STORMWATER DRAINAGE REPORT

Prepared By:

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NCBELS #: C-3881

DATE: December 23rd, 2024

Prepared For:

Mitchell Mill Road Investors, LLC
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All HGLs must stay within the pipe for 10-year events. There are several locations this is not the case currently. Please review and revise accordingly.

Digitally signed by Jakob Klein
Date: 2024.12.23 12:10:15-05'00'

TABLE OF CONTENTS

REPORT

I. SITE HISTORY

The existing parcel use is vacant. It is located west of Rolesville Road between Fowler Road and Mitchell Mill Road. The property totals 23.45 acres, PIN: 1767-17-5039. The parcel is bordered by a Bonafide Farm to the west, with new subdivisions being built along the eastern property boundary and northwest property corner. The parcel along the southern boundary is currently vacant. An existing pond located on the southeast portion of the property feeds a stream that runs north along the eastern property boundary. There is no FEMA flood plain on this site.

The soil on site predominately consists of Rawlings-Rion, 2 to 6 percent slopes (RgB), Rawlings-Rion 10 to 15 percent slopes (RgD), Helena sandy loam (HeB), and Chewacla and Wehadkee soils (ChA). The site also consists of a small portion of Wedowee-Saw (Wfb), and Altavista fine sandy loam (AaA) according to the US Department of Agriculture (USDA) NRCS soil report. More detailed soil information can be found in the project Geotechnical Report, see Appendix A.

The existing site is relatively hilly, with a high point on the southwest corner directing site drainage towards the northern property boundary. The contours on the site range from 390' to 355' above mean sea level.

II. PROJECT DESCRIPTION

The proposed development is a residential subdivision zoned parcel (R&PUD-CZ) that will consist of 95 townhomes. It is the fifth (5^{th}) phase of a five (5) phase development, Kalas Falls. The northern entrance is connected to Kalas Falls Phase 3 and the southern entrance is connected to Kalas Falls Phase 2. The project will utilize an offsite, regional stormwater control measure (SCM) to the north of the property that is located on Kalas Falls Phase 3. This SCM (SCM #3B) has been designed to handle stormwater discharge from both Kalas Falls Phase 3 and Kalas Falls Phase 5. Kalas Falls Phase 3 is currently under review with the Town of Rolesville and Wake County.

III. RESULTS SUMMARY

Pipe Network

The stormwater conveyance on site is one system that will connect to the pipe system designed and constructed with Phase 3 of Kalas Falls. Stormwater pipe material is proposed to be reinforced concrete pipe (RCP) within the rights-of-way. RCP pipes on site range from 15" to 48" in diameter. Proposed public easements to allow for future access and maintenance of infrastructure can be seen in the Construction Drawings (CD) Plan set.

Modeling was performed in *Autodesk Hydrograph Storm Sewers* for the 10 and 25-year storm events, see Appendix C. The 10-year modeling ensured hydraulic grade lines (HGL) were maintained within the pipe networks, see Appendix C: Attachment 8. The 25-year modeling ensured HGL's were maintained within the structures, see Appendix C: Attachment 9. To accomplish modeling, inlet areas were delineated for each structure that is to accept overland flow, see Appendix B: Attachment 1. A uniform rational C-value of 0.59 was determined by implementing the post-development impervious area being conveyed to SCM's and the post-development total area being conveyed to SCM's, see Appendix C: Attachment 1. A uniform time of concentration of 10 minutes was used during modeling.

Energy Dissipation

Riprap dissipater pads have been sized for pipe outlets following NCDOT charts and methodology (see NCDOT Detail #876.02 in plan set) to reduce sediment erosion in areas where water is discharging to the surface, see Appendix C: Attachment 2. Flared-end sections or headwalls are proposed at the outlets of each system entering/exiting SCM's or proposed ditches. Class "B riprap is proposed at each of these outlets, determined by pipe size and exit velocity.

Inlet Spreads

Spreads were determined on site using a storm intensity of 4 in/hr, see Appendix C: Attachment 8. The method by Limited Area was used to calculate spread sizes and determine the max drainage area per structure based off several variables including road width, longitudinal slope, cross slope, and curb and gutter profile by implementing Manning's Equation. If the max drainage area exceeded the actual drainage area, then a double inlet was implemented in design. Max spreads for this project could not exceed 7.5-feet (5.5-foot half lane + 2-foot gutter).

Culvert Crossings

There are one culvert crossing within the Phase 5 project. The culverts are to be a 48" RCP pipe that will convey stormwater runoff underneath Graymont Oaks Dr. These 48" culvert conveys stormwater received from the north existing pond on site and the drainage area upstream.

Autodesk Hydraflow Hydrograph Extension was used to determine the peaks flows for the 10-year, 25-year, and 100-year storm events for each culvert, see Table 2: *Culvert Peak Flows*. This modeling can be seen in Appendix C. *Autodesk Hydraflow Express Extension* was used to model each culvert, by implementing peaks flows obtained from *Hydrographs*, ensuring that the 10-year hydraulic grade line remained in the pipe and the 100-year storm event does not over top the roadway, see Appendix C: Attachments 3-5.

Culvert Label	Q_{10} (cfs)	Q_{25} (cfs)	Q_{100} (cfs)
Graymont Oaks Dr: 48"	90	90-150	150

IV. METHODOLOGY

The stormwater design calculations are conducted using the following methods:

- Precipitation intensity and depths for the site were obtained from https://hdsc.nws.noaa.gov/pfds/pfds_map_cont.html?bkmrk=nc.
- Rational method was used to determined Q-values for inlet areas.
- The composite runoff coefficients (C-Value) were computed using the C-values from NCDEQ Stormwater Design Manual and are included in Appendix C: Attachments 1.
- *Autodesk Hydrograph Storm Sewers Extension* program was used to model storm pipes.
- *Autodesk Hydraflow Express Extension* program was used to model culverts.
- Riprap sizing for erosion and sediment control was determined using NCDOT standard detail #876.02 "*Guide for Rip Rap at Pipe Outlets*".

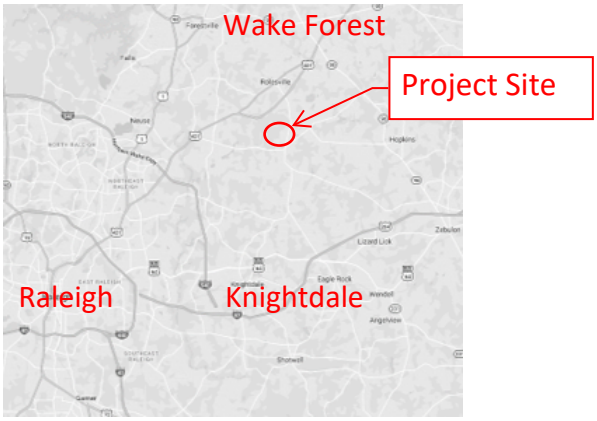
V. CONCLUSION

It is our professional opinion that the proposed stormwater design on site meets the requirements of the applicable Stormwater Rules and Regulations.

APPENDIX A

PROJECT MAPS & DATA

Kalas Falls Phase 5 Vicinity Map



N

0 50 3,200 6,400

1 inch equals 3,200 feet

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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 Wake County, North Carolina

Kalas Falls Phase 5

July 10, 2024

Preface

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

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

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

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

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

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

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Contents

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: 1:3,400 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Wake County, North Carolina
Survey Area Data: Version 25, Oct 2, 2023

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

Date(s) aerial images were photographed: Apr 24, 2022—May 9, 2022

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
AaA	Altavista fine sandy loam, 0 to 4 percent slopes, rarely flooded	0.9	3.7%
ChA	Chewacla and Wehadkee soils, 0 to 2 percent slopes, frequently flooded	2.5	10.8%
HeB	Helena sandy loam, 2 to 6 percent slopes	2.9	12.2%
RgB	Rawlings-Rion complex, 2 to 6 percent slopes	10.5	44.5%
RgD	Rawlings-Rion complex, 10 to 15 percent slopes	3.3	14.1%
W	Water	2.9	12.5%
WfB	Wedowee-Saw complex, 2 to 6 percent slopes	0.5	2.3%
Totals for Area of Interest		**23.5**	**100.0%**

Map Unit Descriptions

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

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

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit

descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

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

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

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

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

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

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

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

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

Wake County, North Carolina

AaA—Altavista fine sandy loam, 0 to 4 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: 2xh95
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Altavista, rarely flooded, and similar soils: 95 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Altavista, Rarely Flooded

Setting

Landform: Stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old loamy alluvium derived from igneous and metamorphic rock

Typical profile

Ap - 0 to 8 inches: fine sandy loam
E - 8 to 12 inches: fine sandy loam
BE - 12 to 15 inches: sandy clay loam
Bt - 15 to 35 inches: clay loam
BC - 35 to 42 inches: sandy loam
C - 42 to 80 inches: coarse sandy loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F136XY660NC - High terraces, very rare Inundation
Hydric soil rating: No

Minor Components

Roanoke, occasionally flooded, undrained

Percent of map unit: 2 percent
Landform: Stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

ChA—Chewacla and Wehadkee soils, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2qwpj
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Chewacla, frequently flooded, and similar soils: 50 percent
Wehadkee, frequently flooded, and similar soils: 45 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chewacla, Frequently Flooded

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium derived from igneous and metamorphic rock

Typical profile

A - 0 to 4 inches: loam
Bw1 - 4 to 26 inches: silty clay loam
Bw2 - 26 to 38 inches: loam
Bw3 - 38 to 60 inches: clay loam
C - 60 to 80 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Ecological site: F136XY610GA - Flood plain forest, wet
Hydric soil rating: No

Description of Wehadkee, Frequently Flooded

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium derived from igneous and metamorphic rock

Typical profile

A - 0 to 7 inches: silt loam
Bg - 7 to 49 inches: clay loam
Cg - 49 to 80 inches: clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B/D
Ecological site: F136XY600NC - Flood plain forest, very wet
Hydric soil rating: Yes

HeB—Helena sandy loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2qqgq

Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Helena and similar soils: 92 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Helena

Setting
Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and gneiss

Typical profile
Ap - 0 to 12 inches: sandy loam
BE - 12 to 19 inches: sandy clay loam
Bt1 - 19 to 39 inches: clay
Bt2 - 39 to 43 inches: clay loam
BCg - 43 to 46 inches: clay loam
C - 46 to 80 inches: sandy loam

Properties and qualities
Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Ecological site: F136XY810SC - Acidic upland forest, seasonally wet
Hydric soil rating: No

RgB—Rawlings-Rion complex, 2 to 6 percent slopes

Map Unit Setting
National map unit symbol: 2xhb9
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches

Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Rawlings and similar soils: 55 percent
Rion and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rawlings

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt - 8 to 20 inches: sandy clay loam
C - 20 to 40 inches: gravelly sandy loam
R - 40 to 80 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F136XY830NC - Acidic upland forest, depth restriction, dry-moist
Hydric soil rating: No

Description of Rion

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite derived from granite and gneiss

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt1 - 8 to 17 inches: sandy clay loam
Bt2 - 17 to 38 inches: sandy loam

C - 38 to 80 inches: sandy loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

RgD—Rawlings-Rion complex, 10 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2xhb8
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Rawlings and similar soils: 55 percent
Rion and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rawlings

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt - 8 to 20 inches: sandy clay loam
C - 20 to 40 inches: gravelly sandy loam
R - 40 to 80 inches: bedrock

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: F136XY830NC - Acidic upland forest, depth restriction, dry-moist
Hydric soil rating: No

Description of Rion

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite derived from granite and gneiss

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt1 - 8 to 17 inches: sandy clay loam
Bt2 - 17 to 38 inches: sandy loam
C - 38 to 80 inches: sandy loam

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

W—Water

Map Unit Setting

National map unit symbol: 2qqjv
Elevation: 70 to 450 feet
Mean annual precipitation: 39 to 51 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

WfB—Wedowee-Saw complex, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2xn42
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Wedowee and similar soils: 60 percent
Saw and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wedowee

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex

Parent material: Saprolite residuum weathered from granite and gneiss and/or saprolite residuum weathered from schist

Typical profile

Ap - 0 to 4 inches: sandy loam
E - 4 to 7 inches: sandy loam
BC - 23 to 35 inches: clay loam
C - 35 to 80 inches: sandy clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

Description of Saw

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and gneiss

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt - 8 to 20 inches: clay
BC - 20 to 26 inches: sandy clay loam
C - 26 to 29 inches: sandy loam
R - 29 to 80 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: C
Ecological site: F136XY830NC - Acidic upland forest, depth restriction, dry-moist
Hydric soil rating: No

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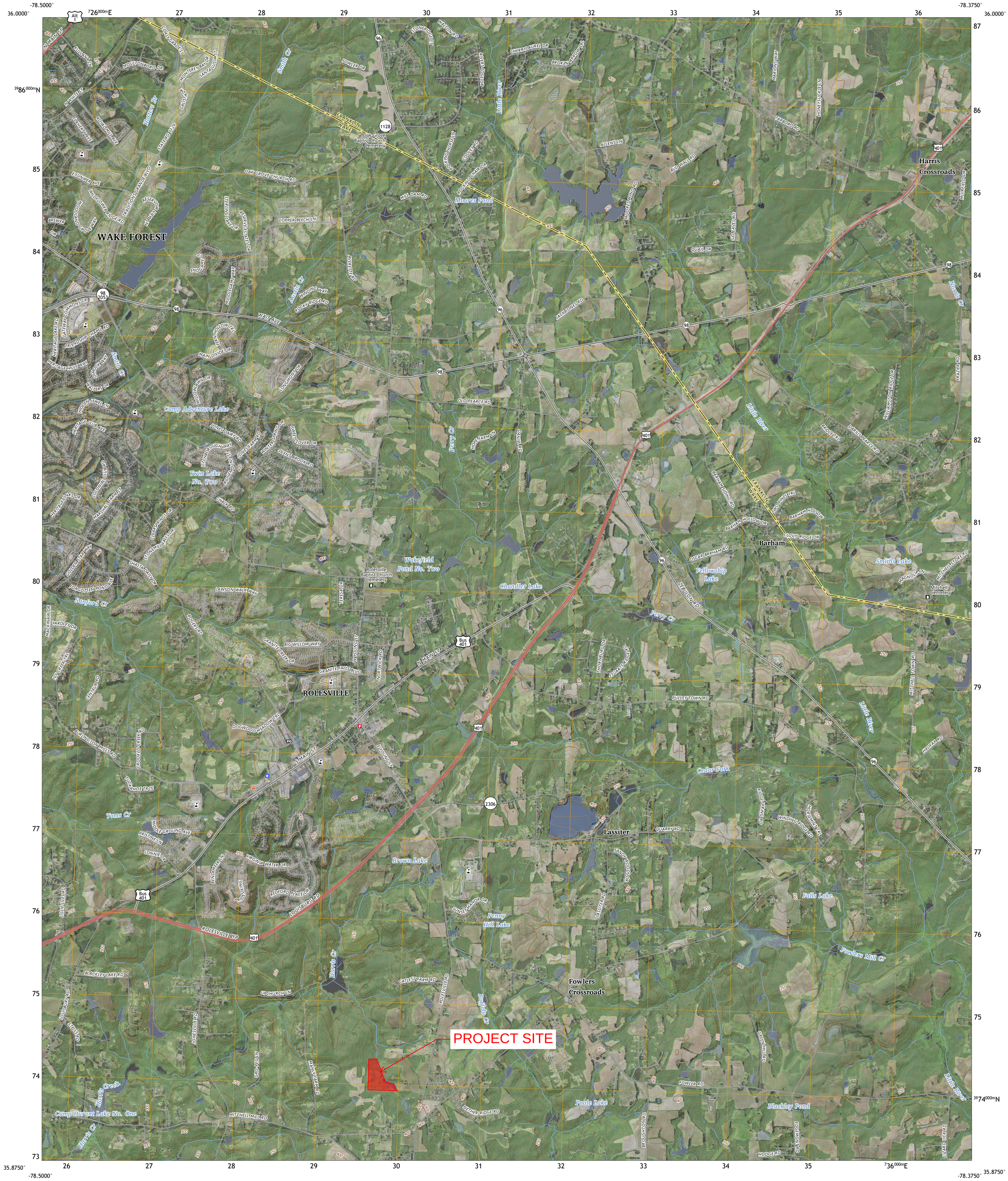
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
OnDemand Topo

ROLESVILLE QUADRANGLE
NORTH CAROLINA
7.5-MINUTE TOPO



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid:Universal Transverse Mercator, Zone 17S

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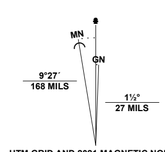


UTM GRID AND 2021 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
QV
Grid Zone Designation
17S

SCALE 1:24 000

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

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988
CONTOUR SMOOTHNESS = Medium

QUADRANGLE LOCATION

Grissom	Franklinton	Louisburg
Wake Forest	Rolesville	Bunn West
Raleigh East	Knightdale	Zebulon

ADJOINING QUADRANGLES

ROAD CLASSIFICATION

Expressway	Local Connector
Secondary Hwy	Local Road
Ramp	4WD

Interstate Route · US Route · State Route

ROLESVILLE, NC
2024

KALAS 5 SITE

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR ZONE DESCRIPTIONS AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://FRIS.NC.GOV/FRIS

HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A,V, A99* With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% Annual Chance Flood with Average Depth Less Than One Foot or With Drainage Areas of Less Than One Square Mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee See Notes *Zone X*
OTHER AREAS	Areas Determined to be Outside the 0.2% Annual Chance Floodplain *Zone X*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
	012 18.2 Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
	8 Coastal Transect
	Coastal Transect Baseline
OTHER FEATURES	Profile Baseline
	Hydrographic Feature
	Limit of Study
	Jurisdiction Boundary

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at https://msc.fema.gov. An accompanying Flood Insurance Study report, Letter of Map Revision (LOMR) or Letter of Map Amendment (LOMA) revising portions of this panel, and digital versions of this FIRM may be available. Visit the North Carolina Floodplain Mapping Program website at https://flood.nc.gov/ncflood, or contact the FEMA Map Service Center.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

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

Flood Insurance Study (FIS) means an examination, evaluation, and determination of flood hazards, corresponding water surface elevations, flood hazard risk zones, and other flood data in a community issued by the North Carolina Floodplain Mapping Program (NCFMP). The Flood Insurance Study (FIS) is comprised of the following products used together: the Digital Flood Hazard Database, the Water Surface Elevation Rasters, the digitally derived, autogenerated Flood Insurance Rate Map and the Flood Insurance Survey Report. A Flood Insurance Survey is a compilation and presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community. This report contains detailed flood elevation data, data tables and FIRM indices. When a flood study is completed for the NFIP, the digital information, reports and maps are assembled into an FIS. Information shown on this FIRM is provided in digital format by the NCFMP. Base map information shown on this FIRM was provided in digital format by the NCFMP. The source of this information can be determined from the metadata available in the digital FLOOD database and in the Technical Support Data Notebook (TSDN).

ACCREDITED LEVEE NOTES TO USERS: If an accredited levee note appears on this panel check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at https://www.fema.gov/national-flood-insurance-program.

PROVISIONALLY ACCREDITED LEVEE NOTES TO USERS: If a Provisionally Accredited Levee (PAL) note appears on this panel, check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To maintain accreditation, the levee owner or community is required to submit the data and documentation necessary to comply with Section 65.10 of the NFIP regulations. If the community or owner does not provide the necessary data and documentation or if the data and documentation provided indicate the levee system does not comply with Section 65.10 requirements, FEMA will revise the flood hazard and risk information for this area to reflect de-accreditation of the levee system. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at https://www.fema.gov/national-flood-insurance-program.

LIMIT OF MODERATE WAVE ACTION NOTES TO USERS: For some coastal flooding zones the AE Zone category has been divided by a Limit of Moderate Wave Action (LiMWA). The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LiMWA (or between the shoreline and the LiMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

Limit of Moderate Wave Action (LiMWA)

SCALE

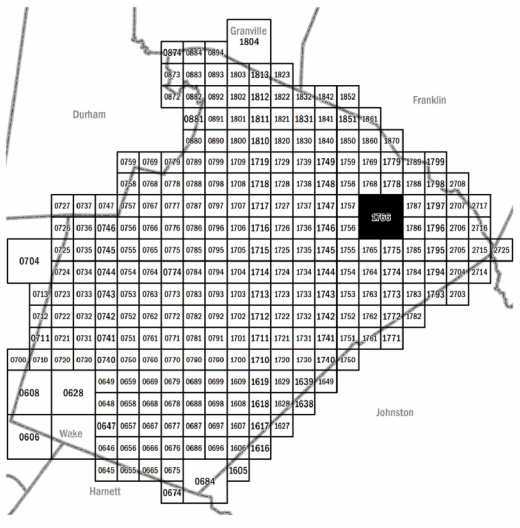
Map Projection:
North Carolina State Plane Projection Feet (Zone 3200)
Datum: NAD 1983 (Horizontal), NAVD 1988 (Vertical)

1 inch = 1,000 feet 1:12,000

0 500 1,000 2,000 Feet

0 150 300 600 Meters

PANEL LOCATOR



FEMA

National Flood Insurance Program

NORTH CAROLINA FLOODPLAIN MAPPING PROGRAM
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

NORTH CAROLINA

PANEL 1766

FEMA

Panel Contains:

COMMUNITY	CID	PANEL	SUFFIX
ROLESVILLE, TOWN OF	370468	1766	K
WAKE COUNTY	370368	1766	K

VERSION NUMBER
2.3.3.2

MAP NUMBER
3720176600K

MAP REVISED
July 19, 2022

NOAA Atlas 14, Volume 2, Version 3
Location name: Wake Forest, North Carolina, USA*
Latitude: 35.8876°, Longitude: -78.4479°
Elevation: 396 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.85** (4.44-5.30)	**5.63** (5.16-6.14)	**6.41** (5.87-7.00)	**7.20** (6.59-7.86)	**7.99** (7.28-8.72)	**8.64** (7.82-9.41)	**9.20** (8.29-10.0)	**9.71** (8.70-10.6)	**10.3** (9.12-11.2)	**10.8** (9.49-11.8)
10-min	**3.87** (3.55-4.24)	**4.50** (4.12-4.91)	**5.13** (4.70-5.60)	**5.76** (5.27-6.28)	**6.37** (5.80-6.95)	**6.88** (6.23-7.49)	**7.31** (6.59-7.97)	**7.69** (6.89-8.39)	**8.12** (7.22-8.87)	**8.48** (7.48-9.29)
15-min	**3.22** (2.95-3.53)	**3.77** (3.46-4.12)	**4.33** (3.96-4.72)	**4.86** (4.44-5.30)	**5.38** (4.90-5.87)	**5.80** (5.26-6.33)	**6.16** (5.55-6.71)	**6.47** (5.80-7.06)	**6.81** (6.06-7.44)	**7.10** (6.26-7.77)
30-min	**2.21** (2.02-2.42)	**2.60** (2.39-2.85)	**3.07** (2.82-3.35)	**3.52** (3.22-3.84)	**3.99** (3.63-4.35)	**4.37** (3.96-4.76)	**4.72** (4.25-5.14)	**5.04** (4.51-5.50)	**5.42** (4.82-5.92)	**5.75** (5.07-6.29)
60-min	**1.38** (1.26-1.51)	**1.63** (1.50-1.78)	**1.97** (1.80-2.15)	**2.29** (2.10-2.50)	**2.66** (2.42-2.90)	**2.96** (2.68-3.23)	**3.25** (2.93-3.54)	**3.53** (3.16-3.86)	**3.89** (3.46-4.25)	**4.20** (3.70-4.59)
2-hr	**0.805** (0.732-0.889)	**0.958** (0.874-1.05)	**1.17** (1.06-1.28)	**1.38** (1.25-1.51)	**1.62** (1.46-1.77)	**1.83** (1.65-2.00)	**2.04** (1.82-2.23)	**2.25** (2.00-2.46)	**2.53** (2.22-2.77)	**2.78** (2.41-3.04)
3-hr	**0.568** (0.516-0.630)	**0.676** (0.617-0.746)	**0.828** (0.753-0.913)	**0.981** (0.890-1.08)	**1.17** (1.05-1.28)	**1.33** (1.19-1.46)	**1.50** (1.33-1.64)	**1.67** (1.47-1.83)	**1.90** (1.66-2.09)	**2.12** (1.82-2.32)
6-hr	**0.341** (0.311-0.377)	**0.407** (0.372-0.448)	**0.498** (0.454-0.548)	**0.591** (0.538-0.649)	**0.706** (0.638-0.773)	**0.810** (0.727-0.885)	**0.914** (0.814-0.998)	**1.02** (0.903-1.12)	**1.17** (1.02-1.28)	**1.31** (1.13-1.43)
12-hr	**0.200** (0.183-0.220)	**0.238** (0.219-0.261)	**0.293** (0.268-0.322)	**0.350** (0.319-0.383)	**0.420** (0.381-0.459)	**0.486** (0.436-0.529)	**0.552** (0.491-0.600)	**0.623** (0.548-0.677)	**0.721** (0.624-0.784)	**0.813** (0.693-0.884)
24-hr	**0.119** (0.110-0.128)	**0.144** (0.134-0.155)	**0.181** (0.168-0.195)	**0.211** (0.195-0.227)	**0.251** (0.232-0.271)	**0.284** (0.262-0.306)	**0.318** (0.292-0.343)	**0.353** (0.323-0.381)	**0.402** (0.365-0.434)	**0.441** (0.399-0.478)
2-day	**0.069** (0.064-0.074)	**0.083** (0.077-0.089)	**0.103** (0.096-0.111)	**0.120** (0.111-0.129)	**0.142** (0.132-0.153)	**0.160** (0.148-0.173)	**0.179** (0.164-0.193)	**0.198** (0.181-0.214)	**0.225** (0.204-0.243)	**0.246** (0.222-0.266)
3-day	**0.048** (0.045-0.052)	**0.058** (0.054-0.063)	**0.073** (0.068-0.078)	**0.084** (0.078-0.090)	**0.099** (0.092-0.107)	**0.112** (0.103-0.120)	**0.125** (0.115-0.134)	**0.138** (0.126-0.148)	**0.156** (0.142-0.168)	**0.171** (0.154-0.184)
4-day	**0.038** (0.036-0.041)	**0.046** (0.043-0.049)	**0.057** (0.053-0.061)	**0.066** (0.061-0.070)	**0.078** (0.072-0.083)	**0.087** (0.081-0.094)	**0.097** (0.090-0.104)	**0.108** (0.099-0.115)	**0.122** (0.111-0.131)	**0.133** (0.121-0.143)
7-day	**0.025** (0.024-0.027)	**0.030** (0.028-0.032)	**0.037** (0.035-0.040)	**0.042** (0.040-0.045)	**0.050** (0.046-0.053)	**0.056** (0.052-0.060)	**0.062** (0.057-0.066)	**0.068** (0.063-0.073)	**0.077** (0.070-0.083)	**0.084** (0.076-0.090)
10-day	**0.020** (0.019-0.021)	**0.024** (0.022-0.025)	**0.029** (0.027-0.031)	**0.033** (0.031-0.035)	**0.038** (0.036-0.041)	**0.042** (0.039-0.045)	**0.047** (0.043-0.050)	**0.051** (0.047-0.055)	**0.057** (0.052-0.061)	**0.062** (0.056-0.066)
20-day	**0.013** (0.012-0.014)	**0.016** (0.015-0.017)	**0.019** (0.018-0.020)	**0.021** (0.020-0.023)	**0.024** (0.023-0.026)	**0.027** (0.025-0.029)	**0.029** (0.027-0.031)	**0.032** (0.030-0.034)	**0.036** (0.033-0.038)	**0.038** (0.035-0.041)
30-day	**0.011** (0.010-0.012)	**0.013** (0.012-0.014)	**0.015** (0.014-0.016)	**0.017** (0.016-0.018)	**0.019** (0.018-0.020)	**0.021** (0.020-0.022)	**0.023** (0.021-0.024)	**0.024** (0.023-0.026)	**0.027** (0.025-0.029)	**0.029** (0.026-0.031)
45-day	**0.009** (0.009-0.010)	**0.011** (0.010-0.011)	**0.012** (0.012-0.013)	**0.014** (0.013-0.015)	**0.015** (0.015-0.016)	**0.017** (0.016-0.018)	**0.018** (0.017-0.019)	**0.019** (0.018-0.020)	**0.021** (0.019-0.022)	**0.022** (0.021-0.023)
60-day	**0.008** (0.008-0.009)	**0.010** (0.009-0.010)	**0.011** (0.010-0.012)	**0.012** (0.011-0.013)	**0.013** (0.013-0.014)	**0.014** (0.014-0.015)	**0.015** (0.015-0.016)	**0.016** (0.015-0.017)	**0.018** (0.017-0.019)	**0.019** (0.017-0.020)

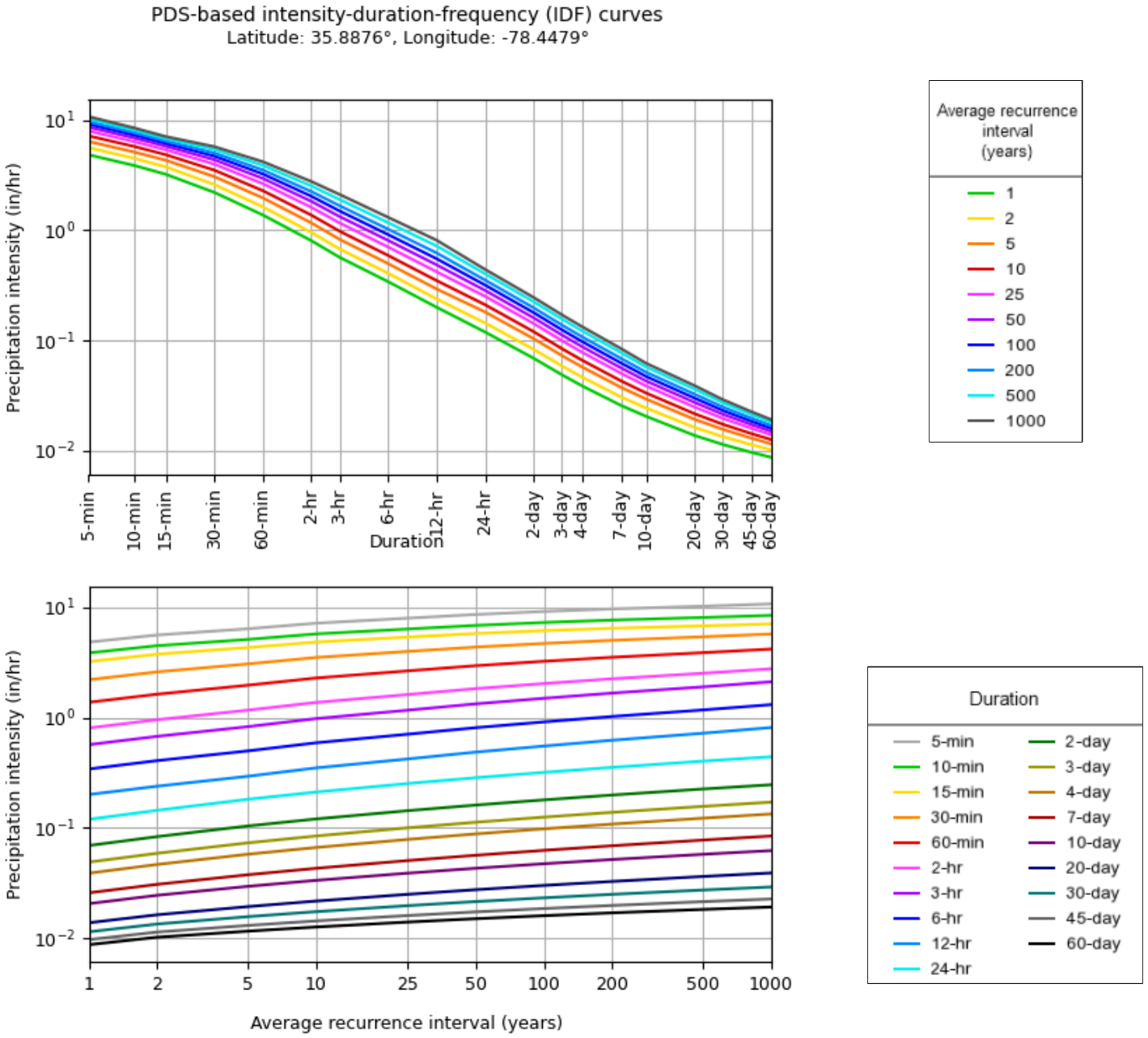
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



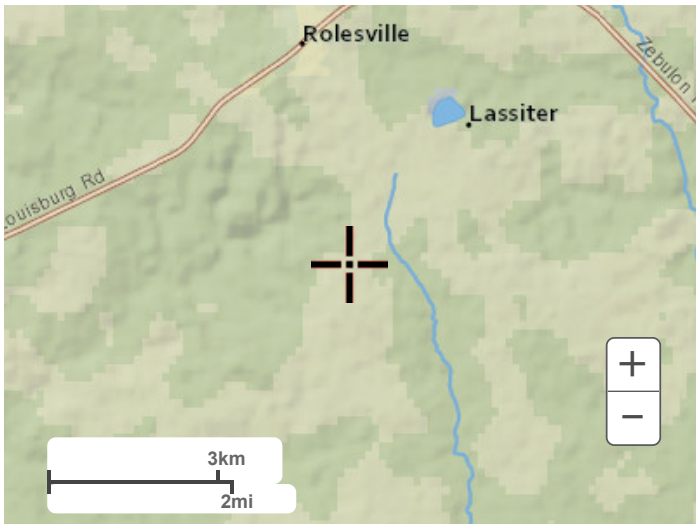
NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Tue Nov 12 22:22:08 2024

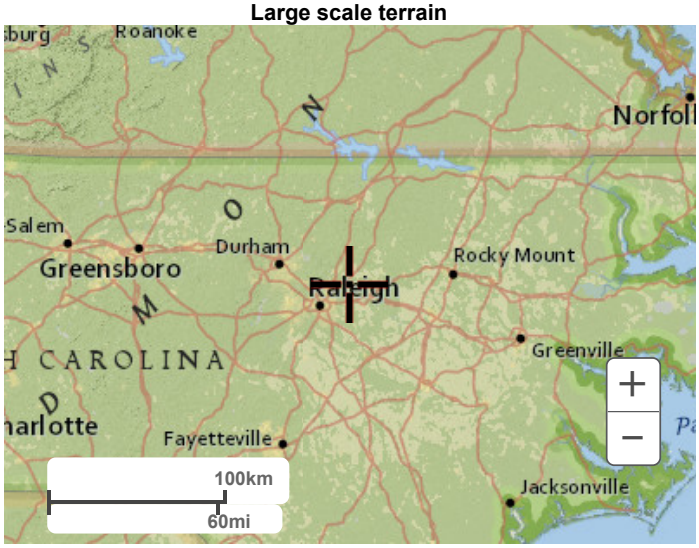
Back to Top

Maps & aerials

Small scale terrain



Large scale terrain



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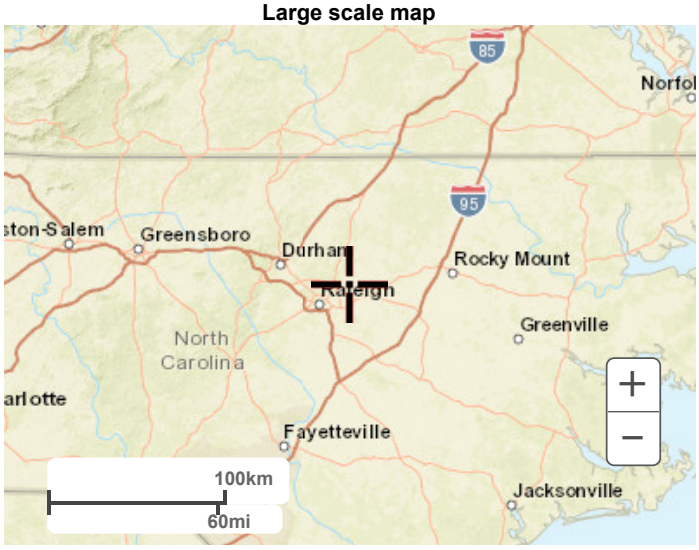
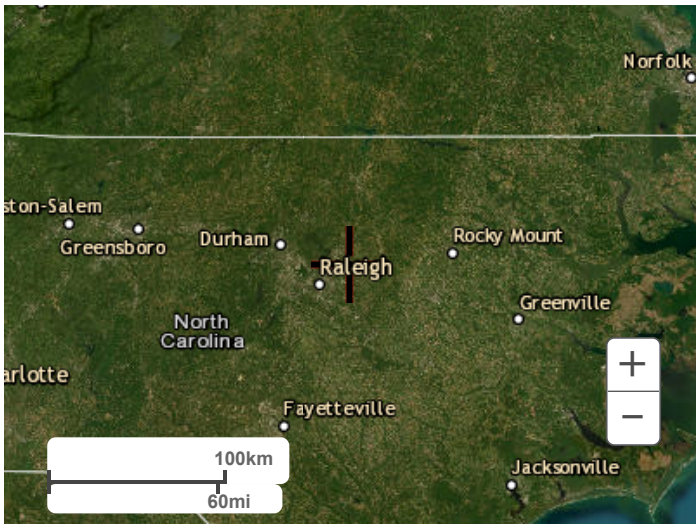


Large scale aerial



Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

ECS Southeast, LLP

Preliminary Geotechnical Engineering Report

Kalas Falls Residential Development

1832 Rolesville Road
Rolesville, North Carolina

ECS Project Number 06:24735

March 11, 2022

ECS SOUTHEAST, LLP
"Setting the Standard for Service"
Geotechnical • Construction Materials • Environmental • Facilities

March 11, 2022

Ms. Julie Spencer
D.R. Horton
2000 Aerial Center Parkway
Suite 110-A
Morrisville, North Carolina 27560

ECS Project No. 06:24735

Reference: Preliminary Geotechnical Engineering Report
Kalas Falls Residential Development
1832 Rolesville Road
Rolesville, North Carolina

Dear Ms. Spencer:

ECS Southeast, LLP (ECS) has completed the preliminary subsurface exploration, laboratory testing, and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our agreed to scope of work. This report presents our understanding of the geotechnical aspects of the project, the results of the field exploration conducted, and our preliminary geotechnical design and construction recommendations for the project.

It has been our pleasure to be of service to you during this phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to verify subsurface conditions assumed for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

ECS Southeast, LLP

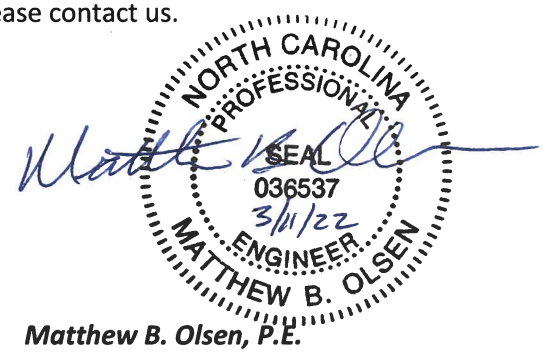


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TABLE OF CONTENTS

APPENDICES

EXECUTIVE SUMMARY

This executive summary is intended as a very brief overview of the primary geotechnical conditions that are expected to affect design and construction. Information gleaned from the executive summary should not be utilized in lieu of reading the entire geotechnical report.

- Elastic SILT (MH) and Fat CLAY (CH) are present at the site in localized areas. These are potentially expansive soils per the current North Carolina Building Code and local practice. Based on laboratory testing and our experience, these soils have a medium to high potential for expansion (i.e., shrink-swell) and are considered to be expansive. We recommend that the mitigation measures given in this report be implemented to reduce the potential for structure or pavement distress (cracking, excessive deformation) as a result of volumetric changes in potentially expansive soils due to variations in its moisture content. Mitigation options include a 1 foot separation distance under footings, floor slabs and pavements and chemical (lime) stabilization. Additional soil sampling and laboratory testing should be performed during the design phase of the project to further evaluate the potentially expansive soils.

- The site is underlain by foliated to massive intrusive granitic rock in a geologic area known for shallow partially weathered rock (WR) and hard competent rock.

- Most of the borings (29 of 53) encountered PWR and/or hard competent rock at depths of 1 to 10 feet below the existing ground surface.

- Based upon the assumed grades, we anticipate that ripping, hammering, and/or blasting of partially weathered rock and rock will be required across the majority of the site to achieve design site, foundation, and underground utility grades.

- Existing fill was encountered in Boring B-08. The SPT boring N-values indicate that the existing fill was probably not thoroughly and adequately compacted. The existing fill should be evaluated at the time of construction by proofrolling, excavation of test pits, hand auger borings, and/or construction excavations. If the existing fill is very soft to soft and/or contains excessive inert debris or excessive organic materials, it should not be used to support foundations, floor slabs, or pavements, and it should be undercut and replaced with engineered fill consisting of suitable materials.

- Based on 14 of the soil test borings, we anticipate undercutting of very soft to soft or very loose near-surface natural soils could be necessary in numerous areas across the site during mass grading, depending on design grades. If site earthwork is performed during the typically cooler, wetter months of the year, additional undercutting is anticipated due to excessively wet unstable soils.

- We anticipate that most of the soils encountered in the borings within the anticipated excavation depths will be suitable for use as engineered fill. For areas with ripped or blasted rock, these materials can be included in engineered fills in accordance with report recommendations.

- Most of the borings were dry to their termination depths. Some of the borings encountered groundwater at depths between 3 and 16 feet. The Web Soil Survey Report indicates that the seasonal high water table is generally more than 6 feet deep in the upland areas, which make up the majority of the site. The seasonal high water table is as shallow as 1 to 2 feet in the lower areas of the site near the drainage features. Once a preliminary grading plan has been prepared, it should be provided to ECS for review and comment regarding the potential need for temporary and/or permanent dewatering of the groundwater at the site.

- Lightly loaded 1- to 3-story wood-framed residential structures (column loads less than 50 kips and wall loads less than 5 kips per foot) can be supported by shallow foundations and floor slabs bearing on undisturbed natural soils or new engineered fill.

- Additional subsurface explorations consisting of additional seismic refraction testing, soil test borings, and/or test pits should be performed to obtain additional data to estimate quantities of rip rock, mass blast rock, and trench blast rock for the proposed site grading.

- This is a preliminary report, and it should not be used for final design or for construction.

1.0 INTRODUCTION

The purpose of this study was to provide preliminary geotechnical information for the design and construction of a new subdivision with 455 single-family homes, streets, stormwater control measures, and underground utilities, including an off-site sanitary sewer outfall line for D.R. Horton. The recommendations developed for this report are based on project information supplied by Ms. Julie Spencer with D.R. Horton.

Our services were provided in accordance with our Proposal No. 06:22970, dated November 22, 2021, as authorized by Jonathan Cooper with D.R. Horton on November 30, 2021, which includes our Terms and Conditions of Service.

This report contains the procedures and results of our subsurface exploration and laboratory testing programs, review of existing site conditions, engineering analyses, and preliminary recommendations for development of the project.

2.0 PROJECT INFORMATION

This report is based on the following sources of information:

- Emails between Ms. Julie Spencer and Mr. Jonathan Cooper with D.R. Horton and Mr. Santhosh Mahavadi with ECS between November 5 and November 8, 2021.
- General site plans titled “Development Essentials Brochure” prepared by American Engineering dated April 21, 2020.
- Overall Phase Plan for Kalas Falls, prepared by American Engineering, dated September 19, 2019.
- Kalas Property Traffic Impact Analysis Report, prepared by Stantec, prepare for Mitchel Mill Road Investors, LLC, dated January 16, 2016.
- Report of Subsurface Exploration, Dam @ Rolesville Road ant Mitchel Mill Road, prepared by GeoTechnologies, prepared for Withers & Ravenel, dated April 28, 2016.
- Report titled “Difficult Excavation Potential, Kalas Tract Sewer”, prepared by GeoTechnologies, prepared for Mitchell Mill Investors, LLC, dated July 12, 2016.
- Report titled “Difficult Excavation Potential & Dam Embankment Impact, Kalas Tract Sewer MH-1 to MH-3”, prepared by GeoTechnologies, prepared for Mitchell Mill Investors, LLC, dated November 8, 2016.
- Drawings titled “Construction Phase 1 for Kalas Falls”, prepared by American Engineering, dated June 28, 2021.
- Drawings titled “Construction Phase 2 for Kalas Falls”, prepared by American Engineering, dated July 22, 2021.
- Drawings titled “Construction Phase 3 for Kalas Falls”, prepared by American Engineering, dated August 17, 2021.
- Preliminary site plan drawings prepared by American Engineering, dated September 19, 2019.
- Google Earth aerial photos dated between December 1985 and March 2021.
- Site and topographic information obtained from the Wake County GIS website.
- United States Geologic Survey Quadrangle Map (Google Earth overlay .kmz file).

2.1 SITE INFORMATION

The site is located at 1832 Rolesville Road in Rolesville, North Carolina, at the approximate location shown in the following figure.

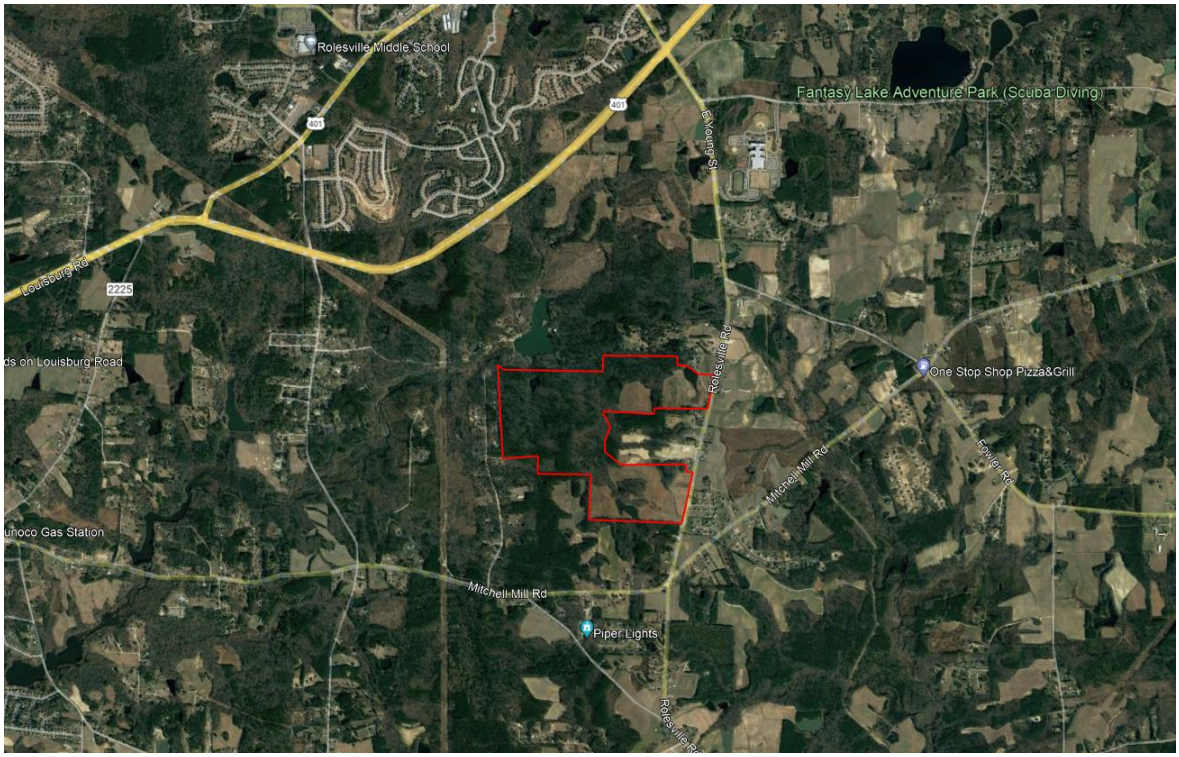


Figure 2.1.1. Site Location

The property is currently undeveloped and mostly wooded, with some open fields. The site generally slopes downward to the north and to the south from the central portion of the site. Four ponds and numerous creeks were observed on site. Numerous rock outcrops and boulders were found in the western portion of the site. A stream was observed in the central portion of the site leading to an approximate 10-foot-tall waterfall northwestern portion of the site.

2.2 PROPOSED CONSTRUCTION

The project involves constructing a new subdivision with 455 single-family homes, streets, stormwater control measures, and underground utilities, included an off-site sanitary sewer outfall line.

We assume that the proposed houses will be 2 to 3-story, wood-framed structures with slab-on-grade ground floors or crawl spaces. Design foundation loads have not been provided to us. We assume maximum unfactored loads will be less than or equal to the following:

- Maximum Wall Load = 3 kips per foot
- Maximum Ground Floor Slab Load = 150 pounds per square foot (psf)

The structural engineer should verify these assumptions and notify ECS if the actual unfactored foundation design loads exceed or are significantly less than this assumed value.

The grading plans provided to us indicates that maximum cuts in the pavement areas will be approximately 10 feet, with maximum cuts of approximately 15 feet in some of the SCM areas. Maximum fill depths will be approximately 10 feet. Water lines will be approximately 4 feet below the finished grades along the streets and sanitary sewer lines will be approximately 10 to 15 feet below the finished grades along the streets.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

Our exploration procedures are explained in greater detail in Appendix B including the insert titled Subsurface Exploration Procedure: Standard Penetration Testing (SPT). Our scope of work included drilling 50 borings. Our borings were located with a handheld GPS unit and their approximate locations are shown on the Boring Location Diagram in Appendix A.

3.1 SUBSURFACE CHARACTERIZATION

The subsurface conditions encountered were generally consistent with published geological mapping. The following sections provide generalized characterizations of the soil and rock strata. Please refer to the boring logs in Appendix B.

The site is located within the Piedmont physiographic province. The Piedmont is characterized by residual overburden soils weathered in place from the underlying igneous and metamorphic rock. The topography and relief of the Piedmont uplands have developed from differential weathering of the bedrock. Because of the continued chemical and physical weathering, the bedrock in the Piedmont is now generally covered with a mantle of soil that has weathered in place from the parent bedrock. These soils have variable thicknesses and are referred to as residuum or residual soils. The residuum is typically finer grained and has higher clay content near the surface because of the advanced weathering. Similarly, the soils typically become coarser grained with increasing depth because of decreased weathering. As the degree of weathering decreases, the residual soils generally retain the overall appearance, texture, gradation and foliations of the parent rock.

The boundary between soil and rock in the Piedmont is not sharply defined. A transitional zone termed “partially weathered rock” is normally found overlying the parent bedrock. Partially weathered rock (WR) is defined for engineering purposes as residual material with Standard Penetration Resistances (N-values) exceeding 100 blows per foot. The transition between hard/dense residual soils and partially weathered rock occurs at irregular depths due to variations in degree of weathering. Also, it is not unusual to find lenses and boulders of hard rock and/or zones of partially weathered rock within the soil mantel well above the general bedrock level.

According to the *1985 Geologic Map of North Carolina* the site is underlain by foliated to massive granitic rock of Permian to Pennsylvanian age (PPmg).

It is important to note that the natural geology within portions of the site has been modified in the past that included the placement of fill materials. The quality of man-made fills can vary significantly, and it is often difficult to assess the engineering properties of existing fills.

The following sections provide additional information about the soil and rock strata encountered during our subsurface exploration.

Surficial Material: A surficial layer of topsoil, ranging from approximately 4 to 12 inches in thickness, was encountered at most boring locations.

Existing Fill: Existing fill/possible fill soils consisting of Silty SAND (SM) and Silty Clayey SAND (SC-SM) were encountered below the topsoil and extended to approximate depths of 8 feet below existing grade at Boring B-8.

Residuum: The natural soils encountered below the fill and/or topsoil generally consisted of Silty SAND (SM), Clayey SAND (SC), Silty Clayey SAND (SC-SM), Sandy with SILT (SP-SM), Sandy SILT (ML), Sandy Elastic SILT (MH), Sandy Lean CLAY (CL) and Sandy Fat CLAY (CH). The SPT N-values within the sands ranged from 1 to 79 bpf, indicating a relative density of very loose to very dense. The SPT N-values within the silts and clays ranged from 2 to 50 bpf, indicating a consistency varying from very soft to very hard.

Weathered Rock: Weathered Rock (WR), which is classified as material with SPT blow counts greater than 50 blows per 6 inches of penetration, was encountered in the majority of borings. The depths of the top of weathered rock are given in the following table:

Weathered Rock (WR)

Boring	Depth to WR (ft)
B-1	3.5
B-2	0.5
B-3	3.0
B-4	0.5
B-5	3.0
B-6	3.5
B-7	5.5*, 17.5
B-8	12
B-9	3.0
B-10	3.0
B-12	0.6
B-14	8.0
B-15	0.5
B-16	3.0
B-17	0.5
B-18	3.0
B-19	13.0
B-20	0.3
B-24	3.0
B-28	3.0

Boring	Depth to WR (ft)
B-29	8.0
B-30	5.5
SCM-01	3.0
SCM-04	0.5
SCM-05	12.5
SCM-07	5.5
SCM-09	8.0
SCM-10	0.6
SCM-11	3.0
SCM-12	0.3
SCM-13	3.0
SCM-14	0.5

* - Lens of PWR encountered between depths of about 5.5 feet to 8 feet within location B-7

Competent Rock: Competent Rock, classified as auger refusal material, was encountered in the majority of borings. The depths of the top of weathered rock are given in the following table:

Competent Rock

Boring	Depth to Rock (ft)
B-1	3.5
B-2	1.1
B-3	3.0
B-4	2.0
B-5	3.0
B-6	3.5
B-7	17.5
B-8	13.7
B-9	3.5
B-10	3.0
B-12	3.6
B-14	8.7
B-15	0.5
B-16	3.6
B-17	2.5
B-18	4.2
B-19	13.0
B-20	1.6
B-24	5.5
B-28	5.5

Boring	Depth to Rock (ft)
B-29	12.5
B-30	6.0
SCM-01	5.5
SCM-04	1.0
SCM-05	12.5
SCM-07	6.0
SCM-09	9.5
SCM-10	2.0
SCM-11	3.7
SCM-12	0.5
SCM-13	3.0
SCM-14	1.2

3.2 GROUNDWATER OBSERVATIONS

Water levels were measured and are given on the boring logs in Appendix B. Most borings were observed dry after drilling with cave-in at various depths. Groundwater was observed in some borings at the completion of drilling and were measured at depths ranging from 3.5 to 12.5 feet below the ground surface. As stated in the ECS Seasonal High Water Table Estimation Report dated February 7, 2022 (ECS Project No. 49:16341), the SHWTs were estimated to range from 12 inches below the existing ground surface at location SCM-18 to as much as 122 inches (10 feet) deep at location SCM-15. Variations in the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, construction activities, and other factors.

3.3 LABORATORY TESTING

Each sample was visually classified on the basis of texture and plasticity in accordance with ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures).

The laboratory testing consisted of selected tests performed on samples obtained during our field exploration operations. Classification and index property tests were performed on representative soil samples in accordance with ASTM D2487 Standard Practice for Classification for Engineering Purposes. Additionally, standard Proctor and California Bearing Ratio (CBR) tests were performed on representative samples.

After identification and classification, the samples were grouped in the major zones noted on the boring logs in Appendix B. The group symbols for each soil type are indicated in parentheses along with the soil descriptions. The stratification lines between strata on the logs are approximate; in situ, the transitions may be gradual.

4.0 PRELIMINARY RECOMMENDATIONS

4.1 BUILDING/STRUCTURE DESIGN

Lightly loaded 1- to 3-story structures (column loads less than 50 kips and wall loads less than 6 kips per foot) can be supported by shallow foundations and ground supported slabs bearing on undisturbed residual soils, new engineered fill, or approved existing fill.

For preliminary design purposes, the footings can be sized using a presumptive allowable bearing pressure of 2,000 psf. A higher bearing pressure could be achieved, depending on the results of the recommended design-phase geotechnical borings and engineering analysis.

4.2 SUBGRADE PREPARATION

4.2.1 Stripping and Grubbing

The subgrade preparation should consist of stripping all vegetation, rootmat, topsoil, and any other soft or unsuitable materials from the proposed construction areas. The borings generally encountered 4 to 12 inches of topsoil. Deeper topsoil or organic laden soils are likely present in wet, low-lying, and poorly drained areas. In the wooded areas, the rootmat may extend as deep as about 1 to 2 feet and will require additional localized stripping and grubbing depth to completely remove the organics. In agricultural fields, organics within the cultivated soil are anticipated primarily to a depth of about 6 inches. The topsoil encountered in the borings was not analyzed for its suitability for reuse in landscaping areas. ECS should be called on to verify that topsoil and unsuitable surficial materials have been completely removed prior to the placement of engineered fill or construction of structures and pavements.

We anticipate average stripping depths of 12 inches to remove the cultivated soil from the existing agricultural fields, 6 inches to remove topsoil and rootmat from areas that are currently grass-, weed- or brush-covered, and 12 inches to remove the topsoil and rootmat from areas that are currently wooded. We recommend that these average stripping depths be used for quantity approximations for earthwork design and construction cost estimating.

4.2.2 Proofrolling

After removing all unsuitable surface materials, cutting to the proposed grade, and prior to the placement of any engineered fill or other construction materials, the exposed subgrade should be examined by the geotechnical engineer or authorized representative. The exposed subgrade should be thoroughly densified in place using a 10-ton, self-propelled, vibratory smooth drum roller due to the very loose to loose sands encountered in the borings at the anticipated subgrade elevations. The exposed subgrade should then be proofrolled with previously approved construction equipment having a minimum axle load of 10 tons (e.g. fully loaded tandem-axle dump truck). The areas subject to proofrolling should be traversed by the equipment in two perpendicular (orthogonal) directions with overlapping passes of the vehicle under the observation of the geotechnical engineer or authorized representative. This procedure is intended to assist in identifying any localized yielding materials.

In the event that unstable or "pumping" subgrade is identified by the proofrolling, those areas should be marked for repair prior to the placement of any subsequent engineered fill or other construction materials. Methods of repair of unstable subgrade, such as undercutting or moisture conditioning or chemical stabilization, should be discussed with the geotechnical engineer to determine the appropriate procedure with regard to the existing conditions causing the instability. Test pits and/or hand auger borings may be excavated to explore the shallow subsurface materials in the area of the instability to help in determining the cause of the observed unstable materials and to assist in the evaluation of the appropriate remedial action to stabilize the subgrade.

Based on the soil test borings, we anticipate undercutting of existing fill and very soft to soft or very loose near-surface natural soils will be necessary in numerous areas across the site. If site earthwork is performed during the typically cooler, wetter months of the year, additional undercutting in other areas of the site is anticipated due to potentially excessively wet unstable soils. Undercut excavations should be backfilled with properly placed and engineered fill. Use of geotextiles and select granular fill may be recommended by ECS during construction to reduce the required undercut depths and/or aid in stabilization of subgrades. We recommend that unsuitable/unstable soil undercut allowance quantities be determined by the design team for inclusion in a classified earthwork contract, and bidders should provide unit prices for the following:

- Excavation of, disposal of (either off-site or on-site, depending on available space and owner's preference), and replacement of unsuitable/unstable soils with engineered fill (per cubic yard).
- Excavation of, disposal of (either off-site or on-site, depending on available space and owner's preference), and replacement of unsuitable/unstable soils with NCDOT Class II, Type 1 Select Material (per cubic yard).
- Installation of woven geotextile, Mirafi HP270 or equivalent (per square yard)

4.3 EARTHWORK OPERATIONS

4.3.1 Engineered Fill Materials

Materials suitable for use as engineered fill should consist of inorganic soils classified as CL, ML, SM, SC, SW, SP, GW, GM and GC, or a combination of these group symbols, per ASTM D 2487. The materials should be free of organic matter and debris. The fill should exhibit a maximum dry density of at least 90 pounds per cubic foot, as determined by a Standard Proctor compaction test (ASTM D 698).

Engineered fill should be placed in maximum 8-inch loose lifts. In confined areas such as utility trenches, portable compaction equipment and thin lifts of 4 inches to 6 inches may be required to achieve specified degrees of compaction.Engineered fill should be moisture conditioned as necessary to within -3 and +3 % of the soil's optimum moisture content. Moisture conditioning options include spraying and mixing in water to excessively dry soils, scarifying and drying of excessively wet soils, and adding lime to excessively wet soils.Engineered fill should be compacted with suitable equipment to a dry density of at least 95% of the Standard Proctor maximum dry density (ASTM D698) more than 12 inches below the finish subgrade elevation and to a least 98% in the upper 12 inches. ECS should be retained to observe and test the placement and compaction of engineered fill.

Product Submittals: At least one week prior to placement of engineered fill, representative bulk samples (about 50 pounds) of on-site and/or off-site borrow should be submitted to ECS for laboratory testing, which will include Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships for compaction. Import materials should be tested prior to being hauled to the site to determine if they meet project specifications.

Suitable Engineered Fill Materials: Materials suitable for use as engineered fill should consist of inorganic soils classified as CL, ML, SM, SC, SW, SP, GW, GM and GC, or a combination of these group symbols, per ASTM D 2487. The materials should be free of organic matter and debris. The fill should exhibit a maximum dry density of at least 90 pounds per cubic foot, as determined by a Standard Proctor compaction test (ASTM D 698). On-site Fat CLAY (CH) and Elastic SILT (MH) may be placed as engineered fill for mass grading, provided the previously recommended separation distance is achieved or lime stabilization is implemented. Rock fragments should generally be less than 3 inches in maximum dimension and should be blended with soil.

For sites with ripped or blasted rock, these materials can be included in engineered fills in accordance with the following table:

Loose Lifts and Rock Fragment Sizes

Engineered fill Depth Below Finish Subgrade Elevation	Maximum Loose Lift (in.)	Maximum Particle (Rock Fragment) Size (in.)
0 to 5 ft	8	3
5 to 10 ft	12	6
>10 ft	24	18

If ripped or blast rock is used as engineered fill, and it is not thoroughly blended to avoid the formation of voids within the fill, then the ripped/blast rock fill should be covered with a 2-feet-thick layer of well-graded “choke stone” material to prevent the migration of fines downward from the upper soil fill into the ripped/blast rock fill voids.

Unsuitable Materials: Unsuitable fill materials include materials which do not satisfy the requirements for suitable materials, such as topsoil, organic materials, debris, and debris-laden fill.

On-Site Borrow Suitability: The on-site soils meeting the classifications for recommended suitable engineered fill, plus meeting the restrictions on separation distances, organic content, and debris, may be used as engineered fill. We anticipate that most of the soils encountered in the borings within the anticipated excavation depths will be suitable for use as engineered fill.

The on-site Elastic SILT (MH) and Fat CLAY (CH) may be used as engineered fill for mass grading, as long as the previously recommended foundation bearing depths and vertical separation distance between floor slab subgrade and pavement subgrade elevations are achieved. However, these soils should not be used as retaining wall backfill. Please note that these soils are very moisture sensitive, can be relatively weak and compressible, and may be difficult to properly moisture condition and compact.

On-site soils used as engineered fill will require careful moisture control in order to achieve compaction and stability. Any soils excavated from below the water table will require significant drying to achieve the recommended moisture content and minimum compaction. Soils above the water table may also be relatively dry at the time of construction and require wetting to achieve the recommended moisture content and minimum compaction.

The gradation of partially weathered rock and rock removed by ripping or blasting will probably be quite varied. Crushing of boulder-sized rock fragments may be required to meet the maximum particle sizes given in the previous table if ripped or blasted rock is to be used as engineered fill.

4.3.2 Existing Fill

Based on the relative strength and stiffness of the existing fill/possible fill soils indicated by the SPT N-values from the soil test borings, in addition to the organics and construction debris encountered in Borings B-8, it appears that some of the existing fill was placed in an uncontrolled manner without consistent compaction. As we have not been provided fill placement construction field testing reports, we interpret the existing fill to also be undocumented.

Uncontrolled and/or undocumented fill poses risks associated with under-compacted soil, undetected deleterious inclusions within the fill, and/or deleterious materials at the virgin ground fill interface that are covered by the fill. ECS does not recommend supporting building foundations and pavements on under-compacted existing fill or existing fill with excessive organics or excessive inert debris. Therefore, we recommend that these conditions be addressed by on-site engineering evaluation by ECS during construction, including proofrolling and test pits, if recommended. Under-compacted fill indicated by Boring B-8, and potentially in other localized areas, should be over-excavated and replaced with engineered fill. Undercutting and replacement of existing fill should be anticipated for this project and could be addressed contractually through allowances and unit prices.

4.3.3 Expansive Soil

Elastic SILT (MH) and Fat CLAY (CH) are present at the site. These are potentially expansive soils per the current North Carolina Building Code and local practice. Based on laboratory testing and our experience, these soils have a low to medium potential for expansion (i.e., shrink-swell) and are considered to be expansive. We recommend that the mitigation measures given in this report be implemented to reduce the potential for structure or pavement distress (cracking, excessive deformation) as a result of volumetric changes in potentially expansive soils due to variations in its moisture content. Mitigation options include a 1-foot separation distance or chemical (lime) stabilization.

We recommend that if and where the expansive soils are present at the footing bearing elevations, they should be undercut to a depth of 1 foot below bottom of footing and replaced with engineered fill, compacted ABC, flowable fill, or lean concrete. We also recommend that a minimum separation distance of 1 foot be maintained between slab subgrade and pavement subgrade elevations and expansive soil (CH, MH) to reduce the potential for structure or pavement distress (cracking, excessive deformation) as a result of volumetric changes in the soil due to variations in its moisture content. Based on the borings and anticipated design grades, we anticipate that this separation

distance may be required in the areas represented by Borings B-6, B-11, B-13, B-14, B-18, B-19, B-23, B-28, B-31, and SCM-08, in addition to other localized areas at the site.

The minimum separation distance should be achieved by undercutting the undisturbed natural expansive soil and replacing it with low-plasticity engineered fill. This will require overexavation and replacement of 1 foot of expansive soil where present in the cut-fill transition.

Alternatively, the recommended separation distance could be achieved by treating the expansive soil with lime. With a 1-foot separation distance, the soil could be treated in situ with lime.

It may be possible to reduce the separation distance and the amount of undercutting/replacement or lime stabilization required with additional soil sampling, advanced laboratory testing (Expansion Index and Swell Potential), and detailed structural dead-load analysis. If lime stabilization is selected, additional laboratory testing is recommended to determine the percentage of lime required. ECS can provide a proposal for these additional services/analyses upon request.

Even though the Elastic SILT (MH) and Fat CLAY (CH) can be used as fill below the recommended separation distance elevations, they are very moisture sensitive and can be relatively weak and compressible. The moisture contents will require careful control and must be within +/- 3% of the soil's standard Proctor optimum moisture content to provide stability and to prevent excessive swell heave, shrinkage settlement, or collapse settlement upon wetting.

4.3.4 Compaction

Fill Compaction: Engineered fill should be placed in maximum 8-inch loose lifts. In confined areas such as utility trenches, portable compaction equipment and thin lifts of 4 inches to 6 inches may be required to achieve specified degrees of compaction.

Engineered fill should be moisture conditioned as necessary to within -3 and +3 % of the soil's optimum moisture content. Moisture conditioning options include spraying and mixing in water to excessively dry soils, scarifying and drying of excessively wet soils, and adding lime to excessively wet soils.

Engineered fill should be compacted with suitable equipment to a dry density of at least 95% of the Standard Proctor maximum dry density (ASTM D698) more than 12 inches below the finish subgrade elevation and to a least 98% in the upper 12 inches.

ECS should be retained to observe and test the placement and compaction of engineered fill.

Moisture Conditioning: The on-site soils are moisture sensitive and can be difficult to work. Problems include softening of exposed subgrade soils, excessive rutting or deflection under construction traffic, and the inability to adequately dry and compact wet soil.

Drying and compaction of wet soils is typically difficult during typically cooler, wetter months of the year (typically November through March). During the cooler and wetter periods of the year, delays and additional costs should be anticipated. At these times, reduction of soil moisture may need to be accomplished by a combination of mechanical manipulation and the use of chemical additives,

such as lime or cement, in order to lower moisture contents to levels appropriate for compaction. Alternatively, removal and replacement with drier, off-site materials may be necessary.

4.4 PAVEMENTS

4.4.1 Pavement Sections

Undisturbed low-plasticity soils or newly placed engineered fill can provide adequate support for a pavement structure designed for appropriate subgrade strength and traffic characteristics.

Based on the results of our soil test borings, it appears that the soils that will be exposed as pavement subgrades, exposed in cuts and placed as fill, will consist mainly of Silty Sand (SM), Sandy Lean CLAY (CL), Sandy SILT (ML), and Clayey SAND (SC). A California Bearing Ratio (CBR) of 5 should be used for preliminary pavement section thickness design, until design phase CBR laboratory testing is performed.

Fat CLAY (CH) and Elastic SILT (MH) should not be left in place in cut areas or placed as fill immediately below the pavements. A minimum separation of 1 foot should be maintained between the pavement subgrade elevation and Elastic SILT (MH) or Fat CLAY (CH), or lime stabilization should be implemented. This will require undercutting of Elastic SILT (MH) and Fat CLAY (CH) at cut fill transitions and the placement of low-plasticity soil in the upper 1 foot of engineered fill.

5.0 ADDITIONAL GEOTECHNICAL SERVICES

Once final grades, building locations, and pavement locations measure locations have been determined, we recommend that additional soil test borings and laboratory testing be performed to develop final geotechnical design and construction recommendations. Additional laboratory testing should include Expansion Index and Swell Pressure testing of the highly plastic soil encountered in the preliminary borings.

If site retaining walls 5 feet or more in height are needed to achieve design grades, we recommend that additional soil test borings and laboratory testing be performed to evaluate the foundation bearing conditions along the wall alignments and to test the on-site soils for potential use as retaining wall backfill. ECS would be pleased to provide a proposal for these additional services, including site retaining wall design, upon request.

6.0 CLOSING

ECS has prepared this report of findings, evaluations, and preliminary recommendations to guide geotechnical-related aspects of the project. These recommendations are not intended for final design and construction. Additional exploration and/or analysis will be required to develop final commendations.

The description of the proposed project is based on information provided to ECS. If any of this information is inaccurate, either due to our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted immediately in order that we can

review the report in light of the changes and provide additional or alternate recommendations as may be required to reflect the proposed construction.

We recommend that ECS be retained to develop design and construction recommendations once the project's plans have been developed.

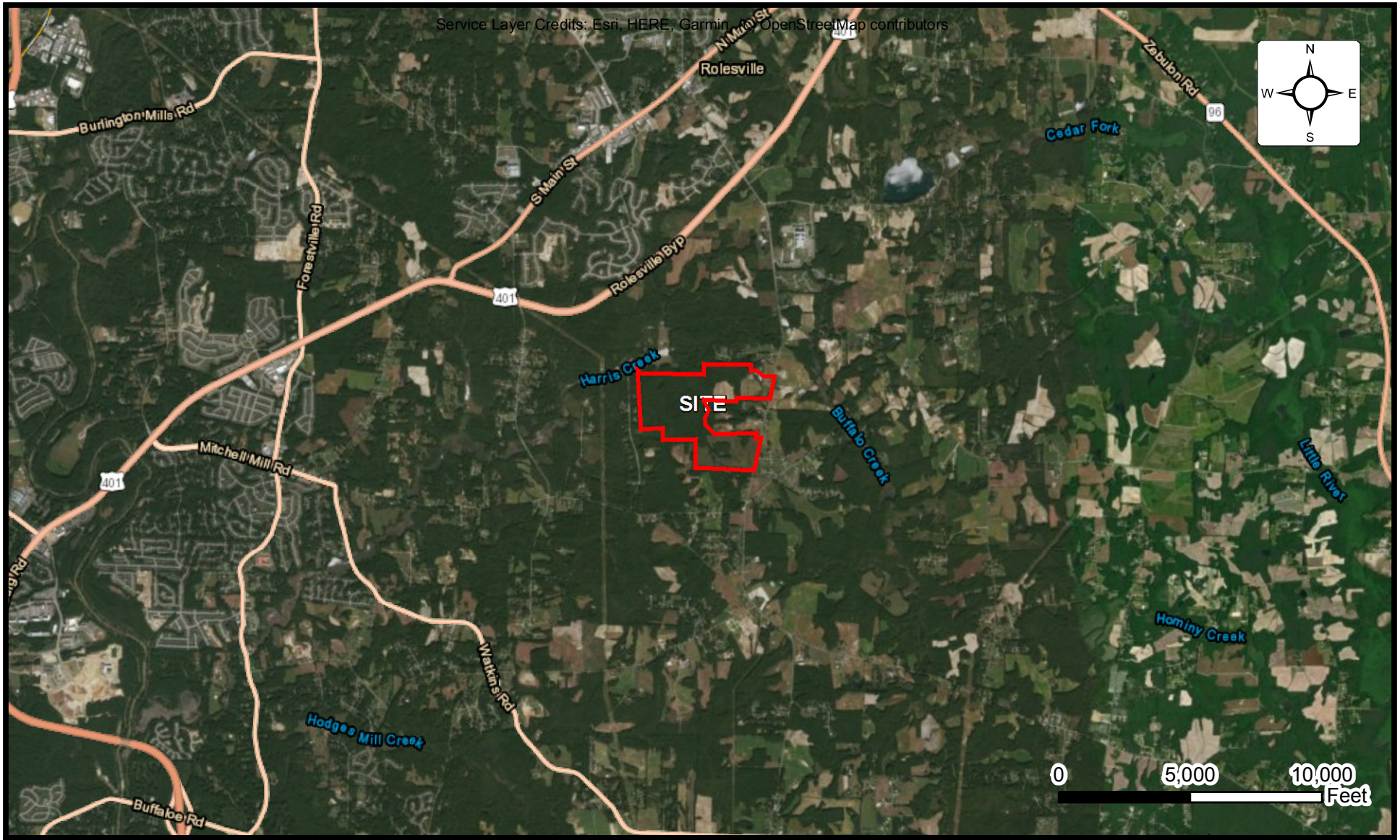
Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of and integral to the geotechnical design recommendation. We recommend that the owner retain these quality assurance services and that ECS be allowed to continue our involvement throughout these critical phases of construction to provide general consultation as issues arise.

ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

Appendix A - Drawings and Reports

Site Location Diagram

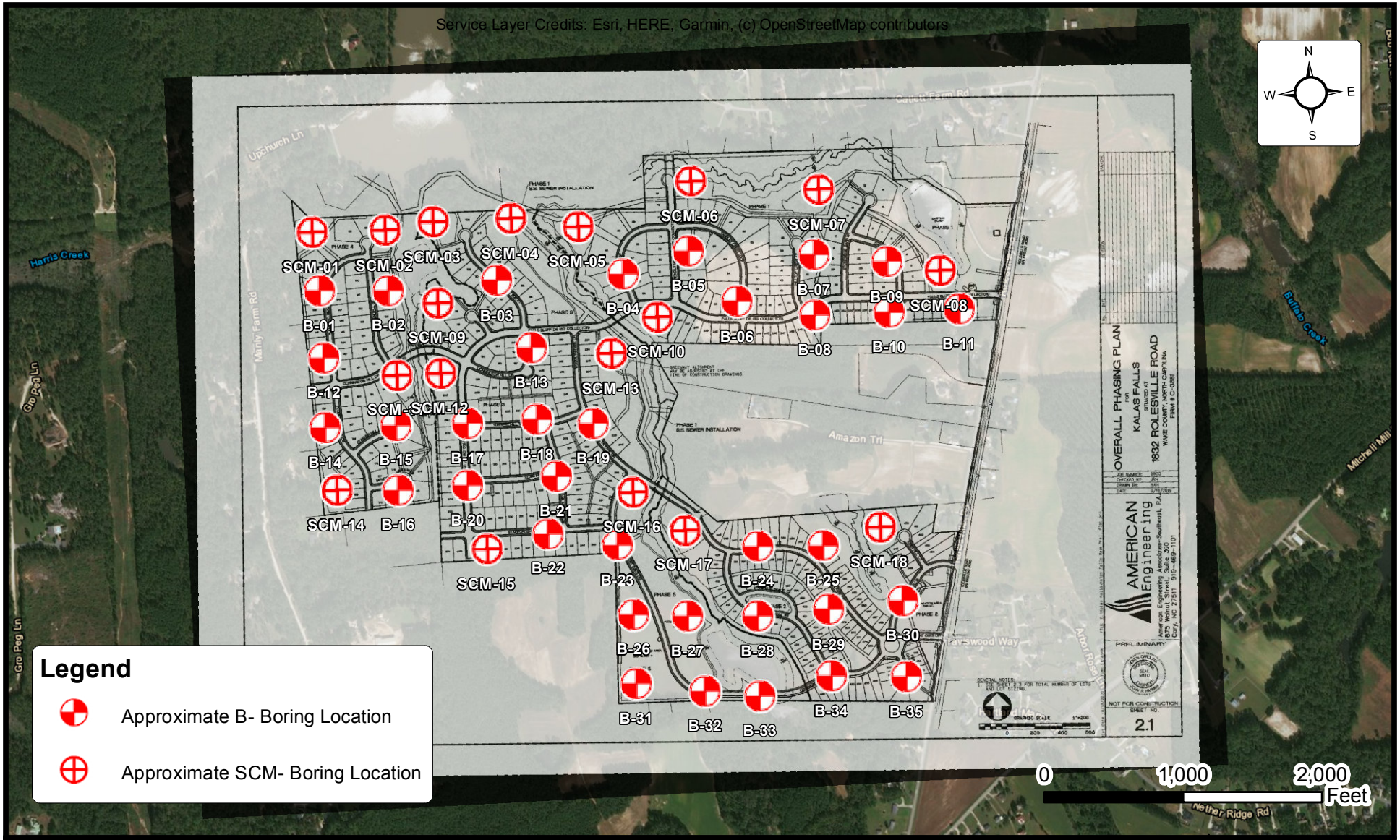
Boring Location Diagram(s)



SITE LOCATION DIAGRAM
KALAS FALLS RESIDENTIAL DEVELOPMENT

1832 ROLESVILLE ROAD, ROLESVILLE, NORTH CAROLINA
D.R. HORTON

ENGINEER	TMS4
SCALE	AS NOTED
PROJECT NO.	06:24735
SHEET	1
DATE	2/17/2022



BORING LOCATION DIAGRAM
KALAS FALLS RESIDENTIAL DEVELOPMENT

1832 ROLESVILLE ROAD, ROLESVILLE, NORTH CAROLINA
D.R. HORTON

ENGINEER	TMS4
SCALE	AS NOTED
PROJECT NO.	06:24735
SHEET	2
DATE	2/17/2022

Appendix B – Field Operations

Reference Notes

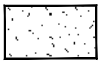
Subsurface Exploration Procedures

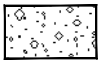
Boring Logs

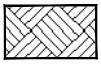
REFERENCE NOTES FOR BORING LOGS

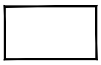
MATERIAL[1,2]

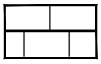

ASPHALT


CONCRETE


GRAVEL

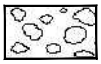

TOPSOIL

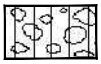

VOID


BRICK

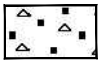

AGGREGATE BASE COURSE

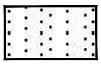

GW **WELL-GRADED GRAVEL**
gravel-sand mixtures, little or no fines

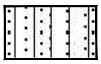

GP **POORLY-GRADED GRAVEL**
gravel-sand mixtures, little or no fines


GM **SILTY GRAVEL**
gravel-sand-silt mixtures

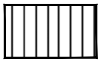

GC **CLAYEY GRAVEL**
gravel-sand-clay mixtures

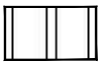

SW **WELL-GRADED SAND**
gravelly sand, little or no fines

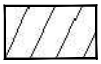

SP **POORLY-GRADED SAND**
gravelly sand, little or no fines


SM **SILTY SAND**
sand-silt mixtures

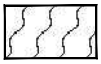

SC **CLAYEY SAND**
sand-clay mixtures

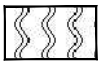

ML **SILT**
non-plastic to medium plasticity

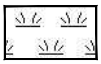

MH **ELASTIC SILT**
high plasticity


CL **LEAN CLAY**
low to medium plasticity


CH **FAT CLAY**
high plasticity


OL **ORGANIC SILT or CLAY**
non-plastic to low plasticity


OH **ORGANIC SILT or CLAY**
high plasticity


PT **PEAT**
highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

DESIGNATION		PARTICLE SIZES
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

UNCONFINED COMPRESSIVE STRENGTH, Q_P[4]	SPT[5] (BPF)	CONSISTENCY[7] (COHESIVE)
<0.25	<2	Very Soft
0.25 - <0.50	2 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT[5]	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

RELATIVE AMOUNT[7]	COARSE GRAINED (%)[8]	FINE GRAINED (%)[8]
Trace	≤5	≤5
With	10 - 20	10 - 25
Adjective *(ex: "Silty")*	25 - 45	30 - 45

WATER LEVELS[6]

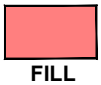

WL (First Encountered)


WL (Completion)


WL (Seasonal High Water)


WL (Stabilized)

FILL AND ROCK


FILL


POSSIBLE FILL


PROBABLE FILL


ROCK

[1]Classifications and symbols per ASTM D 2488-17 (Visual-Manual Procedure) unless noted otherwise.

[2]To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

[3]Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

[4]Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

[5]Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf). SPT correlations per 7.4.2 Method B and need to be corrected if using an auto hammer.

[6]The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

[7]Minor deviation from ASTM D 2488-17 Note 14.

[8]Percentages are estimated to the nearest 5% per ASTM D 2488-17.

SUBSURFACE EXPLORATION PROCEDURE: STANDARD PENETRATION TESTING (SPT) ASTM D 1586 Split-Barrel Sampling

Standard Penetration Testing, or **SPT**, is the most frequently used subsurface exploration test performed worldwide. This test provides samples for identification purposes, as well as a measure of penetration resistance, or N-value. The N-Value, or blow counts, when corrected and correlated, can approximate engineering properties of soils used for geotechnical design and engineering purposes.

SPT Procedure:

- Involves driving a hollow tube (split-spoon) into the ground by dropping a 140-lb hammer a height of 30-inches at desired depth
- Recording the number of hammer blows required to drive split-spoon a distance of 12 inches (in 3 or 4 Increments of 6 inches each)
- Auger is advanced* and an additional SPT is performed
- One SPT typically performed for every two to five feet
- Obtain 1.5-inch diameter soil sample

**Drilling Methods May Vary*— The predominant drilling methods used for SPT are open hole fluid rotary drilling and hollow-stem auger drilling.

ECS provides Boring Location Diagrams and Boring Logs for each project!

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-01**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	18	18	Topsoil Thickness[7.00"] (SM) Residuum, SILTY MEDIUM SAND, pink and tan, moist, medium dense		0	2-5-11 (16)
					AUGER REFUSAL AT 3.5 FT			
5							-5	
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

⊗16

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 03 2022**		CAVE IN DEPTH:
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 03 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-02**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	1	1	Topsoil Thickness[7.00"] (WR) PARTIALLY WEATHERED ROCK SAMPLED AS, No recovery [Weathered ROCK] **AUGER REFUSAL AT 1.1 FT**		0	50/1" (50/1")
5							-5	
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

⊗ 50/1"

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 09 2022**		CAVE IN DEPTH:
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 09 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-03**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	18	18	Topsoil Thickness[6.00"] (SM) Residuum, SILTY FINE SAND, brown, moist, very loose		0	1-1-1 (2)
					AUGER REFUSAL AT 3 FT			
5							-5	
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 09 2022**		CAVE IN DEPTH: **2.00**
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 09 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-04**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	6	6	Topsoil Thickness[6.00"] (WR) PARTIALLY WEATHERED ROCK SAMPLED AS SILTY FINE TO MEDIUM SAND, pink, tan and gray, moist [Weathered ROCK] Refusal encountered at 2.0 feet. **END OF DRILLING AT 2.0 FT**		0	50/6 (50/6")
5							-5	
10							-10	
15							-15	
20							-20	
25							-25	
30								

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

⊗ 50/6"

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 08 2022**	CAVE IN DEPTH: **1.00**	
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 08 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-05**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **367.00**	BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Content Liquid Limit (X—●—△) ⊗ STANDARD PENETRATION BLOWS/FT; ROCK QUALITY DESIGNATION & RECOVERY; RQD; REC; ○ CALIBRATED PENETROMETER TON/SF; [FINES CONTENT] %
					Topsoil Thickness[6.00"]				
	S-1	SS	18	18	(SC) Residuum, CLAYEY MEDIUM SAND, brown and orange, moist, loose			3-3-4 (7)	⊗7
					AUGER REFUSAL AT 3 FT				
5							-5		
10							-10		
15							-15		
20							-20		
25							-25		
30							-30		

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 08 2022**		CAVE IN DEPTH: **2.00**
▼ WL (Completion) **DRY**	BORING COMPLETED: **Feb 08 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV CME550**	LOGGED BY: **CAR3**	DRILLING METHOD: **2.25 HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-06**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[8.00"]			
	S-1	SS	18	18	(SM) Residuum, SILTY FINE TO MEDIUM SAND, dark yellowish brown, moist, medium dense			1-3-8 (11)
					AUGER REFUSAL AT 3.5 FT			
5							-5	
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	

⊗11 13.7 [19.6%]

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 08 2022**		CAVE IN DEPTH:
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 08 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-07**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[4.00"]		0	
	S-1	SS	18	18	(ML) Residuum, SANDY SILT, orange, moist, firm			1-2-3 (5)
	S-2	SS	18	18	(SM) Residuum, SILTY MEDIUM TO COARSE SAND, gray and white, moist, medium dense		-5	11-13-11 (24)
5	S-3	SS	6	6	(WR) PARTIALLY WEATHERED ROCK SAMPLED AS SILTY FINE SAND, orange, moist [Weathered ROCK]			50/6 (50/6")
	S-4	SS	18	18	(SM) Residuum, SILTY FINE SAND, orange, moist, medium dense to loose		-10	6-6-7 (13)
10								
	S-5	SS	18	18				3-4-5 (9)
15							-15	
					Refusal encountered at 17.5 feet.			
					END OF DRILLING AT 17.5 FT			
20							-20	
25							-25	
30								

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

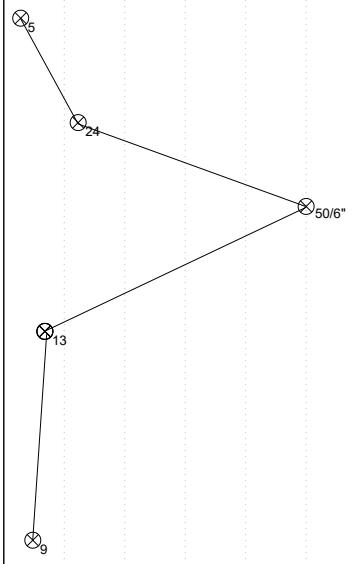
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered)	BORING STARTED: **Feb 03 2022**		CAVE IN DEPTH:
WL (Completion) **Dry**	BORING COMPLETED: **Feb 03 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-08**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[12.00"]		0	
	S-1	SS	18	18	(SM FILL) FILL, SILTY MEDIUM SAND, gray and brown, moist			2-3-2 (5)
	S-2	SS	18	18	(SC-SM FILL) FILL, SILTY CLAYEY MEDIUM SAND, orange, moist			2-3-5 (8)
5	S-3	SS	18	18			-5	2-4-5 (9)
	S-4	SS	18	18	(SM) Residuum, SILTY FINE TO MEDIUM SAND, orange, moist, medium dense			6-8-9 (17)
10							-10	
	S-5	SS	2	2	(WR) PARTIALLY WEATHERED ROCK SAMPLED AS SILTY MEDIUM TO COARSE SAND, pink and white, moist [Weathered ROCK]			50/2" (50/2")
15					**AUGER REFUSAL AT 13.7 FT**		-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

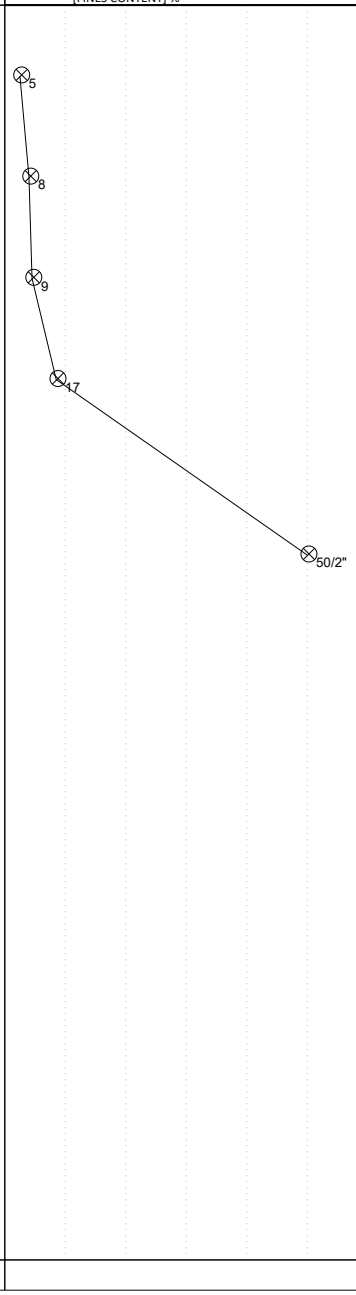
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 03 2022**		CAVE IN DEPTH:
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 03 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-09**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[2.00"]			
	S-1	SS	18	18	(SM) Residuum, SILTY MEDIUM SAND, orange, moist, loose			WOH-1-6 (7)
5	~~S-2~~	~~SS~~	~~0~~	~~0~~	(WR) PARTIALLY WEATHERED ROCK SAMPLED AS, No recovery [Weathered ROCK]		-5	50/0" (50/0")
					AUGER REFUSAL AT 3.5 FT			
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 02 2022**	CAVE IN DEPTH: **3.00**	
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 02 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-10**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[6.00"]			
	S-1	SS	18	18	(SM) Residuum, SILTY MEDIUM TO COARSE SAND, gray and tan, moist, medium dense			5-5-17 (22)
					AUGER REFUSAL AT 3 FT			
5							-5	
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

⊗22

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 03 2022**		CAVE IN DEPTH:
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 03 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-11**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[4.00"]			
	S-1	SS	18	18	(CH) Residuum, SANDY FAT CLAY, brownish yellow, moist, firm			1-2-4 (6)
	S-2	SS	18	18	(SM) Residuum, SILTY FINE TO MEDIUM SAND, tan and pink, moist, very loose to loose			1-1-3 (4)
5	S-3	SS	18	18			-5	2-2-4 (6)
	S-4	SS	18	18				1-1-4 (5)
10							-10	
	S-5	SS	18	18				2-3-5 (8)
15							-15	
	S-6	SS	18	18	(SM) Residuum, SILTY FINE SAND, pink and tan, moist, medium dense			3-4-7 (11)
20					**END OF BORING AT 20 FT**		-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ STANDARD PENETRATION BLOWS/FT

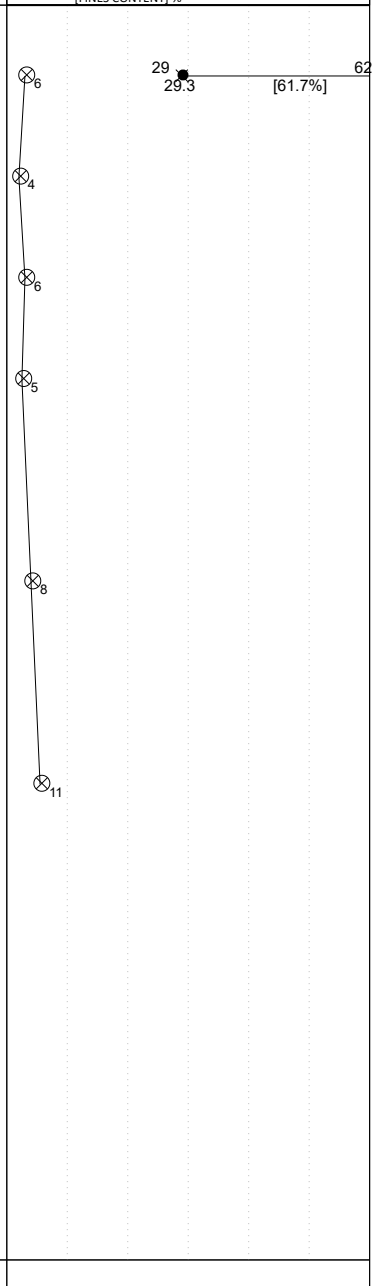
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **dry**	BORING STARTED: **Jan 24 2022**		CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Jan 24 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Truck 55 Trailer/2013 F350**	LOGGED BY: **CAR3**	DRILLING METHOD: **2.25 HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-12**	**1 of 1**
PROJECT NAME: **Kalas Falls Residential Development**	DRILLER/CONTRACTOR: **Bridger Drilling Inc.**		
SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**			LOSS OF CIRCULATION
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: / BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[8.00"]		0	
	S-1	SS	16	16	(WR) PARTIALLY WEATHERED ROCK SAMPLED AS SILTY MEDIUM TO COARSE SAND, orange, brown and gray, moist			4-5-50/4" (55/10")
	~~S-2~~	~~SS~~	~~1~~	~~1~~	[Weathered ROCK]			50/1" (50/1")
					AUGER REFUSAL AT 3.6 FT			
5							-5	
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

55/10"

50/1"

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 11 2022**		CAVE IN DEPTH: **2.00**
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 11 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-13**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[6.00"]		0	
	S-1	SS	18	18	(SC) Residuum, CLAYEY FINE TO MEDIUM SAND, brown, moist to wet, very loose			WOH-1-1 (2)
	S-2	SS	18	18	(CL) Residuum, SANDY LEAN CLAY, trace silt, red and brown, moist, stiff			4-6-7 (13)
5	S-3	SS	18	18	(SM) Residuum, SILTY FINE TO MEDIUM SAND, pink and gray, moist, loose to medium dense		-5	5-5-3 (8)
	S-4	SS	18	18				4-4-5 (9)
10							-10	
	S-5	SS	18	18				6-7-10 (17)
15							-15	
	S-6	SS	18	18				9-12-16 (28)
20					**END OF BORING AT 20 FT**		-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

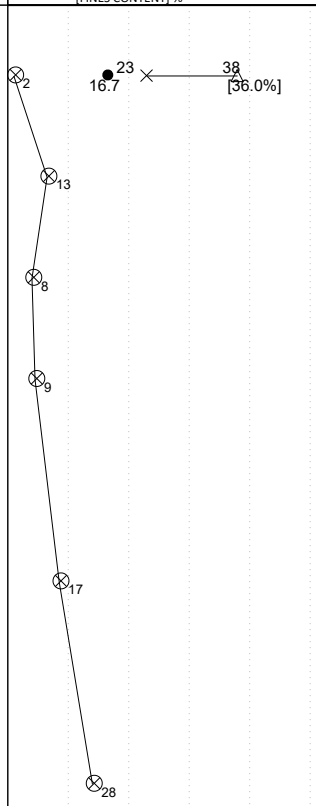
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 09 2022**	CAVE IN DEPTH: **16.90**	
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 09 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-14**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[6.00"]		0	
	S-1	SS	18	18	(ML) Residuum, SANDY SILT, light yellowish brown, moist, firm to stiff			2-3-3 (6)
	S-2	SS	18	18				4-6-7 (13)
5							-5	
	S-3	SS	18	18	(SM) Residuum, SILTY FINE SAND, gray and tan, moist, dense			9-17-29 (46)
	S-4	SS	2	2	(WR) PARTIALLY WEATHERED ROCK SAMPLED AS FINE SAND WITH SILT, gray and tan, moist [Weathered ROCK]			50/2" (50/2")
10					**AUGER REFUSAL AT 8.7 FT**		-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ STANDARD PENETRATION BLOWS/FT

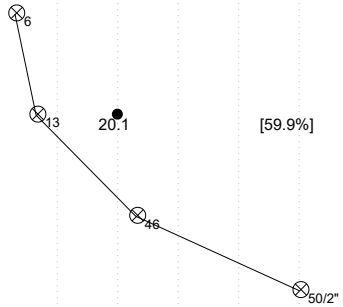
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 11 2022**	CAVE IN DEPTH: **8.00**	
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 11 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-15**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	0	0	Topsoil Thickness[5.00"] (WR) PARTIALLY WEATHERED ROCK SAMPLED AS, No recovery [Weathered ROCK] **AUGER REFUSAL AT 0.5 FT**		0 -5	50/0" (50/0")

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

⊗ 50/0"

5 -5
10 -10
15 -15
20 -20
25 -25
30 -30

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Jan 19 2022**		CAVE IN DEPTH:
▼ WL (Completion) **Dry**	BORING COMPLETED: **Jan 25 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-16**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

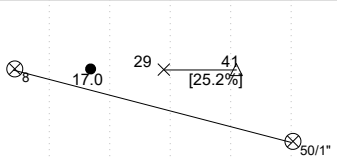
RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[8.00"]			
	S-1	SS	18	18	(SM) Residuum, SILTY MEDIUM SAND, brown, moist, loose			2-3-5 (8)
	~~S-2~~	~~SS~~	~~1~~	~~1~~	(WR) PARTIALLY WEATHERED ROCK SAMPLED AS SILTY FINE TO MEDIUM SAND, tan and gray, moist [Weathered ROCK]			50/1" (50/1")
5					**AUGER REFUSAL AT 3.6 FT**		-5	
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 11 2022**		CAVE IN DEPTH:
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 11 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-17**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[6.00"]		0	
	S-1	SS	16	16	(WR) PARTIALLY WEATHERED ROCK SAMPLED AS SILTY MEDIUM SAND, brown, moist [Weathered ROCK]			3-4-50/4" (54/10")
					AUGER REFUSAL AT 2.5 FT			
5							-5	
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ **STANDARD PENETRATION BLOWS/FT**

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ **CALIBRATED PENETROMETER TON/SF**

[FINES CONTENT] %

54/10"

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Jan 19 2022**	CAVE IN DEPTH: **2.50**	
▼ WL (Completion) **Dry**	BORING COMPLETED: **Jan 25 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-18**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[6.00"]		0	
	S-1	SS	18	18	(CH) Residuum, SANDY FAT CLAY, yellowish brown, moist, firm			2-3-3 (6)
	S-2	SS	8	8	(WR) PARTIALLY WEATHERED ROCK SAMPLED AS SILTY MEDIUM SAND, orange and brown, moist [Weathered ROCK]			6-50/2" (50/2")
5					**AUGER REFUSAL AT 4.2 FT**		-5	
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ **STANDARD PENETRATION BLOWS/FT**

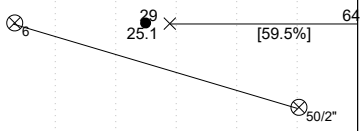
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ **CALIBRATED PENETROMETER TON/SF**

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 10 2022**	CAVE IN DEPTH: **4.00**	
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 10 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-19**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[4.00"]		0	
	S-1	SS	18	18	(MH) Residuum, SANDY ELASTIC SILT, brown, moist, stiff			3-4-5 (9)
	S-2	SS	18	18	(SM) Residuum, SILTY FINE SAND, orange and gray, moist, loose to medium dense			3-4-6 (10)
5	S-3	SS	18	18			-5	3-4-4 (8)
	S-4	SS	18	18				4-5-6 (11)
10							-10	
					AUGER REFUSAL AT 13 FT			
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

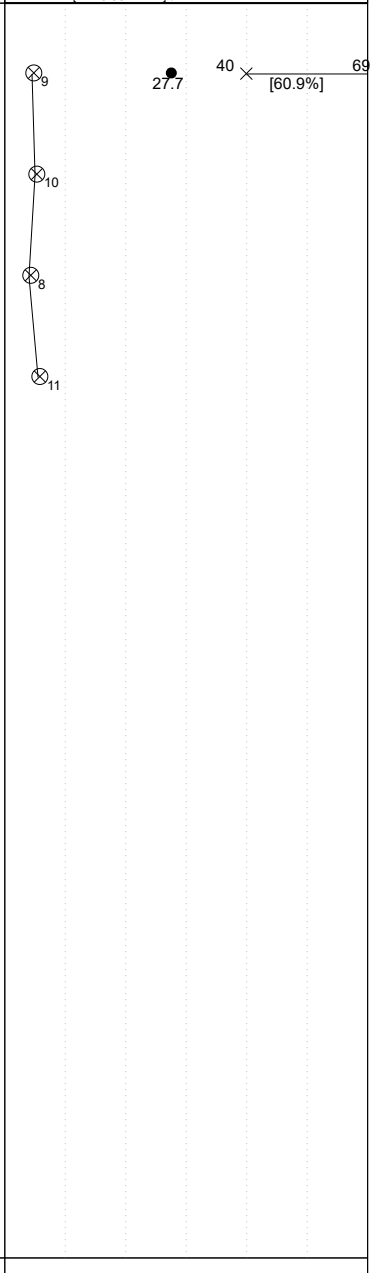
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 10 2022**	CAVE IN DEPTH: **12.10**	
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 10 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-20**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[3.00"]			
	S-1	SS	7	7	(WR) PARTIALLY WEATHERED ROCK SAMPLED AS SILTY MEDIUM SAND, tan and gray, moist [Weathered ROCK]			5-50/1" (50/1")
					AUGER REFUSAL AT 1.6 FT			
5							-5	
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ **STANDARD PENETRATION BLOWS/FT**

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ **CALIBRATED PENETROMETER TON/SF**

[FINES CONTENT] %

⊗50/1"

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 11 2022**		CAVE IN DEPTH:
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 11 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-21**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[7.00"]			
	S-1	SS	18	18	(CL) Residuum, SANDY LEAN CLAY, tan and pink, moist, firm to stiff			2-2-4 (6)
	S-2	SS	18	18				4-6-6 (12)
5							-5	
	S-3	SS	18	18	(SC-SM) Residuum, SILTY CLAYEY FINE TO MEDIUM SAND, pink and gray, moist, loose to medium dense			4-5-5 (10)
	S-4	SS	18	18				3-4-6 (10)
10							-10	
	S-5	SS	18	18				4-6-6 (12)
15							-15	
	S-6	SS	18	18				6-7-9 (16)
20					**END OF BORING AT 20 FT**		-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ STANDARD PENETRATION BLOWS/FT

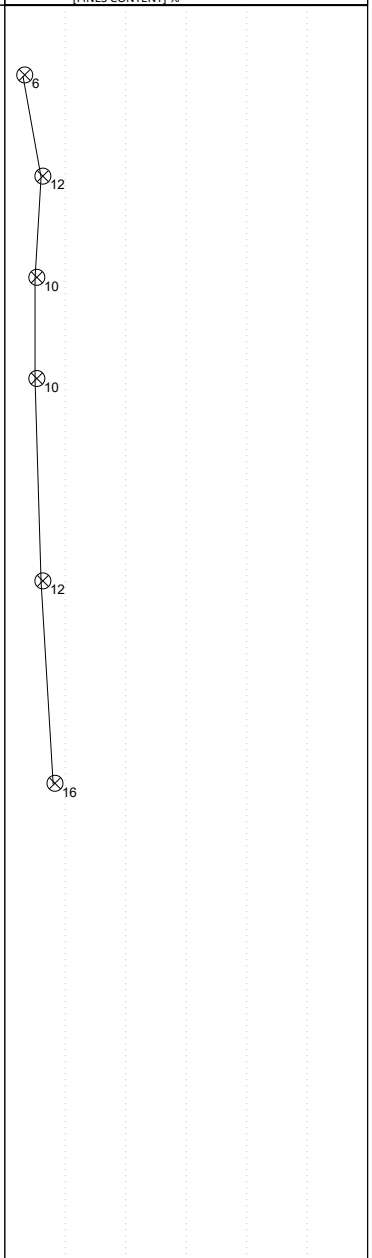
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 10 2022**		CAVE IN DEPTH: **12.30**
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 10 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-22**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

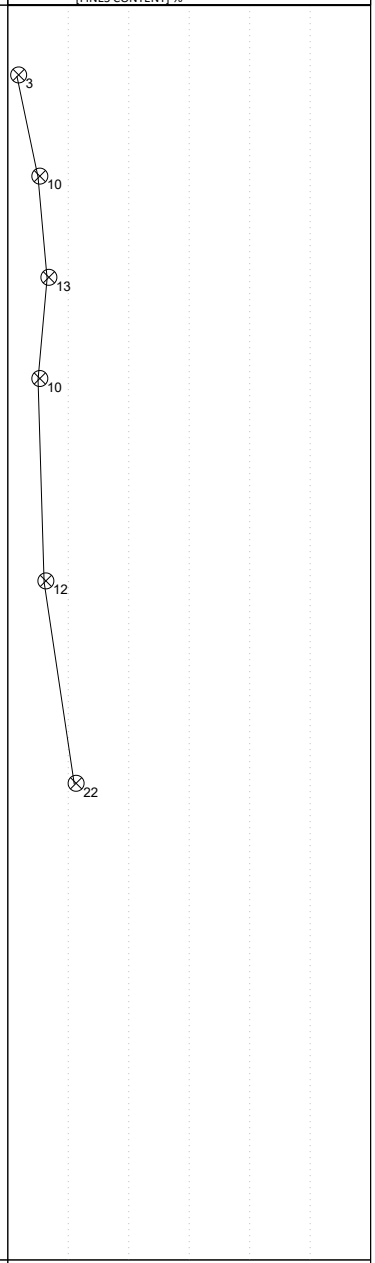
RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[6.00"]			
	S-1	SS	18	18	(CL) Residuum, SANDY LEAN CLAY, trace silt, orange, moist, soft			1-1-2 (3)
	S-2	SS	18	18	(SC) Residuum, CLAYEY FINE TO MEDIUM SAND, orange, moist, loose			3-5-5 (10)
5	S-3	SS	18	18	(SM) Residuum, SILTY FINE TO MEDIUM SAND, pink and gray, moist, loose to medium dense		-5	4-6-7 (13)
	S-4	SS	18	18				4-5-5 (10)
10							-10	
	S-5	SS	18	18				3-5-7 (12)
15							-15	
	S-6	SS	18	18				7-10-12 (22)
20					**END OF BORING AT 20 FT**		-20	
25							-25	
30							-30	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 10 2022**		CAVE IN DEPTH: **12.90**
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 10 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-23**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[6.00"]		0	
	S-1	SS	18	18	(SC) Alluvium, CLAYEY FINE TO MEDIUM SAND, grayish brown, saturated, very loose, no recovery at 3.5 feet, obstruction			1-1-1 (2)
	S-2	SS	18	18		▼		2-2-3 (5)
5							-5	
	S-3	SS	18	18	(SM) Residuum, SILTY FINE TO MEDIUM SAND, gray and brown, saturated, very loose			1-1-2 (3)
	S-4	SS	18	18				1-1-2 (3)
10							-10	
	S-5	SS	18	18				1-2-1 (3)
15							-15	
	S-6	SS	18	18	(SM) Residuum, SILTY FINE TO MEDIUM SAND, orange and brown, saturated, medium dense			5-7-9 (16)
20					**END OF BORING AT 20 FT**		-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

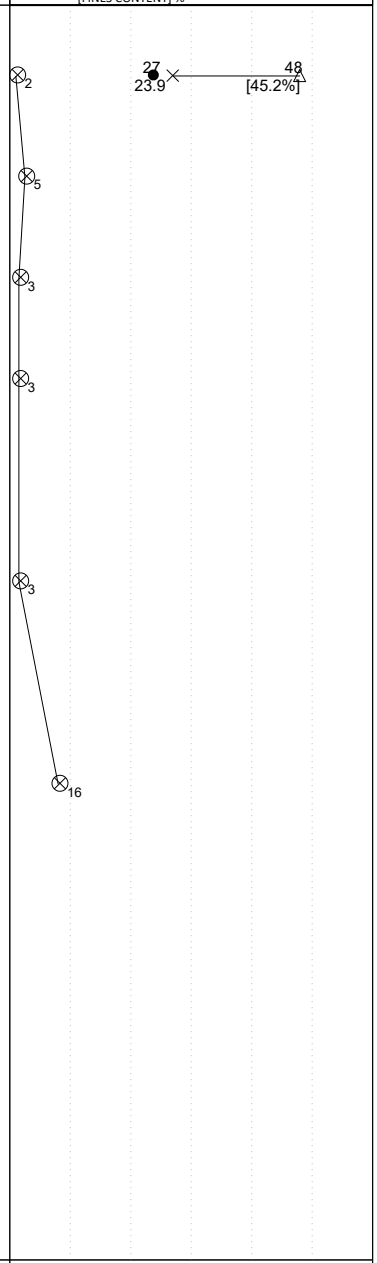
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 12 2022**	CAVE IN DEPTH: **13.00**	
▼ WL (Completion) **5.00**	BORING COMPLETED: **Feb 12 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-24**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[6.00"]			
	S-1	SS	18	18	(CL) Residuum, SANDY LEAN CLAY, brown, moist, stiff			3-4-7 (11)
	S-2	SS	13	13	(WR) PARTIALLY WEATHERED ROCK SAMPLED AS SILTY FINE SAND, orange and gray, moist [Weathered ROCK]			10-20-50/1" (70/7")
5					**AUGER REFUSAL AT 5.5 FT**		-5	
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ **STANDARD PENETRATION BLOWS/FT**

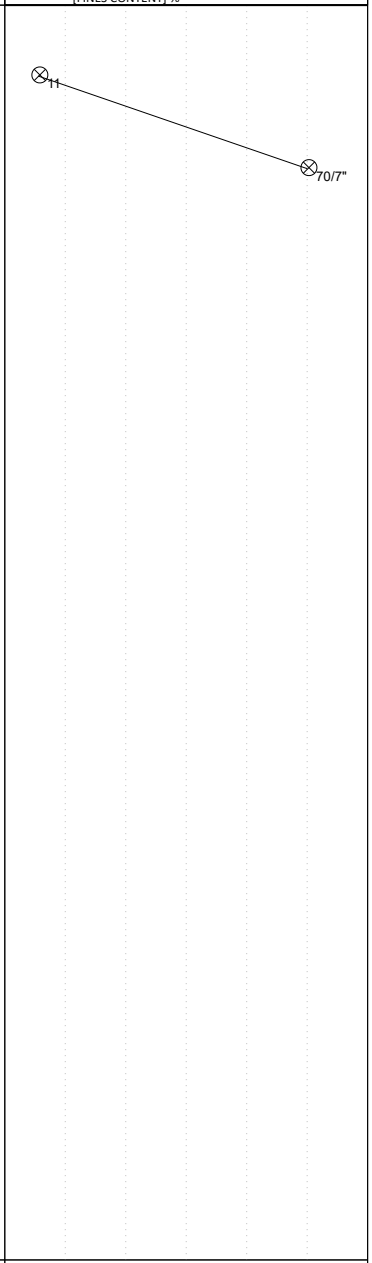
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ **CALIBRATED PENETROMETER TON/SF**

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Jan 19 2022**		CAVE IN DEPTH: **4.00**
▼ WL (Completion) **Dry**	BORING COMPLETED: **Jan 25 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-25**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[6.00"]		0	
	S-1	SS	18	18	(SM) Residuum, SILTY FINE SAND, reddish yellow, moist, loose			2-3-5 (8)
	S-2	SS	18	18				1-4-5 (9)
5	S-3	SS	18	18			-5	3-3-4 (7)
	S-4	SS	18	18				2-2-4 (6)
10					(SC) Residuum, CLAYEY FINE SAND, gray, brown, moist, loose	▽	-10	
	S-5	SS	18	18				2-2-3 (5)
15							-15	
					(SM) Residuum, SILTY FINE TO MEDIUM SAND, gray, moist, medium dense			
	S-6	SS	18	18				10-14-16 (30)
20					**END OF BORING AT 20 FT**		-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

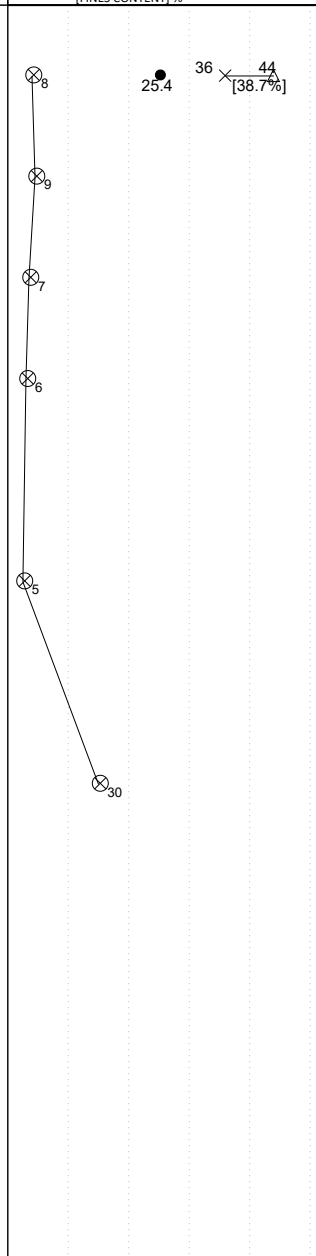
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **12.50**	BORING STARTED: **Jan 20 2022**	CAVE IN DEPTH: **14.00**	
▼ WL (Completion)	BORING COMPLETED: **Jan 20 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **Truck 55 Trailer/2013 F350**	LOGGED BY: **CAR3**	DRILLING METHOD: **2.25 HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-26**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[6.00"]			
	S-1	SS	18	18	(ML) Residuum, SILT, tan and brown, moist, stiff			2-4-5 (9)
	S-2	SS	18	18				1-6-9 (15)
5							-5	
	S-3	SS	18	18	(SM) Residuum, SILTY FINE SAND, tan and gray, moist to wet, loose			3-2-4 (6)
	S-4	SS	18	18		▽		2-2-3 (5)
10							-10	
	S-5	SS	18	18				2-2-3 (5)
15							-15	
	S-6	SS	18	18				3-3-6 (9)
20					**END OF BORING AT 20 FT**		-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

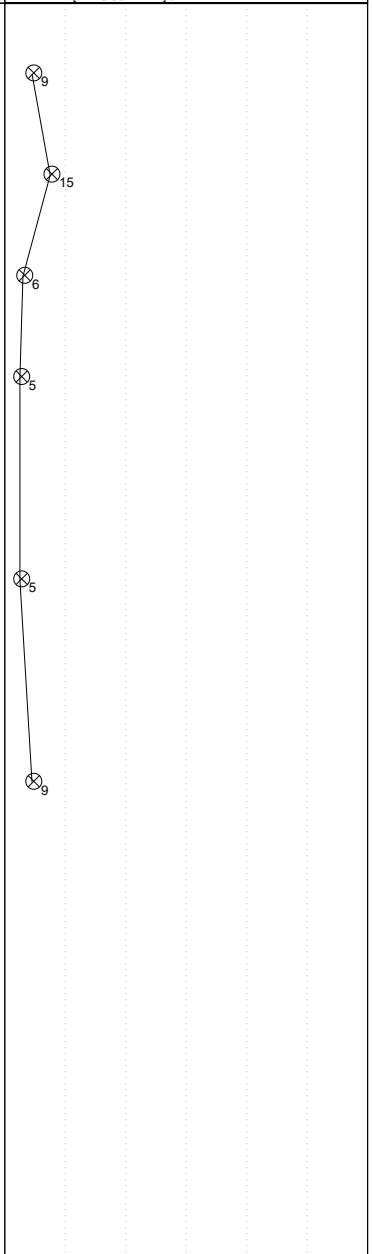
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **10.50**	BORING STARTED: **Jan 19 2022**		CAVE IN DEPTH: **12.00**
▼ WL (Completion)	BORING COMPLETED: **Jan 19 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Truck 55 Trailer/2013 F350**	LOGGED BY: **CAR3**	DRILLING METHOD: **2.25 HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-27**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[6.00"]			
	S-1	SS	18	18	(SC) Residuum, CLAYEY SAND, tannish brown, moist, loose to medium dense			1-3-5 (8)
	S-2	SS	18	18				2-5-7 (12)
5							-5	
	S-3	SS	18	18	(SM) Residuum, SILTY SAND, gray and brown, moist, loose to medium dense			3-4-4 (8)
	S-4	SS	18	18				3-3-4 (7)
10						▽	-10	
	S-5	SS	18	18				2-5-3 (8)
15							-15	
	S-6	SS	18	18				4-6-10 (16)
20					**END OF BORING AT 20 FT**		-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

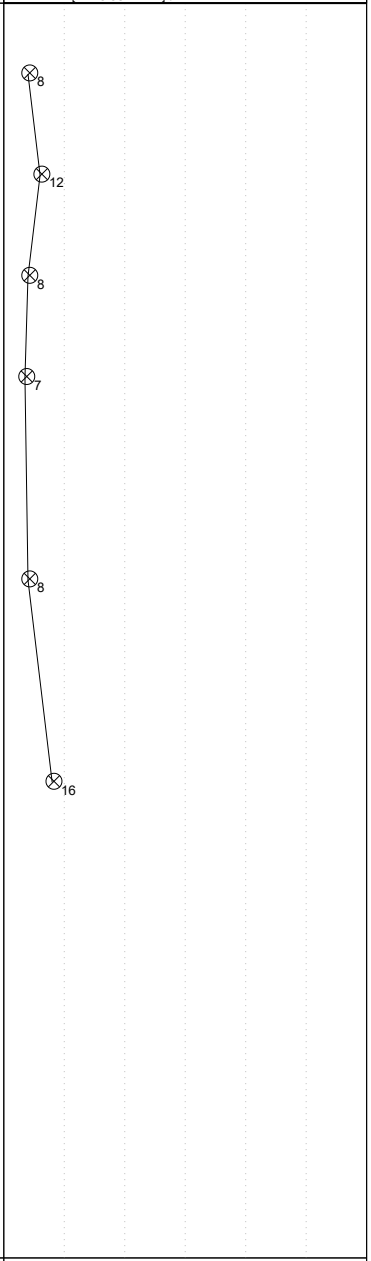
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **11.00**	BORING STARTED: **Jan 20 2022**	CAVE IN DEPTH: **12.00**	
▼ WL (Completion)	BORING COMPLETED: **Jan 20 2022**	HAMMER TYPE: **Auto**	
▽ WL (Seasonal High Water)	EQUIPMENT: **Truck 55 Trailer/2013 F350**	LOGGED BY: **CAR3**	DRILLING METHOD: **2.25 HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-28**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[6.00"]		0	
	S-1	SS	18	18	(SP-SM) Residuum, SAND WITH SILT, dark brown, moist, loose			1-2-3 (5)
	S-2	SS	4	4	(WR) PARTIALLY WEATHERED ROCK SAMPLED AS SILTY SAND, white and gray, moist [Weathered ROCK]			50/4" (50/4")
5					**AUGER REFUSAL AT 5.5 FT**		-5	
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

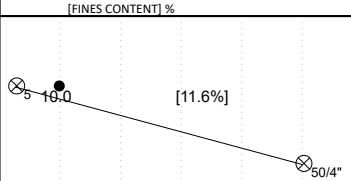
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	**dry**	BORING STARTED:	**Jan 20 2022**	CAVE IN DEPTH:	**5.50**
▼ WL (Completion)		BORING COMPLETED:	**Jan 20 2022**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **Truck 55 Trailer/2013 F350**	LOGGED BY: **CAR3**	DRILLING METHOD:	**2.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-29**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[5.00"]		0	
	S-1	SS	18	18	(SM) Residuum, SILTY SAND, tannish brown, moist, loose			1-2-4 (6)
	S-2	SS	18	18	(ML) Residuum, SILT, trace sand, tannish brown, moist, stiff			4-5-7 (12)
5	S-3	SS	18	18			-5	3-5-6 (11)
	S-4	SS	15	15	(WR) PARTIALLY WEATHERED ROCK SAMPLED AS SILTY FINE TO MEDIUM SAND, gray and tan, moist [Weathered ROCK]			2-7-50/3" (57/9")
10					**AUGER REFUSAL AT 12.5 FT**		-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ STANDARD PENETRATION BLOWS/FT

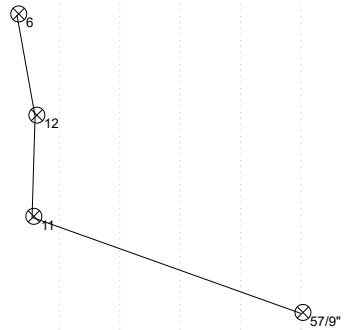
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **dry**	BORING STARTED: **Jan 19 2022**		CAVE IN DEPTH: **12.50**
▼ WL (Completion)	BORING COMPLETED: **Jan 19 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Truck 55Trailer/2013 F350**	LOGGED BY: **CAR3**	DRILLING METHOD: **2.25 HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-30**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[12.00"]			
	S-1	SS	18	18	(CL) Residuum, SANDY LEAN CLAY, gray and tan, moist, firm			1-2-3 (5)
	S-2	SS	18	18	(SM) Residuum, SILTY FINE TO MEDIUM SAND, gray, moist to wet, loose	▼		11-3-2 (5)
5	S-3	SS	0	0	(WR) PARTIALLY WEATHERED ROCK SAMPLED AS, No recovery [Weathered ROCK]		-5	50/0" (50/0")
					AUGER REFUSAL AT 6 FT			
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

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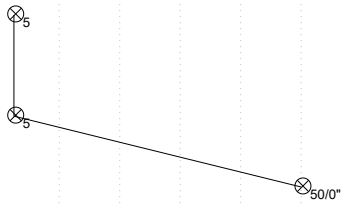

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 12 2022**		CAVE IN DEPTH: **6.00**
▼ WL (Completion) **5.00**	BORING COMPLETED: **Feb 12 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-31**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[6.00"]			
	S-1	SS	18	18	(CH) Residuum, SANDY FAT CLAY, brownish yellow, moist, soft			2-2-2 (4)
	S-2	SS	18	18	(SM) Residuum, SILTY FINE SAND, orangish brown and gray, moist to wet, loose to medium dense			1-3-4 (7)
5	S-3	SS	18	18			-5	1-2-4 (6)
	S-4	SS	18	18				1-3-5 (8)
10	S-5	SS	18	18		▽	-10	7-9-14 (23)
15	S-6	SS	18	18	(SM) Residuum, SILTY FINE SAND, orangish brown and gray, moist to wet, very dense		-15	15-21-41 (62)
20					**END OF BORING AT 20 FT**		-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

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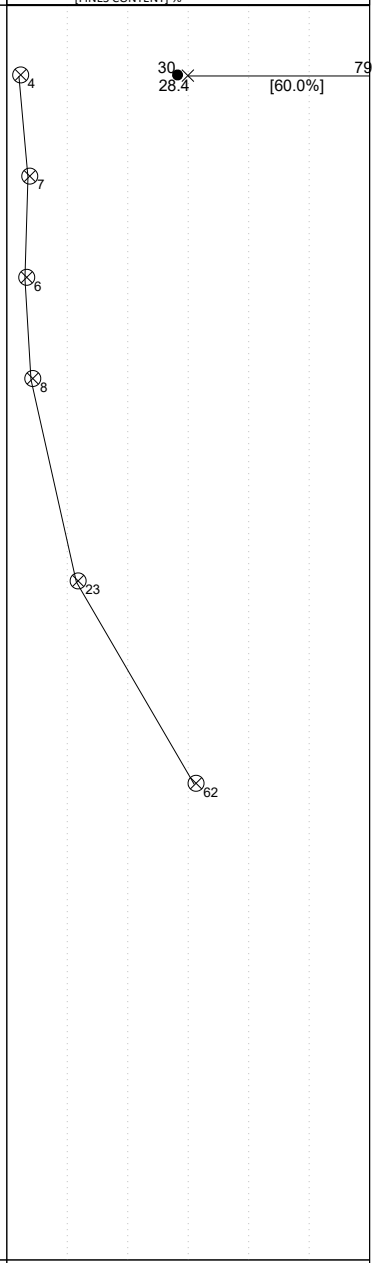


THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **16.00**	BORING STARTED: **Jan 19 2022**	CAVE IN DEPTH: **17.50**	
▼ WL (Completion)	BORING COMPLETED: **Jan 19 2022**	HAMMER TYPE: **Auto**	
▽ WL (Seasonal High Water)	EQUIPMENT: **Truck 55Trailer/2013 F350**	LOGGED BY: **CAR3**	DRILLING METHOD: **2.25 HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-32**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[6.00"]		0	
	S-1	SS	18	18	(SM) Residuum, SILTY FINE SAND, contains mica, tannish brown and orange, moist, medium dense to loose			2-5-7 (12)
	S-2	SS	18	18				2-4-5 (9)
5	S-3	SS	18	18			-5	2-3-3 (6)
	S-4	SS	18	18				2-3-4 (7)
10					(ML) Residuum, SANDY SILT, tan and gray, moist to wet, firm		-10	
	S-5	SS	18	18		▽		2-3-4 (7)
15							-15	
	S-6	SS	18	18	(ML) Residuum, SANDY SILT, tan and gray, wet, very stiff			5-10-11 (21)
20					**END OF BORING AT 20 FT**		-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

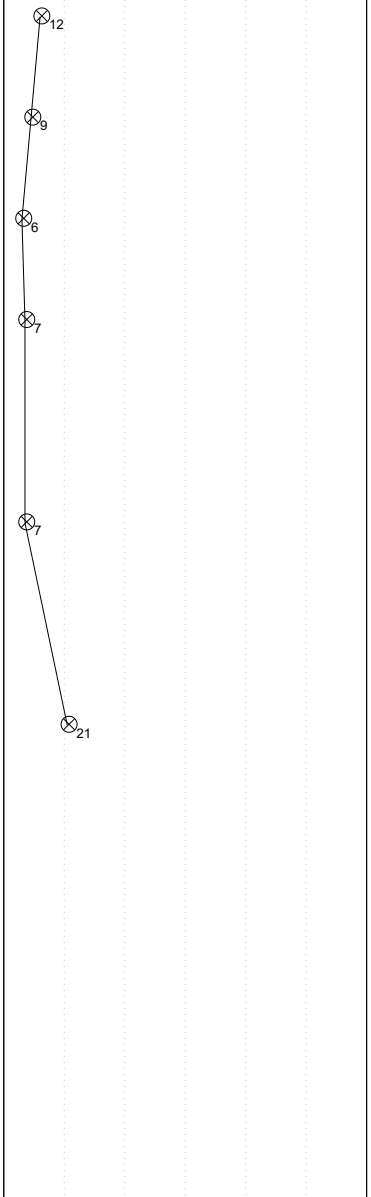
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	**14.50**	BORING STARTED:	**Jan 19 2022**	CAVE IN DEPTH:	**17.00**
▼ WL (Completion)		BORING COMPLETED:	**Jan 19 2022**	HAMMER TYPE:	**Auto**
▽ WL (Seasonal High Water)		EQUIPMENT:	**Truck 55Trailer/2013 F350**	LOGGED BY: **CAR3**	DRILLING METHOD: **2.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-33**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[6.00"]			
	S-1	SS	18	18	(SM) Residuum, SILTY FINE SAND, tan, gray and brown, moist to wet, medium dense to loose	▽		3-5-6 (11)
	S-2	SS	18	18				1-3-3 (6)
5	S-3	SS	18	18	(ML) Residuum, SILT, white, orange and gray, wet, very soft		-5	2-1-1 (2)
	S-4	SS	18	18	(ML) Residuum, SILT, white, orange and gray, moist, firm			2-3-3 (6)
10							-10	
	S-5	SS	18	18				1-2-4 (6)
15							-15	
	S-6	SS	18	18	(ML) Residuum, SILT, white, orange and gray, moist, hard			7-12-38 (50)
20					**END OF BORING AT 20 FT**		-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

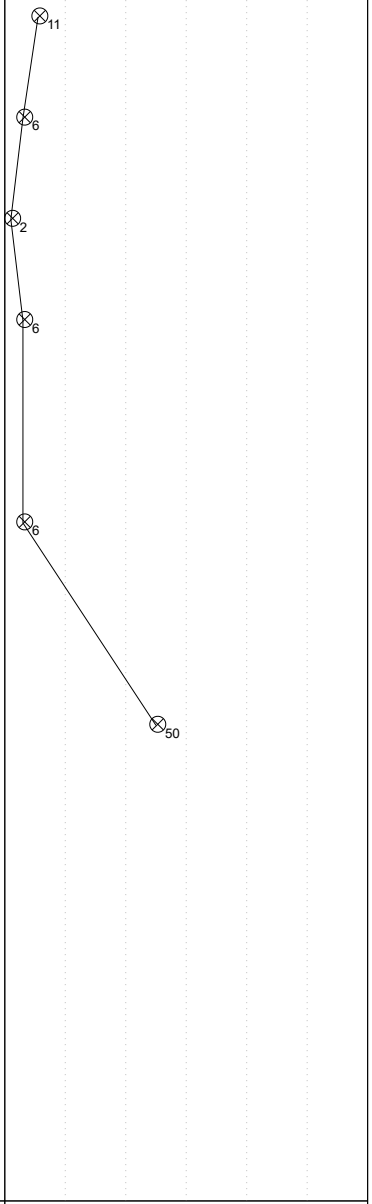
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **3.50**	BORING STARTED: **Jan 20 2022**	CAVE IN DEPTH: **10.00**	
▼ WL (Completion)	BORING COMPLETED: **Jan 20 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **Truck 55Trailer/2013 F350**	LOGGED BY: **CAR3**	DRILLING METHOD: **2.25 HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-34**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

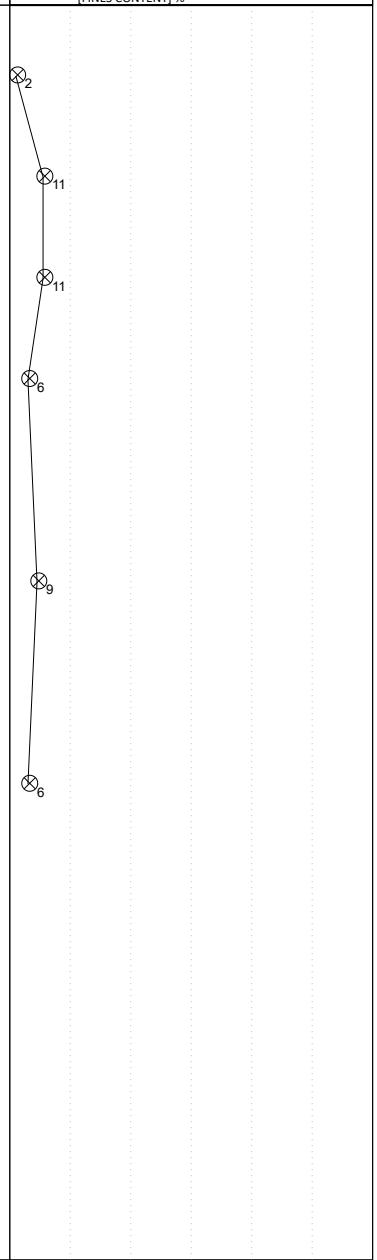
RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[6.00"]			
	S-1	SS	18	18	(SM) Residuum, SILTY FINE SAND, gray and orange, moist, very loose			1-1-1 (2)
	S-2	SS	18	18	(SM) Residuum, SILTY FINE SAND, gray and orange, moist, medium dense to loose			2-5-6 (11)
5	S-3	SS	18	18			-5	4-5-6 (11)
	S-4	SS	18	18				4-3-3 (6)
10							-10	
	S-5	SS	18	18				4-4-5 (9)
15							-15	
	S-6	SS	18	18				1-3-3 (6)
20					**END OF BORING AT 20 FT**		-20	
25							-25	
30							-30	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **dry**	BORING STARTED: **Jan 19 2022**	CAVE IN DEPTH: **18.00**	
▼ WL (Completion)	BORING COMPLETED: **Jan 19 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **Truck 55 Trailer/2013 F350**	LOGGED BY: **CAR3**	DRILLING METHOD: **2.25 HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**B-35**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	18	18	(SM) Residuum, SILTY FINE SAND, light gray and dark brown, moist to wet, very loose to loose	▽	0	1-1-1 (2)
	S-2	SS	18	18				1-1-2 (3)
5	S-3	SS	18	18			-5	1-1-1 (2)
	S-4	SS	18	18				2-3-5 (8)
10	S-5	SS	18	18			-10	4-4-3 (7)
15	S-6	SS	18	18	(SM) Residuum, SILTY FINE SAND, gray and white and orange, wet, dense		-15	14-18-16 (34)
20					**END OF BORING AT 20 FT**		-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

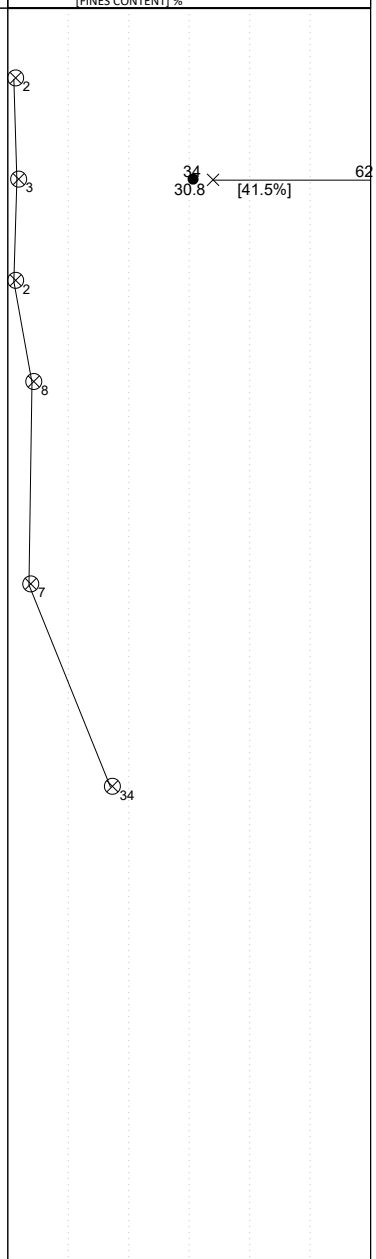
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **6.00**	BORING STARTED: **Jan 19 2022**	CAVE IN DEPTH: **11.50**	
▼ WL (Completion)	BORING COMPLETED: **Jan 25 2022**	HAMMER TYPE: **Auto**	
▽ WL (Seasonal High Water)	EQUIPMENT: **Truck 55 Trailer/2013 F350**	LOGGED BY: **CAR3**	DRILLING METHOD: **2.25 HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**SCM-01**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[10.00"]		0	
	S-1	SS	18	18	(SM) Residuum, SILTY MEDIUM SAND, tan, moist, very loose			WOH-1-2 (3)
	S-2	SS	18	18	(WR) PARTIALLY WEATHERED ROCK SAMPLED AS SILTY MEDIUM TO COARSE SAND, orange, moist [Weathered ROCK]		-5	5-8-50 (58)
5					**AUGER REFUSAL AT 5.5 FT**			
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ STANDARD PENETRATION BLOWS/FT

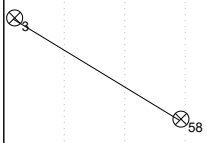
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 11 2022**	CAVE IN DEPTH: **4.00**	
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 11 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**SCM-02**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[6.00"]		0	
	S-1	SS	18	18	(SC) Residuum, CLAYEY FINE SAND, yellowish brown, moist, loose			2-3-4 (7)
	S-2	SS	18	18	(SM) Residuum, SILTY MEDIUM SAND, tan, moist, medium dense to loose			4-5-6 (11)
5	S-3	SS	18	18			-5	3-4-6 (10)
	S-4	SS	18	18				5-4-5 (9)
10							-10	
	S-5	SS	18	18				3-4-4 (8)
15					**END OF BORING AT 15 FT**		-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

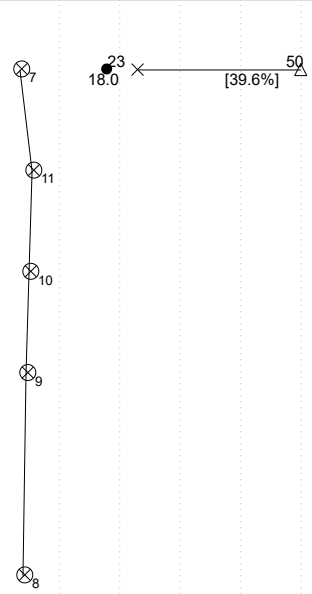
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 09 2022**	CAVE IN DEPTH: **12.00**	
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 09 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**SCM-03**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[7.00"]			
	S-1	SS	18	18	(SC-SM) Residuum, SILTY CLAYEY FINE TO MEDIUM SAND, gray and tan, moist, very loose			1-1-2 (3)
	S-2	SS	18	18	(SM) Residuum, SILTY MEDIUM TO COARSE SAND, orange and gray, moist, medium dense			3-5-7 (12)
5	S-3	SS	18	18			-5	6-9-13 (22)
	S-4	SS	18	18				7-10-9 (19)
10							-10	
	S-5	SS	18	18				9-12-16 (28)
15					**END OF BORING AT 15 FT**		-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ STANDARD PENETRATION BLOWS/FT

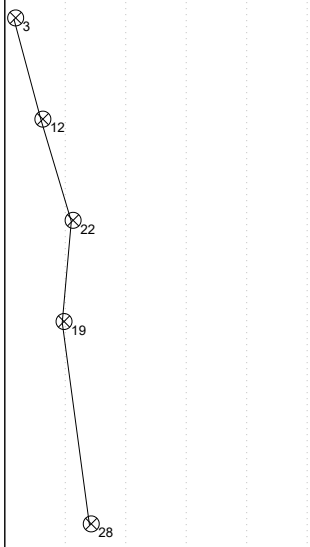
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 09 2022**		CAVE IN DEPTH: **12.40**
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 09 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**SCM-04**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	0	0	Topsoil Thickness[6.00"] (WR) PARTIALLY WEATHERED ROCK SAMPLED AS, No recovery [Weathered ROCK] **AUGER REFUSAL AT 1 FT**		0	50/0" (50/0")
5							-5	
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit
X——●——△

⊗ **STANDARD PENETRATION BLOWS/FT**

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ **CALIBRATED PENETROMETER TON/SF**

[FINES CONTENT] %

⊗ 50/0"

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 09 2022**		CAVE IN DEPTH: **1.00**
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 09 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**SCM-05**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[9.00"]		0	
	S-1	SS	18	18	(SM) Residuum, SILTY MEDIUM SAND, light greenish brown, moist, medium dense			2-7-11 (18)
	S-2	SS	18	18				4-6-7 (13)
5	S-3	SS	18	18			-5	6-9-12 (21)
	S-4	SS	18	18				6-7-9 (16)
10							-10	
					AUGER REFUSAL AT 12.5 FT			
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ STANDARD PENETRATION BLOWS/FT

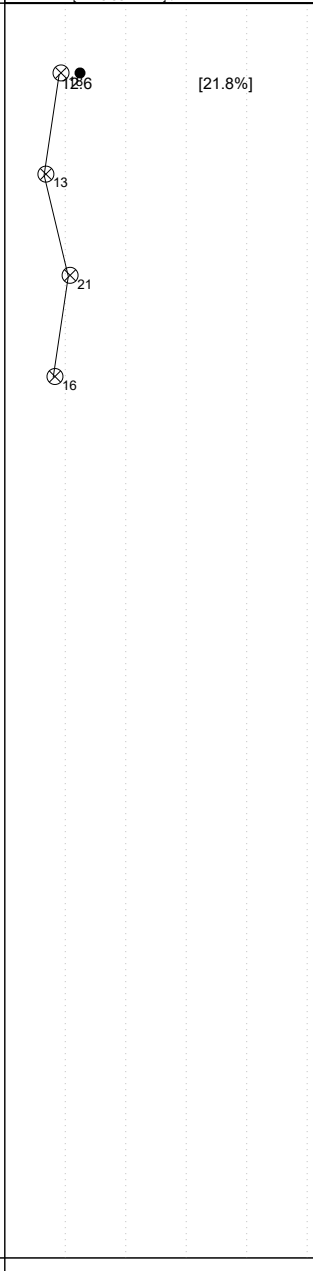
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 08 2022**	CAVE IN DEPTH: **11.50**	
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 08 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**SCM-06**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[8.00"]		0	
	S-1	SS	18	18	(SM) Residuum, SILTY MEDIUM SAND, brown, moist, loose			2-3-6 (9)
	S-2	SS	18	18	(ML) Residuum, SANDY SILT, trace clay, gray, moist to wet, very stiff to stiff		-5	7-10-10 (20)
5	S-3	SS	18	18				6-8-7 (15)
	S-4	SS	18	18	(SM) Residuum, SILTY FINE TO MEDIUM SAND, gray and orange, moist to wet, loose	▼	-10	3-4-4 (8)
10								
	S-5	SS	18	18				2-3-4 (7)
15					**END OF BORING AT 15 FT**		-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

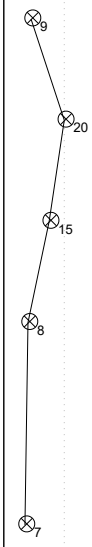
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 08 2022**	CAVE IN DEPTH: **12.30**	
▼ WL (Completion) **12.00**	BORING COMPLETED: **Feb 08 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**SCM-07**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **336.00**	BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

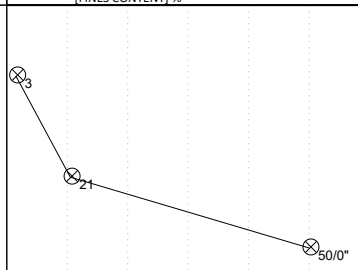
RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[10.00"]			
	S-1	SS	18	18	(ML) Residuum, SANDY SILT, tan, moist, soft			1-1-2 (3)
	S-2	SS	18	18	(SM) Residuum, SILTY MEDIUM SAND, tan, moist, medium dense			6-8-13 (21)
5	S-3	SS	0	0	(WR) PARTIALLY WEATHERED ROCK SAMPLED AS, No recovery [Weathered ROCK]		-5	50/0" (50/0")
					AUGER REFUSAL AT 6 FT			
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 08 2022**	CAVE IN DEPTH: **4.70**	
▼ WL (Completion) **DRY**	BORING COMPLETED: **Feb 08 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV CME550**	LOGGED BY: **CAR3**	DRILLING METHOD: **2.25 HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**SCM-08**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **378.00**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[12.00"]		0	
	S-1	SS	18	18	(CH) Residuum, FAT CLAY WITH SAND, brownish yellow, moist, firm			2-2-3 (5)
5	S-2	SS	18	18	(SM) Residuum, SILTY MEDIUM SAND, pink and brown, moist to wet, loose to medium dense		-5	2-2-4 (6)
	S-3	SS	18	18		▽		2-3-5 (8)
	S-4	SS	18	18				2-4-7 (11)
10							-10	
	S-5	SS	18	18				3-3-6 (9)
15					**END OF BORING AT 15 FT**		-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ STANDARD PENETRATION BLOWS/FT

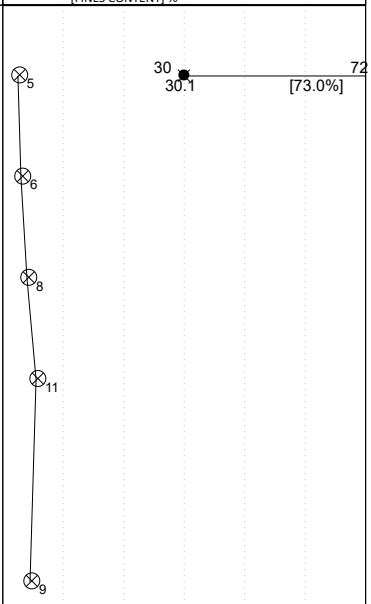
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **7.00**	BORING STARTED: **Feb 08 2022**		CAVE IN DEPTH: **12.00**
▼ WL (Completion)	BORING COMPLETED: **Feb 08 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **CAR3**	DRILLING METHOD:
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**SCM-09**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[8.00"]		0	
	S-1	SS	18	18	(SM) Residuum, SILTY FINE TO MEDIUM SAND, gray and brown, moist, loose to medium dense			2-3-4 (7)
	S-2	SS	18	18				5-10-24 (34)
5							-5	
	S-3	SS	18	18	(SM) Residuum, SILTY FINE TO MEDIUM SAND, gray and brown, moist, very dense			17-29-50 (79)
	S-4	SS	8	8	(WR) PARTIALLY WEATHERED ROCK SAMPLED AS SILTY FINE TO MEDIUM SAND, orange and gray, moist to wet [Weathered ROCK]	▼		35-50/2" (50/2")
10					**AUGER REFUSAL AT 9.5 FT**		-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ STANDARD PENETRATION BLOWS/FT

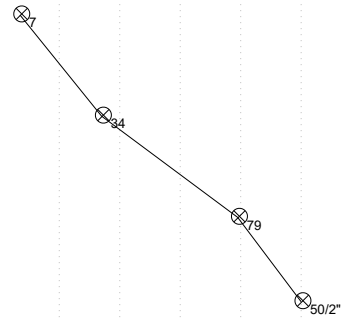
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Jan 19 2022**		CAVE IN DEPTH: **9.50**
▼ WL (Completion) **9.40**	BORING COMPLETED: **Jan 25 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**SCM-10**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	3	3	Topsoil Thickness[8.00"] (WR) PARTIALLY WEATHERED ROCK SAMPLED AS SILTY MEDIUM SAND, gray, moist [Weathered ROCK] **AUGER REFUSAL AT 2 FT**		0	50/3" (50/3")
5							-5	
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

⊗ 50/3"

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Jan 19 2022**		CAVE IN DEPTH: **1.00**
▼ WL (Completion) **Dry**	BORING COMPLETED: **Jan 25 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**SCM-11**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[12.00"]			
	S-1	SS	18	18	(SM) Residuum, SILTY FINE SAND, brown, moist, very loose			1-1-WOH (1)
	~~S-2~~	~~SS~~	~~1~~	~~1~~	(WR) PARTIALLY WEATHERED ROCK SAMPLED AS, No recovery [Weathered ROCK]			50/1" (50/1")
					AUGER REFUSAL AT 3.7 FT			

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 11 2022**		CAVE IN DEPTH:
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 11 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**SCM-12**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	0	0	Topsoil Thickness[4.00"] (WR) PARTIALLY WEATHERED ROCK SAMPLED AS, No recovery [Weathered ROCK] **AUGER REFUSAL AT 0.5 FT**		0	50/0" (50/0")
5							-5	
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit
X———●———△

⊗ **STANDARD PENETRATION BLOWS/FT**

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ **CALIBRATED PENETROMETER TON/SF**

[FINES CONTENT] %

⊗ 50/0"

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 11 2022**		CAVE IN DEPTH: **0.50**
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 11 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**SCM-13**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Content Liquid Limit X——●——△ ⊗ STANDARD PENETRATION BLOWS/FT; ROCK QUALITY DESIGNATION & RECOVERY; RQD; REC; ○ CALIBRATED PENETROMETER TON/SF; [FINES CONTENT] %
					Topsoil Thickness[7.00"]				
	S-1	SS	18	18	(SM) Residuum, SILTY MEDIUM SAND, tan, moist, medium dense			1-7-10 (17)	⊗17
					AUGER REFUSAL AT 3 FT				
5							-5		
10							-10		
15							-15		
20							-20		
25							-25		
30							-30		

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 09 2022**	CAVE IN DEPTH: **3.00**	
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 09 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**SCM-14**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	2	2	Topsoil Thickness[6.00"] (WR) PARTIALLY WEATHERED ROCK SAMPLED AS SILTY MEDIUM TO COARSE SAND, brown, moist [Weathered ROCK] **AUGER REFUSAL AT 1.2 FT**		0	50/2" (50/2")
5							-5	
10							-10	
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

⊗ 50/2"

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 11 2022**	CAVE IN DEPTH: **1.20**	
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 11 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
D.R. Horton	**06:24735**	**SCM-15**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Kalas Falls Residential Development	**Bridger Drilling Inc.**

SITE LOCATION: **1832 Rolesville Road, Rolesville, North Carolina 27587**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[4.00"]			
	S-1	SS	18	18	(CL) Residuum, SANDY LEAN CLAY, brown, moist, soft			1-1-2 (3)
	S-2	SS	18	18	(ML) Residuum, SANDY SILT, trace clay, trace gravel, orange and brown, moist to wet, stiff			3-6-6 (12)
5	S-3	SS	18	18			-5	4-4-5 (9)
	S-4	SS	18	18				3-4-6 (10)
10						▼	-10	
	S-5	SS	18	18				3-6-4 (10)
15					**END OF BORING AT 15 FT**		-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ **STANDARD PENETRATION BLOWS/FT**

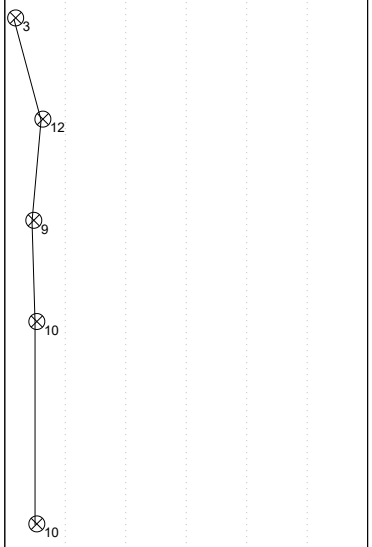
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ **CALIBRATED PENETROMETER TON/SF**

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Feb 10 2022**		CAVE IN DEPTH: **13.00**
▼ WL (Completion) **12.10**	BORING COMPLETED: **Feb 10 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **GHG**	DRILLING METHOD: **2-1/4" H.S.A.**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

Appendix C – Laboratory Testing

Laboratory Testing Summary

Plasticity Chart(s)

Moisture-Density Relationship Curve(s)

CBR Test Results

Laboratory Testing Summary

Sample Source	Sample Number	Start Depth (feet)	End Depth (feet)	Sample Distance (feet)	MC[1] (%)	Soil Type[2]	Atterberg Limits[3]			Percent Passing No. 200 Sieve[4]	Moisture - Density (Corr.)[5]		CBR Value[6]	Organic Content
							LL	PL	PI		Maximum Density (pcf)	Optimum Moisture (%)		
B-06	S-1	1.0	2.5	1.5	13.7	SM		NP		19.6	111.7	11.5	20	
B-11	S-1	1.0	2.5	1.5	29.3	CH	62	29	33	61.7				
B-13	S-1	1.0	2.5	1.5	16.7	SC	38	23	15	36.0	100.7	14.2	10	
B-14	S-2	3.5	5.0	1.5	20.1	ML		NP		59.9				
B-16	S-1	1.0	2.5	1.5	17.0	SM	41	29	12	25.2				
B-18	S-1	1.0	2.5	1.5	25.1	CH	64	29	35	59.5				
B-19	S-1	1.0	2.5	1.5	27.7	MH	69	40	29	60.9				
B-23	S-1	1.0	2.5	1.5	23.9	SC	48	27	21	45.2				
B-25	S-1	1.0	2.5	1.5	25.4	SM	44	36	8	38.7				
B-28	S-1	1.0	2.5	1.5	10.0	SP-SM		NP		11.6	118.4	11.2	17	
B-31	S-1	1.0	2.5	1.5	28.4	CH	79	30	49	60.0				
B-35	S-2	3.5	5.0	1.5	30.8	SM	62	34	28	41.5				
SCM-02	S-1	1.0	2.5	1.5	18.0	SC	50	23	27	39.6				
SCM-05	S-1	1.0	2.5	1.5	12.6	SM		NP		21.8				
SCM-08	S-1	1.0	2.5	1.5	30.1	CH	72	30	42	73.0				

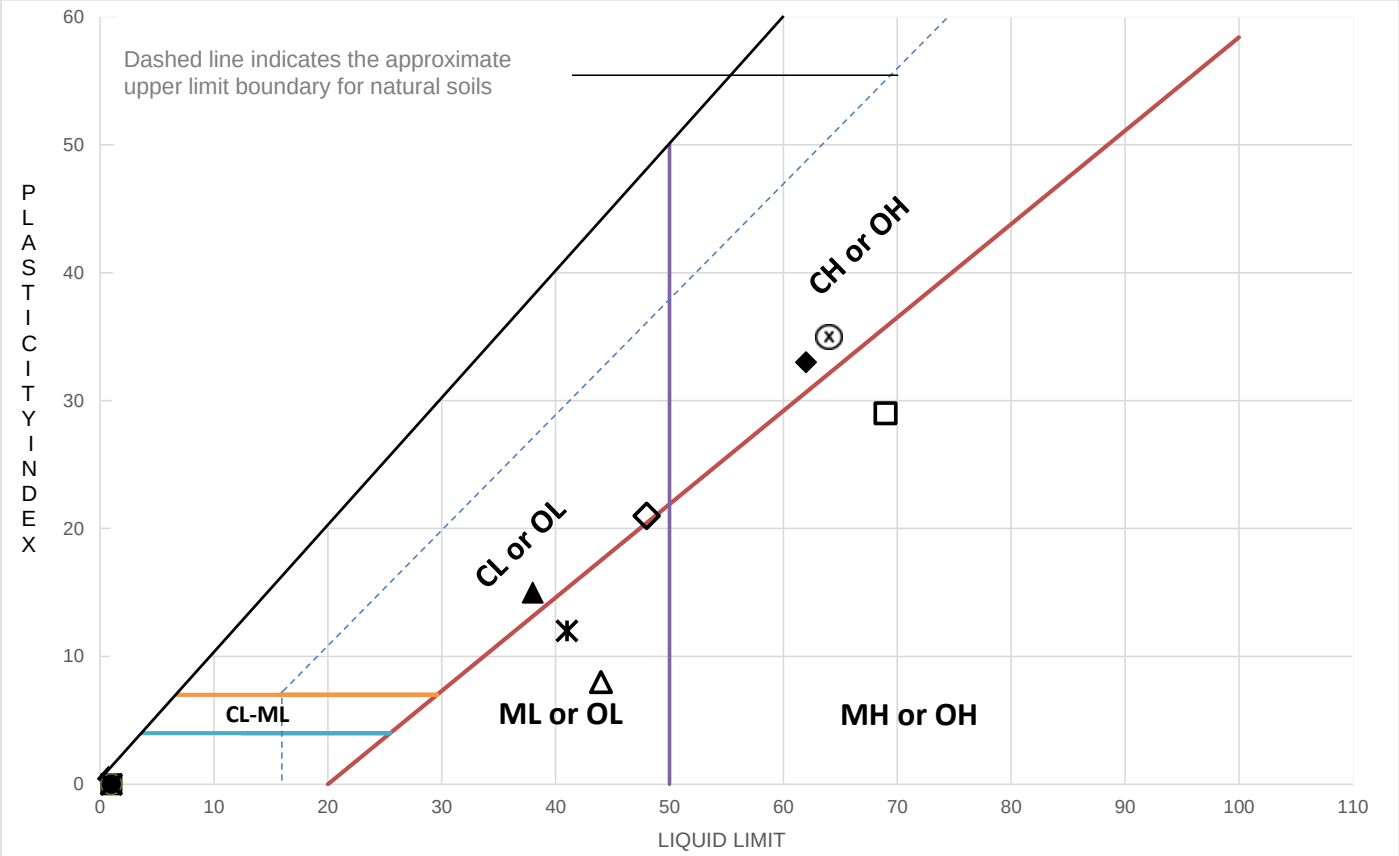
Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ration, OC: Organic Content (ASTM D 2974)

Project No. 06:24735
Project Name: Kalas Falls Residential Development
PM: Gunnar Goslin
PE: Thomas Schipporeit
Printed On: March 7, 2022

ECS Southeast, LLP - Raleigh
9001 Glenwood Avenue
Raleigh, NC 27617-7505
Phone: 919-861-9910
Fax: 919-861-9911

LIQUID AND PLASTIC LIMITS TEST REPORT



TEST RESULTS (ASTM D4318-10 (MULTIPOINT TEST))

	Sample Location	Sample Number	Sample Depth (ft)	LL	PL	PI	%<#40	%<#200	AASHTO	USCS	Material Description
■	B-06	S-1	1-2.5	NP	NP	NP		19.6			(SM) SILTY SAND, Dark Yellowish-Brown
◆	B-11	S-1	1-2.5	62	29	33		61.7			(CH) SANDY FAT CLAY, Brownish-Yellow
▲	B-13	S-1	1-2.5	38	23	15		36.0			(SC) CLAYEY SAND, Strong Brown
●	B-14	S-2	3.5-5	NP	NP	NP		59.9			(ML) SANDY SILT, Light Yellowish-Brown
✳	B-16	S-1	1-2.5	41	29	12		25.2			(SM) SILTY SAND, Brown
⊗	B-18	S-1	1-2.5	64	29	35		59.5			(CH) SANDY FAT CLAY, Yellowish-Brown
□	B-19	S-1	1-2.5	69	40	29		60.9			(MH) SANDY ELASTIC SILT, Strong Brown
◇	B-23	S-1	1-2.5	48	27	21		45.2			(SC) CLAYEY SAND, Grayish-Brown
△	B-25	S-1	1-2.5	44	36	8		38.7			(SM) SILTY SAND, Reddish-Yellow
×	B-28	S-1	1-2.5	NP	NP	NP		11.6			(SP-SM) POORLY GRADED SAND w/ SILT, Dark Brown

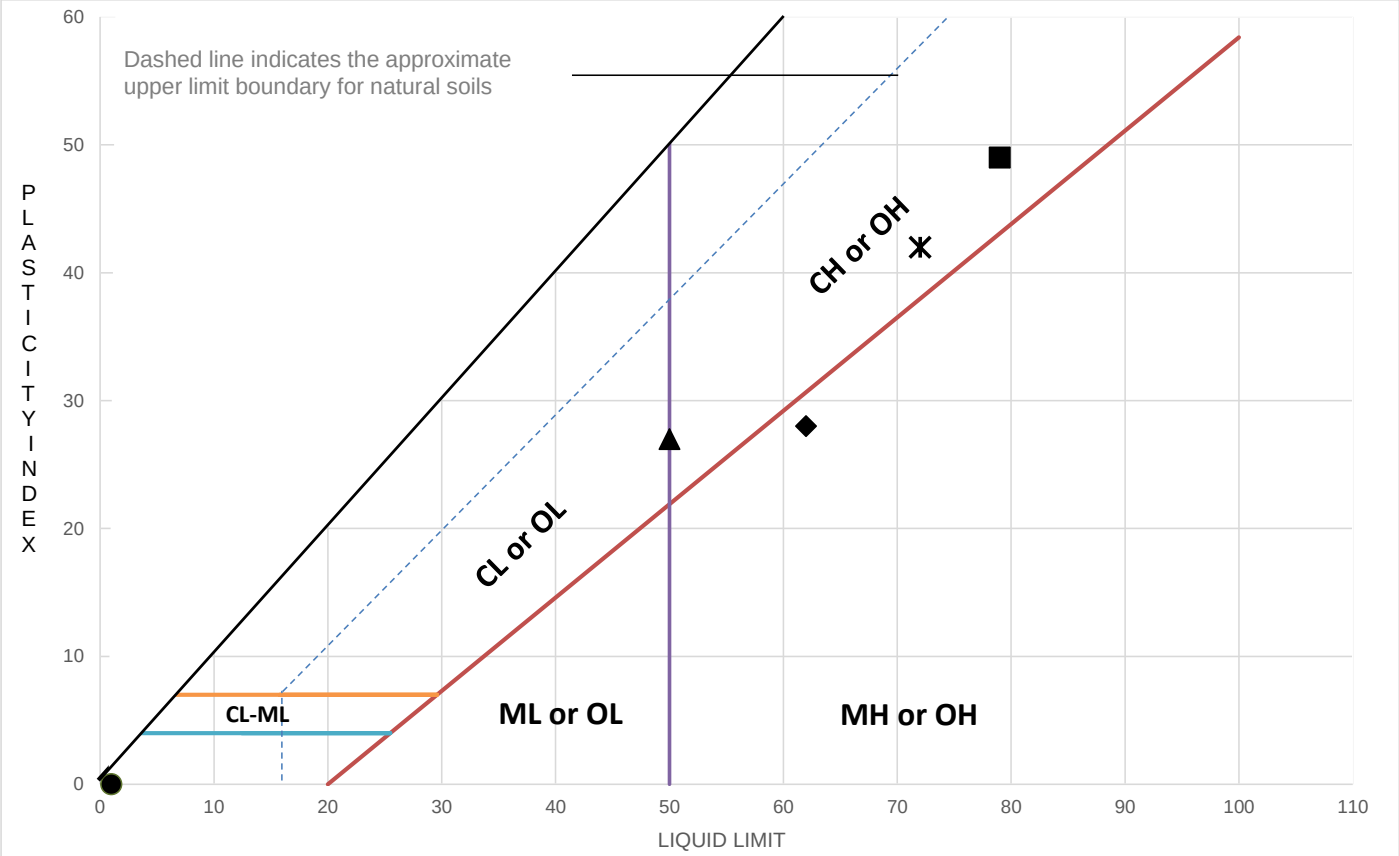
Project: Kalas Falls Residential Development
Client: D.R. Horton

Project No.: 06:24735
Date Reported: 3/2/2022

Office / Lab	Address	Office Number / Fax
ECS Southeast LLP - Raleigh	5260 Greens Dairy Road Raleigh, NC 27616	(919)861-9910 (919)861-9911

Tested by	Checked by	Approved by	Date Received
acreech	ssisell2	ssisell2	2/22/2022

LIQUID AND PLASTIC LIMITS TEST REPORT



TEST RESULTS (ASTM D4318-10 (MULTIPOINT TEST))

	Sample Location	Sample Number	Sample Depth (ft)	LL	PL	PI	%<#40	%<#200	AASHTO	USCS	Material Description
■	B-31	S-1	1-2.5	79	30	49		60.0			(CH) SANDY FAT CLAY, Brownish-Yellow
◆	B-35	S-2	3.5-5	62	34	28		41.5			(SM) SILTY SAND, Light Gray
▲	SCM-02	S-1	1-2.5	50	23	27		39.6			(SC) CLAYEY SAND, Yellowish-Brown
●	SCM-05	S-1	1-2.5	NP	NP	NP		21.8			(SM) SILTY SAND, Light Olive Brown
✳	SCM-08	S-1	1-2.5	72	30	42		73.0			(CH) FAT CLAY w/ SAND, Brownish-Yellow

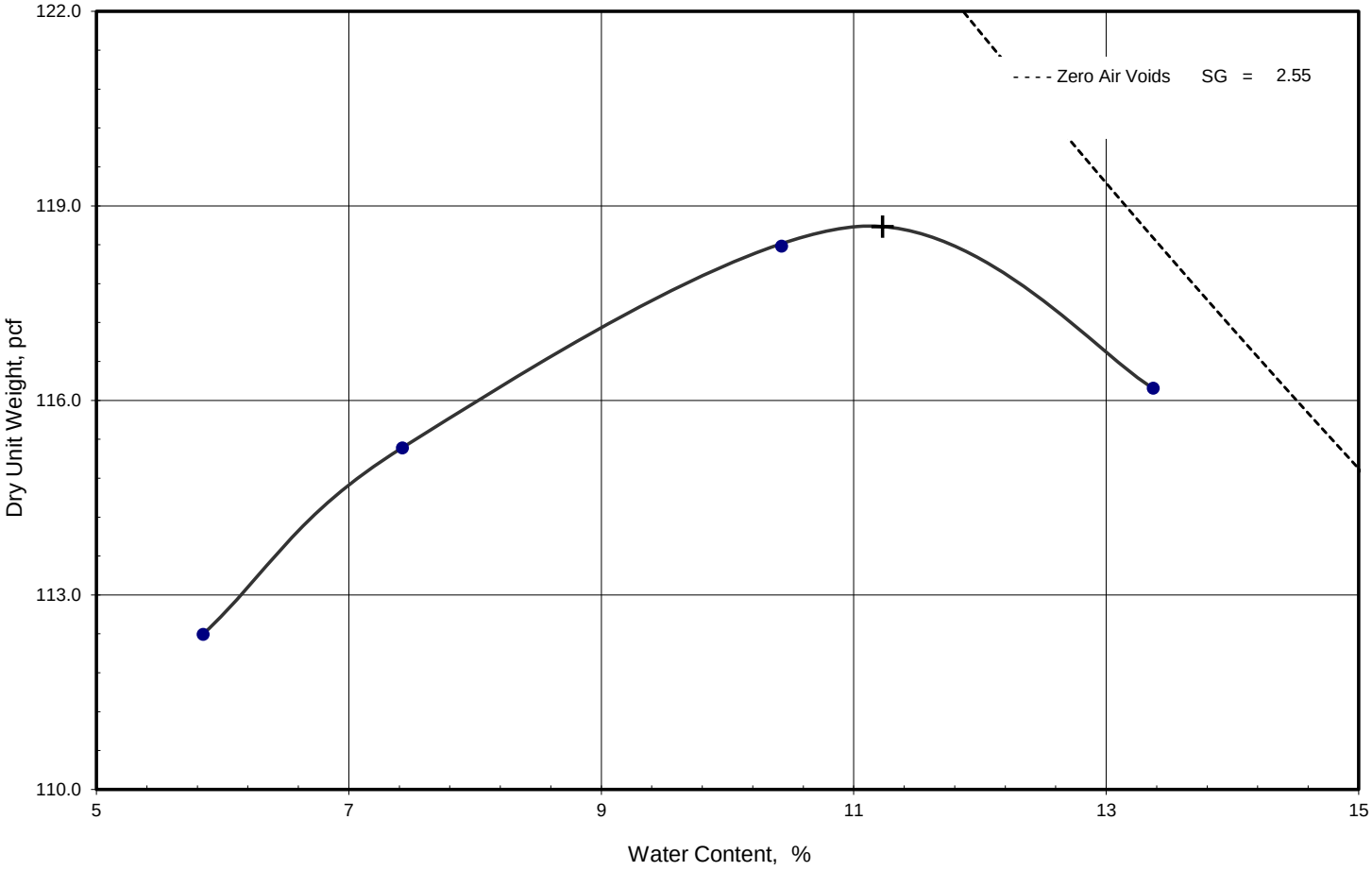
Project: Kalas Falls Residential Development
Client: D.R. Horton

Project No.: 06:24735
Date Reported: 3/2/2022

Office / Lab	Address	Office Number / Fax
ECS Southeast LLP - Raleigh	5260 Greens Dairy Road Raleigh, NC 27616	(919)861-9910 (919)861-9911

Tested by	Checked by	Approved by	Date Received
acreech	ssisell2	ssisell2	2/22/2022

Laboratory Compaction Characteristics of Soil
Using Standard Effort



Optimum Moisture Content		**11.2**	%
Maximum Dry Unit Weight		**118.7**	pcf
Cumulative material retained on:	3/4 in. sieve	2.3	%
	3/8 in. sieve	4.6	%
	#4 sieve	10.4	%

Preparation	ASTM dry preparation method	
Type of rammer	Mechanical - sector face	
Test Specfication / Method	ASTM D698-12e2-method C	
Specific gravity - D854 water pycnometer	2.55	Historical
Coarse Aggregate Specific Gravity -		

Soil Description	Nat. Moist. %	Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
(SP-SM) POORLY GRADED SAND w/ SILT, Dark Brown	10.0	NP	NP	11.6		

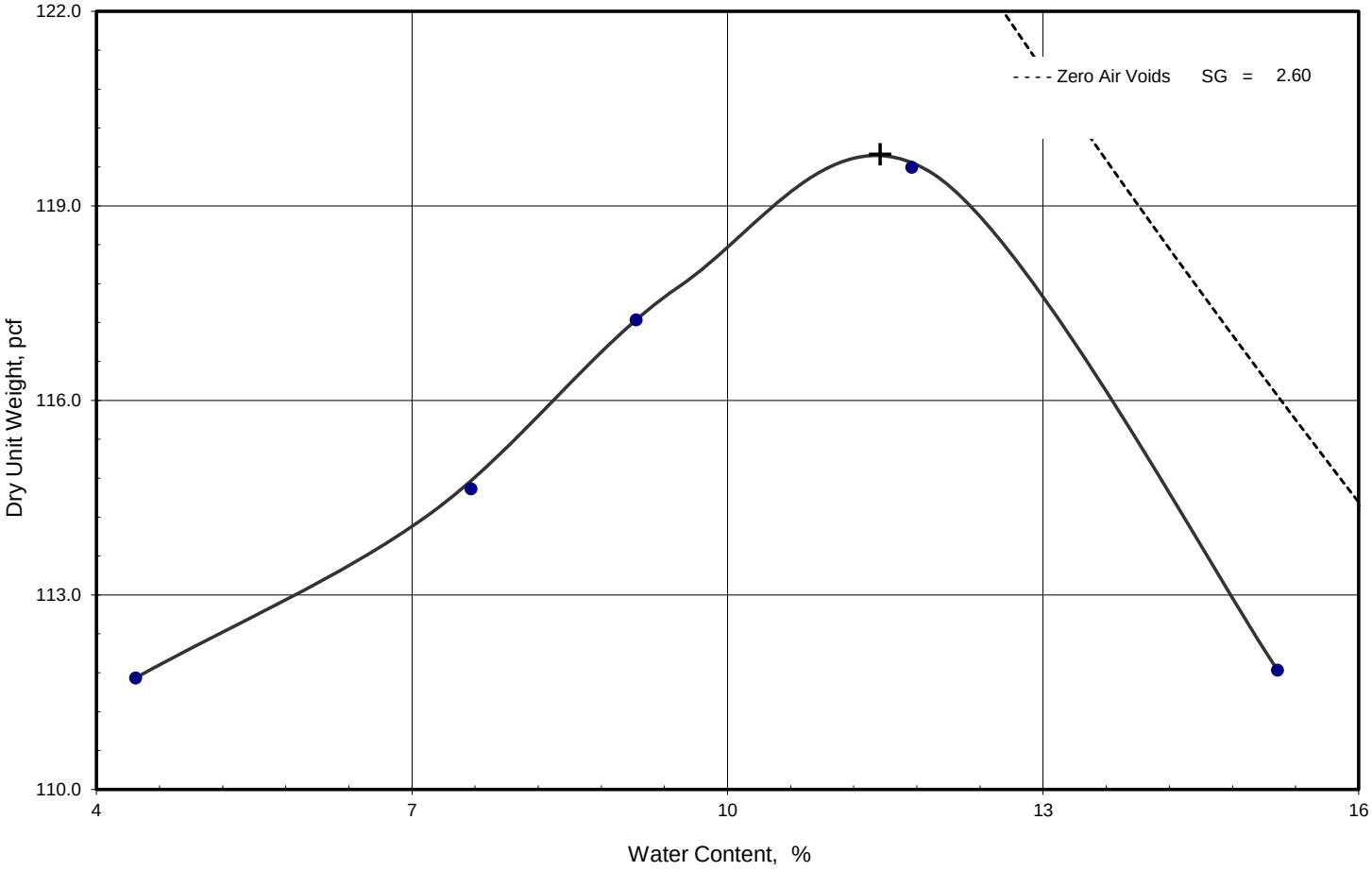
Project: Kalas Falls Residential Development
Client: D.R. Horton
Sample / Source B-28
Test Reference/No.:

Project No.: 06:24735
Depth (ft.): 1 - 2.5
Sample No.: S-1
Date Reported: 3/4/2022

Office / Lab	Address	Office Number / Fax
ECS Southeast LLP - Raleigh	5260 Greens Dairy Road Raleigh, NC 27616	(919)861-9910 (919)861-9911

Tested by	Checked by	Approved by	Date Received	Remarks
acreech	ssisell2	ssisell2	2/22/2022	

Laboratory Compaction Characteristics of Soil
Using Standard Effort



Optimum Moisture Content		**11.5**	%
Maximum Dry Unit Weight		**119.8**	pcf
Cumulative material retained on:	3/4 in. sieve	0.2	%
	3/8 in. sieve	0.8	%
	#4 sieve	3.7	%

Preparation	ASTM dry preparation method	
Type of rammer	Mechanical - circular face	
Test Specfication / Method	ASTM D698-12e2-method B	
Specific gravity - D854 water pycnometer	2.60	Historical
Coarse Aggregate Specific Gravity -		

Soil Description	Nat. Moist. %	Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
(SM) SILTY SAND, Dark Yellowish-Brown	13.7	NP	NP	19.6		

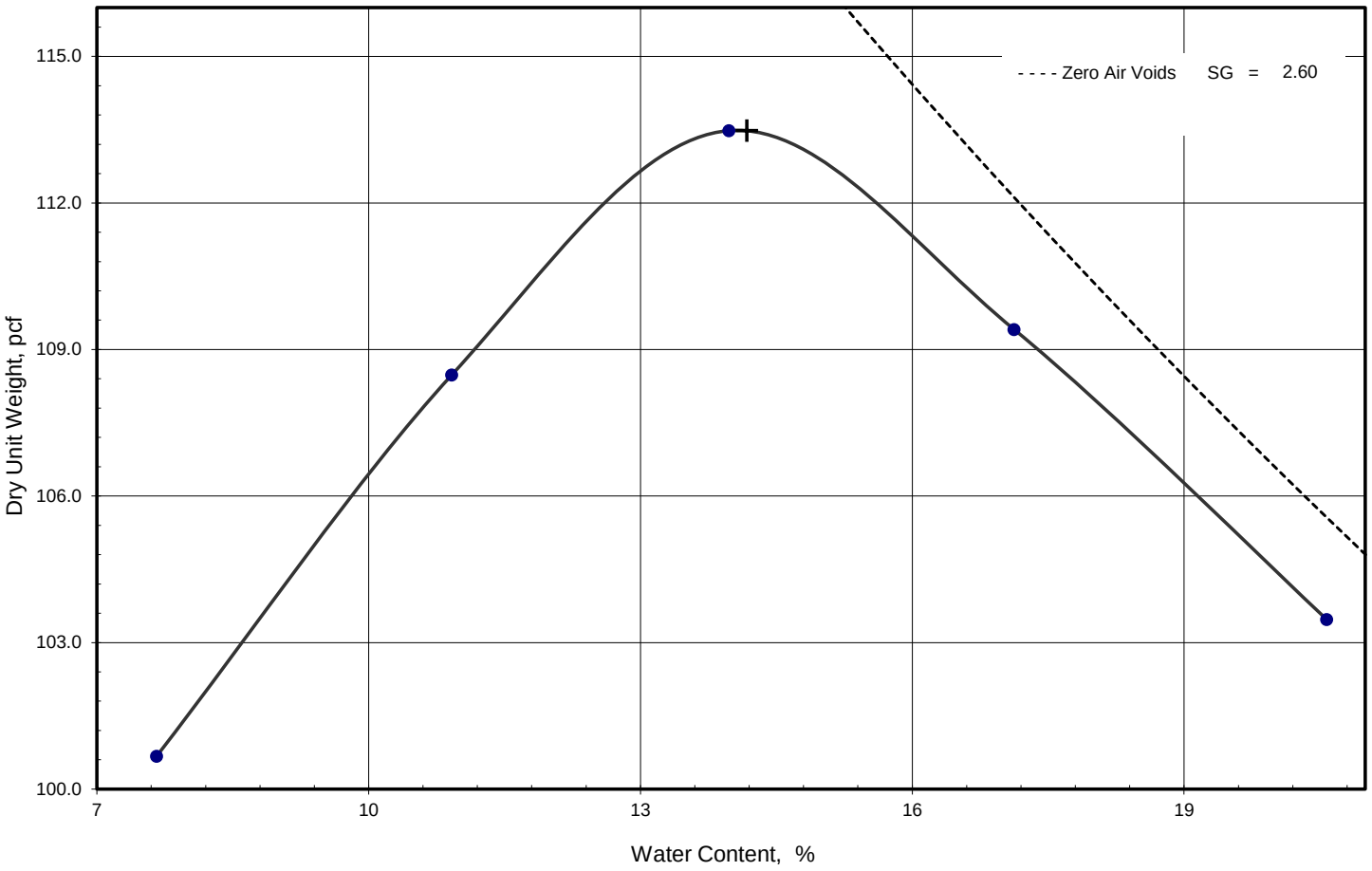
Project: Kalas Falls Residential Development
Client: D.R. Horton
Sample / Source B-06
Test Reference/No.:

Project No.: 06:24735
Depth (ft.): 1 - 2.5
Sample No.: S-1
Date Reported: 3/4/2022

Office / Lab	Address	Office Number / Fax
ECS Southeast LLP - Raleigh	5260 Greens Dairy Road Raleigh, NC 27616	(919)861-9910 (919)861-9911

Tested by	Checked by	Approved by	Date Received	Remarks
acreech	ssisell2	ssisell2	2/22/2022	

Laboratory Compaction Characteristics of Soil
Using Standard Effort



Optimum Moisture Content		**14.2**	%
Maximum Dry Unit Weight		**113.5**	pcf
Cumulative material retained on:	3/4 in. sieve	0.0	%
	3/8 in. sieve	0.0	%
	#4 sieve	0.0	%

Preparation	ASTM dry preparation method	
Type of rammer	Mechanical - circular face	
Test Specfication / Method	ASTM D698-12e2-method A	
Specific gravity - D854 water pycnometer	2.60	Historical
Coarse Aggregate Specific Gravity -		

Soil Description	Nat. Moist. %	Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
(SC) CLAYEY SAND, Strong Brown	16.7	38	15	36.0		

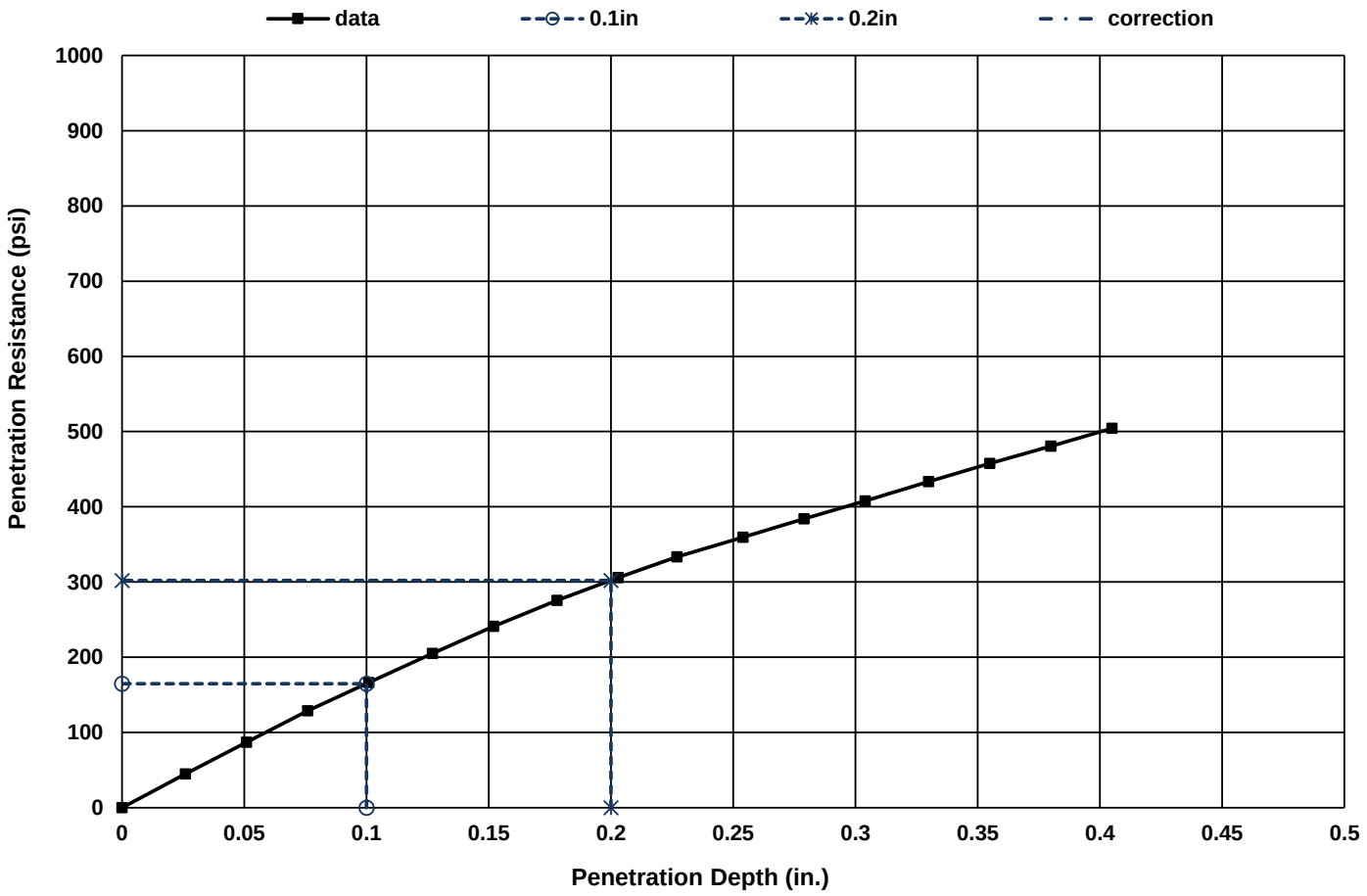
Project: Kalas Falls Residential Development
Client: D.R. Horton
Sample / Source B-13
Test Reference/No.:

Project No.: 06:24735
Depth (ft.): 1 - 2.5
Sample No.: S-1
Date Reported: 3/4/2022

Office / Lab	Address	Office Number / Fax
ECS Southeast LLP - Raleigh	5260 Greens Dairy Road Raleigh, NC 27616	(919)861-9910 (919)861-9911

Tested by	Checked by	Approved by	Date Received	Remarks
	ssisell2	ssisell2	2/22/2022	

California Bearing Ratios (CBR) of Laboratory-Compacted Soils



TEST RESULTS (ASTM D1883-16)

Molded			Soaked			CBR (%)		Linearty Correction (in.)	Surcharge (lbs.)		Swell (%)	
Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.1 in.	0.2 in.					
114.4	96.4	10.1	110.4	93.0	14.1	16.5	20.1	0.00	10		0.02	
Material Description				AASHTO	USCS	MAX. Dens. (pcf)	Optimum Moisture (%)	LL	PI	% Fines	% Gravel	
(SP-SM) POORLY GRADED SAND w/ SILT, Dark Brown						118.7	11.2	NP	NP			

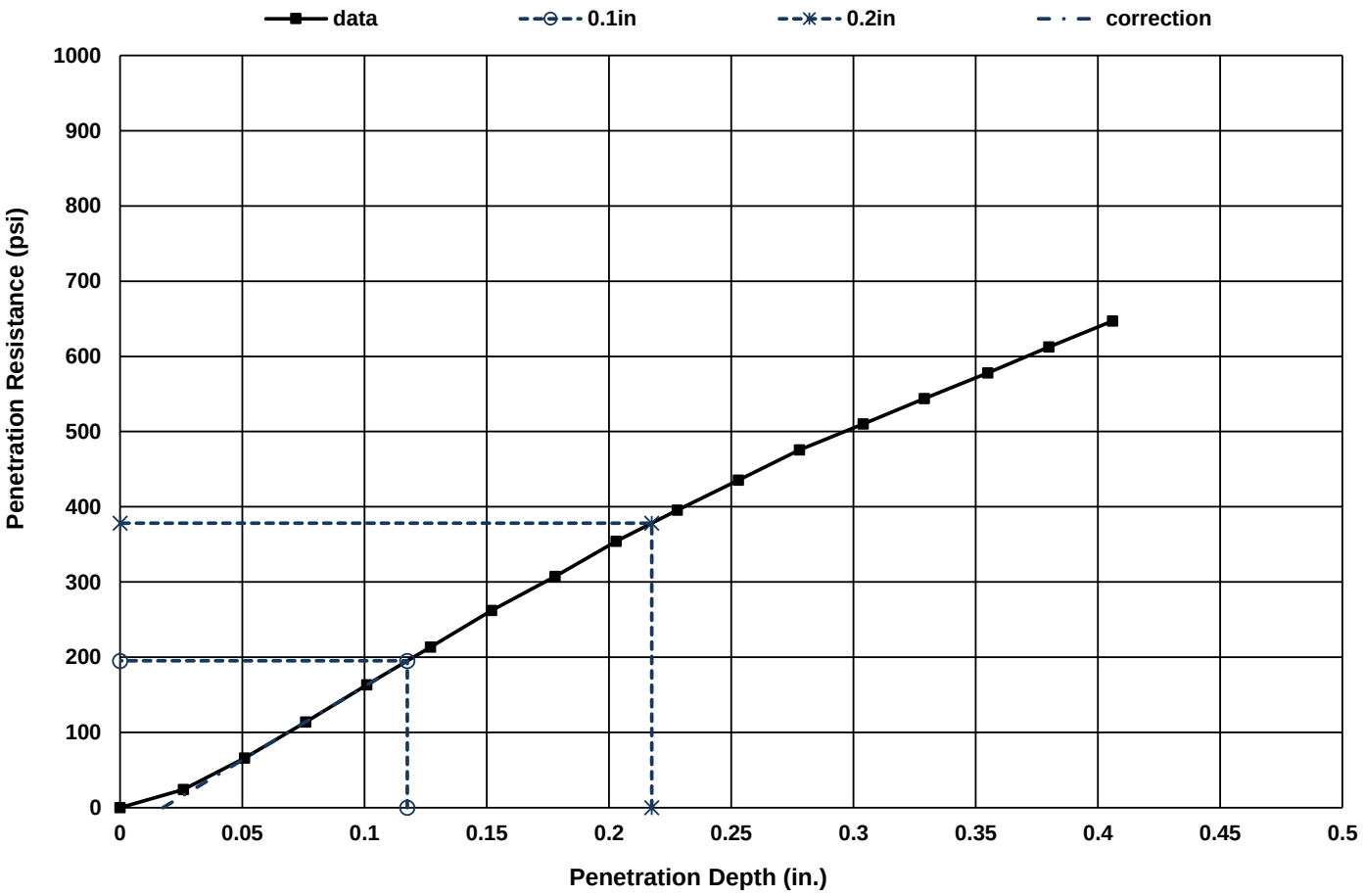
Project: Kalas Falls Residential Development
Client: D.R. Horton
Sample / Source B-28
Test Reference/No.: 1

Project No.: 06:24735
Depth (ft.): 1 - 2.5
Sample No.: S-1
Date Reported: 3/4/2022

Office / Lab	Address	Office Number / Fax
ECS Southeast LLP - Raleigh	5260 Greens Dairy Road Raleigh, NC 27616	(919)861-9910 (919)861-9911

Tested by	Checked by	Approved by	Date Received	Remarks
acreech	ssisell2	ssisell2	2/22/2022	

California Bearing Ratios (CBR) of Laboratory-Compacted Soils



TEST RESULTS (ASTM D1883-16)

Molded			Soaked			CBR (%)		Linearty Correction (in.)	Surcharge (lbs.)		Swell (%)	
Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.1 in.	0.2 in.					
116.2	97.0	11.3	114.7	95.7	12.7	19.5	25.2	0.02	10		0.00	

Material Description	AASHTO	USCS	MAX. Dens. (pcf)	Optimum Moisture (%)	LL	PI	% Fines	% Gravel
(SM) SILTY SAND, Dark Yellowish-Brown			119.8	11.5	NP	NP		

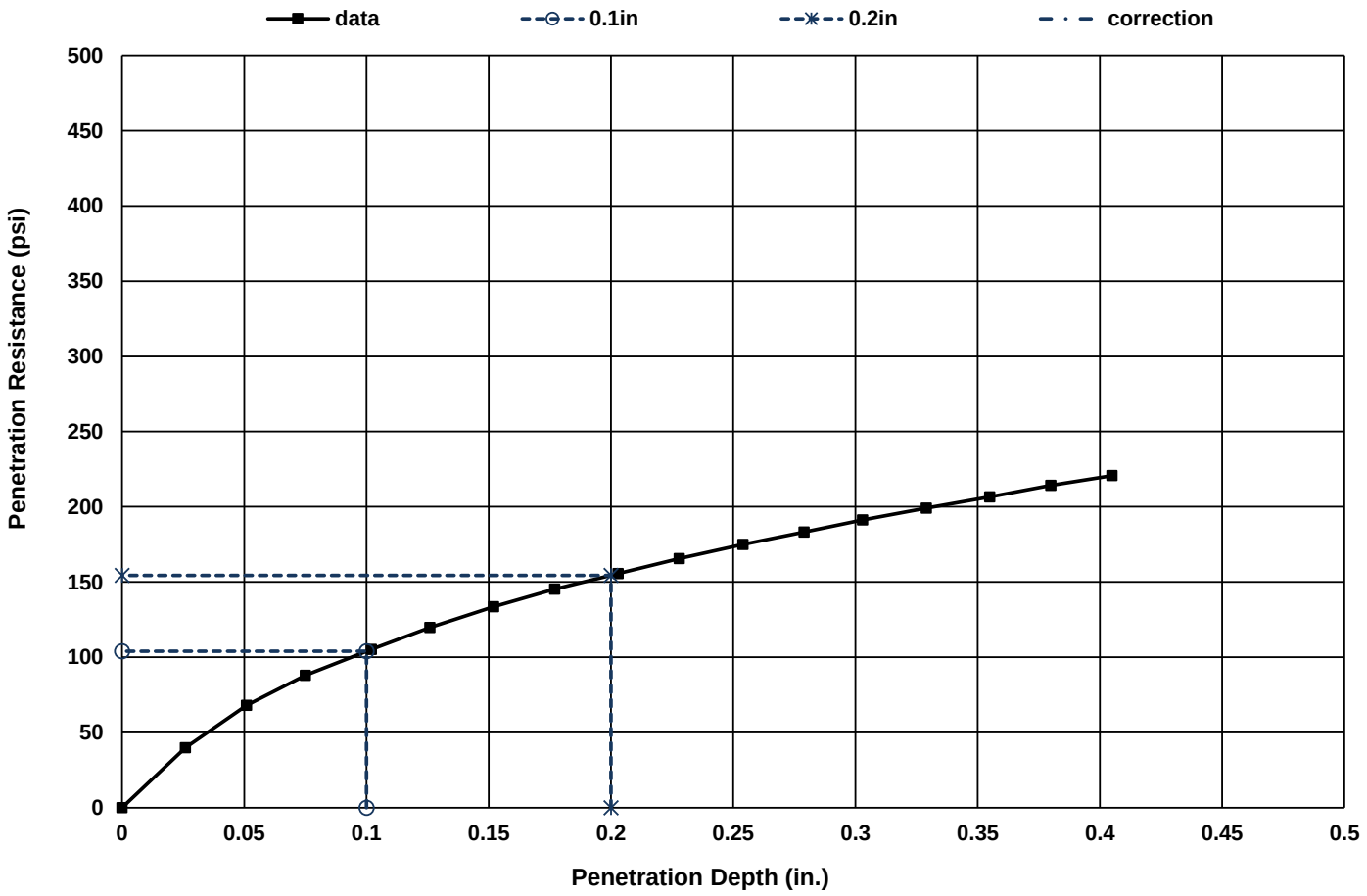
Project: Kalas Falls Residential Development
Client: D.R. Horton
Sample / Source B-06
Test Reference/No.: 1

Project No.: 06:24735
Depth (ft.): 1 - 2.5
Sample No.: S-1
Date Reported: 3/4/2022

Office / Lab	Address	Office Number / Fax
ECS Southeast LLP - Raleigh	5260 Greens Dairy Road Raleigh, NC 27616	(919)861-9910 (919)861-9911

Tested by	Checked by	Approved by	Date Received	Remarks
acreech	ssisell2	ssisell2	2/22/2022	

California Bearing Ratios (CBR) of Laboratory-Compacted Soils



TEST RESULTS (ASTM D1883-16)

Molded			Soaked			CBR (%)		Linearty Correction (in.)	Surcharge (lbs.)		Swell (%)	
Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.1 in.	0.2 in.					
106.8	94.1	14.3	101.3	89.3	19.8	10.4	10.3	0.00	10		0.52	

Material Description	AASHTO	USCS	MAX. Dens. (pcf)	Optimum Moisture (%)	LL	PI	% Fines	% Gravel
(SC) CLAYEY SAND, Strong Brown			113.5	14.2	38	15		

Project: Kalas Falls Residential Development
Client: D.R. Horton
Sample / Source B-13
Test Reference/No.: 1

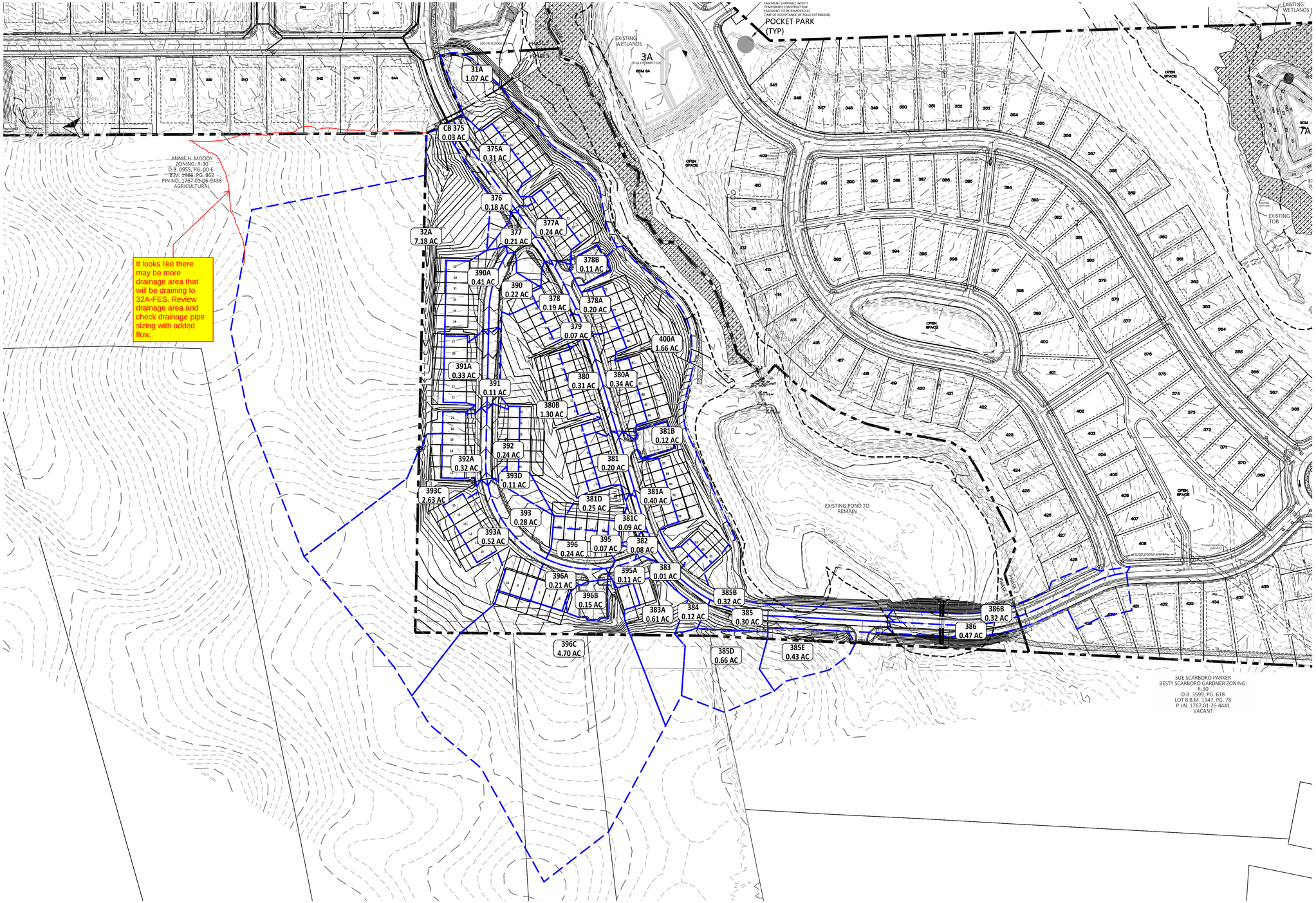
Project No.: 06:24735
Depth (ft.): 1 - 2.5
Sample No.: S-1
Date Reported: 3/4/2022

Office / Lab	Address	Office Number / Fax
ECS Southeast LLP - Raleigh	5260 Greens Dairy Road Raleigh, NC 27616	(919)861-9910 (919)861-9911

Tested by	Checked by	Approved by	Date Received	Remarks
	ssisell2	ssisell2	2/22/2022	

APPENDIX B

DRAINAGE AREA MAPS



NOTE: THIS EXHIBIT IS TO BE USED IN TANDEM WITH HYDRAFLOW STORM SEWERS MODELING FOR CONVEYANCE CALCULATIONS.

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)

1 inch = 100ft

AMERICAN Engineering

RALEIGH NC | CHARLOTTE NC | CHESAPEAKE VA

PROJECT # 220020

KALAS FALLS PHASE 5

ROLESVILLE, NC | WAKE COUNTY

December 20, 2024

APPENDIX C

STORM CONVEYANCE CALCULATIONS

AMERICAN Engineering

4020 Westchase Boulevard Suite 450 Raleigh, NC 27607
OFFICE: 919.469.1101 | **AMERICAN-EA.COM**

Project Name:	**Kalas Falls PH5**
Project Number:	**R180115**
Date:	**12/20/2024**
Calculated By:	**SM**
Checked By:	**JK**

Input data in blue boxes

Rational C-Value Calculations for Inlet Areas

Area ID	Drainage Area (ac)	Roof (ac)	Roadway (ac)	Driveway (ac)	Sidewalk (ac)	Open Space (ac)	Pasture (ac)	Wooded (ac)	Offsite Impervious	Impervious C	Open Space C	Pasture C	Wooded C	Composite C Value
Onsite	12.85	2.52	2.32	1.31	0.71	5.77	0.00	0.00	0.20	0.9	0.22	0.38	0.3	**0.59**
Offsite	5.64	0.00	0.00	0.00	0.00	0.00	1.54	4.10	0.00	0.9	0.22	0.38	0.3	**0.32**

AMERICAN Engineering

4020 Westchase Boulevard Suite 450 Raleigh, NC 27607
OFFICE: 919.469.1101 | **AMERICAN-EA.COM**

Project Name:	**Kalas Falls Phase 5**
Project Number:	**180115**
Date:	**12/23/2024**
Calculated By:	**SM**
Checked By:	**JK**

Rip Rap Dissipater Calculations 10-Year Storm

Outlet ID	Pipe Diameter (in)	Pipe Velocity (fps)	Stone Class	Stone Depth (in)	Stone Material (tons)	Geo-Textile (SY)	Start Width (ft)	End Width (ft)	Length (ft)
FES 10 (TEMP)	12	0.25	B	12	1	4	2	6	4
FES 11 (TEMP)	12	0.17	B	12	1	4	2	6	4
FES 20 (TEMP)	36	3.71	B	12	7	22	6	18	12
FES 30B	36	4.17	B	12	7	22	6	18	12
FES 400A	18	3.25	B	12	2	7	3	9	6

Calculations were determined from NCDOT Detail 876.02 *Guide for Rip Rap at Pipe Outlets*
Values shown in table above are minimum quantities and dimensions

10-YEAR

Culvert Report

10 Yr. Flow

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc.

Thursday, May 18 2017

Crossing A

Invert Elev Dn (ft)	= 371.00
Pipe Length (ft)	= 70.00
Slope (%)	= 0.71
Invert Elev Up (ft)	= 371.50
Rise (in)	= 48.0
Shape	= Cir
Span (in)	= 48.0
No. Barrels	= 2
n-Value	= 0.012
Inlet Edge	= Beveled
Coeff. K,M,c,Y,k	= 0.0018, 2.5, 0.03, 0.74, 0.2

Embankment

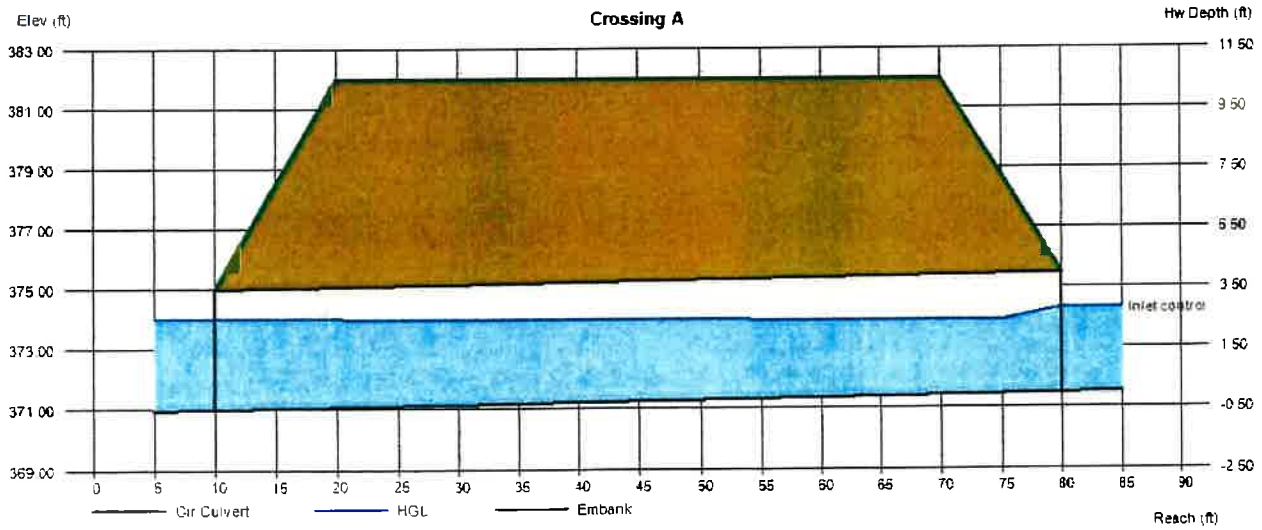
Top Elevation (ft)	= 382.00
Top Width (ft)	= 50.00
Crest Width (ft)	= 200.00

Calculations

Qmin (cfs)	= 90.00
Qmax (cfs)	= 90.00
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

Qtotal (cfs)	= 90.00
Qpipe (cfs)	= 90.00
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 4.44
Veloc Up (ft/s)	= 5.67
HGL Dn (ft)	= 374.01
HGL Up (ft)	= 373.92
Hw Elev (ft)	= 374.33
Hw/D (ft)	= 0.71
Flow Regime	= Inlet Control



Culvert Report

25-YEAR

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc.

Tuesday, Apr 18 2017

Crossing A

Invert Elev Dn (ft)	= 371.00
Pipe Length (ft)	= 100.00
Slope (%)	= 0.50
Invert Elev Up (ft)	= 371.50
Rise (in)	= 48.0
Shape	= Cir
Span (in)	= 48.0
No. Barrels	= 2
n-Value	= 0.012
Inlet Edge	= Sq Edge
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment

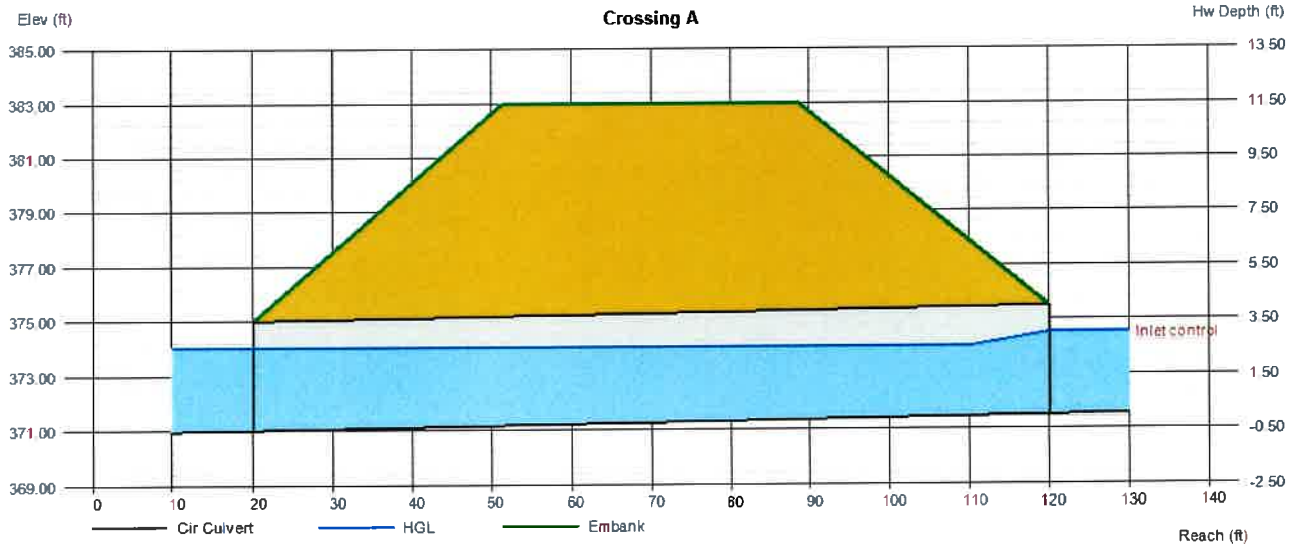
Top Elevation (ft)	= 383.00
Top Width (ft)	= 37.00
Crest Width (ft)	= 100.00

Calculations

Qmin (cfs)	= 95.00
Qmax (cfs)	= 150.00
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

Qtotal (cfs)	= 95.00
Qpipe (cfs)	= 95.00
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 4.64
Veloc Up (ft/s)	= 5.72
HGL Dn (ft)	= 374.04
HGL Up (ft)	= 374.01
Hw Elev (ft)	= 374.52
Hw/D (ft)	= 0.76
Flow Regime	= Inlet Control



Culvert Report

100-YEAR

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc.

Tuesday, Apr 18 2017

Crossing A

Invert Elev Dn (ft)	= 371.00
Pipe Length (ft)	= 100.00
Slope (%)	= 0.50
Invert Elev Up (ft)	= 371.50
Rise (in)	= 48.0
Shape	= Cir
Span (in)	= 48.0
No. Barrels	= 2
n-Value	= 0.012
Inlet Edge	= Sq Edge
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment

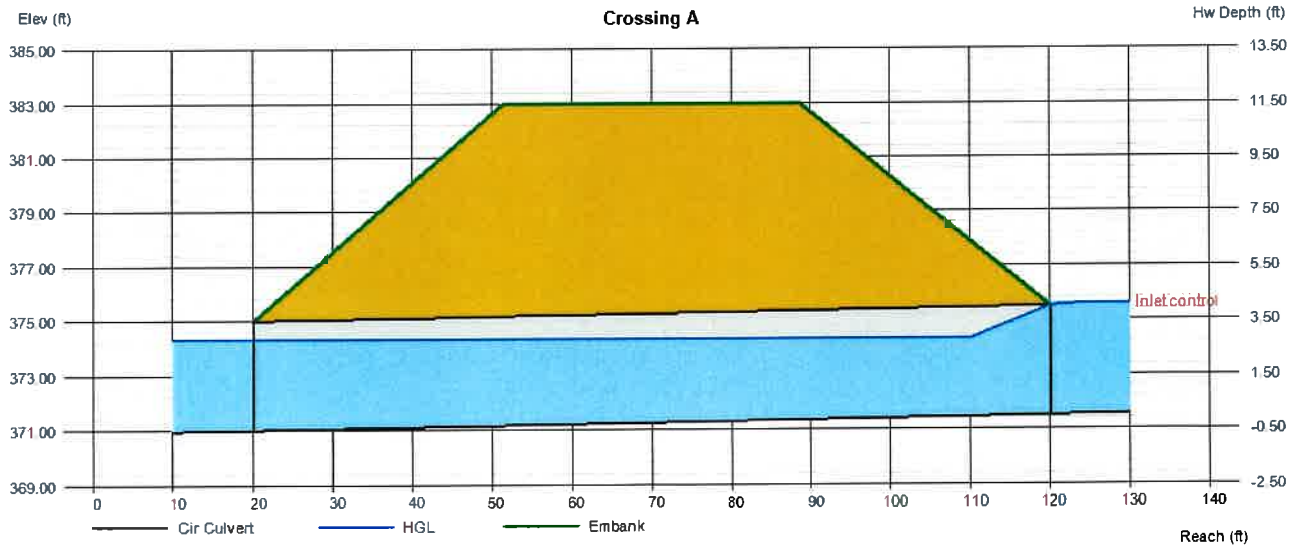
Top Elevation (ft)	= 383.00
Top Width (ft)	= 37.00
Crest Width (ft)	= 100.00

Calculations

Qmin (cfs)	= 150.00
Qmax (cfs)	= 150.00
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

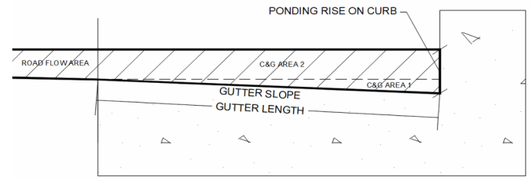
Qtotal (cfs)	= 150.00
Qpipe (cfs)	= 150.00
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 6.74
Veloc Up (ft/s)	= 7.91
HGL Dn (ft)	= 374.31
HGL Up (ft)	= 374.32
Hw Elev (ft)	= 375.62
Hw/D (ft)	= 1.03
Flow Regime	= Inlet Control



Gutter Spread by Limited Area

Determine maximum area to on-grade inlet using input factors as shown below.

Project: **Kalas Falls PH5** Road: **Armfield Creek Place (27' B-B)** Date: 12/20/24



Inlet No. **1** Allowable Spread=Pvm't + Gutter Width: 7.5 ft

Compute "C" Factor: One Half R/W Width: 25 One Half B/B Width: 13.5 S/W Width 5

Paved Area "C": 0.95 Grass Area 0.2

0.70 0.05

Gutter Width= 2.00 ft.

Total Allow. Spread = 7.50 ft. Manning's n = 0.015 Weir C = 3.33

Inlet Type 1 Inlet Types 1 NCDOT Std. 840.03

Composite Rational C = 0.76 I (2yr.) = 4.00 iph

Roadway X-slope = 0.02 Varies Manual Input

Standard Curb and Gutter Profile (see diagram above)

Gutter Length (ft)	2
Gutter Slope (ft/ft)	0.04
Ponding Rise on Curb (ft)	0.19

Max Flow for Limited Spread

C.B. NUMBER	Long. Slope	ROAD X-SLOPE	E. O. P. Depth	Weir Depth	C&G Flow Area 1	C&G Flow Area 2	C&G WP	Road Flow Area	Road WP	Total Flow A	Total WP	MAX Q FOR SPREAD, CFS	On-Grade Spread	Max Drainage Area (S.F.)	Actual Drainage Area (S.F.)	Actual Drainage Area (ACRE)	Check	
390A-CB	0.019	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.54**	7.50	20455	18052	0.41	GOOD	
390-CB	0.019	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.54**	7.50	20455	9666	0.22	GOOD	
391A-CB	0.019	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.54**	7.50	20455	14478	0.33	GOOD	
391-CB	0.019	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.54**	7.50	20455	4809	0.11	GOOD	
392A-CB	0.019	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.54**	7.50	20455	13982	0.32	GOOD	
392-CB	0.019	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.54**	7.50	20455	10647	0.24	GOOD	
393A/393B-CB	0.019	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.54**	7.50	40909	22658	0.52	GOOD	*Double
393-CB	0.019	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.54**	7.50	20455	12130	0.28	GOOD	
395A-CB	0.008	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.01**	7.50	13460	4586	0.11	GOOD	
395-CB	0.008	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.01**	7.50	13460	3179	0.07	GOOD	
396A-CB	0.008	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.01**	7.50	13460	9273	0.21	GOOD	
396B-CB	0.008	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.01**	7.50	13460	6744	0.15	GOOD	
396-CB	0.008	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.01**	7.50	13460	10609	0.24	GOOD	

E. O. P. - Edge of Pavement
C&G - Curb and gutter
WP - Wetted Perimeter (ft.)

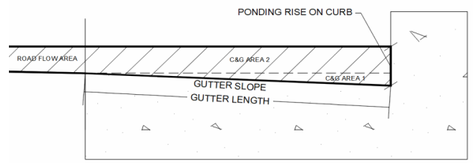
A - Area (s. f.)
V - Velocity (fps)

Note: Program uses Manning's formula for open channel flow.

Gutter Spread by Limited Area

Determine maximum area to on-grade inlet using input factors as shown below.

Project: **Kalas Falls PH5** Road: **Graymont Oaks Dr. (27' B-B)** Date: 12/20/24



Inlet No. **1** Allowable Spread=Pvm't + Gutter Width: 7.5 ft

Compute "C" Factor: One Half R/W Width: 25 One Half B/B Width: 13.5 S/W Width 5

Paved Area "C": 0.95 Grass Area 0.2

0.70 0.05

Gutter Width= 2.00 ft.

Total Allow. Spread = 7.50 ft. Manning's n = 0.015 Weir C = 3.33

Inlet Type 1 Inlet Types 1 NCDOT Std. 840.03

Composite Rational C = 0.76 I (2yr.) = 4.00 iph

Roadway X-slope = 0.02 Varies Manual Input

Standard Curb and Gutter Profile (see diagram above)

Gutter Length (ft)	2
Gutter Slope (ft/ft)	0.04
Ponding Rise on Curb (ft)	0.19

Max Flow for Limited Spread

C.B. NUMBER	Long. Slope	ROAD X-SLOPE	E. O. P. Depth	Weir Depth	C&G Flow Area 1	C&G Flow Area 2	C&G WP	Road Flow Area	Road WP	Total Flow A	Total WP	MAX Q FOR SPREAD, CFS	On-Grade Spread	Max Drainage Area (S.F.)	ctual Drainage Ar Area (S.F.)	al Drainage Area (ACRE)	Check
375A-CB	0.017	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.43**	7.50	19091	13291	0.31	GOOD
376-CB	0.017	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.43**	7.50	19091	7896	0.18	GOOD
377A-CB	0.017	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.43**	7.50	19091	10439	0.24	GOOD
377-CB	0.017	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.43**	7.50	19091	9361	0.21	GOOD
378A-CB	0.017	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.43**	7.50	19091	8896	0.20	GOOD
378B-CB	0.017	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.43**	7.50	19091	4939	0.11	GOOD
378-CB	0.017	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.43**	7.50	19091	8137	0.19	GOOD
379-CB	0.017	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.43**	7.50	19091	3059	0.07	GOOD
380A-CB	0.017	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.43**	7.50	19091	15026	0.34	GOOD
380-CB	0.017	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.43**	7.50	19091	13389	0.31	GOOD
381A-CB	0.017	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.43**	7.50	19091	17358	0.40	GOOD
381B-CB	0.017	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.43**	7.50	19091	5036	0.12	GOOD
381-CB	0.017	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.43**	7.50	19091	8877	0.20	GOOD
381C-CB	0.017	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.43**	7.50	19091	3965	0.09	GOOD
382-CB	0.017	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.43**	7.50	19091	3553	0.08	GOOD
383-CB	0.005	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**0.78**	7.50	10384	281	0.01	GOOD
384-CB	0.005	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**0.78**	7.50	10384	5116	0.12	GOOD
385/385A-CB	0.005	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**0.78**	7.50	20769	13125	0.30	GOOD
385B/385C-CB	0.005	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**0.78**	7.50	20769	13958	0.32	GOOD
386/386A-CB	0.005	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**0.78**	7.50	20769	20662	0.47	GOOD
386B/386C-CB	0.005	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**0.78**	7.50	20769	14052	0.32	GOOD
EX. 375-CB	0.017	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.43**	7.50	19091	1103	0.03	GOOD

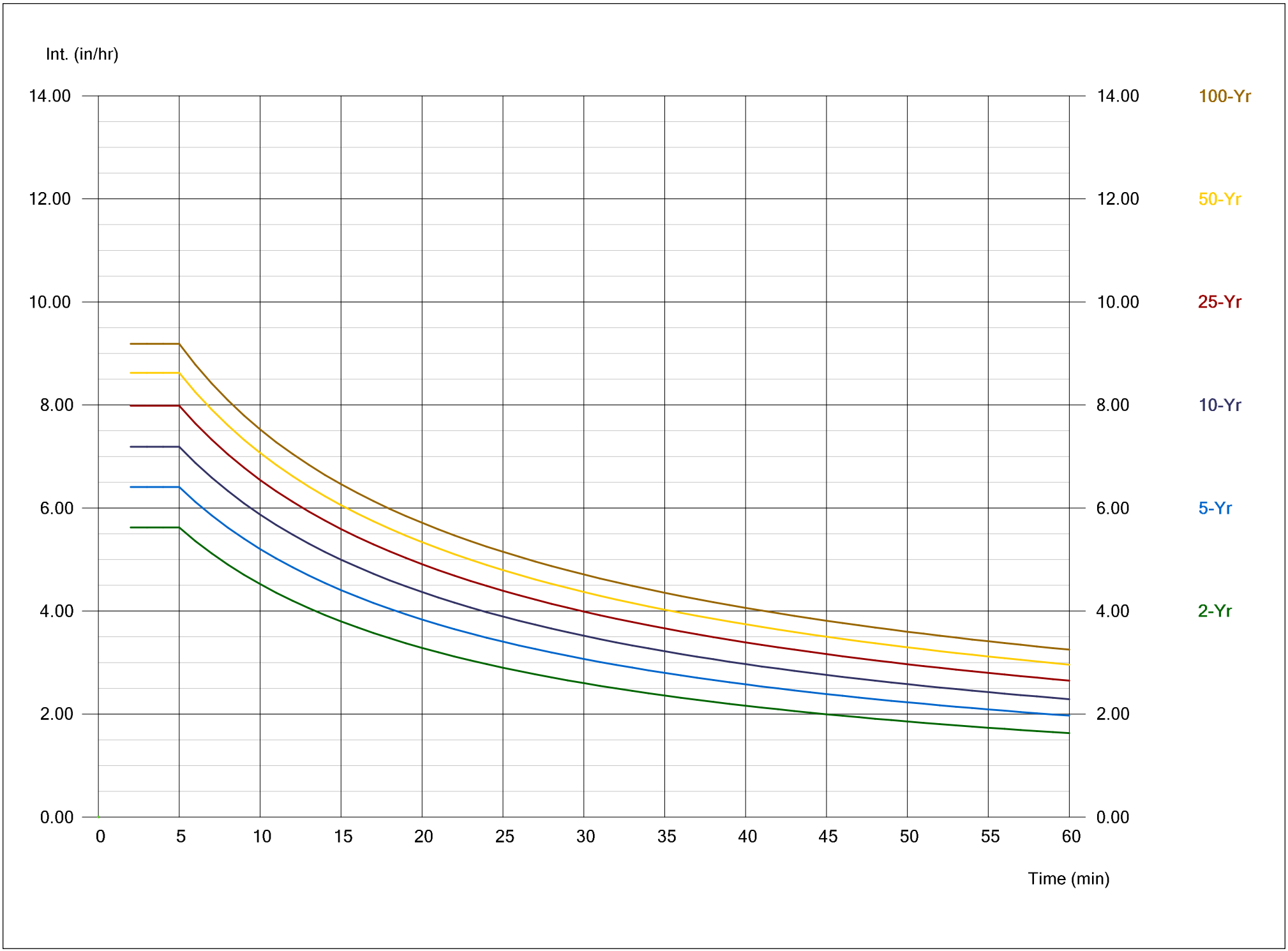
E. O. P. - Edge of Pavement
C&G - Curb and gutter
WP - Wetted Perimeter (ft.)

A - Area (s. f.)
V - Velocity (fps)

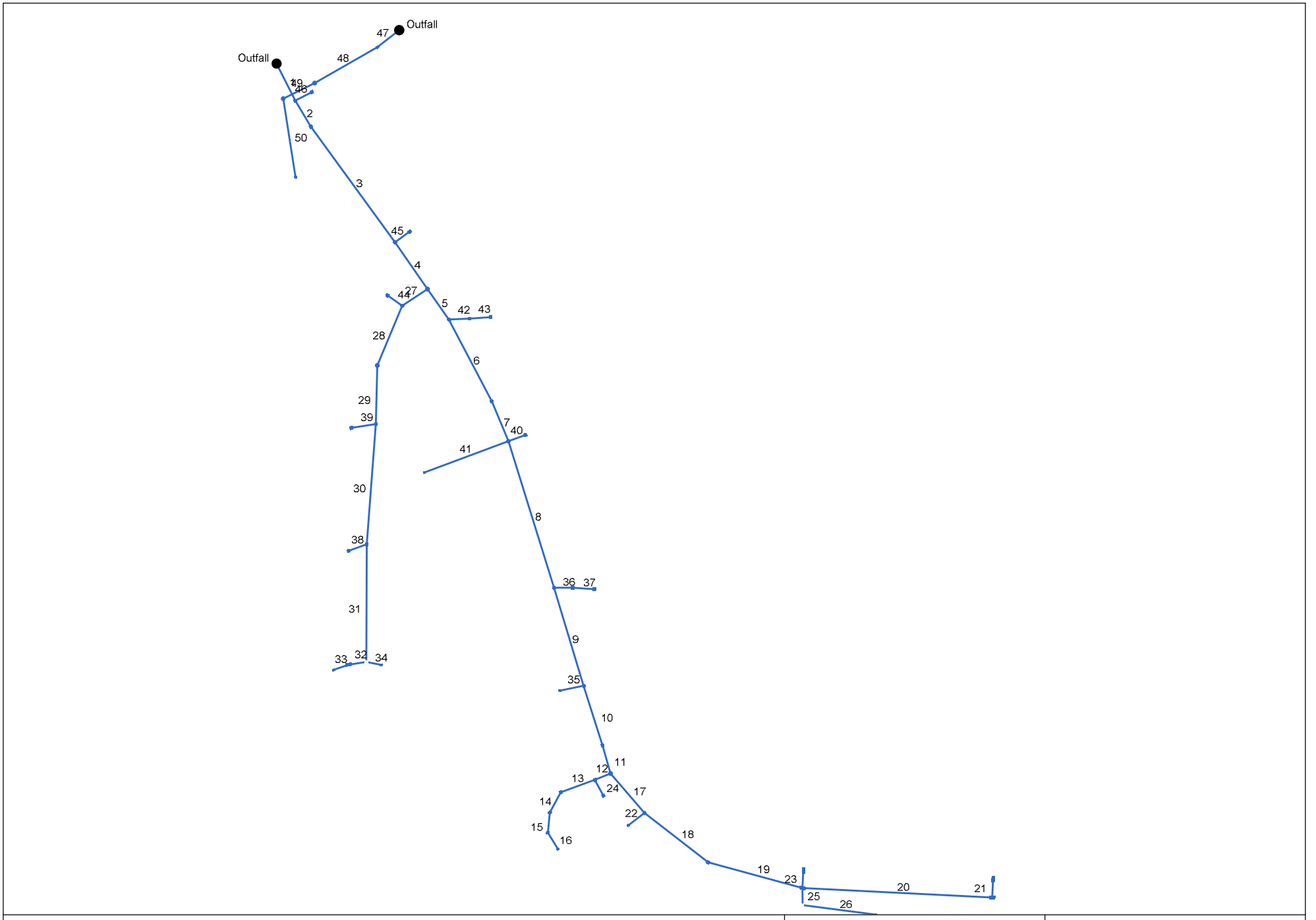
Note: Program uses Manning's formula for open channel flow.

Storm Sewer IDF Curves

IDF file: 20241113 Kalas 5.IDF



Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan 10-Year Report



Project File: Outfall #1.stm	Number of lines: 50	Date: 12/20/2024

Storm Sewer Inventory Report

10-Year Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	57.000	63.252	Comb	0.00	0.01	0.59	10.0	357.90	0.68	358.29	36	Cir	0.013	1.50	364.82	Ex. 375 Out
2	1	41.866	-4.047	Comb	0.00	0.18	0.59	10.0	358.40	1.07	358.85	36	Cir	0.013	0.50	365.27	Pipe - (20)
3	2	196.394	-5.160	Comb	0.00	0.21	0.59	10.0	358.95	1.64	362.17	36	Cir	0.013	1.50	368.56	Pipe - (19)
4	3	78.359	1.332	MH	0.00	0.01	0.59	10.0	362.27	1.57	363.50	36	Cir	0.013	1.00	370.06	Pipe - (18)
5	4	51.020	-0.352	Comb	0.00	0.19	0.59	10.0	364.00	1.90	364.97	30	Cir	0.013	1.30	370.73	Pipe - (16)
6	5	126.897	7.290	Comb	0.00	0.07	0.59	10.0	365.07	1.42	366.87	30	Cir	0.013	0.50	372.89	Pipe - (15)
7	6	59.532	5.165	Comb	0.00	0.31	0.59	10.0	366.97	1.73	368.00	30	Cir	0.013	1.50	373.89	Pipe - (14)
8	7	210.964	5.328	Comb	0.00	0.20	0.59	10.0	368.10	1.73	371.75	30	Cir	0.013	1.44	377.52	Pipe - (13)
9	8	140.875	0.547	Comb	0.00	0.09	0.59	10.0	371.86	0.65	372.77	30	Cir	0.013	1.50	379.89	Pipe - (12) (1)
10	9	86.180	-0.829	Comb	0.00	0.08	0.59	10.0	373.07	0.61	373.60	30	Cir	0.013	0.50	381.39	Pipe - (12)
11	10	40.124	1.547	MH	0.00	0.01	0.59	10.0	373.70	0.75	374.00	24	Cir	0.013	1.00	381.95	Pipe - (51)
12	11	23.025	83.735	Comb	0.00	0.07	0.59	10.0	375.70	0.52	375.82	24	Cir	0.013	1.50	382.14	Pipe - (50) (1)
13	12	49.905	2.092	Comb	0.00	0.24	0.59	10.0	376.02	0.56	376.30	24	Cir	0.013	1.07	382.55	Pipe - (50)
14	13	31.516	-41.901	Comb	0.00	0.21	0.59	10.0	376.40	0.98	376.71	24	Cir	0.013	0.65	382.87	Pipe - (49)
15	14	27.860	-22.271	Comb	0.00	0.15	0.59	10.0	376.81	0.57	376.97	24	Cir	0.013	0.99	382.23	Pipe - (48)
16	15	25.968	-37.432	DrGrt	0.00	4.70	0.32	10.0	377.47	0.89	377.70	18	Cir	0.013	1.00	380.79	Pipe - (58)
17	11	71.389	-24.767	Comb	0.00	0.01	0.59	10.0	374.10	0.53	374.48	24	Cir	0.013	1.50	382.72	Pipe - (11)
18	17	110.816	-11.425	Comb	0.00	0.12	0.59	10.0	374.58	0.50	375.13	24	Cir	0.013	0.66	382.29	Pipe - (10)
19	18	133.897	-22.601	Comb	0.00	0.30	0.59	10.0	375.23	0.50	375.90	24	Cir	0.013	2.18	381.56	Pipe - (9)
20	19	260.141	-12.381	Comb	0.00	0.47	0.59	10.0	377.00	0.50	378.30	18	Cir	0.013	1.50	382.86	Pipe - (8)
21	20	25.751	-90.000	Comb	0.00	0.32	0.59	10.0	378.55	0.66	378.72	15	Cir	0.013	1.00	382.92	Pipe - (7)
22	17	28.157	93.178	DrGrt	0.00	0.61	0.59	10.0	376.03	2.24	376.66	15	Cir	0.013	1.00	380.41	Pipe - (59)
23	19	24.491	-102.382	Comb	0.00	0.32	0.59	10.0	377.45	0.53	377.58	15	Cir	0.013	1.00	381.56	Pipe - (55)

Project File: Outfall #1.stm

Number of lines: 50

Date: 12/20/2024

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
24	12	24.507	-95.925	Comb	0.00	0.11	0.59	10.0	376.87	0.73	377.05	15	Cir	0.013	1.00	382.14	Pipe - (70)
25	19	23.549	74.368	DrGrt	0.00	0.66	0.32	10.0	376.05	0.72	376.22	15	Cir	0.013	1.49	381.51	Pipe - (60)
26	25	100.850	-82.180	DrGrt	0.00	0.43	0.32	10.0	376.32	0.53	376.85	15	Cir	0.013	1.00	377.88	Pipe - (71)
27	4	41.676	91.283	Comb	0.00	0.22	0.59	10.0	364.00	0.84	364.35	24	Cir	0.013	1.42	370.22	Pipe - (57)
28	27	88.898	-34.214	MH	0.00	0.01	0.59	10.0	364.75	2.25	366.75	24	Cir	0.013	0.41	372.10	Pipe - (56)
29	28	80.422	-21.032	Comb	0.00	0.11	0.59	10.0	366.95	2.00	368.56	24	Cir	0.013	1.48	373.82	Pipe - (39)
30	29	166.115	2.964	Comb	0.00	0.24	0.59	10.0	369.06	1.57	371.67	18	Cir	0.013	1.39	376.92	Pipe - (37)
31	30	161.824	-4.236	Comb	0.00	0.28	0.59	10.0	371.77	1.93	374.90	18	Cir	0.013	2.22	380.04	Pipe - (36)
32	31	24.500	81.321	Comb	0.00	0.52	0.59	10.0	375.00	0.69	375.17	18	Cir	0.013	0.50	380.20	Pipe - (42)
33	32	22.252	-10.400	DrGrt	0.00	2.63	0.32	10.0	375.42	0.99	375.64	15	Cir	0.013	1.00	378.27	Pipe - (61)
34	31	20.817	-78.889	DrGrt	0.00	0.11	0.59	10.0	375.15	0.72	375.30	15	Cir	0.013	1.00	379.93	Pipe - (62)
35	9	32.881	95.114	DrGrt	0.00	0.25	0.59	10.0	374.07	1.09	374.43	18	Cir	0.013	1.00	377.38	Pipe - (69)
36	8	25.642	-72.321	Comb	0.00	0.40	0.59	10.0	372.50	0.70	372.68	15	Cir	0.013	0.50	377.65	Pipe - (54)
37	36	29.330	3.216	Comb	0.00	0.12	0.59	10.0	372.80	3.00	373.68	15	Cir	0.013	1.00	378.77	Pipe - (22)
38	30	26.271	65.734	Comb	0.00	0.32	0.59	10.0	371.92	1.45	372.30	15	Cir	0.013	1.00	377.11	Pipe - (41)
39	29	34.056	79.521	Comb	0.00	0.33	0.59	10.0	368.91	0.65	369.13	15	Cir	0.013	1.00	373.82	Pipe - (40)
40	7	24.427	-88.012	Comb	0.00	0.34	0.59	10.0	368.75	1.06	369.01	15	Cir	0.013	1.00	374.05	Pipe - (43)
41	7	123.325	91.973	DrGrt	0.00	1.30	0.59	10.0	368.30	0.54	368.97	18	Cir	0.013	1.00	372.49	Pipe - (63)
42	5	28.012	-57.519	Comb	0.00	0.20	0.59	10.0	365.72	1.36	366.10	15	Cir	0.013	0.50	371.06	Pipe - (24)
43	42	29.509	-1.479	Comb	0.00	0.11	0.59	10.0	366.20	0.51	366.35	15	Cir	0.013	1.00	371.27	Pipe - (53)
44	27	24.451	69.302	Comb	0.00	0.41	0.59	10.0	364.85	1.02	365.10	18	Cir	0.013	1.00	370.23	Pipe - (17)
45	3	24.503	-90.507	Comb	0.00	0.24	0.59	10.0	363.42	0.94	363.65	15	Cir	0.013	1.00	368.56	Pipe - (28)
46	1	25.748	-90.230	Comb	0.00	0.31	0.59	10.0	359.79	0.66	359.96	18	Cir	0.013	1.00	364.57	Pipe - (26)

Project File: Outfall #1.stm | Number of lines: 50 | Date: 12/20/2024

Storm Sewer Inventory Report

10-Year Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
47	End	38.074	141.899	DrGrt	0.00	1.07	0.32	10.0	353.31	0.50	353.50	36	Cir	0.013	0.50	359.06	Pipe - (67)
48	47	98.975	8.202	MH	0.00	0.01	0.59	10.0	353.61	0.50	354.10	30	Cir	0.013	0.15	364.91	Pipe - (66)
49	48	48.268	3.525	MH	0.00	0.01	0.59	10.0	354.21	0.99	354.69	30	Cir	0.013	0.96	364.48	Pipe - (65)
50	49	109.030	-72.571	DrGrt	0.00	7.18	0.32	10.0	355.19	2.35	357.75	24	Cir	0.013	1.00	360.04	Pipe - (29)

Project File: Outfall #1.stm | Number of lines: 50 | Date: 12/20/2024

Structure Report

10-Year Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	EX. CB 375	Combination	364.82	Rect	4.00	4.00	36	Cir	358.29	36 18	Cir Cir	358.40 359.79
2	376	Combination	365.27	Rect	4.00	4.00	36	Cir	358.85	36	Cir	358.95
3	377	Combination	368.56	Rect	4.00	4.00	36	Cir	362.17	36 15	Cir Cir	362.27 363.42
4	377B	Manhole	370.06	Cir	4.00	4.00	36	Cir	363.50	30 24	Cir Cir	364.00 364.00
5	378	Combination	370.73	Rect	4.00	4.00	30	Cir	364.97	30 15	Cir Cir	365.07 365.72
6	379	Combination	372.89	Rect	4.00	4.00	30	Cir	366.87	30	Cir	366.97
7	380	Combination	373.89	Rect	4.00	4.00	30	Cir	368.00	30 15 18	Cir Cir Cir	368.10 368.75 368.30
8	381	Combination	377.52	Rect	4.00	4.00	30	Cir	371.75	30 15	Cir Cir	371.86 372.50
9	381C	Combination	379.89	Rect	4.00	4.00	30	Cir	372.77	30 18	Cir Cir	373.07 374.07
10	382	Combination	381.39	Rect	4.00	4.00	30	Cir	373.60	24	Cir	373.70
11	382A	Manhole	381.95	Cir	4.00	4.00	24	Cir	374.00	24 24	Cir Cir	375.70 374.10
12	395	Combination	382.14	Rect	4.00	4.00	24	Cir	375.82	24 15	Cir Cir	376.02 376.87
13	396	Combination	382.55	Rect	4.00	4.00	24	Cir	376.30	24	Cir	376.40
14	396A	Combination	382.87	Rect	4.00	4.00	24	Cir	376.71	24	Cir	376.81
15	396B	Combination	382.23	Rect	4.00	4.00	24	Cir	376.97	18	Cir	377.47
16	396C	DropGrate	380.79	Rect	3.00	3.00	18	Cir	377.70			
17	383	Combination	382.72	Rect	4.00	4.00	24	Cir	374.48	24 15	Cir Cir	374.58 376.03

Project File: Outfall #1.stm | Number of Structures: 50 | Run Date: 12/20/2024

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
18	384	Combination	382.29	Rect	4.00	4.00	24	Cir	375.13	24	Cir	375.23
19	385	Combination	381.56	Rect	8.00	4.00	24	Cir	375.90	18 15 15	Cir Cir Cir	377.00 377.45 376.05
20	386	Combination	382.86	Rect	8.00	4.00	18	Cir	378.30	15	Cir	378.55
21	386A	Combination	382.92	Rect	8.00	4.00	15	Cir	378.72			
22	383A	DropGrate	380.41	Rect	3.00	3.00	15	Cir	376.66			
23	385A	Combination	381.56	Rect	8.00	4.00	15	Cir	377.58			
24	395A	Combination	382.14	Rect	4.00	4.00	15	Cir	377.05			
25	385B	DropGrate	381.51	Rect	3.00	3.00	15	Cir	376.22	15	Cir	376.32
26	385C	DropGrate	377.88	Rect	3.00	3.00	15	Cir	376.85			
27	390	Combination	370.22	Rect	4.00	4.00	24	Cir	364.35	24 18	Cir Cir	364.75 364.85
28	390B	Manhole	372.10	Cir	4.00	4.00	24	Cir	366.75	24	Cir	366.95
29	391	Combination	373.82	Rect	4.00	4.00	24	Cir	368.56	18 15	Cir Cir	369.06 368.91
30	392	Combination	376.92	Rect	4.00	4.00	18	Cir	371.67	18 15	Cir Cir	371.77 371.92
31	393	Combination	380.04	Rect	4.00	4.00	18	Cir	374.90	18 15	Cir Cir	375.00 375.15
32	393A	Combination	380.20	Rect	8.00	4.00	18	Cir	375.17	15	Cir	375.42
33	393B	DropGrate	378.27	Rect	3.00	3.00	15	Cir	375.64			
34	393C	DropGrate	379.93	Rect	3.00	3.00	15	Cir	375.30			
35	381D	DropGrate	377.38	Rect	3.00	3.00	18	Cir	374.43			
36	381A	Combination	377.65	Rect	4.00	4.00	15	Cir	372.68	15	Cir	372.80
37	381B	Combination	378.77	Rect	4.00	4.00	15	Cir	373.68			

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
38	392A	Combination	377.11	Rect	4.00	4.00	15	Cir	372.30			
39	391A	Combination	373.82	Rect	4.00	4.00	15	Cir	369.13			
40	380A	Combination	374.05	Rect	4.00	4.00	15	Cir	369.01			
41	380B	DropGrate	372.49	Rect	3.00	3.00	18	Cir	368.97			
42	378A	Combination	371.06	Rect	4.00	4.00	15	Cir	366.10	15	Cir	366.20
43	378B	Combination	371.27	Rect	4.00	4.00	15	Cir	366.35			
44	390A	Combination	370.23	Rect	4.00	4.00	18	Cir	365.10			
45	377A	Combination	368.56	Rect	4.00	4.00	15	Cir	363.65			
46	375A	Combination	364.57	Rect	4.00	4.00	18	Cir	359.96			
47	31A	DropGrate	359.06	Rect	3.00	3.00	36	Cir	353.50	30	Cir	353.61
48	EX. 31	Manhole	364.91	Cir	4.00	4.00	30	Cir	354.10	30	Cir	354.21
49	EX. 32	Manhole	364.48	Cir	4.00	4.00	30	Cir	354.69	24	Cir	355.19
50	32A	DropGrate	360.04	Rect	3.00	3.00	24	Cir	357.75			

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	Ex. 375 Out	38.57	36	Cir	57.000	357.90	358.29	0.684	360.59	360.31	1.35	360.31	End	Combination
2	Pipe - (20)	37.85	36	Cir	41.866	358.40	358.85	1.075	360.31	360.85	0.44	360.85	1	Combination
3	Pipe - (19)	37.96	36	Cir	196.394	358.95	362.17	1.640	360.85	364.17	n/a	364.17	2	Combination
4	Pipe - (18)	36.99	36	Cir	78.359	362.27	363.50	1.570	364.17	365.48	0.87	365.48	3	Manhole
5	Pipe - (16)	26.35	30	Cir	51.020	364.00	364.97	1.901	365.48	366.72	1.04	366.72	4	Combination
6	Pipe - (15)	25.26	30	Cir	126.897	365.07	366.87	1.418	366.72	368.58	0.39	368.58	5	Combination
7	Pipe - (14)	25.19	30	Cir	59.532	366.97	368.00	1.730	368.58	369.71	n/a	369.71	6	Combination
8	Pipe - (13)	20.28	30	Cir	210.964	368.10	371.75	1.730	369.71	373.28	n/a	373.28 j	7	Combination
9	Pipe - (12) (1)	18.55	30	Cir	140.875	371.86	372.77	0.646	373.28	374.23	0.91	374.23	8	Combination
10	Pipe - (12)	17.77	30	Cir	86.180	373.07	373.60	0.615	374.40	375.03	n/a	375.03	9	Combination
11	Pipe - (51)	17.60	24	Cir	40.124	373.70	374.00	0.747	375.18	375.51	0.74	375.51	10	Manhole
12	Pipe - (50) (1)	11.02	24	Cir	23.025	375.70	375.82	0.521	376.90	377.02	0.73	377.75	11	Combination
13	Pipe - (50)	10.76	24	Cir	49.905	376.02	376.30	0.561	377.75	377.47	0.52	377.47	12	Combination
14	Pipe - (49)	9.99	24	Cir	31.516	376.40	376.71	0.984	377.47	377.84	0.30	377.84	13	Combination
15	Pipe - (48)	9.32	24	Cir	27.860	376.81	376.97	0.574	377.86	378.06	0.44	378.06	14	Combination
16	Pipe - (58)	8.83	18	Cir	25.968	377.47	377.70	0.886	378.58	378.85	0.57	378.85	15	DropGrate
17	Pipe - (11)	8.03	24	Cir	71.389	374.10	374.48	0.532	375.51	375.49	n/a	375.49	11	Combination
18	Pipe - (10)	6.37	24	Cir	110.816	374.58	375.13	0.496	375.49	376.02	n/a	376.02 j	17	Combination
19	Pipe - (9)	6.21	24	Cir	133.897	375.23	375.90	0.500	376.10	376.78	0.73	376.78	18	Combination
20	Pipe - (8)	2.69	18	Cir	260.141	377.00	378.30	0.500	377.62	378.93	0.35	379.27	19	Combination
21	Pipe - (7)	1.11	15	Cir	25.751	378.55	378.72	0.660	379.27	379.13	0.15	379.13	20	Combination
22	Pipe - (59)	2.11	15	Cir	28.157	376.03	376.66	2.237	376.43	377.24	n/a	377.24	17	DropGrate
23	Pipe - (55)	1.11	15	Cir	24.491	377.45	377.58	0.531	377.86	377.99	0.15	377.99	19	Combination
24	Pipe - (70)	0.38	15	Cir	24.507	376.87	377.05	0.734	377.75	377.29	n/a	377.29	12	Combination

Project File: Outfall #1.stm | Number of lines: 50 | Run Date: 12/20/2024

NOTES: Return period = 10 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	Pipe - (60)	1.88	15	Cir	23.549	376.05	376.22	0.722	376.78	376.76	n/a	376.76 j	19	DropGrate
26	Pipe - (71)	0.81	15	Cir	100.850	376.32	376.85	0.525	376.76	377.20	n/a	377.20 j	25	DropGrate
27	Pipe - (57)	12.44	24	Cir	41.676	364.00	364.35	0.840	365.48	365.62	n/a	365.62 j	4	Combination
28	Pipe - (56)	10.62	24	Cir	88.898	364.75	366.75	2.250	365.62	367.92	n/a	367.92	27	Manhole
29	Pipe - (39)	10.72	24	Cir	80.422	366.95	368.56	2.002	367.92	369.73	n/a	369.73	28	Combination
30	Pipe - (37)	9.46	18	Cir	166.115	369.06	371.67	1.571	370.00	372.86	n/a	372.86	29	Combination
31	Pipe - (36)	7.79	18	Cir	161.824	371.77	374.90	1.934	372.86	375.98	n/a	375.98 j	30	Combination
32	Pipe - (42)	6.72	18	Cir	24.500	375.00	375.17	0.694	375.99	376.17	0.22	376.17	31	Combination
33	Pipe - (61)	4.94	15	Cir	22.252	375.42	375.64	0.989	376.24	376.54	n/a	376.54	32	DropGrate
34	Pipe - (62)	0.38	15	Cir	20.817	375.15	375.30	0.721	375.98	375.54	n/a	375.54	31	DropGrate
35	Pipe - (69)	0.87	18	Cir	32.881	374.07	374.43	1.095	374.36	374.78	0.12	374.78	9	DropGrate
36	Pipe - (54)	1.71	15	Cir	25.642	372.50	372.68	0.702	373.28	373.20	n/a	373.20	8	Combination
37	Pipe - (22)	0.42	15	Cir	29.330	372.80	373.68	3.000	373.20	373.93	n/a	373.93 j	36	Combination
38	Pipe - (41)	1.11	15	Cir	26.271	371.92	372.30	1.446	372.86	372.71	0.15	372.71	30	Combination
39	Pipe - (40)	1.14	15	Cir	34.056	368.91	369.13	0.646	369.73	369.55	n/a	369.55	29	Combination
40	Pipe - (43)	1.18	15	Cir	24.427	368.75	369.01	1.064	369.71	369.44	0.16	369.44	7	Combination
41	Pipe - (63)	4.50	18	Cir	123.325	368.30	368.97	0.543	369.71	369.90	0.24	370.14	7	DropGrate
42	Pipe - (24)	1.02	15	Cir	28.012	365.72	366.10	1.357	366.72	366.50	0.07	366.50	5	Combination
43	Pipe - (53)	0.38	15	Cir	29.509	366.20	366.35	0.508	366.50	366.59	n/a	366.67 j	42	Combination
44	Pipe - (17)	1.42	18	Cir	24.451	364.85	365.10	1.022	365.62	365.55	0.16	365.55	27	Combination
45	Pipe - (28)	0.83	15	Cir	24.503	363.42	363.65	0.939	364.17	364.01	n/a	364.01	3	Combination
46	Pipe - (26)	1.07	18	Cir	25.748	359.79	359.96	0.661	360.31	360.35	n/a	360.35 j	1	Combination
47	Pipe - (67)	14.87	36	Cir	38.074	353.31	353.50	0.499	355.42	354.73	0.23	354.73	End	DropGrate
48	Pipe - (66)	13.22	30	Cir	98.975	353.61	354.10	0.495	354.80	355.32	n/a	355.32	47	Manhole

Project File: Outfall #1.stm | Number of lines: 50 | Run Date: 12/20/2024

NOTES: Return period = 10 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
49	Pipe - (65)	13.33	30	Cir	48.268	354.21	354.69	0.994	355.32	355.92	n/a	355.92	48	Manhole
50	Pipe - (29)	13.49	24	Cir	109.030	355.19	357.75	2.348	356.06	359.07	n/a	359.07	49	DropGrate

Project File: Outfall #1.stm

Number of lines: 50

Run Date: 12/20/2024

NOTES: Return period = 10 Yrs. ; j - Line contains hyd. jump.

Inlet Report

10-Year Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	EX. CB 375	0.03	0.00	0.03	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.07	1.08	0.00	0.00	0.0	Off
2	376	0.62	0.00	0.56	0.06	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.18	5.21	0.08	1.35	0.0	Off
3	377	0.73	0.00	0.64	0.09	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.19	5.66	0.09	1.55	0.0	Off
4	377B	0.03	0.00	0.00	0.03	MH	6.0	0.00	0.00	3.00	2.50	Sag	2.00	0.060	0.020	0.013	0.00	0.00	0.00	0.00	0.0	Off
5	378	0.66	0.00	0.59	0.07	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.19	5.37	0.09	1.42	0.0	Off
6	379	0.24	0.00	0.24	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.13	2.73	0.02	0.28	0.0	Off
7	380	1.07	0.00	0.87	0.20	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.22	6.88	0.13	2.32	0.0	Off
8	381	0.69	0.00	0.61	0.08	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.19	5.52	0.09	1.49	0.0	Off
9	381C	0.31	0.00	0.31	0.01	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.15	3.35	0.03	0.55	0.0	Off
10	382	0.28	0.00	0.27	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.14	3.06	0.03	0.43	0.0	Off
11	382A	0.03	0.00	0.00	0.03	MH	6.0	0.00	0.00	3.00	2.50	Sag	2.00	0.060	0.020	0.013	0.00	0.00	0.00	0.00	0.0	Off
12	395	0.24	0.00	0.24	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.13	2.73	0.02	0.28	0.0	Off
13	396	0.83	0.00	0.71	0.12	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.20	6.07	0.10	1.74	0.0	Off
14	396A	0.73	0.00	0.64	0.09	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.19	5.66	0.09	1.55	0.0	Off
15	396B	0.52	0.00	0.48	0.04	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.17	4.70	0.07	1.13	0.0	Off
16	396C	8.83	0.00	8.83	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.010	0.010	0.013	0.51	104.68	0.51	104.68	0.0	Off
17	383	0.03	0.00	0.03	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.07	1.08	0.00	0.00	0.0	Off
18	384	0.42	0.00	0.40	0.02	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.16	4.09	0.05	0.87	0.0	Off
19	385	1.04	0.00	0.96	0.08	Comb	6.0	1.50	0.00	6.00	2.50	0.005	2.00	0.060	0.020	0.013	0.22	6.78	0.09	1.50	0.0	Off
20	386	1.63	0.00	1.43	0.20	Comb	6.0	1.50	0.00	6.00	2.50	0.005	2.00	0.060	0.020	0.013	0.25	8.34	0.12	2.22	0.0	Off
21	386A	1.11	0.00	1.01	0.09	Comb	6.0	1.50	0.00	6.00	2.50	0.005	2.00	0.060	0.020	0.013	0.22	6.99	0.09	1.58	0.0	Off
22	383A	2.11	0.00	2.11	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.010	0.010	0.013	0.20	41.56	0.20	41.56	0.0	Off
23	385A	1.11	0.00	1.01	0.09	Comb	6.0	1.50	0.00	6.00	2.50	0.005	2.00	0.060	0.020	0.013	0.22	6.99	0.09	1.58	0.0	Off

Project File: Outfall #1.stm | Number of lines: 50 | Run Date: 12/20/2024

NOTES: Inlet N-Values = 0.016; Intensity = 72.00 / (Inlet time + 12.50) ^ 0.80; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
24	395A	0.38	0.00	0.37	0.01	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.16	3.87	0.05	0.77	0.0	Off
25	385B	1.24	0.00	1.24	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.010	0.010	0.013	0.14	29.72	0.14	29.72	0.0	Off
26	385C	0.81	0.00	0.81	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.013	0.10	12.42	0.10	12.42	0.0	Off
27	390	0.76	0.00	0.66	0.10	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.20	5.80	0.10	1.62	0.0	Off
28	390B	0.03	0.00	0.00	0.03	MH	6.0	0.00	0.00	3.00	2.50	Sag	2.00	0.060	0.020	0.013	0.00	0.00	0.00	0.00	0.0	Off
29	391	0.38	0.00	0.37	0.01	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.16	3.87	0.05	0.77	0.0	Off
30	392	0.83	0.00	0.71	0.12	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.20	6.07	0.10	1.74	0.0	Off
31	393	0.97	0.00	0.80	0.17	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.21	6.55	0.12	1.95	0.0	Off
32	393A	1.80	0.00	1.57	0.23	Comb	6.0	1.50	0.00	6.00	2.50	0.005	2.00	0.060	0.020	0.013	0.25	8.73	0.13	2.65	0.0	Off
33	393B	4.94	0.00	4.94	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.010	0.010	0.013	0.35	71.71	0.35	71.71	0.0	Off
34	393C	0.38	0.00	0.38	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.010	0.010	0.013	0.06	14.62	0.06	14.62	0.0	Off
35	381D	0.87	0.00	0.87	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.010	0.010	0.013	0.11	23.82	0.11	23.82	0.0	Off
36	381A	1.39	0.00	1.06	0.33	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.24	7.76	0.15	3.46	0.0	Off
37	381B	0.42	0.00	0.40	0.02	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.16	4.09	0.05	0.87	0.0	Off
38	392A	1.11	0.00	0.89	0.22	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.22	6.99	0.13	2.46	0.0	Off
39	391A	1.14	0.00	0.91	0.23	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.22	7.09	0.13	2.60	0.0	Off
40	380A	1.18	0.00	0.94	0.24	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.22	7.19	0.13	2.73	0.0	Off
41	380B	4.50	0.00	4.50	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.010	0.010	0.013	0.33	67.53	0.33	67.53	0.0	Off
42	378A	0.69	0.00	0.61	0.08	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.19	5.52	0.09	1.49	0.0	Off
43	378B	0.38	0.00	0.37	0.01	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.16	3.87	0.05	0.77	0.0	Off
44	390A	1.42	0.00	1.08	0.34	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.24	7.85	0.15	3.57	0.0	Off
45	377A	0.83	0.00	0.71	0.12	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.20	6.07	0.10	1.74	0.0	Off
46	375A	1.07	0.00	0.87	0.20	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.22	6.88	0.13	2.32	0.0	Off

Project File: Outfall #1.stm | Number of lines: 50 | Run Date: 12/20/2024

NOTES: Inlet N-Values = 0.016; Intensity = 72.00 / (Inlet time + 12.50) ^ 0.80; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
47	31A	2.01	0.00	2.01	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.010	0.010	0.013	0.19	40.27	0.19	40.27	0.0	Off
48	EX. 31	0.03	0.00	0.00	0.03	MH	6.0	0.00	0.00	3.00	2.50	Sag	2.00	0.060	0.020	0.013	0.00	0.00	0.00	0.00	0.0	Off
49	EX. 32	0.03	0.00	0.00	0.03	MH	6.0	0.00	0.00	3.00	2.50	Sag	2.00	0.060	0.020	0.013	0.00	0.00	0.00	0.00	0.0	Off
50	32A	13.49	0.00	13.49	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.010	0.010	0.013	0.68	138.22	0.68	138.22	0.0	Off

Project File: Outfall #1.stm | Number of lines: 50 | Run Date: 12/20/2024

NOTES: Inlet N-Values = 0.016; Intensity = 72.00 / (Inlet time + 12.50) ^ 0.80; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Hydraulic Grade Line Computations

10-Year Report

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	36	38.57	357.90	360.59	2.69	5.06	5.77	0.90	361.49	0.000	57.000	358.29	360.31	2.02**	5.06	7.62	0.90	361.21	0.000	0.000	n/a	1.50	1.35
2	36	37.85	358.40	360.31	1.91	4.75	7.97	0.89	361.20	0.000	41.866	358.85	360.85	2.00**	5.01	7.56	0.89	361.74	0.000	0.000	n/a	0.50	0.44
3	36	37.96	358.95	360.85	1.90	4.72	8.04	0.89	361.74	0.000	196.394	362.17	364.17	2.00**	5.01	7.57	0.89	365.06	0.000	0.000	n/a	1.50	n/a
4	36	36.99	362.27	364.17	1.90	4.73	7.82	0.87	365.04	0.000	78.359	363.50	365.48	1.98**	4.94	7.49	0.87	366.35	0.000	0.000	n/a	1.00	0.87
5	30	26.35	364.00	365.48	1.48	3.02	8.73	0.80	366.28	0.000	51.020	364.97	366.72	1.75**	3.67	7.19	0.80	367.52	0.000	0.000	n/a	1.30	1.04
6	30	25.26	365.07	366.72	1.65	3.43	7.36	0.77	367.49	0.000	126.897	366.87	368.58	1.71**	3.58	7.06	0.77	369.36	0.000	0.000	n/a	0.50	0.39
7	30	25.19	366.97	368.58	1.61	3.34	7.53	0.77	369.35	0.000	59.532	368.00	369.71	1.71**	3.58	7.05	0.77	370.48	0.000	0.000	n/a	1.50	n/a
8	30	20.28	368.10	369.71	1.61	3.14	6.07	0.65	370.36	0.000	210.964	371.75	373.28 j	1.53**	3.14	6.45	0.65	373.92	0.000	0.000	n/a	1.44	n/a
9	30	18.55	371.86	373.28	1.42	2.87	6.46	0.61	373.88	0.000	140.875	372.77	374.23	1.46**	2.97	6.24	0.61	374.83	0.000	0.000	n/a	1.50	0.91
10	30	17.77	373.07	374.40	1.33*	2.65	6.71	0.59	374.98	0.000	86.180	373.60	375.03	1.43**	2.89	6.14	0.59	375.61	0.000	0.000	n/a	0.50	n/a
11	24	17.60	373.70	375.18	1.48*	2.50	7.04	0.74	375.93	0.000	40.124	374.00	375.51	1.51**	2.55	6.91	0.74	376.25	0.000	0.000	n/a	1.00	0.74
12	24	11.02	375.70	376.90	1.20*	1.98	5.58	0.48	377.39	0.521	23.025	375.82	377.02	1.20	1.98	5.58	0.48	377.51	0.520	0.521	0.120	1.50	0.73
13	24	10.76	376.02	377.75	1.73	1.92	3.73	0.49	378.24	0.000	49.905	376.30	377.47	1.17**	1.92	5.61	0.49	377.96	0.000	0.000	n/a	1.07	0.52
14	24	9.99	376.40	377.47	1.07	1.72	5.81	0.46	377.94	0.000	31.516	376.71	377.84	1.13**	1.83	5.46	0.46	378.30	0.000	0.000	n/a	0.65	0.30
15	24	9.32	376.81	377.86	1.05*	1.67	5.57	0.44	378.30	0.000	27.860	376.97	378.06	1.09**	1.75	5.33	0.44	378.50	0.000	0.000	n/a	0.99	0.44
16	18	8.83	377.47	378.58	1.11*	1.40	6.32	0.57	379.15	0.000	25.968	377.70	378.85	1.15**	1.45	6.08	0.57	379.42	0.000	0.000	n/a	1.00	0.57
17	24	8.03	374.10	375.51	1.41	1.59	3.39	0.40	375.91	0.000	71.389	374.48	375.49	1.01**	1.59	5.06	0.40	375.89	0.000	0.000	n/a	1.50	n/a
18	24	6.37	374.58	375.49	0.91	1.36	4.59	0.34	375.83	0.000	110.816	375.13	376.02 j	0.89**	1.36	4.69	0.34	376.37	0.000	0.000	n/a	0.66	0.23
19	24	6.21	375.23	376.10	0.87*	1.30	4.77	0.34	376.43	0.000	133.897	375.90	376.78	0.88**	1.33	4.66	0.34	377.12	0.000	0.000	n/a	2.18	0.73
20	18	2.69	377.00	377.62	0.62*	0.69	3.86	0.23	377.86	0.500	260.141	378.30	378.93	0.63**	0.70	3.86	0.23	379.16	0.497	0.499	1.297	1.50	0.35
21	15	1.11	378.55	379.27	0.72	0.36	1.51	0.15	379.42	0.000	25.751	378.72	379.13	0.41**	0.36	3.12	0.15	379.29	0.000	0.000	n/a	1.00	0.15
22	15	2.11	376.03	376.43	0.40*	0.34	6.30	0.22	376.65	0.000	28.157	376.66	377.24	0.58**	0.56	3.80	0.22	377.46	0.000	0.000	n/a	1.00	n/a

Project File: Outfall #1.stm | Number of lines: 50 | Run Date: 12/20/2024

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
23	15	1.11	377.45	377.86	0.41*	0.35	3.13	0.15	378.01	0.000	24.491	377.58	377.99	0.41**	0.36	3.12	0.15	378.15	0.000	0.000	n/a	1.00	0.15
24	15	0.38	376.87	377.75	0.88	0.16	0.41	0.08	377.83	0.000	24.507	377.05	377.29	0.24**	0.16	2.32	0.08	377.37	0.000	0.000	n/a	1.00	n/a
25	15	1.88	376.05	376.78	0.73	0.51	2.52	0.21	376.99	0.000	23.549	376.22	376.76 j	0.54**	0.51	3.66	0.21	376.97	0.000	0.000	n/a	1.49	n/a
26	15	0.81	376.32	376.76	0.44	0.28	2.07	0.13	376.89	0.000	100.850	376.85	377.20 j	0.35**	0.28	2.85	0.13	377.33	0.000	0.000	n/a	1.00	0.13
27	24	12.44	364.00	365.48	1.48	2.10	5.00	0.55	366.02	0.000	41.676	364.35	365.62 j	1.27**	2.10	5.93	0.55	366.16	0.000	0.000	n/a	1.42	n/a
28	24	10.62	364.75	365.62	0.87	1.31	8.13	0.48	366.10	0.000	88.898	366.75	367.92	1.17**	1.90	5.58	0.48	368.40	0.000	0.000	n/a	0.41	n/a
29	24	10.72	366.95	367.92	0.97	1.50	7.13	0.49	368.40	0.000	80.422	368.56	369.73	1.17**	1.91	5.60	0.49	370.22	0.000	0.000	n/a	1.48	n/a
30	18	9.46	369.06	370.00	0.94*	1.17	8.10	0.62	370.62	0.000	166.115	371.67	372.86	1.19**	1.50	6.31	0.62	373.48	0.000	0.000	n/a	1.39	n/a
31	18	7.79	371.77	372.86	1.09	1.36	5.68	0.51	373.37	0.000	161.824	374.90	375.98 j	1.08**	1.36	5.72	0.51	376.49	0.000	0.000	n/a	2.22	1.13
32	18	6.72	375.00	375.99	0.99*	1.23	5.46	0.45	376.43	0.000	24.500	375.17	376.17	1.00**	1.25	5.36	0.45	376.62	0.000	0.000	n/a	0.50	0.22
33	15	4.94	375.42	376.24	0.82*	0.86	5.77	0.42	376.67	0.000	22.252	375.64	376.54	0.90**	0.95	5.22	0.42	376.96	0.000	0.000	n/a	1.00	n/a
34	15	0.38	375.15	375.98	0.83	0.16	0.44	0.08	376.06	0.000	20.817	375.30	375.54	0.24**	0.16	2.32	0.08	375.62	0.000	0.000	n/a	1.00	n/a
35	18	0.87	374.07	374.36	0.28*	0.23	3.71	0.12	374.48	0.000	32.881	374.43	374.78	0.35**	0.31	2.81	0.12	374.90	0.000	0.000	n/a	1.00	0.12
36	15	1.71	372.50	373.28	0.78	0.48	2.14	0.20	373.47	0.000	25.642	372.68	373.20	0.52**	0.48	3.55	0.20	373.40	0.000	0.000	n/a	0.50	n/a
37	15	0.42	372.80	373.20	0.40	0.18	1.23	0.09	373.29	0.000	29.330	373.68	373.93 j	0.25**	0.18	2.37	0.09	374.02	0.000	0.000	n/a	1.00	0.09
38	15	1.11	371.92	372.86	0.94	0.36	1.12	0.15	373.01	0.000	26.271	372.30	372.71	0.41**	0.36	3.12	0.15	372.87	0.000	0.000	n/a	1.00	0.15
39	15	1.14	368.91	369.73	0.82	0.36	1.34	0.15	369.89	0.000	34.056	369.13	369.55	0.42**	0.36	3.15	0.15	369.71	0.000	0.000	n/a	1.00	n/a
40	15	1.18	368.75	369.71	0.96	0.37	1.17	0.16	369.87	0.000	24.427	369.01	369.44	0.43**	0.37	3.18	0.16	369.59	0.000	0.000	n/a	1.00	0.16
41	18	4.50	368.30	369.71	1.41	1.72	2.61	0.11	369.82	0.159	123.325	368.97	369.90	0.93	1.15	3.90	0.24	370.14	0.367	0.263	0.324	1.00	0.24
42	15	1.02	365.72	366.72	1.00	0.33	0.97	0.14	366.86	0.000	28.012	366.10	366.50	0.40**	0.33	3.04	0.14	366.64	0.000	0.000	n/a	0.50	0.07
43	15	0.38	366.20	366.50	0.30	0.16	1.71	0.05	366.54	0.230	29.509	366.35	366.59 j	0.24**	0.17	2.29	0.08	366.67	0.519	0.375	0.111	1.00	0.08
44	18	1.42	364.85	365.62	0.77	0.44	1.56	0.16	365.78	0.000	24.451	365.10	365.55	0.45**	0.44	3.22	0.16	365.71	0.000	0.000	n/a	1.00	0.16

Project File: Outfall #1.stm | Number of lines: 50 | Run Date: 12/20/2024

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

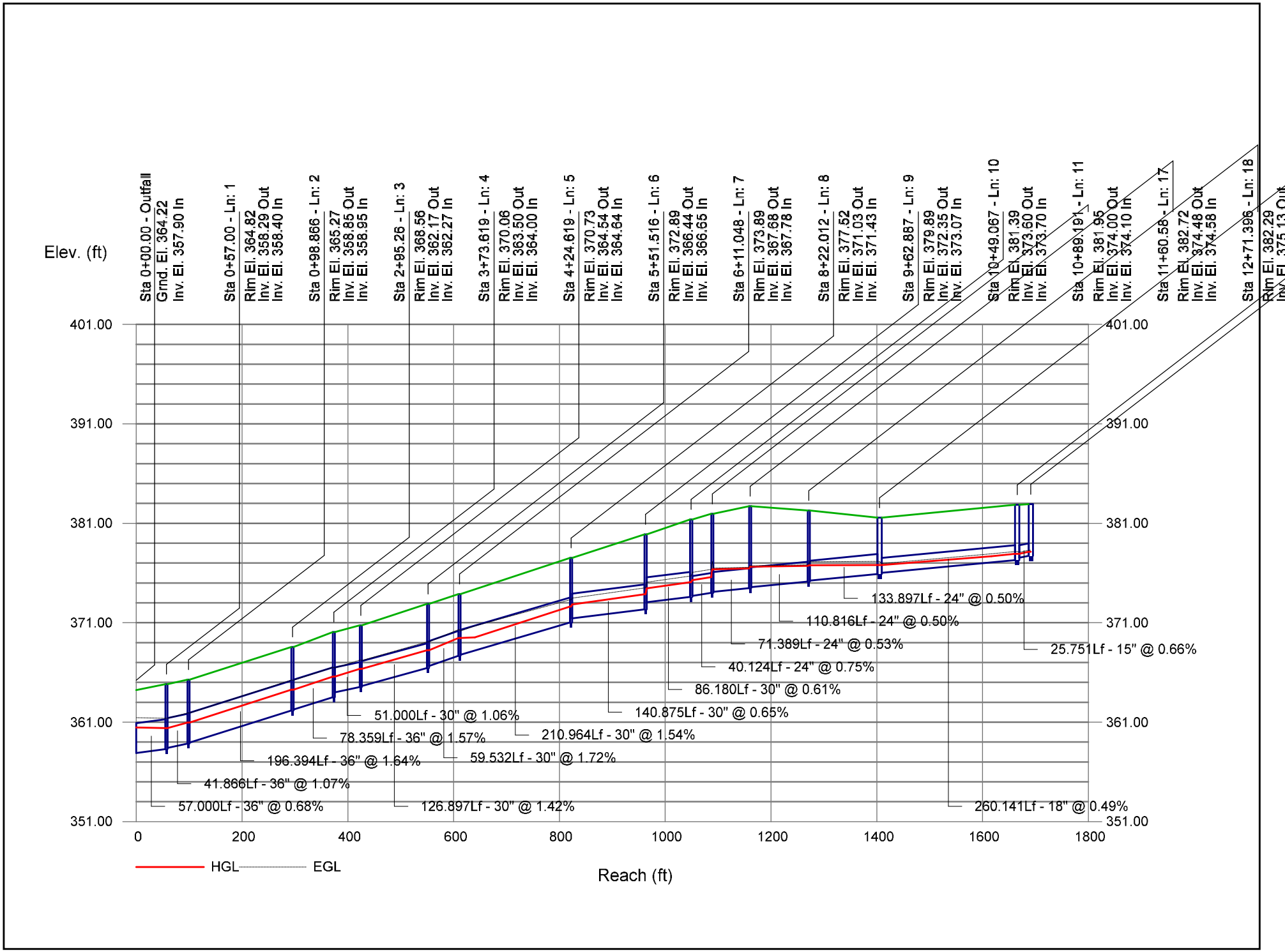
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
45	15	0.83	363.42	364.17	0.75	0.29	1.08	0.13	364.30	0.000	24.503	363.65	364.01	0.36**	0.29	2.87	0.13	364.14	0.000	0.000	n/a	1.00	n/a
46	18	1.07	359.79	360.31	0.52	0.36	1.98	0.14	360.45	0.000	25.748	359.96	360.35 j	0.39**	0.36	2.98	0.14	360.48	0.000	0.000	n/a	1.00	n/a
47	36	14.87	353.31	355.42	2.11	2.72	2.79	0.46	355.89	0.000	38.074	353.50	354.73	1.23**	2.72	5.46	0.46	355.19	0.000	0.000	n/a	0.50	0.23
48	30	13.22	353.61	354.80	1.19*	2.30	5.75	0.48	355.28	0.000	98.975	354.10	355.32	1.22**	2.38	5.55	0.48	355.80	0.000	0.000	n/a	0.15	n/a
49	30	13.33	354.21	355.32	1.11	2.11	6.32	0.48	355.80	0.000	48.268	354.69	355.92	1.23**	2.40	5.56	0.48	356.40	0.000	0.000	n/a	0.96	n/a
50	24	13.49	355.19	356.06	0.87*	1.30	10.34	0.58	356.64	0.000	109.030	357.75	359.07	1.32**	2.20	6.13	0.58	359.66	0.000	0.000	n/a	1.00	n/a

Project File: Outfall #1.stm | Number of lines: 50 | Run Date: 12/20/2024

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

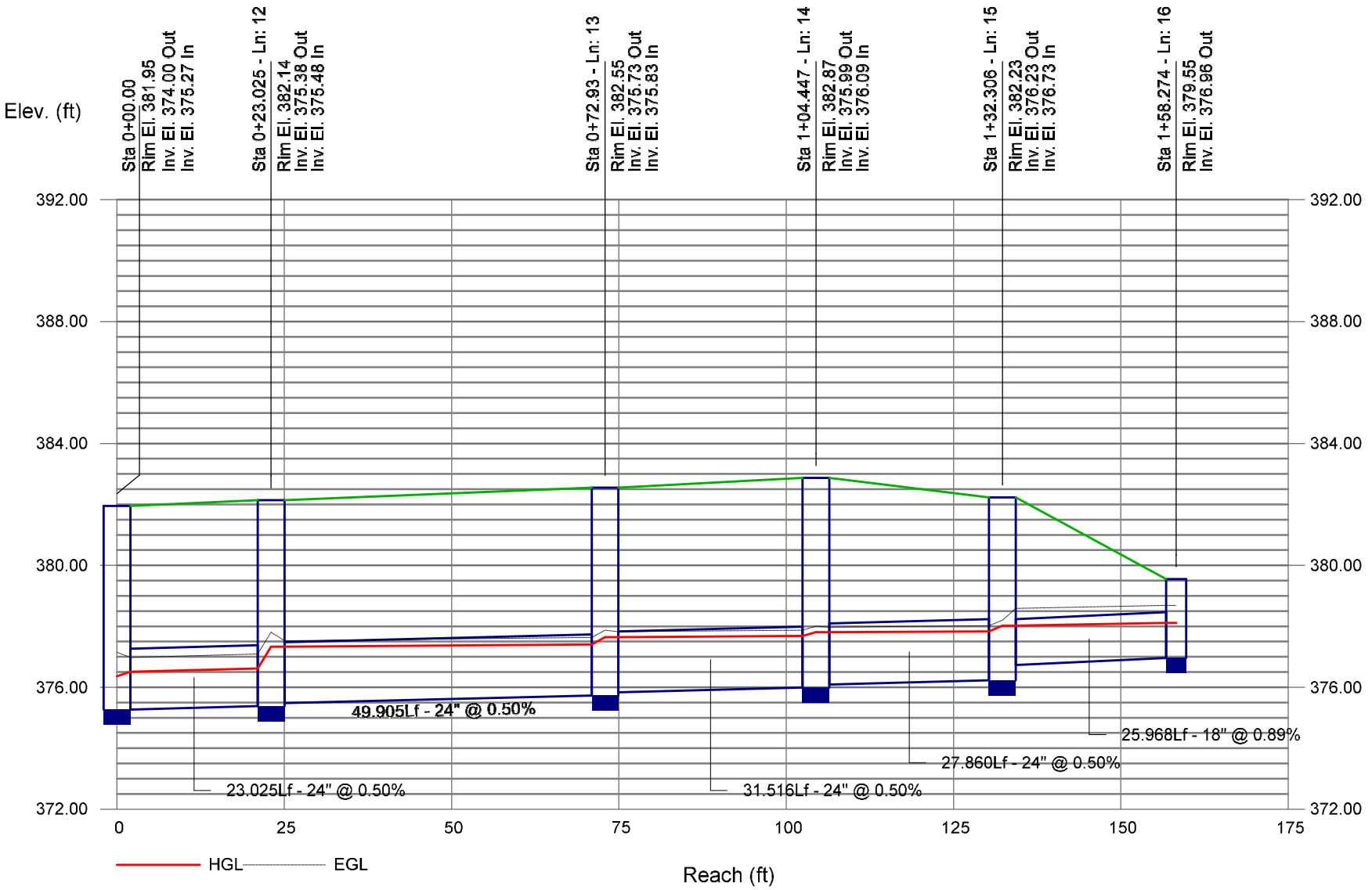
Storm Sewer Profile

10-Year: 1-21 Profile Proj. file: Outfall #1.stm



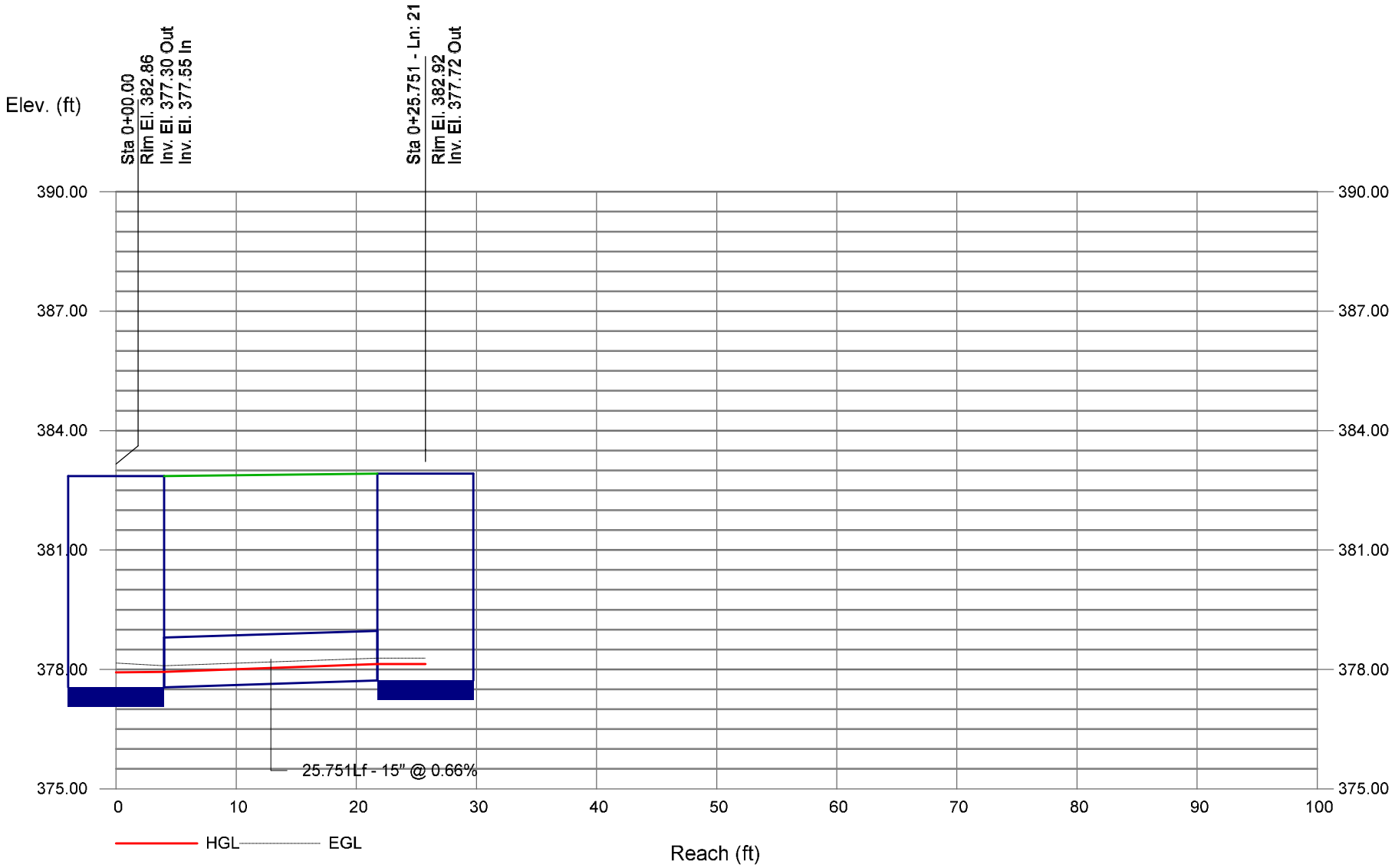
Storm Sewer Profile

10-Year: 12-16 Profile Proj. file: Outfall #1.stm



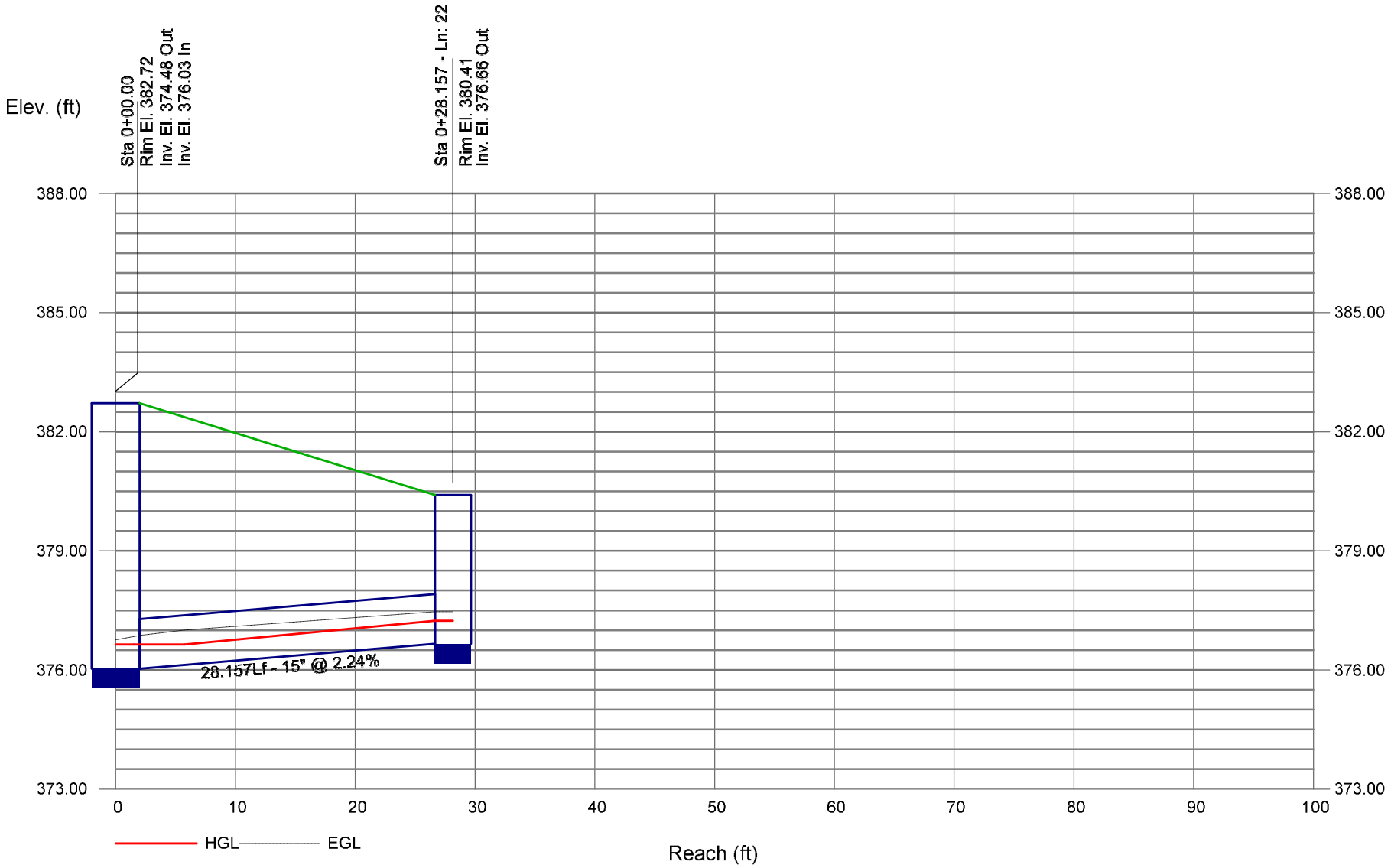
Storm Sewer Profile

10-Year: 21-21 Profile Proj. file: Outfall #1.stm



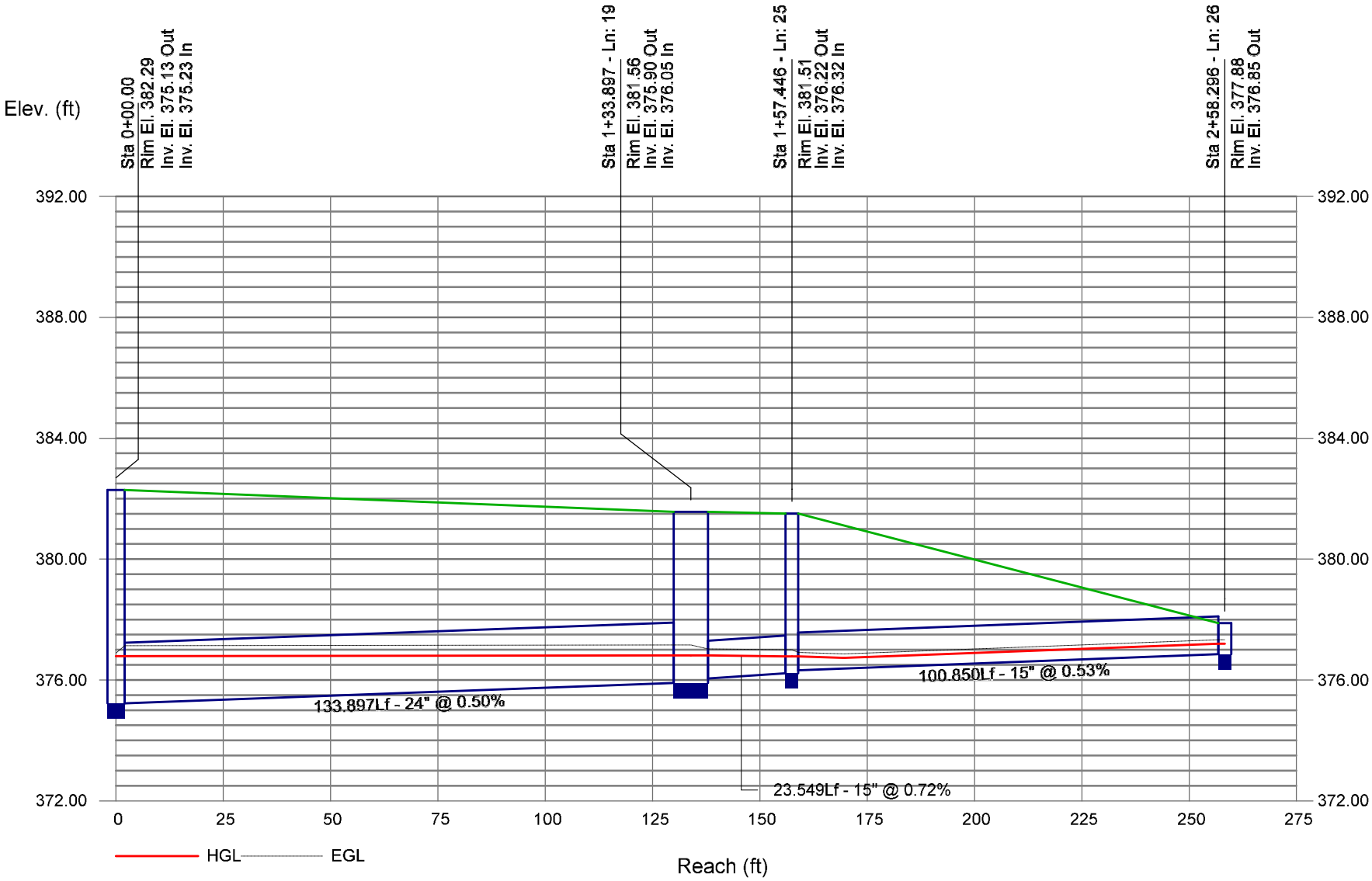
Storm Sewer Profile

10-Year: 22-22 Profile Proj. file: Outfall #1.stm



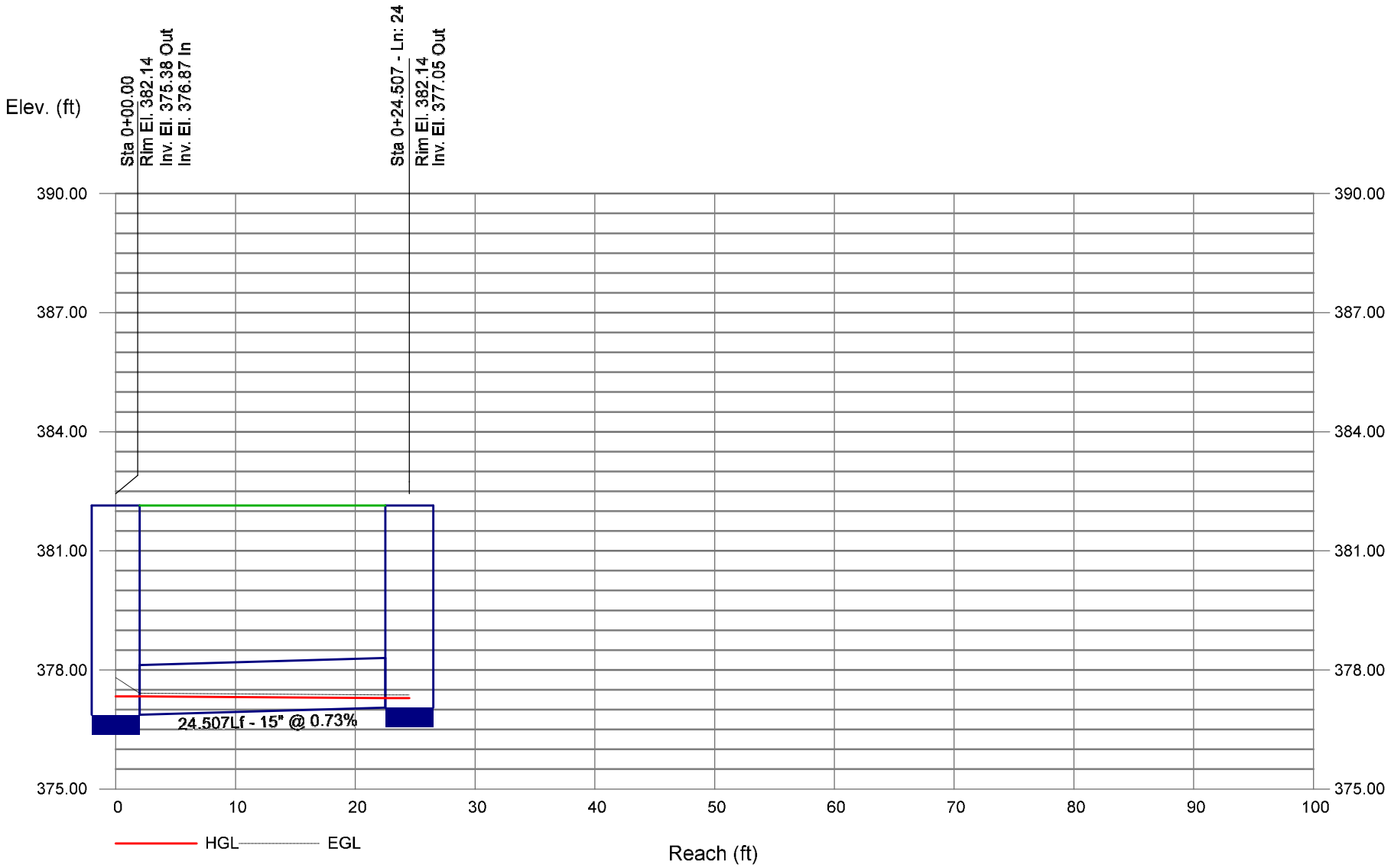
Storm Sewer Profile

10-Year: 23-26 Profile Proj. file: Outfall #1.stm



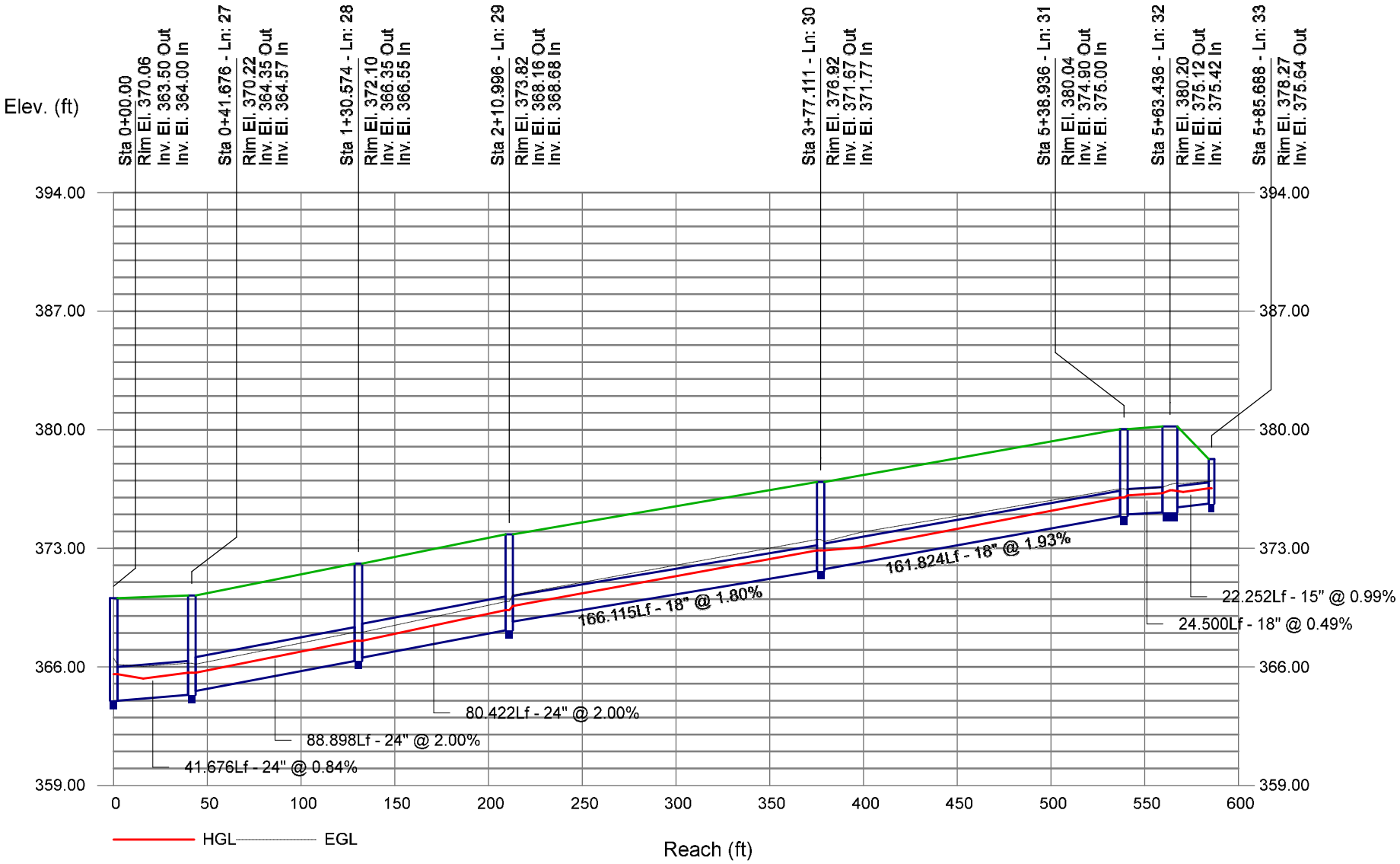
Storm Sewer Profile

10-Year: 24-24 Profile Proj. file: Outfall #1.stm



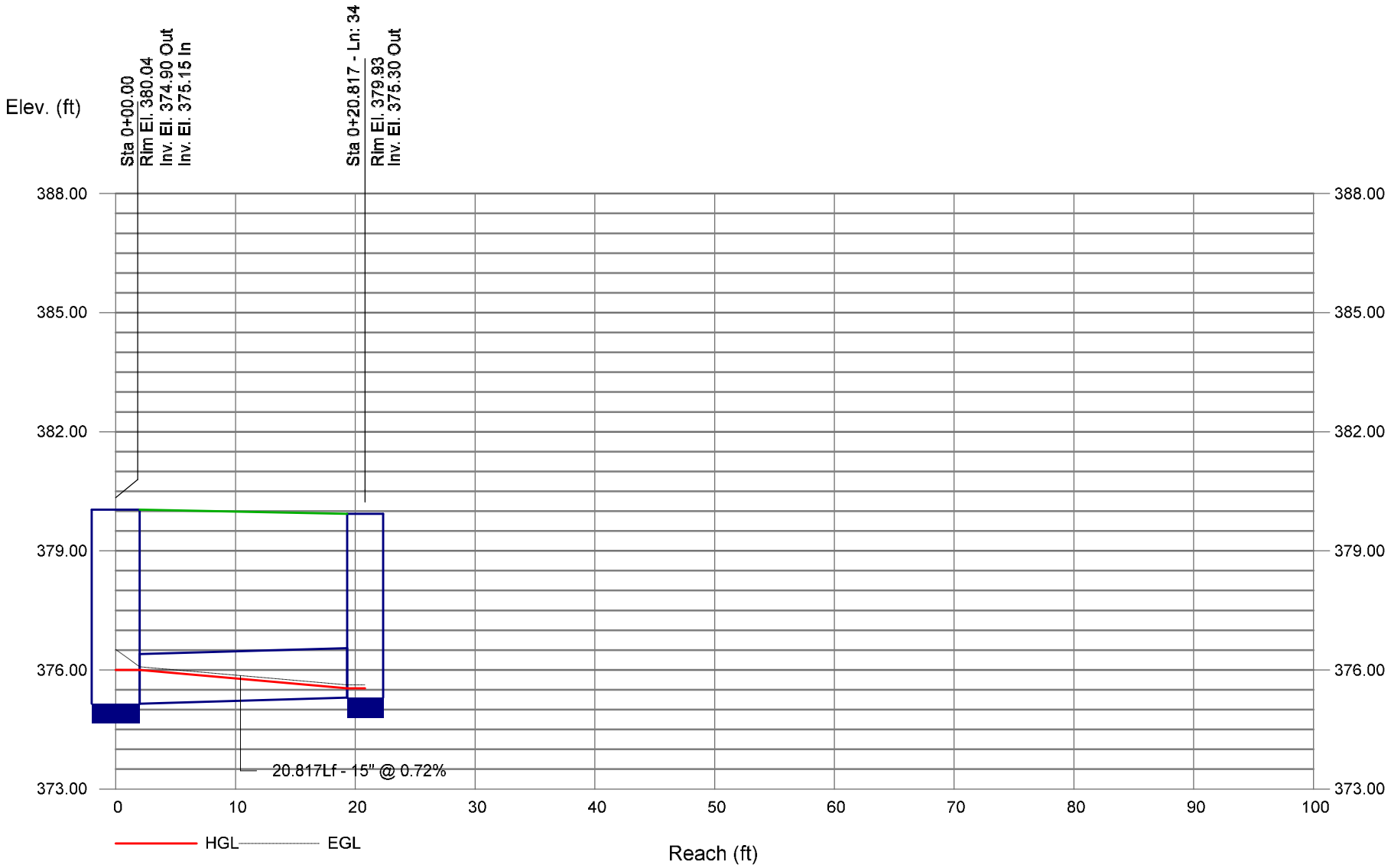
Storm Sewer Profile

10-Year: 27-33 Profile Proj. file: Outfall #1.stm



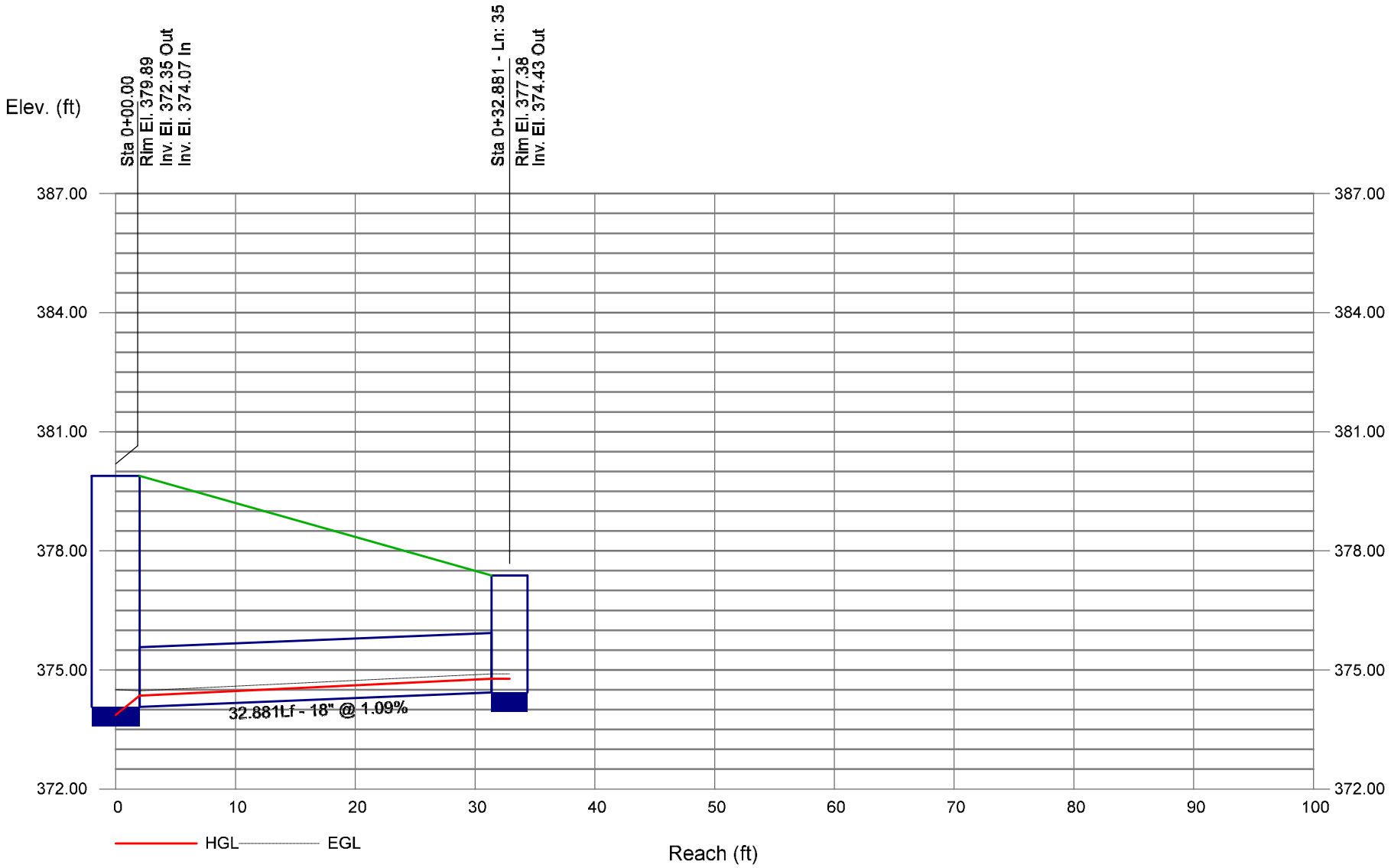
Storm Sewer Profile

10-Year: 34-34 Profile Proj. file: Outfall #1.stm



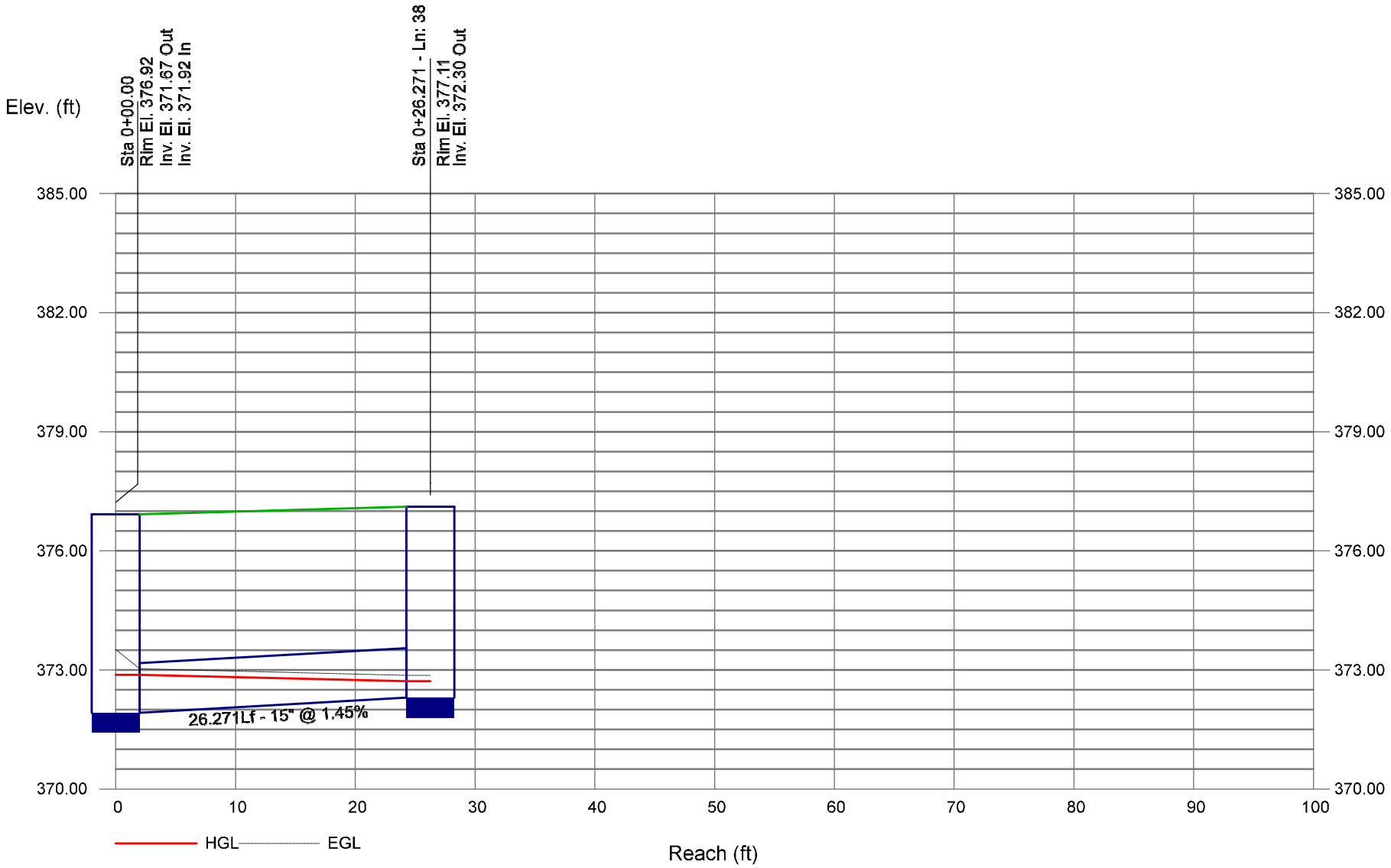
Storm Sewer Profile

10-Year: 35-35 Profile Proj. file: Outfall #1.stm



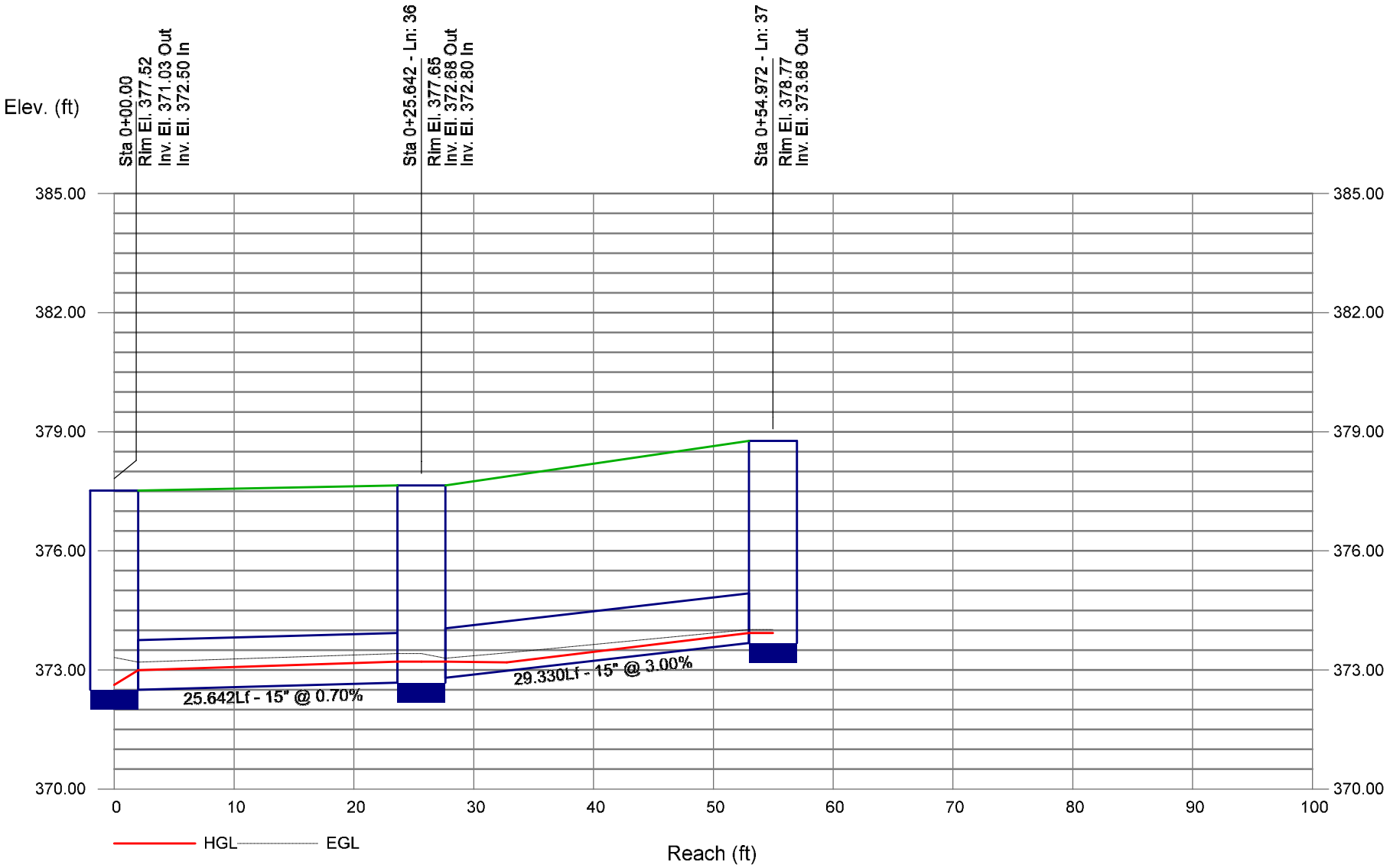
Storm Sewer Profile

10-Year: 38-38 Profile Proj. file: Outfall #1.stm



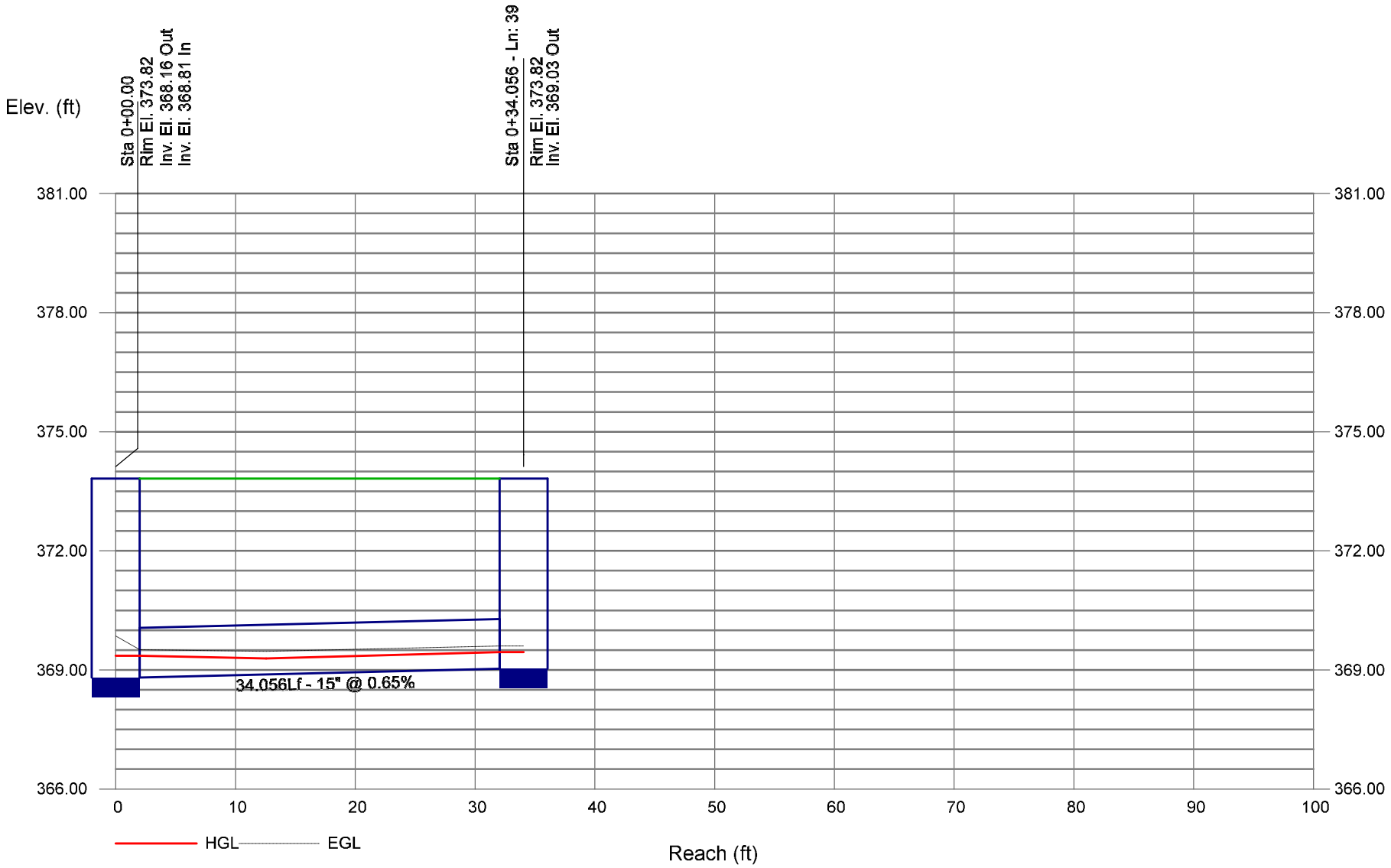
Storm Sewer Profile

10-Year: 36-37 Profile Proj. file: Outfall #1.stm



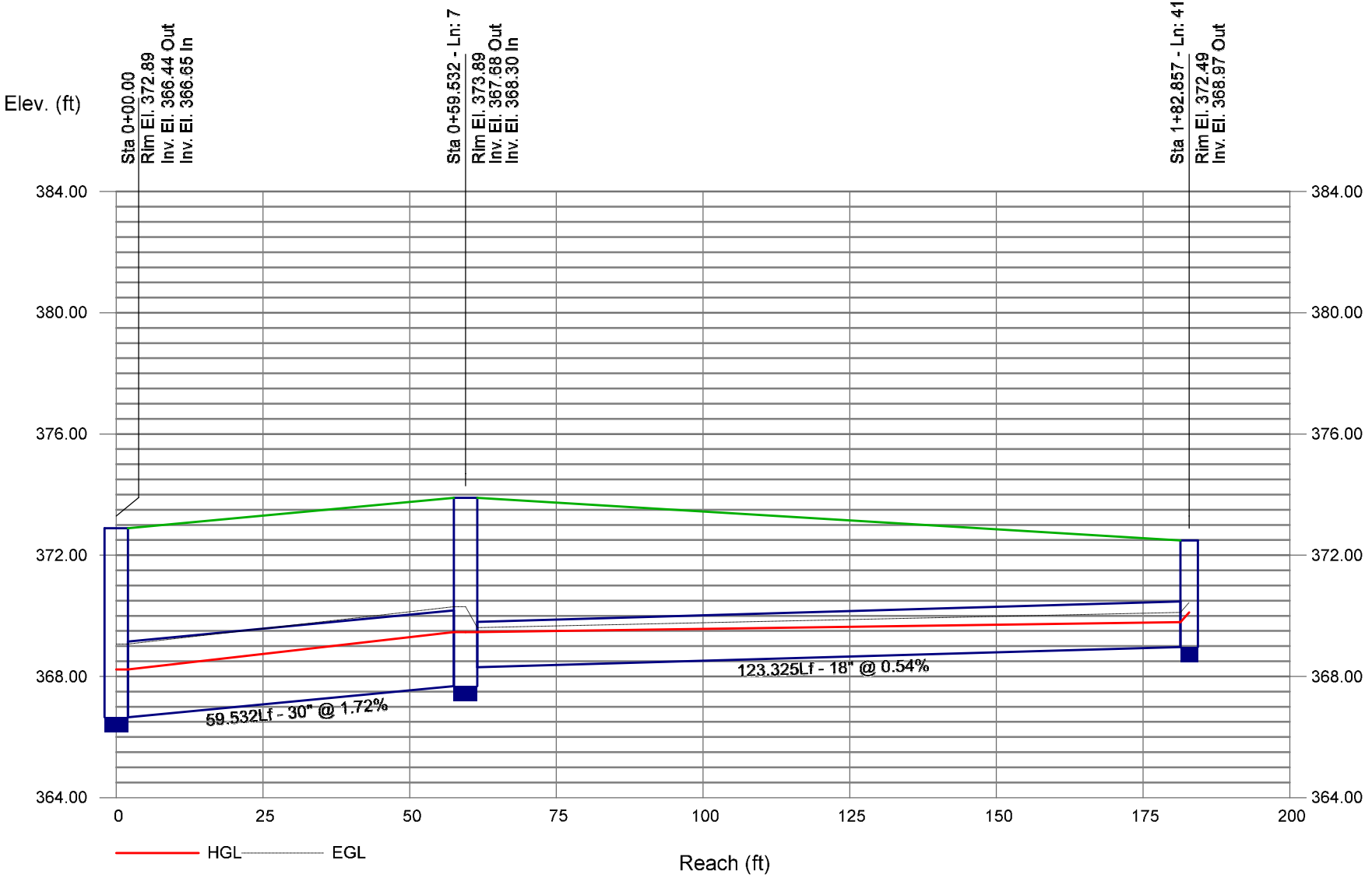
Storm Sewer Profile

10-Year: 39-39 Profile Proj. file: Outfall #1.stm



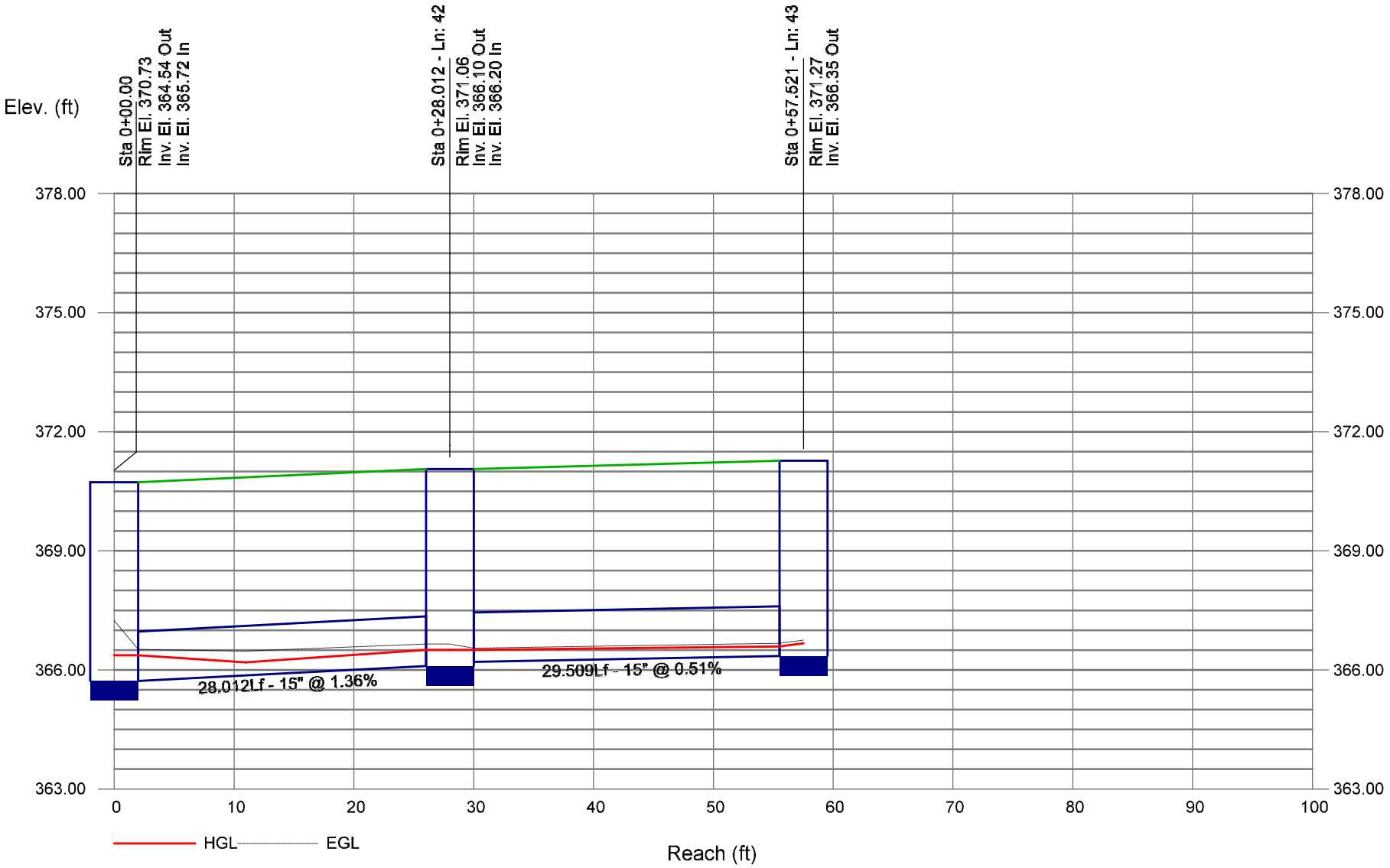
Storm Sewer Profile

10-Year: 40-41 Profile Proj. file: Outfall #1.stm



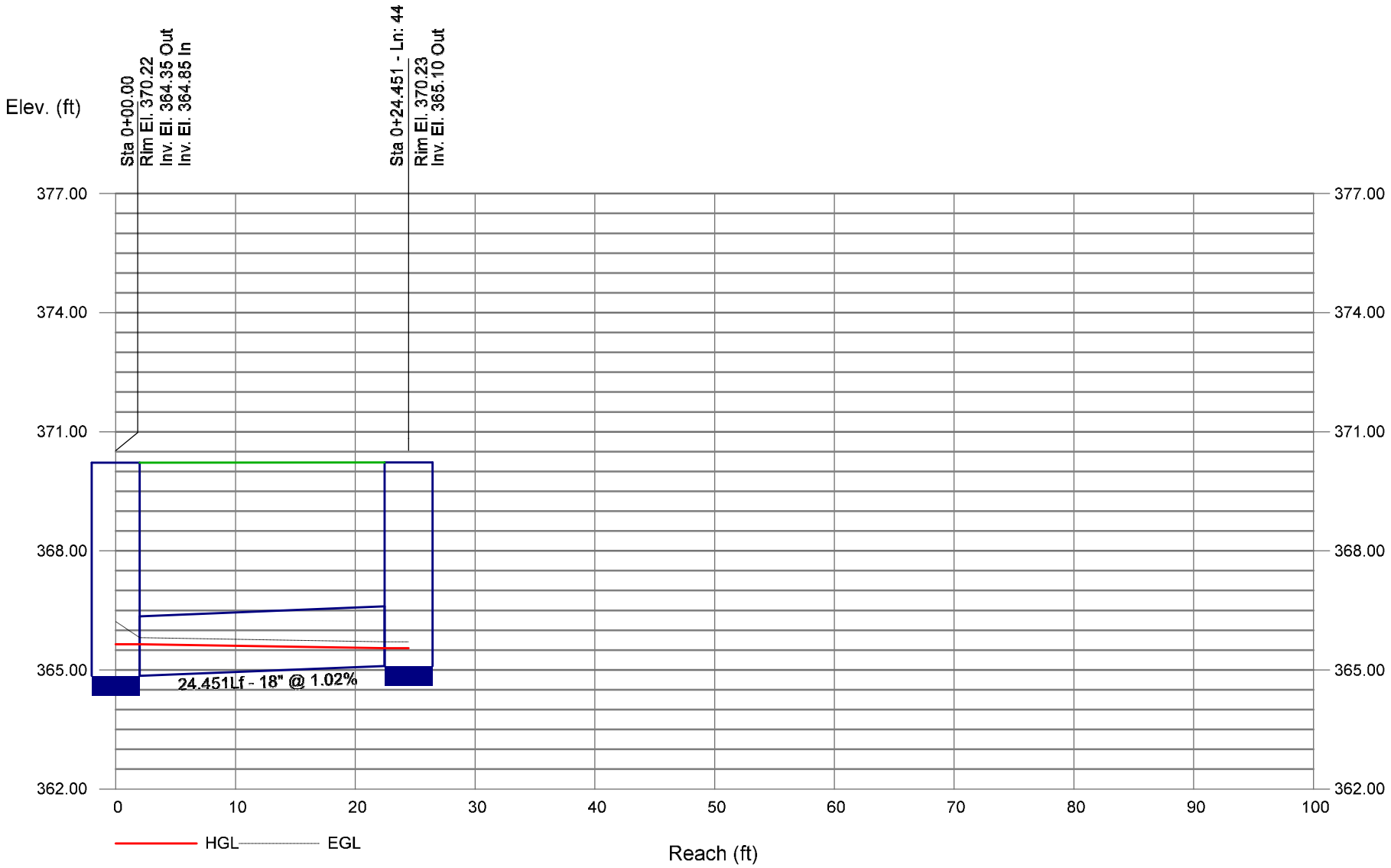
Storm Sewer Profile

10-Year: 42-43 Profile Proj. file: Outfall #1.stm



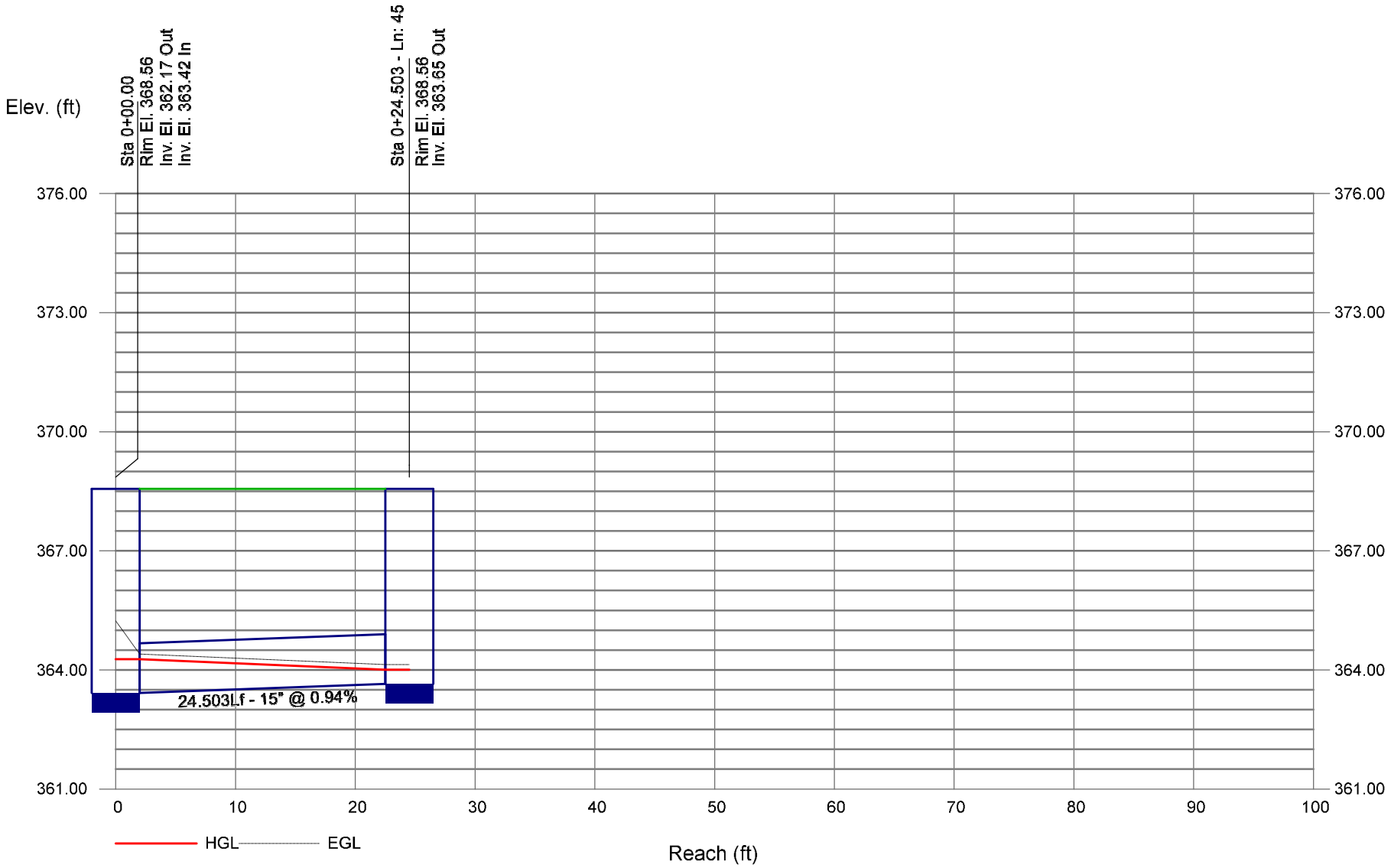
Storm Sewer Profile

10-Year: 44-44 Profile Proj. file: Outfall #1.stm



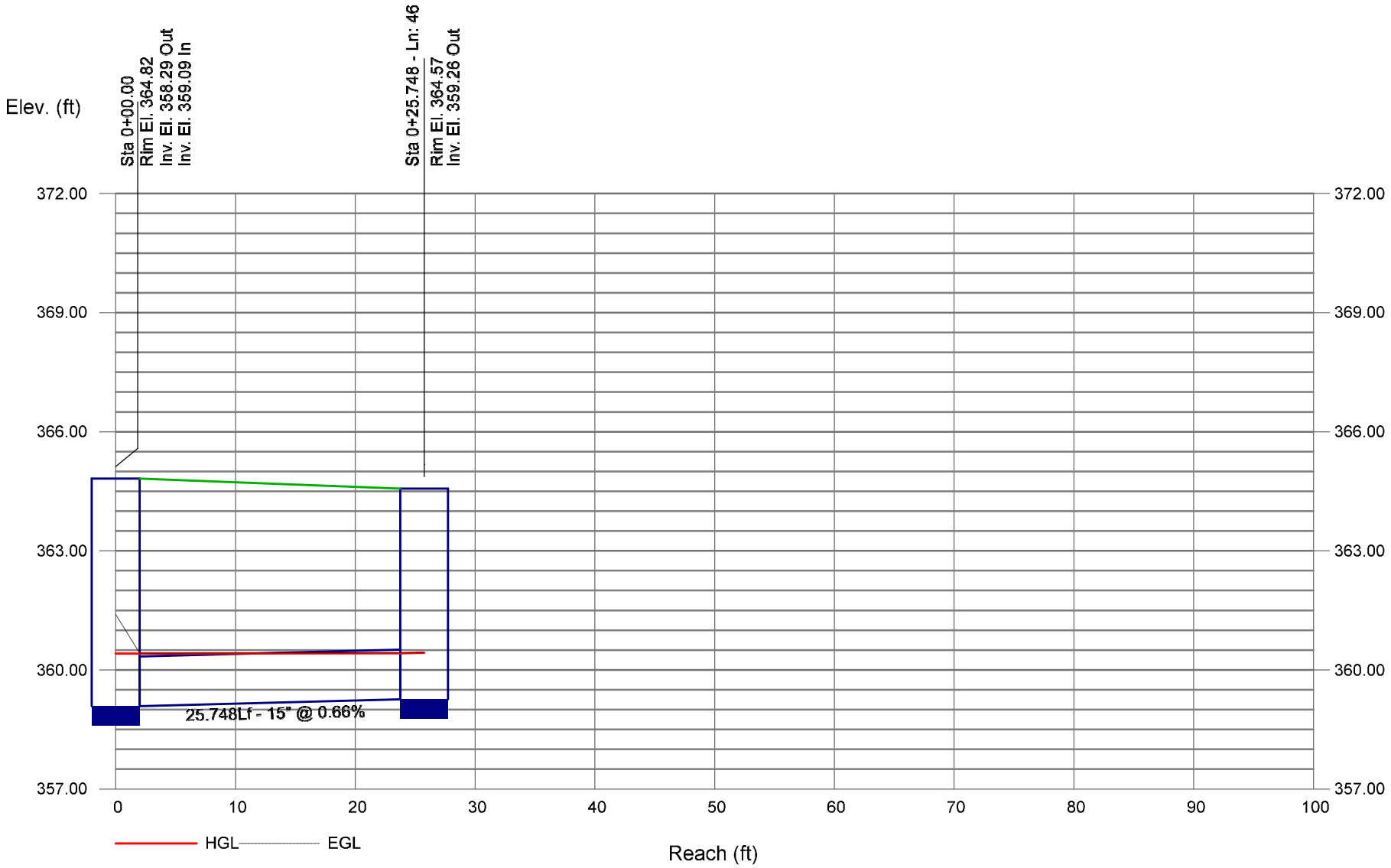
Storm Sewer Profile

10-Year: 45-45 Profile Proj. file: Outfall #1.stm



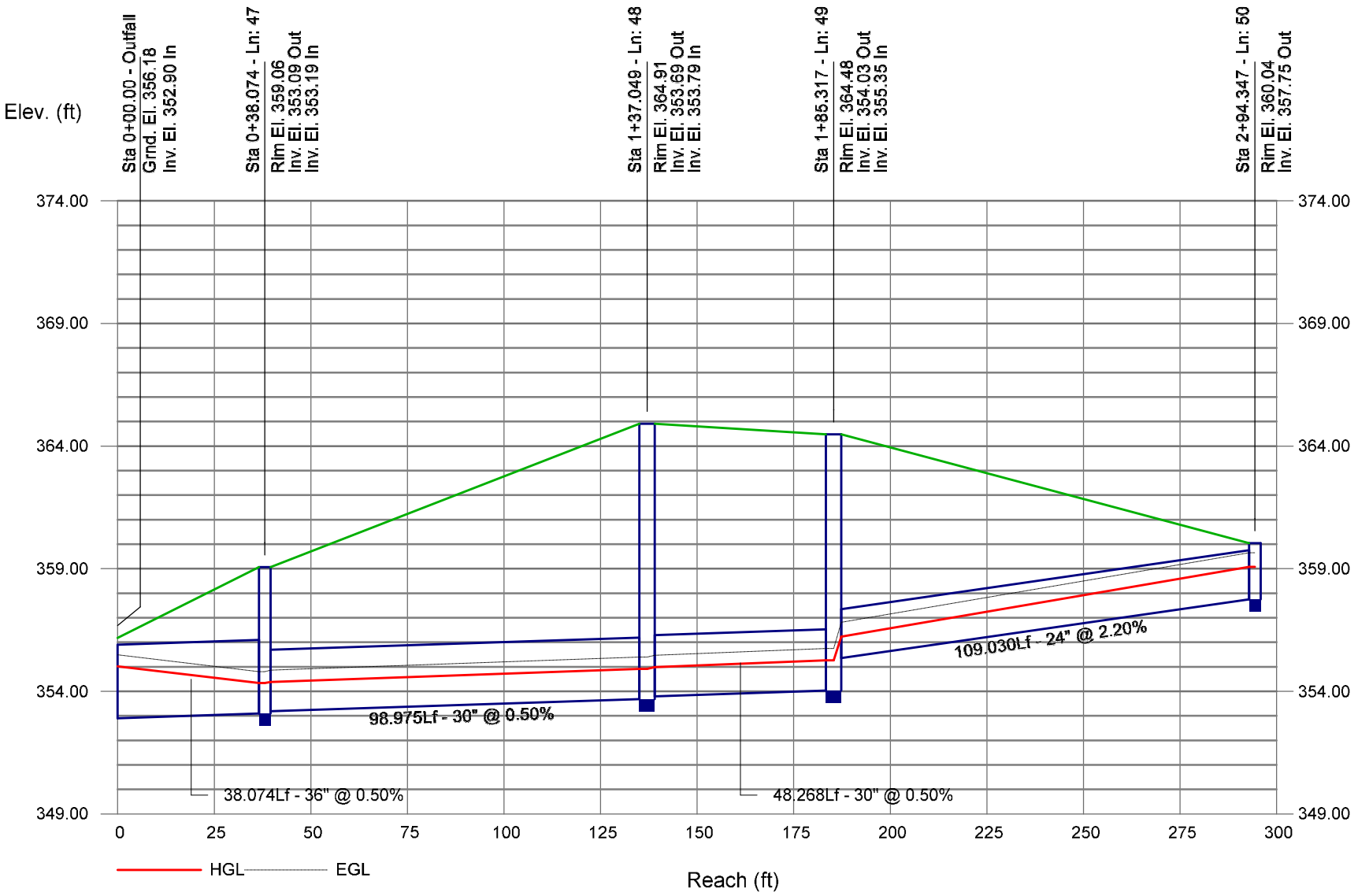
Storm Sewer Profile

10-Year: 46-46 Profile Proj. file: Outfall #1.stm



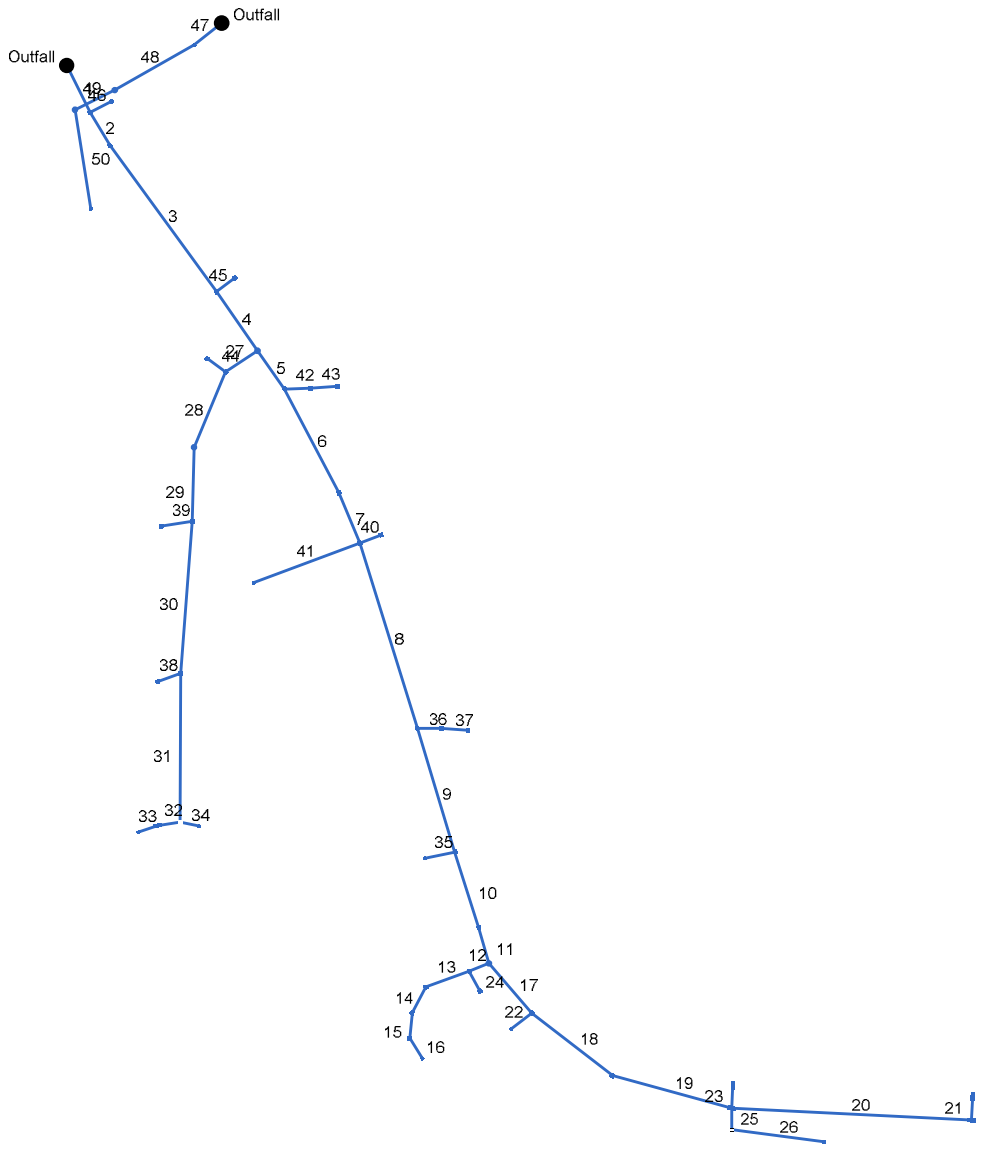
Storm Sewer Profile

10-Year: 47-50 Profile Proj. file: Outfall #1.stm



Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan

25-Year Report



Project File: Outfall #1.stm	Number of lines: 50	Date: 12/23/2024

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	57.000	63.252	Comb	0.00	0.01	0.59	10.0	357.90	0.68	358.29	36	Cir	0.013	1.50	364.82	Ex. 375 Out
2	1	41.866	-4.047	Comb	0.00	0.18	0.59	10.0	358.40	1.07	358.85	36	Cir	0.013	0.50	365.27	Pipe - (20)
3	2	196.394	-5.160	Comb	0.00	0.21	0.59	10.0	358.95	1.64	362.17	36	Cir	0.013	1.50	368.56	Pipe - (19)
4	3	78.359	1.332	MH	0.00	0.01	0.59	10.0	362.27	1.57	363.50	36	Cir	0.013	1.00	370.06	Pipe - (18)
5	4	51.000	-0.352	Comb	0.00	0.19	0.59	10.0	364.00	1.06	364.54	30	Cir	0.013	1.30	370.73	Pipe - (16)
6	5	126.897	7.290	Comb	0.00	0.07	0.59	10.0	364.64	1.42	366.44	30	Cir	0.013	0.50	372.89	Pipe - (15)
7	6	59.532	5.165	Comb	0.00	0.31	0.59	10.0	366.65	1.72	367.68	30	Cir	0.013	1.50	373.89	Pipe - (14)
8	7	210.964	5.328	Comb	0.00	0.20	0.59	10.0	367.78	1.54	371.03	30	Cir	0.013	1.44	377.52	Pipe - (13)
9	8	140.875	0.547	Comb	0.00	0.09	0.59	10.0	371.43	0.65	372.35	30	Cir	0.013	1.50	379.89	Pipe - (12) (1)
10	9	86.180	-0.829	Comb	0.00	0.08	0.59	10.0	373.07	0.61	373.60	30	Cir	0.013	0.50	381.39	Pipe - (12)
11	10	40.124	1.547	MH	0.00	0.01	0.59	10.0	373.70	0.75	374.00	24	Cir	0.013	1.00	381.95	Pipe - (51)
12	11	23.025	83.735	Comb	0.00	0.07	0.59	10.0	375.27	0.50	375.38	24	Cir	0.013	1.50	382.14	Pipe - (50) (1)
13	12	49.905	2.092	Comb	0.00	0.24	0.59	10.0	375.48	0.50	375.73	24	Cir	0.013	1.07	382.55	Pipe - (50)
14	13	31.516	-41.901	Comb	0.00	0.21	0.59	10.0	375.83	0.50	375.99	24	Cir	0.013	0.65	382.87	Pipe - (49)
15	14	27.860	-22.271	Comb	0.00	0.15	0.59	10.0	376.09	0.50	376.23	24	Cir	0.013	0.99	382.23	Pipe - (48)
16	15	25.968	-37.432	DrGrt	0.00	4.70	0.32	10.0	376.73	0.89	376.96	18	Cir	0.013	1.00	379.55	Pipe - (58)
17	11	71.389	-24.767	Comb	0.00	0.01	0.59	10.0	374.10	0.53	374.48	24	Cir	0.013	1.50	382.72	Pipe - (11)
18	17	110.816	-11.425	Comb	0.00	0.12	0.59	10.0	374.58	0.50	375.13	24	Cir	0.013	0.66	382.29	Pipe - (10)
19	18	133.897	-22.601	Comb	0.00	0.30	0.59	10.0	375.23	0.50	375.90	24	Cir	0.013	2.18	381.56	Pipe - (9)
20	19	260.141	-12.381	Comb	0.00	0.47	0.59	10.0	376.02	0.49	377.30	18	Cir	0.013	1.50	382.86	Pipe - (8)
21	20	25.751	-90.000	Comb	0.00	0.32	0.59	10.0	377.55	0.66	377.72	15	Cir	0.013	1.00	382.92	Pipe - (7)
22	17	28.157	93.178	DrGrt	0.00	0.61	0.59	10.0	376.03	2.24	376.66	15	Cir	0.013	1.00	380.41	Pipe - (59)
23	19	24.491	-102.382	Comb	0.00	0.32	0.59	10.0	376.45	0.53	376.58	15	Cir	0.013	1.00	381.56	Pipe - (55)

Project File: Outfall #1.stm | Number of lines: 50 | Date: 12/23/2024

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
24	12	24.507	-95.925	Comb	0.00	0.11	0.59	10.0	376.87	0.73	377.05	15	Cir	0.013	1.00	382.14	Pipe - (70)
25	19	23.549	74.368	DrGrt	0.00	0.66	0.32	10.0	376.05	0.72	376.22	15	Cir	0.013	1.49	381.51	Pipe - (60)
26	25	100.850	-82.180	DrGrt	0.00	0.43	0.32	10.0	376.32	0.53	376.85	15	Cir	0.013	1.00	377.88	Pipe - (71)
27	4	41.676	91.283	Comb	0.00	0.22	0.59	10.0	364.00	0.84	364.35	24	Cir	0.013	1.42	370.22	Pipe - (57)
28	27	88.898	-34.214	MH	0.00	0.01	0.59	10.0	364.57	2.00	366.35	24	Cir	0.013	0.41	372.10	Pipe - (56)
29	28	80.422	-21.032	Comb	0.00	0.11	0.59	10.0	366.55	2.00	368.16	24	Cir	0.013	1.48	373.82	Pipe - (39)
30	29	166.115	2.964	Comb	0.00	0.24	0.59	10.0	368.68	1.80	371.67	18	Cir	0.013	1.39	376.92	Pipe - (37)
31	30	161.824	-4.236	Comb	0.00	0.28	0.59	10.0	371.77	1.93	374.90	18	Cir	0.013	2.22	380.04	Pipe - (36)
32	31	24.500	81.321	Comb	0.00	0.52	0.59	10.0	375.00	0.49	375.12	18	Cir	0.013	0.50	380.20	Pipe - (42)
33	32	22.252	-10.400	DrGrt	0.00	2.63	0.32	10.0	375.42	0.99	375.64	15	Cir	0.013	1.00	378.27	Pipe - (61)
34	31	20.817	-78.889	DrGrt	0.00	0.11	0.59	10.0	375.15	0.72	375.30	15	Cir	0.013	1.00	379.93	Pipe - (62)
35	9	32.881	95.114	DrGrt	0.00	0.25	0.59	10.0	374.07	1.09	374.43	18	Cir	0.013	1.00	377.38	Pipe - (69)
36	8	25.642	-72.321	Comb	0.00	0.40	0.59	10.0	372.50	0.70	372.68	15	Cir	0.013	0.50	377.65	Pipe - (54)
37	36	29.330	3.216	Comb	0.00	0.12	0.59	10.0	372.80	3.00	373.68	15	Cir	0.013	1.00	378.77	Pipe - (22)
38	30	26.271	65.734	Comb	0.00	0.32	0.59	10.0	371.92	1.45	372.30	15	Cir	0.013	1.00	377.11	Pipe - (41)
39	29	34.056	79.521	Comb	0.00	0.33	0.59	10.0	368.81	0.65	369.03	15	Cir	0.013	1.00	373.82	Pipe - (40)
40	7	24.427	-88.012	Comb	0.00	0.34	0.59	10.0	368.75	1.06	369.01	15	Cir	0.013	1.00	374.05	Pipe - (43)
41	7	123.325	91.973	DrGrt	0.00	1.30	0.59	10.0	368.30	0.54	368.97	18	Cir	0.013	1.00	372.49	Pipe - (63)
42	5	28.012	-57.519	Comb	0.00	0.20	0.59	10.0	365.72	1.36	366.10	15	Cir	0.013	0.50	371.06	Pipe - (24)
43	42	29.509	-1.479	Comb	0.00	0.11	0.59	10.0	366.20	0.51	366.35	15	Cir	0.013	1.00	371.27	Pipe - (53)
44	27	24.451	69.302	Comb	0.00	0.41	0.59	10.0	364.85	1.02	365.10	18	Cir	0.013	1.00	370.23	Pipe - (17)
45	3	24.503	-90.507	Comb	0.00	0.24	0.59	10.0	363.42	0.94	363.65	15	Cir	0.013	1.00	368.56	Pipe - (28)
46	1	25.748	-90.230	Comb	0.00	0.31	0.59	10.0	359.09	0.66	359.26	15	Cir	0.013	1.00	364.57	Pipe - (26)

Project File: Outfall #1.stm | Number of lines: 50 | Date: 12/23/2024

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
47	End	38.074	141.899	DrGrt	0.00	1.07	0.32	10.0	352.90	0.50	353.09	36	Cir	0.013	0.50	359.06	Pipe - (67)
48	47	98.975	8.202	MH	0.00	0.01	0.59	10.0	353.19	0.50	353.69	30	Cir	0.013	0.15	364.91	Pipe - (66)
49	48	48.268	3.525	MH	0.00	0.01	0.59	10.0	353.79	0.50	354.03	30	Cir	0.013	0.96	364.48	Pipe - (65)
50	49	109.030	-72.571	DrGrt	0.00	7.18	0.32	10.0	355.35	2.20	357.75	24	Cir	0.013	1.00	360.04	Pipe - (29)

Project File: Outfall #1.stm

Number of lines: 50

Date: 12/23/2024

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	EX. CB 375	Combination	364.82	Rect	4.00	4.00	36	Cir	358.29	36 15	Cir Cir	358.40 359.09
2	376	Combination	365.27	Rect	4.00	4.00	36	Cir	358.85	36	Cir	358.95
3	377	Combination	368.56	Rect	4.00	4.00	36	Cir	362.17	36 15	Cir Cir	362.27 363.42
4	377B	Manhole	370.06	Cir	4.00	4.00	36	Cir	363.50	30 24	Cir Cir	364.00 364.00
5	378	Combination	370.73	Rect	4.00	4.00	30	Cir	364.54	30 15	Cir Cir	364.64 365.72
6	379	Combination	372.89	Rect	4.00	4.00	30	Cir	366.44	30	Cir	366.65
7	380	Combination	373.89	Rect	4.00	4.00	30	Cir	367.68	30 15 18	Cir Cir Cir	367.78 368.75 368.30
8	381	Combination	377.52	Rect	4.00	4.00	30	Cir	371.03	30 15	Cir Cir	371.43 372.50
9	381C	Combination	379.89	Rect	4.00	4.00	30	Cir	372.35	30 18	Cir Cir	373.07 374.07
10	382	Combination	381.39	Rect	4.00	4.00	30	Cir	373.60	24	Cir	373.70
11	382A	Manhole	381.95	Cir	4.00	4.00	24	Cir	374.00	24 24	Cir Cir	375.27 374.10
12	395	Combination	382.14	Rect	4.00	4.00	24	Cir	375.38	24 15	Cir Cir	375.48 376.87
13	396	Combination	382.55	Rect	4.00	4.00	24	Cir	375.73	24	Cir	375.83
14	396A	Combination	382.87	Rect	4.00	4.00	24	Cir	375.99	24	Cir	376.09
15	396B	Combination	382.23	Rect	4.00	4.00	24	Cir	376.23	18	Cir	376.73
16	396C	DropGrate	379.55	Rect	3.00	3.00	18	Cir	376.96			
17	383	Combination	382.72	Rect	4.00	4.00	24	Cir	374.48	24 15	Cir Cir	374.58 376.03

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
18	384	Combination	382.29	Rect	4.00	4.00	24	Cir	375.13	24	Cir	375.23
19	385	Combination	381.56	Rect	8.00	4.00	24	Cir	375.90	18 15 15	Cir Cir Cir	376.02 376.45 376.05
20	386	Combination	382.86	Rect	8.00	4.00	18	Cir	377.30	15	Cir	377.55
21	386A	Combination	382.92	Rect	8.00	4.00	15	Cir	377.72			
22	383A	DropGrate	380.41	Rect	3.00	3.00	15	Cir	376.66			
23	385A	Combination	381.56	Rect	8.00	4.00	15	Cir	376.58			
24	395A	Combination	382.14	Rect	4.00	4.00	15	Cir	377.05			
25	385B	DropGrate	381.51	Rect	3.00	3.00	15	Cir	376.22	15	Cir	376.32
26	385C	DropGrate	377.88	Rect	3.00	3.00	15	Cir	376.85			
27	390	Combination	370.22	Rect	4.00	4.00	24	Cir	364.35	24 18	Cir Cir	364.57 364.85
28	390B	Manhole	372.10	Cir	4.00	4.00	24	Cir	366.35	24	Cir	366.55
29	391	Combination	373.82	Rect	4.00	4.00	24	Cir	368.16	18 15	Cir Cir	368.68 368.81
30	392	Combination	376.92	Rect	4.00	4.00	18	Cir	371.67	18 15	Cir Cir	371.77 371.92
31	393	Combination	380.04	Rect	4.00	4.00	18	Cir	374.90	18 15	Cir Cir	375.00 375.15
32	393A	Combination	380.20	Rect	8.00	4.00	18	Cir	375.12	15	Cir	375.42
33	393B	DropGrate	378.27	Rect	3.00	3.00	15	Cir	375.64			
34	393C	DropGrate	379.93	Rect	3.00	3.00	15	Cir	375.30			
35	381D	DropGrate	377.38	Rect	3.00	3.00	18	Cir	374.43			
36	381A	Combination	377.65	Rect	4.00	4.00	15	Cir	372.68	15	Cir	372.80
37	381B	Combination	378.77	Rect	4.00	4.00	15	Cir	373.68			

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
38	392A	Combination	377.11	Rect	4.00	4.00	15	Cir	372.30			
39	391A	Combination	373.82	Rect	4.00	4.00	15	Cir	369.03			
40	380A	Combination	374.05	Rect	4.00	4.00	15	Cir	369.01			
41	380B	DropGrate	372.49	Rect	3.00	3.00	18	Cir	368.97			
42	378A	Combination	371.06	Rect	4.00	4.00	15	Cir	366.10	15	Cir	366.20
43	378B	Combination	371.27	Rect	4.00	4.00	15	Cir	366.35			
44	390A	Combination	370.23	Rect	4.00	4.00	18	Cir	365.10			
45	377A	Combination	368.56	Rect	4.00	4.00	15	Cir	363.65			
46	375A	Combination	364.57	Rect	4.00	4.00	15	Cir	359.26			
47	31A	DropGrate	359.06	Rect	3.00	3.00	36	Cir	353.09	30	Cir	353.19
48	EX. 31	Manhole	364.91	Cir	4.00	4.00	30	Cir	353.69	30	Cir	353.79
49	EX. 32	Manhole	364.48	Cir	4.00	4.00	30	Cir	354.03	24	Cir	355.35
50	32A	DropGrate	360.04	Rect	3.00	3.00	24	Cir	357.75			

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	Ex. 375 Out	46.35	36	Cir	57.000	357.90	358.29	0.684	360.90	361.13	1.05	362.17	End	Combination
2	Pipe - (20)	45.47	36	Cir	41.866	358.40	358.85	1.075	362.17*	362.37*	0.32	362.69	1	Combination
3	Pipe - (19)	45.44	36	Cir	196.394	358.95	362.17	1.640	362.69	364.36	n/a	364.36 j	2	Combination
4	Pipe - (18)	44.18	36	Cir	78.359	362.27	363.50	1.570	364.36	365.66	n/a	365.66	3	Manhole
5	Pipe - (16)	31.44	30	Cir	51.000	364.00	364.54	1.059	365.66	366.45	n/a	366.45	4	Combination
6	Pipe - (15)	30.05	30	Cir	126.897	364.64	366.44	1.418	366.45	368.31	0.45	368.31	5	Combination
7	Pipe - (14)	29.92	30	Cir	59.532	366.65	367.68	1.723	368.31	369.54	n/a	369.54	6	Combination
8	Pipe - (13)	23.91	30	Cir	210.964	367.78	371.03	1.539	369.54	372.69	n/a	372.69 j	7	Combination
9	Pipe - (12) (1)	21.73	30	Cir	140.875	371.43	372.35	0.653	372.91	373.93	1.02	373.93	8	Combination
10	Pipe - (12)	20.72	30	Cir	86.180	373.07	373.60	0.615	374.53	375.15	n/a	375.15	9	Combination
11	Pipe - (51)	20.51	24	Cir	40.124	373.70	374.00	0.747	375.45	375.75	0.77	376.52	10	Manhole
12	Pipe - (50) (1)	12.60	24	Cir	23.025	375.27	375.38	0.499	376.60	376.72	0.74	377.46	11	Combination
13	Pipe - (50)	12.01	24	Cir	49.905	375.48	375.73	0.501	377.46	377.57	0.26	377.83	12	Combination
14	Pipe - (49)	11.15	24	Cir	31.516	375.83	375.99	0.501	377.83	377.90	0.13	378.03	13	Combination
15	Pipe - (48)	10.39	24	Cir	27.860	376.09	376.23	0.499	378.03	378.07	0.18	378.25	14	Combination
16	Pipe - (58)	9.84	18	Cir	25.968	376.73	376.96	0.886	378.25	378.46	0.48	378.94	15	DropGrate
17	Pipe - (11)	9.35	24	Cir	71.389	374.10	374.48	0.532	376.52*	376.64*	0.21	376.85	11	Combination
18	Pipe - (10)	7.40	24	Cir	110.816	374.58	375.13	0.496	376.85	376.95	0.06	377.01	17	Combination
19	Pipe - (9)	7.17	24	Cir	133.897	375.23	375.90	0.500	377.01	376.85	0.81	376.85	18	Combination
20	Pipe - (8)	3.03	18	Cir	260.141	376.02	377.30	0.491	376.85	377.96	n/a	377.96 j	19	Combination
21	Pipe - (7)	1.24	15	Cir	25.751	377.55	377.72	0.660	377.96	378.16	n/a	378.16	20	Combination
22	Pipe - (59)	2.36	15	Cir	28.157	376.03	376.66	2.237	376.85	377.27	n/a	377.27 j	17	DropGrate
23	Pipe - (55)	1.24	15	Cir	24.491	376.45	376.58	0.531	376.89	377.02	n/a	377.02	19	Combination
24	Pipe - (70)	0.42	15	Cir	24.507	376.87	377.05	0.734	377.46	377.30	n/a	377.30	12	Combination

Project File: Outfall #1.stm | Number of lines: 50 | Run Date: 12/23/2024

NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	Pipe - (60)	2.13	15	Cir	23.549	376.05	376.22	0.722	376.85	376.80	0.34	376.80	19	DropGrate
26	Pipe - (71)	0.90	15	Cir	100.850	376.32	376.85	0.526	376.80	377.22	n/a	377.22	25	DropGrate
27	Pipe - (57)	14.60	24	Cir	41.676	364.00	364.35	0.840	365.66	365.73	n/a	365.73 j	4	Combination
28	Pipe - (56)	12.39	24	Cir	88.898	364.57	366.35	2.002	365.73	367.61	0.22	367.61	27	Manhole
29	Pipe - (39)	12.43	24	Cir	80.422	366.55	368.16	2.001	367.61	369.43	0.81	369.43	28	Combination
30	Pipe - (37)	10.92	18	Cir	166.115	368.68	371.67	1.800	369.67	372.94	1.02	372.94	29	Combination
31	Pipe - (36)	8.94	18	Cir	161.824	371.77	374.90	1.934	372.94	376.06	n/a	376.06 j	30	Combination
32	Pipe - (42)	7.50	18	Cir	24.500	375.00	375.12	0.490	376.26	376.38	0.17	376.55	31	Combination
33	Pipe - (61)	5.51	15	Cir	22.252	375.42	375.64	0.989	376.55	376.59	0.47	376.59	32	DropGrate
34	Pipe - (62)	0.42	15	Cir	20.817	375.15	375.30	0.721	376.06	375.55	n/a	375.55	31	DropGrate
35	Pipe - (69)	0.97	18	Cir	32.881	374.07	374.43	1.095	374.37	374.80	0.13	374.80	9	DropGrate
36	Pipe - (54)	1.99	15	Cir	25.642	372.50	372.68	0.702	373.02	373.24	n/a	373.24	8	Combination
37	Pipe - (22)	0.46	15	Cir	29.330	372.80	373.68	3.000	373.24	373.94	n/a	373.94 j	36	Combination
38	Pipe - (41)	1.24	15	Cir	26.271	371.92	372.30	1.446	372.94	372.74	n/a	372.74	30	Combination
39	Pipe - (40)	1.27	15	Cir	34.056	368.81	369.03	0.646	369.43	369.48	n/a	369.48 j	29	Combination
40	Pipe - (43)	1.31	15	Cir	24.427	368.75	369.01	1.064	369.54	369.46	n/a	369.46	7	Combination
41	Pipe - (63)	5.02	18	Cir	123.325	368.30	368.97	0.543	369.54	369.84	0.34	370.19	7	DropGrate
42	Pipe - (24)	1.19	15	Cir	28.012	365.72	366.10	1.357	366.45	366.53	n/a	366.53 j	5	Combination
43	Pipe - (53)	0.42	15	Cir	29.509	366.20	366.35	0.508	366.53	366.61	0.09	366.69	42	Combination
44	Pipe - (17)	1.58	18	Cir	24.451	364.85	365.10	1.022	365.73	365.57	n/a	365.57	27	Combination
45	Pipe - (28)	0.93	15	Cir	24.503	363.42	363.65	0.939	364.36	364.03	n/a	364.03	3	Combination
46	Pipe - (26)	1.20	15	Cir	25.748	359.09	359.26	0.660	362.17*	362.18*	0.01	362.20	1	Combination
47	Pipe - (67)	16.81	36	Cir	38.074	352.90	353.09	0.499	355.90	355.92	0.05	355.96	End	DropGrate
48	Pipe - (66)	14.91	30	Cir	98.975	353.19	353.69	0.500	355.96	356.08	0.02	356.11	47	Manhole

Project File: Outfall #1.stm | Number of lines: 50 | Run Date: 12/23/2024

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Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
49	Pipe - (65)	14.96	30	Cir	48.268	353.79	354.03	0.497	356.11	355.33	0.50	355.33	48	Manhole
50	Pipe - (29)	15.03	24	Cir	109.030	355.35	357.75	2.200	356.29	359.15	n/a	359.15	49	DropGrate

Project File: Outfall #1.stm

Number of lines: 50

Run Date: 12/23/2024

NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Inlet Report

25-Year Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	EX. CB 375	0.04	0.00	0.04	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.07	1.13	0.00	0.00	0.0	Off
2	376	0.69	0.00	0.61	0.08	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.19	5.53	0.09	1.49	0.0	Off
3	377	0.81	0.00	0.70	0.12	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.20	5.99	0.10	1.70	0.0	Off
4	377B	0.04	0.00	0.00	0.04	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.060	0.020	0.013	0.00	0.00	0.00	0.00	0.0	Off
5	378	0.73	0.00	0.64	0.09	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.19	5.69	0.09	1.56	0.0	Off
6	379	0.27	0.00	0.27	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.14	3.00	0.02	0.39	0.0	Off
7	380	1.20	0.00	0.95	0.25	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.22	7.25	0.14	2.80	0.0	Off
8	381	0.77	0.00	0.67	0.10	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.20	5.84	0.10	1.64	0.0	Off
9	381C	0.35	0.00	0.34	0.01	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.15	3.63	0.04	0.67	0.0	Off
10	382	0.31	0.00	0.30	0.01	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.15	3.33	0.03	0.54	0.0	Off
11	382A	0.04	0.00	0.00	0.04	MH	6.0	0.00	0.00	3.00	2.50	Sag	2.00	0.060	0.020	0.013	0.00	0.00	0.00	0.00	0.0	Off
12	395	0.27	0.00	0.27	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.14	3.00	0.02	0.39	0.0	Off
13	396	0.93	0.00	0.77	0.15	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.21	6.40	0.11	1.89	0.0	Off
14	396A	0.81	0.00	0.70	0.12	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.20	5.99	0.10	1.70	0.0	Off
15	396B	0.58	0.00	0.53	0.05	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.18	5.00	0.08	1.26	0.0	Off
16	396C	9.84	0.00	9.84	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.010	0.010	0.013	0.55	112.36	0.55	112.36	0.0	Off
17	383	0.04	0.00	0.04	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.07	1.13	0.00	0.00	0.0	Off
18	384	0.46	0.00	0.44	0.03	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.17	4.38	0.06	0.99	0.0	Off
19	385	1.16	0.00	1.06	0.10	Comb	6.0	1.50	0.00	6.00	2.50	0.005	2.00	0.060	0.020	0.013	0.22	7.13	0.10	1.63	0.0	Off
20	386	1.81	0.00	1.58	0.24	Comb	6.0	1.50	0.00	6.00	2.50	0.005	2.00	0.060	0.020	0.013	0.26	8.76	0.13	2.67	0.0	Off
21	386A	1.24	0.00	1.12	0.12	Comb	6.0	1.50	0.00	6.00	2.50	0.005	2.00	0.060	0.020	0.013	0.23	7.35	0.10	1.71	0.0	Off
22	383A	2.36	0.00	2.36	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.010	0.010	0.013	0.21	44.52	0.21	44.52	0.0	Off
23	385A	1.24	0.00	1.12	0.12	Comb	6.0	1.50	0.00	6.00	2.50	0.005	2.00	0.060	0.020	0.013	0.23	7.35	0.10	1.71	0.0	Off

Project File: Outfall #1.stm | Number of lines: 50 | Run Date: 12/23/2024

NOTES: Inlet N-Values = 0.016; Intensity = 65.79 / (Inlet time + 11.50) ^ 0.75; Return period = 25 Yrs. ; * Indicates Known Q added.All curb inlets are throat.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
24	395A	0.42	0.00	0.40	0.02	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.16	4.15	0.05	0.90	0.0	Off
25	385B	1.38	0.00	1.38	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.010	0.010	0.013	0.15	31.80	0.15	31.80	0.0	Off
26	385C	0.90	0.00	0.90	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.013	0.11	13.19	0.11	13.19	0.0	Off
27	390	0.85	0.00	0.72	0.13	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.20	6.13	0.11	1.76	0.0	Off
28	390B	0.04	0.00	0.00	0.04	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.060	0.020	0.013	0.00	0.00	0.00	0.00	0.0	Off
29	391	0.42	0.00	0.40	0.02	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.16	4.15	0.05	0.90	0.0	Off
30	392	0.93	0.00	0.77	0.15	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.21	6.40	0.11	1.89	0.0	Off
31	393	1.08	0.00	0.87	0.21	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.22	6.90	0.13	2.35	0.0	Off
32	393A	2.01	0.00	1.72	0.28	Comb	6.0	1.50	0.00	6.00	2.50	0.005	2.00	0.060	0.020	0.013	0.26	9.15	0.14	3.11	0.0	Off
33	393B	5.51	0.00	5.51	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.010	0.010	0.013	0.37	76.93	0.37	76.93	0.0	Off
34	393C	0.42	0.00	0.42	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.010	0.010	0.013	0.07	15.56	0.07	15.56	0.0	Off
35	381D	0.97	0.00	0.97	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.010	0.010	0.013	0.12	25.45	0.12	25.45	0.0	Off
36	381A	1.54	0.00	1.15	0.39	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.24	8.15	0.16	3.94	0.0	Off
37	381B	0.46	0.00	0.44	0.03	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.17	4.38	0.06	0.99	0.0	Off
38	392A	1.24	0.00	0.97	0.27	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.23	7.35	0.14	2.95	0.0	Off
39	391A	1.27	0.00	0.99	0.28	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.23	7.46	0.14	3.08	0.0	Off
40	380A	1.31	0.00	1.02	0.29	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.23	7.57	0.14	3.21	0.0	Off
41	380B	5.02	0.00	5.02	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.010	0.010	0.013	0.35	72.43	0.35	72.43	0.0	Off
42	378A	0.77	0.00	0.67	0.10	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.20	5.84	0.10	1.64	0.0	Off
43	378B	0.42	0.00	0.40	0.02	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.16	4.15	0.05	0.90	0.0	Off
44	390A	1.58	0.00	1.17	0.41	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.24	8.24	0.16	4.05	0.0	Off
45	377A	0.93	0.00	0.77	0.15	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.21	6.40	0.11	1.89	0.0	Off
46	375A	1.20	0.00	0.95	0.25	Comb	6.0	1.50	0.00	3.00	2.50	0.005	2.00	0.060	0.020	0.013	0.22	7.25	0.14	2.80	0.0	Off

Project File: Outfall #1.stm | Number of lines: 50 | Run Date: 12/23/2024

NOTES: Inlet N-Values = 0.016; Intensity = 65.79 / (Inlet time + 11.50) ^ 0.75; Return period = 25 Yrs. ; * Indicates Known Q added.All curb inlets are throat.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
47	31A	2.24	0.00	2.24	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.010	0.010	0.013	0.21	43.13	0.21	43.13	0.0	Off
48	EX. 31	0.04	0.00	0.00	0.04	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.060	0.020	0.013	0.00	0.00	0.00	0.00	0.0	Off
49	EX. 32	0.04	0.00	0.00	0.04	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.060	0.020	0.013	0.00	0.00	0.00	0.00	0.0	Off
50	32A	15.03	0.00	15.03	0.00	DrGrt	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.010	0.010	0.013	0.73	148.40	0.73	148.40	0.0	Off

Project File: Outfall #1.stm | Number of lines: 50 | Run Date: 12/23/2024

NOTES: Inlet N-Values = 0.016; Intensity = 65.79 / (Inlet time + 11.50) ^ 0.75; Return period = 25 Yrs. ; * Indicates Known Q added.All curb inlets are throat.

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	36	46.35	357.90	360.90	3.00	7.07	6.56	0.67	361.57	0.483	57.000	358.29	361.13	2.84	6.92	6.70	0.70	361.83	0.418	0.451	0.257	1.50	1.05
2	36	45.47	358.40	362.17	3.00	7.07	6.43	0.64	362.82	0.465	41.866	358.85	362.37	3.00	7.07	6.43	0.64	363.01	0.465	0.465	0.195	0.50	0.32
3	36	45.44	358.95	362.69	3.00	5.54	6.43	0.64	363.33	0.464	196.394	362.17	364.36 j	2.19**	5.54	8.20	1.05	365.41	0.593	0.528	n/a	1.50	n/a
4	36	44.18	362.27	364.36	2.09	5.27	8.39	1.02	365.38	0.000	78.359	363.50	365.66	2.16**	5.46	8.10	1.02	366.68	0.000	0.000	n/a	1.00	n/a
5	30	31.44	364.00	365.66	1.66	3.47	9.06	0.95	366.61	0.000	51.000	364.54	366.45	1.91**	4.02	7.82	0.95	367.40	0.000	0.000	n/a	1.30	n/a
6	30	30.05	364.64	366.45	1.81	3.80	7.90	0.91	367.36	0.000	126.897	366.44	368.31	1.87**	3.93	7.64	0.91	369.22	0.000	0.000	n/a	0.50	0.45
7	30	29.92	366.65	368.31	1.65	3.44	8.69	0.90	369.21	0.000	59.532	367.68	369.54	1.86**	3.92	7.63	0.90	370.45	0.000	0.000	n/a	1.50	n/a
8	30	23.91	367.78	369.54	1.76	3.47	6.48	0.74	370.28	0.000	210.964	371.03	372.69 j	1.66**	3.47	6.89	0.74	373.43	0.000	0.000	n/a	1.44	1.06
9	30	21.73	371.43	372.91	1.48*	3.02	7.20	0.68	373.59	0.000	140.875	372.35	373.93	1.58**	3.28	6.63	0.68	374.62	0.000	0.000	n/a	1.50	1.02
10	30	20.72	373.07	374.53	1.46*	2.98	6.96	0.66	375.19	0.000	86.180	373.60	375.15	1.54**	3.18	6.51	0.66	375.80	0.000	0.000	n/a	0.50	n/a
11	24	20.51	373.70	375.45	1.75*	2.91	7.05	0.77	376.22	0.747	40.124	374.00	375.75	1.75	2.91	7.05	0.77	376.52	0.747	0.747	0.300	1.00	0.77
12	24	12.60	375.27	376.60	1.34*	2.24	5.64	0.49	377.10	0.499	23.025	375.38	376.72	1.34	2.23	5.64	0.50	377.21	0.501	0.500	0.115	1.50	0.74
13	24	12.01	375.48	377.46	1.98	3.14	3.83	0.23	377.69	0.260	49.905	375.73	377.57	1.84	3.02	3.97	0.25	377.81	0.245	0.252	0.126	1.07	0.26
14	24	11.15	375.83	377.83	2.00	3.14	3.55	0.20	378.03	0.241	31.516	375.99	377.90	1.91	3.09	3.61	0.20	378.10	0.211	0.226	0.071	0.65	0.13
15	24	10.39	376.09	378.03	1.93	3.11	3.34	0.17	378.20	0.185	27.860	376.23	378.07	1.84	3.02	3.44	0.18	378.25	0.183	0.184	0.051	0.99	0.18
16	18	9.84	376.73	378.25	1.50	1.77	5.57	0.48	378.73	0.879	25.968	376.96	378.46	1.50	1.77	5.57	0.48	378.94	0.854	0.866	0.225	1.00	0.48
17	24	9.35	374.10	376.52	2.00	3.14	2.98	0.14	376.66	0.171	71.389	374.48	376.64	2.00	3.14	2.98	0.14	376.78	0.171	0.171	0.122	1.50	0.21
18	24	7.40	374.58	376.85	2.00	3.14	2.36	0.09	376.93	0.107	110.816	375.13	376.95	1.82	3.00	2.47	0.09	377.04	0.094	0.100	0.111	0.66	0.06
19	24	7.17	375.23	377.01	1.78	1.47	2.42	0.37	377.38	0.106	133.897	375.90	376.85	0.95**	1.47	4.88	0.37	377.22	0.138	0.122	n/a	2.18	0.81
20	18	3.03	376.02	376.85	0.83	0.75	3.04	0.14	376.99	0.241	260.141	377.30	377.96 j	0.66**	0.75	4.04	0.25	378.21	0.516	0.379	n/a	1.50	n/a
21	15	1.24	377.55	377.96	0.41*	0.35	3.49	0.16	378.12	0.000	25.751	377.72	378.16	0.44**	0.38	3.22	0.16	378.32	0.000	0.000	n/a	1.00	n/a
22	15	2.36	376.03	376.85	0.82	0.60	2.77	0.24	377.09	0.000	28.157	376.66	377.27 j	0.61**	0.60	3.93	0.24	377.51	0.000	0.000	n/a	1.00	0.24

Project File: Outfall #1.stm | Number of lines: 50 | Run Date: 12/23/2024

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
23	15	1.24	376.45	376.89	0.44*	0.38	3.23	0.16	377.05	0.000	24.491	376.58	377.02	0.44**	0.38	3.22	0.16	377.18	0.000	0.000	n/a	1.00	n/a
24	15	0.42	376.87	377.46	0.59	0.18	0.74	0.09	377.55	0.000	24.507	377.05	377.30	0.25**	0.18	2.39	0.09	377.39	0.000	0.000	n/a	1.00	n/a
25	15	2.13	376.05	376.85	0.80	0.56	2.57	0.23	377.08	0.119	23.549	376.22	376.80	0.58**	0.56	3.81	0.23	377.03	0.119	0.119	n/a	1.49	0.34
26	15	0.90	376.32	376.80	0.48	0.31	2.06	0.13	376.94	0.019	100.850	376.85	377.22	0.37**	0.31	2.94	0.13	377.36	0.024	0.022	n/a	1.00	n/a
27	24	14.60	364.00	365.66	1.66	2.30	5.23	0.62	366.29	0.000	41.676	364.35	365.73 j	1.38**	2.30	6.34	0.62	366.35	0.000	0.000	n/a	1.42	0.89
28	24	12.39	364.57	365.73	1.16	1.88	6.58	0.54	366.27	0.000	88.898	366.35	367.61	1.26**	2.09	5.92	0.54	368.16	0.000	0.000	n/a	0.41	0.22
29	24	12.43	366.55	367.61	1.06	1.70	7.33	0.55	368.16	0.000	80.422	368.16	369.43	1.27**	2.10	5.93	0.55	369.97	0.000	0.000	n/a	1.48	0.81
30	18	10.92	368.68	369.67	0.99*	1.24	8.81	0.73	370.41	0.000	166.115	371.67	372.94	1.27**	1.59	6.87	0.73	373.67	0.000	0.000	n/a	1.39	1.02
31	18	8.94	371.77	372.94	1.17	1.46	6.07	0.58	373.52	0.000	161.824	374.90	376.06 j	1.16**	1.46	6.12	0.58	376.64	0.000	0.000	n/a	2.22	n/a
32	18	7.50	375.00	376.26	1.26*	1.58	4.74	0.35	376.61	0.490	24.500	375.12	376.38	1.26	1.58	4.73	0.35	376.73	0.489	0.490	0.120	0.50	0.17
33	15	5.51	375.42	376.55	1.13	1.00	4.71	0.47	377.02	0.000	22.252	375.64	376.59	0.95**	1.00	5.50	0.47	377.06	0.000	0.000	n/a	1.00	0.47
34	15	0.42	375.15	376.06	0.91	0.18	0.45	0.09	376.14	0.000	20.817	375.30	375.55	0.25**	0.18	2.39	0.09	375.64	0.000	0.000	n/a	1.00	n/a
35	18	0.97	374.07	374.37	0.30*	0.25	3.82	0.13	374.50	0.000	32.881	374.43	374.80	0.37**	0.33	2.89	0.13	374.93	0.000	0.000	n/a	1.00	0.13
36	15	1.99	372.50	373.02	0.52*	0.49	4.07	0.22	373.24	0.000	25.642	372.68	373.24	0.56**	0.53	3.73	0.22	373.46	0.000	0.000	n/a	0.50	n/a
37	15	0.46	372.80	373.24	0.44	0.19	1.20	0.09	373.33	0.000	29.330	373.68	373.94 j	0.26**	0.19	2.45	0.09	374.04	0.000	0.000	n/a	1.00	0.09
38	15	1.24	371.92	372.94	1.02	0.38	1.16	0.16	373.10	0.000	26.271	372.30	372.74	0.44**	0.38	3.22	0.16	372.90	0.000	0.000	n/a	1.00	n/a
39	15	1.27	368.81	369.43	0.62	0.39	2.11	0.16	369.59	0.000	34.056	369.03	369.48 j	0.45**	0.39	3.25	0.16	369.64	0.000	0.000	n/a	1.00	n/a
40	15	1.31	368.75	369.54	0.79	0.40	1.60	0.17	369.71	0.000	24.427	369.01	369.46	0.45**	0.40	3.28	0.17	369.63	0.000	0.000	n/a	1.00	n/a
41	18	5.02	368.30	369.54	1.24	1.57	3.21	0.16	369.70	0.224	123.325	368.97	369.84	0.87	1.07	4.71	0.34	370.19	0.558	0.391	0.482	1.00	0.34
42	15	1.19	365.72	366.45	0.73	0.37	1.60	0.16	366.61	0.000	28.012	366.10	366.53 j	0.43**	0.37	3.18	0.16	366.69	0.000	0.000	n/a	0.50	n/a
43	15	0.42	366.20	366.53	0.33	0.18	1.65	0.04	366.57	0.188	29.509	366.35	366.61	0.26**	0.18	2.35	0.09	366.69	0.516	0.352	0.104	1.00	0.09
44	18	1.58	364.85	365.73	0.88	0.48	1.48	0.17	365.90	0.000	24.451	365.10	365.57	0.47**	0.48	3.32	0.17	365.74	0.000	0.000	n/a	1.00	n/a

Project File: Outfall #1.stm | Number of lines: 50 | Run Date: 12/23/2024

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

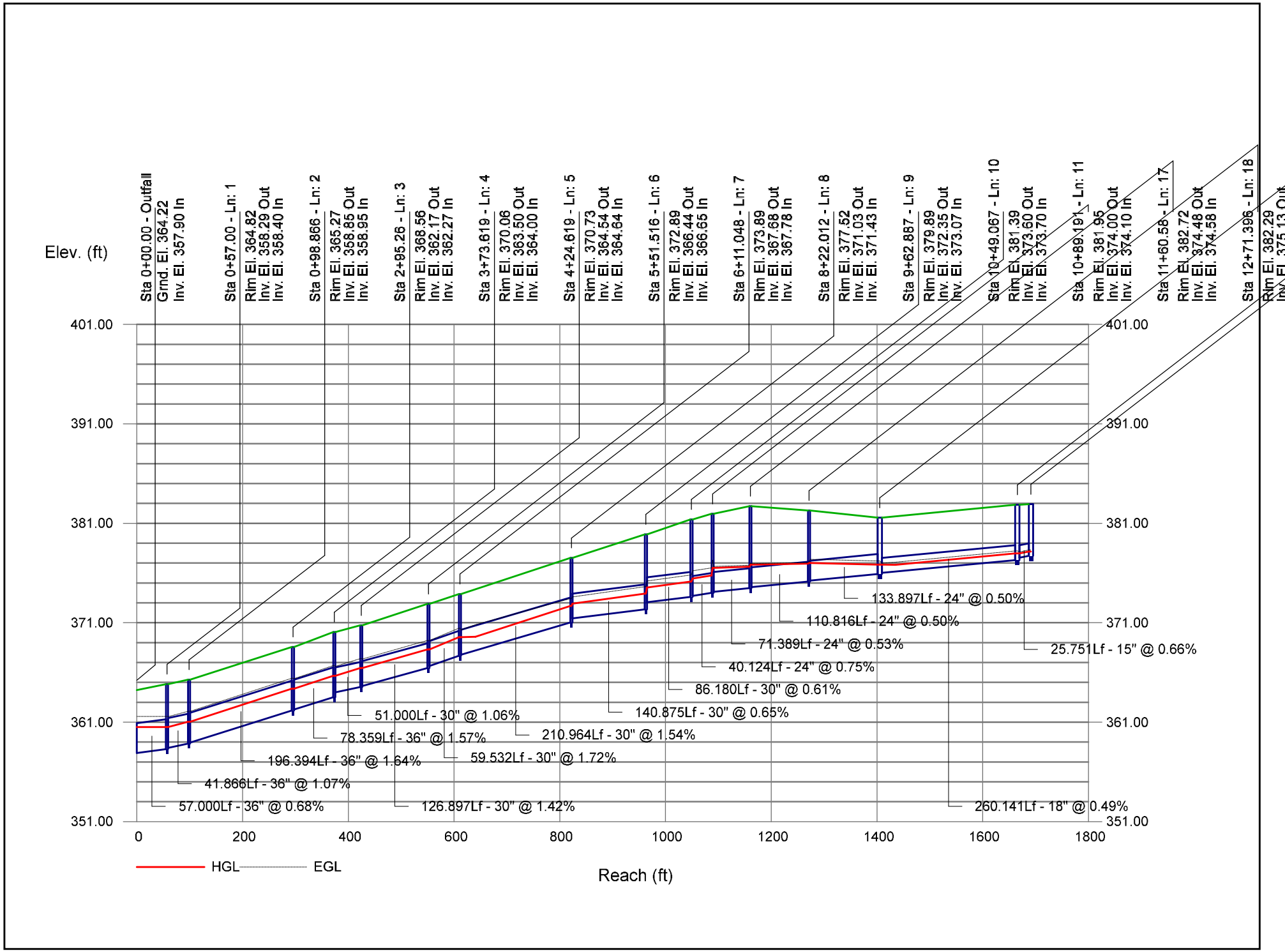
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
45	15	0.93	363.42	364.36	0.94	0.31	0.93	0.14	364.50	0.000	24.503	363.65	364.03	0.38**	0.31	2.97	0.14	364.16	0.000	0.000	n/a	1.00	n/a
46	15	1.20	359.09	362.17	1.25	1.23	0.98	0.01	362.19	0.034	25.748	359.26	362.18	1.25	1.23	0.98	0.01	362.20	0.034	0.034	0.009	1.00	0.01
47	36	16.81	352.90	355.90	3.00*	7.07	2.38	0.09	355.99	0.064	38.074	353.09	355.92	2.83	6.91	2.43	0.09	356.01	0.055	0.059	0.023	0.50	0.05
48	30	14.91	353.19	355.96	2.50	4.91	3.04	0.14	356.11	0.132	98.975	353.69	356.08	2.40	4.84	3.08	0.15	356.23	0.115	0.124	0.122	0.15	0.02
49	30	14.96	353.79	356.11	2.32	2.59	3.15	0.52	356.63	0.000	48.268	354.03	355.33	1.30**	2.59	5.78	0.52	355.85	0.000	0.000	n/a	0.96	0.50
50	24	15.03	355.35	356.29	0.94*	1.45	10.38	0.64	356.93	0.000	109.030	357.75	359.15	1.40**	2.34	6.42	0.64	359.79	0.000	0.000	n/a	1.00	n/a

Project File: Outfall #1.stm | Number of lines: 50 | Run Date: 12/23/2024

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

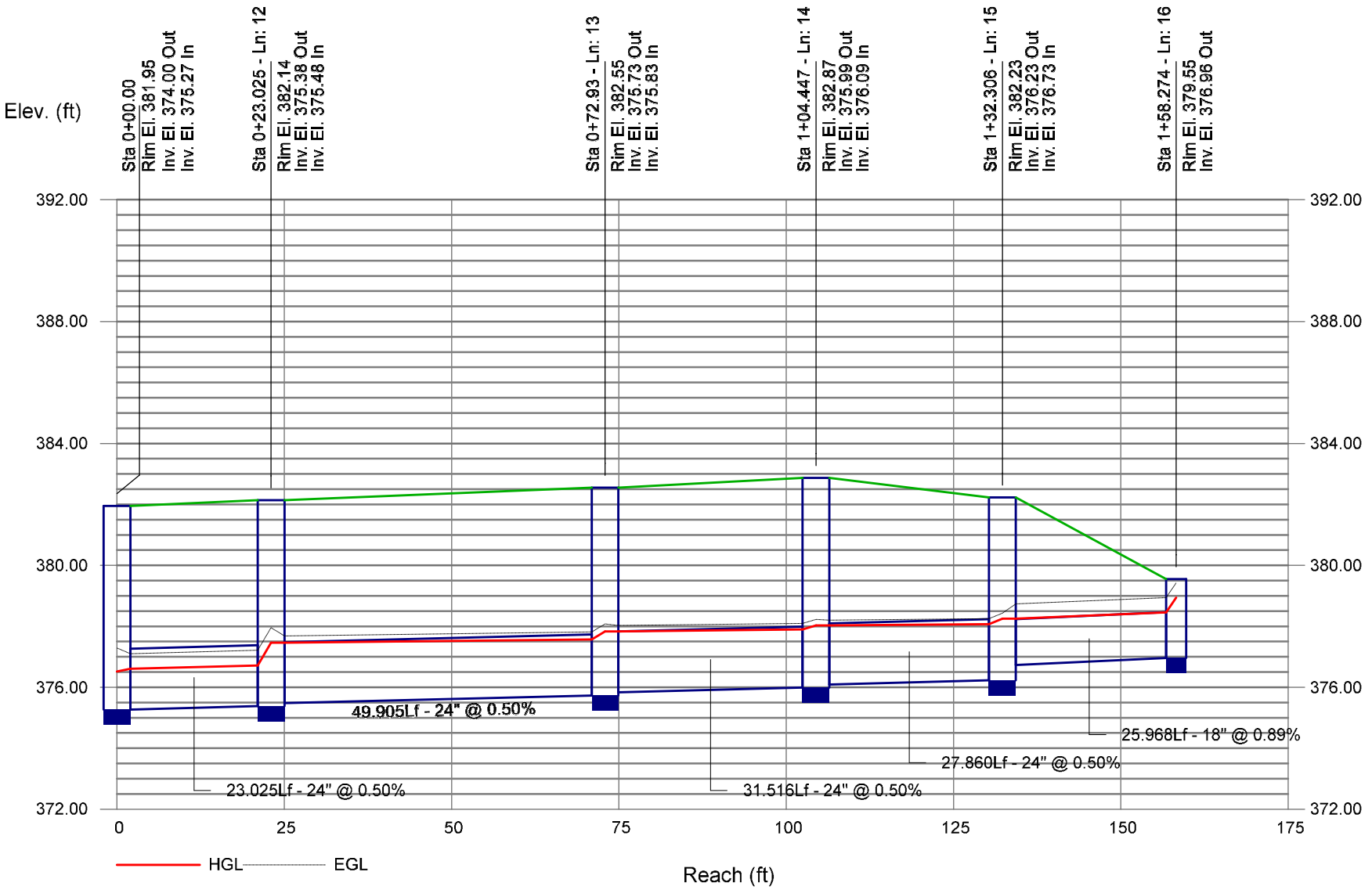
Storm Sewer Profile

25-Year: 1-21 Profile Proj. file: Outfall #1.stm



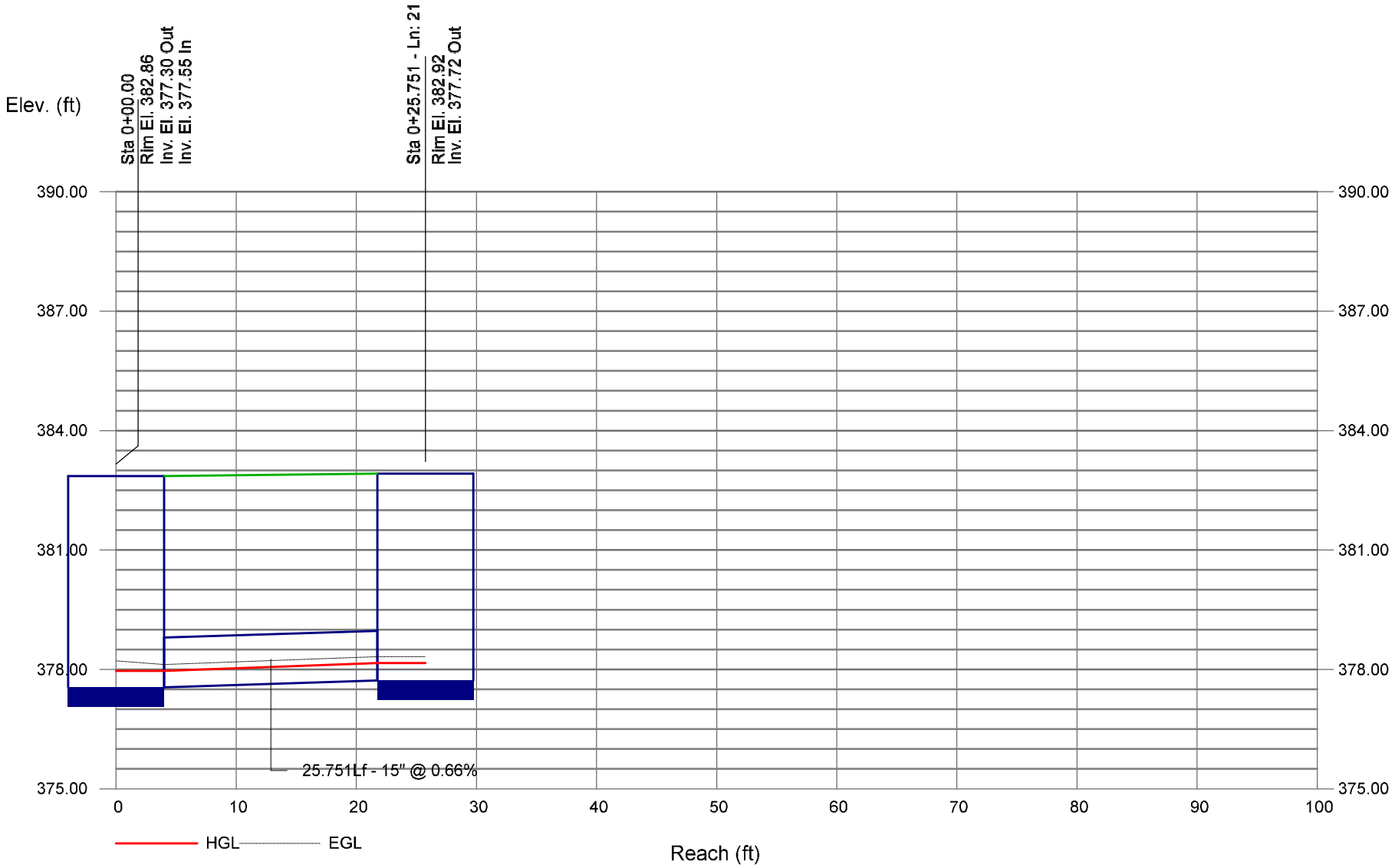
Storm Sewer Profile

25-Year: 12-16 Profile Proj. file: Outfall #1.stm



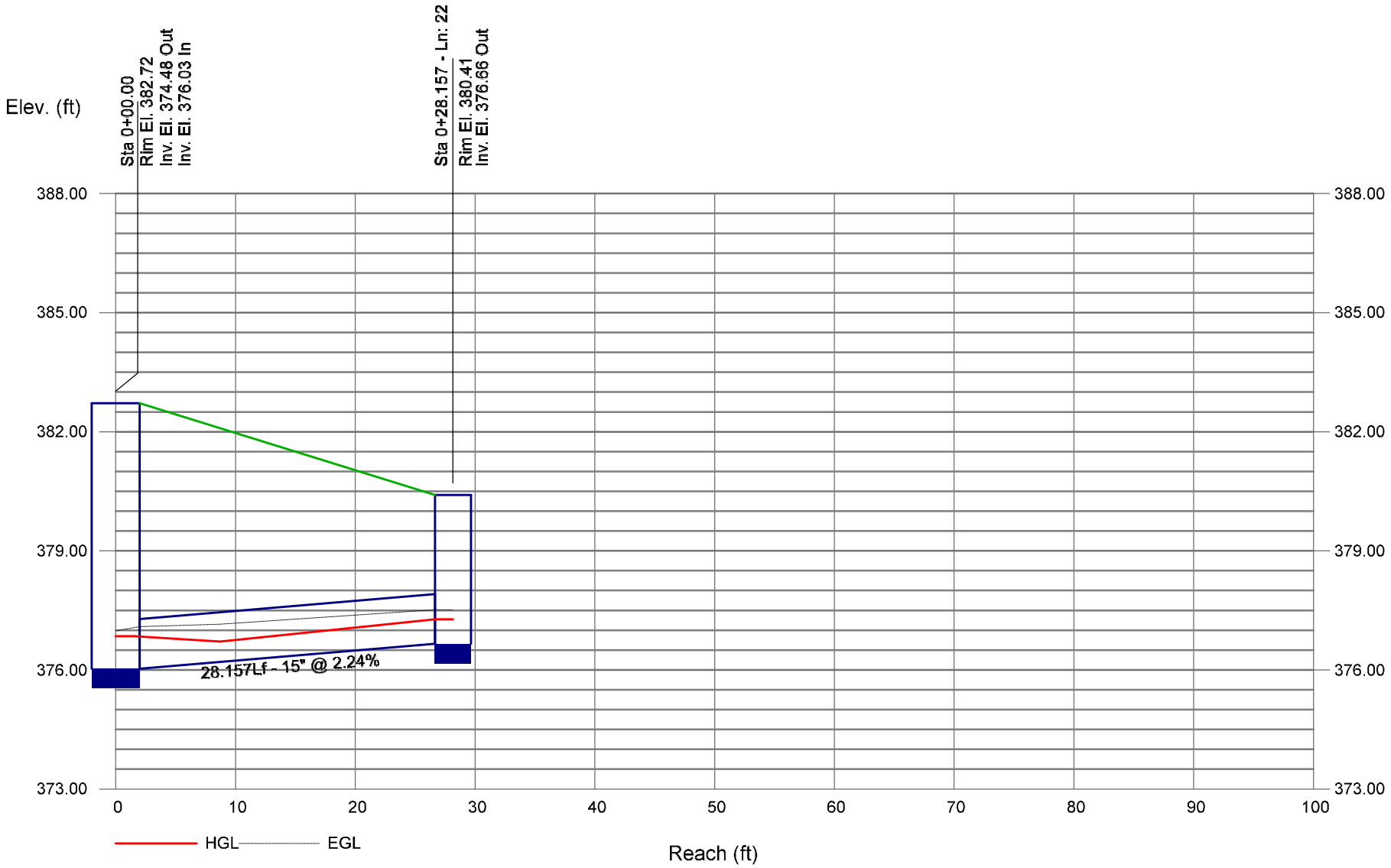
Storm Sewer Profile

25-Year: 21-21 Profile Proj. file: Outfall #1.stm



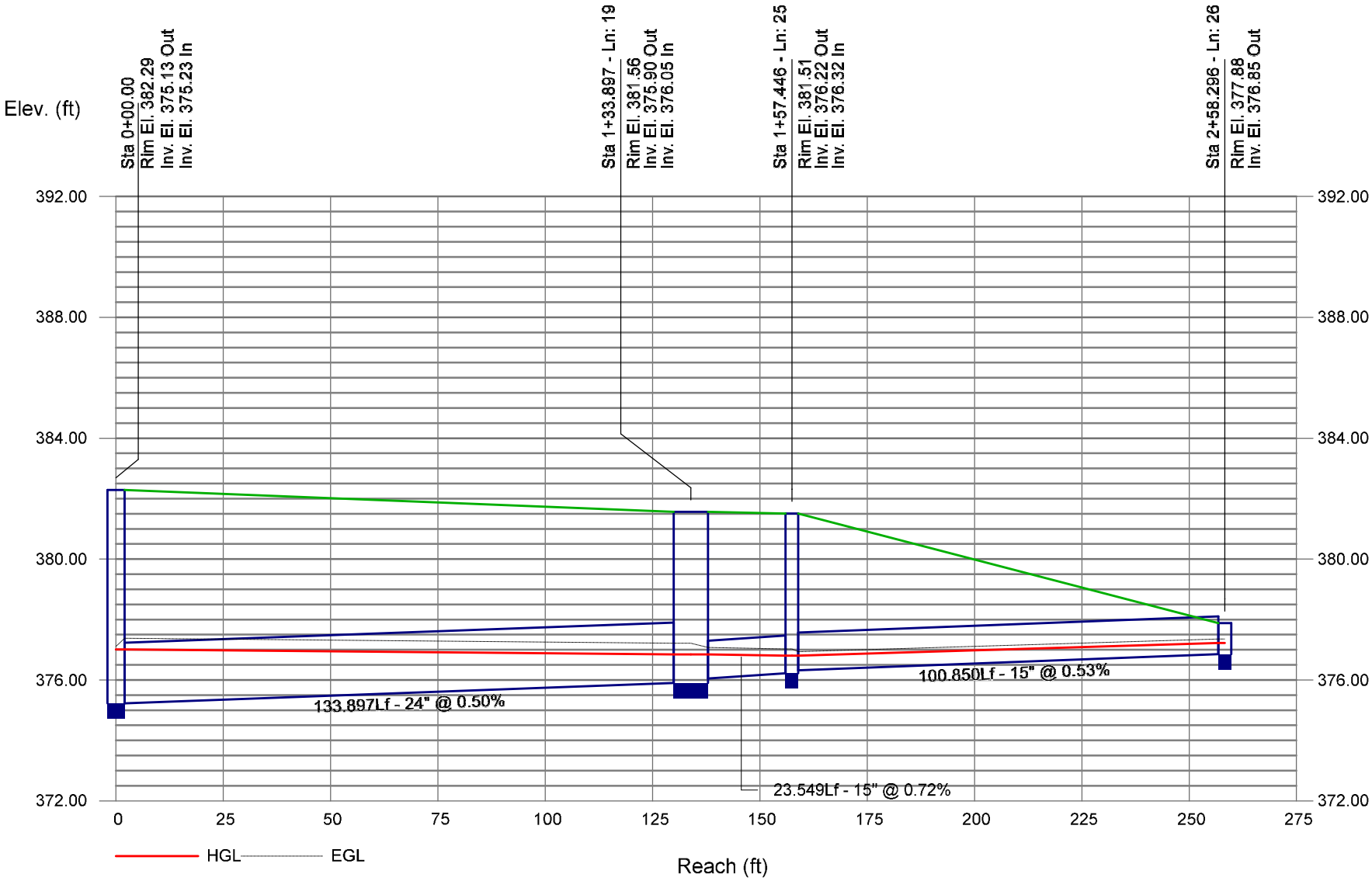
Storm Sewer Profile

25-Year: 22-22 Profile Proj. file: Outfall #1.stm



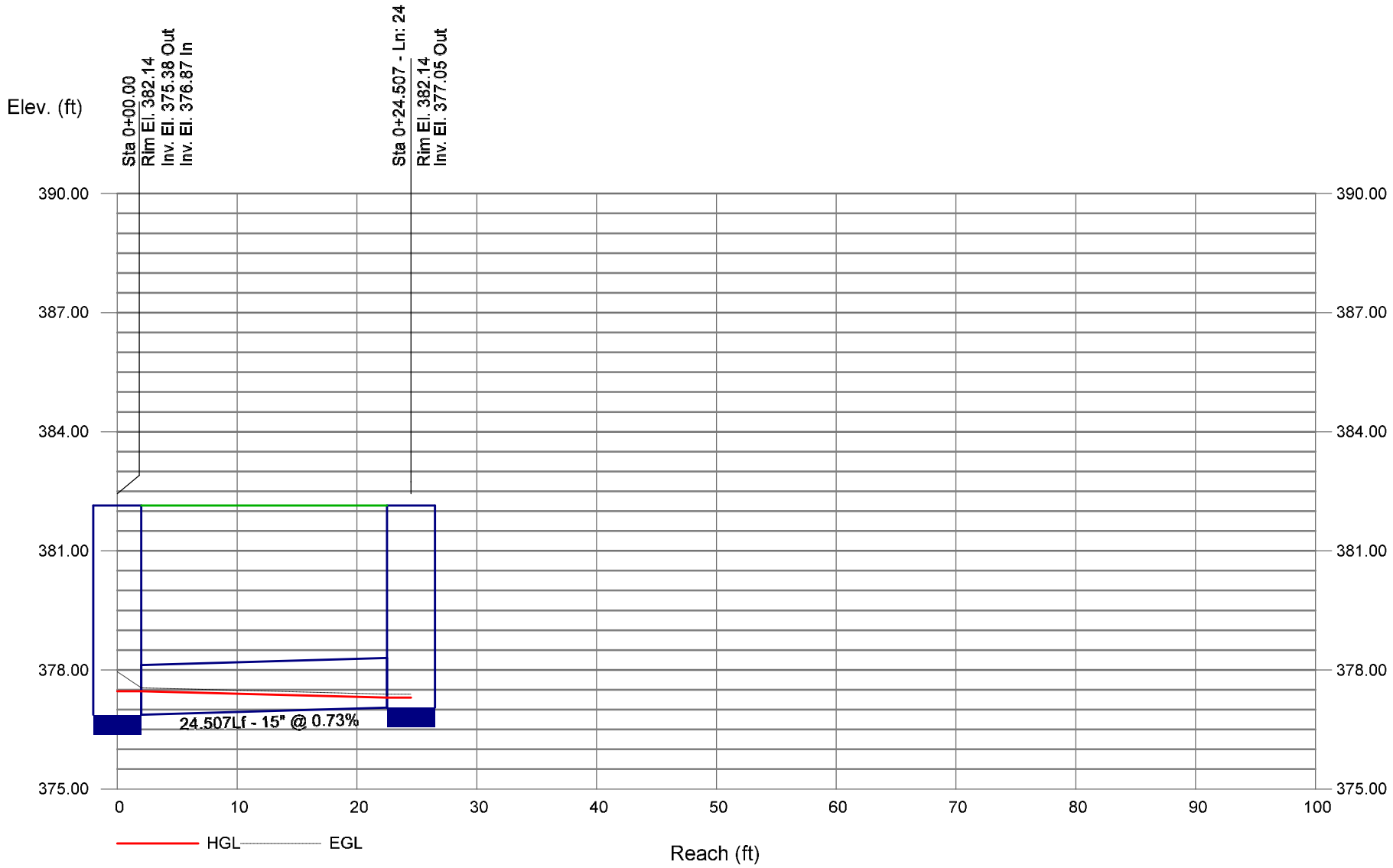
Storm Sewer Profile

25-Year: 23-26 Profile Proj. file: Outfall #1.stm



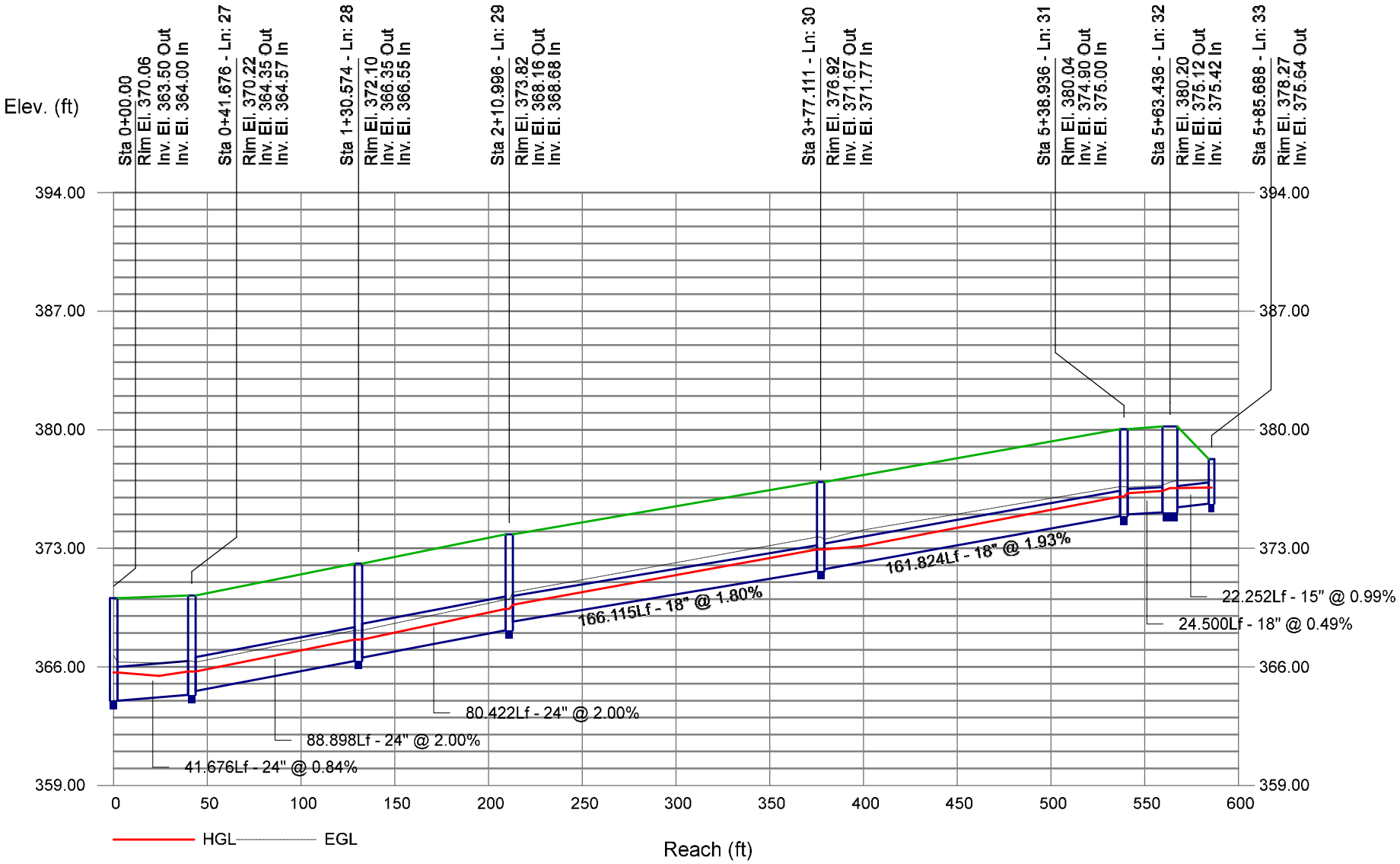
Storm Sewer Profile

25-Year: 24-24 Profile Proj. file: Outfall #1.stm



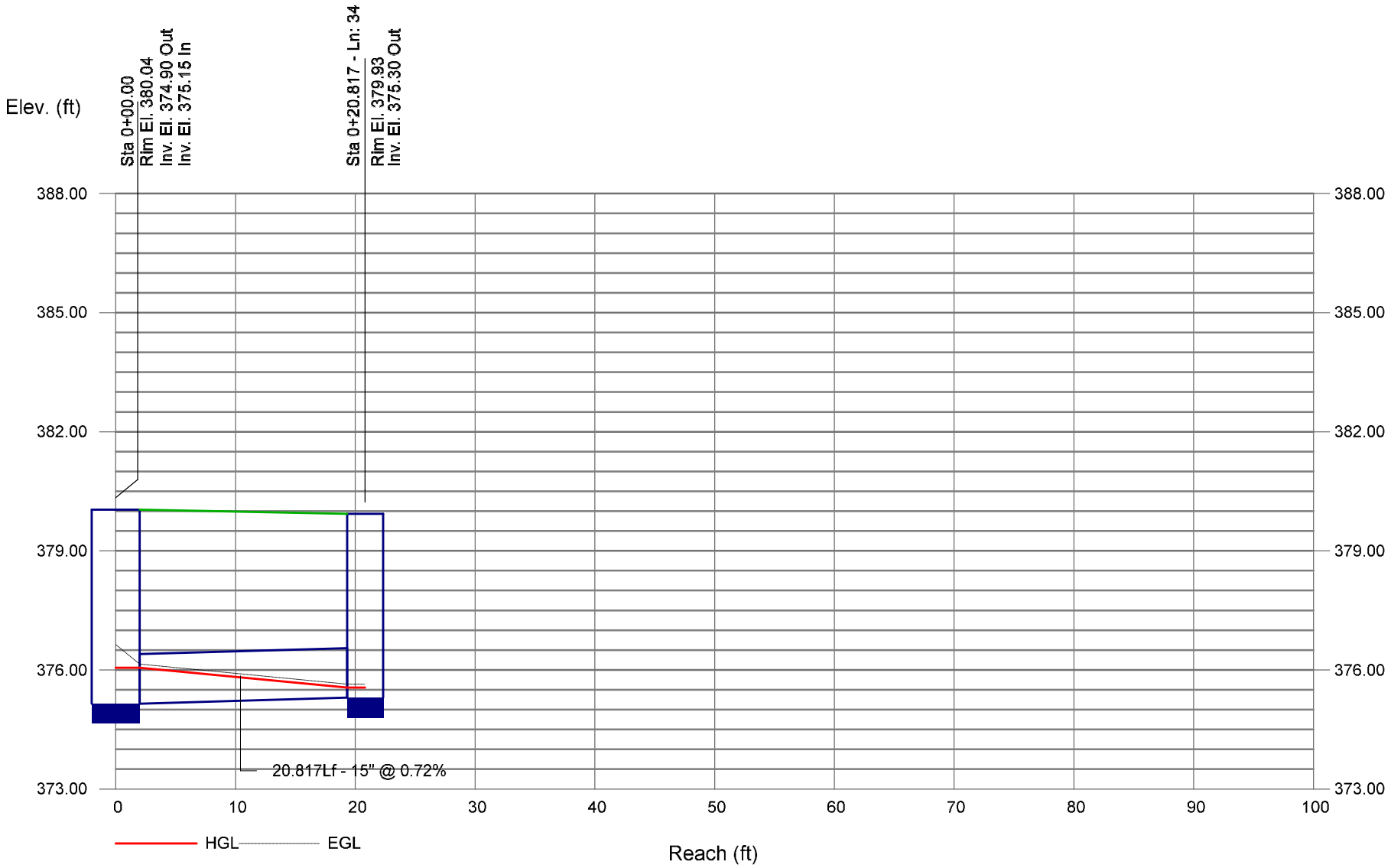
Storm Sewer Profile

25-Year: 27-33 Profile Proj. file: Outfall #1.stm



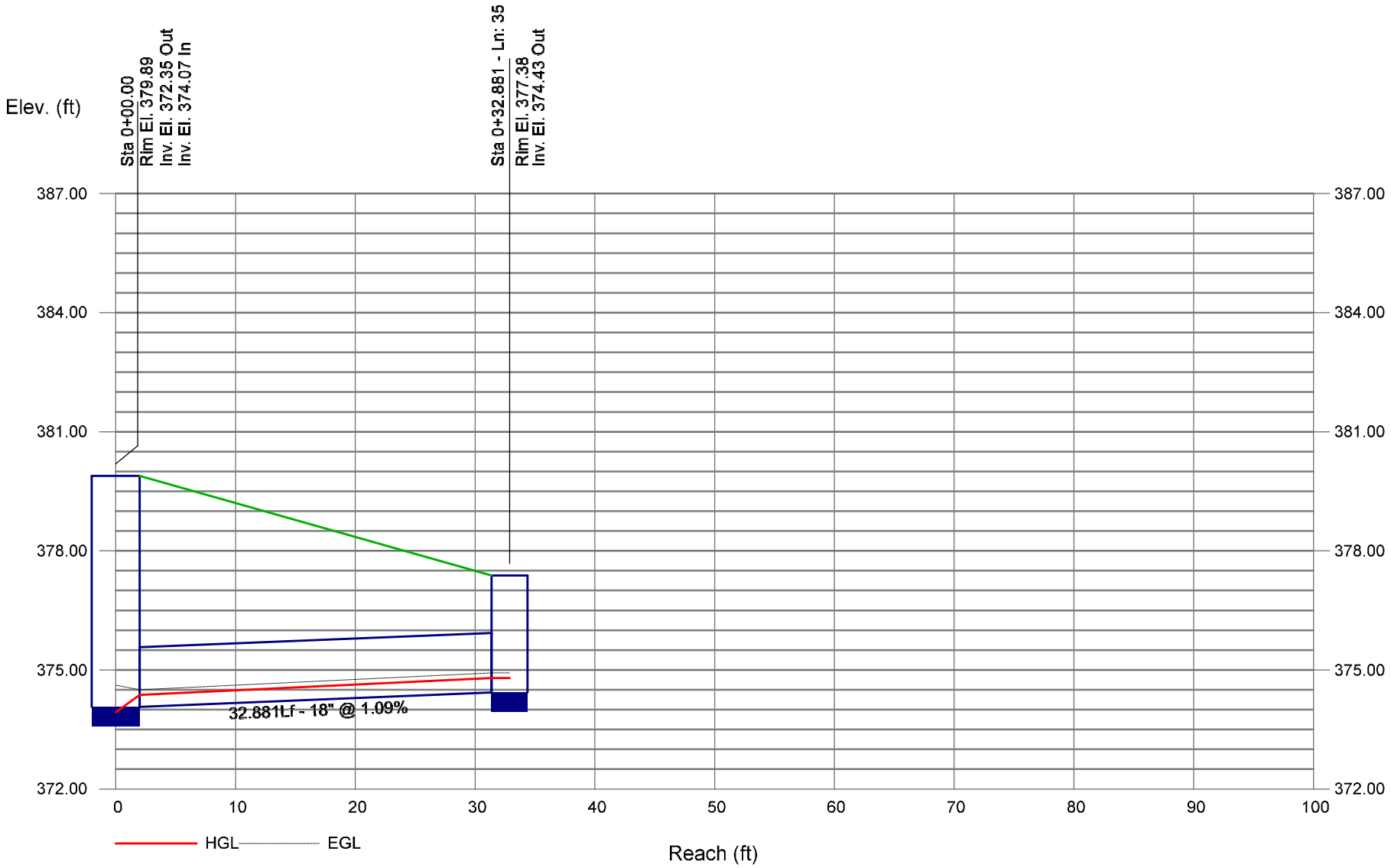
Storm Sewer Profile

25-Year: 34-34 Profile Proj. file: Outfall #1.stm



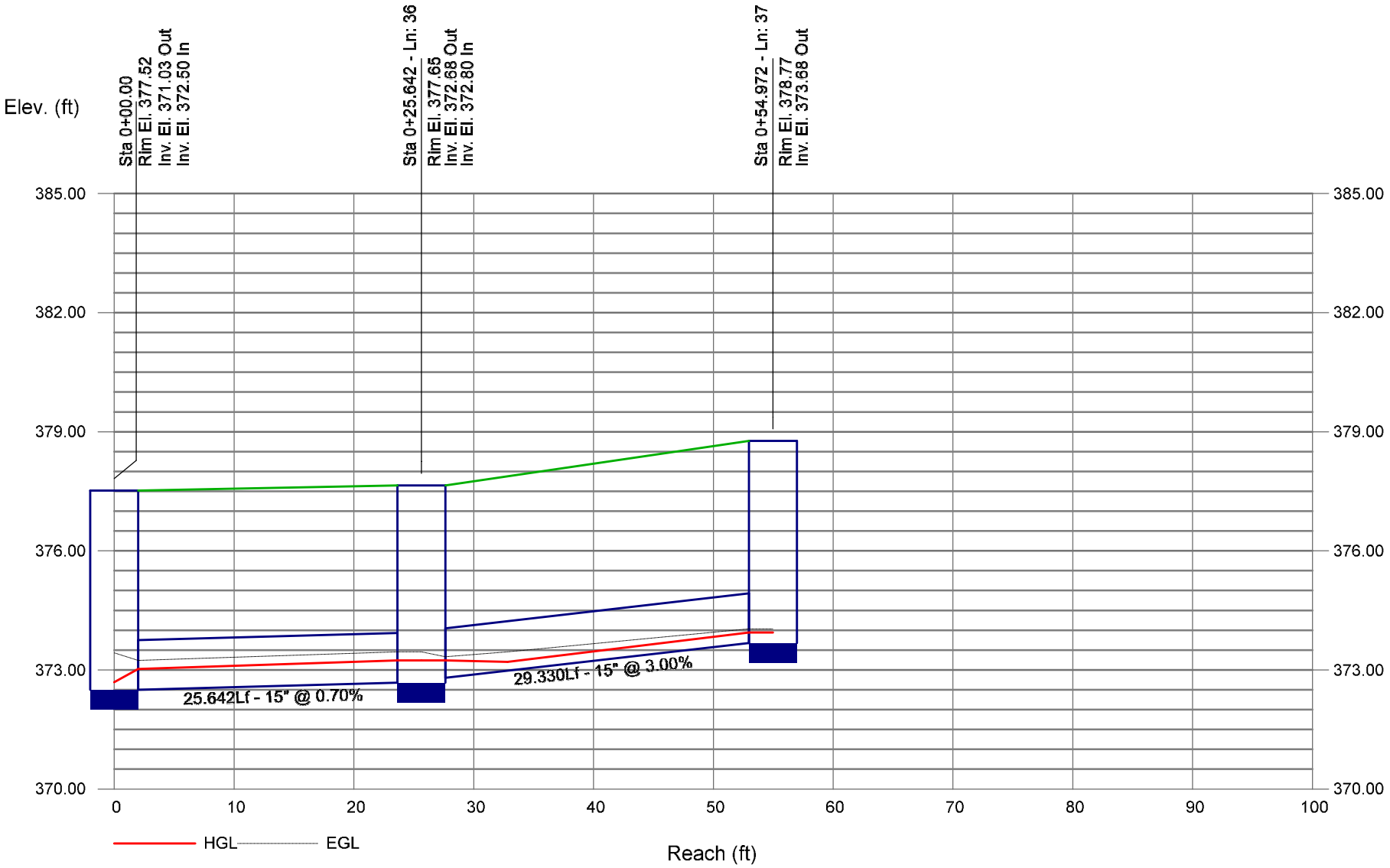
Storm Sewer Profile

25-Year: 35-35 Profile Proj. file: Outfall #1.stm



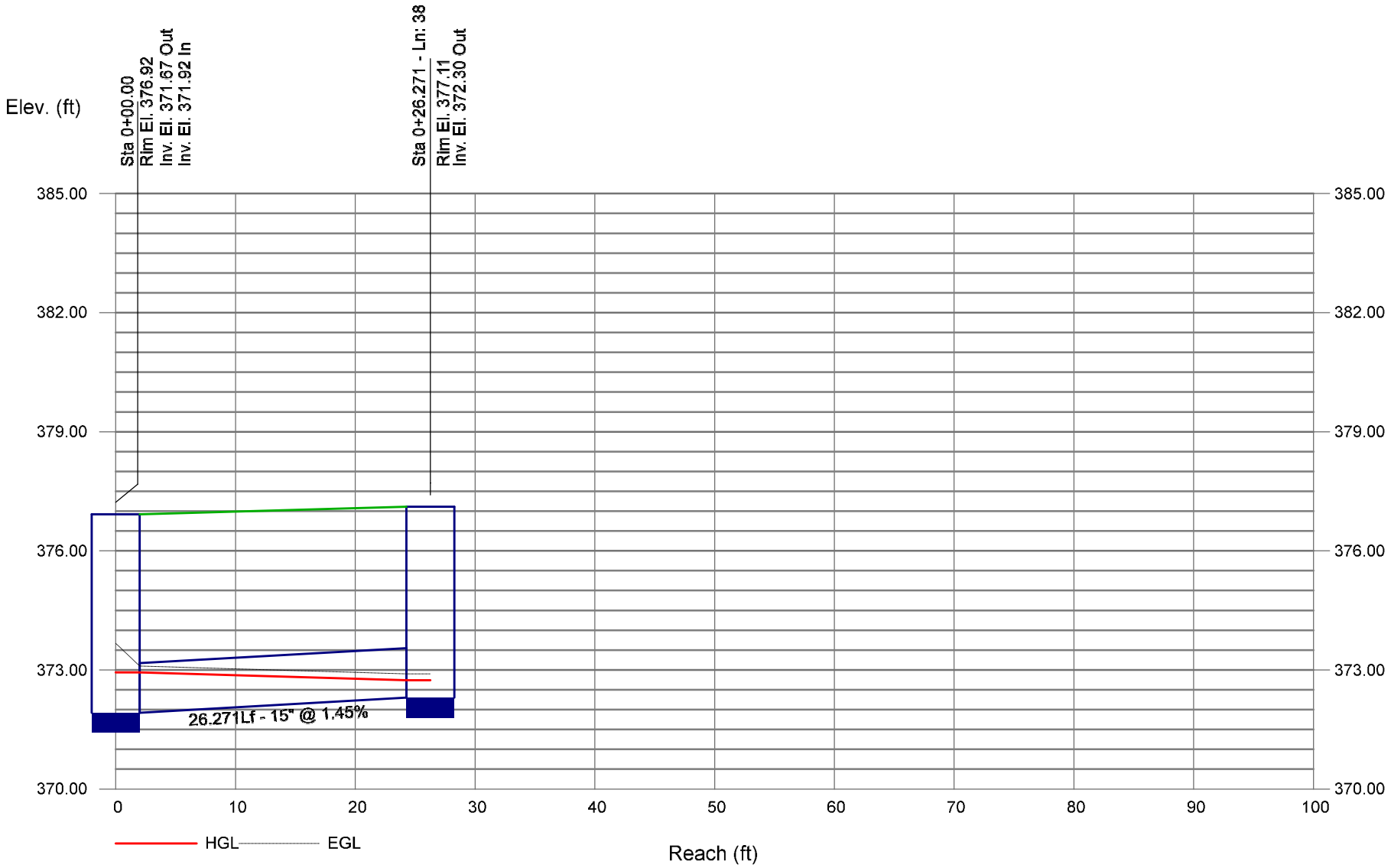
Storm Sewer Profile

25-Year: 36-37 Profile Proj. file: Outfall #1.stm



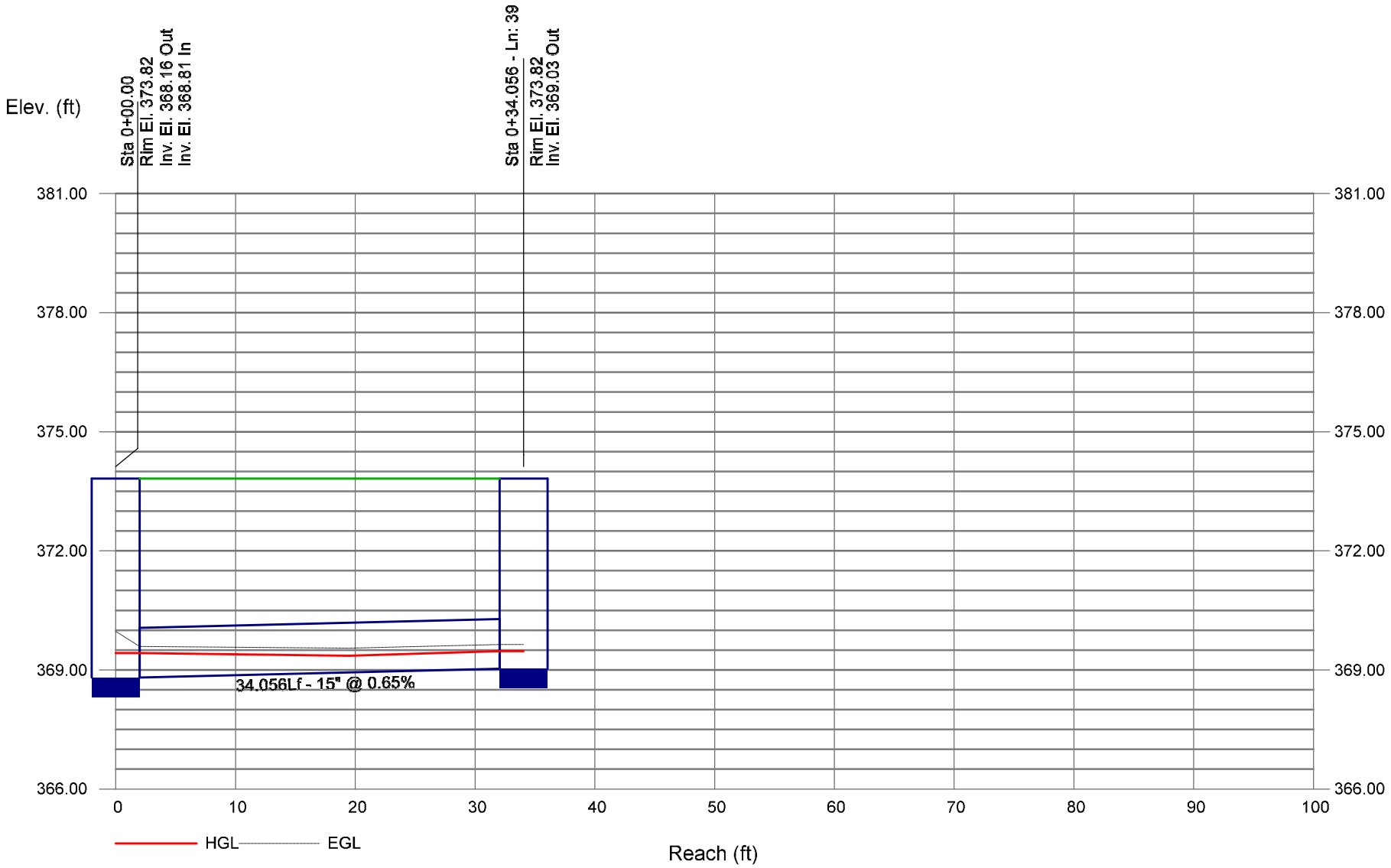
Storm Sewer Profile

25-Year: 38-38 Profile Proj. file: Outfall #1.stm



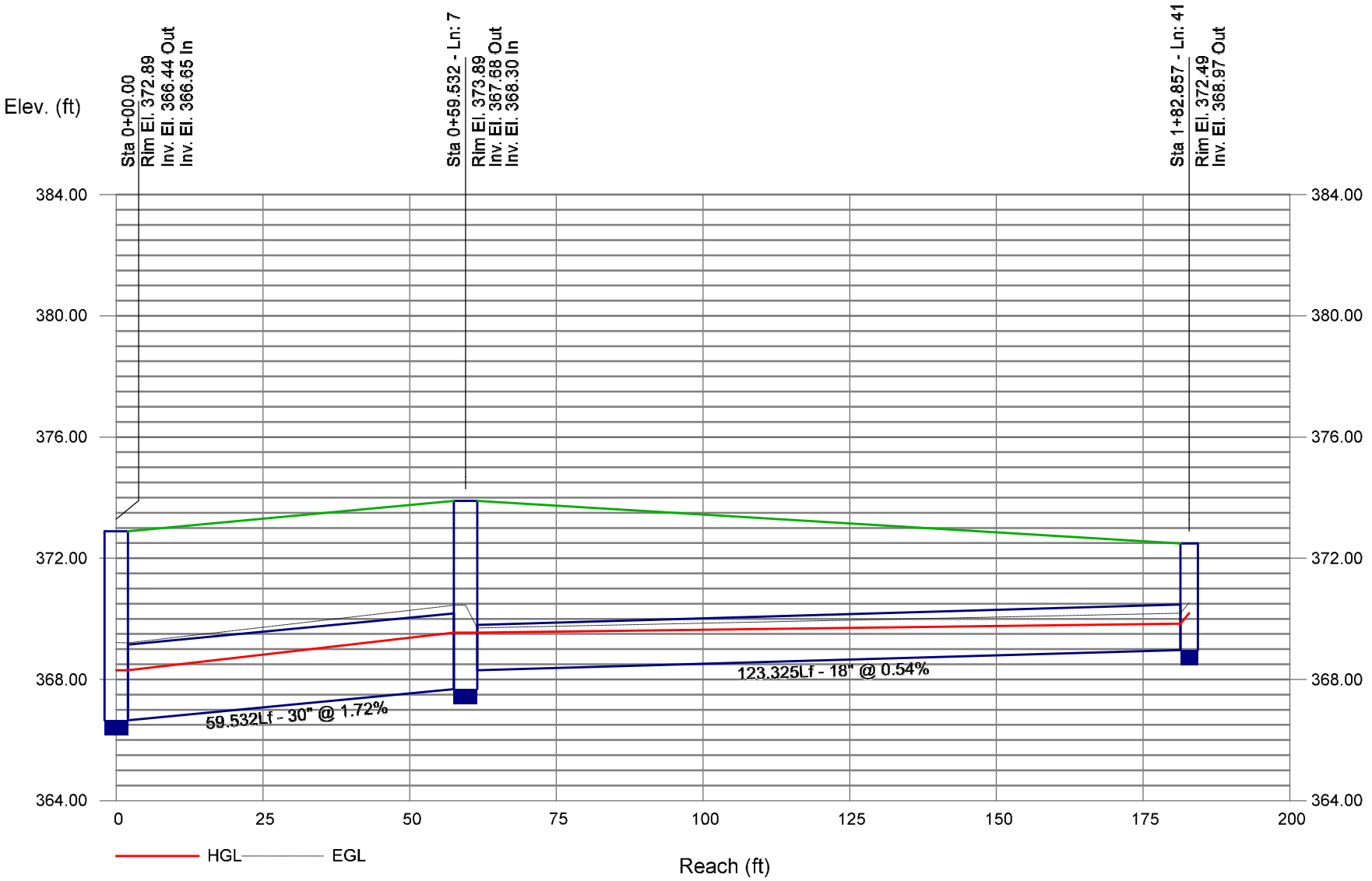
Storm Sewer Profile

25-Year: 39-39 Profile Proj. file: Outfall #1.stm



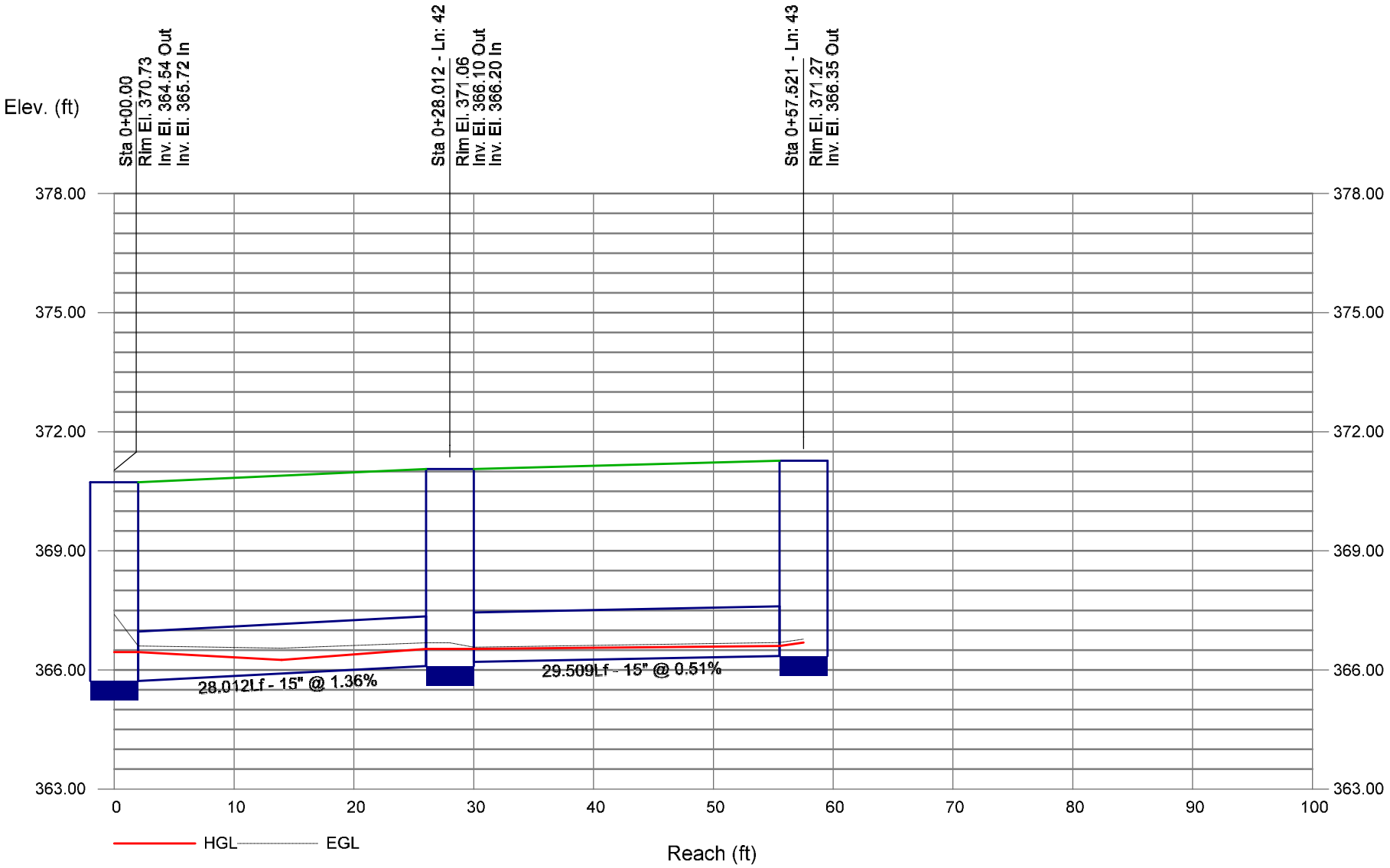
Storm Sewer Profile

25-Year: 40-41 Profile Proj. file: Outfall #1.stm



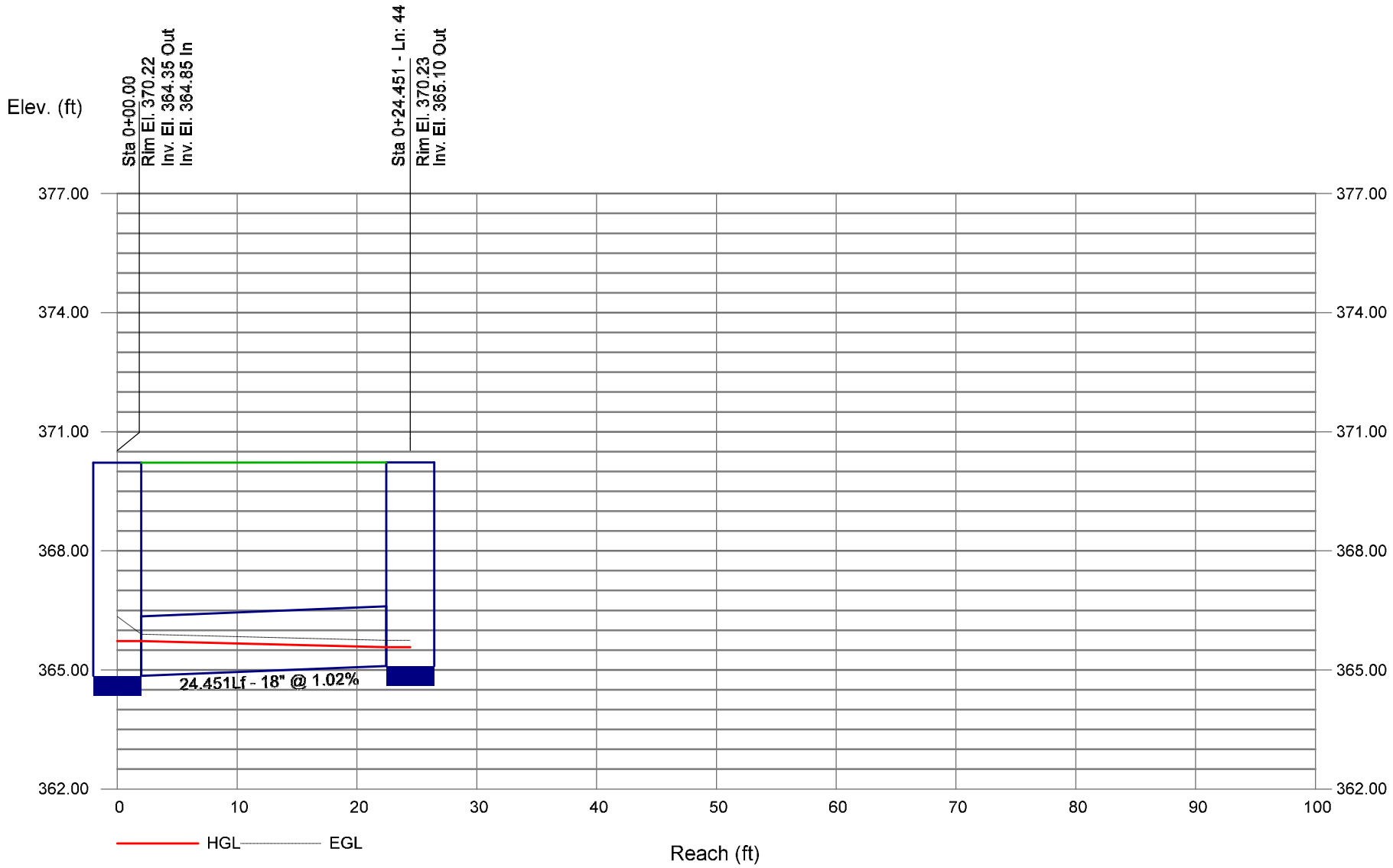
Storm Sewer Profile

25-Year: 42-43 Profile Proj. file: Outfall #1.stm



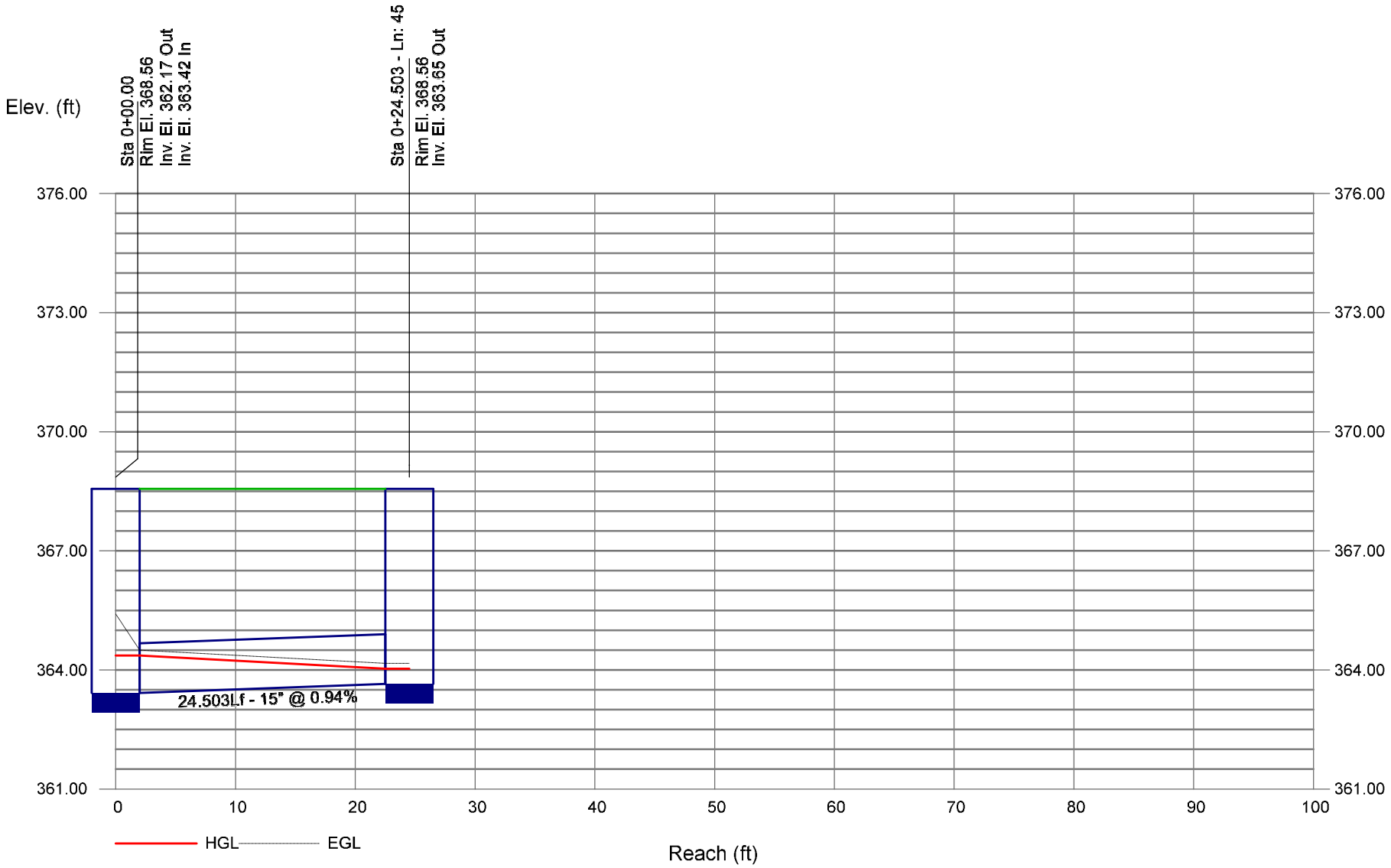
Storm Sewer Profile

25-Year: 44-44 Profile Proj. file: Outfall #1.stm



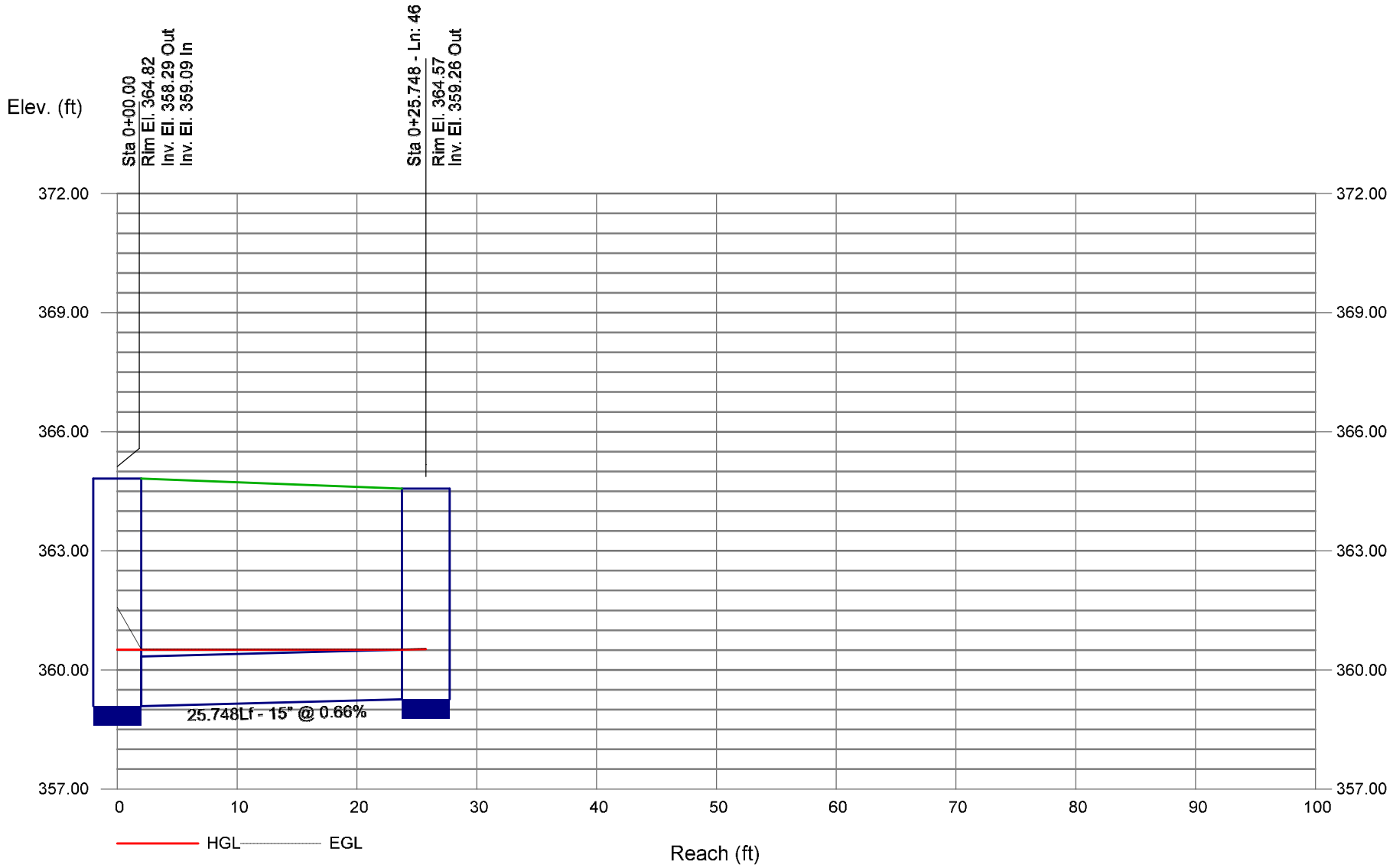
Storm Sewer Profile

25-Year: 45-45 Profile Proj. file: Outfall #1.stm



Storm Sewer Profile

25-Year: 46-46 Profile Proj. file: Outfall #1.stm



Storm Sewer Profile

25-Year: 47-50 Profile Proj. file: Outfall #1.stm