Crestview Crossing Commercial Design Review Application

Date: November 2020

Submitted to:
City of Newberg
Planning Division
414 E First Street
Newberg, OR 97132

Applicant:
Gramor Newberg Crestview, LLC
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Tualatin, OR 97062

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Table of Contents

Exhibits

Exhibit A:	Preliminary Plans
Exhibit B:	Application Form and Checklist
Exhibit C:	Property Ownership Information
Exhibit D:	Yamhill County Tax Assessor's Maps
Exhibit E:	Public Notice Information
Exhibit F:	Preliminary Stormwater Report
Exhibit G:	Trip Generation Letter
Exhibit H:	Geotechnical Report
Exhibit I:	Preliminary Sanitary Sewer Analysis
Exhibit J:	Fire Flow Information
Exhibit K:	Intersection Sight Distance Analysis

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Applicant:	Gramor Newberg Crestview, LLC 19767 SW 72nd Avenue, Suite 100 Tualatin, OR 97062
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Applicant's Consultant:	AKS Engineering & Forestry, LLC 12965 SW Herman Road, Suite 100 Tualatin, OR 97062 Contact: Chris Goodell, AICP, LEED[AP] Email: chrisg@aks-eng.com Phone: (503) 563-6151
Site Location:	4505 E Portland Road (Highway 99W)
Assessor's Map:	Yamhill County Assessor's Map 3216 Tax Lot 01100 and Map 3216AC Tax Lot 13800
Site Size:	±4.2 Acres
Land Use Districts:	C-2 – Community Commercial Bypass Interchange (BI) Overlay Airport Conical Surface (ACS) Overlay

I. Executive Summary

Gramor Newberg Crestview, LLC (Applicant), is submitting this Design Review application for a retail commercial project on a portion of the Crestview Crossing Planned Unit Development (PUD) site. The PUD site is located at 4505 E Portland Road (Highway 99W) on two existing tax lots (Yamhill County Assessor's Map 3216, Tax Lot 1100 and Map 3216AC, Tax Lot 13800).

Crestview Crossing Planned Unit Development: The Crestview Crossing PUD is a ±33-acre mixed-use project which was approved in October 2018. The PUD approval included lots for future detached and attached single-family residential homes, a 51-unit multi-family residential component, and set aside this ±4.2-acre site for future commercial use. The PUD also includes active and passive open space areas, an interconnected pedestrian and vehicular circulation network, and other associated improvements.

The project site abuts E Portland Road (Highway 99W) with access planned from N Crestview Drive to the west and E Jory Street to the north. Public improvements, including streets, underground utilities, sidewalks, and driveway approaches are being completed with the Crestview Crossing PUD. A stormwater facility east of the commercial site will also be constructed with the PUD improvements. The sanitary sewer line and associated easement originally planned to run along the east property line is being relocated slightly to the west and will run through the site from Highway 99W to the south to E Jory Street to the north. Please see the Post Crestview Crossing PUD and Public Improvements Plan of Exhibit A for details on the planned PUD improvements adjacent to the commercial site.

Crestview Crossing Commercial Design: The essential design features of the commercial project include:

- Five new retail commercial buildings located adjacent to street frontages
- Pedestrian oriented features (pathways connecting to adjacent sidewalks and through the parking areas to building entrances, inviting plazas for gathering and retail use)
- Architectural detailing, such as articulated rooflines and a variety of surface materials, to provide interest and design compatibility with the surrounding residential uses
- Ample off-street vehicle and bicycle parking areas
- Abundant interior and perimeter landscaping used to screen, soften, and complement the commercial site design

This Design Review application is a "Limited Land Use Decision," as that term is defined in ORS 197.015(12), because it is a local government decision based on discretionary design review standards regulating the physical characteristics of a use permitted outright within the City of Newberg Urban Growth Boundary (UGB). ORS 197.195(1) prohibits a local government from directly applying comprehensive plan requirements as a basis for its decision on an application for a limited land use decision where the comprehensive plan requirements have not been incorporated into the local government's land use regulations. Therefore, comprehensive plan policies may not be applied to the Design Review application under ORS 197.195(1) because the applicable Newberg Development Code (NDC) approval criteria do not make the application subject to specific comprehensive plan policies. Compliance with the applicable portions of the NDC are addressed in the responses throughout this narrative.

This written statement includes findings of fact demonstrating the application complies with the applicable approval criteria. These findings are supported by substantial evidence in the application, including preliminary plans and other written documentation. Considered together, this information provides the necessary basis for the City of Newberg to approve the application.

II. Site Description/Setting

The subject ±4.2-acre site is located within the approved Crestview Crossing Planned Unit Development (PUD). The site is located on the north side of OR-99W across from Providence Newberg Medical Center and the intersection of Providence Drive.

The site gently slopes down from the southwest corner toward the northeast corner and has recently been graded as part of the Crestview Crossing PUD improvements. The site is designated C-2 (Community Commercial) and is also located within the Bypass Interchange (BI) and Airport Conical Surface (ACS) Overlay Districts. The larger ±33-acre PUD site has C-2, R-2, and R-1 designations.

The City Limit and UGB lies north of the site. Oxberg Lake Estates, a large lot subdivision, is north of the Crestview Crossing PUD and is designated VLDR-1 (Very Low Density Residential) by Yamhill County. East of the PUD are two tax lots with the same C-2, R-2, and R-1 designations within the City Limit and the UGB. The Providence Newberg Medical Center to the south is designated Institutional (I) and there is an urban reserve area to the southeast with existing single-family residences. Spring Meadow Park and the Spring Meadow subdivision with R-1 zoning are west of the PUD.

III. Applicable Review Criteria

CITY OF NEWBERG DEVELOPMENT CODE

Division 15.200 Land Use Applications

Chapter 15.220 SITE DESIGN REVIEW

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15.220.020 Site design review applicability.

A. Applicability of Requirements. Site design review shall be required prior to issuance of building permits or commencement of work for all improvements noted below. Site design review permits shall be processed as either Type I or Type II, as noted below.

1. Type I.

a. Single-family dwellings;

b. Duplexes;

c. Institutional, commercial or industrial additions which do not exceed 1,000 square feet in gross floor area;

d. Multifamily additions which do not exceed 1,000 square feet in gross floor area and do not add any new units, or new construction incidental to the main use on an existing developed site which does not exceed 1,000 square feet in gross floor area and does not add any new units;

e. Institutional, commercial or industrial interior remodels which do not exceed 25 percent of the assessed valuation of the existing structure;

f. Multifamily remodels which do not exceed 25 percent of the assessed valuation of the existing structure and do not add any new units;

g. Signs which are not installed in conjunction with a new development or remodel;

h. Modifications, paving, landscaping, restriping, or regrading of an existing duplex, multifamily, institutional, commercial or industrial parking lot;

i. Fences and trash enclosures;

j. Accessory dwelling units.

2. Type II.

a. Any new development or remodel which is not specifically identified within subsection (A)(1) of this section.

b. Telecommunications facilities.

Response: This application involves the construction of a new retail commercial center and associated improvements. Therefore, it is subject to Type II Design Review.

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C. Site Design Review Time Limit. An approved site design review plan intended to be constructed in a single phase shall be valid for one year from the date of the notice of final decision. A building permit must be acquired within this time period or the design review approval shall terminate. The director under a Type I procedure may grant an extension for up to six months if the applicant files a request in writing prior to the expiration of the approval and demonstrates compliance with the following:

1. The land use designation of the property has not been changed since the initial design review approval; and

2. The applicable standards in this code which applied to the project have not changed.

Response: This commercial retail project is planned to be constructed in a single phase, therefore the above time limits apply. The criteria can be met.

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15.220.030 Site design review requirements.

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B. Type II. The following information is required to be submitted with all Type II applications for site design review:

1. Site Development Plan. A site development plan shall be to scale and shall indicate the following as appropriate to the nature of the use:

a. Access to site from adjacent right-of-way, streets and arterials;

b. Parking and circulation areas;

c. Location and design of buildings and signs;

d. Orientation of windows and doors;

e. Entrances and exits;

f. Private and shared outdoor recreation spaces;

g. Pedestrian circulation;

h. Outdoor play areas;

i. Service areas for uses such as mail delivery, trash disposal, above-ground utilities, loading and delivery;

j. Areas to be landscaped;

k. Exterior lighting;

l. Special provisions for handicapped persons;

m. Other site elements and spaces which will assist in the evaluation of site development;

n. Proposed grading, slopes, and proposed drainage;

o. Location and access to utilities including hydrant locations; and

p. Streets, driveways, and sidewalks.

Response: The Preliminary Plans (Exhibit A) contain the applicable information listed above. The criteria are met.

2. Site Analysis Diagram. A site analysis diagram shall be to scale and shall indicate the following characteristics on the site and within 100 feet of the site:

a. Relationship of adjacent lands;

b. Location of species of trees greater than four inches in diameter at four feet above ground level;

c. Existing and proposed topography;

d. Natural drainage and proposed drainage and grading;

e. Natural features and structures having a visual or other significant relationship with the site.

Response: The Preliminary Plans (Exhibit A) contain the applicable information listed above. The criteria are met.

3. Architectural Drawings. Architectural drawings shall be prepared which identify floor plans and elevations.

Response: The Floor Plan and Elevations Sheets of Exhibit A illustrate the floor plans and elevations of the planned commercial buildings. This criterion is met.

4. Landscape Plan. The landscape plan shall indicate:

   a. The size, species and approximate locations of plant materials to be retained or placed on the site together with a statement which indicates the mature size and canopy shape of all plant materials;

   b. Proposed site contouring; and

   c. A calculation of the percentage of the site to be landscaped.

Response: The Preliminary Landscape Planting Plan in Exhibit A includes the above information. The criteria are met.

5. Special Needs for Handicapped. Where appropriate, the design review plan shall indicate compliance with handicapped accessibility requirements including, but not limited to, the location of handicapped parking spaces, the location of accessible routes from the entrance to the public way, and ramps for wheelchairs.

Response: As applicable, accessibility features are shown on the Overall Site Plan in Exhibit A, including ADA compliant parking spaces and accessible routes to and from entrances. This criterion is met.

6. Existing Features and Natural Landscape. The plans shall indicate existing landscaping and existing grades. Existing trees or other features intended to be preserved or removed shall be indicated on the plans.

Response: The Pre-Crestview Crossing PUD Existing Conditions Plan (Exhibit A) contains the applicable information listed above. Existing trees will be removed with the development of the Crestview Crossing PUD as shown on the Pre-Crestview Crossing PUD Existing Conditions Plan of Exhibit A. This criterion is met.

7. Drives, Parking and Circulation. Proposed vehicular and pedestrian circulation, parking spaces, parking aisles, and the location and number of access points shall be indicated on the plans. Dimensions shall be provided on the plans for parking aisles, back-up areas, and other items as appropriate.

Response: The Preliminary Plans (Exhibit A) contain the applicable information listed above. This criterion is met.

8. Drainage. The direction and location of on- and off-site drainage shall be indicated on the plans. This shall include, but not be limited to, site drainage, parking lot drainage, size and location of storm drain lines, and any retention or detention facilities necessary for the project.

Response: Drainage details and stormwater management measures are shown on the Preliminary Storm Drainage Plan of Exhibit A. This criterion is met.

9. Buffering and Screening. Buffering and screening of areas, structures and facilities for storage, machinery and equipment, services (mail, refuse, utility wires, and the like),

loading and parking and similar accessory areas and structures shall be shown on the plans.

Response: The Preliminary Landscape Planting Plan in Exhibit A depicts the buffering and screening of areas described above and located on the subject site. This criterion is met as applicable.

10. Signs and Graphics. The location, colors, materials, and lighting of all exterior signs, graphics or other informational or directional features shall be shown on the plans.

Response: Exterior signs and graphics are not included with this application. Therefore, this criterion is not applicable at this time.

11. Exterior Lighting. Exterior lighting within the design review plan shall be indicated on the plans. The direction of the lighting, size and type of fixtures, and an indication of the amount of lighting shall be shown on the plans.

Response: Exterior lighting and information regarding the direction of lighting, size, and type is included on the Site Lighting Plan of Exhibit A. This criterion is met.

12. Trash and Refuse Storage. All trash or refuse storage areas, along with appropriate screening, shall be indicated on the plans. Refuse storage areas must be constructed of brick, concrete block or other similar products as approved by the director.

Response: Trash enclosures are planned to be appropriately screened and constructed with materials as described above and shown on the Preliminary Plans (Exhibit A). This criterion is met.

13. Roadways and Utilities. The proposed plans shall indicate any public improvements that will be constructed as part of the project, including, but not limited to, roadway and utility improvements.

Response: Public improvements along 99W, N Crestview Drive, and E Jory Street are being constructed as part of the Crestview Crossing PUD. (See the Post Crestview Crossing PUD and Public Improvements Plan of Exhibit A.) Details on the utility connections associated with this project are included on the Preliminary Water and Sanitary Sewer Plan (Exhibit A). This criterion is met.

14. Traffic Study. A traffic study shall be submitted for any project that generates in excess of 40 trips per p.m. peak hour. This requirement may be waived by the director when a determination is made that a previous traffic study adequately addresses the proposal and/or when off-site and frontage improvements have already been completed which adequately mitigate any traffic impacts and/or the proposed use is not in a location which is adjacent to an intersection which is functioning at a poor level of service. A traffic study may be required by the director for projects below 40 trips per p.m. peak hour where the use is located immediately adjacent to an intersection functioning at a poor level of

service. The traffic study shall be conducted according to the City of Newberg design standards.

Response: The August 2018 *Crestview Crossing Transportation Impact Analysis* (traffic study) was submitted as part of the Crestview Crossing PUD application. As discussed in the Kittelson & Associates letter included as Exhibit G, the August 2018 traffic study included the anticipated trips for this portion of the PUD. The traffic analysis and planned transportation improvements remain valid and will be sufficient to accommodate the trips associated with this portion of the PUD. This criterion is met.

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15.220.050 Criteria for design review (Type II process)

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B. Type II. The following criteria are required to be met in order to approve a Type II design review request:

1. Design Compatibility. The proposed design review request incorporates an architectural design which is compatible with and/or superior to existing or proposed uses and structures in the surrounding area. This shall include, but not be limited to, building architecture, materials, colors, roof design, landscape design, and signage.

Response: Surrounding uses are described above under Site Description/Setting. The existing adjacent uses surrounding the Crestview Crossing PUD site are lower density residential. The approved PUD includes a mix of residential densities from a multi-family project to larger detached residential lots. The planned architecture, materials, colors, etc. of this retail commercial project are compatible with the surrounding residential uses through the use of canopies, changes in surface materials, ample windows, and other architectural detailing that contribute to a pedestrian-friendly environment and complement the residential character of the neighborhood. The Providence Newberg Medical Center is south of the site across Highway 99W. The large medical building is set back more than 300 feet from the highway with surface parking in between. While the use and scale of the buildings of the planned commercial project are much more pedestrian in nature, the natural finishes and flat rooflines will generally be compatible with the medical center brick building. The Floor Plan and Elevations Sheets of Exhibit A illustrate the planned design details. This criterion is met.

2. Parking and On-Site Circulation. Parking areas shall meet the requirements of NMC 15.440.010. Parking studies may be required to determine if adequate parking and circulation are provided for uses not specifically identified in NMC 15.440.010. Provisions shall be made to provide efficient and adequate on-site circulation without using the public streets as part of the parking lot circulation pattern. Parking areas shall be designed so that vehicles can efficiently enter and exit the public streets with a minimum impact on the functioning of the public street.

Response: The planned parking areas and on-site circulation system is illustrated on the Preliminary Plans (Exhibit A). The commercial center is anticipated to include a mix of commercial uses listed in Section 15.440.030. In accordance with Section 15.440.040, a Parking

Demand Assessment is included in the Trip Generation Letter, provided as Exhibit G, to demonstrate that the parking provided is adequate for the anticipated future uses. Vehicle access and circulation are designed to meet the provisions included in this section. See the responses to Section 15.440.010 for additional detail. This criterion is met.

3. **Setbacks and General Requirements. The proposal shall comply with NMC 15.415.010 through 15.415.060 dealing with height restrictions and public access; and NMC 15.405.010 through 15.405.040 and 15.410.010 through 15.410.070 dealing with setbacks, coverage, vision clearance, and yard requirements.**

Response: The planned setbacks, lot coverage, vision clearance, and yard requirements are illustrated on the Preliminary Plans (Exhibit A) and meet the applicable development standards of Division 15.400 of the Newberg Municipal Code (NMC) as referenced above. This criterion is met.

4. **Landscaping Requirements. The proposal shall comply with NMC 15.420.010 dealing with landscape requirements and landscape screening.**

Response: The overall minimum landscaping requirement is 15 percent. The Preliminary Landscape Planting Plan in Exhibit A depicts the planned landscape areas, including landscape islands separated by a maximum of seven parking spaces, perimeter landscaping, and pedestrian plazas or walkways. The planned landscaping complies with the landscape and screening requirements listed above. This criterion is met.

5. **Signs. Signs shall comply with NMC 15.435.010 et seq. dealing with signs.**

Response: Signs will be reviewed under a separate application. This criterion does not apply.

6. **Manufactured Dwelling, Mobile Home and RV Parks. Manufactured dwelling and mobile home parks shall also comply with the standards listed in NMC 15.445.075 through 15.445.100 in addition to the other clear and objective criteria listed in this section. RV parks also shall comply with NMC 15.445.170 in addition to the other criteria listed in this section.**

Response: This application involves a retail commercial project. This criterion does not apply.

7. **Zoning District Compliance. The proposed use shall be listed as a permitted or conditionally permitted use in the zoning district in which it is located as found in NMC 15.305.010 through 15.336.020. Through this site review process, the director may make a determination that a use is determined to be similar to those listed in the applicable zoning district, if it is not already specifically listed. In this case, the director shall make a finding that the use shall not have any different or more detrimental effects upon the adjoining neighborhood area than those specifically listed.**

Response: A wide range of uses are permitted within the C-2 Zoning District. Future land uses are anticipated to be of a retail commercial nature, which is permitted within the C-2 District. This criterion is met.

8. **Subdistrict Compliance. Properties located within subdistricts shall comply with the provisions of those subdistricts located in NMC 15.340.010 through 15.348.060.**

Response: The subject property is located within the Bypass Interchange Overlay (BI) Subdistrict and the Airport Overlay (AO). The project is planned to be in compliance with the provisions of these subdistricts as described in further detail in the responses to Chapters 15.340 and 15.356 below. This criterion is met.

9. **Alternative Circulation, Roadway Frontage Improvements and Utility Improvements. Where applicable, new developments shall provide for access for vehicles and pedestrians to adjacent properties which are currently developed or will be developed in the future. This may be accomplished through the provision of local public streets or private access and utility easements. At the time of development of a parcel, provisions shall be made to develop the adjacent street frontage in accordance with city street standards and the standards contained in the transportation plan. At the discretion of the city, these improvements may be deferred through use of a deferred improvement agreement or other form of security.**

Response: With the Crestview Crossing PUD improvements in place, the site fronts on three public streets. Access is planned from N Crestview Drive to the west and E Jory Street to the north. Access to the stormwater facility to the east (Tract E) is provided east of the subject site from 99W and access is not needed through the site. This criterion is met.

10. **Traffic Study Improvements. If a traffic study is required, improvements identified in the traffic study shall be implemented as required by the director.**

Response: The August 2018 *Crestview Crossing PUD Traffic Impact Analysis* (traffic study) assumed full build-out of the entire PUD, including this commercial site. The traffic study assumed that up to 48,243 square feet of retail would be created on this site. This application includes approximately 37,200 square feet of retail uses. Therefore, the assumptions, findings, and conclusions included in the traffic analysis remain valid and the recommendations therein are sufficient to accommodate the trips associated with this project. Please see the updated Trip Generation Letter (Exhibit G) included in this application for additional details. This criterion is met.

15.220.070 Additional requirements for development in the C-2 zoning district.

The purpose of this section is to ensure that development in the C-2 zoning district is designed to promote pedestrian and bicycle uses and improve aesthetics and compatibility. An applicant for a new development or redevelopment within the C-2 zoning district, which is subject to the site design review process, must demonstrate that the following site and building design elements have been incorporated into the design of the project. Exceptions to these additional development requirements may be granted if the requirements would result in construction that is out of character with surrounding development. Applicants for redevelopment of a designated landmark will not be subject to these additional requirements, except for requirements regarding parking and service drives.

Response: The subject site is located in the C-2 District; therefore, the following standards are required to be met.

> **A.** **Building Entrances. Each building on a lot shall have a primary pedestrian entrance oriented to the primary street. "Oriented to a street" means that the building entrance faces the street or is connected to the street by a direct and convenient pathway not exceeding 60 feet in length. "Primary street" means the street which has the highest estimated volume of pedestrian traffic. This requirement does not apply to buildings that are located behind other buildings on the lot such that 50 percent or more of their building frontage is blocked by the front building, as measured by sight lines that are perpendicular to the street right-of-way. Such rear buildings shall have a primary entrance oriented to an internal sidewalk or pedestrian pathway system which is internally connected and provides a connection to the primary street.**

Response: There are two corners on the subject site; therefore, the primary entrances of Buildings A, B, and C are required to be oriented to the corners in accordance with Subsection E below. Entrances on Buildings D and E are connected to the adjacent street rights-of-way by direct and convenient pathways that do not exceed 60 feet in length in accordance with the above standards. See the Overall Site Plan in Exhibit A for details. This criterion is met.

> **B.** **Parking and Service Drives. No off-street parking or service drives shall be placed within the required front yard setback. No off-street parking shall be placed between the front property line of the primary street, as defined in subsection (A) of this section, and the building. This requirement does not apply to buildings that are located behind other buildings on the lot such that 50 percent or more of their building frontage is blocked by the front building, as measured by sight lines that are perpendicular to the street right-of-way.**

Response: As described above under Subsection 15.220.070.A, the "primary street" is the street with the highest estimated volume of pedestrian traffic. E Jory Street and N Crestview Drive are anticipated to have the highest amount of pedestrian traffic from the adjacent residential uses and are considered the "primary streets" for the site. Building placement along the primary streets was given priority in the site design. Parking and service drives are not located between the buildings and the primary streets or between Buildings A and E and Highway 99W. This criterion is met.

> **C.** **Exceptions. The review body may approve exceptions to the above, provided there are no reasonable alternatives that would allow access to or parking on the lot.**

Response: Exceptions to the above standards are not included in this application. This criterion does not apply.

> **D.** **Building Mass. Where building elevations are oriented to the street in conformance with subsection (A) of this section, architectural features such as windows, pedestrian entrances, building offsets, projections, detailing, change in materials or similar features, shall be used to break up and articulate large building surfaces and volumes.**

Response: As illustrated on the Floor Plan and Elevations Sheets of Exhibit A, architectural features such as building offsets, canopies, changes in surface materials, and a variety of rooflines are used to break up and articulate building surfaces and volumes. This criterion is met.

> **E. Corner Lots. Buildings on corner lots shall have their primary entrance oriented to the street corner, or within 40 feet of the street corner (i.e., as measured from the lot corner). In this case, the street corner shall provide an extra-wide sidewalk or plaza area with landscaping, seating or other pedestrian amenities. The building corner shall provide architectural detailing or beveling to add visual interest to the corner.**

Response: As illustrated on the Preliminary Plans (Exhibit A), a primary entrance to Building A is located within 40 feet of the 99W/N Crestview Drive corner. Additionally, primary entrances to Buildings B and C are located within 40 feet of the N Crestview Drive/E Jory Street corner. Plaza areas are also provided allowing for pedestrian amenities and seating as well as landscaping. As illustrated on the Floor Plan and Elevations Sheets (Exhibit A), architectural details such as canopies, articulated pedestrian entrances, varying rooflines, and changes in surface materials break up the mass of the buildings and provide visual interest at the corners. This criterion is met.

> **F. Pedestrian-Scale Building Entrances. Recessed entries, canopies, and/or similar features shall be used at the entries to buildings in order to create a pedestrian scale.**

Response: As illustrated on the Preliminary Plans (Exhibit A), features such as plaza areas, awnings, and ample windows are used near building entrances to emphasize a pedestrian scale. This criterion is met.

> **G. Windows.**
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> **1. On commercial building facades facing a public street, windows shall comprise a minimum of 40 percent of the ground floor facade. For large-scale buildings and developments meeting the standards under subsection (H) of this section, windows shall comprise a minimum of 20 percent of the ground floor facade.**

Response: As illustrated on the Floor Plan and Elevations Sheets of Exhibit A, each façade on the commercial buildings, not just those façades facing a public street, includes a generous amount of window area. For the purposes of calculating the window area, the ground floor façade is considered as the area between 3-feet and 10-feet above the finished floor. The windows on ground floor façades facing public streets exceed the minimum 40 percent standard. Please see the Ground Floor Street Façade Glazing Area sheets of Exhibit A for more detail. The project does not involve large-scale buildings or development as defined below. The applicable criteria are met.

> **2. For large-scale buildings and developments meeting the standards under subsection (H) of this section, 50 percent of all required window area shall allow view into an active space. An "active space" is defined as any area within a building that is used for shopping, dining, office space, and so forth. Merchandise display windows with displays that change at least semi-annually shall be considered an active**

space. Examples of areas that are considered nonactive spaces are storage and mechanical equipment areas, and windows that are obscured by shelving or material affixed to the window.

Response: The project does not involve large-scale buildings or development as defined below. This criterion does not apply.

H. Design of Large-Scale Buildings and Developments. All buildings on a development site shall conform to the design standards included under this subsection where the total square footage of one commercial building exceeds 30,000 square feet of total ground floor area or all commercial buildings exceed 50,000 square feet of total ground floor area. Deviations from these standards may be approved, where appropriate, through the conditional use permit process.

Response: Individual buildings do not exceed 30,000 square feet of total ground floor area and the total ground floor area in the overall project does not exceed 50,000 square feet. Therefore, this subsection does not apply.

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Division 15.300 Zoning Districts

Chapter 15.305 ZONING USE TABLE

15.305.010 Classification of uses.

The zoning use table under NMC 15.305.020 identifies the land uses that are allowed in the various zoning districts. The specific land use categories are described in Chapter 15.303 NMC. The table identifies each use as one of the following:

P Permitted Use. The use is a permitted use within the zone. Note that the use still may require design review, building permits, or other approval in order to operate.

C Conditional Use. A conditional use permit is required for the use. See Chapter 15.225 NMC.

S Special Use. The use is subject to specific standards as identified within this code. The applicable section is included in the last column of the table.

(#) A note indicates specific limits on the use. These notes are listed at the bottom of the table.

X Prohibited Use. The use is specifically prohibited.

15.305.020 Zoning use table – Use districts.

Newberg Development Code – Zoning Use Table			
#	Use	C-2	Notes and Special Use Standards
400	COMMERCIAL USES		
411	Medical office	P	
412	Local business office	P	
421	Retail sales – General	P	
422	Retail sales – Bulk outdoor	P	
423	Retail sales – Convenience	P	

Newberg Development Code – Zoning Use Table			
#	Use	C-2	Notes and Special Use Standards
430	Eating and drinking – Alcohol-related	P	Requires liquor license
430	Eating and drinking – Non-alcohol-related	P	
441	Personal services	P	
442	Commercial services	P	
451	Commercial recreation - Indoors	P	

Response: This application involves the construction of a new retail commercial center. Specific tenants have not been determined at this time. As listed above in the zoning use table, offices, retail sales, eating and drinking establishments, personal services, and commercial services are permitted uses within the C-2 Zoning District. A conditional use permit is not required for a drive-up use in the C-2 Zoning District.

Chapter 15.340 AIRPORT OVERLAY (AO) SUBDISTRICT

15.340.020 Permitted uses within the airport approach safety zone.

The following uses are permitted:

A. Single-family dwellings, mobile homes, duplexes and multifamily dwellings, when located greater than 3,000 feet from the displaced threshold and when authorized in the primary zoning district, provided the landowner signs and records in the deed and mortgage records of Yamhill County a hold harmless agreement and avigation and hazard easement and submits them to the airport sponsor and the planning and building department.

B. All uses permitted in the primary zoning district, provided the use does not create the following:

1. Electrical interference with navigational signals or radio communication between the airport and aircraft.
2. Visual interference which would make it difficult for pilots to distinguish between airport lights or other lighting.
3. Impairment of visibility.
4. Bird strike hazards.
5. Endangerment or interference with the landing, taking off or maneuvering of aircraft intending to use the airport.
6. Population densities which exceed the following limitations:

Permitted Density Table	
Distance from the Displaced Threshold	Occupant Load (Gross Sq. Ft. of Building per Person)
Less than 1,500 ft.	125 sq. ft.
1,501 – 2,000 ft.	30 sq. ft.
Greater than 2,000 ft.	15 sq. ft.

C. **Roadways, parking areas and storage yards located in such a manner that vehicle lights will not make it difficult for pilots to distinguish between landing lights and vehicle lights or result in glare, or in any way impair visibility in the vicinity of the landing approach. Approach surfaces must clear these by a minimum of 15 feet.**

Response: Sportsman Airpark is an airport located south of OR 219 in the City of Newberg. The "Airport Conical Surface" is an "Airport imaginary surface" that applies to this site; therefore, the property is considered to be within the "Airport Overlay" Subdistrict. As shown in the zoning use table (NMC 15.305.020) above, commercial uses are permitted within the C-2 zone. Therefore, they are permitted uses in the Airport Overlay Subdistrict. The planned land uses are of such a nature that they are not anticipated to create any potential conflicts listed in the section above. These criteria are met.

15.340.040 Procedures.

A. **Development Permits. An application for a development permit for any permitted use within the airport approach safety zone or the displaced threshold approach surface zone which is subject to site design review as required by NMC 15.220.010 et seq. and shall include the following information:**

1. **The boundaries of the airport imaginary surfaces as they relate to property boundary lines; and**
2. **The location and height of all existing and proposed buildings, structures, utility lines and roads; and**
3. **A statement from the Oregon Aeronautics Division indicating whether the proposed use will interfere with operation of the landing facility.**

Response: The site is not within the Airport Approach Safety Zone or the Displaced Threshold Approach Surface Zone. Therefore, the above information is not required.

B. **FAA Notice Required. To meet the requirements of Federal Aviation Regulations Part 77, FAA Form 7460-1, Notice of Proposed Construction or Alteration, must be submitted for any construction or alteration of greater height than an imaginary surface extending outward and upward at a slope of 50 to one for a horizontal distance of 10,000 feet from the nearest point of the nearest runway of the airport. Notice is not required for construction or alteration that is shielded by existing structures or terrain as defined in Section 77.15 of Part 77 of the Federal Aviation Regulations.**

Response: Given that the site is ±6,125 feet from the nearest point of the nearest runway of the airport, the buildings would need to be ±122 feet or more in height to extend into the imaginary surface as defined above. As shown on the Floor Plan and Elevations Sheets of Exhibit A, the planned buildings are ±28 feet or less above finish grade. Therefore, a FAA notice is not required. This criterion is met.

15.340.050 Limitations.

A. **To meet the standards and reporting requirements established in FAA Regulations, Part 77, no structure shall penetrate into the airport**

imaginary surfaces as defined in this code except as provided in NMC 15.340.030(B).

Response: As stated above, the "Airport Conical Surface" imaginary surface applies to this site. The conical surface is defined as a *"surface extending 20 feet outward for each one foot upward (20:1) for 4,000 feet beginning at the edge of the horizontal surface (5,000 feet from the center of each end of the primary surface of each visual and utility runway at 150 feet above the airport elevation) and upward extending to a height of 350 feet above the airport elevation."* Given that the site is ±925 feet northeast of the "Horizontal Surface," the "Airport Conical Surface" imaginary surface is approximately 196 feet above the ground elevation at the site. As shown on the Floor Plan and Elevations Sheets of Exhibit A, the planned buildings do not approach this height and do not penetrate into an airport imaginary surface. This criterion is met.

B. High density public uses as defined in this code shall not be permitted in the airport approach safety zone or the displaced threshold approach surface zone.

Response: The site is not within the Airport Approach Safety Zone or the Displaced Threshold Approach Surface Zone. Therefore, this criterion does not apply.

C. Following July 1990, if FAA funds are used by the city to improve or enhance the airport, new structures, buildings and dense uses shall be prohibited in the runway protection zone consistent with federal requirements.

Response: The subject site is not located in the Runway Protection Zone. Therefore, this criterion does not apply.

D. Whenever there is a conflict in height limitations prescribed by this overlay zone and the primary zoning district, the lowest height limitation fixed shall govern; provided, however, that the height limitations here imposed shall not apply to such structures customarily employed for aeronautical purposes.

Response: As explained above, the planned buildings do not intrude into the Airport Conical Surface Area. Therefore, there is no conflict in the height limitations and the criterion is met.

E. No glare-producing materials shall be used on the exterior of any structure located within the airport approach safety zone.

Response: The site is not located within the Airport Approach Safety Zone. This criterion does not apply.

F. In noise-sensitive areas (within 1,500 feet of an airport or within established noise contour boundaries of 55 Ldn and above for identified airports) where noise levels are a concern, a declaration of anticipated noise levels shall be attached to any building permit or development approval. In areas where the noise level is anticipated to be 55 Ldn and above, prior to issuance of a building permit for construction of noise-sensitive land use (real property normally used for sleeping or normally used as schools, churches, hospitals, or public libraries) the permit applicant shall be required to demonstrate that the indoor noise level will not exceed 55 Ldn. The director will review building permits for noise-sensitive developments.

Response: The site is not located within 1,500 feet of the airport or within established noise contour boundaries of 55 Ldn (day-night average sound level) and above. This criterion does not apply.

Chapter 15.356 BYPASS INTERCHANGE (BI) OVERLAY

…

15.356.020 Area of application of interchange overlay.

A. The bypass interchange overlay shall apply to lands inside the city limits within the boundaries shown on Map VI (East Newberg Interchange) and Map VII (Oregon 219 Interchange).

B. The bypass interchange overlay applies in addition to the regulations of the underlying zoning district. All property within the bypass interchange overlay shall be subject to both the provisions of this section and to the underlying zoning district. Nothing in this section shall be construed as a waiver or suspension of the provisions of any underlying zoning district, or any other applicable overlay district.

C. The general boundaries of the bypass interchange overlay are shown on Map VI (East Newberg Interchange) and Map VII (Oregon 219 Interchange) and shall be delineated on a parcel-specific basis on the official zoning map. The width of the bypass corridor and interchanges shall be automatically narrowed to a smaller alignment-specific width as contained in the record of decision when it is issued for the Tier 2 environmental impact statement.

Response: The frontage of the site is within the Bypass Interchange (BI) Overlay. Therefore, this chapter applies.

15.356.030 Permitted uses.

All uses of land and water that are permitted in the underlying zoning district(s) are also permitted in the bypass interchange overlay, with the exception of the special limitations on commercial uses in the industrial districts as outlined in NMC 15.356.050.

Response: The planned commercial uses are permitted uses within the underlying C-2 zone; therefore, the uses are permitted in the BI Overlay.

Division 15.400 Development Standards

Chapter 15.405 LOT REQUIREMENTS

15.405.010 Lot area – Lot areas per dwelling unit.

…

15.405.020 Lot area exceptions.

…

15.405.030 Lot dimensions and frontage.

…

Response: The application does not involve the creation of new lots or parcels, nor does it alter the size or configuration of the existing properties. Therefore, the standards in these subsections do not apply.

15.405.040 **Lot coverage and parking coverage requirements.**

B. Residential uses in residential zones shall meet the following maximum lot coverage and parking coverage standards. See the definitions in NMC 15.05.030 and Appendix A, Figure 4.

…

C. All other districts and uses not listed in subsection (B) of this section shall not be limited as to lot coverage and parking coverage except as otherwise required by this code.

Response: Commercial uses in a commercial district do not have lot coverage and parking coverage requirements. This subsection does not apply.

Chapter 15.410 YARD SETBACK REQUIREMENTS

15.410.010 **General yard regulations.**

A. No yard or open space provided around any building for the purpose of complying with the provisions of this code shall be considered as providing a yard or open space for any other building.

B. No yard or open space on adjoining property shall be considered as providing required yard or open space for another lot or development site under the provisions of this code.

C. No front yards provided around any building for the purpose of complying with the regulations of this code shall be used for public or private parking areas or garages, or other accessory buildings, except as specifically provided elsewhere in this code.

D. When the common property line separating two or more contiguous lots is covered by a building or a permitted group of buildings with respect to such common property line or lines does not fully conform to the required yard spaces on each side of such common property line or lines, such lots shall constitute a single development site and the yards as required by this code shall then not apply to such common property lines.

E. Dwellings Where Permitted above Nonresidential Buildings. The front and interior yard requirements for residential uses shall not be applicable; provided, that all yard requirements for the district in which such building is located are complied with.

F. In the AI airport industrial district, clear areas, safety areas, object-free areas, taxiways, parking aprons, and runways may be counted as required yards for a building, even if located upon an adjacent parcel.

G. In the AR airport residential district, clear areas, safety areas, object-free areas, taxiways, parking aprons, and runways may be counted as required yards for a building, if located upon an adjacent parcel.

Response: As illustrated on the Preliminary Plans (Exhibit A) and to the extent applicable, this application is in conformance with the general regulations listed above.

15.410.020 **Front yard setback.**

…

B. Commercial.

…

2. All lots or development sites in the C-2 district shall have a front yard of not less than 10 feet. There shall be no minimum front yard setback for C-2 zoned property that has frontage on E. Portland Road or Highway 99 W. The maximum front yard setback for C-2 zoned property that has frontage on E. Portland Road or Highway 99 W. shall be no greater than 10 feet. A greater front yard setback is allowed for C-2 zoned property having frontage on E. Portland Road or Highway 99 W. when a plaza or other pedestrian amenity is provided; however, said front yard setback should be the minimum setback needed to accommodate a pedestrian amenity. No parking shall be allowed in said yard. Said yard shall be landscaped and maintained.

Response: As shown on the Preliminary Plans (Exhibit A), there are three street frontages. The buildings are set back 10 feet along N Crestview Drive and E Jory Street, meeting the 10-foot minimum standard. The site also fronts on Highway 99W; therefore, a maximum setback of 10 feet and no minimum setback apply along the southern site frontage. The planned setbacks for Buildings A and E exceed the 10-foot maximum. As described above, a greater front yard setback is allowed when a plaza or pedestrian amenity is provided.

Pedestrian spaces are provided between each building and the Highway 99W right-of-way. A multi-purpose pedestrian plaza occupies the area between Building A and Highway 99W. This plaza is located behind a landscaping strip, providing a small separation from the highway. The location and size of the plaza are the minimum needed to provide a usable outdoor pedestrian space that will complement the future corner retail user.

Due to the slope of the site and the site grading needed for improvements, a stairway and ramp are planned along the 99W frontage adjacent to Building E. These access features provide excellent pedestrian connectivity from the street to a smaller pedestrian plaza at the top of the stairs. As illustrated on Sheet P2 of Exhibit A, two easements are located in front of Building E: a 10-foot private utility easement and a 15-foot public sanitary sewer easement. The ramp and stairs are located within the easement areas, however the retaining wall needed for site improvements needs to be located outside the easement areas. Building E is located as close to Highway 99W as feasible given the location of the retaining wall and the queuing area needed for the future drive-through use.

As described above and illustrated on the Preliminary Plans (Exhibit A), the front yard areas between Buildings A and E and Highway 99W include pedestrian spaces (plazas, stairway, ramp) as well as planting areas. Parking is not located in the front yards. The criteria are met.

…

15.410.030 Interior yard setback.

B. Commercial.

1. All lots or development sites in the C-1 and C-2 districts have no interior yards required where said lots or development sites abut property lines of commercially or industrially zoned property. When interior lot lines of said districts are

common with property zoned residentially, interior yards of not less than 10 feet shall be required opposite the residential districts.

Response: The subject site abuts property with C-2 zoning. Therefore, interior yards are not required. This criterion is met.

…

15.410.050 Special setback requirements to planned rights-of-way.

A. Yard Requirements for Property Abutting Partial or Future Street Rights-of-Way.

1. Except as provided in subsection (A)(2) of this section, no building shall be erected on a lot which abuts a street having only a portion of its required width dedicated, unless the yards provided and maintained in connection with such building have a width and/or depth needed to complete the street width plus the width and/or depths of the yards required on the lot by this code.

Response: The approved tentative plat for the Crestview Crossing PUD includes the required right-of-way dedications for the abutting public streets. The front yard setbacks are measured from the approved future rights-of-way. This criterion, as far as it is applicable, is met.

…

B. Planned Street Right-of-Way Widths. Planned street right-of-way widths are established as indicated in subsection (C) of this section for the various categories of streets shown in the transportation system plan.

Response: The right-of-way widths on the abutting public streets were established and approved with the Crestview Crossing PUD tentative plat approval. This criterion, as far as it is applicable, is met.

…

15.410.060 Vision clearance setback.

The following vision clearance standards shall apply in all zones (see Appendix A, Figure 9).

A. At the intersection of two streets, including private streets, a triangle formed by the intersection of the curb lines, each leg of the vision clearance triangle shall be a minimum of 50 feet in length.

B. At the intersection of a private drive and a street, a triangle formed by the intersection of the curb lines, each leg of the vision clearance triangle shall be a minimum of 25 feet in length.

C. Vision clearance triangles shall be kept free of all visual obstructions from two and one-half feet to nine feet above the curb line. Where curbs are absent, the edge of the asphalt or future curb location shall be used as a guide, whichever provides the greatest amount of vision clearance.

D. There is no vision clearance requirement within the commercial zoning district(s) located within the riverfront (RF) overlay subdistrict.

Response: As illustrated on the Preliminary Plans (Exhibit A), the applicable vision clearance standards are met. The criteria are met.

15.410.070 Yard exceptions and permitted intrusions into required yard setbacks.

The following intrusions may project into required yards to the extent and under the conditions and limitations indicated:

A. Depressed Areas. In any district, open work fences, hedges, guard railings or other landscaping or architectural devices for safety protection around depressed ramps, stairs or retaining walls may be located in required yards; provided, that such devices are not more than three and one-half feet in height.

B. Accessory Buildings. In front yards on through lots, where a through lot has a depth of not more than 140 feet, accessory buildings may be located in one of the required front yards; provided, that every portion of such accessory building is not less than 10 feet from the nearest street line.

C. Projecting Building Features. The following building features may project into the required front yard no more than five feet and into the required interior yards no more than two feet; provided, that such projections are no closer than three feet to any interior lot line:

1. Eaves, cornices, belt courses, sills, awnings, buttresses or other similar features.

2. Chimneys and fireplaces, provided they do not exceed eight feet in width.

3. Porches, platforms or landings which do not extend above the level of the first floor of the building.

4. Mechanical structures (heat pumps, air conditioners, emergency generators and pumps).

Response: As shown on the Floor Plan and Elevation Sheets of Exhibit A, canopies project into the required front yard by not more than five feet. Interior yards do not apply to the site. The applicable criteria are met.

D. Fences and Walls.

…

2. In any commercial or industrial district, a fence or wall shall be permitted to be placed at the property line or within a yard setback as follows:

a. Not to exceed eight feet in height. Located or maintained in any interior yard except where the requirements of vision clearance apply. For purposes of fencing only, lots that are corner lots or through lots may select one of the street frontages as a front yard and all other yards shall be considered as interior yards, allowing the placement of an eight-foot fence on the property line.

b. Not to exceed four feet in height. Located or maintained within all other front yards.

3. If chain link (wire-woven) fences are used, they are manufactured of corrosion-proof materials of at least 11-1/2 gauge.

4. The requirements of vision clearance shall apply to the placement of fences.

Response: A fence and a retaining wall are planned along the eastern property line. Interior yard requirements do not apply along this property line because the adjacent property is also zoned C-2. (See Section 15.410.030 above.) A chain link fence, meeting the above standards, is planned at the top of the retaining wall. There is existing chain link fencing surrounding the stormwater facility on Tract E to the east. Additional fencing is not included in the application. Retaining walls are planned along the eastern edge of the site adjacent to Building E and north to E Jory Street. The retaining walls are designed to be less than four feet in height within the required front setback area along E Jory Street. The criteria are met.

E. Parking and Service Drives (Also Refer to NMC 15.440.010 through 15.440.080).

1. In any district, service drives or accessways providing ingress and egress shall be permitted, together with any appropriate traffic control devices in any required yard.

…

3. In any commercial or industrial district, except C-1, C-4 and M-1, public or private parking areas or parking spaces shall be permitted in any required yard (see NMC 15.410.030). Parking requirements in the C-4 district are described in NMC 15.352.040(H).

…

Response: The planned parking and accessways are shown on the Preliminary Plans (Exhibit A) and are in conformance with the above criteria. The criteria are met.

F. Public Telephone Booths and Public Transit Shelters. Public telephone booths and public transit shelters shall be permitted; provided, that vision clearance is maintained for vehicle requirements for vision clearance.

Response: Public telephone booths and public transit shelters are not included with this application. Therefore, this criterion does not apply.

…

Chapter 15.415 BUILDING AND SITE DESIGN STANDARDS

…

15.415.020 Building height limitation.

…

B. Commercial and Industrial.

…

2. **In the AI, C-2, C-3, M-1, M-2, and M-3 districts there is no building height limitation, except, where said districts abut upon a residential district, the maximum permitted building height shall not exceed the maximum building height permitted in the abutting residential district for a distance of 50 feet from the abutting boundary.**

Response: The subject property does not abut a residential district; therefore, there is no building height limitation. This criterion is met.

…

C. **The maximum height of buildings and uses permitted conditionally shall be stated in the conditional use permits.**

Response: This application does not involve a conditional use; therefore, this criterion does not apply.

…

E. **Alternative Building Height Standard. As an alternative to the building height standards above, any project may elect to use the following standard (see Figure 24 in Appendix A). To meet this standard:**

1. **Each point on the building must be no more than 20 feet higher than the ground level at all points on the property lines, plus one vertical foot for each horizontal foot of distance from that property line; and**

2. **Each point on the building must be no more than 20 feet higher than the ground level at a point directly north on a property line, plus one vertical foot for each two horizontal feet of distance between those points. This second limit does not apply if the property directly to the north is a right-of-way, parking lot, protected natural resource, or similar unbuildable property.**

Response: As noted above, building height limitations do not apply to the subject site. Therefore, the alternative building height standard is not applicable.

…

15.415.030 Building height exemptions.

Roof structures and architectural features for the housing of elevators, stairways, tanks, ventilating fans and similar equipment required to operate and maintain the building, fire or parapet walls, skylights, towers, flagpoles, chimneys, smokestacks, wireless masts, TV antennas, steeples and similar structures may be erected above the height limits prescribed in this code; provided, that no roof structure, feature or any other device above the prescribed height limit shall be allowed or used for the purpose of providing additional floor space. Further, no roof structure or architectural feature under this exemption shall be erected more than 18 feet above the height of the main building, whether such structure is attached to it or freestanding, nor shall any such structure or feature exceed the height limits of the airport overlay subdistrict.

Response: As noted above, building height limitations do not apply to the subject site. Therefore, the building height exemptions are not applicable.

15.415.040 Public access required.

No building or structure shall be erected or altered except on a lot fronting or abutting on a public street or having access to a public street over a private street or easement of record approved in accordance with provisions contained in this code. New private streets may not be created to provide access except as allowed under NMC 15.332.020(B)(24), 15.336.020(B)(8), and in the M-4 zone. Existing private streets may not be used for access for new dwelling units, except as allowed under NMC 15.405.030. No building or structure shall be erected or altered without provisions for access roadways as required in the Oregon Fire Code, as adopted by the city.

Response: The subject site fronts on public streets. This criterion is met.

Chapter 15.420 LANDSCAPING AND OUTDOOR AREAS

15.420.010 Required minimum standards.

…

B. Required Landscaped Area. The following landscape requirements are established for all developments except single-family dwellings:

1. A minimum of 15 percent of the lot area shall be landscaped; provided, however, that computation of this minimum may include areas landscaped under subsection (B)(3) of this section. Development in the C-3 (central business district) zoning district and M-4 (large lot industrial) zoning district is exempt from the 15 percent landscape area requirement of this section. Additional landscaping requirements in the C-4 district are described in NMC 15.352.040(K). In the AI airport industrial district, only a five percent landscaping standard is required with the goal of "softening" the buildings and making the development "green" with plants, where possible. The existence of the runway, taxiway, and approach open areas already provide generally for the 15 percent requirement. Developments in the AI airport industrial district with a public street frontage shall have said minimum landscaping between the front property line and the front of the building.

Response: As illustrated on the Preliminary Landscape Planting Plan of Exhibit A, more than 18 percent of the site area is planting area and more than 17 percent of the site is plazas or walkways that may count toward landscaped area. Therefore, more than 35 percent landscaping area is provided on the site. This criterion is met.

2. All areas subject to the final design review plan and not otherwise improved shall be landscaped.

Response: As illustrated on the Preliminary Landscape Planting Plan of Exhibit A, all areas of the site that are not otherwise improved are planned to be landscaped. This criterion is met.

3. The following landscape requirements shall apply to the parking and loading areas:

a. **A parking or loading area providing 10 or more spaces shall be improved with defined landscaped areas totaling no less than 25 square feet per parking space.**

Response: The Preliminary Landscape Planting Plan in Exhibit A depicts the planned landscaping within the parking and loading areas. There is a total of 169 parking spaces; therefore, a minimum of 4,225 square feet of defined landscaped areas is required in the parking and loading area. More than 13,000 square feet of landscaped area is provided within the parking and loading areas. Please also see the Overall Landscape Area Plan in Exhibit A for details. This criterion is met.

b. **A parking, loading area, or drive aisle which runs adjacent to a property line shall be separate from any lot line adjacent to a street by a landscaped strip at least 10 feet in interior width or the width of the required yard, whichever is greater, and any other lot line by a landscaped strip of at least five feet in interior width. See subsections (B)(3)(c) and (d) of this section for material to plant within landscape strips.**

Response: As illustrated on the Preliminary Plans (Exhibit A), the required landscape strip separating the property line adjacent to Highway 99W and the parking area is provided. This criterion is met.

c. **A landscaped strip separating a parking area, loading area, or drive aisle from a street shall contain street trees spaced as appropriate to the species, not to exceed 50 feet apart on average, and a combination of shrubs and ground cover, or lawn. This landscaping shall provide partial screening of these areas from the street.**

Response: Streets trees and other vegetation are being provided in the planter strip as part of the approved Crestview Crossing PUD improvements along Highway 99W between the parking area and the right-of-way. Additionally, a combination of shrubs and ground cover is planned in the landscaped area between the sidewalk and parking area. This criterion is met.

d. **A landscaped strip separating a parking area, loading area, or drive aisle from an interior lot line shall contain any combination of trees, shrubs, ground cover or lawn. Plant material shall be selected from at least two different plant material groups (example: trees and shrubs, or lawn and shrubs, or lawn and trees and shrubs).**

Response: As illustrated on the Preliminary Landscape Planting Plan in Exhibit A, a landscape strip separates the eastern interior lot line from the drive-up queueing area. Plant material meets the above standards. This criterion is met.

e. **Landscaping in a parking or loading area shall be located in defined landscaped areas which are**

uniformly distributed throughout the parking or loading area.

Response: As shown on the Preliminary Landscape Planting Plan in Exhibit A, the landscaping within the parking area is planned within defined landscaped areas and uniformly distributed throughout the parking areas. This standard is met.

f. Landscaping areas in a parking lot, service drive or loading area shall have an interior width of not less than five feet.

Response: The planned parking lot landscaping areas are shown on the Preliminary Landscape Planting Plan in Exhibit A and meet the minimum interior width of five feet. This criterion is met.

g. All multifamily, institutional, commercial, or industrial parking areas, service drives, or loading zones which abut a residential district shall be enclosed with a 75 percent opaque, site-obscuring fence, wall or evergreen hedge along and immediately adjacent to any interior property line which abuts the residential district. Landscape plantings must be large enough to provide the required minimum screening requirement within 12 months after initial installation. Adequate provisions shall be maintained to protect walls, fences or plant materials from being damaged by vehicles using said parking areas.

Response: The subject site does not abut a residential district. This standard does not apply.

h. An island of landscaped area shall be located to separate blocks of parking spaces. At a minimum, one deciduous shade tree per seven parking spaces shall be planted to create a partial tree canopy over and around the parking area. No more than seven parking spaces may be grouped together without an island separation unless otherwise approved by the director based on the following alternative standards:

  i. Provision of a continuous landscaped strip, with a five-foot minimum width, which runs perpendicular to the row of parking spaces (see Appendix A, Figure 13).

  ii. Provision of tree planting landscape islands, each of which is at least 16 square feet in size, and spaced no more than 50 feet apart on average, within areas proposed for back-to-back parking (see Appendix A, Figure 14).

Response: Throughout the parking area, a maximum of seven parking spaces are grouped together with adjacent landscaped areas that each contain a deciduous shade tree. The above alternative standards are not necessary, and the criteria are met.

4. Trees, Shrubs and Ground Covers. The species of street trees required under this section shall conform to those authorized by the city council through resolution. The director shall have the responsibility for preparing and updating the street tree species list which shall be adopted in resolution form by the city council.

   a. Arterial and minor arterial street trees shall have spacing of approximately 50 feet on center. These trees shall have a minimum two-inch caliper tree trunk or stalk at a measurement of two feet up from the base and shall be balled and burlapped or boxed.

   b. Collector and local street trees shall be spaced approximately 35 to 40 feet on center. These trees shall have a minimum of a one and one-half or one and three-fourths inch tree trunk or stalk and shall be balled and burlapped or boxed.

   c. Accent Trees. Accent trees are trees such as flowering cherry, flowering plum, crab-apple, Hawthorne and the like. These trees shall have a minimum one and one-half inch caliper tree trunk or stalk and shall be at least eight to 10 feet in height. These trees may be planted bare root or balled and burlapped. The spacing of these trees should be approximately 25 to 30 feet on center.

   d. All broad-leafed evergreen shrubs and deciduous shrubs shall have a minimum height of 12 to 15 inches and shall be balled and burlapped or come from a two-gallon can. Gallon-can size shrubs will not be allowed except in ground covers. Larger sizes of shrubs may be required in special areas and locations as specified by the design review board. Spacing of these shrubs shall be typical for the variety, three to eight feet, and shall be identified on the landscape planting plan.

   e. Ground Cover Plant Material. Ground cover plant material such as greening juniper, cotoneaster, minor Bowles, English ivy, hypericum and the like shall be one of the following sizes in specified spacing for that size:

Ground Cover Plant Material	
Gallon cans	3 feet on center
4” containers	2 feet on center
2-1/4” containers	18” on center
Rooted cuttings	12” on center

Response: The Preliminary Landscape Planting Plan in Exhibit A details the planned landscaping materials, including the sizing, spacing, and plant type, which meet the provisions of this section. The criteria are satisfied.

5. Automatic, underground irrigation systems shall be provided for all areas required to be planted by this section. The director shall retain the flexibility to allow a combination of irrigated and nonirrigated areas. Landscaping material used within nonirrigated areas must consist of drought- resistant varieties. Provision must be made for alternative irrigation during the first year after initial installation to provide sufficient moisture for plant establishment.

Response: An automatic underground irrigation system is planned in accordance with this standard. Detailed irrigation plans will be submitted at the time of the building permit application submittal. This criterion is met.

6. Required landscaping shall be continuously maintained.

Response: This criterion can be met.

7. Maximum height of tree species shall be considered when planting under overhead utility lines.

Response: The subject site does not include existing or planned overhead utility lines. This criterion does not apply.

8. Landscaping requirements and standards for parking and loading areas (subsection (B)(3) of this section) will apply to development proposals unless the institution has addressed the requirements and standards by an approved site development master plan. With an approved site development master plan, the landscape requirements will be reviewed through an administrative Type I review process.

Response: This application involves site design review; therefore, it is subject to the landscaping requirements and standards.

9. In the M-4 zone, landscaping requirements and standards for parking and loading areas (subsection (B)(3) of this section) do not apply unless within 50 feet of a residential district.

Response: The subject site is located within the C-2 zone. This criterion does not apply.

C. Installation of Landscaping. All landscaping required by these provisions shall be installed prior to the issuance of occupancy permits, unless security equal to 110 percent of the cost of the landscaping as determined by the director is filed with the city, insuring such installation within six months of occupancy. A security – cash, certified check, time certificates of deposit, assignment of a savings account, bond or such other assurance of completion as shall meet with the approval of the city attorney – shall satisfy the security requirements. If the installation of the landscaping is not completed within the six-month period, or within an extension of time authorized by the director, the security may be used by the city to complete the installation. Upon completion of the installation, any portion of the remaining security deposited with the city shall be returned to the applicant.

Response: This criterion can be met.

15.420.020 Landscaping and amenities in public rights-of-way.

The following standards are intended to create attractive streetscapes and inviting pedestrian spaces. A review body may require any of the following landscaping and amenities to be placed in abutting public rights-of-way as part of multifamily, commercial, industrial, or institutional design reviews, or for subdivisions and planned unit developments. In addition, any entity improving existing rights-of-way should consider including these elements in the project. A decision to include any amenity shall be based on comprehensive plan guidelines, pedestrian volumes in the area, and the nature of surrounding development.

Response: Planting strips between the public sidewalk and the curb along the three frontages were included in the street tree plan of the Crestview Crossing PUD. Where there is additional area between the back of sidewalk and the edge of right-of-way, landscaping is provided as illustrated on the Preliminary Landscape Planting Plan of Exhibit A. Additional amenities can be provided as required by the City.

A. Pedestrian Space Landscaping. Pedestrian spaces shall include all sidewalks and medians used for pedestrian refuge. Spaces near sidewalks shall provide plant material for cooling and dust control, and street furniture for comfort and safety, such as benches, waste receptacles and pedestrian-scale lighting. These spaces should be designed for short-term as well as long-term use. Elements of pedestrian spaces shall not obstruct sightlines and shall adhere to any other required city safety measures. Medians used for pedestrian refuge shall be designed for short-term use only with plant material for cooling and dust control, and pedestrian-scale lighting. The design of these spaces shall facilitate safe pedestrian crossing with lighting and accent paving to delineate a safe crossing zone visually clear to motorists and pedestrians alike.

1. **Street trees planted in pedestrian spaces shall be planted according to NMC 15.420.010(B)(4).**
2. **Pedestrian spaces shall have low (two and one-half feet) shrubs and ground covers for safety purposes, enhancing visibility and discouraging criminal activity.**
    - a. **Plantings shall be 90 percent evergreen year-round, provide seasonal interest with fall color or blooms, and at maturity maintain growth within the planting area (refer to plant material matrix below).**
    - b. **Plant placement shall also adhere to clear sight line requirements as well as any other relevant city safety measures.**
3. **Pedestrian-scale lighting shall be installed along sidewalks and in medians used for pedestrian refuge.**
    - a. **Pole lights as well as bollard lighting may be specified; however, the amount and type of pedestrian activity during evening hours, e.g., transit stops, nighttime service districts, shall ultimately determine the type of fixture chosen.**

b. Luminaire styles shall match the area/district theme of existing luminaires and shall not conflict with existing building or roadway lights causing glare.

c. Lighting heights and styles shall be chosen to prevent glare and to designate a clear and safe path and limit opportunities for vandalism (see Appendix A, Figure 17, Typical Pedestrian Space Layouts).

d. Lighting shall be placed near the curb to provide maximum illumination for spaces furthest from building illumination. Spacing shall correspond to that of the street trees to prevent tree foliage from blocking light.

4. Street furniture such as benches and waste receptacles shall be provided for spaces near sidewalks only.

a. Furniture should be sited in areas with the heaviest pedestrian activity, such as downtown, shopping districts, and shopping centers.

b. Benches should be arranged to facilitate conversation between individuals with L-shaped arrangements and should face the area focal point, such as shops, fountains, plazas, and should divert attention away from nearby traffic.

5. Paving and curb cuts shall facilitate safe pedestrian crossing and meet all ADA requirements for accessibility.

Response: As illustrated on the Preliminary Landscape Planting Plan in Exhibit A, planting strip landscaping was included in the Crestview Crossing PUD application and will be completed as part of the PUD public improvements. Additional amenities as detailed above are not planned within the abutting rights-of-way but can be provided as required by the City.

B. Planting Strip Landscaping. All planting strips shall be landscaped. Planting strips provide a physical and psychological buffer for pedestrians from traffic with plant material that reduces heat and dust, creating a more comfortable pedestrian environment. Planting strips shall have different arrangements and combinations of plant materials according to the frequency of on-street parking (see Appendix A, Figures 18 and 19).

1. Planting strips which do not have adjacent parking shall have a combination of ground covers, low (two and one-half feet) shrubs and trees. Planting strips adjacent to frequently used on-street parking, as defined by city staff, shall only have trees protected by tree grates, and planting strips adjacent to infrequently used on-street parking shall be planted with ground cover as well as trees (see Appendix A, Figures 18 and 19, Typical Planting Strip Layouts). District themes or corridor themes linking individual districts should be followed utilizing a unifying plant characteristic, e.g., bloom color, habit, or fall color. When specifying thematic

plant material, monocultures should be avoided, particularly those species susceptible to disease.

2. Street trees shall be provided in all planting strips as provided in NMC 15.420.010(B)(4).

   a. Planting strips without adjacent parking or with infrequent adjacent parking shall have street trees in conjunction with ground covers and/or shrubs.

   b. Planting strips with adjacent parking used frequently shall have only street trees protected by tree grates.

3. Shrubs and ground covers shall be provided in planting strips without adjacent parking with low (two and one-half feet) planting masses to enhance visibility, discourage criminal activity, and provide a physical as well as psychological buffer from passing traffic.

   a. Plantings shall be 90 percent evergreen year-round, provide seasonal interest with fall color or blooms and at maturity maintain growth within the planting area.

   b. Ground cover able to endure infrequent foot traffic shall be used in combination with street trees for planting strips with adjacent occasional parking (refer to plant material matrix below).

   c. All plant placement shall adhere to clear sight line requirements as well as any other relevant city safety measures.

Response: As illustrated on the Preliminary Landscape Planting Plan in Exhibit A, planting strip landscaping was included in the Crestview Crossing PUD application and will be completed as part of the PUD public improvements. The criteria do not apply.

C. Maintenance. All landscapes shall be maintained for the duration of the planting to encourage health of plant material as well as public health and safety. All street trees and shrubs shall be pruned to maintain health and structure of the plant material for public safety purposes.

Response: The above landscape maintenance standard can be met.

…

Chapter 15.425 EXTERIOR LIGHTING

15.425.020 Applicability and exemptions.

A. Applicability. Outdoor lighting shall be required for safety and personal security in areas of assembly, parking, and traverse, as part of multifamily residential, commercial, industrial, public, recreational and institutional uses. The applicant for any Type I or Type II development permit shall submit, as part of the site plan, evidence that the proposed outdoor lighting plan will comply with this section. This information shall contain but not be limited to the following:

1. The location, height, make, model, lamp type, wattage, and proposed cutoff angle of each outdoor lighting fixture.
2. Additional information the director may determine is necessary, including but not limited to illuminance level profiles, hours of business operation, and percentage of site dedicated to parking and access.
3. If any portion of the site is used after dark for outdoor parking, assembly or traverse, an illumination plan for these areas is required. The plan must address safety and personal security.

Response: The Site Lighting Plan in Exhibit A includes the above information as applicable. Lighting is provided where necessary and appropriate in accordance with the standards of this section. The criteria are met.

B. Exemptions. The following uses shall be exempt from the provisions of this section:

1. Public street and airport lighting.
2. Circus, fair, carnival, or outdoor governmentally sponsored event or festival lighting.
3. Construction or emergency lighting, provided such lighting is discontinued immediately upon completion of the construction work or abatement of the emergency necessitating said lighting.
4. Temporary Lighting. In addition to the lighting otherwise permitted in this code, a lot may contain temporary lighting during events as listed below:
    a. Grand Opening Event. A grand opening is an event of up to 30 days in duration within 30 days of issuance of a certificate of occupancy for a new or remodeled structure, or within 30 days of change of business or ownership. No lot may have more than one grand opening event per calendar year. The applicant shall notify the city in writing of the beginning and ending dates prior to the grand opening event.
    b. Other Events. A lot may have two other events per calendar year. The events may not be more than eight consecutive days in duration, nor less than 30 days apart.
5. Lighting activated by motion sensor devices.
6. Nonconforming lighting in place as of September 5, 2000. Replacement of nonconforming lighting is subject to the requirements of NMC 15.205.010 through 15.205.100.
7. Light Trespass onto Industrial Properties. The lighting trespass standards of NMC 15.425.040 do not apply where the light trespass would be onto an industrially zoned property.

Response: Exempt lighting is not included with the project. The criteria do not apply.

15.425.030 **Alternative materials and methods of construction, installation, or operation.**

The provisions of this section are not intended to prevent the use of any design, material, or methods of installation or operation not specifically prescribed by this section, provided any such alternate has been approved by the director. Alternatives must be an approximate equivalent to the applicable specific requirement of this section and must comply with all other applicable standards in this section.

Response: Alternatives to the exterior lighting materials and methods of construction, installation, and operation are not included with this application. This criterion does not apply.

15.425.040 **Requirements.**

A. General Requirements – All Zoning Districts.

1. Low-level light fixtures include exterior lights which are installed between ground level and six feet tall. Low-level light fixtures are considered nonintrusive and are unrestricted by this code.
2. Medium-level light fixtures include exterior lights which are installed between six feet and 15 feet above ground level. Medium-level light fixtures must either comply with the shielding requirements of subsection (B) of this section, or the applicant shall show that light trespass from a property has been designed not to exceed one-half foot-candle at the property line.
3. High-level light fixtures include exterior lights which are installed 15 feet or more above ground level. High-level light fixtures must comply with the shielding requirements of subsection (B) of this section, and light trespass from a property may not exceed one-half foot-candle at the property line.

B. Table of Shielding Requirements.

Table of Shielding Requirements	
Fixture Lamp Type	Shielded
Low/high pressure sodium, mercury vapor, metal halide and fluorescent over 50 watts	Fully
Incandescent over 160 watts	Fully
Incandescent 160 watts or less	None
Fossil fuel	None
Any light source of 50 watts or less	None
Other sources	As approved by NMC 15.425.030
Note: “Incandescent” includes tungsten-halogen (quartz) lamps.	

Response: As illustrated on the Site Lighting Plan of Exhibit A, lighting is designed to meet the above standards as applicable. The criteria are met.

Chapter 15.430 UNDERGROUND UTILITY INSTALLATION

15.430.010 Underground utility installation.

A. All new utility lines, including but not limited to electric, communication, natural gas, and cable television transmission lines, shall be placed underground. This does not include surface-mounted transformers, connections boxes, meter cabinets, service cabinets, temporary facilities during construction, and high-capacity electric lines operating at 50,000 volts or above.

B. Existing utility lines shall be placed underground when they are relocated, or when an addition or remodel requiring a Type II design review is proposed, or when a developed area is annexed to the city.

C. The director may make exceptions to the requirement to underground utilities based on one or more of the following criteria:

1. The cost of undergrounding the utility is extraordinarily expensive.

2. here are physical factors that make undergrounding extraordinarily difficult.

3. Existing utility facilities in the area are primarily overhead and are unlikely to be changed.

Response: As shown on the Preliminary Plans (Exhibit A), new utilities are planned to be installed underground. The criteria are met.

Chapter 15.440 OFF-STREET PARKING, BICYCLE PARKING, AND PRIVATE WALKWAYS

Article I. Off-Street Parking Requirements

15.440.010 Required off-street parking.

A. Off-street parking shall be provided on the development site for all R-1, C-1, M-1, M-2 and M-3 zones. In all other zones, the required parking shall be on the development site or within 400 feet of the development site which the parking is required to serve. All required parking must be under the same ownership as the development site served except through special covenant agreements as approved by the city attorney, which bind the parking to the development site.

Response: As illustrated on the Preliminary Plans (Exhibit A), parking areas are provided on the project site and are under the same ownership. This criterion is met.

B. Off-street parking is required pursuant to NMC 15.440.030 in the C-2 district.

1. In cases where the applicant is proposing off-street parking, refer to subsection (F) of this section for the maximum number of parking spaces.

Response: As illustrated on the Preliminary Plans (Exhibit A), off-street parking areas are provided on the project site. See Subsection (F) below for the applicable maximum parking standards. This criterion is met.

…

E. **All commercial, office, or industrial developments that have more than 20 off-street parking spaces and that have designated employee parking must provide at least one preferential carpool/vanpool parking space. The preferential carpool/vanpool parking space(s) must be located close to a building entrance.**

Response: The parking area does not include designated employee parking spaces. This criterion does not apply.

F. **Maximum Number of Off-Street Automobile Parking Spaces. The maximum number of off-street automobile parking spaces allowed per site equals the minimum number of required spaces, pursuant to NMC 15.440.030, multiplied by a factor of:**

1. **One and one-fifth spaces for uses fronting a street with adjacent on-street parking spaces; or**
2. **One and one-half spaces for uses fronting no street with adjacent on-street parking; or**
3. **A factor determined according to a parking analysis.**

Response: The minimum number of required parking spaces, as discussed under Section 15.440.030 below, is 124 spaces. The site does not have adjacent on-street parking; therefore, the applicable maximum parking standard is 1.5 times 124 parking spaces, equaling 186 parking spaces. The planned 169 off-street parking spaces meets the maximum parking standard. This criterion is met.

15.440.020 Parking area and service drive design.

A. **All public or private parking areas, parking spaces, or garages shall be designed, laid out and constructed in accordance with the minimum standards as set forth in NMC 15.440.070.**

Response: As illustrated on the Preliminary Plans (Exhibit A), the planned parking area is designed in accordance with the minimum standards as set forth in NMC 15.440.070 below. This criterion is met.

B. **Groups of three or more parking spaces, except those in conjunction with single-family or two-family dwellings on a single lot, shall be served by a service drive so that no backward movement or other maneuvering of a vehicle within a street, other than an alley, will be required. Service drives shall be designed and constructed to facilitate the flow of traffic, provide maximum safety in traffic access and egress and maximum safety of pedestrian and vehicular traffic on the site, but in no case shall two-way and one-way service drives be less than 20 feet and 12 feet, respectively. Service drives shall be improved in accordance with the minimum standards as set forth in NMC 15.440.060.**

Response: As illustrated on the Preliminary Plans (Exhibit A), access driveways meeting the above standards are provided to the parking area from the west and north sides of the site. This criterion is met.

…

15.440.030 **Parking spaces required.**

Parking Spaces Required	
Use	**Minimum Parking Spaces Required**
Commercial Types	
Barber and beauty shops	1 for each 75 sq. ft. of gross floor area
Establishments for the sale and consumption on the premises of food and beverages with a drive-up window	1 for each 75 sq. ft. of gross floor area
Establishments for the sale and consumption on the premises of food and beverages without a drive-up window	1 for each 100 sq. ft. of gross floor area
Office buildings, business and professional offices	1 for every 400 sq. ft. of gross floor area
Retail establishments, except as otherwise specified herein	1 for each 300 sq. ft. of gross floor area
Retail stores handling bulky merchandise, household furniture, or appliance repair	1 for each 600 sq. ft. of gross floor area

15.440.040 **Parking requirements for uses not specified.**

The parking space requirements for buildings and uses not set forth herein shall be determined by the director through a Type I procedure. Such determination shall be based upon the requirements for the most comparable building or use specified herein.

Response: The Applicant anticipates that a mix of compatible commercial land uses, including those listed above, will occupy the retail center. If all of the uses are considered “retail establishments,” a minimum of 1 for every 300 square feet of gross floor area would be required. With the gross retail floor area of 37,204 square feet (does not include the utility room area), a minimum of 124 parking spaces are required. As illustrated on the Overall Site Plan of Exhibit A, a total of 169 parking spaces are provided.

To illustrate the appropriateness of the parking quantities planned for this site and to demonstrate "comparable buildings or uses" as described in 15.440.040 above, the Applicant has provided a survey of parking demand at three similar retail locations. (See the Parking Demand Assessment in the Trip Generation Letter, Exhibit G). Each of the surveyed locations is owned by Gramor Development and includes a mix of retail uses similar to the tenant mix planned for the subject site. The study was completed in 2019 prior to COVID-19 conditions. The parking demand analysis concludes that the parking ratio planned for the subject site exceeds the average weekday and Saturday parking demand ratios of the similar sites and therefore the planned parking supply is sufficient for this site. The criteria are met.

15.440.050 **Common facilities for mixed uses.**

A. In the case of mixed uses, the total requirements for off-street parking spaces shall be the sum of the requirements for the various uses. Off-street parking facilities for one use shall not be considered as providing parking facilities for any other use except as provided below.

B. Joint Uses of Parking Facilities. The director may, upon application, authorize the joint use of parking facilities required by said uses and any other parking facility; provided, that:

1. The applicant shows that there is no substantial conflict in the principal operating hours of the building or use for which the joint use of parking facilities is proposed.
2. The parking facility for which joint use is proposed is no further than 400 feet from the building or use required to have provided parking.
3. The parties concerned in the joint use of off-street parking facilities shall evidence agreement for such joint use by a legal instrument approved by the city attorney as to form and content. Such instrument, when approved as conforming to the provisions of the ordinance, shall be recorded in the office of the county recorder and copies of the instrument filed with the director.

C. Commercial establishments within 200 feet of a commercial public parking lot may reduce the required number of parking spaces by 50 percent.

Response: The total parking required is the sum of the anticipated retail commercial uses. (See also the Parking Demand Assessment included in the Trip Generation Letter, Exhibit G). Therefore, the above joint use standards are not necessary. In addition, commercial public parking lots are not located within 200 feet of the site; therefore, the applicable criteria are met.

15.440.060 Parking area and service drive improvements.

All public or private parking areas, outdoor vehicle sales areas, and service drives shall be improved according to the following:

A. All parking areas and service drives shall have surfacing of asphaltic concrete or Portland cement concrete or other hard surfacing such as brick or concrete pavers. Other durable and dust-free surfacing materials may be approved by the director for infrequently used parking areas. All parking areas and service drives shall be graded so as not to drain stormwater over the public sidewalk or onto any abutting public or private property.

Response: As shown on the Preliminary Plans (Exhibit A), the parking area and access driveways are planned to be constructed with a hard surface and graded to avoid stormwater draining over public sidewalks or onto abutting property. The criteria are met.

B. All parking areas shall be designed not to encroach on public streets, alleys, and other rights-of-way. Parking areas shall not be placed in the area between the curb and sidewalk or, if there is no sidewalk, in the public right-of-way between the curb and the property line. The director may issue a permit for exceptions for unusual circumstances where the design maintains safety and aesthetics.

Response: As illustrated on the Preliminary Plans (Exhibit A), the parking area does not encroach on public streets, alleys, and other rights-of-way. This criterion is met.

C. All parking areas, except those required in conjunction with a single-family or two-family dwelling, shall provide a substantial bumper which will prevent cars from encroachment on abutting private and public property.

Response: As illustrated on the Preliminary Plans (Exhibit A), the parking area is designed with curbs adjacent to the parking stalls to prevent cars from encroaching onto adjacent property. This criterion is met.

D. All parking areas, including service drives, except those required in conjunction with single-family or two-family dwellings, shall be screened in accordance with NMC 15.420.010(B).

Response: The parking area is landscaped and screened, as depicted on the Preliminary Landscape Planting Plan in Exhibit A, in accordance with NMC 15.420.010(B). This criterion is met.

E. Any lights provided to illuminate any public or private parking area or vehicle sales area shall be so arranged as to reflect the light away from any abutting or adjacent residential district.

Response: The parking area does not abut a residential district. This criterion does not apply.

F. All service drives and parking spaces shall be substantially marked and comply with NMC 15.440.070.

Response: As detailed on the Overall Site Plan in Exhibit A, the parking spaces and access driveways are planned to be clearly delineated in compliance with NMC 15.440.070. This criterion is met.

G. Parking areas for residential uses shall not be located in a required front yard, except as follows:

1. Attached or detached single-family or two-family: parking is authorized in a front yard on a service drive which provides access to an improved parking area outside the front yard.
2. Three- or four-family: parking is authorized in a front yard on a service drive which is adjacent to a door at least seven feet wide intended and used for entrance of a vehicle (see Appendix A, Figure 12).

Response: This application does not involve a residential use. Therefore, the criteria do not apply.

H. A reduction in size of the parking stall may be allowed for up to a maximum of 30 percent of the total number of spaces to allow for compact cars. For high turnover uses, such as convenience stores or fast-food restaurants, at the discretion of the director, all stalls will be required to be full-sized.

Response: As illustrated on the Overall Site Plan in Exhibit A, compact parking spaces are not included on the site. This criterion does not apply.

I. Affordable housing projects may use a tandem parking design, subject to approval of the community development director.

Response: This application does not involve affordable housing. This criterion does not apply.

J. Portions of off-street parking areas may be developed or redeveloped for transit-related facilities and uses such as transit shelters or park-and-ride lots, subject to meeting all other applicable standards, including retaining the required minimum number of parking spaces

Response: This application does not involve transit-related facilities and uses. This criterion does not apply.

15.440.070 Parking tables and diagrams.

The following tables provide the minimum dimensions of public or private parking areas

…

90 º Parking - Table of Dimensions (in feet) Stall Width with Corresponding Aisle Width						
Stall Width = X	9	9.5	10	10.5	11	12
Aisle Width = Y	24	24	22	22	20	20
Notes: 1. Bumpers must be installed where paved areas abut street right-of-way (except at driveways). 2. No stalls shall be such that cars must back over the property line to enter or leave stall. 3. Stalls must be clearly marked and the markings must be maintained in good condition. 4. The sketches show typical situations to illustrate the required standards. For further information or advice, contact the planning department.						

Response: The dimensions of the parking spaces are shown on the Overall Site Plan in Exhibit A and are in conformance with the 90° parking dimensions provided in the table above. The criteria are met.

Article II. Bicycle Parking

…

15.440.100 Facility requirements.

Bicycle parking facilities shall be provided for the uses shown in the following table. Fractional space requirements shall be rounded up to the next whole number.

Bicycle Parking Requirements	
Use	Minimum Number of Bicycle Parking Spaces Required
New commercial, industrial, office, and institutional developments, including additions that total 4,000 square feet or more	One bicycle parking space for every 10,000 square feet of gross floor area. In C-4 districts, two bicycle parking spaces, or one per 5,000 square feet of building area, must be provided, whichever is greater

Response: The total amount of gross floor area planned is ±37,204 square feet (does not include the utility room area); therefore, a minimum of four bicycle parking spaces is required. Two bicycle parking spaces are planned at each building in compliance with these standards, for a total of 10 bicycle parking spaces. See the Overall Site Plan in Exhibit A for details. This criterion is met.

15.440.110 Design.

A. Bicycle parking facilities shall consist of one or more of the following:

1. **A firmly secured loop, bar, rack, or similar facility that accommodates locking the bicycle frame and both wheels using a cable or U-shaped lock.**
2. **An enclosed locker.**
3. **A designated area within the ground floor of a building, garage, or storage area. Such area shall be clearly designated for bicycle parking.**
4. **Other facility designs approved by the director.**

Response: As shown on the Overall Site Plan of Exhibit A, the planned bicycle parking design allows for bicycle frames and wheels to be locked. The criterion is met.

B. All bicycle parking spaces shall be at least six feet long and two and one-half feet wide. Spaces shall not obstruct pedestrian travel.

Response: The planned bicycle parking spaces are a minimum of 6 feet long and 2.5 feet wide and outside of pedestrian circulation areas as illustrated on the Overall Site Plan in Exhibit A. This criterion is met.

C. All spaces shall be located within 50 feet of a building entrance of the development.

Response: The planned bicycle parking is located within 50 feet of building entrances, as depicted on the Overall Site Plan in Exhibit A. This criterion is met.

D. Required bicycle parking facilities may be located in the public right-of-way adjacent to a development subject to approval of the authority responsible for maintenance of that right-of-way.

Response: The planned bicycle parking is not located in the public right-of-way; therefore, this criterion does not apply.

Article III. Private Walkways

…

15.440.140 Private walkway design.

A. All required private walkways shall meet the applicable building code and Americans with Disabilities Act requirements.

Response: Pedestrian walkways including ADA accessible ramps are planned to be provided as depicted on the Overall Site Plan in Exhibit A. This criterion is met.

B. Required private walkways shall be a minimum of four feet wide.

Response: As shown on the Overall Site Plan in Exhibit A, the planned private pedestrian walkways vary between 4 feet and 20 feet wide. This criterion is met.

C. Required private walkways shall be constructed of portland cement concrete or brick.

Response: As shown on the Overall Site Plan in Exhibit A, private pedestrian walkways are planned to be constructed with a concrete surface. This criterion is met.

D. Crosswalks crossing service drives shall, at a minimum, be painted on the asphalt or clearly marked with contrasting paving materials or humps/raised crossings. If painted striping is used, it should consist of thermoplastic striping or similar type of durable application.

Response: As shown on the Overall Site Plan in Exhibit A, pedestrian walkways crossing the access driveways are clearly delineated as required above. This criterion is met.

E. At a minimum, required private walkways shall connect each main pedestrian building entrance to each abutting public street and to each other.

Response: As shown on the Overall Site Plan in Exhibit A, pedestrian walkways are planned to connect to each main building entrance, to each other, and to the abutting public streets, as appropriate. This criterion is met.

F. The review body may require on-site walks to connect to development on adjoining sites.

Response: The on-site pedestrian walkways connect to the public sidewalk system of the approved PUD. Additional connections are not available; therefore, this criterion does not apply.

G. The review body may modify these requirements where, in its opinion, the development provides adequate on-site pedestrian circulation, or where lot dimensions, existing building layout, or topography preclude compliance with these standards.

Response: The project is designed to meet the private walkway standards; therefore, modifications are not necessary, and this criterion does not apply.

Division 15.500 Public Improvement Standards

Chapter 15.505 PUBLIC IMPROVEMENTS STANDARDS

…

15.505.020 Applicability.

The provision and utilization of public facilities and services within the City of Newberg shall apply to all land developments in accordance with this chapter. No development shall be approved unless the following improvements are provided for prior to occupancy or operation, unless future provision is assured in accordance with NMC 15.505.030(E).

Response: This applicability statement is understood.

A. Public Works Design and Construction Standards. The design and construction of all improvements within existing and proposed rights-of-way and easements, all improvements to be maintained by the city, and all improvements for which city approval is required shall comply with the requirements of the most recently adopted Newberg public works design and construction standards.

Response: The Preliminary Plans (Exhibit A) demonstrate this application is in conformance with the City of Newberg Public Works Design and Construction Standards. This criterion is met.

B. Street Improvements. All projects subject to a Type II design review, partition, or subdivision approval must construct street improvements necessary to serve the development.

Response: Street improvements were reviewed and approved with the Crestview Crossing PUD. Construction of the approved improvements is planned to be completed as part of the PUD. This criterion is met.

C. Water. All developments, lots, and parcels within the City of Newberg shall be served by the municipal water system as specified in Chapter 13.15 NMC.

Response: As shown on the Preliminary Water and Sanitary Sewer Plan in Exhibit A, this criterion is met.

D. Wastewater. All developments, lots, and parcels within the City of Newberg shall be served by the municipal wastewater system as specified in Chapter 13.10 NMC.

Response: As shown on the Preliminary Water and Sanitary Sewer Plan in Exhibit A, this criterion is met.

E. Stormwater. All developments, lots, and parcels within the City of Newberg shall manage stormwater runoff as specified in Chapters 13.20 and 13.25 NMC.

Response: As shown on the Preliminary Storm Drainage Plan in Exhibit A and demonstrated in the Preliminary Stormwater Report (Exhibit F), stormwater runoff is planned to be managed on-site and is in conformance with Chapters 13.20 and 13.25 NMC.

F. Utility Easements. Utility easements shall be provided as necessary and required by the review body to provide needed facilities for present or future development of the area.

Response: A sanitary sewer line and associated easement runs through the site from Highway 99W to E Jory Street and will be completed as part of the Crestview Crossing PUD improvements. A 10-foot public utility easement is provided adjacent to each of the three public street frontages. Additional easements can be provided as necessary if required by the City. This criterion is met.

G. City Approval of Public Improvements Required. No building permit may be issued until all required public facility improvements are in place and approved by the director, or are otherwise bonded for in a manner approved by the review authority, in conformance with the provisions of this code and the Newberg Public Works Design and Construction Standards.

Response: Public facility improvements that are relevant to this application will be complete or bonded in a manner approved by the City in conformance with the standards of this code and the Public Works Design and Construction Standards prior to the issuance of building permits. This criterion is met.

15.505.030 Street standards.

…

B. Applicability. The provisions of this section apply to:

1. **The creation, dedication, and/or construction of all public streets, bike facilities, or pedestrian facilities in all subdivisions, partitions, or other developments in the City of Newberg.**
2. **The extension or widening of existing public street rights-of-way, easements, or street improvements including those which may be proposed by an individual or the city, or which may be required by the city in association with other development approvals.**
3. **The construction or modification of any utilities, pedestrian facilities, or bike facilities in public rights-of-way or easements.**
4. **The designation of planter strips. Street trees are required subject to Chapter 15.420 NMC.**
5. **Developments outside the city that tie into or take access from city streets.**

Response: The street standards of this section apply to the subject application.

C. Layout of Streets, Alleys, Bikeways, and Walkways. Streets, alleys, bikeways, and walkways shall be laid out and constructed as shown in the Newberg transportation system plan. In areas where the transportation system plan or future street plans do not show specific transportation improvements, roads and streets shall be laid out so as to conform to previously approved subdivisions, partitions, and other developments for adjoining properties, unless it is found in the public interest to modify these patterns. Transportation improvements shall conform to the standards within the Newberg Municipal Code, the Newberg public works design and construction standards, the Newberg transportation system plan, and other adopted city plans.

Response: The layout of streets, alleys, bikeways, and walkways was reviewed and approved with the Crestview Crossing PUD. This application does not alter the approved layout. This criterion is met.

D. Construction of New Streets. Where new streets are necessary to serve a new development, subdivision, or partition, right-of-way dedication and full street improvements shall be required. Three-quarter streets may be approved in lieu of full street improvements when the city finds it to be practical to require the completion of the other one-quarter street improvement when the adjoining property is developed; in such cases, three-quarter street improvements may be allowed by the city only where all of the following criteria are met:

1. **The land abutting the opposite side of the new street is undeveloped and not part of the new development; and**
2. **The adjoining land abutting the opposite side of the street is within the city limits and the urban growth boundary.**

Response: The public streets adjacent to the subject site were reviewed and approved through the Crestview Crossing PUD. Therefore, three-quarter street improvements are neither necessary nor included in this application. The applicable criteria are met.

E. Improvements to Existing Streets.

1. **All projects subject to partition, subdivision, or Type II design review approval shall dedicate right-of-way sufficient to improve the street to the width specified in subsection (G) of this section.**

2. **All projects subject to partition, subdivision, or Type II design review approval must construct a minimum of a three-quarter street improvement to all existing streets adjacent to, within, or necessary to serve the development. The director may waive or modify this requirement where the applicant demonstrates that the condition of existing streets to serve the development meets city standards and is in satisfactory condition to handle the projected traffic loads from the development. Where a development has frontage on both sides of an existing street, full street improvements are required.**

3. **In lieu of the street improvement requirements outlined in NMC 15.505.040(B), the review authority may elect to accept from the applicant monies to be placed in a fund dedicated to the future reconstruction of the subject street(s). The amount of money deposited with the city shall be 100 percent of the estimated cost of the required street improvements (including any associated utility improvements), and 10 percent of the estimated cost for inflation. Cost estimates used for this purpose shall be based on preliminary design of the constructed street provided by the applicant's engineer and shall be approved by the director.**

Response: The public streets adjacent to the subject site were reviewed and approved through the Crestview Crossing PUD. Highway 99W (E Portland Road) is the only existing street adjacent to the subject site. Right-of-way dedication and the construction of a right-turn lane are required as a condition of approval of the Crestview Crossing PUD. Therefore, the criteria are met, as applicable.

F. Improvements Relating to Impacts. Improvements required as a condition of development approval shall be roughly proportional to the impact of the development on public facilities and services. The review body must make findings in the development approval that indicate how the required improvements are roughly proportional to the impact. Development may not occur until required transportation facilities are in place or guaranteed, in conformance with the provisions of this code. If required transportation facilities cannot be put in place or be guaranteed, then the review body shall deny the requested land use application.

Response: The August 2018 Crestview Crossing PUD Traffic Impact Analysis (TIA) included this site/project. The assumptions, findings, and conclusions included in the traffic analysis remain valid and the recommendations therein are sufficient to accommodate the trips associated with this project. Additional transportation improvements are not needed.

Please see the Trip Generation Letter (Exhibit G) for additional details. This criterion is met.

G. Street Width and Design Standards.

1. Design Standards. All streets shall conform with the standards contained in Table 15.505.030(G). Where a range of values is listed, the director shall determine the width based on a consideration of the total street section width needed, existing street widths, and existing development patterns. Preference shall be given to the higher value. Where values may be modified by the director, the overall width shall be determined using the standards under subsections (G)(2) through (10) of this section.

Table 15.505.030(G) Street Design Standards

Type of Street	Right-of-Way Width	Curb-to-Curb Pavement Width	Motor Vehicle Travel Lanes	Median Type	Striped Bike Lane (Both Sides)	On-Street Parking
Arterial Streets						
Expressway**	ODOT	ODOT	ODOT	ODOT	ODOT	ODOT
Major arterial	95 – 100 feet	74 feet	4 lanes	TWLTL or median*	Yes	No*
Minor arterial	69 – 80 feet	48 feet	2 lanes	TWLTL or median*	Yes	No*
Collectors						
Major	57 – 80 feet	36 feet	2 lanes	None*	Yes	No*
Minor	61 – 65 feet	40 feet	2 lanes	None*	Yes*	Yes*
Local Streets						
Local residential	54 – 60 feet	32 feet	2 lanes	None	No	Yes
Limited residential, parking both sides	44 – 50 feet	28 feet	2 lanes	None	No	Yes
Limited residential, parking one side	40 – 46 feet	26 feet	2 lanes	None	No	One side
Local commercial/ industrial	55 – 65 feet	34 feet	2 lanes	None*	No*	Yes*

* May be modified with approval of the director. Modification will change overall curb-to-curb and right-of-way width. Where a center turn lane is not required, a landscaped median shall be provided instead, with turning pockets as necessary to preserve roadway functions.

** All standards shall be per ODOT expressway standards.

2. Motor Vehicle Travel Lanes. Collector and arterial streets shall have a minimum width of 12 feet.

3. Bike Lanes. Striped bike lanes shall be a minimum of six feet wide. Bike lanes shall be provided where shown in the Newberg transportation system plan.

4. Parking Lanes. Where on-street parking is allowed on collector and arterial streets, the parking lane shall be a minimum of eight feet wide.

5. Center Turn Lanes. Where a center turn lane is provided, it shall be a minimum of 12 feet wide.

6. Limited Residential Streets. Limited residential streets shall be allowed only at the discretion of the review authority, and only in consideration of the following factors:

   a. The requirements of the fire chief shall be followed.

   b. The estimated traffic volume on the street is low, and in no case more than 600 average daily trips.

   c. Use for through streets or looped streets is preferred over cul-de-sac streets.

   d. Use for short blocks (under 400 feet) is preferred over longer blocks.

   e. The total number of residences or other uses accessing the street in that block is small, and in no case more than 30 residences.

   f. On-street parking usage is limited, such as by providing ample off-street parking, or by staggering driveways so there are few areas where parking is allowable on both sides.

7. Sidewalks. Sidewalks shall be provided on both sides of all public streets. Minimum width is five feet.

8. Planter Strips. Except where infeasible, a planter strip shall be provided between the sidewalk and the curb line, with a minimum width of five feet. This strip shall be landscaped in accordance with the standards in NMC 15.420.020. Curb-side sidewalks may be allowed on limited residential streets. Where curb-side sidewalks are allowed, the following shall be provided:

   a. Additional reinforcement is done to the sidewalk section at corners.

   b. Sidewalk width is six feet.

9. Slope Easements. Slope easements shall be provided adjacent to the street where required to maintain the stability of the street.

10. Intersections and Street Design. The street design standards in the Newberg public works design and construction standards shall apply to all public streets, alleys, bike facilities, and sidewalks in the city.

11. The planning commission may approve modifications to street standards for the purpose of ingress or egress to a

minimum of three and a maximum of six lots through a conditional use permit.

Response: The public streets adjacent to the subject site were designed, reviewed, and approved as part of the Crestview Crossing PUD. The design details of the streets, including travel lanes, sidewalks, and planter strips were detailed in the Crestview Crossing PUD application and notice of decision. This application is consistent with the PUD approval; therefore, the criteria are met.

H. Modification of Street Right-of-Way and Improvement Width. The director, pursuant to the Type II review procedures of Chapter 15.220 NMC, may allow modification to the public street standards of subsection (G) of this section, when the criteria in both subsections (H)(1) and (2) of this section are satisfied:

1. The modification is necessary to provide design flexibility in instances where:

a. Unusual topographic conditions require a reduced width or grade separation of improved surfaces; or

b. Lot shape or configuration precludes accessing a proposed development with a street which meets the full standards of this section; or

c. A modification is necessary to preserve trees or other natural features determined by the city to be significant to the aesthetic character of the area; or

d. A planned unit development is proposed and the modification of street standards is necessary to provide greater privacy or aesthetic quality to the development.

2. Modification of the standards of this section shall only be approved if the director finds that the specific design proposed provides adequate vehicular access based on anticipated traffic volumes.

Response: Modifications to the approved street rights-of-way and improvement widths are not included with this application. The criteria do not apply.

I. Temporary Turnarounds. Where a street will be extended as part of a future phase of a development, or as part of development of an abutting property, the street may be terminated with a temporary turnaround in lieu of a standard street connection or circular cul-de-sac bulb. The director and fire chief shall approve the temporary turnaround. It shall have an all-weather surface, and may include a hammerhead-type turnaround meeting fire apparatus access road standards, a paved or graveled circular turnaround, or a paved or graveled temporary access road. For streets extending less than 150 feet and/or with no significant access, the director may approve the street without a temporary turnaround. Easements or right-of-way may be required as necessary to preserve access to the turnaround.

Response: Temporary turnarounds are not included in this application. The criteria do not apply.

J. **Topography. The layout of streets shall give suitable recognition to surrounding topographical conditions in accordance with the purpose of this code.**

Response: The approved street layout considered the existing topographic conditions of the site in its design. This criterion is met.

K. **Future Extension of Streets. All new streets required for a subdivision, partition, or a project requiring site design review shall be constructed to be "to and through": through the development and to the edges of the project site to serve adjacent properties for future development.**

Response: The approved street layout considered the existing topographic conditions of the site in its design. This criterion is met.

L. **Cul-de-Sacs.**

…

Response: Cul-de-sacs are not included in this application. This subsection does not apply.

M. **Street Names and Street Signs. Streets that are in alignment with existing named streets shall bear the names of such existing streets. Names for new streets not in alignment with existing streets are subject to approval by the director and the fire chief and shall not unnecessarily duplicate or resemble the name of any existing or platted street in the city. It shall be the responsibility of the land divider to provide street signs.**

Response: Installation of street signs with approved street names is a condition of approval of the Crestview Crossing PUD. Therefore, this criterion does not apply with this application.

N. **Platting Standards for Alleys.**

…

O. **Platting Standards for Blocks.**

…

P. **Private Streets. New private streets, as defined in NMC 15.05.030, shall not be created, except as allowed by NMC 15.240.020(L)(2).**

Response: Alleys, blocks, and private streets are not appropriate, necessary, or included for this project. These subsections do not apply.

Q. **Traffic Calming.**

1. **The following roadway design features may be required in new street construction where traffic calming needs are anticipated:**
   a. **Serpentine alignment.**
   b. **Curb extensions.**
   c. **Traffic diverters/circles.**
   d. **Raised medians and landscaping.**

e. Other methods shown effective through engineering studies.

2. Traffic-calming measures such as speed humps should be applied to mitigate traffic operations and/or safety problems on existing streets. They should not be applied with new street constructions.

Response: Adjacent public streets were designed, reviewed, and approved as part of the Crestview Crossing PUD. A traffic circle and raised medians are planned to be provided at the N Crestview Drive/E Jory Street intersection in accordance with City standards as part of the PUD project. The criteria are met.

R. Vehicular Access Standards.

…

2. Access Spacing Standards. Public street intersection and driveway spacing shall follow the standards in Table 15.505.R below. The Oregon Department of Transportation (ODOT) has jurisdiction of some roadways within the Newberg city limits, and ODOT access standards will apply on those roadways.

Table 15.505.R. Access Spacing Standards

Roadway Functional Classification	Area[1]	Minimum Public Street Intersection Spacing (Feet)[2]	Driveway Setback from Intersecting Street[3]
Expressway	All	Refer to ODOT Access Spacing Standards	NA
Major arterial	Urban CBD	Refer to ODOT Access Spacing Standards	
Minor arterial	Urban CBD	500 200	150 100
Major collector	All	400	150
Minor collector	All	300	100

[1] "Urban" refers to intersections inside the city urban growth boundary outside the central business district (C-3 zone).

"CBD" refers to intersections within the central business district (C-3 zone).

"All" refers to all intersections within the Newberg urban growth boundary.

[2] Measured centerline to centerline.

[3] The setback is based on the higher classification of the intersecting streets. Measured from the curb line of the intersecting street to the beginning of the driveway, excluding flares. If the driveway setback listed above would preclude a lot from having at least one driveway, including shared driveways or driveways on adjoining streets, one driveway is allowed as far from the intersection as possible.

Response: N Crestview Drive is classified as a "Major Collector" and E Jory Street is classified as a "Minor Collector". The access driveways to the subject site meet the applicable access spacing requirements above. The criterion is met.

3. **Properties with Multiple Frontages. Where a property has frontage on more than one street, access shall be limited to the street with the lesser classification.**

Response: The subject site has three frontages. Access is limited to the N Crestview Drive and E Jory Street frontages, streets with lesser classifications than E Portland Road (Hwy 99W). The criterion is met.

4. **Driveways. More than one driveway is permitted on a lot accessed from either a minor collector or local street as long as there is at least 40 feet of lot frontage separating each driveway approach. More than one driveway is permitted on a lot accessed from a major collector as long as there is at least 100 feet of lot frontage separating each driveway approach.**

Response: Consistent with the approved Crestview Crossing PUD, one driveway is planned on N Crestview Drive, a "Major Collector," and one driveway on E Jory Street, a "Minor Collector." The criterion is met.

5. **Alley Access. Where a property has frontage on an alley and the only other frontages are on collector or arterial streets, access shall be taken from the alley only. The review body may allow creation of an alley for access to lots that do not otherwise have frontage on a public street provided all of the following are met:**
    a. **The review body finds that creating a public street frontage is not feasible.**
    b. **The alley access is for no more than six dwellings and no more than six lots.**
    c. **The alley has through access to streets on both ends.**
    d. **One additional parking space over those otherwise required is provided for each dwelling. Where feasible, this shall be provided as a public use parking space adjacent to the alley.**

Response: Alley access is not included in this application. The criteria do not apply.

6. **Closure of Existing Accesses. Existing accesses that are not used as part of development or redevelopment of a property shall be closed and replaced with curbing, sidewalks, and landscaping, as appropriate.**

Response: The existing access to E Portland Road (Hwy 99W) is planned to be removed. The criterion is met.

7. **Shared Driveways.**

…

Response: Shared driveways are not included in this application. This subsection does not apply.

8. **Frontage Streets and Alleys. The review body for a partition, subdivision, or design review may require construction of a frontage street to provide access to properties fronting an arterial or collector street.**

Response: Frontage streets and alleys are not included in this application. This subsection does not apply.

9. **ODOT or Yamhill County Right-of-Way. Where a property abuts an ODOT or Yamhill County right-of-way, the applicant for any development project shall obtain an access permit from ODOT or Yamhill County.**

Response: The access permit to allow the N Crestview Drive connection with Highway 99W was obtained with the Crestview Crossing PUD approval. This criterion does not apply to this application.

10. **Exceptions. The director may allow exceptions to the access standards above in any of the following circumstances:**

    a. **Where existing and planned future development patterns or physical constraints, such as topography, parcel configuration, and similar conditions, prevent access in accordance with the above standards.**

    b. **Where the proposal is to relocate an existing access for existing development, where the relocated access is closer to conformance with the standards above and does not increase the type or volume of access.**

    c. **Where the proposed access results in safer access, less congestion, a better level of service, and more functional circulation, both on street and on site, than access otherwise allowed under these standards.**

11. **Where an exception is approved, the access shall be as safe and functional as practical in the particular circumstance. The director may require that the applicant submit a traffic study by a registered engineer to show the proposed access meets these criteria.**

Response: Exceptions to the above access standards are not included in this application. The criteria do not apply.

S. **Public Walkways.**

1. **Projects subject to Type II design review, partition, or subdivision approval may be required to provide public walkways where necessary for public safety and convenience, or where necessary to meet the standards of this code. Public walkways are meant to connect cul-de-sacs to adjacent areas, to pass through oddly shaped or unusually long blocks, to provide for networks of public paths according to adopted plans, or to provide access to schools, parks or other community destinations or public areas.**

Where practical, public walkway easements and locations may also be used to accommodate public utilities.

…

Response: Sidewalks were provided along the public street frontages with the previous PUD approval. "Public walkways" as defined in the Newberg Development Code are paths other than sidewalks and are not included in this application. This subsection does not apply.

T. Street Trees. Street trees shall be provided for all projects subject to Type II design review, partition, or subdivision. Street trees shall be installed in accordance with the provisions of NMC 15.420.010(B)(4).

Response: Street trees were reviewed and approved along the project frontage with the Crestview Crossing PUD. This criterion does not apply.

U. Street Lights. All developments shall include underground electric service, light standards, wiring and lamps for street lights according to the specifications and standards of the Newberg public works design and construction standards. The developer shall install all such facilities and make the necessary arrangements with the serving electric utility as approved by the city. Upon the city's acceptance of the public improvements associated with the development, the street lighting system, exclusive of utility-owned service lines, shall be and become property of the city unless otherwise designated by the city through agreement with a private utility.

Response: Street lights were reviewed and approved along the project frontage with the Crestview Crossing PUD. Changes are not planned with this application. The criteria are met.

V. Transit Improvements. Development proposals for sites that include or are adjacent to existing or planned transit facilities, as shown in the Newberg transportation system plan or adopted local or regional transit plan, shall be required to provide any of the following, as applicable and required by the review authority:

…

Response: Transit facilities are not included with the subject project nor adjacent to the site. The criteria do not apply.

15.505.040 Public utility standards.

…

B. Applicability. This section applies to all development where installation, extension or improvement of water, wastewater, or private utilities is required to serve the development or use of the subject property.

Response: As demonstrated on the Preliminary Plans (Exhibit A), this application includes the installation and extension of water, wastewater, and private utilities. Therefore, this application is subject to the standards of this section.

C. General Standards.

1. **The design and construction of all improvements within existing and proposed rights-of-way and easements, all improvements to be maintained by the city, and all improvements for which city approval is required shall conform to the Newberg public works design and construction standards and require a public improvements permit.**

2. **The location, design, installation and maintenance of all utility lines and facilities shall be carried out with minimum feasible disturbances of soil and site. Installation of all proposed public and private utilities shall be coordinated by the developer and be approved by the city to ensure the orderly extension of such utilities within public right-of-way and easements.**

Response: As demonstrated on the Preliminary Plans (Exhibit A), the utility infrastructure is designed in accordance with the Newberg Public Works Design and Construction Standards. Applicable permits will be obtained prior to work within public rights-of-way. The criteria are met.

D. Standards for Water Improvements. All development that has a need for water service shall install the facilities pursuant to the requirements of the city and all of the following standards. Installation of such facilities shall be coordinated with the extension or improvement of necessary wastewater and stormwater facilities, as applicable.

1. **All developments shall be required to be linked to existing water facilities adequately sized to serve their intended area by the construction of water distribution lines, reservoirs and pumping stations which connect to such water service facilities. All necessary easements required for the construction of these facilities shall be obtained by the developer and granted to the city pursuant to the requirements of the city.**

2. **Specific location, size and capacity of such facilities will be subject to the approval of the director with reference to the applicable water master plan. All water facilities shall conform with city pressure zones and shall be looped where necessary to provide adequate pressure and fire flows during peak demand at every point within the system in the development to which the water facilities will be connected. Installation costs shall remain entirely the developer's responsibility.**

Response: Reclaimed water and domestic water lines are available to the site. The Preliminary Water and Sanitary Sewer Plan in Exhibit A details the planned water facilities. The water improvements are designed in accordance with the above applicable standards. The applicable criteria are met.

3. **The design of the water facilities shall take into account provisions for the future extension beyond the development to serve adjacent properties, which, in the judgment of the city, cannot be feasibly served otherwise.**

Response: Water lines will not need to be extended to adjacent properties in the future. This criterion does not apply.

4. **Design, construction and material standards shall be as specified by the director for the construction of such public water facilities in the city.**

Response: The water facilities are designed to the Public Works Design and Construction Standards. The City will complete additional review as part of the Public Improvement Permit process. This criterion can be met.

E. Standards for Wastewater Improvements. All development that has a need for wastewater services shall install the facilities pursuant to the requirements of the city and all of the following standards. Installation of such facilities shall be coordinated with the extension or improvement of necessary water services and stormwater facilities, as applicable.

1. **All septic tank systems and on-site sewage systems are prohibited. Existing septic systems must be abandoned or removed in accordance with Yamhill County standards.**

Response: Any existing septic systems will be abandoned in accordance with Yamhill County standards. This criterion is met.

2. **All properties shall be provided with gravity service to the city wastewater system, except for lots that have unique topographic or other natural features that make gravity wastewater extension impractical as determined by the director. Where gravity service is impractical, the developer shall provide all necessary pumps/lift stations and other improvements, as determined by the director.**

Response: The subject site uses gravity wastewater service and connects to the planned sanitary sewer infrastructure in E Jory Street. This criterion is met.

3. **All developments shall be required to be linked to existing wastewater collection facilities adequately sized to serve their intended area by the construction of wastewater lines which connect to existing adequately sized wastewater facilities. All necessary easements required for the construction of these facilities shall be obtained by the developer and granted to the city pursuant to the requirements of the city.**

4. **Specific location, size and capacity of wastewater facilities will be subject to the approval of the director with reference to the applicable wastewater master plan. All wastewater facilities shall be sized to provide adequate capacity during peak flows from the entire area potentially served by such facilities. Installation costs shall remain entirely the developer's responsibility.**

Response: The planned wastewater facilities are appropriately sized in accordance with City standards. A sanitary sewer line and associated easement runs through the site from Highway 99W to E Jory Street. The criteria are met.

5. **Temporary wastewater service facilities, including pumping stations, will be permitted only if the director approves the temporary facilities, and the developer provides for all facilities that are necessary for transition to permanent facilities.**

Response: Temporary wastewater facilities are not included in the application. This criterion does not apply.

6. **The design of the wastewater facilities shall take into account provisions for the future extension beyond the development to serve upstream properties, which, in the judgment of the city, cannot be feasibly served otherwise.**

7. **Design, construction and material standards shall be as specified by the director for the construction of such wastewater facilities in the city.**

Response: The wastewater infrastructure within E Jory Street takes future development into consideration in accordance with the Crestview Crossing PUD approval. The wastewater facilities planned with this commercial project are illustrated on the Preliminary Water and Sanitary Sewer Plan in Exhibit A and are designed in accordance with City standards. The criteria are met.

F. **Easements. Easements for public and private utilities shall be provided as deemed necessary by the city, special districts, and utility companies. Easements for special purpose uses shall be of a width deemed appropriate by the responsible agency. Such easements shall be recorded on easement forms approved by the city and designated on the final plat of all subdivisions and partitions. Minimum required easement width and locations are as provided in the Newberg public works design and construction standards.**

Response: Existing and planned easements on the subject site are delineated on the Preliminary Plans in Exhibit A and are the appropriate width in accordance with City standards. The criterion is met.

15.505.050 Stormwater system standards.

…

B. **Applicability. The provisions of this section apply to all developments subject to site development review or land division review and to the reconstruction or expansion of such developments that increases the flow or changes the point of discharge to the city stormwater system. Additionally, the provisions of this section shall apply to all drainage facilities that impact any public storm drain system, public right-of-way or public easement, including but not limited to off-street parking and loading areas.**

Response: This application involves design review for a retail commercial center which includes new structures, parking areas, and hard surfaces that increase the flow to the City stormwater system. Therefore, this application is subject to the standards of this section.

C. **General Requirement. All stormwater runoff shall be conveyed to a public storm wastewater or natural drainage channel having adequate capacity to carry the flow without overflowing or otherwise**

causing damage to public and/or private property. The developer shall pay all costs associated with designing and constructing the facilities necessary to meet this requirement.

Response: The Preliminary Storm Drainage Plan in Exhibit A and the Preliminary Stormwater Report (Exhibit F) illustrate the planned on-site stormwater management plan. This criterion is met.

D. Plan for Stormwater and Erosion Control. No construction of any facilities in a development included in subsection (B) of this section shall be permitted until an engineer registered in the State of Oregon prepares a stormwater report and erosion control plan for the project. This plan shall contain at a minimum:

1. The methods to be used to minimize the amount of runoff, sedimentation, and pollution created from the development both during and after construction.

2. Plans for the construction of stormwater facilities and any other facilities that depict line sizes, profiles, construction specifications, and other such information as is necessary for the city to review the adequacy of the stormwater plans.

3. Design calculations shall be submitted for all drainage facilities. These drainage calculations shall be included in the stormwater report and shall be stamped by a licensed professional engineer in the State of Oregon. Peak design discharges shall be computed based upon the design criteria outlined in the public works design and construction standards for the city.

Response: A Preliminary Stormwater Report including the above information has been prepared by a licensed professional engineer in the State of Oregon and is included with this application as Exhibit F. The criteria are met.

E. Development Standards. Development subject to this section shall be planned, designed, constructed, and maintained in compliance with the Newberg public works design and construction standards.

Response: The subject retail commercial development included in this application is planned to be designed, constructed, and maintained in compliance with the Newberg Public Works Design and Construction Standards. This criterion is met.

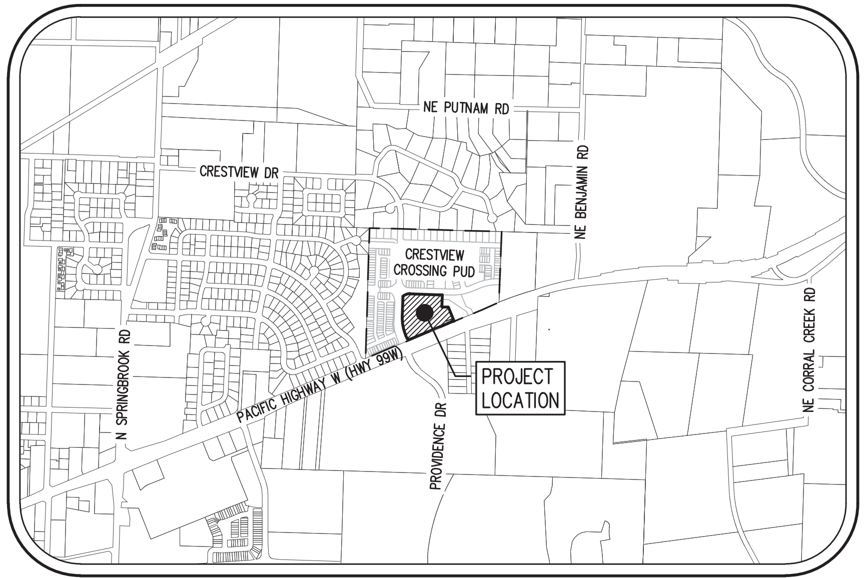
IV. Conclusion

The required findings have been made and this written narrative and the accompanying documentation demonstrate that the application is consistent with the applicable provisions of the City of Newberg Municipal Code. The evidence in the record is substantial and the City can rely upon this information in its approval of the application.

Exhibit A: Preliminary Plans

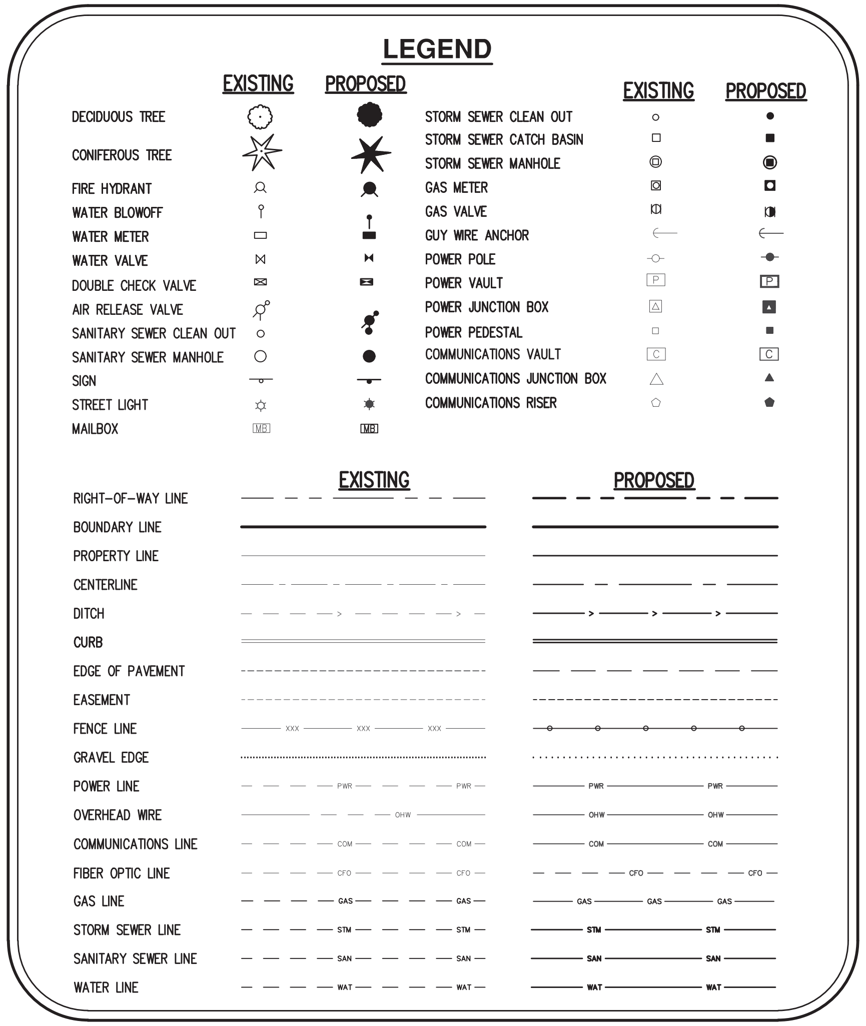
CRESTVIEW CROSSING COMMERCIAL

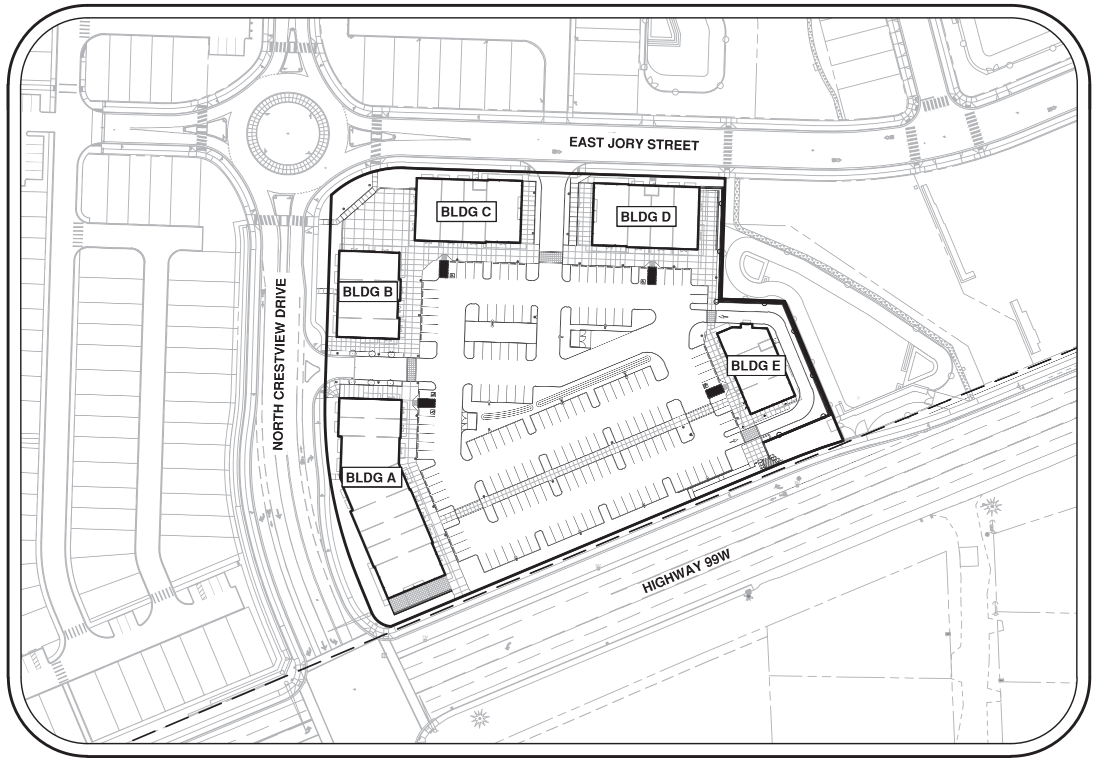
DESIGN REVIEW PLANS



VICINITY MAP

NOT TO SCALE





SITE MAP

SCALE: 1"=100' FEET (22"x34")
SCALE: 1"=200' FEET (11"x17")

PROPERTY DESCRIPTION:

YAMHILL COUNTY TAX MAP 3.2.16AC, TAX LOT 13800
YAMHILL COUNTY TAX MAP 3.2.16, TAX LOT 1100

VERTICAL DATUM

VERTICAL DATUM: ELEVATIONS ARE BASED ON TRIMBLE NOW NETWORK OBSERVATIONS (NAVD88) AND CHECKED AGAINST YAMHILL COUNTY STATION NO. 22, LOCATED AT THE NORTHERLY RIGHT-OF-WAY LINE OF DOUGLAS AVENUE AND ON THE CENTERLINE OF SPRINGBROOK WAY. ELEVATION = 223.403 FEET (NAVD 88)

APLICANT

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CIVIL ENGINEERING, LANDSCAPE ARCHITECTURE, PLANNING, AND SURVEYING FIRM

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ENGINEERING · SURVEYING · NATURAL RESOURCES
FORESTRY · PLANNING · LANDSCAPE ARCHITECTURE

GRAMOR DEVELOPMENT

COVER SHEET WITH SITE AND VICINITY MAP
CRESTVIEW CROSSING COMMERCIAL
GRAMOR NEWBERG CRESTVIEW, LLC

PRELIMINARY NOT FOR CONSTRUCTION

CHARLES EDWARD GREGORY
RENEWS: JUNE 30, 2021

JOB NUMBER: 3723
DATE: 11/20/2020
DESIGNED BY: MCC
DRAWN BY: MCC
CHECKED BY: CEG

NOTES:

1. UTILITIES SHOWN ARE BASED ON UNDERGROUND UTILITY LOCATE MARKINGS AS PROVIDED BY OTHERS, PROVIDED PER UTILITY LOCATE TICKET NUMBERS 14165137, 18120893, 18120897, 18120907, AND 18120914. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND LOCATES REPRESENT THE ONLY UTILITIES IN THE AREA. CONTRACTORS ARE RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BEGINNING CONSTRUCTION.

2. FIELD WORK WAS CONDUCTED BY AKS ON AUGUST 6–9 AND 12 2013, JULY 7, 9, 10, 14, 15, AND 18 2014, MAY 14, 16, 17, AND 22–25 2018, AND JUNE 1 2018. FIELD WORK WAS CONDUCTED BY OTHERS IN NOVEMBER 2009 AND 2008.

3. HORIZONTAL DATUM: A LOCAL DATUM PLANE DERIVED FROM STATE PLANE OREGON NORTH 3601 NAD83(2011)EPOCH: 2010.0000 BY MULTIPLYING BY A PROJECT MEAN GROUND COMBINED SCALE FACTOR OF 1.0001080704 AT A CENTRAL PROJECT POINT WITH INTERNATIONAL FOOT STATE PLANE GRID COORDINATES N608751.880 E7576192.404 AND A MERIDIAN CONVERGENCE ANGLE OF –1°43'33". STATE PLANE COORDINATES WERE DERIVED FROM GPS OBSERVATIONS USING THE TRIMBLE VRS NOW NETWORK. DISTANCES SHOWN ARE INTERNATIONAL FOOT GROUND VALUES.

4. VERTICAL DATUM: ELEVATIONS ARE BASED ON TRIMBLE NOW NETWORK OBSERVATIONS (NAVD88) AND CHECKED AGAINST YAMHILL COUNTY STATION NO. 22,. LOCATED AT THE NORTHERLY RIGHT–OF–WAY LINE OF DOUGLAS AVENUE AND ON THE CENTERLINE OF SPRINGBROOK WAY. ELEVATION = 223.403 FEET (NAVD 88).

5. THIS MAP DOES NOT CONSTITUTE A PROPERTY BOUNDARY SURVEY.

6. SURVEY IS ONLY VALID WITH SURVEYOR'S STAMP AND SIGNATURE.

7. BUILDING FOOTPRINTS ARE MEASURED TO SIDING UNLESS NOTED OTHERWISE. CONTACT SURVEYOR WITH QUESTIONS REGARDING BUILDING TIES.

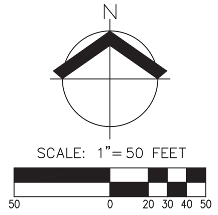
8. CONTOUR INTERVAL IS 1 FOOT.

9. TREES WITH DIAMETER OF 6" AND GREATER ARE SHOWN. TREE DIAMETERS WERE MEASURED UTILIZING A DIAMETER TAPE AT BREAST HEIGHT. TREE INFORMATION IS SUBJECT TO CHANGE UPON ARBORIST INSPECTION.

10. WETLAND BOUNDARIES SHOWN WERE DELINEATED BY SCHOTT AND ASSOCIATES AND WERE PROFESSIONALLY SURVEYED BY AKS ENGINEERING & FORESTRY, LLC. ON THE WEEK OF 3/11/2013–03/14/2013.

11. THE SUBJECT PROPERTY SHOWN HEREON IS SUBJECT TO THE EASEMENT RECORDED UNDER BOOK 113, PAGE 457 OF YAMHILL COUNTY DEED RECORDS AND IS UNMAPPABLE.

12. ALL CONTOURS AND IMPROVEMENTS SHOWN HERE ARE BASED ON AKS' TOPOGRAPHIC SURVEY PRIOR TO THE START OF CURRENT SITE PLAN CONSTRUCTION BY OTHERS.



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GRAMOR DEVELOPMENT

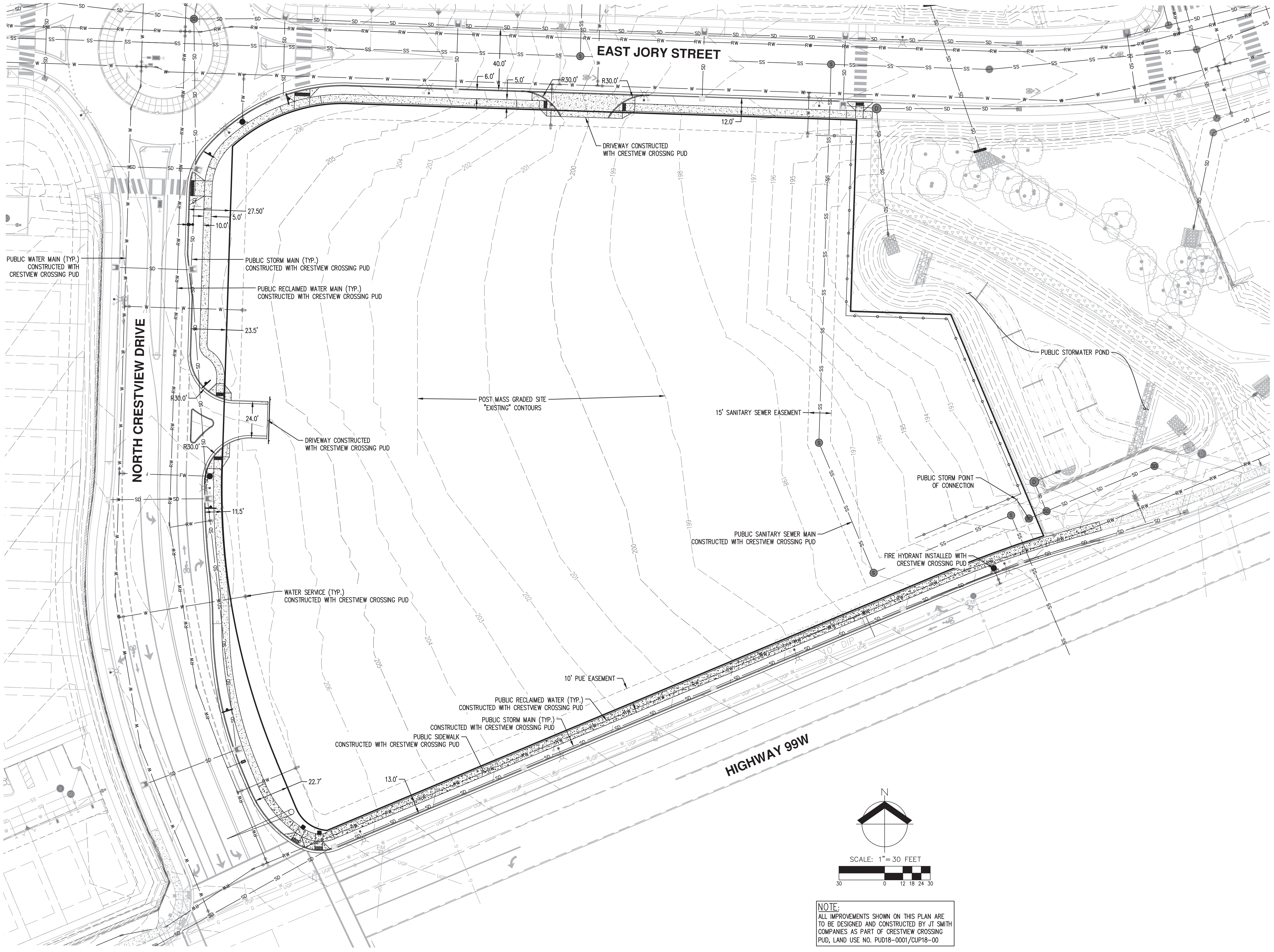
PRE CRESTVIEW CROSSING PUD
EXISTING CONDITIONS PLAN
CRESTVIEW CROSSING COMMERCIAL
GRAMOR NEWBERG CRESTVIEW, LLC

REGISTERED PROFESSIONAL LAND SURVEYOR
PRELIMINARY NOT FOR CONSTRUCTION
OREGON
JANUARY 9, 2007
NICK WHITE
70652LS
RENEWS: 6/30/22

JOB NUMBER:	3723
DATE:	11/20/2020
DESIGNED BY:	MCC
DRAWN BY:	MCC
CHECKED BY:	CEG

P1

AKS DRAWING FILE: 3723 EXCOND.DWG | LAYOUT: P1



NOTE:
ALL IMPROVEMENTS SHOWN ON THIS PLAN ARE TO BE DESIGNED AND CONSTRUCTED BY JT SMITH COMPANIES AS PART OF CRESTVIEW CROSSING PUD, LAND USE NO. PUD18-0001/CUP18-00

AKS DRAWING FILE: 3723 P02 PUBLIC IMPROVEMENTS.DWG | LAYOUT: P2

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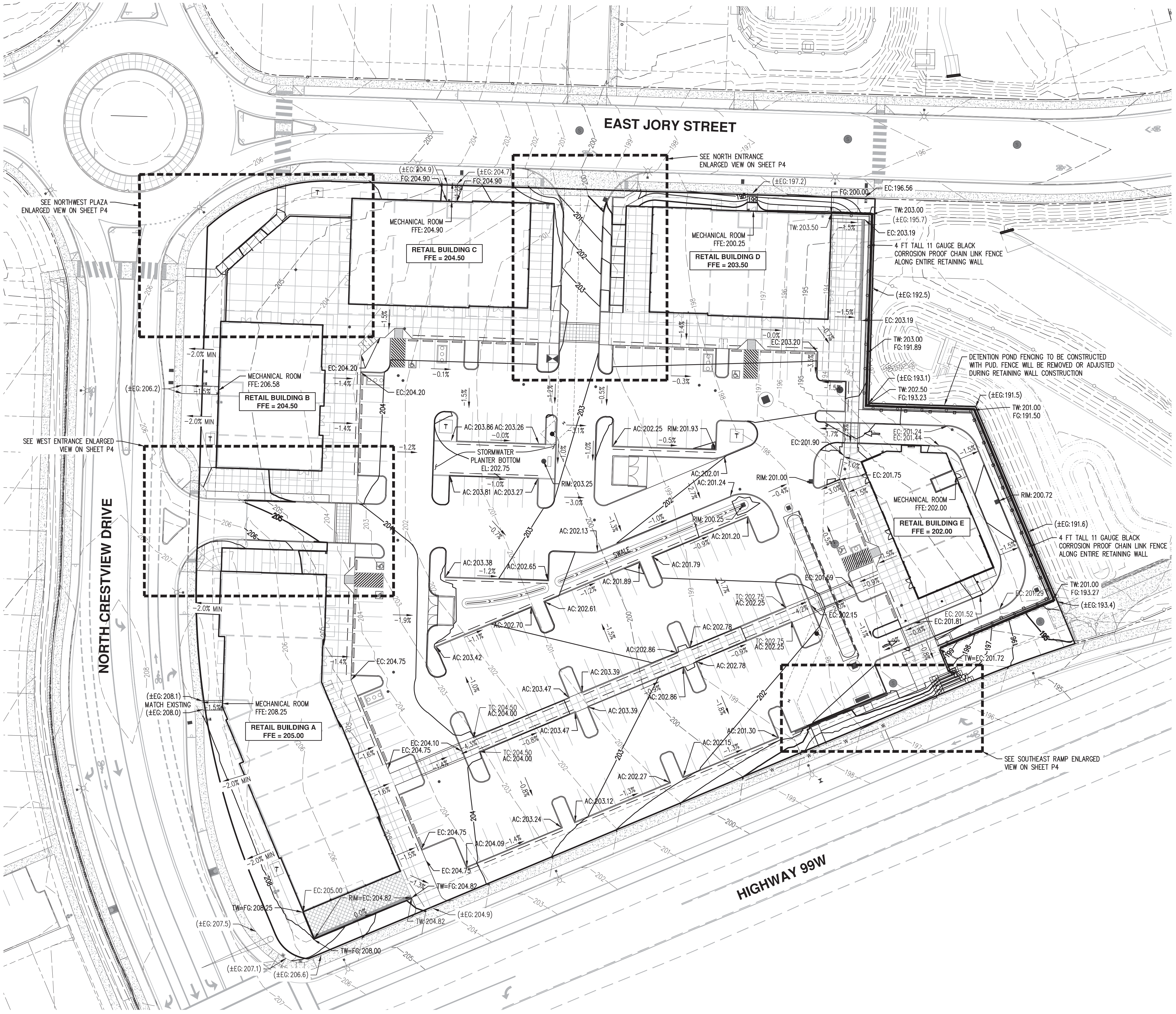
GRAMOR DEVELOPMENT

POST CRESTVIEW CROSSING PUD AND PUBLIC IMPROVEMENTS PLAN
CRESTVIEW CROSSING COMMERCIAL
GRAMOR NEWBERG CRESTVIEW, LLC

REGISTERED PROFESSIONAL ENGINEER
OREGON
CHARLES EDWARD GREGORY
PRELIMINARY NOT FOR CONSTRUCTION
RENEWS: JUNE 30, 2021

JOB NUMBER:	3723
DATE:	11/20/2020
DESIGNED BY:	MCC
DRAWN BY:	MCC
CHECKED BY:	CEG

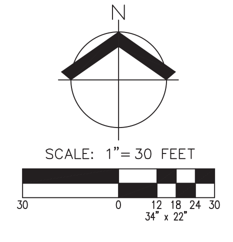
P2



LEGEND

EXISTING GROUND CONTOUR (1 FT) (POST CRESTVIEW CROSSING PUD)	-199-
EXISTING GROUND CONTOUR (5 FT) (POST CRESTVIEW CROSSING PUD)	-200-
FINISHED GRADE CONTOUR (1 FT)	199
FINISHED GRADE CONTOUR (5 FT)	**200**
DOWNWARD SLOPE	–X.X%
EXISTING GRADE ELEVATION	(±EG: XXX.X)
FINISH FLOOR ELEVATION	FFE: XXX.XX
FINISH GRADE ELEVATION	FG: XXX.XX
EDGE OF CONCRETE ELEVATION	EC: XXX.XX
TOP OF CURB ELEVATION	TC: XXX.XX
TOP OF WALL ELEVATION	TW: XXX.XX
TOP OF STAIRS ELEVATION	TS: XXX.XX
BOTTOM OF STAIRS ELEVATION	BS: XXX.XX
SURFACE RIM ELEVATION	RIM: XXX.XX

NOTE:
CURB OPENINGS TO BE CONSTRUCTED TO ALLOW STORMWATER TO DRAIN INTO THE PLANTER AND SWALE.



AKS DRAWING FILE: 3723 P03 GRADING PLAN.DWG | LAYOUT: P3

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GRAMOR DEVELOPMENT

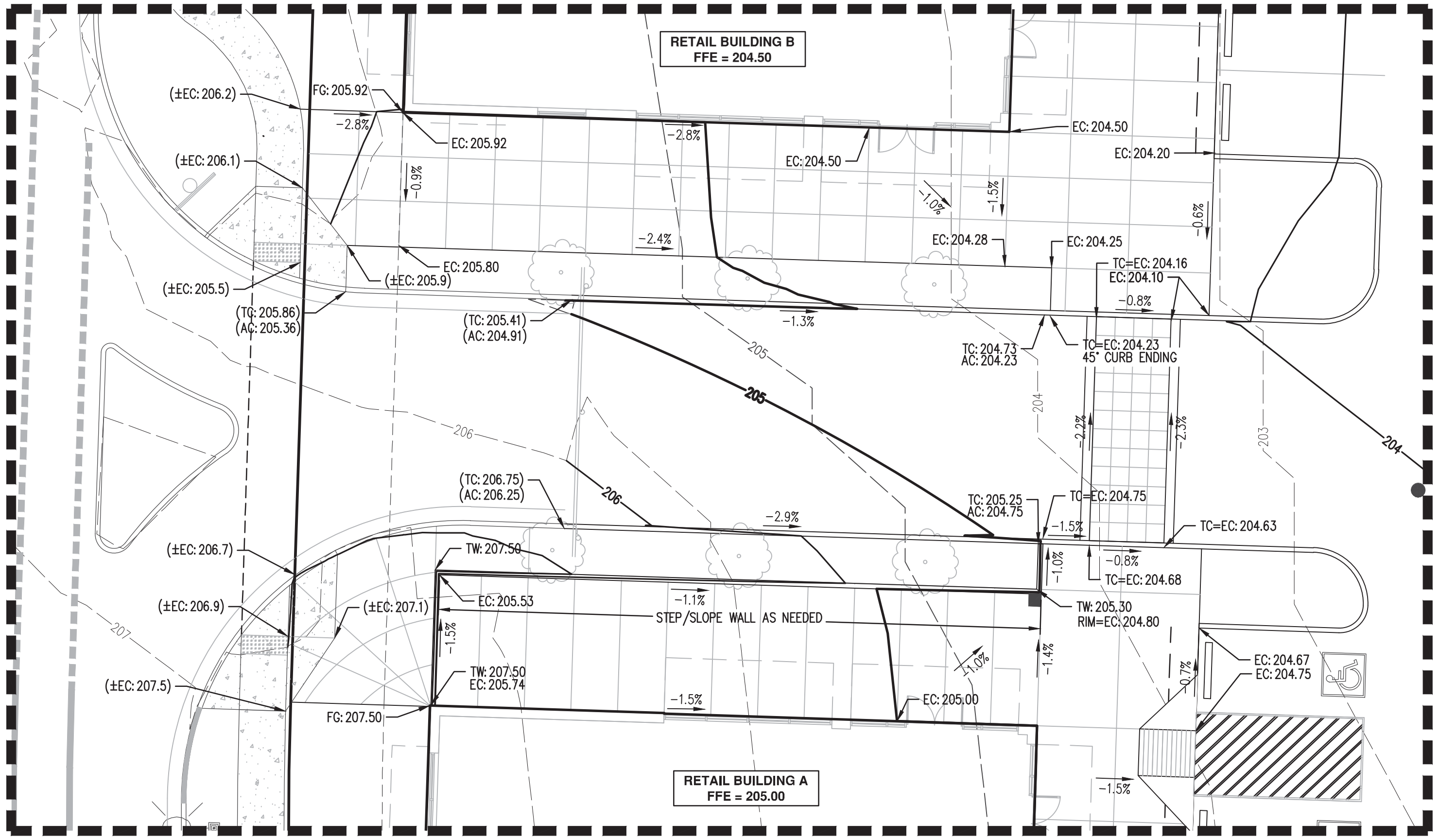
PRELIMINARY GRADING PLAN

CRESTVIEW CROSSING COMMERCIAL
GRAMOR NEWBERG CRESTVIEW, LLC

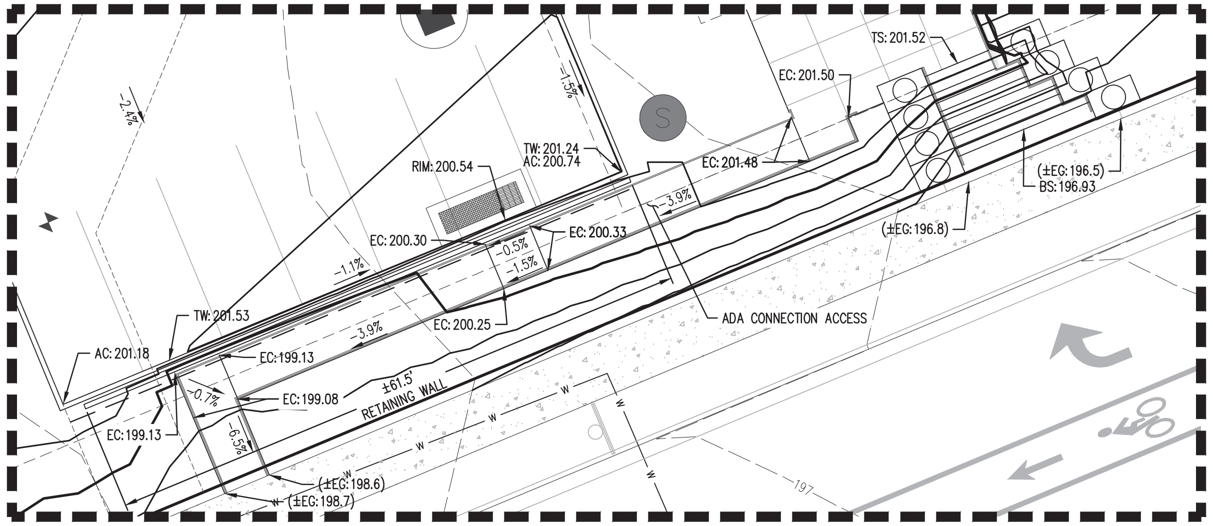
PRELIMINARY NOT FOR CONSTRUCTION
RENEWS: JUNE 30, 2021

JOB NUMBER: 3723
DATE: 11/20/2020
DESIGNED BY: MCC
DRAWN BY: MCC
CHECKED BY: CEG

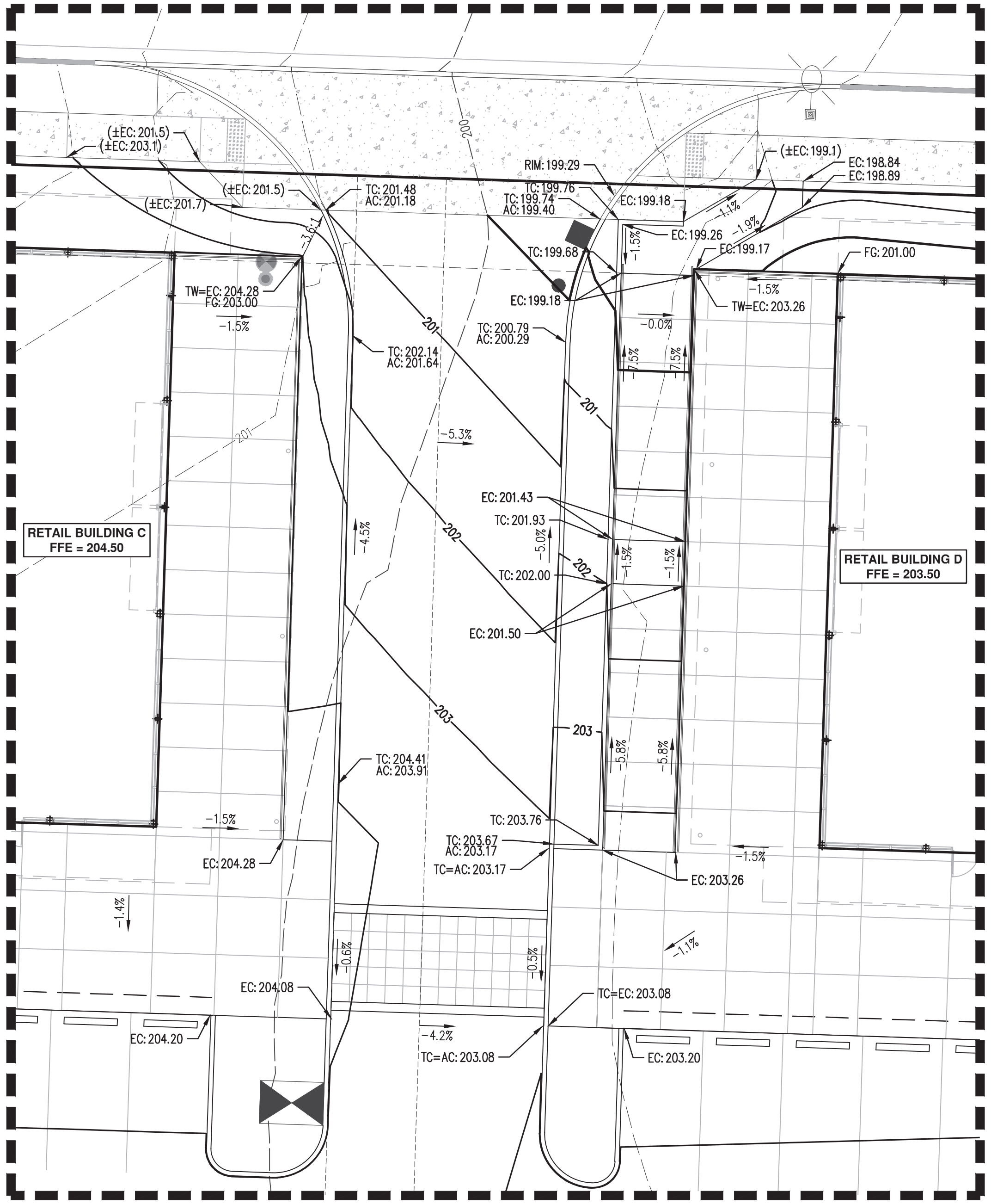
P3



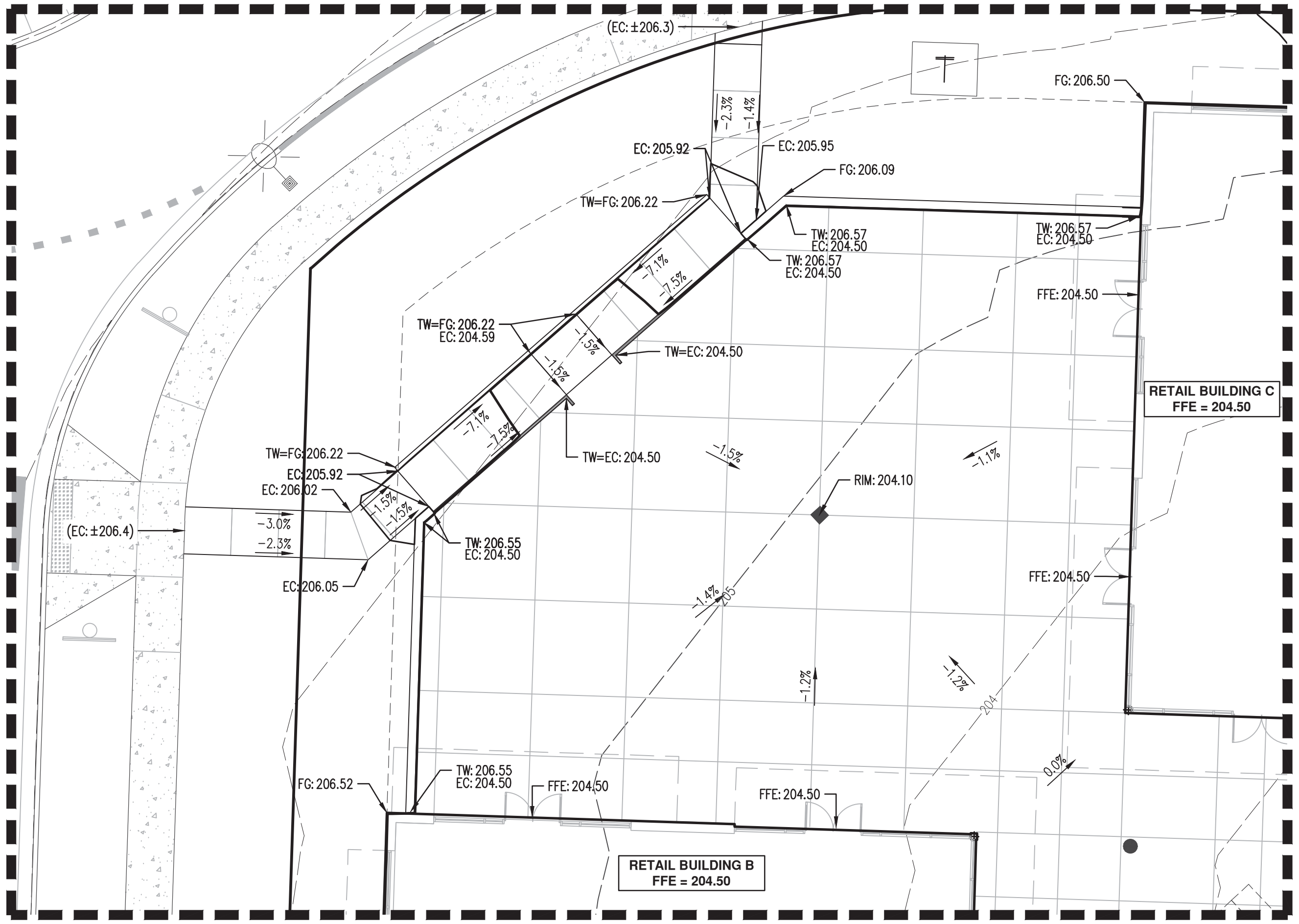
WEST ENTRANCE ENLARGED VIEW



SOUTHEAST RAMP ENLARGED VIEW

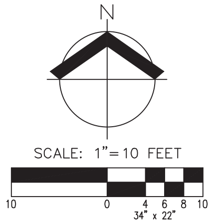


NORTH ENTRANCE ENLARGED VIEW



NORTHWEST PLAZA ENLARGED VIEW

NOTE:
CURB OPENINGS TO BE CONSTRUCTED TO ALLOW STORMWATER TO DRAIN INTO THE PLANTER AND SWALE.



SCALE: 1"=10 FEET

LEGEND

EXISTING GROUND CONTOUR (1 FT) (POST CRESTVIEW CROSSING PUD)	-199-
EXISTING GROUND CONTOUR (5 FT) (POST CRESTVIEW CROSSING PUD)	-200-
FINISHED GRADE CONTOUR (1 FT)	199
FINISHED GRADE CONTOUR (5 FT)	200
DOWNWARD SLOPE	-X.X%
EXISTING GRADE ELEVATION	(±EG: XXX.X)
FINISH FLOOR ELEVATION	FFE: XXX.XX
FINISH GRADE ELEVATION	FG: XXX.XX
EDGE OF CONCRETE ELEVATION	EC: XXX.XX
TOP OF CURB ELEVATION	TC: XXX.XX
TOP OF WALL ELEVATION	TW: XXX.XX
TOP OF STAIRS ELEVATION	TS: XXX.XX
BOTTOM OF STAIRS ELEVATION	BS: XXX.XX
SURFACE RIM ELEVATION	RIM: XXX.XX

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GRAMOR DEVELOPMENT

PRELIMINARY GRADING PLAN

CRESTVIEW CROSSING COMMERCIAL

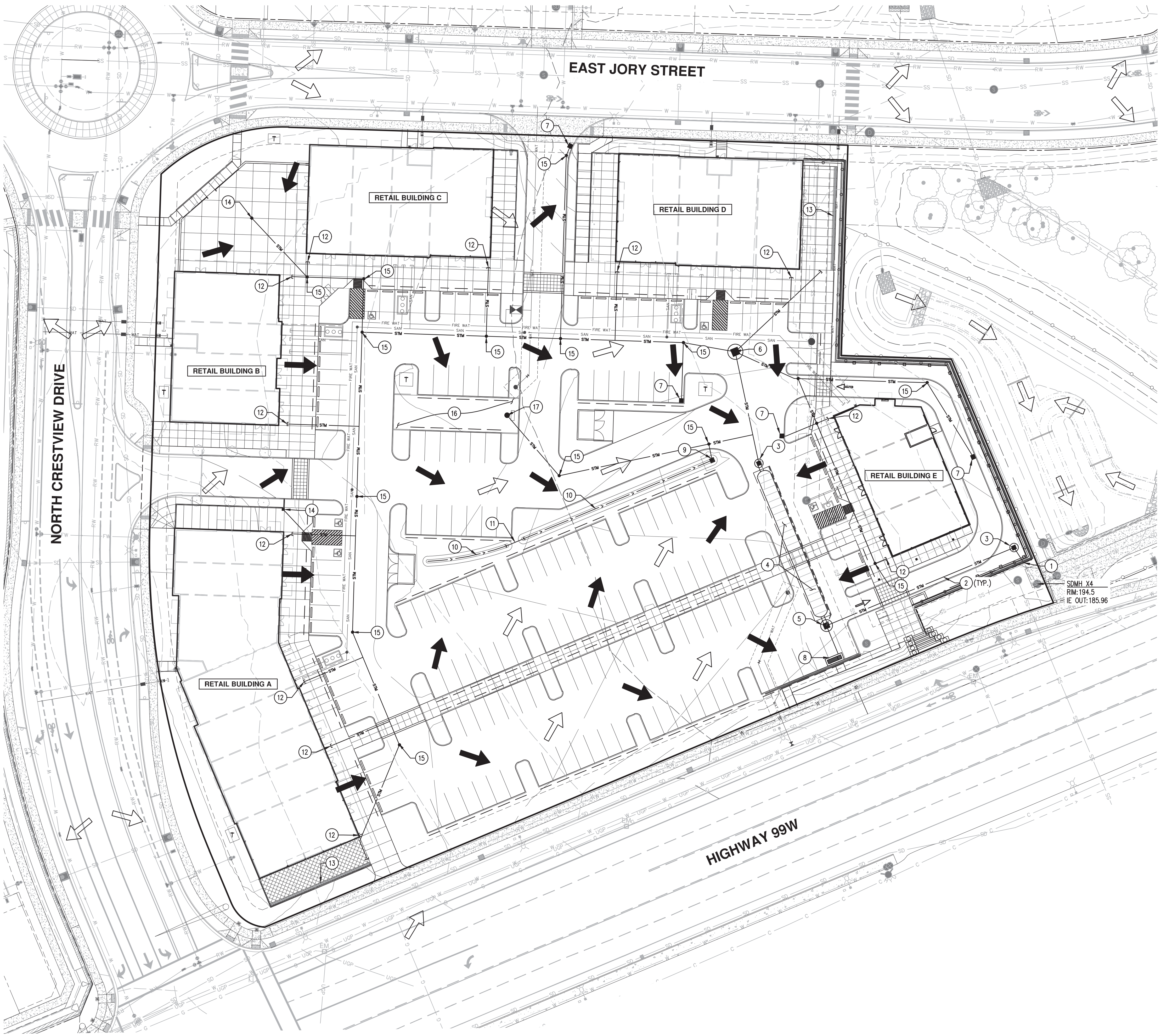
GRAMOR NEWBERG CRESTVIEW, LLC

REGISTERED PROFESSIONAL ENGINEER
OREGON
CHARLES EDWARD GREGORY
PRELIMINARY NOT FOR CONSTRUCTION
RENEWS: JUNE 30, 2021

JOB NUMBER:	3723
DATE:	11/20/2020
DESIGNED BY:	MCC
DRAWN BY:	MCC
CHECKED BY:	CEG

P4

AKS DRAWING FILE: 3723 P03 GRADING PLAN.DWG | LAYOUT: P4

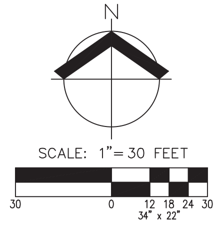


KEYED STORMWATER NOTES

1. CONNECT TO EXISTING STORM DRAIN STUB.
2. PVC D3034 STORM PIPE
3. STORM MANHOLE
4. (1) 96 LF (22 SECTIONS) OF MC–4500 STORMTECH CHAMBER TRENCH WITH 6" PERFORATED UNDER DRAIN FOR STORMWATER DETENTION
5. 72" FLOW CONTROL MANHOLE.
6. 96" WATER QUALITY MANHOLE.
7. CATCH BASIN.
8. WATER QUALITY CATCH BASIN.
9. DITCH INLET.
10. VEGETATED WATER QUALITY SWALE.
11. PVC D3034 CULVERT.
12. BUILDING CONNECTION, SEE BUILDING PLANS BY OTHERS FOR EXACT DOWNSPOUT LOCATION.
13. TRENCH DRAIN.
14. AREA DRAIN.
15. CLEANOUT.
16. STORMWATER PLANTER PER CITY OF NEWBERG STANDARDS, 6" PERFORATED, AND 6" OVERFLOW PIPE.
17. PLANTER OVERFLOW STAND PIPE.

LEGEND:

⇨	DIRECTION OF SURFACE WATER RUNOFF FLOW ARROW PRE–DEVELOPMENT
➡	DIRECTION OF SURFACE WATER RUNOFF FLOW ARROW POST–DEVELOPMENT



SCALE: 1"= 30 FEET

PRELIMINARY STORM DRAINAGE PLAN

CRESTVIEW CROSSING COMMERCIAL

GRAMOR NEWBERG CRESTVIEW, LLC

GRAMOR DEVELOPMENT

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REGISTERED PROFESSIONAL ENGINEER
OREGON
CHARLES EDWARD GREGORY
PRELIMINARY NOT FOR CONSTRUCTION
RENEWS: JUNE 30, 2021

JOB NUMBER:	3723
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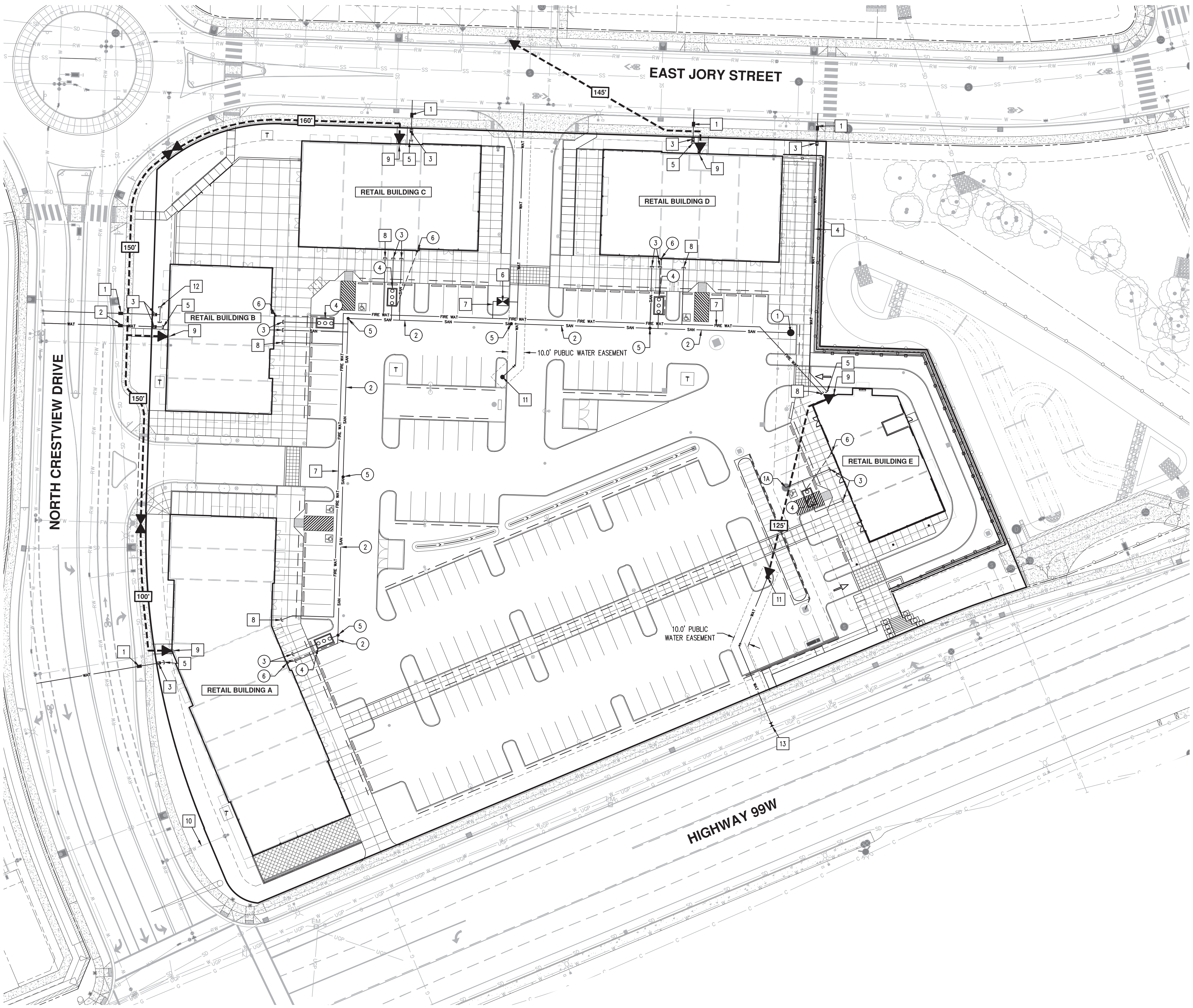
P5

AKS DRAWING FILE: 3723 P04 STM.DWG | LAYOUT: P5

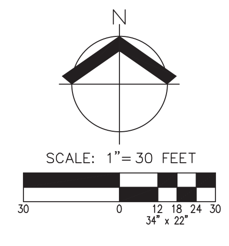


KEYED WATER NOTES

1. 1-1/2" WATER METER.
2. 1-1/4" WATER METER.
3. 2" DOUBLE CHECK VALVE.
4. 2" SCHEDULE 80 PVC WATER PIPE.
5. CONNECT TO BUILDING SERVICE WITH 2" SCHEDULE 80 PVC WATER PIPE, SEE PLANS BY OTHERS.
6. INSTALL 8" FIRE DOUBLE CHECK ASSEMBLY.
7. RESTRAINED JOINT 8" DUCTILE IRON FIRE WATER SERVICE.
8. CONNECT TO BUILDING FIRE SERVICE, COORDINATE WITH FIRE SPRINKLER PLANS.
9. FDC MOUNTED TO BUILDING.
10. RECLAIMED WATER SERVICE, INSTALLED BY CRESTVIEW CROSSING PUD DEVELOPER, TO REMAIN CAPPED FOR FUTURE USE.
11. FIRE HYDRANT ASSEMBLY PER CITY OF NEWBERG STANDARDS.
12. IRRIGATION POINT OF CONNECTION
13. HOT TAP EXISTING 10" WATER MAIN

KEYED SANITARY SEWER NOTES

1. INSTALL SANITARY SEWER MANHOLE OVER EXISTING PUBLIC SANITARY SEWER MAIN.
1A. CONNECT TO EXISTING SANITARY SEWER MANHOLE
2. 6" PVC D3034 SANITARY SEWER PIPE, SLOPE VARIES.
3. CONNECT TO BUILDING, REFER TO PLUMBING PLANS BY OTHERS.
4. 1,500 GALLON GREASE INTERCEPTOR, SEE PLUMBING PLANS BY OTHERS
5. INSTALL CLEANOUT
6. ROUTE TERMINATION VENT PIPE FROM GREASE INTERCEPTOR TO FACE OF BUILDING, SEE PLUMBING PLANS BY OTHERS



SCALE: 1"= 30 FEET

34" x 22"

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GRAMOR DEVELOPMENT

PRELIMINARY WATER AND SANITARY SEWER PLAN
CRESTVIEW CROSSING COMMERCIAL
GRAMOR NEWBERG CRESTVIEW, LLC

PRELIMINARY NOT FOR CONSTRUCTION

CHARLES EDWARD GREGORY

RENEWS: JUNE 30, 2021

JOB NUMBER: 3723
DATE: 11/20/2020
DESIGNED BY: MCC
DRAWN BY: MCC
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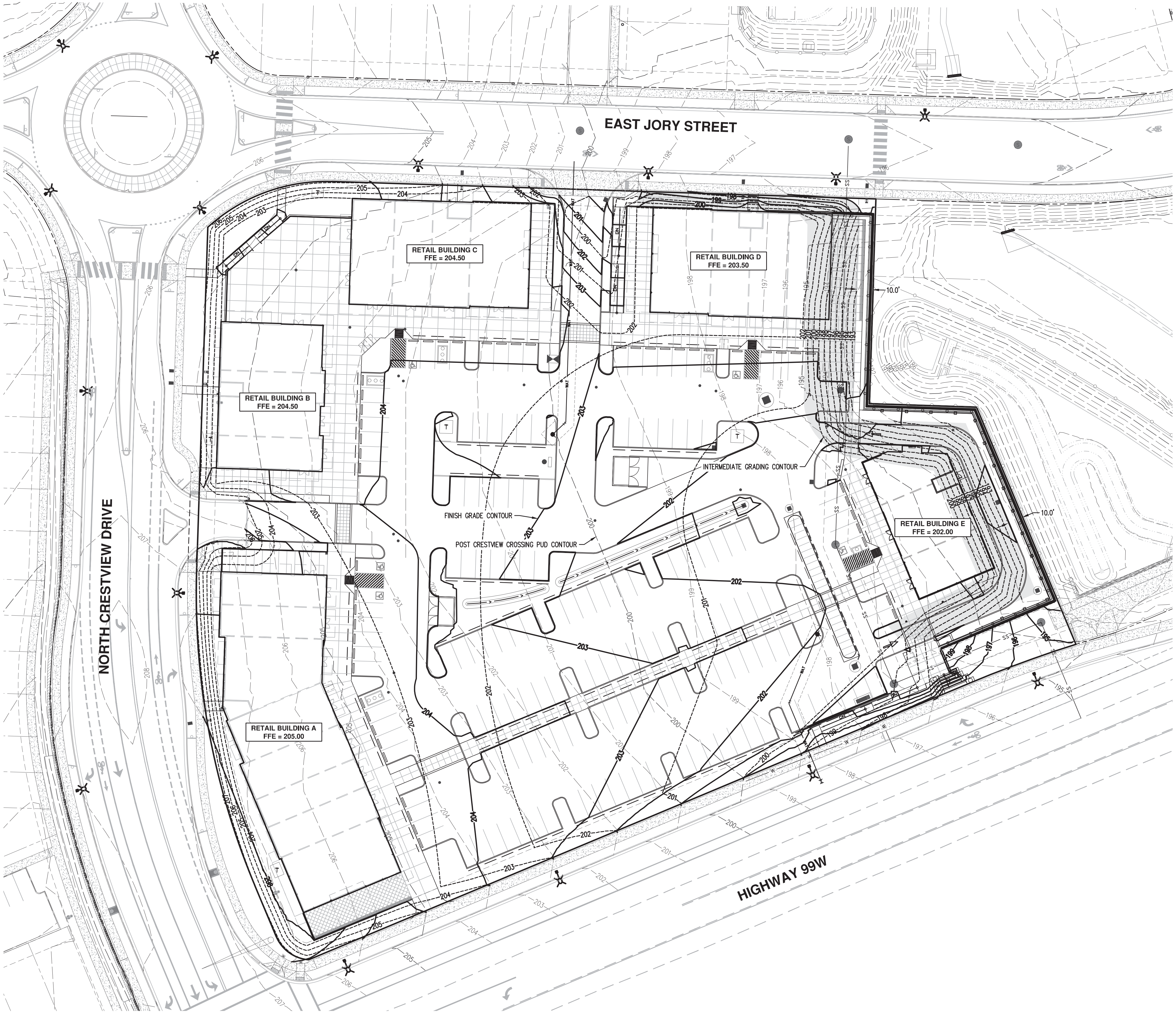
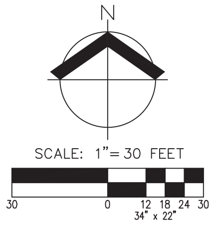


LEGEND

3J DESIGN GROUND CONTOUR (1 FT) (POST CRESTVIEW CROSSING PUD)	-199-
3J DESIGN GROUND CONTOUR (5 FT) (POST CRESTVIEW CROSSING PUD)	-200-
FINISHED GRADE CONTOUR (1 FT)	199
FINISHED GRADE CONTOUR (5 FT)	200
PROPOSED CONTOUR (1 FT) (INTERMEDIATE GRADING)	-199-
PROPOSED CONTOUR (5 FT) (INTERMEDIATE GRADING)	-200-
CAT TRACKING AND MATTING	▨



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GRAMOR DEVELOPMENT

INTERMEDIATE GRADING PLAN

CRESTVIEW CROSSING COMMERCIAL

GRAMOR NEWBERG CRESTVIEW, LLC

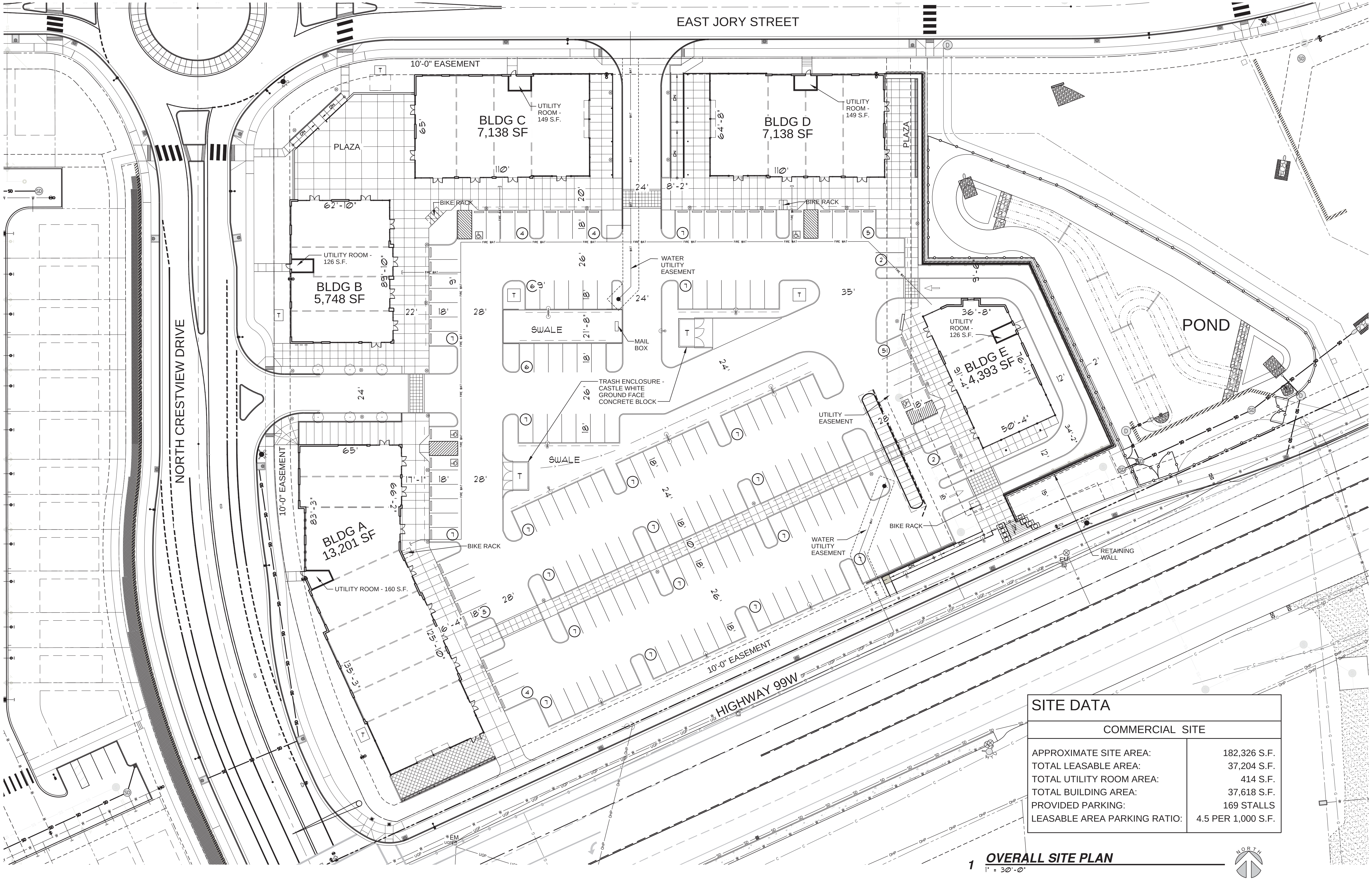
PRELIMINARY NOT FOR CONSTRUCTION

RENEWS: JUNE 30, 2021

JOB NUMBER:	3723
DATE:	11/20/2020
DESIGNED BY:	MCC
DRAWN BY:	MCC
CHECKED BY:	CEG

P7

AKS DRAWING FILE: 3723 P03 INTERMEDIATE GRADING PLAN.DWG | LAYOUT: P7



SITE DATA

COMMERCIAL SITE	
APPROXIMATE SITE AREA:	182,326 S.F.
TOTAL LEASABLE AREA:	37,204 S.F.
TOTAL UTILITY ROOM AREA:	414 S.F.
TOTAL BUILDING AREA:	37,618 S.F.
PROVIDED PARKING:	169 STALLS
LEASABLE AREA PARKING RATIO:	4.5 PER 1,000 S.F.

1 ***OVERALL SITE PLAN***
1" = 30'-0"

NORTH

0 15' 30' 60' 90'
1"= 30'

TILAND / SCHMIDT
ARCHITECTS, P.C.
16101 SW 72ND AVE.
SUITE 135
PORTLAND, OR 97224
(503) 220-8517
FAX (503) 220-8518

CRESTVIEW CROSSING COMMERCIAL
HIGHWAY 99W & N CRESTVIEW DRIVE
NEWBERG, OREGON
GRAMOR NEWBERG CRESTVIEW LLC

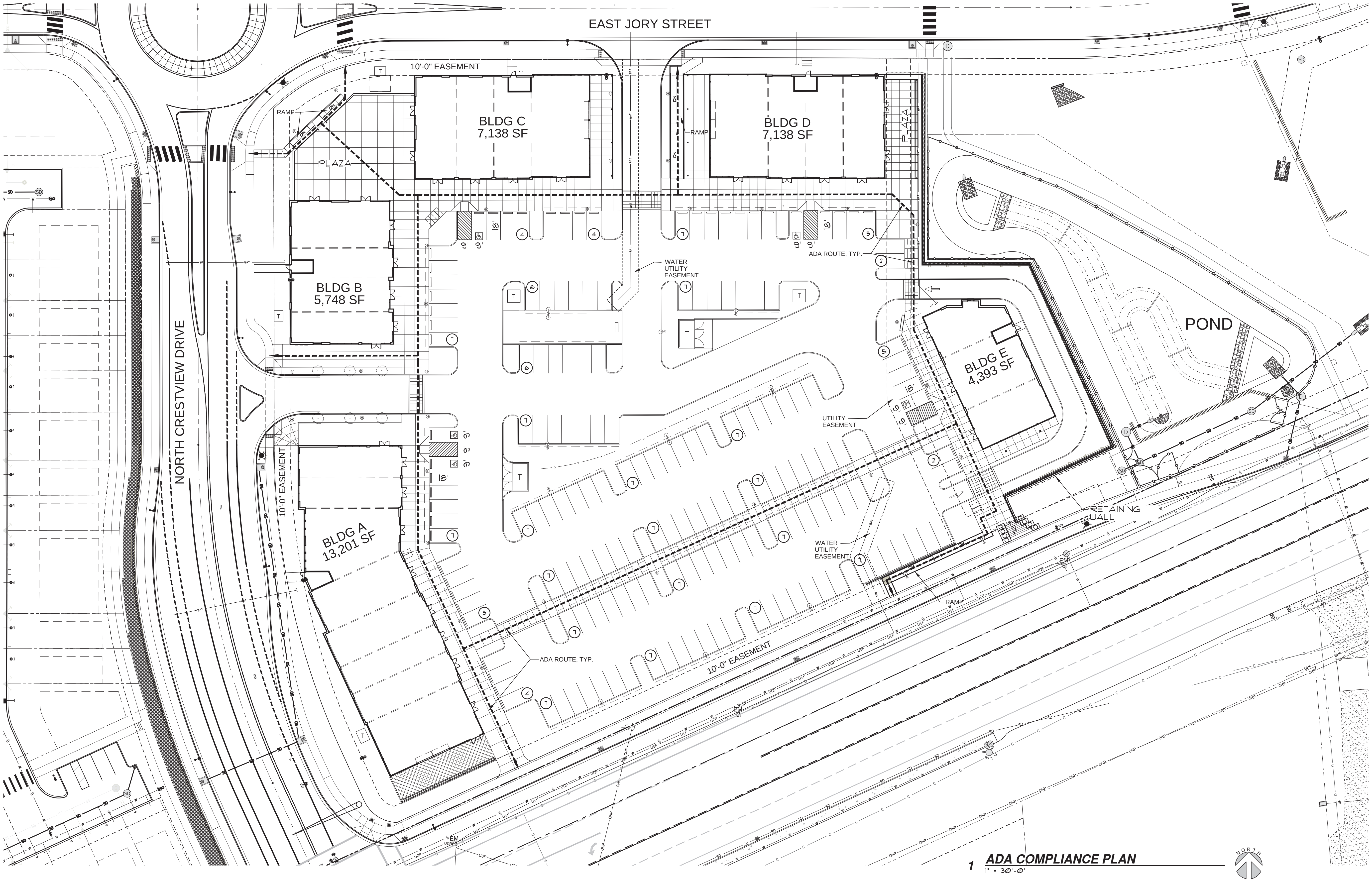
PROJECT NO.
20136

DATE :
11-25-2020
DRAWN BY :
MEB
CHECKED BY :
FMS

REVISIONS

20136 01 Crestview Site Plans
35

SP
1.1



1 ***ADA COMPLIANCE PLAN***
1" = 30'-0"

0 15' 30' 60' 90'
1"= 30'

TILAND / SCHMIDT
ARCHITECTS, P.C.
16101 SW 72ND AVE.
SUITE 135
PORTLAND, OR 97224
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CRESTVIEW CROSSING COMMERCIAL
HIGHWAY 99W & N CRESTVIEW DRIVE
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GRAMOR NEWBERG CRESTVIEW LLC

PROJECT NO.
20136

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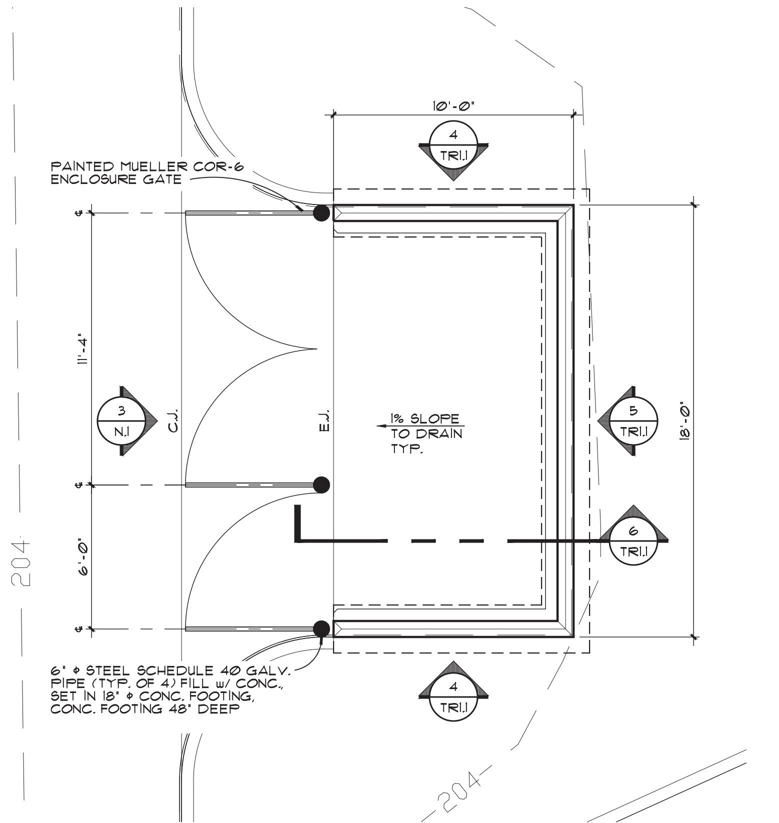
MEB
CHECKED BY :
FMS

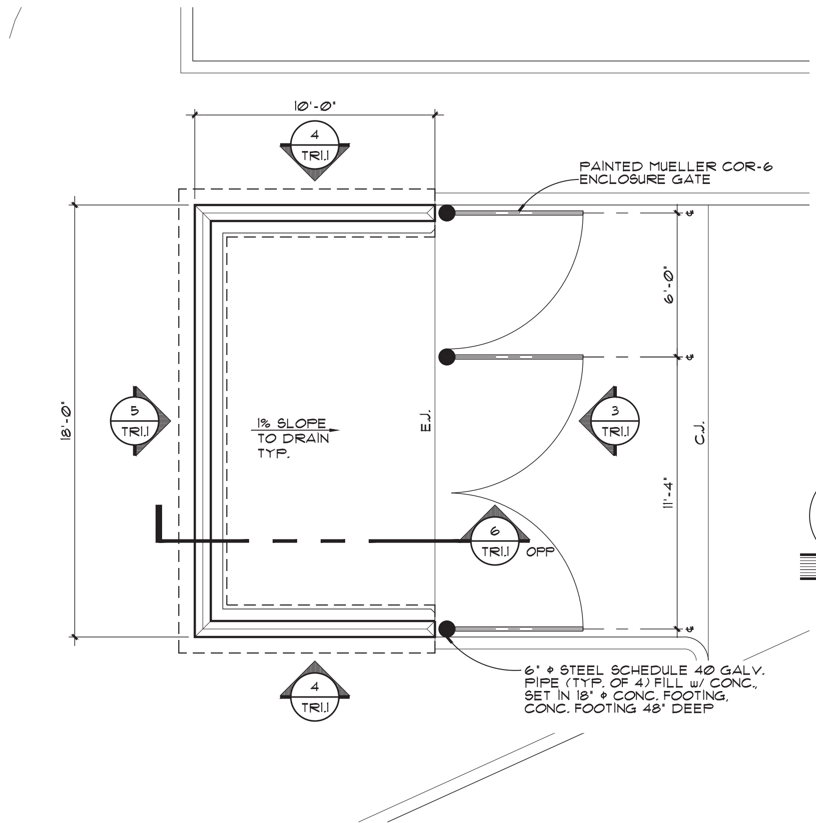
REVISIONS

20136 01 Crestview Site Plans
35

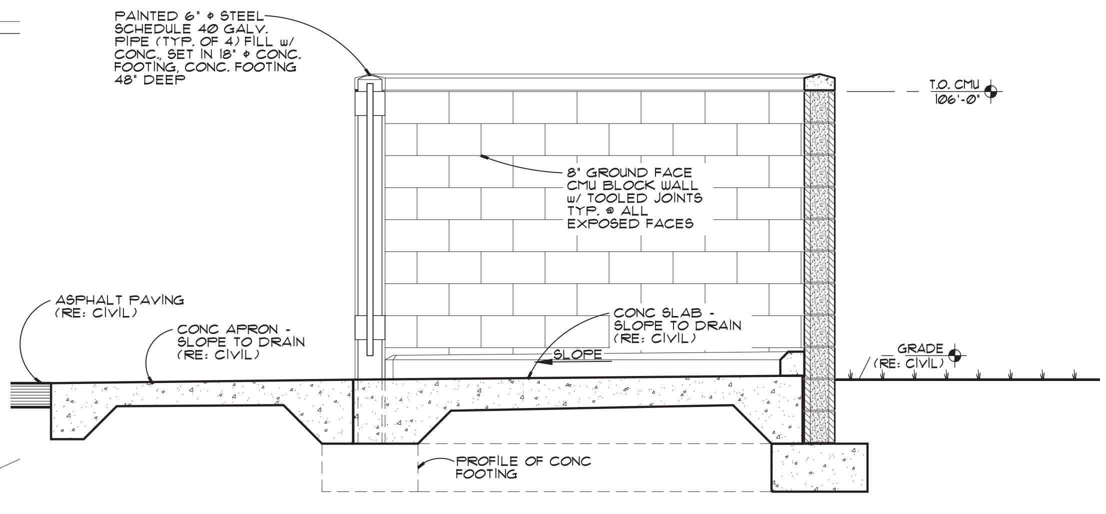
SP
1.2



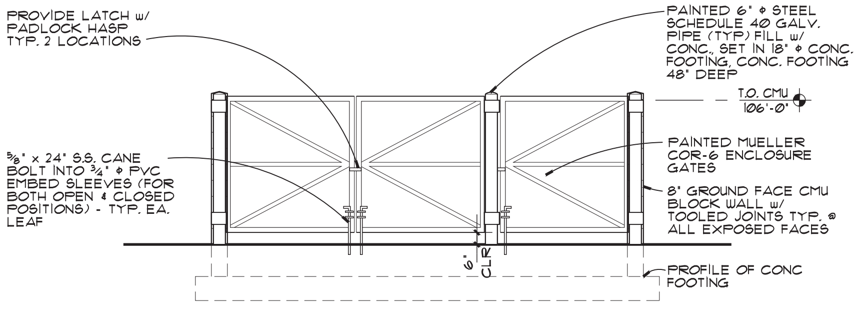
1 **TRASH ENCLOSURE PLAN**
1/4" = 1'-0" (WEST)



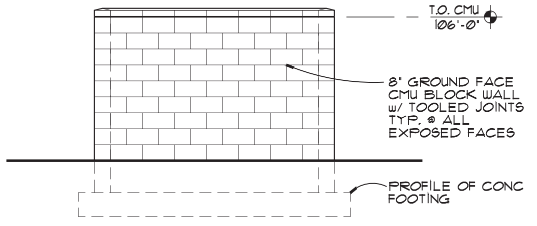
2 **TRASH ENCLOSURE PLAN**
1/4" = 1'-0" (EAST)



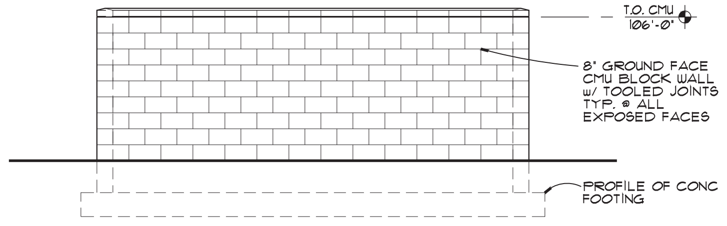
6 **TRASH ENCLOSURE SECTION**
1/4" = 1'-0"



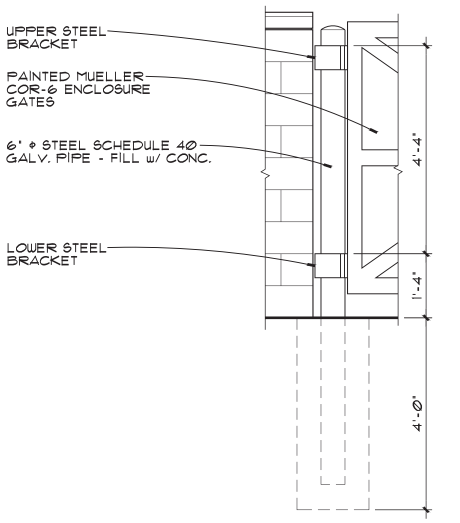
3 **TRASH ENCLOSURE FRONT ELEVATION**
1/4" = 1'-0"



4 **TRASH ENCLOSURE SIDE ELEVATION**
1/4" = 1'-0"



5 **TRASH ENCLOSURE REAR ELEVATION**
1/4" = 1'-0"



7 **GATE BOLLARD DETAIL**
1/2" = 1'-0"

TILAND / SCHMIDT
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16101 SW 72ND AVE.
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PORTLAND, OR 97224
(503) 220-8517
FAX (503) 220-8518

CRESTVIEW CROSSING COMMERCIAL
HIGHWAY 99W & N CRESTVIEW DRIVE
NEWBERG, OREGON
GRAMOR NEWBERG CRESTVIEW LLC

TRASH ENCLOSURE

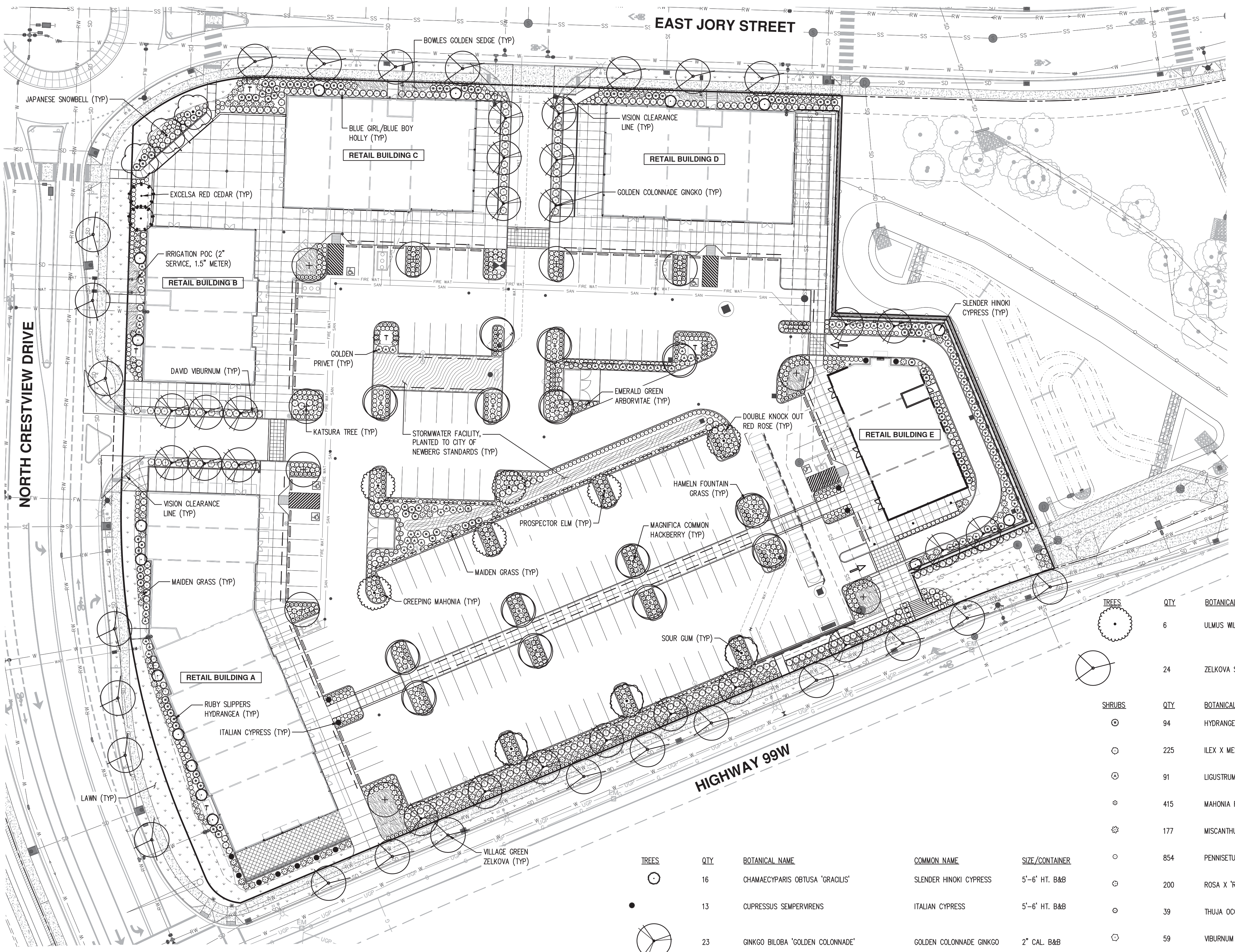
PROJECT NO.
20136

DATE :
11-25-2020
DRAWN BY :
MEB
CHECKED BY :
FMS

REVISIONS

20136 TR1.1 Trash Enclosures

TR
1.1



PRELIMINARY LANDSCAPE NOTES:

1. LANDSCAPE PLAN IS PRELIMINARY AND INTENDED TO SHOW DESIGN INTENT ONLY. PLAN ELEMENTS, PLANT SPECIES, ETC. AS SHOWN ARE SUBJECT TO CHANGE PRIOR TO FINAL REVIEW AND SUBMITTAL BASED ON FINAL SITE CONDITIONS, NURSERY STOCK AVAILABILITY, ETC.
2. LANDSCAPING AND PLANTING ACTIVITY SHALL CONFORM TO APPLICABLE CITY OF NEWBERG STANDARDS, INCLUDING BUT NOT LIMITED TO CHAPTER 15.420 LANDSCAPING AND OUTDOOR AREAS AND APPENDIX A PLANTING REQUIREMENTS FOR STORMWATER FACILITIES.
3. AN AUTOMATIC, UNDERGROUND IRRIGATION SYSTEMS SHALL BE PROVIDED FOR ALL PROPOSED PLANTING AREAS. IRRIGATION SYSTEM SHALL BE 'DESIGN-BUILD' BY THE LANDSCAPE CONTRACTOR AND SUBMITTED TO THE CITY FOR REVIEW AND APPROVAL PRIOR TO INSTALLATION.

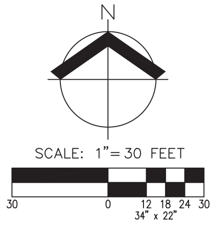
SITE LANDSCAPE DATA:

SITE AREA: ±182,326 SF (±4.2 AC)
LANDSCAPE AREA REQUIRED: ±27,349 SF (15%)

PLANTING AREA PROVIDED (INC. STORMWATER PLANTERS): ±33,711 SF (18.5%)
HARDSCAPE AREA PROVIDED (PLAZAS AND WALKWAYS): ±30,989 SF (17%)
TOTAL LANDSCAPE AREA (PLANTING AND HARDSCAPE): ±64,700 SF (35.5%)

PARKING LOT TREES REQUIRED: 169 SPACES / 7 SPACES = 24 TREES
PARKING LOT TREES PROVIDED: 31 TREES

PARKING LOT LANDSCAPING REQUIRED: 169 SPACES X 25 SF = ±4,225 SF
PARKING LOT LANDSCAPING PROVIDED: ±13,394 SF



SCALE: 1"=30 FEET
34" x 22"

PRELIMINARY PLANT SCHEDULE

TREES	QTY	BOTANICAL NAME	COMMON NAME	SIZE/CONTAINER
◎	14	CELTIS OCCIDENTALIS 'MAGNIFICA'	MAGNIFICA COMMON HACKBERRY	2" CAL. B&B
⊕	10	CERCIDIPHYLLUM JAPONICUM	KATSURA TREE	2" CAL. B&B
⊙	16	CHAMAECYPARIS OBTUSA 'GRACILIS'	SLENDER HINOKI CYPRESS	5'-6' HT. B&B
●	13	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	5'-6' HT. B&B
	23	GINKGO BILOBA 'GOLDEN COLONNADE'	GOLDEN COLONNADE GINKGO	2" CAL. B&B
	3	NYSSA SYLVATICA	SOUR GUM	2" CAL. B&B
	3	STYRAX JAPONICUS	JAPANESE SNOWBELL	2" CAL. B&B
	2	THUJA PLICATA 'EXCELSA'	EXCELSA RED CEDAR	6'-8' HT B&B
	6	ULMUS WILSONIANA 'PROSPECTOR'	PROSPECTOR ELM	2" CAL. B&B
	24	ZELKOVA SERRATA 'VILLAGE GREEN'	VILLAGE GREEN ZELKOVA	2" CAL. B&B

SHRUBS	QTY	BOTANICAL NAME	COMMON NAME	SIZE/CONTAINER
⊡	94	HYDRANGEA QUERCIFOLIA 'RUBY SLIPPERS'	RUBY SLIPPERS HYDRANGEA	5 GAL CONT.
	225	ILEX X MESERVEAE 'BLUE GIRL' 90%, 'BLUE BOY' 10%	BLUE GIRL/BLUE BOY HOLLY	5 GAL. CONT.
	91	LIGUSTRUM VICARYI	GOLDEN PRIVET	5 GAL. CONT.
	415	MAHONIA REPENS	CREEPING MAHONIA	1 GAL CONT.
	177	MISCANTHUS SINENSIS 'GRACILLIMUS'	MAIDEN GRASS	1 GAL CONT.
⊙	854	PENNISETUM ALOPECUROIDES 'HAMELN'	HAMELN FOUNTAIN GRASS	1 GAL CONT.
	200	ROSA X 'RADTKO'	DOUBLE KNOCK OUT RED ROSE	2 GAL. CONT.
	39	THUJA OCCIDENTALIS 'SMARAGD'	EMERALD GREEN ARBORVITAE	4' HT. B&B
	59	VIBURNUM DAVIDII	DAVID VIBURNUM	3 GAL CONT.

GROUND COVERS	QTY	DESCRIPTION		
▨	673	CAREX ELATA 'BOWLES GOLDEN'	BOWLES GOLDEN SEDGE	1 GAL CONT.
	± 15,097 SF	LAWN		
▨	± 2,616 SF	STORMWATER FACILITY PLANTED TO CITY OF NEWBERG STANDARDS		

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12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
503.563.6151
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GRAMOR DEVELOPMENT

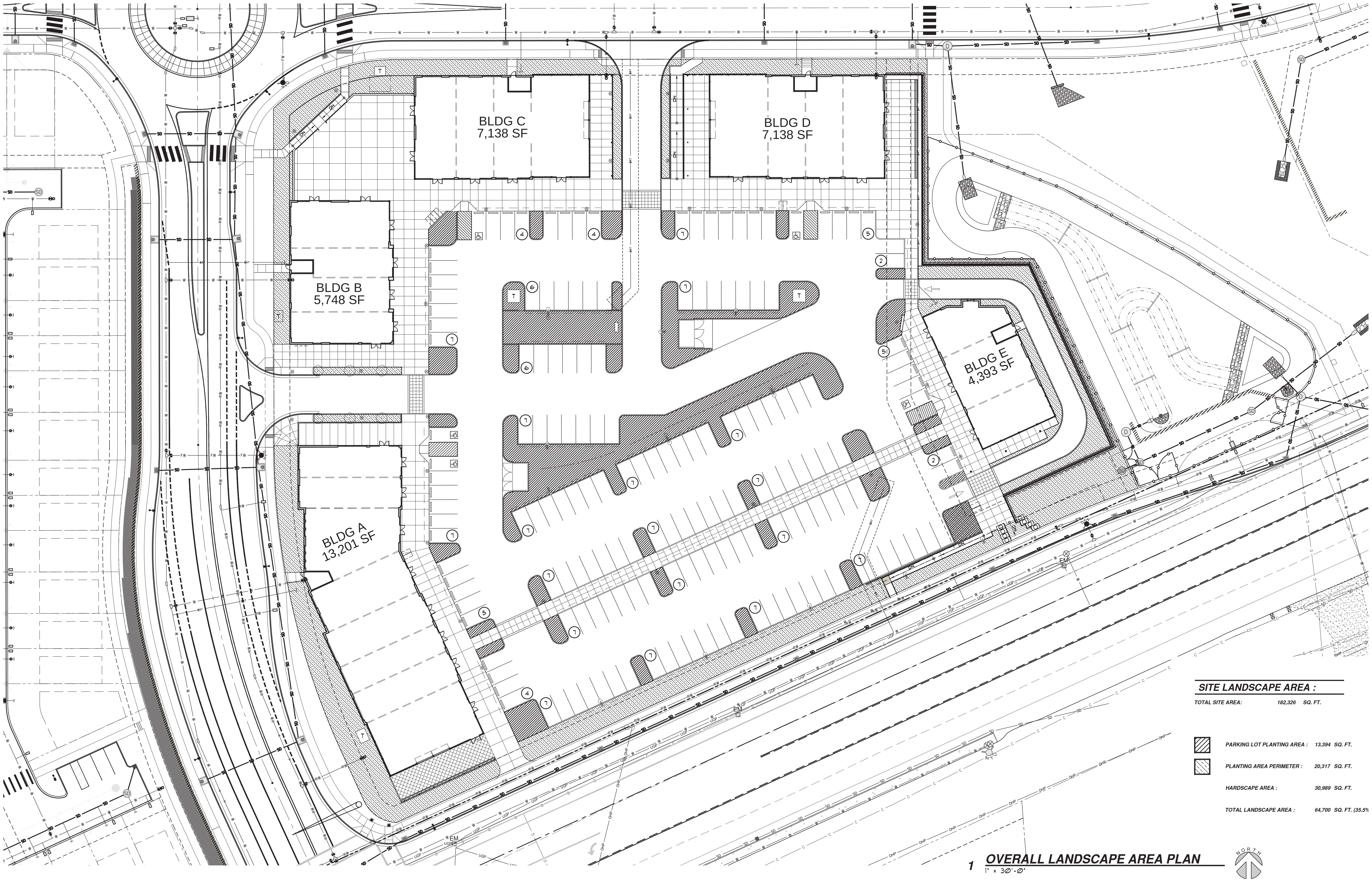
PRELIMINARY LANDSCAPE PLANTING PLAN
CRESTVIEW CROSSING COMMERCIAL
GRAMOR NEWBERG CRESTVIEW, LLC

KRISTI A. HAUSWALD
702
PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	3723
DATE:	11/20/2020
DESIGNED BY:	NKP
DRAWN BY:	NKP
CHECKED BY:	KAH

L1

AKS DRAWING FILE: 3723 P08 LANDSCAPE PLAN.DWG | LAYOUT: P8



SITE LANDSCAPE AREA :

TOTAL SITE AREA: 182,326 SQ. FT.

▨	PARKING LOT PLANTING AREA :	13,394	SQ. FT.
▧	PLANTING AREA PERIMETER :	20,317	SQ. FT.
	HARDSCAPE AREA :	30,989	SQ. FT.
	TOTAL LANDSCAPE AREA :	64,700	SQ. FT. (35.5%

1 **OVERALL LANDSCAPE AREA PLAN**
1" = 30'-0"

NORTH

0 15' 30' 60' 90'
1"= 30'

TILAND / SCHMIDT
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(503) 220-8517
FAX (503) 220-8518

CRESTVIEW CROSSING COMMERCIAL
HIGHWAY 99W & N CRESTVIEW DRIVE
NEWBERG, OREGON
GRAMOR NEWBERG CRESTVIEW LLC

PROJECT NO.
20136

DATE :
11-25-2020

DRAWN BY :
MEB

CHECKED BY :
FMS

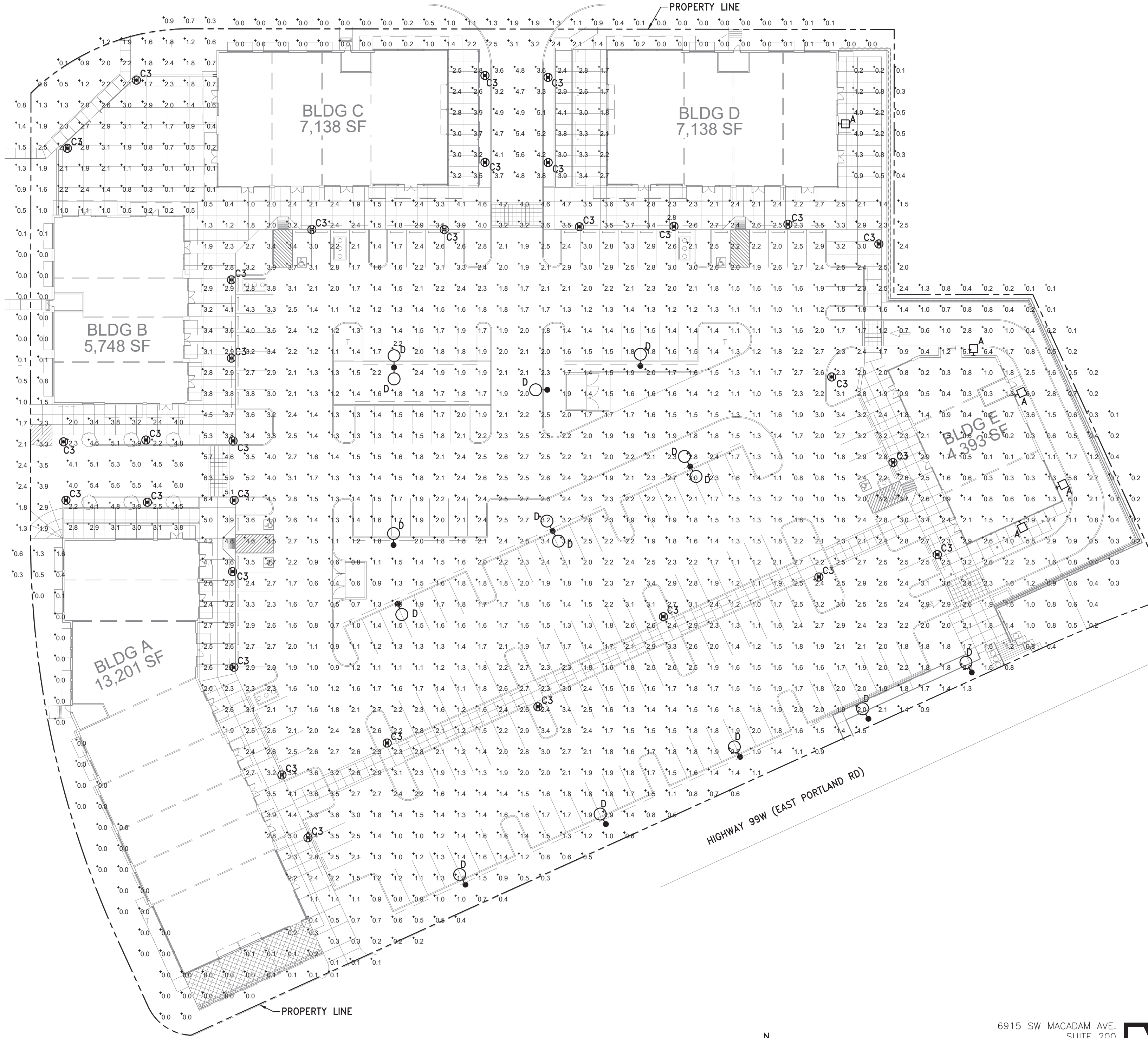
REVISIONS

20136 01 Crestview Site Plans
35

LA
1

Schedule

Symbol	Label	Quantity	Manufacturer	Catalog Number	Description	Number Lamps	Mounting Height	Lumens Per Lamp	Light Loss Factor	Wattage
☐	A	5	Lithonia Lighting	WST LED P2 40K VF MVOLT VG	WST LED, Performance package 2, 4000 K, visual comfort forward throw, MVOLT, vandal guard	1	12'	3000	0.9	25
⦿	C3	34	Lithonia Lighting	MRP LED 42C 530 40K SR5 MVOLT	MRP POST TOP LIGHT 42 LEDs 530 mA DRIVE CURRENT 40K COLOR TEMP TYPE 5 DISTRIBUTION	1	12'	6959	0.9	75
○	D	15	Lithonia Lighting	DSX1 LED P3 40K T3M MVOLT	DSX1 LED P3 40K T3M MVOLT	1	28'	12214	0.9	102



1
E1.0
SITE LIGHTING – PHOTOMETRIC PLAN
SCALE: 1/32"=1'-0"
0 16' 32' 64'
N

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GRAMOR NEWBERG CRESTVIEW LLC

PROJECT NO.
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5195-E1.0
SITE LIGHTING

E
1.0

6915 SW MACADAM AVE.
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FAX: 503.892.1190
CONTACT...STEVE LOCKHART
engineering@mke-inc.com

MKE
MKE & ASSOCIATES, INC.
CONSULTING ENGINEERS
MECHANICAL AND ELECTRICAL SYSTEMS

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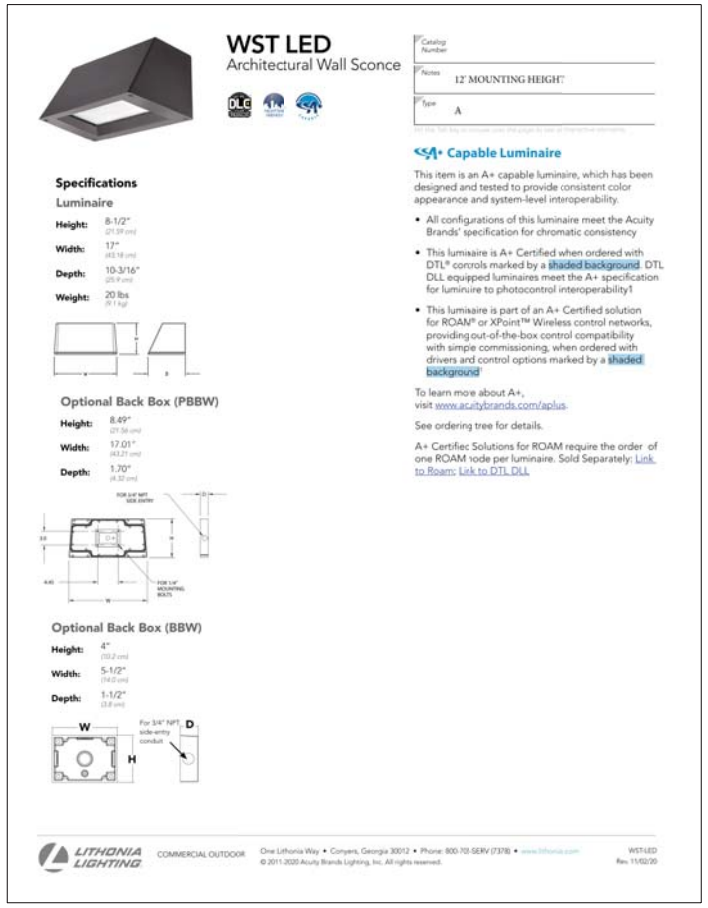

WST LED

Architectural Wall Sconce

Catalog Number

Notes 12' MOUNTING HEIGHT

Type A

A+ Capable Luminaire

This item is an A+ capable luminaire, which has been designed and tested to provide consistent color appearance and system-level interoperability.

- All configurations of this luminaire meet the Acuity Brands' specification for chromatic consistency
- This lumisaire is A+ Certified when ordered with DTL® controls marked by a shaded background. DTL DLL equipped luminaires meet the A+ specification for luminaire to photocontrol interoperability1
- This lumisaire is part of an A+ Certified solution for ROAN® or XPoint™ Wireless control networks, providing out-of-the-box control compatibility with simple commissioning, when ordered with drivers and control options marked by a shaded background[1]

To learn more about A+, visit www.acuitybrands.com/aplus.

See ordering tree for details.

A+ Certified Solutions for ROAM require the order of one ROAM node per luminaire. Sold Separately: Link to Roam; Link to DTL DLL

Specifications

Luminaire

Height:	8-1/2" (21.59 cm)
Width:	17" (43.18 cm)
Depth:	10-3/16" (25.9 cm)
Weight:	20 lbs (9.1 kg)

Optional Back Box (PBBW)

Height:	8.49" (21.56 cm)
Width:	17.01" (43.21 cm)
Depth:	1.70" (4.32 cm)

FOR 3/4" NPT SIDE ENTRY

FOR 1/4" MOUNTING BOLTS

Optional Back Box (BBW)

Height:	4" (10.2 cm)
Width:	5-1/2" (14.0 cm)
Depth:	1-1/2" (3.8 cm)

W

H

D

For 3/4" NPT side-entry conduit

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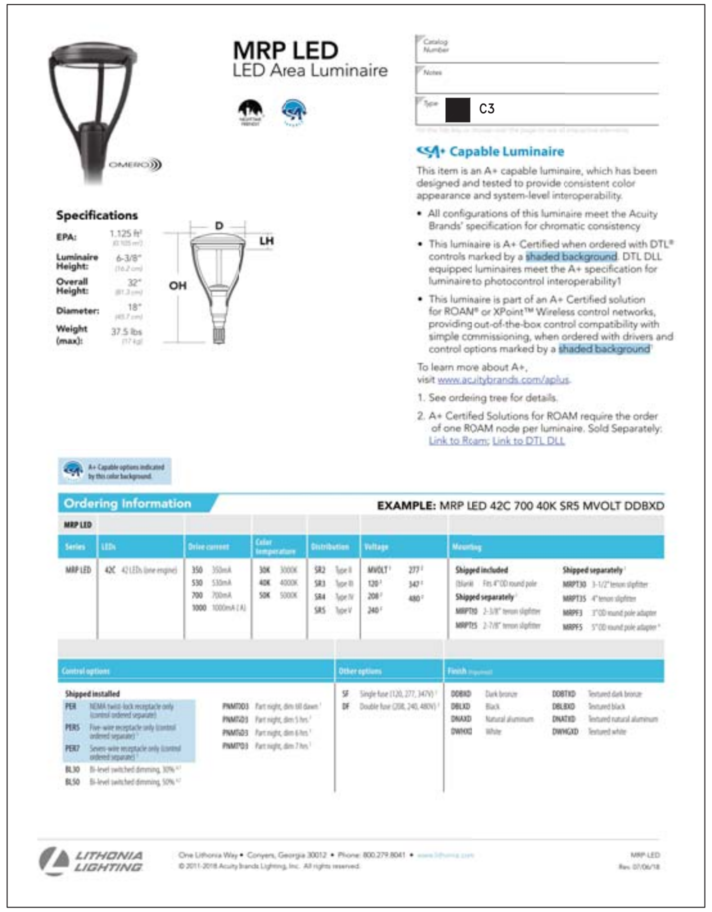
WST-LED
Rev. 11/02/20



MRP LED

LED Area Luminaire

Catalog Number

Notes

Type C3

A+ Capable Luminaire

This item is an A+ capable luminaire, which has been designed and tested to provide consistent color appearance and system-level interoperability.

- All configurations of this luminaire meet the Acuity Brands' specification for chromatic consistency
- This luminaire is A+ Certified when ordered with DTL® controls marked by a shaded background. DTL DLL equipped luminaires meet the A+ specification for luminaire to photocontrol interoperability1
- This luminaire is part of an A+ Certified solution for ROAN® or XPoint™ Wireless control networks, providing out-of-the-box control compatibility with simple commissioning, when ordered with drivers and control options marked by a shaded background[1]

To learn more about A+, visit www.acuitybrands.com/aplus.

1. See ordering tree for details.
2. A+ Certified Solutions for ROAM require the order of one ROAM node per luminaire. Sold Separately: Link to Roam; Link to DTL DLL

Specifications

EPA:	1.125 ft² (0.105 m²)
Luminaire Height:	6-3/8" (16.2 cm)
Overall Height:	32" (81.3 cm)
Diameter:	18" (45.7 cm)
Weight (max):	37.5 lbs (17 kg)

D
LH
OH

A+ Capable options indicated by this color background.

Ordering Information EXAMPLE: MRP LED 42C 700 40K SR5 MVOLT DDBXD

MRP LED

Series	LEDs	Drive current	Color temperature	Distribution	Voltage	Mounting
MRP LED	42C 42 LEDs (one engine)	350 350mA 530 530mA 700 700mA 1000 1000mA (1 A)	30K 3000K 40K 4000K 50K 5000K	SR2 Type II SR3 Type III SR4 Type IV SR5 Type V	MVOLT[1] 120[1] 208[1] 240[1] 277[1] 347[1] 480[1]	**Shipped included** (blank) Fits 4" OD round pole **Shipped separately**[1] MRPT10 2-3/8" tenon slipfitter MRPT15 2-7/8" tenon slipfitter **Shipped separately**[1] MRPT30 3-1/2" tenon slipfitter MRPT35 4" tenon slipfitter MRPF3 3" OD round pole adapter MRPF5 5" OD round pole adapter

Control options		Other options	Finish (required)
Shipped installed PER NEMA twist-lock receptacle only (control ordered separate) PER5 Five-wire receptacle only (control ordered separate)[1] PER7 Seven-wire receptacle only (control ordered separate)[1] BL30 Bi-level switched dimming, 30% BL50 Bi-level switched dimming, 50%	PNMTDD3 Part night, dim till dawn[1] PNMT5D3 Part night, dim 5 hrs.[1] PNMT6D3 Part night, dim 6 hrs.[1] PNMT7D3 Part night, dim 7 hrs.[1]	SF Single fuse (120, 277, 347V)[1] DF Double fuse (208, 240, 480V)[1]	DDBXD Dark bronze DBLXD Black DNAXD Natural aluminum DWHXD White DDBTXD Textured dark bronze DBLBXD Textured black DNATXD Textured natural aluminum DWHGXD Textured white

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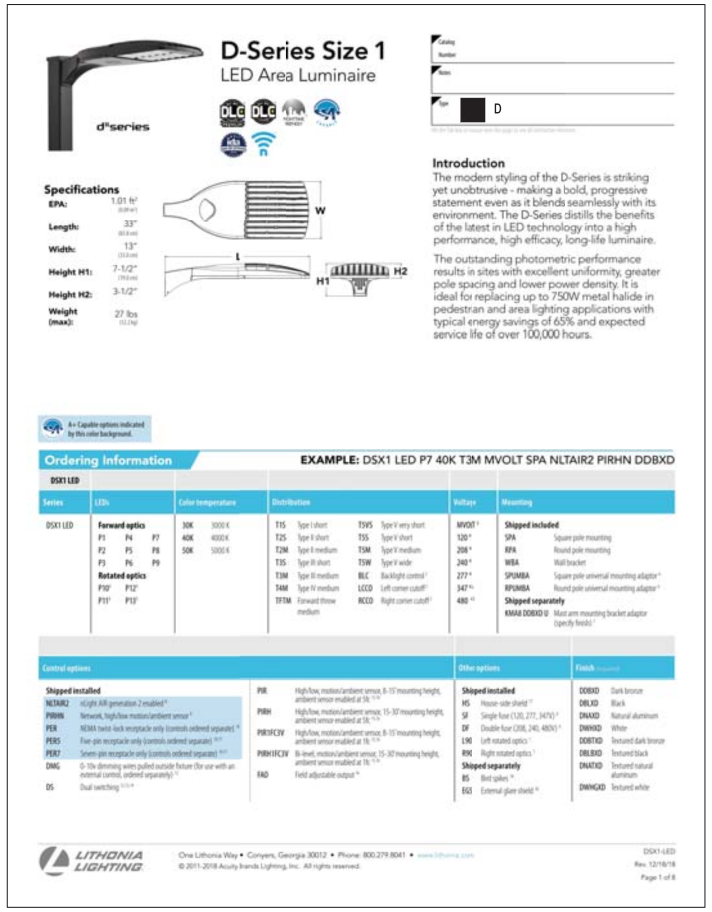
MRP-LED
Rev. 07/06/18



D-Series Size 1

LED Area Luminaire

Catalog Number

Notes

Type D

Specifications

EPA:	1.01 ft²
Length:	33"
Width:	13"
Height H1:	7-1/2"
Height H2:	3-1/2"
Weight (max):	27 lbs

W
L
H1
H2

Introduction

The modern styling of the D-Series is striking yet unobtrusive - making a bold, progressive statement even as it blends seamlessly with its environment. The D-Series distills the benefits of the latest in LED technology into a high performance, high efficacy, long-life luminaire.

The outstanding photometric performance results in sites with excellent uniformity, greater pole spacing and lower power density. It is ideal for replacing up to 750W metal halide in pedestrian and area lighting applications with typical energy savings of 65% and expected service life of over 100,000 hours.

A+ Capable options indicated by this color background.

Ordering Information EXAMPLE: DSX1 LED P7 40K T3M MVOLT SPA NLTAIR2 PIRHN DDBXD

DSX1 LED

Series	LEDs	Color temperature	Distribution	Voltage	Mounting
DSX1 LED	**Forward optics** P1 P4 P7 P2 P5 P8 P3 P6 P9 **Rotated optics** P10 P12 P11 P13	30K 3000 K 40K 4000 K 50K 5000 K	T1S Type I short T2S Type II short T2M Type II medium T3S Type III short T3M Type III medium T4M Type IV medium TFTM Forward throw medium T5VS Type V very short T5S Type V short T5M Type V medium T5W Type V wide BLC Backlight control LCCO Left corner cutoff RCCO Right corner cutoff	MVOLT 120 208 240 277 347 480	**Shipped included** SPA Square pole mounting RPA Round pole mounting WBA Wall bracket SPUMBA Square pole universal mounting adaptor RPUMBA Round pole universal mounting adaptor **Shipped separately** KMA8 DDBXD U Mast arm mounting bracket adaptor (specify finish)

Control options		Other options	Finish (required)
Shipped installed NLTAIR2 nLight AIR generation 2 enabled PIRHN Network, high/low motion/ambient sensor PER NEMA twist-lock receptacle only (controls ordered separate) PER5 Five-pin receptacle only (controls ordered separate) PER7 Seven-pin receptacle only (controls ordered separate) DMG 0-10v dimming wires pulled outside fixture (for use with an external control, ordered separately) DS Dual switching	PIR High/low, motion/ambient sensor, 8-15' mounting height, ambient sensor enabled at 5fc PIRH High/low, motion/ambient sensor, 15-30' mounting height, ambient sensor enabled at 5fc PIR1FC3V High/low, motion/ambient sensor, 8-15' mounting height, ambient sensor enabled at 1fc PIRH1FC3V Bi-level, motion/ambient sensor, 15-30' mounting height, ambient sensor enabled at 1fc FAO Field adjustable output	**Shipped installed** HS House-side shield SF Single fuse (120, 277, 347V) DF Double fuse (208, 240, 480V) L90 Left rotated optics R90 Right rotated optics **Shipped separately** BS Bird spikes EGS External glare shield	DDBXD Dark bronze DBLXD Black DNAXD Natural aluminum DWHXD White DDBTXD Textured dark bronze DBLBXD Textured black DNATXD Textured natural aluminum DWHGXD Textured white

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DSX1-LED
Rev. 12/18/18
Page 1 of 8

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FAX (503) 220-8518

CRESTVIEW CROSSING COMMERCIAL

HIGHWAY 99W & N CRESTVIEW DRIVE
NEWBERG, OREGON

GRAMOR NEWBERG CRESTVIEW LLC

PROJECT NO.
20136

DATE : 11/20/2020
DRAWN BY : IS
CHECKED BY : SL

REVISIONS

5195-E2.0
LIGHTING FIXTURES

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engineering@mke-inc.com

MKE & ASSOCIATES, INC.
CONSULTING ENGINEERS
MECHANICAL AND ELECTRICAL SYSTEMS

E
2.0

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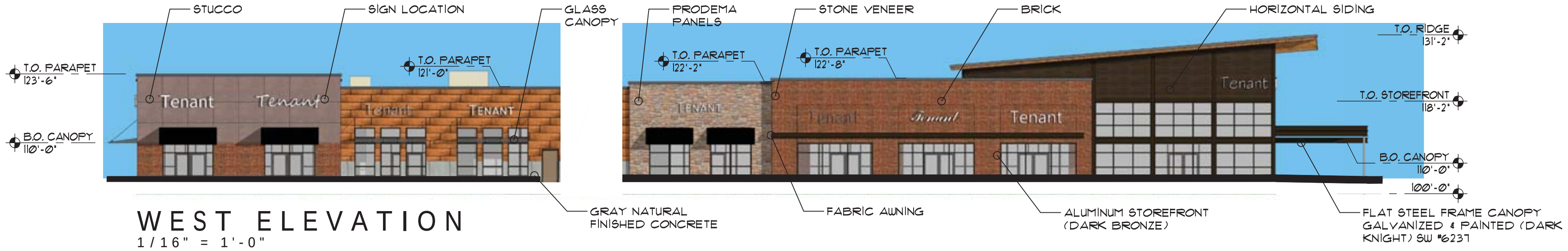

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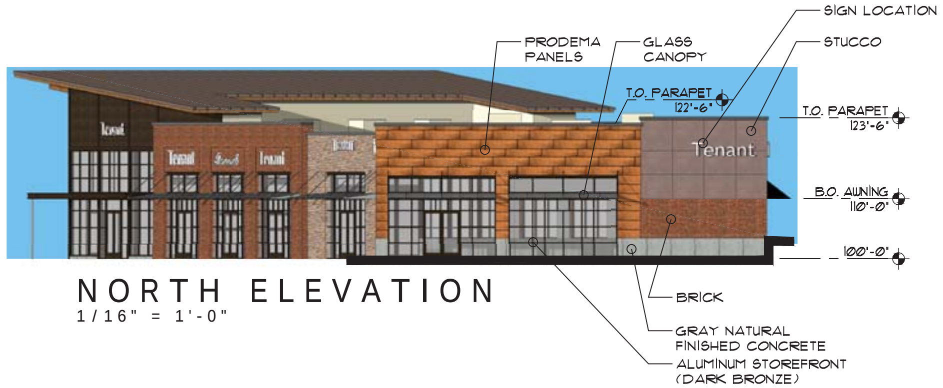

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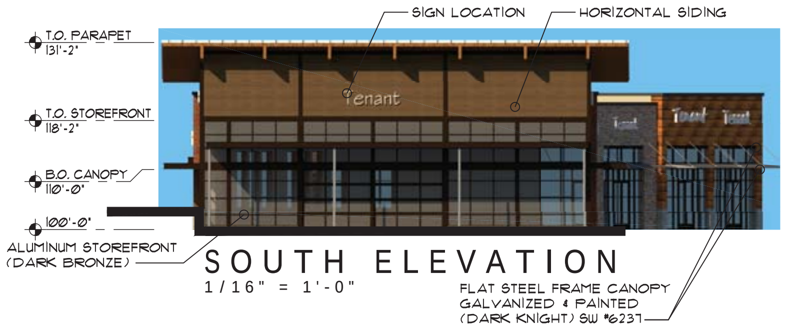

SOUTH ELEVATION
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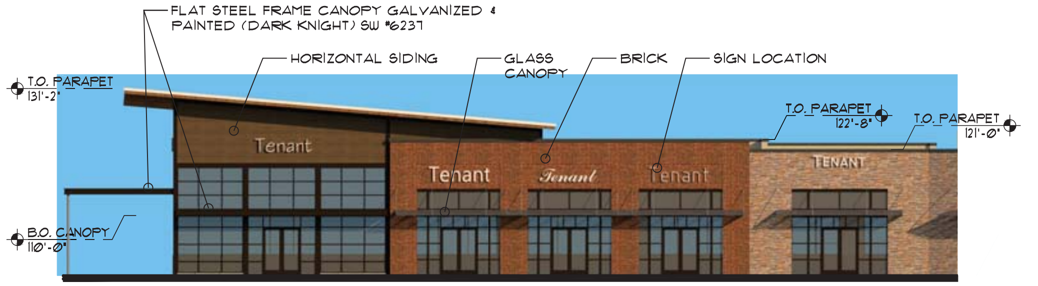

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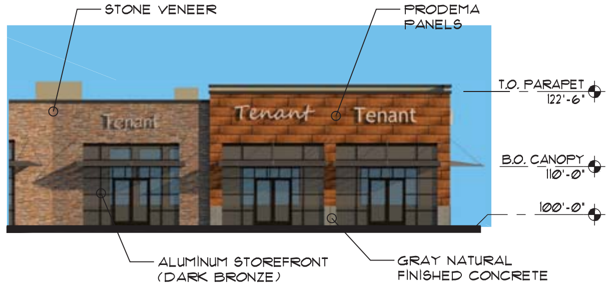
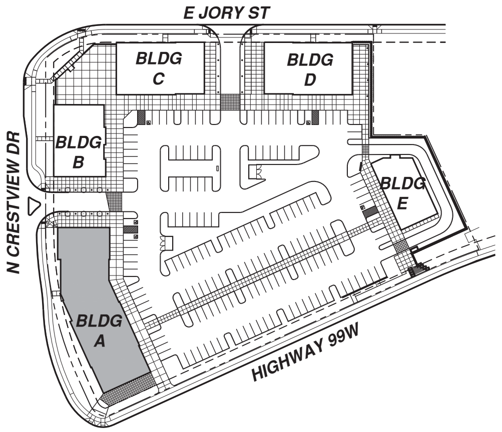
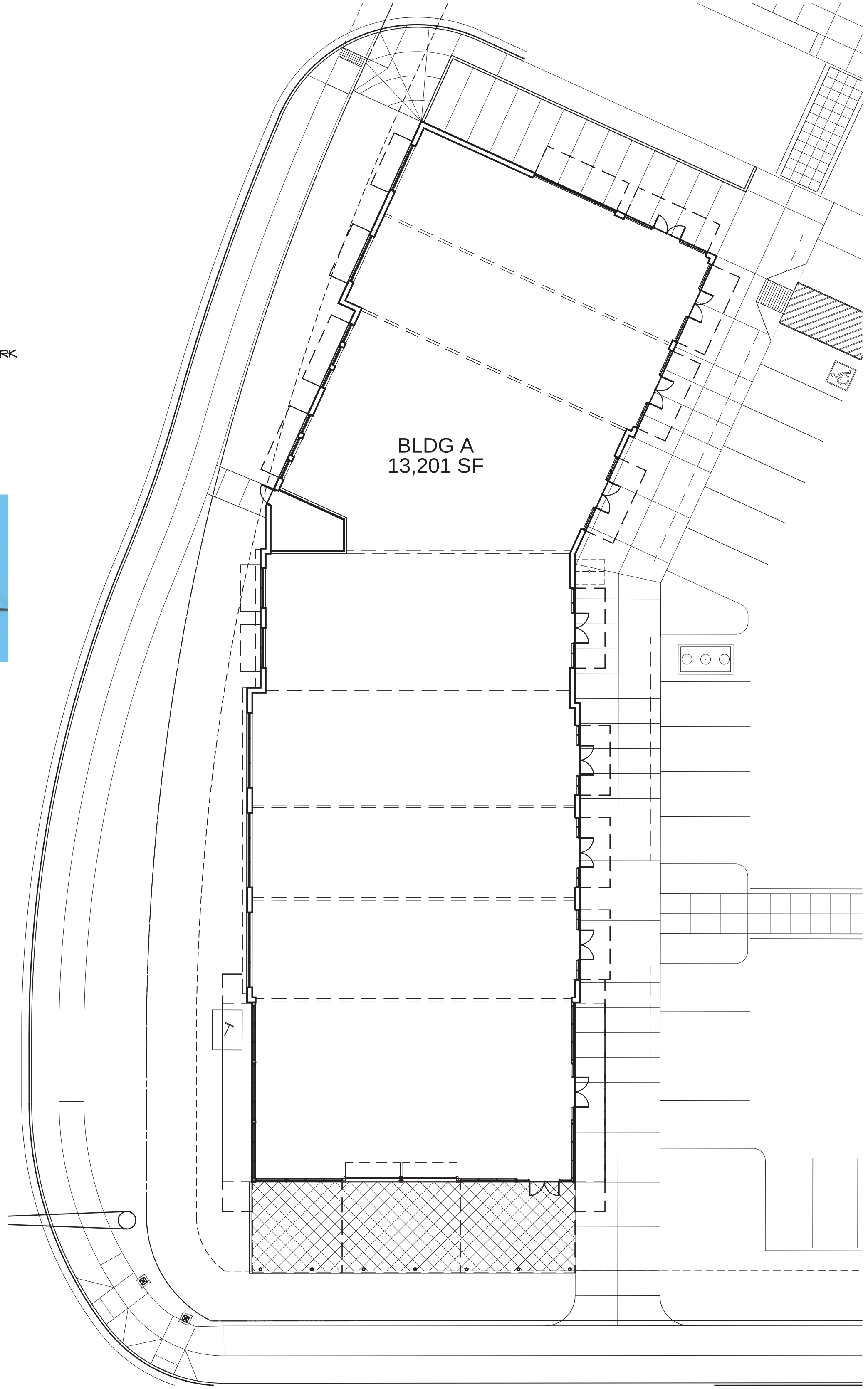




KEY PLAN
N.T.S.



FLOOR PLAN
1/16" = 1'-0"

NORTH

BUILDING A
FLOOR PLAN AND COLOR ELEVATIONS

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ARCHITECTS, P.C.
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CRESTVIEW CROSSING COMMERCIAL
HIGHWAY 99W & N CRESTVIEW DRIVE
NEWBERG, OREGON
GRAMOR NEWBERG CRESTVIEW LLC

EXHIBIT 'A'

PROJECT NO.
20136

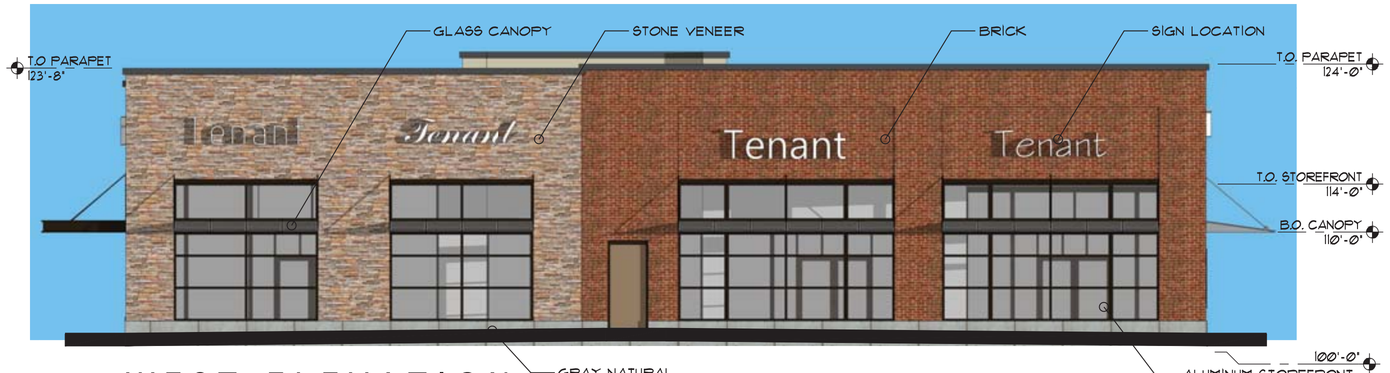
DATE :
11-25-2020
DRAWN BY :
AJH
CHECKED BY :
FMS

REVISIONS

20136 Bldg A Plan Elevations - Exhibits

A

A



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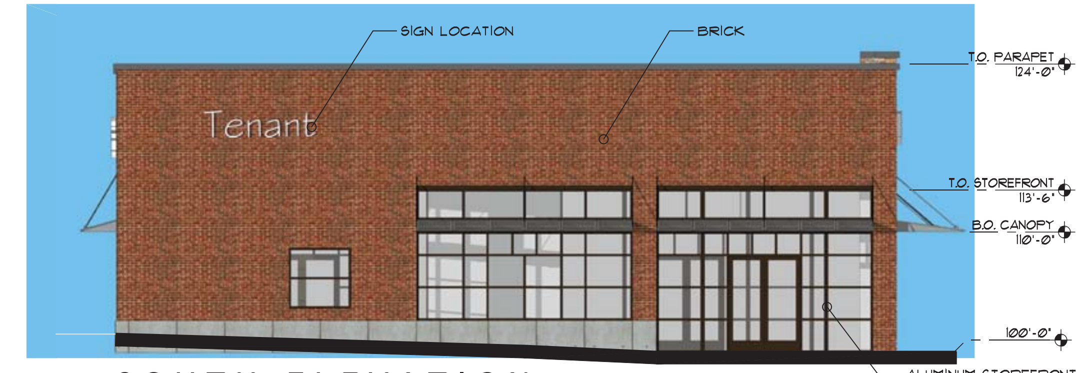

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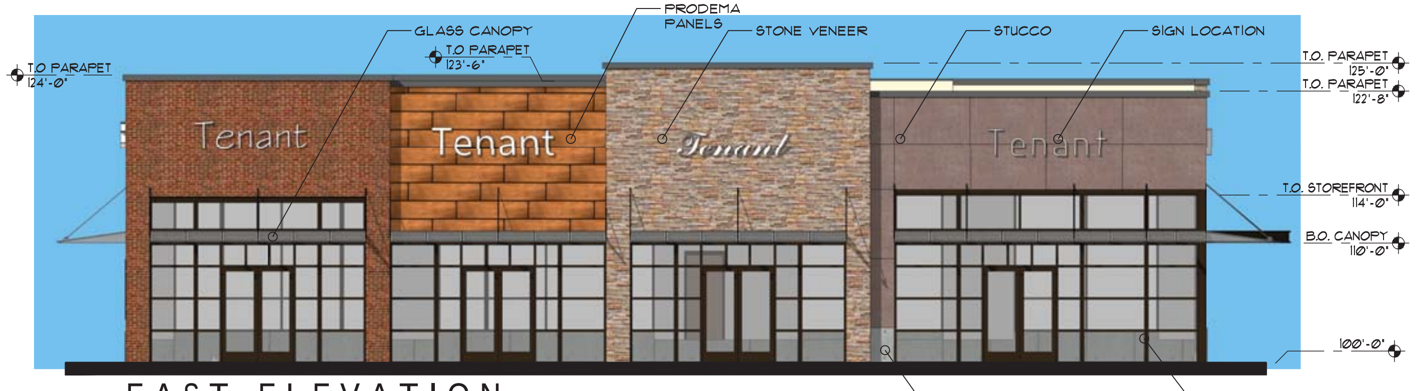

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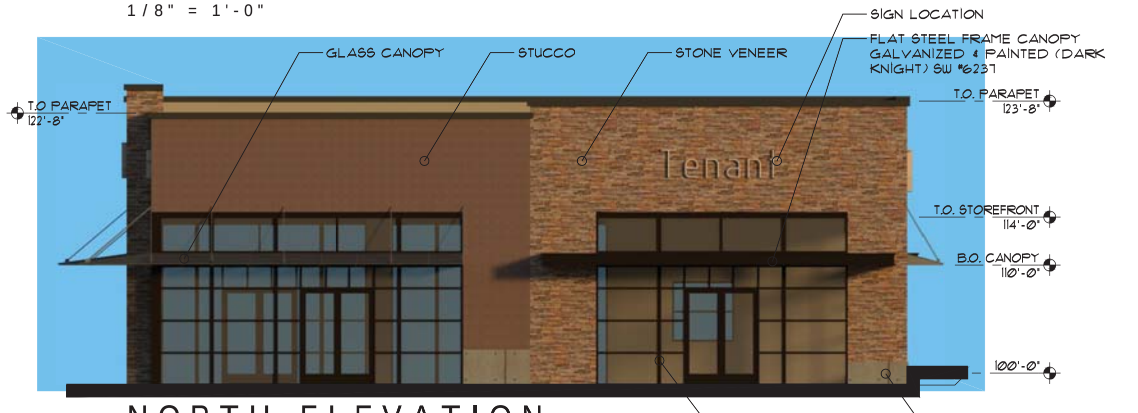

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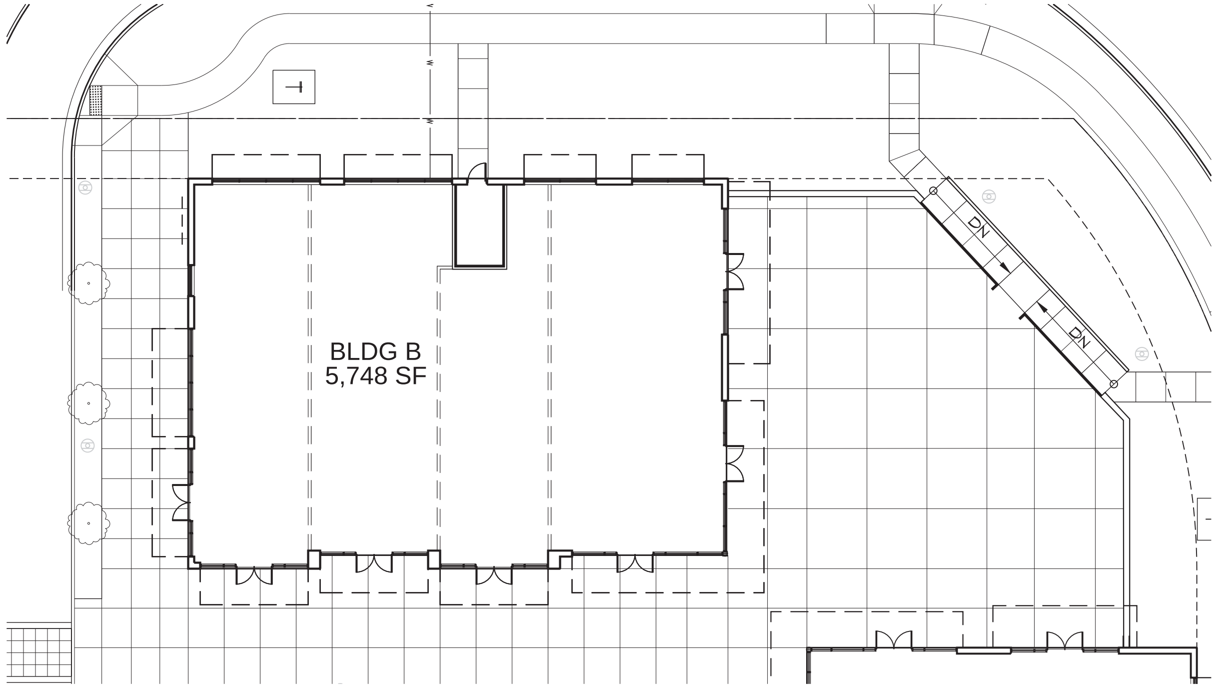
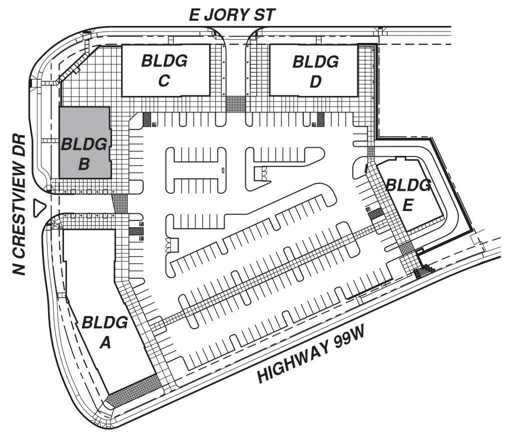


FLOOR PLAN
1/16" = 1'-0"

NORTH



KEY PLAN
N.T.S.

BUILDING B
FLOOR PLAN AND COLOR ELEVATIONS

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CRESTVIEW CROSSING COMMERCIAL
HIGHWAY 99W & N CRESTVIEW DRIVE
NEWBERG, OREGON
GRAMOR NEWBERG CRESTVIEW LLC

EXHIBIT 'A'

PROJECT NO.
20136

DATE :
11-25-2020
DRAWN BY :
AJH
CHECKED BY :
FMS

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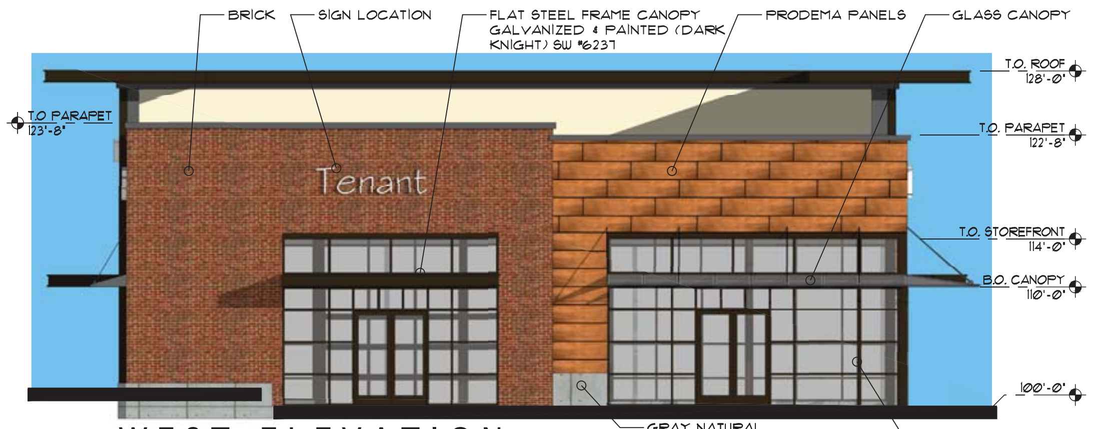
20136 Bldg B Plan Elevations - Exhibits

B
A



WEST ELEVATION
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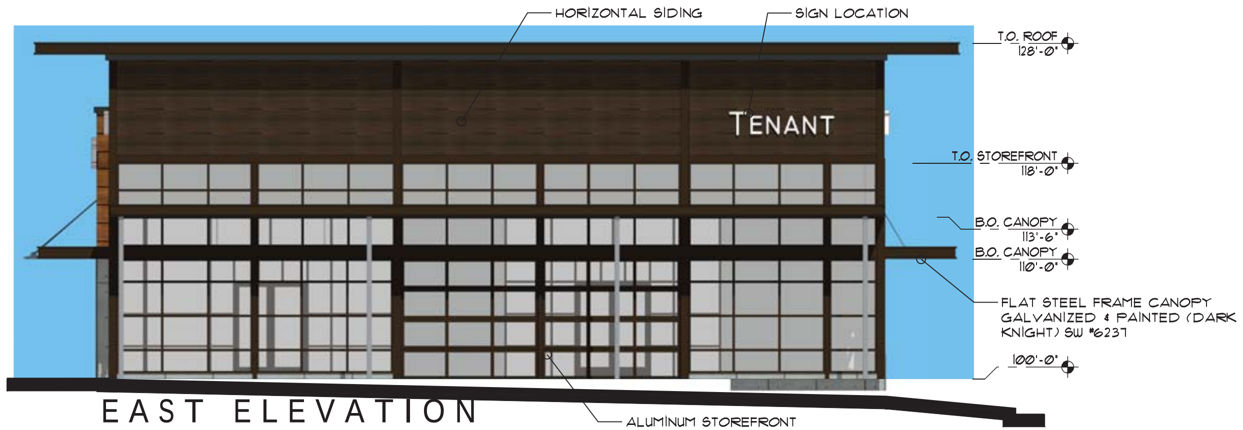
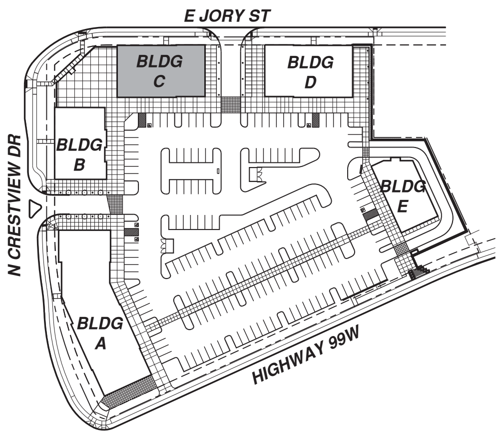


EAST ELEVATION
1/8" = 1'-0"

SOUTH ELEVATION
1/8" = 1'-0"



KEY PLAN
N.T.S.

NORTH ELEVATION
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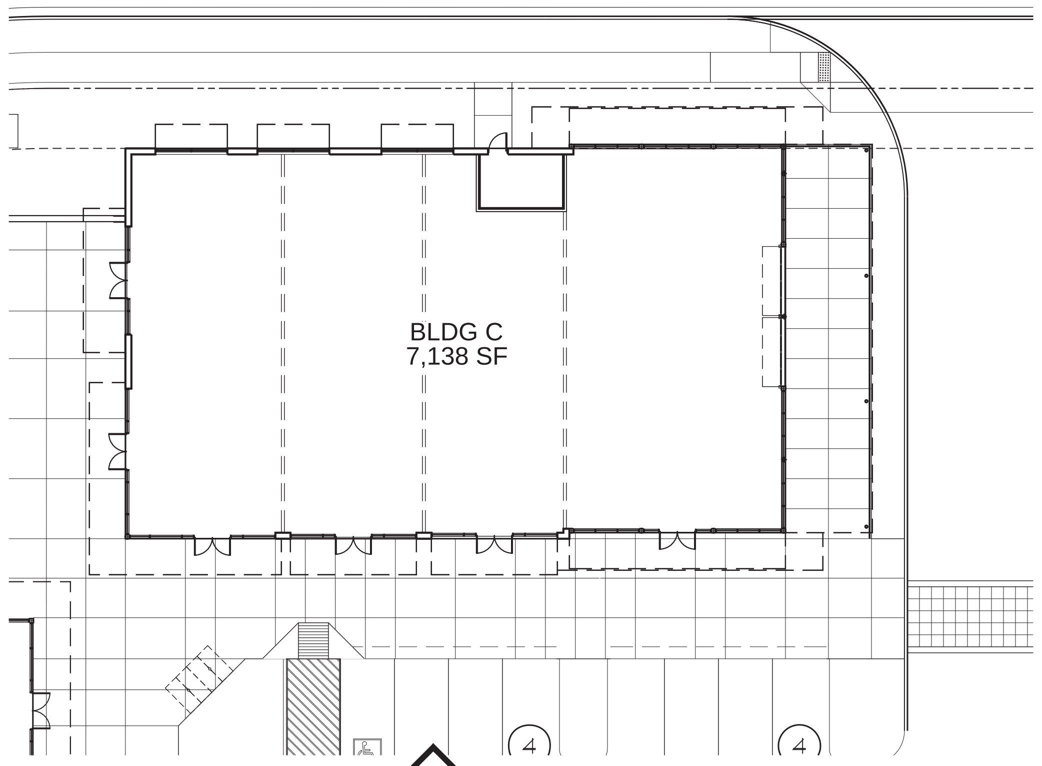

FLOOR PLAN
1/16" = 1'-0"

NORTH

BUILDING C
FLOOR PLAN AND COLOR ELEVATIONS

TILAND / SCHMIDT
ARCHITECTS, P.C.
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CRESTVIEW CROSSING COMMERCIAL
HIGHWAY 99W & N CRESTVIEW DRIVE
NEWBERG, OREGON
GRAMOR NEWBERG CRESTVIEW LLC

EXHIBIT 'A'

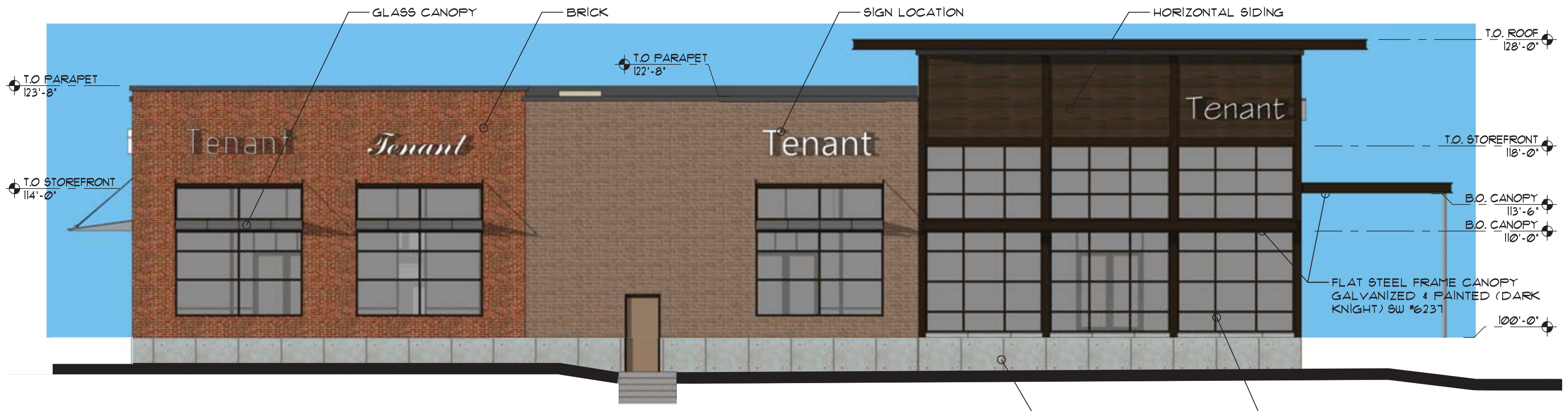
PROJECT NO.
20136

DATE :
11-25-2020
DRAWN BY :
AJH
CHECKED BY :
FMS

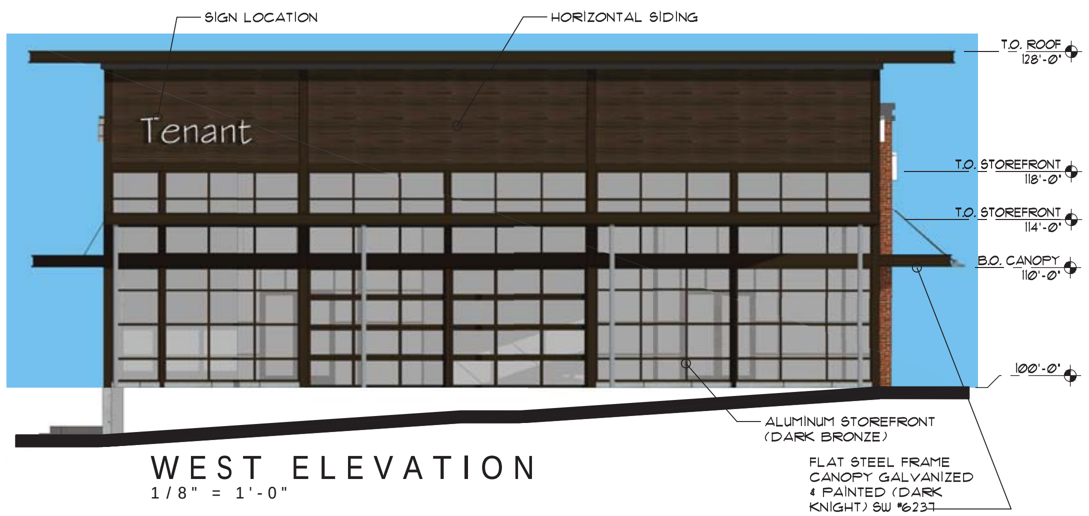
REVISIONS

20136 Bldg C Plan Elevations - Exhibits

C
A

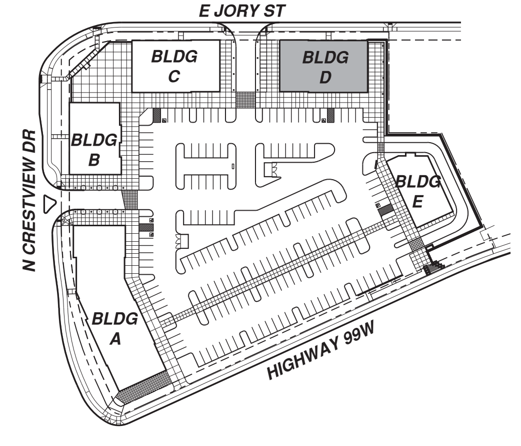


NORTH ELEVATION
1/8" = 1'-0"



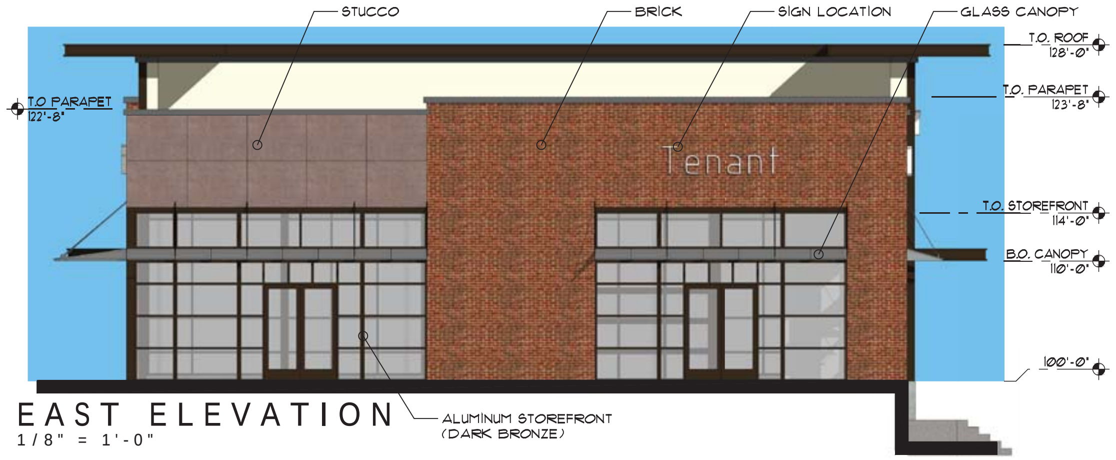
WEST ELEVATION
1/8" = 1'-0"

SOUTH ELEVATION
1/8" = 1'-0"

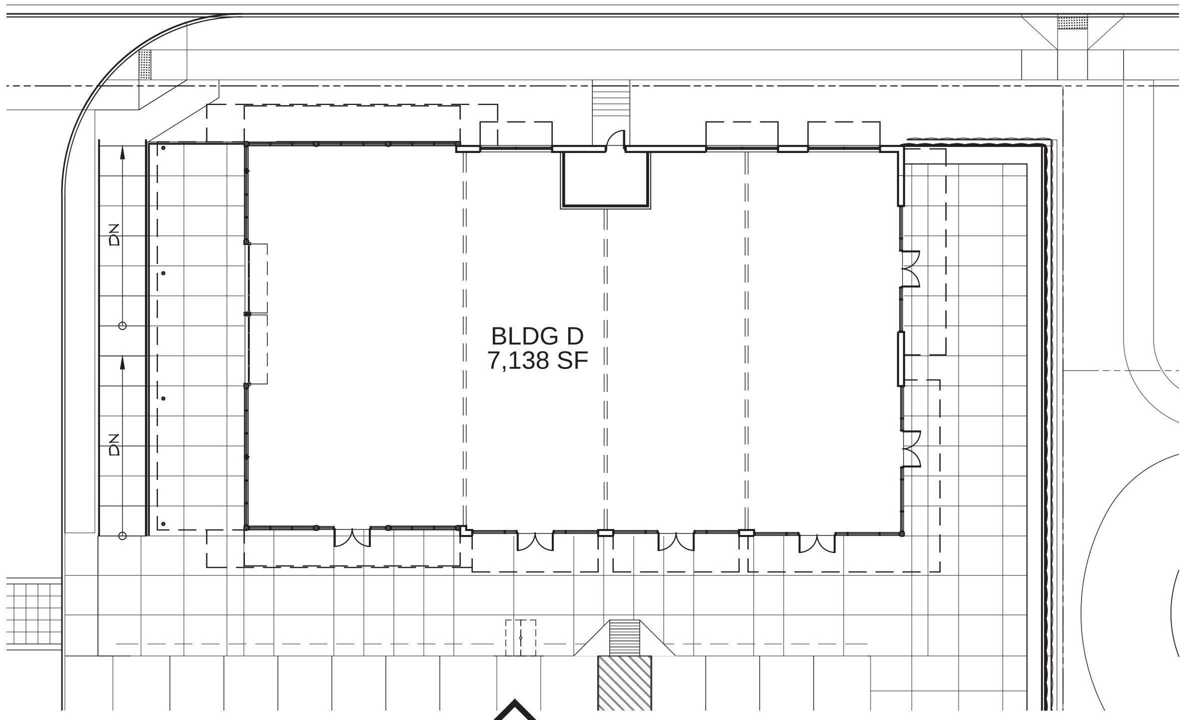


KEY PLAN
N.T.S.

NORTH



EAST ELEVATION
1/8" = 1'-0"



FLOOR PLAN
1/16" = 1'-0"

NORTH

BUILDING D
FLOOR PLAN AND COLOR ELEVATIONS

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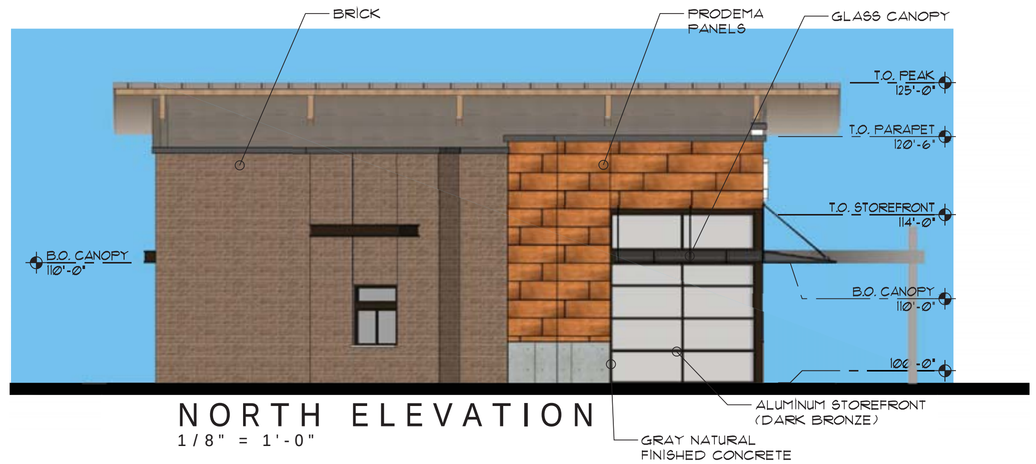
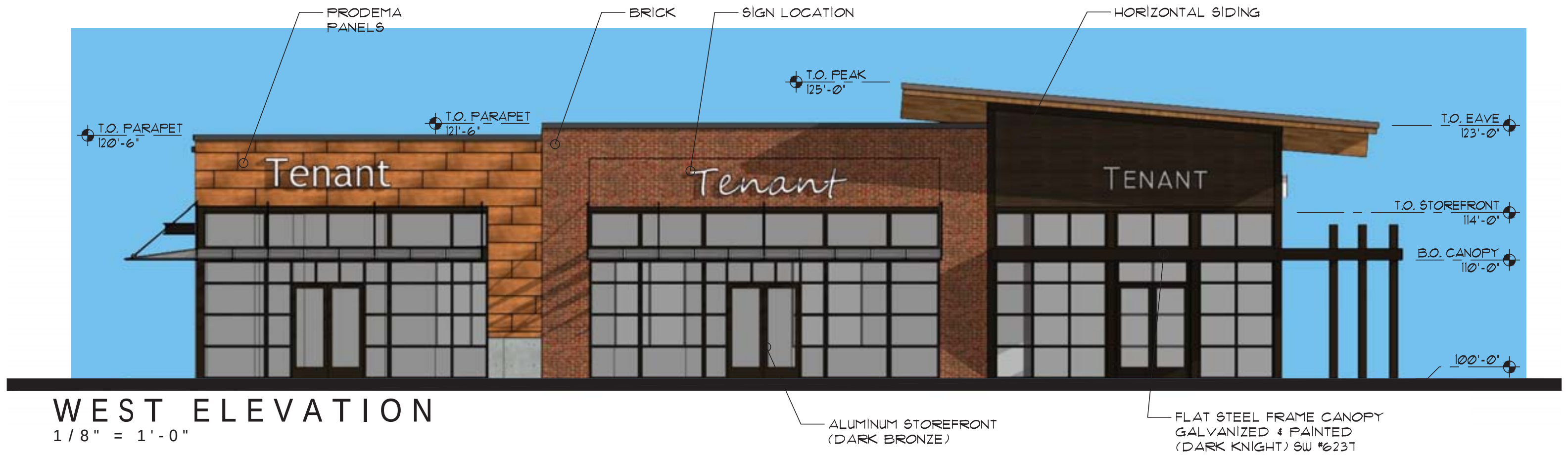
20136 Bldg D Plan Elevations - Exhibits

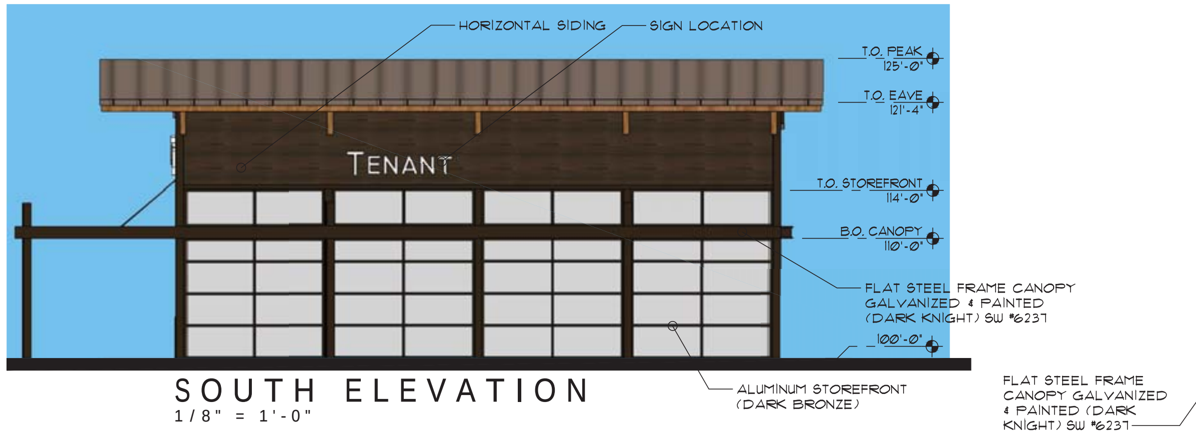
D
A



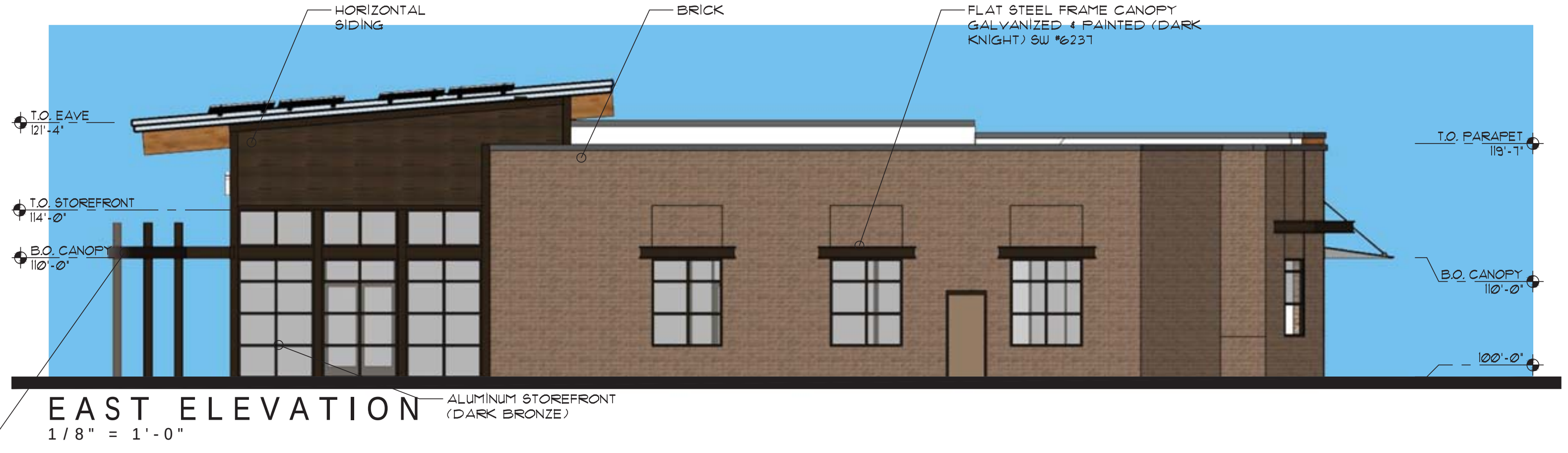
NORTH ELEVATION
1/8" = 1'-0"



WEST ELEVATION
1/8" = 1'-0"

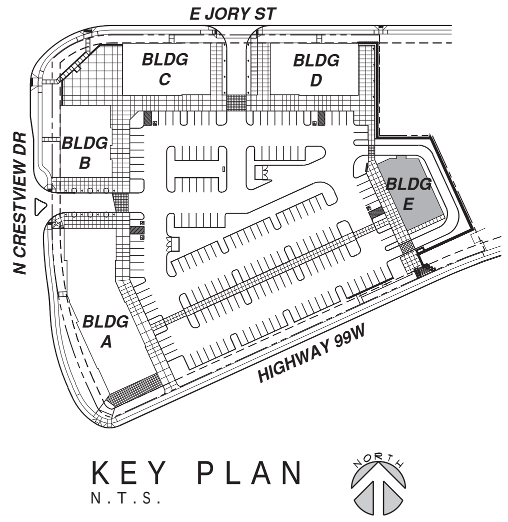


SOUTH ELEVATION
1/8" = 1'-0"



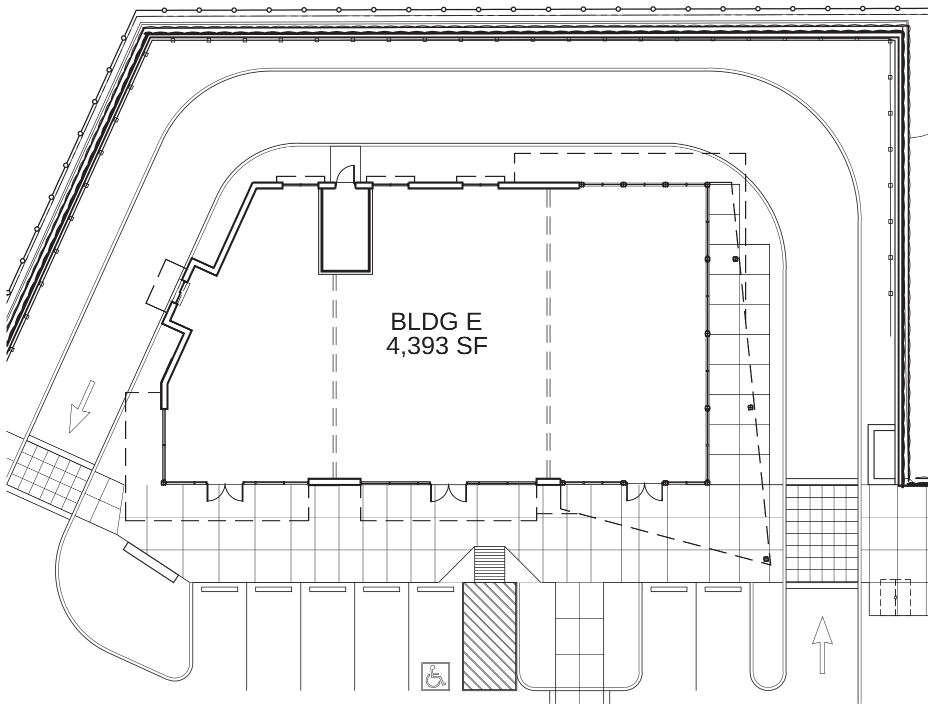
EAST ELEVATION
1/8" = 1'-0"

NORTH-EAST ELEVATION
1/8" = 1'-0"



KEY PLAN
N.T.S.

BUILDING E
FLOOR PLAN AND COLOR ELEVATIONS



FLOOR PLAN
1/16" = 1'-0"

NORTH

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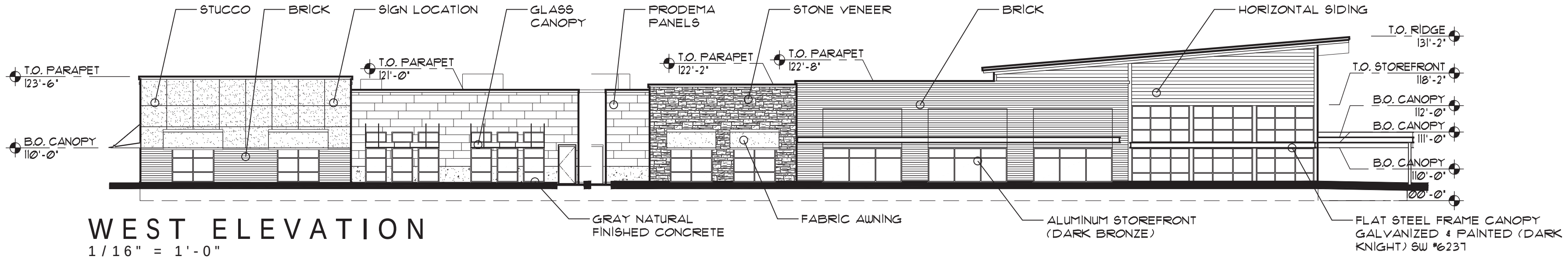
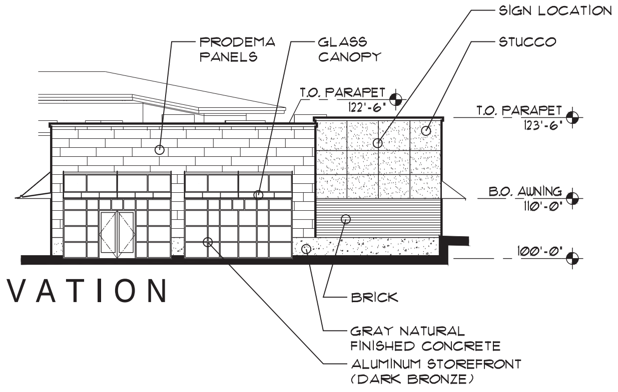
REVISIONS

20136 Bldg E Plan Elevations - Exhibits

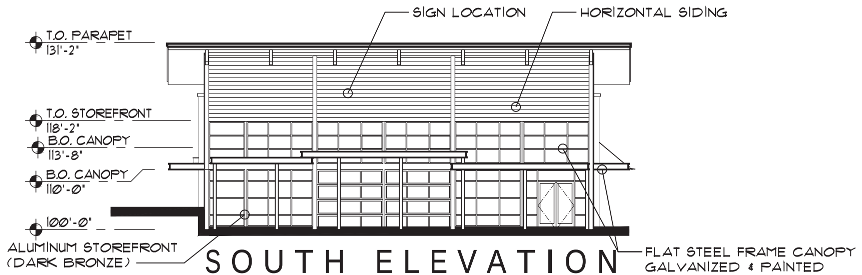
E
A



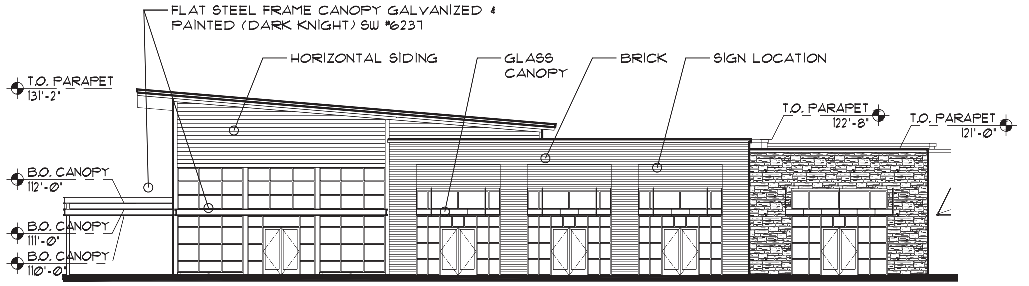
WEST ELEVATION
1/16" = 1'-0"



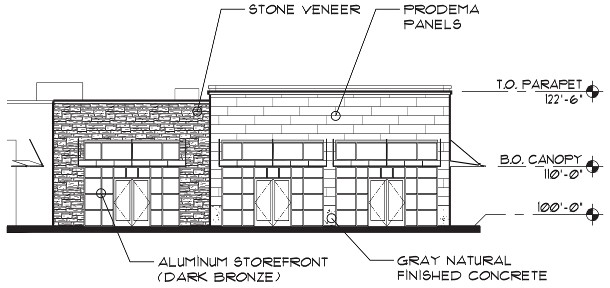
NORTH ELEVATION
1/16" = 1'-0"

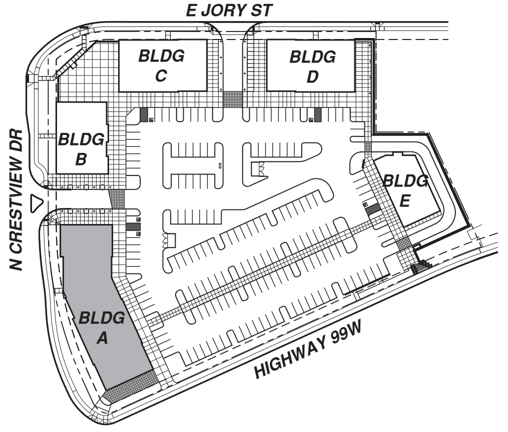


SOUTH ELEVATION
1/16" = 1'-0"



EAST ELEVATION
1/16" = 1'-0"

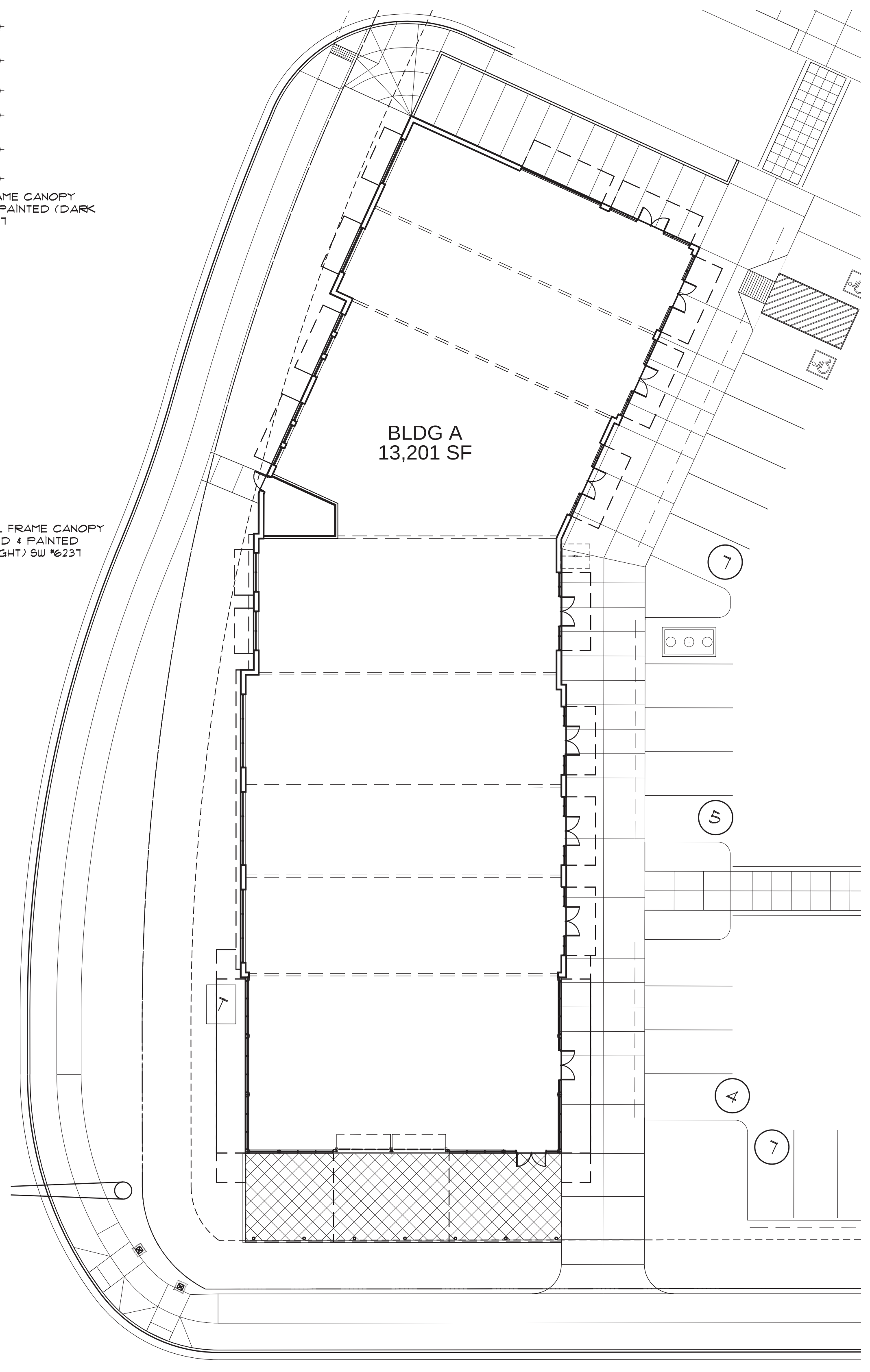




KEY PLAN
N.T.S.

NORTH

BUILDING A
FLOOR PLAN AND ELEVATIONS



FLOOR PLAN
1/16" = 1'-0"

NORTH

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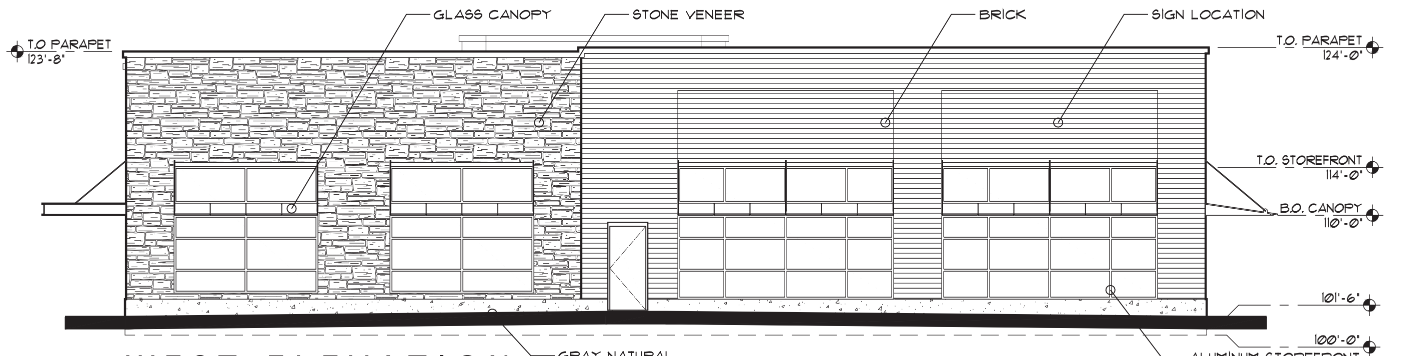
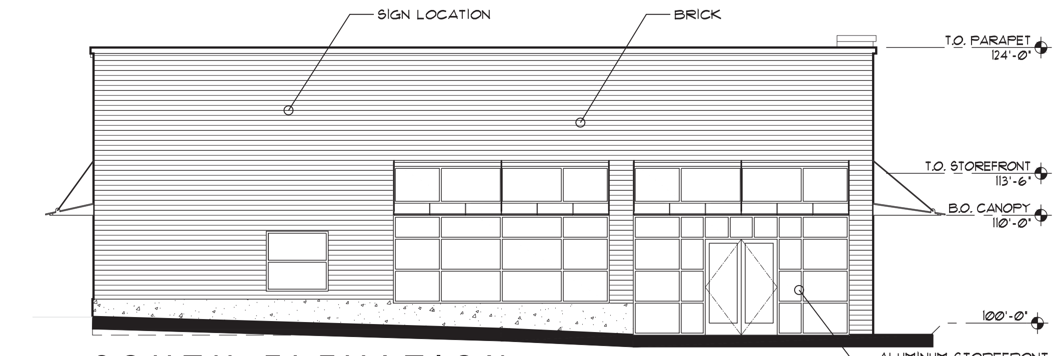
20136 Bldg A Plan Elevations - Exhibits

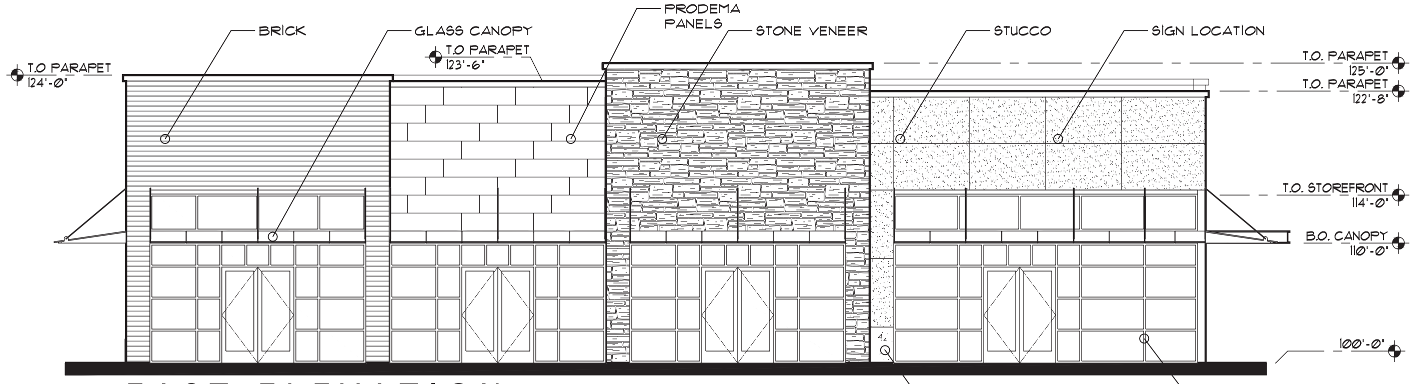
A
B



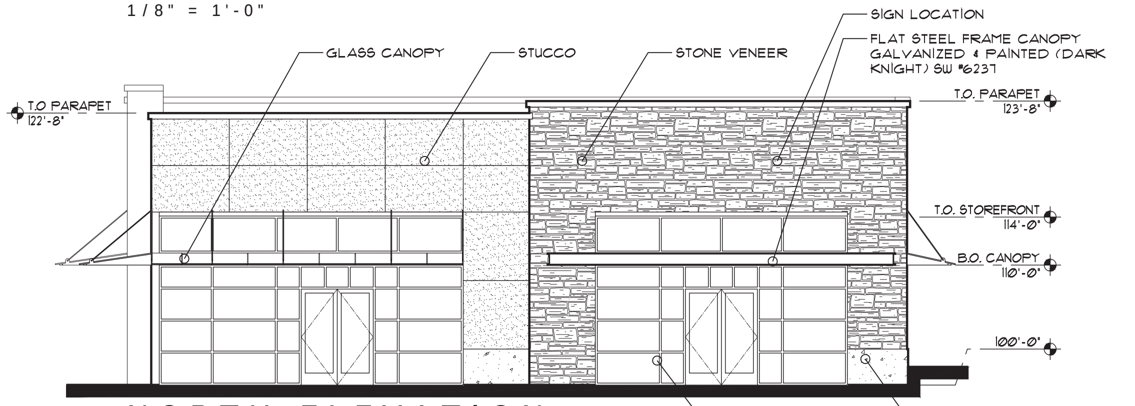
WEST ELEVATION
1/8" = 1'-0"



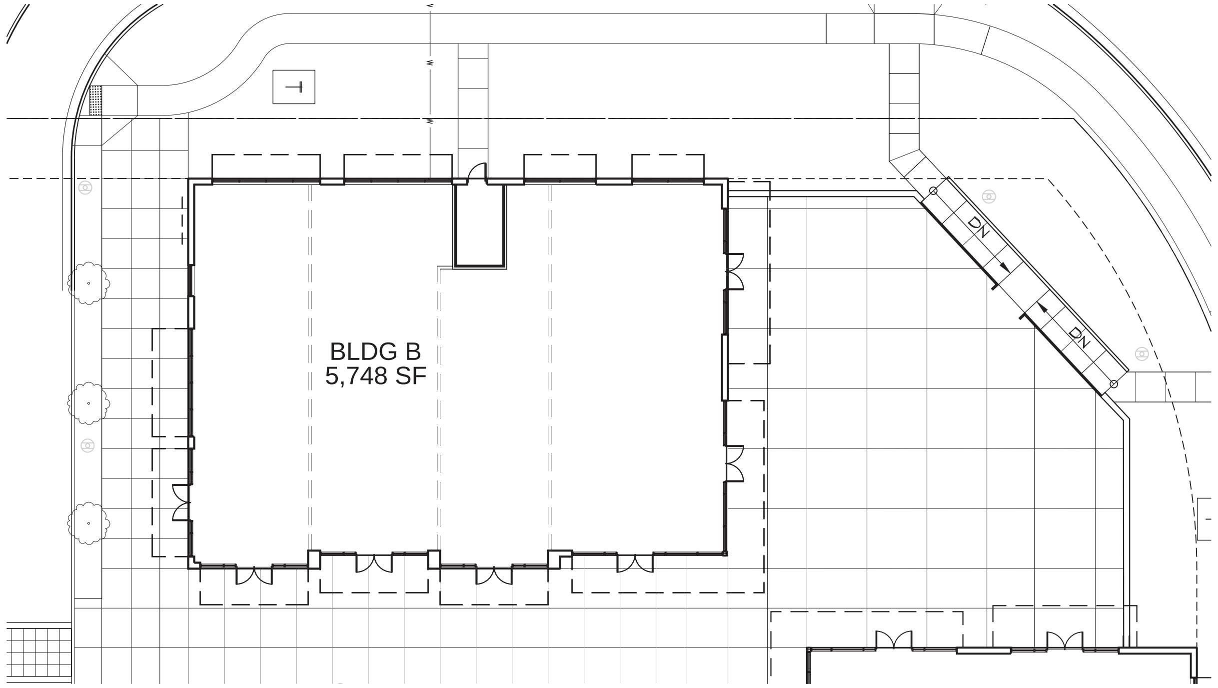
SOUTH ELEVATION
1/8" = 1'-0"



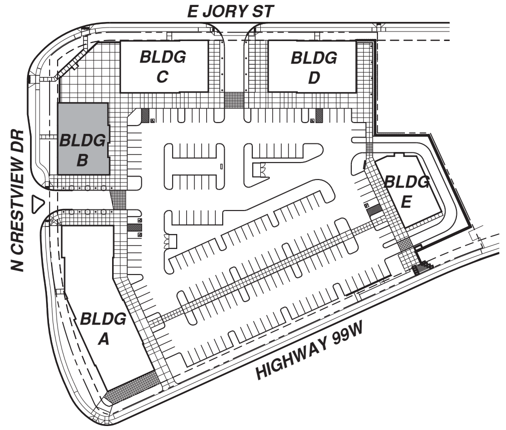
EAST ELEVATION
1/8" = 1'-0"



NORTH ELEVATION
1/8" = 1'-0"



FLOOR PLAN
1/16" = 1'-0"
NORTH



KEY PLAN
N.T.S.

NORTH

BUILDING B
FLOOR PLAN AND ELEVATIONS

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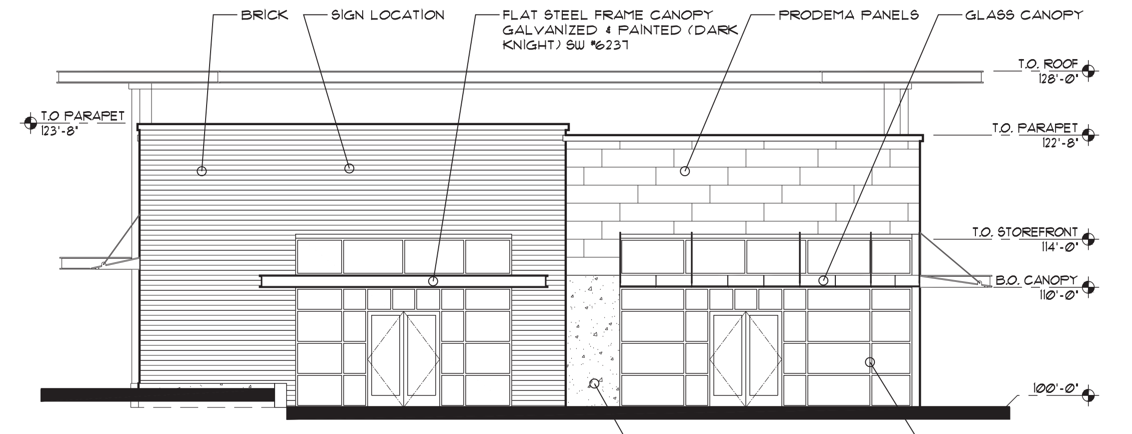
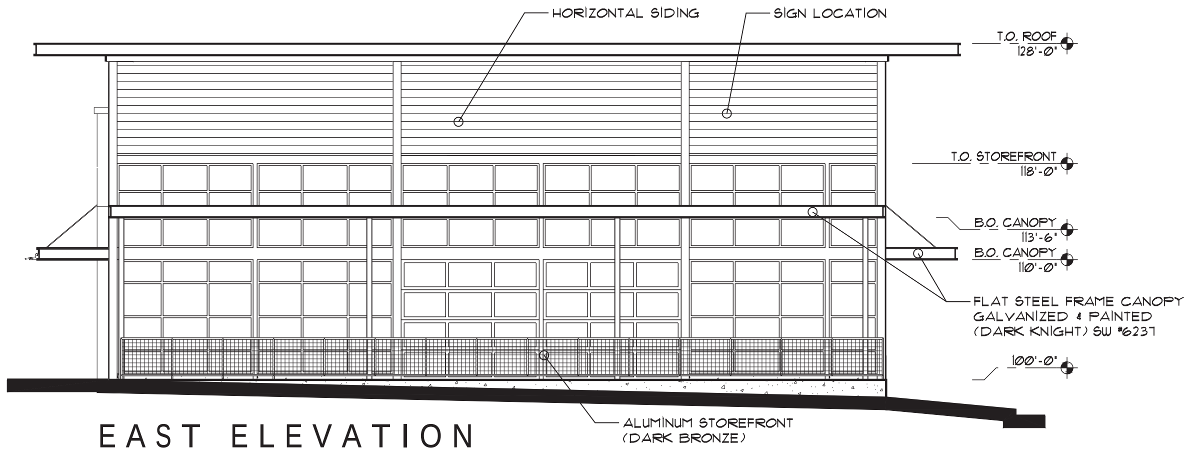
20136 Bldg B Plan Elevations - Exhibits

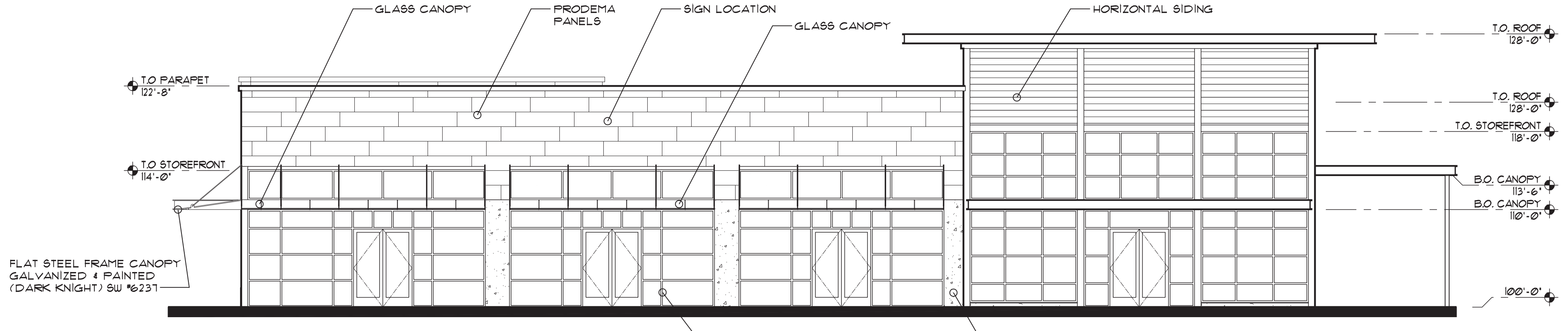
B
B



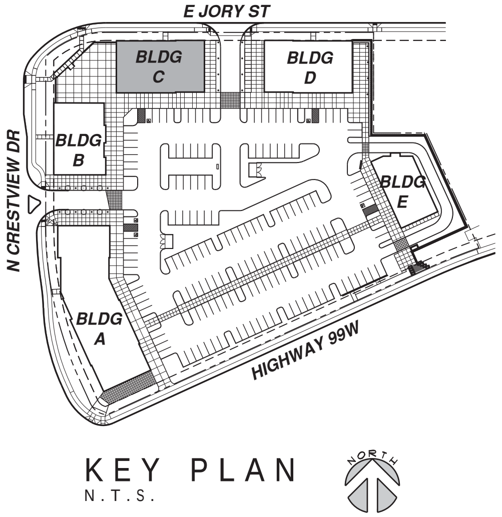
WEST ELEVATION
1/8" = 1'-0"



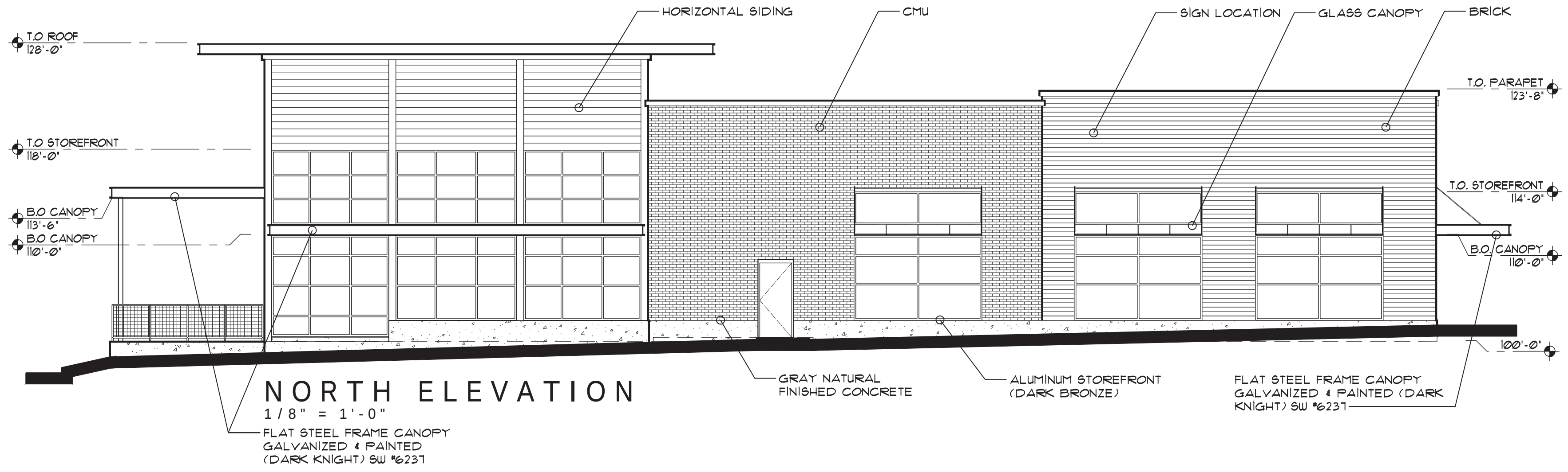
EAST ELEVATION
1/8" = 1'-0"



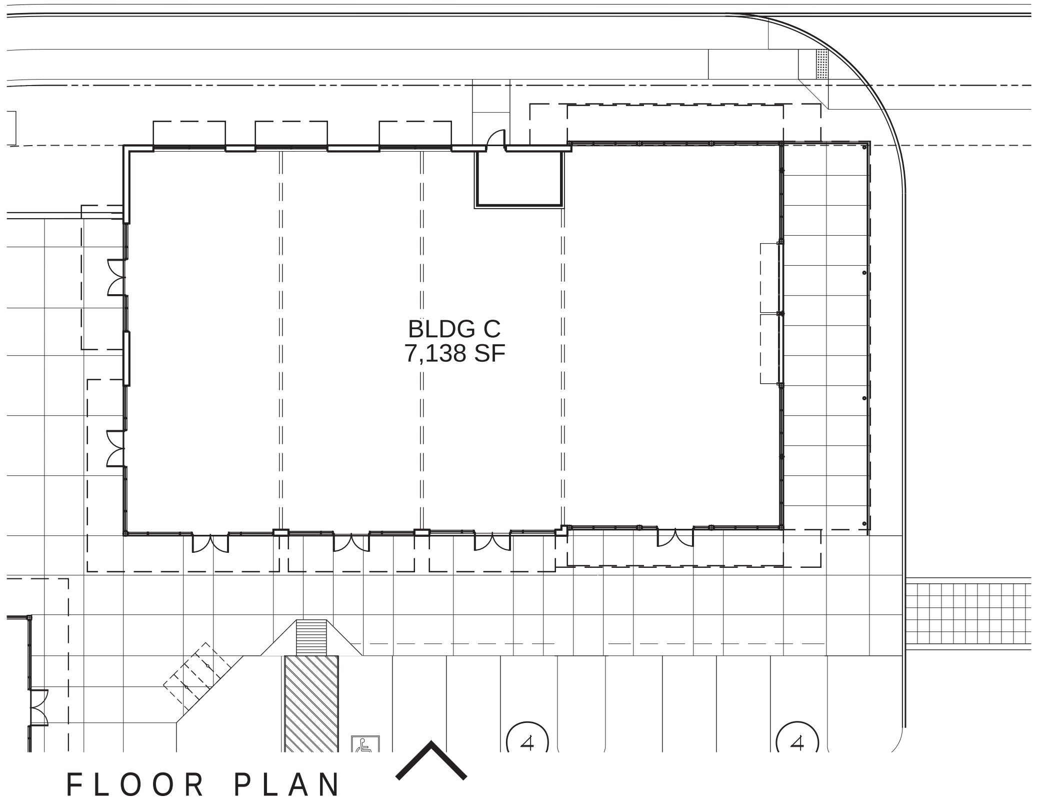
SOUTH ELEVATION
1/8" = 1'-0"



KEY PLAN
N.T.S.



NORTH ELEVATION
1/8" = 1'-0"



FLOOR PLAN
1/16" = 1'-0"

BUILDING C
FLOOR PLAN AND ELEVATIONS

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CRESTVIEW CROSSING COMMERCIAL
HIGHWAY 99W & N CRESTVIEW DRIVE
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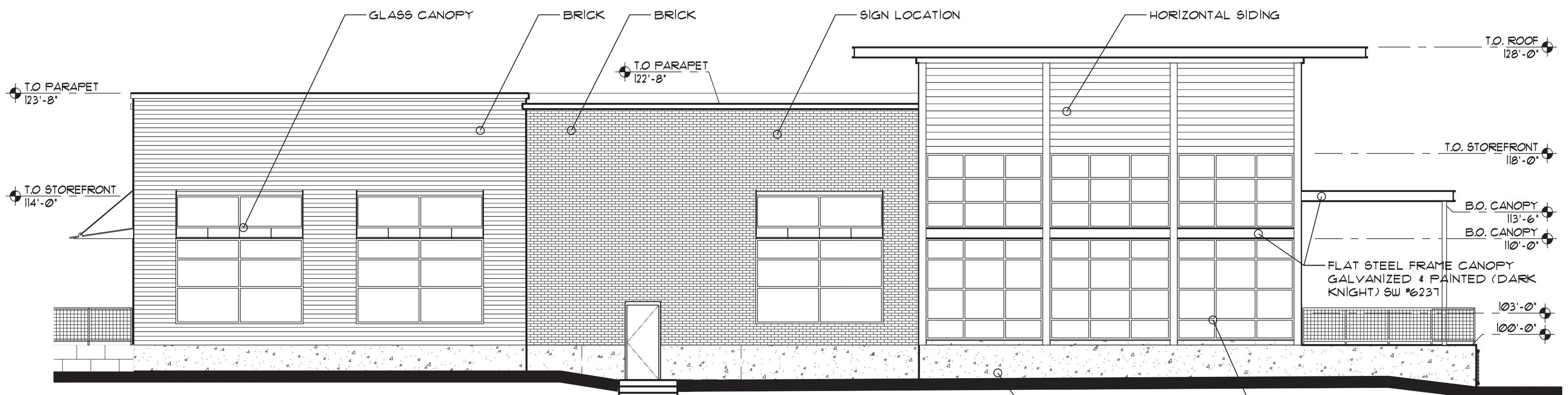
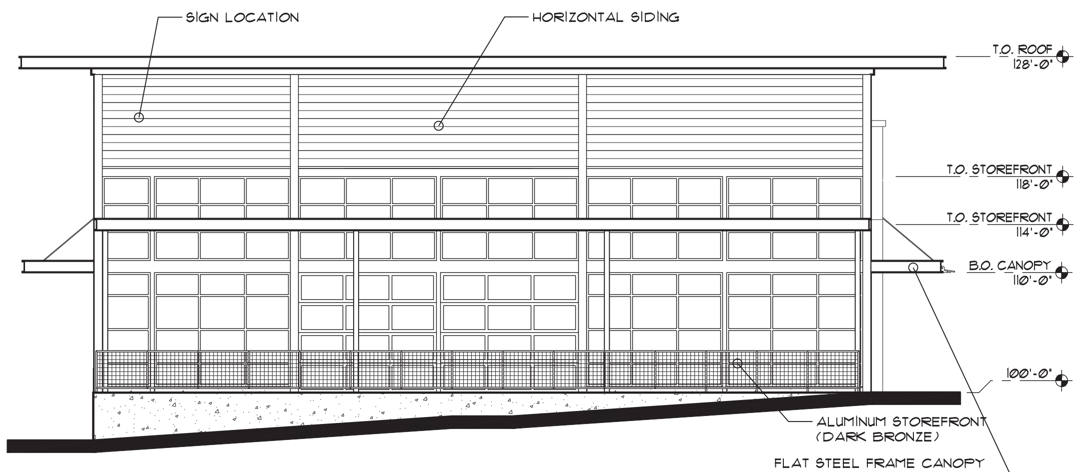
20136 Bldg C Plan Elevations - Exhibits

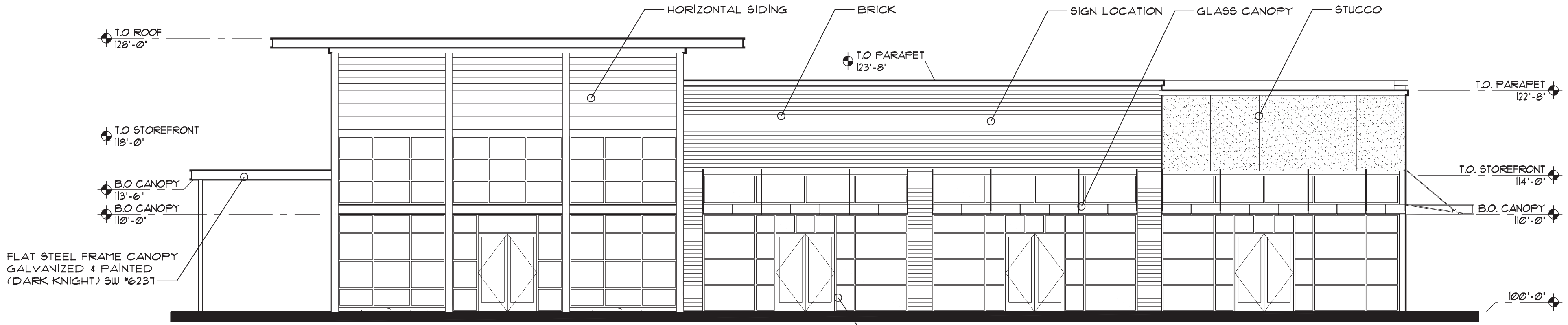
C
B



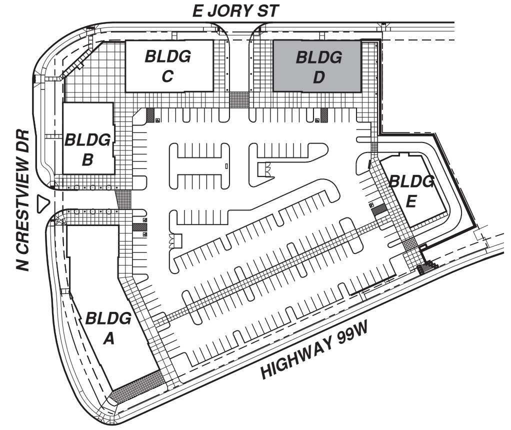
NORTH ELEVATION
1/8" = 1'-0"



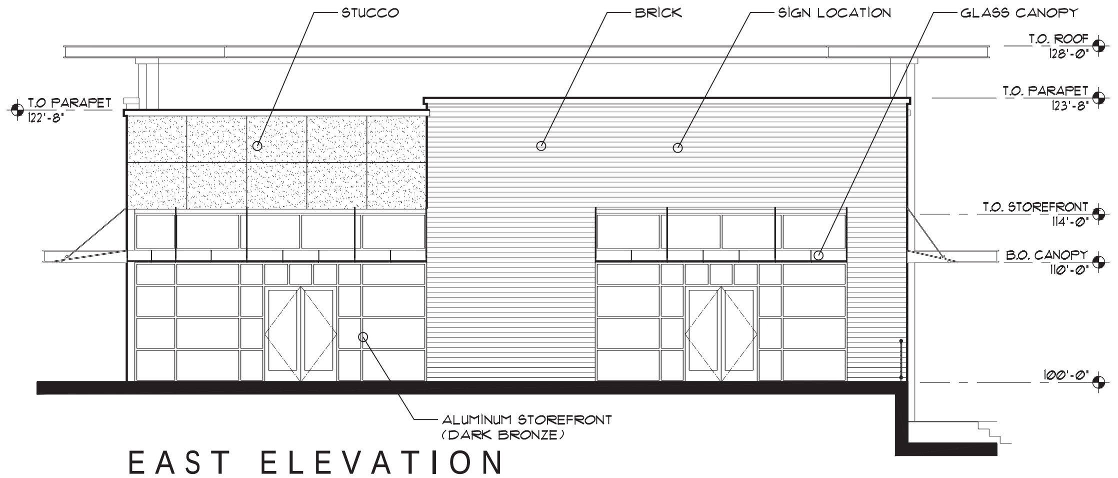
WEST ELEVATION
1/8" = 1'-0"



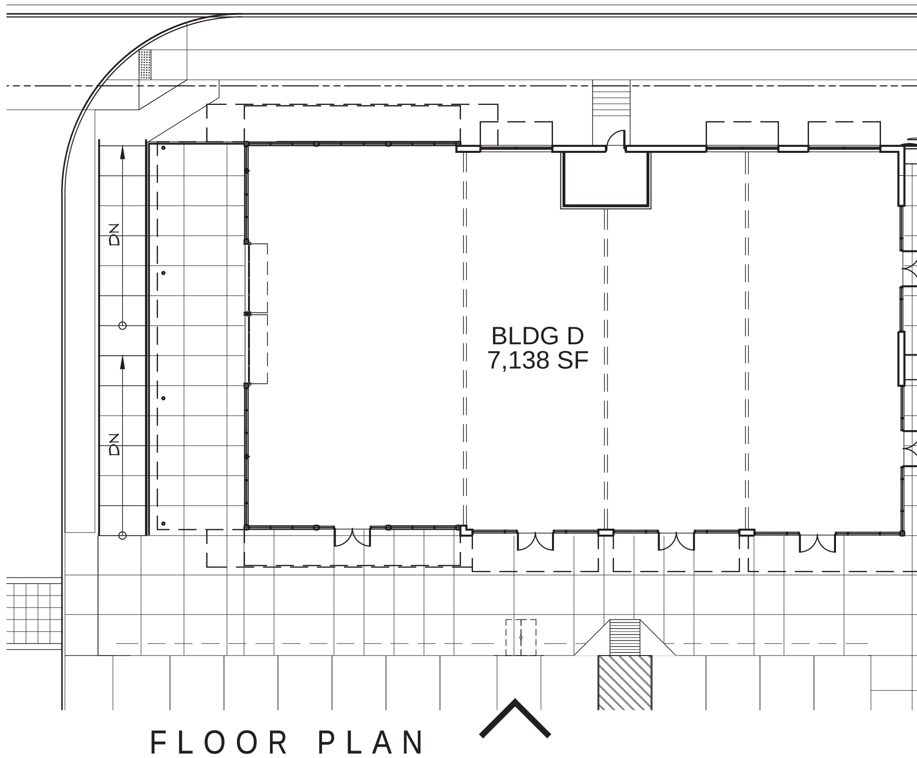
SOUTH ELEVATION
1/8" = 1'-0"



KEY PLAN
N.T.S.



EAST ELEVATION
1/8" = 1'-0"



FLOOR PLAN
1/16" = 1'-0"

NORTH

BUILDING D
FLOOR PLAN AND ELEVATIONS

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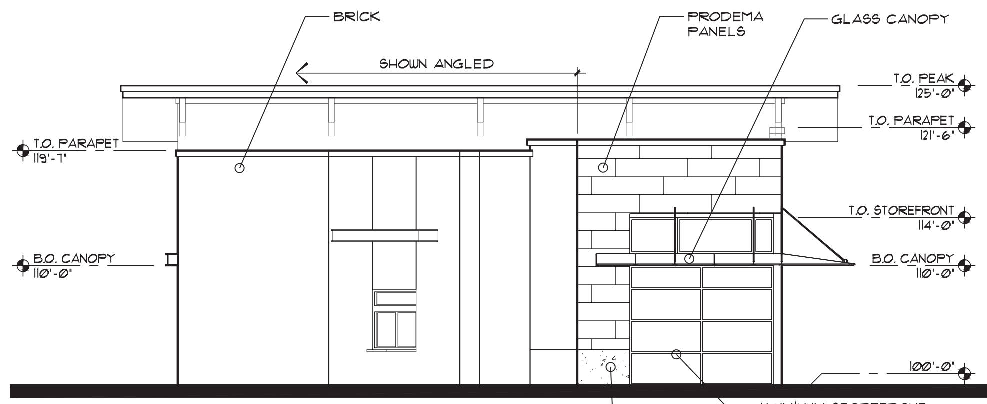
FMS

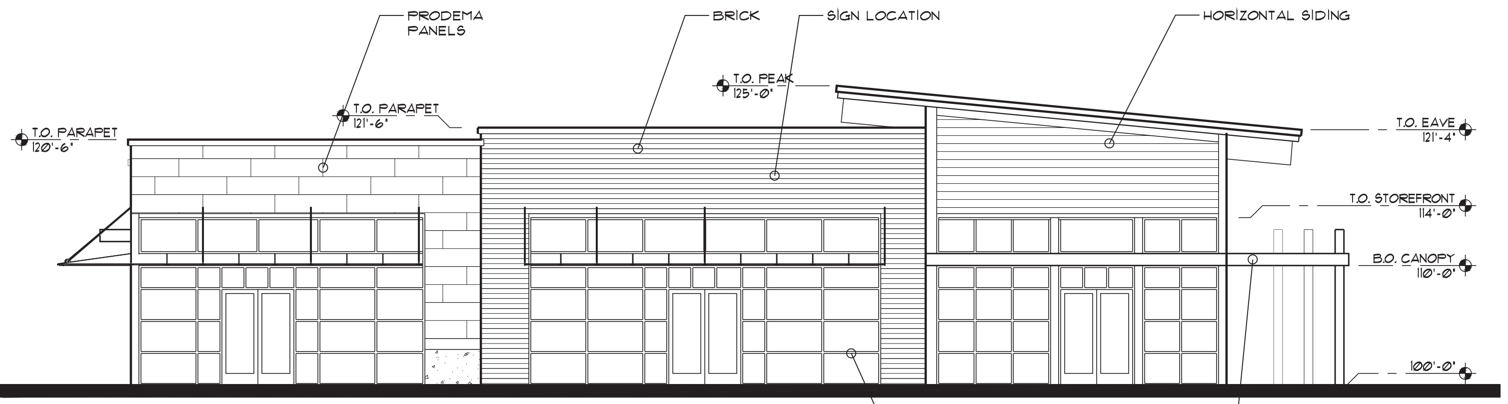
REVISIONS

20136 Bldg D Plan Elevations - Exhibits

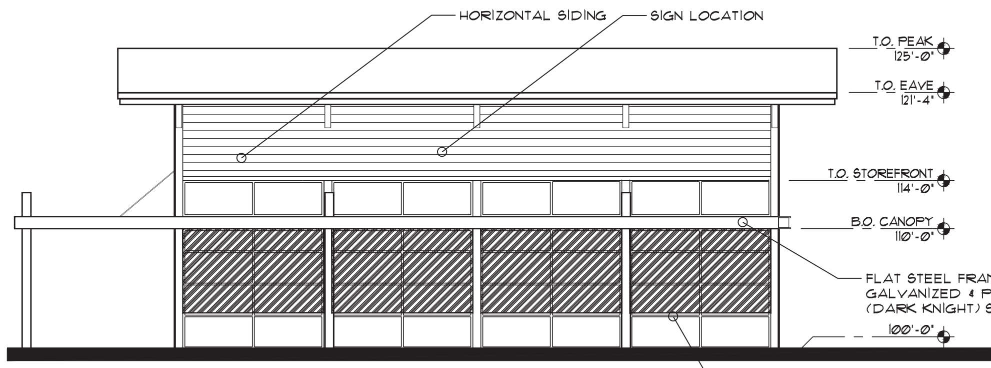
D
B



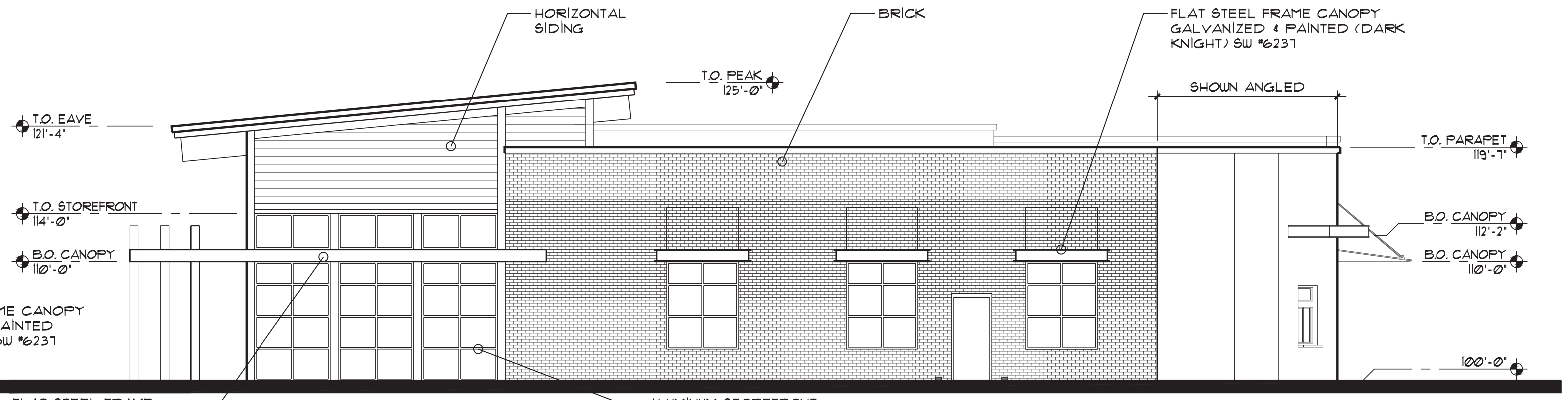
NORTH ELEVATION
1/8" = 1'-0"



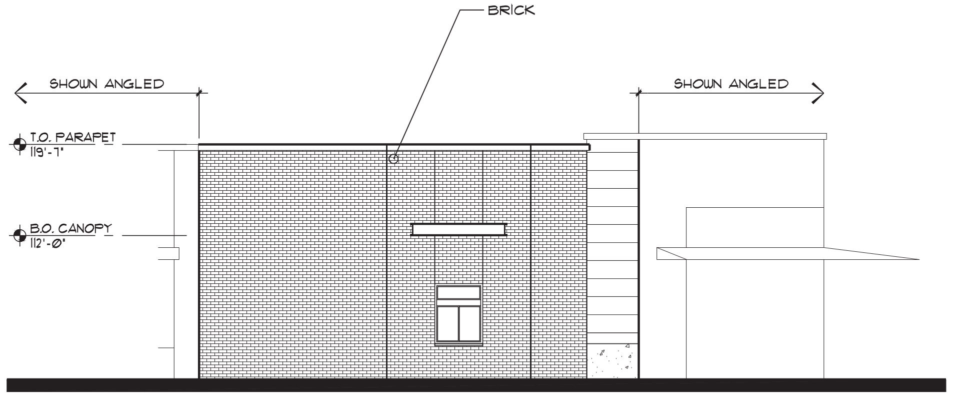
WEST ELEVATION
1/8" = 1'-0"



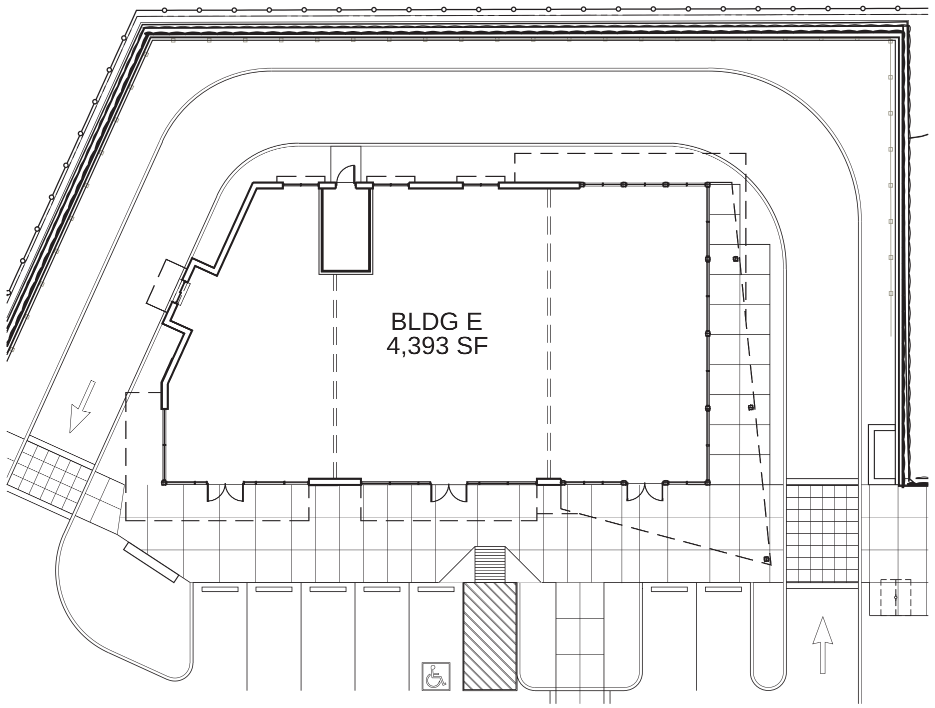
SOUTH ELEVATION
1/8" = 1'-0"



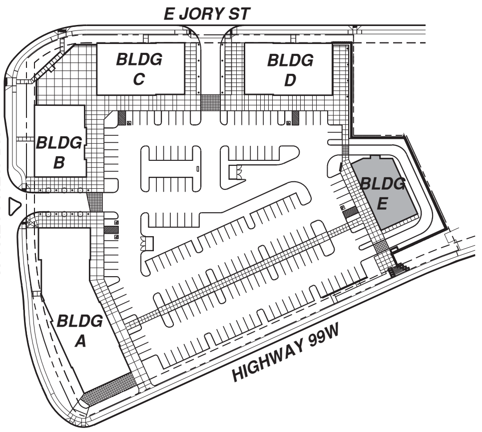
EAST ELEVATION
1/8" = 1'-0"



NORTH-EAST ELEVATION
1/8" = 1'-0"



FLOOR PLAN
1/16" = 1'-0"
NORTH



KEY PLAN
N.T.S.
NORTH

BUILDING E
FLOOR PLAN AND ELEVATIONS

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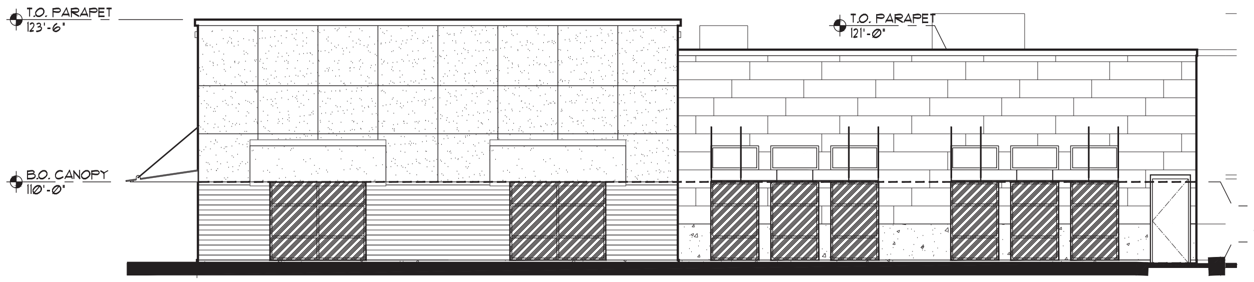
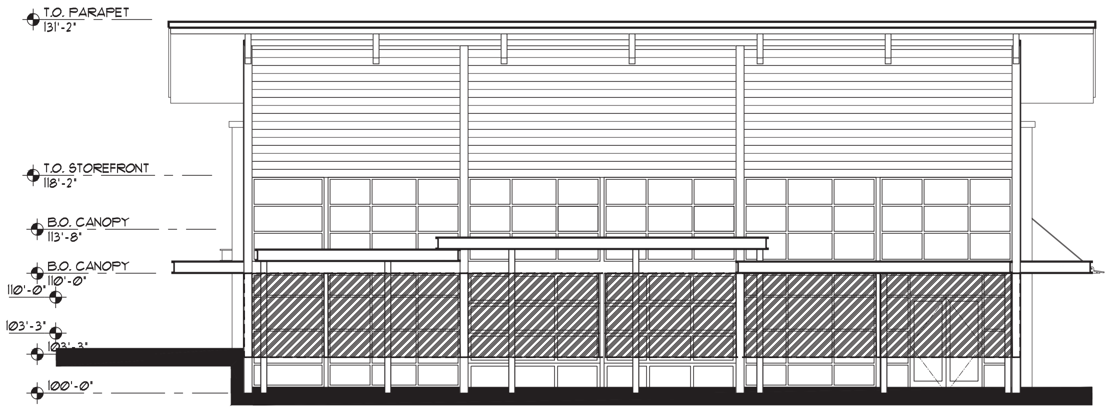
REVISIONS

20136 Bldg E Plan Elevations - Exhibits

E
B



WEST ELEVATION
1/8" = 1'-0"



SOUTH ELEVATION
1/8" = 1'-0"

BUILDING AREA :

WEST SIDE GROUND FLOOR AREA :	1529.5 SQ. FT.	
GLAZING AREA :	873.2 SQ. FT.	(57.1%)
WEST SIDE BUILDING LENGTH :	218.5 LF	
GLAZING LENGTH :	134 LF	(61.3%)
SOUTH SIDE GROUND FLOOR AREA :	452.7 SQ. FT.	
GLAZING AREA :	425.2 SQ. FT.	(93.9%)
SOUTH SIDE BUILDING LENGTH :	64.7 LF	
GLAZING LENGTH :	60.8 LF	(94.0%)

THE GROUND FLOOR FACADE IS CONSIDERED AS THE AREA BETWEEN 3-FEET AND 10-FEET ABOVE THE FINISHED FLOOR.

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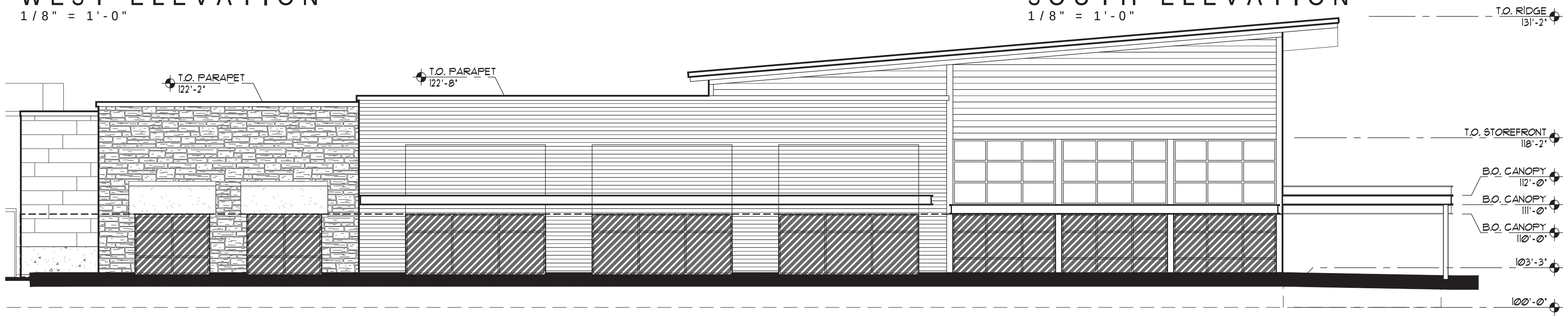
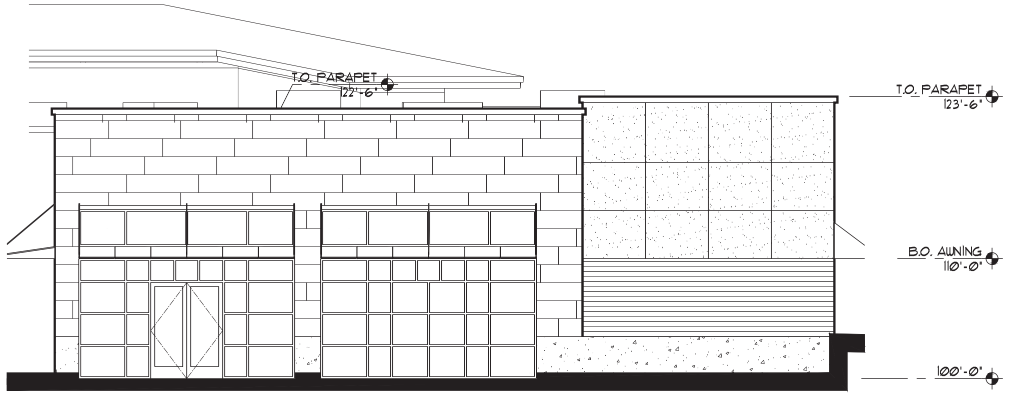


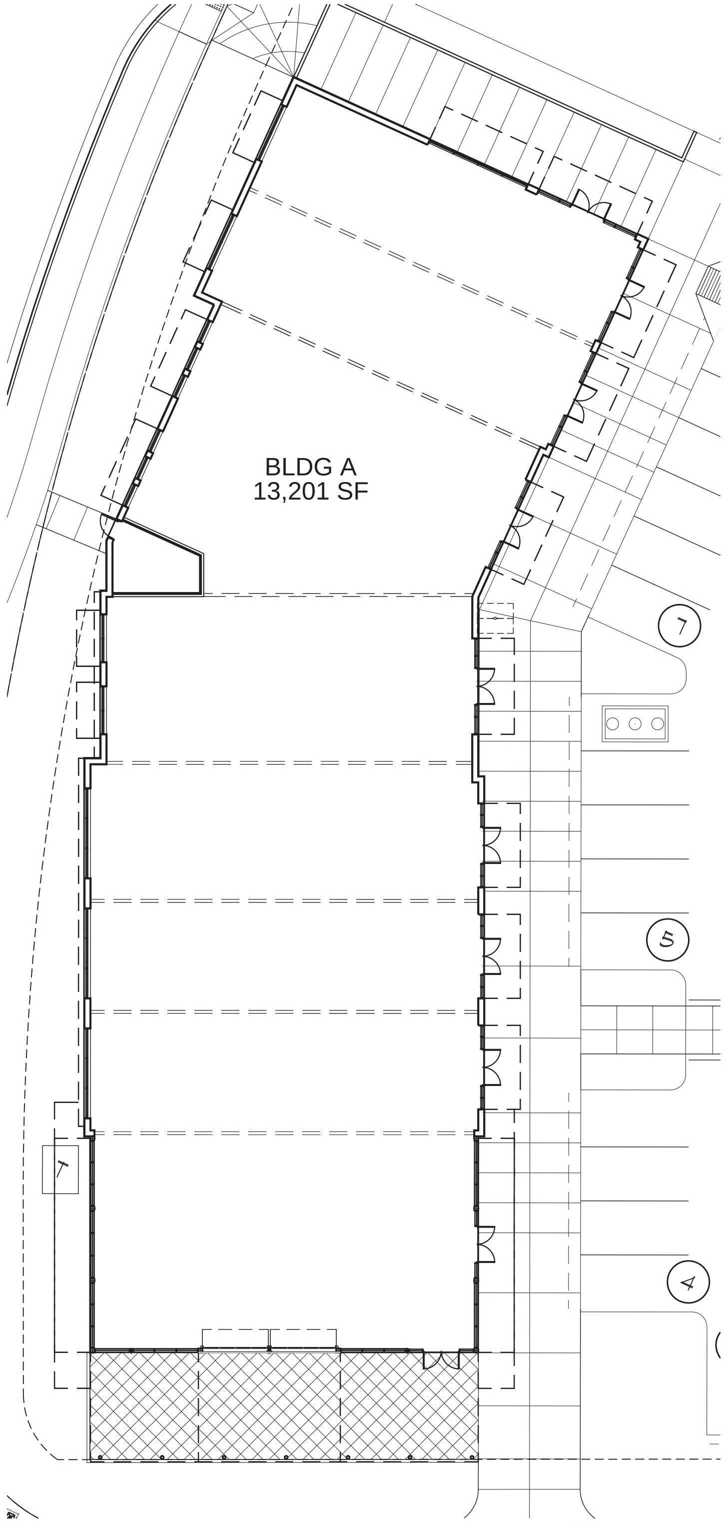
WEST ELEVATION
1/8" = 1'-0"

EAST ELEVATION
1/8" = 1'-0"

EAST ELEVATION
1/8" = 1'-0"



NORTH ELEVATION
1/8" = 1'-0"



FLOOR PLAN
1/16" = 1'-0"

NORTH

BUILDING A
FLOOR PLAN AND ELEVATIONS
GROUND FLOOR STREET FACADE GLAZING AREA

CRESTVIEW CROSSING COMMERCIAL
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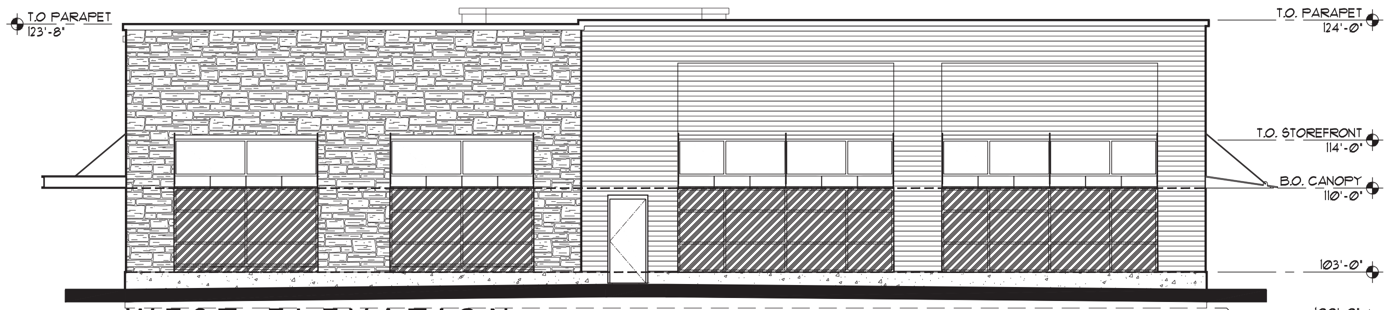
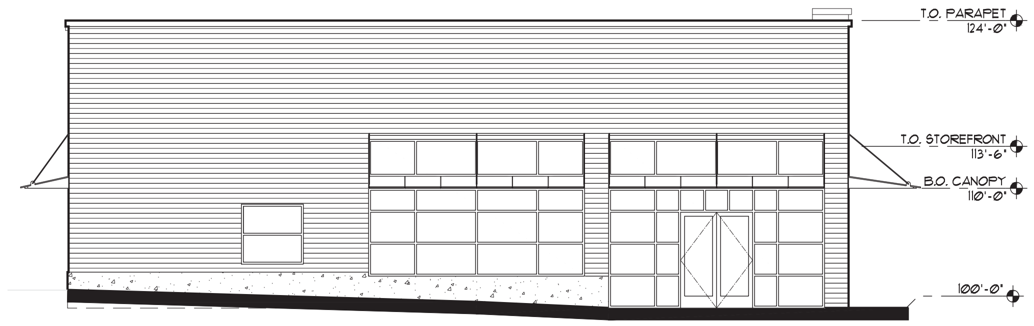
20136 Bldg A Plan Elevations - Exhibits

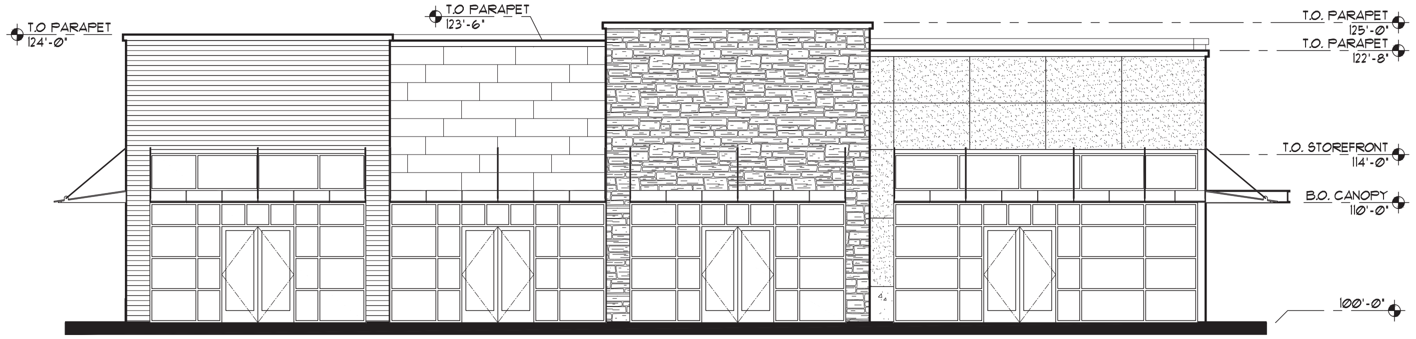
A
C



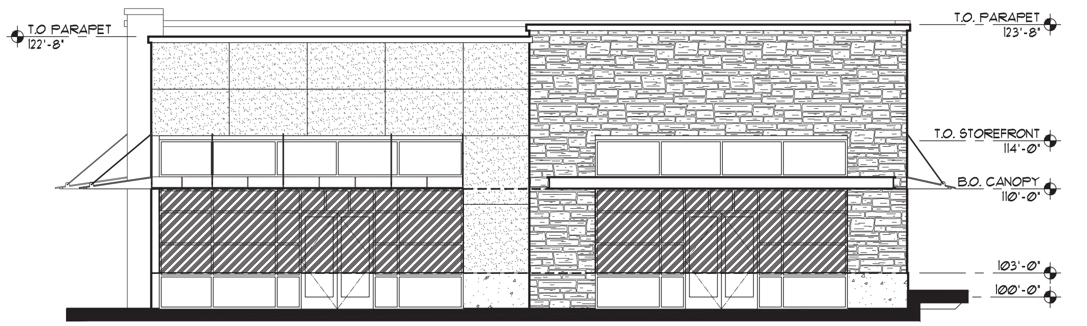
WEST ELEVATION
1/8" = 1'-0"



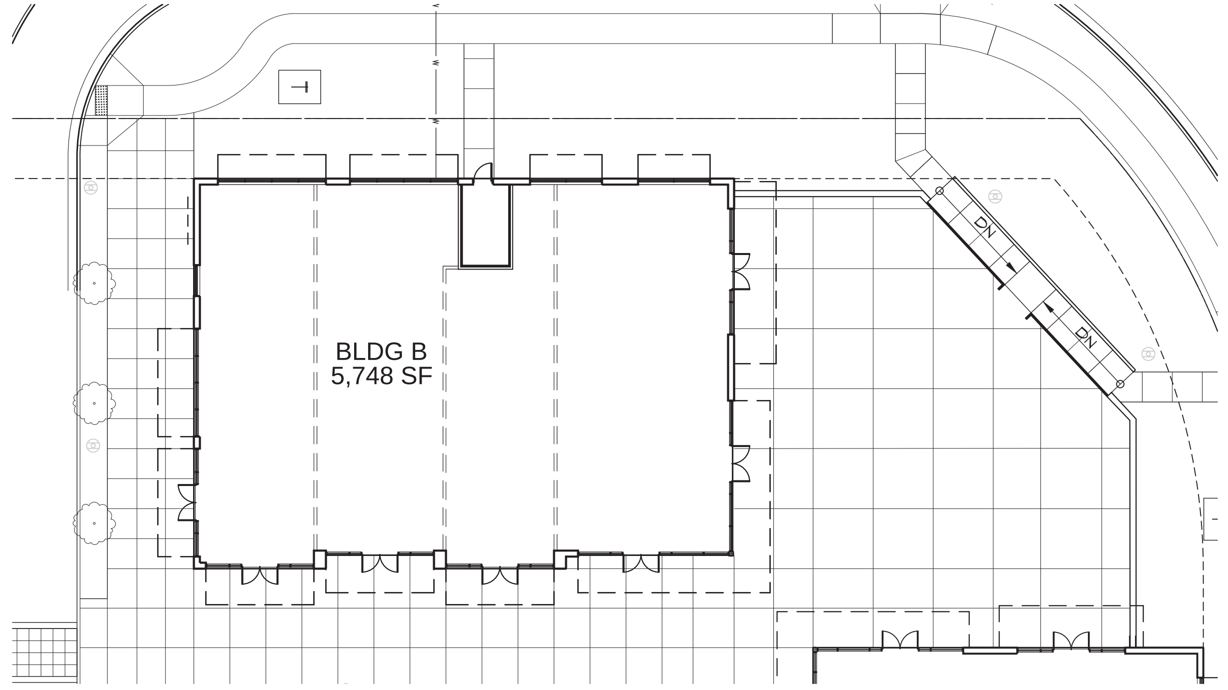
SOUTH ELEVATION
1/8" = 1'-0"



EAST ELEVATION
1/8" = 1'-0"



NORTH ELEVATION
1/8" = 1'-0"



FLOOR PLAN
1/16" = 1'-0"

NORTH

BUILDING AREA :

NORTH SIDE GROUND FLOOR AREA :	441	SQ. FT.	
GLAZING AREA :	324.3	SQ. FT.	(73.5%)
NORTH SIDE BUILDING LENGTH :	63	LF	
GLAZING LENGTH :	46.3	LF	(73.5%)
WEST SIDE GROUND FLOOR AREA :	630	SQ. FT.	
GLAZING AREA :	420	SQ. FT.	(66.7%)
WEST SIDE BUILDING LENGTH :	90	LF	
GLAZING LENGTH :	60	LF	(66.7%)

THE GROUND FLOOR FACADE IS CONSIDERED AS THE AREA BETWEEN 3-FEET AND 10-FEET ABOVE THE FINISHED FLOOR.

BUILDING B
FLOOR PLAN AND ELEVATIONS
GROUND FLOOR STREET FACADE GLAZING AREA

TILAND / SCHMIDT
ARCHITECTS, P.C.
16101 SW 72ND AVE.
SUITE 135
PORTLAND, OR 97224
(503) 220-8517
FAX (503) 220-8518

CRESTVIEW CROSSING COMMERCIAL
HIGHWAY 99W & N CRESTVIEW DRIVE
NEWBERG, OREGON
GRAMOR NEWBERG CRESTVIEW LLC

EXHIBIT 'C'

PROJECT NO.
20136

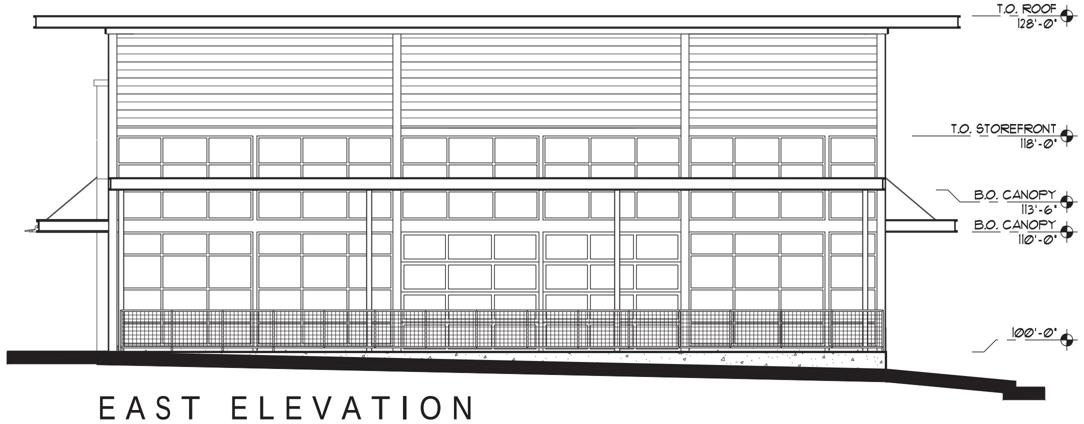
DATE :
11-25-2020
DRAWN BY :
AJH
CHECKED BY :
FMS

REVISIONS

20136 Bldg B Plan Elevations - Exhibits

B
C

WEST ELEVATION
1/8" = 1'-0"

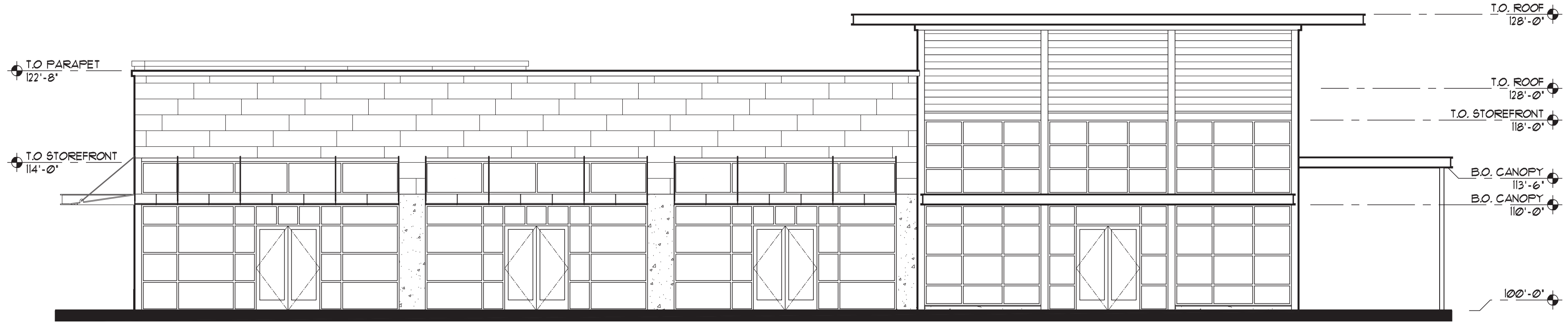


EAST ELEVATION
1/8" = 1'-0"

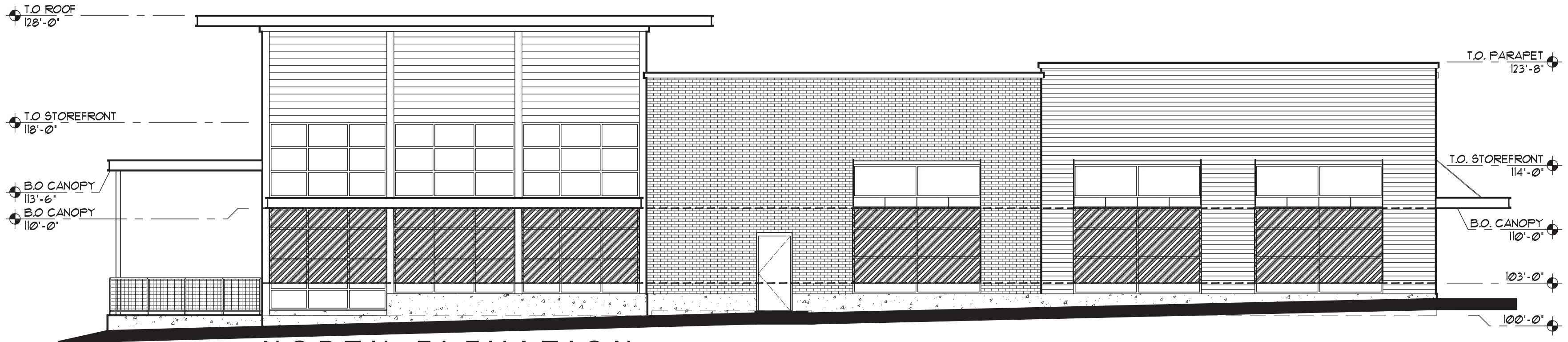
BUILDING AREA :

NORTH SIDE GROUND FLOOR AREA :	770	SQ. FT.	
GLAZING AREA :	485	SQ. FT.	(63.0%)
NORTH SIDE BUILDING LENGTH :	110	LF	
GLAZING LENGTH :	69.3	LF	(63.0%)
WEST SIDE GROUND FLOOR AREA :	455	SQ. FT.	
GLAZING AREA :	317.3	SQ. FT.	(69.7%)
WEST SIDE BUILDING LENGTH :	65	LF	
GLAZING LENGTH :	45.3	LF	(69.7%)

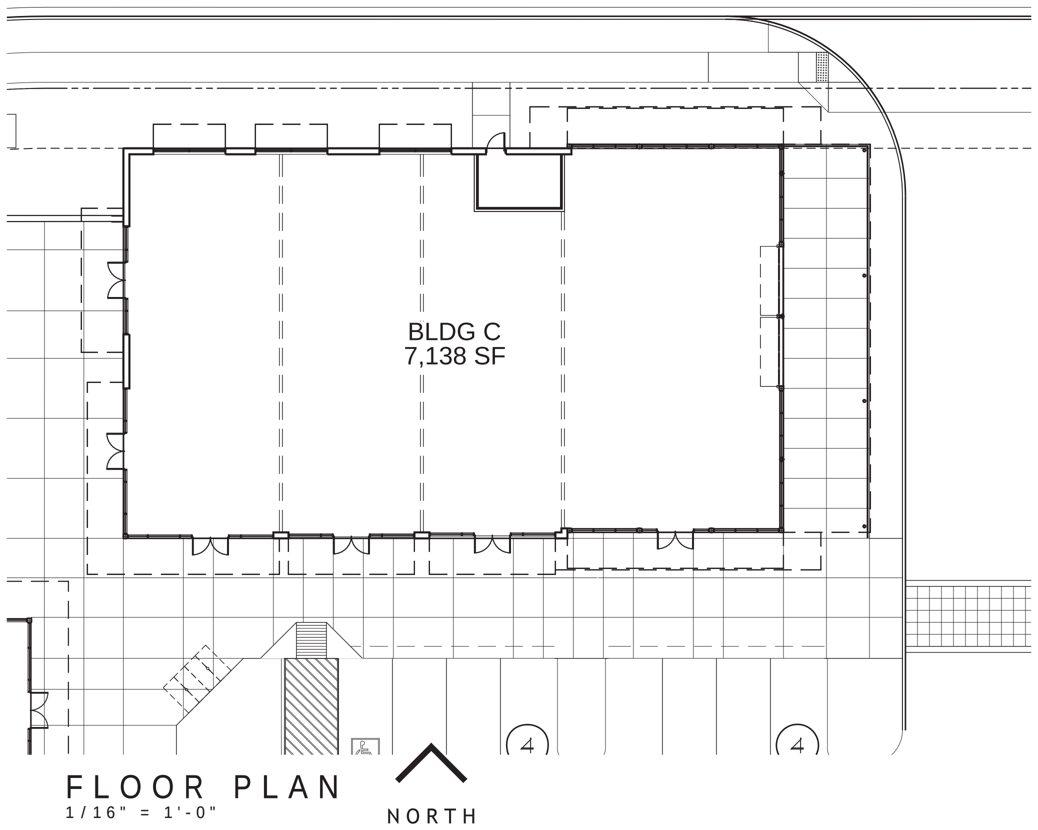
THE GROUND FLOOR FACADE IS CONSIDERED AS THE AREA BETWEEN 3-FEET AND 10-FEET ABOVE THE FINISHED FLOOR.



SOUTH ELEVATION
1/8" = 1'-0"



NORTH ELEVATION
1/8" = 1'-0"



FLOOR PLAN
1/16" = 1'-0"

BUILDING C
FLOOR PLAN AND ELEVATIONS
GROUND FLOOR STREET FACADE GLAZING AREA

TILAND / SCHMIDT
ARCHITECTS, P.C.
16101 SW 72ND AVE.
SUITE 135
PORTLAND, OR 97224
(503) 220-8517
FAX (503) 220-8518

CRESTVIEW CROSSING COMMERCIAL
HIGHWAY 99W & N CRESTVIEW DRIVE
NEWBERG, OREGON
GRAMOR NEWBERG CRESTVIEW LLC

EXHIBIT 'C'

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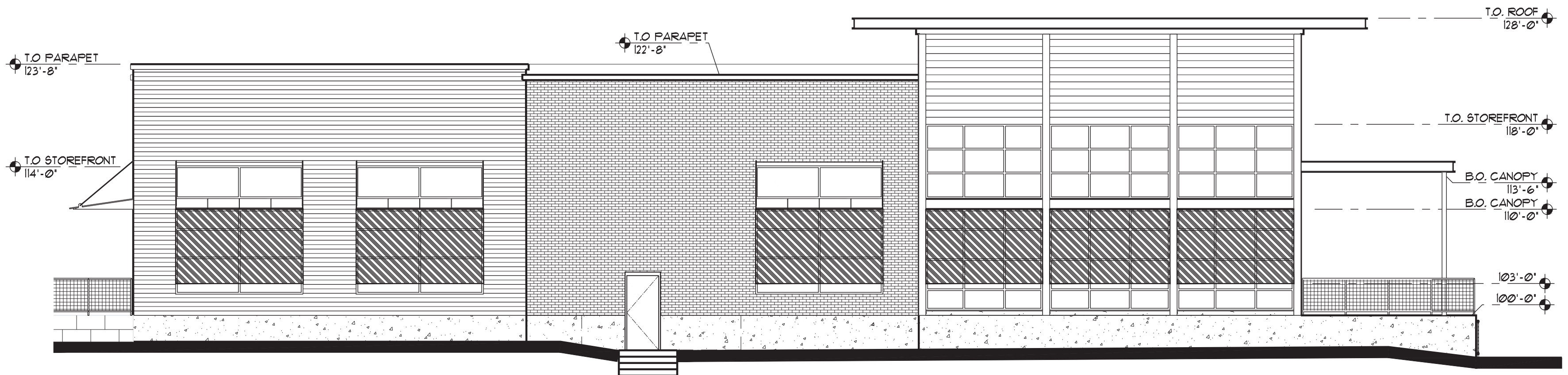
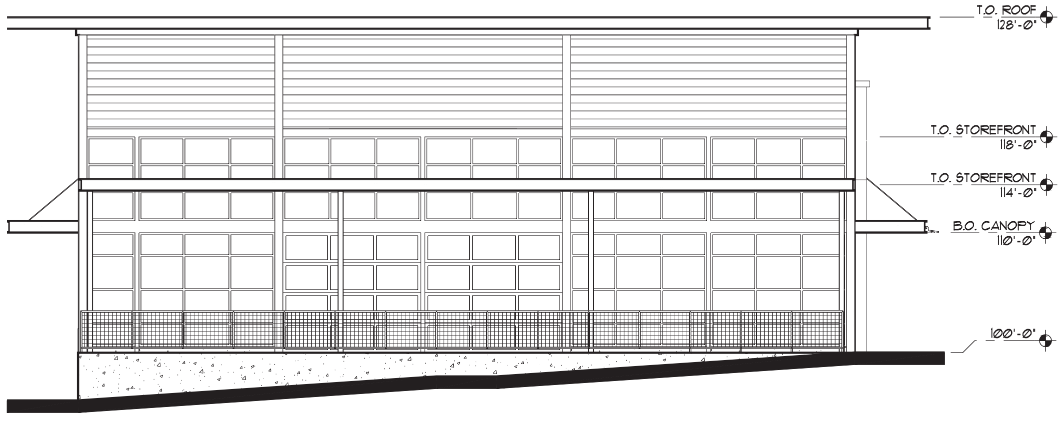
20136
DATE :
11-25-2020
DRAWN BY :
AJH
CHECKED BY :
FMS
REVISIONS

20136 Bldg C Plan Elevations - Exhibits

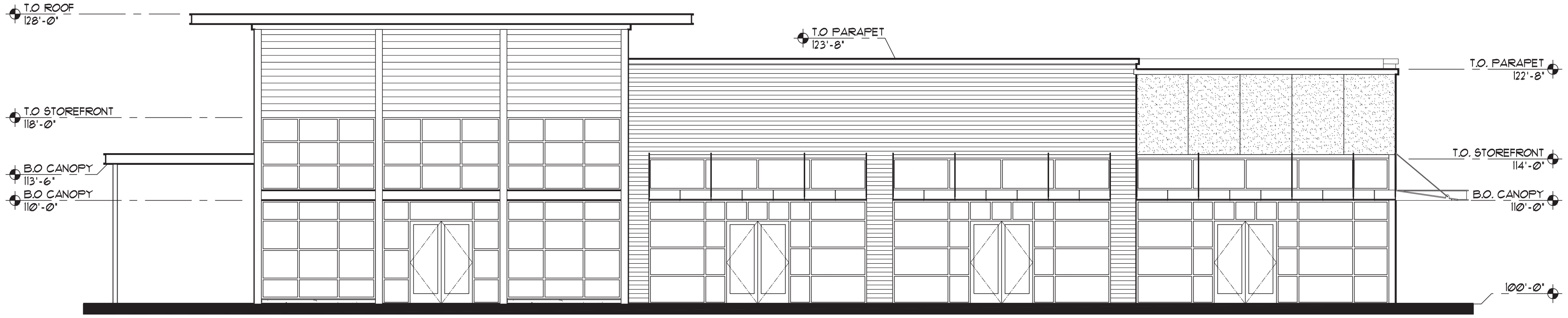
C
C



NORTH ELEVATION
1/8" = 1'-0"



WEST ELEVATION
1/8" = 1'-0"

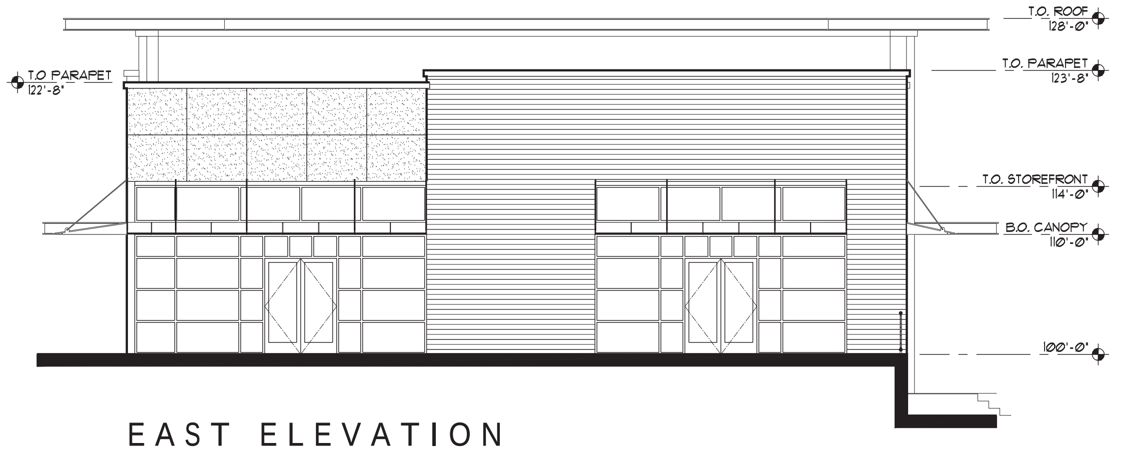


SOUTH ELEVATION
1/8" = 1'-0"

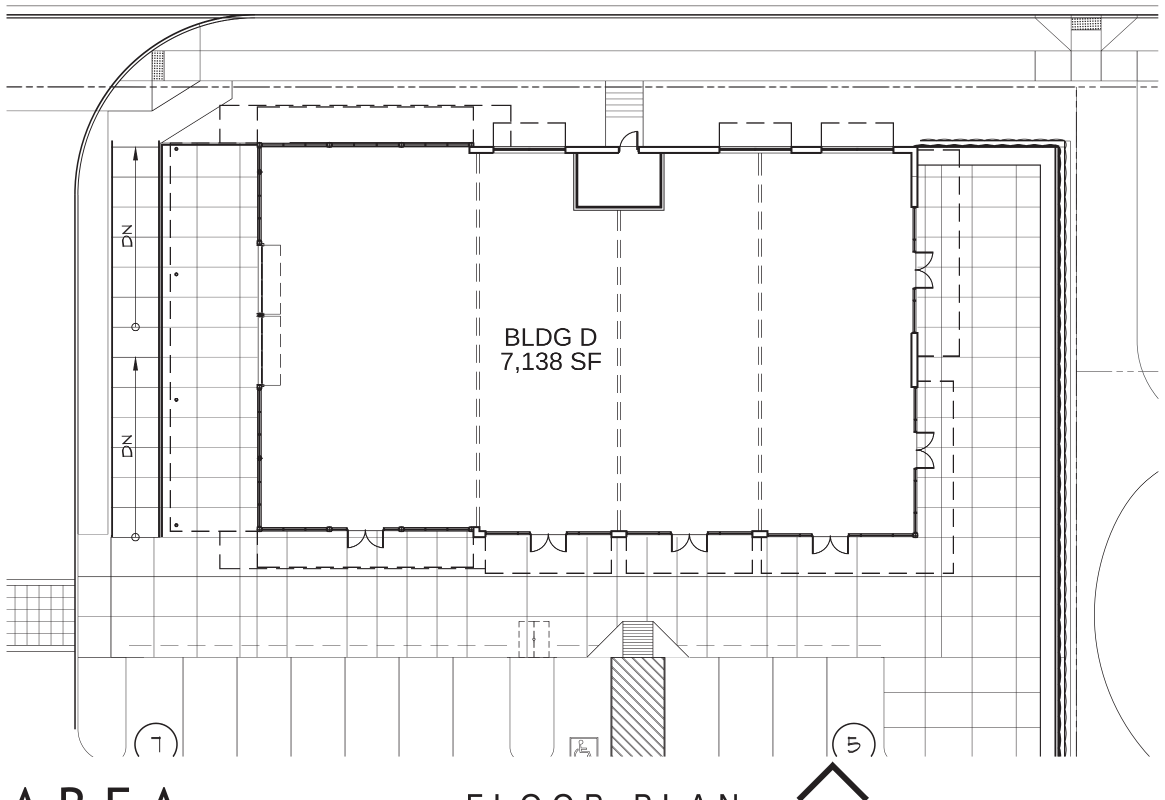
BUILDING AREA :

NORTH SIDE GROUND FLOOR AREA :	770	SQ. FT.	
GLAZING AREA :	485	SQ. FT.	(63.0%)
NORTH SIDE BUILDING LENGTH :	110	LF	
GLAZING LENGTH :	69.3	LF	(63.0%)

THE GROUND FLOOR FACADE IS CONSIDERED AS THE AREA BETWEEN 3-FEET AND 10-FEET ABOVE THE FINISHED FLOOR.



EAST ELEVATION
1/8" = 1'-0"



FLOOR PLAN
1/16" = 1'-0"

NORTH

BUILDING D
FLOOR PLAN AND ELEVATIONS
GROUND FLOOR STREET FACADE GLAZING AREA

TILAND / SCHMIDT
ARCHITECTS, P.C.
16101 SW 72ND AVE.
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PORTLAND, OR 97224
(503) 220-8517
FAX (503) 220-8518

CRESTVIEW CROSSING COMMERCIAL
HIGHWAY 99W & N CRESTVIEW DRIVE
NEWBERG, OREGON
GRAMOR NEWBERG CRESTVIEW LLC

EXHIBIT 'C'

PROJECT NO.
20136

DATE :
11-25-2020

DRAWN BY :
AJH

CHECKED BY :
FMS

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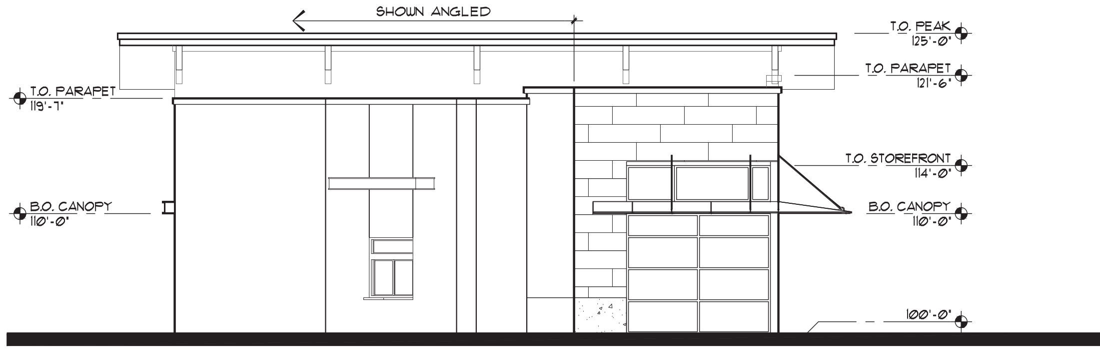
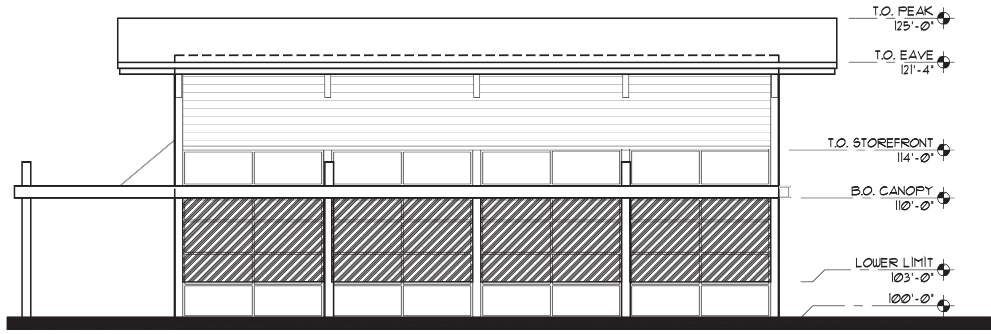
20136 Bldg D Plan Elevations - Exhibits

D
C



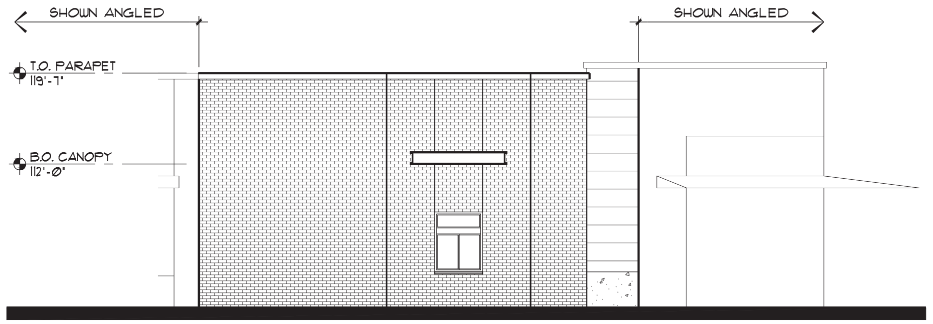
NORTH ELEVATION
1/8" = 1'-0"

WEST ELEVATION
1/8" = 1'-0"



SOUTH ELEVATION
1/8" = 1'-0"

EAST ELEVATION
1/8" = 1'-0"

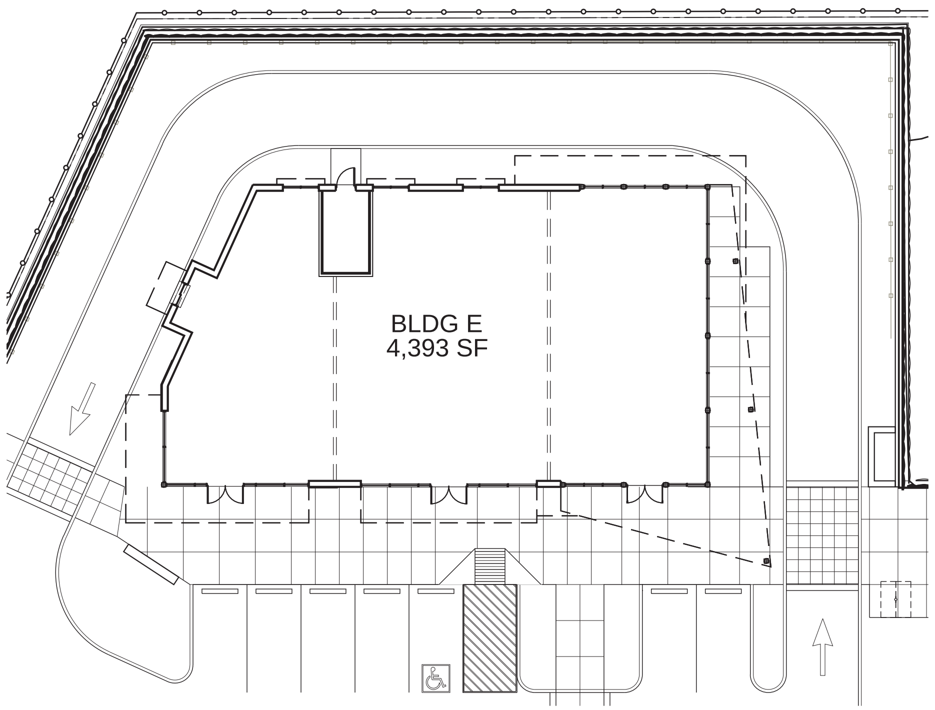


NORTH-EAST ELEVATION
1/8" = 1'-0"

BUILDING AREA :

SOUTH SIDE GROUND FLOOR AREA :	352.3	SQ. FT.	
GLAZING AREA :	329	SQ. FT.	(93.4%)
SOUTH SIDE BUILDING LENGTH :	50.3	LF	
GLAZING LENGTH :	47.0	LF	(93.4%)

THE GROUND FLOOR FACADE IS CONSIDERED AS THE AREA BETWEEN 3-FEET AND 10-FEET ABOVE THE FINISHED FLOOR.



FLOOR PLAN
1/16" = 1'-0"
NORTH

BUILDING E
FLOOR PLAN AND ELEVATIONS
GROUND FLOOR STREET FACADE GLAZING AREA

TILAND / SCHMIDT
ARCHITECTS, P.C.
16101 SW 72ND AVE.
SUITE 135
PORTLAND, OR 97224
(503) 220-8517
FAX (503) 220-8518

CRESTVIEW CROSSING COMMERCIAL
HIGHWAY 99W & N CRESTVIEW DRIVE
NEWBERG, OREGON
GRAMOR NEWBERG CRESTVIEW LLC

EXHIBIT 'C'

PROJECT NO.
20136

DATE :
11-25-2020
DRAWN BY :
AJH
CHECKED BY :
FMS

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20136 Bldg E Plan Elevations - Exhibits

E
C

CRESTVIEW CROSSING
NEWBERG, OREGON
COLORS & MATERIALS

TILAND /
SCHMIDT
ARCHITECTS, P.C.
16101 SW 72ND AVE.
SUITE 135
PORTLAND, OR 97224
(503) 220-8517
FAX (503) 220-8518

BASE MATERIALS :

STONE & CONCRETE :

STONE VENEER -
MUTUAL MATERIALS
'BITTERROOT NATURAL
LEDGESTONE'

ALTERNATE STONE
VENEER SELECTION :

CHOCTAW DARK

ALTERNATE STONE
VENEER SELECTION :

GRANITE MOSAIC

CONCRETE -
BOARD FORMED
-OR-
PRECAST VENEER PANELS

ALTERNATE STONE
VENEER SELECTION :

LOON LAKE

ALTERNATE STONE
VENEER SELECTION :

SILVER SUNSET

CONCRETE MASONRY UNITS (CMU) & BRICK :

CONCRETE MASONRY UNITS (CMU) :

GROUND FACE -
'CASTLE WHITE'
AT TRASH ENCLOSURES

BRICK :

BRICK VENEER -
MUTUAL MATERIALS
TRADITIONAL IRON WASHED
'WINDSOR'

WALL MATERIALS :

NATURAL WOOD APPEARANCE
WITH EXPOSED MOUNTING -
PRODEMA PANELS
OKUME VENEER
'RUSTIK'

16MM THICK
1'-6" x 6'-0" NOMINAL
(457.2MM x 1828.8MM)

DISTRIBUTED BY :
'SPEC SYSTEMS'

SIDING -
WOOD GRAIN SURFACE / WPC
WALL CLADDING
MODEL No. W150S16A
RING PATTERN 1
'BROWN'

BY : 'G&T INDUSTRIAL'

STUCCO -
INTEGRAL COLOR TO MATCH
PPG-1077-3 'PERSUASION'

WOOD STRUCTURE -
LOW SHEEN, CLEAR STAIN /
SEALER

ROOFING :

FABRIC AWNING :
SUNBRELLA -
BLACK

SHED ROOF, CANOPIES, &
CAP FLASHING :
CUSTOM BILT METALS
'WEATHERED COPPER'

GLASS CANOPIES :
SHERWIN WILLIAMS
SW #6234
'UNCERTAIN GRAY'

STOREFRONT :
DARK BRONZE

EXPOSED STEEL :
MATCH STOREFRONT

NOTE :
COLORS SHOWN ON MATERIAL
BOARDS WILL DIFFER FROM THOSE
SUPPLIED BY MANUFACTURER

TILAND /
SCHMIDT
ARCHITECTS, P.C.
16101 SW 72ND AVE.
SUITE 135
PORTLAND, OR 97224
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FAX (503) 220-8518

CRESTVIEW CROSSING COMMERCIAL
HIGHWAY 99W & N CRESTVIEW DRIVE
NEWBERG, OREGON
GRAMOR NEWBERG CRESTVIEW LLC

PROJECT NO.
20136

DATE :
11-25-2020
DRAWN BY :
REG
CHECKED BY :
FMS

REVISIONS

20136 Material Boards

MB
1

Exhibit B: Application Form and Checklist

Exhibit B: Application Form and Checklist

TYPE II APPLICATION (LAND USE) -- 2020

File #: ______________________

TYPES – PLEASE CHECK ONE:

☑ **Design review**
☐ **Tentative Plan for Partition**
☐ **Tentative Plan for Subdivision**
☐ **Type II Major Modification**
☐ **Variance** ______________________
☐ **Other: (Explain)** ______________________

APPLICANT INFORMATION:

APPLICANT: Gramor Newberg Crestview, LLC
ADDRESS: 19767 SW 72nd Avenue, Suite 100, Tualatin, OR 97062
EMAIL ADDRESS: Contact Applicant's Consultant
PHONE: Contact Applicant's Consultant MOBILE: Contact Applicant's Consultant FAX: Contact Applicant's Consultant
OWNER (if different from above): Newberg Crestview LLC PHONE: Contact Applicant's Consultant
ADDRESS: 5285 Meadows Road, Suite 171, Lake Oswego, OR 97035
ENGINEER/SURVEYOR: /APPLICANT'S CONSULTANT: AKS Engineering & Forestry, LLC PHONE: 503-563-6151 (Chris Goodell)
ADDRESS: 12965 SW Herman Road, Suite 100, Tualatin OR 97062

GENERAL INFORMATION:

PROJECT NAME: Crestview Crossing Commercial PROJECT LOCATION: 4505 East Portland Road (Hwy 99W)
PROJECT VALUATION: ±$4,100,000
PROJECT DESCRIPTION/USE: Retail Commercial Center
MAP/TAX LOT NO. (i.e.3200AB-400): 3216-01100 and 3216AC-13800 ZONE: C-2 SITE SIZE: ±4.2 SQ. FT. ☐ ACRE ☑
COMP PLAN DESIGNATION: Commercial TOPOGRAPHY: Please see Preliminary Plans
CURRENT USE: Vacant developed lot in Crestview Crossing PUD
SURROUNDING USES:
NORTH: Residential County Subdivision SOUTH: Providence Hospital
EAST: Rural Residential WEST: Residential Subdivision

SPECIFIC PROJECT CRITERIA AND REQUIREMENTS ARE ATTACHED

General Checklist: ☑ Fees ☑ Public Notice Information ☑ Current Title Report ☑ Written Criteria Response ☑ Owner Signature

For detailed checklists, applicable criteria for the written criteria response, and number of copies per application type, turn to:

Design Review .... **p. 12**
Partition Tentative Plat .... **p. 14**
Subdivision Tentative Plat .... **p. 17**
Variance Checklist .... **p. 20**

The above statements and information herein contained are in all respects true, complete, and correct to the best of my knowledge and belief. Tentative plans must substantially conform to all standards, regulations, and procedures officially adopted by the City of Newberg. All owners must sign the application or submit letters of consent. Incomplete or missing information may delay the approval process.

10-30-20
Applicant Signature Date

Ryan Cain
Print Name

10-27-2020
Owner Signature Date

Jeff Smith, Newberg Crestview, LLC
Print Name

Attachments: General Information, Fee Schedule, Criteria, Checklists

DESIGN REVIEW CHECKLIST

The following items must be submitted with each application. Incomplete applications will not be processed. Incomplete or missing information may delay the review process. Check with the Planning Division regarding additional requirements for your project.

☑ **FEES**

☑ **PUBLIC NOTICE INFORMATION** – Draft of mailer notice and sign; mailing list of all properties within 500'.

☑ **CURRENT TITLE REPORT** (within 60 days old)

☑ **SUBMIT one original and three copies 8-1/2″ x 11″ or 11″ x 17″ reproducible document together with 20 copies of the following information. In addition, submit two (2) full size copies of all plans.**

☑ **WRITTEN CRITERIA RESPONSE** – Address the criteria listed on page 12.

☑ **SITE DEVELOPMENT PLAN**. Make sure the plans are prepared so that they are at least 8 ½ x 11 inches in size and the scale is standard, being 10, 20, 30, 40, 50, 100 or multiples of 100 to the inch (such as 1":10', 1":20' or other multiples of 10). Include the following information in the plan set (information may be shown on multiple pages):

- ☑ Existing Site Features: Show existing landscaping, grades, slopes, wetlands and structures on the site and for areas within 100' of the site. Indicate items to be preserved and removed.
- ☑ Drainage & Grading: Show the direction and location of on and off-site drainage on the plans. This shall include site drainage, parking lot drainage, size and location of storm drain lines, and any retention or detention facilities necessary for the project. Provide an engineered grading plan if necessary. A preliminary storm water report is required (see Public works Design and Construction standards).
- ☑ Utilities: Show the location of and access to all public and private utilities, including sewer, water, storm water and any overhead utilities.
- ☑ Public Improvements: Indicate any public improvements that will be constructed as part of the project, including sidewalks, roadways, and utilities.
- ☑ Access, Parking, and Circulation: Show proposed vehicular and pedestrian circulation, parking spaces, parking aisles, and the location and number of access points from adjacent streets. Provide dimensions for parking aisles, back-up areas, and other items as appropriate. Indicate where required bicycle parking will be provided on the site along with the dimensions of the parking spaces.
- ☑ Site Features: Indicate the location and design of all on-site buildings and other facilities such as mail delivery, trash disposal, above ground utilities, loading areas, and outdoor recreation areas. Include appropriate buffering and screening as required by the code.
- ☑ Exterior Lighting Plan: Show all exterior lighting, including the direction of the lighting, size and type of fixtures, and an indication of the amount of lighting using foot candles for analysis.
- ☑ Landscape Plan: Include a comprehensive plan that indicates the size, species and locations of all planned landscaping for the site. The landscape plan should have a legend that indicates the common and botanical names of plants, quantity and spacing, size (caliper, height, or container size), planned landscaping materials, and description of the irrigation system. Include a calculation of the percentage of landscaped area.
- ☑ ADA Plan Compliance: Indicate compliance with any applicable ADA provisions, including the location of accessible parking spaces, accessible routes from the entrance to the public way, and ramps for wheelchairs.
- ☑ Architectural Drawings: Provide floor plans and elevations for all planned structures.
- N/A ☐ Signs and Graphics: Show the location, size, colors, materials, and lighting of all exterior signs, graphics or other informational or directional features if applicable.
- ☐ Other: Show any other site elements which will assist in the evaluation of the site and the project.

☑ **TRAFFIC STUDY**

A traffic study shall be submitted for any project that generates in excess of forty (40) trips per p.m. peak hour. This requirement may be waived by the Director when a determination is made that a previous traffic study adequately addresses the proposal and/or when off-site and frontage improvements have already been completed which adequately mitigate any traffic impacts and/or the proposed use is not in a location which is adjacent to an intersection which is functioning at a poor level of service. A traffic study may be required by the

Director for projects below forty (40) trips per p.m. peak hour where the use is located immediately adjacent to an intersection functioning at a poor level of service.

Exhibit C: Property Ownership Information

First American Title Insurance Company

775 NE Evans Street
McMinnville, OR 97128
Phn - (503)376-7363
Fax - (866)800-7294

Order No.: 7000-3183351
October 28, 2020

FOR QUESTIONS REGARDING YOUR CLOSING, PLEASE CONTACT:
JOYCE JAMESON, Escrow Officer/Closer
Phone: (503)350-5005 - Fax: (866)656-1602 - Email:jjameson@firstam.com
First American Title Insurance Company
5335 SW Meadows Road, Suite 100, Lake Oswego, OR 97035

FOR ALL QUESTIONS REGARDING THIS PRELIMINARY REPORT, PLEASE CONTACT:
Larry Ball, Title Officer
Phone: (503)376-7363 - Fax: (866)800-7294 - Email: lball@firstam.com

2nd Supplemental Preliminary Title Report

County Tax Roll Situs Address: Approx. 4.2 ac, NE Corner of Providence Dr, and Highway 99, Newberg, OR

2006 ALTA Owners Standard Coverage	Liability $	4,024,944.00	Premium $	4,314.00	**BLDR**
2006 ALTA Owners Extended Coverage	Liability $		Premium $		
2006 ALTA Lenders Standard Coverage	Liability $		Premium $		
2006 ALTA Lenders Extended Coverage	Liability $		Premium $		
Endorsement			Premium $		
Govt Service Charge			Cost $	40.00	
Other			Cost $		

We are prepared to issue Title Insurance Policy or Policies of First American Title Insurance Company, a Nebraska Corporation in the form and amount shown above, insuring title to the following described land:

The land referred to in this report is described in Exhibit A attached hereto.

and as of October 26, 2020 at 8:00 a.m., title to the fee simple estate is vested in:

Newberg Crestview LLC, an Oregon limited liability company

Subject to the exceptions, exclusions, and stipulations which are ordinarily part of such Policy form and the following:

1. Taxes or assessments which are not shown as existing liens by the records of any taxing authority that levies taxes or assessments on real property or by the public records; proceedings by a public agency which may result in taxes or assessments, or notices of such proceedings, whether or not shown by the records of such agency or by the public records.

2. Facts, rights, interests or claims which are not shown by the public records but which could be ascertained by an inspection of the land or by making inquiry of persons in possession thereof.

3. Easements, or claims of easement, not shown by the public records; reservations or exceptions in patents or in Acts authorizing the issuance thereof; water rights, claims or title to water.

4. Any encroachment (of existing improvements located on the subject land onto adjoining land or of existing improvements located on adjoining land onto the subject land), encumbrance, violation, variation, or adverse circumstance affecting the title that would be disclosed by an accurate and complete land survey of the subject land.

5. Any lien, or right to a lien, for services, labor, material, equipment rental or workers compensation heretofore or hereafter furnished, imposed by law and not shown by the public records.

The exceptions to coverage 1-5 inclusive as set forth above will remain on any subsequently issued Standard Coverage Title Insurance Policy.

In order to remove these exceptions to coverage in the issuance of an Extended Coverage Policy the following items are required to be furnished to the Company; additional exceptions to coverage may be added upon review of such information:

A. Survey or alternative acceptable to the company
B. Affidavit regarding possession
C. Proof that there is no new construction or remodeling of any improvement located on the premises. In the event of new construction or remodeling the following is required:
    i. Satisfactory evidence that no construction liens will be filed; or
    ii. Adequate security to protect against actual or potential construction liens;
    iii. Payment of additional premiums as required by the Industry Rate Filing approved by the Insurance Division of the State of Oregon

6. Water rights, claims to water or title to water, whether or not such rights are a matter of public record.

7. Taxes for the year 2020-2021

Tax Amount	$ 2,097.24
Unpaid Balance:	$ 2,097.24, plus interest and penalties, if any
Code No.:	29.0
Map & Tax Lot No.:	R3216AC-13800
Property ID No.:	30479

(PARCEL 1)

8. Taxes for the year 2020-2021

Tax Amount	$ 26,048.81
Unpaid Balance:	$ 26,048.81, plus interest and penalties, if any.
Code No.:	29.0
Map & Tax Lot No.:	R3216-01100
Property ID No.:	29098

(PARCEL 2)

9. City liens, if any, of the City of Newberg.

Note: There are no liens as of January 30, 2019. All outstanding utility and user fees are not liens and therefore are excluded from coverage.

10. The rights of the public in and to that portion of the premises herein described lying within the limits of streets, roads and highways.

11. Easement, including terms and provisions contained therein:
Recording Information: December 14, 1937 in Book 113, Page 457, Deed Records
In Favor of: Pacific Telephone & Telegraph Co.
For: the right to place, construct operate and maintain, inspect, reconstruct, repair, replace and keep clear one anchor to be placed not more than 6 feet in on property with wires, cables, fixtures and appurtenances attached thereto
(PARCEL 2)

12. Restrictive Covenant to Waive Remonstrance, pertaining to including the terms and provisions thereof
Recorded: January 31, 2007 as Instrument No. 200702374, Deed and Mortgage Records
(PARCEL 2)

13. Restrictive Covenant to Waive Remonstrance, pertaining to including the terms and provisions thereof
Recorded: January 31, 2007 as Instrument No. 200702375, Deed and Mortgage Records
(PARCEL 2)

14. Effect, if any, of Public Improvement Agreement and the terms and conditions thereof:
Between: JT Smith Companies, an Oregon corporation
And: City of Newberg, Oregon, a municipal corporation
Recording Information: May 14, 2008 as Instrument No. 200808299, Deed and Mortgage Records

(PARCEL 1)

15. Restrictive Covenant to Waive Remonstrance, pertaining to including the terms and provisions thereof
Recorded: June 13, 2008 as Instrument No. 200810248, Deed and Mortgage Records
(Parcel 2)

16. Easement, including terms and provisions contained therein:
Recording Information: September 25, 2008 as Instrument No. 200816260, Deed and Mortgage Records
For: Temporary Construction and Slope

17. Easement, including terms and provisions contained therein:
Recording Information: April 04, 2011 as Instrument No. 201104481, Deed and Mortgage Records
In Favor of: City of Newberg, a municipal corporation
For: Public utilities
(PARCEL 1)

18. Line of Credit Trust Deed, including the terms and provisions thereof, given to secure an indebtedness of up to $3,500,000.00

Grantor:	Newberg Crestview, LLC, an Oregon limited liability company
Beneficiary:	Community Financial Corporation, an Oregon corporation
Trustee:	First American Title Insurance Company
Dated:	September 21, 2018
Recorded:	September 27, 2018
Recording Information:	Instrument No. 201813897, Deed and Mortgage Records

Modification and/or amendment by instrument:
Recording Information: July 9, 2020 as Instrument No. 202011414, Deed and Mortgage Records

19. Unrecorded leases or periodic tenancies, if any.

20. Any conveyance or encumbrance by Newberg Crestview LLC should be executed pursuant to their Operating Agreement , a copy of which should be submitted to this office for inspection.

21. A legal description was not included in the application for Title Insurance. The legal description contained herein was taken from the record and the presumed intention of the parties to the transaction. Said description must be examined and approved by all parties prior to closing.

22. This Preliminary Report for title insurance, due to the nature of the transaction, is subject to amendment or modification by the Regional Underwriter for First American Title Company of Oregon. No final policy of title insurance will be issued until authorization is received. Any directed changes or additions will be disclosed by a Supplemental Report.

- END OF EXCEPTIONS -

NOTE: This report has been supplented to update tax information and title plant effective date, and to add recorded Trust Deed Modification.

NOTE: According to the public record, the following deed(s) affecting the property herein described have been recorded within 24 months of the effective date of this report: Bargain and Sale Deed recorded September 27, 2018 as Instrument No. 201813896, Deed and Mortgage Records, VPCF Crestview, LLC, an Oregon limited liability company to Newberg Crestview LLC, an Oregon limited liability company (PARCEL1), and Warranty Deed recorded September 27, 2018 as Instrument No. 201813898, Deed and Mortgage Records, GC Commercial, LLC, an Oregon limited liability company to Newberg Crestview LLC, an Oregon limited liability company (PARCEL 2).

NOTE: We find no matters of public record against Gramor Newberg Crestview LLC that will take priority over any trust deed, mortgage or other security instrument given to purchase the subject real property as established by ORS 18.165.

Situs Address as disclosed on Yamhill County Tax Roll:

NE Corner of Providence Dr, and Highway 99, Newberg, OR

THANK YOU FOR CHOOSING FIRST AMERICAN TITLE!
WE KNOW YOU HAVE A CHOICE!

RECORDING INFORMATION

Filing Address:	**Yamhill County** 777 Commercial Street SE, Suite 100 Salem, OR 97301
Recording Fees:	$ **81.00** for the first page $ **5.00** for each additional page

cc: Gramor Newberg Crestview LLC
cc: Vergepointe Capital, LLC
cc: Washington Federal
PO BOX 5210, Klamath Falls, OR 97601
cc: Bateman Seidel
888 SW 5th AVE STE 1250, Portland, OR 97204
cc: Lane Powell PC
601 SW 2nd Avenue, Suite 2100, Portland, OR 97204

SCHEDULE OF EXCLUSIONS FROM COVERAGE

ALTA LOAN POLICY (06/17/06)

The following matters are expressly excluded from the coverage of this policy, and the Company will not pay loss or damage, costs, attorneys' fees, or expenses that arise by reason of:

1. (a) Any law, ordinance, permit, or governmental regulation (including those relating to building and zoning) restricting, regulating, prohibiting, or relating to
   (i) the occupancy, use, or enjoyment of the Land;
   (ii) the character, dimensions, or location of any improvement erected on the Land;
   (iii) the subdivision of land; or
   (iv) environmental protection;
   or the effect of any violation of these laws, ordinances, or governmental regulations. This Exclusion 1(a) does not modify or limit the coverage provided under Covered Risk 5.
   (b) Any governmental police power. This Exclusion 1(b) does not modify or limit the coverage provided under Covered Risk 6.
2. Rights of eminent domain. This Exclusion does not modify or limit the coverage provided under Covered Risk 7 or 8.
3. Defects, liens, encumbrances, adverse claims, or other matters
   (a) created, suffered, assumed, or agreed to by the Insured Claimant;
   (b) not Known to the Company, not recorded in the Public Records at Date of Policy, but Known to the Insured Claimant and not disclosed in writing to the Company by the Insured Claimant prior to the date the Insured Claimant became an Insured under this policy;
   (c) resulting in no loss or damage to the Insured Claimant;
   (d) attaching or created subsequent to Date of Policy (however, this does not modify or limit the coverage provided under Covered Risk 11, 13, or 14); or
   (e) resulting in loss or damage that would not have been sustained if the Insured Claimant had paid value for the Insured Mortgage.
4. Unenforceability of the lien of the Insured Mortgage because of the inability or failure of an Insured to comply with applicable doing-business laws of the state where the Land is situated.
5. Invalidity or unenforceability in whole or in part of the lien of the Insured Mortgage that arises out of the transaction evidenced by the Insured Mortgage and is based upon usury or any consumer credit protection or truth-in-lending law.
6. Any claim, by reason of the operation of federal bankruptcy, state insolvency, or similar creditors' rights laws, that the transaction creating the lien of the Insured Mortgage, is
   (a) a fraudulent conveyance or fraudulent transfer, or
   (b) a preferential transfer for any reason not stated in Covered Risk 13(b) of this policy.
7. Any lien on the Title for real estate taxes or assessments imposed by governmental authority and created or attaching between Date of Policy and the date of recording of the Insured Mortgage in the Public Records. This Exclusion does not modify or limit the coverage provided under Covered Risk 11(b).

ALTA OWNER'S POLICY (06/17/06)

The following matters are expressly excluded from the coverage of this policy, and the Company will not pay loss or damage, costs, attorneys' fees, or expenses that arise by reason of:

1. (a) Any law, ordinance, permit, or governmental regulation (including those relating to building and zoning) restricting, regulating, prohibiting, or relating to
   (i) the occupancy, use, or enjoyment of the Land;
   (ii) the character, dimensions, or location of any improvement erected on the Land;
   (iii) the subdivision of land; or
   (iv) environmental protection;
   or the effect of any violation of these laws, ordinances, or governmental regulations. This Exclusion 1(a) does not modify or limit the coverage provided under Covered Risk 5.
   (b) Any governmental police power. This Exclusion 1(b) does not modify or limit the coverage provided under Covered Risk 6.
2. Rights of eminent domain. This Exclusion does not modify or limit the coverage provided under Covered Risk 7 or 8.
3. Defects, liens, encumbrances, adverse claims, or other matters
   (a) created, suffered, assumed, or agreed to by the Insured Claimant;
   (b) not Known to the Company, not recorded in the Public Records at Date of Policy, but Known to the Insured Claimant and not disclosed in writing to the Company by the Insured Claimant prior to the date the Insured Claimant became an Insured under this policy;
   (c) resulting in no loss or damage to the Insured Claimant;
   (d) attaching or created subsequent to Date of Policy (however, this does not modify or limit the coverage provided under Covered Risks 9 and 10); or
   (e) resulting in loss or damage that would not have been sustained if the Insured Claimant had paid value for the Title.
4. Any claim, by reason of the operation of federal bankruptcy, state insolvency, or similar creditors' rights laws, that the transaction vesting the Title as shown in Schedule A, is
   (a) a fraudulent conveyance or fraudulent transfer; or
   (b) a preferential transfer for any reason not stated in Covered Risk 9 of this policy.
5. Any lien on the Title for real estate taxes or assessments imposed by governmental authority and created or attaching between Date of Policy and the date of recording of the deed or other instrument of transfer in the Public Records that vests Title as shown in Schedule A.

SCHEDULE OF STANDARD EXCEPTIONS

1. Taxes or assessments which are not shown as existing liens by the records of any taxing authority that levies taxes or assessments on real property or by the public records; proceedings by a public agency which may result in taxes or assessments, or notices of such proceedings, whether or not shown by the records of such agency or by the public records.
2. Facts, rights, interests or claims which are not shown by the public records but which could be ascertained by an inspection of the land or by making inquiry of persons in possession thereof.
3. Easements, or claims of easement, not shown by the public records; reservations or exceptions in patents or in Acts authorizing the issuance thereof; water rights, claims or title to water.
4. Any encroachment (of existing improvements located on the subject land onto adjoining land or of existing improvements located on adjoining land onto the subject land), encumbrance, violation, variation, or adverse circumstance affecting the title that would be disclosed by an accurate and complete land survey of the subject land.
5. Any lien" or right to a lien, for services, labor, material, equipment rental or workers compensation heretofore or hereafter furnished, imposed by law and not shown by the public records.

NOTE: A SPECIMEN COPY OF THE POLICY FORM (OR FORMS) WILL BE FURNISHED UPON REQUEST

TI 149 Rev. 7-22-08

First American Title

Privacy Information

We Are Committed to Safeguarding Customer Information

In order to better serve your needs now and in the future, we may ask you to provide us with certain information. We understand that you may be concerned about what we will do with such information - particularly any personal or financial information. We agree that you have a right to know how we will utilize the personal information you provide to us. Therefore, together with our subsidiaries we have adopted this Privacy Policy to govern the use and handling of your personal information.

Applicability

This Privacy Policy governs our use of the information that you provide to us. It does not govern the manner in which we may use information we have obtained from any other source, such as information obtained from a public record or from another person or entity. First American has also adopted broader guidelines that govern our use of personal information regardless of its source. First American calls these guidelines its Fair Information Values.

Types of Information

Depending upon which of our services you are utilizing, the types of nonpublic personal information that we may collect include:

- Information we receive from you on applications, forms and in other communications to us, whether in writing, in person, by telephone or any other means;
- Information about your transactions with us, our affiliated companies, or others; and
- Information we receive from a consumer reporting agency.

Use of Information

We request information from you for our own legitimate business purposes and not for the benefit of any nonaffiliated party. Therefore, we will not release your information to nonaffiliated parties except: (1) as necessary for us to provide the product or service you have requested of us; or (2) as permitted by law. We may, however, store such information indefinitely, including the period after which any customer relationship has ceased. Such information may be used for any internal purpose, such as quality control efforts or customer analysis. We may also provide all of the types of nonpublic personal information listed above to one or more of our affiliated companies. Such affiliated companies include financial service providers, such as title insurers, property and casualty insurers, and trust and investment advisory companies, or companies involved in real estate services, such as appraisal companies, home warranty companies and escrow companies. Furthermore, we may also provide all the information we collect, as described above, to companies that perform marketing services on our behalf, on behalf of our affiliated companies or to other financial institutions with whom we or our affiliated companies have joint marketing agreements.

Former Customers

Even if you are no longer our customer, our Privacy Policy will continue to apply to you.

Confidentiality and Security

We will use our best efforts to ensure that no unauthorized parties have access to any of your information. We restrict access to nonpublic personal information about you to those individuals and entities who need to know that information to provide products or services to you. We will use our best efforts to train and oversee our employees and agents to ensure that your information will be handled responsibly and in accordance with this Privacy Policy and First American's Fair Information Values. We currently maintain physical, electronic, and procedural safeguards that comply with federal regulations to guard your nonpublic personal information.

Information Obtained Through Our Web Site

First American Financial Corporation is sensitive to privacy issues on the Internet. We believe it is important you know how we treat the information about you we receive on the Internet.

In general, you can visit First American or its affiliates' Web sites on the World Wide Web without telling us who you are or revealing any information about yourself. Our Web servers collect the domain names, not the e-mail addresses, of visitors. This information is aggregated to measure the number of visits, average time spent on the site, pages viewed and similar information. First American uses this information to measure the use of our site and to develop ideas to improve the content of our site.

There are times, however, when we may need information from you, such as your name and email address. When information is needed, we will use our best efforts to let you know at the time of collection how we will use the personal information. Usually, the personal information we collect is used only by us to respond to your inquiry, process an order or allow you to access specific account/profile information. If you choose to share any personal information with us, we will only use it in accordance with the policies outlined above.

Business Relationships

First American Financial Corporation's site and its affiliates' sites may contain links to other Web sites. While we try to link only to sites that share our high standards and respect for privacy, we are not responsible for the content or the privacy practices employed by other sites.

Cookies

Some of First American's Web sites may make use of "cookie" technology to measure site activity and to customize information to your personal tastes. A cookie is an element of data that a Web site can send to your browser, which may then store the cookie on your hard drive.

FirstAm.com uses stored cookies. The goal of this technology is to better serve you when visiting our site, save you time when you are here and to provide you with a more meaningful and productive Web site experience.

Fair Information Values

Fairness We consider consumer expectations about their privacy in all our businesses. We only offer products and services that assure a favorable balance between consumer benefits and consumer privacy.

Public Record We believe that an open public record creates significant value for society, enhances consumer choice and creates consumer opportunity. We actively support an open public record and emphasize its importance and contribution to our economy.

Use We believe we should behave responsibly when we use information about a consumer in our business. We will obey the laws governing the collection, use and dissemination of data.

Accuracy We will take reasonable steps to help assure the accuracy of the data we collect, use and disseminate. Where possible, we will take reasonable steps to correct inaccurate information. When, as with the public record, we cannot correct inaccurate information, we will take all reasonable steps to assist consumers in identifying the source of the erroneous data so that the consumer can secure the required corrections.

Education We endeavor to educate the users of our products and services, our employees and others in our industry about the importance of consumer privacy. We will instruct our employees on our fair information values and on the responsible collection and use of data. We will encourage others in our industry to collect and use information in a responsible manner.

Security We will maintain appropriate facilities and systems to protect against unauthorized access to and corruption of the data we maintain.

Form 50-PRIVACY (9/1/10) Page 1 of 1 Privacy Information (2001-2010 First American Financial Corporation)

EXHIBIT A
LEGAL DESCRIPTION

PARCEL 1:

A tract of land in Section 16, Township 3 South, Range 2 West of the Willamette Meridian in Yamhill County, Oregon, described as follows:

Being a part of the Sebastian Brutscher Donation Land Claim No. 51, Notification No. 1470 in Township 3 South, Range 2 West of the Willamette Meridian in said County and State, and beginning at an iron pipe set on the North line of said Claim, and 162.00 feet South 89º57' East from a stone at the Southwest corner of the Benjamin Heater Donation Land Claim; thence South 89º57' East along the North line of said Brutscher Claim, 515.8 feet to an iron pipe; thence South 1168.5 feet to the center of the West side of Pacific Highway; thence South 65°30' West along the center of said Highway 568.2 feet to the Southwest corner of Lot 1 of County Survey #2795; thence North 00º03' East 1404.6 feet to the place of beginning.

SAVE AND EXCEPTING THEREFROM that portion conveyed to the State of Oregon by and through its State Highway Commission, recorded April 8, 1935 in Book 110, Page 220, Yamhill County Deed Records.

ALSO SAVE AND EXCEPTING THEREFROM that portion conveyed to the State of Oregon by and through its Department of Transportation, recorded January 17, 2020 as Instrument No. 202000916, Deed and Mortgage Records.

PARCEL 2:

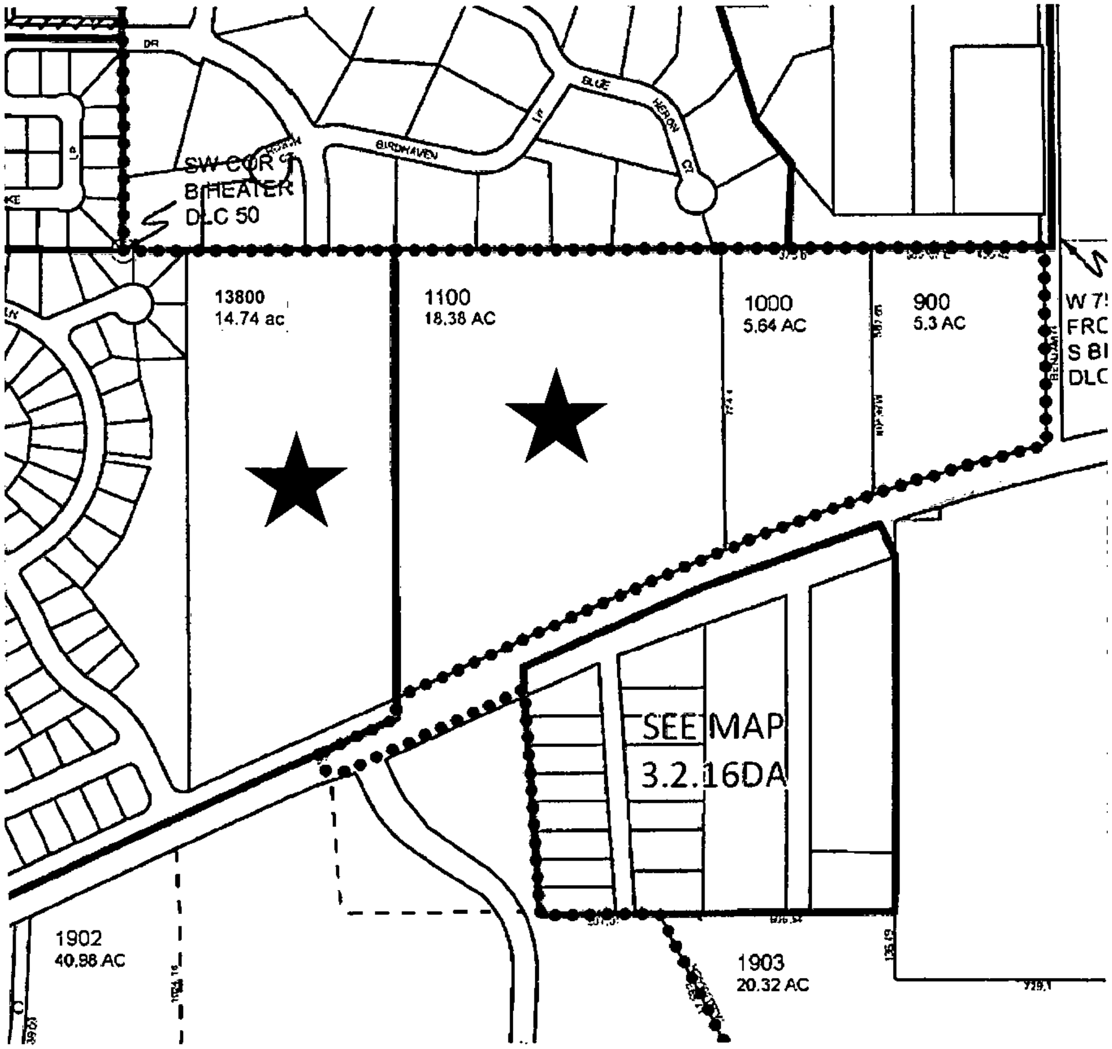
Situate, lying and being in the County of Yamhill and State of Oregon, and being a part of the Sebastian Brutscher Donation Land Claim, No. 1470, Claim No. 51 in Township 3 South, Range 2 West of the Willamette Meridian, Yamhill County, Oregon and beginning at an iron pipe at the Northeast corner of Lot No. 1 in County Survey No. 2795 being on the South line of the Heater and on the North line of said Brutscher Claim at a point South 89º57' East, 677.8 feet from a stone at the Southwest corner of the Benjamin Heater Donation Land Claim; thence South 89º57' East along the line between the said Brutshcer and Heater Claims, 863.2 feet to an iron pipe at the Northeast corner of Lot No. 2 of said Survey No. 2795, said iron pipe being also at the Northwest corner of Lot 4A, of said County Survey No. 2795; thence South 774.4 feet to the center of the West Side Pacific Highway; thence South 65º30' West along the center of said Highway, 948.6 feet to the Southeast corner of said Lot No. 1; thence North 1,168.5 feet to the place of beginning.

EXCEPTING that portion lying within the boundaries of the West Side Pacific Highway.

SAVE AND EXCEPTING THEREFROM that portion conveyed to the State of Oregon by and through its Department of Transportation, recorded January 17, 2020 as Instrument No. 202000916, Deed and Mortgage Records.

First American

This map is furnished for illustration and to assist in property location. The company assumes no ability for any variation in dimensions by location ascertainable by actual survey

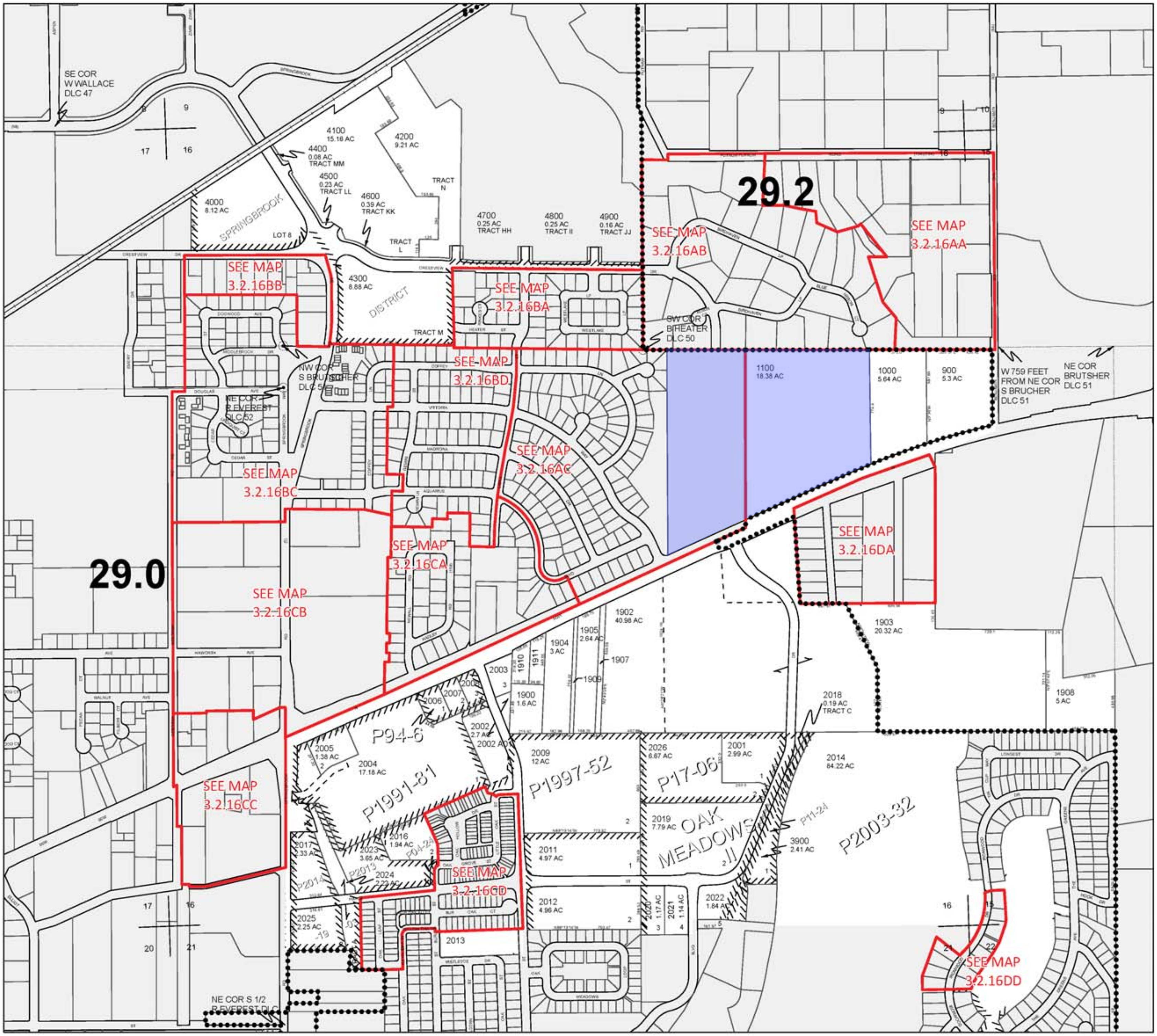


3 2 16

Exhibit D: Yamhill County Tax Assessor's Maps

ASSESSMENT & TAX
CARTOGRAPHY

SECTION 16 T.3S. R.2W. W.M.
YAMHILL COUNTY OREGON
1" = 400'



CANCELLED TAXLOTS:
2009 A01
3800
3701
3700
3602
3601
3600
3500
3400
3300
3200
3100
3001
3000
2900
2807
2806
2805
2804
2803
2802
2801
2800
2701
2700
2600
2501
2500
2400
2300
2200
2100
2015
2010
1906
1901
1700
1600
1502
1501
1500
1300
800
600
500
400
300
200
105
104
103
102
101
100

DATE PRINTED: 3/7/2019

This product is for Assessment and Taxation (A&T) purposes only and has not been prepared or is suitable for legal, engineering, surveying or any purposes other than assessment and taxation.

THIS MAP WAS PREPARED FOR
ASSESSMENT PURPOSE ONLY

SW1/4 NE1/4 SEC 16 T3S R2W W.M.
YAMHILL COUNTY

3 2 16AC
NEWBERG

3 2 16AC

CANCELLED NO.
2600
2700
2800
2900
3000
3100
3200
3300
3400
3500
3600
3700
3800
3900
11501
11600

Exhibit E: Public Notice Information

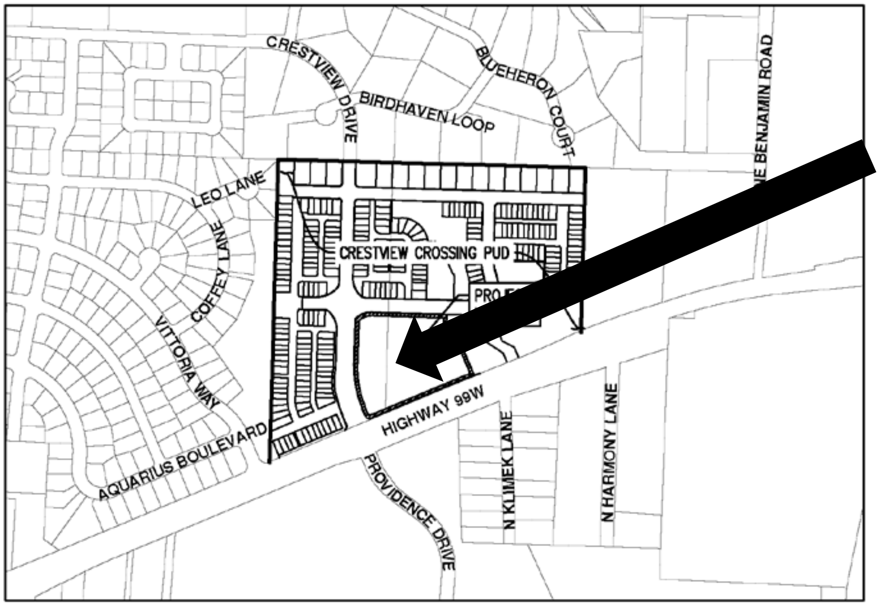
Community Development Department
P.O. Box 970 ▪ 414 E First Street ▪ Newberg, Oregon 97132
503-537-1240. Fax 503-537-1272 www.newbergoregon.gov

Notice of Site Design Review
For a Commercial Development

A property owner in your neighborhood has submitted an application to the City of Newberg for site design review of a five-building commercial development. You are invited to take part in the City's review of this project by sending in your written comments. For more details about giving comments, please see the back of this sheet.

The project involves the improvement of a ±4.2-acre site with approximately ±37,615 square feet of retail commercial buildings, parking, and landscaping areas. The site is a portion of the previously approved ±33-acre Crestview Crossing mixed-use Planned Unit Development. The public streets and infrastructure were reviewed and approved as part of the larger Crestview Crossing Planned Unit Development.

APPLICANT:	Gramor Newberg Crestview, LLC
APPLICANT'S CONSULTANT:	AKS Engineering & Forestry, LLC—Chris Goodell, AICP, LEED^{AP}
TELEPHONE:	(503) 563-6151
EMAIL:	ChrisG@aks-eng.com
PROPERTY OWNER:	Newberg Crestview, LLC
LOCATION:	4505 E Portland Road (Highway 99W)
TAX LOT NUMBER:	Yamhill County Assessor's Map 3216, Tax Lot 01100 and Map 3216AC, Tax Lot 13800



Project Site

VICINITY MAP
NTS

City of Newberg

Community Development Department
P.O. Box 970 ▪ 414 E First Street ▪ Newberg, Oregon 97132
503-537-1240. Fax 503-537-1272 www.newbergoregon.gov

We are mailing you information about this project because you own land within 500 feet of the planned project. We invite you to send any written comments for or against the project within 14 days from the date this notice is mailed. You also may request that the Newberg Planning Commission hold a hearing on the application by sending a written request during this 14-day period and identifying the issues you would like the Planning Commission to address.

If you mail your comments to the City, please put the following information on the outside of the envelope:

Written Comments: File No. DR_______
City of Newberg
Community Development
PO Box 970
Newberg, OR 97132

All written comments must be turned in by 4:30 p.m. on _____, 2020. Any issue which might be raised in an appeal of this case to the Land Use Board of Appeals (LUBA) must be submitted to the City in writing before this date. You must include enough detail to enable the decision maker an opportunity to respond. The applicable criteria used to make a decision on this application for design review approval are found in Newberg Development Code 15.220.050.

You can look over all the information about this project or drop comments off at Newberg City Hall, 414 E. First Street. You can also buy copies of the information for a cost of 25 cents a page. If you have any questions about the project, you can call the Newberg Planning Division at 503-537-1240. A copy of the application is posted at www.newbergoregon.gov/planning.

The Community Development Director will make a decision at the end of a 14-day comment period. If you send in written comments about this project, you will be sent information about any decision made by the City relating to this project.

Date Mailed: ______, 2020

First American

Date of Production: 10/28/2020

TERMS AND CONDITIONS OF INFORMATION REPORTS

IMPORTANT - READ CAREFULLY: AN INFORMATION REPORT IS **NOT** AN INSURED PRODUCT OR SERVICE OR A REPRESENTATION OF THE CONDITION OF TITLE TO REAL PROPERTY. IT IS NOT AN ABSTRACT, LEGAL OPINION, OPINION OF TITLE, TITLE INSURANCE COMMITMENT OR PRELIMINARY REPORT, OR ANY FORM OF TITLE INSURANCE OR GUARANTY. THE INFORMATION REPORT IS ISSUED EXCLUSIVELY FOR THE BENEFIT OF THE REQUESTOR, AND MAY NOT BE USED OR RELIED UPON BY ANY OTHER PERSON. THE INFORMATION REPORT MAY NOT BE REPRODUCED IN ANY MANNER WITHOUT FIRST AMERICAN TITLE'S PRIOR WRITTEN CONSENT. FIRST AMERICAN TITLE DOES NOT REPRESENT OR WARRANT THAT THE INFORMATION CONTAINED IN THE INFORMATION REPORT IS COMPLETE OR FREE FROM ERROR, AND THE INFORMATION THEREIN IS PROVIDED WITHOUT ANY WARRANTIES OF ANY KIND, AS-IS, AND WITH ALL FAULTS. AS A MATERIAL PART OF THE CONSIDERATION GIVEN IN EXCHANGE FOR THE ISSUANCE OF AN INFORMATION REPORT, REQUESTOR AGREES THAT FIRST AMERICAN TITLE'S SOLE LIABILITY FOR ANY LOSS OR DAMAGE CAUSED BY AN ERROR OR OMISSION DUE TO INACCURATE INFORMATION OR NEGLIGENCE IN PREPARING THE INFORMATION REPORT SHALL BE LIMITED TO THE GREATOR OF THE FEE CHARGED FOR THE INFORMATION REPORT OR $15. REQUESTOR ACCEPTS THE INFORMATION REPORT WITH THIS LIMITATION AND AGREES THAT FIRST AMERICAN TITLE WOULD NOT HAVE ISSUED THE INFORMATION REPORT BUT FOR THE LIMITATION OF LIABILITY DESCRIBED ABOVE. FIRST AMERICAN TITLE MAKES NO REPRESENTATION OR WARRANTY AS TO THE LEGALITY OR PROPRIETY OF REQUESTOR'S USE OF THE INFORMATION CONTAINED IN THE INFORMATION REPORT.

R3216DA 01400
Frank & Pat Dittman
Po Box 1116
Newberg, OR 97132

R3216AC 09900
Geoffrey Godfrey
3714 E Coffey Ln
Newberg, OR 97132

R3216AC 09700
Cody King & Kyra Mathews
3800 E Coffey Ln
Newberg, OR 97132

R3216AC 13500
Lee & Brandy Bigelow
3809 E Vittoria Way
Newberg, OR 97132

R3216BA 03104
Mark & Sara Sundquist
1947 N Westlake Loop
Newberg, OR 97132

R3216DA 00100
John & Marita Trunk
1306 NE Harmony Ln
Newberg, OR 97132

R3216AC 09500
Jeffrey Nunamaker & Megan Johnson
3806 E Coffey Ln
Newberg, OR 97132

R3216AB 01812
Bruce & Roberta Barnett
1102 N Springbrook Rd NO 268
Newberg, OR 97132

R3216AC 01800
Moser & Moser Mireles
4016 E Aquarius Blvd
Newberg, OR 97132

R3216AB 01813
Brian & Laila Abbe
4507 NE Blue Heron Ct
Newberg, OR 97132

R3215   00600
Jaime Lim
4900 Portland Rd
Newberg, OR 97132

R3216AC 09800
Laura Wellons
9369 SW Umiat St
Tualatin, OR 97062

R3216AC 12400
Richard & Joan Dalton
3801 E Coffey Ln
Newberg, OR 97132

R3216AC 13600
Robert & Geraldine Lefebvre
3811 E Vittoria Way
Newberg, OR 97132

R3216BA 03107
Peter Hansen
1939 N Westlake Loop
Newberg, OR 97132

R3216AC 12000
Ronny & Maethorne Bernier
1811 E Leo Ln
Newberg, OR 97132

R3216AC 08400
Corey Selfridge & Anthony Duvall
1713 N Meadow Ln
Newberg, OR 97132

R3216AC 13300
Sonya & Benjamin Howard
3803 E Vittoria Way
Newberg, OR 97132

R3216AC 01100
Sarae & Casey Kasai
3805 E Madrona Dr
Newberg, OR 97132

R3216AB 01200
Daniel & Darlene Gile
4505 NE Blue Heron Ct
Newberg, OR 97132

R3216AC 12300
Randy Wortman
1804 E Leo Ln
Newberg, OR 97132

R3216AC 12200
Russell & Lisa Thomas
1808 E Leo Ln
Newberg, OR 97132

R3216AC 09600
Ginger & Jeffrey Petersen
3804 E Coffey Ln
Newberg, OR 97132

R3216AC 13400
Karen Beck
3805 E Vittoria Way
Newberg, OR 97132

R3216DA 01700
Richard & Patricia Dittman
Po Box 1116
Newberg, OR 97132

R3216AC 12600
Wayne & Christine Kalick
3807 E Coffey Ln
Newberg, OR 97132

R3216AC 13100
Herbert & Carolyn Kuhn
3817 E Coffey Ln
Newberg, OR 97132

R3216DA 00400
Wayne & Rebecca Cannaday
1312 NE Klimek Ln
Newberg, OR 97132

R3216AC 02300
Jackson Tabscott Iii
3916 E Aquarius Blvd
Newberg, OR 97132

R3216AB 01500
Jacob & Elan Bellenghi
4400 NE Birdhaven Loop
Newberg, OR 97132

R3216BA 03101
Denise Banta
3516 N Morris St
Newberg, OR 97132

R3216AB 01803
Terry & Amelia Coss
4304 NE Robin Ct
Newberg, OR 97132

R3216BA 03109
Jordan & Jessica Allen
1935 N Westlake Loop
Newberg, OR 97132

R3216AC 11500
Josiah & Anna Philipsen
1803 E Leo Ln
Newberg, OR 97132

R3216AC 13000
Michael & Delynn Mcbride
3815 E Coffey Ln
Newberg, OR 97132

R3216AB 01811
Steven & Joanne Goodfellow
4410 NE Birdhaven Loop
Newberg, OR 97132

R3216BA 03111
Larry & Karen Hall
1929 N Westlake Loop
Newberg, OR 97132

R3216DA 00600
Leo French-Pinzon & Cristina Pinzon
1300 NE Klimek Ln
Newberg, OR 97132

R3216AC 08900
Rebeckah Puppo & Alex Richards
3715 E Vittoria Way
Newberg, OR 97132

R3216AC 01400
David Sexton & Natasha Luepke
4001 E Aquarius Blvd
Newberg, OR 97132

R3216BA 03125
Hoy Richard L & Geneva J Hoy Family
1958 N Westlake Loop
Newberg, OR 97132

R3215   00700
Lim Family Llc
922 N Killingsworth St
Portland, OR 97217

R3216AC 09100
Rick & Jill Dorrell
1211 S Pennington Dr
Newberg, OR 97132

R3216AC 11700
Joel Cramer
1805 E Leo Ln
Newberg, OR 97132

R3216AA 00103
Damman Gary W & Joyce A Damman
30160 NE Benjamin Rd
Newberg, OR 97132

R3216BA 03103
Rand & Kathleen Sargent
1949 N Westlake Loop
Newberg, OR 97132

R3216   01000
Richard Kimball
12000 NE Parrett Mountain Rd
Newberg, OR 97132

R3216AC 10000
Dennis & Judith Startin
3712 E Coffey Ln
Newberg, OR 97132

R3216AC 01000
Rick Hodges
3801 E Madrona Dr
Newberg, OR 97132

R3216AC 01900
Seno & Bethany Ariahadi
4012 E Aquarius Blvd
Newberg, OR 97132

R3216AB 01809
Bruce Ernst
4406 NE Birdhaven Loop
Newberg, OR 97132

R3216DA 00700
Leo French-Pinzon & Cristina Pinzon
1300 NE Klimek Ln
Newberg, OR 97132

R3216AA 01600
Daniel & Vicki Shepherd
30230 NE Benjamin Rd
Newberg, OR 97132

R3216AC 09200
Laura Wellons
9369 SW Umiat St
Tualatin, OR 97062

R3216AB 01814
Tonna Farrar
4509 NE Blue Heron Ct
Newberg, OR 97132

R3216BA 03108
Robert Hartley Jr & Debbie Pelzer-Hartley
1937 N Westlake Loop
Newberg, OR 97132

R3216DA 00300
John & Ericka Read
1305 NE Harmony Ln
Newberg, OR 97132

R3216AC 08600
Martin & Lisa Taylor
1708 N Meadow Ln
Newberg, OR 97132

R3216AC 01700
Nicholas & Jocelyn Simpson
3816 E Vittoria Way
Newberg, OR 97132

R3216AC 02200
Scott Maytubby
4000 E Aquarius Blvd
Newberg, OR 97132

R3216AB 01100
Matthew Vondrachek
17684 Soumwest Inkster Dr
Sherwood, OR 97140

R3216AB 01817
Caroline Crabtree
4300 NE Robin Ct
Newberg, OR 97132

R3216AC 12500
Andre & Jill Bogers
3805 E Coffey Ln
Newberg, OR 97132

R3216AC 11800
David Hansen
1807 E Leo Ln
Newberg, OR 97132

R3216AC 08700
Kathryn Sherman-Wentz & Nicholas
1704 N Meadow Ln
Newberg, OR 97132

R3216AC 01600
Clayton & Kristina Moore
4009 E Aquarius Blvd
Newberg, OR 97132

R3216BA 03126
James Weber
1956 N Westlake Loop
Newberg, OR 97132

R3216DA 00500
Jerold & Margaret Neill
1102 N Springbrook Rd NO 222
Newberg, OR 97132

R3216AC 08500
Warren & Dawn Kurisu
22 Ardilla Rd
Orinda, CA 94563

R3216AC 13200
Gary & Rebecca Shelton
3819 E Coffey Ln
Newberg, OR 97132

R3216BA 03102
David & Linda Campbell
1951 N Westlake Loop
Newberg, OR 97132

R3216DA 01500
Frank & Pat Dittman
Po Box 1116
Newberg, OR 97132

R3216AC 13700
The Public
535 NE 5th St
Mcminnville, OR 97128

R3216AC 11300
Deborah Smith & Kristina Ouellette
3713 E Coffey Ln
Newberg, OR 97132

R3216AC 09000
Kimberly Frentress
3818 E Coffey Ln
Newberg, OR 97132

R3216AB 01000
Michael Green
4407 NE Birdhaven Loop
Newberg, OR 97132

R3216BA 03127
Howard Tribbett
1942 N Westlake Loop
Newberg, OR 97132

R3216DA 01600
Frank & Pat Dittman
Po Box 1116
Newberg, OR 97132

R3216AC 09400
Caleb Grimstad
3808 E Coffey Ln
Newberg, OR 97132

R3216AC 02000
Monica & Tyler Skaggs
4008 E Aquarius Blvd
Newberg, OR 97132

R3216AB 01400
Terry Stenson
4404 NE Birdhaven Loop
Newberg, OR 97132

R3216AC 07200
Gary & Rosana Wong
29235 NE Putnam Rd
Newberg, OR 97132

R3216AA 01590
Saaddedine & Eryn Dichari
13660 NE Lake Shore Dr
Newberg, OR 97132

R3216AC 09300
Alisha Batchelor
3810 E Coffey Ln
Newberg, OR 97132

R3216AC 07000
Bradley & Katelynn Vose
3716 E Vittoria Way
Newberg, OR 97132

R3216AB 01600
Cherie & Samuel Steele
4300 NE Birdhaven Loop
Newberg, OR 97132

R3216DA 01900
Geovanni & Maria Zamora
1305 NE Klimek Ln
Newberg, OR 97132

R3216AC 11400
Nicholas & Marla Valenzuela
3715 E Coffey Ln
Newberg, OR 97132

R3216AC 08800
Timothy Mukhin
1700 N Meadow Ln
Newberg, OR 97132

R3216AC 07400
Todd & Pamela Pennington
10175 SW Barbur Blvd STE 210B
Portland, OR 97219

R3216AC 07500
Tammy Burns
3812 E Vittoria Way
Newberg, OR 97132

R3216AC 01500
Christine & James Park
4005 E Aquarius Blvd
Newberg, OR 97132

R3216AA 01490
Anthony & Elizabeth Perez
13665 NE Lake Shore Dr
Newberg, OR 97132

R3216AB 01300
Blake & Chyrel Williams
4500 NE Blue Heron Ct
Newberg, OR 97132

R3216BA 03105
Roberta Ashton
1945 N Westlake Loop
Newberg, OR 97132

R3216   00900
Bruce & Valerie Thomas
21709 Gallagher Ave
Corning, CA 96021

R3216DA 00800
Frederick & Beatrice Bohannon
425 Seagrove Loop
Lincoln City, OR 97367

R3216AC 12100
Kenneth & Kathleen Klus
1812 E Leo Ln
Newberg, OR 97132

R3216AA 00104
Noel Taylor
13700 NE Lake Shore Dr
Newberg, OR 97132

R3216AC 11900
Jess & Tamera Yocom
1809 E Leo Ln
Newberg, OR 97132

R3216DA 01800
Frank & Pat Dittman
Po Box 1116
Newberg, OR 97132

R3216AC 12700
Gary Dunn
3809 E Coffey Ln
Newberg, OR 97132

R3216AC 12900
Kenneth & Sherrie Mathison
3813 E Coffey Ln
Newberg, OR 97132

R3216AC 12800
Pamela Peebles
3811 E Coffey Ln
Newberg, OR 97132

R3216AB 01815
Paul & Carla Anderson
4601 NE Blue Heron Ct
Newberg, OR 97132

R3216AC 07100
Delvin & Georgia White
3800 E Vittoria Way
Newberg, OR 97132

R3216AC 07300
Kennedy & Kim Anoe
16245 SW Bull Mountain Rd
Portland, OR 97224

R3216AC 01200
Michael & Michelle Davenport
3809 E Madrona Dr
Newberg, OR 97132

R3216AC 02100
Abraham Aguirre
4004 E Aquarius Blvd
Newberg, OR 97132

R3216AC 01300
Thomas Vandyke
3813 E Madrona Dr
Newberg, OR 97132

R3216BA 03128
Helga Schrieber
1930 N Westlake Loop
Newberg, OR 97132

R3216BA 03106
Kyle & Suzanne Kern
1941 N Westlake Loop
Newberg, OR 97132

R3216AB 01810
Palmer Dale B & Doris Palmer Doris Living
4408 NE Birdhaven Loop
Newberg, OR 97132

R3216AB 01807
Kevin Draz & Angela Barkes-Draz
4409 NE Birdhaven Loop
Newberg, OR 97132

R3216BA 03110
Larry & Polly Siler
1931 N Westlake Loop
Newberg, OR 97132

R3216AB 01805
Petrone Richard C & Carol A (Trustees
4301 NE Crestview Dr
Newberg, OR 97132

R3216AB 01808
Daniel & Rebecca Peek
4402 NE Birdhaven Loop
Newberg, OR 97132

R3216AB 01806
Mark & Sandra Wagner
4403 NE Birdhaven Loop
Newberg, OR 97132

R3216AB 01816
Erika Rankin & Mark Currier
4100 NE Crestview Dr
Newberg, OR 97132

R3216AB 01804
Teresa Treinen & Joshua Swake
4308 NE Robin Ct
Newberg, OR 97132

R3216   01902
Providence Health System
800 5th Ave # 1200
Seattle, WA 98104

R3216AC 13800
Newberg Crestview Llc
5285 Meadows Rd STE 171
Lake Oswego, OR 97035

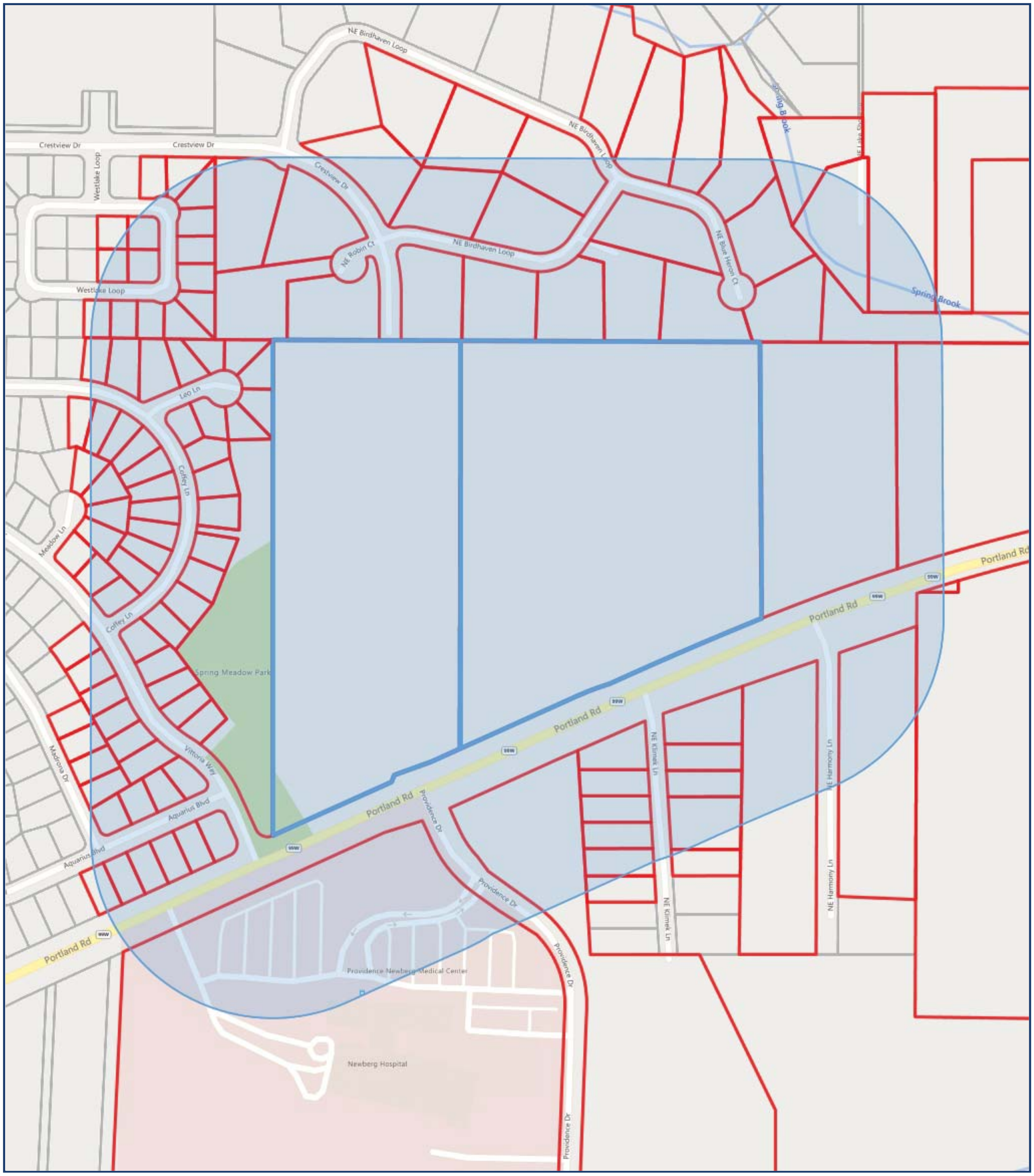
R3216   01100
Newberg Crestview Llc
5285 Meadows Rd STE 171
Lake Oswego, OR 97035

First American Title™

500 ft Buffer

4505 E Portland Rd, Newberg, OR 97132

Report Generated: 10/28/2020



First American Title™

Customer Service Department
Phone: 503.219.8746(TRIO)
Email: cs.oregon@firstam.com
Report Generated: 10/28/2020

Ownership

Legal Owner(s): Newberg Crestview Llc
Site Address: No Site Address Newberg, OR 97132
Mailing Address: 5285 Meadows Rd STE 171 Lake Oswego, OR 97035

Parcel #: R3216AC 13800
APN: 30479
County: Yamhill

Property Characteristics

Bedrooms: 0
Total Bathrooms: 0
Full Bathrooms: 0
Half Bathrooms: 0
Units: 0
Stories:
Fire Place: Y
Air Conditioning:
Heating Type:
Electric Type:

Year Built: 0
Building SqFt: 0
First Floor SqFt: 0
Basement Sqft: 0
Basment Type:

Lot SqFt: 642074
Lot Acres: 14.74
Roof Type:
Roof Shape:
Porch Type:
Building Style:
Garage:
Garage SqFt: 0
Parking Spots: 0
Pool:

Property Information

Land Use: VACANT
Improvement Type: Commercial-
Legal Description: SEE METES & BOUNDS

Zoning: C-2
School District: Newberg School
Neighborhood:
Subdivision:

Assessor & Tax

Market Land: $4,005,167
Market Total: $4,005,167
Market Structure: $0
Assessed Total: $137,456

Taxes: $2,068.96
% Improved: 0
Levy Code:
Millage Rate:

Sale History

Last Sale Date: 9/27/2018
Prior Sale Date: 3/17/2008

Doc #: 201813898
Prior Doc #: 200804527

Last Sale Price: $2,800,000
Prior Sale Price: $0

Mortgage

1st Mortgage Date: 9/27/2018
1st Mortgage Type:
2nd Mortgage Type:

Doc #: 201813897
1st Mortgage Lender: Community Financial Corp

1st Mortgage: $3,500,000
2nd Mortgage: $0

First American Title™

Customer Service Department
Phone: 503.219.8746(TRIO)
Email: cs.oregon@firstam.com
Report Generated: 10/28/2020

Ownership

Legal Owner(s): Newberg Crestview Llc
Site Address: 4505 E Portland Rd Newberg, OR 97132
Mailing Address: 5285 Meadows Rd STE 171 Lake Oswego, OR 97035

Parcel #: R3216 01100
APN: 29098
County: Yamhill

Property Characteristics

Bedrooms: 2
Total Bathrooms: 1
Full Bathrooms: 1
Half Bathrooms: 0
Units: 0
Stories:
Fire Place: Y
Air Conditioning:
Heating Type: Forced air unit
Electric Type:

Year Built: 1951
Building SqFt: 2264
First Floor SqFt: 1132
Basement Sqft: 1132
Basment Type: Unspecified

Lot SqFt: 757073
Lot Acres: 17.38
Roof Type: Composition
Roof Shape: HIP
Porch Type:
Building Style:
Garage:
Garage SqFt: 0
Parking Spots: 0
Pool:

Property Information

Land Use: RESIDENTIAL
Improvement Type: Single
Legal Description: SEE METES & BOUNDS

Zoning: C-2
School District: Newberg School
Neighborhood:
Subdivision:

Assessor & Tax

Market Land: $2,467,137
Market Total: $2,650,652
Market Structure: $183,515
Assessed Total: $1,707,280

Taxes: $25,697.64
% Improved: 7
Levy Code:
Millage Rate:

Sale History

Last Sale Date: 8/29/2014
Prior Sale Date:

Doc #: 201410991
Prior Doc #:

Last Sale Price: $2,200,000
Prior Sale Price: $0

Mortgage

1st Mortgage Date:
1st Mortgage Type:
2nd Mortgage Type:

Doc #:
1st Mortgage Lender:

1st Mortgage: $0
2nd Mortgage: $0

Land Use Notice

FILE #

PROPOSAL: Site Design Review for a Retail Commercial Project on ± a 4.2-acre property in the C-2 district.

FOR FURTHER INFORMATION, CONTACT:

City of Newberg
Community Development Department
414 E First Street
Phone: 503-537-1240

Exhibit F: Preliminary Stormwater Report

Crestview Crossing Commercial
Newberg, Oregon

Preliminary Stormwater Report

Date:	November 20, 2020
Client:	Gramor Newberg Crestview, LLC. 19767 SW 72nd Ave, Suite 100 Tualatin, OR, 97062
Engineering Contact:	Chuck Gregory, PE 503.563.6151 | chuckg@aks-eng.com
Engineering Firm:	AKS Engineering & Forestry, LLC 12965 SW Herman Road, Suite 100 Tualatin, OR, 97062
AKS Job Number:	3723

50644PE
CHARLES EDWARD GREGORY
SEPT. 14, 1999
PRELIMINARY
RENEWS: JUNE 30, 2021

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Table of Contents

Tables

Figures

Appendices

Preliminary Stormwater Report

CRESTVIEW CROSSING COMMERCIAL

NEWBERG, OREGON

1.0 Purpose of Report

The purpose of this report is to: analyze the effects the proposed development will have on the existing stormwater conveyance system; document the criteria, methodology, and informational sources used to design the proposed stormwater system; and present the results of the preliminary hydraulic analysis.

2.0 Project Location/Description

The proposed development is a retail commercial project on a portion of the Crestview Crossing Planned Unit Development (PUD) site. The property is located at 4505 E Portland Road (Highway 99W) on two existing tax lots (Yamhill County Assessor's Map 3216, Tax Lot 1100 and Map 3216AC, Tax Lot 13800).

The Crestview Crossing PUD is a ±33-acre mixed-use development which was approved in October 2018. The PUD approval includes detached and attached single-family residential homes, a 51-unit multi-family residential component, and sets aside this ±4.2-acre site for future commercial development. The PUD includes active and passive open space areas, a network of pedestrian and vehicular circulation, and stormwater treatment facilities. The PUD is being developed separately from this subject property by JT Smith Companies.

This project consists of 5 retail buildings with a total roof area of approximately 37,630 square feet along with approximately 169 parking spaces, landscaping, associated underground utilities, and stormwater management facilities.

Stormwater management is provided through a combination of low impact development approach (LIDA) facilities (vegetated swale and flow-through planter), underground detention, and proprietary treatment. A portion of the site will be treated by StormFilter cartridges due to space, and grading restrictions. Infiltration testing from the Crestview Crossing PUD, completed by JT Smith Companies, showed an infiltration rate of 0 in/hr. Therefore, all LIDA facilities were modeled assuming no infiltration.

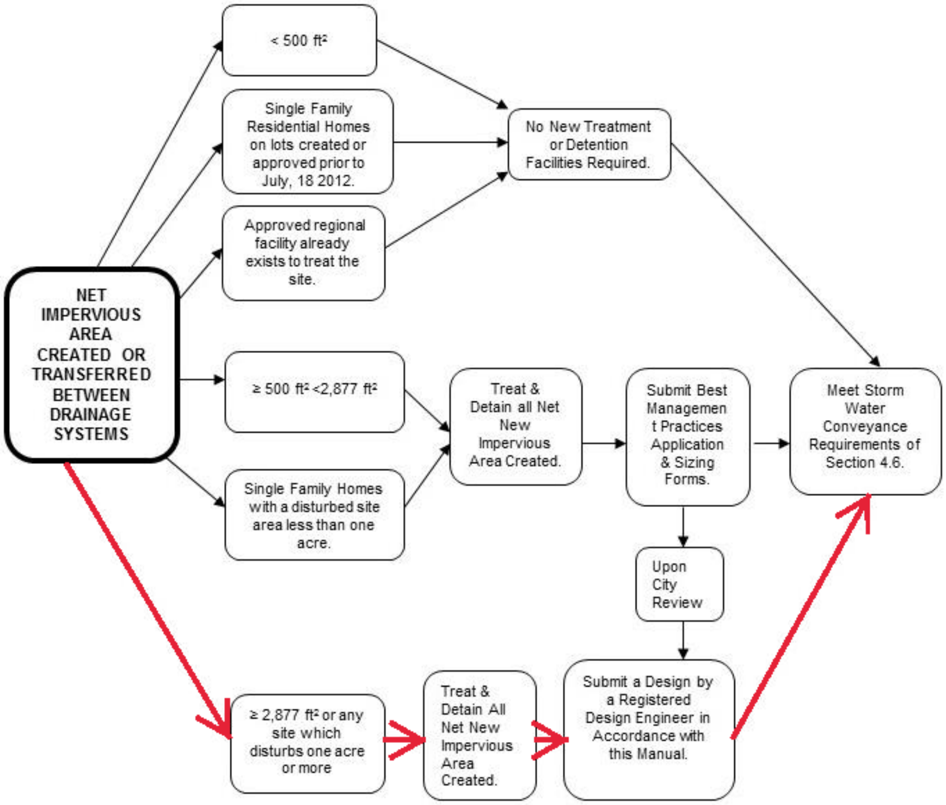
After stormwater quality treatment and quantity control, runoff from the proposed development is conveyed to the stormwater system designed by 3J Consulting (3J) as a part of the PUD design.

3.0 Regulatory Design Criteria

Stormwater design criteria is dictated by the City of Newberg Public Works Design and Construction Standards (August 2015). Per figure 4.4, the proposed development will create more than 2,877 square feet of impervious area and therefore is required to provide treatment and detention for all net new impervious area created. The proposed design meets the requirements of section 4.6 and is designed by a Registered Civil Engineer. Additionally, due to the overall PUD filling wetlands on site, stormwater facilities have been designed to comply with the Standard Local Operating Procedures for Endangered Species (SLOPES V) by the U.S. Army Corps of Engineers (USACE, 2014). ODOT (Oregon Department of Transportation) standards will also be considered as the runoff from the site eventually enters a culvert that crosses Highway 99W.

4.6 Water Quantity and Quality Facilities

Figure 4.4 Storm water Quality & Quantity Design Flow Chart



3.1 STORMWATER QUANTITY

The site is required to meet the City of Newberg, SLOPES V and ODOT flow control requirements. See below for the expected performance standards per jurisdiction.

- City of Newberg
  - Stormwater quantity on-site detention facilities shall be designed to capture runoff so the post-development runoff rates from the site do not exceed the pre-developed runoff rates from the site, based on 24-hr storm events ranging from ½ the 2-yr return storm to the 25-yr return storm. Specifically, the ½ of the 2-, 2-, 10-, and 25-yr post-development runoff rates will not exceed their respective ½ of the 2-, 2-, 10-, and 25-yr pre-development runoff rates.
- SLOPES V
  - The post-developed runoff rate for the 2-yr design storm shall not exceed ½ of the 2-yr pre-development runoff rate. Additionally, the post-developed runoff rate for the 10-year design storm shall not exceed the 10-yr pre-developed runoff rate.
- ODOT
  - The post-developed runoff rate for the 2-, 10-, and 50-yr design storm shall not exceed their respective pre-developed 2-, 10-, and 50-yr runoff rates.

However, per the attached memorandum from Kathleen Freeman regarding surplus stormwater detention (see Appendix H), 3J consulting has amended their original stormwater report for the Crestview Crossing PUD to show a surplus of allowable release rates for each design storm to be used as a proportionate share by this commercial development and the multifamily development in the future. As such, the surplus of allowable release from this commercial site is shown in table 3-1.

Table 3-1: Allowable Release Rates

Design Storm	Release Rates (cfs)
2-yr	0.79**
10-yr	3.86
25-yr	4.77
50-yr	5.13

*** This accounts for ½ of the 2-yr development – see 3J's Calculations*

To keep the entire Crestview Crossing development in compliance with all three agency's regulatory design criteria, runoff from the subject commercial project site will not exceed the above-mentioned release rates for any of the required design storms.

3.2 STORMWATER QUALITY

The site is required to follow City of Newberg, SLOPES V, and ODOT Water Quality Standards. Per the stormwater management plan for the greater Crestview Crossing development, the subject commercial site must provide a standalone stormwater quality treatment system that complies with all governing jurisdiction's requirements. See below for each Jurisdictions standard.

- City of Newberg
    - The stormwater quality only facilities shall be designed for a dry weather storm event totaling 1.0 inch of precipitation falling in 24 hours with an average storm return period of 96 hours.
- SLOPES V
    - All stormwater quality treatment practices and facilities have been designed to accept and fully treat the volume of water equal to 50% of the cumulative rainfall from the 2-yr, 24-hr storm for that site.
- ODOT
    - Stormwater quality treatment facilities shall be designed to treat the water quality design flow rate or water quality design volume. The water quality storm is designated as a percentage of the 2-yr, 24-hr design storm, depending on the location of the site. For the proposed site, the water quality design storm is 50% of the 2-yr, 24-hr design storm.

SLOPES V and ODOT have the same water quality design storm and are the most stringent. The water quality facilities will be sized to treat 50% of the 2-yr, 24-hr design storm (i.e. 1.25" precipitation depth).

4.0 Design Methodology

The Santa Barbara Urban Hydrograph (SBUH) Method was used to analyze stormwater runoff from the site. This method utilizes the SCS Type 1A 24-hour design storm. HydroCAD 10 computer software aided in the analysis. Representative CN numbers were obtained from the *Technical Release 55 Urban Hydrology for Small Watersheds* and *King County, Washington Surface Water Design Manual, Section 3.5.2* and are included in Appendix C.

5.0 Design Parameters

5.1 DESIGN STORMS

Per City of Newberg requirements, the stormwater analysis utilized the 24-hour storm for the evaluation and design of the existing and proposed stormwater facilities. The following 24-hour rainfall intensities were utilized as the design storm for the recurrence interval:

Table 5-1: Rainfall Intensities	
Recurrence Interval (Years)	**Total Precipitation Depth (Inches)**
WQ = ½ of 2	1.25 (SLOPES V & ODOT)
2	2.5
10	3.5
25	4.0
50	4.2

Stormwater facilities are placed at locations that adequately collect and control the stormwater for the site. The stormwater pipes on-site and off-site are sized using Manning's equation based on peak flows for the 50-year storm.

5.2 PRE-DEVELOPED SITE CONDITIONS

5.2.1 Site Topography

Prior to the PUD development, the existing on-site grades generally vary from ±1% to ±15%, with the site draining towards the northeast. The site has a high point of ±214 feet in the southwest property corner and a low point of ±187 feet near the northeast property corner. A conservative time of concentration of five minutes was used in the analysis.

5.2.2 Land Use

The existing site, for the past 30 years, has consisted of a residential property with a gravel driveway, house and outbuildings with the rest of the property being wetlands, brush and grass. The property is zoned community commercial (C-2).

5.3 SOIL TYPE

Per Section 4.5.4, *Santa Barbara Urban Hydrograph (SBUH)*, of the City of Newberg *Public Works Design and Construction Standards* (August 2015):

> *II. Curve numbers shall be derived from the National Resources Conservation Service's (NRCS) runoff curve numbers contained in Technical Release 55 (TR-55)-Urban Hydrology for Small Watersheds.*
>
> *III. Soil types shall be derived from the NRCS Soil Survey for Yamhill County.*

The soils for the site are classified as Amity Silt Loam (Hydrologic Soil Group C/D) and Woodburn silt loam (Hydrologic Soil Group C) per the USDA Soil Survey for Yamhill County. Information for these soils is contained within the appendices of this report.

5.4 POST-DEVELOPED SITE CONDITIONS

5.4.1 Site Topography

The on-site slopes will be modified with cuts and fills to accommodate the construction of retail buildings, a parking lot and stormwater facilities. Finish grades of the development are dictated by the northern, southern, and western public roads. The eastern grades are controlled by the pond grading design completed by 3J.

5.4.2 Land Use

The post-developed site land use will consist of 5 retail buildings with associated parking spaces, walkways and underground utilities. The Zoning for the property will remain C-2.

5.4.3 Post-Developed Input Parameters

See HydroCAD Analysis in the attached appendices.

5.4.4 Description of Off-Site Contributing Basins

The surrounding public streets and residential properties do not direct any stormwater runoff towards the subject site.

6.0 Stormwater Analyses

6.1 PROPOSED STORMWATER QUANTITY CONTROL FACILITIES

The proposed site will utilize LIDA facilities (vegetated swale and flow-through planter) to aide in the detention of a portion of the site. A chamber trench system will provide the additional detention needed to accommodate the increased runoff from the new development. A flow control manhole with an orifice and weir, will be utilized to limit flow to the allowable release rates for the required design storms. A portion of landscape, mainly within the PUE, will be situated at grades and elevations that will not allow stormwater runoff to be directed and discharged into the proposed chamber trench system. This runoff will be discharged into the public right of way and ultimately make its way into the detention pond on the adjacent property (the proposed on-site detention system has been oversized to compensate for this un-detained flow – See appendix A for additional information).

The following table summarizes the required storm events and provides a comparison between the pre-developed and post-developed total site flows at the point of discharge (see attached Figure 3: Post-Developed Basin delineation for point of discharge).

Table 6-1: Peak Pre- and Post-Development Flow Comparison

Recurrence Interval (Years)	Allowable Release Rates from 3J (cfs)	Peak Post-Development Flows* (cfs)	Peak Flow Increase or (Decrease) – (cfs)
2	0.79**	0.79	(0.00)
10	3.86	2.66	(1.20)
25	4.77	3.25	(1.52)
50	5.13	3.48	(1.65)

**This flow rate includes discharge from the flow control manhole as well as the un-detained landscape around the perimeter of the property.*
*** This accounts for ½ of the 2-yr development – see 3J's Calculations*

The stormwater facility will limit the post-developed peak flows to less than or equal to the allowable release rates set forth during the design of the PUD for all listed storm events.

6.2 PROPOSED STORMWATER QUALITY CONTROL FACILITY

Based on the *City of Newberg Public Works Design and Construction Standards* section 4.6.8, Facility Selection Hierarchy (table 6.2 below), LIDA facilities have been selected first to treat as much impervious area as practically possible. The remaining roof and paved area will be treated through proprietary treatment.

Table 6-2: Facility Selection Hierarchy Table	
Detention Facilities	**Water Quality Facilities**
LIDA Facilities/Regional Facility	LIDA Facilities/Regional Facility
Surface Pond	Swale
Underground Tank/Pipes	Proprietary Treatment Systems
Fee in lieu of construction payment	Fee in lieu of construction payment

Due to limited space, topography, public utility easements, and poorly drained soils within the project site, forms of water quality treatment facilities higher in the Facility Selection Hierarchy, were deemed impractical or limited. The proposed design utilizes as much landscape area as possible to implement LIDA facilities. The proposed site will utilize a vegetated swale and a flow through planter designed per City of Newberg *Design and Construction Standards.* They will provide water quality treatment for much of the impervious parking lot and walkways. The flow through planter has been sized with a planter area/ impervious area ratio of 6.9%. The vegetated swale has been designed to have a maximum water depth of 6 inches. The remainder of the impervious area on site will be treated through StormFilter cartridges. See attached StormFilter Cartridge Sizing Calculations.

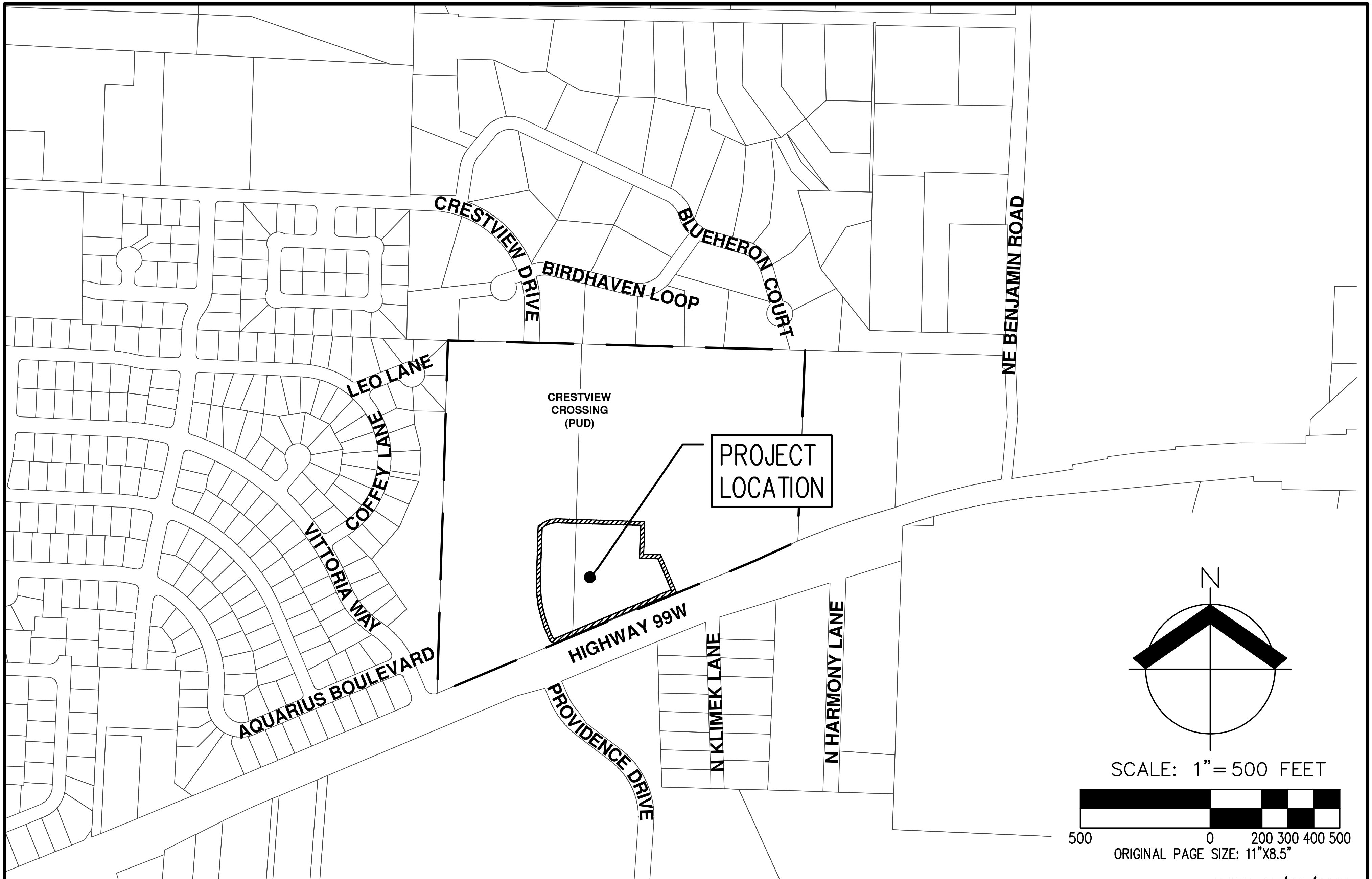
6.3 DOWNSTREAM ANALYSIS

A downstream analysis was completed by 3J during their design of the Crestview Crossing PUD and included the subject site. Stormwater runoff collected from the site is conveyed to the stormwater system designed for the PUD under permit number PUD18-0001. Please refer to the Crestview Crossing PUD Stormwater Report by 3J. Furthermore, the development is providing extra detention, therefore the downstream system should experience no adverse impact due to the development.

6.4 CONCLUSION

The stormwater system for the proposed development has been designed to meet the City of Newberg Municipal Code section 13.25 and complies with the requirements in the City of Newberg Public Works Design and Construction Standards Manual. Additionally, the project complies with the National Marine Fisheries Service criteria as part of the March 2014 Programmatic Biological Opinion and Essential Fish Habitat Consultation for the Standard Local Operating Procedures for Endangered Species (SLOPES V) as part of the Wetland Fill Permit with the Army Corps of Engineers as well as ODOT.

Figure 1:
Vicinity Map



DATE: 11/20/2020

VICINITY MAP

FIGURE
1

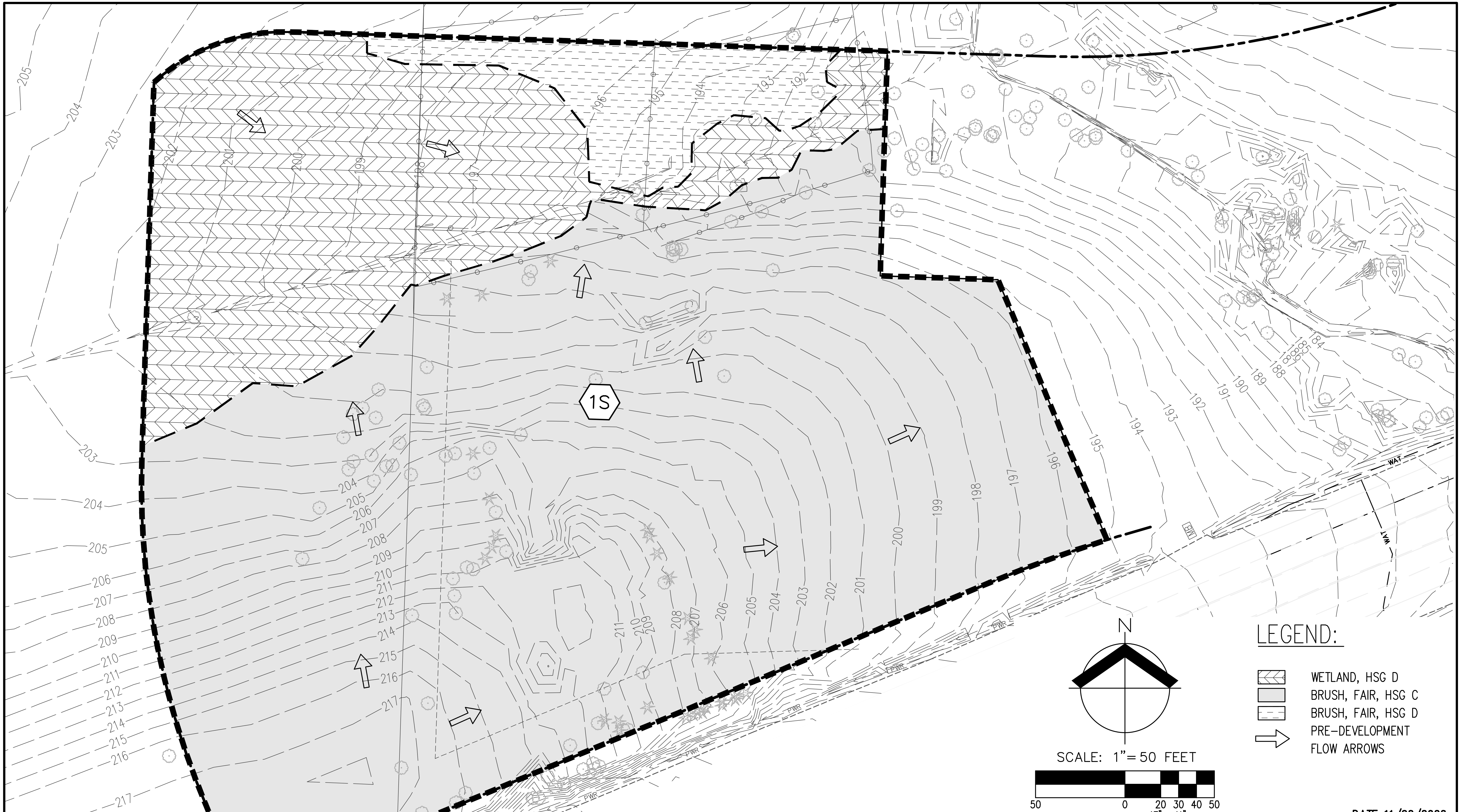
AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
P: 503.563.6151 F: 503.563.6152 aks-eng.com

AKS

DRWN: MCC
CHKD: CEG
AKS JOB:
3723

DWG: 3723 VICINITY MAP | 1A – VICINITY MAP

Figure 2:
Pre-Development Basin Map



TC WAS CALCULATED BY 3J CONSULTING AND IS OUTLINED IN A MEMORANDUM FROM KATHLEEN FREEMAN DATED 10/20/20 REGARDING SURPLUS STORMWATER DETENTION

Total Area (ac)	Imp. Area (ac) (Wetland), CN = 98	Per. Area (ac) C Soils (Brush), CN = 70	Per. Area (ac) D Soils (Brush), CN = 77
4.186	1.05	2.926	0.21

Table 1 - Predeveloped Commercial Site

DATE: 11/20/2020

PRE-DEVELOPMENT BASIN MAP

CRESTVIEW CROSSING

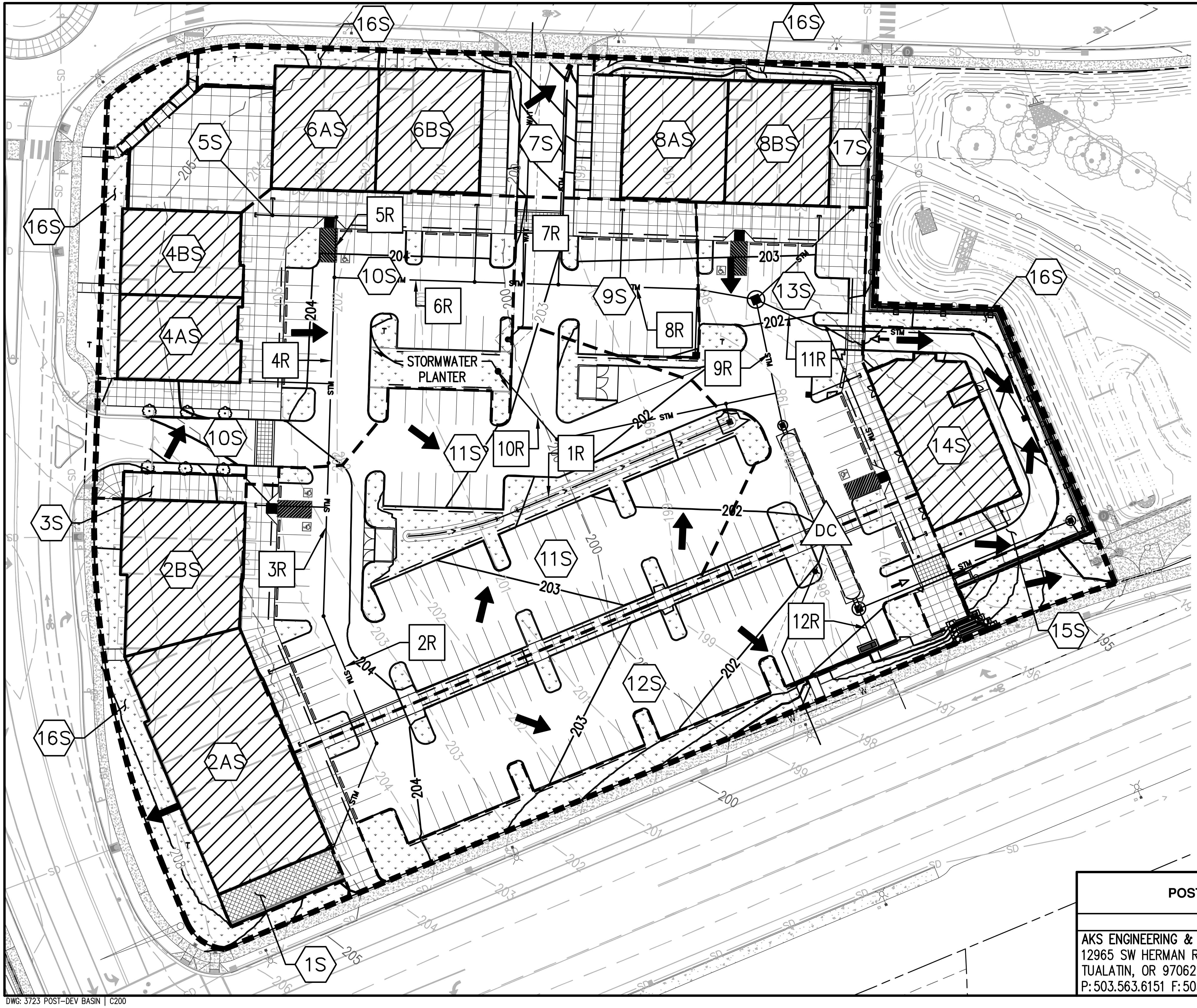
AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
P: 503.563.6151 F: 503.563.6152 aks-eng.com

FIGURE
2

DRWN: MCC
CHKD: CEG
AKS JOB:
3723

DWG: 3723 PRE-DEV BASIN | LAYOUT1

Figure 3:
Post-Development Basin Map



LEGEND:

- ▨ ROOFS
- ⁘ LANDSCAPE
- ☐ ASPHALT/CONCRETE
- ➡ POST-DEVELOPMENT FLOW ARROWS

AREA SUMMARY:

BUILDING ROOF:	37,630 SF
LANDSCAPE:	35,130 SF
CONCRETE/ASPHALT:	109,566 SF
TOTAL:	182,326 SF

N

SCALE: 1"=50 FEET

50 0 20 30 40 50
17" x 11"

DATE: 11/20/2020

POST-DEVELOPMENT BASIN MAP

FIGURE
3

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
P: 503.563.6151 F: 503.563.6152 aks-eng.com

DRWN: MCC
CHKD: CEG
AKS JOB:
3723

DWG: 3723 POST-DEV BASIN | C200

Appendix A: Pre & Post-Developed Site Analysis HydroCAD Reports

Routing Diagram for 3723 Pre Dev copying 3J Addendum
Prepared by AKS Engineering & Forestry, Printed 11/5/2020

Summary for Subcatchment 1S: Pre-Development

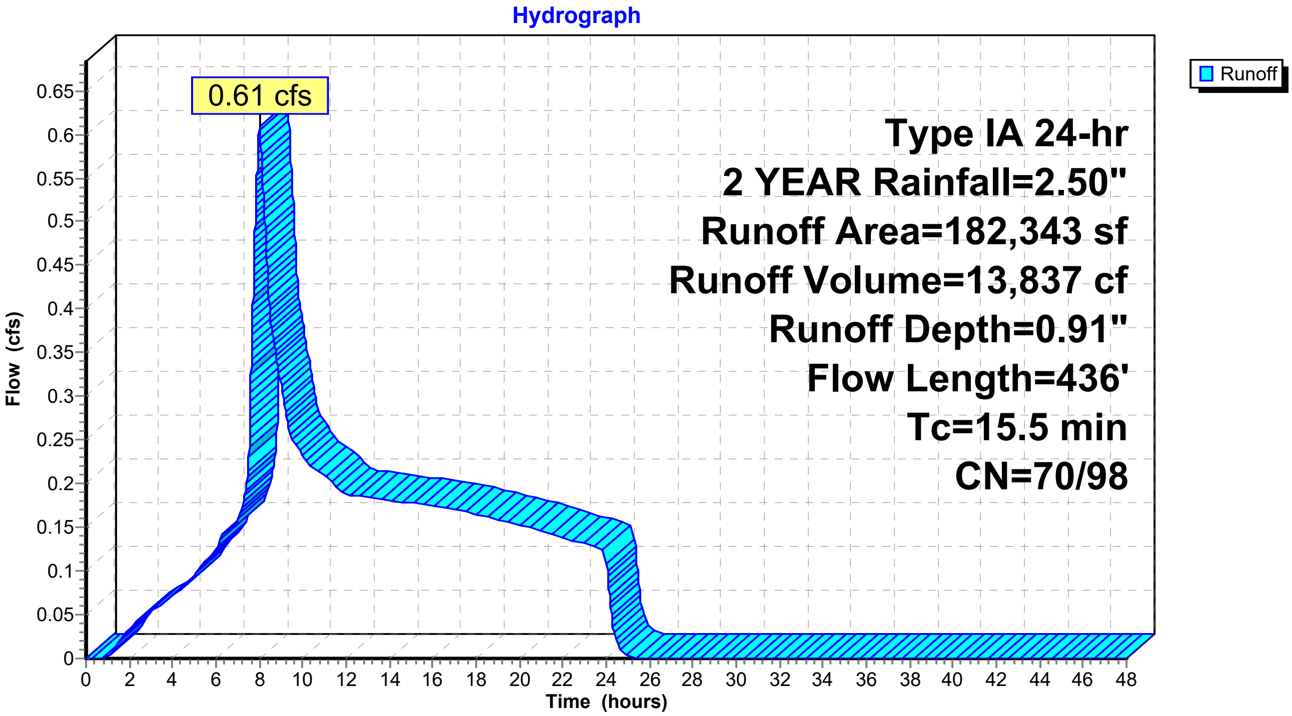
Runoff = 0.61 cfs @ 8.00 hrs, Volume= 13,837 cf, Depth= 0.91"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

	Area (sf)	CN	Description
*	45,738	98	wetland
*	127,457	70	C Soil
*	9,148	77	C soil
	182,343	77	Weighted Average
	136,605		74.92% Pervious Area
	45,738		25.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0310	0.12		**Sheet Flow, Sheet Flow 1** Grass: Dense n= 0.240 P2= 2.50"
2.0	336	0.0302	2.80		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.5	436	Total			

Subcatchment 1S: Pre-Development



Summary for Subcatchment 1S: Pre-Development

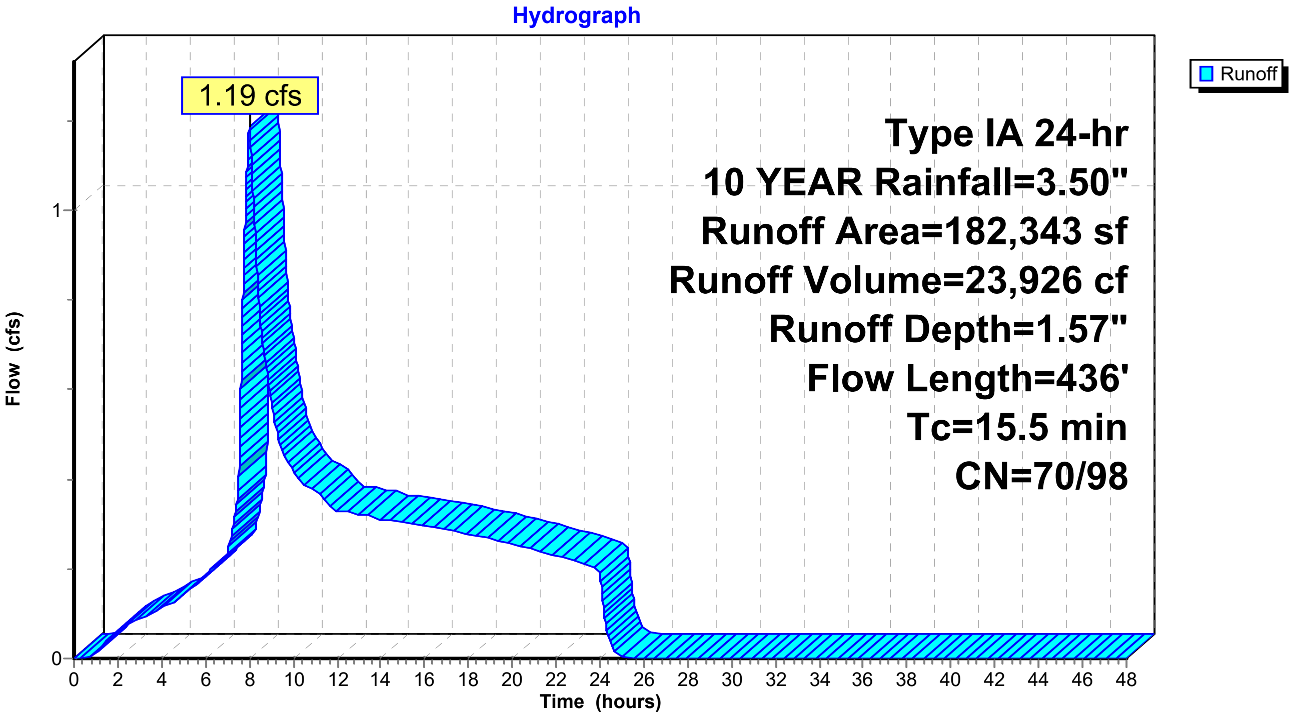
Runoff = 1.19 cfs @ 8.00 hrs, Volume= 23,926 cf, Depth= 1.57"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

	Area (sf)	CN	Description
*	45,738	98	wetland
*	127,457	70	C Soil
*	9,148	77	C soil
	182,343	77	Weighted Average
	136,605		74.92% Pervious Area
	45,738		25.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0310	0.12		**Sheet Flow, Sheet Flow 1** Grass: Dense n= 0.240 P2= 2.50"
2.0	336	0.0302	2.80		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.5	436	Total			

Subcatchment 1S: Pre-Development



Summary for Subcatchment 1S: Pre-Development

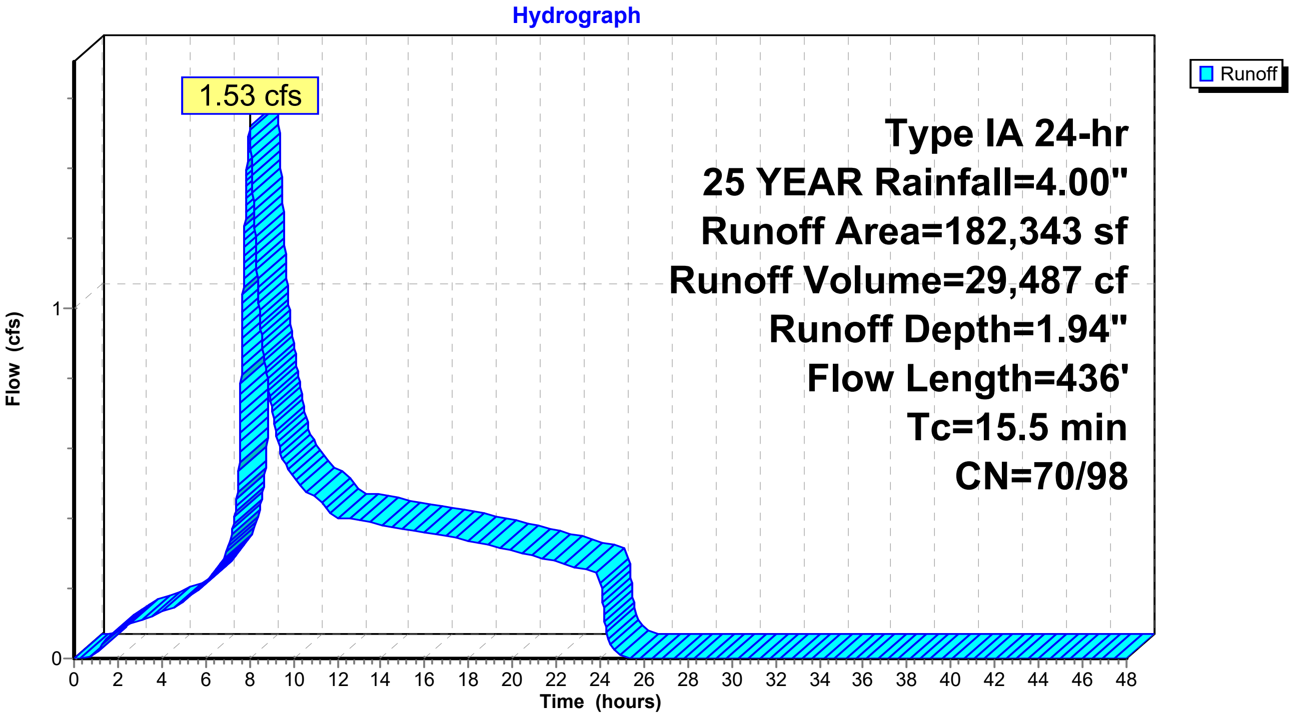
Runoff = 1.53 cfs @ 8.00 hrs, Volume= 29,487 cf, Depth= 1.94"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

	Area (sf)	CN	Description
*	45,738	98	wetland
*	127,457	70	C Soil
*	9,148	77	C soil
	182,343	77	Weighted Average
	136,605		74.92% Pervious Area
	45,738		25.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0310	0.12		**Sheet Flow, Sheet Flow 1** Grass: Dense n= 0.240 P2= 2.50"
2.0	336	0.0302	2.80		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.5	436	Total			

Subcatchment 1S: Pre-Development



Summary for Subcatchment 1S: Pre-Development

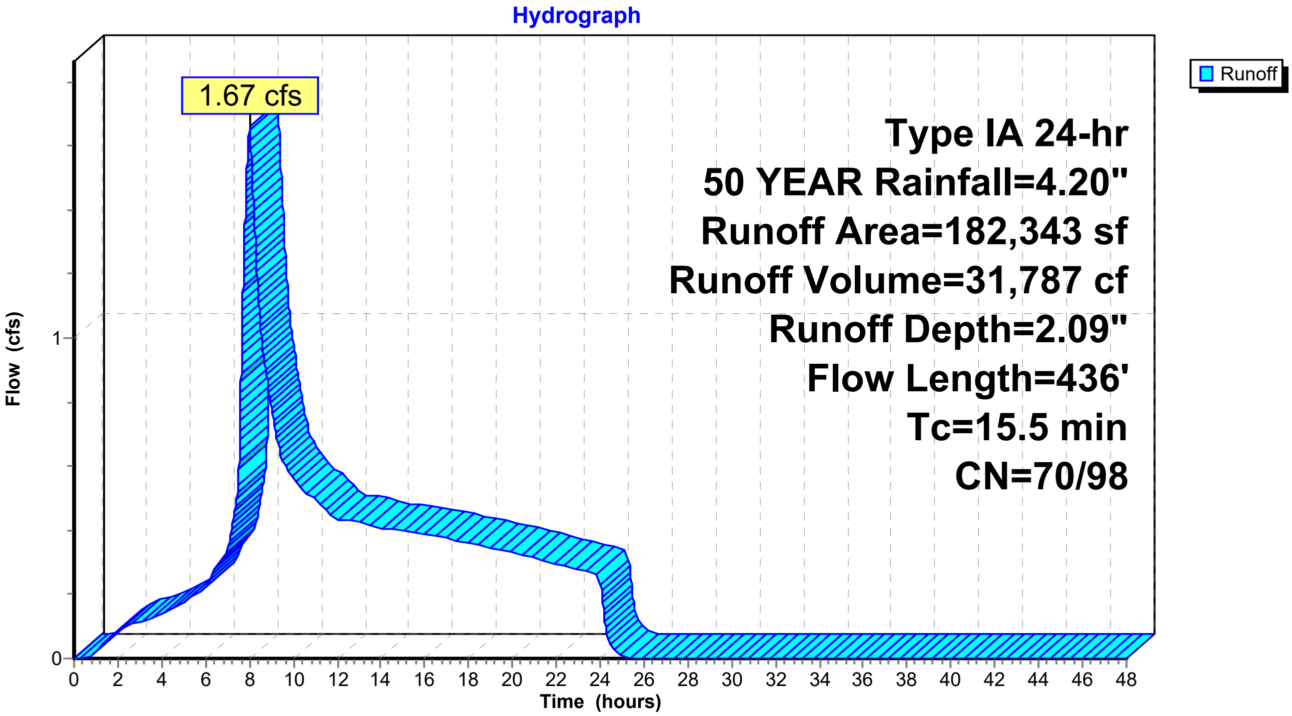
Runoff = 1.67 cfs @ 8.00 hrs, Volume= 31,787 cf, Depth= 2.09"

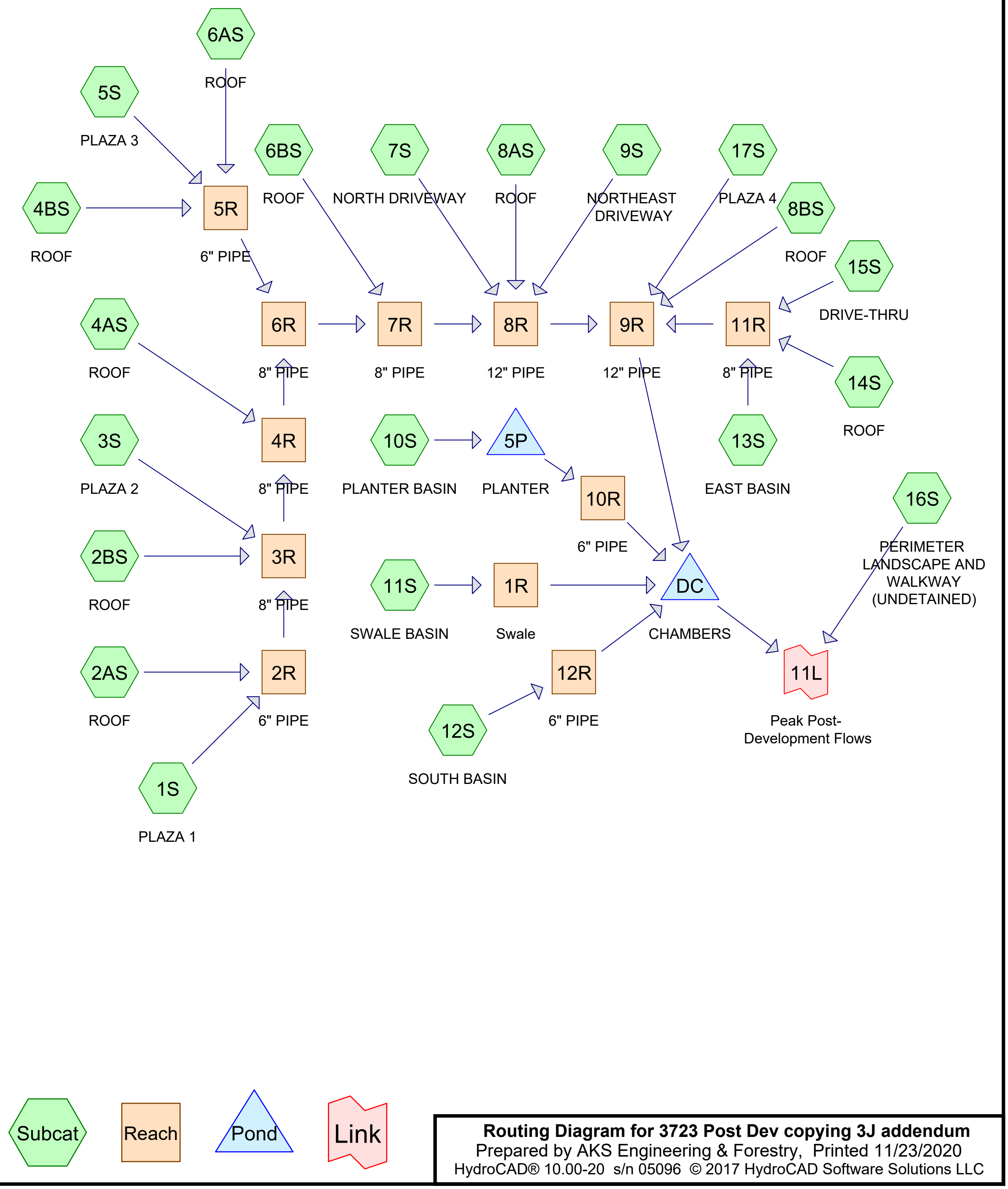
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

	Area (sf)	CN	Description
*	45,738	98	wetland
*	127,457	70	C Soil
*	9,148	77	C soil
	182,343	77	Weighted Average
	136,605		74.92% Pervious Area
	45,738		25.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0310	0.12		**Sheet Flow, Sheet Flow 1** Grass: Dense n= 0.240 P2= 2.50"
2.0	336	0.0302	2.80		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.5	436	Total			

Subcatchment 1S: Pre-Development





Routing Diagram for 3723 Post Dev copying 3J addendum
Prepared by AKS Engineering & Forestry, Printed 11/23/2020
HydroCAD® 10.00-20 s/n 05096 © 2017 HydroCAD Software Solutions LLC

Summary for Subcatchment 1S: PLAZA 1

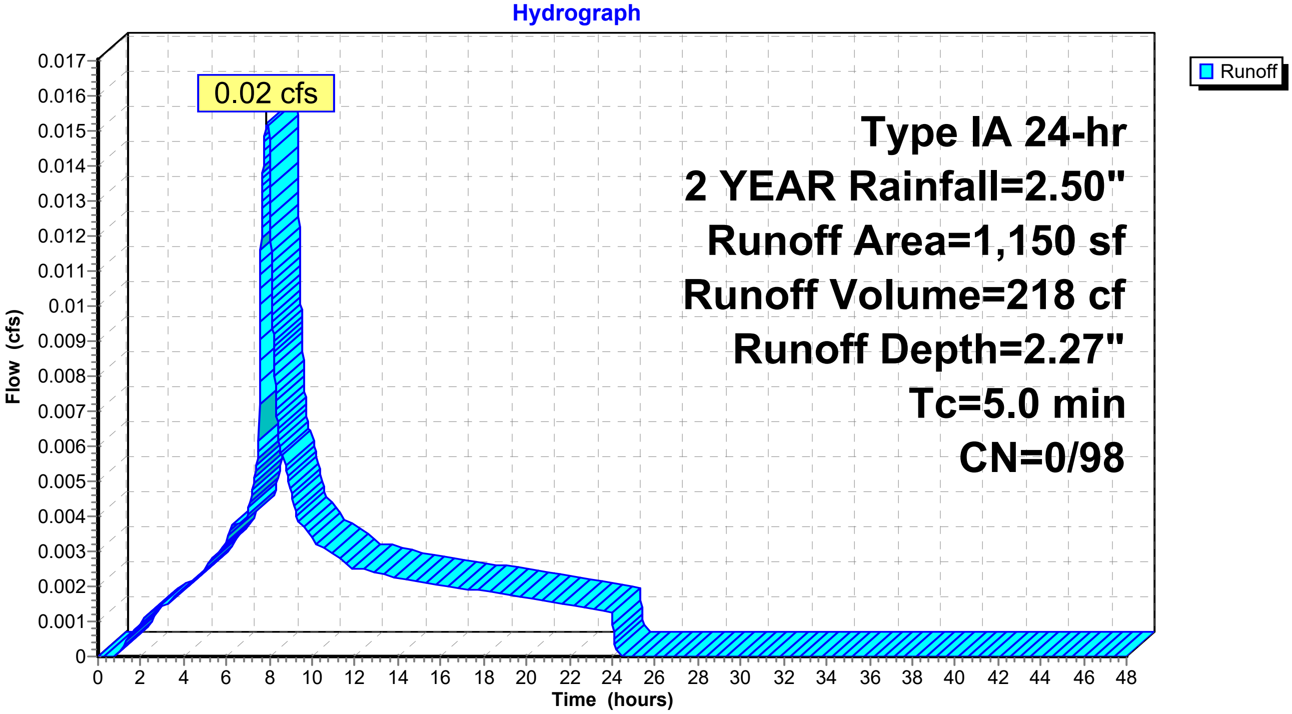
Runoff = 0.02 cfs @ 7.88 hrs, Volume= 218 cf, Depth= 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

Area (sf)	CN	Description
1,150	98	Paved parking, HSG C
1,150		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: PLAZA 1



Summary for Subcatchment 2AS: ROOF

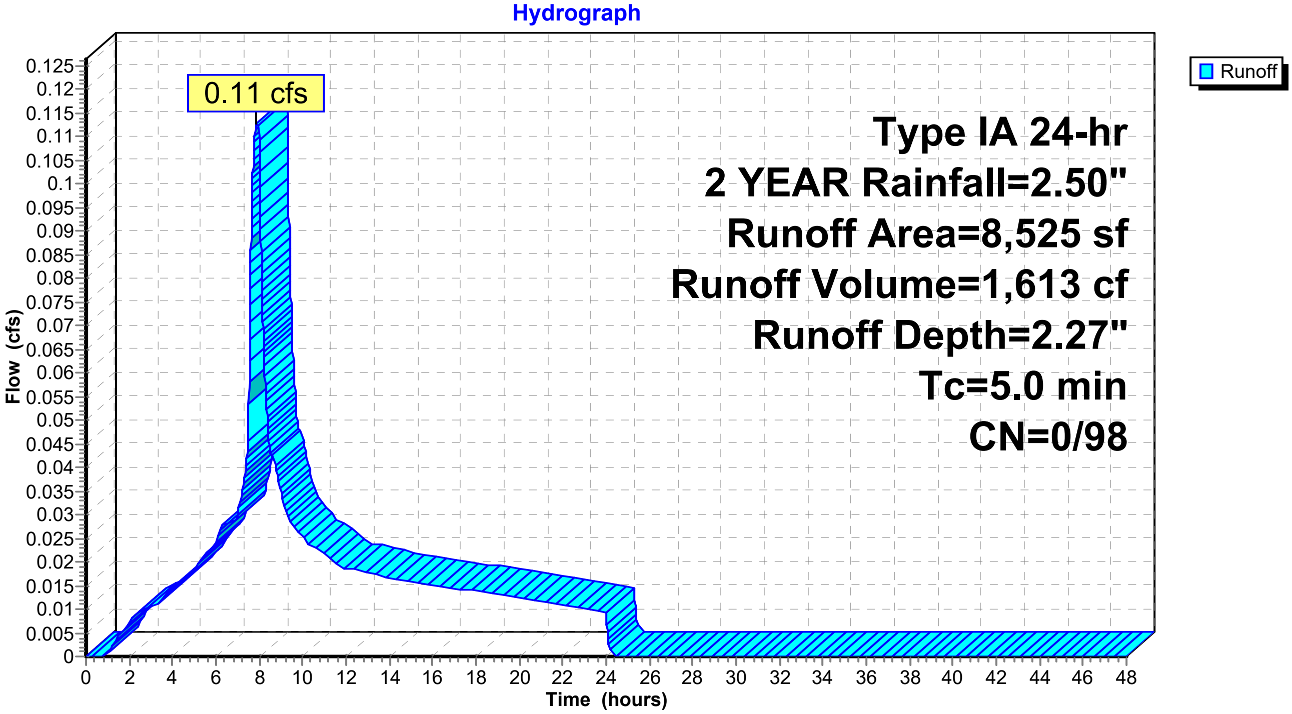
Runoff = 0.11 cfs @ 7.88 hrs, Volume= 1,613 cf, Depth= 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

Area (sf)	CN	Description
8,525	98	Roofs, HSG C
8,525		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2AS: ROOF



Summary for Subcatchment 2BS: ROOF

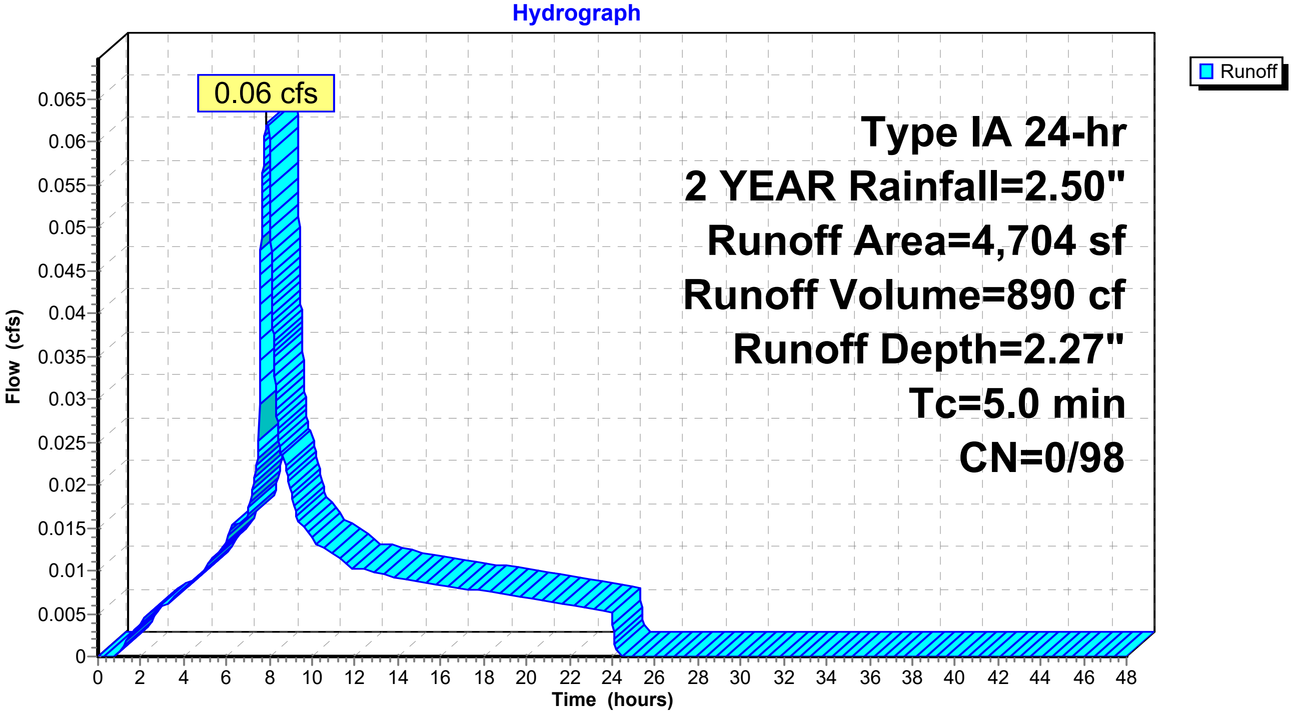
Runoff = 0.06 cfs @ 7.88 hrs, Volume= 890 cf, Depth= 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

Area (sf)	CN	Description
4,704	98	Roofs, HSG C
4,704		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2BS: ROOF



Summary for Subcatchment 3S: PLAZA 2

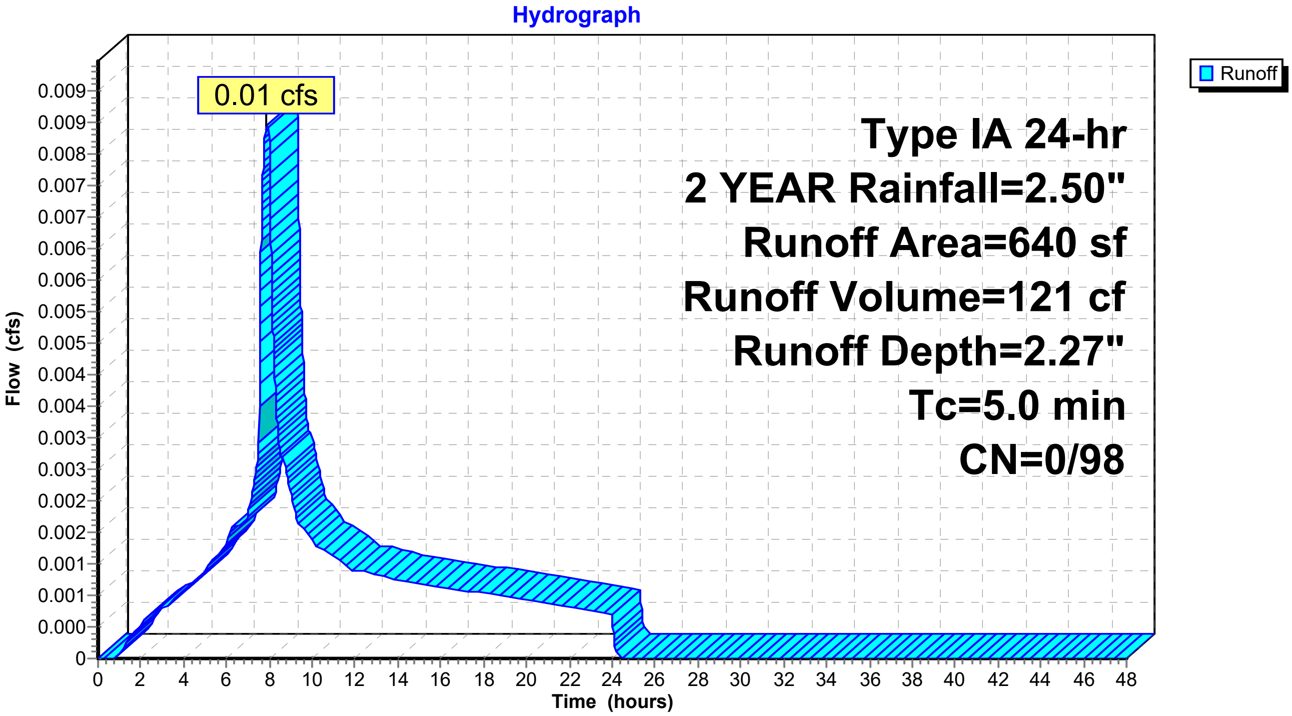
Runoff = 0.01 cfs @ 7.88 hrs, Volume= 121 cf, Depth= 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

Area (sf)	CN	Description
640	98	Paved parking, HSG C
640		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S: PLAZA 2



Summary for Subcatchment 4AS: ROOF

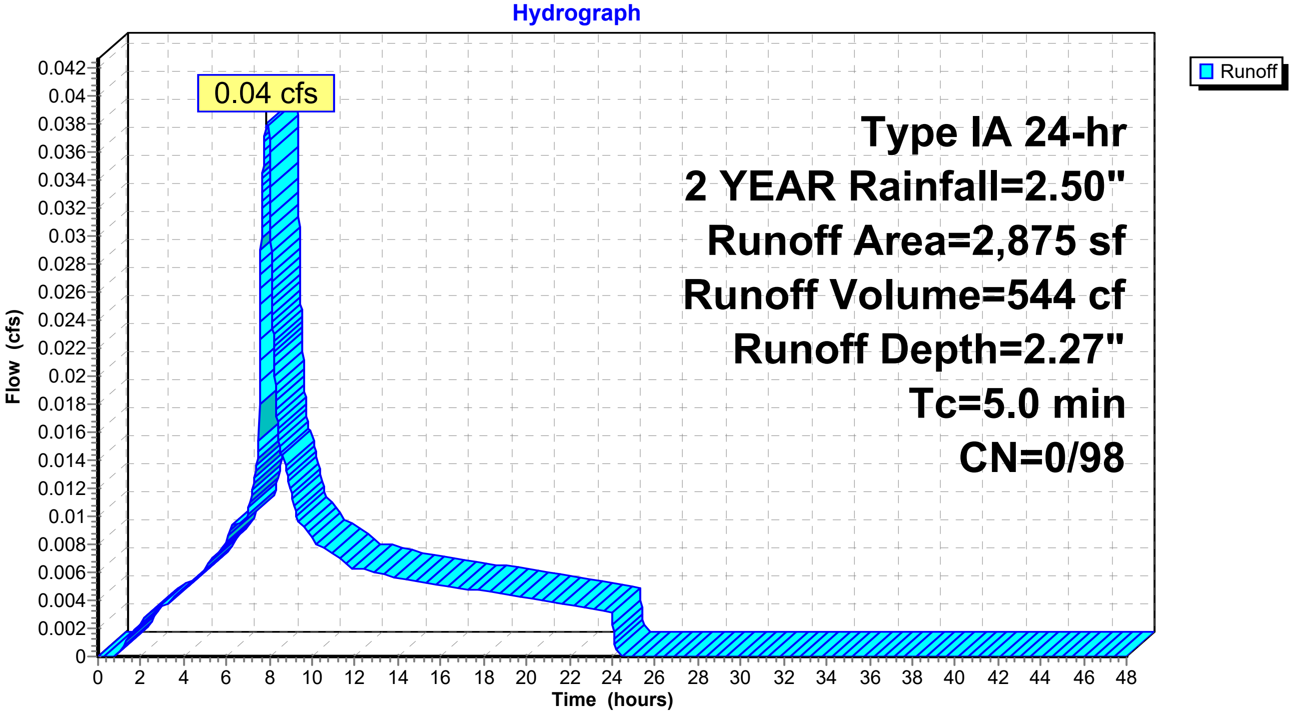
Runoff = 0.04 cfs @ 7.88 hrs, Volume= 544 cf, Depth= 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

Area (sf)	CN	Description
2,875	98	Roofs, HSG C
2,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4AS: ROOF



Summary for Subcatchment 4BS: ROOF

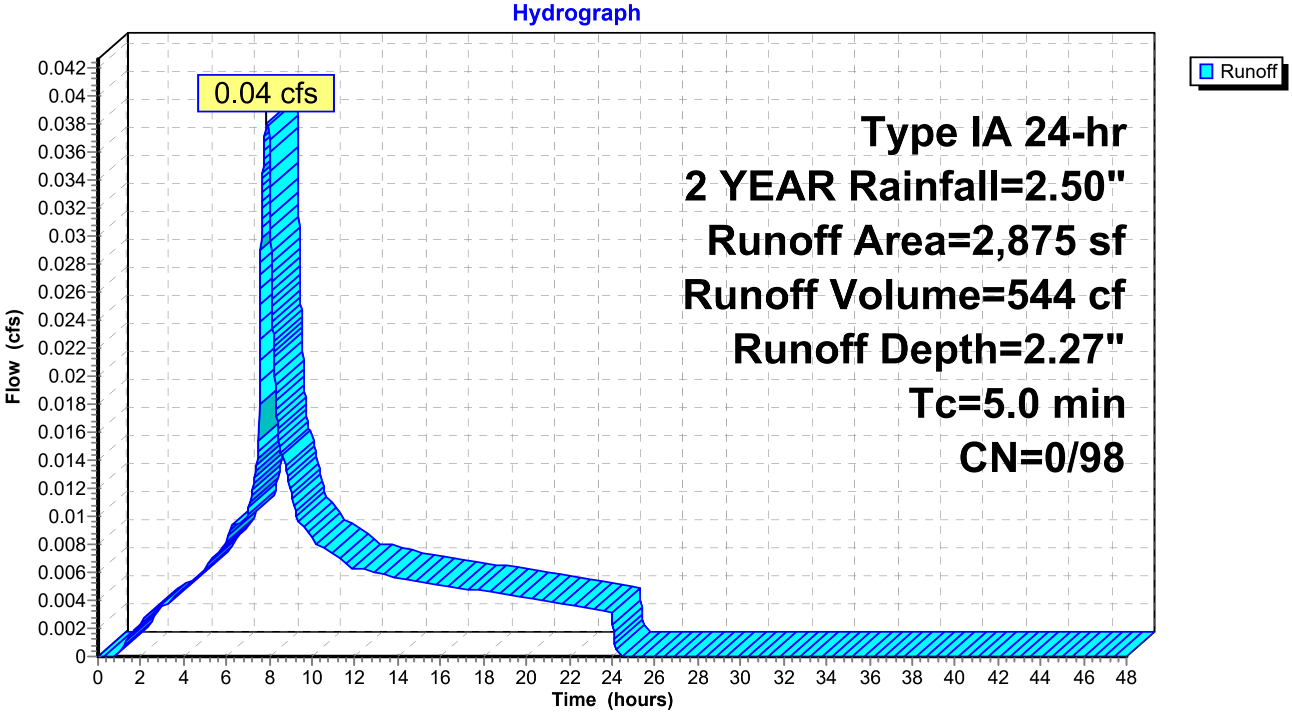
Runoff = 0.04 cfs @ 7.88 hrs, Volume= 544 cf, Depth= 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

Area (sf)	CN	Description
2,875	98	Roofs, HSG C
2,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4BS: ROOF



Summary for Subcatchment 5S: PLAZA 3

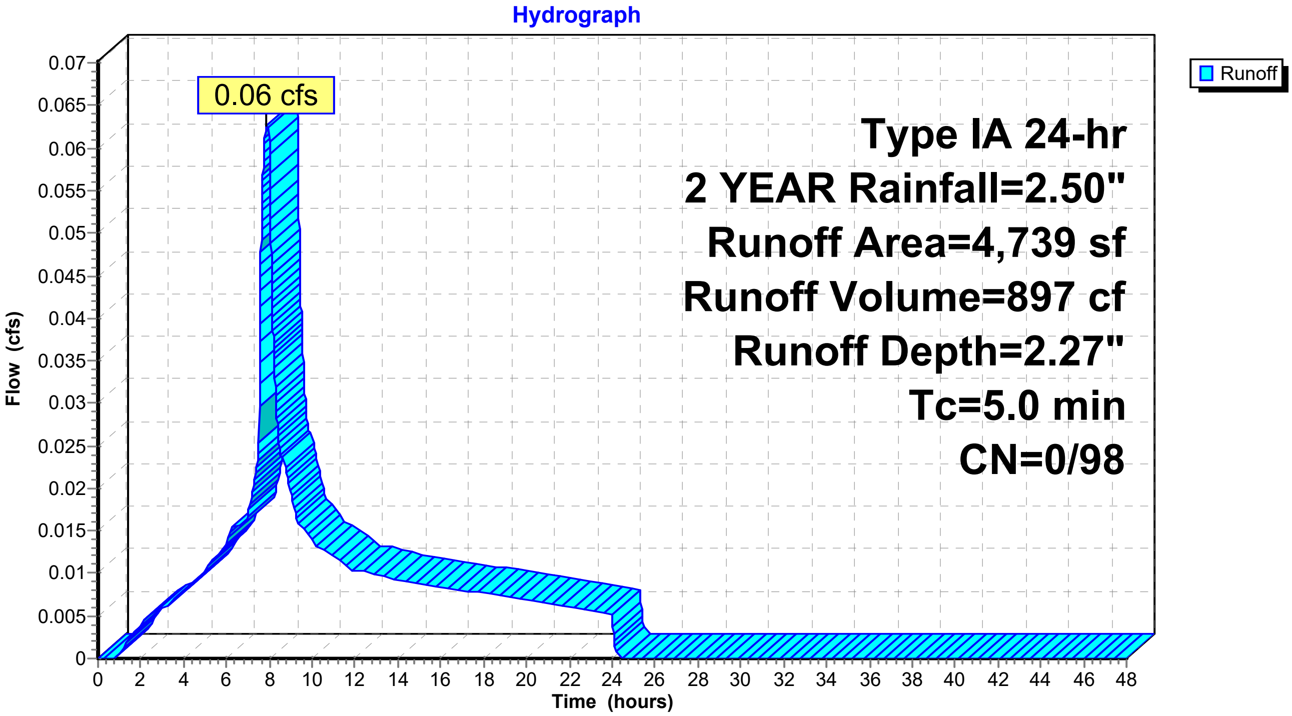
Runoff = 0.06 cfs @ 7.88 hrs, Volume= 897 cf, Depth= 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

Area (sf)	CN	Description
4,739	98	Paved parking, HSG C
4,739		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5S: PLAZA 3



Summary for Subcatchment 6AS: ROOF

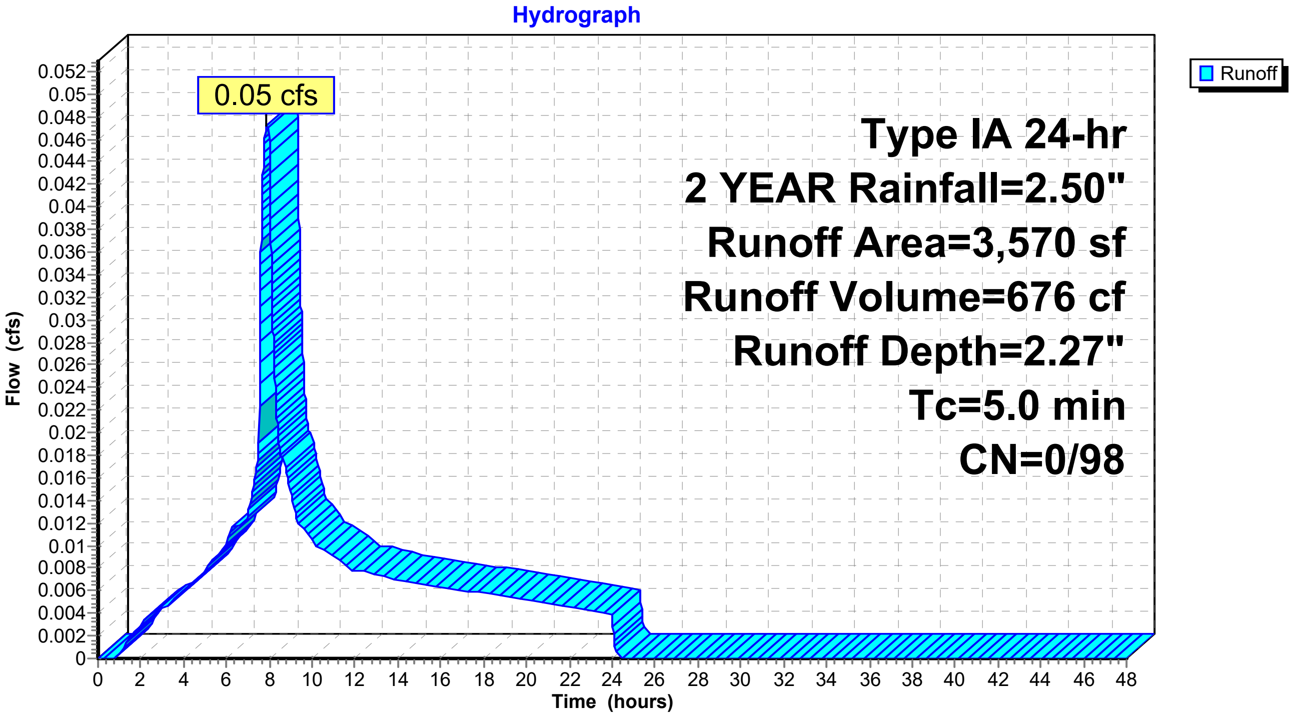
Runoff = 0.05 cfs @ 7.88 hrs, Volume= 676 cf, Depth= 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

Area (sf)	CN	Description
3,570	98	Roofs, HSG C
3,570		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6AS: ROOF



Summary for Subcatchment 6BS: ROOF

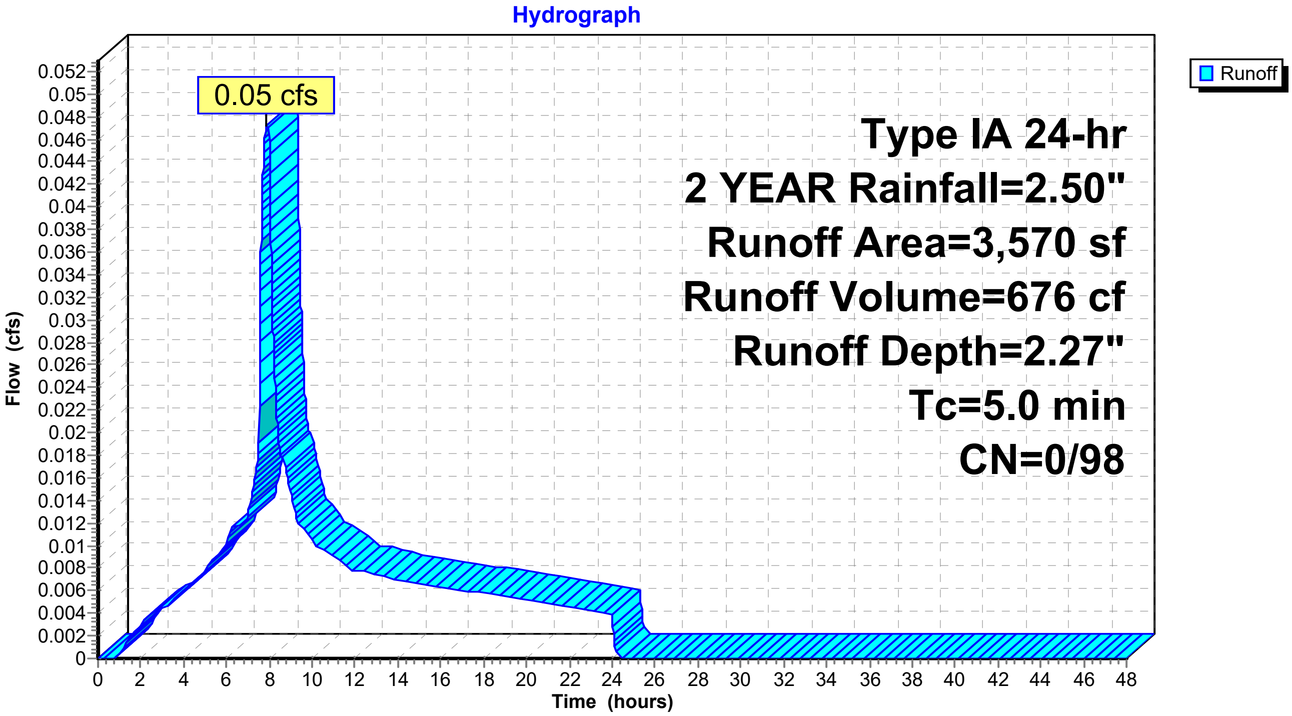
Runoff = 0.05 cfs @ 7.88 hrs, Volume= 676 cf, Depth= 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

Area (sf)	CN	Description
3,570	98	Roofs, HSG C
3,570		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6BS: ROOF



Summary for Subcatchment 7S: NORTH DRIVEWAY

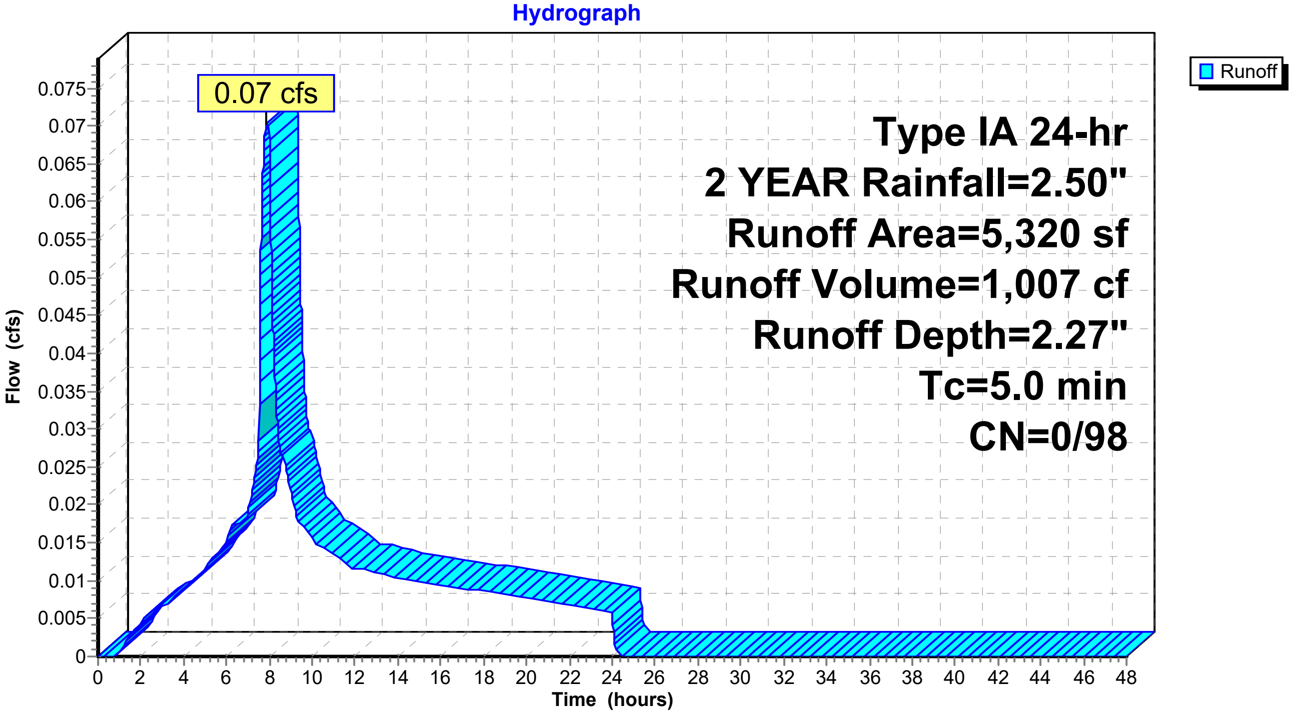
Runoff = 0.07 cfs @ 7.88 hrs, Volume= 1,007 cf, Depth= 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

Area (sf)	CN	Description
5,320	98	Paved parking, HSG C
5,320		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 7S: NORTH DRIVEWAY



Summary for Subcatchment 8AS: ROOF

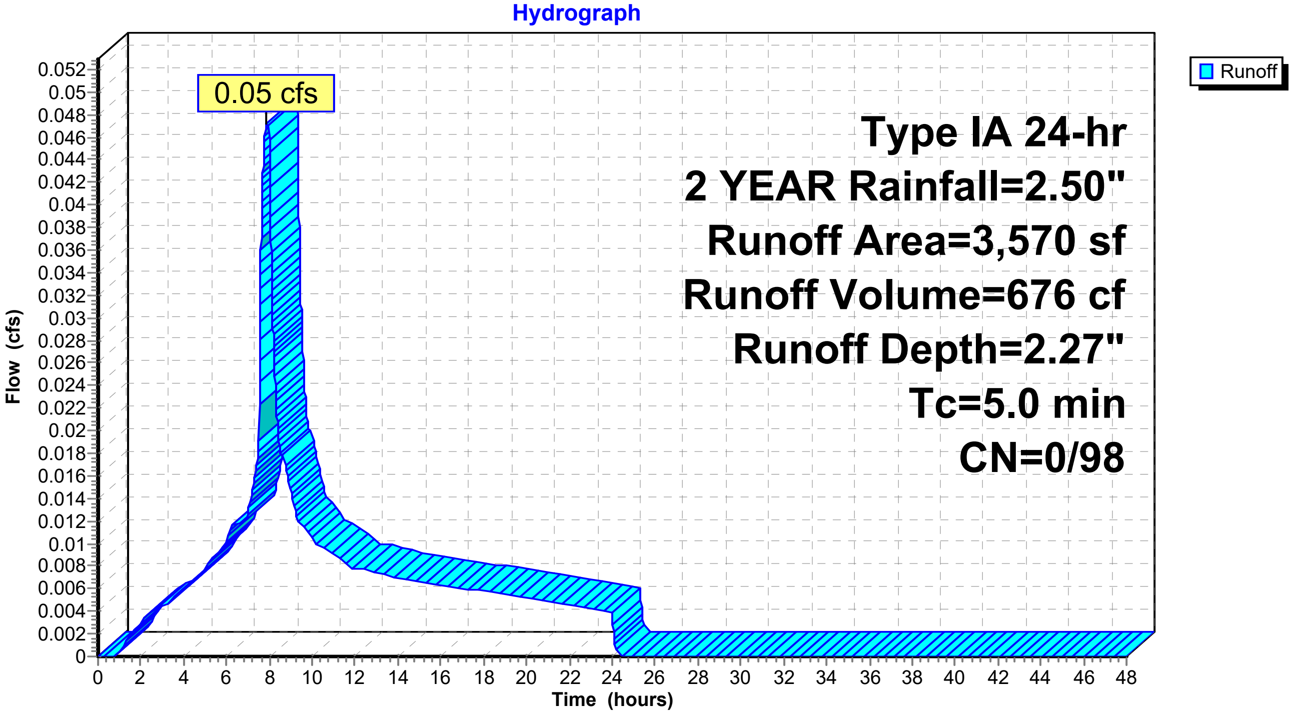
Runoff = 0.05 cfs @ 7.88 hrs, Volume= 676 cf, Depth= 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

Area (sf)	CN	Description
3,570	98	Roofs, HSG C
3,570		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8AS: ROOF



Summary for Subcatchment 8BS: ROOF

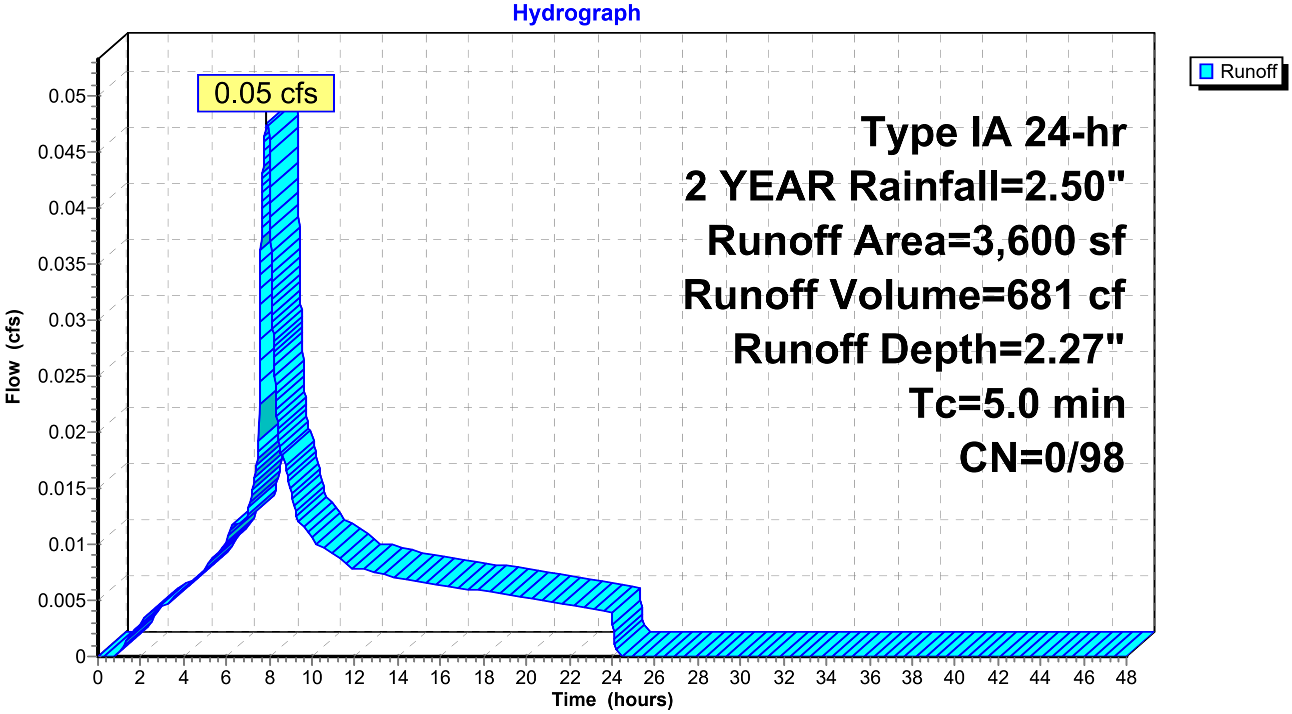
Runoff = 0.05 cfs @ 7.88 hrs, Volume= 681 cf, Depth= 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

Area (sf)	CN	Description
3,600	98	Roofs, HSG C
3,600		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8BS: ROOF



Summary for Subcatchment 9S: NORTHEAST DRIVEWAY

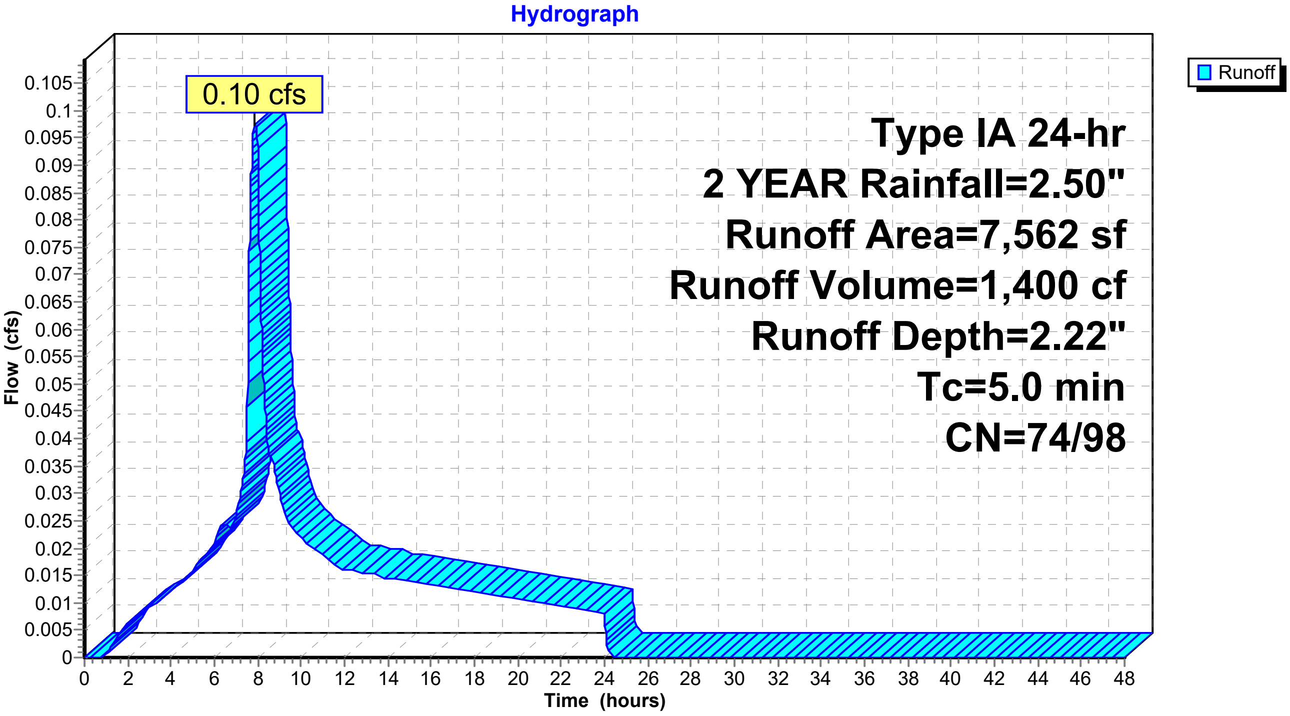
Runoff = 0.10 cfs @ 7.88 hrs, Volume= 1,400 cf, Depth= 2.22"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

Area (sf)	CN	Description
7,340	98	Paved parking, HSG C
222	74	>75% Grass cover, Good, HSG C
7,562	97	Weighted Average
222		2.94% Pervious Area
7,340		97.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 9S: NORTHEAST DRIVEWAY



Summary for Subcatchment 10S: PLANTER BASIN

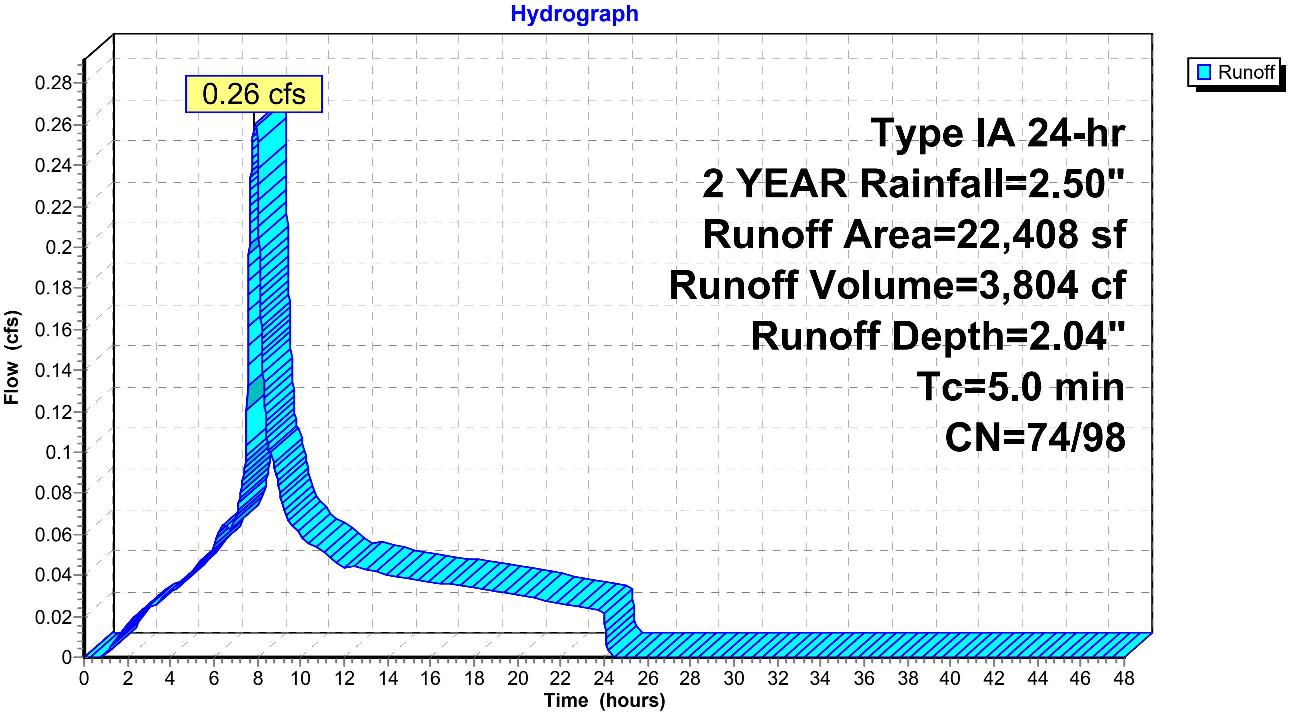
Runoff = 0.26 cfs @ 7.89 hrs, Volume= 3,804 cf, Depth= 2.04"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

	Area (sf)	CN	Description
*	19,258	98	Pavement
	3,150	74	>75% Grass cover, Good, HSG C
	22,408	95	Weighted Average
	3,150		14.06% Pervious Area
	19,258		85.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10S: PLANTER BASIN



Summary for Subcatchment 11S: SWALE BASIN

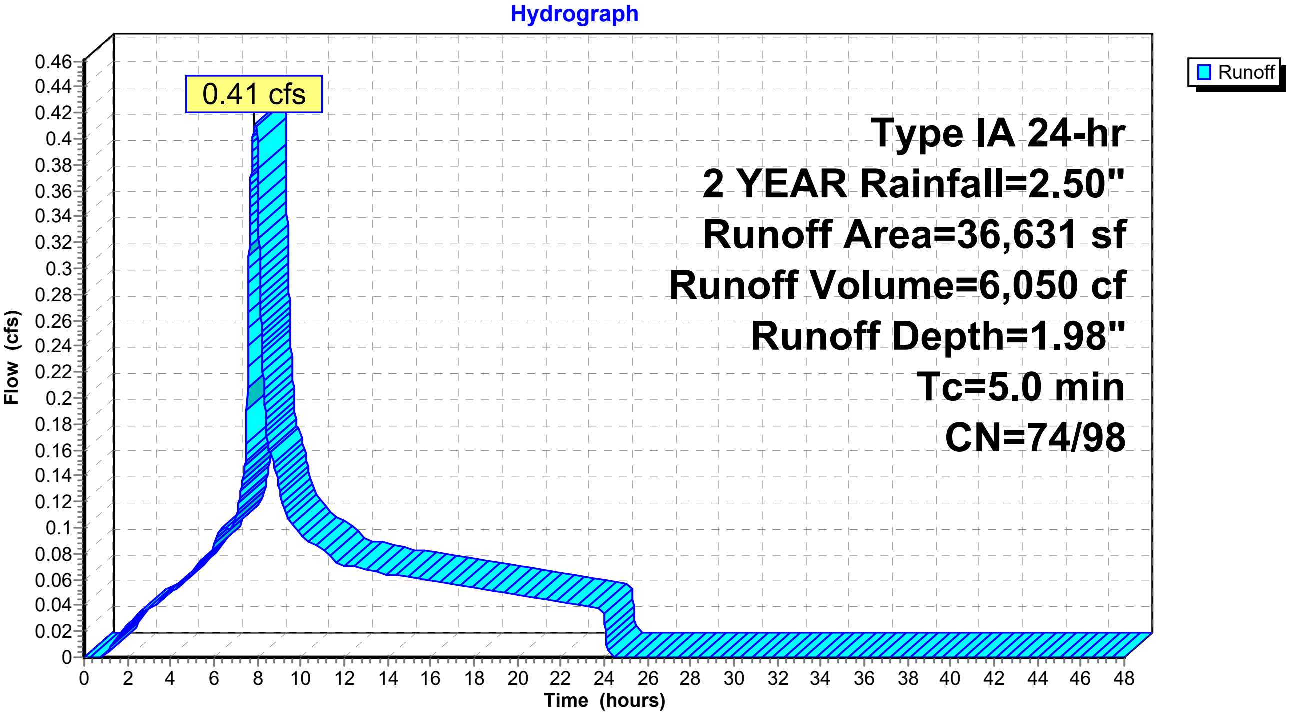
Runoff = 0.41 cfs @ 7.89 hrs, Volume= 6,050 cf, Depth= 1.98"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

	Area (sf)	CN	Description
*	30,268	98	Pavement
	6,363	74	>75% Grass cover, Good, HSG C
	36,631	94	Weighted Average
	6,363		17.37% Pervious Area
	30,268		82.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 11S: SWALE BASIN



Summary for Subcatchment 12S: SOUTH BASIN

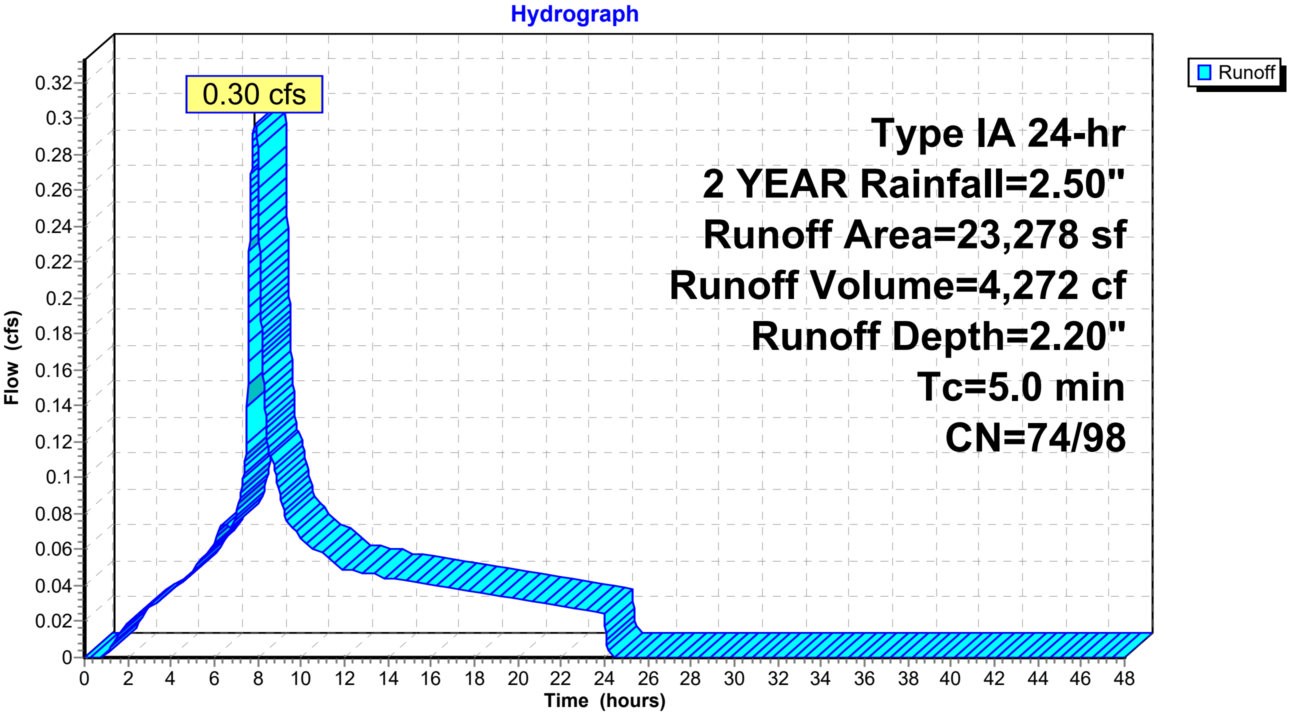
Runoff = 0.30 cfs @ 7.88 hrs, Volume= 4,272 cf, Depth= 2.20"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

	Area (sf)	CN	Description
*	22,316	98	Pavement
	962	74	>75% Grass cover, Good, HSG C
	23,278	97	Weighted Average
	962		4.13% Pervious Area
	22,316		95.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 12S: SOUTH BASIN



Summary for Subcatchment 13S: EAST BASIN

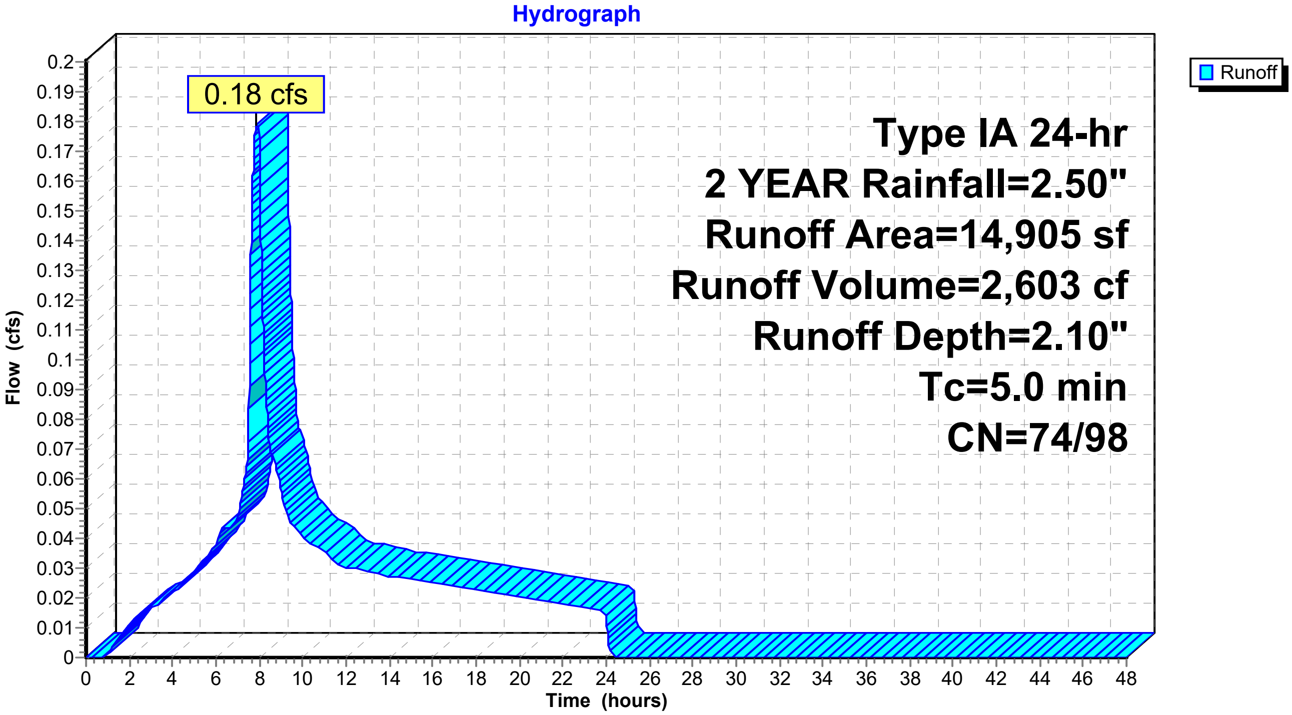
Runoff = 0.18 cfs @ 7.89 hrs, Volume= 2,603 cf, Depth= 2.10"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

	Area (sf)	CN	Description
*	13,332	98	Pavement
	1,573	74	>75% Grass cover, Good, HSG C
	14,905	95	Weighted Average
	1,573		10.55% Pervious Area
	13,332		89.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 13S: EAST BASIN



Summary for Subcatchment 14S: ROOF

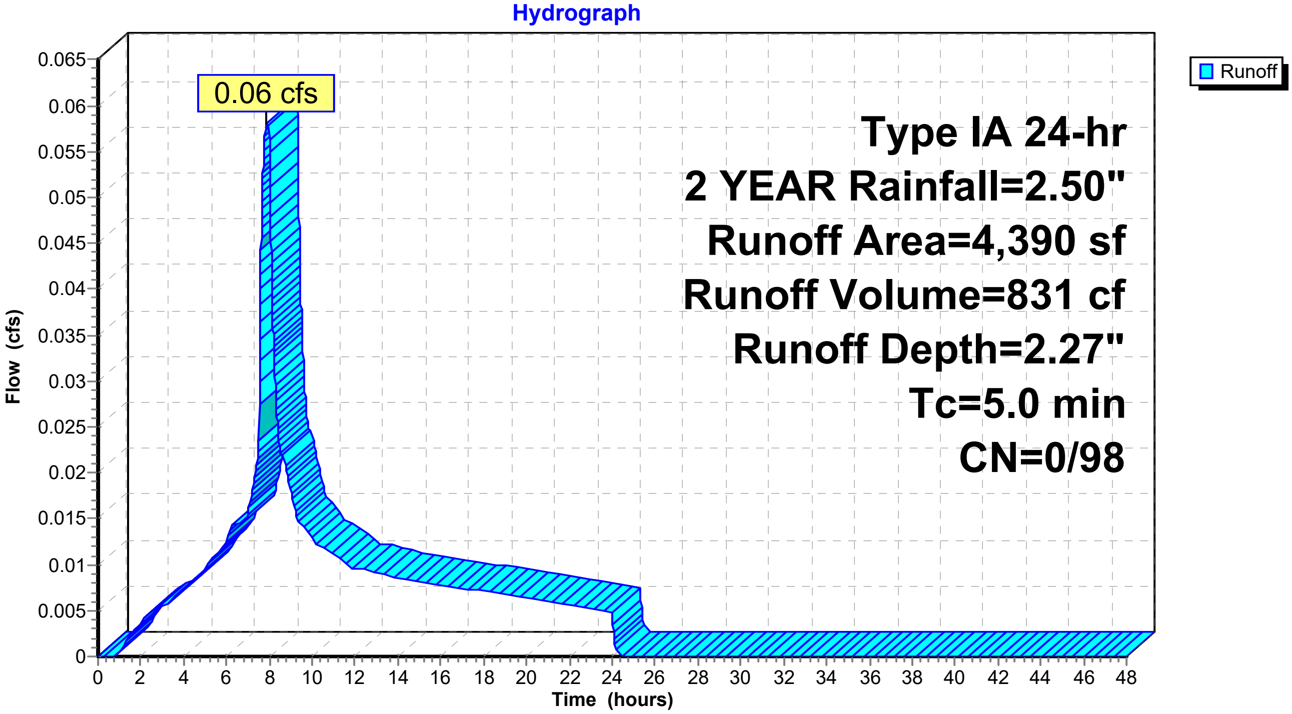
Runoff = 0.06 cfs @ 7.88 hrs, Volume= 831 cf, Depth= 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

Area (sf)	CN	Description
4,390	98	Roofs, HSG C
4,390		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 14S: ROOF



Summary for Subcatchment 15S: DRIVE-THRU

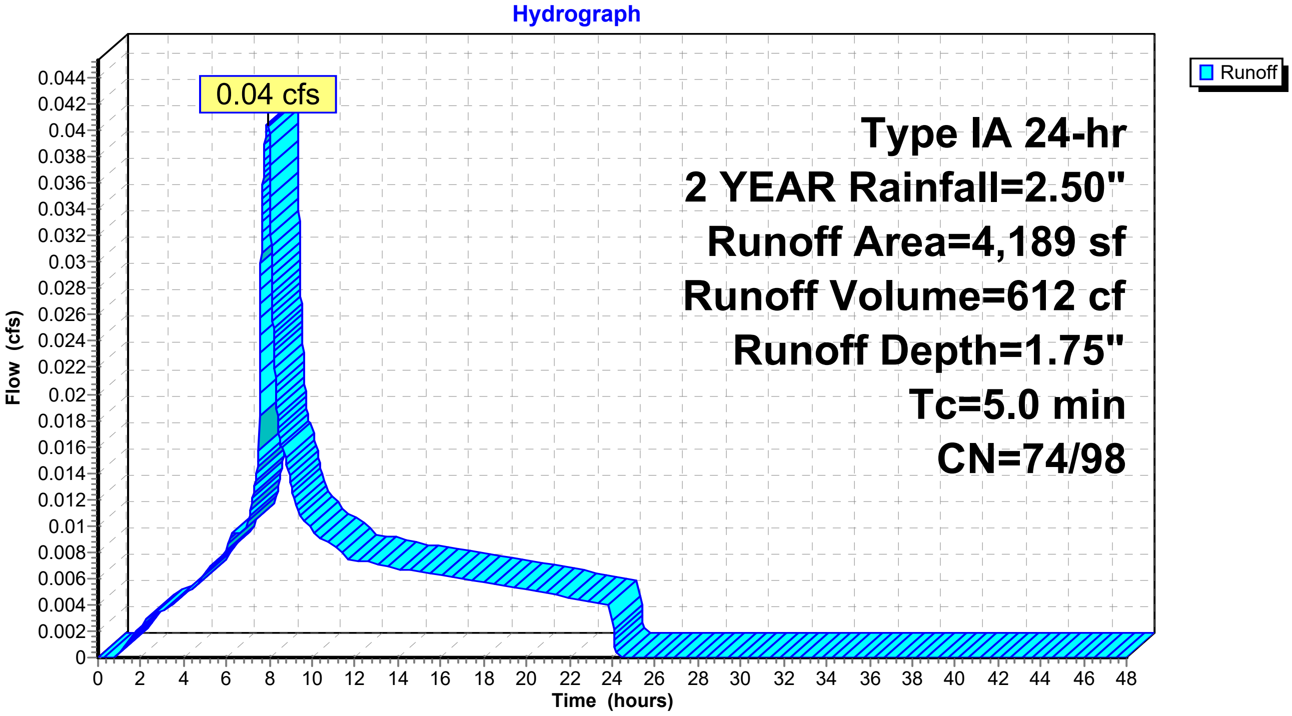
Runoff = 0.04 cfs @ 7.90 hrs, Volume= 612 cf, Depth= 1.75"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

	Area (sf)	CN	Description
*	2,887	98	Pavement
	1,302	74	>75% Grass cover, Good, HSG C
	4,189	91	Weighted Average
	1,302		31.08% Pervious Area
	2,887		68.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 15S: DRIVE-THRU



Summary for Subcatchment 16S: PERIMETER LANDSCAPE AND WALKWAY (UNDETAINED)

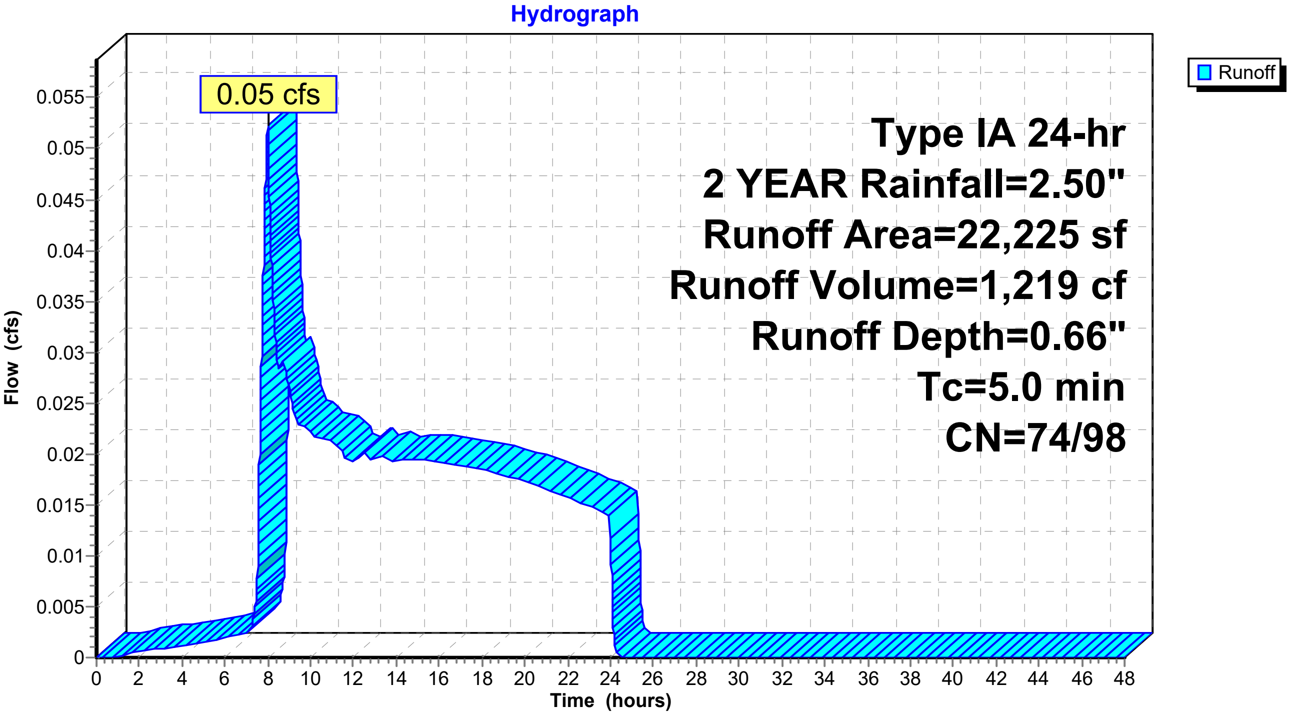
Runoff = 0.05 cfs @ 8.00 hrs, Volume= 1,219 cf, Depth= 0.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

Area (sf)	CN	Description
21,560	74	>75% Grass cover, Good, HSG C
665	98	Paved parking, HSG C
22,225	75	Weighted Average
21,560		97.01% Pervious Area
665		2.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 16S: PERIMETER LANDSCAPE AND WALKWAY (UNDETAINED)



Summary for Subcatchment 17S: PLAZA 4

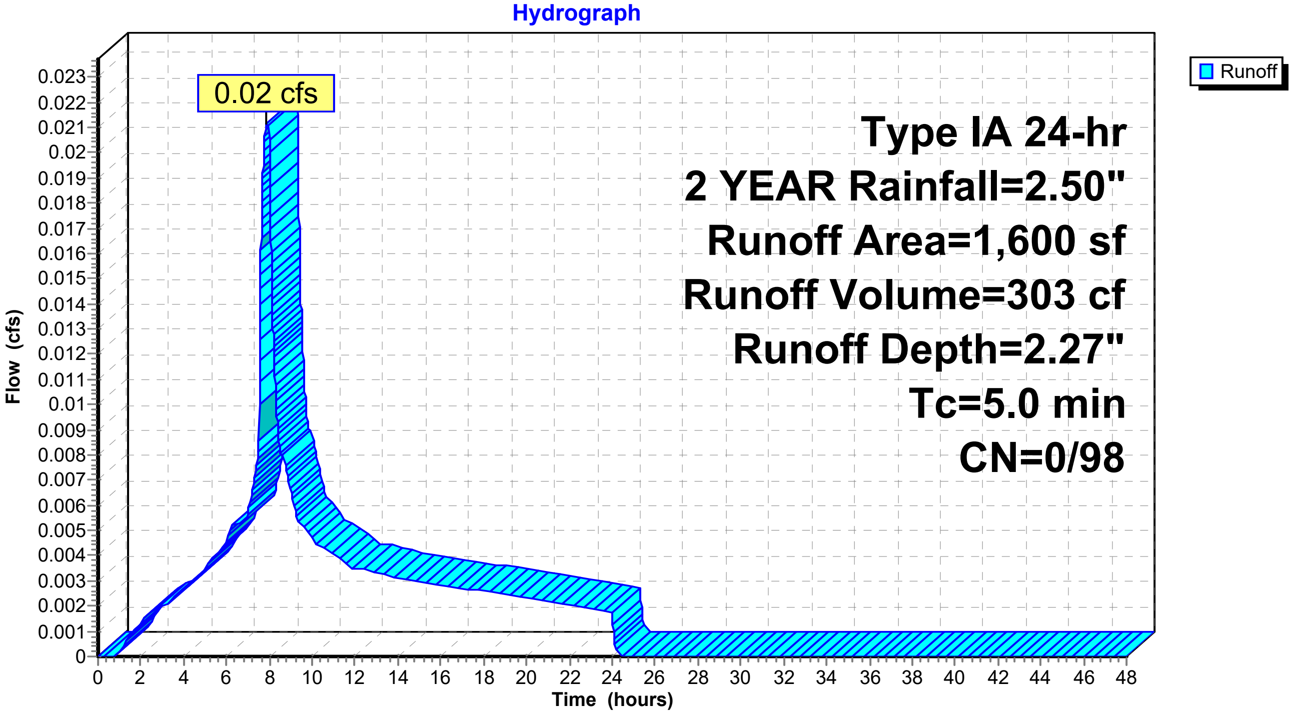
Runoff = 0.02 cfs @ 7.88 hrs, Volume= 303 cf, Depth= 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 YEAR Rainfall=2.50"

Area (sf)	CN	Description
1,600	98	Roofs, HSG C
1,600		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 17S: PLAZA 4



Summary for Reach 1R: Swale

Inflow Area =	36,631 sf,	82.63% Impervious,	Inflow Depth = 1.98"	for 2 YEAR event
Inflow =	0.41 cfs @	7.89 hrs,	Volume=	6,050 cf
Outflow =	0.38 cfs @	8.01 hrs,	Volume=	6,050 cf, Atten= 6%, Lag= 7.4 min

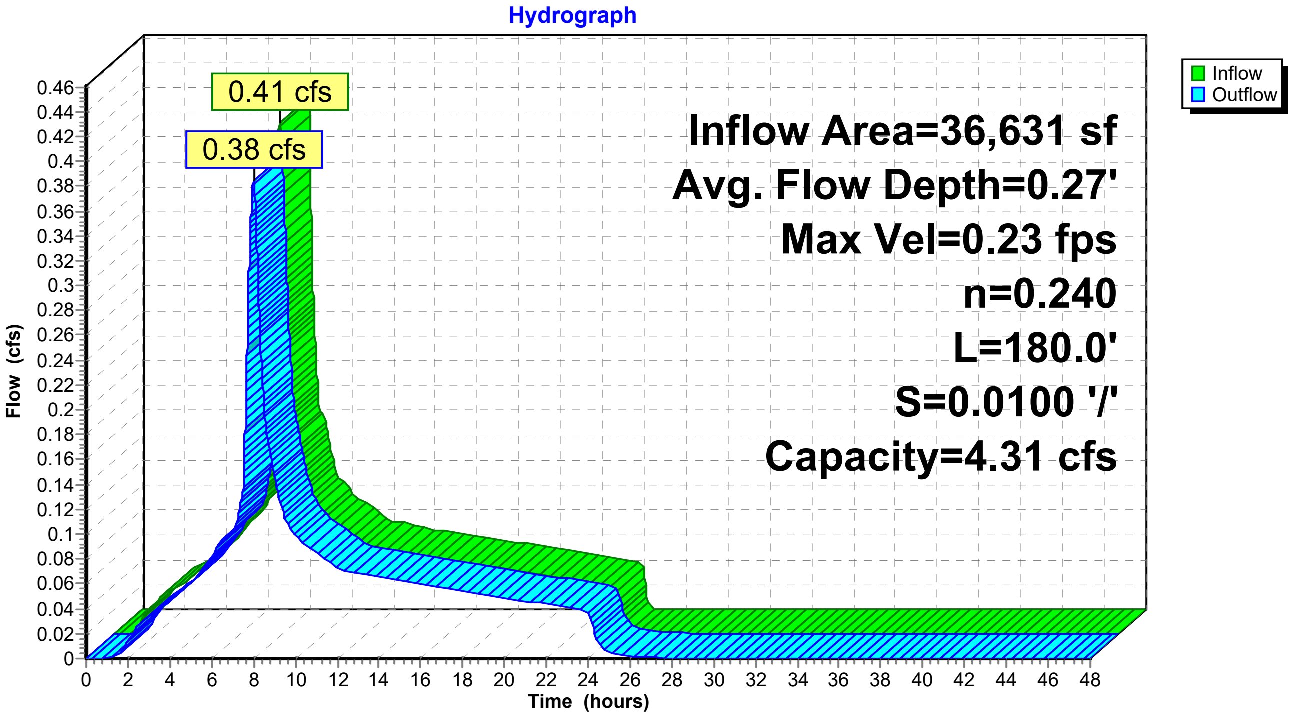
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.23 fps, Min. Travel Time= 12.9 min
Avg. Velocity = 0.09 fps, Avg. Travel Time= 33.3 min

Peak Storage= 299 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 4.31 cfs

5.00' x 1.00' deep channel, n= 0.240
Side Slope Z-value= 4.0 '/' Top Width= 13.00'
Length= 180.0' Slope= 0.0100 '/'
Inlet Invert= 202.00', Outlet Invert= 200.20'

‡

Reach 1R: Swale



Summary for Reach 2R: 6" PIPE

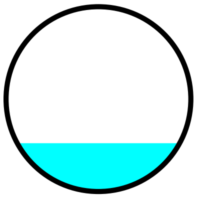
[52] Hint: Inlet/Outlet conditions not evaluated

```
Inflow Area =          9,675 sf,100.00% Impervious,  Inflow Depth =  2.27"   for  2 YEAR event
Inflow      =       0.13 cfs @    7.88 hrs,  Volume=            1,831 cf
Outflow     =       0.13 cfs @    7.88 hrs,  Volume=            1,831 cf,  Atten= 0%,  Lag= 0.3 min
```

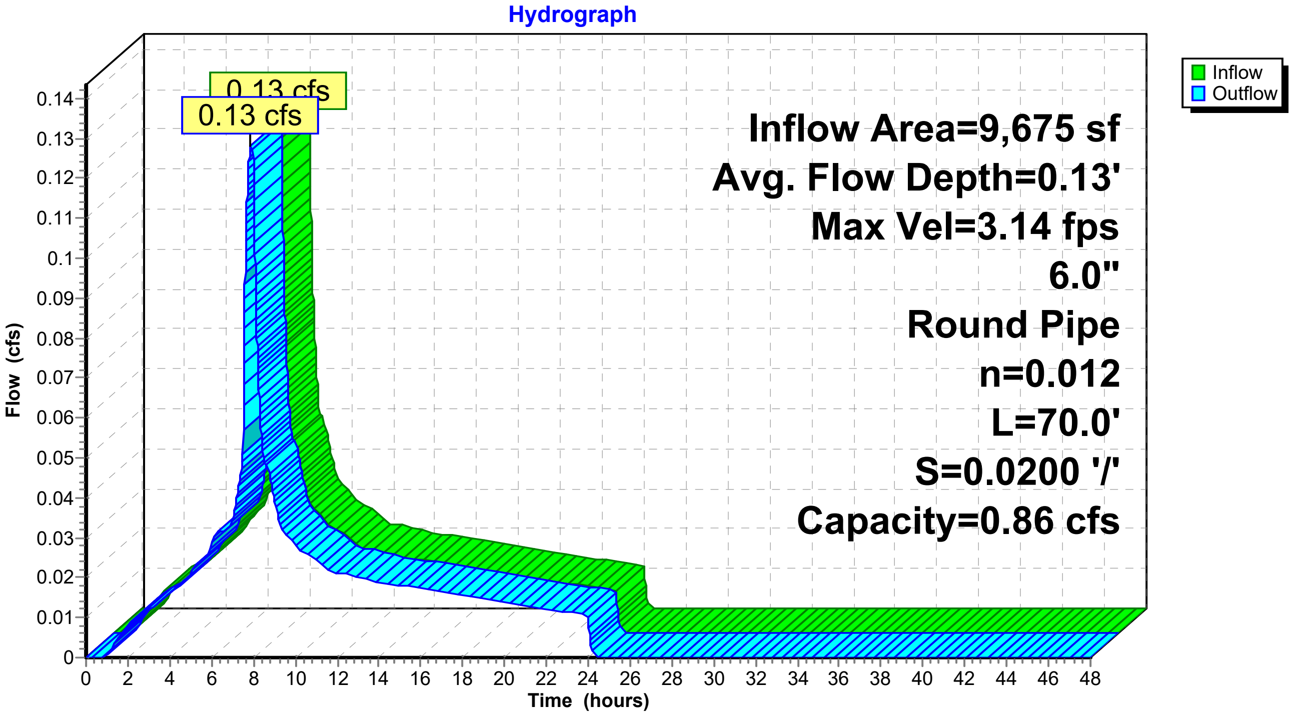
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.14 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.76 fps, Avg. Travel Time= 0.7 min

Peak Storage= 3 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.86 cfs

6.0" Round Pipe
n= 0.012
Length= 70.0' Slope= 0.0200 '/'
Inlet Invert= 203.36', Outlet Invert= 201.96'



Reach 2R: 6" PIPE



Summary for Reach 3R: 8" PIPE

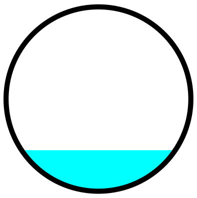
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 2R OUTLET depth by 0.02' @ 8.02 hrs

```
Inflow Area =         15,019 sf,100.00% Impervious,  Inflow Depth =   2.27"    for  2 YEAR event
Inflow      =        0.20 cfs @    7.88 hrs,  Volume=            2,842 cf
Outflow     =        0.20 cfs @    7.89 hrs,  Volume=            2,842 cf,  Atten= 0%,  Lag= 0.3 min
```

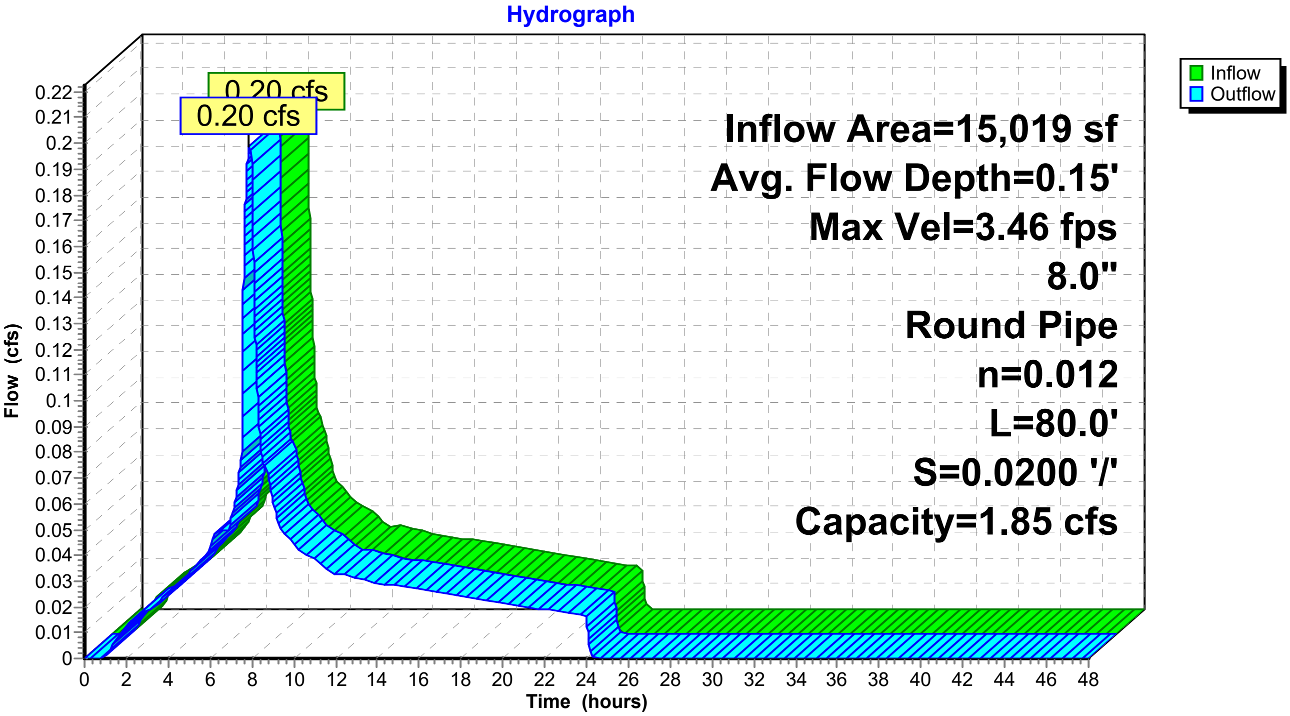
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.46 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.93 fps, Avg. Travel Time= 0.7 min

Peak Storage= 5 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.85 cfs

8.0" Round Pipe
n= 0.012
Length= 80.0' Slope= 0.0200 '/'
Inlet Invert= 201.96', Outlet Invert= 200.36'



Reach 3R: 8" PIPE



Summary for Reach 4R: 8" PIPE

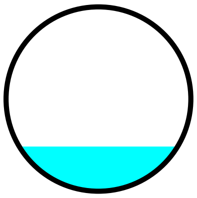
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 3R OUTLET depth by 0.01' @ 8.03 hrs

```
Inflow Area =        17,894 sf,100.00% Impervious,  Inflow Depth =   2.27"    for  2 YEAR event
Inflow      =      0.24 cfs @    7.89 hrs,  Volume=           3,386 cf
Outflow     =      0.24 cfs @    7.89 hrs,  Volume=           3,386 cf,  Atten= 0%,  Lag= 0.3 min
```

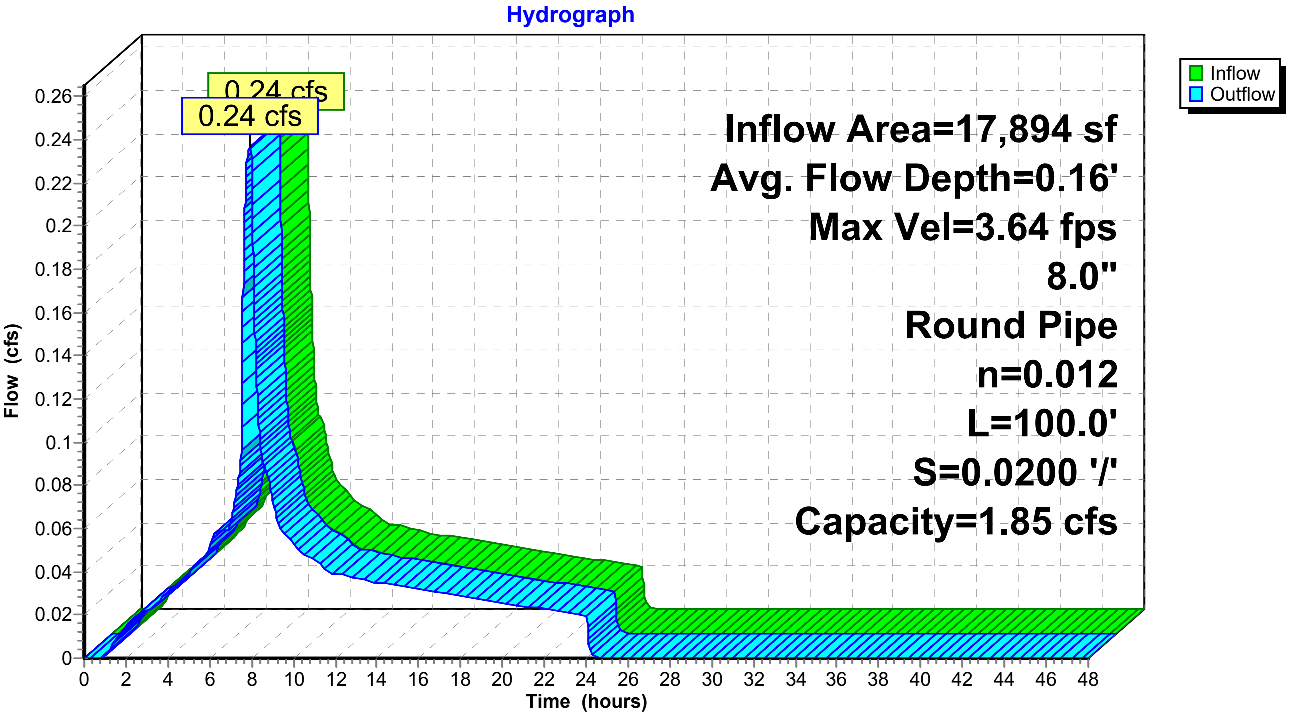
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.64 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 2.03 fps, Avg. Travel Time= 0.8 min

Peak Storage= 6 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.85 cfs

8.0" Round Pipe
n= 0.012
Length= 100.0' Slope= 0.0200 '/'
Inlet Invert= 200.36', Outlet Invert= 198.36'



Reach 4R: 8" PIPE



Summary for Reach 5R: 6" PIPE

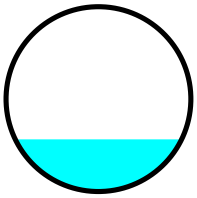
[52] Hint: Inlet/Outlet conditions not evaluated

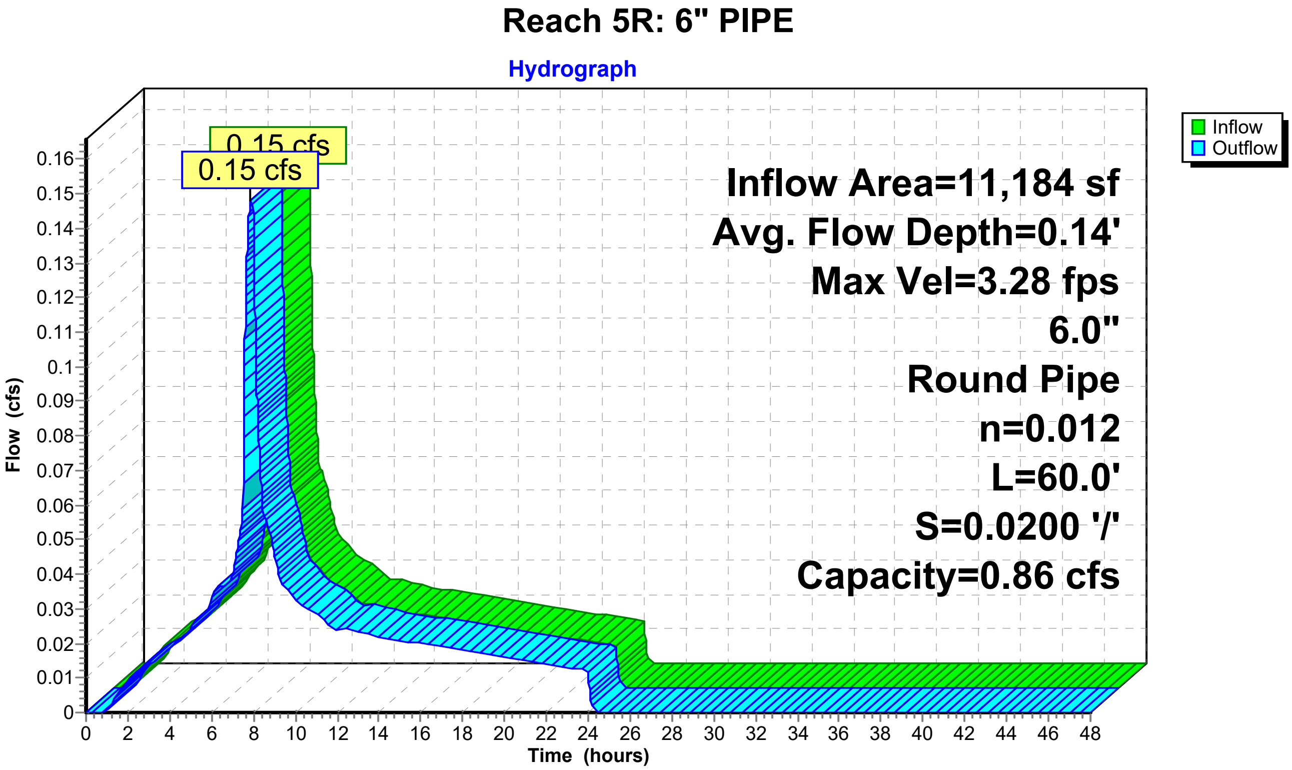
Inflow Area = 11,184 sf,100.00% Impervious, Inflow Depth = 2.27" for 2 YEAR event
Inflow = 0.15 cfs @ 7.88 hrs, Volume= 2,116 cf
Outflow = 0.15 cfs @ 7.88 hrs, Volume= 2,116 cf, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.28 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.84 fps, Avg. Travel Time= 0.5 min

Peak Storage= 3 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.86 cfs

6.0" Round Pipe
n= 0.012
Length= 60.0' Slope= 0.0200 '/'
Inlet Invert= 199.56', Outlet Invert= 198.36'





Summary for Reach 6R: 8" PIPE

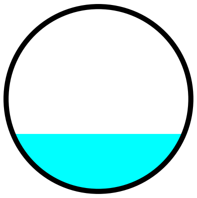
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 4R OUTLET depth by 0.05' @ 7.89 hrs
[62] Hint: Exceeded Reach 5R OUTLET depth by 0.07' @ 7.91 hrs

```
Inflow Area =         29,078 sf,100.00% Impervious,  Inflow Depth =   2.27"    for  2 YEAR event
Inflow       =        0.38 cfs @     7.89 hrs,  Volume=             5,502 cf
Outflow      =        0.38 cfs @     7.89 hrs,  Volume=             5,502 cf,  Atten= 0%,  Lag= 0.2 min
```

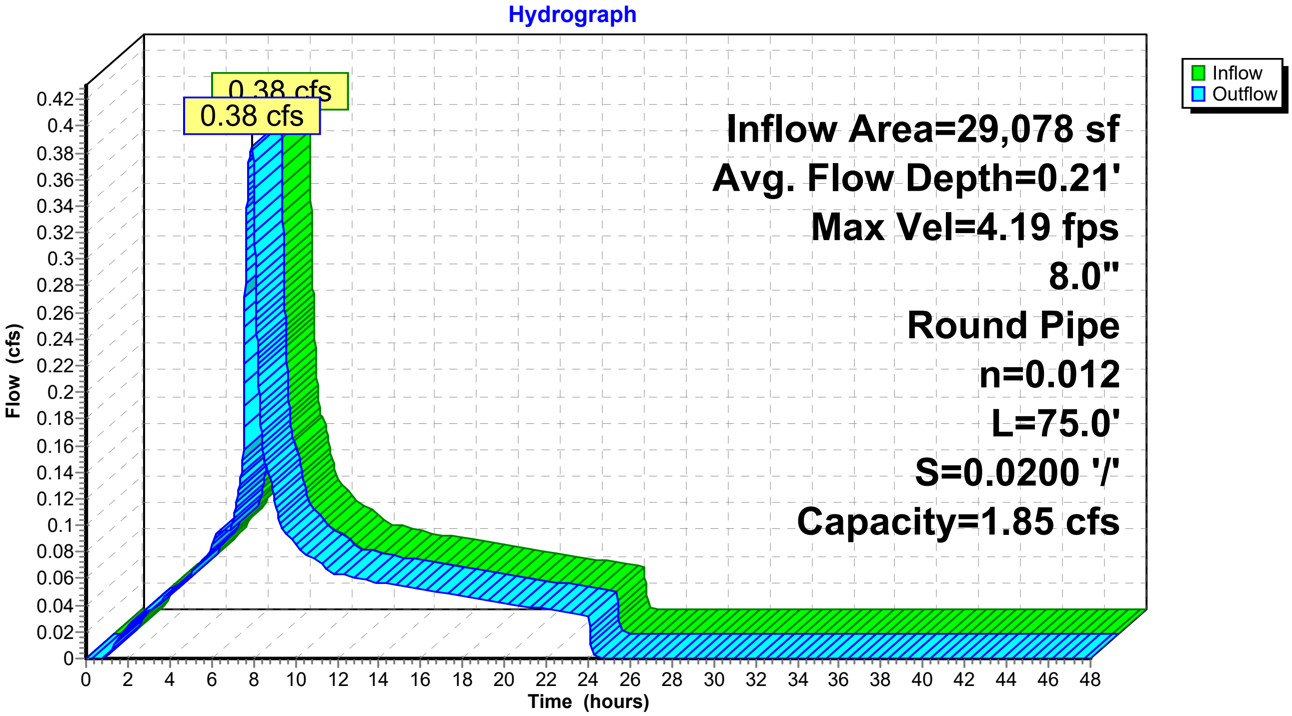
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.19 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.34 fps, Avg. Travel Time= 0.5 min

Peak Storage= 7 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.85 cfs

8.0" Round Pipe
n= 0.012
Length= 75.0' Slope= 0.0200 '/'
Inlet Invert= 198.36', Outlet Invert= 196.86'



Reaction 6R: 8" PIPE



Summary for Reach 7R: 8" PIPE

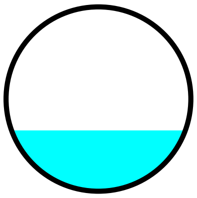
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 6R OUTLET depth by 0.01' @ 7.90 hrs

```
Inflow Area =       32,648 sf,100.00% Impervious,  Inflow Depth =   2.27"    for  2 YEAR event
Inflow      =      0.43 cfs @    7.89 hrs,  Volume=           6,178 cf
Outflow     =      0.43 cfs @    7.89 hrs,  Volume=           6,178 cf,  Atten= 0%,  Lag= 0.1 min
```

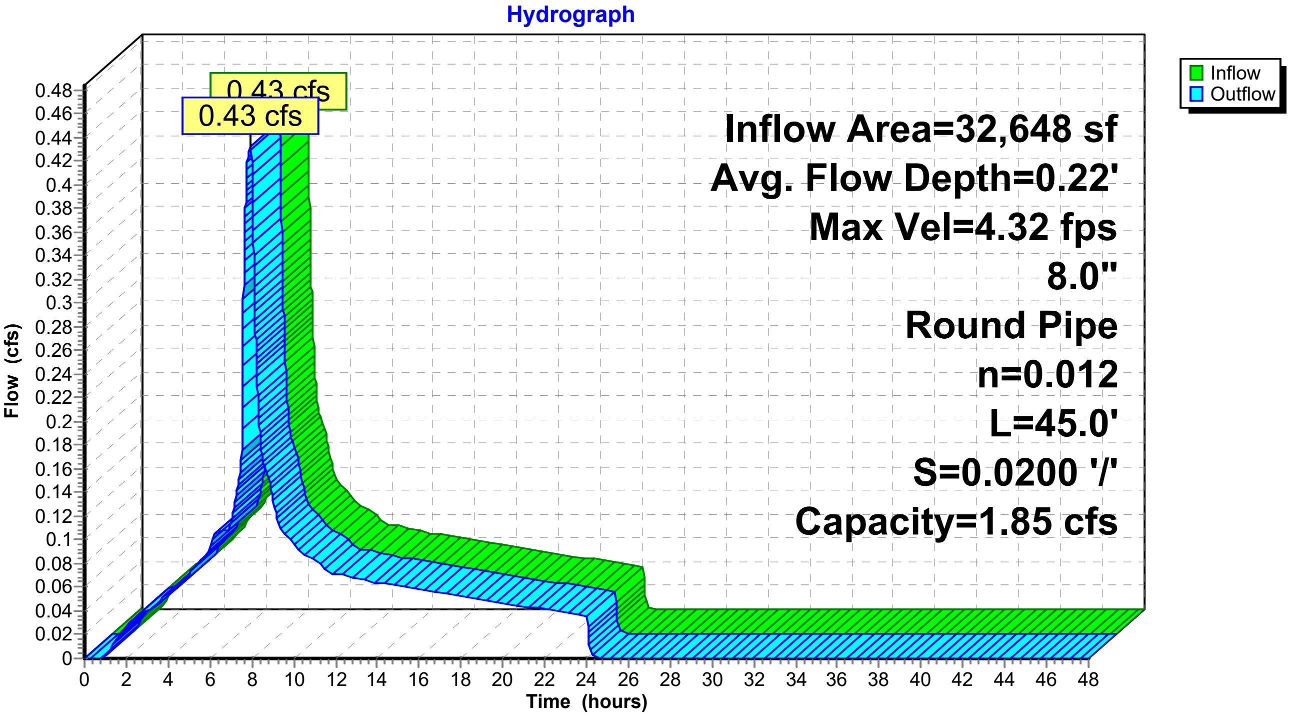
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.32 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.42 fps, Avg. Travel Time= 0.3 min

Peak Storage= 4 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.22'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.85 cfs

8.0" Round Pipe
n= 0.012
Length= 45.0' Slope= 0.0200 '/'
Inlet Invert= 196.86', Outlet Invert= 195.96'



Reach 7R: 8" PIPE



Summary for Reach 8R: 12" PIPE

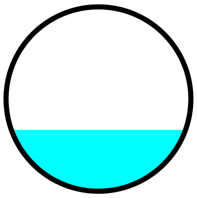
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 7R OUTLET depth by 0.11' @ 7.90 hrs

```
Inflow Area =          49,100 sf,  99.55% Impervious,  Inflow Depth =   2.26"    for  2 YEAR event
Inflow      =        0.65 cfs @    7.89 hrs,  Volume=             9,260 cf
Outflow     =        0.65 cfs @    7.90 hrs,  Volume=             9,260 cf,  Atten= 0%,  Lag= 0.4 min
```

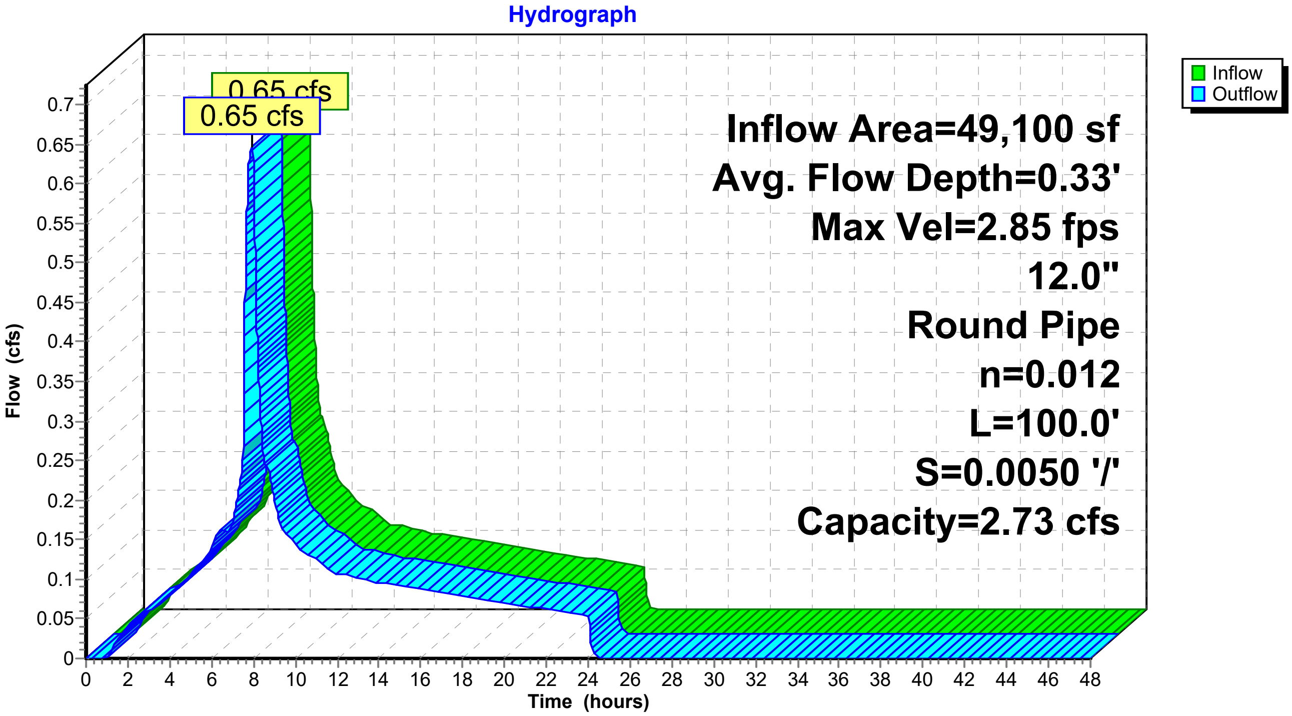
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.85 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.59 fps, Avg. Travel Time= 1.1 min

Peak Storage= 23 cf @ 7.90 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.73 cfs

12.0" Round Pipe
n= 0.012
Length= 100.0' Slope= 0.0050 '/'
Inlet Invert= 195.96', Outlet Invert= 195.46'



Reach 8R: 12" PIPE



Summary for Reach 9R: 12" PIPE

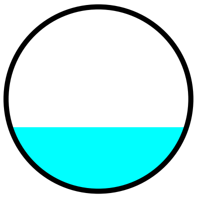
[52] Hint: Inlet/Outlet conditions not evaluated
[61] Hint: Exceeded Reach 11R outlet invert by 0.18' @ 7.89 hrs

```
Inflow Area =        77,784 sf,  96.02% Impervious,  Inflow Depth =   2.20"    for  2 YEAR event
Inflow      =        0.99 cfs @    7.89 hrs,  Volume=          14,290 cf
Outflow     =        0.99 cfs @    7.89 hrs,  Volume=          14,290 cf,  Atten= 0%,  Lag= 0.1 min
```

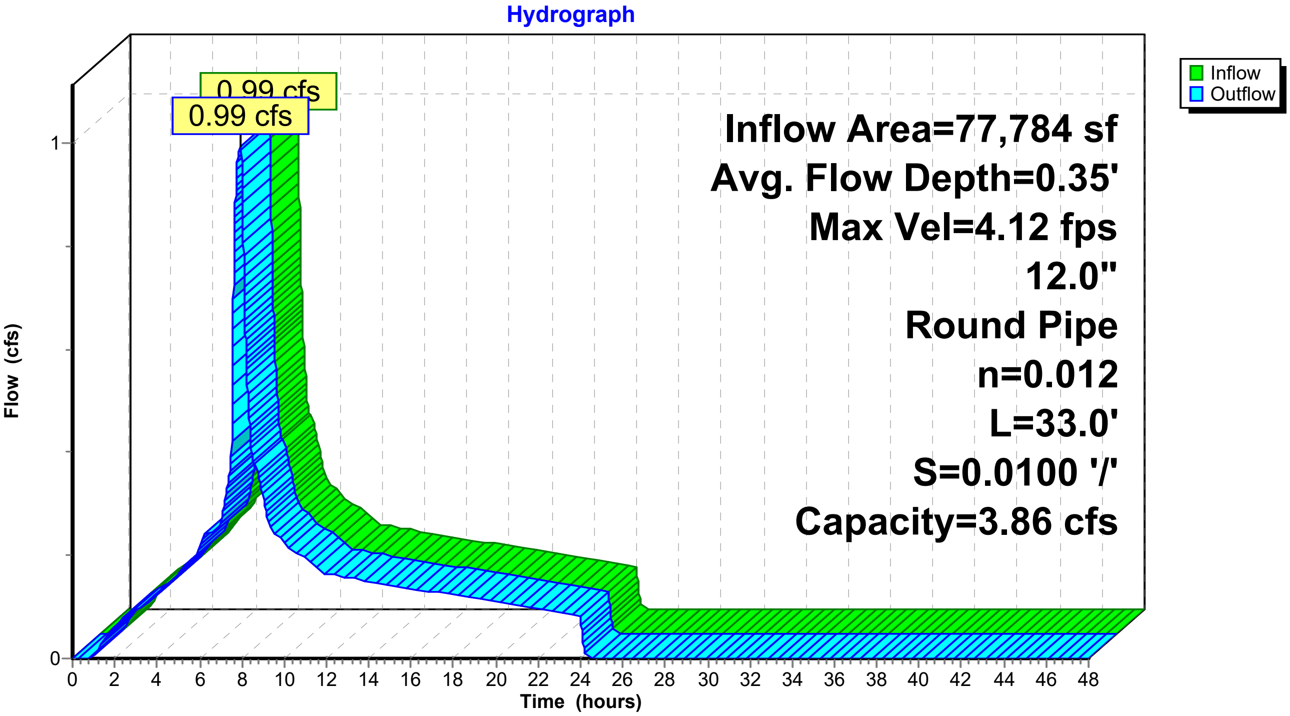
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.12 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.30 fps, Avg. Travel Time= 0.2 min

Peak Storage= 8 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.86 cfs

12.0" Round Pipe
n= 0.012
Length= 33.0' Slope= 0.0100 '/'
Inlet Invert= 194.33', Outlet Invert= 194.00'



Reach 9R: 12" PIPE



Summary for Reach 10R: 6" PIPE

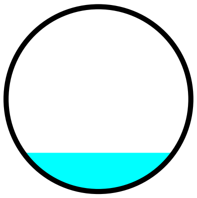
[52] Hint: Inlet/Outlet conditions not evaluated

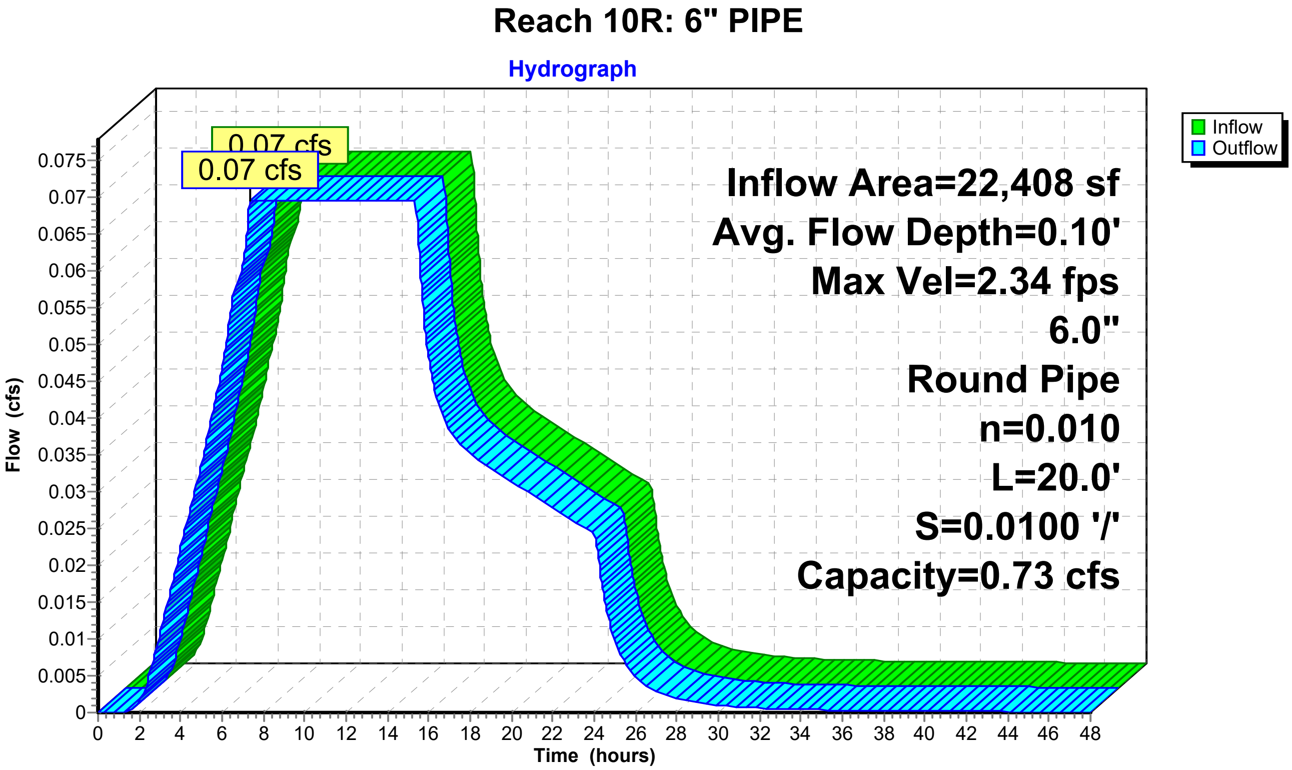
Inflow Area = 22,408 sf, 85.94% Impervious, Inflow Depth > 2.03" for 2 YEAR event
Inflow = 0.07 cfs @ 7.43 hrs, Volume= 3,796 cf
Outflow = 0.07 cfs @ 7.34 hrs, Volume= 3,796 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.34 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.25 fps, Avg. Travel Time= 0.3 min

Peak Storage= 1 cf @ 7.34 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.73 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 20.0' Slope= 0.0100 '/'
Inlet Invert= 194.20', Outlet Invert= 194.00'





Summary for Reach 11R: 8" PIPE

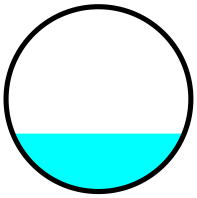
[52] Hint: Inlet/Outlet conditions not evaluated

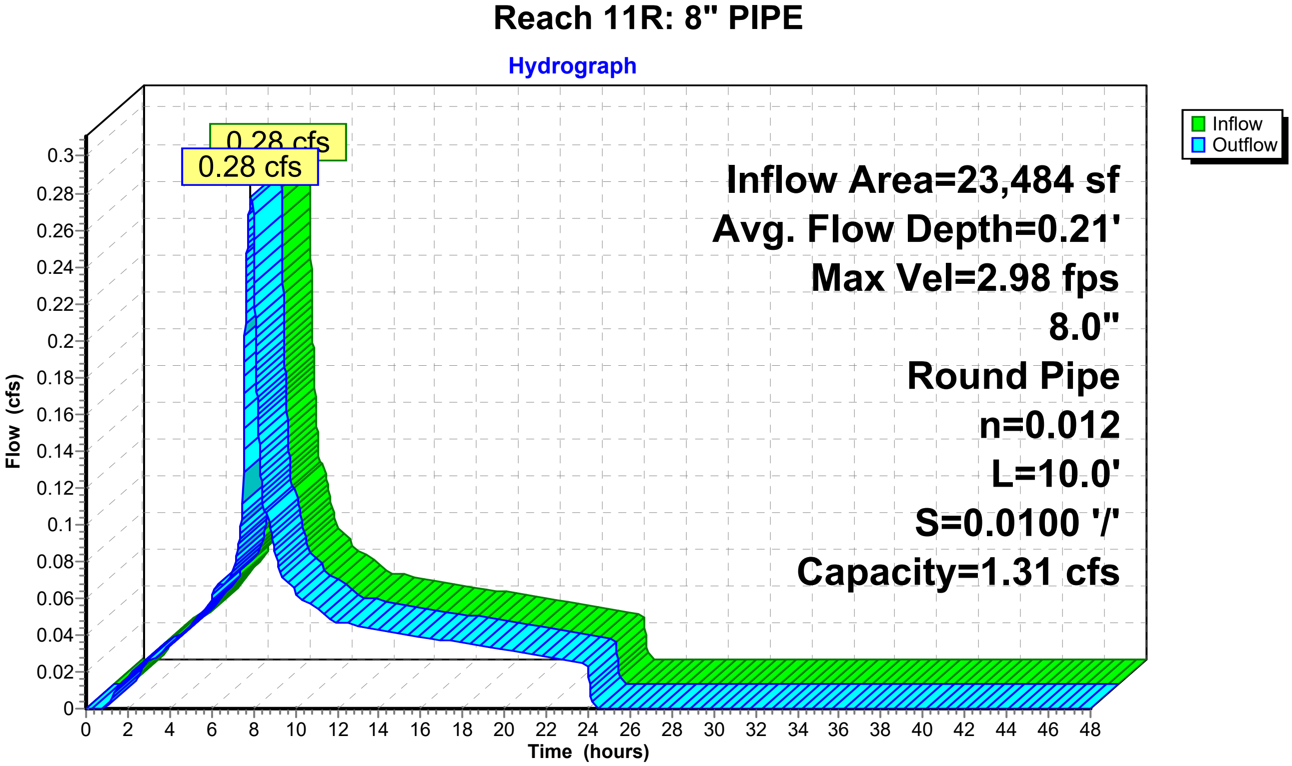
Inflow Area = 23,484 sf, 87.76% Impervious, Inflow Depth = 2.07" for 2 YEAR event
Inflow = 0.28 cfs @ 7.89 hrs, Volume= 4,046 cf
Outflow = 0.28 cfs @ 7.89 hrs, Volume= 4,046 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.98 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.69 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.31 cfs

8.0" Round Pipe
n= 0.012
Length= 10.0' Slope= 0.0100 '/'
Inlet Invert= 194.60', Outlet Invert= 194.50'





Summary for Reach 12R: 6" PIPE

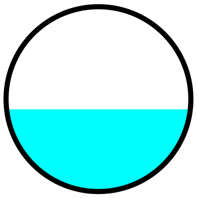
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area =	23,278 sf,	95.87% Impervious,	Inflow Depth = 2.20"	for 2 YEAR event	
Inflow =	0.30 cfs @	7.88 hrs,	Volume=	4,272 cf	
Outflow =	0.30 cfs @	7.88 hrs,	Volume=	4,272 cf,	Atten= 0%, Lag= 0.1 min

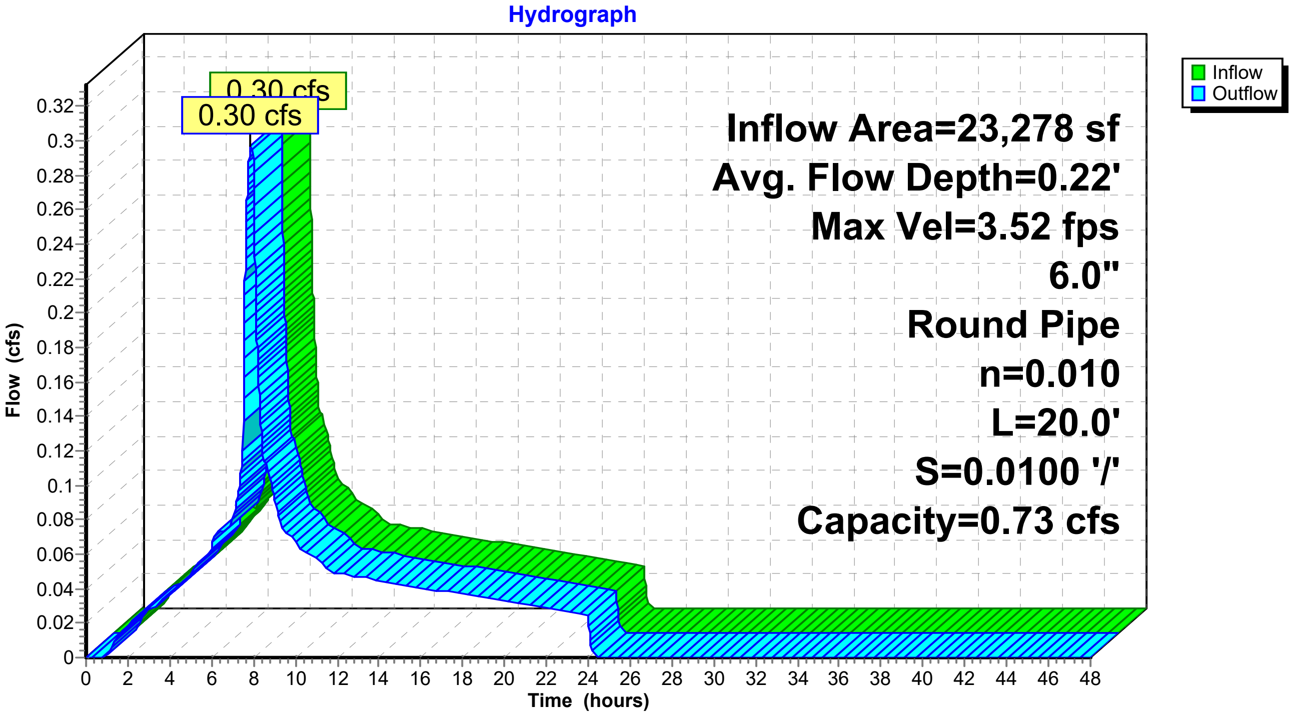
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.52 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.02 fps, Avg. Travel Time= 0.2 min

Peak Storage= 2 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.22'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.73 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 20.0' Slope= 0.0100 '/'
Inlet Invert= 194.20', Outlet Invert= 194.00'



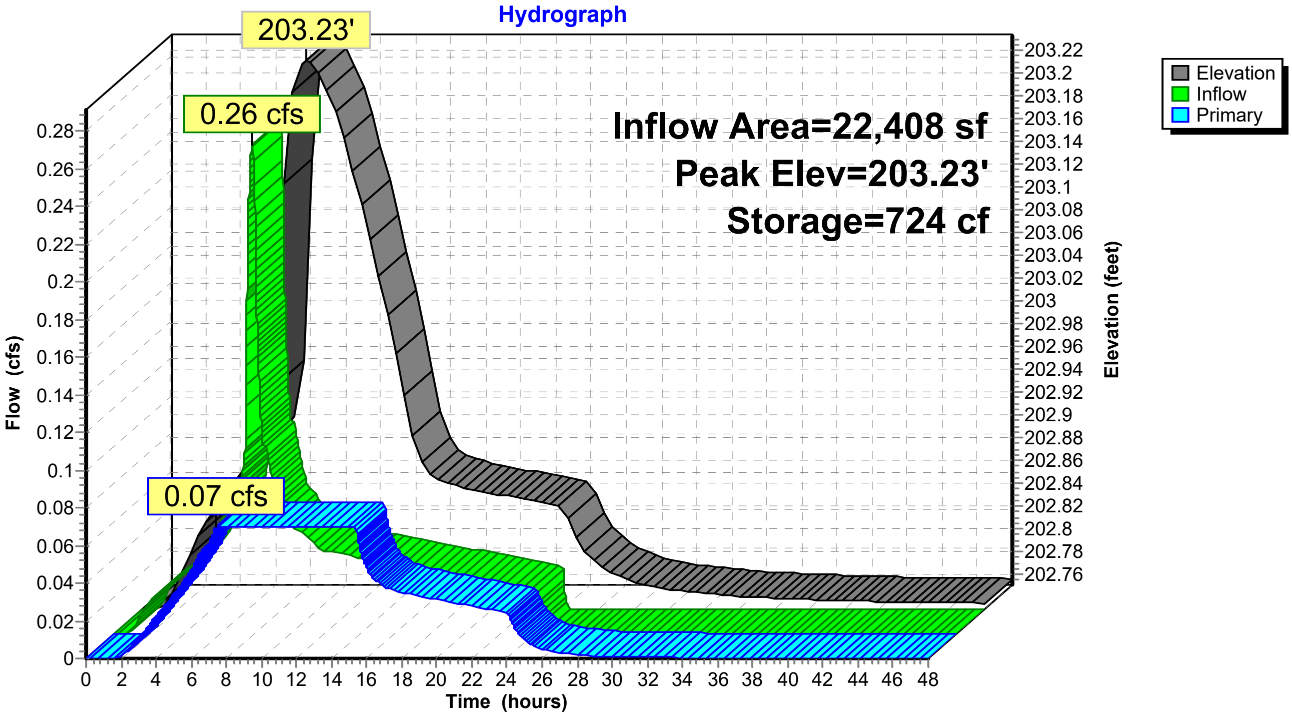
Reach 12R: 6" PIPE



Summary for Pond 5P: PLANTER

```
Inflow Area =       22,408 sf, 85.94% Impervious,  Inflow Depth =  2.04"    for  2 YEAR event
Inflow      =     0.26 cfs @   7.89 hrs,  Volume=          3,804 cf
Outflow     =     0.07 cfs @   7.43 hrs,  Volume=          3,796 cf,  Atten= 73%,  Lag= 0.0 min
Primary     =     0.07 cfs @   7.43 hrs,  Volume=          3,796 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 203.23' @ 9.30 hrs   Surf.Area= 1,500 sf   Storage= 724 cf
Flood Elev= 203.75'   Surf.Area= 1,500 sf   Storage= 1,500 cf

Plug-Flow detention time= 108.3 min calculated for 3,796 cf (100% of inflow)
Center-of-Mass det. time= 106.7 min ( 788.9 - 682.2 )

Volume      Invert    Avail.Storage   Storage Description
   #1      202.75'         1,500 cf   Ponding Depth (Prismatic)Listed below (Recalc)

 Elevation       Surf.Area        Inc.Store        Cum.Store
    (feet)         (sq-ft)     (cubic-feet)     (cubic-feet)
    202.75           1,500                0                0
    203.75           1,500            1,500            1,500

Device   Routing            Invert   Outlet Devices
   #1    Primary           202.75'   6.0"  Round Culvert  L= 10.0'   Ke= 0.500
                                     Inlet / Outlet Invert= 202.75' / 202.50'   S= 0.0250 '/'   Cc= 0.900
                                     n= 0.013,  Flow Area= 0.20 sf
   #2    Device 1          202.75'   2.000 in/hr Exfiltration over Surface area
   #3    Device 1          203.25'   6.0" Horiz. Orifice/Grate   C= 0.610
                                     Limited to weir flow at low heads

Primary OutFlow  Max=0.07 cfs @ 7.43 hrs  HW=202.91'  TW=194.30'   (Dynamic Tailwater)
↑
└─1=Culvert  (Passes 0.07 cfs of 0.07 cfs potential flow)
     ↑
     ├─2=Exfiltration  (Exfiltration Controls 0.07 cfs)
     └─3=Orifice/Grate  ( Controls 0.00 cfs)
```

Pond 5P: PLANTER



Summary for Pond DC: CHAMBERS

Inflow Area = 160,101 sf, 91.52% Impervious, Inflow Depth = 2.13" for 2 YEAR event
Inflow = 1.73 cfs @ 7.93 hrs, Volume= 28,407 cf
Outflow = 0.76 cfs @ 8.55 hrs, Volume= 28,406 cf, Atten= 56%, Lag= 36.9 min
Primary = 0.76 cfs @ 8.55 hrs, Volume= 28,406 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 193.52' @ 8.55 hrs Surf.Area= 989 sf Storage= 3,400 cf
Flood Elev= 195.00' Surf.Area= 989 sf Storage= 3,901 cf

Plug-Flow detention time= 36.8 min calculated for 28,400 cf (100% of inflow)
Center-of-Mass det. time= 36.7 min (734.8 - 698.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	188.00'	1,487 cf	**10.33'W x 95.67'L x 7.00'H Field A** 6,920 cf Overall - 2,414 cf Embedded = 4,506 cf x 33.0% Voids
#2A	189.00'	2,414 cf	**ADS_StormTech MC-4500 +Cap** x 22 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap Cap Storage= +35.7 cf x 2 x 1 rows = 71.4 cf
		3,901 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	188.00'	**18.0" Round Culvert** L= 100.0' Ke= 0.500 Inlet / Outlet Invert= 188.00' / 187.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	188.00'	**3.5" Horiz. 2yr Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	193.60'	**18.0" Horiz. EMERGENCY OVERFLOW** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.76 cfs @ 8.55 hrs HW=193.52' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 0.76 cfs of 17.41 cfs potential flow)
  ↑—**2=2yr Orifice** (Orifice Controls 0.76 cfs @ 11.31 fps)
  └—**3=EMERGENCY OVERFLOW** (Controls 0.00 cfs)

Pond DC: CHAMBERS - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-4500 +Cap (ADS StormTech® MC-4500 with cap volume)
Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf
Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap
Cap Storage= +35.7 cf x 2 x 1 rows = 71.4 cf

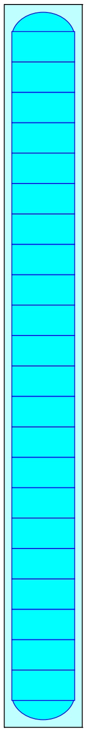
22 Chambers/Row x 4.02' Long +2.56' Cap Length x 2 = 93.67' Row Length +12.0" End Stone x 2 = 95.67' Base Length
1 Rows x 100.0" Wide + 12.0" Side Stone x 2 = 10.33' Base Width
12.0" Base + 60.0" Chamber Height + 12.0" Cover = 7.00' Field Height

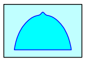
22 Chambers x 106.5 cf + 35.7 cf Cap Volume x 2 x 1 Rows = 2,414.2 cf Chamber Storage

6,919.9 cf Field - 2,414.2 cf Chambers = 4,505.7 cf Stone x 33.0% Voids = 1,486.9 cf Stone Storage

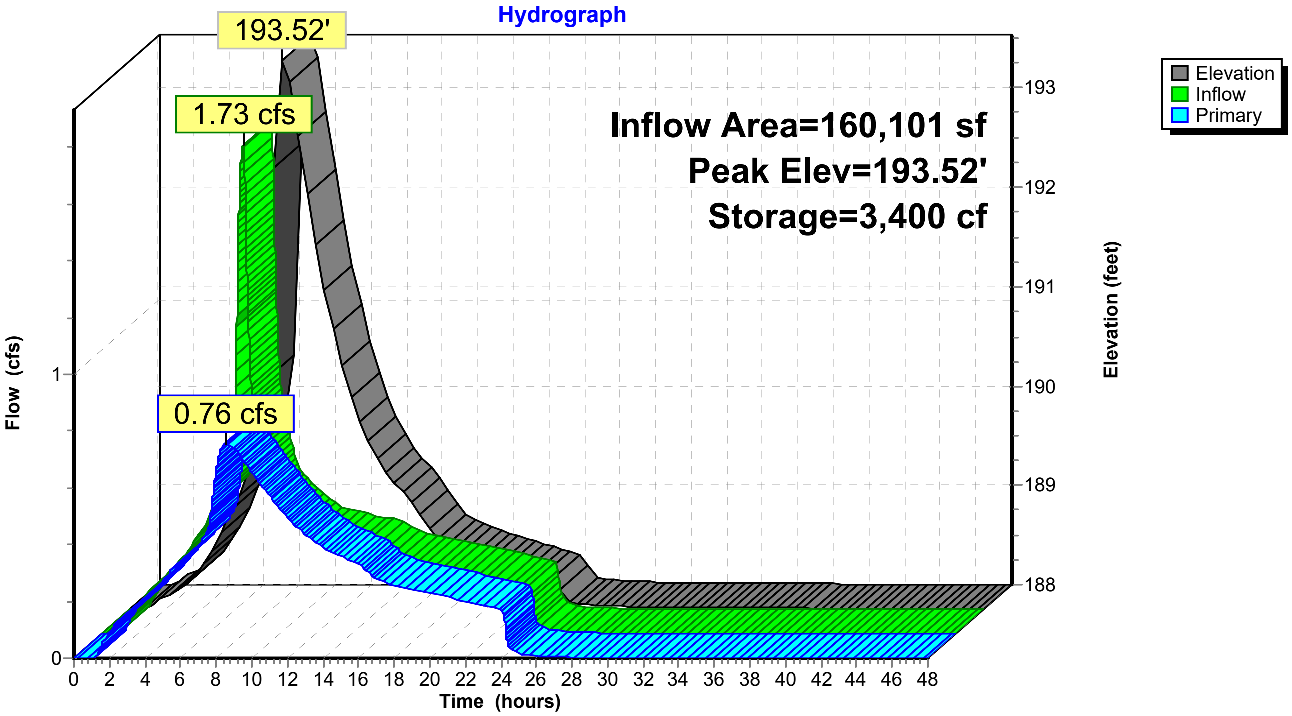
Chamber Storage + Stone Storage = 3,901.1 cf = 0.090 af
Overall Storage Efficiency = 56.4%
Overall System Size = 95.67' x 10.33' x 7.00'

22 Chambers
256.3 cy Field
166.9 cy Stone





Pond DC: CHAMBERS

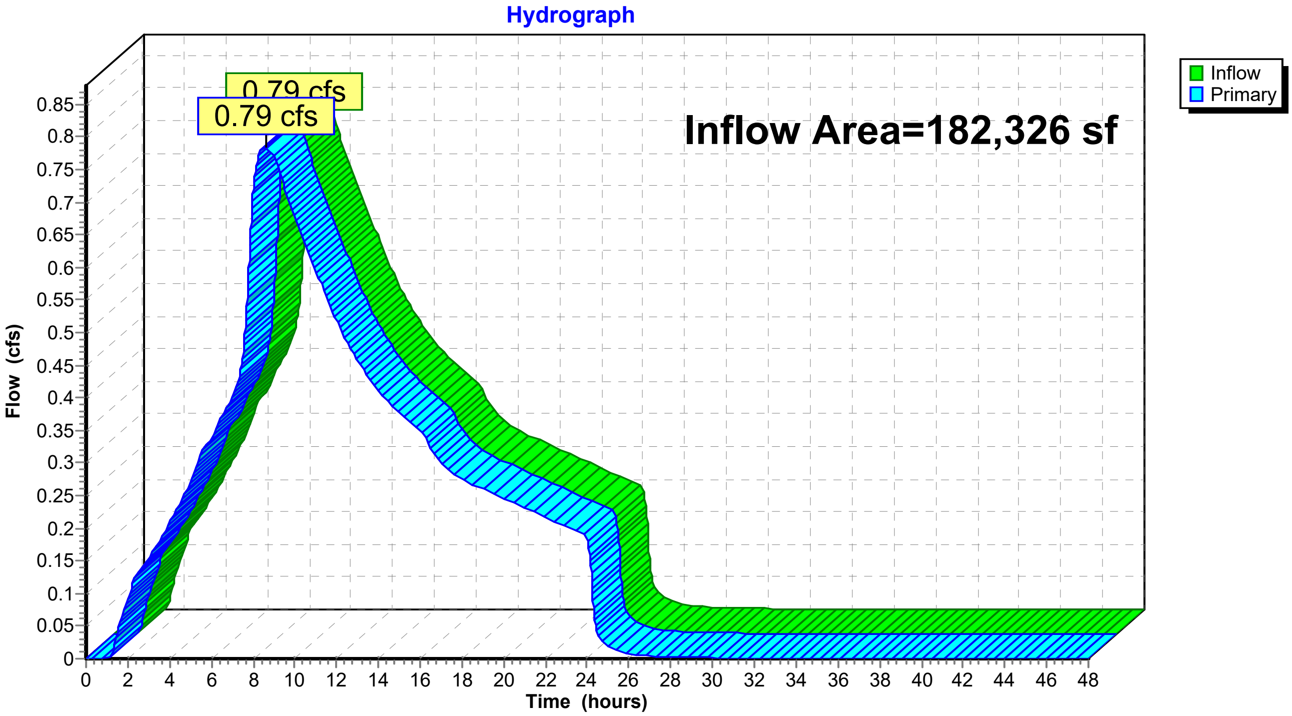


Summary for Link 11L: Peak Post- Development Flows

```
Inflow Area =      182,326 sf,  80.73% Impervious,  Inflow Depth >   1.95"    for  2 YEAR event
Inflow      =     0.79 cfs @     8.60 hrs,  Volume=           29,624 cf
Primary     =     0.79 cfs @     8.60 hrs,  Volume=           29,624 cf,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 11L: Peak Post- Development Flows



Summary for Subcatchment 1S: PLAZA 1

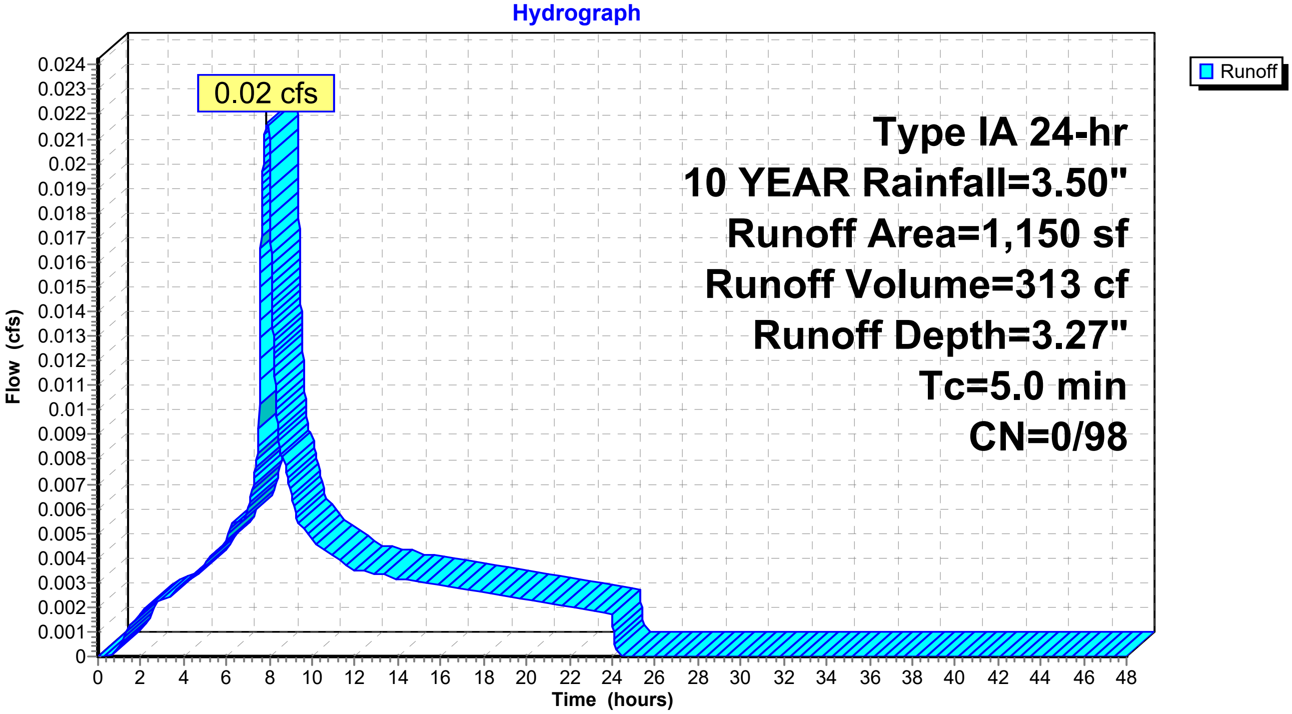
Runoff = 0.02 cfs @ 7.88 hrs, Volume= 313 cf, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

Area (sf)	CN	Description
1,150	98	Paved parking, HSG C
1,150		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: PLAZA 1



Summary for Subcatchment 2AS: ROOF

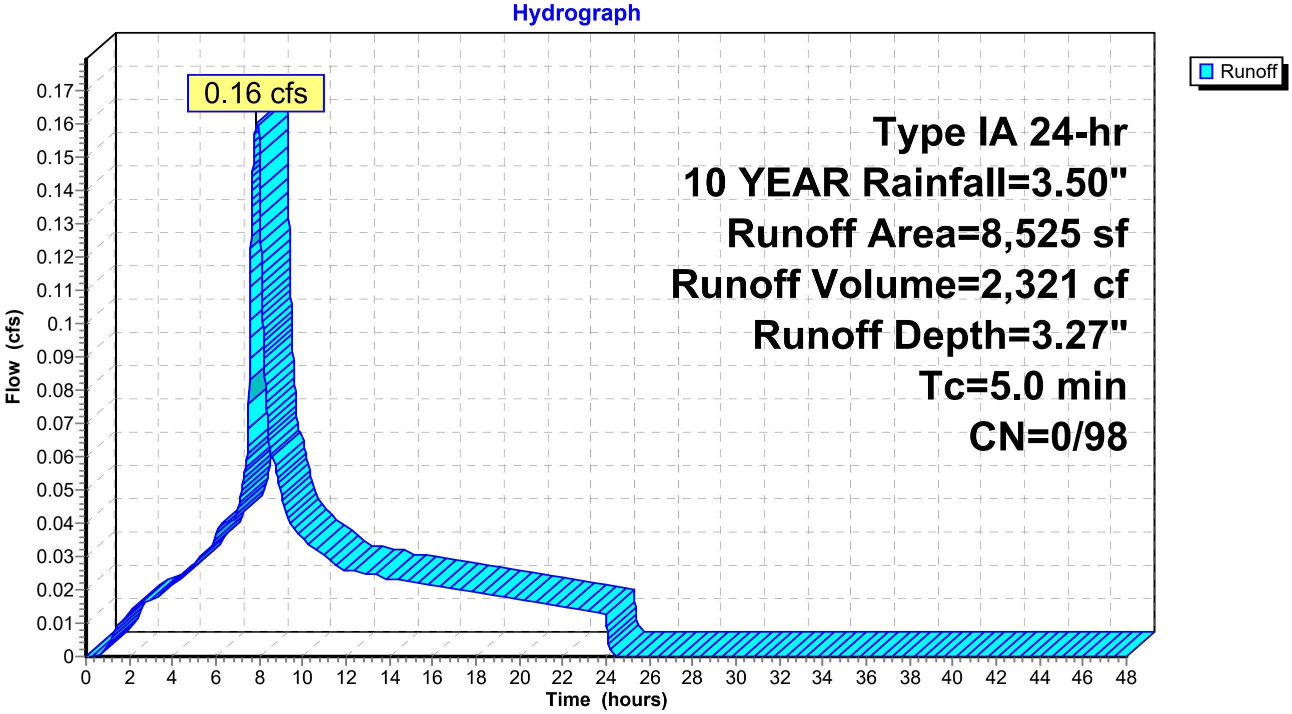
Runoff = 0.16 cfs @ 7.88 hrs, Volume= 2,321 cf, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

Area (sf)	CN	Description
8,525	98	Roofs, HSG C
8,525		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2AS: ROOF



Summary for Subcatchment 2BS: ROOF

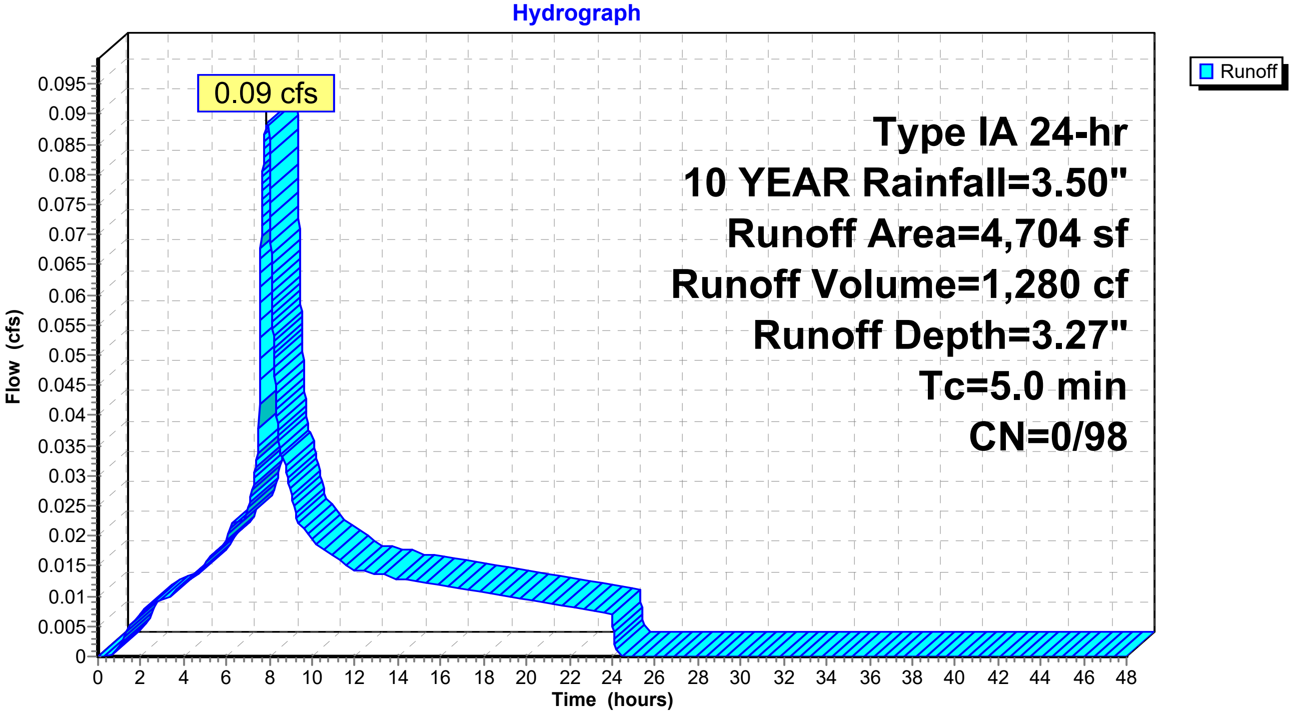
Runoff = 0.09 cfs @ 7.88 hrs, Volume= 1,280 cf, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

Area (sf)	CN	Description
4,704	98	Roofs, HSG C
4,704		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2BS: ROOF



Summary for Subcatchment 3S: PLAZA 2

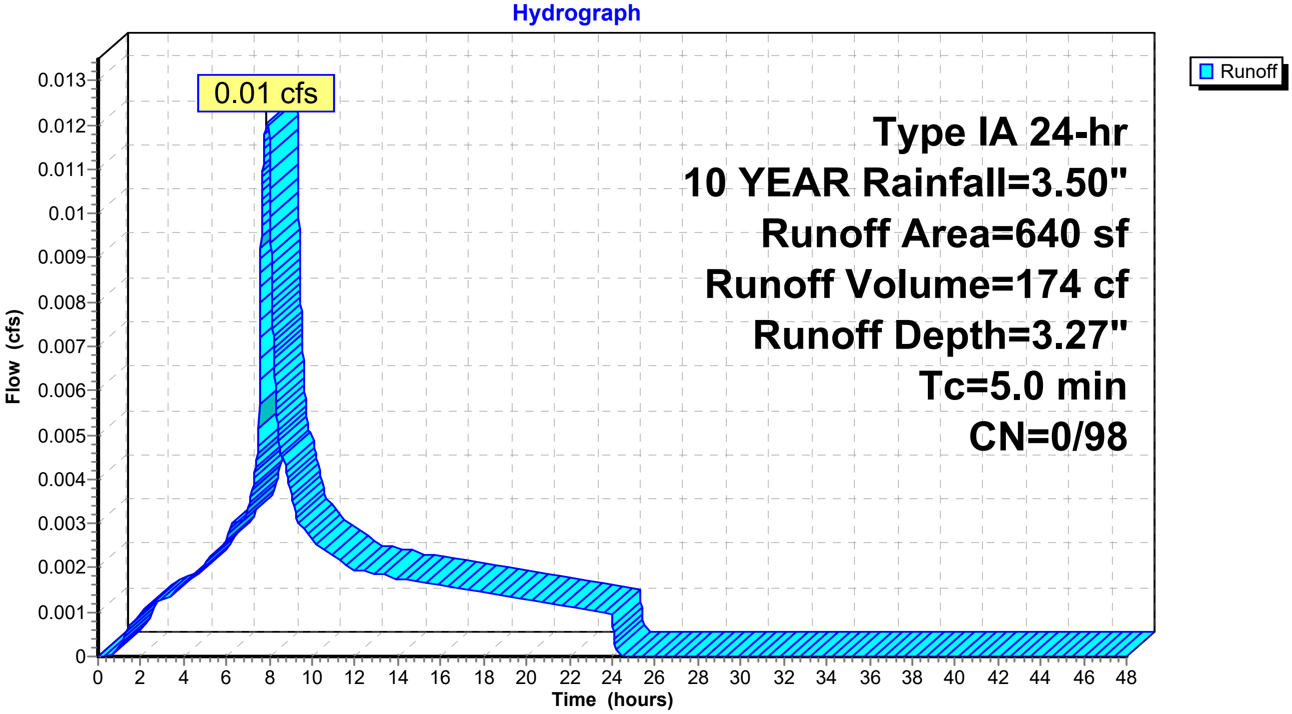
Runoff = 0.01 cfs @ 7.88 hrs, Volume= 174 cf, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

Area (sf)	CN	Description
640	98	Paved parking, HSG C
640		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S: PLAZA 2



Summary for Subcatchment 4AS: ROOF

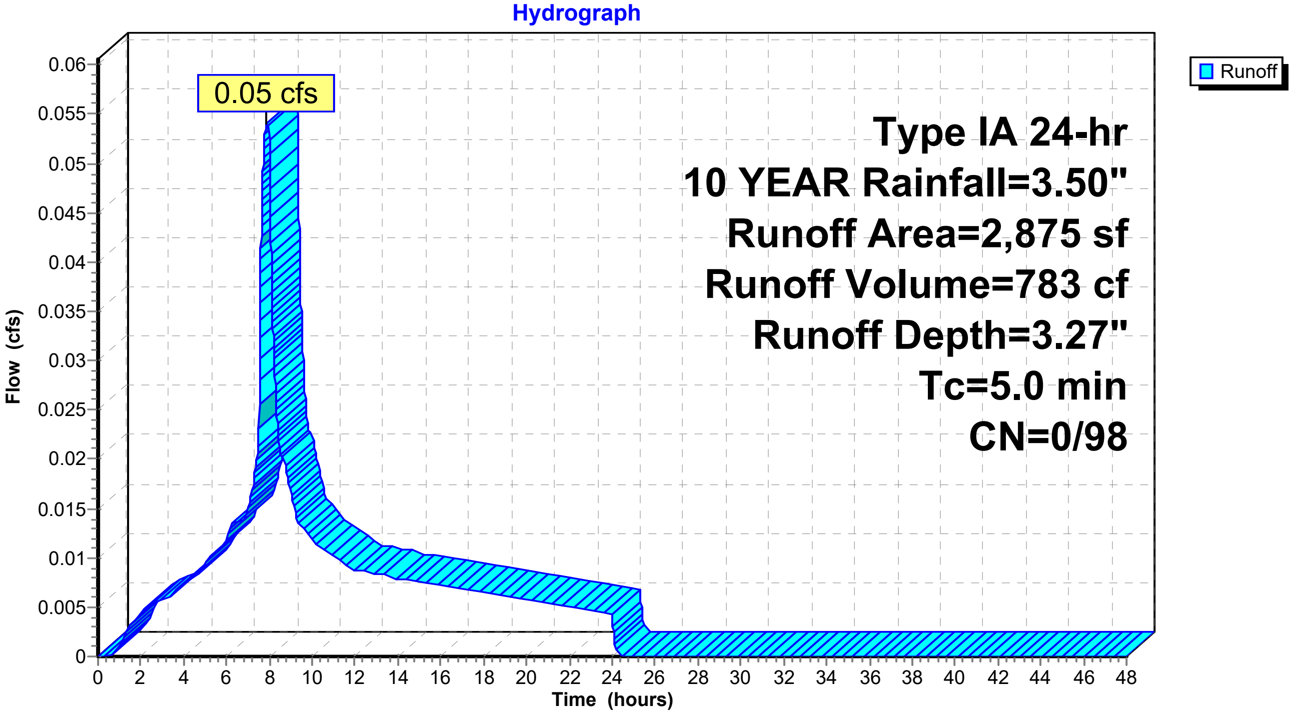
Runoff = 0.05 cfs @ 7.88 hrs, Volume= 783 cf, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

Area (sf)	CN	Description
2,875	98	Roofs, HSG C
2,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4AS: ROOF



Summary for Subcatchment 4BS: ROOF

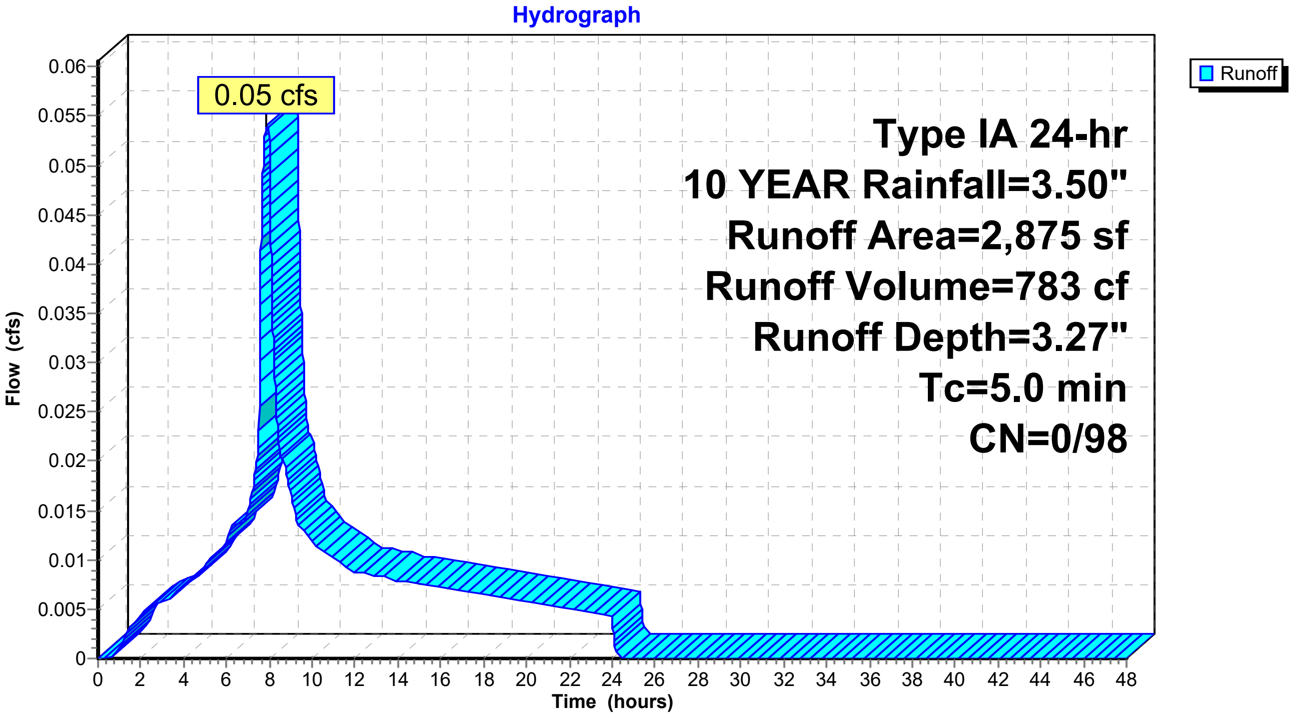
Runoff = 0.05 cfs @ 7.88 hrs, Volume= 783 cf, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

Area (sf)	CN	Description
2,875	98	Roofs, HSG C
2,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4BS: ROOF



Summary for Subcatchment 5S: PLAZA 3

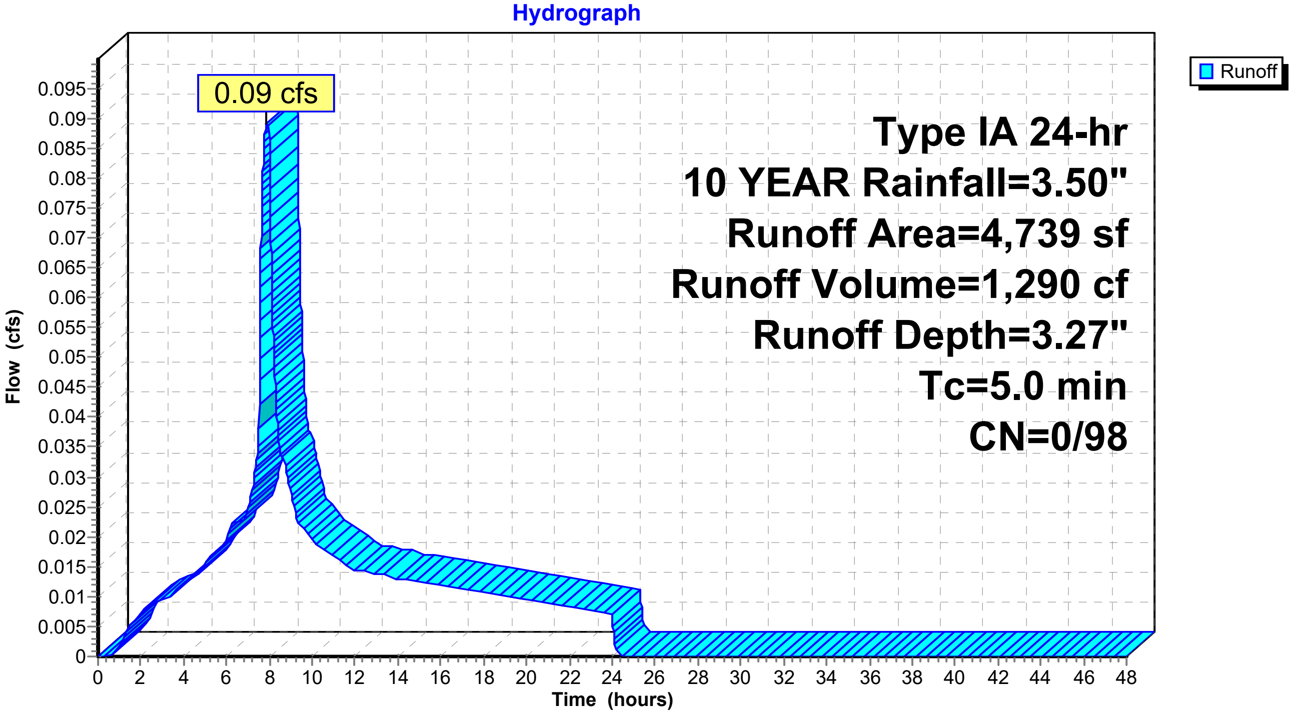
Runoff = 0.09 cfs @ 7.88 hrs, Volume= 1,290 cf, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

Area (sf)	CN	Description
4,739	98	Paved parking, HSG C
4,739		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5S: PLAZA 3



Summary for Subcatchment 6AS: ROOF

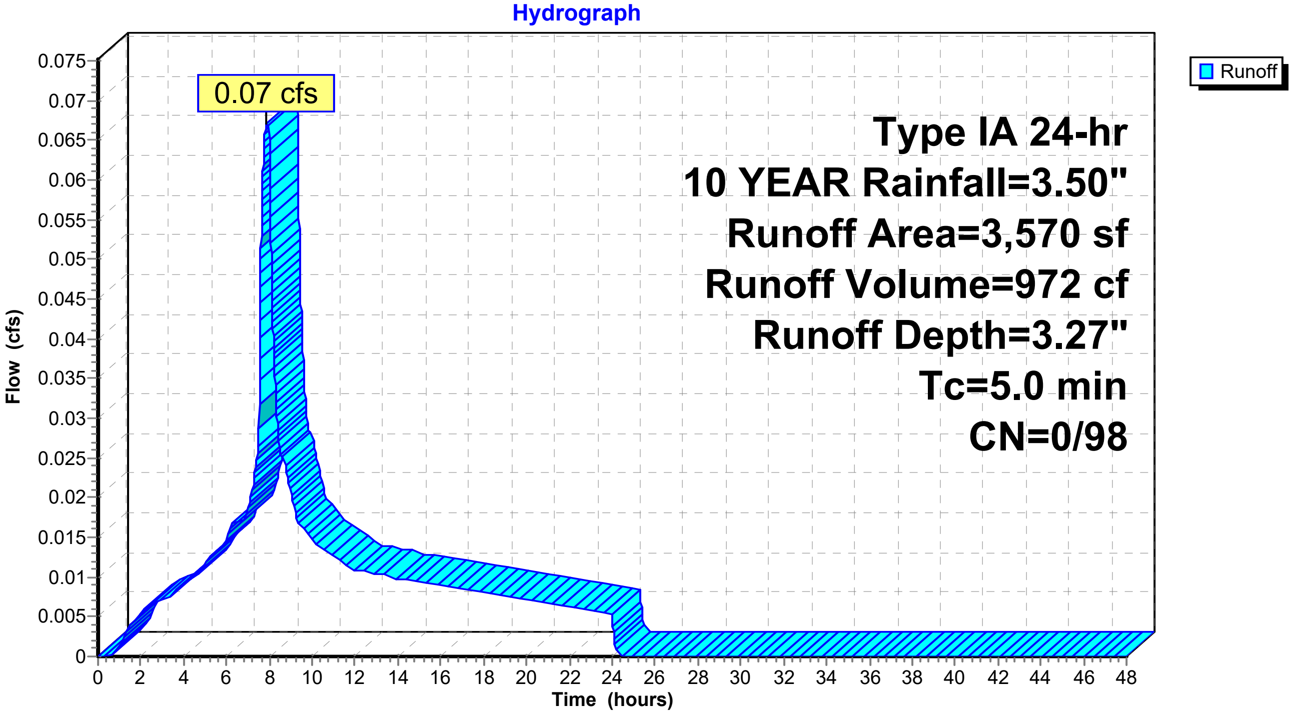
Runoff = 0.07 cfs @ 7.88 hrs, Volume= 972 cf, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

Area (sf)	CN	Description
3,570	98	Roofs, HSG C
3,570		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6AS: ROOF



Summary for Subcatchment 6BS: ROOF

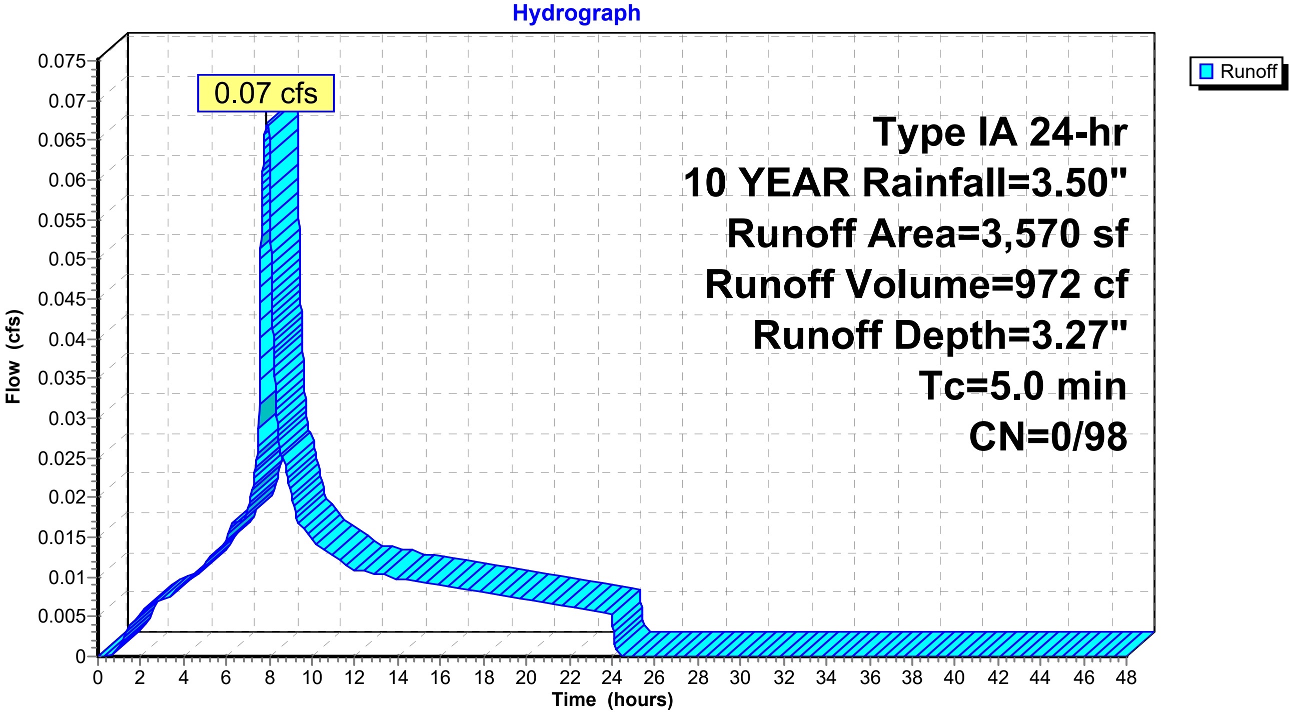
Runoff = 0.07 cfs @ 7.88 hrs, Volume= 972 cf, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

Area (sf)	CN	Description
3,570	98	Roofs, HSG C
3,570		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6BS: ROOF



Summary for Subcatchment 7S: NORTH DRIVEWAY

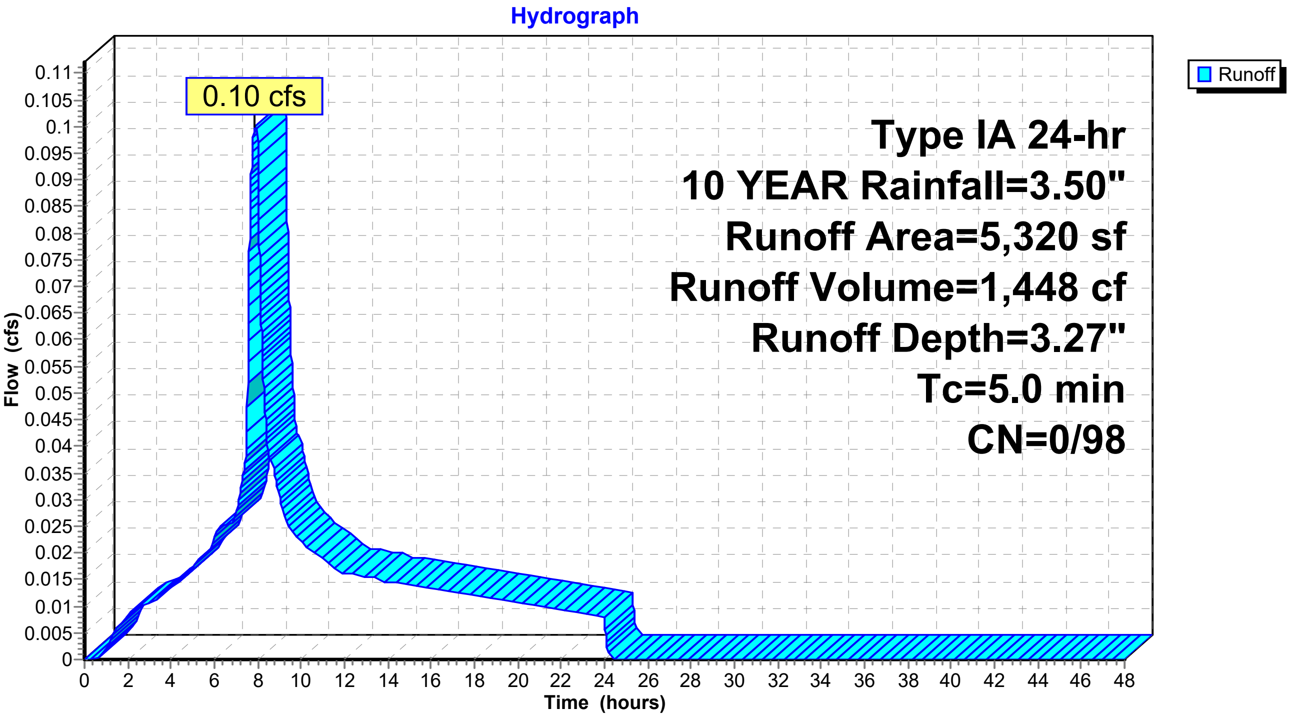
Runoff = 0.10 cfs @ 7.88 hrs, Volume= 1,448 cf, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

Area (sf)	CN	Description
5,320	98	Paved parking, HSG C
5,320		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 7S: NORTH DRIVEWAY



Summary for Subcatchment 8AS: ROOF

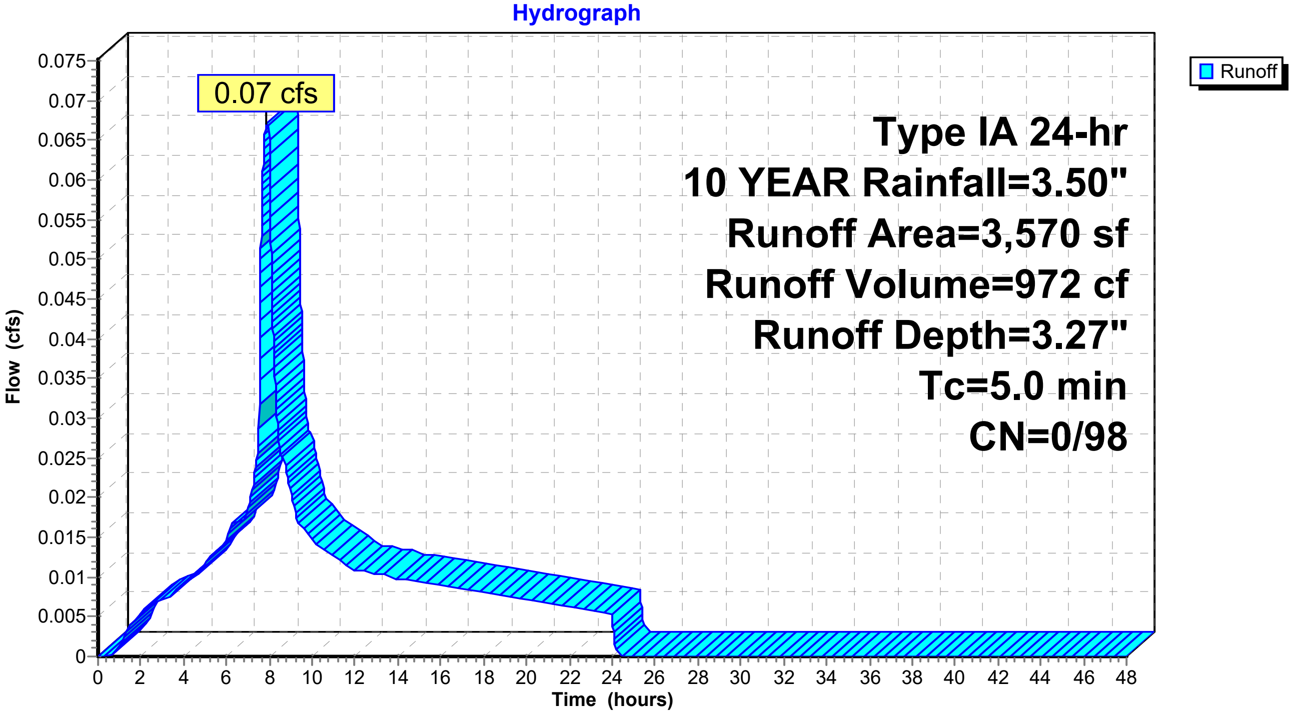
Runoff = 0.07 cfs @ 7.88 hrs, Volume= 972 cf, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

Area (sf)	CN	Description
3,570	98	Roofs, HSG C
3,570		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8AS: ROOF



Summary for Subcatchment 8BS: ROOF

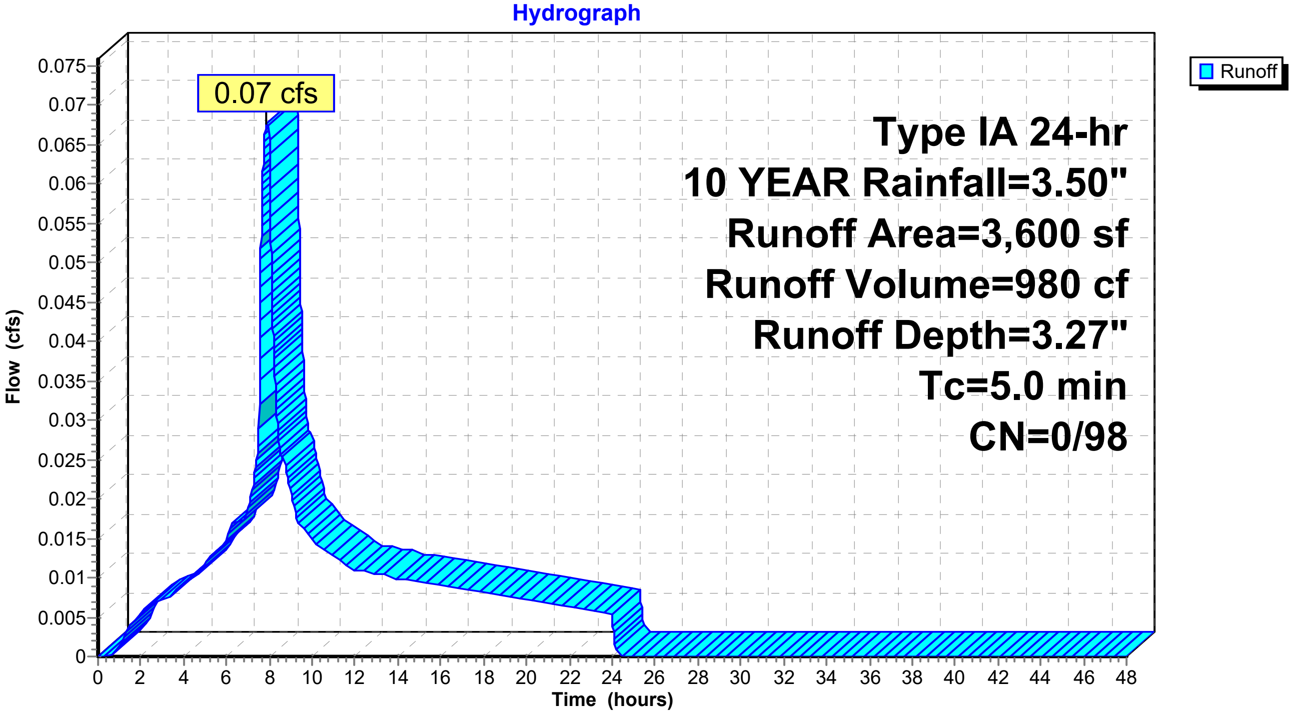
Runoff = 0.07 cfs @ 7.88 hrs, Volume= 980 cf, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

Area (sf)	CN	Description
3,600	98	Roofs, HSG C
3,600		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8BS: ROOF



Summary for Subcatchment 9S: NORTHEAST DRIVEWAY

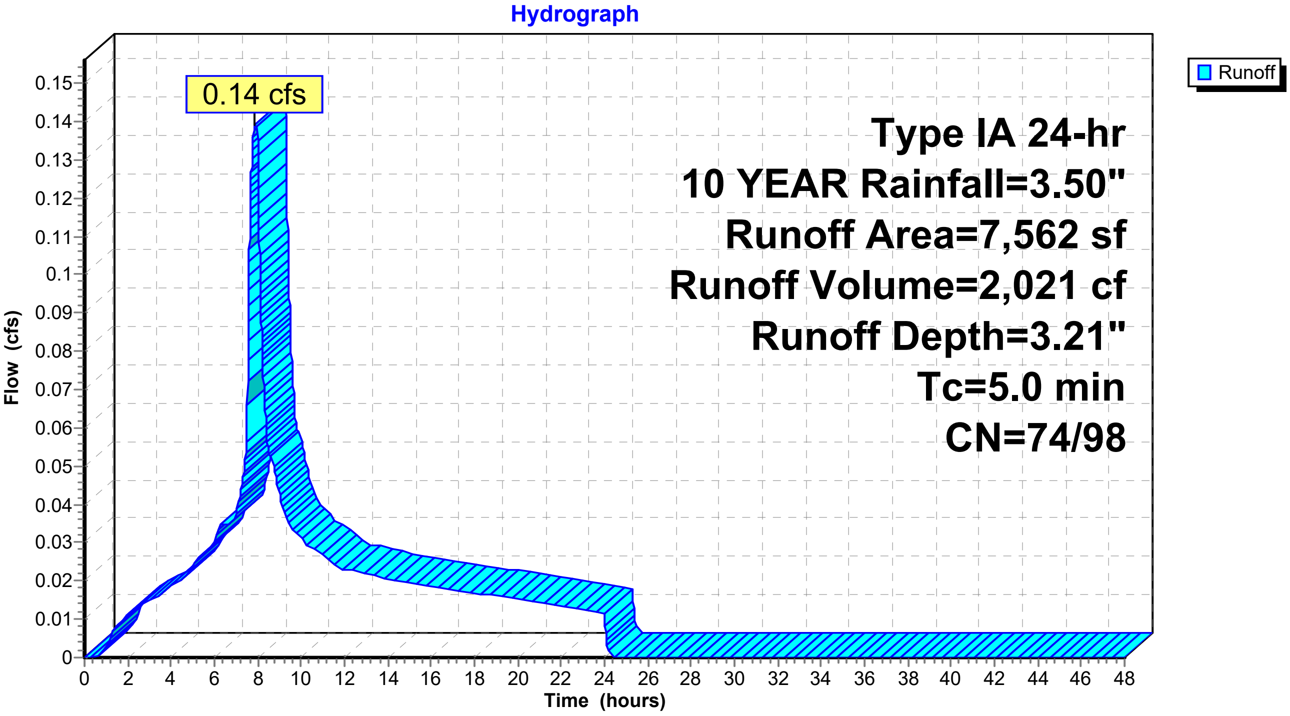
Runoff = 0.14 cfs @ 7.88 hrs, Volume= 2,021 cf, Depth= 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

Area (sf)	CN	Description
7,340	98	Paved parking, HSG C
222	74	>75% Grass cover, Good, HSG C
7,562	97	Weighted Average
222		2.94% Pervious Area
7,340		97.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 9S: NORTHEAST DRIVEWAY



Summary for Subcatchment 10S: PLANTER BASIN

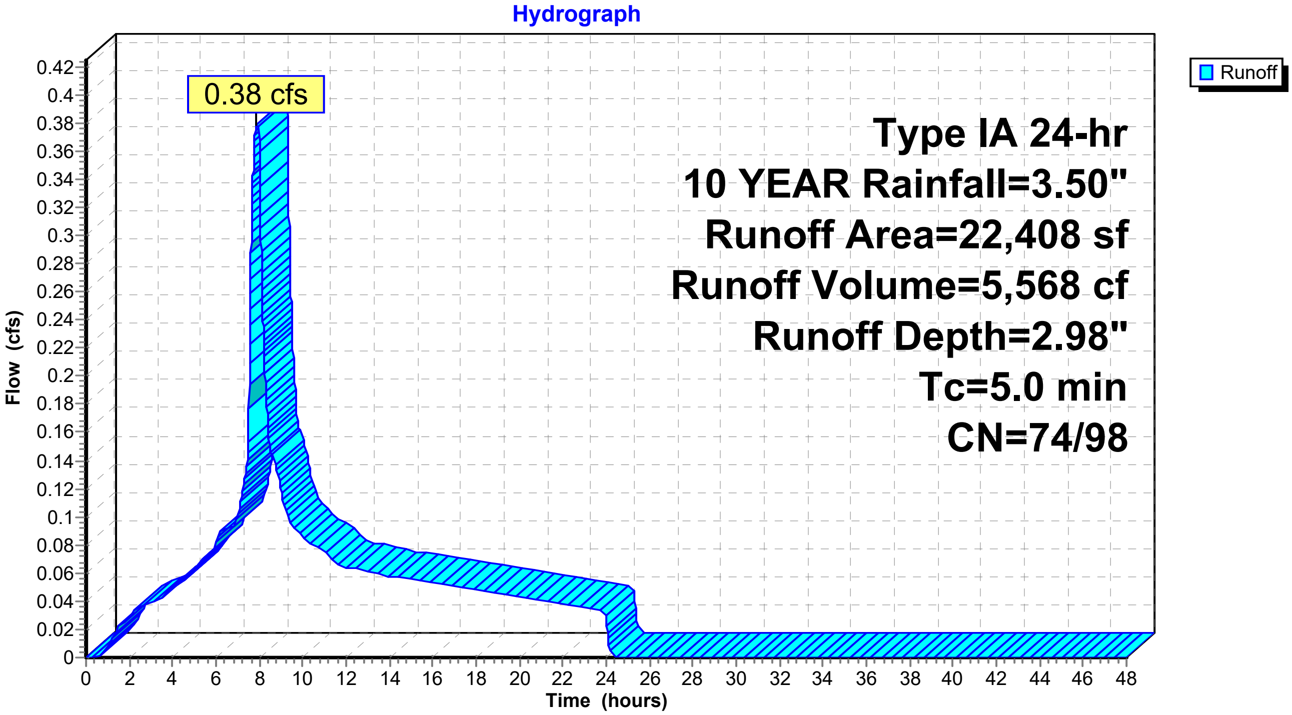
Runoff = 0.38 cfs @ 7.89 hrs, Volume= 5,568 cf, Depth= 2.98"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

	Area (sf)	CN	Description
*	19,258	98	Pavement
	3,150	74	>75% Grass cover, Good, HSG C
	22,408	95	Weighted Average
	3,150		14.06% Pervious Area
	19,258		85.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10S: PLANTER BASIN



Summary for Subcatchment 11S: SWALE BASIN

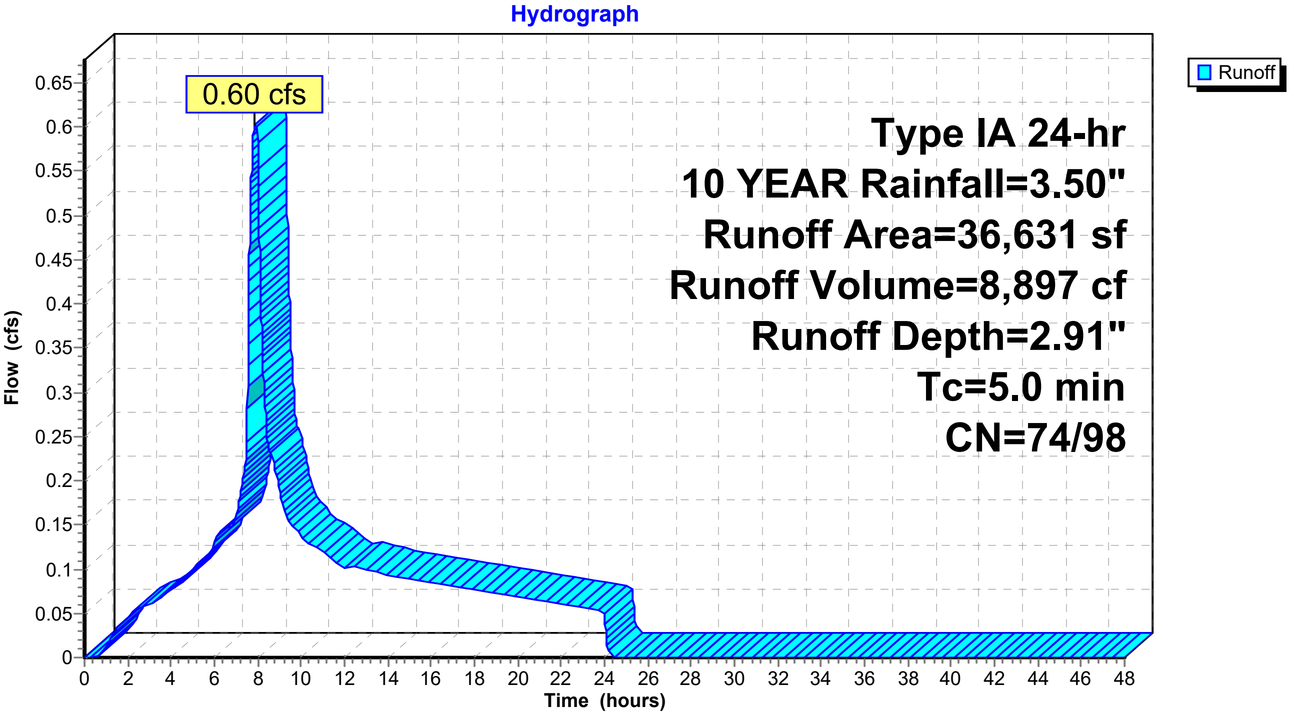
Runoff = 0.60 cfs @ 7.89 hrs, Volume= 8,897 cf, Depth= 2.91"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

	Area (sf)	CN	Description
*	30,268	98	Pavement
	6,363	74	>75% Grass cover, Good, HSG C
	36,631	94	Weighted Average
	6,363		17.37% Pervious Area
	30,268		82.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 11S: SWALE BASIN



Summary for Subcatchment 12S: SOUTH BASIN

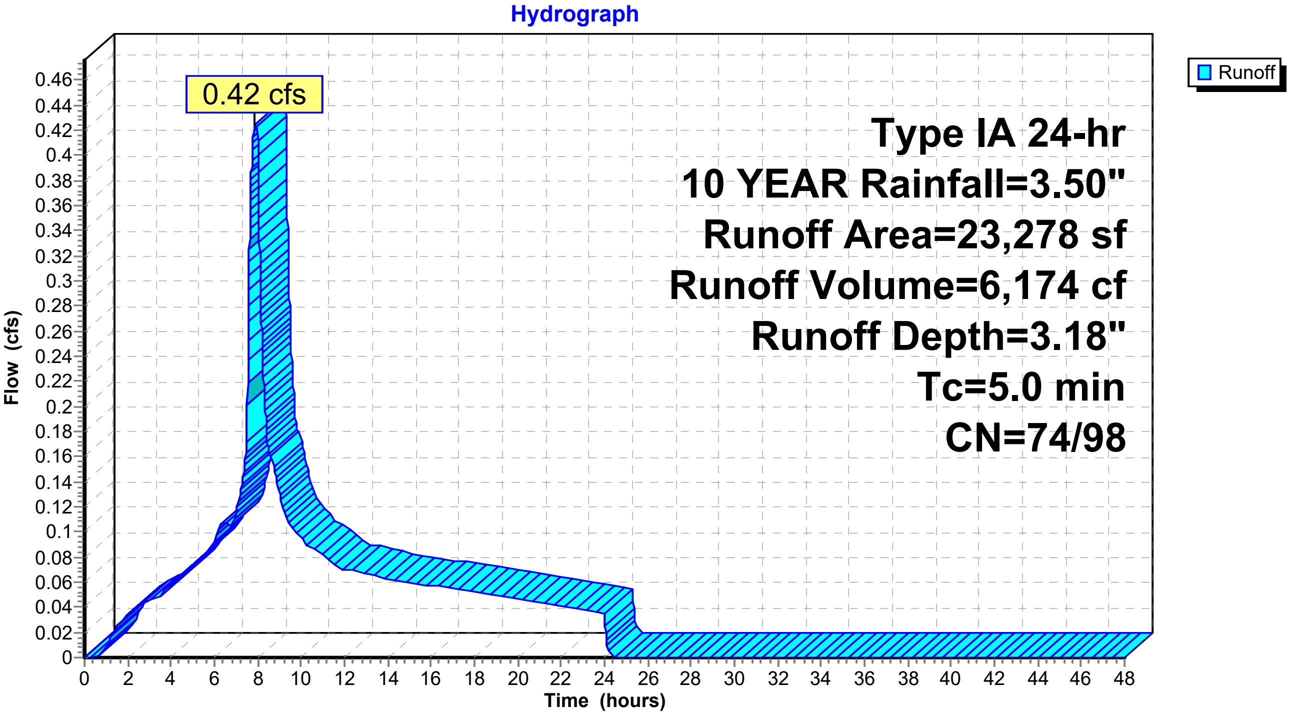
Runoff = 0.42 cfs @ 7.88 hrs, Volume= 6,174 cf, Depth= 3.18"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

	Area (sf)	CN	Description
*	22,316	98	Pavement
	962	74	>75% Grass cover, Good, HSG C
	23,278	97	Weighted Average
	962		4.13% Pervious Area
	22,316		95.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 12S: SOUTH BASIN



Summary for Subcatchment 13S: EAST BASIN

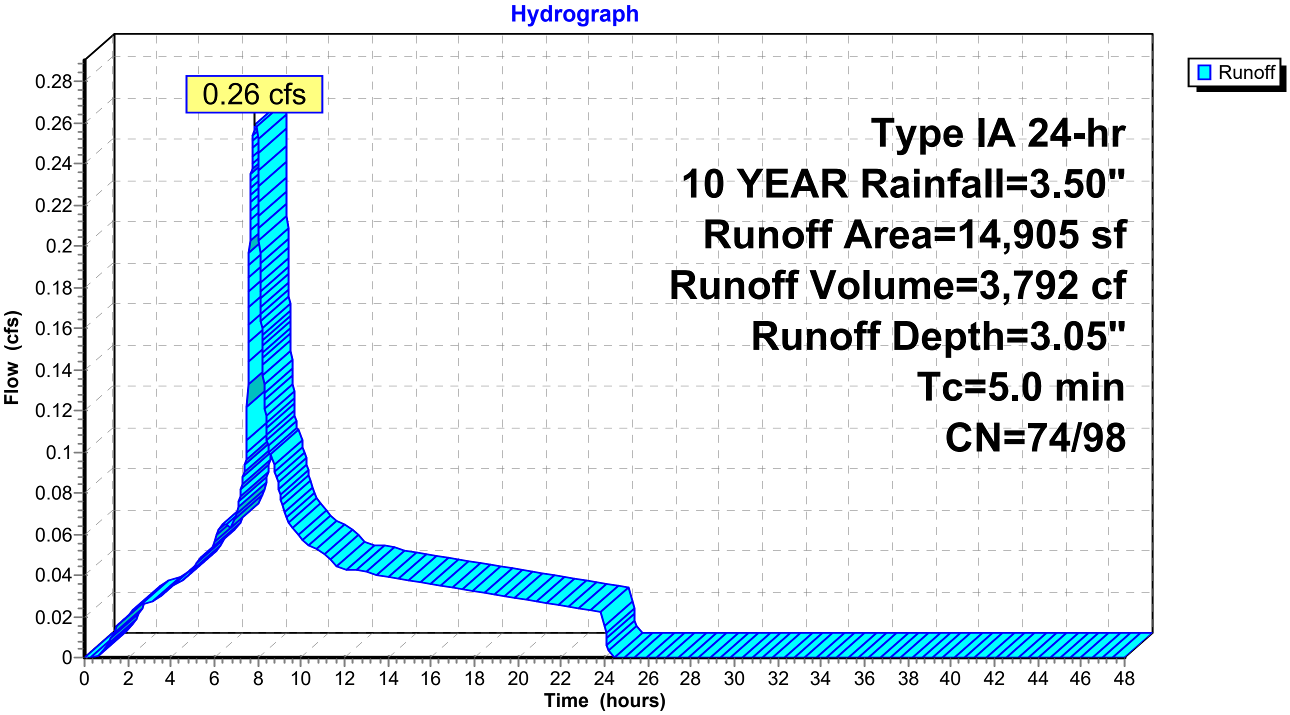
Runoff = 0.26 cfs @ 7.88 hrs, Volume= 3,792 cf, Depth= 3.05"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

	Area (sf)	CN	Description
*	13,332	98	Pavement
	1,573	74	>75% Grass cover, Good, HSG C
	14,905	95	Weighted Average
	1,573		10.55% Pervious Area
	13,332		89.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 13S: EAST BASIN



Summary for Subcatchment 14S: ROOF

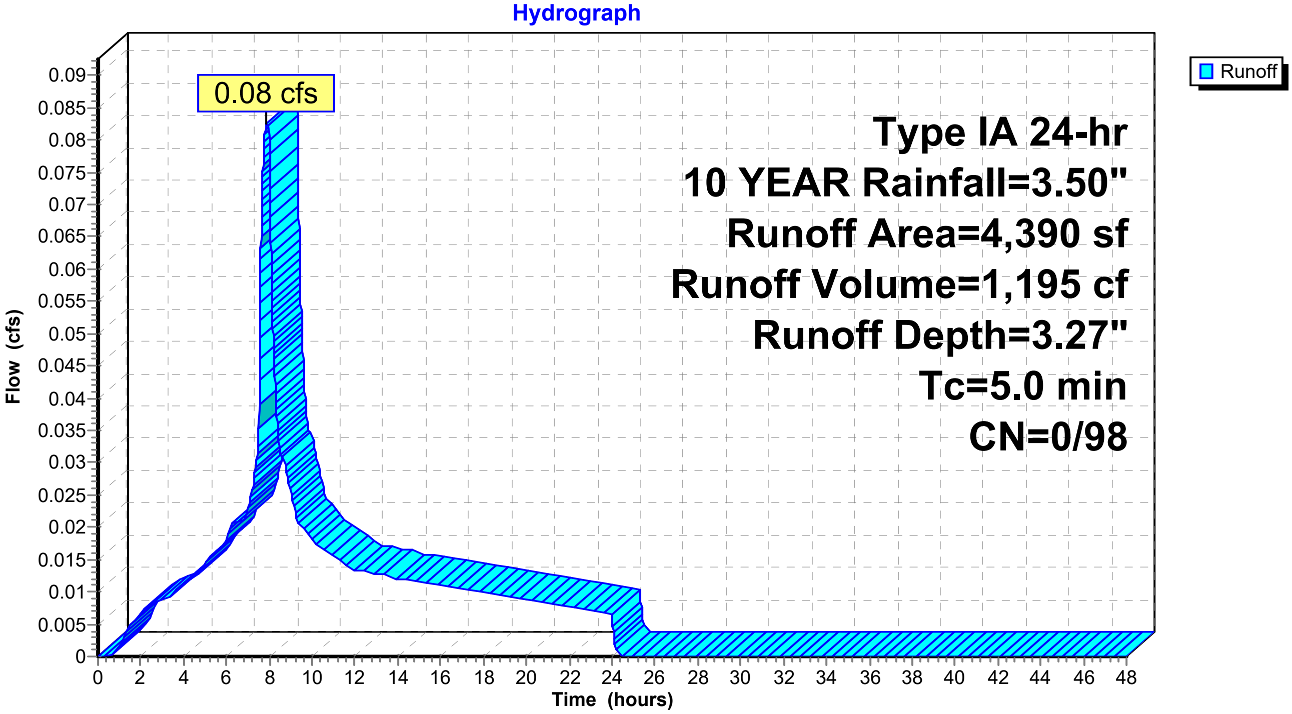
Runoff = 0.08 cfs @ 7.88 hrs, Volume= 1,195 cf, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

Area (sf)	CN	Description
4,390	98	Roofs, HSG C
4,390		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 14S: ROOF



Summary for Subcatchment 15S: DRIVE-THRU

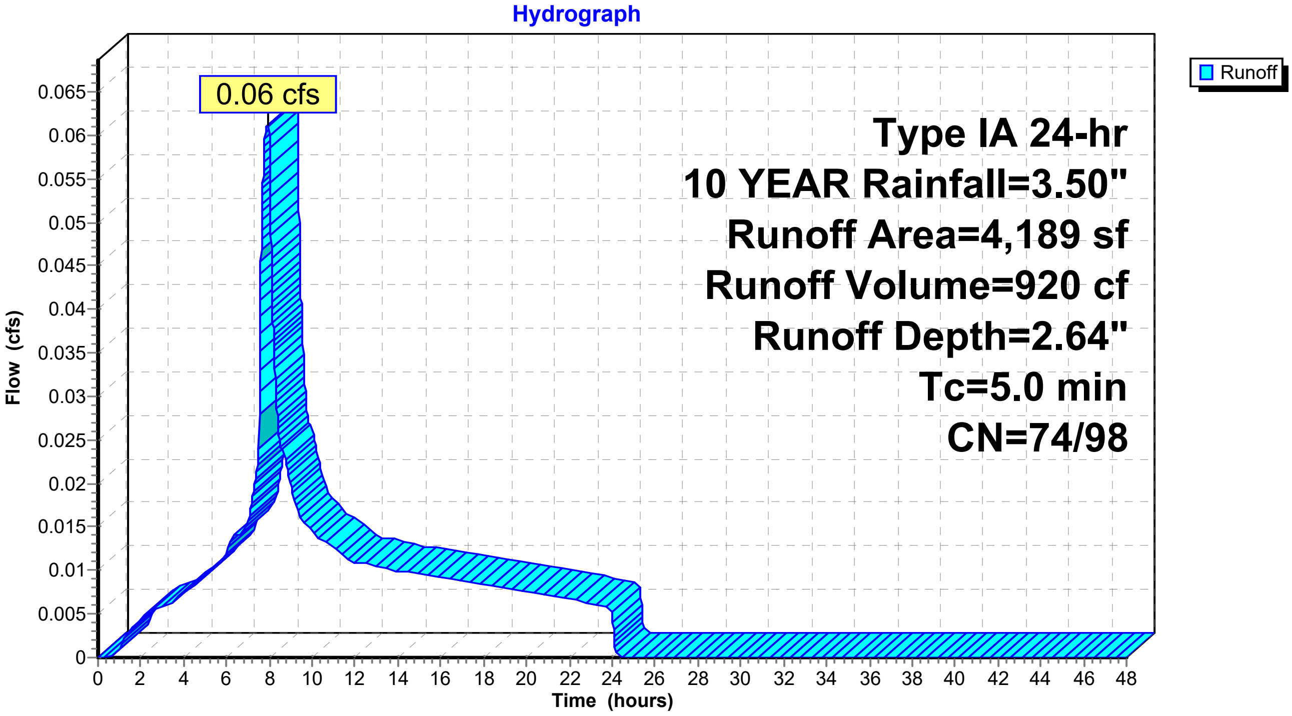
Runoff = 0.06 cfs @ 7.90 hrs, Volume= 920 cf, Depth= 2.64"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

	Area (sf)	CN	Description
*	2,887	98	Pavement
	1,302	74	>75% Grass cover, Good, HSG C
	4,189	91	Weighted Average
	1,302		31.08% Pervious Area
	2,887		68.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 15S: DRIVE-THRU



Summary for Subcatchment 16S: PERIMETER LANDSCAPE AND WALKWAY (UNDETAINED)

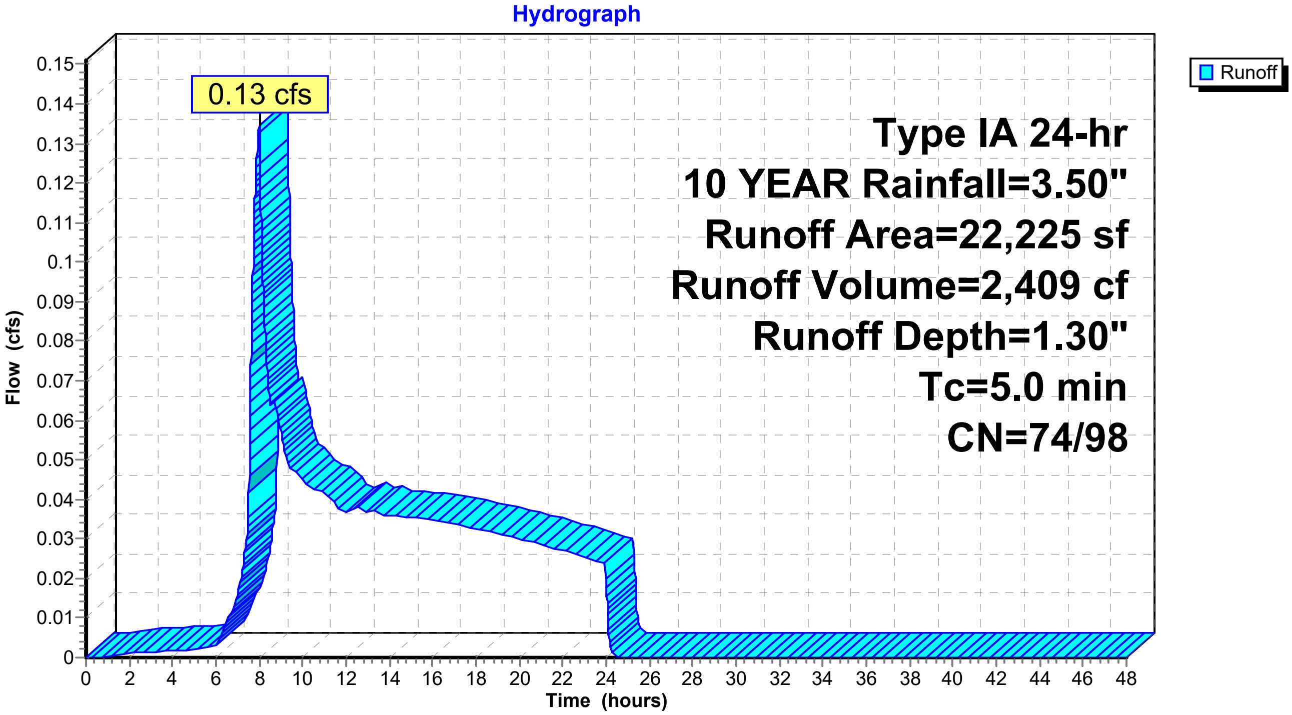
Runoff = 0.13 cfs @ 8.00 hrs, Volume= 2,409 cf, Depth= 1.30"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

Area (sf)	CN	Description
21,560	74	>75% Grass cover, Good, HSG C
665	98	Paved parking, HSG C
22,225	75	Weighted Average
21,560		97.01% Pervious Area
665		2.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 16S: PERIMETER LANDSCAPE AND WALKWAY (UNDETAINED)



Summary for Subcatchment 17S: PLAZA 4

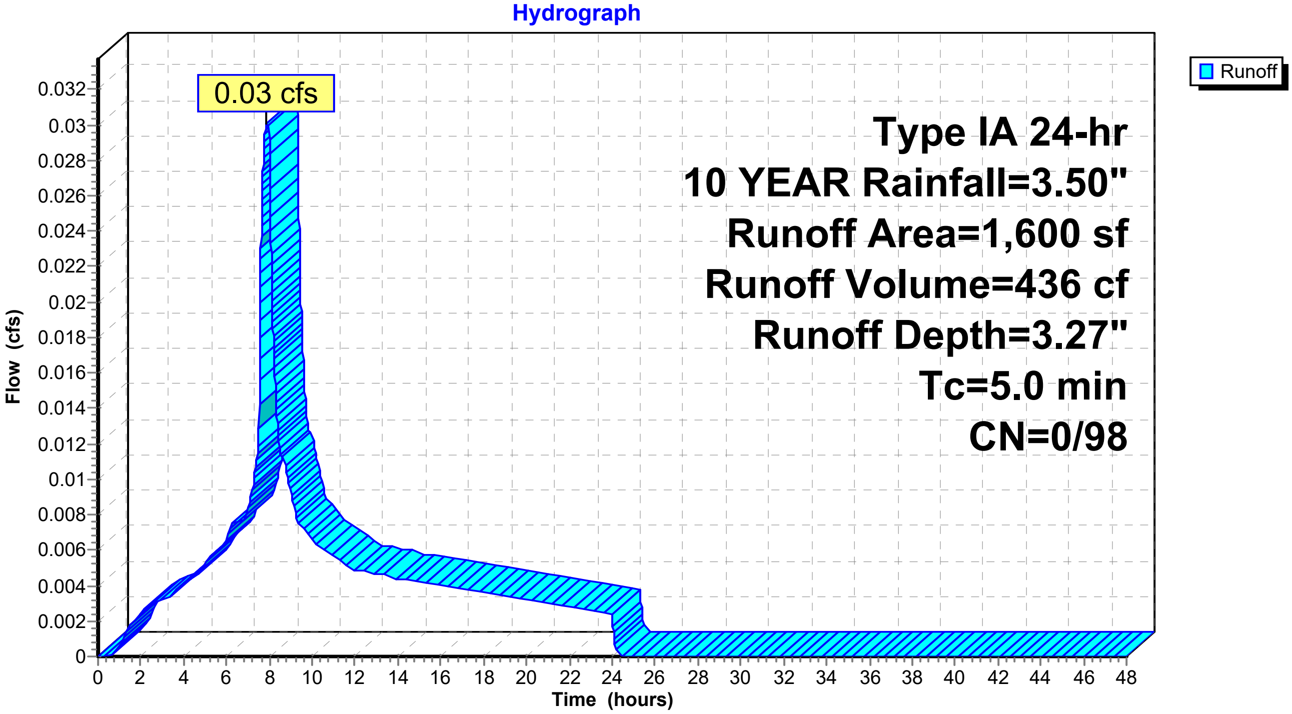
Runoff = 0.03 cfs @ 7.88 hrs, Volume= 436 cf, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 YEAR Rainfall=3.50"

Area (sf)	CN	Description
1,600	98	Roofs, HSG C
1,600		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 17S: PLAZA 4



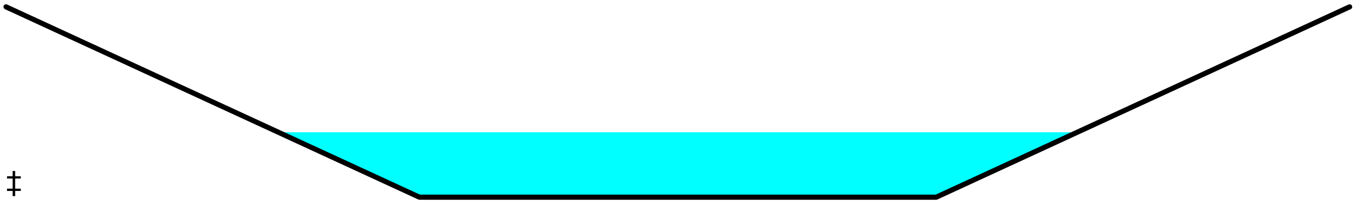
Summary for Reach 1R: Swale

Inflow Area = 36,631 sf, 82.63% Impervious, Inflow Depth = 2.91" for 10 YEAR event
Inflow = 0.60 cfs @ 7.89 hrs, Volume= 8,897 cf
Outflow = 0.57 cfs @ 8.01 hrs, Volume= 8,897 cf, Atten= 5%, Lag= 7.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.26 fps, Min. Travel Time= 11.4 min
Avg. Velocity = 0.10 fps, Avg. Travel Time= 29.5 min

Peak Storage= 391 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.34'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 4.31 cfs

5.00' x 1.00' deep channel, n= 0.240
Side Slope Z-value= 4.0 '/' Top Width= 13.00'
Length= 180.0' Slope= 0.0100 '/'
Inlet Invert= 202.00', Outlet Invert= 200.20'



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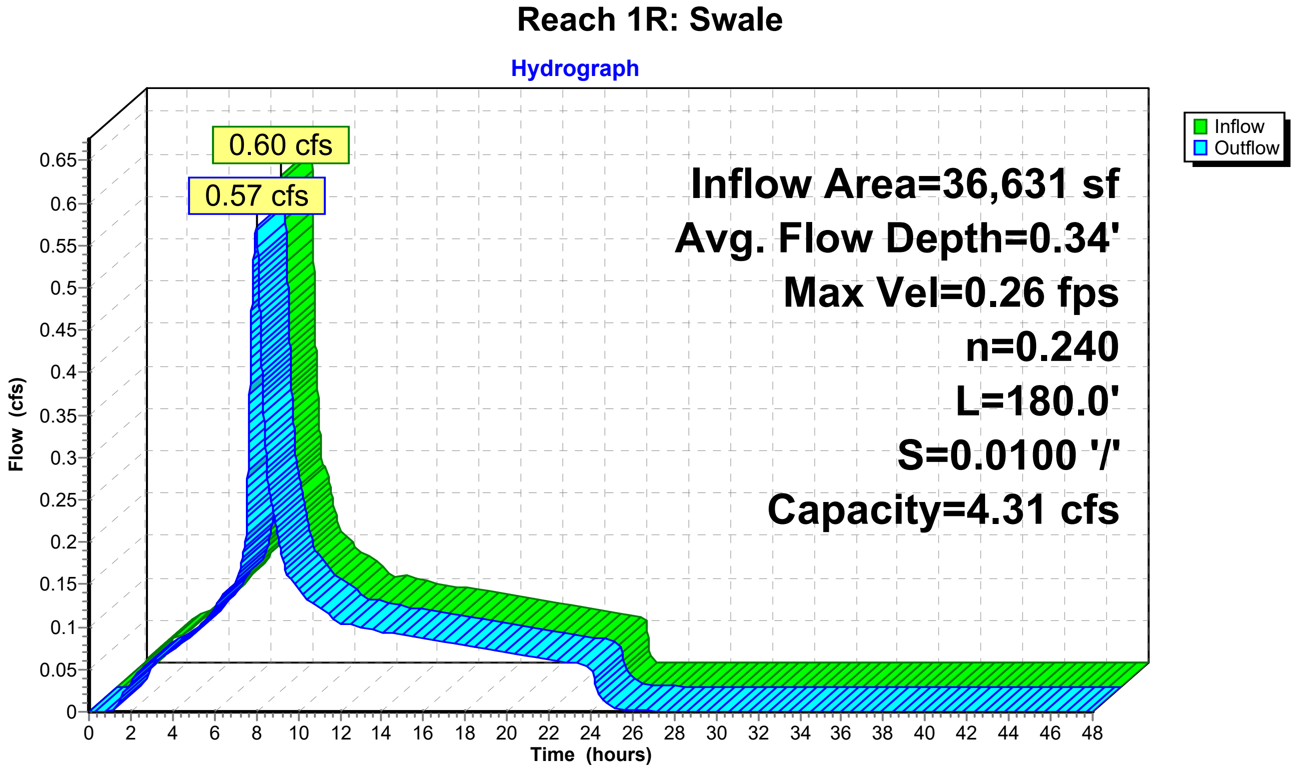


Summary for Reach 2R: 6" PIPE

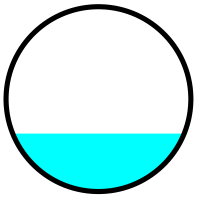
[52] Hint: Inlet/Outlet conditions not evaluated

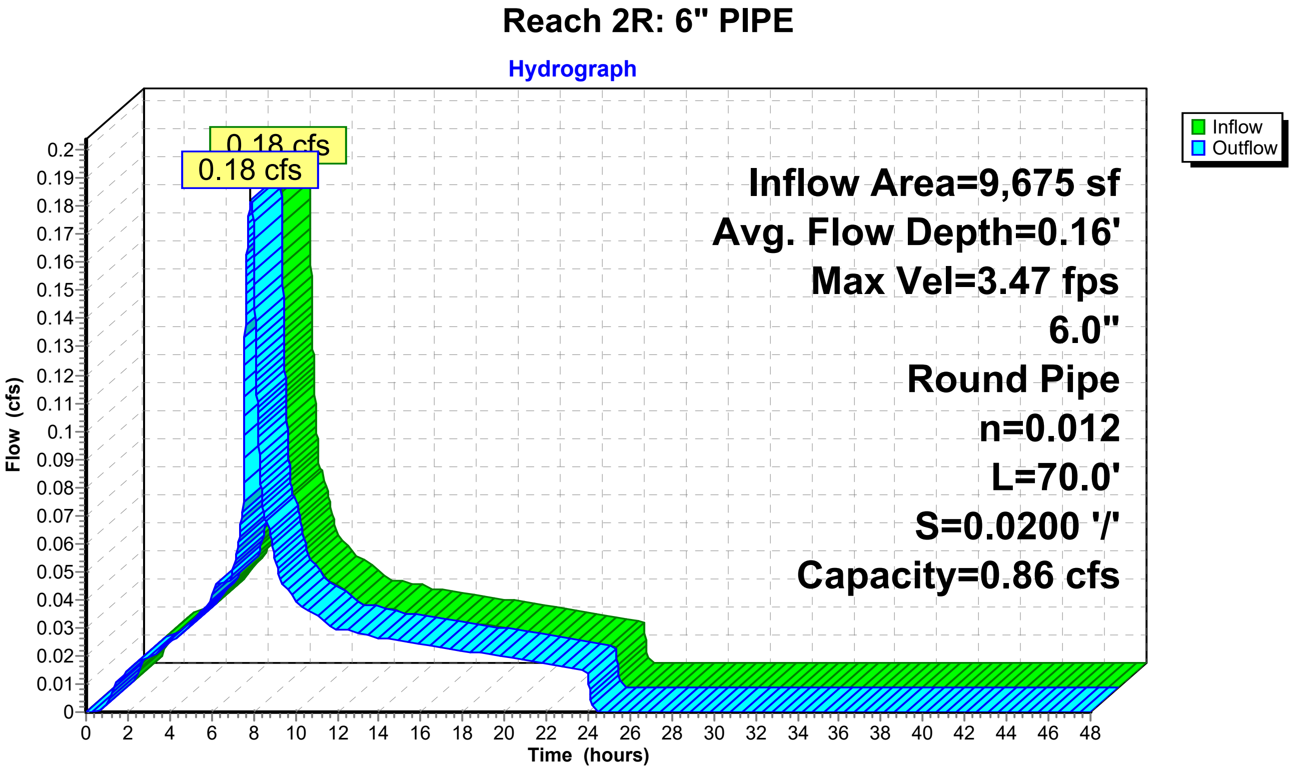
Inflow Area = 9,675 sf,100.00% Impervious, Inflow Depth = 3.27" for 10 YEAR event
Inflow = 0.18 cfs @ 7.88 hrs, Volume= 2,634 cf
Outflow = 0.18 cfs @ 7.88 hrs, Volume= 2,634 cf, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.47 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.96 fps, Avg. Travel Time= 0.6 min

Peak Storage= 4 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.86 cfs

6.0" Round Pipe
n= 0.012
Length= 70.0' Slope= 0.0200 '/'
Inlet Invert= 203.36', Outlet Invert= 201.96'





Summary for Reach 3R: 8" PIPE

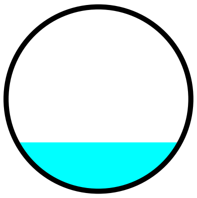
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 2R OUTLET depth by 0.02' @ 8.02 hrs

```
Inflow Area =          15,019 sf,100.00% Impervious,  Inflow Depth =   3.27"    for  10 YEAR event
Inflow      =         0.28 cfs @     7.88 hrs,  Volume=               4,088 cf
Outflow     =         0.28 cfs @     7.88 hrs,  Volume=               4,088 cf,  Atten= 0%,  Lag= 0.2 min
```

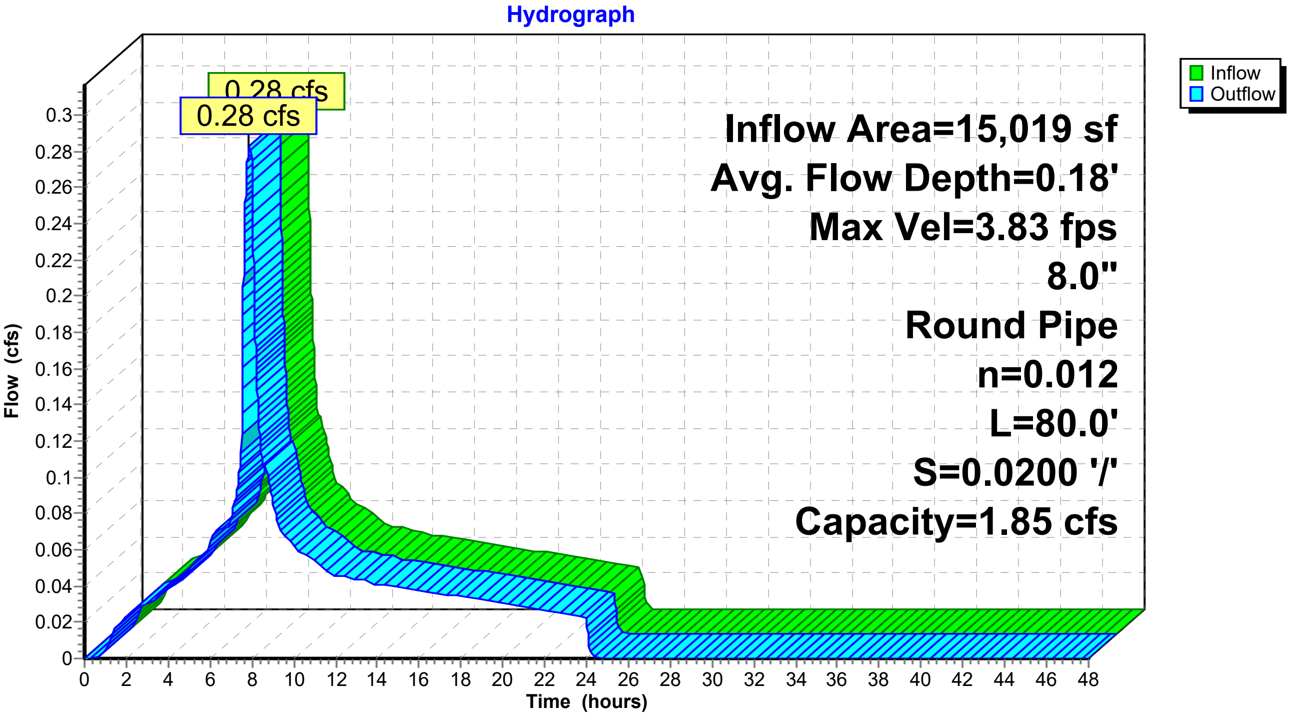
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.83 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.15 fps, Avg. Travel Time= 0.6 min

Peak Storage= 6 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.85 cfs

8.0" Round Pipe
n= 0.012
Length= 80.0' Slope= 0.0200 '/'
Inlet Invert= 201.96', Outlet Invert= 200.36'



Reach 3R: 8" PIPE



Summary for Reach 4R: 8" PIPE

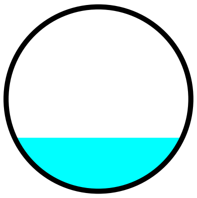
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 3R OUTLET depth by 0.02' @ 8.02 hrs

```
Inflow Area =          17,894 sf,100.00% Impervious,  Inflow Depth =   3.27"    for  10 YEAR event
Inflow      =          0.34 cfs @     7.88 hrs,  Volume=             4,871 cf
Outflow     =          0.34 cfs @     7.89 hrs,  Volume=             4,871 cf,  Atten= 0%,  Lag= 0.3 min
```

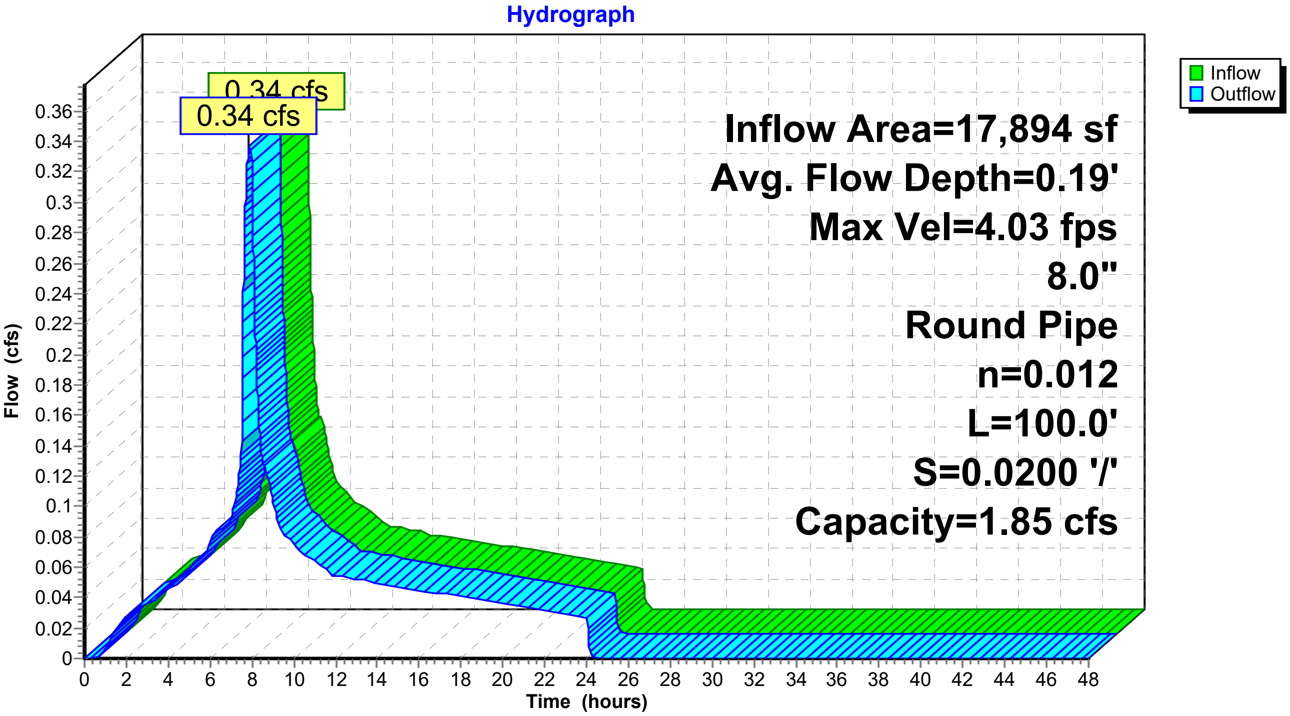
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.03 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.26 fps, Avg. Travel Time= 0.7 min

Peak Storage= 8 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.85 cfs

8.0" Round Pipe
n= 0.012
Length= 100.0' Slope= 0.0200 '/'
Inlet Invert= 200.36', Outlet Invert= 198.36'



Reach 4R: 8" PIPE



Summary for Reach 5R: 6" PIPE

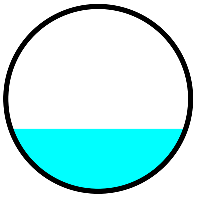
[52] Hint: Inlet/Outlet conditions not evaluated

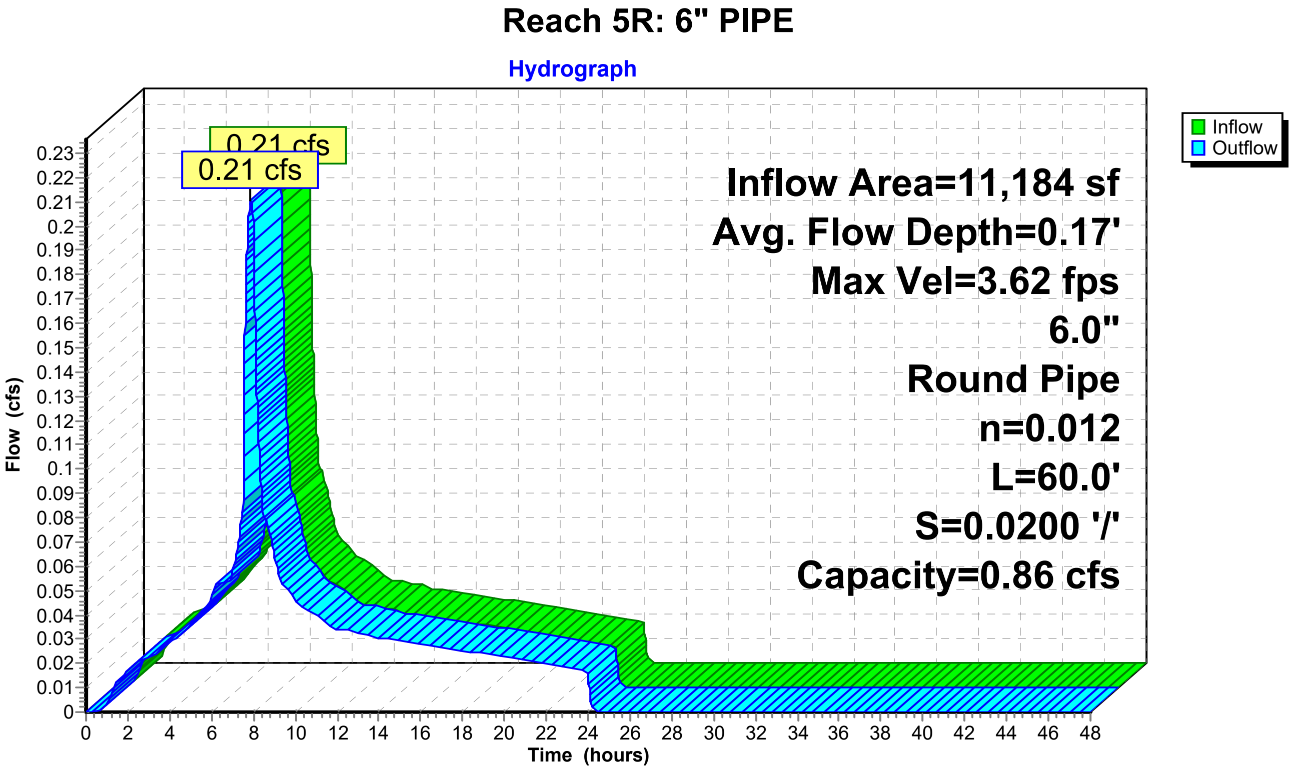
Inflow Area = 11,184 sf,100.00% Impervious, Inflow Depth = 3.27" for 10 YEAR event
Inflow = 0.21 cfs @ 7.88 hrs, Volume= 3,044 cf
Outflow = 0.21 cfs @ 7.88 hrs, Volume= 3,044 cf, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.62 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.04 fps, Avg. Travel Time= 0.5 min

Peak Storage= 3 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.86 cfs

6.0" Round Pipe
n= 0.012
Length= 60.0' Slope= 0.0200 '/'
Inlet Invert= 199.56', Outlet Invert= 198.36'





Summary for Reach 6R: 8" PIPE

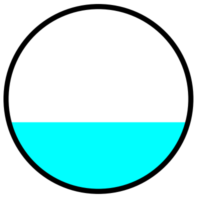
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 4R OUTLET depth by 0.06' @ 7.89 hrs
[62] Hint: Exceeded Reach 5R OUTLET depth by 0.08' @ 7.90 hrs

```
Inflow Area =          29,078 sf,100.00% Impervious,  Inflow Depth =   3.27"    for  10 YEAR event
Inflow      =         0.55 cfs @     7.88 hrs,  Volume=              7,915 cf
Outflow     =         0.55 cfs @     7.89 hrs,  Volume=              7,915 cf,  Atten= 0%,  Lag= 0.2 min
```

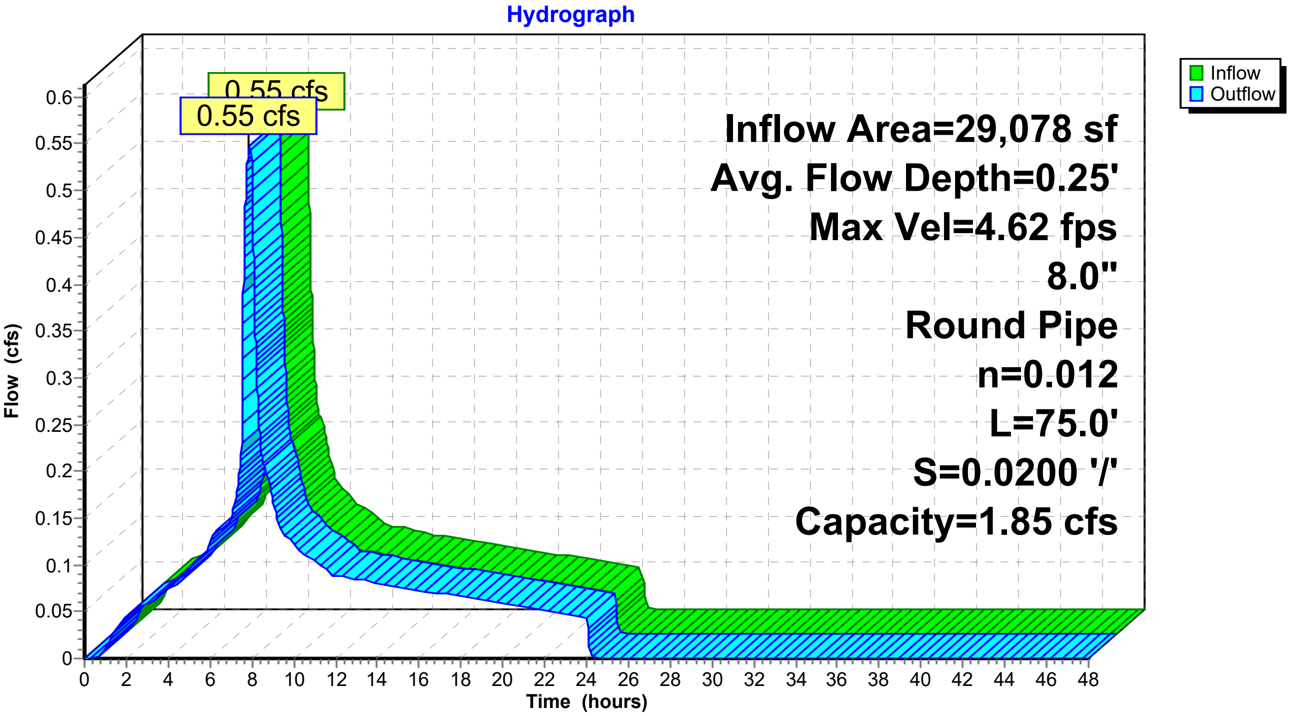
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.62 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.60 fps, Avg. Travel Time= 0.5 min

Peak Storage= 9 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.85 cfs

8.0" Round Pipe
n= 0.012
Length= 75.0' Slope= 0.0200 '/'
Inlet Invert= 198.36', Outlet Invert= 196.86'



Reach 6R: 8" PIPE



Summary for Reach 7R: 8" PIPE

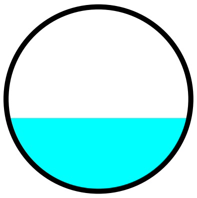
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 6R OUTLET depth by 0.02' @ 7.90 hrs

```
Inflow Area =           32,648 sf,100.00% Impervious,  Inflow Depth =   3.27"    for  10 YEAR event
Inflow      =          0.61 cfs @     7.89 hrs,  Volume=             8,887 cf
Outflow     =          0.61 cfs @     7.89 hrs,  Volume=             8,887 cf,  Atten= 0%,  Lag= 0.1 min
```

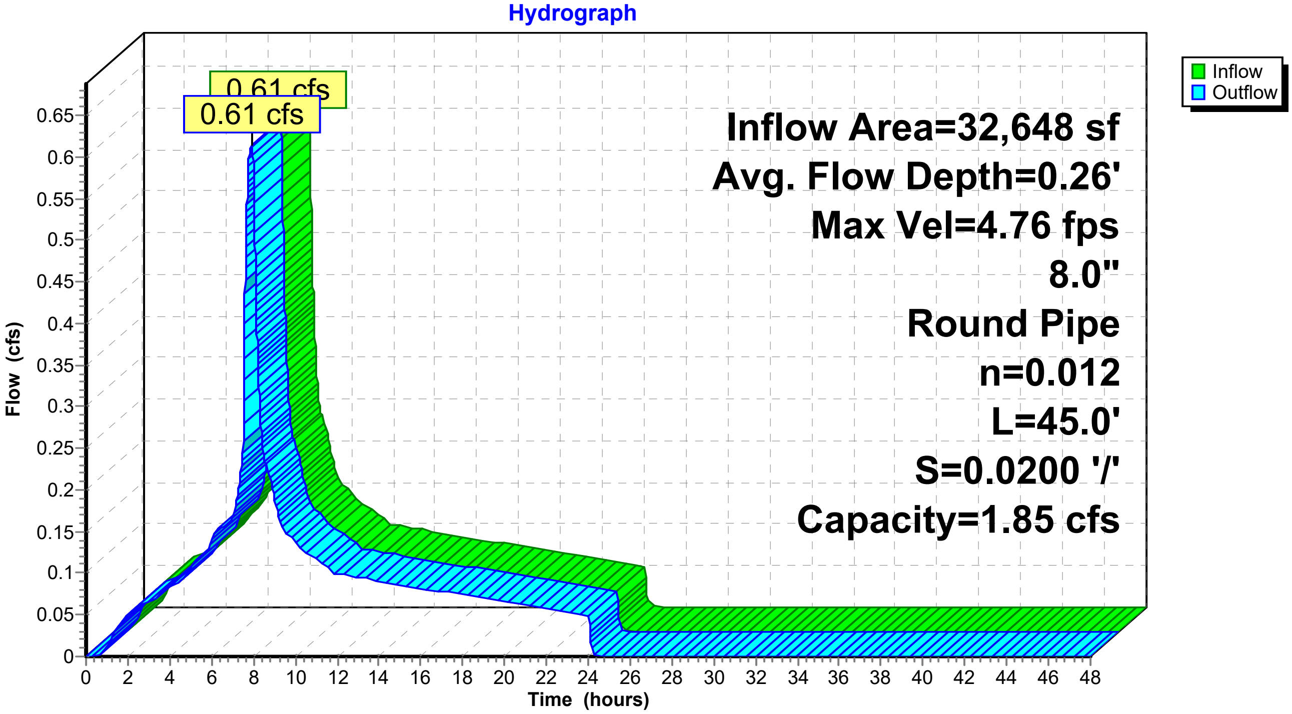
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.76 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.69 fps, Avg. Travel Time= 0.3 min

Peak Storage= 6 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.26'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.85 cfs

8.0" Round Pipe
n= 0.012
Length= 45.0' Slope= 0.0200 '/'
Inlet Invert= 196.86', Outlet Invert= 195.96'

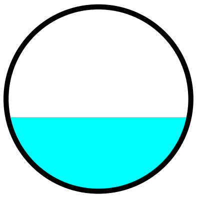


Reach 7R: 8" PIPE

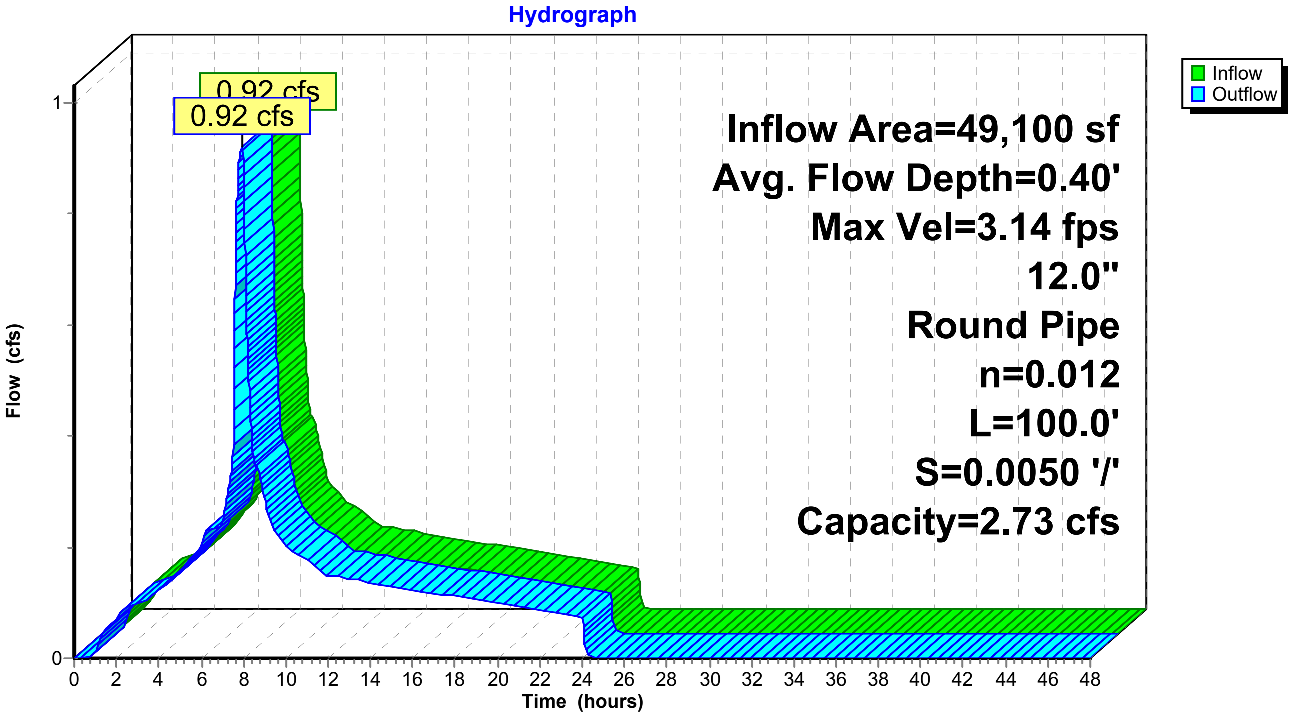


Summary for Reach 8R: 12" PIPE

```
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 7R OUTLET depth by 0.14' @ 7.90 hrs

Inflow Area =         49,100 sf,  99.55% Impervious,  Inflow Depth =   3.26"    for  10 YEAR event
Inflow      =        0.92 cfs @    7.89 hrs,  Volume=           13,328 cf
Outflow     =        0.92 cfs @    7.89 hrs,  Volume=           13,328 cf,  Atten= 0%,  Lag= 0.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.14 fps,  Min. Travel Time= 0.5 min
Avg. Velocity = 1.76 fps,  Avg. Travel Time= 0.9 min

Peak Storage= 29 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 1.00'  Flow Area= 0.8 sf,  Capacity= 2.73 cfs

12.0"  Round Pipe
n= 0.012
Length= 100.0'   Slope= 0.0050 '/'
Inlet Invert= 195.96',  Outlet Invert= 195.46'
```



Reach 8R: 12" PIPE



Summary for Reach 9R: 12" PIPE

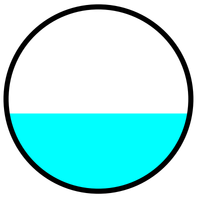
[52] Hint: Inlet/Outlet conditions not evaluated
[61] Hint: Exceeded Reach 11R outlet invert by 0.25' @ 7.89 hrs

```
Inflow Area =        77,784 sf,  96.02% Impervious,  Inflow Depth =   3.19"    for  10 YEAR event
Inflow      =       1.42 cfs @     7.89 hrs,  Volume=          20,650 cf
Outflow     =       1.42 cfs @     7.89 hrs,  Volume=          20,650 cf,  Atten= 0%,  Lag= 0.1 min
```

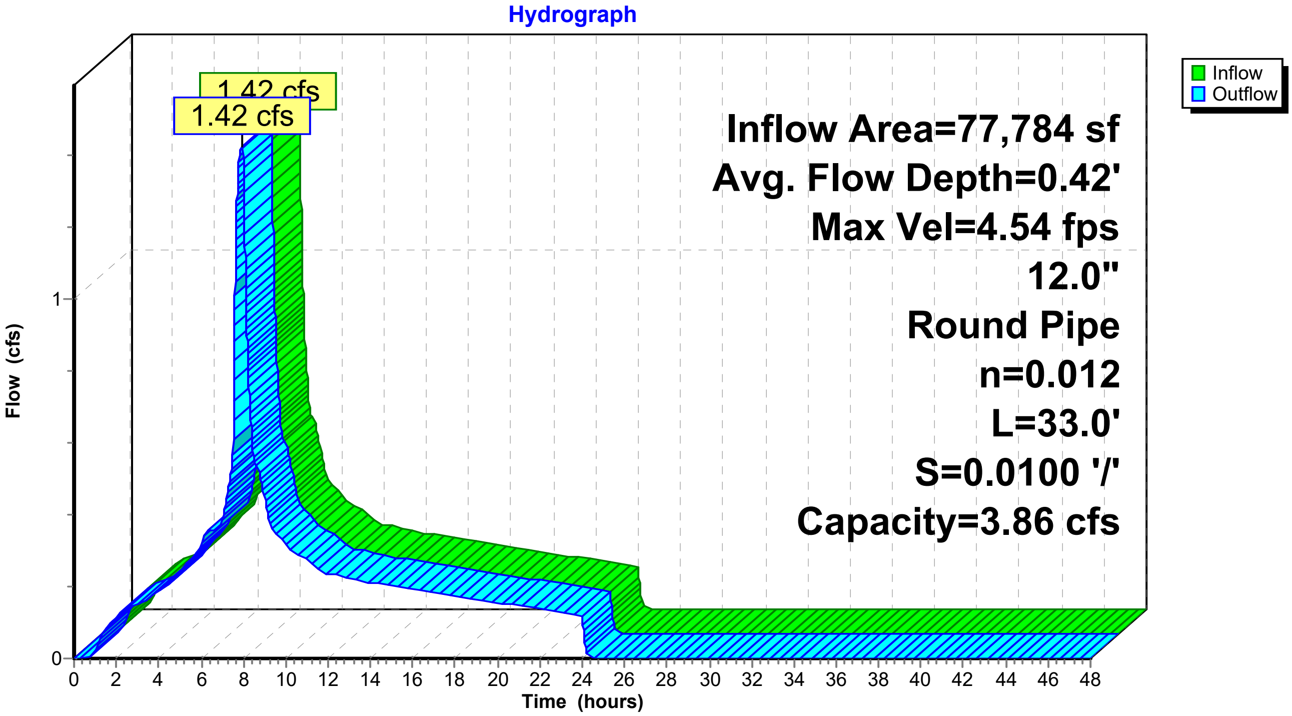
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.54 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.56 fps, Avg. Travel Time= 0.2 min

Peak Storage= 10 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.86 cfs

12.0" Round Pipe
n= 0.012
Length= 33.0' Slope= 0.0100 '/'
Inlet Invert= 194.33', Outlet Invert= 194.00'



Reach 9R: 12" PIPE



Summary for Reach 10R: 6" PIPE

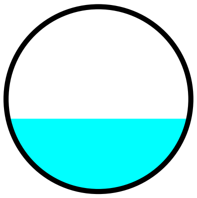
[52] Hint: Inlet/Outlet conditions not evaluated

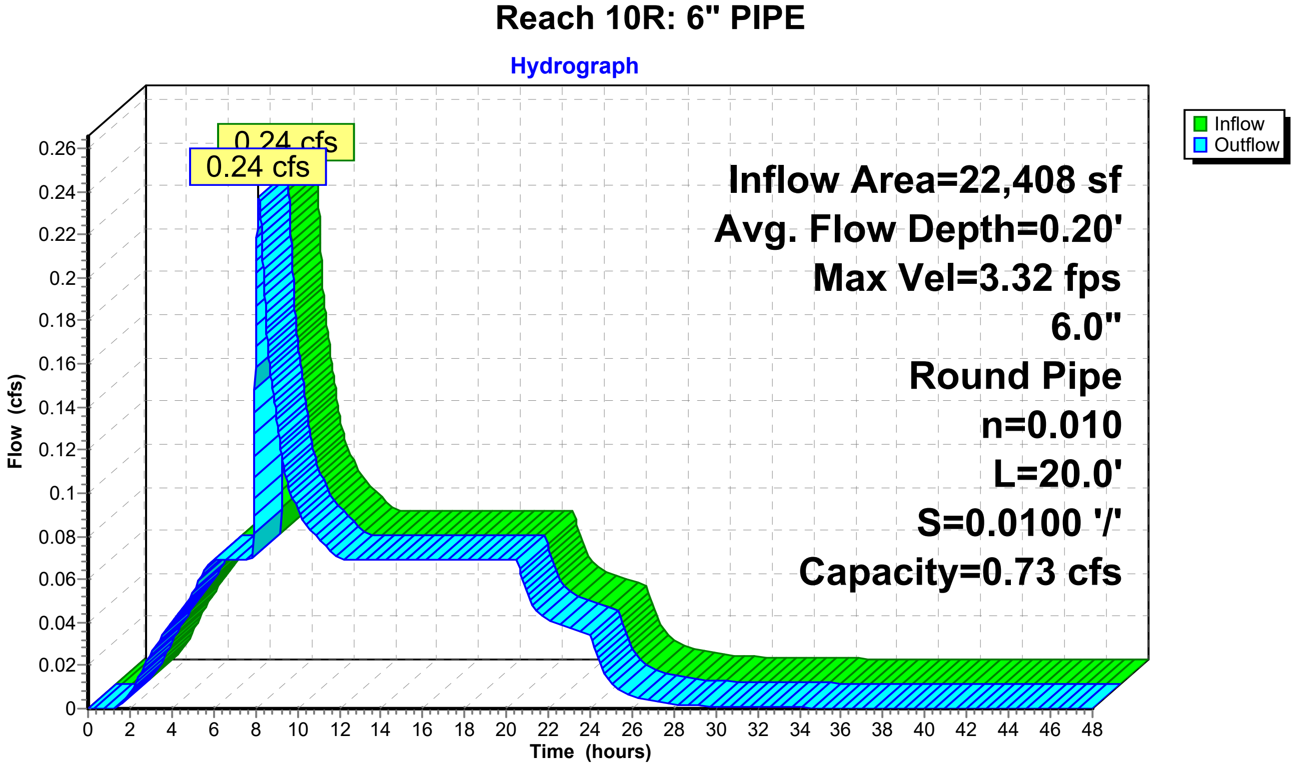
Inflow Area = 22,408 sf, 85.94% Impervious, Inflow Depth > 2.98" for 10 YEAR event
Inflow = 0.24 cfs @ 8.17 hrs, Volume= 5,560 cf
Outflow = 0.24 cfs @ 8.17 hrs, Volume= 5,560 cf, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.32 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.38 fps, Avg. Travel Time= 0.2 min

Peak Storage= 1 cf @ 8.17 hrs
Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.73 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 20.0' Slope= 0.0100 '/'
Inlet Invert= 194.20', Outlet Invert= 194.00'





Summary for Reach 11R: 8" PIPE

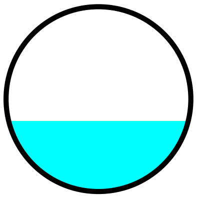
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 23,484 sf, 87.76% Impervious, Inflow Depth = 3.02" for 10 YEAR event
Inflow = 0.40 cfs @ 7.88 hrs, Volume= 5,907 cf
Outflow = 0.40 cfs @ 7.89 hrs, Volume= 5,907 cf, Atten= 0%, Lag= 0.0 min

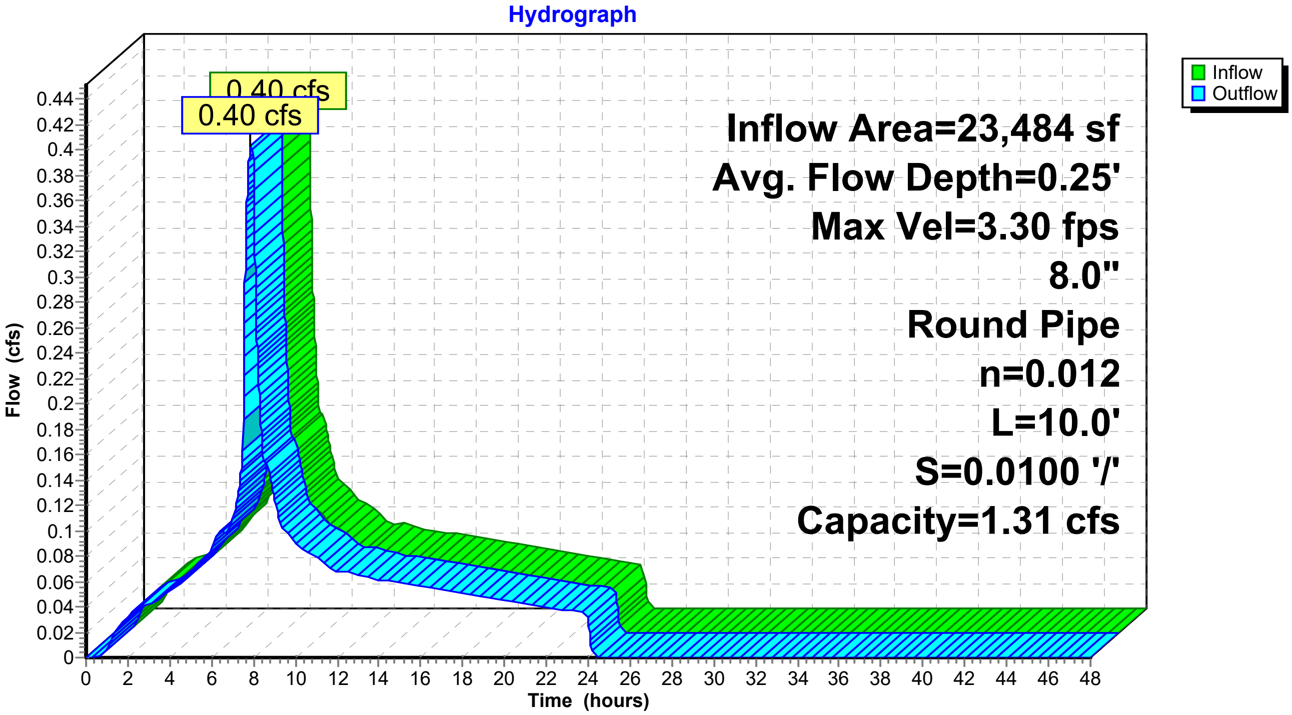
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.30 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.88 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.31 cfs

8.0" Round Pipe
n= 0.012
Length= 10.0' Slope= 0.0100 '/'
Inlet Invert= 194.60', Outlet Invert= 194.50'



Reach 11R: 8" PIPE



Summary for Reach 12R: 6" PIPE

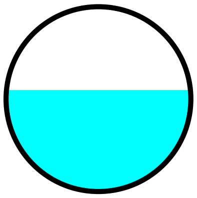
[52] Hint: Inlet/Outlet conditions not evaluated

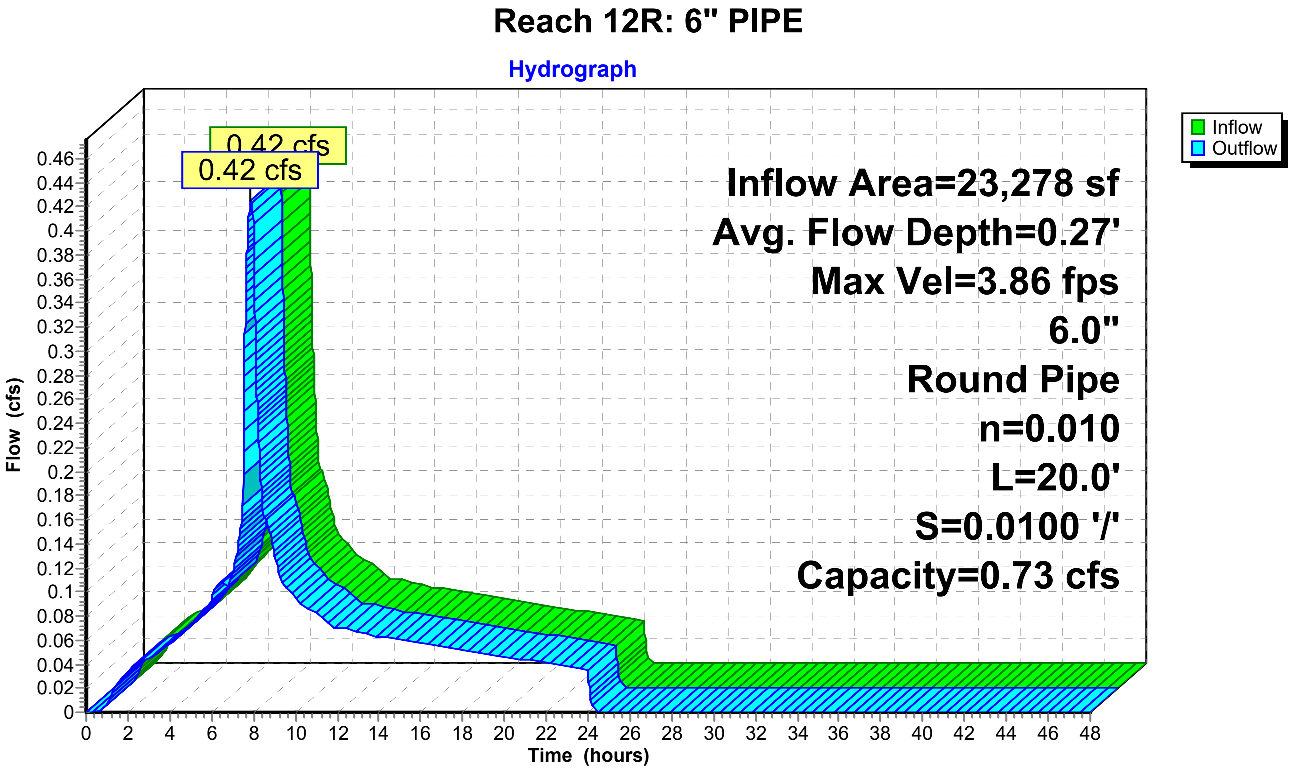
Inflow Area = 23,278 sf, 95.87% Impervious, Inflow Depth = 3.18" for 10 YEAR event
Inflow = 0.42 cfs @ 7.88 hrs, Volume= 6,174 cf
Outflow = 0.42 cfs @ 7.88 hrs, Volume= 6,174 cf, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.86 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.24 fps, Avg. Travel Time= 0.1 min

Peak Storage= 2 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.73 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 20.0' Slope= 0.0100 '/'
Inlet Invert= 194.20', Outlet Invert= 194.00'

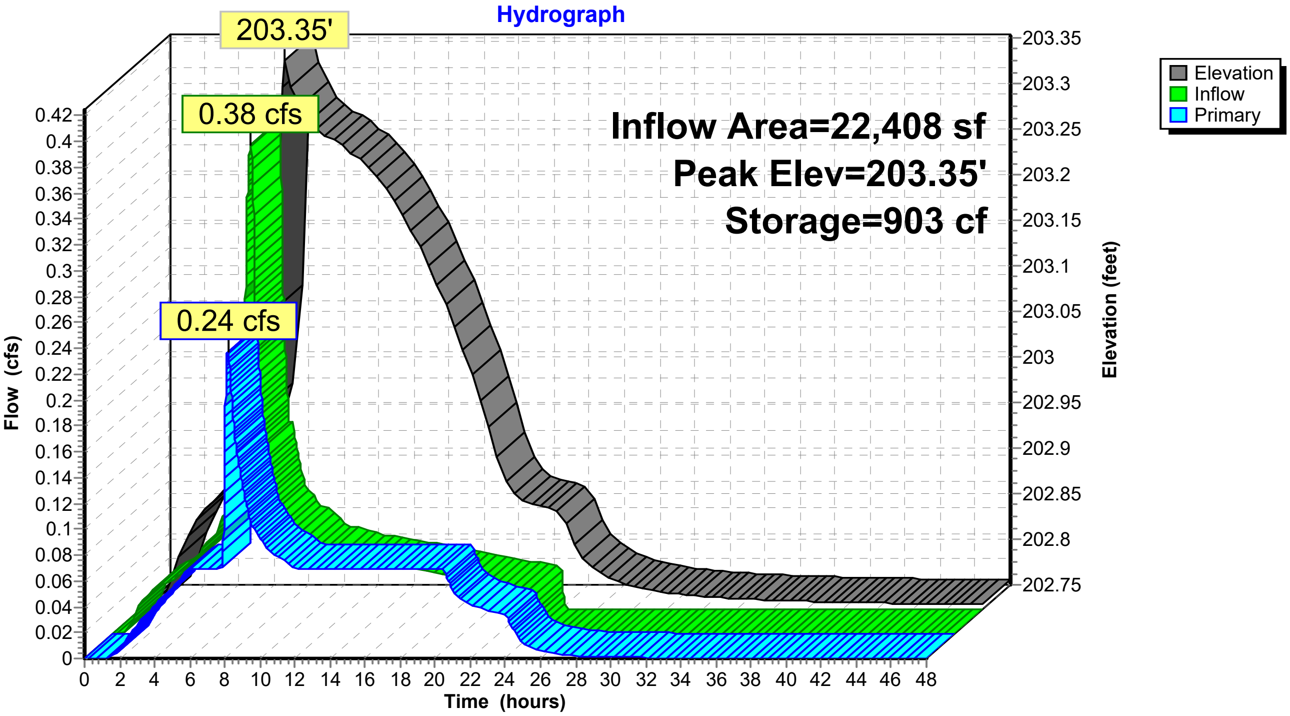




Summary for Pond 5P: PLANTER

```
Inflow Area =        22,408 sf, 85.94% Impervious,  Inflow Depth =  2.98"   for  10 YEAR event
Inflow      =     0.38 cfs @   7.89 hrs,  Volume=           5,568 cf
Outflow     =     0.24 cfs @   8.17 hrs,  Volume=           5,560 cf,  Atten= 37%,  Lag= 16.8 min
Primary     =     0.24 cfs @   8.17 hrs,  Volume=           5,560 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 203.35' @ 8.17 hrs   Surf.Area= 1,500 sf   Storage= 903 cf
Flood Elev= 203.75'   Surf.Area= 1,500 sf   Storage= 1,500 cf

Plug-Flow detention time= 112.4 min calculated for 5,560 cf (100% of inflow)
Center-of-Mass det. time= 111.3 min ( 785.1 - 673.8 )

Volume      Invert     Avail.Storage   Storage Description
   #1       202.75'         1,500 cf   Ponding Depth (Prismatic)Listed below (Recalc)

 Elevation       Surf.Area        Inc.Store        Cum.Store
     (feet)          (sq-ft)     (cubic-feet)     (cubic-feet)
   202.75           1,500                0                0
   203.75           1,500            1,500            1,500

Device   Routing            Invert   Outlet Devices
   #1    Primary           202.75'   6.0"  Round Culvert  L= 10.0'   Ke= 0.500
                                     Inlet / Outlet Invert= 202.75' / 202.50'   S= 0.0250 '/'   Cc= 0.900
                                     n= 0.013,  Flow Area= 0.20 sf
   #2    Device 1          202.75'   2.000 in/hr Exfiltration over Surface area
   #3    Device 1          203.25'   6.0" Horiz. Orifice/Grate   C= 0.610
                                     Limited to weir flow at low heads

Primary OutFlow  Max=0.24 cfs @ 8.17 hrs  HW=203.35'  TW=194.40'   (Dynamic Tailwater)
↑
└─1=Culvert  (Passes 0.24 cfs of 0.56 cfs potential flow)
    ↑
    ├─2=Exfiltration  (Exfiltration Controls 0.07 cfs)
    └─3=Orifice/Grate  (Weir Controls 0.17 cfs @ 1.05 fps)
```

Pond 5P: PLANTER



Summary for Pond DC: CHAMBERS

```
Inflow Area =      160,101 sf,  91.52% Impervious,  Inflow Depth =   3.09"    for  10 YEAR event
Inflow      =      2.53 cfs @    8.00 hrs,  Volume=          41,280 cf
Outflow     =      2.53 cfs @    8.00 hrs,  Volume=          41,279 cf,  Atten= 0%,  Lag= 0.2 min
Primary     =      2.53 cfs @    8.00 hrs,  Volume=          41,279 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 193.83' @ 8.00 hrs   Surf.Area= 989 sf   Storage= 3,519 cf
Flood Elev= 195.00'   Surf.Area= 989 sf   Storage= 3,901 cf

Plug-Flow detention time= 42.7 min calculated for 41,270 cf (100% of inflow)
Center-of-Mass det. time= 42.6 min ( 731.8 - 689.2 )

Volume        Invert    Avail.Storage   Storage Description
   #1A       188.00'         1,487 cf   10.33'W x 95.67'L x 7.00'H Field A
                                        6,920 cf Overall - 2,414 cf Embedded = 4,506 cf  x 33.0% Voids
   #2A       189.00'         2,414 cf   ADS_StormTech MC-4500 +Cap x 22  Inside #1
                                        Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf
                                        Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap
                                        Cap Storage= +35.7 cf x 2 x 1 rows = 71.4 cf
                                 3,901 cf   Total Available Storage

   Storage Group A created with Chamber Wizard

Device   Routing          Invert   Outlet Devices
   #1    Primary         188.00'   18.0"  Round Culvert  L= 100.0'   Ke= 0.500
                                   Inlet / Outlet Invert= 188.00' / 187.00'   S= 0.0100 '/'   Cc= 0.900
                                   n= 0.013,  Flow Area= 1.77 sf
   #2    Device 1        188.00'   3.5" Horiz. 2yr Orifice   C= 0.600   Limited to weir flow at low heads
   #3    Device 1        193.60'   18.0" Horiz. EMERGENCY OVERFLOW   C= 0.600
                                   Limited to weir flow at low heads

Primary OutFlow  Max=2.53 cfs @ 8.00 hrs  HW=193.83'  TW=0.00'   (Dynamic Tailwater)
└─1=Culvert  (Passes 2.53 cfs of 17.95 cfs potential flow)
   ├─2=2yr Orifice  (Orifice Controls 0.78 cfs @ 11.63 fps)
   └─3=EMERGENCY OVERFLOW (Weir Controls 1.75 cfs @ 1.58 fps)
```

Pond DC: CHAMBERS - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-4500 +Cap (ADS StormTech® MC-4500 with cap volume)
Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf
Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap
Cap Storage= +35.7 cf x 2 x 1 rows = 71.4 cf

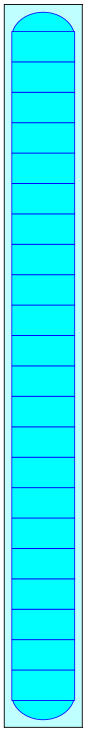
22 Chambers/Row x 4.02' Long +2.56' Cap Length x 2 = 93.67' Row Length +12.0" End Stone x 2 = 95.67' Base Length
1 Rows x 100.0" Wide + 12.0" Side Stone x 2 = 10.33' Base Width
12.0" Base + 60.0" Chamber Height + 12.0" Cover = 7.00' Field Height

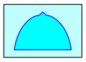
22 Chambers x 106.5 cf + 35.7 cf Cap Volume x 2 x 1 Rows = 2,414.2 cf Chamber Storage

6,919.9 cf Field - 2,414.2 cf Chambers = 4,505.7 cf Stone x 33.0% Voids = 1,486.9 cf Stone Storage

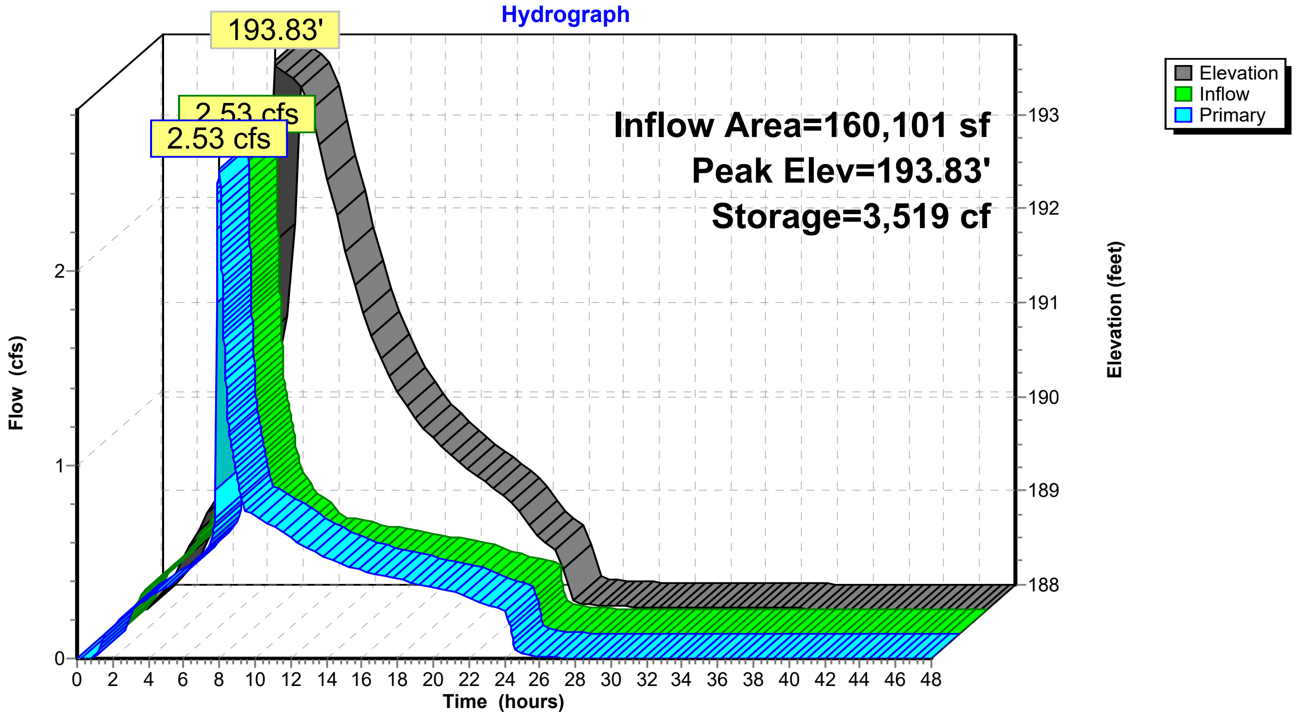
Chamber Storage + Stone Storage = 3,901.1 cf = 0.090 af
Overall Storage Efficiency = 56.4%
Overall System Size = 95.67' x 10.33' x 7.00'

22 Chambers
256.3 cy Field
166.9 cy Stone





Pond DC: CHAMBERS

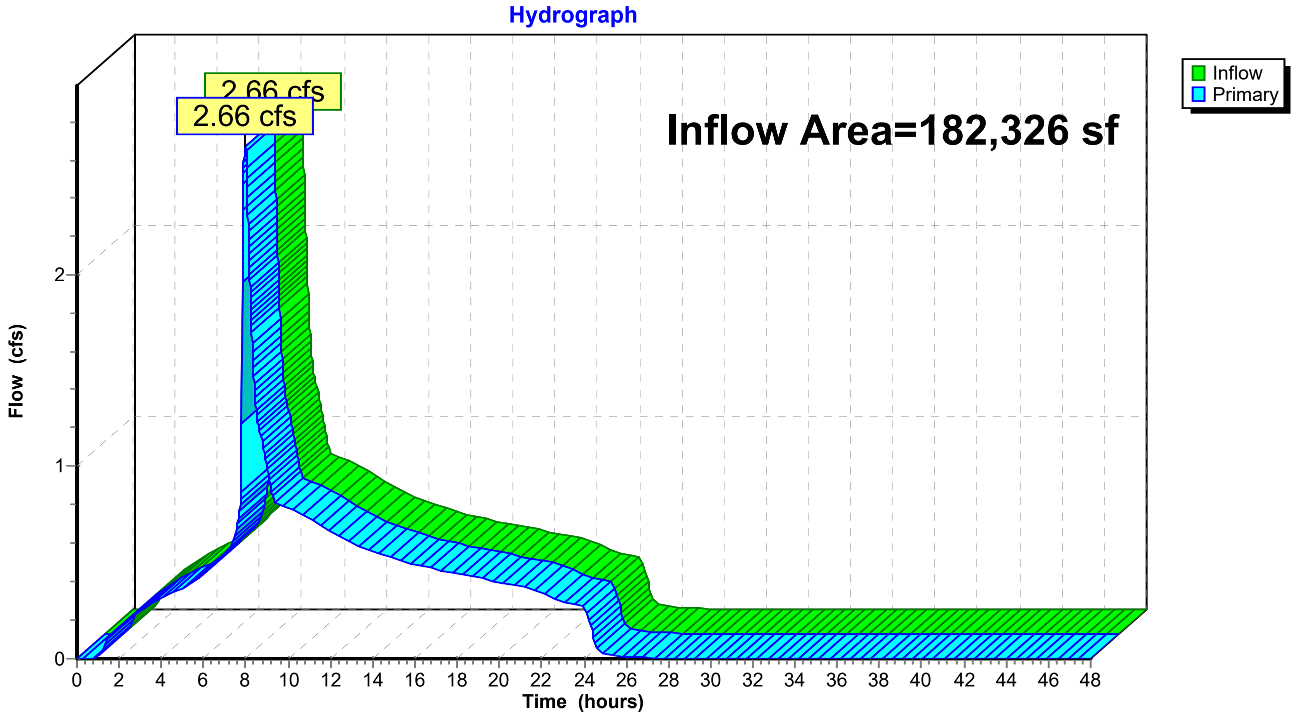


Summary for Link 11L: Peak Post- Development Flows

Inflow Area = 182,326 sf, 80.73% Impervious, Inflow Depth = 2.88" for 10 YEAR event
Inflow = 2.66 cfs @ 8.00 hrs, Volume= 43,687 cf
Primary = 2.66 cfs @ 8.00 hrs, Volume= 43,687 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 11L: Peak Post- Development Flows



Summary for Subcatchment 1S: PLAZA 1

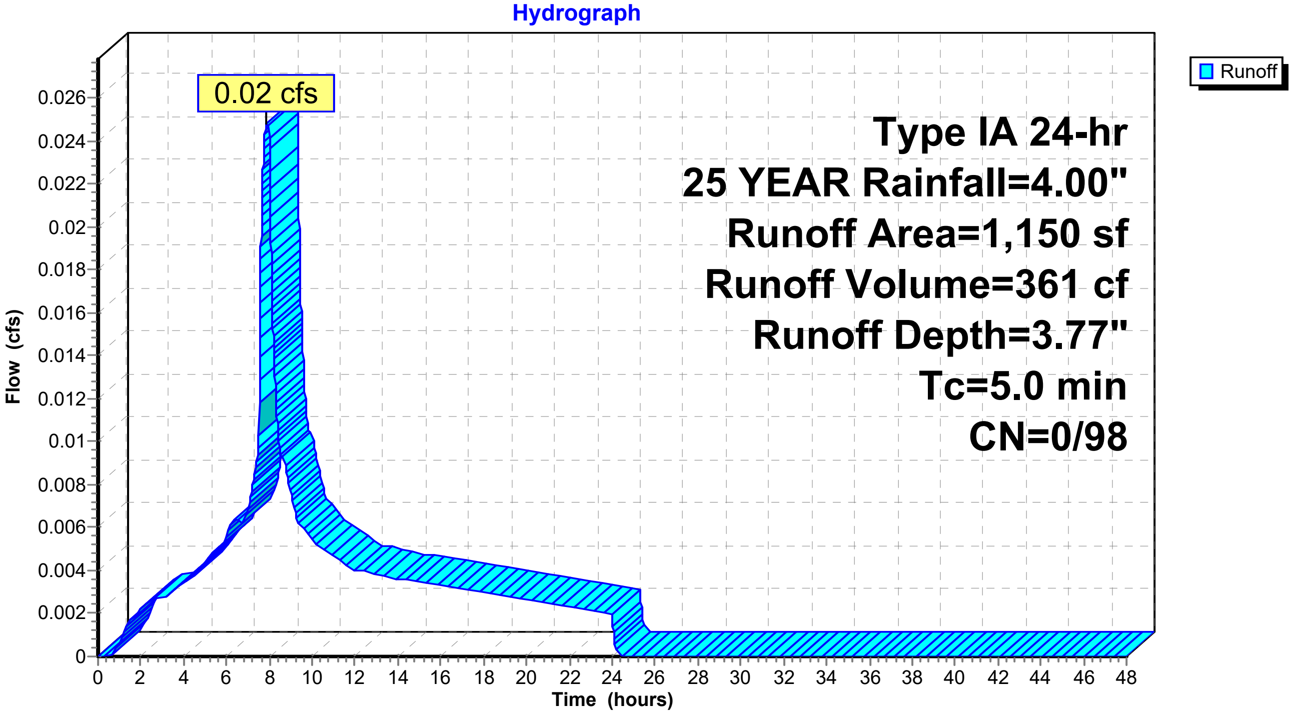
Runoff = 0.02 cfs @ 7.88 hrs, Volume= 361 cf, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

Area (sf)	CN	Description
1,150	98	Paved parking, HSG C
1,150		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: PLAZA 1



Summary for Subcatchment 2AS: ROOF

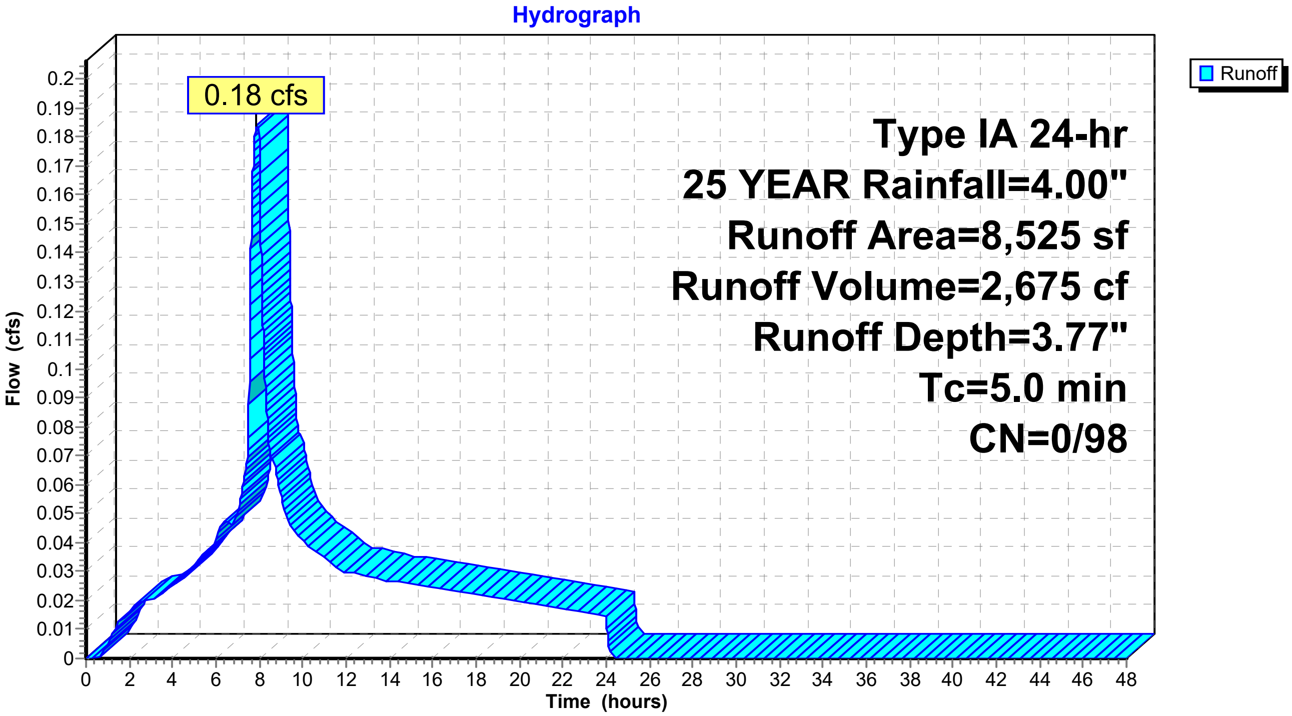
Runoff = 0.18 cfs @ 7.88 hrs, Volume= 2,675 cf, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

Area (sf)	CN	Description
8,525	98	Roofs, HSG C
8,525		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2AS: ROOF



Summary for Subcatchment 2BS: ROOF

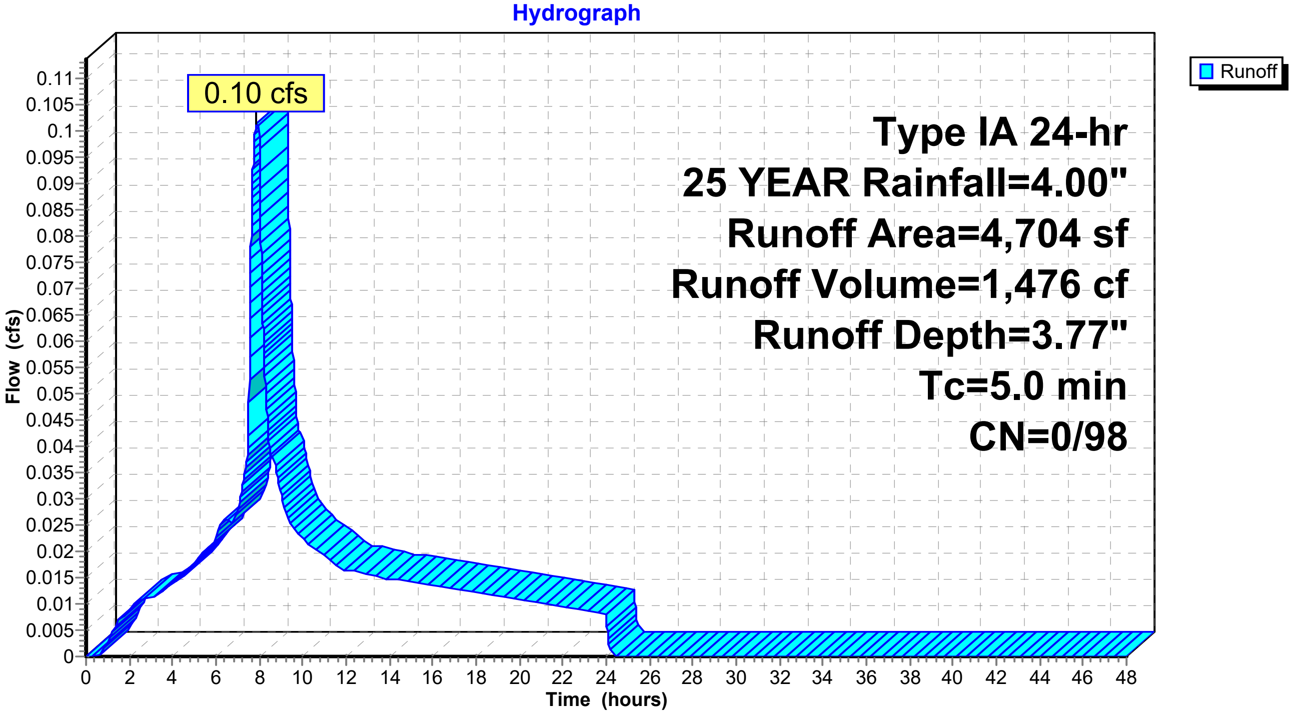
Runoff = 0.10 cfs @ 7.88 hrs, Volume= 1,476 cf, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

Area (sf)	CN	Description
4,704	98	Roofs, HSG C
4,704		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2BS: ROOF



Summary for Subcatchment 3S: PLAZA 2

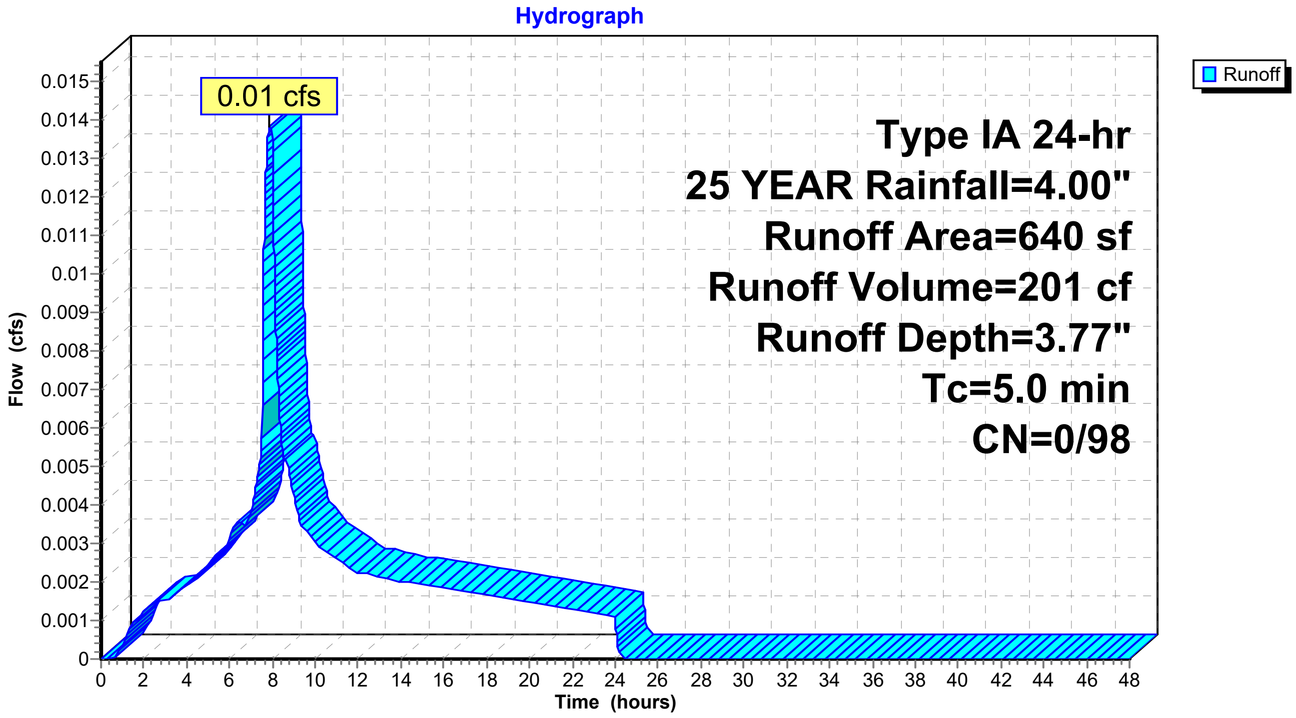
Runoff = 0.01 cfs @ 7.88 hrs, Volume= 201 cf, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

Area (sf)	CN	Description
640	98	Paved parking, HSG C
640		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S: PLAZA 2



Summary for Subcatchment 4AS: ROOF

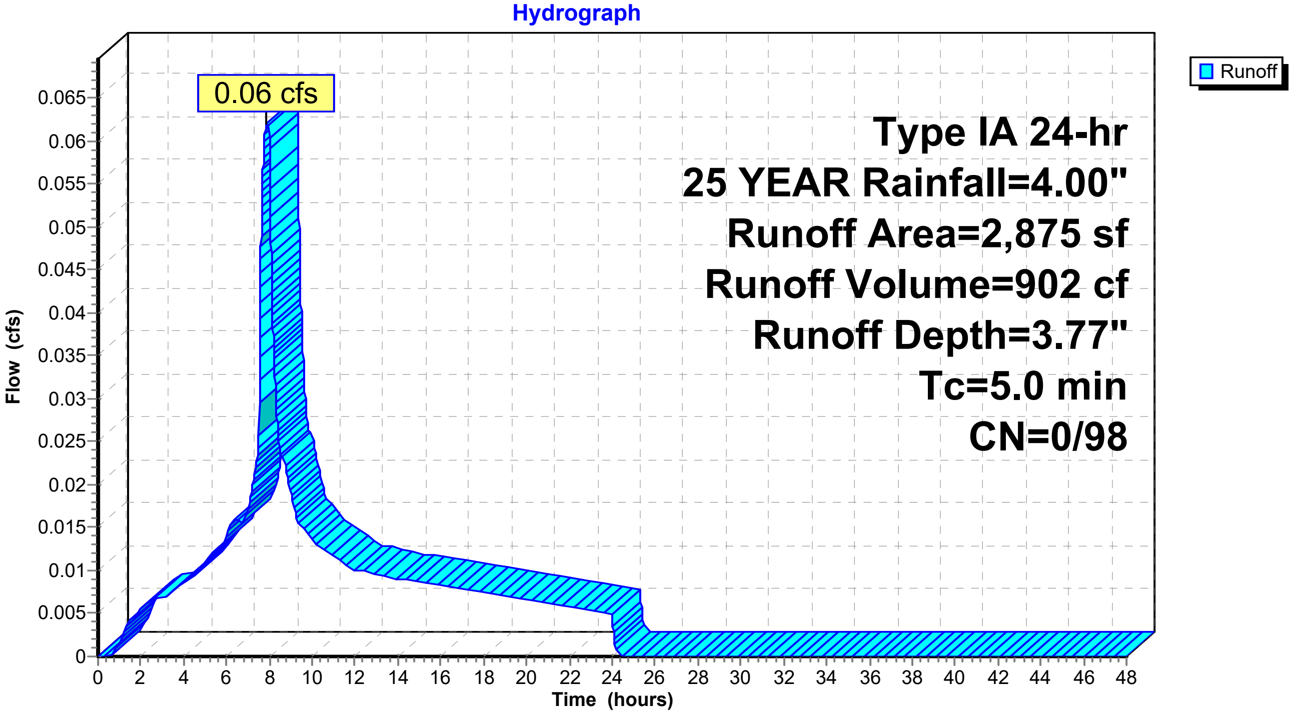
Runoff = 0.06 cfs @ 7.88 hrs, Volume= 902 cf, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

Area (sf)	CN	Description
2,875	98	Roofs, HSG C
2,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4AS: ROOF



Summary for Subcatchment 4BS: ROOF

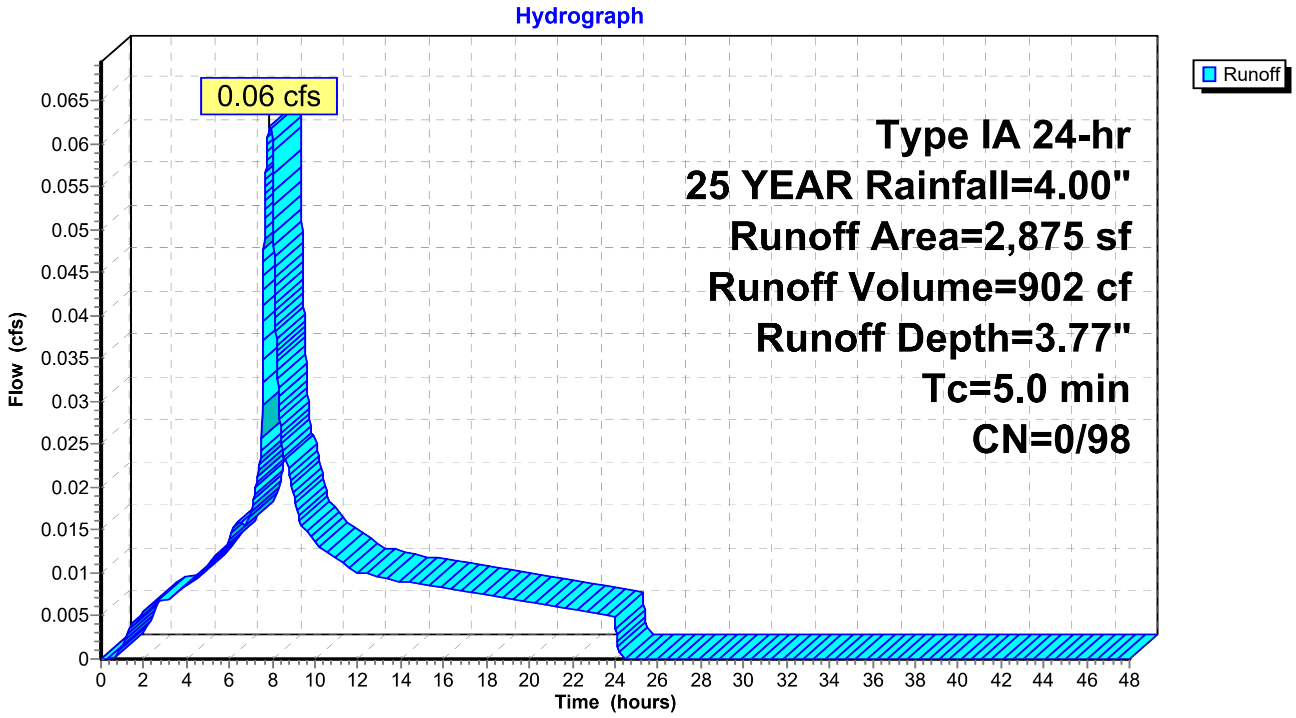
Runoff = 0.06 cfs @ 7.88 hrs, Volume= 902 cf, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

Area (sf)	CN	Description
2,875	98	Roofs, HSG C
2,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4BS: ROOF



Summary for Subcatchment 5S: PLAZA 3

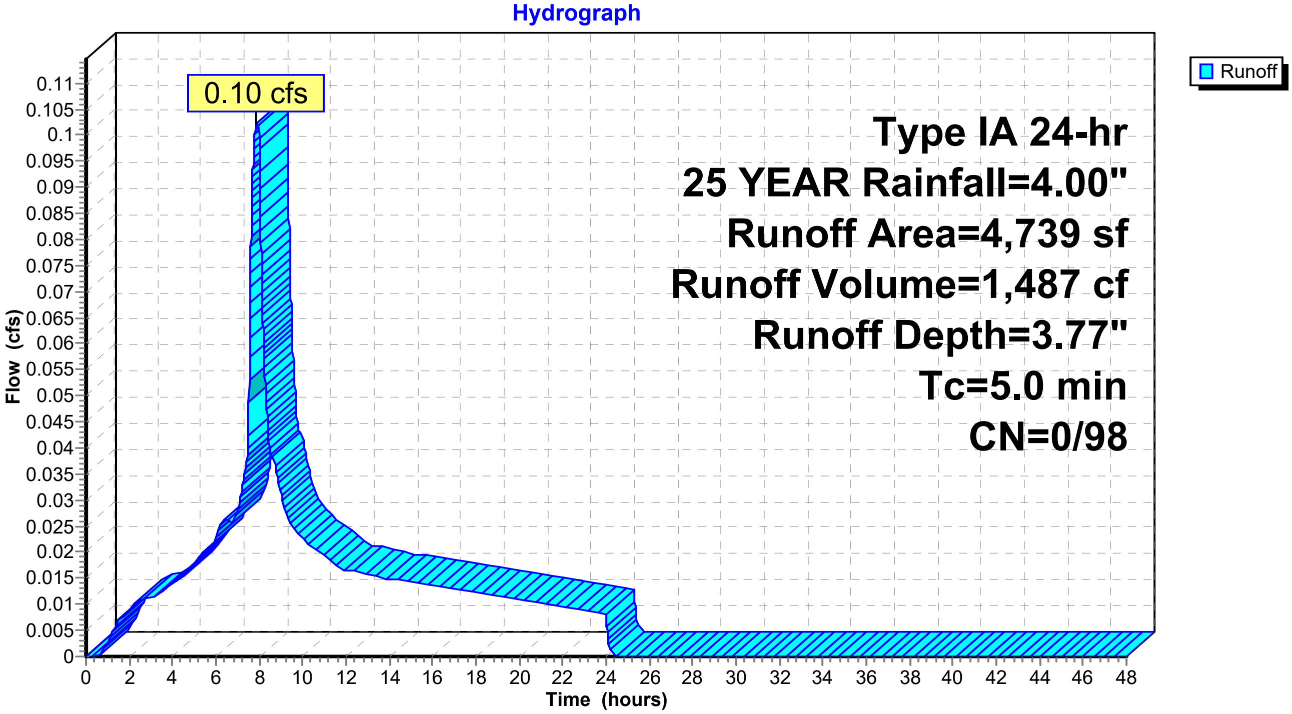
Runoff = 0.10 cfs @ 7.88 hrs, Volume= 1,487 cf, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

Area (sf)	CN	Description
4,739	98	Paved parking, HSG C
4,739		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5S: PLAZA 3



Summary for Subcatchment 6AS: ROOF

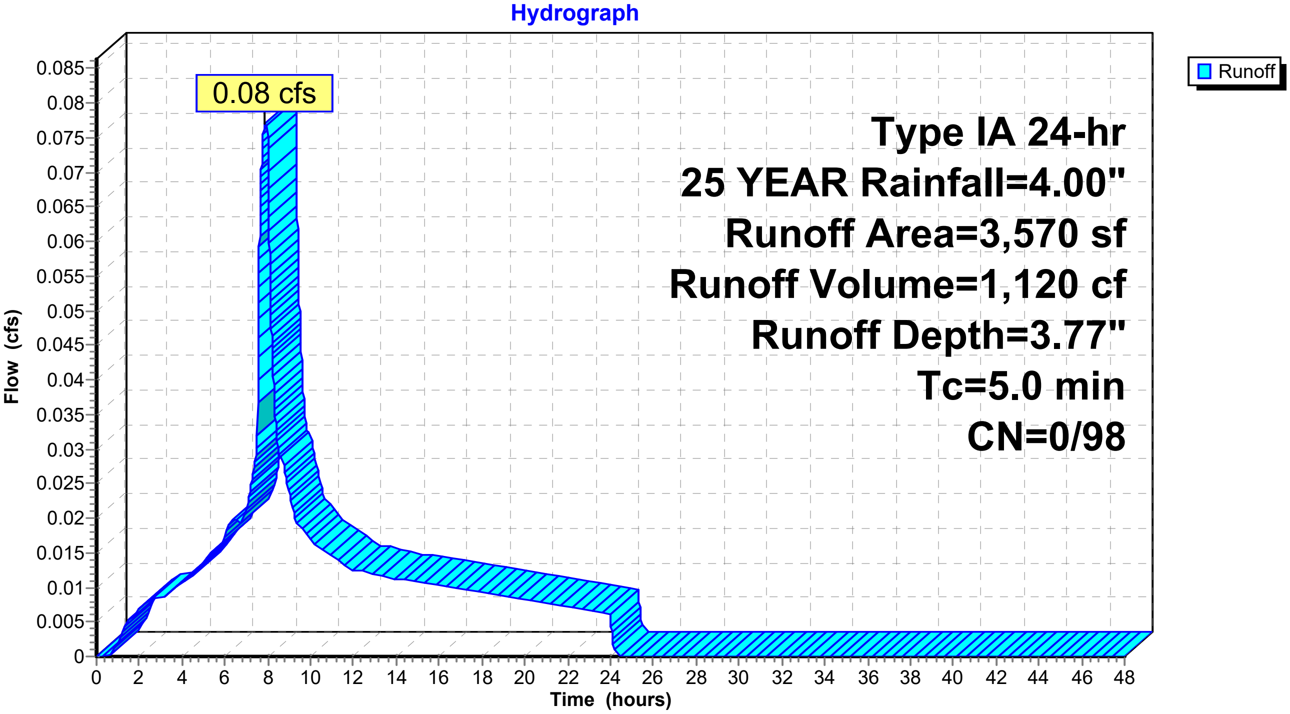
Runoff = 0.08 cfs @ 7.88 hrs, Volume= 1,120 cf, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

Area (sf)	CN	Description
3,570	98	Roofs, HSG C
3,570		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6AS: ROOF



Summary for Subcatchment 6BS: ROOF

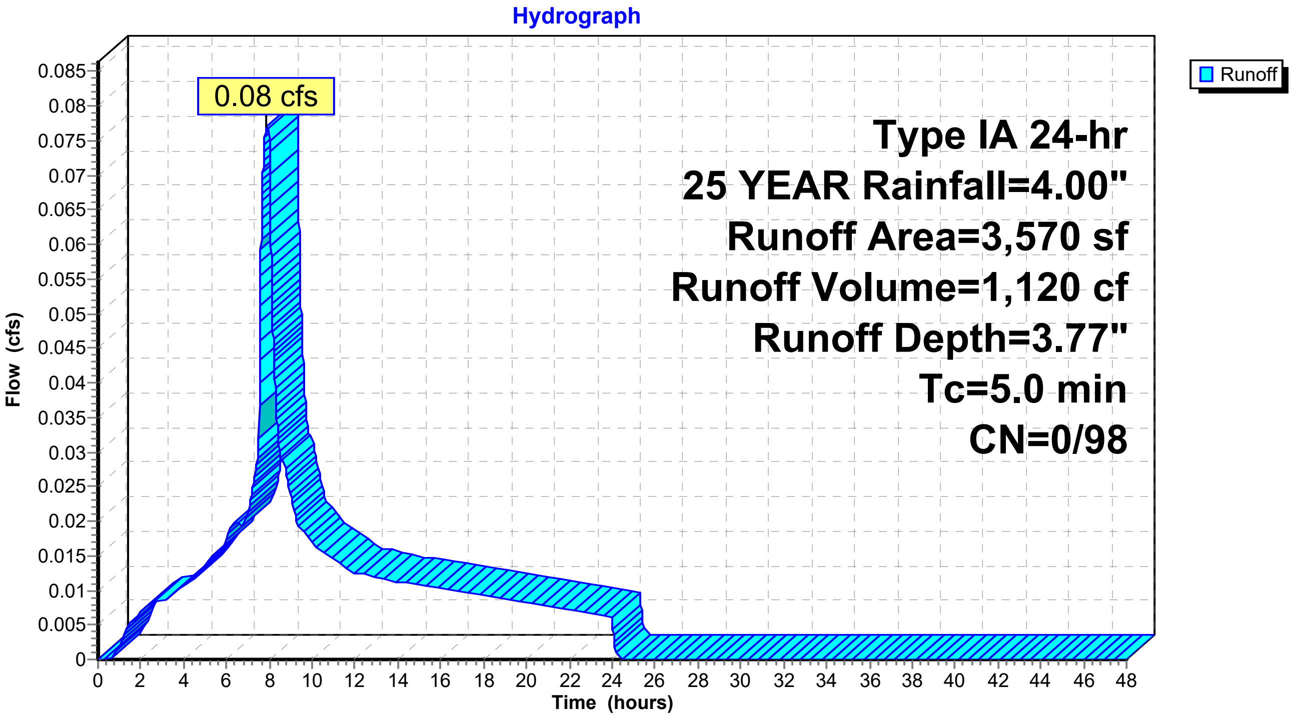
Runoff = 0.08 cfs @ 7.88 hrs, Volume= 1,120 cf, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

Area (sf)	CN	Description
3,570	98	Roofs, HSG C
3,570		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6BS: ROOF



Summary for Subcatchment 7S: NORTH DRIVEWAY

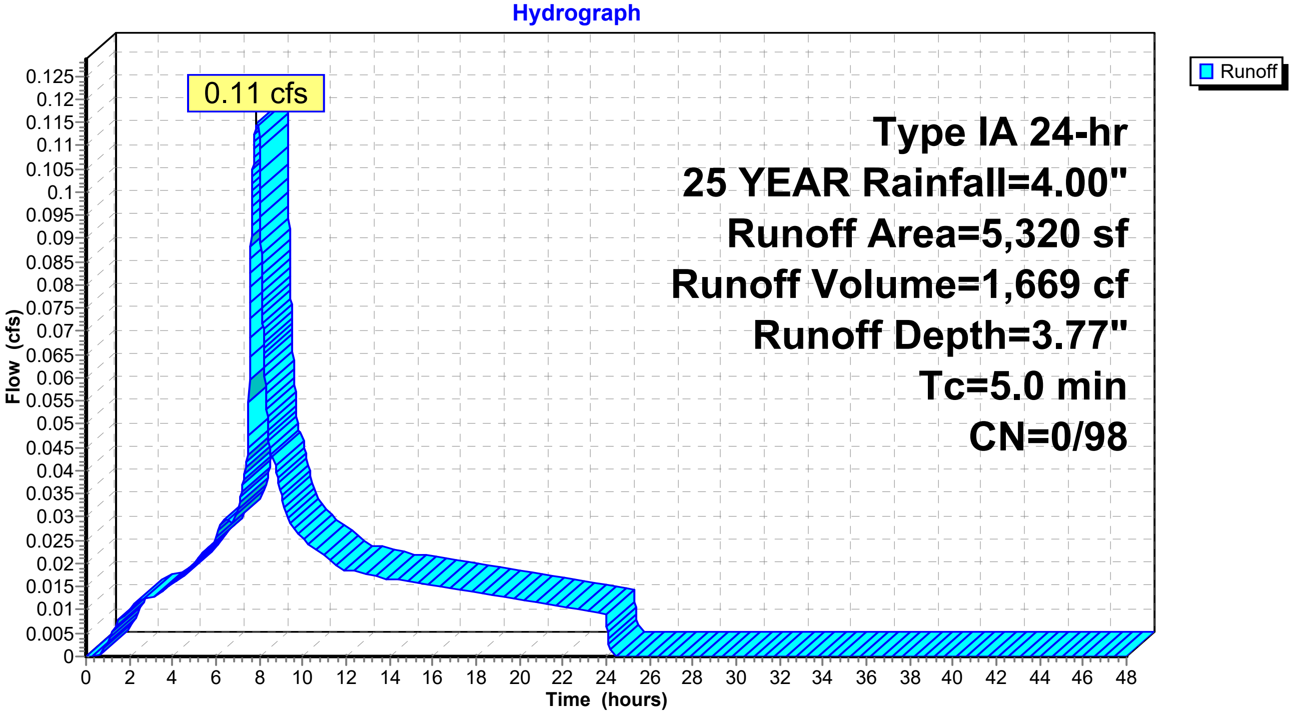
Runoff = 0.11 cfs @ 7.88 hrs, Volume= 1,669 cf, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

Area (sf)	CN	Description
5,320	98	Paved parking, HSG C
5,320		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 7S: NORTH DRIVEWAY



Summary for Subcatchment 8AS: ROOF

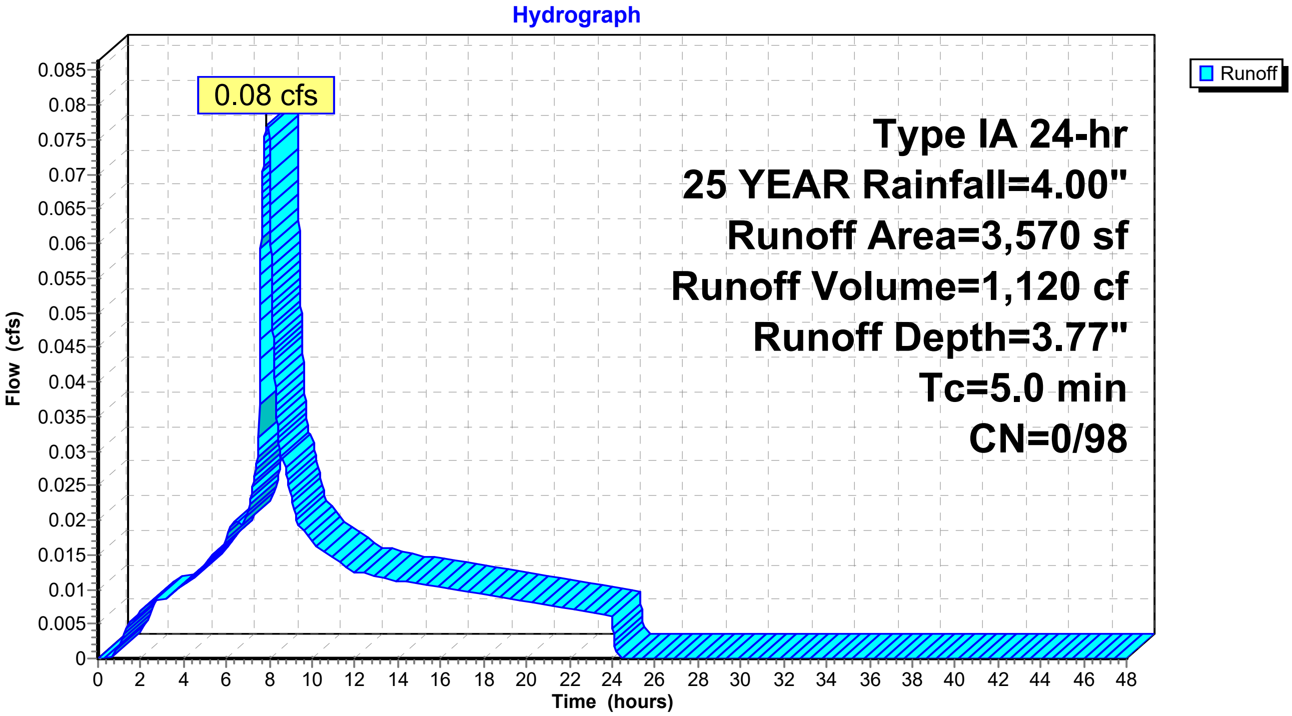
Runoff = 0.08 cfs @ 7.88 hrs, Volume= 1,120 cf, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

Area (sf)	CN	Description
3,570	98	Roofs, HSG C
3,570		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8AS: ROOF



Summary for Subcatchment 8BS: ROOF

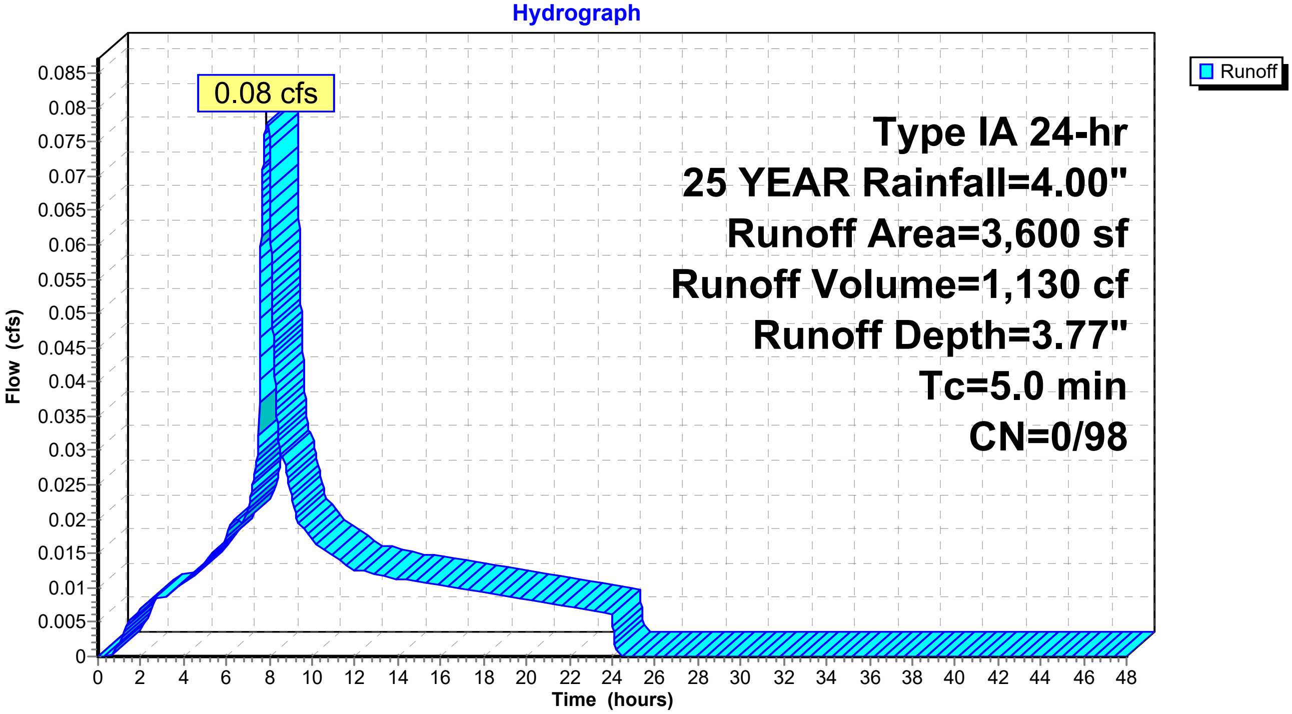
Runoff = 0.08 cfs @ 7.88 hrs, Volume= 1,130 cf, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

Area (sf)	CN	Description
3,600	98	Roofs, HSG C
3,600		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8BS: ROOF



Summary for Subcatchment 9S: NORTHEAST DRIVEWAY

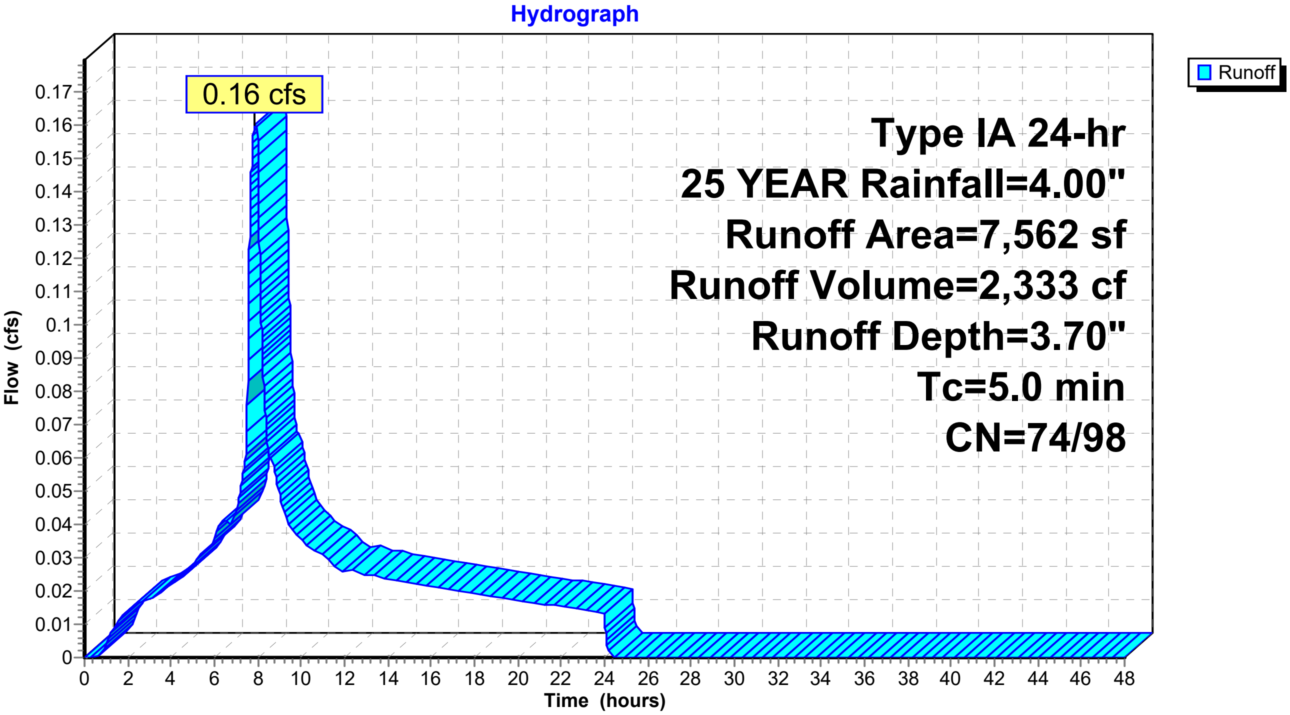
Runoff = 0.16 cfs @ 7.88 hrs, Volume= 2,333 cf, Depth= 3.70"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

Area (sf)	CN	Description
7,340	98	Paved parking, HSG C
222	74	>75% Grass cover, Good, HSG C
7,562	97	Weighted Average
222		2.94% Pervious Area
7,340		97.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 9S: NORTHEAST DRIVEWAY



Summary for Subcatchment 10S: PLANTER BASIN

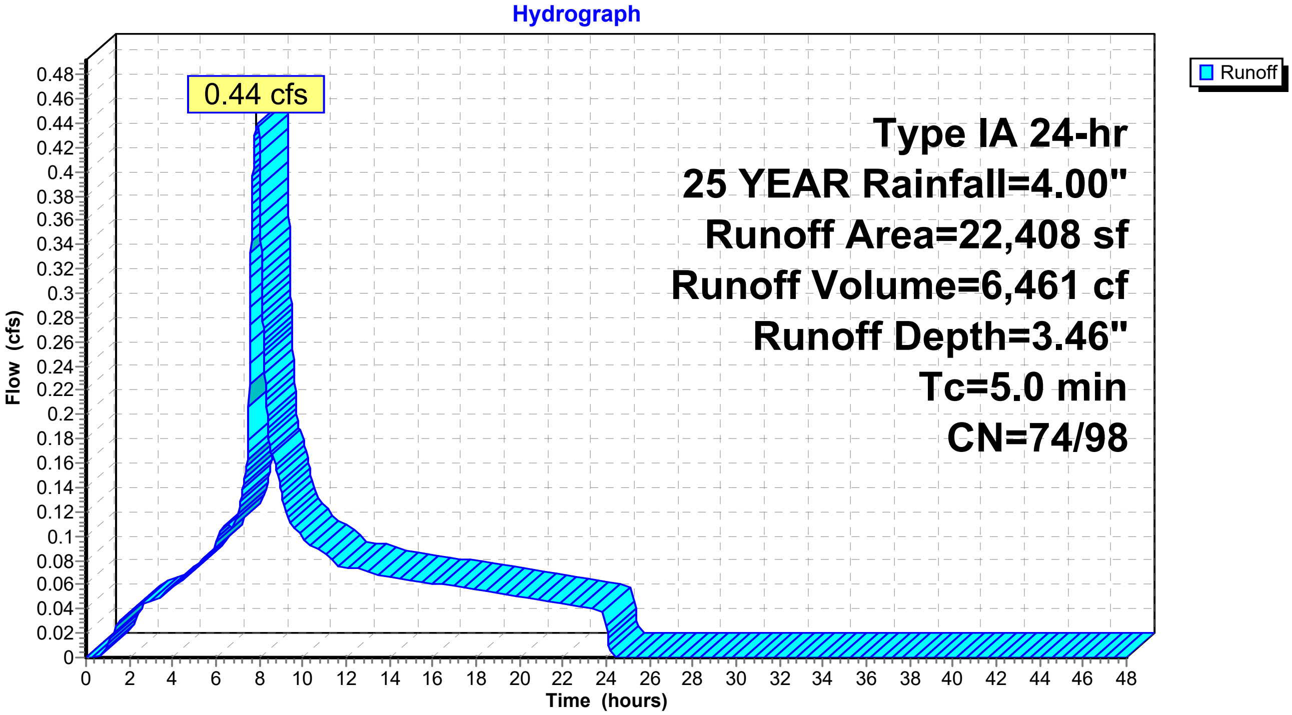
Runoff = 0.44 cfs @ 7.88 hrs, Volume= 6,461 cf, Depth= 3.46"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

	Area (sf)	CN	Description
*	19,258	98	Pavement
	3,150	74	>75% Grass cover, Good, HSG C
	22,408	95	Weighted Average
	3,150		14.06% Pervious Area
	19,258		85.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10S: PLANTER BASIN



Summary for Subcatchment 11S: SWALE BASIN

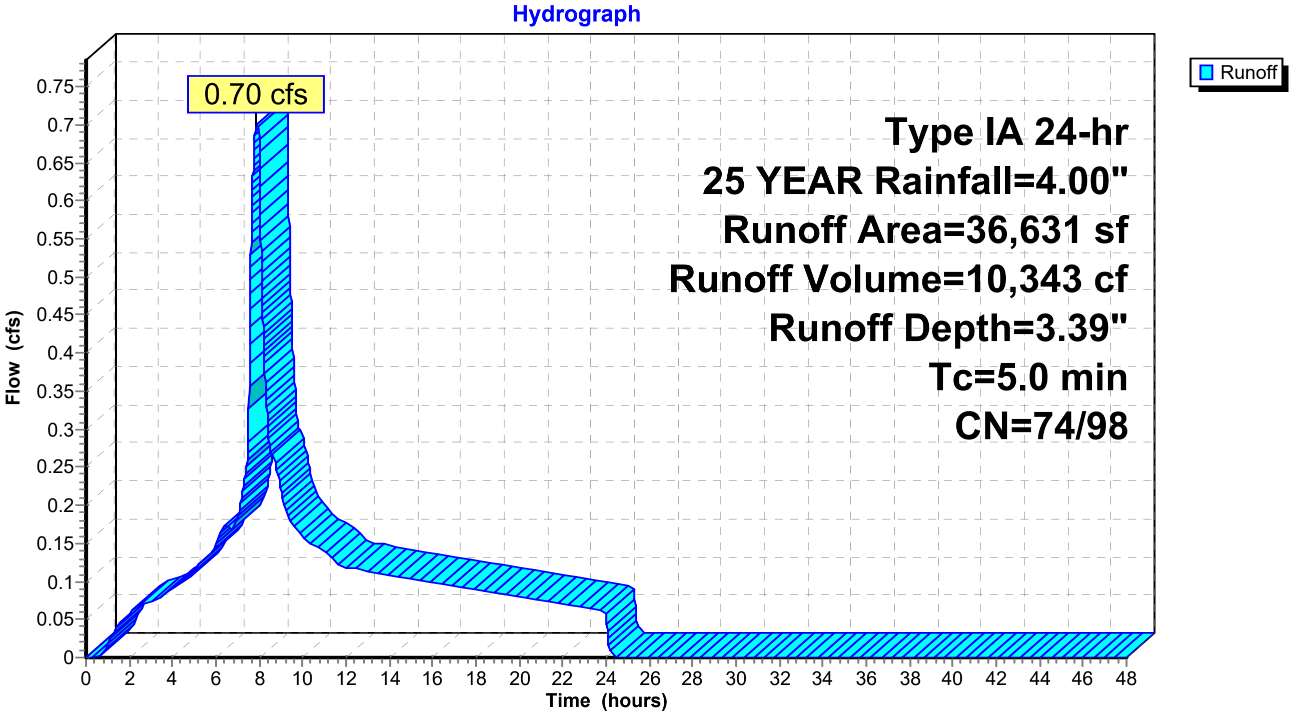
Runoff = 0.70 cfs @ 7.89 hrs, Volume= 10,343 cf, Depth= 3.39"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

	Area (sf)	CN	Description
*	30,268	98	Pavement
	6,363	74	>75% Grass cover, Good, HSG C
	36,631	94	Weighted Average
	6,363		17.37% Pervious Area
	30,268		82.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 11S: SWALE BASIN



Summary for Subcatchment 12S: SOUTH BASIN

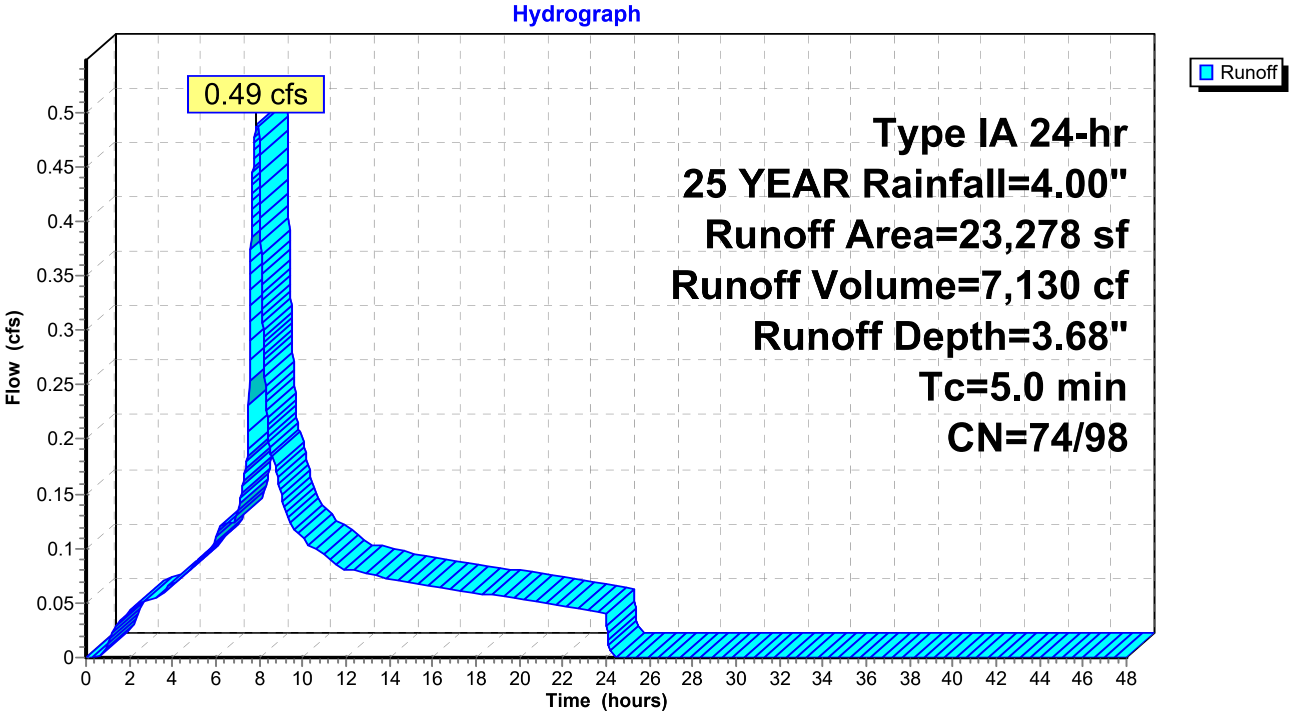
Runoff = 0.49 cfs @ 7.88 hrs, Volume= 7,130 cf, Depth= 3.68"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

	Area (sf)	CN	Description
*	22,316	98	Pavement
	962	74	>75% Grass cover, Good, HSG C
	23,278	97	Weighted Average
	962		4.13% Pervious Area
	22,316		95.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 12S: SOUTH BASIN



Summary for Subcatchment 13S: EAST BASIN

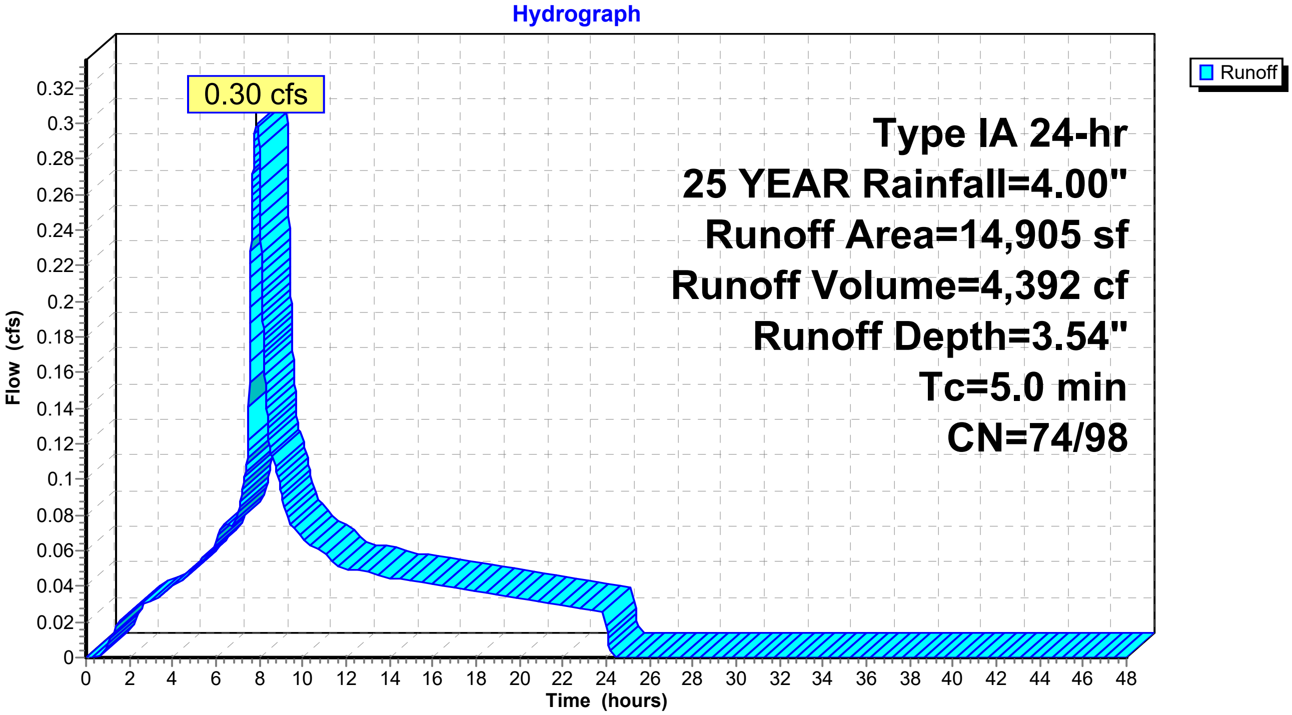
Runoff = 0.30 cfs @ 7.88 hrs, Volume= 4,392 cf, Depth= 3.54"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

	Area (sf)	CN	Description
*	13,332	98	Pavement
	1,573	74	>75% Grass cover, Good, HSG C
	14,905	95	Weighted Average
	1,573		10.55% Pervious Area
	13,332		89.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 13S: EAST BASIN



Summary for Subcatchment 14S: ROOF

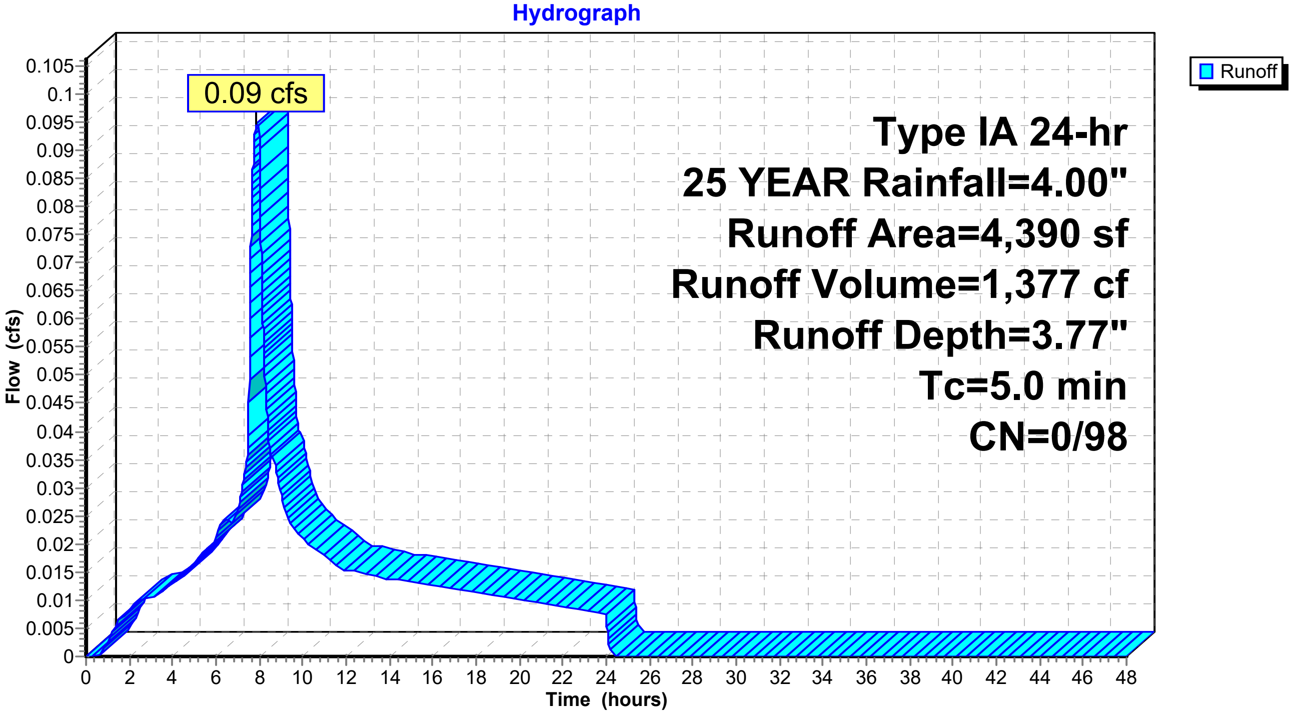
Runoff = 0.09 cfs @ 7.88 hrs, Volume= 1,377 cf, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

Area (sf)	CN	Description
4,390	98	Roofs, HSG C
4,390		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 14S: ROOF



Summary for Subcatchment 15S: DRIVE-THRU

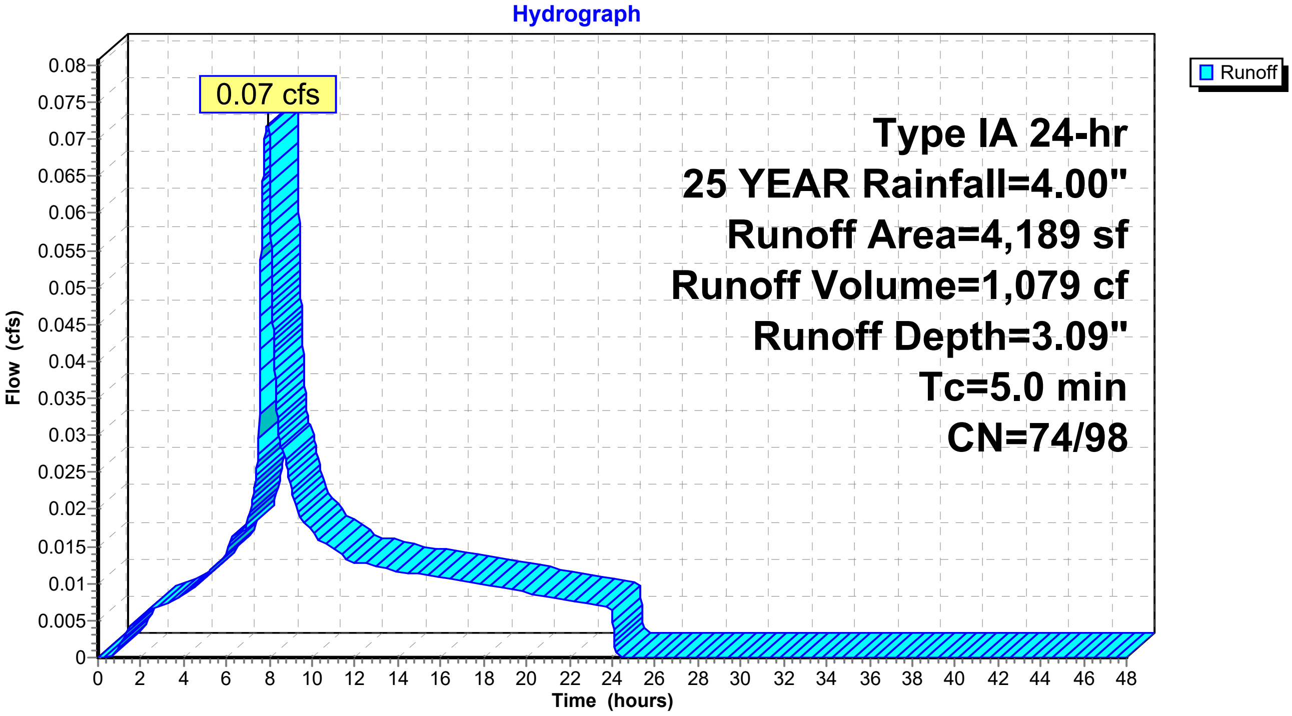
Runoff = 0.07 cfs @ 7.90 hrs, Volume= 1,079 cf, Depth= 3.09"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

	Area (sf)	CN	Description
*	2,887	98	Pavement
	1,302	74	>75% Grass cover, Good, HSG C
	4,189	91	Weighted Average
	1,302		31.08% Pervious Area
	2,887		68.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 15S: DRIVE-THRU



Summary for Subcatchment 16S: PERIMETER LANDSCAPE AND WALKWAY (UNDETAINED)

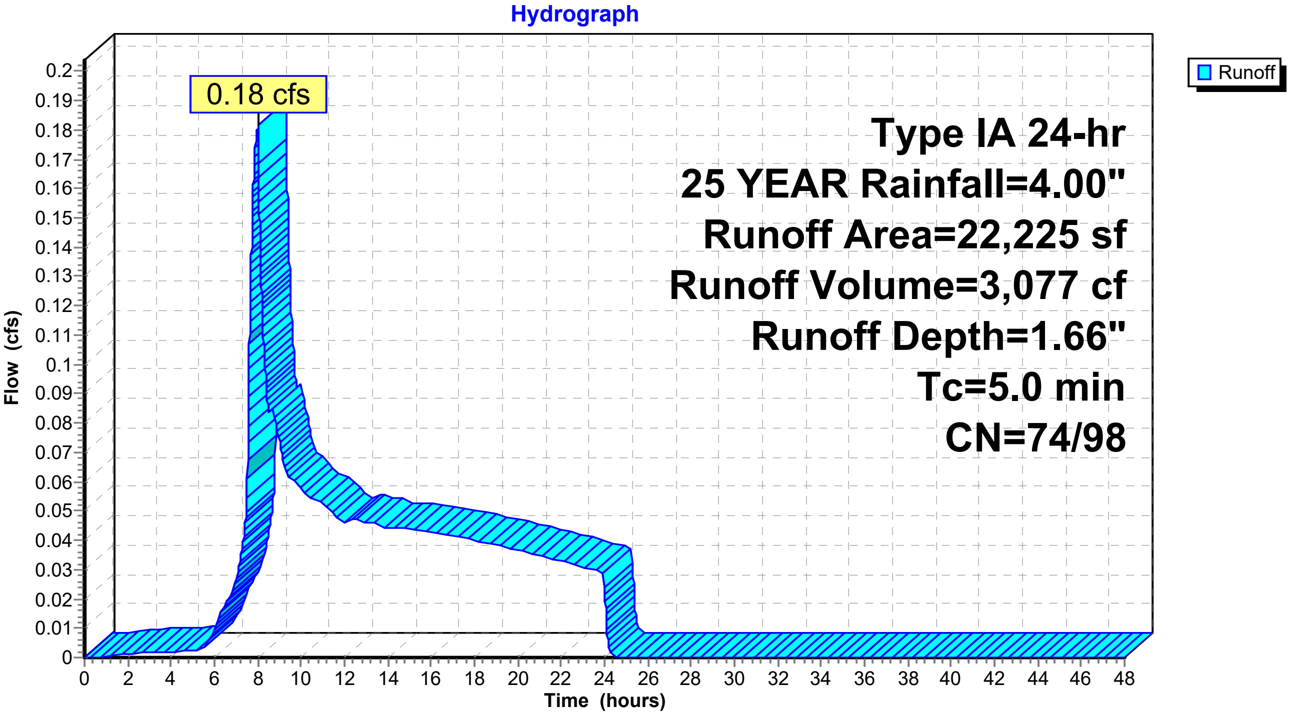
Runoff = 0.18 cfs @ 8.00 hrs, Volume= 3,077 cf, Depth= 1.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

Area (sf)	CN	Description
21,560	74	>75% Grass cover, Good, HSG C
665	98	Paved parking, HSG C
22,225	75	Weighted Average
21,560		97.01% Pervious Area
665		2.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 16S: PERIMETER LANDSCAPE AND WALKWAY (UNDETAINED)



Summary for Subcatchment 17S: PLAZA 4

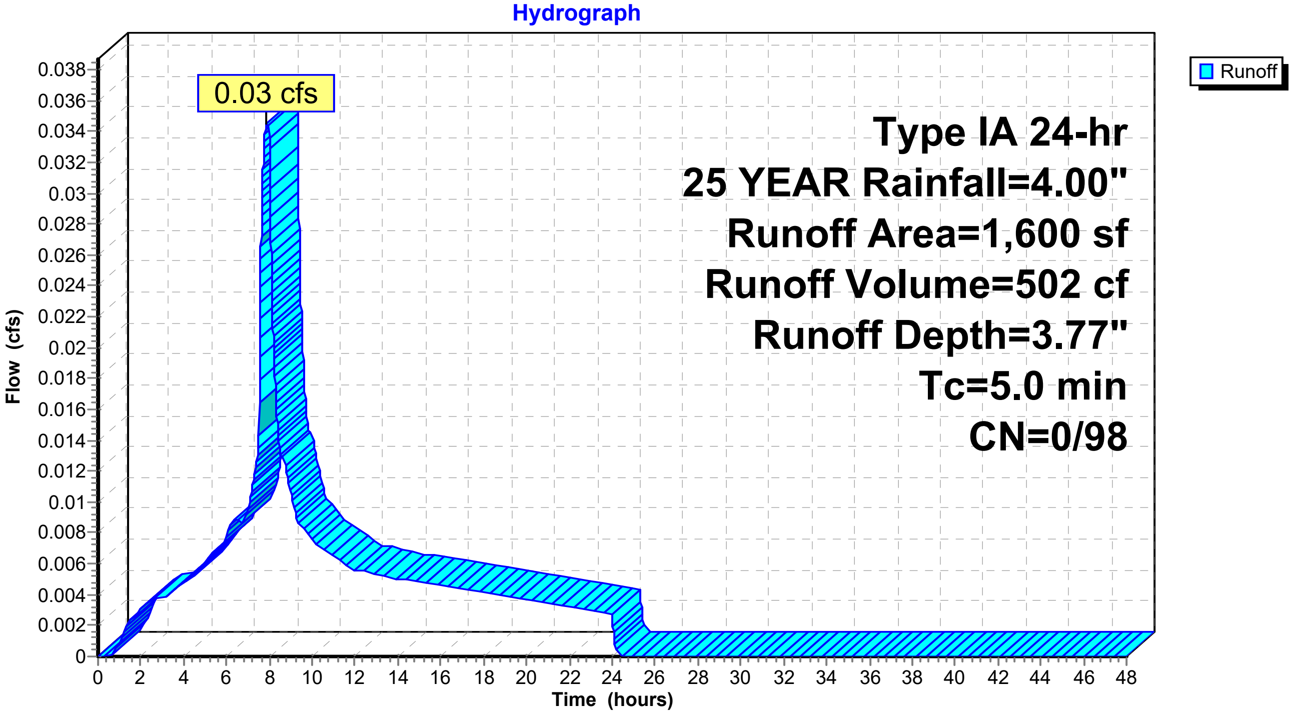
Runoff = 0.03 cfs @ 7.88 hrs, Volume= 502 cf, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YEAR Rainfall=4.00"

Area (sf)	CN	Description
1,600	98	Roofs, HSG C
1,600		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 17S: PLAZA 4



Summary for Reach 1R: Swale

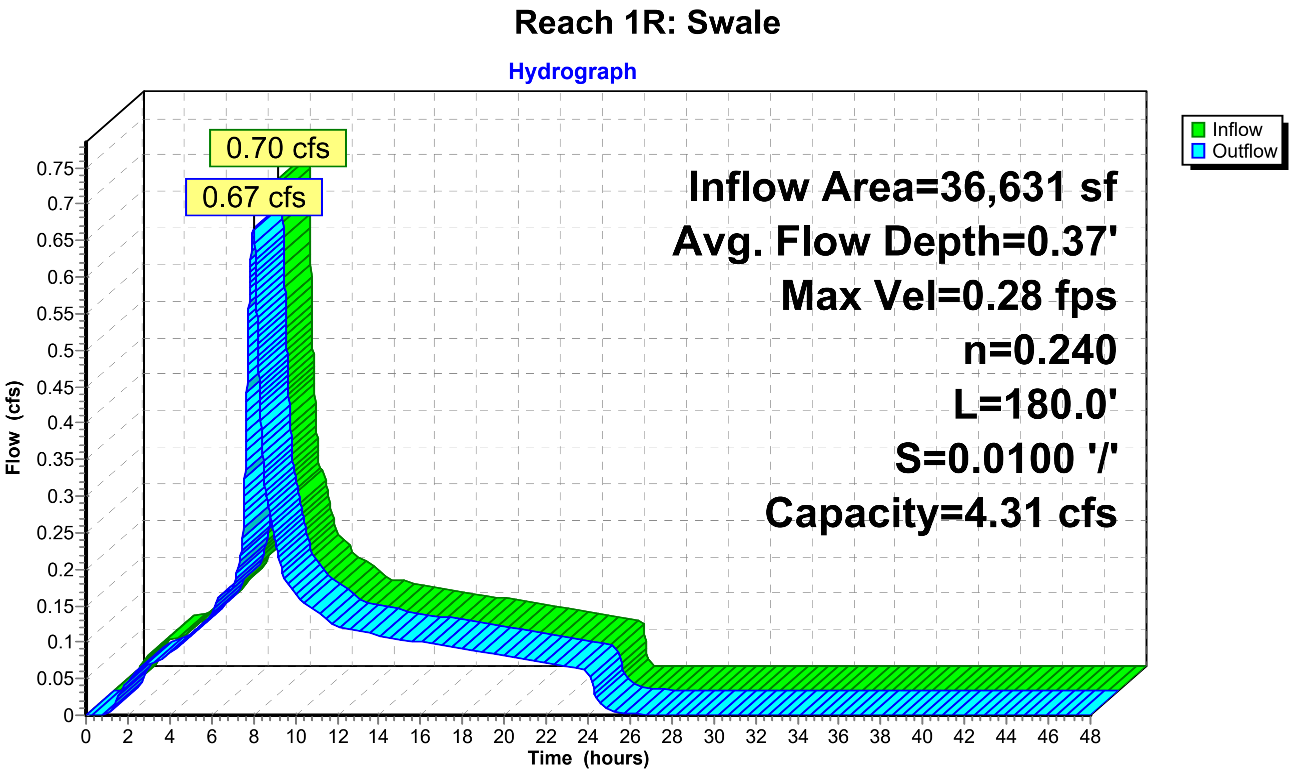
Inflow Area = 36,631 sf, 82.63% Impervious, Inflow Depth = 3.39" for 25 YEAR event
Inflow = 0.70 cfs @ 7.89 hrs, Volume= 10,343 cf
Outflow = 0.67 cfs @ 8.01 hrs, Volume= 10,343 cf, Atten= 5%, Lag= 7.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.28 fps, Min. Travel Time= 10.8 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 28.1 min

Peak Storage= 434 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 4.31 cfs

5.00' x 1.00' deep channel, n= 0.240
Side Slope Z-value= 4.0 '/' Top Width= 13.00'
Length= 180.0' Slope= 0.0100 '/'
Inlet Invert= 202.00', Outlet Invert= 200.20'

‡



Summary for Reach 2R: 6" PIPE

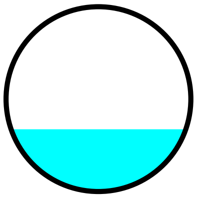
[52] Hint: Inlet/Outlet conditions not evaluated

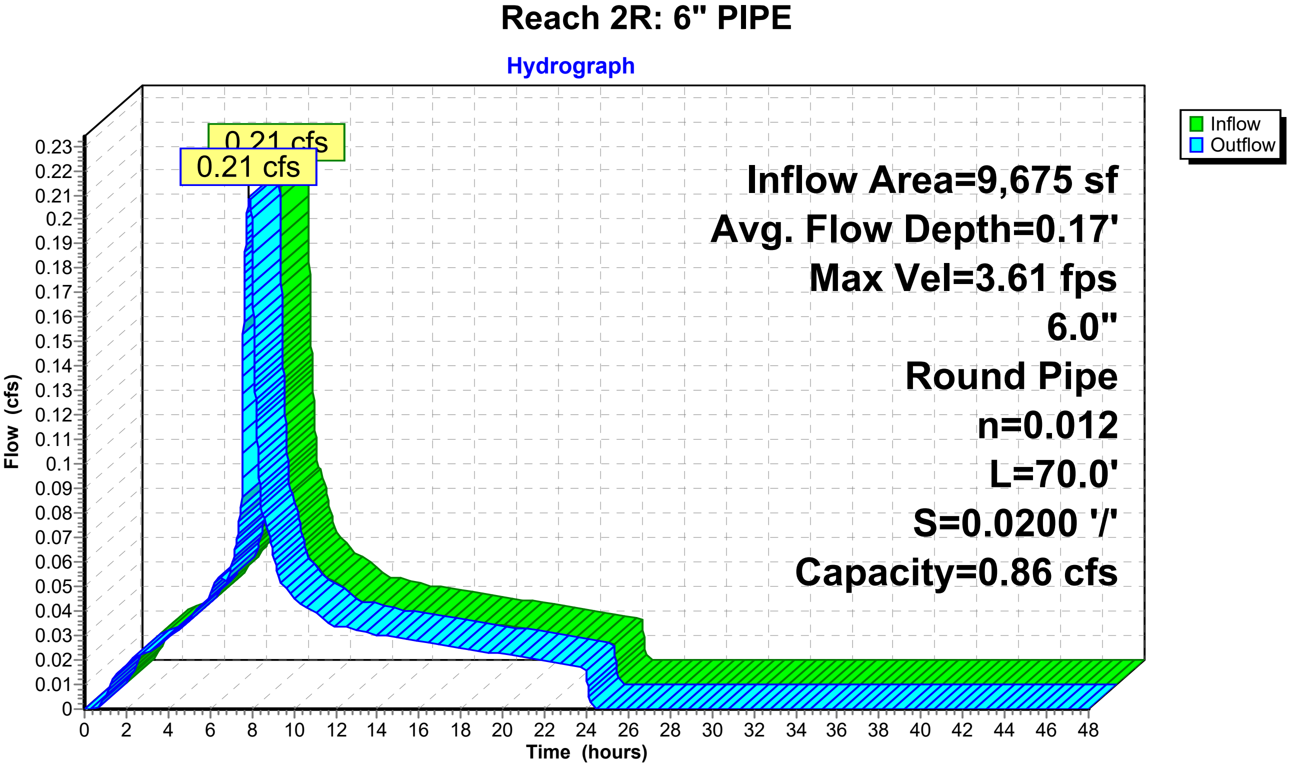
Inflow Area = 9,675 sf,100.00% Impervious, Inflow Depth = 3.77" for 25 YEAR event
Inflow = 0.21 cfs @ 7.88 hrs, Volume= 3,036 cf
Outflow = 0.21 cfs @ 7.88 hrs, Volume= 3,036 cf, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.61 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.04 fps, Avg. Travel Time= 0.6 min

Peak Storage= 4 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.86 cfs

6.0" Round Pipe
n= 0.012
Length= 70.0' Slope= 0.0200 '/'
Inlet Invert= 203.36', Outlet Invert= 201.96'





Summary for Reach 3R: 8" PIPE

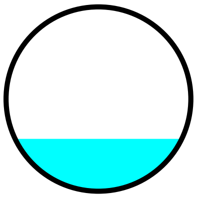
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 2R OUTLET depth by 0.02' @ 8.02 hrs

```
Inflow Area =         15,019 sf,100.00% Impervious,  Inflow Depth =   3.77"    for  25 YEAR event
Inflow      =       0.32 cfs @    7.88 hrs,  Volume=             4,712 cf
Outflow     =       0.32 cfs @    7.88 hrs,  Volume=             4,712 cf,  Atten= 0%,  Lag= 0.2 min
```

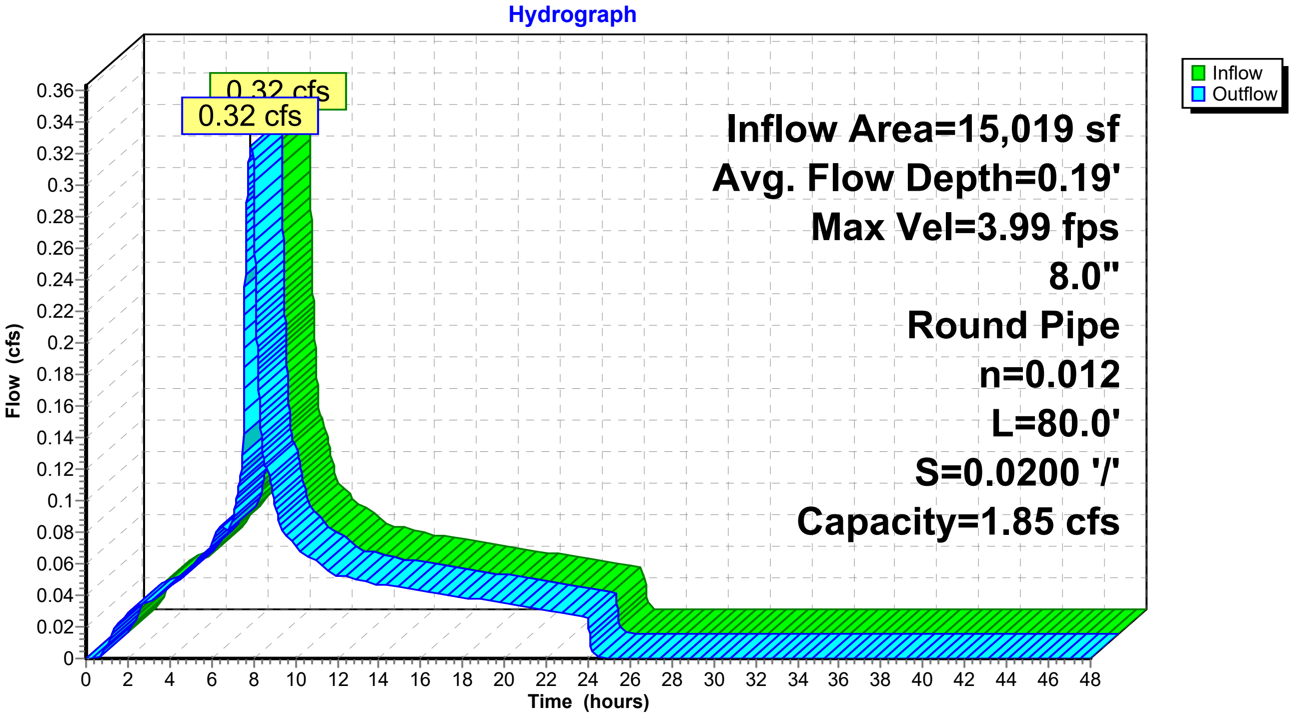
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.99 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.24 fps, Avg. Travel Time= 0.6 min

Peak Storage= 7 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.85 cfs

8.0" Round Pipe
n= 0.012
Length= 80.0' Slope= 0.0200 '/'
Inlet Invert= 201.96', Outlet Invert= 200.36'



Reach 3R: 8" PIPE



Summary for Reach 4R: 8" PIPE

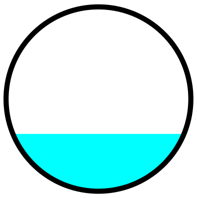
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 3R OUTLET depth by 0.02' @ 8.02 hrs

```
Inflow Area =         17,894 sf,100.00% Impervious,  Inflow Depth =   3.77"    for  25 YEAR event
Inflow      =        0.39 cfs @     7.88 hrs,  Volume=             5,614 cf
Outflow     =        0.39 cfs @     7.89 hrs,  Volume=             5,614 cf,  Atten= 0%,  Lag= 0.3 min
```

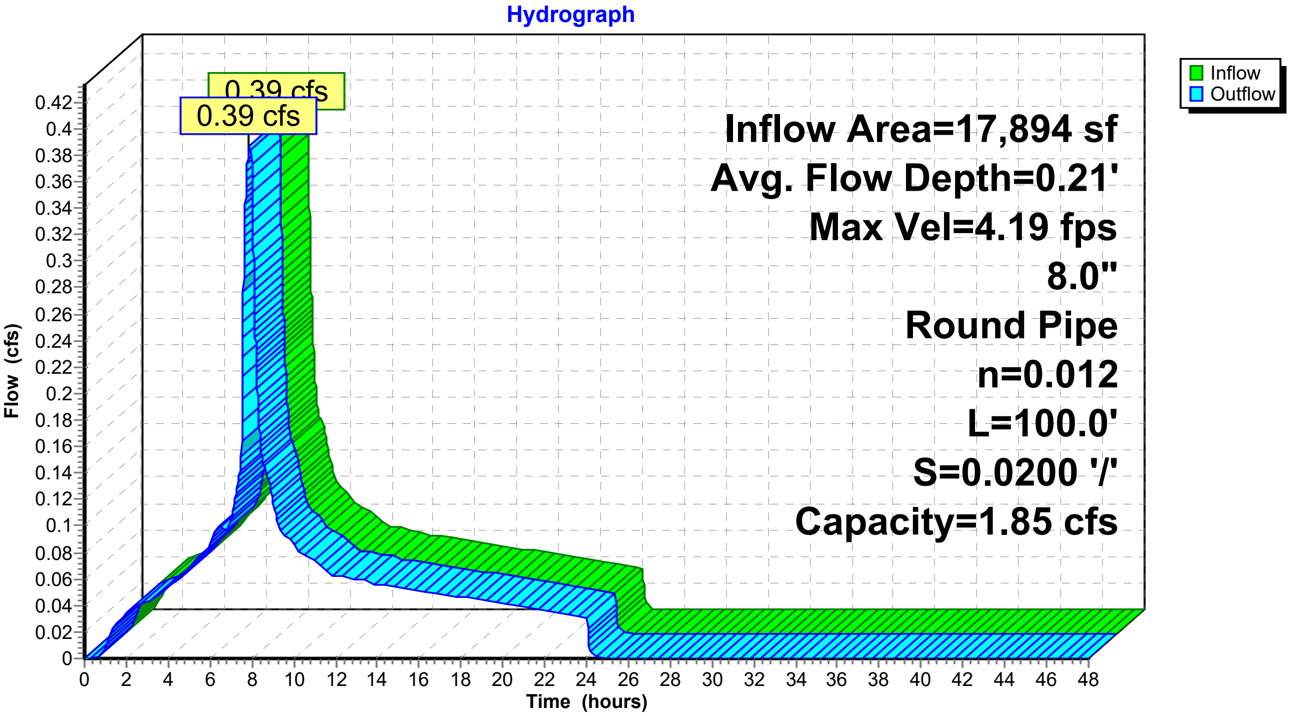
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.19 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.35 fps, Avg. Travel Time= 0.7 min

Peak Storage= 9 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.85 cfs

8.0" Round Pipe
n= 0.012
Length= 100.0' Slope= 0.0200 '/'
Inlet Invert= 200.36', Outlet Invert= 198.36'



Reach 4R: 8" PIPE



Summary for Reach 5R: 6" PIPE

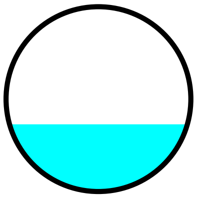
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 11,184 sf,100.00% Impervious, Inflow Depth = 3.77" for 25 YEAR event
Inflow = 0.24 cfs @ 7.88 hrs, Volume= 3,509 cf
Outflow = 0.24 cfs @ 7.88 hrs, Volume= 3,509 cf, Atten= 0%, Lag= 0.2 min

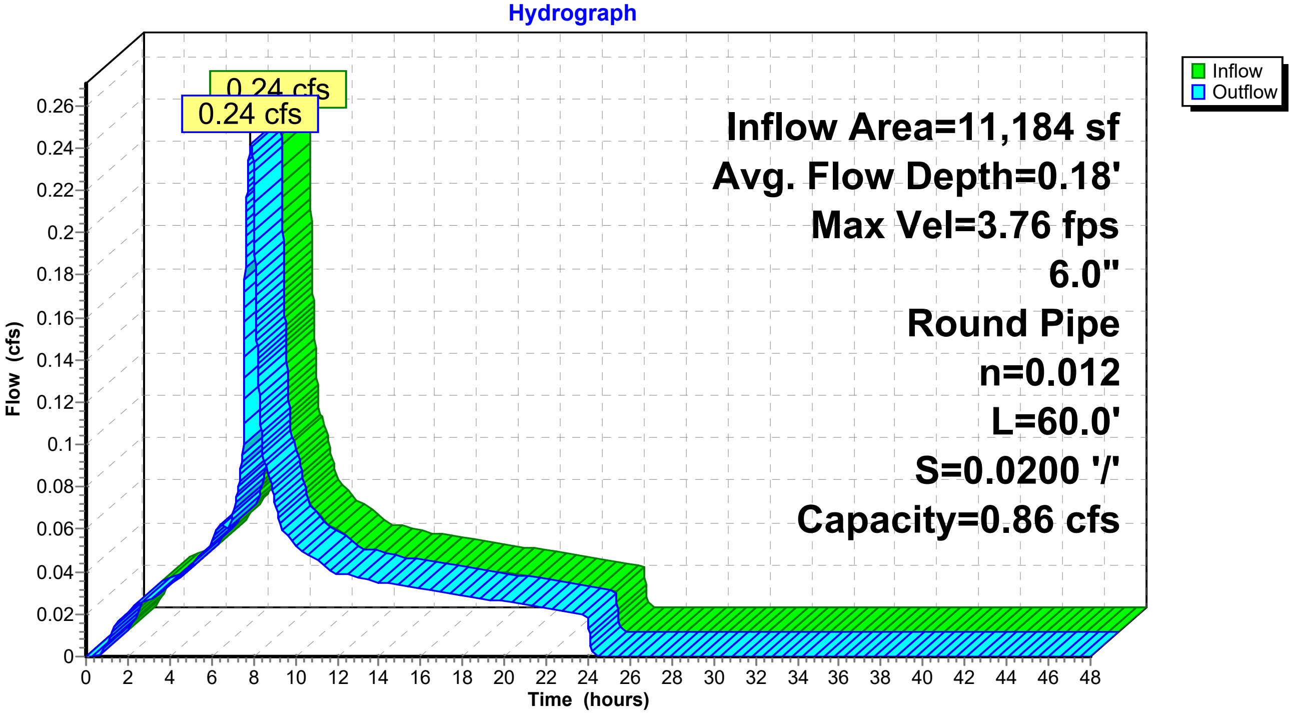
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.76 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.13 fps, Avg. Travel Time= 0.5 min

Peak Storage= 4 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.86 cfs

6.0" Round Pipe
n= 0.012
Length= 60.0' Slope= 0.0200 '/'
Inlet Invert= 199.56', Outlet Invert= 198.36'



Reach 5R: 6" PIPE



Summary for Reach 6R: 8" PIPE

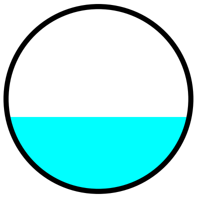
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 4R OUTLET depth by 0.06' @ 7.89 hrs
[62] Hint: Exceeded Reach 5R OUTLET depth by 0.09' @ 7.90 hrs

```
Inflow Area =          29,078 sf,100.00% Impervious,  Inflow Depth =   3.77"    for  25 YEAR event
Inflow      =         0.63 cfs @     7.88 hrs,  Volume=             9,123 cf
Outflow     =         0.63 cfs @     7.89 hrs,  Volume=             9,123 cf,  Atten= 0%,  Lag= 0.2 min
```

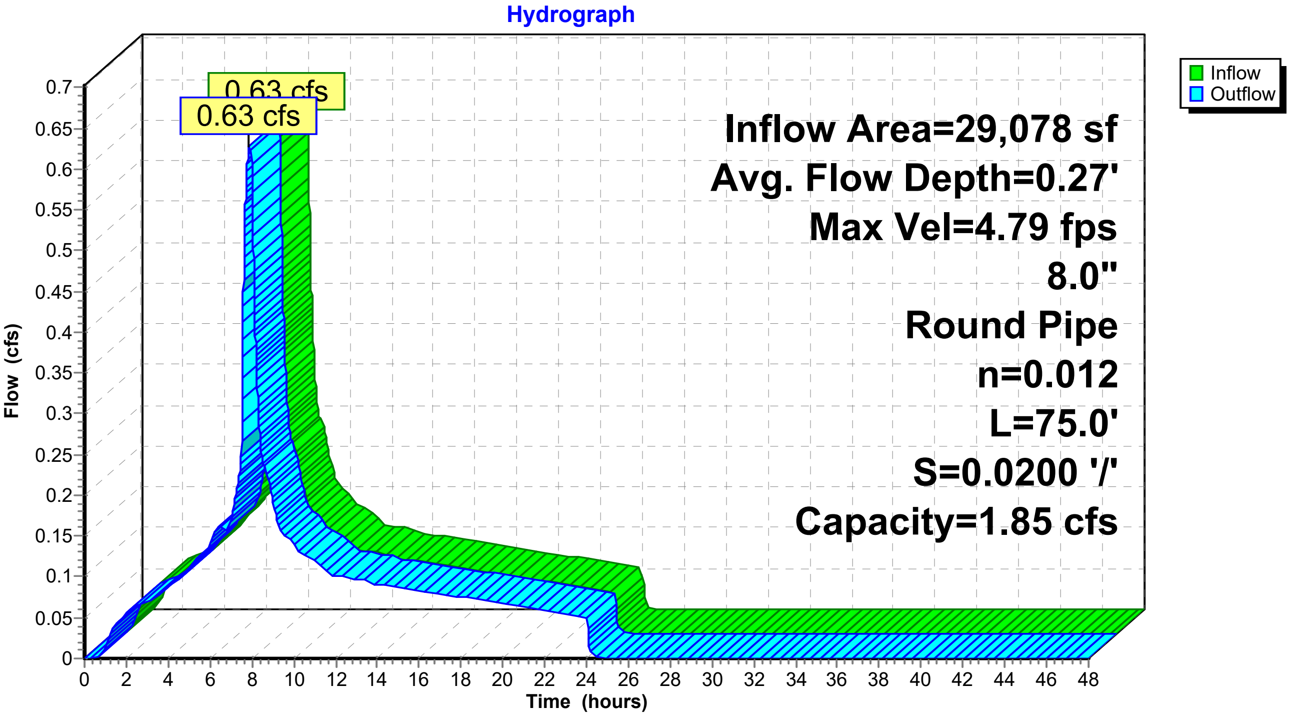
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.79 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.71 fps, Avg. Travel Time= 0.5 min

Peak Storage= 10 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.85 cfs

8.0" Round Pipe
n= 0.012
Length= 75.0' Slope= 0.0200 '/'
Inlet Invert= 198.36', Outlet Invert= 196.86'



Reach 6R: 8" PIPE



Summary for Reach 7R: 8" PIPE

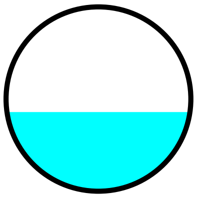
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 6R OUTLET depth by 0.02' @ 7.90 hrs

```
Inflow Area =        32,648 sf,100.00% Impervious,  Inflow Depth =   3.77"    for  25 YEAR event
Inflow      =      0.70 cfs @     7.89 hrs,  Volume=          10,244 cf
Outflow     =      0.70 cfs @     7.89 hrs,  Volume=          10,244 cf,  Atten= 0%,  Lag= 0.1 min
```

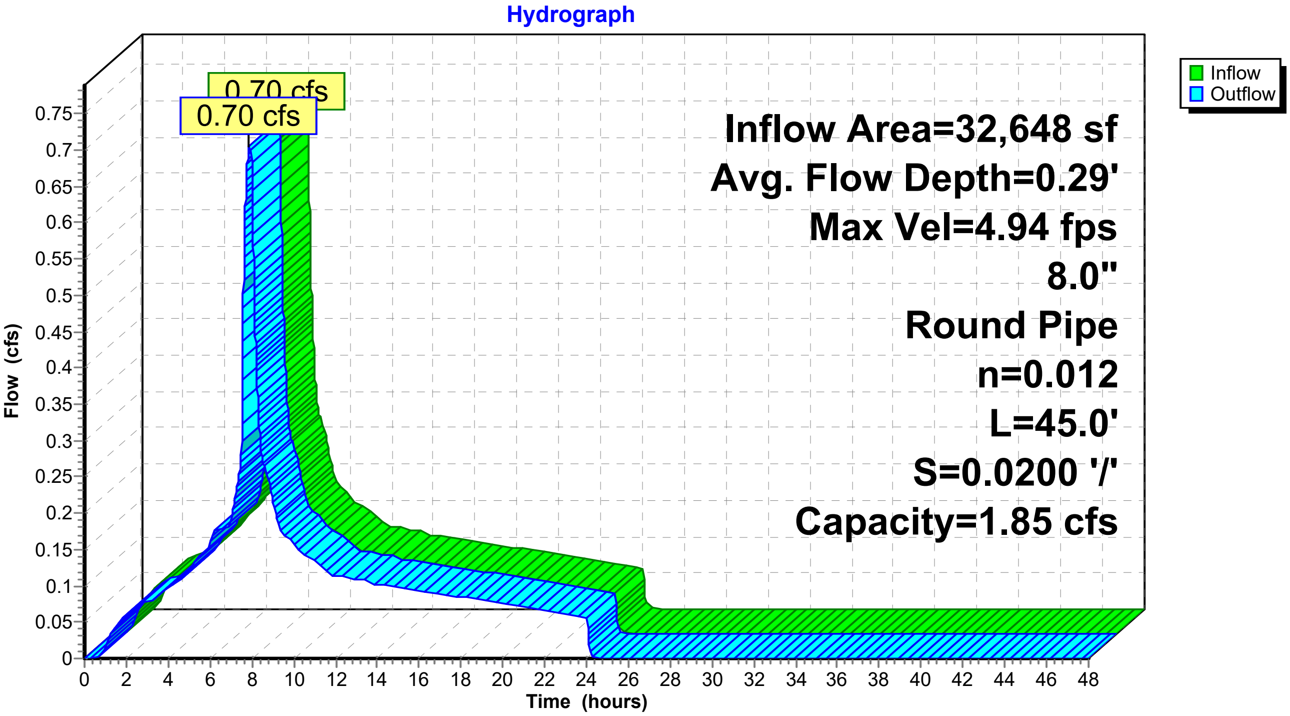
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.94 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.80 fps, Avg. Travel Time= 0.3 min

Peak Storage= 6 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.29'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.85 cfs

8.0" Round Pipe
n= 0.012
Length= 45.0' Slope= 0.0200 '/'
Inlet Invert= 196.86', Outlet Invert= 195.96'



Reach 7R: 8" PIPE



Summary for Reach 8R: 12" PIPE

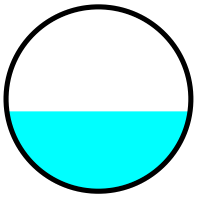
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 7R OUTLET depth by 0.15' @ 7.90 hrs

```
Inflow Area =           49,100 sf,  99.55% Impervious,  Inflow Depth =   3.76"    for  25 YEAR event
Inflow       =          1.06 cfs @     7.88 hrs,  Volume=              15,365 cf
Outflow      =          1.06 cfs @     7.89 hrs,  Volume=              15,365 cf,  Atten= 0%,  Lag= 0.4 min
```

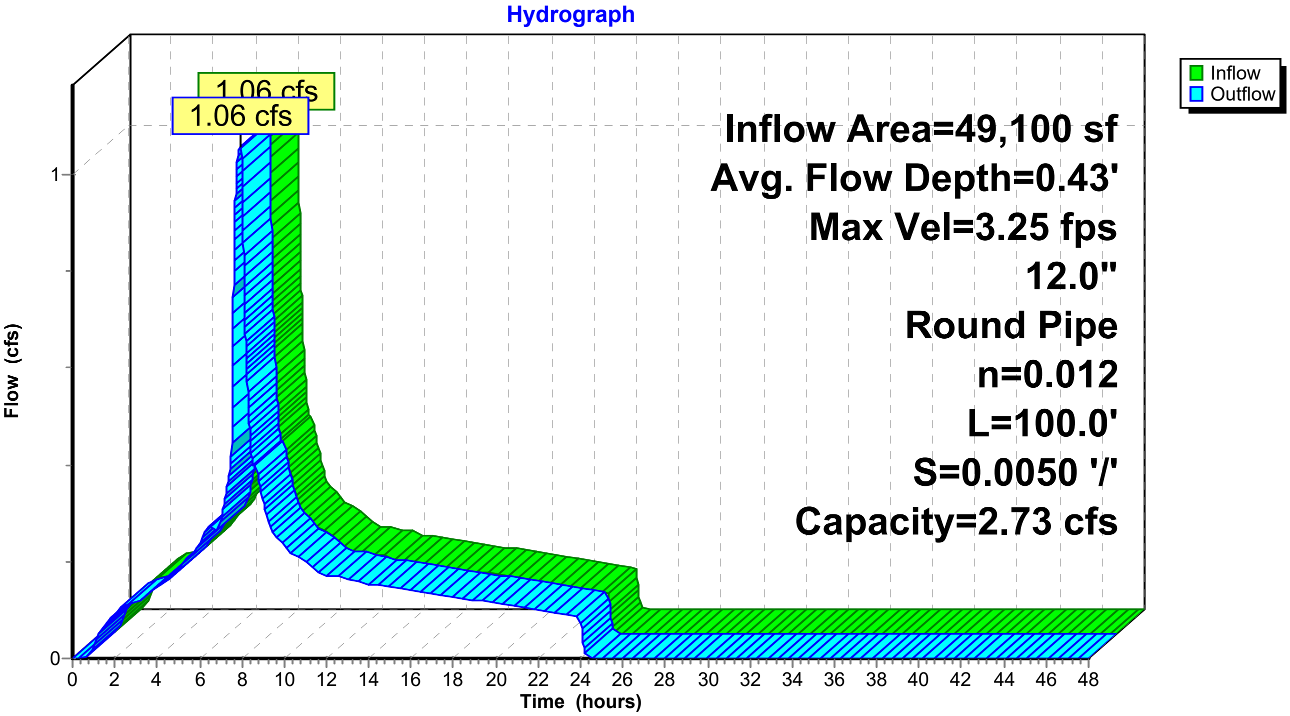
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.25 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.83 fps, Avg. Travel Time= 0.9 min

Peak Storage= 32 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.73 cfs

12.0" Round Pipe
n= 0.012
Length= 100.0' Slope= 0.0050 '/'
Inlet Invert= 195.96', Outlet Invert= 195.46'



Reach 8R: 12" PIPE



Summary for Reach 9R: 12" PIPE

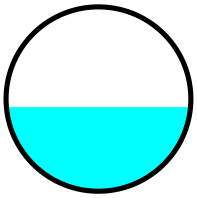
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 11R OUTLET depth by 0.01' @ 7.90 hrs

```
Inflow Area =          77,784 sf,  96.02% Impervious,  Inflow Depth =   3.68"    for  25 YEAR event
Inflow      =        1.64 cfs @     7.89 hrs,  Volume=            23,846 cf
Outflow     =        1.64 cfs @     7.89 hrs,  Volume=            23,846 cf,  Atten= 0%,  Lag= 0.1 min
```

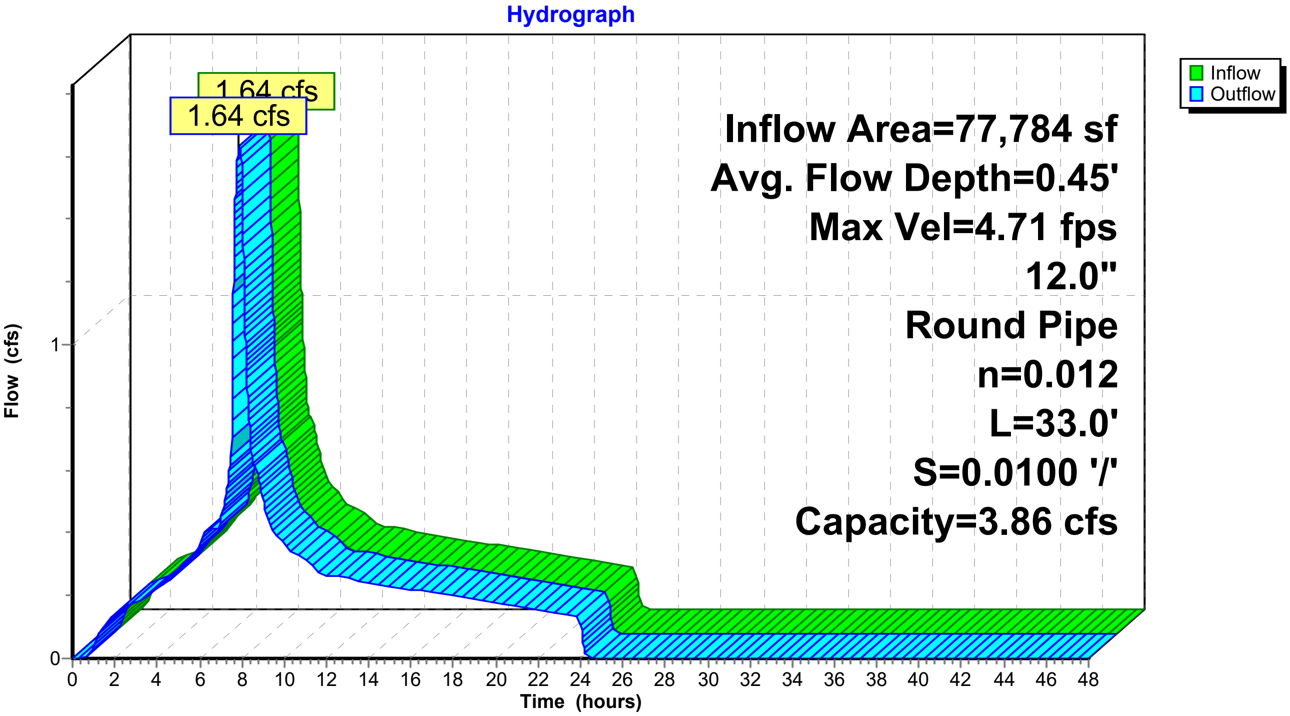
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.71 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.66 fps, Avg. Travel Time= 0.2 min

Peak Storage= 11 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.86 cfs

12.0" Round Pipe
n= 0.012
Length= 33.0' Slope= 0.0100 '/'
Inlet Invert= 194.33', Outlet Invert= 194.00'



Reach 9R: 12" PIPE



Summary for Reach 10R: 6" PIPE

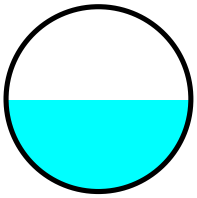
[52] Hint: Inlet/Outlet conditions not evaluated

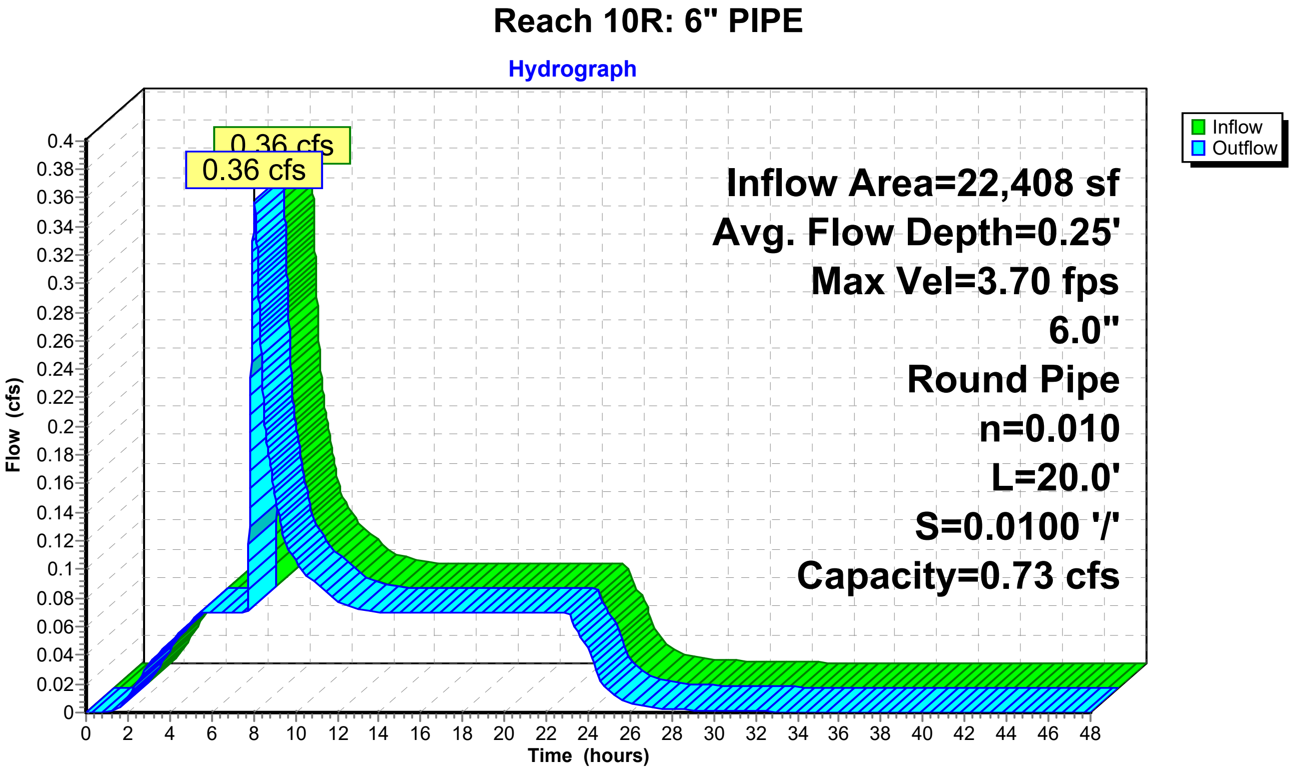
Inflow Area =	22,408 sf,	85.94% Impervious,	Inflow Depth > 3.46" for 25 YEAR event
Inflow =	0.36 cfs @	8.06 hrs, Volume=	6,453 cf
Outflow =	0.36 cfs @	8.06 hrs, Volume=	6,453 cf, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.70 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.44 fps, Avg. Travel Time= 0.2 min

Peak Storage= 2 cf @ 8.06 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.73 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 20.0' Slope= 0.0100 '/'
Inlet Invert= 194.20', Outlet Invert= 194.00'





Summary for Reach 11R: 8" PIPE

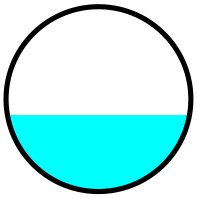
[52] Hint: Inlet/Outlet conditions not evaluated

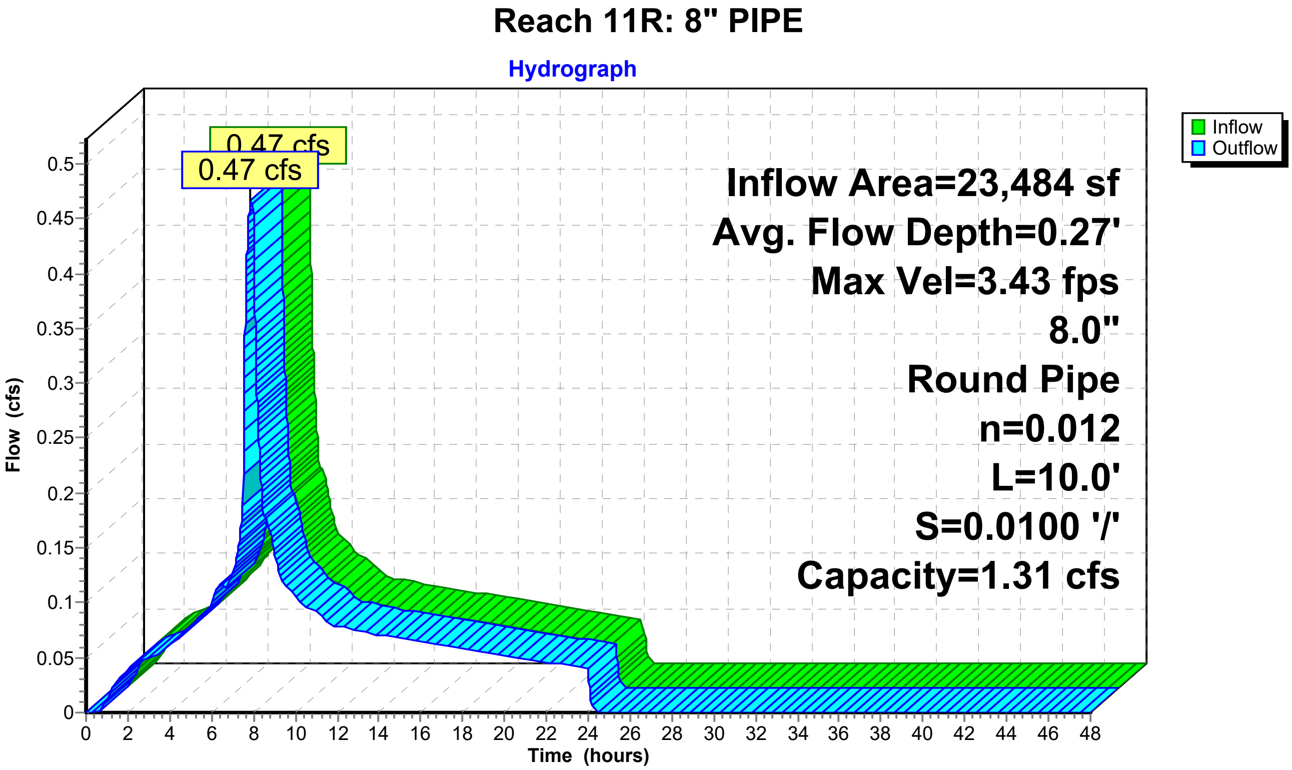
Inflow Area = 23,484 sf, 87.76% Impervious, Inflow Depth = 3.50" for 25 YEAR event
Inflow = 0.47 cfs @ 7.88 hrs, Volume= 6,849 cf
Outflow = 0.47 cfs @ 7.88 hrs, Volume= 6,849 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.43 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.96 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.31 cfs

8.0" Round Pipe
n= 0.012
Length= 10.0' Slope= 0.0100 '/'
Inlet Invert= 194.60', Outlet Invert= 194.50'





Summary for Reach 12R: 6" PIPE

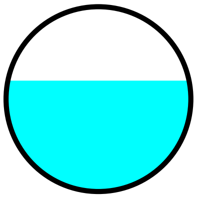
[52] Hint: Inlet/Outlet conditions not evaluated

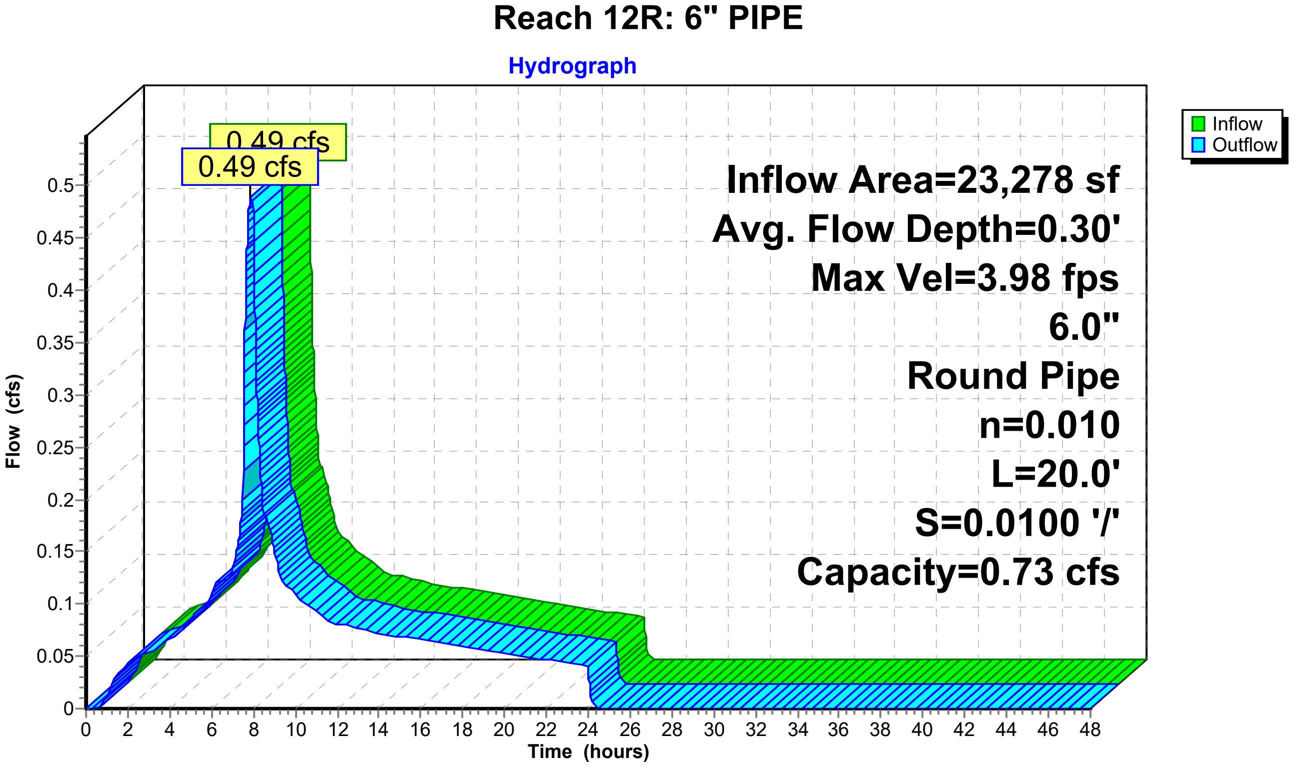
Inflow Area = 23,278 sf, 95.87% Impervious, Inflow Depth = 3.68" for 25 YEAR event
Inflow = 0.49 cfs @ 7.88 hrs, Volume= 7,130 cf
Outflow = 0.49 cfs @ 7.88 hrs, Volume= 7,130 cf, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.98 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.33 fps, Avg. Travel Time= 0.1 min

Peak Storage= 2 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.73 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 20.0' Slope= 0.0100 '/'
Inlet Invert= 194.20', Outlet Invert= 194.00'

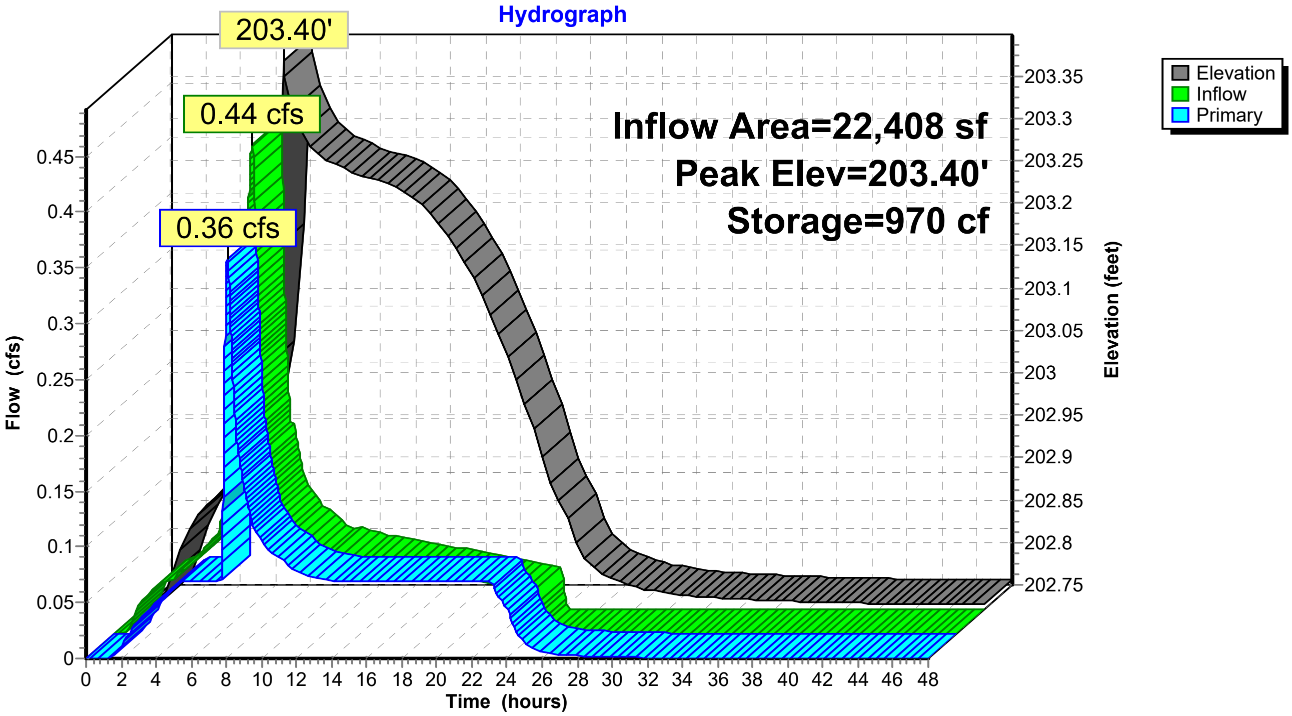




Summary for Pond 5P: PLANTER

```
Inflow Area =         22,408 sf,  85.94% Impervious,  Inflow Depth =   3.46"    for  25 YEAR event
Inflow      =       0.44 cfs @    7.88 hrs,  Volume=             6,461 cf
Outflow     =       0.36 cfs @    8.06 hrs,  Volume=             6,453 cf,  Atten= 19%,  Lag= 10.3 min
Primary     =       0.36 cfs @    8.06 hrs,  Volume=             6,453 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 203.40' @ 8.06 hrs   Surf.Area= 1,500 sf   Storage= 970 cf
Flood Elev= 203.75'   Surf.Area= 1,500 sf   Storage= 1,500 cf

Plug-Flow detention time= 114.8 min calculated for 6,452 cf (100% of inflow)
Center-of-Mass det. time= 114.0 min ( 784.9 - 670.9 )

Volume       Invert     Avail.Storage   Storage Description
   #1        202.75'         1,500 cf   Ponding Depth (Prismatic)Listed below (Recalc)

 Elevation          Surf.Area          Inc.Store          Cum.Store
     (feet)             (sq-ft)      (cubic-feet)      (cubic-feet)
    202.75              1,500                  0                  0
    203.75              1,500              1,500              1,500

Device   Routing             Invert   Outlet Devices
    #1   Primary            202.75'   6.0"  Round Culvert  L= 10.0'   Ke= 0.500
                                      Inlet / Outlet Invert= 202.75' / 202.50'   S= 0.0250 '/'   Cc= 0.900
                                      n= 0.013,  Flow Area= 0.20 sf
    #2   Device 1           202.75'   2.000 in/hr Exfiltration over Surface area
    #3   Device 1           203.25'   6.0" Horiz. Orifice/Grate   C= 0.610
                                      Limited to weir flow at low heads

Primary OutFlow  Max=0.36 cfs @ 8.06 hrs  HW=203.40'  TW=194.45'   (Dynamic Tailwater)
└─1=Culvert  (Passes 0.36 cfs of 0.60 cfs potential flow)
   ├─2=Exfiltration  (Exfiltration Controls 0.07 cfs)
   └─3=Orifice/Grate  (Weir Controls 0.29 cfs @ 1.25 fps)
```

Pond 5P: PLANTER



Summary for Pond DC: CHAMBERS

```
Inflow Area =        160,101 sf,  91.52% Impervious,  Inflow Depth =   3.58"    for  25 YEAR event
Inflow      =       3.07 cfs @    7.97 hrs,  Volume=            47,772 cf
Outflow     =       3.07 cfs @    7.98 hrs,  Volume=            47,770 cf,  Atten= 0%,  Lag= 0.5 min
Primary     =       3.07 cfs @    7.98 hrs,  Volume=            47,770 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 193.88' @ 7.98 hrs   Surf.Area= 989 sf   Storage= 3,535 cf
Flood Elev= 195.00'   Surf.Area= 989 sf   Storage= 3,901 cf

Plug-Flow detention time= 45.2 min calculated for 47,770 cf (100% of inflow)
Center-of-Mass det. time= 45.1 min ( 731.4 - 686.3 )

Volume        Invert    Avail.Storage   Storage Description
------------------------------------------------------------------------------------------
   #1A       188.00'         1,487 cf   10.33'W x 95.67'L x 7.00'H Field A
                                        6,920 cf Overall - 2,414 cf Embedded = 4,506 cf  x 33.0% Voids
   #2A       189.00'         2,414 cf   ADS_StormTech MC-4500 +Cap x 22  Inside #1
                                        Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf
                                        Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap
                                        Cap Storage= +35.7 cf x 2 x 1 rows = 71.4 cf
------------------------------------------------------------------------------------------
                             3,901 cf   Total Available Storage

   Storage Group A created with Chamber Wizard

Device   Routing          Invert   Outlet Devices
------------------------------------------------------------------------------------------
   #1    Primary         188.00'   18.0"  Round Culvert  L= 100.0'   Ke= 0.500
                                   Inlet / Outlet Invert= 188.00' / 187.00'   S= 0.0100 '/'   Cc= 0.900
                                   n= 0.013,  Flow Area= 1.77 sf
   #2    Device 1        188.00'   3.5" Horiz. 2yr Orifice   C= 0.600   Limited to weir flow at low heads
   #3    Device 1        193.60'   18.0" Horiz. EMERGENCY OVERFLOW   C= 0.600
                                   Limited to weir flow at low heads

Primary OutFlow  Max=3.07 cfs @ 7.98 hrs  HW=193.88'  TW=0.00'   (Dynamic Tailwater)
↑
└─1=Culvert  (Passes 3.07 cfs of 18.03 cfs potential flow)
   ↑
   ├─2=2yr Orifice  (Orifice Controls 0.78 cfs @ 11.68 fps)
   └─3=EMERGENCY OVERFLOW (Weir Controls 2.29 cfs @ 1.73 fps)
```

Pond DC: CHAMBERS - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-4500 +Cap (ADS StormTech® MC-4500 with cap volume)
Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf
Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap
Cap Storage= +35.7 cf x 2 x 1 rows = 71.4 cf

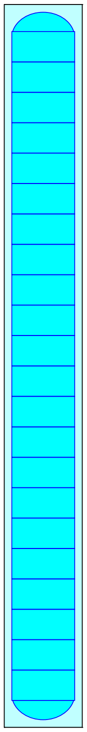
22 Chambers/Row x 4.02' Long +2.56' Cap Length x 2 = 93.67' Row Length +12.0" End Stone x 2 = 95.67' Base Length
1 Rows x 100.0" Wide + 12.0" Side Stone x 2 = 10.33' Base Width
12.0" Base + 60.0" Chamber Height + 12.0" Cover = 7.00' Field Height

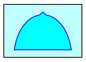
22 Chambers x 106.5 cf + 35.7 cf Cap Volume x 2 x 1 Rows = 2,414.2 cf Chamber Storage

6,919.9 cf Field - 2,414.2 cf Chambers = 4,505.7 cf Stone x 33.0% Voids = 1,486.9 cf Stone Storage

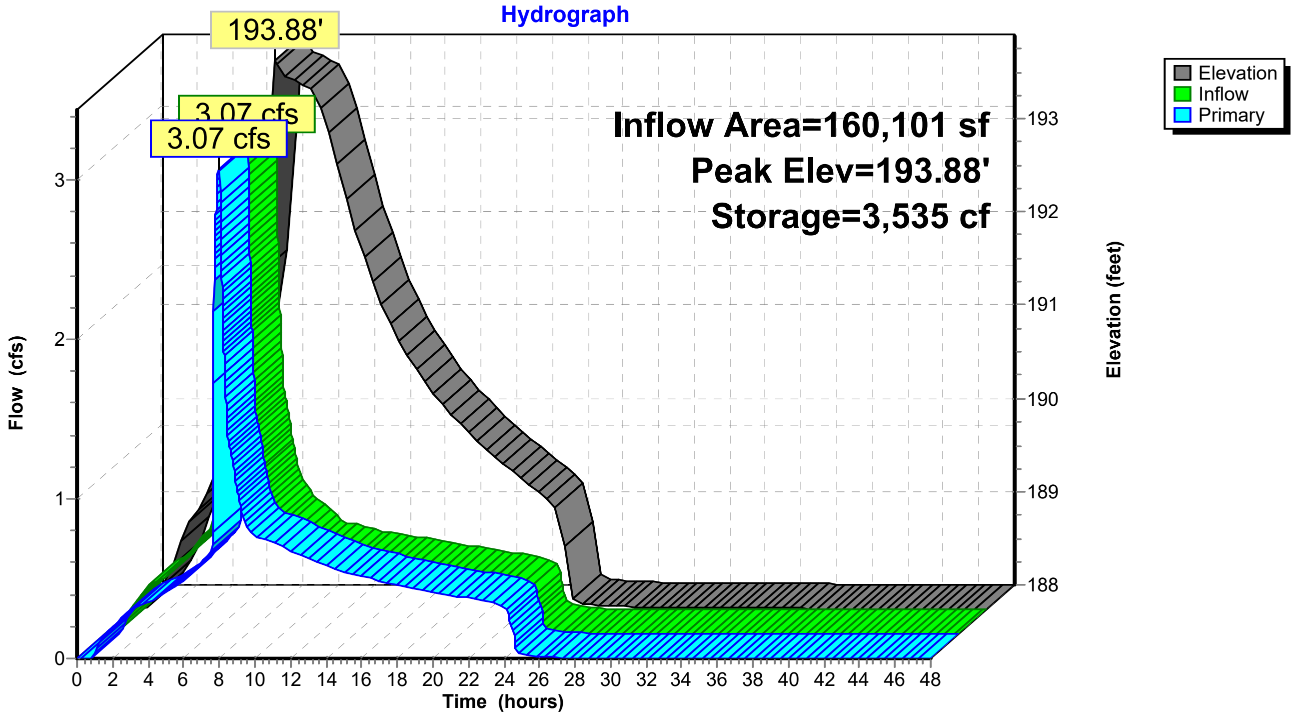
Chamber Storage + Stone Storage = 3,901.1 cf = 0.090 af
Overall Storage Efficiency = 56.4%
Overall System Size = 95.67' x 10.33' x 7.00'

22 Chambers
256.3 cy Field
166.9 cy Stone





Pond DC: CHAMBERS

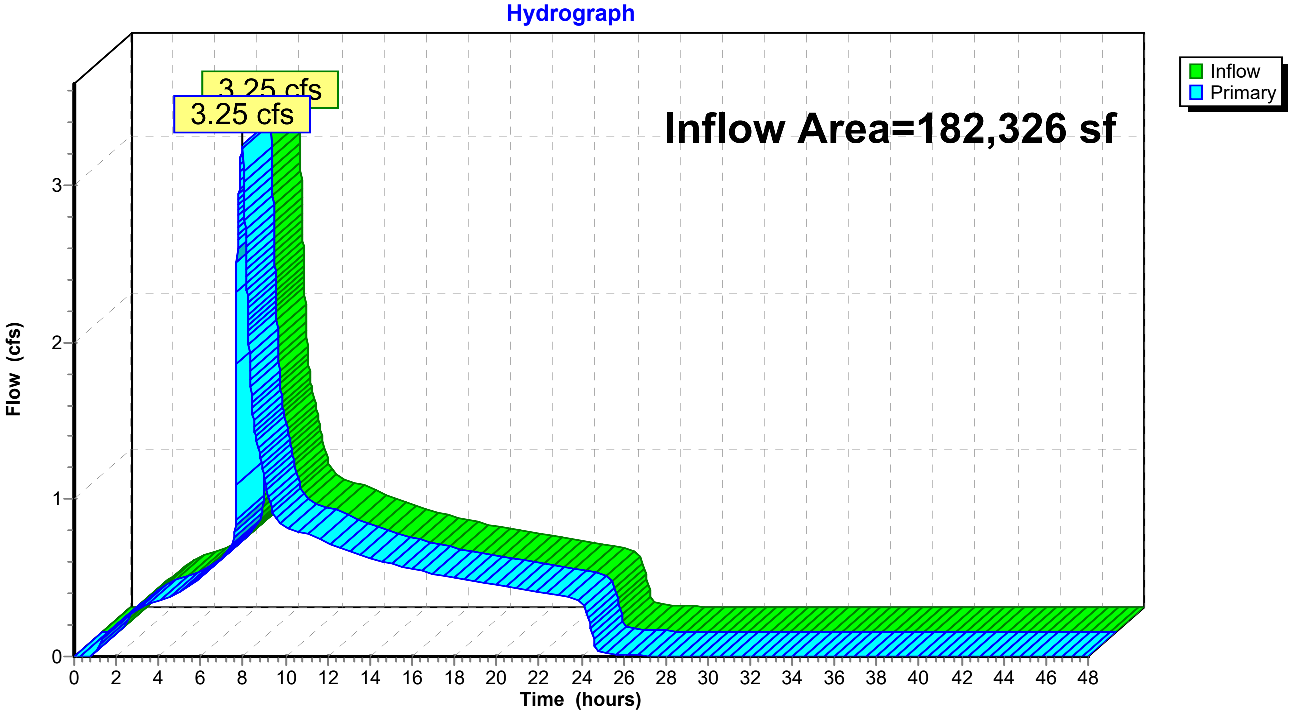


Summary for Link 11L: Peak Post- Development Flows

Inflow Area = 182,326 sf, 80.73% Impervious, Inflow Depth = 3.35" for 25 YEAR event
Inflow = 3.25 cfs @ 7.98 hrs, Volume= 50,847 cf
Primary = 3.25 cfs @ 7.98 hrs, Volume= 50,847 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 11L: Peak Post- Development Flows



Summary for Subcatchment 1S: PLAZA 1

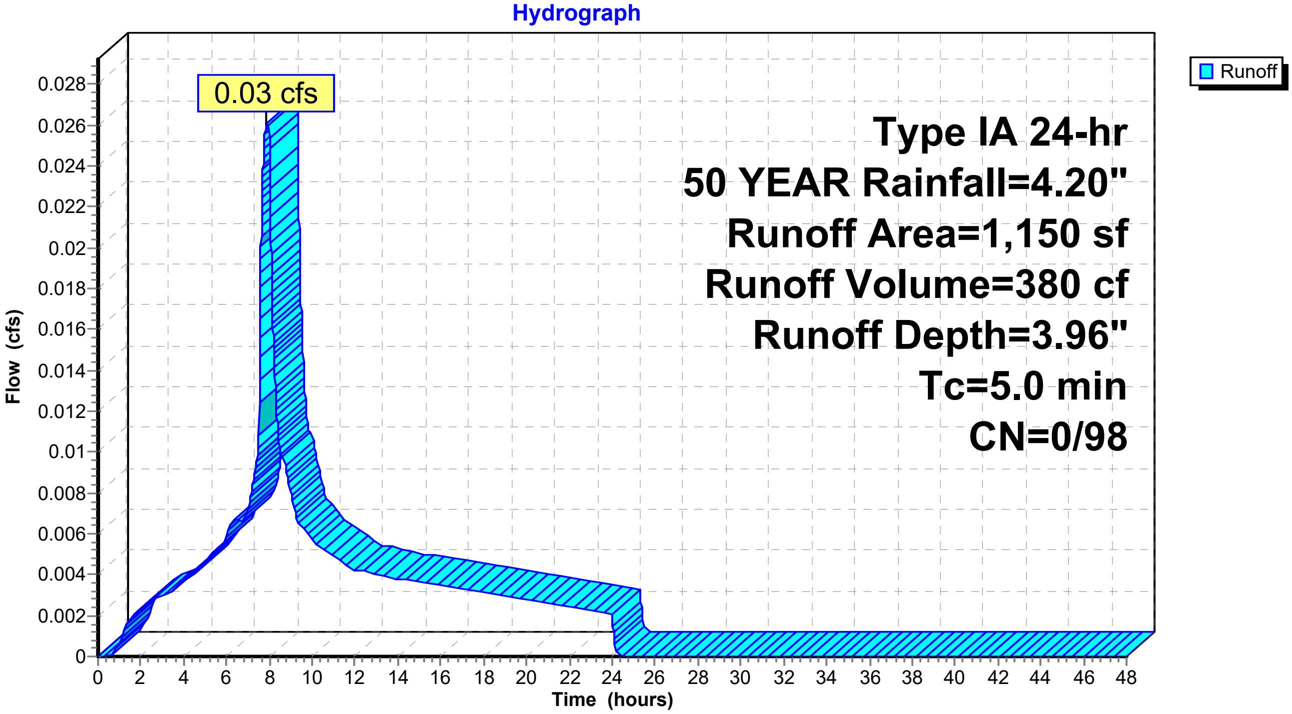
Runoff = 0.03 cfs @ 7.88 hrs, Volume= 380 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

Area (sf)	CN	Description
1,150	98	Paved parking, HSG C
1,150		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: PLAZA 1



Summary for Subcatchment 2AS: ROOF

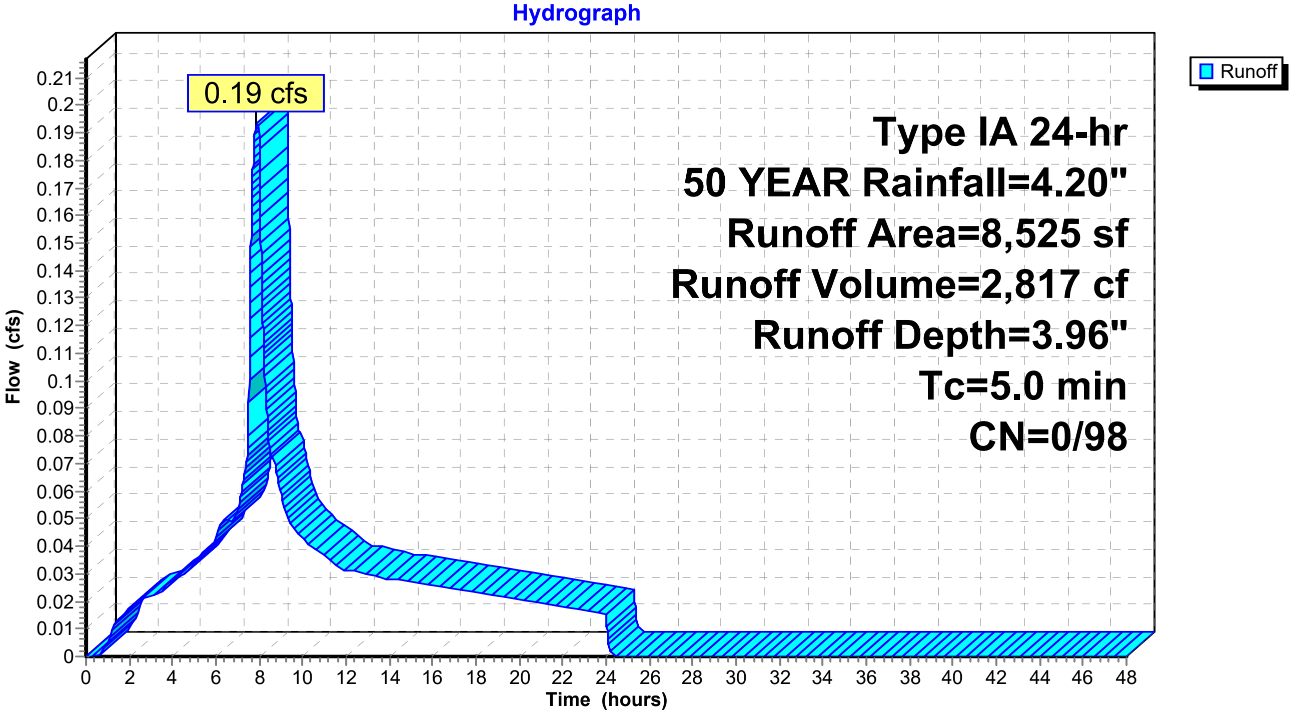
Runoff = 0.19 cfs @ 7.88 hrs, Volume= 2,817 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

Area (sf)	CN	Description
8,525	98	Roofs, HSG C
8,525		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2AS: ROOF



Summary for Subcatchment 2BS: ROOF

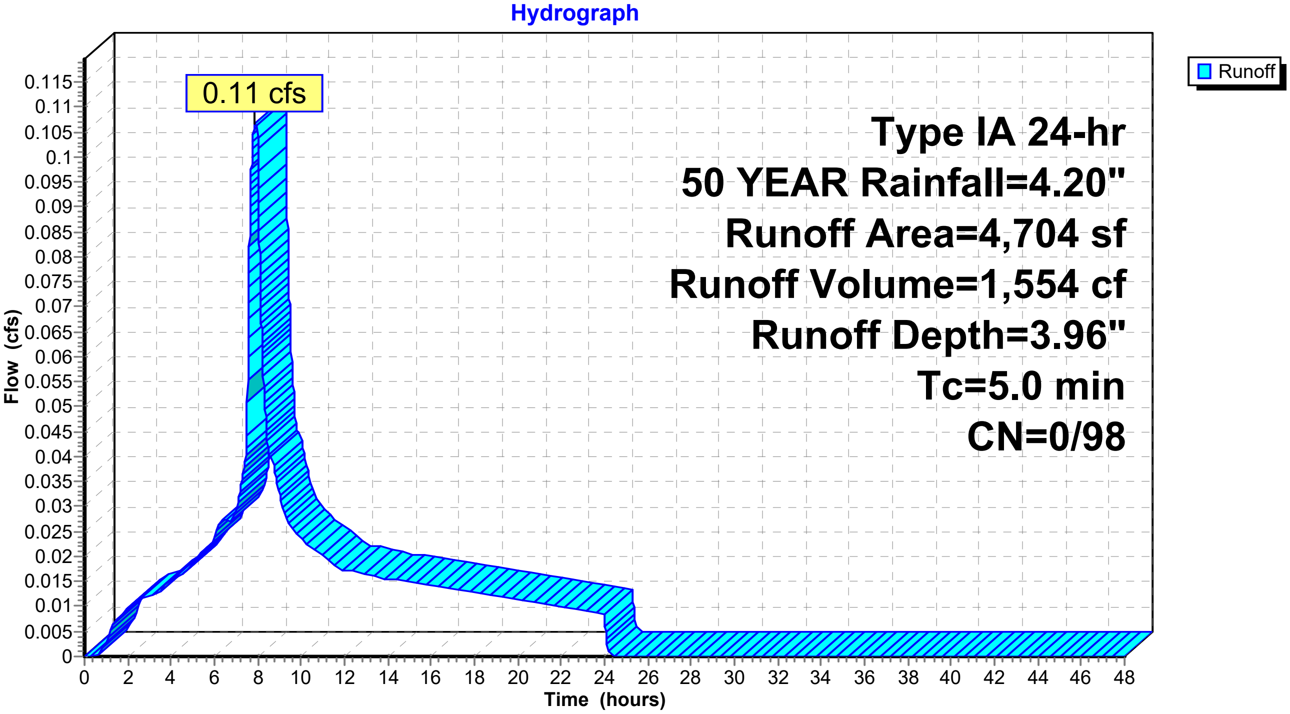
Runoff = 0.11 cfs @ 7.88 hrs, Volume= 1,554 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

Area (sf)	CN	Description
4,704	98	Roofs, HSG C
4,704		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2BS: ROOF



Summary for Subcatchment 3S: PLAZA 2

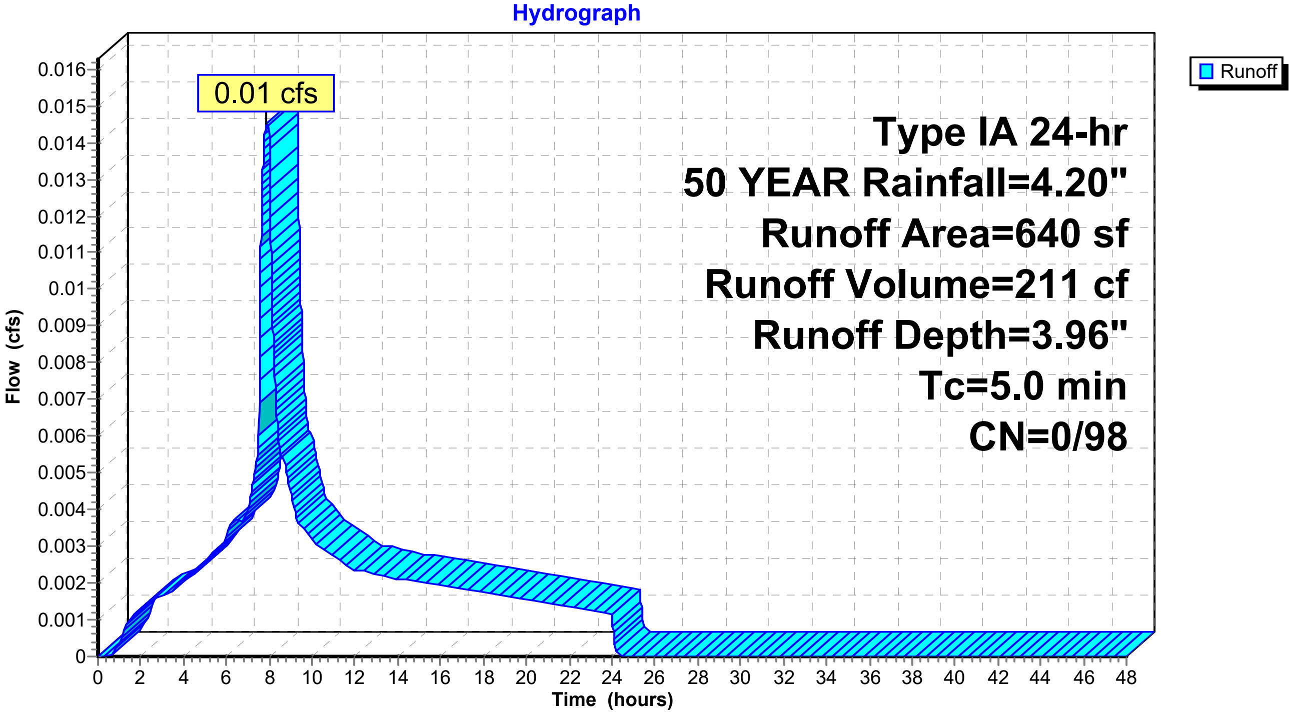
Runoff = 0.01 cfs @ 7.88 hrs, Volume= 211 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

Area (sf)	CN	Description
640	98	Paved parking, HSG C
640		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S: PLAZA 2



Summary for Subcatchment 4AS: ROOF

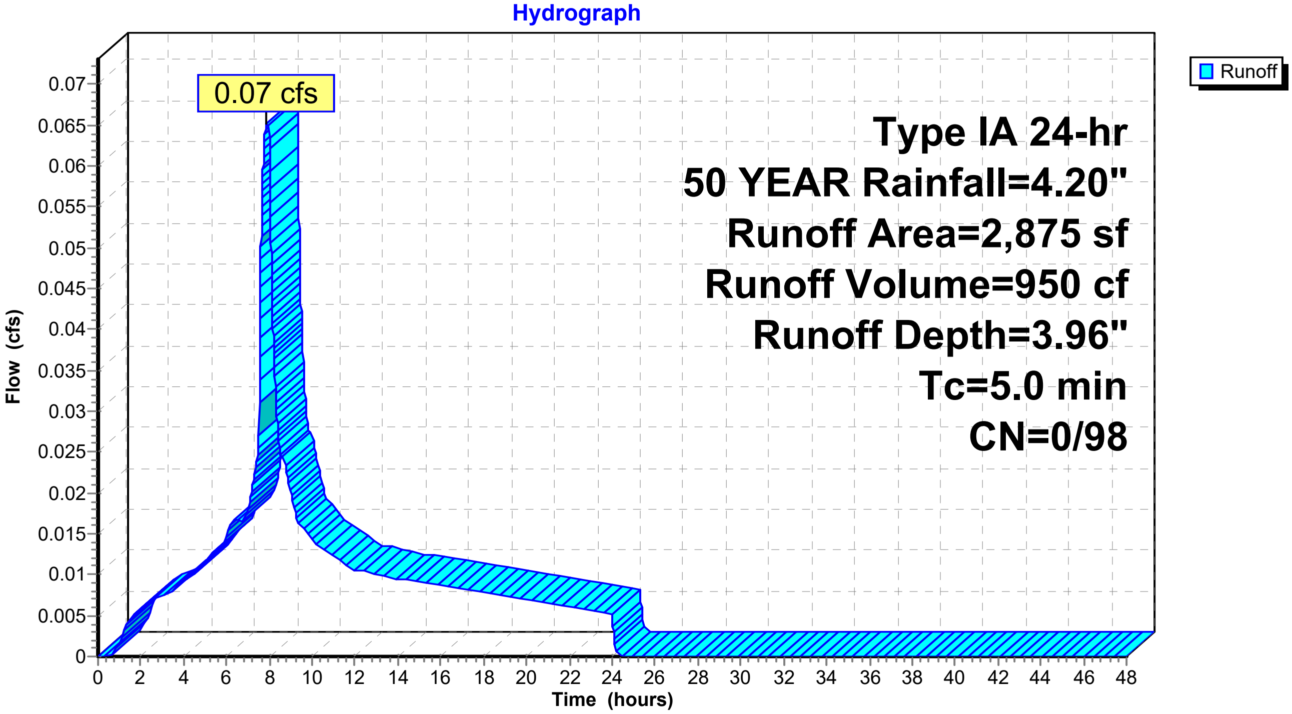
Runoff = 0.07 cfs @ 7.88 hrs, Volume= 950 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

Area (sf)	CN	Description
2,875	98	Roofs, HSG C
2,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4AS: ROOF



Summary for Subcatchment 4BS: ROOF

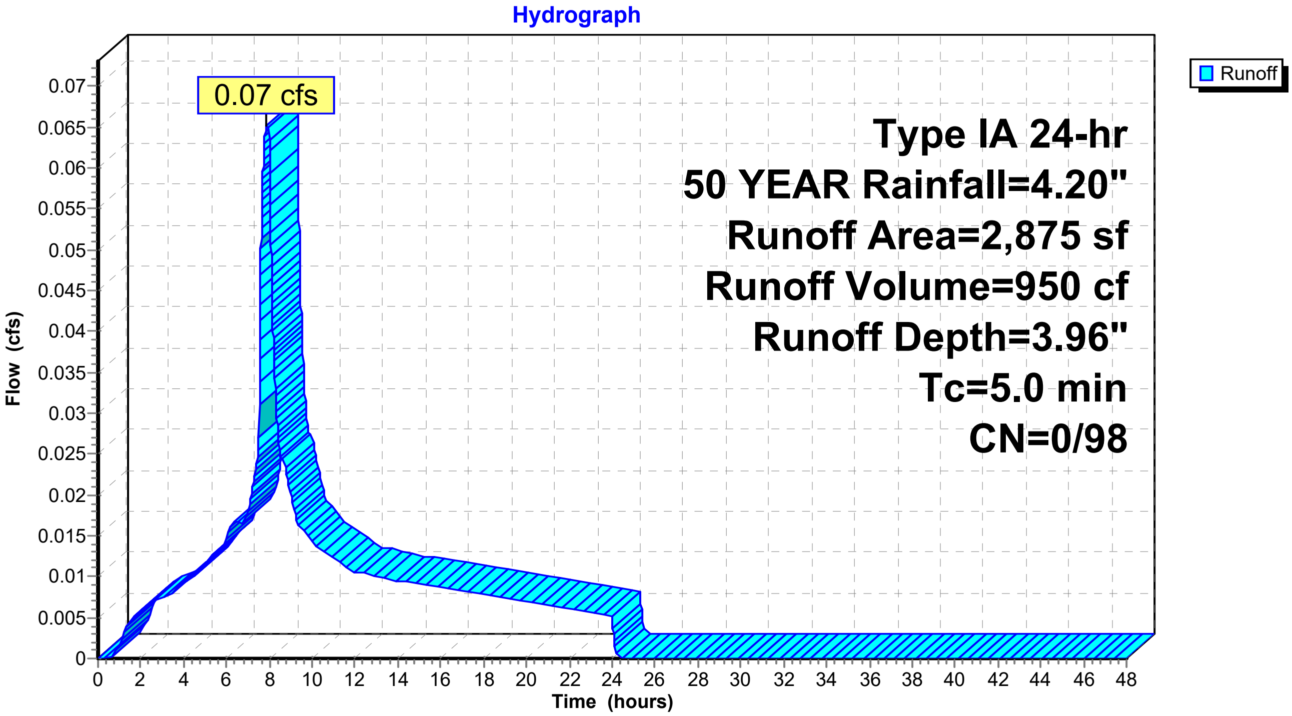
Runoff = 0.07 cfs @ 7.88 hrs, Volume= 950 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

Area (sf)	CN	Description
2,875	98	Roofs, HSG C
2,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4BS: ROOF



Summary for Subcatchment 5S: PLAZA 3

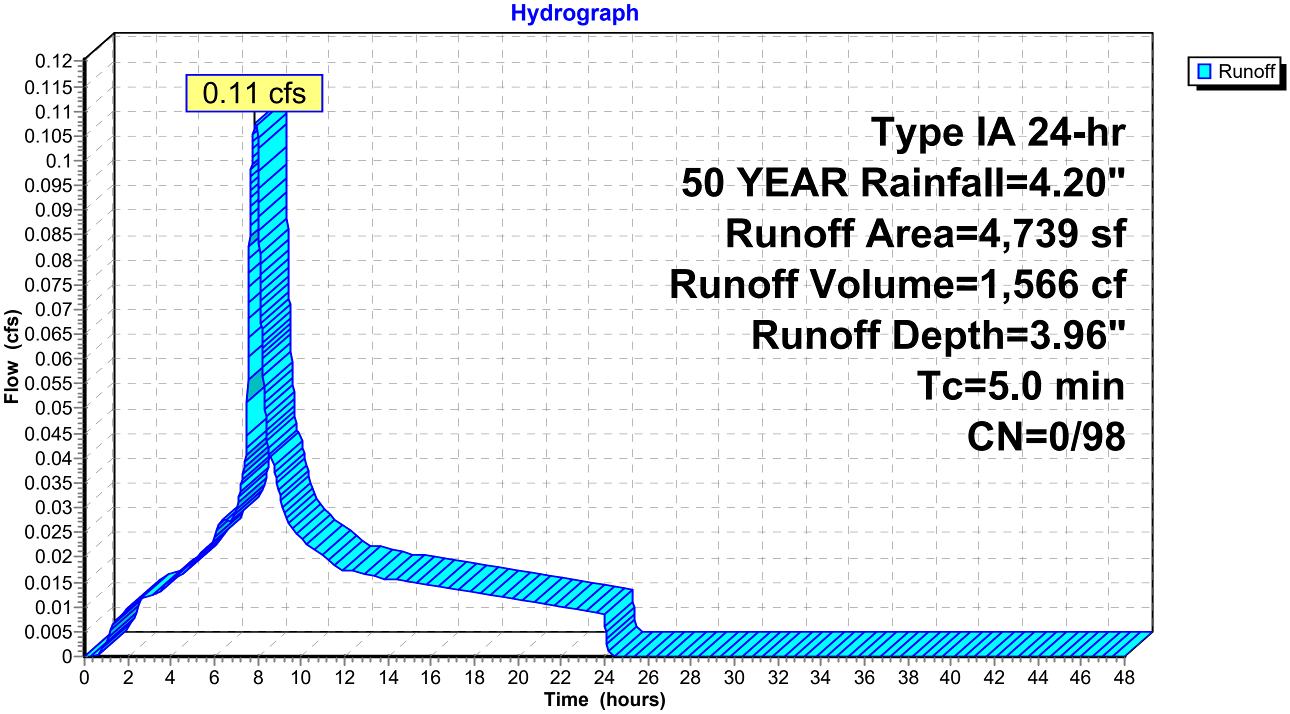
Runoff = 0.11 cfs @ 7.88 hrs, Volume= 1,566 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

Area (sf)	CN	Description
4,739	98	Paved parking, HSG C
4,739		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5S: PLAZA 3



Summary for Subcatchment 6AS: ROOF

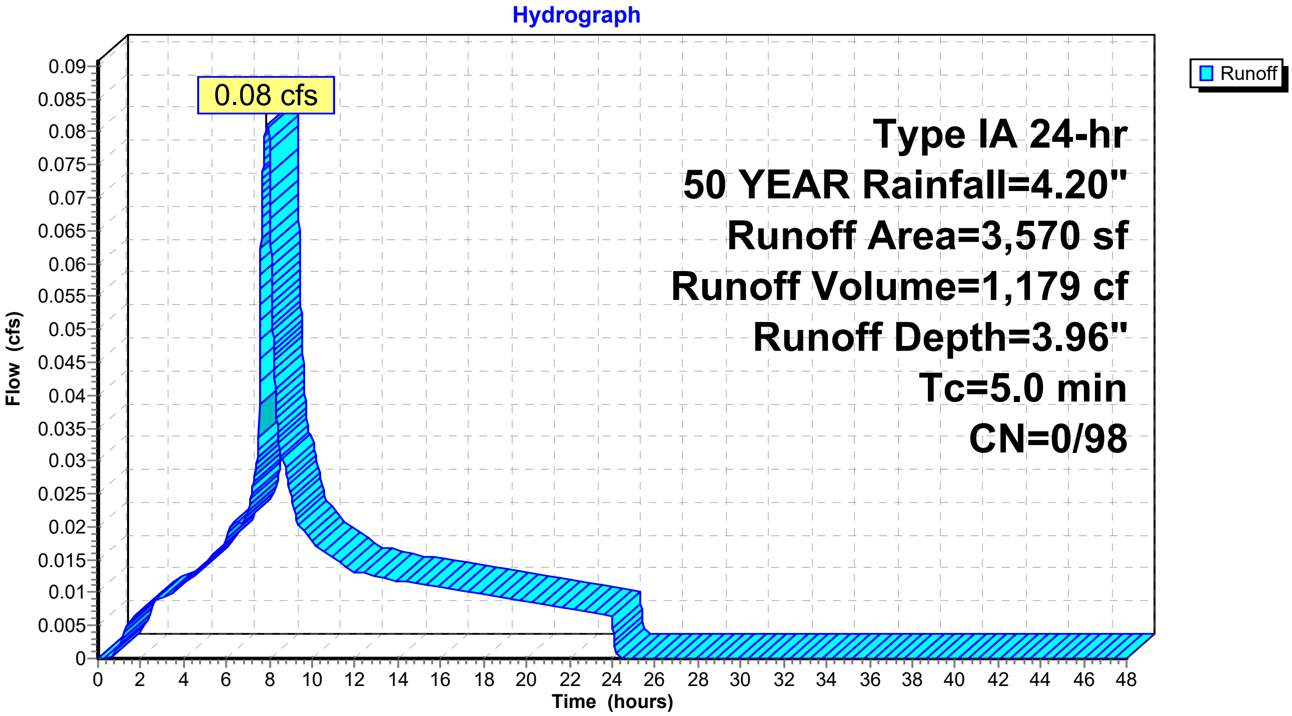
Runoff = 0.08 cfs @ 7.88 hrs, Volume= 1,179 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

Area (sf)	CN	Description
3,570	98	Roofs, HSG C
3,570		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6AS: ROOF



Summary for Subcatchment 6BS: ROOF

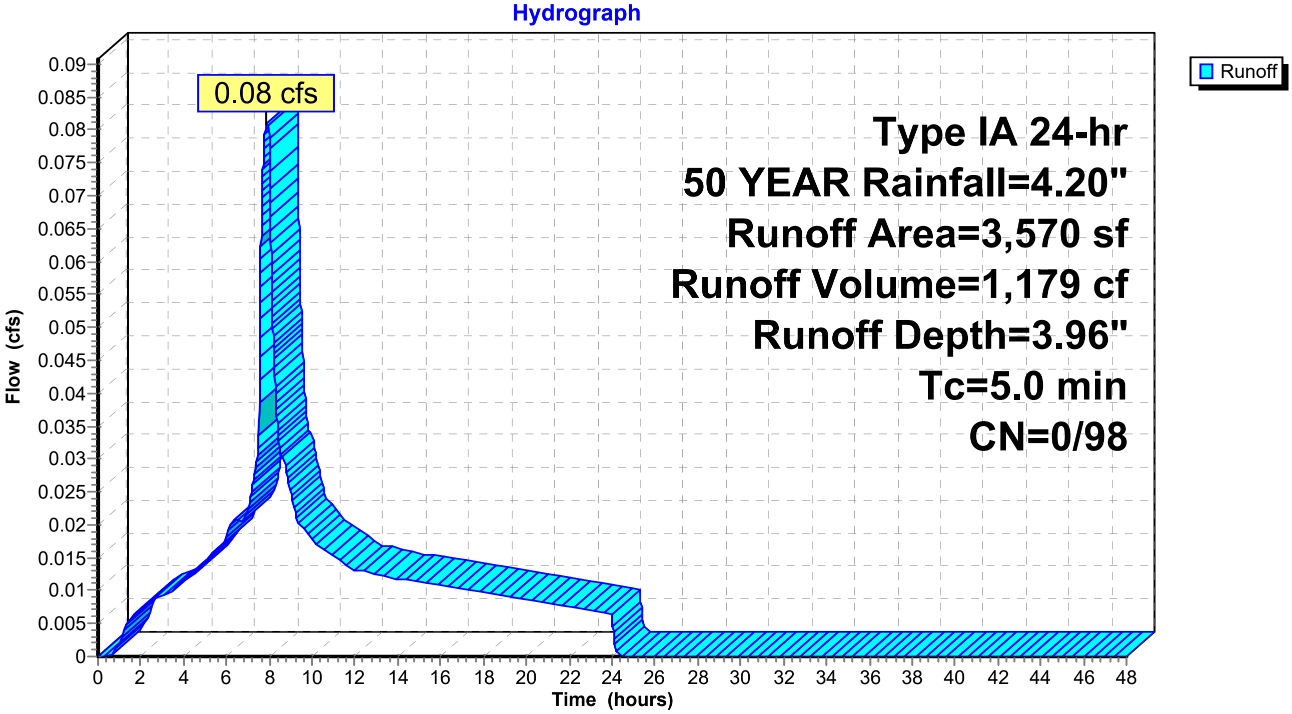
Runoff = 0.08 cfs @ 7.88 hrs, Volume= 1,179 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

Area (sf)	CN	Description
3,570	98	Roofs, HSG C
3,570		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6BS: ROOF



Summary for Subcatchment 7S: NORTH DRIVEWAY

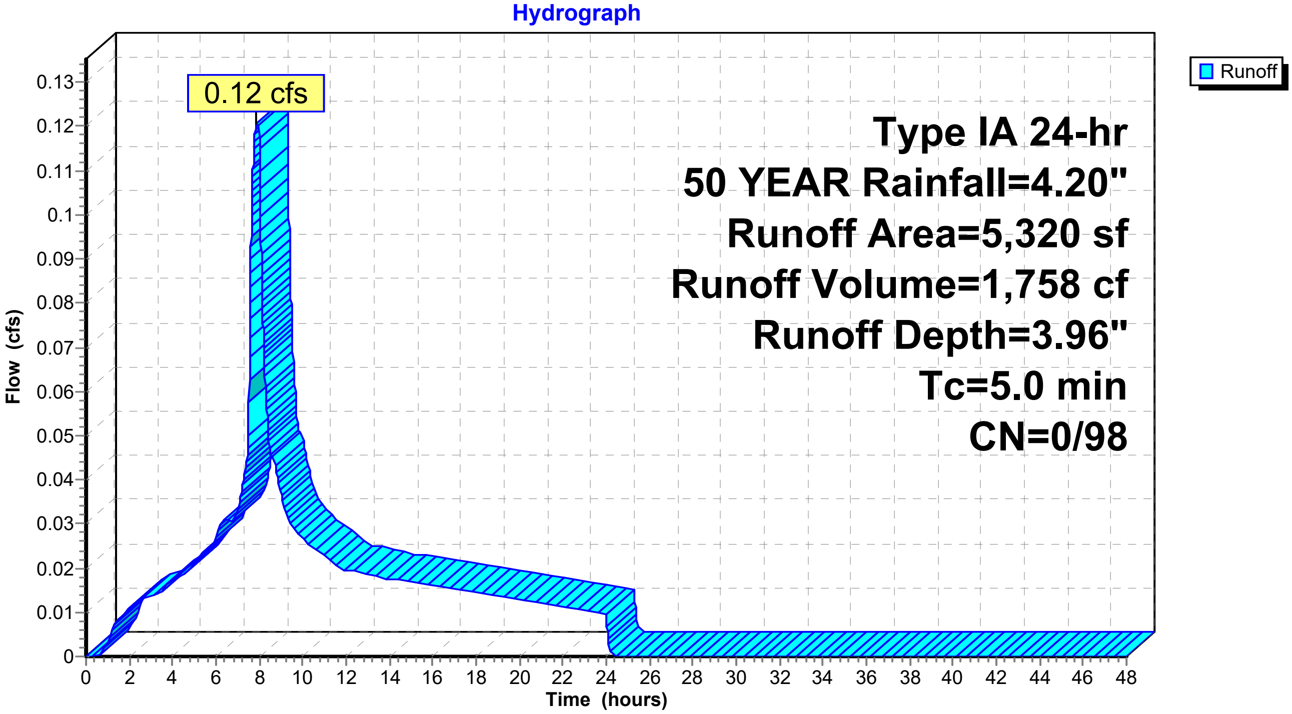
Runoff = 0.12 cfs @ 7.88 hrs, Volume= 1,758 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

Area (sf)	CN	Description
5,320	98	Paved parking, HSG C
5,320		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 7S: NORTH DRIVEWAY



Summary for Subcatchment 8AS: ROOF

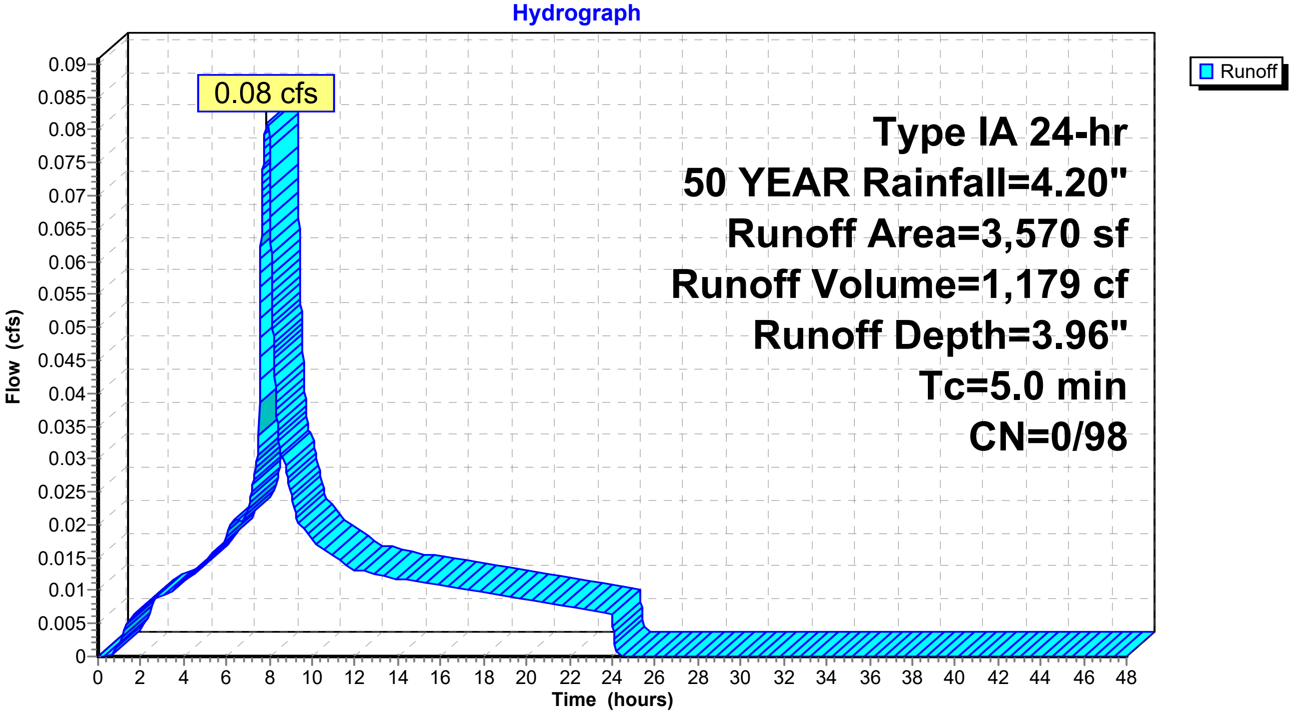
Runoff = 0.08 cfs @ 7.88 hrs, Volume= 1,179 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

Area (sf)	CN	Description
3,570	98	Roofs, HSG C
3,570		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8AS: ROOF



Summary for Subcatchment 8BS: ROOF

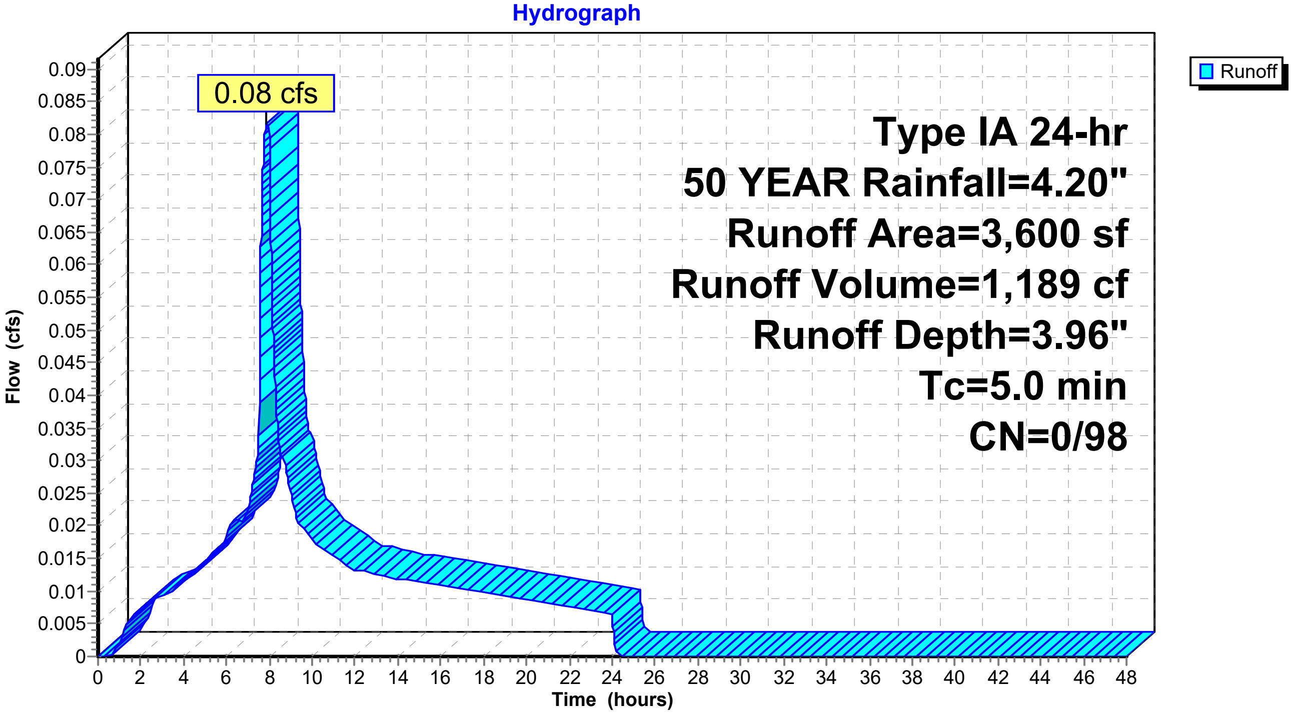
Runoff = 0.08 cfs @ 7.88 hrs, Volume= 1,189 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

Area (sf)	CN	Description
3,600	98	Roofs, HSG C
3,600		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8BS: ROOF



Summary for Subcatchment 9S: NORTHEAST DRIVEWAY

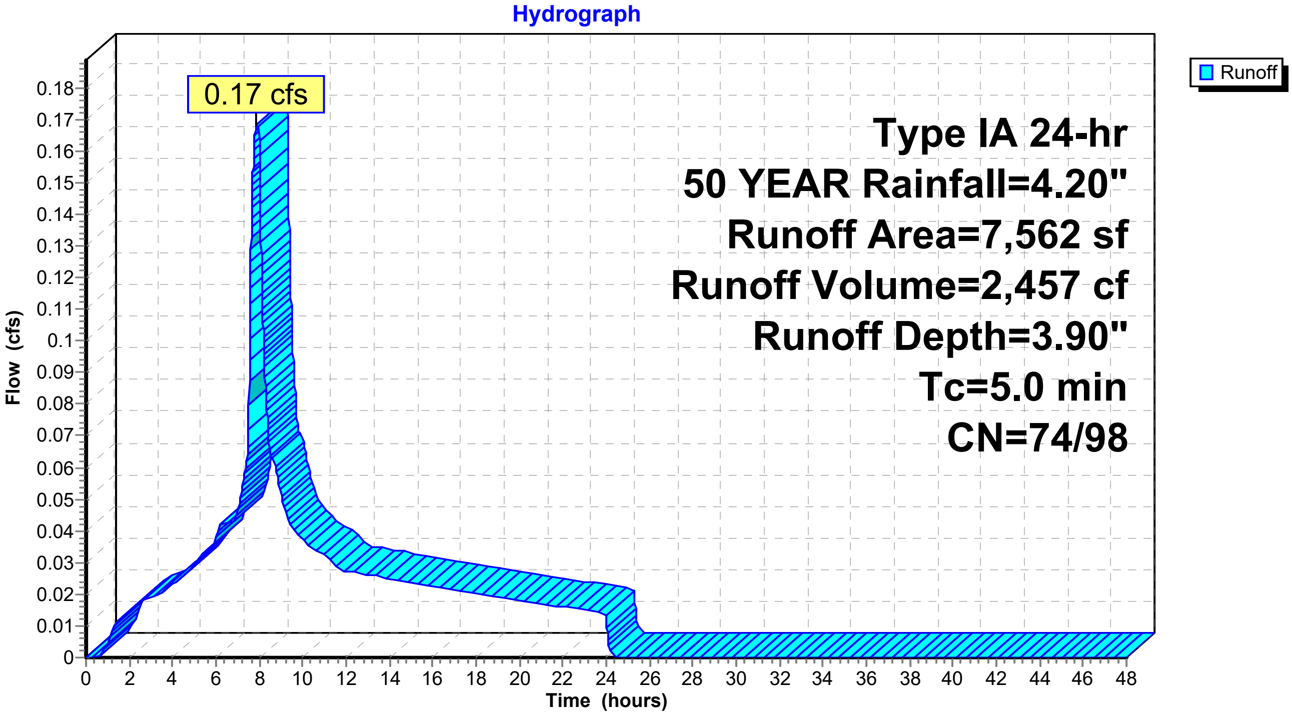
Runoff = 0.17 cfs @ 7.88 hrs, Volume= 2,457 cf, Depth= 3.90"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

Area (sf)	CN	Description
7,340	98	Paved parking, HSG C
222	74	>75% Grass cover, Good, HSG C
7,562	97	Weighted Average
222		2.94% Pervious Area
7,340		97.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 9S: NORTHEAST DRIVEWAY



Summary for Subcatchment 10S: PLANTER BASIN

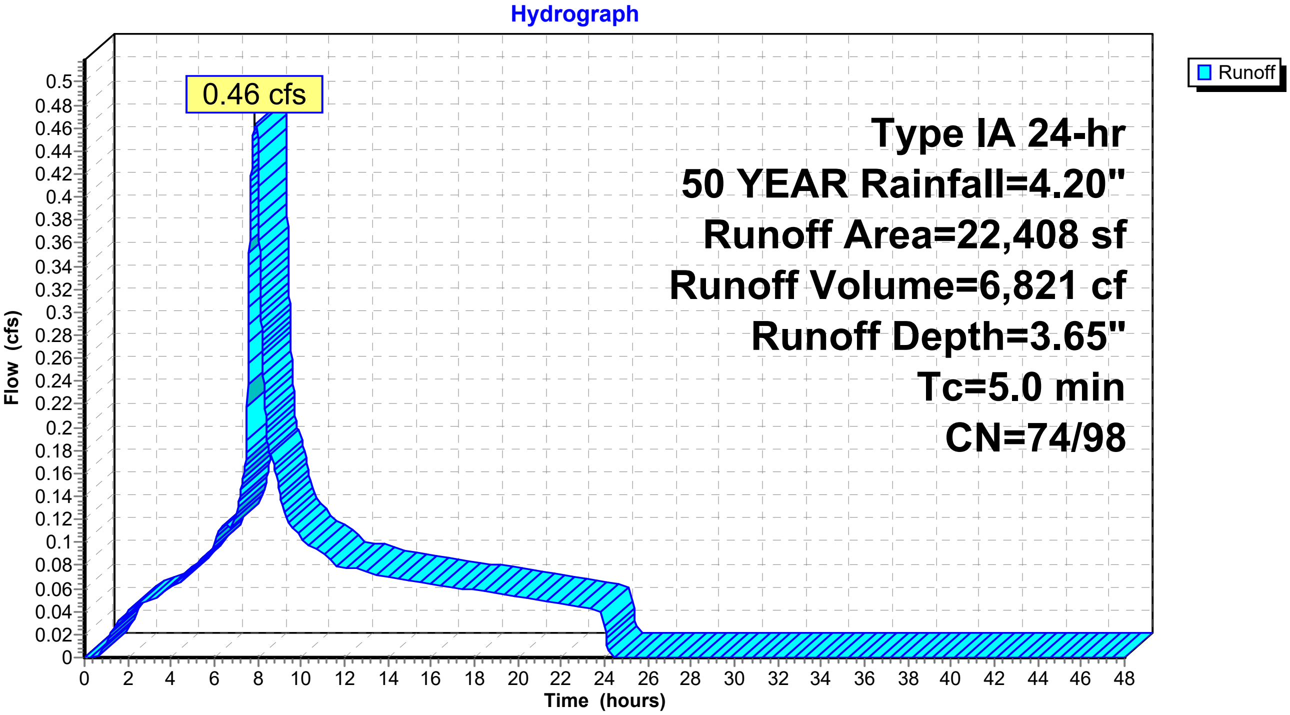
Runoff = 0.46 cfs @ 7.88 hrs, Volume= 6,821 cf, Depth= 3.65"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

	Area (sf)	CN	Description
*	19,258	98	Pavement
	3,150	74	>75% Grass cover, Good, HSG C
	22,408	95	Weighted Average
	3,150		14.06% Pervious Area
	19,258		85.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10S: PLANTER BASIN



Summary for Subcatchment 11S: SWALE BASIN

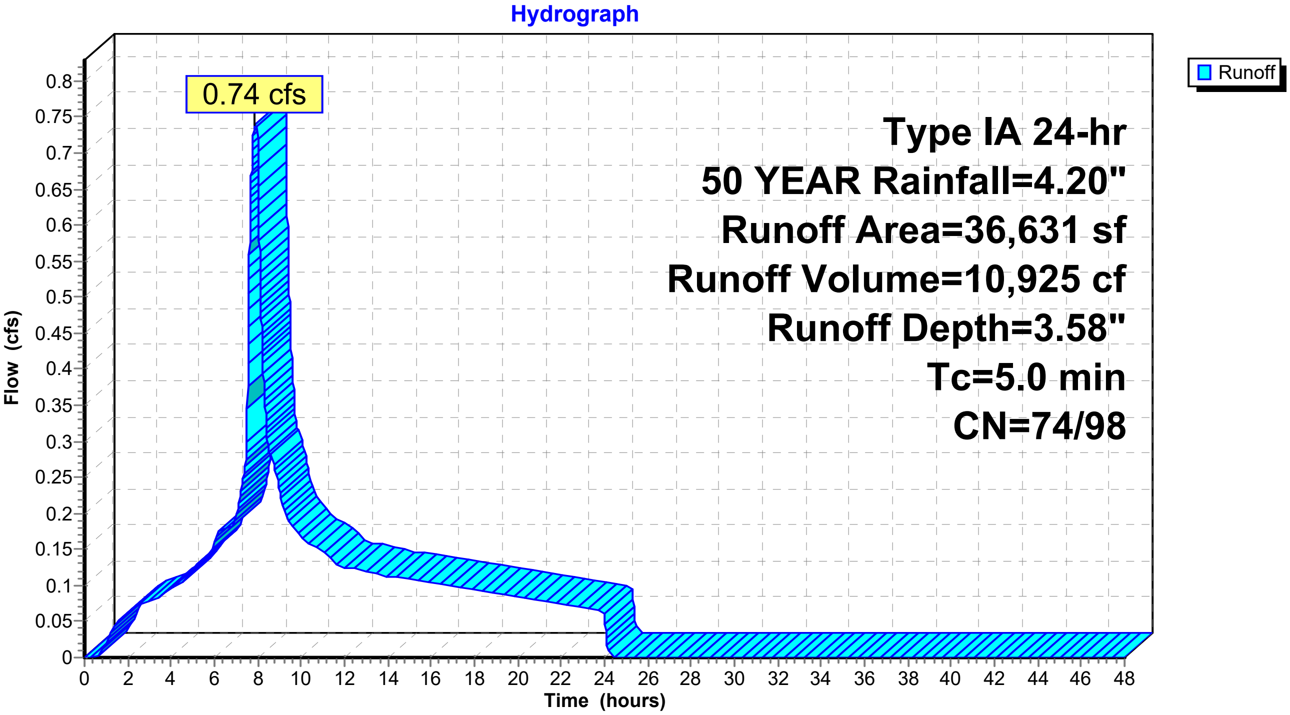
Runoff = 0.74 cfs @ 7.89 hrs, Volume= 10,925 cf, Depth= 3.58"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

	Area (sf)	CN	Description
*	30,268	98	Pavement
	6,363	74	>75% Grass cover, Good, HSG C
	36,631	94	Weighted Average
	6,363		17.37% Pervious Area
	30,268		82.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 11S: SWALE BASIN



Summary for Subcatchment 12S: SOUTH BASIN

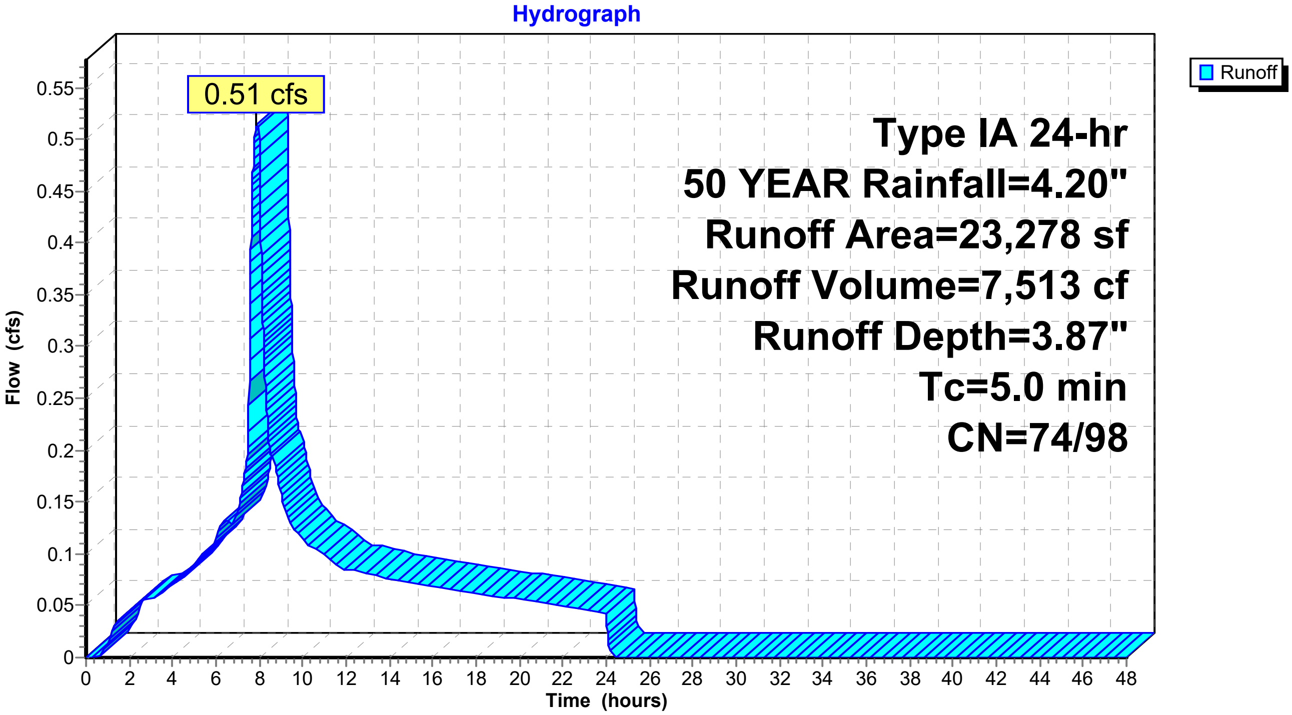
Runoff = 0.51 cfs @ 7.88 hrs, Volume= 7,513 cf, Depth= 3.87"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

	Area (sf)	CN	Description
*	22,316	98	Pavement
	962	74	>75% Grass cover, Good, HSG C
	23,278	97	Weighted Average
	962		4.13% Pervious Area
	22,316		95.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 12S: SOUTH BASIN



Summary for Subcatchment 13S: EAST BASIN

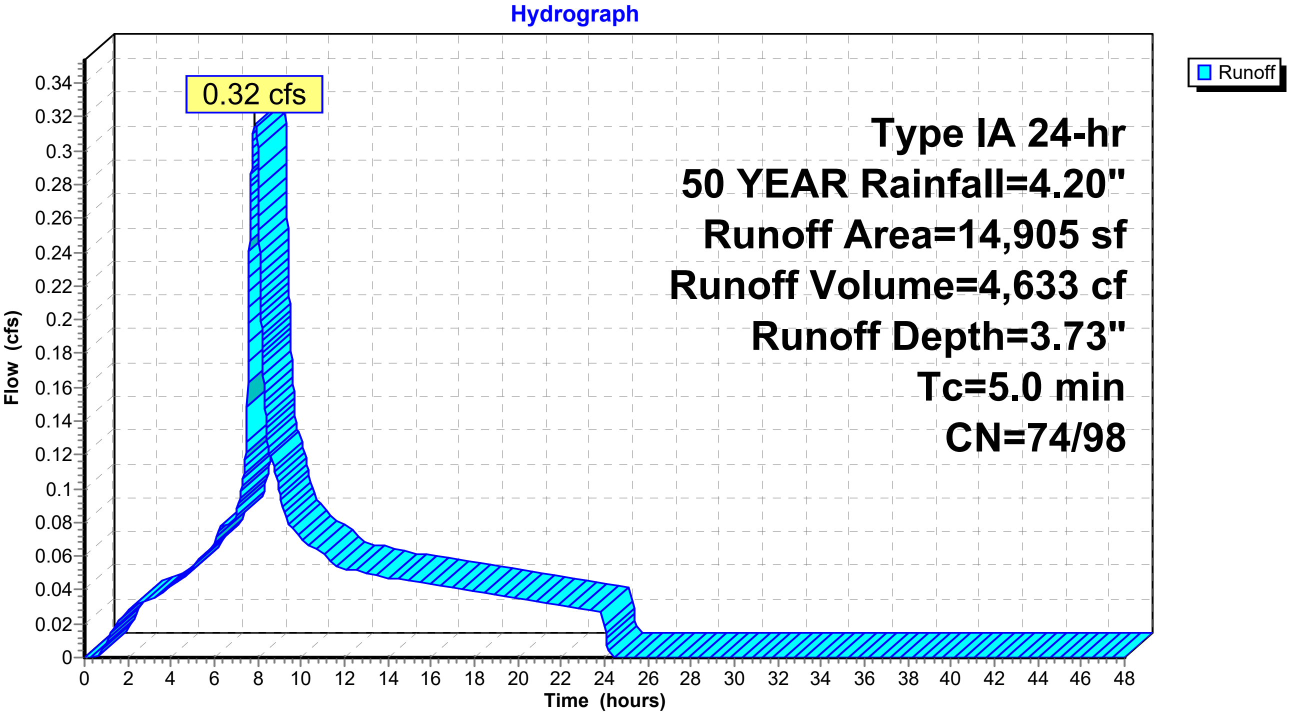
Runoff = 0.32 cfs @ 7.88 hrs, Volume= 4,633 cf, Depth= 3.73"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

	Area (sf)	CN	Description
*	13,332	98	Pavement
	1,573	74	>75% Grass cover, Good, HSG C
	14,905	95	Weighted Average
	1,573		10.55% Pervious Area
	13,332		89.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 13S: EAST BASIN



Summary for Subcatchment 14S: ROOF

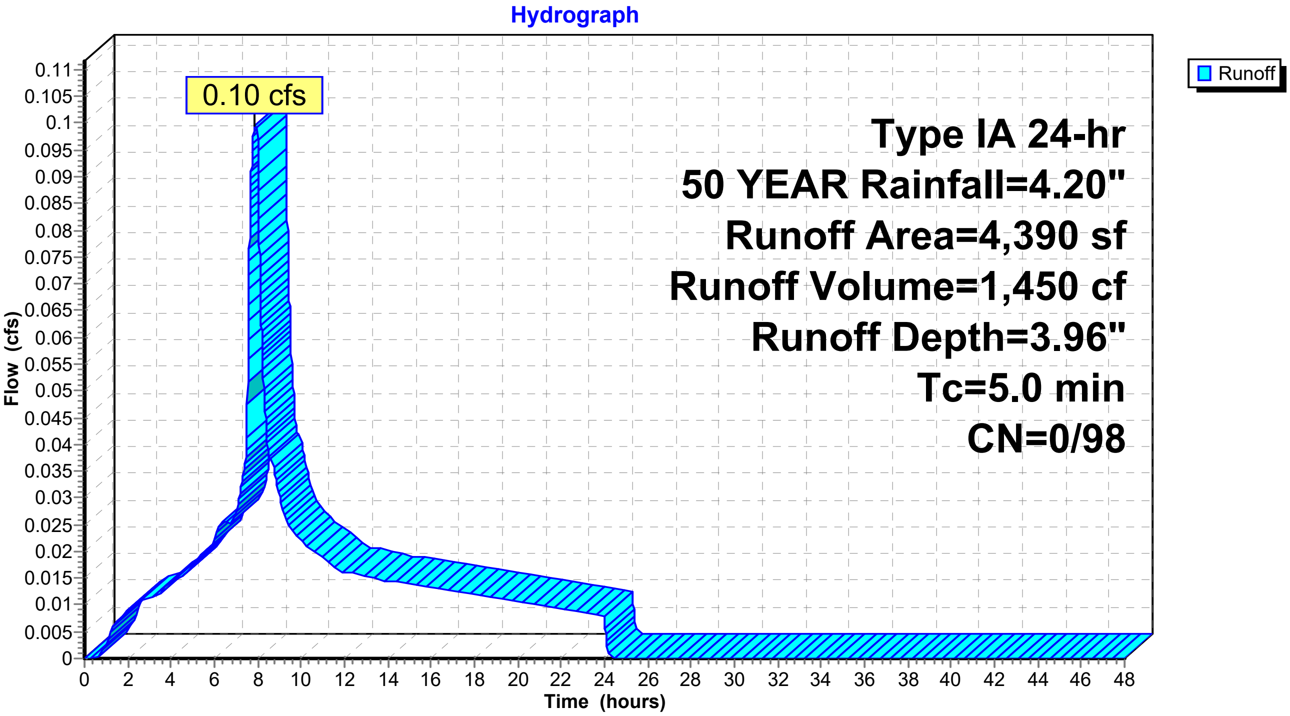
Runoff = 0.10 cfs @ 7.88 hrs, Volume= 1,450 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

Area (sf)	CN	Description
4,390	98	Roofs, HSG C
4,390		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 14S: ROOF



Summary for Subcatchment 15S: DRIVE-THRU

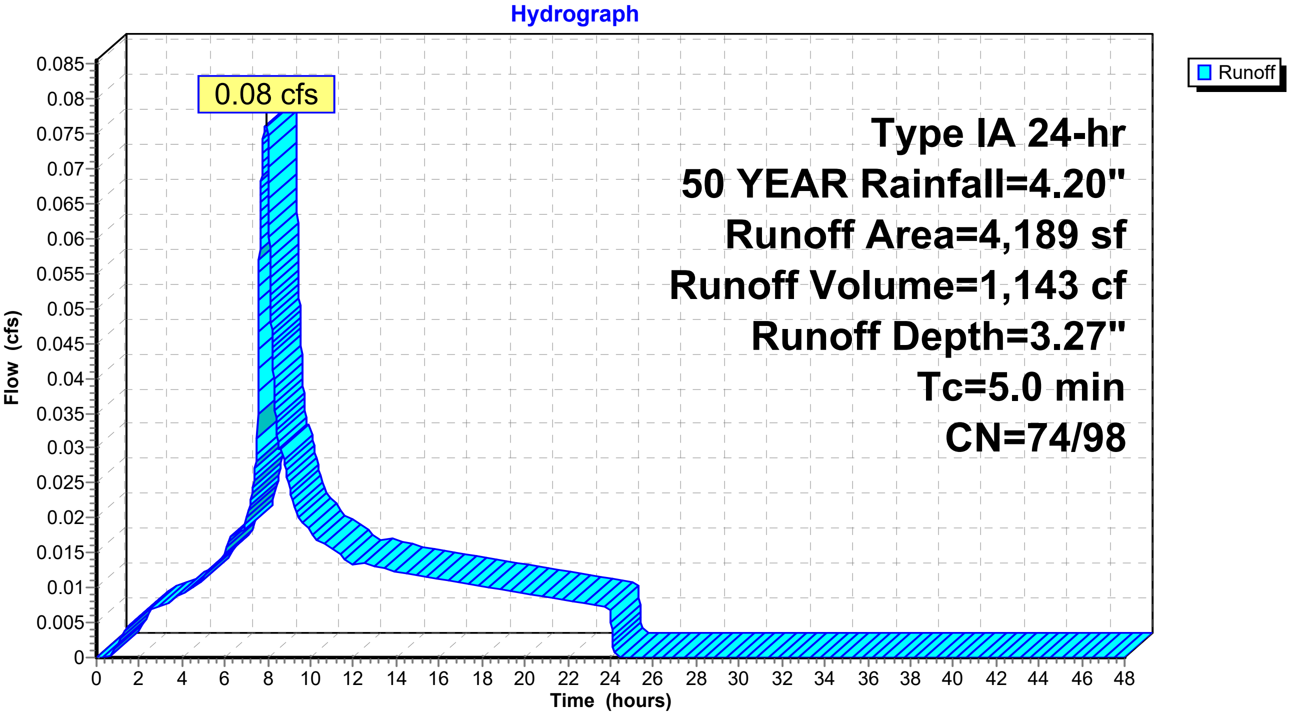
Runoff = 0.08 cfs @ 7.90 hrs, Volume= 1,143 cf, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

	Area (sf)	CN	Description
*	2,887	98	Pavement
	1,302	74	>75% Grass cover, Good, HSG C
	4,189	91	Weighted Average
	1,302		31.08% Pervious Area
	2,887		68.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 15S: DRIVE-THRU



Summary for Subcatchment 16S: PERIMETER LANDSCAPE AND WALKWAY (UNDETAINED)

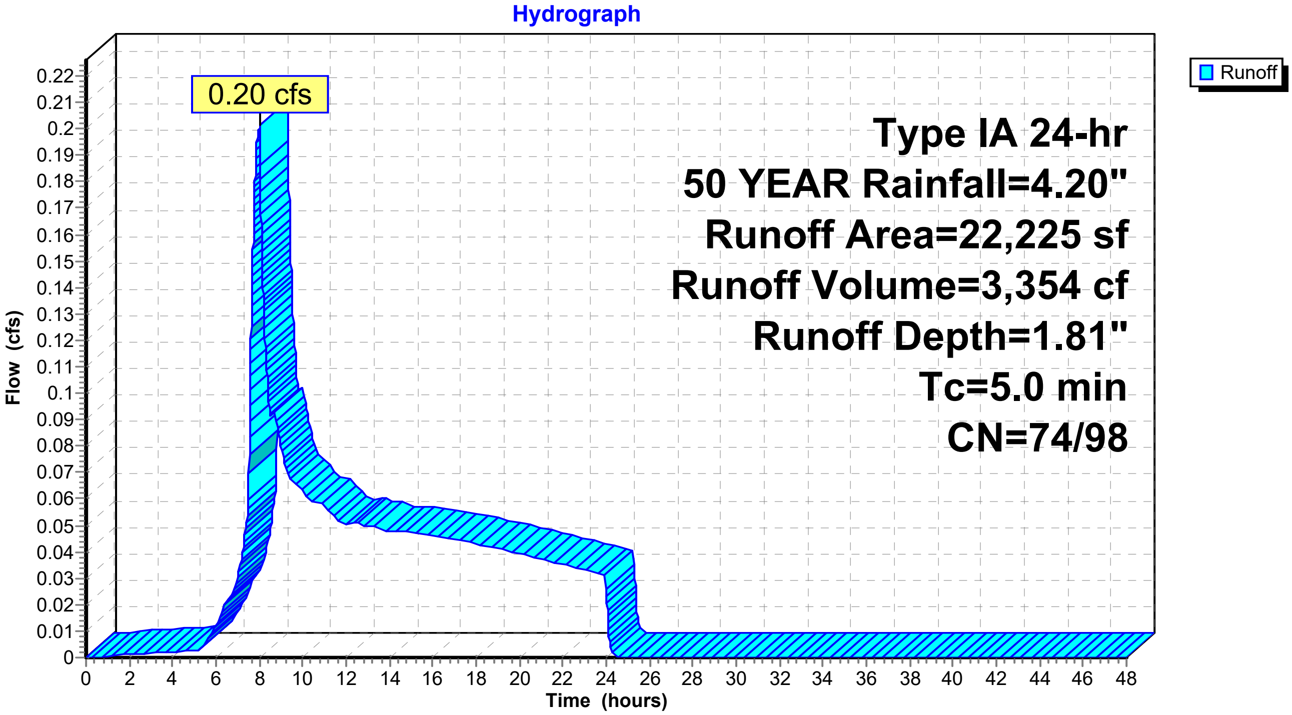
Runoff = 0.20 cfs @ 7.99 hrs, Volume= 3,354 cf, Depth= 1.81"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

Area (sf)	CN	Description
21,560	74	>75% Grass cover, Good, HSG C
665	98	Paved parking, HSG C
22,225	75	Weighted Average
21,560		97.01% Pervious Area
665		2.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 16S: PERIMETER LANDSCAPE AND WALKWAY (UNDETAINED)



Summary for Subcatchment 17S: PLAZA 4

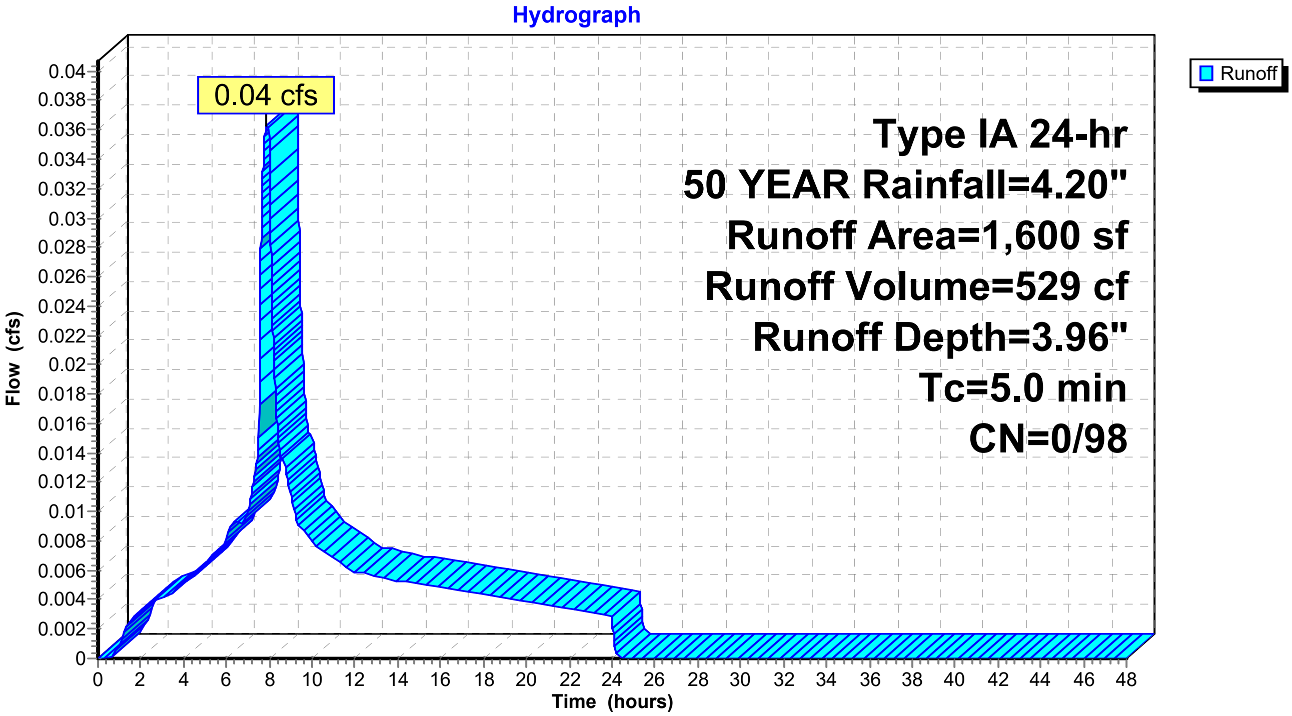
Runoff = 0.04 cfs @ 7.88 hrs, Volume= 529 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 YEAR Rainfall=4.20"

Area (sf)	CN	Description
1,600	98	Roofs, HSG C
1,600		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 17S: PLAZA 4



Summary for Reach 1R: Swale

Inflow Area =	36,631 sf,	82.63% Impervious,	Inflow Depth = 3.58"	for 50 YEAR event
Inflow =	0.74 cfs @	7.89 hrs, Volume=	10,925 cf	
Outflow =	0.71 cfs @	8.01 hrs, Volume=	10,925 cf, Atten= 5%, Lag= 7.2 min	

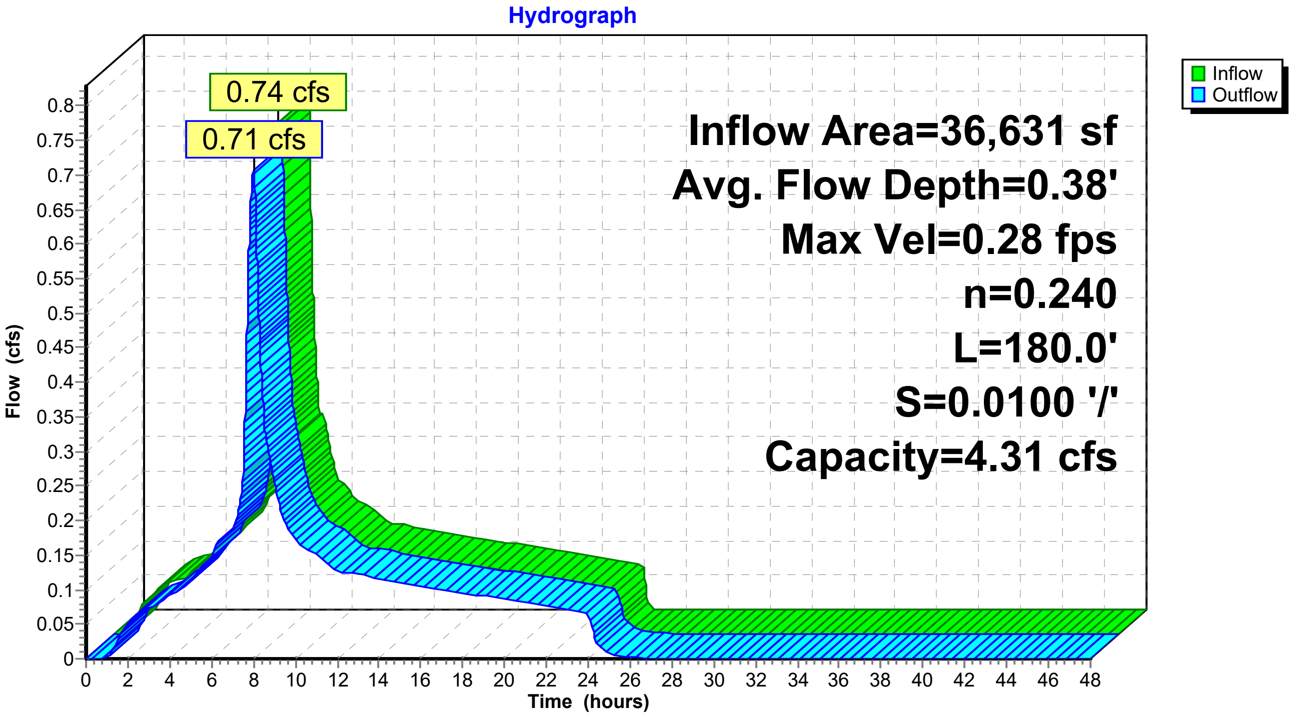
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.28 fps, Min. Travel Time= 10.6 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 27.6 min

Peak Storage= 451 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 4.31 cfs

5.00' x 1.00' deep channel, n= 0.240
Side Slope Z-value= 4.0 '/' Top Width= 13.00'
Length= 180.0' Slope= 0.0100 '/'
Inlet Invert= 202.00', Outlet Invert= 200.20'

‡

Reach 1R: Swale



Summary for Reach 2R: 6" PIPE

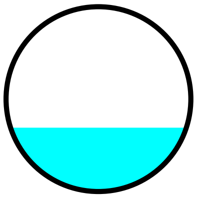
[52] Hint: Inlet/Outlet conditions not evaluated

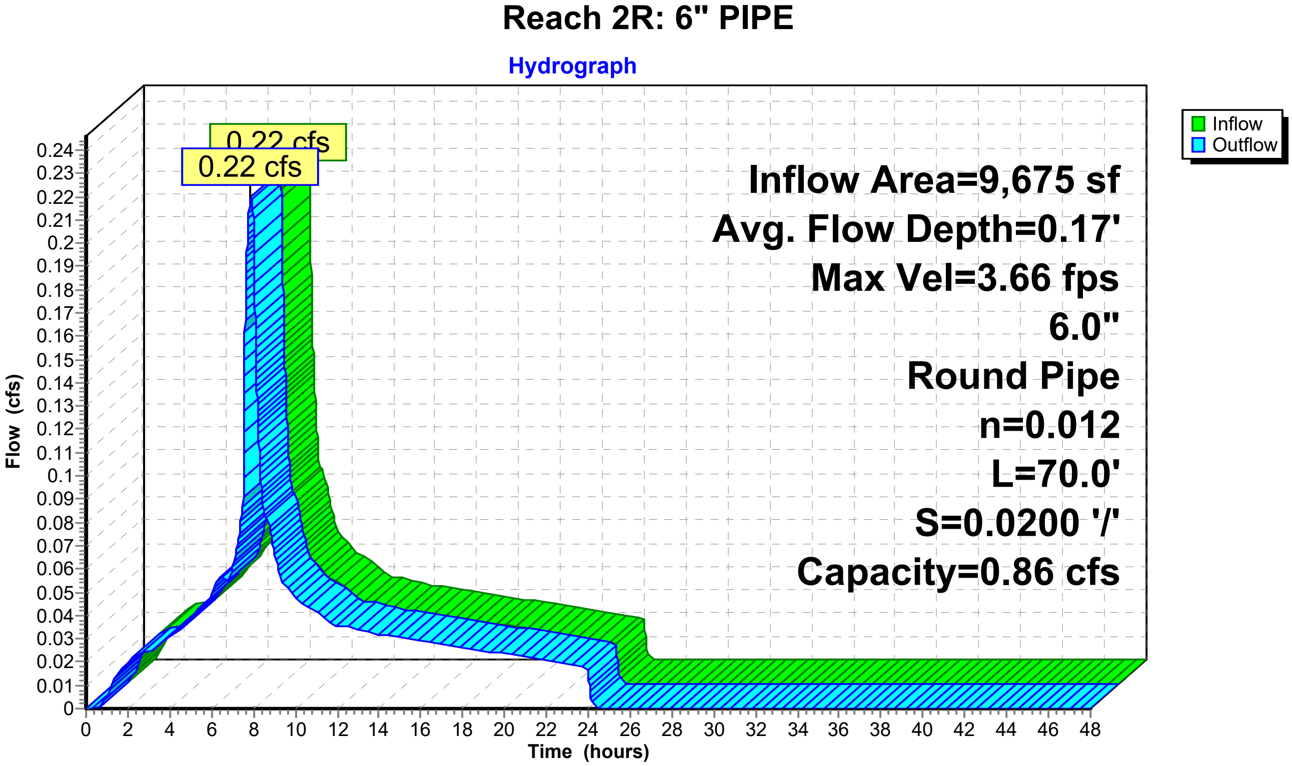
```
Inflow Area =          9,675 sf,100.00% Impervious,  Inflow Depth =   3.96"    for  50 YEAR event
Inflow      =       0.22 cfs @     7.88 hrs,  Volume=              3,196 cf
Outflow     =       0.22 cfs @     7.88 hrs,  Volume=              3,196 cf,  Atten= 0%,  Lag= 0.2 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.66 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.07 fps, Avg. Travel Time= 0.6 min

Peak Storage= 4 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.86 cfs

6.0" Round Pipe
n= 0.012
Length= 70.0' Slope= 0.0200 '/'
Inlet Invert= 203.36', Outlet Invert= 201.96'





Summary for Reach 3R: 8" PIPE

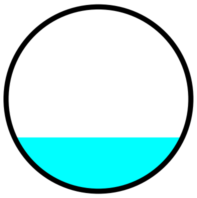
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 2R OUTLET depth by 0.02' @ 8.02 hrs

```
Inflow Area =        15,019 sf,100.00% Impervious,  Inflow Depth =   3.96"    for  50 YEAR event
Inflow      =       0.34 cfs @    7.88 hrs,  Volume=             4,962 cf
Outflow     =       0.34 cfs @    7.88 hrs,  Volume=             4,962 cf,  Atten= 0%,  Lag= 0.2 min
```

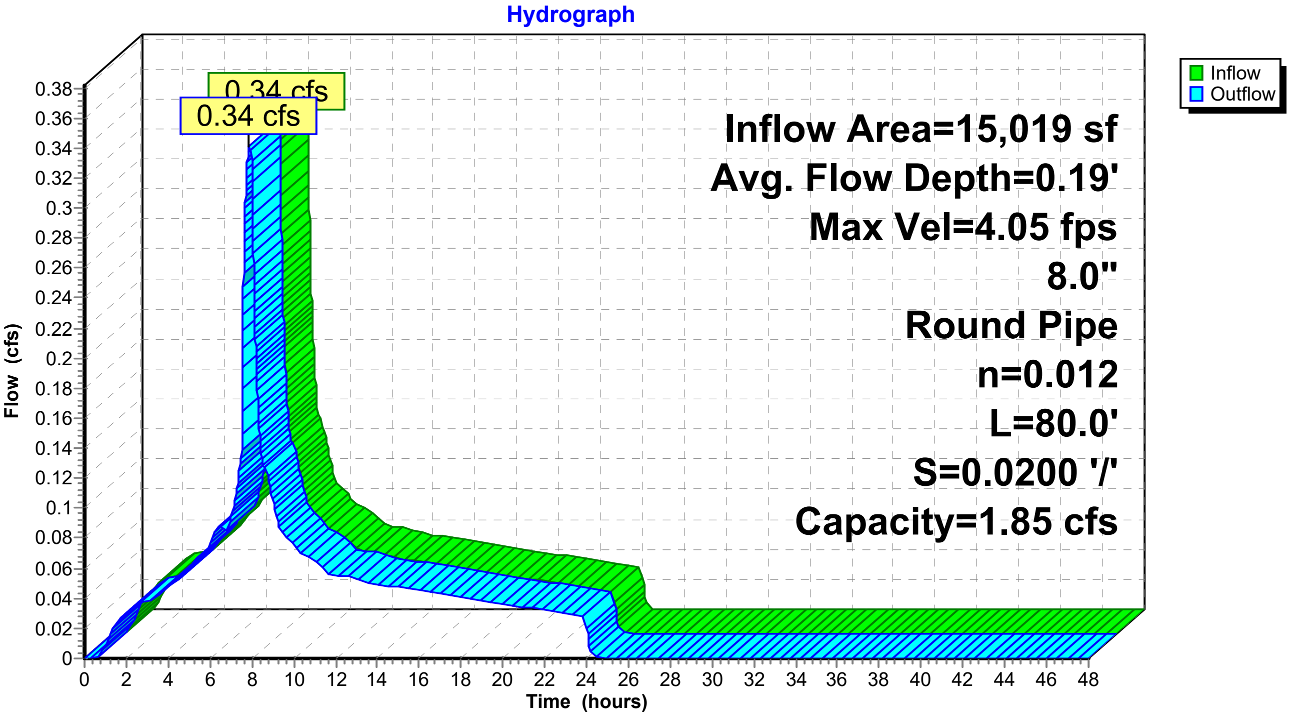
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.05 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.27 fps, Avg. Travel Time= 0.6 min

Peak Storage= 7 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.85 cfs

8.0" Round Pipe
n= 0.012
Length= 80.0' Slope= 0.0200 '/'
Inlet Invert= 201.96', Outlet Invert= 200.36'

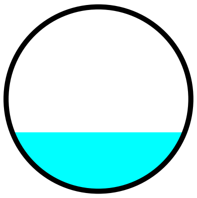


Reach 3R: 8" PIPE

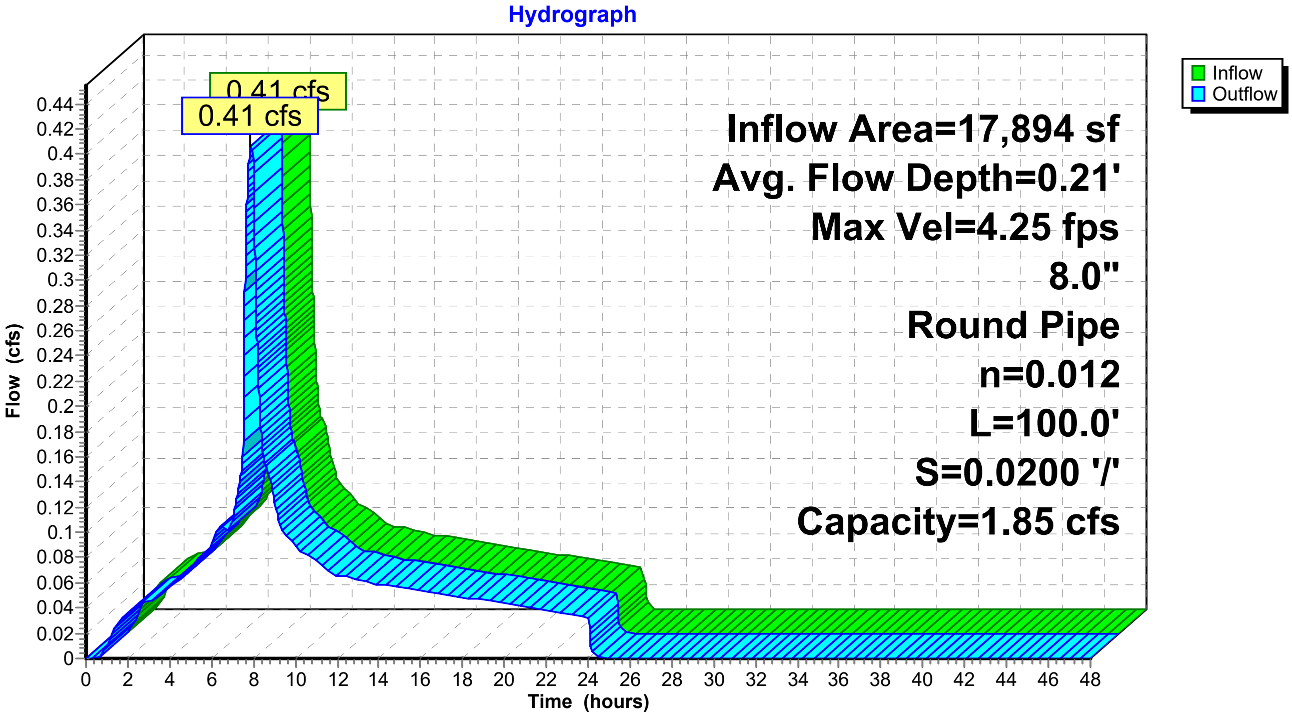


Summary for Reach 4R: 8" PIPE

```
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 3R OUTLET depth by 0.02' @ 8.02 hrs

Inflow Area =        17,894 sf,100.00% Impervious,  Inflow Depth =   3.96"    for  50 YEAR event
Inflow      =        0.41 cfs @    7.88 hrs,  Volume=            5,912 cf
Outflow     =        0.41 cfs @    7.89 hrs,  Volume=            5,912 cf,  Atten= 0%,  Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.25 fps,  Min. Travel Time= 0.4 min
Avg. Velocity = 2.39 fps,  Avg. Travel Time= 0.7 min

Peak Storage= 10 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 0.67'  Flow Area= 0.3 sf,  Capacity= 1.85 cfs

8.0"  Round Pipe
n= 0.012
Length= 100.0'   Slope= 0.0200 '/'
Inlet Invert= 200.36',  Outlet Invert= 198.36'
```



Reach 4R: 8" PIPE



Summary for Reach 5R: 6" PIPE

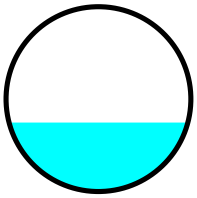
[52] Hint: Inlet/Outlet conditions not evaluated

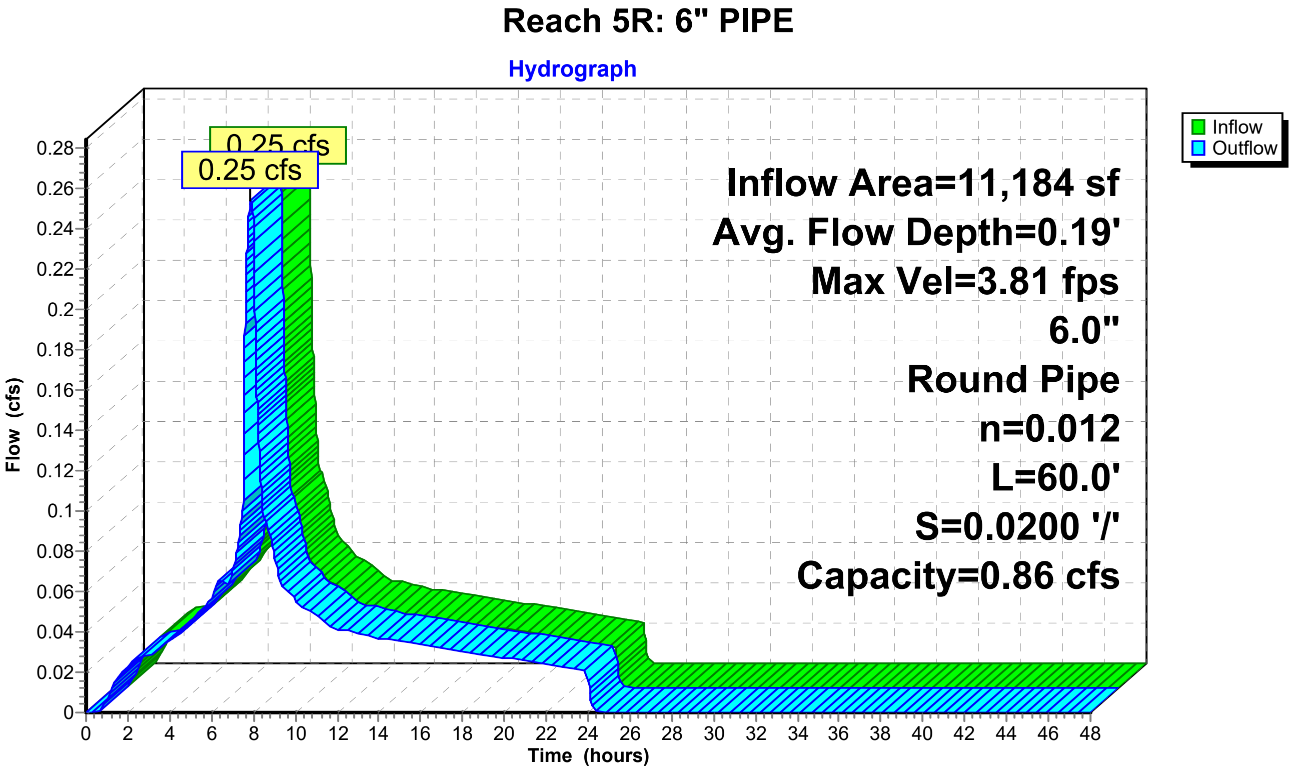
```
Inflow Area =        11,184 sf,100.00% Impervious,  Inflow Depth =   3.96"    for  50 YEAR event
Inflow      =      0.25 cfs @    7.88 hrs,  Volume=           3,695 cf
Outflow     =      0.25 cfs @    7.88 hrs,  Volume=           3,695 cf,  Atten= 0%,  Lag= 0.2 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.81 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.16 fps, Avg. Travel Time= 0.5 min

Peak Storage= 4 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.86 cfs

6.0" Round Pipe
n= 0.012
Length= 60.0' Slope= 0.0200 '/'
Inlet Invert= 199.56', Outlet Invert= 198.36'





Summary for Reach 6R: 8" PIPE

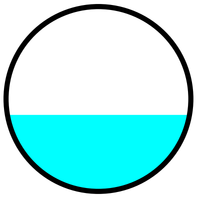
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 4R OUTLET depth by 0.06' @ 7.89 hrs
[62] Hint: Exceeded Reach 5R OUTLET depth by 0.09' @ 7.90 hrs

```
Inflow Area =          29,078 sf,100.00% Impervious,  Inflow Depth =   3.96"    for  50 YEAR event
Inflow      =        0.66 cfs @     7.88 hrs,  Volume=             9,607 cf
Outflow     =        0.66 cfs @     7.89 hrs,  Volume=             9,607 cf,  Atten= 0%,  Lag= 0.2 min
```

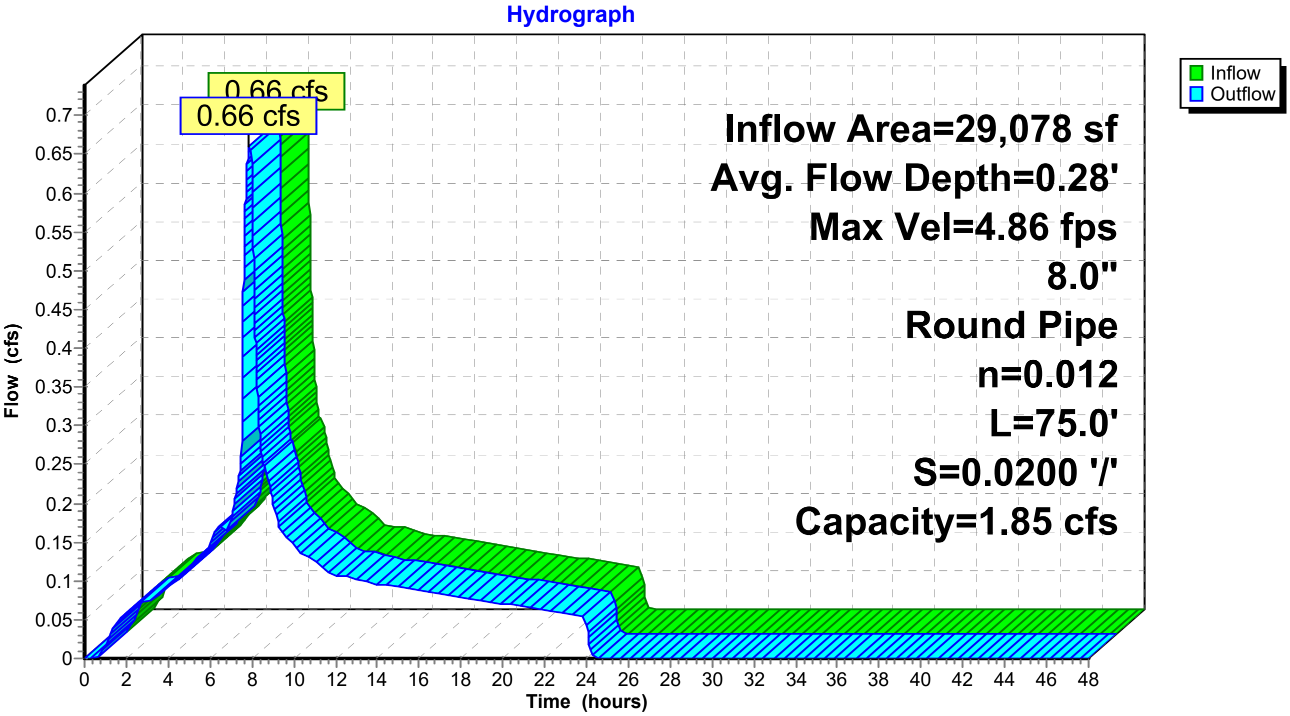
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.86 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.75 fps, Avg. Travel Time= 0.5 min

Peak Storage= 10 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.85 cfs

8.0" Round Pipe
n= 0.012
Length= 75.0' Slope= 0.0200 '/'
Inlet Invert= 198.36', Outlet Invert= 196.86'



Reach 6R: 8" PIPE



Summary for Reach 7R: 8" PIPE

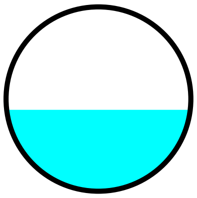
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 6R OUTLET depth by 0.02' @ 7.89 hrs

```
Inflow Area =          32,648 sf,100.00% Impervious,  Inflow Depth =   3.96"    for  50 YEAR event
Inflow      =         0.74 cfs @     7.89 hrs,  Volume=              10,786 cf
Outflow     =         0.74 cfs @     7.89 hrs,  Volume=              10,786 cf,  Atten= 0%,  Lag= 0.1 min
```

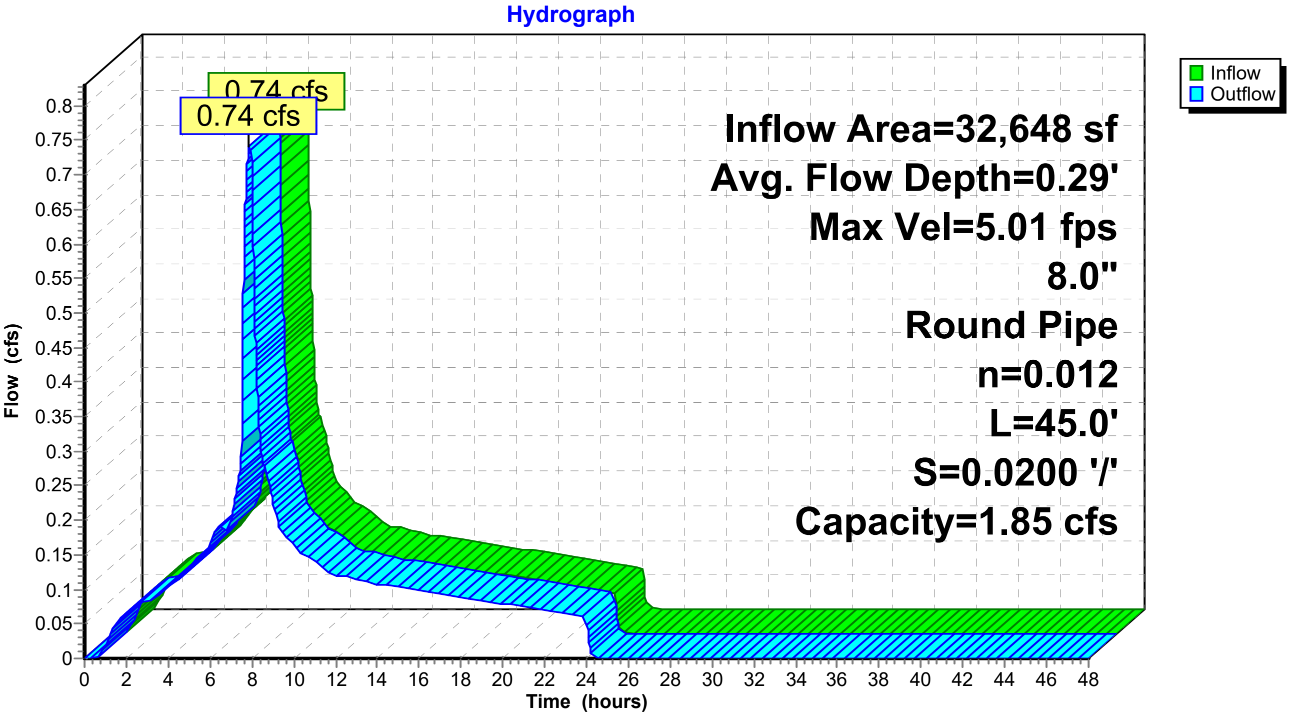
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.01 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.84 fps, Avg. Travel Time= 0.3 min

Peak Storage= 7 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.29'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.85 cfs

8.0" Round Pipe
n= 0.012
Length= 45.0' Slope= 0.0200 '/'
Inlet Invert= 196.86', Outlet Invert= 195.96'



Reach 7R: 8" PIPE



Summary for Reach 8R: 12" PIPE

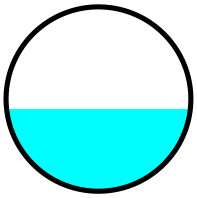
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 7R OUTLET depth by 0.15' @ 7.90 hrs

```
Inflow Area =        49,100 sf,  99.55% Impervious,  Inflow Depth =   3.95"    for  50 YEAR event
Inflow      =       1.11 cfs @    7.88 hrs,  Volume=            16,181 cf
Outflow     =       1.11 cfs @    7.89 hrs,  Volume=            16,181 cf,  Atten= 0%,  Lag= 0.4 min
```

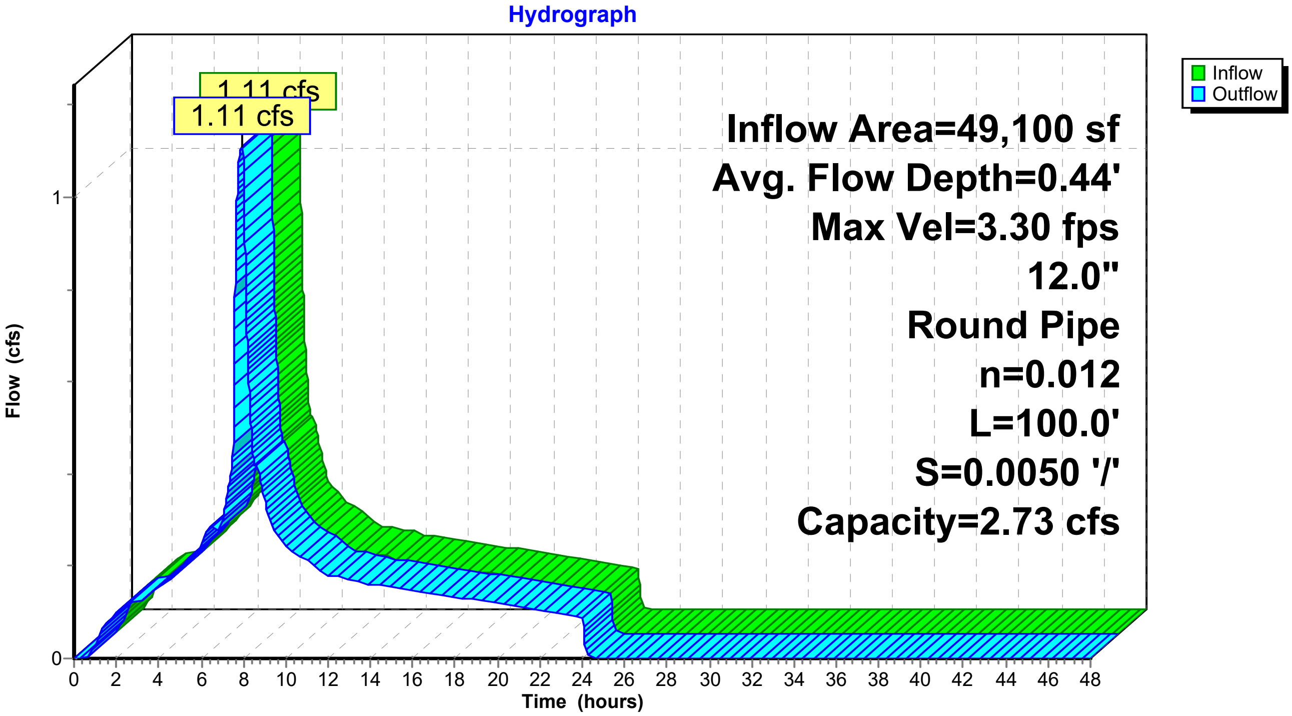
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.30 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.86 fps, Avg. Travel Time= 0.9 min

Peak Storage= 34 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.44'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.73 cfs

12.0" Round Pipe
n= 0.012
Length= 100.0' Slope= 0.0050 '/'
Inlet Invert= 195.96', Outlet Invert= 195.46'



Reach 8R: 12" PIPE



Summary for Reach 9R: 12" PIPE

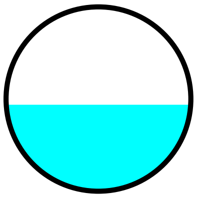
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 11R OUTLET depth by 0.01' @ 7.90 hrs

```
Inflow Area =         77,784 sf,  96.02% Impervious,  Inflow Depth =   3.88"    for  50 YEAR event
Inflow      =        1.72 cfs @    7.89 hrs,  Volume=           25,126 cf
Outflow     =        1.72 cfs @    7.89 hrs,  Volume=           25,126 cf,  Atten= 0%,  Lag= 0.1 min
```

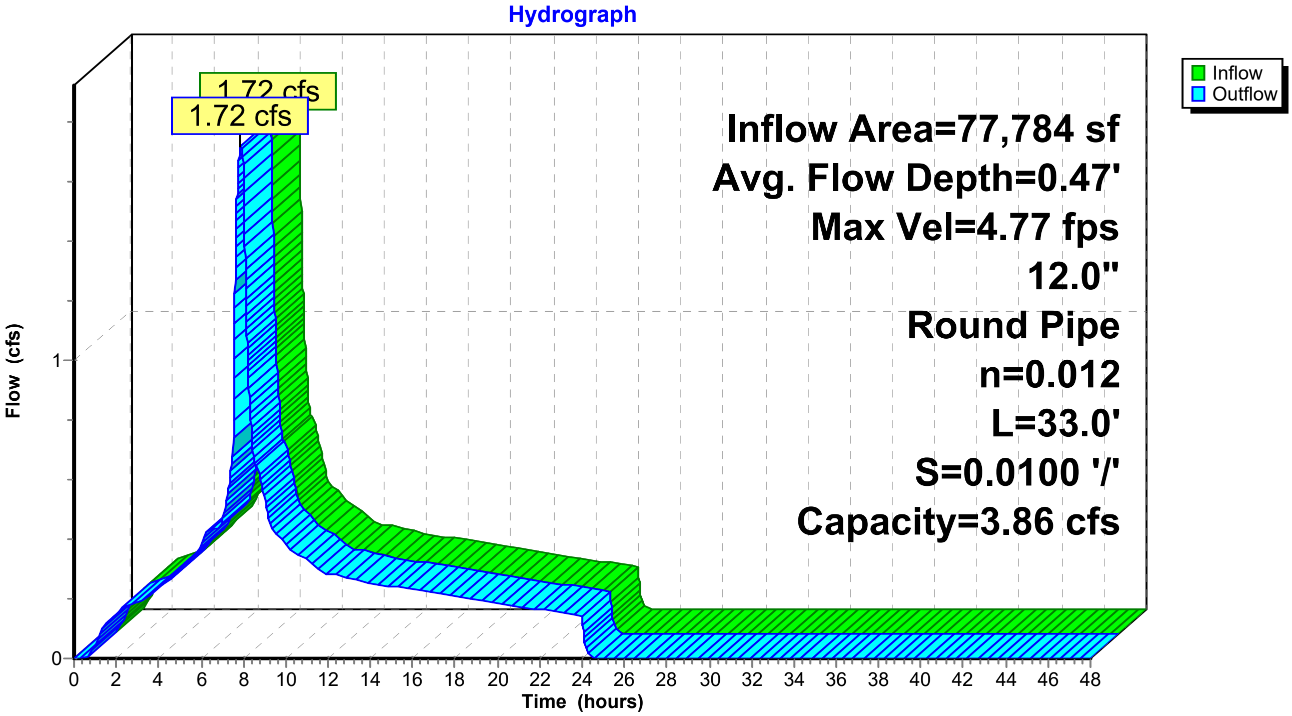
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.77 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.70 fps, Avg. Travel Time= 0.2 min

Peak Storage= 12 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.86 cfs

12.0" Round Pipe
n= 0.012
Length= 33.0' Slope= 0.0100 '/'
Inlet Invert= 194.33', Outlet Invert= 194.00'



Reach 9R: 12" PIPE



Summary for Reach 10R: 6" PIPE

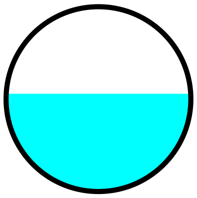
[52] Hint: Inlet/Outlet conditions not evaluated

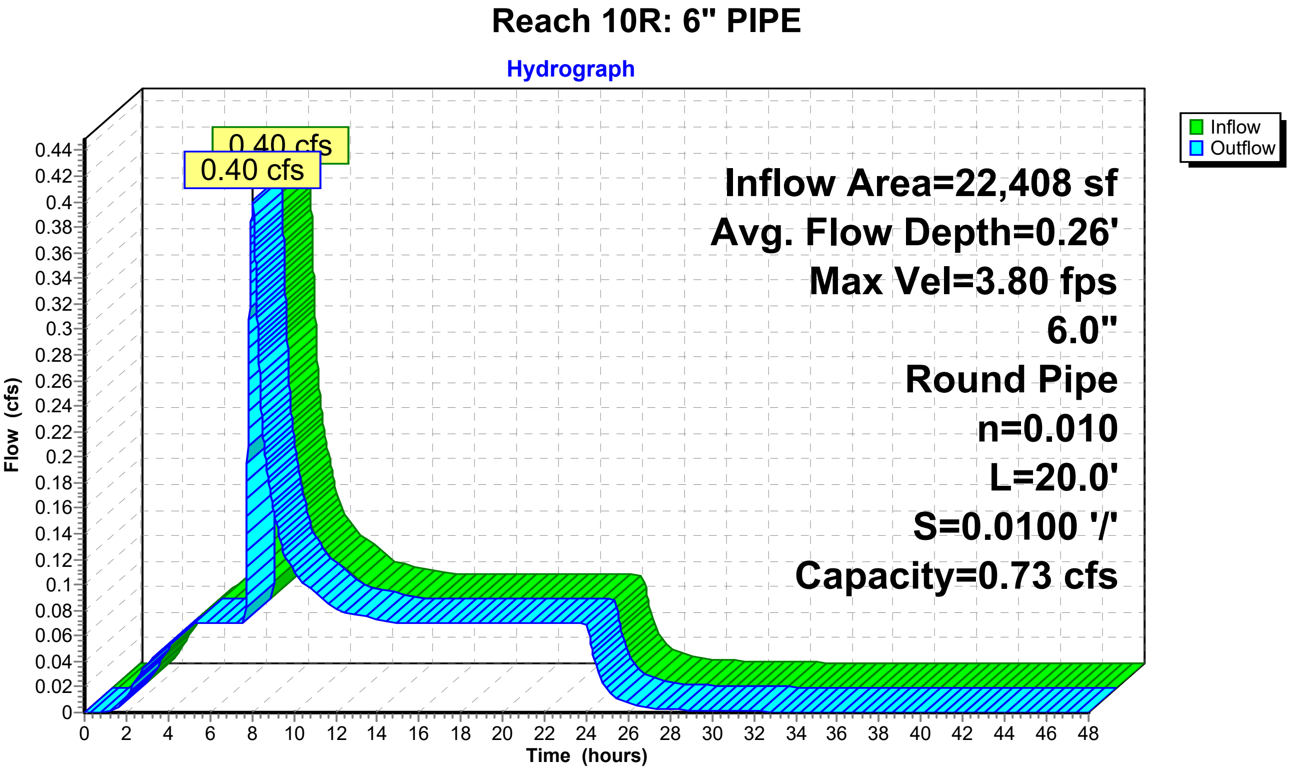
Inflow Area = 22,408 sf, 85.94% Impervious, Inflow Depth > 3.65" for 50 YEAR event
Inflow = 0.40 cfs @ 8.04 hrs, Volume= 6,812 cf
Outflow = 0.40 cfs @ 8.04 hrs, Volume= 6,812 cf, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.80 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.46 fps, Avg. Travel Time= 0.2 min

Peak Storage= 2 cf @ 8.04 hrs
Average Depth at Peak Storage= 0.26'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.73 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 20.0' Slope= 0.0100 '/'
Inlet Invert= 194.20', Outlet Invert= 194.00'





Summary for Reach 11R: 8" PIPE

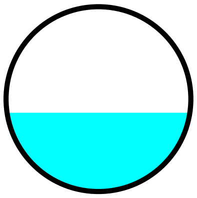
[52] Hint: Inlet/Outlet conditions not evaluated

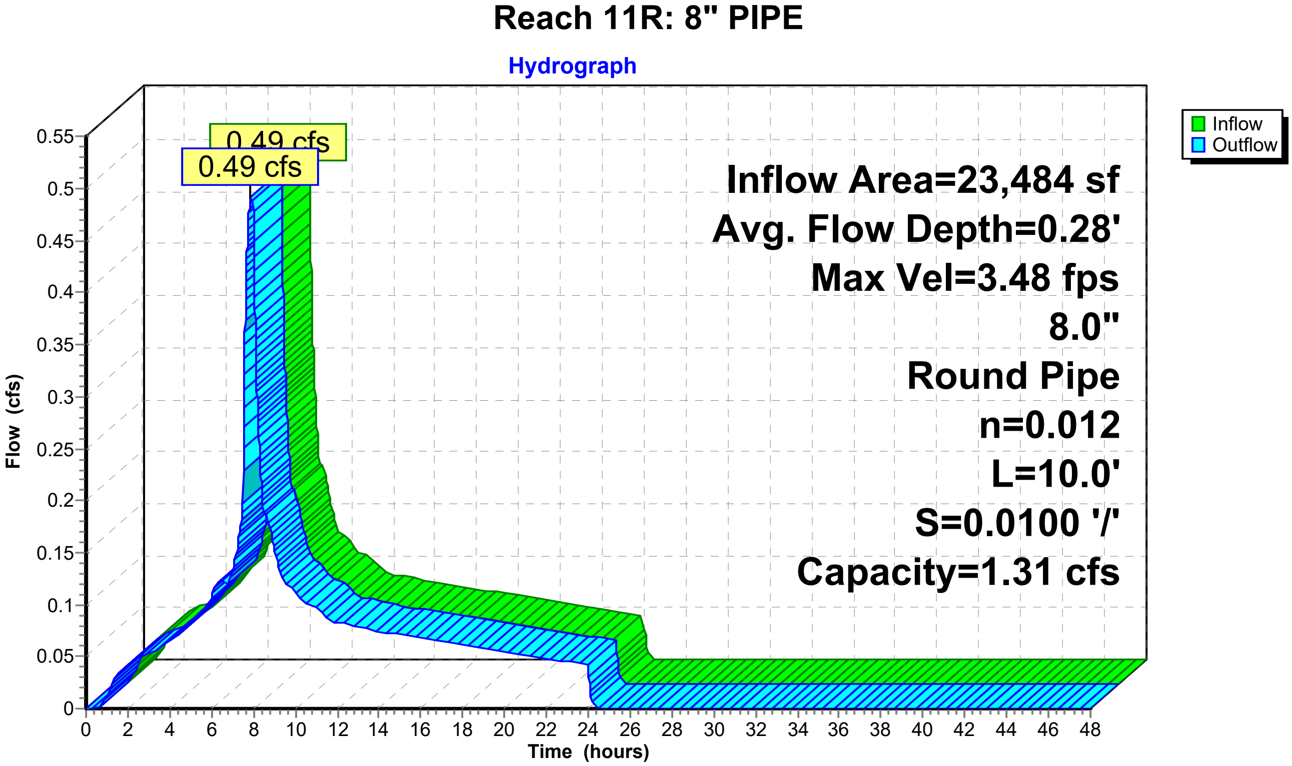
Inflow Area = 23,484 sf, 87.76% Impervious, Inflow Depth = 3.69" for 50 YEAR event
Inflow = 0.49 cfs @ 7.88 hrs, Volume= 7,227 cf
Outflow = 0.49 cfs @ 7.88 hrs, Volume= 7,227 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.48 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.99 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.31 cfs

8.0" Round Pipe
n= 0.012
Length= 10.0' Slope= 0.0100 '/'
Inlet Invert= 194.60', Outlet Invert= 194.50'





Summary for Reach 12R: 6" PIPE

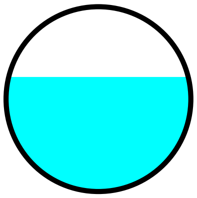
[52] Hint: Inlet/Outlet conditions not evaluated

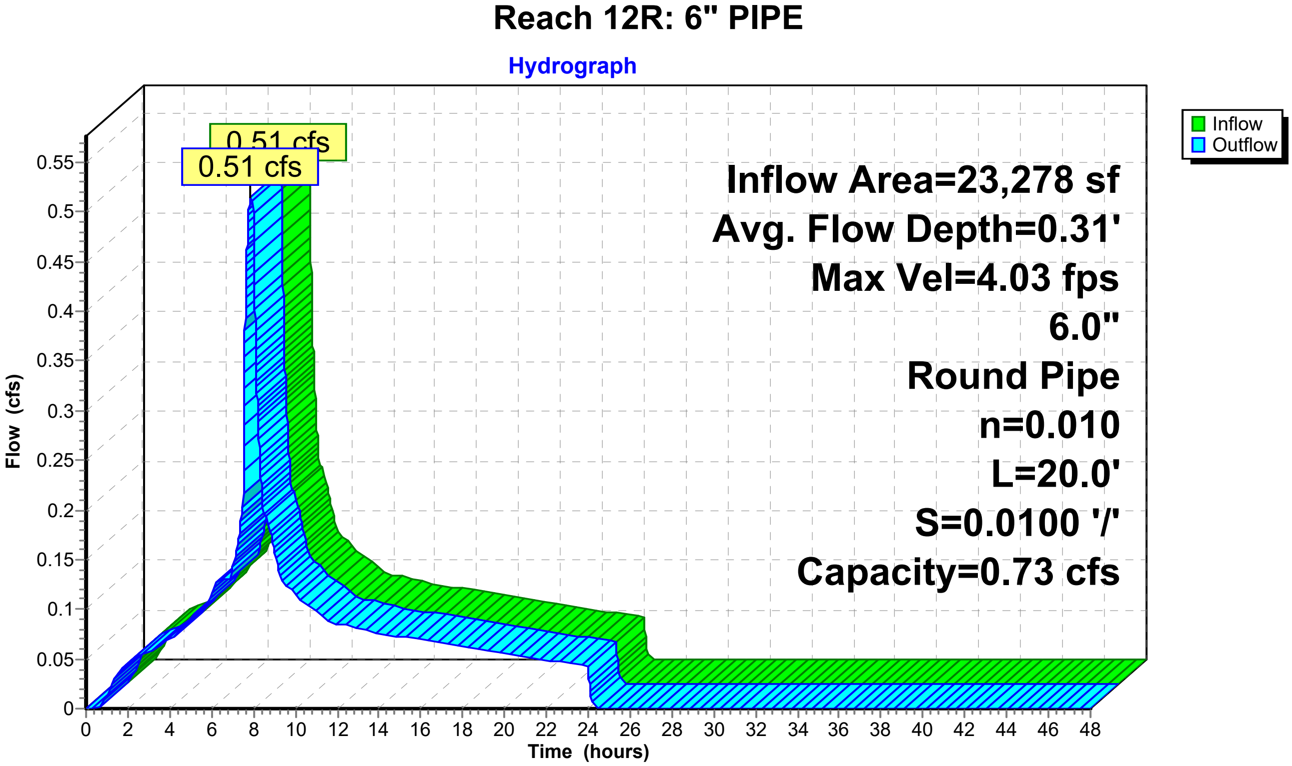
Inflow Area = 23,278 sf, 95.87% Impervious, Inflow Depth = 3.87" for 50 YEAR event
Inflow = 0.51 cfs @ 7.88 hrs, Volume= 7,513 cf
Outflow = 0.51 cfs @ 7.88 hrs, Volume= 7,513 cf, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.03 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.37 fps, Avg. Travel Time= 0.1 min

Peak Storage= 3 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.73 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 20.0' Slope= 0.0100 '/'
Inlet Invert= 194.20', Outlet Invert= 194.00'





Summary for Pond 5P: PLANTER

```
Inflow Area =          22,408 sf,  85.94% Impervious,  Inflow Depth =   3.65"    for  50 YEAR event
Inflow      =        0.46 cfs @    7.88 hrs,  Volume=            6,821 cf
Outflow     =        0.40 cfs @    8.04 hrs,  Volume=            6,812 cf,  Atten= 14%,  Lag= 9.1 min
Primary     =        0.40 cfs @    8.04 hrs,  Volume=            6,812 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 203.41' @ 8.04 hrs   Surf.Area= 1,500 sf   Storage= 991 cf
Flood Elev= 203.75'   Surf.Area= 1,500 sf   Storage= 1,500 cf

Plug-Flow detention time= 115.6 min calculated for 6,811 cf (100% of inflow)
Center-of-Mass det. time= 114.9 min ( 784.7 - 669.8 )
```

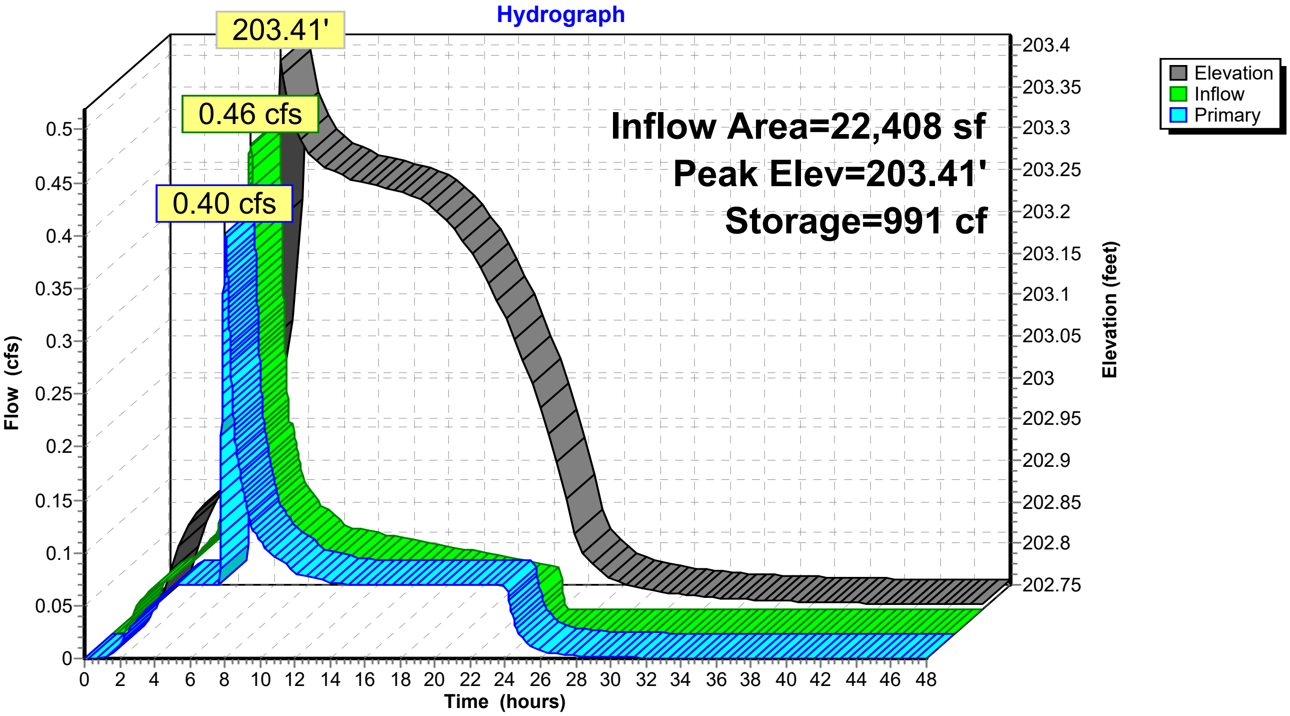
Volume	Invert	Avail.Storage	Storage Description
#1	202.75'	1,500 cf	**Ponding Depth (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
202.75	1,500	0	0
203.75	1,500	1,500	1,500

Device	Routing	Invert	Outlet Devices
#1	Primary	202.75'	**6.0" Round Culvert** L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 202.75' / 202.50' S= 0.0250 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf
#2	Device 1	202.75'	**2.000 in/hr Exfiltration over Surface area**
#3	Device 1	203.25'	**6.0" Horiz. Orifice/Grate** C= 0.610 Limited to weir flow at low heads

```
Primary OutFlow  Max=0.40 cfs @ 8.04 hrs  HW=203.41'  TW=194.46'   (Dynamic Tailwater)
└─1=Culvert  (Passes 0.40 cfs of 0.61 cfs potential flow)
   ├─2=Exfiltration  (Exfiltration Controls 0.07 cfs)
   └─3=Orifice/Grate  (Weir Controls 0.33 cfs @ 1.31 fps)
```

Pond 5P: PLANTER



Summary for Pond DC: CHAMBERS

Inflow Area = 160,101 sf, 91.52% Impervious, Inflow Depth = 3.78" for 50 YEAR event
Inflow = 3.28 cfs @ 7.96 hrs, Volume= 50,376 cf
Outflow = 3.28 cfs @ 7.97 hrs, Volume= 50,374 cf, Atten= 0%, Lag= 0.5 min
Primary = 3.28 cfs @ 7.97 hrs, Volume= 50,374 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 193.90' @ 7.97 hrs Surf.Area= 989 sf Storage= 3,540 cf
Flood Elev= 195.00' Surf.Area= 989 sf Storage= 3,901 cf

Plug-Flow detention time= 46.0 min calculated for 50,374 cf (100% of inflow)
Center-of-Mass det. time= 45.9 min (731.2 - 685.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	188.00'	1,487 cf	**10.33'W x 95.67'L x 7.00'H Field A** 6,920 cf Overall - 2,414 cf Embedded = 4,506 cf x 33.0% Voids
#2A	189.00'	2,414 cf	**ADS_StormTech MC-4500 +Cap** x 22 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap Cap Storage= +35.7 cf x 2 x 1 rows = 71.4 cf
		3,901 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	188.00'	**18.0" Round Culvert** L= 100.0' Ke= 0.500 Inlet / Outlet Invert= 188.00' / 187.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	188.00'	**3.5" Horiz. 2yr Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	193.60'	**18.0" Horiz. EMERGENCY OVERFLOW** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.28 cfs @ 7.97 hrs HW=193.90' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 3.28 cfs of 18.06 cfs potential flow)
  ├─**2=2yr Orifice** (Orifice Controls 0.78 cfs @ 11.69 fps)
  └─**3=EMERGENCY OVERFLOW** (Weir Controls 2.50 cfs @ 1.78 fps)

Pond DC: CHAMBERS - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-4500 +Cap (ADS StormTech® MC-4500 with cap volume)
Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf
Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap
Cap Storage= +35.7 cf x 2 x 1 rows = 71.4 cf

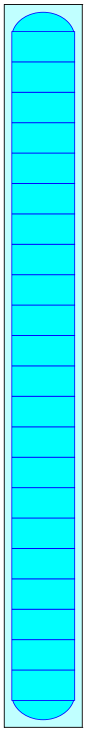
22 Chambers/Row x 4.02' Long +2.56' Cap Length x 2 = 93.67' Row Length +12.0" End Stone x 2 = 95.67' Base Length
1 Rows x 100.0" Wide + 12.0" Side Stone x 2 = 10.33' Base Width
12.0" Base + 60.0" Chamber Height + 12.0" Cover = 7.00' Field Height

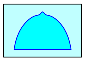
22 Chambers x 106.5 cf + 35.7 cf Cap Volume x 2 x 1 Rows = 2,414.2 cf Chamber Storage

6,919.9 cf Field - 2,414.2 cf Chambers = 4,505.7 cf Stone x 33.0% Voids = 1,486.9 cf Stone Storage

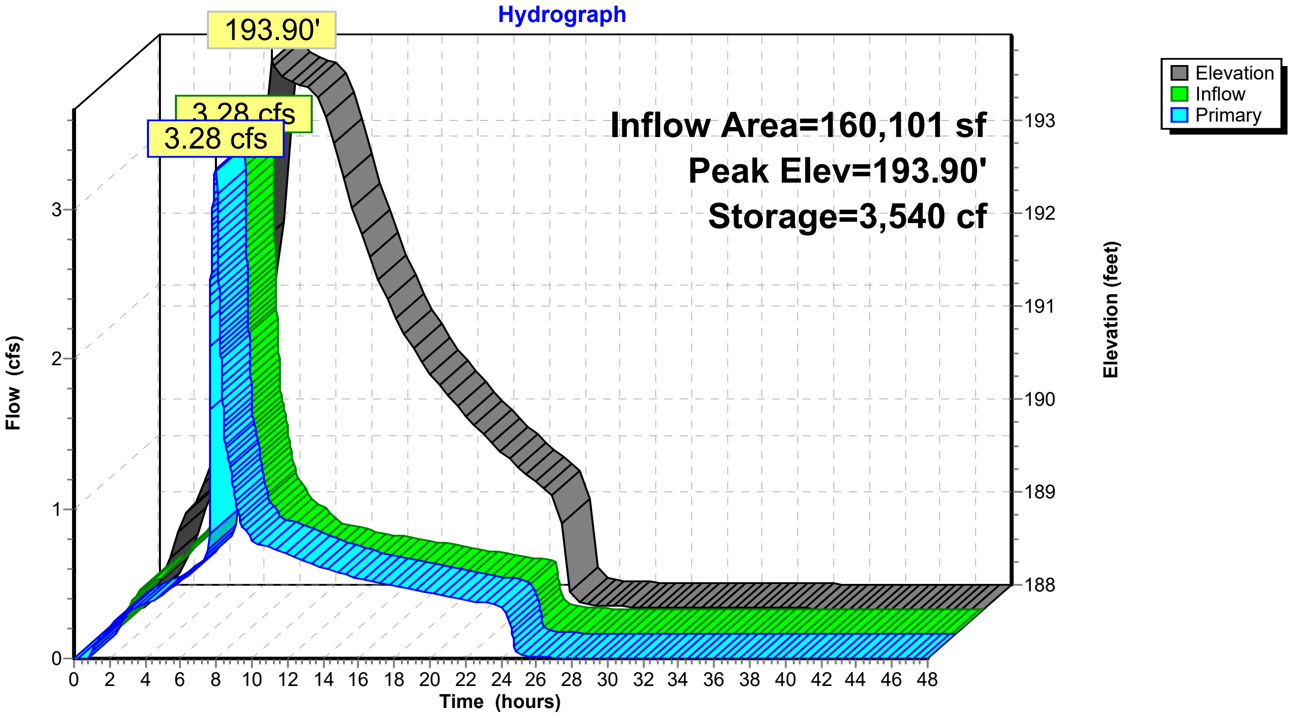
Chamber Storage + Stone Storage = 3,901.1 cf = 0.090 af
Overall Storage Efficiency = 56.4%
Overall System Size = 95.67' x 10.33' x 7.00'

22 Chambers
256.3 cy Field
166.9 cy Stone





Pond DC: CHAMBERS

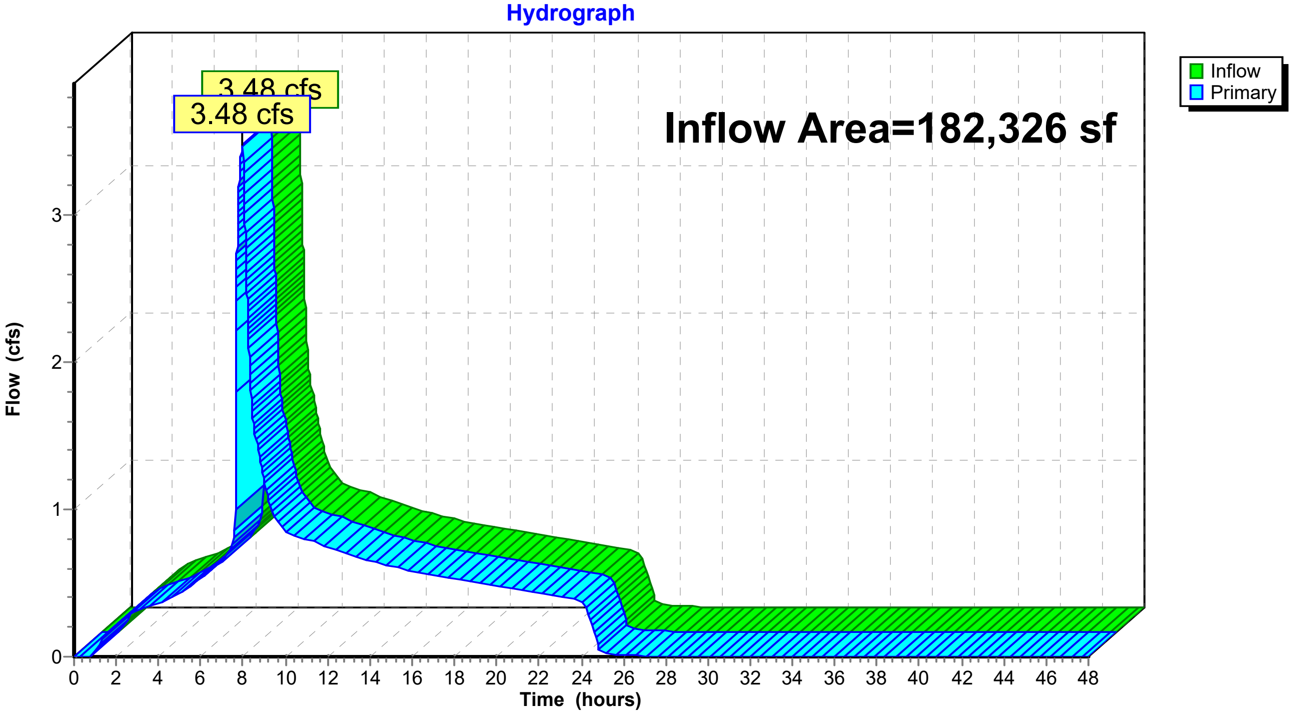


Summary for Link 11L: Peak Post- Development Flows

Inflow Area = 182,326 sf, 80.73% Impervious, Inflow Depth = 3.54" for 50 YEAR event
Inflow = 3.48 cfs @ 7.97 hrs, Volume= 53,729 cf
Primary = 3.48 cfs @ 7.97 hrs, Volume= 53,729 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 11L: Peak Post- Development Flows



Appendix B:
USDA/NRCS Soil Resource Report

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

Yamhill County, Oregon

January 31, 2019

Preface

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

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

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

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

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

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

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

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.

Soil Map

Map Scale: 1:1,330 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N 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
- ʌ 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
- ø 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: Yamhill County, Oregon
Survey Area Data: Version 6, Sep 18, 2018

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

Date(s) aerial images were photographed: Aug 19, 2015—Sep 13, 2016

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
2301A	Amity silt loam, 0 to 3 percent slopes	2.1	46.7%
2310A	Woodburn silt loam, 0 to 3 percent slopes	2.4	53.3%
Totals for Area of Interest		**4.5**	**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.

Yamhill County, Oregon

2301A—Amity silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 1j8b1
Elevation: 150 to 400 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Amity and similar soils: 96 percent
Minor components: 4 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Amity

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear, concave
Parent material: Silty glaciolacustrine deposits

Typical profile

Ap - 0 to 7 inches: silt loam
A - 7 to 16 inches: silt loam
E - 16 to 22 inches: silt loam
Bt1 - 22 to 28 inches: silty clay loam
Bt2 - 28 to 35 inches: silty clay loam
C - 35 to 72 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 16 to 22 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very high (about 12.2 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Forage suitability group: Somewhat Poorly Drained (G002XY005OR)
Hydric soil rating: No

Minor Components

Dayton

Percent of map unit: 3 percent

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Willamette

Percent of map unit: 1 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

2310A—Woodburn silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 1j8b4
Elevation: 100 to 290 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Woodburn and similar soils: 93 percent
Minor components: 7 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodburn

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Silty glaciolacustrine deposits

Typical profile

Ap - 0 to 9 inches: silt loam
A - 9 to 17 inches: silt loam
2Bt1 - 17 to 25 inches: silty clay loam
2Bt2 - 25 to 32 inches: silty clay loam
2BCt1 - 32 to 39 inches: silt loam
2BCt2 - 39 to 54 inches: silt loam
2C1 - 54 to 68 inches: silt loam
2C2 - 68 to 80 inches: stratified fine sandy loam to silt loam
3C3 - 80 to 92 inches: stratified fine sandy loam to silt loam

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well 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 25 to 32 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very high (about 12.2 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: C
Forage suitability group: Moderately Well Drained < 15% Slopes (G002XY004OR)
Hydric soil rating: No

Minor Components

Amity

Percent of map unit: 5 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear, concave
Hydric soil rating: No

Dayton

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

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

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

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

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

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

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Percentage of rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

References:

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

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

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Engineering Properties–Yamhill County, Oregon

Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
2301A—Amity silt loam, 0 to 3 percent slopes														
Amity	96	C/D	0-7	Silt loam	ML, CL	A-4, A-6	0- 0- 0	0- 0- 0	95-99-100	95-98-100	95-96-100	85-93-100	30-36-40	5-11-15
			7-16	Silt loam	ML, CL	A-6, A-4	0- 0- 0	0- 0- 0	95-99-100	95-98-100	95-96-100	85-93-100	30-36-40	5-11-15
			16-22	Silt loam, silty clay loam	CL, ML	A-6, A-4	0- 0- 0	0- 0- 0	95-100-100	95-98-100	95-96-100	85-93-100	30-36-40	10-12-15
			22-28	Silty clay loam	CL	A-6, A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-99-100	90-97-100	30-39-45	10-16-20
			28-35	Silty clay loam	CL	A-7, A-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-99-100	90-97-100	35-45-45	10-20-25
			35-72	Silt loam, silty clay loam	CL	A-6, A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-99-100	90-97-100	30-36-45	10-14-20

Engineering Properties–Yamhill County, Oregon

Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
2310A—Woodburn silt loam, 0 to 3 percent slopes														
Woodburn	93	C	0-9	Silt loam	ML, CL	A-4, A-6	0- 0- 0	0- 0- 0	95-99-100	95-98-100	95-97-100	85-94-100	30-36-40	5-11-15
			9-17	Silt loam	ML, CL	A-6, A-4	0- 0- 0	0- 0- 0	95-99-100	95-98-100	95-97-100	85-94-100	30-36-40	5-11-15
			17-25	Silty clay loam, silt loam	CL	A-6, A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-99-100	90-97-100	30-38-45	10-15-20
			25-32	Silty clay loam, silt loam	CL	A-6, A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-99-100	90-97-100	30-38-45	10-15-20
			32-39	Silt loam, silty clay loam	CL	A-7, A-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-99-100	90-97-100	30-36-45	10-14-20
			39-54	Silt loam, silty clay loam	CL	A-7, A-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-99-100	90-97-100	30-36-45	10-14-20
			54-68	Silty clay loam, silt loam	CL-ML, CL	A-6, A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	80-90-100	25-35-40	5-11-15
			68-80	Stratified fine sandy loam to silt loam	ML, SM	A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	70-92-100	40-60-90	20-28-35	NP-5-10
			80-92	Stratified fine sandy loam to silt loam	ML, SM	A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	70-92-100	40-51-90	20-28-35	NP-5-10

Appendix C:
TR55 RUNOFF CURVE NUMBERS

Table 2-2a Runoff curve numbers for urban areas [1]

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area [2]	A	B	C	D
Open space (lawns, parks, golf courses, cemeteries, etc.) [3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Newly graded areas (pervious areas only, no vegetation) [5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

---

[1] Average runoff condition, and $I_a = 0.2S$.

[2] The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

[3] CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

[4] Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

[5] Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2b Runoff curve numbers for cultivated agricultural lands [1]

Cover description			Curve numbers for hydrologic soil group			
Cover type	Treatment [2]	Hydrologic condition [3]	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T+ CR	Poor	65	73	79	81
		Good	61	70	77	80
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T+ CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

[1] Average runoff condition, and I_a=0.2S

[2] Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.

[3] Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

Table 2-2c Runoff curve numbers for other agricultural lands [1]

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition	A	B	C	D
Pasture, grassland, or range—continuous forage for grazing. [2]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element. [3]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30 [4]	48	65	73
Woods—grass combination (orchard or tree farm). [5]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods. [6]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30 [4]	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

[1] Average runoff condition, and $I_a = 0.2S$.

[2] <50%) ground cover or heavily grazed with no mulch.
50 to 75% ground cover and not heavily grazed.
> 75% ground cover and lightly or only occasionally grazed.

[3] : <50% ground cover.
50 to 75% ground cover.
>75% ground cover.

[4] Actual curve number is less than 30; use CN = 30 for runoff computations.

[5] CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.

[6] Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Woods are grazed but not burned, and some forest litter covers the soil.
Woods are protected from grazing, and litter and brush adequately cover the soil.

TABLE 3.5.2B SCS WESTERN WASHINGTON RUNOFF CURVE NUMBERS

SCS WESTERN WASHINGTON RUNOFF CURVE NUMBERS (Published by SCS in 1982)

Runoff curve numbers for selected agricultural, suburban and urban land use for Type 1A rainfall distribution, 24-hour storm duration.

LAND USE DESCRIPTION		CURVE NUMBERS BY HYDROLOGIC SOIL GROUP			
		A	B	C	D
Cultivated land(1):	winter condition	86	91	94	95
Mountain open areas:	low growing brush and grasslands	74	82	89	92
Meadow or pasture:		65	78	85	89
Wood or forest land:	undisturbed or older second growth	42	64	76	81
Wood or forest land:	young second growth or brush	55	72	81	86
Orchard:	with cover crop	81	88	92	94
Open spaces, lawns, parks, golf courses, cemeteries, landscaping,					
good condition:	grass cover on 75% or more of the area	68	80	86	90
fair condition:	grass cover on 50% to 75% of the area	77	85	90	92
Gravel roads and parking lots		76	85	89	91
Dirt roads and parking lots		72	82	87	89
Impervious surfaces, pavement, roofs, etc.		98	98	98	98
Open water bodies:	lakes, wetlands, ponds, etc.	100	100	100	100
Single Family Residential (2)					
Dwelling Unit/Gross Acre	% Impervious (3)				
1.0 DU/GA	15	Separate curve number shall be selected for pervious and impervious portion of the site or basin			
1.5 DU/GA	20				
2.0 DU/GA	25				
2.5 DU/GA	30				
3.0 DU/GA	34				
3.5 DU/GA	38				
4.0 DU/GA	42				
4.5 DU/GA	46				
5.0 DU/GA	48				
5.5 DU/GA	50				
6.0 DU/GA	52				
6.5 DU/GA	54				
7.0 DU/GA	56				
Planned unit developments, condominiums, apartments, commercial business and industrial areas.	% impervious must be computed				

(1) For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Section 4, Hydrology, Chapter 9, August 1972.

(2) Assumes roof and driveway runoff is directed into street/storm system.

(3) The remaining pervious areas (lawn) are considered to be in good condition for these curve numbers.

Appendix D:
Stormwater Quality Facility Sizing

AKS ENGINEERING & FORESTRY, LLC.
12965 SW HERMAN ROAD, SUITE 100
TUALATIN, OR 97062
503-563-6151

Date: 11/13/2020
Designed by: MCC
Checked by: CEG

Crestview Crossing Commercial

StormFilter Manhole Cartridge Sizing

STORMFILTER® DESIGN PARAMETERS

Number of Cartridges Required:

$N=Q_{treat}\,(449_{gpm/cfs} / Q_{cart\ gpm/cart})$

$Q_{cart\ gpm/cart}$ = Treatment per Cartridge = 15 $_{gpm/cart}$ 18 inch Cartridge

StormFilter Sizing

Area Requiring Treatment	76,800 SF	
Water Quality Stormwater event:	1.25 inches falling in 24 hours	
WQF Q (see hydrograph) =	0.460 CFS	
Cartridge Required	$N=Q_{treat}\,(449_{gpm/cfs} / Q_{cart\ gpm/cart})$	$N=Q_{treat}\,(449_{gpm/cfs} / 15\ _{cart\ gpm/cart})$
	N= 13.8 cart	14 CARTRIDGE CATCHBASIN STORMFILTER

AKS ENGINEERING & FORESTRY, LLC.
12965 SW HERMAN ROAD, SUITE 100
TUALATIN, OR 97062
503-563-6151

Date: 11/13/2020
Designed by: MCC
Checked by: CEG

Crestview Crossing Commercial

StormFilter Catch Basin #1 Cartridge Sizing

STORMFILTER® DESIGN PARAMETERS

Number of Cartridges Required:

$N=Q_{treat}\ (449_{gpm/cfs}\ /\ Q_{cart\ gpm/cart})$

$Q_{cart\ gpm/cart}$ = Treatment per Cartridge = 22.5 $_{gpm/cart}$ 27 inch Cartridge

StormFilter Sizing

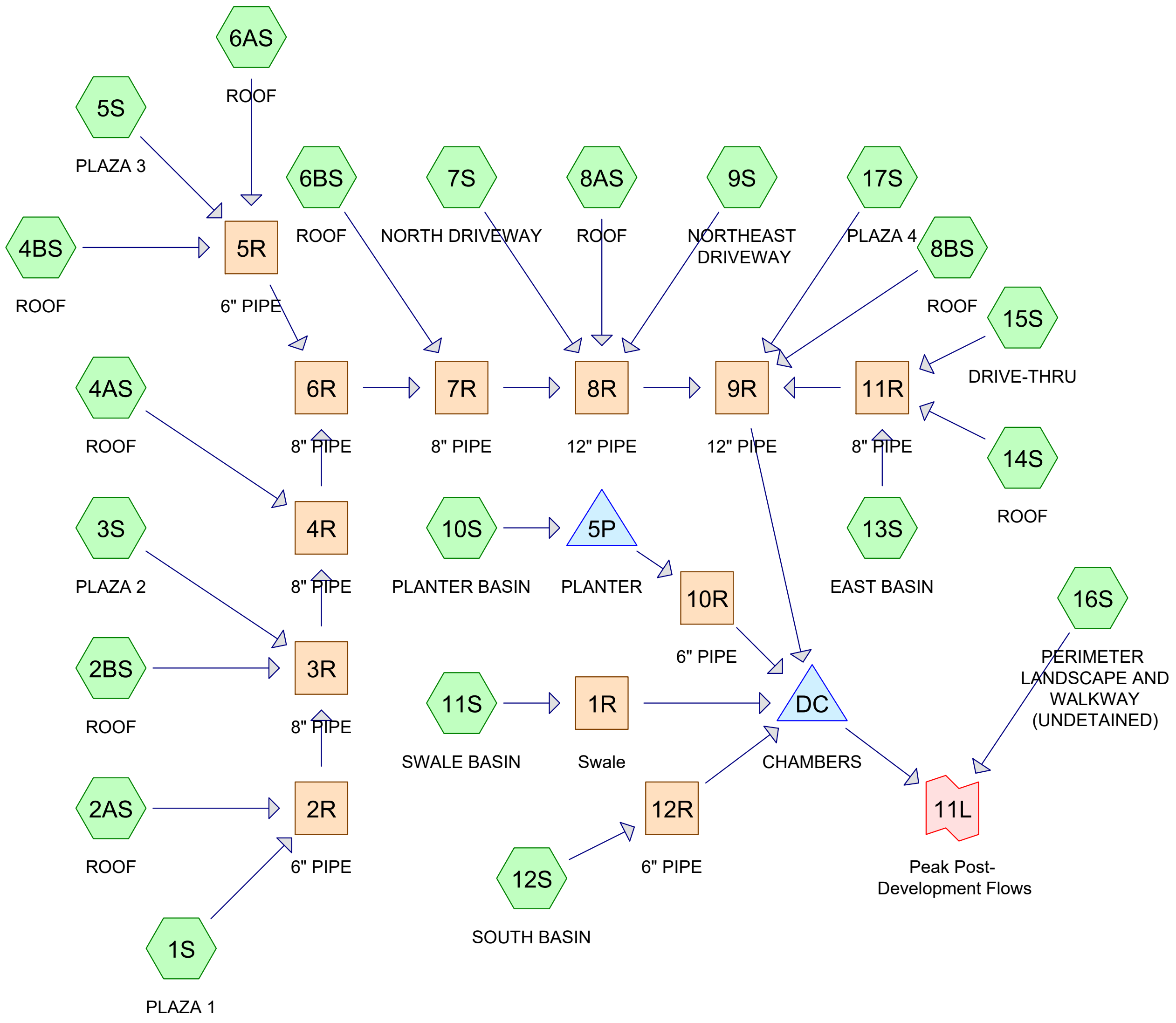
Area Requiring Treatment 23,300 SF

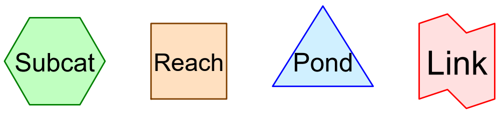
Water Quality Stormwater event 1.25 inches falling in 24 hours

WQF Q (see hydrograph) = 0.140 CFS

Cartridge Required $N=Q_{treat}\ (449_{gpm/cfs}\ /\ Q_{cart\ gpm/cart})$ $N=Q_{treat}\ (449_{gpm/cfs}\ /\ 22.5\ _{cart\ gpm/cart})$

N= 2.8 cart 3 CARTRIDGE CATCHBASIN STORMFILTER





Routing Diagram for 3723 Post Dev copying 3J addendum
Prepared by AKS Engineering & Forestry, Printed 11/23/2020
HydroCAD® 10.00-20 s/n 05096 © 2017 HydroCAD Software Solutions LLC

Summary for Subcatchment 1S: PLAZA 1

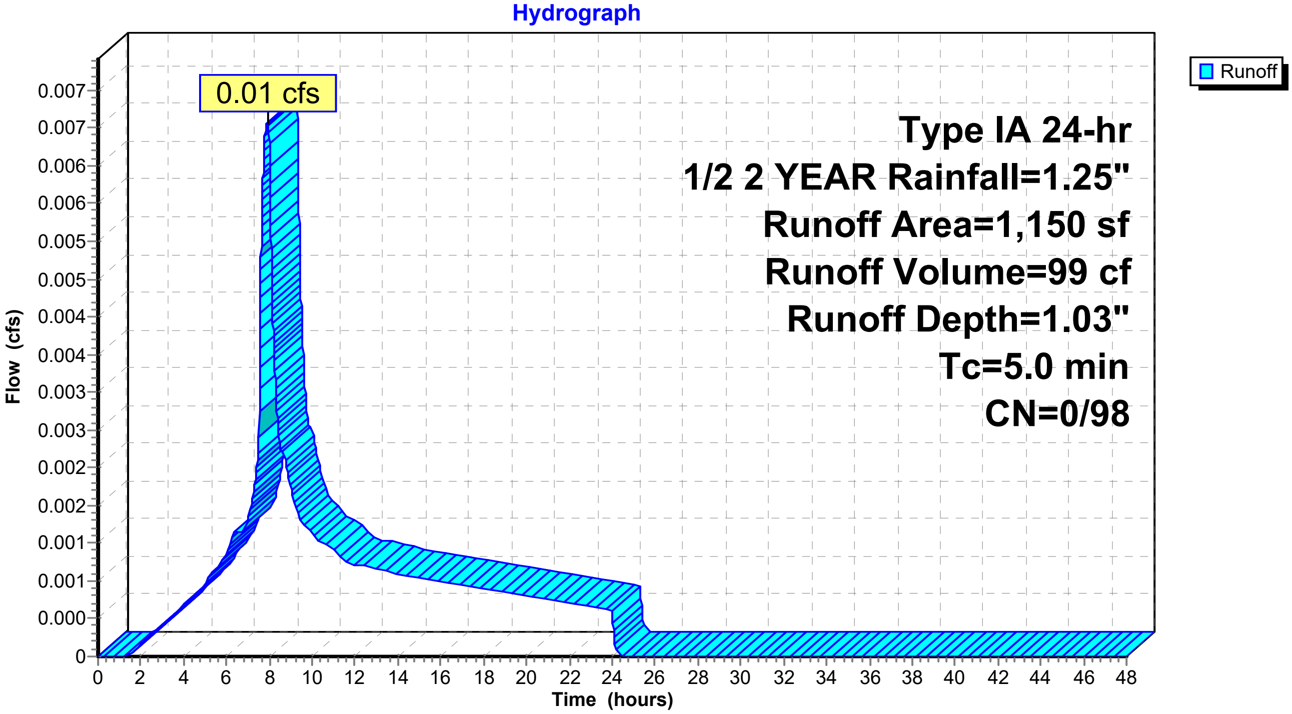
Runoff = 0.01 cfs @ 7.89 hrs, Volume= 99 cf, Depth= 1.03"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

Area (sf)	CN	Description
1,150	98	Paved parking, HSG C
1,150		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: PLAZA 1



Summary for Subcatchment 2AS: ROOF

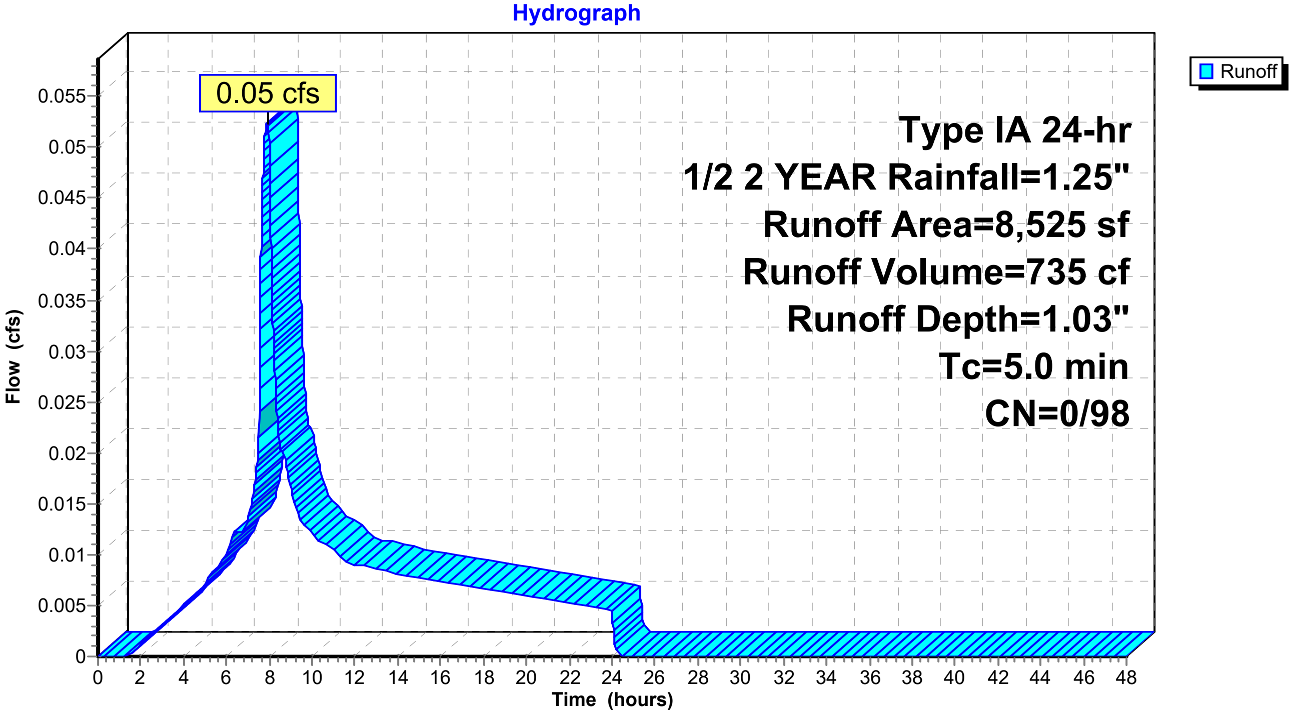
Runoff = 0.05 cfs @ 7.89 hrs, Volume= 735 cf, Depth= 1.03"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

Area (sf)	CN	Description
8,525	98	Roofs, HSG C
8,525		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2AS: ROOF



Summary for Subcatchment 2BS: ROOF

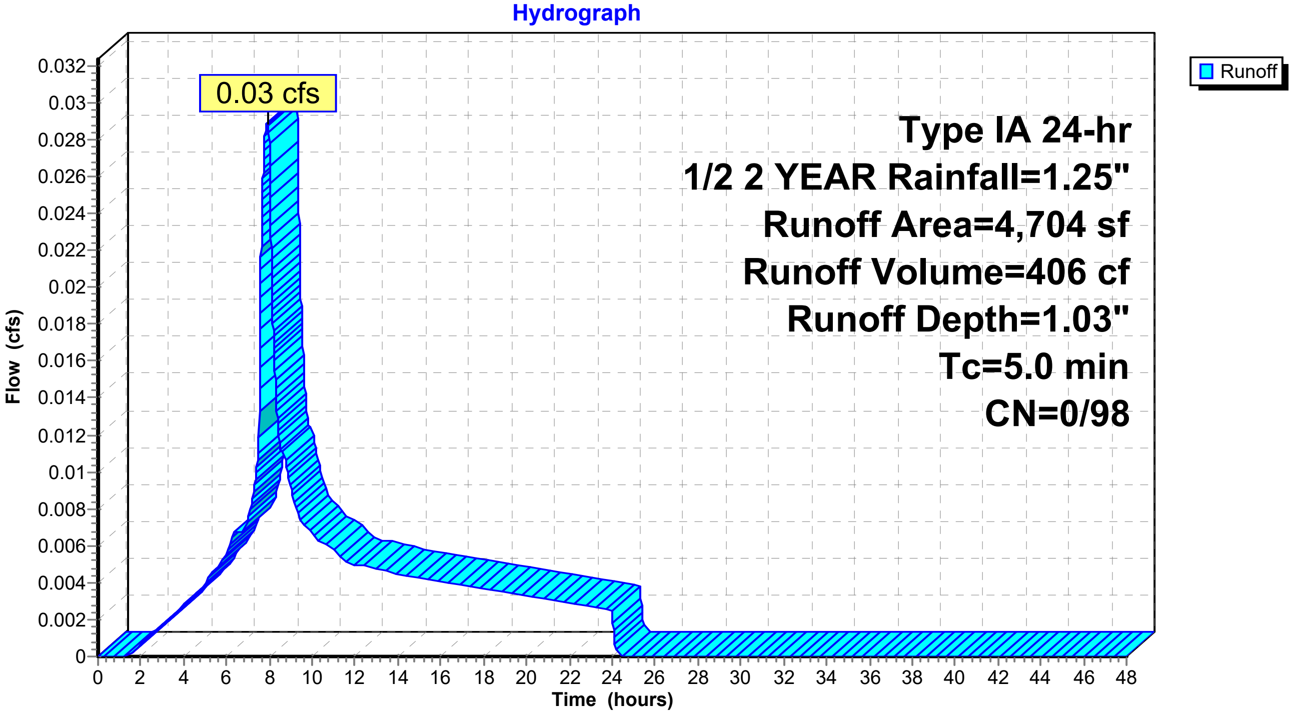
Runoff = 0.03 cfs @ 7.89 hrs, Volume= 406 cf, Depth= 1.03"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

Area (sf)	CN	Description
4,704	98	Roofs, HSG C
4,704		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2BS: ROOF



Summary for Subcatchment 3S: PLAZA 2

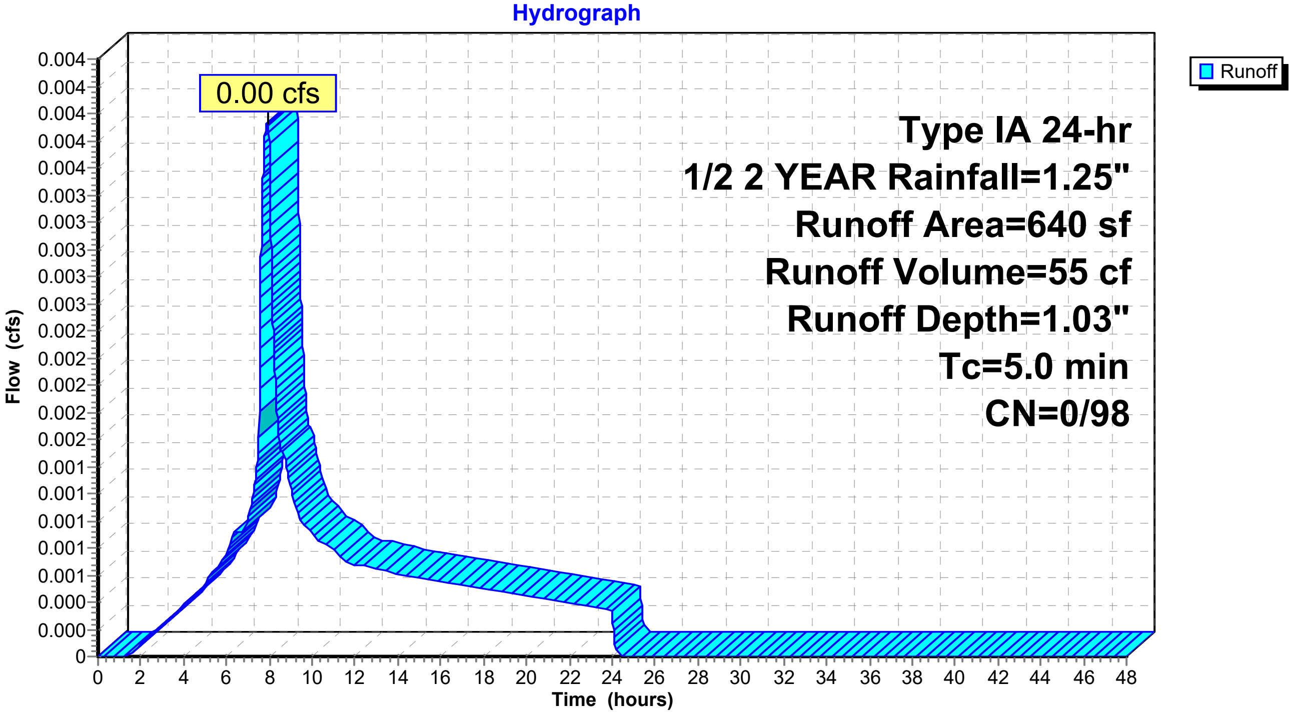
Runoff = 0.00 cfs @ 7.89 hrs, Volume= 55 cf, Depth= 1.03"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

Area (sf)	CN	Description
640	98	Paved parking, HSG C
640		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S: PLAZA 2



Summary for Subcatchment 4AS: ROOF

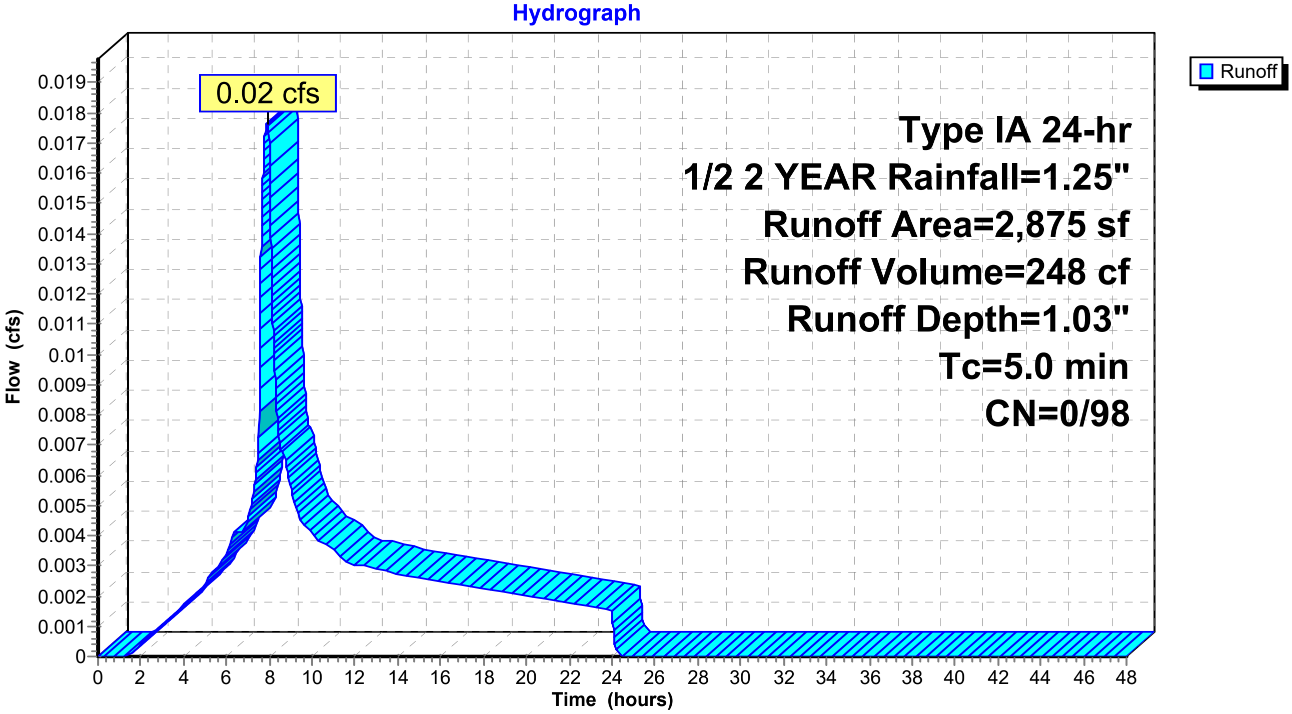
Runoff = 0.02 cfs @ 7.89 hrs, Volume= 248 cf, Depth= 1.03"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

Area (sf)	CN	Description
2,875	98	Roofs, HSG C
2,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4AS: ROOF



Summary for Subcatchment 4BS: ROOF

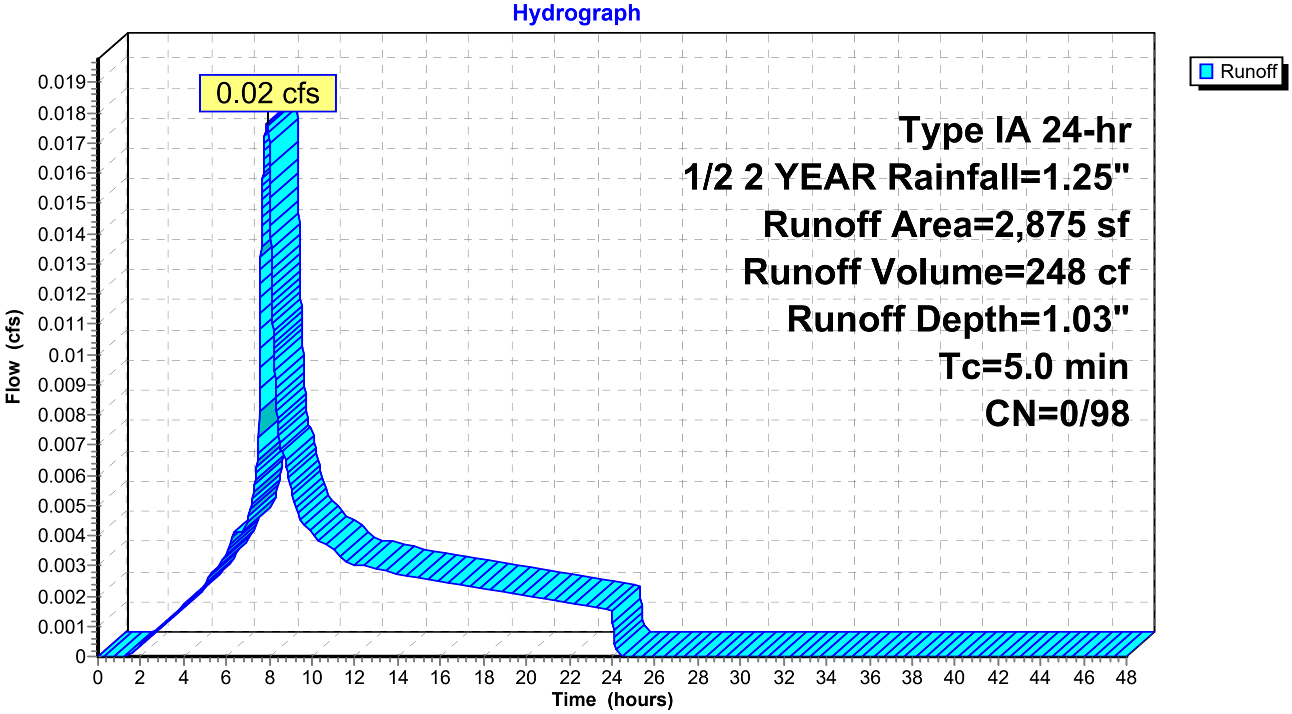
Runoff = 0.02 cfs @ 7.89 hrs, Volume= 248 cf, Depth= 1.03"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

Area (sf)	CN	Description
2,875	98	Roofs, HSG C
2,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4BS: ROOF



Summary for Subcatchment 5S: PLAZA 3

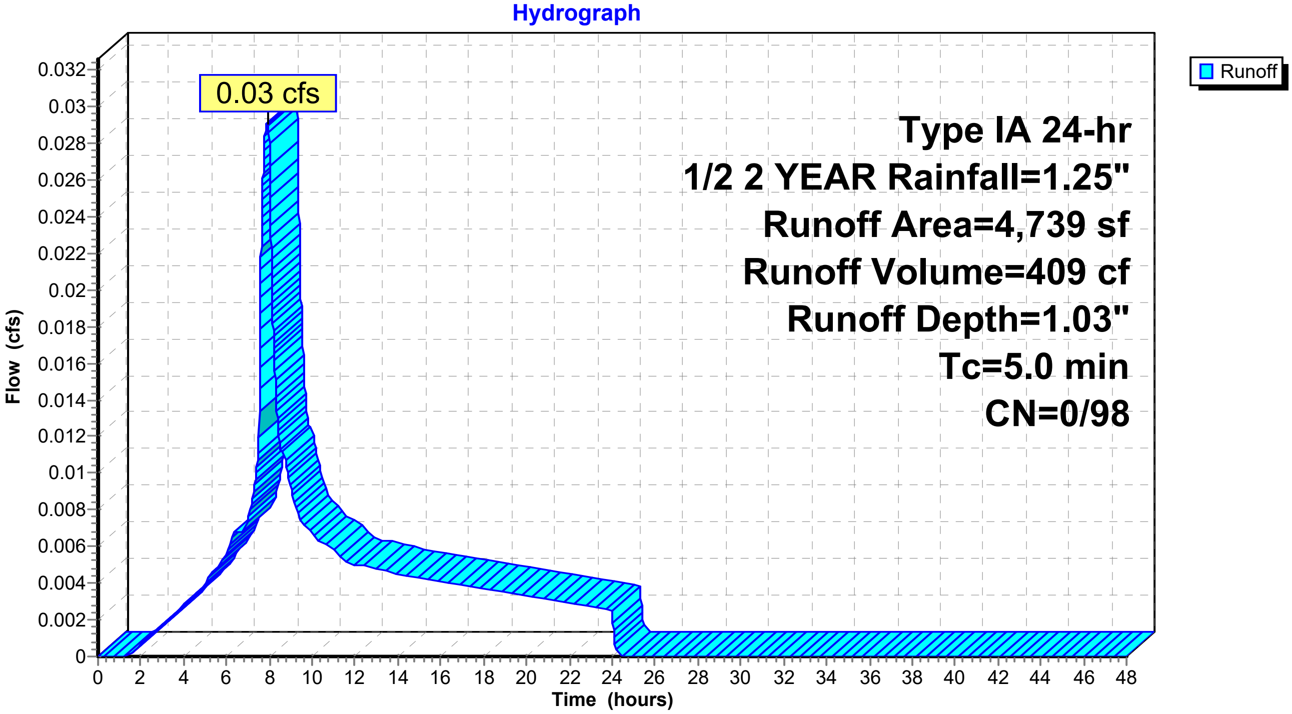
Runoff = 0.03 cfs @ 7.89 hrs, Volume= 409 cf, Depth= 1.03"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

Area (sf)	CN	Description
4,739	98	Paved parking, HSG C
4,739		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5S: PLAZA 3



Summary for Subcatchment 6AS: ROOF

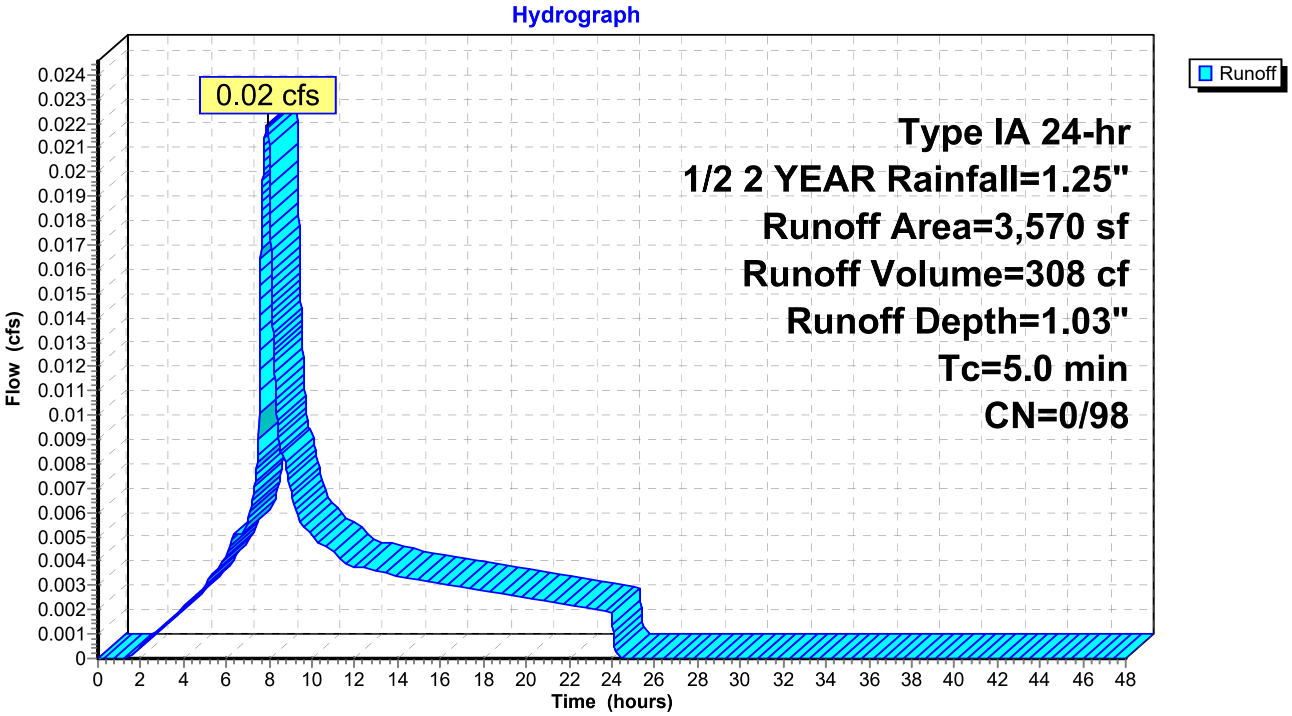
Runoff = 0.02 cfs @ 7.89 hrs, Volume= 308 cf, Depth= 1.03"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

Area (sf)	CN	Description
3,570	98	Roofs, HSG C
3,570		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6AS: ROOF



Summary for Subcatchment 6BS: ROOF

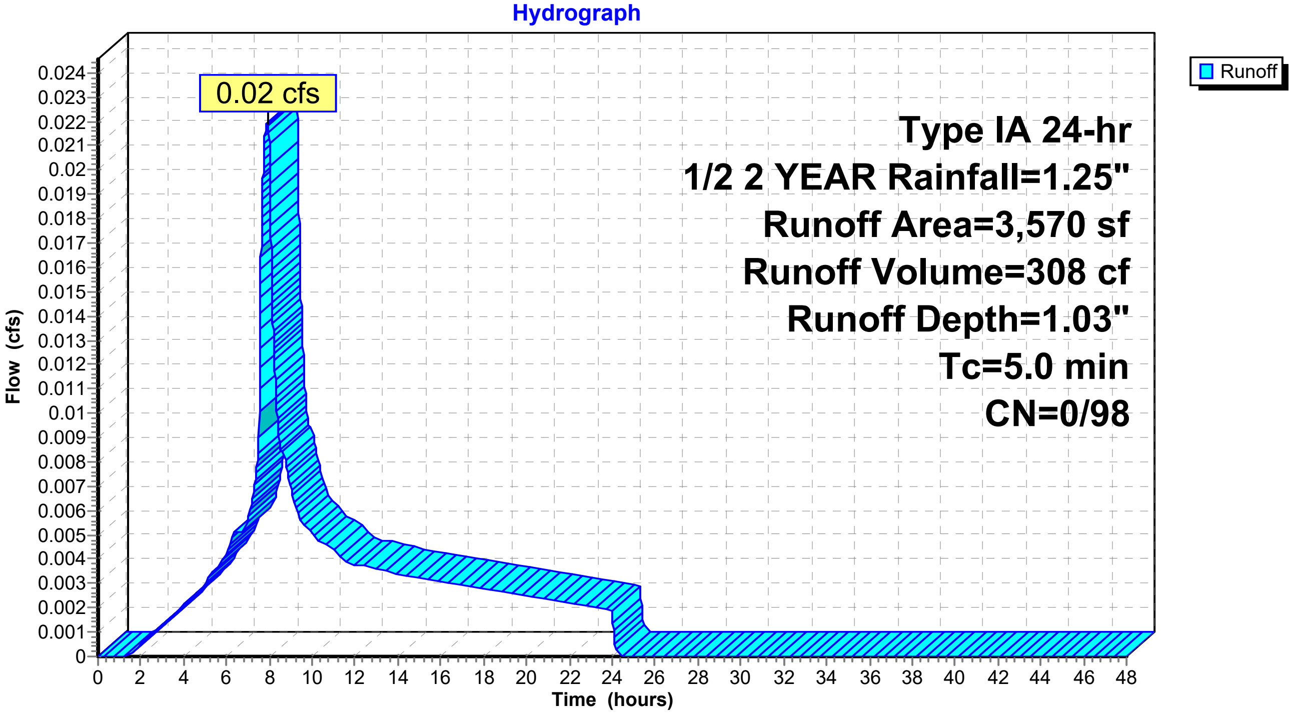
Runoff = 0.02 cfs @ 7.89 hrs, Volume= 308 cf, Depth= 1.03"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

Area (sf)	CN	Description
3,570	98	Roofs, HSG C
3,570		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6BS: ROOF



Summary for Subcatchment 7S: NORTH DRIVEWAY

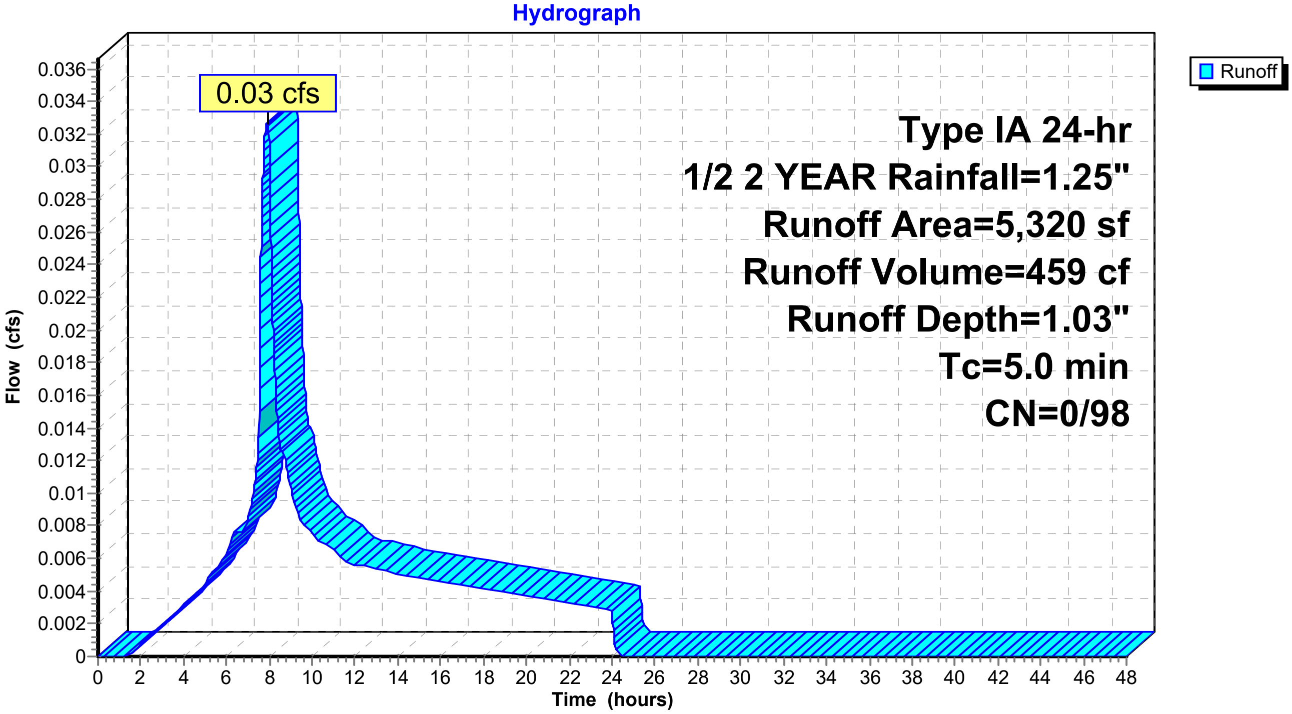
Runoff = 0.03 cfs @ 7.89 hrs, Volume= 459 cf, Depth= 1.03"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

Area (sf)	CN	Description
5,320	98	Paved parking, HSG C
5,320		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 7S: NORTH DRIVEWAY



Summary for Subcatchment 8AS: ROOF

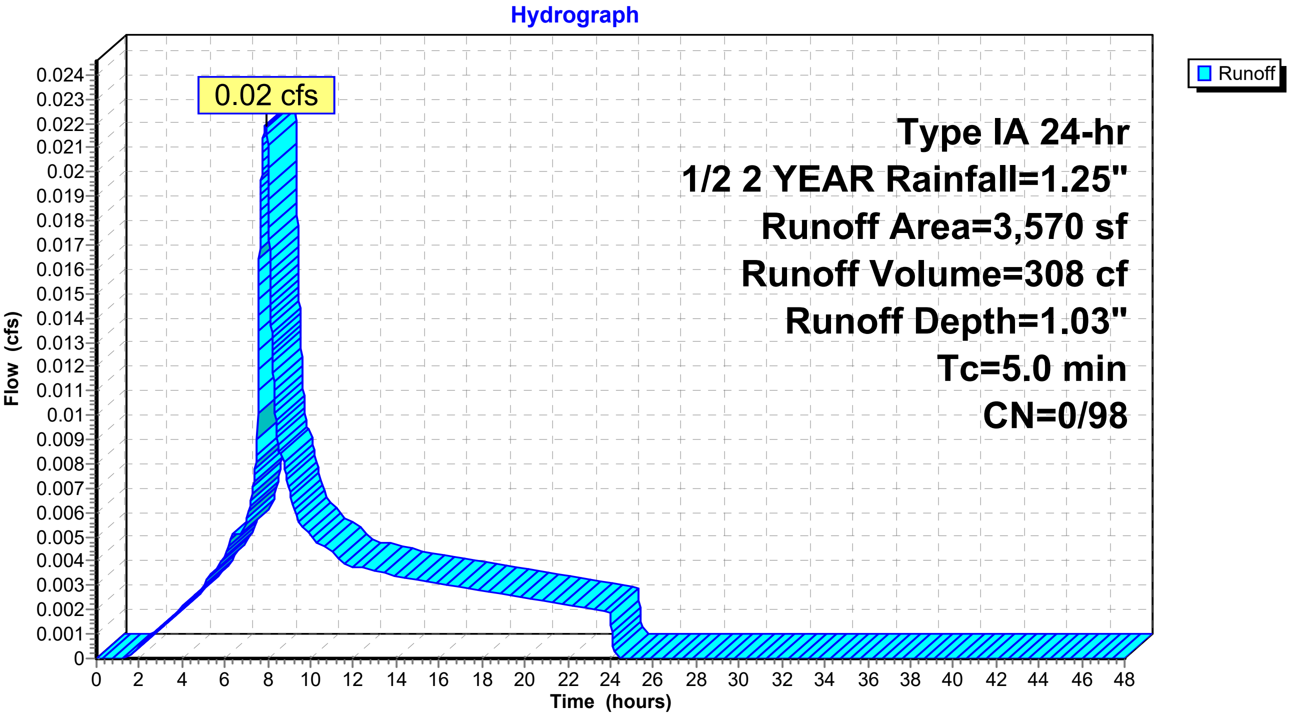
Runoff = 0.02 cfs @ 7.89 hrs, Volume= 308 cf, Depth= 1.03"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

Area (sf)	CN	Description
3,570	98	Roofs, HSG C
3,570		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8AS: ROOF



Summary for Subcatchment 8BS: ROOF

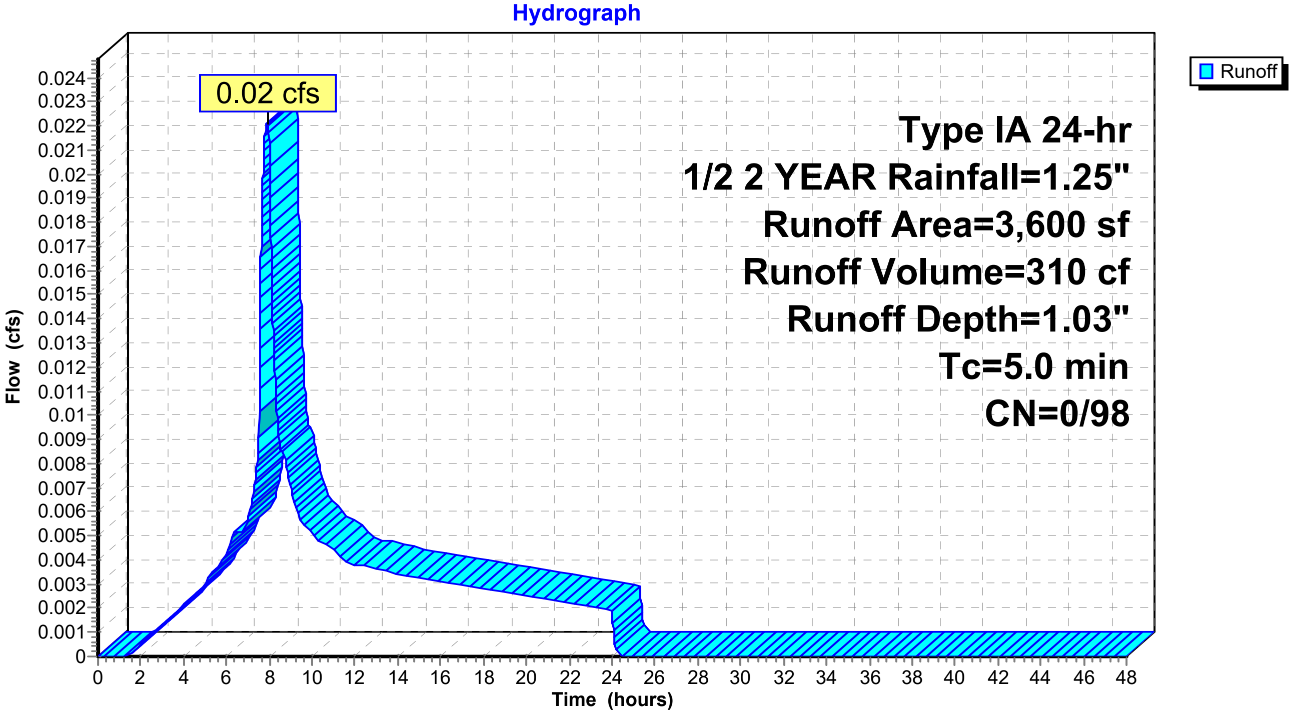
Runoff = 0.02 cfs @ 7.89 hrs, Volume= 310 cf, Depth= 1.03"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

Area (sf)	CN	Description
3,600	98	Roofs, HSG C
3,600		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8BS: ROOF



Summary for Subcatchment 9S: NORTHEAST DRIVEWAY

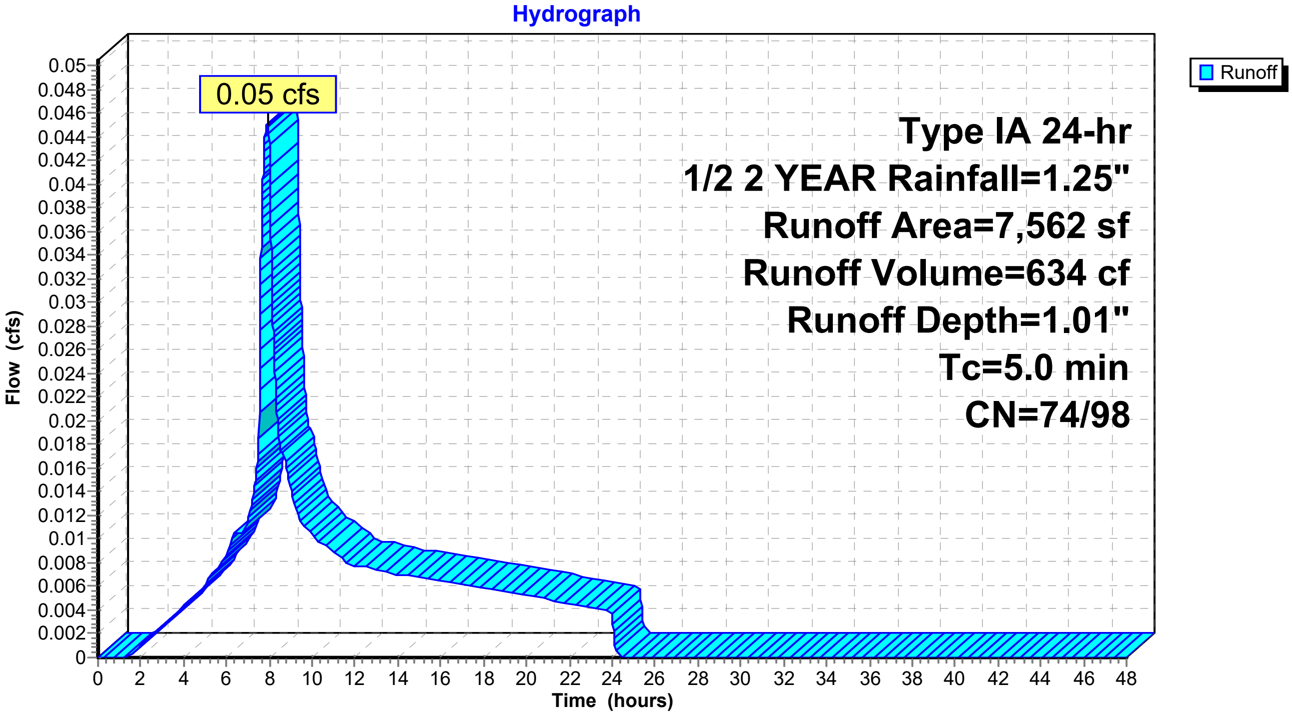
Runoff = 0.05 cfs @ 7.89 hrs, Volume= 634 cf, Depth= 1.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

Area (sf)	CN	Description
7,340	98	Paved parking, HSG C
222	74	>75% Grass cover, Good, HSG C
7,562	97	Weighted Average
222		2.94% Pervious Area
7,340		97.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 9S: NORTHEAST DRIVEWAY



Summary for Subcatchment 10S: PLANTER BASIN

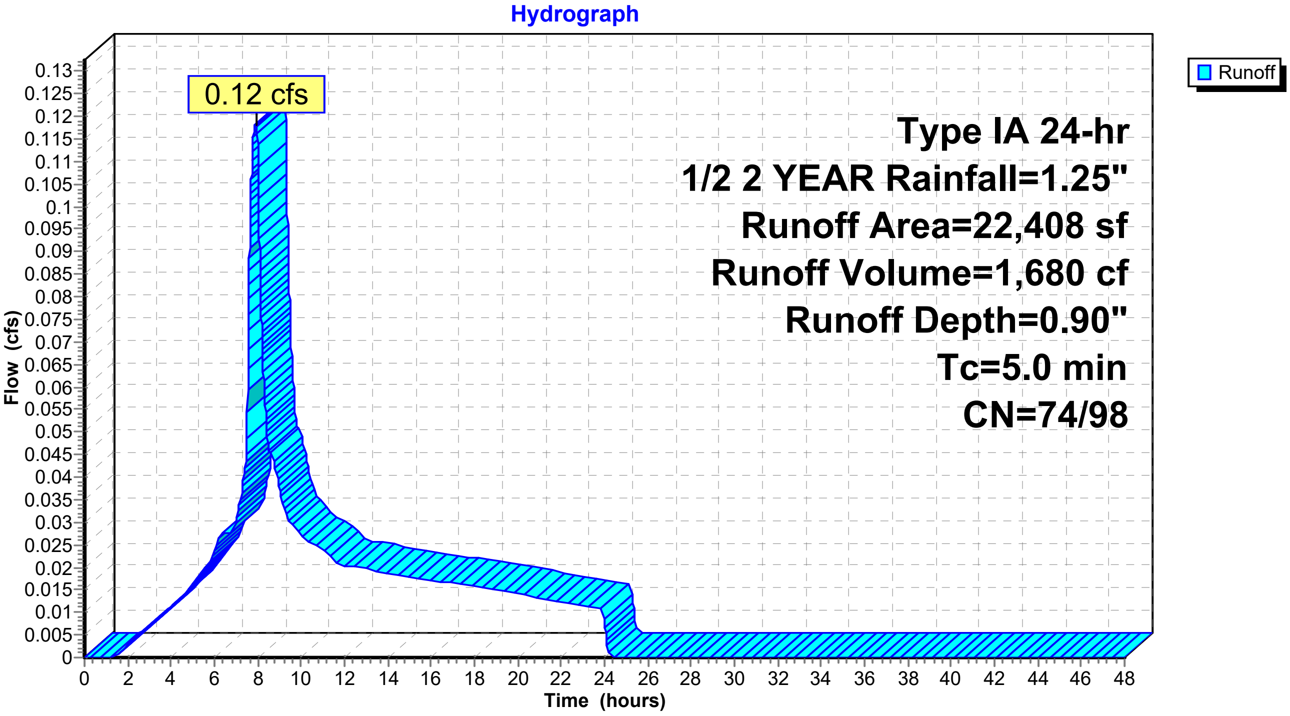
Runoff = 0.12 cfs @ 7.89 hrs, Volume= 1,680 cf, Depth= 0.90"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

	Area (sf)	CN	Description
*	19,258	98	Pavement
	3,150	74	>75% Grass cover, Good, HSG C
	22,408	95	Weighted Average
	3,150		14.06% Pervious Area
	19,258		85.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10S: PLANTER BASIN



Summary for Subcatchment 11S: SWALE BASIN

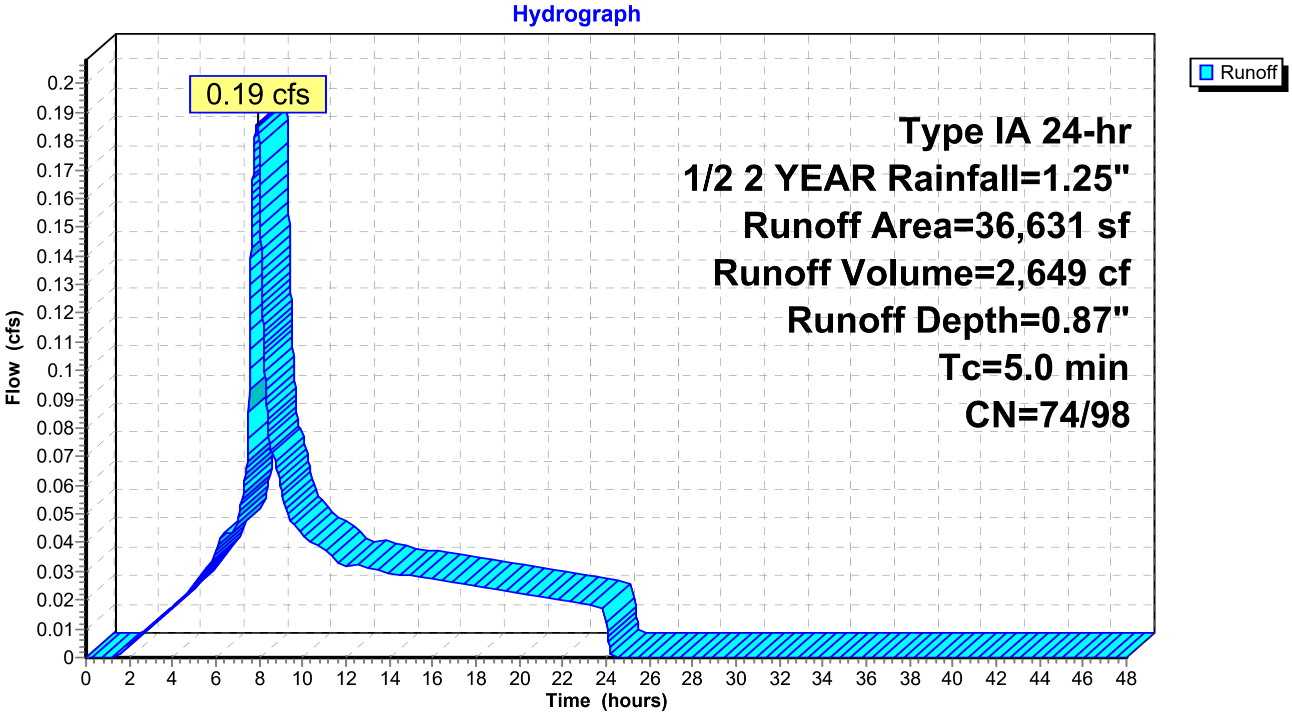
Runoff = 0.19 cfs @ 7.89 hrs, Volume= 2,649 cf, Depth= 0.87"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

	Area (sf)	CN	Description
*	30,268	98	Pavement
	6,363	74	>75% Grass cover, Good, HSG C
	36,631	94	Weighted Average
	6,363		17.37% Pervious Area
	30,268		82.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 11S: SWALE BASIN



Summary for Subcatchment 12S: SOUTH BASIN

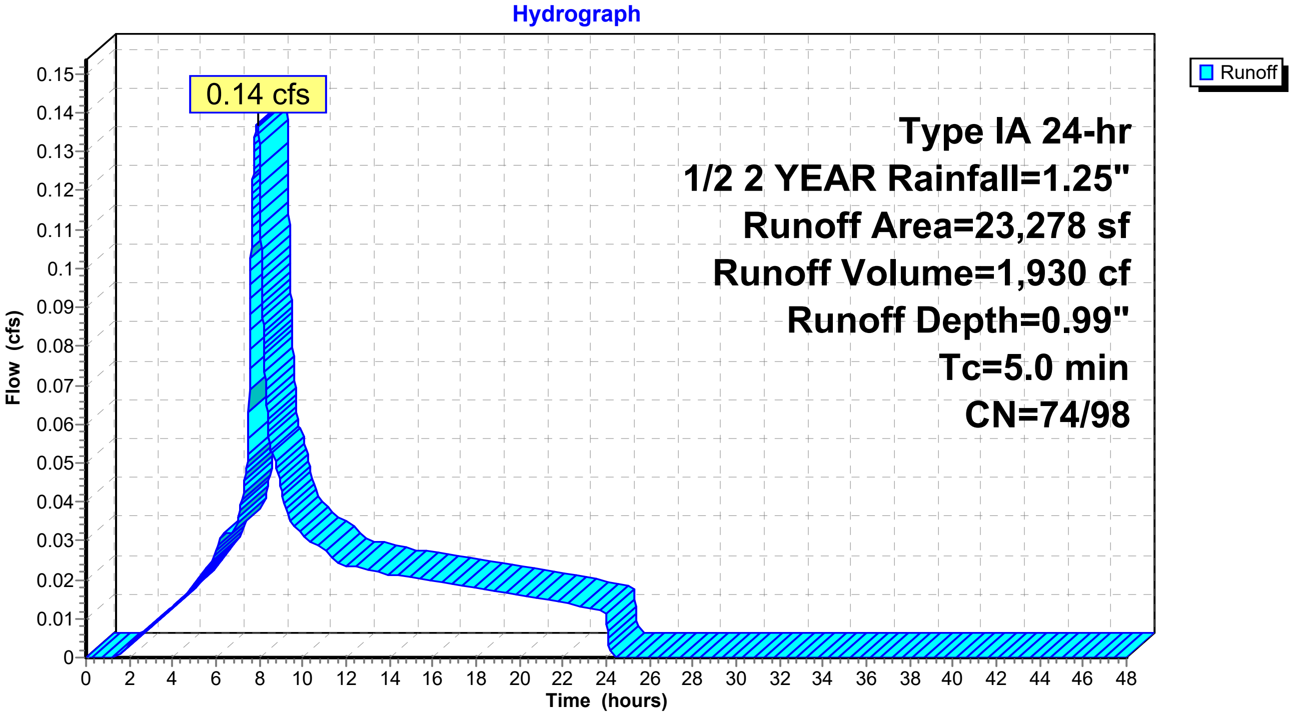
Runoff = 0.14 cfs @ 7.89 hrs, Volume= 1,930 cf, Depth= 0.99"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

	Area (sf)	CN	Description
*	22,316	98	Pavement
	962	74	>75% Grass cover, Good, HSG C
	23,278	97	Weighted Average
	962		4.13% Pervious Area
	22,316		95.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 12S: SOUTH BASIN



Summary for Subcatchment 13S: EAST BASIN

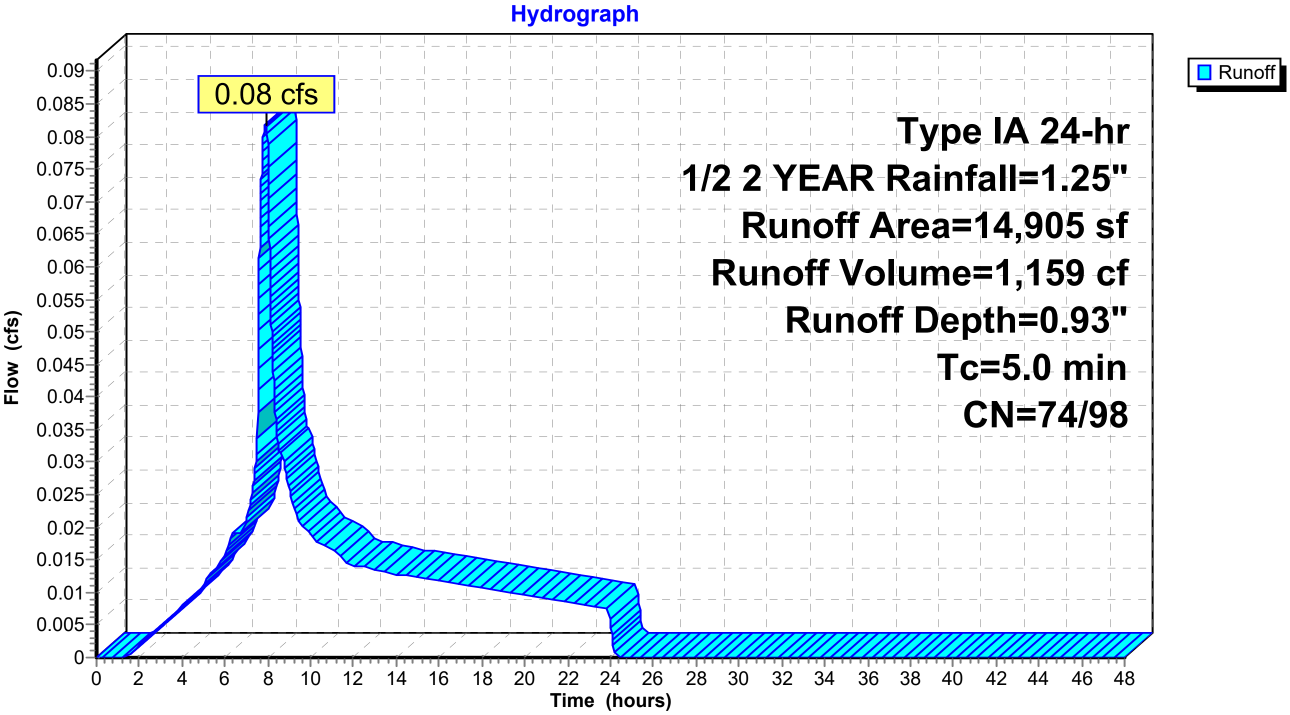
Runoff = 0.08 cfs @ 7.89 hrs, Volume= 1,159 cf, Depth= 0.93"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

	Area (sf)	CN	Description
*	13,332	98	Pavement
	1,573	74	>75% Grass cover, Good, HSG C
	14,905	95	Weighted Average
	1,573		10.55% Pervious Area
	13,332		89.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 13S: EAST BASIN



Summary for Subcatchment 14S: ROOF

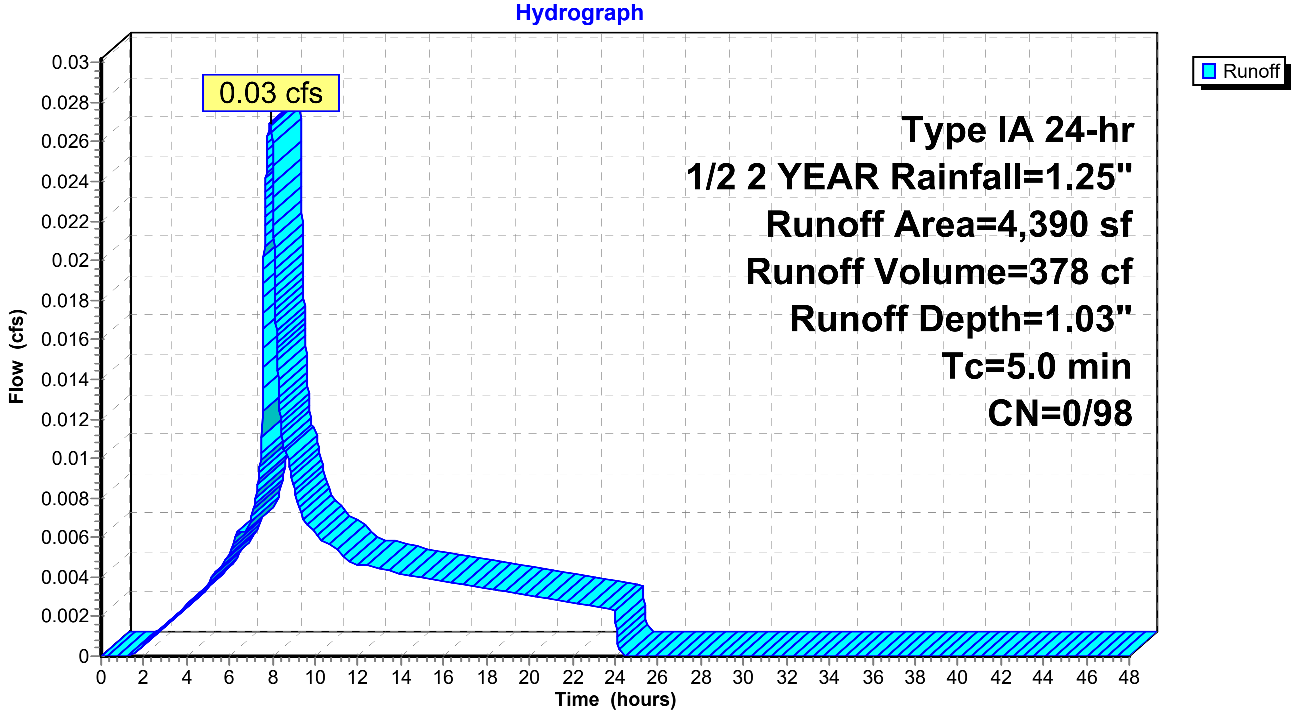
Runoff = 0.03 cfs @ 7.89 hrs, Volume= 378 cf, Depth= 1.03"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

Area (sf)	CN	Description
4,390	98	Roofs, HSG C
4,390		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 14S: ROOF



Summary for Subcatchment 15S: DRIVE-THRU

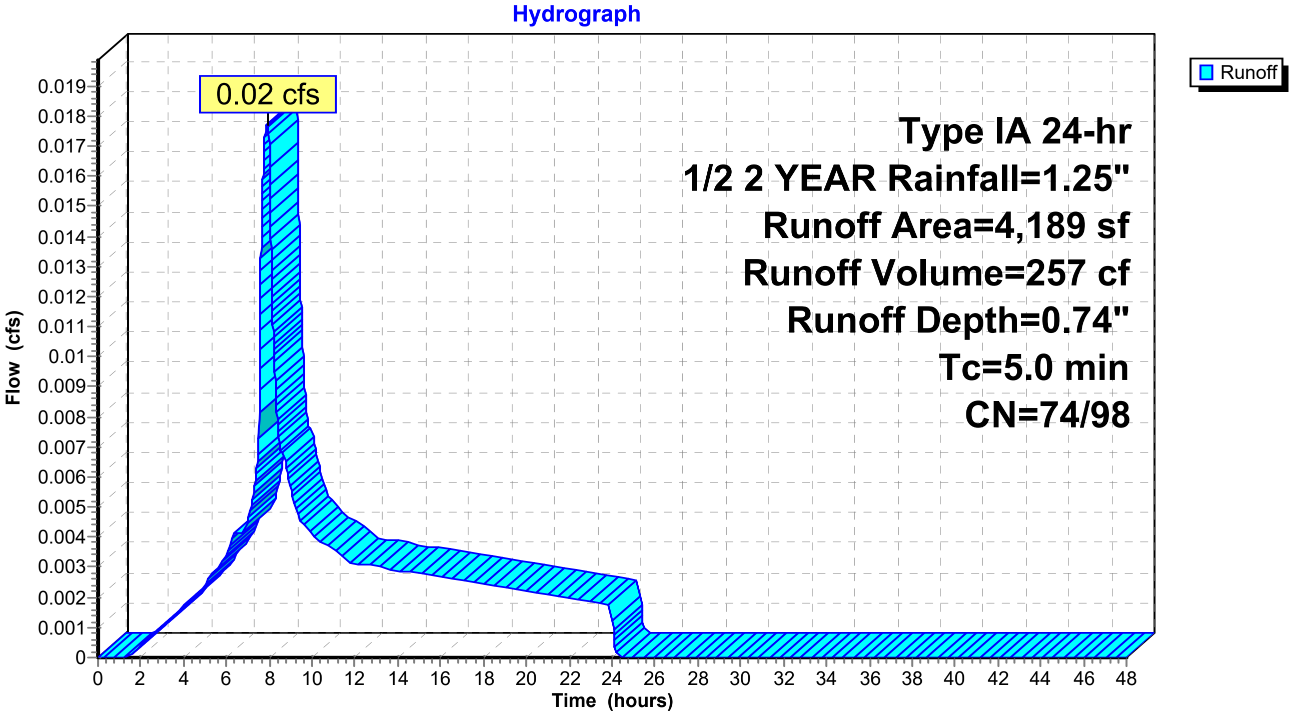
Runoff = 0.02 cfs @ 7.89 hrs, Volume= 257 cf, Depth= 0.74"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

	Area (sf)	CN	Description
*	2,887	98	Pavement
	1,302	74	>75% Grass cover, Good, HSG C
	4,189	91	Weighted Average
	1,302		31.08% Pervious Area
	2,887		68.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 15S: DRIVE-THRU



Summary for Subcatchment 16S: PERIMETER LANDSCAPE AND WALKWAY (UNDETAINED)

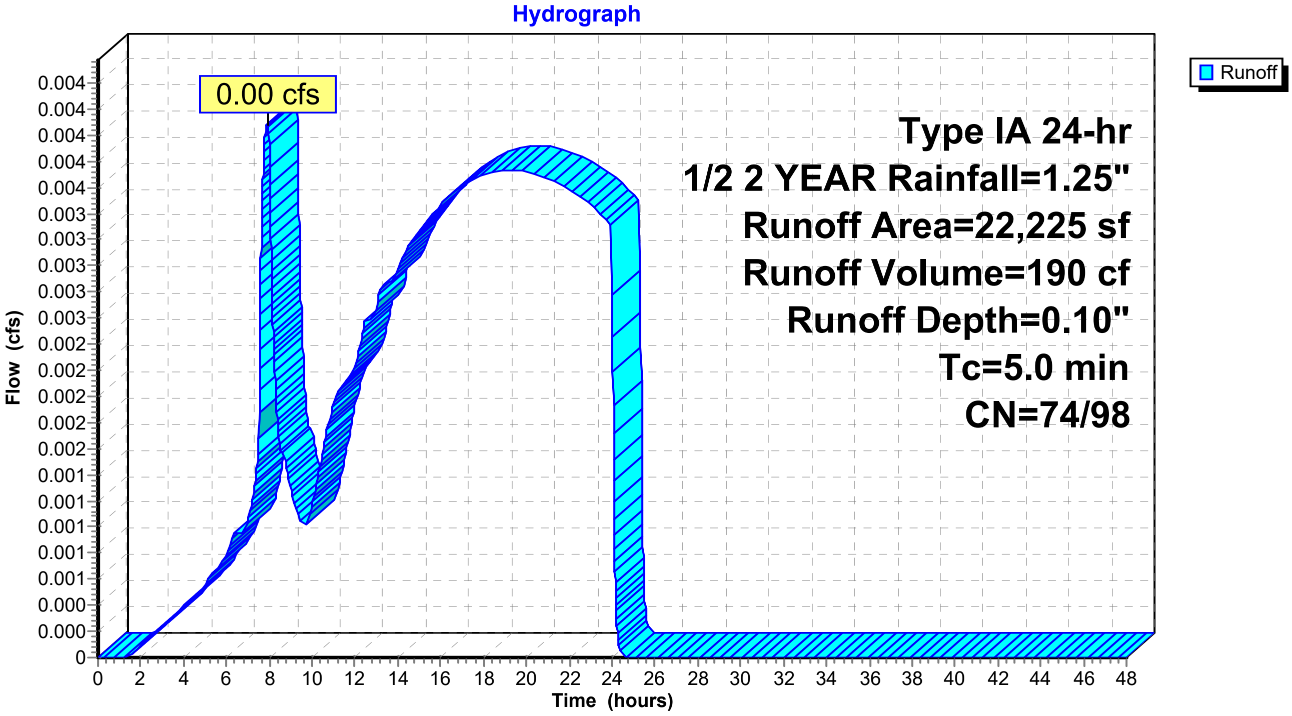
Runoff = 0.00 cfs @ 7.89 hrs, Volume= 190 cf, Depth= 0.10"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

Area (sf)	CN	Description
21,560	74	>75% Grass cover, Good, HSG C
665	98	Paved parking, HSG C
22,225	75	Weighted Average
21,560		97.01% Pervious Area
665		2.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 16S: PERIMETER LANDSCAPE AND WALKWAY (UNDETAINED)



Summary for Subcatchment 17S: PLAZA 4

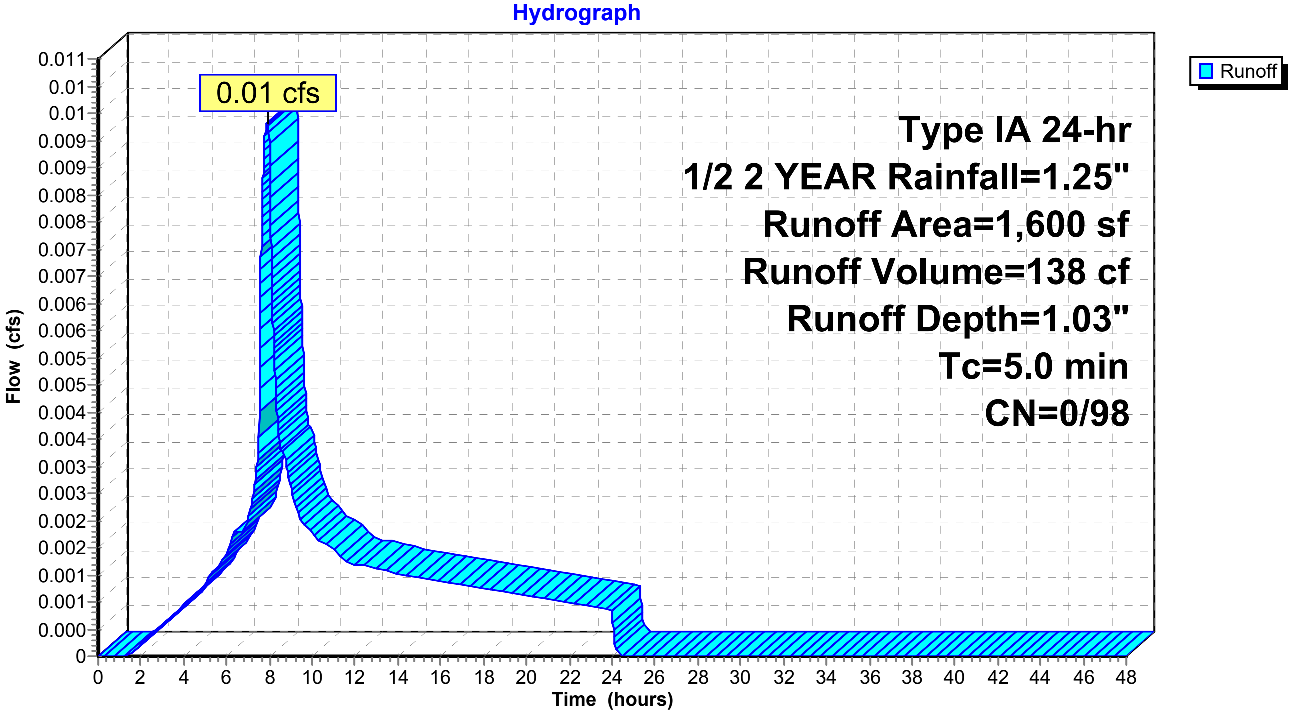
Runoff = 0.01 cfs @ 7.89 hrs, Volume= 138 cf, Depth= 1.03"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 1/2 2 YEAR Rainfall=1.25"

Area (sf)	CN	Description
1,600	98	Roofs, HSG C
1,600		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 17S: PLAZA 4



Summary for Reach 1R: Swale

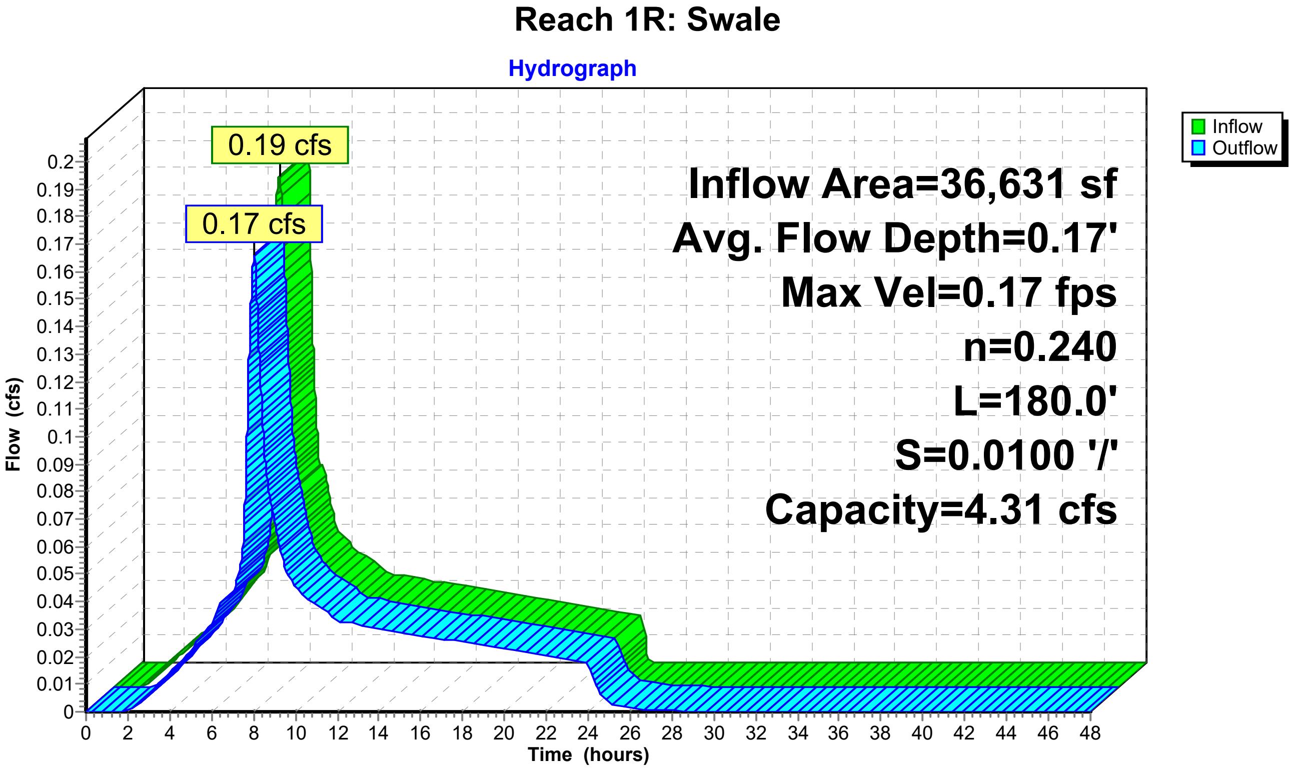
Inflow Area =	36,631 sf,	82.63% Impervious,	Inflow Depth = 0.87"	for 1/2 2 YEAR event	
Inflow =	0.19 cfs @	7.89 hrs,	Volume=	2,649 cf	
Outflow =	0.17 cfs @	8.03 hrs,	Volume=	2,649 cf,	Atten= 11%, Lag= 8.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.17 fps, Min. Travel Time= 17.2 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 43.5 min

Peak Storage= 172 cf @ 8.03 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 4.31 cfs

5.00' x 1.00' deep channel, n= 0.240
Side Slope Z-value= 4.0 '/' Top Width= 13.00'
Length= 180.0' Slope= 0.0100 '/'
Inlet Invert= 202.00', Outlet Invert= 200.20'

‡



Summary for Reach 2R: 6" PIPE

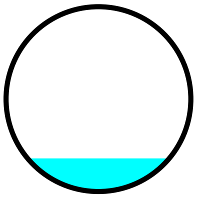
[52] Hint: Inlet/Outlet conditions not evaluated

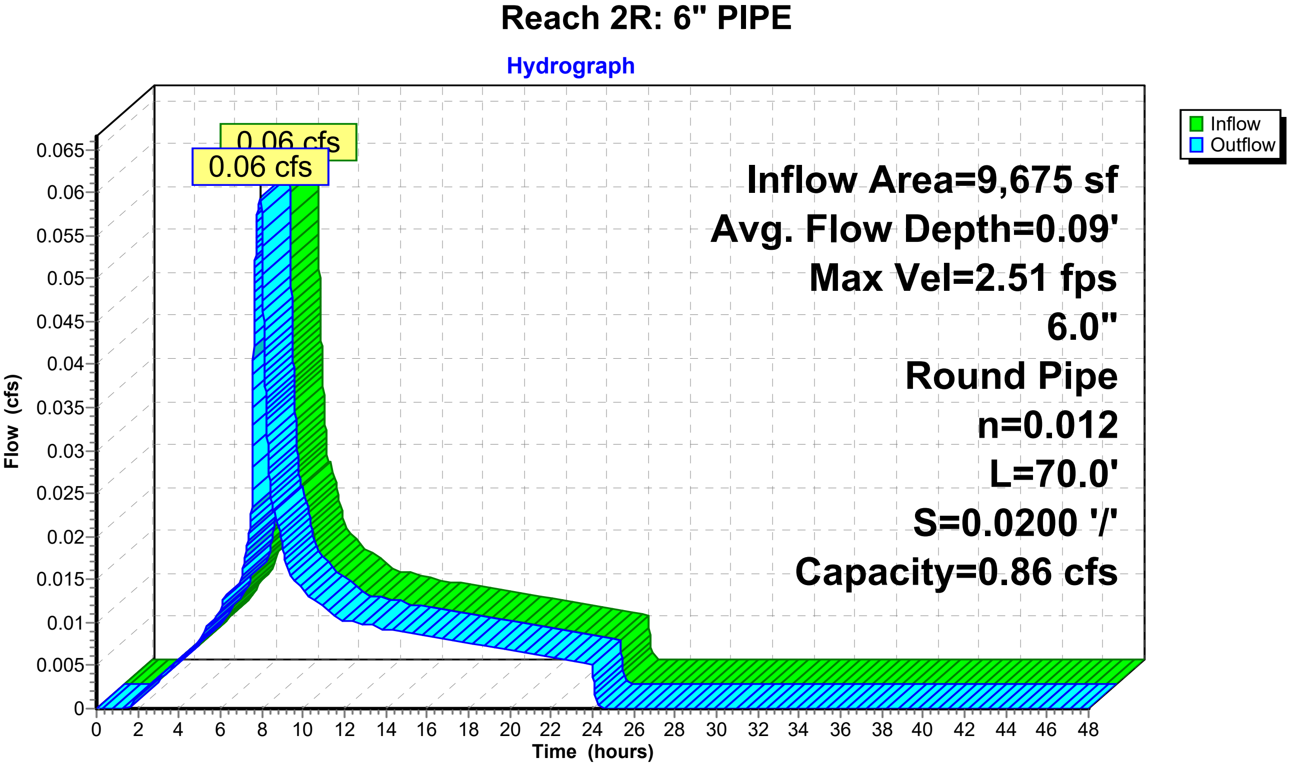
Inflow Area = 9,675 sf,100.00% Impervious, Inflow Depth = 1.03" for 1/2 2 YEAR event
Inflow = 0.06 cfs @ 7.89 hrs, Volume= 834 cf
Outflow = 0.06 cfs @ 7.90 hrs, Volume= 834 cf, Atten= 0%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.51 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.40 fps, Avg. Travel Time= 0.8 min

Peak Storage= 2 cf @ 7.90 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.86 cfs

6.0" Round Pipe
n= 0.012
Length= 70.0' Slope= 0.0200 '/'
Inlet Invert= 203.36', Outlet Invert= 201.96'





Summary for Reach 3R: 8" PIPE

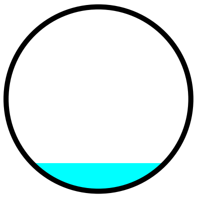
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 2R OUTLET depth by 0.01' @ 8.02 hrs

```
Inflow Area =          15,019 sf,100.00% Impervious,  Inflow Depth =   1.03"    for  1/2 2 YEAR event
Inflow      =         0.09 cfs @     7.90 hrs,  Volume=              1,295 cf
Outflow     =         0.09 cfs @     7.90 hrs,  Volume=              1,295 cf,  Atten= 0%,  Lag= 0.3 min
```

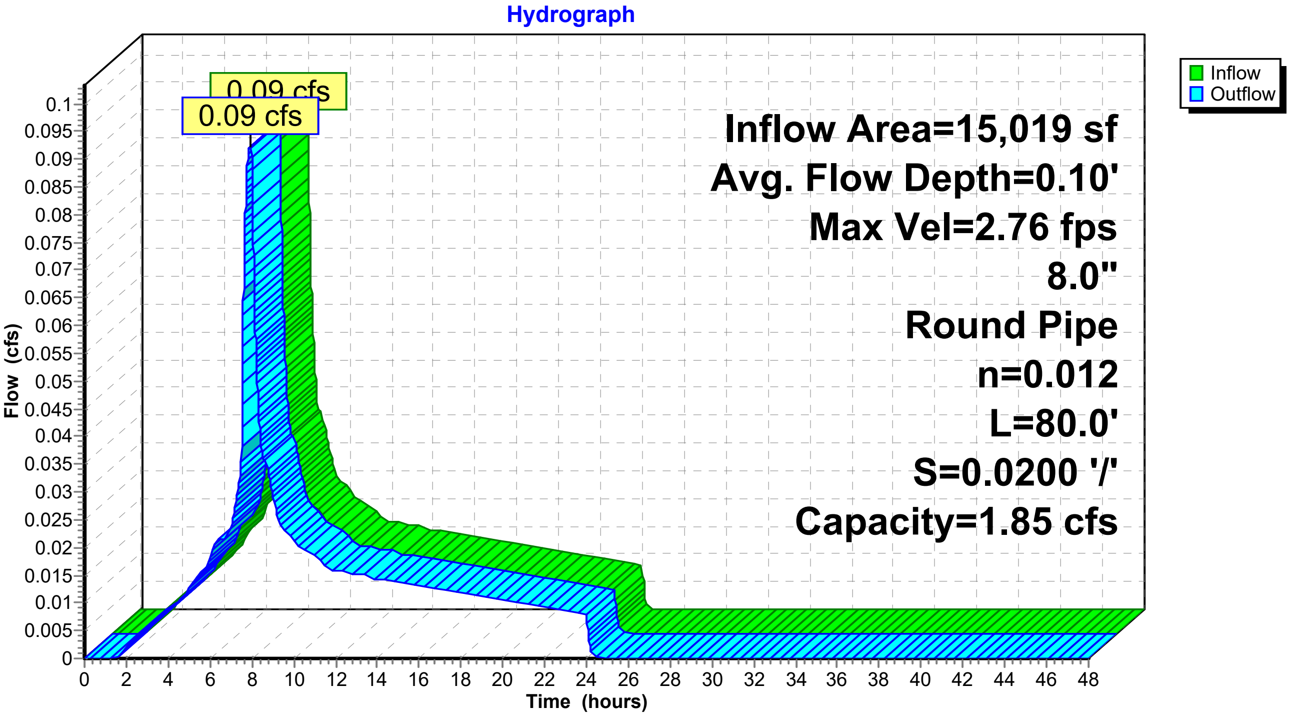
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.76 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.54 fps, Avg. Travel Time= 0.9 min

Peak Storage= 3 cf @ 7.90 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.85 cfs

8.0" Round Pipe
n= 0.012
Length= 80.0' Slope= 0.0200 '/'
Inlet Invert= 201.96', Outlet Invert= 200.36'



Reach 3R: 8" PIPE



Summary for Reach 4R: 8" PIPE

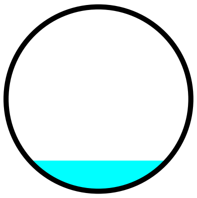
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 3R OUTLET depth by 0.01' @ 8.03 hrs

```
Inflow Area =        17,894 sf,100.00% Impervious,  Inflow Depth =   1.03"    for  1/2 2 YEAR event
Inflow      =      0.11 cfs @    7.90 hrs,  Volume=            1,543 cf
Outflow     =      0.11 cfs @    7.91 hrs,  Volume=            1,543 cf,  Atten= 0%,  Lag= 0.4 min
```

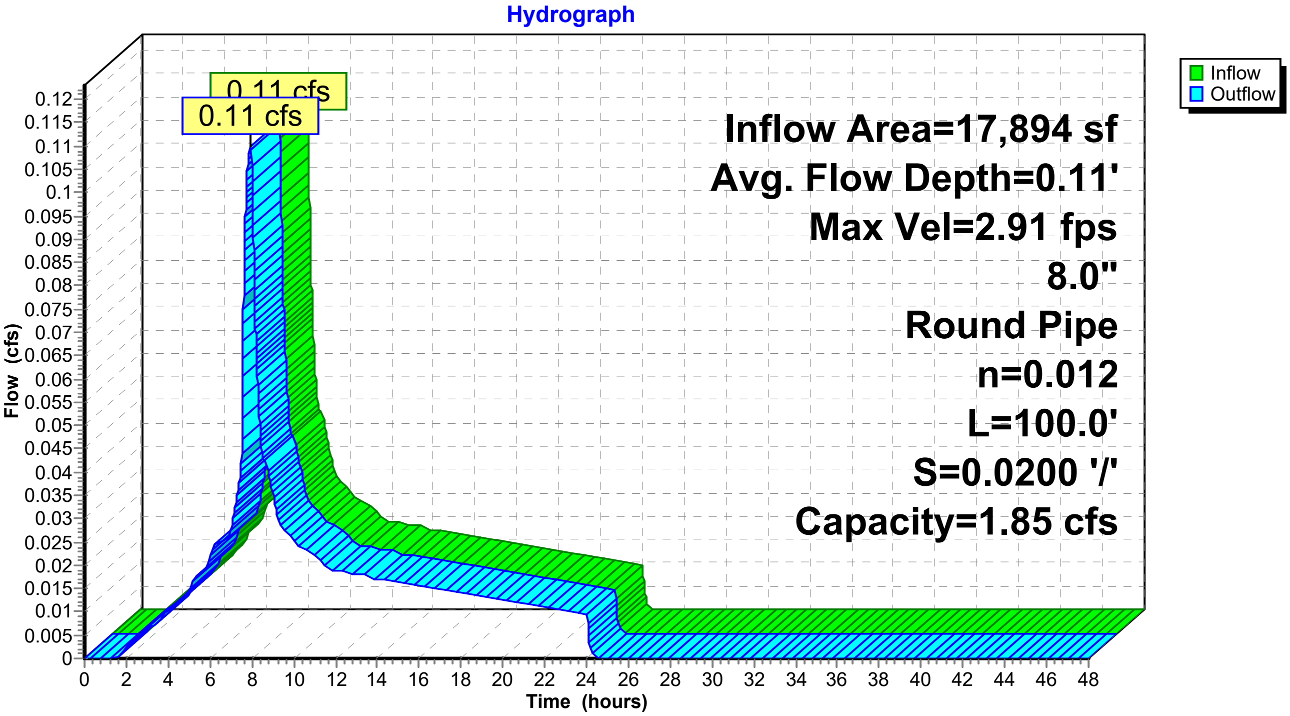
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.91 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.62 fps, Avg. Travel Time= 1.0 min

Peak Storage= 4 cf @ 7.91 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.85 cfs

8.0" Round Pipe
n= 0.012
Length= 100.0' Slope= 0.0200 '/'
Inlet Invert= 200.36', Outlet Invert= 198.36'



Reach 4R: 8" PIPE



Summary for Reach 5R: 6" PIPE

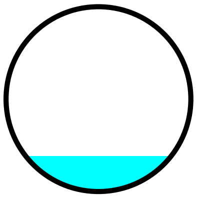
[52] Hint: Inlet/Outlet conditions not evaluated

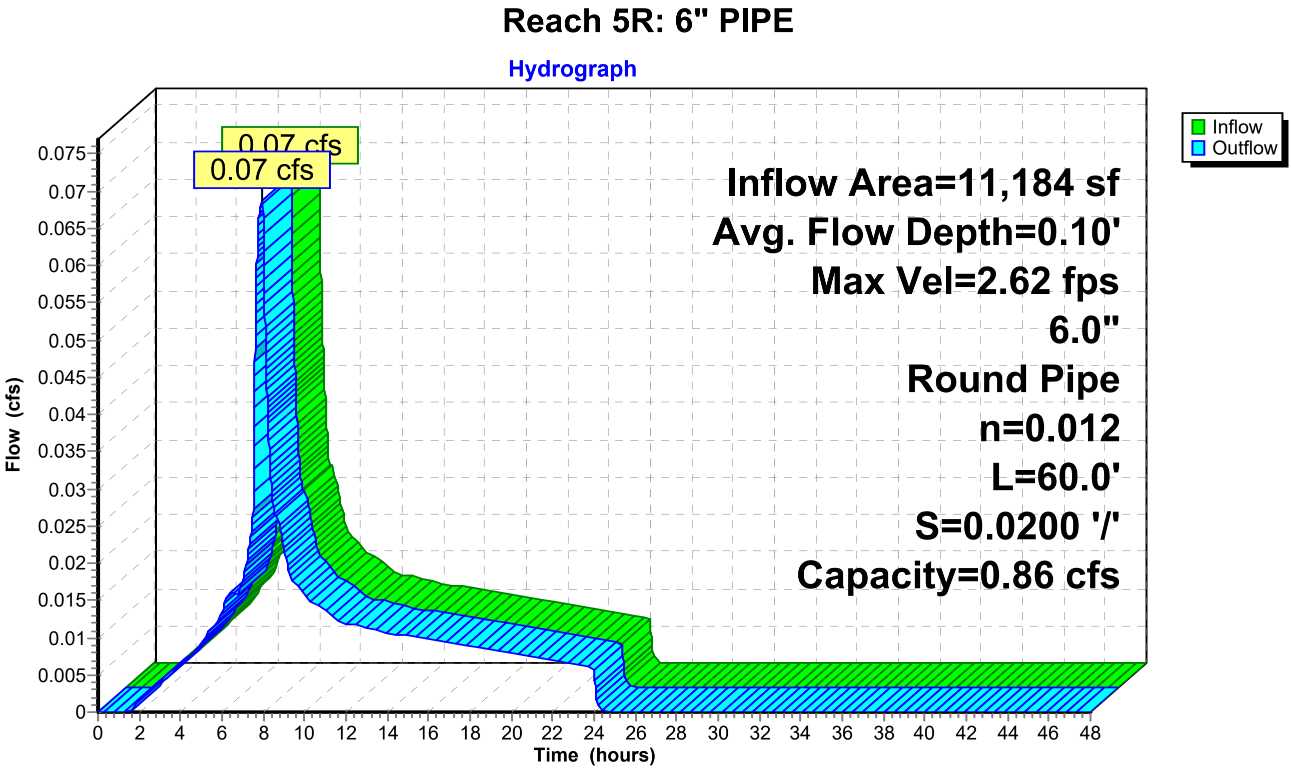
Inflow Area = 11,184 sf,100.00% Impervious, Inflow Depth = 1.03" for 1/2 2 YEAR event
Inflow = 0.07 cfs @ 7.89 hrs, Volume= 964 cf
Outflow = 0.07 cfs @ 7.90 hrs, Volume= 964 cf, Atten= 0%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.62 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.46 fps, Avg. Travel Time= 0.7 min

Peak Storage= 2 cf @ 7.90 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.86 cfs

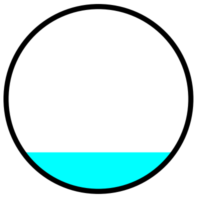
6.0" Round Pipe
n= 0.012
Length= 60.0' Slope= 0.0200 '/'
Inlet Invert= 199.56', Outlet Invert= 198.36'



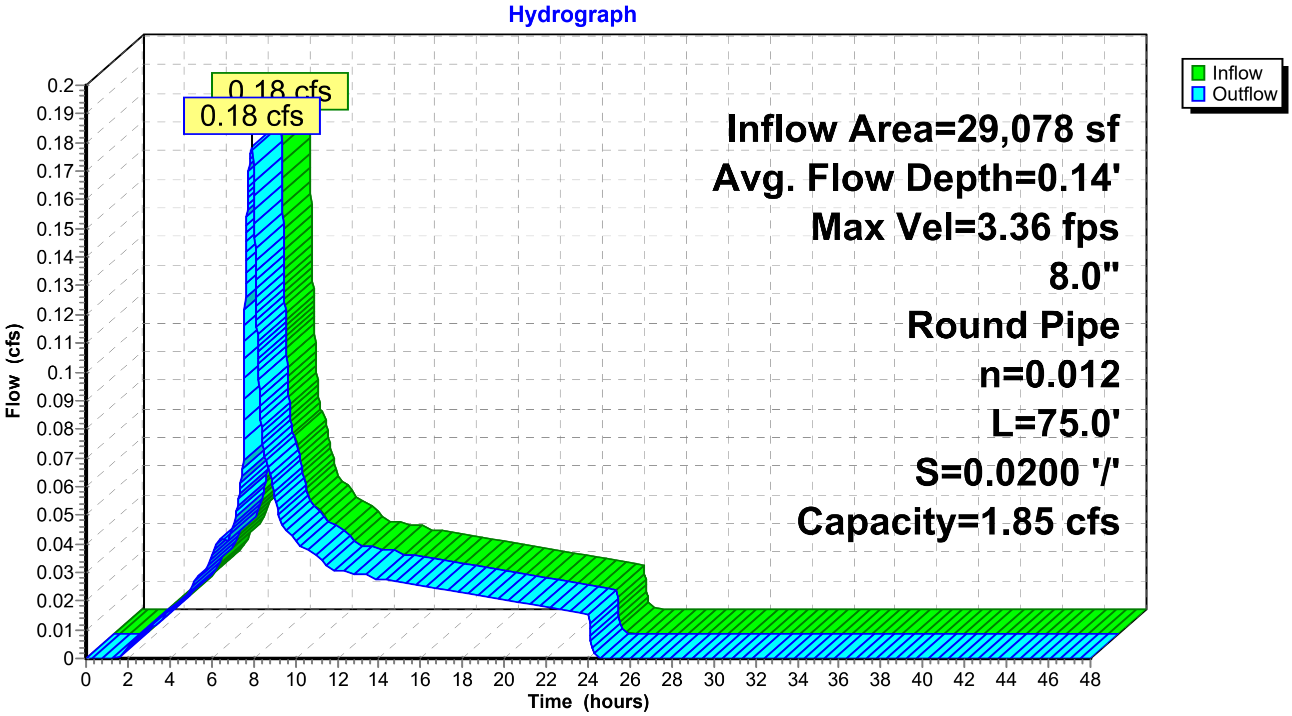


Summary for Reach 6R: 8" PIPE

```
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 4R OUTLET depth by 0.03' @ 7.91 hrs
[62] Hint: Exceeded Reach 5R OUTLET depth by 0.04' @ 8.02 hrs

Inflow Area =       29,078 sf,100.00% Impervious,  Inflow Depth =   1.03"    for  1/2 2 YEAR event
Inflow      =        0.18 cfs @    7.90 hrs,  Volume=            2,507 cf
Outflow     =        0.18 cfs @    7.91 hrs,  Volume=            2,507 cf,  Atten= 0%,  Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.36 fps,  Min. Travel Time= 0.4 min
Avg. Velocity = 1.87 fps,  Avg. Travel Time= 0.7 min

Peak Storage= 4 cf @ 7.91 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 0.67'  Flow Area= 0.3 sf,  Capacity= 1.85 cfs

8.0"  Round Pipe
n= 0.012
Length= 75.0'   Slope= 0.0200 '/'
Inlet Invert= 198.36',  Outlet Invert= 196.86'
```



Reach 6R: 8" PIPE



Summary for Reach 7R: 8" PIPE

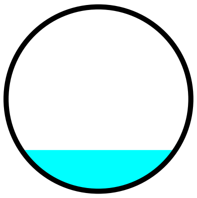
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 6R OUTLET depth by 0.01' @ 7.94 hrs

```
Inflow Area =          32,648 sf,100.00% Impervious,  Inflow Depth =   1.03"    for  1/2 2 YEAR event
Inflow      =        0.20 cfs @    7.91 hrs,  Volume=              2,815 cf
Outflow     =        0.20 cfs @    7.91 hrs,  Volume=              2,815 cf,  Atten= 0%,  Lag= 0.2 min
```

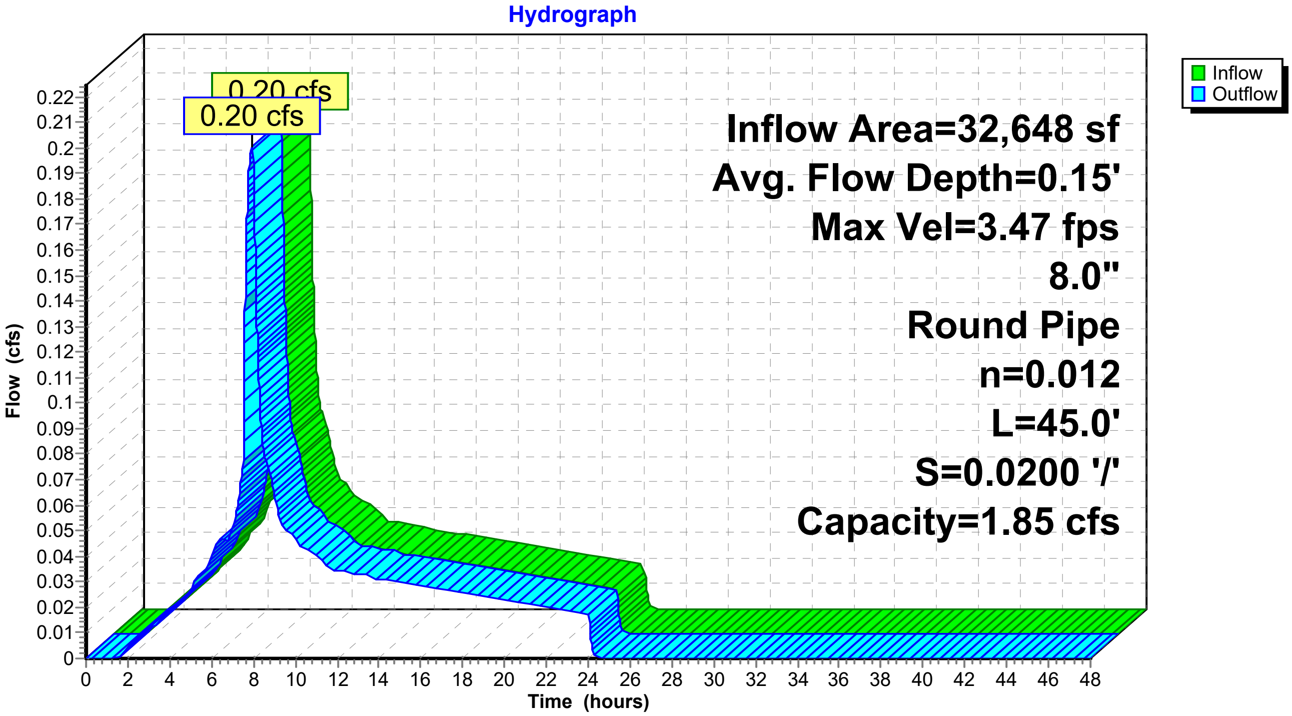
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.47 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.93 fps, Avg. Travel Time= 0.4 min

Peak Storage= 3 cf @ 7.91 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.85 cfs

8.0" Round Pipe
n= 0.012
Length= 45.0' Slope= 0.0200 '/'
Inlet Invert= 196.86', Outlet Invert= 195.96'



Reach 7R: 8" PIPE



Summary for Reach 8R: 12" PIPE

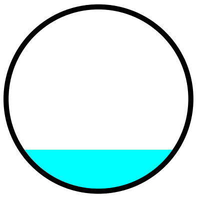
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 7R OUTLET depth by 0.08' @ 7.92 hrs

Inflow Area = 49,100 sf, 99.55% Impervious, Inflow Depth = 1.03" for 1/2 2 YEAR event
Inflow = 0.30 cfs @ 7.90 hrs, Volume= 4,215 cf
Outflow = 0.30 cfs @ 7.91 hrs, Volume= 4,215 cf, Atten= 0%, Lag= 0.5 min

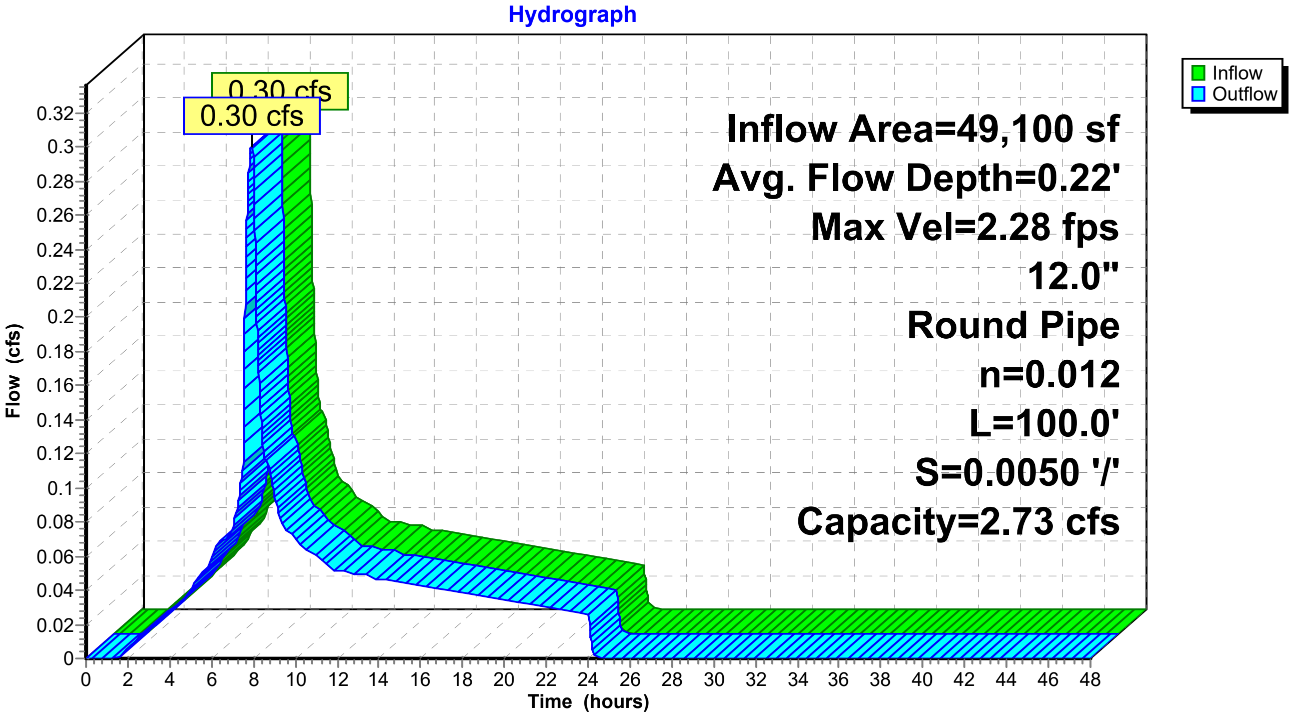
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.28 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.26 fps, Avg. Travel Time= 1.3 min

Peak Storage= 13 cf @ 7.91 hrs
Average Depth at Peak Storage= 0.22'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.73 cfs

12.0" Round Pipe
n= 0.012
Length= 100.0' Slope= 0.0050 '/'
Inlet Invert= 195.96', Outlet Invert= 195.46'



Reach 8R: 12" PIPE



Summary for Reach 9R: 12" PIPE

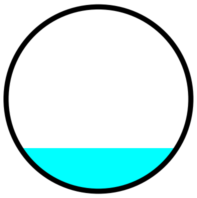
[52] Hint: Inlet/Outlet conditions not evaluated
[61] Hint: Exceeded Reach 11R outlet invert by 0.06' @ 7.91 hrs

```
Inflow Area =        77,784 sf,  96.02% Impervious,  Inflow Depth =   1.00"    for  1/2 2 YEAR event
Inflow      =       0.46 cfs @    7.91 hrs,  Volume=            6,458 cf
Outflow     =       0.46 cfs @    7.91 hrs,  Volume=            6,458 cf,  Atten= 0%,  Lag= 0.1 min
```

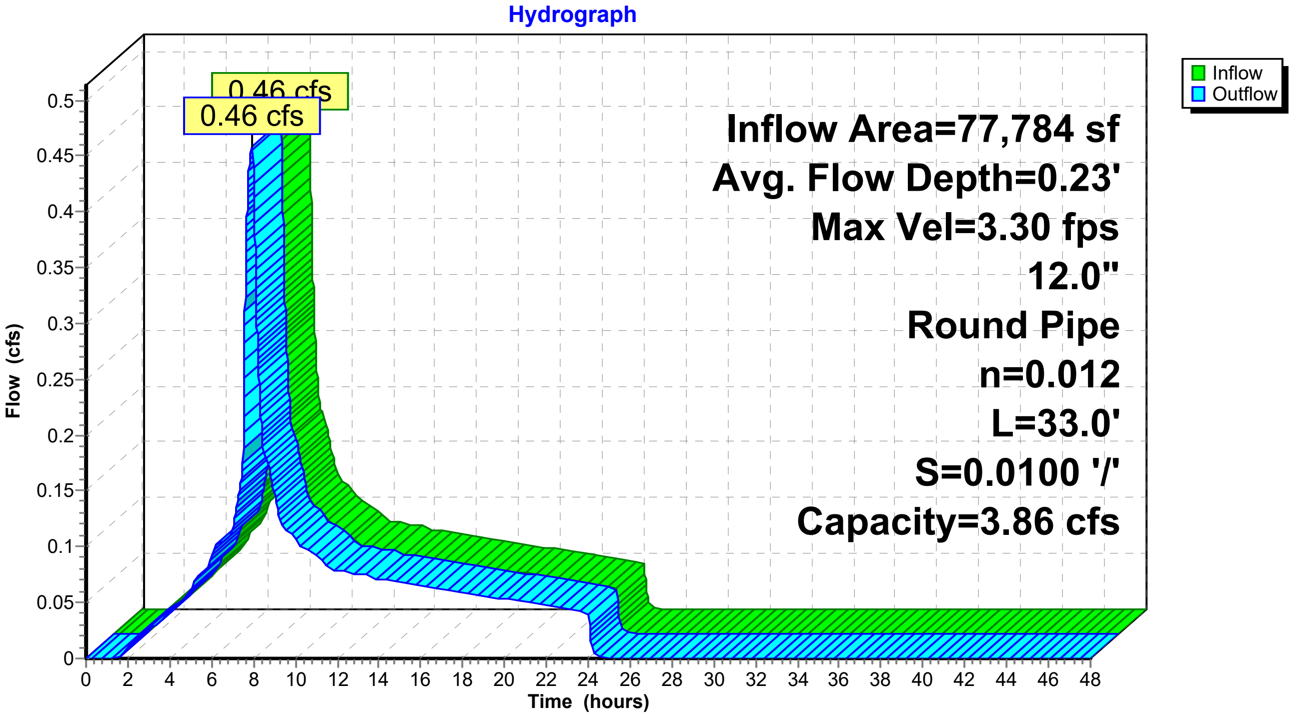
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.30 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.83 fps, Avg. Travel Time= 0.3 min

Peak Storage= 5 cf @ 7.91 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.86 cfs

12.0" Round Pipe
n= 0.012
Length= 33.0' Slope= 0.0100 '/'
Inlet Invert= 194.33', Outlet Invert= 194.00'



Reach 9R: 12" PIPE



Summary for Reach 10R: 6" PIPE

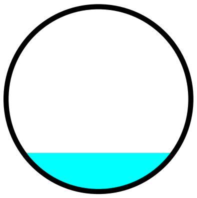
[52] Hint: Inlet/Outlet conditions not evaluated

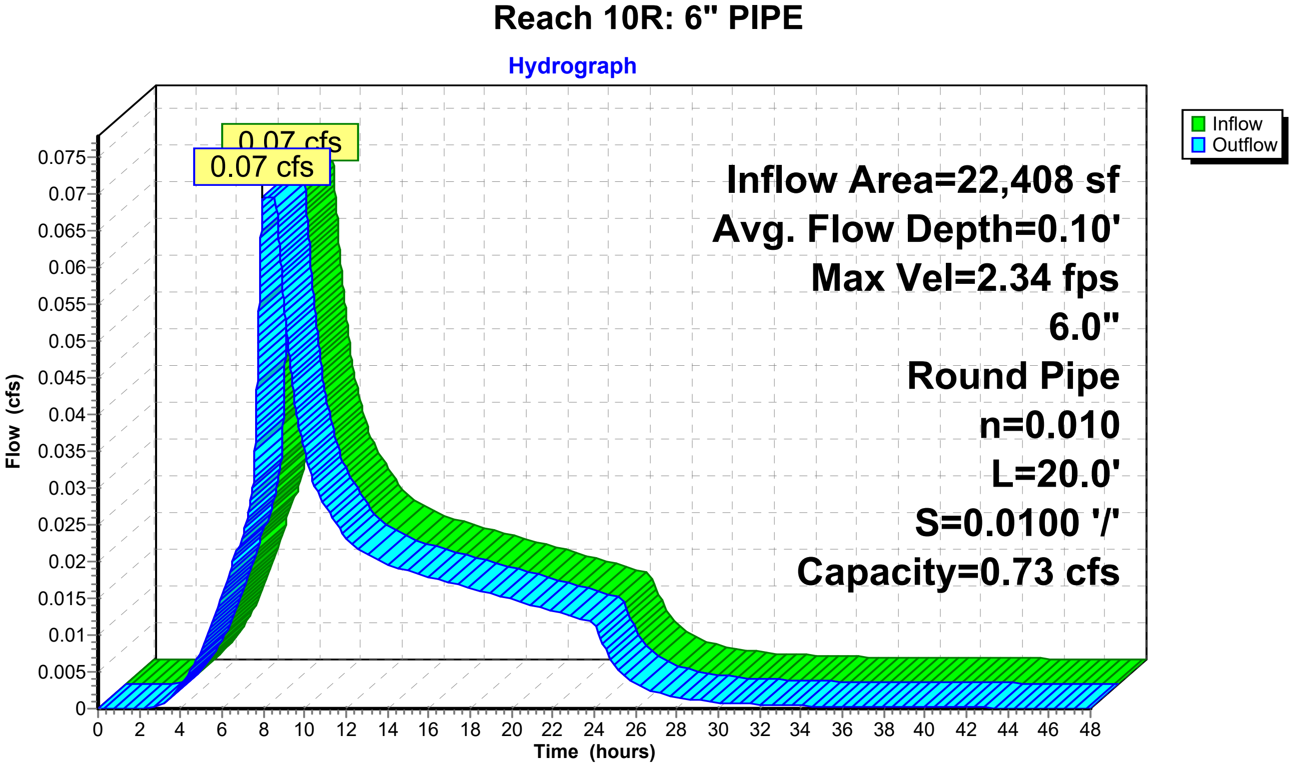
```
Inflow Area =          22,408 sf,  85.94% Impervious,  Inflow Depth >   0.90"    for  1/2 2 YEAR event
Inflow      =        0.07 cfs @    7.98 hrs,  Volume=            1,672 cf
Outflow     =        0.07 cfs @    7.94 hrs,  Volume=            1,672 cf,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.34 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.01 fps, Avg. Travel Time= 0.3 min

Peak Storage= 1 cf @ 7.94 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.73 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 20.0' Slope= 0.0100 '/'
Inlet Invert= 194.20', Outlet Invert= 194.00'





Summary for Reach 11R: 8" PIPE

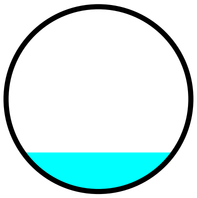
[52] Hint: Inlet/Outlet conditions not evaluated

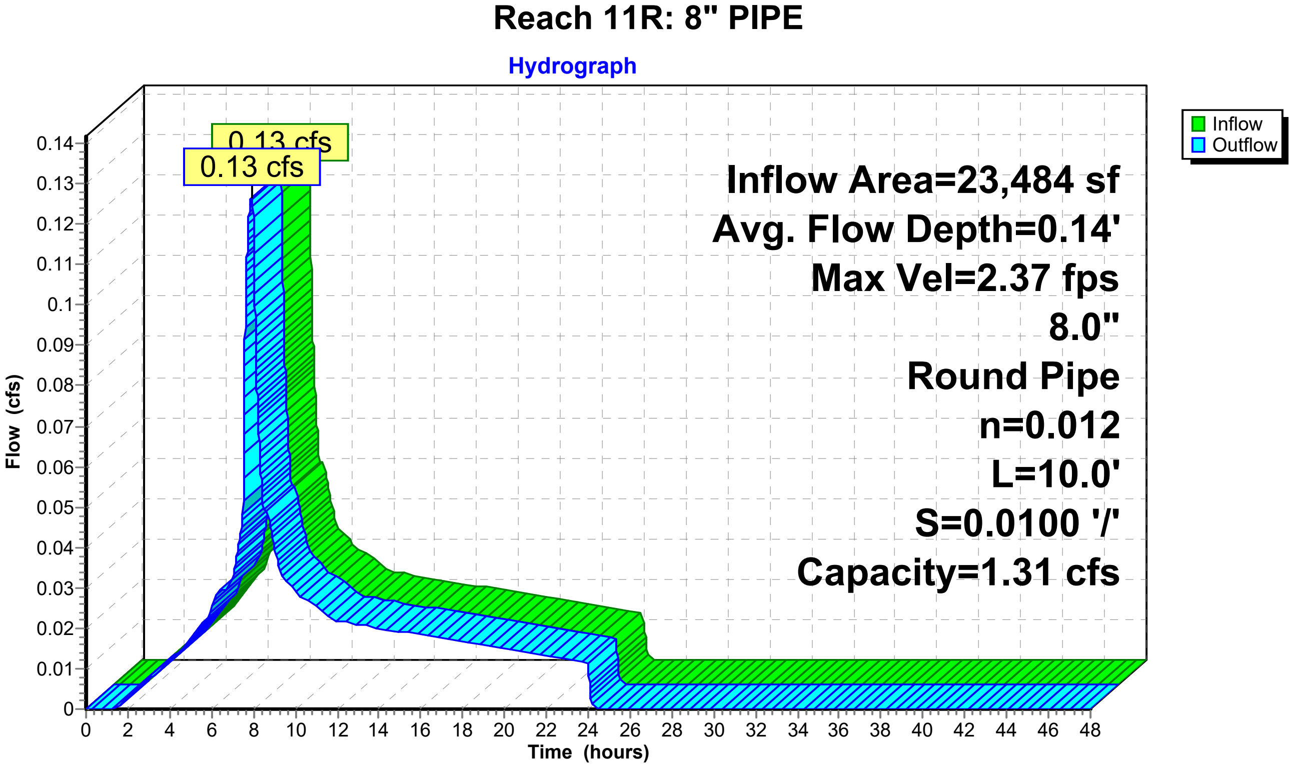
```
Inflow Area =          23,484 sf,  87.76% Impervious,  Inflow Depth =   0.92"    for  1/2 2 YEAR event
Inflow      =        0.13 cfs @    7.89 hrs,  Volume=              1,794 cf
Outflow     =        0.13 cfs @    7.89 hrs,  Volume=              1,794 cf,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.37 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.33 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.31 cfs

8.0" Round Pipe
n= 0.012
Length= 10.0' Slope= 0.0100 '/'
Inlet Invert= 194.60', Outlet Invert= 194.50'





Summary for Reach 12R: 6" PIPE

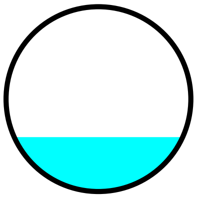
[52] Hint: Inlet/Outlet conditions not evaluated

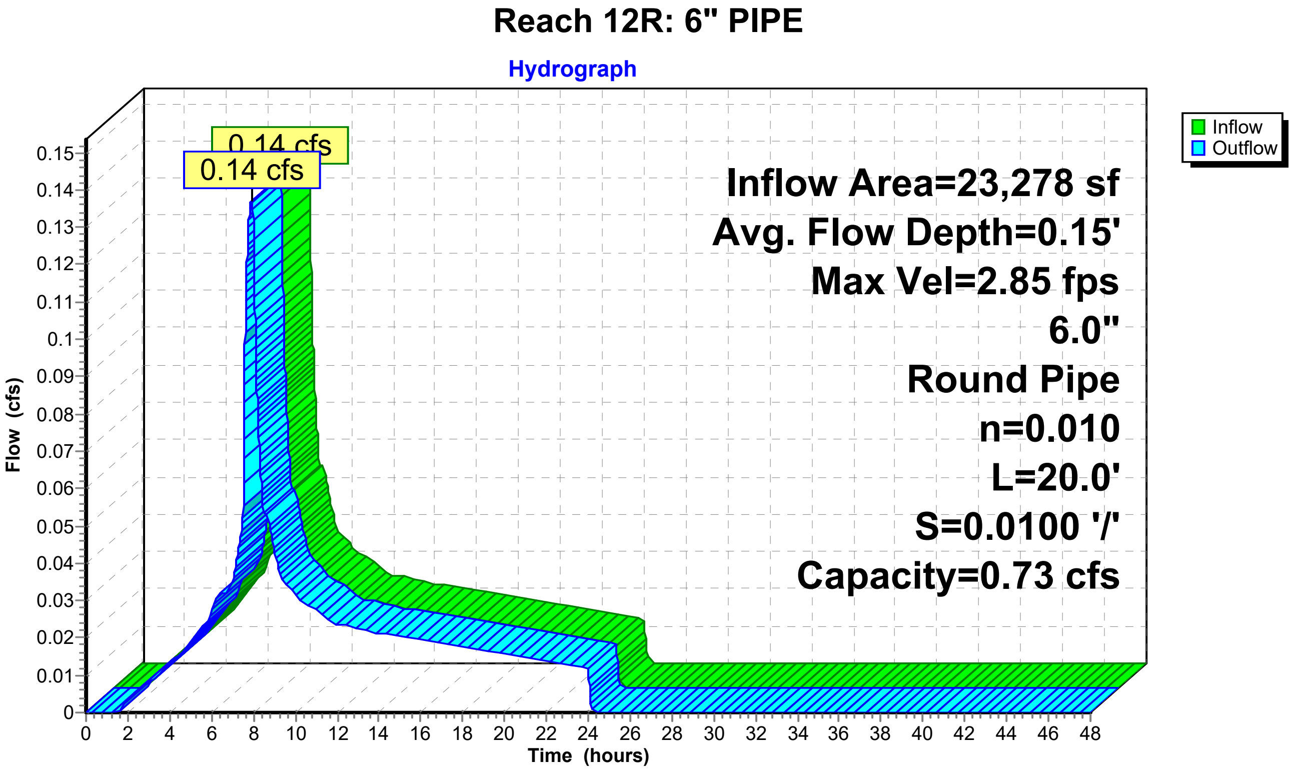
Inflow Area = 23,278 sf, 95.87% Impervious, Inflow Depth = 0.99" for 1/2 2 YEAR event
Inflow = 0.14 cfs @ 7.89 hrs, Volume= 1,930 cf
Outflow = 0.14 cfs @ 7.89 hrs, Volume= 1,930 cf, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.85 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.60 fps, Avg. Travel Time= 0.2 min

Peak Storage= 1 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.73 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 20.0' Slope= 0.0100 '/'
Inlet Invert= 194.20', Outlet Invert= 194.00'





Summary for Pond 5P: PLANTER

Inflow Area = 22,408 sf, 85.94% Impervious, Inflow Depth = 0.90" for 1/2 2 YEAR event
Inflow = 0.12 cfs @ 7.89 hrs, Volume= 1,680 cf
Outflow = 0.07 cfs @ 7.98 hrs, Volume= 1,672 cf, Atten= 41%, Lag= 5.2 min
Primary = 0.07 cfs @ 7.98 hrs, Volume= 1,672 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 202.92' @ 8.20 hrs Surf.Area= 1,500 sf Storage= 258 cf
Flood Elev= 203.75' Surf.Area= 1,500 sf Storage= 1,500 cf

Plug-Flow detention time= 101.0 min calculated for 1,672 cf (100% of inflow)
Center-of-Mass det. time= 97.9 min (803.1 - 705.2)

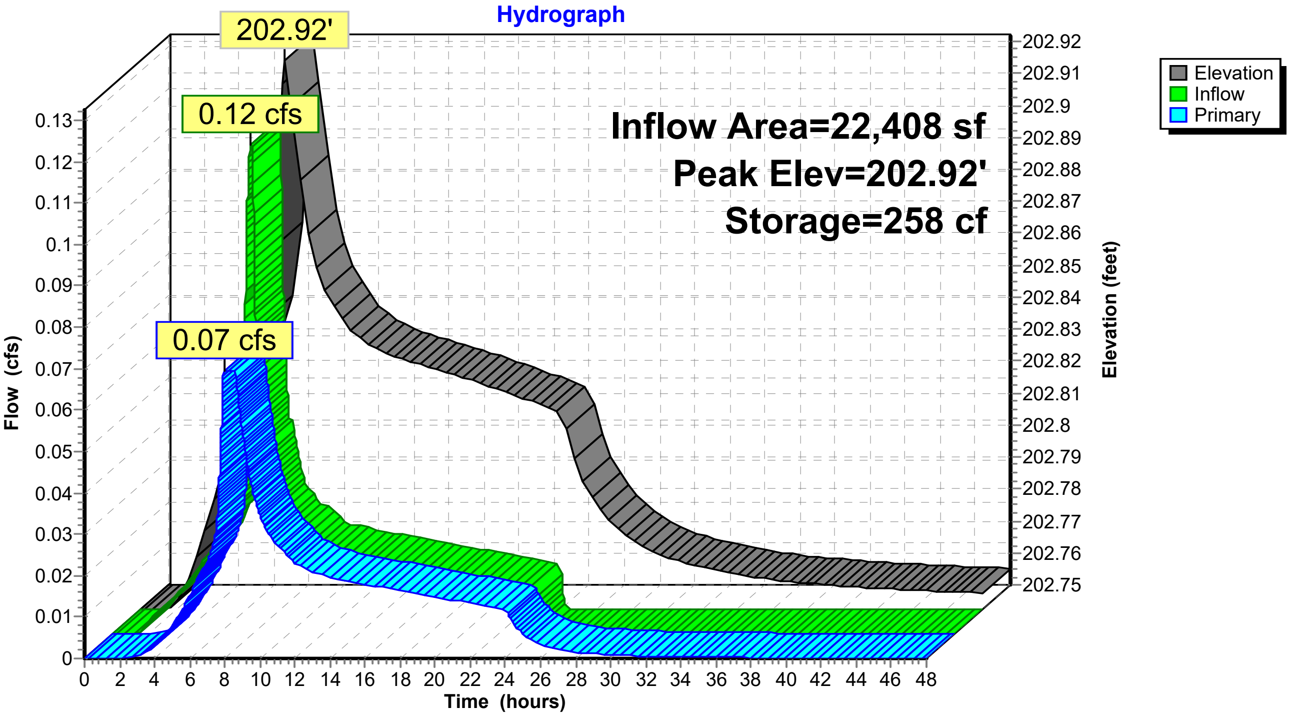
Volume	Invert	Avail.Storage	Storage Description
#1	202.75'	1,500 cf	**Ponding Depth (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
202.75	1,500	0	0
203.75	1,500	1,500	1,500

Device	Routing	Invert	Outlet Devices
#1	Primary	202.75'	**6.0" Round Culvert** L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 202.75' / 202.50' S= 0.0250 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf
#2	Device 1	202.75'	**2.000 in/hr Exfiltration over Surface area**
#3	Device 1	203.25'	**6.0" Horiz. Orifice/Grate** C= 0.610 Limited to weir flow at low heads

Primary OutFlow Max=0.07 cfs @ 7.98 hrs HW=202.91' TW=194.30' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.07 cfs of 0.07 cfs potential flow)
  ├─**2=Exfiltration** (Exfiltration Controls 0.07 cfs)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 5P: PLANTER



Summary for Pond DC: CHAMBERS

```
Inflow Area =        160,101 sf, 91.52% Impervious,  Inflow Depth =  0.95"   for  1/2 2 YEAR event
Inflow      =       0.82 cfs @    7.95 hrs,  Volume=          12,709 cf
Outflow     =       0.44 cfs @    8.40 hrs,  Volume=          12,707 cf,  Atten= 46%,  Lag= 27.0 min
Primary     =       0.44 cfs @    8.40 hrs,  Volume=          12,707 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 189.91' @ 8.40 hrs   Surf.Area= 989 sf   Storage= 1,031 cf
Flood Elev= 195.00'   Surf.Area= 989 sf   Storage= 3,901 cf

Plug-Flow detention time= 15.6 min calculated for 12,704 cf (100% of inflow)
Center-of-Mass det. time= 15.4 min ( 739.0 - 723.6 )

Volume      Invert    Avail.Storage   Storage Description
   #1A     188.00'         1,487 cf   10.33'W x 95.67'L x 7.00'H Field A
                                      6,920 cf Overall - 2,414 cf Embedded = 4,506 cf  x 33.0% Voids
   #2A     189.00'         2,414 cf   ADS_StormTech MC-4500 +Cap x 22  Inside #1
                                      Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf
                                      Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap
                                      Cap Storage= +35.7 cf x 2 x 1 rows = 71.4 cf
                                   3,901 cf   Total Available Storage

   Storage Group A created with Chamber Wizard

Device   Routing          Invert   Outlet Devices
   #1    Primary         188.00'   18.0"  Round Culvert  L= 100.0'   Ke= 0.500
                                   Inlet / Outlet Invert= 188.00' / 187.00'   S= 0.0100 '/'   Cc= 0.900
                                   n= 0.013,  Flow Area= 1.77 sf
   #2    Device 1        188.00'   3.5" Horiz. 2yr Orifice   C= 0.600   Limited to weir flow at low heads
   #3    Device 1        193.60'   18.0" Horiz. EMERGENCY OVERFLOW   C= 0.600
                                   Limited to weir flow at low heads

Primary OutFlow  Max=0.44 cfs @ 8.40 hrs  HW=189.91'  TW=0.00'   (Dynamic Tailwater)
└─1=Culvert  (Passes 0.44 cfs of 9.15 cfs potential flow)
   ├─2=2yr Orifice  (Orifice Controls 0.44 cfs @ 6.65 fps)
   └─3=EMERGENCY OVERFLOW ( Controls 0.00 cfs)
```

Pond DC: CHAMBERS - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-4500 +Cap (ADS StormTech® MC-4500 with cap volume)
Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf
Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap
Cap Storage= +35.7 cf x 2 x 1 rows = 71.4 cf

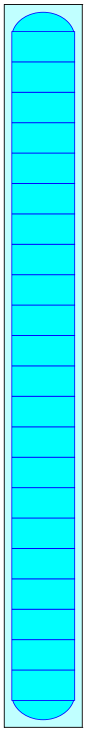
22 Chambers/Row x 4.02' Long +2.56' Cap Length x 2 = 93.67' Row Length +12.0" End Stone x 2 = 95.67' Base Length
1 Rows x 100.0" Wide + 12.0" Side Stone x 2 = 10.33' Base Width
12.0" Base + 60.0" Chamber Height + 12.0" Cover = 7.00' Field Height

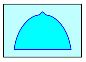
22 Chambers x 106.5 cf + 35.7 cf Cap Volume x 2 x 1 Rows = 2,414.2 cf Chamber Storage

6,919.9 cf Field - 2,414.2 cf Chambers = 4,505.7 cf Stone x 33.0% Voids = 1,486.9 cf Stone Storage

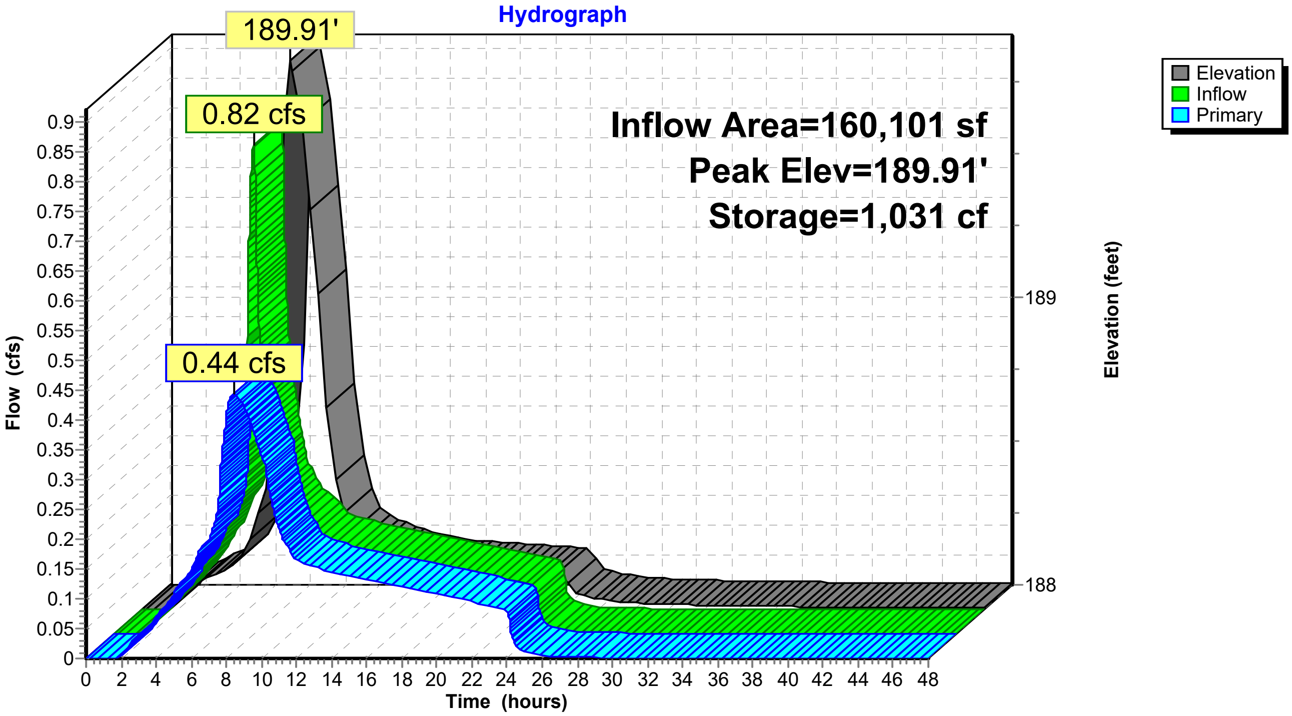
Chamber Storage + Stone Storage = 3,901.1 cf = 0.090 af
Overall Storage Efficiency = 56.4%
Overall System Size = 95.67' x 10.33' x 7.00'

22 Chambers
256.3 cy Field
166.9 cy Stone





Pond DC: CHAMBERS

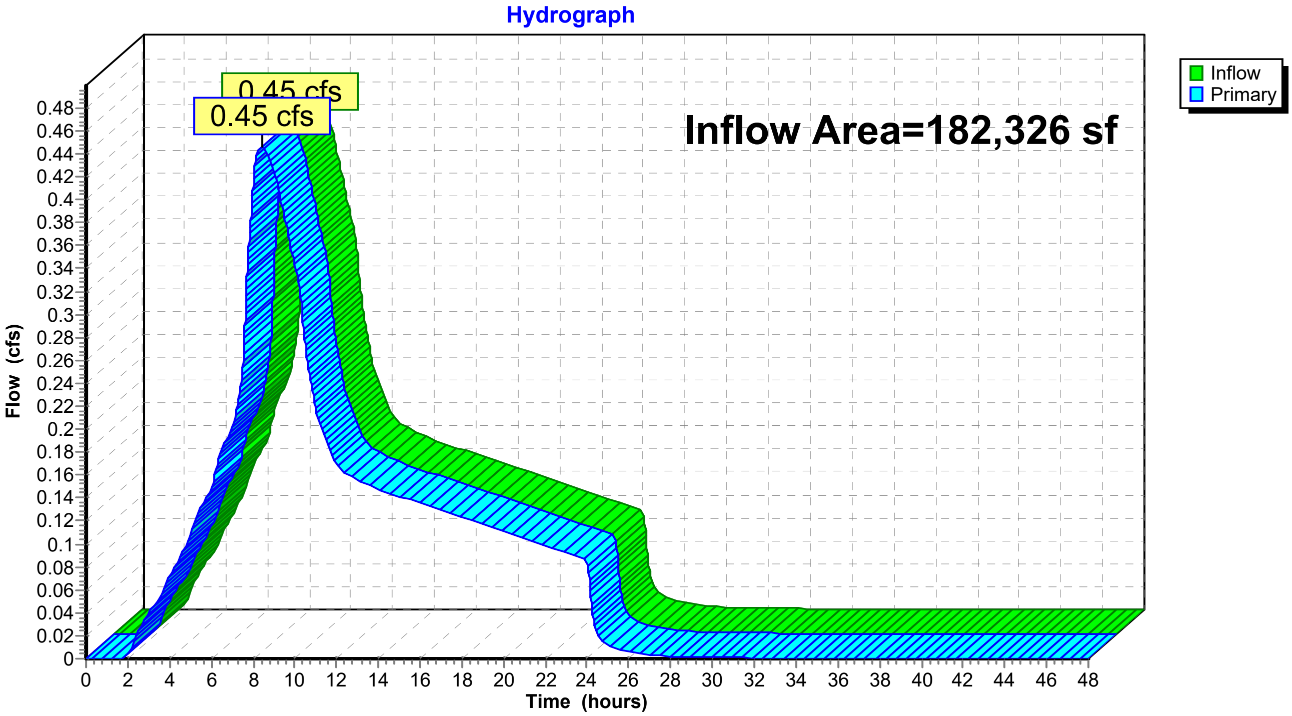


Summary for Link 11L: Peak Post- Development Flows

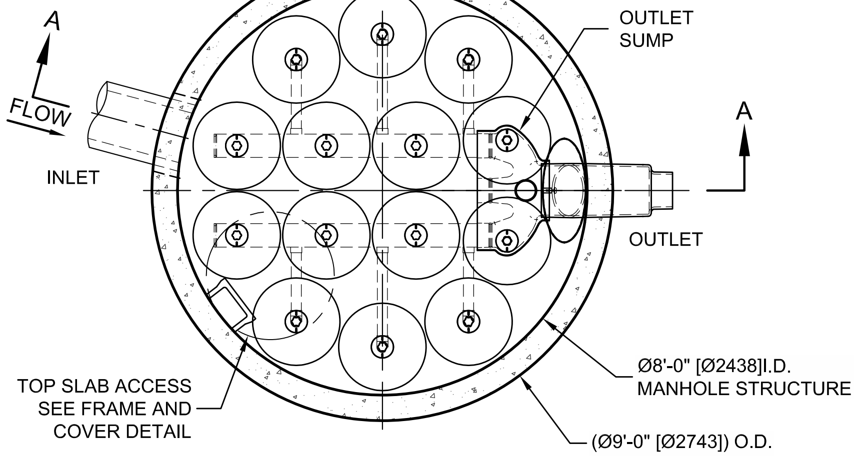
Inflow Area =	182,326 sf,	80.73% Impervious,	Inflow Depth > 0.85"	for 1/2 2 YEAR event	
Inflow =	0.45 cfs @	8.39 hrs,	Volume=	12,897 cf	
Primary =	0.45 cfs @	8.39 hrs,	Volume=	12,897 cf,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 11L: Peak Post- Development Flows

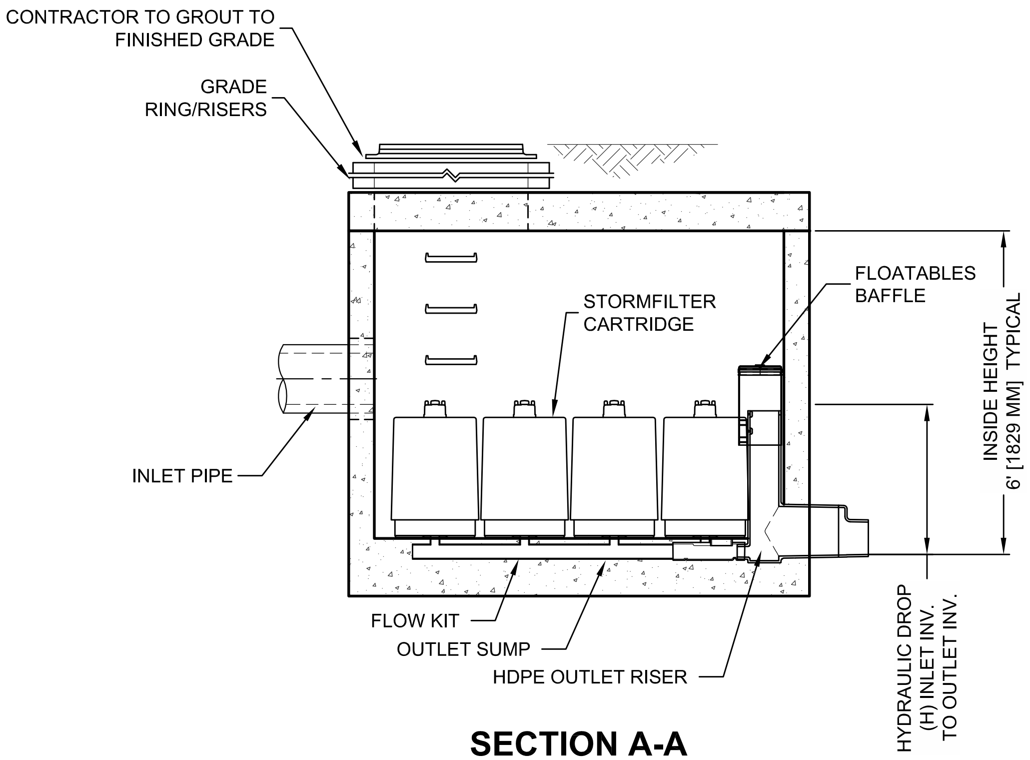


Appendix E:
Details (LIDA Facilities & Contech)



PLAN VIEW

STANDARD OUTLET RISER
FLOWKIT: 43A



SECTION A-A

The Stormwater Management StormFilter®

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,322,629; 5,524,576; 5,707,527; 5,985,157; 6,027,639; 6,649,048; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

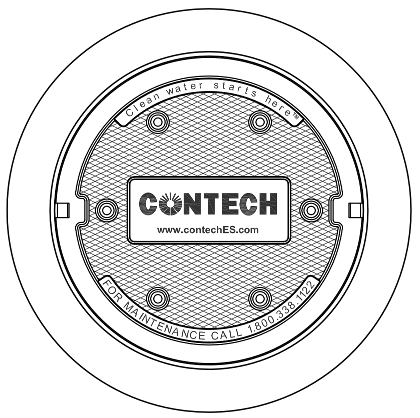
STORMFILTER DESIGN NOTES

STORMFILTER TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. THE STANDARD MANHOLE STYLE IS SHOWN WITH THE MAXIMUM NUMBER OF CARTRIDGES (14). VOLUME SYSTEM IS ALSO AVAILABLE WITH MAXIMUM 14 CARTRIDGES. Ø8'-0" [2438 mm] MANHOLE STORMFILTER PEAK HYDRAULIC CAPACITY IS 1.8 CFS [51 L/s] . IF THE SITE CONDITIONS EXCEED 1.8 CFS [51 L/s] AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

CARTRIDGE SELECTION

CARTRIDGE HEIGHT	27" [686 mm]			18" [458 mm]			LOW DROP		
RECOMMENDED HYDRAULIC DROP (H)	3.05' [930 mm]			2.3' [700 mm]			1.8' [550 mm]		
SPECIFIC FLOW RATE (gpm/sf) [L/s/m^2]	2 [1.30]	1.67* [1.08]	1 [0.65]	2 [1.30]	1.67* [1.08]	1 [0.65]	2 [1.30]	1.67* [1.08]	1 [0.65]
CARTRIDGE FLOW RATE (gpm) [L/s]	22.5 [1.42]	18.79 [1.19]	11.25 [0.71]	15 [0.95]	12.53 [0.79]	7.5 [0.44]	10 [0.63]	8.35 [0.54]	5 [0.32]

* 1.67 gpm/sf [1.08 L/s/m^2] SPECIFIC FLOW RATE IS APPROVED WITH PHOSPHOSORB® (PSORB) MEDIA ONLY



FRAME AND COVER

(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			*
WATER QUALITY FLOW RATE (cfs) [L/s]			*
PEAK FLOW RATE (cfs) [L/s]			*
RETURN PERIOD OF PEAK FLOW (yrs)			*
CARTRIDGE HEIGHT (SEE TABLE ABOVE)			*
NUMBER OF CARTRIDGES REQUIRED			*
CARTRIDGE FLOW RATE			*
MEDIA TYPE (PERLITE, ZPG, PSORB)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE #1	*	*	*
INLET PIPE #2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*
NOTES/SPECIAL REQUIREMENTS:			

* PER ENGINEER OF RECORD

GENERAL NOTES

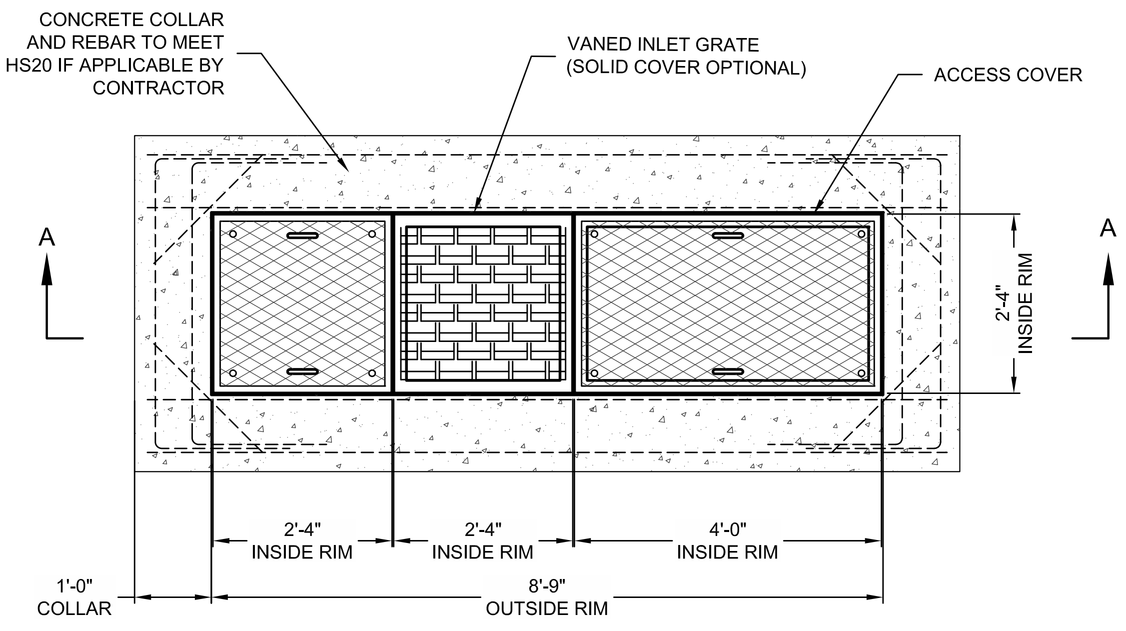
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR SITE SPECIFIC DRAWINGS WITH DETAILED VAULT DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS-20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 5' [1524 mm] AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
6. FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. RADIAL MEDIA DEPTH SHALL BE 7-INCHES [178 mm]. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST 38 SECONDS.
7. SPECIFIC FLOW RATE IS EQUAL TO THE FILTER TREATMENT CAPACITY (gpm) [L/s] DIVIDED BY THE FILTER CONTACT SURFACE AREA (sq ft)[m^2].
8. STORMFILTER STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES

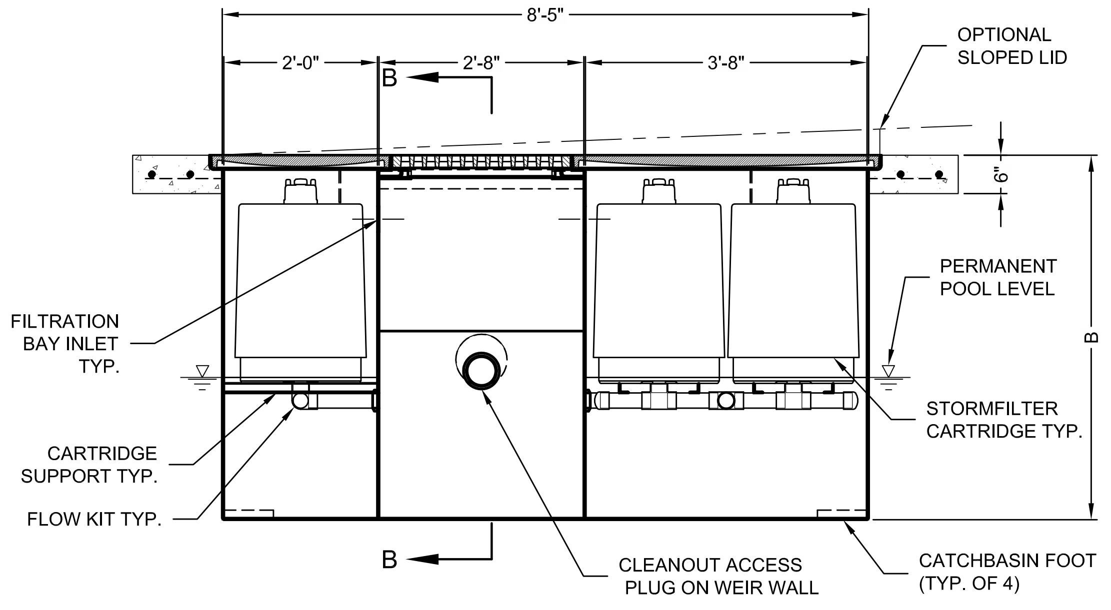
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET PIPE(S).
E. CONTRACTOR TO PROVIDE AND INSTALL CONNECTOR TO THE OUTLET RISER STUB. STORMFILTER EQUIPPED WITH A DUAL DIAMETER HDPE OUTLET STUB AND SAND COLLAR. IF OUTLET PIPE IS LARGER THAN 8 INCHES [200 mm], CONTRACTOR TO REMOVE THE 8 INCH [200 mm] OUTLET STUB AT MOLDED-IN CUT LINE. COUPLING BY FERNCO OR EQUAL AND PROVIDED BY CONTRACTOR.
F. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.

CONTECH®
ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

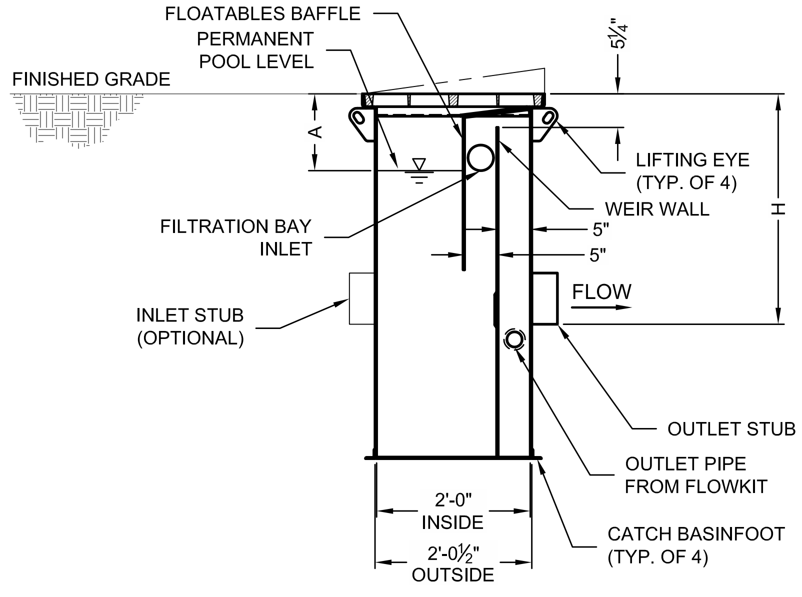
SFMH96
STORMFILTER
STANDARD DETAIL



PLAN VIEW



SECTION A-A



SECTION B-B

The Stormwater Management StormFilter®

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,322,629; 5,524,576; 5,707,527; 5,985,157; 6,027,639; 6,649,048; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

STORMFILTER STEEL CATCHBASIN DESIGN NOTES

STORMFILTER TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. 3 CARTRIDGE CATCHBASIN HAS A MAXIMUM OF THREE CARTRIDGES. SYSTEM IS SHOWN WITH A 27" CARTRIDGE, AND IS ALSO AVAILABLE WITH AN 18" CARTRIDGE. STORMFILTER CATCHBASIN CONFIGURATIONS ARE AVAILABLE WITH A DRY INLET BAY FOR VECTOR CONTROL.
PEAK HYDRAULIC CAPACITY PER TABLE BELOW. IF THE SITE CONDITIONS EXCEED PEAK HYDRAULIC CAPACITY, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

CARTRIDGE SELECTION

CARTRIDGE HEIGHT	27"			18"			18" DEEP		
RECOMMENDED HYDRAULIC DROP (H)	3.05'			2.3'			3.3'		
SPECIFIC FLOW RATE (gpm/sf)	2 gpm/sf	1.67* gpm/sf	1 gpm/sf	2 gpm/sf	1.67* gpm/sf	1 gpm/sf	2 gpm/sf	1.67* gpm/sf	1 gpm/sf
CARTRIDGE FLOW RATE (gpm)	22.5	18.79	11.25	15	12.53	7.5	15	12.53	7.5
PEAK HYDRAULIC CAPACITY	1.0			1.0			1.8		
INLET PERMANENT POOL LEVEL (A)	1'-0"			1'-0"			2'-0"		
OVERALL STRUCTURE HEIGHT (B)	4'-9"			3'-9"			4'-9"		

* 1.67 gpm/sf SPECIFIC FLOW RATE IS APPROVED WITH PHOSPHOSORB® (PSORB) MEDIA ONLY

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STORMFILTER CATCHBASIN STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ANGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
3. STORMFILTER CATCHBASIN WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
4. INLET SHOULD NOT BE LOWER THAN OUTLET. INLET (IF APPLICABLE) AND OUTLET PIPING TO BE SPECIFIED BY ENGINEER AND PROVIDED BY CONTRACTOR.
5. MANUFACTURER TO APPLY A SURFACE BEAD WELD IN THE SHAPE OF THE LETTER "O" ABOVE THE OUTLET PIPE STUB ON THE EXTERIOR SURFACE OF THE STEEL SFCB.
6. STORMFILTER CATCHBASIN EQUIPPED WITH 4 INCH (APPROXIMATE) LONG STUBS FOR INLET (IF APPLICABLE) AND OUTLET PIPING. STANDARD OUTLET STUB IS 8 INCHES IN DIAMETER. MAXIMUM OUTLET STUB IS 15 INCHES IN DIAMETER. CONNECTION TO COLLECTION PIPING CAN BE MADE USING FLEXIBLE COUPLING BY CONTRACTOR.
7. STEEL STRUCTURE TO BE MANUFACTURED OF 1/4 INCH STEEL PLATE. CASTINGS SHALL MEET AASHTO M306 LOAD RATING. TO MEET HS20 LOAD RATING ON STRUCTURE, A CONCRETE COLLAR IS REQUIRED. WHEN REQUIRED, CONCRETE COLLAR WITH #4 REINFORCING BARS TO BE PROVIDED BY CONTRACTOR.
8. FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. RADIAL MEDIA DEPTH SHALL BE 7-INCHES. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST 38 SECONDS.
9. SPECIFIC FLOW RATE IS EQUAL TO THE FILTER TREATMENT CAPACITY (gpm) DIVIDED BY THE FILTER CONTACT SURFACE AREA (sq ft).

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CATCHBASIN (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.

3-CARTRIDGE CATCHBASIN STORMFILTER DATA

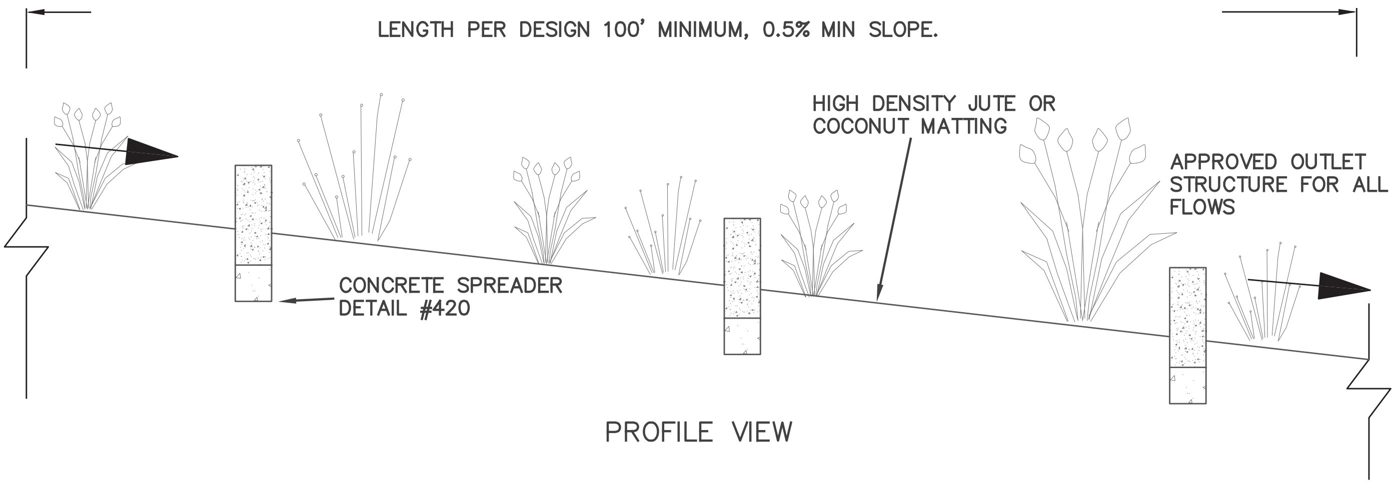
STRUCTURE ID		XXX
WATER QUALITY FLOW RATE (cfs)		X.XX
PEAK FLOW RATE (<1 cfs)		X.XX
RETURN PERIOD OF PEAK FLOW (yrs)		XXX
CARTRIDGE FLOW RATE (gpm)		XX
MEDIA TYPE (PERLITE, ZPG, PSORB)		XXXXX
RIM ELEVATION		XXX.XX'
PIPE DATA:	I.E.	DIAMETER
INLET STUB	XXX.XX'	XX"
OUTLET STUB	XXX.XX'	XX"

CONFIGURATION

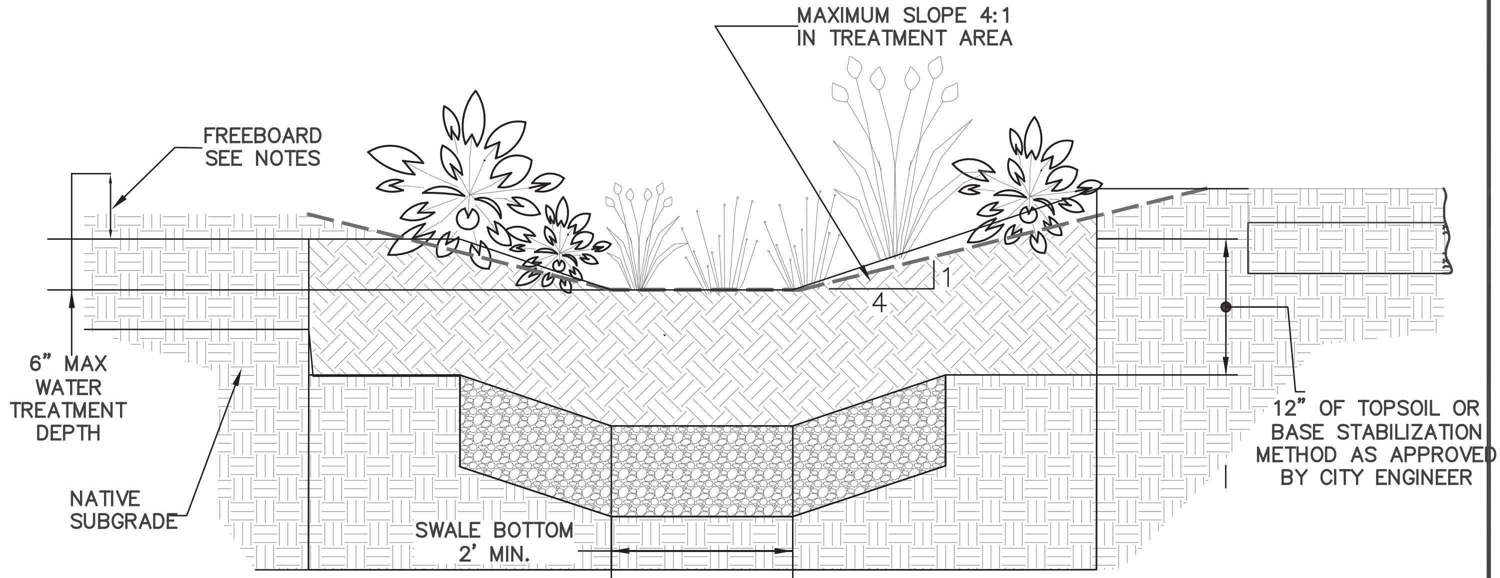
SLOPED LID	YES\NO
SOLID COVER	YES\NO
NOTES/SPECIAL REQUIREMENTS:	

CONTECH® ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-526-3999 513-645-7000 513-645-7993 FAX

3 CARTRIDGE CATCHBASIN STORMFILTER STANDARD DETAIL



PROFILE VIEW



CROSS–SECTIONAL VIEW WITH ON STREET PARKING

HYDRAULIC DESIGN CRITERIA:

1. DESIGN FLOW: WATER QUALITY FLOW
2. MIN. HYDRAULIC RESIDENCE TIME: 9 MINUTES
3. MAXIMUM WATER DESIGN DEPTH: 0.5 FEET
4. MINIMUM FREE BOARD: 1.0 FOOT (FOR FACILITIES NOT NOT PROTECTED FROM HIGH FLOWS)
5. MANNING "n" VALUE: 0.24
6. MAXIMUM VELOCITY: 2.0 fps BASED ON 25–YEAR FLOW

FACILITY DESIGN CRITERIA:

1. UP UNTIL THE MAX WATER SURFACE, INTERIOR SIDE SLOPES, MAX SLOPE IS 4H:1V
2. ABOVE MAX WATER SURFACE, INTERIOR SIDE SLOPES, MAX SLOPE IS 2H:1V
3. IF INTERIOR SIDE SLOPES MUST BE MOWED SIDE SLOPE THEN THE MAX SLOPE IS 4H:1V
4. EXTERIOR SIDE SLOPES MAX 2H:1V
5. MINIMUM FREEBOARD 1 FOOT FROM 25 YEAR DESIGN WATER SURFACE ELEVATION
6. PROVIDE AN ENERGY DISSIPATER AT THE ENTRANCE OF SWALE, WITH A MINIMUM LENGTH OF 4 FEET. IT WILL BE DESIGNED TO REDUCE VELOCITIES AND SPREAD THE FLOW ACROSS THE TREATMENT CROSS SECTION.

FACILITY DESIGN CRITERIA:

7. THE USE OF INTERMEDIATE FLOW SPREADERS IS REQUIRED, SPACING FOR CONCRETE SPREADERS TO BE DETERMINED BY DESIGN ENGINEER.
8. EXTEND RIVER ROCK, TOPSOIL, AND HIGH DENSITY JUTE OR COCONUT MATTING TO TOP OF TREATMENT AREA (OR WQV LEVEL). EXTEND TOPSOIL AND LOW DENSITY JUTE MATTING TO THE EDGE OF WATER QUALITY TRACT.
9. WHERE SWALES WRAP 180–DEGREES FORMING PARALLEL CHANNELS, FREEBOARD SHALL BE PROVIDED BETWEEN EACH OF THE PARALLEL CHANNELS. A 1 FOOT WALL ABOVE GROUND SURFACE MAY ALSO BE USED. ALTERNATIVE: A SOIL BASED BERM WITH A MIN. TOP WIDTH OF 1 FOOT & MAX 2.5H:1V SIDE SLOPES MAY BE USED.
10. WHERE SWALES ARE DESIGNED WITH DITCH INLETS & OUTLET STRUCTURES & DESIGN OF MAINTENANCE ACCESS TO SUCH STRUCTURES MAY BE DIFFICULT DUE TO SWALE LOCATION, SWALES MAYBE DESIGNED AS FLOW THROUGH FACILITIES WITH UNSUMPED STRUCTURES. MAINTENANCE ACCESS TO STRUCTURE END OF THE FACILITY IS REQUIRED.

City of Newberg

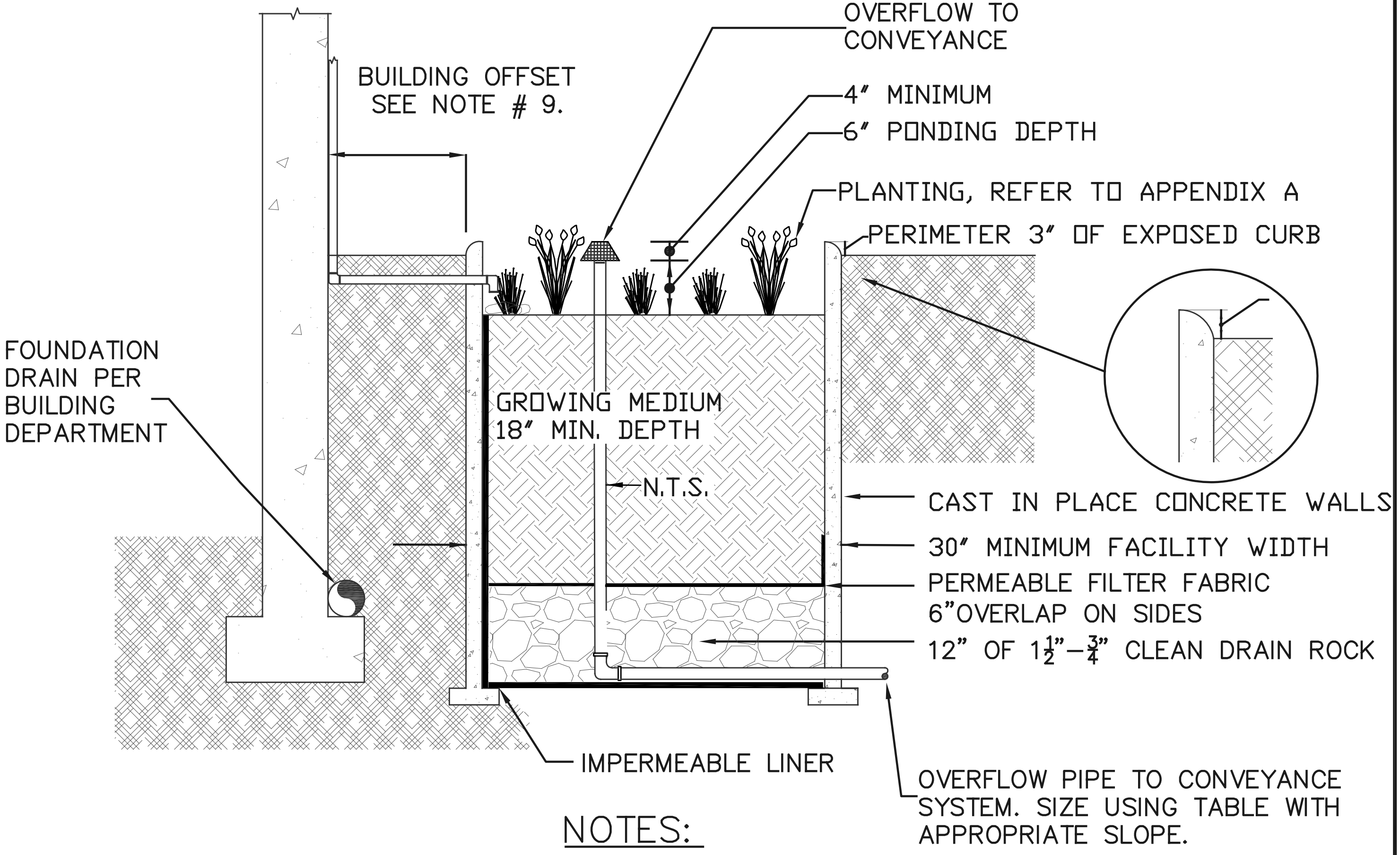
PUBLIC WORKS ENGINEERING DIVISION
414 E. FIRST STREET NEWBERG, OR 97132
PHONE: 503-537-1240
FAX: 503-537-1277

REVISIONS:

VEGETATED SWALE

SCALE: N.T.S.
DATE: MARCH 2014
APPROVED BY: JAY H.
STANDARD DRAWING 460

PRIVATE/ PUBLIC WATER QUALITY & QUANTITY TREATMENT



NOTES:

1. MAXIMUM SLOPE OF PLANTER 0.5%.
2. NO TREES OR DEEP ROOTED VEGETATION OVER PIPING IS ALLOWED IN FACILITY.
3. STORM PIPING TO FACILITY THROUGH WALL CORE HOLES, MAINTAIN MAXIMUM DISTANCE FROM THE OVERFLOW PIPE AS POSSIBLE.
4. PRIVATE OVERFLOW PIPE TO BE MINIMUM SPECIFIED IN PLUMBING CODE, SEE TABLE. PUBLIC FACILITIES SHALL BE SIZED TO CONVEY THE 25 YEAR STORM.
5. ENERGY DISSIPATERS REQUIRED AT WATER ENTRANCES MINIMUM 18"X18"X6" OF 4 TO 6 INCH ANGULAR RIPRAP.
6. PERMEABLE FILTER FABRIC REQUIRED BETWEEN LAYERS
7. IMPERMEABLE LINER REQUIRED AT FACILITY BOTTOM AND ON WALLS ADJACENT TO STRUCTURES (AS SHOWN).
8. "PARTIAL" INFILTRATION FACILITIES ARE ENCOURAGED. IMPERMEABLE LINER LOCATED AT FACILITY BOTTOM, MAY BE REMOVED FOR "PARTIAL" INFILTRATION, APPROVAL BY DESIGN PROFESSIONAL AND BUILDING DEPARTMENT REQUIRED.
9. BUILDING OFFSET REQUIRED ONLY WHEN INFILTRATING, 10 FT MINIMUM.
10. MUST BE LOCATED A MINIMUM OF 3 FT FROM ADJACENT PROPERTY LINE.

OVERFLOW PIPE SIZE (1/8 in./ft. SLOPE)

MAX PROJECT ROOF AREA (ft.)	OVERFLOW PIPE SIZE (in.)
822	3
1,880	4
3,340	6

OVERFLOW PIPE SIZE (1/4 in./ft. SLOPE)

MAX PROJECT ROOF AREA (ft.)	OVERFLOW PIPE SIZE (in.)
1,160	3
2,650	4
4,720	6

City of Newberg

PUBLIC WORKS ENGINEERING DIVISION
414 E. FIRST STREET NEWBERG, OR 97132
PHONE: 503-537-1240
FAX: 503-537-1277

REVISIONS:

FLOW THROUGH PLANTER

SCALE: N.T.S.
DATE: MARCH 2014
APPROVED BY: JAY H.
STANDARD DRAWING 452

Appendix F:
Operations and Maintenance Plan

LIDA Swale Operation and Maintenance Plan

Annual inspections are required. It is recommended that the facility is inspected on a monthly basis to ensure proper function. The plan below describes inspection and maintenance activities, and may be used as an inspection log. Contact the design engineer, Clean Water Services or City representative for more information.

Identified Problem	Condition to Check for	Maintenance Activity	Maintenance Timing	✔ Task Complete Comments
Sediment Accumulation in Treatment Area	Sediment depth exceeds 3 inches	Remove sediment deposits in treatment area. Swale should be level from side to side and drain freely toward outlet	SUMMER FALL Ideally in Dry Season	
Standing Water	Standing water in the swale between storms that does not drain freely	Remove sediment or trash blockages; improve grade from end to end of swale; no standing water 24 hours after any major storm (1 inch in 24 hours)	WINTER SPRING Inspect after any major storm (1-inch in 24 hours)	
Flow Not Distributed Evenly	Flows unevenly distributed through swale due to uneven or clogged flow spreader	Level the spreader and clean so that flows spread evenly over entire swale width	As Needed	
Poor Vegetation Coverage	80% survival of approved vegetation and no bare areas large enough to affect function of facility	Determine cause of poor growth and correct the condition; replant with plugs or containerized plants per approved plans and applicable standards at time of construction. Remove excessive weeds and all invasive plants.	FALL SPRING Ideal time to plant is Spring and Fall seasons	
Excessive Vegetation	Vegetation grows so tall it competes with or shades approved emergent wetland grass/shrubs; interferes with access or becomes a fire danger	Prune overhanging limbs if possible. Prune emergent wetland grass/shrubs that have become overgrown	SPRING Ideal time to prune emergent wetland grass is Spring	

LIDA Swale Operation and Maintenance Plan (continued)

Annual inspections are required. It is recommended that the facility is inspected on a monthly basis to ensure proper function. The plan below describes inspection and maintenance activities, and may be used as an inspection log. Contact the design engineer, Clean Water Services or City representative for more information.

Identified Problem	Condition to Check for	Maintenance Activity	Maintenance Timing	✔ Task Complete Comments
Invasive Vegetation as outlined in Appendix A	Invasive vegetation found in facility. Reed Canary Grass; Teasel, English Ivy; Nightshade; Clematis; Cattail, Thistle; Scotch Broom	Remove excessive weeds and all invasive plants. Attempt to control even if complete eradication is not feasible. Refer to Clean Water Services Integrated Pest Management Plan for appropriate control methods, including proper use of chemical treatment	SPRING SUMMER FALL	
Hazard Trees	Observed dead, dying or diseased trees	Remove hazard trees. A certified arborist may need to determine health of tree or removal requirements	As Needed	
Obstructed Inlet/Outlet	Material such as vegetation, sediment or debris is blocking more than 10% of the inlet/outlet pipe	Remove blockages from facility	WINTER SPRING Inspect after any major storm (1-inch in 24 hours)	
Damage to Outlet Structure	Outlet structure damage may include a grate that is missing or not in place. Grate may have broken members or have a damaged frame	Grate must be in place and meet design standards. Replace or repair grate and ensure grate is firmly attached	As Needed	
Erosion	Erosion or channelization that impacts or effects the function of the facility or creates a safety concern Evidence of trash, debris or dumping	Repair eroded areas and stabilized using proper erosion control measures. Establish appropriate vegetation as needed	FALL WINTER SPRING	

LIDA Swale Operation and Maintenance Plan (continued)

Annual inspections are required. It is recommended that the facility is inspected on a monthly basis to ensure proper function. The plan below describes inspection and maintenance activities, and may be used as an inspection log. Contact the design engineer, Clean Water Services or City representative for more information.

Identified Problem	Condition to Check for	Maintenance Activity	Maintenance Timing	✔ Task Complete Comments
Trash and Debris		Remove trash and debris from facility. Dispose of properly	SPRING SUMMER FALL WINTER	
Contamination and Pollution	Evidence of oil, gasoline, contaminants, or other pollutants. Look for sheens, odor or other signs of contamination	Locate source of contamination and correct. Remove oil using oil-absorbent pads or vactor truck. If low levels of oil persist plant wetland plants that can uptake small concentrations of oil such as Juncus effuses. (soft rush) If high levels of contaminants or pollutants are present, coordinate removal/ cleanup with local jurisdiction	SPRING SUMMER FALL WINTER	
Vector Control	General evidence of rodents or water piping through facility via rodent holes. Insects such as wasps and hornets interfere with maintenance/ inspection activities	Repair facility if damaged. Remove harmful insects, use professional if needed. Refer to Clean Water Services Integrated Pest Management Plan for management options	As Needed	
Damage to Outlet Structure	Damage to Frame or Top Slab. Frame not sitting flush on top slab (more than ¾ inch between frame and top slab); frame not securely attached	Ensure frame is firmly attached and sits flush on the riser rings or top slab	As Needed	
Damage to Outlet Structure	Fractures or Cracks in Walls or Bottom. Maintenance person determines the structure is unsound. Soil entering structure through cracks	Structure replaced or repaired to design standards	As Needed	

Flow-Through Planter Operation and Maintenance Plan

Annual inspections are required. It is recommended that the facility is inspected on a monthly basis to ensure proper function. The plan below describes inspection and maintenance activities, and may be used as an inspection log. Contact the design engineer, Clean Water Services or City representative for more information.

Identified Problem	Condition to Check for	Maintenance Activity	Maintenance Timing	✔ Task Complete Comments
Sediment Accumulation in Treatment Area	Sediment depth exceeds 3 inches	Remove sediment from treatment area. Ensure planter is level from side to side and drains freely toward outlet; no standing water within 24 hours after any major storm (1-inch in 24 hours)	SUMMER FALL Ideally in dry season	
Erosion	Erosion or channelization that impacts or effects the function of the facility or creates a safety concern	Repair eroded areas and stabilized using proper erosion control measures Establish appropriate vegetation as needed	FALL WINTER SPRING Inspect after major storm (1-inch in 24 hours)	
Standing Water	Standing water in the planter between storms that does not drain freely. Water should drain after 24 hours of dry weather.	Remove sediment or trash blockages. Grade out areas of mounding and improve end to end grade so there is no standing water.	WINTER SPRING	
Flow Not Distributed Evenly	Flow unevenly distributed through planter width due to uneven or clogged flow spreader	Level the spreader and clean so that flows spread evenly over entire planter width	WINTER SPRING	
Obstructed Inlet/Outlet	Material such as vegetation, sediment, trash is blocking more than 10% of the inlet/outlet pipe	Remove blockages from facility	WINTER SPRING Inspect after major storm (1-inch in 24 hours)	

Flow-Through Planter Operation and Maintenance Plan (continued)

Annual inspections are required. It is recommended that the facility is inspected on a monthly basis to ensure proper function. The plan below describes inspection and maintenance activities, and may be used as an inspection log. Contact the design engineer, Clean Water Services or City representative for more information.

Identified Problem	Condition to Check for	Maintenance Activity	Maintenance Timing	✔ Task Complete Comments
Poor Vegetation Coverage	80% survival of approved vegetation and no bare areas large enough to affect function of facility.	Determine cause of poor growth and correct the condition; replant with plugs or containerized plants per approved plans and applicable standards at time of construction. Remove excessive weeds and all invasive plants.	SPRING FALL Ideal time to plant is spring and fall seasons	
Invasive Vegetation as outlined in Appendix A	Invasive vegetation found in facility. Examples include: Himalayan Blackberry; Reed Canary Grass; Teasel, English Ivy, Nightshade, Clematis, Cattail, Thistle	Remove excessive weeds and all invasive plants. Attempt to control even if complete eradication is not feasible. Refer to Clean Water Services Integrated Pest Management Plan for appropriate control methods, including proper use of chemical treatment.	SPRING SUMMER FALL	
Excessive Vegetation	Vegetation grows so tall it competes with or shades approved emergent wetland grass/shrubs; interferes with access or becomes a fire danger	Prune over-hanging limbs, if possible; remove brushy vegetation as needed. Prune emergent wetland grass/shrubs that have become overgrown.	SPRING Ideal time to prune emergent wetland grass is spring	
Vector Control	Evidence of rodents or water flowing through facility via rodent holes. Harmful insects such as wasps or hornets present	Repair damage to facility. Remove harmful insects, call professional if needed. Refer to Clean Water Services Integrated Pest Management Plan for management options.	As Needed	

Flow-Through Planter Operation and Maintenance Plan (continued)

Annual inspections are required. It is recommended that the facility is inspected on a monthly basis to ensure proper function. The plan below describes inspection and maintenance activities, and may be used as an inspection log. Contact the design engineer, Clean Water Services or City representative for more information.

Identified Problem	Condition to Check for	Maintenance Activity	Maintenance Timing	✔ Task Complete Comments
Trash and Debris	Visual evidence of trash, debris or dumping.	Remove and dispose of trash and debris from facility. Dispose of properly	SPRING SUMMER FALL WINTER	
Contamination and Pollution	Evidence of oil, gasoline, contaminants, or other pollutants. Look for sheens, odor or signs of contamination.	If contaminants or pollutants present, coordinate removal/cleanup with local jurisdiction.	SPRING SUMMER FALL WINTER	
Outlet Structure Damaged	Grate or overflow structure is missing or only partially in place and may have missing or broken grate members.	Repair or replace outlet structure.	As Needed	

CONTECH®
ENGINEERED SOLUTIONS

StormFilter Inspection and Maintenance Procedures

The Stormwater Management StormFilter®

Maintenance Guidelines

The primary purpose of the Stormwater Management StormFilter® is to filter and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the StormFilter to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is a good practice to inspect the system after major storm events.

Maintenance Procedures

Although there are many effective maintenance options, we believe the following procedure to be efficient, using common equipment and existing maintenance protocols. The following two-step procedure is recommended::

1. **Inspection**
   - Inspection of the vault interior to determine the need for maintenance.
2. **Maintenance**
   - Cartridge replacement
   - Sediment removal

Inspection and Maintenance Timing

At least one scheduled inspection should take place per year with maintenance following as warranted.

First, an inspection should be done before the winter season. During the inspection the need for maintenance should be determined and, if disposal during maintenance will be required, samples of the accumulated sediments and media should be obtained.

Second, if warranted, a maintenance (replacement of the filter cartridges and removal of accumulated sediments) should be performed during periods of dry weather.

In addition to these two activities, it is important to check the condition of the StormFilter unit after major storms for potential damage caused by high flows and for high sediment accumulation that may be caused by localized erosion in the drainage area. It may be necessary to adjust the inspection/ maintenance schedule depending on the actual operating conditions encountered by the system. In general, inspection activities can be conducted at any time, and maintenance should occur, if warranted, during dryer months in late summer to early fall.

Maintenance Frequency

The primary factor for determining frequency of maintenance for the StormFilter is sediment loading.

A properly functioning system will remove solids from water by trapping particulates in the porous structure of the filter media inside the cartridges. The flow through the system will naturally decrease as more and more particulates are trapped. Eventually the flow through the cartridges will be low enough to require replacement. It may be possible to extend the usable span of the cartridges by removing sediment from upstream trapping devices on a routine as-needed basis, in order to prevent material from being re-suspended and discharged to the StormFilter treatment system.

The average maintenance lifecycle is approximately 1-5 years. Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction may need to be inspected and maintained more often than those with fully stabilized surface conditions.

Regulatory requirements or a chemical spill can shift maintenance timing as well. The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after major storms. Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual StormFilter system or site. It is recommended that the site owner develop a database to properly manage StormFilter inspection and maintenance programs..

Inspection Procedures

The primary goal of an inspection is to assess the condition of the cartridges relative to the level of visual sediment loading as it relates to decreased treatment capacity. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, then maintenance is warranted and the cartridges need to be replaced.

Warning: In the case of a spill, the worker should abort inspection activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct an inspection:

Important: Inspection should be performed by a person who is familiar with the operation and configuration of the StormFilter treatment unit.

1. If applicable, set up safety equipment to protect and notify surrounding vehicle and pedestrian traffic.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the access portals to the vault and allow the system vent.
4. Without entering the vault, visually inspect the inside of the unit, and note accumulations of liquids and solids.
5. Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the flow of water per drainage pipe. Record all observations. Digital pictures are valuable for historical documentation.
6. Close and fasten the access portals.
7. Remove safety equipment.
8. If appropriate, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.
9. Discuss conditions that suggest maintenance and make decision as to weather or not maintenance is needed.

Maintenance Decision Tree

The need for maintenance is typically based on results of the inspection. The following Maintenance Decision Tree should be used as a general guide. (Other factors, such as Regulatory Requirements, may need to be considered)

1. Sediment loading on the vault floor.
   a. If >4" of accumulated sediment, maintenance is required.
2. Sediment loading on top of the cartridge.
   a. If >1/4" of accumulation, maintenance is required.
3. Submerged cartridges.
   a. If >4" of static water above cartridge bottom for more than 24 hours after end of rain event, maintenance is required. (Catch basins have standing water in the cartridge bay.)
4. Plugged media.
   a. If pore space between media granules is absent, maintenance is required.
5. Bypass condition.
   a. If inspection is conducted during an average rain fall event and StormFilter remains in bypass condition (water over the internal outlet baffle wall or submerged cartridges), maintenance is required.
6. Hazardous material release.
   a. If hazardous material release (automotive fluids or other) is reported, maintenance is required.
7. Pronounced scum line.
   a. If pronounced scum line (say ≥ 1/4" thick) is present above top cap, maintenance is required.

Maintenance

Depending on the configuration of the particular system, maintenance personnel will be required to enter the vault to perform the maintenance.

Important: If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flows is occurring.

Replacement cartridges can be delivered to the site or customers facility. Information concerning how to obtain the replacement cartridges is available from Contech Engineered Solutions.

Warning: In the case of a spill, the maintenance personnel should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct cartridge replacement and sediment removal maintenance:

1. If applicable, set up safety equipment to protect maintenance personnel and pedestrians from site hazards.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the doors (access portals) to the vault and allow the system to vent.
4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.
5. Make notes about the external and internal condition of the vault. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.
6. Using appropriate equipment offload the replacement cartridges (up to 150 lbs. each) and set aside.
7. Remove used cartridges from the vault using one of the following methods:

Method 1:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

Using appropriate hoisting equipment, attach a cable from the boom, crane, or tripod to the loose cartridge. Contact Contech Engineered Solutions for suggested attachment devices.

B. Remove the used cartridges (up to 250 lbs. each) from the vault.

Important: Care must be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner.

C. Set the used cartridge aside or load onto the hauling truck.

D. Continue steps a through c until all cartridges have been removed.

Method 2:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

B. Unscrew the cartridge cap.

C. Remove the cartridge hood and float.

D. At location under structure access, tip the cartridge on its side.

E. Empty the cartridge onto the vault floor. Reassemble the empty cartridge.

F. Set the empty, used cartridge aside or load onto the hauling truck.

G. Continue steps a through e until all cartridges have been removed.

8. Remove accumulated sediment from the floor of the vault and from the forebay. This can most effectively be accomplished by use of a vacuum truck.
9. Once the sediments are removed, assess the condition of the vault and the condition of the connectors.
10. Using the vacuum truck boom, crane, or tripod, lower and install the new cartridges. Once again, take care not to damage connections.
11. Close and fasten the door.
12. Remove safety equipment.
13. Finally, dispose of the accumulated materials in accordance with applicable regulations. Make arrangements to return the used **empty** cartridges to Contech Engineered Solutions.

Related Maintenance Activities - Performed on an as-needed basis

StormFilter units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

In order for maintenance of the StormFilter to be successful, it is imperative that all other components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

Inspection Report

Date: Personnel:

Location:________________________ System Size: ____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

Sediment Thickness in Forebay: __________________________________ Date: ____________

Sediment Depth on Vault Floor: ____

Structural Damage: ____

Estimated Flow from Drainage Pipes (if available):________________________________

Cartridges Submerged: Yes ☐ No ☐ Depth of Standing Water:________________________

StormFilter Maintenance Activities (check off if done and give description)

☐ Trash and Debris Removal: ____

☐ Minor Structural Repairs: ____

☐ Drainage Area Report ____

Excessive Oil Loading:	Yes ☐	No ☐	Source: ____________________
Sediment Accumulation on Pavement:	Yes ☐	No ☐	Source: ____________________
Erosion of Landscaped Areas:	Yes ☐	No ☐	Source: ____________________

Items Needing Further Work: ____

Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals.

Other Comments:

____

____

____

____

____

____

____

____

Review the condition reports from the previous inspection visits.

StormFilter Maintenance Report

Date: ____________________ Personnel: ____________________

Location: ____________________ System Size: ____________________

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

List Safety Procedures and Equipment Used: ____________________

____

____

System Observations

Months in Service:

Oil in Forebay (if present): Yes ☐ No ☐

Sediment Depth in Forebay (if present): ____________________

Sediment Depth on Vault Floor: ____________________

Structural Damage: ____________________

Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source: ____________________

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: ____________________

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: ____________________

StormFilter Cartridge Replacement Maintenance Activities

Remove Trash and Debris: Yes ☐ No ☐ Details: ____________________

Replace Cartridges: Yes ☐ No ☐ Details: ____________________

Sediment Removed: Yes ☐ No ☐ Details: ____________________

Quantity of Sediment Removed (estimate?):

Minor Structural Repairs: Yes ☐ No ☐ Details: ____________________

Residuals (debris, sediment) Disposal Methods: ____________________

Notes:

____

____

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____

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____

____

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PAPER

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800-338-1122

www.ContechES.com

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech’s portfolio includes bridges, drainage, sanitary sewer, stormwater and earth stabilization products. For information on other Contech division offerings, visit contech-cpi.com or call 800.338.1122.

Support

- **Drawings and specifications are available at www.conteches.com.**
- **Site-specific design support is available from our engineers.**

800.338.1122
www.conteches.com

Appendix G:
Geotechnical Data Excerpt

Geotechnical Engineering Report

Crestview Crossing Development
Newberg, Oregon

File No. 6748-002-00

March 12, 2018

Prepared for:

J.T. Smith Companies
c/o 3J Consulting, Inc.
5075 SW Griffith Drive, Suite 150
Beaverton, Oregon 97005

Attention: Aaron Murphy, PE

Prepared by:

GeoEngineers, Inc.
1200 NW Naito Parkway, Suite 180
Portland, Oregon 97209
503.624.9274

Tyler A. Pierce, PE
Project Engineer

REGISTERED PROFESSIONAL ENGINEER
60333
OREGON
FEBRUARY 08, 2000
JULIO C VELA

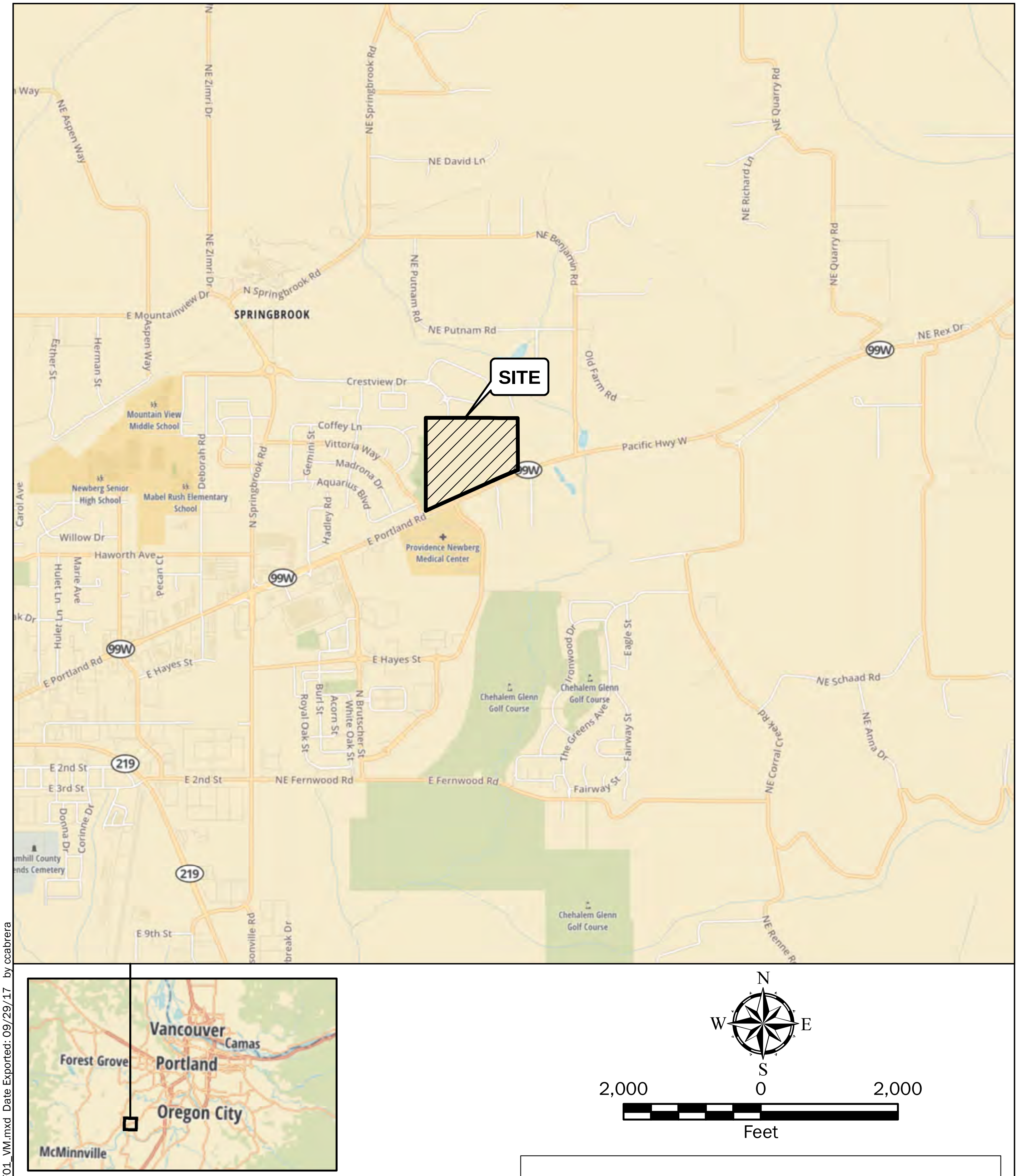
03/12/18

Julio C. Vela, PhD, PE, GE
Principal

EXPIRES: 06/30/18

TAP:JCV:cje

GeoEngineers



Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Mapbox Open Street Map, 2017

Projection: NAD 1983 UTM Zone 10N

Vicinity Map

Crestview Crossing
Newberg, Oregon

GEOENGINEERS

Figure 1

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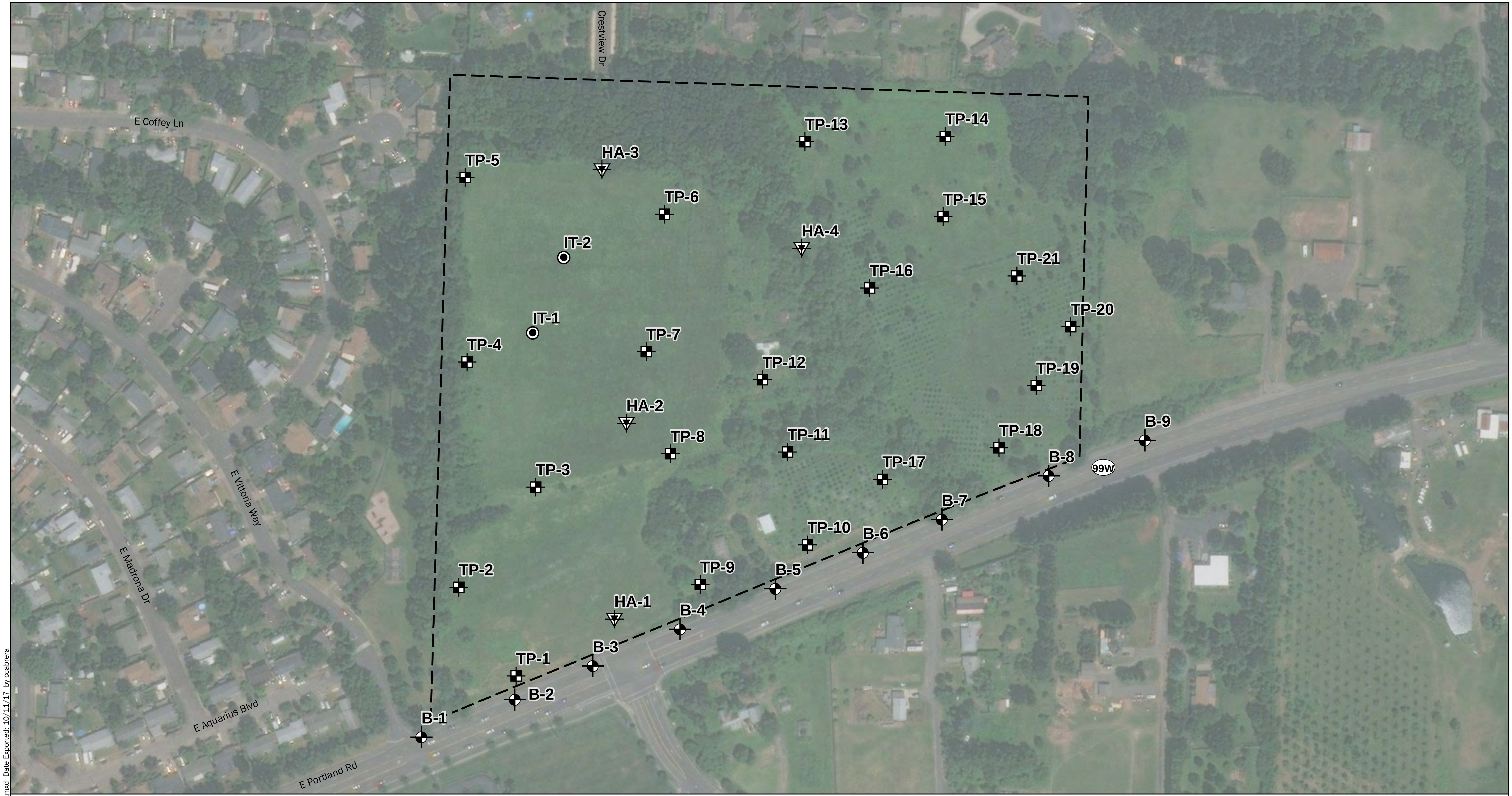


Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Aerial from ESRI ArcGIS Online.
Base image from 3J Consulting, August 8, 2017.

Projection: NAD 1983 HARN StatePlane Oregon North FIPS 3601 IntlFeet

Legend

B-1 ⊕ Boring Number and Approximate Location
HA-1 ▽ Hand Auger Number and Approximate Location
IT-1 ◉ Infiltration Test Number and Approximate Location
TP-1 ▣ Test Pit Number and Approximate Location
[_] Project Approximate Extents

N W E S

200 0 200
Feet

Site Plan

Crestview Crossing
Newberg, Oregon

GeoEngineers

Figure 2

P:\6\6748002\GIS\MXD\674800200_F02_SP.mxd Date Exported: 10/11/17 by ccabrera

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)	○	GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
			○	GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	▥	GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
			▨	GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)	░	SW	WELL-GRADED SANDS, GRAVELLY SANDS
			░	SP	POORLY-GRADED SANDS, GRAVELLY SAND
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	▥	SM	SILTY SANDS, SAND - SILT MIXTURES
			▨	SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	▥	ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
			▨	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			▥	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	▥	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
			▨	CH	INORGANIC CLAYS OF HIGH PLASTICITY
			▨	OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			﹏	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS		TYPICAL DESCRIPTIONS
GRAPH	LETTER	
■	AC	Asphalt Concrete
▨	CC	Cement Concrete
●	CR	Crushed Rock/ Quarry Spalls
⩛	SOD	Sod/Forest Duff
░	TS	Topsoil

Groundwater Contact

▼	**Measured groundwater level in exploration, well, or piezometer**
▼	**Measured free product in well or piezometer**

Graphic Log Contact

——	**Distinct contact between soil strata**
╱	**Approximate contact between soil strata**

Material Description Contact

——	**Contact between geologic units**
– – – –	**Contact between soil of the same geologic unit**

Sampler Symbol Descriptions

◫	**2.4-inch I.D. split barrel**
☒	**Standard Penetration Test (SPT)**
■	**Shelby tube**
☰	**Piston**
◧	**Direct-Push**
◫	**Bulk or grab**
▥	**Continuous Coring**

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

Laboratory / Field Tests

%F	Percent fines
%G	Percent gravel
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DD	Dry density
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
Mohs	Mohs hardness scale
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

Key to Exploration Logs

GeoEngineers

Figure A-1

Drilled	Start 9/21/2017 End 9/21/2017	Total Depth (ft) 6.5	Logged By TAP Checked By TAP	Driller Dan Fischer Excavating, Inc.	Drilling Method Solid-stem Auger
Surface Elevation (ft) 213 Vertical Datum NAVD88		Hammer Data Rope & Cathead 140 (lbs) / 30 (in) Drop		Drilling Equipment Portable Beaver Drill Trailer Mounted	
Easting (X) 7575736 Northing (Y) 608651		System Datum OR State Plane North NAD83 (feet)		Groundwater not observed at time of exploration	
Notes:					

		FIELD DATA										
Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	3 inches asphalt			
								GM	26 inches silty fine to coarse gravel with sand (fill)			
		☒	4	7		1						
								ML	Brown silt (medium stiff, moist)			
210												
	5	☒	18	7		2			Becomes red brown			

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Boring B-4/C-4

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-5
Sheet 1 of 1

Drilled	Start 9/21/2017	End 9/21/2017	Total Depth (ft) 6.5	Logged By TAP Checked By TAP	Driller Dan Fischer Excavating, Inc.
Drilling Method	Solid-stem Auger				
Surface Elevation (ft) Vertical Datum	202 NAVD88	Hammer Data	Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Portable Beaver Drill Trailer Mounted
Easting (X) Northing (Y)	7575936 608735	System Datum	OR State Plane North NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	5½ inches asphalt			
								GM	16½ inches silty fine to coarse gravel with sand (fill)			
200		☒	18	7		1		ML	Brown silt with trace sand (medium stiff, moist)			PP = 2 tsf
	5			4		MC				33		PP = 1 tsf

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Boring B-5/C-5

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-6
Sheet 1 of 1

Drilled	Start 9/21/2017	End 9/21/2017	Total Depth (ft) 6.5	Logged By TAP Checked By TAP	Driller Dan Fischer Excavating, Inc.
Drilling Method	Solid-stem Auger				

Surface Elevation (ft) Vertical Datum	200 NAVD88	Hammer Data	Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Portable Beaver Drill Trailer Mounted
Easting (X) Northing (Y)	7576120 608811	System Datum	OR State Plane North NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

		FIELD DATA										
Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	9½ inches asphalt			
								GP	11½ inches brown fine gravel with sand, trace silt (fill)			
		☒	18	8		1		ML	Brown silt with trace sand (medium stiff, moist)			PP = 2.5 tsf
195	5	☒		6		2			Becomes clayey silt			PP 1.25 tsf

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Date:11/1/17 Path:P:\6\6748002\GINT\674800200.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_STANDARD_%F_NO_GW

Log of Boring B-6/C-6

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-7
Sheet 1 of 1

Drilled	Start 9/21/2017	End 9/21/2017	Total Depth (ft) 4.5	Logged By TAP Checked By TAP	Driller Dan Fischer Excavating, Inc.
Drilling Method	Solid-stem Auger				
Surface Elevation (ft) Vertical Datum	190 NAVD88	Hammer Data	Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Portable Beaver Drill Trailer Mounted
Easting (X) Northing (Y)	7576285 608880	System Datum	OR State Plane North NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

		FIELD DATA										
Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	5½ inches asphalt			
								GM	19½ inches silty gravel (fill)			
		☒		20		1 MC		ML	Orange-brown sandy silt, trace organic matter (very stiff, dry)	32		Organic matter are roots and some burnt Smooth, hard drilling at 4 feet below ground surface Unable to drill past 4½ feet below ground surface. Attempt to sample 50/2" sample. Water is filling up the hole. Public works notified and observed water and stated that it was not from a utility.

Boring terminated due to refusal

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Boring B-7/C-7

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-8
Sheet 1 of 1

Date Excavated 9/21/2017	Total Depth (ft) 9.5	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft) 202 Vertical Datum NAVD88	Easting (X) 7575716 Northing (Y) 609019	Coordinate System OR State Plane North Horizontal Datum NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (soft, moist) (topsoil)			
201	1				ML	Gray silt with trace organic matter (stiff, dry) (tilled zone)			
200	2				CL	Dark gray clay with trace organic matter (very stiff, dry to moist)			
199	3		1 MC				21		
198	4								
197	5								
196	6								
195	7		2		ML	Gray-brown silt with orange mottling (stiff, moist)			
194	8								
193	9								

Test pit completed at 9½ feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-8

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-18
Sheet 1 of 1

Date Excavated	9/21/2017	Total Depth (ft)	11.5	Logged By DMH Checked By TAP	Excavator	Dan Fischer Excavating, Inc.	Groundwater not observed	
					Equipment	CAT 305 E Mini-excavator	Caving not observed	

Surface Elevation (ft) Vertical Datum	210 NAVD88	Easting (X) Northing (Y)	7575778 608744	Coordinate System Horizontal Datum	OR State Plane North NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					ML	Brown silt with organic matter (soft, moist) (topsoil)			
209	1				ML	Brown silt with organic matter (stiff, moist) (native)			
208	2					Grades to trace organic matter			
207	3		1						
206	4								
205	5								
204	6								
203	7								
202	8								
201	9								
200	10								
199	11		2						

Test pit completed at 11½ feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-9

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-19
Sheet 1 of 1

Date Excavated 9/20/2017	Total Depth (ft) 12	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft) 202 Vertical Datum NAVD88	Easting (X) 7576003 Northing (Y) 608827	Coordinate System OR State Plane North Horizontal Datum NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (soft, dry to moist) (topsoil)			
201	1				ML	Light brown silt with organic matter (soft, dry to moist) (tilled zone)			
200	2				ML	Light brown silt (soft, dry to moist) (native)			
199	3		1 MC			Becomes to without organic matter	24		
198	4								
197	5								
196	6								
195	7					Becomes stiff			
194	8								
193	9								
192	10								
191	11								
190	12		2						

Test pit completed at 12 feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-10

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-20
Sheet 1 of 1

Date Excavated	9/20/2017	Total Depth (ft)	11.5	Logged By	DMH	Excavator	Dan Fischer Excavating, Inc.	Groundwater not observed	
				Checked By	TAP	Equipment	CAT 305 E Mini-excavator	Caving not observed	

Surface Elevation (ft)	194	Easting (X)	7575961	Coordinate System	OR State Plane North
Vertical Datum	NAVD88	Northing (Y)	609022	Horizontal Datum	NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (topsoil)			
193	1				ML	Light brown silt with organic matter (medium stiff, dry to moist) (tilled zone)			
192	2				ML	Light brown silt (medium stiff, dry to moist) (native)			
191	3		1			Becomes light brown-gray with black mottling			
190	4								
189	5								
188	6								
187	7								
186	8								
185	9								
184	10								
183	11		2						

Test pit completed at 11½ feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-11

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-21
Sheet 1 of 1

Date Excavated 9/20/2017	Total Depth (ft) 8	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft) 198 Vertical Datum NAVD88	Easting (X) 7575909 Northing (Y) 609174	Coordinate System OR State Plane North Horizontal Datum NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (topsoil)			
					ML	Brown silt with organic matter (medium stiff, moist) (tilled zone)			
197	1								
					ML	Brown silt (medium stiff, moist) (native)			
196	2								
195	3								
194	4								
193	5								
192	6								
191	7								
			1 AL				31		AL (LL = 33; PI = 5)
190	8								

Test pit completed at 8 feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-12

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-22
Sheet 1 of 1

Date Excavated	9/20/2017	Total Depth (ft)	11.5	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft) Vertical Datum	193 NAVD88	Easting (X) Northing (Y)	7576160 608965	Coordinate System Horizontal Datum	OR State Plane North NAD83 (feet)

		SAMPLE							
Elevation (feet)	Depth (feet)	Testing Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (topsoil)			
192	1				ML	Brown silt with organic matter (soft, dry to moist) (tilled zone)			
191	2				ML	Brown silt (soft, dry to moist) (native)			
190	3		1 MC				23		
189	4								
188	5					Becomes soft, moist			
187	6								
186	7								
185	8					Becomes gray-brown with black mottling (soft, moist)			
184	9								
183	10		2						
182	11		3			Becomes light brown with orange mottling			

Test pit completed at 11½ feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-17

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-27
Sheet 1 of 1

For the open pit infiltration testing, test pits were 2 feet wide and 2 to 3 feet long with a testing depth of 1 foot. Approximately 2 inches of clean rock was placed in the bottom of the test locations to help minimize disturbance of the fine-grained materials in the excavation while adding water. Between 12 and 14 inches of water was added to the test pits for a period of 4 hours to saturate the underlying soils.

After the saturation period, the test locations were filled with clean water to at least 1 foot above the bottom of the pipe or excavation. The drop-in water level was measured over a period of 1 hour after the soak period. In the case where the water level falls during the time-measured testing, infiltration rates diminish as a result of less head from the water column in the test. In this test, we observed zero to negligible drops in the water level during the testing period. The field test results are summarized in Table 3.

TABLE 3. INFILTRATION RESULTS

Infiltration Test No.	Test Method	Depth (feet)	USCS Material Type	Field Measured Infiltration Rate[1] (inches/hour)
IT-1	Open Pit	2	ML	0.1
IT-2	Encased Falling Head	3	ML	0.0

Notes:

[1] Appropriate factors should be applied to the field-measured infiltration rate, based on the design methodology and specific system used.

USCS = Unified Soil Classification System

Based on the test results, we do not recommend on-site stormwater disposal unless additional testing is performed and yields higher infiltration rates in other areas of the site, or at different elevations.

The infiltration rates shown in Table 3 are field-measured infiltration rates. These represent a relatively short-term measured rate taken after the required saturation period, and factors of safety have not been applied for the type of infiltration system being considered, or for variability that may be present in the on-site soil. In our opinion, and consistent with the state of the practice, correction factors should be applied to this measured rate to reflect the small area of testing and the number of tests conducted.

During infiltration testing, we observed negligible infiltration rates (effectively zero). If other textural-based infiltration rates (even if they are very low infiltration rates) are used for design, appropriate correction factors should also be applied by the project civil engineer to account for long-term infiltration parameters. From a geotechnical perspective, we recommend a factor of safety (correction factor) of at least 3 be applied to the infiltration values derived from field observations to account for potential soil variability with depth and location within the area tested. In addition, the stormwater system design engineer should determine and apply appropriate remaining correction factor values, or factors of safety, to account for repeated wetting and drying that occur in this area, degree of in-system filtration, frequency and type of system maintenance, vegetation, potential for siltation and bio-fouling, etc., as well as system design correction factors for overflow or redundancy and base and facility size.

The actual depths, lateral extent and estimated infiltration rates can vary from the values presented above. Field testing/confirmation during construction is often required in large or long systems or other situations where soil conditions may vary within the area where the system is constructed. The results of this field testing might necessitate that the infiltration locations be modified to achieve the design infiltration rate.

Location: Newberg, OR
Depth to bottom: 2'
Tester's Name: Danny Hess
Tester's Company: GeoEngineers, Inc.

Date: 9/21/2018
Dimension: 6"

Test Hole Number: IT-1
Test Method: Open Pit Fallin Head
GeoEngineers Job: 6748-002-00

	Depth	**Soil Texture**
	0-2'	Brown silt

Time of Day	Time Interval (min)	Total Time (min)	Depth to Water from Top of Pipe (inches)	Dist. Interval (inches)	Infiltration (inches/hour)	
10:43	0		1.17			Test #1
10:44	1	1	1.21	0.04	2.4	
10:45	1	2	1.23	0.02	1.2	
10:46	1	3	1.25	0.02	1.2	
10:47	1	4	1.27	0.02	1.2	
10:48	1	5	1.29	0.02	1.2	
10:49	1	6	1.31	0.02	1.2	
10:50	1	7	1.33	0.02	1.2	
10:51	1	8	1.36	0.03	1.8	
10:52	1	9	1.38	0.02	1.2	
10:53	1	10	1.38	0.00	0.0	
10:58	5	15	1.44	0.06	0.7	
11:03	5	20	1.50	0.06	0.7	
11:08	5	25	1.54	0.04	0.5	
11:13	5	30	1.58	0.04	0.5	
11:23	10	40	1.64	0.06	0.4	
11:33	10	50	1.70	0.06	0.4	
11:43	10	60	1.74	0.04	0.2	

Location: Newberg, OR
Depth to bottom: 3'
Tester's Name: Danny Hess
Tester's Company: GeoEngineers, Inc.

Date: 9/21/2018
Dimension: 6"

Test Hole Number: IT-2
Test Method: Encased Falling Head
GeoEngineers Job: 6748-002-00

Depth		**Soil Texture**
	0-3'	Brown silt

Time of Day	Time Interval (min)	Total Time (min)	Depth to Water from Top of Pipe (inches)	Dist. Interval (inches)	Infiltration (inches/hour)	
15:00			3.98			Test #1
15:10	10	10	3.98	0.00	0.0	
15:20	10	20	3.98	0.00	0.0	
15:30	10	30	3.98	0.00	0.0	
15:40	10	40	3.98	0.00	0.0	
15:50	10	50	3.99	0.01	0.1	
16:00	10	60	3.99	0.00	0.0	

Appendix H:
Surplus Stormwater Detention Memorandum

3J CONSULTING
9600 SW NIMBUS AVENUE, SUITE 100
BEAVERTON, OREGON 97008
PH: (503) 946.9365
WWW.3JCONSULTING.COM

MEMORANDUM

To: Kaaren Hofmann
City Engineer
City of Newberg
414 E First Street
Newberg, Oregon 97132

From: Kathleen Freeman, PE, CFM
Water Resources Project Manager

Cc: Aaron Murphy, PE
Senior Project Manager

Date: November 10, 2020

Project: **Crestview Crossing**
Project No: **17393**
RE: **Surplus Stormwater Detention**

74498PE
Jan. 8, 2009
KATHLEEN E. FREEMAN
EXPIRES: 12/31/2021

On May 28, 2020, 3J Consulting submitted a Stormwater Management Plan (SWMP) for the proposed Crestview Crossing development. The SWMP detailed how the proposed subdivision site would treat and detain stormwater to the requirements set forth by the following jurisdictions:

- Army Corp of Engineers SLOPES V
- City of Newberg
- ODOT
- DEQ

Two lots in the area will be developed by others. One is the Commercial development to be constructed on the west side of the intermittent stream bisecting the property and the other is a Multi-family development to be constructed on the east side. To obtain permits through Department of Environmental Quality (DEQ), 3J was required to include detention and water quality sizing for the two lots, while the City of Newberg explicitly required the Crestview Crossing SWMP to include the following text:

Both lots will have standalone stormwater facilities and have been included in this report in order to comply with comments and requirements from the Oregon Department of Environmental Quality (DEQ). Calculations and site plans have been provided as guidance for future developers of these lots. Per City requirements, the future commercial and multi-family lots will be required to use the City's Facility Selection Hierarchy with preference beginning with LIDA facilities or show that they cannot be used. This Stormwater Management Plan is not a guarantee of an approved stormwater management plan for the future lots; the City will require the two future developments to provide a detailed stormwater management plan.

Therefore, 3J provided sizing for the two future developments utilizing a very conservative approach (entire areas as Hydrologic soil class C and assuming 100% pervious) and a calculated time of concentration of 20 minutes (assuming dense bermudagrass) during the predeveloped conditions. Additionally, the proposed storm design for the Crestview Crossing did not consider over-detaining for the two future sites in the onsite stormwater management facilities.

Due to the need of filling wetlands on the site, stormwater facilities have been designed to comply with the Standard Local Operating Procedures for Endangered Species (SLOPES V) by the U.S. Army Corps of Engineers (USACE, 2014). The treatment and detention requirements are as follows:

- Capture and detain the 2-year, 24-hour post developed runoff rate to ½ of the 2-year, 24-hour predeveloped discharge rate.
- Capture and detain the 10-year, 24-hour post developed runoff to the 10-year, 24-hour predeveloped discharge rate.

In addition to the SLOPES V requirements, the City of Newberg requires the 25-year post-developed runoff rate to match the 25-year predeveloped runoff rate. Also, since runoff enters a culvert crossing OR 99W (Oregon Department of Transportation jurisdiction), the 50-year post-developed runoff rate is required to match the 50-year predeveloped runoff rate.

The ponds have been constructed and each were [1]surveyed to provide a comparison between the designed ponds and the as-built ponds. The as-built ponds were evaluated to determine if they can provide over-detention for the two future sites so that the developers on the Commercial and Multi-family sites need only provide water quality treatment and detention for a portion of the post-developed storm events.

The purpose of this memorandum is to re-evaluate the two sites (Commercial land Multi-family) for predeveloped conditions and provide justification for the re-evaluation, as well as evaluate whether the as-built ponds can provide over-detention for the two future developments.

Predeveloped Commercial Site

The predeveloped Commercial Site contains approximately 1.05 acres of wetland that will be removed by the proposed development. Additionally, a small portion of the site contains Hydrologic soils class D with the remaining class C. The analysis for the SWMP classified the entire site as pervious with C soils and a CN=70. Table 1 below shows the revised predeveloped basin areas and curve numbers associated with the site.

Total Area (ac)	**Imp. Area (ac) (Wetland), CN = 98**	**Per. Area (ac) C Soils (Brush), CN = 70**	**Per. Area (ac) D Soils (Brush), CN = 77**
4.186	1.05	2.926	0.21

Table 1 - Predeveloped Commercial Site

The time of concentration for the site was calculated to be 16 minutes (See Attached: Time of Concentration Calculation).

---

[1] Survey conducted by AKS Engineering & Forestry. To account for the addition of topsoil in the future, 3J Consulting adjusted the surveyed topography +3 inches.

Predeveloped Multi-Family Site

The Multi-Family Site contains both Hydrologic soils class C and D but no wetlands. The analysis for the SWMP classified the entire site as pervious with C soils and a CN=70. Table 2 below shows the revised predeveloped basin areas and curve numbers associated with the site.

Total Area (ac)	Imp. Area (ac) (Wetland), CN = 98	Per. Area (ac) C Soils (Brush), CN = 70	Per. Area (ac) D Soils (Brush), CN = 77
1.81	0	1.243	0.567

Table 2 - Predeveloped Multi-Family Site

The time of concentration for the site was calculated to be 16 minutes (See Attached: Time of Concentration Calculation).

Basin Runoff

The predeveloped runoff and allowable release rates for each site are shown in Table 3 (See Attached: Hydrographs).

Predeveloped Basin	2-yr Runoff/ Allowable Release Rate (cfs)	10-yr Runoff/ Allowable Release Rate (cfs)	25-yr Runoff/ Allowable Release Rate (cfs)	50-yr Runoff/ Allowable Release Rate (cfs)
Commercial	0.62/0.31	1.20/1.20	1.54/1.54	1.68/1.68
Multi-Family	0.09/0.05	0.31/0.31	0.45/0.45	0.51/0.51
Total	0.71/0.36	1.51/1.51	1.99/1.99	2.19/2.19

Table 3 – Predeveloped Basin Runoff Rates (Commercial & Multi-Family)

The allowable release rates from Table 3 were added to the allowable release rates for the Crestview Crossing development shown in Table 17 of the SWMP and presented below.

Predeveloped Basin	2-yr Allowable Release Rate (cfs)	10-yr Allowable Release Rate (cfs)	25-yr Allowable Release Rate (cfs)	50-yr Allowable Release Rate (cfs)
1	0.17	1.28	1.89	2.15
2	0.29+1.46†	1.69+2.73†	2.37+3.43†	2.66+3.72†
3	0.70	2.67	3.38	3.68
4	21.44‡	36.66‡	44.47‡	47.61‡
Total	24.06	45.03	55.54	59.82
Total Table 3	0.36	1.51	1.99	2.19
Total Allowable	**24.42**	**46.54**	**57.53**	**62.01**

†Runoff from Offsite West Basin

‡Runoff through Basin 4 includes upstream discharge

Table 4 – Allowable Release Rates

As-Built Conditions: Crestview Crossing

As presented in the SWMP in Table 18, the release rates modeled for the development were below the required released rates. The as-built ponds were used to revise the XPSTORM model to ascertain the actual release rates and determine if there is potential for over-detention. Table 5 shows the revised release rates for the site and the surplus in detention. Release rates in Ponds 1 and 3 show very little change between the designed and as-built conditions.

Post-Developed Basin	**2-yr Release Rate (cfs)**	**10-yr Release Rate (cfs)**	**25-yr Release Rate (cfs)**	**50-yr Release Rate (cfs)**
1	0.48	1.23	1.75	1.97
†2	1.05	3.13	4.33	4.77
3	0.36	0.78	1.07	1.22
4	21.69‡	36.82‡	44.65‡	47.79‡
[1]ODOT ROW Offsite	0.14	0.21	0.24	0.25
Total	23.72	42.17	52.04	56.00
Surplus Detention	**0.70**	**4.37**	**5.49**	**6.01**

†Includes runoff from Offsite West Basin

‡ Discharge through Basin 4's storm drain system includes upstream discharge

[1]Runoff from ODOT ROW that flows east and cannot be Conveyed to Pond 3

Table 5 – Release Rates with As-Built Ponds

Table 6 shows the revised pond stage and freeboard for the as-built ponds. As the table shows, Pond 2 has surplus capacity to provide additional detention by modifying the flow control structure.

Recurrence Interval (yr)	**Pond 1 Stage (ft)**	**Pond 1 Freeboard (ft)**	**Pond 2 Stage (ft)**	**Pond 2 Freeboard (ft)**	**Pond 3 Stage (ft)**	**Pond 3 Freeboard (ft)**
2	188.75	1.75	196.90	3.10	188.93	1.57
10	189.11	1.39	197.43	2.57	189.34	1.16
25	189.32	1.18	197.74	2.26	189.47	1.03
50	189.41	1.09	197.86	2.14	189.53	0.97
100	189.53	0.97	198.05	1.95	189.61	0.89

Table 6 – Pond Stage & Freeboard per Return Interval for As-Built Ponds

Proposed Flow Control Structure Modifications

The designed flow control structure for Pond 2 had a 4.25" orifice and a weir with a crest elevation of 196.40 ft. By decreasing the orifice size to 3.0" and raising FCMH Weir elevation to 198.28, a greater surplus in detention can be provided. Table 7 shows what the revised release rates would be with a *modified flow control structure.*

Post-Developed Basin	2-yr Release Rate (cfs)	10-yr Release Rate (cfs)	25-yr Release Rate (cfs)	50-yr Release Rate (cfs)
1	0.48	1.23	1.75	1.97
†2	0.62	1.99	3.01	3.45
3	0.36	0.78	1.07	1.22
4	21.69‡	36.82‡	44.65‡	47.79‡
[1]ODOT ROW Offsite	0.14	0.21	0.24	0.25
Total	23.29	41.03	50.72	54.68
Surplus Detention	**1.13**	**5.51**	**6.81**	**7.33**

†Includes runoff from Offsite West Basin

‡ Discharge through Basin 4's storm drain system includes upstream discharge

[1]Runoff from ODOT ROW that flows east and cannot be Conveyed to Pond 3

Table 7 – Release Rates with Modified FCMH at Pond 2

Table 8 shows the peak stage and freeboard in Pond 2 if the flow control manhole is modified.

Recurrence Interval (yr)	Pond 2 Stage (ft)	Pond 2 Freeboard (ft)
2	198.27	1.73
10	198.64	1.36
25	198.87	1.13
50	198.98	1.03
100	199.17	0.83

Table 8 – Pond Stage & Freeboard per Return Interval with Revised Flow Control Manhole

Post-Developed Commercial and Multi-Family Sites

As Table 7 shows, there is surplus in detention that, if allowed, could be allotted to the two future developments so additional large detention facilities would not be required. A simple ratio using the basin areas for each development can be used to determine how much of the surplus each site would get. Table 9 shows this ratio.

Site	Total Area (ac)	%
Commercial	4.186	70
Multi-Family	1.81	30
Total Area	5.996	100

Table 9 – Detention Sizing Ratio

The proportional shared release rate for post-developed conditions can be calculated by applying the sizing ratio to the surplus detention in Table 7. The calculation is shown below and itemized in Table 10 below.

Example: 2-Year Surplus = 1.13 cfs
Shared release rate for Commercial = 1.13 cfs X 0.70 = 0.79 cfs
Shared release rate for Multi-Family = 1.13 cfs X 0.30 = 0.35 cfs

Post-Developed Basin	2-yr Release Rate (cfs)	10-yr Release Rate (cfs)	25-yr Release Rate (cfs)	50-yr Release Rate (cfs)
Commercial	0.79	3.86	4.77	5.13
Multi-Family	0.34	1.65	2.04	2.20

Table 10 – Proportional Shared Release Rates

Based on the preliminary site plan provided by AKS for the Commercial Site, the post-developed runoff for the 2-year storm event will exceed the proportional shared release rate; therefore, if this alternative to detention is allowed, the site will still need to provide detention for any runoff above 0.79 cfs during the 2-year storm event. However, no other post-developed runoff events would exceed the shared release rates (10, 25 and 50-year). No site information was available for the future Multi-Family site.

Conclusion

The analysis shows that by re-evaluating the two sites, modeling the as-built conditions for each pond and reconfiguring the flow control structure in Pond 2, over detention on the Crestview Crossing could provide detention mitigation for the Commercial and Multi-Family sites. Should this be allowed, each site would still be required to provide a proportional detention volume during the 2-year post-developed storm event, as well as water quality treatment.

Attached:

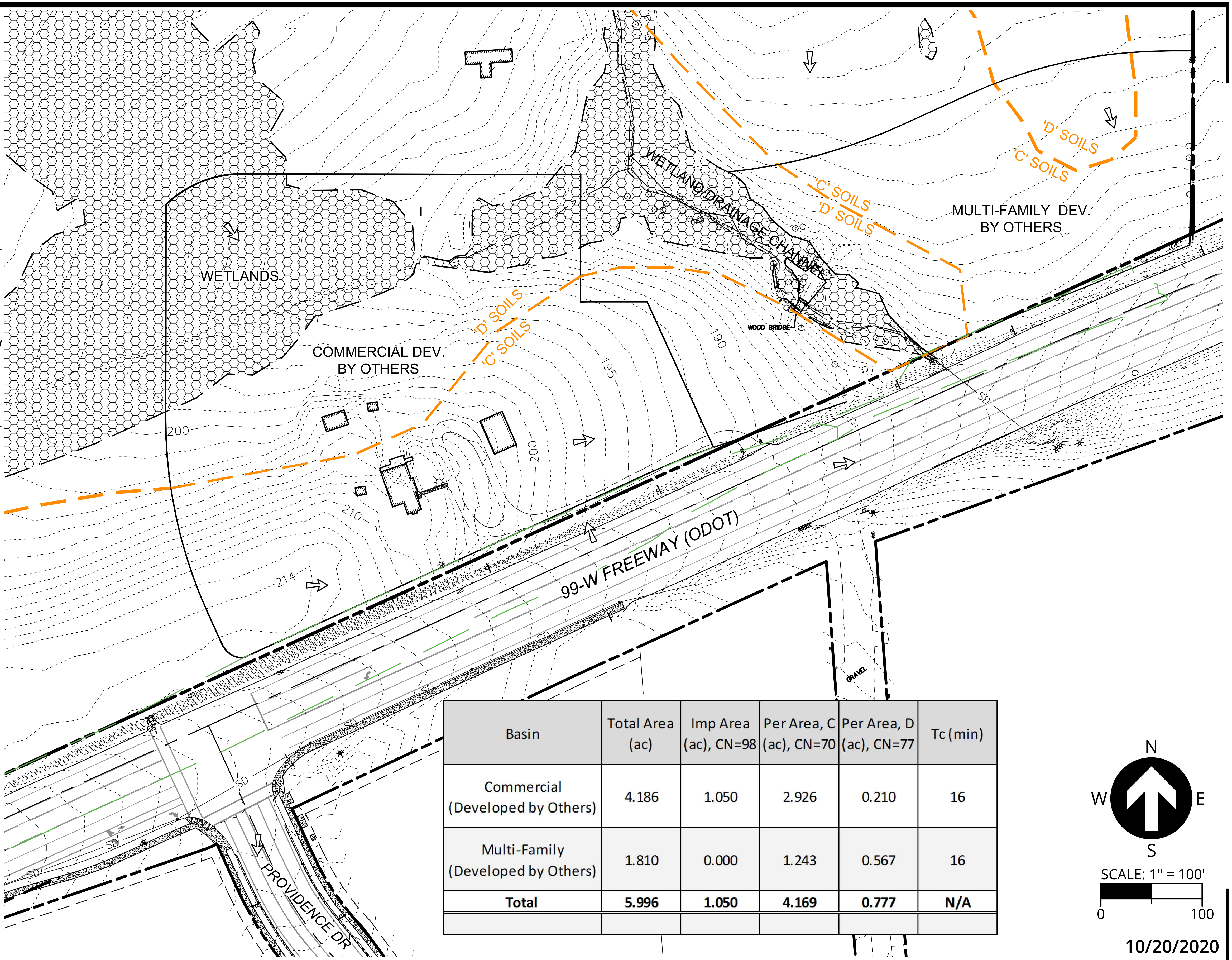
- Exhibit 1 – Predeveloped Conditions
- Time of Concentration Calculation
- Table 2.2 Runoff Curve Numbers
- Hydrographs
- Post-Developed Basin Map (AKS Engineering & Forestry, LLC)

- - - END OF DOCUMENT - - -

LEGEND

- - - -100- - - -	EXISTING MAJOR CONTOUR
·······92·······	EXISTING MINOR CONTOUR
▨	EXISTING WETLAND
⇨	SURFACE RUN-OFF FLOW ARROW
— — —	SOIL TYPE BOUNDARY

PREDEVELOPED BASIN TABLE



Basin	Total Area (ac)	Imp Area (ac), CN=98	Per Area, C (ac), CN=70	Per Area, D (ac), CN=77	Tc (min)
Commercial (Developed by Others)	4.186	1.050	2.926	0.210	16
Multi-Family (Developed by Others)	1.810	0.000	1.243	0.567	16
Total	**5.996**	**1.050**	**4.169**	**0.777**	**N/A**

10/20/2020

CRESTVIEW CROSSING

JT SMITH COMPANIES

EXHIBIT 1 - PREDEVELOPED CONDITIONS

3J CONSULTING

CIVIL ENGINEERING | WATER RESOURCES | LAND USE PLANNING

Table 2.2
Runoff Curve Numbers for Selected Agricultural, Suburban, and Urban Areas

(Sources: TR 55, 1986, and Stormwater Management Manual, 1992. See Section 2.1.1 for explanation)

	CNs for hydrologic soil group			
Cover type and hydrologic condition.	A	B	C	D
Curve Numbers for Pre-Development Conditions				
Pasture, grassland, or range-continuous forage for grazing:				
Fair condition (ground cover 50% to 75% and not heavily grazed).	49	69	79	84
Good condition (ground cover >75% and lightly or only occasionally grazed)	39	61	74	80
Woods:				
Fair (Woods are grazed but not burned, and some forest litter covers the soil).	36	60	73	79
Good (Woods are protected from grazing, and litter and brush adequately cover the soil).	30	55	70	77
Curve Numbers for Post-Development Conditions				
Open space (lawns, parks, golf courses, cemeteries, landscaping, etc.)[1]				
Fair condition (grass cover on 50% - 75% of the area).	77	85	90	92
Good condition (grass cover on >75% of the area)	68	80	86	90
Impervious areas:				
Open water bodies: lakes, wetlands, ponds etc.	100	100	100	100
Paved parking lots, roofs[2], driveways, etc. (excluding right-of-way)	98	98	98	98
Permeable Pavement (See Appendix C to decide which condition below to use)				
Landscaped area	77	85	90	92
50% landscaped area/50% impervious	87	91	94	96
100% impervious area	98	98	98	98
Paved	98	98	98	98
Gravel (including right-of-way)	76	85	89	91
Dirt (including right-of-way)	72	82	87	89
Pasture, grassland, or range-continuous forage for grazing:				
Poor condition (ground cover <50% or heavily grazed with no mulch).	68	79	86	89
Fair condition (ground cover 50% to 75% and not heavily grazed).	49	69	79	84
Good condition (ground cover >75% and lightly or only occasionally grazed)	39	61	74	80
Woods:				
Poor (Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning).	45	66	77	83
Fair (Woods are grazed but not burned, and some forest litter covers the soil).	36	60	73	79
Good (Woods are protected from grazing, and litter and brush adequately cover the soil).	30	55	70	77
Single family residential[3]**:** Dwelling Unit/Gross Acre	Should only be used for subdivisions > 50 acres	Average Percent impervious area[3,4]		
1.0 DU/GA		15	Separate curve number	
1.5 DU/GA		20	shall be selected for	
2.0 DU/GA		25	pervious & impervious	
2.5 DU/GA		30	portions of the site or	
3.0 DU/GA		34	basin	
3.5 DU/GA		38		
4.0 DU/GA		42		
4.5 DU/GA		46		
5.0 DU/GA		48		
5.5 DU/GA		50		
6.0 DU/GA		52		
6.5 DU/GA		54		
7.0 DU/GA		56		
7.5 DU/GA		58		
PUD's, condos, apartments, commercial businesses, industrial areas & & subdivisions < 50 acres	%impervious must be computed	Separate curve numbers shall be selected for pervious and impervious portions of the site		

For a more detailed and complete description of land use curve numbers refer to chapter two (2) of the Soil Conservation Service's Technical Release No. 55 , (210-VI-TR-55, Second Ed., June 1986).

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[1] Composite CN's may be computed for other combinations of open space cover type.

[2] Where roof runoff and driveway runoff are infiltrated or dispersed according to the requirements in Chapter 3, the average percent impervious area may be adjusted in accordance with the procedure described under "Flow Credit for Roof Downspout Infiltration" (Section 3.1.1), and "Flow Credit for Roof Downspout Dispersion" (Section 3.1.2).

[3] Assumes roof and driveway runoff is directed into street/storm system.

[4] All the remaining pervious area (lawn) are considered to be in good condition for these curve numbers.

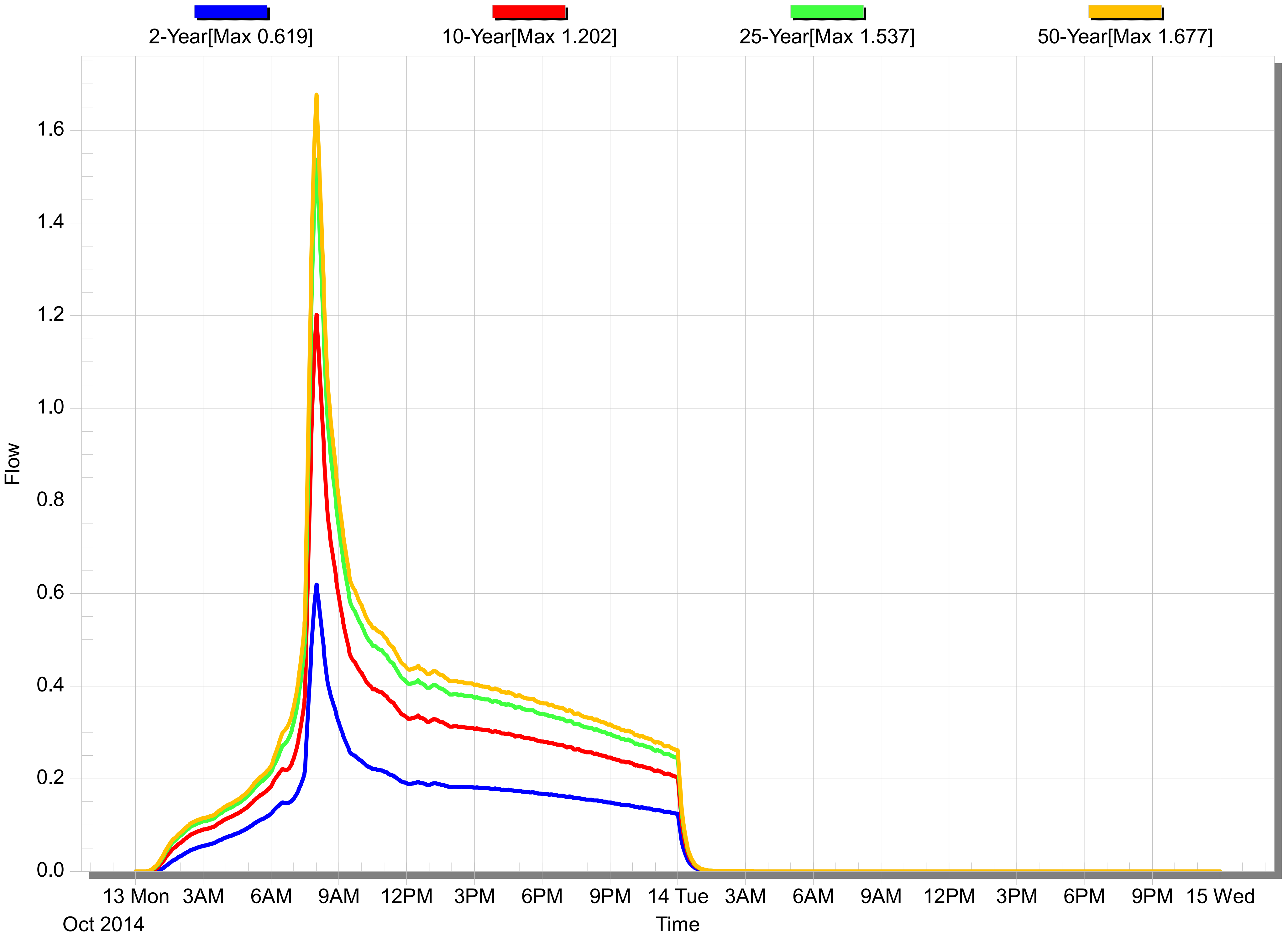
TIME OF CONCENTRATION

PROJECT NO. 17393	**BY** KEF	**DATE** 8/17/2020

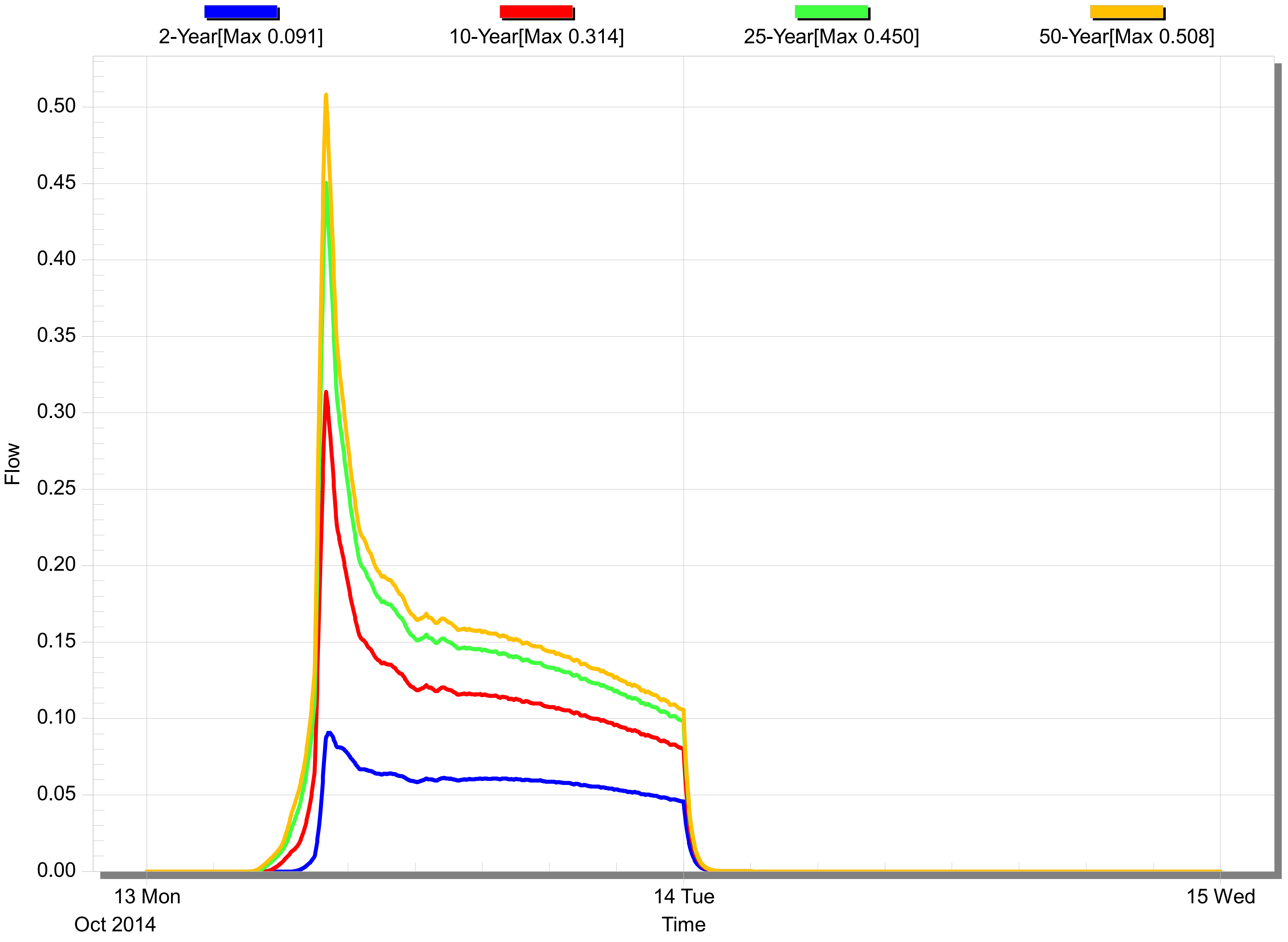
COMMERCIAL SITE

SHEET FLOW			
INPUT	**COMMERCIAL SITE**	**MULTI-FAMILY**	
Surface Description	**Type 6** **Grass (dense)**	**Type 6**	**Type**
Manning's "n"	**0.24**	**0.24**	
Flow Length, L	**100** ft	**100** ft	ft
2-Yr 24 Hour Rainfall, P_2	**2.5** in	**2.5** in	in
Land Slope, s	**0.031** ft/ft	**0.021** ft/ft	**0** ft/ft
OUTPUT			
Travel Time	0.23 hr	0.26 hr	hr
SHALLOW CONCENTRATED FLOW			
INPUT	**VALUE**	**VALUE**	**VALUE**
Surface Description	**Unpaved**	**Unpaved**	
Flow Length, L	**336** ft	**82** ft	
Watercourse Slope*, s	**0.030161** ft/ft	**0.065024** ft/ft	ft/ft
OUTPUT			
Average Velocity, V	2.80 ft/s	4.11 ft/s	ft/s
Travel Time	0.033 hr	0.006 hr	hr
CHANNEL FLOW			
INPUT	**VALUE**	**VALUE**	**VALUE**
Cross Sectional Flow Area, a	**0** ft^2	**0** ft^2	**0** ft^2
Wetted Perimeter, P_w	**0** ft	**0** ft	**0** ft
Channel Slope, s	**0** ft/ft	**0** ft/ft	**0** ft/ft
Manning's "n"	**0.24**	**0.24**	**0.24**
Flow Length, L	**0** ft	**0** ft	**0** ft
OUTPUT			
Average Velocity	0.00 ft/s	0.00 ft/s	ft/s
Hydraulic Radius, $r = a / P_w$	1.00 ft	1.00 ft	ft
Travel Time	0.00 hr	0.00 hr	hr
Watershed or Subarea T_c =	**0.26 hr**	**0.27 hr**	**0.00 hr**
Watershed or Subarea T_c =	**16 minutes**	**16 minutes**	**0 minutes**

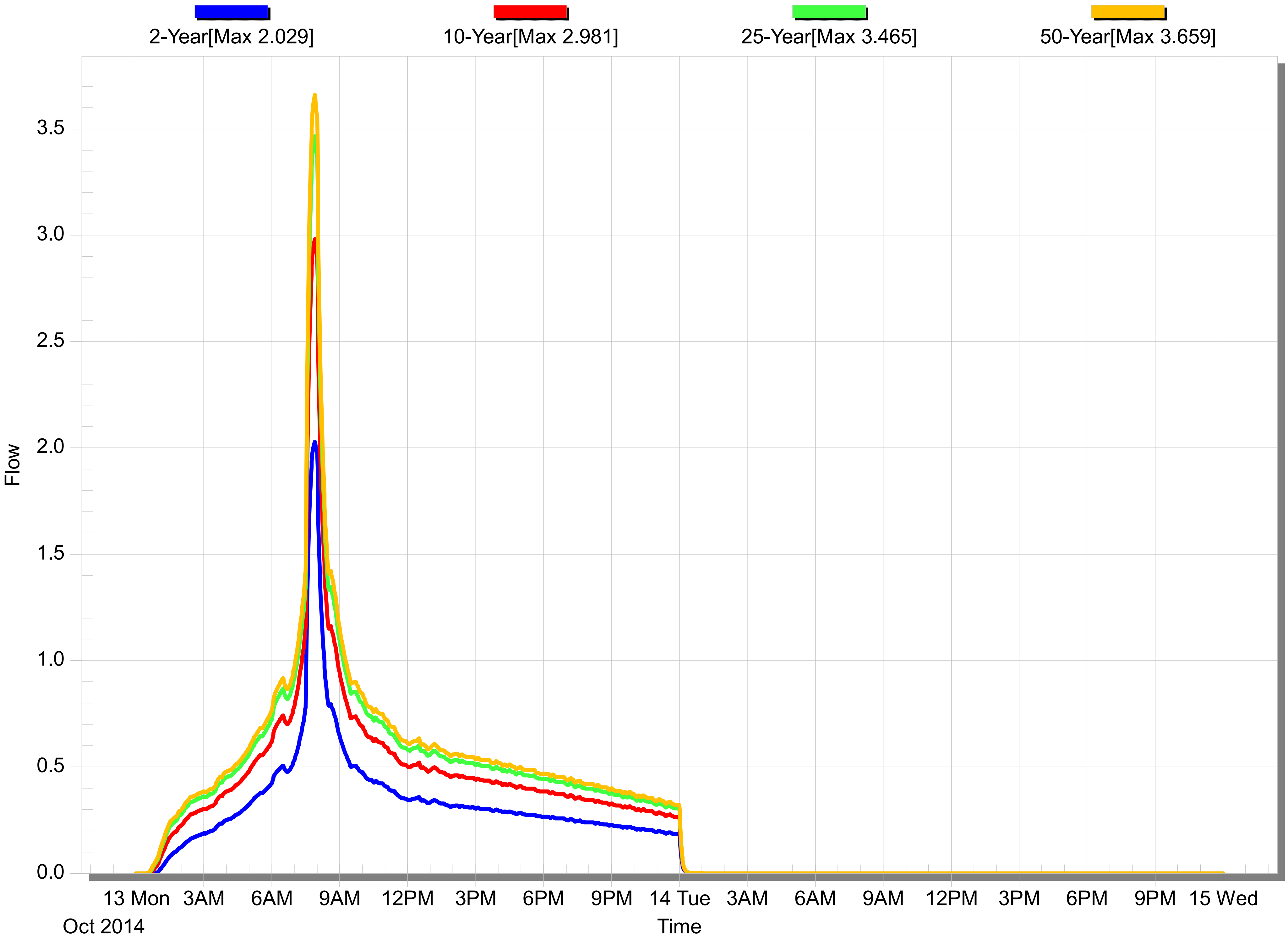
PREDEVELOPED COMMERCIAL SITE

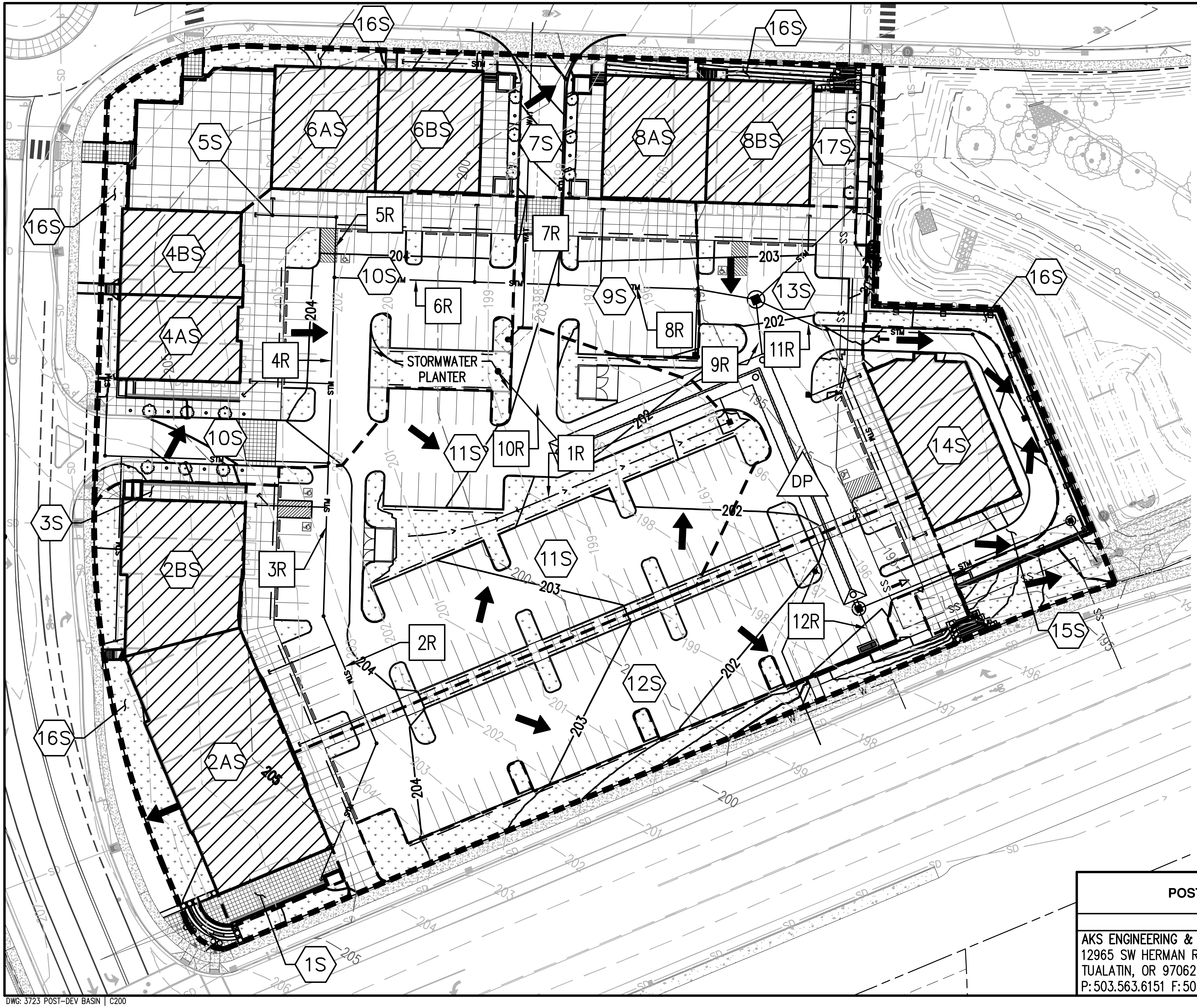


PREDEVELOPED MULTI-FAMILY SITE



POST-DEVELOPED
COMMERCIAL SITE





LEGEND:

▨ ROOFS

⁘ LANDSCAPE

☐ ASPHALT/CONCRETE

➡ POST-DEVELOPMENT FLOW ARROWS

AREA SUMMARY:

BUILDING ROOF:	37,665 SF
LANDSCAPE:	33,310 SF
CONCRETE/ASPHALT:	111,355 SF
TOTAL:	182,330 SF

N

SCALE: 1"=50 FEET

50 0 20 30 40 50

17" x 11"

DATE: 08/19/2020

POST-DEVELOPMENT BASIN MAP

FIGURE

3

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
P: 503.563.6151 F: 503.563.6152 aks-eng.com

DRWN: MCC
CHKD: CEG
AKS JOB:
3723

DWG: 3723 POST-DEV BASIN | C200

Exhibit G: Trip Generation Letter

KITTELSON & ASSOCIATES
851 SW 6th AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

August 25, 2020 Project #: 23776

Kristen Svicarovich, PE
City of Newberg, OR
414 E First Street
Newberg, OR 97132

RE: Crestview Crossing Commercial Development – Newberg, Oregon

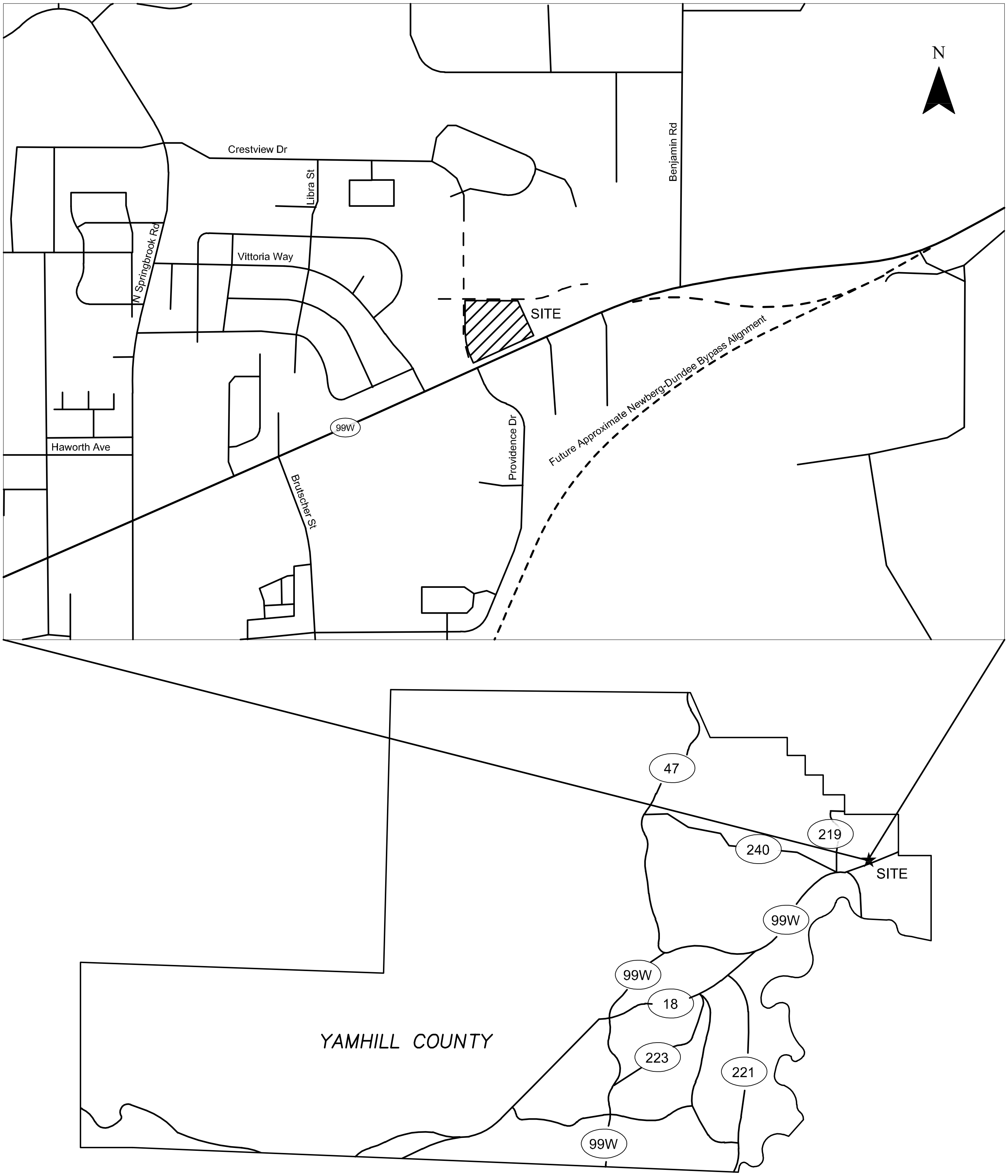
Dear Kristen,

Gramor Development proposes to develop 37,615 square feet of retail uses and supporting on-site parking on a vacant 4.19-acre property north of OR 99W in Newberg. The site is located within the greater boundary of the recently approved *Crestview Crossing* residential development, a 33.13-acre property approved for up to 260 single-family homes and 48 apartment units, to be constructed by JT Smith Companies. Figure 1 displays the project site vicinity, and Figure 2 displays the proposed site plan.

The August 2018 *Crestview Crossing Transportation Impact Analysis* (August 2018 TIA) for the JT Smith development included a sensitivity analysis that assumed development of 48,243 square feet on the proposed commercial retail site, as well as the impact of site development on key study intersections. This letter documents the trip generation of the currently proposed commercial uses and an assessment of site parking demand. As documented herein, the trip impacts of the proposed commercial uses were previously anticipated and have been accommodated through the transportation infrastructure improvements conditioned to the Crestview Crossing development. Further, the proposed commercial parking supply is forecast to accommodate projected parking demand on site. Additional details are provided herein.

BACKGROUND

Crestview Drive will be extended south past the commercial site to form a new north leg of the existing OR 99W/Providence Drive signalized intersection as part of the *Crestview Crossing* development. Additionally, an east-west collector roadway will be constructed through the *Crestview Crossing* development. Located on the north side of the commercial site, the new collector will connect with the Crestview Drive extension at a single-lane roundabout approximately 550 feet north of OR 99W.

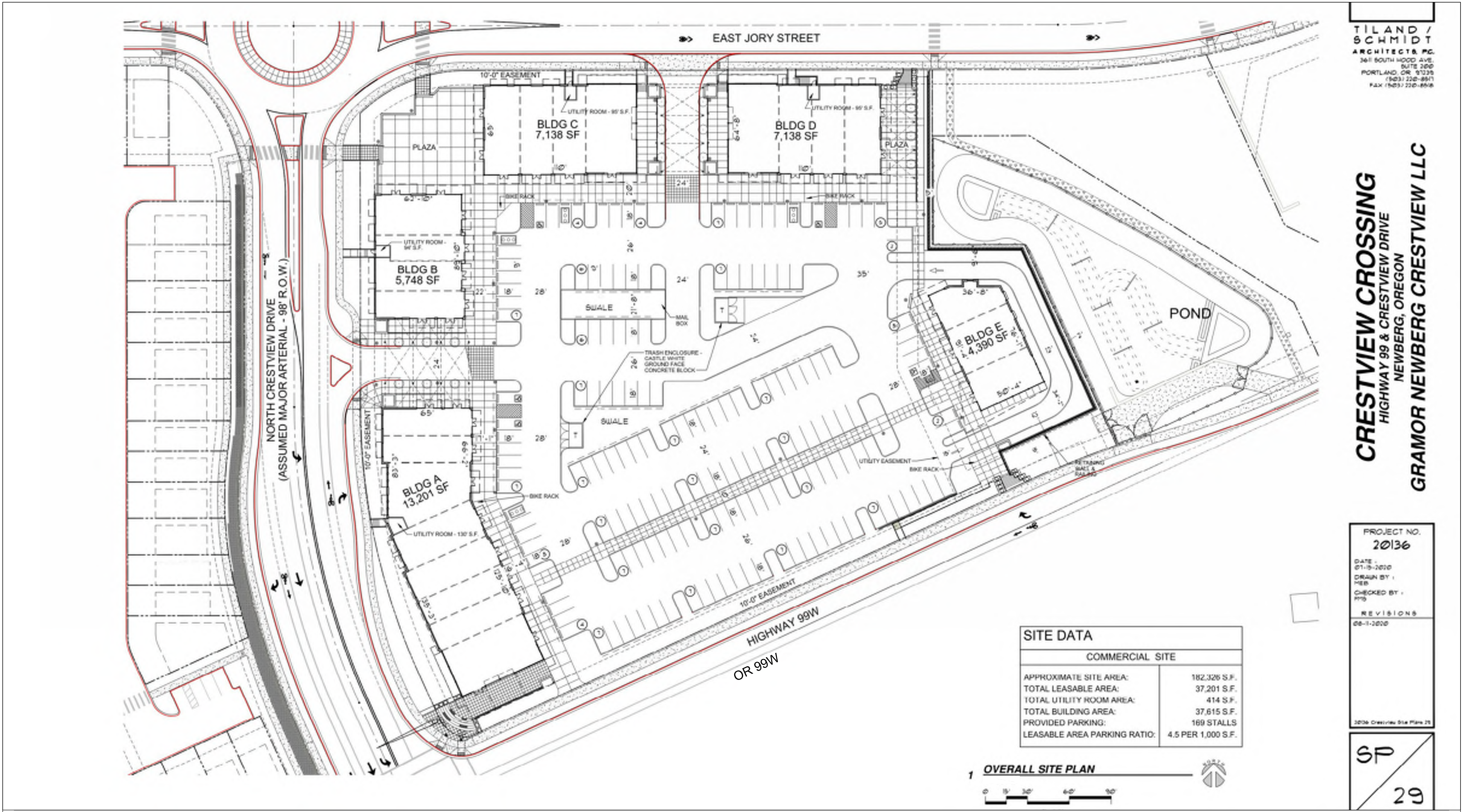


Site Vicinity
Newberg, Oregon

Figure
1

H:\23\23776 - Crestview Crossing Commercial\dwgs\23776_figs.dwg Aug 01, 2020 - 9:05am - zbugg Layout Tab: Site Vicinity Map

KITTELSON & ASSOCIATES



SITE DATA	
COMMERCIAL SITE	
APPROXIMATE SITE AREA:	182,326 S.F.
TOTAL LEASABLE AREA:	37,201 S.F.
TOTAL UTILITY ROOM AREA:	414 S.F.
TOTAL BUILDING AREA:	37,615 S.F.
PROVIDED PARKING:	169 STALLS
LEASABLE AREA PARKING RATIO:	4.5 PER 1,000 S.F.

Site Plan Provided on 8/20/2020

Proposed Site Plan
Newberg, Oregon

Figure
2

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PROPOSED DEVELOPMENT PLAN

As shown in the proposed site plan, the retail property will be accessed via two driveways:

- A right-in/right-out access on the Crestview Drive extension approximately 300 feet north of OR 99W, and
- A full-movement access on the east-west collector approximately 400 feet east of the Crestview Drive extension.

Access Spacing Considerations

The City of Newberg Transportation System Plan (Reference 1) classifies Crestview Drive as a major collector and the east-west collector to be constructed as part of *Crestview Crossing* as a minor collector. Per Table 15.505R of Title 15 (Chapter 15.505) of the City Municipal Code (Reference 2), the minimum driveway setback is 150 feet on a major collector and 100 feet on a minor collector. Both the driveway placement on the Crestview Drive extension and the east-west collector satisfy the Code-minimum spacing requirements.

Crestview Drive/Providence Drive/OR 99W Intersection Improvements

The August 2018 *Crestview Crossing Transportation Impact Analysis* (August 2018 TIA) included a sensitivity analysis that included approximately 48,000 square feet of commercial development so that the project transportation infrastructure improvements would accommodate full buildout of the residential and commercial site components. Construction of the following transportation improvements was recommended and approved at the Crestview Drive/Providence Drive/OR 99W intersection[1] based on the full residential and commercial buildout:

- A westbound right turn lane with at least 275 feet of storage;
- The eastbound left turn lane restriped to include at least 125 feet of storage;
- An exclusive southbound left turn lane with at least 225 feet of storage, and
- An exclusive southbound right turn lane with at least 150 feet of storage.

The storage lengths shown on the site plan in Figure 2 satisfy the August 2018 turn lane storage recommendations.

---

[1] Queuing analysis in the August 2018 TIA was based on a *SimTraffic* analysis of peak hour 95th-percentile queues.

TRIP GENERATION

The August 2018 TIA assumed up to 48,243 square feet of retail would be developed on the commercial property, and the TIA results and recommendations reflect the commercial development related trip impact. Table 1 displays the total assumed trip generation in the approved August 2018 TIA while Table 2 summarizes the currently proposed commercial development square footage. The trip estimates in both tables reflect trip rates obtained from the *Trip Generation Manual, 10th Edition* (Reference 3).

Table 1. Crestview Crossing Approved TIA (August 2018) Trip Generation

Land Use	ITE Code	Size		Weekday Trips	Weekday AM Peak Hour			Weekday PM Peak Hour		
					Total	In	Out	Total	In	Out
Single-Family Detached Housing	210	260	Units	2,504	189	47	142	254	160	94
Less Internal Trips				*276*	*9*	*2*	*7*	*28*	*18*	*10*
Apartment	220	48	Units	322	24	6	18	31	20	11
Less Internal Trips				*36*	*1*	*0*	*1*	*3*	*2*	*1*
Shopping Center (equation)	820	48,243	feet²	3,662	176	109	67	317	152	165
Less Internal Trips				*402*	*9*	*5*	*4*	*35*	*17*	*18*
Less Pass-by Trips				*358*	*0*	*0*	*0*	*96*	*48*	*48*
Total Gross Trips				6,488	389	162	227	602	332	270
Less Internal Trips				*714*	*19*	*7*	*12*	*66*	*37*	*29*
Less Pass-by Trips				*1,108*	*0*	*0*	*0*	*96*	*48*	*48*
Total Net New Trips				**4,666**	**370**	**155**	**215**	**440**	**247**	**193**

Table 2 shows trip estimates reflecting the current commercial development site plan. Note that the proposed site plan reflects a net reduction in retail area compared to the August 2018 TIA but also introduces a potential drive through tenant use. While specific tenants for the proposed commercial uses have not yet been identified, one-half of the area of Building E (see Figure 2) was assumed to be a drive-through coffee shop given the proposed drive-through window shown on that building. The coffee shop was identified as the maximum trip generator that could reasonably be expected to occupy the building.

Table 2. Current Gramor Development Application Trip Generation (includes 2018 TIA Residential)

Land Use	ITE Code	Size		Weekday Trips	Weekday AM Peak Hour			Weekday PM Peak Hour		
					Total	In	Out	Total	In	Out
Single-Family Detached Housing	210	260	Units	2,504	189	47	142	254	160	94
Less Internal Trips				*468*	*22*	*3*	*19*	*36*	*24*	*12*
Apartment	220	48	Units	322	24	6	18	31	20	11
Less Internal Trips				*60*	*3*	*1*	*2*	*4*	*3*	*1*
Shopping Center (average)	820	35,420	feet²	1,338	33	20	13	135	65	70
Less Internal Trips				*768*	*6*	*3*	*3*	*58*	*26*	*32*
Less Pass-by Trips (34%)				*194*	*0*	*0*	*0*	*26*	*13*	*13*
Drive-Through Coffee Shop	937	2,195	feet²	1,800	195	99	96	95	48	47
Less Internal Trips				*816*	*26*	*22*	*4*	*48*	*20*	*28*
Less Pass-by Trips (89%)				*876*	*150*	*75*	*75*	*42*	*21*	*21*
Total Gross Trips				5,964	441	172	269	515	293	222
Less Internal Trips				*2,112*	*57*	*29*	*28*	*146*	*73*	*73*
Less Pass-by Trips				*1,070*	*150*	*75*	*75*	*68*	*34*	*34*
Total Net New Trips				**2,782**	**234**	**68**	**166**	**301**	**186**	**115**

Note that the 2018 TIA applied the *Trip Generation Manual* equation-based shopping center trip rates for the full commercial area due to uncertainty of tenants at the time of preparation. In preparing the trip estimates shown in Table 2, the site plan provides more detail and thus we instead introduce a separate drive-through coffee shop trip rate (higher driveway trip rate per square foot of building area) and use the average trip generation rates for the remaining retail area along with assumed internalization between the retail tenants and the coffee shop. The site trips could alternatively be evaluated continuing to use the entire commercial retail building area and the shopping center equation as was done in the August 2018 TIA, also resulting in a reduction in trips compared to the previously approved study due to the reduced building area. With either approach, the findings remain consistent with the recommendations and approvals from the August 2018 TIA.

Table 3 compares the net new trips for the combined residential and commercial development. As shown, the reduction in commercial development size is projected to result in 1,884 fewer weekday daily trips than were assumed in the August 2018 TIA, including 136 fewer weekday AM peak hour trips and 139 fewer weekday PM peak hour trips.

Table 3. Change in Assumed Retail Commercial Trips

Trip Generation	Weekday Trips	Weekday AM Peak Hour			Weekday PM Peak Hour		
		Total	In	Out	Total	In	Out
Total Net New Trips (August 2018 TIA)	**4,666**	**370**	**155**	**215**	**440**	**247**	**193**
Total Net New Trips (Current Gramor Application)	**2,782**	**234**	**68**	**166**	**301**	**186**	**115**
Change in Trips (Current – August 2018)	**-1,884**	**-136**	**-87**	**-49**	**-139**	**-61**	**-78**

TRIP ASSIGNMENT & INTERSECTION OPRERATIONS ANALYSIS

As part of the August 2018 TIA, trips from the commercial development were assigned to the following intersections:

1. Crestview Drive Extension/East-West Collector (proposed roundabout)
2. Crestview Drive Extension/Providence Drive/OR 99W (existing signalized intersection, to be improved).

The two study intersections were found to satisfy the applicable City and Oregon Department of Transportation (ODOT) performance standards. Because of the reduced site trip generation compared to the August 2018 TIA assumptions, the study intersections are expected to operate better than projected in the August 2018 TIA during the critical peak hour, and the previously recommended turn lane improvements are sufficient to accommodate the proposed commercial uses. *An excerpt from the August 2018 TIA describing the sensitivity analysis for the commercial property and associated findings and recommendations is included in Attachment "A".*

Consistent with the August 2018 TIA, we continue to recommend that on-site landscaping, signage, and above-ground utilities should be located and maintained to provide adequate sight distance along OR 99W, the Crestview Drive extension, and all internal site roadways.

PARKING DEMAND ASSESSMENT

The proposed commercial site plan includes a surface parking lot with 169 parking stalls to serve the five buildings. The Applicant desires to accommodate all retail and coffee shop parking on-site to have no impact to on-street parking within *Crestview Crossing*.

A parking demand analysis was prepared to validate the proposed 169-space parking supply for the proposed 37,615 square feet of retail uses (equivalent to providing 4.49 parking spaces/1,000 square feet of building area). Note that excluding the utility areas (414 square feet), the gross leasable area is 37,201 square feet, and the resulting parking supply ratio increases to 4.54.

To confirm the proposed parking supply ratio will satisfy the demand, three similar retail locations were surveyed for a period of three consecutive mid-week days and one weekend day the week of March 3-9, 2019. Each of these sites is owned by Gramor Development and has a mix of retail land uses similar to the tenant mix planned for the proposed commercial development. Key attributes of the comparison survey sites are presented in Table 4 along with the parking analysis findings.

Table 4. Parking Demand Analysis

Location	Parking Supply (spaces)	Peak Parking Demand		Size of Retail (SF)	Parking Ratio (spaces/1,000 SF)		
		Weekday[1]	Saturday		Supply	Weekday Demand	Saturday Demand
Kruse Village 4859 Meadows Road, Lake Oswego, OR 97035	249	226 spaces (91%)	188 spaces (76%)	69,807	3.57	3.24	2.69
Center Square 13305 NE Hwy 99, Vancouver, WA 98686	113	89 spaces (79%)	96 spaces (85%)	21,775	5.19	4.09	4.41
205 Place Shopping Center 9732 SE Washington Street, Portland, OR 97216	350	226 spaces (65%)	188 spaces (54%)	63,356	5.52	3.86	3.63
Average Weekday and Saturday Parking Demand Ratios						**3.73**	**3.58**

[1] Represents average of three weekdays
SF = square feet

As shown in Table 4, the average parking demand measured at the three sites was approximately 3.73 spaces per thousand square feet for a weekday and 3.58 for a Saturday, despite the availability of additional parking at each site. Both of these observed weekday and Saturday demand parking ratios are lower than the proposed parking ratio of 4.49 spaces per thousand square feet to be supplied at the proposed Crestview Crossing Commercial Development—thus, the proposed parking ratio is predicted to satisfy the parking demand.

The parking data is included in Attachment "B".

SUMMARY

Findings

- The trip impacts of site commercial development were previously accounted for in the *Crestview Crossing* August 2018 TIA sensitivity analysis.
- The proposed commercial building area is less than was assumed in the August 2018 TIA and results in 1,884 fewer weekday daily trips, including 136 fewer weekday AM peak hour trips and 139 fewer weekday PM peak hour trips than were assumed in the August 2018 TIA.
- Previous analysis of study intersections assuming completion of the recommended street and intersection improvements identified in the August 2018 TIA for *Crestview Crossing* demonstrates the study intersections will satisfy City and ODOT standards after construction of the currently proposed 37,615 square feet of commercial uses in Phase II (both in the 2020 build-out year and the 2025 horizon year).

- The proposed 169-space on-site parking supply is sufficient to accommodate the proposed uses as demonstrated by parking demand measured at three comparable commercial retail development sites.

Recommendations

- No new study recommendations were identified.
- On-site landscaping, signage, and above-ground utilities should be located and maintained to provide adequate sight distance along OR 99W, the Crestview Drive extension, and all internal site roadways.

We trust this document adequately addresses the transportation impacts associated with the Crestview Crossing commercial development proposal. If you have any questions, please call us at 503-535-7462.

Sincerely,
KITTELSON & ASSOCIATES, INC.

Zachary Bugg, PhD
Senior Engineer

Diego Arguea, PE
Associate Engineer

REGISTERED PROFESSIONAL ENGINEER
84418PE
OREGON
Dec. 20, 2011
DIEGO FEDERICO ARGUEA
EXPIRES: Dec. 31 2021

REFERENCES

1. City of Newberg Transportation System Plan. 2016.
2. City of Newberg Municipal Code.
3. Institute of Transportation Engineers. *Trip Generation Manual, 10th Edition.* 2017.

ATTACHMENTS

A. Excerpt from August 2018 Traffic Impact Analysis Summary
B. Parking Demand Data

Attachment A
Excerpt from August 2018 Traffic Impact Analysis Summary

2025 Horizon Year Commercial Property Sensitivity Analysis

A planning-level analysis was prepared to account for the future development potential of the 4.43-acre commercial property adjacent to the development site. While this is NOT part of this development application, the analysis was conducted to evaluate the future effectiveness of the recommended mitigations.

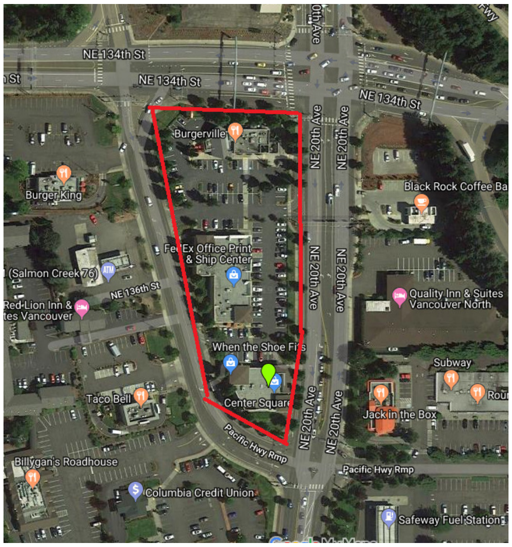
- A planning-level estimate for developable commercial area was used to estimate the number of potential commercial-related site trips. The gross leasable area-to-acreage ratio was assumed at 25 percent, and the entire commercial property was assumed as shopping center land use.
- The commercial development trips were added to the residential trips of this application to arrive at a total development estimate of 5,416 weekday daily trips, of which 370 (155 in, 215 out) will occur during the AM peak hour and 440 (247 in, 193 out) will occur during the PM peak hour. The development is also expected to generate approximately 96 pass-by trips during the weekday PM peak hour—these were treated as diverted trips from OR 99W.
- The Crestview Drive/Providence Drive/OR 99W intersection and Crestview Drive/East-West Connector roundabout were analyzed under 2025 conditions assuming development of the 4.43-acre commercial property.
- The Crestview Drive/East-West Connector intersection is expected to continue operating acceptably as a single-lane roundabout.
- With the mitigation improvements associated with the residential development in place, the weekday AM and PM peak hour v/c ratios at the Crestview Drive/Providence Drive/OR 99W intersection are forecast to be 0.98 and 1.02, respectively.

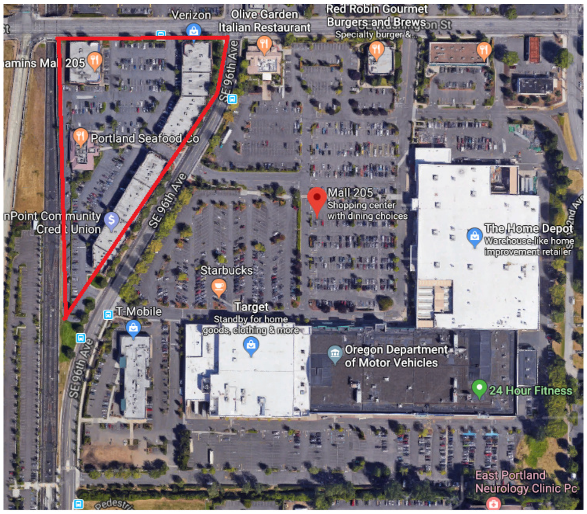
  Per ODOT policy guidance, when an intersection exceeds the mobility target but the v/c ratio increases by less than 0.03 as a result of development, the impacts are not considered significant. For this reason, no additional mitigation measures would be warranted as a result of additional commercial development.

Attachment B
Parking Demand Data

Quality Counts
DATA THAT DRIVES COMMUNITIES

7409 SW Tech Center Dr
Tigard, OR 97223
(503) 620-4242





Hwy 99 - Vancouver

Mall 205 - Portland

Kruse Meadows - Lake Oswego

Quality Counts
DATA THAT DRIVES COMMUNITIES

Location
- Hwy 99
- Kruse Meadows
- Mall 205

Date
- 5-Mar
- 6-Mar
- 7-Mar
- 9-Mar

7409 SW Tech Center Dr
Tigard, OR 97223
(503) 620-4242

Row Labels	Sum of Inventory	Sum of 10:00	Sum of 11:00	Sum of 12:00	Sum of 13:00	Sum of 14:00	Sum of 15:00	Sum of 16:00	Sum of 17:00	Sum of 18:00	Sum of 19:00	Sum of 20:00	Sum of 21:00	Sum of 22:00
5-Mar	**712**	**372**	**439**	**542**	**538**	**506**	**496**	**454**	**466**	**423**	**332**	**201**	**111**	**72**
Hwy 99	**113**	**30**	**56**	**83**	**78**	**98**	**103**	**68**	**80**	**78**	**51**	**50**	**24**	**9**
15m	3	1	1	2	1	1	2	2	0	0	0	0	0	0
ADA	5	0	0	3	2	2	3	0	2	3	1	0	0	0
FedEx	1	0	1	0	0	1	1	1	1	0	0	0	0	0
Regular	103	29	53	78	75	94	97	65	77	74	50	50	24	9
Shipping	1	0	1	0	0	0	0	0	0	1	0	0	0	0
Kruse Meadows	**249**	**163**	**198**	**212**	**196**	**189**	**155**	**147**	**147**	**190**	**140**	**72**	**43**	**25**
15m	1	0	0	0	0	1	0	0	1	1	0	0	0	0
ADA	8	0	2	1	0	0	0	0	1	0	0	2	1	0
Carpool-Vanpool	13	8	9	10	10	10	7	8	5	7	2	2	0	0
Compact	71	43	53	59	54	52	45	40	36	50	50	16	12	8
Regular	153	112	132	141	131	123	100	97	104	131	87	52	30	17
Reserved - Parsons Farm Van	1	0	0	1	1	1	1	1	0	1	1	0	0	0
Reserved - Rebound Patient	2	0	2	0	0	2	2	1	0	0	0	0	0	0
Mall 205	**350**	**179**	**185**	**247**	**264**	**219**	**238**	**239**	**239**	**155**	**141**	**79**	**44**	**38**
15m	7	4	2	2	1	4	4	4	1	1	0	0	0	0
ADA	10	4	3	2	5	4	5	4	1	1	0	0	1	0
Grab N Go	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Medical	1	1	0	0	1	1	1	1	1	1	0	0	0	0
Regular	331	170	180	243	257	210	228	230	236	152	141	79	43	38
6-Mar	**712**	**358**	**416**	**507**	**492**	**471**	**431**	**487**	**489**	**402**	**318**	**238**	**129**	**52**
Hwy 99	**113**	**44**	**59**	**67**	**69**	**83**	**72**	**79**	**73**	**76**	**52**	**55**	**31**	**9**
15m	3	1	0	0	2	1	2	1	0	0	0	0	0	0
ADA	5	0	0	0	0	1	2	1	2	3	0	0	2	0
FedEx	1	0	1	0	0	0	0	1	1	1	0	0	0	0
Regular	103	43	57	67	67	80	67	75	70	72	52	55	29	9
Shipping	1	0	1	0	0	1	1	1	0	0	0	0	0	0
Kruse Meadows	**249**	**164**	**177**	**220**	**198**	**176**	**153**	**181**	**203**	**222**	**148**	**93**	**43**	**14**
15m	1	1	1	1	1	0	0	0	1	0	0	0	0	0
ADA	8	0	2	3	3	2	2	2	2	0	0	0	0	0
Carpool-Vanpool	13	7	8	9	7	7	7	5	5	10	6	3	2	1
Compact	71	44	53	67	60	57	42	57	62	68	41	19	8	4
Illegal	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Regular	153	111	112	139	125	108	101	116	132	142	101	71	33	9
Reserved - Parsons Farm Van	1	0	1	1	0	0	0	0	1	1	0	0	0	0
Reserved - Rebound Patient	2	0	0	0	2	2	1	1	0	1	0	0	0	0
Mall 205	**350**	**150**	**180**	**220**	**225**	**212**	**206**	**227**	**213**	**104**	**118**	**90**	**55**	**29**
15m	7	0	3	1	1	2	1	2	0	1	0	0	0	0
ADA	10	2	2	2	5	7	4	3	4	2	0	1	1	0
Grab N Go	1	0	0	0	0	0	0	0	0	0	1	0	0	0
Medical	1	0	0	0	1	1	0	0	0	1	1	1	0	0
Regular	331	148	175	217	218	202	201	222	209	100	116	88	54	29
7-Mar	**712**	**384**	**411**	**557**	**528**	**422**	**448**	**490**	**501**	**495**	**372**	**225**	**134**	**66**
Hwy 99	**113**	**40**	**64**	**70**	**64**	**60**	**65**	**72**	**80**	**81**	**65**	**39**	**27**	**11**
15m	3	0	3	1	3	0	1	1	0	0	0	0	0	0
ADA	5	1	1	5	3	2	1	0	2	2	1	0	0	0
FedEx	1	0	1	0	0	0	1	1	1	1	0	1	0	0
Regular	103	39	59	64	58	58	62	70	76	77	64	38	27	11
Shipping	1	0	0	0	0	0	0	0	1	1	0	0	0	0
Kruse Meadows	**249**	**196**	**185**	**244**	**233**	**167**	**153**	**191**	**193**	**209**	**158**	**83**	**36**	**16**
15m	1	0	1	1	1	1	1	1	0	0	0	0	0	1
ADA	8	1	0	3	2	1	0	1	1	0	2	0	0	0
Carpool-Vanpool	13	9	6	13	12	6	5	8	7	12	3	2	2	1
Compact	71	62	55	71	69	45	46	56	60	57	46	25	11	5
Regular	153	122	122	153	146	113	100	123	124	140	107	56	23	9
Reserved - Parsons Farm Van	1	0	0	1	1	0	0	0	1	0	0	0	0	0
Reserved - Rebound Patient	2	2	1	2	2	1	1	2	0	0	0	0	0	0
Mall 205	**350**	**148**	**162**	**243**	**231**	**195**	**230**	**227**	**228**	**205**	**149**	**103**	**71**	**39**
15m	7	1	3	2	3	4	2	3	2	0	1	0	0	0
ADA	10	0	1	5	3	2	6	5	5	2	2	2	0	0
Grab N Go	1	0	0	0	1	0	0	0	0	0	0	0	0	0
Medical	1	0	1	1	1	1	0	0	1	0	0	1	1	1
Regular	331	147	157	235	223	188	222	219	220	203	146	100	70	38
9-Mar	**712**	**338**	**387**	**488**	**487**	**471**	**403**	**349**	**371**	**397**	**340**	**253**	**145**	**85**
Hwy 99	**113**	**36**	**64**	**82**	**81**	**96**	**82**	**82**	**58**	**70**	**59**	**61**	**38**	**11**
15m	3	0	2	0	1	1	0	1	2	1	1	1	0	0
ADA	5	1	1	2	1	2	0	2	0	1	3	0	0	0

FedEx	1	0	1	0	0	0	1	1	0	1	0	0	0	0
Regular	103	35	60	80	78	92	80	78	56	67	55	60	37	11
Shipping	1	0	0	0	1	1	1	0	0	0	0	0	1	0
Kruse Meadows	**249**	**172**	**155**	**188**	**176**	**147**	**118**	**108**	**119**	**142**	**122**	**84**	**50**	**31**
15m	1	1	0	0	1	0	0	0	0	0	0	0	0	0
ADA	8	1	1	0	0	0	1	0	0	2	2	0	0	0
Carpool-Vanpool	13	10	6	6	6	1	2	4	4	7	2	1	1	1
Compact	71	41	41	57	49	42	33	31	35	43	32	19	12	9
Regular	153	119	106	124	119	103	81	72	80	90	86	63	37	21
Reserved - Parsons Farm Van	1	0	1	1	1	1	1	1	0	0	0	1	0	0
Reserved - Rebound Patient	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Mall 205	**350**	**130**	**168**	**218**	**230**	**228**	**203**	**159**	**194**	**185**	**159**	**108**	**57**	**43**
15m	7	2	3	1	1	4	2	3	3	1	3	2	0	0
ADA	10	0	4	6	5	2	5	3	4	4	4	1	1	0
Grab N Go	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Medical	1	0	1	0	0	0	0	0	0	0	0	0	0	0
Regular	331	128	160	211	224	222	196	153	187	180	152	105	56	43
Grand Total	**2848**	**1452**	**1653**	**2094**	**2045**	**1870**	**1778**	**1780**	**1827**	**1717**	**1362**	**917**	**519**	**275**

Exhibit H: Geotechnical Report

Geotechnical Engineering Report

Crestview Crossing Development
Newberg, Oregon

for
J.T. Smith Companies

March 12, 2018

GeoEngineers
Earth Science + Technology

Geotechnical Engineering Report

Crestview Crossing Development
Newberg, Oregon

for
J.T. Smith Companies

March 12, 2018

GeoEngineers

1200 NW Naito Parkway, Suite 180
Portland, Oregon 97209
503.624.9274

Geotechnical Engineering Report

Crestview Crossing Development
Newberg, Oregon

File No. 6748-002-00

March 12, 2018

Prepared for:

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Project Engineer

Julio C. Vela, PhD, PE, GE
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REGISTERED PROFESSIONAL ENGINEER
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03/12/18
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FEBRUARY 08, 2000
JULIO C VELA

EXPIRES: 06/30/18

TAP:JCV:cje

GEOENGINEERS

Table of Contents

LIST OF FIGURES

APPENDICES

INTRODUCTION

This geotechnical report summarizes our geotechnical engineering services provided for the proposed Crestview Crossing development in Newberg, Oregon. The proposed project is located north of Pacific Highway West (Hwy 99W) between Vittoria Way and North Harmony Lane. The site is currently undeveloped and is approximately 33 acres.

A preliminary site development drawing for Crestview Crossing was provided to us by 3J Consulting Engineers (3J). The plan is titled "Crestview Planned Development – Preliminary Zoning Map," dated June 2017. The preliminary zoning plan indicates the project will consist of multi-story apartment buildings, residential lots, commercial buildings, new City streets and shared access roadways, utilities associated with site development and off-site road improvements. The off-site road improvements include widening and intersection improvements along Hwy 99W adjacent to the site to the south.

Our recommendations for earthwork and retaining structures assume that maximum cuts and fills will be less than 10 feet each and that on-site retaining walls will be less than 10 feet in height.

Our structural design recommendations are based on the following:

- For commercial buildings, we assumed that maximum column and wall loads will be on the order of 40 kips per column and 2 kips per lineal foot (klf) respectively and that floor loads for slabs on grade will be 100 pounds per square foot (psf) or less.
- For apartments, we assumed typical light wood-frame structural loads.

The purpose of our services was to provide geotechnical design and construction recommendations for general site development (infrastructure development, overall site grading and design recommendations) and for proposed commercial and apartment buildings. Our report should not be used for individual residential lot development. Depending on building type, lot configuration and location, and final grading and site development as it varies across the site, lot-specific evaluation and additional geotechnical investigations may be required for future development for individual residential lots and near retaining walls, or for critical facilities if they are developed on site.

SCOPE OF SERVICES

The purpose of our services was to evaluate soil and groundwater conditions as a basis for developing geotechnical engineering design recommendations for general site development. Our proposed scope of services included the following:

1. Reviewed selected information regarding subsurface soil and groundwater at the site.
2. Coordinated and managed the field explorations, including public utility notification and scheduling of subcontractors and GeoEngineers' field staff.
3. Explored subsurface soil and groundwater conditions at the site by conducting:
    a. Twenty-one test pit explorations in proposed building and parking areas to depths of 8 to 12 feet below the ground surface (bgs).

   b. Nine pavement explorations (on the shoulder lane) along the proposed lane widening of Hwy 99W to depths between 4 and 6½ feet bgs.
   c. Four direct cone penetration tests (DCP) tests in four of the pavement explorations.
   d. Four hand augers and DCP in on-site new roadway areas to depths between 3 and 4½ feet bgs.
   e. Two infiltration tests near the proposed enhanced wetland areas.
4. Obtained samples at representative intervals from the explorations, observed groundwater conditions and maintained detailed logs in general accordance with ASTM International (ASTM) Standard Practices Test Method D 2488. Qualified staff from our office observed and documented field activities.
5. Performed laboratory tests on selected soil samples obtained from the explorations to evaluate pertinent engineering characteristics.
6. Performed a general geologic assessment of slopes at the site relative to existing stability and impact on proposed site development.
7. Provided a geotechnical evaluation of the site and design recommendations in this geotechnical report to address the following geotechnical engineering components:
   a. A general description of site topography, geology and subsurface conditions.
   b. An opinion, from a geotechnical engineering standpoint, as to the adequacy of the encountered soils to support the proposed development based on our recommendations.
   c. Recommendations for site preparation measures, including disposition of undocumented fill and unsuitable native soils, recommendations for temporary cut slopes and constraints for wet weather construction.
   d. Recommendations for temporary excavation and temporary excavation protection, such as excavation sheeting and bracing.
   e. Recommendations for earthwork construction, including use of on-site and imported structural fill and fill placement and compaction requirements.
   f. Geotechnical engineering recommendations for use in designing conventional retaining walls, including backfill and drainage requirements.
   g. Recommendations for foundations to support proposed structures, including minimum width and embedment, design soil bearing pressures, settlement estimates (total and differential), coefficient of friction and passive earth pressures for sliding resistance. We assumed that shallow foundations could be used to adequately support the structures.
   h. Recommendations for supporting on-grade slabs, including aggregate base, capillary break and modulus of subgrade reaction.
   i. Seismic design parameters, including soil site class evaluation in accordance with the current version of the International Building Code (IBC).
   j. Infiltration test results at infiltration facility locations provided by the project civil engineer.
   k. Pavement recommendations for widening Hwy 99W meeting Oregon Department of Transportation (ODOT) Pavement Design recommendations.

l. Pavement recommendations for constructing asphaltic concrete (AC) pavements for proposed on-site roadways, including subgrade, drainage, base rock and pavement section.

SITE CONDITIONS

Site Geology

The project site is located within the western edge of the Willamette Basin physiographic province near the border with the Chehalem Mountains that separate the Willamette and Tualatin Basins. The project site is located within the Chehalem Creek Valley, a broad alluvial drainage that forms an embayment of the Willamette Valley extending north and northwest into the Chehalem Mountains.

The *Engineering Geology of the Tualatin Valley Region, Oregon* (Schlicker and Deacon 1967) shows the Newberg area mantled by "Willamette Silt," the term used by this publication for what is now more typically referred to as "fine-grained flood deposits" (Madin 1990). This alluvial sediment is described as "unconsolidated beds and lenses of fine sand, silt and clay." The mapping shows the project site within an area mapped as mantled by more clayey materials that are reported to accumulate in low-lying areas (Schlicker and Deacon 1967). The topography of the site and our field investigation suggests that the area of clay mantling is incorrectly mapped at this location but that the near-surface site geology is otherwise generally consistent with published geologic mapping.

Surface Conditions

A representative of GeoEngineers performed a general visual reconnaissance of the site. The site was accessed from a driveway located just off Hwy 99W that leads up to the single-family residence identified as 4505 East Portland Road. The residence appeared abandoned at the time of our field reconnaissance.

The site is approximately 33 acres of undeveloped land aside from the single-family residence, a barn and several small structures (animal coops/pens or storage sheds). The site appears to have been farmland that was used for pasture/hay, with a smaller portion (approximately 3 acres) in the southwest corner used as an orchard. Portions of the site appear to have been used as a tree farm in the past; however, in recent years much of the subject property appears to have been left fallow.

Site vegetation is variable and consists of tall grasses, brush, shrubs and trees. The trees are small to large (semi-mature to mature) individual trees, dense stands of trees and an old orchard area.

Surrounding properties are generally residential and farmland (orchards and other crops) with a commercial development (Providence Medical Center) to the south of the site across Hwy 99W. The area immediately north of the site is generally single-family residential properties. The area to the east of the site is generally single-family residential with farmland. The area west of the site is generally single-family residential properties.

Slope Conditions

In addition to our general site reconnaissance, we performed a visual geologic reconnaissance on September 29, 2017, to observe existing slope conditions. Site topography is undulatory to gently sloping, with maximum gradients typically less than 4H:1V (horizontal to vertical) to as low as 10H:1V or flatter. The exception to this is the cut slope along the Hwy 99W right-of-way that has been constructed to gradients as steep as 1H:1V locally.

The interior site slopes appear planar to convex and regular. We did not observe indications of large, deeply-seated, recent or active slope instability such as concave, steeply-inclined bare-soil scarps, bulging or hummocky topography, anomalous drainage features or vegetation. Minor sloughing or slumping along a portion of the Hwy 99W cut slope appears related to localized oversteepening of the slope cut. The exposed soils in this cut are fine-grained soils that correspond to the same silt soil unit we encountered in the site test pits.

Light Detection and Ranging (LiDAR) landslide hazard mapping has not been completed for the Newberg area. The Oregon State Landslide Information Layer (SLIDO) (Oregon Department of Geology and Mineral Industries 2017) shows a large area of "landslide topography" extending to within ¼ mile of the site. The SLIDO layer states that this is based on the hazard mapping of Schlicker and Deacon (1967), but a close examination of the hazard map from the earlier publication shows that the investigators did not extend the "landslide area" as far south as shown on the SLIDO database. Our observations likewise do not support the proximity of this old or ancient landslide to the project site.

Subsurface Conditions

We completed field explorations at the site on September 20, 21 and 26, 2017. Our explorations included:

- Twenty-one test pit (TP) explorations, TP-1 to TP-21, to depths of 8 to 12 feet bgs.
- Nine pavement borings, B-1 to B-9, to depths between 4 and 6½ feet bgs, with four DCP tests completed in four of the borings (B-2, B-4, B-6 and B-8).
- Four hand augers with DCP to depths between 3 and 4½ feet bgs.
- Two infiltration tests near the proposed onsite enhanced wetlands.

The approximate locations of the explorations are shown in the Site Plan, Figure 2. A member of our professional staff maintained detailed logs of the soils encountered and gathered representative soil samples. Appendix A summarizes our exploration methods and presents our exploration logs and DCP results. Laboratory test results are provided in the exploration logs and described in Appendix A.

Hwy 99W Pavement Explorations

In general, our Hwy 99W pavement explorations encountered typical pavement sections (AC underlain by aggregate base) over native subgrade material. Specifically, the ground surface at the pavement explorations consisted of 3 to 9½ inches of AC. The AC was underlain by gravel fill (aggregate base) having a variable thickness between approximately 11½ and 26 inches. In six of the pavement explorations, the gravel fill was underlain by native medium stiff brown silt. However, we encountered additional layers of fill materials underlying the pavement section in three of the borings, B-6, B-8 and B-9. The reader is referred to the boring logs and DCP results in Appendix A for more detailed information about the soils encountered in the pavement explorations.

Site Test Pits and Hand Augers

In general, our test pit and hand-auger explorations conducted on the proposed development site encountered a topsoil layer, underlain by a tilled soil zone, which was in turn underlain by native soil materials. The topsoil is approximately 6 inches thick and consists of brown to dark brown silt with roots and organic material.

The material underlying the topsoil is a tilled zone typical of previously farmed land and extends approximately 12 inches below the topsoil. The tilled zone is brown and gray silt classified as soft in consistency based on its disturbed state.

The tilled zone is underlain by native soils consisting primarily of medium stiff to stiff brown and gray silt. The consistency of the silt material has some variability with depth based on encountering some areas of stiff silt in addition to the medium stiff silt in several explorations. The silt also had zones of yellow, orange and red mottling. Although the primary native material observed in our test pits was silt, we encountered clay in two of our test pits, TP-3 and TP-8. The reader is referred to the exploration logs and DCP results for more detailed information about the soils encountered in the pavement explorations.

Groundwater

Our explorations revealed the following information about groundwater:

- Areal groundwater was not observed in most of our explorations.
- We did observe groundwater in boring B-7, which was drilled in Hwy 99W. Based on adjacent site grades (uphill to the north on to the site from Hwy 99W), and the nature of the native fine-grained silt and clay to perch groundwater, downslope areas may encounter perched groundwater above the level of permanent groundwater.
- The site soils, particularly the near-surface soils, contain high amounts of moisture.

Based on our site explorations, we expect that groundwater will be present at shallow depths in a perched condition during wet times of the year or during extended periods of wet weather. Some artesian-type groundwater conditions (upward flowing from perched conditions upslope) may be encountered in downslope areas. Groundwater conditions at the site are expected to vary seasonally due to rainfall events and other factors not observed in our explorations. For example, our past experience with agricultural sites indicates that remnant drainage features, such as buried clay tiles and cisterns, can produce local groundwater and temporary strong flow into excavations where drain tiles are pierced.

CONCLUSIONS

General

Based on our explorations, testing and analyses, it is our opinion that the site is suitable for the proposed project from a geotechnical standpoint, provided the recommendations in this report are incorporated into the project design and implemented during construction. We offer the following conclusions regarding geotechnical engineering design and construction at the site.

- Existing site structures and structural features designated for removal should be demolished and completely removed from the site.
- Existing utilities below proposed structural areas, including proposed buildings and roads, should be relocated or abandoned and grouted full if left in place.
- Surface conditions at the site consist primarily of vegetated areas covered with grasses, shrubs and trees; therefore, clearing, stripping and grubbing will be required. We anticipate a stripping depth of approximately 6 inches bgs to remove the topsoil layer. Grubbing and deeper excavations up to several feet will be required to remove the root zones of shrubs and trees. Portions of the site are heavily vegetated and previously buried roots are also expected, even in the current grassy areas of the site. Cleared, stripped and grubbed materials should be hauled off-site and properly disposed unless otherwise allowed by the project specifications for other uses such as landscaping, stockpiling or on-site burning.
- A “tilled zone” mantels the site from previous agriculture land use. The tilled zone consists of moist loose silt with trace roots and extends to a depth of approximately 18 inches bgs. The tilled zone is too loose to support structures, including buildings, foundations, floor slabs, pavements and other settlement-sensitive structures. Therefore, in areas designated to receive fill, and in areas where site cuts do not extend below the tilled zone, it should be either: (1) scarified, moisture-conditioned and compacted in place during the dry season; or (2) removed and replaced with Imported Select Structural Fill if construction occurs during the wet season or at other times when the material cannot be compacted in place.
- The soils at the site below the topsoil zone are suitable to use as structural fill if they are properly moisture conditioned and compacted. Because the site soils have a moisture content that is currently wet of optimum, they will become significantly disturbed from construction traffic, particularly during wet weather. Wet weather construction practices will be required over exposed native soils and to protect exposed subgrades, except during the dry summer months.
- Previously farmed areas can have buried features that are not encountered in geotechnical borings and test pits, for example: old foundations, structures, agricultural drain pipes and cisterns. We recommend a budget contingency for removing old buried features.
- Groundwater was not encountered during our explorations, but based on our experience and our observations, perched groundwater may be present during periods of persistent rainfall.
- Proposed commercial and apartment structures can be satisfactorily supported on continuous and isolated shallow foundations supported on the firm native soils encountered below the tilled zone, or on structural fill that extends to the firm native soils.
- Slabs on grade for proposed commercial and apartment structures can be satisfactorily supported on Aggregate Base that is founded on the firm native soils encountered below the tilled zone, or on structural fill that extends to the firm native soils. We recommend that slabs-on-grade be provided with proper moisture control by constructing the aggregate base as a capillary break and providing a vapor barrier for moisture-sensitive applications.
- Based on the assumed design loads described in the “Introduction” section of this report, we estimate total settlements will be less than 1 inch for foundations constructed as recommended. If larger structural loads are anticipated, we should review and reassess the estimated settlement.

- As stated earlier, our report should not be used for individual residential lot development. Lot-specific studies and additional geotechnical assessment/investigations may be required for future development for individual residential lots.
- Standard pavement sections as summarized in this report, consisting of AC over Aggregate Base and/or Aggregate Subbase, over properly prepared subgrade, can be used to support the estimated traffic loads provided the pavement sections are designed and constructed as recommended in this report.

EARTHWORK RECOMMENDATIONS

In general, site preparation and earthwork operations will include the following:

- Demolishing and disposing of debris from existing structures and hardscapes.
- Removing or relocating existing site utilities if present.
- Clearing to remove vegetation and grubbing to remove roots.
- Site stripping.
- Recompacting (dry weather) or replacing (wet weather) the tilled zone.
- Cutting and filling for mass grading.
- Excavating and filling for grade separators, such as retaining walls and slopes.
- Excavating and filling for roads and pavements.
- Excavating and filling for foundations and site utilities.
- Fine-grading to establish final surface grades.

Site Preparation

In general, site preparation will include demolishing existing structures, removing or relocating existing site utilities, grubbing and stripping.

Demolition

All structures and belowground structures to be demolished should be completely removed from proposed structural areas and for a margin of at least 3 feet around proposed structural areas. Proposed structural areas are areas where new structures will be built, including building pads and roadways. Existing utilities that will be abandoned on site should be identified prior to construction. Abandoned utility lines should be completely removed or filled with grout if abandoned and left in place to reduce potential settlement or caving in the future. Materials generated during demolition should be transported off site and properly disposed.

Clearing and Grubbing

Site clearing will be required to remove site vegetation, including grass, shrubs and trees that are designated for removal. Following clearing, grubbing and excavations up to several feet will be required to remove the root zones of shrubs and trees. Deeper excavations, up to 6 or 8 feet may be required to remove the root zones of large trees. Roots larger than ½ inch in diameter should be removed. Excavations to remove root zones should be done with a smooth-bucket to minimize subgrade disturbance. Portions of the site are heavily vegetated and previously buried roots are also expected, even in the current grassy areas of the site. Grubbed materials should be hauled off site and properly disposed unless otherwise allowed by the project specifications for other uses such as landscaping, stockpiling or on-site burning.

Existing voids and new depressions created during demolition, clearing, grubbing or other site preparation activities, should be excavated to firm soil and backfilled with Imported Select Structural Fill. Greater depths of disturbance should be expected if site preparation and earthwork are conducted during periods of wet weather.

Stripping

Based on our observations at the site, we estimate that the depth of stripping should be on the order of about 6 inches. Greater stripping depths may be required to remove localized zones of loose or organic soil, and in areas where moderate to heavy vegetation are present, or where surface disturbance from prior use has occurred. The actual stripping depth should be based on field observations at the time of construction. Stripped material should be transported off site for disposal unless otherwise allowed by the project specifications for other uses such as landscaping.

Subgrade Improvement for the Tilled Zone

A “tilled zone” mantels the site from previous agriculture land use. The tilled zone consists of disturbed soil comprised of moist, loose silt with trace roots and extends to a depth of approximately 18 inches bgs. The tilled zone is too loose to support structures, including buildings, foundations, floor slabs, pavements and other settlement-sensitive structures. Therefore, if the tilled zone remains in place to receive site fills during mass grading, it should be either: (1) scarified, moisture-conditioned and compacted in-place during the dry season; or (2) removed and replaced with Imported Select Structural Fill if construction occurs during the wet season, or at other times when the material cannot be compacted in place. If the tilled zone is cut away (cuts extend below the tilled zone) as a part of mass grading, recompaction or removal of in-place undisturbed soils is not required.

The tilled zone soil will be generally loose, especially when wet and will provide marginal to poor support for construction equipment. Wet weather construction practices will be required when improving the tilled zone, except during the dry summer months.

Subgrade improvement for the tilled zone can be accomplished by removing and replacing or scarifying and re-compacting the tilled zone. Scarification is typically performed by ripping with agricultural discs and aerating the soils to dry them during dry weather periods. Considerable soil processing, including moisture conditioning (primarily drying - to reduce the existing moisture content), should be expected to adequately compact the tilled zone. If the soil cannot be properly moisture conditioned (dried), the subgrade should be removed and replaced with Imported Select Structural Fill. If the project specifications allow, the tilled zone can be cement amended as described in “Soil Amendment with Cement” section of this report. Cement amendment is typically performed to depths of 12 to 18 inches. When performed in silty soils, such as those at the site, multiple tilling and application passes may be required to adequately blend and amend the soils.

Subgrade Evaluation

As described above, disturbed material may be present after demolition and site stripping are complete. Subgrade areas to be developed should be prepared to be in a uniformly firm and unyielding condition prior to placing structural fill or structural elements. We recommend that prepared subgrades be observed by a member of our firm, who will evaluate the suitability of the subgrade and identify areas of yielding, which are indicative of soft or loose soil.

Subgrades, including subgrades to receive fill, should be proof-rolled with heavy rubber-tired equipment and/or probed with a ½-inch-diameter steel rod, as appropriate depending on prevailing conditions. If soft, yielding or otherwise unsuitable areas revealed during probing or proof-rolling cannot be compacted to a stable and uniformly firm condition, we recommend that: (1) the subgrade soils be scarified, aerated and recompacted; or (2) the unsuitable soils be removed and replaced with Structural Fill.

Subgrade Protection and Wet Weather Considerations

The soils at the site are highly susceptible to moisture. Wet weather construction practices will be necessary if work is performed during periods of wet weather. If site grading will occur during wet weather conditions, it will be necessary to use track-mounted equipment, load removed material into trucks supported on gravel haul roads, use gravel working pads and employ other methods to reduce ground disturbance. The contractor should be responsible to protect the subgrade during construction.

Earthwork planning should include considerations for minimizing subgrade disturbance. We provide the following recommendations if wet weather construction is considered:

- The ground surface in and around the work area should be sloped so that surface water is directed to a sump or discharge location. The ground surface should be graded such that areas of ponded water do not develop. Measures should be taken by the contractor to prevent surface water from collecting in excavations and trenches. Measures should be implemented to remove surface water from the work areas.
- Earthwork activities should not take place during periods of heavy precipitation.
- Slopes with exposed soils should be covered with plastic sheeting or similar means.
- The site soils should not be left in a disturbed or uncompacted state and exposed to moisture. Sealing the surficial soils by rolling with a smooth-drum roller prior to periods of precipitation may reduce the extent to which these soils become wet or unstable.
- Construction activities should be scheduled so that the length of time that soils are left exposed to moisture is reduced to the extent practicable.
- Construction traffic should be restricted to specific areas of the site, preferably areas that are not susceptible to wet weather disturbance such as haul roads and areas that are adequately surfaced with working pad materials.
- When on-site soils are wet of optimum, they are easily disturbed and will not provide adequate support for construction traffic nor for the proposed development. The use of granular haul roads and staging areas will be necessary to support heavy construction traffic. Generally, a 12- to 16-inch-thick mat of Imported Select Structural Fill should be sufficient for light staging areas for the building pad and light staging activities but is not expected to be adequate to support repeated heavy equipment or truck

traffic. The thickness of the Imported Select Structural Fill for haul roads and areas with repeated heavy construction traffic should be increased to between 18 and 24 inches. The actual thickness of haul roads and staging areas should be determined at the time of construction and based on the contractor's approach to site development and the amount and type of construction traffic.

- The base rock (Aggregate Base and Aggregate Subbase) thicknesses described in the "Pavement Recommendations" sections of this report are intended to support post-construction design traffic loads. The design base rock thicknesses will likely not support repeated heavy construction traffic during site construction or during pavement construction. A thicker base rock section as described above for haul roads will likely be required to support construction traffic.
- During periods of wet weather, concrete should be placed as soon as practical after preparing foundation excavations. Foundation bearing surfaces should not be exposed to standing water. Should water infiltrate and pool in the excavation, the water should be removed, and the foundation subgrade should be re-evaluated before placing reinforcing steel or concrete. Foundation subgrade protection, such as a 3- to 4-inch thickness of Aggregate Base/Aggregate Subbase or lean concrete, may be necessary if footing excavations are exposed to extended wet weather conditions.

During wet weather, or when the exposed subgrade is wet or unsuitable for proof-rolling, the prepared subgrade should be evaluated by observing excavation activity and probing with a steel foundation probe. Observations and probing should be performed by a member of our staff. Wet soil that has been disturbed due to site preparation activities, or soft or loose zones identified during probing, should be removed and replaced with Imported Select Structural Fill.

Soil Amendment with Cement

As an alternative to the using Imported Select Structural Fill material for wet weather structural fill, an experienced contractor may be able to amend the on-site soil with portland cement concrete (PCC) to obtain suitable support properties. It is often less costly to amend on-site soils than to remove and replace soft soils with imported granular materials. We also considered lime amendment for the site soils. However, based on our experience on nearby sites, in-place soil moisture contents, observed soil types and processing speed, cement amendment would be more suitable at this site than lime amendment. Single pass tilling depths for cement amendment equipment is typically 18 inches or less. However, multiple tilling passes may be required to adequately blend in the cement with the soils and to sufficiently process the soils. It may also be necessary to place the recommended cement quantities in multiple passes between tilling passes, which requires intermediate compaction.

The contractor should be responsible for selecting the means and methods to construct the amended soil without disturbing exposed subgrades. We recommend low ground-pressure (such as balloon-tired) cement spreading equipment be required. We have observed other methods used for spreading that have resulted in significant site disturbance and high remedial costs. For example, we have observed amendment efforts using a spreader truck equipped with road tires pulled by track-mounted equipment that resulted in significant disturbance to the work area and required re-working large areas of cement-amended product at additional expense.

Some areas of the site, notably in the vicinity of test pits TP-3 and TP-8 appear to have higher clay contents, which typically results in higher cement volumes than in areas of predominantly silt and will likely require multiple tilling and cement spreading passes, as well as higher cement volumes in order to achieve target soil strengths and required levels of compaction.

Areas of standing water, or areas where traffic patterns are concentrated and disturbing the subgrade, will also create a need for higher amounts of cement to be applied and additional tilling for better mixing and cement hydration prior to final compaction.

Successful use of soil amendment depends on the use of correct mixing techniques, the soil moisture content at the time of amendment and amendment quantities. Specific recommendations, based on exposed site conditions for soil amending, can be provided if necessary. However, for preliminary planning purposes, it may be assumed that a minimum of 5 percent cement (by dry weight, assuming a unit weight of 100 pounds per cubic foot [pcf]) will be sufficient for improving on-site soils. Treatment depths of 12 to 16 inches are typical (assuming a seven-day unconfined compressive strength of at least 80 pounds per square inch [psi]), although they may be adjusted in the field depending on site conditions. Soil amending should be conducted in accordance with the specifications provided in Oregon Structural Specialty Code (OSSC) 00344 (Treated Subgrade).

We recommend a target strength for cement-amended soils of 80 psi. The amount of cement used to achieve this target generally varies with moisture content and soil type. It is difficult to predict field performance of soil-to-cement amendment due to variability in soil response and we recommend laboratory testing to confirm expectations. However, for preliminary design purposes, 4 to 5 percent cement by weight of dry soil can generally be used when the soil moisture content does not exceed approximately 20 percent. If the soil moisture content is in the range of 20 to 35 percent, 5 to 7 percent by weight of dry soil is recommended. The amount of cement added to the soil should be adjusted based on field observations and performance.

PCC-amended soil is hard and has low permeability; therefore, this soil does not drain well nor is it suitable for planting. Future landscape areas should not be cement amended, if practical, or accommodations should be planned for drainage and planting. Cement amendment should not be used if runoff during construction cannot be directed away from adjacent low-lying wet areas and active waterways and drainage paths.

When used for constructing pavement, staging, or haul road subgrades, the amended surface should be protected from abrasion by placing a minimum 4-inch thickness of base rock material (Aggregate Base/Aggregate Subbase). To prevent strength loss during curing, cement-amended soil should be allowed to cure for a minimum of four days prior to placing the base rock. The base rock typically becomes contaminated with soil during construction. Contaminated base rock should be removed and replaced with clean base rock in pavement areas to meet the required thickness(es) in the “Pavement Recommendations” section to this report.

It is not possible to amend soil during heavy or continuous rainfall. Work should be completed during suitable weather conditions.

Separation Geotextile Fabric

A separation geotextile fabric should be placed as a barrier between the subgrade and granular fill materials in staging areas, haul road areas and in areas of repeated construction traffic. The geotextile should have a minimum Mullen burst strength of 250 psi for puncture resistance and an apparent opening size (AOS) between U.S. Standard No. 70 and No. 100 sieves.

Erosion Control

Erosion control measures should be implemented in accordance with the City of Newberg's "Erosion and Sediment Control Manual."

Excavation

Based on the materials encountered in our subsurface exploration, it is our opinion that conventional earthmoving equipment in proper working condition should be capable of making necessary general excavations.

The earthwork contractor should be responsible for reviewing this report, including the boring logs, providing their own assessments and providing equipment and methods needed to excavate the site soils while protecting subgrades.

Dewatering

As discussed in the "Groundwater" section of this report, groundwater was not encountered in our explorations, and we do not expect groundwater to be a major factor during shallow excavations and earthwork. Excavations that extend into saturated/wet soils, or excavations that extend into perched groundwater, should be dewatered. Sump pumps are expected to adequately address groundwater encountered in shallow excavations. In addition to groundwater seepage, surface water inflow to the excavations during the wet season can be problematic. Provisions for surface water control during earthwork and excavations should be included in the project plans and should be installed prior to commencing earthwork.

Permanent Slopes

Permanent cut and fill slopes, where incorporated into the grading plan, should not exceed 2H:1V. The slopes should be planted with appropriate vegetation to provide protection against erosion as soon as possible after grading. Buildings, access roads and pavements should be located at least 10 feet from the top of new fill slopes or existing slopes. Placement of fill near the top of the existing slope should be limited to 2 feet or less in thickness. If the grading plan requires additional fill, we should be contacted to evaluate the impact of the additional loading on the slope. Surface water runoff should be collected and directed away from slopes to prevent water from running down the face of the slope.

Trench Cuts and Trench Shoring

All trench excavations should be made in accordance with applicable Occupational Safety and Health Administration (OSHA) and state regulations. In our opinion, native soils are generally OSHA Type B. Temporary excavations deeper than 4 feet should be shored or laid back at an inclination of 1H:1V or flatter if workers are required to enter. Excavations made to construct footings or other structural elements should be laid back or shored at the surface as necessary to prevent soil from falling into excavations.

It should be expected that unsupported cut slopes will experience some sloughing and raveling if exposed to water. Plastic sheeting, placed over the exposed slope and directing water away from the slope, will reduce the potential for sloughing and erosion of cut slopes during wet weather.

The contractor is responsible for shoring methods and shoring system design. Shoring systems should be designed by a professional engineer before installation.

In our opinion, the contractor will be in the best position to observe subsurface conditions continuously throughout the construction process and to respond to the soil and groundwater conditions. Construction site safety is generally the sole responsibility of the contractor, who also is solely responsible for the means, methods, and sequencing of the construction operations and choices regarding excavations and shoring.

Under no circumstances should the information provided by GeoEngineers be interpreted to mean that GeoEngineers is assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

Fill Materials

General

Structural areas include areas beneath foundations, floor slabs, pavements, and any other areas intended to support structures or within the influence zone of structures. Fill intended for use in structural areas should meet the criteria for structural fill presented below. All structural fill soils should be free of debris, clay balls, roots, organic matter, frozen soil, man-made contaminants, particles with greatest dimension exceeding 4 inches (3-inch-maximum particle size in building footprints) and other deleterious materials.

The suitability of soil for use as structural fill will depend on the gradation and moisture content of the soil. As the amount of fines in the soil matrix increases, the soil becomes increasingly more sensitive to small changes in moisture content and achieving the required degree of compaction becomes more difficult or impossible. Recommendations for suitable fill material are provided in the following sections.

On-Site Soils

The on-site soil is generally suitable for use as structural fill if it meets the requirements set forth in OSSC 00330.12 (Borrow Material). However, it will be very difficult to achieve adequate compaction during periods of wet weather or when the moisture content is above optimum. Accordingly, extended dry weather will be required to adequately condition and place the soils as structural fill.

The site soil is very sensitive to small changes in moisture content and highly susceptible to disturbance when wet. Use of the on-site soils as structural fill will be very difficult or may not be possible during wet weather (see the "Subgrade Protection and Wet Weather Considerations" section of this report).

The properly prepared and compacted on-site soils in the tilled zone qualify as structural fill provided they meet the recommendations in the "Subgrade Improvement for the Tilled Zone" section of this report.

Imported Select Structural Fill

Imported Select Structural Fill may be used as structural fill and should consist of pit or quarry run rock, crushed rock, or crushed gravel and sand that is fairly well-graded between coarse and fine sizes (approximately 25 to 65 percent passing the U.S. No. 4 sieve). It should have less than 5 percent passing the U.S. No. 200 sieve and have a minimum of 75 percent fractured particles according to American Association of State Highway and Transportation Officials (AASHTO) TP-61.

Aggregate Base

Aggregate Base material located under floor slabs and pavements, crushed rock used in footing overexcavations and retaining wall backfill should consist of imported clean, durable, crushed angular rock. Such rock should be well-graded, have a maximum particle size of 1 inch, have less than 5 percent passing the U.S. No. 200 sieve (3 percent for retaining walls) and meet the gradation requirements in Table 1. The gradations shown in Table 1 meet the requirements of ODOT Standard Section 02630. In addition, Aggregate Base shall have a minimum of 75 percent fractured particles according to AASHTO TP-61 and a sand equivalent of not less than 30 percent based on AASHTO T-176.

TABLE 1. RECOMMENDED GRADATION FOR AGGREGATE BASE

Sieve size	Percent Passing (by weight)
1 inch	100
½ inch	50 to 65
No. 4	40 to 60
No. 40	5 to 15
No. 200	0 to 5

Aggregate Subbase

Aggregate Subbase material should consist of imported, clean, durable, crushed angular rock. Such rock should be well-graded, have a maximum particle size of 1½ inch, have less than 5 percent passing the U.S. No. 200 sieve and meet the gradation requirements in ODOT Standard Section 00331. In addition, Aggregate Base shall have a minimum of 75 percent fractured particles according to AASHTO TP-61 and a sand equivalent of not less than 30 percent based on AASHTO T-176.

Trench Backfill

Backfill for pipe bedding and in the pipe zone should consist of well-graded granular material with a maximum particle size of ¾ inch and less than 5 percent passing the U.S. No. 200 sieve. The material should be free of organic matter and other deleterious materials. Further, the backfill should meet the pipe manufacturer's recommendations. Above the pipe zone backfill, Imported Select Structural Fill may be used as described above.

Fill Placement and Compaction

Structural fill should be compacted at moisture contents that are within 3 percent of the optimum moisture content as determined by ASTM Test Method D 1557 (Modified Proctor). The optimum moisture content varies with gradation and should be evaluated during construction. Fill material that is not near the optimum moisture content should be moisture conditioned prior to compaction.

Fill and backfill material should be placed in uniform, horizontal lifts and compacted with appropriate equipment. The appropriate lift thickness will vary depending on the material and compaction equipment used. Fill material should be compacted in accordance with Table 2. It is the contractor's responsibility to select appropriate compaction equipment and place the material in lifts that are thin enough to meet these criteria. However, in no case should the loose lift thickness exceed 18 inches.

TABLE 2. COMPACTION CRITERIA

Fill Type	Compaction Requirements		
	Percent Maximum Dry Density Determined by ASTM Test Method D 1557 at ± 3% of Optimum Moisture		
	0 to 2 Feet Below Subgrade	> 2 Feet Below Subgrade	Pipe Zone
Fine-grained soils (non-expansive)	92	92	----
Imported Granular, maximum particle size < 1¼ inch	95	95	----
Imported Granular, maximum particle size 1¼ inch to 6 inches (3-inch-maximum under building footprints)	n/a (proof-roll)	n/a (proof-roll)	----
Retaining Wall Backfill*	92	92	-----
Nonstructural Zones	90	90	90
Trench Backfill	95	90	90

Note:

* Measures should be taken to prevent overcompaction of the backfill behind retaining walls. We recommend placing the zone of backfill located within 5 feet of the wall in lifts not exceeding about 6 inches in loose thickness and compacting this zone with hand-operated equipment such as a vibrating plate compactor or a jumping jack.

A representative from GeoEngineers should evaluate compaction of each lift of fill. Compaction should be evaluated by compaction testing unless other methods are proposed for oversized materials and are approved by GeoEngineers during construction. These other methods typically involve procedural placement and compaction specifications together with verification requirements such as proof-rolling.

INFILTRATION TESTING

As requested, we conducted infiltration testing to assist in evaluating the site for design for stormwater infiltration. We conducted infiltration testing in general accordance with the City of Portland Stormwater Design Manual (2014 version) at depths between 2 and 3 feet bgs, marked as IT-1 and IT-2 in Figure 2. Testing was conducted using the encased falling head and open pit infiltration testing procedures.

Testing Methods and Results

For the encased falling head testing a 6-inch-layer of pea gravel was placed in the pipe prior to adding water to diminish disturbance from water flowing at the base of the pipe interior. The test area was pre-soaked over a 4-hour period by adding water into the pipe when necessary. A good seal was present between the base of the pipe and the underlying soil, in our opinion.

For the open pit infiltration testing, test pits were 2 feet wide and 2 to 3 feet long with a testing depth of 1 foot. Approximately 2 inches of clean rock was placed in the bottom of the test locations to help minimize disturbance of the fine-grained materials in the excavation while adding water. Between 12 and 14 inches of water was added to the test pits for a period of 4 hours to saturate the underlying soils.

After the saturation period, the test locations were filled with clean water to at least 1 foot above the bottom of the pipe or excavation. The drop-in water level was measured over a period of 1 hour after the soak period. In the case where the water level falls during the time-measured testing, infiltration rates diminish as a result of less head from the water column in the test. In this test, we observed zero to negligible drops in the water level during the testing period. The field test results are summarized in Table 3.

TABLE 3. INFILTRATION RESULTS

Infiltration Test No.	Test Method	Depth (feet)	USCS Material Type	Field Measured Infiltration Rate[1] (inches/hour)
IT-1	Open Pit	2	ML	0.1
IT-2	Encased Falling Head	3	ML	0.0

Notes:

[1] Appropriate factors should be applied to the field-measured infiltration rate, based on the design methodology and specific system used.

USCS = Unified Soil Classification System

Based on the test results, we do not recommend on-site stormwater disposal unless additional testing is performed and yields higher infiltration rates in other areas of the site, or at different elevations.

The infiltration rates shown in Table 3 are field-measured infiltration rates. These represent a relatively short-term measured rate taken after the required saturation period, and factors of safety have not been applied for the type of infiltration system being considered, or for variability that may be present in the on-site soil. In our opinion, and consistent with the state of the practice, correction factors should be applied to this measured rate to reflect the small area of testing and the number of tests conducted.

During infiltration testing, we observed negligible infiltration rates (effectively zero). If other textural-based infiltration rates (even if they are very low infiltration rates) are used for design, appropriate correction factors should also be applied by the project civil engineer to account for long-term infiltration parameters. From a geotechnical perspective, we recommend a factor of safety (correction factor) of at least 3 be applied to the infiltration values derived from field observations to account for potential soil variability with depth and location within the area tested. In addition, the stormwater system design engineer should determine and apply appropriate remaining correction factor values, or factors of safety, to account for repeated wetting and drying that occur in this area, degree of in-system filtration, frequency and type of system maintenance, vegetation, potential for siltation and bio-fouling, etc., as well as system design correction factors for overflow or redundancy and base and facility size.

The actual depths, lateral extent and estimated infiltration rates can vary from the values presented above. Field testing/confirmation during construction is often required in large or long systems or other situations where soil conditions may vary within the area where the system is constructed. The results of this field testing might necessitate that the infiltration locations be modified to achieve the design infiltration rate.

Also, infiltration flow rate of a focused stormwater system typically diminishes over time as suspended solids and precipitates in the stormwater further clog the void spaces between the soil particles or cake on the infiltration surface. The serviceable life of an infiltration media in a stormwater system can be extended by pre-filtering or with on-going accessible maintenance. Eventually, most systems will fail and will need to be replaced or have media regenerated or replaced. We recommend that infiltration systems include an overflow that is connected to a suitable discharge point. Also, infiltration systems can cause localized high groundwater levels and should not be located near basement walls, retaining walls, or other embedded structures unless these are specifically designed to account for the resulting hydrostatic pressure. Infiltration locations should not be located on sloping ground, unless it is approved by a geotechnical engineer, and should not be infiltrated at a location that allows for flow to travel laterally toward a slope face, such as a mounded water condition or too close to a slope face.

Suitability of Infiltration System

Successful design and implementation of stormwater infiltration systems and whether a system is suitable for a development depend on several site-specific factors. Stormwater infiltration systems are generally best suited for sites having sandy or gravelly soil with saturated hydraulic conductivities greater than 2 inches per hour. Sites with silty or clayey soil such as encountered at this site, are generally not well-suited for stormwater infiltration. Soils that have fine-grained matrices are susceptible to volumetric change and softening during wetting and drying cycles. Fine-grained soils also have large variations in the magnitude of infiltration rates because of bedding and stratification that occurs during alluvial deposition, and often have thin layers of less permeable or impermeable soil within a larger layer.

Based on the fine-grained soil conditions and very low to negligible measured infiltration rates, we recommend infiltration of stormwater not be used as the sole method of stormwater management at this site unless those design factors can be otherwise accounted for.

PAVEMENT RECOMMENDATIONS

Our pavement recommendations are based on the results of our field testing and analysis. The Hwy 99W pavement analysis and recommendations were developed in general accordance with the ODOT Pavement Design Guide.

The recommended pavement sections assume that final improvements surrounding the pavement will be designed and constructed such that stormwater or excess irrigation water from landscape areas does not infiltrate below the pavement section into the base rock materials.

Dynamic Cone Penetrometer (DCP) Field Testing and Resilient Modulus (M_R)

We conducted four DCP tests onsite near the proposed locations of the new roadway and four DCP tests in the north shoulder of Hwy 99W for widening the road. The tests were conducted in general accordance with ASTM D 6951 to estimate the subgrade support value, M_R. At each test location, we recorded penetration depths of the cone versus hammer blow counts. The DCP tests were terminated at depths between 3 and 5 feet bgs. The resilient modulus was estimated in general accordance with the ODOT Pavement Design Guide using a conversion coefficient, C_f, of 0.35.

Table 4 lists the estimated subgrade resilient modulus at each test location based on data obtained in the upper 18 inches below the proposed pavement section. Field DCP data are summarized in Figures A-37 through A-44.

TABLE 4. ESTIMATED SUBGRADE RESILIENT MODULI BASED ON DCP TESTING

Boring Number	Estimated Resilient Modulus (psi)
HA-1	4,800
HA-2	3,900
HA-3	5,000
HA-5	4,500
B-2	4,600
B-4	4,800
B-6	5,200
B-8	5,000

On-Site Local Roads

Pavement subgrades should be prepared in accordance with the “Earthwork Recommendations” section of this report. Our pavement recommendations at the site are based on estimated average daily traffic provided by the project traffic engineer. We have based our design analysis for truck traffic percentages from a nearby traffic count on Hwy 99W provided by ODOT.

Our pavement recommendations are based on the following assumptions and design parameters included in the ODOT Pavement Design Guide:

- The pavement subgrades, fill subgrades and site earthwork used to establish road grades below the Aggregate Subbase and Aggregate Base materials have been prepared as described in the “Earthwork Recommendations” section of this report.
- A resilient modulus of 20,000 psi has been estimated for compacted Aggregate Subbase and Aggregate Base materials.
- A resilient modulus of 4,200 psi was estimated for firm native soils below the tilled zone or structural fill placed on firm native soils below the tilled zone.
- Initial and terminal serviceability indices of 4.2 and 2.0, respectively.
- Reliability and standard deviations of 75 percent and 0.49, respectively.
- Structural coefficients of 0.42 and 0.10 for the asphalt and base rock, respectively.
- A 20-year design life.
- Estimated traffic levels based on annul average daily traffic (AADT) provided by the project traffic engineer. The design Equivalent Single Axle Loads (ESAL) calculated from the AADT are 1,190,805 from

Hwy 99W to the roundabout and 1,069,585 for the remaining on-site roads, for a 20-year design life, 2 percent growth and single-lane, one-way traffic.

- Estimated combined truck percentage of 5.4 percent is based on nearby ODOT traffic counts on Hwy 99W.

If any of the noted assumptions vary from project design use, our office should be contacted with the appropriate information so that the pavement designs can be revised or confirmed adequate.

The recommended minimum pavement sections are provided in Table 5. Pavement recommendations for “On-Site Local Roads” are for roadways within the development.

The alternate pavement section using Aggregate Subbase material is provided because it may be more applicable during wet-weather construction where a gravel haul road or working surface is needed to support construction traffic. Wet weather construction recommendations are provided in the “Earthworks Recommendations” section of this report. The sub-base material can be incorporated into the gravel working blankets and haul roads provided the material meets the minimum thickness in Table 5 and meets the specifications for Aggregate Subbase. Working blanket and haul road materials that pump excessively, or have excessive fines from construction traffic, should be removed and replaced with specified materials prior to constructing roadways over those areas.

If cement amendment is used during site development, as described in the “Earthwork Recommendations” section of this report, it may be possible to reduce the amount of aggregate base for the pavement sections. This will depend on several factors, including the prevailing weather conditions, depth of amendment and condition of the subgrade after amendment. GeoEngineers can provide additional information for on-site pavement sections if cement amendment will be used during construction.

TABLE 5. MINIMUM PAVEMENT SECTIONS FOR ON-SITE ROADS

Road Section	Minimum Asphalt Thickness (inches)	Minimum Aggregate Base Thickness (inches)	Minimum Aggregate Sub-Base Thickness (inches)
On-site Local Road between Hwy 99W and Roundabout	6.0	17.5	0.0
	6.0	8.0	12.0
Other On-site Local Roads	6.0	15.5	0.0
	6.0	6.0	12.0

The aggregate base course should conform to the “Aggregate Base” section of this report and be compacted to at least 95 percent of the maximum dry density (MDD) determined in accordance with AASHTO T-180/ASTM Test Method D 1557.

The AC pavement should conform to Section 00745 of the most current edition of the ODOT Standard Specifications for Highway Construction. The Job Mix Formula should meet the requirements for a ½-inch Dense Graded Level 2 Mix. The AC should be PG 64-22 grade meeting the ODOT Standard Specifications for Asphalt Materials. AC pavement should be compacted to 92.0 percent at Maximum Theoretical Unit Weight (Rice Gravity) of AASHTO T-209.

Hwy 99W Widening Pavement

Project development includes widening Hwy 99W to include a turn lane into the development. Widening the roadway will involve raising the current grade to match the existing roadway elevation. Fill placement to raise subgrade elevations and pavement subgrades should be prepared in accordance with the "Earthwork Recommendations" section of this report.

Our pavement recommendations for the right turn lane are based on estimated ADT provided by the traffic engineers. We have based our design analysis for truck traffic percentages from a nearby traffic count on Hwy 99W provided by ODOT.

Our pavement recommendations are based on the following assumptions and design parameters included in the ODOT Pavement Design Guide:

- The pavement subgrades, fill subgrades and site earthwork used to establish road grades below the Aggregate Subbase and Aggregate Base materials have been prepared as described in the "Earthwork Recommendations" section of this report.
- A resilient modulus of 20,000 psi has been estimated for compacted Aggregate Base.
- A resilient modulus of 4,800 psi was estimated for subgrade prepared and compacted as recommended.
- Initial and terminal serviceability indices of 4.2 and 2.5, respectively.
- Reliability and standard deviations of 85 percent and 0.49, respectively.
- Structural coefficients of 0.42 and 0.10 for the asphalt and base rock, respectively.
- A 20-year design life.
- Estimated traffic levels based on estimated AADT from the traffic engineer. Estimated combined truck percentage of 5.4 percent is based on nearby ODOT traffic counts on Hwy 99W. The design ESALs calculated from the AADT are 2,907,533 for a 20-year design life, 3.4 percent growth and single-lane, one-way traffic.
- Truck traffic consists of a range of 2- to 6-axle trucks with the distribution equaling the truck counts at the ODOT traffic counts on Hwy 99W.

Road widening AC pavement recommendations are for the turn lane widening entering the development. The recommended pavement sections are provided in Table 6. If any of the noted assumptions vary from project design use, our office should be contacted with the appropriate information so that the pavement designs can be revised or confirmed adequate.

TABLE 6. MINIMUM PAVEMENT SECTIONS FOR HWY 99W TURN LANE

Minimum Asphalt Thickness (inches)	Minimum Aggregate Base Thickness (inches)	Minimum Aggregate Sub-Base Thickness (inches)
7.0	18.0	0.0
7.0	8.5	12.0

The AC pavement should conform to Section 00745 of the most current edition of the ODOT Standard Specifications for Highway Construction. The Job Mix Formula should meet the requirements for a ½-inch Dense Graded Level 2 Mix. The AC should be PG 70-22 grade meeting the ODOT Standard Specifications for Asphalt Materials. AC pavement should be compacted to 91.0 percent at Maximum Theoretical Unit Weight (Rice Gravity) of AASHTO T-209.

STRUCTURAL DESIGN RECOMMENDATIONS

Foundation Support Recommendations

Proposed commercial and apartment structures can be satisfactorily founded on continuous wall or isolated column footings supported on firm native soils encountered below the tilled zone, or on structural fill placed over firm native soils. Exterior footings should be established at least 18 inches below the lowest adjacent grade. The recommended minimum footing depth is greater than the anticipated frost depth. Interior footings can be founded a minimum of 12 inches below the top of the first-floor slab. Isolated column and continuous wall footings should have minimum widths of 24 and 18 inches, respectively. We have assumed that the column loads will be 40 kips or less, wall loads will be 2 klf or less, and floor loads for slabs on grade will be 100 psf or less for the proposed buildings. If design loads exceed these values, our recommendations may need to be revised.

Foundation Subgrade Preparation

The subgrades beneath proposed structural elements should be prepared as described below and in the “Earthworks Recommendations” section of this report. We recommend loose or disturbed soils resulting from foundation excavation be removed before placing reinforcing steel and concrete. Foundation bearing surfaces should not be exposed to standing water. If water infiltrates and pools in the excavation, the water, along with any disturbed soil, should be removed before placing reinforcing steel and concrete. A thin gravel layer consisting of Aggregate Base or Aggregate Subbase material can be placed at the base of foundation excavations to help protect the subgrade from weather and light foot traffic. The layer thickness for the gravel layer should be determined at the time of construction but is typically 3 to 4 inches. The gravel layer should be compacted as described in the “Fill Placement and Compaction” section.

We recommend GeoEngineers observe all foundation subgrades before placing concrete forms and reinforcing steel to determine that bearing surfaces have been adequately prepared and the soil conditions are consistent with those observed during our explorations.

Bearing Capacity – Spread Footings

We recommend conventional footings be proportioned using a maximum allowable bearing pressure of 2,500 psf if supported on firm native soils below the tilled zone, or on structural fill placed over firm native soils. This bearing pressure applies to the total of dead and long-term live loads and may be increased by one-third when considering earthquake or wind loads. This is a net bearing pressure. The weight of the footing and overlying backfill can be ignored in calculating footing sizes.

Foundation Settlement

Foundations designed and constructed as recommended are expected to experience settlements of less than 1 inch. Differential settlements of up to one half of the total settlement magnitude can be expected between adjacent footings supporting comparable loads.

Lateral Resistance

The ability of the soil to resist lateral loads is a function of frictional resistance, which can develop on the base of footings and slabs, and the passive resistance, which can develop on the face of below-grade elements of the structure as these elements tend to move into the soil. For footings and floor slabs founded in accordance with the recommendations presented above, the allowable frictional resistance may be computed using a coefficient of friction of 0.30 applied to vertical dead-load forces. Our analysis indicates that the available passive earth pressure for footings confined by on-site soil and structural fill is 350 pcf, modeled as an equivalent fluid pressure. Typically, the movement required to develop the available passive resistance may be relatively large; therefore, we recommend using a reduced passive pressure of 250 pcf equivalent fluid pressure. In addition, in order to rely on passive resistance, a minimum of 10 feet of horizontal clearance must exist between the face of the footings and adjacent downslopes.

The passive earth pressure and friction components may be combined provided that the passive component does not exceed two-thirds of the total. The passive earth pressure value is based on the assumptions that the adjacent grade is level and that groundwater remains below the base of the footing throughout the year. The top foot of soil should be neglected when calculating passive lateral earth pressures unless the foundation area is covered with pavement or slab-on-grade. The lateral resistance values include a safety factor of approximately 1.5.

Drainage Considerations

We recommend the ground surface be sloped away from the buildings at least 2 percent. All downspouts should be tightlined away from the building foundation areas and should be discharged into a stormwater system. Downspouts should not be connected to footing drains.

Although not required based on groundwater depths observed in our explorations, if perimeter footing drains are used for below-grade structural elements or walls or to capture perched groundwater resulting from downslope cuts, they should be installed at the base of the exterior footings. The perimeter footing drains should be provided with cleanouts and should consist of at least 4-inch-diameter perforated pipe placed on a 3-inch bed of, and surrounded by, 6 inches of granular drainage material. Aggregate Base can be used for the granular pipe bedding and drainage materials provided the material has less than 3 percent passing the U.S. No. 200 sieve. The drainage material should be enclosed in a non-woven geotextile such as Mirafi 140N (or approved alternate) to prevent fine soil from migrating into the drain material. We recommend against using flexible tubing for footing drainpipes. The perimeter drains should be sloped to drain by gravity to a suitable discharge, preferably a storm drain. We recommend that the cleanouts be covered and placed in flush-mounted utility boxes. Water collected in roof downspout lines must not be routed to the footing drain lines.

Floor Slabs

Satisfactory subgrade support for floor slabs on grade supporting the planned 100 psf floor loads can be obtained provided the floor slab subgrade is described in the “Earthworks Recommendations” section of this report. Slabs should be reinforced according to their proposed use and per the structural engineer's recommendations. Subgrade support for concrete slabs can be obtained from the firm native soils underlying the tilled zone or on structural fill placed over firm native soils.

We recommend that on-grade slabs be underlain by a minimum 6-inch-thickness of Aggregate Base acting as a capillary break material to reduce the potential for moisture migration into the slab. The capillary break material should be placed as recommended in the "Fill Placement and Compaction" section of this report.

If dry on-grade slabs are required, for example at interior spaces where adhesives are used to anchor carpet or tile to the slab, a waterproof liner may be placed as a vapor barrier below the slab. The vapor barrier should be selected by the structural engineer and should be accounted for in the design floor section and mix design selection for the concrete, to accommodate the effect of the vapor barrier on concrete slab curing. Load-bearing concrete slabs should be designed assuming a modulus of subgrade reaction (k) of 150 psi per inch. We estimate that concrete slabs constructed as recommended will settle less than ½ inch. Floor slab subgrades should be evaluated according to the "Subgrade Evaluation" section of this report.

Conventional Retaining Walls

Drainage

Positive drainage is imperative behind retaining structures. This can be accomplished by providing a drainage zone behind the wall consisting of free-draining material and perforated pipes to collect and dispose the water. The drainage material should consist of Aggregate Base having less than 3 percent passing the U.S. No. 200 sieve. The wall drainage zone should extend horizontally at least 18 inches from the back of the wall.

A perforated smooth-walled rigid drainpipe having a minimum diameter of 4 inches should be placed at the bottom of the drainage zone along the entire length of the wall, with the pipe invert at or below the base of the wall footing. The drainpipes should discharge to a tightline leading to an appropriate collection and disposal system. An adequate number of cleanouts should be incorporated into the design of the drains to provide access for regular maintenance. Roof downspouts, perimeter drains, or other types of drainage systems should not be connected to retaining wall drain systems.

Design Parameters

The pressures presented assume that backfill placed within 2 feet of the wall is compacted by hand-operated equipment to a density of 90 percent of the MDD and that wall drainage measures are included as previously recommended. For walls constructed as described above, we recommend using an active lateral earth pressure corresponding to an equivalent fluid density of 35 pcf for the level backfill condition. For walls with backfill sloping upward behind the wall at 2H:1V, an equivalent fluid density of 55 pcf should be used. This assumes that the tops of the walls are not structurally restrained and are free to rotate. For the at-rest condition (walls restrained from movement at the top) an equivalent fluid density of 55 pcf should be used for design. For seismic conditions, we recommend a uniform lateral pressure of 4H (where H is the height of the wall) psf be added to these lateral pressures. If the retaining system is designed as a braced system but is expected to yield a small amount during a seismic event, an active earth pressure condition may be assumed and combined with the uniform seismic surcharge pressure.

The recommended pressures do not include the effects of surcharges from surface loads. If vehicles will be operated within one-half the height of the wall, a traffic surcharge should be added to the wall pressure. The traffic surcharge can be approximated by the equivalent weight of an additional 2 feet of backfill behind the wall. Additional surcharge loading conditions should also be considered on a case-by-case basis.

Retaining walls founded on native soil, or structural fill extending to these materials, may be designed using the allowable soil bearing values and lateral resistance values presented above in the "Shallow Foundations" section of this report. We estimate settlement of retaining structures will be similar to the values previously presented for building foundations.

Seismic Design

We recommend seismic design be performed using the procedure outlined in the 2012/2015 IBC and the 2014 OSSC. The parameters provided in Table 7 are based on the conditions encountered during our subsurface exploration program and should be used in preparation of response spectra for the proposed structures.

TABLE 7. SEISMIC DESIGN PARAMETERS

Parameter	Value
Site Class	D
Spectral Response Acceleration, S_s	0.95 g
Spectral Response Acceleration, S_1	0.43 g
Site Coefficient, F_a	1.12
Site Coefficient, F_v	1.57
Spectral Response Acceleration (Short Period), S_{DS}	0.71 g
Spectral Response Acceleration (1-Second Period) S_{D1}	0.45 g

Liquefaction Potential

Liquefaction is a phenomenon caused by a rapid increase in pore water pressure that reduces the effective stress between soil particles to near zero. The excessive buildup of pore water pressure results in the sudden loss of shear strength in a soil. Granular soil, which relies on interparticle friction for strength, is susceptible to liquefaction until the excess pore pressures can dissipate. Sand boils and flows observed at the ground surface after an earthquake are the result of excess pore pressures dissipating upwards, carrying soil particles with the draining water. In general, loose, saturated sand soil with low silt and clay contents is the most susceptible to liquefaction. Low plasticity, silty sand may be moderately susceptible to liquefaction under relatively higher levels of ground shaking.

Based on our analysis, the site soils are not prone to liquefaction during the design level earthquake. Accordingly, lateral spreading or liquefaction induced deformations are not expected.

DESIGN REVIEW AND CONSTRUCTION SERVICES

Recommendations provided in this report are based on the assumptions and preliminary design information stated herein. We welcome the opportunity to review and discuss construction plans and specifications for this project as they are being developed. In addition, GeoEngineers should be retained to review the geotechnical-related portions of the plans and specifications to evaluate whether they are in conformance with the recommendations provided in this report.

Satisfactory foundation and earthwork performance depends to a large degree on quality of construction. Sufficient monitoring of the contractor's activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications. Subsurface conditions observed during construction should be compared with those encountered during the subsurface explorations. Recognition of changed conditions often requires experience; therefore, qualified personnel should visit the site with sufficient frequency to detect whether subsurface conditions change significantly from those anticipated.

We recommend that GeoEngineers be retained to observe construction at the site to confirm that subsurface conditions are consistent with the site explorations, and to confirm that the intent of project plans and specifications relating to earthwork, pavement and foundation construction are being met.

LIMITATIONS

We have prepared this report for the exclusive use of 3J Consulting, Inc., J.T. Smith Companies and their authorized agents and/or regulatory agencies for the proposed Crestview Crossing Development at located north of Hwy 99W between Vittoria Way and North Harmony Way in Newberg, Oregon.

This report is not intended for use by others and the information contained herein is not applicable to other sites. No other party may rely on the product of our services unless we agree in advance and in writing to such reliance.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in the area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Please refer to Appendix C titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

REFERENCES

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FIGURES

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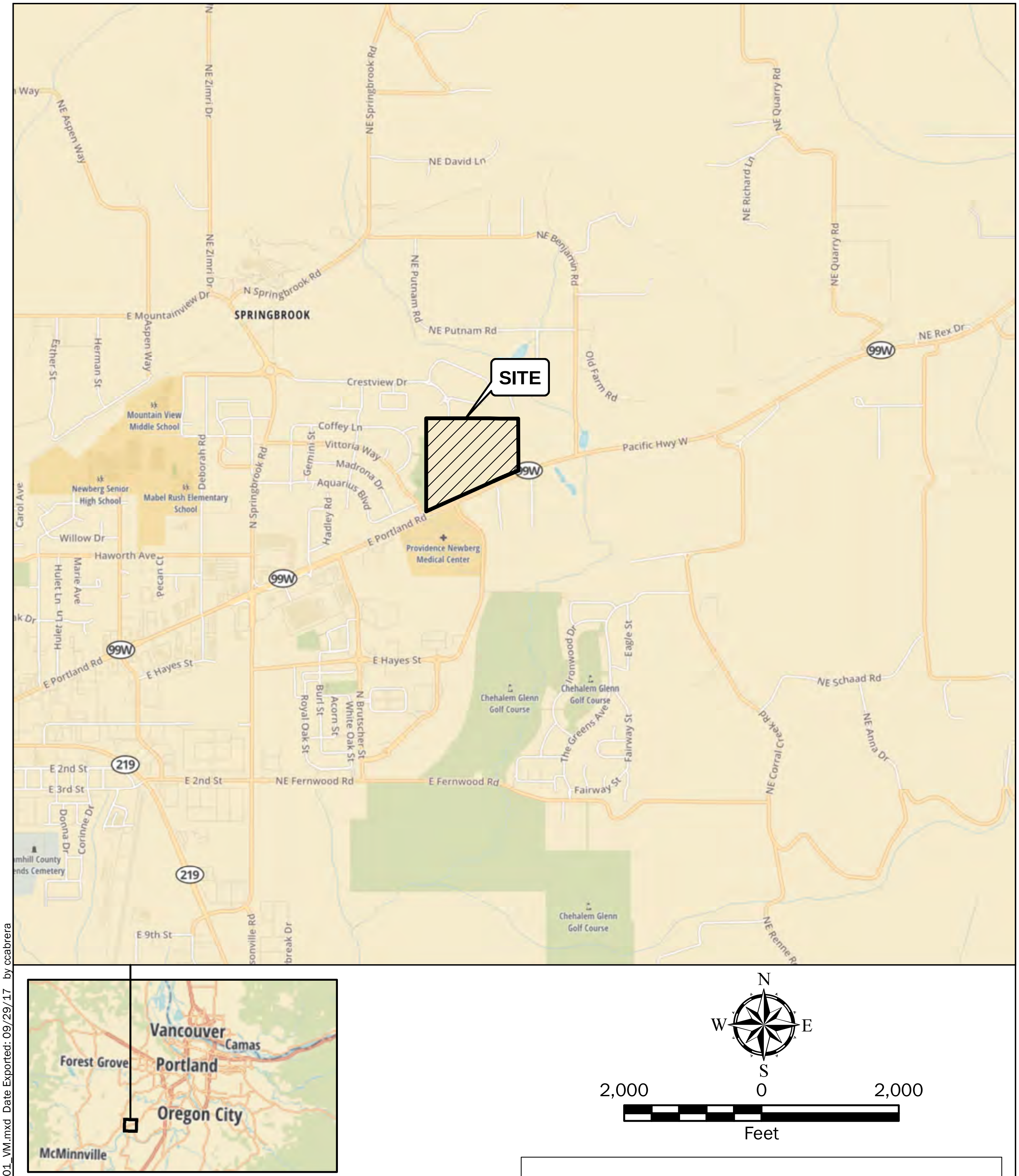

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Mapbox Open Street Map, 2017

Projection: NAD 1983 UTM Zone 10N

Vicinity Map

Crestview Crossing
Newberg, Oregon

GEOENGINEERS

Figure 1

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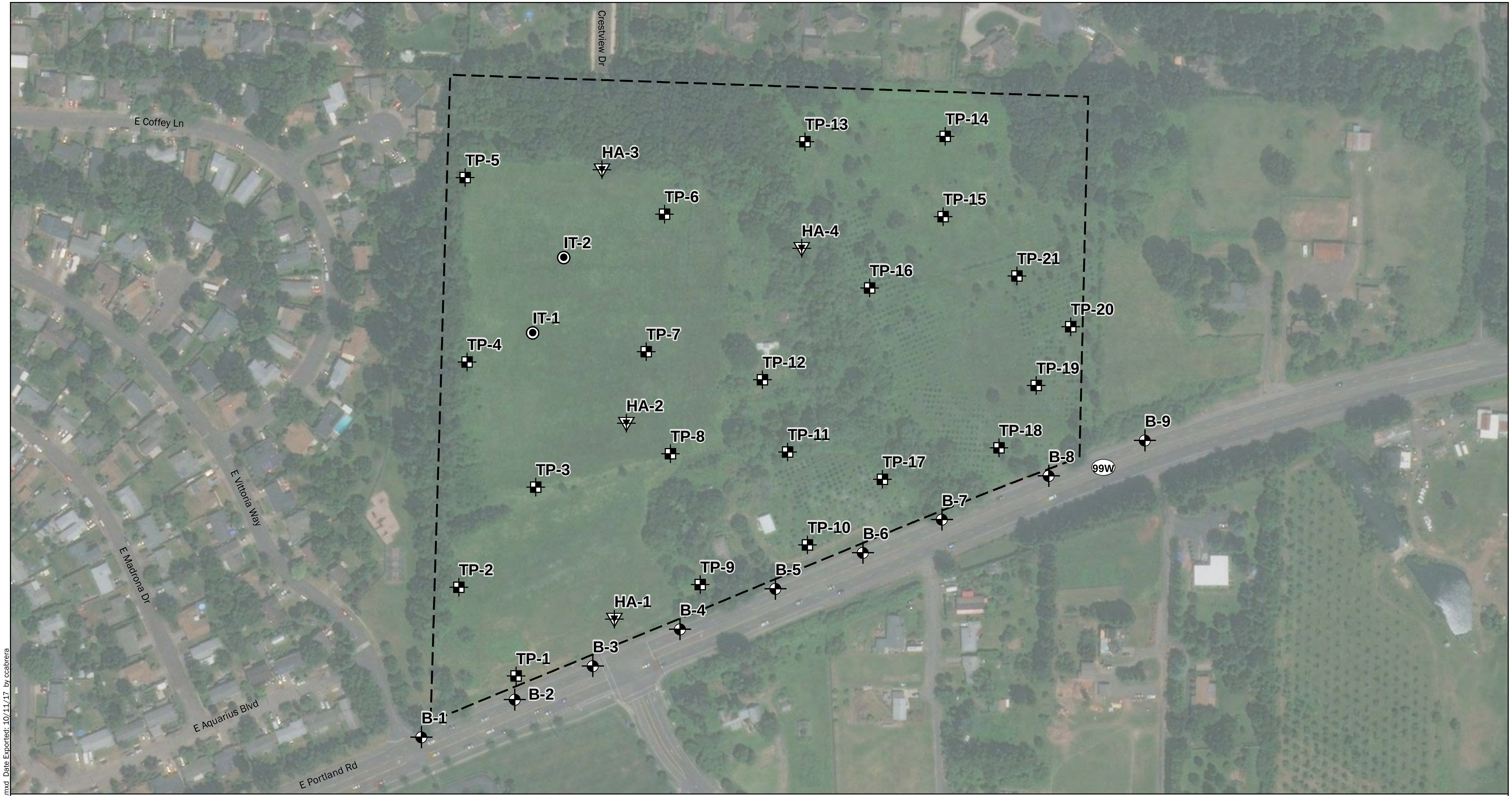

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Data Source: Aerial from ESRI ArcGIS Online.
Base image from 3J Consulting, August 8, 2017.

Projection: NAD 1983 HARN StatePlane Oregon North FIPS 3601 IntlFeet

Legend

B-1 Boring Number and Approximate Location
HA-1 Hand Auger Number and Approximate Location
IT-1 Infiltration Test Number and Approximate Location
TP-1 Test Pit Number and Approximate Location
Project Approximate Extents

Site Plan

Crestview Crossing
Newberg, Oregon

GeoEngineers

Figure 2

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APPENDICES

APPENDIX A

Field Explorations and Laboratory Testing

APPENDIX A
FIELD EXPLORATIONS AND LABORATORY TESTING

Field Explorations

Soil and groundwater conditions at the proposed Crestview Crossing Development locations were explored on August 20, 21 and 26, 2017, by completing nine borings (B-1 through B-9), twenty-one test pits (TP-1 through TP-21), four hand augers (HA-1 through HA-4), two infiltration tests (IT-1 and IT-2) and eight DCP soundings. Boring depths extended between 4 and 6½ feet bgs, test pits were extended to depths between 8 and 12 feet bgs, hand augers were extended to depth between 3 and 4½ feet bgs, and DCP soundings were extended to depths between 3 and 4 feet bgs at the approximate locations shown in Figure 2.

The borings were advanced using solid stem drilling techniques using a trailer-mounted drill rig owned and operated by Dan Fischer Excavating of Banks, Oregon. Test pits were excavated using a mini-excavator owned and operated by K&E Excavating out of Salem, Oregon.

The drilling was continuously monitored by a staff engineer from our office who maintained a detailed log of subsurface explorations, visually classified the soil encountered and obtained representative soil samples from the borings. Representative soil samples were obtained from each boring at approximate 2½- to 5-foot-depth intervals using a standard split spoon sampler. The samplers were driven into the soil using an automatic 140-pound hammer, free-falling 30 inches on each blow. The number of blows required to drive the sampler each of three, 6-inch increments of penetration were recorded in the field. The sum of the blow counts for the last two, 6-inch increments of penetration is reported on the boring logs as the ASTM D 1556 Standard Penetration Test (SPT) N-value.

The test pit excavations were continuously monitored by an engineer from our office who maintained a detailed log of subsurface explorations, visually classified the soil encountered and obtained representative soil samples from the test pits, from the sidewalls above a depth of 4 feet bgs and from excavation spoil below that depth.

DCP soundings were performed by a staff geotechnical engineer from our office who recorded blow count versus cumulative penetration depth. This penetration resistance data was compared to the nearby borings where a detailed log of subsurface explorations was maintained, the soils encountered were visually classified and representative soil samples from the borings were obtained. The results of the DCP soundings are presented in Figures A-3 through A-10.

Recovered soil samples from exploratory borings were visually classified in the field in general accordance with ASTM D 2488 and the classification chart listed in Key to Exploration Logs, Figure A-1. Logs of the borings are presented in Figures A-2 through A-10. Logs of the test pits are presented in Figures A-11 through A-31. Logs of the hand augers are presented in Figures A-32 through A-35. The logs are based on interpretation of the field and laboratory data and indicate the depth at which subsurface materials or their characteristics change, although these changes might actually be gradual.

Laboratory Testing

Soil samples obtained from the explorations were visually classified in the field and in our laboratory using the USCS and ASTM classification methods. ASTM Test Method D 2488 was used to visually classify the soil samples, while ASTM D 2487 was used to classify the soils based on laboratory tests results. Moisture content tests were performed in general accordance with ASTM D 2216-05. Atterberg limits test (ASTM 4813) were completed on representative soil samples. Results of the moisture contents testing are presented in the appropriate exploration logs at the respective sample depths and the Atterberg limits results in Figure A-36 in this appendix.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)	▨	GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
			▨	GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	▨	GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
			▨	GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)	▨	SW	WELL-GRADED SANDS, GRAVELLY SANDS
			▨	SP	POORLY-GRADED SANDS, GRAVELLY SAND
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	▥	SM	SILTY SANDS, SAND - SILT MIXTURES
			▨	SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	▥	ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
			▨	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			▥	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	▥	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
			▨	CH	INORGANIC CLAYS OF HIGH PLASTICITY
			▨	OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			▨	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS		TYPICAL DESCRIPTIONS
GRAPH	LETTER	
■	AC	Asphalt Concrete
▨	CC	Cement Concrete
■	CR	Crushed Rock/ Quarry Spalls
▨	SOD	Sod/Forest Duff
▨	TS	Topsoil

Groundwater Contact

▼	Measured groundwater level in exploration, well, or piezometer
▼	Measured free product in well or piezometer

Graphic Log Contact

─	Distinct contact between soil strata
╱	Approximate contact between soil strata

Material Description Contact

─	Contact between geologic units
‐ ‐ ‐ ‐	Contact between soil of the same geologic unit

Sampler Symbol Descriptions

◫	2.4-inch I.D. split barrel
⊠	Standard Penetration Test (SPT)
■	Shelby tube
▤	Piston
◧	Direct-Push
◫	Bulk or grab
▥	Continuous Coring

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

Laboratory / Field Tests

%F	Percent fines
%G	Percent gravel
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DD	Dry density
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
Mohs	Mohs hardness scale
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

Key to Exploration Logs

GeoEngineers

Figure A-1

Drilled	Start 9/21/2017	End 9/21/2017	Total Depth (ft) 6.5	Logged By TAP Checked By TAP	Driller Dan Fischer Excavating, Inc.
Drilling Method	Solid-stem Auger				
Surface Elevation (ft) Vertical Datum	220 NAVD88	Hammer Data	Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Portable Beaver Drill Trailer Mounted
Easting (X) Northing (Y)	7575194 608424	System Datum	OR State Plane North NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	7 inches asphalt			
								GM	11 inches brown silty gravel with sand (fill)			
		☒	18	11		1 MC		ML	Gray silt with sand (stiff, moist)	19		
215	5	☒	18	9		2						

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Boring B-1/C-1

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-2
Sheet 1 of 1

Drilled	Start 9/21/2017	End 9/21/2017	Total Depth (ft) 6.5	Logged By TAP Checked By TAP	Driller Dan Fischer Excavating, Inc.
Drilling Method	Solid-stem Auger				
Surface Elevation (ft) Vertical Datum	218 NAVD88	Hammer Data	Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Portable Beaver Drill Trailer Mounted
Easting (X) Northing (Y)	7575389 608503	System Datum	OR State Plane North NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	5½ inches asphalt			
								GM	13 inches silty gravel with sand (fill)			
		☒	18	13		1						PP = 4 tsf
								ML	Brown silt with trace sand (stiff, moist)			
215												
	5	☒	18	6		2			Becomes medium stiff			PP = 1.5 tsf

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Boring B-2/C-2

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-3
Sheet 1 of 1

Date:11/1/17 Path:P:\6\6748002\GINT\674800200.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_STANDARD_%F_NO_GW

Drilled	Start 9/21/2017	End 9/21/2017	Total Depth (ft) 6.5	Logged By TAP Checked By TAP	Driller Dan Fischer Excavating, Inc.
Drilling Method	Solid-stem Auger				

Surface Elevation (ft) Vertical Datum	211 NAVD88	Hammer Data	Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Portable Beaver Drill Trailer Mounted
Easting (X) Northing (Y)	7575553 608574	System Datum	OR State Plane North NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	4½ inches asphalt			
210								GM	8½ inches silty fine to coarse gravel with sand (fill)			
								ML	Brown silt with trace sand (medium stiff, moist)			
		☒	18	7		1 AL				32		AL (LL = 39; PI = 14)
	5	☒	18	5		2						
205												

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Boring B-3/C-3

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-4
Sheet 1 of 1

Drilled	Start 9/21/2017	End 9/21/2017	Total Depth (ft) 6.5	Logged By TAP Checked By TAP	Driller Dan Fischer Excavating, Inc.
Drilling Method	Solid-stem Auger				
Surface Elevation (ft) Vertical Datum	213 NAVD88	Hammer Data	Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Portable Beaver Drill Trailer Mounted
Easting (X) Northing (Y)	7575736 608651	System Datum	OR State Plane North NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

		FIELD DATA										
Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	3 inches asphalt			
								GM	26 inches silty fine to coarse gravel with sand (fill)			
		☒	4	7		1						
								ML	Brown silt (medium stiff, moist)			
210												
	5	☒	18	7		2			Becomes red brown			

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Boring B-4/C-4

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-5
Sheet 1 of 1

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Drilled	Start 9/21/2017	End 9/21/2017	Total Depth (ft) 6.5	Logged By TAP Checked By TAP	Driller Dan Fischer Excavating, Inc.	Drilling Method Solid-stem Auger

Surface Elevation (ft) 202 Vertical Datum NAVD88	Hammer Data Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment Portable Beaver Drill Trailer Mounted
Easting (X) 7575936 Northing (Y) 608735	System OR State Plane North Datum NAD83 (feet)	Groundwater not observed at time of exploration

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
		Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
	0							AC	5½ inches asphalt			
								GM	16½ inches silty fine to coarse gravel with sand (fill)			
200		☒	18	7		1		ML	Brown silt with trace sand (medium stiff, moist)			PP = 2 tsf
	5			4		MC				33		PP = 1 tsf

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Boring B-5/C-5

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Drilled	Start 9/21/2017	End 9/21/2017	Total Depth (ft) 6.5	Logged By TAP Checked By TAP	Driller Dan Fischer Excavating, Inc.	Drilling Method Solid-stem Auger

Surface Elevation (ft) 200 Vertical Datum NAVD88	Hammer Data Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment Portable Beaver Drill Trailer Mounted
Easting (X) 7576120 Northing (Y) 608811	System Datum OR State Plane North NAD83 (feet)	Groundwater not observed at time of exploration

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	9½ inches asphalt			
								GP	11½ inches brown fine gravel with sand, trace silt (fill)			
		☒	18	8		1		ML	Brown silt with trace sand (medium stiff, moist)			PP = 2.5 tsf
195	5	☒		6		2			Becomes clayey silt			PP 1.25 tsf

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Boring B-6/C-6

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-7
Sheet 1 of 1

Drilled	Start 9/21/2017	End 9/21/2017	Total Depth (ft)	4.5
Logged By	TAP	Checked By	TAP	
Driller	Dan Fischer Excavating, Inc.	Drilling Method	Solid-stem Auger	
Surface Elevation (ft) Vertical Datum	190 NAVD88	Hammer Data	Rope & Cathead 140 (lbs) / 30 (in) Drop	
Drilling Equipment	Portable Beaver Drill Trailer Mounted			
Easting (X) Northing (Y)	7576285 608880	System Datum	OR State Plane North NAD83 (feet)	
Groundwater not observed at time of exploration				

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA				Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
		Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing					
	0						AC	5½ inches asphalt			
							GM	19½ inches silty gravel (fill)			
		☒	20			1 MC	ML	Orange-brown sandy silt, trace organic matter (very stiff, dry)	32		Organic matter are roots and some burnt Smooth, hard drilling at 4 feet below ground surface Unable to drill past 4½ feet below ground surface. Attempt to sample 50/2" sample. Water is filling up the hole. Public works notified and observed water and stated that it was not from a utility.

Boring terminated due to refusal

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Boring B-7/C-7

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-8
Sheet 1 of 1

Drilled	Start 9/21/2017	End 9/21/2017	Total Depth (ft) 6.5	Logged By TAP Checked By TAP	Driller Dan Fischer Excavating, Inc.
Drilling Method	Solid-stem Auger				

Surface Elevation (ft) Vertical Datum	184 NAVD88	Hammer Data	Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Portable Beaver Drill Trailer Mounted
Easting (X) Northing (Y)	7576509 608972	System Datum	OR State Plane North NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	5½ inches asphalt			
								GM	17 inches silty fine to coarse gravel with sand (fill)			
			18	19		1		ML	Gray brown silt with sand (stiff, moist)			
								GM	Gray silty fine to coarse gravel with trace sand (medium dense, moist)			
180								ML	Gray silt with orange mottling (medium stiff, moist)			
	5			10		2 MC				24		

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Boring B-8/C-8

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-9
Sheet 1 of 1

Drilled Start 9/21/2017 End 9/21/2017	Total Depth (ft) 4	Logged By TAP Checked By TAP	Driller Dan Fischer Excavating, Inc.	Drilling Method Solid-stem Auger
Surface Elevation (ft) 182 Vertical Datum NAVD88	Hammer Data Rope & Cathead 140 (lbs) / 30 (in) Drop		Drilling Equipment Portable Beaver Drill Trailer Mounted	
Easting (X) 7576711 Northing (Y) 609047	System Datum OR State Plane North NAD83 (feet)		Groundwater not observed at time of exploration	
Notes:				

		FIELD DATA										
Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	5½ inches asphalt			
								GM	16½ inches brown silty fine to coarse gravel with sand (fill)			
180		☒	18	23		1		ML	Gray brown silt with trace sand (stiff, moist) (fill)			
								GM	Gray silty gravel with sand (medium dense, moist) (fill)			
								AC	Asphalt			

Boring terminated due to presence of unlocatable utility and encountering asphalt

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Boring B-9/C-9

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-10
Sheet 1 of 1

Date Excavated 9/20/2017	Total Depth (ft) 11.5	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft) 218 Vertical Datum NAVD88	Easting (X) 7575392 Northing (Y) 608552	Coordinate System OR State Plane North Horizontal Datum NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (topsoil)			
217	1				ML	Light brown silt with trace organic matter (medium stiff, moist) (tilled zone)			
216	2		1 MC		ML	Light brown silt with trace organic matter (stiff, moist) (native)	21		
215	3								
214	4								
213	5					Becomes medium stiff			
212	6								
211	7								
210	8								
209	9								
208	10								
207	11		2						

Test pit completed at 11½ feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-1

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Date Excavated 9/20/2017	Total Depth (ft) 12	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft) 209 Vertical Datum NAVD88	Easting (X) 7575272 Northing (Y) 608739	Coordinate System OR State Plane North Horizontal Datum NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (soft, moist) (topsoil)			
208	1				ML	Light brown silt with organic matter (medium stiff, dry to moist) (tilled zone)			
207	2				ML	Light brown silt with organic matter (medium stiff, dry to moist) (native)			
206	3		1						
205	4								
204	5								
203	6								
202	7								
201	8								
200	9								
199	10					Becomes light brown with dark brown mottling			
198	11		2						
197	12		3						

Test pit completed at 12 feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-2

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-12
Sheet 1 of 1

Date Excavated 9/21/2017	Total Depth (ft) 9.5	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft) 207 Vertical Datum NAVD88	Easting (X) 7575434 Northing (Y) 608948	Coordinate System OR State Plane North Horizontal Datum NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (soft, moist) (topsoil)			
206	1				ML	Gray silt with trace organic matter (stiff, dry) (tilled zone)			
205	2			▨	CL	Dark gray clay with trace organic matter (very stiff, dry to moist) (native)			
204	3		1 MC				24		
203	4								
202	5								
201	6								
200	7								
199	8				ML	Gray brown silt with trace fine sand (stiff, moist)			
198	9		2						

Test pit completed at 9½ feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-3

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-13
Sheet 1 of 1

Date Excavated	9/21/2017	Total Depth (ft)	10.5	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft) Vertical Datum	211 NAVD88	Easting (X) Northing (Y)	7575289 609211	Coordinate System Horizontal Datum	OR State Plane North NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (soft, moist) (topsoil)			
210	1				ML	Gray silt with trace organic matter (stiff, dry to moist) (tilled zone)			
209	2				ML	Gray silt with trace organic matter (stiff, dry to moist) (native)			
208	3		1			Becomes brown, moist			
207	4								
206	5								
205	6								
204	7								
203	8								
202	9					Becomes brown with orange mottling, with trace fine sand			
201	10		2						

Test pit completed at 10½ feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

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Log of Test Pit TP-4

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-14
Sheet 1 of 1

Date Excavated	9/21/2017	Total Depth (ft)	11	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator
Groundwater not observed Caving not observed					

Surface Elevation (ft)	213	Easting (X)	7575285	Coordinate System	OR State Plane North
Vertical Datum	NAVD88	Northing (Y)	609598	Horizontal Datum	NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (soft, moist) (topsoil)			
212	1				ML	Brown silt with trace organic matter (stiff, dry to moist) (tilled zone)			
211	2				ML	Brown silt with trace organic matter (stiff, dry to moist) (native)			
210	3		1 AL				16		AL (LL = 44; PI = 16)
209	4								
208	5								
207	6					Becomes moist			
206	7					Becomes very stiff			
205	8								
204	9								
203	10		2			Grades to with trace fine sand			
202	11					Test pit completed at 11 feet below ground surface			

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-5

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-15
Sheet 1 of 1

Date Excavated	9/21/2017	Total Depth (ft)	10	Logged By	DMH	Excavator	Dan Fischer Excavating, Inc.
				Checked By	TAP	Equipment	CAT 305 E Mini-excavator

Groundwater not observed
Caving not observed

Surface Elevation (ft)	207	Easting (X)	7575703	Coordinate System	OR State Plane North
Vertical Datum	NAVD88	Northing (Y)	609521	Horizontal Datum	NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (stiff, moist) (topsoil)			
206	1				ML	Gray-brown silt with trace organic matter (stiff, dry) (tilled zone)			
205	2		1 MC		ML	Gray-brown silt with trace organic matter (stiff, dry) (native) Becomes brown, moist	21		
204	3								
203	4								
202	5								
201	6								
200	7								
199	8								
198	9								
197	10		2						

Test completed at 10 feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-6

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-16
Sheet 1 of 1

Date Excavated	9/21/2017	Total Depth (ft)	10.5	Logged By	DMH
				Checked By	TAP
Excavator	Dan Fischer Excavating, Inc.	Equipment	CAT 305 E Mini-excavator	Groundwater not observed	Caving not observed
Surface Elevation (ft)	204	Easting (X)	7575665	Coordinate System	OR State Plane North
Vertical Datum	NAVD88	Northing (Y)	609233	Horizontal Datum	NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (soft, moist) (topsoil)			
203	1				ML	Gray-brown silt with trace organic matter (stiff, dry) (tilled zone)			
202	2				ML	Gray-brown silt with trace organic matter (stiff, moist) (native)			
201	3								
200	4		1						
199	5								
198	6								
197	7								
196	8								
195	9					Becomes gray-brown and black mottling, trace fine sand			
194	10								
			2						

Test pit completed at 10½ feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-7

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-17
Sheet 1 of 1

Date Excavated 9/21/2017	Total Depth (ft) 9.5	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft) 202 Vertical Datum NAVD88	Easting (X) 7575716 Northing (Y) 609019	Coordinate System OR State Plane North Horizontal Datum NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (soft, moist) (topsoil)			
					ML	Gray silt with trace organic matter (stiff, dry) (tilled zone)			
201	1								
200	2								
					CL	Dark gray clay with trace organic matter (very stiff, dry to moist)			
199	3		1 MC				21		
198	4								
197	5								
196	6								
195	7								
			2		ML	Gray-brown silt with orange mottling (stiff, moist)			
194	8								
193	9								

Test pit completed at 9½ feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-8

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-18
Sheet 1 of 1

Date Excavated	9/21/2017	Total Depth (ft)	11.5	Logged By DMH Checked By TAP
Excavator	Dan Fischer Excavating, Inc.	Equipment	CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft)	210	Easting (X)	7575778	Coordinate System	OR State Plane North
Vertical Datum	NAVD88	Northing (Y)	608744	Horizontal Datum	NAD83 (feet)

		SAMPLE							
Elevation (feet)	Depth (feet)	Testing Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					ML	Brown silt with organic matter (soft, moist) (topsoil)			
209	1				ML	Brown silt with organic matter (stiff, moist) (native)			
208	2					Grades to trace organic matter			
207	3		1						
206	4								
205	5								
204	6								
203	7								
202	8								
201	9								
200	10								
199	11		2						

Test pit completed at 11½ feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-9

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-19
Sheet 1 of 1

Date Excavated 9/20/2017	Total Depth (ft) 12	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft) 202 Vertical Datum NAVD88	Easting (X) 7576003 Northing (Y) 608827	Coordinate System OR State Plane North Horizontal Datum NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (soft, dry to moist) (topsoil)			
201	1				ML	Light brown silt with organic matter (soft, dry to moist) (tilled zone)			
200	2				ML	Light brown silt (soft, dry to moist) (native)			
199	3					Becomes to without organic matter			
			1 MC				24		
198	4								
197	5								
196	6								
195	7					Becomes stiff			
194	8								
193	9								
192	10								
191	11								
190	12		2						

Test pit completed at 12 feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

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Log of Test Pit TP-10

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-20
Sheet 1 of 1

Date Excavated 9/20/2017	Total Depth (ft) 11.5	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft) 194 Vertical Datum NAVD88	Easting (X) 7575961 Northing (Y) 609022	Coordinate System OR State Plane North Horizontal Datum NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (topsoil)			
193	1				ML	Light brown silt with organic matter (medium stiff, dry to moist) (tilled zone)			
192	2				ML	Light brown silt (medium stiff, dry to moist) (native)			
191	3		1			Becomes light brown-gray with black mottling			
190	4								
189	5								
188	6								
187	7								
186	8								
185	9								
184	10								
183	11		2						

Test pit completed at 11½ feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-11

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-21
Sheet 1 of 1

Date Excavated	9/20/2017	Total Depth (ft)	8	Logged By	DMH
				Checked By	TAP

Excavator	Dan Fischer Excavating, Inc.
Equipment	CAT 305 E Mini-excavator

Groundwater not observed
Caving not observed

Surface Elevation (ft)	198	Easting (X)	7575909	Coordinate System	OR State Plane North
Vertical Datum	NAVD88	Northing (Y)	609174	Horizontal Datum	NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (topsoil)			
197	1				ML	Brown silt with organic matter (medium stiff, moist) (tilled zone)			
196	2				ML	Brown silt (medium stiff, moist) (native)			
195	3								
194	4								
193	5								
192	6								
191	7								
190	8		1 AL				31		AL (LL = 33; PI = 5)

Test pit completed at 8 feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-12

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-22
Sheet 1 of 1

Date Excavated	9/20/2017	Total Depth (ft)	8.5	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft) Vertical Datum	206 NAVD88	Easting (X) Northing (Y)	7575998 609673	Coordinate System Horizontal Datum	OR State Plane North NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (topsoil)			
205	1				ML	Gray-brown silt with organic matter (medium dense, dry to moist) (tilled zone)			
204	2				ML	Gray-brown silt (medium dense, dry to moist) (native)			
203	3								
202	4								
201	5								
200	6					Becomes moist			
199	7								
198	8		1						

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-13

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-23
Sheet 1 of 1

Date Excavated	9/20/2017	Total Depth (ft)	9	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator
Groundwater not observed Caving not observed					

Surface Elevation (ft) Vertical Datum	205 NAVD88	Easting (X) Northing (Y)	7576292 609684	Coordinate System Horizontal Datum	OR State Plane North NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (topsoil)			
					ML	Brown silt with organic matter (medium stiff, moist) (tilled zone)			
204	1								
					ML	Brown silt (medium stiff, moist) (native)			
203	2								
202	3								
201	4								
200	5								
199	6								
198	7								
197	8								
196	9		1 AL				30		AL (LL = 41; PI = 17)

Test pit completed at 9 feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-14

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-24
Sheet 1 of 1

Date Excavated 9/20/2017	Total Depth (ft) 9	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft) 201 Vertical Datum NAVD88	Easting (X) 7576287 Northing (Y) 609516	Coordinate System OR State Plane North Horizontal Datum NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0				OL	Dark brown topsoil with organic matter (topsoil)			
					ML	Gray silt with organic matter (medium stiff, dry) (tilled zone)			
200	1								
					ML	Gray silt (medium stiff, dry) (native)			
199	2								
198	3								
197	4					Becomes gray-brown, moist			
196	5								
195	6								
194	7								
193	8								
192	9		1 MC				36		

Test pit completed at 9 feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-15

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-25
Sheet 1 of 1

Date Excavated 9/20/2017	Total Depth (ft) 8.5	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft) 196 Vertical Datum NAVD88	Easting (X) 7576133 Northing (Y) 609366	Coordinate System OR State Plane North Horizontal Datum NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE		Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
		Testing Sample	Sample Name Testing						
					OL	Dark brown topsoil with organic matter (topsoil)			
195	1				ML	Brown silt with organic matter (medium stiff, moist) (tilled zone)			
194	2				ML	Brown silt (medium stiff, moist) (native)			
193	3								
192	4								
191	5								
190	6								
189	7								
188	8		1 MC				34		

Test pit completed at 8½ feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-16

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Date Excavated	9/20/2017	Total Depth (ft)	11.5	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft)	193	Easting (X)	7576160	Coordinate System	OR State Plane North
Vertical Datum	NAVD88	Northing (Y)	608965	Horizontal Datum	NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (topsoil)			
192	1				ML	Brown silt with organic matter (soft, dry to moist) (tilled zone)			
191	2				ML	Brown silt (soft, dry to moist) (native)			
190	3		1 MC				23		
189	4								
188	5					Becomes soft, moist			
187	6								
186	7								
185	8					Becomes gray-brown with black mottling (soft, moist)			
184	9								
183	10		2						
182	11		3			Becomes light brown with orange mottling			

Test pit completed at 11½ feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

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Log of Test Pit TP-17

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-27
Sheet 1 of 1

Date Excavated	9/20/2017	Total Depth (ft)	8	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft) Vertical Datum	187 NAVD88	Easting (X) Northing (Y)	7576405 609031	Coordinate System Horizontal Datum	OR State Plane North NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (topsoil)			
186	1				ML	Light brown-gray silt with organic matter (medium stiff, dry to moist) (tilled zone)			
185	2				ML	Light brown-gray silt (medium stiff, dry to moist) (native)			
184	3					Becomes moist			
183	4								
182	5								
181	6					Becomes gray with orange mottling			
180	7								
179	8		1						

Test pit completed at 8 feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-18

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Date Excavated 9/20/2017	Total Depth (ft) 8	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft) 191 Vertical Datum NAVD88	Easting (X) 7576483 Northing (Y) 609162	Coordinate System OR State Plane North Horizontal Datum NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (topsoil)			
					ML	Light brown-gray silt with organic matter (medium stiff, dry to moist) (tilled zone)			
190	1								
					ML	Light brown-gray silt (medium stiff, dry to moist) (native)			
189	2								
188	3								
187	4								
						Becomes moist			
186	5								
185	6								
184	7								
183			1 MC				37		
	8								

Test pit completed at 8 feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-19

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-29
Sheet 1 of 1

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Date Excavated	9/20/2017	Total Depth (ft)	9.5	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator
Groundwater not observed Caving not observed					

Surface Elevation (ft) Vertical Datum	192 NAVD88	Easting (X) Northing (Y)	7576555 609285	Coordinate System Horizontal Datum	OR State Plane North NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (topsoil)			
191	1				ML	LIght brown silt with organic matter (medium stiff, dry to moist) (tilled zone)			
190	2				ML	LIght brown silt (medium stiff, dry to moist) (native)			
189	3					Becomes moist			
188	4								
187	5								
186	6								
185	7								
184	8								
183	9		1						

Test pit completed at 9½ feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-20

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-30
Sheet 1 of 1

Date Excavated 9/20/2017	Total Depth (ft) 8.5	Logged By DMH Checked By TAP	Excavator Dan Fischer Excavating, Inc. Equipment CAT 305 E Mini-excavator	Groundwater not observed Caving not observed

Surface Elevation (ft) 195 Vertical Datum NAVD88	Easting (X) 7576442 Northing (Y) 609391	Coordinate System OR State Plane North Horizontal Datum NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (topsoil)			
194	1				ML	Gray silt with organic matter (medium stiff, dry to moist) (tilled zone)			
193	2				ML	Gray silt (medium stiff, dry to moist) (native)			
192	3								
191	4					Becomes gray-brown, moist			
190	5								
189	6								
188	7								
187	8		1 MC				36		

Test pit completed at 8½ feet below ground surface

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Test Pit TP-21

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-31
Sheet 1 of 1

Date Excavated	9/26/2017	Total Depth (ft)	4.5	Logged By JLL Checked By TAP	Excavator GeoEngineers, Inc. Equipment Hand Tools	Groundwater not observed Caving not observed

Surface Elevation (ft) Vertical Datum	214 NAVD88	Easting (X) Northing (Y)	7575598 608672	Coordinate System Horizontal Datum	OR State Plane North NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (topsoil)			
213	1				ML	Brown silt with organic matter (stiff, dry to moist) (tilled zone)			
					ML	Yellow-brown silt (medium stiff to stiff) (native)			
212	2	▯	1						
211	3								
210	4								

Notes: See Figure A-1 for explanation of symbols.
The depths on the hand-augered boring logs are based on an average of measurements across the hand-auger and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Hand Auger HA-1

GeoEngineers

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-32
Sheet 1 of 1

Date Excavated 9/26/2017	Total Depth (ft) 4.5	Logged By JLL Checked By TAP	Excavator GeoEngineers, Inc. Equipment Hand Tools	Groundwater not observed Caving not observed

Surface Elevation (ft) 204 Vertical Datum NAVD88	Easting (X) 7575624 Northing (Y) 609083	Coordinate System OR State Plane North Horizontal Datum NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (topsoil)			
					ML	Dark brown silt with organic matter (medium stiff, moist) (tilled zone)			
203	1				ML	Yellow-brown silt (medium stiff, moist) (native)			
202	2								
201	3	☐	1			Grades to brown with red-brown mottling			
200	4								

Notes: See Figure A-1 for explanation of symbols.
The depths on the hand-augered boring logs are based on an average of measurements across the hand-auger and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

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Log of Hand Auger HA-2

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Date Excavated	9/26/2017	Total Depth (ft)	4	Logged By JLL Checked By TAP	Excavator GeoEngineers, Inc. Equipment Hand Tools	Groundwater not observed Caving not observed

Surface Elevation (ft) Vertical Datum	210 NAVD88	Easting (X) Northing (Y)	7575572 609614	Coordinate System Horizontal Datum	OR State Plane North NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (topsoil)			
209	1				ML	Brown silt organic matter (stiff, moist) (topsoil)			
					ML	Yellow-brown silt (native)			
208	2								
207	3								
206	4								

Notes: See Figure A-1 for explanation of symbols.
The depths on the hand-augered boring logs are based on an average of measurements across the hand-auger and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Hand Auger HA-3

GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-34
Sheet 1 of 1

Date Excavated 9/26/2017	Total Depth (ft) 3	Logged By JLL Checked By TAP	Excavator GeoEngineers, Inc. Equipment Hand Tools	Groundwater not observed Caving not observed

Surface Elevation (ft) 200 Vertical Datum NAVD88	Easting (X) 7575991 Northing (Y) 609449	Coordinate System OR State Plane North Horizontal Datum NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					OL	Dark brown topsoil with organic matter (topsoil)			
					ML	Light brown silt, fine roots and organic matter (stiff, dry) (tilled zone)			
199	1				ML	Yellow-brown silt (stiff, dry to moist) (native)			
198	2								
197	3								

Notes: See Figure A-1 for explanation of symbols.
The depths on the hand-augered boring logs are based on an average of measurements across the hand-auger and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery, Vertical approximated based on DEM

Log of Hand Auger HA-4

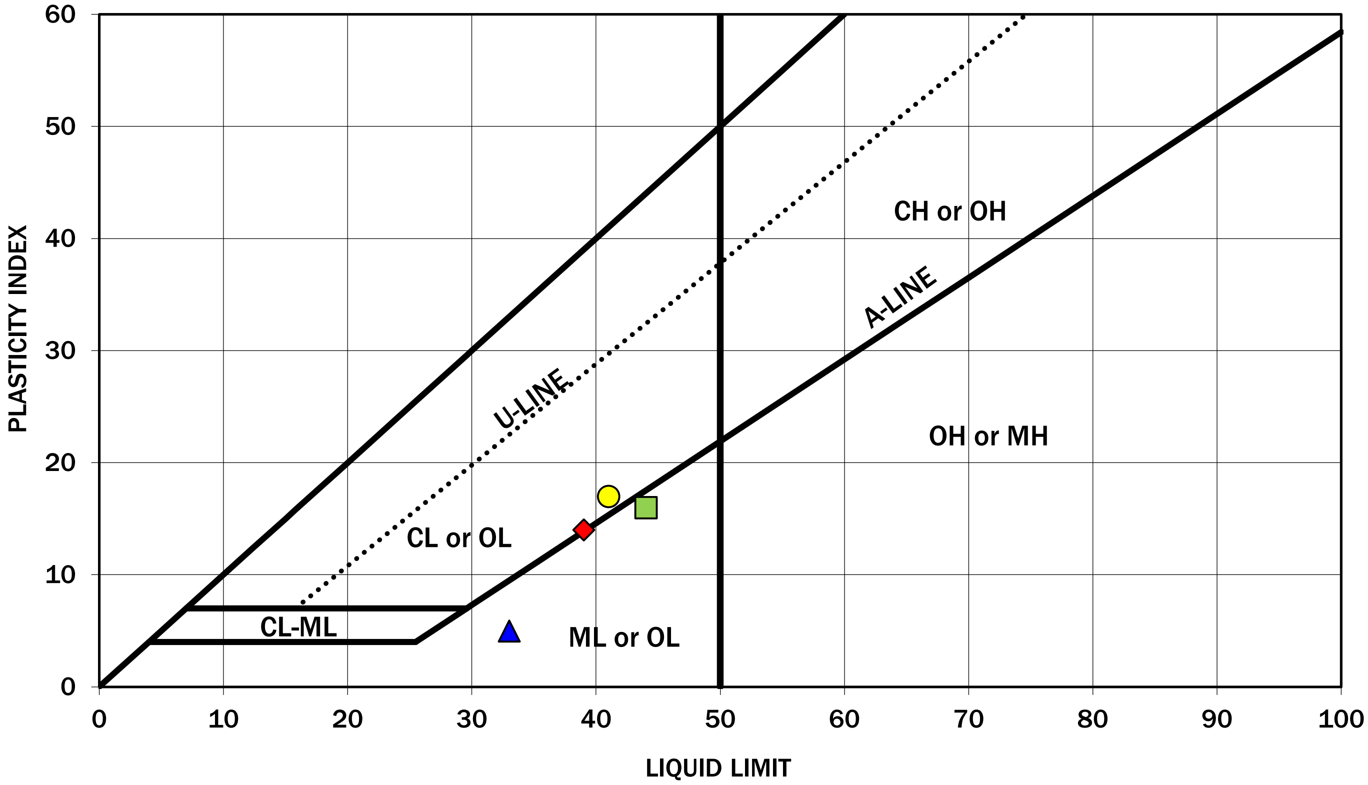
GEOENGINEERS

Project: Crestview Crossing
Project Location: Newberg, Oregon
Project Number: 6748-002-00

Figure A-35
Sheet 1 of 1

Date:11/1/17 Path:P:\6\6748002\GINT\674800200.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

PLASTICITY CHART



Symbol	Boring Number	Depth (feet)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Description
◆	B-3	2.5	32	39	14	Silt (ML)
🟩	TP-5	3	16	44	16	Silt (ML)
▲	TP-12	8	31	33	5	Silt (ML)
🟡	TP-14	9	30	41	17	Lean clay (CL)

Note: This report may not be reproduced, except in full, without written approval of GeoEngineers, Inc. Test results are applicable only to the specific sample on which they were performed, and should not be interpreted as representative of any other samples obtained at other times, depths or locations, or generated by separate operations or processes.

The liquid limit and plasticity index were obtained in general accordance with ASTM D 4318.

Atterberg Limits Test Results

Crestview Crossing Development
Newberg, Oregon

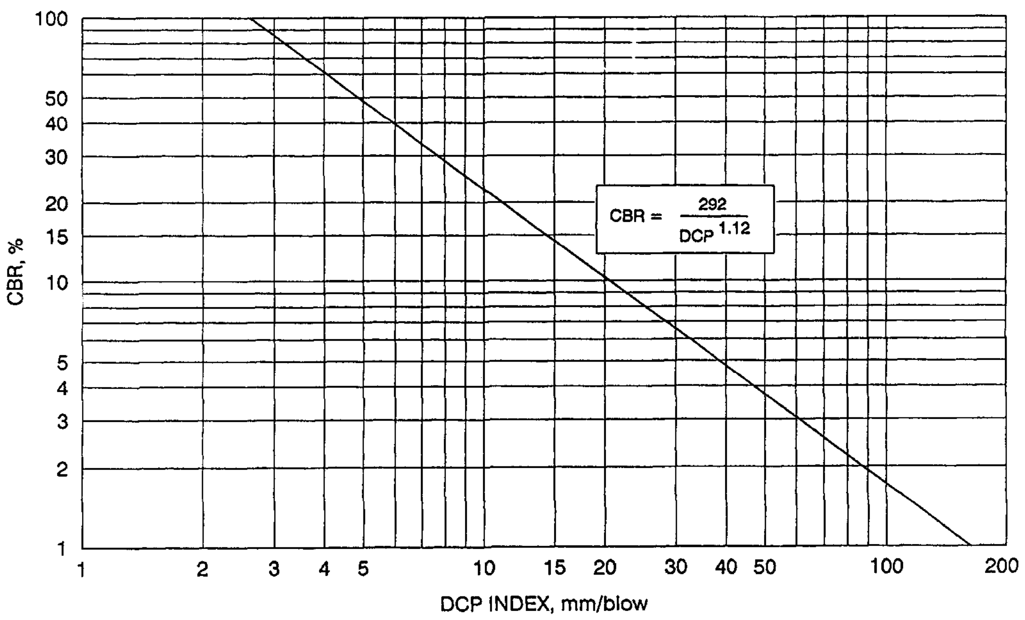
GeoEngineers

Figure A-36

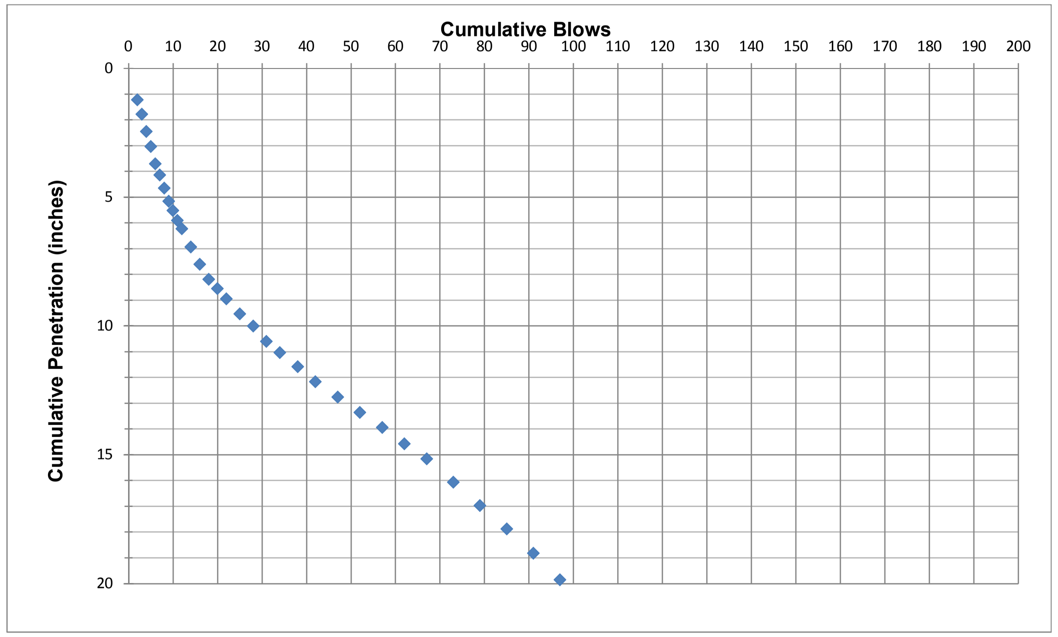
Location: Pacific Highway at NE Harmony
Date: 9/26/2017
Test Hole Number: HA-1
Depth to bottom: 2.86' (87.3cm)
Dimension: 4"
N/A
Test Method: Dynamic Cone Penetration
Tester's Name: John Lawes
GeoEngineers Job: 6748-002-00
Tester's Company: GeoEngineers, Inc.
Tester's Contact No:

Depth, feet	**Soil Texture**
0-4.5	Yellow-brown SILT, topsoil in the top 12-14"

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Penetration per increment	Cumulative penetration	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR	M_R
#	#	#	(in)	(mm)	(mm)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%	psi
1	1	2	1.2	31.0	31.0	1.2	1.2	1.22	2	2.44	62.00	3	3431
2	1	3	1.8	14.0	45.0	1.8	0.6	0.55	2	1.10	28.00	7	4678
3	1	4	2.4	17.0	62.0	2.4	0.7	0.67	2	1.34	34.00	6	4337
4	1	5	3.0	15.0	77.0	3.0	0.6	0.59	2	1.18	30.00	6	4554
5	1	6	3.7	17.0	94.0	3.7	0.7	0.67	2	1.34	34.00	6	4337
6	1	7	4.1	11.0	105.0	4.1	0.4	0.43	2	0.87	22.00	9	5140
7	1	8	4.6	13.0	118.0	4.6	0.5	0.51	2	1.02	26.00	8	4815
8	1	9	5.2	13.0	131.0	5.2	0.5	0.51	2	1.02	26.00	8	4815
9	1	10	5.5	9.0	140.0	5.5	0.4	0.35	2	0.71	18.00	11	5558
10	1	11	5.9	10.0	150.0	5.9	0.4	0.39	2	0.79	20.00	10	5334
11	1	12	6.2	8.0	158.0	6.2	0.3	0.31	2	0.63	16.00	13	5819
12	2	14	6.9	18.0	176.0	6.9	0.7	0.35	2	0.71	18.00	11	5558
13	2	16	7.6	17.0	193.0	7.6	0.7	0.33	2	0.67	17.00	12	5683
14	2	18	8.2	15.0	208.0	8.2	0.6	0.30	2	0.59	15.00	14	5967
15	2	20	8.5	9.0	217.0	8.5	0.4	0.18	2	0.35	9.00	25	7283
16	2	22	8.9	10.0	227.0	8.9	0.4	0.20	2	0.39	10.00	22	6990
17	3	25	9.5	15.0	242.0	9.5	0.6	0.20	2	0.39	10.00	22	6990
18	3	28	10.0	12.0	254.0	10.0	0.5	0.16	2	0.31	8.00	28	7625
19	3	31	10.6	15.0	269.0	10.6	0.6	0.20	2	0.39	10.00	22	6990
20	3	34	11.0	11.0	280.0	11.0	0.4	0.14	2	0.29	7.33	31	7889
21	4	38	11.6	14.0	294.0	11.6	0.6	0.14	2	0.28	7.00	33	8033
22	4	42	12.2	15.0	309.0	12.2	0.6	0.15	2	0.30	7.50	31	7820
23	5	47	12.8	15.0	324.0	12.8	0.6	0.12	2	0.24	6.00	39	8531
24	5	52	13.3	15.0	339.0	13.3	0.6	0.12	2	0.24	6.00	39	8531
25	5	57	13.9	15.0	354.0	13.9	0.6	0.12	2	0.24	6.00	39	8531
26	5	62	14.6	16.0	370.0	14.6	0.6	0.13	2	0.25	6.40	37	8319
27	5	67	15.2	15.0	385.0	15.2	0.6	0.12	2	0.24	6.00	39	8531
28	6	73	16.1	23.0	408.0	16.1	0.9	0.15	2	0.30	7.67	30	7753
29	6	79	17.0	23.0	431.0	17.0	0.9	0.15	2	0.30	7.67	30	7753
30	6	85	17.9	23.0	454.0	17.9	0.9	0.15	2	0.30	7.67	30	7753
31	6	91	18.8	24.0	478.0	18.8	0.9	0.16	2	0.31	8.00	28	7625
32	6	97	19.8	26.0	504.0	19.8	1.0	0.17	2	0.34	8.67	26	7391
33	6	103	20.9	26.0	530.0	20.9	1.0	0.17	2	0.34	8.67	26	7391
34	6	109	21.9	27.0	557.0	21.9	1.1	0.18	2	0.35	9.00	25	7283
35	6	115	23.0	28.0	585.0	23.0	1.1	0.18	2	0.37	9.33	24	7180
36	6	121	24.5	37.0	622.0	24.5	1.5	0.24	2	0.49	12.33	18	6441
37	6	127	26.0	38.0	660.0	26.0	1.5	0.25	2	0.50	12.67	17	6374
38	6	133	28.0	52.0	712.0	28.0	2.0	0.34	2	0.68	17.33	12	5640
39	2	135	28.8	20.0	732.0	28.8	0.8	0.39	2	0.79	20.00	10	5334
40	2	137	29.5	17.0	749.0	29.5	0.7	0.33	2	0.67	17.00	12	5683
41	2	139	32.0	63.0	812.0	32.0	2.5	1.24	2	2.48	63.00	3	3410
42	2	141	32.6	15.0	827.0	32.6	0.6	0.30	2	0.59	15.00	14	5967
43	2	143	33.1	15.0	842.0	33.1	0.6	0.30	2	0.59	15.00	14	5967
44	2	145	33.8	16.0	858.0	33.8	0.6	0.31	2	0.63	16.00	13	5819
45	2	147	34.4	15.0	873.0	34.4	0.6	0.30	2	0.59	15.00	14	5967



(after Webster et al., 1992)
Webster, S. L., Grau, R. H., and Williams, T. P. (1992). Description and application of dual mass dynamic cone penetrometer. Department of the Army Waterways Equipment Station, No. GL-92-3.



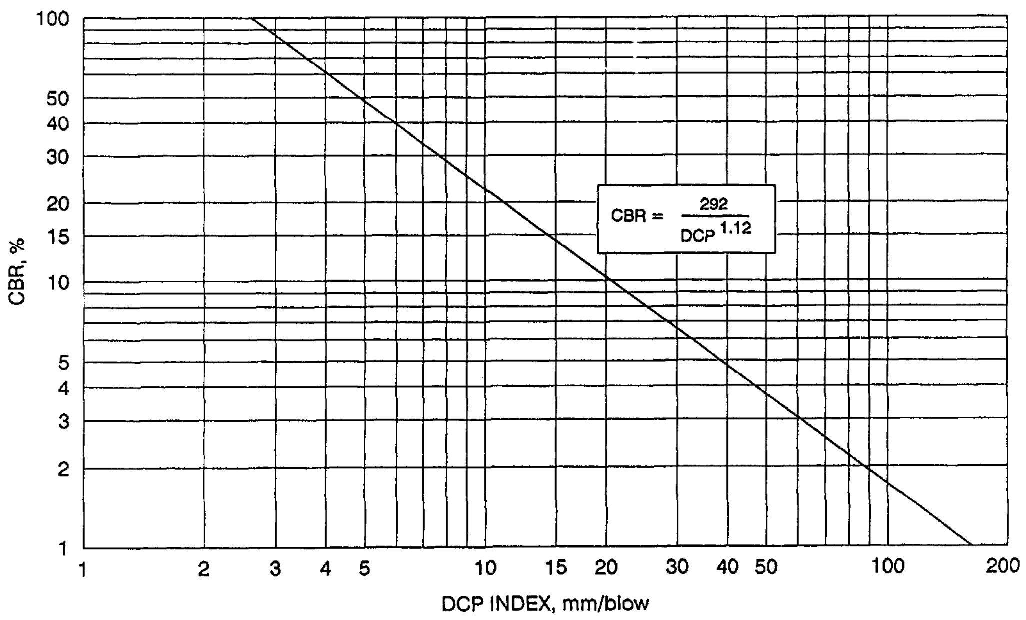
Location: Pacific Highway at NE Harmony
Depth to bottom: 2.67' (81.4cm)
Tester's Name: John Lawes
Tester's Company: GeoEngineers, Inc.

Date: 9/26/2017
Dimension: 4" N/A
Tester's Contact No:

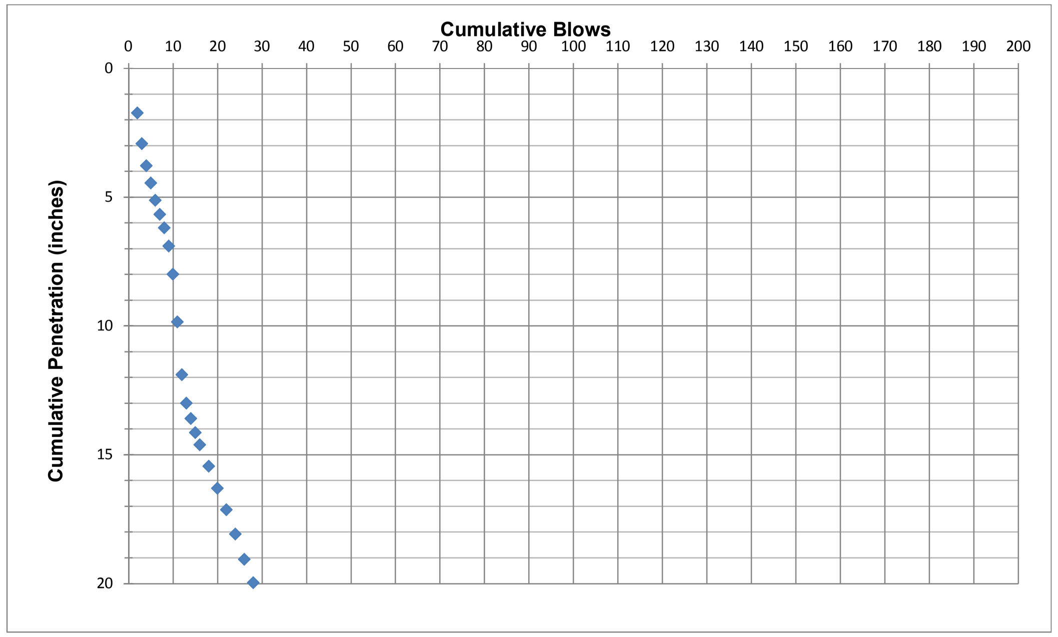
Test Hole Number: HA-2
Test Method: Dynamic Cone Penetration
GeoEngineers Job: 6748-002-00

Depth, feet	Soil Texture
0-4.5	Yellow-brown SILT, topsoil in the top 12-14"

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Penetration per increment	Cumulative penetration	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR	M_R
#	#	#	(in)	(mm)	(mm)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%	psi
1	1	2	16.7	44.0	44.0	1.7	1.7	1.73	2	3.46	88.00	2	2993
2	1	3	17.9	30.0	74.0	2.9	1.2	1.18	2	2.36	60.00	3	3475
3	1	4	18.8	22.0	96.0	3.8	0.9	0.87	2	1.73	44.00	4	3922
4	1	5	19.4	17.0	113.0	4.4	0.7	0.67	2	1.34	34.00	6	4337
5	1	6	20.1	17.0	130.0	5.1	0.7	0.67	2	1.34	34.00	6	4337
6	1	7	20.7	14.0	144.0	5.7	0.6	0.55	2	1.10	28.00	7	4678
7	1	8	21.2	13.0	157.0	6.2	0.5	0.51	2	1.02	26.00	8	4815
8	1	9	21.9	18.0	175.0	6.9	0.7	0.71	2	1.42	36.00	5	4241
9	1	10	23.0	28.0	203.0	8.0	1.1	1.10	2	2.20	56.00	3	3570
10	1	11	24.8	47.0	250.0	9.8	1.9	1.85	2	3.70	94.00	2	2917
11	1	12	26.9	52.0	302.0	11.9	2.0	2.05	2	4.09	104.00	2	2804
12	1	13	28.0	28.0	330.0	13.0	1.1	1.10	2	2.20	56.00	3	3570
13	1	14	28.6	15.0	345.0	13.6	0.6	0.59	2	1.18	30.00	6	4554
14	1	15	29.1	14.0	359.0	14.1	0.6	0.55	2	1.10	28.00	7	4678
15	1	16	29.6	12.0	371.0	14.6	0.5	0.47	2	0.94	24.00	8	4968
16	2	18	30.4	21.0	392.0	15.4	0.8	0.41	2	0.83	21.00	10	5234
17	2	20	31.3	22.0	414.0	16.3	0.9	0.43	2	0.87	22.00	9	5140
18	2	22	32.1	21.0	435.0	17.1	0.8	0.41	2	0.83	21.00	10	5234
19	2	24	33.1	24.0	459.0	18.1	0.9	0.47	2	0.94	24.00	8	4968
20	2	26	34.1	25.0	484.0	19.1	1.0	0.49	2	0.98	25.00	8	4890
21	2	28	35.0	23.0	507.0	20.0	0.9	0.45	2	0.91	23.00	9	5051
22	2	30	35.9	25.0	532.0	20.9	1.0	0.49	2	0.98	25.00	8	4890
23	2	32	36.8	22.0	554.0	21.8	0.9	0.43	2	0.87	22.00	9	5140
24	2	34	37.6	20.0	574.0	22.6	0.8	0.39	2	0.79	20.00	10	5334
25	2	36	38.4	21.0	595.0	23.4	0.8	0.41	2	0.83	21.00	10	5234
26	2	38	39.2	19.0	614.0	24.2	0.7	0.37	2	0.75	19.00	11	5442
27	2	40	39.9	18.0	632.0	24.9	0.7	0.35	2	0.71	18.00	11	5558
28	2	42	40.7	22.0	654.0	25.7	0.9	0.43	2	0.87	22.00	9	5140
29	2	44	41.5	18.0	672.0	26.5	0.7	0.35	2	0.71	18.00	11	5558
30	2	46	42.2	20.0	692.0	27.2	0.8	0.39	2	0.79	20.00	10	5334
31	2	48	43.0	20.0	712.0	28.0	0.8	0.39	2	0.79	20.00	10	5334
32	2	50	43.8	20.0	732.0	28.8	0.8	0.39	2	0.79	20.00	10	5334
33	2	52	44.5	17.0	749.0	29.5	0.7	0.33	2	0.67	17.00	12	5683
34	2	54	45.1	15.0	764.0	30.1	0.6	0.30	2	0.59	15.00	14	5967
35	2	56	45.9	20.0	784.0	30.9	0.8	0.39	2	0.79	20.00	10	5334
36	2	58	46.5	15.0	799.0	31.5	0.6	0.30	2	0.59	15.00	14	5967
37	2	60	47.0	15.0	814.0	32.0	0.6	0.30	2	0.59	15.00	14	5967



(after Webster et al., 1992)
Webster, S. L., Grau, R. H., and Williams, T. P. (1992). Description and application of dual mass dynamic cone penetrometer. Department of the Army Waterways Equipment Station, No. GL-92-3.



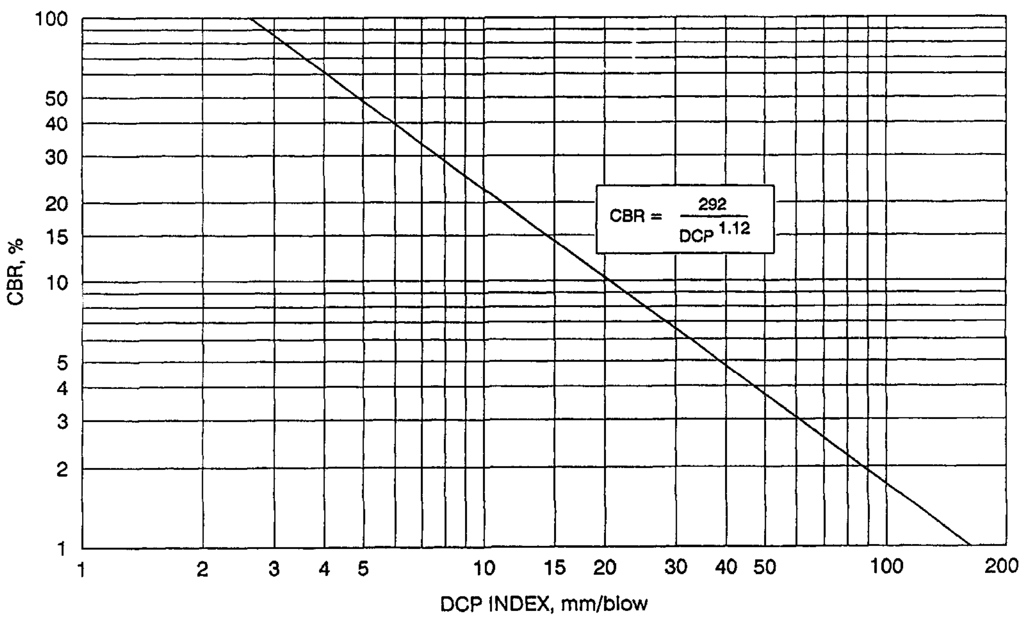
Location: Pacific Highway at NE Harmony
Depth to bottom: 2.58' (78.8cm)
Tester's Name: John Lawes
Tester's Company: GeoEngineers, Inc.

Date: 9/26/2017
Dimension: 4" N/A
Tester's Contact No:

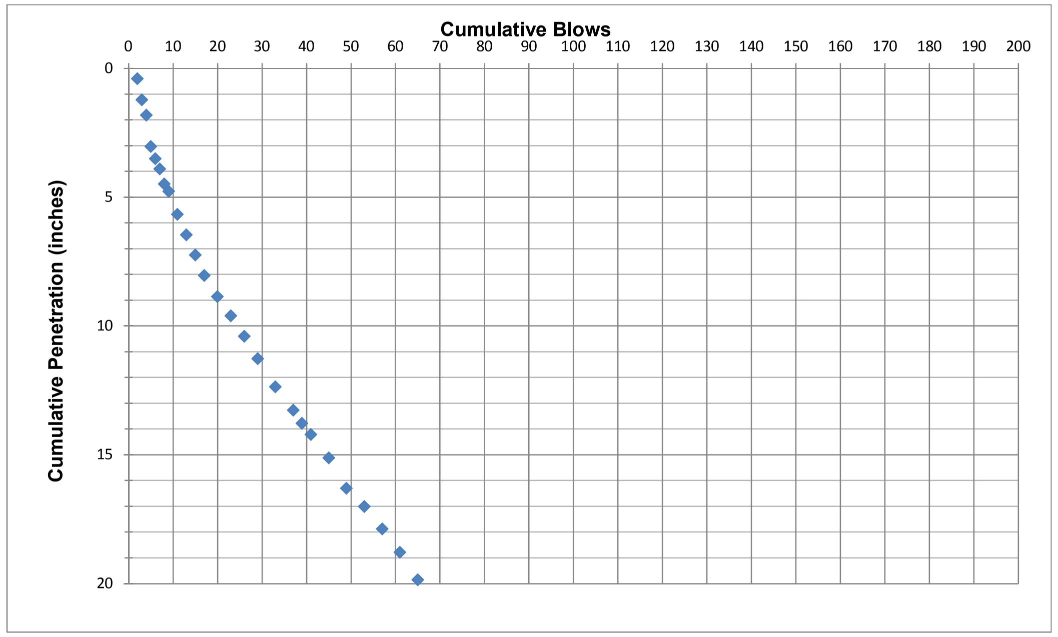
Test Hole Number: HA-3
Test Method: Dynamic Cone Penetration
GeoEngineers Job: 6748-002-00

Depth, feet	Soil Texture
0-4	Yellow-brown SILT, topsoil in the top 12-14"

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Penetration per increment	Cumulative penetration	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR	M_R
#	#	#	(in)	(mm)	(mm)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%	psi
1	1	2	15.4	10.0	10.0	0.4	0.4	0.39	2	0.79	20.00	10	5334
2	1	3	16.2	21.0	31.0	1.2	0.8	0.83	2	1.65	42.00	4	3994
3	1	4	16.8	15.0	46.0	1.8	0.6	0.59	2	1.18	30.00	6	4554
4	1	5	18.0	31.0	77.0	3.0	1.2	1.22	2	2.44	62.00	3	3431
5	1	6	18.5	12.0	89.0	3.5	0.5	0.47	2	0.94	24.00	8	4968
6	1	7	18.9	10.0	99.0	3.9	0.4	0.39	2	0.79	20.00	10	5334
7	1	8	19.5	15.0	114.0	4.5	0.6	0.59	2	1.18	30.00	6	4554
8	1	9	19.8	7.0	121.0	4.8	0.3	0.28	2	0.55	14.00	15	6130
9	2	11	20.7	23.0	144.0	5.7	0.9	0.45	2	0.91	23.00	9	5051
10	2	13	21.5	20.0	164.0	6.5	0.8	0.39	2	0.79	20.00	10	5334
11	2	15	22.2	20.0	184.0	7.2	0.8	0.39	2	0.79	20.00	10	5334
12	2	17	23.0	20.0	204.0	8.0	0.8	0.39	2	0.79	20.00	10	5334
13	3	20	23.9	21.0	225.0	8.9	0.8	0.28	2	0.55	14.00	15	6130
14	3	23	24.6	19.0	244.0	9.6	0.7	0.25	2	0.50	12.67	17	6374
15	3	26	25.4	20.0	264.0	10.4	0.8	0.26	2	0.52	13.33	16	6248
16	3	29	26.3	22.0	286.0	11.3	0.9	0.29	2	0.58	14.67	14	6020
17	4	33	27.4	28.0	314.0	12.4	1.1	0.28	2	0.55	14.00	15	6130
18	4	37	28.3	23.0	337.0	13.3	0.9	0.23	2	0.45	11.50	19	6619
19	2	39	28.8	13.0	350.0	13.8	0.5	0.26	2	0.51	13.00	17	6310
20	2	41	29.2	11.0	361.0	14.2	0.4	0.22	2	0.43	11.00	20	6735
21	4	45	30.1	23.0	384.0	15.1	0.9	0.23	2	0.45	11.50	19	6619
22	4	49	31.3	30.0	414.0	16.3	1.2	0.30	2	0.59	15.00	14	5967
23	4	53	32.0	18.0	432.0	17.0	0.7	0.18	2	0.35	9.00	25	7283
24	4	57	32.9	22.0	454.0	17.9	0.9	0.22	2	0.43	11.00	20	6735
25	4	61	33.8	23.0	477.0	18.8	0.9	0.23	2	0.45	11.50	19	6619
26	4	65	34.8	27.0	504.0	19.8	1.1	0.27	2	0.53	13.50	16	6218
27	4	69	35.8	24.0	528.0	20.8	0.9	0.24	2	0.47	12.00	18	6510
28	4	73	36.9	29.0	557.0	21.9	1.1	0.29	2	0.57	14.50	15	6047
29	6	79	38.5	39.0	596.0	23.5	1.5	0.26	2	0.51	13.00	17	6310
30	6	85	39.8	35.0	631.0	24.8	1.4	0.23	2	0.46	11.67	19	6582
31	6	91	41.3	38.0	669.0	26.3	1.5	0.25	2	0.50	12.67	17	6374
32	6	97	42.7	35.0	704.0	27.7	1.4	0.23	2	0.46	11.67	19	6582
33	6	103	44.2	38.0	742.0	29.2	1.5	0.25	2	0.50	12.67	17	6374
34	6	109	45.4	31.0	773.0	30.4	1.2	0.20	2	0.41	10.33	21	6901
35	6	115	46.0	15.0	788.0	31.0	0.6	0.10	2	0.20	5.00	48	9159



(after Webster et al., 1992)
Webster, S. L., Grau, R. H., and Williams, T. P. (1992). Description and application of dual mass dynamic cone penetrometer. Department of the Army Waterways Equipment Station, No. GL-92-3.



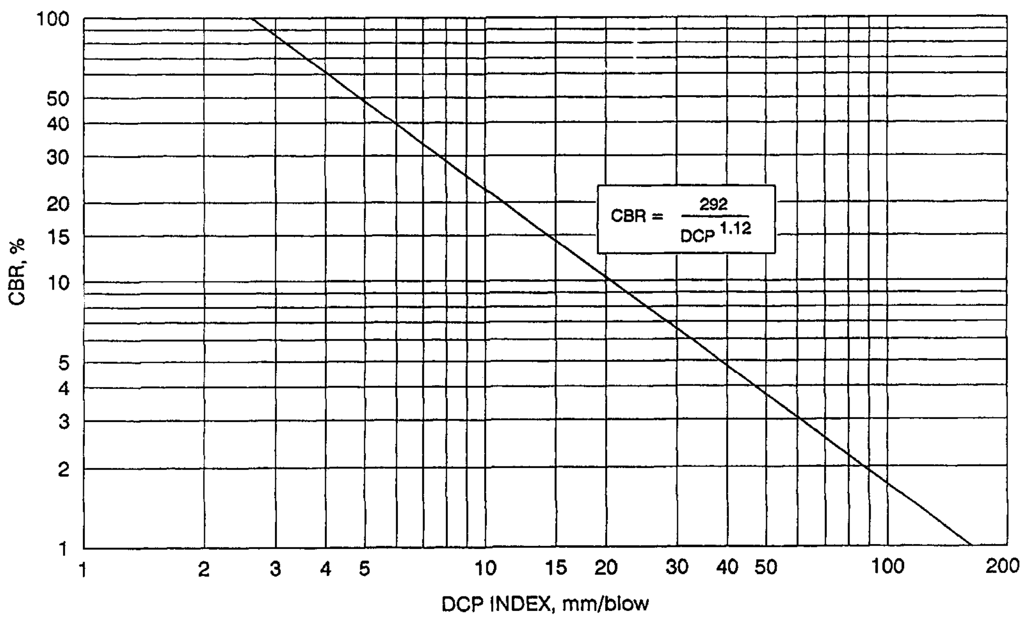
Location: Pacific Highway at NE Harmony
Depth to bottom: 2.12' (64.6cm)
Tester's Name: John Lawes
Tester's Company: GeoEngineers, Inc.

Date: 9/26/2017
Dimension: 4" N/A
Tester's Contact No:

Test Hole Number: HA-4
Test Method: Dynamic Cone Penetration
GeoEngineers Job: 6748-002-00

Depth, feet	Soil Texture
0-3	Yellow-brown SILT, topsoil in the top 10-12"

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Penetration per increment	Cumulative penetration	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR	M_R
#	#	#	(in)	(mm)	(mm)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%	psi
1	2	2	15.9	24.0	24.0	0.9	0.9	0.47	2	0.94	24.00	8	4968
2	2	4	17.4	36.0	60.0	2.4	1.4	0.71	2	1.42	36.00	5	4241
3	1	5	17.9	13.0	73.0	2.9	0.5	0.51	2	1.02	26.00	8	4815
4	1	6	18.6	19.0	92.0	3.6	0.7	0.75	2	1.50	38.00	5	4153
5	1	7	19.3	16.0	108.0	4.3	0.6	0.63	2	1.26	32.00	6	4441
6	1	8	19.9	16.0	124.0	4.9	0.6	0.63	2	1.26	32.00	6	4441
7	1	9	20.5	15.0	139.0	5.5	0.6	0.59	2	1.18	30.00	6	4554
8	1	10	21.1	15.0	154.0	6.1	0.6	0.59	2	1.18	30.00	6	4554
9	2	12	21.8	19.0	173.0	6.8	0.7	0.37	2	0.75	19.00	11	5442
10	2	14	22.9	27.0	200.0	7.9	1.1	0.53	2	1.06	27.00	7	4745
11	2	16	23.7	20.0	220.0	8.7	0.8	0.39	2	0.79	20.00	10	5334
12	2	18	24.3	15.0	235.0	9.3	0.6	0.30	2	0.59	15.00	14	5967
13	3	21	24.8	15.0	250.0	9.8	0.6	0.20	2	0.39	10.00	22	6990
14	3	24	25.4	15.0	265.0	10.4	0.6	0.20	2	0.39	10.00	22	6990
15	3	27	26.0	15.0	280.0	11.0	0.6	0.20	2	0.39	10.00	22	6990
16	3	30	26.6	15.0	295.0	11.6	0.6	0.20	2	0.39	10.00	22	6990
17	3	33	27.2	15.0	310.0	12.2	0.6	0.20	2	0.39	10.00	22	6990
18	3	36	27.9	18.0	328.0	12.9	0.7	0.24	2	0.47	12.00	18	6510
19	3	39	28.5	16.0	344.0	13.5	0.6	0.21	2	0.42	10.67	21	6816
20	3	42	29.2	16.0	360.0	14.2	0.6	0.21	2	0.42	10.67	21	6816
21	3	45	29.7	14.0	374.0	14.7	0.6	0.18	2	0.37	9.33	24	7180
22	3	48	30.4	16.0	390.0	15.4	0.6	0.21	2	0.42	10.67	21	6816
23	3	51	30.7	10.0	400.0	15.7	0.4	0.13	2	0.26	6.67	35	8187
24	4	55	31.5	20.0	420.0	16.5	0.8	0.20	2	0.39	10.00	22	6990
25	4	59	32.3	20.0	440.0	17.3	0.8	0.20	2	0.39	10.00	22	6990
26	4	63	33.1	20.0	460.0	18.1	0.8	0.20	2	0.39	10.00	22	6990
27	4	67	34.1	24.0	484.0	19.1	0.9	0.24	2	0.47	12.00	18	6510
28	4	71	35.0	24.0	508.0	20.0	0.9	0.24	2	0.47	12.00	18	6510
29	4	75	35.8	20.0	528.0	20.8	0.8	0.20	2	0.39	10.00	22	6990
30	4	79	36.7	22.0	550.0	21.7	0.9	0.22	2	0.43	11.00	20	6735
31	4	83	37.6	24.0	574.0	22.6	0.9	0.24	2	0.47	12.00	18	6510
32	4	87	38.6	25.0	599.0	23.6	1.0	0.25	2	0.49	12.50	17	6407
33	4	91	39.6	25.0	624.0	24.6	1.0	0.25	2	0.49	12.50	17	6407
34	4	95	40.4	22.0	646.0	25.4	0.9	0.22	2	0.43	11.00	20	6735
	4												



(after Webster et al., 1992)
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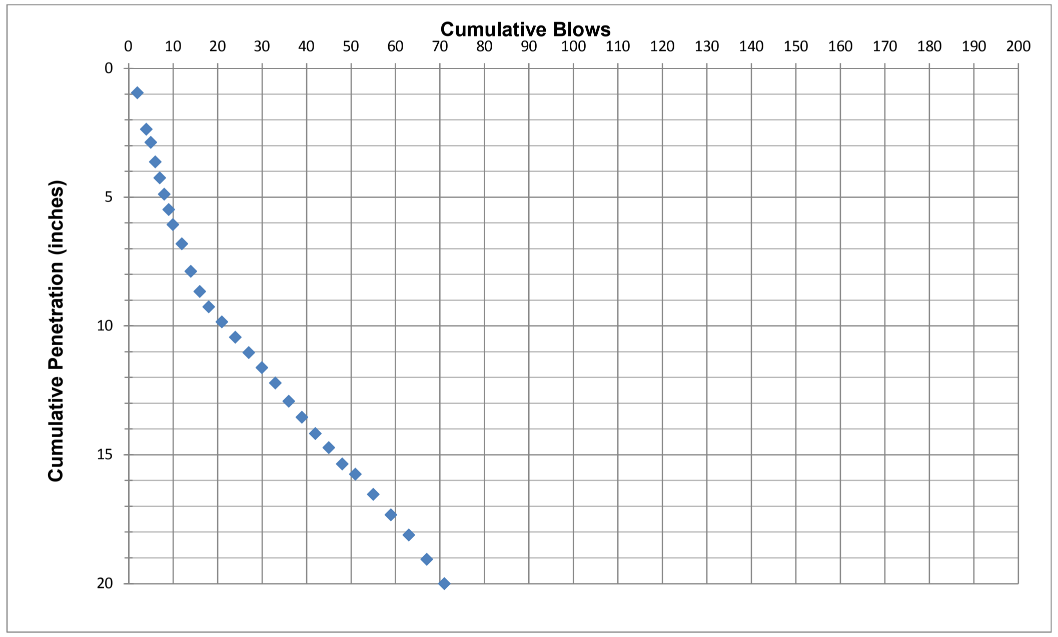


Figure A-40

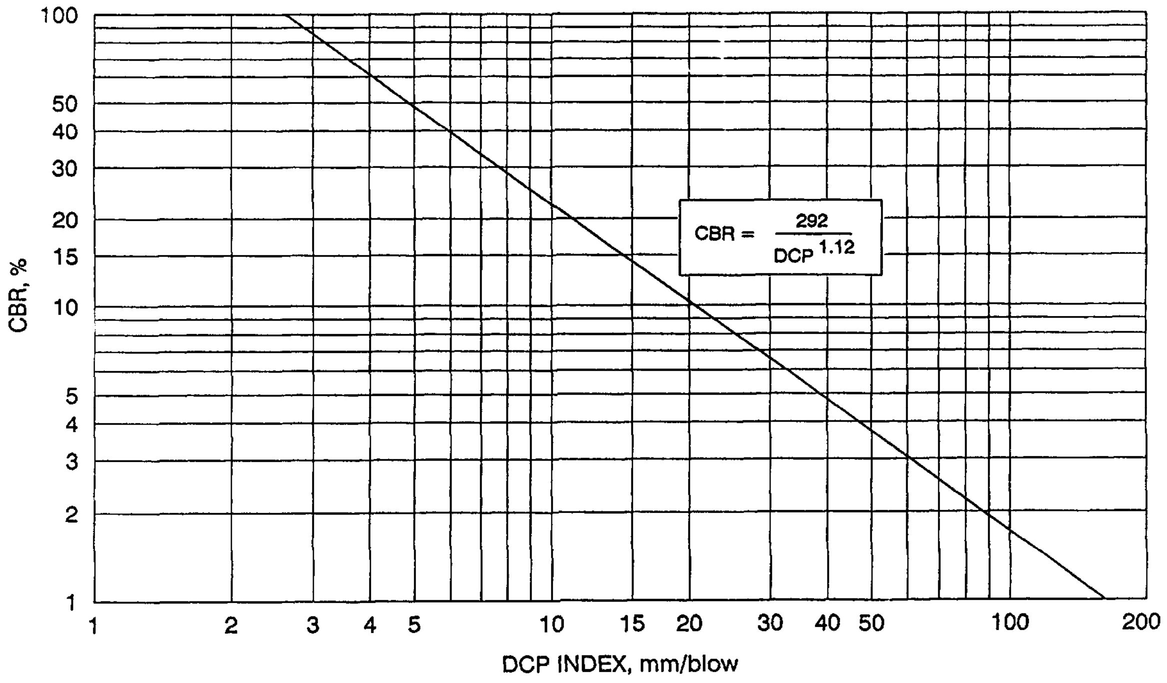
Location: Crestview, Newber, OR
Depth to bottom: 13"
Tester's Name: TAP
Tester's Company: GeoEngineers, Inc.

Date: 9/21/2017
Dimension: 4"
Tester's Contact No: 503-951-1810

Test Hole Number: B-2
Test Method: Dynamic Cone Penetration
GeoEngineers Job: 6748-002-00

Depth, feet	Soil Texture
0-13"	Silty Gravel Fill
13"-6.5'	Brown Silt trace sand

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR	M_R
#	#	#	(in)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%	psi
1	1	1	14.2	1.2	1.2	1.2	1	1.2	30.48	6.357496	4525.87
2	1	2	15.2	2.2	1.0	1	1	1	25.4	7.797746	4859.401
3	1	3	16.1	3.1	0.9	0.9	1	0.9	22.86	8.774401	5063.236
4	1	4	17.2	4.2	1.1	1.1	1	1.1	27.94	7.008245	4682.089
5	1	5	18.2	5.2	1.0	1	1	1	25.4	7.797746	4859.401
6	1	6	19.3	6.3	1.1	1.1	1	1.1	27.94	7.008245	4682.089
7	1	7	20.5	7.5	1.2	1.2	1	1.2	30.48	6.357496	4525.87
8	1	8	21.6	8.6	1.1	1.1	1	1.1	27.94	7.008245	4682.089
9	1	9	22.6	9.6	1.0	1	1	1	25.4	7.797746	4859.401
10	1	10	23.6	10.6	1.0	1	1	1	25.4	7.797746	4859.401
11	1	11	24.7	11.7	1.1	1.1	1	1.1	27.94	7.008245	4682.089
12	1	12	25.5	12.5	0.8	0.8	1	0.8	20.32	10.01171	5301.243
13	1	13	26.2	13.2	0.7	0.7	1	0.7	17.78	11.62678	5584.632
14	1	14	26.8	13.8	0.6	0.6	1	0.6	15.24	13.81783	5930.67
15	1	15	28.1	15.1	1.3	1.3	1	1.3	33.02	5.81236	4386.77
16	1	16	29.3	16.3	1.2	1.2	1	1.2	30.48	6.357496	4525.87
17	1	17	30.6	17.6	1.3	1.3	1	1.3	33.02	5.81236	4386.77
18	1	18	31.8	18.8	1.2	1.2	1	1.2	30.48	6.357496	4525.87
19	1	19	33	20	1.2	1.2	1	1.2	30.48	6.357496	4525.87
20	1	20	34.1	21.1	1.1	1.1	1	1.1	27.94	7.008245	4682.089
21	1	21	35.1	22.1	1.0	1	1	1	25.4	7.797746	4859.401
22	1	22	36.1	23.1	1.0	1	1	1	25.4	7.797746	4859.401
23	1	23	37	24	0.9	0.9	1	0.9	22.86	8.774401	5063.236
24	1	24	37.9	24.9	0.9	0.9	1	0.9	22.86	8.774401	5063.236



(after Webster et al., 1992)
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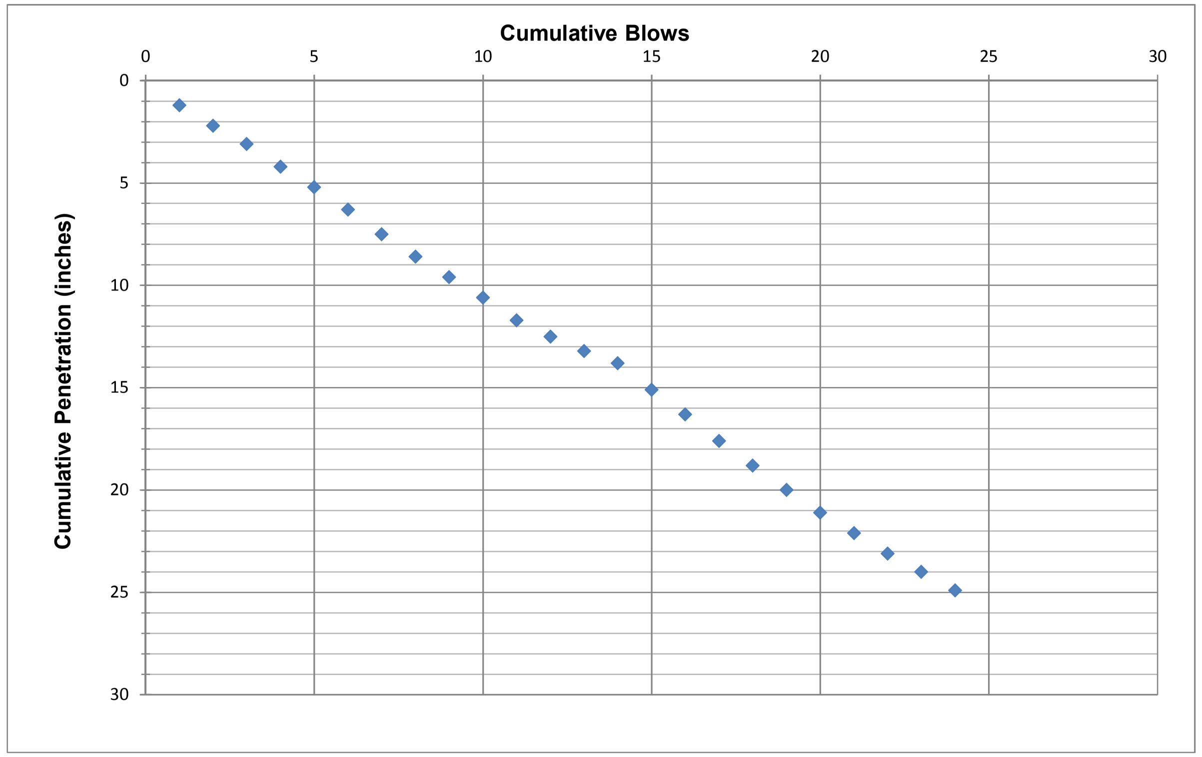


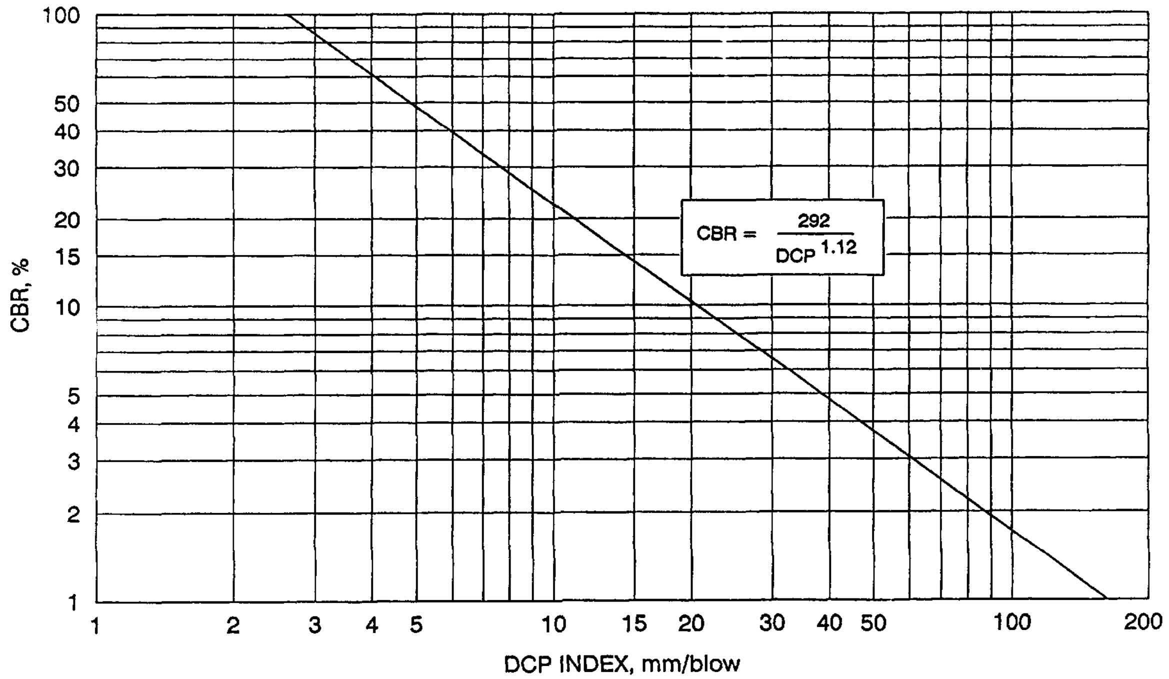
Location: Crestview, Newber, OR
Depth to bottom: 26"
Tester's Name: TAP
Tester's Company: GeoEngineers, Inc.

Date: 9/21/2017
Dimension: 4"
Tester's Contact No: 503-951-1810

Test Hole Number: B-4
Test Method: Dynamic Cone Penetration
GeoEngineers Job: 6748-002-00

Depth, feet	Soil Texture
0-26"	Silty Gravel Fill
26"-6.5'	Brown Silt

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR	M_R
#	#	#	(in)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%	psi
1	1	1	27.8	1.8	1.8	1.7716545	1	1.771655	45.00002	4.109458	3887.899
2	1	2	29.2	3.2	1.5	1.4566937	1	1.456694	37.00002	5.116779	4196.325
3	1	3	30.3	4.3	1.1	1.1023628	1	1.102363	28.00002	6.991423	4678.172
4	1	4	31.2	5.2	0.8	0.8267721	1	0.826772	21.00001	9.649326	5233.622
5	1	5	32.0	6.0	0.8	0.8267721	1	0.826772	21.00001	9.649326	5233.622
6	1	6	32.9	6.9	0.9	0.9055123	1	0.905512	23.00001	8.714599	5051.193
7	1	7	33.9	7.9	1.0	0.9842525	1	0.984253	25.00001	7.93761	4889.576
8	1	8	34.7	8.7	0.8	0.787402	1	0.787402	20.00001	10.19129	5334.161
9	1	9	35.5	9.5	0.8	0.8267721	1	0.826772	21.00001	9.649326	5233.622
10	1	10	36.5	10.5	1.0	0.9842525	1	0.984253	25.00001	7.93761	4889.576
11	1	11	37.4	11.4	0.9	0.9055123	1	0.905512	23.00001	8.714599	5051.193
12	1	12	38.2	12.2	0.9	0.8661422	1	0.866142	22.00001	9.159446	5139.525
13	1	13	39.2	13.2	0.9	0.9448824	1	0.944882	24.00001	8.308947	4968.044
14	1	14	40.0	14.0	0.8	0.8267721	1	0.826772	21.00001	9.649326	5233.622
15	1	15	40.9	14.9	0.9	0.9055123	1	0.905512	23.00001	8.714599	5051.193
16	1	16	41.6	15.6	0.6	0.6299216	1	0.629922	16.00001	13.08483	5819.17
17	1	17	42.3	16.3	0.7	0.7480319	1	0.748032	19.00001	10.7939	5441.942
18	1	18	43.1	17.1	0.8	0.8267721	1	0.826772	21.00001	9.649326	5233.622
19	1	19	43.7	17.7	0.6	0.5905515	1	0.590552	15.00001	14.06567	5967.498
20	1	20	44.4	18.4	0.7	0.7086618	1	0.708662	18.00001	11.46773	5557.911
21	1	21	45.0	19.0	0.6	0.5905515	1	0.590552	15.00001	14.06567	5967.498
22	1	22	45.6	19.6	0.6	0.6299216	1	0.629922	16.00001	13.08483	5819.17
23	1	23	46.2	20.2	0.6	0.5905515	1	0.590552	15.00001	14.06567	5967.498
24	1	24	46.9	20.9	0.6	0.6299216	1	0.629922	16.00001	13.08483	5819.17



(after Webster et al., 1992)
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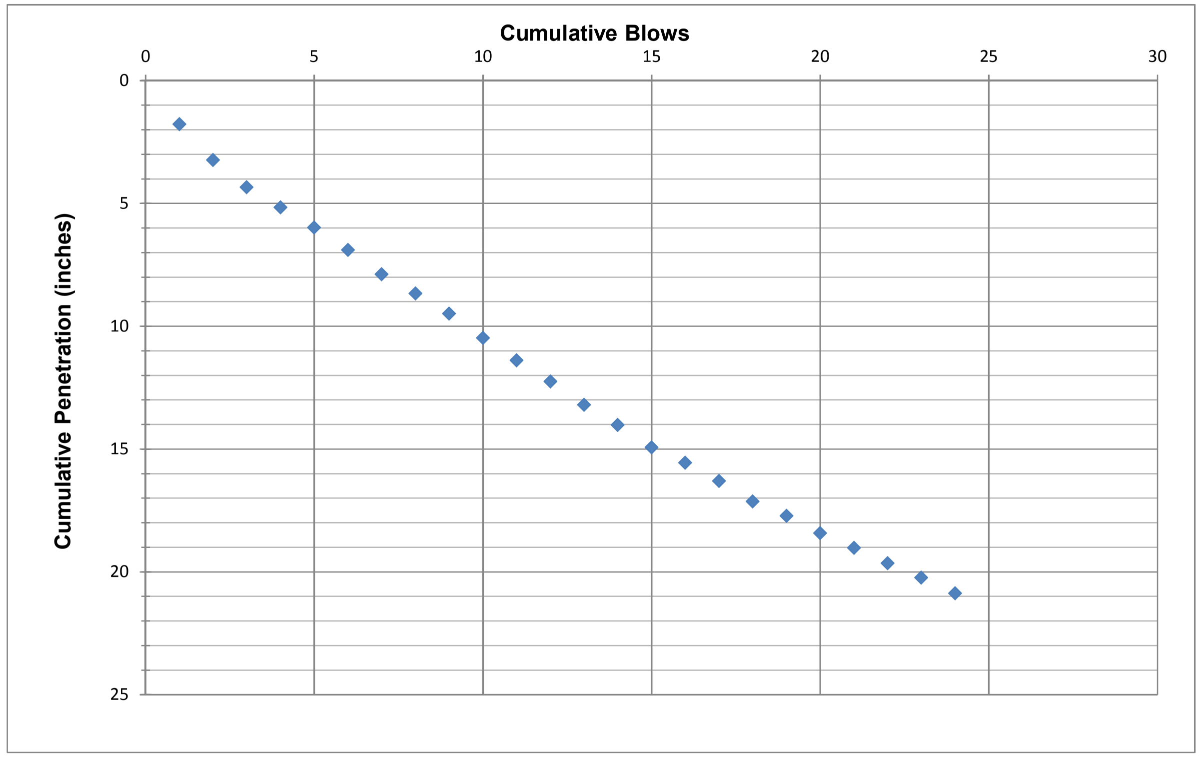


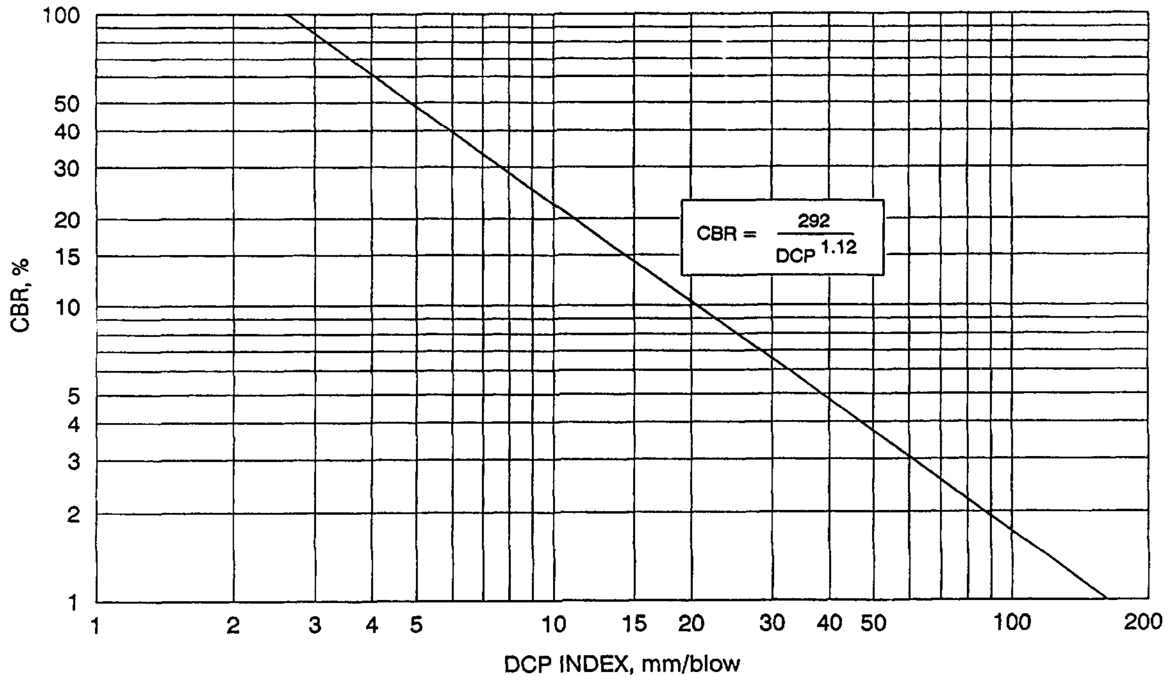
Location: Crestview, Newberg, OR
Depth to bottom: 22"
Tester's Name: TAP
Tester's Company: GeoEngineers, Inc.

Date: 9/21/2017
Dimension: 4"
Tester's Contact No: 503-951-1810

Test Hole Number: B-6
Test Method: Dynamic Cone Penetration
GeoEngineers Job: 6748-002-00

Depth, feet	Soil Texture
0-22"	Silty Gravel Fill
22"-6.5'	Brown Silt

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR	M_R
#	#	#	(in)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%	psi
1	1	1	23.9	1.9	1.9	1.9	1	1.9	48.26	3.799838	3783.283
2	1	2	25.8	3.8	1.9	1.9	1	1.9	48.26	3.799838	3783.283
3	1	3	26.8	4.8	1.0	1	1	1	25.4	7.797746	4859.401
4	1	4	27.7	5.7	0.9	0.9	1	0.9	22.86	8.774401	5063.236
5	1	5	28.6	6.6	0.9	0.9	1	0.9	22.86	8.774401	5063.236
6	1	6	29.5	7.5	0.9	0.9	1	0.9	22.86	8.774401	5063.236
7	1	7	30.3	8.3	0.8	0.8	1	0.8	20.32	10.01171	5301.243
8	1	8	31.2	9.2	0.9	0.9	1	0.9	22.86	8.774401	5063.236
9	1	9	32	10	0.8	0.8	1	0.8	20.32	10.01171	5301.243
10	1	10	32.8	10.8	0.8	0.8	1	0.8	20.32	10.01171	5301.243
11	2	12	34.1	12.1	1.3	0.65	1	0.65	16.51	12.63299	5748.395
12	2	14	35.4	13.4	1.3	0.65	1	0.65	16.51	12.63299	5748.395
13	2	16	36.6	14.6	1.2	0.6	1	0.6	15.24	13.81783	5930.67
14	2	18	37.8	15.8	1.2	0.6	1	0.6	15.24	13.81783	5930.67
15	2	20	38.8	16.8	1.0	0.5	1	0.5	12.7	16.94817	6367.728
16	3	23	40.3	18.3	1.5	0.5	1	0.5	12.7	16.94817	6367.728
17	3	26	41.6	19.6	1.3	0.433333333	1	0.433333	11.00667	19.89429	6733.21
18	3	29	42.9	20.9	1.3	0.433333333	1	0.433333	11.00667	19.89429	6733.21
19	3	32	44.1	22.1	1.2	0.4	1	0.4	10.16	21.76015	6946.713
20	3	35	45.5	23.5	1.4	0.466666667	1	0.466667	11.85333	18.30971	6541.391
21	3	38	46.6	24.6	1.1	0.366666667	1	0.366667	9.313333	23.98751	7186.492
22	3	41	47.7	25.7	1.1	0.366666667	1	0.366667	9.313333	23.98751	7186.492
23	3	44	48.7	26.7	1.0	0.333333333	1	0.333333	8.466667	26.68977	7458.647



$$\text{CBR} = \frac{292}{\text{DCP}^{1.12}}$$

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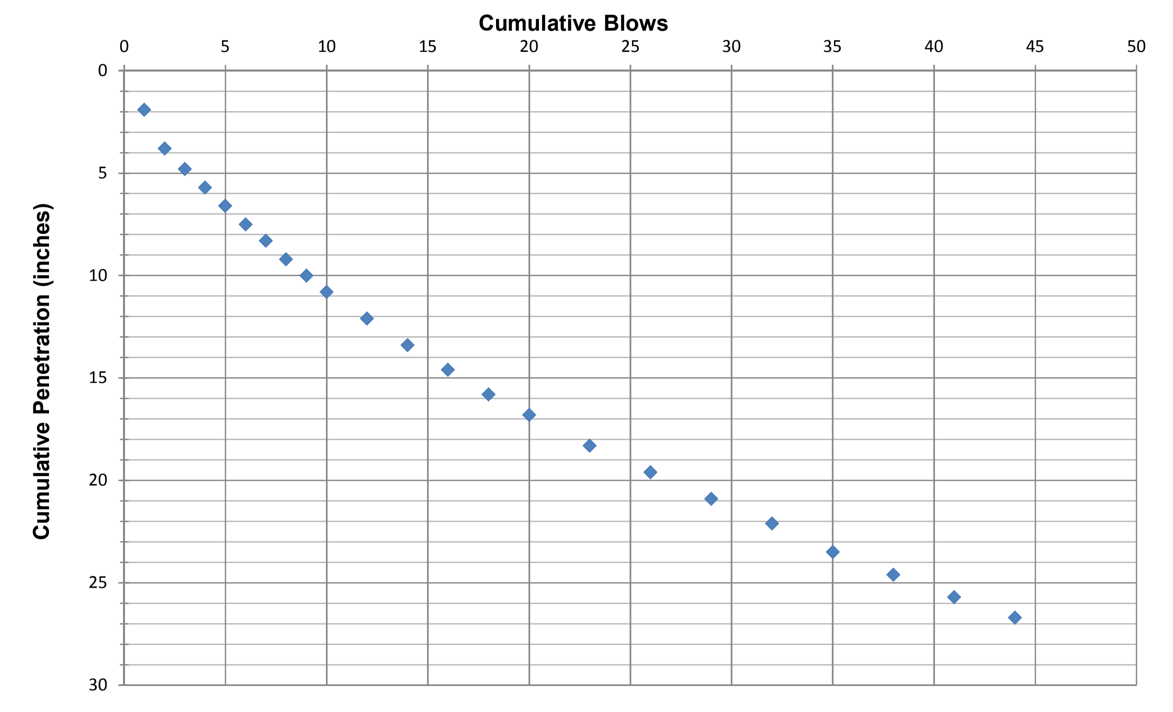


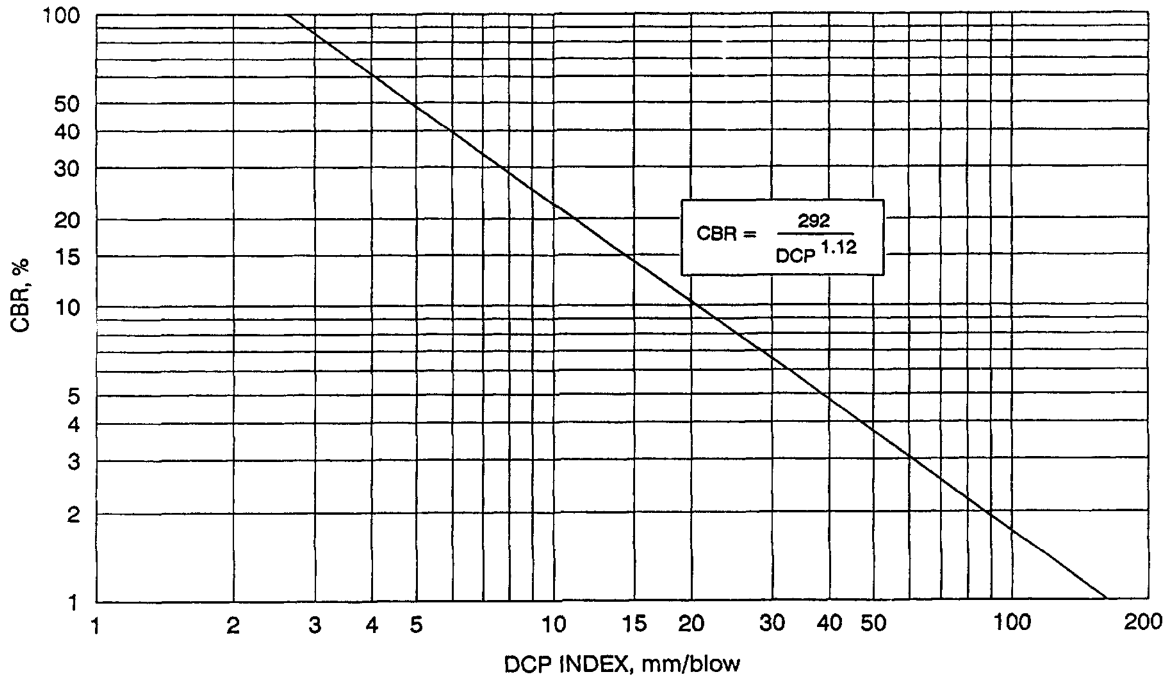
Location: Crestview, Newberg, OR
Depth to bottom: 22.5
Tester's Name: TAP
Tester's Company: GeoEngineers, Inc.

Date: 9/21/2017
Dimension: 4"
Tester's Contact No: 503-951-1810

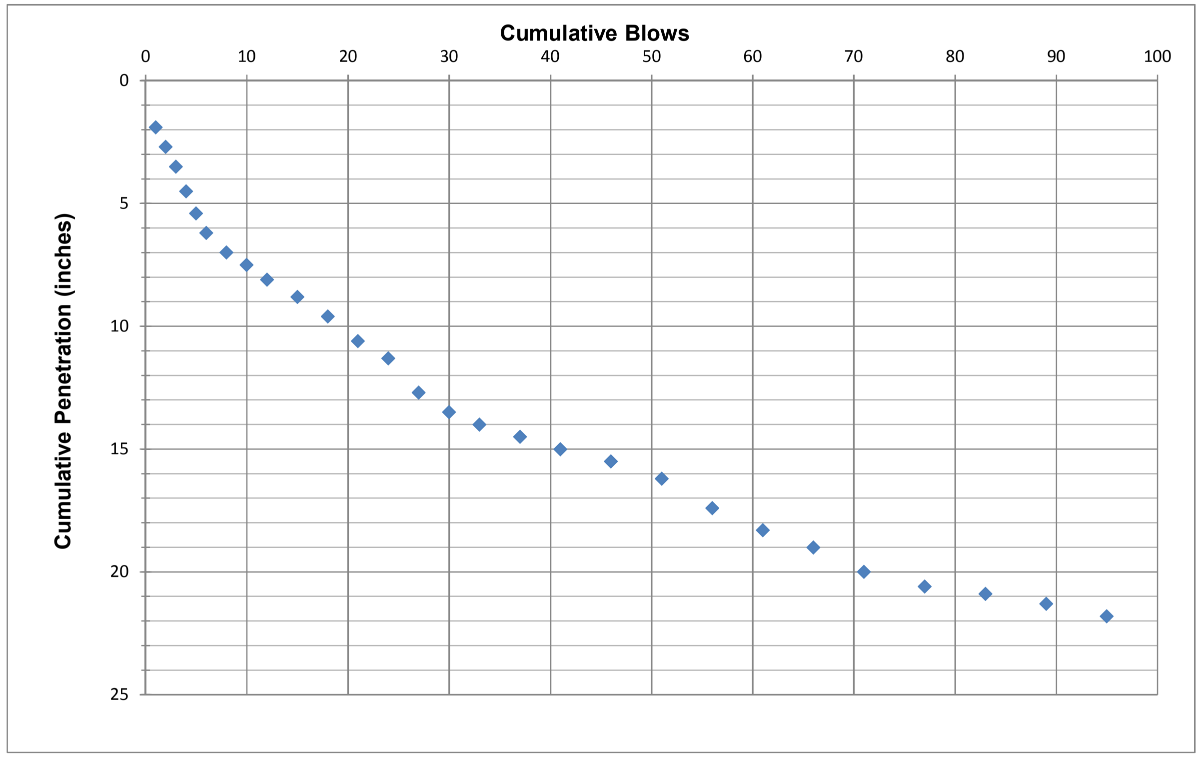
Test Hole Number: B-8
Test Method: Dynamic Cone Penetration
GeoEngineers Job: 6748-002-00

Depth, feet	Soil Texture
0-22.5"	Silty Gravel Fill
22.5"-6.5'	Brown Silt

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR	M_R
#	#	#	(in)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%	psi
1	1	1	24.4	1.9	1.9	1.9	1	1.9	48.26	3.799838	3783.283
2	1	2	25.2	2.7	0.8	0.8	1	0.8	20.32	10.01171	5301.243
3	1	3	26	3.5	0.8	0.8	1	0.8	20.32	10.01171	5301.243
4	1	4	27	4.5	1.0	1	1	1	25.4	7.797746	4859.401
5	1	5	27.9	5.4	0.9	0.9	1	0.9	22.86	8.774401	5063.236
6	1	6	28.7	6.2	0.8	0.8	1	0.8	20.32	10.01171	5301.243
7	2	8	29.5	7	0.8	0.4	1	0.4	10.16	21.76015	6946.713
8	2	10	30	7.5	0.5	0.25	1	0.25	6.35	36.83632	8344.228
9	2	12	30.6	8.1	0.6	0.3	1	0.3	7.62	30.03262	7771.511
10	3	15	31.3	8.8	0.7	0.233333333	1	0.233333	5.926667	39.7956	8571.796
11	3	18	32.1	9.6	0.8	0.266666667	1	0.266667	6.773333	34.26763	8136.825
12	3	21	33.1	10.6	1.0	0.333333333	1	0.333333	8.466667	26.68977	7458.647
13	3	24	33.8	11.3	0.7	0.233333333	1	0.233333	5.926667	39.7956	8571.796
14	3	27	35.2	12.7	1.4	0.466666667	1	0.466667	11.85333	18.30971	6541.391
15	3	30	36	13.5	0.8	0.266666667	1	0.266667	6.773333	34.26763	8136.825
16	3	33	36.5	14	0.5	0.166666667	1	0.166667	4.233333	58.00942	9773.762
17	4	37	37	14.5	0.5	0.125	1	0.125	3.175	80.06263	10934.22
18	4	41	37.5	15	0.5	0.125	1	0.125	3.175	80.06263	10934.22
19	5	46	38	15.5	0.5	0.1	1	0.1	2.54	102.7943	11928.42
20	5	51	38.7	16.2	0.7	0.14	1	0.14	3.556	70.51893	10461.47
21	5	56	39.9	17.4	1.2	0.24	1	0.24	6.096	38.5596	8478.136
22	5	61	40.8	18.3	0.9	0.18	1	0.18	4.572	53.21865	9484.763
23	5	66	41.5	19	0.7	0.14	1	0.14	3.556	70.51893	10461.47
24	5	71	42.5	20	1.0	0.2	1	0.2	5.08	47.29503	9102.927
25	6	77	43.1	20.6	0.6	0.1	1	0.1	2.54	102.7943	11928.42
26	6	83	43.4	20.9	0.3	0.05	1	0.05	1.27	223.4203	15630.92
27	6	89	43.8	21.3	0.4	0.066666667	1	0.066667	1.693333	161.8793	13971.99
28	6	95	44.3	21.8	0.5	0.083333333	1	0.083333	2.116667	126.0817	12807.47



(after Webster et al., 1992)
Webster, S. L., Grau, R. H., and Williams, T. P. (1992). Description and application of dual mass dynamic cone penetrometer. Department of the Army Waterways Equipment Station, No. GL-92-3.



Location: Newberg, OR
Depth to bottom: 2'
Tester's Name: Danny Hess
Tester's Company: GeoEngineers, Inc.

Date: 9/21/2018
Dimension: 6"

Test Hole Number: IT-1
Test Method: Open Pit Fallin Head
GeoEngineers Job: 6748-002-00

Depth		**Soil Texture**
	0-2'	Brown silt

Time of Day	Time Interval (min)	Total Time (min)	Depth to Water from Top of Pipe (inches)	Dist. Interval (inches)	Infiltration (inches/hour)	
10:43	0		1.17			Test #1
10:44	1	1	1.21	0.04	2.4	
10:45	1	2	1.23	0.02	1.2	
10:46	1	3	1.25	0.02	1.2	
10:47	1	4	1.27	0.02	1.2	
10:48	1	5	1.29	0.02	1.2	
10:49	1	6	1.31	0.02	1.2	
10:50	1	7	1.33	0.02	1.2	
10:51	1	8	1.36	0.03	1.8	
10:52	1	9	1.38	0.02	1.2	
10:53	1	10	1.38	0.00	0.0	
10:58	5	15	1.44	0.06	0.7	
11:03	5	20	1.50	0.06	0.7	
11:08	5	25	1.54	0.04	0.5	
11:13	5	30	1.58	0.04	0.5	
11:23	10	40	1.64	0.06	0.4	
11:33	10	50	1.70	0.06	0.4	
11:43	10	60	1.74	0.04	0.2	

Location: Newberg, OR
Depth to bottom: 3'
Tester's Name: Danny Hess
Tester's Company: GeoEngineers, Inc.

Date: 9/21/2018
Dimension: 6"

Test Hole Number: IT-2
Test Method: Encased Falling Head
GeoEngineers Job: 6748-002-00

Depth		**Soil Texture**
	0-3'	Brown silt

Time of Day	Time Interval (min)	Total Time (min)	Depth to Water from Top of Pipe (inches)	Dist. Interval (inches)	Infiltration (inches/hour)	
15:00			3.98			Test #1
15:10	10	10	3.98	0.00	0.0	
15:20	10	20	3.98	0.00	0.0	
15:30	10	30	3.98	0.00	0.0	
15:40	10	40	3.98	0.00	0.0	
15:50	10	50	3.99	0.01	0.1	
16:00	10	60	3.99	0.00	0.0	

APPENDIX B

Asphalt Core Photographs

← Top

Asphalt Core Photographs

Crestview Crossing Development
Newberg, Oregon

GeoEngineers

Figure B-1

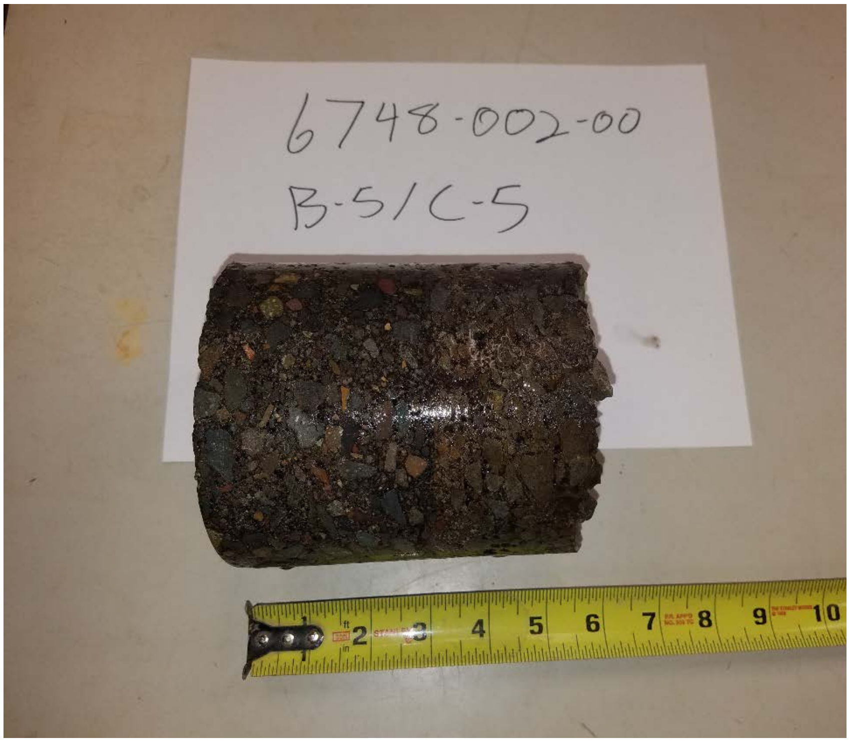
← Top

Asphalt Core Photographs

Crestview Crossing Development
Newberg, Oregon

GeoEngineers

Figure B-2



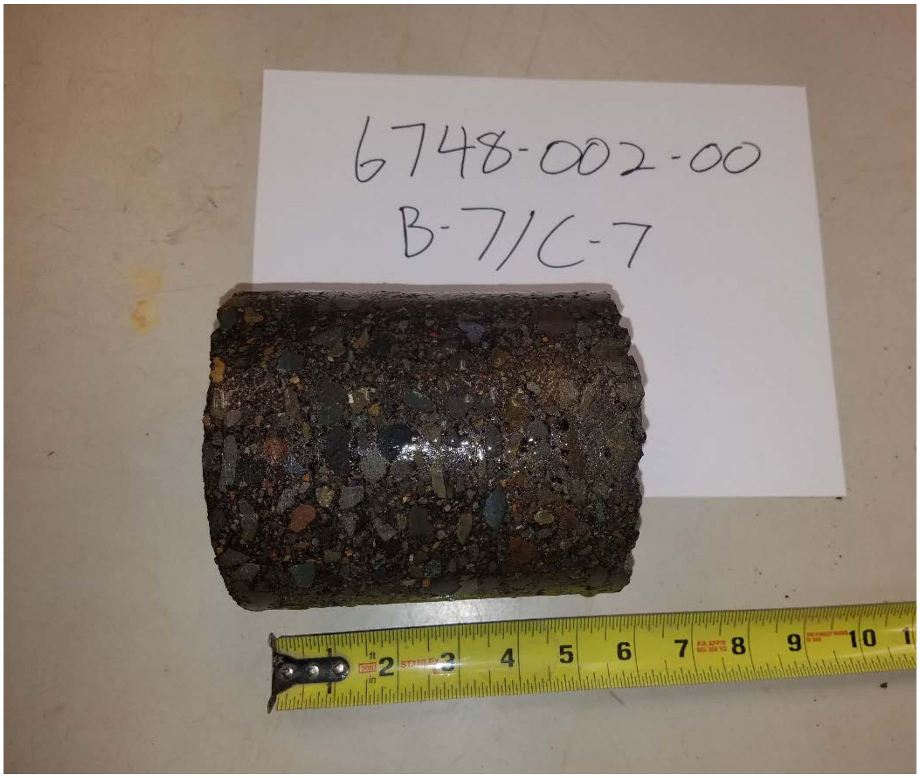
← Top

Asphalt Core Photographs

Crestview Crossing Development
Newberg, Oregon

GeoEngineers

Figure B-3



← **Top**

Asphalt Core Photographs

Crestview Crossing Development
Newberg, Oregon

GeoEngineers

Figure B-4

Top

Asphalt Core Photographs

Crestview Crossing Development
Newberg, Oregon

GeoEngineers

Figure B-5

APPENDIX C
Report Limitations and Guidelines for Use

APPENDIX C
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

Read These Provisions Closely

It is important to recognize that the geoscience practices (geotechnical engineering, geology and environmental science) rely on professional judgment and opinion to a greater extent than other engineering and natural science disciplines, where more precise and/or readily observable data may exist. To help clients better understand how this difference pertains to our services, GeoEngineers includes the following explanatory "limitations" provisions in its reports. Please confer with GeoEngineers if you need to know more how these "Report Limitations and Guidelines for Use" apply to your project or site.

Geotechnical Services Are Performed for Specific Purposes, Persons and Projects

This report has been prepared for 3J Consulting, Inc., J.T. Smith Companies and their authorized agents and/or regulatory agencies for the project specifically identified in the report. The information contained herein is not applicable to other sites or projects.

GeoEngineers structures its services to meet the specific needs of its clients. No party other than the party to whom this report is addressed may rely on the product of our services unless we agree to such reliance in advance and in writing. Within the limitations of the agreed scope of services for the Project, and its schedule and budget, our services have been executed in accordance with our Agreement with J.T. Smith Companies dated June 29, 2017 and generally accepted geotechnical practices in this area at the time this report was prepared. We do not authorize, and will not be responsible for, the use of this report for any purposes or projects other than those identified in the report.

A Geotechnical Engineering or Geologic Report is Based on a Unique Set of Project-Specific Factors

This report has been prepared for the proposed Crestview Crossing Development north of Hwy 99W between Vittoria Way and North Harmony Lane in Newberg, Oregon. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, it is important not to rely on this report if it was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

---

[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org.

For example, changes that can affect the applicability of this report include those that affect:

- the function of the proposed structure;
- elevation, configuration, location, orientation or weight of the proposed structure;
- composition of the design team; or
- project ownership.

If changes occur after the date of this report, GeoEngineers cannot be responsible for any consequences of such changes in relation to this report unless we have been given the opportunity to review our interpretations and recommendations. Based on that review, we can provide written modifications or confirmation, as appropriate.

Environmental Concerns Are Not Covered

Unless environmental services were specifically included in our scope of services, this report does not provide any environmental findings, conclusions, or recommendations, including but not limited to, the likelihood of encountering underground storage tanks or regulated contaminants.

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by man-made events such as construction on or adjacent to the site, new information or technology that becomes available subsequent to the report date, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. If more than a few months have passed since issuance of our report or work product, or if any of the described events may have occurred, please contact GeoEngineers before applying this report for its intended purpose so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

Geotechnical and Geologic Findings Are Professional Opinions

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies the specific subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied its professional judgment to render an informed opinion about subsurface conditions at other locations. Actual subsurface conditions may differ, sometimes significantly, from the opinions presented in this report. Our report, conclusions and interpretations are not a warranty of the actual subsurface conditions.

Geotechnical Engineering Report Recommendations Are Not Final

We have developed the following recommendations based on data gathered from subsurface investigation(s). These investigations sample just a small percentage of a site to create a snapshot of the subsurface conditions elsewhere on the site. Such sampling on its own cannot provide a complete and accurate view of subsurface conditions for the entire site. Therefore, the recommendations included in this report are preliminary and should not be considered final. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for the recommendations in this report if we do not perform construction observation.

We recommend that you allow sufficient monitoring, testing and consultation during construction by GeoEngineers to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes if the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective means of managing the risks associated with unanticipated conditions. If another party performs field observation and confirms our expectations, the other party must take full responsibility for both the observations and recommendations. Please note, however, that another party would lack our project-specific knowledge and resources.

A Geotechnical Engineering or Geologic Report Could Be Subject to Misinterpretation

Misinterpretation of this report by members of the design team or by contractors can result in costly problems. GeoEngineers can help reduce the risks of misinterpretation by conferring with appropriate members of the design team after submitting the report, reviewing pertinent elements of the design team's plans and specifications, participating in pre-bid and preconstruction conferences, and providing construction observation.

Do Not Redraw the Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. The logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Photographic or electronic reproduction is acceptable but separating logs from the report can create a risk of misinterpretation.

Give Contractors a Complete Report and Guidance

To help reduce the risk of problems associated with unanticipated subsurface conditions, GeoEngineers recommends giving contractors the complete geotechnical engineering or geologic report, including these "Report Limitations and Guidelines for Use." When providing the report, you should preface it with a clearly written letter of transmittal that:

- advises contractors that the report was not prepared for purposes of bid development and that its accuracy is limited; and
- encourages contractors to confer with GeoEngineers and/or to conduct additional study to obtain the specific types of information they need or prefer.

Contractors Are Responsible for Site Safety on Their Own Construction Projects

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and adjacent properties.

Biological Pollutants

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants, and no conclusions or inferences should be drawn regarding Biological Pollutants as they may relate to this project. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria and viruses, and/or any of their byproducts.

A Client that desires these specialized services is advised to obtain them from a consultant who offers services in this specialized field.

Have we delivered World Class Client Service?

Please let us know by visiting **www.geoengineers.com/feedback**.

GeoEngineers

Exhibit I: Preliminary Sewer Analysis

Exhibit I: Preliminary Sewer Analysis

AKS
ENGINEERING & FORESTRY

November 20, 2020

Attn: Engineering Department
City of Newberg
414 E. First Street
Newberg, OR 97132

RE: Preliminary Sanitary Sewer Analysis for the Crestview Crossing Commercial Project

City Engineering Staff:

The purpose of this letter is to analyze and document the existing and future wastewater flows from the Crestview Crossing Commercial Project and the capacity of the existing Fernwood lift station as required by the City of Newberg. This analysis shows that the existing public sanitary sewer has capacity to support this project which is a part of the larger Crestview Crossing Planned Unit Development (PUD) that is being developed by JT Smith Companies.

The subject property, zoned C-2, is approximately ±4.2 acres and is essentially undeveloped. The project consists of 5 retail buildings totaling approximately 40,000 square feet along with parking and associated utilities. This project is a part of the Crestview Crossing PUD and will be constructed after the completion of phase 1 of the development.

Existing Sanitary Sewer:

The site was previously occupied with a single-family home most likely served by a private underground septic system. Prior to the construction of the project, the construction of the Crestview Crossing PUD will take place and will provide adequate utility connections for the subject site.

Proposed Sanitary Sewer:

Wastewater from the project is planned to be conveyed to a new 10” public sanitary sewer main that will run through the east side of the property (to be constructed by JT Smith Companies). It will then, enter the existing 24” main south of Highway 99W that connects to the Fernwood lift station.

The developer (JT Smith Companies) of the entire Crestview Crossing PUD has completed their own analysis of the downstream wastewater system’s capacity. This commercial site/project was included in the analysis and flow rates were calculated using 3,000 gal/acre/day which is more than twice of that used in Table 4-2 of the City of Newberg Wastewater Master Plan. The report found that there will be no capacity issues with the wastewater system downstream of the PUD. It is expected the Crestview PUD will provide a system that can accommodate the wastewater flows from the commercial project. Please see the attached report for more information.

In May 2018 the City of Newberg contracted with Keller and Associates to update their Wastewater Master plan which evaluates and plans for future growth of the wastewater system throughout the city. The City of Newberg’s Wastewater Master Plan includes an evaluation of the current wastewater system and recommends future short and long-term improvements. For this evaluation the subject property was fully accounted for in the 20-year buildout (see Figure 12). The Wastewater Master Plan does not recommend any short or long-term improvements for the sanitary sewer downstream of the proposed development nor for the Fernwood lift station (see section 4.2 Future Collection System Performance).

Per the City of Newberg Wastewater Master Plan section 3.2 the Fernwood lift station, which will receive flows from the subject development, had a third pump installed in 2010 and currently has two force mains exiting the station, with the 6" not currently in use. The Wastewater Master Plan found that the Fernwood lift station is in good working condition and does not foresee any needed improvements within the next 20 years (page 1-4). The Fernwood lift station has also seen the lowest I/I peaking factors of the eight lift stations throughout the city.

The subject site is included in the 20-year buildout as depicted in the Wastewater Master Plan. As such, calculations were completed using the model created by Keller and Associates for the 20-year buildout during a 5-year, 24-hour storm event. Attached is a map from the City of Newberg's GIS utility maps showing the Fernwood lift station along with the manhole ID numbers for the corresponding manholes that discharge into the lift station. The attached tables, taken from the Wastewater Master Plan, shows that the Fernwood lift station is expected to receive a maximum inflow of 2.8 cfs (1257 gpm) at a 20-year buildout. This includes the property to the east of the site that is currently not proposed to be developed. The Fernwood lift station has an average field test flow rate of 670 gpm with one pump and 1210 gpm with 2 pumps (Table 3-3). This shows that, with the third pump, the Fernwood lift station would have more than sufficient capacity to accommodate the estimated increased flows from the full 20-year buildout.

The City of Newberg's Wastewater Master Plan shows that there are no anticipated upgrades needed for the sanitary sewer system downstream of the proposed project for the estimated 20-year buildout. Also, the project has been conservatively accounted for during the analysis of the wastewater conveyance system downstream of the Crestview Crossing PUD. All studies indicate that the Fernwood pump station along with the planned/new and existing piping system has sufficient capacity for this project.

If you have any questions or need additional information, please let us know.
Sincerely,

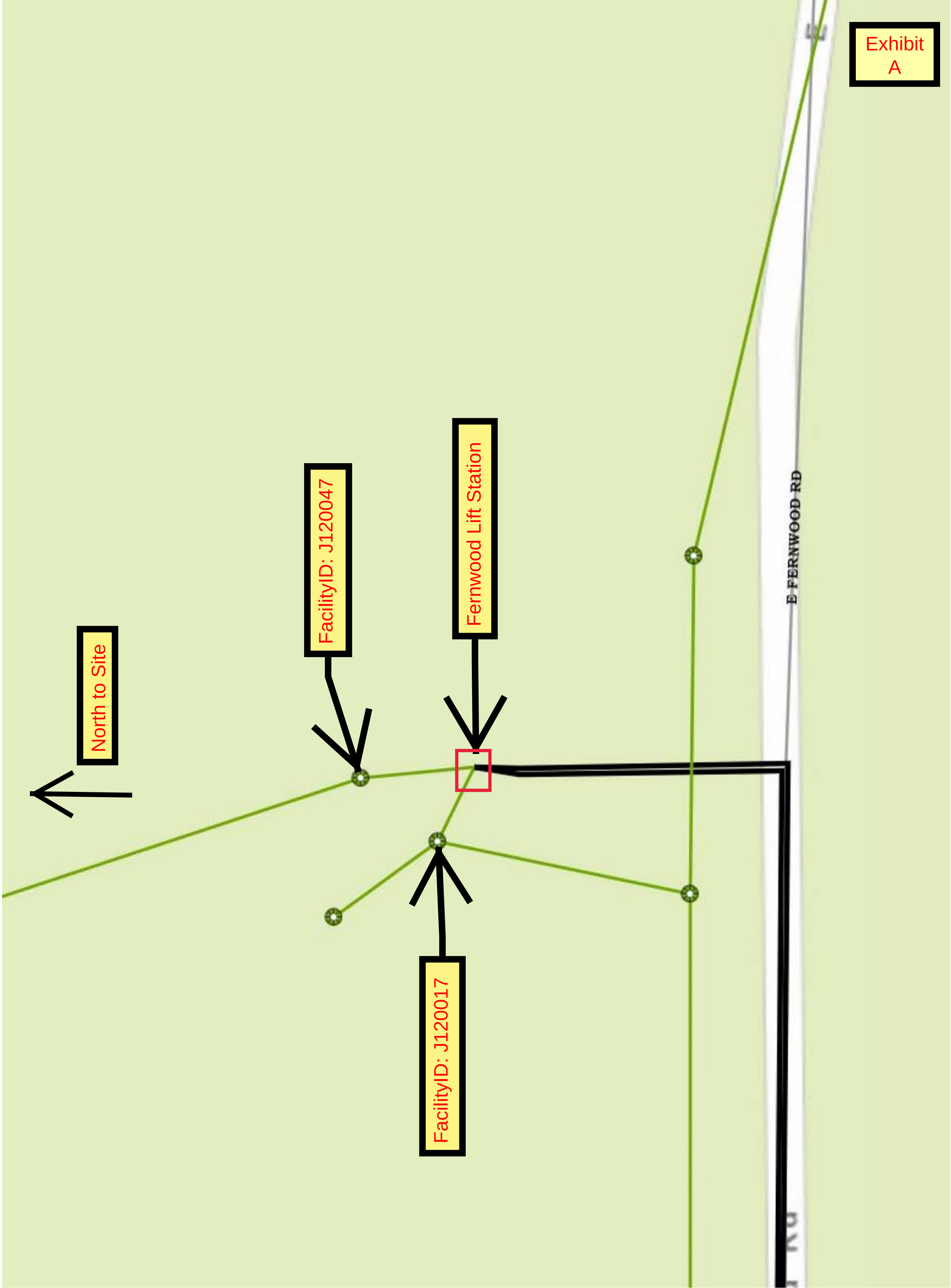
AKS ENGINEERING & FORESTRY, LLC
Chuck Gregory, PE – Associate
12965 SW Herman Road, Suite 100
Tualatin, OR 97062
503.563.6151 | chuckg@aks-eng.com

REGISTERED PROFESSIONAL ENGINEER
50644PE
Gregory
OREGON
SEPT. 14, 1999
CHARLES EDWARD GREGORY
RENEWS: JUNE 30, 2021

Attachments:

- Exhibit A
- City of Newberg Wastewater Master Plan Excerpts
- 3J Consulting – Proposed Wastewater System

Exhibit A


North to Site
FacilityID: J120047
Fernwood Lift Station
FacilityID: J120017
E FERNWOOD RD

1.3 COLLECTION SYSTEM EVALUATION

The wastewater collection system consists of approximately 80 miles of gravity sewer mains, 3 miles of force main, and eight lift stations.

1.3.1 Lift Station Evaluation

There are eight lift stations and approximately 3 miles of force main operated and maintained by the City in its wastewater collection system (Figure 7 in Appendix A). Lift stations are generally named by their locations in the city: Andrew, Charles, Chehalem, Creekside, Dayton, Fernwood, Highway 240, and Sheridan. An onsite facility evaluation was completed in January 2017 with City operations personnel to review conditions of the lift station facilities, current maintenance activities, and operational problems encountered by City staff.

All stations are equipped with submersible pumps except Dayton, which uses self-priming, centrifugal pumps; however, the City is currently planning to upgrade the Dayton Lift Station with a submersible pump system. Table 3-2 contains summary information for the eight lift stations. Appendix C includes available data such as pump curves, data sheets, and other data resources.

This evaluation presents general observations and recommendations, along with specific recommendations for individual lift station sites. General recommendations are provided as a guideline to allow the City to maintain the lift stations for the 20-year planning period. Functionality, Inventory and any items of concern observed during the onsite evaluation are noted in Section 3.2.

Overall the Andrew, Charles, Chehalem, Creekside (although not lined), Fernwood, and Sheridan lift stations are in good condition. The Hwy 240 Lift Station is in need of preventative repairs and maintenance and the Dayton Lift Station has multiple notable deficiencies that are sited in the report.

1.3.2 Pipeline Condition and Capacity Evaluation

Except for the summary of the upper Hess Creek trunk line investigation, the inspection reports, pipeline rehabilitation, and spot repair recommendations for the collection system gravity mains are all summarized in Section 7.

The Upper Hess Creek trunk line investigation evaluated an exposed sewer pipe in Hess Creek (Section 3). The exposed pipe was first documented on August 8th, 2017 by City maintenance department and Keller Associates staff. Overall, the monitoring and testing indicates that the exposed pipe is not an excessive source of I/I to the Hess Creek trunk line. It is recommended that the pipe be monitored, but no immediate rehabilitation or replacement is required.

peak flows at buildout. Once the HWY 240 pumps have been upsized, the HWY 240 diversion structure should be adjusted to prevent flow going to the Dayton Lift Station. However, prior to upsizing HWY 240, South River Street improvements must be completed to prevent greater impacts to surcharging and overflows in the South River Street area.

Lift station trunk line consolidation/displacement were focuses of the alternatives evaluation. The alternatives did not present feasible opportunities to consolidate trunk lines. There are a variety of alternatives to displace and consolidate lift stations in conjunction with future infrastructure growth (See Figure 19, Appendix A).

1.3.4 Recommended Collection System Improvements

Lift Stations

Recommendations and tables are detailed in Section 6 of this report. In summary:

Priority 1 lift station improvements address existing deficiencies and have a total estimated cost of $1,429,000. Most of this estimate is for replacement of the Dayton Avenue Lift Station.

Long-term Priority 2 improvements assume that Andrew, Charles, Chehalem, and Creekside lift stations are displaced with other CIP projects. Fernwood, HWY 240 and Sheridan lift stations need video monitoring installed. HWY 240 will need to have upsized pumps. Sheridan will need several upgrades to improve flow.

Two new lift stations to service future development are recommended: one of them being a new lift station for the Hess Creek trunk line to address existing and future deficiencies. The second would be located North of the Fernwood Lift Station. A regional lift station is recommended to serve future development northeast of the intersection of Portland Road and Vittoria Way. Any pre-design for lift station abandonments should include a return on investment analysis.

Pipelines

The recommended alternative for Hess Creek trunk line and Villa Road is Alternative C - New Lift Station, Parallel Gravity Main, and Partial Abandonment of Hess Creek Line. This alternative can be completed as one project or could be divided into three phases.

The recommended alternative for Springbrook Road is adding a parallel gravity line. The improvements include upsizing a portion of the existing Springbrook line north of Fernwood Road.

It is recommended that the line on Pinehurst Court be disconnected from the North Main Street trunk line, re-graded to the west, and extended south to connect to the existing line on Creekside Court.

Table 3-2: Lift Station Inventory

	Andrew	Charles	Chehalem	Creekside	Dayton	Fernwood	Highway 240	Sheridan
LIFT STATION								
Type	Wet-well, submersible, duplex pump system	Wet-well, submersible, duplex pump system	Wet-well, submersible, duplex pump system	Wet-well, submersible, duplex pump system	Wet-well, self-priming, centrifugal, duplex pump system	Wet-well, submersible, triplex pump system	Wet-well, submersible, triplex pump system	Wet-well, submersible, duplex pump system
Pump Type	Submersible, VFD (set for soft start), non-clog centrifugal (Flygt CP3127.090 MT)	Submersible, VFD (set for soft start), non-clog centrifugal (Flygt CP3127.090 MT)	Submersible, soft start, non-clog centrifugal (Flygt NP3171.090 HT)	Submersible, VFD (set for soft start), non-clog, centrifugal (Flygt CP3085.182 MT)	Vertical, soft start, self-priming centrifugal (Gorman-Rupp T10A-B)	Submersible, VFD (set for soft start), non-clog centrifugal (Flygt CP3170.090 HT)	ubmersible, VFD (set for soft start), non-clog entrifugal (ABS XFP 150J-CH2)	Submersible, VFD (set for soft start), non-clog centrifugal (Flygt CP3102.090 MT)
Capacity[1] (gpm)	Each pump: 155 gpm @ approx. 43 ft. TDH	Each pump: 150 gpm @ approx. 43 ft. TDH	Each pump: 630 gpm @ approx. 112 ft. TDH	Each pump: 153 gpm @ approx. 30 ft. TDH	Each pump: 2,100 gpm @ approx. 90 ft. TDH (with 15 ft. suction lift)	Each pump: 900 gpm @ approx. 70 ft. TDH	ach pump: 1010 gpm @ approx. 60 ft. TDH	Each pump: 115 gpm @ approx. 40 ft. TDH
Pump (each)	7.5 hp @ 1,200 rpm (460V, 60 Hz, 3 ph)	7.5 hp @ 1,150 rpm (230V, 60 Hz, 1 ph)	30 hp @ 1,760 rpm (460V, 60 Hz, 3 ph)	3 hp @ 1,710 rpm (460V, 60 Hz, 3 ph)	75 hp @ 1,315 rpm (460V, 60 Hz, 3 ph)	30 hp @ 1,750 rpm (460V, 60 Hz, 3 ph)	25 hp @ 1,185 rpm (460V, 60 Hz, 3 ph)	5 hp @ 1,715 rpm (230V, 60 Hz, 3 ph)
Level Control Type	Conductive level probe (6-in increments)	Conductive level probe (6-in increments)	Pressure transducer and conductive probe	Conductive level probe (6-in increments)	Ultrasonic	Pressure transducer	Pressure transducer	Conductive level probe (6-in increments)
Overflow Point	Overflow discharge pipe	Inlet MH	Overflow discharge pipe	Overflow vault at pump station	MH south of pump station	MH at pump station	Diversion structure in collection system	MH just north of pump station
Overflow Discharge	To creek south of pump station	To storm drain in road	To creek south of pump station	To creek west of pump station	To creek south of pump station	To swale east of pump station	To Dayton pump station	To creek west of pump station
Auxiliary Power Type	Permanent natural gas generator	Permanent diesel generator	Permanent diesel generator	Portable generator	Permanent natural gas generator	Permanent diesel generator	Permanent natural gas generator	Portable generator
Location	At pump station	At pump station	At pump station	At WWTP	At pump station	At pump station	At pump station	At WWTP
Output (kW)	35	25	100	40	150	250	60	25
Fuel Tank Capacity (gal)	N/A	126	173	50	N/A	170	N/A	50
Transfer Switch	Automatic	Automatic	Automatic	Manual	Automatic	Automatic	Automatic	Manual
Alarm Telemetry Type	Radio, operator call-out	Radio, operator call-out	Radio, operator call-out	Radio, operator call-out	Radio, operator call-out	Radio, operator call-out	Radio, operator call-out	Radio, operator call-out
Originally Constructed	2000	2000	2004	1998	1993	2001	2010	2001
Year Upgraded	N/A	2010	2010	2008	2010	2010	N/A	N/A
Wet Well Diameter (ft)	6	5	8	5	12	12	12	6
Wet Well Net Storage (gal)	1,000	1,100	4,500	1,200	5,300	12,900	14,100	920
FORCE MAIN								
Length, Type	Approx. 900 ft. of 4-inch C-900	Approx. 990 ft. of 4-inch C-900	Approx. 3,120 ft. of 6-inch C-900	Approx. 525 ft. of 4-inch C-900	Approx. 4,000 ft. of 12-inch C-900 and DI	Approx. 3,200 ft. of 12-inch C-900	Approx. 2,775 ft. of 10-inch C-900	Approx. 500 ft. of two parallel 4-inch C-900
Profile, Continuously Ascending (Yes/No)	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Discharge Location	MH at S. College and E. 9th Street	MH at S. Blaine and E. 9th Street	MH at N. College Street and E. Henry Road	MH at N. Main Street and Creekside Lane	MH at S. River and E. 9th Street	MH at S. Springbrook and E. Fernwood Road	MH at E. Illinois and Deskins Street	MH at W. Sheridan and N. Morton Street
Combination Air Release/Vaccuum Valves	None	None	None	None	Yes	None	None	None

[1] Capacity as reported in record drawings and O&M Manuals

Deficiencies

- Inability to isolate pumps and perform maintenance on the station.
- Lack of bypass pumping system.
- Inaccurate level sensor readings.
- Regular "brownouts" causing programming, control issues, and overflows.
- Loss of prime on pumps.
- Reduced pumping capacity.
- Small wet well storage volume.

F. Fernwood Lift Station

Fernwood Lift Station is located at 4651 Fernwood Road and was installed in 2001. The fenced site has a small brick building, wet well, and generator. Electrical equipment is located inside the building, which also contains old equipment that is no longer used. An electric meter and enclosure for the meter transformers is located on the building's exterior. The site, including the entrance access, is covered with a concrete slab. The wet well cover is raised above the surrounding concrete with a triple access floor door. The wet well has steel safety grating over the opening when its access doors are open. The valve vault has two access doors but no steel safety grating.

The lift station was built as a duplex system with necessary space, piping, electrical, and other provisions to expand to a triplex system. The third pump was installed in 2010, and the valving was adjusted to utilize the larger force main that had been installed in 2001 with the station. The smaller force main was 6-inch, the larger is 12-inch. The level in the wet well is monitored with transducer level sensor and a high-level float backup system. A Flygt MultiSmart pump controller is used for pump operation. Pumps are mounted on steel pipe rails in the wet well to allow for their removal without entering the wet well. The interior of the wet well and piping is lined with protective coating.

Fernwood Lift Station

The Fernwood Lift Station services approximately 670 homes, discharging through a 12-inch force main leading to the gravity main at E. Fernwood and S. Springbrook Road. The velocity in the force main is approximately 2.6 fps with one pump operating and 3.4 fps with two pumps. The lift station should be adjusted to operate all three pumps together at least once a day to produce scour velocities (>3.5 fps) in the force main. There is a pressure gauge on the force main discharge pipe. Each pump has a reported capacity of 900 gpm, with approximately 70 feet of TDH.

Typically, each pump runs about 260 minutes per day. There have been no known issues with the lift station overflowing, or with multiple pumps running continually for an extended period of time. In the 7-year pump runtime history analyzed, the maximum runtime was a total of 12.3 hours in a day for the lift station. If an overflow were to occur, it would flow from the wet well into an overflow pipe, then into the creek northeast of the lift station. City staff have observed surcharging at the force main discharge manhole. The flow from the lift station may be contributing to surcharging and backups in the Springbrook line.

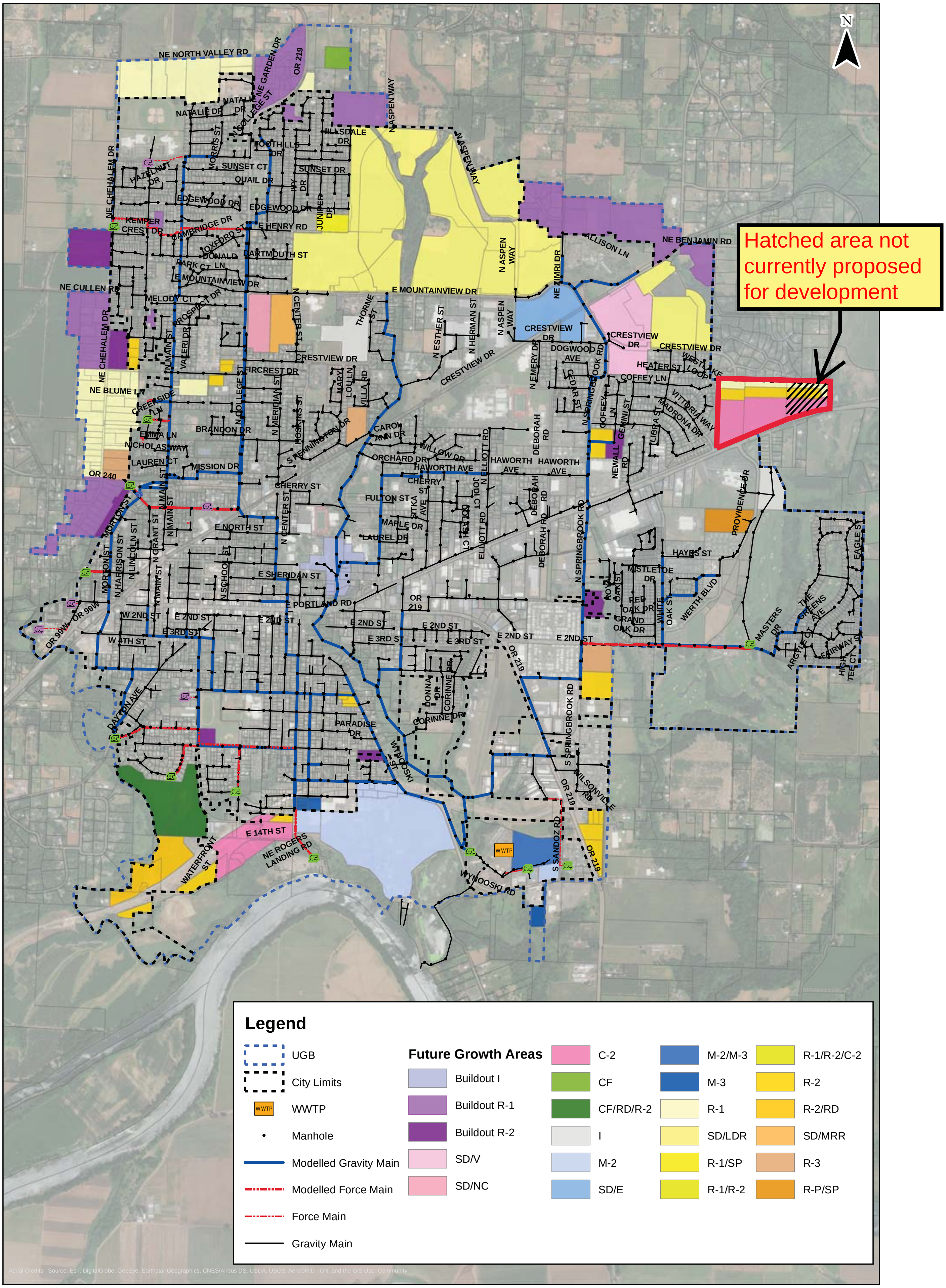
The wash-down water for the wet well is supplied by a backflow preventer connected to the water supply. The water supply backflow preventer is located in an insulated housing with an electric heater in the enclosure.

Overall, the Fernwood Lift Station is in good condition, though the field-tested pump capacity is lower than expected from the provided pump curves.

The wet well is in fair condition. There was some floating FOG accumulation in the wet well at the time of the site visit, but there was very little FOG buildup on the piping and wet well. The piping is uncoated and has surface rust (it does not appear to be severe or deep into the pipes). The wet well has an influent sewer discharge in the center of the three-pump installation. This configuration causes frequent plugging of the center pump by sucking up debris. The problem can be corrected by redirecting the influent sewage flow, or by installing a grinder on the influent. Normally, the best approach is to redirect the flow away from the pump suction.

The valve vault is in good condition with very little rusting of pipe, fittings, and valves. The wet well has a floor drain trench in the bottom for draining water entering from above. This station has a spare force main connection. Currently, only the larger force main is being used. The valves and adapters have their original finish with very little corrosion. The pipe is uncoated and is in good condition. There is and pressure gauge, but not a flow meter, installed in the discharge pipe.

The building is brick and in good condition. The steel painted doors are oxidized, which deteriorates the paint. The shingle roof is in fair condition, with very little shingle deterioration showing at this time. A weatherproof enclosure near the wet well houses the pump disconnects and the connection points for the submersible pumps. The enclosure is mounted very close to the wet well; there are no hazardous seal-offs visible at the enclosure. The generator and weather enclosure are both in good condition.



Hatched area not currently proposed for development

KELLER ASSOCIATES

Future Growth Areas 20-Year and Buildout

Wastewater Master Plan

City of Newberg OREGON

Figure 12

City of Newberg, OR
March 2018

to the SCADA, but will turn the pumps on (high) or off (low) if the water level reaches the floats. It is recommended that the floats be connected to the SCADA to send out unique alarms for the high/low water levels.

Drawdown Tests

During the site visit, drawdown pump tests were completed to review wet well conditions and determine approximate pump flow rates. Each pump and pumping combination were tested at all lift stations. Dayton and Fernwood have depth readouts on their PLCs that were used to record depth over time. The Highway 240 Lift Station has a flow meter on its discharge pipe, allowing for measured flow rates to be recorded over time. Andrew, Charles, Chehalem (pressure transducer was not operational at time of tests), Creekside, and Sheridan do not have continuous depth measurement readouts; for these lift stations, depth to the water surface was measured manually during testing. Estimates for average pump flow rates were calculated using the pump test data. These estimated flow rates, along with the rated pump capacities, are shown in Table 3-3. For the majority of the lift stations, the calculated flow rate was relatively close to the reported pump capacity. Dayton has had historical problems with pump capacity and overflows, which are discussed in more detail in the Dayton Lift Station section. Fernwood field test results are lower than expected.

Table 3-3: Measured Pump Flow Rates

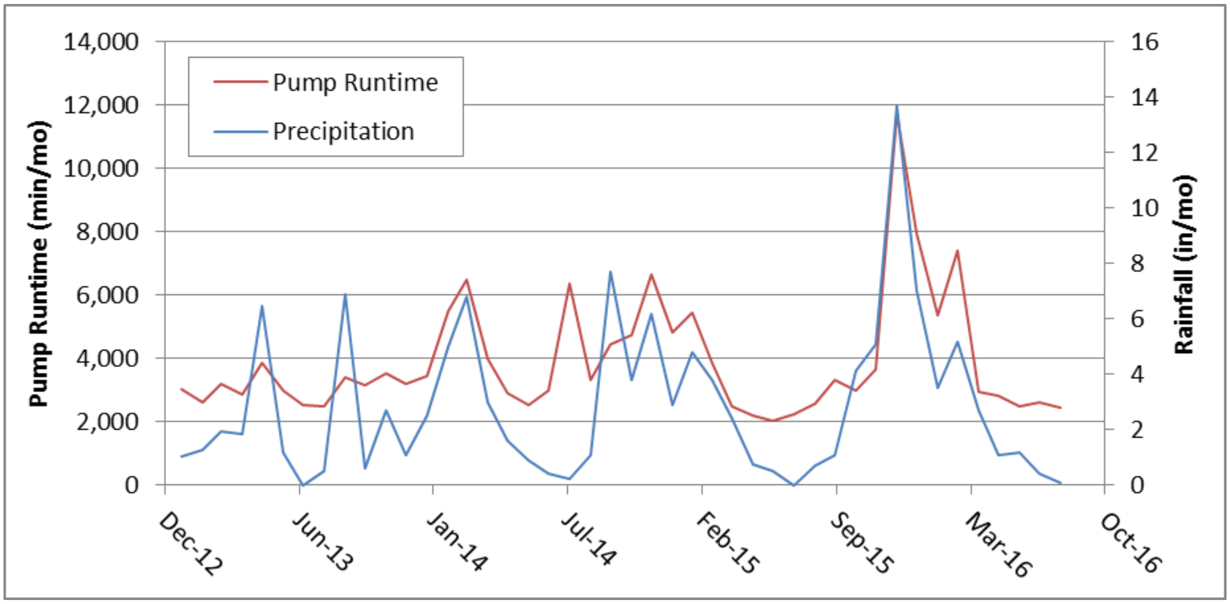
	Avg Field Test Flow Rate (gpm)	Reported Pump Capacity (gpm)
Andrew	140	155
Charles	150	150
Chehalem	660	630
Creekside	190	153
Dayton[1]	1,300	2,100
Fernwood	670	900
2 Pumps	1,210	-
Highway 240	910	1,010
2 Pumps	1,230	-
Sheridan	180	115

[1] As reported by RH2, April 2016 (Appendix C)

Housekeeping/Maintenance

Interiors of the lift station buildings are being kept in very good condition. Floors and walls are clean, painted, and maintained. The wash-down hose (which should be stored off of the ground) was found on the floor at a few of lift stations. The source of wash-down water is a hose bib on the lift station side of a backflow preventer fed by a water source. Backflow preventers should be installed at least 12-inches aboveground to facilitate proper operation, maintenance, and inspection. The backflow preventer is located in an insulated fiberglass cover. Some covers have electric heaters – while others have heat tape – to prevent freezing at the backflow preventer. Heat tape is not

Chart 7-3: Andrew Lift Station Runtimes & Precipitation vs. Time



In order to compare high daily run times caused by I/I against average daily flows, several peaking factors were calculated. Peaking factors compare wet and dry weather flows. A higher peaking factor indicates more I/I in the lift station service area. The results of these analyses for January 2012–October 2016 are summarized in Table 7-1. The peaking factors are color scaled from red (highest I/I ratio) to green (lowest I/I ratio). Of the eight lift stations, Dayton had the highest peaking factors, which suggests the highest ratio of I/I to average flow in its service area.

Table 7-1: Lift Station Peaking Factors

Peaking Factors by Lift Station	Andrew	Charles	Chehalem	Creekside	Dayton	Sheridan	Fernwood	HWY 240
Summer Peak Factor summer peak day/summer avg day	2.1	1.9	1.7	1.8	2.1	3.1	1.5	1.9
Winter Peak Factor winter peak day/winter avg day	2.0	3.1	1.4	1.6	3.0	2.5	1.4	1.5
Peak Day Factor annual peak day/annual avg day	4.5	7.8	2.5	3.0	8.5	5.5	2.3	3.4
Peak Month Factor annual peak month/annual avg month	1.9	2.2	1.4	1.7	2.5	1.8	1.3	1.7
Winter-Summer Avg Factor winter avg day/summer avg day	1.9	2.8	1.3	1.7	3.6	1.7	1.3	2.3
Winter-Summer Peak Factor winter peak day/summer avg day	5.8	13.4	2.6	3.6	16.6	6.3	2.5	5.1
Totals	**18.3**	**31.2**	**11.0**	**13.3**	**36.2**	**20.9**	**10.4**	**16.1**

*Red is the highest factor in each category; green is the lowest.

The highest daily pump run time at the Dayton Lift Station was 8.5 times the average daily pump run time for 2012–2016. The Charles Lift Station was a close second for I/I based on run time peaking factors, followed by Sheridan. Dayton occasionally overflows to Chehalem Creek; thus, the area upstream of Dayton Lift Station should be a priority for repairing I/I problems. The City is currently in the process of improving Dayton due to capacity and condition issues.

The relative magnitude of peak I/I flows upstream of each lift station were compared for the years 2009 to 2016 (Table 7-2). Values were calculated by subtracting the average summer day run time for a given year from the peak day run time, and multiplying that by the average flow rate for the lift station. Rated pump capacities were used, where field test pump flow rates were close to the rated capacity. Field test capacities were used if the data indicated lower pump performance than the rated capacity (see Section 3.1 for pump performance discussion). From Table 7-2, it is evident that the area upstream of the Dayton Lift Station has the greatest volume of I/I. It was noted by City staff that I/I flows through the Fernwood and Highway 240 lift stations have increased in the last few years, which is affirmed by data in Table 7-2.

Table 7-2: Peak I/I Flow

I/I Flow (MGD)	Andrew	Charles	Chehalem	Creekside	Dayton	Sheridan	Fernwood	Hwy 240
2009	0.07	0.11	0.10	0.06	3.2	0.02	0.13	N/A
2010	0.06	0.09	0.17	0.05	1.8	0.01	0.12	0.35
2011	0.05	0.11	0.48	0.05	1.0	0.02	0.21	0.35
2012	0.06	0.09	0.25	0.07	1.3	0.01	0.16	0.37
2013	0.04	0.06	0.06	0.01	0.48	0.00	0.16	0.50
2014	0.07	0.14	0.08	0.01	1.0	0.01	0.18	0.70
2015	0.12	0.25	0.13	0.02	1.8	0.01	0.44	1.03
2016	0.08	0.13	0.13	0.01	0.9	0.01	0.54	1.04
Average	0.07	0.12	0.18	0.04	1.5	0.01	0.24	0.62

*Red indicates higher peak I/I flow in each category; green indicates lower I/I flows.

As a result of this analysis, subsequent phases of monitoring (e.g., flow monitoring, CCTV, and smoke testing) were focused in the service area upstream of the Dayton, Fernwood, and Highway 240 lift stations – which includes the Sheridan Lift Station service area. It is recommended that pump run time data be reviewed every couple of years to establish trends and prioritize rehabilitation efforts. It is also suggested the City install permanent flow meters and pressure gauges at all lift stations to better track I/I and pump performance. These instruments should be connected to the SCADA system to allow for continuous monitoring, recording, and trending.

7.3 FLOW MONITORING

Continuous flow monitoring was completed for five weeks during January-March 2017 to better characterize the nature and distribution of I/I in the system. Eleven flow monitors were placed throughout the system (See Figure 9 (Appendix A) based on staff recommendations, the pump run time analysis, previous I/I study data collected, and land use considerations. Eight flow monitors from Keller and three City-owned flow monitors were used to collect level, velocity, and flow data at 10- to 15-minute intervals. Rainfall data was collected at the WWTP weather station in 5-minute intervals.

Chart 7-4 illustrates the flow and precipitation data for Basins 2, 3, 16, and 17. Site 16 flow is significantly lower than flow at the other sites and thus appears to be near zero on the chart because of the axis scale. The pattern of flow in Basin 16 shows similar responses to rainfall as the other three basins. Appendix G shows flow and precipitation data over time for all of the flow monitoring sites. Flow monitoring basins 2, 12, 13, 14, 16, and 17 are sub-basins of another basin, as indicated by Chart 7-5.

20-Year Flows (2037), 5-year, 24-hour storm event

Input						Output					
Manhole ID	**Rim Elev.**	**Invert Elev.**	**Install Year**	**Avg DWF (cfs)**	**DWF Pattern**	**Max Depth (ft)**	**Max HGL (ft)**	**Freeboard (ft)**	**Max Inflow (cfs)**	**Total Flood Vol. (MG)**	**Time Flooded (hrs)**
WWMI141008	162.12	150.54	1970	0.002	FM15_DIURNAL	2.6	153.1	9.0	5.5	0	0.00
WWMI81	279.93	268.14	2009	0.000	FM12_DIURNAL	0.2	268.4	11.6	0.6	0	0.00
WWMI92143	265.85	257.49	2008	0.072	FM12_DIURNAL	0.4	257.9	8.0	1.1	0	0.00
WWMI92144	264.43	256.47	2008	0.000	FM12_DIURNAL	0.4	256.9	7.6	1.1	0	0.00
WWMI92146	263.91	254.54	2017	0.000	FM12_DIURNAL	1.7	256.2	7.7	1.1	0	0.00
WWMI92147	262.12	243.47	2017	0.000	FM12_DIURNAL	0.4	243.9	18.2	1.2	0	0.00
WWMI92148	251.71	241.52	2017	0.000	FM12_DIURNAL	0.3	241.8	9.9	1.2	0	0.00
WWMI92149	245.17	236.97	2017	0.100	FM12_DIURNAL	0.3	237.3	7.9	1.4	0	0.00
WWMI92150	241.50	229.75	2017	0.000	FM12_DIURNAL	0.3	230.0	11.5	1.4	0	0.00
WWMI92151	239.75	225.75	2017	0.130	FM12_DIURNAL	0.5	226.3	13.5	1.5	0	0.00
WWMI92152	234.71	223.96	2017	0.000	FM12_DIURNAL	0.4	224.4	10.3	1.5	0	0.00
WWMI92156	263.55	244.65	2017	0.000	FM12_DIURNAL	0.1	244.7	18.8	0.0	0	0.00
WWMI92157	260.95	245.57	2008	0.000	FM12_DIURNAL	0.1	245.7	15.3	0.0	0	0.00
WWMI92158	255.21	247.11	2017	0.000	FM12_DIURNAL	0.1	247.2	8.0	0.0	0	0.00
WWMI92159	253.49	248.10	2008	0.000	FM12_DIURNAL	0.1	248.2	5.3	0.0	0	0.00
WWMI92161	255.92	249.58	2017	0.038	FM12_DIURNAL	0.1	249.7	6.2	0.0	0	0.00
WWMJ102130	184.15	171.61	2037	0.027	FM20_DIURNAL	0.1	171.7	12.5	0.0	0	0.00
WWMJ102131	185.10	170.08	2037			0.4	170.4	14.6	1.0	0	0.00
WWMJ111043	194.89	184.33	2001	0.001	FM13_DIURNAL	0.2	184.6	10.3	0.6	0	0.00
WWMJ111047	185.59	176.73	2004	0.003	FM13_DIURNAL	2.5	179.3	6.3	1.9	0	0.00
WWMJ111056	204.04	191.76	2005	0.006	FM13_DIURNAL	0.2	192.0	12.0	0.6	0	0.00
WWMJ111061	183.35	168.54	2037			0.4	168.9	14.4	1.0	0	0.00
WWMJ111062	190.78	167.35	2037			0.3	167.7	23.1	0.8	0	0.00
WWMJ111063	186.84	165.36	2037			0.3	165.6	21.2	0.7	0	0.00
WWMJ111064	182.91	162.76	2037			0.3	163.0	19.9	0.7	0	0.00
WWMJ111094	184.62	177.95	2008	0.038	FM13_DIURNAL	0.4	178.4	6.2	0.7	0	0.00
WWMJ111103	185.08	176.58	2017	0.000	FM13_DIURNAL	1.2	177.8	7.3	1.0	0	0.00
WWMJ120001	175.85	163.63	2003	0.050	FM13_DIURNAL	0.4	164.0	11.9	0.2	0	0.00
WWMJ120009	173.82	163.22	2001	0.000	FM13_DIURNAL	0.8	164.0	9.8	1.4	0	0.00
WWMJ120010	164.76	153.07	2001	0.000	FM15_DIURNAL	0.2	153.3	11.5	1.4	0	0.00
WWMJ120012	177.26	160.24	2001	0.000	FM13_DIURNAL	1.0	161.2	16.1	1.4	0	0.00
WWMJ120013	175.25	161.35	2001	0.000	FM13_DIURNAL	0.6	162.0	13.3	1.4	0	0.00
WWMJ120014	174.68	162.10	2001	0.000	FM13_DIURNAL	0.7	162.8	11.9	1.4	0	0.00
WWMJ120015	176.85	164.04	2001	0.000	FM13_DIURNAL	0.0	164.0	12.8	0.0	0	0.00
WWMJ120016	147.26	124.42	2001	0.000	FM15_DIURNAL	0.3	124.8	22.5	2.2	0	0.00
WWMJ120017	140.24	122.37	2001	0.000	FM15_DIURNAL	0.3	122.7	17.6	2.2	0	0.00
WWMJ120018	140.24	135.90	2001	0.000	FM15_DIURNAL	0.0	135.9	4.3	0.0	0	0.00
WWMJ120021	176.02	166.16	2001	0.000	FM13_DIURNAL	0.5	166.7	9.4	1.3	0	0.00
WWMJ120022	179.00	168.60	2001	0.000	FM13_DIURNAL	0.6	169.2	9.8	1.3	0	0.00
WWMJ120023	183.04	172.55	2001	0.000	FM13_DIURNAL	0.4	172.9	10.1	0.6	0	0.00
WWMJ120024	187.12	177.01	2001	0.000	FM13_DIURNAL	0.3	177.3	9.8	0.6	0	0.00
WWMJ120025	179.01	174.85	2004	0.001	FM13_DIURNAL	2.0	176.9	2.1	0.8	0	0.00
WWMJ120026	178.93	174.41	2004	0.001	FM13_DIURNAL	2.3	176.7	2.3	0.7	0	0.00
WWMJ120027	183.34	176.14	2004	0.001	FM13_DIURNAL	2.3	178.4	4.9	0.8	0	0.00
WWMJ120032	183.73	172.89	2004	0.002	FM13_DIURNAL	0.6	173.5	10.2	0.8	0	0.00
WWMJ120033	182.16	171.58	2004	0.000	FM13_DIURNAL	0.5	172.0	10.1	1.3	0	0.00
WWMJ120034	141.74	124.85	2005	0.000	FM15_DIURNAL	0.4	125.2	16.5	1.0	0	0.00

20-Year Flows (2037), 5-year, 24-hour storm event

Input						Output					
Manhole ID	Rim Elev.	Invert Elev.	Install Year	Avg DWF (cfs)	DWF Pattern	Max Depth (ft)	Max HGL (ft)	Freeboard (ft)	Max Inflow (cfs)	Total Flood Vol. (MG)	Time Flooded (hrs)
WWMJ120035	133.71	126.31	2017	0.000	FM15_DIURNAL	0.4	126.7	7.0	1.0	0	0.00
WWMJ120036	137.44	127.46	2005	0.000	FM14_DIURNAL	0.5	127.9	9.5	1.0	0	0.00
WWMJ120037	140.82	132.41	2005	0.002	FM14_DIURNAL	0.2	132.6	8.2	1.0	0	0.00
WWMJ120038	150.33	139.45	2017	0.000	FM14_DIURNAL	0.3	139.8	10.5	1.0	0	0.00
WWMJ120039	150.91	141.24	2005	0.000	FM14_DIURNAL	0.3	141.6	9.3	1.0	0	0.00
WWMJ120040	153.37	143.48	2005	0.000	FM14_DIURNAL	0.3	143.8	9.6	1.0	0	0.00
WWMJ120041	157.38	146.02	2005	0.004	FM14_DIURNAL	0.3	146.3	11.1	1.0	0	0.00
WWMJ120042	169.74	153.34	2005	0.094	FM14_DIURNAL	0.3	153.6	16.1	0.9	0	0.00
WWMJ120043	177.19	167.14	2017	0.000	FM13_DIURNAL	0.6	167.7	9.5	1.3	0	0.00
WWMJ120044	180.73	160.50	2037			0.3	160.8	20.0	0.6	0	0.00
WWMJ120045	168.92	157.75	2037			0.1	157.9	11.0	0.6	0	0.00
WWMJ120046	137.67	120.13	2037			0.5	120.6	17.1	0.6	0	0.00
WWMJ120047	141.37	119.80	2017	0.014	FM15_DIURNAL	0.0	119.8	21.6	0.6	0	0.00
WWMJ120048	178.45	159.33	2017	0.000	FM15_DIURNAL	0.4	159.7	18.8	1.4	0	0.00
WWMJ120060	152.36	136.72	2017	0.008	FM14_DIURNAL	0.3	137.0	15.3	1.0	0	0.00
WWMK120007	170.09	154.55	2005	0.002	FM14_DIURNAL	0.4	154.9	15.2	0.6	0	0.00
WWMK120008	172.35	154.54	2005	0.002	FM14_DIURNAL	0.7	155.3	17.1	0.6	0	0.00
WWMK120009	171.58	156.94	2005	0.021	FM14_DIURNAL	0.4	157.3	14.3	0.6	0	0.00

3J CONSULTING

CIVIL ENGINEERING | WATER RESOURCES | LAND USE PLANNING

PROPOSED WASTEWATER SYSTEM

Crestview Crossing
Newberg, OR

September 28, 2018

Prepared For:

JT Smith Companies
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Lake Oswego, OR 97035

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KATHLEEN E. FREEMAN
EXPIRES: 12/31/2019

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Project No: 17393
KEF

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

The purpose of this report is to describe the proposed wastewater system for the Crestview Crossing development and show that it meets the City of Newberg standards. The project is located along OR 99W between Vittoria Way and NE Benjamin Rd in the City of Newberg, OR and consists of two tax lots (3216AC 13800 & 1100). The total area of the two tax lots is 33.11 acres containing a private residence and several outbuildings. The rest of the property is used for farming and is undeveloped. All existing structures and the driveway will be demolished for the proposed development. A commercial development consisting of 4.40 acres will be developed by others.

The proposed project will consist of subdividing the property into 248 single-family residential lots, a two-building apartment complex with clubhouse and new roads and sidewalks. A commercial development will be constructed by others but has been accounted for in the future wastewater design flows. The City of Newberg requires a wastewater study that includes a study map, wastewater flow calculations and pipe hydraulic calculations.

The City’s Wastewater Master Plan (WWMP), written in March, 2018 has been utilized to determine post-construction design flows on the site. The WWMP uses land use zoning to determine the existing and future flows. The proposed development zoning will differ slightly from the WWMP.

The proposed wastewater system was modeled using the computer software program XPSTORM along with calculated flow rates (modeled as constant flow) to determine the pipe sizes of the proposed system. The flow rates were calculated using Table 4-2 of the WWMP.

The XPSTORM Models shows that the peak flows for the proposed system will operate well below surcharging condition for the whole site. Additionally, the added flow from the proposed development will be within the available pumping capacity of the Fernwood lift station.

PROJECT DESCRIPTION

The project is located along OR 99W between Vittoria Way and NE Benjamin Rd in the City of Newberg, OR and consists of two tax lots (3216AC 13800 & 1100). The total area of the two tax lots is 33.11 acres containing a private residence and several outbuildings. The rest of the property is used for farming and is undeveloped. All existing structures and the driveway will be demolished for the proposed development. A commercial development consisting of 4.40 acres will be developed by others.

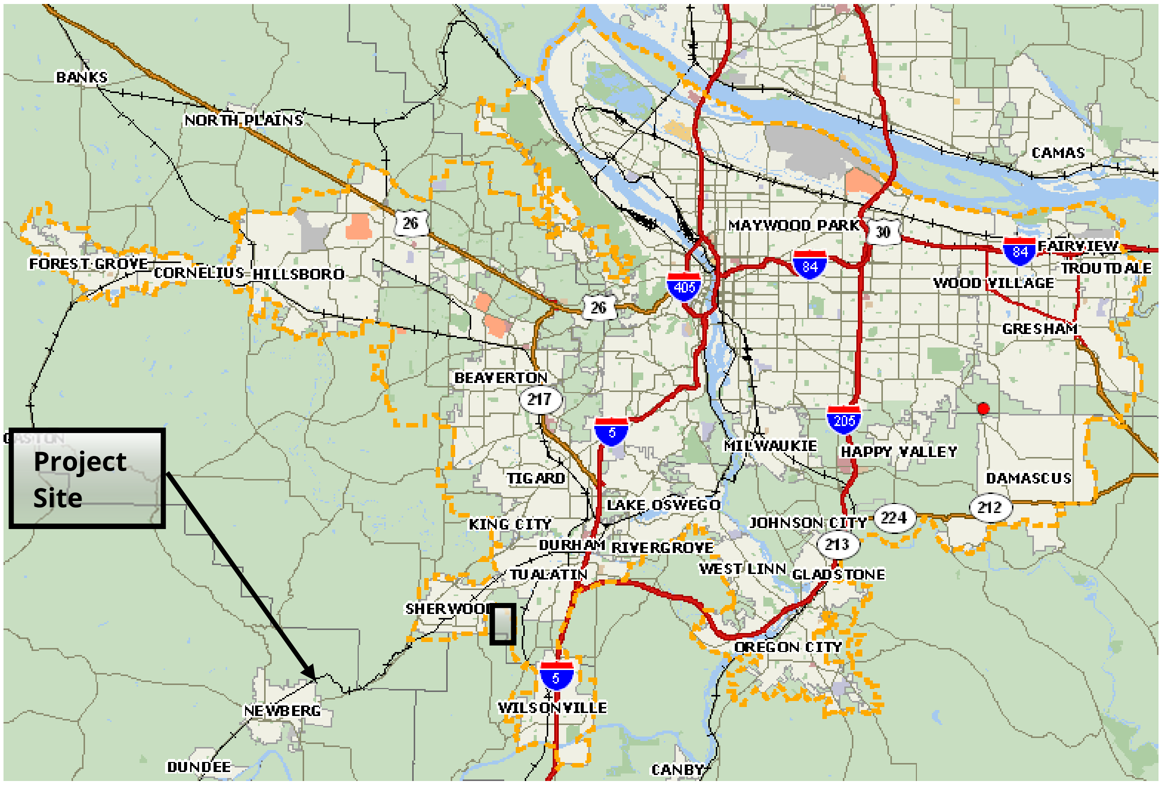


Figure 1 - Vicinity Map

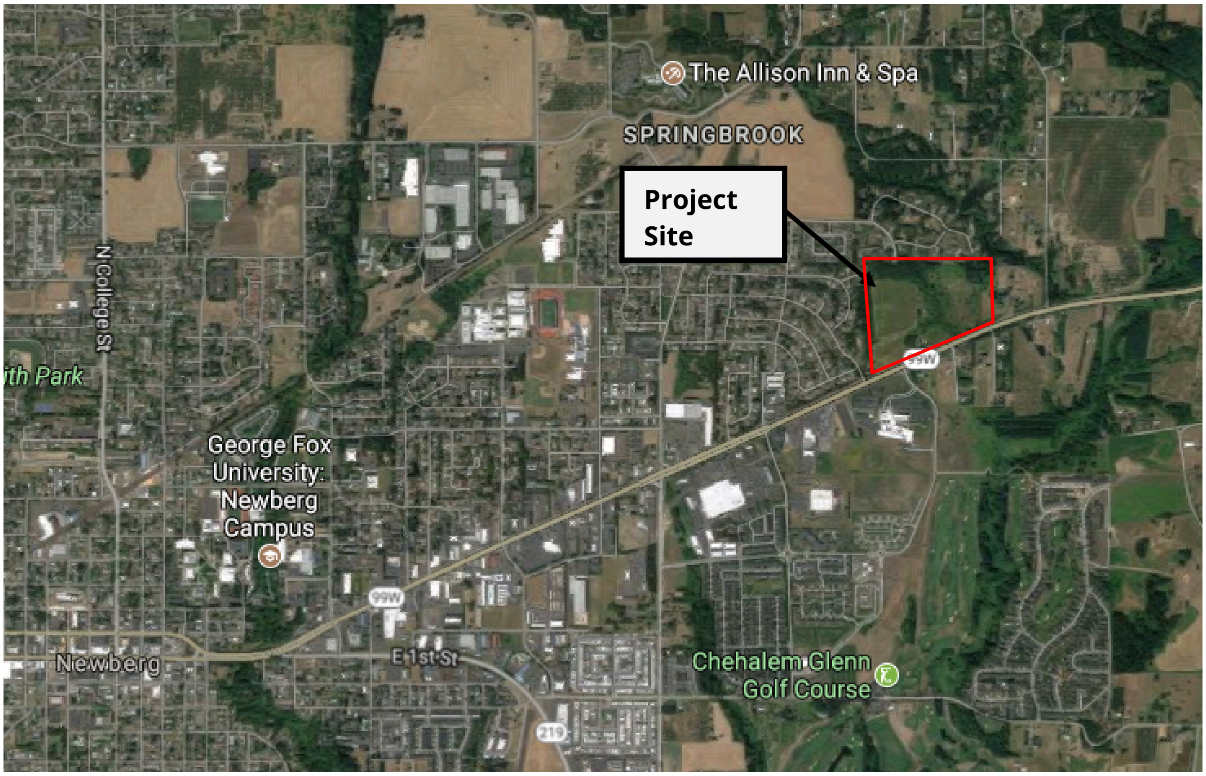


Figure 2 - Site Location

EXISTING CONDITIONS

Existing Conditions

The existing site contains a private residence, driveway and outbuildings. All existing structures will be demolished for the proposed development.

Existing Wastewater System

There is currently no existing wastewater system onsite. The properties to the north utilize underground septic systems for the wastewater volumes. The properties to the west are conveying wastewater flows southwest into an existing wastewater system.

WASTEWATER ANALYSIS

Post-Developed Conditions

The proposed project will consist of three zones: R-1, R-3 and C-2 (See Technical Appendix: Exhibits – Crestview Crossing Sewer Basins). The C-2 area is a commercial development that will be designed by others; however, we have accounted for this area in the design flow calculations. The proposed site will connect into the existing 24" wastewater line approximately 780 feet south of the site across from Highway 99.

SS Flow Calculations

The future flows for the proposed site and commercial area were calculated using Table 4-2 of the City of Newberg's Wastewater Master Plan published in 2018. The estimated flows were based on zoning for the proposed development and differ slightly from the WWMP. Flow rates for the commercial area were calculated using 3,000 gal/acre/day which is more than twice of that used in Table 4-2 as a conservative approach since it is not known exactly what will be constructed (See Technical Appendix: Calculations – Crestview Crossing Post-Construction Wastewater Flow Calculations). Additionally, per section 2.3.4 of the City's Public Works Design and Construction Standards, an allowance of 1,000 gpad for inflow and infiltration was added to each calculated flow.

The only apparent offsite area contributing wastewater flow to the existing 24" pipe is the Providence Newberg Medical Facility. This property is zone Industrial and per Table 4-2 of the WWMP, a flow rate of 2,000 gpad was accounted for in the 24" pipe.

HYDROLOGIC ANALYSIS

XPSTORM Input

The City of Newberg's ArcGIS Public Utility Map was used to model the existing downstream system to the Fernwood Lift Station. The WWMP work did not include modeling the existing 24" pipe that the proposed system will connect to. Therefore, information from the City's mapping system was utilized to create the post-developed model (See Technical Appendix: Exhibits – City of Newberg GIS: Downstream WW System).

Table 1 below shows the calculated flow rates for each zone within the wastewater sewer basin (See Technical Appendix: Calculations – Wastewater Flow Calculations). The flows (in cfs) were added into the XPSTORM model as constant flows.

Zoning	Flow (gpd)	Flow (cfs)	Add to MH
R-1	7,249	0.0112	N/A
R-3	72,394	0.1120	N/A
C-2	13,720	0.0212	N/A
Increase in Flow to Existing 24" Pipe and Fernwood Lift Statin	**93,363**	**0.1444**	WWMHJ102130
I	72,960	0.1129	WWMHJ111061

Table 1 - Wastewater Flows

Downstream Conveyance

The XPSTORM Conveyance Data shows that the flows in the existing 24" conveyance pipe for both existing and post-developed conditions do not exceed the conveyance capacity of the pipe (See Technical Appendix: XPSTORM Output – Proposed Wastewater Conveyance Data). In all pipe segments, the flow is less than the capacity and the flow depth is less than the pipe diameter.

Fernwood Lift Station

Per the WWMP, the Fernwood Lift Station has three pumps, each with a 900 gpm capacity. Per Table 3-3 in the WWMP, the average field test flow rate through the lift station is 670 gpm. The added flow from the proposed development at Crestview Crossing is 65 gpm (0.144 cfs); therefore, the total flow will be approximately 735 gpm, well below the capacity of one pump at the lift station.

SUMMARY

The existing downstream 24" wastewater pipe that the proposed Crestview Crossing will connect to will have the capacity to convey the increase in flow from the development. The Fernwood Lift Station pumps will have the capacity to pump the additional flow.

TECHNICAL APPENDIX

Exhibits

- Crestview Crossing Sewer Basins
- Table 4-20: 20-Year Projected Flows by Zoning, City of Newberg WWMP, 2018
- City of Newberg GIS: Downstream System
- Public Utility Map
- Table 3-3: Measured Pump Flow Rates, City of Newberg WWMP, 2018

Calculations

- Wastewater Flow Calculations

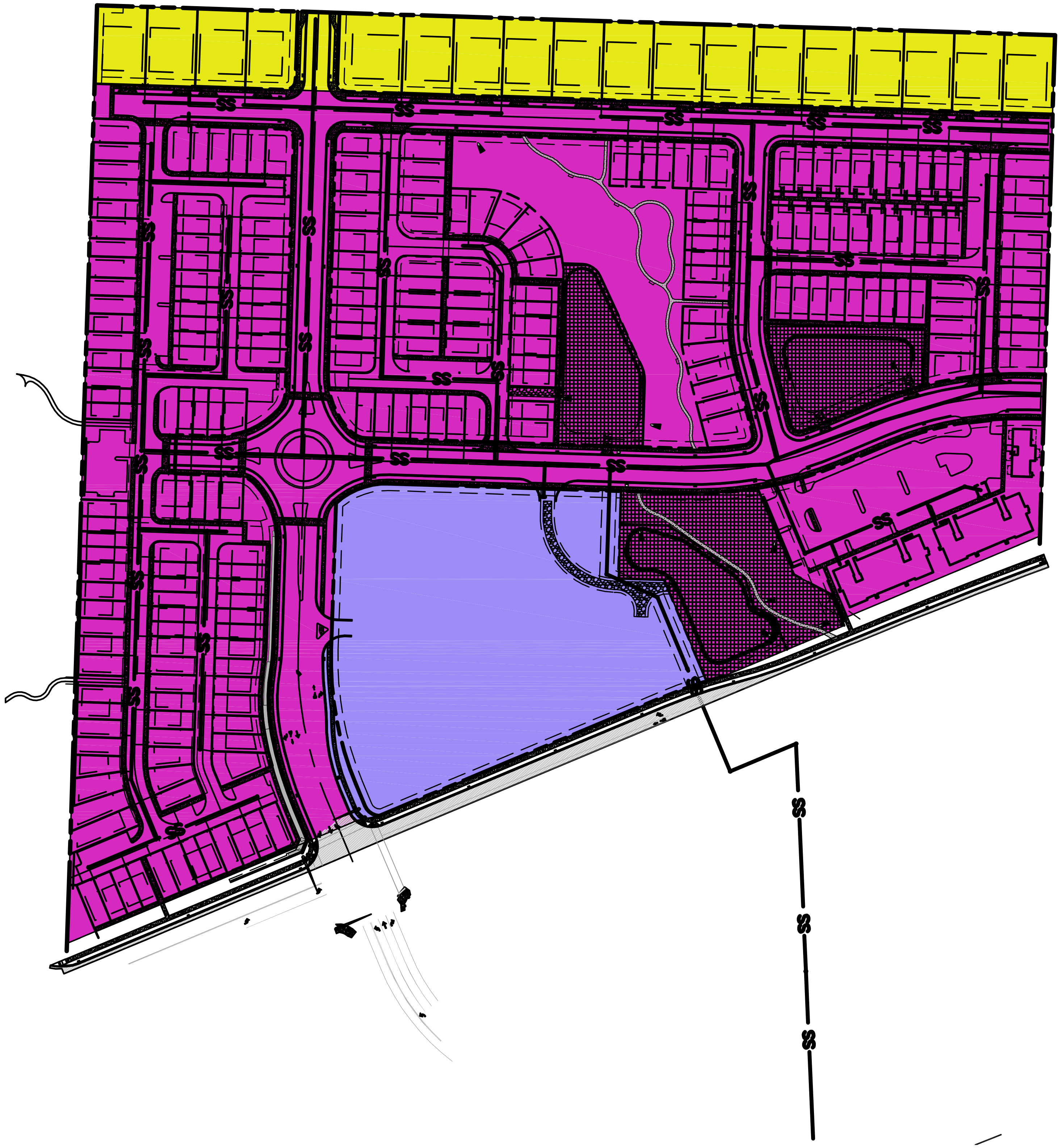
XPSTORM Output

- XPSTORM Wastewater Conveyance Data – Existing Conditions for Downstream 24" Pipe
- XPSTORM Wastewater Conveyance Data – Post-Developed Conditions for Downstream 24" Pipe
- Downstream 24-inch WW Pipe with Post-Developed Flow from Crestview Crossing

REFERENCES

1. City of Newberg Public Works Design and Construction Standards, August 2015
2. City of Newberg Wastewater Master Plan, March 2018

EXHIBITS



ZONING	AREA (AC)
🟨 R-1	3.586
🟪 R-3	[1]16.937
🟦 C-2	[2]3.430

▩ PROPOSED STORM FACILITIES: AREAS NOT INCLUDED

[1]PER WWMP, 25% OF THE AREA IS ALLOCATED TO ROAD, SIDEWALKS, ETC

[2]PER WWMP, 20% OF THE AREA IS ALLOCATED TO ROAD, SIDEWALKS, ETC

N
W E
S

SCALE: 1" = 200'
0 200

CRESTVIEW CROSSING

09/28/2018

JT SMITH

SEWER BASINS

3J CONSULTING
CIVIL ENGINEERING . WATER RESOURCES . COMMUNITY PLANNING

[A] Recommended Standards for Wastewater Facilities (Great Lakes – Upper Mississippi River Board, 2014 edition).

Modeled gravity main slopes were compared with these recommended minimum slopes. The mains that are less than their recommended minimum slope are shown in Figure 11 (Appendix A). Pipes with inverse slopes are highlight in this figure as well. Low or inverse slopes can cause capacity issues and require higher than normal O&M. These mains should be monitored for capacity, odor, and solids buildup problems. All pipes in the collection system should be on a regular maintenance schedule. Pipes with low slopes may need to be cleaned more frequently to prevent solids buildup and flow disruption.

4.2 FUTURE COLLECTION SYSTEM PERFORMANCE

This section summarizes future flow projections and the model evaluation of future system expansion, and documents anticipated future deficiencies. Alternative improvements to address these deficiencies are presented in Section 5.

4.2.1 Future Flow Projections & Model Scenarios

Future loads were distributed based on PSU population projections (Section 2) and City projected future residential, commercial, and industrial growth. Flows per capita for projected population growth were assumed to be similar to existing flows per capita. Residential flows were projected using future growth area, average lot size, population density, and ADWF per capita attributed with residential contributions. Commercial, industrial, and institutional flows were projected using future growth areas indicated by City planning staff and typical flow per acre values (Metcalf and Eddie, 3rd Edition). Projected flows per zoning designation for the 20-year planning period are presented in Table 4-2. Projected flows per zoning designation for buildout are presented in Table 4-3.

Table 4-2: 20-Year Projected Flows by Zoning

Zoning	Average Lot Size[A] (ac)	Pop. Density[A, B] (people/ac)	Flow[C] (gpad)	Future Growth Area[A] (ac)	Flow[D] (gpd)
R-1	0.227	12	880	388	334,500
R-2	0.111	24	1,801	99	213,800
R-3, R-4	0.061	44	3,301	37	131,700
M-1, M-2, M-3	N/A	N/A	1,250	109	135,700
C-1, C-2, C-3	N/A	N/A	1,250	61	76,700
I	N/A	N/A	2,000	56	113,000
Infill	N/A	N/A	N/A	N/A	40,100
			Totals:	**751**	**1,046,000**

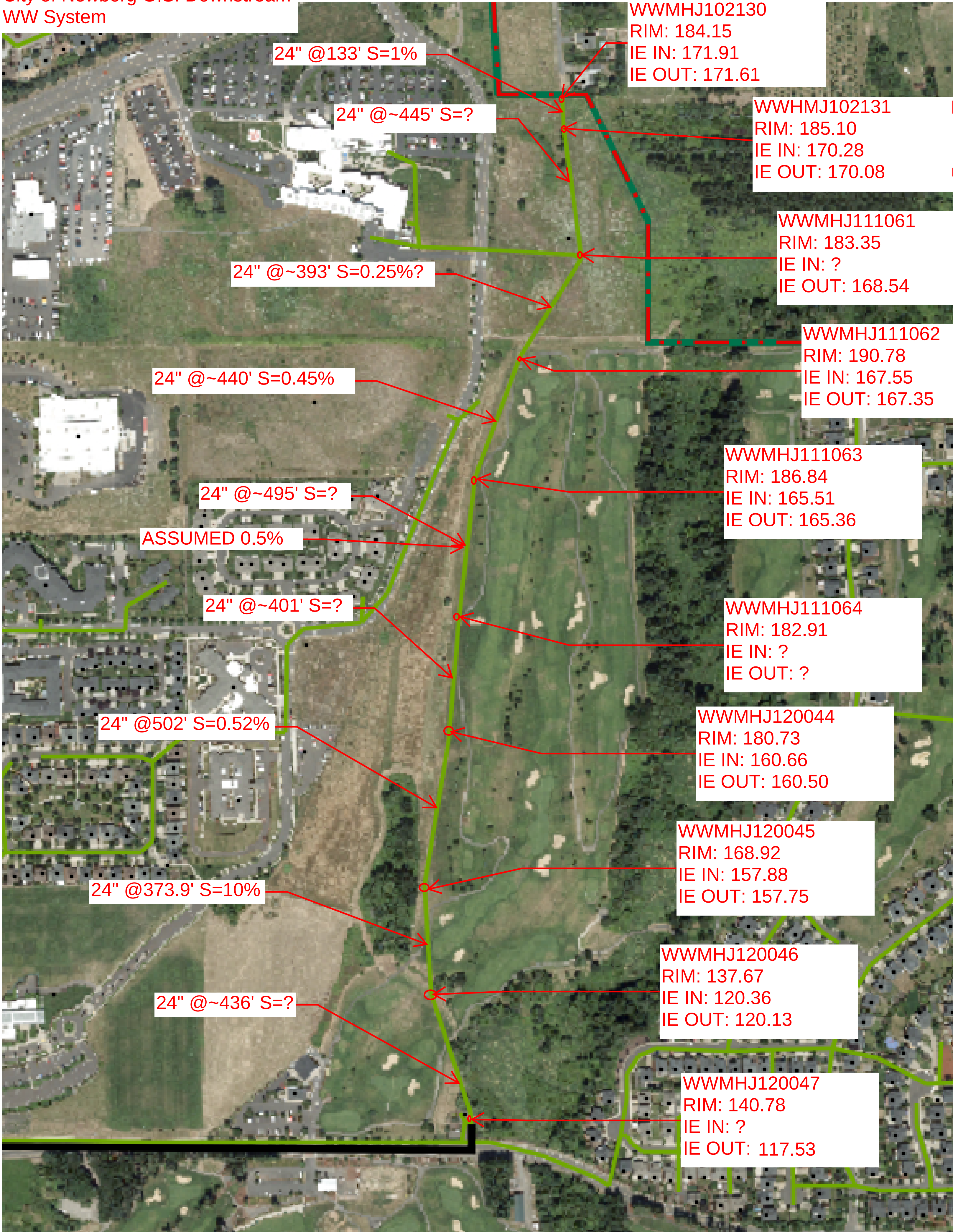
[A] Allocates 25% of area for roads and other public dedication, except on industrial and commercial zones, where 20% is allocated.

[B] Assume 2.69 people/dwelling unit (2010 US Census).

[C] Residential flows based on design ADWF per capita value of 99 gpcd (Table 2-5) then reduced by 25% accounting for removal of the industrial, commercial and institutional flows that contribute to the derivation of the 99 gpcd value. Industrial, commercial, and institutional flows based on typical flow per acre values (Metcalf and Eddie, 3rd Edition).

[D] Utilizes average annual dry-weather flows.

City of Newberg GIS: Downstream WW System



Public Utility Map

GISWEB_Address_Point

●

Newberg City Limits

Wastewater Mains

▬ Force Main

▬ Gravity Main

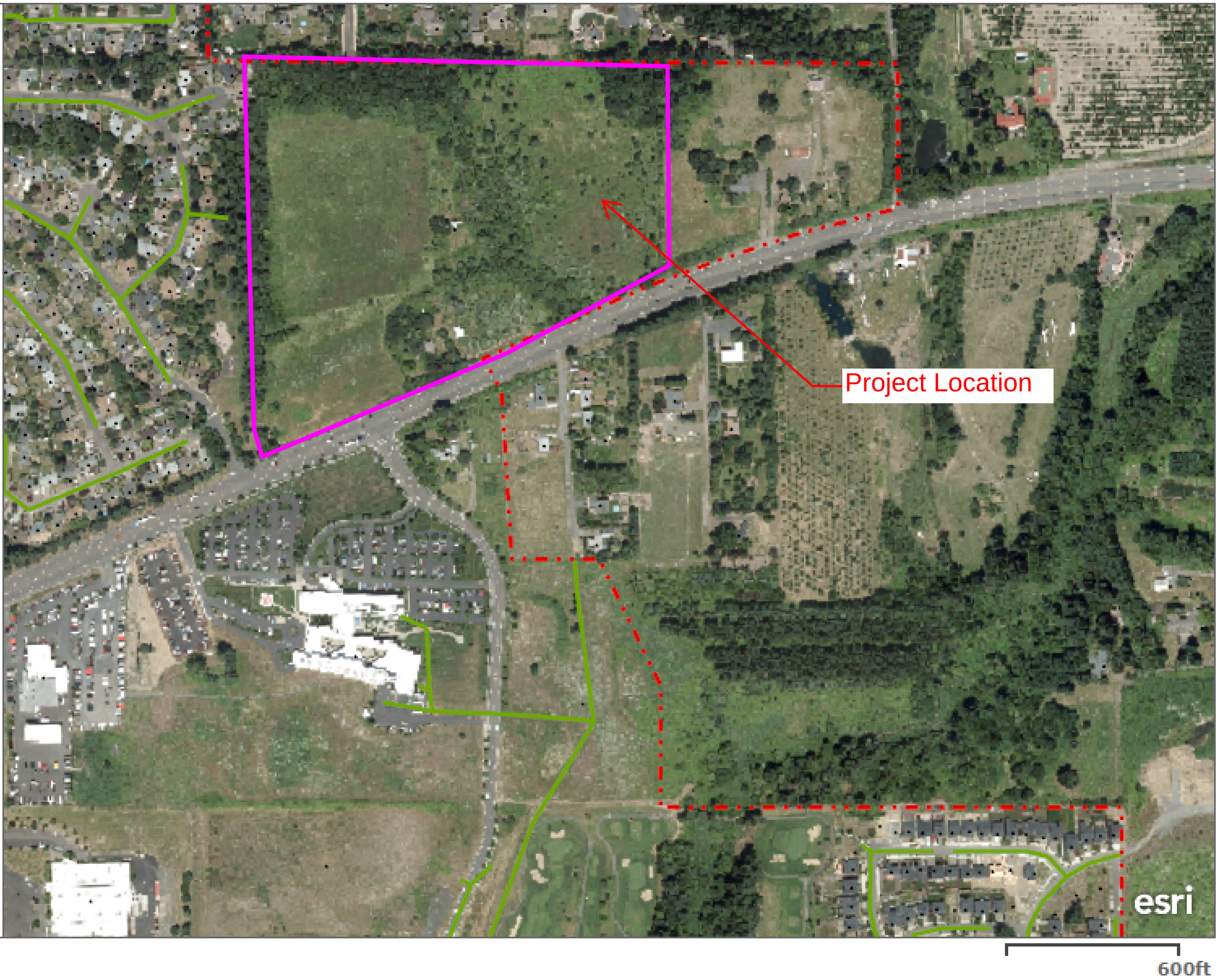
2016_Aerials

sde.DBO.Newberg2016

🟥 Red: Band_1

🟩 Green: Band_2

🟦 Blue: Band_3



Oregon Metro, Bureau of Land Management, State of Oregon, State of Oregon DOT, State of Oregon GEO, Esri Canada, Esri, HERE, Garmin, INCREMENT P, Intermap, USGS, METI/NASA, EPA, USDA | Pictometry | City of Newberg Planning Department | City of Newberg, Planning Department | Originally created by Jan Wolf 2007-present to the SCADA, but will turn the pumps on (high) or off (low) if the water level reaches the floats. It is recommended that the floats be connected to the SCADA to send out unique alarms for the high/low water levels.

Drawdown Tests

During the site visit, drawdown pump tests were completed to review wet well conditions and determine approximate pump flow rates. Each pump and pumping combination were tested at all lift stations. Dayton and Fernwood have depth readouts on their PLCs that were used to record depth over time. The Highway 240 Lift Station has a flow meter on its discharge pipe, allowing for measured flow rates to be recorded over time. Andrew, Charles, Chehalem (pressure transducer was not operational at time of tests), Creekside, and Sheridan do not have continuous depth measurement readouts; for these lift stations, depth to the water surface was measured manually during testing. Estimates for average pump flow rates were calculated using the pump test data. These estimated flow rates, along with the rated pump capacities, are shown in Table 3-3. For the majority of the lift stations, the calculated flow rate was relatively close to the reported pump capacity. Dayton has had historical problems with pump capacity and overflows, which are discussed in more detail in the Dayton Lift Station section. Fernwood field test results are lower than expected.

Table 3-3: Measured Pump Flow Rates

	Avg Field Test Flow Rate (gpm)	Reported Pump Capacity (gpm)
Andrew	140	155
Charles	150	150
Chehalem	660	630
Creekside	190	153
Dayton[1]	1,300	2,100
Fernwood	670	900
2 Pumps	1,210	-
Highway 240	910	1,010
2 Pumps	1,230	-
Sheridan	180	115

[1] As reported by RH2, April 2016 (Appendix C)

Housekeeping/Maintenance

Interiors of the lift station buildings are being kept in very good condition. Floors and walls are clean, painted, and maintained. The wash-down hose (which should be stored off of the ground) was found on the floor at a few of lift stations. The source of wash-down water is a hose bib on the lift station side of a backflow preventer fed by a water source. Backflow preventers should be installed at least 12-inches aboveground to facilitate proper operation, maintenance, and inspection. The backflow preventer is located in an insulated fiberglass cover. Some covers have electric heaters – while others have heat tape – to prevent freezing at the backflow preventer. Heat tape is not

CALCULATIONS

WASTEWATER FLOW CALCULATIONS

Zoning	[1]Average Lot Size (ac)	DU/Average Lot Size (DU/ac)	[1]People/ DU	[2]ADWF (gpcd)	Flow (gpad)	[3]I/I (gpad)	Flow + I/I (gpad)	[4]Net Area (ac)	Flow (gpd)	Conversion to cfs	Flow (cfs)
R-1	0.227	4.405	2.69	74.25	880	1,000	1,880	3.856	7,249	1.547E-06	0.0112
R-3	0.061	16.393	2.69	74.25	3,274	1,000	4,274	16.937	72,394	1.547E-06	0.1120
[5]C-2	N/A	N/A	N/A	N/A	3,000	1,000	4,000	3.430	13,720	1.547E-06	0.0212
									93,363	1.547E-06	**0.1444**
[7]I	N/A	NA	N/A	N/A	2,000	1,000	3,000	24.320	72,960	1.547E-06	0.1129

[1] See Page 4-6, Table 4-2 of WWMP

[2] Residential flows based on design ADWF per capita value of 99 gpcd & reduced by 25%: See Page 4-6, Table 4-2 of WWMP

[3] Inflow/Infiltration per City of Newberg's 2015 Design Manual

[4] Allocates 25% of area for roads and other public dedication: See Page 4-6, Table 4-2 of WWMP

[5] WWMP used 1,250 gpad; however with the uncertanty of what is being planned, this study increased it to 3,000 gpad

[6] Total WW Flow used as constanct flow in XPSTORM model

[7] Providence Newberg Medical Center: Floww add in at WWMHJ111061

XPSTORM OUTPUT

XPSTORM WASTEWATER CONVEYANCE DATA - EXISTING CONDITIONS FOR DOWNSTREAM 24" PIPE

CRESTVIEW CROSSING

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
wwgm1187	WWMHJ102130	WWMHJ102131	2.00	133.00	3.00	39.18	0.00	0.00	0.00	0.00	0.00	184.19	185.10	174.27	170.08	9.92	15.02	174.27	170.08
wwgm1186	WWMHJ102131	WWHMJ111061	2.00	445.00	0.32	12.87	0.00	0.00	0.00	0.05	0.00	185.10	183.35	170.08	168.54	15.02	14.66	170.08	168.69
wwgm1183	WWHMJ111061	WWMHJ111062	2.00	393.00	0.25	11.35	0.01	0.11	1.06	0.15	0.08	183.35	190.78	168.54	167.35	14.66	23.30	168.69	167.48
wwgm1182	WWMHJ111062	WWMHJ111063	2.00	440.00	0.42	14.63	0.01	0.12	1.36	0.13	0.07	190.78	186.84	167.35	165.51	23.30	21.21	167.48	165.63
wwgm1181	WWMHJ111063	WWMHJ111064	2.00	495.00	0.50	16.00	0.01	0.11	1.39	0.12	0.06	186.84	182.91	165.51	163.00	21.21	19.79	165.63	163.12
wwgm1180	WWMHJ111064	WWMHJ120044	2.00	468.00	0.50	16.00	0.01	0.11	1.39	0.12	0.06	182.91	180.73	163.00	160.50	19.79	20.11	163.12	160.62
wwgm1179	WWMHJ120044	WWMHJ120045	2.00	502.00	0.52	16.34	0.01	0.11	1.42	0.12	0.06	180.73	168.92	160.50	157.75	20.11	11.11	160.62	157.81
wwgm1178	WWMHJ120045	WWMHJ120046	2.00	373.90	10.00	71.54	0.00	0.11	9.54	0.06	0.03	168.92	137.67	157.75	120.13	11.11	17.42	157.81	120.25
wwgm1177	WWMHJ120046	WWMHJ120047	2.00	436.00	0.60	17.47	0.01	0.11	1.50	0.12	0.06	137.67	140.78	120.13	117.53	17.42	23.14	120.25	117.64

XPSTORM WASTEWATER CONVEYANCE DATA - POST-DEVELOPED CONDITIONS FOR DOWNSTREAM 24" PIPE

CRESTVIEW CROSSING

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
wwgm1187	WWMHJ102130	WWMHJ102131	2.00	133.00	3.00	39.18	0.00	0.14	2.90	0.09	0.04	184.19	185.10	174.27	170.08	9.83	14.86	174.36	170.24
wwgm1186	WWMHJ102131	WWHMJ111061	2.00	445.00	0.32	12.87	0.01	0.14	1.27	0.16	0.08	185.10	183.35	170.08	168.54	14.86	14.59	170.24	168.76
wwgm1183	WWHMJ111061	WWMHJ111062	2.00	393.00	0.25	11.35	0.02	0.26	1.38	0.22	0.11	183.35	190.78	168.54	167.35	14.59	23.24	168.76	167.54
wwgm1182	WWMHJ111062	WWMHJ111063	2.00	440.00	0.42	14.63	0.02	0.26	1.74	0.19	0.10	190.78	186.84	167.35	165.51	23.24	21.15	167.54	165.69
wwgm1181	WWMHJ111063	WWMHJ111064	2.00	495.00	0.50	16.00	0.02	0.26	1.85	0.18	0.09	186.84	182.91	165.51	163.00	21.15	19.73	165.69	163.18
wwgm1180	WWMHJ111064	WWMHJ120044	2.00	468.00	0.50	16.00	0.02	0.26	1.85	0.18	0.09	182.91	180.73	163.00	160.50	19.73	20.05	163.18	160.68
wwgm1179	WWMHJ120044	WWMHJ120045	2.00	502.00	0.52	16.34	0.02	0.26	1.89	0.18	0.09	180.73	168.92	160.50	157.75	20.05	11.08	160.68	157.84
wwgm1178	WWMHJ120045	WWMHJ120046	2.00	373.90	10.00	71.54	0.00	0.26	9.53	0.09	0.04	168.92	137.67	157.75	120.13	11.08	17.37	157.84	120.30
wwgm1177	WWMHJ120046	WWMHJ120047	2.00	436.00	0.60	17.47	0.02	0.26	1.99	0.17	0.09	137.67	140.78	120.13	117.53	17.37	23.08	120.30	117.70

Downstream 24-inch WW Pipe with Post-Developed Flow from Crestview Crossing
Day [0] Time 00:00:00 Step 0

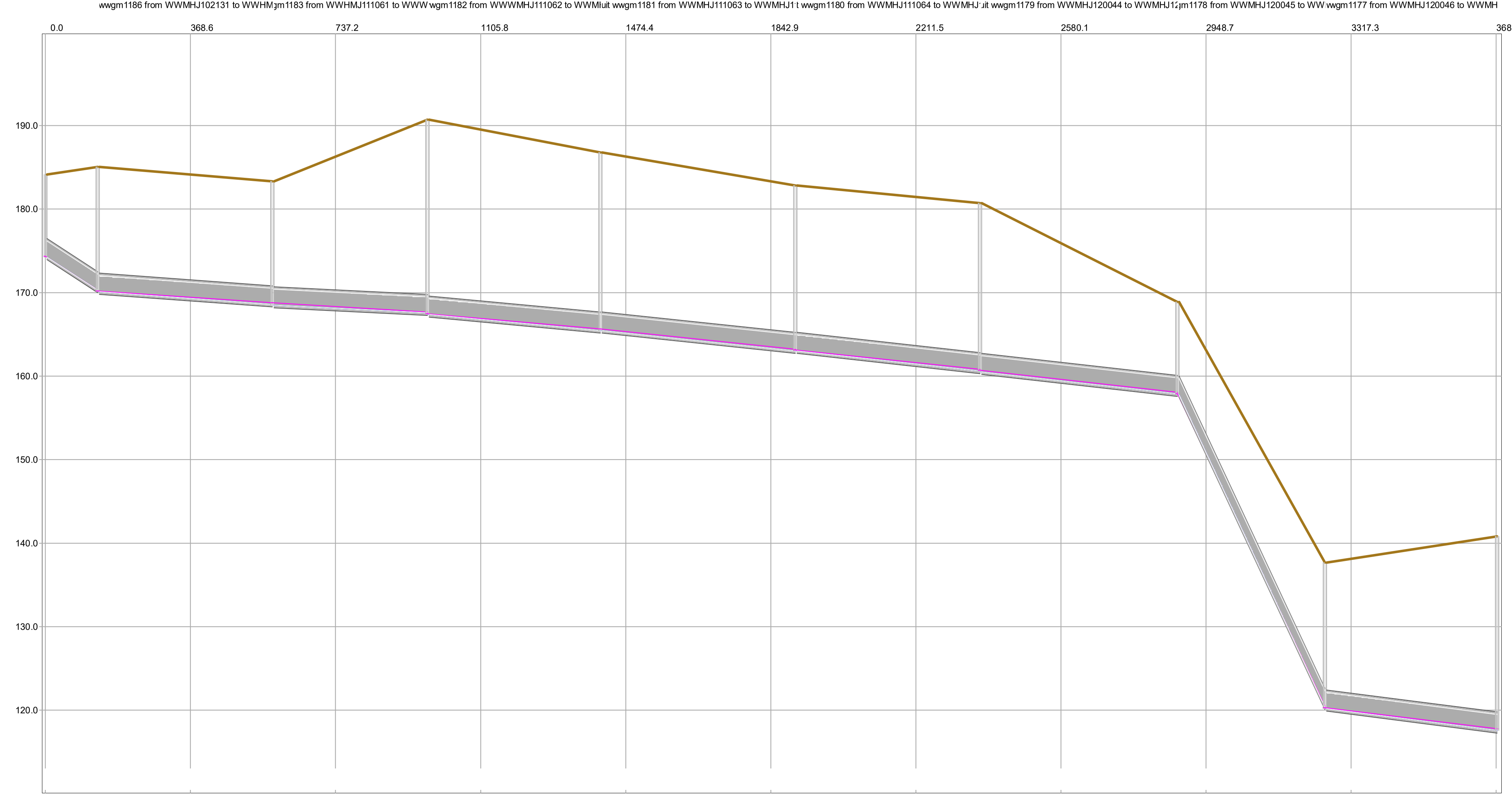


Exhibit J: Fire Flow Information

AKS
ENGINEERING & FORESTRY

November 20, 2020

Attn: Engineering Department
City of Newberg
414 E. First Street
Newberg, OR 97132

RE: Fire Flow Information for the Crestview Crossing Commercial Project

City Engineering Staff:

The purpose of this letter is to provide documentation of the existing water system flow capacity as required by the City of Newberg. This analysis shows that the existing public water system has adequate flow to support the planned retail commercial center that represents a small portion of the Crestview Crossing Planned Unit Development (PUD) developed by JT Smith Companies.

Currently there is a 10’’ ductile iron water main along E Portland Road (Hwy 99W), an 8” ductile iron water main along E Vittoria Way, and an 8” ductile iron main ending at NE Crestview Drive. As part of the Crestview Crossing PUD, NE Crestview Drive is going to be extended south and connected to Hwy 99W. Along with the road extension the water system will also be extended and connected to the water main on Hwy 99W, creating a closed loop in the City’s water network.

Domestic and fire water services to the project site are being designed and constructed as part of the PUD improvements. The following flow data has been provided by the PUD design team and a copy of the reports are attached to this document for reference:

1. Flow test #1:
    a. Fire hydrant located at the intersection between Vittoria Way and Hwy 99W
    b. Static pressure: 75 psi
    c. Residual pressure: 73 psi
    d. Calculated flow rates at 20 psi: 7328.6 gpm
2. Flow test #2:
    a. Fire hydrant located at the intersection between Crestview Drive and NE Robin Court
    b. Static pressure: 71 psi
    c. Residual pressure: 56 psi
    d. Calculated flow rates at 20 psi: 2157.3 gpm
3. Flow test #3:
    a. Fire hydrant located on Hwy 99W
    b. Static pressure: 102 psi
    c. Residual pressure: 88 psi
    d. Calculated flow rates at 20 psi: 3323.3 gpm

Since the public system is to be looped, it is anticipated that the new water main(s) serving the commercial site should have a water flow better than averaging the results of test #2 and test #3. Since the water main in Vittoria Way is already part of a looped system, test #1 provides a good indicator for the performance of the new water system.

The planned retail buildings are relatively small (± 12,860 sf is the largest) and will be sprinklered. As such, the required fire flow is anticipated to be 1500 gpm at 20 psi. Based on the flow tests, the system should be able to provide an excess of 7000 gpm at 20 psi.

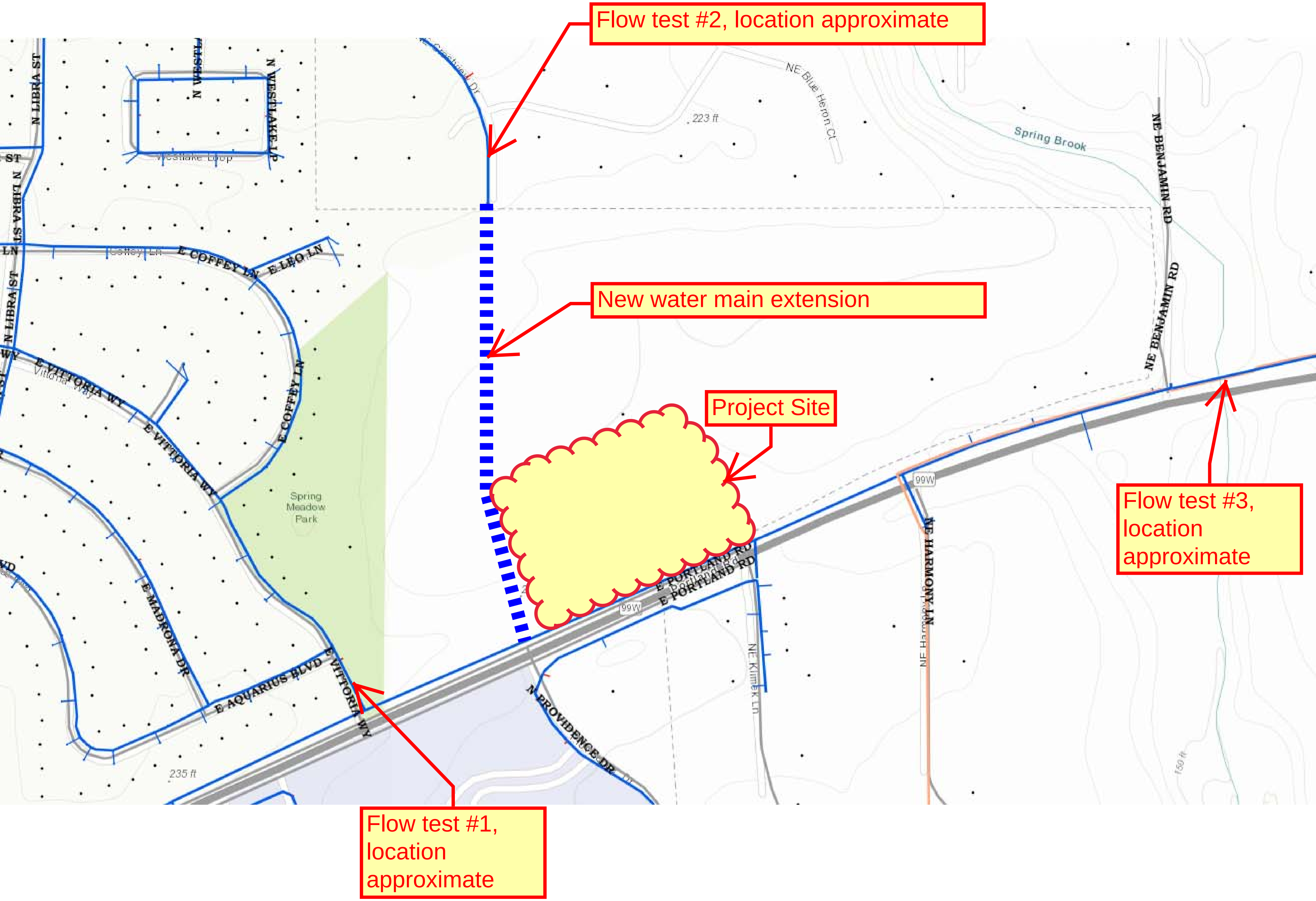
If you have any questions or need additional information, please let us know.
Sincerely,

AKS ENGINEERING & FORESTRY, LLC
Chuck Gregory, PE – Associate
12965 SW Herman Road, Suite 100
Tualatin, OR 97062
503.563.6151 | chuckg@aks-eng.com

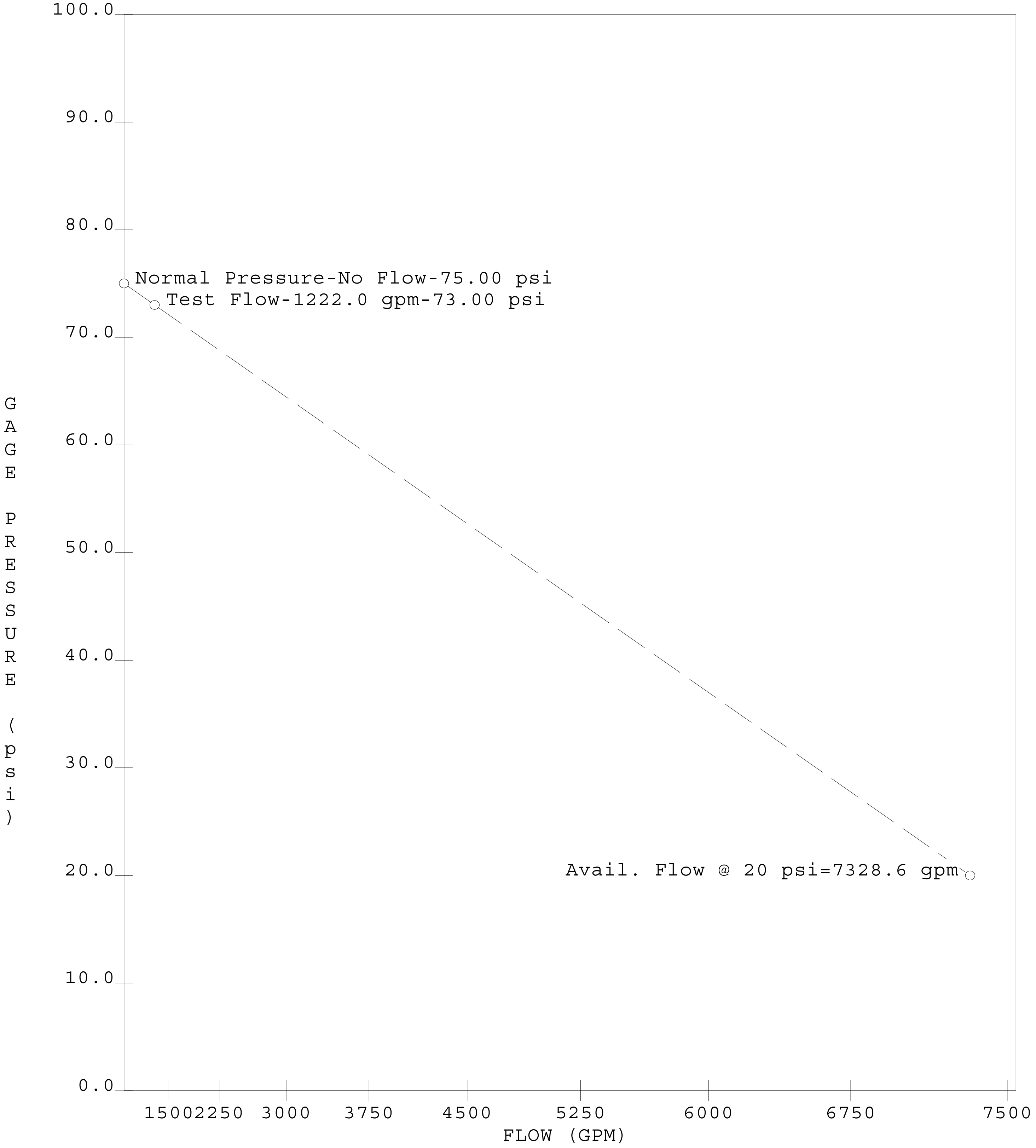
REGISTERED PROFESSIONAL ENGINEER
50644PE
OREGON
SEPT. 14, 1999
CHARLES EDWARD GREGORY

Gregory

RENEWS: JUNE 30, 2021

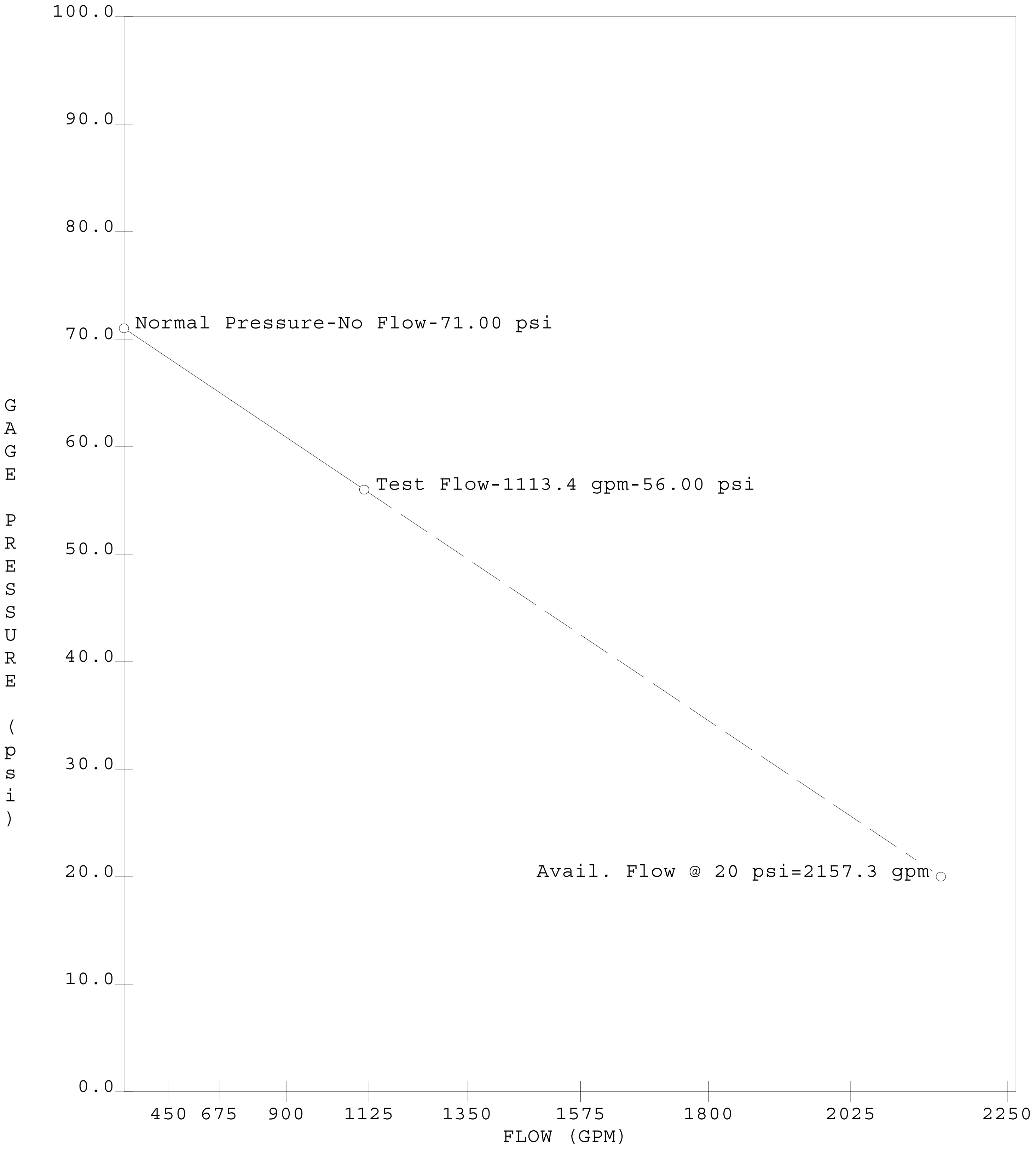

Flow test #2, location approximate
New water main extension
Project Site
Flow test #3, location approximate
Flow test #1, location approximate
NE Blue Heron Ct
223 ft
Spring Brook
NE BENJAMIN RD
N WESTLAKE LP
Westlake Loop
N LIBRA ST
E COFFEY LN
Coffey Ln
E LEO LN
E VITTORIA WY
Vittoria Way
Spring Meadow Park
E MADRONA DR
E AQUARIUS BLVD
235 ft
E PORTLAND RD
99W
N PROVIDENCE DR
NE Klimek Ln
NE HARMONY LN
150 ft

```
FLOW TEST SUMMARY REPORT page1

LOCATION:Vittoria Way & 99W                                    DATE:  10.16.18
                                                               TIME:  9:15

Static Hydrant Number:              1        Flowing Hydrant Number:         2
     Elevation:                     0             Elevation:                 0

Dist. Between Hydrants:           200

Diameter of Main:                   8

Outlet Diameter:                 2.50 in     Number flowing: 1  Coeff.:   0.90

Static pressure:                75.00 psi    Residual pressure:          73.00 psi

Pitot Reading:                  53.00 psi    Flow:                      1222.0 gpm

Flow at 20 psi:  7328.6 gpm

GRAPH:
  PSI  -----------------------------------------------------------------
       |                                                               |
  100  +                                                               |
       |                                                               |
   90  +                                                               |
       |                                                               |
   80  +//Test Flow-1222.0 gpm-73.00 psisi                             |
       S\R..                                                           |
   70  +    ......                                                     |
       |          .....                                                |
   60  +               ......                                          |
       |                     ......                                    |
   50  +                           .....                               |
       |                                ......                         |
   40  +                                      ......                   |
       |                                            .....              |
   30  +                                                 ......        |
       |                                                       ......  |
   20  +                             Avail. Flow @ 20 psi=7328.6 gpm * |
       |                                                               |
   10  +                                                               |
       |                                                               |
    0  +-+---+----+-----+------+--------+--------+---------+-----------+
       15002250 3000  3750   4500     5250     6000      6750        7500
                                FLOW (GPM)
NOTES:
 (1) Flowing hydrant is assumed to be on a circulating main or
     downstream of the pressure test hydrant on a dead-end system.
 (2) Flow analysis assumes a gravity flow system with no distribution
     pumps and having no demand, other than the test flow.
 (3) Distance between hydrants, elevations & main diameter are for
     information only.
```


100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
GAGE PRESSURE (psi)
Normal Pressure-No Flow-75.00 psi
Test Flow-1222.0 gpm-73.00 psi
Avail. Flow @ 20 psi=7328.6 gpm
1500
2250
3000
3750
4500
5250
6000
6750
7500
FLOW (GPM)

```
FLOW TEST SUMMARY REPORT page1

LOCATION:Crestview Dr. & NE Robin Ct.                          DATE:  10.16.18
                                                               TIME:  9:45

Static Hydrant Number:              3        Flowing Hydrant Number:         4
     Elevation:                     0             Elevation:                 0

Dist. Between Hydrants:           200

Diameter of Main:                   8

Outlet Diameter:                 2.50 in     Number flowing: 1  Coeff.:   0.90

Static pressure:                71.00 psi    Residual pressure:          56.00 psi

Pitot Reading:                  44.00 psi    Flow:                      1113.4 gpm

Flow at 20 psi:  2157.3 gpm

GRAPH:
  PSI  -----------------------------------------------------------------
       |                                                               |
  100  +                                                               |
       |                                                               |
   90  +                                                               |
       |                                                               |
   80  +/Normal Pressure-No Flow-71.00 psi                             |
       S                                                               |
   70  \\\\\                                                           |
       |    \\\\\    /Test Flow-1113.4 gpm-56.00 psi                   |
   60  +         \\\\R                                                 |
       |              .....                                            |
   50  +                   .....                                       |
       |                        .....                                  |
   40  +                             ....                              |
       |                                 .....                         |
   30  +                                      .....                    |
       |                                           .....               |
   20  +                Avail. Flow @ 20 psi=2157.3 gpm *              |
       |                                                               |
   10  +                                                               |
       |                                                               |
    0  +-+---+----+-----+------+--------+--------+---------+-----------+
        500 750 1000  1250   1500     1750     2000      2250        2500
                                  FLOW (GPM)
NOTES:
 (1) Flowing hydrant is assumed to be on a circulating main or
     downstream of the pressure test hydrant on a dead-end system.
 (2) Flow analysis assumes a gravity flow system with no distribution
     pumps and having no demand, other than the test flow.
 (3) Distance between hydrants, elevations & main diameter are for
     information only.
```

FLOW TEST SUMMARY REPORT page2



```
FLOW TEST SUMMARY REPORT page1

LOCATION:Hwy 99W in between NE Benjamin Rd and                 DATE:  10.16.18
         the Hazelnut Farm                                     TIME:  10:15

Static Hydrant Number:              5        Flowing Hydrant Number:         6
     Elevation:                     0             Elevation:                 0

Dist. Between Hydrants:           150

Diameter of Main:                   8

Outlet Diameter:                 2.50 in     Number flowing: 1  Coeff.:   0.90

Static pressure:               102.00 psi    Residual pressure:          88.00 psi

Pitot Reading:                  58.00 psi    Flow:                      1278.3 gpm

Flow at 20 psi:  3323.3 gpm

GRAPH:
  PSI  -----------------------------------------------------------------
       |                                                               |
  150  +                                                               |
       |                                                               |
  135  +                                                               |
       |                                                               |
  120  +                                                               |
       |/Normal Pressure-No Flow-102.00 psi                            |
  105  S\\                                                             |
       |  \\\\\  /Test Flow-1278.3 gpm-88.00 psi                       |
   90  +       \\R...                                                  |
       |             .....                                             |
   75  +                  .....                                        |
       |                       ......                                  |
   60  +                             .....                             |
       |                                  ......                       |
   45  +                                        .....                  |
       |                                             .....             |
   30  +                                                  ......       |
       |                          Avail. Flow @ 20 psi=3323.3 gpm.*    |
   15  +                                                               |
       |                                                               |
    0  +-+---+----+-----+------+--------+--------+---------+-----------+
        7001050 1400  1750   2100     2450     2800      3150        3500
                                  FLOW (GPM)
NOTES:
 (1) Flowing hydrant is assumed to be on a circulating main or
     downstream of the pressure test hydrant on a dead-end system.
 (2) Flow analysis assumes a gravity flow system with no distribution
     pumps and having no demand, other than the test flow.
 (3) Distance between hydrants, elevations & main diameter are for
     information only.
```

FLOW TEST SUMMARY REPORT page2

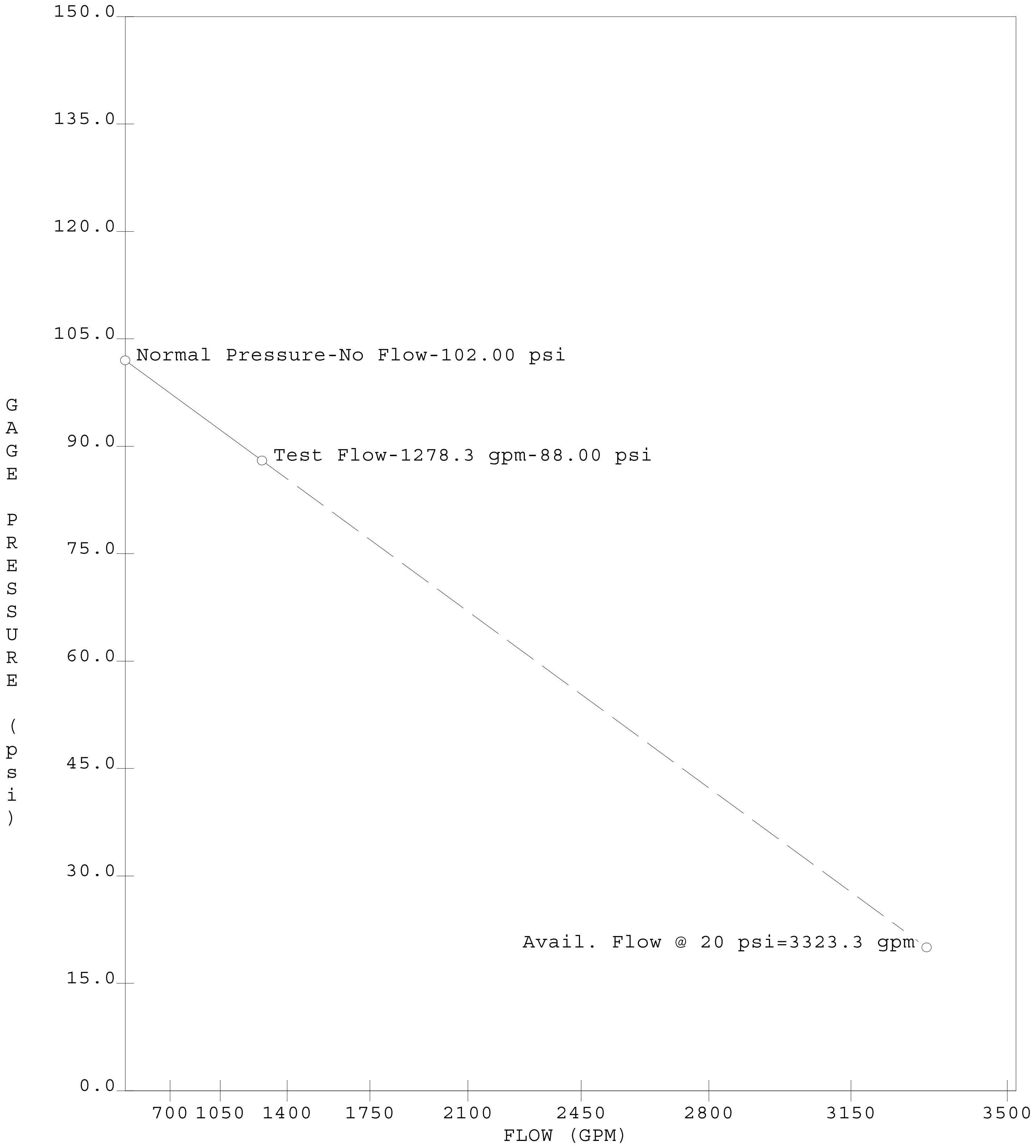


Exhibit K: Intersection Sight Distance Analysis

AKS
ENGINEERING & FORESTRY

November 20, 2020

Attn: Engineering Department
City of Newberg
414 E. First Street
Newberg, OR 97132

RE: INTERSECTION SIGHT DISTANCE ANALYSIS FOR NEW ACCESS POINTS FOR THE CRESTVIEW CROSSING COMMERCIAL PROJECT

City Engineering Staff:

Background/Overview

The purpose of this letter is to provide a sight distance analysis for two new private commercial driveway access points, for a portion of the property located at 4505 East Portland Road (Highway 99W), Newberg Oregon (Yamhill County Assessor's Map 3216, Tax Lot 1100 and Map 3216AC, Tax Lot 13800). One is on N Crestview Drive the other on E Jory Street.

The site was previously occupied by a single-family home and outbuildings. Planned improvements include the construction of 5 new retail commercial buildings and associated parking. The project site is part of the Crestview Crossing Planned Unit Development (PUD) which provided the two roads adjacent to the subject site. The new driveway approach to N Crestview Drive is planned to be located approximately 210' south of the northern property line. The new driveway approach to E Jory Street is planned to be located approximately 230' east of the western property line. These new driveways provide direct access to both N Crestview Drive and E Jory Street

N Crestview Drive is planned to be an approximately 44'-60' (varies from 2-4 lanes) wide major arterial road with an anticipated posted speed of 25 mph for both northbound (NB) and southbound (SB) traffic. E Jory Street is planned to be an approximately 40' wide collector road with an anticipated posted speed of 25 mph for both eastbound (EB) and westbound (WB) traffic.

Sight distance for the new driveways were studied as follows:

1. Intersection sight distance from the new driveway access to N Crestview Drive looking south (turning south at this driveway is not permitted).
2. Intersection sight distance from the new driveway access to E Jory Street looking east.
3. Intersection sight distance from the new driveway access to E Jory Street looking west.

Intersection Sight Distance Evaluation at 25 mph Design Speed

In accordance with City of Newberg *Public Works Design and Construction Standards, Section 5.23 Intersection Sight Distance,* measurements are based on an object height of 3.5 feet and a driver's eye height of 3.5 above the road surface, at 15 feet from the edge of the nearest travel lane. For a design speed of 25 mph, the minimum intersection sight distance required is 240 feet.

I. Intersection (and Driveway) Sight Distance: The following table is for intersection and driveway sight distances:

Intersection Sight Distance Design Speed (MPH)	Minimum Intersection Sight Distance (Feet)
15	145
20	195
25	240
30	290
35	335
40	385
45	430

Source: American Association of State Highway and Transportation Officials, A Policy of Geometric Design of Highways and Streets 2001, Fourth Edition, (based on AASHTO Case B2 and B3).

New Driveway Access to N Crestview Drive

The new driveway access to North Crestview Drive requires 240 feet of intersection sight distance. As shown on the attached exhibit, this requirement is met for NB traffic. Sight distance is not required for SB traffic as the driveway will allow right turns only. N Crestview Drive is expected to be a well-maintained road with street trees and nearly level grades. As such, no conflicts with terrain or other objects (fences, shrubs, etc.) that will create sight obstructions are anticipated. See the attached exhibit for further justification.

New Driveway Access to E Jory Street

The new driveway access to E Jory Street requires 240 feet of intersection sight distance. As shown on the attached exhibit, these requirements are met for both EB and WB traffic. E Jory Street is expected to be a well-maintained road with street trees and slightly sloped grades. As such, no conflicts with new terrain or other objects (fences, shrubs, etc.) that will create sight obstructions are anticipated. See the attached exhibit for further justification.

Conclusion

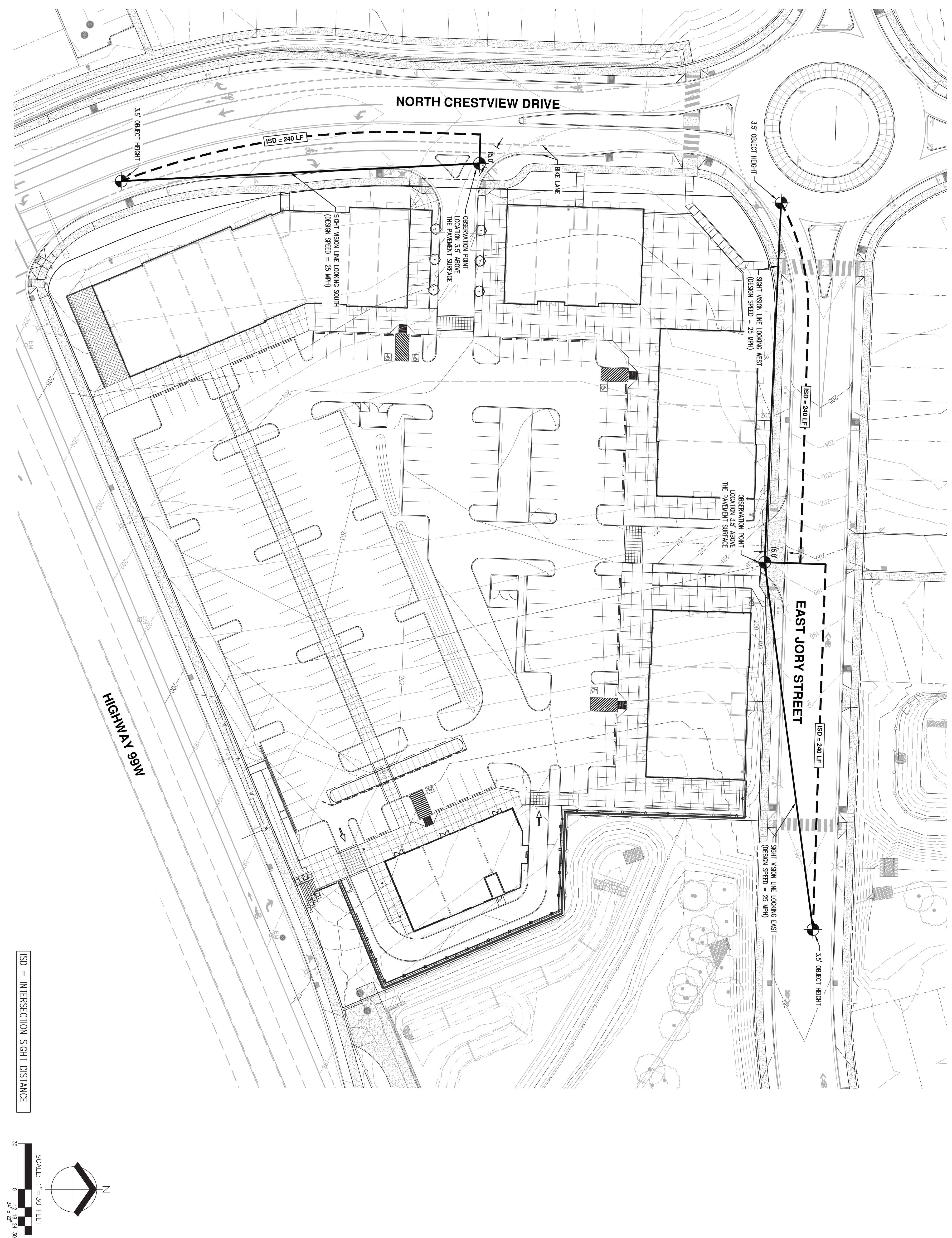
Based on the sight distance evaluations, the new driveway access points meet City of Newberg Roadway Standard sight distance requirements.

If you have any questions or need additional information, please let us know.
Sincerely,

AKS ENGINEERING & FORESTRY, LLC
Chuck Gregory, PE – Associate
12965 SW Herman Road, Suite 100
Tualatin, OR 97062
503.563.6151 | chuckg@aks-eng.com

REGISTERED PROFESSIONAL ENGINEER
50644PE
Gregory
OREGON
SEPT. 14, 1999
CHARLES EDWARD GREGORY
RENEWS: JUNE 30, 2021

Enclosure: EX-1: Intersection Sight Distance Exhibit



CRESTVIEW CROSSING
COMMERCIAL

NEWBERG **OREGON**
TAX LOT 13800 AND 1100
YAMHILL COUNTY TAX MAP 3 2 16AC

INTERSECTION SIGHT DISTANCE EXHIBIT

AKS ENGINEERING & FORESTRY, LLC
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aks-eng.com

ENGINEERING · SURVEYING · NATURAL RESOURCES
FORESTRY · PLANNING · LANDSCAPE ARCHITECTURE

DESIGNED BY: MCC
DRAWN BY: MCC
MANAGED BY: CEG
CHECKED BY: CEG
DATE: 11/20/2020

REGISTERED PROFESSIONAL ENGINEER
OREGON
SEPT. 14, 19
CHARLES EDWARD GREG
RENEWS: JUNE 30, 2021

REVISIONS

JOB NUMBER
3723

SHEET
EX-1