

# **FINAL DRAINAGE REPORT**

FOR

## **LINCOLN & DRANSFELDT**

July 30, 2021  
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Prepared for:

Plaza Street Partners  
2400 W 75<sup>th</sup> St, Suite 220  
Prairie Village, KS 66208

Prepared by:



Rachel Patton, P.E.  
1120 Lincoln Street, Suite 1000  
Denver, CO 80203  
Ph: 303-623-6300  
Fax: 303-623-6311

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## **ENGINEER CERTIFICATION**

This report for the final design of Lincoln & Dransfeldt was prepared by me or under my direct supervision in accordance with the provisions of the Town of Parker Storm Drainage and Environmental Criteria Manual. I understand that the Town of Parker and its designated town authority do not and will not assume liability for drainage facilities designed by others.

By: Rachel C. Patton  
Licensed Professional Engineer  
State of Colorado  
No. 54450  
On behalf of Harris Kocher Smith

## **1. GENERAL LOCATION AND DESCRIPTION**

### **A. Location**

The Lincoln & Dransfeldt development (herein referred to as "Site") lies within the Town of Parker and County of Douglas. The Site is bounded by existing commercial development to the east and south and Lincoln Avenue to the north and Dransfeldt Road to the west.

The Site is more particularly situated in the Southwest  $\frac{1}{4}$  of Section 15, Township 6 South, Range 66 West of the 6<sup>th</sup> Principal Meridian, County of Douglas, State of Colorado.

A Vicinity Map is included in Appendix A.

### **B. Description of Property**

The planned Lincoln & Dransfeldt development will contain a gas station, restaurants and retail.

The Site is approximately 7.27 acres. The entire Site will be disturbed by demolition, excavation, grading, utility installation and other construction activities.

Currently, the Site is an empty lot with an existing drainage ditch that runs east to west along the northern property line. The existing grades on Site slope generally from east to west, at approximately 2.5%.

There is an existing drainage ditch that runs along the northern property line that will be rerouted via proposed storm infrastructure. There are no existing major irrigation facilities such as ditches or canals located on the Site.

There is no known contamination on site. The contractor will be responsible for monitoring for contamination throughout the construction and any required remediation will occur immediately.

The hydrologic soil group for the Site consists of Natural Resources Conservation Service (NRCS) Type B and C soil. Type C/D was used for conservative design purposes.

## **2. MAJOR DRAINAGE BASINS AND SUB-BASINS**

### **A. Major Basin Description**

The site is located within the Cherry Creek 4600 basin, an area of minimal flood hazard as defined by MHFD. The Site is shown to be in a Zone X (unshaded) Flood Area according to FIRM Map 08035C0067G County of Douglas, Colorado March 16, 2016 (See FIRM map in Appendix A). Zone X (unshaded), as depicted on the aforementioned Map, is described by FEMA as "Areas determined to be outside the 0.2% annual change floodplain". A copy of the FIRM Map is included in Appendix A for reference.

### **B. Sub-basin Description**

Existing runoff from the Site flows overland to an existing storm culvert at the northwest corner of the property. The culvert ties into an existing storm sewer infrastructure and conveys flows to the west.

The proposed drainage will follow these existing patterns. There are proposed widening improvements along Dransfeldt Road. The existing drainage patterns on Dransfeldt Road will be maintained and will be routed to the existing storm infrastructure, which be ultimately routed to the existing downstream drainage facility.

The following section describes in detail the on-site drainage basins.

Basin A (0.74 acres) consists of commercial area, with an assumed impervious of 95%. Runoff from Basin A will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. The runoff will be connected to the proposed storm system at Design Point 1.

Basin B (1.31 acres) consists of commercial area, with an assumed impervious of 95%. Runoff from Basin B will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. A proposed manhole with a grated lid has been provided for a future connection. The runoff will be connected to the proposed storm system at Design Point 11.

Basin C (1.26 acres) consists of commercial area, with an assumed impervious of 95%. Runoff from Basin C will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. The runoff will be connected to the proposed storm system at Design Point 15.

Basin D (0.81 acres) consists of commercial area, with an assumed impervious of 95%. Runoff from Basin D will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. A proposed manhole with a grated lid has been provided for a future connection. The runoff will be connected to the proposed storm system at Design Point 16.

Basin E (0.96 acres) consists of commercial area, with a calculated impervious of 95%. Runoff from Basin E will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. A proposed manhole with a grated lid has been provided for a future connection. The runoff will be connected to the proposed storm system at Design Point 12.

Basin F (0.46 acres) consists of commercial area, with an assumed impervious of 95%. Runoff from Basin F will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. A proposed manhole with a grated lid has been provided for a future connection. The runoff will be connected to the proposed storm system at Design Point 4.

Basin G (0.69 acres) consists of the proposed extended detention basin, with an assumed impervious of 7%. Runoff from this basin will be routed from the outlet structure to the existing storm infrastructure.

Basin RAB1 (0.03 acres) consists of portions of proposed Roads A & B, with a calculated impervious of 90%. Runoff from Basin RAB1 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet A6 at Design Point 10.

Basin RAB2 (0.05 acres) consists of portions of proposed Road B, with a calculated impervious of 75%. Runoff from Basin RAB2 will runoff to the proposed curb and gutter and will be routed to the proposed

detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet D3 at Design Point 5.

Basin RB1 (0.07 acres) consists of a portion of proposed Road B, with a calculated impervious of 76%. Runoff from Basin RB1 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet F2 at Design Point 2.

Basin RB2 (0.07 acres) consists of a portion of proposed Road B, with a calculated impervious of 76%. Runoff from Basin RB2 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet F1 at Design Point 3.

Basin RB3 (0.08 acres) consists of a portion of proposed Roads A & B, with a calculated impervious of 80%. Runoff from Basin RB3 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet D2 at Design Point 6.

Basin RA1 (0.11 acres) consists of a portion of proposed Road A, with a calculated impervious of 80%. Runoff from Basin RA1 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet J2 at Design Point 7.

Basin RA2 (0.11 acres) consists of a portion proposed Road A, with a calculated impervious of 79%. Runoff from Basin RA2 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet J1 at Design Point 8.

Basin RA3 (0.09 acres) consists of a portion of proposed Road A, with a calculated impervious of 76%. Runoff from Basin RA3 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet C1 at Design Point 13.

Basin RA4 (0.09 acres) consists of a portion of proposed Road A, with a calculated impervious of 76%. Runoff from Basin RA4 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet A3 at Design Point 14.

Basin RA5 (0.12 acres) consists of a portion of proposed Road A, with a calculated impervious of 79%. Runoff from Basin RA5 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet B1 at Design Point 17.

Basin RA6 (0.12 acres) consists of a portion of proposed Road A, with a calculated impervious of 99%. Runoff from Basin RA6 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet A1 at Design Point 18.

The following section describes the off-site basins:

Basin OS-1 (0.05 acres) consists of a portion of proposed Road B, which runs off-site, with a calculated impervious of 77%. Runoff from Basin OS-1 will runoff to the north to the existing access road and will be captured by the existing storm infrastructure.

Basin OS-2 (0.12 acres) consists of a portion of proposed Road A, which runs off-site, with a calculated impervious of 84%. Runoff from Basin OS-2 will runoff to the west to Dransfeldt and will be captured by the existing storm infrastructure.

Storage for these in the proposed extended detention basin as compensatory storage as in accordance with section 7.2.4 of the Town of Parker Storm Drainage and Environmental Criteria Manual and is further described in the Drainage Facility Design section of this Report.

Calculations for Storm Line E along the northern property boundary have been included in the Rational Calculations in Appendix B. This proposed storm line picks up flows that discharge from an existing water quality pond to an existing drainage ditch. The 24-inch pipe was sized using an estimation of the existing area going to the pond.

In addition to the on-site basins, the inlet capturing the flow from the widening of the east side of Dransfeldt Road was also analyzed. Based on the "Final Drainage Report for Dransfeldt Road Improvements Phase IV" prepared by Tetra Tech RMC, INC on February 2003, the existing inlet captured 0.4 acres (Basin 131 in the original report). Due to the proposed widening of Dransfeldt by the development, Basin EX-RD (0.58 acres total, 0.18 acres from the widening) and Basin OS-2 (0.12 acres) will need to be captured by the relocated inlet. Both basins are shown on the proposed drainage plan as EX-RD in Appendix D. The proposed inlet is a 15-ft Type R Inlet (Inlet I1) and has capacity to accept the additional flows, refer to the Inlet Calcs in Appendix C.

### **3. DRAINAGE DESIGN CRITERIA**

#### **A. Regulations**

The principal design criteria used for this Study was the Town of Parker Storm Drainage and Environmental Criteria Manual revised February 2014.

In addition, the Urban Storm Drainage Criteria Manual, Volumes 1-3 for Mile High Flood District (MHFD) was also consulted.

#### **B. Town of Parker Stream Protection Standards**

Compliance with the Town of Parker's Stream Protection Standards is not applicable because there are no "natural drainage systems", as defined by the Parker Criteria.

#### **C. Development Criteria References and Constraints**

The principal design guidelines that will be sourced for this Site development are the Town of Parker Storm Drainage and Environmental Criteria Manual (hereinafter referred to as "Parker Criteria") and the Urban Storm Drainage Criteria Manual, January 2016 (Volume 1&2) and November 2010 (Volume 3) (hereinafter referred to as "District Manual").

The drainage design will be affected by the proposed grading, building outline and legal boundaries of the Site. In order to conform to existing grades at property boundaries, the 2009 International Building Code, and Geotechnical Report recommendations, areas of the Site consisting of small swaths of walks and landscaping are to drain away from the building and off-site to the existing right-of-way, undetained and untreated.

#### **D. Hydrologic Criteria**

The following formula, from the District Manual, was used to determine rainfall intensities:

$$I = \frac{28.5P_1}{(10 + T_C)^{0.786}}$$

One-hour rainfall  $P_1$  values were taken from Table 5.1 in Parker Criteria. The  $P_1$  values for the 5-year and 100-year storms are 0.99 inches and 2.60 inches, respectively.

As previously mentioned, the hydrologic soil group of the Site is assumed to be comprised of NRCS Type C and D soil for conservative design purposes.

The Rational Method, as presented in the District Manual, was used to calculate the maximum rate of runoff for the minor and major storm events. "C" coefficients were taken from Table 6-4 of the District Manual. Rational Method calculation results, including composite C-values, time of concentration, and flow rates can be found in Appendix C.

For the Final Drainage Report, the 5-year and 100-year storm events have been analyzed, from Table 3-1 of the District Manual. The 5-year storm is considered the minor event and the 100-year storm is considered the major event.

The maximum allowable unit flow release rates (cfs/acre) for on-site detention facilities were obtained from Equation 12-5 from Volume 2 Chapter 12 of the District Manual. The maximum allowable unit release rate is equal to 90 percent of the predevelopment discharge for the upstream watershed. The WQCV will be released using a cap with an orifice designed to release the storm using a 40-hour drain time. Calculations are in Appendix D.

Other criteria or calculation methods outside of Parker Criteria were not used in the hydrologic design for the Site.

#### **E. Hydraulic Criteria**

Hydraulic capacity for proposed storm sewer system was designed in accordance with the Parker Criteria and the Streets/Inlets/Storm Sewers chapter of the District Manual.

The routing method for the proposed storm sewer system was designed in accordance with the Parker Criteria and the Streets/Inlets/Storm Sewers chapter of the District Manual. StormCAD software will be used to calculate storm sewer capacity and hydraulic grade lines.

Hydraulic grade lines were designed in accordance with the Parker Criteria. During the initial storm event, the hydraulic grade line must be located below the crown of the pipe. For the major storm event, the hydraulic grade must be located 12 inches below finished grade as a maximum condition.

Other criteria or calculation methods outside of Parker Criteria was not used in the drainage facility design for the Site.

The Water Quality Control Volume (WQCV) treatment system and release rate was designed in accordance with Volume 3 of the District Manual. WQCV calculations for the Site can be found in Appendix D.

**F. Variance from Criteria**

A variance from the retaining wall criteria listed in Parker Criteria section 7.3.13 is requested in order to meet other design criteria.

**4. DRAINAGE FACILITY DESIGN**

**A. General Concept**

The general drainage concept for the Site is to capture runoff and route the runoff through proposed curb and gutter and storm sewer infrastructure to an extended detention basin where runoff will be treated and detained. The Extended Detention will have an overflow to the public roadway.

**B. Specific Details**

There is an existing 36"x24" HERCP storm sewer conveyance system underneath Dransfeldt Road that flows from east to west. The system includes street drainage, inlets, and manholes. There are no existing stormwater storage facilities located on the Site.

Once captured, runoff will be routed to an extended detention basin. Runoff captured from Basins A-F will be routed into the detention basin. Runoff will then be treated, detained and released to the public storm infrastructure. See Appendix D for calculations.

An assumed imperviousness of 95% for commercial areas was used in the design of the drainage infrastructure based on Table 6-3 in Volume 1 Chapter 6 of the District Criteria. The total required volume is provided based on the UD-Detention Design Spreadsheet.

Additional volume was provided to allow for construction tolerance in the field.

<b>EXTENDED DETENTION BASIN SUMMARY TABLE</b>		
<b>STAGE – STORAGE DESCRIPTION</b>	<b>VOLUME REQUIRED [AC-FT]</b>	<b>VOLUME PROVIDED [AC-FT]</b>
WQCV	0.289	0.289
EURV	0.445	0.445
100-YEAR	0.304	0.304
<b>TOTAL</b>	<b>1.038</b>	<b>1.726</b>

Compensatory flows for basins OS-1 and OS-2, have been provided, were accounted for in storage and release rate calculations, per section 7.2.4 of the Town of Parker Storm Drainage and Environmental Criteria Manual. The original outflow of the pond was 8.26 cfs. Per Town of Parker Storm Drainage and Environmental Criteria Manual, the release rate should be decreased by the sum of the undetained flows for the off-site basins. Thus, the outlet structure of the extended detention basin has been designed to outflow at 7.03 cfs. Please see the rational calculations and UD detention calculations in appendices B and C, respectively.

This site is categorized as a tier 3 development based on the Cherry Creek tiered water quality requirements because the total disturbed area is over one acre. Based on Town of Parker standards (section 8.3), "Tier three new development and redevelopment must install and operated PBMPs that provide WQCV designed and constructed to capture and treat, at a minimum, the 80<sup>th</sup> percentile runoff event, in accordance with this SDECM and the MANUAL Volume 3".

### **C. Storm Sewer System**

Storm sewer pipes were modeled in StormCAD using both Town of Parker and MHFD storm drainage standards to ensure the 5-year and 100-year storm criteria were met. Improvements will not impact receiving structures or downstream properties to any greater extents than allowed by regulation or consistent with prior study. Inlets were modeled using the latest version of the MHFD Inlet Spreadsheet. All inlets will capture all flows within their respective basins and no carryover flows are anticipated.

## **5. Environmental Protection Criteria**

### **A. General**

There are no wetland areas or waters of the U.S. situated within the Site. There are no anticipated impacts on threatened and endangered species or presence of Habitat Protection Areas and Stream Restoration Areas.

A Stormwater discharge permit will be acquired through the Colorado Discharge Permit System (CDPS) in addition to a grading permit granted by the Town of Parker.

### **B. Construction BMP Plan**

CBMPs are required to be constructed for use before, during and immediately after the phases of construction. All initial phase CBMPs must be approved and installed prior to the issuance of a grading permit from the Town of Parker. The primary purpose of the CBMPs to be implemented is erosion and sediment control and to contain land disturbing activities onsite. Example of some of the CBMPs to be utilized are silt fencing, sediment basins, vehicle tracking control, seeding and mulching, etc. CBMP Plans will be submitted and approved by the Town of Parker prior to land disturbance.

### **C. Permanent BMP Plan**

A permanent BMP Plan will be required for the Site since there is an on-site detention basin.

## **6. CONCLUSIONS**

### **A. Compliance with Standards**

Drainage design for the Site was performed in accordance with Parker Criteria, except for when instructed to by said Standard.

Major Drainageway Planning Studies did not implicate specific design requirements to the Site.

The District Manual was used for the design of the Site only when instructed to by Parker Criteria.

### **B. Drainage Concept**

The proposed development will have no negative drainage impacts on upstream and downstream properties.

The proposed development will not influence any master drainage plan recommendations.

### **C. Sediment and Erosion Control Concept**

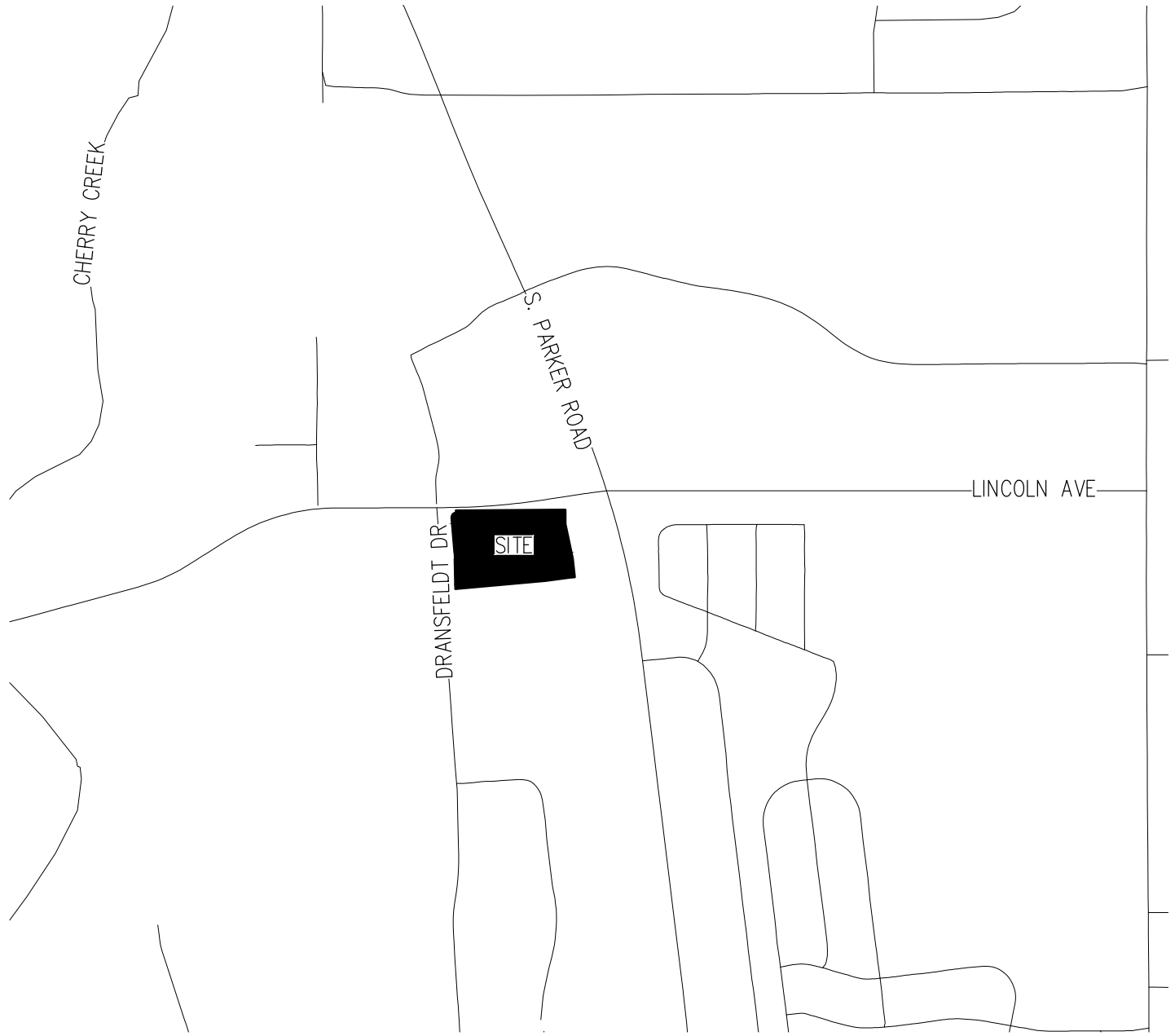
As designed, the proposed CBMP plan satisfies all requirements to obtain a stormwater discharge permit from the CDPS. The CBMP plan also satisfies, at a minimum, all requirements set forth by the Town of Parker and MHFD. All stormwater runoff generated by the Site during construction will be treated by CBMPs. The effect of land disturbing activities on adjacent development and right-of-ways is minimized through the use of various CBMPs.

## 7. LIST OF REFERENCES

1. Storm Drainage and Environmental Criteria Manual, Town of Parker, Colorado; revised February 2014.
2. Urban Storm Drainage Criteria Manual, Vol. 1 & 2, Urban Drainage and Flood Control District, January 2016.
3. Urban Storm Drainage Criteria Manual, Vol. 3, Urban Drainage and Flood Control District, November 2010.
4. Flood Insurance Rate Map, City and County of Denver, Colorado, Map #0800460201G, FEMA, revised November 17<sup>th</sup>, 2005.
5. Final Drainage Report for Dransfeldt Road Improvements Phase IV, prepared by Tetra Tech RMC, Inc, February 2003.

**APPENDIX A – Vicinity Map, FIRM, Geotechnical Report**

Plotted: FRI 07/30/21 4:54:02P By: Olivia McCracken Filepath: k:\200829\engineering\ref\vic map.dwg Layout: layout1



SCALE: 1" = 1000'

# LINCOLN & DRANSFELDT

## VICINITY MAP

PROJECT #: 200829  
SHEET NUMBER

# 1

1 OF 1

**HKS** HARRIS KOCHER SMITH  
 1120 Lincoln Street, Suite 1000  
 Denver, Colorado 80203  
 P: 303.623.6300 F: 303.623.6311  
 HarrisKocherSmith.com



United States  
Department of  
Agriculture

**NRCS**

Natural  
Resources  
Conservation  
Service

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

# Custom Soil Resource Report for Castle Rock Area, Colorado



# Preface

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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](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

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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

## Custom Soil Resource Report

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

## Custom Soil Resource Report

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

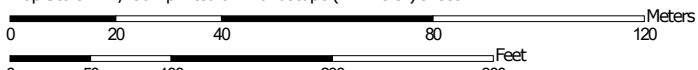
---

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: 1:1,430 if printed on A landscape (11" x 8.5") sheet.




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


### MAP LEGEND

**Area of Interest (AOI)**

 Area of Interest (AOI)




















**Soils**







 Soil Map Unit Polygons

 Soil Map Unit Lines


 Soil Map Unit Points

**Special Point Features**






-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot

-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features


**Water Features**

 Streams and Canals

**Transportation**

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

**Background**

 Aerial Photography

### MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Castle Rock Area, Colorado  
 Survey Area Data: Version 13, Jun 5, 2020

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

Date(s) aerial images were photographed: Jun 10, 2014—Dec 4, 2018

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

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BrB	Bresser sandy loam, cool, 1 to 3 percent slopes	7.8	89.4%
Lo	Loamy alluvial land	0.4	5.0%
Sa	Sampson loam	0.5	5.6%
<b>Totals for Area of Interest</b>		<b>8.8</b>	<b>100.0%</b>

## 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

## Custom Soil Resource Report

development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

## Castle Rock Area, Colorado

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

#### Map Unit Setting

*National map unit symbol:* 2t1pj

*Elevation:* 5,500 to 6,500 feet

*Mean annual precipitation:* 15 to 19 inches

*Mean annual air temperature:* 48 to 52 degrees F

*Frost-free period:* 100 to 130 days

*Farmland classification:* Farmland of statewide importance

#### Map Unit Composition

*Bresser, cool, and similar soils:* 90 percent

*Minor components:* 10 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Bresser, Cool

##### Setting

*Landform:* Hillslopes, terraces

*Landform position (two-dimensional):* Footslope

*Landform position (three-dimensional):* Base slope, tread

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Tertiary aged alluvium derived from arkose

##### Typical profile

*Ap - 0 to 5 inches:* sandy loam

*Bt1 - 5 to 8 inches:* sandy loam

*Bt2 - 8 to 27 inches:* sandy clay loam

*Bt3 - 27 to 36 inches:* sandy loam

*C - 36 to 80 inches:* loamy coarse sand

##### Properties and qualities

*Slope:* 1 to 3 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Well drained

*Runoff class:* Low

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high  
(0.60 to 6.00 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Calcium carbonate, maximum content:* 5 percent

*Maximum salinity:* Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)

*Available water capacity:* Low (about 5.4 inches)

##### Interpretive groups

*Land capability classification (irrigated):* 2e

*Land capability classification (nonirrigated):* 4s

*Hydrologic Soil Group:* B

*Ecological site:* R049XB210CO - Sandy Foothill

*Hydric soil rating:* No

## Minor Components

### Sampson

*Percent of map unit:* 5 percent  
*Landform:* Terraces, alluvial fans  
*Landform position (two-dimensional):* Toeslope  
*Landform position (three-dimensional):* Base slope, tread  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Ecological site:* R049XC202CO - Loamy Foothill 14-19 P.Z.  
*Hydric soil rating:* No

### Truckton

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

## Lo—Loamy alluvial land

### Map Unit Setting

*National map unit symbol:* jqzb  
*Elevation:* 7,000 to 8,000 feet  
*Mean annual precipitation:* 17 to 19 inches  
*Mean annual air temperature:* 44 to 46 degrees F  
*Frost-free period:* 115 to 120 days  
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Loamy alluvial land:* 80 percent  
*Minor components:* 20 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Loamy Alluvial Land

#### Setting

*Landform:* Flood plains, swales  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear

#### Typical profile

*H1 - 0 to 20 inches:* sandy loam  
*H2 - 20 to 40 inches:* stratified loamy sand to clay loam  
*H3 - 40 to 60 inches:* sand and gravel

**Properties and qualities**

*Slope:* 1 to 5 percent  
*Drainage class:* Well drained  
*Runoff class:* Very low  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high  
(0.20 to 6.00 in/hr)  
*Depth to water table:* About 48 to 72 inches  
*Frequency of flooding:* FrequentNone  
*Calcium carbonate, maximum content:* 5 percent  
*Maximum salinity:* Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)  
*Available water capacity:* Moderate (about 6.0 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 4w  
*Hydrologic Soil Group:* C  
*Ecological site:* R049XY036CO - Overflow  
*Hydric soil rating:* No

**Minor Components**

**Bresser**

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

**Sampson**

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

**Sandy alluvial land**

*Percent of map unit:* 5 percent

**Fluvaquentic haplustolls**

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

**Sa—Sampson loam**

**Map Unit Setting**

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

**Map Unit Composition**

*Sampson and similar soils:* 80 percent  
*Minor components:* 20 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

## Description of Sampson

### Setting

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

### Typical profile

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

### Properties and qualities

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

### Interpretive groups

*Land capability classification (irrigated):* 3e  
*Land capability classification (nonirrigated):* 3c  
*Hydrologic Soil Group:* B  
*Ecological site:* R049XC202CO - Loamy Foothill 14-19 P.Z.  
*Hydric soil rating:* No

## Minor Components

### Englewood

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

### Bresser

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

### Loamy alluvial land

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

### Aquic haplustolls

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

## Custom Soil Resource Report

# **Soil Information for All Uses**

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## **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.

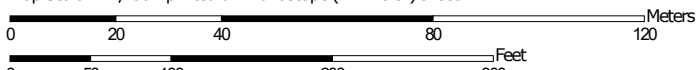
## **Wind Erodibility Index**

The wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

# Custom Soil Resource Report Map—Wind Erodibility Index



Map Scale: 1:1,430 if printed on A landscape (11" x 8.5") sheet.




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**













-  0
-  38
-  48
-  56
-  86
-  134
-  160
-  180
-  220
-  250
-  310
-  Not rated or not available

**Soil Rating Lines**


-  0
-  38
-  48
-  56
-  86
-  134
-  160
-  180
-  220

-  250
-  310
-  Not rated or not available






**Soil Rating Points**

-  0
-  38
-  48
-  56
-  86
-  134
-  160
-  180
-  220
-  250
-  310
-  Not rated or not available

**Water Features**

 Streams and Canals

**Transportation**

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

**Background**

 Aerial Photography

### MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Castle Rock Area, Colorado  
 Survey Area Data: Version 13, Jun 5, 2020

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

Date(s) aerial images were photographed: Jun 10, 2014—Dec 4, 2018

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 Index**

Map unit symbol	Map unit name	Rating (tons per acre per year)	Acres in AOI	Percent of AOI
BrB	Bresser sandy loam, cool, 1 to 3 percent slopes	86	7.8	89.4%
Lo	Loamy alluvial land	86	0.4	5.0%
Sa	Sampson loam	48	0.5	5.6%
<b>Totals for Area of Interest</b>			<b>8.8</b>	<b>100.0%</b>

**Rating Options—Wind Erodibility Index**

*Units of Measure:* tons per acre per year  
*Aggregation Method:* Dominant Condition  
*Component Percent Cutoff:* None Specified  
*Tie-break Rule:* Higher

**Soil Qualities and Features**

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

**Hydrologic Soil Group**

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

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

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

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained

## Custom Soil Resource Report

soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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

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

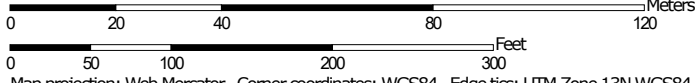
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Custom Soil Resource Report  
Map—Hydrologic Soil Group



Soil Map may not be valid at this scale.


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

### MAP LEGEND

**Area of Interest (AOI)**









 Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**





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

**Soil Rating Lines**


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

**Soil Rating Points**






-  A
-  A/D
-  B
-  B/D

-  C
-  C/D
-  D
-  Not rated or not available


**Water Features**

 Streams and Canals

**Transportation**

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

**Background**

 Aerial Photography

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 Web Soil Survey URL:  
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**Table—Hydrologic Soil Group**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BrB	Bresser sandy loam, cool, 1 to 3 percent slopes	B	7.8	89.4%
Lo	Loamy alluvial land	C	0.4	5.0%
Sa	Sampson loam	B	0.5	5.6%
<b>Totals for Area of Interest</b>			<b>8.8</b>	<b>100.0%</b>

**Rating Options—Hydrologic Soil Group**

*Aggregation Method: Dominant Condition*

*Component Percent Cutoff: None Specified*

*Tie-break Rule: Higher*

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## APPENDIX B – Hydrologic Computations

Project Name: Lincoln & Dransfeldt  
**Composite C-Value Computations**  
**Post-Development**

Project No: 200829  
Date: 07/30/21  
Revised: 10/19/22  
Design by: ORM  
Checked by: RCP  
NRCS Soil Group: C/D

BASIN	TOTAL AREA (ACRES)	ROOFS (90%)	CONCRETE DRIVES & WALKS (90%)	STREETS (100%)	LANDSCAPE AREA (2%)	PERCENT IMPERVIOUS	C <sub>5</sub> =	C <sub>100</sub> =
A	0.74					95%	0.81	0.87
B	1.31					95%	0.81	0.87
C	1.26					95%	0.81	0.87
D	0.81					95%	0.81	0.87
E	0.96					95%	0.81	0.87
F	0.46					95%	0.81	0.87
G	0.69	0.00	0.04	0.00	0.65	7%	0.09	0.51
RAB1	0.03	0.00	0.00	0.02	0.00	90%	0.77	0.85
RAB2	0.05	0.00	0.00	0.03	0.01	75%	0.65	0.79
RB1	0.07	0.00	0.00	0.05	0.02	76%	0.66	0.80
RB2	0.07	0.00	0.00	0.05	0.02	76%	0.66	0.80
RB3	0.08	0.00	0.00	0.06	0.02	80%	0.69	0.81
RA1	0.11	0.00	0.00	0.08	0.02	80%	0.69	0.81
RA2	0.11	0.00	0.00	0.08	0.02	79%	0.68	0.81
RA3	0.09	0.00	0.00	0.07	0.02	76%	0.66	0.79
RA4	0.09	0.00	0.00	0.07	0.02	76%	0.66	0.80
RA5	0.12	0.00	0.00	0.09	0.02	79%	0.69	0.81
RA6	0.12	0.00	0.01	0.11	0.00	99%	0.84	0.89
<b>OFF-SITE TO EX POND</b>								
EX-1	0.43	0.00	0.00	0.17	0.26	41%	0.37	0.65
EX-2	2.38					100%	0.86	0.89
<b>OFF-SITE RUNOFF</b>								
OS-1	0.05	0.00	0.00	0.04	0.01	77%	0.67	0.80
OS-2	0.12	0.00	0.01	0.09	0.02	84%	0.72	0.83
Total Runoff Off-Site	0.17							
<b>Total Treated</b>	<b>7.15</b>					<b>81%</b>	<b>0.70</b>	<b>0.82</b>
EX-RD	0.58	0.00	0.00	0.58	0.00	100%	0.86	0.89

\*Percent Impervious for Basins A-F determined from USDCM Vol 1 Table 6-3

**Runoff Coefficient Equations (from USDCM Vol. 1)**  
NRCS Soil Group: C/D  
5-year:  $0.82(i)+0.035$   
100-year:  $0.41(i)+0.484$

Project Name: Lincoln & Dransfeldt  
 Project No: 200829  
 Date: 07/30/21  
 Revised: 10/19/22

**STANDARD FORM SF-2**  
**TIME OF CONCENTRATION**  
**Post-Development**

Designed By: ORM  
 Checked By: RCP

SUB-BASIN DATA			INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Ti)					Tc CHECK (URBANIZED BASINS)			FINAL	REMARKS
BASIN	AREA (AC)	C <sub>s</sub>	LENGTH (FT)	SLOPE %	Ti (MIN)	LENGTH (FT)	SLOPE %	C <sub>v</sub>	VELOCITY (FPS)	Tt (MIN)	COMPOS. Tc (MIN)	TOTAL LENGTH	Tc = (L/180) + 10 (MIN)	Tc (MIN)	
A	0.74	0.81	62.5	2.00	3.29	219.9	2.00	20	2.83	1.30	5.00	282	11.57	5.00	
B	1.31	0.81	150	2.00	5.10	142.81	2.00	20	2.83	0.84	5.94	293	11.63	5.94	
C	1.26	0.81	102.6	2.00	4.22	241	2.00	20	2.83	1.42	5.64	344	11.91	5.64	
D	0.81	0.81	150	2.00	5.10	238.9	2.00	20	2.83	1.41	6.50	389	12.16	6.50	
E	0.96	0.81	150	2.00	5.10	318.9	2.00	20	2.83	1.88	6.98	469	12.61	6.98	
F	0.46	0.81	25	2.00	2.08	76	2.00	20	2.83	0.45	5.00	101	10.56	5.00	
G	0.69	0.09	87	2.00	13.67	244	2.00	7	0.99	4.11	17.78	331	11.84	11.84	
RAB1	0.03	0.77	20.5	2.00	2.17	75	1.00	20	2.00	0.63	5.00	96	10.53	5.00	
RAB2	0.05	0.65	20.5	2.00	2.98	210	2.50	20	3.16	1.11	5.00	231	11.28	5.00	
RB1	0.07	0.66	15	2.00	2.49	89	1.00	20	2.00	0.74	5.00	104	10.58	5.00	
RB2	0.07	0.66	15	2.00	2.48	89	1.00	20	2.00	0.74	5.00	104	10.58	5.00	
RB3	0.08	0.69	15	2.00	2.30	244	2.50	20	3.16	1.29	5.00	259	11.44	5.00	
RA1	0.11	0.69	15	2.00	2.32	105	1.00	20	2.00	0.88	5.00	120	10.67	5.00	
RA2	0.11	0.68	15	2.00	2.36	40	2.30	20	3.03	0.22	5.00	55	10.31	5.00	
RA3	0.09	0.66	15	2.00	2.50	180	2.30	20	3.03	0.99	5.00	195	11.08	5.00	
RA4	0.09	0.66	15	2.00	2.48	180	2.30	20	3.03	0.99	5.00	195	11.08	5.00	
RA5	0.12	0.69	15	2.00	2.33	200	2.30	20	3.03	1.10	5.00	215	11.19	5.00	
RA6	0.12	0.84	15	2.00	1.45	200	2.30	20	3.03	1.10	5.00	215	11.19	5.00	
<b>OFF-SITE TO EX POND</b>															
EX-1	0.43	0.37	40	2.00	6.73	240	2.30	20	3.03	1.32	8.05	280	11.56	8.05	
EX-2	0.14	0.86	60	2.00	2.76	450	2.30	20	3.03	2.47	5.23	510	12.83	5.23	
<b>OFF-SITE RUNOFF</b>															
OS-1	0.05	0.67	22	2.00	2.94	37	1.00	20	2.00	0.31	5.00	59	10.33	5.00	
OS-2	0.05	0.72	35	2.00	3.25	70	4.00	20	4.00	0.29	5.00	105	10.58	5.00	
EX-RD	0.05	0.00	38	2.00	9.87	620	4.00	20	4.00	2.58	12.45	658	13.66	12.45	

**1-HR Rainfall**

<u>Return Interval (YR)</u>	<u>1-hour Rainfall</u>
2	0.99
5	1.37
10	1.64
100	2.6

Project Name: Lincoln & Dransfeldt  
 Project No: 200829  
 Date: 07/30/21  
 Revised: 10/19/22

**STANDARD FORM SF-2**  
**Post-Development**  
**Rational Method Procedure**

Designed By: ORM  
 Checked By: RCP  
 Design Storm: 5 YR

BASIN (s)	DESIGN POINT	DIRECT RUNOFF					TOTAL RUNOFF			STREET/INLET				STORM SEWER PIPE				TRAVEL TIME			CARRYOVER FLOWS				REMARKS				
		AREA (AC)	RUNOFF COEFF	Tc (min)	C x A (AC)	I (IN/HR)	DIRECT RUNOFF, Q (CFS)	Tc (min)	Σ(C x A) (AC)	I (IN/HR)	TOTAL RUNOFF, Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	INLET DESIGN FLOW (CFS)	STREET OR INLET INTERCEPTION (CFS)	CARRYOVER (CFS)	DESIGN FLOW (CFS)	PIPE SLOPE (%)	PIPE SIZE (IN)	Q <sub>FULL</sub> (CFS)	LENGTH (FT)	VELOCITY (FPS)	Tt (min)	Σ(C x A) BYPASS (AC)		LENGTH (FT)	SLOPE (%)	VELOCITY (FPS)	Tt (min)
A	1	0.74	0.81	5.00	0.60	4.65	2.79									2.8	0.5	18	9.7	29.3	1.1	0.46							Runoff for Lot 3
B	11	1.31	0.81	5.94	1.07	4.43	4.73									4.7	2.0	18	19.3	15.7	2.1	0.12						Runoff for Lot 2	
C	15	1.26	0.81	5.64	1.02	4.50	4.60																					Runoff for Lot 1	
D	16	0.81	0.81	6.50	0.66	4.31	2.84									2.8	0.5	18	9.7	46.7	1.1	0.73						Runoff for Lot 4	
E	12	0.96	0.81	6.98	0.78	4.22	3.30									3.3	1.0	18	13.7	36.9	1.5	0.41						Runoff for Lot 5	
F	4	0.46	0.81	5.00	0.37	4.65	1.73									1.7	0.5	18	9.7	26.9	1.1	0.42						Runoff of Lot 6	
G		0.69	0.09	11.84	0.06	3.46	0.22																					Detention Pond	
RAB1		0.03	0.77	5.00	0.02	4.65	0.11																					Portions of Roads A & B captured by Inlet A6	
RAB2		0.05	0.65	5.00	0.03	4.65	0.14																					Portions of Road B captured by Inlet D3	
RB1		0.07	0.66	5.00	0.04	4.65	0.20																					Portion of Road B captured by Inlet F2	
RB2		0.07	0.66	5.00	0.04	4.65	0.20																					Portion of Road B captured by Inlet F1	
RB3		0.08	0.69	5.00	0.05	4.65	0.25																					Portion of Road B captured by Inlet D2	
RA1	7	0.11	0.69	5.00	0.07	4.65	0.34									0.3	1.0	18	13.7	31.3	1.5	0.35						Portion of Road A captured by Inlet J2	
RA2		0.11	0.68	5.00	0.07	4.65	0.34																					Portion of Road A captured by Inlet J1	
RA3		0.09	0.66	5.00	0.06	4.65	0.29																					Portion of Road A captured by Inlet C1	
RA4		0.09	0.66	5.00	0.06	4.65	0.29																					Portion of Road A captured by Inlet A3	
RA5		0.12	0.69	5.00	0.08	4.65	0.37																					Portion of Road A captured by Inlet B1	
RA6		0.12	0.84	5.00	0.10	4.65	0.48																					Portion of Road A captured by Inlet A1	
ΣDP1 + BASIN RB1	2							5.46	0.64	4.54	2.92					2.9	0.5	18	9.7	31.3	1.1	0.49							
ΣDP2 + BASIN RB2	3							5.95	0.69	4.43	3.04					3.0	2.4	18	21.2	113.6	2.3	0.81							
ΣDP4 + BASIN RAB2	5							5.42	0.40	4.55	1.83					1.8	0.5	18	9.7	31.4	1.1	0.49							
ΣDP5 + BASIN RB3	6							5.92	0.45	4.44	2.01					2.0	0.5	18	9.7	84.9	1.1	1.33							
ΣDP7 + BASIN RA2	8							5.35	0.15	4.56	0.67					0.7	2.7	18	22.4	100.0	2.5	0.68							
ΣDP6 + DP8	9							7.25	0.60	4.16	2.50					2.5	0.5	18	9.7	42.2	1.1	0.66							
ΣDP3 + DP9	10							7.91	1.31	4.04	5.30					5.3	0.6	18	10.6	194.2	1.2	2.78							
ΣDP12 + BASIN RA3	13							7.40	0.84	4.14	3.49					3.5	1.0	18	13.7	31.3	1.5	0.35							
ΣDP10 + DP11 + DP13	14							10.70	3.29	3.61	11.86					11.9	0.5	24	20.8	107.2	1.1	1.68							
ΣDP14 + BASIN C	15							12.38	4.31	3.39	14.61					14.6	0.5	24	20.8	68.2	1.1	1.07							
ΣDP16 + BASIN RA5	17							7.24	0.74	4.17	3.08					3.1	0.5	18	9.7	40.5	1.1	0.64							
ΣDP17 + DP15 + BASIN RA6	18							13.45	5.15	3.27	16.85					16.8	0.5	24	20.8	58.1	1.1	0.91							
TOTAL OUTFLOW TO POND	19							14.37	5.22	3.17	16.55																		
OFFSITE AREA GOING TO EX POND																0.0	3.0	24	50.9	521.4	2.6	3.34							
EX-1		0.43	0.37	8.05	0.16	4.02	0.64																						
EX-2		2.38	0.86	5.23	2.03	4.59	9.34																						
ΣBASIN EX-1 + BASIN EX-2	20							8.05	2.19	4.02	8.81																		
OUTFLOW FROM POND							0.20									0.2	0.5	24	20.8	35.6	1.1	0.56						Outflow from UD_Detention Spreadsheet	
ΣOUTFLOW FROM POND + DP16	21										9.01																	Combined Flows from Proposed Detention Pond and Existing Basins Conservatively Summed	
OS-1		0.05	0.67	5.00	0.03	4.65	0.16																						
OS-2		0.12	0.72	5.00	0.09	4.65	0.40																						
EX-RD		0.58	0.86	12.45	0.50	3.38	1.68																						
ΣBASIN EX-RD + BASIN OS-2	22							12.45	0.58	3.38	1.97																	Flows Captured by Inlet I1 in Dransfeldt	

Project Name: Lincoln & Dransfeldt  
 Project No: 200829  
 Date: 07/30/21  
 Revised: 10/19/22

**STANDARD FORM SF-2**  
**Post-Development**  
**Rational Method Procedure**

Designed By: ORM  
 Checked By: RCP  
 Design Storm: 100 YR

BASIN (s)	DESIGN POINT	DIRECT RUNOFF					TOTAL RUNOFF			STREET/INLET				STORM SEWER PIPE				TRAVEL TIME			CARRYOVER FLOWS					REMARKS					
		AREA (AC)	RUNOFF COEFF	Tc (min)	C x A (AC)	I (IN/HR)	DIRECT RUNOFF, Q (CFS)	Tc (min)	Σ(C x A) (AC)	I (IN/HR)	TOTAL RUNOFF, Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	INLET DESIGN FLOW (CFS)	STREET OR INLET INTERCEPTION (CFS)	CARRYOVER (CFS)	DESIGN FLOW (CFS)	PIPE SLOPE (%)	PIPE SIZE (IN)	Q <sub>FULL</sub> (CFS)	LENGTH (FT)	VELOCITY (FPS)	T <sub>t</sub> (min)	Σ(C x A) BYPASS (AC)	LENGTH (FT)		SLOPE (%)	VELOCITY (FPS)	T <sub>t</sub> (min)		
A	1	0.74	0.87	5.00	0.64	8.82	5.67									5.7	0.5	18	9.7	29.3	1.1	0.46							Runoff for Lot 3		
B	11	1.31	0.87	5.94	1.15	8.41	9.64									9.6	2.0	18	19.3	15.7	2.1	0.12							Runoff for Lot 2		
C	15	1.26	0.87	5.64	1.10	8.54	9.36																						Runoff for Lot 1		
D	16	0.81	0.87	6.50	0.71	8.18	5.79									5.8	0.5	18	9.7	46.7	1.1	0.73							Runoff for Lot 4		
E	12	0.96	0.87	6.98	0.84	8.00	6.72									6.7	1.0	18	13.7	36.9	1.5	0.41							Runoff for Lot 5		
F	4	0.46	0.87	5.00	0.40	8.82	3.52									3.5	0.5	18	9.7	26.9	1.1	0.42							Runoff for Lot 6		
G		0.69	0.51	11.84	0.36	6.56	2.34																						Detention Pond		
RAB1		0.03	0.85	5.00	0.03	8.82	0.22																						Portions of Roads A & B captured by Inlet A6		
RAB2		0.05	0.79	5.00	0.04	8.82	0.32																						Portions of Road B captured by Inlet D3		
RB1		0.07	0.80	5.00	0.05	8.82	0.47																						Portion of Road B captured by Inlet F2		
RB2		0.07	0.80	5.00	0.05	8.82	0.47																						Portion of Road B captured by Inlet F1		
RB3		0.08	0.81	5.00	0.06	8.82	0.55																						Portion of Road B captured by Inlet F1		
RA1	7	0.11	0.81	5.00	0.09	8.82	0.76								0.8	1.0	18	13.7	31.3	1.5	0.35								Portion of Road B captured by Inlet D2		
RA2		0.11	0.81	5.00	0.09	8.82	0.77																							Portion of Road A captured by Inlet J2	
RA3		0.09	0.79	5.00	0.07	8.82	0.66																							Portion of Road A captured by Inlet J1	
RA4		0.09	0.80	5.00	0.07	8.82	0.66																							Portion of Road A captured by Inlet C1	
RA5		0.12	0.81	5.00	0.09	8.82	0.83																							Portion of Road A captured by Inlet A3	
RA6		0.12	0.89	5.00	0.11	8.82	0.97																							Portion of Road A captured by Inlet B1	
ΣDP1 + BASIN RB1	2							5.46	0.70	8.61	6.00					6.0	0.5	18	9.7	31.3	1.1	0.49							Portion of Road A captured by Inlet A1		
ΣDP2 + BASIN RB2	3							5.95	0.75	8.40	6.30					6.3	2.4	18	21.2	113.6	2.3	0.81									
ΣDP4 + BASIN RAB2	5							5.42	0.44	8.63	3.75					3.8	0.5	18	9.7	31.4	1.1	0.49									
ΣDP5 + BASIN RB3	6							5.92	0.50	8.42	4.18					4.2	0.5	18	9.7	84.9	1.1	1.33									
ΣDP7 + BASIN RA2	8							5.35	0.17	8.66	1.50					1.5	2.7	18	22.4	100.0	2.5	0.68									
ΣDP6 + DP8	9							7.25	0.67	7.90	5.30					5.3	0.5	18	9.7	42.2	1.1	0.66									
ΣDP3 + DP9	10							7.91	1.45	7.67	11.09					11.1	0.6	18	10.6	194.2	1.2	2.78									
ΣDP12 + BASIN RA3	13							7.40	0.91	7.85	7.18					7.2	1.0	18	13.7	31.3	1.5	0.35									
ΣDP10 + DP11 + DP13	14							10.70	3.58	6.85	24.52					24.5	0.5	24	20.8	107.2	1.1	1.68									
ΣDP14 + BASIN C	15							12.38	4.68	6.44	30.12					30.1	0.5	24	20.8	68.2	1.1	1.07									
ΣDP16 + BASIN RA5	17							7.24	0.80	7.91	6.34					6.3	0.5	18	9.7	40.5	1.1	0.64									
ΣDP17 + DP15 + BASIN RA6	18							13.45	5.59	6.21	34.69					34.7	0.5	24	20.8	58.1	1.1	0.91									
TOTAL OUTFLOW TO POND	19							14.37	5.95	6.02	35.81																				
OFFSITE AREA GOING TO EX POND																															
EX-1		0.43	0.65	8.05	0.28	7.63	2.13									0.0	3.0	24	50.9	521.4	2.6	3.34									
EX-2		2.38	0.89	5.23	2.13	8.71	18.54																								
ΣBASIN EX-1 + BASIN EX-2	20							8.05	2.41	7.63	18.36																				
OUTFLOW FROM POND							7.03									7.0	0.5	24	20.8	35.6	1.1	0.56								Outflow from UD_Detention Spreadsheet	
ΣOUTFLOW FROM POND + DP16	21										25.39																			Combined Flows from Proposed Detention Pond and Existing Basins Conservatively Summed	
OS-1		0.05	0.80	5.00	0.04	8.82	0.35																								
OS-2		0.12	0.83	5.00	0.10	8.82	0.88																								
EX-RD		0.58	0.89	12.45	0.52	6.42	3.33																								
ΣBASIN EX-RD + BASIN OS-2	22							12.45	0.62	6.42	3.97																			Flows Captured by Inlet I1 in Dransfeldt	

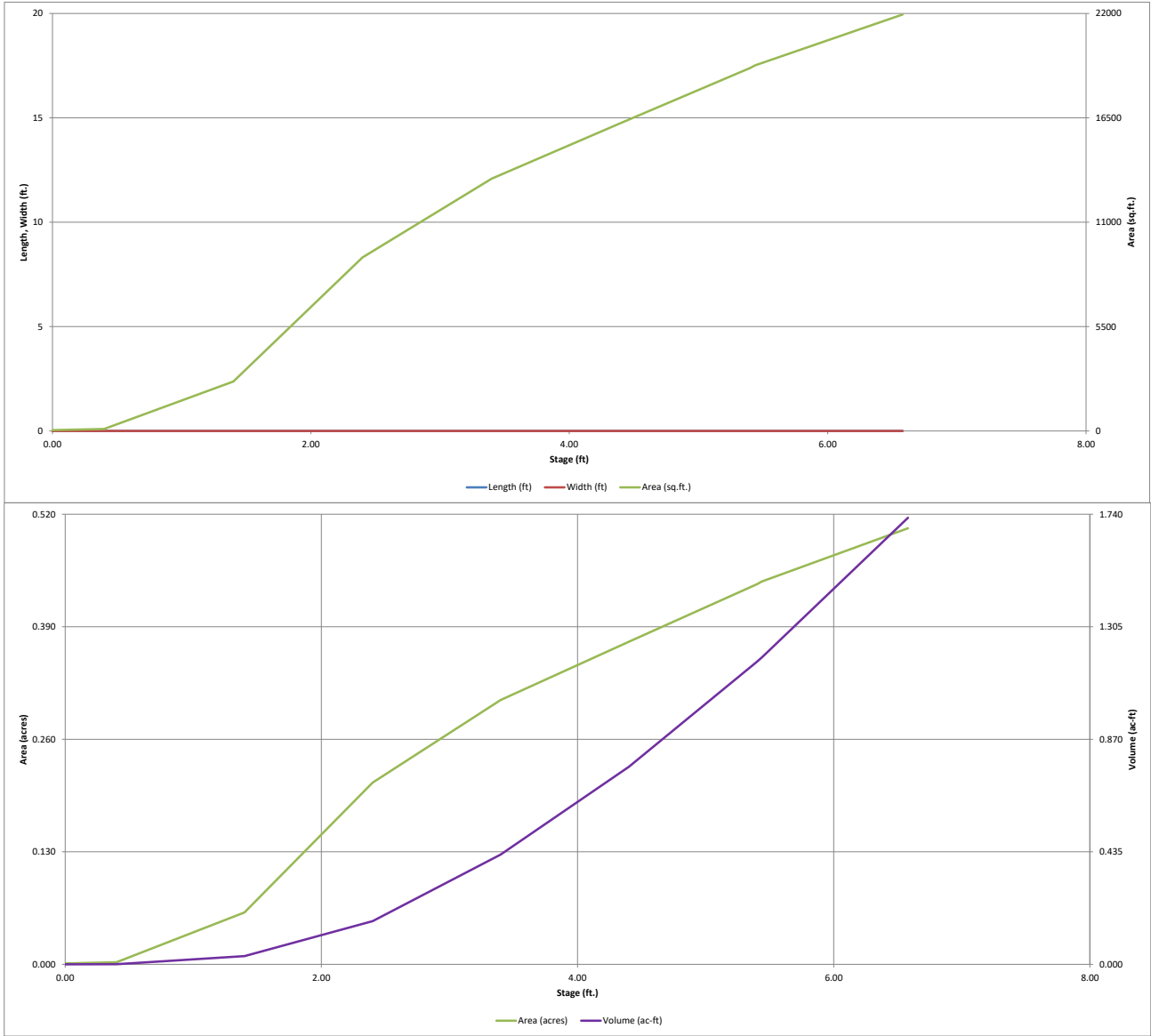
<b>DIRECT RUNOFF SUMMARY TABLE</b>			
<b>BASIN</b>	<b>AREA (AC)</b>	<b>Q<sub>5</sub> (CFS)</b>	<b>Q<sub>100</sub> (CFS)</b>
A	0.74	2.79	5.67
B	1.31	4.73	9.64
C	1.26	4.60	9.36
D	0.81	2.84	5.79
E	0.96	3.30	6.72
F	0.46	1.73	3.52
G	0.69	0.22	2.34
RAB1	0.03	0.11	0.22
RAB2	0.05	0.14	0.32
RB1	0.07	0.20	0.47
RB2	0.07	0.20	0.47
RB3	0.08	0.25	0.55
RA1	0.11	0.34	0.76
RA2	0.11	0.34	0.77
RA3	0.09	0.29	0.66
RA4	0.09	0.29	0.66
RA5	0.12	0.37	0.83
RA6	0.12	0.48	0.97
<b>OFF-SITE</b>			
OS-1	0.05	0.16	0.35
OS-2	0.12	0.40	0.88

## APPENDIX C – Hydraulic Computations



# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

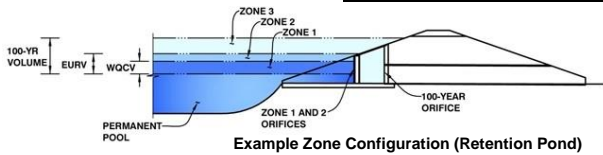
MHFD-Detention, Version 4.05 (January 2022)



# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

**Project:** Lincoln & Dransfeldt  
**Basin ID:** BASINS A - RA6



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.93	0.289	Orifice Plate
Zone 2 (EURV)	4.33	0.445	Orifice Plate
Zone 3 (100-year)	5.10	0.304	Weir&Pipe (Restrict)
<b>Total (all zones)</b>		<b>1.038</b>	

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

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

**Calculated Parameters for Underdrain**  
 Underdrain Orifice Area =  ft<sup>2</sup>  
 Underdrain Orifice Centroid =  feet

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

Centroid of Lowest Orifice =  ft (relative to basin bottom at Stage = 0 ft)  
 Depth at top of Zone using Orifice Plate =  ft (relative to basin bottom at Stage = 0 ft)  
 Orifice Plate: Orifice Vertical Spacing =  inches  
 Orifice Plate: Orifice Area per Row =  sq. inches (diameter = 1-3/16 inches)

**Calculated Parameters for Plate**  
 WQ Orifice Area per Row =  ft<sup>2</sup>  
 Elliptical Half-Width =  feet  
 Elliptical Slot Centroid =  feet  
 Elliptical Slot Area =  ft<sup>2</sup>

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.25	2.50					
Orifice Area (sq. inches)	1.11	1.11	1.11					
	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 =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	inches

**Calculated Parameters for Vertical Orifice**  

	Not Selected	Not Selected	
Vertical Orifice Area =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	ft <sup>2</sup>
Vertical Orifice Centroid =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	<input type="text" value="4.33"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	<input type="text" value="13.90"/>	<input type="text" value="N/A"/>	feet
Overflow Weir Grate Slope =	<input type="text" value="4.00"/>	<input type="text" value="N/A"/>	H:V
Horiz. Length of Weir Sides =	<input type="text" value="2.92"/>	<input type="text" value="N/A"/>	feet
Overflow Grate Type =	<input type="text" value="Close Mesh Grate"/>	<input type="text" value="N/A"/>	
Debris Clogging % =	<input type="text" value="50%"/>	<input type="text" value="N/A"/>	%

**Calculated Parameters for Overflow Weir**  

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H <sub>u</sub> =	<input type="text" value="5.06"/>	<input type="text" value="N/A"/>	feet
Overflow Weir Slope Length =	<input type="text" value="3.01"/>	<input type="text" value="N/A"/>	feet
Grate Open Area / 100-yr Orifice Area =	<input type="text" value="58.08"/>	<input type="text" value="N/A"/>	
Overflow Grate Open Area w/o Debris =	<input type="text" value="33.06"/>	<input type="text" value="N/A"/>	ft <sup>2</sup>
Overflow Grate Open Area w/ Debris =	<input type="text" value="16.53"/>	<input type="text" value="N/A"/>	ft <sup>2</sup>

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	<input type="text" value="2.50"/>	<input type="text" value="N/A"/>	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	<input type="text" value="18.00"/>	<input type="text" value="N/A"/>	inches
Restrictor Plate Height Above Pipe Invert =	<input type="text" value="6.45"/>	<input type="text" value="N/A"/>	inches

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

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	<input type="text" value="0.57"/>	<input type="text" value="N/A"/>	ft <sup>2</sup>
Outlet Orifice Centroid =	<input type="text" value="0.31"/>	<input type="text" value="N/A"/>	feet
Half-Central Angle of Restrictor Plate on Pipe =	<input type="text" value="1.28"/>	<input type="text" value="N/A"/>	radians

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

Spillway Invert Stage =	<input type="text" value="5.11"/>	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	<input type="text" value="25.00"/>	feet
Spillway End Slopes =	<input type="text" value="4.00"/>	H:V
Freeboard above Max Water Surface =	<input type="text" value="1.00"/>	feet

**Calculated Parameters for Spillway**  

Spillway Design Flow Depth =	<input type="text" value="0.47"/>	feet
Stage at Top of Freeboard =	<input type="text" value="6.58"/>	feet
Basin Area at Top of Freeboard =	<input type="text" value="0.50"/>	acres
Basin Volume at Top of Freeboard =	<input type="text" value="1.73"/>	acre-ft

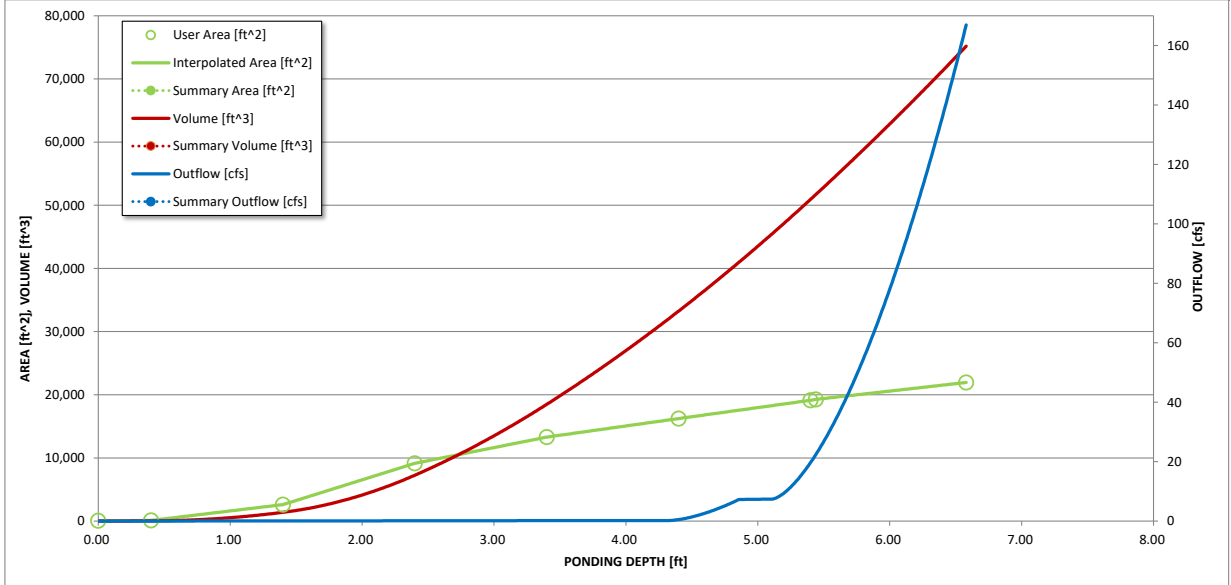
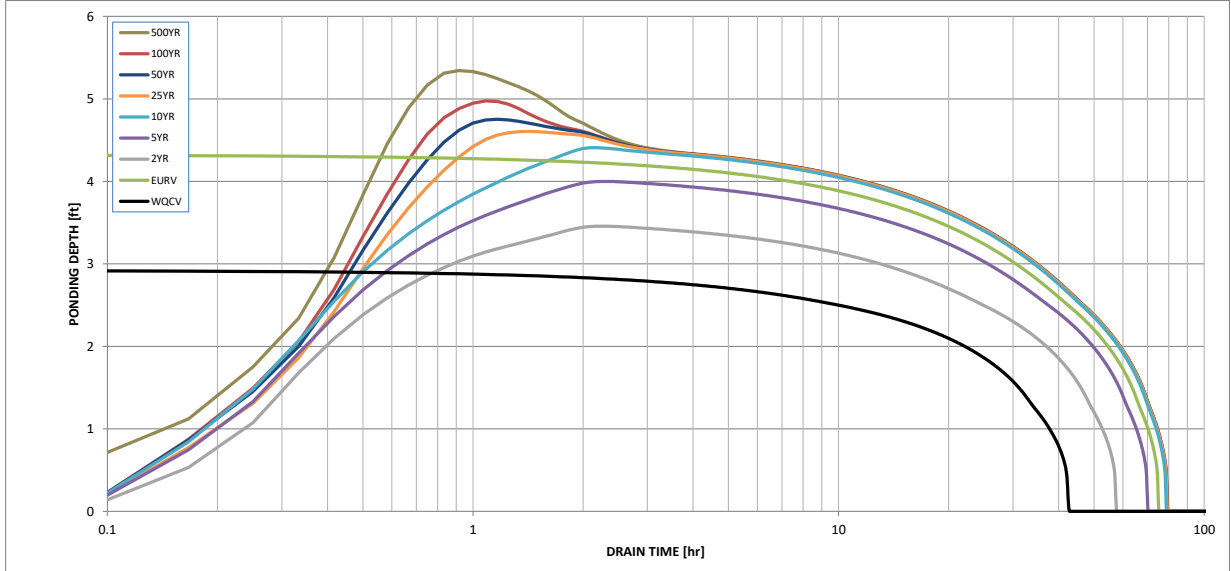
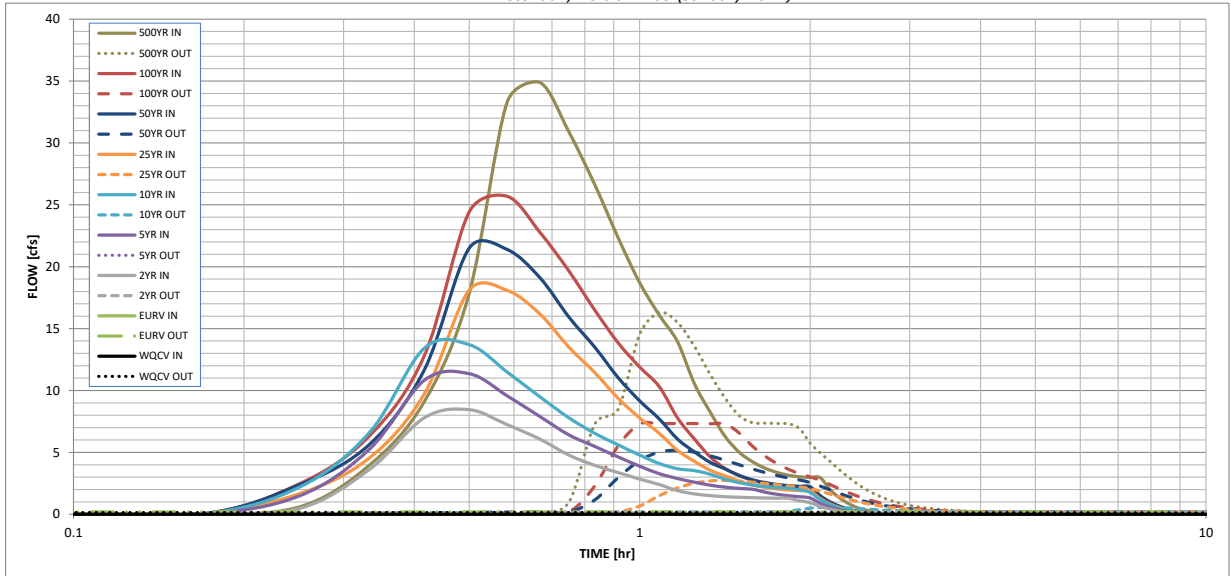
## Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	0.82	1.10	1.34	1.69	1.98	2.29	3.08
One-Hour Rainfall Depth (in) =	N/A	N/A	0.82	1.10	1.34	1.69	1.98	2.29	3.08
CUHP Runoff Volume (acre-ft) =	0.289	0.734	0.467	0.649	0.808	1.043	1.238	1.447	1.978
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.467	0.649	0.808	1.043	1.238	1.447	1.978
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.7	1.9	4.9	6.7	9.1	14.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.09	0.25	0.63	0.86	1.17	1.82
Peak Inflow Q (cfs) =	N/A	N/A	8.5	11.4	13.7	18.1	21.5	25.7	34.9
Peak Outflow Q (cfs) =	0.1	0.2	0.2	0.2	0.6	2.7	5.2	7.33	16.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	0.3	0.6	0.8	0.8	1.2
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.1	0.1	0.2	0.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	67	52	63	70	69	68	67	64
Time to Drain 99% of Inflow Volume (hours) =	41	72	55	67	75	75	75	74	72
Maximum Ponding Depth (ft) =	2.93	4.33	3.46	4.00	4.41	4.61	4.75	4.98	5.34
Area at Maximum Ponding Depth (acres) =	0.26	0.37	0.31	0.35	0.37	0.39	0.40	0.41	0.44
Maximum Volume Stored (acre-ft) =	0.291	0.737	0.440	0.616	0.763	0.839	0.898	0.987	1.143

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.05 (January 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.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	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	0.00	0.00	0.58
	0:15:00	0.00	0.00	0.46	1.47	2.17	1.65	2.36	2.44	3.97
	0:20:00	0.00	0.00	3.63	5.26	6.61	4.56	5.65	6.34	9.11
	0:25:00	0.00	0.00	7.80	10.83	13.42	9.74	11.68	12.82	17.85
	0:30:00	0.00	0.00	8.45	11.36	13.70	18.11	21.50	24.42	33.29
	0:35:00	0.00	0.00	7.24	9.57	11.49	18.09	21.39	25.69	34.88
	0:40:00	0.00	0.00	6.07	7.89	9.48	16.18	19.11	22.77	30.88
	0:45:00	0.00	0.00	4.78	6.41	7.79	13.49	15.93	19.65	26.62
	0:50:00	0.00	0.00	3.95	5.48	6.54	11.44	13.49	16.49	22.32
	0:55:00	0.00	0.00	3.37	4.63	5.61	9.36	11.02	13.84	18.71
	1:00:00	0.00	0.00	2.84	3.89	4.78	7.78	9.16	11.90	16.08
	1:05:00	0.00	0.00	2.40	3.28	4.10	6.54	7.70	10.31	13.93
	1:10:00	0.00	0.00	1.91	2.89	3.68	5.16	6.07	7.78	10.52
	1:15:00	0.00	0.00	1.64	2.59	3.53	4.27	5.04	6.07	8.23
	1:20:00	0.00	0.00	1.50	2.35	3.23	3.55	4.18	4.62	6.26
	1:25:00	0.00	0.00	1.42	2.19	2.83	3.10	3.65	3.69	5.00
	1:30:00	0.00	0.00	1.37	2.09	2.55	2.66	3.13	3.12	4.24
	1:35:00	0.00	0.00	1.34	2.02	2.36	2.36	2.78	2.74	3.71
	1:40:00	0.00	0.00	1.32	1.78	2.24	2.17	2.56	2.49	3.38
	1:45:00	0.00	0.00	1.30	1.61	2.15	2.04	2.41	2.32	3.15
	1:50:00	0.00	0.00	1.29	1.50	2.09	1.96	2.31	2.23	3.03
	1:55:00	0.00	0.00	1.09	1.42	1.98	1.92	2.26	2.20	2.98
	2:00:00	0.00	0.00	0.94	1.32	1.77	1.89	2.22	2.18	2.96
	2:05:00	0.00	0.00	0.64	0.89	1.20	1.28	1.51	1.49	2.02
	2:10:00	0.00	0.00	0.42	0.59	0.80	0.85	1.00	1.00	1.35
	2:15:00	0.00	0.00	0.27	0.38	0.52	0.56	0.66	0.66	0.89
	2:20:00	0.00	0.00	0.17	0.23	0.33	0.35	0.42	0.41	0.56
	2:25:00	0.00	0.00	0.10	0.15	0.20	0.23	0.27	0.26	0.36
	2:30:00	0.00	0.00	0.05	0.08	0.11	0.13	0.15	0.15	0.20
	2:35:00	0.00	0.00	0.02	0.04	0.05	0.06	0.07	0.07	0.09
	2:40:00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.03
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	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	



# Channel Report

## Emergency Spillway Analysis

### Trapezoidal

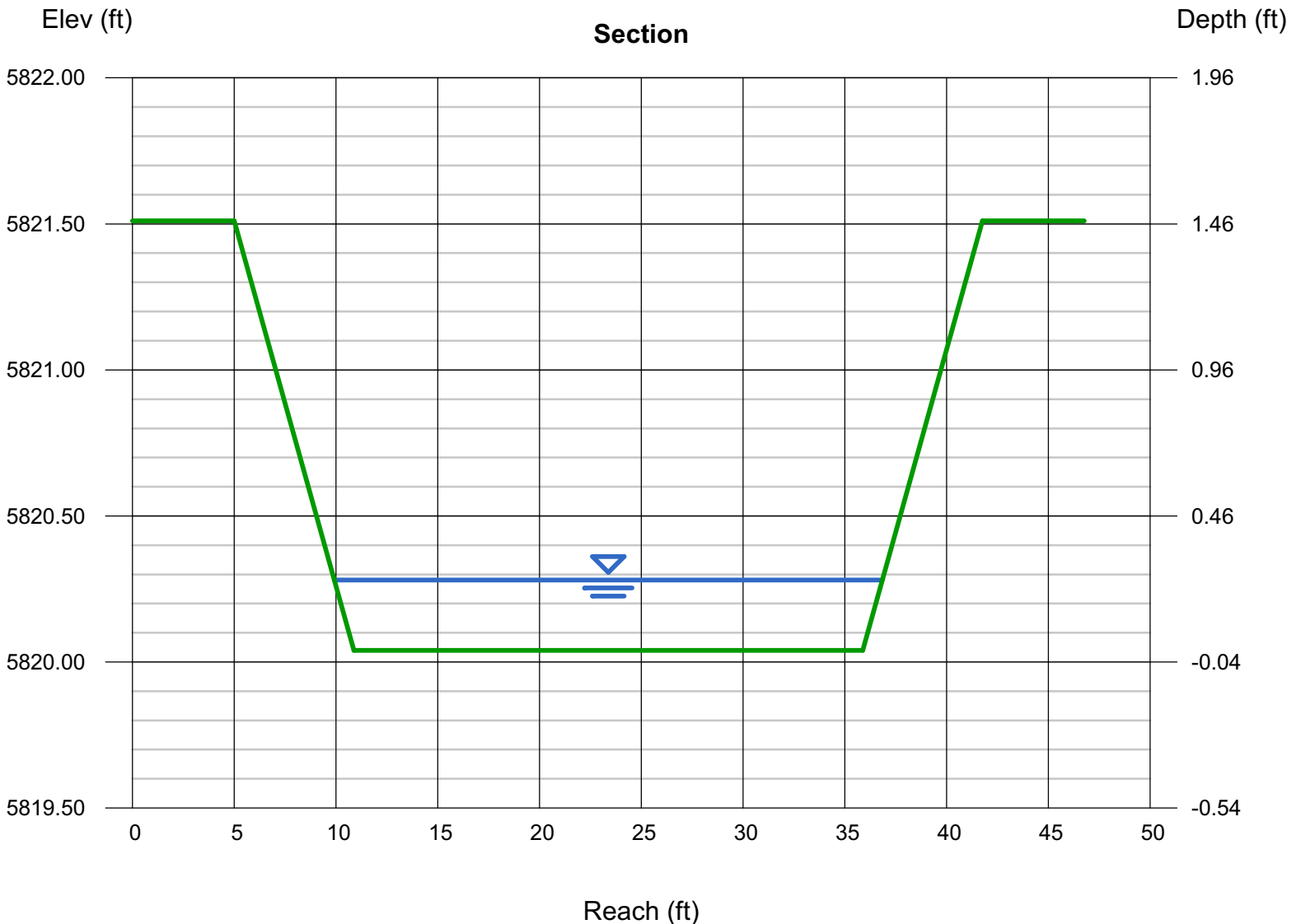
Bottom Width (ft) = 25.00  
Side Slopes (z:1) = 4.00, 4.00  
Total Depth (ft) = 1.47  
Invert Elev (ft) = 5820.04  
Slope (%) = 2.50  
N-Value = 0.020

### Highlighted

Depth (ft) = 0.24  
Q (cfs) = 25.70  
Area (sqft) = 6.23  
Velocity (ft/s) = 4.12  
Wetted Perim (ft) = 26.98  
Crit Depth,  $Y_c$  (ft) = 0.32  
Top Width (ft) = 26.92  
EGL (ft) = 0.50

### Calculations

Compute by: Known Q  
Known Q (cfs) = 25.70



**Design Procedure Form: Extended Detention Basin (EDB)**

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 3

**Designer:** Brad Weaverling  
**Company:** Harris Kocher Smith  
**Date:** October 20, 2022  
**Project:** Lincoln & Dransfeldt  
**Location:** Tower of Parker Colorado

<p>1. Basin Storage Volume</p> <p>A) Effective Imperviousness of Tributary Area, <math>I_a</math></p> <p>B) Tributary Area's Imperviousness Ratio (<math>i = I_a / 100</math>)</p> <p>C) Contributing Watershed Area</p> <p>D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm</p> <p>E) Design Concept (Select EURV when also designing for flood control)</p> <p>F) Design Volume (WQCV) Based on 40-hour Drain Time (<math>V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area)</math>)</p> <p>G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume (<math>V_{WQCV\ OTHER} = (d_c * V_{DESIGN} / 0.43)</math>)</p> <p>H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)</p> <p>I) NRCS Hydrologic Soil Groups of Tributary Watershed              i) Percentage of Watershed consisting of Type A Soils              ii) Percentage of Watershed consisting of Type B Soils              iii) Percentage of Watershed consisting of Type C/D Soils</p> <p>J) Excess Urban Runoff Volume (EURV) Design Volume              For HSG A: <math>EURV_A = 1.68 * i^{1.28}</math>              For HSG B: <math>EURV_B = 1.36 * i^{1.08}</math>              For HSG C/D: <math>EURV_{C/D} = 1.20 * i^{1.08}</math></p> <p>K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)</p>	<p><math>I_a = </math> <input type="text" value="95.0"/> %</p> <p><math>i = </math> <input type="text" value="0.950"/></p> <p>Area = <input type="text" value="7.760"/> ac</p> <p><math>d_c = </math> <input type="text" value=""/></p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Choose One</p> <p><input type="radio"/> Water Quality Capture Volume (WQCV)</p> <p><input checked="" type="radio"/> Excess Urban Runoff Volume (EURV)</p> </div> <p><math>V_{DESIGN} = </math> <input type="text" value="0.289"/> ac-ft</p> <p><math>V_{DESIGN\ OTHER} = </math> <input type="text" value=""/></p> <p><math>V_{DESIGN\ USER} = </math> <input type="text" value=""/></p> <p>HSG <sub>A</sub> = <input type="text" value="0"/> %              HSG <sub>B</sub> = <input type="text" value="0"/> %              HSG <sub>C/D</sub> = <input type="text" value="100"/> %</p> <p><math>EURV_{DESIGN} = </math> <input type="text" value="0.734"/> ac-ft</p> <p><math>EURV_{DESIGN\ USER} = </math> <input type="text" value=""/></p>
<p>2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)</p>	<p>L : W = <input type="text" value="2.5"/> : 1</p>
<p>3. Basin Side Slopes</p> <p>A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)</p>	<p>Z = <input type="text" value="4.00"/> ft / ft</p>
<p>4. Inlet</p> <p>A) Describe means of providing energy dissipation at concentrated inflow locations:</p>	<p>_____</p> <p>_____</p> <p>_____</p>
<p>5. Forebay</p> <p>A) Minimum Forebay Volume (<math>V_{MIN} = </math> <input type="text" value="3%"/> of the WQCV)</p> <p>B) Actual Forebay Volume</p> <p>C) Forebay Depth (<math>D_F = </math> <input type="text" value="18"/> inch maximum)</p> <p>D) Forebay Discharge</p> <p>i) Undetained 100-year Peak Discharge</p> <p>ii) Forebay Discharge Design Flow (<math>Q_F = 0.02 * Q_{100}</math>)</p> <p>E) Forebay Discharge Design</p> <p>F) Discharge Pipe Size (minimum 8-inches)</p> <p>G) Rectangular Notch Width</p>	<p><math>V_{MIN} = </math> <input type="text" value="0.009"/> ac-ft</p> <p><math>V_F = </math> <input type="text" value="0.011"/> ac-ft</p> <p><math>D_F = </math> <input type="text" value="18.0"/> in</p> <p><math>Q_{100} = </math> <input type="text" value="25.70"/> cfs</p> <p><math>Q_F = </math> <input type="text" value="0.51"/> cfs</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Choose One</p> <p><input type="radio"/> Berm With Pipe</p> <p><input checked="" type="radio"/> Wall with Rect. Notch</p> <p><input type="radio"/> Wall with V-Notch Weir</p> </div> <p align="right" style="color: blue; font-weight: bold;">Flow too small for berm w/ pipe</p> <p>Calculated <math>D_P = </math> <input type="text" value=""/> in</p> <p>Calculated <math>W_N = </math> <input type="text" value="4.6"/> in</p>

**Design Procedure Form: Extended Detention Basin (EDB)**

**Designer:** Brad Weaverling  
**Company:** Harris Kocher Smith  
**Date:** October 20, 2022  
**Project:** Lincoln & Dransfeldt  
**Location:** Tower of Parker Colorado

<p>6. Trickle Channel</p> <p>A) Type of Trickle Channel</p> <p>F) Slope of Trickle Channel</p>	<div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">             Choose One  <input checked="" type="radio"/> Concrete  <input type="radio"/> Soft Bottom         </div> <p>S = <input type="text" value="0.0050"/> ft / ft</p>
<p>7. Micropool and Outlet Structure</p> <p>A) Depth of Micropool (2.5-foot minimum)</p> <p>B) Surface Area of Micropool (10 ft<sup>2</sup> minimum)</p> <p>C) Outlet Type</p> <p>D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)</p> <p>E) Total Outlet Area</p>	<p>D<sub>M</sub> = <input type="text" value="2.5"/> ft</p> <p>A<sub>M</sub> = <input type="text" value="41"/> sq ft</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">             Choose One  <input checked="" type="radio"/> Orifice Plate  <input type="radio"/> Other (Describe):         </div> <hr/> <hr/> <p>D<sub>orifice</sub> = <input type="text" value="1.19"/> inches</p> <p>A<sub>or</sub> = <input type="text" value="3.39"/> square inches</p>
<p>8. Initial Surcharge Volume</p> <p>A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)</p> <p>B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)</p> <p>C) Initial Surcharge Provided Above Micropool</p>	<p>D<sub>IS</sub> = <input type="text" value="4"/> in</p> <p>V<sub>IS</sub> = <input type="text" value="38"/> cu ft</p> <p>V<sub>s</sub> = <input type="text" value="13.6"/> cu ft</p>
<p>9. Trash Rack</p> <p>A) Water Quality Screen Open Area: <math>A_t = A_{or} * 38.5 * (e^{-0.095D})</math></p> <p>B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)</p> <p style="margin-left: 40px;">Other (Y/N): <input type="text" value="N"/></p> <p>C) Ratio of Total Open Area to Total Area (only for type 'Other')</p> <p>D) Total Water Quality Screen Area (based on screen type)</p> <p>E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)</p> <p>F) Height of Water Quality Screen (H<sub>TR</sub>)</p> <p>G) Width of Water Quality Screen Opening (W<sub>opening</sub>) (Minimum of 12 inches is recommended)</p>	<p>A<sub>t</sub> = <input type="text" value="117"/> square inches</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px; text-align: center;"> <i>S.S. Well Screen with 60% Open Area</i> </div> <hr/> <hr/> <p>User Ratio = <input type="text"/></p> <p>A<sub>total</sub> = <input type="text" value="194"/> sq. in.</p> <p>H = <input type="text" value="5.06"/> feet</p> <p>H<sub>TR</sub> = <input type="text" value="89.08"/> inches</p> <p>W<sub>opening</sub> = <input type="text" value="12.0"/> inches</p> <p style="color: red; font-size: small;">VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.</p>

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 3 of 3

Designer: Brad Weaverling  
Company: Harris Kocher Smith  
Date: October 20, 2022  
Project: Lincoln & Dransfeldt  
Location: Tower of Parker Colorado

<p>10. Overflow Embankment</p> <p>A) Describe embankment protection for 100-year and greater overtopping:</p>  <p>B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)</p>	<p>_____</p> <p>_____</p> <p>_____</p> <p>Ze = <input type="text" value="40.00"/> ft / ft</p>
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<p>11. Vegetation</p>	<p>Choose One</p> <p><input type="radio"/> Irrigated</p> <p><input checked="" type="radio"/> Not Irrigated</p>
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<p>12. Access</p> <p>A) Describe Sediment Removal Procedures</p>	<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
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Notes: \_\_\_\_\_

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# INLET MANAGEMENT

Worksheet Protected

INLET NAME	<a href="#">INLET F2 (BASIN RB1)</a>	<a href="#">INLET A3 (BASIN RA4)</a>	<a href="#">INLET B2 (BASIN RA5)</a>
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	On Grade	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)	0.20	0.26	0.37
Major $Q_{Known}$ (cfs)	0.47	0.66	0.83

### 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

<b>Minor Total Design Peak Flow, <math>Q</math> (cfs)</b>	<b>0.2</b>	<b>0.3</b>	<b>0.4</b>
<b>Major Total Design Peak Flow, <math>Q</math> (cfs)</b>	<b>0.5</b>	<b>0.7</b>	<b>0.8</b>
Minor Flow Bypassed Downstream, $Q_b$ (cfs)	N/A	0.0	N/A
Major Flow Bypassed Downstream, $Q_b$ (cfs)	N/A	0.0	N/A

# INLET MANAGEMENT

Worksheet Protected

INLET NAME	INLET C1 (BASIN RA3)	INLET A1 (BASIN RA6)	INLET F1 (BASIN RB2)
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
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)	0.29	0.48	0.20
Major $Q_{Known}$ (cfs)	0.66	0.97	0.47

### 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

<b>Minor Total Design Peak Flow, <math>Q</math> (cfs)</b>	<b>0.3</b>	<b>0.5</b>	<b>0.2</b>
<b>Major Total Design Peak Flow, <math>Q</math> (cfs)</b>	<b>0.7</b>	<b>1.0</b>	<b>0.5</b>
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

# INLET MANAGEMENT

Worksheet Protected

INLET NAME	<a href="#">INLET A6 (BASIN RAB1)</a>	<a href="#">INLET D2 (BASIN RB3)</a>	<a href="#">INLET J2 (BASIN RA1)</a>
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
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)	0.11	0.25	0.34
Major $Q_{Known}$ (cfs)	0.22	0.55	0.76

### 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

<b>Minor Total Design Peak Flow, <math>Q</math> (cfs)</b>	<b>0.1</b>	<b>0.3</b>	<b>0.3</b>
<b>Major Total Design Peak Flow, <math>Q</math> (cfs)</b>	<b>0.2</b>	<b>0.6</b>	<b>0.8</b>
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

# INLET MANAGEMENT

Worksheet Protected

INLET NAME	<a href="#">INLET J1 (BASIN RA2)</a>	<a href="#">INLET D4 (BASIN RAB2)</a>	<a href="#">INLET I1 (DP 22)</a>
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
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)	0.34	0.14	1.97
Major $Q_{Known}$ (cfs)	0.77	0.32	3.97

### 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	
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)			

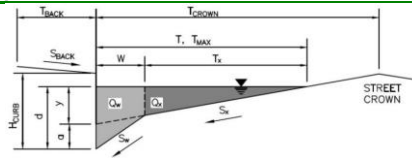
## CALCULATED OUTPUT

<b>Minor Total Design Peak Flow, <math>Q</math> (cfs)</b>	<b>0.3</b>	<b>0.1</b>	<b>2.0</b>
<b>Major Total Design Peak Flow, <math>Q</math> (cfs)</b>	<b>0.8</b>	<b>0.3</b>	<b>4.0</b>
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

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

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

**Project:** LINCOLN & DRANSFELDT  
**Inlet ID:** INLET F2 (BASIN RB1)



**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)  
 Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} = 5.0$  ft  
 $S_{BACK} = 0.015$  ft/ft  
 $n_{BACK} = 0.013$

$H_{CURB} = 6.00$  inches  
 $T_{CROWN} = 15.0$  ft  
 $W = 2.00$  ft  
 $S_X = 0.020$  ft/ft  
 $S_Y = 0.083$  ft/ft  
 $S_0 = 0.000$  ft/ft  
 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	15.0	15.0	ft
$d_{MAX} =$	6.0	12.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

MINOR STORM Allowable Capacity is based on Depth Criterion  
 MAJOR STORM Allowable Capacity is based on Depth Criterion

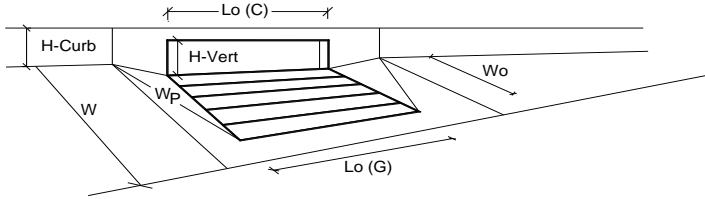
$Q_{allow} =$ 

Minor Storm	Major Storm
<b>SUMP</b>	<b>SUMP</b>

 cfs

# INLET IN A SUMP OR SAG LOCATION

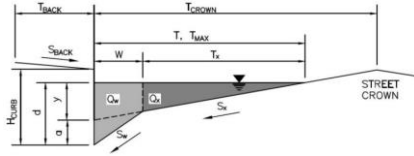
MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	5.1	5.1	inches
<b>Grate Information</b>			
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>			
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>			
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.26	0.26	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.66	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>			
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;0 PEAK)</b>	<b>3.69</b>	<b>3.69</b>	<b>cfs</b>
Q <sub>PEAK REQUIRED</sub>	0.20	0.47	cfs

**ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)**  
 (Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

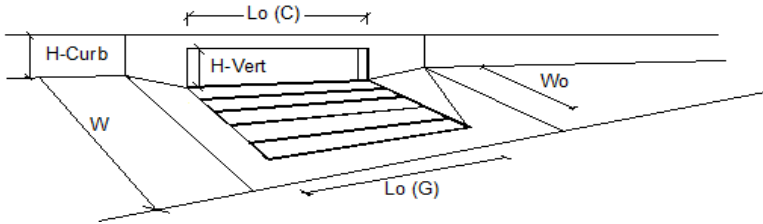
Project: LINCOLN & DRANSFELDT  
 Inlet ID: INLET A3 (BASIN RA4)



<b>Gutter Geometry:</b>									
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 5.0$ ft								
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.015$ 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	$T_{CROWN} = 15.0$ 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	$S_o = 0.010$ ft/ft								
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = 0.016$								
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <tr> <th></th> <th>Minor Storm</th> <th>Major Storm</th> <th></th> </tr> <tr> <td><math>T_{MAX}</math></td> <td>15.0</td> <td>15.0</td> <td>ft</td> </tr> </table>		Minor Storm	Major Storm		$T_{MAX}$	15.0	15.0	ft
	Minor Storm	Major Storm							
$T_{MAX}$	15.0	15.0	ft						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1"> <tr> <th></th> <th>Minor Storm</th> <th>Major Storm</th> <th></th> </tr> <tr> <td><math>d_{MAX}</math></td> <td>6.0</td> <td>12.0</td> <td>inches</td> </tr> </table>		Minor Storm	Major Storm		$d_{MAX}$	6.0	12.0	inches
	Minor Storm	Major Storm							
$d_{MAX}$	6.0	12.0	inches						
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)	<table border="1"> <tr> <th></th> <th>Minor Storm</th> <th>Major Storm</th> </tr> <tr> <td></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table>		Minor Storm	Major Storm		<input type="checkbox"/>	<input type="checkbox"/>		
	Minor Storm	Major Storm							
	<input type="checkbox"/>	<input type="checkbox"/>							
MINOR STORM Allowable Capacity is based on Spread Criterion									
MAJOR STORM Allowable Capacity is based on Spread Criterion									
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'									
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'									
$Q_{allow}$	<table border="1"> <tr> <th></th> <th>Minor Storm</th> <th>Major Storm</th> <th></th> </tr> <tr> <td></td> <td>8.0</td> <td>8.0</td> <td>cfs</td> </tr> </table>		Minor Storm	Major Storm			8.0	8.0	cfs
	Minor Storm	Major Storm							
	8.0	8.0	cfs						

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)

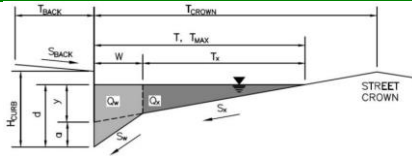


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>			
Total Inlet Interception Capacity	Q = 0.26	Q = 0.66	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q <sub>b</sub> = 0.0	Q <sub>b</sub> = 0.0	cfs
Capture Percentage = Q <sub>i</sub> /Q <sub>s</sub> =	C% = 100	C% = 100	%

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

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

**Project:** LINCOLN & DRANSFELDT  
**Inlet ID:** INLET B2 (BASIN RA5)



**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)  
 Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} = 5.0$  ft  
 $S_{BACK} = 0.015$  ft/ft  
 $n_{BACK} = 0.013$

$H_{CURB} = 6.00$  inches  
 $T_{CROWN} = 18.5$  ft  
 $W = 2.00$  ft  
 $S_X = 0.020$  ft/ft  
 $S_Y = 0.083$  ft/ft  
 $S_0 = 0.000$  ft/ft  
 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	18.5	18.5	ft
$d_{MAX} =$	6.0	12.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

MINOR STORM Allowable Capacity is based on Depth Criterion  
 MAJOR STORM Allowable Capacity is based on Depth Criterion

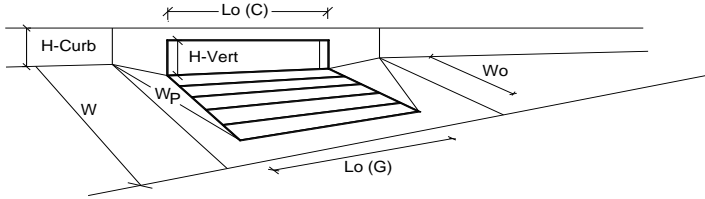
$Q_{allow} =$ 

Minor Storm	Major Storm
<b>SUMP</b>	<b>SUMP</b>

 cfs

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



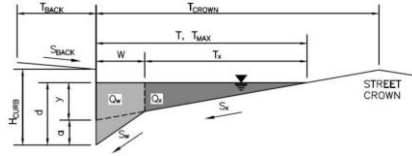
Design Information (Input)	MINOR      MAJOR	
Type of Inlet	CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00
Number of Unit Inlets (Grate or Curb Opening)	1	1
Water Depth at Flowline (outside of local depression)	6.0	6.0
<b>Grate Information</b>	MINOR	MAJOR
Length of a Unit Grate	N/A	N/A
Width of a Unit Grate	N/A	N/A
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A
<b>Curb Opening Information</b>	MINOR	MAJOR
Length of a Unit Curb Opening	5.00	5.00
Height of Vertical Curb Opening in Inches	6.00	6.00
Height of Curb Orifice Throat in Inches	6.00	6.00
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67
<b>Low Head Performance Reduction (Calculated)</b>	MINOR	MAJOR
Depth for Grate Midwidth	N/A	N/A
Depth for Curb Opening Weir Equation	0.33	0.33
Combination Inlet Performance Reduction Factor for Long Inlets	0.76	0.76
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A
Total Inlet Interception Capacity (assumes clogged condition)	5.3	5.3
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;0 PEAK)</b>	0.4	0.8

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

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

Project: LINCOLN & DRANSFELDT

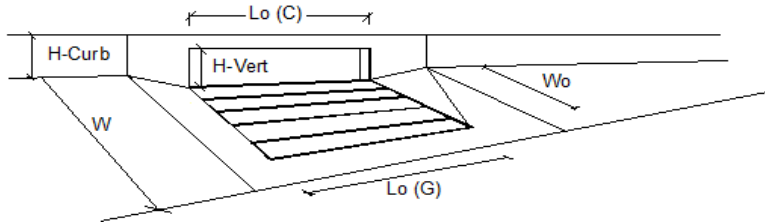
Inlet ID: INLET C1 (BASIN RA3)



<b>Gutter Geometry:</b>									
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 5.0$ ft								
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.015$ 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	$T_{CROWN} = 15.0$ 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)	$S_Y = 0.083$ ft/ft								
Street Longitudinal Slope - Enter 0 for sump condition	$S_O = 0.010$ ft/ft								
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = 0.013$								
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <tr> <th></th> <th>Minor Storm</th> <th>Major Storm</th> <th></th> </tr> <tr> <td><math>T_{MAX}</math></td> <td>15.0</td> <td>15.0</td> <td>ft</td> </tr> </table>		Minor Storm	Major Storm		$T_{MAX}$	15.0	15.0	ft
	Minor Storm	Major Storm							
$T_{MAX}$	15.0	15.0	ft						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1"> <tr> <th></th> <th>Minor Storm</th> <th>Major Storm</th> <th></th> </tr> <tr> <td><math>d_{MAX}</math></td> <td>6.0</td> <td>12.0</td> <td>inches</td> </tr> </table>		Minor Storm	Major Storm		$d_{MAX}$	6.0	12.0	inches
	Minor Storm	Major Storm							
$d_{MAX}$	6.0	12.0	inches						
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)	<table border="1"> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table>	<input type="checkbox"/>	<input type="checkbox"/>						
<input type="checkbox"/>	<input type="checkbox"/>								
MINOR STORM Allowable Capacity is based on Spread Criterion									
MAJOR STORM Allowable Capacity is based on Spread Criterion									
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'									
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'									
$Q_{allow}$	<table border="1"> <tr> <th></th> <th>Minor Storm</th> <th>Major Storm</th> <th></th> </tr> <tr> <td><math>Q_{allow}</math></td> <td>9.8</td> <td>9.8</td> <td>cfs</td> </tr> </table>		Minor Storm	Major Storm		$Q_{allow}$	9.8	9.8	cfs
	Minor Storm	Major Storm							
$Q_{allow}$	9.8	9.8	cfs						

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



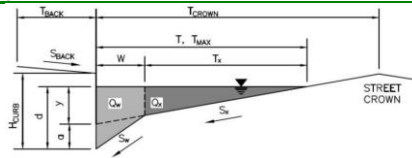
<b>Design Information (Input)</b> Type of Inlet: <span style="border: 1px solid black; padding: 2px;">CDOT Type R Curb Opening</span> Local Depression (additional to continuous gutter depression 'a') Total Number of Units in the Inlet (Grate or Curb Opening) Length of a Single Unit Inlet (Grate or Curb Opening) Width of a Unit Grate (cannot be greater than W, Gutter Width) Clogging Factor for a Single Unit Grate (typical min. value = 0.5) Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;">MINOR</th> <th style="text-align: center;">MAJOR</th> <th></th> </tr> </thead> <tbody> <tr> <td>Type =</td> <td colspan="2" style="text-align: center;">CDOT Type R Curb Opening</td> <td></td> </tr> <tr> <td>a<sub>LOCAL</sub> =</td> <td style="text-align: center;">3.0</td> <td style="text-align: center;">3.0</td> <td style="text-align: right;">inches</td> </tr> <tr> <td>No =</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td></td> </tr> <tr> <td>L<sub>o</sub> =</td> <td style="text-align: center;">5.00</td> <td style="text-align: center;">5.00</td> <td style="text-align: right;">ft</td> </tr> <tr> <td>W<sub>o</sub> =</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">N/A</td> <td style="text-align: right;">ft</td> </tr> <tr> <td>C<sub>r-G</sub> =</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">N/A</td> <td></td> </tr> <tr> <td>C<sub>-C</sub> =</td> <td style="text-align: center;">0.10</td> <td style="text-align: center;">0.10</td> <td></td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;">MINOR</th> <th style="text-align: center;">MAJOR</th> <th></th> </tr> </thead> <tbody> <tr> <td><b>Q</b> =</td> <td style="text-align: center;"><b>0.3</b></td> <td style="text-align: center;"><b>0.7</b></td> <td style="text-align: right;"><b>cfs</b></td> </tr> <tr> <td><b>Q<sub>b</sub></b> =</td> <td style="text-align: center;"><b>0.0</b></td> <td style="text-align: center;"><b>0.0</b></td> <td style="text-align: right;"><b>cfs</b></td> </tr> <tr> <td><b>C%</b> =</td> <td style="text-align: center;"><b>100</b></td> <td style="text-align: center;"><b>100</b></td> <td style="text-align: right;"><b>%</b></td> </tr> </tbody> </table>		MINOR	MAJOR		Type =	CDOT Type R Curb Opening			a <sub>LOCAL</sub> =	3.0	3.0	inches	No =	1	1		L <sub>o</sub> =	5.00	5.00	ft	W <sub>o</sub> =	N/A	N/A	ft	C <sub>r-G</sub> =	N/A	N/A		C <sub>-C</sub> =	0.10	0.10			MINOR	MAJOR		<b>Q</b> =	<b>0.3</b>	<b>0.7</b>	<b>cfs</b>	<b>Q<sub>b</sub></b> =	<b>0.0</b>	<b>0.0</b>	<b>cfs</b>	<b>C%</b> =	<b>100</b>	<b>100</b>	<b>%</b>
	MINOR	MAJOR																																															
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<b>C%</b> =	<b>100</b>	<b>100</b>	<b>%</b>																																														

**Street Hydraulics: OK - Q < Allowable Street Capacity**

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

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

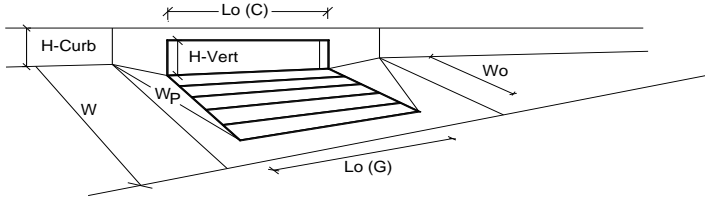
**Project:** LINCOLN & DRANSFELDT  
**Inlet ID:** INLET A1 (BASIN RA6)



<b>Gutter Geometry:</b>													
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="5.0"/> ft												
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.015"/> ft/ft												
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.013"/>												
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches												
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="18.5"/> ft												
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="2.00"/> ft												
Street Transverse Slope	$S_X = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft												
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_Y = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft												
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = $ <input style="width: 50px;" type="text" value="0.000"/> ft/ft												
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.016"/>												
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; font-weight: bold;">Minor Storm</td> <td style="text-align: center; font-weight: bold;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="padding: 5px;"><math>T_{MAX} = </math></td> <td style="border: 1px solid black; text-align: center;"><input style="width: 50px;" type="text" value="18.5"/></td> <td style="border: 1px solid black; text-align: center;"><input style="width: 50px;" type="text" value="18.5"/></td> <td style="text-align: right; padding: 5px;">ft</td> </tr> </table>		Minor Storm	Major Storm		$T_{MAX} = $	<input style="width: 50px;" type="text" value="18.5"/>	<input style="width: 50px;" type="text" value="18.5"/>	ft				
	Minor Storm	Major Storm											
$T_{MAX} = $	<input style="width: 50px;" type="text" value="18.5"/>	<input style="width: 50px;" type="text" value="18.5"/>	ft										
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; font-weight: bold;">Minor Storm</td> <td style="text-align: center; font-weight: bold;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="padding: 5px;"><math>d_{MAX} = </math></td> <td style="border: 1px solid black; text-align: center;"><input style="width: 50px;" type="text" value="6.0"/></td> <td style="border: 1px solid black; text-align: center;"><input style="width: 50px;" type="text" value="12.0"/></td> <td style="text-align: right; padding: 5px;">inches</td> </tr> <tr> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> </table>		Minor Storm	Major Storm		$d_{MAX} = $	<input style="width: 50px;" type="text" value="6.0"/>	<input style="width: 50px;" type="text" value="12.0"/>	inches		<input type="checkbox"/>	<input type="checkbox"/>	
	Minor Storm	Major Storm											
$d_{MAX} = $	<input style="width: 50px;" type="text" value="6.0"/>	<input style="width: 50px;" type="text" value="12.0"/>	inches										
	<input type="checkbox"/>	<input type="checkbox"/>											
Check boxes are not applicable in SUMP conditions													
<a href="#">MINOR STORM Allowable Capacity is based on Depth Criterion</a>													
<a href="#">MAJOR STORM Allowable Capacity is based on Depth Criterion</a>													
$Q_{allow} = $	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; font-weight: bold;">Minor Storm</td> <td style="text-align: center; font-weight: bold;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td></td> <td style="border: 1px solid black; text-align: center; font-weight: bold;">SUMP</td> <td style="border: 1px solid black; text-align: center; font-weight: bold;">SUMP</td> <td style="text-align: right; padding: 5px;">cfs</td> </tr> </table>		Minor Storm	Major Storm			SUMP	SUMP	cfs				
	Minor Storm	Major Storm											
	SUMP	SUMP	cfs										

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



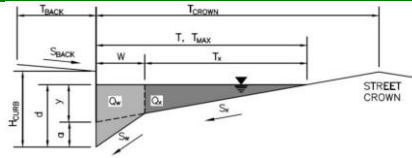
Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	6.0	6.0	inches
<b>Grate Information</b>			
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>			
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>			
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.76	0.76	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	<b>5.3</b>	<b>5.3</b>	cfs
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;0 PEAK)</b>	0.5	1.0	cfs

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

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

**Project:** LINCOLN & DRANSFELDT

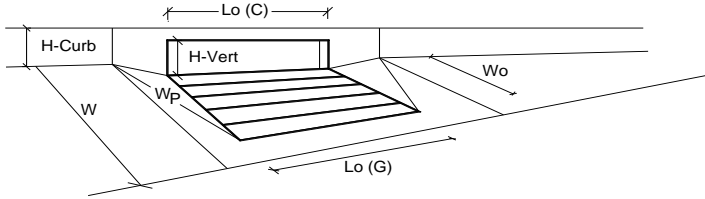
**Inlet ID:** INLET F1 (BASIN RB2)



<b>Gutter Geometry:</b>						
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 5.0$ ft					
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.015$ 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	$T_{CROWN} = 15.0$ 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)	$S_Y = 0.083$ ft/ft					
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = 0.000$ ft/ft					
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = 0.016$					
Max. Allowable Spread for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;">Minor Storm</td> <td style="text-align: center;">Major Storm</td> <td rowspan="2" style="text-align: center;">ft</td> </tr> <tr> <td style="text-align: center;"><math>T_{MAX} = 15.0</math></td> <td style="text-align: center;"><math>15.0</math></td> </tr> </table>	Minor Storm	Major Storm	ft	$T_{MAX} = 15.0$	$15.0$
Minor Storm	Major Storm	ft				
$T_{MAX} = 15.0$	$15.0$					
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;">Minor Storm</td> <td style="text-align: center;">Major Storm</td> <td rowspan="2" style="text-align: center;">inches</td> </tr> <tr> <td style="text-align: center;"><math>d_{MAX} = 6.0</math></td> <td style="text-align: center;"><math>12.0</math></td> </tr> </table>	Minor Storm	Major Storm	inches	$d_{MAX} = 6.0$	$12.0$
Minor Storm	Major Storm	inches				
$d_{MAX} = 6.0$	$12.0$					
Check boxes are not applicable in SUMP conditions	<input type="checkbox"/> <input type="checkbox"/>					
MINOR STORM Allowable Capacity is based on Depth Criterion						
MAJOR STORM Allowable Capacity is based on Depth Criterion						
<b>Q<sub>allow</sub></b>	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;">Minor Storm</td> <td style="text-align: center;">Major Storm</td> <td rowspan="2" style="text-align: center;">cfs</td> </tr> <tr> <td style="text-align: center;"><b>SUMP</b></td> <td style="text-align: center;"><b>SUMP</b></td> </tr> </table>	Minor Storm	Major Storm	cfs	<b>SUMP</b>	<b>SUMP</b>
Minor Storm	Major Storm	cfs				
<b>SUMP</b>	<b>SUMP</b>					

# INLET IN A SUMP OR SAG LOCATION

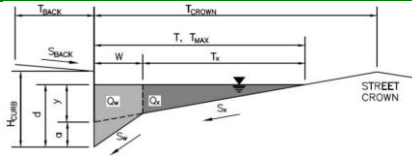
MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	5.1	5.1	inches
<b>Grate Information</b>			
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>			
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>			
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.26	0.26	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.66	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>			
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;0 PEAK)</b>	<b>3.7</b>	<b>3.7</b>	<b>cfs</b>
Q PEAK REQUIRED =	0.2	0.5	cfs

**ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)**  
 (Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

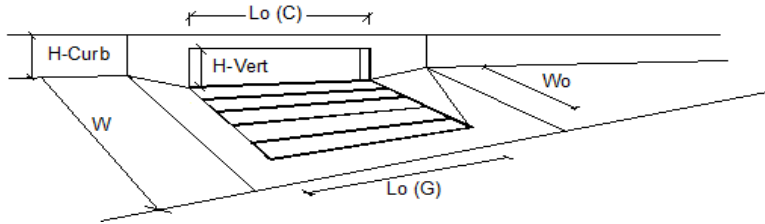
Project: LINCOLN & DRANSFELDT  
 Inlet ID: INLET A6 (BASIN RAB1)



<b>Gutter Geometry:</b>	
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 5.0$ ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.015$ 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	$T_{CROWN} = 15.0$ 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	$S_0 = 0.023$ ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = 0.016$
Max. Allowable Spread for Minor & Major Storm	$T_{MAX} = \begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ 15.0 & 15.0 \end{matrix}$ ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	$d_{MAX} = \begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ 6.0 & 12.0 \end{matrix}$ inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)	<input type="checkbox"/> <input type="checkbox"/>
<a href="#">MINOR STORM Allowable Capacity is based on Spread Criterion</a>	
<a href="#">MAJOR STORM Allowable Capacity is based on Spread Criterion</a>	
<b>Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b>	
<b>Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b>	
$Q_{allow} =$	$\begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ 12.1 & 12.1 \end{matrix}$ cfs

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)

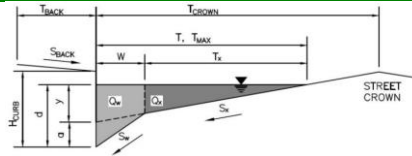


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>			
Total Inlet Interception Capacity	Q = 0.1	Q = 0.2	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q <sub>b</sub> = 0.0	Q <sub>b</sub> = 0.0	cfs
Capture Percentage = Q <sub>i</sub> /Q <sub>s</sub> =	C% = 100	C% = 100	%

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

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

**Project:** LINCOLN & DRANSFELDT  
**Inlet ID:** INLET D2 (BASIN RB3)



**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)  
 Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} = 5.0$  ft  
 $S_{BACK} = 0.015$  ft/ft  
 $n_{BACK} = 0.013$

$H_{CURB} = 6.00$  inches  
 $T_{CROWN} = 15.0$  ft  
 $W = 2.00$  ft  
 $S_X = 0.020$  ft/ft  
 $S_W = 0.083$  ft/ft  
 $S_0 = 0.000$  ft/ft  
 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	15.0	15.0	ft
$d_{MAX} =$	6.0	12.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

MINOR STORM Allowable Capacity is based on Depth Criterion  
 MAJOR STORM Allowable Capacity is based on Depth Criterion

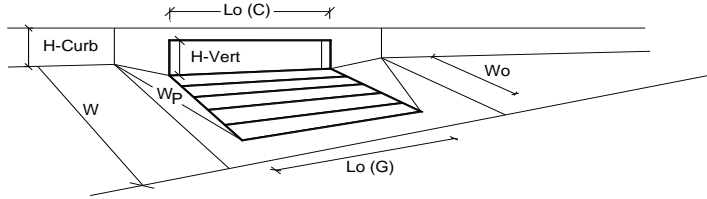
$Q_{allow} =$ 

Minor Storm	Major Storm
<b>SUMP</b>	<b>SUMP</b>

 cfs

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)

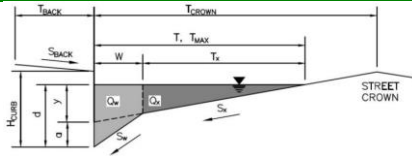


Design Information (Input)	MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a' from above)	3.00		3.00	
Number of Unit Inlets (Grate or Curb Opening)	1		1	
Water Depth at Flowline (outside of local depression)	5.1		5.1	
<b>Grate Information</b>				
Length of a Unit Grate	N/A		N/A	
Width of a Unit Grate	N/A		N/A	
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A		N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A		N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A		N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A		N/A	
<b>Curb Opening Information</b>				
Length of a Unit Curb Opening	5.00		5.00	
Height of Vertical Curb Opening in Inches	6.00		6.00	
Height of Curb Orifice Throat in Inches	6.00		6.00	
Angle of Throat (see USDCM Figure ST-5)	63.40		63.40	
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00		2.00	
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10		0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60		3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67		0.67	
<b>Low Head Performance Reduction (Calculated)</b>				
Depth for Grate Midwidth	N/A		N/A	
Depth for Curb Opening Weir Equation	0.26		0.26	
Combination Inlet Performance Reduction Factor for Long Inlets	0.66		0.66	
Curb Opening Performance Reduction Factor for Long Inlets	1.00		1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A		N/A	
Total Inlet Interception Capacity (assumes clogged condition)	3.7		3.7	
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;0 PEAK)</b>	0.3		0.6	

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

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

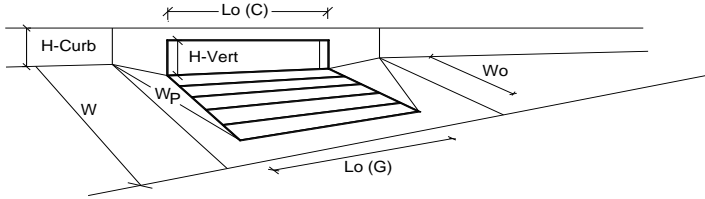
**Project:** LINCOLN & DRANSFELDT  
**Inlet ID:** INLET J2 (BASIN RA1)



<b>Gutter Geometry:</b>						
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 5.0$ ft					
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.015$ 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	$T_{CROWN} = 15.0$ 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)	$S_Y = 0.083$ ft/ft					
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = 0.000$ ft/ft					
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = 0.016$					
Max. Allowable Spread for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;">Minor Storm</td> <td style="text-align: center;">Major Storm</td> <td rowspan="2" style="text-align: center;">ft</td> </tr> <tr> <td style="text-align: center;"><math>T_{MAX} = 15.0</math></td> <td style="text-align: center;"><math>T_{MAX} = 15.0</math></td> </tr> </table>	Minor Storm	Major Storm	ft	$T_{MAX} = 15.0$	$T_{MAX} = 15.0$
Minor Storm	Major Storm	ft				
$T_{MAX} = 15.0$	$T_{MAX} = 15.0$					
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;">Minor Storm</td> <td style="text-align: center;">Major Storm</td> <td rowspan="2" style="text-align: center;">inches</td> </tr> <tr> <td style="text-align: center;"><math>d_{MAX} = 6.0</math></td> <td style="text-align: center;"><math>d_{MAX} = 12.0</math></td> </tr> </table>	Minor Storm	Major Storm	inches	$d_{MAX} = 6.0$	$d_{MAX} = 12.0$
Minor Storm	Major Storm	inches				
$d_{MAX} = 6.0$	$d_{MAX} = 12.0$					
Check boxes are not applicable in SUMP conditions	<input type="checkbox"/> <input type="checkbox"/>					
MINOR STORM Allowable Capacity is based on Depth Criterion						
MAJOR STORM Allowable Capacity is based on Depth Criterion						
<b>Q<sub>allow</sub></b>	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;">Minor Storm</td> <td style="text-align: center;">Major Storm</td> <td rowspan="2" style="text-align: center;">cfs</td> </tr> <tr> <td style="text-align: center;"><b>SUMP</b></td> <td style="text-align: center;"><b>SUMP</b></td> </tr> </table>	Minor Storm	Major Storm	cfs	<b>SUMP</b>	<b>SUMP</b>
Minor Storm	Major Storm	cfs				
<b>SUMP</b>	<b>SUMP</b>					

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)

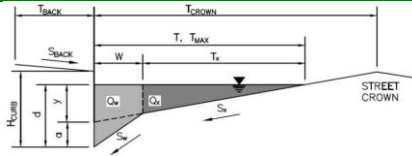


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	5.1	5.1	inches
<b>Grate Information</b>			
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>			
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>			
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.26	0.26	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.66	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	3.7	3.7	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>0 PEAK)	0.3	0.8	cfs

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

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

**Project:** LINCOLN & DRANSFELDT  
**Inlet ID:** INLET J1 (BASIN RA2)



**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)  
 Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

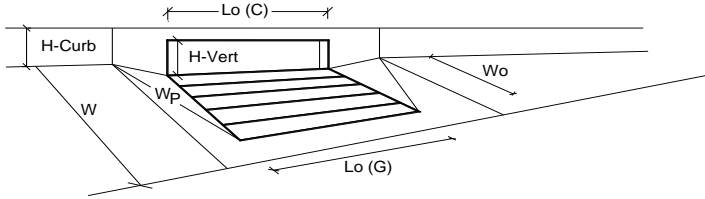
$T_{BACK}$ =	5.0	ft	
$S_{BACK}$ =	0.015	ft/ft	
$n_{BACK}$ =	0.013		
$H_{CURB}$ =	6.00	inches	
$T_{CROWN}$ =	15.0	ft	
$W$ =	2.00	ft	
$S_x$ =	0.020	ft/ft	
$S_y$ =	0.083	ft/ft	
$S_o$ =	0.000	ft/ft	
$n_{STREET}$ =	0.016		
$T_{MAX}$ =	15.0	15.0	ft
$d_{MAX}$ =	6.0	12.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	
$Q_{allow}$ =	Minor Storm	Major Storm	
	<b>SUMP</b>	<b>SUMP</b>	cfs

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Check boxes are not applicable in SUMP conditions

[MINOR STORM Allowable Capacity is based on Depth Criterion](#)  
[MAJOR STORM Allowable Capacity is based on Depth Criterion](#)

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)

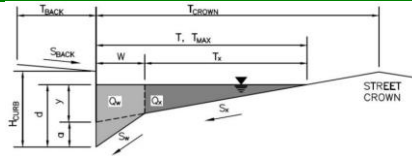


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	5.1	5.1	inches
<b>Grate Information</b>			
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>			
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>			
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.26	0.26	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.66	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	<b>3.7</b>	<b>3.7</b>	<b>cfs</b>
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;0 PEAK)</b>	0.3	0.8	cfs

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

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

**Project:** LINCOLN & DRANSFELDT  
**Inlet ID:** INLET D4 (BASIN RAB2)



**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)  
 Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK}$	=	5.0	ft
$S_{BACK}$	=	0.015	ft/ft
$n_{BACK}$	=	0.013	
$H_{CURB}$	=	6.00	inches
$T_{CROWN}$	=	15.0	ft
$W$	=	2.00	ft
$S_x$	=	0.020	ft/ft
$S_w$	=	0.083	ft/ft
$S_o$	=	0.000	ft/ft
$n_{STREET}$	=	0.016	

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Check boxes are not applicable in SUMP conditions

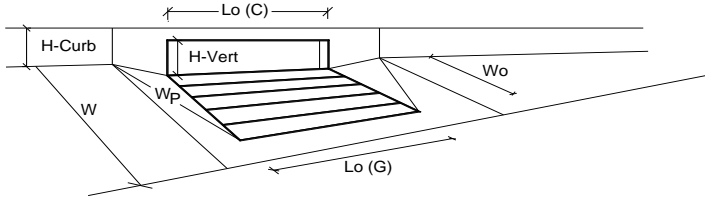
		Minor Storm	Major Storm	
$T_{MAX}$	=	15.0	15.0	ft
$d_{MAX}$	=	6.0	12.0	inches
		<input type="checkbox"/>	<input type="checkbox"/>	

MINOR STORM Allowable Capacity is based on Depth Criterion  
 MAJOR STORM Allowable Capacity is based on Depth Criterion

		Minor Storm	Major Storm
$Q_{allow}$	=	SUMP	SUMP
			cfs

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)

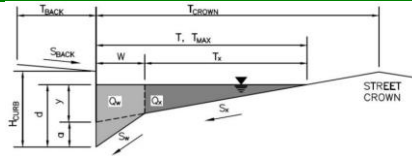


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	5.1	5.1	inches
<b>Grate Information</b>			
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>			
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>			
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.26	0.26	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.66	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	3.7	3.7	cfs
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;0 PEAK)</b>	0.1	0.3	cfs

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

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

**Project:** LINCOLN & DRANSFELDT  
**Inlet ID:** INLET I1 (DP 22)



**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)  
 Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK}$ =	5.0	ft
$S_{BACK}$ =		ft/ft
$n_{BACK}$ =		
$H_{CURB}$ =	6.00	inches
$T_{CROWN}$ =	38.8	ft
$W$ =	2.00	ft
$S_X$ =	0.040	ft/ft
$S_Y$ =	0.083	ft/ft
$S_0$ =	0.000	ft/ft
$n_{STREET}$ =	0.016	

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Check boxes are not applicable in SUMP conditions

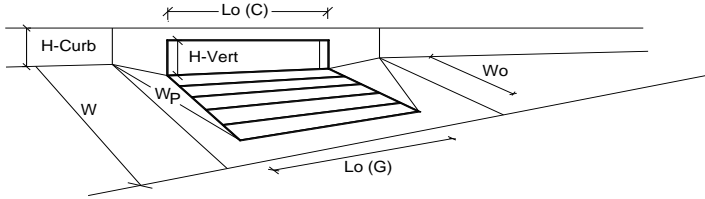
	Minor Storm	Major Storm	
$T_{MAX}$ =	10.5	38.0	ft
$d_{MAX}$ =	6.0	12.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

[MINOR STORM Allowable Capacity is based on Depth Criterion](#)  
[MAJOR STORM Allowable Capacity is based on Depth Criterion](#)

	Minor Storm	Major Storm	
$Q_{allow}$ =	<b>SUMP</b>	<b>SUMP</b>	cfs

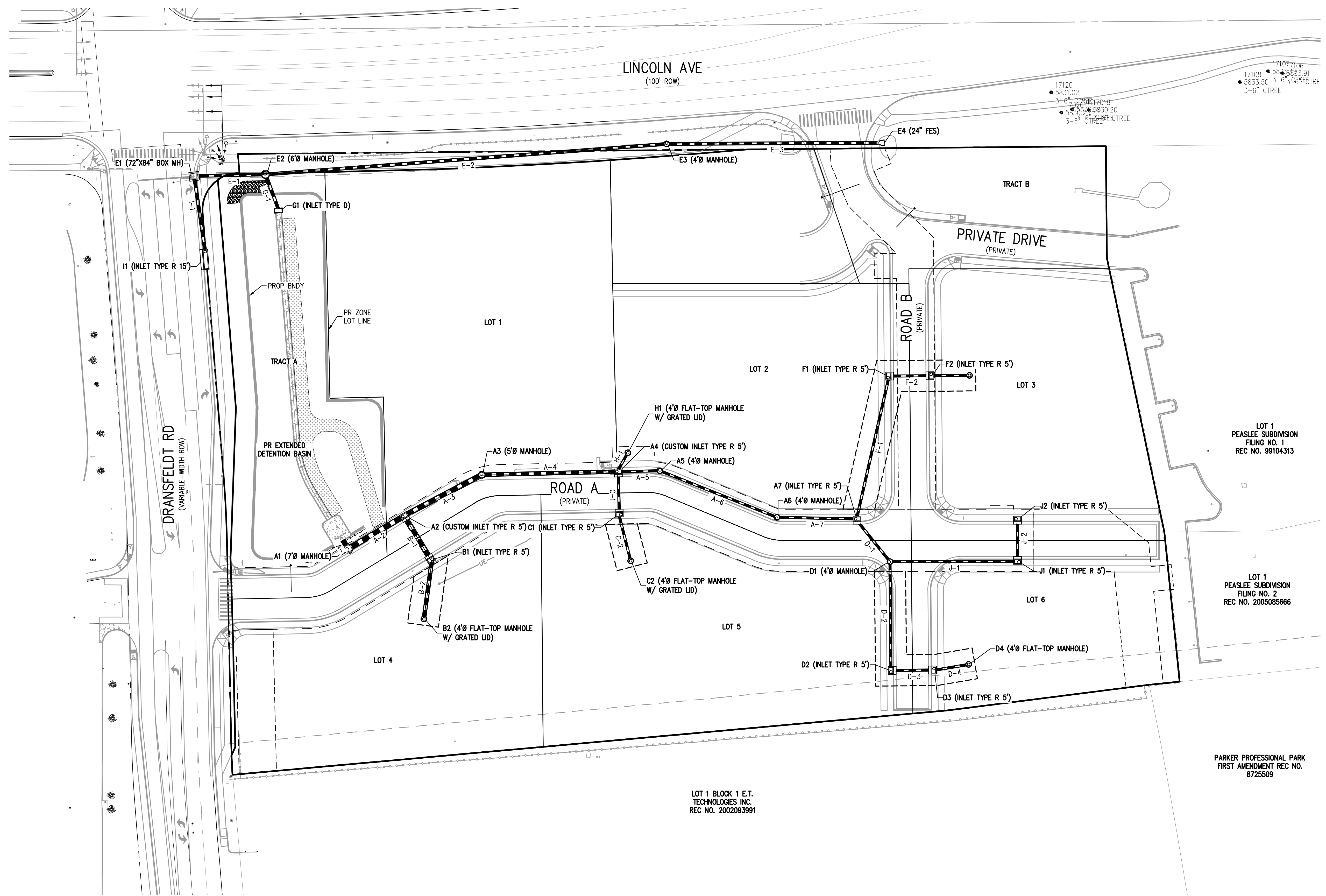
# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	MINOR      MAJOR	
Type of Inlet: <span style="border: 1px solid black; padding: 2px;">CDOT Type R Curb Opening</span>	<b>CDOT Type R Curb Opening</b>	
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00
Number of Unit Inlets (Grate or Curb Opening)	3	3
Water Depth at Flowline (outside of local depression)	6.0	12.0
<b>Grate Information</b>	MINOR	MAJOR
Length of a Unit Grate	N/A	N/A
Width of a Unit Grate	N/A	N/A
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A
<b>Curb Opening Information</b>	MINOR	MAJOR
Length of a Unit Curb Opening	10.00	10.00
Height of Vertical Curb Opening in Inches	6.00	6.00
Height of Curb Orifice Throat in Inches	6.00	6.00
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67
<b>Low Head Performance Reduction (Calculated)</b>	MINOR	MAJOR
Depth for Grate Midwidth	N/A	N/A
Depth for Curb Opening Weir Equation	0.33	0.83
Combination Inlet Performance Reduction Factor for Long Inlets	0.57	1.00
Curb Opening Performance Reduction Factor for Long Inlets	0.79	1.00
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A
Total Inlet Interception Capacity (assumes clogged condition)	<b>21.8</b>	<b>79.9</b>
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;0 PEAK)</b>	2.0	4.0

NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT WRITTEN PERMISSION OF HARRIS KOCHER SMITH.



17107106  
 17108 5833.91  
 5833.50 3-6" TREE  
 17120 5831.02  
 3-6" TREE  
 5830.20  
 5830.20  
 3-6" TREE

LOT 1  
 PEASLEE SUBDIVISION  
 FILING NO. 1  
 REC NO. 99104313

LOT 1  
 PEASLEE SUBDIVISION  
 FILING NO. 2  
 REC NO. 2005085666

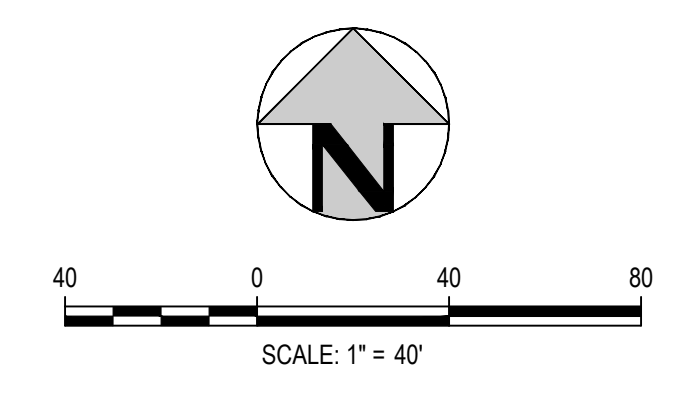
PARKER PROFESSIONAL PARK  
 FIRST AMENDMENT REC NO.  
 8725509

LOT 1 BLOCK 1 E.T.  
 TECHNOLOGIES INC.  
 REC NO. 2002093991

**STORMCAD EXHIBIT**  
 SCALE: 1" = 40'



1120 Lincoln Street, Suite 1000  
 Denver, Colorado 80203  
 P: 303.623.6300 F: 303.623.6311  
 HarrisKocherSmith.com



Project: K:\2008\ENGINEERING\DRAINAGE\STORMCAD\PLAN DWG Layout 19 OVERALL UTILITY PLAN  
 Date: 10/20/10 10:23:15 AM By: Chris MacCroskey

**FlexTable: Conduit Table**  
**Active Scenario: 5 YR**

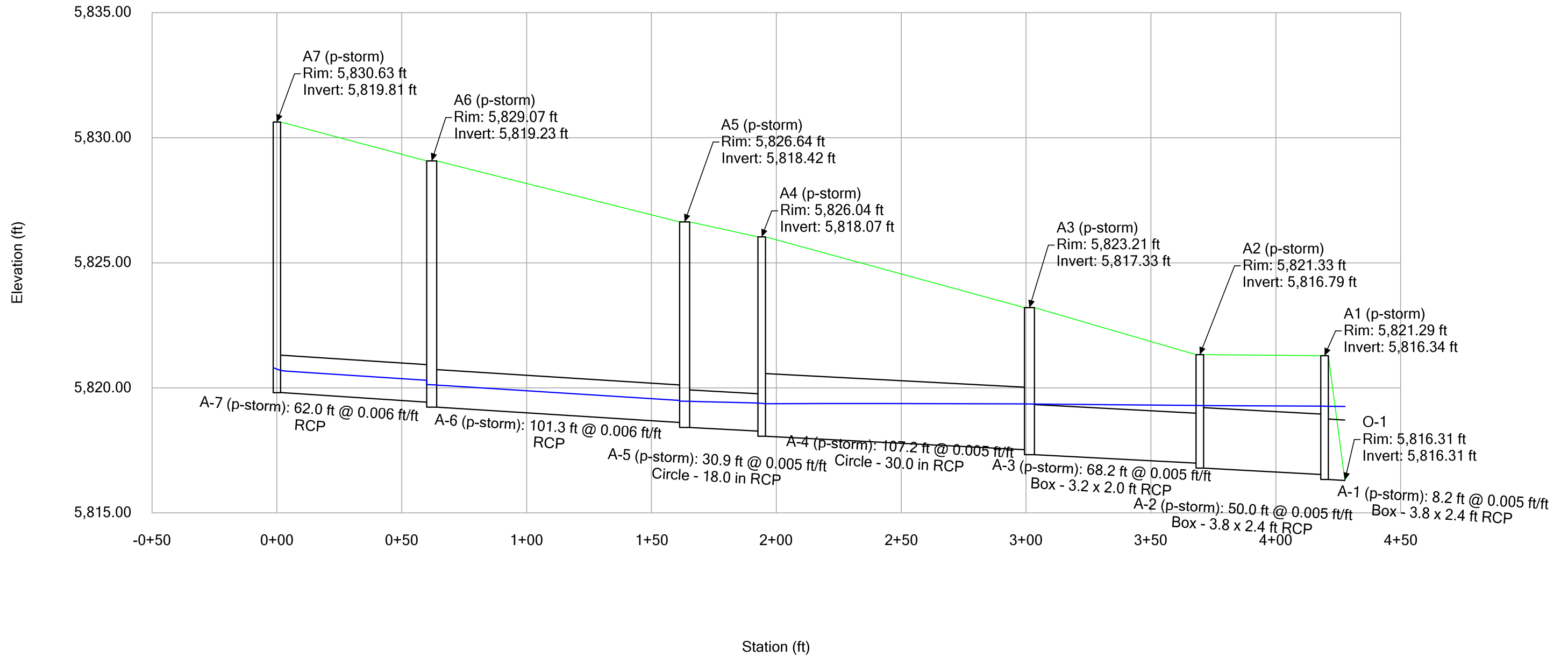
Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Out) (ft)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Notes
F-3 (p-storm)	F3 (p-storm)	5,823.27	F2 (p-storm)	5,823.12	29.3	0.005	18.0	0.013	2.79	3.90	0.92	7.43	37.6	18" RCP
D-1 (p-storm)	D1 (p-storm)	5,820.22	A7 (p-storm)	5,820.01	42.2	0.005	18.0	0.013	2.50	3.79	0.81	7.43	33.7	18" RCP
A-7 (p-storm)	A7 (p-storm)	5,819.81	A6 (p-storm)	5,819.43	62.0	0.006	18.0	0.013	5.30	4.95	0.87	8.24	64.3	18" RCP
F-1 (p-storm)	F1 (p-storm)	5,822.75	A7 (p-storm)	5,820.01	113.6	0.024	18.0	0.013	3.04	7.06	0.79	16.30	18.6	18" RCP
F-2 (p-storm)	F2 (p-storm)	5,822.92	F1 (p-storm)	5,822.76	31.3	0.005	18.0	0.013	2.92	3.95	1.23	7.43	39.3	18" RCP
D-2 (p-storm)	D2 (p-storm)	5,820.85	D1 (p-storm)	5,820.42	84.9	0.005	18.0	0.013	2.01	3.57	0.53	7.43	27.1	18" RCP
J-1 (p-storm)	J1 (p-storm)	5,823.12	D1 (p-storm)	5,820.42	100.1	0.027	18.0	0.013	0.67	4.72	0.42	17.25	3.9	18" RCP
A-6 (p-storm)	A6 (p-storm)	5,819.23	A5 (p-storm)	5,818.62	101.3	0.006	18.0	0.013	5.30	4.91	0.88	8.15	65.0	18" RCP
J-2 (p-storm)	J2 (p-storm)	5,823.64	J1 (p-storm)	5,823.32	31.3	0.010	18.0	0.013	0.34	2.73	0.18	10.50	3.2	18" RCP
D-4 (p-storm)	D4 (p-storm)	5,821.54	D3 (p-storm)	5,821.40	26.9	0.005	18.0	0.013	1.73	3.43	0.49	7.43	23.3	18" RCP
D-3 (p-storm)	D3 (p-storm)	5,821.20	D2 (p-storm)	5,821.04	31.4	0.005	18.0	0.013	1.83	3.48	0.73	7.43	24.6	18" RCP
A-5 (p-storm)	A5 (p-storm)	5,818.42	A4 (p-storm)	5,818.27	30.9	0.005	18.0	0.013	5.30	4.52	1.13	7.32	72.4	18" RCP
E-3 (p-storm)	E4 (p-storm)	5,824.01	E3 (p-storm)	5,815.73	175.2	0.047	24.0	0.013	8.81	11.85	0.57	49.18	17.9	24" RCP
A-4 (p-storm)	A4 (p-storm)	5,818.07	A3 (p-storm)	5,817.53	107.2	0.005	30.0	0.013	11.86	5.63	1.83	29.11	40.7	24" RCP
C-1 (p-storm)	C1 (p-storm)	5,818.88	A4 (p-storm)	5,818.57	31.3	0.010	18.0	0.013	3.49	5.32	0.83	10.45	33.4	18" RCP
H-1 (p-storm)	H1 (p-storm)	5,818.88	A4 (p-storm)	5,818.57	15.7	0.020	18.0	0.013	4.73	7.43	0.87	14.76	32.1	18" RCP
C-2 (p-storm)	C2 (p-storm)	5,819.45	C1 (p-storm)	5,819.08	36.9	0.010	18.0	0.013	3.30	5.26	0.73	10.52	31.4	18" RCP
E-2 (p-storm)	E3 (p-storm)	5,815.53	E2 (p-storm)	5,811.86	323.4	0.011	24.0	0.013	8.81	7.08	0.84	24.10	36.6	24" RCP
A-3 (p-storm)	A3 (p-storm)	5,817.33	A2 (p-storm)	5,816.99	68.2	0.005		0.013	14.61	2.31	2.31	36.88	39.6	38"x24" HECRP CLASS IV
B-2 (p-storm)	B2 (p-storm)	5,817.62	B1 (p-storm)	5,817.39	46.7	0.005		0.013	2.84	0.72	1.91	19.60	14.5	30"x19" HECRP CLASS IV
B-1 (p-storm)	B1 (p-storm)	5,817.19	A2 (p-storm)	5,816.99	40.5	0.005		0.013	3.08	0.49	2.31	36.70	8.4	38"x24" HECRP CLASS IV
E-1 (p-storm)	E2 (p-storm)	5,811.66	O-2	5,811.39	54.4	0.005	24.0	0.013	9.01	5.23	1.07	15.94	56.5	24" RCP
G-1 (p-storm)	G1 (p-storm)	5,812.04	E2 (p-storm)	5,811.86	29.5	0.006	24.0	0.013	0.20	1.88	0.88	17.68	1.1	24" RCP
A-2 (p-storm)	A2 (p-storm)	5,816.79	A1 (p-storm)	5,816.54	50.0	0.005		0.013	16.85	1.86	2.73	59.66	28.2	45"x29" HECRP CLASS IV
A-1 (p-storm)	A1 (p-storm)	5,816.34	O-1	5,816.30	8.2	0.005		0.013	16.85	1.86	2.96	59.09	28.5	45"x29" HECRP CLASS IV
I-1	I1	5,811.68	O-2	5,811.39	57.4	0.005	24.0	0.013	1.97	3.47	0.47	16.08	12.2	

**FlexTable: Manhole Table**

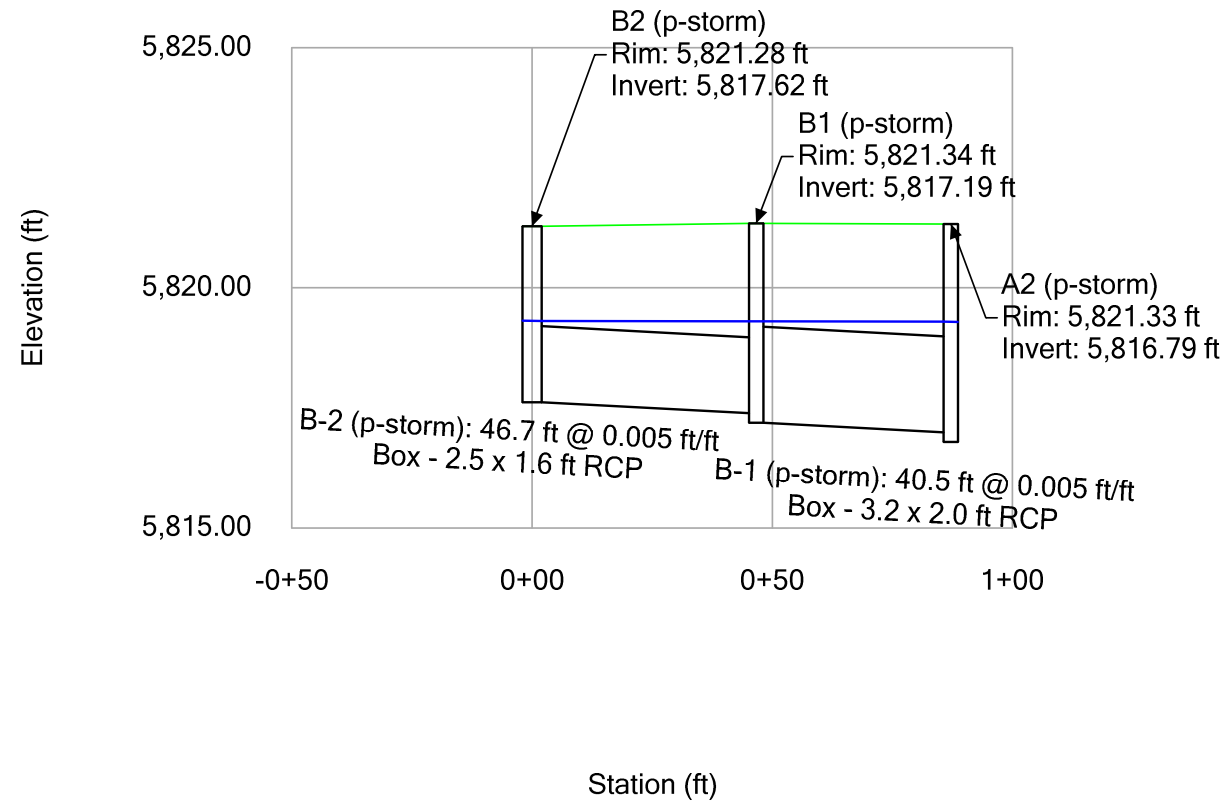
**Active Scenario: 5 YR**

Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Hydraulic Grade Line (In) (ft)	Notes
F3 (p-storm)	5,830.85	5,830.85	(N/A)	2.79	0.78	5,824.05	Standard	5,824.22	4'Ø Flat-Top Manhole
A7 (p-storm)	5,830.63	5,830.63	5,820.01	5.30	0.89	5,820.70	HEC-22 Energy (Second Edition)	5,820.81	Inlet Type R 5'
F1 (p-storm)	5,830.26	5,830.26	5,822.76	3.04	0.66	5,823.41	HEC-22 Energy (Second Edition)	5,823.99	Inlet Type R 5'
F2 (p-storm)	5,830.05	5,830.05	5,823.12	2.92	1.09	5,824.01	HEC-22 Energy (Second Edition)	5,824.04	Inlet Type R 5'
D1 (p-storm)	5,829.72	5,829.72	5,820.42	2.50	0.61	5,820.83	HEC-22 Energy (Second Edition)	5,820.84	4'Ø Manhole
A6 (p-storm)	5,829.07	5,829.07	5,819.43	5.30	0.89	5,820.12	HEC-22 Energy (Second Edition)	5,820.13	4'Ø Manhole
J2 (p-storm)	5,828.92	5,828.92	(N/A)	0.34	0.22	5,823.85	Standard	5,823.94	Inlet Type R 5'
J1 (p-storm)	5,828.92	5,828.92	5,823.32	0.67	0.30	5,823.43	HEC-22 Energy (Second Edition)	5,823.53	Inlet Type R 5'
D4 (p-storm)	5,828.19	5,828.19	(N/A)	1.73	0.49	5,822.03	Standard	5,822.26	4'Ø Flat-Top Manhole
D2 (p-storm)	5,828.16	5,828.16	5,821.04	2.01	0.53	5,821.38	HEC-22 Energy (Second Edition)	5,821.77	Inlet Type R 5'
D3 (p-storm)	5,828.14	5,828.14	5,821.40	1.83	0.58	5,821.78	HEC-22 Energy (Second Edition)	5,821.85	Inlet Type R 5'
A5 (p-storm)	5,826.64	5,826.64	5,818.62	5.30	1.04	5,819.46	HEC-22 Energy (Second Edition)	5,819.47	4'Ø Manhole
A4 (p-storm)	5,826.04	5,826.04	5,818.27	11.86	1.29	5,819.36	HEC-22 Energy (Second Edition)	5,819.40	Inlet Type R 5'
C1 (p-storm)	5,826.02	5,826.02	5,819.08	3.49	0.88	5,819.59	HEC-22 Energy (Second Edition)	5,819.81	Inlet Type R 5'
E3 (p-storm)	5,825.36	5,825.36	5,815.73	8.81	1.06	5,816.59	HEC-22 Energy (Second Edition)	5,816.60	4'Ø Manhole
H1 (p-storm)	5,825.11	5,825.11	(N/A)	4.73	0.84	5,819.72	Standard	5,820.14	4'Ø Flat-Top ManholeW/ GRATED LID
C2 (p-storm)	5,823.93	5,823.93	(N/A)	3.30	0.86	5,820.14	Standard	5,820.48	4'Ø Flat-Top ManholeW/ GRATED LID
A3 (p-storm)	5,823.21	5,823.21	5,817.53	14.61	2.02	5,819.35	HEC-22 Energy (Second Edition)	5,819.36	4'Ø Manhole
B1 (p-storm)	5,821.34	5,821.34	5,817.39	3.08	2.11	5,819.30	HEC-22 Energy (Second Edition)	5,819.30	Inlet Type R 5'
B2 (p-storm)	5,821.28	5,821.28	(N/A)	2.84	1.69	5,819.31	Standard	5,819.32	4'Ø Flat-Top ManholeW/ GRATED LID
A2 (p-storm)	5,821.33	5,821.33	5,816.99	16.85	2.50	5,819.29	HEC-22 Energy (Second Edition)	5,819.30	Inlet Type R 5'
E2 (p-storm)	5,818.77	5,818.77	5,811.86	9.01	1.08	5,812.74	HEC-22 Energy (Second Edition)	5,812.74	6'Ø Manhole
G1 (p-storm)	5,818.36	5,820.60	(N/A)	0.20	0.70	5,812.74	Standard	5,812.74	Inlet Type D
E4 (p-storm)	5,826.26	5,826.26	(N/A)	8.81	1.06	5,825.07	Standard	5,825.60	24" FES
A1 (p-storm)	5,821.29	5,821.29	5,816.54	16.85	2.92	5,819.26	HEC-22 Energy (Second Edition)	5,819.27	
I1	5,816.34	5,816.34	(N/A)	1.97	0.49	5,812.17	Standard	5,812.38	

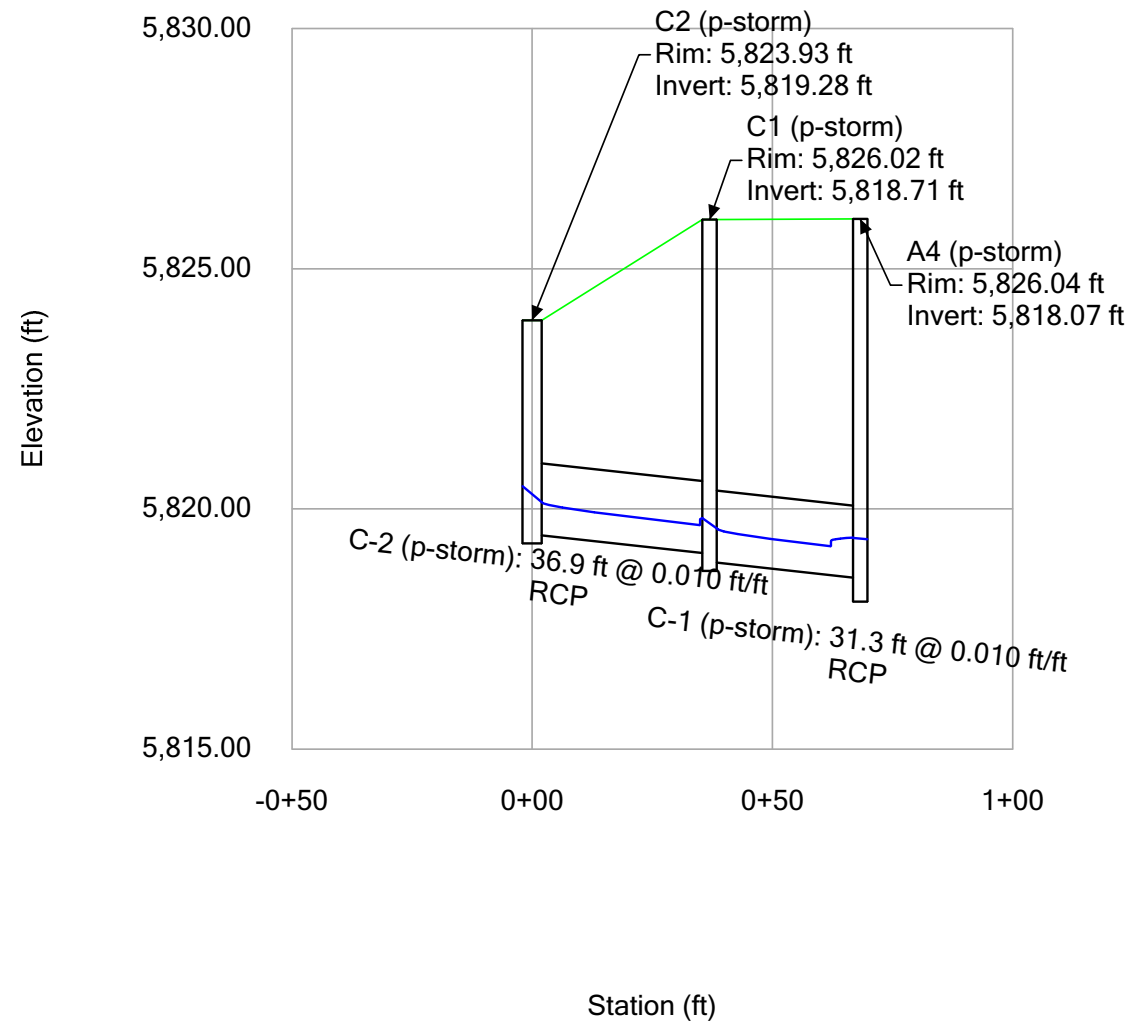
**Profile Report**  
**Engineering Profile - Storm Line A (StormCAD-10-6-2022.stsw)**  
**Active Scenario: 5 YR**



**Profile Report**  
**Engineering Profile - Storm Line B (StormCAD-10-6-2022.stsw)**  
**Active Scenario: 5 YR**



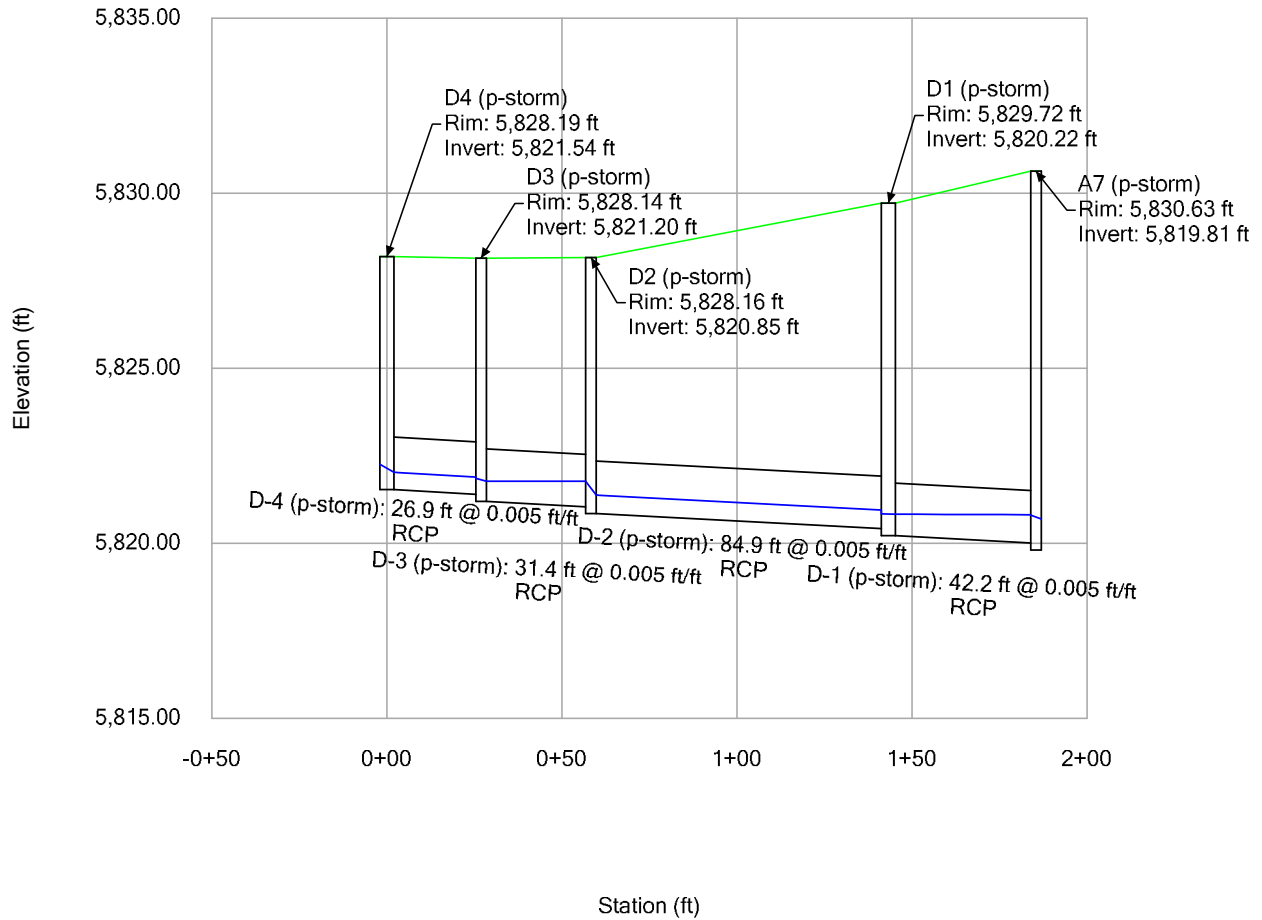
**Profile Report**  
**Engineering Profile - Storm Line C (StormCAD-10-6-2022.stsw)**  
**Active Scenario: 5 YR**



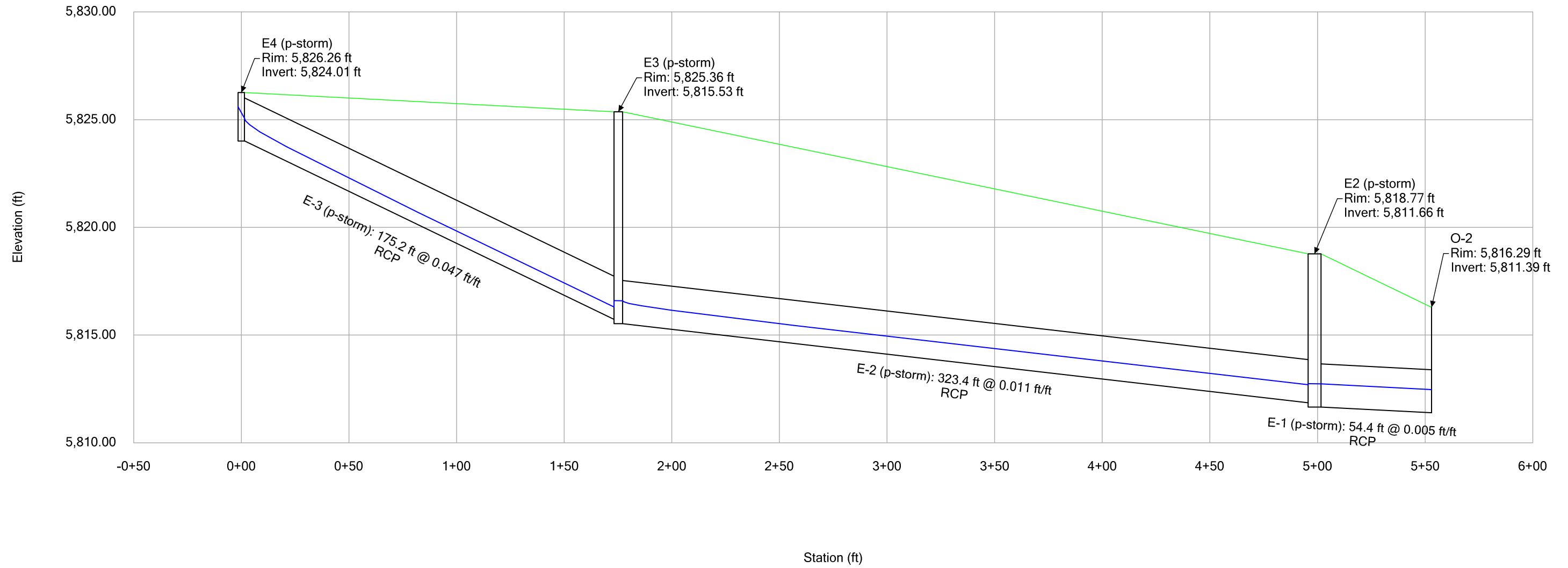
# Profile Report

## Engineering Profile - Storm Line D (StormCAD-10-6-2022.stsw)

### Active Scenario: 5 YR



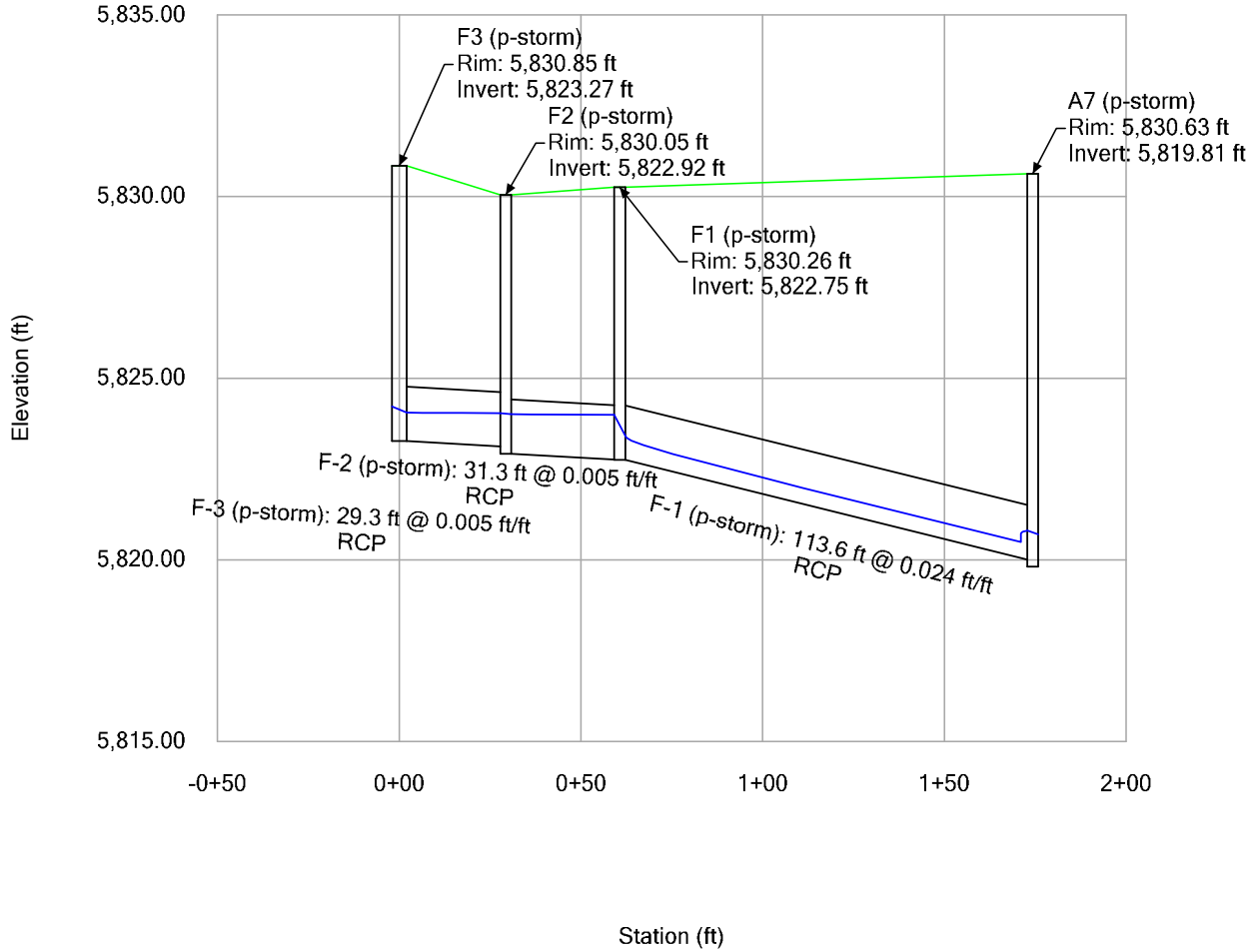
**Profile Report**  
**Engineering Profile - Storm Line E (StormCAD-10-6-2022.stsw)**  
**Active Scenario: 5 YR**



# Profile Report

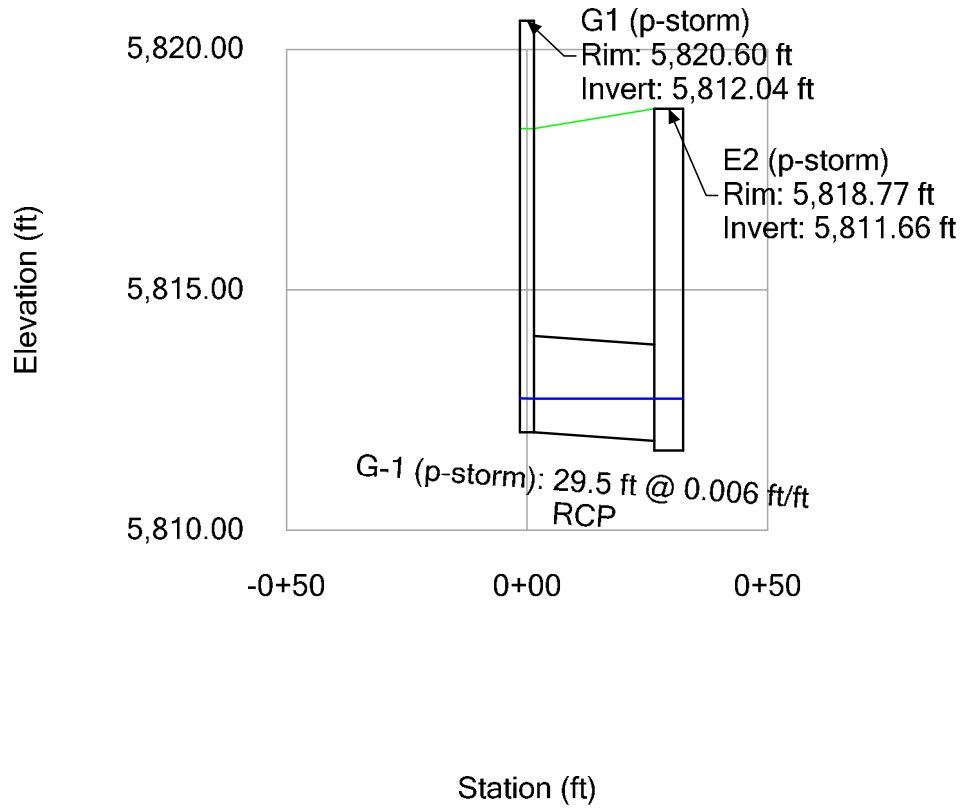
## Engineering Profile - Storm Line F (StormCAD-10-6-2022.stsw)

### Active Scenario: 5 YR

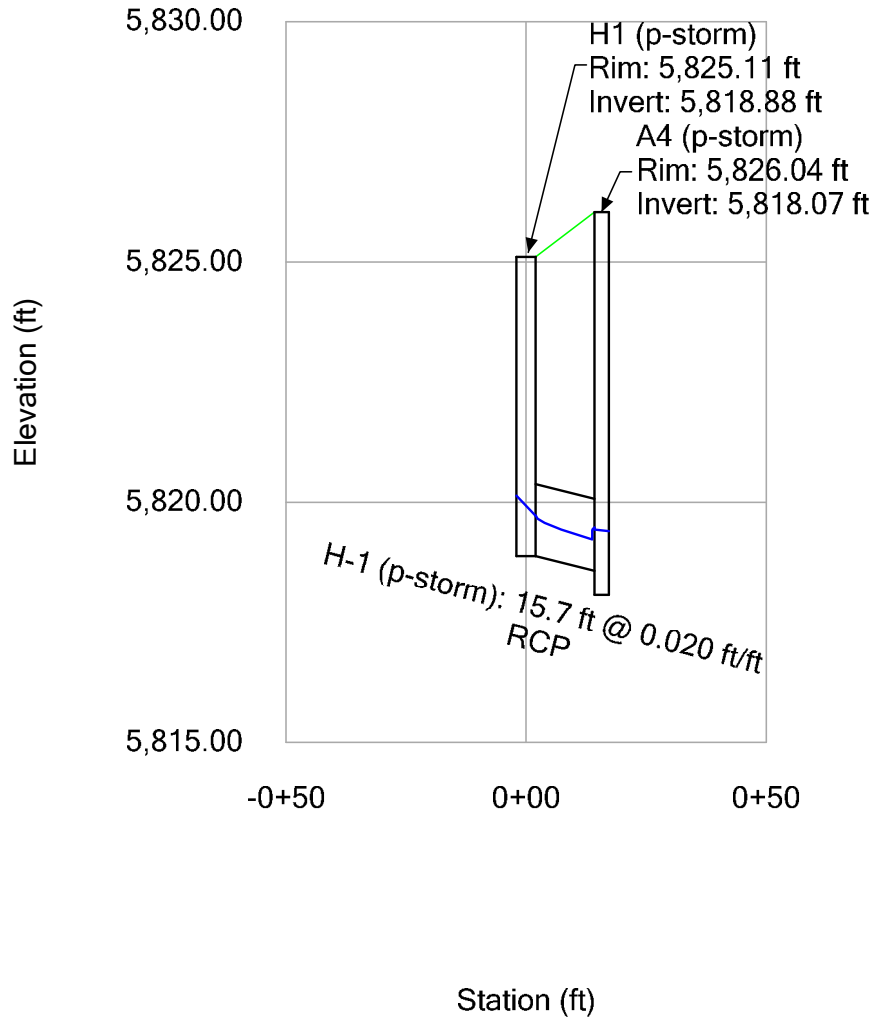


**Profile Report**  
**Engineering Profile - Storm Line G (StormCAD-10-6-2022.stsw)**

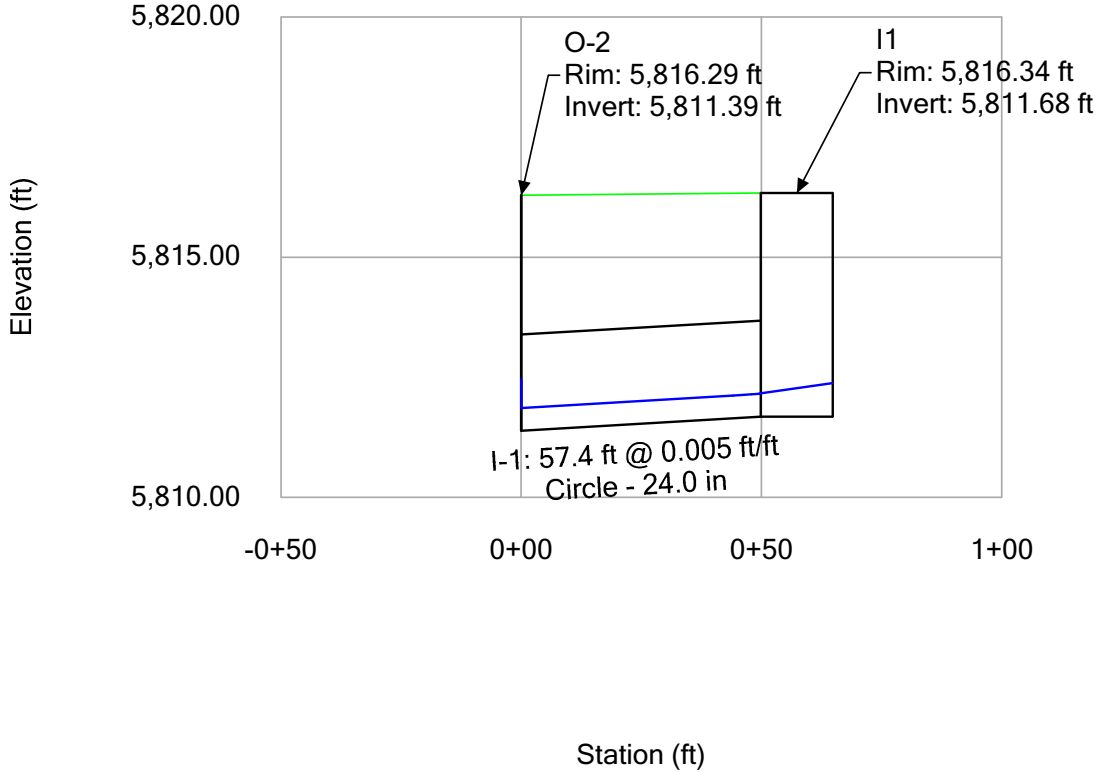
**Active Scenario: 5 YR**



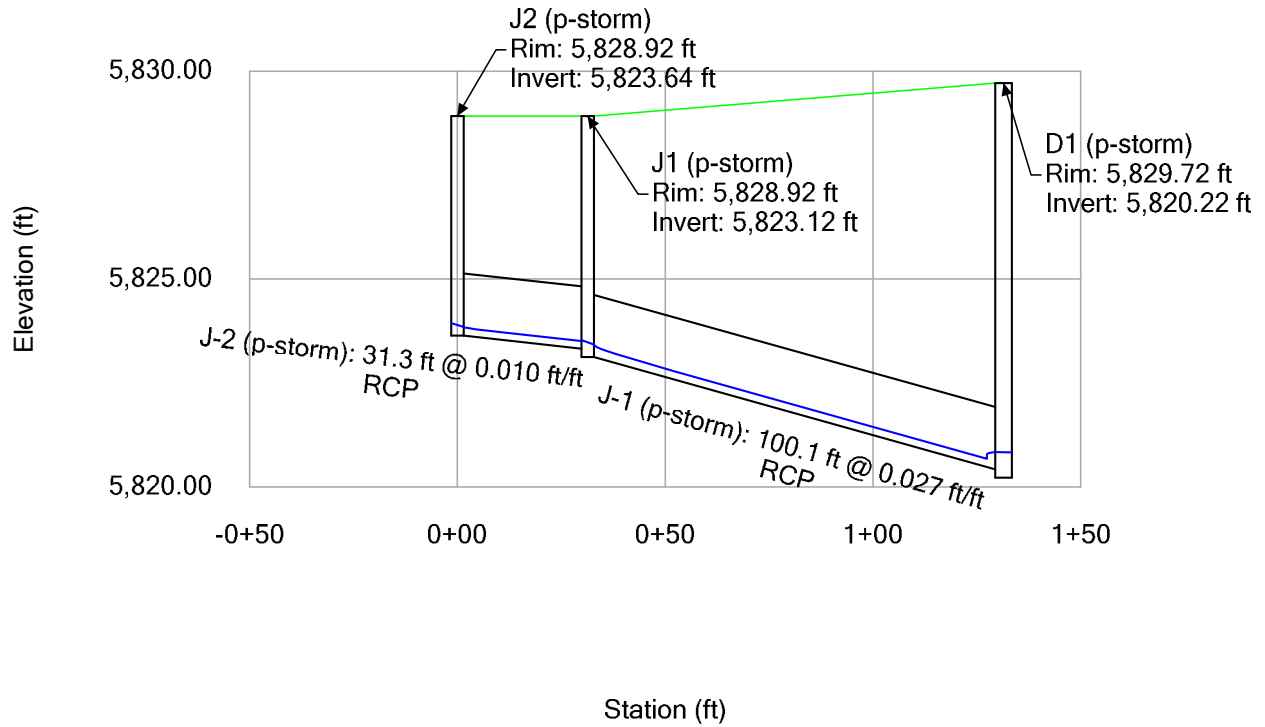
**Profile Report**  
**Engineering Profile - Storm Line H (StormCAD-10-6-2022.stsw)**  
**Active Scenario: 5 YR**



**Profile Report**  
**Engineering Profile - Storm Line I (StormCAD-10-6-2022.stsw)**  
**Active Scenario: 5 YR**



**Profile Report**  
**Engineering Profile - Storm Line J (StormCAD-10-6-2022.stsw)**  
**Active Scenario: 5 YR**



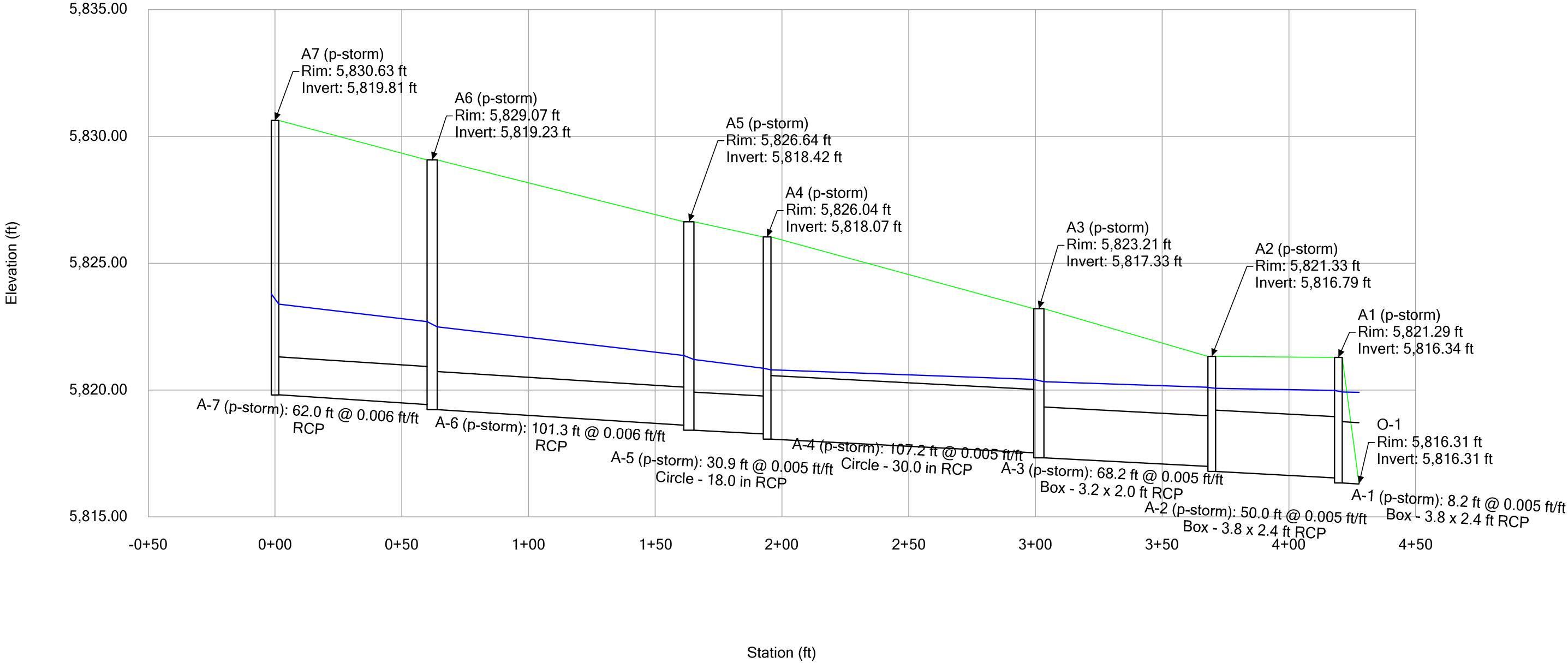
**FlexTable: Conduit Table**  
**Active Scenario: 100 YR**

Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Out) (ft)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Notes
F-3 (p-storm)	F3 (p-storm)	5,823.27	F2 (p-storm)	5,823.12	29.3	0.005	18.0	0.013	5.67	3.21	1.96	7.43	76.3	18" RCP
D-1 (p-storm)	D1 (p-storm)	5,820.22	A7 (p-storm)	5,820.01	42.2	0.005	18.0	0.013	5.30	3.00	3.83	7.43	71.4	18" RCP
A-7 (p-storm)	A7 (p-storm)	5,819.81	A6 (p-storm)	5,819.43	62.0	0.006	18.0	0.013	11.09	6.28	3.27	8.24	134.5	18" RCP
F-1 (p-storm)	F1 (p-storm)	5,822.75	A7 (p-storm)	5,820.01	113.6	0.024	18.0	0.013	6.30	8.63	3.78	16.30	38.6	18" RCP
F-2 (p-storm)	F2 (p-storm)	5,822.92	F1 (p-storm)	5,822.76	31.3	0.005	18.0	0.013	6.00	3.40	2.11	7.43	80.8	18" RCP
D-2 (p-storm)	D2 (p-storm)	5,820.85	D1 (p-storm)	5,820.42	84.9	0.005	18.0	0.013	4.18	2.37	3.61	7.43	56.3	18" RCP
J-1 (p-storm)	J1 (p-storm)	5,823.12	D1 (p-storm)	5,820.42	100.1	0.027	18.0	0.013	1.50	5.99	3.59	17.25	8.7	18" RCP
A-6 (p-storm)	A6 (p-storm)	5,819.23	A5 (p-storm)	5,818.62	101.3	0.006	18.0	0.013	11.09	6.28	2.74	8.15	136.1	18" RCP
J-2 (p-storm)	J2 (p-storm)	5,823.64	J1 (p-storm)	5,823.32	31.3	0.010	18.0	0.013	0.76	3.46	0.74	10.50	7.2	18" RCP
D-4 (p-storm)	D4 (p-storm)	5,821.54	D3 (p-storm)	5,821.40	26.9	0.005	18.0	0.013	3.52	1.99	3.21	7.43	47.4	18" RCP
D-3 (p-storm)	D3 (p-storm)	5,821.20	D2 (p-storm)	5,821.04	31.4	0.005	18.0	0.013	3.75	2.12	3.46	7.43	50.5	18" RCP
A-5 (p-storm)	A5 (p-storm)	5,818.42	A4 (p-storm)	5,818.27	30.9	0.005	18.0	0.013	11.09	6.28	2.59	7.32	151.4	18" RCP
E-3 (p-storm)	E4 (p-storm)	5,824.01	E3 (p-storm)	5,815.73	175.2	0.047	24.0	0.013	18.36	14.52	0.85	49.18	37.3	24" RCP
A-4 (p-storm)	A4 (p-storm)	5,818.07	A3 (p-storm)	5,817.53	107.2	0.005	30.0	0.013	24.52	5.00	2.89	29.11	84.2	24" RCP
C-1 (p-storm)	C1 (p-storm)	5,818.88	A4 (p-storm)	5,818.57	31.3	0.010	18.0	0.013	7.18	4.06	2.30	10.45	68.7	18" RCP
H-1 (p-storm)	H1 (p-storm)	5,818.88	A4 (p-storm)	5,818.57	15.7	0.020	18.0	0.013	9.64	5.46	2.36	14.76	65.3	18" RCP
C-2 (p-storm)	C2 (p-storm)	5,819.45	C1 (p-storm)	5,819.08	36.9	0.010	18.0	0.013	6.72	3.80	2.25	10.52	63.9	18" RCP
E-2 (p-storm)	E3 (p-storm)	5,815.53	E2 (p-storm)	5,811.86	323.4	0.011	24.0	0.013	18.36	8.44	2.17	24.10	76.2	24" RCP
A-3 (p-storm)	A3 (p-storm)	5,817.33	A2 (p-storm)	5,816.99	68.2	0.005		0.013	30.12	4.76	3.12	36.88	81.7	38"x24" HECRP CLASS IV
B-2 (p-storm)	B2 (p-storm)	5,817.62	B1 (p-storm)	5,817.39	46.7	0.005		0.013	5.79	1.46	2.73	19.60	29.5	30"x19" HECRP CLASS IV
B-1 (p-storm)	B1 (p-storm)	5,817.19	A2 (p-storm)	5,816.99	40.5	0.005		0.013	6.34	1.00	3.11	36.70	17.3	38"x24" HECRP CLASS IV
E-1 (p-storm)	E2 (p-storm)	5,811.66	O-2	5,811.39	54.4	0.005	24.0	0.013	25.39	8.08	1.77	15.94	159.3	24" RCP
G-1 (p-storm)	G1 (p-storm)	5,812.04	E2 (p-storm)	5,811.86	29.5	0.006	24.0	0.013	7.03	2.24	2.16	17.68	39.8	24" RCP
A-2 (p-storm)	A2 (p-storm)	5,816.79	A1 (p-storm)	5,816.54	50.0	0.005		0.013	34.69	3.83	3.45	59.66	58.1	45"x29" HECRP CLASS IV
A-1 (p-storm)	A1 (p-storm)	5,816.34	O-1	5,816.30	8.2	0.005		0.013	34.69	3.83	3.61	59.09	58.7	45"x29" HECRP CLASS IV
I-1	I1	5,811.68	O-2	5,811.39	57.4	0.005	24.0	0.013	3.97	4.24	0.68	16.08	24.7	

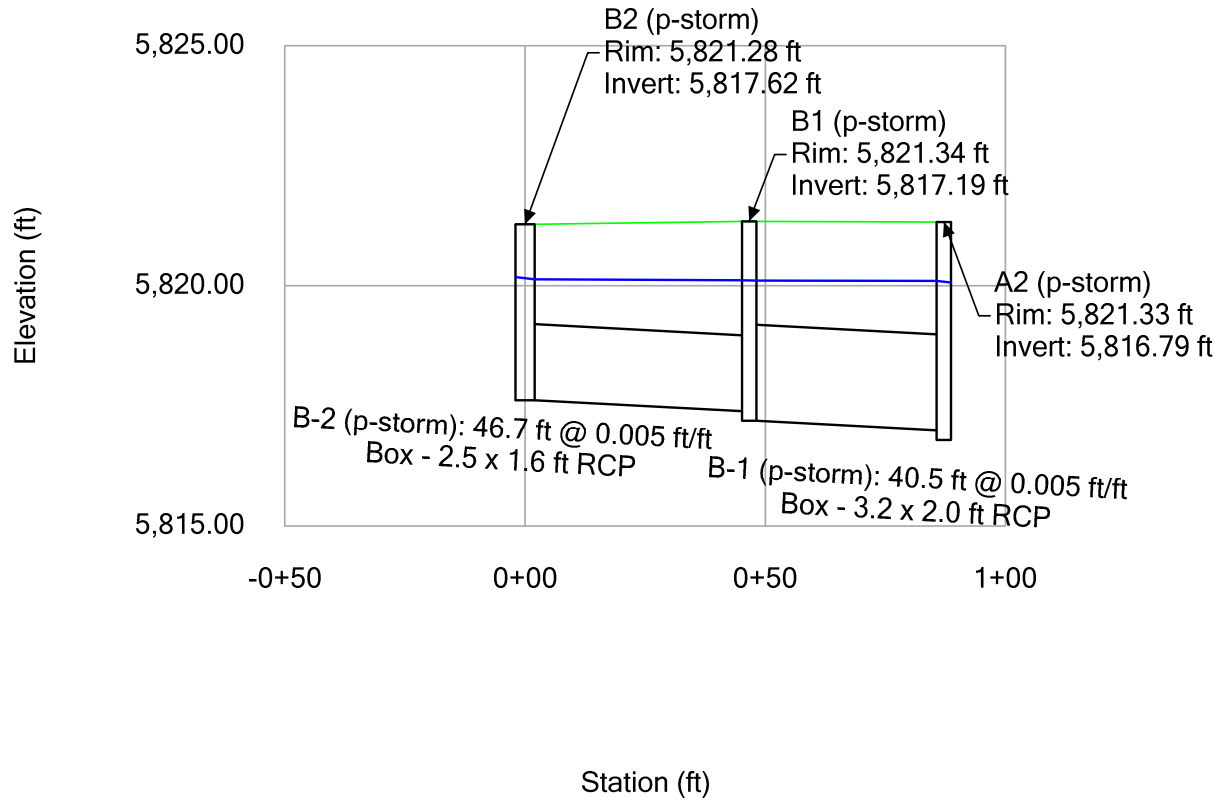
**FlexTable: Manhole Table**  
**Active Scenario: 100 YR**

Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Hydraulic Grade Line (In) (ft)	Notes
F3 (p-storm)	5,830.85	5,830.85	(N/A)	5.67	1.89	5,825.16	Standard	5,825.36	4'Ø Flat-Top Manhole
A7 (p-storm)	5,830.63	5,830.63	5,820.01	11.09	3.58	5,823.39	HEC-22 Energy (Second Edition)	5,823.80	Inlet Type R 5'
F1 (p-storm)	5,830.26	5,830.26	5,822.76	6.30	1.45	5,824.20	HEC-22 Energy (Second Edition)	5,824.87	Inlet Type R 5'
F2 (p-storm)	5,830.05	5,830.05	5,823.12	6.00	2.05	5,824.97	HEC-22 Energy (Second Edition)	5,825.08	Inlet Type R 5'
D1 (p-storm)	5,829.72	5,829.72	5,820.42	5.30	3.73	5,823.95	HEC-22 Energy (Second Edition)	5,824.01	4'Ø Manhole
A6 (p-storm)	5,829.07	5,829.07	5,819.43	11.09	3.26	5,822.49	HEC-22 Energy (Second Edition)	5,822.70	4'Ø Manhole
J2 (p-storm)	5,828.92	5,828.92	(N/A)	0.76	0.40	5,824.04	Standard	5,824.12	Inlet Type R 5'
J1 (p-storm)	5,828.92	5,828.92	5,823.32	1.50	0.89	5,824.02	HEC-22 Energy (Second Edition)	5,824.07	Inlet Type R 5'
D4 (p-storm)	5,828.19	5,828.19	(N/A)	3.52	3.11	5,824.65	Standard	5,824.72	4'Ø Flat-Top Manhole
D2 (p-storm)	5,828.16	5,828.16	5,821.04	4.18	3.32	5,824.17	HEC-22 Energy (Second Edition)	5,824.50	Inlet Type R 5'
D3 (p-storm)	5,828.14	5,828.14	5,821.40	3.75	3.34	5,824.54	HEC-22 Energy (Second Edition)	5,824.62	Inlet Type R 5'
A5 (p-storm)	5,826.64	5,826.64	5,818.62	11.09	2.78	5,821.20	HEC-22 Energy (Second Edition)	5,821.36	4'Ø Manhole
A4 (p-storm)	5,826.04	5,826.04	5,818.27	24.52	2.73	5,820.80	HEC-22 Energy (Second Edition)	5,820.86	Inlet Type R 5'
C1 (p-storm)	5,826.02	5,826.02	5,819.08	7.18	2.30	5,821.02	HEC-22 Energy (Second Edition)	5,821.33	Inlet Type R 5'
E3 (p-storm)	5,825.36	5,825.36	5,815.73	18.36	1.54	5,817.08	HEC-22 Energy (Second Edition)	5,817.09	4'Ø Manhole
H1 (p-storm)	5,825.11	5,825.11	(N/A)	9.64	2.18	5,821.06	Standard	5,821.64	4'Ø Flat-Top ManholeW/ GRATED LID
C2 (p-storm)	5,823.93	5,823.93	(N/A)	6.72	2.20	5,821.48	Standard	5,821.76	4'Ø Flat-Top ManholeW/ GRATED LID
A3 (p-storm)	5,823.21	5,823.21	5,817.53	30.12	3.00	5,820.33	HEC-22 Energy (Second Edition)	5,820.42	4'Ø Manhole
B1 (p-storm)	5,821.34	5,821.34	5,817.39	6.34	2.92	5,820.11	HEC-22 Energy (Second Edition)	5,820.12	Inlet Type R 5'
B2 (p-storm)	5,821.28	5,821.28	(N/A)	5.79	2.52	5,820.14	Standard	5,820.18	4'Ø Flat-Top ManholeW/ GRATED LID
A2 (p-storm)	5,821.33	5,821.33	5,816.99	34.69	3.28	5,820.07	HEC-22 Energy (Second Edition)	5,820.10	Inlet Type R 5'
E2 (p-storm)	5,818.77	5,818.77	5,811.86	25.39	2.31	5,813.97	HEC-22 Energy (Second Edition)	5,814.02	6'Ø Manhole
G1 (p-storm)	5,818.36	5,820.60	(N/A)	7.03	2.01	5,814.05	Standard	5,814.15	Inlet Type D
E4 (p-storm)	5,826.26	5,826.26	(N/A)	18.36	1.54	5,825.56	Standard	5,826.52	24" FES
A1 (p-storm)	5,821.29	5,821.29	5,816.54	34.69	3.58	5,819.92	HEC-22 Energy (Second Edition)	5,819.99	
I1	5,816.34	5,816.34	(N/A)	3.97	0.70	5,812.38	Standard	5,812.70	

**Profile Report**  
**Engineering Profile - Storm Line A (StormCAD-10-6-2022.stsw)**  
**Active Scenario: 100 YR**



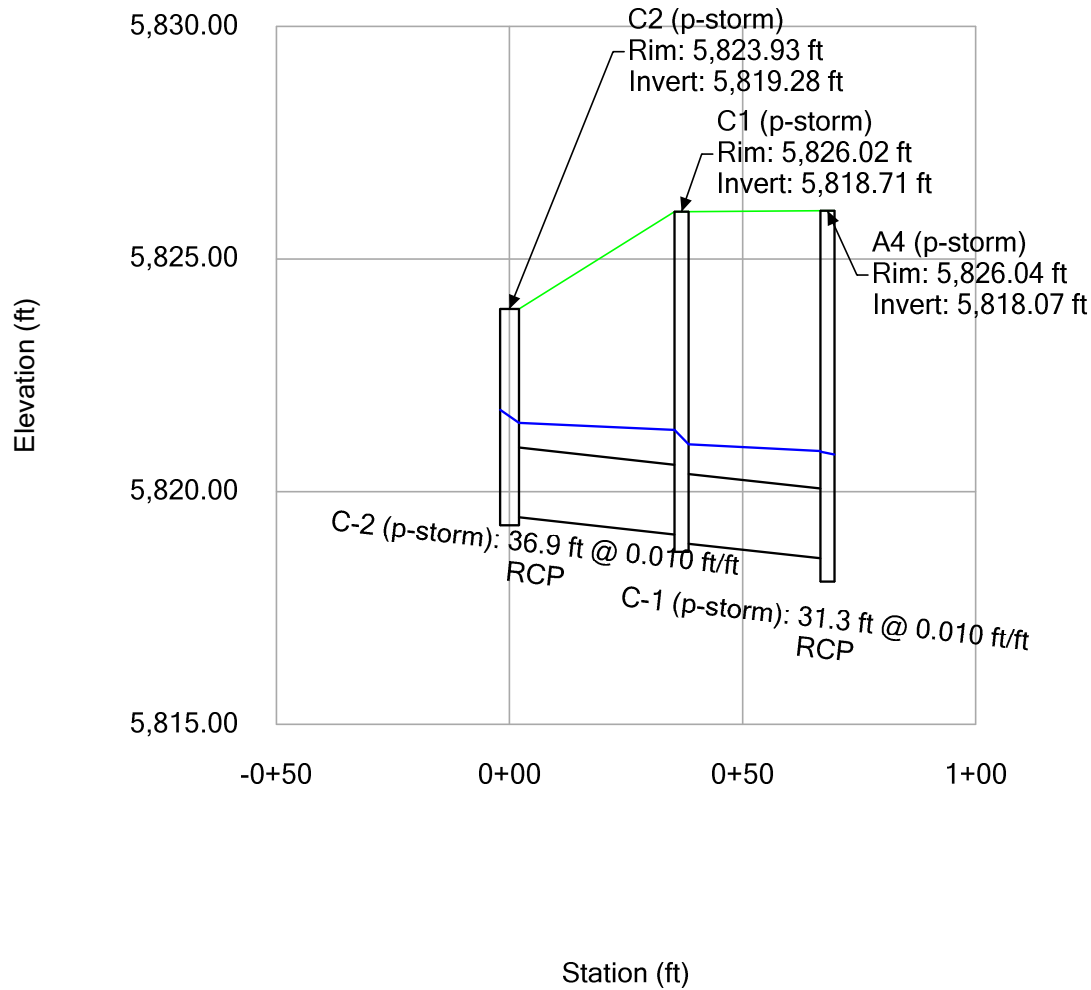
**Profile Report**  
**Engineering Profile - Storm Line B (StormCAD-10-6-2022.stsw)**  
**Active Scenario: 100 YR**



# Profile Report

## Engineering Profile - Storm Line C (StormCAD-10-6-2022.stsw)

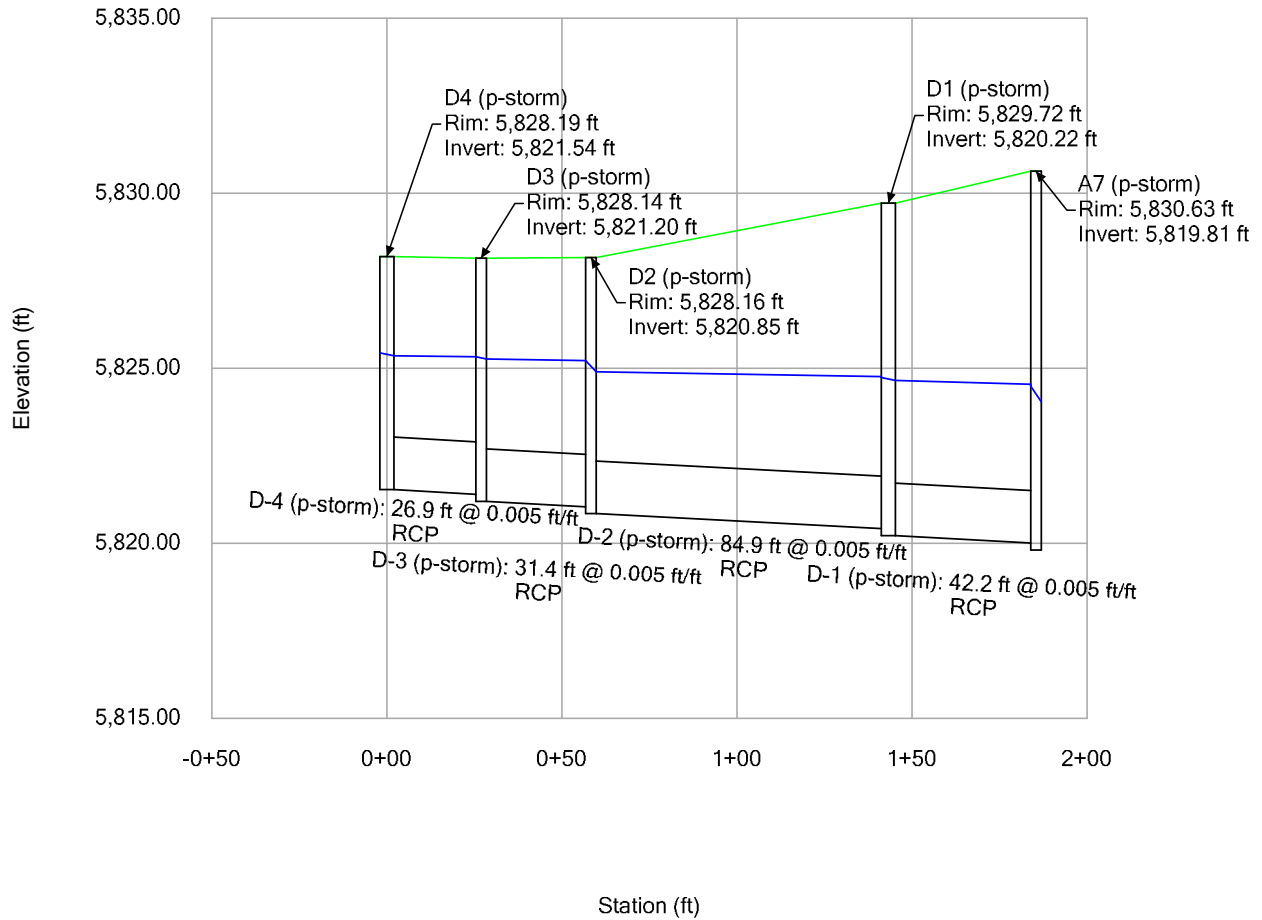
**Active Scenario: 100 YR**



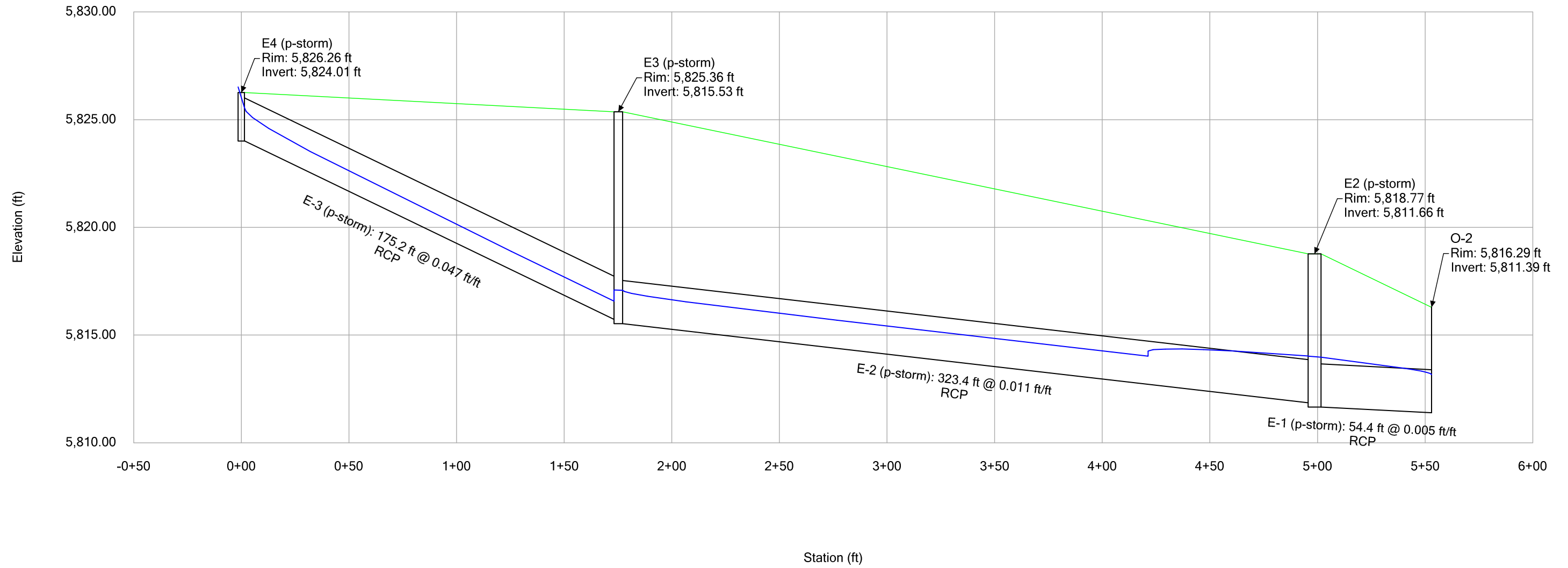
# Profile Report

## Engineering Profile - Storm Line D (StormCAD-10-6-2022.stsw)

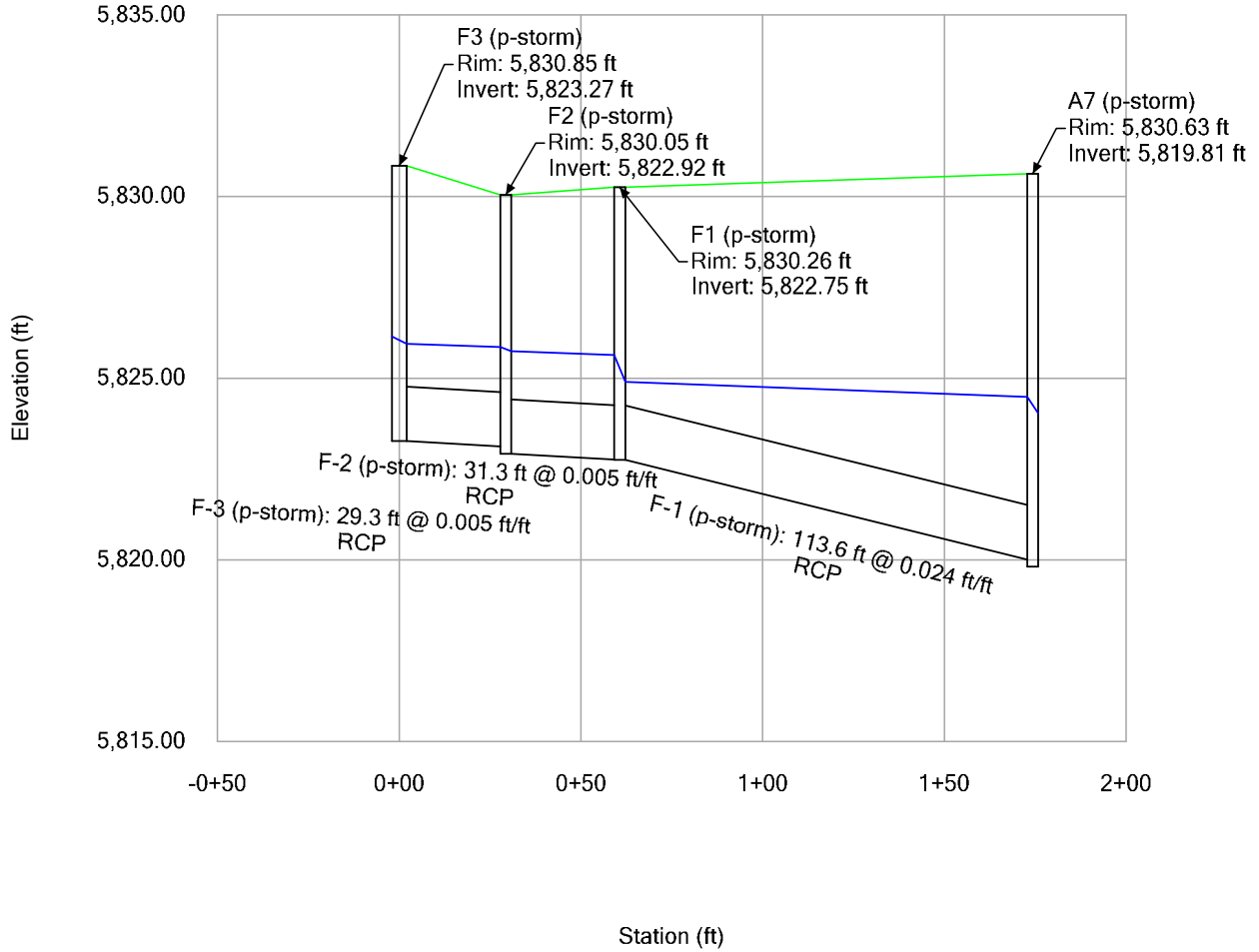
### Active Scenario: 100 YR



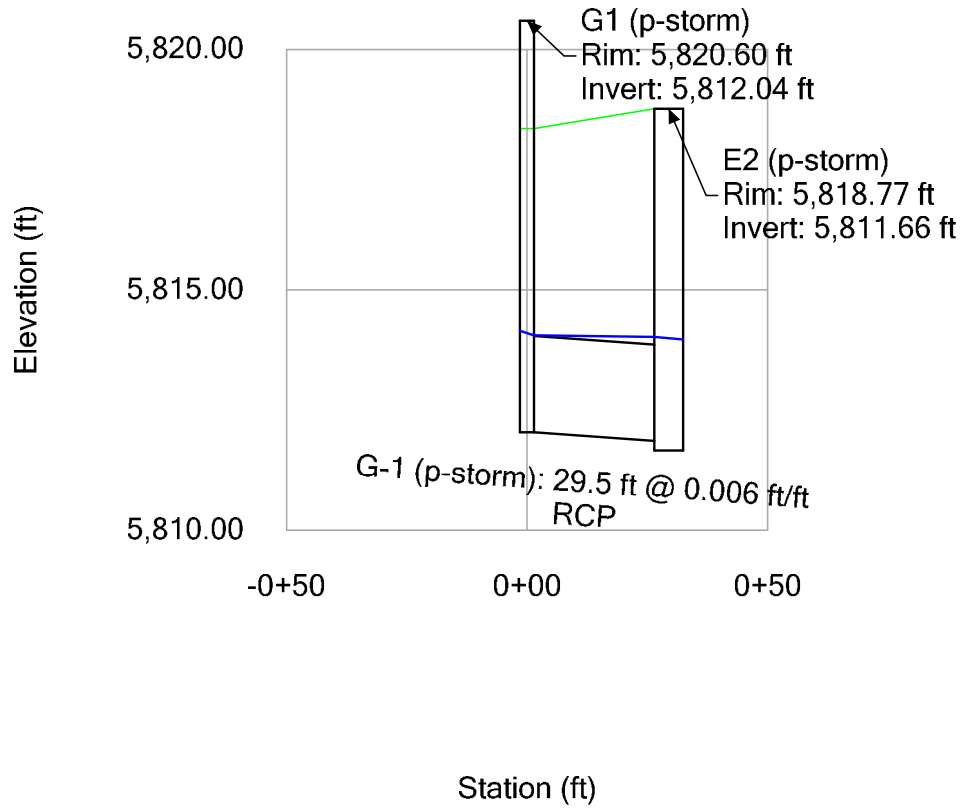
**Profile Report**  
**Engineering Profile - Storm Line E (StormCAD-10-6-2022.stsw)**  
**Active Scenario: 100 YR**



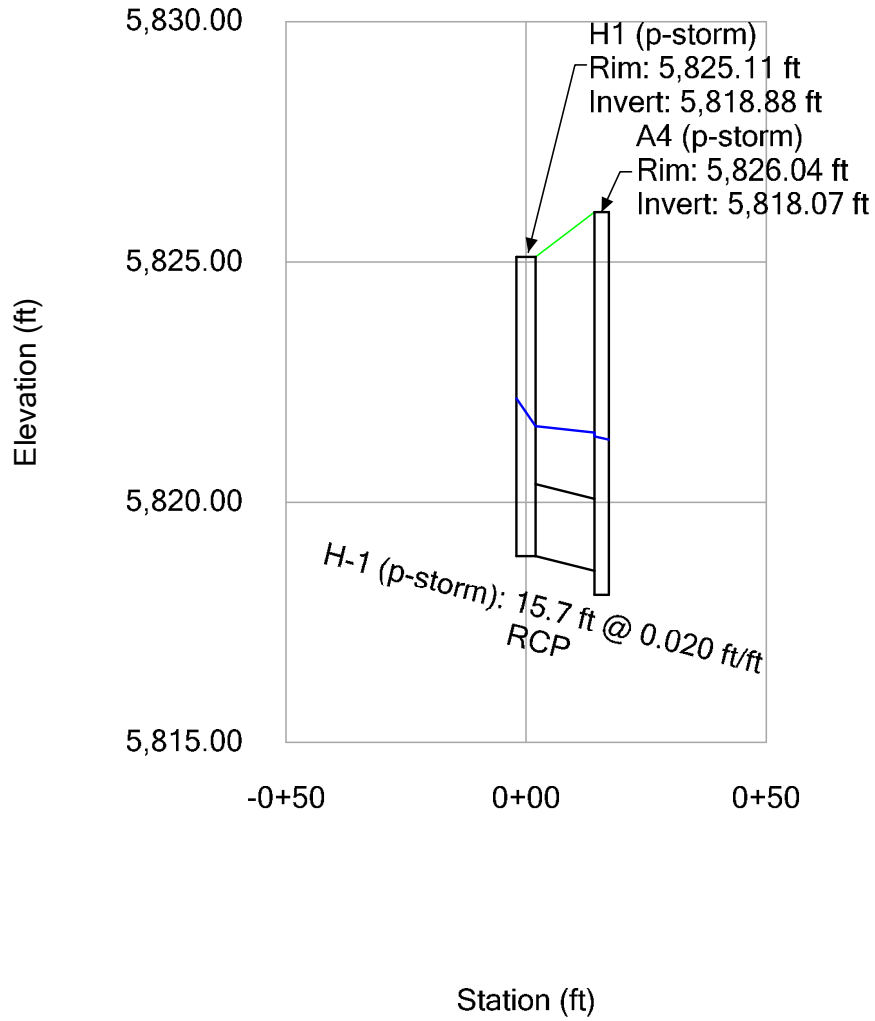
**Profile Report**  
**Engineering Profile - Storm Line F (StormCAD-10-6-2022.stsw)**  
**Active Scenario: 100 YR**



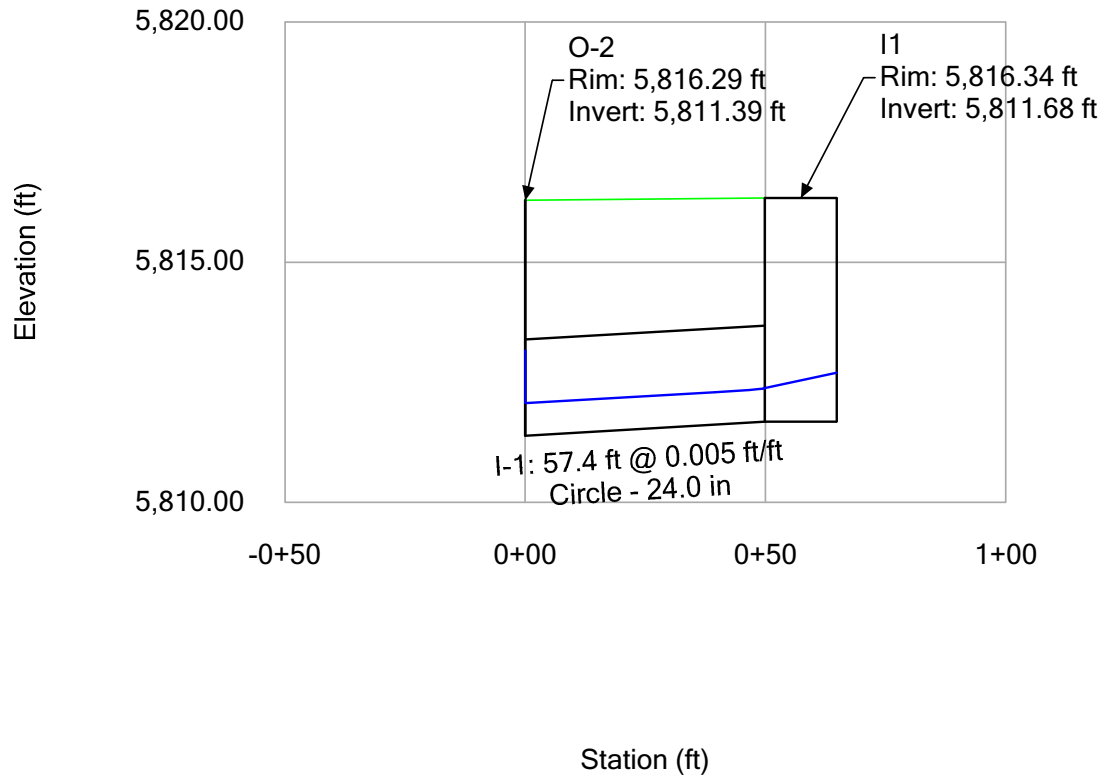
**Profile Report**  
**Engineering Profile - Storm Line G (StormCAD-10-6-2022.stsw)**  
**Active Scenario: 100 YR**



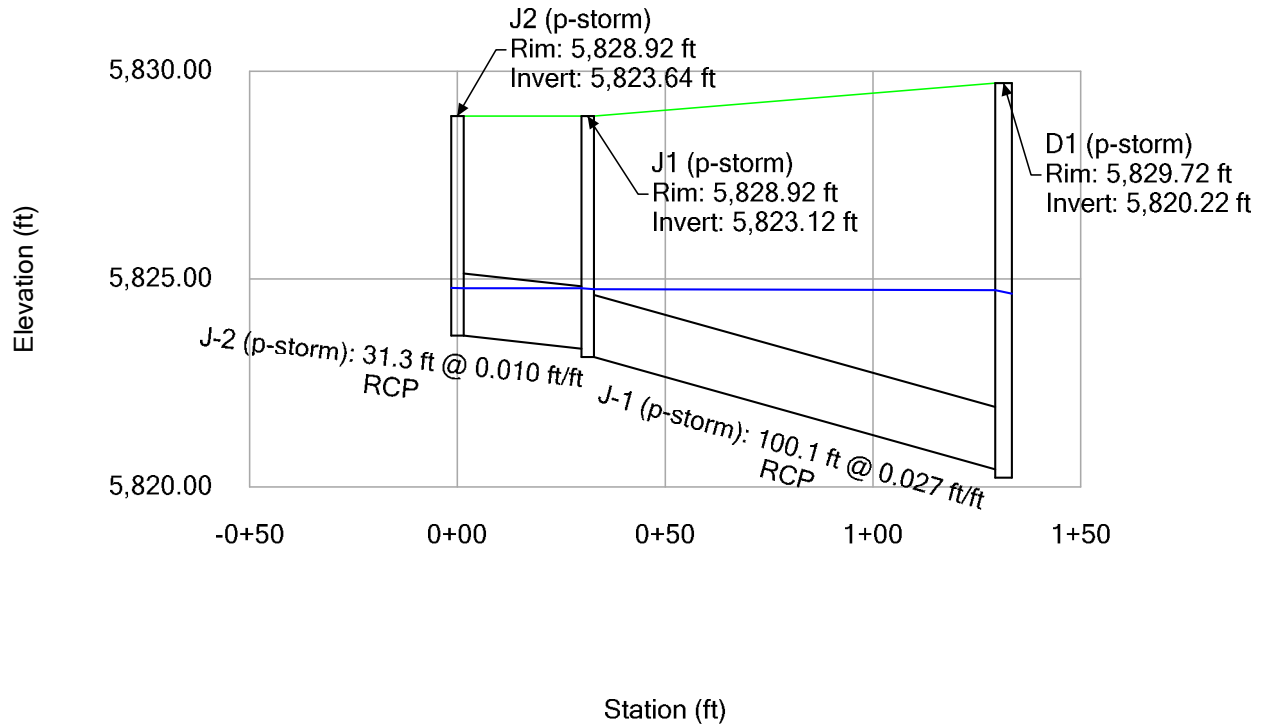
**Profile Report**  
**Engineering Profile - Storm Line H (StormCAD-10-6-2022.stsw)**  
**Active Scenario: 100 YR**



**Profile Report**  
**Engineering Profile - Storm Line I (StormCAD-10-6-2022.stsw)**  
**Active Scenario: 100 YR**

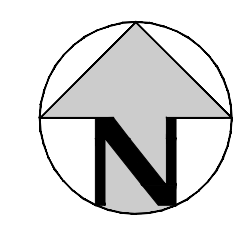


**Profile Report**  
**Engineering Profile - Storm Line J (StormCAD-10-6-2022.stsw)**  
**Active Scenario: 100 YR**

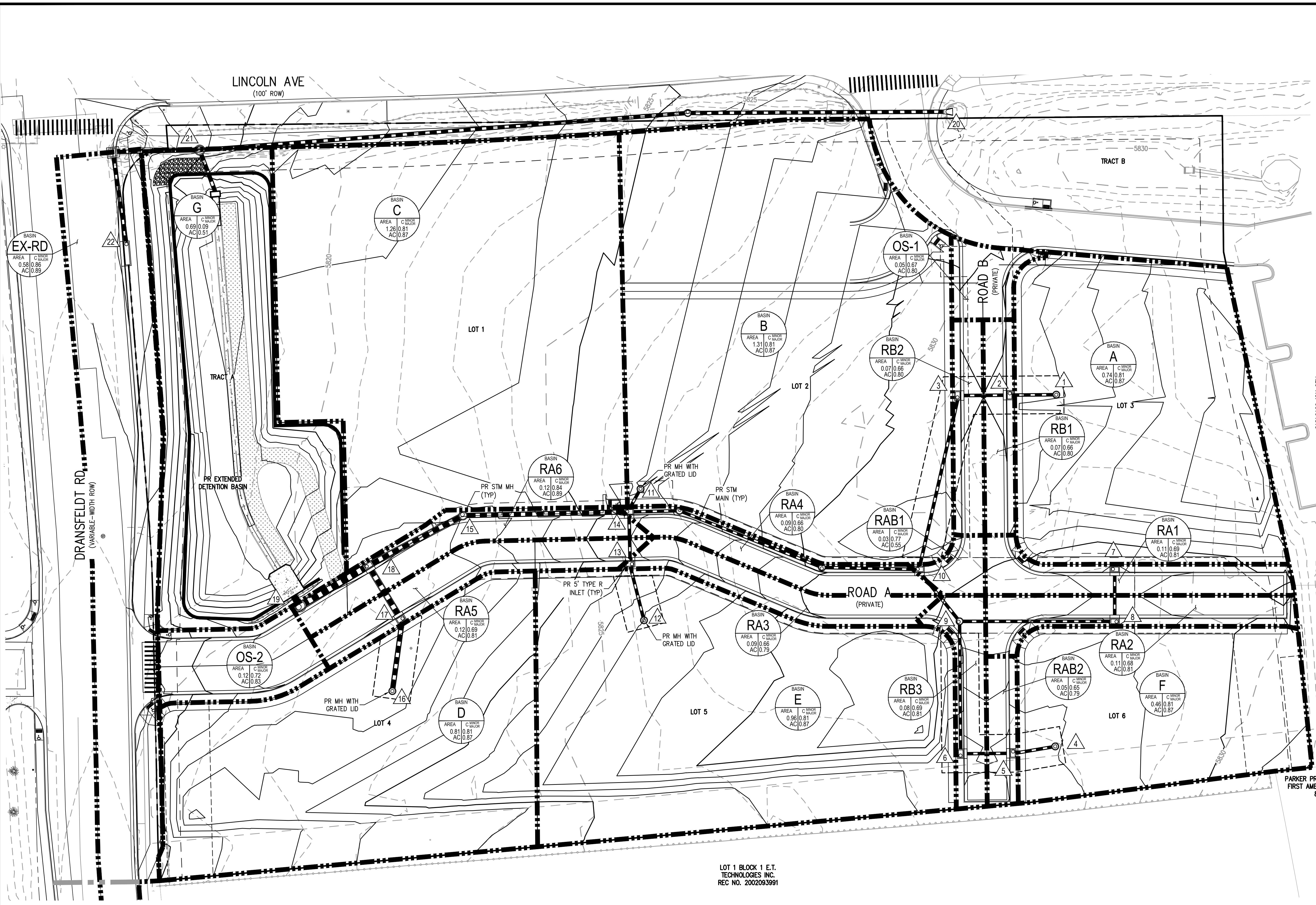


**APPENDIX D – Final Drainage Plan**

NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT WRITTEN PERMISSION OF HARRIS KOCHER SMITH.



DIRECT RUNOFF SUMMARY TABLE			
BASIN	AREA (AC)	Q <sub>2</sub> (CFS)	Q <sub>100</sub> (CFS)
A	0.74	2.79	5.67
B	1.31	4.73	9.64
C	1.26	4.60	9.36
D	0.81	2.84	5.79
E	0.96	3.30	6.72
F	0.46	1.73	3.52
G	0.69	0.22	2.34
RAB1	0.03	0.11	0.22
RAB2	0.05	0.14	0.32
RB1	0.07	0.20	0.47
RB2	0.07	0.20	0.47
RB3	0.08	0.25	0.55
RA1	0.11	0.34	0.76
RA2	0.11	0.34	0.77
RA3	0.09	0.29	0.66
RA4	0.09	0.29	0.66
RA5	0.12	0.37	0.83
RA6	0.12	0.48	0.97
OFF-SITE			
OS-1	0.05	0.16	0.35
OS-2	0.12	0.40	0.88



PLEASE SUBMIT  
FILE NO. 1  
REC. NO. 99104513

PLEASE SUBMIT  
FILE NO. 2  
REC. NO. 200508666

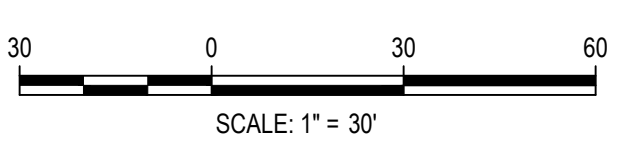
PARKER PROFESSIONAL PARK  
FIRST AMENDMENT REC. NO.  
8725509

LOT 1 BLOCK 1 E.T.  
TECHNOLOGIES INC.  
REC. NO. 2002093991

FILES: K:\2002\ENGINEERING\DRAINAGE\PLANNING LAYOUT: LAYOUT1  
C:\PLOT\2023\110923A.DWG  
PLOTTED: WED 01/16/23 11:09:23A BY: OLIVIA MCCracken



Know what's below.  
Call before you dig.



DESIGNED BY: ORM  
CHECKED BY: RCP  
DRAWN BY: ORM

ISSUE DATE: 07-30-2021	
DATE	REVISION COMMENTS
11-19-2021	PER TOWN OF PARKER COMMENTS
04-08-2022	PER TOWN OF PARKER COMMENTS
07-21-2022	PER TOWN OF PARKER COMMENTS
10-20-2022	PER TOWN OF PARKER COMMENTS
01-18-2023	PER TOWN OF PARKER COMMENTS



1120 Lincoln Street, Suite 1000  
Denver, Colorado 80203  
P: 303.623.6300 F: 303.623.6311  
HarrisKocherSmith.com

PLAZA STREET PARTNERS

LINCOLN & DRANSFELDT  
DRAINAGE MAP

PROJECT #: 200829  
SHEET NUMBER

1

1 OF 1

**APPENDIX E – Excerpts from Existing Drainage Report**

Avenue and Parker Road. This sub-basin flows directly to a roadside ditch along Lincoln Avenue, eventually draining to Dransfeldt Road.

- c. Sub-basin 121 has an approximate area of 3.4 acres. The land cover for this sub-basin is mostly grassland with some surrounding houses. This sub-basin sheet flows towards Lincoln Avenue. After Dransfeldt Road improvements, the runoff from this sub-basin will be captured along a roadside ditch that will direct the flow to the proposed culverts at the intersection of Dransfeldt Road and Lincoln Avenue.

- d. Sub-basin 131 is the portion of Dransfeldt Road runoff draining to Lincoln Avenue. The area of this small sub-basin is approximately 0.4 acres. For the proposed conditions the runoff generated by this basin will flow along the proposed curb and gutter to be collected at a proposed 10-ft Type R inlet (DP #13) located at the southeast corner of the intersection between Dransfeldt Road and Lincoln Avenue.

2. Hot Springs Tributary Basin has a total area draining to Dransfeldt Road of approximately 354 acres. It flows under Parker Road through a 60" CMP. This tributary has a wide, shallow and undefined flood area about 400 feet downstream of Parker Road. As stated on reference 7, it is anticipated that without improvements at this location floodwaters will not be able to flow through the pipe; they will travel west along Lincoln. There is no riparian habitat and no base flow. The land use in the area includes open space and residential with some commercial and industrial. The detention pond at Hot Springs Drive drains into this tributary. Currently, for greater than the 10-year flow, flow is diverted to Baldwin Gulch. A 60" pipe was proposed to outfall into a proposed 100-year channel from Dransfeldt Road to Cherry Creek (Ref. 7).

Hot Springs Tributary Basin was divided into three sub-basins draining to proposed culverts under Dransfeldt Road. These sub-basins are:

#### Hot Springs Tributary North (Basin 200's on Drainage Map)

- a. Sub-basin 211 (Basin A-095 per reference 5) is approximately 250 acres in area. This sub-basin extends east of Pine Drive (Douglas County Road 45). Land use is primarily residential. Future land use is projected to be mainly low-density residential. The runoff generated by this basin flows into an existing detention pond which outflows into sub-basin 221 by twin 29"x45" reinforced concrete arch pipes. The *Newlin/Baldwin Gulches and Basin 4600-09 Outfall System Planning Study* calculated the detention pond release rates as 214 cfs for the 100-year storm and 40 cfs for the 5-year storm.
- b. Sub-basin 221 is located downstream of sub-basin 211. It has an approximate drainage area of 34.1 acres. The land use for this area is mostly residential. All the runoff generated by this basin combined with the release from the detention pond in sub-basin 211 is anticipated not to flow through the pipe 60" CMP crossing Parker Road. The diverted flow will travel west along Lincoln Baldwin Gulch for storms greater than the 10-year. The flow drain through the 60" RCP discharges into sub-basin 231, where it flows westerly through an existing ditch. The amount of flow that the existing 60" CMP was calculated to carry is 163 cfs for the 100-year storm and 84 cfs for the 5-year storm (*Newlin/Baldwin Gulches and Basin 4600-09 Outfall System Planning Study*). Approximately 131 cfs will be diverted north to Baldwin Gulch during the 100-year

STANDARD FORM SF-2  
TIME OF CONCENTRATION

Subdivision : Dransfield Road on Town of Parker

Calculated by : PMG

Date : 14-Feb-2003

$$T_c = T_i + T_t$$

Des. Pt. #	Sub-Basin Data			Overland Flow			Travel Time (Tt)				Urban Check			Remarks
	Area Design.	Area (ac)	C 5 yr.	L (ft)	Slope (%)	Ti (min)	L (ft)	Slope (%)	Vel (fps)	Tt (min)	Comp. Tc (min.)	L (ft)	Urban Tc (min)	
10	101	31.1	0.38	300.0	5.0	13.2	2600	2.0	2.1	20.4	33.6	2900	26.1	26.1
11	111	4.3	0.54	50.0	2.0	5.7	1100	0.9	1.4	12.8	18.5	1150	16.4	16.4
12	121	3.4	0.38	115.0	1.7	11.6	660	0.8	1.3	8.4	20.0	775	14.3	14.3
	101,111,121	38.8	0.40	300.0	5.0	12.6	3700	1.7	1.9	31.8	44.4	4000	32.2	32.2
13	131	0.4	0.90	10.0	3.0	0.8	580	0.6	1.5	6.2	7.0	590	13.3	7.0
14	101,111,121,131	39.2	0.40	300.0	5.0	12.6	3780	1.7	1.9	32.4	45.0	4080	32.7	32.7
21	211	250.0	0.22											Tc taken from Kiowa Report
22	221	34.1	0.41	100.0	3.0	8.6	2300	2.2	2.2	17.2	25.9	2400	23.3	23.3
	211,221	284.1	0.24				1400	2.0	5.0	4.7			59.7	
23	231	13.6	0.59	50.0	2.0	5.2	1220	0.8	1.4	15.0	20.1	1270	17.1	17.1
	211-231	297.7	0.26				1250	0.8	5.0	4.2			63.8	
31	311	17.7	0.59	50.0	2.0	5.2	1580	0.9	1.4	18.7	23.8	1630	19.1	19.1
32	321	0.6	0.90	10.0	2.0	0.9	610	2.8	5.0	2.0	2.9	620	13.4	5.0
	311-321	18.3	0.60	50.0	2.0	5.2	1580	0.9	1.4	18.7	23.8	1630	19.1	19.1

STANDARD FORM SF-3  
STORM DRAINAGE SYSTEM DESIGN  
(RATIONAL METHOD PROCEDURE)

Subdivision : Dransfield Road on Town of Parker 5-year

Calculated by : PMG Date : 14-Feb-2003

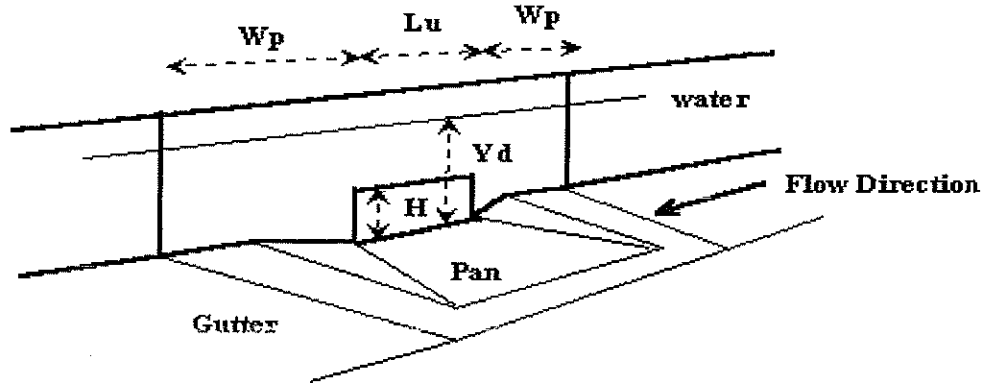
Street	De-sign Pt.	Direct Runoff						Total Runoff				Max Street			Max Pipe			Travel Time		
		Area De-sign (3)	Area (ac) (4)	Runoff Coeff. (C) (5)	Tc min (6)	C*A (ac) (7)	I in/hr (8)	Q (cfs) (9)	Tc min (10)	$\Sigma(C*A)I$ (ac) (11)	I in/hr (12)	Q (cfs) (13)	S (%) (14)	Str. Flow (cfs) (15)	Q cfs (16)	S (%) (17)	Pipe Size (in) (18)	L (ft) (19)	V fps (20)	Tt min (21)
	10	101	31.1	0.38	26.1	11.8	2.4	28.4												
	11	111	4.3	0.54	16.4	2.3	3.1	7.2												
	12	121	3.4	0.38	14.3	1.3	3.3	4.2												
		101-121																		
	13	131	0.4	0.90	7.0	0.4	4.4	1.7	32.2	15.4	2.1			32.4						
	14	101-131	39.2						32.7	15.8	2.1			33.2						
	21	211	250.0	0.22																
	22	221	34.1	0.41	23.3	14.0	2.6	36.4	55.0					40.0						
		211,221	284.1	0.24					59.7					84.0						
	23	231	13.6	0.59	17.1	8.0	3.0	24.1												
		211-231	13.6	0.59	63.8	8.0	1.4	11.2	63.8					95.2						
	31	311	17.7	0.59	19.1	10.4	2.9	29.8												
	32	321	0.6	0.90	5.0	0.5	4.9	2.6												
		311-321	18.3	0.60	19.1	0.5	2.9	1.5	19.1	11.0	2.9			31.3						
	33	331	0.6	0.90	5.0	0.5	4.9	2.6												
		311-331	18.9	0.61	19.1	0.5	2.9	1.5	19.1	11.5	2.9			32.8						



## CURB OPENING INLET IN A SUMP

Project = Dransfeldt Road Expansion

Inlet ID = Dransfeldt Road Design Point #13 (Minor Storm)



### Design Information (Input)

Design Discharge on the Street (from *Street Hy*)

$Q_o = 6.3$  cfs

Length of a Unit Inlet

$L_u = 5.00$  ft

Side Width for Depression Pan

$W_p = 3.00$  ft

Clogging Factor for a Single Unit

$C_o = 0.10$

Height of Curb Opening in Inches

$H = 6.00$  inches

Angle of Throat (see USDCM Figure ST-5)

Theta = 63.4 degrees

Orifice Coefficient (see USDCM Figure ST-5)

$C_d = 0.67$

Weir Coefficient (see USDCM Figure ST-5)

$C_w = 3.00$

Water Depth for the Design Condition

$Y_d = 6.00$  inches

Number of Curb Opening Inlets

$N_o = 1$

### Curb Opening Inlet Capacity in a Sump

#### As a Weir

Total Length of Curb Opening Inlet

$L = 5.00$  ft

Capacity as a Weir without Clogging

$Q_{wi} = 11.0$  cfs

Clogging Coefficient for Multiple Units

Coef = 1.00

Clogging Factor for Multiple Units

Clog = 0.10

Capacity as a Weir with Clogging

$Q_{wa} = 10.5$  cfs

#### As an Orifice

Capacity as an Orifice without Clogging

$Q_{oi} = 7.1$  cfs

Capacity as an Orifice with Clogging

$Q_{oa} = 6.4$  cfs

#### Capacity for Design with Clogging

$Q_a = 6.4$  cfs

Capture Percentage for this Inlet =  $Q_a / Q_o =$

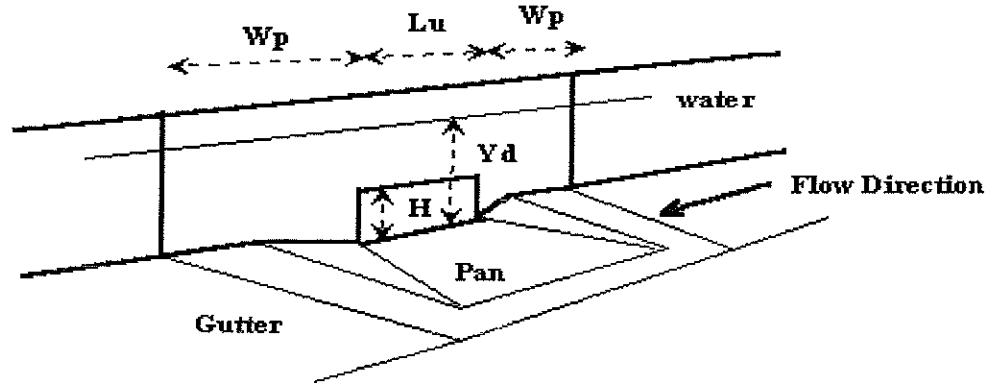
$C\% = 100.00$  %

Note: Unless additional ponding depth or spilling over the curb is acceptable, a capture percentage of less than 100% in a sump may indicate the need for additional inlet units.

## CURB OPENING INLET IN A SUMP

Project = Dransfeldt Road Expansion

Inlet ID = Dransfeldt Road Design Point #13 (Major Storm)



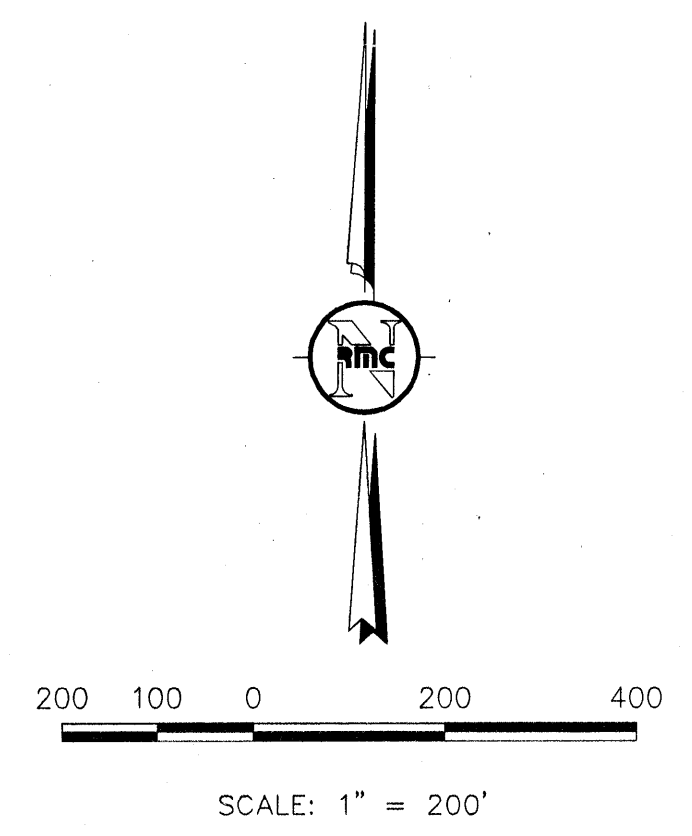
<b>Design Information (Input)</b>	
Design Discharge on the Street (from <i>Street Hy</i> )	$Q_o = 14.3$ cfs
Length of a Unit Inlet	$L_u = 10.00$ ft
Side Width for Depression Pan	$W_p = 3.00$ ft
Clogging Factor for a Single Unit	$C_o = 0.10$
Height of Curb Opening in Inches	$H = 6.00$ inches
Angle of Throat (see USDCM Figure ST-5)	Theta = 63.4 degrees
Orifice Coefficient (see USDCM Figure ST-5)	$C_d = 0.67$
Weir Coefficient (see USDCM Figure ST-5)	$C_w = 3.00$
Water Depth for the Design Condition	$Y_d = 7.00$ inches
Number of Curb Opening Inlets	$N_o = 1$
<b>Curb Opening Inlet Capacity in a Sump</b>	
<b>As a Weir</b>	
Total Length of Curb Opening Inlet	$L = 10.00$ ft
Capacity as a Weir without Clogging	$Q_{wi} = 20.6$ cfs
Clogging Coefficient for Multiple Units	Coef = 1.00
Clogging Factor for Multiple Units	Clog = 0.10
Capacity as a Weir with Clogging	$Q_{wa} = 19.2$ cfs
<b>As an Orifice</b>	
Capacity as an Orifice without Clogging	$Q_{oi} = 16.1$ cfs
Capacity as an Orifice with Clogging	$Q_{oa} = 14.5$ cfs
<b>Capacity for Design with Clogging</b>	$Q_a = 14.5$ cfs
<b>Capture Percentage for this Inlet = <math>Q_a / Q_o =</math></b>	<b>C% = 100.00 %</b>

Note: Unless additional ponding depth or spilling over the curb is acceptable, a capture percentage of less than 100% in a sump may indicate the need for additional inlet units.



**DISCHARGE SUMMARY TABLE**

DESIGN POINT	CONTRIBUTING SUB-BASINS	TOTAL AREA ACRES	Q 5-YEAR CF8	Q 100-YEAR CF8
10	101	31.4	28.4	73.9
11	111	4.3	7.2	18.3
12	101-121	38.8	32.4	81.5
13	131	0.4	1.7	3.4
14	101-141	39.2	33.2	83.1
21	211	250.0	40.0	214.0
22	211-221	284.1	84.0	163.0
23	211-231	297.7	95.2	186.8
24	211-241	296.3	96.0	186.2
25	211-251	298.9	96.7	189.7
31	311	17.7	28.8	64.4
32	311-321	18.3	31.3	67.4
33	311-331	18.9	32.8	70.4
41	411-421	7.9	19.1	41.5
42	411-431	23.7	39.1	84.5
43	411-431	32.7	54.1	118.9
44	411-441	33.3	55.3	116.3
45	451	3.5	6.8	15.0
46	411-461	37.3	62.4	134.3
51	511	1.8	5.8	11.7
52	521	1.5	5.0	10.2
53	511-531	20.0	43.8	89.1
54	511-541	21.3	47.3	95.9
61	611	17.2	13.3	27.0
62	621	1.8	4.7	9.5
63	611-631	19.3	18.0	36.3



- LEGEND**
- BASIN BOUNDARY
  - SUB-BASIN BOUNDARY
  - BASIN DESIGNATION
  - BASIN AREA IN ACRES
  - DESIGN POINTS
  - STORM SEWER

ROCKY MOUNTAIN CONSULTANTS, INC. **rnc**  
 CIVIL AND ENVIRONMENTAL ENGINEERING • PLANNING  
 8301 E. Prentice Ave.  
 Suite 101  
 Greenwood Village, CO 80111  
 (303) 741-6000  
 FAX (303) 741-6106

Date: DATE Job No. 0300.02-02