | 1.35 | | | | | | 1.35 | | | | | | | Surface Flow to Inlet 02G_01 at DP B1, Inlet Capture |
| | | | | | | | | | | | | | | | 1.35 | 0.50 | 18 | 168 | 4.1 | 0.7 | Pipe Flow to JP-12 |
| OS-102 | OS-102 | OS-102 | 0.47 | 0.68 | 5.0 | 0.32 | 3.48 | 1.13 | | | | | | 1.13 | | | | | | | Surface Flow to ex. offsite inlet at DP OS-102, Inlet Capture |
| | | | | | | | | | | | | | | | 1.13 | 0.50 | 24 | 95 | 4.9 | 0.3 | Pipe Flow to JP-12, (Slope is unknown due to conditions at time of survey) |
| | JP-12 | SUM B1, OS-102 | 0.97 | 0.74 | | | | | 5.7 | 0.71 | 3.30 | 2.35 | | | | | | | | | Combined Flow at JP-12 |
| | | | | | | | | | | | | | | | 2.35 | 2.00 | 24 | 276 | 10.3 | 0.4 | Pipe Flow to JP-18 |
| | B2 | B2 | 0.17 | 0.66 | 5.0 | 0.11 | 3.48 | 0.39 | | | | | | 0.39 | | | | | | | Surface Flow to Inlet 02F_07 at DP B2, Inlet Capture |
| | | | | | | | | | | | | | | | 0.39 | 0.40 | 10 | 51 | 2.5 | 0.3 | Pipe Flow to JP-13 |
| | B3 | B3 | 0.09 | 0.53 | 5.0 | 0.05 | 3.48 | 0.16 | | | | | | | | | | | | | Surface Flow to Inlet 02F_06 at DP B3, Inlet Capture |
| | JP-13 | SUM B2, B3 | 0.26 | 0.61 | | | | | 5.3 | 0.16 | 3.40 | 0.54 | | | | | | | | | Combined Flow at JP-13 |
| | | | | | | | | | | | | | | | 0.54 | 0.50 | 18 | 160 | 4.1 | 0.7 | Pipe Flow to JP-14 |
| | B4 | B4 | 0.21 | 0.79 | 5.0 | 0.16 | 3.48 | 0.57 | | | | | | 0.57 | | | | | | | Roof Drain Flow to DP B4 |
| | JP-14 | SUM JP-13, B4 | 0.47 | 0.69 | | | | | 6.0 | 0.32 | 3.22 | 1.04 | | | 0.57 | 1.00 | 8 | 45 | 3.5 | 0.2 | Pipe Flow to JP-14 |
| | | | | | | | | | | | | | | | 1.04 | 0.50 | 18 | 102 | 4.1 | 0.4 | Combined Flow at JP-14<br>Pipe Flow to JP-16 |
| | B5 | B5 | 2.52 | 0.59 | 5.0 | 1.49 | 3.48 | 5.18 | | | | | | 5.18 | | | | | | | Surface Flow to Inlet 02F.2_01 at DP B5, Inlet Capture |
| | | | | | | | | | | | | | | | 5.18 | 0.50 | 18 | 102 | 4.1 | 0.4 | Pipe Flow to JP-15 |
| | B6 | B6 | 0.19 | 0.79 | 5.0 | 0.15 | 3.48 | 0.51 | | | | | | 0.51 | | | | | | | Roof Drain Flow to DP B6 |
| | JP-15 | SUM B5, B6 | 2.70 | 0.61 | | | | | 5.4 | 1.64 | 3.38 | 5.53 | | | 0.51 | 1.00 | 8 | 45 | 3.5 | 0.2 | Pipe Flow to JP-15 |
| | JP-16 | SUM JP-14, JP-15 | 3.17 | 0.62 | | | | | 6.4 | 1.96 | 3.15 | 6.18 | | | 5.53 | 1.00 | 8 | 45 | 3.5 | 0.2 | Combined Flow at JP-15<br>Pipe Flow to JP-16 |
| | | | | | | | | | | | | | | | 6.18 | 0.50 | 30 | 148 | 5.6 | 0.4 | Combined Flow at JP-16<br>Pipe Flow to JP-18 |
| | B7 | B7 | 2.58 | 0.71 | 9.5 | 1.83 | 2.74 | 5.01 | | | | | | 5.01 | | | | | | | Surface Flow to Inlet 02F_01 at DP B7, Inlet Capture |
| | | | | | | | | | | | | | | | 5.01 | 0.50 | 18 | 79 | 4.1 | 0.3 | Pipe Flow to JP-17 |

# STANDARD FORM SF-2
## STORM DRAINAGE SYSTEM DESIGN
## (RATIONAL METHOD PROCEDURE)

**2-year P1 =** **1.00**
100-year P1 = 2.66

CALCULATED BY: DFL
CHECKED BY: BEC

PROJECT: CENTERRA SOUTH
BASIN: Minor

DESIGN STORM: **2-YEAR (Minor Storm)**
JOB NO: 130-00201
LOCATION: Loveland, Colorado

| LOCATION | DESIGN POINT | AREA DESIG. | DIRECT RUNOFF AREA (Acres) | DIRECT RUNOFF RUNOFF COEFF | DIRECT RUNOFF Tc (min) | DIRECT RUNOFF C A (Acres) | DIRECT RUNOFF I (in/hour) | DIRECT RUNOFF Q (cfs) | TOTAL RUNOFF Tc (min) | TOTAL RUNOFF (C A) (Acres) | TOTAL RUNOFF I (in/hour) | TOTAL RUNOFF Q (cfs) | STREET SLOPE (%) | STREET STREET FLOW (cfs) | PIPE DESIGN FLOW (cfs) | PIPE SLOPE (%) | PIPE PIPE SIZE | TRAVEL TIME LENGTH (ft) | TRAVEL TIME VELOCITY (fps) | TRAVEL TIME Tt (min) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B8 | B8 | 0.38 | 0.79 | 5.0 | 0.30 | 3.48 | 1.04 | | | | | | 1.04 | | | | | | | Roof Drain Flow to DP B8 |
| | | | | | | | | | | | | | | | 1.04 | 1.00 | 8 | 45 | 3.5 | 0.2 | Pipe Flow to JP-17 |
| | JP-17 | SUM B7, B8 | 2.96 | 0.72 | | | | | 9.8 | 2.13 | 2.72 | 5.79 | | | | | | | | | Combined Flow at JP-17 |
| | | | | | | | | | | | | | | | 5.79 | 0.50 | 30 | 163 | 5.6 | 0.5 | Pipe Flow to JP-18 |
| | JP-18 | SUM JP-12, JP-16, JP-17 | 7.10 | 0.68 | | | | | 10.3 | 4.80 | 2.67 | 12.82 | | | | | | | | | Combined Flow at JP-18 |
| | | | | | | | | | | | | | | | 12.82 | 0.50 | 36 | 80 | 6.3 | 0.2 | Pipe Flow to JP-19 |
| | B9 | B9 | 0.30 | 0.72 | 5.0 | 0.22 | 3.48 | 0.76 | | | | | | 0.76 | | | | | | | Surface Flow at Inlet 02E_01 at DP B9, Inlet Capture |
| | | | | | | | | | | | | | | | 0.76 | 0.50 | 18 | 25 | 4.1 | 0.1 | Pipe Flow to JP-19 |
| | JP-19 | SUM JP-18, B9 | 7.40 | 0.68 | | | | | 10.5 | 5.02 | 2.64 | 13.25 | | | | | | | | | Combined Flow at JP-19 |
| | | | | | | | | | | | | | | | 13.25 | 0.50 | 36 | 80 | 6.3 | 0.2 | Pipe Flow to JP-23 |
| | B10 | B10 | 0.22 | 0.72 | 5.0 | 0.16 | 3.48 | 0.55 | | | | | | 0.55 | | | | | | | Surface Flow at Inlet 02D_05 at DP B11, Inlet Capture |
| | | | | | | | | | | | | | | | 0.55 | 0.50 | 18 | 87 | 4.1 | 0.4 | Pipe Flow to JP-23 |
| | B11 | B11 | 0.17 | 0.79 | 5.0 | 0.13 | 3.48 | 0.46 | | | | | | 0.46 | | | | | | | Roof Drain Flow to DP B11 |
| | | | | | | | | | | | | | | | 0.46 | 0.50 | 8 | 30 | 2.4 | 0.2 | Pipe Flow to JP-20 |
| | B12 | B12 | 0.25 | 0.70 | 5.0 | 0.18 | 3.48 | 0.62 | | | | | | | | | | | | | Surface Flow at Inlet 02D_01 at DP B12, Inlet Capture |
| | JP-20 | SUM B11, B12 | 0.42 | 0.74 | | | | | 5.2 | 0.31 | 3.43 | 1.06 | | | | | | | | | Combined Flow at JP-21 |
| | | | | | | | | | | | | | | | 1.06 | 0.50 | 18 | 88 | 4.1 | 0.4 | Pipe Flow to JP-22 |
| | B13 | B13 | 0.34 | 0.68 | 5.0 | 0.23 | 3.48 | 0.80 | | | | | | 0.80 | | | | | | | Surface Flow at Inlet 02D.4_01 at DP B13, Inlet Capture |
| | | | | | | | | | | | | | | | 0.80 | 0.50 | 18 | 23 | 4.1 | 0.1 | Pipe Flow to JP-21 |
| | JP-21 | SUM JP-20, B13 | 0.76 | 0.71 | | | | | 5.6 | 0.54 | 3.32 | 1.78 | | | | | | | | | Combined Flow at JP-22 |
| | | | | | | | | | | | | | | | 1.78 | 0.50 | 30 | 92 | 5.6 | 0.3 | Pipe Flow to JP-23 |
| | B14 | B14 | 0.12 | 0.72 | 5.0 | 0.09 | 3.48 | 0.30 | | | | | | 0.30 | | | | | | | Surface Flow at Inlet 02D.3_01 at DP B14, Inlet Capture |
| | | | | | | | | | | | | | | | 0.30 | 0.50 | 18 | 23 | 4.1 | 0.1 | Pipe Flow to JP-22 |
| | JP-22 | SUM JP-21, B14 | 0.88 | 0.71 | | | | | 5.8 | 0.62 | 3.27 | 2.04 | | | | | | | | | Combined Flow at JP-23 |
| | | | | | | | | | | | | | | | 2.04 | 0.50 | 18 | 23 | 4.1 | 0.1 | Pipe Flow to JP-24 |
| | JP-23 | SUM JP-19, JP-22, B10 | 8.50 | 0.68 | | | | | 10.8 | 5.80 | 2.61 | 15.14 | | | | | | | | | Combined Flow at JP-23 |
| | | | | | | | | | | | | | | | 15.14 | 0.50 | 42 | 66 | 6.9 | 0.2 | Pipe Flow to JP-25 |
| | B15 | B15 | 0.27 | 0.79 | 5.0 | 0.21 | 3.48 | 0.73 | | | | | | 0.73 | | | | | | | Roof Drain Flow to DP B15 |
| | | | | | | | | | | | | | | | 0.73 | 1.00 | 8 | 35 | 3.5 | 0.2 | Pipe Flow to JP-24 |
| | B16 | B16 | 0.67 | 0.70 | 5.0 | 0.47 | 3.48 | 1.63 | | | | | | | | | | | | | Surface Flow at Inlet 02C_01 at DP B16, Inlet Capture |
| | JP-24 | SUM B15, B16 | 0.93 | 0.73 | | | | | 5.2 | 0.68 | 3.43 | 2.33 | | | | | | | | | Combined Flow at JP-24 |
| | | | | | | | | | | | | | | | 2.33 | 0.50 | 18 | 21 | 4.1 | 0.1 | Pipe Flow to JP-25 |
| | B17 | B17 | 0.29 | 0.79 | 5.0 | 0.23 | 3.48 | 0.79 | | | | | | 0.79 | | | | | | | Roof Drain Flow to DP B17 |
| | | | | | | | | | | | | | | | 0.79 | 1.00 | 8 | 40 | 3.5 | 0.2 | Pipe Flow to JP-25 |
| | JP-25 | SUM JP-23, JP-24, B17 | 9.72 | 0.69 | | | | | 10.9 | 6.71 | 2.60 | 17.44 | | | | | | | | | Combined Flow at JP-25 |
| | | | | | | | | | | | | | | | 17.44 | 0.50 | 42 | 147 | 6.9 | 0.4 | Channel Flow to JP-26 |
| | B18 | B18 | 0.59 | 0.72 | 5.0 | 0.42 | 3.48 | 1.46 | | | | | | 1.46 | | | | | | | Surface Flow at Inlet 02B_01 at DP B18, Inlet Capture |
| | | | | | | | | | | | | | | | 1.46 | 0.50 | 18 | 23 | 4.1 | 0.1 | Pipe Flow to JP-26 |
| | JP-26 | SUM JP-25, B18 | 10.31 | 0.69 | | | | | 11.3 | 7.13 | 2.56 | 18.25 | | | | | | | | | Combined Flow at JP-26 |
| | | | | | | | | | | | | | | | 18.25 | 0.50 | 42 | 93 | 6.9 | 0.2 | Pipe Flow to JP-29 |
| | B19 | B19 | 1.75 | 0.66 | 5.7 | 1.15 | 3.30 | 3.79 | | | | | | 3.79 | | | | | | | Surface Flow at Inlet 02A_03 at DP B21, Inlet Capture |
| | | | | | | | | | | | | | | | 0.00 | 0.50 | 42 | 93 | 6.9 | 0.2 | Pipe Flow to JP-28 |
| | B20 | B20 | 0.15 | 0.63 | 5.0 | 0.09 | 3.48 | 0.33 | | | | | | | | | | | | | Surface Flow at Inlet 02A_02 at DP B22, Inlet Capture |
| | JP-27 | SUM B19, B20 | 1.89 | 0.66 | | | | | 5.9 | 1.24 | 3.25 | 4.03 | | | | | | | | | Combined Flow at JP-27 |
| | | | | | | | | | | | | | | | 4.03 | 0.50 | 42 | 93 | 6.9 | 0.2 | Pipe Flow to JP-28 |
| | OS-1 | OS-1 | 0.58 | 0.37 | 5.4 | 0.21 | 3.38 | 0.76 | | | | | | | | | | | | | Surface Flow from Offsite Basin OS-1 |
| | | | | | | | | | | | | | | | | | | | | | Combines with Surface Flow from Basin B21 at DP B21, Inlet Capture |
| | B21 | B21 | 0.42 | 0.51 | 5.5 | 0.21 | 3.35 | 0.72 | | | | | | 1.48 | | | | | | | Surface Flow at Inlet 02A.1_01 at DP B21, Inlet Capture |
| | | | | | | | | | | | | | | | 1.48 | 0.50 | 18 | 30 | 4.1 | 0.1 | Pipe Flow to JP-28 |
| | JP-28 | SUM JP-27, OS-1, B21 | 2.89 | 0.58 | | | | | 6.1 | 1.67 | 3.20 | 5.34 | | | | | | | | | Combined Flow at JP-28 |
| | | | | | | | | | | | | | | | 5.34 | 0.50 | 18 | 30 | 4.1 | 0.1 | Channel Flow to JP-29 |
| | JP-29 | SUM JP-26, JP-28 | 13.20 | 0.67 | | | | | 11.5 | 8.80 | 2.54 | 22.35 | | | | | | | | | Combined Flow at JP-30 |
| | | | | | | | | | | | | | | | 22.35 | 0.50 | 48 | 192 | 7.5 | 0.4 | Pipe Flow to JP-31 |
| | | | | | | | | | | | | | | | | | | | | | |
| C | C1 | C1 | 1.36 | 0.79 | 5.0 | 1.07 | 3.48 | 3.71 | | | | | | 3.71 | | | | | | | Roof Drain Flow to DP C1 |
| | | | | | | | | | | | | | | | 3.71 | 0.50 | 8 | 100 | 2.4 | 0.7 | Pipe Flow to JP-30 |
| | JP-30 | SUM JP-29, C1 | 14.55 | 0.68 | | | | | 11.9 | 9.86 | 2.50 | 24.66 | | | | | | | | | Combined Flow at JP-30 |
| | | | | | | | | | | | | | | | 24.66 | 0.50 | 48 | 290 | 7.5 | 0.6 | Pipe Flow to JP-31 |
| | A106 | A106 | 0.25 | 0.76 | 5.0 | 0.19 | 3.48 | 1.28 | | | | | | | | | | | | | Surface Flow to Inlet within Future Multifamily Development |
| | | | | | | | | | | | | | | | | | | | | | Pipe Flow to JP-31 |
| | A108 | A108 | 0.48 | 0.38 | 5.0 | 0.18 | 3.48 | 0.33 | | | | | | | | | | | | | Surface Flow at Inlet 02_05 at DP C2, Inlet Capture |
| | C2 | C2 | 1.07 | 0.14 | 7.2 | 0.15 | 3.01 | 0.44 | | | | | | | | | | | | | Surface Flow at Inlet 02_05 at DP C2, Inlet Capture |
| | JP-31 | SUM JP-30, C2, A106, A108 | 16.36 | 0.62 | | | | | 12.6 | 10.19 | 2.44 | 24.87 | | | | | | | | | Combined Flow at JP-31 |
| | | | | | | | | | | | | | | | 24.87 | 0.45 | 48 | 171 | 7.1 | 0.4 | Pipe Flow to JP-32 |
| | A200 | A200 | 2.71 | 0.71 | 5.2 | 1.92 | 3.43 | 6.77 | | | | | | | | | | | | | Surface Flow to Inlet within Future Multifamily Development |
| | | | | | | | | | | | | | | | | | | | | | Pipe Flow to JP-32 |
| | A202 | A202 | 1.80 | 0.70 | 5.0 | 1.26 | 3.48 | 4.37 | | | | | | | | | | | | | Surface Flow to Inlet within Future Multifamily Development |
| | | | | | | | | | | | | | | | | | | | | | Pipe Flow to JP-32 |
| | A104 | A104 | 0.38 | 0.60 | 5.0 | 0.23 | 3.48 | 0.98 | | | | | | | | | | | | | Surface Flow to Inlet within Future Multifamily Development |
| | | | | | | | | | | | | | | | | | | | | | Pipe Flow to JP-32 |
| | A100 | A100 | 2.66 | 0.70 | 5.0 | 1.86 | 3.48 | 6.52 | | | | | | | | | | | | | Surface Flow to Inlet within Future Multifamily Development |
| | | | | | | | | | | | | | | | | | | | | | Pipe Flow to JP-32 |
| | A102 | A102 | 0.41 | 0.63 | 5.0 | 0.26 | 3.48 | 0.90 | | | | | | | | | | | | | Surface Flow to Inlet within Future Multifamily Development |
| | | | | | | | | | | | | | | | | | | | | | Pipe Flow to JP-32 |
| | JP-32 | SUM JP-31, A200, A202, A104, A100, A102 | 24.32 | 0.65 | | | | | 13.0 | 15.73 | 2.41 | 37.90 | | | | | | | | | Combined Flow at JP-32 |

## STANDARD FORM SF-2
## STORM DRAINAGE SYSTEM DESIGN
## (RATIONAL METHOD PROCEDURE)

**2-year P1 =** **1.00**
100-year P1 = 2.66

CALCULATED BY: DFL
CHECKED BY: BEC

PROJECT: CENTERRA SOUTH
BASIN: Minor

DESIGN STORM: **2-YEAR (Minor Storm)**
JOB NO: 130-00201
LOCATION: Loveland, Colorado

| LOCATION | DESIGN POINT | AREA DESIG. | DIRECT RUNOFF AREA (Acres) | DIRECT RUNOFF RUNOFF COEFF | DIRECT RUNOFF Tc (min) | DIRECT RUNOFF C A (Acres) | DIRECT RUNOFF I (in/hour) | DIRECT RUNOFF Q (cfs) | TOTAL RUNOFF Tc (min) | TOTAL RUNOFF (C A) (Acres) | TOTAL RUNOFF I (in/hour) | TOTAL RUNOFF Q (cfs) | STREET SLOPE (%) | STREET FLOW (cfs) | PIPE DESIGN FLOW (cfs) | PIPE SLOPE (%) | PIPE PIPE SIZE | TRAVEL TIME LENGTH (ft) | TRAVEL TIME VELOCITY (fps) | TRAVEL TIME Tt (min) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pond | JP-33 | SUM JP-32, Travel time | 24.32 | 0.65 | | | | | 13.4 | 15.73 | 2.38 | 37.43 | | | 37.90 | 0.88 | 54 | 296 | 11.0 | 0.4 | Pipe Flow to POND |
| | | | | | | | | | | | | | | | | | | | | | |
| D | D1 | D1 | 3.15 | 0.66 | 13.6 | 2.07 | 2.37 | 4.91 | | | | | | 4.91 | | | | | | | Surface Flow to Inlet 03_15 at DP D1, Inlet Capture |
| | | | | | | | | | | | | | | | 4.91 | 0.49 | 18 | 46 | 4.0 | 0.2 | Pipe Flow to JP-34 |
| OS-103 | OS-103 | OS-103 | 2.77 | 0.42 | 5.0 | 1.18 | 3.48 | 4.10 | | | | | | 4.10 | | | | | | | Surface Flow to ex. offsite inlet at DP OS-103, Inlet Capture |
| | | | | | | | | | | | | | | | 4.10 | 3.00 | 24 | 46 | 12.8 | 0.1 | Pipe Flow to JP-34 |
| | JP-34 | SUM D1, OS-103 | 5.92 | 0.55 | | | | | 13.8 | 3.25 | 2.35 | 7.63 | | | | | | | | | Combined Flow at JP-34 |
| | | | | | | | | | | | | | | | 7.63 | 1.40 | 30 | 440 | 9.8 | 0.7 | Pipe Flow to JP-37 |
| | D2 | D2 | 0.35 | 0.79 | 6.9 | 0.28 | 3.05 | 0.84 | | | | | | 0.84 | | | | | | | Roof Drain Flow to DP D3 |
| | | | | | | | | | | | | | | | 0.84 | 0.50 | 24 | 24 | 4.9 | 0.1 | Pipe Flow to JP-35 |
| | D3 | D3 | 2.87 | 0.73 | 7.7 | 2.10 | 2.94 | 6.18 | | | | | | | | | | | | | Surface Flow at Inlet 03G_01 at DP D2, Inlet Capture |
| | JP-35 | SUM D2, D3 | 3.22 | 0.74 | | | | | 7.7 | 2.38 | 2.94 | 6.99 | | | | | | | | | Combined Flow at JP-35 |
| | | | | | | | | | | | | | | | 6.99 | 0.50 | 24 | 175 | 4.9 | 0.6 | Pipe Flow to JP-37 |
| | D4 | D4 | 2.98 | 0.68 | 5.1 | 2.03 | 3.45 | 7.01 | | | | | | 7.01 | | | | | | | Surface Flow at Inlet 03G_05 at DP D4, Inlet Capture |
| | | | | | | | | | | | | | | | 7.01 | 0.50 | 24 | 215 | 4.9 | 0.7 | Pipe Flow to JP-36 |
| | D5 | D5 | 3.47 | 0.65 | 5.0 | 2.25 | 3.48 | 7.82 | | | | | | 7.82 | | | | | | | Surface Flow at Inlet 03G.2_01 at DP D5, Inlet Capture |
| | | | | | | | | | | | | | | | 7.82 | 0.50 | 24 | 22 | 4.9 | 0.1 | Pipe Flow to JP-36 |
| | JP-36 | SUM D4, D5 | 6.45 | 0.66 | | | | | 5.8 | 4.28 | 3.27 | 14.00 | | | | | | | | | Combined Flow at JP-36 |
| | | | | | | | | | | | | | | | 14.00 | 0.50 | 36 | 169 | 6.3 | 0.4 | Pipe Flow to JP-37 |
| | JP-37 | SUM JP-34, JP-35, JP-36 | 15.60 | 0.64 | | | | | 14.5 | 9.91 | 2.31 | 22.88 | | | | | | | | | Combined Flow at JP-37 |
| | | | | | | | | | | | | | | | 22.88 | 0.50 | 48 | 84 | 7.5 | 0.2 | Pipe Flow to JP-38 |
| | D6 | D6 | 0.11 | 0.70 | 5.0 | 0.08 | 3.48 | 0.28 | | | | | | 0.28 | | | | | | | Surface Flow at Inlet 03F_01 at DP D6, Inlet Capture |
| | | | | | | | | | | | | | | | 0.28 | 0.50 | 18 | 30 | 4.1 | 0.1 | Pipe Flow to JP-38 |
| | D7 | D7 | 0.33 | 0.68 | 5.0 | 0.23 | 3.48 | 0.78 | | | | | | 0.78 | | | | | | | Surface Flow at Inlet 03F_02 at DP D7, Inlet Capture |
| | | | | | | | | | | | | | | | 0.78 | 0.50 | 18 | 17 | 4.1 | 0.1 | Pipe Flow to JP-38 |
| | JP-38 | SUM JP-37, D6, D7 | 16.04 | 0.64 | | | | | 14.7 | 10.21 | 2.30 | 23.49 | | | | | | | | | Combined Flow at JP-38 |
| | | | | | | | | | | | | | | | 23.49 | 0.50 | 48 | 84 | 7.5 | 0.2 | Pipe Flow to JP-45 |
| | D8 | D8 | 0.26 | 0.70 | 5.0 | 0.18 | 3.48 | 0.62 | | | | | | 0.62 | | | | | | | Surface Flow at Inlet 03E_07 at DP D8, Inlet Capture |
| | | | | | | | | | | | | | | | 0.62 | 0.50 | 18 | 27 | 4.1 | 0.1 | Pipe Flow to JP-39 |
| | D9 | D9 | 0.46 | 0.70 | 5.0 | 0.32 | 3.48 | 1.12 | | | | | | 1.12 | | | | | | | Surface Flow at Inlet 03E.1_01 at DP D9, Inlet Capture |
| | | | | | | | | | | | | | | | 1.12 | 0.50 | 18 | 20 | 4.1 | 0.1 | Pipe Flow to JP-39 |
| | JP-39 | SUM D8, D9 | 0.72 | 0.70 | | | | | 5.1 | 0.50 | 3.45 | 1.73 | | | | | | | | | Combined Flow at JP-39 |
| | | | | | | | | | | | | | | | 1.73 | 0.50 | 18 | 139 | 4.1 | 0.6 | Channel Flow to JP-45 |
| | D10 | D10 | 6.51 | 0.65 | 7.8 | 4.23 | 2.92 | 12.34 | | | | | | 12.34 | | | | | | | Future Development Pipe Flow at DP D10 |
| | | | | | | | | | | | | | | | 12.34 | 0.50 | 36 | 50 | 6.3 | 0.1 | Pipe Flow to JP-40 |
| | D11 | D11 | 0.39 | 0.75 | 5.0 | 0.29 | 3.48 | 1.01 | | | | | | 1.01 | | | | | | | Surface Flow at Inlet 03E_01 at DP D11, Inlet Capture |
| | JP-40 | SUM D10, D11 | 6.90 | 0.65 | | | | | 7.9 | 4.52 | 2.91 | 13.15 | | | | | | | | | Combined Flow at JP-40 |
| | | | | | | | | | | | | | | | 13.15 | 0.50 | 36 | 19 | 6.3 | 0.1 | Pipe Flow to JP-41 |
| | D12 | D12 | 0.16 | 0.75 | 5.0 | 0.12 | 3.48 | 0.42 | | | | | | 0.42 | | | | | | | Surface Flow at Inlet 03E.4_01 at DP D12, Inlet Capture |
| | | | | | | | | | | | | | | | 0.42 | 0.50 | 18 | 9 | 4.1 | 0.0 | Pipe Flow to JP-41 |
| | JP-41 | SUM JP-40, D12 | 7.06 | 0.66 | | | | | 7.9 | 4.64 | 2.91 | 13.50 | | | | | | | | | Combined Flow at JP-41 |
| | | | | | | | | | | | | | | | 13.50 | 0.50 | 42 | 92 | 6.9 | 0.2 | Pipe Flow to JP-42 |
| | D13 | D13 | 1.59 | 0.75 | 8.8 | 1.19 | 2.81 | 3.34 | | | | | | 3.34 | | | | | | | Surface Flow at Inlet 03E.5_02 at DP D13, Inlet Capture |
| | | | | | | | | | | | | | | | 3.34 | 0.50 | 24 | 153 | 4.9 | 0.5 | Pipe Flow to JP-42 |
| | JP-42 | SUM JP-41, D13 | 8.66 | 0.67 | | | | | 9.3 | 5.83 | 2.76 | 16.09 | | | | | | | | | Combined Flow at JP-42 |
| | | | | | | | | | | | | | | | 0.00 | 0.50 | 42 | 95 | 6.9 | 0.2 | Pipe Flow to JP-43 |
| | D14 | D14 | 0.27 | 0.68 | 5.0 | 0.19 | 3.48 | 0.65 | | | | | | 0.65 | | | | | | | Surface Flow at Inlet 03E.3_01 at DP D14, Inlet Capture |
| | | | | | | | | | | | | | | | 0.65 | 0.50 | 18 | 23 | 4.1 | 0.1 | Pipe Flow to JP-43 |
| | D15 | D15 | 0.72 | 0.72 | 6.8 | 0.52 | 3.07 | 1.59 | | | | | | 1.59 | | | | | | | Surface Flow at Inlet 03E.3_02 at DP D15, Inlet Capture |
| | | | | | | | | | | | | | | | 1.59 | 0.50 | 18 | 15 | 4.1 | 0.1 | Pipe Flow to JP-43 |
| | JP-43 | SUM JP-42, D14, D15 | 9.65 | 0.68 | | | | | 9.5 | 6.53 | 2.74 | 17.90 | | | | | | | | | Combined Flow at JP-43 |
| | | | | | | | | | | | | | | | 17.90 | 0.50 | 42 | 183 | 6.9 | 0.4 | Pipe Flow to JP-44 |
| | D16 | D16 | 0.37 | 0.70 | 5.0 | 0.26 | 3.48 | 0.90 | | | | | | 0.90 | | | | | | | Surface Flow at Inlet 03E.2_01 at DP D16, Inlet Capture |
| | | | | | | | | | | | | | | | 0.90 | 0.50 | 18 | 23 | 4.1 | 0.1 | Pipe Flow to JP-44 |
| | D17 | D17 | 0.24 | 0.57 | 5.0 | 0.14 | 3.48 | 0.48 | | | | | | 0.48 | | | | | | | Surface Flow at Inlet 03E.2_02 at DP D17, Inlet Capture |
| | | | | | | | | | | | | | | | 0.48 | 1.00 | 18 | 15 | 5.9 | 0.0 | Pipe Flow to JP-44 |
| | JP-44 | SUM JP-43, D16, D17 | 10.26 | 0.68 | | | | | 10.0 | 6.93 | 2.70 | 18.71 | | | | | | | | | Combined Flow at JP-44 |
| | | | | | | | | | | | | | | | 18.71 | 0.50 | 42 | 184 | 6.9 | 0.4 | Pipe Flow to JP-45 |
| | JP-45 | SUM JP-38, JP-39, JP-44 | 27.02 | 0.65 | | | | | 14.9 | 17.64 | 2.29 | 40.40 | | | | | | | | | Combined Flow at JP-45 |
| | | | | | | | | | | | | | | | 40.40 | 0.50 | 54 | 187 | 8.1 | 0.4 | Pipe Flow to JP-47 |
| | D18 | D18 | 0.34 | 0.79 | 5.0 | 0.27 | 3.48 | 0.93 | | | | | | 0.93 | | | | | | | Roof Drain Flow at DP D18 |
| | | | | | | | | | | | | | | | 0.93 | 1.00 | 8 | 30 | 3.5 | 0.1 | Pipe Flow to JP-46 |
| | D19 | D19 | 0.44 | 0.73 | 5.0 | 0.32 | 3.48 | 1.12 | | | | | | | | | | | | | Surface Flow at Inlet 03D_01 at DP D19, Inlet Capture |
| | JP-46 | SUM D18, D19 | 0.78 | 0.76 | | | | | 5.1 | 0.59 | 3.45 | 2.03 | | | | | | | | | Combined Flow at JP-46 |
| | | | | | | | | | | | | | | | 2.03 | 0.50 | 18 | 30 | 4.1 | 0.1 | Pipe Flow to JP-47 |
| | D20 | D20 | 1.20 | 0.58 | 5.0 | 0.70 | 3.48 | 2.43 | | | | | | 2.43 | | | | | | | Surface Flow at Inlet 03D_02 at DP D20, Inlet Capture |
| | | | | | | | | | | | | | | | 2.43 | 0.50 | 18 | 17 | 4.1 | 0.1 | Pipe Flow to JP-47 |
| | JP-47 | SUM JP-45, JP-46, D20 | 29.00 | 0.65 | | | | | 15.3 | 18.93 | 2.26 | 42.79 | | | | | | | | | Combined Flow at JP-47 |
| | | | | | | | | | | | | | | | 42.79 | 0.56 | 54 | 102 | 8.6 | 0.2 | Pipe Flow to JP-48 |
| | D21 | D21 | 0.35 | 0.68 | 5.0 | 0.24 | 3.48 | 0.82 | | | | | | | | | | | | | Future Commercial Surface Flow at DP D21, Inlet Capture |
| | D22 | D22 | 0.25 | 0.66 | 5.0 | 0.17 | 3.48 | 0.58 | | | | | | | | | | | | | Future Commercial Surface Flow at DP D22, Inlet Capture |

# STANDARD FORM SF-2
# STORM DRAINAGE SYSTEM DESIGN
# (RATIONAL METHOD PROCEDURE)

**2-year P1 =** **1.00**
100-year P1 = 2.66

CALCULATED BY: DFL
CHECKED BY: BEC

PROJECT: CENTERRA SOUTH
BASIN: Minor

DESIGN STORM: **2-YEAR (Minor Storm)**
JOB NO: 130-00201
LOCATION: Loveland, Colorado

| LOCATION | DESIGN POINT | AREA DESIG. | DIRECT RUNOFF AREA (Acres) | DIRECT RUNOFF RUNOFF COEFF | DIRECT RUNOFF Tc (min) | DIRECT RUNOFF C A (Acres) | DIRECT RUNOFF I (in/hour) | DIRECT RUNOFF Q (cfs) | TOTAL RUNOFF Tc (min) | TOTAL RUNOFF (C A) (Acres) | TOTAL RUNOFF I (in/hour) | TOTAL RUNOFF Q (cfs) | STREET SLOPE (%) | STREET FLOW (cfs) | PIPE DESIGN FLOW (cfs) | PIPE SLOPE (%) | PIPE SIZE | TRAVEL TIME LENGTH (ft) | TRAVEL TIME VELOCITY (fps) | TRAVEL TIME Tt (min) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | D23 | D23 | 0.26 | 0.66 | 5.0 | 0.18 | 3.48 | 0.61 | | | | | | | | | | | | | Surface Flow at Inlet 03C_03 at DP D23, Inlet Capture |
| | D24 | D24 | 0.12 | 0.65 | 5.0 | 0.08 | 3.48 | 0.26 | | | | | | | | | | | | | Surface Flow at Inlet 03C_02 at DP D24, Inlet Capture |
| | D25 | D25 | 0.15 | 0.65 | 5.0 | 0.10 | 3.48 | 0.33 | | | | | | 2.60 | | | | | | | Surface Flow at Inlet 03C_01 at DP D25, Inlet Capture |
| | JP-48 | SUM JP-47, D21, D22, D23, D24, D25 | 30.13 | 0.65 | | | | | 15.5 | 19.68 | 2.24 | 44.08 | | | 2.60 | 0.50 | 18 | 385 | 4.1 | 1.6 | Pipe Flow to JP-48 |
| | D26 | D26 | 0.45 | 0.79 | 5.0 | 0.35 | 3.48 | 1.23 | | | | | | | 15.50 | 0.50 | 54 | 80 | 8.1 | 0.2 | Combined Flow at JP-48<br>Pipe Flow to JP-49 |
| | JP-49 | SUM JP-48, D22 | 30.57 | 0.66 | | | | | 15.7 | 20.03 | 2.23 | 44.67 | | 1.23 | 1.23 | 1.00 | 8 | 60 | 3.5 | 0.3 | Roof Drain Flow at DP D26<br>Pipe Flow to JP-49 |
| | D27 | D27 | 0.59 | 0.79 | 5.0 | 0.47 | 3.48 | 1.62 | | | | | | | 44.67 | 0.50 | 54 | 81 | 8.1 | 0.2 | Combined Flow at JP-49<br>Pipe Flow to JP-51 |
| | D28 | D28 | 0.19 | 0.72 | 5.0 | 0.13 | 3.48 | 0.47 | | | | | | 1.62 | 1.62 | 1.00 | 8 | 25 | 3.5 | 0.1 | Roof Drain Flow at DP D27<br>Pipe Flow to JP-50 |
| | JP-50 | SUM D23, D24 | 0.78 | 0.77 | | | | | 5.1 | 0.60 | 3.45 | 2.08 | | | | | | | | | Surface Flow at Inlet 03B_01 at DP D28, Inlet Capture |
| | D29 | D29 | 0.11 | 0.70 | 5.0 | 0.08 | 3.48 | 0.28 | | | | | | | 2.08 | 0.50 | 18 | 20 | 4.1 | 0.1 | Combined Flow at JP-50<br>Pipe Flow to JP-51 |
| | JP-51 | SUM JP-49, JP-50, D29 | 31.47 | 0.66 | | | | | 15.8 | 20.71 | 2.22 | 45.98 | | 0.28 | 0.28 | 0.50 | 24 | 18 | 4.9 | 0.1 | Surface Flow at Inlet 03B_02 at DP D29, Inlet Capture<br>Pipe Flow to JP-51 |
| | D30 | D30 | 0.43 | 0.79 | 5.0 | 0.34 | 3.48 | 1.17 | | | | | | | 45.98 | 0.50 | 54 | 126 | 8.1 | 0.3 | Combined Flow at JP-51<br>Pipe Flow to JP-54 |
| | D31 | D31 | 0.41 | 0.73 | 5.0 | 0.30 | 3.48 | 1.04 | | | | | | 1.17 | 1.17 | 1.00 | 8 | 100 | 3.5 | 0.5 | Roof Drain Flow at DP D30<br>Pipe Flow to JP-52 |
| | JP-52 | SUM D30, D31 | 0.83 | 0.76 | | | | | 5.5 | 0.63 | 3.35 | 2.12 | | 1.04 | 1.04 | 0.50 | 18 | 23 | 4.1 | 0.1 | Surface Flow at Inlet 03A_06 at DP D31, Inlet Capture<br>Pipe Flow to JP-52 |
| | OS-5 | OS-5 | 0.28 | 0.67 | 5.0 | 0.19 | 3.48 | 0.66 | | | | | | | 2.12 | 0.50 | 18 | 284 | 4.1 | 1.2 | Combined Flow at JP-52<br>Pipe Flow to JP-53 |
| | D32 | D32 | 0.73 | 0.73 | 5.0 | 0.53 | 3.48 | 1.84 | | | | | | | | | | | | | Surface Flow from Offsite Basin OS-5<br>Combines with Surface Flow from Basin B32 at DP B32, Inlet Capture |
| | JP-53 | SUM JP-52, OS-5, D32 | 1.84 | 0.73 | | | | | 6.6 | 1.35 | 3.11 | 4.20 | | | | | | | | | Surface Flow at Inlet 03A_01 at DP D32, Inlet Capture |
| | JP-54 | SUM JP-51, JP-53 | 33.31 | 0.66 | | | | | 16.1 | 22.06 | 2.20 | 48.54 | | | 4.20 | 0.50 | 18 | 235 | 4.1 | 1.0 | Combined Flow at JP-53<br>Pipe Flow to JP-54 |
| | D33 | D33 | 1.55 | 0.46 | 7.2 | 0.72 | 3.01 | 2.16 | | | | | | | 48.54 | 0.50 | 60 | 420 | 8.7 | 0.8 | Combined Flow at JP-54<br>Pipe Flow to JP-60 |
| | D34 | D34 | 1.53 | 0.46 | 7.2 | 0.71 | 3.01 | 2.13 | | | | | | 2.16 | 2.16 | 0.50 | 18 | 34 | 4.1 | 0.1 | Future Surface Flow to Inlet at DP D33, Inlet Capture<br>Pipe Flow to JP-55 |
| | JP-55 | SUM D33, D34 | 3.08 | 0.46 | | | | | 7.3 | 1.42 | 2.99 | 4.26 | | 2.13 | 2.13 | 0.50 | 18 | 20 | 4.1 | 0.1 | Future Surface Flow to Inlet at DP D34, Inlet Capture<br>Pipe Flow to JP-55 |
| | D35 | D35 | 12.51 | 0.57 | 11.0 | 7.14 | 2.59 | 18.48 | | | | | | | 4.26 | 0.50 | 24 | 862 | 4.9 | 2.9 | Combined Flow at JP-55<br>Pipe Flow to JP-57 |
| | D36 | D36 | 1.08 | 0.69 | 6.9 | 0.74 | 3.05 | 2.27 | | | | | | 18.48 | 18.48 | 0.50 | 30 | 43 | 5.6 | 0.1 | Future Flow to Storm Stub at DP D35<br>Pipe Flow to JP-56 |
| | JP-56 | SUM D35, D36 | 13.59 | 0.58 | | | | | 11.1 | 7.88 | 2.58 | 20.33 | | | | | | | | | Future Surface Flow to Inlet at DP D36, Inlet Capture |
| | D37 | D37 | 1.22 | 0.46 | 7.7 | 0.56 | 2.94 | 1.66 | | | | | | | 20.33 | 0.50 | 30 | 34 | 5.6 | 0.1 | Combined Flow at JP-56<br>Pipe Flow to JP-57 |
| | JP-57 | SUM JP-55, JP-56, D37 | 17.89 | 0.55 | | | | | 11.2 | 9.87 | 2.57 | 25.36 | | 1.66 | 1.66 | 0.50 | 18 | 20 | 4.1 | 0.1 | Future Surface Flow to Inlet at DP D37, Inlet Capture<br>Pipe Flow to JP-57 |
| | D38 | D38 | 13.09 | 0.56 | 12.5 | 7.32 | 2.45 | 17.92 | | | | | | | 25.36 | 0.50 | 36 | 34 | 6.3 | 0.1 | Combined Flow at JP-57<br>Pipe Flow to JP-59 |
| | OS-4 | OS-4 | 1.53 | 0.56 | 5.0 | 0.86 | 3.48 | 2.97 | | | | | | 17.92 | 17.92 | 0.50 | 30 | 51 | 5.6 | 0.2 | Future Flow to Storm Stub at DP D38<br>Pipe Flow to JP-58 |
| | D39 | D39 | 1.81 | 0.62 | 9.2 | 1.13 | 2.77 | 3.14 | | | | | | | | | | | | | Surface Flow from Offsite Basin OS-1<br>Combines with Surface Flow from Basin B39 at DP B39, Inlet Capture |
| | JP-58 | SUM D38, OS-4, D39 | 16.43 | 0.57 | | | | | 12.6 | 9.31 | 2.44 | 22.71 | | | | | | | | | Surface Flow to Inlet 04A_02 at DP D39, Inlet Capture |
| | D40 | D40 | 1.35 | 0.62 | 7.5 | 0.85 | 2.96 | 2.50 | | | | | | | 22.71 | 0.50 | 36 | 48 | 6.3 | 0.1 | Combined Flow at JP-58<br>Pipe Flow to JP-59 |
| | JP-59 | SUM JP-57, JP-58, D40 | 35.68 | 0.56 | | | | | 12.8 | 20.02 | 2.43 | 48.65 | | 2.50 | 2.50 | 0.50 | 18 | 20 | 4.1 | 0.1 | Surface Flow at Inlet 04A_01 at DP D40, Inlet Capture<br>Pipe Flow to JP-59 |
| | JP-60 | SUM JP-54, JP-59 | 68.99 | 0.61 | | | | | 16.9 | 42.08 | 2.15 | 90.48 | | | 48.65 | 0.50 | 48 | 56 | 7.5 | 0.1 | Combined Flow at JP-59<br>Pipe Flow to JP-60 |
| POND | JP-61 | SUM JP-60, Travel time | 68.99 | 0.61 | | | | | 17.0 | 42.08 | 2.14 | 90.06 | | | 90.48 | 0.50 | 60 | 79 | 8.7 | 0.2 | Combined Flow at JP-60<br>Pipe Flow to POND |
| | | | | | | | | | | | | | | | | | | | | | |
| **TOTAL TO POND** | **POND** | **SUM JP-61, JP-33, JP-11** | **113.88** | **0.62** | | | | | **17.0** | **70.45** | **2.14** | **150.75** | | | | | | | | | |

Note: Orange highlight notes values were retrieved from third party report - "FINAL DRAINAGE REPORT, AVENUE SOUTH MULTIFAMILY" By Kimley Horn Dated April 25, 2025

Note: Rainfall Intensities based on Intensity-Duration Curve for Rational Method per Figure 502 (Chapter 5 - Rainfall, Loveland Storm Drainage Criteria Manual, March 1986)

# STANDARD FORM SF-2
# STORM DRAINAGE SYSTEM DESIGN
# (RATIONAL METHOD PROCEDURE)

2-year P1 = 1.00

**100-year P1 = 2.66**

CALCULATED BY: DFL

CHECKED BY: BEC

PROJECT: CENTERRA SOUTH

BASIN: Major

DESIGN STORM: **100-YEAR (Minor Storm)**

JOB NO: 130-00201

LOCATION: Loveland, Colorado

| | | DIRECT RUNOFF | | | | | | | TOTAL RUNOFF | | | | STREET | | PIPE | | | TRAVEL TIME | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOCATION | DESIGN POINT | AREA DESIG. | AREA (Acres) | RUNOFF COEFF | Tc (min) | C A (Acres) | I (in/hour) | Q (cfs) | Tc (min) | (C A) (Acres) | I (in/hour) | Q (cfs) | SLOPE (%) | STREET FLOW (cfs) | DESIGN FLOW (cfs) | SLOPE (%) | PIPE SIZE | LENGTH (ft) | VELOCITY (fps) | Tt (min) | REMARKS |
| A | A1 | A1 | 1.27 | 0.87 | 6.7 | 1.10 | 8.22 | 9.07 | | | | | | 9.07 | | | | | | | |
| | | | | | | | | | | | | | | | 9.07 | 0.50 | 18 | 58 | 4.1 | 0.2 | Surface Flow to Inlet 01_14 at DP A1, Inlet Capture<br>Pipe Flow to JP-1 |
| OS-101 | OS-101 | OS-101 | 3.37 | 0.70 | 5.0 | 2.36 | 9.24 | 21.79 | | | | | | 21.79 | | | | | | | Surface Flow to ex. offsite inlet at DP OS-101, Inlet Capture |
| | | | | | | | | | | | | | | | 21.79 | 0.53 | 24 | 64 | 5.0 | 0.2 | Pipe Flow to JP-1 |
| | JP-1 | Sum A1, OS-101 | 4.63 | 0.75 | | | | | 7.0 | 3.46 | 8.07 | 27.94 | | | | | | | | | Combined Flow at JP-1 |
| | | | | | | | | | | | | | | | 21.79 | 0.50 | 30 | 270 | 5.6 | 0.8 | Pipe Flow to JP-2 |
| OS-104 | OS-104 | OS-104 | 3.34 | 0.79 | 5.0 | 2.65 | 9.24 | 24.47 | | | | | | 24.47 | | | | | | | Surface Flow to ex. offsite inlet at DP OS-104, Inlet Capture |
| | | | | | | | | | | | | | | | 24.47 | 0.85 | 24 | 360 | 6.5 | 0.9 | Pipe Flow to JP-2 |
| | JP-2 | Sum JP-1, OS-104 | 7.97 | 0.77 | | | | | 7.8 | 6.11 | 7.78 | 47.54 | | | | | | | | | Combined Flow at JP-2 |
| | | | | | | | | | | | | | | | 47.54 | 1.00 | 30 | 118 | 8.2 | 0.2 | Pipe Flow to JP-4 |
| | A2 | A2 | 0.85 | 0.87 | 5.0 | 0.74 | 9.24 | 6.85 | | | | | | 6.85 | | | | | | | Roof Drain Flow to DP A2 |
| | | | | | | | | | | | | | | | 6.85 | 1.00 | 8 | 60 | 3.5 | 0.3 | Pipe Flow to JP-3 |
| | A3 | A3 | 1.84 | 0.81 | 5.0 | 1.50 | 9.24 | 13.86 | | | | | | | | | | | | | Surface Flow to Inlet 01E_01 at DP A3, Inlet Capture |
| | JP-3 | Sum A2, A3 | 2.69 | 0.83 | | | | | 5.3 | 2.24 | 9.04 | 20.26 | | | | | | | | | Combined Flow at JP-3 |
| | | | | | | | | | | | | | | | | | | | | | Pipe Flow to JP-4 |
| | JP-4 | Sum JP-2, JP-3 | 10.66 | 0.78 | | | | | 8.0 | 8.35 | 7.71 | 64.39 | | | | | | | | | Combined Flow at JP-4 |
| | | | | | | | | | | | | | | | 20.26 | 0.50 | 36 | 161 | 6.3 | 0.4 | Pipe Flow to JP-6 |
| | A4 | A4 | 1.24 | 0.82 | 5.0 | 1.02 | 9.24 | 9.46 | | | | | | 9.46 | | | | | | | Surface Flow to Inlet 01D_02 at DP A4, Inlet Capture |
| | | | | | | | | | | | | | | | 9.46 | 0.50 | 24 | 14 | 4.9 | 0.0 | Pipe Flow to JP-5 |
| | A5 | A5 | 1.69 | 0.84 | 5.0 | 1.41 | 9.24 | 13.03 | | | | | | | | | | | | | Surface Flow to Inlet 01D_01 at DP A5, Inlet Capture |
| | JP-5 | Sum A4, A5 | 2.93 | 0.83 | | | | | 5.0 | 2.43 | 9.24 | 22.49 | | | | | | | | | Combined Flow at JP-5 |
| | | | | | | | | | | | | | | | 22.49 | 0.50 | 30 | 255 | 5.6 | 0.8 | Pipe Flow to JP-6 |
| | JP-6 | Sum JP-2, JP-3 | 13.59 | 0.79 | | | | | 8.5 | 10.79 | 7.57 | 81.64 | | | | | | | | | Combined Flow at JP-6 |
| | | | | | | | | | | | | | | | 81.64 | 0.50 | 42 | 204 | 6.9 | 0.5 | Pipe Flow to JP-7 |
| | A6 | A6 | 0.52 | 0.73 | 5.0 | 0.38 | 9.24 | 3.54 | | | | | | 3.54 | | | | | | | Surface Flow to Inlet 01C_02 at DP A6, Inlet Capture |
| | | | | | | | | | | | | | | | 3.54 | 0.50 | 18 | 28 | 4.1 | 0.1 | Pipe Flow to JP-7 |
| | A7 | A7 | 2.05 | 0.83 | 7.3 | 1.69 | 7.97 | 13.48 | | | | | | 13.48 | | | | | | | Surface Flow to Inlet 01C_01 at DP A7, Inlet Capture |
| | | | | | | | | | | | | | | | 13.48 | 0.50 | 18 | 76 | 4.1 | 0.3 | Pipe Flow to JP-7 |
| | JP-7 | Sum JP-6, A6, A7 | 16.16 | 0.80 | | | | | 8.9 | 12.86 | 7.46 | 95.93 | | | | | | | | | Combined Flow at JP-7 |
| | | | | | | | | | | | | | | | 95.93 | 0.50 | 42 | 686 | 6.9 | 1.6 | Pipe Flow to JP-8 |
| | OS-2 | OS-2 | 0.68 | 0.72 | 5.6 | 0.49 | 8.83 | 1.12 | | | | | | | | | | | | | Surface Flow from Offsite Basin OS-2<br>Combines with Surface Flow from Basin A8 at DP A8, Inlet Capture |
| | A8 | A8 | 0.76 | 0.80 | 5.0 | 0.61 | 9.24 | 5.61 | | | | | | 6.73 | | | | | | | Surface Flow to Inlet 01B_02 at DP A8, Inlet Capture |
| | | | | | | | | | | | | | | | 6.73 | 0.50 | 18 | 10 | 4.1 | 0.0 | Pipe Flow to JP-8 |
| | A9 | A9 | 0.94 | 0.81 | 5.0 | 0.77 | 9.24 | 7.07 | | | | | | 7.07 | | | | | | | Surface Flow to Inlet 01B_01 at DP A9, Inlet Capture |
| | | | | | | | | | | | | | | | 7.07 | 0.50 | 18 | 33 | 4.1 | 0.1 | Pipe Flow to JP-8 |
| | JP-8 | Sum JP-7, OS-2, A8, A9 | 18.55 | 0.79 | | | | | 10.6 | 14.72 | 7.02 | 103.35 | | | | | | | | | Combined Flow at JP-8 |
| | | | | | | | | | | | | | | | 103.35 | 0.50 | 48 | 407 | 7.5 | 0.9 | Pipe Flow to JP-9 |
| | OS-3 | OS-3 | 0.66 | 0.71 | 5.0 | 0.47 | 9.24 | 1.01 | | | | | | | | | | | | | Surface Flow from Offsite Basin OS-3<br>Combines with Surface Flow from Basin A10 at DP A10, Inlet Capture |
| | A10 | A10 | 0.64 | 0.80 | 5.0 | 0.51 | 9.24 | 4.70 | | | | | | 5.71 | | | | | | | Surface Flow to Inlet 01A_01 at DP A10, Inlet Capture |
| | | | | | | | | | | | | | | | 5.71 | 0.50 | 18 | 44 | 4.1 | 0.2 | Pipe Flow to JP-9 |
| | JP-9 | Sum JP-8, OS-3, A10 | 19.85 | 0.79 | | | | | 11.5 | 15.70 | 6.77 | 106.28 | | | | | | | | | Combined Flow at JP-9 |
| | | | | | | | | | | | | | | | 106.28 | 0.50 | 48 | 25 | 7.5 | 0.1 | Pipe Flow to JP-10 |
| | A11 | A11 | 0.73 | 0.78 | 5.0 | 0.57 | 9.24 | 5.27 | | | | | | | | | | | | | Surface Flow to Inlet 01_02 at DP A11, Inlet Capture |
| | JP-10 | Sum JP-9, A11 | 20.58 | 0.79 | | | | | 11.5 | 16.27 | 6.77 | 110.14 | | | | | | | | | Combined Flow at JP-10 |
| | | | | | | | | | | | | | | | 110.14 | 0.50 | 48 | 62 | 7.5 | 0.1 | Pipe Flow to POND |
| POND | JP-11 | Sum JP-10, Travel time | 20.58 | 0.79 | | | | | 11.7 | 16.27 | 6.72 | 109.33 | | | | | | | | | |
| B | B1 | B1 | 0.49 | 0.87 | 5.0 | 0.43 | 9.24 | 3.98 | | | | | | 3.98 | | | | | | | Surface Flow to Inlet 02G_01 at DP B1, Inlet Capture |
| | | | | | | | | | | | | | | | 3.98 | 0.50 | 18 | 168 | 4.1 | 0.7 | Pipe Flow to JP-12 |
| OS-102 | OS-102 | OS-102 | 0.47 | 0.82 | 5.0 | 0.39 | 9.24 | 3.60 | | | | | | 3.60 | | | | | | | Surface Flow to ex. offsite inlet at DP OS-102, Inlet Capture |
| | | | | | | | | | | | | | | | 3.60 | 0.50 | 24 | 95 | 4.9 | 0.3 | Pipe Flow to JP-12, (Slope is unknown due to conditions at time of survey) |
| | JP-12 | SUM B1, OS-102 | 0.97 | 0.85 | | | | | 5.7 | 0.82 | 8.76 | 7.18 | | | | | | | | | Combined Flow at JP-12 |
| | | | | | | | | | | | | | | | 7.18 | 2.00 | 24 | 276 | 10.3 | 0.4 | Pipe Flow to JP-18 |
| | B2 | B2 | 0.17 | 0.81 | 5.0 | 0.14 | 9.24 | 1.29 | | | | | | 1.29 | | | | | | | Surface Flow to Inlet 02F_07 at DP B2, Inlet Capture |
| | | | | | | | | | | | | | | | 1.29 | 0.40 | 10 | 51 | 2.5 | 0.3 | Pipe Flow to JP-13 |
| | B3 | B3 | 0.09 | 0.75 | 5.0 | 0.06 | 9.24 | 0.60 | | | | | | | | | | | | | Surface Flow to Inlet 02F_06 at DP B3, Inlet Capture |
| | JP-13 | SUM B2, B3 | 0.26 | 0.79 | | | | | 5.3 | 0.20 | 9.04 | 1.85 | | | | | | | | | Combined Flow at JP-13 |
| | | | | | | | | | | | | | | | 1.85 | 0.50 | 18 | 160 | 4.1 | 0.7 | Pipe Flow to JP-14 |
| | B4 | B4 | 0.21 | 0.87 | 5.0 | 0.18 | 9.24 | 1.69 | | | | | | 1.69 | | | | | | | Roof Drain Flow to DP B4 |
| | | | | | | | | | | | | | | | 1.69 | 1.00 | 8 | 45 | 3.5 | 0.2 | Pipe Flow to JP-14 |
| | JP-14 | SUM JP-13, B4 | 0.47 | 0.83 | | | | | 6.0 | 0.39 | 8.56 | 3.32 | | | | | | | | | Combined Flow at JP-14 |
| | | | | | | | | | | | | | | | 3.32 | 0.50 | 18 | 102 | 4.1 | 0.4 | Pipe Flow to JP-16 |
| | B5 | B5 | 2.52 | 0.78 | 5.0 | 1.96 | 9.24 | 18.14 | | | | | | 18.14 | | | | | | | Surface Flow to Inlet 02F.2_01 at DP B5, Inlet Capture |
| | | | | | | | | | | | | | | | 18.14 | 0.50 | 18 | 102 | 4.1 | 0.4 | Pipe Flow to JP-15 |
| | B6 | B6 | 0.19 | 0.87 | 5.0 | 0.16 | 9.24 | 1.51 | | | | | | 1.51 | | | | | | | Roof Drain Flow to DP B6 |
| | | | | | | | | | | | | | | | 1.51 | 1.00 | 8 | 45 | 3.5 | 0.2 | Pipe Flow to JP-15 |
| | JP-15 | SUM B5, B6 | 2.70 | 0.79 | | | | | 5.4 | 2.13 | 8.97 | 19.07 | | | | | | | | | Combined Flow at JP-15 |
| | | | | | | | | | | | | | | | 19.07 | 1.00 | 8 | 45 | 3.5 | 0.2 | Pipe Flow to JP-16 |
| | JP-16 | SUM JP-14, JP-15 | 3.17 | 0.79 | | | | | 6.4 | 2.51 | 8.37 | 21.04 | | | | | | | | | Combined Flow at JP-16 |
| | | | | | | | | | | | | | | | 21.04 | 0.50 | 30 | 148 | 5.6 | 0.4 | Pipe Flow to JP-18 |
| | B7 | B7 | 2.58 | 0.84 | 9.5 | 2.16 | 7.31 | 15.77 | | | | | | 15.77 | | | | | | | Surface Flow to Inlet 02F_01 at DP B7, Inlet Capture |
| | | | | | | | | | | | | | | | 15.77 | 0.50 | 18 | 79 | 4.1 | 0.3 | Pipe Flow to JP-17 |

# STANDARD FORM SF-2
# STORM DRAINAGE SYSTEM DESIGN
# (RATIONAL METHOD PROCEDURE)

2-year P1 = 1.00

**100-year P1 = 2.66**

CALCULATED BY: DFL

CHECKED BY: BEC

PROJECT: CENTERRA SOUTH

BASIN: Major

DESIGN STORM: **100-YEAR (Minor Storm)**

JOB NO: 130-00201

LOCATION: Loveland, Colorado

| | | | DIRECT RUNOFF | | | | | | TOTAL RUNOFF | | | | STREET | | PIPE | | | TRAVEL TIME | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOCATION | DESIGN POINT | AREA DESIG. | AREA (Acres) | RUNOFF COEFF | Tc (min) | C A (Acres) | I (in/hour) | Q (cfs) | Tc (min) | (C A) (Acres) | I (in/hour) | Q (cfs) | SLOPE (%) | STREET FLOW (cfs) | DESIGN FLOW (cfs) | SLOPE (%) | PIPE SIZE | LENGTH (ft) | VELOCITY (fps) | Tt (min) | REMARKS |
| | B8 | B8 | 0.38 | 0.87 | 5.0 | 0.33 | 9.24 | 3.06 | | | | | | 3.06 | | | | | | | |
| | | | | | | | | | | | | | | | 3.06 | 1.00 | 8 | 45 | 3.5 | 0.2 | Roof Drain Flow to DP B8<br>Pipe Flow to JP-17 |
| | JP-17 | SUM B7, B8 | 2.96 | 0.84 | | | | | 9.8 | 2.49 | 7.25 | 18.05 | | | | | | | | | |
| | | | | | | | | | | | | | | | 18.05 | 0.50 | 30 | 163 | 5.6 | 0.5 | Combined Flow at JP-17<br>Pipe Flow to JP-18 |
| | JP-18 | SUM JP-12, JP-16, JP-17 | 7.10 | 0.82 | | | | | 10.3 | 5.82 | 7.11 | 41.40 | | | | | | | | | |
| | | | | | | | | | | | | | | | 41.40 | 0.50 | 36 | 80 | 6.3 | 0.2 | Combined Flow at JP-18<br>Pipe Flow to JP-19 |
| | B9 | B9 | 0.30 | 0.84 | 5.0 | 0.25 | 9.24 | 2.35 | | | | | | 2.35 | | | | | | | |
| | | | | | | | | | | | | | | | 2.35 | 0.50 | 18 | 25 | 4.1 | 0.1 | Surface Flow at Inlet 02E_01 at DP B9, Inlet Capture<br>Pipe Flow to JP-19 |
| | JP-19 | SUM JP-18, B9 | 7.40 | 0.82 | | | | | 10.5 | 6.08 | 7.05 | 42.85 | | | | | | | | | |
| | | | | | | | | | | | | | | | 42.85 | 0.50 | 36 | 80 | 6.3 | 0.2 | Combined Flow at JP-19<br>Pipe Flow to JP-23 |
| | B10 | B10 | 0.22 | 0.84 | 5.0 | 0.19 | 9.24 | 1.72 | | | | | | 1.72 | | | | | | | |
| | | | | | | | | | | | | | | | 1.72 | 0.50 | 18 | 87 | 4.1 | 0.4 | Surface Flow at Inlet 02D_05 at DP B11, Inlet Capture<br>Pipe Flow to JP-23 |
| | B11 | B11 | 0.17 | 0.87 | 5.0 | 0.15 | 9.24 | 1.34 | | | | | | 1.34 | | | | | | | |
| | | | | | | | | | | | | | | | 1.34 | 0.50 | 8 | 30 | 2.4 | 0.2 | Roof Drain Flow to DP B11<br>Pipe Flow to JP-20 |
| | B12 | B12 | 0.25 | 0.84 | 5.0 | 0.21 | 9.24 | 1.94 | | | | | | | | | | | | | Surface Flow at Inlet 02D_01 at DP B12, Inlet Capture |
| | JP-20 | SUM B11, B12 | 0.42 | 0.85 | | | | | 5.2 | 0.35 | 9.10 | 3.23 | | | | | | | | | |
| | | | | | | | | | | | | | | | 3.23 | 0.50 | 18 | 88 | 4.1 | 0.4 | Combined Flow at JP-21<br>Pipe Flow to JP-22 |
| | B13 | B13 | 0.34 | 0.82 | 5.0 | 0.28 | 9.24 | 2.58 | | | | | | 2.58 | | | | | | | |
| | | | | | | | | | | | | | | | 2.58 | 0.50 | 18 | 23 | 4.1 | 0.1 | Surface Flow at Inlet 02D.4_01 at DP B13, Inlet Capture<br>Pipe Flow to JP-21 |
| | JP-21 | SUM JP-20, B13 | 0.76 | 0.84 | | | | | 5.6 | 0.63 | 8.83 | 5.60 | | | | | | | | | |
| | | | | | | | | | | | | | | | 5.60 | 0.50 | 30 | 92 | 5.6 | 0.3 | Combined Flow at JP-22<br>Pipe Flow to JP-23 |
| | B14 | B14 | 0.12 | 0.84 | 5.0 | 0.10 | 9.24 | 0.93 | | | | | | 0.93 | | | | | | | |
| | | | | | | | | | | | | | | | 0.93 | 0.50 | 18 | 23 | 4.1 | 0.1 | Surface Flow at Inlet 02D.3_01 at DP B14, Inlet Capture<br>Pipe Flow to JP-22 |
| | JP-22 | SUM JP-21, B14 | 0.88 | 0.84 | | | | | 5.8 | 0.73 | 8.70 | 6.39 | | | | | | | | | |
| | | | | | | | | | | | | | | | 6.39 | 0.50 | 18 | 23 | 4.1 | 0.1 | Combined Flow at JP-23<br>Pipe Flow to JP-24 |
| | JP-23 | SUM JP-19, JP-22, B10 | 8.50 | 0.82 | | | | | 10.8 | 7.00 | 6.96 | 48.71 | | | | | | | | | |
| | | | | | | | | | | | | | | | 48.71 | 0.50 | 42 | 66 | 6.9 | 0.2 | Combined Flow at JP-23<br>Pipe Flow to JP-25 |
| | B15 | B15 | 0.27 | 0.87 | 5.0 | 0.23 | 9.24 | 2.15 | | | | | | 2.15 | | | | | | | |
| | | | | | | | | | | | | | | | 2.15 | 1.00 | 8 | 35 | 3.5 | 0.2 | Roof Drain Flow to DP B15<br>Pipe Flow to JP-24 |
| | B16 | B16 | 0.67 | 0.84 | 5.0 | 0.56 | 9.24 | 5.14 | | | | | | | | | | | | | Surface Flow at Inlet 02C_01 at DP B16, Inlet Capture |
| | JP-24 | SUM B15, B16 | 0.93 | 0.85 | | | | | 5.2 | 0.79 | 9.10 | 7.18 | | | | | | | | | |
| | | | | | | | | | | | | | | | 7.18 | 0.50 | 18 | 21 | 4.1 | 0.1 | Combined Flow at JP-24<br>Pipe Flow to JP-25 |
| | B17 | B17 | 0.29 | 0.87 | 5.0 | 0.25 | 9.24 | 2.34 | | | | | | 2.34 | | | | | | | |
| | | | | | | | | | | | | | | | 2.34 | 1.00 | 8 | 40 | 3.5 | 0.2 | Roof Drain Flow to DP B17<br>Pipe Flow to JP-25 |
| | JP-25 | SUM JP-23, JP-24, B17 | 9.72 | 0.83 | | | | | 10.9 | 8.04 | 6.93 | 55.72 | | | | | | | | | |
| | | | | | | | | | | | | | | | 55.72 | 0.50 | 42 | 147 | 6.9 | 0.4 | Combined Flow at JP-25<br>Channel Flow to JP-26 |
| | B18 | B18 | 0.59 | 0.84 | 5.0 | 0.49 | 9.24 | 4.55 | | | | | | 4.55 | | | | | | | |
| | | | | | | | | | | | | | | | 4.55 | 0.50 | 18 | 23 | 4.1 | 0.1 | Surface Flow at Inlet 02B_01 at DP B18, Inlet Capture<br>Pipe Flow to JP-26 |
| | JP-26 | SUM JP-25, B18 | 10.31 | 0.83 | | | | | 11.3 | 8.53 | 6.82 | 58.20 | | | | | | | | | |
| | | | | | | | | | | | | | | | 58.20 | 0.50 | 42 | 93 | 6.9 | 0.2 | Combined Flow at JP-26<br>Pipe Flow to JP-29 |
| | B19 | B19 | 1.75 | 0.81 | 5.7 | 1.42 | 8.76 | 12.40 | | | | | | 12.40 | | | | | | | |
| | | | | | | | | | | | | | | | 0.00 | 0.50 | 42 | 93 | 6.9 | 0.2 | Surface Flow at Inlet 02A_03 at DP B21, Inlet Capture<br>Pipe Flow to JP-28 |
| | B20 | B20 | 0.15 | 0.80 | 5.0 | 0.12 | 9.24 | 1.10 | | | | | | | | | | | | | Surface Flow at Inlet 02A_02 at DP B22, Inlet Capture |
| | JP-27 | SUM B19, B20 | 1.89 | 0.81 | | | | | 5.9 | 1.53 | 8.63 | 13.24 | | | | | | | | | |
| | | | | | | | | | | | | | | | 13.24 | 0.50 | 42 | 93 | 6.9 | 0.2 | Combined Flow at JP-27<br>Pipe Flow to JP-28 |
| | OS-1 | OS-1 | 0.58 | 0.68 | 5.4 | 0.39 | 8.97 | 0.76 | | | | | | | | | | | | | Surface Flow from Offsite Basin OS-1<br>Combines with Surface Flow from Basin B21 at DP B21, Inlet Capture |
| | B21 | B21 | 0.42 | 0.74 | 5.5 | 0.31 | 8.90 | 2.78 | | | | | | 3.54 | | | | | | | Surface Flow at Inlet 02A.1_01 at DP B21, Inlet Capture |
| | | | | | | | | | | | | | | | 3.54 | 0.50 | 18 | 30 | 4.1 | 0.1 | Pipe Flow to JP-28 |
| | JP-28 | SUM JP-27, OS-1, B21 | 2.89 | 0.77 | | | | | 6.1 | 2.24 | 8.51 | 19.07 | | | | | | | | | |
| | | | | | | | | | | | | | | | 19.07 | 0.50 | 18 | 30 | 4.1 | 0.1 | Combined Flow at JP-28<br>Channel Flow to JP-29 |
| | JP-29 | SUM JP-26, JP-28 | 13.20 | 0.82 | | | | | 11.5 | 10.77 | 6.77 | 72.94 | | | | | | | | | |
| | | | | | | | | | | | | | | | 72.94 | 0.50 | 48 | 192 | 7.5 | 0.4 | Combined Flow at JP-30<br>Pipe Flow to JP-31 |
| | | | | | | | | | | | | | | | | | | | | | |
| C | C1 | C1 | 1.36 | 0.87 | 5.0 | 1.18 | 9.24 | 10.93 | | | | | | 10.93 | | | | | | | |
| | | | | | | | | | | | | | | | 10.93 | 0.50 | 8 | 100 | 2.4 | 0.7 | Roof Drain Flow to DP C1<br>Pipe Flow to JP-30 |
| | JP-30 | SUM JP-29, C1 | 14.55 | 0.82 | | | | | 11.9 | 11.96 | 6.67 | 79.75 | | | | | | | | | |
| | | | | | | | | | | | | | | | 79.75 | 0.50 | 48 | 290 | 7.5 | 0.6 | Combined Flow at JP-30<br>Pipe Flow to JP-31 |
| | A106 | A106 | 0.25 | 0.86 | 5.0 | 0.22 | 9.24 | 1.28 | | | | | | | | | | | | | Surface Flow to Inlet within Future Multifamily Development<br>Pipe Flow to JP-31 |
| | A108 | A108 | 0.48 | 0.68 | 5.0 | 0.33 | 9.24 | 0.33 | | | | | | | | | | | | | Surface Flow at Inlet 02_05 at DP C2, Inlet Capture |
| | C2 | C2 | 1.07 | 0.57 | 7.2 | 0.61 | 8.00 | 4.86 | | | | | | | | | | | | | Surface Flow at Inlet 02_05 at DP C2, Inlet Capture |
| | JP-31 | SUM JP-30, C2, A106, A108 | 16.36 | 0.79 | | | | | 12.6 | 12.89 | 6.51 | 83.92 | | | | | | | | | |
| | | | | | | | | | | | | | | | 83.92 | 0.45 | 48 | 171 | 7.1 | 0.4 | Combined Flow at JP-31<br>Pipe Flow to JP-32 |
| | A200 | A200 | 2.71 | 0.84 | 5.2 | 2.28 | 9.10 | 6.77 | | | | | | | | | | | | | Surface Flow to Inlet within Future Multifamily Development<br>Pipe Flow to JP-32 |
| | A202 | A202 | 1.80 | 0.83 | 5.0 | 1.49 | 9.24 | 4.37 | | | | | | | | | | | | | Surface Flow to Inlet within Future Multifamily Development<br>Pipe Flow to JP-32 |
| | A104 | A104 | 0.38 | 0.78 | 5.0 | 0.30 | 9.24 | 0.98 | | | | | | | | | | | | | Surface Flow to Inlet within Future Multifamily Development<br>Pipe Flow to JP-32 |
| | A100 | A100 | 2.66 | 0.83 | 5.0 | 2.21 | 9.24 | 6.52 | | | | | | | | | | | | | Surface Flow to Inlet within Future Multifamily Development<br>Pipe Flow to JP-32 |
| | A102 | A102 | 0.41 | 0.80 | 5.0 | 0.33 | 9.24 | 0.90 | | | | | | | | | | | | | Surface Flow to Inlet within Future Multifamily Development<br>Pipe Flow to JP-32 |
| | JP-32 | SUM JP-31, A200, A202, A104, A100, A102 | 24.32 | 0.80 | | | | | 13.0 | 19.49 | 6.42 | 125.15 | | | | | | | | | Combined Flow at JP-32 |

## STANDARD FORM SF-2
## STORM DRAINAGE SYSTEM DESIGN
## (RATIONAL METHOD PROCEDURE)

2-year P1 = 1.00

**100-year P1 = 2.66**

DESIGN STORM: **100-YEAR (Minor Storm)**

CALCULATED BY: DFL

PROJECT: CENTERRA SOUTH

JOB NO: 130-00201

CHECKED BY: BEC

BASIN: Major

LOCATION: Loveland, Colorado

| | | DIRECT RUNOFF | | | | | | | TOTAL RUNOFF | | | | STREET | | PIPE | | | TRAVEL TIME | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOCATION | DESIGN POINT | AREA DESIG. | AREA (Acres) | RUNOFF COEFF | Tc (min) | C A (Acres) | I (in/hour) | Q (cfs) | Tc (min) | (C A) (Acres) | I (in/hour) | Q (cfs) | SLOPE (%) | STREET FLOW (cfs) | DESIGN FLOW (cfs) | SLOPE (%) | PIPE SIZE | LENGTH (ft) | VELOCITY (fps) | Tt (min) | REMARKS |
| | | | | | | | | | 13.4 | | | | | | 125.15 | 0.88 | 54 | 296 | 11.0 | 0.4 | |
| Pond | JP-33 | SUM JP-32, Travel time | 24.32 | 0.80 | | | | | | 19.49 | 6.35 | 123.78 | | | | | | | | | Pipe Flow to POND |
| | | | | | | | | | | | | | | | | | | | | | |
| D | D1 | D1 | 3.15 | 0.81 | 13.6 | 2.56 | 6.31 | 16.12 | | | | | | 16.12 | | | | | | | Surface Flow to Inlet 03_15 at DP D1, Inlet Capture |
| | | | | | | | | | | | | | | | 16.12 | 0.49 | 18 | 46 | 4.0 | 0.2 | Pipe Flow to JP-34 |
| OS-103 | OS-103 | OS-103 | 2.77 | 0.70 | 5.0 | 1.94 | 9.24 | 17.96 | | | | | | 17.96 | | | | | | | Surface Flow to ex. offsite inlet at DP OS-103, Inlet Capture |
| | JP-34 | SUM D1, OS-103 | 5.92 | 0.76 | | | | | 13.8 | 4.50 | 6.28 | 28.26 | | | 17.96 | 3.00 | 24 | 46 | 12.8 | 0.1 | Pipe Flow to JP-34 |
| | | | | | | | | | | | | | | | 28.26 | 1.40 | 30 | 440 | 9.8 | 0.7 | Combined Flow at JP-34<br>Pipe Flow to JP-37 |
| | D2 | D2 | 0.35 | 0.87 | 6.9 | 0.31 | 8.12 | 2.48 | | | | | | 2.48 | | | | | | | Roof Drain Flow to DP D3 |
| | | | | | | | | | | | | | | | 2.48 | 0.50 | 24 | 24 | 4.9 | 0.1 | Pipe Flow to JP-35 |
| | D3 | D3 | 2.87 | 0.85 | 7.7 | 2.44 | 7.82 | 19.04 | | | | | | | | | | | | | Surface Flow at Inlet 03G_01 at DP D2, Inlet Capture |
| | JP-35 | SUM D2, D3 | 3.22 | 0.85 | | | | | 7.7 | 2.74 | 7.82 | 21.43 | | | 21.43 | 0.50 | 24 | 175 | 4.9 | 0.6 | Combined Flow at JP-35<br>Pipe Flow to JP-37 |
| | D4 | D4 | 2.98 | 0.82 | 5.1 | 2.46 | 9.17 | 22.53 | | | | | | 22.53 | | | | | | | Surface Flow at Inlet 03G_05 at DP D4, Inlet Capture |
| | | | | | | | | | | | | | | | 22.53 | 0.50 | 24 | 215 | 4.9 | 0.7 | Pipe Flow to JP-36 |
| | D5 | D5 | 3.47 | 0.81 | 5.0 | 2.80 | 9.24 | 25.89 | | | | | | 25.89 | | | | | | | Surface Flow at Inlet 03G.2_01 at DP D5, Inlet Capture |
| | | | | | | | | | | | | | | | 25.89 | 0.50 | 24 | 22 | 4.9 | 0.1 | Pipe Flow to JP-36 |
| | JP-36 | SUM D4, D5 | 6.45 | 0.82 | | | | | 5.8 | 5.26 | 8.70 | 45.76 | | | 45.76 | 0.50 | 36 | 169 | 6.3 | 0.4 | Combined Flow at JP-36<br>Pipe Flow to JP-37 |
| | JP-37 | SUM JP-34, JP-35, JP-36 | 15.60 | 0.80 | | | | | 14.5 | 12.50 | 6.16 | 77.00 | | | 77.00 | 0.50 | 48 | 84 | 7.5 | 0.2 | Combined Flow at JP-37<br>Pipe Flow to JP-38 |
| | D6 | D6 | 0.11 | 0.84 | 5.0 | 0.10 | 9.24 | 0.88 | | | | | | 0.88 | | | | | | | Surface Flow at Inlet 03F_01 at DP D6, Inlet Capture |
| | | | | | | | | | | | | | | | 0.88 | 0.50 | 18 | 30 | 4.1 | 0.1 | Pipe Flow to JP-38 |
| | D7 | D7 | 0.33 | 0.83 | 5.0 | 0.27 | 9.24 | 2.51 | | | | | | 2.51 | | | | | | | Surface Flow at Inlet 03F_02 at DP D7, Inlet Capture |
| | | | | | | | | | | | | | | | 2.51 | 0.50 | 18 | 17 | 4.1 | 0.1 | Pipe Flow to JP-38 |
| | JP-38 | SUM JP-37, D6, D7 | 16.04 | 0.80 | | | | | 14.7 | 12.87 | 6.13 | 78.88 | | | 78.88 | 0.50 | 48 | 84 | 7.5 | 0.2 | Combined Flow at JP-38<br>Pipe Flow to JP-45 |
| | D8 | D8 | 0.26 | 0.83 | 5.0 | 0.21 | 9.24 | 1.98 | | | | | | 1.98 | | | | | | | Surface Flow at Inlet 03E_07 at DP D8, Inlet Capture |
| | | | | | | | | | | | | | | | 1.98 | 0.50 | 18 | 27 | 4.1 | 0.1 | Pipe Flow to JP-39 |
| | D9 | D9 | 0.46 | 0.83 | 5.0 | 0.39 | 9.24 | 3.57 | | | | | | 3.57 | | | | | | | Surface Flow at Inlet 03E.1_01 at DP D9, Inlet Capture |
| | | | | | | | | | | | | | | | 3.57 | 0.50 | 18 | 20 | 4.1 | 0.1 | Pipe Flow to JP-39 |
| | JP-39 | SUM D8, D9 | 0.72 | 0.83 | | | | | 5.1 | 0.60 | 9.17 | 5.50 | | | 5.50 | 0.50 | 18 | 139 | 4.1 | 0.6 | Combined Flow at JP-39<br>Channel Flow to JP-45 |
| | D10 | D10 | 6.51 | 0.81 | 7.8 | 5.28 | 7.78 | 41.08 | | | | | | 41.08 | | | | | | | Future Development Pipe Flow at DP D10 |
| | | | | | | | | | | | | | | | 41.08 | 0.50 | 36 | 50 | 6.3 | 0.1 | Pipe Flow to JP-40 |
| | D11 | D11 | 0.39 | 0.85 | 5.0 | 0.33 | 9.24 | 3.08 | | | | | | 3.08 | | | | | | | Surface Flow at Inlet 03E_01 at DP D11, Inlet Capture |
| | JP-40 | SUM D10, D11 | 6.90 | 0.81 | | | | | 7.9 | 5.61 | 7.75 | 43.51 | | | 43.51 | 0.50 | 36 | 19 | 6.3 | 0.1 | Combined Flow at JP-40<br>Pipe Flow to JP-41 |
| | D12 | D12 | 0.16 | 0.85 | 5.0 | 0.14 | 9.24 | 1.29 | | | | | | 1.29 | | | | | | | Surface Flow at Inlet 03E.4_01 at DP D12, Inlet Capture |
| | | | | | | | | | | | | | | | 1.29 | 0.50 | 18 | 9 | 4.1 | 0.0 | Pipe Flow to JP-41 |
| | JP-41 | SUM JP-40, D12 | 7.06 | 0.81 | | | | | 7.9 | 5.75 | 7.75 | 44.60 | | | 44.60 | 0.50 | 42 | 92 | 6.9 | 0.2 | Combined Flow at JP-41<br>Pipe Flow to JP-42 |
| | D13 | D13 | 1.59 | 0.85 | 8.8 | 1.36 | 7.48 | 10.18 | | | | | | 10.18 | | | | | | | Surface Flow at Inlet 03E.5_02 at DP D13, Inlet Capture |
| | | | | | | | | | | | | | | | 10.18 | 0.50 | 24 | 153 | 4.9 | 0.5 | Pipe Flow to JP-42 |
| | JP-42 | SUM JP-41, D13 | 8.66 | 0.82 | | | | | 9.3 | 7.11 | 7.36 | 52.37 | | | 0.00 | 0.50 | 42 | 95 | 6.9 | 0.2 | Combined Flow at JP-42<br>Pipe Flow to JP-43 |
| | D14 | D14 | 0.27 | 0.83 | 5.0 | 0.23 | 9.24 | 2.08 | | | | | | 2.08 | | | | | | | Surface Flow at Inlet 03E.3_01 at DP D14, Inlet Capture |
| | | | | | | | | | | | | | | | 2.08 | 0.50 | 18 | 23 | 4.1 | 0.1 | Pipe Flow to JP-43 |
| | D15 | D15 | 0.72 | 0.84 | 6.8 | 0.60 | 8.17 | 4.93 | | | | | | 4.93 | | | | | | | Surface Flow at Inlet 03E.3_02 at DP D15, Inlet Capture |
| | | | | | | | | | | | | | | | 4.93 | 0.50 | 18 | 15 | 4.1 | 0.1 | Pipe Flow to JP-43 |
| | JP-43 | SUM JP-42, D14, D15 | 9.65 | 0.82 | | | | | 9.5 | 7.94 | 7.31 | 58.06 | | | 58.06 | 0.50 | 42 | 183 | 6.9 | 0.4 | Combined Flow at JP-43<br>Pipe Flow to JP-44 |
| | D16 | D16 | 0.37 | 0.84 | 5.0 | 0.31 | 9.24 | 2.85 | | | | | | 2.85 | | | | | | | Surface Flow at Inlet 03E.2_01 at DP D16, Inlet Capture |
| | | | | | | | | | | | | | | | 2.85 | 0.50 | 18 | 23 | 4.1 | 0.1 | Pipe Flow to JP-44 |
| | D17 | D17 | 0.24 | 0.77 | 5.0 | 0.19 | 9.24 | 1.73 | | | | | | 1.73 | | | | | | | Surface Flow at Inlet 03E.2_02 at DP D17, Inlet Capture |
| | | | | | | | | | | | | | | | 1.73 | 1.00 | 18 | 15 | 5.9 | 0.0 | Pipe Flow to JP-44 |
| | JP-44 | SUM JP-43, D16, D17 | 10.26 | 0.82 | | | | | 10.0 | 8.44 | 7.20 | 60.76 | | | 60.76 | 0.50 | 42 | 184 | 6.9 | 0.4 | Combined Flow at JP-44<br>Pipe Flow to JP-45 |
| | JP-45 | SUM JP-38, JP-39, JP-44 | 27.02 | 0.81 | | | | | 14.9 | 21.91 | 6.10 | 133.63 | | | 133.63 | 0.50 | 54 | 187 | 8.1 | 0.4 | Combined Flow at JP-45<br>Pipe Flow to JP-47 |
| | D18 | D18 | 0.34 | 0.87 | 5.0 | 0.29 | 9.24 | 2.72 | | | | | | 2.72 | | | | | | | Roof Drain Flow at DP D18 |
| | | | | | | | | | | | | | | | 2.72 | 1.00 | 8 | 30 | 3.5 | 0.1 | Pipe Flow to JP-46 |
| | D19 | D19 | 0.44 | 0.85 | 5.0 | 0.37 | 9.24 | 3.45 | | | | | | | | | | | | | Surface Flow at Inlet 03D_01 at DP D19, Inlet Capture |
| | JP-46 | SUM D18, D19 | 0.78 | 0.86 | | | | | 5.1 | 0.67 | 9.17 | 6.13 | | | 6.13 | 0.50 | 18 | 30 | 4.1 | 0.1 | Combined Flow at JP-46<br>Pipe Flow to JP-47 |
| | D20 | D20 | 1.20 | 0.78 | 5.0 | 0.94 | 9.24 | 8.64 | | | | | | 8.64 | | | | | | | Surface Flow at Inlet 03D_02 at DP D20, Inlet Capture |
| | | | | | | | | | | | | | | | 8.64 | 0.50 | 18 | 17 | 4.1 | 0.1 | Pipe Flow to JP-47 |
| | JP-47 | SUM JP-45, JP-46, D20 | 29.00 | 0.81 | | | | | 15.3 | 23.51 | 6.02 | 141.53 | | | 141.53 | 0.56 | 54 | 102 | 8.6 | 0.2 | Combined Flow at JP-47<br>Pipe Flow to JP-48 |
| | D21 | D21 | 0.35 | 0.82 | 5.0 | 0.29 | 9.24 | 2.64 | | | | | | | | | | | | | Future Commercial Surface Flow at DP D21, Inlet Capture |
| | D22 | D22 | 0.25 | 0.81 | 5.0 | 0.21 | 9.24 | 1.90 | | | | | | | | | | | | | Future Commercial Surface Flow at DP D22, Inlet Capture |

# STANDARD FORM SF-2
# STORM DRAINAGE SYSTEM DESIGN
# (RATIONAL METHOD PROCEDURE)

2-year P1 = 1.00

**100-year P1 = 2.66**

CALCULATED BY: DFL

CHECKED BY: BEC

DESIGN STORM: **100-YEAR (Minor Storm)**

PROJECT: CENTERRA SOUTH

BASIN: Major

JOB NO: 130-00201

LOCATION: Loveland, Colorado

| | | DIRECT RUNOFF | | | | | | | TOTAL RUNOFF | | | | STREET | | PIPE | | | TRAVEL TIME | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOCATION | DESIGN POINT | AREA DESIG. | AREA (Acres) | RUNOFF COEFF | Tc (min) | C A (Acres) | I (in/hour) | Q (cfs) | Tc (min) | (C A) (Acres) | I (in/hour) | Q (cfs) | SLOPE (%) | STREET FLOW (cfs) | DESIGN FLOW (cfs) | SLOPE (%) | PIPE SIZE | LENGTH (ft) | VELOCITY (fps) | Tt (min) | REMARKS |
| | D23 | D23 | 0.26 | 0.82 | 5.0 | 0.22 | 9.24 | 2.00 | | | | | | | | | | | | | Surface Flow at Inlet 03C_03 at DP D23, Inlet Capture |
| | D24 | D24 | 0.12 | 0.81 | 5.0 | 0.09 | 9.24 | 0.88 | | | | | | | | | | | | | Surface Flow at Inlet 03C_02 at DP D24, Inlet Capture |
| | D25 | D25 | 0.15 | 0.81 | 5.0 | 0.12 | 9.24 | 1.10 | | | | | | 8.52 | | | | | | | Surface Flow at Inlet 03C_01 at DP D25, Inlet Capture |
| | JP-48 | SUM JP-47, D21, D22, D23, D24, D25 | 30.13 | 0.81 | | | | | 15.5 | 24.43 | 5.99 | 146.35 | | | 8.52 | 0.50 | 18 | 385 | 4.1 | 1.6 | Pipe Flow to JP-48 |
| | D26 | D26 | 0.45 | 0.87 | 5.0 | 0.39 | 9.24 | 3.61 | | | | | | | 15.50 | 0.50 | 54 | 80 | 8.1 | 0.2 | Combined Flow at JP-48<br>Pipe Flow to JP-49 |
| | JP-49 | SUM JP-48, D22 | 30.57 | 0.81 | | | | | 15.7 | 24.82 | 5.95 | 147.69 | | 3.61 | 3.61 | 1.00 | 8 | 60 | 3.5 | 0.3 | Roof Drain Flow at DP D26<br>Pipe Flow to JP-49 |
| | D27 | D27 | 0.59 | 0.87 | 5.0 | 0.52 | 9.24 | 4.78 | | | | | | | 147.69 | 0.50 | 54 | 81 | 8.1 | 0.2 | Combined Flow at JP-49<br>Pipe Flow to JP-51 |
| | D28 | D28 | 0.19 | 0.84 | 5.0 | 0.16 | 9.24 | 1.45 | | | | | | 4.78 | 4.78 | 1.00 | 8 | 25 | 3.5 | 0.1 | Roof Drain Flow at DP D27<br>Pipe Flow to JP-50 |
| | JP-50 | SUM D23, D24 | 0.78 | 0.87 | | | | | 5.1 | 0.67 | 9.17 | 6.19 | | | | | | | | | Surface Flow at Inlet 03B_01 at DP D28, Inlet Capture |
| | D29 | D29 | 0.11 | 0.83 | 5.0 | 0.10 | 9.24 | 0.88 | | | | | | | 6.19 | 0.50 | 18 | 20 | 4.1 | 0.1 | Combined Flow at JP-50<br>Pipe Flow to JP-51 |
| | JP-51 | SUM JP-49, JP-50, D29 | 31.47 | 0.81 | | | | | 15.8 | 25.59 | 5.93 | 151.76 | | 0.88 | 0.88 | 0.50 | 24 | 18 | 4.9 | 0.1 | Surface Flow at Inlet 03B_02 at DP D29, Inlet Capture<br>Pipe Flow to JP-51 |
| | D30 | D30 | 0.43 | 0.87 | 5.0 | 0.37 | 9.24 | 3.44 | | | | | | | 151.76 | 0.50 | 54 | 126 | 8.1 | 0.3 | Combined Flow at JP-51<br>Pipe Flow to JP-54 |
| | D31 | D31 | 0.41 | 0.85 | 5.0 | 0.35 | 9.24 | 3.19 | | | | | | 3.44 | 3.44 | 1.00 | 8 | 100 | 3.5 | 0.5 | Roof Drain Flow at DP D30<br>Pipe Flow to JP-52 |
| | JP-52 | SUM D30, D31 | 0.83 | 0.86 | | | | | 5.5 | 0.72 | 8.90 | 6.39 | | 3.19 | 3.19 | 0.50 | 18 | 23 | 4.1 | 0.1 | Surface Flow at Inlet 03A_06 at DP D31, Inlet Capture<br>Pipe Flow to JP-52 |
| | OS-5 | OS-5 | 0.28 | 0.82 | 5.0 | 0.23 | 9.24 | 0.66 | | | | | | | 6.39 | 0.50 | 18 | 284 | 4.1 | 1.2 | Combined Flow at JP-52<br>Pipe Flow to JP-53 |
| | D32 | D32 | 0.73 | 0.84 | 5.0 | 0.61 | 9.24 | 5.68 | | | | | | | | | | | | | Surface Flow from Offsite Basin OS-5<br>Combines with Surface Flow from Basin B32 at DP B32, Inlet Capture |
| | JP-53 | SUM JP-52, OS-5, D32 | 1.84 | 0.85 | | | | | 6.6 | 1.56 | 8.27 | 12.91 | | | | | | | | | Surface Flow at Inlet 03A_01 at DP D32, Inlet Capture |
| | JP-54 | SUM JP-51, JP-53 | 33.31 | 0.82 | | | | | 16.1 | 27.15 | 5.88 | 159.67 | | | 12.91 | 0.50 | 18 | 235 | 4.1 | 1.0 | Combined Flow at JP-53<br>Pipe Flow to JP-54 |
| | D33 | D33 | 1.55 | 0.72 | 7.2 | 1.12 | 8.00 | 8.95 | | | | | | | 159.67 | 0.50 | 60 | 420 | 8.7 | 0.8 | Combined Flow at JP-54<br>Pipe Flow to JP-60 |
| | D34 | D34 | 1.53 | 0.72 | 7.2 | 1.10 | 8.00 | 8.79 | | | | | | 8.95 | 8.95 | 0.50 | 18 | 34 | 4.1 | 0.1 | Future Surface Flow to Inlet at DP D33, Inlet Capture<br>Pipe Flow to JP-55 |
| | JP-55 | SUM D33, D34 | 3.08 | 0.72 | | | | | 7.3 | 2.22 | 7.97 | 17.67 | | 8.79 | 8.79 | 0.50 | 18 | 20 | 4.1 | 0.1 | Future Surface Flow to Inlet at DP D34, Inlet Capture<br>Pipe Flow to JP-55 |
| | D35 | D35 | 12.51 | 0.78 | 11.0 | 9.70 | 6.89 | 66.84 | | | | | | | 17.67 | 0.50 | 24 | 862 | 4.9 | 2.9 | Combined Flow at JP-55<br>Pipe Flow to JP-57 |
| | D36 | D36 | 1.08 | 0.83 | 6.9 | 0.89 | 8.12 | 7.25 | | | | | | 66.84 | 66.84 | 0.50 | 30 | 43 | 5.6 | 0.1 | Future Flow to Storm Stub at DP D35<br>Pipe Flow to JP-56 |
| | JP-56 | SUM D35, D36 | 13.59 | 0.78 | | | | | 11.1 | 10.59 | 6.87 | 72.77 | | | | | | | | | Future Surface Flow to Inlet at DP D36, Inlet Capture |
| | D37 | D37 | 1.22 | 0.72 | 7.7 | 0.88 | 7.82 | 6.87 | | | | | | | 72.77 | 0.50 | 30 | 34 | 5.6 | 0.1 | Combined Flow at JP-56<br>Pipe Flow to JP-57 |
| | JP-57 | SUM JP-55, JP-56, D37 | 17.89 | 0.76 | | | | | 11.2 | 13.69 | 6.84 | 93.63 | | 6.87 | 6.87 | 0.50 | 18 | 20 | 4.1 | 0.1 | Future Surface Flow to Inlet at DP D37, Inlet Capture<br>Pipe Flow to JP-57 |
| | D38 | D38 | 13.09 | 0.77 | 12.5 | 10.08 | 6.55 | 66.04 | | | | | | | 93.63 | 0.50 | 36 | 34 | 6.3 | 0.1 | Combined Flow at JP-57<br>Pipe Flow to JP-59 |
| | OS-4 | OS-4 | 1.53 | 0.76 | 5.0 | 1.16 | 9.24 | 2.97 | | | | | | 66.04 | 66.04 | 0.50 | 30 | 51 | 5.6 | 0.2 | Future Flow to Storm Stub at DP D38<br>Pipe Flow to JP-58 |
| | D39 | D39 | 1.81 | 0.80 | 9.2 | 1.44 | 7.38 | 10.66 | | | | | | | | | | | | | Surface Flow from Offsite Basin OS-1<br>Combines with Surface Flow from Basin B39 at DP B39, Inlet Capture |
| | JP-58 | SUM D38, OS-4, D39 | 16.43 | 0.77 | | | | | 12.6 | 12.69 | 6.51 | 82.61 | | | | | | | | | Surface Flow to Inlet 04A_02 at DP D39, Inlet Capture |
| | D40 | D40 | 1.35 | 0.80 | 7.5 | 1.08 | 7.89 | 8.50 | | | | | | | 82.61 | 0.50 | 36 | 48 | 6.3 | 0.1 | Combined Flow at JP-58<br>Pipe Flow to JP-59 |
| | JP-59 | SUM JP-57, JP-58, D40 | 35.68 | 0.77 | | | | | 12.8 | 27.45 | 6.47 | 177.63 | | 8.50 | 8.50 | 0.50 | 18 | 20 | 4.1 | 0.1 | Surface Flow at Inlet 04A_01 at DP D40, Inlet Capture<br>Pipe Flow to JP-59 |
| | JP-60 | SUM JP-54, JP-59 | 68.99 | 0.79 | | | | | 16.9 | 54.61 | 5.75 | 314.00 | | | 177.63 | 0.50 | 48 | 56 | 7.5 | 0.1 | Combined Flow at JP-59<br>Pipe Flow to JP-60 |
| POND | JP-61 | SUM JP-60, Travel time | 68.99 | 0.79 | | | | | 17.0 | 54.61 | 5.73 | 312.91 | | | 314.00 | 0.50 | 60 | 79 | 8.7 | 0.2 | Combined Flow at JP-60<br>Pipe Flow to POND |
| | | | | | | | | | | | | | | | | | | | | | |
| **TOTAL TO POND** | **POND** | **SUM JP-53, JP-30, JP-9** | **113.88** | **0.79** | | | | | **17.0** | **90.37** | **5.73** | **517.83** | | | | | | | | | |

Note: Orange highlight notes values were retrieved from third party report - "FINAL DRAINAGE REPORT, AVENUE SOUTH MULTIFAMILY" By Kimley Horn Dated April 25, 2025

Note: Rainfall Intensities based on Intensity-Duration Curve for Rational Method per Figure 502 (Chapter 5 - Rainfall, Loveland Storm Drainage Criteria Manual, March 1986)

# DETENTION VOLUME BY THE MODIFIED FAA METHOD

**Project:** Centerra South

**Basin ID:**

**(For catchments less than 160 acres only. For larger catchments, use hydrograph routing method)**
**(NOTE: for catchments larger than 90 acres, CUHP hydrograph and routing are recommended)**

## Determination of MINOR Detention Volume Using Modified FAA Method

**Design Information (Input):**

| | | | |
|---|---|---|---|
| Catchment Drainage Imperviousness | $I_a$ = | 71.40 | percent |
| Catchment Drainage Area | A = | 103.070 | acres |
| Predevelopment NRCS Soil Group | Type = | C | A, B, C, or D |
| Return Period for Detention Control | T = | 5 | years (2, 5, 10, 25, 50, or 100) |
| Time of Concentration of Watershed | Tc = | 17 | minutes |
| Allowable Unit Release Rate | q = | 0.00 | cfs/acre |
| One-hour Precipitation | $P_1$ = | 1.41 | inches |
| **Design Rainfall IDF Formula** $i = C_1 * P_1/(C_2+T_c)^{C_3}$ | | | |
| Coefficient One | $C_1$ = | 28.50 | |
| Coefficient Two | $C_2$ = | 10 | |
| Coefficient Three | $C_3$ = | 0.789 | |

**Determination of Average Outflow from the Basin (Calculated):**

| | | | |
|---|---|---|---|
| Runoff Coefficient | C = | 0.52 | |
| Inflow Peak Runoff | Qp-in = | 160.37 | cfs |
| Allowable Peak Outflow Rate | Qp-out = | **0.00** | cfs |
| **Mod. FAA Minor Storage Volume =** | | 419,554 | **cubic feet** |
| **Mod. FAA Minor Storage Volume =** | | **9.632** | **acre-ft** |

5 <- Enter Rainfall Duration Incremental Increase Value Here (e.g. 5 for 5-Minutes)

| Rainfall Duration minutes (input) | Rainfall Intensity inches / hr (output) | Inflow Volume acre-feet (output) | Adjustment Factor "m" (output) | Average Outflow cfs (output) | Outflow Volume acre-feet (output) | Storage Volume acre-feet (output) |
|---|---|---|---|---|---|---|
| 0 | 0.00 | 0.000 | 0.00 | 0.00 | 0.000 | 0.000 |
| 5 | 4.74 | 1.751 | 1.00 | 0.00 | 0.000 | 1.751 |
| 10 | 3.78 | 2.791 | 1.00 | 0.00 | 0.000 | 2.791 |
| 15 | 3.17 | 3.511 | 1.00 | 0.00 | 0.000 | 3.511 |
| 20 | 2.75 | 4.054 | 0.92 | 0.00 | 0.000 | 4.054 |
| 25 | 2.43 | 4.487 | 0.84 | 0.00 | 0.000 | 4.487 |
| 30 | 2.19 | 4.846 | 0.78 | 0.00 | 0.000 | 4.846 |
| 35 | 1.99 | 5.152 | 0.74 | 0.00 | 0.000 | 5.152 |
| 40 | 1.83 | 5.418 | 0.71 | 0.00 | 0.000 | 5.418 |
| 45 | 1.70 | 5.654 | 0.69 | 0.00 | 0.000 | 5.654 |
| 50 | 1.59 | 5.865 | 0.67 | 0.00 | 0.000 | 5.865 |
| 55 | 1.49 | 6.057 | 0.65 | 0.00 | 0.000 | 6.057 |
| 60 | 1.41 | 6.232 | 0.64 | 0.00 | 0.000 | 6.232 |
| 65 | 1.33 | 6.394 | 0.63 | 0.00 | 0.000 | 6.394 |
| 70 | 1.27 | 6.544 | 0.62 | 0.00 | 0.000 | 6.544 |
| 75 | 1.21 | 6.684 | 0.61 | 0.00 | 0.000 | 6.684 |
| 80 | 1.15 | 6.815 | 0.61 | 0.00 | 0.000 | 6.815 |
| 85 | 1.11 | 6.938 | 0.60 | 0.00 | 0.000 | 6.938 |
| 90 | 1.06 | 7.055 | 0.59 | 0.00 | 0.000 | 7.055 |
| 95 | 1.02 | 7.166 | 0.59 | 0.00 | 0.000 | 7.166 |
| 100 | 0.98 | 7.271 | 0.58 | 0.00 | 0.000 | 7.271 |
| 105 | 0.95 | 7.372 | 0.58 | 0.00 | 0.000 | 7.372 |
| 110 | 0.92 | 7.468 | 0.58 | 0.00 | 0.000 | 7.468 |
| 115 | 0.89 | 7.560 | 0.57 | 0.00 | 0.000 | 7.560 |
| 120 | 0.86 | 7.648 | 0.57 | 0.00 | 0.000 | 7.648 |
| 125 | 0.84 | 7.733 | 0.57 | 0.00 | 0.000 | 7.733 |
| 130 | 0.81 | 7.815 | 0.57 | 0.00 | 0.000 | 7.815 |
| 135 | 0.79 | 7.894 | 0.56 | 0.00 | 0.000 | 7.894 |
| 140 | 0.77 | 7.970 | 0.56 | 0.00 | 0.000 | 7.970 |
| 145 | 0.75 | 8.044 | 0.56 | 0.00 | 0.000 | 8.044 |
| 150 | 0.73 | 8.115 | 0.56 | 0.00 | 0.000 | 8.115 |
| 155 | 0.72 | 8.185 | 0.55 | 0.00 | 0.000 | 8.185 |
| 160 | 0.70 | 8.252 | 0.55 | 0.00 | 0.000 | 8.252 |
| 165 | 0.68 | 8.317 | 0.55 | 0.00 | 0.000 | 8.317 |
| 170 | 0.67 | 8.381 | 0.55 | 0.00 | 0.000 | 8.381 |
| 175 | 0.65 | 8.443 | 0.55 | 0.00 | 0.000 | 8.443 |
| 180 | 0.64 | 8.504 | 0.55 | 0.00 | 0.000 | 8.504 |
| 185 | 0.63 | 8.562 | 0.55 | 0.00 | 0.000 | 8.562 |
| 190 | 0.61 | 8.620 | 0.54 | 0.00 | 0.000 | 8.620 |
| 195 | 0.60 | 8.676 | 0.54 | 0.00 | 0.000 | 8.676 |
| 200 | 0.59 | 8.731 | 0.54 | 0.00 | 0.000 | 8.731 |
| 205 | 0.58 | 8.785 | 0.54 | 0.00 | 0.000 | 8.785 |
| 210 | 0.57 | 8.837 | 0.54 | 0.00 | 0.000 | 8.837 |
| 215 | 0.56 | 8.889 | 0.54 | 0.00 | 0.000 | 8.889 |
| 220 | 0.55 | 8.939 | 0.54 | 0.00 | 0.000 | 8.939 |
| 225 | 0.54 | 8.988 | 0.54 | 0.00 | 0.000 | 8.988 |
| 230 | 0.53 | 9.037 | 0.54 | 0.00 | 0.000 | 9.037 |
| 235 | 0.52 | 9.084 | 0.54 | 0.00 | 0.000 | 9.084 |
| 240 | 0.52 | 9.131 | 0.54 | 0.00 | 0.000 | 9.131 |
| 245 | 0.51 | 9.176 | 0.53 | 0.00 | 0.000 | 9.176 |
| 250 | 0.50 | 9.221 | 0.53 | 0.00 | 0.000 | 9.221 |
| 255 | 0.49 | 9.265 | 0.53 | 0.00 | 0.000 | 9.265 |
| 260 | 0.48 | 9.309 | 0.53 | 0.00 | 0.000 | 9.309 |
| 265 | 0.48 | 9.351 | 0.53 | 0.00 | 0.000 | 9.351 |
| 270 | 0.47 | 9.393 | 0.53 | 0.00 | 0.000 | 9.393 |
| 275 | 0.46 | 9.435 | 0.53 | 0.00 | 0.000 | 9.435 |
| 280 | 0.46 | 9.475 | 0.53 | 0.00 | 0.000 | 9.475 |
| 285 | 0.45 | 9.515 | 0.53 | 0.00 | 0.000 | 9.515 |
| 290 | 0.45 | 9.555 | 0.53 | 0.00 | 0.000 | 9.555 |
| 295 | 0.44 | 9.593 | 0.53 | 0.00 | 0.000 | 9.593 |
| 300 | 0.43 | 9.632 | 0.53 | 0.00 | 0.000 | 9.632 |

**Mod. FAA Minor Storage Volume (cubic ft.) = 419,554**
**Mod. FAA Minor Storage Volume (acre-ft.) = 9.6316**

## Determination of MAJOR Detention Volume Using Modified FAA Method

**Design Information (Input):**

| | | | |
|---|---|---|---|
| Catchment Drainage Imperviousness | $I_a$ = | 71.40 | percent |
| Catchment Drainage Area | A = | 103.070 | acres |
| Predevelopment NRCS Soil Group | Type = | C | A, B, C, or D |
| Return Period for Detention Control | T = | 100 | years (2, 5, 10, 25, 50, or 100) |
| Time of Concentration of Watershed | Tc = | 17 | minutes |
| Allowable Unit Release Rate | q = | 0.00 | cfs/acre |
| One-hour Precipitation | $P_1$ = | 2.66 | inches |
| **Design Rainfall IDF Formula** $i = C_1 * P_1/(C_2+T_c)^{C_3}$ | | | |
| Coefficient One | $C_1$ = | 28.50 | |
| Coefficient Two | $C_2$ = | 10 | |
| Coefficient Three | $C_3$ = | 0.789 | |

**Determination of Average Outflow from the Basin (Calculated):**

| | | | |
|---|---|---|---|
| Runoff Coefficient | C = | 0.69 | |
| Inflow Peak Runoff | Qp-in = | 401.45 | cfs |
| Allowable Peak Outflow Rate | Qp-out = | **0.00** | cfs |
| **Mod. FAA Major Storage Volume =** | | 1,050,258 | **cubic feet** |
| **Mod. FAA Major Storage Volume =** | | **24.111** | **acre-ft** |

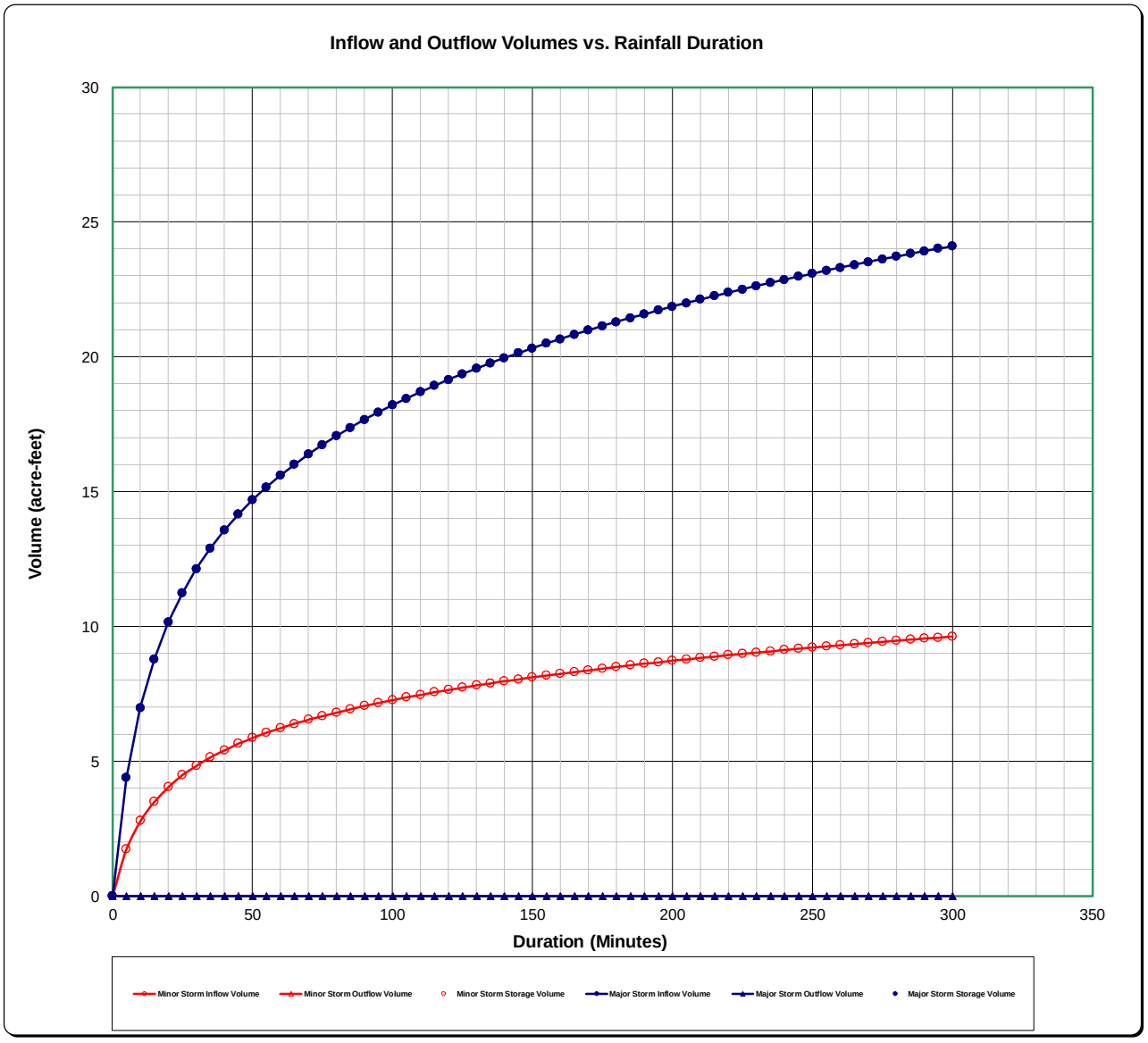
| Rainfall Duration minutes (input) | Rainfall Intensity inches / hr (output) | Inflow Volume acre-feet (output) | Adjustment Factor "m" (output) | Average Outflow cfs (output) | Outflow Volume acre-feet (output) | Storage Volume acre-feet (output) |
|---|---|---|---|---|---|---|
| 0 | 0.00 | 0.000 | 0.00 | 0.00 | 0.000 | 0.000 |
| 5 | 8.95 | 4.383 | 1.00 | 0.00 | 0.000 | 4.383 |
| 10 | 7.13 | 6.986 | 1.00 | 0.00 | 0.000 | 6.986 |
| 15 | 5.98 | 8.788 | 1.00 | 0.00 | 0.000 | 8.788 |
| 20 | 5.18 | 10.147 | 0.92 | 0.00 | 0.000 | 10.147 |
| 25 | 4.59 | 11.232 | 0.84 | 0.00 | 0.000 | 11.232 |
| 30 | 4.13 | 12.130 | 0.78 | 0.00 | 0.000 | 12.130 |
| 35 | 3.76 | 12.896 | 0.74 | 0.00 | 0.000 | 12.896 |
| 40 | 3.46 | 13.563 | 0.71 | 0.00 | 0.000 | 13.563 |
| 45 | 3.21 | 14.153 | 0.69 | 0.00 | 0.000 | 14.153 |
| 50 | 3.00 | 14.682 | 0.67 | 0.00 | 0.000 | 14.682 |
| 55 | 2.81 | 15.162 | 0.65 | 0.00 | 0.000 | 15.162 |
| 60 | 2.65 | 15.601 | 0.64 | 0.00 | 0.000 | 15.601 |
| 65 | 2.51 | 16.005 | 0.63 | 0.00 | 0.000 | 16.005 |
| 70 | 2.39 | 16.381 | 0.62 | 0.00 | 0.000 | 16.381 |
| 75 | 2.28 | 16.731 | 0.61 | 0.00 | 0.000 | 16.731 |
| 80 | 2.18 | 17.059 | 0.61 | 0.00 | 0.000 | 17.059 |
| 85 | 2.09 | 17.369 | 0.60 | 0.00 | 0.000 | 17.369 |
| 90 | 2.00 | 17.661 | 0.59 | 0.00 | 0.000 | 17.661 |
| 95 | 1.93 | 17.938 | 0.59 | 0.00 | 0.000 | 17.938 |
| 100 | 1.86 | 18.202 | 0.58 | 0.00 | 0.000 | 18.202 |
| 105 | 1.79 | 18.453 | 0.58 | 0.00 | 0.000 | 18.453 |
| 110 | 1.73 | 18.693 | 0.58 | 0.00 | 0.000 | 18.693 |
| 115 | 1.68 | 18.924 | 0.57 | 0.00 | 0.000 | 18.924 |
| 120 | 1.63 | 19.145 | 0.57 | 0.00 | 0.000 | 19.145 |
| 125 | 1.58 | 19.357 | 0.57 | 0.00 | 0.000 | 19.357 |
| 130 | 1.54 | 19.562 | 0.57 | 0.00 | 0.000 | 19.562 |
| 135 | 1.49 | 19.760 | 0.56 | 0.00 | 0.000 | 19.760 |
| 140 | 1.45 | 19.951 | 0.56 | 0.00 | 0.000 | 19.951 |
| 145 | 1.42 | 20.136 | 0.56 | 0.00 | 0.000 | 20.136 |
| 150 | 1.38 | 20.315 | 0.56 | 0.00 | 0.000 | 20.315 |
| 155 | 1.35 | 20.488 | 0.55 | 0.00 | 0.000 | 20.488 |
| 160 | 1.32 | 20.657 | 0.55 | 0.00 | 0.000 | 20.657 |
| 165 | 1.29 | 20.821 | 0.55 | 0.00 | 0.000 | 20.821 |
| 170 | 1.26 | 20.980 | 0.55 | 0.00 | 0.000 | 20.980 |
| 175 | 1.23 | 21.135 | 0.55 | 0.00 | 0.000 | 21.135 |
| 180 | 1.21 | 21.287 | 0.55 | 0.00 | 0.000 | 21.287 |
| 185 | 1.18 | 21.434 | 0.55 | 0.00 | 0.000 | 21.434 |
| 190 | 1.16 | 21.578 | 0.54 | 0.00 | 0.000 | 21.578 |
| 195 | 1.14 | 21.719 | 0.54 | 0.00 | 0.000 | 21.719 |
| 200 | 1.12 | 21.856 | 0.54 | 0.00 | 0.000 | 21.856 |
| 205 | 1.10 | 21.990 | 0.54 | 0.00 | 0.000 | 21.990 |
| 210 | 1.08 | 22.122 | 0.54 | 0.00 | 0.000 | 22.122 |
| 215 | 1.06 | 22.250 | 0.54 | 0.00 | 0.000 | 22.250 |
| 220 | 1.04 | 22.376 | 0.54 | 0.00 | 0.000 | 22.376 |
| 225 | 1.02 | 22.500 | 0.54 | 0.00 | 0.000 | 22.500 |
| 230 | 1.00 | 22.621 | 0.54 | 0.00 | 0.000 | 22.621 |
| 235 | 0.99 | 22.740 | 0.54 | 0.00 | 0.000 | 22.740 |
| 240 | 0.97 | 22.856 | 0.54 | 0.00 | 0.000 | 22.856 |
| 245 | 0.96 | 22.971 | 0.53 | 0.00 | 0.000 | 22.971 |
| 250 | 0.94 | 23.083 | 0.53 | 0.00 | 0.000 | 23.083 |
| 255 | 0.93 | 23.194 | 0.53 | 0.00 | 0.000 | 23.194 |
| 260 | 0.91 | 23.302 | 0.53 | 0.00 | 0.000 | 23.302 |
| 265 | 0.90 | 23.409 | 0.53 | 0.00 | 0.000 | 23.409 |
| 270 | 0.89 | 23.514 | 0.53 | 0.00 | 0.000 | 23.514 |
| 275 | 0.88 | 23.617 | 0.53 | 0.00 | 0.000 | 23.617 |
| 280 | 0.86 | 23.719 | 0.53 | 0.00 | 0.000 | 23.719 |
| 285 | 0.85 | 23.819 | 0.53 | 0.00 | 0.000 | 23.819 |
| 290 | 0.84 | 23.918 | 0.53 | 0.00 | 0.000 | 23.918 |
| 295 | 0.83 | 24.015 | 0.53 | 0.00 | 0.000 | 24.015 |
| 300 | 0.82 | 24.111 | 0.53 | 0.00 | 0.000 | 24.111 |

**Mod. FAA Major Storage Volume (cubic ft.) = 1,050,258**
**Mod. FAA Major Storage Volume (acre-ft.) = 24.1106**

## DETENTION VOLUME BY THE MODIFIED FAA METHOD

**Project:** Centerra South

**Basin ID:**

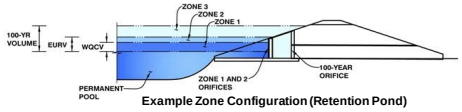


# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

*MHFD-Detention, Version 4.06 (July 2022)*

Project: CENTERRA SOUTH FILING NO. 1

Basin ID:




**Example Zone Configuration (Retention Pond)**

## Watershed Information

| | | |
|---|---|---|
| Selected BMP Type = | EDB | |
| Watershed Area = | 103.07 | acres |
| Watershed Length = | 3,003 | ft |
| Watershed Length to Centroid = | 914 | ft |
| Watershed Slope = | 0.008 | ft/ft |
| Watershed Imperviousness = | 71.40% | percent |
| Percentage Hydrologic Soil Group A = | 0.0% | percent |
| Percentage Hydrologic Soil Group B = | 0.0% | percent |
| Percentage Hydrologic Soil Groups C/D = | 100.0% | percent |
| Target WQCV Drain Time = | 40.0 | hours |
| Location for 1-hr Rainfall Depths = | Denver - Capitol Building | |

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) = | 2.418 | acre-feet | acre-feet |
| Excess Urban Runoff Volume (EURV) = | 7.164 | acre-feet | acre-feet |
| 2-yr Runoff Volume (P1 = 1 in.) = | 6.062 | acre-feet | 1.00 inches |
| 5-yr Runoff Volume (P1 = 1.41 in.) = | 9.548 | acre-feet | 1.41 inches |
| 10-yr Runoff Volume (P1 = 1.69 in.) = | 12.045 | acre-feet | 1.69 inches |
| 25-yr Runoff Volume (P1 = 2.03 in.) = | 15.289 | acre-feet | 2.03 inches |
| 50-yr Runoff Volume (P1 = 2.36 in.) = | 18.320 | acre-feet | 2.36 inches |
| 100-yr Runoff Volume (P1 = 2.66 in.) = | 21.248 | acre-feet | 2.66 inches |
| 500-yr Runoff Volume (P1 = 3.14 in.) = | 25.684 | acre-feet | inches |
| Approximate 2-yr Detention Volume = | 5.416 | acre-feet | |
| Approximate 5-yr Detention Volume = | 8.423 | acre-feet | |
| Approximate 10-yr Detention Volume = | 9.923 | acre-feet | |
| Approximate 25-yr Detention Volume = | 11.088 | acre-feet | |
| Approximate 50-yr Detention Volume = | 11.765 | acre-feet | |
| Approximate 100-yr Detention Volume = | 12.744 | acre-feet | |

## Define Zones and Basin Geometry

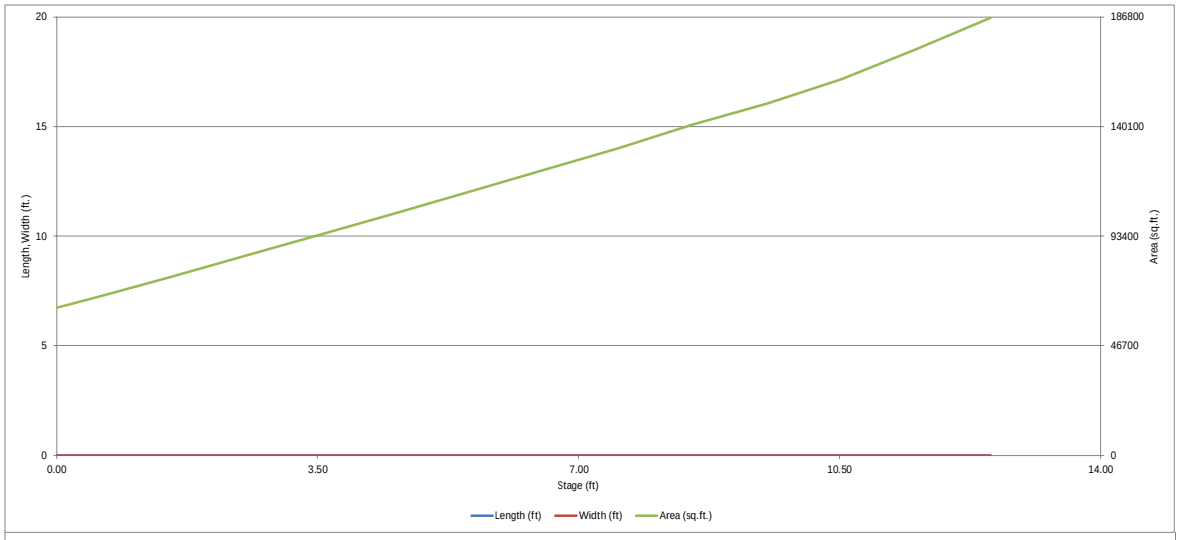
| | | |
|---|---|---|
| Zone 1 Volume (WQCV) = | 2.418 | acre-feet |
| Zone 2 Volume (5-year - Zone 1) = | 6.005 | acre-feet |
| Zone 3 Volume (100-year - Zones 1 & 2) = | 4.321 | acre-feet |
| Total Detention Basin Volume = | 12.744 | acre-feet |
| Initial Surcharge Volume (ISV) = | user | $ft^3$ |
| 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 ($R_{LW}$) = | 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 |

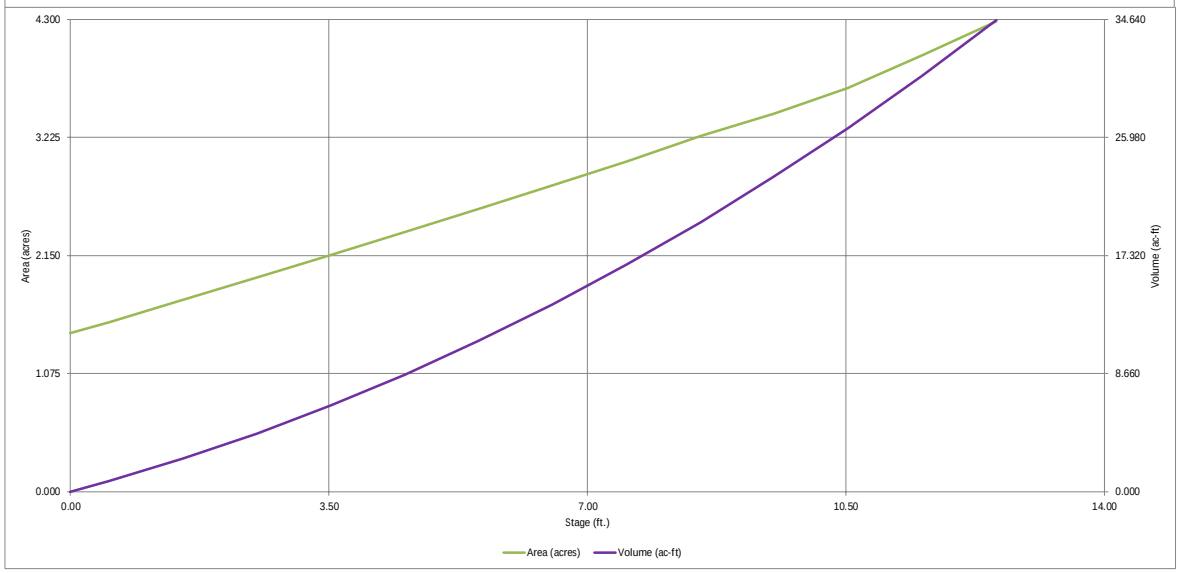
Depth Increment = ft

| 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 | -- | -- | -- | 62,928 | 1.445 | | |
| 4906 | -- | 0.53 | -- | -- | -- | 67,284 | 1.545 | 34,506 | 0.792 |
| 4907 | -- | 1.53 | -- | -- | -- | 76,071 | 1.746 | 106,184 | 2.438 |
| 4908 | -- | 2.53 | -- | -- | -- | 84,959 | 1.950 | 186,699 | 4.286 |
| 4909 | -- | 3.53 | -- | -- | -- | 93,948 | 2.157 | 276,152 | 6.340 |
| 4910 | -- | 4.53 | -- | -- | -- | 103,037 | 2.365 | 374,645 | 8.601 |
| 4911 | -- | 5.53 | -- | -- | -- | 112,226 | 2.576 | 482,276 | 11.072 |
| 4912 | -- | 6.53 | -- | -- | -- | 121,515 | 2.790 | 599,147 | 13.755 |
| 4913 | -- | 7.53 | -- | -- | -- | 130,905 | 3.005 | 725,357 | 16.652 |
| 4914 | -- | 8.53 | -- | -- | -- | 140,938 | 3.235 | 861,278 | 19.772 |
| 4915 | -- | 9.53 | -- | -- | -- | 149,986 | 3.443 | 1,006,740 | 23.112 |
| 4916 | -- | 10.53 | -- | -- | -- | 160,156 | 3.677 | 1,161,811 | 26.672 |
| 4917 | -- | 11.53 | -- | -- | -- | 173,023 | 3.972 | 1,328,401 | 30.496 |
| 4918 | -- | 12.53 | -- | -- | -- | 186,639 | 4.285 | 1,508,232 | 34.624 |

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

*MHFD-Detention, Version 4.06 (July 2022)*



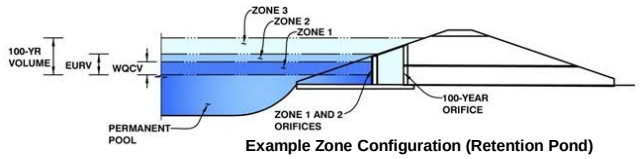



# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.06 (July 2022)*

Project: CENTERRA SOUTH FILING NO. 1

Basin ID:




**Example Zone Configuration (Retention Pond)**

| | Estimated Stage (ft) | Estimated Volume (ac-ft) | Outlet Type |
|---|---|---|---|
| Zone 1 (WQCV) | 1.52 | 2.418 | Orifice Plate |
| Zone 2 (5-year) | 4.46 | 6.005 | Not Utilized |
| Zone 3 (100-year) | 6.17 | 4.321 | Not Utilized |
| Total (all zones) | | 12.744 | |

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

| | | | | | |
|---|---|---|---|---|---|
| Underdrain Orifice Invert Depth = | N/A | ft (distance below the filtration media surface) | Underdrain Orifice Area = | N/A | ft² |
| 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 BMP)**

| | | | | | |
|---|---|---|---|---|---|
| Centroid of Lowest Orifice = | 0.00 | ft (relative to basin bottom at Stage = 0 ft) | WQ Orifice Area per Row = | N/A | ft² |
| Depth at top of Zone using Orifice Plate = | 1.52 | 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 | ft² |

**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) | | | | | | | | |
| Orifice Area (sq. inches) | | | | | | | | |

| | 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) | Vertical Orifice Area = | N/A | N/A |
| 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 |
| Vertical Orifice Diameter = | N/A | N/A | inches | | | |

**Calculated Parameters for Vertical Orific**

| Not Selected | Not Selected |
|---|---|

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

| | Not Selected | Not Selected | | | | |
|---|---|---|---|---|---|---|
| Overflow Weir Front Edge Height, Ho = | N/A | N/A | ft (relative to basin bottom at Stage = 0 ft) | Height of Grate Upper Edge, $H_t$ = | N/A | N/A |
| Overflow Weir Front Edge Length = | N/A | N/A | feet | Overflow Weir Slope Length = | N/A | N/A |
| Overflow Weir Grate Slope = | N/A | N/A | H:V | Grate Open Area / 100-yr Orifice Area = | N/A | N/A |
| Horiz. Length of Weir Sides = | N/A | N/A | feet | Overflow Grate Open Area w/o Debris = | N/A | N/A |
| Overflow Grate Type = | N/A | N/A | | Overflow Grate Open Area w/ Debris = | N/A | N/A |
| Debris Clogging % = | N/A | N/A | % | | | |

**Calculated Parameters for Overflow We**

| Not Selected | Not Selected |
|---|---|

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

| | Not Selected | Not Selected | | | | |
|---|---|---|---|---|---|---|
| Depth to Invert of Outlet Pipe = | N/A | N/A | ft (distance below basin bottom at Stage = 0 ft) | Outlet Orifice Area = | N/A | N/A |
| Circular Orifice Diameter = | N/A | N/A | inches | Outlet Orifice Centroid = | N/A | N/A |
| | | | | Half-Central Angle of Restrictor Plate on Pipe = | N/A | N/A |

**Calculated Parameters for Outlet Pipe w/ Flow Restriction Plat**

| Not Selected | Not Selected |
|---|---|

**User Input: Emergency Spillway (Rectangular or Trapezoidal)**

| | | | | | |
|---|---|---|---|---|---|
| Spillway Invert Stage= | 10.53 | ft (relative to basin bottom at Stage = 0 ft) | Spillway Design Flow Depth= | 0.51 | feet |
| Spillway Crest Length = | 341.00 | feet | Stage at Top of Freeboard = | 12.04 | feet |
| Spillway End Slopes = | 4.00 | H:V | Basin Area at Top of Freeboard = | 4.13 | acres |
| Freeboard above Max Water Surface = | 1.00 | feet | Basin Volume at Top of Freeboard = | 32.56 | acre-ft |

**Calculated Parameters for Spillway**

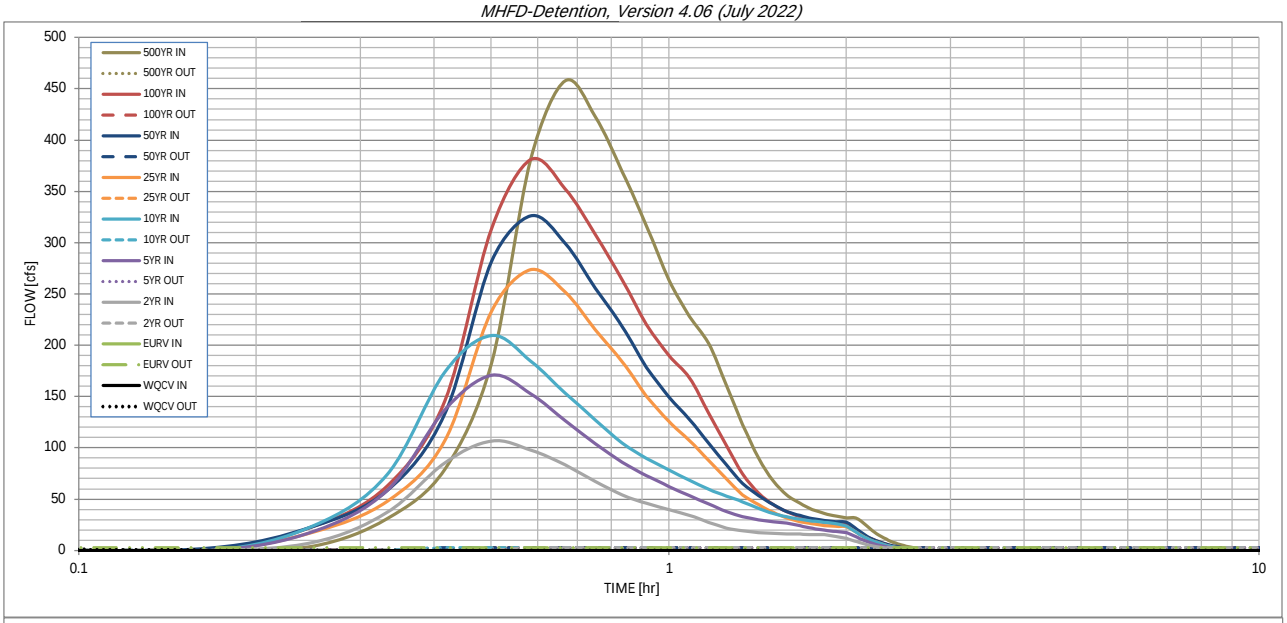
**Routed Hydrograph Results**

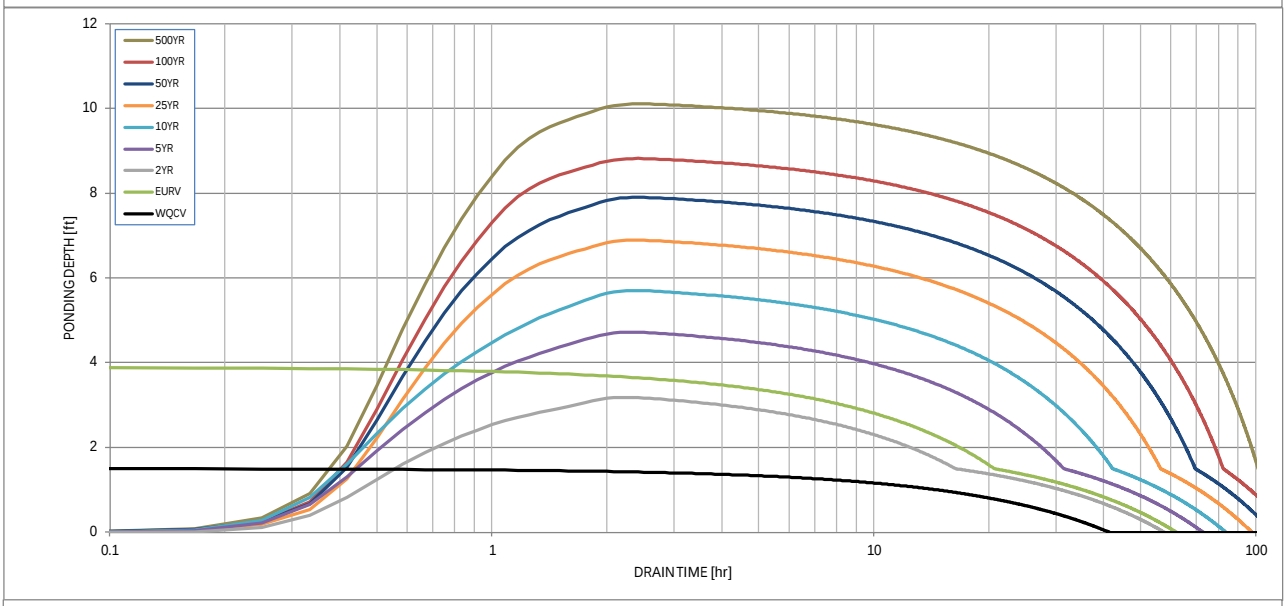
*The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

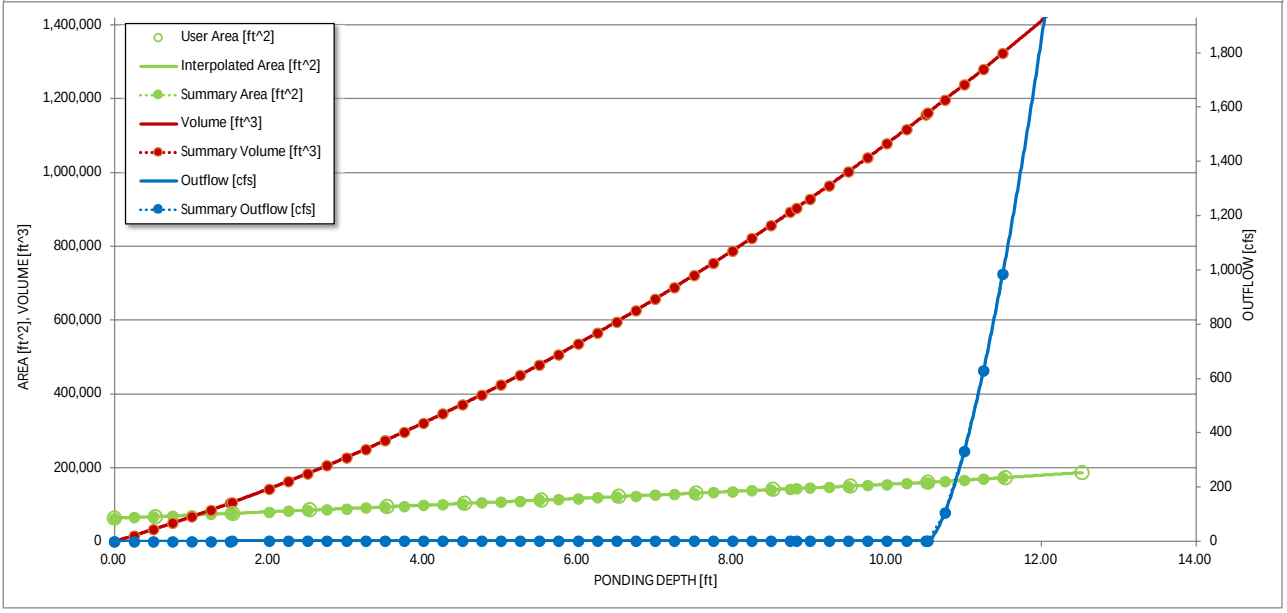
| Design Storm Return Period = | WQCV | EURV | 2 Year | 5 Year | 10 Year | 25 Year | 50 Year | 100 Year |
|---|---|---|---|---|---|---|---|---|
| One-Hour Rainfall Depth (in) = | N/A | N/A | 1.00 | 1.41 | 1.69 | 2.03 | 2.36 | 2.66 |
| CUHP Runoff Volume (acre-ft) = | 2.418 | 7.164 | 6.062 | 9.548 | 12.045 | 15.289 | 18.320 | 21.248 |
| Inflow Hydrograph Volume (acre-ft) = | N/A | N/A | 6.062 | 9.548 | 12.045 | 15.289 | 18.320 | 21.248 |
| CUHP Predevelopment Peak Q (cfs) = | N/A | N/A | 5.4 | 36.9 | 56.7 | 98.6 | 127.9 | 159.5 |
| OPTIONAL Override Predevelopment Peak Q (cfs) = | N/A | N/A | | | | | | |
| Predevelopment Unit Peak Flow, q (cfs/acre) = | N/A | N/A | 0.05 | 0.36 | 0.55 | 0.96 | 1.24 | 1.55 |
| Peak Inflow Q (cfs) = | N/A | N/A | 107.1 | 170.8 | 209.6 | 273.7 | 326.4 | 381.3 |
| Peak Outflow Q (cfs) = | 2.8 | 2.8 | 2.8 | 2.8 | 2.8 | 2.8 | 2.8 | 2.8 |
| Ratio Peak Outflow to Predevelopment Q = | N/A | N/A | N/A | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Structure Controlling Flow = | User Defined | User Defined | User Defined | User Defined | User Defined | User Defined | User Defined | User Defined |
| Max Velocity through Grate 1 (fps) = | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Max Velocity through Grate 2 (fps) = | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Time to Drain 97% of Inflow Volume (hours) = | 40 | 58 | 55 | 68 | 77 | 90 | 101 | 112 |
| Time to Drain 99% of Inflow Volume (hours) = | 41 | 61 | 57 | 71 | 81 | 95 | 108 | 120 |
| Maximum Ponding Depth (ft) = | 1.52 | 3.91 | 3.19 | 4.73 | 5.71 | 6.90 | 7.91 | 8.83 |
| Area at Maximum Ponding Depth (acres) = | 1.74 | 2.24 | 2.08 | 2.41 | 2.61 | 2.87 | 3.09 | 3.30 |
| Maximum Volume Stored (acre-ft) = | 2.420 | 7.174 | 5.597 | 9.054 | 11.539 | 14.773 | 17.780 | 20.719 |

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.06 (July 2022)*




| 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 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.42 | 1.17 | 4.67 |
| | 0:15:00 | 0.00 | 0.00 | 7.95 | 18.70 | 24.53 | 18.01 | 24.04 | 23.54 | 31.25 |
| | 0:20:00 | 0.00 | 0.00 | 37.27 | 58.94 | 74.37 | 48.40 | 58.58 | 63.32 | 79.50 |
| | 0:25:00 | 0.00 | 0.00 | 85.79 | 137.30 | 173.96 | 107.23 | 133.34 | 145.89 | 182.87 |
| | 0:30:00 | 0.00 | 0.00 | 107.06 | 170.84 | 209.65 | 233.53 | 281.80 | 314.23 | 381.50 |
| | 0:35:00 | 0.00 | 0.00 | 98.14 | 152.94 | 185.04 | 273.70 | 326.39 | 381.28 | 458.25 |
| | 0:40:00 | 0.00 | 0.00 | 83.48 | 126.76 | 153.49 | 251.99 | 299.57 | 352.77 | 423.19 |
| | 0:45:00 | 0.00 | 0.00 | 67.43 | 104.16 | 127.68 | 215.59 | 256.13 | 308.30 | 369.51 |
| | 0:50:00 | 0.00 | 0.00 | 54.27 | 86.34 | 104.71 | 184.13 | 218.48 | 263.92 | 316.15 |
| | 0:55:00 | 0.00 | 0.00 | 46.04 | 73.15 | 89.90 | 150.48 | 178.83 | 220.32 | 264.18 |
| | 1:00:00 | 0.00 | 0.00 | 40.02 | 62.68 | 78.82 | 125.99 | 149.91 | 190.52 | 228.53 |
| | 1:05:00 | 0.00 | 0.00 | 34.53 | 53.44 | 68.59 | 107.55 | 128.11 | 168.33 | 201.93 |
| | 1:10:00 | 0.00 | 0.00 | 27.78 | 45.52 | 59.69 | 87.80 | 104.76 | 134.27 | 161.33 |
| | 1:15:00 | 0.00 | 0.00 | 22.22 | 38.14 | 53.42 | 69.92 | 83.68 | 102.24 | 123.29 |
| | 1:20:00 | 0.00 | 0.00 | 19.27 | 33.14 | 47.75 | 54.55 | 65.46 | 74.73 | 90.41 |
| | 1:25:00 | 0.00 | 0.00 | 17.75 | 30.18 | 41.26 | 44.95 | 53.94 | 56.39 | 68.31 |
| | 1:30:00 | 0.00 | 0.00 | 16.86 | 28.32 | 36.25 | 37.38 | 44.85 | 45.06 | 54.64 |
| | 1:35:00 | 0.00 | 0.00 | 16.41 | 27.08 | 32.88 | 32.04 | 38.42 | 38.02 | 46.11 |
| | 1:40:00 | 0.00 | 0.00 | 16.06 | 24.30 | 30.55 | 28.47 | 34.12 | 33.14 | 40.20 |
| | 1:45:00 | 0.00 | 0.00 | 15.79 | 21.72 | 28.97 | 26.25 | 31.44 | 29.94 | 36.33 |
| | 1:50:00 | 0.00 | 0.00 | 15.62 | 19.93 | 27.85 | 24.66 | 29.51 | 27.73 | 33.64 |
| | 1:55:00 | 0.00 | 0.00 | 13.74 | 18.67 | 26.25 | 23.67 | 28.31 | 26.49 | 32.13 |
| | 2:00:00 | 0.00 | 0.00 | 11.84 | 17.29 | 23.54 | 23.08 | 27.59 | 26.04 | 31.56 |
| | 2:05:00 | 0.00 | 0.00 | 8.76 | 12.94 | 17.31 | 17.46 | 20.86 | 19.78 | 23.97 |
| | 2:10:00 | 0.00 | 0.00 | 5.94 | 8.74 | 11.73 | 11.80 | 14.09 | 13.45 | 16.29 |
| | 2:15:00 | 0.00 | 0.00 | 4.01 | 5.87 | 7.97 | 8.04 | 9.60 | 9.21 | 11.15 |
| | 2:20:00 | 0.00 | 0.00 | 2.68 | 3.84 | 5.30 | 5.38 | 6.42 | 6.16 | 7.46 |
| | 2:25:00 | 0.00 | 0.00 | 1.69 | 2.44 | 3.42 | 3.48 | 4.15 | 3.99 | 4.82 |
| | 2:30:00 | 0.00 | 0.00 | 1.03 | 1.59 | 2.17 | 2.28 | 2.72 | 2.61 | 3.15 |
| | 2:35:00 | 0.00 | 0.00 | 0.54 | 0.91 | 1.21 | 1.33 | 1.58 | 1.52 | 1.83 |
| | 2:40:00 | 0.00 | 0.00 | 0.23 | 0.43 | 0.53 | 0.63 | 0.75 | 0.72 | 0.87 |
| | 2:45:00 | 0.00 | 0.00 | 0.07 | 0.12 | 0.15 | 0.19 | 0.23 | 0.21 | 0.26 |
| | 2:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:30:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:30:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:30:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 6:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.06 (July 2022)*

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] | Area [ft$^2$] | Area [acres] | Volume [ft$^3$] | Volume [ac-ft] | Total Outflow [cfs] |
|---|---|---|---|---|---|---|
| BOTTOM | 0.00 | 62,928 | 1.445 | 0 | 0.000 | 0.00 |
| | 0.25 | 64,983 | 1.492 | 15,989 | 0.367 | 0.70 |
| | 0.50 | 67,037 | 1.539 | 32,491 | 0.746 | 0.70 |
| | 0.75 | 69,217 | 1.589 | 49,521 | 1.137 | 0.70 |
| | 1.00 | 71,414 | 1.639 | 67,100 | 1.540 | 0.70 |
| | 1.25 | 73,611 | 1.690 | 85,228 | 1.957 | 0.70 |
| | 1.50 | 75,807 | 1.740 | 103,905 | 2.385 | 0.70 |
| WQCV=4906.99 | 1.52 | 75,983 | 1.744 | 105,423 | 2.420 | 2.79 |
| | 2.00 | 80,248 | 1.842 | 142,919 | 3.281 | 2.79 |
| | 2.25 | 82,470 | 1.893 | 163,259 | 3.748 | 2.79 |
| | 2.50 | 84,692 | 1.944 | 184,154 | 4.228 | 2.79 |
| | 2.75 | 86,937 | 1.996 | 205,607 | 4.720 | 2.79 |
| | 3.00 | 89,184 | 2.047 | 227,622 | 5.225 | 2.79 |
| | 3.25 | 91,431 | 2.099 | 250,199 | 5.744 | 2.79 |
| | 3.50 | 93,678 | 2.151 | 273,338 | 6.275 | 2.79 |
| | 3.75 | 95,948 | 2.203 | 297,041 | 6.819 | 2.79 |
| | 4.00 | 98,220 | 2.255 | 321,312 | 7.376 | 2.79 |
| | 4.25 | 100,492 | 2.307 | 346,151 | 7.947 | 2.79 |
| | 4.50 | 102,764 | 2.359 | 371,558 | 8.530 | 2.79 |
| | 4.75 | 105,059 | 2.412 | 397,535 | 9.126 | 2.79 |
| | 5.00 | 107,356 | 2.465 | 424,087 | 9.736 | 2.79 |
| | 5.25 | 109,653 | 2.517 | 451,213 | 10.358 | 2.79 |
| | 5.50 | 111,950 | 2.570 | 478,914 | 10.994 | 2.79 |
| | 5.75 | 114,270 | 2.623 | 507,191 | 11.643 | 2.79 |
| | 6.00 | 116,592 | 2.677 | 536,048 | 12.306 | 2.79 |
| | 6.25 | 118,914 | 2.730 | 565,487 | 12.982 | 2.79 |
| | 6.50 | 121,236 | 2.783 | 595,505 | 13.671 | 2.79 |
| | 6.75 | 123,581 | 2.837 | 626,107 | 14.373 | 2.79 |
| | 7.00 | 125,928 | 2.891 | 657,296 | 15.089 | 2.79 |
| | 7.25 | 128,276 | 2.945 | 689,071 | 15.819 | 2.79 |
| | 7.50 | 130,623 | 2.999 | 721,434 | 16.562 | 2.79 |
| | 7.75 | 133,112 | 3.056 | 754,399 | 17.319 | 2.79 |
| | 8.00 | 135,621 | 3.113 | 787,990 | 18.090 | 2.79 |
| | 8.25 | 138,129 | 3.171 | 822,209 | 18.875 | 2.79 |
| | 8.50 | 140,637 | 3.229 | 857,055 | 19.675 | 2.79 |
| | 8.75 | 142,929 | 3.281 | 892,503 | 20.489 | 2.79 |
| 100 YR=4914.3 | 8.83 | 143,652 | 3.298 | 903,967 | 20.752 | 2.79 |
| | 9.00 | 145,191 | 3.333 | 928,518 | 21.316 | 2.79 |
| | 9.25 | 147,453 | 3.385 | 965,099 | 22.156 | 2.79 |
| | 9.50 | 149,715 | 3.437 | 1,002,245 | 23.008 | 2.79 |
| | 9.75 | 152,223 | 3.495 | 1,039,983 | 23.875 | 2.79 |
| | 10.00 | 154,766 | 3.553 | 1,078,357 | 24.756 | 2.79 |
| | 10.25 | 157,308 | 3.611 | 1,117,366 | 25.651 | 2.79 |
| | 10.50 | 159,851 | 3.670 | 1,157,011 | 26.561 | 2.79 |
| SPILLOVER=4916.00 | 10.53 | 160,156 | 3.677 | 1,161,811 | 26.672 | 2.79 |
| | 10.75 | 162,987 | 3.742 | 1,197,357 | 27.488 | 105.78 |
| | 11.00 | 166,203 | 3.816 | 1,238,506 | 28.432 | 331.08 |
| | 11.25 | 169,420 | 3.889 | 1,280,459 | 29.395 | 629.21 |
| | 11.50 | 172,637 | 3.963 | 1,323,216 | 30.377 | 986.21 |
| | | | | | | |
| | | | | | | |
| | | | | | |

# APPENDIX D – STREET AND INLET CALCULATIONS

Street Capacity / Inlet Calculations

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 01_14 | STRM INLET 01E_1 | STRM INLET 01D_2 |
|---|---|---|---|
| Site Type (Urban or Rural) | | | |
| Inlet Application (Street or Area) | STREET | STREET | STREET |
| Hydraulic Condition | In Sump | In Sump | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type R Curb Opening | CDOT Type R Curb Opening |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | | | |
|---|---|---|---|
| Minor $Q_{Known}$ (cfs) | 3.1 | 4.3 | 2.8 |
| Major $Q_{Known}$ (cfs) | 9.1 | 13.9 | 9.0 |

**Bypass (Carry-Over) Flow from Upstream** Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

| | | | |
|---|---|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |

**Watershed Characteristics**

| | | | |
|---|---|---|---|
| Subcatchment Area (acres) | | | |
| Percent Impervious | | | |
| NRCS Soil Type | | | |

**Watershed Profile**

| | | | |
|---|---|---|---|
| Overland Slope (ft/ft) | | | |
| Overland Length (ft) | | | |
| Channel Slope (ft/ft) | | | |
| Channel Length (ft) | | | |

**Minor Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**Major Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**CALCULATED OUTPUT**

| | | | |
|---|---|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **3.1** | **4.3** | **2.8** |
| **Major Total Design Peak Flow, Q (cfs)** | **9.1** | **13.9** | **9.0** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 01D_1 | STRM INLET 01C_2 | STRM INLET 01C_1 |
|---|---|---|---|
| Site Type (Urban or Rural) | | | |
| Inlet Application (Street or Area) | STREET | STREET | STREET |
| Hydraulic Condition | In Sump | In Sump | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type R Curb Opening | CDOT Type R Curb Opening |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | | | |
|---|---|---|---|
| Minor $Q_{Known}$ (cfs) | 4.2 | 0.9 | 4.0 |
| Major $Q_{Known}$ (cfs) | 13.0 | 3.5 | 13.2 |

**Bypass (Carry-Over) Flow from Upstream**

| | | | |
|---|---|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |

**Watershed Characteristics**

| | | | |
|---|---|---|---|
| Subcatchment Area (acres) | | | |
| Percent Impervious | | | |
| NRCS Soil Type | | | |

**Watershed Profile**

| | | | |
|---|---|---|---|
| Overland Slope (ft/ft) | | | |
| Overland Length (ft) | | | |
| Channel Slope (ft/ft) | | | |
| Channel Length (ft) | | | |

**Minor Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**Major Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**CALCULATED OUTPUT**

| | | | |
|---|---|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **4.2** | **0.9** | **4.0** |
| **Major Total Design Peak Flow, Q (cfs)** | **13.0** | **3.5** | **13.2** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 01B_2 | STRM INLET 01B_1 | STRM INLET 01A_1 |
|---|---|---|---|
| Site Type (Urban or Rural) | | | |
| Inlet Application (Street or Area) | STREET | STREET | STREET |
| Hydraulic Condition | In Sump | In Sump | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type R Curb Opening | CDOT Type R Curb Opening |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | | | |
|---|---|---|---|
| Minor $Q_{Known}$ (cfs) | 2.2 | 2.2 | 3.0 |
| Major $Q_{Known}$ (cfs) | 7.3 | 7.1 | 9.7 |

**Bypass (Carry-Over) Flow from Upstream**

| | | | |
|---|---|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |

**Watershed Characteristics**

| | | | |
|---|---|---|---|
| Subcatchment Area (acres) | | | |
| Percent Impervious | | | |
| NRCS Soil Type | | | |

**Watershed Profile**

| | | | |
|---|---|---|---|
| Overland Slope (ft/ft) | | | |
| Overland Length (ft) | | | |
| Channel Slope (ft/ft) | | | |
| Channel Length (ft) | | | |

**Minor Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**Major Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**CALCULATED OUTPUT**

| | | | |
|---|---|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **2.2** | **2.2** | **3.0** |
| **Major Total Design Peak Flow, Q (cfs)** | **7.3** | **7.1** | **9.7** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 01_2 |
|---|---|
| Site Type (Urban or Rural) | |
| Inlet Application (Street or Area) | STREET |
| Hydraulic Condition | In Sump |
| Inlet Type | CDOT Type R Curb Opening |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | |
|---|---|
| Minor $Q_{Known}$ (cfs) | 1.5 |
| Major $Q_{Known}$ (cfs) | 5.3 |

**Bypass (Carry-Over) Flow from Upstream**

| | |
|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 |

**Watershed Characteristics**

| | |
|---|---|
| Subcatchment Area (acres) | |
| Percent Impervious | |
| NRCS Soil Type | |

**Watershed Profile**

| | |
|---|---|
| Overland Slope (ft/ft) | |
| Overland Length (ft) | |
| Channel Slope (ft/ft) | |
| Channel Length (ft) | |

**Minor Storm Rainfall Input**

| | |
|---|---|
| Design Storm Return Period, $T_r$ (years) | |
| One-Hour Precipitation, $P_1$ (inches) | |

**Major Storm Rainfall Input**

| | |
|---|---|
| Design Storm Return Period, $T_r$ (years) | |
| One-Hour Precipitation, $P_1$ (inches) | |

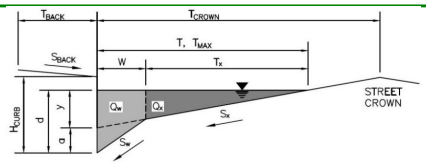
**CALCULATED OUTPUT**

| | |
|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **1.5** |
| **Major Total Design Peak Flow, Q (cfs)** | **5.3** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A |

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Centerra South**
**Inlet ID:** **STRM INLET 01_14**




## Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 36.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.005 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.017 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 94.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.029 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 20.0 | 84.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 6.0 | 9.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

## Maximum Capacity for 1/2 Street based On Allowable Spread

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Water Depth without Gutter Depression (T * $S_x$ * 12) | y = | 6.96 | 29.23 | inches |
| Vertical Depth between Gutter Lip and Gutter Flowline (W * $S_w$ * 12) | $d_C$ = | 2.0 | 2.0 | inches |
| Gutter Depression ($d_C$ - (W * $S_x$ * 12)) | a = | 1.30 | 1.30 | inches |
| Water Depth at Gutter Flowline (y + a) | d = | 8.26 | 30.53 | inches |
| Allowable Spread for Discharge outside the Gutter Section (T - W) | $T_X$ = | 18.0 | 82.0 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.275 | 0.064 | |
| Discharge outside the Gutter Section, carried in Section $T_X$ | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_T$ - $Q_X$ - $Q_{BACK}$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Maximum Flow Based On Allowable Spread | **$Q_T$ =** | **SUMP** | **SUMP** | **cfs** |
| Flow Velocity within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |

## Maximum Capacity for 1/2 Street based on Allowable Depth

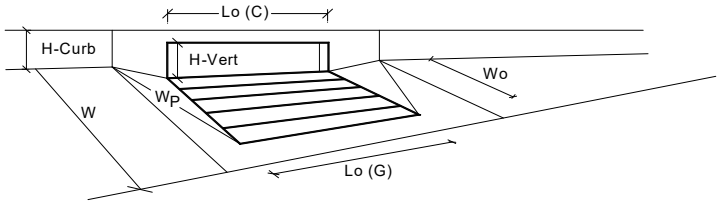
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Theoretical Water Spread | $T_{TH}$ = | 13.5 | 22.1 | ft |
| Theoretical Spread for Discharge outside the Gutter Section (T - W) | $T_{X\,TH}$ = | 11.5 | 20.1 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.403 | 0.249 | |
| Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$ | $Q_{X\,TH}$ = | 0.0 | 0.0 | cfs |
| Actual Discharge outside the Gutter Section, (limited by distance $T_{CROWN}$) | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_d$ - $Q_X$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | SUMP | SUMP | cfs |
| Average Flow Velocity Within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6" | R = | SUMP | SUMP | |
| Max Flow based on Allowable Depth (Safety Factor Applied) | **$Q_d$ =** | **SUMP** | **SUMP** | **cfs** |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | | | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | $d_{CROWN}$ = | | | inches |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*




| | | | | | |
|---|---|---|---|---|---|
| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 3 | 3 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 5.6 | 6.0 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| **Warning 3** Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.05 | 0.05 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.30 | 0.33 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 0.76 | 0.79 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | | **$Q_a$ =** | **8.4** | **10.0** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | | $Q_{PEAK\ REQUIRED}$ = | 3.1 | 9.1 | cfs |

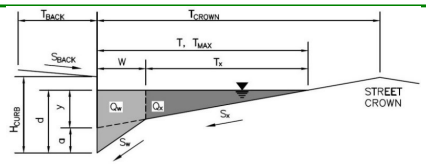
**Warning 3: Clogging Factor is not the recommended value for inlet type specified..**

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Centerra South**
**Inlet ID:** **STRM INLET 01E_1**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 44.8 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.027 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 55.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

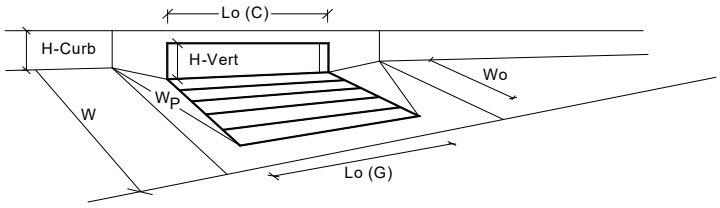
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 45.0 | 45.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 8.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*

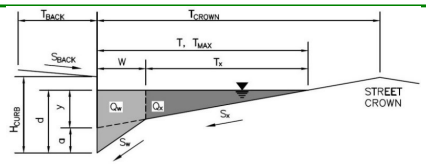



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 2 | 2 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.5 | 8.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.08 | 0.08 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.29 | 0.50 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 0.91 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **6.7** | **16.5** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 4.3 | 13.9 | cfs |

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Centerra South**
**Inlet ID:** **STRM INLET 01D_2**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 64.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.006 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

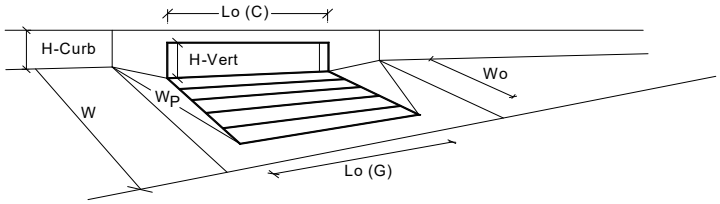
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 64.0 | 64.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 12.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



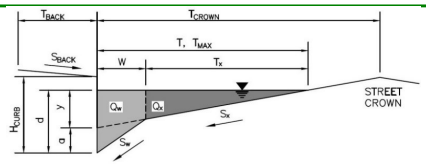

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.5 | 12.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.29 | 0.83 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **4.3** | **12.0** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 2.8 | 9.0 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Centerra South**
**Inlet ID:** **STRM INLET 01D_1**




| Gutter Geometry: | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 5.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 192.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.010 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 57.1 | 62.3 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

| Maximum Capacity for 1/2 Street based On Allowable Spread | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Water Depth without Gutter Depression (T * $S_x$ * 12) | y = | 6.61 | 7.21 | inches |
| Vertical Depth between Gutter Lip and Gutter Flowline (W * $S_w$ * 12) | $d_C$ = | 2.0 | 2.0 | inches |
| Gutter Depression ($d_C$ - (W * $S_x$ * 12)) | a = | 1.76 | 1.76 | inches |
| Water Depth at Gutter Flowline (y + a) | d = | 8.37 | 8.97 | inches |
| Allowable Spread for Discharge outside the Gutter Section (T - W) | $T_X$ = | 55.1 | 60.3 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.110 | 0.100 | |
| Discharge outside the Gutter Section, carried in Section $T_X$ | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_T$ - $Q_X$ - $Q_{BACK}$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Maximum Flow Based On Allowable Spread | **$Q_T$ =** | **SUMP** | **SUMP** | **cfs** |
| Flow Velocity within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |

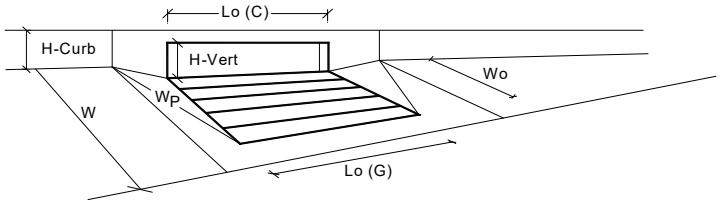
| Maximum Capacity for 1/2 Street based on Allowable Depth | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Theoretical Water Spread | $T_{TH}$ = | 32.5 | 36.6 | ft |
| Theoretical Spread for Discharge outside the Gutter Section (T - W) | $T_{X\,TH}$ = | 30.5 | 34.6 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.211 | 0.183 | |
| Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$ | $Q_{X\,TH}$ = | 0.0 | 0.0 | cfs |
| Actual Discharge outside the Gutter Section, (limited by distance $T_{CROWN}$) | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_d$ - $Q_X$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | SUMP | SUMP | cfs |
| Average Flow Velocity Within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6" | R = | SUMP | SUMP | |
| Max Flow based on Allowable Depth (Safety Factor Applied) | **$Q_d$ =** | **SUMP** | **SUMP** | **cfs** |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | | | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | $d_{CROWN}$ = | | | inches |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



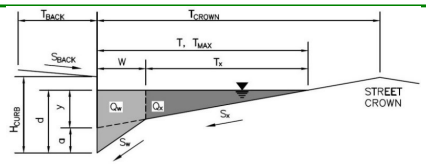

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 2 | 2 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.6 | 12.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.08 | 0.08 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.30 | 0.83 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 0.91 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **7.1** | **25.9** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 4.2 | 13.0 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Centerra South**
**Inlet ID:** **STRM INLET 01C_2**




Gutter Geometry:

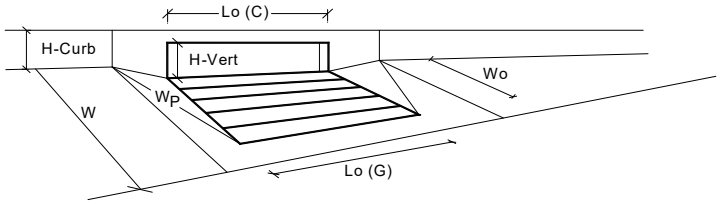
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 30.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.030 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.020 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 34.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.032 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 14.0 | 24.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 6.0 | 9.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| MINOR STORM Allowable Capacity is not applicable to Sump Condition | | | | |
| MAJOR STORM Allowable Capacity is not applicable to Sump Condition | **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*

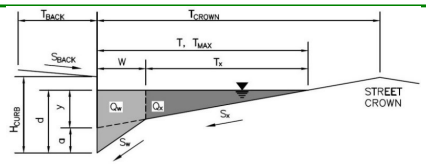



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.0 | 9.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.33 | 0.58 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **5.3** | **10.4** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.9 | 3.5 | cfs |

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Centerra South**
**Inlet ID:** **STRM INLET 01C_1**




Gutter Geometry:

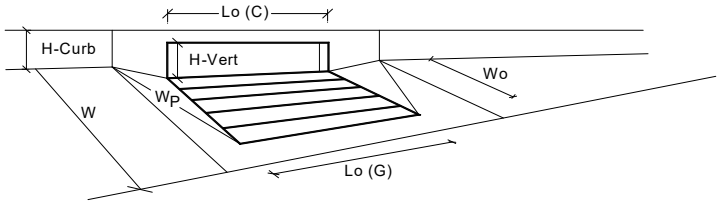
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 20.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.023 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.017 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 28.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.025 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 18.0 | 18.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 6.0 | 9.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| MINOR STORM Allowable Capacity is not applicable to Sump Condition | | | | |
| MAJOR STORM Allowable Capacity is not applicable to Sump Condition | **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



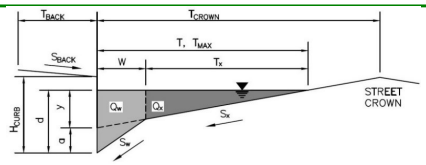

| | | | | | |
|---|---|---|---|---|---|
| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 3 | 3 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 6.0 | 6.8 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| **Warning 3** Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.05 | 0.05 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.33 | 0.40 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 0.79 | 0.83 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | | **$Q_a$ =** | **10.0** | **13.8** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | | $Q_{PEAK\ REQUIRED}$ = | 4.0 | 13.2 | cfs |

**Warning 3: Clogging Factor is not the recommended value for inlet type specified..**

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Centerra South**
**Inlet ID:** **STRM INLET 01B_2**




## Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 20.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.017 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 34.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 24.0 | 24.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 6.0 | 9.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

## Maximum Capacity for 1/2 Street based On Allowable Spread

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Water Depth without Gutter Depression (T * $S_x$ * 12) | y = | 5.76 | 5.76 | inches |
| Vertical Depth between Gutter Lip and Gutter Flowline (W * $S_w$ * 12) | $d_C$ = | 2.0 | 2.0 | inches |
| Gutter Depression ($d_C$ - (W * $S_x$ * 12)) | a = | 1.51 | 1.51 | inches |
| Water Depth at Gutter Flowline (y + a) | d = | 7.27 | 7.27 | inches |
| Allowable Spread for Discharge outside the Gutter Section (T - W) | $T_X$ = | 22.0 | 22.0 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.245 | 0.245 | |
| Discharge outside the Gutter Section, carried in Section $T_X$ | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_T$ - $Q_X$ - $Q_{BACK}$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Maximum Flow Based On Allowable Spread | **$Q_T$ =** | **SUMP** | **SUMP** | **cfs** |
| Flow Velocity within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |

## Maximum Capacity for 1/2 Street based on Allowable Depth

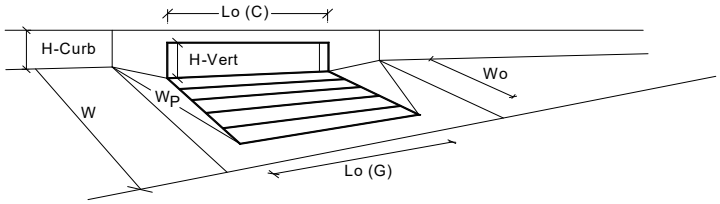
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Theoretical Water Spread | $T_{TH}$ = | 18.7 | 31.2 | ft |
| Theoretical Spread for Discharge outside the Gutter Section (T - W) | $T_{X\,TH}$ = | 16.7 | 29.2 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.318 | 0.186 | |
| Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$ | $Q_{X\,TH}$ = | 0.0 | 0.0 | cfs |
| Actual Discharge outside the Gutter Section, (limited by distance $T_{CROWN}$) | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_d$ - $Q_X$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | SUMP | SUMP | cfs |
| Average Flow Velocity Within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6" | R = | SUMP | SUMP | |
| Max Flow based on Allowable Depth (Safety Factor Applied) | **$Q_d$ =** | **SUMP** | **SUMP** | **cfs** |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | | | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | $d_{CROWN}$ = | | | inches |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



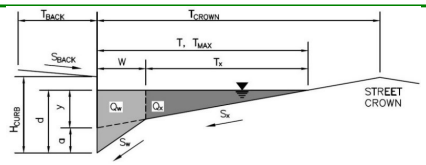

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.0 | 7.3 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.33 | 0.44 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **5.3** | **8.0** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 2.2 | 7.3 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Centerra South**
**Inlet ID:** **STRM INLET 01B_1**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 20.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.017 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 28.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.019 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

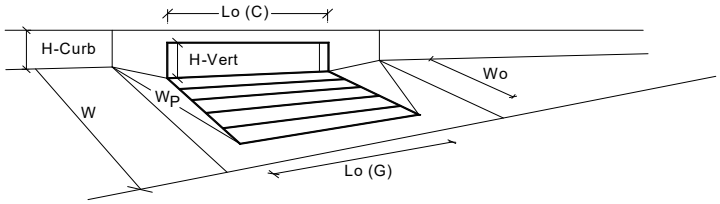
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 18.0 | 18.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 6.0 | 9.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*




| | | | | | |
|---|---|---|---|---|---|
| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 3 | 3 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 5.6 | 5.6 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| **Warning 3** Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.05 | 0.05 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.30 | 0.30 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 0.76 | 0.76 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | | **$Q_a$ =** | **8.2** | **8.2** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | | $Q_{PEAK\ REQUIRED}$ = | 2.2 | 7.1 | cfs |

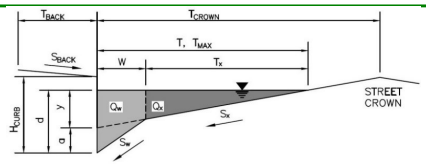
**Warning 3: Clogging Factor is not the recommended value for inlet type specified..**

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Centerra South**
**Inlet ID:** **STRM INLET 01A_1**




Gutter Geometry:

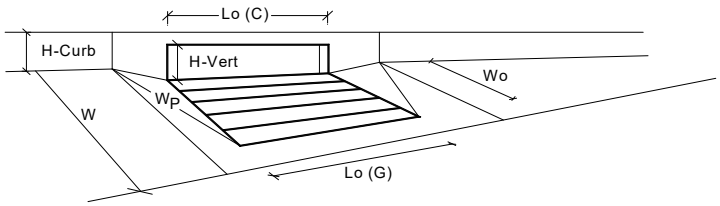
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 20.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.005 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.017 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 35.5 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 30.5 | 30.5 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 6.0 | 9.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| MINOR STORM Allowable Capacity is not applicable to Sump Condition | | | | |
| MAJOR STORM Allowable Capacity is not applicable to Sump Condition | **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



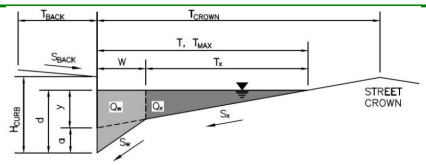

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.0 | 8.8 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.33 | 0.57 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **5.3** | **10.2** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 3.0 | 9.7 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Centerra South**
**Inlet ID:** **STRM INLET 01_2**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 20.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.000 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.017 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 35.5 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

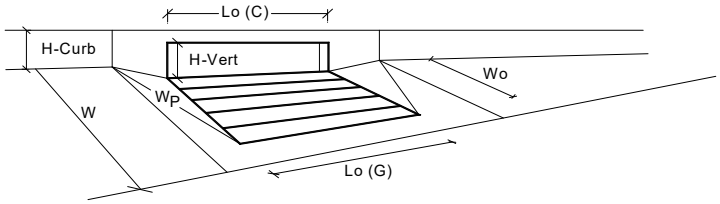
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 30.5 | 30.5 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 6.0 | 9.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*




| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 2 | 2 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.0 | 8.8 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.08 | 0.08 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.33 | 0.57 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 0.93 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **8.4** | **19.6** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 1.5 | 5.3 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 02G_01 | STRM INLET 02F_01 | STRM INLET 02F.2_01 |
|---|---|---|---|
| Site Type (Urban or Rural) | | | |
| Inlet Application (Street or Area) | STREET | STREET | STREET |
| Hydraulic Condition | In Sump | In Sump | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type R Curb Opening | CDOT Type R Curb Opening |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | | | |
|---|---|---|---|
| Minor $Q_{Known}$ (cfs) | 1.4 | 5.0 | 5.2 |
| Major $Q_{Known}$ (cfs) | 4.0 | 15.8 | 18.1 |

**Bypass (Carry-Over) Flow from Upstream** Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

| | | | |
|---|---|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |

**Watershed Characteristics**

| | | | |
|---|---|---|---|
| Subcatchment Area (acres) | | | |
| Percent Impervious | | | |
| NRCS Soil Type | | | |

**Watershed Profile**

| | | | |
|---|---|---|---|
| Overland Slope (ft/ft) | | | |
| Overland Length (ft) | | | |
| Channel Slope (ft/ft) | | | |
| Channel Length (ft) | | | |

**Minor Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**Major Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**CALCULATED OUTPUT**

| | | | |
|---|---|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **1.4** | **5.0** | **5.2** |
| **Major Total Design Peak Flow, Q (cfs)** | **4.0** | **15.8** | **18.1** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 02E_01 | STRM INLET 02D_01 | STRM INLET 02D.4_01 |
|---|---|---|---|
| Site Type (Urban or Rural) | | | |
| Inlet Application (Street or Area) | STREET | STREET | STREET |
| Hydraulic Condition | In Sump | In Sump | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type R Curb Opening | CDOT Type R Curb Opening |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | | | |
|---|---|---|---|
| Minor $Q_{Known}$ (cfs) | 0.8 | 0.6 | 1.0 |
| Major $Q_{Known}$ (cfs) | 2.4 | 1.9 | 3.3 |

**Bypass (Carry-Over) Flow from Upstream**

| | | | |
|---|---|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |

**Watershed Characteristics**

| | | | |
|---|---|---|---|
| Subcatchment Area (acres) | | | |
| Percent Impervious | | | |
| NRCS Soil Type | | | |

**Watershed Profile**

| | | | |
|---|---|---|---|
| Overland Slope (ft/ft) | | | |
| Overland Length (ft) | | | |
| Channel Slope (ft/ft) | | | |
| Channel Length (ft) | | | |

**Minor Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**Major Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**CALCULATED OUTPUT**

| | | | |
|---|---|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **0.8** | **0.6** | **1.0** |
| **Major Total Design Peak Flow, Q (cfs)** | **2.4** | **1.9** | **3.3** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 02D.3_01 | STRM INLET 02D_05 | STRM INLET 02C_01 |
|---|---|---|---|
| Site Type (Urban or Rural) | | | |
| Inlet Application (Street or Area) | STREET | STREET | STREET |
| Hydraulic Condition | In Sump | In Sump | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type R Curb Opening | CDOT Type R Curb Opening |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | | | |
|---|---|---|---|
| Minor $Q_{Known}$ (cfs) | 0.3 | 0.6 | 1.4 |
| Major $Q_{Known}$ (cfs) | 0.9 | 1.7 | 4.3 |

**Bypass (Carry-Over) Flow from Upstream**

| | | | |
|---|---|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |

**Watershed Characteristics**

| | | | |
|---|---|---|---|
| Subcatchment Area (acres) | | | |
| Percent Impervious | | | |
| NRCS Soil Type | | | |

**Watershed Profile**

| | | | |
|---|---|---|---|
| Overland Slope (ft/ft) | | | |
| Overland Length (ft) | | | |
| Channel Slope (ft/ft) | | | |
| Channel Length (ft) | | | |

**Minor Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**Major Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**CALCULATED OUTPUT**

| | | | |
|---|---|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **0.3** | **0.6** | **1.4** |
| **Major Total Design Peak Flow, Q (cfs)** | **0.9** | **1.7** | **4.3** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 02B_01 | STRM INLET 02A_03 | STRM INLET 02A_02 |
|---|---|---|---|
| Site Type (Urban or Rural) | | | |
| Inlet Application (Street or Area) | STREET | STREET | STREET |
| Hydraulic Condition | In Sump | In Sump | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type R Curb Opening | CDOT Type R Curb Opening |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | | | |
|---|---|---|---|
| Minor $Q_{Known}$ (cfs) | 1.8 | 3.8 | 0.3 |
| Major $Q_{Known}$ (cfs) | 5.5 | 12.4 | 1.1 |

**Bypass (Carry-Over) Flow from Upstream**

| | | | |
|---|---|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |

**Watershed Characteristics**

| | | | |
|---|---|---|---|
| Subcatchment Area (acres) | | | |
| Percent Impervious | | | |
| NRCS Soil Type | | | |

**Watershed Profile**

| | | | |
|---|---|---|---|
| Overland Slope (ft/ft) | | | |
| Overland Length (ft) | | | |
| Channel Slope (ft/ft) | | | |
| Channel Length (ft) | | | |

**Minor Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**Major Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**CALCULATED OUTPUT**

| | | | |
|---|---|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **1.8** | **3.8** | **0.3** |
| **Major Total Design Peak Flow, Q (cfs)** | **5.5** | **12.4** | **1.1** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 02A.1_01 | STRM INLET 02F_07 | STRM INLET 02F_06 |
|---|---|---|---|
| Site Type (Urban or Rural) | | | |
| Inlet Application (Street or Area) | STREET | STREET | STREET |
| Hydraulic Condition | In Sump | In Sump | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type C Grate | CDOT Type C Grate |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | | | |
|---|---|---|---|
| Minor $Q_{Known}$ (cfs) | 1.3 | 0.4 | 0.2 |
| Major $Q_{Known}$ (cfs) | 5.1 | 1.3 | 0.6 |

**Bypass (Carry-Over) Flow from Upstream**

| | | | |
|---|---|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |

**Watershed Characteristics**

| | | | |
|---|---|---|---|
| Subcatchment Area (acres) | | | |
| Percent Impervious | | | |
| NRCS Soil Type | | | |

**Watershed Profile**

| | | | |
|---|---|---|---|
| Overland Slope (ft/ft) | | | |
| Overland Length (ft) | | | |
| Channel Slope (ft/ft) | | | |
| Channel Length (ft) | | | |

**Minor Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**Major Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**CALCULATED OUTPUT**

| | | | |
|---|---|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **1.3** | **0.4** | **0.2** |
| **Major Total Design Peak Flow, Q (cfs)** | **5.1** | **1.3** | **0.6** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 02_04 |
|---|---|
| Site Type (Urban or Rural) | |
| Inlet Application (Street or Area) | STREET |
| Hydraulic Condition | In Sump |
| Inlet Type | CDOT Type C Grate |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | |
|---|---|
| Minor $Q_{Known}$ (cfs) | 0.4 |
| Major $Q_{Known}$ (cfs) | 4.9 |

**Bypass (Carry-Over) Flow from Upstream**

| | |
|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 |

**Watershed Characteristics**

| | |
|---|---|
| Subcatchment Area (acres) | |
| Percent Impervious | |
| NRCS Soil Type | |

**Watershed Profile**

| | |
|---|---|
| Overland Slope (ft/ft) | |
| Overland Length (ft) | |
| Channel Slope (ft/ft) | |
| Channel Length (ft) | |

**Minor Storm Rainfall Input**

| | |
|---|---|
| Design Storm Return Period, $T_r$ (years) | |
| One-Hour Precipitation, $P_1$ (inches) | |

**Major Storm Rainfall Input**

| | |
|---|---|
| Design Storm Return Period, $T_r$ (years) | |
| One-Hour Precipitation, $P_1$ (inches) | |

**CALCULATED OUTPUT**

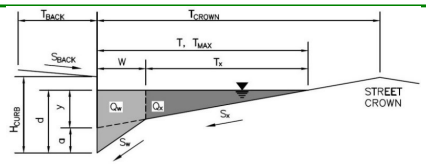
| | |
|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **0.4** |
| **Major Total Design Peak Flow, Q (cfs)** | **4.9** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 02G_01**




| Gutter Geometry: | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 35.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.017 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 55.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.017 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 15.0 | 25.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 6.0 | 9.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

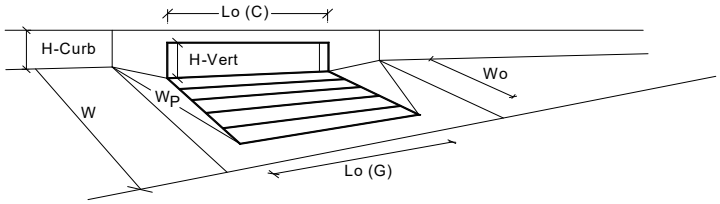
| Maximum Capacity for 1/2 Street based On Allowable Spread | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Water Depth without Gutter Depression (T * $S_x$ * 12) | y = | 3.06 | 5.10 | inches |
| Vertical Depth between Gutter Lip and Gutter Flowline (W * $S_w$ * 12) | $d_C$ = | 2.0 | 2.0 | inches |
| Gutter Depression ($d_C$ - (W * $S_x$ * 12)) | a = | 1.58 | 1.58 | inches |
| Water Depth at Gutter Flowline (y + a) | d = | 4.64 | 6.68 | inches |
| Allowable Spread for Discharge outside the Gutter Section (T - W) | $T_X$ = | 13.0 | 23.0 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.414 | 0.243 | |
| Discharge outside the Gutter Section, carried in Section $T_X$ | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_T$ - $Q_X$ - $Q_{BACK}$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Maximum Flow Based On Allowable Spread | **$Q_T$ =** | **SUMP** | **SUMP** | **cfs** |
| Flow Velocity within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |

| Maximum Capacity for 1/2 Street based on Allowable Depth | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Theoretical Water Spread | $T_{TH}$ = | 21.6 | 36.4 | ft |
| Theoretical Spread for Discharge outside the Gutter Section (T - W) | $T_{X\,TH}$ = | 19.6 | 34.4 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.284 | 0.163 | |
| Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$ | $Q_{X\,TH}$ = | 0.0 | 0.0 | cfs |
| Actual Discharge outside the Gutter Section, (limited by distance $T_{CROWN}$) | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_d$ - $Q_X$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | SUMP | SUMP | cfs |
| Average Flow Velocity Within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6" | R = | SUMP | SUMP | |
| Max Flow based on Allowable Depth (Safety Factor Applied) | **$Q_d$ =** | **SUMP** | **SUMP** | **cfs** |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | | | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | $d_{CROWN}$ = | | | inches |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| MINOR STORM Allowable Capacity is not applicable to Sump Condition | | | | |
| MAJOR STORM Allowable Capacity is not applicable to Sump Condition | **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



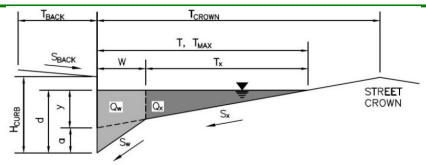

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 4.6 | 6.7 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.22 | 0.39 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **2.8** | **6.7** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 1.4 | 4.0 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 02F_01**




| Gutter Geometry: | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 63.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.017 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 63.0 | 63.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.6 | 12.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

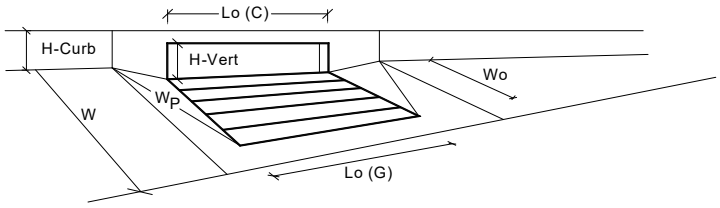
| Maximum Capacity for 1/2 Street based On Allowable Spread | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Water Depth without Gutter Depression (T * $S_x$ * 12) | y = | 12.78 | 12.78 | inches |
| Vertical Depth between Gutter Lip and Gutter Flowline (W * $S_w$ * 12) | $d_C$ = | 2.0 | 2.0 | inches |
| Gutter Depression ($d_C$ - (W * $S_x$ * 12)) | a = | 1.59 | 1.59 | inches |
| Water Depth at Gutter Flowline (y + a) | d = | 14.36 | 14.36 | inches |
| Allowable Spread for Discharge outside the Gutter Section (T - W) | $T_X$ = | 61.0 | 61.0 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.091 | 0.091 | |
| Discharge outside the Gutter Section, carried in Section $T_X$ | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_T$ - $Q_X$ - $Q_{BACK}$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Maximum Flow Based On Allowable Spread | **$Q_T$ =** | **SUMP** | **SUMP** | **cfs** |
| Flow Velocity within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |

| Maximum Capacity for 1/2 Street based on Allowable Depth | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Theoretical Water Spread | $T_{TH}$ = | 20.0 | 51.3 | ft |
| Theoretical Spread for Discharge outside the Gutter Section (T - W) | $T_{X\,TH}$ = | 18.0 | 49.3 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.309 | 0.113 | |
| Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$ | $Q_{X\,TH}$ = | 0.0 | 0.0 | cfs |
| Actual Discharge outside the Gutter Section, (limited by distance $T_{CROWN}$) | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_d$ - $Q_X$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | SUMP | SUMP | cfs |
| Average Flow Velocity Within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6" | R = | SUMP | SUMP | |
| Max Flow based on Allowable Depth (Safety Factor Applied) | **$Q_d$ =** | **SUMP** | **SUMP** | **cfs** |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | | | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | $d_{CROWN}$ = | | | inches |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| MINOR STORM Allowable Capacity is not applicable to Sump Condition | | | | |
| MAJOR STORM Allowable Capacity is not applicable to Sump Condition | **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*

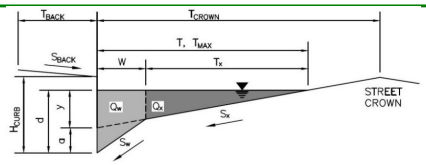



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 2 | 2 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.6 | 12.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.08 | 0.08 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.30 | 0.83 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 0.91 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **7.1** | **25.9** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 5.0 | 15.8 | cfs |

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 02F.2_01**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 81.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.018 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

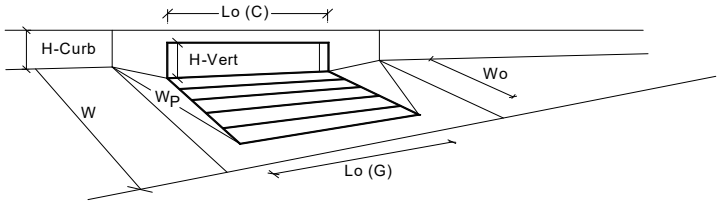
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 81.0 | 81.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.6 | 12.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



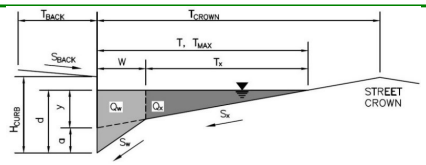

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 2 | 2 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.6 | 12.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.08 | 0.08 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.30 | 0.83 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 0.91 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **7.1** | **25.9** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 5.2 | 18.1 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 02E_01**




| Gutter Geometry: | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 15.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.005 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 40.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.017 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 30.0 | 30.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

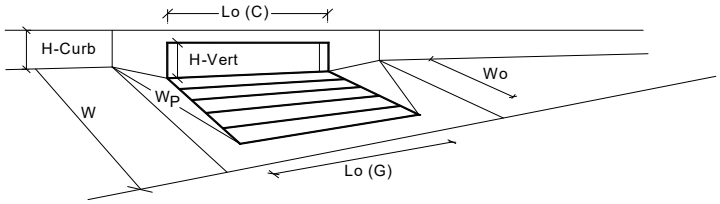
| Maximum Capacity for 1/2 Street based On Allowable Spread | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Water Depth without Gutter Depression (T * $S_x$ * 12) | y = | 5.94 | 5.94 | inches |
| Vertical Depth between Gutter Lip and Gutter Flowline (W * $S_w$ * 12) | $d_C$ = | 2.0 | 2.0 | inches |
| Gutter Depression ($d_C$ - (W * $S_x$ * 12)) | a = | 1.60 | 1.60 | inches |
| Water Depth at Gutter Flowline (y + a) | d = | 7.54 | 7.54 | inches |
| Allowable Spread for Discharge outside the Gutter Section (T - W) | $T_X$ = | 28.0 | 28.0 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.201 | 0.201 | |
| Discharge outside the Gutter Section, carried in Section $T_X$ | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_T$ - $Q_X$ - $Q_{BACK}$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Maximum Flow Based On Allowable Spread | **$Q_T$ =** | **SUMP** | **SUMP** | **cfs** |
| Flow Velocity within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |

| Maximum Capacity for 1/2 Street based on Allowable Depth | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Theoretical Water Spread | $T_{TH}$ = | 19.8 | 22.2 | ft |
| Theoretical Spread for Discharge outside the Gutter Section (T - W) | $T_{X\,TH}$ = | 17.8 | 20.2 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.314 | 0.278 | |
| Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$ | $Q_{X\,TH}$ = | 0.0 | 0.0 | cfs |
| Actual Discharge outside the Gutter Section, (limited by distance $T_{CROWN}$) | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_d$ - $Q_X$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | SUMP | SUMP | cfs |
| Average Flow Velocity Within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6" | R = | SUMP | SUMP | |
| Max Flow based on Allowable Depth (Safety Factor Applied) | **$Q_d$ =** | **SUMP** | **SUMP** | **cfs** |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | | | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | $d_{CROWN}$ = | | | inches |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| MINOR STORM Allowable Capacity is not applicable to Sump Condition | | | | |
| MAJOR STORM Allowable Capacity is not applicable to Sump Condition | **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

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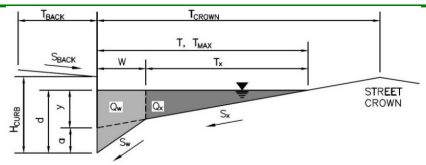



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.5 | 6.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.29 | 0.33 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **4.3** | **5.3** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.8 | 2.4 | cfs |

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 02D_01**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 21.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.029 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

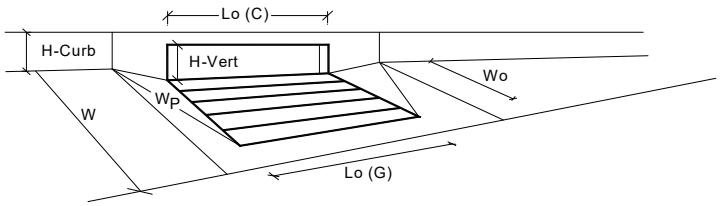
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 11.0 | 16.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*

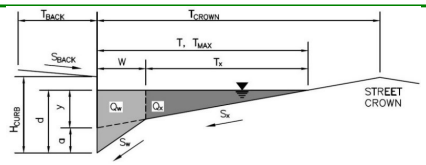



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.1 | 6.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.26 | 0.33 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **3.7** | **5.3** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.6 | 1.9 | cfs |

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 02D.4_01**




Gutter Geometry:

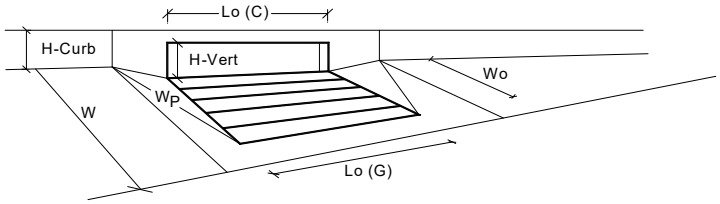
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 21.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.032 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 11.0 | 16.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| MINOR STORM Allowable Capacity is not applicable to Sump Condition | | | | |
| MAJOR STORM Allowable Capacity is not applicable to Sump Condition | | | | |
| | **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*

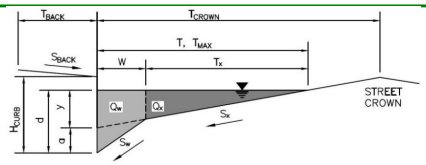



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.5 | 6.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.29 | 0.33 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **4.2** | **5.3** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 1.0 | 3.3 | cfs |

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 02D.3_01**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 21.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.022 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

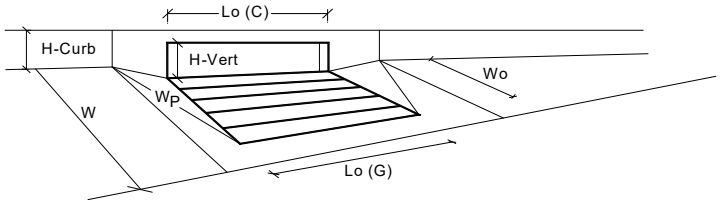
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 11.0 | 16.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



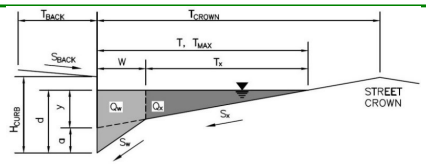

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 4.4 | 5.8 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.20 | 0.31 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **2.5** | **4.8** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.3 | 0.9 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 02D_05**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 34.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.011 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

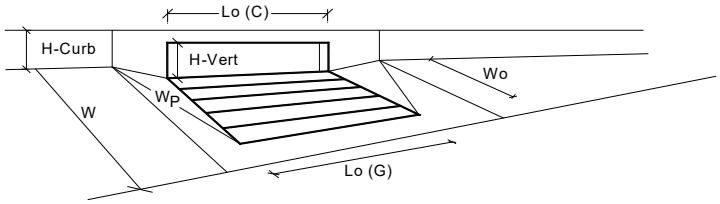
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 24.0 | 29.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



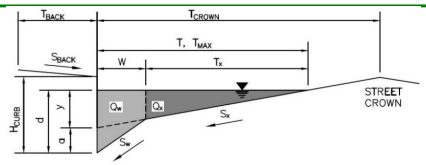

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 4.8 | 5.4 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.23 | 0.28 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **3.0** | **4.1** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.6 | 1.7 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 02C_01**




| Gutter Geometry: | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 34.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.025 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 24.0 | 24.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

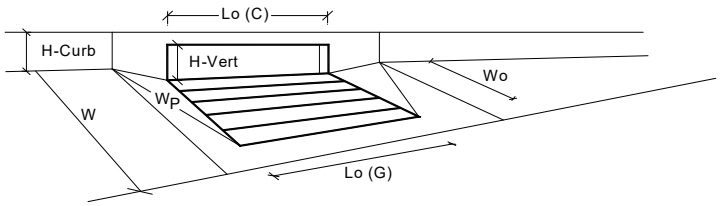
| Maximum Capacity for 1/2 Street based On Allowable Spread | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Water Depth without Gutter Depression (T * $S_x$ * 12) | y = | 7.20 | 7.20 | inches |
| Vertical Depth between Gutter Lip and Gutter Flowline (W * $S_w$ * 12) | $d_C$ = | 2.0 | 2.0 | inches |
| Gutter Depression ($d_C$ - (W * $S_x$ * 12)) | a = | 1.39 | 1.39 | inches |
| Water Depth at Gutter Flowline (y + a) | d = | 8.59 | 8.59 | inches |
| Allowable Spread for Discharge outside the Gutter Section (T - W) | $T_X$ = | 22.0 | 22.0 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.235 | 0.235 | |
| Discharge outside the Gutter Section, carried in Section $T_X$ | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_T$ - $Q_X$ - $Q_{BACK}$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Maximum Flow Based On Allowable Spread | **$Q_T$ =** | **SUMP** | **SUMP** | **cfs** |
| Flow Velocity within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |

| Maximum Capacity for 1/2 Street based on Allowable Depth | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Theoretical Water Spread | $T_{TH}$ = | 13.8 | 15.4 | ft |
| Theoretical Spread for Discharge outside the Gutter Section (T - W) | $T_{X\,TH}$ = | 11.8 | 13.4 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.409 | 0.368 | |
| Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$ | $Q_{X\,TH}$ = | 0.0 | 0.0 | cfs |
| Actual Discharge outside the Gutter Section, (limited by distance $T_{CROWN}$) | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_d$ - $Q_X$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | SUMP | SUMP | cfs |
| Average Flow Velocity Within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6" | R = | SUMP | SUMP | |
| Max Flow based on Allowable Depth (Safety Factor Applied) | **$Q_d$ =** | **SUMP** | **SUMP** | **cfs** |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | | | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | $d_{CROWN}$ = | | | inches |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| MINOR STORM Allowable Capacity is not applicable to Sump Condition | | | | |
| MAJOR STORM Allowable Capacity is not applicable to Sump Condition | **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*

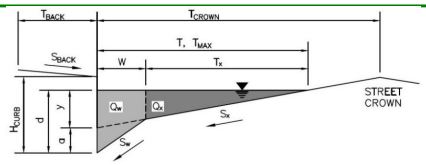



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.5 | 6.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.29 | 0.33 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **4.3** | **5.3** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 1.4 | 4.3 | cfs |

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 02B_01**




Gutter Geometry:

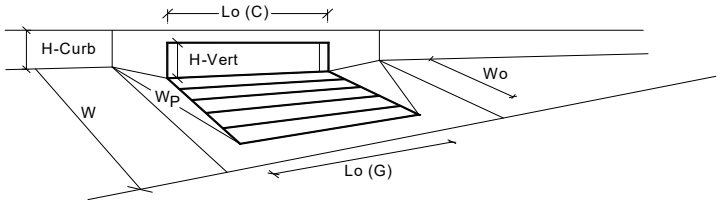
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 5.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 34.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 24.0 | 24.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 8.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| MINOR STORM Allowable Capacity is not applicable to Sump Condition | | | | |
| MAJOR STORM Allowable Capacity is not applicable to Sump Condition | **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*

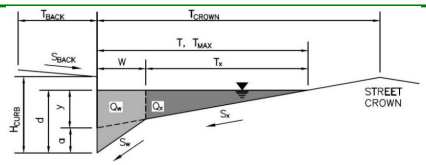



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.5 | 7.3 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.29 | 0.44 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **4.3** | **8.0** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 1.8 | 5.5 | cfs |

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 02A_03**




Gutter Geometry:

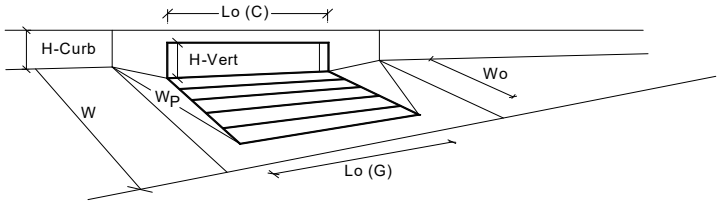
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 10.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 90.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.024 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 90.0 | 90.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 12.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

| | Minor Storm | Major Storm | |
|---|---|---|---|
| MINOR STORM Allowable Capacity is not applicable to Sump Condition | | | |
| MAJOR STORM Allowable Capacity is not applicable to Sump Condition | | | |
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*

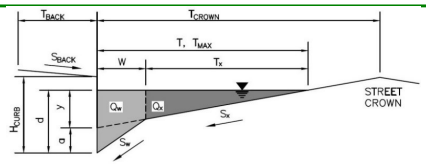



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 2 | 2 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.5 | 12.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.08 | 0.08 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.29 | 0.83 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 0.91 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **6.7** | **25.9** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 3.8 | 12.4 | cfs |

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 02A_02**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 5.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 13.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

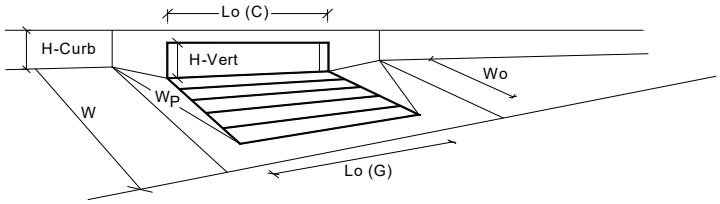
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 8.0 | 8.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 8.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*

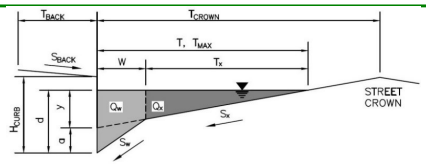



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 2 | 2 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 3.4 | 3.4 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.08 | 0.08 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.12 | 0.12 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 0.73 | 0.73 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **1.4** | **1.4** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.3 | 1.1 | cfs |

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 02A.1_01**




## Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 5.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 21.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 16.0 | 16.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 8.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

## Maximum Capacity for 1/2 Street based On Allowable Spread

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Water Depth without Gutter Depression (T * $S_x$ * 12) | y = | 3.84 | 3.84 | inches |
| Vertical Depth between Gutter Lip and Gutter Flowline (W * $S_w$ * 12) | $d_C$ = | 2.0 | 2.0 | inches |
| Gutter Depression ($d_C$ - (W * $S_x$ * 12)) | a = | 1.51 | 1.51 | inches |
| Water Depth at Gutter Flowline (y + a) | d = | 5.35 | 5.35 | inches |
| Allowable Spread for Discharge outside the Gutter Section (T - W) | $T_X$ = | 14.0 | 14.0 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.372 | 0.372 | |
| Discharge outside the Gutter Section, carried in Section $T_X$ | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_T$ - $Q_X$ - $Q_{BACK}$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Maximum Flow Based On Allowable Spread | **$Q_T$ =** | **SUMP** | **SUMP** | **cfs** |
| Flow Velocity within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |

## Maximum Capacity for 1/2 Street based on Allowable Depth

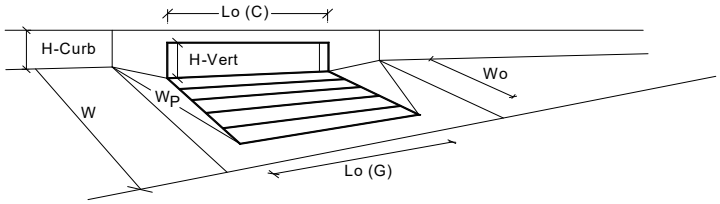
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Theoretical Water Spread | $T_{TH}$ = | 16.7 | 27.0 | ft |
| Theoretical Spread for Discharge outside the Gutter Section (T - W) | $T_{X\,TH}$ = | 14.7 | 25.0 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.357 | 0.216 | |
| Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$ | $Q_{X\,TH}$ = | 0.0 | 0.0 | cfs |
| Actual Discharge outside the Gutter Section, (limited by distance $T_{CROWN}$) | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_d$ - $Q_X$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | SUMP | SUMP | cfs |
| Average Flow Velocity Within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6" | R = | SUMP | SUMP | |
| Max Flow based on Allowable Depth (Safety Factor Applied) | **$Q_d$ =** | **SUMP** | **SUMP** | **cfs** |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | | | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | $d_{CROWN}$ = | | | inches |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



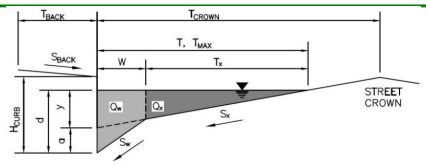

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 2 | 2 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.4 | 5.4 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.08 | 0.08 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.28 | 0.28 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 0.89 | 0.89 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **6.2** | **6.2** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 1.3 | 5.1 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 02F_07**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 0.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 90.0 | ft |
| Gutter Width | W = | 4.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.024 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

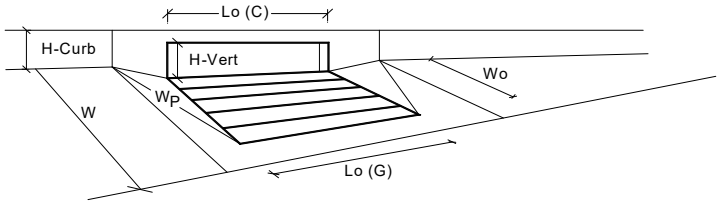
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 90.0 | 90.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 8.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*

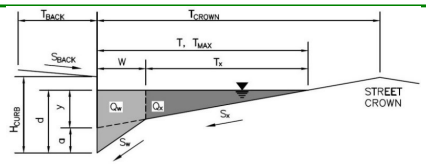



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type C Grate | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 0.00 | 0.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.5 | 8.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | 2.92 | 2.92 | feet |
| Width of a Unit Grate | $W_o$ = | 2.92 | 2.92 | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | 0.70 | 0.70 | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | 0.50 | 0.50 | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | 2.41 | 2.41 | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | 0.67 | 0.67 | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | N/A | N/A | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | N/A | N/A | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | N/A | N/A | inches |
| Angle of Throat | Theta = | N/A | N/A | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | N/A | N/A | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | N/A | N/A | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | N/A | N/A | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | N/A | N/A | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | 0.34 | 0.55 | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | N/A | N/A | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | N/A | N/A | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **1.7** | **3.6** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.4 | 1.3 | cfs |

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 02F_06**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 0.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 90.0 | ft |
| Gutter Width | W = | 4.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.024 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

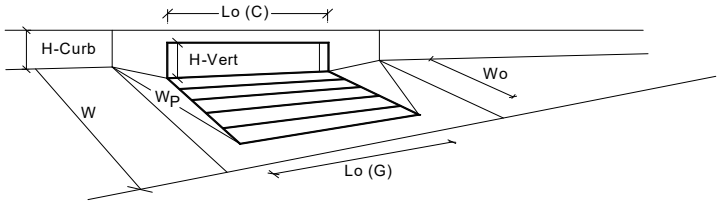
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 90.0 | 90.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 8.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



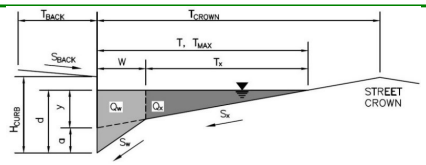

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type C Grate | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 0.00 | 0.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.5 | 8.0 | inches |
| **Grate Information** | | MINOR | MAJOR | Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | 2.92 | 2.92 | feet |
| Width of a Unit Grate | $W_o$ = | 2.92 | 2.92 | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | 0.70 | 0.70 | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | 0.50 | 0.50 | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | 2.41 | 2.41 | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | 0.67 | 0.67 | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | N/A | N/A | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | N/A | N/A | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | N/A | N/A | inches |
| Angle of Throat | Theta = | N/A | N/A | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | N/A | N/A | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | N/A | N/A | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | N/A | N/A | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | N/A | N/A | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | 0.34 | 0.55 | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | N/A | N/A | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | N/A | N/A | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **1.7** | **3.6** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.2 | 0.6 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 02_04**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 50.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.010 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.017 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 50.0 | ft |
| Gutter Width | W = | 3.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.010 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.017 | |

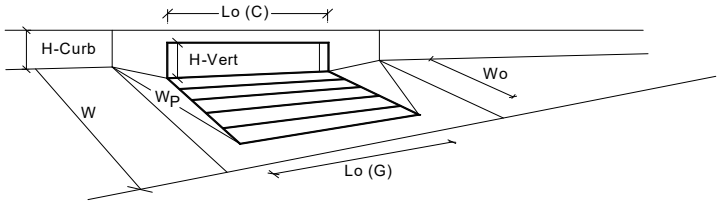
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 50.0 | 50.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 3.0 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*




| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type C Grate | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 0.00 | 0.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 3 | 3 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 3.0 | 6.0 | inches |
| **Grate Information** | | MINOR | MAJOR | Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | 2.92 | 2.92 | feet |
| Width of a Unit Grate | $W_o$ = | 2.92 | 2.92 | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | 0.70 | 0.70 | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | 0.50 | 0.50 | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | 2.41 | 2.41 | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | 0.67 | 0.67 | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | N/A | N/A | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | N/A | N/A | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | N/A | N/A | inches |
| Angle of Throat | Theta = | N/A | N/A | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | N/A | N/A | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | N/A | N/A | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | N/A | N/A | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | N/A | N/A | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | 0.13 | 0.38 | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | N/A | N/A | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | N/A | N/A | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **1.0** | **4.9** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.4 | 4.9 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 03_15 | STRM INLET 03G_05 | STRM INLET 03G.2_01 |
|---|---|---|---|
| Site Type (Urban or Rural) | | | |
| Inlet Application (Street or Area) | STREET | STREET | STREET |
| Hydraulic Condition | In Sump | In Sump | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type R Curb Opening | CDOT Type R Curb Opening |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | | | |
|---|---|---|---|
| Minor $Q_{Known}$ (cfs) | 4.9 | 7.0 | 7.8 |
| Major $Q_{Known}$ (cfs) | 16.1 | 22.5 | 25.9 |

**Bypass (Carry-Over) Flow from Upstream** Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

| | | | |
|---|---|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |

**Watershed Characteristics**

| | | | |
|---|---|---|---|
| Subcatchment Area (acres) | | | |
| Percent Impervious | | | |
| NRCS Soil Type | | | |

**Watershed Profile**

| | | | |
|---|---|---|---|
| Overland Slope (ft/ft) | | | |
| Overland Length (ft) | | | |
| Channel Slope (ft/ft) | | | |
| Channel Length (ft) | | | |

**Minor Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**Major Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**CALCULATED OUTPUT**

| | | | |
|---|---|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **4.9** | **7.0** | **7.8** |
| **Major Total Design Peak Flow, Q (cfs)** | **16.1** | **22.5** | **25.9** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 03G_01 | STRM INLET 03F_02 | STRM INLET 03F_01 |
|---|---|---|---|
| Site Type (Urban or Rural) | | | |
| Inlet Application (Street or Area) | STREET | STREET | STREET |
| Hydraulic Condition | In Sump | In Sump | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type R Curb Opening | CDOT Type R Curb Opening |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | | | |
|---|---|---|---|
| Minor $Q_{Known}$ (cfs) | 6.2 | 0.8 | 0.3 |
| Major $Q_{Known}$ (cfs) | 19.0 | 2.5 | 0.9 |

**Bypass (Carry-Over) Flow from Upstream**

| | | | |
|---|---|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |

**Watershed Characteristics**

| | | | |
|---|---|---|---|
| Subcatchment Area (acres) | | | |
| Percent Impervious | | | |
| NRCS Soil Type | | | |

**Watershed Profile**

| | | | |
|---|---|---|---|
| Overland Slope (ft/ft) | | | |
| Overland Length (ft) | | | |
| Channel Slope (ft/ft) | | | |
| Channel Length (ft) | | | |

**Minor Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**Major Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**CALCULATED OUTPUT**

| | | | |
|---|---|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **6.2** | **0.8** | **0.3** |
| **Major Total Design Peak Flow, Q (cfs)** | **19.0** | **2.5** | **0.9** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 03E.5_02 | STRM INLET 03E_01 | STRM INLET 03E.4_01 |
|---|---|---|---|
| Site Type (Urban or Rural) | | | |
| Inlet Application (Street or Area) | STREET | STREET | STREET |
| Hydraulic Condition | On Grade | In Sump | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type R Curb Opening | CDOT Type R Curb Opening |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | | | |
|---|---|---|---|
| Minor $Q_{Known}$ (cfs) | 3.3 | 1.0 | 0.4 |
| Major $Q_{Known}$ (cfs) | 10.2 | 3.1 | 1.3 |

**Bypass (Carry-Over) Flow from Upstream**

| | | | |
|---|---|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received | STRM INLET 03E.5_02 | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |

**Watershed Characteristics**

| | | | |
|---|---|---|---|
| Subcatchment Area (acres) | | | |
| Percent Impervious | | | |
| NRCS Soil Type | | | |

**Watershed Profile**

| | | | |
|---|---|---|---|
| Overland Slope (ft/ft) | | | |
| Overland Length (ft) | | | |
| Channel Slope (ft/ft) | | | |
| Channel Length (ft) | | | |

**Minor Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**Major Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**CALCULATED OUTPUT**

| | | | |
|---|---|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **3.3** | **1.0** | **0.4** |
| **Major Total Design Peak Flow, Q (cfs)** | **10.2** | **3.1** | **1.3** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | 0.0 | N/A | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | 0.0 | N/A | N/A |

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 03E.3_01 | STRM INLET 03E.3_02 | STRM INLET 03E.2_01 |
|---|---|---|---|
| Site Type (Urban or Rural) | | | |
| Inlet Application (Street or Area) | STREET | STREET | STREET |
| Hydraulic Condition | In Sump | In Sump | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type R Curb Opening | CDOT Type R Curb Opening |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | | | |
|---|---|---|---|
| Minor $Q_{Known}$ (cfs) | 0.7 | 1.6 | 0.9 |
| Major $Q_{Known}$ (cfs) | 2.1 | 4.9 | 2.9 |

**Bypass (Carry-Over) Flow from Upstream**

| | | | |
|---|---|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |

**Watershed Characteristics**

| | | | |
|---|---|---|---|
| Subcatchment Area (acres) | | | |
| Percent Impervious | | | |
| NRCS Soil Type | | | |

**Watershed Profile**

| | | | |
|---|---|---|---|
| Overland Slope (ft/ft) | | | |
| Overland Length (ft) | | | |
| Channel Slope (ft/ft) | | | |
| Channel Length (ft) | | | |

**Minor Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**Major Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**CALCULATED OUTPUT**

| | | | |
|---|---|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **0.7** | **1.6** | **0.9** |
| **Major Total Design Peak Flow, Q (cfs)** | **2.1** | **4.9** | **2.9** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 03E.2_02 | STRM INLET 03E.1_01 | STRM INLET 03E_07 |
|---|---|---|---|
| Site Type (Urban or Rural) | | | |
| Inlet Application (Street or Area) | STREET | STREET | STREET |
| Hydraulic Condition | In Sump | In Sump | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type R Curb Opening | CDOT Type R Curb Opening |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | | | |
|---|---|---|---|
| Minor $Q_{Known}$ (cfs) | 0.5 | 0.9 | 0.6 |
| Major $Q_{Known}$ (cfs) | 1.7 | 3.0 | 2.0 |

**Bypass (Carry-Over) Flow from Upstream**

| | | | |
|---|---|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |

**Watershed Characteristics**

| | | | |
|---|---|---|---|
| Subcatchment Area (acres) | | | |
| Percent Impervious | | | |
| NRCS Soil Type | | | |

**Watershed Profile**

| | | | |
|---|---|---|---|
| Overland Slope (ft/ft) | | | |
| Overland Length (ft) | | | |
| Channel Slope (ft/ft) | | | |
| Channel Length (ft) | | | |

**Minor Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**Major Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**CALCULATED OUTPUT**

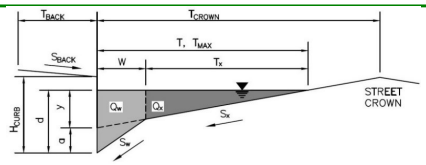
| | | | |
|---|---|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **0.5** | **0.9** | **0.6** |
| **Major Total Design Peak Flow, Q (cfs)** | **1.7** | **3.0** | **2.0** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03_15**




| Gutter Geometry: | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 20.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 65.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 45.0 | 55.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 6.0 | 9.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

| Maximum Capacity for 1/2 Street based On Allowable Spread | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Water Depth without Gutter Depression (T * $S_x$ * 12) | y = | 10.80 | 13.20 | inches |
| Vertical Depth between Gutter Lip and Gutter Flowline (W * $S_w$ * 12) | $d_C$ = | 2.0 | 2.0 | inches |
| Gutter Depression ($d_C$ - (W * $S_x$ * 12)) | a = | 1.51 | 1.51 | inches |
| Water Depth at Gutter Flowline (y + a) | d = | 12.31 | 14.71 | inches |
| Allowable Spread for Discharge outside the Gutter Section (T - W) | $T_X$ = | 43.0 | 53.0 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.127 | 0.103 | |
| Discharge outside the Gutter Section, carried in Section $T_X$ | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_T$ - $Q_X$ - $Q_{BACK}$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Maximum Flow Based On Allowable Spread | **$Q_T$ =** | **SUMP** | **SUMP** | **cfs** |
| Flow Velocity within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |

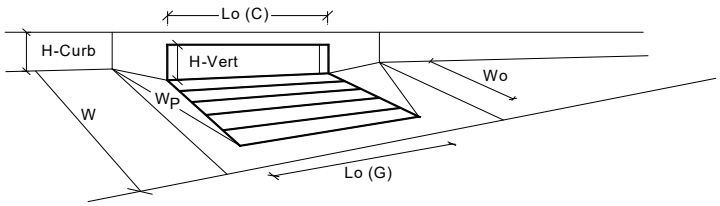
| Maximum Capacity for 1/2 Street based on Allowable Depth | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Theoretical Water Spread | $T_{TH}$ = | 18.7 | 31.2 | ft |
| Theoretical Spread for Discharge outside the Gutter Section (T - W) | $T_{X\,TH}$ = | 16.7 | 29.2 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.318 | 0.186 | |
| Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$ | $Q_{X\,TH}$ = | 0.0 | 0.0 | cfs |
| Actual Discharge outside the Gutter Section, (limited by distance $T_{CROWN}$) | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_d$ - $Q_X$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | SUMP | SUMP | cfs |
| Average Flow Velocity Within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6" | R = | SUMP | SUMP | |
| Max Flow based on Allowable Depth (Safety Factor Applied) | **$Q_d$ =** | **SUMP** | **SUMP** | **cfs** |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | | | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | $d_{CROWN}$ = | | | inches |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



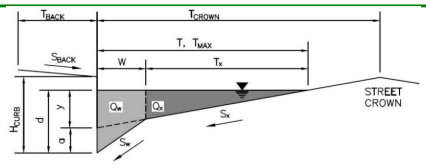

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 2 | 2 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.0 | 9.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.08 | 0.08 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.33 | 0.58 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 0.93 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **8.4** | **20.1** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 4.9 | 16.1 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03G_05**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 81.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.025 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

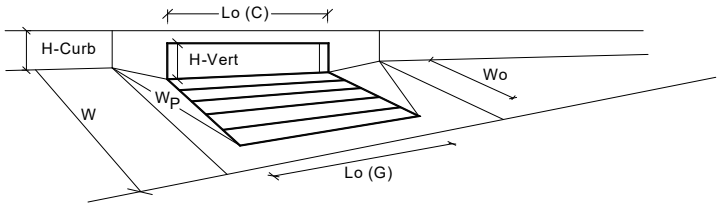
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 81.0 | 81.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 6.0 | 12.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



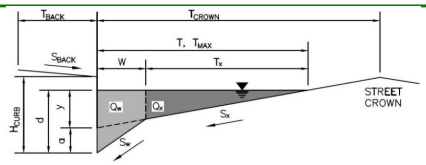

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 2 | 2 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.0 | 12.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.08 | 0.08 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.33 | 0.83 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 0.93 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **8.4** | **25.9** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 7.0 | 22.5 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03G.2_01**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 81.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.027 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

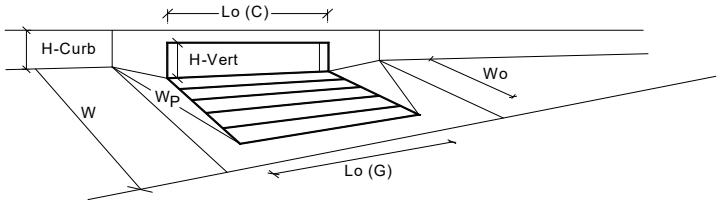
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 81.0 | 81.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 6.0 | 12.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



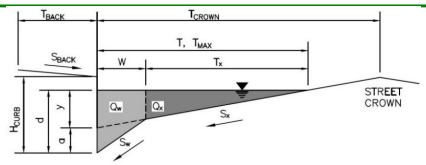

| | | | | | |
|---|---|---|---|---|---|
| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 3 | 3 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 6.0 | 12.0 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| **Warning 3** Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.05 | 0.05 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.33 | 0.83 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 0.79 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | | **$Q_a$ =** | **10.0** | **40.0** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | | $Q_{PEAK\ REQUIRED}$ = | 7.8 | 25.9 | cfs |

**Warning 3: Clogging Factor is not the recommended value for inlet type specified..**

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03G_01**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 81.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.028 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

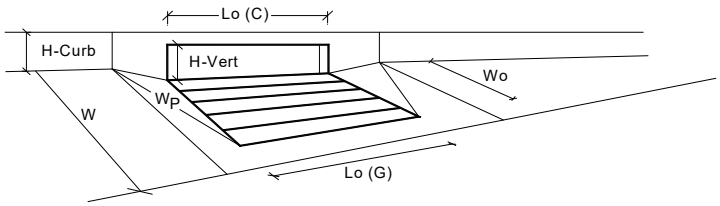
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 81.0 | 81.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 6.0 | 12.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*

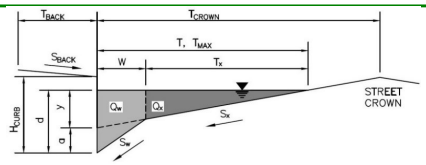



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 2 | 2 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.0 | 12.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.08 | 0.08 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.33 | 0.83 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 0.93 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **8.4** | **25.9** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 6.2 | 19.0 | cfs |

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03F_02**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 5.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 21.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

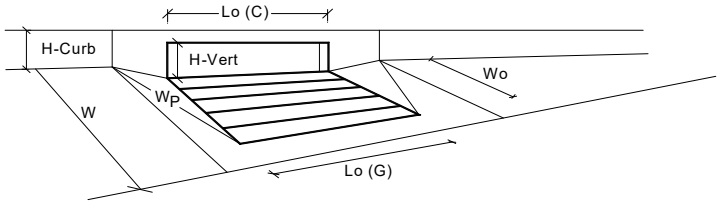
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 16.0 | 16.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



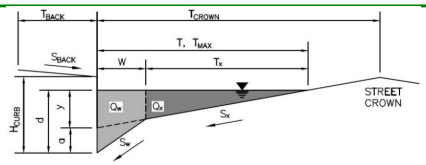

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.4 | 5.4 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.28 | 0.28 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **4.0** | **4.0** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.8 | 2.5 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03F_01**




Gutter Geometry:

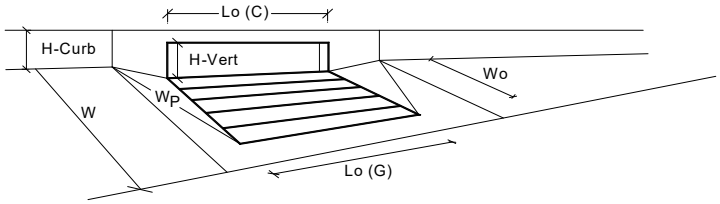
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 21.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 16.0 | 16.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| MINOR STORM Allowable Capacity is not applicable to Sump Condition | | | | |
| MAJOR STORM Allowable Capacity is not applicable to Sump Condition | **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



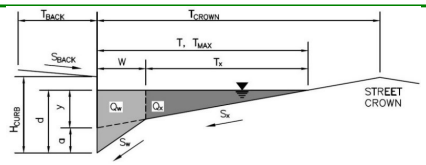

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.4 | 5.4 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.28 | 0.28 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **4.0** | **4.0** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.3 | 0.9 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03E.5_02**




## Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 16.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 13.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.009 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 8.0 | 8.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Allow Flow Depth at Street Crown (check box for yes, leave blank for no) | | ☐ | ☐ | |

## Maximum Capacity for 1/2 Street based On Allowable Spread

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Water Depth without Gutter Depression (T * $S_x$ * 12) | y = | 1.92 | 1.92 | inches |
| Vertical Depth between Gutter Lip and Gutter Flowline (W * $S_w$ * 12) | $d_C$ = | 2.0 | 2.0 | inches |
| Gutter Depression ($d_C$ - (W * $S_x$ * 12)) | a = | 1.51 | 1.51 | inches |
| Water Depth at Gutter Flowline (y + a) | d = | 3.43 | 3.43 | inches |
| Allowable Spread for Discharge outside the Gutter Section (T - W) | $T_X$ = | 6.0 | 6.0 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.688 | 0.688 | |
| Discharge outside the Gutter Section, carried in Section $T_X$ | $Q_X$ = | 0.6 | 0.6 | cfs |
| Discharge within the Gutter Section ($Q_T$ - $Q_X$ - $Q_{BACK}$) | $Q_W$ = | 1.3 | 1.3 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Maximum Flow Based On Allowable Spread | **$Q_T$ =** | **1.9** | **1.9** | **cfs** |
| Flow Velocity within the Gutter Section | V = | 3.2 | 3.2 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.9 | 0.9 | |

## Maximum Capacity for 1/2 Street based on Allowable Depth

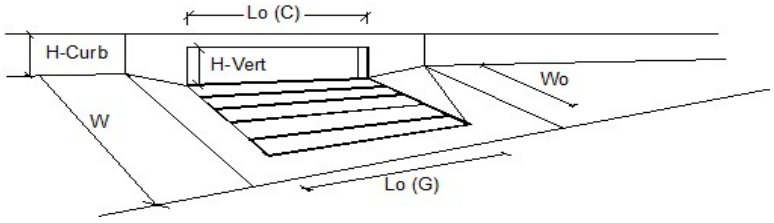
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Theoretical Water Spread | $T_{TH}$ = | 16.7 | 18.7 | ft |
| Theoretical Spread for Discharge outside the Gutter Section (T - W) | $T_{X\,TH}$ = | 14.7 | 16.7 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.357 | 0.318 | |
| Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$ | $Q_{X\,TH}$ = | 6.4 | 9.1 | cfs |
| Actual Discharge outside the Gutter Section, (limited by distance $T_{CROWN}$) | $Q_X$ = | 6.3 | 8.5 | cfs |
| Discharge within the Gutter Section ($Q_d$ - $Q_X$) | $Q_W$ = | 3.6 | 4.2 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | 9.9 | 12.8 | cfs |
| Average Flow Velocity Within the Gutter Section | V = | 4.7 | 5.1 | fps |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 2.2 | 2.5 | |
| Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6" | R = | 1.00 | 1.00 | |
| Max Flow based on Allowable Depth (Safety Factor Applied) | **$Q_d$ =** | **9.9** | **12.8** | **cfs** |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | 5.52 | 6.00 | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | $d_{CROWN}$ = | 0.89 | 1.37 | inches |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| MINOR STORM Allowable Capacity is based on Spread Criterion | | | | |
| MAJOR STORM Allowable Capacity is based on Spread Criterion | **$Q_{allow}$ =** | **1.9** | **1.9** | **cfs** |

**WARNING: MINOR STORM max. allowable capacity is less than the design peak flow of 3.34 cfs on sheet 'Inlet Management'**
**WARNING: MAJOR STORM max. allowable capacity is less than the design peak flow of 10.18 cfs on sheet 'Inlet Management'**

# INLET ON A CONTINUOUS GRADE

*MHFD-Inlet, Version 5.03 (August 2023)*

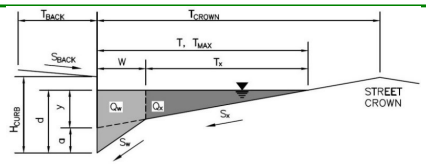



| | Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|---|
| | Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| | Local Depression (additional to continuous gutter depression 'a') | $a_{LOCAL}$ = | 3.0 | 3.0 | inches |
| | Total Number of Units in the Inlet (Grate or Curb Opening) | No = | 4 | 4 | |
| | Length of a Single Unit Inlet (Grate or Curb Opening) | $L_o$ = | 5.00 | 5.00 | ft |
| | Width of a Unit Grate (cannot be greater than W, Gutter Width) | $W_o$ = | N/A | N/A | ft |
| | Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | $C_f$ (G) = | N/A | N/A | |
| Warning 2 | Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | $C_f$ (C) = | 0.05 | 0.05 | |
| | **Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MINOR & MAJOR STORM** | | MINOR | MAJOR | |
| | Total Inlet Interception Capacity | **Q =** | **3.3** | **10.2** | **cfs** |
| | Total Inlet Carry-Over Flow (flow bypassing inlet) | **$Q_b$ =** | **0.0** | **0.0** | **cfs** |
| | Capture Percentage = $Q_a/Q_o$ | **C% =** | **100** | **100** | **%** |

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03E_01**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 20.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.017 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 12.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.019 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

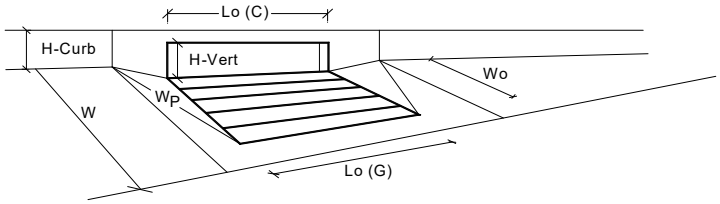
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 12.0 | 12.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 8.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



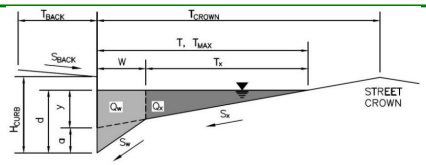

| | | | | | |
|---|---|---|---|---|---|
| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 3 | 3 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 4.2 | 4.2 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| **Warning 3** Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.05 | 0.05 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.19 | 0.19 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 0.66 | 0.66 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | | **$Q_a$ =** | **3.5** | **3.5** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | | $Q_{PEAK\ REQUIRED}$ = | 1.0 | 3.1 | cfs |

**Warning 3: Clogging Factor is not the recommended value for inlet type specified..**

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03E.4_01**




Gutter Geometry:

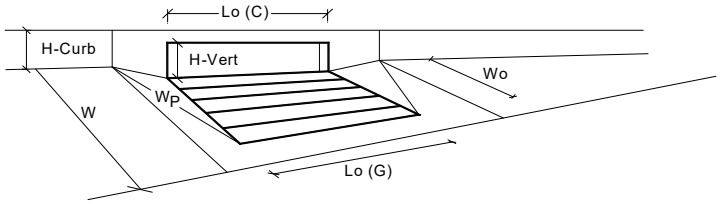
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 12.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 12.0 | 12.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| MINOR STORM Allowable Capacity is not applicable to Sump Condition | | | | |
| MAJOR STORM Allowable Capacity is not applicable to Sump Condition | | | | |
| | **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



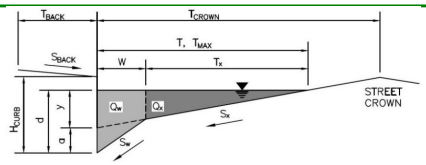

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 4.4 | 4.4 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.20 | 0.20 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **2.4** | **2.4** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.4 | 1.3 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03E.3_01**




## Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 21.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 16.0 | 16.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

## Maximum Capacity for 1/2 Street based On Allowable Spread

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Water Depth without Gutter Depression (T * $S_x$ * 12) | y = | 3.84 | 3.84 | inches |
| Vertical Depth between Gutter Lip and Gutter Flowline (W * $S_w$ * 12) | $d_C$ = | 2.0 | 2.0 | inches |
| Gutter Depression ($d_C$ - (W * $S_x$ * 12)) | a = | 1.51 | 1.51 | inches |
| Water Depth at Gutter Flowline (y + a) | d = | 5.35 | 5.35 | inches |
| Allowable Spread for Discharge outside the Gutter Section (T - W) | $T_X$ = | 14.0 | 14.0 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.372 | 0.372 | |
| Discharge outside the Gutter Section, carried in Section $T_X$ | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_T$ - $Q_X$ - $Q_{BACK}$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Maximum Flow Based On Allowable Spread | **$Q_T$ =** | **SUMP** | **SUMP** | **cfs** |
| Flow Velocity within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |

## Maximum Capacity for 1/2 Street based on Allowable Depth

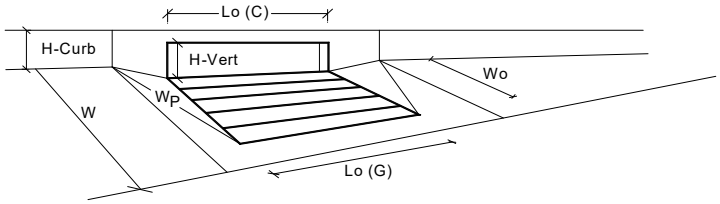
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Theoretical Water Spread | $T_{TH}$ = | 16.7 | 18.7 | ft |
| Theoretical Spread for Discharge outside the Gutter Section (T - W) | $T_{X\,TH}$ = | 14.7 | 16.7 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.357 | 0.318 | |
| Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$ | $Q_{X\,TH}$ = | 0.0 | 0.0 | cfs |
| Actual Discharge outside the Gutter Section, (limited by distance $T_{CROWN}$) | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_d$ - $Q_X$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | SUMP | SUMP | cfs |
| Average Flow Velocity Within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6" | R = | SUMP | SUMP | |
| Max Flow based on Allowable Depth (Safety Factor Applied) | **$Q_d$ =** | **SUMP** | **SUMP** | **cfs** |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | | | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | $d_{CROWN}$ = | | | inches |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*

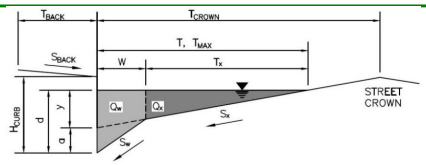



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.4 | 5.4 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on MHFD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as an Orifice (based on MHFD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| Resulting Grate Capacity (assumes clogged condition) | **$Q_{Grate}$ =** | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.00 | 1.00 | |
| Clogging Factor for Multiple Units | Clog = | 0.12 | 0.12 | |
| **Curb Capacity as a Weir (based on MHFD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 4.6 | 4.6 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 4.0 | 4.0 | cfs |
| **Curb Capacity as an Orifice (based on MHFD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 9.2 | 9.2 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 8.1 | 8.1 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 6.1 | 6.1 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 5.3 | 5.3 | cfs |
| Resulting Curb Opening Capacity (assumes clogged condition) | **$Q_{Curb}$ =** | **4.0** | **4.0** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 5.00 | 5.00 | feet |
| Resultant Street Flow Spread (based on street geometry from above) | T = | 16.0 | 16.0 | ft |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 0.0 | 0.0 | inches |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.28 | 0.28 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **4.0** | **4.0** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.7 | 2.1 | cfs |

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03E.3_02**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 13.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.035 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

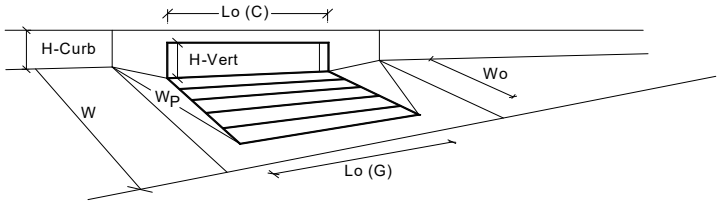
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 8.0 | 8.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 8.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



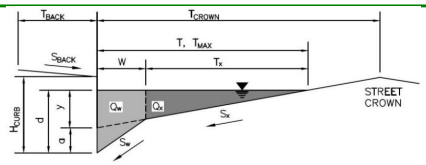

| | | | | | |
|---|---|---|---|---|---|
| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 4 | 4 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 4.5 | 4.5 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| **Warning 3** Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.05 | 0.05 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.21 | 0.21 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 0.68 | 0.68 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | | **$Q_a$ =** | **5.5** | **5.5** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | | $Q_{PEAK\ REQUIRED}$ = | 1.6 | 4.9 | cfs |

**Warning 3: Clogging Factor is not the recommended value for inlet type specified..**

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03E.2_01**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 21.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

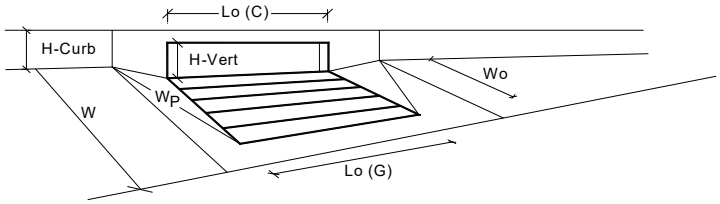
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 16.0 | 16.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



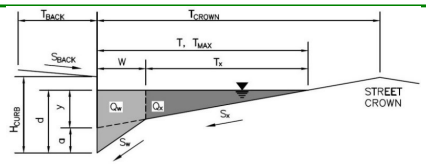

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.4 | 5.4 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.28 | 0.28 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **4.0** | **4.0** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.9 | 2.9 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03E.2_02**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 13.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

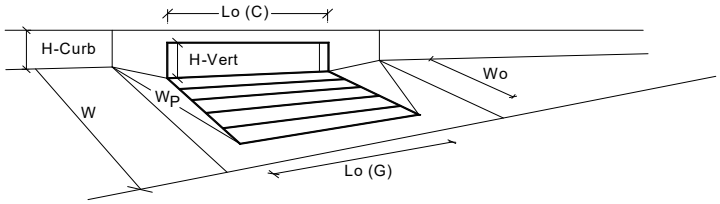
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 8.0 | 8.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



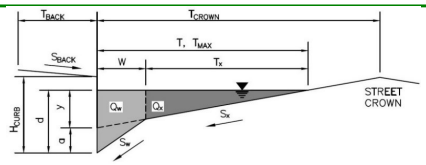

| | | | | | |
|---|---|---|---|---|---|
| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 4 | 4 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 3.4 | 3.4 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| **Warning 3** Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.05 | 0.05 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.12 | 0.12 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 0.58 | 0.58 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | | **$Q_a$ =** | **2.0** | **2.0** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | | $Q_{PEAK\ REQUIRED}$ = | 0.5 | 1.7 | cfs |

**Warning 3: Clogging Factor is not the recommended value for inlet type specified..**

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03E.1_01**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 21.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

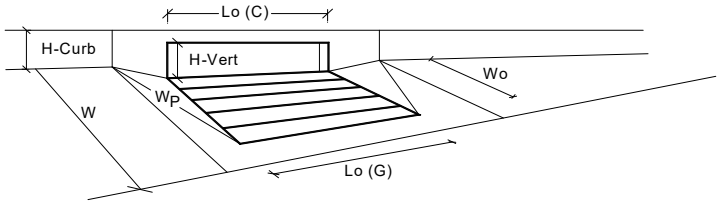
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 16.0 | 16.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*

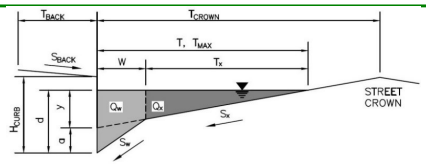



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 2 | 2 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.4 | 5.4 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.08 | 0.08 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.28 | 0.28 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 0.89 | 0.89 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **6.2** | **6.2** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.9 | 3.0 | cfs |

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03E_07**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 21.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

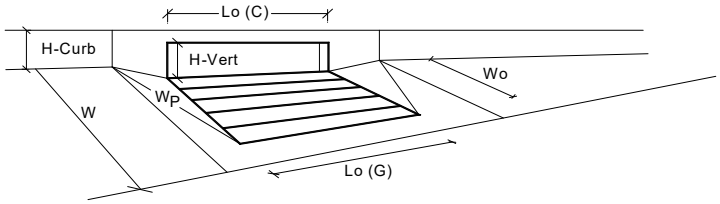
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 16.0 | 16.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*




| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 2 | 2 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.4 | 5.4 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.08 | 0.08 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.28 | 0.28 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 0.89 | 0.89 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **6.2** | **6.2** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.6 | 2.0 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 03D_02 | STRM INLET 03D_01 | STRM INLET 03B_02 |
|---|---|---|---|
| Site Type (Urban or Rural) | | | |
| Inlet Application (Street or Area) | STREET | STREET | STREET |
| Hydraulic Condition | In Sump | In Sump | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type R Curb Opening | CDOT Type R Curb Opening |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | | | |
|---|---|---|---|
| Minor $Q_{Known}$ (cfs) | 2.4 | 1.1 | 0.2 |
| Major $Q_{Known}$ (cfs) | 8.6 | 3.5 | 0.7 |

**Bypass (Carry-Over) Flow from Upstream** Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

| | | | |
|---|---|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |

**Watershed Characteristics**

| | | | |
|---|---|---|---|
| Subcatchment Area (acres) | | | |
| Percent Impervious | | | |
| NRCS Soil Type | | | |

**Watershed Profile**

| | | | |
|---|---|---|---|
| Overland Slope (ft/ft) | | | |
| Overland Length (ft) | | | |
| Channel Slope (ft/ft) | | | |
| Channel Length (ft) | | | |

**Minor Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**Major Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**CALCULATED OUTPUT**

| | | | |
|---|---|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **2.4** | **1.1** | **0.2** |
| **Major Total Design Peak Flow, Q (cfs)** | **8.6** | **3.5** | **0.7** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 03B_01 | STRM INLET 03A_06 | STRM INLET 03A_01 |
|---|---|---|---|
| Site Type (Urban or Rural) | | | |
| Inlet Application (Street or Area) | STREET | STREET | STREET |
| Hydraulic Condition | In Sump | In Sump | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type R Curb Opening | CDOT Type R Curb Opening |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | | | |
|---|---|---|---|
| Minor $Q_{Known}$ (cfs) | 0.4 | 0.9 | 1.8 |
| Major $Q_{Known}$ (cfs) | 1.1 | 2.8 | 5.7 |

**Bypass (Carry-Over) Flow from Upstream**

| | | | |
|---|---|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |

**Watershed Characteristics**

| | | | |
|---|---|---|---|
| Subcatchment Area (acres) | | | |
| Percent Impervious | | | |
| NRCS Soil Type | | | |

**Watershed Profile**

| | | | |
|---|---|---|---|
| Overland Slope (ft/ft) | | | |
| Overland Length (ft) | | | |
| Channel Slope (ft/ft) | | | |
| Channel Length (ft) | | | |

**Minor Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**Major Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**CALCULATED OUTPUT**

| | | | |
|---|---|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **0.4** | **0.9** | **1.8** |
| **Major Total Design Peak Flow, Q (cfs)** | **1.1** | **2.8** | **5.7** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 04A_02 | STRM INLET 04A_01 | STRM INLET 03C_01 |
|---|---|---|---|
| Site Type (Urban or Rural) | | | |
| Inlet Application (Street or Area) | STREET | STREET | STREET |
| Hydraulic Condition | In Sump | In Sump | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type R Curb Opening | CDOT Type C Grate |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | | | |
|---|---|---|---|
| Minor $Q_{Known}$ (cfs) | 6.1 | 1.9 | 0.3 |
| Major $Q_{Known}$ (cfs) | 13.6 | 7.7 | 1.1 |

**Bypass (Carry-Over) Flow from Upstream**

| | | | |
|---|---|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 | 0.0 |

**Watershed Characteristics**

| | | | |
|---|---|---|---|
| Subcatchment Area (acres) | | | |
| Percent Impervious | | | |
| NRCS Soil Type | | | |

**Watershed Profile**

| | | | |
|---|---|---|---|
| Overland Slope (ft/ft) | | | |
| Overland Length (ft) | | | |
| Channel Slope (ft/ft) | | | |
| Channel Length (ft) | | | |

**Minor Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**Major Storm Rainfall Input**

| | | | |
|---|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | | |
| One-Hour Precipitation, $P_1$ (inches) | | | |

**CALCULATED OUTPUT**

| | | | |
|---|---|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **6.1** | **1.9** | **0.3** |
| **Major Total Design Peak Flow, Q (cfs)** | **13.6** | **7.7** | **1.1** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A | N/A |

*MHFD-Inlet, Version 5.03 (August 2023)*

# INLET MANAGEMENT

Worksheet Protected

| **INLET NAME** | STRM INLET 03C_02 | STRM INLET 03C_03 |
|---|---|---|
| Site Type (Urban or Rural) | | |
| Inlet Application (Street or Area) | STREET | STREET |
| Hydraulic Condition | In Sump | In Sump |
| Inlet Type | CDOT Type C Grate | CDOT Type C Grate |

**USER-DEFINED INPUT**

**User-Defined Design Flows**

| | | |
|---|---|---|
| Minor $Q_{Known}$ (cfs) | 0.3 | 0.6 |
| Major $Q_{Known}$ (cfs) | 0.9 | 2.0 |

**Bypass (Carry-Over) Flow from Upstream**

| | | |
|---|---|---|
| Receive Bypass Flow from: | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0 | 0.0 |

**Watershed Characteristics**

| | | |
|---|---|---|
| Subcatchment Area (acres) | | |
| Percent Impervious | | |
| NRCS Soil Type | | |

**Watershed Profile**

| | | |
|---|---|---|
| Overland Slope (ft/ft) | | |
| Overland Length (ft) | | |
| Channel Slope (ft/ft) | | |
| Channel Length (ft) | | |

**Minor Storm Rainfall Input**

| | | |
|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | |
| One-Hour Precipitation, $P_1$ (inches) | | |

**Major Storm Rainfall Input**

| | | |
|---|---|---|
| Design Storm Return Period, $T_r$ (years) | | |
| One-Hour Precipitation, $P_1$ (inches) | | |

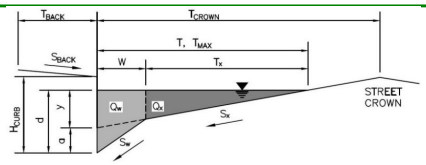
**CALCULATED OUTPUT**

| | | |
|---|---|---|
| **Minor Total Design Peak Flow, Q (cfs)** | **0.3** | **0.6** |
| **Major Total Design Peak Flow, Q (cfs)** | **0.9** | **2.0** |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A | N/A |

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03D_02**




## Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 9.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.020 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 21.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 16.0 | 16.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

## Maximum Capacity for 1/2 Street based On Allowable Spread

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Water Depth without Gutter Depression (T * $S_x$ * 12) | y = | 3.86 | 3.86 | inches |
| Vertical Depth between Gutter Lip and Gutter Flowline (W * $S_w$ * 12) | $d_C$ = | 2.0 | 2.0 | inches |
| Gutter Depression ($d_C$ - (W * $S_x$ * 12)) | a = | 1.51 | 1.51 | inches |
| Water Depth at Gutter Flowline (y + a) | d = | 5.37 | 5.37 | inches |
| Allowable Spread for Discharge outside the Gutter Section (T - W) | $T_X$ = | 14.0 | 14.0 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.372 | 0.372 | |
| Discharge outside the Gutter Section, carried in Section $T_X$ | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_T$ - $Q_X$ - $Q_{BACK}$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Maximum Flow Based On Allowable Spread | **$Q_T$ =** | **SUMP** | **SUMP** | **cfs** |
| Flow Velocity within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |

## Maximum Capacity for 1/2 Street based on Allowable Depth

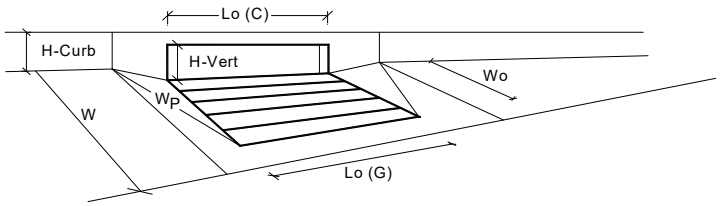
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Theoretical Water Spread | $T_{TH}$ = | 16.6 | 18.6 | ft |
| Theoretical Spread for Discharge outside the Gutter Section (T - W) | $T_{X\,TH}$ = | 14.6 | 16.6 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.358 | 0.319 | |
| Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$ | $Q_{X\,TH}$ = | 0.0 | 0.0 | cfs |
| Actual Discharge outside the Gutter Section, (limited by distance $T_{CROWN}$) | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_d$ - $Q_X$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | SUMP | SUMP | cfs |
| Average Flow Velocity Within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6" | R = | SUMP | SUMP | |
| Max Flow based on Allowable Depth (Safety Factor Applied) | **$Q_d$ =** | **SUMP** | **SUMP** | **cfs** |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | | | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | $d_{CROWN}$ = | | | inches |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*




| | | | MINOR | MAJOR | |
|---|---|---|---|---|---|
| **Design Information (Input)** | | | | | |
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 4 | 4 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 5.4 | 5.4 | inches |
| **Grate Information** | | | MINOR | MAJOR | Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | Warning 3 | $C_f$ (C) = | 0.05 | 0.05 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.28 | 0.28 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 0.75 | 0.75 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | | **$Q_a$ =** | **9.3** | **9.3** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | | $Q_{PEAK\ REQUIRED}$ = | 2.4 | 8.6 | cfs |

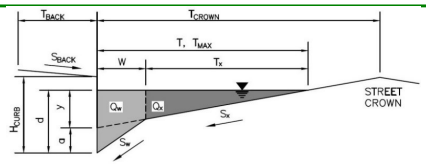
**Warning 3: Clogging Factor is not the recommended value for inlet type specified..**

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03D_01**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 44.8 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.027 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 21.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

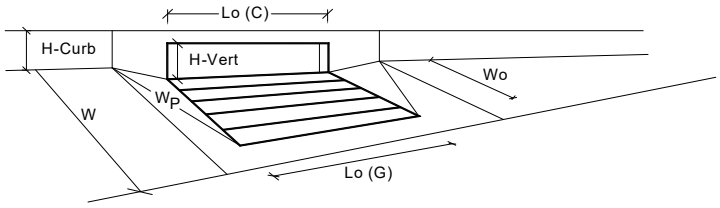
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 16.0 | 16.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*

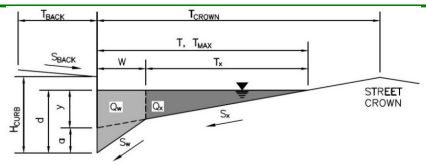



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.4 | 5.4 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.28 | 0.28 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **4.0** | **4.0** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 1.1 | 3.5 | cfs |

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03B_02**




Gutter Geometry:

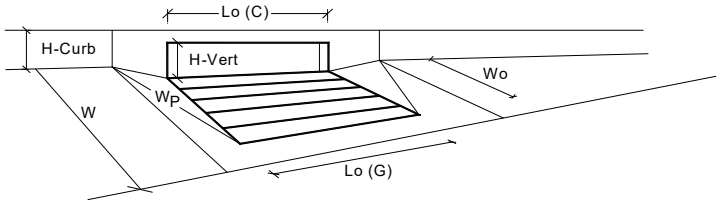
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 17.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.000 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.020 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 21.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 16.0 | 16.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| MINOR STORM Allowable Capacity is not applicable to Sump Condition | | | | |
| MAJOR STORM Allowable Capacity is not applicable to Sump Condition | **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



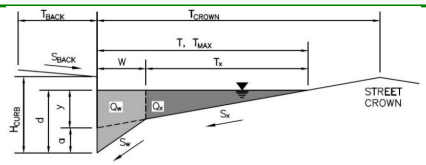

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.4 | 5.4 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.28 | 0.28 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **4.0** | **4.0** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.2 | 0.7 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03B_01**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 17.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 13.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

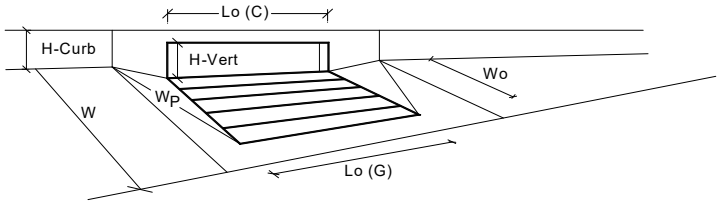
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 8.0 | 8.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



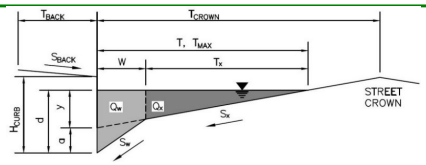

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 3.4 | 3.4 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.12 | 0.12 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 0.98 | 0.98 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **1.1** | **1.1** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.4 | 1.1 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03A_06**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 30.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.030 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.020 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 27.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.025 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

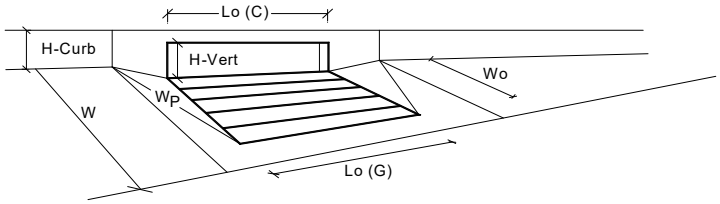
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 17.0 | 17.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 8.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



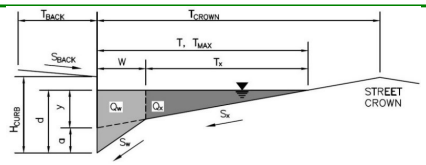

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.5 | 6.5 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.29 | 0.38 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **4.3** | **6.3** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.9 | 2.8 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03A_01**




Gutter Geometry:

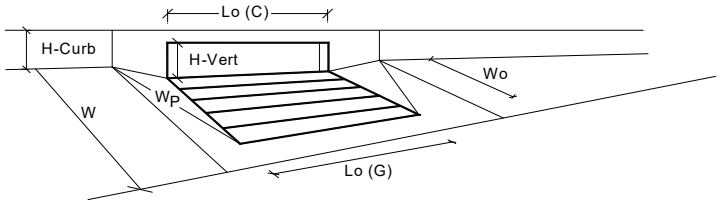
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 20.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.023 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.017 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 60.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.015 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 50.0 | 50.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 8.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| MINOR STORM Allowable Capacity is not applicable to Sump Condition | | | | |
| MAJOR STORM Allowable Capacity is not applicable to Sump Condition | | | | |
| | **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



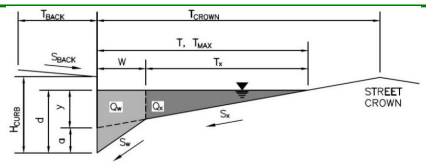

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.5 | 8.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.29 | 0.50 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **4.3** | **9.1** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 1.8 | 5.7 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 04A_02**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 10.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 35.5 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

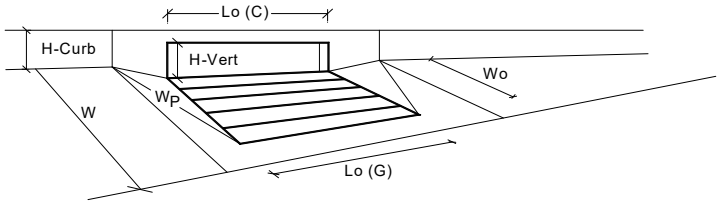
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 30.5 | 30.5 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.6 | 8.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*




| | | | | | |
|---|---|---|---|---|---|
| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 3 | 3 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 5.6 | 8.0 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| **Warning 3** Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.05 | 0.05 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.30 | 0.50 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 0.76 | 0.89 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | | **$Q_a$ =** | **8.4** | **20.7** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | | $Q_{PEAK\ REQUIRED}$ = | 6.1 | 13.6 | cfs |

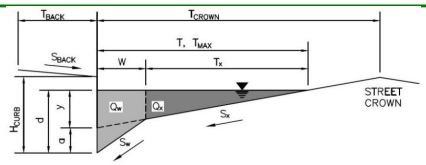
**Warning 3: Clogging Factor is not the recommended value for inlet type specified..**

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 04A_01**




| Gutter Geometry: | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 2.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 35.5 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 30.5 | 30.5 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.6 | 8.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

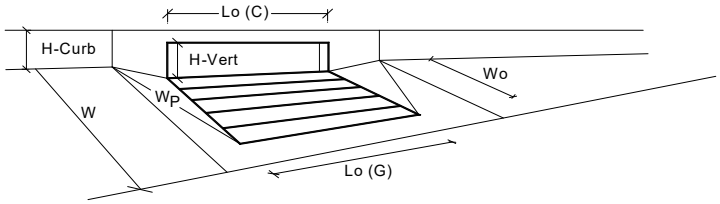
| Maximum Capacity for 1/2 Street based On Allowable Spread | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Water Depth without Gutter Depression (T * $S_x$ * 12) | y = | 7.32 | 7.32 | inches |
| Vertical Depth between Gutter Lip and Gutter Flowline (W * $S_w$ * 12) | $d_C$ = | 2.0 | 2.0 | inches |
| Gutter Depression ($d_C$ - (W * $S_x$ * 12)) | a = | 1.51 | 1.51 | inches |
| Water Depth at Gutter Flowline (y + a) | d = | 8.83 | 8.83 | inches |
| Allowable Spread for Discharge outside the Gutter Section (T - W) | $T_X$ = | 28.5 | 28.5 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.191 | 0.191 | |
| Discharge outside the Gutter Section, carried in Section $T_X$ | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_T$ - $Q_X$ - $Q_{BACK}$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Maximum Flow Based On Allowable Spread | **$Q_T$ =** | **SUMP** | **SUMP** | **cfs** |
| Flow Velocity within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |

| Maximum Capacity for 1/2 Street based on Allowable Depth | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Theoretical Water Spread | $T_{TH}$ = | 17.2 | 27.0 | ft |
| Theoretical Spread for Discharge outside the Gutter Section (T - W) | $T_{X\,TH}$ = | 15.2 | 25.0 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.346 | 0.216 | |
| Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$ | $Q_{X\,TH}$ = | 0.0 | 0.0 | cfs |
| Actual Discharge outside the Gutter Section, (limited by distance $T_{CROWN}$) | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_d$ - $Q_X$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | SUMP | SUMP | cfs |
| Average Flow Velocity Within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6" | R = | SUMP | SUMP | |
| Max Flow based on Allowable Depth (Safety Factor Applied) | **$Q_d$ =** | **SUMP** | **SUMP** | **cfs** |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | | | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | $d_{CROWN}$ = | | | inches |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| MINOR STORM Allowable Capacity is not applicable to Sump Condition | | | | |
| MAJOR STORM Allowable Capacity is not applicable to Sump Condition | **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



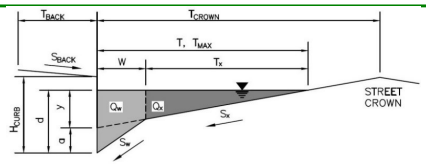

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.6 | 8.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.12 | 0.12 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.30 | 0.50 | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **4.6** | **9.1** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 1.9 | 7.7 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03C_01**




| Gutter Geometry: | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 20.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 20.0 | ft |
| Gutter Width | W = | 4.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.013 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 20.0 | 20.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

| Maximum Capacity for 1/2 Street based On Allowable Spread | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Water Depth without Gutter Depression (T * $S_x$ * 12) | y = | 4.80 | 4.80 | inches |
| Vertical Depth between Gutter Lip and Gutter Flowline (W * $S_w$ * 12) | $d_C$ = | 4.0 | 4.0 | inches |
| Gutter Depression ($d_C$ - (W * $S_x$ * 12)) | a = | 3.02 | 3.02 | inches |
| Water Depth at Gutter Flowline (y + a) | d = | 7.82 | 7.82 | inches |
| Allowable Spread for Discharge outside the Gutter Section (T - W) | $T_X$ = | 16.0 | 16.0 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.577 | 0.577 | |
| Discharge outside the Gutter Section, carried in Section $T_X$ | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_T$ - $Q_X$ - $Q_{BACK}$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Maximum Flow Based On Allowable Spread | **$Q_T$ =** | **SUMP** | **SUMP** | **cfs** |
| Flow Velocity within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |

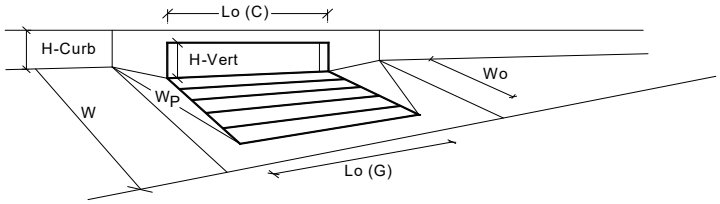
| Maximum Capacity for 1/2 Street based on Allowable Depth | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Theoretical Water Spread | $T_{TH}$ = | 10.4 | 12.4 | ft |
| Theoretical Spread for Discharge outside the Gutter Section (T - W) | $T_{X\,TH}$ = | 6.4 | 8.4 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7) | $E_O$ = | 0.876 | 0.807 | |
| Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$ | $Q_{X\,TH}$ = | 0.0 | 0.0 | cfs |
| Actual Discharge outside the Gutter Section, (limited by distance $T_{CROWN}$) | $Q_X$ = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section ($Q_d$ - $Q_X$) | $Q_W$ = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | SUMP | SUMP | cfs |
| Average Flow Velocity Within the Gutter Section | V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6" | R = | SUMP | SUMP | |
| Max Flow based on Allowable Depth (Safety Factor Applied) | **$Q_d$ =** | **SUMP** | **SUMP** | **cfs** |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | | | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | $d_{CROWN}$ = | | | inches |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



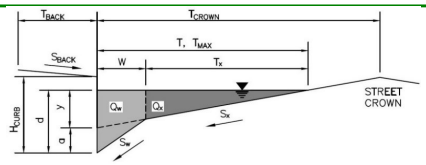

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type C Grate | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 0.00 | 0.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.5 | 6.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☐ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | 2.92 | 2.92 | feet |
| Width of a Unit Grate | $W_o$ = | 2.92 | 2.92 | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | 0.70 | 0.70 | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | 0.50 | 0.50 | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | 2.41 | 2.41 | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | 0.67 | 0.67 | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | N/A | N/A | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | N/A | N/A | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | N/A | N/A | inches |
| Angle of Throat | Theta = | N/A | N/A | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | N/A | N/A | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | N/A | N/A | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | N/A | N/A | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | N/A | N/A | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | 0.34 | 0.38 | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | N/A | N/A | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | N/A | N/A | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **1.7** | **2.1** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.3 | 1.1 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03C_02**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 20.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 20.0 | ft |
| Gutter Width | W = | 4.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.013 | |

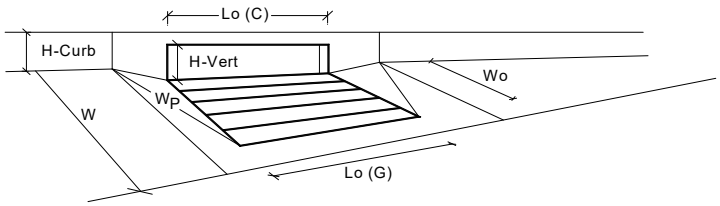
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 20.0 | 20.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*



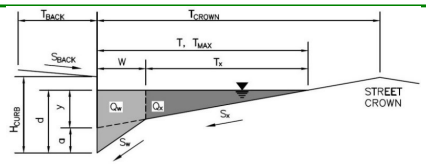

| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type C Grate | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 0.00 | 0.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.5 | 6.0 | inches |
| **Grate Information** | | MINOR | MAJOR | Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | 2.92 | 2.92 | feet |
| Width of a Unit Grate | $W_o$ = | 2.92 | 2.92 | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | 0.70 | 0.70 | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | 0.50 | 0.50 | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | 2.41 | 2.41 | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | 0.67 | 0.67 | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | N/A | N/A | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | N/A | N/A | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | N/A | N/A | inches |
| Angle of Throat | Theta = | N/A | N/A | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | N/A | N/A | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | N/A | N/A | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | N/A | N/A | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | N/A | N/A | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | 0.34 | 0.38 | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | N/A | N/A | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | N/A | N/A | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **1.7** | **2.1** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.3 | 0.9 | cfs |

*MHFD-Inlet, Version 5.03 (August 2023)*

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** **Avenue South**
**Inlet ID:** **STRM INLET 03C_03**




Gutter Geometry:

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 20.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 20.0 | ft |
| Gutter Width | W = | 4.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.013 | |

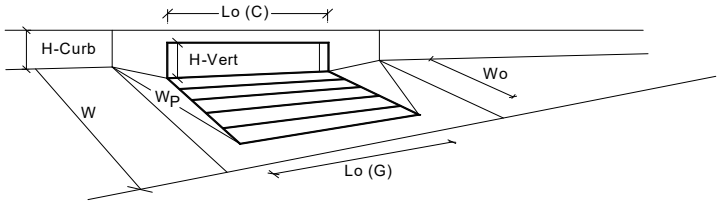
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 20.0 | 20.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.5 | 6.0 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

| | Minor Storm | Major Storm | |
|---|---|---|---|
| **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

*MHFD-Inlet, Version 5.03 (August 2023)*




| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type C Grate | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 0.00 | 0.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 5.5 | 6.0 | inches |
| **Grate Information** | | MINOR | MAJOR | Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | 2.92 | 2.92 | feet |
| Width of a Unit Grate | $W_o$ = | 2.92 | 2.92 | feet |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | 0.70 | 0.70 | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | 0.50 | 0.50 | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | 2.41 | 2.41 | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | 0.67 | 0.67 | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | N/A | N/A | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | N/A | N/A | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | N/A | N/A | inches |
| Angle of Throat | Theta = | N/A | N/A | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | N/A | N/A | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | N/A | N/A | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | N/A | N/A | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | N/A | N/A | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | 0.34 | 0.38 | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | N/A | N/A | ft |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | N/A | N/A | |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (assumes clogged condition) | **$Q_a$ =** | **1.7** | **2.1** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)** | $Q_{PEAK\ REQUIRED}$ = | 0.6 | 2.0 | cfs |

# APPENDIX E – STORM SEWER CALCULATIONS

Autodesk Storm and Sanitary Analysis – 2yr Node Summary
Autodesk Storm and Sanitary Analysis – 2yr Link Summary

Autodesk Storm and Sanitary Analysis – 100yr Node Summary
Autodesk Storm and Sanitary Analysis – 100yr Link Summary

MINOR 2-YEAR

## Node Summary

| SN | Element ID | Element Type | Invert Elevation (ft) | Ground/Rim (Max) Elevation (ft) | Initial Water Elevation (ft) | Surcharge Elevation (ft) | Ponded Area ($ft^2$) | Peak Inflow (cfs) | Max HGL Elevation Attained (ft) | Max Surcharge Depth Attained (ft) | Min Freeboard Attained (ft) | Time of Peak Flooding Occurrence (days hh:mm) | Total Flooded Volume (ac-in) | Total Time Flooded (min) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | B11 ROOF DRAIN | Junction | 4922.48 | 4926.46 | 0.00 | 0.00 | 0.00 | 1.24 | 4922.84 | 0.00 | 3.62 | 0 00:00 | 0.00 | 0.00 |
| 2 | B15 ROOF DRAIN | Junction | 4920.91 | 4925.54 | 0.00 | 0.00 | 0.00 | 1.97 | 4921.49 | 0.00 | 4.05 | 0 00:00 | 0.00 | 0.00 |
| 3 | B17 ROOF DRAIN | Junction | 4920.84 | 4926.06 | 0.00 | 0.00 | 0.00 | 2.12 | 4921.47 | 0.00 | 4.59 | 0 00:00 | 0.00 | 0.00 |
| 4 | B4 ROOF DRAIN | Junction | 4920.40 | 4925.56 | 0.00 | 0.00 | 0.00 | 1.53 | 4921.03 | 0.00 | 4.53 | 0 00:00 | 0.00 | 0.00 |
| 5 | B6 ROOF DRAIN | Junction | 4921.22 | 4925.40 | 0.00 | 0.00 | 0.00 | 1.39 | 4921.64 | 0.00 | 3.76 | 0 00:00 | 0.00 | 0.00 |
| 6 | B8 ROOF DRAIN | Junction | 4921.88 | 4926.18 | 0.00 | 0.00 | 0.00 | 2.77 | 4922.46 | 0.00 | 3.72 | 0 00:00 | 0.00 | 0.00 |
| 7 | D18 ROOF DRAIN | Junction | 4922.07 | 4926.17 | 0.00 | 0.00 | 0.00 | 2.48 | 4922.68 | 0.00 | 3.49 | 0 00:00 | 0.00 | 0.00 |
| 8 | D2 ROOF DRAIN | Junction | 4921.19 | 4926.46 | 0.00 | 0.00 | 0.00 | 2.43 | 4921.93 | 0.00 | 4.53 | 0 00:00 | 0.00 | 0.00 |
| 9 | D26 ROOF DRAIN | Junction | 4921.33 | 4925.62 | 0.00 | 0.00 | 0.00 | 3.28 | 4922.17 | 0.00 | 3.45 | 0 00:00 | 0.00 | 0.00 |
| 10 | D27 ROOF DRAIN | Junction | 4922.23 | 4925.62 | 0.00 | 0.00 | 0.00 | 4.31 | 4923.02 | 0.00 | 2.60 | 0 00:00 | 0.00 | 0.00 |
| 11 | D30 ROOF DRAIN | Junction | 4921.61 | 4925.90 | 0.00 | 0.00 | 0.00 | 2.15 | 4922.23 | 0.00 | 3.67 | 0 00:00 | 0.00 | 0.00 |
| 12 | EX_INLET_OS1 | Junction | 4926.64 | 4931.09 | 0.00 | 0.00 | 0.00 | 13.08 | 4928.04 | 0.00 | 3.05 | 0 00:00 | 0.00 | 0.00 |
| 13 | EX_INLET_OS2 | Junction | 4928.27 | 4931.72 | 0.00 | 0.00 | 0.00 | 2.95 | 4928.85 | 0.00 | 2.87 | 0 00:00 | 0.00 | 0.00 |
| 14 | EX_INLET_OS3 | Junction | 4929.68 | 4932.43 | 0.00 | 0.00 | 0.00 | 10.75 | 4930.35 | 0.00 | 2.08 | 0 00:00 | 0.00 | 0.00 |
| 15 | EX_INLET_OS4 | Junction | 4926.47 | 4928.47 | 0.00 | 0.00 | 0.00 | 19.13 | 4928.47 | 0.00 | 0.00 | 0 00:05 | 0.01 | 1.00 |
| 16 | ROOF DRAIN A2 | Junction | 4921.25 | 4925.00 | 0.00 | 0.00 | 0.00 | 6.20 | 4922.08 | 0.00 | 2.92 | 0 00:00 | 0.00 | 0.00 |
| 17 | ROOF DRAIN C1 | Junction | 4918.38 | 4925.90 | 0.00 | 0.00 | 0.00 | 9.93 | 4919.03 | 0.00 | 6.87 | 0 00:00 | 0.00 | 0.00 |
| 18 | STRM FES 01_01 | Junction | 4907.08 | 4915.05 | 0.00 | 0.00 | 0.00 | 92.37 | 4909.76 | 0.00 | 5.29 | 0 00:00 | 0.00 | 0.00 |
| 19 | STRM FES 02_01 | Junction | 4906.60 | 4915.54 | 0.00 | 0.00 | 0.00 | 113.00 | 4909.53 | 0.00 | 6.01 | 0 00:00 | 0.00 | 0.00 |
| 20 | STRM FES 03_01 | Junction | 4905.47 | 4915.00 | 0.00 | 0.00 | 0.00 | 228.86 | 4907.89 | 0.00 | 7.11 | 0 00:00 | 0.00 | 0.00 |
| 21 | STRM INLET 01_02 | Junction | 4907.53 | 4919.46 | 0.00 | 0.00 | 0.00 | 92.40 | 4910.39 | 0.00 | 9.07 | 0 00:00 | 0.00 | 0.00 |
| 22 | STRM INLET 01_14 | Junction | 4925.39 | 4929.46 | 0.00 | 0.00 | 0.00 | 8.29 | 4926.42 | 0.00 | 3.04 | 0 00:00 | 0.00 | 0.00 |
| 23 | STRM INLET 01A_1 | Junction | 4915.26 | 4919.88 | 0.00 | 0.00 | 0.00 | 6.35 | 4916.13 | 0.00 | 3.75 | 0 00:00 | 0.00 | 0.00 |
| 24 | STRM INLET 01B_1 | Junction | 4916.83 | 4921.46 | 0.00 | 0.00 | 0.00 | 5.73 | 4917.82 | 0.00 | 3.64 | 0 00:00 | 0.00 | 0.00 |
| 25 | STRM INLET 01B_2 | Junction | 4916.50 | 4921.52 | 0.00 | 0.00 | 0.00 | 8.11 | 4917.51 | 0.00 | 4.01 | 0 00:00 | 0.00 | 0.00 |
| 26 | STRM INLET 01C_01 | Junction | 4919.41 | 4924.07 | 0.00 | 0.00 | 0.00 | 11.32 | 4920.65 | 0.00 | 3.42 | 0 00:00 | 0.00 | 0.00 |
| 27 | STRM INLET 01C_02 | Junction | 4919.17 | 4924.44 | 0.00 | 0.00 | 0.00 | 2.35 | 4919.75 | 0.00 | 4.69 | 0 00:00 | 0.00 | 0.00 |
| 28 | STRM INLET 01D_01 | Junction | 4917.73 | 4923.38 | 0.00 | 0.00 | 0.00 | 18.81 | 4919.21 | 0.00 | 4.17 | 0 00:00 | 0.00 | 0.00 |
| 29 | STRM INLET 01D_2 | Junction | 4918.30 | 4923.55 | 0.00 | 0.00 | 0.00 | 7.79 | 4919.28 | 0.00 | 4.27 | 0 00:00 | 0.00 | 0.00 |
| 30 | STRM INLET 01E_01 | Junction | 4919.35 | 4924.42 | 0.00 | 0.00 | 0.00 | 17.28 | 4921.50 | 0.00 | 2.92 | 0 00:00 | 0.00 | 0.00 |
| 31 | STRM INLET 02_04 | Junction | 4909.40 | 4923.06 | 0.00 | 0.00 | 0.00 | 77.02 | 4912.20 | 0.00 | 10.86 | 0 00:00 | 0.00 | 0.00 |
| 32 | STRM INLET 02A.1_01 | Junction | 4918.27 | 4922.84 | 0.00 | 0.00 | 0.00 | 5.24 | 4919.20 | 0.00 | 3.64 | 0 00:00 | 0.00 | 0.00 |
| 33 | STRM INLET 02A_02 | Junction | 4917.08 | 4923.08 | 0.00 | 0.00 | 0.00 | 10.75 | 4918.43 | 0.00 | 4.65 | 0 00:00 | 0.00 | 0.00 |
| 34 | STRM INLET 02A_03 | Junction | 4917.67 | 4922.32 | 0.00 | 6.00 | 0.00 | 10.15 | 4918.82 | 0.00 | 3.50 | 0 00:00 | 0.00 | 0.00 |
| 35 | STRM INLET 02B_01 | Junction | 4919.42 | 4924.00 | 0.00 | 0.00 | 0.00 | 3.93 | 4920.19 | 0.00 | 3.81 | 0 00:00 | 0.00 | 0.00 |
| 36 | STRM INLET 02C_01 | Junction | 4919.72 | 4924.34 | 0.00 | 0.00 | 0.00 | 6.26 | 4921.13 | 0.00 | 3.21 | 0 00:00 | 0.00 | 0.00 |
| 37 | STRM INLET 02D.3_01 | Junction | 4920.82 | 4925.56 | 0.00 | 0.00 | 0.00 | 0.80 | 4921.10 | 0.00 | 4.46 | 0 00:00 | 0.00 | 0.00 |
| 38 | STRM INLET 02D.4_01 | Junction | 4921.07 | 4925.59 | 0.00 | 0.00 | 0.00 | 2.14 | 4921.68 | 0.00 | 3.91 | 0 00:00 | 0.00 | 0.00 |
| 39 | STRM INLET 02D_01 | Junction | 4920.96 | 4925.67 | 0.00 | 0.00 | 0.00 | 2.84 | 4921.98 | 0.00 | 3.69 | 0 00:00 | 0.00 | 0.00 |
| 40 | STRM INLET 02D_05 | Junction | 4920.22 | 4924.93 | 0.00 | 0.00 | 0.00 | 1.46 | 4920.67 | 0.00 | 4.26 | 0 00:00 | 0.00 | 0.00 |
| 41 | STRM INLET 02E_01 | Junction | 4920.09 | 4924.75 | 0.00 | 0.00 | 0.00 | 2.00 | 4920.72 | 0.00 | 4.03 | 0 00:00 | 0.00 | 0.00 |
| 42 | STRM INLET 02F.2_01 | Junction | 4918.80 | 4923.60 | 0.00 | 0.00 | 0.00 | 15.07 | 4920.63 | 0.00 | 2.97 | 0 00:00 | 0.00 | 0.00 |
| 43 | STRM INLET 02F_01 | Junction | 4919.46 | 4924.69 | 0.00 | 0.00 | 0.00 | 13.64 | 4921.54 | 0.00 | 3.15 | 0 00:00 | 0.00 | 0.00 |
| 44 | STRM INLET 02F_05 | Junction | 4918.69 | 4921.73 | 0.00 | 0.00 | 0.00 | 1.46 | 4919.28 | 0.00 | 2.45 | 0 00:00 | 0.00 | 0.00 |
| 45 | STRM INLET 02F_06 | Junction | 4920.17 | 4923.42 | 0.00 | 0.00 | 0.00 | 1.04 | 4920.48 | 0.00 | 2.94 | 0 00:00 | 0.00 | 0.00 |
| 46 | STRM INLET 02G_01 | Junction | 4927.34 | 4931.85 | 0.00 | 0.00 | 0.00 | 3.58 | 4928.07 | 0.00 | 3.78 | 0 00:00 | 0.00 | 0.00 |
| 47 | STRM INLET 03_15 | Junction | 4927.75 | 4932.74 | 0.00 | 0.00 | 0.00 | 13.12 | 4929.14 | 0.00 | 3.60 | 0 00:00 | 0.00 | 0.00 |
| 48 | STRM INLET 03A_01 | Junction | 4918.14 | 4923.77 | 0.00 | 0.00 | 0.00 | 8.51 | 4919.15 | 0.00 | 4.62 | 0 00:00 | 0.00 | 0.00 |
| 49 | STRM INLET 03A_06 | Junction | 4916.66 | 4924.77 | 0.00 | 0.00 | 0.00 | 2.43 | 4920.26 | 0.00 | 4.51 | 0 00:00 | 0.00 | 0.00 |
| 50 | STRM INLET 03B_01 | Junction | 4919.93 | 4925.13 | 0.00 | 0.00 | 0.00 | 4.71 | 4922.82 | 0.00 | 2.31 | 0 00:00 | 0.00 | 0.00 |
| 51 | STRM INLET 03B_02 | Junction | 4919.43 | 4924.97 | 0.00 | 0.00 | 0.00 | 0.71 | 4919.71 | 0.00 | 5.26 | 0 00:00 | 0.00 | 0.00 |
| 52 | STRM INLET 03C_01 | Junction | 4915.64 | 4925.18 | 0.00 | 0.00 | 0.00 | 6.53 | 4917.47 | 0.00 | 7.71 | 0 00:00 | 0.00 | 0.00 |
| 53 | STRM INLET 03C_02 | Junction | 4917.08 | 4925.01 | 0.00 | 0.00 | 0.00 | 5.78 | 4918.62 | 0.00 | 6.39 | 0 00:00 | 0.00 | 0.00 |
| 54 | STRM INLET 03C_03 | Junction | 4918.20 | 4924.82 | 0.00 | 0.00 | 0.00 | 5.14 | 4919.01 | 0.00 | 5.81 | 0 00:00 | 0.00 | 0.00 |
| 55 | STRM INLET 03C_04 | Junction | 4919.28 | 4925.82 | 0.00 | 0.00 | 0.00 | 3.66 | 4919.94 | 0.00 | 5.88 | 0 00:00 | 0.00 | 0.00 |
| 56 | STRM INLET 03C_05 | Junction | 4920.23 | 4925.13 | 0.00 | 0.00 | 0.00 | 2.20 | 4920.70 | 0.00 | 4.43 | 0 00:00 | 0.00 | 0.00 |
| 57 | STRM INLET 03D_01 | Junction | 4920.99 | 4925.62 | 0.00 | 0.00 | 0.00 | 5.42 | 4922.43 | 0.00 | 3.19 | 0 00:00 | 0.00 | 0.00 |
| 58 | STRM INLET 03D_02 | Junction | 4920.92 | 4925.62 | 0.00 | 0.00 | 0.00 | 6.43 | 4921.81 | 0.00 | 3.81 | 0 00:00 | 0.00 | 0.00 |
| 59 | STRM INLET 03E.1_01 | Junction | 4921.05 | 4925.68 | 0.00 | 0.00 | 0.00 | 2.98 | 4921.71 | 0.00 | 3.97 | 0 00:00 | 0.00 | 0.00 |
| 60 | STRM INLET 03E.2_01 | Junction | 4921.18 | 4925.87 | 0.00 | 0.00 | 0.00 | 2.39 | 4921.68 | 0.00 | 4.19 | 0 00:00 | 0.00 | 0.00 |

MINOR 2-YEAR

## Node Summary

| SN | Element ID | Element Type | Invert Elevation (ft) | Ground/Rim (Max) Elevation (ft) | Initial Water Elevation (ft) | Surcharge Elevation (ft) | Ponded Area ($ft^2$) | Peak Inflow (cfs) | Max HGL Elevation Attained (ft) | Max Surcharge Depth Attained (ft) | Min Freeboard Attained (ft) | Time of Peak Flooding Occurrence (days hh:mm) | Total Flooded Volume (ac-in) | Total Time Flooded (min) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 61 | STRM INLET 03E.2_02 | Junction | 4919.22 | 4926.03 | 0.00 | 0.00 | 0.00 | 1.26 | 4919.62 | 0.00 | 6.41 | 0 00:00 | 0.00 | 0.00 |
| 62 | STRM INLET 03E.3_01 | Junction | 4921.29 | 4926.01 | 0.00 | 0.00 | 0.00 | 1.70 | 4921.75 | 0.00 | 4.26 | 0 00:00 | 0.00 | 0.00 |
| 63 | STRM INLET 03E.3_02 | Junction | 4921.25 | 4926.02 | 0.00 | 0.00 | 0.00 | 4.26 | 4922.12 | 0.00 | 3.90 | 0 00:00 | 0.00 | 0.00 |
| 64 | STRM INLET 03E.4_01 | Junction | 4921.55 | 4926.20 | 0.00 | 0.00 | 0.00 | 1.11 | 4921.93 | 0.00 | 4.27 | 0 00:00 | 0.00 | 0.00 |
| 65 | STRM INLET 03E.5_02 | Junction | 4922.07 | 4927.79 | 0.00 | 0.00 | 0.00 | 8.88 | 4922.93 | 0.00 | 4.86 | 0 00:00 | 0.00 | 0.00 |
| 66 | STRM INLET 03E_01 | Junction | 4919.80 | 4926.21 | 0.00 | 0.00 | 0.00 | 34.03 | 4921.66 | 0.00 | 4.55 | 0 00:00 | 0.00 | 0.00 |
| 67 | STRM INLET 03E_07 | Junction | 4921.07 | 4925.95 | 0.00 | 0.00 | 0.00 | 1.68 | 4921.56 | 0.00 | 4.39 | 0 00:00 | 0.00 | 0.00 |
| 68 | STRM INLET 03F_01 | Junction | 4921.09 | 4926.10 | 0.00 | 0.00 | 0.00 | 0.71 | 4921.40 | 0.00 | 4.70 | 0 00:00 | 0.00 | 0.00 |
| 69 | STRM INLET 03F_02 | Junction | 4921.02 | 4925.89 | 0.00 | 0.00 | 0.00 | 2.07 | 4921.57 | 0.00 | 4.32 | 0 00:00 | 0.00 | 0.00 |
| 70 | STRM INLET 03G.2_01 | Junction | 4919.44 | 4924.91 | 0.00 | 0.00 | 0.00 | 20.84 | 4921.27 | 0.00 | 3.64 | 0 00:00 | 0.00 | 0.00 |
| 71 | STRM INLET 03G_01 | Junction | 4919.69 | 4924.86 | 0.00 | 0.00 | 0.00 | 20.36 | 4921.58 | 0.00 | 3.28 | 0 00:00 | 0.00 | 0.00 |
| 72 | STRM INLET 03G_05 | Junction | 4920.21 | 4925.55 | 0.00 | 0.00 | 0.00 | 18.58 | 4921.87 | 0.00 | 3.68 | 0 00:00 | 0.00 | 0.00 |
| 73 | STRM INLET 04A.1_01 | Junction | 4912.72 | 4918.10 | 0.00 | 0.00 | 0.00 | 6.63 | 4913.59 | 0.00 | 4.51 | 0 00:00 | 0.00 | 0.00 |
| 74 | STRM INLET 04A.2_01 | Junction | 4913.34 | 4920.05 | 0.00 | 0.00 | 0.00 | 4.40 | 4914.02 | 0.00 | 6.03 | 0 00:00 | 0.00 | 0.00 |
| 75 | STRM INLET 04A.2_02 | Junction | 4913.63 | 4920.05 | 0.00 | 0.00 | 0.00 | 51.05 | 4915.72 | 0.00 | 4.33 | 0 00:00 | 0.00 | 0.00 |
| 76 | STRM INLET 04A.3_01 | Junction | 4919.06 | 4924.15 | 0.00 | 0.00 | 0.00 | 5.66 | 4919.91 | 0.00 | 4.24 | 0 00:00 | 0.00 | 0.00 |
| 77 | STRM INLET 04A.3_02 | Junction | 4919.25 | 4924.31 | 0.00 | 0.00 | 0.00 | 5.73 | 4920.04 | 0.00 | 4.27 | 0 00:00 | 0.00 | 0.00 |
| 78 | STRM INLET 04A_02 | Junction | 4910.70 | 4917.62 | 0.00 | 0.00 | 0.00 | 52.88 | 4913.07 | 0.00 | 4.55 | 0 00:00 | 0.00 | 0.00 |
| 79 | STRM MH 01_03 | Junction | 4907.85 | 4920.00 | 0.00 | 0.00 | 0.00 | 89.98 | 4915.89 | 0.00 | 4.11 | 0 00:00 | 0.00 | 0.00 |
| 80 | STRM MH 01_04 | Junction | 4909.35 | 4921.32 | 0.00 | 0.00 | 0.00 | 87.41 | 4912.14 | 0.00 | 9.18 | 0 00:00 | 0.00 | 0.00 |
| 81 | STRM MH 01_05 | Junction | 4910.29 | 4921.49 | 0.00 | 0.00 | 0.00 | 87.55 | 4917.40 | 0.00 | 4.09 | 0 00:00 | 0.00 | 0.00 |
| 82 | STRM MH 01_06 | Junction | 4912.61 | 4923.25 | 0.00 | 0.00 | 0.00 | 79.32 | 4915.47 | 0.00 | 7.78 | 0 00:00 | 0.00 | 0.00 |
| 83 | STRM MH 01_07 | Junction | 4914.24 | 4925.74 | 0.00 | 0.00 | 0.00 | 79.75 | 4917.11 | 0.00 | 8.63 | 0 00:00 | 0.00 | 0.00 |
| 84 | STRM MH 01_08 | Junction | 4915.04 | 4924.62 | 0.00 | 0.00 | 0.00 | 79.86 | 4920.26 | 0.00 | 4.36 | 0 00:00 | 0.00 | 0.00 |
| 85 | STRM MH 01_09 | Junction | 4916.26 | 4925.83 | 0.00 | 0.00 | 0.00 | 68.87 | 4920.26 | 0.00 | 5.57 | 0 00:00 | 0.00 | 0.00 |
| 86 | STRM MH 01_10 | Junction | 4918.83 | 4926.27 | 0.00 | 0.00 | 0.00 | 52.34 | 4922.54 | 0.00 | 3.73 | 0 00:00 | 0.00 | 0.00 |
| 87 | STRM MH 01_11 | Junction | 4922.11 | 4927.89 | 0.00 | 0.00 | 0.00 | 37.55 | 4924.29 | 0.00 | 3.60 | 0 00:00 | 0.00 | 0.00 |
| 88 | STRM MH 01_12 | Junction | 4923.09 | 4929.07 | 0.00 | 0.00 | 0.00 | 18.86 | 4924.76 | 0.00 | 4.31 | 0 00:00 | 0.00 | 0.00 |
| 89 | STRM MH 01_13 | Junction | 4924.12 | 4929.89 | 0.00 | 0.00 | 0.00 | 19.13 | 4927.68 | 0.00 | 2.21 | 0 00:00 | 0.00 | 0.00 |
| 90 | STRM MH 01F_01 | Junction | 4923.16 | 4927.94 | 0.00 | 0.00 | 0.00 | 18.94 | 4924.64 | 0.00 | 3.30 | 0 00:00 | 0.00 | 0.00 |
| 91 | STRM MH 01F_02 | Junction | 4924.93 | 4929.90 | 0.00 | 0.00 | 0.00 | 19.17 | 4926.63 | 0.00 | 3.27 | 0 00:00 | 0.00 | 0.00 |
| 92 | STRM MH 01F_03 | Junction | 4925.27 | 4930.96 | 0.00 | 0.00 | 0.00 | 19.48 | 4927.29 | 0.00 | 3.67 | 0 00:00 | 0.00 | 0.00 |
| 93 | STRM MH 02_02 | Junction | 4907.10 | 4921.10 | 0.00 | 0.00 | 0.00 | 113.03 | 4910.23 | 0.00 | 10.87 | 0 00:00 | 0.00 | 0.00 |
| 94 | STRM MH 02_03 | Junction | 4908.43 | 4922.39 | 0.00 | 0.00 | 0.00 | 113.09 | 4911.36 | 0.00 | 11.03 | 0 00:00 | 0.00 | 0.00 |
| 95 | STRM MH 02_05 | Junction | 4910.30 | 4924.18 | 0.00 | 0.00 | 0.00 | 73.26 | 4915.98 | 0.00 | 8.20 | 0 00:00 | 0.00 | 0.00 |
| 96 | STRM MH 02_06 | Junction | 4911.02 | 4924.48 | 0.00 | 0.00 | 0.00 | 66.01 | 4917.47 | 0.00 | 7.01 | 0 00:00 | 0.00 | 0.00 |
| 97 | STRM MH 02_07 | Junction | 4911.94 | 4924.03 | 0.00 | 0.00 | 0.00 | 50.81 | 4920.06 | 0.00 | 3.97 | 0 00:00 | 0.00 | 0.00 |
| 98 | STRM MH 02_08 | Junction | 4912.80 | 4924.22 | 0.00 | 0.00 | 0.00 | 47.98 | 4921.07 | 0.00 | 3.15 | 0 00:00 | 0.00 | 0.00 |
| 99 | STRM MH 02_09 | Junction | 4913.24 | 4924.41 | 0.00 | 0.00 | 0.00 | 41.15 | 4915.40 | 0.00 | 9.01 | 0 00:00 | 0.00 | 0.00 |
| 100 | STRM MH 02_10 | Junction | 4913.56 | 4924.64 | 0.00 | 0.00 | 0.00 | 41.16 | 4919.50 | 0.00 | 5.14 | 0 00:00 | 0.00 | 0.00 |
| 101 | STRM MH 02_11 | Junction | 4914.05 | 4924.44 | 0.00 | 0.00 | 0.00 | 34.41 | 4920.60 | 0.00 | 3.84 | 0 00:00 | 0.00 | 0.00 |
| 102 | STRM MH 02_12 | Junction | 4914.84 | 4925.71 | 0.00 | 0.00 | 0.00 | 32.93 | 4921.15 | 0.00 | 4.56 | 0 00:00 | 0.00 | 0.00 |
| 103 | STRM MH 02_13 | Junction | 4923.10 | 4928.32 | 0.00 | 0.00 | 0.00 | 6.28 | 4923.84 | 0.00 | 4.48 | 0 00:00 | 0.00 | 0.00 |
| 104 | STRM MH 02_14 | Junction | 4926.30 | 4931.26 | 0.00 | 0.00 | 0.00 | 6.29 | 4928.36 | 0.00 | 2.90 | 0 00:00 | 0.00 | 0.00 |
| 105 | STRM MH 02A_01 | Junction | 4916.84 | 4922.73 | 0.00 | 0.00 | 0.00 | 15.76 | 4919.05 | 0.00 | 3.68 | 0 00:00 | 0.00 | 0.00 |
| 106 | STRM MH 02D_02 | Junction | 4920.40 | 4925.52 | 0.00 | 0.00 | 0.00 | 4.95 | 4921.55 | 0.00 | 3.97 | 0 00:00 | 0.00 | 0.00 |
| 107 | STRM MH 02D_03 | Junction | 4919.38 | 4925.36 | 0.00 | 0.00 | 0.00 | 5.54 | 4920.98 | 0.00 | 4.38 | 0 00:00 | 0.00 | 0.00 |
| 108 | STRM MH 02D_04 | Junction | 4919.30 | 4925.13 | 0.00 | 0.00 | 0.00 | 1.45 | 4920.54 | 0.00 | 4.59 | 0 00:00 | 0.00 | 0.00 |
| 109 | STRM MH 02F_02 | Junction | 4919.22 | 4924.52 | 0.00 | 0.00 | 0.00 | 13.63 | 4920.73 | 0.00 | 3.79 | 0 00:00 | 0.00 | 0.00 |
| 110 | STRM MH 02F_03 | Junction | 4916.17 | 4923.38 | 0.00 | 0.00 | 0.00 | 17.46 | 4920.05 | 0.00 | 3.33 | 0 00:00 | 0.00 | 0.00 |
| 111 | STRM MH 02F_04 | Junction | 4917.58 | 4924.19 | 0.00 | 0.00 | 0.00 | 2.87 | 4920.60 | 0.00 | 3.59 | 0 00:00 | 0.00 | 0.00 |
| 112 | STRM MH 03_02 | Junction | 4906.89 | 4918.13 | 0.00 | 0.00 | 0.00 | 228.86 | 4913.01 | 0.00 | 5.12 | 0 00:00 | 0.00 | 0.00 |
| 113 | STRM MH 03_03 | Junction | 4910.33 | 4919.03 | 0.00 | 0.00 | 0.00 | 140.06 | 4913.79 | 0.00 | 5.24 | 0 00:00 | 0.00 | 0.00 |
| 114 | STRM MH 03_04 | Junction | 4912.16 | 4924.86 | 0.00 | 0.00 | 0.00 | 140.84 | 4917.75 | 0.00 | 7.11 | 0 00:00 | 0.00 | 0.00 |
| 115 | STRM MH 03_05 | Junction | 4912.88 | 4924.89 | 0.00 | 0.00 | 0.00 | 131.19 | 4920.70 | 0.00 | 4.19 | 0 00:00 | 0.00 | 0.00 |
| 116 | STRM MH 03_06 | Junction | 4913.49 | 4925.19 | 0.00 | 0.00 | 0.00 | 127.19 | 4921.94 | 0.00 | 3.25 | 0 00:00 | 0.00 | 0.00 |
| 117 | STRM MH 03_07 | Junction | 4914.04 | 4925.55 | 0.00 | 0.00 | 0.00 | 124.85 | 4917.18 | 0.00 | 8.37 | 0 00:00 | 0.00 | 0.00 |
| 118 | STRM MH 03_08 | Junction | 4914.80 | 4925.50 | 0.00 | 0.00 | 0.00 | 119.15 | 4921.78 | 0.00 | 3.72 | 0 00:00 | 0.00 | 0.00 |
| 119 | STRM MH 03_09 | Junction | 4915.93 | 4926.25 | 0.00 | 0.00 | 0.00 | 110.72 | 4920.88 | 0.00 | 5.37 | 0 00:00 | 0.00 | 0.00 |
| 120 | STRM MH 03_10 | Junction | 4917.17 | 4925.80 | 0.00 | 0.00 | 0.00 | 69.72 | 4921.49 | 0.00 | 4.31 | 0 00:00 | 0.00 | 0.00 |

MINOR 2-YEAR

## Node Summary

| SN | Element ID | Element Type | Invert Elevation (ft) | Ground/Rim (Max) Elevation (ft) | Initial Water Elevation (ft) | Surcharge Elevation (ft) | Ponded Area ($ft^2$) | Peak Inflow (cfs) | Max HGL Elevation Attained (ft) | Max Surcharge Depth Attained (ft) | Min Freeboard Attained (ft) | Time of Peak Flooding Occurrence (days hh:mm) | Total Flooded Volume (ac-in) | Total Time Flooded (min) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 121 | STRM MH 03_11 | Junction | 4917.93 | 4926.36 | 0.00 | 0.00 | 0.00 | 67.50 | 4921.24 | 0.00 | 5.12 | 0 00:00 | 0.00 | 0.00 |
| 122 | STRM MH 03_12 | Junction | 4925.65 | 4931.05 | 0.00 | 0.00 | 0.00 | 15.32 | 4926.87 | 0.00 | 4.18 | 0 00:00 | 0.00 | 0.00 |
| 123 | STRM MH 03_13 | Junction | 4926.74 | 4932.17 | 0.00 | 0.00 | 0.00 | 15.36 | 4928.09 | 0.00 | 4.08 | 0 00:00 | 0.00 | 0.00 |
| 124 | STRM MH 03_14 | Junction | 4927.31 | 4933.01 | 0.00 | 0.00 | 0.00 | 15.42 | 4928.89 | 0.00 | 4.12 | 0 00:00 | 0.00 | 0.00 |
| 125 | STRM MH 03A_01 | Junction | 4917.78 | 4923.85 | 0.00 | 0.00 | 0.00 | 11.21 | 4919.03 | 0.00 | 4.82 | 0 00:00 | 0.00 | 0.00 |
| 126 | STRM MH 03A_02 | Junction | 4918.70 | 4925.02 | 0.00 | 0.00 | 0.00 | 3.27 | 4919.60 | 0.00 | 5.42 | 0 00:00 | 0.00 | 0.00 |
| 127 | STRM MH 03A_03 | Junction | 4919.35 | 4924.87 | 0.00 | 0.00 | 0.00 | 3.32 | 4921.38 | 0.00 | 3.49 | 0 00:00 | 0.00 | 0.00 |
| 128 | STRM MH 03E.5_01 | Junction | 4921.78 | 4927.51 | 0.00 | 0.00 | 0.00 | 8.88 | 4922.84 | 0.00 | 4.67 | 0 00:00 | 0.00 | 0.00 |
| 129 | STRM MH 03E_02 | Junction | 4919.50 | 4925.94 | 0.00 | 0.00 | 0.00 | 34.49 | 4921.88 | 0.00 | 4.06 | 0 00:00 | 0.00 | 0.00 |
| 130 | STRM MH 03E_03 | Junction | 4918.84 | 4926.44 | 0.00 | 0.00 | 0.00 | 42.20 | 4921.21 | 0.00 | 5.23 | 0 00:00 | 0.00 | 0.00 |
| 131 | STRM MH 03E_04 | Junction | 4918.16 | 4925.93 | 0.00 | 0.00 | 0.00 | 46.18 | 4922.03 | 0.00 | 3.90 | 0 00:00 | 0.00 | 0.00 |
| 132 | STRM MH 03E_05 | Junction | 4917.05 | 4925.67 | 0.00 | 0.00 | 0.00 | 47.22 | 4921.57 | 0.00 | 4.10 | 0 00:00 | 0.00 | 0.00 |
| 133 | STRM MH 03E_06 | Junction | 4920.79 | 4925.88 | 0.00 | 0.00 | 0.00 | 4.60 | 4921.57 | 0.00 | 4.31 | 0 00:00 | 0.00 | 0.00 |
| 134 | STRM MH 03G_02 | Junction | 4919.41 | 4924.82 | 0.00 | 0.00 | 0.00 | 20.33 | 4921.33 | 0.00 | 3.49 | 0 00:00 | 0.00 | 0.00 |
| 135 | STRM MH 03G_03 | Junction | 4918.98 | 4924.84 | 0.00 | 0.00 | 0.00 | 37.33 | 4921.20 | 0.00 | 3.64 | 0 00:00 | 0.00 | 0.00 |
| 136 | STRM MH 03G_04 | Junction | 4920.14 | 4925.46 | 0.00 | 0.00 | 0.00 | 18.53 | 4921.78 | 0.00 | 3.68 | 0 00:00 | 0.00 | 0.00 |
| 137 | STRM MH 04_01 | Junction | 4907.37 | 4918.06 | 0.00 | 0.00 | 0.00 | 114.48 | 4913.39 | 0.00 | 4.67 | 0 00:00 | 0.00 | 0.00 |
| 138 | STRM MH 04A_02 | Junction | 4910.27 | 4920.34 | 0.00 | 0.00 | 0.00 | 61.48 | 4912.46 | 0.00 | 7.88 | 0 00:00 | 0.00 | 0.00 |
| 139 | STRM MH 04A_03 | Junction | 4912.94 | 4920.00 | 0.00 | 0.00 | 0.00 | 61.51 | 4914.93 | 0.00 | 5.07 | 0 00:00 | 0.00 | 0.00 |
| 140 | STRM MH 04A_04 | Junction | 4914.95 | 4922.05 | 0.00 | 0.00 | 0.00 | 10.74 | 4916.28 | 0.00 | 5.77 | 0 00:00 | 0.00 | 0.00 |
| 141 | STRM MH 04A_05 | Junction | 4917.55 | 4925.95 | 0.00 | 0.00 | 0.00 | 11.15 | 4918.91 | 0.00 | 7.04 | 0 00:00 | 0.00 | 0.00 |
| 142 | STRM MH 04A_06 | Junction | 4918.71 | 4924.30 | 0.00 | 0.00 | 0.00 | 11.35 | 4919.88 | 0.00 | 4.41 | 0 00:00 | 0.00 | 0.00 |
| 143 | STRM STUB 03_00 | Junction | 4920.81 | 4926.00 | 0.00 | 0.00 | 0.00 | 33.01 | 4922.11 | 0.00 | 3.89 | 0 00:00 | 0.00 | 0.00 |
| 144 | STRM STUB 04A.2_03 | Junction | 4914.25 | 4916.94 | 0.00 | 0.00 | 0.00 | 48.79 | 4916.16 | 0.00 | 1.10 | 0 00:00 | 0.00 | 0.00 |
| 145 | STRM STUB 04A_03 | Junction | 4911.71 | 4921.63 | 0.00 | 0.00 | 0.00 | 47.77 | 4913.59 | 0.00 | 8.04 | 0 00:00 | 0.00 | 0.00 |
| 146 | OUTFALL | Outfall | 4904.92 | | | | | 2.79 | 4904.92 | | | | | |
| 147 | POND | Storage Node | 4905.47 | 4915.00 | 0.00 | | 0.00 | 424.74 | 4908.58 | | | | 0.00 | 0.00 |

MINOR 2-YEAR

## Link Summary

| SN | Element ID | Element Type | From (Inlet) Node | To (Outlet) Node | Length | Inlet Invert Elevation | Outlet Invert Elevation | Average Slope | Diameter or Height | Manning's Roughness | Peak Flow | Design Flow Capacity | Peak Flow/ Design Flow Ratio | Peak Flow Velocity | Peak Flow Depth | Peak Flow Depth/ Total Depth Ratio | Total Time Surcharged | Reported Condition |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (ft) | (ft) | (ft) | (%) | (in) | | (cfs) | (cfs) | | (ft/sec) | (ft) | | (min) | |
| 1 | {MCD-STRM}.Pipe - (106) (MCD-STRM) | Pipe | STRM INLET 02F_06 | STRM INLET 02F_05 | 50.50 | 4920.17 | 4918.86 | 2.5900 | 10.000 | 0.0130 | 1.03 | 3.53 | 0.29 | 6.72 | 0.31 | 0.37 | 0.00 | Calculated |
| 2 | {MCD-STRM}.Pipe - (119) (1) (MCD-STRM) | Pipe | STRM INLET 04A.2_01 | STRM MH 04A_03 | 20.09 | 4913.34 | 4913.14 | 1.0000 | 18.000 | 0.0130 | 4.39 | 10.48 | 0.42 | 5.68 | 0.68 | 0.45 | 0.00 | Calculated |
| 3 | {MCD-STRM}.Pipe - (119) (MCD-STRM) | Pipe | STRM INLET 04A.2_02 | STRM MH 04A_03 | 48.27 | 4913.63 | 4913.14 | 1.0000 | 42.000 | 0.0130 | 51.00 | 100.85 | 0.51 | 10.52 | 1.76 | 0.50 | 0.00 | Calculated |
| 4 | {MCD-STRM}.Pipe - (120) (MCD-STRM) | Pipe | STRM STUB 04A.2_03 | STRM INLET 04A.2_02 | 43.33 | 4914.25 | 4913.82 | 1.0000 | 36.000 | 0.0130 | 48.70 | 66.75 | 0.73 | 10.32 | 1.90 | 0.63 | 0.00 | Calculated |
| 5 | {MCD-STRM}.Pipe - (126) (MCD-STRM) | Pipe | STRM STUB 04A_03 | STRM INLET 04A_02 | 50.84 | 4911.71 | 4911.20 | 1.0000 | 36.000 | 0.0130 | 47.69 | 66.80 | 0.71 | 10.28 | 1.87 | 0.62 | 0.00 | Calculated |
| 6 | {MCD-STRM}.Pipe - (127) (1) (MCD-STRM) | Pipe | STRM INLET 04A.1_01 | STRM MH 04_01 | 20.17 | 4912.72 | 4912.52 | 0.9900 | 18.000 | 0.0130 | 6.61 | 10.46 | 0.63 | 6.27 | 0.87 | 0.58 | 0.00 | Calculated |
| 7 | {MCD-STRM}.Pipe - (127) (MCD-STRM) | Pipe | STRM INLET 04A_02 | STRM MH 04_01 | 48.17 | 4910.70 | 4910.46 | 0.5000 | 48.000 | 0.0130 | 52.83 | 101.39 | 0.52 | 8.16 | 2.05 | 0.51 | 0.00 | Calculated |
| 8 | {MCD-STRM}.Pipe - (131) (MCD-STRM) | Pipe | STRM INLET 03B_01 | STRM MH 03_05 | 19.92 | 4919.93 | 4919.83 | 0.5000 | 18.000 | 0.0130 | 4.70 | 7.44 | 0.63 | 4.46 | 0.86 | 0.58 | 0.00 | Calculated |
| 9 | {MCD-STRM}.Pipe - (132) (MCD-STRM) | Pipe | STRM INLET 01C_01 | STRM MH 01_08 | 75.97 | 4919.41 | 4919.03 | 0.5000 | 24.000 | 0.0130 | 11.20 | 16.00 | 0.70 | 6.79 | 1.23 | 0.62 | 0.00 | Calculated |
| 10 | {MCD-STRM}.Pipe - (133) (MCD-STRM) | Pipe | STRM INLET 01C_02 | STRM MH 01_08 | 28.17 | 4919.17 | 4919.03 | 0.5000 | 18.000 | 0.0130 | 2.33 | 7.41 | 0.31 | 4.27 | 0.58 | 0.39 | 0.00 | Calculated |
| 11 | {MCD-STRM}.Pipe - (134) (1) (MCD-STRM) | Pipe | STRM INLET 01B_2 | STRM MH 01_05 | 19.88 | 4916.50 | 4916.40 | 0.5000 | 24.000 | 0.0130 | 8.09 | 16.04 | 0.50 | 5.12 | 1.00 | 0.50 | 0.00 | Calculated |
| 12 | {MCD-STRM}.Pipe - (134) (MCD-STRM) | Pipe | STRM INLET 01B_1 | STRM MH 01_05 | 85.50 | 4916.83 | 4916.40 | 0.5000 | 18.000 | 0.0130 | 5.64 | 7.45 | 0.76 | 6.74 | 0.97 | 0.65 | 0.00 | Calculated |
| 13 | {MCD-STRM}.Pipe - (145) (1) (MCD-STRM) | Pipe | STRM MH 02A_01 | STRM MH 02_06 | 135.04 | 4916.84 | 4916.16 | 0.5000 | 30.000 | 0.0130 | 15.68 | 29.11 | 0.54 | 6.12 | 1.30 | 0.52 | 0.00 | Calculated |
| 14 | {MCD-STRM}.Pipe - (146) (MCD-STRM) | Pipe | STRM INLET 02A_02 | STRM MH 02A_01 | 8.19 | 4917.08 | 4917.04 | 0.4900 | 24.000 | 0.0130 | 10.75 | 15.81 | 0.68 | 5.41 | 1.21 | 0.61 | 0.00 | Calculated |
| 15 | {MCD-STRM}.Pipe - (147) (MCD-STRM) | Pipe | STRM INLET 02A.1_01 | STRM MH 02A_01 | 30.14 | 4918.27 | 4918.12 | 0.5000 | 18.000 | 0.0130 | 5.23 | 7.41 | 0.71 | 4.65 | 0.93 | 0.62 | 0.00 | Calculated |
| 16 | {MCD-STRM}.Pipe - (163) (MCD-STRM) | Pipe | STRM INLET 02E_01 | STRM MH 02_11 | 10.34 | 4920.29 | 4920.17 | 1.1600 | 18.000 | 0.0130 | 1.99 | 11.32 | 0.18 | 4.82 | 0.43 | 0.28 | 0.00 | Calculated |
| 17 | {MCD-STRM}.Pipe - (180) (MCD-STRM) | Pipe | STRM MH 02D_03 | STRM MH 02_10 | 138.19 | 4919.38 | 4918.69 | 0.5000 | 24.000 | 0.0130 | 5.45 | 15.99 | 0.34 | 4.68 | 0.80 | 0.40 | 0.00 | Calculated |
| 18 | {MCD-STRM}.Pipe - (19) (MCD-STRM) | Pipe | STRM INLET 03_15 | STRM MH 03_14 | 48.78 | 4927.75 | 4927.51 | 0.4900 | 24.000 | 0.0130 | 13.08 | 15.87 | 0.82 | 5.65 | 1.38 | 0.69 | 0.00 | Calculated |
| 19 | {MCD-STRM}.Pipe - (195) (2) (1) (MCD-STRM) | Pipe | STRM MH 02_03 | STRM MH 02_02 | 251.29 | 4908.43 | 4907.30 | 0.4500 | 60.000 | 0.0130 | 113.03 | 174.65 | 0.65 | 9.56 | 2.93 | 0.59 | 0.00 | Calculated |
| 20 | {MCD-STRM}.Pipe - (195) (2) (MCD-STRM) | Pipe | STRM INLET 02_04 | STRM MH 02_03 | 171.32 | 4909.40 | 4908.63 | 0.4500 | 54.000 | 0.0130 | 76.85 | 131.84 | 0.58 | 8.67 | 2.47 | 0.55 | 0.00 | Calculated |
| 21 | {MCD-STRM}.Pipe - (196) (MCD-STRM) | Pipe | STRM MH 02_02 | STRM FES 02_01 | 111.30 | 4907.10 | 4906.60 | 0.4500 | 60.000 | 0.0130 | 113.00 | 174.56 | 0.65 | 9.47 | 2.93 | 0.59 | 0.00 | Calculated |
| 22 | {MCD-STRM}.Pipe - (20) (MCD-STRM) | Pipe | STRM MH 03_14 | STRM MH 03_13 | 49.32 | 4927.31 | 4926.94 | 0.7500 | 30.000 | 0.0130 | 15.36 | 35.53 | 0.43 | 6.98 | 1.15 | 0.46 | 0.00 | Calculated |
| 23 | {MCD-STRM}.Pipe - (21) (MCD-STRM) | Pipe | STRM MH 03_13 | STRM MH 03_12 | 77.43 | 4926.74 | 4925.85 | 1.1500 | 30.000 | 0.0130 | 15.32 | 43.97 | 0.35 | 8.16 | 1.02 | 0.41 | 0.00 | Calculated |
| 24 | {MCD-STRM}.Pipe - (220) (MCD-STRM) | Pipe | STRM MH 03G_03 | STRM MH 03_11 | 169.47 | 4918.98 | 4918.13 | 0.5000 | 36.000 | 0.0130 | 37.16 | 47.24 | 0.79 | 7.52 | 2.00 | 0.67 | 0.00 | Calculated |
| 25 | {MCD-STRM}.Pipe - (222) (MCD-STRM) | Pipe | STRM INLET 03G.2_01 | STRM MH 03G_03 | 15.67 | 4919.64 | 4919.57 | 0.4500 | 30.000 | 0.0130 | 20.79 | 27.41 | 0.76 | 6.15 | 1.63 | 0.65 | 0.00 | Calculated |
| 26 | {MCD-STRM}.Pipe - (223) (MCD-STRM) | Pipe | STRM MH 03G_04 | STRM MH 03G_03 | 193.00 | 4920.14 | 4919.18 | 0.5000 | 30.000 | 0.0130 | 18.00 | 28.93 | 0.62 | 7.38 | 1.42 | 0.57 | 0.00 | Calculated |
| 27 | {MCD-STRM}.Pipe - (226) (MCD-STRM) | Pipe | STRM INLET 03F_01 | STRM MH 03_10 | 29.59 | 4921.09 | 4920.94 | 0.5100 | 18.000 | 0.0130 | 0.71 | 7.48 | 0.09 | 3.35 | 0.31 | 0.21 | 0.00 | Calculated |
| 28 | {MCD-STRM}.Pipe - (227) (MCD-STRM) | Pipe | STRM INLET 03D_02 | STRM MH 03_08 | 16.75 | 4920.92 | 4920.84 | 0.4800 | 24.000 | 0.0130 | 6.41 | 15.63 | 0.41 | 4.74 | 0.89 | 0.45 | 0.00 | Calculated |
| 29 | {MCD-STRM}.Pipe - (24) (2) (1) (MCD-STRM) | Pipe | STRM MH 03_10 | STRM MH 03_09 | 73.39 | 4917.17 | 4916.80 | 0.5000 | 48.000 | 0.0130 | 69.66 | 101.99 | 0.68 | 8.74 | 2.43 | 0.61 | 0.00 | Calculated |
| 30 | {MCD-STRM}.Pipe - (24) (2) (MCD-STRM) | Pipe | STRM MH 03_11 | STRM MH 03_10 | 112.39 | 4917.93 | 4917.37 | 0.5000 | 48.000 | 0.0130 | 67.38 | 101.39 | 0.66 | 8.65 | 2.38 | 0.60 | 0.00 | Calculated |
| 31 | {MCD-STRM}.Pipe - (24) (MCD-STRM) | Pipe | STRM MH 03_12 | STRM MH 03_11 | 273.39 | 4925.65 | 4920.36 | 1.9300 | 30.000 | 0.0130 | 15.13 | 57.06 | 0.27 | 9.88 | 0.88 | 0.35 | 0.00 | Calculated |
| 32 | {MCD-STRM}.Pipe - (257) (MCD-STRM) | Pipe | STRM MH 02D_02 | STRM MH 02D_03 | 162.41 | 4920.40 | 4919.58 | 0.5000 | 24.000 | 0.0130 | 4.80 | 16.07 | 0.30 | 4.57 | 0.75 | 0.37 | 0.00 | Calculated |
| 33 | {MCD-STRM}.Pipe - (259) (MCD-STRM) | Pipe | STRM INLET 03E_07 | STRM MH 03E_06 | 50.26 | 4921.07 | 4920.82 | 0.5000 | 18.000 | 0.0130 | 1.66 | 7.41 | 0.22 | 4.59 | 0.48 | 0.32 | 0.00 | Calculated |
| 34 | {MCD-STRM}.Pipe - (260) (MCD-STRM) | Pipe | STRM MH 03E_06 | STRM MH 03_09 | 104.15 | 4920.79 | 4920.10 | 0.6600 | 18.000 | 0.0130 | 4.54 | 8.55 | 0.53 | 4.97 | 0.77 | 0.52 | 0.00 | Calculated |
| 35 | {MCD-STRM}.Pipe - (261) (MCD-STRM) | Pipe | STRM INLET 01D_2 | STRM INLET 01D_01 | 13.67 | 4918.30 | 4918.23 | 0.5100 | 24.000 | 0.0130 | 7.76 | 16.19 | 0.48 | 5.11 | 0.98 | 0.49 | 0.00 | Calculated |
| 36 | {MCD-STRM}.Pipe - (262) (MCD-STRM) | Pipe | STRM INLET 01D_01 | STRM MH 01_09 | 254.63 | 4917.73 | 4916.46 | 0.5000 | 30.000 | 0.0130 | 18.11 | 28.97 | 0.63 | 8.34 | 1.43 | 0.57 | 0.00 | Calculated |
| 37 | {MCD-STRM}.Pipe - (263) (MCD-STRM) | Pipe | STRM INLET 02G_01 | STRM MH 02_14 | 168.29 | 4927.34 | 4926.50 | 0.5000 | 18.000 | 0.0130 | 3.43 | 7.42 | 0.46 | 6.99 | 0.71 | 0.48 | 0.00 | Calculated |
| 38 | {MCD-STRM}.Pipe - (266) (MCD-STRM) | Pipe | STRM INLET 02D.4_01 | STRM MH 02D_02 | 34.13 | 4921.07 | 4920.95 | 0.3500 | 18.000 | 0.0130 | 2.12 | 6.23 | 0.34 | 3.97 | 0.60 | 0.40 | 0.00 | Calculated |
| 39 | {MCD-STRM}.Pipe - (268) (MCD-STRM) | Pipe | STRM INLET 02C_01 | STRM MH 02_08 | 14.07 | 4919.72 | 4919.61 | 0.7800 | 18.000 | 0.0130 | 6.25 | 9.29 | 0.67 | 5.64 | 0.90 | 0.60 | 0.00 | Calculated |
| 40 | {MCD-STRM}.Pipe - (27) (1) (MCD-STRM) | Pipe | STRM MH 03_08 | STRM MH 03_07 | 112.91 | 4914.80 | 4914.24 | 0.5000 | 60.000 | 0.0130 | 119.06 | 183.42 | 0.65 | 9.95 | 2.94 | 0.59 | 0.00 | Calculated |
| 41 | {MCD-STRM}.Pipe - (27) (MCD-STRM) | Pipe | STRM MH 03_09 | STRM MH 03_08 | 197.50 | 4915.93 | 4915.00 | 0.4700 | 60.000 | 0.0130 | 110.52 | 178.72 | 0.62 | 9.60 | 2.84 | 0.57 | 0.00 | Calculated |
| 42 | {MCD-STRM}.Pipe - (270) (MCD-STRM) | Pipe | STRM INLET 02B_01 | STRM MH 02_07 | 23.17 | 4919.42 | 4919.30 | 0.5200 | 18.000 | 0.0130 | 3.90 | 7.56 | 0.52 | 4.64 | 0.76 | 0.51 | 0.00 | Calculated |
| 43 | {MCD-STRM}.Pipe - (271) (MCD-STRM) | Pipe | STRM INLET 01E_01 | STRM MH 01_10 | 65.18 | 4919.35 | 4919.03 | 0.4900 | 30.000 | 0.0130 | 17.13 | 28.74 | 0.60 | 6.15 | 1.39 | 0.56 | 0.00 | Calculated |
| 44 | {MCD-STRM}.Pipe - (272) (MCD-STRM) | Pipe | STRM INLET 03D_01 | STRM MH 03_08 | 29.59 | 4920.99 | 4920.84 | 0.5100 | 18.000 | 0.0130 | 5.40 | 7.48 | 0.72 | 4.63 | 0.94 | 0.63 | 0.00 | Calculated |

MINOR 2-YEAR

## Link Summary

| SN | Element ID | Element Type | From (Inlet) Node | To (Outlet) Node | Length (ft) | Inlet Invert Elevation (ft) | Outlet Invert Elevation (ft) | Average Slope (%) | Diameter or Height (in) | Manning's Roughness | Peak Flow (cfs) | Design Flow Capacity (cfs) | Peak Flow/ Design Flow Ratio | Peak Flow Velocity (ft/sec) | Peak Flow Depth (ft) | Peak Flow Depth/ Total Depth Ratio | Total Time Surcharged (min) | Reported Condition |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | {MCD-STRM}.Pipe - (273) (MCD-STRM) | Pipe | STRM INLET 03E.3_01 | STRM MH 03E_04 | 18.90 | 4921.29 | 4921.17 | 0.6300 | 18.000 | 0.0130 | 1.69 | 8.37 | 0.20 | 3.91 | 0.46 | 0.30 | 0.00 | Calculated |
| 46 | {MCD-STRM}.Pipe - (274) (MCD-STRM) | Pipe | STRM MH 03E_04 | STRM MH 03E_05 | 183.07 | 4918.16 | 4917.25 | 0.5000 | 42.000 | 0.0130 | 45.99 | 70.93 | 0.65 | 7.90 | 2.05 | 0.59 | 0.00 | Calculated |
| 47 | {MCD-STRM}.Pipe - (277) (MCD-STRM) | Pipe | STRM INLET 03E.3_02 | STRM MH 03E_04 | 19.43 | 4921.25 | 4921.17 | 0.4100 | 18.000 | 0.0130 | 4.25 | 6.74 | 0.63 | 4.04 | 0.86 | 0.58 | 0.00 | Calculated |
| 48 | {MCD-STRM}.Pipe - (278) (MCD-STRM) | Pipe | STRM INLET 03E.2_01 | STRM MH 03E_05 | 12.21 | 4921.18 | 4921.07 | 0.9000 | 18.000 | 0.0130 | 2.39 | 9.97 | 0.24 | 4.64 | 0.50 | 0.33 | 0.00 | Calculated |
| 49 | {MCD-STRM}.Pipe - (279) (1) (MCD-STRM) | Pipe | STRM MH 04A_02 | STRM MH 04_01 | 329.83 | 4910.27 | 4907.80 | 0.7500 | 48.000 | 0.0130 | 61.37 | 124.31 | 0.49 | 9.97 | 1.98 | 0.50 | 0.00 | Calculated |
| 50 | {MCD-STRM}.Pipe - (279) (MCD-STRM) | Pipe | STRM MH 04A_03 | STRM MH 04A_02 | 329.82 | 4912.94 | 4910.47 | 0.7500 | 48.000 | 0.0130 | 61.48 | 124.31 | 0.49 | 9.99 | 1.98 | 0.50 | 0.00 | Calculated |
| 51 | {MCD-STRM}.Pipe - (28) (1) (1) (MCD-STRM) | Pipe | STRM MH 03_04 | STRM MH 03_03 | 325.53 | 4912.16 | 4910.53 | 0.5000 | 60.000 | 0.0130 | 140.06 | 184.29 | 0.76 | 10.41 | 3.26 | 0.65 | 0.00 | Calculated |
| 52 | {MCD-STRM}.Pipe - (28) (1) (2) (2) (MCD-STRM) | Pipe | STRM MH 03_05 | STRM MH 03_04 | 105.00 | 4912.88 | 4912.36 | 0.5000 | 60.000 | 0.0130 | 131.11 | 183.28 | 0.72 | 10.16 | 3.13 | 0.63 | 0.00 | Calculated |
| 53 | {MCD-STRM}.Pipe - (28) (1) (2) (MCD-STRM) | Pipe | STRM INLET 03B_02 | STRM MH 03_05 | 18.41 | 4919.43 | 4919.33 | 0.5400 | 24.000 | 0.0130 | 0.71 | 16.67 | 0.04 | 2.97 | 0.28 | 0.14 | 0.00 | Calculated |
| 54 | {MCD-STRM}.Pipe - (28) (1) (MCD-STRM) | Pipe | STRM MH 03_06 | STRM MH 03_05 | 81.18 | 4913.49 | 4913.08 | 0.5100 | 60.000 | 0.0130 | 127.16 | 185.09 | 0.69 | 10.16 | 3.04 | 0.61 | 0.00 | Calculated |
| 55 | {MCD-STRM}.Pipe - (28) (MCD-STRM) | Pipe | STRM MH 03_07 | STRM MH 03_06 | 69.13 | 4914.04 | 4913.69 | 0.5100 | 60.000 | 0.0130 | 124.83 | 185.32 | 0.67 | 10.13 | 3.01 | 0.60 | 0.00 | Calculated |
| 56 | {MCD-STRM}.Pipe - (280) (MCD-STRM) | Pipe | STRM INLET 03A_06 | STRM MH 03A_03 | 23.00 | 4919.66 | 4919.55 | 0.4800 | 18.000 | 0.0130 | 2.41 | 7.26 | 0.33 | 4.04 | 0.59 | 0.40 | 0.00 | Calculated |
| 57 | {MCD-STRM}.Pipe - (285) (MCD-STRM) | Pipe | STRM MH 04A_06 | STRM MH 04A_05 | 160.52 | 4918.71 | 4917.75 | 0.6000 | 24.000 | 0.0130 | 11.15 | 17.49 | 0.64 | 5.98 | 1.16 | 0.58 | 0.00 | Calculated |
| 58 | {MCD-STRM}.Pipe - (286) (MCD-STRM) | Pipe | STRM MH 04A_05 | STRM MH 04A_04 | 400.00 | 4917.55 | 4915.15 | 0.6000 | 24.000 | 0.0130 | 10.74 | 17.52 | 0.61 | 6.07 | 1.12 | 0.56 | 0.00 | Calculated |
| 59 | {MCD-STRM}.Pipe - (287) (MCD-STRM) | Pipe | STRM MH 04A_04 | STRM MH 04A_03 | 301.18 | 4914.95 | 4913.14 | 0.6000 | 24.000 | 0.0130 | 10.55 | 17.54 | 0.60 | 5.99 | 1.11 | 0.56 | 0.00 | Calculated |
| 60 | {MCD-STRM}.Pipe - (288) (MCD-STRM) | Pipe | STRM INLET 04A.3_02 | STRM MH 04A_06 | 33.85 | 4919.25 | 4918.91 | 1.0000 | 18.000 | 0.0130 | 5.71 | 10.53 | 0.54 | 6.09 | 0.79 | 0.52 | 0.00 | Calculated |
| 61 | {MCD-STRM}.Pipe - (289) (MCD-STRM) | Pipe | STRM INLET 04A.3_01 | STRM MH 04A_06 | 19.70 | 4919.06 | 4918.91 | 0.7600 | 18.000 | 0.0130 | 5.64 | 9.17 | 0.62 | 5.46 | 0.85 | 0.57 | 0.00 | Calculated |
| 62 | {MCD-STRM}.Pipe - (290) (MCD-STRM) | Pipe | STRM INLET 03E_01 | STRM MH 03E_02 | 19.13 | 4919.80 | 4919.70 | 0.5200 | 36.000 | 0.0130 | 34.01 | 48.22 | 0.71 | 7.40 | 1.85 | 0.62 | 0.00 | Calculated |
| 63 | {MCD-STRM}.Pipe - (291) (MCD-STRM) | Pipe | STRM MH 03E_02 | STRM MH 03E_03 | 91.72 | 4919.50 | 4919.04 | 0.5000 | 42.000 | 0.0130 | 34.41 | 71.25 | 0.48 | 7.38 | 1.71 | 0.49 | 0.00 | Calculated |
| 64 | {MCD-STRM}.Pipe - (292) (MCD-STRM) | Pipe | STRM MH 03E_03 | STRM MH 03E_04 | 95.09 | 4918.84 | 4918.36 | 0.5000 | 42.000 | 0.0130 | 42.08 | 71.48 | 0.59 | 7.76 | 1.93 | 0.55 | 0.00 | Calculated |
| 65 | {MCD-STRM}.Pipe - (293) (MCD-STRM) | Pipe | STRM INLET 03E.4_01 | STRM MH 03E_02 | 9.21 | 4921.55 | 4921.50 | 0.5400 | 18.000 | 0.0130 | 1.11 | 7.74 | 0.14 | 3.11 | 0.38 | 0.26 | 0.00 | Calculated |
| 66 | {MCD-STRM}.Pipe - (294) (MCD-STRM) | Pipe | STRM INLET 03F_02 | STRM MH 03_10 | 16.75 | 4921.02 | 4920.94 | 0.4800 | 18.000 | 0.0130 | 2.06 | 7.26 | 0.28 | 3.69 | 0.55 | 0.36 | 0.00 | Calculated |
| 67 | {MCD-STRM}.Pipe - (32) (MCD-STRM) | Pipe | EX_INLET_OS3 | STRM MH 03_14 | 51.98 | 4929.68 | 4927.71 | 3.7900 | 24.000 | 0.0130 | 10.70 | 44.04 | 0.24 | 11.88 | 0.67 | 0.34 | 0.00 | Calculated |
| 68 | {MCD-STRM}.Pipe - (50) (1) (1) (MCD-STRM) | Pipe | STRM MH 02_08 | STRM MH 02_07 | 147.03 | 4912.80 | 4912.14 | 0.4500 | 42.000 | 0.0130 | 47.78 | 67.41 | 0.71 | 7.65 | 2.17 | 0.62 | 0.00 | Calculated |
| 69 | {MCD-STRM}.Pipe - (50) (2) (MCD-STRM) | Pipe | STRM MH 02_11 | STRM MH 02_10 | 44.96 | 4914.26 | 4914.06 | 0.4400 | 36.000 | 0.0130 | 34.38 | 44.49 | 0.77 | 6.96 | 1.98 | 0.66 | 0.00 | Calculated |
| 70 | {MCD-STRM}.Pipe - (50) (MCD-STRM) | Pipe | STRM MH 02_12 | STRM MH 02_11 | 143.74 | 4915.11 | 4914.46 | 0.4500 | 36.000 | 0.0130 | 32.74 | 44.85 | 0.73 | 6.97 | 1.90 | 0.63 | 0.00 | Calculated |
| 71 | {MCD-STRM}.Pipe - (51) (MCD-STRM) | Pipe | EX_INLET_OS2 | STRM MH 02_14 | 95.18 | 4928.27 | 4927.79 | 0.5000 | 24.000 | 0.0130 | 2.89 | 16.07 | 0.18 | 5.89 | 0.57 | 0.29 | 0.00 | Calculated |
| 72 | {MCD-STRM}.Pipe - (52) (MCD-STRM) | Pipe | STRM MH 02_14 | STRM MH 02_13 | 97.48 | 4926.30 | 4923.30 | 3.0800 | 24.000 | 0.0130 | 6.28 | 39.69 | 0.16 | 9.25 | 0.54 | 0.27 | 0.00 | Calculated |
| 73 | {MCD-STRM}.Pipe - (53) (MCD-STRM) | Pipe | STRM MH 02_13 | STRM MH 02_12 | 127.82 | 4923.10 | 4920.55 | 1.9900 | 24.000 | 0.0130 | 6.25 | 31.95 | 0.20 | 7.94 | 0.60 | 0.30 | 0.00 | Calculated |
| 74 | {MCD-STRM}.Pipe - (62) (MCD-STRM) | Pipe | STRM MH 02_07 | STRM MH 02_06 | 93.46 | 4911.94 | 4911.52 | 0.4500 | 42.000 | 0.0130 | 50.75 | 67.45 | 0.75 | 7.74 | 2.26 | 0.65 | 0.00 | Calculated |
| 75 | {MCD-STRM}.Pipe - (67) (MCD-STRM) | Pipe | EX_INLET_OS1 | STRM MH 01_13 | 70.66 | 4926.64 | 4926.30 | 0.4800 | 24.000 | 0.0130 | 12.92 | 15.69 | 0.82 | 7.51 | 1.38 | 0.69 | 0.00 | Calculated |
| 76 | {MCD-STRM}.Pipe - (68) (MCD-STRM) | Pipe | STRM INLET 01_14 | STRM MH 01_13 | 55.01 | 4925.39 | 4925.12 | 0.4900 | 24.000 | 0.0130 | 8.21 | 15.85 | 0.52 | 6.02 | 1.02 | 0.51 | 0.00 | Calculated |
| 77 | {MCD-STRM}.Pipe - (69) (MCD-STRM) | Pipe | STRM MH 01_13 | STRM MH 01_12 | 165.65 | 4924.12 | 4923.29 | 0.5000 | 30.000 | 0.0130 | 18.86 | 29.03 | 0.65 | 6.34 | 1.47 | 0.59 | 0.00 | Calculated |
| 78 | {MCD-STRM}.Pipe - (71) (MCD-STRM) | Pipe | STRM MH 01_12 | STRM MH 01_11 | 104.60 | 4923.09 | 4922.57 | 0.5000 | 30.000 | 0.0130 | 18.81 | 28.92 | 0.65 | 6.29 | 1.47 | 0.59 | 0.00 | Calculated |
| 79 | {MCD-STRM}.Pipe - (73) (2) (MCD-STRM) | Pipe | STRM MH 01_10 | STRM MH 01_09 | 160.94 | 4918.83 | 4918.03 | 0.5000 | 42.000 | 0.0130 | 52.12 | 70.93 | 0.73 | 8.15 | 2.22 | 0.64 | 0.00 | Calculated |
| 80 | {MCD-STRM}.Pipe - (74) (MCD-STRM) | Pipe | STRM MH 01_09 | STRM MH 01_08 | 203.55 | 4916.26 | 4915.24 | 0.5000 | 48.000 | 0.0130 | 68.69 | 101.68 | 0.68 | 8.81 | 2.40 | 0.60 | 0.00 | Calculated |
| 81 | {MCD-STRM}.Pipe - (78) (1) (1) (MCD-STRM) | Pipe | STRM MH 01_08 | STRM MH 01_07 | 119.81 | 4915.04 | 4914.44 | 0.5000 | 48.000 | 0.0130 | 79.75 | 101.65 | 0.78 | 9.02 | 2.67 | 0.67 | 0.00 | Calculated |
| 82 | {MCD-STRM}.Pipe - (81) (MCD-STRM) | Pipe | STRM MH 01_06 | STRM MH 01_05 | 279.98 | 4912.61 | 4911.21 | 0.5000 | 48.000 | 0.0130 | 78.74 | 101.57 | 0.78 | 9.08 | 2.64 | 0.66 | 0.00 | Calculated |
| 83 | {MCD-STRM}.Pipe - (84) (MCD-STRM) | Pipe | STRM MH 01_04 | STRM MH 01_03 | 259.14 | 4909.35 | 4908.05 | 0.5000 | 54.000 | 0.0130 | 86.95 | 139.28 | 0.62 | 9.35 | 2.57 | 0.57 | 0.00 | Calculated |
| 84 | {MCD-STRM}.Pipe - (85) (1) (MCD-STRM) | Pipe | STRM MH 01_03 | STRM INLET 01_02 | 24.69 | 4907.85 | 4907.73 | 0.4900 | 54.000 | 0.0130 | 89.98 | 137.10 | 0.66 | 9.19 | 2.66 | 0.59 | 0.00 | Calculated |
| 85 | {MCD-STRM}.Pipe - (85) (MCD-STRM) | Pipe | STRM INLET 01A_1 | STRM MH 01_03 | 47.14 | 4915.26 | 4915.02 | 0.5100 | 24.000 | 0.0130 | 6.27 | 16.14 | 0.39 | 5.86 | 0.86 | 0.43 | 0.00 | Calculated |
| 86 | {MCD-STRM}.Pipe - (86) (MCD-STRM) | Pipe | STRM INLET 01_02 | STRM FES 01_01 | 89.83 | 4907.53 | 4907.08 | 0.5000 | 54.000 | 0.0130 | 92.37 | 139.18 | 0.66 | 9.37 | 2.68 | 0.60 | 0.00 | Calculated |
| 87 | Link-01 | Pipe | STRM MH 02_05 | STRM INLET 02_04 | 155.17 | 4910.30 | 4909.60 | 0.4500 | 48.000 | 0.0130 | 73.13 | 96.48 | 0.76 | 8.52 | 2.60 | 0.65 | 0.00 | Calculated |
| 88 | Link-05 | Pipe | STRM FES 03_01 | POND | 552.60 | 4905.47 | 4905.47 | 0.0000 | 0.000 | 0.0150 | 228.86 | 0.00 | 0.76 | 0.00 | 2.60 | 0.65 | 0.00 | Calculated |

MINOR 2-YEAR

## Link Summary

| SN | Element ID | Element Type | From (Inlet) Node | To (Outlet) Node | Length | Inlet Invert Elevation | Outlet Invert Elevation | Average Slope | Diameter or Height | Manning's Roughness | Peak Flow | Design Flow Capacity | Peak Flow/ Design Flow Ratio | Peak Flow Velocity | Peak Flow Depth | Peak Flow Depth/ Total Depth Ratio | Total Time Surcharged | Reported Condition |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (ft) | (ft) | (ft) | (%) | (in) | | (cfs) | (cfs) | | (ft/sec) | (ft) | | (min) | |
| 89 | Link-06 | Pipe | STRM FES 02_01 | POND | 212.05 | 4905.47 | 4905.47 | 0.0000 | 0.000 | 0.0150 | 113.00 | 0.00 | 0.76 | 0.00 | 2.60 | 0.65 | 0.00 | Calculated |
| 90 | Link-07 | Pipe | STRM FES 01_01 | POND | 329.69 | 4905.47 | 4905.47 | 0.0000 | 0.000 | 0.0150 | 92.37 | 0.00 | 0.76 | 0.00 | 2.60 | 0.65 | 0.00 | Calculated |
| 91 | Link-11 | Pipe | STRM MH 03_03 | STRM MH 03_02 | 115.71 | 4910.33 | 4909.75 | 0.5000 | 60.000 | 0.0130 | 139.96 | 184.39 | 0.76 | 10.35 | 3.26 | 0.65 | 0.00 | Calculated |
| 92 | Link-12 | Pipe | STRM MH 03_02 | STRM FES 03_01 | 110.66 | 4906.02 | 4905.47 | 0.5000 | 48.000 | 0.0130 | 228.86 | 350.93 | 0.65 | 15.74 | 2.42 | 0.61 | 0.00 | Calculated |
| 93 | Link-13 | Pipe | STRM MH 04_01 | STRM MH 03_02 | 56.25 | 4907.37 | 4907.09 | 0.5000 | 60.000 | 0.0130 | 114.47 | 183.75 | 0.62 | 9.86 | 2.86 | 0.57 | 0.00 | Calculated |
| 94 | Link-15 | Pipe | STRM MH 01_11 | STRM MH 01_10 | 117.84 | 4922.11 | 4920.93 | 1.0000 | 36.000 | 0.0130 | 37.40 | 66.74 | 0.56 | 9.75 | 1.60 | 0.53 | 0.00 | Calculated |
| 95 | Link-16 | Pipe | ROOF DRAIN A2 | STRM INLET 01E_01 | 56.30 | 4921.25 | 4920.68 | 1.0100 | 18.000 | 0.0130 | 6.15 | 10.57 | 0.58 | 7.67 | 0.82 | 0.55 | 0.00 | Calculated |
| 96 | Link-17 | Pipe | STRM MH 01_07 | STRM MH 01_06 | 286.16 | 4914.24 | 4912.81 | 0.5000 | 48.000 | 0.0130 | 79.32 | 101.54 | 0.78 | 9.11 | 2.65 | 0.66 | 0.00 | Calculated |
| 97 | Link-18 | Pipe | STRM MH 01_05 | STRM MH 01_04 | 147.71 | 4910.29 | 4909.55 | 0.5000 | 54.000 | 0.0130 | 87.41 | 139.19 | 0.63 | 9.29 | 2.58 | 0.57 | 0.00 | Calculated |
| 98 | Link-19 | Pipe | EX_INLET_OS4 | STRM MH 01F_03 | 157.22 | 4926.47 | 4925.47 | 0.6400 | 24.000 | 0.0130 | 19.48 | 18.04 | 1.08 | 10.44 | 1.82 | 0.91 | 0.00 | > CAPACITY |
| 99 | Link-20 | Pipe | STRM MH 01F_03 | STRM MH 01F_02 | 28.87 | 4925.27 | 4925.13 | 0.4800 | 30.000 | 0.0130 | 19.17 | 28.56 | 0.67 | 6.38 | 1.49 | 0.60 | 0.00 | Calculated |
| 100 | Link-21 | Pipe | STRM MH 01F_02 | STRM MH 01F_01 | 104.78 | 4924.93 | 4923.36 | 1.5000 | 30.000 | 0.0130 | 18.94 | 50.21 | 0.38 | 9.57 | 1.06 | 0.43 | 0.00 | Calculated |
| 101 | Link-22 | Pipe | STRM MH 01F_01 | STRM MH 01_11 | 68.95 | 4923.16 | 4922.82 | 0.4900 | 30.000 | 0.0130 | 18.79 | 28.80 | 0.65 | 6.31 | 1.47 | 0.59 | 0.00 | Calculated |
| 102 | Link-23 | Pipe | ROOF DRAIN C1 | STRM MH 02_05 | 61.00 | 4918.38 | 4915.33 | 5.0000 | 24.000 | 0.0150 | 9.88 | 43.84 | 0.23 | 12.07 | 0.64 | 0.32 | 0.00 | Calculated |
| 103 | Link-24 | Pipe | STRM MH 02_06 | STRM MH 02_05 | 114.38 | 4911.02 | 4910.50 | 0.4500 | 48.000 | 0.0130 | 65.92 | 96.85 | 0.68 | 8.32 | 2.42 | 0.61 | 0.00 | Calculated |
| 104 | Link-25 | Pipe | STRM INLET 02A_03 | STRM INLET 02A_02 | 77.44 | 4917.67 | 4917.28 | 0.5000 | 24.000 | 0.0130 | 10.02 | 16.05 | 0.62 | 7.15 | 1.14 | 0.57 | 0.00 | Calculated |
| 105 | Link-26 | Pipe | B17 ROOF DRAIN | STRM MH 02_08 | 45.20 | 4920.83 | 4920.44 | 0.8600 | 12.000 | 0.0150 | 2.09 | 2.90 | 0.72 | 5.21 | 0.63 | 0.63 | 0.00 | Calculated |
| 106 | Link-27 | Pipe | B15 ROOF DRAIN | STRM INLET 02C_01 | 35.65 | 4920.91 | 4920.55 | 1.0100 | 12.000 | 0.0150 | 1.96 | 3.10 | 0.63 | 5.05 | 0.57 | 0.58 | 0.00 | Calculated |
| 107 | Link-30 | Pipe | STRM INLET 02D_05 | STRM MH 02D_04 | 25.21 | 4920.22 | 4920.09 | 0.5200 | 18.000 | 0.0130 | 1.45 | 7.54 | 0.19 | 3.83 | 0.45 | 0.30 | 0.00 | Calculated |
| 108 | Link-31 | Pipe | STRM INLET 02D.3_01 | STRM MH 02D_03 | 12.20 | 4920.82 | 4920.70 | 0.9800 | 18.000 | 0.0130 | 0.80 | 10.42 | 0.08 | 3.50 | 0.28 | 0.19 | 0.00 | Calculated |
| 109 | Link-32 | Pipe | B11 ROOF DRAIN | STRM INLET 02D_01 | 30.07 | 4922.48 | 4921.62 | 2.8600 | 10.000 | 0.0150 | 1.23 | 3.21 | 0.38 | 5.85 | 0.36 | 0.43 | 0.00 | Calculated |
| 110 | Link-33 | Pipe | STRM INLET 02D_01 | STRM MH 02D_02 | 12.21 | 4920.96 | 4920.90 | 0.4900 | 18.000 | 0.0130 | 2.83 | 7.36 | 0.38 | 3.90 | 0.64 | 0.43 | 0.00 | Calculated |
| 111 | Link-39 | Pipe | B4 ROOF DRAIN | STRM MH 02F_04 | 73.45 | 4920.40 | 4919.98 | 0.5700 | 10.000 | 0.0130 | 1.50 | 1.66 | 0.91 | 5.24 | 0.62 | 0.74 | 0.00 | Calculated |
| 112 | Link-40 | Pipe | D30 ROOF DRAIN | STRM MH 03A_03 | 84.54 | 4921.61 | 4920.76 | 1.0100 | 12.000 | 0.0153 | 2.13 | 3.04 | 0.70 | 5.18 | 0.62 | 0.62 | 0.00 | Calculated |
| 113 | Link-41 | Pipe | STRM MH 03A_03 | STRM MH 03A_02 | 90.02 | 4919.35 | 4918.90 | 0.5000 | 18.000 | 0.0130 | 3.27 | 7.43 | 0.44 | 4.09 | 0.70 | 0.46 | 0.00 | Calculated |
| 114 | Link-44 | Pipe | STRM INLET 03A_01 | STRM MH 03A_01 | 22.17 | 4918.14 | 4918.02 | 0.5400 | 24.000 | 0.0130 | 8.47 | 16.64 | 0.51 | 5.39 | 1.01 | 0.51 | 0.00 | Calculated |
| 115 | Link-45 | Pipe | D27 ROOF DRAIN | STRM INLET 03B_01 | 20.00 | 4922.23 | 4922.03 | 1.0000 | 14.000 | 0.0130 | 4.29 | 5.37 | 0.80 | 5.68 | 0.79 | 0.68 | 0.00 | Calculated |
| 116 | Link-46 | Pipe | D26 ROOF DRAIN | STRM MH 03_06 | 46.97 | 4921.33 | 4921.10 | 0.4900 | 14.000 | 0.0130 | 3.25 | 3.76 | 0.86 | 5.31 | 0.83 | 0.72 | 0.00 | Calculated |
| 117 | Link-47 | Pipe | D18 ROOF DRAIN | STRM INLET 03D_01 | 25.00 | 4922.07 | 4921.82 | 1.0000 | 12.000 | 0.0130 | 2.47 | 3.56 | 0.69 | 5.27 | 0.61 | 0.61 | 0.00 | Calculated |
| 118 | Link-48 | Pipe | STRM INLET 03E.1_01 | STRM MH 03E_06 | 46.21 | 4921.05 | 4920.82 | 0.5000 | 18.000 | 0.0130 | 2.94 | 7.41 | 0.40 | 5.08 | 0.65 | 0.44 | 0.00 | Calculated |
| 119 | Link-49 | Pipe | STRM MH 03E_05 | STRM MH 03_09 | 184.33 | 4917.05 | 4916.13 | 0.5000 | 42.000 | 0.0130 | 47.05 | 71.08 | 0.66 | 7.96 | 2.08 | 0.59 | 0.00 | Calculated |
| 120 | Link-50 | Pipe | STRM INLET 03E.2_02 | STRM MH 03E_05 | 26.13 | 4919.22 | 4919.07 | 0.5700 | 18.000 | 0.0130 | 1.26 | 7.96 | 0.16 | 3.84 | 0.40 | 0.27 | 0.00 | Calculated |
| 121 | Link-51 | Pipe | STRM INLET 03E.5_02 | STRM MH 03E.5_01 | 8.59 | 4922.07 | 4921.98 | 1.0500 | 24.000 | 0.0130 | 8.88 | 23.16 | 0.38 | 6.88 | 0.86 | 0.43 | 0.00 | Calculated |
| 122 | Link-52 | Pipe | STRM MH 03E.5_01 | STRM MH 03E_03 | 144.34 | 4921.78 | 4920.34 | 1.0000 | 24.000 | 0.0130 | 8.78 | 22.60 | 0.39 | 6.78 | 0.86 | 0.43 | 0.00 | Calculated |
| 123 | Link-53 | Pipe | STRM STUB 03_00 | STRM INLET 03E_01 | 50.00 | 4920.81 | 4920.00 | 1.6200 | 36.000 | 0.0130 | 32.89 | 84.89 | 0.39 | 11.26 | 1.30 | 0.43 | 0.00 | Calculated |
| 124 | Link-54 | Pipe | STRM INLET 03G_05 | STRM MH 03G_04 | 15.67 | 4920.42 | 4920.34 | 0.5100 | 30.000 | 0.0130 | 18.53 | 29.31 | 0.63 | 6.32 | 1.44 | 0.58 | 0.00 | Calculated |
| 125 | Link-56 | Pipe | STRM MH 02F_04 | STRM MH 02F_03 | 102.32 | 4917.58 | 4917.17 | 0.4000 | 18.000 | 0.0130 | 2.82 | 6.65 | 0.42 | 3.67 | 0.68 | 0.45 | 0.00 | Calculated |
| 126 | Link-57 | Pipe | STRM MH 02F_03 | STRM MH 02_12 | 140.11 | 4916.17 | 4915.61 | 0.4000 | 30.000 | 0.0130 | 17.13 | 25.93 | 0.66 | 5.72 | 1.48 | 0.59 | 0.00 | Calculated |
| 127 | Link-58 | Pipe | B6 ROOF DRAIN | STRM INLET 02F.2_01 | 62.65 | 4921.22 | 4920.22 | 1.6000 | 10.000 | 0.0130 | 1.37 | 2.77 | 0.49 | 6.63 | 0.41 | 0.50 | 0.00 | Calculated |
| 128 | Link-59 | Pipe | STRM INLET 02F.2_01 | STRM MH 02F_03 | 10.71 | 4918.80 | 4918.75 | 0.4700 | 30.000 | 0.0130 | 15.03 | 28.03 | 0.54 | 5.81 | 1.30 | 0.52 | 0.00 | Calculated |
| 129 | Link-60 | Pipe | B8 ROOF DRAIN | STRM INLET 02F_01 | 62.82 | 4921.88 | 4920.96 | 1.4600 | 12.000 | 0.0130 | 2.74 | 4.31 | 0.64 | 7.36 | 0.58 | 0.58 | 0.00 | Calculated |
| 130 | Link-61 | Pipe | STRM INLET 02F_01 | STRM MH 02F_02 | 10.71 | 4919.46 | 4919.42 | 0.3700 | 30.000 | 0.0130 | 13.63 | 25.07 | 0.54 | 5.22 | 1.31 | 0.53 | 0.00 | Calculated |
| 131 | Link-62 | Pipe | STRM MH 02F_02 | STRM MH 02_12 | 170.89 | 4919.22 | 4918.54 | 0.4000 | 30.000 | 0.0130 | 13.53 | 25.87 | 0.52 | 5.62 | 1.28 | 0.51 | 0.00 | Calculated |
| 132 | Link-63 | Pipe | STRM MH 02D_04 | STRM MH 02_10 | 121.91 | 4919.30 | 4918.69 | 0.5000 | 18.000 | 0.0130 | 1.42 | 7.43 | 0.19 | 3.41 | 0.44 | 0.29 | 0.00 | Calculated |

MINOR 2-YEAR

## Link Summary

| SN | Element ID | Element Type | From (Inlet) Node | To (Outlet) Node | Length | Inlet Invert Elevation | Outlet Invert Elevation | Average Slope | Diameter or Height | Manning's Roughness | Peak Flow | Design Flow Capacity | Peak Flow/ Design Flow Ratio | Peak Flow Velocity | Peak Flow Depth | Peak Flow Depth/ Total Depth Ratio | Total Time Surcharged | Reported Condition |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (ft) | (ft) | (ft) | (%) | (in) | | (cfs) | (cfs) | | (ft/sec) | (ft) | | (min) | |
| 133 | Link-64 | Pipe | STRM MH 02_10 | STRM MH 02_09 | 25.96 | 4913.56 | 4913.44 | 0.4600 | 42.000 | 0.0130 | 41.15 | 68.40 | 0.60 | 7.43 | 1.96 | 0.56 | 0.00 | Calculated |
| 134 | Link-65 | Pipe | STRM MH 02_09 | STRM MH 02_08 | 52.42 | 4913.24 | 4913.00 | 0.4600 | 42.000 | 0.0130 | 41.13 | 68.08 | 0.60 | 7.41 | 1.96 | 0.56 | 0.00 | Calculated |
| 135 | Link-66 | Pipe | STRM INLET 02F_05 | STRM MH 02F_04 | 152.36 | 4918.69 | 4918.08 | 0.4000 | 12.000 | 0.0130 | 1.40 | 2.25 | 0.62 | 3.54 | 0.57 | 0.57 | 0.00 | Calculated |
| 136 | Link-67 | Pipe | STRM MH 03A_02 | STRM MH 03A_01 | 143.78 | 4918.70 | 4917.98 | 0.5000 | 18.000 | 0.0130 | 3.21 | 7.43 | 0.43 | 4.09 | 0.69 | 0.46 | 0.00 | Calculated |
| 137 | Link-68 | Pipe | STRM MH 03A_01 | STRM MH 03_04 | 247.73 | 4917.78 | 4916.54 | 0.5000 | 24.000 | 0.0130 | 10.83 | 16.01 | 0.68 | 5.61 | 1.20 | 0.60 | 0.00 | Calculated |
| 138 | Link-69 | Pipe | STRM INLET 03C_05 | STRM INLET 03C_04 | 74.86 | 4920.23 | 4919.48 | 1.0000 | 18.000 | 0.0130 | 2.17 | 10.51 | 0.21 | 6.47 | 0.46 | 0.31 | 0.00 | Calculated |
| 139 | Link-70 | Pipe | STRM INLET 03C_04 | STRM INLET 03C_03 | 88.15 | 4919.28 | 4918.40 | 1.0000 | 18.000 | 0.0130 | 3.63 | 10.50 | 0.35 | 5.44 | 0.61 | 0.41 | 0.00 | Calculated |
| 140 | Link-71 | Pipe | STRM INLET 03C_03 | STRM INLET 03C_02 | 72.02 | 4918.20 | 4917.84 | 0.5000 | 24.000 | 0.0130 | 5.12 | 15.99 | 0.32 | 4.56 | 0.78 | 0.39 | 0.00 | Calculated |
| 141 | Link-72 | Pipe | STRM INLET 03C_02 | STRM INLET 03C_01 | 88.54 | 4917.08 | 4916.64 | 0.5000 | 24.000 | 0.0130 | 5.74 | 15.95 | 0.36 | 4.70 | 0.83 | 0.41 | 0.00 | Calculated |
| 142 | Link-73 | Pipe | STRM INLET 03C_01 | STRM MH 03_07 | 61.23 | 4915.64 | 4915.33 | 0.5100 | 24.000 | 0.0130 | 6.52 | 16.10 | 0.41 | 4.88 | 0.89 | 0.44 | 0.00 | Calculated |
| 143 | Link-74 | Pipe | STRM MH 03G_02 | STRM MH 03_11 | 175.09 | 4919.41 | 4918.54 | 0.5000 | 30.000 | 0.0130 | 20.09 | 28.91 | 0.69 | 6.45 | 1.53 | 0.61 | 0.00 | Calculated |
| 144 | Link-75 | Pipe | D2 ROOF DRAIN | STRM INLET 03G_01 | 65.71 | 4921.26 | 4920.92 | 0.5200 | 14.000 | 0.0130 | 2.39 | 3.87 | 0.62 | 5.37 | 0.66 | 0.57 | 0.00 | Calculated |
| 145 | Link-76 | Pipe | STRM INLET 03G_01 | STRM MH 03G_02 | 15.67 | 4919.69 | 4919.61 | 0.5100 | 30.000 | 0.0153 | 20.33 | 24.90 | 0.82 | 5.66 | 1.72 | 0.69 | 0.00 | Calculated |
| 146 | Link-08 | Outlet | POND | OUTFALL | | 4905.47 | 4904.92 | | | | 2.79 | | | | | | | |

MAJOR 100-YEAR

## Node Summary

| SN | Element ID | Element Type | Invert Elevation (ft) | Ground/Rim (Max) Elevation (ft) | Initial Water Elevation (ft) | Surcharge Elevation (ft) | Ponded Area ($ft^2$) | Peak Inflow (cfs) | Max HGL Elevation Attained (ft) | Max Surcharge Depth Attained (ft) | Min Freeboard Attained (ft) | Time of Peak Flooding Occurrence (days hh:mm) | Total Flooded Volume (ac-in) | Total Time Flooded (min) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | B11 ROOF DRAIN | Junction | 4922.48 | 4926.46 | 0.00 | 0.00 | 0.00 | 1.37 | 4922.86 | 0.00 | 3.60 | 0 00:00 | 0.00 | 0.00 |
| 2 | B15 ROOF DRAIN | Junction | 4920.91 | 4925.54 | 0.00 | 0.00 | 0.00 | 2.17 | 4921.53 | 0.00 | 4.01 | 0 00:00 | 0.00 | 0.00 |
| 3 | B17 ROOF DRAIN | Junction | 4920.84 | 4926.06 | 0.00 | 0.00 | 0.00 | 2.33 | 4921.52 | 0.00 | 4.54 | 0 00:00 | 0.00 | 0.00 |
| 4 | B4 ROOF DRAIN | Junction | 4920.40 | 4925.56 | 0.00 | 0.00 | 0.00 | 1.69 | 4920.97 | 0.00 | 4.59 | 0 00:00 | 0.00 | 0.00 |
| 5 | B6 ROOF DRAIN | Junction | 4921.22 | 4925.40 | 0.00 | 0.00 | 0.00 | 1.53 | 4921.66 | 0.00 | 3.74 | 0 00:00 | 0.00 | 0.00 |
| 6 | B8 ROOF DRAIN | Junction | 4921.88 | 4926.18 | 0.00 | 0.00 | 0.00 | 3.05 | 4922.50 | 0.00 | 3.68 | 0 00:00 | 0.00 | 0.00 |
| 7 | D18 ROOF DRAIN | Junction | 4922.07 | 4926.17 | 0.00 | 0.00 | 0.00 | 2.73 | 4922.73 | 0.00 | 3.44 | 0 00:00 | 0.00 | 0.00 |
| 8 | D2 ROOF DRAIN | Junction | 4921.19 | 4926.46 | 0.00 | 0.00 | 0.00 | 2.81 | 4922.75 | 0.00 | 3.71 | 0 00:00 | 0.00 | 0.00 |
| 9 | D26 ROOF DRAIN | Junction | 4921.33 | 4925.62 | 0.00 | 0.00 | 0.00 | 3.62 | 4922.25 | 0.00 | 3.37 | 0 00:00 | 0.00 | 0.00 |
| 10 | D27 ROOF DRAIN | Junction | 4922.23 | 4925.62 | 0.00 | 0.00 | 0.00 | 4.74 | 4923.08 | 0.00 | 2.54 | 0 00:00 | 0.00 | 0.00 |
| 11 | D30 ROOF DRAIN | Junction | 4921.61 | 4925.90 | 0.00 | 0.00 | 0.00 | 2.37 | 4922.28 | 0.00 | 3.62 | 0 00:00 | 0.00 | 0.00 |
| 12 | EX_INLET_OS1 | Junction | 4926.64 | 4931.09 | 0.00 | 0.00 | 0.00 | 21.80 | 4931.09 | 0.00 | 0.00 | 0 00:05 | 0.14 | 3.00 |
| 13 | EX_INLET_OS2 | Junction | 4928.27 | 4931.72 | 0.00 | 0.00 | 0.00 | 3.56 | 4928.91 | 0.00 | 2.81 | 0 00:00 | 0.00 | 0.00 |
| 14 | EX_INLET_OS3 | Junction | 4929.68 | 4932.43 | 0.00 | 0.00 | 0.00 | 17.92 | 4930.57 | 0.00 | 1.86 | 0 00:00 | 0.00 | 0.00 |
| 15 | EX_INLET_OS4 | Junction | 4926.47 | 4928.47 | 0.00 | 0.00 | 0.00 | 24.38 | 4928.47 | 0.00 | 0.00 | 0 00:05 | 0.14 | 3.00 |
| 16 | ROOF DRAIN A2 | Junction | 4921.25 | 4925.00 | 0.00 | 0.00 | 0.00 | 6.83 | 4922.13 | 0.00 | 2.87 | 0 00:00 | 0.00 | 0.00 |
| 17 | ROOF DRAIN C1 | Junction | 4918.38 | 4925.90 | 0.00 | 0.00 | 0.00 | 10.93 | 4919.06 | 0.00 | 6.84 | 0 00:00 | 0.00 | 0.00 |
| 18 | STRM FES 01_01 | Junction | 4907.08 | 4915.05 | 0.00 | 0.00 | 0.00 | 113.48 | 4910.17 | 0.00 | 4.88 | 0 00:00 | 0.00 | 0.00 |
| 19 | STRM FES 02_01 | Junction | 4906.60 | 4915.54 | 0.00 | 0.00 | 0.00 | 141.81 | 4910.02 | 0.00 | 5.52 | 0 00:00 | 0.00 | 0.00 |
| 20 | STRM FES 03_01 | Junction | 4905.47 | 4915.00 | 0.00 | 0.00 | 0.00 | 295.84 | 4908.40 | 0.00 | 6.60 | 0 00:00 | 0.00 | 0.00 |
| 21 | STRM INLET 01_02 | Junction | 4907.53 | 4919.46 | 0.00 | 0.00 | 0.00 | 113.54 | 4910.79 | 0.00 | 8.67 | 0 00:00 | 0.00 | 0.00 |
| 22 | STRM INLET 01_14 | Junction | 4925.39 | 4929.46 | 0.00 | 0.00 | 0.00 | 9.13 | 4926.48 | 0.00 | 2.98 | 0 00:00 | 0.00 | 0.00 |
| 23 | STRM INLET 01A_1 | Junction | 4915.26 | 4919.88 | 0.00 | 0.00 | 0.00 | 9.06 | 4916.33 | 0.00 | 3.55 | 0 00:00 | 0.00 | 0.00 |
| 24 | STRM INLET 01B_1 | Junction | 4916.83 | 4921.46 | 0.00 | 0.00 | 0.00 | 7.04 | 4917.99 | 0.00 | 3.47 | 0 00:00 | 0.00 | 0.00 |
| 25 | STRM INLET 01B_2 | Junction | 4916.50 | 4921.52 | 0.00 | 0.00 | 0.00 | 11.07 | 4917.72 | 0.00 | 3.80 | 0 00:00 | 0.00 | 0.00 |
| 26 | STRM INLET 01C_01 | Junction | 4919.41 | 4924.07 | 0.00 | 0.00 | 0.00 | 13.28 | 4920.80 | 0.00 | 3.27 | 0 00:00 | 0.00 | 0.00 |
| 27 | STRM INLET 01C_02 | Junction | 4919.17 | 4924.44 | 0.00 | 0.00 | 0.00 | 3.51 | 4919.90 | 0.00 | 4.54 | 0 00:00 | 0.00 | 0.00 |
| 28 | STRM INLET 01D_01 | Junction | 4917.73 | 4923.38 | 0.00 | 0.00 | 0.00 | 22.44 | 4919.38 | 0.00 | 4.00 | 0 00:00 | 0.00 | 0.00 |
| 29 | STRM INLET 01D_2 | Junction | 4918.30 | 4923.55 | 0.00 | 0.00 | 0.00 | 9.40 | 4919.39 | 0.00 | 4.16 | 0 00:00 | 0.00 | 0.00 |
| 30 | STRM INLET 01E_01 | Junction | 4919.35 | 4924.42 | 0.00 | 0.00 | 0.00 | 20.44 | 4921.55 | 0.00 | 2.87 | 0 00:00 | 0.00 | 0.00 |
| 31 | STRM INLET 02_04 | Junction | 4909.40 | 4923.06 | 0.00 | 0.00 | 0.00 | 97.47 | 4912.65 | 0.00 | 10.41 | 0 00:00 | 0.00 | 0.00 |
| 32 | STRM INLET 02A.1_01 | Junction | 4918.27 | 4922.84 | 0.00 | 0.00 | 0.00 | 8.29 | 4919.29 | 0.00 | 3.55 | 0 00:00 | 0.00 | 0.00 |
| 33 | STRM INLET 02A_02 | Junction | 4917.08 | 4923.08 | 0.00 | 0.00 | 0.00 | 13.26 | 4918.59 | 0.00 | 4.49 | 0 00:00 | 0.00 | 0.00 |
| 34 | STRM INLET 02A_03 | Junction | 4917.67 | 4922.32 | 0.00 | 6.00 | 0.00 | 12.46 | 4918.99 | 0.00 | 3.33 | 0 00:00 | 0.00 | 0.00 |
| 35 | STRM INLET 02B_01 | Junction | 4919.42 | 4924.00 | 0.00 | 0.00 | 0.00 | 4.58 | 4920.26 | 0.00 | 3.74 | 0 00:00 | 0.00 | 0.00 |
| 36 | STRM INLET 02C_01 | Junction | 4919.72 | 4924.34 | 0.00 | 0.00 | 0.00 | 7.31 | 4921.16 | 0.00 | 3.18 | 0 00:00 | 0.00 | 0.00 |
| 37 | STRM INLET 02D.3_01 | Junction | 4920.82 | 4925.56 | 0.00 | 0.00 | 0.00 | 0.93 | 4921.12 | 0.00 | 4.44 | 0 00:00 | 0.00 | 0.00 |
| 38 | STRM INLET 02D.4_01 | Junction | 4921.07 | 4925.59 | 0.00 | 0.00 | 0.00 | 2.64 | 4921.75 | 0.00 | 3.84 | 0 00:00 | 0.00 | 0.00 |
| 39 | STRM INLET 02D_01 | Junction | 4920.96 | 4925.67 | 0.00 | 0.00 | 0.00 | 3.29 | 4922.00 | 0.00 | 3.67 | 0 00:00 | 0.00 | 0.00 |
| 40 | STRM INLET 02D_05 | Junction | 4920.22 | 4924.93 | 0.00 | 0.00 | 0.00 | 1.71 | 4920.71 | 0.00 | 4.22 | 0 00:00 | 0.00 | 0.00 |
| 41 | STRM INLET 02E_01 | Junction | 4920.09 | 4924.75 | 0.00 | 0.00 | 0.00 | 2.33 | 4920.75 | 0.00 | 4.00 | 0 00:00 | 0.00 | 0.00 |
| 42 | STRM INLET 02F.2_01 | Junction | 4918.80 | 4923.60 | 0.00 | 0.00 | 0.00 | 19.64 | 4920.66 | 0.00 | 2.94 | 0 00:00 | 0.00 | 0.00 |
| 43 | STRM INLET 02F_01 | Junction | 4919.46 | 4924.69 | 0.00 | 0.00 | 0.00 | 16.11 | 4921.58 | 0.00 | 3.11 | 0 00:00 | 0.00 | 0.00 |
| 44 | STRM INLET 02F_05 | Junction | 4918.69 | 4921.73 | 0.00 | 0.00 | 0.00 | 1.88 | 4919.39 | 0.00 | 2.34 | 0 00:00 | 0.00 | 0.00 |
| 45 | STRM INLET 02F_06 | Junction | 4920.17 | 4923.42 | 0.00 | 0.00 | 0.00 | 1.27 | 4920.52 | 0.00 | 2.90 | 0 00:00 | 0.00 | 0.00 |
| 46 | STRM INLET 02G_01 | Junction | 4927.34 | 4931.85 | 0.00 | 0.00 | 0.00 | 3.94 | 4928.12 | 0.00 | 3.73 | 0 00:00 | 0.00 | 0.00 |
| 47 | STRM INLET 03_15 | Junction | 4927.75 | 4932.74 | 0.00 | 0.00 | 0.00 | 16.10 | 4929.09 | 0.00 | 3.65 | 0 00:00 | 0.00 | 0.00 |
| 48 | STRM INLET 03A_01 | Junction | 4918.09 | 4923.77 | 0.00 | 0.00 | 0.00 | 10.11 | 4919.25 | 0.00 | 4.52 | 0 00:00 | 0.00 | 0.00 |
| 49 | STRM INLET 03A_06 | Junction | 4916.66 | 4924.77 | 0.00 | 0.00 | 0.00 | 2.83 | 4920.31 | 0.00 | 4.46 | 0 00:00 | 0.00 | 0.00 |
| 50 | STRM INLET 03B_01 | Junction | 4919.93 | 4925.13 | 0.00 | 0.00 | 0.00 | 5.15 | 4922.88 | 0.00 | 2.25 | 0 00:00 | 0.00 | 0.00 |
| 51 | STRM INLET 03B_02 | Junction | 4919.43 | 4924.97 | 0.00 | 0.00 | 0.00 | 0.84 | 4919.74 | 0.00 | 5.23 | 0 00:00 | 0.00 | 0.00 |
| 52 | STRM INLET 03C_01 | Junction | 4915.64 | 4925.18 | 0.00 | 0.00 | 0.00 | 7.98 | 4917.57 | 0.00 | 7.61 | 0 00:00 | 0.00 | 0.00 |
| 53 | STRM INLET 03C_02 | Junction | 4917.08 | 4925.01 | 0.00 | 0.00 | 0.00 | 7.09 | 4918.71 | 0.00 | 6.30 | 0 00:00 | 0.00 | 0.00 |
| 54 | STRM INLET 03C_03 | Junction | 4918.20 | 4924.82 | 0.00 | 0.00 | 0.00 | 6.28 | 4919.08 | 0.00 | 5.74 | 0 00:00 | 0.00 | 0.00 |
| 55 | STRM INLET 03C_04 | Junction | 4919.28 | 4925.82 | 0.00 | 0.00 | 0.00 | 4.45 | 4919.99 | 0.00 | 5.83 | 0 00:00 | 0.00 | 0.00 |
| 56 | STRM INLET 03C_05 | Junction | 4920.23 | 4925.13 | 0.00 | 0.00 | 0.00 | 2.65 | 4920.74 | 0.00 | 4.39 | 0 00:00 | 0.00 | 0.00 |
| 57 | STRM INLET 03D_01 | Junction | 4920.99 | 4925.62 | 0.00 | 0.00 | 0.00 | 6.16 | 4922.47 | 0.00 | 3.15 | 0 00:00 | 0.00 | 0.00 |
| 58 | STRM INLET 03D_02 | Junction | 4920.92 | 4925.62 | 0.00 | 0.00 | 0.00 | 8.65 | 4921.98 | 0.00 | 3.64 | 0 00:00 | 0.00 | 0.00 |
| 59 | STRM INLET 03E.1_01 | Junction | 4921.05 | 4925.68 | 0.00 | 0.00 | 0.00 | 3.53 | 4921.78 | 0.00 | 3.90 | 0 00:00 | 0.00 | 0.00 |
| 60 | STRM INLET 03E.2_01 | Junction | 4921.18 | 4925.87 | 0.00 | 0.00 | 0.00 | 2.87 | 4921.73 | 0.00 | 4.14 | 0 00:00 | 0.00 | 0.00 |

MAJOR 100-YEAR

## Node Summary

| SN | Element ID | Element Type | Invert Elevation (ft) | Ground/Rim (Max) Elevation (ft) | Initial Water Elevation (ft) | Surcharge Elevation (ft) | Ponded Area ($ft^2$) | Peak Inflow (cfs) | Max HGL Elevation Attained (ft) | Max Surcharge Depth Attained (ft) | Min Freeboard Attained (ft) | Time of Peak Flooding Occurrence (days hh:mm) | Total Flooded Volume (ac-in) | Total Time Flooded (min) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 61 | STRM INLET 03E.2_02 | Junction | 4919.22 | 4926.03 | 0.00 | 0.00 | 0.00 | 1.71 | 4919.69 | 0.00 | 6.34 | 0 00:00 | 0.00 | 0.00 |
| 62 | STRM INLET 03E.3_01 | Junction | 4921.29 | 4926.01 | 0.00 | 0.00 | 0.00 | 2.07 | 4921.80 | 0.00 | 4.21 | 0 00:00 | 0.00 | 0.00 |
| 63 | STRM INLET 03E.3_02 | Junction | 4921.25 | 4926.02 | 0.00 | 0.00 | 0.00 | 4.97 | 4922.21 | 0.00 | 3.81 | 0 00:00 | 0.00 | 0.00 |
| 64 | STRM INLET 03E.4_01 | Junction | 4921.55 | 4926.20 | 0.00 | 0.00 | 0.00 | 1.26 | 4921.96 | 0.00 | 4.24 | 0 00:00 | 0.00 | 0.00 |
| 65 | STRM INLET 03E.5_02 | Junction | 4922.07 | 4927.79 | 0.00 | 0.00 | 0.00 | 10.07 | 4922.99 | 0.00 | 4.80 | 0 00:00 | 0.00 | 0.00 |
| 66 | STRM INLET 03E_01 | Junction | 4919.80 | 4926.21 | 0.00 | 0.00 | 0.00 | 42.34 | 4921.98 | 0.00 | 4.23 | 0 00:00 | 0.00 | 0.00 |
| 67 | STRM INLET 03E_07 | Junction | 4921.07 | 4925.95 | 0.00 | 0.00 | 0.00 | 1.99 | 4921.60 | 0.00 | 4.35 | 0 00:00 | 0.00 | 0.00 |
| 68 | STRM INLET 03F_01 | Junction | 4921.09 | 4926.10 | 0.00 | 0.00 | 0.00 | 0.85 | 4921.43 | 0.00 | 4.67 | 0 00:00 | 0.00 | 0.00 |
| 69 | STRM INLET 03F_02 | Junction | 4921.02 | 4925.89 | 0.00 | 0.00 | 0.00 | 2.53 | 4921.63 | 0.00 | 4.26 | 0 00:00 | 0.00 | 0.00 |
| 70 | STRM INLET 03G.2_01 | Junction | 4919.44 | 4924.91 | 0.00 | 0.00 | 0.00 | 25.97 | 4921.58 | 0.00 | 3.33 | 0 00:00 | 0.00 | 0.00 |
| 71 | STRM INLET 03G_01 | Junction | 4919.69 | 4924.86 | 0.00 | 0.00 | 0.00 | 20.51 | 4921.42 | 0.00 | 3.44 | 0 00:00 | 0.00 | 0.00 |
| 72 | STRM INLET 03G_05 | Junction | 4920.21 | 4925.55 | 0.00 | 0.00 | 0.00 | 22.41 | 4922.06 | 0.00 | 3.49 | 0 00:00 | 0.00 | 0.00 |
| 73 | STRM INLET 04A.1_01 | Junction | 4912.72 | 4918.10 | 0.00 | 0.00 | 0.00 | 8.55 | 4913.75 | 0.00 | 4.35 | 0 00:00 | 0.00 | 0.00 |
| 74 | STRM INLET 04A.2_01 | Junction | 4913.34 | 4920.05 | 0.00 | 0.00 | 0.00 | 6.89 | 4914.23 | 0.00 | 5.82 | 0 00:00 | 0.00 | 0.00 |
| 75 | STRM INLET 04A.2_02 | Junction | 4913.63 | 4920.05 | 0.00 | 0.00 | 0.00 | 71.05 | 4916.34 | 0.00 | 3.71 | 0 00:00 | 0.00 | 0.00 |
| 76 | STRM INLET 04A.3_01 | Junction | 4919.06 | 4924.15 | 0.00 | 0.00 | 0.00 | 8.86 | 4920.25 | 0.00 | 3.90 | 0 00:00 | 0.00 | 0.00 |
| 77 | STRM INLET 04A.3_02 | Junction | 4919.25 | 4924.31 | 0.00 | 0.00 | 0.00 | 8.97 | 4920.32 | 0.00 | 4.00 | 0 00:00 | 0.00 | 0.00 |
| 78 | STRM INLET 04A_02 | Junction | 4910.70 | 4917.62 | 0.00 | 0.00 | 0.00 | 72.20 | 4913.61 | 0.00 | 4.01 | 0 00:00 | 0.00 | 0.00 |
| 79 | STRM MH 01_03 | Junction | 4907.85 | 4920.00 | 0.00 | 0.00 | 0.00 | 110.63 | 4916.09 | 0.00 | 3.91 | 0 00:00 | 0.00 | 0.00 |
| 80 | STRM MH 01_04 | Junction | 4909.35 | 4921.32 | 0.00 | 0.00 | 0.00 | 105.85 | 4912.49 | 0.00 | 8.83 | 0 00:00 | 0.00 | 0.00 |
| 81 | STRM MH 01_05 | Junction | 4910.29 | 4921.49 | 0.00 | 0.00 | 0.00 | 105.94 | 4917.62 | 0.00 | 3.87 | 0 00:00 | 0.00 | 0.00 |
| 82 | STRM MH 01_06 | Junction | 4912.61 | 4923.25 | 0.00 | 0.00 | 0.00 | 93.57 | 4915.84 | 0.00 | 7.41 | 0 00:00 | 0.00 | 0.00 |
| 83 | STRM MH 01_07 | Junction | 4914.24 | 4925.74 | 0.00 | 0.00 | 0.00 | 94.25 | 4917.49 | 0.00 | 8.25 | 0 00:00 | 0.00 | 0.00 |
| 84 | STRM MH 01_08 | Junction | 4915.04 | 4924.62 | 0.00 | 0.00 | 0.00 | 94.41 | 4920.41 | 0.00 | 4.21 | 0 00:00 | 0.00 | 0.00 |
| 85 | STRM MH 01_09 | Junction | 4916.26 | 4925.83 | 0.00 | 0.00 | 0.00 | 81.86 | 4920.51 | 0.00 | 5.32 | 0 00:00 | 0.00 | 0.00 |
| 86 | STRM MH 01_10 | Junction | 4918.83 | 4926.27 | 0.00 | 0.00 | 0.00 | 60.51 | 4922.69 | 0.00 | 3.58 | 0 00:00 | 0.00 | 0.00 |
| 87 | STRM MH 01_11 | Junction | 4922.11 | 4927.89 | 0.00 | 0.00 | 0.00 | 43.64 | 4924.36 | 0.00 | 3.53 | 0 00:00 | 0.00 | 0.00 |
| 88 | STRM MH 01_12 | Junction | 4923.09 | 4929.07 | 0.00 | 0.00 | 0.00 | 25.01 | 4925.08 | 0.00 | 3.99 | 0 00:00 | 0.00 | 0.00 |
| 89 | STRM MH 01_13 | Junction | 4924.12 | 4929.89 | 0.00 | 0.00 | 0.00 | 25.77 | 4928.30 | 0.00 | 1.59 | 0 00:00 | 0.00 | 0.00 |
| 90 | STRM MH 01F_01 | Junction | 4923.16 | 4927.94 | 0.00 | 0.00 | 0.00 | 19.58 | 4924.67 | 0.00 | 3.27 | 0 00:00 | 0.00 | 0.00 |
| 91 | STRM MH 01F_02 | Junction | 4924.93 | 4929.90 | 0.00 | 0.00 | 0.00 | 19.54 | 4926.65 | 0.00 | 3.25 | 0 00:00 | 0.00 | 0.00 |
| 92 | STRM MH 01F_03 | Junction | 4925.27 | 4930.96 | 0.00 | 0.00 | 0.00 | 19.52 | 4927.47 | 0.00 | 3.49 | 0 00:00 | 0.00 | 0.00 |
| 93 | STRM MH 02_02 | Junction | 4907.10 | 4921.10 | 0.00 | 0.00 | 0.00 | 141.86 | 4910.72 | 0.00 | 10.38 | 0 00:00 | 0.00 | 0.00 |
| 94 | STRM MH 02_03 | Junction | 4908.43 | 4922.39 | 0.00 | 0.00 | 0.00 | 142.17 | 4911.86 | 0.00 | 10.53 | 0 00:00 | 0.00 | 0.00 |
| 95 | STRM MH 02_05 | Junction | 4910.30 | 4924.18 | 0.00 | 0.00 | 0.00 | 89.93 | 4916.01 | 0.00 | 8.17 | 0 00:00 | 0.00 | 0.00 |
| 96 | STRM MH 02_06 | Junction | 4911.02 | 4924.48 | 0.00 | 0.00 | 0.00 | 81.84 | 4917.74 | 0.00 | 6.74 | 0 00:00 | 0.00 | 0.00 |
| 97 | STRM MH 02_07 | Junction | 4911.94 | 4924.03 | 0.00 | 0.00 | 0.00 | 61.29 | 4920.14 | 0.00 | 3.89 | 0 00:00 | 0.00 | 0.00 |
| 98 | STRM MH 02_08 | Junction | 4912.80 | 4924.22 | 0.00 | 0.00 | 0.00 | 57.90 | 4921.11 | 0.00 | 3.11 | 0 00:00 | 0.00 | 0.00 |
| 99 | STRM MH 02_09 | Junction | 4913.24 | 4924.41 | 0.00 | 0.00 | 0.00 | 49.92 | 4915.66 | 0.00 | 8.75 | 0 00:00 | 0.00 | 0.00 |
| 100 | STRM MH 02_10 | Junction | 4913.56 | 4924.64 | 0.00 | 0.00 | 0.00 | 49.93 | 4919.58 | 0.00 | 5.06 | 0 00:00 | 0.00 | 0.00 |
| 101 | STRM MH 02_11 | Junction | 4914.05 | 4924.44 | 0.00 | 0.00 | 0.00 | 41.94 | 4920.63 | 0.00 | 3.81 | 0 00:00 | 0.00 | 0.00 |
| 102 | STRM MH 02_12 | Junction | 4914.84 | 4925.71 | 0.00 | 0.00 | 0.00 | 40.17 | 4921.19 | 0.00 | 4.52 | 0 00:00 | 0.00 | 0.00 |
| 103 | STRM MH 02_13 | Junction | 4923.10 | 4928.32 | 0.00 | 0.00 | 0.00 | 7.21 | 4923.88 | 0.00 | 4.44 | 0 00:00 | 0.00 | 0.00 |
| 104 | STRM MH 02_14 | Junction | 4926.30 | 4931.26 | 0.00 | 0.00 | 0.00 | 7.22 | 4928.42 | 0.00 | 2.84 | 0 00:00 | 0.00 | 0.00 |
| 105 | STRM MH 02A_01 | Junction | 4916.84 | 4922.73 | 0.00 | 0.00 | 0.00 | 21.19 | 4919.14 | 0.00 | 3.59 | 0 00:00 | 0.00 | 0.00 |
| 106 | STRM MH 02D_02 | Junction | 4920.40 | 4925.52 | 0.00 | 0.00 | 0.00 | 5.89 | 4921.63 | 0.00 | 3.89 | 0 00:00 | 0.00 | 0.00 |
| 107 | STRM MH 02D_03 | Junction | 4919.38 | 4925.36 | 0.00 | 0.00 | 0.00 | 6.56 | 4921.00 | 0.00 | 4.36 | 0 00:00 | 0.00 | 0.00 |
| 108 | STRM MH 02D_04 | Junction | 4919.30 | 4925.13 | 0.00 | 0.00 | 0.00 | 1.70 | 4920.57 | 0.00 | 4.56 | 0 00:00 | 0.00 | 0.00 |
| 109 | STRM MH 02F_02 | Junction | 4919.22 | 4924.52 | 0.00 | 0.00 | 0.00 | 16.10 | 4920.88 | 0.00 | 3.64 | 0 00:00 | 0.00 | 0.00 |
| 110 | STRM MH 02F_03 | Junction | 4916.17 | 4923.38 | 0.00 | 0.00 | 0.00 | 22.50 | 4920.29 | 0.00 | 3.09 | 0 00:00 | 0.00 | 0.00 |
| 111 | STRM MH 02F_04 | Junction | 4917.58 | 4924.19 | 0.00 | 0.00 | 0.00 | 3.42 | 4920.55 | 0.00 | 3.64 | 0 00:00 | 0.00 | 0.00 |
| 112 | STRM MH 03_02 | Junction | 4906.89 | 4918.13 | 0.00 | 0.00 | 0.00 | 295.89 | 4913.58 | 0.00 | 4.55 | 0 00:00 | 0.00 | 0.00 |
| 113 | STRM MH 03_03 | Junction | 4910.33 | 4919.03 | 0.00 | 0.00 | 0.00 | 172.36 | 4914.37 | 0.00 | 4.66 | 0 00:00 | 0.00 | 0.00 |
| 114 | STRM MH 03_04 | Junction | 4912.16 | 4924.86 | 0.00 | 0.00 | 0.00 | 173.26 | 4917.89 | 0.00 | 6.97 | 0 00:00 | 0.00 | 0.00 |
| 115 | STRM MH 03_05 | Junction | 4912.88 | 4924.89 | 0.00 | 0.00 | 0.00 | 161.69 | 4920.75 | 0.00 | 4.14 | 0 00:00 | 0.00 | 0.00 |
| 116 | STRM MH 03_06 | Junction | 4913.49 | 4925.19 | 0.00 | 0.00 | 0.00 | 157.25 | 4922.01 | 0.00 | 3.18 | 0 00:00 | 0.00 | 0.00 |
| 117 | STRM MH 03_07 | Junction | 4914.04 | 4925.55 | 0.00 | 0.00 | 0.00 | 154.59 | 4917.64 | 0.00 | 7.91 | 0 00:00 | 0.00 | 0.00 |
| 118 | STRM MH 03_08 | Junction | 4914.80 | 4925.50 | 0.00 | 0.00 | 0.00 | 147.54 | 4921.90 | 0.00 | 3.60 | 0 00:00 | 0.00 | 0.00 |
| 119 | STRM MH 03_09 | Junction | 4915.93 | 4926.25 | 0.00 | 0.00 | 0.00 | 136.77 | 4920.96 | 0.00 | 5.29 | 0 00:00 | 0.00 | 0.00 |
| 120 | STRM MH 03_10 | Junction | 4917.17 | 4925.80 | 0.00 | 0.00 | 0.00 | 87.13 | 4921.55 | 0.00 | 4.25 | 0 00:00 | 0.00 | 0.00 |

MAJOR 100-YEAR

## Node Summary

| SN | Element ID | Element Type | Invert Elevation (ft) | Ground/Rim (Max) Elevation (ft) | Initial Water Elevation (ft) | Surcharge Elevation (ft) | Ponded Area ($ft^2$) | Peak Inflow (cfs) | Max HGL Elevation Attained (ft) | Max Surcharge Depth Attained (ft) | Min Freeboard Attained (ft) | Time of Peak Flooding Occurrence (days hh:mm) | Total Flooded Volume (ac-in) | Total Time Flooded (min) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 121 | STRM MH 03_11 | Junction | 4917.93 | 4926.36 | 0.00 | 0.00 | 0.00 | 84.36 | 4921.47 | 0.00 | 4.89 | 0 00:00 | 0.00 | 0.00 |
| 122 | STRM MH 03_12 | Junction | 4925.65 | 4931.05 | 0.00 | 0.00 | 0.00 | 23.47 | 4927.15 | 0.00 | 3.90 | 0 00:00 | 0.00 | 0.00 |
| 123 | STRM MH 03_13 | Junction | 4926.74 | 4932.17 | 0.00 | 0.00 | 0.00 | 23.56 | 4928.43 | 0.00 | 3.74 | 0 00:00 | 0.00 | 0.00 |
| 124 | STRM MH 03_14 | Junction | 4927.31 | 4933.01 | 0.00 | 0.00 | 0.00 | 23.64 | 4928.85 | 0.00 | 4.16 | 0 00:00 | 0.00 | 0.00 |
| 125 | STRM MH 03A_01 | Junction | 4917.78 | 4923.85 | 0.00 | 0.00 | 0.00 | 13.24 | 4919.17 | 0.00 | 4.68 | 0 00:00 | 0.00 | 0.00 |
| 126 | STRM MH 03A_02 | Junction | 4918.70 | 4925.02 | 0.00 | 0.00 | 0.00 | 3.75 | 4919.65 | 0.00 | 5.37 | 0 00:00 | 0.00 | 0.00 |
| 127 | STRM MH 03A_03 | Junction | 4919.35 | 4924.87 | 0.00 | 0.00 | 0.00 | 3.80 | 4921.42 | 0.00 | 3.45 | 0 00:00 | 0.00 | 0.00 |
| 128 | STRM MH 03E.5_01 | Junction | 4921.78 | 4927.51 | 0.00 | 0.00 | 0.00 | 10.06 | 4922.90 | 0.00 | 4.61 | 0 00:00 | 0.00 | 0.00 |
| 129 | STRM MH 03E_02 | Junction | 4919.50 | 4925.94 | 0.00 | 0.00 | 0.00 | 42.84 | 4921.91 | 0.00 | 4.03 | 0 00:00 | 0.00 | 0.00 |
| 130 | STRM MH 03E_03 | Junction | 4918.84 | 4926.44 | 0.00 | 0.00 | 0.00 | 51.53 | 4921.27 | 0.00 | 5.17 | 0 00:00 | 0.00 | 0.00 |
| 131 | STRM MH 03E_04 | Junction | 4918.16 | 4925.93 | 0.00 | 0.00 | 0.00 | 56.15 | 4922.13 | 0.00 | 3.80 | 0 00:00 | 0.00 | 0.00 |
| 132 | STRM MH 03E_05 | Junction | 4917.05 | 4925.67 | 0.00 | 0.00 | 0.00 | 57.41 | 4921.62 | 0.00 | 4.05 | 0 00:00 | 0.00 | 0.00 |
| 133 | STRM MH 03E_06 | Junction | 4920.79 | 4925.88 | 0.00 | 0.00 | 0.00 | 5.46 | 4921.66 | 0.00 | 4.22 | 0 00:00 | 0.00 | 0.00 |
| 134 | STRM MH 03G_02 | Junction | 4919.41 | 4924.82 | 0.00 | 0.00 | 0.00 | 20.48 | 4921.34 | 0.00 | 3.48 | 0 00:00 | 0.00 | 0.00 |
| 135 | STRM MH 03G_03 | Junction | 4918.98 | 4924.84 | 0.00 | 0.00 | 0.00 | 45.93 | 4921.51 | 0.00 | 3.33 | 0 00:00 | 0.00 | 0.00 |
| 136 | STRM MH 03G_04 | Junction | 4920.14 | 4925.46 | 0.00 | 0.00 | 0.00 | 22.35 | 4921.97 | 0.00 | 3.49 | 0 00:00 | 0.00 | 0.00 |
| 137 | STRM MH 04_01 | Junction | 4907.37 | 4918.06 | 0.00 | 0.00 | 0.00 | 158.09 | 4913.55 | 0.00 | 4.51 | 0 00:00 | 0.00 | 0.00 |
| 138 | STRM MH 04A_02 | Junction | 4910.27 | 4920.34 | 0.00 | 0.00 | 0.00 | 87.34 | 4912.94 | 0.00 | 7.39 | 0 00:00 | 0.00 | 0.00 |
| 139 | STRM MH 04A_03 | Junction | 4912.94 | 4920.00 | 0.00 | 0.00 | 0.00 | 87.39 | 4915.41 | 0.00 | 4.59 | 0 00:00 | 0.00 | 0.00 |
| 140 | STRM MH 04A_04 | Junction | 4914.95 | 4922.05 | 0.00 | 0.00 | 0.00 | 17.35 | 4916.77 | 0.00 | 5.28 | 0 00:00 | 0.00 | 0.00 |
| 141 | STRM MH 04A_05 | Junction | 4917.55 | 4925.95 | 0.00 | 0.00 | 0.00 | 18.26 | 4925.95 | 0.00 | 0.00 | 0 00:07 | 0.00 | 0.00 |
| 142 | STRM MH 04A_06 | Junction | 4918.71 | 4924.30 | 0.00 | 0.00 | 0.00 | 17.77 | 4924.30 | 0.00 | 0.00 | 0 00:07 | 0.00 | 0.00 |
| 143 | STRM STUB 03_00 | Junction | 4920.81 | 4926.00 | 0.00 | 0.00 | 0.00 | 41.13 | 4922.28 | 0.00 | 3.72 | 0 00:00 | 0.00 | 0.00 |
| 144 | STRM STUB 04A.2_03 | Junction | 4914.25 | 4916.94 | 0.00 | 0.00 | 0.00 | 66.77 | 4917.25 | 0.00 | 0.00 | 0 00:11 | 0.00 | 0.00 |
| 145 | STRM STUB 04A_03 | Junction | 4911.71 | 4921.63 | 0.00 | 0.00 | 0.00 | 65.69 | 4914.13 | 0.00 | 7.50 | 0 00:00 | 0.00 | 0.00 |
| 146 | OUTFALL | Outfall | 4904.92 | | | | | 2.79 | 4904.92 | | | | | |
| 147 | POND | Storage Node | 4905.47 | 4915.00 | 0.00 | | 0.00 | 538.99 | 4909.31 | | | | 0.00 | 0.00 |

# MAJOR 100-YEAR

## Link Summary

| SN | Element ID | Element Type | From (Inlet) Node | To (Outlet) Node | Length (ft) | Inlet Invert Elevation (ft) | Outlet Invert Elevation (ft) | Average Slope (%) | Diameter or Height (in) | Manning's Roughness | Peak Flow (cfs) | Design Flow Capacity (cfs) | Peak Flow/ Design Flow Ratio | Peak Flow Velocity (ft/sec) | Peak Flow Depth (ft) | Peak Flow Depth/ Total Depth Ratio | Total Time Surcharged (min) | Reported Condition |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | {MCD-STRM}.Pipe - (106) (MCD-STRM) | Pipe | STRM INLET 02F_06 | STRM INLET 02F_05 | 50.50 | 4920.17 | 4918.86 | 2.5900 | 10.000 | 0.0130 | 1.26 | 3.53 | 0.36 | 7.12 | 0.34 | 0.41 | 0.00 | Calculated |
| 2 | {MCD-STRM}.Pipe - (119) (1) (MCD-STRM) | Pipe | STRM INLET 04A.2_01 | STRM MH 04A_03 | 20.09 | 4913.34 | 4913.14 | 1.0000 | 18.000 | 0.0130 | 6.86 | 10.48 | 0.65 | 6.33 | 0.89 | 0.59 | 0.00 | Calculated |
| 3 | {MCD-STRM}.Pipe - (119) (MCD-STRM) | Pipe | STRM INLET 04A.2_02 | STRM MH 04A_03 | 48.27 | 4913.63 | 4913.14 | 1.0000 | 42.000 | 0.0130 | 70.39 | 100.85 | 0.70 | 11.75 | 2.13 | 0.61 | 0.00 | Calculated |
| 4 | {MCD-STRM}.Pipe - (120) (MCD-STRM) | Pipe | STRM STUB 04A.2_03 | STRM INLET 04A.2_02 | 43.33 | 4914.25 | 4913.82 | 1.0000 | 36.000 | 0.0130 | 68.21 | 66.75 | 1.02 | 10.88 | 2.63 | 0.88 | 0.00 | > CAPACITY |
| 5 | {MCD-STRM}.Pipe - (126) (MCD-STRM) | Pipe | STRM STUB 04A_03 | STRM INLET 04A_02 | 50.84 | 4911.71 | 4911.20 | 1.0000 | 36.000 | 0.0130 | 65.51 | 66.80 | 0.98 | 10.79 | 2.41 | 0.80 | 0.00 | Calculated |
| 6 | {MCD-STRM}.Pipe - (127) (1) (MCD-STRM) | Pipe | STRM INLET 04A.1_01 | STRM MH 04_01 | 20.17 | 4912.72 | 4912.52 | 0.9900 | 18.000 | 0.0130 | 8.53 | 10.46 | 0.82 | 6.61 | 1.03 | 0.69 | 0.00 | Calculated |
| 7 | {MCD-STRM}.Pipe - (127) (MCD-STRM) | Pipe | STRM INLET 04A_02 | STRM MH 04_01 | 48.17 | 4910.70 | 4910.46 | 0.5000 | 48.000 | 0.0130 | 72.13 | 101.39 | 0.71 | 8.77 | 2.49 | 0.62 | 0.00 | Calculated |
| 8 | {MCD-STRM}.Pipe - (131) (MCD-STRM) | Pipe | STRM INLET 03B_01 | STRM MH 03_05 | 19.92 | 4919.93 | 4919.83 | 0.5000 | 18.000 | 0.0130 | 5.13 | 7.44 | 0.69 | 4.55 | 0.91 | 0.61 | 0.00 | Calculated |
| 9 | {MCD-STRM}.Pipe - (132) (MCD-STRM) | Pipe | STRM INLET 01C_01 | STRM MH 01_08 | 75.97 | 4919.41 | 4919.03 | 0.5000 | 24.000 | 0.0130 | 13.17 | 16.00 | 0.82 | 7.08 | 1.38 | 0.69 | 0.00 | Calculated |
| 10 | {MCD-STRM}.Pipe - (133) (MCD-STRM) | Pipe | STRM INLET 01C_02 | STRM MH 01_08 | 28.17 | 4919.17 | 4919.03 | 0.5000 | 18.000 | 0.0130 | 3.48 | 7.41 | 0.47 | 4.71 | 0.72 | 0.48 | 0.00 | Calculated |
| 11 | {MCD-STRM}.Pipe - (134) (1) (MCD-STRM) | Pipe | STRM INLET 01B_2 | STRM MH 01_05 | 19.88 | 4916.50 | 4916.40 | 0.5000 | 24.000 | 0.0130 | 11.04 | 16.04 | 0.69 | 5.51 | 1.22 | 0.61 | 0.00 | Calculated |
| 12 | {MCD-STRM}.Pipe - (134) (MCD-STRM) | Pipe | STRM INLET 01B_1 | STRM MH 01_05 | 85.50 | 4916.83 | 4916.40 | 0.5000 | 18.000 | 0.0130 | 6.91 | 7.45 | 0.93 | 7.03 | 1.13 | 0.76 | 0.00 | Calculated |
| 13 | {MCD-STRM}.Pipe - (145) (1) (MCD-STRM) | Pipe | STRM MH 02A_01 | STRM MH 02_06 | 135.04 | 4916.84 | 4916.16 | 0.5000 | 30.000 | 0.0130 | 21.10 | 29.11 | 0.72 | 6.55 | 1.57 | 0.63 | 0.00 | Calculated |
| 14 | {MCD-STRM}.Pipe - (146) (MCD-STRM) | Pipe | STRM INLET 02A_02 | STRM MH 02A_01 | 8.19 | 4917.08 | 4917.04 | 0.4900 | 24.000 | 0.0130 | 13.26 | 15.81 | 0.84 | 5.64 | 1.40 | 0.70 | 0.00 | Calculated |
| 15 | {MCD-STRM}.Pipe - (147) (MCD-STRM) | Pipe | STRM INLET 02A.1_01 | STRM MH 02A_01 | 30.14 | 4918.27 | 4918.12 | 0.5000 | 24.000 | 0.0130 | 8.29 | 15.96 | 0.52 | 5.15 | 1.02 | 0.51 | 0.00 | Calculated |
| 16 | {MCD-STRM}.Pipe - (163) (MCD-STRM) | Pipe | STRM INLET 02E_01 | STRM MH 02_11 | 10.34 | 4920.29 | 4920.17 | 1.1600 | 18.000 | 0.0130 | 2.32 | 11.32 | 0.21 | 5.04 | 0.46 | 0.31 | 0.00 | Calculated |
| 17 | {MCD-STRM}.Pipe - (180) (MCD-STRM) | Pipe | STRM MH 02D_03 | STRM MH 02_10 | 138.19 | 4919.38 | 4918.69 | 0.5000 | 24.000 | 0.0130 | 6.47 | 15.99 | 0.40 | 4.90 | 0.88 | 0.44 | 0.00 | Calculated |
| 18 | {MCD-STRM}.Pipe - (19) (MCD-STRM) | Pipe | STRM INLET 03_15 | STRM MH 03_14 | 48.78 | 4927.75 | 4927.51 | 0.4900 | 30.000 | 0.0130 | 16.06 | 28.77 | 0.56 | 6.03 | 1.33 | 0.53 | 0.00 | Calculated |
| 19 | {MCD-STRM}.Pipe - (195) (2) (1) (MCD-STRM) | Pipe | STRM MH 02_03 | STRM MH 02_02 | 251.29 | 4908.43 | 4907.30 | 0.4500 | 60.000 | 0.0130 | 141.86 | 174.65 | 0.81 | 10.03 | 3.42 | 0.68 | 0.00 | Calculated |
| 20 | {MCD-STRM}.Pipe - (195) (2) (MCD-STRM) | Pipe | STRM INLET 02_04 | STRM MH 02_03 | 171.32 | 4909.40 | 4908.63 | 0.4500 | 54.000 | 0.0130 | 97.32 | 131.84 | 0.74 | 9.13 | 2.87 | 0.64 | 0.00 | Calculated |
| 21 | {MCD-STRM}.Pipe - (196) (MCD-STRM) | Pipe | STRM MH 02_02 | STRM FES 02_01 | 111.30 | 4907.10 | 4906.60 | 0.4500 | 60.000 | 0.0130 | 141.81 | 174.56 | 0.81 | 9.93 | 3.42 | 0.68 | 0.00 | Calculated |
| 22 | {MCD-STRM}.Pipe - (20) (MCD-STRM) | Pipe | STRM MH 03_14 | STRM MH 03_13 | 49.32 | 4927.31 | 4926.94 | 0.7500 | 30.000 | 0.0130 | 23.56 | 35.53 | 0.66 | 7.75 | 1.48 | 0.59 | 0.00 | Calculated |
| 23 | {MCD-STRM}.Pipe - (21) (MCD-STRM) | Pipe | STRM MH 03_13 | STRM MH 03_12 | 77.43 | 4926.74 | 4925.85 | 1.1500 | 30.000 | 0.0130 | 23.47 | 43.97 | 0.53 | 9.13 | 1.30 | 0.52 | 0.00 | Calculated |
| 24 | {MCD-STRM}.Pipe - (220) (MCD-STRM) | Pipe | STRM MH 03G_03 | STRM MH 03_11 | 169.47 | 4918.98 | 4918.13 | 0.5000 | 36.000 | 0.0130 | 45.71 | 47.24 | 0.97 | 7.79 | 2.37 | 0.79 | 0.00 | Calculated |
| 25 | {MCD-STRM}.Pipe - (222) (MCD-STRM) | Pipe | STRM INLET 03G.2_01 | STRM MH 03G_03 | 15.67 | 4919.64 | 4919.57 | 0.4500 | 30.000 | 0.0130 | 25.90 | 27.41 | 0.94 | 6.37 | 1.93 | 0.77 | 0.00 | Calculated |
| 26 | {MCD-STRM}.Pipe - (223) (MCD-STRM) | Pipe | STRM MH 03G_04 | STRM MH 03G_03 | 193.00 | 4920.14 | 4919.18 | 0.5000 | 30.000 | 0.0130 | 21.80 | 28.93 | 0.75 | 7.65 | 1.61 | 0.65 | 0.00 | Calculated |
| 27 | {MCD-STRM}.Pipe - (226) (MCD-STRM) | Pipe | STRM INLET 03F_01 | STRM MH 03_10 | 29.59 | 4921.09 | 4920.94 | 0.5100 | 18.000 | 0.0130 | 0.85 | 7.48 | 0.11 | 3.49 | 0.34 | 0.23 | 0.00 | Calculated |
| 28 | {MCD-STRM}.Pipe - (227) (MCD-STRM) | Pipe | STRM INLET 03D_02 | STRM MH 03_08 | 16.75 | 4920.92 | 4920.84 | 0.4800 | 24.000 | 0.0130 | 8.61 | 15.63 | 0.55 | 5.10 | 1.06 | 0.53 | 0.00 | Calculated |
| 29 | {MCD-STRM}.Pipe - (24) (2) (1) (MCD-STRM) | Pipe | STRM MH 03_10 | STRM MH 03_09 | 73.39 | 4917.17 | 4916.80 | 0.5000 | 48.000 | 0.0130 | 87.07 | 101.99 | 0.85 | 9.13 | 2.84 | 0.71 | 0.00 | Calculated |
| 30 | {MCD-STRM}.Pipe - (24) (2) (MCD-STRM) | Pipe | STRM MH 03_11 | STRM MH 03_10 | 112.39 | 4917.93 | 4917.37 | 0.5000 | 48.000 | 0.0130 | 84.25 | 101.39 | 0.83 | 9.06 | 2.78 | 0.70 | 0.00 | Calculated |
| 31 | {MCD-STRM}.Pipe - (24) (MCD-STRM) | Pipe | STRM MH 03_12 | STRM MH 03_11 | 273.39 | 4925.65 | 4920.36 | 1.9300 | 30.000 | 0.0130 | 23.11 | 57.06 | 0.41 | 11.09 | 1.11 | 0.44 | 0.00 | Calculated |
| 32 | {MCD-STRM}.Pipe - (257) (MCD-STRM) | Pipe | STRM MH 02D_02 | STRM MH 02D_03 | 162.41 | 4920.40 | 4919.58 | 0.5000 | 24.000 | 0.0130 | 5.71 | 16.07 | 0.35 | 4.78 | 0.82 | 0.41 | 0.00 | Calculated |
| 33 | {MCD-STRM}.Pipe - (259) (MCD-STRM) | Pipe | STRM INLET 03E_07 | STRM MH 03E_06 | 50.26 | 4921.07 | 4920.82 | 0.5000 | 18.000 | 0.0130 | 1.97 | 7.41 | 0.27 | 4.74 | 0.53 | 0.35 | 0.00 | Calculated |
| 34 | {MCD-STRM}.Pipe - (260) (MCD-STRM) | Pipe | STRM MH 03E_06 | STRM MH 03_09 | 104.15 | 4920.79 | 4920.10 | 0.6600 | 18.000 | 0.0130 | 5.38 | 8.55 | 0.63 | 5.18 | 0.86 | 0.57 | 0.00 | Calculated |
| 35 | {MCD-STRM}.Pipe - (261) (MCD-STRM) | Pipe | STRM INLET 01D_2 | STRM INLET 01D_01 | 13.67 | 4918.30 | 4918.23 | 0.5100 | 24.000 | 0.0130 | 9.37 | 16.19 | 0.58 | 5.35 | 1.09 | 0.55 | 0.00 | Calculated |
| 36 | {MCD-STRM}.Pipe - (262) (MCD-STRM) | Pipe | STRM INLET 01D_01 | STRM MH 01_09 | 254.63 | 4917.73 | 4916.46 | 0.5000 | 30.000 | 0.0130 | 21.67 | 28.97 | 0.75 | 8.84 | 1.60 | 0.64 | 0.00 | Calculated |
| 37 | {MCD-STRM}.Pipe - (263) (MCD-STRM) | Pipe | STRM INLET 02G_01 | STRM MH 02_14 | 168.29 | 4927.34 | 4926.50 | 0.5000 | 18.000 | 0.0130 | 3.77 | 7.42 | 0.51 | 7.14 | 0.75 | 0.50 | 0.00 | Calculated |
| 38 | {MCD-STRM}.Pipe - (266) (MCD-STRM) | Pipe | STRM INLET 02D.4_01 | STRM MH 02D_02 | 34.13 | 4921.07 | 4920.95 | 0.3500 | 18.000 | 0.0130 | 2.61 | 6.23 | 0.42 | 4.11 | 0.68 | 0.45 | 0.00 | Calculated |
| 39 | {MCD-STRM}.Pipe - (268) (MCD-STRM) | Pipe | STRM INLET 02C_01 | STRM MH 02_08 | 14.07 | 4919.72 | 4919.61 | 0.7800 | 18.000 | 0.0130 | 7.31 | 9.29 | 0.79 | 5.83 | 1.00 | 0.67 | 0.00 | Calculated |
| 40 | {MCD-STRM}.Pipe - (27) (1) (MCD-STRM) | Pipe | STRM MH 03_08 | STRM MH 03_07 | 112.91 | 4914.80 | 4914.24 | 0.5000 | 60.000 | 0.0130 | 147.46 | 183.42 | 0.80 | 10.41 | 3.39 | 0.68 | 0.00 | Calculated |
| 41 | {MCD-STRM}.Pipe - (27) (MCD-STRM) | Pipe | STRM MH 03_09 | STRM MH 03_08 | 197.50 | 4915.93 | 4915.00 | 0.4700 | 60.000 | 0.0130 | 136.47 | 178.72 | 0.76 | 10.06 | 3.27 | 0.65 | 0.00 | Calculated |
| 42 | {MCD-STRM}.Pipe - (270) (MCD-STRM) | Pipe | STRM INLET 02B_01 | STRM MH 02_07 | 23.17 | 4919.42 | 4919.30 | 0.5200 | 18.000 | 0.0130 | 4.55 | 7.56 | 0.60 | 4.85 | 0.84 | 0.56 | 0.00 | Calculated |
| 43 | {MCD-STRM}.Pipe - (271) (MCD-STRM) | Pipe | STRM INLET 01E_01 | STRM MH 01_10 | 65.18 | 4919.35 | 4919.03 | 0.4900 | 30.000 | 0.0130 | 20.28 | 28.74 | 0.71 | 6.39 | 1.54 | 0.62 | 0.00 | Calculated |
| 44 | {MCD-STRM}.Pipe - (272) (MCD-STRM) | Pipe | STRM INLET 03D_01 | STRM MH 03_08 | 29.59 | 4920.99 | 4920.84 | 0.5100 | 18.000 | 0.0130 | 6.13 | 7.48 | 0.82 | 4.74 | 1.03 | 0.69 | 0.00 | Calculated |
| 45 | {MCD-STRM}.Pipe - (273) (MCD-STRM) | Pipe | STRM INLET 03E.3_01 | STRM MH 03E_04 | 18.90 | 4921.29 | 4921.17 | 0.6300 | 18.000 | 0.0130 | 2.06 | 8.37 | 0.25 | 4.10 | 0.51 | 0.34 | 0.00 | Calculated |
| 46 | {MCD-STRM}.Pipe - (274) (MCD-STRM) | Pipe | STRM MH 03E_04 | STRM MH 03E_05 | 183.07 | 4918.16 | 4917.25 | 0.5000 | 42.000 | 0.0130 | 55.89 | 70.93 | 0.79 | 8.24 | 2.34 | 0.67 | 0.00 | Calculated |
| 47 | {MCD-STRM}.Pipe - (277) (MCD-STRM) | Pipe | STRM INLET 03E.3_02 | STRM MH 03E_04 | 19.43 | 4921.25 | 4921.17 | 0.4100 | 18.000 | 0.0130 | 4.95 | 6.74 | 0.74 | 4.18 | 0.96 | 0.64 | 0.00 | Calculated |
| 48 | {MCD-STRM}.Pipe - (278) (MCD-STRM) | Pipe | STRM INLET 03E.2_01 | STRM MH 03E_05 | 12.21 | 4921.18 | 4921.07 | 0.9000 | 18.000 | 0.0130 | 2.87 | 9.97 | 0.29 | 4.88 | 0.55 | 0.37 | 0.00 | Calculated |
| 49 | {MCD-STRM}.Pipe - (279) (1) (MCD-STRM) | Pipe | STRM MH 04A_02 | STRM MH 04_01 | 329.83 | 4910.27 | 4907.80 | 0.7500 | 48.000 | 0.0130 | 85.95 | 124.31 | 0.69 | 10.79 | 2.44 | 0.61 | 0.00 | Calculated |

# MAJOR 100-YEAR

## Link Summary

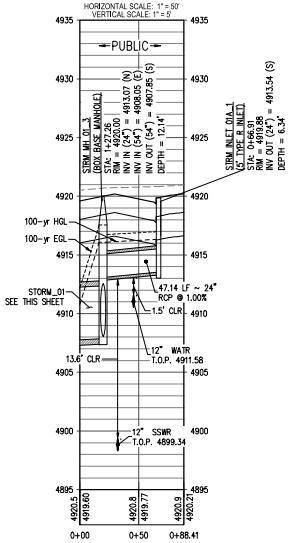
| SN | Element ID | Element Type | From (Inlet) Node | To (Outlet) Node | Length (ft) | Inlet Invert Elevation (ft) | Outlet Invert Elevation (ft) | Average Slope (%) | Diameter or Height (in) | Manning's Roughness | Peak Flow (cfs) | Design Flow Capacity (cfs) | Peak Flow/ Design Flow Ratio | Peak Flow Velocity (ft/sec) | Peak Flow Depth (ft) | Peak Flow Depth/ Total Depth Ratio | Total Time Surcharged (min) | Reported Condition |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | {MCD-STRM}.Pipe - (279) (MCD-STRM) | Pipe | STRM MH 04A_03 | STRM MH 04A_02 | 329.82 | 4912.94 | 4910.47 | 0.7500 | 48.000 | 0.0130 | 87.34 | 124.31 | 0.70 | 10.93 | 2.45 | 0.61 | 0.00 | Calculated |
| 51 | {MCD-STRM}.Pipe - (28) (1) (1) (MCD-STRM) | Pipe | STRM MH 03_04 | STRM MH 03_03 | 325.53 | 4912.16 | 4910.53 | 0.5000 | 60.000 | 0.0130 | 172.36 | 184.29 | 0.94 | 10.80 | 3.83 | 0.77 | 0.00 | Calculated |
| 52 | {MCD-STRM}.Pipe - (28) (1) (2) (2) (MCD-STRM) | Pipe | STRM MH 03_05 | STRM MH 03_04 | 105.00 | 4912.88 | 4912.36 | 0.5000 | 60.000 | 0.0130 | 161.58 | 183.28 | 0.88 | 10.55 | 3.65 | 0.73 | 0.00 | Calculated |
| 53 | {MCD-STRM}.Pipe - (28) (1) (2) (MCD-STRM) | Pipe | STRM INLET 03B_02 | STRM MH 03_05 | 18.41 | 4919.43 | 4919.33 | 0.5400 | 24.000 | 0.0130 | 0.84 | 16.67 | 0.05 | 3.11 | 0.30 | 0.15 | 0.00 | Calculated |
| 54 | {MCD-STRM}.Pipe - (28) (1) (MCD-STRM) | Pipe | STRM MH 03_06 | STRM MH 03_05 | 81.18 | 4913.49 | 4913.08 | 0.5100 | 60.000 | 0.0130 | 157.18 | 185.09 | 0.85 | 10.59 | 3.54 | 0.71 | 0.00 | Calculated |
| 55 | {MCD-STRM}.Pipe - (28) (MCD-STRM) | Pipe | STRM MH 03_07 | STRM MH 03_06 | 69.13 | 4914.04 | 4913.69 | 0.5100 | 60.000 | 0.0130 | 154.57 | 185.32 | 0.83 | 10.57 | 3.49 | 0.70 | 0.00 | Calculated |
| 56 | {MCD-STRM}.Pipe - (280) (MCD-STRM) | Pipe | STRM INLET 03A_06 | STRM MH 03A_03 | 23.00 | 4919.66 | 4919.55 | 0.4800 | 18.000 | 0.0130 | 2.81 | 7.26 | 0.39 | 4.20 | 0.65 | 0.43 | 0.00 | Calculated |
| 57 | {MCD-STRM}.Pipe - (285) (MCD-STRM) | Pipe | STRM MH 04A_06 | STRM MH 04A_05 | 160.52 | 4918.71 | 4917.75 | 0.6000 | 24.000 | 0.0130 | 18.26 | 17.49 | 1.04 | 6.51 | 1.78 | 0.89 | 0.00 | > CAPACITY |
| 58 | {MCD-STRM}.Pipe - (286) (MCD-STRM) | Pipe | STRM MH 04A_05 | STRM MH 04A_04 | 400.00 | 4917.55 | 4915.15 | 0.6000 | 24.000 | 0.0130 | 17.35 | 17.52 | 0.99 | 6.70 | 1.70 | 0.85 | 0.00 | Calculated |
| 59 | {MCD-STRM}.Pipe - (287) (MCD-STRM) | Pipe | STRM MH 04A_04 | STRM MH 04A_03 | 301.18 | 4914.95 | 4913.14 | 0.6000 | 24.000 | 0.0130 | 16.98 | 17.54 | 0.97 | 6.80 | 1.58 | 0.79 | 0.00 | Calculated |
| 60 | {MCD-STRM}.Pipe - (288) (MCD-STRM) | Pipe | STRM INLET 04A.3_02 | STRM MH 04A_06 | 33.85 | 4919.25 | 4918.91 | 1.0000 | 18.000 | 0.0130 | 8.94 | 10.53 | 0.85 | 6.79 | 1.06 | 0.71 | 0.00 | Calculated |
| 61 | {MCD-STRM}.Pipe - (289) (MCD-STRM) | Pipe | STRM INLET 04A.3_01 | STRM MH 04A_06 | 19.70 | 4919.06 | 4918.91 | 0.7600 | 18.000 | 0.0130 | 8.83 | 9.17 | 0.96 | 5.92 | 1.18 | 0.79 | 0.00 | Calculated |
| 62 | {MCD-STRM}.Pipe - (290) (MCD-STRM) | Pipe | STRM INLET 03E_01 | STRM MH 03E_02 | 19.13 | 4919.80 | 4919.70 | 0.5200 | 36.000 | 0.0130 | 42.31 | 48.22 | 0.88 | 7.70 | 2.17 | 0.73 | 0.00 | Calculated |
| 63 | {MCD-STRM}.Pipe - (291) (MCD-STRM) | Pipe | STRM MH 03E_02 | STRM MH 03E_03 | 91.72 | 4919.50 | 4919.04 | 0.5000 | 42.000 | 0.0130 | 42.70 | 71.25 | 0.60 | 7.78 | 1.95 | 0.56 | 0.00 | Calculated |
| 64 | {MCD-STRM}.Pipe - (292) (MCD-STRM) | Pipe | STRM MH 03E_03 | STRM MH 03E_04 | 95.09 | 4918.84 | 4918.36 | 0.5000 | 42.000 | 0.0130 | 51.35 | 71.48 | 0.72 | 8.11 | 2.19 | 0.63 | 0.00 | Calculated |
| 65 | {MCD-STRM}.Pipe - (293) (MCD-STRM) | Pipe | STRM INLET 03E.4_01 | STRM MH 03E_02 | 9.21 | 4921.55 | 4921.50 | 0.5400 | 18.000 | 0.0130 | 1.25 | 7.74 | 0.16 | 3.22 | 0.41 | 0.27 | 0.00 | Calculated |
| 66 | {MCD-STRM}.Pipe - (294) (MCD-STRM) | Pipe | STRM INLET 03F_02 | STRM MH 03_10 | 16.75 | 4921.02 | 4920.94 | 0.4800 | 18.000 | 0.0130 | 2.52 | 7.26 | 0.35 | 3.85 | 0.61 | 0.41 | 0.00 | Calculated |
| 67 | {MCD-STRM}.Pipe - (32) (MCD-STRM) | Pipe | EX_INLET_OS3 | STRM MH 03_14 | 51.98 | 4929.68 | 4927.71 | 3.7900 | 24.000 | 0.0130 | 17.85 | 44.04 | 0.41 | 13.34 | 0.89 | 0.44 | 0.00 | Calculated |
| 68 | {MCD-STRM}.Pipe - (50) (1) (1) (MCD-STRM) | Pipe | STRM MH 02_08 | STRM MH 02_07 | 147.03 | 4912.80 | 4912.14 | 0.4500 | 42.000 | 0.0130 | 57.73 | 67.41 | 0.86 | 7.95 | 2.49 | 0.71 | 0.00 | Calculated |
| 69 | {MCD-STRM}.Pipe - (50) (2) (MCD-STRM) | Pipe | STRM MH 02_11 | STRM MH 02_10 | 44.96 | 4914.26 | 4914.06 | 0.4400 | 36.000 | 0.0130 | 41.92 | 44.49 | 0.94 | 7.17 | 2.32 | 0.77 | 0.00 | Calculated |
| 70 | {MCD-STRM}.Pipe - (50) (MCD-STRM) | Pipe | STRM MH 02_12 | STRM MH 02_11 | 143.74 | 4915.11 | 4914.46 | 0.4500 | 36.000 | 0.0130 | 40.00 | 44.85 | 0.89 | 7.24 | 2.21 | 0.74 | 0.00 | Calculated |
| 71 | {MCD-STRM}.Pipe - (51) (MCD-STRM) | Pipe | EX_INLET_OS2 | STRM MH 02_14 | 95.18 | 4928.27 | 4927.79 | 0.5000 | 24.000 | 0.0130 | 3.48 | 16.07 | 0.22 | 6.14 | 0.63 | 0.32 | 0.00 | Calculated |
| 72 | {MCD-STRM}.Pipe - (52) (MCD-STRM) | Pipe | STRM MH 02_14 | STRM MH 02_13 | 97.48 | 4926.30 | 4923.30 | 3.0800 | 24.000 | 0.0130 | 7.21 | 39.69 | 0.18 | 9.61 | 0.58 | 0.29 | 0.00 | Calculated |
| 73 | {MCD-STRM}.Pipe - (53) (MCD-STRM) | Pipe | STRM MH 02_13 | STRM MH 02_12 | 127.82 | 4923.10 | 4920.55 | 1.9900 | 24.000 | 0.0130 | 7.18 | 31.95 | 0.22 | 8.25 | 0.64 | 0.32 | 0.00 | Calculated |
| 74 | {MCD-STRM}.Pipe - (62) (MCD-STRM) | Pipe | STRM MH 02_07 | STRM MH 02_06 | 93.46 | 4911.94 | 4911.52 | 0.4500 | 42.000 | 0.0130 | 61.22 | 67.45 | 0.91 | 7.98 | 2.61 | 0.75 | 0.00 | Calculated |
| 75 | {MCD-STRM}.Pipe - (67) (MCD-STRM) | Pipe | EX_INLET_OS1 | STRM MH 01_13 | 70.66 | 4926.64 | 4926.30 | 0.4800 | 24.000 | 0.0130 | 16.97 | 15.69 | 1.08 | 8.41 | 2.00 | 1.00 | 2.00 | SURCHARGED |
| 76 | {MCD-STRM}.Pipe - (68) (MCD-STRM) | Pipe | STRM INLET 01_14 | STRM MH 01_13 | 55.01 | 4925.39 | 4925.12 | 0.4900 | 24.000 | 0.0130 | 9.06 | 15.85 | 0.57 | 6.22 | 1.08 | 0.54 | 0.00 | Calculated |
| 77 | {MCD-STRM}.Pipe - (69) (MCD-STRM) | Pipe | STRM MH 01_13 | STRM MH 01_12 | 165.65 | 4924.12 | 4923.29 | 0.5000 | 30.000 | 0.0130 | 25.01 | 29.03 | 0.86 | 6.83 | 1.78 | 0.71 | 0.00 | Calculated |
| 78 | {MCD-STRM}.Pipe - (71) (MCD-STRM) | Pipe | STRM MH 01_12 | STRM MH 01_11 | 104.60 | 4923.09 | 4922.57 | 0.5000 | 30.000 | 0.0130 | 24.85 | 28.92 | 0.86 | 6.72 | 1.78 | 0.71 | 0.00 | Calculated |
| 79 | {MCD-STRM}.Pipe - (73) (2) (MCD-STRM) | Pipe | STRM MH 01_10 | STRM MH 01_09 | 160.94 | 4918.83 | 4918.03 | 0.5000 | 42.000 | 0.0130 | 60.21 | 70.93 | 0.85 | 8.33 | 2.47 | 0.71 | 0.00 | Calculated |
| 80 | {MCD-STRM}.Pipe - (74) (MCD-STRM) | Pipe | STRM MH 01_09 | STRM MH 01_08 | 203.55 | 4916.26 | 4915.24 | 0.5000 | 48.000 | 0.0130 | 81.33 | 101.68 | 0.80 | 9.06 | 2.70 | 0.68 | 0.00 | Calculated |
| 81 | {MCD-STRM}.Pipe - (78) (1) (1) (MCD-STRM) | Pipe | STRM MH 01_08 | STRM MH 01_07 | 119.81 | 4915.04 | 4914.44 | 0.5000 | 48.000 | 0.0130 | 94.25 | 101.65 | 0.93 | 9.21 | 3.04 | 0.76 | 0.00 | Calculated |
| 82 | {MCD-STRM}.Pipe - (81) (MCD-STRM) | Pipe | STRM MH 01_06 | STRM MH 01_05 | 279.98 | 4912.61 | 4911.21 | 0.5000 | 48.000 | 0.0130 | 93.06 | 101.57 | 0.92 | 9.35 | 3.01 | 0.75 | 0.00 | Calculated |
| 83 | {MCD-STRM}.Pipe - (84) (MCD-STRM) | Pipe | STRM MH 01_04 | STRM MH 01_03 | 259.14 | 4909.35 | 4908.05 | 0.5000 | 54.000 | 0.0130 | 105.46 | 139.28 | 0.76 | 9.71 | 2.92 | 0.65 | 0.00 | Calculated |
| 84 | {MCD-STRM}.Pipe - (85) (1) (MCD-STRM) | Pipe | STRM MH 01_03 | STRM INLET 01_02 | 24.69 | 4907.85 | 4907.73 | 0.4900 | 54.000 | 0.0130 | 110.63 | 137.10 | 0.81 | 9.59 | 3.06 | 0.68 | 0.00 | Calculated |
| 85 | {MCD-STRM}.Pipe - (85) (MCD-STRM) | Pipe | STRM INLET 01A_1 | STRM MH 01_03 | 47.14 | 4915.26 | 4915.02 | 0.5100 | 24.000 | 0.0130 | 8.98 | 16.14 | 0.56 | 6.46 | 1.06 | 0.53 | 0.00 | Calculated |
| 86 | {MCD-STRM}.Pipe - (86) (MCD-STRM) | Pipe | STRM INLET 01_02 | STRM FES 01_01 | 89.83 | 4907.53 | 4907.08 | 0.5000 | 54.000 | 0.0130 | 113.48 | 139.18 | 0.82 | 9.77 | 3.09 | 0.69 | 0.00 | Calculated |
| 87 | Link-01 | Pipe | STRM MH 02_05 | STRM INLET 02_04 | 155.17 | 4910.30 | 4909.60 | 0.4500 | 48.000 | 0.0130 | 89.73 | 96.48 | 0.93 | 8.82 | 3.05 | 0.76 | 0.00 | Calculated |
| 88 | Link-05 | Pipe | STRM FES 03_01 | POND | 552.60 | 4905.47 | 4905.47 | 0.0000 | 0.000 | 0.0150 | 295.84 | 0.00 | 0.93 | 0.00 | 3.05 | 0.76 | 0.00 | Calculated |
| 89 | Link-06 | Pipe | STRM FES 02_01 | POND | 212.05 | 4905.47 | 4905.47 | 0.0000 | 0.000 | 0.0150 | 141.81 | 0.00 | 0.93 | 0.00 | 3.05 | 0.76 | 0.00 | Calculated |
| 90 | Link-07 | Pipe | STRM FES 01_01 | POND | 329.69 | 4905.47 | 4905.47 | 0.0000 | 0.000 | 0.0150 | 113.48 | 0.00 | 0.93 | 0.00 | 3.05 | 0.76 | 0.00 | Calculated |
| 91 | Link-11 | Pipe | STRM MH 03_03 | STRM MH 03_02 | 115.71 | 4910.33 | 4909.75 | 0.5000 | 60.000 | 0.0130 | 172.24 | 184.39 | 0.93 | 10.70 | 3.83 | 0.77 | 0.00 | Calculated |
| 92 | Link-12 | Pipe | STRM MH 03_02 | STRM FES 03_01 | 110.66 | 4906.02 | 4905.47 | 0.5000 | 48.000 | 0.0130 | 295.84 | 350.93 | 0.84 | 16.84 | 2.93 | 0.73 | 0.00 | Calculated |
| 93 | Link-13 | Pipe | STRM MH 04_01 | STRM MH 03_02 | 56.25 | 4907.37 | 4907.09 | 0.5000 | 60.000 | 0.0130 | 158.06 | 183.75 | 0.86 | 10.54 | 3.57 | 0.72 | 0.00 | Calculated |
| 94 | Link-15 | Pipe | STRM MH 01_11 | STRM MH 01_10 | 117.84 | 4922.11 | 4920.93 | 1.0000 | 36.000 | 0.0130 | 43.40 | 66.74 | 0.65 | 10.14 | 1.76 | 0.59 | 0.00 | Calculated |
| 95 | Link-16 | Pipe | ROOF DRAIN A2 | STRM INLET 01E_01 | 56.30 | 4921.25 | 4920.68 | 1.0100 | 18.000 | 0.0130 | 6.77 | 10.57 | 0.64 | 7.74 | 0.87 | 0.58 | 0.00 | Calculated |
| 96 | Link-17 | Pipe | STRM MH 01_07 | STRM MH 01_06 | 286.16 | 4914.24 | 4912.81 | 0.5000 | 48.000 | 0.0130 | 93.57 | 101.54 | 0.92 | 9.36 | 3.02 | 0.76 | 0.00 | Calculated |
| 97 | Link-18 | Pipe | STRM MH 01_05 | STRM MH 01_04 | 147.71 | 4910.29 | 4909.55 | 0.5000 | 54.000 | 0.0130 | 105.85 | 139.19 | 0.76 | 9.66 | 2.93 | 0.65 | 0.00 | Calculated |
| 98 | Link-19 | Pipe | EX_INLET_OS4 | STRM MH 01F_03 | 157.22 | 4926.47 | 4925.47 | 0.6400 | 24.000 | 0.0130 | 19.52 | 18.04 | 1.08 | 11.02 | 2.00 | 1.00 | 2.00 | SURCHARGED |

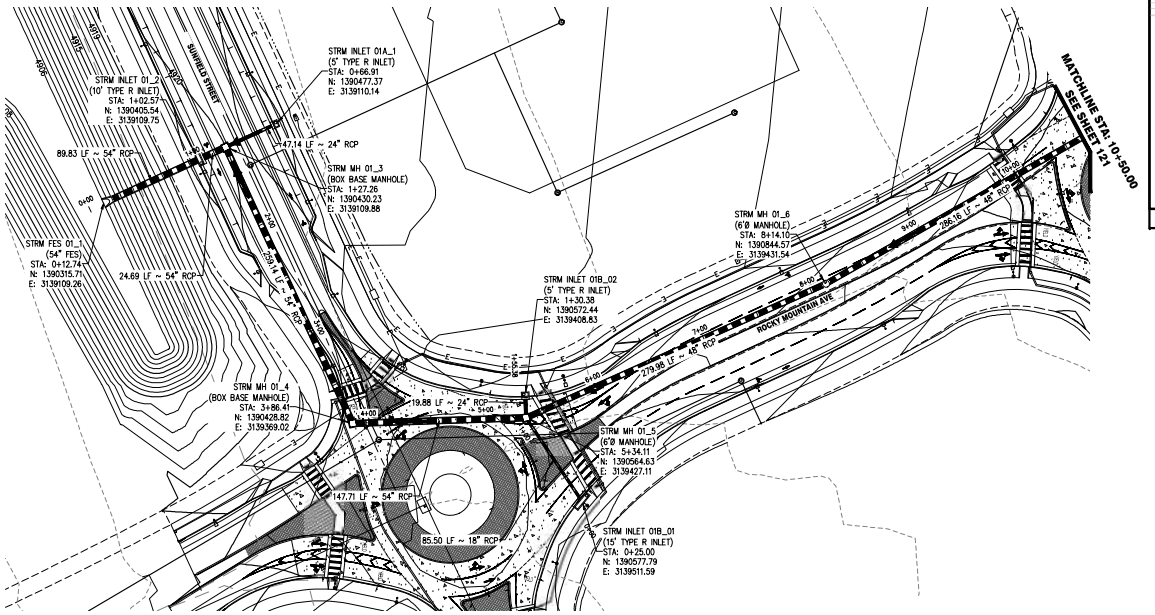
# MAJOR 100-YEAR

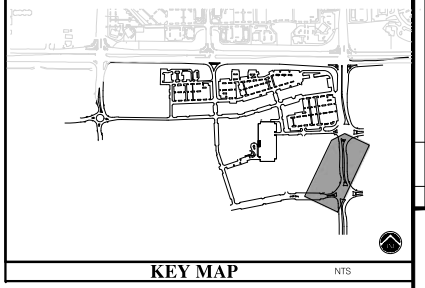
## Link Summary

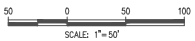
| SN | Element ID | Element Type | From (Inlet) Node | To (Outlet) Node | Length | Inlet Invert Elevation | Outlet Invert Elevation | Average Slope | Diameter or Height | Manning's Roughness | Peak Flow | Design Flow Capacity | Peak Flow/ Design Flow Ratio | Peak Flow Velocity | Peak Flow Depth | Peak Flow Depth/ Total Depth Ratio | Total Time Surcharged | Reported Condition |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (ft) | (ft) | (ft) | (%) | (in) | | (cfs) | (cfs) | | (ft/sec) | (ft) | | (min) | |
| 99 | Link-20 | Pipe | STRM MH 01F_03 | STRM MH 01F_02 | 28.87 | 4925.27 | 4925.13 | 0.4800 | 30.000 | 0.0130 | 19.54 | 28.56 | 0.68 | 6.39 | 1.51 | 0.61 | 0.00 | Calculated |
| 100 | Link-21 | Pipe | STRM MH 01F_02 | STRM MH 01F_01 | 104.78 | 4924.93 | 4923.36 | 1.5000 | 30.000 | 0.0130 | 19.58 | 50.21 | 0.39 | 9.78 | 1.08 | 0.43 | 0.00 | Calculated |
| 101 | Link-22 | Pipe | STRM MH 01F_01 | STRM MH 01_11 | 68.95 | 4923.16 | 4922.82 | 0.4900 | 30.000 | 0.0130 | 19.33 | 28.80 | 0.67 | 6.38 | 1.49 | 0.60 | 0.00 | Calculated |
| 102 | Link-23 | Pipe | ROOF DRAIN C1 | STRM MH 02_05 | 61.00 | 4918.38 | 4915.33 | 5.0000 | 24.000 | 0.0150 | 10.88 | 43.84 | 0.25 | 12.34 | 0.68 | 0.34 | 0.00 | Calculated |
| 103 | Link-24 | Pipe | STRM MH 02_06 | STRM MH 02_05 | 114.38 | 4911.02 | 4910.50 | 0.4500 | 48.000 | 0.0130 | 81.75 | 96.85 | 0.84 | 8.69 | 2.82 | 0.70 | 0.00 | Calculated |
| 104 | Link-25 | Pipe | STRM INLET 02A_03 | STRM INLET 02A_02 | 77.44 | 4917.67 | 4917.28 | 0.5000 | 24.000 | 0.0130 | 12.33 | 16.05 | 0.77 | 7.45 | 1.31 | 0.66 | 0.00 | Calculated |
| 105 | Link-26 | Pipe | B17 ROOF DRAIN | STRM MH 02_08 | 45.20 | 4920.83 | 4920.44 | 0.8600 | 12.000 | 0.0150 | 2.31 | 2.90 | 0.79 | 5.29 | 0.67 | 0.67 | 0.00 | Calculated |
| 106 | Link-27 | Pipe | B15 ROOF DRAIN | STRM INLET 02C_01 | 35.65 | 4920.91 | 4920.55 | 1.0100 | 12.000 | 0.0150 | 2.15 | 3.10 | 0.69 | 5.19 | 0.61 | 0.61 | 0.00 | Calculated |
| 107 | Link-30 | Pipe | STRM INLET 02D_05 | STRM MH 02D_04 | 25.21 | 4920.22 | 4920.09 | 0.5200 | 18.000 | 0.0130 | 1.70 | 7.54 | 0.23 | 3.95 | 0.48 | 0.32 | 0.00 | Calculated |
| 108 | Link-31 | Pipe | STRM INLET 02D.3_01 | STRM MH 02D_03 | 12.20 | 4920.82 | 4920.70 | 0.9800 | 18.000 | 0.0130 | 0.93 | 10.42 | 0.09 | 3.65 | 0.30 | 0.20 | 0.00 | Calculated |
| 109 | Link-32 | Pipe | B11 ROOF DRAIN | STRM INLET 02D_01 | 30.07 | 4922.48 | 4921.62 | 2.8600 | 10.000 | 0.0150 | 1.36 | 3.21 | 0.42 | 5.97 | 0.38 | 0.45 | 0.00 | Calculated |
| 110 | Link-33 | Pipe | STRM INLET 02D_01 | STRM MH 02D_02 | 12.21 | 4920.96 | 4920.90 | 0.4900 | 18.000 | 0.0130 | 3.28 | 7.36 | 0.45 | 4.05 | 0.70 | 0.47 | 0.00 | Calculated |
| 111 | Link-39 | Pipe | B4 ROOF DRAIN | STRM MH 02F_04 | 73.45 | 4920.40 | 4919.98 | 0.5700 | 12.000 | 0.0130 | 1.65 | 2.69 | 0.61 | 5.32 | 0.56 | 0.57 | 0.00 | Calculated |
| 112 | Link-40 | Pipe | D30 ROOF DRAIN | STRM MH 03A_03 | 84.54 | 4921.61 | 4920.76 | 1.0100 | 12.000 | 0.0153 | 2.35 | 3.04 | 0.78 | 5.27 | 0.66 | 0.66 | 0.00 | Calculated |
| 113 | Link-41 | Pipe | STRM MH 03A_03 | STRM MH 03A_02 | 90.02 | 4919.35 | 4918.90 | 0.5000 | 18.000 | 0.0130 | 3.75 | 7.43 | 0.50 | 4.24 | 0.75 | 0.50 | 0.00 | Calculated |
| 114 | Link-44 | Pipe | STRM INLET 03A_01 | STRM MH 03A_01 | 22.17 | 4918.09 | 4917.98 | 0.5000 | 24.000 | 0.0130 | 10.07 | 15.94 | 0.63 | 5.54 | 1.15 | 0.58 | 0.00 | Calculated |
| 115 | Link-45 | Pipe | D27 ROOF DRAIN | STRM INLET 03B_01 | 20.00 | 4922.23 | 4922.03 | 1.0000 | 14.000 | 0.0130 | 4.73 | 5.37 | 0.88 | 5.78 | 0.85 | 0.73 | 0.00 | Calculated |
| 116 | Link-46 | Pipe | D26 ROOF DRAIN | STRM MH 03_06 | 46.97 | 4921.33 | 4921.10 | 0.4900 | 14.000 | 0.0130 | 3.57 | 3.76 | 0.95 | 5.37 | 0.90 | 0.78 | 0.00 | Calculated |
| 117 | Link-47 | Pipe | D18 ROOF DRAIN | STRM INLET 03D_01 | 25.00 | 4922.07 | 4921.82 | 1.0000 | 12.000 | 0.0130 | 2.72 | 3.56 | 0.76 | 5.40 | 0.65 | 0.65 | 0.00 | Calculated |
| 118 | Link-48 | Pipe | STRM INLET 03E.1_01 | STRM MH 03E_06 | 46.21 | 4921.05 | 4920.82 | 0.5000 | 18.000 | 0.0130 | 3.49 | 7.41 | 0.47 | 5.32 | 0.72 | 0.48 | 0.00 | Calculated |
| 119 | Link-49 | Pipe | STRM MH 03E_05 | STRM MH 03_09 | 184.33 | 4917.05 | 4916.13 | 0.5000 | 42.000 | 0.0130 | 57.22 | 71.08 | 0.81 | 8.30 | 2.38 | 0.68 | 0.00 | Calculated |
| 120 | Link-50 | Pipe | STRM INLET 03E.2_02 | STRM MH 03E_05 | 26.13 | 4919.22 | 4919.07 | 0.5700 | 18.000 | 0.0130 | 1.70 | 7.96 | 0.21 | 4.11 | 0.47 | 0.31 | 0.00 | Calculated |
| 121 | Link-51 | Pipe | STRM INLET 03E.5_02 | STRM MH 03E.5_01 | 8.59 | 4922.07 | 4921.98 | 1.0500 | 24.000 | 0.0130 | 10.06 | 23.16 | 0.43 | 7.11 | 0.92 | 0.46 | 0.00 | Calculated |
| 122 | Link-52 | Pipe | STRM MH 03E.5_01 | STRM MH 03E_03 | 144.34 | 4921.78 | 4920.34 | 1.0000 | 24.000 | 0.0130 | 9.95 | 22.60 | 0.44 | 7.01 | 0.93 | 0.46 | 0.00 | Calculated |
| 123 | Link-53 | Pipe | STRM STUB 03_00 | STRM INLET 03E_01 | 50.00 | 4920.81 | 4920.00 | 1.6200 | 36.000 | 0.0130 | 41.03 | 84.89 | 0.48 | 11.92 | 1.47 | 0.49 | 0.00 | Calculated |
| 124 | Link-54 | Pipe | STRM INLET 03G_05 | STRM MH 03G_04 | 15.67 | 4920.42 | 4920.34 | 0.5100 | 30.000 | 0.0130 | 22.35 | 29.31 | 0.76 | 6.59 | 1.63 | 0.65 | 0.00 | Calculated |
| 125 | Link-56 | Pipe | STRM MH 02F_04 | STRM MH 02F_03 | 102.32 | 4917.58 | 4917.17 | 0.4000 | 18.000 | 0.0130 | 3.36 | 6.65 | 0.51 | 3.83 | 0.75 | 0.50 | 0.00 | Calculated |
| 126 | Link-57 | Pipe | STRM MH 02F_03 | STRM MH 02_12 | 140.11 | 4916.17 | 4915.61 | 0.4000 | 30.000 | 0.0130 | 22.09 | 25.93 | 0.85 | 6.03 | 1.77 | 0.71 | 0.00 | Calculated |
| 127 | Link-58 | Pipe | B6 ROOF DRAIN | STRM INLET 02F.2_01 | 62.65 | 4921.22 | 4920.22 | 1.6000 | 10.000 | 0.0130 | 1.51 | 2.77 | 0.55 | 6.71 | 0.44 | 0.53 | 0.00 | Calculated |
| 128 | Link-59 | Pipe | STRM INLET 02F.2_01 | STRM MH 02F_03 | 10.71 | 4918.80 | 4918.75 | 0.4700 | 30.000 | 0.0130 | 19.61 | 28.03 | 0.70 | 6.18 | 1.54 | 0.62 | 0.00 | Calculated |
| 129 | Link-60 | Pipe | B8 ROOF DRAIN | STRM INLET 02F_01 | 62.82 | 4921.88 | 4920.96 | 1.4600 | 12.000 | 0.0130 | 3.02 | 4.31 | 0.70 | 7.54 | 0.62 | 0.62 | 0.00 | Calculated |
| 130 | Link-61 | Pipe | STRM INLET 02F_01 | STRM MH 02F_02 | 10.71 | 4919.46 | 4919.42 | 0.3700 | 30.000 | 0.0130 | 16.10 | 25.07 | 0.64 | 5.42 | 1.46 | 0.58 | 0.00 | Calculated |
| 131 | Link-62 | Pipe | STRM MH 02F_02 | STRM MH 02_12 | 170.89 | 4919.22 | 4918.54 | 0.4000 | 30.000 | 0.0130 | 15.96 | 25.87 | 0.62 | 5.78 | 1.42 | 0.57 | 0.00 | Calculated |
| 132 | Link-63 | Pipe | STRM MH 02D_04 | STRM MH 02_10 | 121.91 | 4919.30 | 4918.69 | 0.5000 | 18.000 | 0.0130 | 1.65 | 7.43 | 0.22 | 3.52 | 0.48 | 0.32 | 0.00 | Calculated |
| 133 | Link-64 | Pipe | STRM MH 02_10 | STRM MH 02_09 | 25.96 | 4913.56 | 4913.44 | 0.4600 | 42.000 | 0.0130 | 49.92 | 68.40 | 0.73 | 7.76 | 2.22 | 0.63 | 0.00 | Calculated |
| 134 | Link-65 | Pipe | STRM MH 02_09 | STRM MH 02_08 | 52.42 | 4913.24 | 4913.00 | 0.4600 | 42.000 | 0.0130 | 49.90 | 68.08 | 0.73 | 7.74 | 2.23 | 0.64 | 0.00 | Calculated |
| 135 | Link-66 | Pipe | STRM INLET 02F_05 | STRM MH 02F_04 | 152.36 | 4918.69 | 4918.08 | 0.4000 | 12.000 | 0.0130 | 1.81 | 2.25 | 0.80 | 3.79 | 0.67 | 0.67 | 0.00 | Calculated |
| 136 | Link-67 | Pipe | STRM MH 03A_02 | STRM MH 03A_01 | 143.78 | 4918.70 | 4917.98 | 0.5000 | 18.000 | 0.0130 | 3.67 | 7.43 | 0.49 | 4.24 | 0.74 | 0.50 | 0.00 | Calculated |
| 137 | Link-68 | Pipe | STRM MH 03A_01 | STRM MH 03_04 | 247.73 | 4917.78 | 4916.54 | 0.5000 | 24.000 | 0.0130 | 12.80 | 16.01 | 0.80 | 5.83 | 1.35 | 0.67 | 0.00 | Calculated |
| 138 | Link-69 | Pipe | STRM INLET 03C_05 | STRM INLET 03C_04 | 74.86 | 4920.23 | 4919.48 | 1.0000 | 18.000 | 0.0130 | 2.62 | 10.51 | 0.25 | 6.72 | 0.51 | 0.34 | 0.00 | Calculated |
| 139 | Link-70 | Pipe | STRM INLET 03C_04 | STRM INLET 03C_03 | 88.15 | 4919.28 | 4918.40 | 1.0000 | 18.000 | 0.0130 | 4.41 | 10.50 | 0.42 | 5.73 | 0.68 | 0.45 | 0.00 | Calculated |
| 140 | Link-71 | Pipe | STRM INLET 03C_03 | STRM INLET 03C_02 | 72.02 | 4918.20 | 4917.84 | 0.5000 | 24.000 | 0.0130 | 6.26 | 15.99 | 0.39 | 4.81 | 0.87 | 0.43 | 0.00 | Calculated |
| 141 | Link-72 | Pipe | STRM INLET 03C_02 | STRM INLET 03C_01 | 88.54 | 4917.08 | 4916.64 | 0.5000 | 24.000 | 0.0130 | 7.00 | 15.95 | 0.44 | 4.97 | 0.93 | 0.46 | 0.00 | Calculated |
| 142 | Link-73 | Pipe | STRM INLET 03C_01 | STRM MH 03_07 | 61.23 | 4915.64 | 4915.33 | 0.5100 | 24.000 | 0.0130 | 7.97 | 16.10 | 0.49 | 5.14 | 0.99 | 0.50 | 0.00 | Calculated |
| 143 | Link-74 | Pipe | STRM MH 03G_02 | STRM MH 03_11 | 175.09 | 4919.41 | 4918.54 | 0.5000 | 30.000 | 0.0130 | 20.26 | 28.91 | 0.70 | 6.46 | 1.54 | 0.62 | 0.00 | Calculated |
| 144 | Link-75 | Pipe | D2 ROOF DRAIN | STRM INLET 03G_01 | 65.71 | 4922.26 | 4920.92 | 2.0400 | 14.000 | 0.0130 | 2.79 | 7.67 | 0.36 | 8.11 | 0.49 | 0.42 | 0.00 | Calculated |
| 145 | Link-76 | Pipe | STRM INLET 03G_01 | STRM MH 03G_02 | 15.67 | 4919.69 | 4919.61 | 0.5100 | 30.000 | 0.0153 | 20.48 | 24.90 | 0.82 | 5.67 | 1.73 | 0.69 | 0.00 | Calculated |
| 146 | Link-08 | Outlet | POND | OUTFALL | | 4905.47 | 4904.92 | | | | 2.79 | | | | | | | |

## MCD-STRM_01A

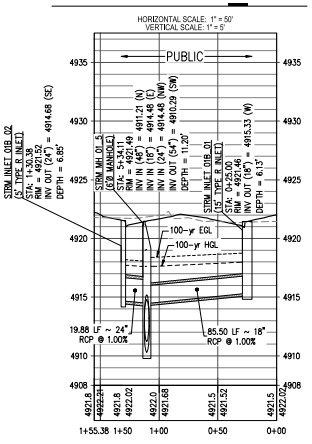


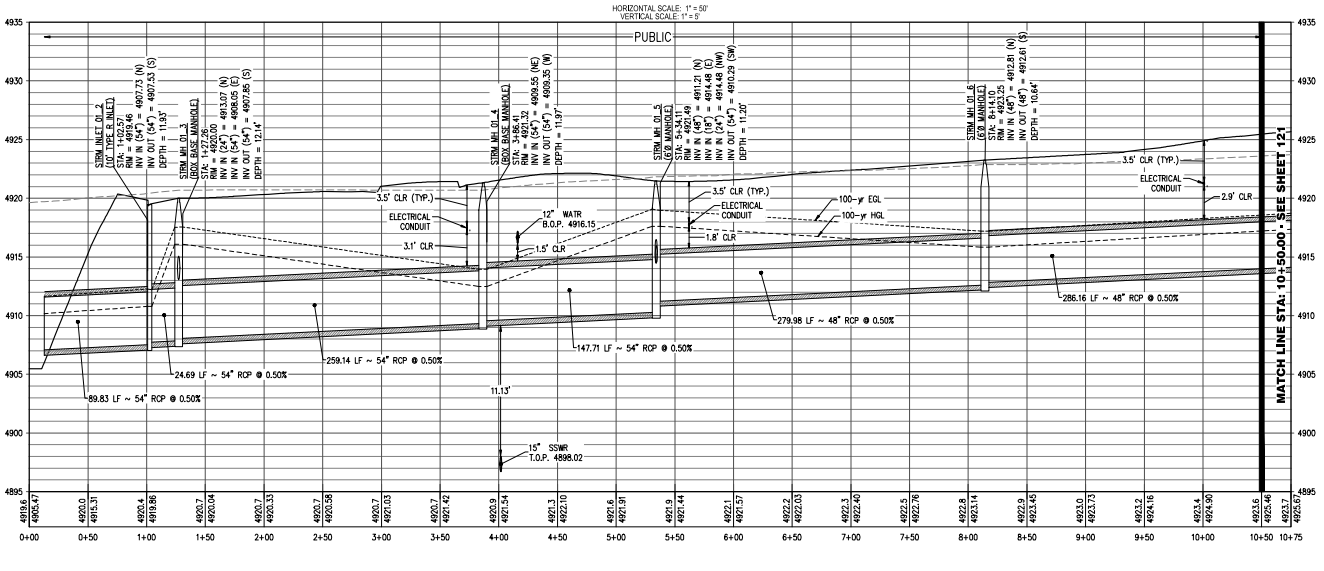

## MCD-STRM_01B




NOTE:

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## MCD-STRM_01
## FROM STA: 0+00.00 TO STA: 10+50.00




To request marking of underground facilities

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| No. | Date | Description |
|---|---|---|
| 4 | 07/25/2025 | 4th SUBMITTAL |
| 3 | 05/30/2025 | 3RD SUBMITTAL |
| 2 | 03/07/2025 | 2ND SUBMITTAL |
| 1 | 12/23/2024 | 1ST SUBMITTAL |

DOCUMENT AMENDMENTS

McWHINNEY
Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE, SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-2900

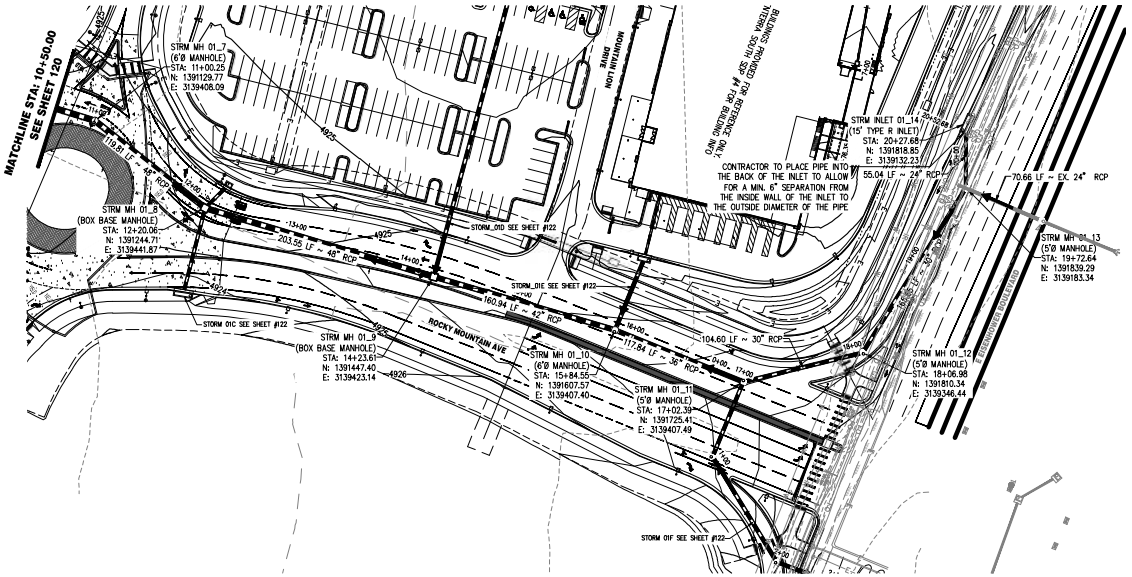
**CENTERRA SOUTH FIRST SUBDIVISION**
CIVIL CONSTRUCTION PLANS

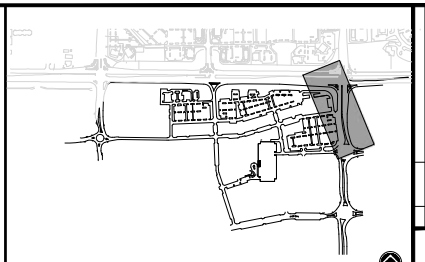
STORM SEWER PLAN AND PROFILE

CWC CONSULTING GROUP
CIVIL ENGINEERING · LAND SURVEYING · CONSTRUCTION SERVICES
9380 TEDDY LANE, SUITE 203
LONE TREE, COLORADO 80124
TELEPHONE: 303-3952700
FAX 303-3952701

Project Number: 130-00192
Designed By: DFL
Drawn By: HLM/MLG
Reviewed By: BEC
Sheet Number: 120

P:\JOBS\MCWHINNEY\MCWHINNEY-MCDONOUGH ENGINEERING\PLAN SETS\MCDH_CCP-STRM-PROF-01.DWG, 7/29/2025 10:29 AM, DYLAN LEKTORICH



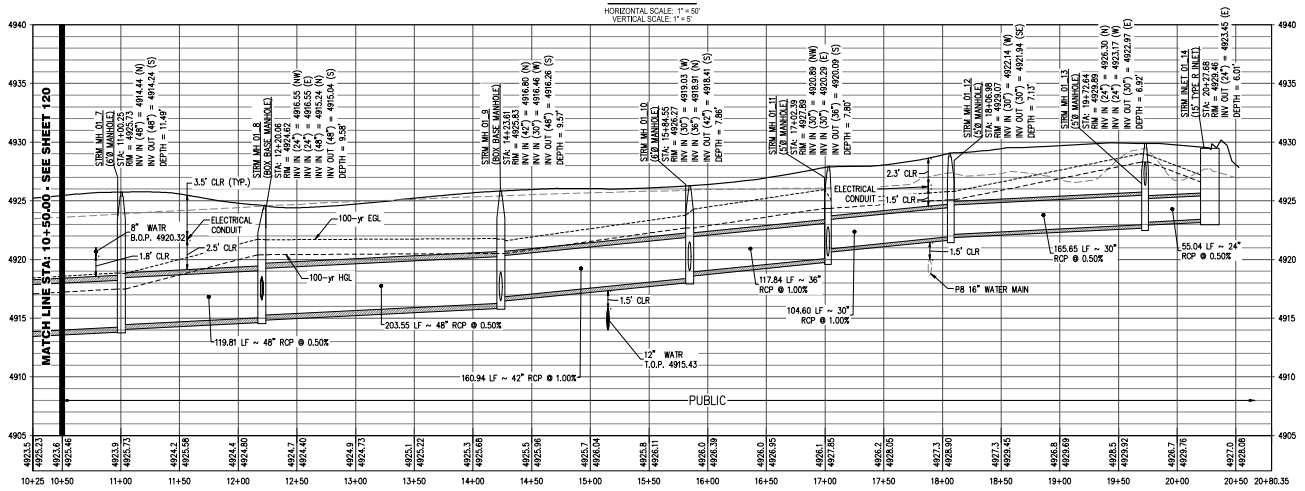







## *MCD-STRM_01*

## *FROM STA: 10+50.00 TO STA: 20+12.08*




NOTE:

ANY PUBLIC STORM SEWERS THAT ARE INSTALLED WITHIN 9 FEET OF TREES SHALL HAVE THE JOINTS WRAPPED IN ROOT BARRIER WRAP FOR A DISTANCE OF 10 FEET ON EITHER SIDE OF THE TREE. NO TREE MAY BE WITHIN 6 FEET OF THE OUTSIDE DIAMETER OF THE PUBLIC STORM SEWERS. SHRUBS NEED TO MAINTAIN A MINIMUM 5 FEET FROM THE OUTSIDE DIAMETER OF PUBLIC STORM SEWERS.

To request marking of underground facilities

811

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for more information

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| No. | Date | Description |
|---|---|---|
| | 07/25/2025 | 4th SUBMITTAL |
| | 05/30/2025 | 3RD SUBMITTAL |
| | 03/20/2025 | 2ND SUBMITTAL |
| | 12/23/2024 | 1ST SUBMITTAL |

DOCUMENT AMENDMENTS

McWHINNEY

Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE, SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-2900

**CENTERRA SOUTH FIRST SUBDIVISION**
CIVIL CONSTRUCTION PLANS

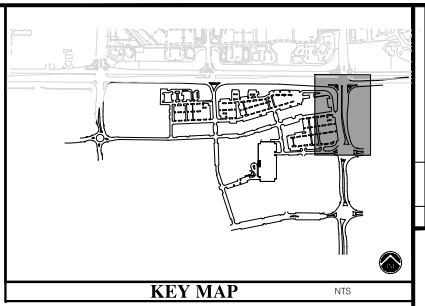
STORM SEWER PLAN AND PROFILE


9380 TEDDY LANE, SUITE 203
LONE TREE, COLORADO
80124
TELEPHONE: 303-395-2700
FAX 303-395-2701

CWC CONSULTING GROUP
CIVIL ENGINEERING • LAND SURVEYING •
CONSTRUCTION MANAGEMENT SERVICES


Project Number: 130-00192
Designed By: DFL
Drawn By: HLM/MLG
Reviewed By: BEC
Sheet Number: 121


R:\JOBS\MCWHINNEY\VACONO\GDA\ENGINEERING\PLAN_SETS\MCD#_CCP-STRM-PROF-01.DWG, 7/29/2025 10:23 AM, DYLAN LEKTORICH,

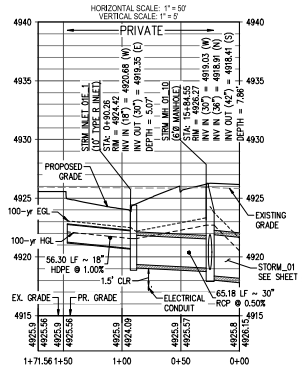



NOTE:

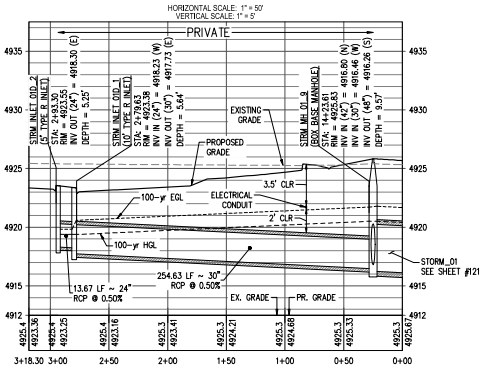
ANY PUBLIC STORM SEWERS THAT ARE INSTALLED WITHIN 9 FEET OF TREES SHALL HAVE THE JOINTS WRAPPED IN ROOT BARRIER WRAP FOR A DISTANCE OF 10 FEET ON EITHER SIDE OF THE TREE. NO TREE MAY BE WITHIN 6 FEET OF THE OUTSIDE DIAMETER OF THE PUBLIC STORM SEWERS. SHRUBS NEED TO MAINTAIN A MINIMUM 5 FEET FROM THE OUTSIDE DIAMETER OF PUBLIC STORM SEWERS.

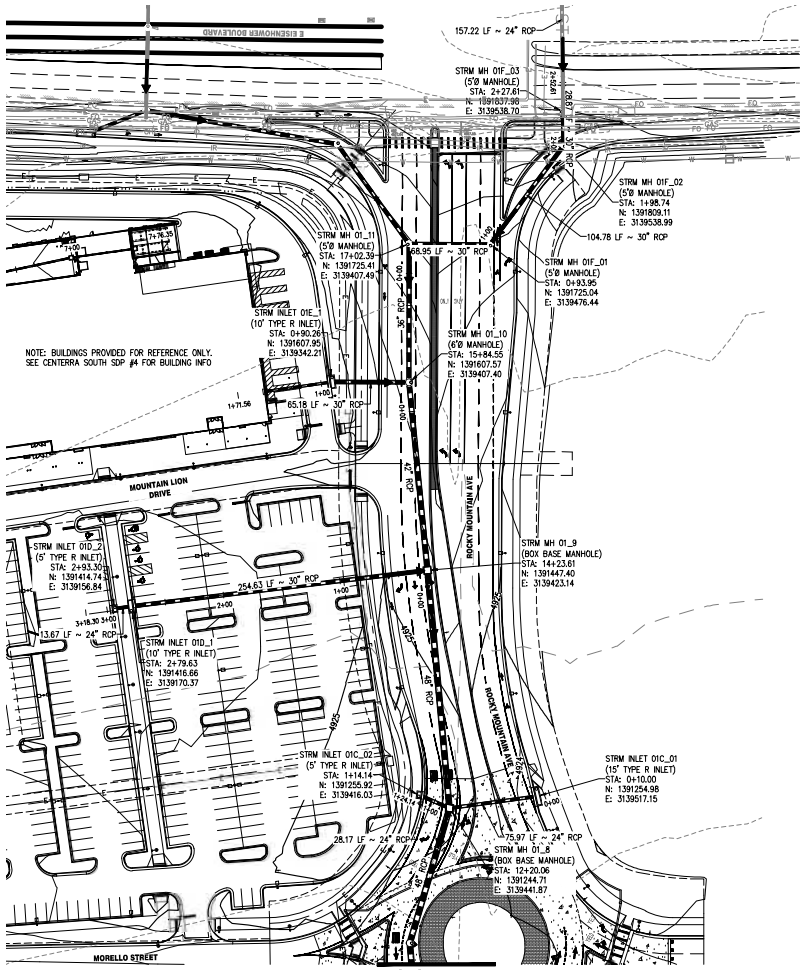
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SCALE: 1"= 50'

## MCD-STRM_01E



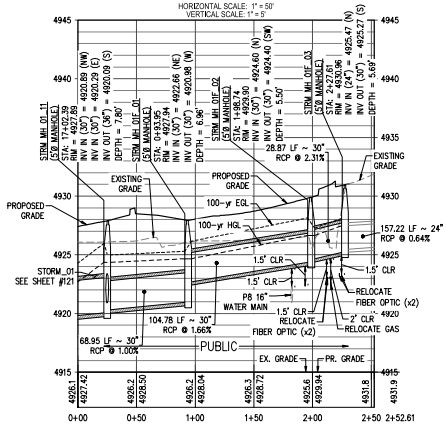

## MCD-STRM_01D



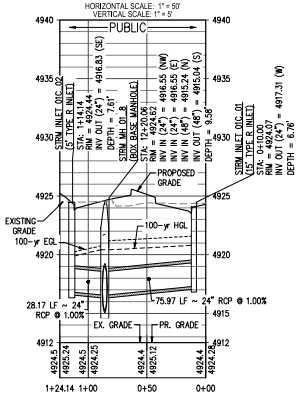




**MCD-STRM_01**
**SEE SHEET 120**

## MCD-STRM_01F




## MCD-STRM_01C




To request marking of underground facilities

811 Know what's **below.** **Call** before you dig.
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| No. | Date | Description |
|---|---|---|
| 1 | 07/25/2025 | 4th SUBMITTAL |
| 2 | 05/30/2025 | 3RD SUBMITTAL |
| 3 | 03/07/2025 | 2ND SUBMITTAL |
| 4 | 12/23/2024 | 1ST SUBMITTAL |

DOCUMENT AMENDMENTS

McWHINNEY
Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE, SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-2900

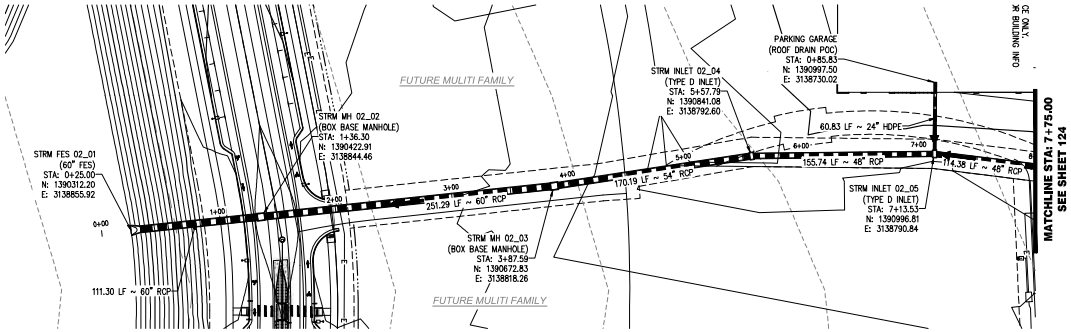
**CENTERRA SOUTH FIRST SUBDIVISION**
CIVIL CONSTRUCTION PLANS

STORM SEWER PLAN AND PROFILE

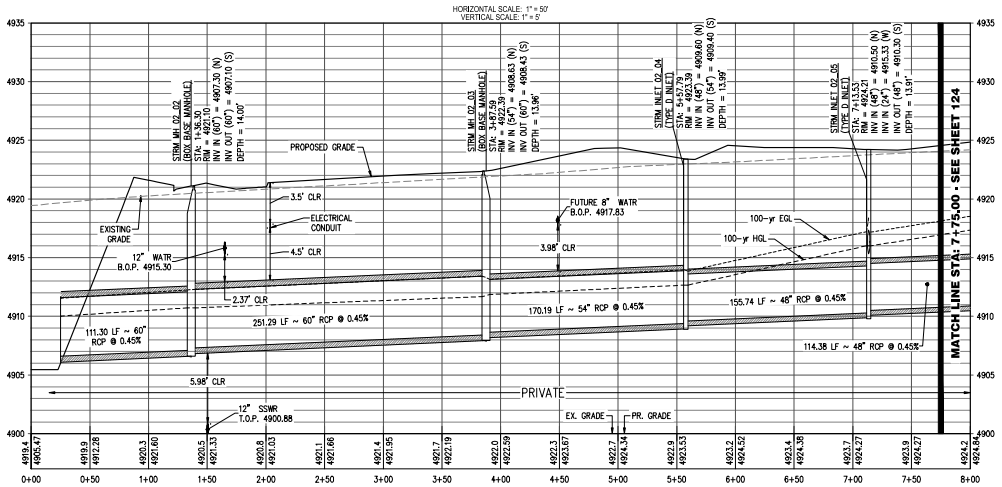
CWC CONSULTING GROUP
CIVIL ENGINEERING • LAND SURVEYING • CONSTRUCTION MANAGEMENT SERVICES
9380 TEDDY LANE, SUITE 203
LONE TREE, COLORADO 80124
TELEPHONE: 303-395-2700
FAX 303-395-2701

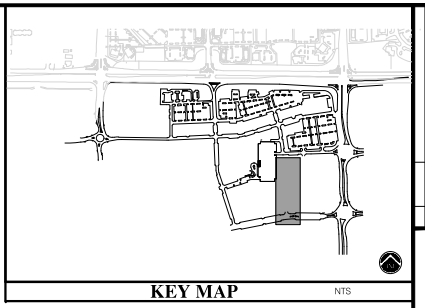
Project Number: 130-00192
Designed By: DFL
Drawn By: HLM/MLG
Reviewed By: BEC
Sheet Number: 122

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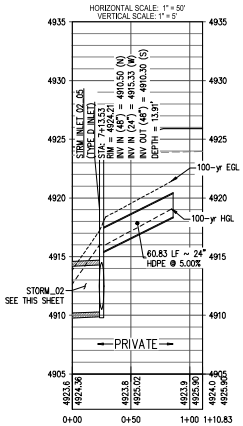



## MCD-STRM_02
## FROM STA: 0+00.00 TO STA: 7+75.00




## PARKING GARAGE ROOF DRAIN




NOTE:

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| No. | Date | Description |
|---|---|---|
| 1 | 12/23/2024 | 1ST SUBMITTAL |
| 2 | 03/03/2025 | 2ND SUBMITTAL |
| 3 | 05/30/2025 | 3RD SUBMITTAL |
| 4 | 07/29/2025 | 4th SUBMITTAL |

DOCUMENT AMENDMENTS

McWHINNEY
Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE.
SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-2900

**CENTERRA SOUTH FIRST SUBDIVISION**
CIVIL CONSTRUCTION PLANS

STORM SEWER PLAN AND PROFILE

CWC CONSULTING GROUP
CIVIL ENGINEERING • LAND SURVEYING •
CONSTRUCTION MANAGEMENT SERVICES
9380 TEDDY LANE, SUITE 203
LONE TREE, COLORADO
80124
TELEPHONE: 303-3954-2700
FAX 303-3954-2701

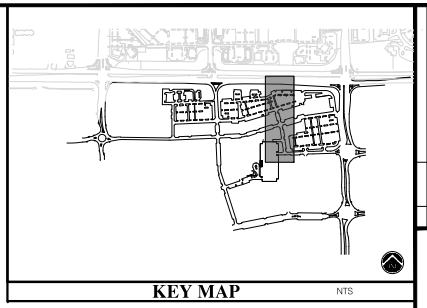
To request marking of underground facilities

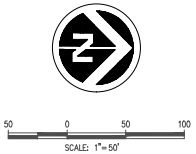
811
Know what's **below.**
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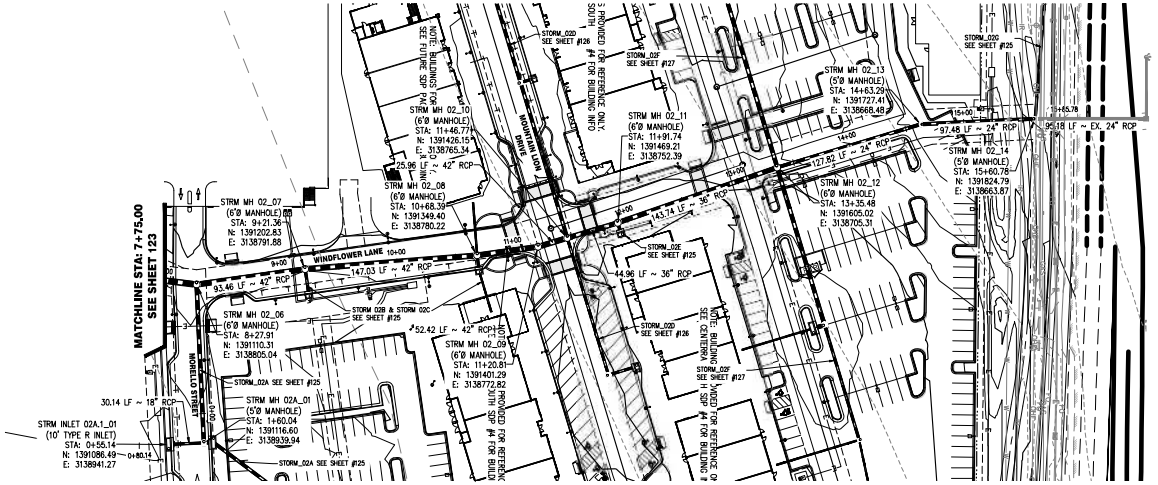
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| | |
|---|---|
| Project Number: | 130-00192 |
| Designed By: | DFL |
| Drawn By: | HLM/MLG |
| Reviewed By: | BEC |
| Sheet Number: | 123 |

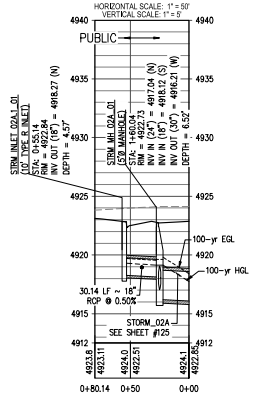
R:\JOBS\MCWHINNEY\MCD\NOGA\ENGINEERING\PLAN_SETS\MCDH_CCP-STRM-PROF-01.DWG, 7/29/2025 10:24 AM, DYLAN LEKTORICH



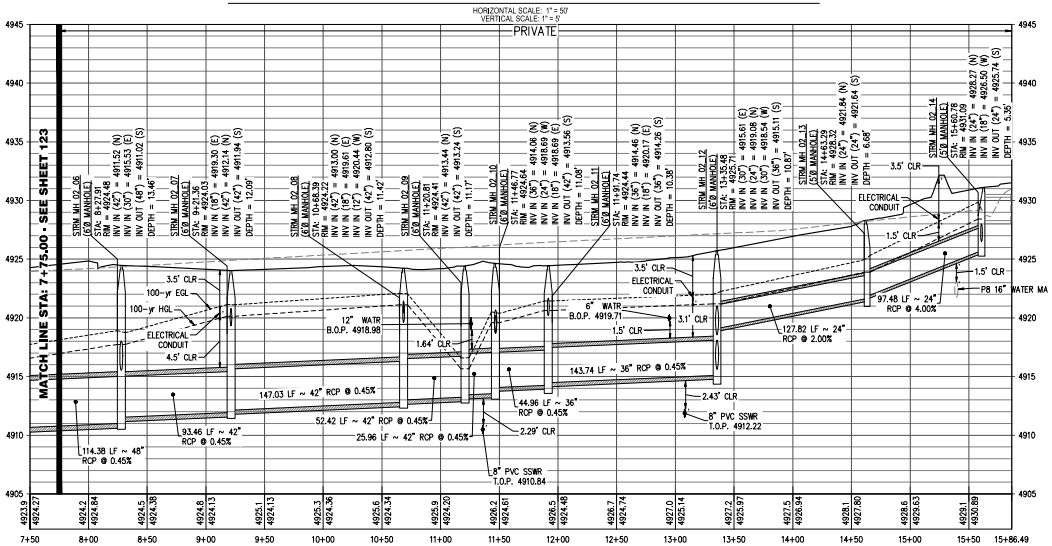




## MCD-STRM_02A.1




## MCD-STRM_02
## FROM STA: 7+75.00 TO STA: 15+61.30




NOTE:

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| 4 | 07/25/2025 | 4th SUBMITTAL |
| 3 | 05/30/2025 | 3RD SUBMITTAL |
| 2 | 03/05/2025 | 2ND SUBMITTAL |
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DOCUMENT AMENDMENTS

McWHINNEY
Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE, SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-2900

**CENTERRA SOUTH FIRST SUBDIVISION**
CIVIL CONSTRUCTION PLANS

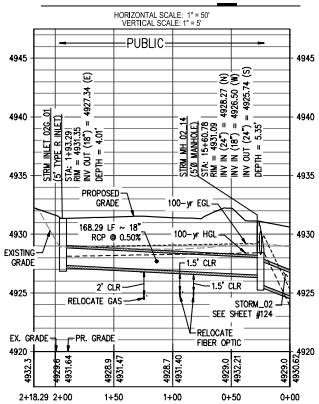
STORM SEWER PLAN AND PROFILE

CWC CONSULTING GROUP
CIVIL ENGINEERING • LAND SURVEYING • CONSTRUCTION MANAGEMENT SERVICES
9380 TEDDY LANE, SUITE 203
LONE TREE, COLORADO 80124
TELEPHONE: 303-395-2700
FAX 303-395-2701

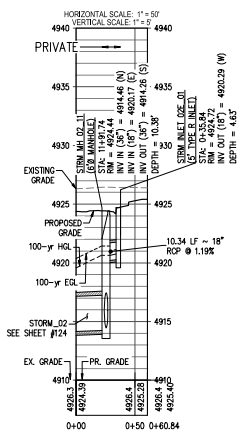
Project Number: 130-00192
Designed By: DFL
Drawn By: HLM/MLG
Reviewed By: BEC
Sheet Number: 124

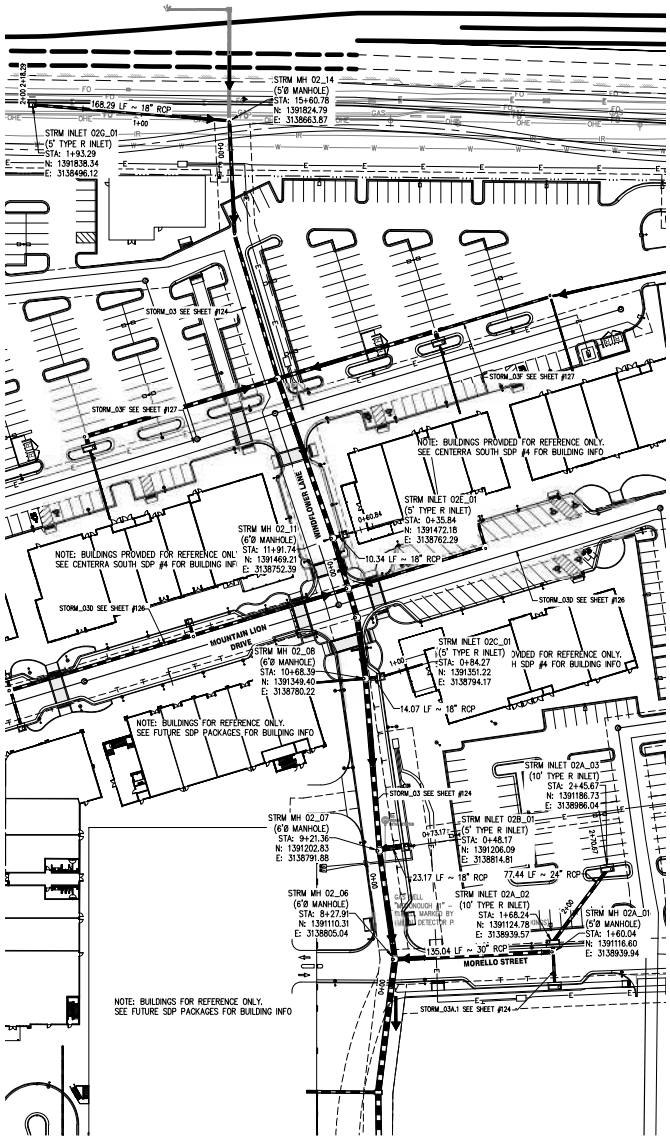
D:\JOBS\MCWHINNEY\MCDONOUGH ENGINEERING\PLAN_SETS\MCDH_CCP-STRM-PROF-01.DWG, 7/29/2025 10:29 AM, DYLAN LEKTORICH

## MCD-STRM_02G

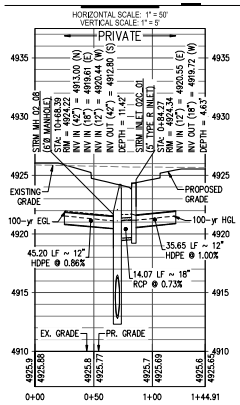



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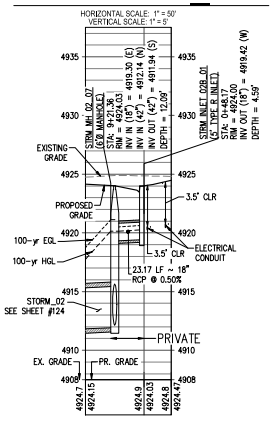


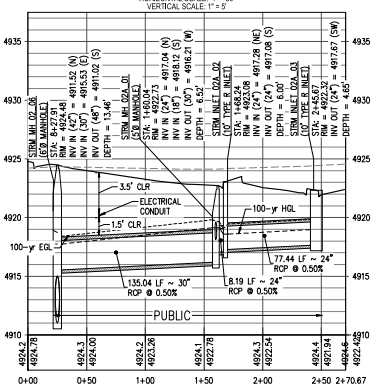

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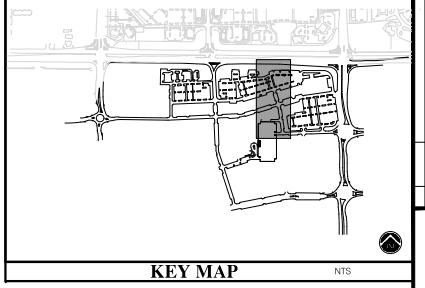


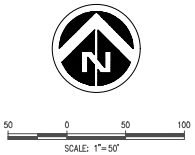

## MCD-STRM_02B




## MCD-STRM_02A




NOTE:

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| No. | Date | Description |
|---|---|---|
| 4 | 07/25/2025 | 4th SUBMITTAL |
| 3 | 05/30/2025 | 3RD SUBMITTAL |
| 2 | 03/07/2025 | 2ND SUBMITTAL |
| 1 | 12/23/2024 | 1ST SUBMITTAL |

DOCUMENT AMENDMENTS

McWHINNEY
Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE, SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-2900

**CENTERRA SOUTH FIRST SUBDIVISION**
CIVIL CONSTRUCTION PLANS

STORM SEWER PLAN AND PROFILE

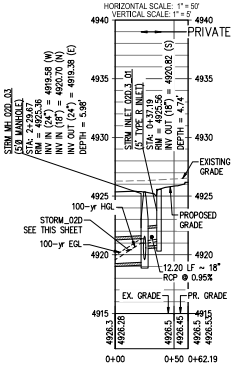
9380 TEDDY LANE, SUITE 203
LONE TREE, COLORADO 80124
TELEPHONE: 303-395-2700
FAX 303-395-2701

CWC CONSULTING GROUP
CIVIL ENGINEERING • LAND SURVEYING •
CONSTRUCTION SERVICES

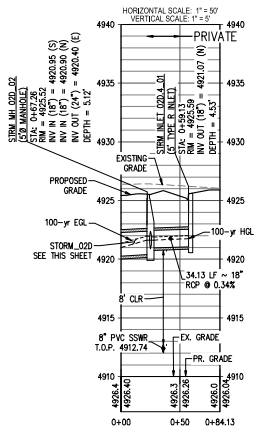
Project Number: 130-00192
Designed By: DFL
Drawn By: HLM/MLG
Reviewed By: BEC
Sheet Number: 125

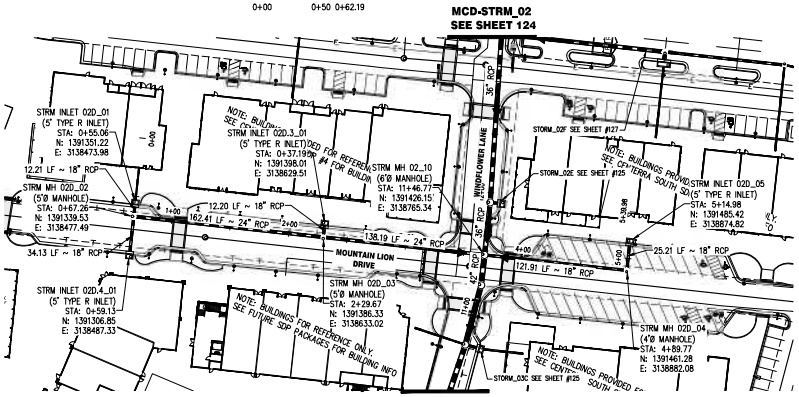
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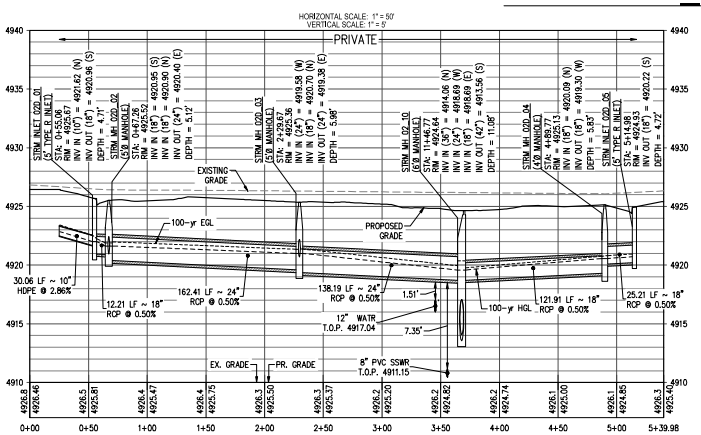


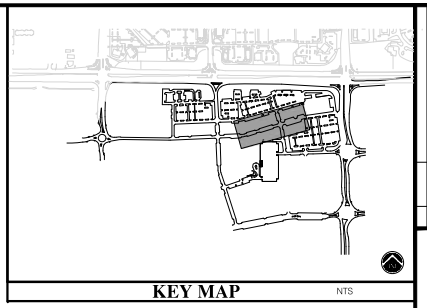

## MCD-STRM_02D.4




## MCD-STRM_02D



KEY MAP NTS




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SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-2900


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| 3 | 05/30/2025 | 3RD SUBMITTAL |
| 4 | 07/29/2025 | 4th SUBMITTAL |

DOCUMENT AMENDMENTS

**CENTERRA SOUTH FIRST SUBDIVISION**
CIVIL CONSTRUCTION PLANS

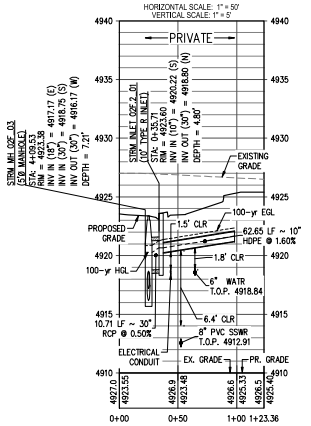
STORM SEWER PLAN AND PROFILE


CWC CONSULTING GROUP
CIVIL ENGINEERING • LAND SURVEYING • CONSTRUCTION MANAGEMENT SERVICES
9380 TEDDY LANE, SUITE 203
LONE TREE, COLORADO 80124
TELEPHONE: 303-3952700
FAX 303-3952701

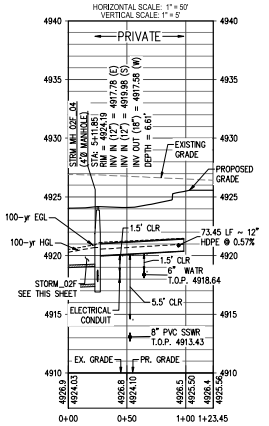

Project Number: 130-00192
Designed By: DFL
Drawn By: HLM/MLG
Reviewed By: BEC
Sheet Number: 126

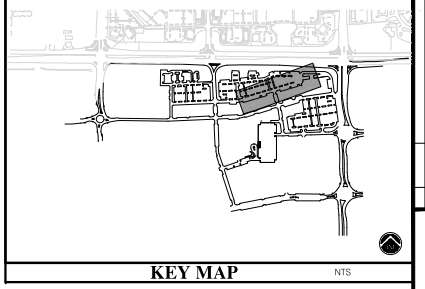

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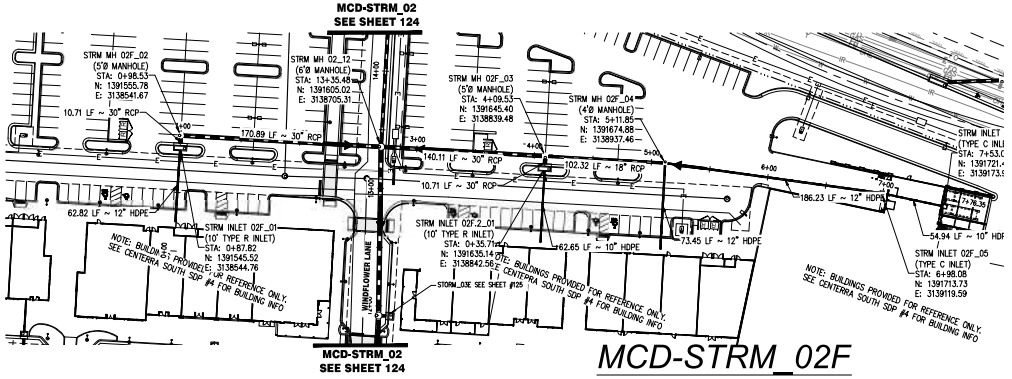

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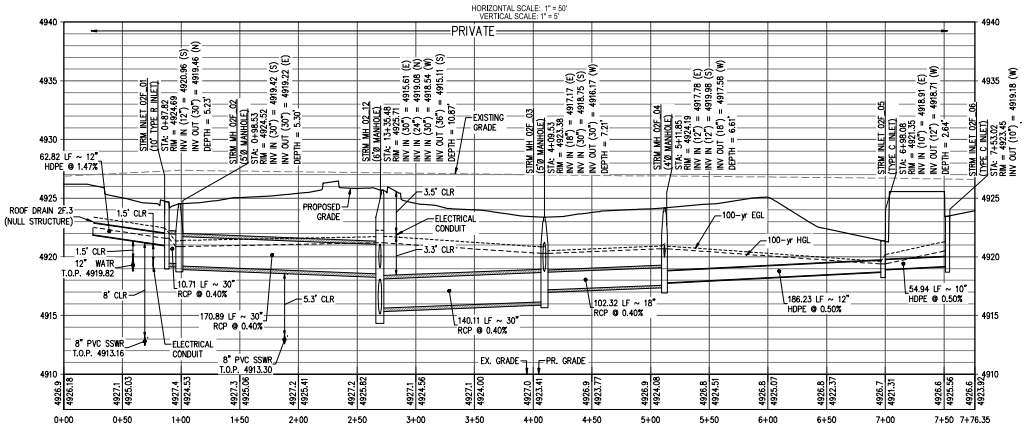










## MCD-STRM_02F




NOTE:

ANY PUBLIC STORM SEWERS THAT ARE INSTALLED WITHIN 9 FEET OF TREES SHALL HAVE THE JOINTS WRAPPED IN ROOT BARRIER WRAP FOR A DISTANCE OF 10 FEET ON EITHER SIDE OF THE TREE. NO TREE MAY BE WITHIN 6 FEET OF THE OUTSIDE DIAMETER OF THE PUBLIC STORM SEWERS. SHRUBS NEED TO MAINTAIN A MINIMUM 5 FEET FROM THE OUTSIDE DIAMETER OF PUBLIC STORM SEWERS.

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| 3 | 03/03/2025 | 2ND SUBMITTAL |
| 4 | 12/23/2024 | 1ST SUBMITTAL |

DOCUMENT AMENDMENTS

McWHINNEY
Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE, SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-2900

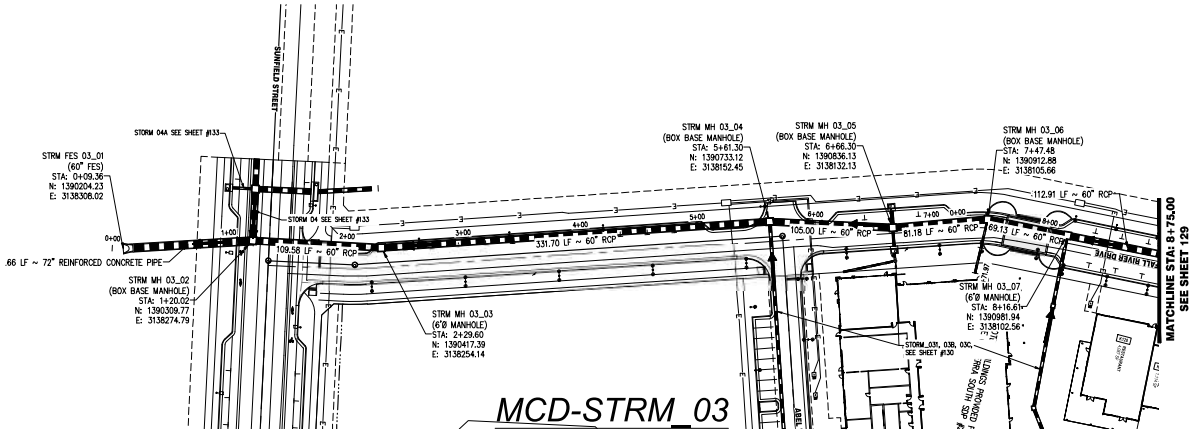
**CENTERRA SOUTH FIRST SUBDIVISION**
CIVIL CONSTRUCTION PLANS

STORM SEWER PLAN AND PROFILE

9380 TEDDY LANE, SUITE 203
LONE TREE, COLORADO 80124
TELEPHONE: 303-3952700
FAX 303-3952701
CWC CONSULTING GROUP
CIVIL ENGINEERING • LAND SURVEYING • CONSTRUCTION MANAGEMENT SERVICES

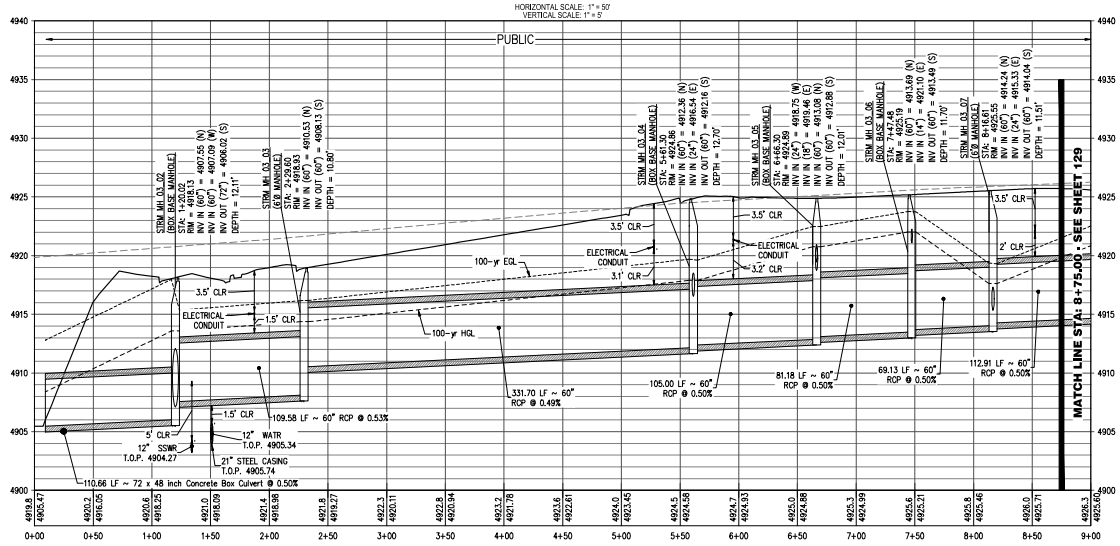
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Designed By: DFL
Drawn By: HLM/MLG
Reviewed By: BEC
Sheet Number: 127

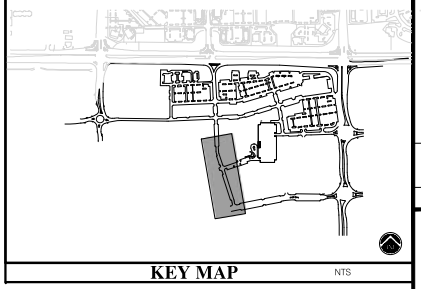
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# MCD-STRM_03

## FROM STA: 0+00.00 TO STA: 8+75.00




NOTE:

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| 3 | 05/30/2025 | 3RD SUBMITTAL |
| 4 | 07/29/2025 | 4th SUBMITTAL |

DOCUMENT AMENDMENTS

McWHINNEY
Contact: KIM PERRY
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SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-2900

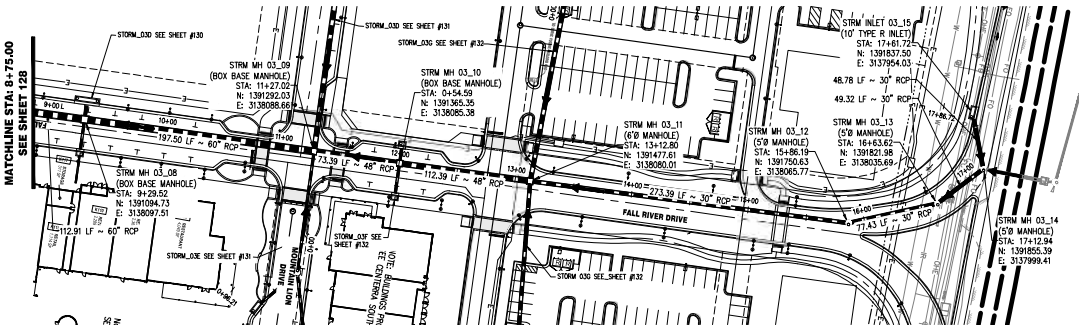
**CENTERRA SOUTH FIRST SUBDIVISION**
CIVIL CONSTRUCTION PLANS

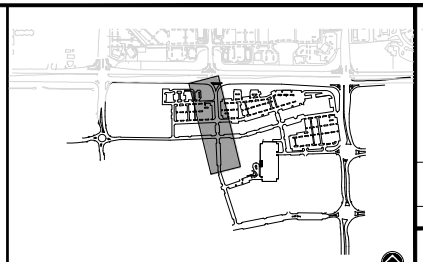
STORM SEWER PLAN AND PROFILE

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CONSTRUCTION MANAGEMENT SERVICES
9380 TEDDY LANE, SUITE 203
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FAX 303-395-2701

Project Number: 130-00192
Designed By: DFL
Drawn By: HLM/MLG
Reviewed By: BEC
Sheet Number: 128

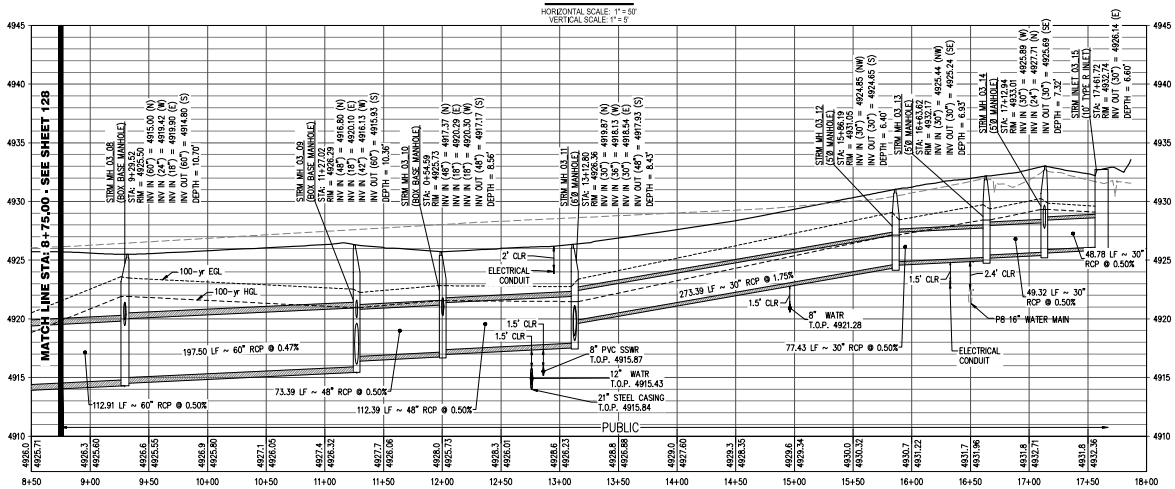
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# MCD-STRM_03

## FROM STA: 8+75.00 TO STA: 17+56.19




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LOVELAND, CO 80538
TEL: (970) 962-2900

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| 4 | 07/29/2025 | 4th SUBMITTAL |

DOCUMENT AMENDMENTS

**CENTERRA SOUTH FIRST SUBDIVISION**
CIVIL CONSTRUCTION PLANS

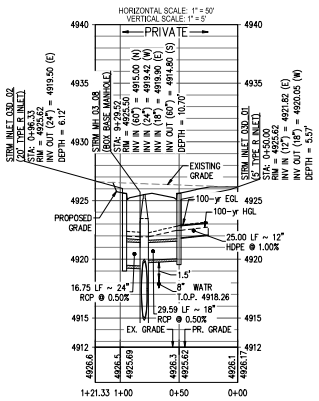
STORM SEWER PLAN AND PROFILE


CWC CONSULTING GROUP
CIVIL ENGINEERING • LAND SURVEYING •
CONSTRUCTION MANAGEMENT SERVICES
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LONE TREE, COLORADO 80124
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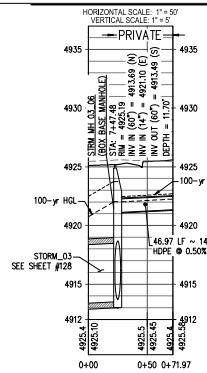

Project Number: 130-00192
Designed By: DFL
Drawn By: HLM/MLG
Reviewed By: BEC
Sheet Number: 129


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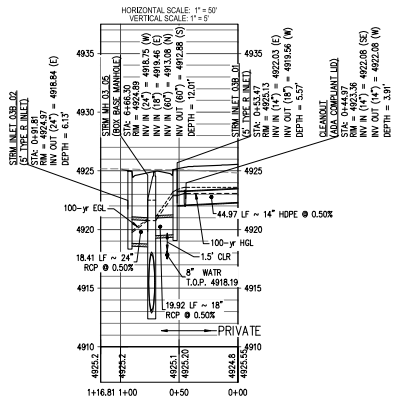
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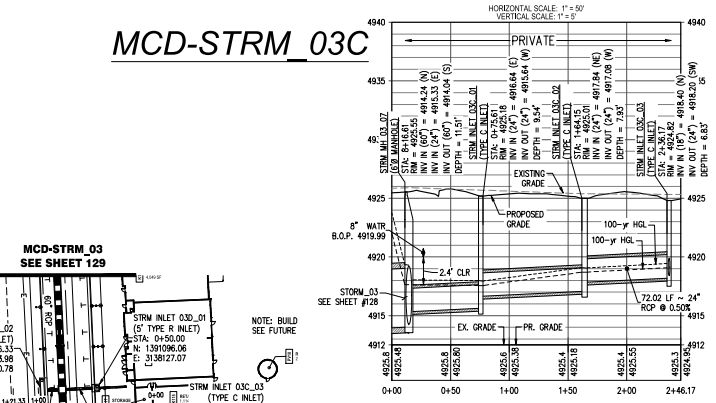

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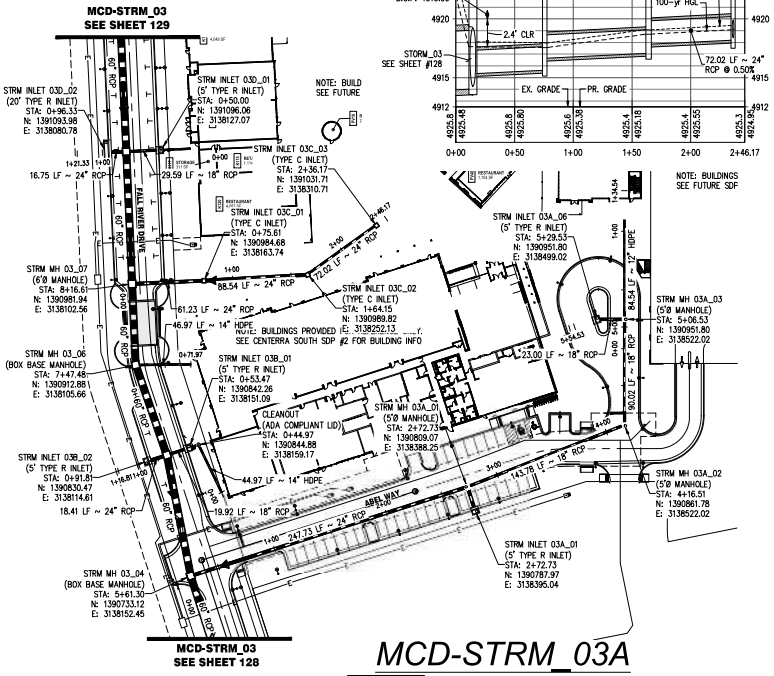



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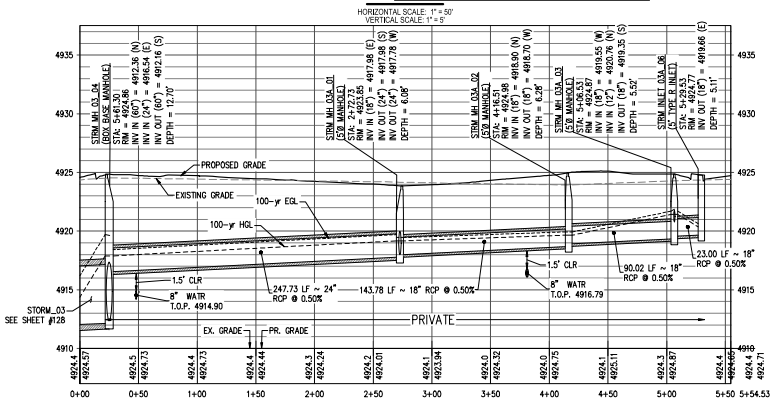



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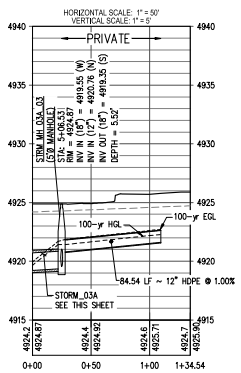


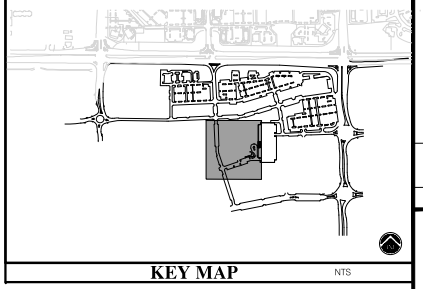




## MCD-STRM_03A




## MCD-STRM_03A.1







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LOVELAND, CO 80538
TEL: (970) 962-2900

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CIVIL CONSTRUCTION PLANS

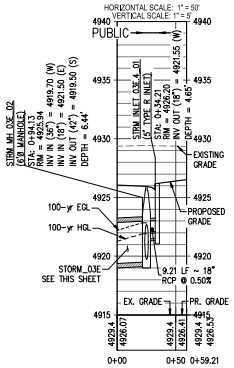
STORM SEWER PLAN AND PROFILE

CWC CONSULTING GROUP
CIVIL ENGINEERING • LAND SURVEYING • CONSTRUCTION MANAGEMENT SERVICES
9380 TEDDY LANE, SUITE 203
LONE TREE, COLORADO 80124
TELEPHONE: 303-395-2700
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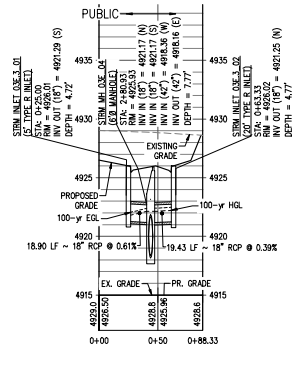
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| Project Number: | 130-00192 |
| Designed By: | DFL |
| Drawn By: | HLM/MLG |
| Reviewed By: | BEC |
| Sheet Number: | 130 |

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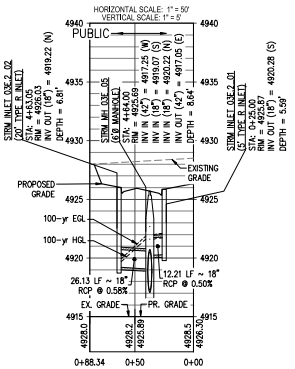
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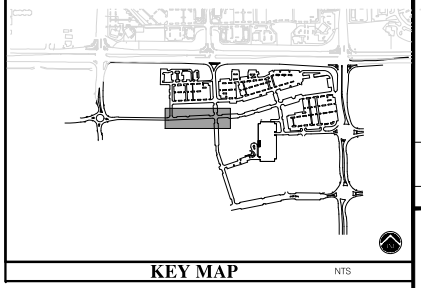


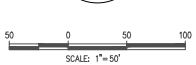

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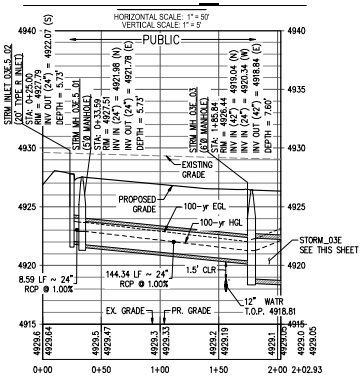

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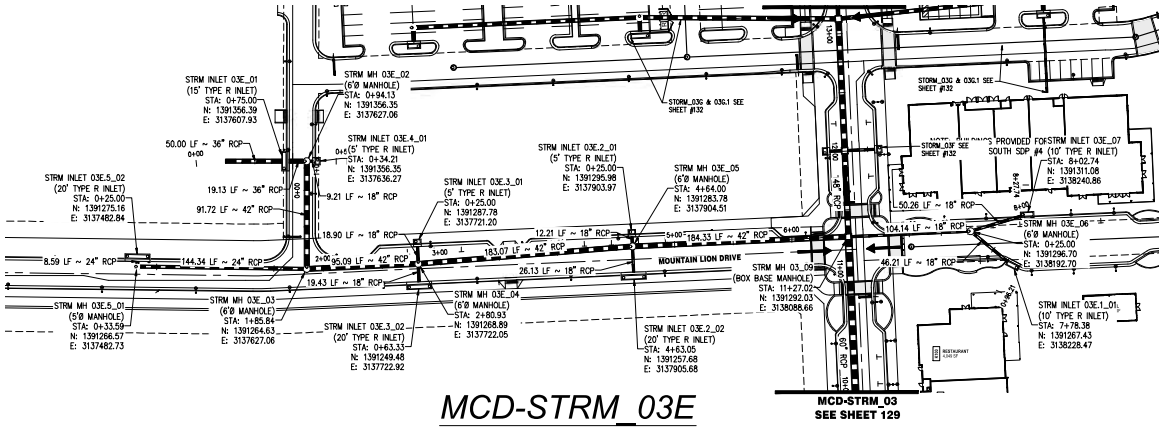


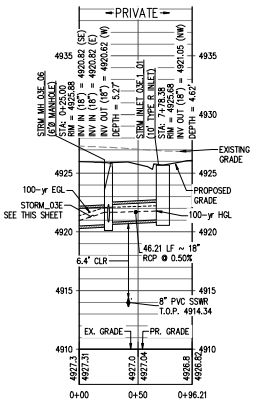




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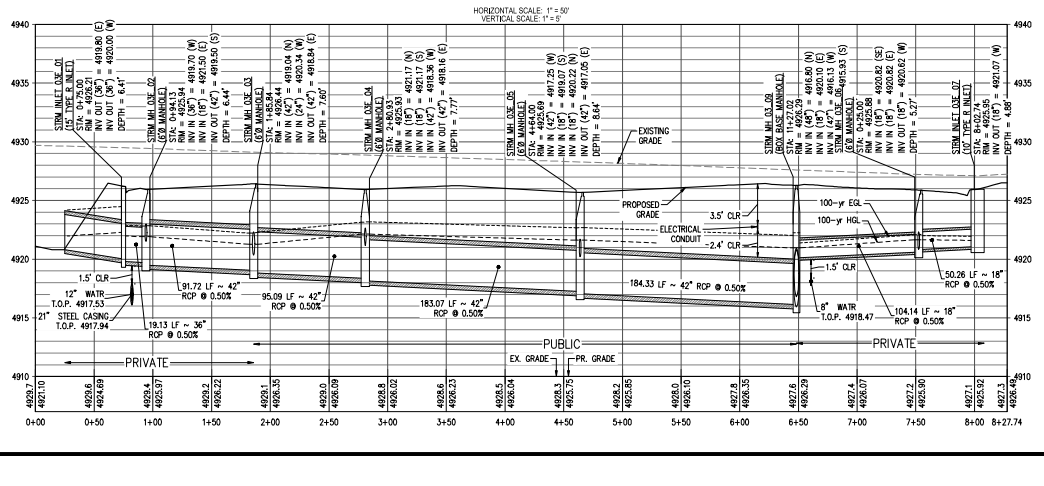



## MCD-STRM_03E.1




## MCD-STRM_03E




To request marking of underground facilities

811

Know what's below. Call before you dig.

Call 811 or visit call811.com for more information

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| No. | Date | Description |
|---|---|---|
| 1 | 07/25/2025 | 4th SUBMITTAL |
| 2 | 05/30/2025 | 3RD SUBMITTAL |
| 3 | 03/20/2025 | 2ND SUBMITTAL |
| 4 | 12/23/2024 | 1ST SUBMITTAL |

DOCUMENT AMENDMENTS

McWHINNEY
Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE, SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-2900

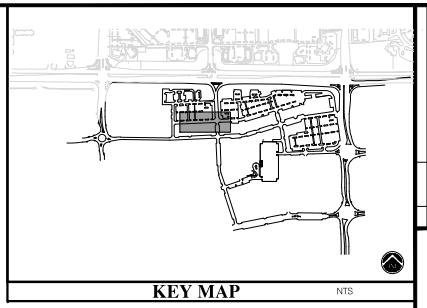
**CENTERRA SOUTH FIRST SUBDIVISION**
CIVIL CONSTRUCTION PLANS

STORM SEWER PLAN AND PROFILE

CWC CONSULTING GROUP
CIVIL ENGINEERING • LAND SURVEYING • CONSTRUCTION MANAGEMENT SERVICES
9380 TEDDY LANE, SUITE 203
LONE TREE, COLORADO 80124
TELEPHONE: 303-395-2700
FAX 303-395-2701

Project Number: 130-00192
Designed By: DFL
Drawn By: HLM/MLG
Reviewed By: BEC
Sheet Number: 131

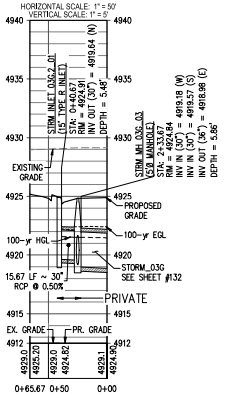
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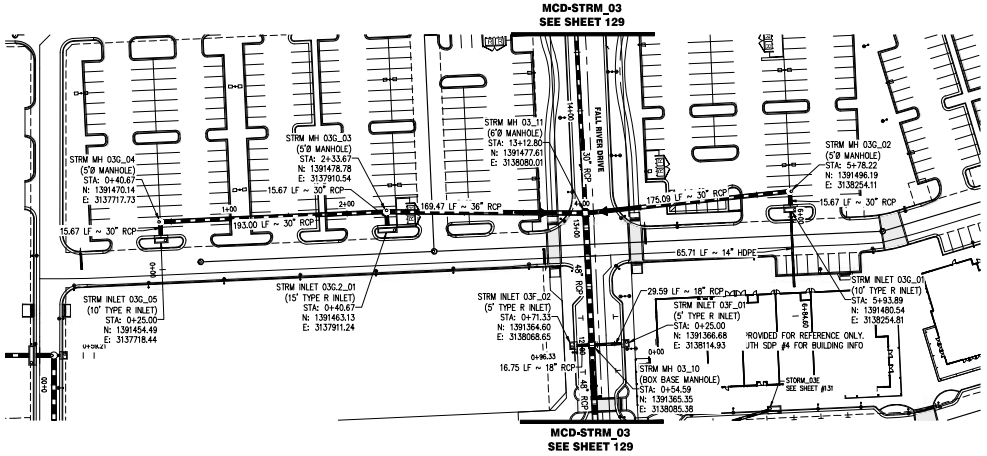




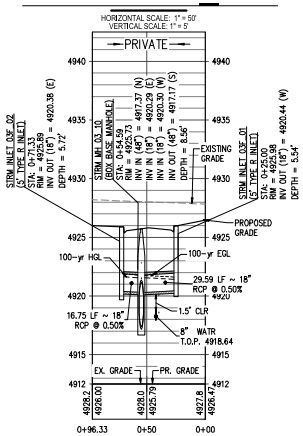


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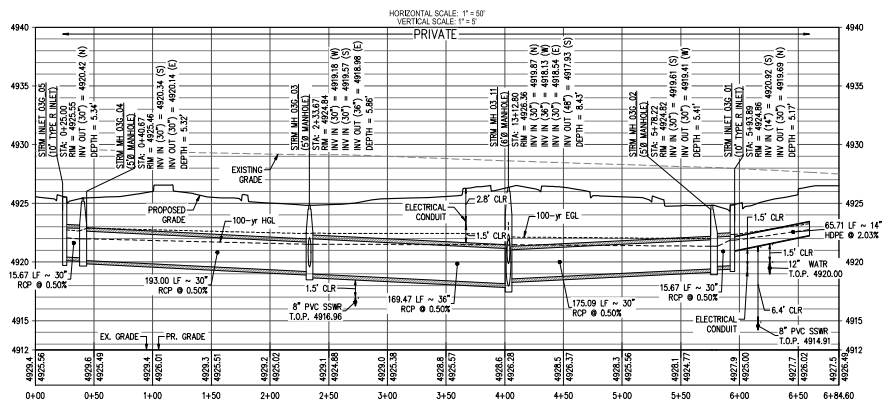



## MCD-STRM_03F




## MCD-STRM_03G




To request marking of underground facilities

811 Know what's below. Call before you dig.
Call 811 or visit call811.com for more information

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| No. | Date | Description |
|---|---|---|
| 4 | 07/25/2025 | 4th SUBMITTAL |
| 3 | 05/30/2025 | 3RD SUBMITTAL |
| 2 | 03/20/2025 | 2ND SUBMITTAL |
| 1 | 12/23/2024 | 1ST SUBMITTAL |

DOCUMENT AMENDMENTS

McWHINNEY
Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE, SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-2900

**CENTERRA SOUTH FIRST SUBDIVISION**
CIVIL CONSTRUCTION PLANS

STORM SEWER PLAN AND PROFILE

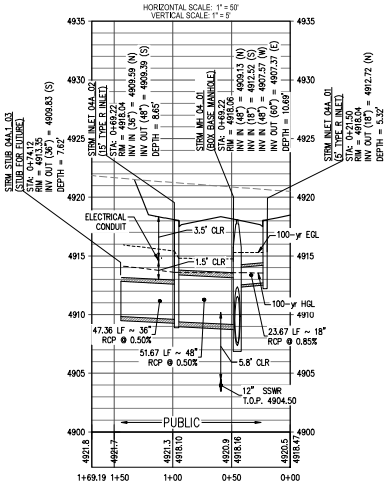
9380 TEDDY LANE, SUITE 203
LONE TREE, COLORADO 80124
TELEPHONE: 303-395-2700
FAX 303-395-2701
CWC CONSULTING GROUP
CIVIL ENGINEERING • LAND SURVEYING • CONSTRUCTION MANAGEMENT SERVICES

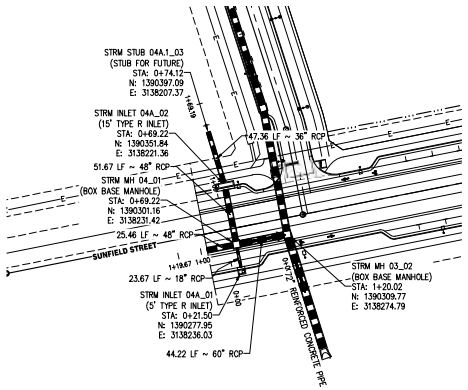
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Designed By: DFL
Drawn By: HLM/MLG
Reviewed By: BEC
Sheet Number: 132

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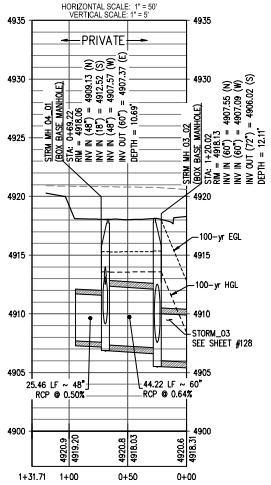
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# MCD-STRM_04A



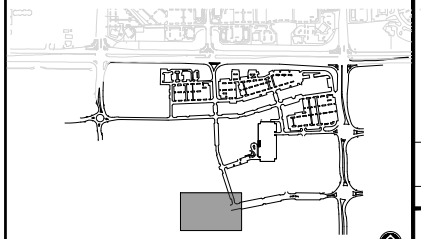




# MCD-STRM_04









KEY MAP NTS

NOTE:

ANY PUBLIC STORM SEWERS THAT ARE INSTALLED WITHIN 9 FEET OF TREES SHALL HAVE THE JOINTS WRAPPED IN ROOT BARRIER WRAP FOR A DISTANCE OF 10 FEET ON EITHER SIDE OF THE TREE. NO TREE MAY BE WITHIN 6 FEET OF THE OUTSIDE DIAMETER OF THE PUBLIC STORM SEWERS. SHRUBS NEED TO MAINTAIN A MINIMUM 5 FEET FROM THE OUTSIDE DIAMETER OF PUBLIC STORM SEWERS.

To request marking of underground facilities

811 Know what's **below.** **Call** before you dig.
Call 811 or visit call811.com for more information

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| No. | Date | Description |
|---|---|---|
| 1 | 12/23/2024 | 1ST SUBMITTAL |
| 2 | 03/20/2025 | 2ND SUBMITTAL |
| 3 | 05/30/2025 | 3RD SUBMITTAL |
| 4 | 07/29/2025 | 4th SUBMITTAL |

DOCUMENT AMENDMENTS

McWHINNEY
Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE. SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-2900

**CENTERRA SOUTH FIRST SUBDIVISION**
CIVIL CONSTRUCTION PLANS

STORM SEWER PLAN AND PROFILE

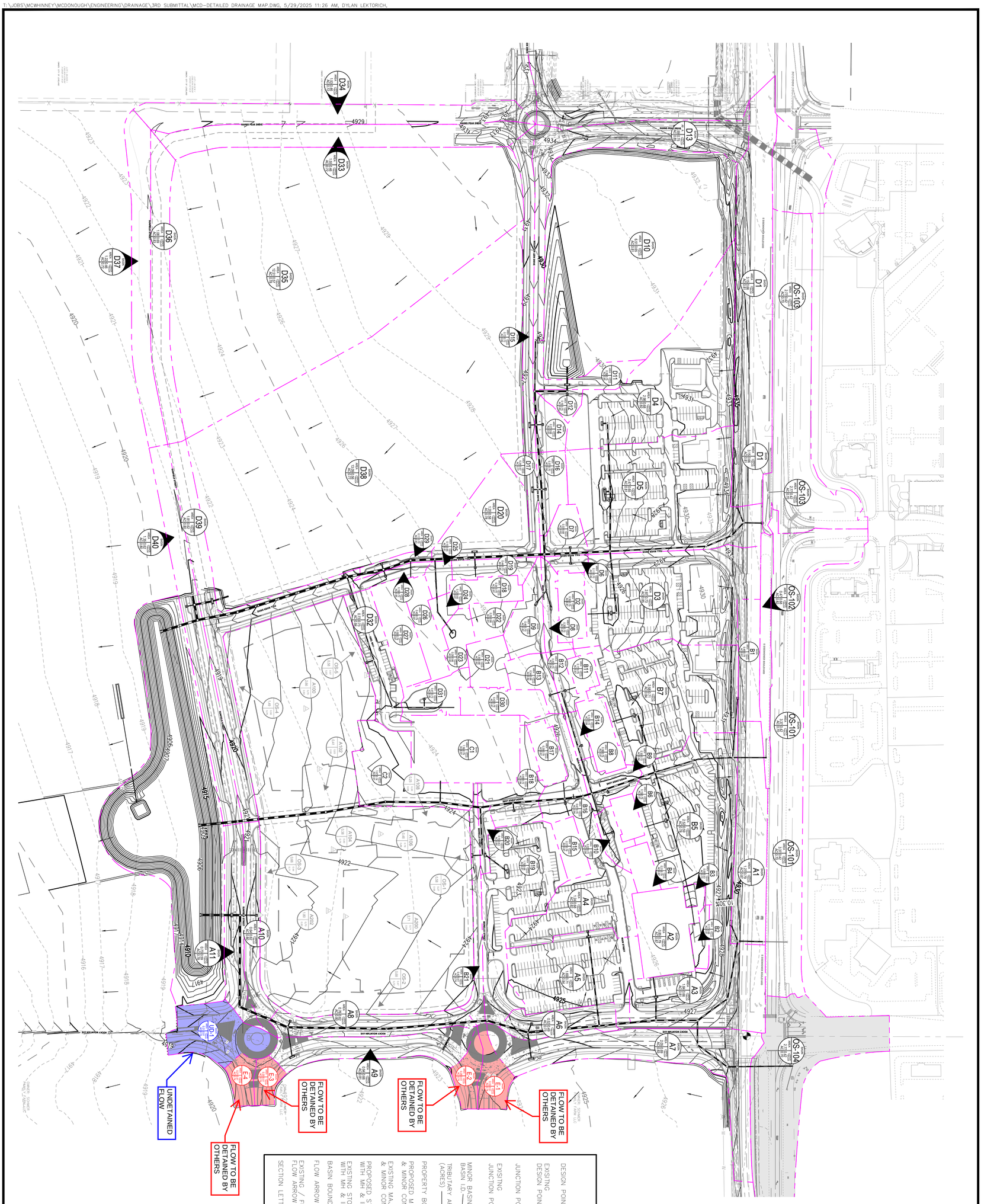
9380 TEDDY LANE, SUITE 203
LONE TREE, COLORADO 80124
TELEPHONE: 303-3952700
FAX 303-3952701
CWC CONSULTING GROUP
CIVIL ENGINEERING • LAND SURVEYING • CONSTRUCTION MANAGEMENT

Project Number: 130-00192
Designed By: DFL
Drawn By: HLM/MLG
Reviewed By: BEC
Sheet Number: 133

# APPENDIX F – DRAINAGE MAPS

Overall Drainage Map
Detailed Drainage Map
Permanent Stormwater Quality BMPs Exhibit
Storm Sewer Index Map

F:\JOBS\MCWHINNEY\MCDONOUGH\ENGINEERING\DRAINAGE\3RD SUBMITTAL\MCD-DETAILED DRAINAGE MAP.DWG, 5/29/2025 11:26 AM, DYLAN LEKTORICH,




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811
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Call 811 or request2.com for more information
It is the contractor's responsibility to contact UNCC a minimum of 2 working days prior to the start of construction operations.
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| | |
|---|---|
| Project Number: | 130-00192 |
| Designed By: | DFL |
| Drawn By: | HLM/MLG |
| Reviewed By: | BEC |
| Sheet Number: | 1 OF 1 |

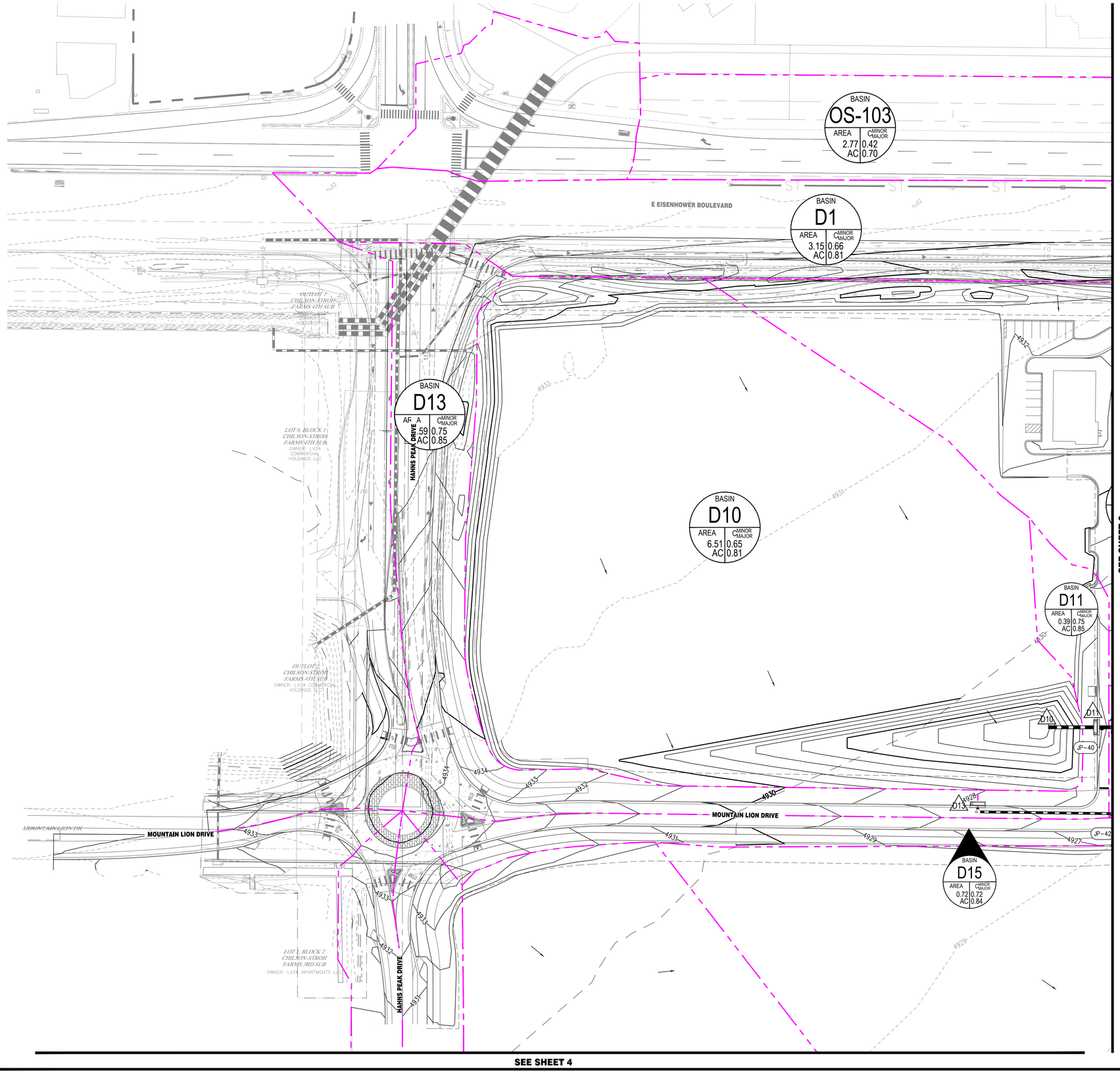
CWC CONSULTING GROUP
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9360 TEDDY LANE, SUITE 203
LONE TREE, COLORADO
80124
TELEPHONE: 303-395-2700
FAX 303-395-2701

# CENTERRA SOUTH FIRST SUBDIVISION
## CIVIL CONSTRUCTION PLANS

## OVERALL DRAINAGE MAP

McWHINNEY
Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE.
SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-9900

| No. | Date | Description |
|---|---|---|
| | | DOCUMENT AMENDMENTS |






KEY MAP NTS




LEGEND

- DESIGN POINT
- EXISITNG DESIGN POINT
- JUNCTION POINT
- EXISITNG JUNCTION POINT
- MINOR BASIN BASIN I.D.
- TRIBUTARY AREA (ACRES)
- RUNOFF COEFFICIENTS: MINOR STORM C2; MAJOR STORM C100
- PROPERTY BOUNDARY
- PROPOSED MAJOR & MINOR CONTOURS
- EXISTING MAJOR & MINOR CONTOURS
- PROPOSED STORM SEWER WITH MH & INLET
- EXISTING STORM SEWER WITH MH & INLET
- BASIN BOUNDARY
- FLOW ARROW
- EXISTING / FUTURE FLOW ARROW
- SECTION LETTER

To request marking of underground facilities

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| No. | Date | Description |
|---|---|---|
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Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE.
SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-2900

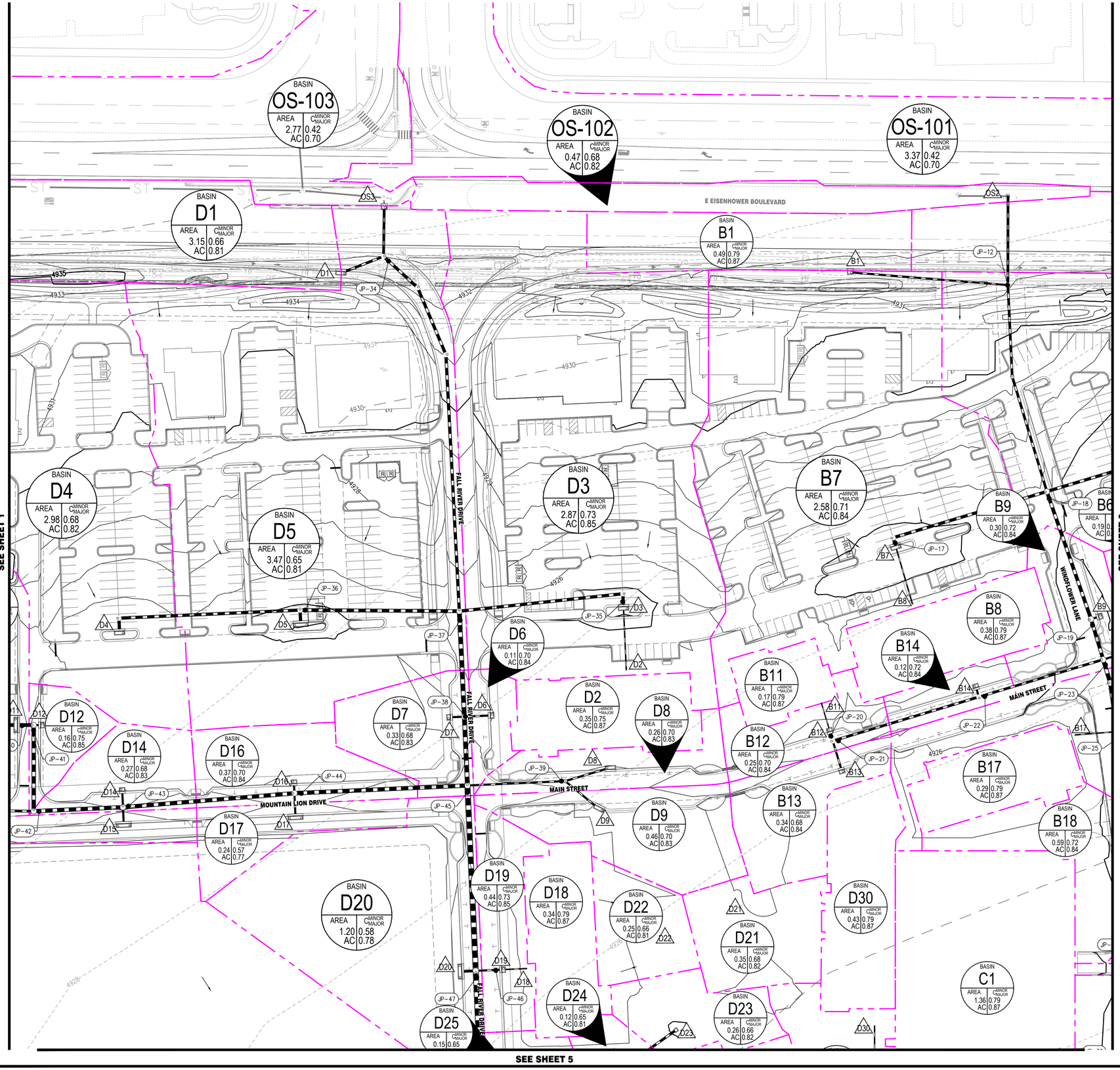
# CENTERRA SOUTH FIRST SUBDIVISION
## CIVIL CONSTRUCTION PLANS

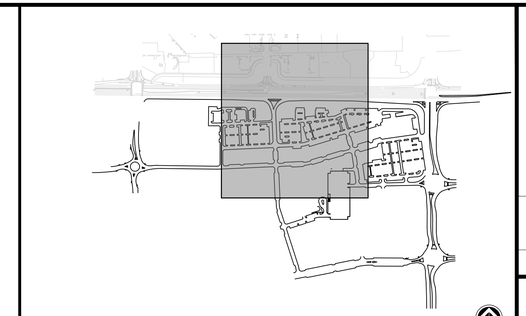
## DETAILED DRAINAGE MAP

9360 TEDDY LANE, SUITE 203
LONE TREE, COLORADO
80124
TELEPHONE: 303-395-2700
FAX 303-395-2701
CWC CONSULTING GROUP
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| Project Number: | Designed By: | Drawn By: | Reviewed By: | Sheet Number: |
|---|---|---|---|---|
| 130-00192 | DFL | HLM/MLG | BEC | 1/6 |

T:\JOBS\MCWHINNEY\MCDONOUGH\ENGINEERING\DRAINAGE_SBD_SUBMITTAL\MCD-DETAILED_DRAINAGE_MAP.DWG, 5/29/2025 11:30 AM, DYLAN.LEKTORICH



**KEY MAP** NTS

40 0 40 80

SCALE: 1" = 40'

## LEGEND

- DESIGN POINT
- EXISITNG DESIGN POINT
- JUNCTION POINT
- EXISITNG JUNCTION POINT
- MINOR BASIN BASIN I.D.
- TRIBUTARY AREA (ACRES)
- RUNOFF COEFFICIENTS: MINOR STORM C2; MAJOR STORM C100
- PROPERTY BOUNDARY
- PROPOSED MAJOR & MINOR CONTOURS
- EXISTING MAJOR & MINOR CONTOURS
- PROPOSED STORM SEWER WITH MH & INLET
- EXISTING STORM SEWER WITH MH & INLET
- BASIN BOUNDARY
- FLOW ARROW
- EXISTING / FUTURE FLOW ARROW
- SECTION LETTER

To request marking of underground facilities

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| No. | Date | Description |
|---|---|---|
| | | DOCUMENT AMENDMENTS |

McWHINNEY
Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE.
SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-2900

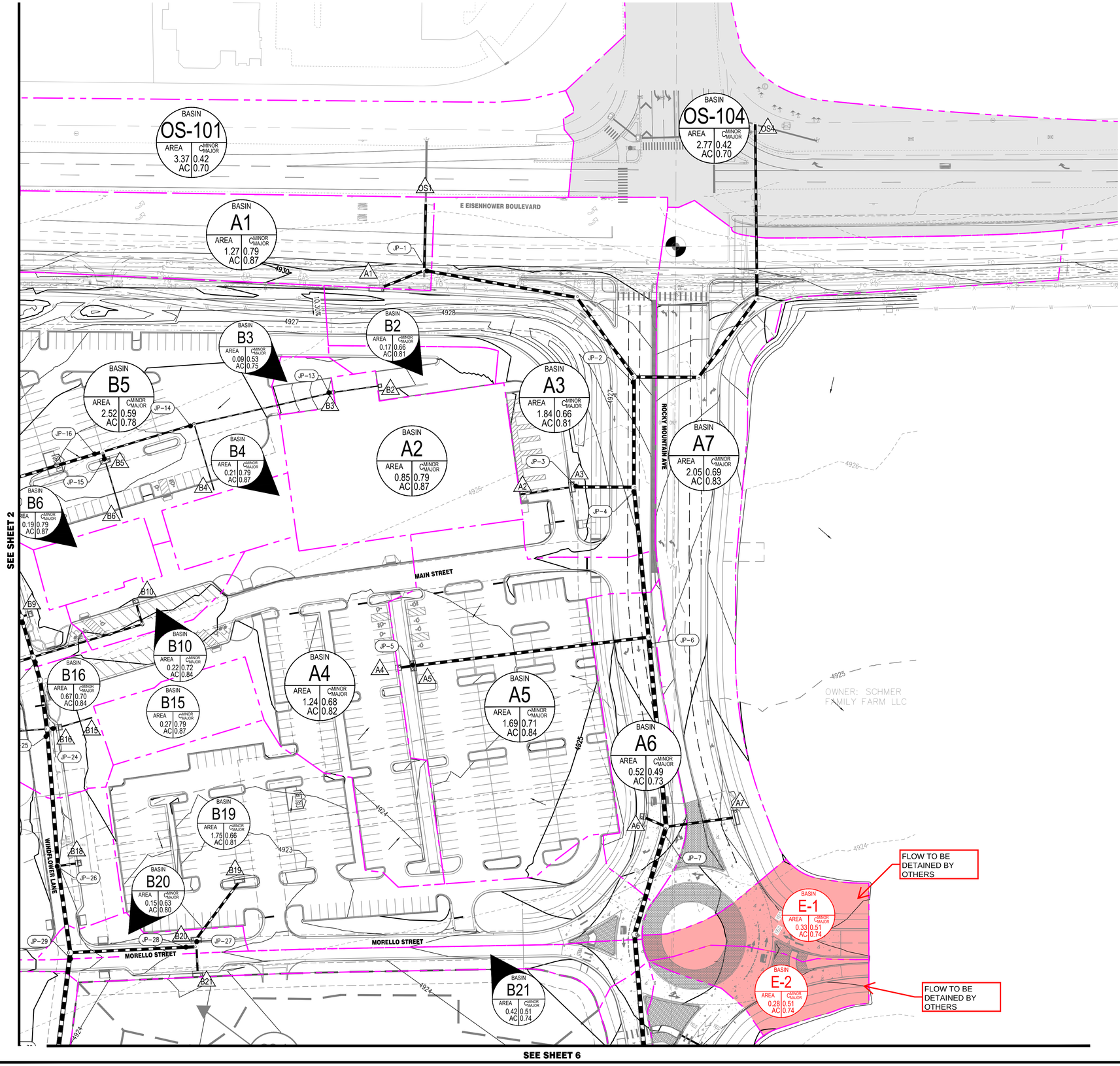
CWC CONSULTING GROUP
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9360 TEDDY LANE, SUITE 203
LONE TREE, COLORADO
80124
TELEPHONE: 303-395-2700
FAX 303-395-2701

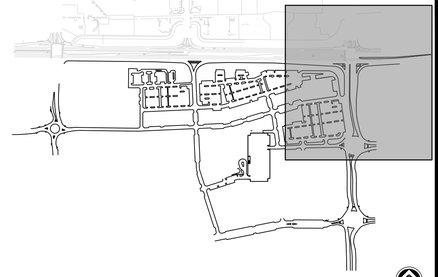
**CENTERRA SOUTH FIRST SUBDIVISION**
CIVIL CONSTRUCTION PLANS

# DETAILED DRAINAGE MAP

Project Number: 130-00192
Designed By: DFL
Drawn By: HLM/MLG
Reviewed By: BEC
Sheet Number: 2/6

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KEY MAP NTS

40 0 40 80

SCALE: 1"= 40'

## LEGEND

- DESIGN POINT (1)
- EXISITNG DESIGN POINT (ME14 X1)
- JUNCTION POINT (JP-4)
- EXISITNG JUNCTION POINT (ME14 JP-6)
- MINOR BASIN BASIN I.D. (D1) / TRIBUTARY AREA (ACRES) (AREA 2.48 C MINOR 0.14 C MAJOR 0.35)
- RUNOFF COEFFICIENTS: MINOR STORM C2; MAJOR STORM C100
- PROPERTY BOUNDARY
- PROPOSED MAJOR & MINOR CONTOURS (5180)
- EXISTING MAJOR & MINOR CONTOURS (5180)
- PROPOSED STORM SEWER WITH MH & INLET
- EXISTING STORM SEWER WITH MH & INLET
- BASIN BOUNDARY
- FLOW ARROW
- EXISTING / FUTURE FLOW ARROW
- SECTION LETTER (A)

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| No. | Date | Description |
|---|---|---|
| | | DOCUMENT AMENDMENTS |

McWHINNEY
Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE.
SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-2900

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CIVIL ENGINEERING · LAND SURVEYING · CONSTRUCTION SERVICES
9360 TEDDY LANE, SUITE 203
LONE TREE, COLORADO 80124
TELEPHONE: 303-395-2700
FAX 303-395-2701

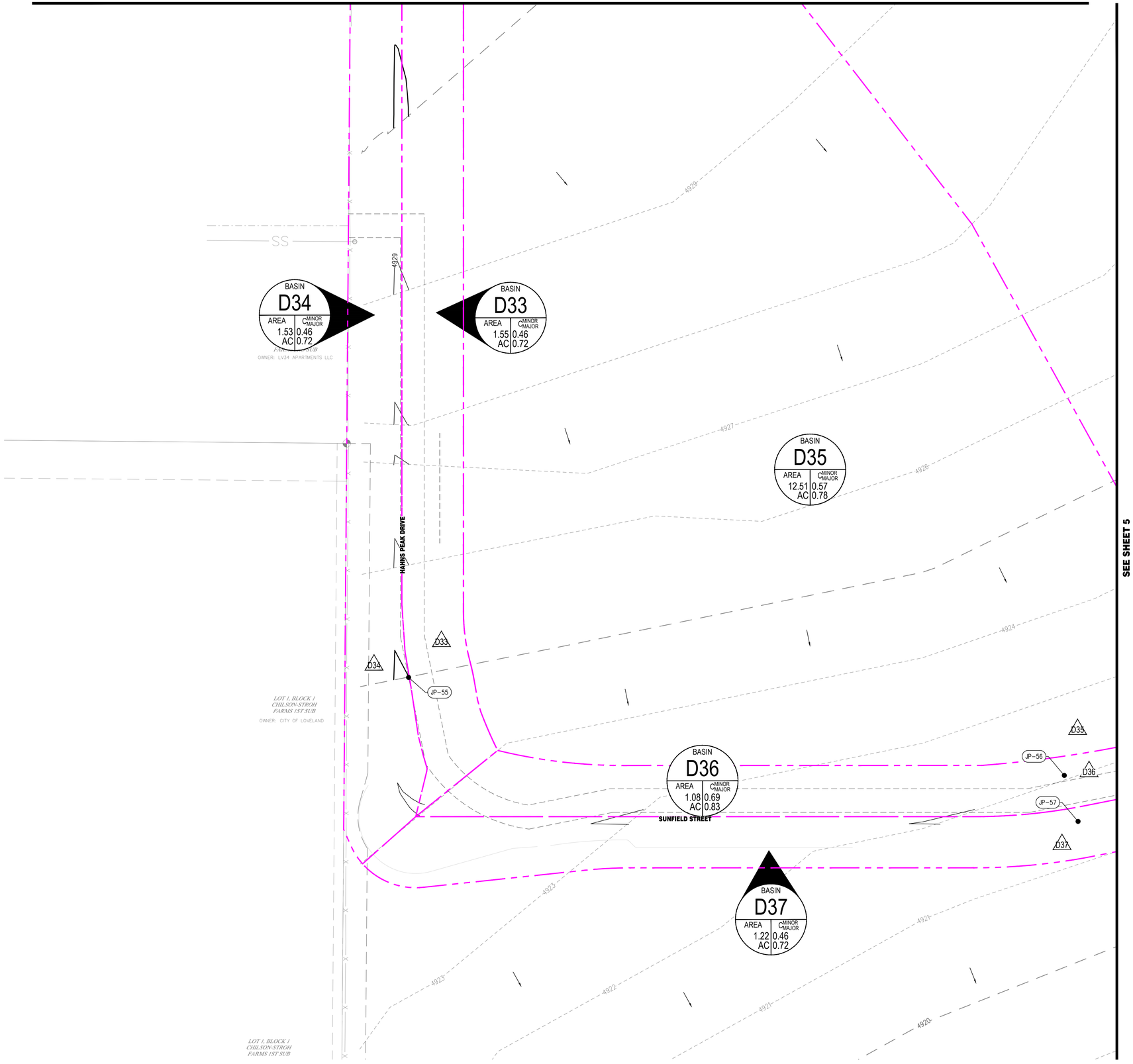
**CENTERRA SOUTH FIRST SUBDIVISION**
CIVIL CONSTRUCTION PLANS

DETAILED DRAINAGE MAP

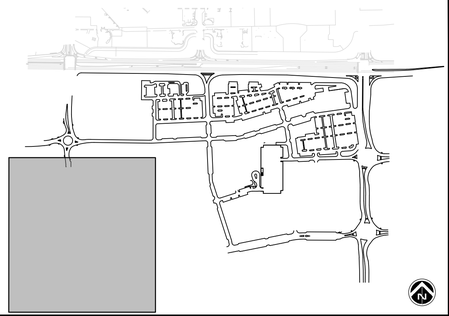
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|---|---|---|---|---|
| 130-00192 | DFL | HLM/MLG | BEC | 3/6 |

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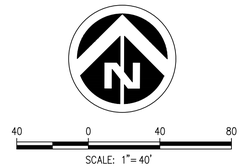
SEE SHEET 1




SEE SHEET 5



KEY MAP NTS




## LEGEND

- DESIGN POINT (1)
- EXISITNG DESIGN POINT (ME14 X1)
- JUNCTION POINT (JP-4)
- EXISITNG JUNCTION POINT (ME14 JP-6)
- MINOR BASIN BASIN I.D. (D1)
- TRIBUTARY AREA (ACRES) (AREA 2.48 0.14 AC 0.35)
- RUNOFF COEFFICIENTS: MINOR STORM C2; MAJOR STORM C100
- PROPERTY BOUNDARY
- PROPOSED MAJOR & MINOR CONTOURS (5180)
- EXISTING MAJOR & MINOR CONTOURS (5180)
- PROPOSED STORM SEWER WITH MH & INLET
- EXISTING STORM SEWER WITH MH & INLET
- BASIN BOUNDARY
- FLOW ARROW
- EXISTING / FUTURE FLOW ARROW
- SECTION LETTER (A)

To request marking of underground facilities

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| No. | Date | Description |
|---|---|---|
| | | DOCUMENT AMENDMENTS |

McWHINNEY
Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE.
SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-2900

# CENTERRA SOUTH FIRST SUBDIVISION
CIVIL CONSTRUCTION PLANS

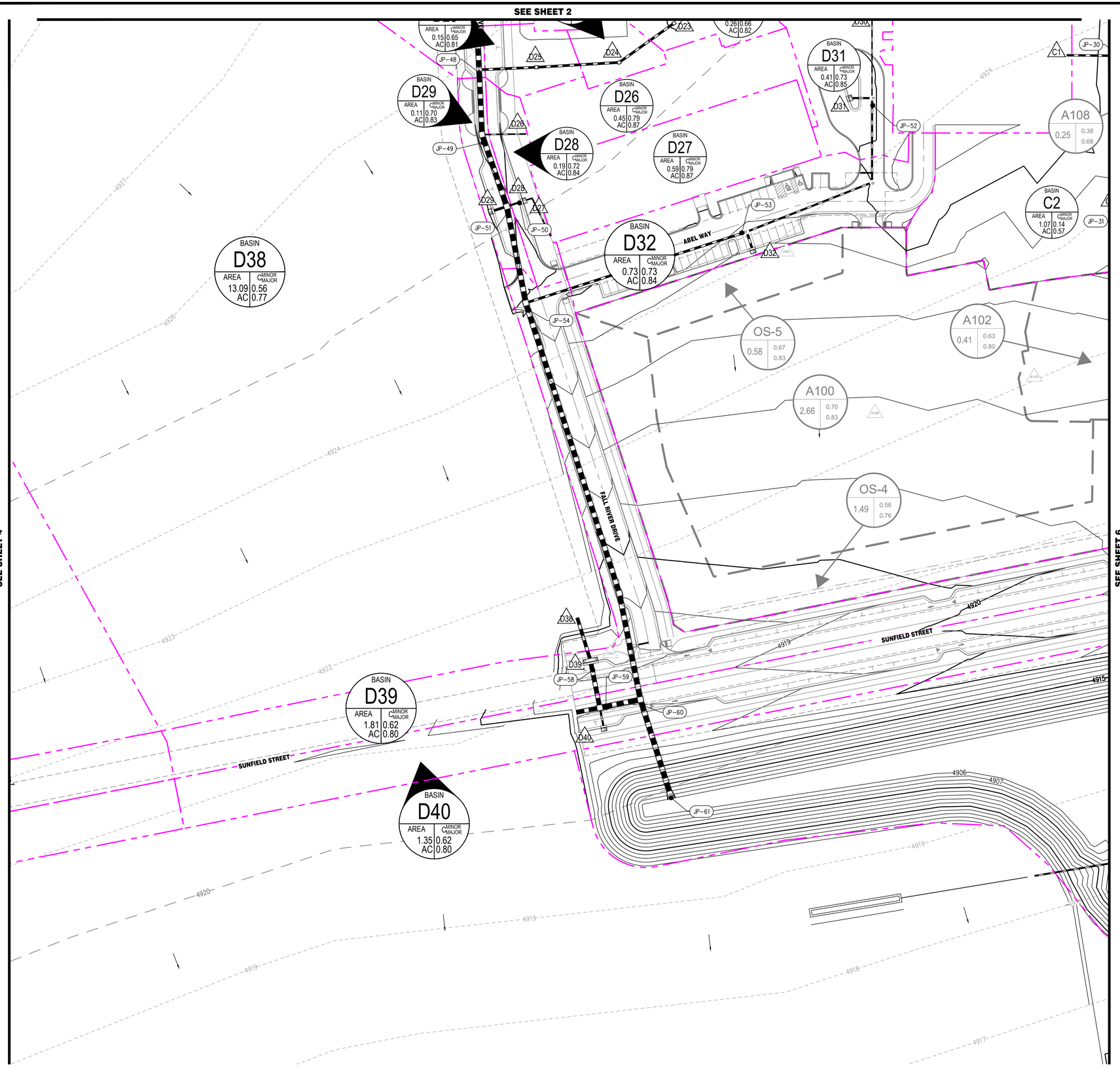
DETAILED DRAINAGE MAP

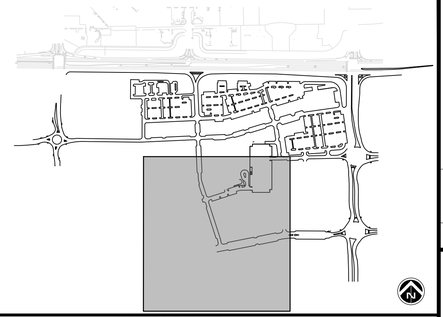
9360 TEDDY LANE, SUITE 203
LONE TREE, COLORADO
80124
TELEPHONE: 303-395-2700
FAX 303-395-2701

CWC CONSULTING GROUP
CIVIL ENGINEERING · LAND SURVEYING · CONSTRUCTION SERVICES

| Project Number: | Drawn By: |
|---|---|
| 130-00192 | HLM/MLG |
| **Designed By:** | **Reviewed By:** |
| DFL | BEC |
| **Sheet Number:** | 4/6 |

T:\JOBS\MCWHINNEY\MCDONOUGH\ENGINEERING\DRAINAGE\3RD SUBMITTAL\MCD-DETAILED DRAINAGE MAP.DWG, 5/29/2025 12:00 PM, DYLAN LEKTORICH



KEY MAP NTS

40 0 40 80

SCALE: 1"= 40'

## LEGEND

- DESIGN POINT
- EXISITNG DESIGN POINT
- JUNCTION POINT
- EXISITNG JUNCTION POINT
- MINOR BASIN BASIN I.D.
- TRIBUTARY AREA (ACRES)
- RUNOFF COEFFICIENTS
- MINOR STORM C2
- MAJOR STORM C100
- PROPERTY BOUNDARY
- PROPOSED MAJOR & MINOR CONTOURS
- EXISTING MAJOR & MINOR CONTOURS
- PROPOSED STORM SEWER WITH MH & INLET
- EXISTING STORM SEWER WITH MH & INLET
- BASIN BOUNDARY
- FLOW ARROW
- EXISTING / FUTURE FLOW ARROW
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|---|---|---|
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Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE.
SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-2900


# CENTERRA SOUTH FIRST SUBDIVISION
CIVIL CONSTRUCTION PLANS

DETAILED DRAINAGE MAP


CWC CONSULTING GROUP
CIVIL ENGINEERING - LAND SURVEYING - CONSTRUCTION SERVICES
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LONE TREE, COLORADO 80124
TELEPHONE: 303-395-2700
FAX 303-395-2701


| Project Number: | Drawn By: | Designed By: | Reviewed By: | Sheet Number: |
|---|---|---|---|---|
| 130-00192 | HLM/MLG | DFL | BEC | 5/6 |

T:\JOBS\MCWHINNEY\MCDONOUGH\ENGINEERING\DRAINAGE\360 SUBMITTAL\MCD-DETAILED DRAINAGE MAP.DWG, 5/29/2025 12:00 PM, DYLAN.EKTOROFF

SEE SHEET 3

SEE SHEET 5

OS-1 | 0.58 | 0.37 / 0.68

A106 | 0.48 | 0.76 / 0.86

A200 | 2.71 | 0.71 / 0.84

OS-2 | 0.68 | 0.47 / 0.72

A104 | 0.38 | 0.60 / 0.79

A202 | 1.80 | 0.70 / 0.83

OS-3 | 0.66 | 0.44 / 0.71

BASIN A9 | AREA 0.94 AC | C MINOR 0.66 | C MAJOR 0.81

BASIN A8 | AREA 0.76 AC | C MINOR 0.62 | C MAJOR 0.80

BASIN A10 | AREA 0.64 AC | C MINOR 0.62 | C MAJOR 0.80

BASIN A11 | AREA 0.73 AC | C MINOR 0.59 | C MAJOR 0.78

BASIN E-3 | AREA 0.20 AC | C MINOR 0.51 | C MAJOR 0.74

BASIN E-4 | AREA 0.21 AC | C MINOR 0.51 | C MAJOR 0.74

BASIN UD-1 | AREA 0.21 AC | C MINOR 0.51 | C MAJOR 0.74

ROCKY MOUNTAIN AVE

SUNFIELD STREET

JP-30 JP-31 JP-32 JP-33 JP-8 JP-9 JP-10 JP-11

C2

OWNER 4921 SCHMER FAMILY FARM LLC

FLOW TO BE DETAINED BY OTHERS

FLOW TO BE DETAINED BY OTHERS

UNDETAINED FLOW TO BE CAPTURED IN FUTURE PHASE

4921 4922 4923 4920 4919 4918 4917 4916 4915 4914 4910 4906

## KEY MAP

NTS

40 0 40 80

SCALE: 1" = 40'

## LEGEND

- DESIGN POINT (1)
- EXISITNG DESIGN POINT (ME14 M1)
- JUNCTION POINT (JP-4)
- EXISITNG JUNCTION POINT (ME14 JP-5)
- MINOR BASIN BASIN I.D. (D1)
- TRIBUTARY AREA (ACRES) (2.48 / 0.14 / 4.62 / 0.26)
- RUNOFF COEFFICIENTS: MINOR STORM C2; MAJOR STORM C100
- PROPERTY BOUNDARY
- PROPOSED MAJOR & MINOR CONTOURS (5180)
- EXISTING MAJOR & MINOR CONTOURS (5180)
- PROPOSED STORM SEWER WITH MH & INLET
- EXISTING STORM SEWER WITH MH & INLET
- BASIN BOUNDARY
- FLOW ARROW
- EXISTING / FUTURE FLOW ARROW
- SECTION LETTER (A)

To request marking of underground facilities

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

Call 811 or visit call811.com for more information

It is the contractor's responsibility to contact UNCC a minimum of 2 days prior to the start of construction operations. CWC Consulting Group claims no responsibility for the underground facilities depicted in this plan set.

| No. | Date | Description |
|---|---|---|
| | | DOCUMENT AMENDMENTS |

McWHINNEY
Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE.
SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-2900

# CENTERRA SOUTH FIRST SUBDIVISION
## CIVIL CONSTRUCTION PLANS

## DETAILED DRAINAGE MAP

CWC CONSULTING GROUP
CIVIL ENGINEERING - LAND SURVEYING - CONSTRUCTION SERVICES
9360 TEDDY LANE, SUITE 203
LONE TREE, COLORADO
80124
TELEPHONE: 303-395-2700
FAX 303-395-2701

| Project Number: | Designed By: | Drawn By: | Reviewed By: | Sheet Number: |
|---|---|---|---|---|
| 130-00192 | DFL | HLM/MLG | BEC | 6/6 |

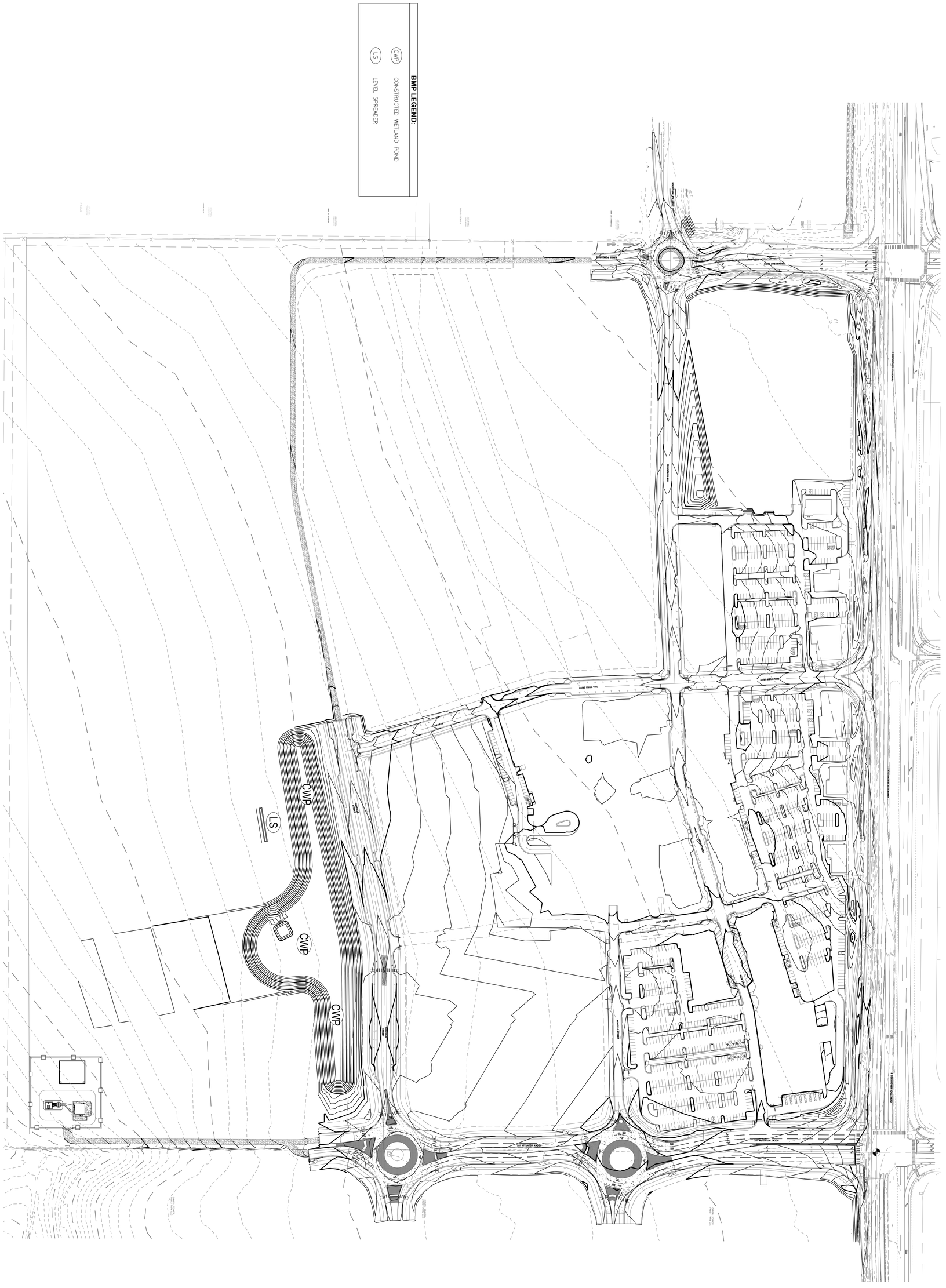
T:\JOBS\MCWHINNEY\MCDONOUGH\ENGINEERING\DRAINAGE_380_SUBMITTAL\MCD-DETAILED_DRAINAGE_MAP.DWG, 5/29/2025 12:00 PM, DYLAN.LEKTORICH

F:\JOBS\MCWHINNEY\MCDONOUGH\ENGINEERING\SOP\PERM_BMP.DWG, 5/29/2025 8:31 PM, DYLAN LEKTORICH,

**BMP LEGEND:**

CWP — CONSTRUCTED WETLAND POND

LS — LEVEL SPREADER




| | |
|---|---|
| Project Number: | 130-00192 |
| Designed By: | DFL |
| Drawn By: | HLM/MLG |
| Reviewed By: | BEC |
| Sheet Number: | 1 OF 1 |

COLORADO REGISTERED BRIAN E. CLERICO 36722 03-02-2021 PROFESSIONAL ENGINEER

CWC CONSULTING GROUP
CIVIL ENGINEERING · LAND SURVEYING · CONSTRUCTION SERVICES
9360 TEDDY LANE, SUITE 203
LONE TREE, COLORADO
80124
TELEPHONE: 303-395-2700
FAX 303-395-2701

# CENTERRA SOUTH FIRST SUBDIVISION

CIVIL CONSTRUCTION PLANS

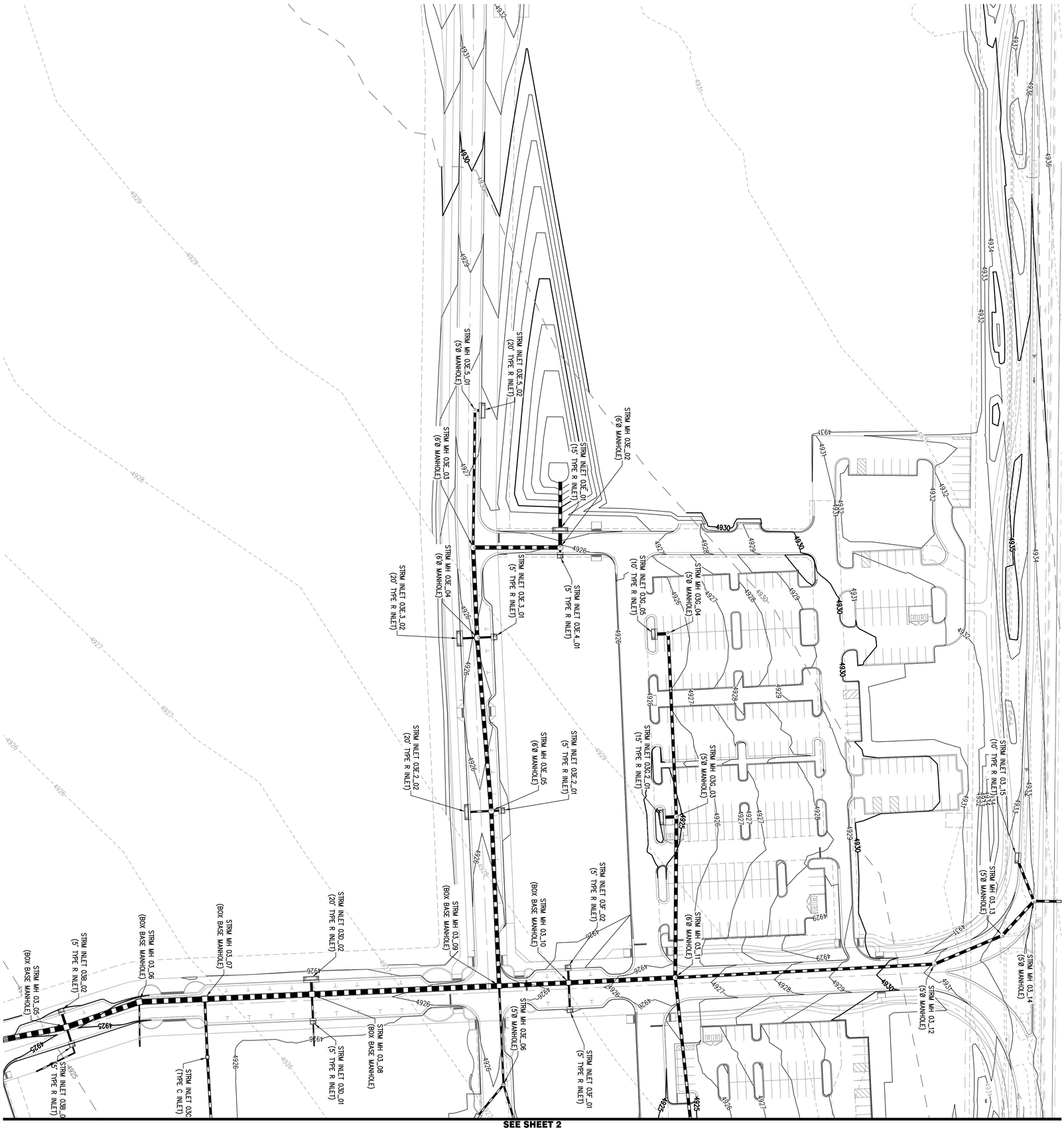
PERMANENT CONTROL MEASURES

McWHINNEY
Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE.
SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-9900

| No. | Date | Description |
|---|---|---|
| | 05/30/2025 | 3RD SUBMITTAL |
| | 03/20/2025 | 2ND SUBMITTAL |
| | 12/23/2024 | 1ST SUBMITTAL |

DOCUMENT AMENDMENTS

F:\JOBS\MCWHINNEY\MCDONOUGH\ENGINEERING\DRAINAGE\3RD SUBMITTAL\REPORT\APPENDIX\APPENDIX G – DRAINAGE MAPS\STORM INDEX MAP.DWG, 5/29/2025 12:11 PM,
DAN LAMBRECHT

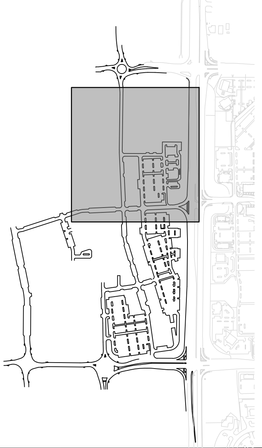



SEE SHEET 2

SCALE: 1" = 50'

## KEY MAP

NTS



| Project Number: | |
|---|---|
| 130-00192 | |
| Designed By: DFL | Drawn By: HLM/MLG |
| Reviewed By: BEC | |
| Sheet Number: 1 | |

CWC CONSULTING GROUP
CIVIL ENGINEERING · LAND SURVEYING · CONSTRUCTION SERVICES
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80124
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# CENTERRA SOUTH FIRST SUBDIVISION

CIVIL CONSTRUCTION PLANS

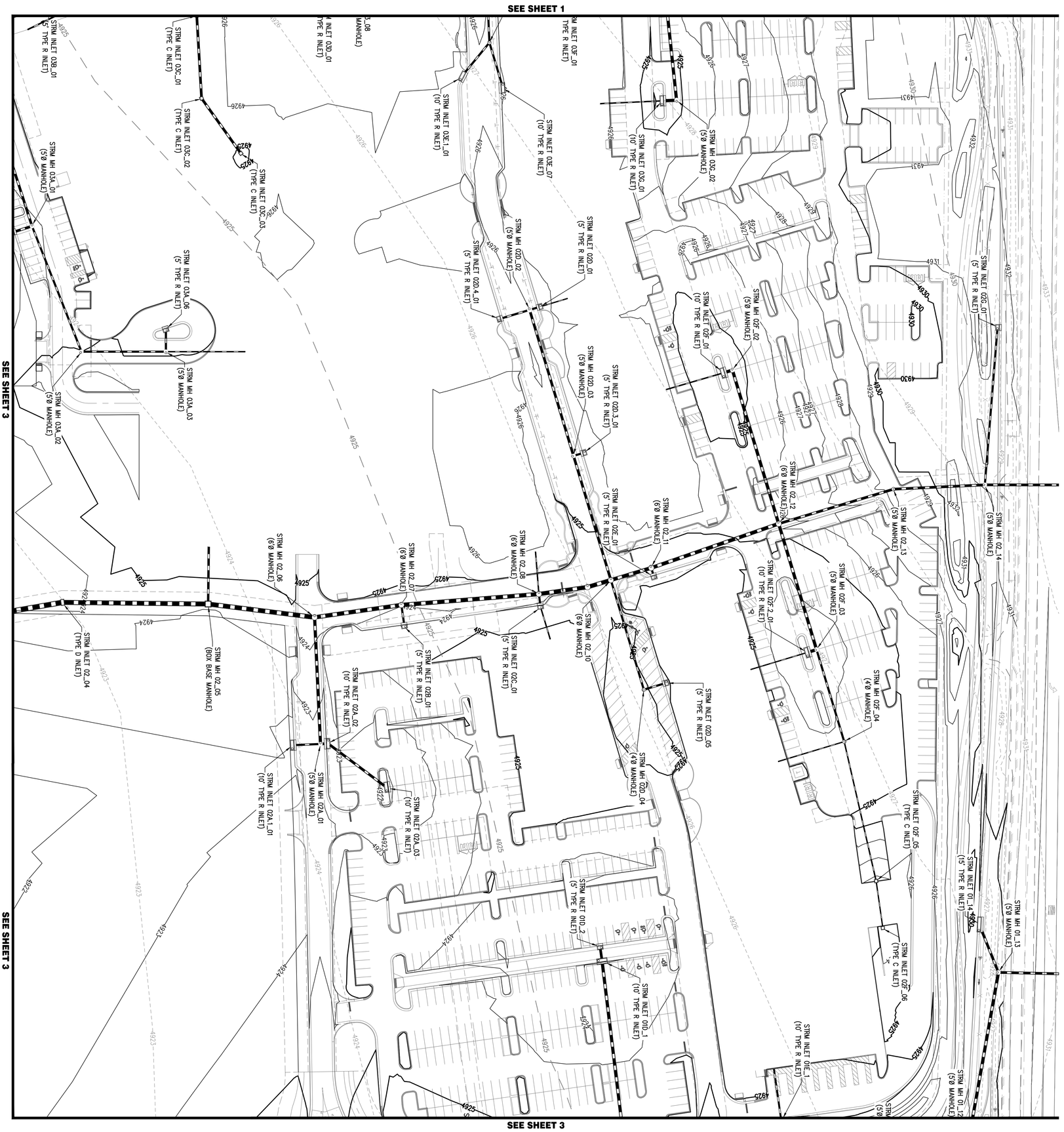
STORM SEWER INDEX MAP

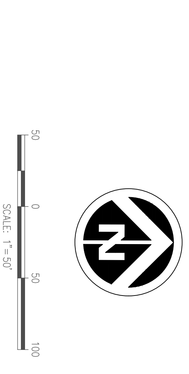
McWHINNEY
Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE.
SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-9900

| No. | Date | Description |
|---|---|---|
| | 03/20/2025 | 2ND SUBMITTAL |
| | 12/23/2024 | 1ST SUBMITTAL |

DOCUMENT AMENDMENTS

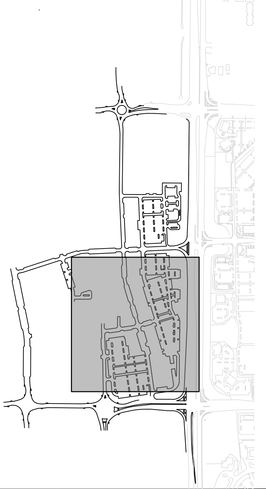
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DAN FLANNIGAN




KEY MAP

NTS



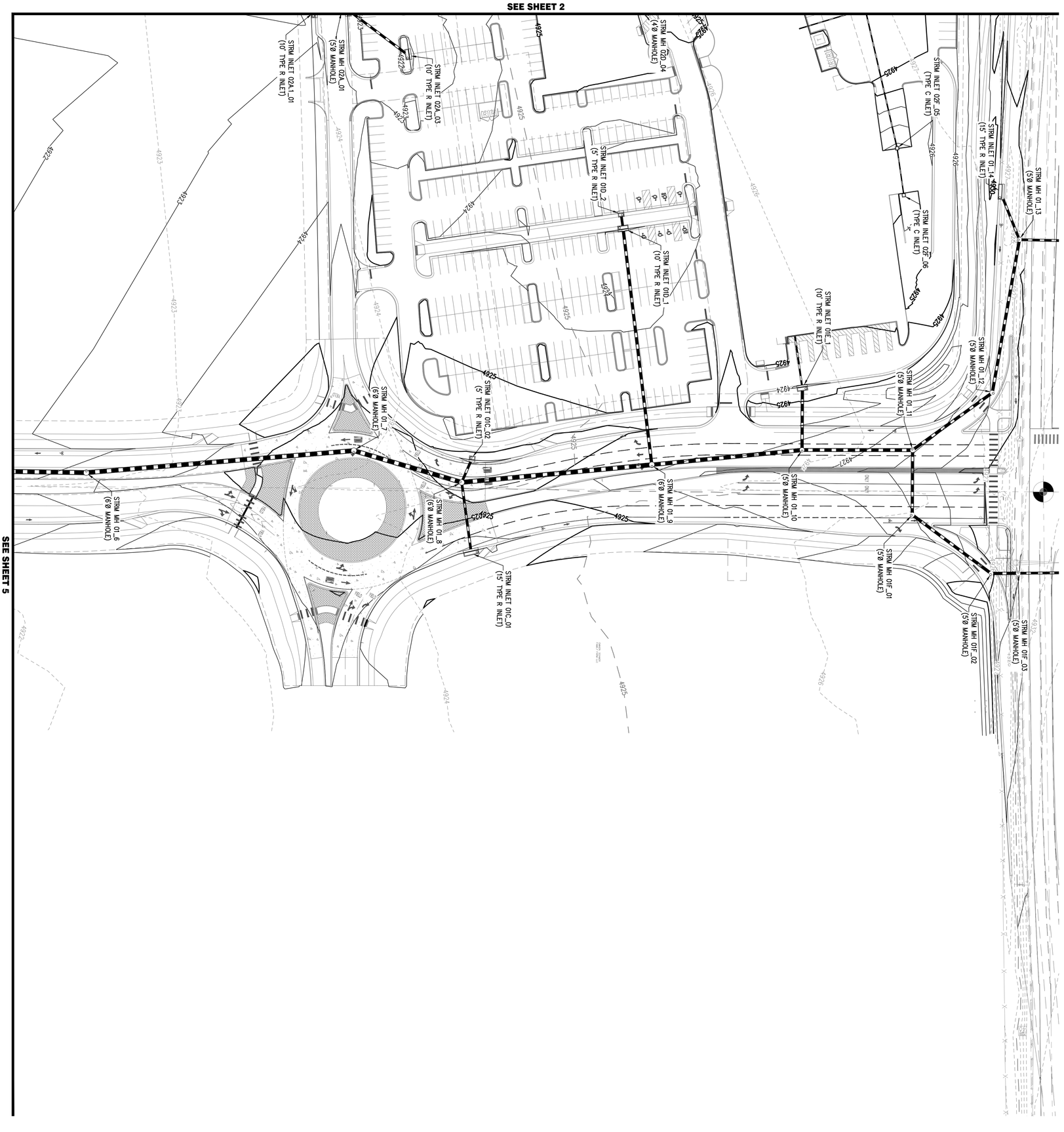
| | | |
|---|---|---|
| Project Number: 130-00192 | CWC CONSULTING GROUP<br>CIVIL ENGINEERING · LAND SURVEYING · CONSTRUCTION SERVICES | **CENTERRA SOUTH FIRST SUBDIVISION**<br>CIVIL CONSTRUCTION PLANS<br>STORM SEWER INDEX MAP |
| Designed By: DFL Drawn By: HLM/MLG | 9360 TEDDY LANE, SUITE 203<br>LONE TREE, COLORADO<br>80124<br>TELEPHONE: 303-395-2700<br>FAX 303-395-2701 | McWHINNEY<br>Contact: KIM PERRY<br>2725 ROCKY MOUNTAIN AVE.<br>SUITE 200<br>LOVELAND, CO 80538<br>TEL: (970) 962-9900 |
| Reviewed By: BEC | | |
| Sheet Number: 2 | | |

| No. | Date | Description |
|---|---|---|
| | 03/20/2025 | 2ND SUBMITTAL |
| | 12/23/2024 | 1ST SUBMITTAL |

DOCUMENT AMENDMENTS

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DAN LAMBRIGHT

SEE SHEET 2




SEE SHEET 5

SCALE: 1" = 50'

KEY MAP

NTS



| Project Number: | |
|---|---|
| 130-00192 | |
| Designed By: DFL | Drawn By: HLM/MLG |
| Reviewed By: BEC | |
| Sheet Number: 3 | |

CWC CONSULTING GROUP
CIVIL ENGINEERING · LAND SURVEYING · CONSTRUCTION SERVICES
9360 TEDDY LANE, SUITE 203
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# CENTERRA SOUTH FIRST SUBDIVISION

## CIVIL CONSTRUCTION PLANS

## STORM SEWER INDEX MAP

McWHINNEY
Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE.
SUITE 200
LOVELAND, CO 80538
TEL: (970) 962-9900

| No. | Date | Description |
|---|---|---|
| | 03/20/2025 | 2ND SUBMITTAL |
| | 12/23/2024 | 1ST SUBMITTAL |

DOCUMENT AMENDMENTS

SEE SHEET 2

SEE SHEET 3

STRM INLET 03B_02
(5' TYPE R INLET)

STRM INLET 03B_01
(5' TYPE R INLET)

STRM MH 03A_01
(5'Ø MANHOLE)

STRM MH 03A_02
(5'Ø MANHOLE)

STRM MH 03_05
(BOX BASE MANHOLE)

STRM MH 03_04
(BOX BASE MANHOLE)

STRM INLET 03A_01
(5' TYPE R INLET)

STRM INLET 02_04
(TYPE D INLET)

STRM MH 02_03
(BOX BASE MANHOLE)

STRM INLET 01A_1
(5' TYPE R INLET)

STRM MH 03_03
(6'Ø MANHOLE)

STRM MH 02_02
(BOX BASE MANHOLE)

STRM MH 01_3
(BOX BASE MANHOLE)

STRM INLET 01_
(10' TYPE R INL

STRM STUB 04A.1_03
(STUB FOR FUTURE)

STRM INLET 04A_02
(15' TYPE R INLET)

STRM MH 03_02
(BOX BASE MANHOLE)

STRM FES 02_01
(60" FES)

STRM MH 04_01
(BOX BASE MANHOLE)

STRM FES 01_1
(54" FES)

STRM INLET 04A_01
(5' TYPE R INLET)

STRM FES 03_01
(60" FES)

PUMP OUTLET

LEVEL SPREADER

FES PUMP
(15" FES W/ TRASH RACK)

SEE SHEET 3

## KEY MAP

NTS

SCALE: 1"= 50'

| No. | Date | Description |
|---|---|---|
| | 03/20/2025 | 2ND SUBMITTAL |
| | 12/23/2024 | 1ST SUBMITTAL |

DOCUMENT AMENDMENTS


McWHINNEY
Contact: KIM PERRY
2725 ROCKY MOUNTAIN AVE.
SUITE 200
LOVELAND, CO 80538
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# CENTERRA SOUTH FIRST SUBDIVISION
CIVIL CONSTRUCTION PLANS

STORM SEWER INDEX MAP


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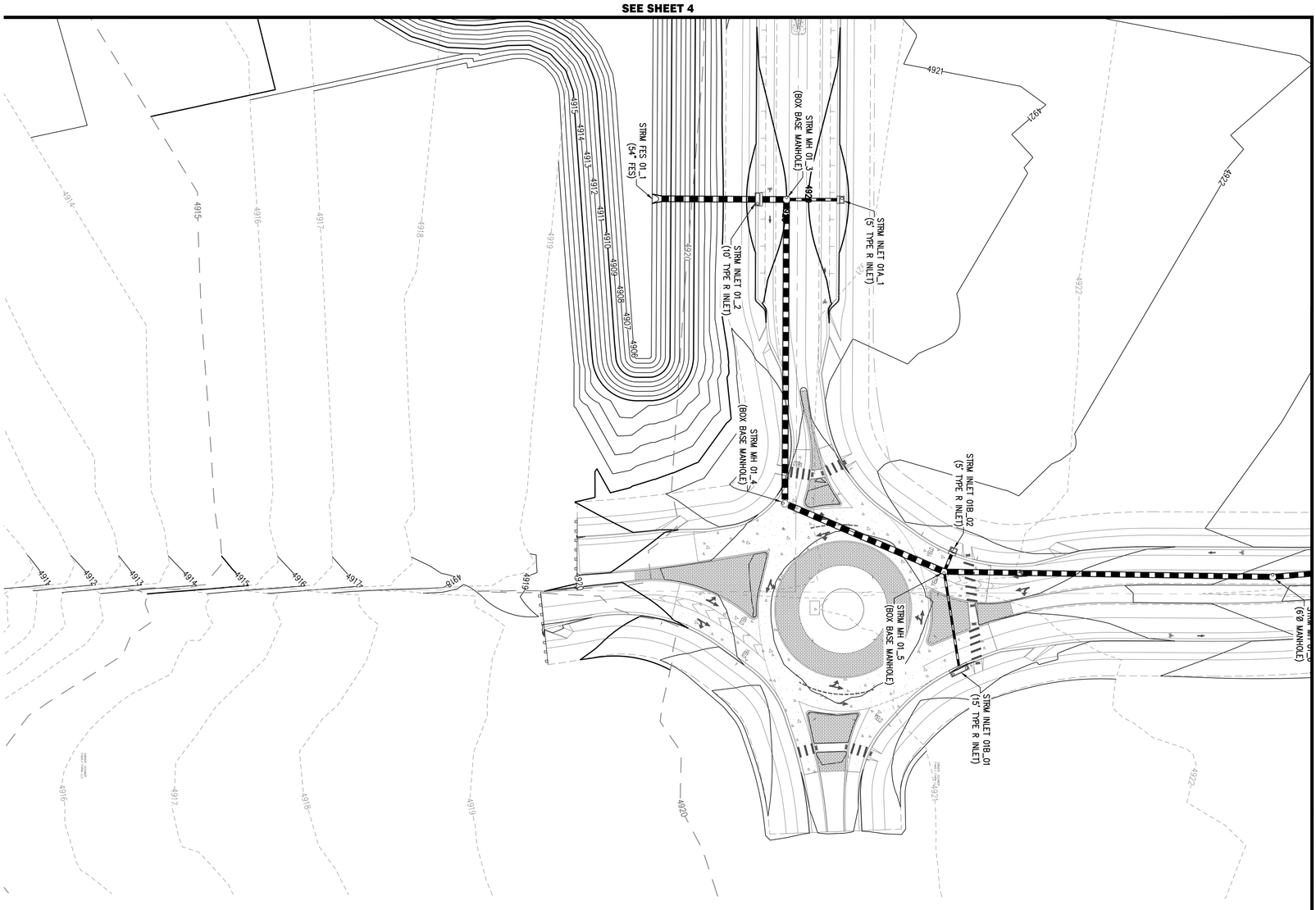
CWC CONSULTING GROUP
CIVIL ENGINEERING - LAND SURVEYING -
CONSTRUCTION SERVICES


Project Number: 130-00192
Designed By: DFL
Drawn By: HLM/MLG
Reviewed By: BEC
Sheet Number: 4

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D:\JOBS\MCWHINNEY\MCDONOUGH\ENGINEERING\DRAINAGE\3RD SUBMITTAL\REPORT\APPENDIX\APPENDIX G — DRAINAGE MAPS\STORM INDEX MAP.DWG, 5/29/2025 12:13 PM, DAN LAMBERSON

SEE SHEET 4



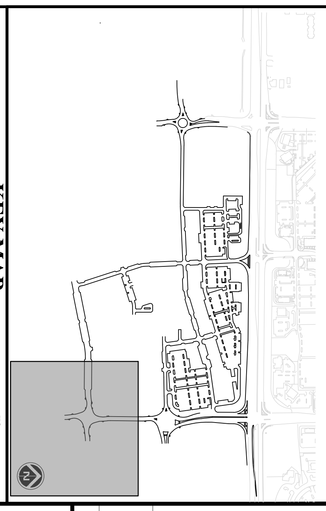

SEE SHEET 3

SEE SHEET 3

SCALE: 1" = 50'

KEY MAP

NTS



| | |
|---|---|
| Project Number: | 130-00192 |
| Designed By: / Drawn By: | DFL / HLM/MLG |
| Reviewed By: | BEC |
| Sheet Number: | 5 |

CWC CONSULTING GROUP
CIVIL ENGINEERING · LAND SURVEYING · CONSTRUCTION SERVICES
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CIVIL CONSTRUCTION PLANS

STORM SEWER INDEX MAP

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DOCUMENT AMENDMENTS