Heritage Crossing
Zone Change and Subdivision Application

(Revised per Compromise Concept)

Date: September 30, 2015

Submitted to: City of Tigard
Planning Department
13500 SW Hall Blvd
Tigard, OR 97223

Applicant: Venture Properties, Inc.
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Lake Oswego, OR 97035

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Exhibits:

Exhibit A: Preliminary Development Plans
Exhibit J: Arborist Report
Exhibit Q: Traffic Impact Analysis
Exhibit R: Storm Drainage Report

All other previous Exhibits remain the same

Zone Change and Subdivision Application for Heritage Crossing

General Information

Applicant:	Venture Properties, Inc. 4230 Galewood Street Lake Oswego, Oregon 97035 (503) 387-7600 Contact: Mimi Doukas, AICP, RLA
Engineer/Planner/Natural Resources:	AKS Engineering & Forestry 12965 SW Herman Road, Suite 100 Tualatin, OR 97062 503.925.8799 Contact: Mimi Doukas, AICP, RLA
Owner Information:	Schmidt Acres LLC 12525 NW Jackson Quarry Rd Hillsboro, OR 97124
Property Address:	15435 SW Hall Boulevard Tigard, OR 97224
Tax Lot:	TL 2S111DA 00400
Acreage:	9.10 acres
Comprehensive Plan Designation:	Medium Density Residential
Existing Zoning Designation:	R-12
Proposed Zoning Designation:	6.03 acres of R-7 and 3.07 acres of R-12

Request

Venture Properties is requesting approval of a Type III Zone Change from 6.03 acres of R-12 to a combination of R-7 and R-12 with a 62 lot subdivision for 9.1 acres on Taxlot 2S111DA 00400 with one Special Adjustment. This written narrative, together with preliminary plans and other documentation included in the application materials, establishes that the application is in compliance with all applicable approval criteria. This documentation represents substantial evidence and provides the basis for the Planning Commission to approve the application.

Site Description

Heritage Crossing (TL 2S111DA 00400) is located on the west side of SW Hall Boulevard and carries a Tigard R-12 zoning designation. The properties to the north, west, and south are all within the city of Tigard and carry and R-7 zoning designation. The land to the east is also within the City of Tigard and zoned primarily

R-7 with R-4.5 to the northeast and R-12 to the southeast. All surrounding properties have been fully developed at urban densities.

The property abuts SW Hall Boulevard to the east, which is under the jurisdiction of ODOT. Local street SW Applewood Avenue stubs into the northern boundary of the site, and local street SW Ashford Street stubs into the western project boundary. Both streets are proposed to extend into and through the proposed project. There are no existing street or pedestrian connections along the southern boundary.

The site is flat, with a slight grade change from northwest to southeast. Two marginal wetlands have been delineated on the property; they are not identified on the City's Local Wetland Inventory. A wetland fill application has been submitted to the Oregon Department of State Lands and the Corps of Engineers. As shown in the summary table below, urban infrastructure is available at several points around the property. This is the last infill site in this fully developed neighborhood.

DESCRIPTION OF SURROUNDING AREA

Area	Jurisdiction	Zoning	Land Uses
North	Tigard	R-7	Single Family detached residential
South	Tigard	R-7	Single Family detached residential
East	Tigard	R-7	Single-family detached residential
West	Tigard	R-7	Single Family detached residential

PUBLIC UTILITIES

Service	Provider	Size	Location	Distance from site
Water	City of Tigard	8"	SW Applewood Ave	Adjacent (N)
Water	City of Tigard	8"	SW Ashford Street	Adjacent (W)
Water	City of Tigard	12"	SW Hall Boulevard	Adjacent (E)
Sanitary Sewer	City of Tigard	8"	SW Applewood Ave	Adjacent (N)
Sanitary Sewer	City of Tigard	8"	SW Ashford Street	Adjacent (W)
Sanitary Sewer	City of Tigard	8"	SW Hall Boulevard	Adjacent (SE)
Storm Sewer	City of Tigard	12"	SW Applewood Ave	Adjacent (N)
Storm Sewer	City of Tigard	12"	SW Ashford Street	Adjacent (W)
Storm Sewer	City of Tigard	12"	SW Hall Boulevard	Adjacent (SE)

TRANSPORTATION

SW Hall Boulevard is classified as an arterial and is under the jurisdiction of ODOT. The planned right-of-way width is 50 feet from centerline. Existing right-of-way is 30 feet from centerline.

Project Description

Venture Properties is requesting approval of a Type III Zone Change from R-12 to R-7 and a 53 lot subdivision for 9.1 acres on Taxlot 2S111DA 00400 with one Special Adjustment for street improvement standards.

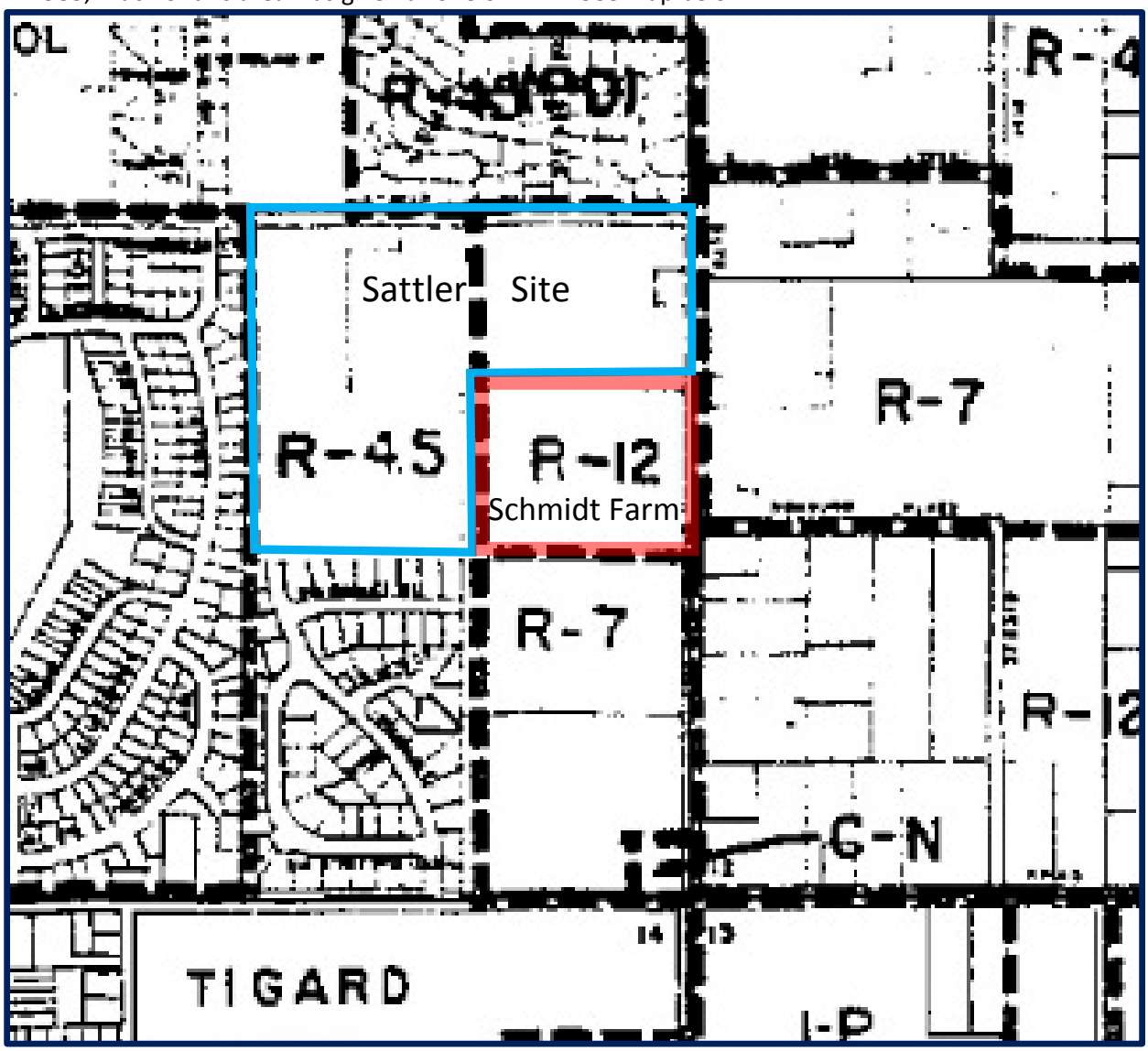
For the proposed subdivision design for Heritage Crossing (Exhibit A), the proposed lot sizes vary from 2,616 square feet to 8,613 square feet, with an average lot size of 4,246 square feet. The existing street stubs of SW Applewood Avenue and SW Ashford Street have been extended into the site connecting to a

loop road, and a local street connection to SW Hall Boulevard at the intersection of SW Ashford Street. A water quality and detention facility has been proposed in the southeast corner of the property. After detention and treatment the stormwater will be released into an existing storm line in SW Hall Boulevard. The Special Adjustment Standard is to allow for the continuation of the existing street cross sections of SW Applewood Avenue and SW Ashford Street to continue into the site for approximately 100 feet before intersecting with Schmidt Loop.

This site has remained in farm production as the neighborhoods around it have developed to urban densities. The zoning in this area had evolved to allow R-7 development to surround this site.

History

In 1983, much of this area was given a zone of R-12. See map below:



Zoning map adopted in 1983 by Ordinance 83-51

"The Sattler Site"

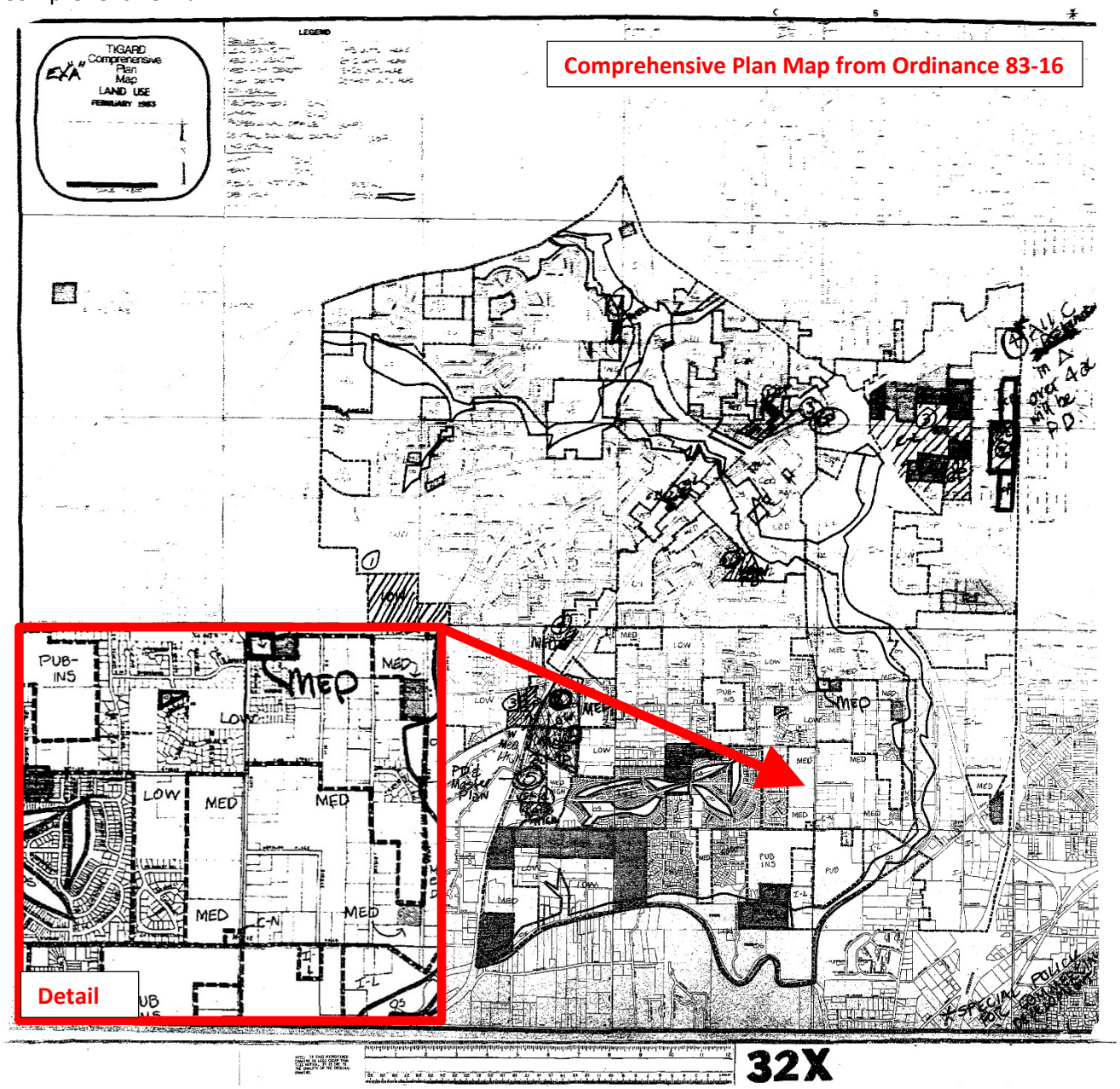
In 1983 the land to the west was zoned R-4.5 and the land to the north was zoned R-12. In 1996, Matrix Development requested a Comprehensive Plan Amendment and Zone Change (CPA 96-0004/ZON 96-0003, Exhibit O) was proposed to blend the R-4.5 and R-12 zones to apply R-7 across them to average out to the same overall density but one uniform housing type and lot size. This application was approved on the basis that a mistake was made when applying the R-12 zone in 1983. The property was annexed to Tigard in 1981 and assigned a zoning designation of R-5 (old zone for 5,000 sf lots). At the time, Staff could find no record of the zoning changing to R-12, so it was considered a mistake.

In reviewing the zoning history in this area from 1982 to 1983, it is easy to see the confusion and why it may have been considered a mistake. In 1982 and 1983 the City of Tigard did a complete update to the Comprehensive Plan and Zoning Map. There were several stages of adoption and the land use designations changed through the course of this update within the Heritage Crossing area. In addition, this was the time that the zoning nomenclature changed; R-7 became R-4.5, R-5 became R-7, and A-12 became R-12. A summary of the adopting Ordinances is listed below.

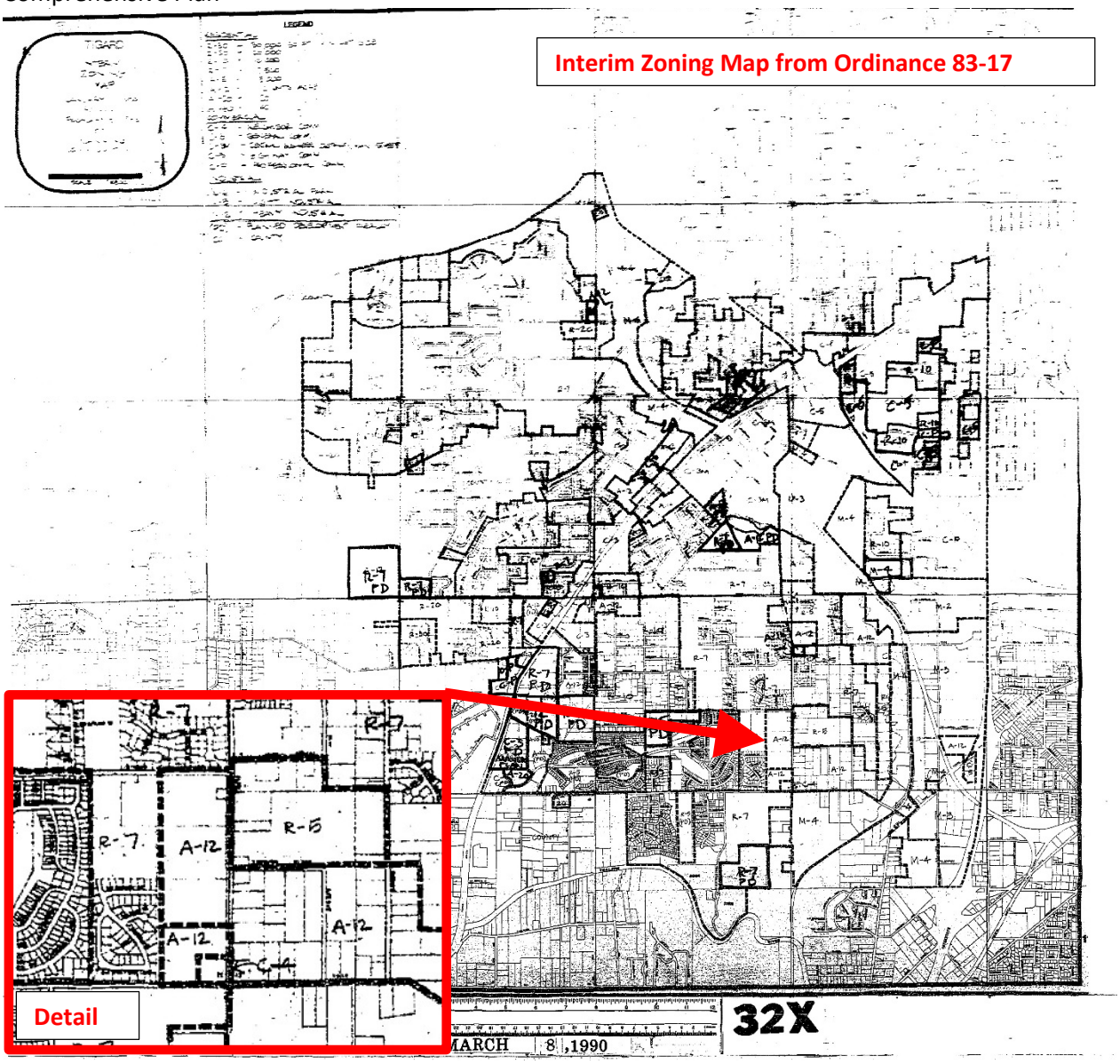
Ordinance History in 1982-1984

Ordinance 83-10 March 2, 1983 – Adopting the Findings, Policies and Implementation Strategies Element of the Tigard Comprehensive Plan (no maps)

Ordinance 83-16 March 16, 1983 – An Ordinance adopting the Comprehensive Plan Map of the Tigard Comprehensive Plan

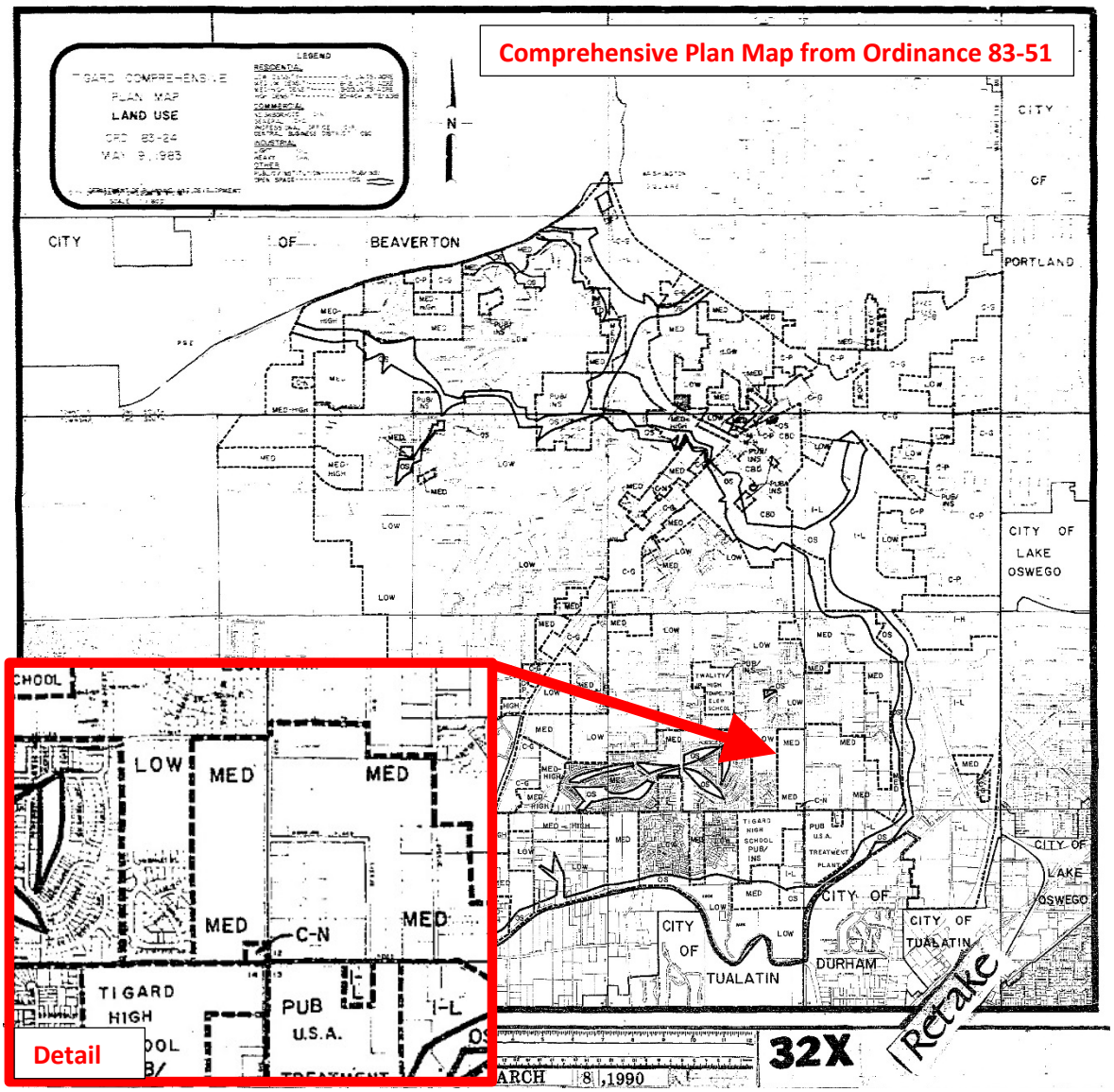


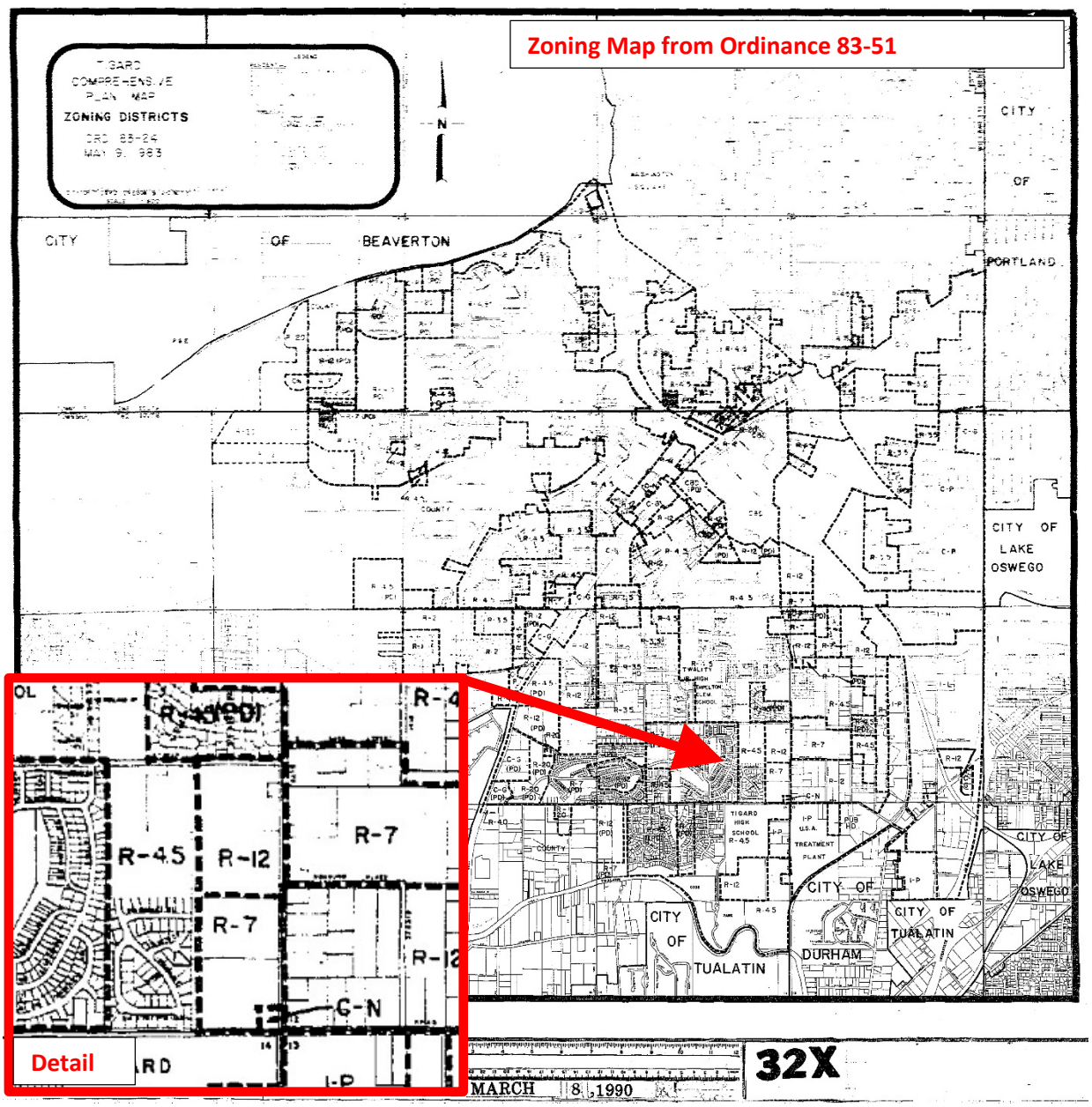
Ordinance 83-17 March 16, 1983 – An Ordinance adopting the Interim Zoning Map of the Tigard Comprehensive Plan



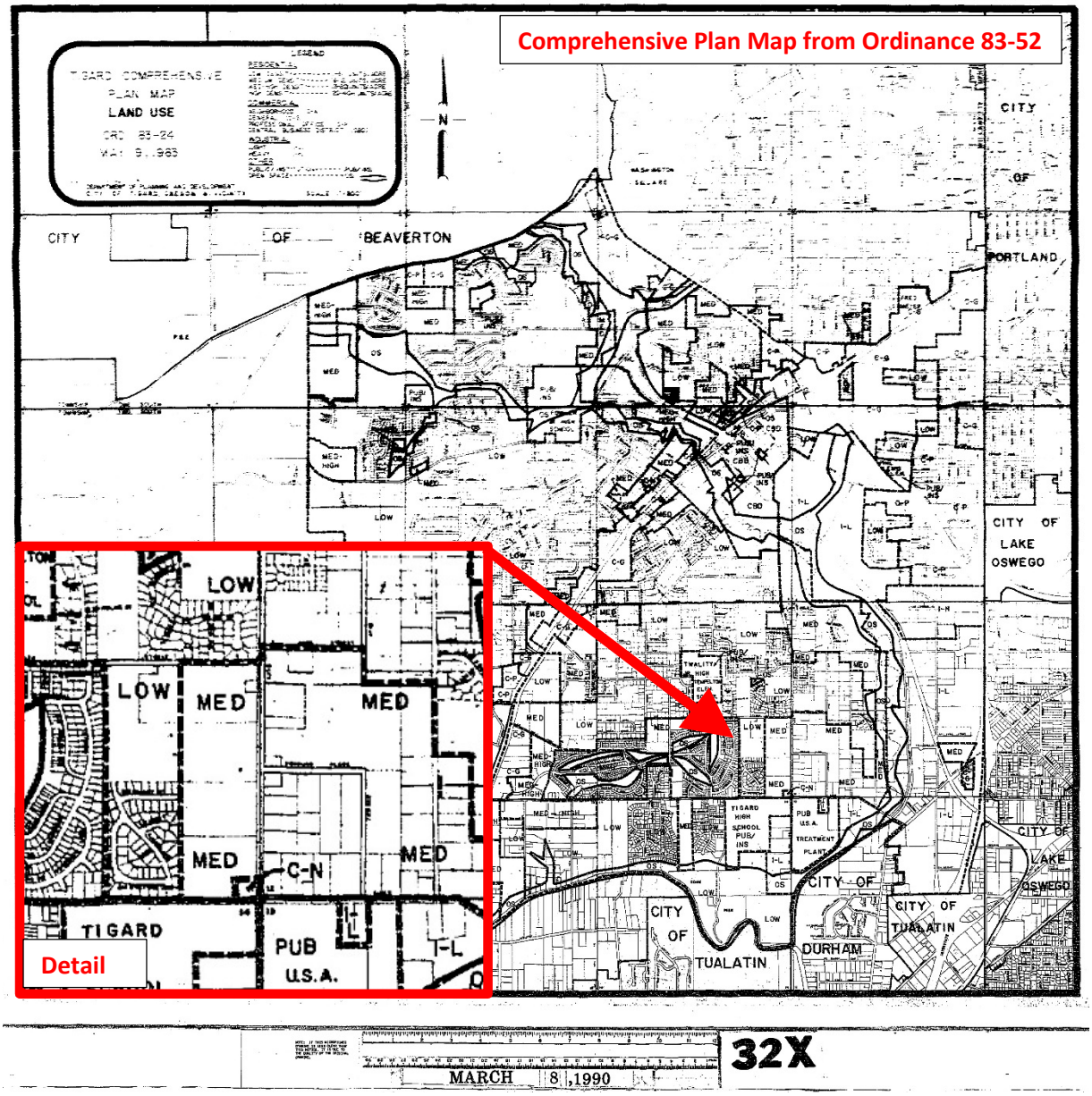
Ordinance 83-24 May 10, 1983 – An Ordinance ratifying the Text and Maps of the Comprehensive Plan (no maps)

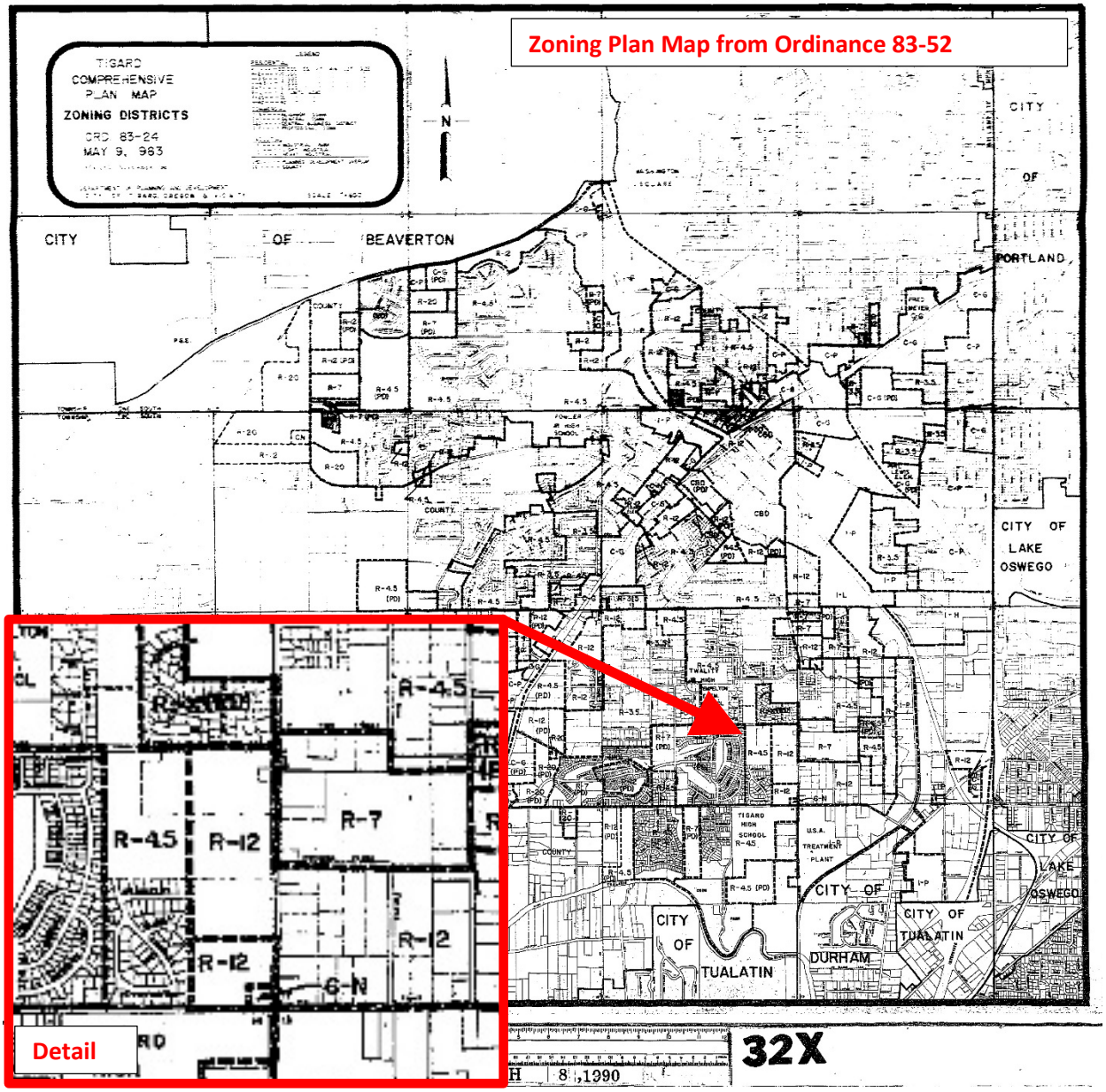
Ordinance 83-51 November 9, 1983 – An Ordinance Adopting Findings and Amending the Comprehensive Plan Map and Zoning District Map (CPA 12-83 PCM)




Zoning Map from Ordinance 83-51
TIGARD
COMPREHENSIVE
PLAN MAP
ZONING DISTRICTS
ORD 83-24
MAY 9, 983
N
CITY OF BEAVERTON
CITY OF PORTLAND
CITY OF LAKE OSWEGO
CITY OF TUALATIN
CITY OF TUALATIN
DURHAM
TIGARD HIGH SCHOOL
U.S.A. TREATMENT PLANT
R-45
R-12
R-7
C-N
I-P
Detail
MARCH 8, 1990
32X

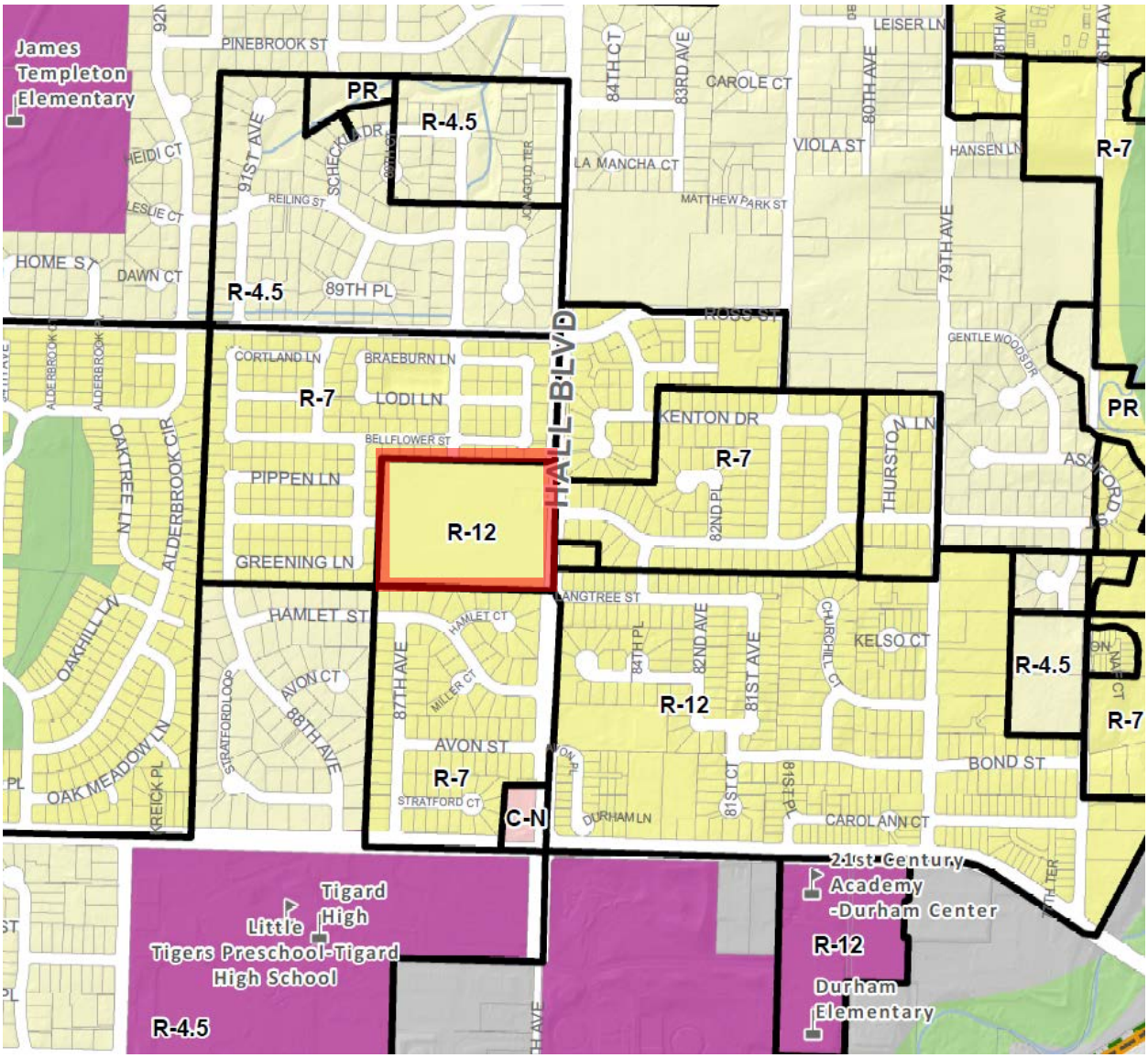
Ordinance 83-52 November 9, 1983 – An Ordinance Repealing Ordinance No. 82-77, 82-78, 82-79, 82-81, 82-89, 83-04, 83-05, 83-07, 83-10, 83-24, and Ratifying the Text and Maps of the Comprehensive Plan and the Community Development Code.




Zoning Plan Map from Ordinance 83-52
TIGARD
COMPREHENSIVE
PLAN MAP
ZONING DISTRICTS
ORD 83-24
MAY 9, 983
N
CITY OF BEAVERTON
CITY OF PORTLAND
CITY OF LAKE OSWEGO
CITY OF TUALATIN
CITY OF TUALATIN
CITY OF DURHAM
R-4.5
R-12
R-7
R-12
R-12
G-N
Detail
32X
8 ,1990

The property to the south of Heritage Crossing also has a current designation of R-7. It appears that this zone was applied in Ordinance 83-51, although Ordinance 83-52 includes a conflicting map; both were adopted at the same hearing. Subsequent City Zoning maps reflect the R-7 zone of 83-51.

The land on the east side of SW Hall Boulevard is primarily zoned R-7, with the R-12 district beginning at the southeast corner of the Heritage Crossing site. Current zoning is shown below:



Current Zoning Map

With this evolution of zoning designations and development patterns, this property is now an anomaly in the area with the historic R-12 zoning designation. The Applicant believes that this site is now a 'spot zone' that is no longer compatible with the surrounding community. In order to meet the density requirements of the R-12 zone, a project must contain primarily attached homes. This property is surrounded by single family detached homes. SW Hall Boulevard provides a more appropriate transition boundary for a change in housing type.

III. Tigard Development Code

Chapter 18.370 VARIANCES AND ADJUSTMENTS

18.370.010 Variances…

18.370.020 Adjustments

A. Purpose. The purpose of this section is to establish two classes of special variances:

1. "Development adjustments" which allow modest variation from required development standards within proscribed limits. Because such adjustments are granted using "clear and objective standards," these can be granted by means of a Type I procedure, as opposed to the more stringent standards of approval and procedure for variances.
2. "Special adjustments" which are variances from development standards which have their own approval criteria as opposed to the standard approval criteria for variances contained in Section 18.370.020.C.

Response: Venture Properties is requesting one special adjustment that will be reviewed as a Type II application. A request is made to provide an alternate street section for the proposed local street extensions of SW Ashford Street and SW Applewood Avenue to match the street sections to the north and west. These streets were built as 32 feet curb-to-curb with five foot curb-tight sidewalks and then street trees on the outside of the sidewalks, and parking on one side. Venture proposes to continue this street section for the short 100 foot sections until they intersect with Schmidt Loop.

B. Development adjustments….

C. Special adjustments.

1. Adjustments to development standards within subdivisions (Chapter 18.430). The director shall consider the application for adjustment at the same time he/she considers the preliminary plat. An adjustment may be approved, approved with conditions, or denied provided the director finds:…

Response: No adjustments to the development standards is requested; this criterion does not apply.

2. Adjustment to minimum residential density requirements (Chapter 18.510). The Director is authorized to grant an adjustment to the minimum residential density requirements in Section 18.510.040, by means of a Type I procedure, as governed by Section 18.390.030 as follows:…

Response: No adjustments to the minimum density standards is requested; this criterion does not apply.

3. For adjustments to density requirements in Washington Square Regional Center, the standards of Section 18.630.020.E apply.

Response: This property is not located within the Washington Square Regional Center; this criterion does not apply.

4. For modifications to dimensional and minimum density requirements for developments within the Washington Square Regional Center that include or abut designated water resource overlay areas, the standards of Section 18.630.020.F apply.

Response: This property is not located within the Washington Square Regional Center; this criterion does not apply.

5. Adjustment to access and egress standards (Chapter 18.705)….

Response: No access spacing adjustments are requested; this criterion does not apply.

6. Adjustments to parking standards (Chapter 18.765)….

Response: No adjustments to the parking standards is requested; this criterion does not apply.

7. Adjustments to sign code (Chapter 18.780)….

Response: No adjustments to the sign code is requested; this criterion does not apply.

8. Adjustments to wireless communication facilities (Chapter 18.798)….

Response: No wireless communication facilities are proposed; this criterion does not apply.

9. Adjustments for street improvement requirements (Chapter 18.810). By means of a Type II procedure, as governed by Section 18.390.040, the director shall approve, approve with conditions, or deny a request for an adjustment to the street improvement requirements, based on findings that the following criterion is satisfied: Strict application of the standards will result in an unacceptably adverse impact on existing development, on the proposed development, or on natural features such as wetlands, bodies of water, significant habitat areas, steep slopes or existing mature trees. In approving an adjustment to the standards, the director shall determine that the potential adverse impacts exceed the public benefits of strict application of the standards.

Response: Venture Properties is requesting one special adjustment that will be reviewed as a Type II application. A request is made to provide an alternate street section for the proposed local street extensions of SW Ashford Street and SW Applewood Avenue to match the street sections to the north and west. These streets were built as 32 feet curb-to-curb with five foot curb-tight sidewalks and then street trees on the outside of the sidewalks, and parking on one side. Venture proposes to continue this street section for the short 100 foot sections until they intersect with Schmidt Loop.

This alternative design collapses the planter strip and provides a standard curb to curb with that allows parking on both sides. There is no adverse impact to public safety.

10. Adjustments to downtown connectivity standards (Section 18.610.025). This adjustment applies to the location of required connections; adjustments to the design of the required improvement are subject to Section 18.370.020.C.11. By means of a Type II procedure, as governed by Section 18.390.040, the director shall approve, approve with conditions, or deny a request for an adjustment to the connectivity standards, based on findings that the following criteria are satisfied:…

Response: This property is not located within the downtown district; this criterion does not apply.

Chapter 18.380 ZONING MAP AND TEXT AMENDMENTS

18.380.010 Purpose

The purpose of this chapter is to set forth the standards and process governing legislative and quasi-judicial amendments to this title and the zoning district map. These will be referred to as "zoning map and text amendments." It is recognized that such amendments may be necessary from time to time to reflect changing community conditions, needs and desires; to correct mistakes; and/or to address changes in the law.

18.380.030 Quasi-Judicial Amendments and Procedures to this Title and Map

A. Quasi-judicial amendments. Quasi-judicial zoning map amendments shall be undertaken by means of a Type III-PC procedure, as governed by Section 18.390.050, using standards of approval contained in subsection D of this section. The approval authority shall be as follows:

1. **The commission shall decide zone change applications which do not involve comprehensive plan map amendments;**
2. **The commission shall make a recommendation to the council on an application for a comprehensive plan map amendment; and**
3. **The commission shall make a recommendation to the council on a zone change application which also involves a concurrent application for a comprehensive plan map amendment. The council shall decide the applications on the record as provided by Chapter 18.390.**

Response: Venture Properties is requesting a zone change from R-12 to a combination of R-12 and R-7. Both zones implement the Medium Density Residential Comprehensive Plan designation. Only a zone change is requested so this application will be decided by the Planning Commission.

B. Standards for making quasi-judicial decisions. A recommendation or a decision to approve, approve with conditions or to deny an application for a quasi-judicial amendment shall be based on all of the following standards:

1. **Demonstration of compliance with all applicable comprehensive plan policies and map designations;**

Response: Findings for compliance with applicable comprehensive plan policies are provided below.

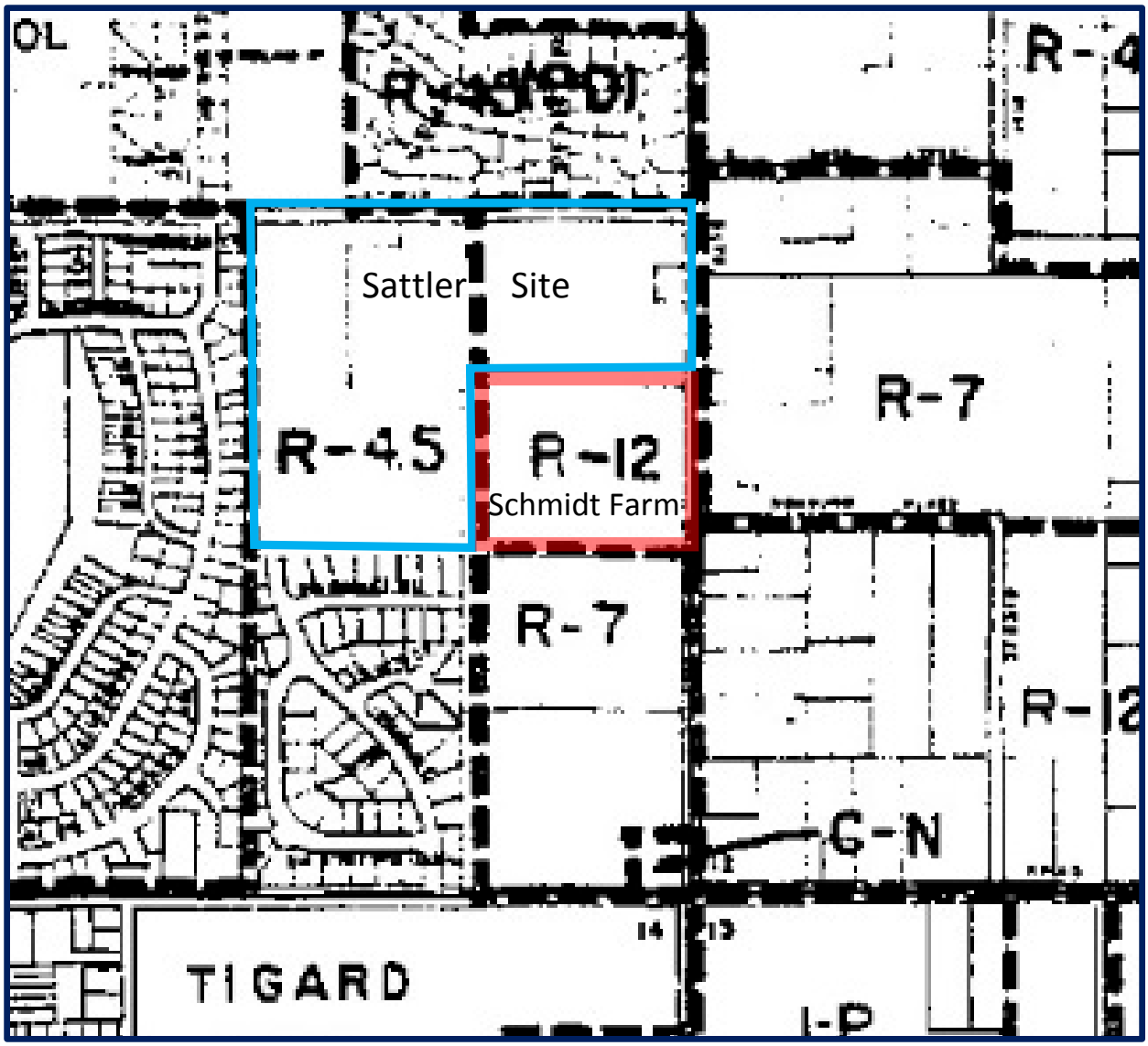
2. **Demonstration of compliance with all applicable standards of any provision of this code or other applicable implementing ordinance; and**

Response: Findings for compliance with applicable development code standards are provided below.

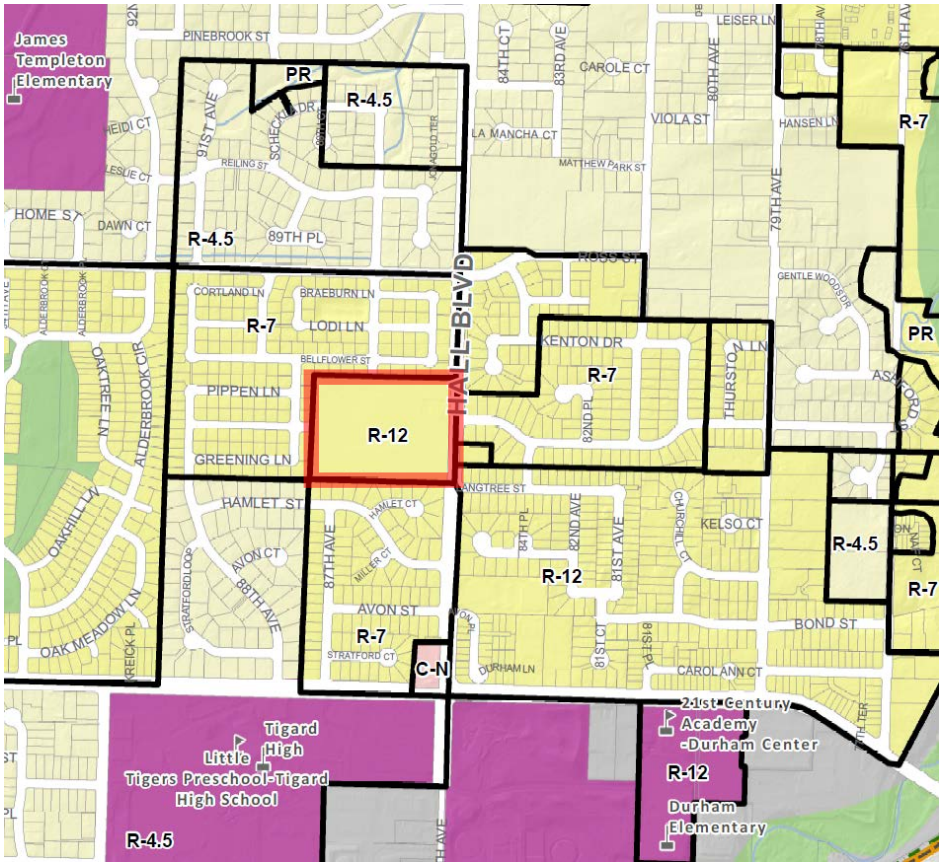
3. **Evidence of change in the neighborhood or community or a mistake or inconsistency in the comprehensive plan or zoning map as it relates to the property which is the subject of the development application.**

Response: As described in the introduction, this region has changed substantially since the R-12 zoning was first applied in 1983. While the Schmidt farm remained in agricultural production, the neighborhoods around it have developed to urban densities with lot sizes of 4,000 to 6,000 square feet. In addition, the zoning in this area has evolved to allow R-7 development to surround this site on all four sides.

In 1983, much of this area was given a zone of R-12. In 1983, the single zones were named to reflect the general lot sizes, so R-7 meant 7,000 square foot lots, R-5 meant 5,000 square foot lots. The multi-family zones were units per acre as they are today. See map below:



Zoning map adopted in 1983 by Ordinance 83-51



Current Zoning Map

"The Sattler Site" - In 1983 the land to the west was zoned R-4.5 and the land to the north was zoned R-12 according to Ordinance 83-51 (Exhibit N). In 1996, Matrix Development requested a Comprehensive Plan Amendment and Zone Change (CPA 96-0004/ZON 96-0003 – Exhibit O) that proposed to blend these the R-4.5 and R-12 zones to apply R-7 across the entirety of the property to average out to the same total number of units but one type of housing and a uniform lot size. This application was approved on the finding that a mistake was made when applying the R-12 zone. The property was originally annexed to Tigard in 1981 and the entire site was assigned a zoning designation of R-5 (old zone for 5,000 sf lots). In 1996, Staff could find no record of the 1983 zone change to R-12, so it was determined to be a mistake. The application was approved and the R-7 zone was applied to the entire property, followed by a subdivision to develop the property. This is a significant change in the community from when the R-12 zone was applied to the Schmidt farm. If a mistake was not actually made in 1983, then a mistake was make in the 1996 decision. Either way, this is a major change to the land use character of this region.

The property to the south of Heritage Crossing also has a current designation of R-7 and was built out with 5,000 square foot lots with single family detached homes. The land on the east side of SW Hall Boulevard is primarily zoned R-7, with the R-12 district beginning at the southeast corner tip of the Heritage Crossing site.

The two subdivisions located to the east of SW Hall Boulevard, to the southeast located along Langtree and Bonaventure Streets and on Bond and Church are zoned as R-12 but developed before minimum density standards were in place, so they have a density at an R-7 level of development (roughly 7 units to the acre). Another large lot in this R-12 area was developed with the Tigard Friend Church. Generally, development in this area is consistently built at the R-7 level, with smaller lots and single-family detached homes.

With this evolution of zoning designations and development patterns, this property is now an anomaly in the area with the historic R-12 zoning designation. The Applicant believes that this site is now a 'spot zone' that is no longer compatible with the surrounding community.

C. Conditions of approval. A quasi-judicial decision may be for denial, approval, or approval with conditions as provided by Section 18.390.050. A legislative decision may be approved or denied.

18.380.040 Record of Amendments

The director shall maintain a record of amendments to the text and map of this title in a format convenient for the use of the public and in accordance with Chapter 18.220.

Chapter 18.390 DECISION-MAKING PROCEDURES

18.390.020 Description of Decision-Making Procedures

A. General. All development permit applications shall be decided by using one of the following procedure types. The procedure type assigned to each action governs the decision-making process for that permit, except to the extent otherwise required by applicable state or federal law. The director shall be responsible for assigning specific procedure types to individual permit or action requests, as requested. Special alternative decision-making procedures have been developed by the city in accordance with existing state law, and are codified in Section 18.390.070.

B. Types defined. There are four types of decision-making procedures, as follows:

1. **Type I Procedure. Type I procedures apply to ministerial permits and actions containing clear and objective approval criteria. Type I actions are decided by the director without public notice and without a public hearing.**
2. **Type II Procedure. Type II procedures apply to quasi-judicial permits and actions that contain some discretionary criteria. Type II actions are decided by the director with public notice and an opportunity for a hearing. If any party with standing appeals a director's Type II decision, the appeal of such decision will be heard by the hearings officer.**
3. **Type III Procedure. Type III procedures apply to quasi-judicial permits and actions that predominantly contain discretionary approval criteria. Type III actions are decided by the Hearings Office (Type III-HO), the Planning Commission (Type III-PC), or Design Review Board (Type III-C) with appeals to or review by the City Council.**
4. **Type IV Procedure. Type IV procedures apply to legislative matters. Legislative matters involve the creation, revision, or large-scale implementation of public policy. Type IV matters are considered initially by the Planning Commission with final decisions made by the City Council.**

C. Summary of permits by decision-making procedure type. Table 18.390.1 summarizes the various land use permits by the type of decision-making procedure.

Table 18.390.1 (abbreviated)
Summary of Permits by Type of Decision-Making Procedure Type

Type II (18.390.040)	**Cross-Reference(s)**
Permit/Land	
Access/Egress Adjustment	18.370.020.C.3.b
Subdivision Without Planned Development[1]	18.430.070
Type IIIB (18.390.050) Planning Commission	
Zone Map/Text Change/Quasi-Judicial	18.380.030.B

Response: As shown in Table 18.390.1, the proposed zone change is a Type IIIPC review by the Planning Commission. By combining the Zone Change application with a Type II Subdivision, both applications were reviewed together by the Planning Commission, and appealed together to the City Council.

18.390.050 Type III Procedure

A. Preapplication conference. A preapplication conference is required for all Type III actions. The requirements and procedures for a preapplication conference are described in 18.390.080.C.

Response: A preapplication meeting was held on the proposed subdivision. Notes are included in Exhibit D. This criterion is met.

B. Application requirements.

1. Application forms. Type III applications shall be made on forms provided by the director as provided by 18.390.080.E.1.

2. Content. Type III applications shall:

a. Include the information requested on the application form;

b. Address the relevant criteria in sufficient detail for review and action;

c. Be accompanied by the required fee;

d. Include two sets of pre-stamped, pre-addressed envelopes for all persons who are property owners of record as specified in subsection C of this section. The records of the Washington County Department of Assessment and Taxation shall be the official records for determining ownership. The applicant shall demonstrate that the most current assessment records have been used to produce the notice list;

e. Include an impact study. The impact study shall quantify the effect of the development on public facilities and services. The study shall address, at a minimum, the transportation system, including bikeways, the drainage system, the parks system, the water system, the sewer system, and the noise impacts of the development. For each public facility system and type of impact, the study shall propose improvements necessary to meet city standards and to minimize the impact of the development on the public at large, public facilities systems, and affected private property users. In situations where the community development code requires the dedication of real property interests, the applicant shall either specifically concur with the dedication requirements, or provide evidence which supports the conclusion that the real property dedication requirement is not roughly proportional to the projected impacts of the development.

Response: The application forms are included in Exhibit C. The applicable approval criteria has been addressed in this narrative. A check for the review fee was submitted with the land use application package. Two sets of mailing envelops will be provided to the City using labels provided by City Staff upon completeness. An Impact Study has been included as Exhibit L. The Impact Study also references the Transportation Impact Analysis (Exhibit Q), a Storm Drainage Report (Exhibit R), and an Arborist Report (Exhibit J). This criterion is met.

C. Notice of hearing….

Response: The City of Tigard will provide all required public notification. This criterion is met.

D. Conduct of the hearing….

Response: The Tigard Planning Commission conducted the public hearing according to the standards of this section.

E. The decision process.

1. **Basis for decision. Approval or denial of a Type II administrative appeal or Type III action shall be based on standards and criteria, which shall be set forth in the development ordinance, and which shall relate approval on denial of a discretionary permit application to the development ordinance and, when appropriate, to the comprehensive plan for the area in which the development would occur and to the development ordinance and comprehensive plan for the city as a whole.**
2. **Findings and conclusions. Approval or denial of a Type II administrative appeal or Type III action shall be based upon and accompanied by a brief statement that explains the criteria and standards considered relevant to the decision, states the facts relied upon in rendering the decision and explains the justification for the decision based on the criteria, standards, and facts set forth.**
3. **Form of decision. The review authority shall issue a final order containing the above-referred findings and conclusions, which either approves, denies, or approves the permit or action with conditions. The review authority may also issue any intermediate rulings as they see fit.**
4. **Decision-making time limits. A final order for any Type II administrative appeal or Type III action shall be filed with the director within 10 business days after the close of the deliberation.**

Response: The applicable approval criteria has been addressed in this narrative with the support of the attached documents. The Staff Report and the City Council's Decision will also be based on the same applicable approval criteria and findings of fact. This criterion will be met.

F. Notice of decision….

Response: The City of Tigard will provide the Notice of Decision per the requirements of this section.

G. Final decision.

1. **Final decision, effective date and appeal. The decision of the Planning Commission or hearings officer in a Type III action is final for purposes of appeal on the date notice of the decision is mailed. Any party with standing may appeal a Type III decision to the City Council by filing a notice of appeal with the director within 10 business days of the date notice of the decision is mailed. The notice of appeal shall be in the form specified in**

18.390.040.G.2.a.ii. The procedures of subsections C through F of this section shall be forwarded in the appeal.

2. Final decision on appeal. The decision of the City Council on any Type III appeal is the final decision of the city and is final and effective on the date notice of the decision is mailed.

Response: The Tigard Planning Commission rendered a decision and issue a notice of decision with the effective date of the decision. After a decision was rendered, the Applicant appealed to the City Council. After public testimonty, the City Council will render a decision on the appeal and issue a notice of decision with the effective date of the decision.

Chapter 18.430 SUBDIVISIONS

18.430.020 General Provisions

A. Approval through two-step process. An application for a subdivision shall be processed through a two-step process: the preliminary plat and the final plat.

1. The preliminary plat shall be approved by the Approval Authority before the final plat can be submitted for approval consideration; and

2. The final plat shall reflect all conditions of approval of the preliminary plat.

Response: This application requests approval of a preliminary plat. After approval, Venture Properties will apply for Final Plat approval that incorporates the adopted conditions of approval.

B. Compliance with ORS Chapter 92. All subdivision proposals shall be in conformity with all state regulations set forth in ORS Chapter 92, Subdivisions and Partitions.

Response: ORS Chapter 92 has been implemented through the adoption of the Tigard Community Development Code; by showing compliance with the Tigard Development Code, this application will be in compliance with the standards of ORS Chapter 92. This provision is met.

C. Future re-division. When subdividing tracts into large lots, the Approval Authority shall require that the lots be of such size and shape as to facilitate future re-division in accordance with the requirements of the zoning district and this title.

Response: None of the proposed lots are designed to allow for future redivision, and the zoning does not allow for any additional dwelling units.

D. Lot averaging, Lot size may be averaged to allow lots less than the minimum lot size allowed in the underlying zoning district as long as the average lot area for all lots is not less than allowed by the underlying zoning district. No lot created under this provision shall be less than 80% of the minimum lot size allowed in the underlying zoning district.

Response: The proposed lots in Heritage Crossing vary in size from 2,616 square feet to 8,613 square feet. This application utilizes the lot size averaging provision for each proposed zoning district. For the proposed R-7 district the average lot size is 5,059 square feet which exceeds the minimum lot average lot size of 5,000 square feet. For the proposed R-12 district the average lot size is 3,193 square feet which exceeds the minimum lot average lot size of 3,050 square feet. It should be noted that the lot width standards do not apply when lot size averaging is used per DIR2013-00002.

E. Temporary sales office. Temporary sales offices in conjunction with any subdivision may be granted as set forth in Chapter 18.785, Temporary Uses.

Response: If a temporary sales office is desired when the subdivision is constructed, Venture Properties will submit a separate application for a Temporary Use.

F. Minimize flood damage. All subdivision proposals shall be consistent with the need to minimize flood damage.

Response: The Heritage Crossing property is not located within a floodplain area or within an area prone to flooding.

G. Floodplain dedications. Where land filling and/or development is allowed within and adjacent to the 100-year floodplain outside the zero-foot rise floodway, the City shall require consideration of the dedication of sufficient open land area for a greenway adjoining and within the floodplain. This area shall include portions at a suitable elevation for the construction of a pedestrian/bicycle pathway within the floodplain in accordance with the adopted pedestrian bicycle pathway plan.

Response: As previously stated, the Heritage Crossing property is not located within a floodplain area.

H. Need for adequate utilities. All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize flood damage.

Response: All proposed infrastructure will be public and located underground and constructed to minimize flood damage. Service will be provided to each individual lot for sewer, water, electricity, and gas.

I. Need for adequate drainage. All subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage; and

Response: The proposed subdivision has been designed with a full stormwater conveyance, detention, and treatment system. A full preliminary Storm Drainage Report has been provided in Exhibit R.

J. Determination of base flood elevation. Where base flood elevation has not been provided or is not available from another authoritative source, it shall be generated for subdivision proposals and other proposed developments which contain at least 50 lots or five acres (whichever is less).

Response: As previously stated, the Heritage Crossing property is not located within a floodplain area.

18.430.030 Approval Process…

A. Review of preliminary plat. Review of a preliminary plat for subdivision shall be processed by means of a Type II procedure, as governed by Chapter 18.390, using approval criteria contained in Section 18.430.040. An application for subdivision may also be reviewed concurrently with an application for a planned development, as governed by Chapter 18.350.

Response: The Heritage Crossing preliminary plat will be processed as a Type III application.

B. Review of final plat. Review of a final plat for subdivision shall be processed by means of a Type I procedure, as governed by Chapter 18.390, using approval criteria contained in Section 18.430.070.

Response: A final plat application will be submitted for review after approval of the preliminary plat.

C. **Approval period. Preliminary plat approval by the Approval Authority shall be effective for a period of 1-1/2 years from the date of approval. The preliminary plat shall lapse if:**

1. **A final plat has not been submitted within a 1-1/2 year period; or**
2. **The final plat does not conform to the preliminary plat as approved or approved with conditions.**

Response: A final plat application will be submitted within 1.5 years of the preliminary plat approval.

D. **Extension….**

Response: No extensions are currently requested.

E. **Phased development….**

Response: No phasing is proposed; this criterion does not apply.

18.430.040 Approval Criteria: Preliminary Plat

A. **Approval criteria. The Approval Authority may approve, approve with conditions or deny a preliminary plat based on the following approval criteria:**

1. **The proposed preliminary plat complies with the applicable zoning ordinance and other applicable ordinances and regulations;**

Response: This narrative provides findings for how the proposed Heritage Crossing preliminary plat meets the applicable review criteria in the Tigard Community Development Code and other applicable ordinances and regulations. This criterion is met.

2. **The proposed plat name is not duplicative or otherwise satisfies the provisions of ORS Chapter 92;**

Response: The name of "Heritage Crossing" has been reviewed and approved by the Washington County Surveyors office, as documented in Exhibit K. This criterion is met.

3. **The streets and roads are laid out so as to conform to the plats of subdivisions and maps of major partitions already approved for adjoining property as to width, general direction and in all other respects unless the City determines it is in the public interest to modify the street or road pattern; and**

Response: As shown on the "Conceptual Future Street Connectivity Plan" in Exhibit A, all existing roadway alignments and dedications are honored through Heritage Crossing. SW Ashford Street stubs into the west property line and has been extended along the existing line and grade. Similarly, SW Applewood Avenue stubs into the north property line and has been designed to extend into the site to match the existing line and grade. No changes to existing streets are proposed. This criterion is met.

4. **An explanation has been provided for all common improvements.**

Response: No common improvements are proposed except for public infrastructure. This criterion does not apply.

B. **Conditions of approval. The Approval Authority may attach such conditions as are necessary to carry out the comprehensive plan and other applicable ordinances and regulations and may require reserve strips be granted to the City for the purpose of controlling access to adjoining undeveloped properties.**

Response: The Applicant anticipates that Conditions of Approval will be applied to the final decision on the Preliminary Plat land use application. No reserve strips are expected. This criterion is met.

18.430.050 Submission Requirements: Preliminary Plat

A. General submission requirements. The applicant shall submit an application containing all of the general information required for a Type II procedure, as governed by Chapter 18.390.

B. Additional information. In addition to the general information described in Subsection A above, the preliminary plat shall contain specific information, the detailed content of which can be obtained from the Director.

Response: This application package contains the required materials for a Type III Preliminary Plat. This criterion is met.

18.430.060 Adjustments Authorized

A. Granting of adjustments. Adjustments to the subdivision regulations prescribed by this title may be authorized by the Director, and application shall be made with a preliminary plat application in accordance with Section 18.430.050. Criteria for granting such adjustments are contained in Section 18.370.020.C.1.

Response: Minor adjustments are requested to allow for the street cross sections of SW Alford Street and SW Applewood Avenue to match the existing geometry in the adjacent neighborhood. Findings are provided in Section 18.370.020.C.1.

18.430.070 Approval Criteria: Final Plat…

Response: After the Preliminary Plat is reviewed and approved, Venture Properties will submit an application for Final Plat review that addresses the criteria in this section.

18.430.080 Improvement Agreement…

Response: Again, after the Preliminary Plat is reviewed and approved, Venture Properties will submit an application for Final Plat review that will provide for improvement guarantees and deposits as necessary.

18.430.090 Bond…

Response: After the Preliminary Plat is reviewed and approved, Venture Properties will submit an application for Final Plat review that will provide for any required bonds.

18.430.100 Filing and Recording…

Response: After the Final Plat is reviewed and approved, Venture Properties will submit to Washington County for final recordation.

18.430.110 Vacation of Plats…

Response: No plat vacations are proposed; this criterion does not apply.

Chapter 18.510 RESIDENTIAL ZONING DISTRICTS

18.510.010 Purpose

A. Preserve neighborhood livability. One of the major purposes of the regulations governing development in residential zoning districts is to protect the livability of existing and future residential neighborhoods, by encouraging primarily residential development with

compatible nonresidential development—schools, churches, parks and recreation facilities, day care centers, neighborhood commercial uses and other services—at appropriate locations and at an appropriate scale.

B. Encourage construction of affordable housing. Another purpose of these regulations is to create the environment in which construction of a full range of owner-occupied and rental housing at affordable prices is encouraged. This can be accomplished by providing residential zoning districts of varying densities and developing flexible design and development standards to encourage innovation and reduce housing costs.

18.510.020 List of Zoning Districts

E. R-7: Medium-Density Residential District. The R-7 zoning district is designed to accommodate attached single-family homes, detached single-family homes with or without accessory residential units, at a minimum lot size of 5,000 square feet, and duplexes, at a minimum lot size of 10,000 square feet. Mobile home parks and subdivisions are also permitted outright. Some civic and institutional uses are also permitted conditionally.

Response: The proposed subdivision application provides a variety of lot sizes as permitted by the lot averaging provision of TDC 18.420.D, varying from 2,616 square feet to 8,613 square feet. For the proposed R-7 district the average lot size is 5,059 square feet which exceeds the minimum lot average lot size of 5,000 square feet. Only single family detached homes are proposed, which is an allowed use in the R-7 zone. This criterion is met.

F. R-12: medium-density residential district. The R-12 zoning district is designed to accommodate a full range of housing types at a minimum lot size of 3,050 square feet. A wide range of civic and institutional uses are also permitted conditionally.

Response: The proposed subdivision application provides a variety of lot sizes as permitted by the lot averaging provision of TDC 18.420.D, varying from 2,616 square feet to 8,613 square feet. For the proposed R-12 district the average lot size is 3,193 square feet which exceeds the minimum lot average lot size of 3,050 square feet. Only single family detached homes are proposed, which is an allowed use in the R-7 zone. This criterion is met.

18.510.040 Minimum and Maximum Densities

A. Purpose. The purpose of this section is to establish minimum and maximum densities in each residential zoning district. To ensure the quality and density of development envisioned, the maximum density establishes the ceiling for development in each zoning district based on minimum lot size. To ensure that property develops at or near the density envisioned for the zone, the minimum density for each zoning district has been established at 80% of maximum density.

B. Calculating minimum and maximum densities. The calculation of minimum and maximum densities is governed by the formulas in Chapter 18.715, Density Computations.

C. Adjustments. Applicants may request an adjustment when, because of the size of the site or other constraint, it is not possible to accommodate the proportional minimum density as required by 18.715.020.C and still comply with all of the development standards in the underlying zoning district, as contained in Table 18.510.2 below. Such an adjustment may be granted by means of a Type I procedure, as governed by Chapter 18.390, using approval criteria in 18.370.020.C.2.

Response: Section 18.715 is addressed below.

18.510.050 Development Standards

A. Compliance required. All development must comply with:

1. All of the applicable development standards contained in the underlying zoning district, except where the applicant has obtained variances or adjustments in accordance with Chapters 18.370;

2. All other applicable standards and requirements contained in this title.

B. Development standards. Development standards in residential zoning districts are contained in Table 18.510.2.

TABLE 18.510.2 DEVELOPMENT STANDARDS IN RESIDENTIAL ZONES

STANDARD	R-7
Minimum Lot Size - Detached unit - Duplexes - Attached unit [1]	 5,000 sq. ft. 10,000 sq.ft. 5,000 sq.ft.
Average Minimum Lot Width - Detached unit lots - Duplex lots - Attached unit lots	 50 ft. 50 ft. 40 ft.
Maximum Lot Coverage	80% [2]
Minimum Setbacks - Front yard - Side facing street on corner & through lots - Side yard - Rear yard - Side or rear yard abutting more restrictive zoning district - Distance between property line and front of garage	 15 ft. 10 ft. 5 ft. 15 ft. 30 ft. 20 ft.
Maximum Height	35 ft.
Minimum Landscape Requirement	20%

STANDARD	R-12	
	MF DU*	SF DU**
Minimum Lot Size Detached unit Attached unit Duplexes Boarding, lodging, rooming house	 3,050 sq.ft. per unit	 3,050 sq.ft. per unit
Average Lot Width	None	None
Minimum Setbacks - Front yard - Side facing street on corner & through lots - Side yard - Rear yard - Side or rear yard abutting more restrictive zoning district - Distance between property line and garage entrance	 20 ft. 20 ft. 10 ft. 20 ft. 30 ft. 20 ft.	 15 ft. 10 ft. 5 ft. [1] 15 ft. 30 ft. 20 ft.
Maximum Height	35 ft.	35 ft.
Maximum Lot Coverage [2]	80%	80%
Minimum Landscape Requirement	20%	20%

[1] Except this shall not apply to attached units on the lot line on which the units are attached.

[2] Lot coverage includes all buildings and impervious surfaces.

* Multiple-family dwelling unit

** Single-family dwelling unit

Response: The proposed subdivision application provides a variety of lot sizes as permitted by the lot averaging provision of TDC 18.420.D, varying from 2,616 square feet to 8,613 square feet. The average R-7 lot size is 5,059 square feet which exceeds the minimum average R-7 lot size of 5,000 square feet. The average R-12 lot size is 3,193 square feet which exceeds the minimum average R-12 lot size of 3,050 square feet. Only single family detached homes are proposed, which is an allowed use in both the R-7 and the R-12 zones. The proposed setbacks match the R-7 and R-12 standards as shown on the Building Setback Plan on Sheet 4 of Exhibit A. Average lot width does not apply when lot size averaging is used per DIR2013-00002. This criterion is met.

Chapter 18.705 ACCESS, EGRESS, AND CIRCULATION

18.705.020 Applicability of Provisions

A. When provisions apply. The provisions of this chapter shall apply to all development including the construction of new structures, the remodeling of existing structures (see Section 18.360.050), and to a change of use which increases the on-site parking or loading requirements or which changes the access requirements.

B. Change or enlargement of use. Should the owner or occupant of a lot or building change or enlarge the use to which the lot or building is put, thereby increasing access and egress requirements, it is unlawful and is a violation of this title to begin or maintain such altered use until the provisions of this chapter have been met if required or until the appropriate approval authority has approved the change.

C. When site design review is not required. Where the provisions of Chapter 18.360, Site Development Review, do not apply, the Director shall approve, approve with conditions, or deny an access plan submitted under the provisions of this chapter in conjunction with another permit or land use action.

D. Conflict with subdivision requirements. The requirements and standards of this chapter shall not apply where they conflict with the subdivision rules and standards of this title.

Response: As a Type III-PC Preliminary Plat application, this review is subject to the standards of this section. Detailed findings are provided below.

18.705.030 General Provisions

A. Continuing obligation of property owner. The provisions and maintenance of access and egress stipulated in this title are continuing requirements for the use of any structure or parcel of real property in the City.

Response: All access is available from public right-of-way with continuous access.

B. Access plan requirements. No building or other permit shall be issued until scaled plans are presented and approved as provided by this chapter that show how access, egress and circulation requirements are to be fulfilled. The applicant shall submit a site plan. The Director shall provide the applicant with detailed information about this submission requirement.

Response: A Preliminary Plat and Site Plan have been provided in Exhibit A. Access for each individual home will be reviewed with the building permit applications.

C. Joint access. Owners of two or more uses, structures, or parcels of land may agree to utilize jointly the same access and egress when the combined access and egress of both uses, structures, or parcels of land satisfies the combined requirements as designated in this title, provided:…

Response: No joint access is proposed; this criterion does not apply.

D. Public street access. All vehicular access and egress as required in Sections 18.705.030.H and 18.705.030.I shall connect directly with a public or private street approved by the City for public use and shall be maintained at the required standards on a continuous basis.

Response: All access is available from public right-of-way with continuous access. Lots 14 and 15 front to SW Hall Boulevard, but driveway access is proposed from an access easement that connects to the public street system.

E. Curb cuts. Curb cuts shall be in accordance with Section 18.810.030.N.

Response: Section 18.810.030.N is addressed later in this narrative.

F. Required walkway location. On-site pedestrian walkways shall comply with the following standards:…

Response: These standards only apply to non-single family detached developments; these criteria do not apply.

G. Inadequate or hazardous access.

1. Applications for building permits shall be referred to the Commission for review when, in the opinion of the Director, the access proposed:

a. Would cause or increase existing hazardous traffic conditions; or

b. Would provide inadequate access for emergency vehicles; or

c. Would in any other way cause hazardous conditions to exist which would constitute a clear and present danger to the public health, safety, and general welfare.

Response: No building permits are requested at this time. This criterion does not apply.

2. Direct individual access to arterial or collector streets from single-family dwellings and duplex lots shall be discouraged. Direct access to collector or arterial streets shall be considered only if there is no practical alternative way to access the site. If direct access is permitted by the City, the applicant will be required to mitigate for any safety or neighborhood traffic management (NTM) impacts deemed applicable by the City Engineer. This may include, but will not be limited to, the construction of a vehicle turnaround on the site to eliminate the need for a vehicle to back out onto the roadway.

Response: Only single family detached homes are proposed. This criterion does not apply.

3. In no case shall the design of the service drive or drives require or facilitate the backward movement or other maneuvering of a vehicle within a street, other than an alley. Single-family and duplex dwellings are exempt from this requirement.

Response: Only single family detached homes are proposed. This application is exempt from this criterion.

H. Access management.

1. An access report shall be submitted with all new development proposals which verifies design of driveways and streets are safe by meeting adequate stacking needs, sight distance and deceleration standards as set by ODOT, Washington County, the City and AASHTO (depending on jurisdiction of facility.)

Response: Access safety has been reviewed in the Transportation Impact Analysis in Exhibit Q. Staff has expressed concern with the width of SW Ashford Street as it intersects with SW Hall Boulevard. Per the Transportation Impact Analysis in Exhibit Q:

"In addition to the lane configurations on SW Hall Boulevard at the proposed site access, consideration was given to the lane configuration on the new eastbound approach to SW Hall Boulevard. The operational and queueing analysis for this intersection assumed a single, shared lane for all eastbound turning movements. This is an appropriate starting assumption for the cross-section based on the classification of the street as well as the projected traffic volume of fewer than 1,000 vehicles per day on the roadway (actual projected traffic is approximately 760 vehicles per day for this approach). In order to verify that this configuration is sufficient for safe and efficient operation of the intersection, the

projected eastbound queues from the SimTraffic analysis were also considered. Based on the analysis, the 95th percentile queue for this approach during the morning peak hour will be 55 feet, with an average queue of 27 feet. During the evening peak hour, the projected 95th percentile queue is 48 feet, with an average queue of 12 feet. These estimates equate to queues of one to two vehicles during the peak hours. Based on the analysis, the intersection would not significantly benefit from installation of additional lanes."

This review shows that one lane in and one lane out is sufficient to allow the reasonable traffic flow in and out of Heritage Crossing. It should also be noted that northbound traffic from Heritage Crossing is likely to travel north to SW Sattler Street to get a signalized intersection to go north on SW Hall Boulevard. This criterion is met.

2. Driveways shall not be permitted to be placed in the influence area of collector or arterial street intersections. Influence area of intersections is that area where queues of traffic commonly form on approach to an intersection. The minimum driveway setback from a collector or arterial street intersection shall be 150 feet, measured from the right-of-way line of the intersecting street to the throat of the proposed driveway. The setback may be greater depending upon the influence area, as determined from City Engineer review of a traffic impact report submitted by the applicant's traffic engineer. In a case where a project has less than 150 feet of street frontage, the applicant must explore any option for shared access with the adjacent parcel. If shared access is not possible or practical, the driveway shall be placed as far from the intersection as possible.

Response: No driveways are proposed within 150 feet of SW Hall Boulevard. This criterion is met.

3. The minimum spacing of driveways and streets along a collector shall be 200 feet. The minimum spacing of driveways and streets along an arterial shall be 600 feet.

Response: No access is proposed along any collector streets. SW Hall Boulevard is classified as an arterial street by Tigard. The proposed local street access of SW Ashford Lane is approximately 720 feet from the centerline of SW Sattler Street and 720 feet from SW Hamlet Street. The access is only 320 feet from SW Langtree Street on the east side of SW Hall Boulevard, but this is an existing access spacing established with SW Ashford Street and SW Langtree Street were constructed on the east side of SW Hall Boulevard.

4. The minimum spacing of local streets along a local street shall be 125 feet.

Response: All proposed local street intersections have a minimum separation of 129 feet curb to curb, which exceeds the minimum separation standard of 125 feet; this criterion is met.

I. Minimum access requirements for residential use.

1. Vehicular access and egress for single-family, duplex or attached single-family dwelling units on individual lots and multifamily residential uses shall not be less than as provided in Tables 18.705.1 and 18.705.2;

TABLE 18.705.1 VEHICULAR ACCESS/EGRESS REQUIREMENTS: RESIDENTIAL USE (SIX OR FEWER UNITS)

Number Dwelling Unit/Lots	Minimum Number of Driveways Required	Minimum Access Width	Minimum Pavement Width
1 or 2	1	15'	10'

3-6	1	20'	20'

Response: Lots 14 and 15 have frontage on SW Hall Boulevard but take access from a 15 foot paved drive in a 20 foot wide access easement. This exceeds the standards of this section. Lots 4 and 33 are both flag lots; both flag poles have 25 feet of frontage on the public street, which meets this standard.

2. **Vehicular access to multifamily structures shall be brought to within 50 feet of the ground floor entrance or the ground floor landing of a stairway, ramp, or elevator leading to the dwelling units;**

Response: No multifamily structures are proposed; this criterion does not apply.

3. **Private residential access drives shall be provided and maintained in accordance with the provisions of the Uniform Fire Code;**

Response: Lots 14 and 15 take access from a shared access drive, and has been designed to comply with the Uniform Fire Code. This criterion is met.

4. **Access drives in excess of 150 feet in length shall be provided with approved provisions for the turning around of fire apparatus by one of the following:**
   a. **A circular, paved surface having a minimum turn radius measured from center point to outside edge of 35 feet;**
   b. **A hammerhead-configured, paved surface with each leg of the hammerhead having a minimum depth of 40 feet and a minimum width of 20 feet;**
   c. **The maximum cross slope of a required turnaround is five percent.**

Response: The only proposed access drive is 78 feet long. No access drives in excess of 150 feet are proposed; this criterion does not apply.

5. **Vehicle turnouts, (providing a minimum total driveway width of 24 feet for a distance of at least 30 feet), may be required so as to reduce the need for excessive vehicular backing motions in situations where two vehicles traveling in opposite directions meet on driveways in excess of 200 feet in length;**

Response: Lots 14 and 15 contain the only access drive which is only 78 feet in length. No turnouts are needed.

6. **Where permitted, minimum width for driveway approaches to arterials or collector streets shall be no less than 20 feet so as to avoid traffic turning from the street having to wait for traffic exiting the site.**

Response: No driveway access is proposed onto a collector or arterial street. Lots 14 through 24 will only have vehicle access from the local street to the west; this criterion does not apply.

J. **Minimum access requirements for commercial and industrial use….**

Response: No commercial or industrial uses are proposed; this criterion does not apply.

K. **One-way vehicular access points. Where a proposed parking facility indicates only one-way traffic flow on the site, it shall be accommodated by a specific driveway serving the facility; the entrance drive shall be situated closest to oncoming traffic and the exit drive shall be situated farthest from oncoming traffic.**

Response: No parking facilities are proposed; this criterion does not apply.

L. **Director's authority to restrict access. The Director has the authority to restrict access when the need to do so is dictated by one or more of the following conditions:…**

Response: There is no need to restrict access for Heritage Crossing.

Chapter 18.715 DENSITY COMPUTATIONS

18.715.020 Density Calculation

A. **Definition of net development area. Net development area, in acres, shall be determined by subtracting the following land area(s) from the total site acres:**

1. **All sensitive land areas:**
   - a. **Land within the 100-year floodplain,**
   - b. **Land or slopes exceeding 25%,**
   - c. **Drainage ways, and**
   - d. **Wetlands,**
   - e. **Optional: Significant tree groves or habitat areas, as designated on the City of Tigard "Significant Tree Grove Map" or "Significant Habitat Areas Map";**
2. **All land dedicated to the public for park purposes;**
3. **All land dedicated for public rights-of-way. When actual information is not available, the following formulas may be used:**
   - a. **Single-family development: allocate 20% of gross acreage,**
   - b. **Multifamily development: allocate 15% of gross acreage or deduct the actual private drive area;**
4. **All land proposed for private streets; and**
5. **A lot of at least the size required by the applicable base zoning district, if an existing dwelling is to remain on the site.**

Response: As shown in the density calculations below, the net developable area has been determined by deducting the public rights-of-way. No other subtractions are necessary.

B. **Calculating maximum number of residential units. To calculate the maximum number of residential units per net acre, divide the number of square feet in the net acres by the minimum number of square feet required for each lot in the applicable zoning district.**

Response: Density calculations for the minimum and maximum densities are shown below for the proposed combination of R-7 and R-12 zones.

C. **Calculating minimum number of residential units. As required by Section 18.510.040, the minimum number of residential units per net acre shall be calculated by multiplying the maximum number of units determined in subsection B above by 80% (0.8).**

Response: Density calculations for the minimum and maximum densities for the R-7 and R-12 zones are shown below:

R-7

Gross Area:	262,621 sf
25%+ Slopes:	0 sf
Right-of-way Dedication:	65,896 sf
Net Buildable Area:	196,725 sf

Maximum Density = 196,725 net sf / 5,000 sf = 39.35 lots = 39 lots
Minimum Density = 39 maximum density x 80% = 31.2 lots = 32 lots

The proposed R-7 density of 35 lots falls between the minimum and maximum allowed density for this property under the R-7 zone. This criterion is met.

R-12

Gross Area:	133,902 sf
25%+ Slopes:	0 sf
Right-of-way Dedication:	47,684 sf
Net Buildable Area:	86,218 sf

Maximum Density = 86,218 net sf / 3,050 sf = 28.27 lots = 28 lots
Minimum Density = 28 maximum density x 80% = 22.4 lots = 22 lots

The proposed R-12 density of 27 lots falls between the minimum and maximum allowed density for this property under the R-12 zone. This criterion is met.

18.715.030 Residential Density Transfer

A. Rules governing residential density transfer.

1. **The units per acre calculated by subtracting land areas listed in Section 18.715.020.A.1.a—c from the gross acres may be transferred to the remaining buildable land areas subject to the following limitations:**
   a. **The number of units which can be transferred is limited to the number of units which would have been allowed on 25% of the unbuildable area if not for these regulations; and**
   b. **The total number of units per site does not exceed 125% of the maximum number of units per gross acre permitted for the applicable comprehensive plan designation.**
2. **Wetlands. Units per acre calculated by subtracting land areas listed in Section 18.715.020.A.1.d from the gross acres may be transferred to the remaining buildable land areas on land zoned R-12, R-25, and R-40 subject to the following limitations:**
   a. **The number of units which can be transferred is limited to the number of units which would have been allowed on the wetland area, if not for these regulations;**
   b. **The total number of units per site does not exceed the maximum number of units per gross acre permitted for the applicable comprehensive plan designation.**

B. Underlying development standards. All density transfer development proposals shall comply with the development standards of the applicable underlying zoning district unless developed under the provisions of Chapter 18.350, Planned Development.

Response: No density transfers are proposed. As shown in the density calculations above, there are no sensitive lands to remove from the buildable land calculation. This criterion does not apply.

Chapter 18.730 EXCEPTIONS TO DEVELOPMENT STANDARDS

18.730.050 Miscellaneous Requirements and Exceptions

E. Lot area for flag lots.

1. The lot area for a flag lot shall comply with the lot area requirements of the applicable zoning district.
2. The lot area shall be provided entirely within the building site area exclusive of any accessway (see figure following).

F. Front yard determination. The owner or developer of a flag lot may determine the location of the front yard, provided no side yard setback area is less than 10 feet and provided the requirements of 18.730.010.C, Building Heights and Flag Lots, are satisfied.

Response: The two proposed flag lots are the two largest lots and meet the minimum lot size requirements even with the area of the 'flag pole' removed. Setbacks are shown for these lots per these standards including ten foot side yard setbacks. This criterion is met.

Chapter 18.745 LANDSCAPING AND SCREENING

18.745.020 Applicability

A. Applicability. The provisions of this chapter shall apply to all development that requires a Type I conditional use minor modification, a Type I site development review minor modification, any Type II land use review or any Type III land use review unless otherwise specified in any of the sections below.

B. When urban forestry plan requirements concurrently apply. When the provisions of Chapter 18.790, Urban Forestry Plan, concurrently apply, any trees required by this chapter shall be included in the urban forestry plan and subject to all of the requirements in Chapter 18.790.

C. Site plan requirements. The applicant shall submit a site plan. The director shall provide the applicant with detailed information about this submission requirement.

Response: As a Type III-PC application, this section is applicable. See findings below.

18.745.030 General Provisions

A. Maintenance responsibility. Unless otherwise provided by the lease agreement, the owner, tenant and his or her agent, if any, shall be jointly and severally responsible for the ongoing maintenance of all landscaping and screening used to meet the requirements of this chapter according to applicable industry standards.

Response: Individual homeowners will be responsible for the maintenance of landscaping on individual lots. Maintenance of common areas will be the responsibility of the Homeowners association.

B. Installation requirements. The installation of all landscaping and screening required by this chapter shall be as follows:

1. All landscaping and screening shall be installed according to applicable industry standards;
2. All plants shall be of high grade, and shall meet the size and grading standards of the American Standards for Nursery Stock (ANSI Z60, 1-2004, and any future revisions); and
3. All landscaping and screening shall be installed in accordance with the provisions of this title.

Response: Installation of landscape materials will follow industry standards and will be specified on the construction documents.

C. Certificate of occupancy. Certificates of occupancy shall not be issued unless the requirements of this chapter have been met or other arrangements have been made and approved by the city such as the posting of a bond.

Response: The City will not issue certificates of occupancy until all requirements are met.

D. Protection of existing plants. Existing plants on a site shall be protected as follows:

1. **The developer shall provide methods for the protection of existing plants to remain during the construction process;**
2. **The plants to remain shall be noted on the landscape plans (i.e., plants to remain can be shown as protected with fencing); and**
3. **The tree protection provisions outlined in Chapter 18.790 and the Urban Forestry Manual shall apply to the land use review types identified in Section 18.790.020.A.**

Response: Sheet 5 in Exhibit A identifies all trees that are proposed to be protected and those proposed for removal. Tree protection measures are also outlined on that sheet consistent with Tigard standards. This plan has been prepared by a certified arborist who will be on-site during construction to inspect the protection measures.

E. Ongoing tree-related rules and regulations. Any trees used to meet the requirements of this chapter shall be subject to all applicable tree-related rules and regulations in other chapters and titles of the Tigard Municipal Code and Tigard Development Code.

Response: All landscaping trees will be subject to City regulations.

18.745.040 Street Tree Standards

A. Street trees shall be required as part of the approval process for conditional use (Type III), downtown design review (Type II and III), minor land partition (Type II), planned development (Type III), site development review (Type II) and subdivision (Type II and III) permits.

Response: Street trees have been proposed as shown on Sheet 13 of Exhibit A. This criterion is met.

B. The minimum number of required street trees shall be determined by dividing the linear amount of street frontage within or adjacent to the site (in feet) by 40 feet. When the result is a fraction, the minimum number of required street trees shall be determined by rounding to the nearest whole number.

Response: Street trees have been proposed as shown on Sheet 13 of Exhibit A. The project contains approximately 4,387 linear feet of street frontage. This would require a minimum of 110 street trees, and 99 street trees have been provided. The new Urban Forestry Plan requires street trees of a greater stature and there is not room to provide the full 111 street trees per this code section. With the conflict in the standard, the more restrictive Urban Tree Code controls. Per Section 18.745.040.G, a fee-in-lieu will be required for the 11 trees that cannot fit on the property.

C. Street trees required by this section shall be planted according to the street tree planting standards in the Urban Forestry Manual.

Response: Street trees have been proposed as shown on Sheet 13 of Exhibit A. Street planting specifications have been outlined in the Supplemental Arborist Report (Exhibit J). This criterion is met.

D. Street trees required by this section shall be provided adequate soil volumes according to the street tree soil volume standards in the Urban Forestry Manual.

Response: Soil volumes have been shown on the table of Sheet 14 of Exhibit A. Over 500 cubic yards of soil have been provided for all proposed trees and over 1,000 cubic yards have been provided for the one existing tree. This criterion is met.

E. Street trees required by this section shall be planted within the right-of-way whenever practicable according to the street tree planting standards in the Urban Forestry Manual. Street trees may be planted no more than six feet from the right-of-way according to the street tree planting standards in the Urban Forestry Manual when planting within the right-of-way is not practicable.

Response: All proposed street trees have been located within the public right-of-way. This criterion is met.

F. An existing tree may be used to meet the street tree standards provided that:

1. **The largest percentage of the tree trunk immediately above the trunk flare or root buttresses is either within the subject site or within the right-of-way immediately adjacent to the subject site;**
2. **The tree would be permitted as a street tree according to the street tree planting and soil volume standards in the Urban Forestry Manual if it were newly planted; and**
3. **The tree is shown as preserved in the tree preservation and removal site plan (per Section 18.790.030.A.2), tree canopy cover site plan (per Section 18.790.030.A.3) and supplemental report (per Section 18.790.030.A.4) of a concurrent urban forestry plan and is eligible for credit towards the effective tree canopy cover of the site.**

Response: No existing trees are proposed to be considered as street trees; this criterion does not apply.

G. In cases where it is not practicable to provide the minimum number of required street trees, the director may allow the applicant to remit payment into the urban forestry fund for tree planting and early establishment in an amount equivalent to the city's cost to plant and maintain a street tree for three years (per the street tree planting standards in the Urban Forestry Manual) for each tree below the minimum required.

Response: As shown above, this application cannot accommodate the minimum number of Street Trees. Therefore, a fee-in-lieu will be required for the 11 trees that cannot fit on the property.

18.745.050 Buffering and Screening

A. General provisions.

1. **It is the intent that these requirements shall provide for privacy and protection and reduce or eliminate the adverse impacts of visual or noise pollution at a development site, without unduly interfering with the view from neighboring properties or jeopardizing the safety of pedestrians and vehicles.**
2. **Buffering and screening is required to reduce the impacts on adjacent uses which are of a different type in accordance with the matrices in this chapter (Tables 18.745.1 and 18.745.2). The owner of each proposed development is responsible for the installation and effective maintenance of buffering and screening. When different uses would be abutting one another except for separation by a right-of-way, buffering, but not screening, shall be required as specified in the matrix.**
3. **In lieu of these standards, a detailed buffer area landscaping and screening plan may be submitted for the director's approval as an alternative to the**

buffer area landscaping and screening standards, provided it affords the same degree of buffering and screening as required by this code.

B. Buffering and screening requirements.

1. A buffer consists of an area within a required setback adjacent to a property line and having a depth equal to the amount specified in the buffering and screening matrix and containing a length equal to the length of the property line of the abutting use or uses.

Response: Per the Buffer Matrix, single family detached development must provide a Type A buffer when adjacent to an arterial street. Lots 14 through 24 will be required to provide a ten foot buffer of lawn or living groundcover. The rear yard setback along these lots is 15 feet, which exceeds the minimum 10 foot buffer. This criterion is met.

2. A buffer area may only be occupied by utilities, screening, sidewalks and bikeways, and landscaping. No buildings, accessways or parking areas shall be allowed in a buffer area except where an accessway has been approved by the city.

Response: As noted previously, the rear yard setback along lots 14 through 24 is 15 feet, which exceeds the minimum ten foot buffer. No buildings, parking, or accessways will be permitted in this area. This criterion is met.

3. A fence, hedge or wall, or any combination of such elements, which are located in any yard is subject to the conditions and requirements of subsections B.8 and D of this section.

Response: Individual homeowners may request private fences along the rear yards of Lots 14 through 21. Fences will be constructed to City standards, and will typically be six foot tall wood fences. This criterion is met.

4. The minimum improvements within a buffer area shall consist of combinations for landscaping and screening as specified in Table 18.745.1. In addition, improvements shall meet the following specifications:…

Response: A Type A buffer requires ten feet of grass or groundcover. No other improvements outlined in this section apply.

5. Where screening is required the following standards shall apply in addition to those required for buffering:…

Response: No screening is required for a Type A buffer; this criterion does not apply.

6. Buffering and screening provisions shall be superseded by the vision clearance requirements as set forth in Chapter 18.795.

Response: No screening is required for a Type A buffer; this criterion does not apply.

7. When the use to be screened is downhill from the adjoining zone or use, the prescribed heights of required fences, walls, or landscape screening shall be measured from the actual grade of the adjoining property. In this case, fences and walls may exceed the permitted six-foot height at the discretion of the director as a condition of approval. When the grades are so steep so as to make the installation of walls, fences or landscaping to the required height impractical, a detailed landscape/screening plan shall be submitted for approval….

Response: No screening is required for a Type A buffer; this criterion does not apply.

8. **Fences and Walls.**

   a. **Fences and walls shall be constructed of any materials commonly used in the construction of fences and walls such as wood, stone, rock or brick, or otherwise acceptable by the director;**

   b. **Such fence or wall construction shall be in compliance with other city regulations;**

   c. **Walls shall be a minimum of six inches thick; and**

   d. **Chain link fences with slats shall qualify for screening; however, chain link fences without slats shall require the planting of a continuous evergreen hedge to be considered screening.**

Response: Individual homeowners may request private fences along the rear yards of Lots 14 through 24. Fences will be constructed to City standards, and will typically be six foot tall wood fences. This criterion is met.

9. **Hedges.**

   a. **An evergreen hedge or other dense evergreen landscaping may satisfy a requirement for a sight-obscuring fence where required subject to the height requirement in subsections C.2.a and C.2.b of this section;**

   b. **Such hedge or other dense landscaping shall be properly maintained and shall be replaced with another hedge, other dense evergreen landscaping, or a fence when it ceases to serve the purpose of obscuring view; and**

   c. **No hedge shall be grown or maintained at a height greater than that permitted by these regulations for a fence or wall in a vision clearance area as set forth in Chapter 18.795.**

Response: No screening is required for a Type A buffer; this criterion does not apply.

C. **Setbacks for fences or walls.**

1. **No fence or wall shall be constructed which exceeds the standards in paragraph 2 of this subsection C except when the approval authority, as a condition of approval, allows that a fence or wall be constructed to a height greater than otherwise permitted to mitigate against potential adverse effects.**

2. **Fences or Walls.**

   a. **May not exceed three feet in height in a required front yard along local streets or eight feet in all other locations and, in all other cases, shall meet vision clearance area requirements in Chapter 18.795;**

   b. **Are permitted up to six feet in height in front yards adjacent to any designated arterial or collector street. For any fence over three feet in height in the required front yard area, permission shall be subject to administrative review of the location of the fence or wall.**

3. **All fences or walls shall meet vision clearance area requirements in Chapter 18.795.**

4. **All fences or walls greater than six feet in height shall be subject to building permit approval.**

Response: Individual homeowners may request private fences along the rear and side yards of Lots 14 through 24. Fences will be constructed to City standards, and will typically be six foot tall wood fences. This criterion is met.

D. **Height restrictions.**

1. **The prescribed heights of required fences, walls or landscaping shall be measured from the actual adjoining level of finished grade, except that where parking, loading, storage or similar areas are located above finished grade, the height of fences, walls or landscaping required to screen such areas or space shall be measured from the level of such improvements.**
2. **An earthen berm and fence or wall combination shall not exceed the six-foot height limitation for screening.**

Response: All fences will be measured per City standard.

E. Screening: special provisions.

1. **Screening and landscaping of parking and loading areas:…**
2. **Screening of service facilities. Except for one-family and two-family dwellings, any refuse container or disposal area and service facilities such as gas meters and air conditioners which would otherwise be visible from a public street, customer or resident parking area, any public facility or any residential area shall be screened from view by placement of a solid wood fence or masonry wall between five and eight feet in height. All refuse materials shall be contained within the screened area.**
3. **Screening of swimming pools. All swimming pools shall be enclosed as required by the State Building Code.**
4. **Screening of refuse containers. Except for one- and two-family dwellings, any refuse container or refuse collection area which would be visible from a public street, parking lot, residential or commercial area, or any public facility such as a school or park shall be screened or enclosed from view by placement of a solid wood fence, masonry wall or evergreen hedge. All refuse shall be contained within the screened area.**

Response: None of these special provisions apply; this criterion does not apply.

F. Buffer matrix.

1. **The buffer matrices contained in Tables 18.745.1 and 18.745.2 shall be used in calculating widths of buffering/screening and required improvements to be installed between proposed uses and abutting uses or zoning districts.**
2. **An application for a variance to the standards required in Tables 18.745.1 and 18.745.2, shall be processed as a Type II procedure, as regulated by Section 18.390.040, using approval criteria in Section 18.370.010.**

Response: Per the Buffer Matrix, single family detached development must provide a Type A buffer when adjacent to an arterial street. Lots 14 through 24 will be required to provide a 10 foot buffer of lawn or living groundcover. The rear yard setback along these lots is 15 feet, which exceeds the minimum ten foot buffer. This criterion is met.

18.745.060 Re-vegetation

A. **When re-vegetation is required. Where natural vegetation has been removed through grading in areas not affected by the landscaping and screening requirements and that are not to be occupied by structures, such areas are to be replanted as set forth in this section to prevent erosion after construction activities are completed.**

B. **Preparation for re-vegetation. Topsoil removed from the surface in preparation for grading and construction is to be stored on or near the sites and protected from erosion while grading operations are underway; and**

1. **Such storage shall be located consistent with an approved urban forestry plan per Chapter 18.790 or outside the tree canopy driplines of trees intended to be preserved in cases when there is no approved urban forestry plan; and**

2. After completion of such grading, the topsoil is to be restored to exposed cut and fill embankments or building pads to provide a suitable base for seeding and planting.

C. Methods of re-vegetation. Acceptable methods of re-vegetation include hydro-mulching or the planting of rye grass, barley, or other seed with equivalent germination rates, and:

1. Where lawn or turf grass is to be established, lawn grass seed or other appropriate landscape cover is to be sown at not less than four pounds to each 1,000 square feet of land area;
2. Other re-vegetation methods offering equivalent protection may be approved by the approval authority;
3. Plant materials are to be watered at intervals sufficient to ensure survival and growth; and
4. The use of native plant materials is encouraged to reduce irrigation and maintenance demands.

Response: All areas of mass grading will be reseeded as required by Clean Water Services erosion control standards. After home construction, yards will be landscaped.

Chapter 18.765 OFF-STREET PARKING AND LOADING REQUIREMENTS

18.765.020 Applicability of Provisions

A. New construction. At the time of the erection of a new structure within any zoning district, offstreet vehicle parking will be provided in accordance with Section 18.765.070….

Response: Heritage Crossing is a new subdivision and subject to the provisions of TDC 18.765. Findings are provided below.

18.765.030 General Provisions

A. Vehicle parking plan requirements. No building or other permit shall be issued until scaled plans are presented and approved as provided by this chapter that show how access, egress and circulation requirements are to be fulfilled. The applicant shall submit a site plan. The Director shall provide the applicant with detailed information about this submission requirement.

B. Location of vehicle parking. The location of off-street parking will be as follows:

1. Off-street parking spaces for single-family and duplex dwellings and single-family attached dwellings shall be located on the same lot with the dwelling(s)….

Response: Heritage Crossing proposes only single family detached homes. Each home will contain a minimum of a two car garage with driveway parking for two additional vehicles. This criterion is met.

C. Joint parking. Owners of two or more uses, structures or parcels of land may agree to utilize jointly the same parking and loading spaces when the peak hours of operation do not overlay, subject to the following:

1. The size of the joint parking facility shall be at least as large as the number of vehicle parking spaces required by the larger(est) use per Section 18.765.070;
2. Satisfactory legal evidence shall be presented to the Director in the form of deeds, leases or contracts to establish the joint use;
3. If a joint use arrangement is subsequently terminated, or if the uses change, the requirements of this title thereafter apply to each separately.

Response: No joint parking is proposed; this criterion does not apply.

D. **Parking in mixed-use projects. In mixed-use projects, the required minimum vehicle parking shall be determined using the following formula:…**

Response: Heritage Crossing is not a mixed-use project; this criterion does not apply.

E. **Visitor parking in multifamily residential developments. Multi-dwelling units with more than 10 required parking spaces shall provide an additional 15% of vehicle parking spaces above the minimum required for the use of guests of residents of the complex. These spaces shall be centrally located or distributed throughout the development. Required bicycle parking facilities shall also be centrally located within or evenly distributed throughout the development.**

Response: Heritage Crossing is not a multi-family project; this criterion does not apply.

F. **Preferential long-term carpool/vanpool parking. Parking lots providing in excess of 20 long-term parking spaces shall provide preferential long-term carpool and vanpool parking for employees, students and other regular visitors to the site. At least five percent of total long-term parking spaces shall be reserved for carpool/vanpool use. Preferential parking for carpools/vanpools shall be closer to the main entrances of the building than any other employee or student parking except parking spaces designated for use by the disabled. Preferential carpool/vanpool spaces shall be full-sized per requirements in Section 18.765.040.N and shall be clearly designated for use only by carpools and vanpools between 7:00 AM and 5:30 PM Monday through Friday.**

Response: No parking lots are proposed; this criterion does not apply.

G. **Disabled-accessible parking. All parking areas shall be provided with the required number of parking spaces for disabled persons as specified by the State Building Code and federal standards. Such parking spaces shall be sized, signed and marked as required by these regulations.**

Response: Each house plan will be reviewed for compliance with accessibility during building permit review.

H. **DEQ indirect source construction permit. All parking lots containing 250 spaces or parking structures containing two or more levels shall require review by the Oregon Department of Environmental Quality (DEQ) to:**

1. **Acquire an Indirect Source Construction Permit;**
2. **Investigate the feasibility of installing oil and grease separators.**

Response: No parking lots are proposed; this criterion does not apply.

18.765.040 General Design Standards

A. **Maintenance of parking areas. All parking lots shall be kept clean and in good repair at all times. Breaks in paved surfaces shall be repaired promptly and broken or splintered wheel stops shall be replaced so that their function will not be impaired.**

Response: No parking lots are proposed; this criterion does not apply.

B. **Access drives. With regard to access to public streets from off-street parking:**

1. **Access drives from the street to off-street parking or loading areas shall be designed and constructed to facilitate the flow of traffic and provide maximum safety for pedestrian and vehicular traffic on the site;**
2. **The number and size of access drives shall be in accordance with the requirements of Chapter 18.705, Access, Egress and Circulation;**

3. **Access drives shall be clearly and permanently marked and defined through use of rails, fences, walls or other barriers or markers on frontage not occupied by service drives;**
4. **Access drives shall have a minimum vision clearance in accordance with Chapter 18.795, Visual Clearance;**
5. **Access drives shall be improved with an asphalt, concrete, or pervious paving surface. Any pervious paving surface must be designed and maintained to remain well-drained; and**
6. **Excluding single-family and duplex residences, except as provided by Subsection 18.810.030.P, groups of two or more parking spaces shall be served by a service drive so that no backing movements or other maneuvering within a street or other public right-of-way will be required.**

Response: All driveways will be constructed of concrete, subject to vision clearance standards, and subject to separation standards from adjacent intersections; this criterion will be met during building permit review.

C. **Loading/unloading driveways. A driveway designed for continuous forward flow of passenger vehicles for the purpose of loading and unloading passengers shall be located on the site of any school or other meeting place which is designed to accommodate more than 25 people at one time.**

Response: No loading zones are proposed; this criterion does not apply.

D. **On-site vehicle stacking for drive-in use….**

Response: No drive-ins are proposed; this criterion does not apply.

E. **Curb cuts. Curb cuts shall be in accordance with Section 18.810.030.N.**

Response: Section 18.810.030.N is addressed in this narrative.

F. **Pedestrian access. Pedestrian access through parking lots shall be provided in accordance with Section 18.705.030.F. Where a parking area or other vehicle area has a drop-off grade separation, the property owner shall install a wall, railing, or other barrier which will prevent a slow-moving vehicle or driverless vehicle from escaping such area and which will prevent pedestrians from walking over drop-off edges.**

Response: No parking lots are proposed; this criterion does not apply.

G. **Parking lot landscaping. Parking lots shall be landscaped in accordance with the requirements of Chapter 18.745.**

Response: No parking lots are proposed; this criterion does not apply.

H. **Parking space surfacing….**

Response: No parking lots are proposed; this criterion does not apply.

I. **Parking lot striping….**

Response: No parking lots are proposed; this criterion does not apply.

J. **Wheel stops. Parking spaces along the boundaries of a parking lot or adjacent to interior landscaped areas or sidewalks shall be provided with a wheel stop at least four inches high located three feet back from the front of the parking stall. The front three feet of the parking stall may be concrete, asphalt or low lying landscape material that does not**

exceed the height of the wheel stop. This area cannot be calculated to meet landscaping or sidewalk requirements.

Response: No parking lots are proposed; this criterion does not apply.

K. Drainage. Off-street parking and loading areas shall be drained in accordance with specifications approved by the City Engineer to ensure that ponds do not occur except for single-family and duplex residences, off-street parking and loading facilities shall be drained to avoid flow of water across public sidewalks.

Response: Heritage Crossing proposes only single family detached homes, and is exempt from this criterion.

L. Lighting. A lights providing to illuminate any public or private parking area or vehicle sales area shall be arranged to direct the light away from any adjacent residential district.

Response: No parking lots are proposed; this criterion does not apply.

M. Signs. Signs which are placed on parking lots shall be designed and installed in accordance with Chapter 18.780, Signs.

Response: No parking lots are proposed; this criterion does not apply.

N. Space and aisle dimensions. (Figure 18.765.1)

Response: No parking lots are proposed; this criterion does not apply.

18.765.050 Bicycle Parking Design Standards

A. Location and access. With regard to the location and access to bicycle parking:

1. Bicycle parking areas shall be provided at locations within 50 feet of primary entrances to structures;
2. Bicycle parking areas shall not be located within parking aisles, landscape areas or pedestrian ways;
3. Outdoor bicycle parking shall be visible from on-site buildings and/or the street. When the bicycle parking area is not visible from the street, directional signs shall be used to located the parking area;
4. Bicycle parking may be located inside a building on a floor which has an outdoor entrance open for use and floor location which does not require the bicyclist to use stairs to gain access to the space. Exceptions may be made to the latter requirement for parking on upper stories within a multi-story residential building.

B. Covered parking spaces.

1. When possible, bicycle parking facilities should be provided under cover.
2. Required bicycle parking for uses served by a parking structure must provide for covered bicycle parking unless the structure will be more than 100 feet from the primary entrance to the building, in which case, the uncovered bicycle parking may be provided closer to the building entrance.

C. Design requirements. The following design requirements apply to the installation of bicycle racks:

1. The racks required for required bicycle parking spaces shall ensure that bicycles may be securely locked to them without undue inconvenience. Provision of bicycle lockers for longterm (employee) parking is encouraged but not required;
2. Bicycle racks must be securely anchored to the ground, wall or other structure;

3. Bicycle parking spaces shall be at least 2½ feet by six feet long, and, when covered, with a vertical clearance of seven feet. An access aisle of at least five feet wide shall be provided and maintained beside or between each row of bicycle parking;
4. Each required bicycle parking space must be accessible without moving another bicycle;
5. Required bicycle parking spaces may not be rented or leased except where required motor vehicle parking is rented or leased. At-cost or deposit fees for bicycle parking are exempt from this requirement;
6. Areas set aside for required bicycle parking must be clearly reserved for bicycle parking only.

D. Paving. Outdoor bicycle parking facilities shall be surfaced with a hard surfaced material, i.e., pavers, asphalt, concrete, other pervious paving surfaces, or similar material. This surface must be designed and maintained to remain well-drained.

E. Minimum bicycle parking requirements. The total number of required bicycle parking spaces for each use is specified in Table 18.768.2 in Section 18.765.070.H. In no case shall there be less than two bicycle parking spaces. Single-family residences and duplexes are excluded from the bicycle parking requirements. The Director may reduce the number of required bicycle parking spaces by means of an adjustment to be reviewed through a Type II procedure, as governed by Section 18.390.040, using approval criteria contained in Section 18.370.020.C.5.e.

Response: Heritage Crossing proposes only single family detached homes and is exempt from this criterion.

18.765.060 Parking Structure Design Standards…

Response: Heritage Crossing proposes only single family detached homes and is exempt from this criterion.

18.765.070 Minimum and Maximum Off-Street Parking Requirements

A. Parking requirements for unlisted uses.

1. The Director may rule that a use, not specifically listed in Section 18.765.070.H, is a use similar to a listed use and that the same parking standards shall apply. If the applicant requests that the Director's decision be rendered in writing, it shall constitute a Director's Interpretation, as governed by Section 18.340.
2. The Director shall maintain a list of approved unlisted use parking requirements which shall have the same effect as an amendment to this chapter.

Response: Per Table 18.765.2, single family detached structures are required to provide a minimum of one vehicle parking space per dwelling unit, and there is no maximum parking provision. This is a listed use, and no Director's Interpretation is required.

B. Choice of parking requirements. When a building or use is planned or constructed in such a manner that a choice of parking requirements could be made, the use which requires the greater number of parking spaces shall govern.

C. Measurements. The following measurements shall be used in calculating the total minimum number of vehicle parking spaces required in Section 18.765.070.H:

1. Fractions. Fractional space requirements shall be counted as a whole space;
2. Employees. Where employees are specified for the purpose of determining the minimum vehicle parking spaces required, the employees counted are those who work on the premises during the largest shift at the peak season;

3. **Students. When students are specified for the purpose of determining the minimum vehicle parking spaces required, the students counted are those who are on the campus during the peak period of the day during a typical school term;**

4. **Space. Unless otherwise specified, where square feet are specified, the area measured shall be gross floor area under the roof measured from the faces of the structure, excluding only space devoted to covered off-street parking or loading.**

D. Exclusions to minimum vehicle parking requirements. The following shall not be counted towards the computation of the minimum parking spaces as required in Section 18.765.070.H:…

Response: No exceptions are requested to the minimum parking requirements; this criterion does not apply.

E. Exceptions to maximum parking standards. When calculating the maximum vehicle parking allowed as regulated by Section 18.765.080.H, the following exception shall apply:…

Response: No exceptions are requested to the maximum parking requirements; this criterion does not apply.

F. Reductions in minimum required vehicle parking. Reductions in the required number of vehicle parking spaces may be permitted as follows:

Response: No exceptions are requested to the minimum parking requirements; this criterion does not apply.

G. Increases in maximum required vehicle parking. The Director may increase the total maximum number of vehicle spaces allowed in Section 18.765.070.H by means of a parking adjustment to be reviewed by means of a Type II procedure, as governed by Section 18.390.040, using approval criteria contained in Section 18.370.020.C.5.d.

Response: No exceptions are requested to the maximum parking requirements; this criterion does not apply.

H. Specific requirements. (See Table 18.765.2)

Response: Per Table 18.765.2, single family detached structures are required to provide a minimum of one vehicle parking space per dwelling unit, and there is no maximum parking provision. This is a listed use, and no Director's Interpretation is required.

I. Developments in the MU-CBD zone. Please see Section 18.610.060, off-street vehicle parking minimum requirements in the MU-CBD zone.

Response: This project is not within the MU-CBD district; this criterion does not apply.

Chapter 18.775 SENSITIVE LANDS

18.775.020 Applicability of Uses—Permitted, Prohibited, and Nonconforming

D. Jurisdictional wetlands. Landform alterations or developments which are only within wetland areas that meet the jurisdictional requirements and permit criteria of the U.S. Army Corps of Engineers, Division of State Lands, CWS, and/or other federal, state, or regional agencies, and are not designated as significant wetlands on the City of Tigard "Wetland and Streams Corridors Map," do not require a sensitive lands permit. The city shall require that all necessary permits from other agencies are obtained. All other

applicable city requirements must be satisfied, including sensitive land permits for areas within the 100-year floodplain, slopes of 25% or greater or unstable ground, drainageways, and wetlands which are not under state or federal jurisdiction.

18.775.050 General Provisions for Wetlands

A. Code compliance requirements. Wetland regulations apply to those areas classified as significant on the City of Tigard "Wetland and Streams Corridors Map," and to a vegetated corridor ranging from 25 to 200 feet wide, measured horizontally, from the defined boundaries of the wetland, per "Table 3.1, Vegetated Corridor Widths," and "Appendix C, Natural Resource Assessments," of the CWS "Design and Construction Standards." Wetland locations may include but are not limited to those areas identified as wetlands in "Wetland Inventory and Assessment for the City of Tigard, Oregon," Fishman Environmental Services, 1994.

Response: Heritage Crossing contains two marginal isolated wetlands. The Applicant has applied to the Oregon Department of State Lands and the US Army Corps of Engineers to fil them and pay for off-site mitigation credits in a registered wetland bank. These wetlands are not identified on the Tigard Local Wetland Inventory map and are not subject to the regulations of a Sensitive Lands Permit.

18.775.070 Sensitive Land Permits

A. Permits required. An applicant, who wishes to develop within a sensitive area, as defined in Chapter 18.775, must obtain a permit in certain situations. Depending on the nature and intensity of the proposed activity within a sensitive area, either a Type II or Type III permit is required, as delineated in Sections 18.775.020.F and G. The approval criteria for various kinds of sensitive areas, e.g., floodplain, are presented in subsections B through E of this section.

Response: Heritage Crossing does not contain any 25% slopes; this criterion does not apply.

B. Within the 100-year floodplain. The hearings officer shall approve, approve with conditions or deny an application request within the 100-year floodplain based upon findings that all of the following criteria have been satisfied:…

Response: Heritage Crossing does not contain any floodplain areas; this criterion does not apply.

C. With steep slopes. The appropriate approval authority shall approve, approve with conditions or deny an application request for a sensitive lands permit on slopes of 25% or greater or unstable ground based upon findings that all of the following criteria have been satisfied:

1. Compliance with all of the applicable requirements of this title;

Response: The provisions of this title have been addressed.

2. The extent and nature of the proposed land form alteration or development will not create site disturbances to an extent greater than that required for the use;

Response: Grading has been limited to areas necessary for the construction of streets, utilities, and driveways. Grading to construct individual houses will be determined once individual house plans have been developed and submitted for each building permit.

3. The proposed land form alteration or development will not result in erosion, stream sedimentation, ground instability, or other adverse on-site and off-site effects or hazards to life or property;

Response: The property is generally flat and will remain so with development which minimizes the risk of erosion or sedimentation. Full erosion control measures will be followed per Clean Water Services standards. The design does not increase the risk of erosion. This criterion is met.

4. **The structures are appropriately sited and designed to ensure structural stability and proper drainage of foundation and crawl space areas for development with any of the following soil conditions: wet/high water table; high shrink-swell capability; compressible/organic; and shallow depth-to-bedrock; and**

Response: As noted above, the property is generally flat and will remain so with development which minimizes the risk of erosion or sedimentation. Building pads and storm water laterals will be provided for the future homes to allow for proper foundation drainage. This criterion is met.

5. **Where natural vegetation has been removed due to land form alteration or development, the areas not covered by structures or impervious surfaces will be replanted to prevent erosion in accordance with Chapter 18.745, Landscaping and Screening.**

Response: As explained in Section 18.745, all disturbed areas will be replanted with grass and vegetation, per the erosion control standards of Clean Water Services.

D. **Within drainageways. The appropriate approval authority shall approve, approve with conditions or deny an application request for a sensitive lands permit within drainageways based upon findings that all of the following criteria have been satisfied:…**

Response: Heritage Crossing does not contain any drainageways; this criterion does not apply.

E. **Within wetlands. The director shall approve, approve with conditions or deny an application request for a sensitive lands permit within wetlands based upon findings that all of the following criteria have been satisfied:**

1. **Compliance with all of the applicable requirements of this title;**
2. **The proposed land form alteration or development is neither on wetland in an area designated as significant wetland on the comprehensive plan floodplain and wetland map nor is within the vegetative corridor established per "Table 3.1 Vegetative Corridor Widths" and "Appendix C: Natural Resources Assessments" of the CWS "Design and Construction Standards," for such a wetland;**
3. **The extent and nature of the proposed land form alteration or development will not create site disturbances to an extent greater than the minimum required for the use;**
4. **Any encroachment or change in on-site or off-site drainage which would adversely impact wetland characteristics have been mitigated;**
5. **Where natural vegetation has been removed due to land form alteration or development, erosion control provisions of the Surface Water Management program of Washington County must be met and areas not covered by structures or impervious surfaces will be replanted in like or similar species in accordance with Chapter 18.745, Landscaping and Screening;**
6. **All other sensitive lands requirements of this chapter have been met;**

7. **The necessary U.S. Army Corps of Engineers and State of Oregon Land Board, Division of State Lands, and CWS approvals shall be obtained;**
8. **The provisions of Chapter 18.790, Tree Removal, shall be met;**
9. **Physical limitations and natural hazards, floodplains and wetlands, natural areas, and parks, recreation and open space policies of the comprehensive plan have been satisfied.**

Response: Heritage Crossing contains two marginal isolated wetlands. The Applicant has applied to the Oregon Department of State Lands and the US Army Corps of Engineers to fill them and pay for off-site mitigation credits in a registered wetland bank. These wetlands are not identified on the Tigard Local Wetland Inventory map and are not subject to the regulations of a Sensitive Lands Permit.

Chapter 18.790 URBAN FORESTRY PLAN

18.790.010 Purpose…

18.790.020 Applicability

The requirements of this chapter apply to the following situations:

A. The following land use reviews:

1. **Conditional use (Type III);**
2. **Downtown design review (Type II and III);**
3. **Minor land partition (Type II);**
4. **Planned development (Type III);**
5. **Sensitive lands review (Type II and III);**
6. **Site development review (Type II); and**
7. **Subdivision (Type II and III).**

B. All Type I modifications to the urban forestry plan component of an approved land use permit as required by Section 18.790.070.

C. For land use projects limited to an existing right-of-way or easement, the development site shall be considered the existing right-of-way or easement and the urban forestry plan requirements shall be limited to the existing right-of-way or easement.

Response: As a Type III-PC Subdivision application, this criteria is applicable.

18.790.030 Urban Forestry Plan Requirements

A. Urban forestry plan requirements. An urban forestry plan shall:

1. **Be coordinated and approved by a landscape architect (the project landscape architect) or a person that is both a certified arborist and tree risk assessor (the project arborist), except for minor land partitions that can demonstrate compliance with effective tree canopy cover and soil volume requirements by planting street trees in open soil volumes only;**
2. **Meet the tree preservation and removal site plan standards in the Urban Forestry Manual;**
3. **Meet the tree canopy site plan standards in the Urban Forestry Manual; and**
4. **Meet the supplemental report standards in the Urban Forestry Manual.**

Response: A certified arborist has prepared the Urban Forestry Plan for Heritage Crossing. Full findings of the tree canopy standards, the tree preservation and removal standards, and the supplemental report standards have been provided on Sheets 13 and 14 of Exhibit A and in the Supplemental Arborist Report in Exhibit J. This criterion is met.

B. Tree canopy fee. If the supplemental report demonstrates that the applicable standard percent effective tree canopy cover will not be provided through any combination of tree planting or preservation for the overall development site (excluding streets) or that the 15% effective tree canopy cover will not be provided through any combination of tree planting or preservation for any individual lot or tract in the R-1, R-2, R-3.5, R-4.5 and R-7 districts (when the overall development site meets or exceeds the standard percent effective tree canopy cover), then the applicant shall provide the city a tree canopy fee according to the methodology outlined in the tree canopy fee calculation requirements in the Urban Forestry Manual.

Response: As shown below and in the Supplemental Arborist Report, this application meets the tree canopy standard; this criterion does not apply.

C. Tree canopy fee use. Tree canopy fees provided to the city shall be deposited into the urban forestry fund and used as approved by council through a resolution.

Response: As shown below and in the Supplemental Arborist Report, this application meets the tree canopy standard; this criterion does not apply.

18.790.040 Discretionary Urban Forestry Plan Review Option…

Response: As shown below and in the Supplemental Arborist Report, this application meets the tree canopy standard; this criterion does not apply.

18.790.050 Flexible Standards for Tree Planting and Preservation…

Response: No flexible design standards are requested; this criterion does not apply.

18.790.060 Urban Forestry Plan Implementation

A. General provisions. An urban forestry plan shall be in effect from the point of land use approval until the director determines all applicable urban forestry plan conditions of approval and code requirements have been met. For subdivisions and partitions, the urban forestry plan shall remain in effect for each resulting lot or tract separately until the director determines all applicable urban forestry plan conditions of approval and code requirements have been met. Prior and subsequent permitting decisions regarding the planting, maintenance, removal and replacement of trees when not associated with one of the land use review types in Section 18.790.020.A shall be administered through Title 8 (Urban Forestry) of the Tigard Municipal Code.

B. Inspections. Implementation of the urban forestry plan shall be inspected, documented and reported by the project arborist or landscape architect whenever an urban forestry plan is in effect. In addition, no person may refuse entry or access to the director for the purpose of monitoring the urban forestry plan on any site with an effective urban forestry plan. The inspection requirements in the Urban Forestry Manual shall apply to sites with an effective urban forestry plan.

C. Tree establishment. The establishment of all trees shown to be planted in the tree canopy site plan (per Section 18.790.030.A.3) and supplemental report (per Section 18.790.030.A.4) of a previously approved urban forestry plan shall

be guaranteed and required according to the tree establishment requirements in the Urban Forestry Manual.

D. Urban forest inventory. Spatial and species specific data shall be collected according to the urban forestry inventory requirements in the Urban Forestry Manual for each open grown tree and area of stand grown trees in the tree canopy site plan (per Section 18.790.030.A.3) and supplemental report (per Section 18.790.030.A.4) of a previously approved urban forestry plan.

Response: The Heritage Crossing Urban Forestry Plan will be implemented as outlined in this Section.

18.790.070 Modification to the Urban Forestry Plan Component of an Approved Land Use Permit

Response: No modifications to the Urban Forestry Plan are requested; this criterion does not apply.

Chapter 18.795 VISUAL CLEARANCE AREAS

18.795.010 Purpose

A. Purpose. The purpose of this chapter is to establish standards which will assure proper sight distances at intersections to reduce the hazard from vehicular turning movements.

18.795.020 Applicability of Provisions

A. When provisions apply. The provisions of this chapter shall apply to all development including the construction of new structures, the remodeling of existing structures and to a change of use which increases the on-site parking or loading requirements or which changes the access requirements.

B. When site development review is not required. Where the provisions of Chapter 18.330, Site Development Review, do not apply, the Director shall approve, approve with conditions, or deny a plan submitted under the provisions of this chapter through a Type I procedure, as governed by Section 18.390.030, using the standards in this chapter as approval criteria.

Response: The criteria of this section will apply to Heritage Crossing as a new subdivision.

18.795.030 Visual Clearance Requirements

A. At corners. Except within the CBD zoning district a visual clearance area shall be maintained on the corners of all property adjacent to the intersection of two streets, a street and a railroad, or a driveway providing access to a public or private street.

B. Obstructions prohibited. A clear vision area shall contain no vehicle, hedge, planting, fence, wall structure or temporary or permanent obstruction (except for an occasional utility pole or tree), exceeding three feet in height, measured from the top of the curb, or where no curb exists, from the street center line grade, except that trees exceeding this height may be located in this area, provided all branches below eight feet are removed.

C. Additional topographical constraints. Where the crest of a hill or vertical curve conditions contribute to the obstruction of clear vision areas at a street or driveway intersection, hedges, plantings, fences, walls, wall structures and temporary or permanent obstructions shall be further reduced in height or eliminated to comply with the intent of the required clear vision area.

Response: Vision clearance triangles have been shown on the Preliminary Plat in Exhibit A. This criterion can be met.

18.795.040 Computations

A. Arterial streets. On all designated arterial streets the visual clearance area shall not be less than 35 feet on each side of the intersection.

B. Non-arterial streets.

1. Non-arterial streets 24 feet or more in width. At all intersections of two non-arterial streets, a nonarterial street and a driveway, and a non-arterial street or driveway and railroad where at least one of the streets or driveways is 24 feet or more in width, a visual clearance area shall be a triangle formed by the right-of-way or property lines along such lots and a straight line joining the right-of- way or property line at points which are 30 feet distance from the intersection of the right-of-way line and measured along such lines. See Figure 18.795.1:

2. Non-arterial streets less than 24 feet in width. At all intersections of two non-arterial streets, a non-arterial street and a driveway, and a non-arterial street or driveway and railroad where both streets and/or driveways are less than 24 feet in width, a visual clearance area shall be a triangle whose base extends 30 feet along the street right-of-way line in both directions from the centerline of the accessway at the front setback line of a single family and two family residence, and 30 feet back from the property line on all other types of uses.

Response: SW Hall Boulevard is an arterial street and 35 foot vision clearance triangles will be required. All other proposed roads are local streets with a width of 28 feet except for SW Applewood Avenue between Schmidt Loop which is 24 feet wide; 30 foot vision clearance triangles will be required for the local street intersections. This criterion can be met.

Chapter 18.810 STREET AND UTILITY IMPROVEMENT STANDARDS

18.810.010 Purpose

The purpose of this chapter is to provide construction standards for the implementation of public and private facilities and utilities such as streets, sewers, and drainage.

18.810.020 General Provisions

A. When standards apply. Unless otherwise provided, construction, reconstruction or repair of streets, sidewalks, curbs and other public improvements shall occur in accordance with the standards of this title. No development may occur and no land use application may be approved unless the public facilities related to development comply with the public facility requirements established in this section and adequate public facilities are available. Applicants may be required to dedicate land and build required public improvements only when the required exaction is directly related to and roughly proportional to the impact of the development.

B. Standard specifications. The city engineer shall establish standard specifications consistent with the application of engineering principles.

C. Chapter 7.40 applies. The provision of Chapter 7.40 of the Tigard Municipal Code shall apply to this chapter.

D. Adjustments. Adjustments to the provisions in this chapter related to street improvements may be granted by means of a Type II procedure, as governed by Section 18.390.040, using approval criteria in Section 18.370.020.C.11.

E. Except as provided in Section 18.810.030.S, as used in this chapter, the term "streets" shall mean "public streets" unless an adjustment under subsection D of this section is allowed.

Response: This subdivision application is subject to the standards of this section. An adjustment has been requested per Section 18.379.020.C to address the alternate street sections of SW Ashford Street and SW Applewood Avenue to match existing.

18.810.030 Streets

A. Improvements.

1. **No development shall occur unless the development has frontage or approved access to a public street.**

Response: Heritage Crossing has access to SW Applewood Avenue, SW Ashford Street, and SW Hall Boulevard. This criterion is met.

2. **No development shall occur unless streets within the development meet the standards of this chapter.**

Response: This narrative addresses how the proposed subdivision design and proposed public streets meet the standards of this Section.

3. **No development shall occur unless the streets adjacent to the development meet the standards of this chapter, provided, however, that a development may be approved if the adjacent street does not meet the standards but half-street improvements meeting the standards of this title are constructed adjacent to the development.**

Response: This property abuts SW Hall Boulevard which is an ODOT facility and classified as an arterial by Tigard. Half street improvements already exist along this roadway except for sidewalks, although ODOT and Tigard have requested additional right-of-way dedication to a half street width of 50 feet. Heritage Crossing will construct an eight foot sidewalk along the SW Hall Boulevard frontage. This criterion is met.

4. **Any new street or additional street width planned as a portion of an existing street shall meet the standards of this chapter.**

Response: As noted above, this property abuts SW Hall Boulevard which is an ODOT facility and classified as an arterial by Tigard. Half street improvements already exist along this roadway except for sidewalks, although ODOT and Tigard have requested additional right-of-way dedication to a half street width of 50 feet. Heritage Crossing will construct an eight foot sidewalk along the SW Hall Boulevard frontage. This criterion is met.

5. **If the city could and would otherwise require the applicant to provide street improvements, the city engineer may accept a future improvements guarantee in lieu of street improvements if one or more of the following conditions exist:**
   a. **A partial improvement is not feasible due to the inability to achieve proper design standards;**
   b. **A partial improvement may create a potential safety hazard to motorists or pedestrians;**
   c. **Due to the nature of existing development on adjacent properties it is unlikely that street improvements would be extended in the foreseeable future and the improvement associated with the project under review does not, by itself, provide a significant improvement to street safety or capacity;**
   d. **The improvement would be in conflict with an adopted capital improvement plan;**

e. The improvement is associated with an approved land partition on property zoned residential and the proposed land partition does not create any new streets; or

f. Additional planning work is required to define the appropriate design standards for the street and the application is for a project which would contribute only a minor portion of the anticipated future traffic on the street.

Response: No future street improvements are proposed or deferred. There is no need for fee-in-lieu of future improvements.

6. The standards of this chapter include the standard specifications adopted by the city engineer pursuant to Section 18.810.020.B.

7. The approval authority may approve adjustments to the standards of this chapter if compliance with the standards would result in an adverse impact on natural features such as wetlands, bodies of water, significant habitat areas, steep slopes, or existing mature trees. The approval authority may also approve adjustments to the standards of this chapter if compliance with the standards would have a substantial adverse impact on existing development or would preclude development on the property where the development is proposed. In approving an adjustment to the standards, the approval authority shall balance the benefit of the adjustment with the impact on the public interest represented by the standards. In evaluating the impact on the public interest, the approval authority shall consider the criteria listed in Section 18.810.030.E.1. An adjustment to the standards may not be granted if the adjustment would risk public safety.

Response: Venture Properties has requested an adjustment to the local street standard per Section 18.810.030.E.1. A request is made to provide an alternate street section for the proposed local street extensions of SW Ashford Street and SW Applewood Avenue to match the street sections to the north and west. These streets were built as 32 feet curb-to-curb with five foot curb-tight sidewalks and then street trees on the outside of the sidewalks. Venture proposes to continue this street section for the short 100 foot sections until they intersect with Schmidt Loop to avoid awkward transitions on a short section of street.

B. Creation of rights-of-way for streets and related purposes. Rights-of-way shall be created through the approval of a final subdivision plat or major partition; however, the council may approve the creation of a street by acceptance of a deed, provided that such street is deemed essential by the council for the purpose of general traffic circulation….

Response: All right-of-way dedications are proposed to be conveyed by final plat recordation.

C. Creation of access easements. The approval authority may approve an access easement established by deed without full compliance with this title provided such an easement is the only reasonable method by which a lot large enough to develop can be created.

1. Access easements shall be provided and maintained in accordance with the Uniform Fire Code, Section 10.207.

2. Access shall be in accordance with Sections 18.705.030.H and 18.705.030.I.

Response: No access easements are proposed; this criterion does not apply.

D. **Street location, width and grade. Except as noted below, the location, width and grade of all streets shall conform to an approved street plan and shall be considered in their relation to existing and planned streets, to topographic conditions, to public convenience and safety, and in their appropriate relation to the proposed use of the land to be served by such streets:**

1. **Street grades shall be approved by the city engineer in accordance with subsection N of this section; and**
2. **Where the location of a street is not shown in an approved street plan, the arrangement of streets in a development shall either:**
   a. **Provide for the continuation or appropriate projection of existing streets in the surrounding areas, or**
   b. **Conform to a plan adopted by the commission, if it is impractical to conform to existing street patterns because of particular topographical or other existing conditions of the land. Such a plan shall be based on the type of land use to be served, the volume of traffic, the capacity of adjoining streets and the need for public convenience and safety.**

Response: There are no adopted street plans for this area of Tigard; all surrounding properties are fully developed.

E. **Minimum rights-of-way and street widths. Unless otherwise indicated on an approved street plan, or as needed to continue an existing improved street or within the Downtown District, street right-of-way and roadway widths shall not be less than the minimum width described below. Where a range is indicated, the width shall be determined by the decision-making authority based upon anticipated average daily traffic (ADT) on the new street segment. (The City Council may adopt by resolution, design standards for street construction and other public improvements. The design standards will provide guidance for determining improvement requirements within the specified ranges.) These are presented in Table 18.810.1.**

1. **The decision-making body shall make its decision about desired right-of-way width and pavement width of the various street types within the subdivision or development after consideration of the following:**
   a. **The type of road as set forth in the comprehensive plan transportation chapter - functional street classification.**
   b. **Anticipated traffic generation.**
   c. **On-street parking needs.**
   d. **Sidewalk and bikeway requirements.**
   e. **Requirements for placement of utilities.**
   f. **Street lighting.**
   g. **Drainage and slope impacts.**
   h. **Street tree location.**
   i. **Planting and landscape areas.**
   j. **Safety and comfort for motorists, bicyclists, and pedestrians.**
   k. **Access needs for emergency vehicles.**

Response: SW Schmidt Loop and SW Ashford Lane are proposed local streets and have been designed with a 28 foot wide street from curb to curb within a 50 foot right-of-way. The short extensions of SW Ashford Street and SW Applewood Avenue have been designed to that match the existing design of 32 feet from curb to curb in a 50 foot right-of-way

and curb tight sidewalks. This meets the standards in Table 18.810.1. The short segment of SW Applewood Lane between SW Schmidt Loop will carry under 500 ADT, and is therefore proposed for a 24 foot wide street within a 46 foot wide right-of-way and no on-street parking. SW Hall Boulevard has been designed with a half street improvement of 24 feet to curb line with a six foot planter strip and an eight foot sidewalk. Street cross sections are shown on Sheet 10 of Exhibit A. The 129 foot section of SW Ashford Lane from SW Hall Boulevard and SW Schmidt Loop has been proposed as a 28 foot wide curb to curb width in a 50 foot wide right-of-way. This section of street will not have on-street parking due to the vision clearance triangles. No homes front along this portion of street.

F. Future street plan and extension of streets.

1. A future street plan shall:

a. Be filed by the applicant in conjunction with an application for a subdivision or partition. The plan shall show the pattern of existing and proposed future streets from the boundaries of the proposed land division and shall include other parcels within 530 feet surrounding and adjacent to the proposed land division. At the applicant's request, the city may prepare a future streets proposal. Costs of the city preparing a future streets proposal shall be reimbursed for the time involved. A street proposal may be modified when subsequent subdivision proposals are submitted.

b. Identify existing or proposed bus routes, pullouts or other transit facilities, bicycle routes and pedestrian facilities on or within 530 feet of the site.

2. Where necessary to give access or permit a satisfactory future division of adjoining land, streets shall be extended to the boundary lines of the tract to be developed, and

a. These extended streets or street stubs to adjoining properties are not considered to be culs-de-sac since they are intended to continue as through streets at such time as the adjoining property is developed.

b. A barricade shall be constructed at the end of the street by the property owners which shall not be removed until authorized by the city engineer, the cost of which shall be included in the street construction cost.

c. Temporary hammerhead turnouts or temporary cul-de-sac bulbs shall be constructed for stub street in excess of 150 feet in length.

Response: A Future Street Connectivity Map has been provided as Sheet 12 in Exhibit A. This is the last parcel to develop at urban densities in this region, so there is no future connectivity to consider beyond Heritage Crossing.

G. Street spacing and access management. Refer to Section 18.705.030.H.

Response: Section 18.705.030.H is addressed previously in this narrative.

H. Street alignment and connections.

1. Full street connections with spacing of no more than 530 feet between connections is required except where prevented by barriers such as topography, railroads, freeways, pre-existing developments, lease provisions, easements, covenants or other restrictions existing prior to May 1, 1995 which preclude street connections. A full street

connection may also be exempted due to a regulated water feature if regulations would not permit construction.

Response: Heritage Crossing is surrounded by existing development; SW Applewood Avenue stubs to the north property line and SW Ashford Street stubs to the west property line. Both streets have been proposed to be extended in and through Heritage Crossing. Street spacing along SW Hall Boulevard has a minimum spacing of 600 feet, which precludes the spacing standard of 530 feet. Existing development prohibits any connections to the south.

2. All local, neighborhood routes and collector streets which abut a development site shall be extended within the site to provide through circulation when not precluded by environmental or topographical constraints, existing development patterns or strict adherence to other standards in this code. A street connection or extension is considered precluded when it is not possible to redesign or reconfigure the street pattern to provide required extensions. Land is considered topographically constrained if the slope is greater than 15% for a distance of 250 feet or more. In the case of environmental or topographical constraints, the mere presence of a constraint is not sufficient to show that a street connection is not possible. The applicant must show why the constraint precludes some reasonable street connection.

Response: Again, Heritage Crossing is surrounded by existing development; SW Applewood Avenue stubs to the north property line and SW Ashford Street stubs to the west property line. Both streets have been proposed to be extended in and through Heritage Crossing. Street spacing along SW Hall Boulevard has a minimum spacing of 600 feet, which precludes the spacing standard of 530 feet. Existing development prohibits any connections to the south.

3. Proposed street or street extensions shall be located to provide direct access to existing or planned transit stops, commercial services, and other neighborhood facilities, such as schools, shopping areas and parks.

Response: Heritage Crossing is primarily surrounded by residential development. SW Hall Boulevard has bus service; a northbound stop is located at SW Ashford Street, and southbound stops are located adjacent to the project at the new SW Ashford Lane and 600 feet to the north and 800 feet to the south. A church is located approximately 900 feet to the south on the east side of SW Hall Boulevard. A small retail convenience center is located approximately 1,200 feet south on SW Hall Boulevard. By provision of a street connection to SW Hall Boulevard, the project allows access to a variety of community resources. This criterion is met.

4. All developments should provide an internal network of connecting streets that provide short, direct travel routes and minimize travel distances within the development.

Response: The proposed street system is designed with a tight grid system; the proposed internal blocks are only 260 feet long. These short blocks and high level of connectivity are very pedestrian friendly and provides multiple direct travel routes.

I. Intersection angles. Streets shall be laid out so as to intersect at an angle as near to a right angle as practicable, except where topography requires a lesser

angle, but in no case shall the angle be less than 75° unless there is special intersection design, and:

1. Streets shall have at least 25 feet of tangent adjacent to the right-of-way intersection unless topography requires a lesser distance;
2. Intersections which are not at right angles shall have a minimum corner radius of 20 feet along the right-of-way lines of the acute angle; and
3. Right-of-way lines at intersection with arterial streets shall have a corner radius of not less than 20 feet.

Response: The existing street stub locations of SW Applewood Avenue and SW Ashford Street control the layout of Heritage Crossing. In order to accommodate lot depths of 90 feet, the intersection of SW Applewood Avenue and SW Schmidt Loop is designed with an intersection angle of 77°. As shown on Sheet 3 of Exhibit A, this street has a right-of-way radii of 23 feet, 26 feet, 20 feet, and 20 feet. Tangent lengths exceed 25 feet. This criterion is met.

J. Existing rights-of-way. Whenever existing rights-of-way adjacent to or within a tract are of less than standard width, additional rights-of-way shall be provided at the time of subdivision or development.

Response: As noted above, this property abuts SW Hall Boulevard which is an ODOT facility. Half street improvements already exist along this roadway, although ODOT has requested additional right-of-way dedication to a half street width of 50 feet. This has been provided on the proposed design. This criterion is met.

K. Partial street improvements. Partial street improvements resulting in a pavement width of less than 20 feet, while generally not acceptable, may be approved where essential to reasonable development when in conformity with the other requirements of these regulations, and when it will be practical to require the improvement of the other half when the adjoining property developed.

Response: No partial street improvements are proposed; this criterion does not apply.

L. Cul-de-sacs. A cul-de-sac shall be no more than 200 feet long, shall not provide access to greater than 20 dwelling units, and shall only be used when environmental or topographical constraints, existing development pattern, or strict adherence to other standards in this code preclude street extension and through circulation:

1. All cul-de-sacs shall terminate with a turnaround. Use of turnaround configurations other than circular shall be approved by the city engineer; and
2. The length of the cul-de-sac shall be measured from the centerline intersection point of the two streets to the radius point of the bulb.
3. If a cul-de-sac is more than 300 feet long, a lighted direct pathway to an adjacent street may be required to be provided and dedicated to the city.

Response: No cul-de-sacs are proposed; this criterion does not apply.

M. Street names. No street name shall be used which will duplicate or be confused with the names of existing streets in Washington County, except for extensions of existing streets. Street names and numbers shall conform to the

established pattern in the surrounding area and as approved by the city engineer.

Response: The proposed street names are primarily continuations of the existing streets. SW Ashford Lane is proposed with 'Lane' instead of 'Street' to provide clarity for emergency services providers. SW Schmidt Loop is named for the historic family ownership of the land. This criterion is met.

N. Grades and curves.

1. Grades shall not exceed 10% on arterials, 12% on collector streets, or 12% on any other street (except that local or residential access streets may have segments with grades up to 15% for distances of no greater than 250 feet); and
2. Centerline radii of curves shall be as determined by the city engineer.

Response: All new proposed streets are classified as local streets. As shown on the street profiles on Sheet 9 of Exhibit A, street grades are all under three percent. This criterion is met.

O. Curbs, curb cuts, ramps, and driveway approaches. Concrete curbs, curb cuts, wheelchair, bicycle ramps and driveway approaches shall be constructed in accordance with standards specified in this chapter and Section 15.04.080, and:

1. Concrete curbs and driveway approaches are required; except:
2. Where no sidewalk is planned, an asphalt approach may be constructed with city engineer approval; and
3. Asphalt and concrete driveway approaches to the property line shall be built to city configuration standards.

Response: All proposed driveways and curbs will be constructed of concrete. This criterion is met.

P. Streets adjacent to railroad right-of-way. Wherever the proposed development contains or is adjacent to a railroad right-of-way, provision shall be made for a street approximately parallel to and on each side of such right-of-way at a distance suitable for the appropriate use of the land. The distance shall be determined with due consideration at cross streets or the minimum distance required for approach grades and to provide sufficient depth to allow screen planting along the railroad right-of-way in nonindustrial areas.

Response: No proposed streets are adjacent to railroad right-of-way. This criterion does not apply.

Q. Access to arterials and collectors. Where a development abuts or is traversed by an existing or proposed arterial or collector street, the development design shall provide adequate protection for residential properties and shall separate residential access and through traffic, or if separation is not feasible, the design shall minimize the traffic conflicts. The design shall include any of the following:

1. A parallel access street along the arterial or collector;
2. Lots of suitable depth abutting the arterial or collector to provide adequate buffering with frontage along another street;
3. Screen planting at the rear or side property line to be contained in a nonaccess reservation along the arterial or collector; or
4. Other treatment suitable to meet the objectives of this subsection;
5. If a lot has access to two streets with different classifications, primary access should be from the lower classification street.

Response: SW Hall Boulevard is classified as an arterial facility. Lots 14 through 24 are designed as double frontage lots, with driveway access only to the new local street. These lots are required to have a ten foot buffer along the southern boundary along SW Hall Boulevard. This criterion is met.

R. Alleys, public or private.

1. **Alleys shall be no less than 20 feet in width. In commercial and industrial districts, alleys shall be provided unless other permanent provisions for access to off-street parking and loading facilities are made.**
2. **While alley intersections and sharp changes in alignment shall be avoided, the corners of necessary alley intersections shall have a radius of not less than 12 feet.**

Response: No alleys are proposed. This criterion does not apply.

S. Survey monuments. Upon completion of a street improvement and prior to acceptance by the city, it shall be the responsibility of the developer's registered professional land surveyor to provide certification to the city that all boundary and interior monuments shall be reestablished and protected.

Response: Survey monuments will be set with the recordation of the final plat. This criterion can be met.

T. Private streets.

1. **Design standards for private streets shall be established by the city engineer; and**
2. **The city shall require legal assurances for the continued maintenance of private streets, such as a recorded maintenance agreement.**
3. **Private streets serving more than six dwelling units are permitted only within planned developments, mobile home parks, and multi-family residential developments.**

Response: No private streets are proposed. This criterion does not apply.

U. Railroad crossings. Where an adjacent development results in a need to install or improve a railroad crossing, the cost for such improvements may be a condition of development approval, or another equitable means of cost distribution shall be determined by the public works director and approved by the commission.

Response: No railroad crossings are proposed. This criterion does not apply.

V. Street signs. The city shall install all street signs, relative to traffic control and street names, as specified by the city engineer for any development. The cost of signs shall be the responsibility of the developer.

Response: Street signs will be installed with site development. This criterion can be met.

W. Mailboxes. Joint mailbox facilities shall be provided in all residential developments, with each joint mailbox serving at least two dwelling units.

1. **Joint mailbox structures shall be placed adjacent to roadway curbs;**
2. **Proposed locations of joint mailboxes shall be designated on a copy of the preliminary plat or development plan, and shall be approved by the city engineer/U.S. post office prior to final plan approval; and**

3. Plans for the joint mailbox structures to be used shall be submitted for approval by the city engineer/U.S. post office prior to final approval.

Response: Joint mailboxes will be installed with site development. This criterion can be met.

X. Traffic signals. The location of traffic signals shall be noted on approved street plans. Where a proposed street intersection will result in an immediate need for a traffic signal, a signal meeting approved specifications shall be installed. The cost shall be included as a condition of development.

Response: No traffic signals are proposed. This criterion does not apply.

Y. Street light standards. Street lights shall be installed in accordance with regulations adopted by the city's direction.

Response: Street lights will be installed with site development. This criterion can be met.

Z. Street name signs. Street name signs shall be installed at all street intersections. Stop signs and other signs may be required.

Response: Street signs will be installed with site development. This criterion can be met.

AA. Street cross-sections. The final lift of asphalt concrete pavement shall be placed on all new constructed public roadways prior to final city acceptance of the roadway and within one year of the conditional acceptance of the roadway unless otherwise approved by the city engineer. The final lift shall also be placed no later than when 90% of the structures in the new development are completed or three years from the commencement of initial construction of the development, whichever is less.

1. Sub-base and leveling course shall be of select crushed rock;
2. Surface material shall be of Class C or B asphaltic concrete;
3. The final lift shall be placed on all new construction roadways prior to city final acceptance of the roadway; however, not before 90% of the structures in the new development are completed unless three years have elapsed since initiation of construction in the development;
4. The final lift shall be Class C asphaltic concrete as defined by A.P.W.A. standard specifications; and
5. No lift shall be less than 1-1/2 inches in thickness.

Response: The proposed street sections for Heritage Crossing has been shown on Sheet 10 of Exhibit A. They are proposed with an eight inch base course and two inch leveling course of crushed rock, with one asphaltic lift of three inches. This criterion is met.

BB. Traffic calming. When, in the opinion of the city engineer, the proposed development will create a negative traffic condition on existing neighborhood streets, such as excessive speeding, the developer may be required to provide traffic calming measures. These measures may be required within the development and/or offsite as deemed appropriate. As an alternative, the developer may be required to deposit funds with the city to help pay for traffic calming measures that become necessary once the development is occupied and the city engineer determines that the additional traffic from the development has triggered the need for traffic calming measures. The city engineer will determine the amount of funds required, and will collect said funds from the developer prior to the issuance of a certificate of occupancy, or in the case of subdivision, prior to the approval of the final plat. The funds

will be held by the city for a period of five years from the date of issuance of certificate of occupancy, or in the case of a subdivision, the date of final plat approval. Any funds not used by the city within the five-year time period will be refunded to the developer.

Response: The proposed street design does not allow for any long fast stretches that would warrant traffic calming. No traffic calming is proposed. This criterion does not apply.

CC. Traffic study.

1. A traffic study shall be required for all new or expanded uses or developments under any of the following circumstances:

a. When they generate a 10% or greater increase in existing traffic to high collision intersections identified by Washington County.

b. Trip generations from development onto the city street at the point of access and the existing ADT fall within the following ranges:…

Response: A Traffic Study has been included in Exhibit Q. This criterion is met.

18.810.040 Blocks

A. Block design. The length, width and shape of blocks shall be designed with due regard to providing adequate building sites for the use contemplated, consideration of needs for convenient access, circulation, control and safety of street traffic and recognition of limitations and opportunities of topography.

B. Sizes.

1. The perimeter of blocks formed by streets shall not exceed 2,000 feet measured along the centerline of the streets except:

a. Where street location is precluded by natural topography, wetlands, significant habitat areas or bodies of water, or pre-existing development; or

b. For blocks adjacent to arterial streets, limited access highways, collectors or railroads.

c. For nonresidential blocks in which internal public circulation provides equivalent access.

2. Bicycle and pedestrian connections on public easements or right-of-ways shall be provided when full street connection is exempted by paragraph 1 of this subsection B. Spacing between connections shall be no more than 330 feet, except where precluded by environmental or topographical constraints, existing development patterns, or strict adherence to other standards in the code.

Response: Heritage Crossing is surrounded by existing development to the north, east, west and south, which limits the ability to provide compact block lengths. Interior block perimeters are a maximum of 1,140 feet. The block created by SW Bellflower, SW Empire Terrace, SW Ashford Street, SW Schmidt Loop and SW Applewood Street has a perimeter length of approximately 2,590 feet. The block to the east of that block is approximately 1,480 as measured from the existing pedestrian connection to SW Hall Boulevard. SW Hall Boulevard is subject to minimum access spacing standards of 600 feet for arterials. The block created along the south is large, but no solution is available due to the existing development pattern. This criterion is met.

18.810.050 Easements

A. Easements. Easements for sewers, drainage, water mains, electric lines or other public utilities shall be either dedicated or provided for in the deed restrictions, and where a development is traversed by a watercourse or drainageway, there shall be provided a stormwater easement or drainage right-of-way conforming substantially with the lines of the watercourse.

B. Utility easements. A property owner proposing a development shall make arrangements with the city, the applicable district, and each utility franchise for the provision and dedication of utility easements necessary to provide full services to the development. The city's standard width for public main line utility easements shall be 15 feet unless otherwise specified by the utility company, applicable district, or city engineer.

Response: All proposed public infrastructure is located within public right-of-way with the exception of a proposed sanitary sewer connection in the southeast corner of the project. This sewer line is proposed to extend from SW Schmidt Loop east along the north side of water quality facility in Tract A to the existing line in SW Hall Boulevard. An easement will be provided over Tract A. This criterion is met.

18.810.060 Lots

A. Size and shape. Lot size, width, shape and orientation shall be appropriate for the location of the development and for the type of use contemplated, and:

1. No lot shall contain part of an existing or proposed public right-of-way within its dimensions.
2. The depth of all lots shall not exceed 2-1/2 times the average width, unless the parcel is less than 1-1/2 times the minimum lot size of the applicable zoning district.
3. Depth and width of properties zoned for commercial and industrial purposes shall be adequate to provide for the off-street parking and service facilities required by the type of use proposed.

Response: All proposed lots are generally rectangular in shape. No proposed lots have a lot depth that is more than 2.5 times the lot width. This criterion is met.

B. Lot frontage. Each lot shall abut upon a public or private street, other than an alley, for a width of at least 25 feet unless the lot is created through a minor land partition in which case Section 18.162.050.C applies, or unless the lot is for an attached single-family dwelling unit, in which case the lot frontage shall be at least 15 feet.

Response: All proposed lots have a minimum of 25 feet of frontage. This criterion is met.

C. Through lots. Through lots shall be avoided except where they are essential to provide separation of residential development from major traffic arterials or to overcome specific disadvantages of topography and orientation, and:

1. A planting buffer at least 10 feet wide is required abutting the arterial rights-of-way; and
2. All through lots shall provide the required front yard setback on each street.

Response: SW Hall Boulevard is classified as an arterial facility. Lots 14 through 24 are designed as double frontage lots, with driveway access only to the new local street. These lots have a ten foot buffer along the eastern boundary along SW Hall Boulevard. This criterion is met.

D. **Lot side lines. The side lines of lots, as far as practicable, shall be at right angles to the street upon which the lots front.**

Response: All lots have side lot lines that are perpendicular to the front right-of-way except for Lots 4 and 30 which are designed as flag lots in the corner of the property. This criterion is met.

E. **Large lots. In dividing tracts into large lots or parcels which at some future time are likely to be redivided, the commission may require that the lots be of such size and shape, and be so divided into building sites, and contain such site restrictions as will provide for the extension and opening of streets at intervals which will permit a subsequent division of any tract into lots or parcels of smaller size. The land division shall be denied if the proposed large development lot does not provide for the future division of the lots and future extension of public facilities.**

Response: No future land division is proposed within this development. This criterion does not apply.

18.810.070 Sidewalks

A. **Sidewalks. All industrial streets and private streets shall have sidewalks meeting city standards along at least one side of the street. All other streets shall have sidewalks meeting city standards along both sides of the street. A development may be approved if an adjoining street has sidewalks on the side adjoining the development, even if no sidewalk exists on the other side of the street.**

Response: Sidewalks are proposed on both sides of all proposed local public streets. This criterion is met.

B. **Requirement of developers.**

1. **As part of any development proposal, or change in use resulting in an additional 1,000 vehicle trips or more per day, an applicant shall be required to identify direct, safe (1.25 x the straight line distance) pedestrian routes within 1/2 mile of their site to all transit facilities and neighborhood activity centers (schools, parks, libraries, etc.). In addition, the developer may be required to participate in the removal of any gaps in the pedestrian system off-site if justified by the development.**
2. **If there is an existing sidewalk on the same side of the street as the development within 300 feet of a development site in either direction, the sidewalk shall be extended from the site to meet the existing sidewalk, subject to rough proportionality (even if the sidewalk does not serve a neighborhood activity center).**

Response: SW Hall Boulevard has a bus line with a northbound stop located at SW Ashford Street and southbound stops located at the new SW Ashford Lane as well as approximately 600 feet to the north and 900 feet to the south. Direct access to SW Hall Boulevard has been provided with the proposed street connection of SW Ashford Lane.

C. **Planter strip requirements. A planter strip separation of at least five feet between the curb and the sidewalk shall be required in the design of streets, except where the following conditions exist: there is inadequate right-of-way; the curbside sidewalks already exist on predominant portions of the street; it would conflict with the utilities; there are significant natural features (large trees, water features, significant habitat areas, etc.) that would be destroyed if**

the sidewalk were located as required; or where there are existing structures in close proximity to the street (15 feet or less) or where the standards in Table 18.810.1 specify otherwise. Additional consideration for exempting the planter strip requirement may be given on a case-by-case basis if a property abuts more than one street frontage.

Response: Venture Properties has requested an adjustment to the local street standard per Section 18.810.030.E.1. A request is made to provide an alternate street section for the proposed local street extensions of SW Ashford Street and SW Applewood Avenue to match the street sections to the north and west. These streets were built as 32 feet curb-to-curb with five foot curb-tight sidewalks and then street trees on the outside of the sidewalks. Venture proposes to continue this street section for the short 100 foot sections until they intersect with Schmidt Loop to avoid awkward transitions on a short section of street. Street trees are still provided within the right-of-way, but at the back of walk.

D. Maintenance. Maintenance of sidewalks, curbs, and planter strips is the continuing obligation of the adjacent property owner.

Response: Maintenance of sidewalks, curbs, and planter strips will be the continuing obligation of the new adjacent property owner.

E. Application for permit and inspection. If the construction of a sidewalk is not included in a performance bond of an approved subdivision or the performance bond has lapsed, then every person, firm or corporation desiring to construct sidewalks as provided by this chapter, shall, before entering upon the work or improvement, apply for a street opening permit to the Engineering Department to so build or construct:

1. An occupancy permit shall not be issued for a development until the provisions of this section are satisfied.

2. The city engineer may issue a permit and certificate allowing temporary noncompliance with the provisions of this section to the owner, builder or contractor when, in his or her opinion, the construction of the sidewalk is impractical for one or more of the following reasons:

a. Sidewalk grades have not and cannot be established for the property in question within a reasonable length of time;

b. Forthcoming installation of public utilities or street paving would be likely to cause severe damage to the new sidewalk;

c. Street right-of-way is insufficient to accommodate a sidewalk on one or both sides of the street; or

d. Topography or elevation of the sidewalk base area makes construction of a sidewalk impractical or economically infeasible.

3. The city engineer shall inspect the construction of sidewalks for compliance with the provision set forth in the standard specifications manual.

Response: Upon approval of the subdivision, Venture Properties will apply to construct the proposed public improvements including sidewalks.

F. Council initiation of construction. In the event one or more of the following situations are found by the council to exist, the council may adopt a resolution to initiate construction of a sidewalk in accordance with city ordinances:…

Response: This criterion does not apply.

18.810.080 Public Use Areas

A. Dedication requirements.

1. Where a proposed park, playground or other public use shown in a development plan adopted by the city is located in whole or in part in a subdivision, the commission may require the dedication or reservation of such area within the subdivision, provided that the reservation or dedication is roughly proportional to the impact of the subdivision on the park system.

2. Where considered desirable by the commission in accordance with adopted comprehensive plan policies, and where a development plan of the city does not indicate proposed public use areas, the commission may require the dedication or reservation of areas within the subdivision or sites of a character, extent and location suitable for the development of parks or other public use, provided that the reservation or dedication is roughly proportional to the impact of the subdivision on the park system.

B. Acquisition by public agency. If the developer is required to reserve land area for a park, playground, or other public use, such land shall be acquired by the appropriate public agency within 18 months following plat approval, at a price agreed upon prior to approval of the plat, or such reservation shall be released to the subdivider.

Response: No public spaces are proposed in this application; this criterion does not apply.

18.810.090 Sanitary Sewers

A. Sewers required. Sanitary sewers shall be installed to serve each new development and to connect developments to existing mains in accordance with the provisions set forth in Design and Construction Standards for Sanitary and Surface Water Management (as adopted by the Unified Sewerage Agency in 1996 and including any future revisions or amendments) and the adopted policies of the comprehensive plan.

B. Sewer plan approval. The city engineer shall approve all sanitary sewer plans and proposed systems prior to issuance of development permits involving sewer service.

C. Over-sizing. Proposed sewer systems shall include consideration of additional development within the area as projected by the comprehensive plan.

D. Permits denied. Development permits may be restricted by the commission or hearings officer where a deficiency exists in the existing sewer system or portion thereof which cannot be rectified within the development and which if not rectified will result in a threat to public health or safety, surcharging of existing mains, or violations of state or federal standards pertaining to operation of the sewage treatment system.

Response: As shown on Sheet 11 of Exhibit A, a full sanitary sewer system has been proposed for Heritage Crossing to provide public sewer access to all proposed lots. The system will connect to the existing manhole at SW Hall Boulevard at the southeast corner of the property. No up-sizing for future development is needed. This criterion is met.

18.810.100 Storm Drainage

A. General provisions. The director and city engineer shall issue a development permit only where adequate provisions for stormwater and floodwater runoff have been made, and:

1. The storm water drainage system shall be separate and independent of any sanitary sewerage system;

2. Where possible, inlets shall be provided so surface water is not carried across any intersection or allowed to flood any street; and

3. Surface water drainage patterns shall be shown on every development proposal plan.

B. Easements. Where a development is traversed by a watercourse, drainageway, channel or stream, there shall be provided a stormwater easement or drainage right-of-way conforming substantially with the lines of such watercourse and such further width as will be adequate for conveyance and maintenance.

C. Accommodation of upstream drainage. A culvert or other drainage facility shall be large enough to accommodate potential runoff from its entire upstream drainage area, whether inside or outside the development, and the city engineer shall approve the necessary size of the facility, based on the provisions of Design and Construction Standards for Sanitary and Surface Water Management (as adopted by the Unified Sewerage Agency in 1996 and including any future revisions or amendments).

D. Effect on downstream drainage. Where it is anticipated by the city engineer that the additional runoff resulting from the development will overload an existing drainage facility, the director and engineer shall withhold approval of the development until provisions have been made for improvement of the potential condition or until provisions have been made for storage of additional runoff caused by the development in accordance with the Design and Construction Standards for Sanitary and Surface Water Management (as adopted by the Unified Sewerage Agency in 1996 and including any future revisions or amendments).

Response: As shown on Sheets 7 and 11 of Exhibit A, a full storm sewer system has been proposed for Heritage Crossing to collect and treat stormwater runoff. The system has been designed based upon the Storm Drainage Analysis in Exhibit R. After collection and treatment, the system will connect to the existing manhole in SW Hall Boulevard at the southeast corner of the property. No up-sizing for future development is needed. This criterion is met.

18.810.110 Bikeways and Pedestrian Pathways

A. Bikeway extension.

1. As a standard, bike lanes shall be required along all arterial and collector routes and where identified on the city's adopted bicycle plan in the transportation system plan (TSP). Bike lane requirements along collectors within the Downtown Urban Renewal District shall be determined by the city engineer unless specified in Table 18.810.1.

2. Developments adjoining proposed bikeways identified on the city's adopted pedestrian/bikeway plan shall include provisions for the future extension of such bikeways through the dedication of easements or rights-of-way, provided such dedication is directly related to and roughly proportional to the impact of the development.

3. Any new street improvement project shall include bicycle lanes as required in this document and on the adopted bicycle plan.

B. Cost of construction. Development permits issued for planned unit developments, conditional use permits, subdivisions and other developments which will principally benefit from such bikeways shall be conditioned to include the cost or construction of bikeway improvements in an amount roughly proportional to the impact of the development.

C. Minimum width.

1. The minimum width for bikeways within the roadway is five feet per bicycle travel lane.
2. The minimum width for multi-use paths separated from the road and classified as regional or community trails in the Greenway Trail System Master Plan is 10 feet. The width may be reduced to eight feet if there are environmental or other constraints.
3. The minimum width for off-street paths classified as neighborhood trails, according to the Greenway Trail System Master Plan, is three feet.
4. Design standards for bike and pedestrian-ways shall be determined by the city engineer.

Response: SW Hall Boulevard is an ODOT facility and improvements will be reviewed by ODOT as part of this application. This criterion is met.

18.810.120 Utilities

A. Underground utilities. All utility lines including, but not limited to those required for electric, communication, lighting and cable television services and related facilities shall be placed underground, except for surface mounted transformers, surface mounted connection boxes and meter cabinets which may be placed above ground, temporary utility service facilities during construction, high capacity electric lines operating at 50,000 volts or above, and:

1. The developer shall make all necessary arrangements with the serving utility to provide the underground services;
2. The city reserves the right to approve location of all surface mounted facilities;
3. All underground utilities, including sanitary sewers and storm drains installed in streets by the developer, shall be constructed prior to the surfacing of the streets; and
4. Stubs for service connections shall be long enough to avoid disturbing the street improvements when service connections are made.

Response: All proposed infrastructure is proposed to be located underground. This criterion is met.

B. Information on development plans. The applicant for a development shall show on the development plan or in the explanatory information, easements for all underground utility facilities, and:

1. Plans showing the location of all underground facilities as described herein shall be submitted to the city engineer for review and approval; and
2. Care shall be taken in all cases to ensure that above ground equipment does not obstruct vision clearance areas for vehicular traffic.

Response: The preliminary development plans in Exhibit A show the public utility easements as well as public rights-of-way. This criterion is met.

C. Exception to undergrounding requirement.

1. The developer shall pay a fee in-lieu of undergrounding costs when the development is proposed to take place on a street where existing utilities which are not underground will serve the development and the approval authority determines that the cost and technical

difficulty of under-grounding the utilities outweighs the benefit of undergrounding in conjunction with the development. The determination shall be on a case-by-case basis. The most common, but not the only, such situation is a short frontage development for which undergrounding would result in the placement of additional poles, rather than the removal of above-ground utilities facilities.

2. An applicant for a development which is served by utilities which are not underground and which are located across a public right-of-way from the applicant's property shall pay the fee in-lieu of undergrounding.

3. Properties within the CBD zoning district shall be exempt from the requirements for undergrounding of utility lines and from the fee in-lieu of undergrounding.

4. The exceptions in paragraphs 1 through 3 of this subsection C shall apply only to existing utility lines. All new utility lines shall be placed underground.

D. Fee in-lieu of undergrounding.

1. The city engineer shall establish utility service areas in the city. All development which occurs within a utility service area shall pay a fee in-lieu of undergrounding for utilities if the development does not provide underground utilities, unless exempted by this code.

2. The city engineer shall establish the fee by utility service area which shall be determined based upon the estimated cost to underground utilities within each service area. The total estimated cost for undergrounding in a service area shall be allocated on a front-foot basis to each party within the service area. The fee due from any developer shall be calculated based on a front-foot basis.

3. A developer shall receive a credit against the fee for costs incurred in the undergrounding of existing overhead utilities. The city engineer shall determine the amount of the credit, after review of cost information submitted by the applicant with the request for credit.

4. The funds collected in each service area shall be used for undergrounding utilities within the city at large. The city engineer shall prepare and maintain a list of proposed undergrounding projects which may be funded with the fees collected by the city. The list shall indicate the estimated timing and cost of each project. The list shall be submitted to the City Council for their review and approval annually.

Response: No undergrounding is proposed.

18.810.130 Cash or Bond Required

A. Guarantee. All improvements installed by the developer shall be guaranteed as to workmanship and material for a period of one year following acceptance by the City Council.

B. Cash deposit or bond. Such guarantee shall be secured by cash deposit or bond in the amount of the value of the improvements as set by the city engineer.

C. Compliance requirements. The cash or bond shall comply with the terms and conditions of Section 18.430.090.

Response: Prior to construction, Venture Properties will meet the bonding requirements for the construction of public improvements and their maintenance. This criterion can be met.

18.810.140 Monuments—Replacement Required

Any monuments that are disturbed before all improvements are completed by the subdivider shall be replaced prior to final acceptance of the improvements.

Response: Monuments will be reviewed prior to recordation of the final plat and will either be in place or bonded for later installation. This criterion can be met.

18.810.150 Installation Prerequisite

A. Approval required. No public improvements, including sanitary sewers, storm sewers, streets, sidewalks, curbs, lighting or other requirements shall be undertaken except after the plans have been approved by the city, permit fee paid, and permit issued.

B. Permit fee. The permit fee is required to defray the cost and expenses incurred by the city for construction and other services in connection with the improvement. The permit fee shall be set by council resolution.

Response: No construction will occur until plans are reviewed and permits issued. This criterion can be met.

18.810.160 Installation Conformation

A. Conformance required. In addition to other requirements, improvements installed by the developer either as a requirement of these regulations or at his/her own option, shall conform to the requirements of this chapter and to improvement standards and specifications followed by the city.

B. Adopted installation standards. The Standard Specifications for Public Works Construction, Oregon Chapter A.P.W.A., and Design and Construction Standards for Sanitary and Surface Water Management (as adopted by the Unified Sewerage Agency in 1996 and including any future revisions or amendments) shall be a part of the city's adopted installation standard(s); other standards may also be required upon recommendation of the city engineer.

Response: Improvements will be reviewed prior to recordation of the final plat and will either be in place or bonded for later installation. This criterion can be met.

18.810.170 Plan Check

A. Submittal requirements. Work shall not begin until construction plans and construction estimates have been submitted and checked for adequacy and approved by the city engineer in writing. The developer can obtain detailed information about submittal requirements from the city engineer.

B. Compliance. All such plans shall be prepared in accordance with requirements of the city.

Response: No construction will occur until plans are reviewed and permits issued. This criterion can be met.

18.810.180 Notice to City

A. Commencement. Work shall not begin until the city has been notified in advance.

B. Resumption. If work is discontinued for any reason, it shall not be resumed until the city is notified.

Response: No construction will occur until plans are reviewed and permits issued. A pre-construction meeting will be held prior to construction. This criterion can be met.

18.810.190 City Inspection of Improvements

Improvements shall be constructed under the inspection and to the satisfaction of the city. The city may require changes in typical sections and details if unusual conditions arising during construction warrant such changes in the public interest.

Response: The City will conduct inspections as needed. This criterion can be met.

18.810.200 Engineer's Written Certification Required

The developer's engineer shall provide written certification of a form provided by the city that all improvements, workmanship and materials are in accord with current and standard engineering and construction practices, and are of high grade, prior to city acceptance of the subdivision's improvements or any portion thereof for operation and maintenance.

Response: A licensed civil engineer will stamp all construction plans. This criterion can be met.

Tigard Comprehensive Plan

Goal 1: Citizen Involvement

Goal: 1.1 Provide citizens, affected agencies, and other jurisdictions the opportunity to participate in all phases of the planning process.

Goal: 1.2 Ensure all citizens have access to:

A. opportunities to communicate directly to the City; and

B. information on issues in an understandable form.

Response: The Tigard Development Code has been reviewed for compliance with statewide goal 1 for public involvement. The Type III-PC land use process provides multiple opportunities for community input for this application. A neighborhood meeting is required prior to submittal of the application. Notice is provided for surrounding area upon acceptance of the application and a public hearing will be held in front of the Planning Commission with opportunity for public testimony prior to deliberation. Any appeal of the Planning Commission's decision will be heard by the City Council. This policy is met.

Goal 2: Land Use Planning

Goal: 2.1 Maintain an up-to-date Comprehensive Plan, implementing regulations and action plans as the legislative foundation of Tigard's land use planning program.

Policies:

1. **The City's land use program shall establish a clear policy direction, comply with state and regional requirements, and serve its citizens' own interests.**
2. **The City's land use regulations, related plans, and implementing actions shall be consistent with and implement its Comprehensive Plan.**

Response: The proposed zone change would change the zoning designation from R-12 to a combination of R-12 and R-7. Both of these zones implement the existing Comprehensive Plan designation of Medium Density Residential. This policy is met.

3. **The City shall coordinate the adoption, amendment, and implementation of its land use program with other potentially affected jurisdictions and agencies.**

Response: The proposed zone change will be forwarded to both Metro and the State of Oregon Department of Land Conservation and Development. This policy is met.

5. **The City shall promote intense urban level development in Metro-designated Centers and Corridors, and employment and industrial areas.**

Response: The site is located along the designated corridor of SW Hall Boulevard, and is also surrounded by existing low density neighborhoods. This creates a conflict between the Comprehensive Plan goals for urban development along corridors and the goals for neighborhood compatibility. The proposed combination of zoning districts retains the R-12 designation along the Hall Boulevard frontage in alignment with the goals of higher densities along designated corridors while placing R-7 where the property abuts existing R-7 detached homes. This compromise balances the competing goals.

7. **The City's regulatory land use maps and development code shall implement the Comprehensive Plan by providing for needed urban land uses including:**

A. Residential;

B. Commercial and office employment including business parks;

C. **Mixed use;**

D. **Industrial;**

E. **Overlay districts where natural resource protections or special planning and regulatory tools are warranted; and**

F. **Public services.**

14. **Applicants shall bear the burden of proof to demonstrate that land use applications are consistent with applicable criteria and requirements of the Development Code, the Comprehensive Plan, and when necessary, those of the state and other agencies.**

Response: This narrative outlines how the Heritage Crossing zone change and subdivision applications are consistent or comply with the criteria and requirements of the Tigard Development Code and Comprehensive Plan, as well as the Metro Functional Plan.

15. **In addition to other Comprehensive Plan goals and policies deemed applicable, amendments to Tigard's Comprehensive Plan/Zone Map shall be subject to the following specific criteria:**

A. **Transportation and other public facilities and services shall be available, or committed to be made available, and of sufficient capacity to serve the land uses allowed by the proposed map designation;**

Response: Heritage Crossing abuts SW Hall Boulevard and has two local streets stubbing into it to provide good transportation connectivity. Sanitary sewer is available in the southeast corner as well as at the two street stubs. Water is available in the two street stubs as well.

B. **Development of land uses allowed by the new designation shall not negatively affect existing or planned transportation or other public facilities and services;**

Response: A Transportation Impact Analysis has been provided in Exhibit A that outlines how the proposed subdivision will impact the surrounding roadway network. The proposed zone change will reduce the density of the project and thus reduce the transportation impacts of any development.

C. **The new land use designation shall fulfill a proven community need such as provision of needed commercial goods and services, employment, housing, public and community services, etc. in the particular location, versus other appropriately designated and developable properties;**

Response: The 2010 Goal 10 analysis by Johnson Reid shows that there is a demonstrated need for both attached and detached residential land within Tigard. Exhibit M has updated this analysis to reflect the buildable lands in 2014 including the adoption of the River Terrace Plan designations. There is an overall balance of attached and detached residential land use designations through Tigard. This area of Tigard is well served by existing R-12 development, particularly south of Highway 99W and SW McDonald Street as well as Bonita and SW 72nd Avenue, and there is no specific locational need for additional attached housing in this location. It should be noted that long range plans for SW Hall Boulevard have changed over time. It was one of several alignments considered in the Southwest Corridor Plan refinement process. It was not part of the recommended High Capacity design options from in the June 9, 2014 report from the Steering Committee. Today, SW Hall Boulevard has infrequent bus service with a schedule that is greater than 30 minutes between busses.

D. Demonstration that there is an inadequate amount of developable, appropriately designated, land for the land uses that would be allowed by the new designation;

Response: The land inventory and zoning maps show that there is an adequate 20 year supply of R-7 and R-12 lands, however much of that land is constrained in the near term within the River Terrace district. The land use plan was recently adopted, but much of that property awaits urban infrastructure before it will be ready to develop. The need for available buildable residential land is well established, but it is also supported by the 2014 Tigard Buildable Land Inventory which shows a need for 621 acres of R-7 land, but in 2014 there was only 563 acres available, leaving a shortage of 65 acres (Exhibit M). River Terrace will solve this shortage over time, but this zone change fills the immediate need for single family detached homes.

E. Demonstration that land uses allowed in the proposed designation could be developed in compliance with all applicable regulations and the purposes of any overlay district would be fulfilled;

Response: This application package with land use narrative and supporting documents shows how the proposed 62 lot compromise combination R-7 and R-12 subdivision complies with the Tigard Development Code.

F. Land uses permitted by the proposed designation would be compatible, or capable of being made compatible, with environmental conditions and surrounding land uses; and

Response: The key consideration for this proposed zone change is neighborhood compatibility. Due to the land use changes that have occurred since 1983, this is now an island of R-12 zoning surrounded by existing R-7 development with detached single family homes.

In order to balance the competing comprehensive Plan goals for urbanization along designated corridors and the goals for neighborhoods compatibility, the application proposes a combination of R-12 zoning along the SW Hall Boulevard frontage and R-7 zoning where the property abuts the existing low density single family detached neighborhoods. This design strikes a balance between the competing goals and creates a livable, diverse neighborhood.

G. Demonstration that the amendment does not detract from the viability of the City's natural systems.

Response: Two marginal wetlands exist on site and a wetland fill permit has been submitted to both the Oregon Department of State Lands and the US Army Corps of Engineers. The wetland are located where SW Applewood Avenue must be extended and at the low portion of the site were the water quality facility must be located. The wetlands will be impacted regardless of any type of urban development; wetland impacts are inevitable. The zone change does not change the wetland impacts.

16. The City may condition the approval of a Plan/Zoning map amendment to assure the development of a definite land use(s) and per specific design/development requirements.

Response: The Applicant understands that conditions may be applied, but does not anticipate the need for any zone change conditions since the impacts of development will lessen with the decreased density.

17. **The City may allow concurrent applications to amend the Comprehensive Plan/Zoning Map(s) and for development plan approval of a specific land use.**

Response: Per this policy, this application requests concurrent review of a zone change and subdivision.

23. **The City shall require new development, including public infrastructure, to minimize conflicts by addressing the need for compatibility between it and adjacent existing and future land uses.**

Response: As previously stated, the key consideration for this proposed zone change is improved neighborhood compatibility. Due to the land use changes that have occurred since 1983, this is now an island of R-12 zoning surrounded by existing R-7 development. A proposed combination of R-12 zoning along SW Hall Boulevard and R-7 zoning where the site abuts existing R-7 detached single family homes strikes a balances the Comprehensive Plan goals for neighborhood compatibility with the goals for urbanizations along designated corridors.

24. **The City shall establish design standards to promote quality urban development and to enhance the community's value, livability, and attractiveness.**

Goal 9: Economic Development

Goal: 9.3 Make Tigard a prosperous and desirable place to live and do business.

Policies:

1. **The City shall focus a significant portion of future employment growth and high-density housing development in its Metro-designated Town Center (Downtown); Regional Center (Washington Square); High Capacity Transit Corridor (Hwy 99W); and the Tigard Triangle.**

Response: SW Hall Boulevard is a designated corridor by Metro, but it traverses an established low density neighborhood in the vicinity of this site with no employment uses, extremely limited retail uses. This corridor will not achieve 'urbanity'; higher densities will have the limited benefit of increased potential ridership. The property carries a Medium Density Residential Plan designation; only a partial zone change is proposed. The application proposes to retain the R-12 designation along the SW Hall Boulevard Corridor, and proposes to reduce the density where the property abuts the existing low density neighborhoods to the north, west, and south. This combination of zones strikes a balance of intensity and compatibility.

Goal 10: Housing

Goal: 10.1 Provide opportunities for a variety of housing types to meet the diverse housing needs of current and future City residents.

Policies:

1. **The City shall adopt and maintain land use policies, codes, and standards that provide opportunities to develop a variety of housing types that meet the needs, preferences, and financial capabilities of Tigard's present and future residents.**

Response: Two state and Metro requirements help determine housing capacities on buildable land within the Portland Metropolitan Area – the state metropolitan Housing Rule and Title 1 of Metro's Urban Grow Management Functional Plan (Functional Plan). Both focus on increasing jurisdictions' housing capacity in order to use land within the UGB efficiently.

The Metropolitan Housing Rule (OAR 660-007/Division 7) established regional residential density standards for new construction by jurisdiction. Tigard must provide for an overall density opportunity of 10 or more dwelling units per net buildable acre, as well as designate sufficient buildable land to provide the opportunity for at least 50% of new residential units to be attached housing (either single family or multiple family).

Metro implements Goal 10 through Title 1. To meet Title 1, each jurisdiction was required to determine its housing capacity and adopt minimum density requirements. Tigard adopted an 80% of minimum density requirement for development in 1998, which means that a development must build 80% of the maximum units allowed by the zoning designation.

The City of Tigard maintains an up-to-date buildable lands inventory, a permit tracking system for development, as well as complying with Metro's Functional Plan. The City is responsible for monitoring residential development. All of these tools aid the City in monitoring its progress toward the above goals, and determining if the opportunity remains for current and future residents to have diverse housing choices.

Exhibit M contains a compilation analysis of three major Tigard reports on Goal 10 compliance: the August 2012 "City Of Tigard Housing and Residential Land Needs Assessment (Oregon Statewide Planning Goal 10)" prepared by Johnson Reid LLC, the January 2014 Buildable Land Inventory Map published by Tigard, and Ordinance 14-15 for River Terrace that contains a Goal 10 analysis for the River Terrace plan area.

AKS utilized the 2012 Johnson Reid report as a baseline; this report has been reviewed and acknowledged by Metro and DLCD. The table at the beginning of Exhibit M starts with the Johnson Reid capacity table. This report shows that the City of Tigard should accommodate 6,458 dwelling units for a 2030 horizon to comply with Goal 10 and Title 1. The capacity of land in 2012 showed a capacity for 6,714 dwelling units, with an average density of 11.6 dwelling units per acre. The River Terrace planning was in its early stages, so this report did a general projection of total dwelling units for these areas without using specific zones.

AKS then updated the Johnson Reid land capacity information with the City's January 2014 land inventory report.

The next step was to merge in the recently adopted River Terrace capacity data. In the AKS review of the River Terrace Goal 10 analysis, it appears that there are two errors in Table 3-1. First, the units projected for the R-4.5 zone only equate to 5.8 dwelling units per acre. The Johnson Reid report used 7.3 dwelling units per acre. This correction would increase the capacity by 77 dwelling units. Second, the total dwelling units per acre for the Roy Rogers West area calculates to 14.12 dwelling units per acre. This does not change the total capacity. AKS provided a corrected table for River Terrace.

The corrected River Terrace data was added to the projected January 2014 data. Tigard now has capacity to accommodate an additional 7,422 dwelling units or 11.47 dwelling units per acre, which exceeds the Johnson Reid projected need of 6,458 dwelling units by 964 dwelling units.

Per this Goal 10 methodology, this is a reduction in potential density of 51 dwelling units. The City had excess capacity of 964 dwelling units, so approval of this zone change would reduce that excess capacity to 913 dwelling units, but still exceeds the adopted minimum for Goal 10. This shows compliance with Metro Code 3.07.120.E listed below.

In addition to this analysis, it should be noted that a Conditional Use Permit was approved in April 2013 for Bonaventure Assisted Living (CUP2013-00001, Exhibit Q). This application is for property located approximately 800 feet north of Heritage Crossing. Bonaventure is zoned as R-4.5, but the land use application was for an assisted living complex using a conditional use permit review. The underlying zoning would assume a capacity of 51 units per Goal 10. The application was approved for 70 independent living, 59 assisted living and 23 units for memory care. This is a total of 152 dwelling units, or an increase in city-wide capacity of 101 dwelling units. This is an appropriate offset to the reduction of 51 dwelling units proposed by Heritage Crossing and is located in close proximity. This would address Metro Code 3.07.120.C; although the two land use actions did not occur as a single application, they are proposed within a year of one another and are located within 800 feet of each other.

For housing types, attached versus detached homes, the MUR-1, MUR-2, R-12 and R-25 zones are primarily attached housing zones. The R-1, R-2, R-3.5, R4.5, and R-7 zones are primarily detached housing zoned. Unfortunately, the Johnson Reid Goal 10 report did not outline the capacity of attached versus detached housing since the zoning split had not yet been determined for the West Bull Mountain (River Terrace) expansion areas. It does show a need for 3,051 attached units and 3,406 detached units. For the non-West Bull Mountain (River Terrace) area of Tigard, the 2010 analysis showed capacity for 2,016 attached units and 1,610 detached units. In 2014, the Tigard Buildable Land Inventory map showed capacity for 1,830 attached units and 1,771 detached units.

The housing capacity in 2014 updated for River Terrace in Exhibit M shows an attached housing capacity of 3,625 units and a detached capacity of 3,796 units. The proposed zone change would change the mix to 3,495 attached and 3,876 detached. Inventories for both attached and detached homes exceed the needs outlined in the 2010 Johnson Reid Goal 10 report by approximately 450 homes in each classification. As noted previously, the Bonaventure CUP exceeded the expected housing inventory by an additional 101 homes, providing 152 attached homes rather than the planned 51 detached homes.

The Heritage Crossing partial zone change proposes to change 6.031 acres of R-12 land to R-7. Here is a comparison of the densities of the existing R-12 zone versus the proposed combination of R-7 and R-12 zones:

R-12 DENSITY COMPARISON TABLE

Description	Current R-12 Zoning	Proposed Mixed R-7 & R-12 Zoning Alternative	Percent Increase (+) or Reduction (-)

Gross Site Area (sf)	396,523	396,523	0%
Maximum Lot Density (units)	93	67	-28%
Minimum Lot Density (units)	74	53	-28%
Proposed Lot Density (units)	93	62	-33%
Proposed Average Lot Area (sf)	2,680	4,246	58%
Proposed Minimum Lot Area (sf)	2,441	2,616	7%

To summarize the impacts to overall residential capacity in Tigard, see below:

Description	**Dwelling Units**
Min Density R-12	74
Min Density R-7	44
Proposed Density for Original R-7 Application	53
Compromise Min Density	53
Compromised Proposed Density	62
Reduction in Density from R-12 Min to Compromise Proposed	*12*

Comparing the overall minimum density of the site with R-12 development with the proposed street network and detached housing versus the proposed application, there is a reduction of twelve dwelling units. This is a minimal impact to overall housing capacity in Tigard. Although it is a permitted use, it is not realistic to assume that this site would accommodate multifamily development. It is not compatible and would face enormous public opposition.

5. **The City shall provide for high and medium density housing in the areas such as town centers (Downtown), regional centers (Washington Square), and along transit corridors where employment opportunities, commercial services, transit, and other public services necessary to support higher population densities are either present or planned for in the future.**

Response: SW Hall Boulevard is a Metro designated Corridor. This vicinity carries a Medium Density Residential comprehensive plan designation; the zone change from R-12 to a combination of R-12 and R-7 will not change the plan designation. Preserving the R-12 designation along SW Hall Boulevard while allowing the remainder of the site to change to R-7 will provide a balance of the competing Comprehensive Plan policies of corridor urbanization and neighborhood compatibility. The proposed zone change will retain the Medium Density Residential Comprehensive Plan designation.

Goal: 10.2 Maintain a high level of residential livability.

Policies:

1. **The City shall adopt measures to protect and enhance the quality and integrity of its residential neighborhoods.**
5. **The City shall encourage housing that supports sustainable development patterns by promoting the efficient use of land, conservation of natural resources, easy access to public transit and other efficient modes of transportation, easy access to services and parks, resource efficient design and construction, and the use of renewable energy resources.**

7. **The City shall ensure that residential densities are appropriately related to locational characteristics and site conditions such as the presence of natural hazards and natural resources, availability of public facilities and services, and existing land use patterns.**
8. **The City shall require measures to mitigate the adverse impacts from differing, or more intense, land uses on residential living environments, such as:**
    A. **orderly transitions from one residential density to another;**
    B. **protection of existing vegetation, natural resources and provision of open space areas; and**
    C. **installation of landscaping and effective buffering and screening.**
9. **The City shall require infill development to be designed to address compatibility with existing neighborhoods.**

Response: As previously stated, the key consideration for this proposed zone change is improved neighborhood compatibility. Due to the land use changes that have occurred since 1983, this is now an island of R-12 zoning surrounded by existing R-7 development. The proposed combination zone change with R-12 along SW Hall Boulevard and R-7 where the property abuts established low density residential neighborhoods to the north, west, and south provides a balance between the competing Plan policies for neighborhood compatibility and urbanization along designated corridors.

Goal 12: Transportation

Goal: 12.1 Develop mutually supportive land use and transportation plans to enhance the livability of the community.

Policies:

1. **The City shall plan for a transportation system that meets current community needs and anticipated growth and development**
3. **The City shall maintain and enhance transportation functionality by emphasizing multi-modal travel options for all types of land uses.**
4. **The City shall promote land uses and transportation investments that promote balanced transportation options.**
5. **The City shall develop plans for major transportation corridors and provide appropriate land uses in and adjacent to those corridors.**
6. **The City shall support land use patterns that reduce greenhouse gas emissions and preserve the function of the transportation system.**

Response: As shown in the Transportation Analysis in Exhibit Q, the proposed zone change proposed a decrease in density, therefore the impacts to the transportation system will be reduced as well. This meets the Transportation Planning Rule and the transportation policies adopted by Tigard.

Metro Regional Functional Plan Requirements

TITLE 1: HOUSING CAPACITY

3.07.110 Purpose and Intent

The Regional Framework Plan calls for a compact urban form and a "fair-share" approach to meeting regional housing needs. It is the purpose of Title 1 to accomplish these policies by requiring each city and county to maintain or increase its housing capacity except as provided in section 3.07.120.

3.07.120 Housing Capacity

A. A city or county may reduce the minimum zoned capacity of the Central City or a Regional Center, Town Center, Corridor, Station Community or Main Street under subsection D or E. A city or county may reduce its minimum zoned capacity in other locations under subsections C, D or E.

C. A city or county may reduce its minimum zoned capacity by one of the following actions if it increases minimum zoned capacity by an equal or greater amount in other places where the increase is reasonably likely to be realized within the 20-year planning period of Metro's last capacity analysis under ORS 197.299:

1. Reduce the minimum dwelling unit density, described in subsection B, for one or more zones;

2. Revise the development criteria or standards for one or more zones; or

3. Change its zoning map such that the city's or county's minimum zoned capacity would be reduced.

Action to reduce minimum zoned capacity may be taken any time within two years after action to increase capacity.

E. A city or county may reduce the minimum zoned capacity of a single lot or parcel so long as the reduction has a negligible effect on the city's or county's overall minimum zoned residential capacity.

Response: As noted in the detailed land inventory analysis above and documented in Exhibit M, the proposed zone change to Heritage Crossing is a minimal impact within the City, there is excess capacity to meet the Tigard Goal 10 capacity standards with the final adoption of the River Terrace zoning, and within the corridor excess residential capacity was created with approval of the Bonaventure assisted living facility 800 feet to the north in 2014.

The proposed zone change proposes to change 6.03 acres of R-12 land to R-7. As shown above, the density reduction from the proposed zone change is minimal:

Description	Dwelling Units
Min Density R-12	74
Min Density R-7	44
Proposed Density for Original R-7 Application	53
Compromise Min Density	53
Compromised Proposed Density	62
Reduction in Density from R-12 Min to Compromise Proposed	*12*

Comparing the overall minimum density of the site with R-12 development with the proposed street network and detached housing versus the proposed application, there is a reduction of twelve dwelling units. This is a minimal impact to overall housing capacity in Tigard. Although it is a permitted use, it is not realistic to assume that this site would accommodate multifamily development. It is not compatible and would face enormous public opposition.

As shown in the land inventory analysis in Exhibit M, the City had excess capacity of 964 dwelling units, so approval of this zone change would reduce that excess capacity to 952 dwelling units, but still exceeds the adopted minimum for Goal 10. This show compliance with Metro Code 3.07.120.E listed below.

In addition to this analysis, it should be noted that a Conditional Use Permit was approved in April 2013 for Bonaventure Assisted Living (CUP2013-00001, Exhibit H). This application is for property located approximately 800 feet north of Heritage Crossing. Bonaventure is zoned as R-4.5, but the land use application was for an assisted living complex using a conditional use permit review. The underlying zoning would assume a capacity of 51 units per Goal 10. The application was approved for 70 independent living, 59 assisted living and 23 units for memory care. This is a total of 152 dwelling units, or an increase in city-wide capacity of 101 dwelling units. This is an appropriate offset to the reduction of 51 dwelling units proposed by Heritage Crossing and is located in close proximity. This would address Metro Code 3.07.120.C; although the two land use actions did not occur as a single application, they are proposed within a year of one another and are located within 800 feet of each other.

TITLE 6: CENTERS, CORRIDORS, STATION COMMUNITIES AND MAIN STREETS

3.07.610 Purpose

The Regional Framework Plan identifies Centers, Corridors, Main Streets and Station Communities throughout the region and recognizes them as the principal centers of urban life in the region. Title 6 calls for actions and investments by cities and counties, complemented by regional investments, to enhance this role. A regional investment is an investment in a new high capacity transit line or designated a regional investment in a grant or funding program administered by Metro or subject to Metro's approval.

3.07.620 Actions and Investments in Centers, Corridors, Station Communities and Main Streets

A. In order to be eligible for a regional investment in a Center, Corridor, Station Community or Main Street, or a portion thereof, a city or county shall take the following actions:

1. **Establish a boundary for the Center, Corridor, Station Community or Main Street, or portion thereof, pursuant to subsection B;**
2. **Perform an assessment of the Center, Corridor, Station Community or Main Street, or portion thereof, pursuant to subsection C; and**
3. **Adopt a plan of actions and investments to enhance the Center, Corridor, Station Community or Main Street, or portion thereof, pursuant to subsection D.**

B. The boundary of a Center, Corridor, Station Community or Main Street, or portion thereof, shall:

1. **Be consistent with the general location shown in the RFP except, for a proposed new Station Community, be consistent with Metro's land use final order for a light rail transit project;**
2. **For a Corridor with existing high-capacity transit service, include at least those segments of the Corridor that pass through a Regional Center or Town Center;**
3. **For a Corridor designated for future high-capacity transit in the RTP, include the area identified during the system expansion planning process in the RTP; and**
4. **Be adopted and may be revised by the city council or county board following notice of the proposed boundary action to the Oregon Department of Transportation and to Metro in the manner set forth in subsection A of section 3.07.820 of this chapter.**

3.07.640 Activity Levels for Centers, Corridors, Station Communities and Main Streets

A. Centers, Corridors, Station Communities and Main Streets need a critical number of residents and workers to be vibrant and successful. The following average number of residents and workers per acre is recommended for each:

1. **Central City - 250 persons**
2. **Regional Centers - 60 persons**
3. **Station Communities - 45 persons**
4. **Corridors - 45 persons**
5. **Town Centers - 40 persons**
6. **Main Streets - 39 persons**

B. Centers, Corridors, Station Communities and Main Streets need a mix of uses to be vibrant and walkable. The following mix of uses is recommended for each:

1. **The land uses listed in State of the Centers:**

   Investing in Our Communities, January, 2009, such as grocery stores and restaurants;
2. **Institutional uses, including schools, colleges, universities, hospitals, medical offices and facilities;**
3. **Civic uses, including government offices open to and serving the general public, libraries, city halls and public spaces.**

C. Centers, Corridors, Station Communities and Main Streets need a mix of housings types to be vibrant and successful. The following mix of housing types is recommended for each:

1. **The types of housing listed in the "needed housing" statute, ORS 197.303(1);**
2. **The types of housing identified in the city's or county's housing need analysis done pursuant to ORS 197.296 or statewide planning Goal 10 (Housing); and**
3. **Accessory dwellings pursuant to section 3.07.120 of this chapter.**

3.07.650 Centers, Corridors, Station Communities and Main Streets Map

A. The Centers, Corridors, Station Communities and Main Streets Map is incorporated in this title and is Metro's official depiction of their boundaries. The map shows the boundaries established pursuant to this title.

B. A city or county may revise the boundary of a Center, Corridor, Station Community or Main Street so long as the boundary is consistent with the general location on the 2040 Growth Concept Map in the RFP. The city or county shall provide notice of its proposed revision as prescribed in subsection B of section 3.07.620.

C. The COO shall revise the Centers, Corridors, Station Communities and Main Streets Map by order to conform the map to establishment or revision of a boundary under this title.

Response: While SW Hall Boulevard is a Metro designated corridor, much of the corridor is built out with single family detached homes that are far from the density goal of 45 persons per acre. Per the Density of People map in the "*Tigard HCT Land Use Plan –Existing Conditions Summary Report*" the density in this area is 6.5-11 people per acre. The June 2012 report on "*Concepts for Potential Station Community – High Capacity Transit Land Use Plan*" did not even review this corridor for station planning. This corridor was also not recommended for High Capacity Transit as part of the Southwest Corridor planning effort. The 5/6/14 discussion draft of the "*Southwest Corridor Refinement Phase – Draft Recommendation of HCT Design Options for Further Study*" on page 28 said that Hall Boulevard to Durham Road was not recommended because it would "travel through predominantly single family residential areas with limited ridership and development potential, and result in slower travel times compared to WES alignment options." Hall Boulevard has been completely removed from the 6/9/14 final "*Recommendations of*

Southwest Corridor High Capacity Transit Design Options, Complementary Multimodal Projects and Potential Station Locations for Future Study" report.

This corridor is not currently mapped as a Metro corridor and does not met the criteria for a future corridor designation.

IV. Conclusion

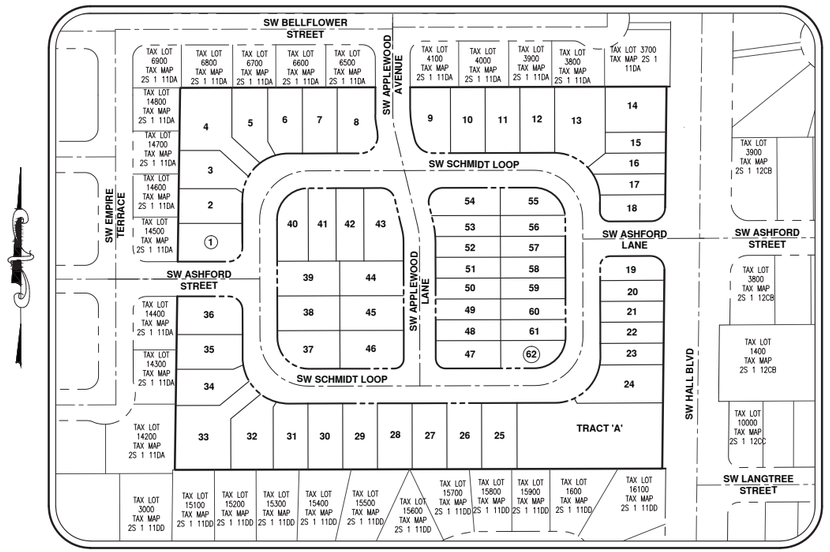
The listed findings and accompanying documentation demonstrates that the proposal is consistent with the applicable provisions of the City of Hillsboro Zoning Ordinance, Subdivision Ordinance, and Development Standards and Guidelines. Therefore, the applicant respectfully requests approval of the proposed Heritage Crossing Preliminary Plat Application.

Exhibit A: Preliminary Development Plans

HERITAGE CROSSING

SUBDIVISION APPLICATION

VICINITY MAP
NOT TO SCALE



SITE MAP
1"=100'

APPLICANT
VENTURE PROPERTIES, INC.
CONTACT: KELLY RITZ
4230 GALEWOOD ST., SUITE 100
LAKE OSWEGO, OR 97035
PH: 503-387-7600

PLANNING/ENGINEERING/SURVEYING/ NATURAL RESOURCE/LANDSCAPE ARCHITECT FIRM
AKS ENGINEERING & FORESTRY, LLC
CONTACT: MIMI DOUKAS, AICP, RLA
12965 SW HERMAN ROAD, SUITE 100
TUALATIN, OR 97062
PH: 503-563-6151
FAX: 503-563-6152

LEGEND

	EXISTING	PROPOSED		EXISTING	PROPOSED
DECIDUOUS TREE			STORM SEWER CLEAN OUT		
CONIFEROUS TREE			STORM SEWER CATCH BASIN		
FIRE HYDRANT			STORM SEWER AREA DRAIN		
WATER BLOWOFF			STORM SEWER MANHOLE		
WATER METER			GAS METER		
WATER VALVE			GAS VALVE		
DOUBLE CHECK VALVE			GUY WIRE ANCHOR		
AIR RELEASE VALVE			POWER POLE		
SANITARY SEWER CLEAN OUT			POWER VAULT		
SANITARY SEWER MANHOLE			POWER JUNCTION BOX		
SIGN			POWER PEDESTAL		
STREET LIGHT			COMMUNICATIONS VAULT		
MAILBOX			COMMUNICATIONS JUNCTION BOX		
			COMMUNICATIONS RISER		

	EXISTING	PROPOSED
RIGHT-OF-WAY LINE		
BOUNDARY LINE		
PROPERTY LINE		
CENTERLINE		
DITCH		
CURB		
EDGE OF PAVEMENT		
EASEMENT		
FENCE LINE		
GRAVEL EDGE		
POWER LINE	PWR	PWR
OVERHEAD WIRE	OHW	OHW
COMMUNICATIONS LINE	COM	COM
FIBER OPTIC LINE	CFO	CFO
GAS LINE	GAS	GAS
STORM SEWER LINE	STM	STM
SANITARY SEWER LINE	SAN	SAN
WATER LINE	WAT	WAT

SHEET INDEX

P01 – COVER SHEET WITH VICINITY AND SITE MAP
P02 – EXISTING CONDITIONS PLAN
P03 – PRELIMINARY SUBDIVISION PLAT
P04 – PRELIMINARY BUILDING SETBACKS PLAN
P05 – PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN
P06 – PRELIMINARY DEMOLITION PLAN
P07 – PRELIMINARY GRADING AND EROSION CONTROL PLAN
P08 – PRELIMINARY STREET PLAN
P09 – PRELIMINARY STREET PROFILES
P10 – PRELIMINARY STREET CROSS-SECTIONS
P11 – PRELIMINARY COMPOSITE UTILITY PLAN
P12 – CONCEPTUAL FUTURE STREET CONNECTIVITY PLAN
P13 – PRELIMINARY SITE TREE CANOPY PLAN
P14 – PRELIMINARY SITE TREE CANOPY TABLE

PROJECT LOCATION: 15435 SW HALL BOULEVARD
TIGARD, OR 97224

PROPERTY DESCRIPTION: TAX LOT 400 (WASHINGTON COUNTY TAX MAP 2S 1 11DA) LOCATED IN THE NORTHEAST 1/4 OF THE SOUTHEAST QUARTER SECTION 11, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON

EXISTING LAND USE: EXISTING RESIDENTIAL HOME, ASSOCIATED BUILDINGS AND AGRICULTURAL FIELD

PROJECT PURPOSE: SINGLE FAMILY DETACHED RESIDENTIAL 62 LOT SUBDIVISION

DATUM: ELEVATIONS ARE BASED ON WASHINGTON COUNTY BENCHMARK NO. 178 AT THE CENTERLINE-CENTERLINE INTERSECTION OF SW HALL BOULEVARD AND SW DURHAM ROAD WITH A NGVD 29 ELEVATION OF 179.155 FEET.

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ENGINEERING · PLANNING · SURVEYING
FORESTRY · LANDSCAPE ARCHITECTURE

HERITAGE CROSSING SUBDIVISION
TIGARD
TAX LOT 400
OREGON
WASHINGTON COUNTY ASSESSOR'S MAP 2S 1 11DA

COVER SHEET WITH VICINITY AND SITE MAP

DESIGNED BY: DS
DRAWN BY: DS
CHECKED BY: PAS
SCALE: AS NOTED
DATE: 09-28-2015

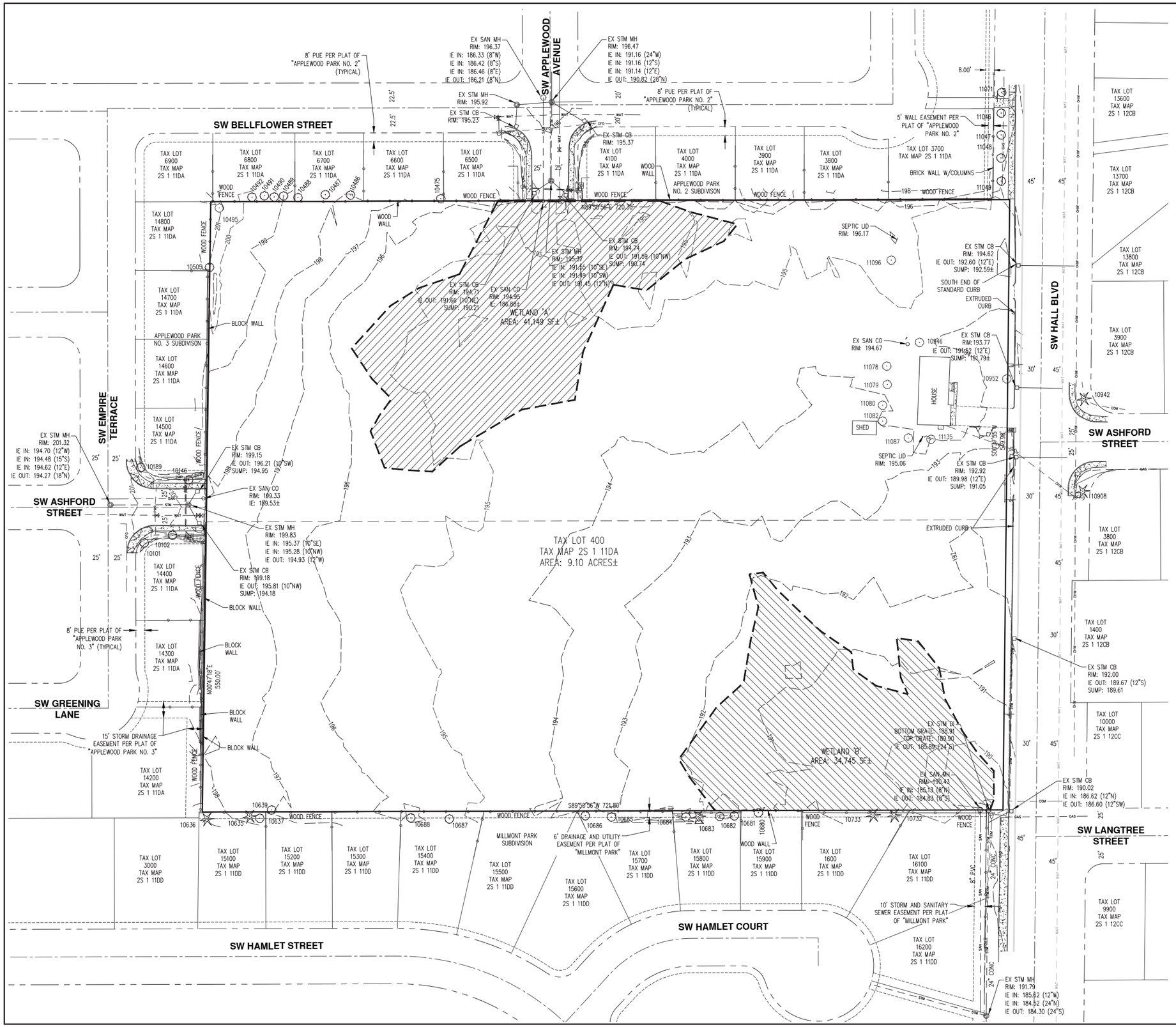
REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY NOT FOR CONSTRUCTION
OREGON JANUARY 13, 2015
PAUL A. SCHNEIDER
RENEWAL DATE: 6/30/17

REVISIONS

JOB NUMBER
3876

SHEET
P01

AKS DRAWING FILE: 3876 P01 COVER.DWG | LAYOUT: P01



NOTES:

1. FIELD WORK WAS CONDUCTED APRIL 21 AND JUNE 17, 2014.
2. VERTICAL DATUM: ELEVATIONS ARE ASSUMED.
3. THIS MAP DOES NOT CONSTITUTE A PROPERTY BOUNDARY SURVEY.
4. SURVEY IS ONLY VALID WITH SURVEYOR'S STAMP AND SIGNATURE.
5. CONTOUR INTERVAL IS 0.5' FOOT.
6. WETLAND BOUNDARIES AND PITS/PLOTS 1–47 FLAGGED IN THE FIELD AND THEIR LOCATIONS WERE PROFESSIONALLY LAND SURVEYED.

LEGEND

WETLAND 'A' – DELINEATION LIMITS (41,149 SF/0.94 ACRES±)

WETLAND 'B' – DELINEATION LIMITS (34,745 SF/0.80 ACRES±)

TREE TABLE

TREE NUMBER	SPECIES	DBH (IN.)
ONSITE		
10495	OREGON WHITE OAK	59
10639	SWEET CHERRY	6
10946	SILKTREE	9
10952	SILKTREE	17
11078	APPLE	16
11079	NORTHEN CATALPA	10,15,17
11080	APPLE	7,10,12
11082	EUROPEAN WHITE BIRCH	19
11087	APPLE	13
11096	WALNUT	17,17
11135	SILKTREE	10,13
OFFSITE		
10101	CRABAPPLE	10
10102	CRABAPPLE	9
10146	CRABAPPLE	9
10189	CRABAPPLE	8
10475	QUAKING ASPEN	13
10486	CALIFORNIA BLACK OAK	24
10487	CALIFORNIA BLACK OAK	16
10488	CALIFORNIA BLACK OAK	18
10489	CALIFORNIA BLACK OAK	20
10490	CALIFORNIA BLACK OAK	13
10491	CALIFORNIA BLACK OAK	13
10492	CALIFORNIA BLACK OAK	13
10505	HAWTHORN	15
10635	PONDEROSA PINE	20
10636	DOUGLAS-FIR	20
10637	SWEET CHERRY	14
10680	EUROPEAN WHITE BIRCH	21
10681	RED MAPLE	12
10682	RED MAPLE	12
10683	LODGEPOLE PINE	7
10684	RED MAPLE	16
10685	QUAKING ASPEN	15
10686	PAPER BIRCH	6
10687	RED MAPLE	14
10688	RED MAPLE	14
10732	WESTERN REDCEDAR	12
10733	WESTERN REDCEDAR	14
10908	DEODAR CEDAR	15
10942	LODGEPOLE PINE	13
11046	PEAR	10
11047	PEAR	9
11048	PEAR	11
11049	PEAR	10
11071	PEAR	11

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HERITAGE CROSSING SUBDIVISION

TIGARD
TAX LOT 400

OREGON
WASHINGTON COUNTY ASSESSOR'S MAP 2S 1 11DA

EXISTING CONDITIONS PLAN

DESIGNED BY:
DRAWN BY: MSK
CHECKED BY: AHH
SCALE: AS NOTED
DATE: 09–28–2015

REGISTERED PROFESSIONAL LAND SURVEYOR
OREGON JULY 15, 2003 ALEXANDER H. HURLEY 53591LS
RENEWS: 6/30/17

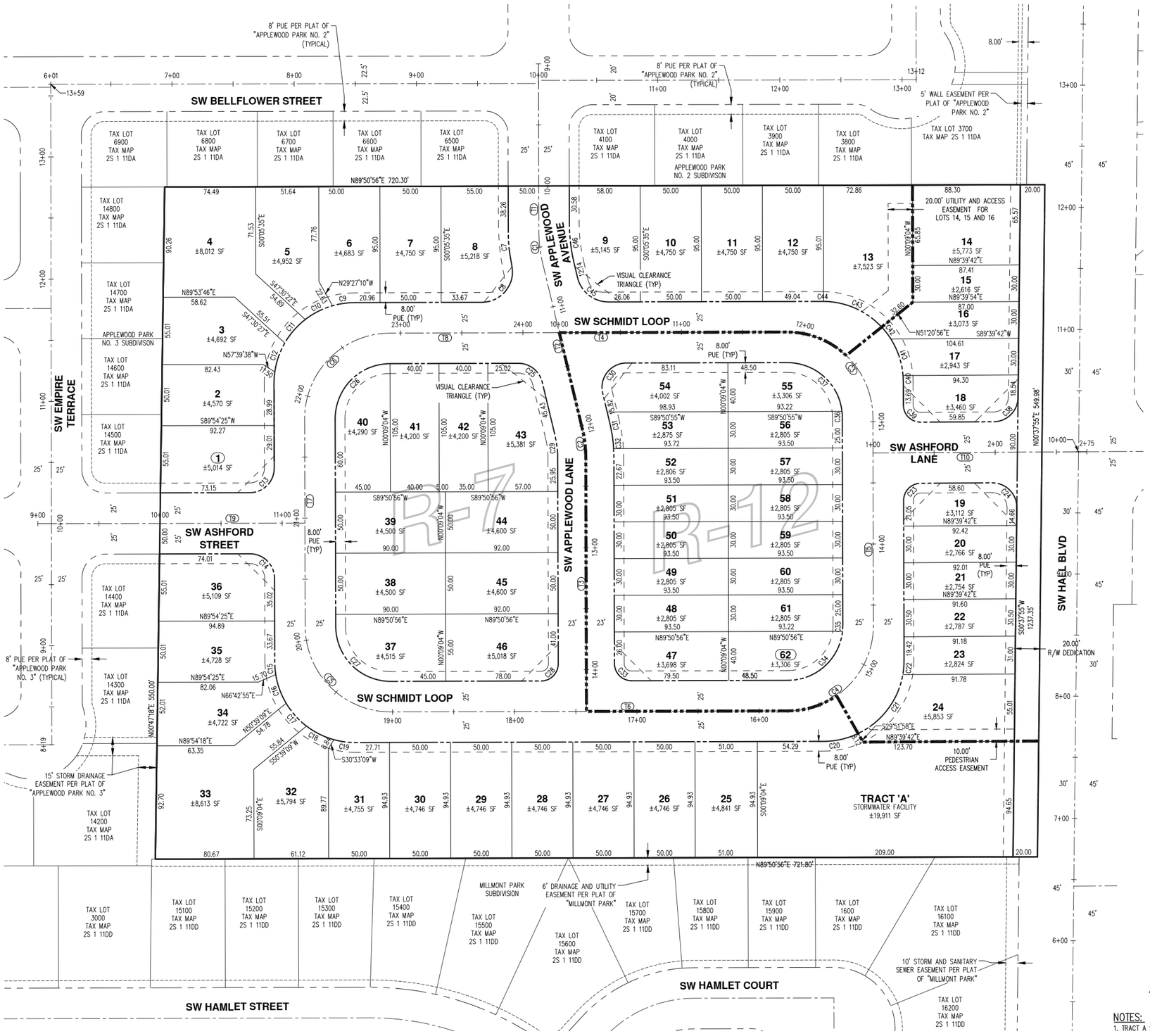
PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER
3876

SHEET
P02

AKS DRAWING FILE: 3876 P02 EXCONLDWG | LAYOUT: P02



SW APPLEWOOD AVENUE – LANE						
CURVE/TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
T1	10+00.00		38.28'			S00°05'35"E
C1	10+38.28	100.00'	23.32'	13°21'41"	23.27	S06°46'25.43"E
T2	10+61.60		141.72'			S13°27'16"E
C2	12+03.33	100.00'	23.22'	13°18'12"	23.17	S06°48'09.93"E
T3	12+26.55		207.67'			S00°09'04"E

SW SCHMIDT LOOP						
CURVE/TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
T4	10+00.00		186.44'			N89°50'56"E
C3	11+86.44	70.00'	109.96'	90°00'00"	98.99	S45°09'04.00"E
T5	12+96.39		170.00'			S00°09'04"E
C4	14+66.39	70.00'	109.96'	90°00'00"	98.99	S44°50'56.00"W
T6	15+76.35		325.00'			S89°50'56"W
C5	19+01.35	70.00'	109.96'	90°00'00"	98.99	N45°09'04.00"W
T7	20+11.30		170.00'			N00°09'04"W
C6	21+81.30	70.00'	109.96'	90°00'00"	98.99	N44°50'56.00"E
T8	22+91.26		138.56'			N89°50'56"E

SW ASHFORD STREET						
CURVE/TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
T9	10+00.00		118.58'			N89°54'25"E

SW ASHFORD LANE						
CURVE/TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
T10	1+00.00		168.24'			N89°39'48"E

CURVE TABLE				
CURVE	RADIUS	DELTA	LENGTH	CHORD
C7	125.00'	12°13'29"	26.67'	S6°12'20"E 26.62'
C8	25.00'	101°37'15"	44.34'	S38°29'23"W 38.75'
C9	66.00'	15°46'36"	18.17'	S81°57'38"W 18.12'
C10	66.00'	21°50'05"	25.15'	S63°09'18"W 25.00'
C11	66.00'	22°16'57"	25.67'	S41°05'46"W 25.51'
C12	66.00'	21°50'05"	25.15'	S19°02'15"W 25.00'
C13	20.00'	90°03'29"	31.44'	S44°52'40"W 28.30'
C14	20.00'	89°56'31"	31.40'	S45°07'20"E 28.27'
C15	66.00'	8°51'00"	10.19'	S4°34'34"E 10.18'
C16	66.00'	21°50'05"	25.15'	S19°55'06"E 25.00'
C17	66.00'	21°51'16"	25.17'	S41°45'47"E 25.02'
C18	66.00'	21°50'05"	25.15'	S63°36'28"E 25.00'
C19	66.00'	15°33'33"	18.00'	S82°20'17"E 17.94'
C20	66.00'	25°22'13"	29.22'	N77°09'50"E 28.99'
C21	66.00'	54°31'15"	62.80'	N37°13'05"E 60.46'
C22	66.00'	10°06'32"	11.64'	N4°54'12"E 11.63'
C23	14.00'	89°48'46"	21.95'	N44°45'19"E 19.77'
C24	20.00'	90°58'13"	31.75'	S44°51'14"E 28.52'
C25	20.00'	76°41'48"	26.77'	S51°48'10"E 24.82'
C26	45.00'	90°00'00"	70.69'	N44°50'56"E 63.64'

CURVE TABLE				
CURVE	RADIUS	DELTA	LENGTH	CHORD
C27	45.00'	90°00'00"	70.69'	N45°09'04"W 63.64'
C28	14.00'	90°00'00"	21.99'	S44°50'56"W 19.80'
C29	77.00'	14°35'23"	19.61'	S6°12'12"E 19.55'
C30	20.00'	103°18'12"	36.06'	S38°11'50"W 31.37'
C31	123.00'	9°53'18"	21.23'	S8°30'37"E 21.20'
C32	123.00'	9°53'18"	21.23'	S8°30'37"E 21.20'
C33	14.00'	90°00'00"	21.99'	S45°09'04"E 19.80'
C34	45.00'	83°37'14"	65.68'	N48°02'19"E 60.00'
C35	45.00'	6°22'46"	5.01'	N3°02'19"E 5.01'
C36	45.00'	6°22'49"	5.01'	N3°20'25"W 5.01'
C37	45.00'	83°37'11"	65.67'	N48°20'29"W 60.00'
C38	20.00'	89°05'35"	31.10'	N45°10'42"E 28.06'
C39	14.00'	90°11'14"	22.04'	S45°14'41"E 19.83'
C40	66.00'	4°26'57"	5.12'	N2°22'32"W 5.12'
C41	66.00'	27°40'00"	31.87'	N18°26'01"W 31.56'
C42	66.00'	10°42'09"	12.33'	N37°37'05"W 12.31'
C43	66.00'	46°20'39"	53.38'	N66°08'29"W 51.94'
C44	66.00'	0°50'15"	0.96'	N89°43'56"W 0.96'
C45	26.00'	76°41'48"	34.80'	S51°48'10"E 32.26'
C46	141.00'	13°21'41"	32.88'	S6°46'25"E 32.81'

DENSITY CALCULATIONS

R-7 ZONE

GROSS SITE AREA:	263,667 SF (6.05 AC)
PUBLIC R.O.W. DEDICATION:	66,855 SF (1.53 AC)
NET DEVELOPABLE AREA:	196,812 SF (4.52 AC)
TRACT 'A' AREA:	19,911 SF (0.43 AC)
MINIMUM LOT AREA:	4,000 SF
MINIMUM AVERAGE LOT AREA:	5,000 SF
MAXIMUM LOT DENSITY:	(196,812/5,000) = 39.36 = 39 LOTS
MINIMUM LOT DENSITY:	39 LOTS(80%) = 31.2 = 31 LOTS
PROPOSED LOT DENSITY:	35 LOTS
PROPOSED AVERAGE LOT AREA:	(176,901 SF/35 LOTS) = 5,054 SF
PROPOSED MINIMUM LOT AREA:	4,200 SF

R-12 ZONE

GROSS SITE AREA:	132,856 SF (3.05 AC)
PUBLIC R.O.W. DEDICATION:	46,717 SF (1.07 AC)
NET DEVELOPABLE AREA:	86,139 SF (2.00 AC)
AVERAGE LOT AREA:	3,050 SF
MAXIMUM LOT DENSITY:	(86,139/3,050) = 28.24 = 28 LOTS
MINIMUM LOT DENSITY:	28 LOTS(80%) = 22.4 = 22 LOTS
PROPOSED LOT DENSITY:	27 LOTS
PROPOSED AVERAGE LOT AREA:	(86,139 SF/27 LOTS) = 3,190 SF
PROPOSED MINIMUM LOT AREA:	2,616 SF

NOTES:
1. TRACT A SHALL BE CONVEYED TO THE CITY OF TIGARD.

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HERITAGE CROSSING SUBDIVISION

TIGARD
TAX LOT 400

OREGON
WASHINGTON COUNTY ASSESSOR'S MAP 2S 1 11DA

PRELIMINARY SUBDIVISION PLAT

DESIGNED BY:	DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 09-28-2015

REGISTERED PROFESSIONAL LAND SURVEYOR
PRELIMINARY NOT FOR CONSTRUCTION
OREGON
JULY 25, 2003
ALEXANDER H. HURLEY
53395
RENEWS: 6/30/17

REVISIONS

JOB NUMBER
3876

SHEET
P03

AKS DRAWING FILE: 3876 P03 PLAT.DWG | LAYOUT: P03

REQUIRED SETBACKS

R-7 ZONE

FRONT YARD:	15 FT
FRONT GARAGE:	20 FT
SIDE YARD:	5 FT
CORNER LOT SIDE YARD:	10 FT
REAR YARD:	15 FT

R-12 ZONE

FRONT YARD:	15 FT
FRONT GARAGE:	20 FT
SIDE YARD:	5 FT
CORNER LOT SIDE YARD:	10 FT
REAR YARD:	15 FT
AGAINST R-7 ZONE	30 FT

SCALE 1" = 40 FEET

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HERITAGE CROSSING SUBDIVISION

TIGARD
TAX LOT 400

OREGON
WASHINGTON COUNTY ASSESSOR'S MAP 2S 1 11DA

PRELIMINARY BUILDING SETBACKS PLAN

DESIGNED BY: DS
DRAWN BY: DS
CHECKED BY: AHH
SCALE: AS NOTED
DATE: 09-28-2015

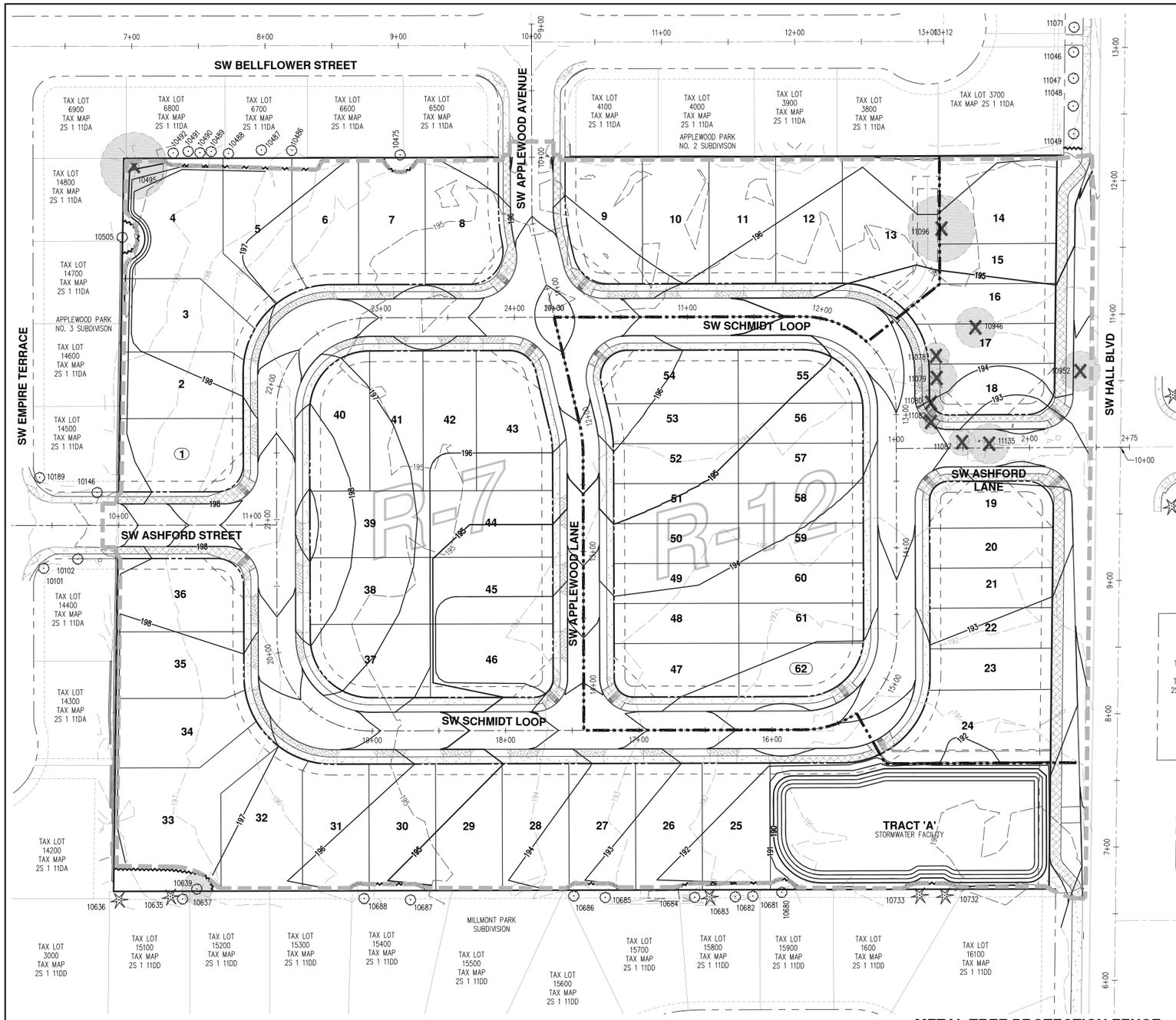
REGISTERED PROFESSIONAL LAND SURVEYOR
PRELIMINARY NOT FOR CONSTRUCTION
OREGON JULY 14, 2003 ALEXANDER H. HURLEY 53393LS
RENEWS: 6/30/17

REVISIONS

JOB NUMBER
3876

SHEET
P04

AKS DRAWING FILE: 3876 P04 SETBUNG | LAYOUT: P04



TREE PROTECTION NOTES:

A. NO CHANGES SHALL BE MADE TO ANY ASPECT OF THE APPROVED URBAN FORESTRY PLAN WITHOUT WRITTEN CONSENT FROM THE PROJECT ARBORIST AND CITY ARBORIST.

B. TREE PROTECTION SHALL BE INSTALLED PRIOR TO ANY GROUND DISTURBANCE WORK.

C. NO PERSON MAY CONDUCT ANY ACTIVITY WITHIN THE PROTECTED AREA OF ANY TREE DESIGNATED TO REMAIN, INCLUDING, BUT NOT LIMITED TO, PARKING EQUIPMENT, PLACING SOLVENTS, STORING BUILDING MATERIAL AND SOIL DEPOSITS, DUMPING CONCRETE WASHOUT AND LOCATING BURN HOLES.

D. ATTACHMENTS TO TREES DURING CONSTRUCTION – NO PERSON SHALL ATTACH ANY OBJECT TO ANY TREE DESIGNATED FOR PRESERVATION.

E. PRIOR TO ANY GROUND DISTURBANCE, THE CONTRACTOR:

1. SHALL ERECT AND MAINTAIN READILY VISIBLE TREE PROTECTION FENCING ALONG THE OUTER EDGE AND COMPLETELY SURROUNDING THE PROTECTED AREA OF ALL PROTECTED TREES OR GROUPS OF TREES AS SHOWN.
2. MAY BE REQUIRED TO COVER WITH MULCH TO A DEPTH OF AT LEAST SIX (6) INCHES, OR WITH PLYWOOD OR SIMILAR MATERIAL, OVER THE ROOT ZONE OF A TREE IN ORDER TO PROTECT ROOTS FROM DAMAGE CAUSED BY HEAVY EQUIPMENT.
3. SHALL PROHIBIT EXCAVATION OR COMPACTING OF EARTH OR OTHER POTENTIALLY DAMAGING ACTIVITIES WITHIN THE TREE PROTECTION ZONE.
4. MAY BE REQUIRED TO MINIMIZE ROOT DAMAGE BY EXCAVATION OF A TWO (2) FEET DEEP TRENCH, AT THE EDGE OF THE TREE PROTECTION ZONE, TO CLEANLY SEVER THE ROOTS OF TREES TO BE RETAINED.
5. MAY BE REQUIRED TO HAVE CORRECTIVE PRUNING PERFORMED ON PRESERVED TREES IN ORDER TO AVOID DAMAGE FROM MACHINERY OR BUILDING ACTIVITY, AND MAY BE REQUIRED TO MAINTAIN TREES THROUGHOUT CONSTRUCTION PERIOD BY WATERING AND FERTILIZING.
6. SHALL MAINTAIN THE TREE PROTECTION FENCING IN PLACE UNTIL THE PROJECT ARBORIST AND CITY ARBORIST AUTHORIZES THEIR REMOVAL.
7. SHALL ENSURE THAT ANY LANDSCAPING DONE IN THE TREE PROTECTION ZONE SUBSEQUENT TO THE REMOVAL OF THE BARRIERS SHALL BE ACCOMPLISHED WITH LIGHT MACHINERY OR HAND LABOR. USE PLANT MATERIALS WITH COMPATIBLE WATER REQUIREMENTS TO TREE TO BE PRESERVED AND DIRECT SPRAY IRRIGATION AWAY FROM TRUNKS.

F. THE GRADE SHALL NOT BE ELEVATED OR REDUCED WITHIN THE TREE PROTECTION ZONE WITHOUT THE PROJECT ARBORIST'S AUTHORIZATION. THE PROJECT ARBORIST MAY ALLOW COVERAGE OF UP TO ONE HALF OF THE AREA OF THE TREE'S ROOT ZONE WITH LIGHT SOILS (NO CLAY) TO THE MINIMUM DEPTH NECESSARY TO CARRY OUT GRADING OR LANDSCAPING PLANS, IF IT WILL NOT IMPERIL THE SURVIVAL OF THE TREE. AERATION DEVICES MAY BE REQUIRED TO ENSURE THE TREE'S SURVIVAL.

G. IF THE GRADE ADJACENT TO A PRESERVED TREE IS RAISED SUCH THAT IT COULD SLOUGH OR ERODE INTO THE TREE PROTECTION ZONE, IT SHALL BE PERMANENTLY STABILIZED TO PREVENT SUFFOCATION OF THE ROOTS.

H. AN IMPERVIOUS SURFACE SHALL NOT BE INSTALLED WITHIN THE TREE PROTECTION ZONE OF ANY TREE TO BE PRESERVED WITHOUT THE AUTHORIZATION OF THE PROJECT ARBORIST. THE PROJECT ARBORIST MAY REQUIRE SPECIFIC CONSTRUCTION METHODS AND/OR USE OF AERATION DEVICES TO ENSURE THE TREE'S SURVIVAL AND TO MINIMIZE THE POTENTIAL FOR ROOT INDUCED DAMAGE TO THE IMPERVIOUS SURFACE.

I. TO THE GREATEST EXTENT PRACTICAL, UTILITY TRENCHES SHALL BE LOCATED OUTSIDE OF THE TREE PROTECTION ZONE OF TREES TO BE PRESERVED. THE PROJECT ARBORIST MAY REQUIRE THAT UTILITIES BE TUNNELED UNDER THE ROOTS OF TREES TO BE PRESERVED IF THE PROJECT ARBORIST DETERMINES THAT TRENCHING WOULD SIGNIFICANTLY REDUCE THE CHANCES OF THE TREES SURVIVAL.

J. DIRECTIONAL FELLING OF TREES SHALL BE USED TO AVOID DAMAGE TO TREES DESIGNATED FOR PRESERVATION.

K. THE PROJECT ARBORIST MAY REQUIRE ADDITIONAL TREE PRESERVATION MEASURES WHICH ARE CONSISTENT WITH TREE CARE INDUSTRY STANDARDS.

L. STUMPS SHALL BE GROUND AS NECESSARY SO AS NOT TO CAUSE DAMAGE TO THE ROOT ZONES OF ADJACENT TREES TO BE PRESERVED ON THE SUBJECT PARCEL OR ABUTTING PARCELS. STUMPS NEAR PROPERTY LINES SHALL ALSO BE GROUND AS NECESSARY SO AS NOT TO CAUSE DISTURBACE TO ADJACENT PARCELS.

TREE NUMBER	SPECIES	DBH (IN.)	PRESERVE /REMOVE
OFFSITE			
10101	CRABAPPLE	10	PRESERVE
10102	CRABAPPLE	9	PRESERVE
10146	CRABAPPLE	9	PRESERVE
10189	CRABAPPLE	8	PRESERVE
10475	QUAKING ASPEN	13	PRESERVE
10486	CALIFORNIA BLACK OAK	24	PRESERVE
10487	CALIFORNIA BLACK OAK	16	PRESERVE
10488	CALIFORNIA BLACK OAK	18	PRESERVE
10489	CALIFORNIA BLACK OAK	20	PRESERVE
10490	CALIFORNIA BLACK OAK	13	PRESERVE
10491	CALIFORNIA BLACK OAK	13	PRESERVE
10492	CALIFORNIA BLACK OAK	13	PRESERVE
10505	HAWTHORN	15	PRESERVE
10635	PONDEROSA PINE	20	PRESERVE
10636	DOUGLAS-FIR	20	PRESERVE
10637	SWEET CHERRY	14	PRESERVE
10680	EUROPEAN WHITE BIRCH	21	PRESERVE
10681	RED MAPLE	12	PRESERVE
10682	RED MAPLE	12	PRESERVE
10683	LODGEPOLE PINE	7	PRESERVE
10684	RED MAPLE	16	PRESERVE
10685	QUAKING ASPEN	15	PRESERVE
10686	PAPER BIRCH	6	PRESERVE
10687	RED MAPLE	14	PRESERVE
10688	RED MAPLE	14	PRESERVE
10732	WESTERN REDCEDAR	12	PRESERVE
10733	WESTERN REDCEDAR	14	PRESERVE
10908	DEODAR CEDAR	15	PRESERVE
10942	LODGEPOLE PINE	13	PRESERVE
11046	PEAR	10	PRESERVE
11047	PEAR	9	PRESERVE
11048	PEAR	11	PRESERVE
11049	PEAR	10	PRESERVE
11071	PEAR	11	PRESERVE

TREE NUMBER	SPECIES	DBH (IN.)	PRESERVE /REMOVE
ONSITE			
10495	OREGON WHITE OAK	59	REMOVE
10639	SWEET CHERRY	6	PRESERVE
10946	SILKTREE	9	REMOVE
10952	SILKTREE	17	REMOVE
11078	APPLE	16	REMOVE
11079	NORTHEN CATALPA	10,15,17	REMOVE
11080	APPLE	7,10,12	REMOVE
11082	EUROPEAN WHITE BIRCH	19	REMOVE
11087	APPLE	13	REMOVE
11096	WALNUT	17,17	REMOVE
11135	SILKTREE	10,13	REMOVE

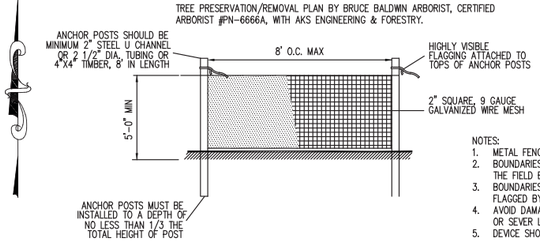
LEGEND

- EXISTING GROUND CONTOUR (1 FT)
- EXISTING GROUND CONTOUR (5 FT) — 190 —
- FINISHED GRADE CONTOUR (1 FT)
- FINISHED GRADE CONTOUR (5 FT) — 190 —
- EXISTING CONIFEROUS TREE
- EXISTING DECIDUOUS TREE
- TREE REMOVAL
- TREE PROTECTION FENCE
- TREE DRIPLINE
- GRADING LIMITS
- ZONE DISTRICT BOUNDARY
- EXISTING ON-SITE TREE CANOPY AREA

NOTE: SEE COVER SHEET FOR GENERAL PLAN LEGEND

METAL TREE PROTECTION FENCE

TREE PRESERVATION/REMOVAL PLAN BY BRUCE BALDWIN ARBORIST, CERTIFIED ARBORIST #PN-6666A, WITH AKS ENGINEERING & FORESTRY.



NOTES:
1. METAL FENCE FOR TREE PROTECTION DEVICE, ONLY.
2. BOUNDARIES OF PROTECTION AREA WILL BE ESTABLISHED IN THE FIELD BY THE ARBORIST PRIOR TO CONSTRUCTION.
3. BOUNDARIES OF PROTECTION AREA SHOULD BE STAKED AND FLAGGED BY THE ARBORIST PRIOR TO INSTALLING DEVICES.
4. AVOID DAMAGE TO CRITICAL ROOT ZONE. DO NOT DAMAGE OR SEVER LARGE ROOTS WHEN INSTALLING POSTS.
5. DEVICE SHOULD BE MAINTAINED THROUGHOUT CONSTRUCTION.

ROOT PROTECTION ZONE NOTES:

ENCROACHMENT INTO THE ROOT PROTECTION ZONE MAY BE ALLOWED WITH PROJECT ARBORIST APPROVAL AS DESCRIBED IN THE FOLLOWING NOTES:

1. EXCAVATION IN THE TOP 24" OF THE SOIL IN THE CRITICAL ROOT ZONE AREA SHOULD BEGIN AT THE EXCAVATION LINE THAT IS CLOSEST TO THE TREE.
2. THE EXCAVATION SHOULD BE DONE BY HAND/SHOVEL OR WITH A BACKHOE AND A MAN WITH A SHOVEL, PRUNING SHEARS, AND A PRUNING SAW.
3. IF DONE BY HAND, ALL ROOTS 1" OR LARGER SHOULD BY PRUNED AT THE EXCAVATION LINE.
4. IF DONE WITH A BACKHOE (MOST LIKELY SCENARIO), THEN THE OPERATOR SHALL START THE CUT AT THE EXCAVATION LINE AND CAREFULLY "FEEL" FOR ROOTS/RESISTANCE. WHEN THERE IS RESISTANCE, THE MAN WITH THE SHOVEL HAND DIGS AROUND THE ROOTS AND PRUNES THE ROOTS LARGER THAN 1" DIAMETER.

SEE SUPPLEMENTAL ARBORIST REPORT FOR MORE INFORMATION

I, BRUCE R. BALDWIN, ATTEST THAT THIS TREE PRESERVATION AND REMOVAL PLAN MEETS ALL OF THE REQUIREMENTS IN SECTION 10, PART 1, OF THE CITY OF TIGARD URBAN FORESTRY MANUAL.

BRUCE BALDWIN, CERTIFIED ARBORIST
PN-6666A

ISA CERTIFIED ARBORIST
BRUCE R. BALDWIN
CERTIFICATE NUMBER: PN-6666A
EXPIRATION DATE: 12/31/17

SCALE 1" = 40 FEET
40 0 16 24 32 40

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HERITAGE CROSSING SUBDIVISION

TIGARD
TAX LOT 400

OREGON
WASHINGTON COUNTY ASSESSOR'S MAP 2S 1 11DA

PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN

DESIGNED BY:	DS
DRAWN BY:	DS
CHECKED BY:	BRB
SCALE:	AS NOTED

DATE: 09-28-2015

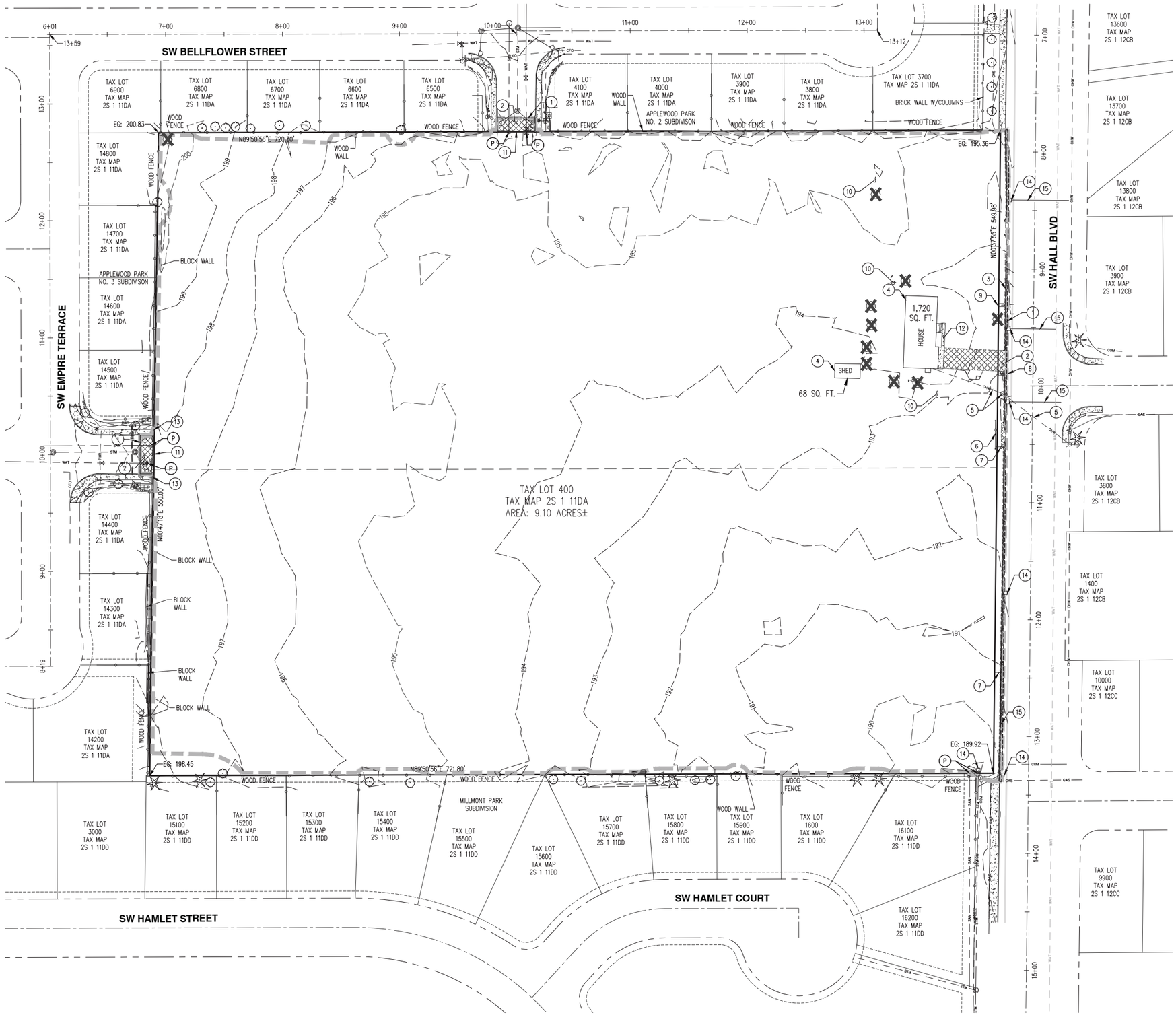
PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER
3876

SHEET
P05

AKS DRAWING FILE: 3876 P05 TREE.DWG | LAYOUT: P05



LEGEND

- EXISTING GROUND CONTOUR (1 FT)
- EXISTING GROUND CONTOUR (5 FT) — 230
- EXISTING TREE TO REMAIN
- EXISTING TREE TO BE REMOVED
- DISTURBED AREA
- AC SAWCUT
- CURB TO BE REMOVED
- AC TO BE REMOVED

KEYED DEMOLITION NOTES (#)

1. AC SAWCUT (TYP)
2. REMOVE AND HAUL OFF EXISTING AC
3. REMOVE EXISTING CURB
4. REMOVE AND HAUL OFF EXISTING STRUCTURES
5. REMOVE EXISTING OVERHEAD WIRES AND POWER POLE – CONTRACTOR TO COORDINATE WITH UTILITY PROVIDER
6. REMOVE EXISTING FENCE
7. EXISTING ROAD SIGN TO BE RELOCATED WITHIN PROPOSED LANDSCAPE STRIP – COORDINATE WITH ODOT AND CITY REGARDING RELOCATION
8. EXISTING MAILBOX TO BE REMOVED
9. REMOVE WATER SERVICE – CONTRACTOR TO COORDINATE WITH CITY OF TIGARD PROJECT INSPECTOR
10. REMOVE EXISTING SEPTIC TANK (APPROXIMATE LOCATION)
11. REMOVE EXISTING ROAD BARRICADE
12. REMOVE AND HAUL OFF EXISTING CONCRETE SIDEWALK
13. REMOVE EXISTING RETAINING WALL TO ACCOMMODATE FOR PROPOSED STREET IMPROVEMENTS
14. REMOVE EXISTING STORM STRUCTURE
15. STORM PIPE TO BE GROUTED AND ABANDONED IN PLACE – CONTRACTOR TO COORDINATE WITH ODOT, PROJECT ENGINEER AND CITY PRIOR TO BEGINNING WORK

NOTES:

1. CONTRACTOR TO COORDINATE THE REMOVAL OF ALL NECESSARY PRIVATE UTILITIES WITH THE APPROPRIATE UTILITY PROVIDERS
2. REMOVE STRUCTURES PER APPLICABLE LOCAL, STATE, AND FEDERAL BUILDING CODE.
3. CONTRACTOR TO ABANDON ANY EXISTING WELLS, SEPTIC TANKS, AND DRAIN FIELDS FOUND DURING CONSTRUCTION PER APPLICABLE LOCAL, STATE, AND FEDERAL REQUIREMENTS.

(P) **CONTRACTOR TO POTHOLE AND VERIFY ALL UTILITY TIE IN ELEVATIONS PRIOR TO ORDERING MANHOLES, PIPES AND ALL MATERIALS**

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HERITAGE CROSSING SUBDIVISION

TIGARD
TAX LOT 400

OREGON
WASHINGTON COUNTY ASSESSOR'S MAP 2S 1 11DA

PRELIMINARY DEMOLITION PLAN

DESIGNED BY:	DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 09-28-2015

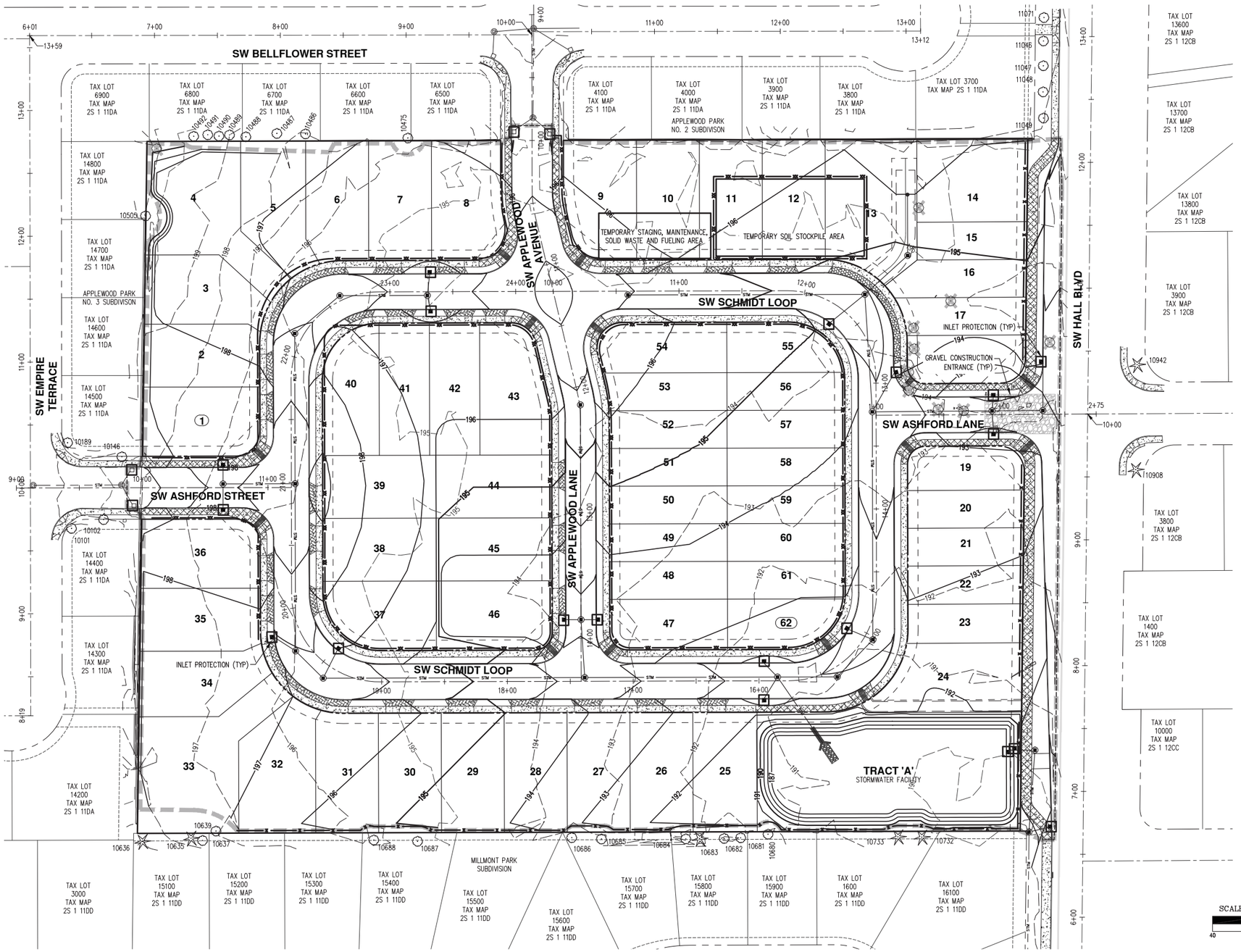
REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY NOT FOR CONSTRUCTION
PETER A. SHIRLEY
RENEWAL DATE: 6/30/17

REVISIONS

JOB NUMBER
3876

SHEET
P06

AKS DRAWING FILE: 3876 P06 DEMOLISH | LAYOUT: P06



LEGEND

- EXISTING GROUND CONTOUR (1 FT)
- EXISTING GROUND CONTOUR (5 FT)
- FINISHED GRADE CONTOUR (1 FT)
- FINISHED GRADE CONTOUR (5 FT)
- EXISTING CONIFEROUS TREE
- EXISTING DECIDUOUS TREE
- TREE REMOVAL
- DISTURBANCE BOUNDARY
- SEDIMENT FENCE (TO BE INSTALLED PRIOR TO GRADING)
- SEDIMENT FENCE (TO BE INSTALLED AFTER GRADING)
- INLET PROTECTION
- OUTLET PROTECTION
- GRAVEL CONSTRUCTION ENTRANCE

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TIGARD OREGON
TAX LOT 400
WASHINGTON COUNTY ASSESSOR'S MAP 2S 1 11DA

PRELIMINARY GRADING AND EROSION CONTROL PLAN

DESIGNED BY:	DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 09-28-2015

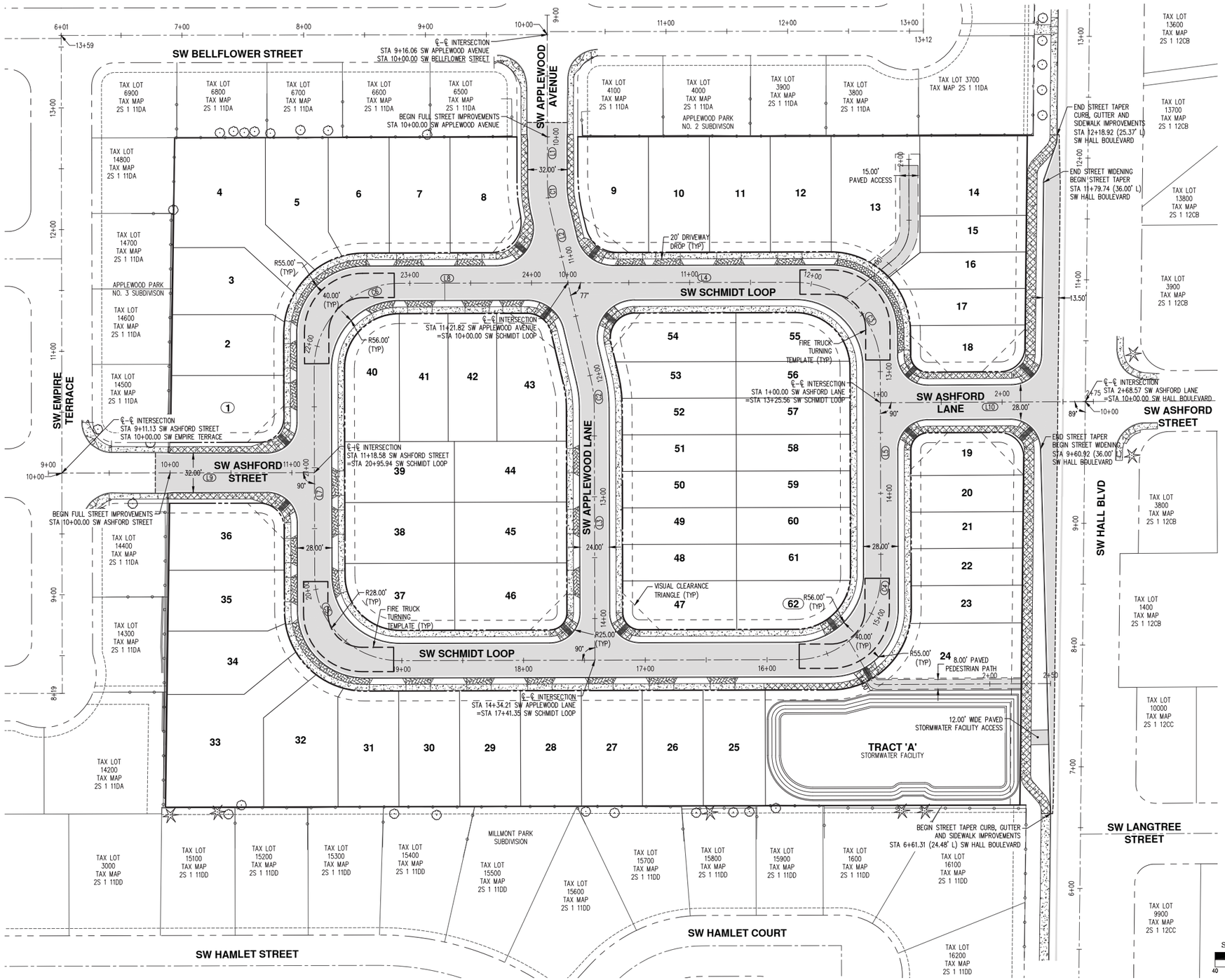
REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY NOT FOR CONSTRUCTION
OREGON
JANUARY 9, 2001
TAYLOR H. HURLEY
RENEWAL DATE: 6/30/17

REVISIONS

JOB NUMBER
3876

SHEET
P07

AKS DRAWING FILE: 3876 P07 GRADE.DWG | LAYOUT: P07



SW APPLEWOOD AVENUE – LANE						
CURVE/TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
L1	10+00.00		38.28'			S00°05'35"E
C1	10+38.28	100.00'	23.32'	13°21'41"	23.27	S06°46'25.43"E
L2	10+61.60		141.72'			S13°27'16"E
C2	12+03.33	100.00'	23.22'	13°18'12"	23.17	S06°48'09.93"E
L3	12+26.55		207.67'			S00°09'04"E

SW SCHMIDT LOOP						
CURVE/TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
L4	10+00.00		186.44'			N89°50'56"E
C3	11+86.44	70.00'	109.96'	90°00'00"	98.99	S45°09'04.00"E
L5	12+96.39		170.00'			S00°09'04"E
C4	14+66.39	70.00'	109.96'	90°00'00"	98.99	S44°50'56.00"W
C5	19+01.35	70.00'	109.96'	90°00'00"	98.99	N45°09'04.00"W
L7	20+11.30		170.00'			N00°09'04"W
C6	21+81.30	70.00'	109.96'	90°00'00"	98.99	N44°50'56.00"E
L8	22+91.26		138.56'			N89°50'56"E

SW ASHFORD STREET						
CURVE/TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
L9	10+00.00		118.58'			N89°54'25"E

SW ASHFORD LANE						
CURVE/TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
L10	1+00.00		168.24'			N89°39'48"E

LEGEND

- CONCRETE SIDEWALK CONSTRUCTED BY CONTRACTOR.
- CONCRETE SIDEWALK CONSTRUCTED BY HOME BUILDER.
- RESIDENTIAL DRIVEWAY CONSTRUCTED BY HOME BUILDER.
- RESIDENTIAL DRIVEWAY CONSTRUCTED BY CONTRACTOR.
- NEW AC PAVEMENT, PER TYPICAL SECTIONS.
- ADA RAMP CONSTRUCTED BY CONTRACTOR.
- FIRE TRUCK TURNING TEMPLATE

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TIGARD
TAX LOT 400

OREGON
WASHINGTON COUNTY, ASSESSOR'S MAP 2S 1 11DA

PRELIMINARY STREET PLAN

DESIGNED BY:	DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 09-28-2015

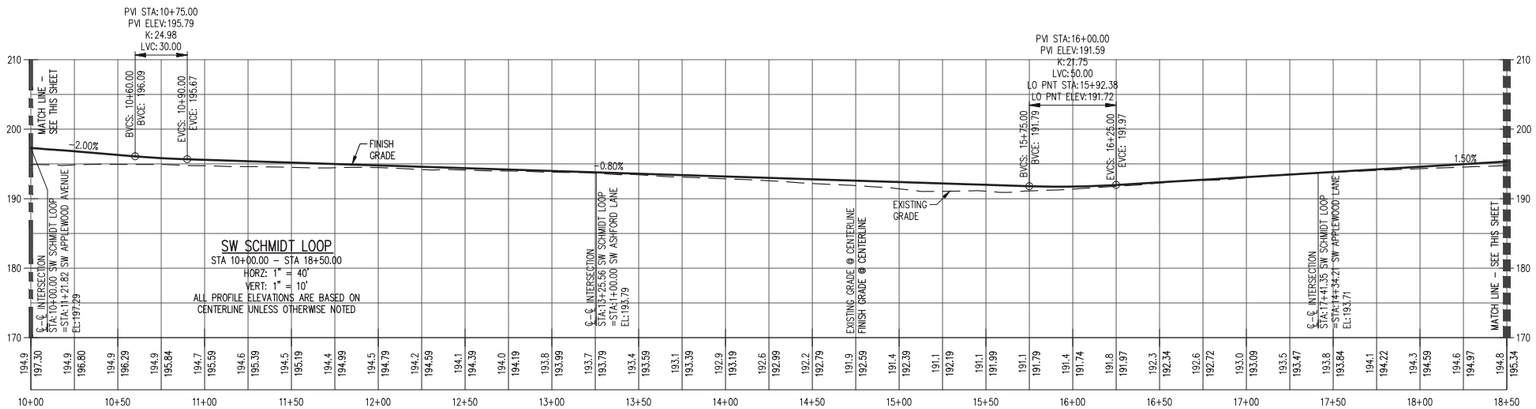
REGISTERED PROFESSIONAL ENGINEER
OREGON JANUARY 12, 2010
PAUL A. SCHMIDT
PRELIMINARY NOT FOR CONSTRUCTION
EXPIRES: 12/31/2015
JAMES H. HURLEY
RENEWAL DATE: 6/30/17

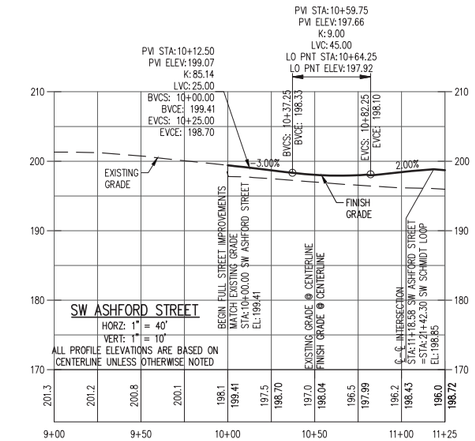
REVISIONS

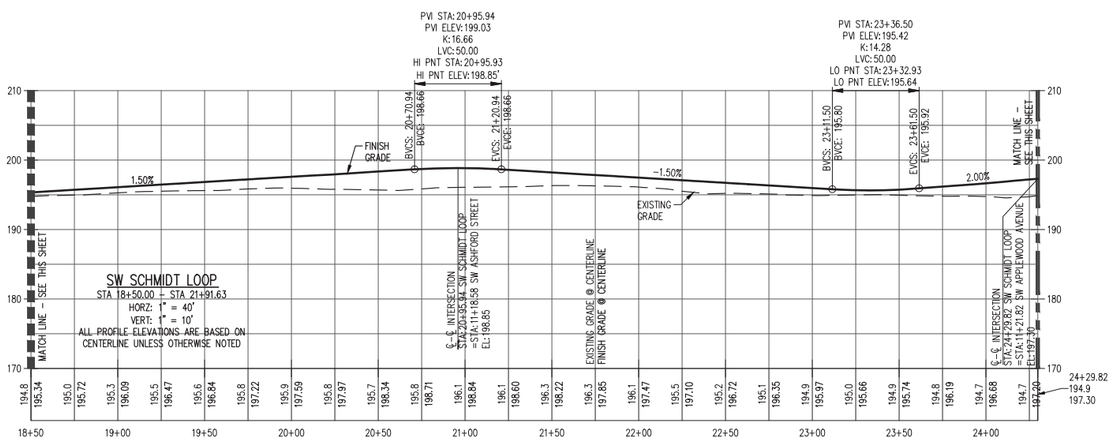
JOB NUMBER
3876

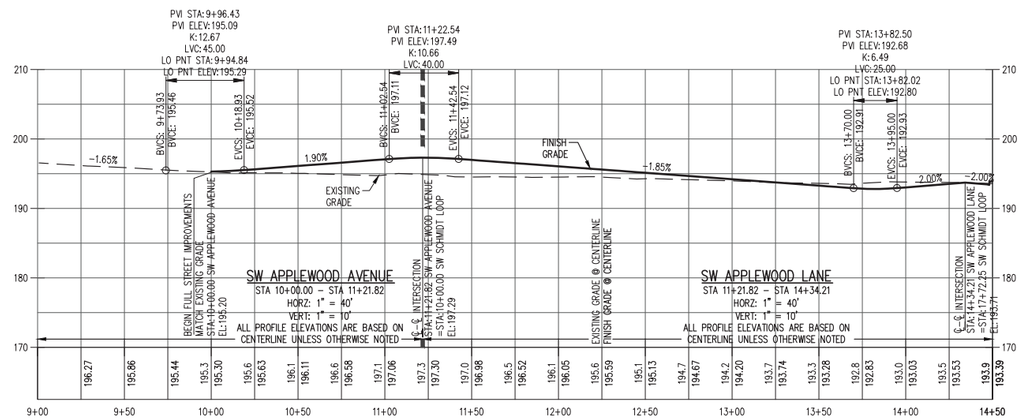
SHEET
P08

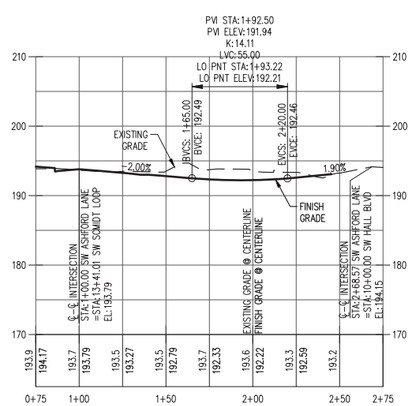
AKS DRAWING FILE: 3876 P08 STREET.DWG | LAYOUT: P08

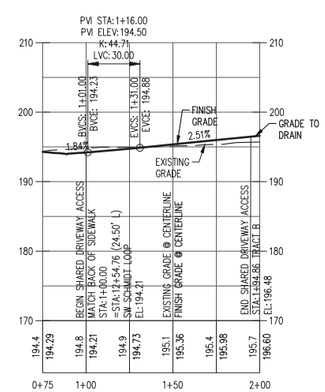


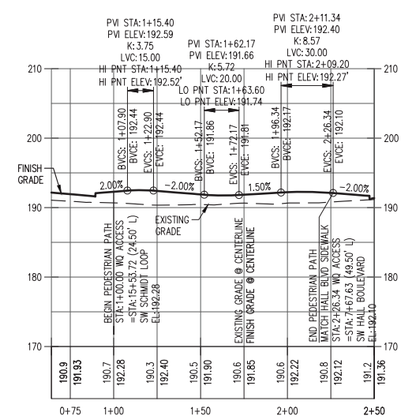












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TIGARD
TAX LOT 400

OREGON
WASHINGTON COUNTY, ASSESSOR'S MAP 2S 1 11DA

PRELIMINARY STREET PROFILES

DESIGNED BY:	DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 09-28-2015

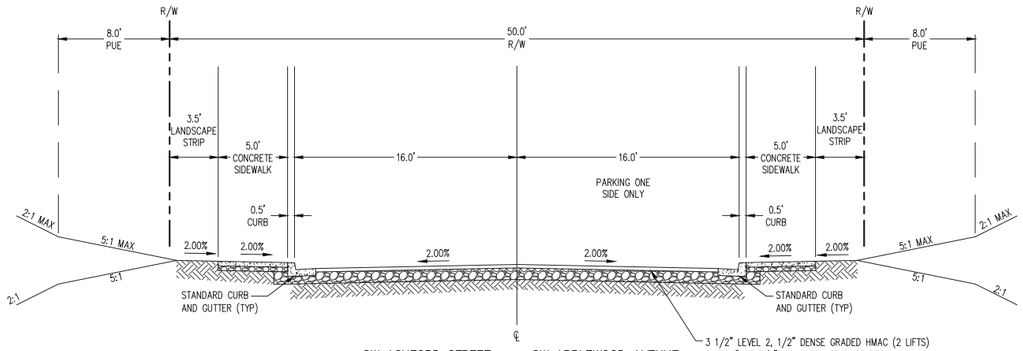
REGISTERED PROFESSIONAL ENGINEER
OREGON
JANUARY 15, 2003
CASPER H. HURLEY
PRELIMINARY NOT FOR CONSTRUCTION
RENEWAL DATE: 6/30/17

REVISIONS

JOB NUMBER
3876

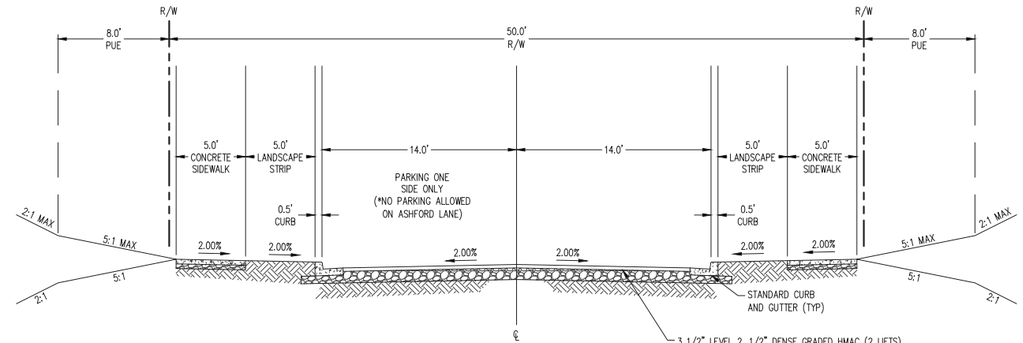
SHEET
P09

AKS DRAWING FILE: 3876 P08 STREETDWG | LAYOUT: P09



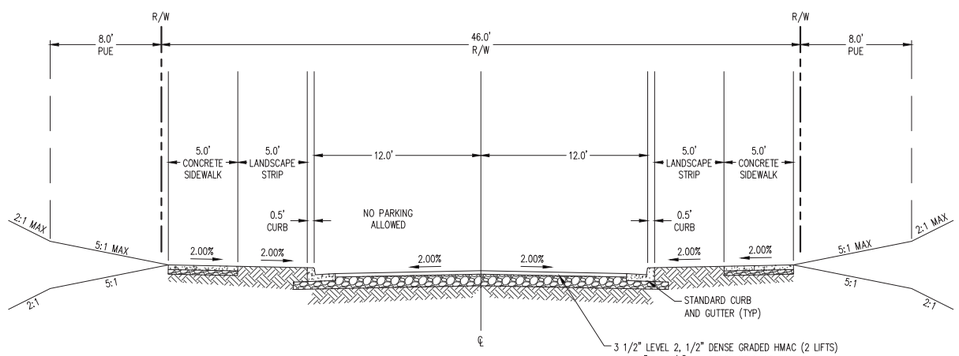
SW ASHFORD STREET
TYPICAL SECTION
(STA 10+00 – STA 11+18.58)
1" = 5'

SW APPLEWOOD AVENUE
TYPICAL SECTION
(STA 10+00.00 – STA 11+21.82)
1" = 5'

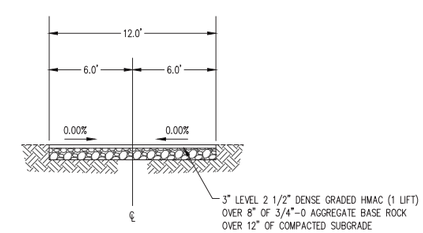


SW SCHMIDT LOOP
TYPICAL SECTION
(STA 10+00.00 – STA 24+29.82)
1" = 5'

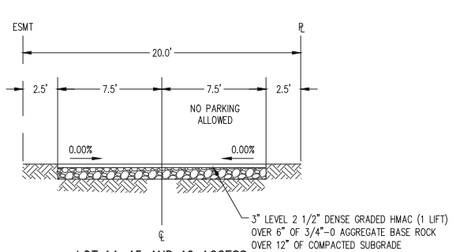
*SW ASHFORD LANE
TYPICAL SECTION
(STA 1+00.00 – STA 2+68.57)
1" = 5'



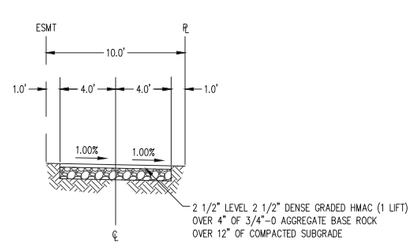
SW APPLEWOOD LANE
TYPICAL SECTION
(STA 11+21.82 – STA 14+34.21)
1" = 5'



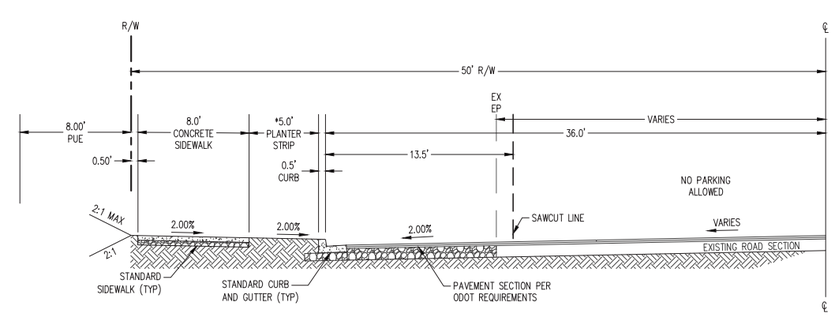
STORMWATER FACILITY ACCESS
TYPICAL SECTION
1" = 5'



LOT 14, 15 AND 16 ACCESS
TYPICAL SECTION
(STA 1+00.00 – STA 2+05.00)
1" = 5'



PEDESTRIAN PATH
TYPICAL SECTION
(STA 1+00.00 – STA 2+12.87)
1" = 5'



*PLANTER STRIP WIDTH VARIES FOR TAPER TRANSITION SECTION

SW HALL BOULEVARD WIDENING
TYPICAL SECTION
(STA 8+21.07 – STA 13+23.69)
1" = 5'

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TIGARD
TAX LOT 400

OREGON
WASHINGTON COUNTY ASSESSOR'S MAP 2S 1 11DA

PRELIMINARY STREET CROSS-SECTIONS

DESIGNED BY:	DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 09-28-2015

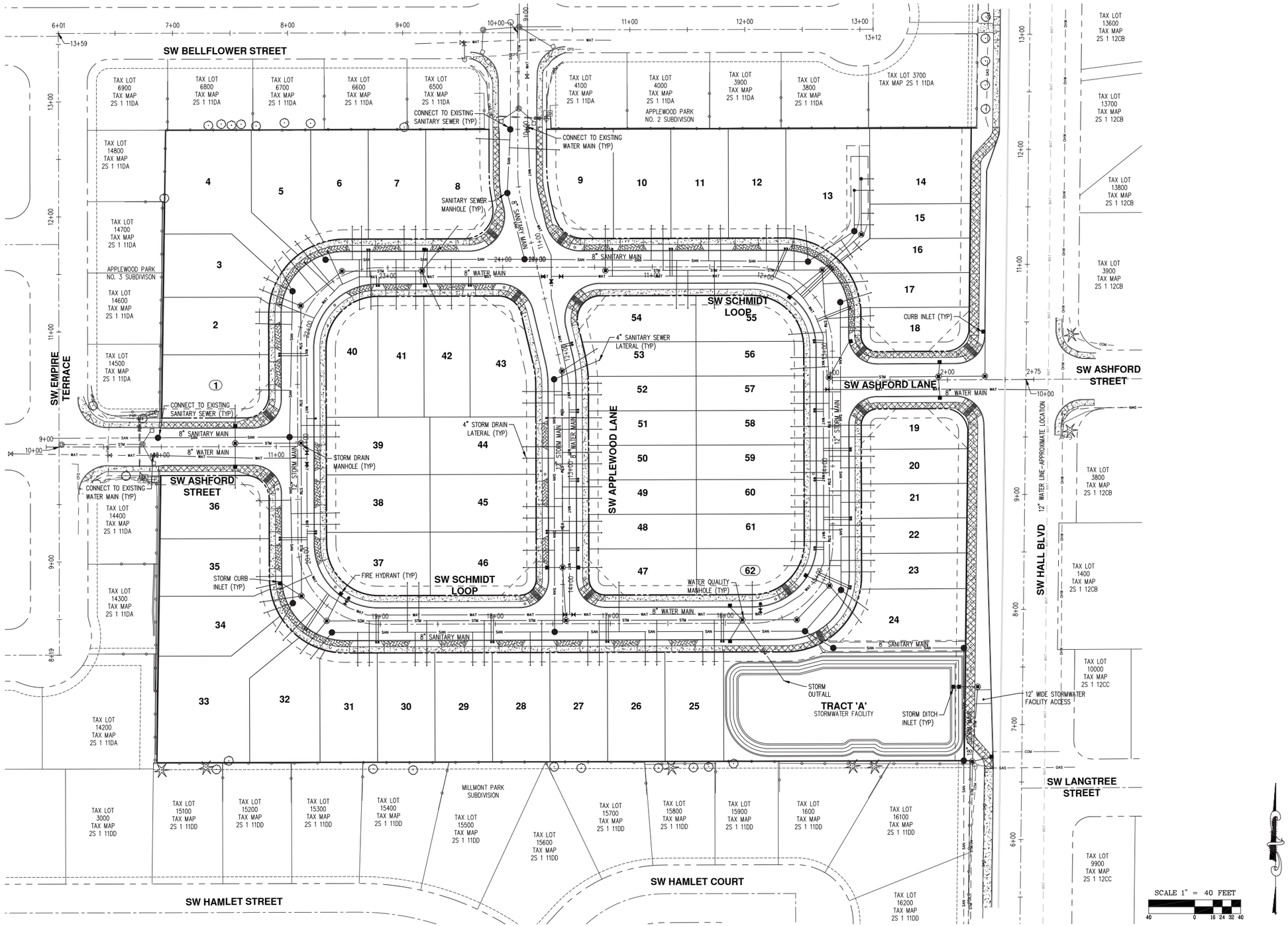
REGISTERED PROFESSIONAL ENGINEER
OREGON JANUARY 13, 2009
PAUL A. SCHMIDT
PRELIMINARY NOT FOR CONSTRUCTION
EXPIRES: 12/31/15
COOPER H. HURLEY
RENEWAL DATE: 6/30/17

REVISIONS

JOB NUMBER
3876

SHEET
P10

AKS DRAWING FILE: 3876 POB STREET.DWG | LAYOUT: P10



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HERITAGE CROSSING SUBDIVISION

TIGARD
TAX LOT 400

OREGON
WASHINGTON COUNTY ASSESSOR'S MAP 2S 1 11DA

PRELIMINARY COMPOSITE UTILITY PLAN

DESIGNED BY:	DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 09-28-2015

REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY NOT FOR CONSTRUCTION
OREGON
JANUARY 13, 2003
TAYLOR H. HURLEY

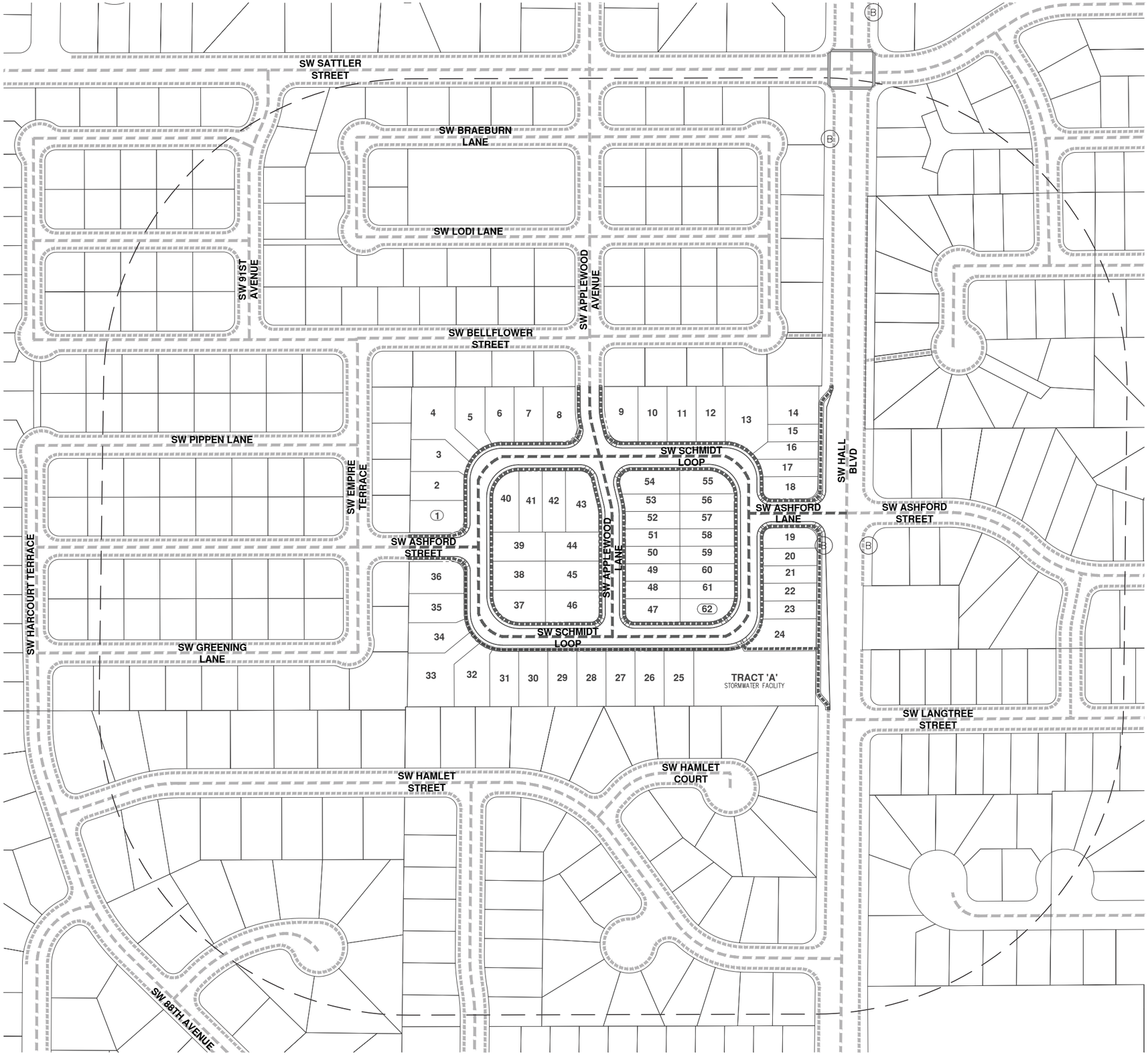
RENEWAL DATE: 6/30/17

REVISIONS

JOB NUMBER
3876

SHEET
P11

AKS DRAWING FILE: 3876 P11 UTIL.DWG | LAYOUT: P11



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TIGARD
TAX LOT 400

OREGON
WASHINGTON COUNTY ASSESSOR'S MAP 2S 1 11DA

CONCEPTUAL FUTURE STREET CONNECTIVITY PLAN

DESIGNED BY:	DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 09-28-2015

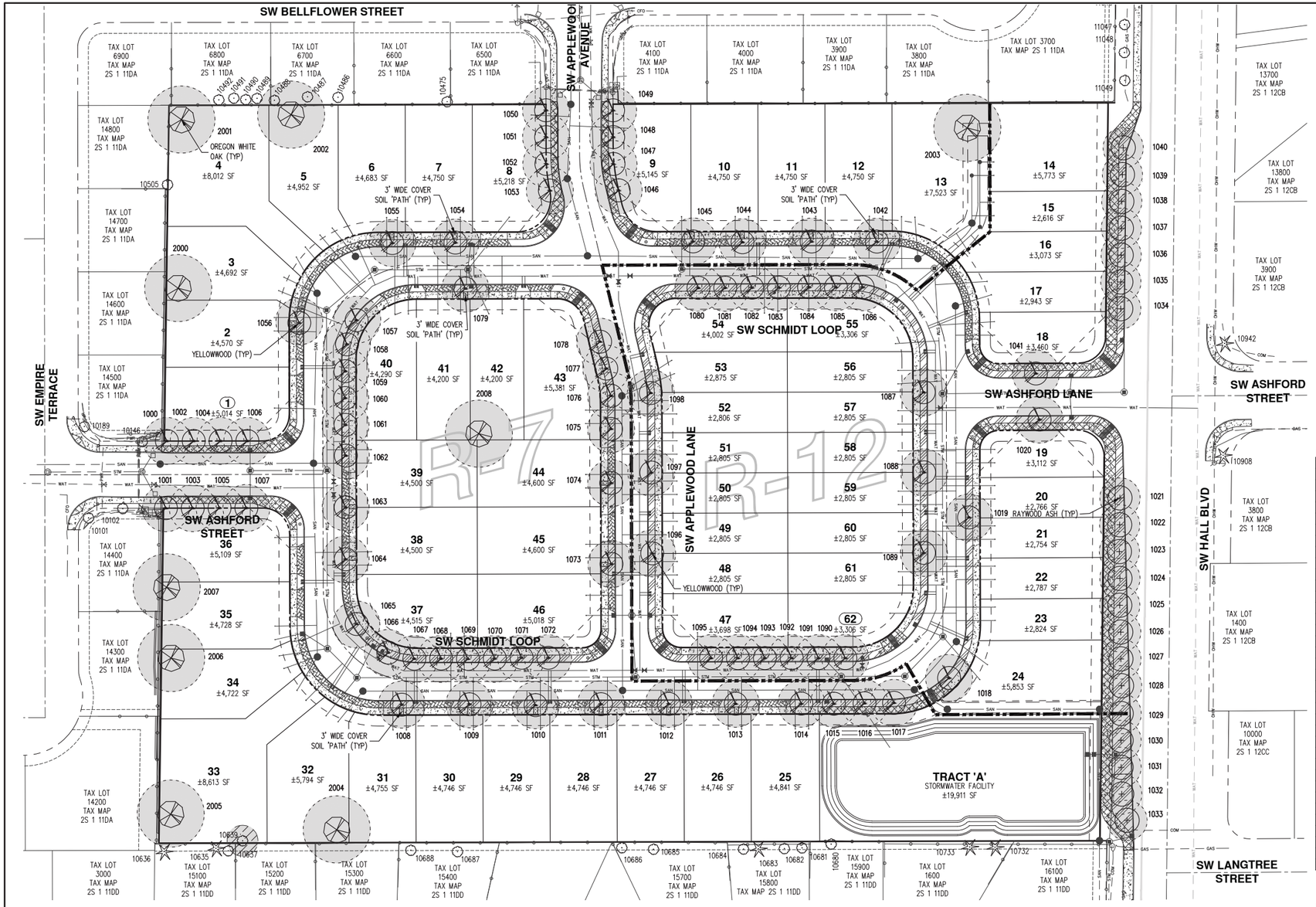
REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY NOT FOR CONSTRUCTION
OREGON
JANUARY 9, 2001
PAUL A. SCHMIDT
RENEWAL DATE: 6/30/17

REVISIONS

JOB NUMBER
3876

SHEET
P12

AKS DRAWING FILE: 3876 P12 CIRCLDWG | LAYOUT: P12



LEGEND

- QUALIFYING PLANTED MATURE CANOPY COVER
- QUALIFYING EXISTING MATURE CANOPY COVER
- APPROXIMATE OPEN SOIL VOLUME AREA (REFER TO NOTE 6 THIS SHEET)
- APPROXIMATE CLOSED SOIL VOLUME AREA (REFER TO NOTE 6 THIS SHEET)
- PLANTED TREE MATURE CANOPY OUTLINE
- EXISTING TREE MATURE CANOPY OUTLINE

R-7 ZONE DISTRICT:

TOTAL R-7 ZONE NET DEVELOPED SITE AREA: 196,816 SF ±
R-7 ZONE MINIMUM % CANOPY COVER: 40%
TOTAL R-7 QUALIFYING MATURE TREE CANOPY COVER : 80,323 SF (41%)

41% IS GREATER THAN THE MINIMUM OF 40% TOTAL QUALIFYING MATURE CANOPY COVER FOR THE R-7 ZONE, THEREFORE CITY REQUIREMENTS ARE MET.

R-12 ZONE DISTRICT:

TOTAL R-12 ZONE NET DEVELOPED SITE AREA: 86,004 SF ±
R-12 ZONE MINIMUM % CANOPY COVER: 33%
TOTAL R-12 QUALIFYING MATURE TREE CANOPY COVER: 32,731 SF ± (38%)

38% IS GREATER THAN THE MINIMUM OF 33% TOTAL QUALIFYING MATURE CANOPY COVER FOR THE R-12 ZONE, THEREFORE CITY REQUIREMETNS ARE MET.

NOTE: SEE COVER SHEET FOR GENERAL PLAN LEGEND

R-7 ZONE LOT CANOPY COVERAGE

LOT #	LOT AREA (SF)	REQUIRED CANOPY COVERAGE (SF) (15%)	ACTUAL CANOPY COVERAGE (SF/%)
1	5,014	752	3848 SF / 77%
2	4,570	686	962 SF / 21%
3	4,692	704	2454 SF / 52%
4	8,012	1,202	2454 SF / 31%
5	4,952	743	2454 SF / 50%
6	4,683	702	962 SF / 21%
7	4,750	713	962 SF / 20%
8	5,218	783	3848 SF / 74%
9	5,145	772	3848 SF / 75%
10	4,750	713	1924 SF / 41%
11	4,750	713	962 SF / 20%
12	4,750	713	962 SF / 20%
13	7,523	1,128	2454 SF / 33%
25	4,841	726	962 SF / 20%
26	4,746	712	962 SF / 20%
27	4,746	712	962 SF / 20%
28	4,746	712	962 SF / 20%
29	4,746	712	962 SF / 20%
30	4,746	712	962 SF / 20%
31	4,755	713	962 SF / 20%
32	5,794	869	2454 SF / 42%
33	8,613	1,292	3284 SF / 38%
34	4,722	708	2454 SF / 52%
35	4,728	709	2454 SF / 52%
36	5,109	766	3848 SF / 75%
37	4,515	677	4810 SF / 107%
38	4,500	675	962 SF / 21%
39	4,500	675	1924 SF / 43%
40	4,290	644	4810 SF / 112%
41	4,200	630	962 SF / 23%
42	4,200	630	2454 SF / 58%
43	5,381	807	3848 SF / 72%
44	4,600	690	962 SF / 21%
45	4,600	690	962 SF / 21%
46	5,018	753	2886 SF / 58%
TRACT A	19,911	2,987	6421 SF / 32%

R-12 ZONE LOT CANOPY COVERAGE

LOT CANOPY COVERAGE IS NOT APPLICABLE IN THE R-12 ZONE PER THE CITY OF TIGARD URBAN FORESTRY MANUAL.

SCALE 1" = 40 FEET

STREET AND SITE TREES

SYMBOL	QTIES.	BOTANICAL NAME	COMMON NAME	CONDITION	SIZE	SPACING	REMARKS
	79	CLADRASTIS KENTUKEA	YELLOWWOOD	B&B	2" CAL.	AS SHOWN	STREET TREE
	20	FRAXINUS OXYCARPA 'RAYWOOD'	RAYWOOD ASH	B&B	2" CAL.	AS SHOWN	STREET TREE
	9	QUERCUS GARRYANA	OREGON WHITE OAK	B&B	1 1/2" CAL.	AS SHOWN	SITE TREE

STREET FRONTAGE: 4,387 ± LINEAR FEET/40 = 110 STREET TREES REQUIRED
PROPOSED STREET TREES: 99
11 STREET TREES ARE PROPOSED TO PAY 'IN-LIEU' OF FEE

REFER TO SHEET P14 FOR EXISTING AND PROPOSED PLANTED TREE CANOPY TABLES.

GENERAL NOTES:

1. ALL TREES AND PLANTINGS TO CONFORM TO THE CITY OF TIGARD DESIGN STANDARDS. PLANT IN ACCORDANCE WITH STANDARDS ADOPTED BY THE OREGON LANDSCAPE CONTRACTORS BOARD (OLCB). ALL STREET TREES SHALL HAVE 10' LONG X 18" DEEP ROOT BARRIER INSTALLED ADJACENT TO BOTH THE CURB AND THE SIDEWALKS. CENTER ROOT BARRIERS ON TREE TRUNK. DOUBLE STAKE ALL STREET TREES. STAKES SHALL BE PARALLEL TO STREET. REFER TO CITY OF TIGARD STREET TREE STANDARDS.
2. PLANTING PLAN MAY BE CHANGED DUE TO AVAILABILITY, COST, ONSITE CONDITIONS, ETC. BY THE LANDSCAPE ARCHITECT PRIOR TO FINAL INSTALLATION, AS ALLOWED UNDER CITY STANDARDS.
3. STREET TREES SHALL BE PLANTED NO CLOSER THAN 20' O.C. FROM ANY OTHER NEWLY PLANTED OR EXISTING TREE, 2 1/2' FROM ANY HARD SURFACE PAVING, 4' O.C. FROM ANY FIRE HYDRANT, UTILITY BOX, OR UTILITY POLE, 2' O.C. FROM ANY UNDERGROUND UTILITY, 10' O.C. FROM A STREE LIGHT STANDARD, AND 20' FROM A STREET RIGHT-OF-WAY CORNER. FIELD ADJUST AS NECESSARY TO MAINTAIN MINIMUM DISTANCES.
4. REFER ALSO TO SUPPLEMENTAL ARBORIST REPORT.
5. INDIVIDUAL HOMEOWNERS RESPONSIBLE FOR IRRIGATING TREES FRONTING LOTS.
6. SOILS: REFER TO SECTION 12 AND APPENDIXES OF TIGARD'S URBAN FORESTRY MANUAL. REMOVAL, STORING, AND AMENDED SOILS FOR PLANTER AREAS; BLENDED SOIL PLACEMENT AND COMPACTION; COVERED SOIL MATERIALS; COVERED SOIL MIXING PROCEDURES; AND COVERED SOIL PLACEMENT SHALL CONFORM TO CITY OF TIGARD STANDARDS. MINIMUM WIDTH OF CLOSED SOIL AREAS TO BE 3 FEET.
7. NUMBERED EXISTING TREES ON PLANS THAT ARE OFF-SITE ARE NOT INCLUDED IN THE TREE CANOPY CALCULATIONS AND THEIR CANOPY AREA IS NOT SHOWN ON THIS PLAN.

I, BRUCE R. BALDWIN, ATTEST THAT THIS TREE CANOPY PLAN MEETS ALL OF THE REQUIREMENTS IN SECTION 10, PART 1, OF THE CITY OF TIGARD URBAN FORESTRY MANUAL.

BRUCE BALDWIN, CERTIFIED ARBORIST
PN-6666A

CERTIFIED ARBORIST
BRUCE R. BALDWIN
CERTIFICATE NUMBER: PN-6666A
EXPIRATION DATE: 12/31/17

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AKS ENGINEERING · PLANNING · SURVEYING
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HERITAGE CROSSING SUBDIVISION

TIGARD
TAX LOT 400

OREGON
WASHINGTON COUNTY ASSESSOR'S MAP 2S 1 11DA

PRELIMINARY SITE TREE CANOPY PLAN

DESIGNED BY:	KAH
DRAWN BY:	KAH
CHECKED BY:	BRB
SCALE:	AS NOTED
DATE: 09-28-2015	

PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER
3876

SHEET
P13

AKS DRAWING FILE: 3876 P13 TREE.DWG | LAYOUT: P13

PLANTED TREE CANOPY

TREE #	SPECIES	TOTAL SOIL VOLUME (500 CF MIN)	AVERAGE MATURE CANOPY (FT/SF)	QUALIFYING SITE CANOPY
1000*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1001*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1002*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1003*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1004*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1005*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1006*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1007*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1008*	YELLOWWOOD	45 CF CLOSED, 500 CF+ OPEN	35' SPREAD/962 SF	962 SF
1009*	YELLOWWOOD	45 CF CLOSED, 500 CF+ OPEN	35' SPREAD/962 SF	962 SF
1010*	YELLOWWOOD	45 CF CLOSED, 500 CF+ OPEN	35' SPREAD/962 SF	962 SF
1011*	YELLOWWOOD	45 CF CLOSED, 500 CF+ OPEN	35' SPREAD/962 SF	962 SF
1012*	YELLOWWOOD	45 CF CLOSED, 500 CF+ OPEN	35' SPREAD/962 SF	962 SF
1013*	YELLOWWOOD	45 CF CLOSED, 500 CF+ OPEN	35' SPREAD/962 SF	962 SF
1014*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1015*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1016*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1017*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1018**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1019**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1020**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1021**	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1022**	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1023**	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1024**	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1025**	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1026**	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1027**	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1028**	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1029*	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1030*	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1031*	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1032*	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1033*	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1034**	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1035**	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1036**	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1037**	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1038**	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1039**	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1040**	RAYWOOD ASH	500 CF+	30' SPREAD/707 SF	707 SF
1041**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1042*	YELLOWWOOD	45 CF CLOSED, 500 CF+ OPEN	35' SPREAD/962 SF	962 SF
1043*	YELLOWWOOD	45 CF CLOSED, 500 CF+ OPEN	35' SPREAD/962 SF	962 SF
1044*	YELLOWWOOD	45 CF CLOSED, 500 CF+ OPEN	35' SPREAD/962 SF	962 SF
1045*	YELLOWWOOD	45 CF CLOSED, 500 CF+ OPEN	35' SPREAD/962 SF	962 SF
1046*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1047*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1048*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1049*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1050*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1051*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1052*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1053*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1054*	YELLOWWOOD	45 CF CLOSED, 500 CF+ OPEN	35' SPREAD/962 SF	962 SF
1055*	YELLOWWOOD	45 CF CLOSED, 500 CF+ OPEN	35' SPREAD/962 SF	962 SF
1056*	YELLOWWOOD	45 CF CLOSED, 500 CF+ OPEN	35' SPREAD/962 SF	962 SF
1057*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1058*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1059*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1060*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1061*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1062*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1063*	YELLOWWOOD	45 CF CLOSED, 500 CF+ OPEN	35' SPREAD/962 SF	962 SF
1064*	YELLOWWOOD	45 CF CLOSED, 500 CF+ OPEN	35' SPREAD/962 SF	962 SF
1065*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1066*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1067*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1068*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1069*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1070*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1071*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1072*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1073*	YELLOWWOOD	45 CF CLOSED, 500 CF+ OPEN	35' SPREAD/962 SF	962 SF
1074*	YELLOWWOOD	45 CF CLOSED, 500 CF+ OPEN	35' SPREAD/962 SF	962 SF
1075*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1076*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1077*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1078*	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1079*	YELLOWWOOD	45 CF CLOSED, 500 CF+ OPEN	35' SPREAD/962 SF	962 SF
1080**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1081**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1082**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1083**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1084**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1085**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1086**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1087**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1088**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1089**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1090**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1091**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1092**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1093**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1094**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1095**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1096**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1097**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
1098**	YELLOWWOOD	500 CF+	35' SPREAD/962 SF	962 SF
2000*	OREGON WHITE OAK	500 CF+	50' SPREAD/1,963 SF	2,454 SF (1.25 NATIVE CREDIT)
2001*	OREGON WHITE OAK	500 CF+	50' SPREAD/1,963 SF	2,454 SF (1.25 NATIVE CREDIT)
2002*	OREGON WHITE OAK	500 CF+	50' SPREAD/1,963 SF	2,454 SF (1.25 NATIVE CREDIT)
2003*	OREGON WHITE OAK	500 CF+	50' SPREAD/1,963 SF	2,454 SF (1.25 NATIVE CREDIT)
2004*	OREGON WHITE OAK	500 CF+	50' SPREAD/1,963 SF	2,454 SF (1.25 NATIVE CREDIT)
2005*	OREGON WHITE OAK	500 CF+	50' SPREAD/1,963 SF	2,454 SF (1.25 NATIVE CREDIT)
2006*	OREGON WHITE OAK	500 CF+	50' SPREAD/1,963 SF	2,454 SF (1.25 NATIVE CREDIT)
2007*	OREGON WHITE OAK	500 CF+	50' SPREAD/1,963 SF	2,454 SF (1.25 NATIVE CREDIT)
2008*	OREGON WHITE OAK	500 CF+	50' SPREAD/1,963 SF	2,454 SF (1.25 NATIVE CREDIT)
			R-7 ZONE PLANTED TREE CANOPY SUBTOTAL	**79,493 SF**
			R-12 ZONE PLANTED TREE CANOPY SUBTOTAL	**32,731 SF**

EXISTING TREE CANOPY

TREE #	SPECIES	TOTAL SOIL VOLUME	CANOPY (FT/SF)	QUALIFYING SITE CANOPY
10639*	SWEET CHERRY	OVER 1,000 SF	23' SPREAD/415 SF	415 SF
		R-7 ZONE EXISTING SITE CANOPY SUBTOTAL		**415 SF X 2 = 830 SF**
		R-12 ZONE EXISTING SITE CANOPY SUBTOTAL		**0 SF X 2 = 0 SF**

NOTE:

* PLANTED TREE WITHIN THE R-7 ZONE DISTRICT

** PLANTED TREE WITHIN THE R-12 ZONE DISTRICT

I, BRUCE R. BALDWIN, ATTEST THAT THIS TREE CANOPY PLAN MEETS ALL OF THE REQUIREMENTS IN SECTION 10, PART 1, OF THE CITY OF TIGARD URBAN FORESTRY MANUAL.

BRUCE BALDWIN, CERTIFIED ARBORIST
PN-6666A

CERTIFIED ARBORIST

BRUCE R. BALDWIN
CERTIFICATE NUMBER: PN-6666A
EXPIRATION DATE: 12/31/17

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HERITAGE CROSSING SUBDIVISION

TIGARD **OREGON**
TAX LOT 400
WASHINGTON COUNTY ASSESSOR'S MAP 2S 1 11DA

PRELIMINARY SITE TREE CANOPY TABLE

DESIGNED BY: KAH
DRAWN BY: KAH
CHECKED BY: BRB
SCALE: AS NOTED
DATE: 09-28-2015

PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER
3876

SHEET
P14

AKS DRAWING FILE: 3876 P13 TREE.DWG | LAYOUT: P14

Exhibit J: Arborist Report

General Information

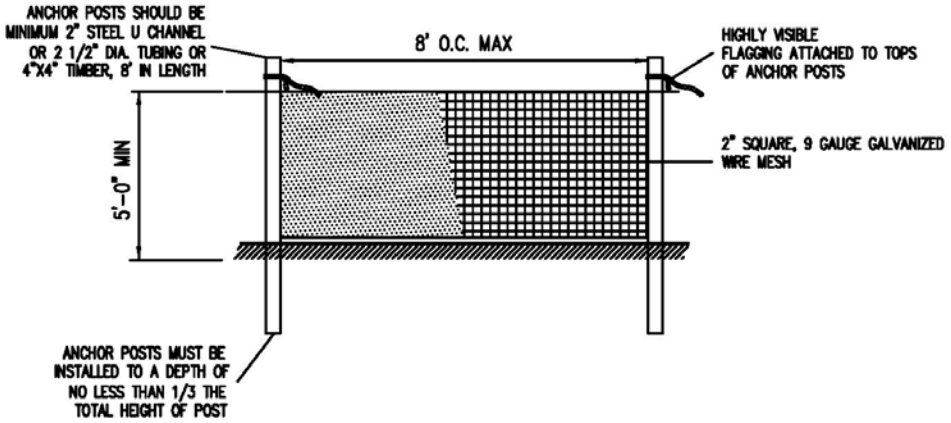
Date: 09/29/2015
Project Name: Heritage Crossing Subdivision
Project Arborist Name: Bruce Baldwin
Project Arborist Address: 12965 SW Herman Road, Suite 100, Tualatin, OR 97062
Project Arborist Telephone Number: 503-563-6151
Project Arborist Email Address: bruce@aks-eng.com
ISA Certified Arborist No.: PN-6666A
ISA Qualified Tree Risk Assessor

Project Summary

This is a multi-zone residential subdivision project with 62 lots, in aggregate. Thirty-five lots are located in the R-7 Medium Density Residential District requiring an effective tree canopy cover of 40%, and 27 lots are located in the R-12 Medium Density Residential District requiring an effective tree canopy cover of 33%. In the R-7 District, one tree is being preserved and 70 trees are being planted. In the R-12 District, no trees are being preserved and 38 trees are being planted. The net developed site area in the R-7 District is +\- 196,816 square feet. Forty percent of that area equals +/- 78,726 square feet. The net developed site area in the R-12 District is +\- 86,004 square feet. Thirty-three percent of that area equals +/- 28,381 square feet. In the R-7 District, the site will have a total qualifying mature tree canopy area of 80,323 square feet, which is above the required 40% for this zone. In the R-12 District, the site will have a total qualifying mature tree canopy area of 32,731 square feet, which is above the required 33% for this zone. Therefore, since the effective canopy area of the existing trees and trees to be planted in the R-7 and R-12 Districts is greater than 40% and 33% (respectively) of the total area, no additional tree canopy fee is required. In addition, each of the 35 lots in the R-7 District individually meets the City's lot canopy coverage of 15% effective canopy. Since all of the City's canopy requirements are met, no tree canopy fee is required.

Specifications

Tree Protection Fencing Specifications:



NOTES:
1. METAL FENCE FOR TREE PROTECTION DEVICE, ONLY.
2. BOUNDARIES OF PROTECTION AREA WILL BE ESTABLISHED IN THE FIELD BY THE ARBORIST PRIOR TO CONSTRUCTION.
3. BOUNDARIES OF PROTECTION AREA SHOULD BE STAKED AND FLAGGED BY THE ARBORIST PRIOR TO INSTALLING DEVICES.
4. AVOID DAMAGE TO CRITICAL ROOT ZONE. DO NOT DAMAGE OR SEVER LARGE ROOTS WHEN INSTALLING POSTS.
5. DEVICE SHOULD BE MAINTAINED THROUGHOUT CONSTRUCTION.

METAL TREE PROTECTION FENCE

Tree Preservation Specifications:

A. No changes shall be made to any aspect of the approved urban forestry plan without written consent from the project arborist and city arborist.

B. Timeline for clearing, grading, and installation of tree protection measures: Tree protection fence shall be installed prior to any ground disturbance work.

C. Placing materials near trees: No person may conduct any activity within the protected area of any tree designated to remain, including, but not limited to, parking equipment, placing solvents, storing building material and soil deposits, dumping concrete washout and locating burn holes.

D. Attachments to trees during construction: No person shall attach any object to any tree designated for preservation.

E. Protective barrier. Prior to any ground disturbance by the contractor:

1. Shall erect and maintain readily visible tree protection fencing along the outer edge and completely surrounding the protected area of all protected trees or groups of trees as shown. Fences shall be constructed of 5 foot tall metal, secured to eight foot tall metal posts. Posts shall not be placed further than 8 feet o.c. Apart.

2. May be required to cover with mulch to a depth of at least six (6) inches, or with plywood or similar material, over the root zone of a tree in order to protect roots from damage caused by heavy equipment.

3. Shall prohibit excavation or compacting of earth or other potentially damaging activities within the tree protection zone.

4. May be required to minimize root damage by excavation of a two (2) feet deep trench, at the edge of the tree protection zone, to cleanly sever the roots of trees to be retained.

5. May be required to have corrective pruning performed on preserved trees in order to avoid damage from machinery or building activity. May be required to maintain trees throughout construction period by watering and fertilizing.

6. Shall maintain the tree protection fencing in place until the project arborist and city arborist authorizes their removal.

7. Shall ensure that any landscaping done in the tree protection zone subsequent to the removal of the barriers shall be accomplished with light machinery or hand labor. Use plant materials with compatible water requirements to tree to be preserved and direct spray irrigation away from trunks.

F. The grade shall not be elevated or reduced within the tree protection zone without the project arborist's authorization. The project arborist may allow coverage of up to one half of

the area of the tree's root zone with light soils (no clay) to the minimum depth necessary to carry out grading or landscaping plans, if it will not imperil the survival of the tree. Aeration devices may be required to ensure the tree's survival.

G. If the grade adjacent to a preserved tree is raised such that it could slough or erode into the tree protection zone, it shall be permanently stabilized to prevent suffocation of the roots.

H. An impervious surface shall not be installed within the tree protection zone of any tree to be preserved without the authorization of the project arborist. The project arborist may require specific construction methods and/or use of aeration devices to ensure the tree's survival and to minimize the potential for root induced damage to the impervious surface.

I. To the greatest extent practical, utility trenches shall be located outside of the tree protection zone of trees to be preserved. The project arborist may require that utilities be tunneled under the roots of trees to be preserved if the project arborist determines that trenching would significantly reduce the chances of the trees survival.

J. Directional felling of trees shall be used to avoid damage to trees designated for preservation.

K. The project arborist may require additional tree preservation measures which are consistent with tree care industry standards.

Root protection zone notes:

Encroachment into the root protection zone may be allowed with project arborist approval as described in the following notes:

1. Excavation in the top 24" of the soil in the critical root zone area should begin at the excavation line that is closest to the tree.
2. The excavation should be done by hand/shovel or with a backhoe and a man with a shovel, pruning shears, and a pruning saw.
3. If done by hand, all roots 1" or larger should by pruned at the excavation line.
4. If done with a backhoe (most likely scenario), then the operator shall start the cut at the excavation line and carefully "feel" for roots/resistance. When there is resistance, the man with the shovel hand digs around the roots and prunes the roots larger than 1" diameter.

Stand Preservation Specifications:

No existing stand trees. Not applicable to this project.

Soil Characteristics and Specifications for Improvement:

Areas of Tree Growth Limiting Soils:
There are no known areas of tree growth limiting soils identified. If soil compaction occurs, backhoe turning should be used to loosen soil. Remove any layers of good topsoil. Spread 3”-4” of organics (high-lignin) compost or ESCS (Expanded shale/Calcine Clay) amendment over the area prior to turning the soil. Maintaining a safe distance from paving, sidewalks, and structures, use backhoe to turn soil to 36”

depth. Break soil and loosely incorporate the soil amendment. Maintain a slope of compacted soil at the edge of the paving so as not to undermine the paving sub-base. Hand turning may be necessary along the edges of paving and at walls. Do not till to a depth greater than the bottom of footing. After turning, re-spread topsoil and add 3"-5" of yard waste organic amendment over the surface and lightly till to break the soil into texture suitable to fine grade.

Removal, Storing, and Amended Soils for Planter Areas:
Contractor shall removal all debris from planter areas and excavate to a depth of 36 inches. Slope sides of excavations at 1:1 slope or shore edges to prevent undermining of vehicle load areas and to provide a sloped profile transition between soil types and structural fill. Dispose of debris and subsoil. Stockpile excavated topsoil in approved area off site.

Existing and imported topsoil amendments shall be determined by the Landscape Architect and approved by the City Arborist. Soil mixing shall be done in designated areas or in the supplier's yard. Mix amendments with topsoil when soil is in a friable condition only (damp and not muddy with adequate moisture to break into clods when turned and will not leave a mud stain on the hand when squeezed). Contractor to provide certificate of content and percent of soil mixes with all amended soil to the City prior to installation.

Blended Soil Placement and Compaction:
Soil shall be friable when placed and compacted. Place soil in layers of not more than 12" in depth. Provide 3 passes with a 2" compact plate vibrating compactor. Compact to 80-85% maximum dry density as measured by the proctor test or as approved for specific blended soil mixes.

Tree Planting Specifications: Tree plantings shall conform to the City of Tigard design standards and to American Nursery Standards ASN 1260.1. Plant in accordance with standards adopted by the Oregon Landscape Contractors Board (OLCB). Trees to be planted shall meet the requirements of the American Association of Nurserymen (AAN) for nursery stock (ANSI Z60.2) for Grade No. 1 or better. Double stake all trees. Root barrier shall be used on all trees adjacent to sidewalks, roads, curbs, utility boxes, and other hardscape per the City of Tigard's Urban Forestry Manual Section 2, Part 1.G.

Stand Planting Specifications:

No proposed stand trees. Not applicable to this project.

Existing Tree Inventory

Tree #	Common Name / *(Genus spp.)*	DBH	Canopy (ft^2)	Open or Stand Grown	Heritage Tree?	Cond. Rating	Pres. Rating	Preserve?	Comments
10101	Crabapple (*Malus sp.*)	10	314	Open	No	3	3	Yes	**Off-site**
10102	Crabapple (*Malus sp.*)	9	314	Open	No	3	3	Yes	**Off-site**
10146	Crabapple (*Malus sp.*)	9	314	Open	No	3	3	Yes	**Off-site**
10189	Crabapple (*Malus sp.*)	8	314	Open	No	3	3	Yes	**Off-site**
10475	Quaking Aspen (*Populus tremuloides*)	13	177	Open	No	3	3	Yes	**Off-site**, Pruned, Evaluated from fence
10486	California Black Oak (*Quercus kelloggii*)	24	2,375	Open	No	3	3	Yes	**Off-site**, Pruned, Evaluated from fence
10487	California Black Oak (*Quercus kelloggii*)	16	2,375	Open	No	3	3	Yes	**Off-site**, Slight Lean (S), Evaluated from fence
10488	California Black Oak (*Quercus kelloggii*)	18	2,375	Open	No	3	3	Yes	**Off-site**, Pruned, Evaluated from fence
10489	California Black Oak (*Quercus kelloggii*)	20	2,375	Open	No	3	3	Yes	**Off-site**, Pruned, Evaluated from fence
10490	California Black Oak (*Quercus kelloggii*)	13	2,375	Open	No	3	3	Yes	**Off-site**, Pruned, Evaluated from fence
10491	California Black Oak (*Quercus kelloggii*)	13	2,375	Open	No	3	3	Yes	**Off-site**, Slight Lean (NW), Evaluated from fence
10492	California Black Oak (*Quercus kelloggii*)	13	2,375	Open	No	3	3	Yes	**Off-site**, Slight Lean (NW), Evaluated from fence
10495	Oregon White Oak (*Quercus garryana*)	59	1,963	Open	No	0	0	No	Codominant, Large crack, Large cavity, Hazard
10505	English Hawthorn (*Crataegus monogyna)*	15	254	Open	No	3	3	Yes	**Off-site**, Minor Pruning
10635	Ponderosa Pine (*Pinus ponderosa*)	20	707	Open	No	3	3	Yes	**Off-site**, Pruned, Evaluated from fence
10636	Douglas-fir (*Pseudotsuga menziesii*)	20	1,256	Open	No	3	3	Yes	**Off-site**, Pruned, Evaluated from fence

Tree #	Common Name / *(Genus spp.)*	DBH	Canopy (ft^2)	Open or Stand Grown	Heritage Tree?	Cond. Rating	Pres. Rating	Preserve?	Comments
10637	Sweet Cherry (*Prunus avium*)	14	415	Open	No	3	3	Yes	**Off-site**, Minor pruning, Evaluated from fence
10639	Sweet Cherry (*Prunus avium*)	6	415	Open	No	3	3	Yes	Bole slightly crooked
10680	European White Birch (*Betula pendula*)	21	254	Open	No	3	3	Yes	**Off-site**, pruned, Evaluated from fence
10681	Red Maple (*Acer rubrum*)	12	1,256	Open	No	3	3	Yes	**Off-site**, pruned, Evaluated from fence
10682	Red Maple (*Acer rubrum*)	12	1,256	Open	No	3	3	Yes	**Off-site**, Healthy, Evaluated from fence
10683	Lodgepole Pine (*Pinus contorta*)	7	415	Open	No	3	3	Yes	**Off-site**, pruned, Evaluated from fence
10684	Red Maple (*Acer rubrum*)	16	1,256	Open	No	3	3	Yes	**Off-site**, pruned, Evaluated from fence
10685	Quaking Aspen (*Populus tremuloides*)	15	177	Open	No	3	3	Yes	**Off-site**, pruned, Evaluated from fence
10686	Paper Birch (*Betula papyrifera*)	6	962	Open	No	3	3	Yes	**Off-site**, Minor pruning, Evaluated from fence
10687	Red Maple (*Acer rubrum*)	14	1,256	Open	No	3	3	Yes	**Off-site**, pruned, Evaluated from fence
10688	Red Maple (*Acer rubrum*)	14	1,256	Open	No	3	3	Yes	**Off-site**, pruned, Evaluated from fence
10732	Western Redcedar (*Thuja plicata*)	12	707	Open	No	3	3	Yes	**Off-site**
10733	Western Redcedar (*Thuja plicata*)	14	707	Open	No	3	3	Yes	**Off-site**
10908	Deodar Cedar *(Cedrus deodara*)	15	1,256	Open	No	3	3	Yes	**Off-site**, Pruned
10942	Lodgepole Pine (*Pinus contorta*)	13	415	Open	No	3	3	Yes	**Off-site**

Tree #	Common Name / *(Genus spp.)*	DBH	Canopy (ft^2)	Open or Stand Grown	Heritage Tree?	Cond. Rating	Pres. Rating	Preserve?	Comments
10946	Silktree *(Albizia julibrissin)*	9	707	Open	No	3	3	No	Healthy
10952	Silktree *(Albizia julibrissin)*	17	707	Open	No	3	3	No	Codominant above DBH, Healthy
11046	Pear *(Pyrus sp.)*	10	491	Open	No	3	3	Yes	**Off-site**, Pruned
11047	Pear *(Pyrus sp.)*	9	491	Open	No	3	3	Yes	**Off-site**, Pruned
11048	Pear *(Pyrus sp.)*	11	491	Open	No	3	3	Yes	**Off-site**, Pruned
11049	Pear *(Pyrus sp.)*	10	491	Open	No	3	3	Yes	**Off-site**, Pruned
11071	Pear *(Pyrus sp.)*	11	491	Open	No	3	3	Yes	**Off-site**, Pruned
11078	Apple (*Malus sp.*)	16	314	Open	No	2	2	No	Lean (SW), Codominant above DBH
11079	Northern Catalpa *(Catalpa speciosa)*	10,15,17	707	Open	No	0	0	No	Codominant, Topped, Partial Failure, Hazard
11080	Apple (*Malus sp.*)	7,10,12	314	Open	No	1	1	No	Codominant, Decay, Mechanical bracing
11082	European White Birch (*Betula pendula*)	19	254	Open	No	3	3	No	Crooked, Pruned
11087	Apple (*Malus sp.*)	13	314	Open	No	1	1	No	Broken scaffold, Cavity with decay, Pruned
11096	Walnut *(Juglans sp.)*	17,17	1,963	Open	No	2	2	No	Codominant, Pruned, Few dead lower limbs
11135	Silktree *(Albizia julibrissin)*	10,13	707	Open	No	2	2	No	Codominant, included bark, Mechanical bracing

Existing Stand Inventory

Stand #	Genus sp./ Common of Dominant	Avg. DBH 1	Avg. Cond. Rating 1	Overall Stand Pres. Rating	Total Canopy (ft^2)	Canopy Preserved (ft^2)	Comments
	Genus sp./ Common of 2nd	Avg. DBH 2	Avg. Cond. Rating 2				
	Genus sp./ Common of 3rd	Avg. DBH 3	Avg. Cond. Rating 3				
	N/A						

Planted Tree Inventory

Tree #	Common Name / *(Genus spp.)*	Caliper (Decid.) or Height (Evergreen)	Mature Canopy Spread (ft)	Mature Canopy Area (ft^2)	Available Soil Volume (ft^3)	Comments
1000*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1001*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1002*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1003*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1004*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1005*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1006*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1007*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1008*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1009*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1010*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree

Tree #	Common Name / *(Genus spp.)*	Caliper (Decid.) or Height (Evergreen)	Mature Canopy Spread (ft)	Mature Canopy Area (ft^2)	Available Soil Volume (ft^3)	Comments
1011*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1012*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1013*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1014*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1015*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1016*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1017*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1018**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1019**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1020**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1021**	Raywood Ash (*Fraxinus oxycarpa* ‘Raywood’)	2”	30	707	500+	Street tree
1022**	Raywood Ash (*Fraxinus oxycarpa* ‘Raywood’)	2”	30	707	500+	Street tree
1023**	Raywood Ash (*Fraxinus oxycarpa* ‘Raywood’)	2”	30	707	500+	Street tree
1024**	Raywood Ash (*Fraxinus oxycarpa* ‘Raywood’)	2”	30	707	500+	Street tree
1025**	Raywood Ash (*Fraxinus oxycarpa* ‘Raywood’)	2”	30	707	500+	Street tree
1026**	Raywood Ash (*Fraxinus oxycarpa* ‘Raywood’)	2”	30	707	500+	Street tree
1027**	Raywood Ash (*Fraxinus oxycarpa* ‘Raywood’)	2”	30	707	500+	Street tree
1028**	Raywood Ash (*Fraxinus oxycarpa* ‘Raywood’)	2”	30	707	500+	Street tree
1029*	Raywood Ash (*Fraxinus oxycarpa* ‘Raywood’)	2”	30	707	500+	Street tree
1030*	Raywood Ash (*Fraxinus oxycarpa* ‘Raywood’)	2”	30	707	500+	Street tree
1031*	Raywood Ash (*Fraxinus oxycarpa* ‘Raywood’)	2”	30	707	500+	Street tree
1032*	Raywood Ash (*Fraxinus oxycarpa* ‘Raywood’)	2”	30	707	500+	Street tree
1033*	Raywood Ash (*Fraxinus oxycarpa* ‘Raywood’)	2”	30	707	500+	Street tree
1034**	Raywood Ash (*Fraxinus oxycarpa* ‘Raywood’)	2”	30	707	500+	Street tree
1035**	Raywood Ash (*Fraxinus oxycarpa* ‘Raywood’)	2”	30	707	500+	Street tree
1036**	Raywood Ash (*Fraxinus oxycarpa* ‘Raywood’)	2”	30	707	500+	Street tree
1037**	Raywood Ash (*Fraxinus oxycarpa* ‘Raywood’)	2”	30	707	500+	Street tree
1038**	Raywood Ash (*Fraxinus oxycarpa* ‘Raywood’)	2”	30	707	500+	Street tree

Tree #	Common Name / *(Genus spp.)*	Caliper (Decid.) or Height (Evergreen)	Mature Canopy Spread (ft)	Mature Canopy Area (ft^2)	Available Soil Volume (ft^3)	Comments
1039**	Raywood Ash (*Fraxinus oxycarpa* 'Raywood')	2"	30	707	500+	Street tree
1040**	Raywood Ash (*Fraxinus oxycarpa* 'Raywood')	2"	30	707	500+	Street tree
1041**	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1042*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1043*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1044*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1045*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1046*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1047*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1048*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1049*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1050*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1051*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1052*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1053*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1054*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1055*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1056*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1057*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1058*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1059*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1060*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1061*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1062*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1063*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1064*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1065*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree
1066*	Yellowwood (*Cladrastis kentukea*)	2"	35	962	500+	Street tree

Tree #	Common Name / *(Genus spp.)*	Caliper (Decid.) or Height (Evergreen)	Mature Canopy Spread (ft)	Mature Canopy Area (ft^2)	Available Soil Volume (ft^3)	Comments
1067*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1068*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1069*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1070*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1071*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1072*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1073*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1074*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1075*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1076*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1077*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1078*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1079*	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1080**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1081**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1082**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1083**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1084**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1085**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1086**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1087**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1088**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1089**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1090**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1091**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1092**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1093**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1094**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree

Tree #	Common Name / *(Genus spp.)*	Caliper (Decid.) or Height (Evergreen)	Mature Canopy Spread (ft)	Mature Canopy Area (ft^2)	Available Soil Volume (ft^3)	Comments
1095**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1096**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1097**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
1098**	Yellowwood (*Cladrastis kentukea*)	2”	35	962	500+	Street tree
2000*	Oregon White Oak (*Quercus garryana*)	1 1/2”	50	2,454	500+	Site tree
2001*	Oregon White Oak (*Quercus garryana*)	1 1/2”	50	2,454	500+	Site tree
2002*	Oregon White Oak (*Quercus garryana*)	1 1/2”	50	2,454	500+	Site tree
2003*	Oregon White Oak (*Quercus garryana*)	1 1/2”	50	2,454	500+	Site tree
2004*	Oregon White Oak (*Quercus garryana*)	1 1/2”	50	2,454	500+	Site tree
2005*	Oregon White Oak (*Quercus garryana*)	1 1/2”	50	2,454	500+	Site tree
2006*	Oregon White Oak (*Quercus garryana*)	1 1/2”	50	2,454	500+	Site tree
2007*	Oregon White Oak (*Quercus garryana*)	1 1/2”	50	2,454	500+	Site tree
2008*	Oregon White Oak (*Quercus garryana*)	1 1/2”	50	2,454	500+	Site tree

* Planted tree within the R-7 Zone District

** Planted tree within the R-12 Zone District

Planted Stand Inventory

Stand #	Genus sp./Common 1	Hgt. or Container size	No. of Trees	Avg. Spacing (ft)	Total Mature Canopy Area (ft^2) Delineated at the Outer Edge of the Stand	Comments
	Genus sp./Common 2	Hgt. or Container size	No. of Trees	Avg. Spacing (ft)		
	Genus sp./Common 3	Hgt. or Container size	No. of Trees	Avg. Spacing (ft)		
	Genus sp./Common 4	Hgt. or Container size	No. of Trees	Avg. Spacing (ft)		
	Genus sp./Common 5	Hgt. or Container size	No. of Trees	Avg. Spacing (ft)		
	N/A					

Effective Tree Canopy Cover Summary for R-7 District

Lot or Tract # (exclude streets)	Lot or Tract Area (ft^2)	2x Canopy Area (ft^2) of Preserved Trees (w/ cond. and pres.≥2)	2x Canopy Area (ft^2) of Preserved Stands (w/ cond. and pres.≥2)	Mature Canopy Area (ft^2) of Planted Trees	Mature Canopy Area (ft^2) of Planted Stands	Total Canopy Area (ft^2) per lot or tract	Effective % Canopy (Canopy Area ÷ Lot or Tract Area)
1	5,014			3,848		3,848	77%
2	4,570			962		962	21%
3	4,692			2,454		2,454	52%
4	8,012			2,454		2,454	31%
5	4,952			2,454		2,454	50%
6	4,683			962		962	21%
7	4,750			962		962	20%
8	5,218			3,848		3,848	74%
9	5,145			3,848		3,848	75%
10	4,750			1,924		1,924	41%
11	4,750			962		962	20%
12	4,750			962		962	20%
13	7,523			2,454		2,454	33%
25	4,841			962		962	20%
26	4,746			962		962	20%
27	4,746			962		962	20%
28	4,746			962		962	20%
29	4,746			962		962	20%
30	4,746			962		962	20%
31	4,755			962		962	20%
32	5,794			2,454		2,454	42%
33	8,613	830		2,454		3,284	38%
34	4,722			2,454		2,454	52%
35	4,728			2,454		2,454	52%
36	5,109			3,848		3,848	75%
37	4,515			4,810		4,810	107%

Lot or Tract # (exclude streets)	Lot or Tract Area (ft^2)	2x Canopy Area (ft^2) of Preserved Trees (w/ cond. and pres.≥2)	2x Canopy Area (ft^2) of Preserved Stands (w/ cond. and pres.≥2)	Mature Canopy Area (ft^2) of Planted Trees	Mature Canopy Area (ft^2) of Planted Stands	Total Canopy Area (ft^2) per lot or tract	Effective % Canopy (Canopy Area ÷ Lot or Tract Area)
38	4,500			962		962	21%
39	4,500			1,924		1,924	43%
40	4,290			4,810		4,810	112%
41	4,200			962		962	23%
42	4,200			2,454		2,454	58%
43	5,381			3,848		3,848	72%
44	4,600			962		962	21%
45	4,600			962		962	21%
46	5,018			2,886		2,886	58%
TRACT 'A'	19,911			6,421		6,421	32%
Total	196,816	830		79,493		80,323	41%

Effective Tree Canopy Cover Summary for R-12 District

Lot or Tract # (exclude streets)	Lot or Tract Area (ft^2)	2x Canopy Area (ft^2) of Preserved Trees (w/ cond. and pres.≥2)	2x Canopy Area (ft^2) of Preserved Stands (w/ cond. and pres.≥2)	Mature Canopy Area (ft^2) of Planted Trees	Mature Canopy Area (ft^2) of Planted Stands	Total Canopy Area (ft^2) per lot or tract	Effective % Canopy (Canopy Area ÷ Lot or Tract Area)
14	5,773			1,414		1,414	N/A
15	2,616			1,414		1,414	N/A
16	3,073			707		707	N/A
17	2,943			1,414		1,414	N/A
18	3,460			962		962	N/A
19	3,112			962		962	N/A
20	2,766			1,669		1,669	N/A
21	2,754			1,414		1,414	N/A
22	2,787			707		707	N/A
23	2,824			1,414		1,414	N/A
24	5,853			2,376		2,376	N/A
47	3,698			2,886		2,886	N/A
48	2,805			962		962	N/A
49	2,805			0		0	N/A
50	2,805			962		962	N/A
51	2,805			0		0	N/A
52	2,806			962		962	N/A
53	2,875			0		0	N/A
54	4,002			3,848		3,848	N/A
55	3,306			2,886		2,886	N/A
56	2,805			962		962	N/A
57	2,805			0		0	N/A
58	2,805			962		962	N/A
59	2,805			0		0	N/A
60	2,805			962		962	N/A
61	2,805			0		0	N/A

Lot or Tract # (exclude streets)	Lot or Tract Area (ft^2)	2x Canopy Area (ft^2) of Preserved Trees (w/ cond. and pres.≥2)	2x Canopy Area (ft^2) of Preserved Stands (w/ cond. and pres.≥2)	Mature Canopy Area (ft^2) of Planted Trees	Mature Canopy Area (ft^2) of Planted Stands	Total Canopy Area (ft^2) per lot or tract	Effective % Canopy (Canopy Area ÷ Lot or Tract Area)
62	3,306			2,886		2,886	N/A
Total	86,004	0		32,731		32,731	38%

The standard percentage of effective tree canopy cover for each lot or tract shall be at least 15%.

The standard percentage of effective tree canopy cover for the overall development site shall be at least:

i. 40% for R-1, R-2, R-3.5, R-4.5, and R-7districts, except for schools (18.130.050(J));

ii. 33% for R-12, R-25, R-40, C-N, C-C, C-G, C-P, MUE, MUE-1, MUE-2, MUC, MUR, and I-P districts, except for schools (18.130.050(J)); and

iii. 25% for MU-CBD, MUC-1, I-L and I-H districts, and for schools (18.130.050(J)) in all districts.

Tree Canopy Fee Calculation (if applicable)

If the percentage of effective tree canopy cover is less than the applicable standard percentage for the development within the R-7 Zone District:

1. Find the required ft^2 of tree canopy: 196,816 sf * 40%= 78,726 sf
   (overall development site area) x (standard required % (40%, 33%, or 25%)).
2. Find the ft^2 of tree canopy the development is short: 78,726 – 80,323 = -1,597; therefore it meets the site canopy requirement.
   (required ft^2 of tree canopy from 1 above) - (proposed ft^2 of tree canopy).
3. Find the $ value of tree canopy: NA
   (PNW-ISA wholesale median cost for a 3" deciduous tree in the Willamette Valley) ÷ 59.
4. Find the required tree canopy fee: NA
   (amount of ft^2 of tree canopy from 2 above) x (the $ value of tree canopy from 3 above).

If the percentage of effective tree canopy cover is less than the applicable standard percentage for the development within the R-12 Zone District:

1. Find the required ft^2 of tree canopy: 86,004 sf * 33%= 28,381 sf
   (overall development site area) x (standard required % (40%, 33%, or 25%)).
2. Find the ft^2 of tree canopy the development is short: 28,381 – 32,731= -4,350; therefore it meets the site canopy requirement.
   (required ft^2 of tree canopy from 1 above) - (proposed ft^2 of tree canopy).
3. Find the $ value of tree canopy: NA
   (PNW-ISA wholesale median cost for a 3" deciduous tree in the Willamette Valley) ÷ 59.
4. Find the required tree canopy fee: NA
   (amount of ft^2 of tree canopy from 2 above) x (the $ value of tree canopy from 3 above).

If the overall development meets the applicable standard percentage, but the percentage of effective tree canopy cover is less than 15% for any individual lot or tract in the R-7 Zone District (does not apply to the R-12 Zone District per the City of Tigard Urban Forestry Manual):

1. Find the required ft^2 of tree canopy for deficient lot or tract: N/A
   (lot or tract area) x 15%. All lots have at least 15% tree canopy cover.
2. Find the ft^2 of tree canopy the lot or tract is short: NA
   (required ft^2 of tree canopy from 1 above) - (proposed ft^2 of tree canopy).
3. Find the $ value of tree canopy: NA
   (PNW-ISA wholesale median cost for a 3" deciduous tree in the Willamette Valley) ÷ 59.
4. Find the required tree canopy fee: NA
   (amount of ft^2 of tree canopy from 2 above) x (the $ value of tree canopy from 3 above).

Signature of Approval

I hereby attest that:

1. The Tree Preservation and Removal site plan meets all of the requirements in Section 10, Part 1 of the Urban Forestry Manual;
2. The Tree Canopy site plan meets all of the requirements in Section 10, Part 2 of the Urban Forestry Manual; and
3. The Supplemental Arborist Report meets all of the requirements in Section 10, Part 3 of the Urban Forestry Manual.

Bruce R. Baldwin
ISA Certified Arborist #PN-6666A
ISA Qualified Tree Risk Assessor
Member, International Society of Arboriculture

CERTIFIED ARBORIST
BRUCE R. BALDWIN
CERTIFICATE NUMBER: PN-6666A
EXPIRATION DATE: 12/31/17

Exhibit Q: Traffic Impact Analysis

HERITAGE CROSSING
TRAFFIC IMPACT STUDY

TIGARD, OREGON

DATE:
September 29, 2015

PREPARED FOR:
Venture Properties, Inc.

PREPARED BY:
Michael Ard, PE

REGISTERED PROFESSIONAL ENGINEER
54983PE
OREGON
JULY 10, 2002
MICHAEL T. ARD
EXPIRES: 12/31/15

LANCASTER ENGINEERING

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EXECUTIVE SUMMARY

1. A 62-lot residential subdivision has been proposed for a 9.1-acre plot of land located on the west side of SW Hall Boulevard opposite SW Ashford Street in Tigard, Oregon.

2. The residential subdivision of 62 lots would be projected to generate 47 site trips during the morning peak hour and 62 site trips during the evening peak hour.

3. Left-turn lane warrants were examined for the northbound Hall Boulevard approach to SW Ashford Street. A left-turn lane is projected to be warranted during the evening peak hour under year 2017 background plus site trips conditions. Accordingly, it is recommended that a northbound left-turn lane be provided for this intersection.

4. By inspection, traffic volumes on the minor-street approaches at the unsignalized study intersections are too low to meet traffic signal warrants. Accordingly, no new traffic signals are recommended.

5. Based on the intersection sight distance measurements at the proposed site access location on SW Hall Boulevard, adequate sight distance can be made available upon clearing of vegetation within the subject property frontage. No other sight distance mitigations are recommended.

6. A detailed examination of the crash history at the study intersections shows no significant safety hazards and no trends that are indicative of design deficiencies. No safety mitigations are recommended.

7. Each of the study intersections is projected to operate within the performance standards established by the Oregon Department of Transportation through the year 2017, either with or without the addition of site trips from the proposed development. No operational mitigations are recommended.

8. The existing access spacing between SW Ashford Street and SW Langtree Street on SW Hall Boulevard does not meet ODOT standards. Based on the operational and queuing analysis, there is sufficient distance between the intersections to accommodate left-turn movements. For best operation, it is recommended that consideration be given to providing a continuous two-way left-turn lane between the intersections.

9. The proposed zone change on the subject property will result in a net reduction in site trips assuming development of the subject property at the maximum density allowable within the site. Accordingly the zone change can neither cause nor exacerbate any potential transportation system concerns at the planning horizon. No mitigation is necessary or recommended to comply with Oregon's Transportation Planning Rule.

10. Existing and future hourly and daily traffic volumes on the local streets impacted by the proposed development are appropriate for safe, efficient and livable communities. No operational or safety mitigations are recommended.

PROJECT DESCRIPTION

INTRODUCTION

A 9.1-acre property located on the west side of SW Hall Boulevard north of SW Hamlet Street and south of SW Bellflower Street in Tigard, Oregon, has been proposed for a zone change and residential subdivision. The proposed land division includes 62 lots for single-family homes.

This report looks at the traffic impacts of the proposed subdivision on the transportation system in the vicinity of the site. The purpose of this report is to ensure safe and efficient performance of the transportation facilities that will be impacted by the proposed development.

All supporting data and calculations are included in the appendix to this report.

LOCATION DESCRIPTION

Based on input from the City of Tigard, the following intersections were analyzed:

- SW Hall Boulevard at SW Sattler Street/SW Ross Street
- SW Hall Boulevard at SW Ashford Street
- SW Hall Boulevard at SW Langtree Street
- SW Hall Boulevard at SW Durham Road

SW Hall Boulevard operates under the jurisdiction of the Oregon Department of Transportation and is classified as a District Highway. It is also classified by the City of Tigard as an Arterial. It generally has one through lane in each direction in the site vicinity, with a center left-turn lane provided at intersections. It has a posted speed limit of 40 mph along the site frontage. Curbs, sidewalks and bike lanes are generally available along both sides of the street except along the frontage of the subject property where sidewalks have not yet been constructed. It is anticipated that sidewalks will be constructed along the site frontage as part of the proposed development.

SW Sattler Street is classified by the City of Tigard as a Neighborhood Route. It generally has a two-lane cross-section with a posted speed limit of 35 mph. The roadway widens between SW Applewood Avenue/SW 88th Avenue and SW Hall Boulevard to provide left-turn lanes. Bike lanes, curbs and sidewalks are provided on both sides of the roadway. Buffered bike lanes are provided from approximately 200 feet west of SW 92nd Avenue to SW 88th Avenue.

SW Ross Street is also classified by the City of Tigard as a Neighborhood Route. It generally has a two-lane cross-section with a posted speed limit of 25 mph. The roadway widens to provide a westbound left-turn lane at SW Hall Boulevard. Curbs and sidewalks are provided on both sides of the roadway in the immediate vicinity of SW Hall Boulevard.

SW Ashford Street is classified by the City of Tigard as a Neighborhood Route east of SW Hall Boulevard. It has a two-lane cross-section with a statutory residential speed limit of 25 mph. Curbs, sidewalks and on-street parking are available on both sides of the roadway. The street is currently discontinuous, with segments extending east from SW Hall Boulevard to near SW 76th Avenue and west from SW 90th Terrace to SW Harcourt Terrace. Upon completion of the proposed development, these street segments will be joined with a new segment of SW Ashford Street that extends across the subject property.

SW Langtree Street is classified by the City of Tigard as a Local Street. It has a two-lane cross-section without centerline striping and a posted speed limit of 25 mph. Curbs, sidewalks and on-street parking are generally available along both sides of the roadway.

SW Durham Road is classified by the City of Tigard as an Arterial. It generally has a three-lane cross-section, with one through lane in each direction and a center two-way left-turn lane. It has a posted speed limit of 35 mph; however there is also a school zone in place west of SW Hall Boulevard which reduces the speed limit to 20 mph on school days between the hours of 7:00 AM and 5:00 PM. Bike lanes, curbs and sidewalks are generally available along both sides of the roadway.

The intersection of SW Hall Boulevard at SW Sattler Road is a four-way intersection controlled by a traffic signal. The northbound and southbound approaches each have a left-turn lane with a flashing yellow arrow display for protected/permitted signal phasing and a shared through/right lane. The eastbound and westbound approaches each have a left-turn lane with permitted-only left-turn phasing and a through/right lane. All four legs of the intersection have marked crosswalks with pedestrian signals.

The intersection of SW Hall Boulevard at SW Ashford Street is currently a T-intersection controlled by a stop sign on the westbound Ashford Street approach. The northbound approach has a single lane for through and right-turn movements. The southbound approach has a left-turn lane and a dedicated through lane. The westbound approach has a single, shared lane for all turning movements.

The intersection of SW Hall Boulevard at SW Langtree Street is also a T-intersection, controlled by a stop sign on the westbound Langtree Street approach. The northbound approach has a single lane for through and right-turn movements. The southbound approach has a left-turn lane and a dedicated through lane. The westbound approach has a single, shared lane for all turning movements.

The intersection of SW Hall Boulevard at SW Durham Road is a four-way intersection controlled by a traffic signal. The westbound approach has a left-turn lane, a dedicated through lane and a right-turn lane. The eastbound approach has a left-turn lane and a shared through/right lane. The southbound approach has a left-turn lane and a shared through/right lane. The northbound approach has a single, shared lane for all turning movements. The traffic signal operates with protected/permitted left-turn phasing for the eastbound and westbound approaches, and with split phasing on the northbound and southbound approaches.

A vicinity map showing the project site and the study area intersections is shown in Figure 1 on page seven.

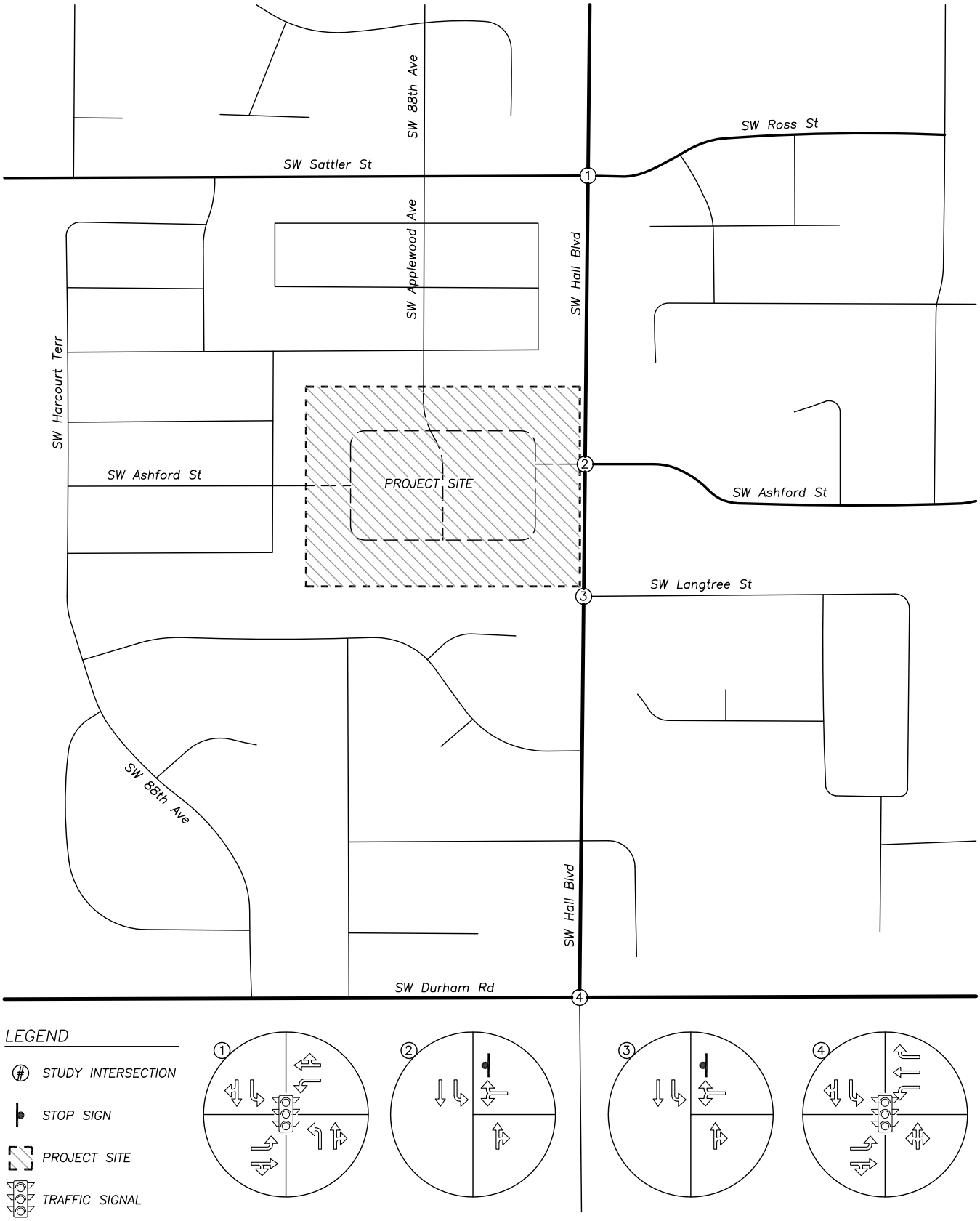
PUBLIC TRANSIT

TriMet route *#76-Beaverton/Tualatin* operates along SW Hall Boulevard in the site vicinity, with the closest bus stops located adjacent to SW Ashford Street. This route extends between the Beaverton Transit Center and the Meridian Park Hospital campus in Tualatin. Service is from about 6:00 AM to 11:00 PM weekdays, with headways of 30 to 60 minutes. Saturday service is from 7:00 AM to 10:00 PM with headways of about 30 to 60 minutes. Sunday service is from about 7:30 AM to 8:00 PM with headways of approximately 35 to 60 minutes.

TRAFFIC COUNTS

Traffic counts were conducted at the study area intersections on December 10, 2014 from 4:00 PM to 6:00 PM, and December 11, 2014, from 7:00 AM to 9:00 AM. Data was used from the system-wide morning peak of 7:10 AM to 8:10 AM and from the system-wide evening peak of 4:10 PM to 5:10 PM.

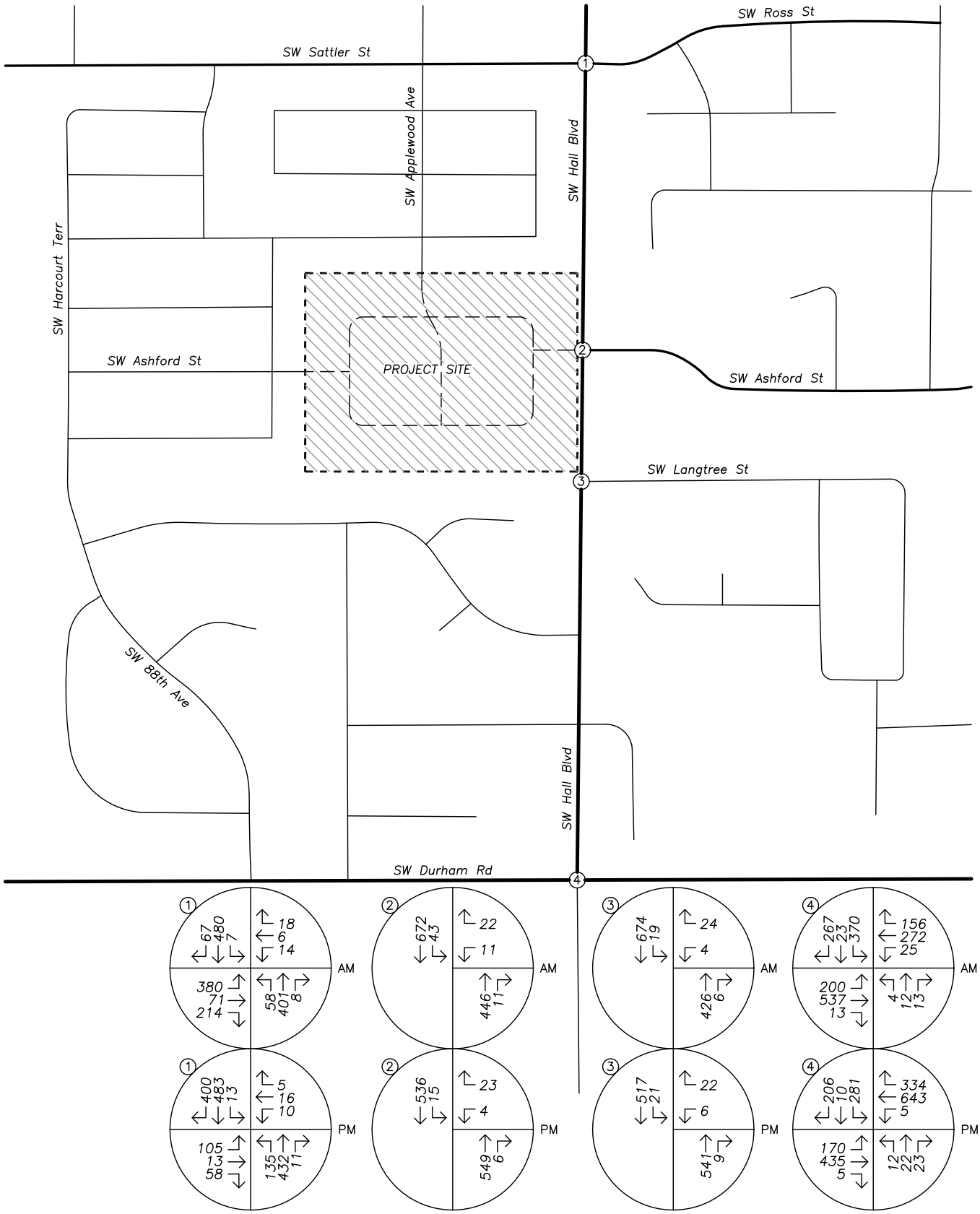
Figure 2 on page eight shows the existing peak-hour traffic volumes for the study area intersections.



VICINITY MAP

no scale

FIGURE 1



TRAFFIC VOLUMES
Existing Conditions
AM & PM Peak Hours

no scale

FIGURE 2

TRIP GENERATION & DISTRIBUTION

TRIP GENERATION

To estimate the number of trips that will be generated by the proposed development, trip rates from *TRIP GENERATION*, Ninth Edition, published by the Institute of Transportation Engineers (ITE), were used.

The development plan proposes the construction of 62 single-family dwellings. To estimate the trip generation of the subject property, trip rates from land-use code 210, *Single-Family Detached Housing*, was used based on the number of dwelling units.

The trip generation calculations show that the proposed development will generate 47 trips during the morning peak hour with 12 trips entering and 35 trips exiting the site. During the evening peak hour, the property is projected to generate up to 62 trips with 39 entering and 23 exiting the site. During a typical weekday, the development would be projected to generate up to 590 daily trips, with half entering and half exiting the site. The following table offers a summary of the trip generation. Detailed trip generation calculations are included in the appendix to this report.

Trip Generation Summary

	ITE Code	Size	Morning Peak Hour			Evening Peak Hour		
			In	Out	Total	In	Out	Total
Proposed Development								
Single-Family Detached Housing	210	62 units	12	35	47	39	23	62

In addition to the evaluation of trip generation for the proposed development, it is necessary to evaluate the potential change in trip generation associated with the proposed zone change. Under existing conditions, the subject property is zoned R-12, which allows attached and detached homes on lots with average minimum area of 3,050 square feet. With the proposed zone change of 6.03 acres to R-7 zoning, the minimum average lot size would be increased to 5,000 square feet for that portion of the property.

Based on a detailed site analysis, it is anticipated that 6.5 acres of the site will be developable, with 2.6 acres of public right-of-way dedicated to serve the future development. Under the existing R-12 zoning, the 6.5 developable acres would allow development of up to 80 single-family homes. This represents the reasonable worst case scenario for the existing zoning on the property.

With the proposed zone change, it is anticipated that there will be 4.52 net developable acres within the R-7 zoning and 1.98 net developable acres within the R-12 zoning. These areas could be developed with up to 39 homes within the R-7 zone and 28 homes within the R-12 zone, for a total of 67 homes on the subject property.

Trip generation estimates resulting from maximum development under the existing and proposed zonings are provided for the morning and evening peak hours in the table below. Based on the analysis, the proposed zone change would result in a net reduction in site trips of 10 site trips during the morning peak hour, 13 site trips during the evening peak hour, and 124 daily site trips.

Trip Generation Summary

	ITE Code	Size	Morning Peak Hour In	Morning Peak Hour Out	Morning Peak Hour Total	Evening Peak Hour In	Evening Peak Hour Out	Evening Peak Hour Total
Existing R-12 Zoning								
Single-Family Detached Housing	210	80 homes	15	45	60	50	30	80
Proposed R-7 and R-12 Zoning								
Single-Family Detached Housing	210	67 homes	13	37	50	42	25	67
Net Change in Site Trips			**-2**	**-8**	**-10**	**-8**	**-5**	**-13**

As shown in the table above, the proposed zone change would result in a reduction in site trips under the reasonable worst-case development scenarios. As such, no negative impacts on the surrounding transportation system are anticipated in association with the proposed zone change.

TRIP DISTRIBUTION

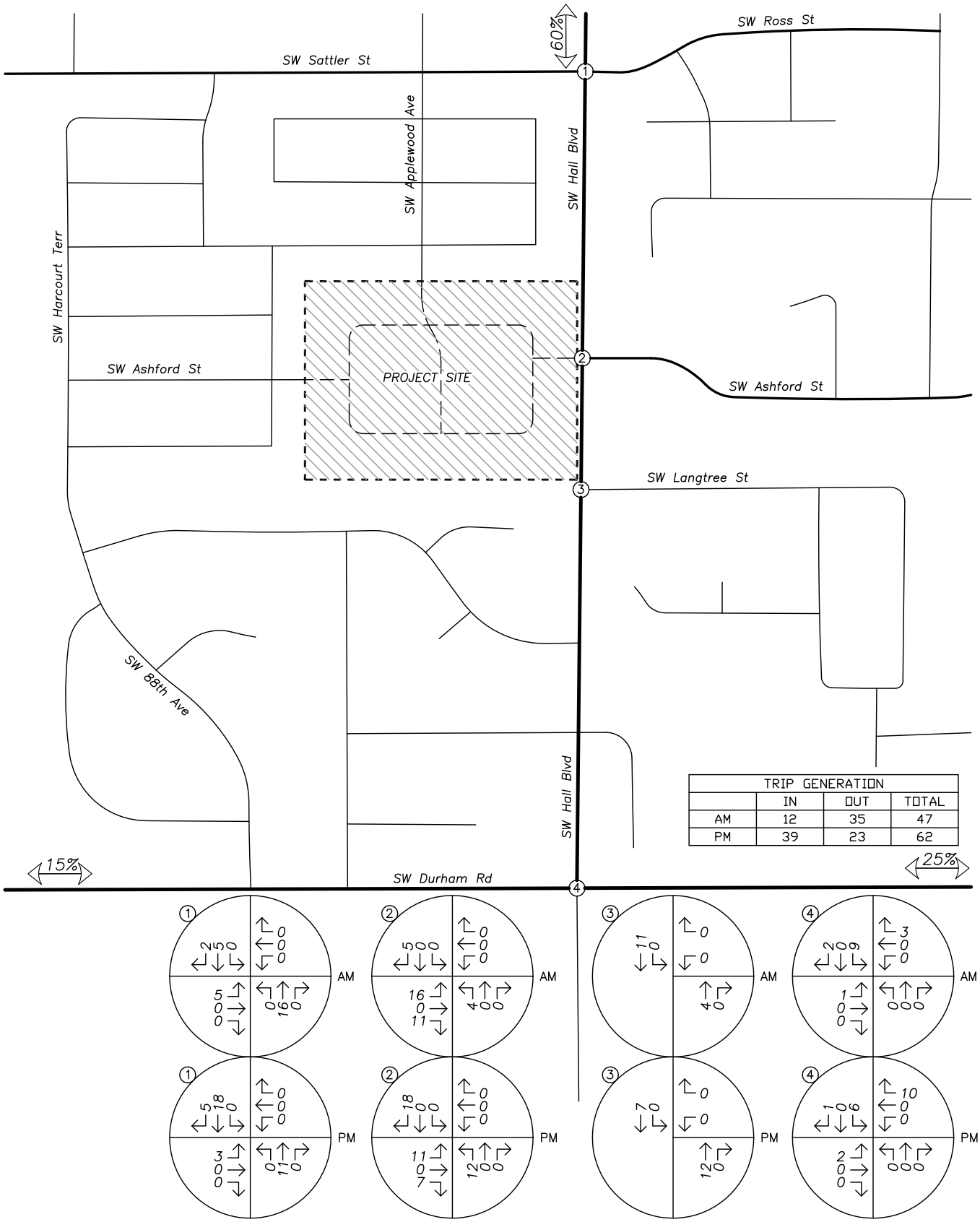
The distribution of site trips from the proposed development was estimated based on existing travel patterns in the site vicinity as well as the locations of likely destinations and major transportation facilities in the surrounding area.

Overall, it was estimated that 60 percent of site trips will travel to and from the north on SW Hall Boulevard. Fifteen percent of site trips are expected to travel to and from the west on SW Durham Road. The remaining 25 percent of site trips are projected to travel to and from the east on SW Durham Road.

Approximately 25 percent of the site trips that travel to and from the north are expected to utilize SW Applewood Avenue to reach SW Sattler Street, since this route will offer a more direct travel path for some residents living in the northerly portion of the subject property. This equates to 7 added trips during the morning peak hour and 9 added trips during the evening peak hour.

Similarly, approximately 60 percent of the site trips that travel to and from the west are expected to utilize SW 88th Avenue to reach SW Durham Road. This equates to 4 trips during the morning peak hour and 6 trips during the evening peak hour.

The trip distribution and assignment for the proposed development is shown in Figure 3 on page 12.



TRIP GENERATION			
	IN	OUT	TOTAL
AM	12	35	47
PM	39	23	62

SITE TRIP DISTRIBUTION & ASSIGNMENT
Proposed Development Plan – Site Trips
AM & PM Peak Hours

no scale

FIGURE 3

SAFETY ANALYSIS

WARRANT ANALYSIS

Left-turn lane warrants and traffic signal warrants were examined for the intersection of SW Hall Boulevard at SW Ashford Street to determine whether installation of a northbound left-turn lane and/or installation of a new traffic signal will be warranted at the primary site access upon completion of the proposed development. SW Hall Boulevard currently has sufficient width for a northbound left-turn lane at SW Ashford Street; however it is not currently striped since there is no west leg of the intersection.

A left-turn lane is primarily a safety consideration for the major street, removing left-turning vehicles from the through traffic stream. The left-turn lane warrants used implement the design curves developed by the Texas Transportation Institute, as adopted by the Oregon Department of Transportation in its Analysis Procedures Manual. The turn lane warrants are evaluated based on the number of advancing and opposing vehicles as well as the number of turning vehicles, the travel speed, and the number of through travel lanes.

Based on the analysis, a northbound left-turn lane will be warranted upon completion of the proposed development. Accordingly, it is recommended that a northbound left-turn lane be striped on SW Hall Boulevard at SW Ashford Street.

Due to the low side-street traffic volumes, traffic signal warrants will not be met for either of the unsignalized analysis intersections under any of the analysis scenarios. Accordingly, no new traffic signals are recommended.

SIGHT DISTANCE

Intersection sight distance was evaluated for the proposed new site access intersection on SW Hall Boulevard. The minimum required intersection sight distance was determined in accordance with *A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS*, published in 2011 by the American Association of State Highway and Transportation Officials (AASHTO). Intersection sight distance measurements are based on an approaching driver's eye height of 3.5 feet above the road and an eye height of 3.5 feet with the opposing driver's eye 15 feet behind the edge of the near-side travel lane.

Based on the posted speed limit of 40 mph along SW Hall Boulevard, the minimum intersection sight distance required is 445 feet in each direction. Intersection sight distance is currently limited by existing vegetation within the frontage of the subject property; however since there are no significant vertical or horizontal curves in the vicinity of the proposed site access and the existing vegetation will be cleared from the site frontage upon development of the proposed subdivision, the available intersection sight distance is projected to be well in excess of 500 feet in each direction from the proposed site access location. Accordingly, adequate intersection sight distance will be available. No additional sight distance mitigations are necessary or recommended.

CRASH DATA ANALYSIS

Using data obtained from ODOT's Crash Analysis and Reporting Unit, a review was performed for the most recent five years of available crash data (2009 – 2013) at each of the study area intersections. A crash rate was calculated under the common assumption that traffic counted during the PM peak period represents 10% of the average daily traffic (ADT) at the intersection. Crash rates greater than 1.0 crashes per million entering vehicles (CMEV) are generally indicative of a need for further investigation and possible mitigation.

The intersection of SW Hall Boulevard at SW Sattler Street/SW Ross Street had a total of seven crashes during the analysis period. These included two rear-end collisions, two turning-movement collisions, one angle collision, one fixed-object collision and one bicycle collision. The bicycle collision occurred when a person riding a bicycle westbound through the intersection was struck by a southbound vehicle that made a right turn after stopping, but failed to yield right-of-way to the cyclist. The crashes resulted in no serious injuries and only two reports of a "possible injury/complaint of pain". No crash patterns were observed from the crash data. The crash rate for the intersection was calculated to be 0.23 CMEV.

The intersection of SW Hall Boulevard at SW Ashford Street had no reported crashes during the five-year analysis period.

The intersection of SW Hall Boulevard at SW Langtree Street had two reported collisions during the five-year analysis period. Both were turning-movement collisions, with one resulting in a report of a "possible injury/complaint of pain." No crash patterns were observed from the crash data. The crash rate for the intersection was calculated to be 0.10 CMEV.

The intersection of SW Hall Boulevard at SW Durham Road had 13 reported collisions during the five-year analysis period, including eight rear-end collisions, four turning-movement collisions and one bicycle collision. The bicycle collision occurred when a person rode a bicycle southbound through the intersection against the red indication and was struck by an eastbound through vehicle. The crash resulted in a non-incapacitating injury to the cyclist. Six of the eight rear-end collisions occurred between westbound vehicles on SW Durham Road; however no phasing, signing, striping or geometric concerns were identified as problematic for the westbound approach and no further patterns were identified in the crash data. The intersection collisions resulted in a total of three non-incapacitating injuries and eight reports of a "possible injury/complaint of pain." The crash rate for the intersection was calculated to be 0.33 CMEV.

Based on the detailed review of all of the crash data, no significant patterns were identified and no contributing design concerns were identified at the study intersections. Accordingly, no safety mitigations are recommended.

OPERATIONAL ANALYSIS

BACKGROUND TRAFFIC

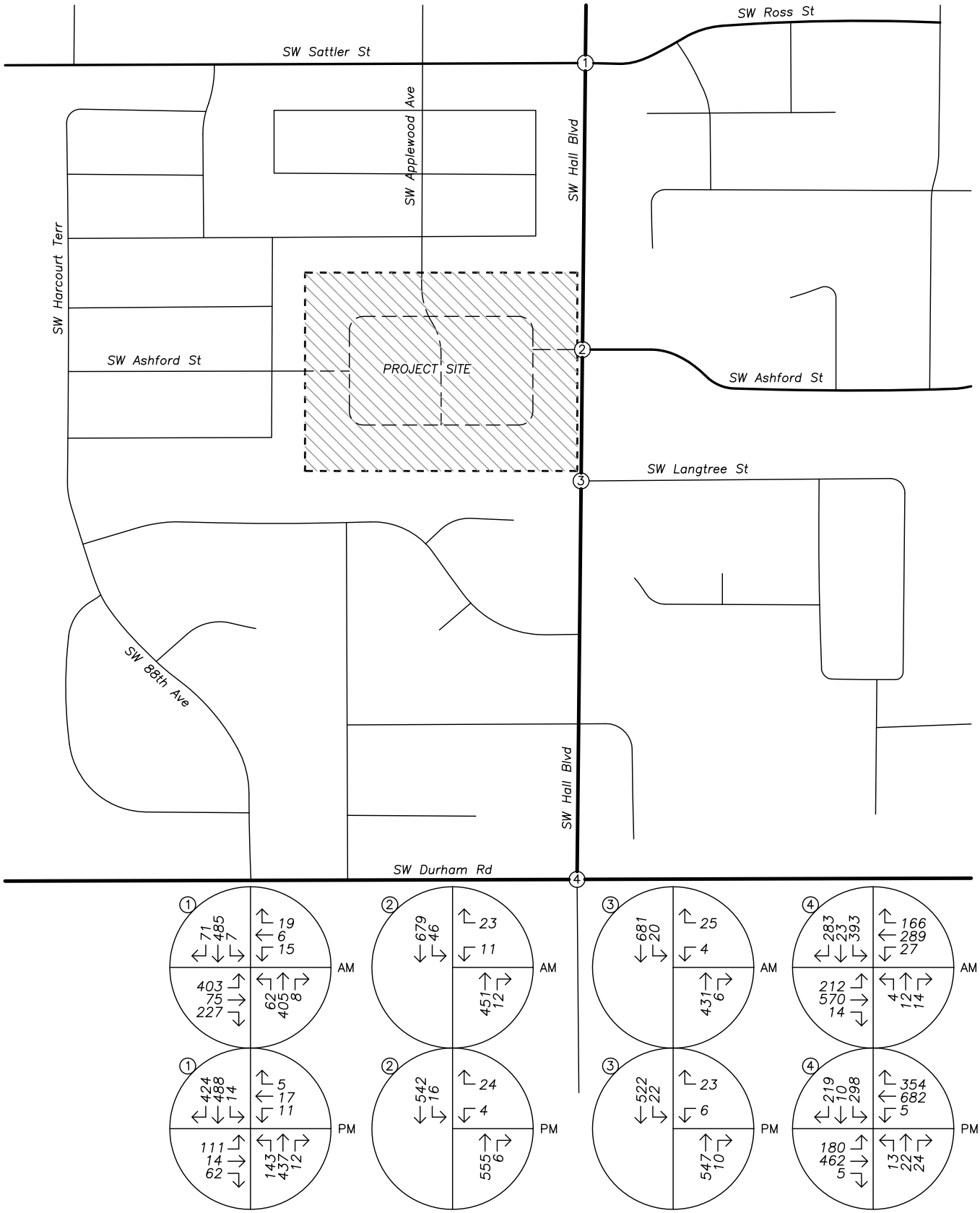
Prior to assigning the site trips to the study intersections, the traffic volumes were adjusted to account for anticipated growth in the study area that will occur during the construction of the development. Background traffic volumes were projected for year 2017 traffic conditions, when the proposed subdivision is assumed to be completed and fully occupied.

To estimate the future traffic volumes, a linear growth rate of 0.4 percent per year was calculated for SW Hall Boulevard using ODOT's Future Volume Tables. This growth rate was applied over a three-year period to determine year 2017 background traffic volumes for through traffic traveling along SW Hall Boulevard. For all other traffic volumes a conservative exponential growth rate of two percent per year was applied to the existing traffic volumes over a three-year period in order to determine the year 2017 background traffic volumes.

In addition to the background traffic growth, traffic volumes at the area intersections were adjusted to account for anticipated changes in background travel patterns that will occur with completion of the new streets within the subject property. Under existing conditions, trips from the homes located west of the subject property traveling to and from the east on SW Durham Road either travel north through the neighborhood to reach SW Sattler Street to turn south onto SW Hall Boulevard or travel south through the neighborhood via SW 88th Avenue to reach SW Durham Road. Upon the completion of the proposed new streets within the subject property, much of this existing traffic would be expected to utilize SW Ashford Street to access SW Hall Boulevard, since this will provide a more direct travel route to and from the southeast for residents living east of SW Harcourt Terrace.

Similarly, existing homes located north of the subject property and destined for locations to the south are likely to re-route through the project site via SW Applewood Avenue to avoid unnecessary out-of-direction travel and reach SW Hall Boulevard via the new SW Ashford Street intersection. For residents of the existing homes along and south of south of SW Lodi Lane, the travel route through the Heritage Crossing site will be the fastest way to and from the south.

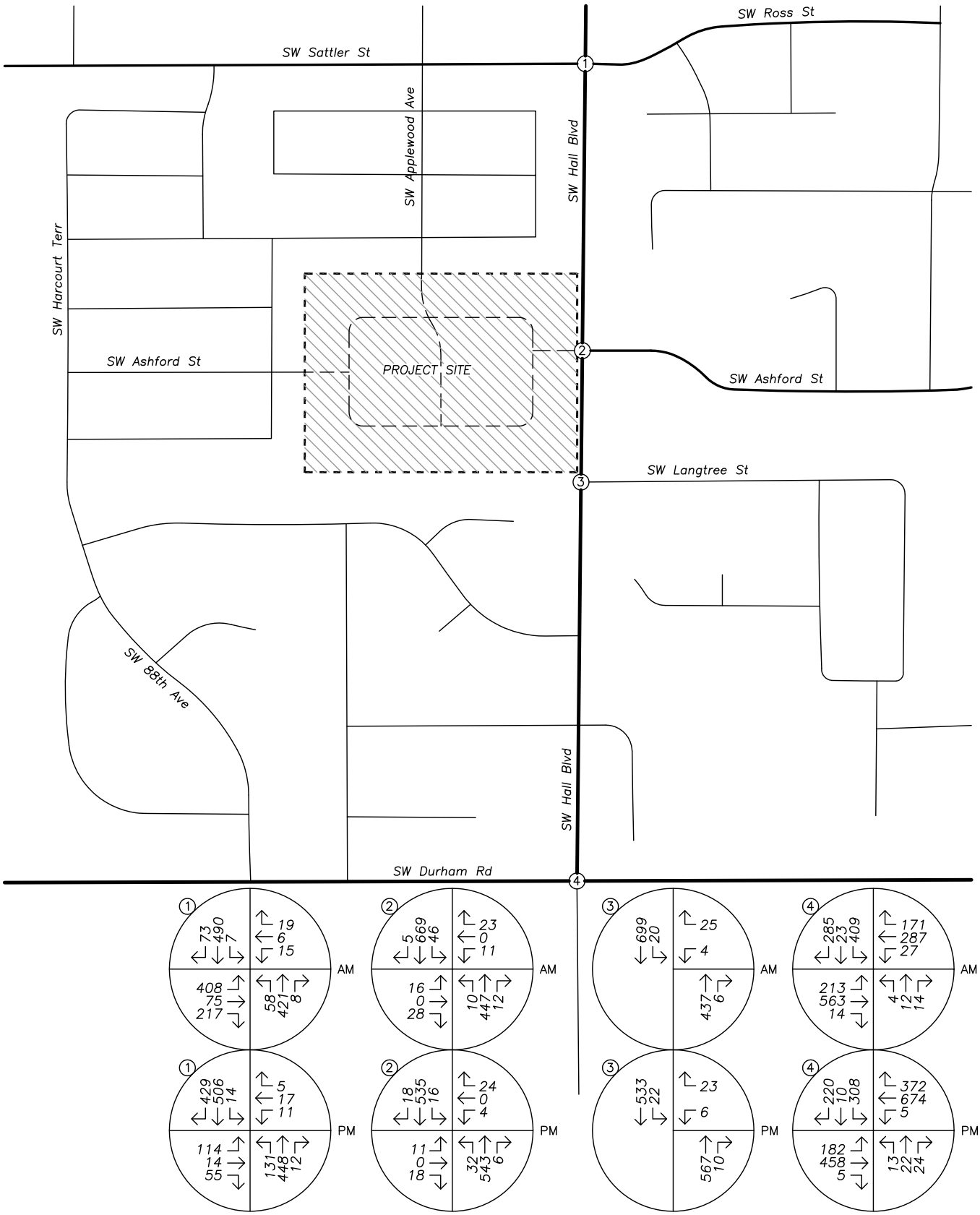
Figure 4 on page 16 shows the projected year 2017 background volumes. Figure 5 on page 17 shows the year 2017 traffic volumes with the addition of site trips from the proposed development.



TRAFFIC VOLUMES
Year 2017 Background Conditions
AM & PM Peak Hours

no scale

FIGURE 4



TRAFFIC VOLUMES
Year 2017 Background plus Site Trips
AM & PM Peak Hours

no scale

FIGURE 5

CAPACITY ANALYSIS

To determine the capacity and level of service at the study intersections, a capacity analysis was conducted. The analysis was conducted according to the unsignalized and signalized intersection analysis methodology given in the *HIGHWAY CAPACITY MANUAL* (HCM) published by the Transportation Research Board. The volume over capacity (v/c) ratio can range from 0.00, which indicates very minimal traffic, to greater than 1.00, which indicates more vehicles are attempting to use the intersection than it was designed to accommodate. The study intersections operate under the jurisdiction of the Oregon Department of Transportation, which requires that intersections along SW Hall Boulevard operate with a v/c of 0.99 or less during the peak hours.

To examine the potential traffic impacts of the proposed subdivision, an analysis was made for morning and evening peak hours under existing conditions, year 2017 background traffic conditions, and year 2017 background plus site trips conditions.

The intersection of SW Hall Boulevard at SW Sattler Street/SW Ross Street currently operates with a v/c ratio of 0.92 during the morning peak hour and 0.76 during the evening peak hour. Under year 2017 background conditions, the intersection is projected to operate with a v/c of 0.94 during the morning peak hour and 0.80 during the evening peak hour. Upon completion of the proposed subdivision, the intersection is projected to operate with a v/c ratio of 0.95 during the morning peak hour and 0.81 during the evening peak hour. Intersection operation is acceptable and no mitigations are recommended.

The intersection of SW Hall Boulevard at SW Ashford Street currently operates with a v/c ratio of 0.47 during the morning peak hour and 0.34 during the evening peak hour. Under year 2017 background traffic conditions, the intersection is projected to continue to operate with a v/c ratio of 0.47 during the morning peak hour and 0.34 during the evening peak hour. With the addition of site trips from the proposed development, the intersection is projected to operate with a v/c ratio of 0.51 during the morning peak hour and 0.34 during the evening peak hour. Intersection operation is acceptable and no mitigation is recommended.

The intersection of SW Hall Boulevard at SW Langtree Street currently operates with a v/c ratio of 0.52 during the morning peak hour and 0.36 during the evening peak hour. Under year 2017 background traffic conditions, the intersection is projected to operate with a v/c ratio of 0.53 during the morning peak hour and 0.36 during the evening peak hour. Upon completion of the proposed development the intersection is projected to operate with a v/c ratio of 0.54 during the morning peak hour and 0.37 during the evening peak hour. Intersection operation is acceptable under all analysis scenarios and no mitigation is recommended.

The intersection of SW Hall Boulevard at SW Durham Road currently operates with a v/c ratio of 0.84 during the morning peak hour and 0.73 during the evening peak hour. Under year 2017 traffic conditions, the intersection is projected to operate with a v/c ratio of 0.89 during the morning peak hour and 0.77 during the evening peak hour either with or without the addition of site trips from the proposed development. Intersection operation is acceptable under and no mitigation is recommended.

The results of the capacity analysis, along with the levels of service, delay, and v/c ratios are shown in the following table. Detailed calculations, as well as tables showing the relationships between delay and level of service are included in the appendix to this report.

CAPACITY ANALYSIS SUMMARY

	AM			PM		
	LOS	Delay (s)	v / c	LOS	Delay (s)	v / c
*SW Hall Boulevard at SW Sattler Street**						
Existing	C	28	0.92	B	12	0.76
2017 Background	C	31	0.94	B	14	0.80
2017 Background + Site	C	32	0.95	B	14	0.81
SW Hall Boulevard at SW Ashford Street						
Existing	D	31	0.47	B	14	0.34
2017 Background	D	33	0.47	B	14	0.34
2017 Background + Site	F	75	0.51	C	21	0.34
SW Hall Boulevard at SW Langtree Street						
Existing	C	20	0.52	C	16	0.36
2017 Background	C	20	0.53	C	16	0.36
2017 Background + Site	C	20	0.54	C	16	0.37
*SW Hall Boulevard at SW Durham Street**						
Existing	C	25	0.84	C	23	0.73
2017 Background	C	28	0.89	C	25	0.77
2017 Background + Site	C	29	0.89	C	26	0.77

* = Signalized Intersection

SITE ACCESS ANALYSIS

The subject property has frontage along SW Hall Boulevard, where a new access is proposed. This street extension is required in order to meet the City of Tigard's connectivity standards.

For District Highway facilities with a posted speed limit of 40 mph within an urban environment, the Oregon Department of Transportation typically requires a minimum of 500 feet of spacing between unsignalized intersections. The existing spacing between SW Ashford Street and SW Langtree Street is approximately 350 feet. Due to the close intersection spacing, it is appropriate to examine the projected left-turn queues to determine whether conflicts would be expected within the center turn lane.

Based on a SimTraffic queueing analysis, the projected 95th-percentile northbound left-turn queue at SW Ashford Street was 22 feet during the morning peak hour and 34 feet during the evening peak hour upon completion of the proposed development. The projected 95th-percentile southbound left-turn queue at SW Langtree Street was 25 feet during the morning peak hour and 36 feet during the evening peak hour.

Although there is 350 feet between these intersections as measured from centerline to centerline, only 300 feet of space is available between the intersections to potentially accommodate back-to-back left-turn lanes. Typically, ODOT requires a minimum of 100 feet of left-turn storage within a left-turn lane. This is specifically noted as sufficient to accommodate one truck and one passenger car. Actual storage lengths may be increased based on the results of a queuing analysis. In this instance, however, neither turn lane would be expected to regularly accommodate truck traffic since both turn lanes serve local residential development. Accordingly, it may be appropriate to allow a shorter storage length at these intersections.

If a 45 mph design speed is used on SW Hall Boulevard (5 mph above the posted speed limit), the required reverse taper length would be 215 feet. Notably, the sum of the projected 95th percentile queues and this reverse taper length is less than 300 feet during both the morning and evening peak hours and can be accommodated within the existing spacing between Ashford Street and Langtree Street. However, for maximum flexibility to accommodate peak queues it is recommended that consideration be given to providing continuous two-way left-turn lane striping between the intersections.

In addition to the lane configurations on SW Hall Boulevard at the proposed site access, consideration was given to the lane configuration on the new eastbound approach to SW Hall Boulevard. The operational and queueing analysis for this intersection assumed a single, shared lane for all eastbound turning movements. This is an appropriate starting assumption for the cross-section based on the classification of the street as well as the projected traffic volume of fewer than 1,000 vehicles per day on the roadway (actual projected traffic is approximately 760 vehicles per day for this approach). In order to verify that this configuration is sufficient for safe and efficient operation of the intersection, the projected eastbound queues from the SimTraffic analysis were also considered. Based on the analysis, the 95th percentile queue for this approach during the morning peak hour will be 54 feet, with an average queue of 24 feet. During the evening peak hour, the projected 95th percentile queue is 49 feet, with an average queue of 22 feet. These estimates equate to queues of one to two vehicles during the peak hours. Based on the analysis, the intersection would not significantly benefit from installation of additional lanes.

TRANSPORTATION PLANNING RULE ANALYSIS

The Transportation Planning Rule (TPR) is in place to ensure that the transportation system is capable of supporting possible increases in traffic intensity that could result from changes to adopted plans and land use regulations. The applicable portions of the TPR are quoted in *italics* below, with responses directly following.

660-012-0060

(1) If an amendment to a functional plan, an acknowledged comprehensive plan, or a land use regulation (including a zoning map) would significantly affect an existing or planned transportation facility, then the local government must put in place measures as provided in section (2) of this rule, unless the amendment is allowed under section (3), (9) or (10) of this rule. A plan or land use regulation amendment significantly affects a transportation facility if it would:

(a) Change the functional classification of an existing or planned transportation facility (exclusive of correction of map errors in an adopted plan);

The proposed zone change will not necessitate changes to the functional classification of existing or planned transportation facilities. Accordingly, this section is not triggered.

(b) Change standards implementing a functional classification system; or

The proposed zone change will not change any standards implementing the functional classification system. Accordingly, this section is also not triggered.

(c) Result in any of the effects listed in paragraphs (A) through (C) of this subsection based on projected conditions measured at the end of the planning period identified in the adopted TSP. As part of evaluating projected conditions, the amount of traffic projected to be generated within the area of the amendment may be reduced if the amendment includes an enforceable, ongoing requirement that would demonstrably limit traffic generation, including, but not limited to, transportation demand management. This reduction may diminish or completely eliminate the significant effect of the amendment.

(A) Types or levels of travel or access that are inconsistent with the functional classification of an existing or planned transportation facility;

(B) Degrade the performance of an existing or planned transportation facility such that it would not meet the performance standards identified in the TSP or comprehensive plan; or

(C) Degrade the performance of an existing or planned transportation facility that is otherwise projected to not meet the performance standards identified in the TSP or comprehensive plan.

In this instance, subsection (A) is not triggered, since the proposed zone change will not impact or alter the functional classification of any existing or planned facility and the proposal does not include a change to any functional classification standards.

Subsections (B) and (C) are also not triggered, since the proposed zone change results in a net reduction in site trips under the reasonable worst-case development scenarios. Accordingly, the proposed zone change cannot result in degrading the performance of any existing or planned transportation facilities. As such, the Transportation Planning Rule is satisfied.

Based on the analysis, no mitigation is necessary or recommended in association with the proposed zone change on the subject property.

LOCAL STREET IMPACT ANALYSIS

In addition to examination of the critical intersections in the study area, consideration was given to the potential impacts of the proposed development on local street traffic volumes and livability in the site vicinity. Generally, it is desirable to maintain traffic volumes of 1,000 vehicles per day or less on local streets. This volume of traffic maintains livability and also can be accommodated on queuing streets where the presence of vehicles parked along the sides of the street can restrict short segments of the roadway to one travel lane, requiring vehicles to pull to the side to allow opposing traffic to travel down the street.

In order to assess the impacts on local street volumes and livability, three primary factors were considered. These consisted of the existing traffic volumes on the streets (at the point where volumes are highest), the added traffic volume from the proposed subdivision, and the impact of traffic from existing homes in the site vicinity diverting to utilize the proposed new street connections.

Three primary travel corridors were considered in this analysis: SW Applewood Way, which connects to SW Sattler Street north of the subject property; SW Ashford Street west of the subject property, which connects to SW Harcourt Terrace/SW 88th Avenue; and the new SW Ashford Street connection to the west side of SW Hall Boulevard.

SW Applewood Avenue currently carries 65 vehicles during the PM peak hour immediately south of SW Sattler Street. This location is the segment of SW Applewood Avenue that carries the highest volume of traffic and the PM peak hour represents the highest hourly traffic volume of the day. It is projected that the proposed development will add 8 trips to this roadway during the evening peak hour, primarily consisting of trips between the north end of the proposed development and locations accessed to the north via SW Hall Boulevard. However, the completion of a new street connection between SW Applewood Way and the new SW Ashford Street extension is also projected to result in 14 trips originating within the existing residential area north of the subject property and traveling to destinations to the south re-routing to use the new streets. Accordingly, the net impact of the proposed development and street connections will be a slight reduction in traffic volumes on SW Applewood Avenue immediately south of SW Sattler Street, from 65 vehicles per hour to 59 vehicles per hour. This equates roughly to a daily traffic volume reduction from 650 vehicles per day to 590 vehicles per day.

SW Ashford Street west of the subject property connects to SW Harcourt Terrace/SW 88th Avenue, which in turn connects to SW Durham Road. The highest-volume segment of this roadway is on SW 88th Avenue immediately north of SW Durham Road. Under existing conditions this segment of the roadway carries 44 vehicles during the PM peak hour, when hourly traffic volumes are highest. It is projected that the proposed development will add 6 site trips to this travel route during the evening peak hour. Completion of the SW Ashford Street connection to the west side of SW Hall Boulevard will also result in diversion of 4 site trips originating within the existing residential development west of the subject property re-routing to use the new street. Accordingly, the net impact of the proposed development and street connections will be a slight increase in traffic volumes on SW 88th Avenue from 44 vehicles per hour to 46 vehicles per hour. This equates roughly to a daily traffic volume increase from 440 vehicles per day to 460 vehicles per day.

The proposed new segment of SW Ashford Street will carry its highest traffic volumes immediately west of SW Hall Boulevard. Upon completion of the proposed development, it is projected that this segment of SW Ashford Street will carry 76 vehicles during the evening peak hour. This equates roughly to a traffic volume of 760 vehicles per day.

Based on the detailed analysis of local street traffic volumes and impacts from the proposed development, all local residential streets impacted by the proposed development currently carry appropriate traffic volumes for maintaining safe, efficient and livable communities. Following completion of the proposed development, the existing local streets will continue to carry appropriate volumes of traffic and the new local streets will also carry appropriate levels of traffic to maintain safe, efficient and livable communities. Based on the analysis, no operational or safety mitigations are recommended.

CONCLUSIONS

Left-turn lane warrants were examined for the northbound Hall Boulevard approach to SW Ashford Street. A left-turn lane is projected to be warranted during the evening peak hour under year 2017 background plus site trips conditions. Accordingly, it is recommended that a northbound left-turn lane be provided for this intersection.

By inspection, traffic volumes on the minor-street approaches at the unsignalized study intersections are too low to meet traffic signal warrants. Accordingly, no new traffic signals are recommended.

Based on the intersection sight distance measurements at the proposed site access location on SW Hall Boulevard, adequate sight distance can be made available upon clearing of vegetation within the subject property frontage. No other sight distance mitigations are recommended.

A detailed examination of the crash history at the study intersections shows no significant safety hazards and no trends that are indicative of design deficiencies. No safety mitigations are recommended.

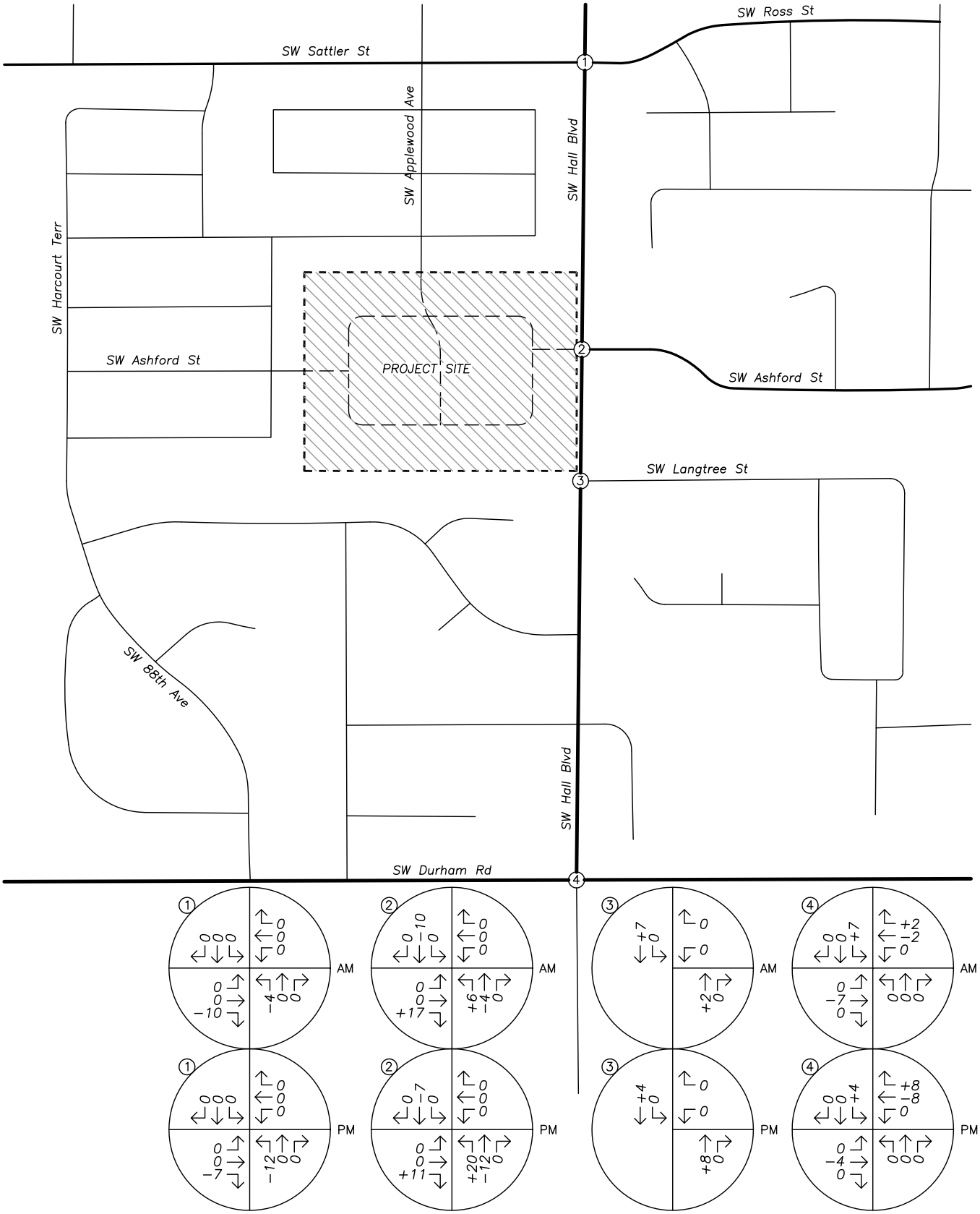
Each of the study intersections is projected to operate within the performance standards established by the Oregon Department of Transportation through the year 2017, either with or without the addition of site trips from the proposed development. No operational mitigations are recommended.

The existing access spacing between SW Ashford Street and SW Langtree Street on SW Hall Boulevard does not meet ODOT standards. Based on the operational and queuing analysis, there is sufficient distance between the intersections to accommodate left-turn movements. For best operation, it is recommended that consideration be given to providing a continuous two-way left-turn lane between the intersections.

The proposed zone change on the subject property will result in a net reduction in site trips assuming development of the subject property at the maximum density allowable within the site. Accordingly the zone change can neither cause nor exacerbate any potential transportation system concerns at the planning horizon. No mitigation is necessary or recommended to comply with Oregon's Transportation Planning Rule.

Existing and future hourly and daily traffic volumes on the local streets impacted by the proposed development are appropriate for safe, efficient and livable communities. No operational or safety mitigations are recommended.

APPENDIX



BACKGROUND TRAFFIC VOLUME ADJUSTMENTS
Diverted Background Trips with Completion of New Roadways
Weekday AM and PM Peak Hours

no scale

FIGURE 6

PAGE APP1

LEVEL OF SERVICE

Level of service is used to describe the quality of traffic flow. Levels of service A to C are considered good, and rural roads are usually designed for level of service C. Urban streets and signalized intersections are typically designed for level of service D. Level of service E is considered to be the limit of acceptable delay. For unsignalized intersections, level of service E is generally considered acceptable. Here is a more complete description of levels of service:

Level of service A: Very low delay at intersections, with all traffic signal cycles clearing and no vehicles waiting through more than one signal cycle. On highways, low volume and high speeds, with speeds not restricted by other vehicles.

Level of service B: Operating speeds beginning to be affected by other traffic; short traffic delays at intersections. Higher average intersection delay than for level of service A resulting from more vehicles stopping.

Level of service C: Operating speeds and maneuverability closely controlled by other traffic; higher delays at intersections than for level of service B due to a significant number of vehicles stopping. Not all signal cycles clear the waiting vehicles. This is the recommended design standard for rural highways.

Level of service D: Tolerable operating speeds; long traffic delays occur at intersections. The influence of congestion is noticeable. At traffic signals many vehicles stop, and the proportion of vehicles not stopping declines. The number of signal cycle failures, for which vehicles must wait through more than one signal cycle, are noticeable. This is typically the design level for urban signalized intersections.

Level of service E: Restricted speeds, very long traffic delays at traffic signals, and traffic volumes near capacity. Flow is unstable so that any interruption, no matter how minor, will cause queues to form and service to deteriorate to level of service F. Traffic signal cycle failures are frequent occurrences. For unsignalized intersections, level of service E or better is generally considered acceptable.

Level of service F: Extreme delays, resulting in long queues which may interfere with other traffic movements. There may be stoppages of long duration, and speeds may drop to zero. There may be frequent signal cycle failures. Level of service F will typically result when vehicle arrival rates are greater than capacity. It is considered unacceptable by most drivers.

LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (Seconds)
A	<10
B	10-20
C	20-35
D	35-55
E	55-80
F	>80

LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (Seconds)
A	<10
B	10-15
C	15-25
D	25-35
E	35-50
F	>50

Total Vehicle Summary

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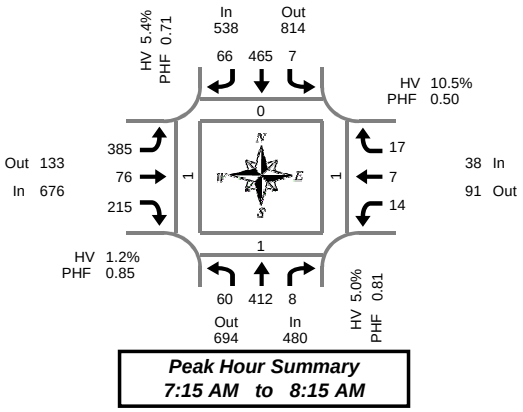

SW Hall Blvd & SW Sattler St

Thursday, December 11, 2014
7:00 AM to 9:00 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	2	30	0	0	1	23	2	0	19	0	8	0	1	0	1	0	87	0	0	0	0
7:05 AM	0	26	0	0	1	29	1	0	16	1	12	0	0	0	0	0	86	0	0	0	0
7:10 AM	2	22	1	0	0	29	5	0	28	0	10	0	0	0	1	0	98	0	0	0	0
7:15 AM	3	29	0	0	1	47	3	0	33	2	14	0	0	1	1	0	134	0	0	0	0
7:20 AM	2	27	0	0	1	48	5	1	20	2	16	0	1	1	2	0	125	0	0	0	0
7:25 AM	4	37	0	0	0	51	5	0	37	5	18	0	0	0	1	0	158	0	0	0	0
7:30 AM	6	35	1	0	0	47	3	0	40	8	22	0	3	0	2	0	167	0	0	0	0
7:35 AM	7	47	3	0	1	71	3	0	31	6	13	0	4	1	5	0	192	0	0	0	0
7:40 AM	4	37	1	0	1	53	10	0	36	11	25	0	2	1	1	0	182	0	0	0	0
7:45 AM	7	43	0	0	1	43	7	0	27	12	24	0	1	0	2	0	167	0	0	0	0
7:50 AM	10	42	1	0	0	36	9	0	32	12	21	0	1	1	1	0	166	0	1	1	0
7:55 AM	3	28	1	0	0	15	8	0	34	10	21	0	1	0	1	0	122	0	0	0	0
8:00 AM	5	21	0	0	2	25	4	0	33	1	20	0	1	1	1	0	114	0	0	0	1
8:05 AM	5	33	0	0	0	15	5	0	29	2	10	0	0	0	0	0	99	0	0	0	0
8:10 AM	4	33	1	0	0	14	4	0	33	5	11	0	0	1	0	0	106	0	0	0	0
8:15 AM	4	32	0	0	0	24	5	1	34	1	6	0	1	0	0	0	107	0	0	0	0
8:20 AM	3	25	0	0	0	11	2	0	22	1	12	0	1	1	0	0	78	0	1	0	0
8:25 AM	5	9	0	0	0	18	8	0	29	1	5	0	0	0	1	0	76	0	0	0	0
8:30 AM	7	27	0	0	0	34	5	0	24	0	5	0	0	0	0	0	102	0	0	0	1
8:35 AM	2	28	1	1	0	19	5	0	23	1	9	0	0	1	0	0	89	0	0	0	0
8:40 AM	4	27	0	0	0	16	9	0	19	1	9	0	0	2	0	0	87	0	0	0	0
8:45 AM	1	27	1	0	1	22	8	0	23	1	16	0	0	2	0	0	102	0	0	0	0
8:50 AM	3	25	0	0	0	17	4	0	29	1	8	0	0	2	1	0	90	0	0	0	0
8:55 AM	4	12	1	0	0	20	9	0	16	0	3	1	0	1	0	0	66	0	0	0	0
Total Survey	97	702	12	1	10	727	129	2	667	84	318	1	17	16	21	0	2,800	0	2	1	2

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	4	78	1	0	2	81	8	0	63	1	30	0	1	0	2	0	271	0	0	0	0
7:15 AM	9	93	0	0	2	146	13	1	90	9	48	0	1	2	4	0	417	0	0	0	0
7:30 AM	17	119	5	0	2	171	16	0	107	25	60	0	9	2	8	0	541	0	0	0	0
7:45 AM	20	113	2	0	1	94	24	0	93	34	66	0	3	1	4	0	455	0	1	1	0
8:00 AM	14	87	1	0	2	54	13	0	95	8	41	0	1	2	1	0	319	0	0	0	1
8:15 AM	12	66	0	0	0	53	15	1	85	3	23	0	2	1	1	0	261	0	1	0	0
8:30 AM	13	82	1	1	0	69	19	0	66	2	23	0	0	3	0	0	278	0	0	0	1
8:45 AM	8	64	2	0	1	59	21	0	68	2	27	1	0	5	1	0	258	0	0	0	0
Total Survey	97	702	12	1	10	727	129	2	667	84	318	1	17	16	21	0	2,800	0	2	1	2

Peak Hour Summary
7:15 AM to 8:15 AM

By Approach	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Sattler St				Westbound SW Sattler St				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	480	694	1,174	0	538	814	1,352	1	676	133	809	0	38	91	129	0	1,732	0	1	1	1
%HV	5.0%				5.4%				1.2%				10.5%				3.8%				
PHF	0.81				0.71				0.85				0.50				0.80				

By Movement	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Sattler St				Westbound SW Sattler St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	60	412	8	480	7	465	66	538	385	76	215	676	14	7	17	38	1,732
%HV	3.3%	5.1%	12.5%	5.0%	28.6%	4.7%	7.6%	5.4%	0.5%	0.0%	2.8%	1.2%	14.3%	0.0%	11.8%	10.5%	3.8%
PHF	0.71	0.81	0.40	0.81	0.58	0.68	0.63	0.71	0.89	0.54	0.77	0.85	0.39	0.88	0.53	0.50	0.80

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	50	403	8	0	7	492	61	1	353	69	204	0	14	5	18	0	1,684	0	1	1	0
7:15 AM	60	412	8	0	7	465	66	1	385	76	215	0	14	7	17	0	1,732	0	1	1	1
7:30 AM	63	385	8	0	5	372	68	1	380	70	190	0	15	6	14	0	1,576	0	2	1	1
7:45 AM	59	348	4	1	3	270	71	1	339	47	153	0	6	7	6	0	1,313	0	2	1	2
8:00 AM	47	299	4	1	3	235	68	1	314	15	114	1	3	11	3	0	1,116	0	1	0	2

Heavy Vehicle Summary

Clay Carney
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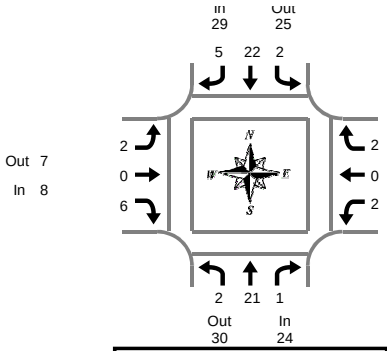


Peak Hour Summary
7:15 AM to 8:15 AM

SW Hall Blvd & SW Sattler St

Thursday, December 11, 2014
7:00 AM to 9:00 AM

Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	0	0	0	0	0	2	1	3	0	0	0	0	0	0	0	0	3
7:05 AM	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0	0	4
7:10 AM	0	1	0	1	0	6	0	6	0	0	0	0	0	0	0	0	7
7:15 AM	0	3	0	3	1	7	1	9	0	0	0	0	0	0	0	0	12
7:20 AM	0	4	0	4	1	3	0	4	0	0	0	0	0	0	1	1	9
7:25 AM	1	4	0	5	0	2	0	2	0	0	0	0	0	0	0	0	7
7:30 AM	1	0	0	1	0	1	0	1	0	0	1	1	0	0	0	0	3
7:35 AM	0	5	1	6	0	1	0	1	1	0	0	1	1	0	1	2	10
7:40 AM	0	0	0	0	0	1	2	3	0	0	0	0	0	0	0	0	3
7:45 AM	0	1	0	1	0	0	2	2	1	0	1	2	0	0	0	0	5
7:50 AM	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	2
7:55 AM	0	0	0	0	0	2	0	2	0	0	1	1	0	0	0	0	3
8:00 AM	0	0	0	0	0	2	0	2	0	0	2	2	1	0	0	1	5
8:05 AM	0	2	0	2	0	1	0	1	0	0	0	0	0	0	0	0	3
8:10 AM	0	2	0	2	0	0	0	0	0	0	1	1	0	0	0	0	3
8:15 AM	0	2	0	2	0	1	0	1	0	0	0	0	0	0	0	0	3
8:20 AM	0	0	0	0	0	1	0	1	0	0	1	1	0	0	0	0	2
8:25 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	1	2	0	3	0	1	3	4	0	0	0	0	0	0	0	0	7
8:35 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
8:40 AM	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
8:45 AM	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
8:50 AM	1	2	0	3	0	1	0	1	0	0	0	0	0	0	0	0	4
8:55 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
Total Survey	4	34	1	39	2	39	9	50	2	0	7	9	2	0	2	4	102

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	0	1	0	1	0	12	1	13	0	0	0	0	0	0	0	0	14
7:15 AM	1	11	0	12	2	12	1	15	0	0	0	0	0	0	1	1	28
7:30 AM	1	5	1	7	0	3	2	5	1	0	1	2	1	0	1	2	16
7:45 AM	0	1	0	1	0	4	2	6	1	0	2	3	0	0	0	0	10
8:00 AM	0	4	0	4	0	3	0	3	0	0	3	3	1	0	0	1	11
8:15 AM	0	2	0	2	0	2	0	2	0	0	1	1	0	0	0	0	5
8:30 AM	1	6	0	7	0	1	3	4	0	0	0	0	0	0	0	0	11
8:45 AM	1	4	0	5	0	2	0	2	0	0	0	0	0	0	0	0	7
Total Survey	4	34	1	39	2	39	9	50	2	0	7	9	2	0	2	4	102

Heavy Vehicle Peak Hour Summary
7:15 AM to 8:15 AM

By Approach	Northbound SW Hall Blvd			Southbound SW Hall Blvd			Eastbound SW Sattler St			Westbound SW Sattler St			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	24	30	54	29	25	54	8	7	15	4	3	7	65
PHF	0.50			0.48			0.67			0.50			0.58

By Movement	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Sattler St				Westbound SW Sattler St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	2	21	1	24	2	22	5	29	2	0	6	8	2	0	2	4	65
PHF	0.25	0.48	0.25	0.50	0.25	0.46	0.31	0.48	0.25	0.00	0.50	0.67	0.50	0.00	0.50	0.50	0.58

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

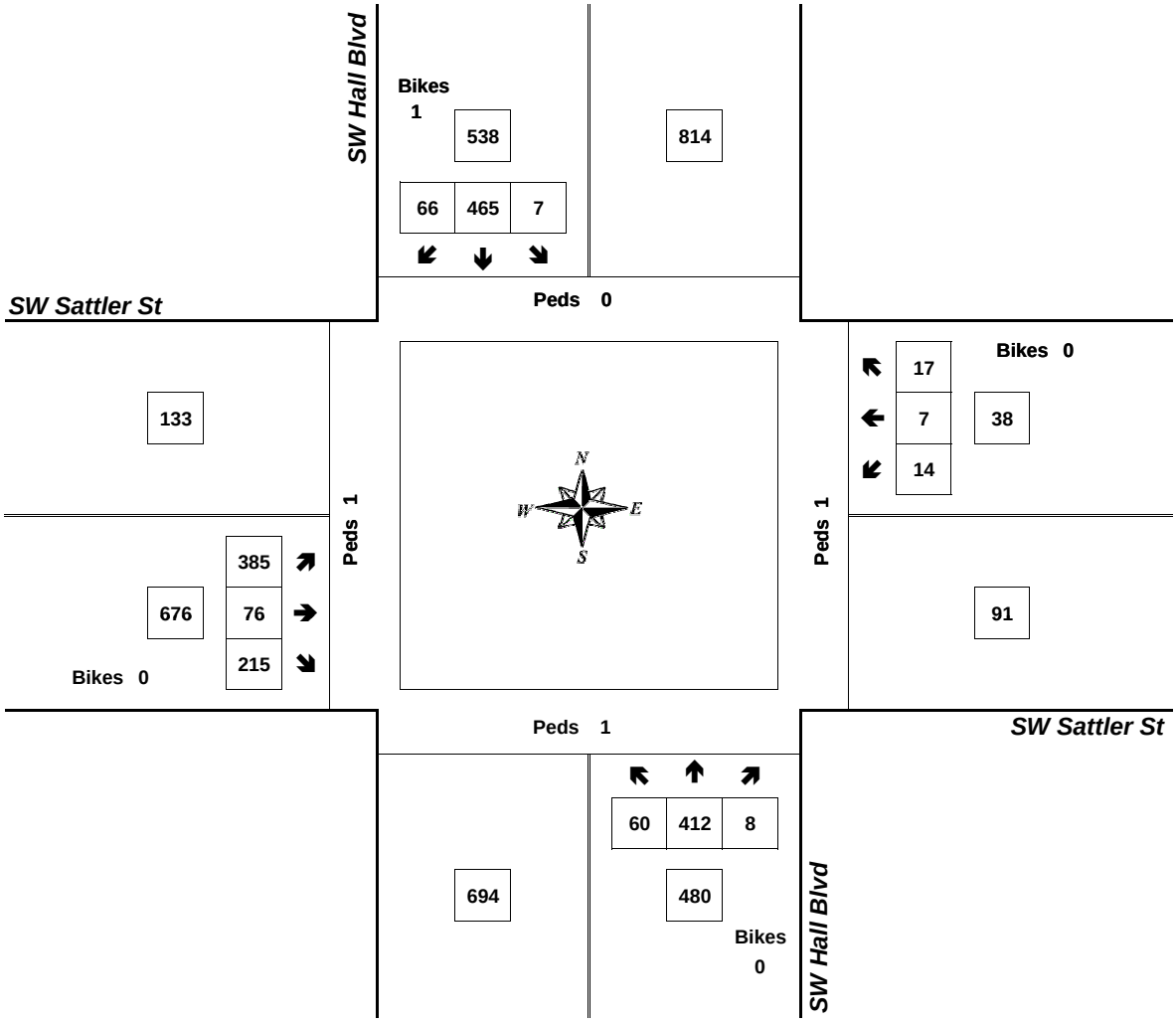
Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	2	18	1	21	2	31	6	39	2	0	3	5	1	0	2	3	68
7:15 AM	2	21	1	24	2	22	5	29	2	0	6	8	2	0	2	4	65
7:30 AM	1	12	1	14	0	12	4	16	2	0	7	9	2	0	1	3	42
7:45 AM	1	13	0	14	0	10	5	15	1	0	6	7	1	0	0	1	37
8:00 AM	2	16	0	18	0	8	3	11	0	0	4	4	1	0	0	1	34

Peak Hour Summary

Clay Carney
(503) 833-2740

SW Hall Blvd & SW Sattler St

7:15 AM to 8:15 AM
Thursday, December 11, 2014

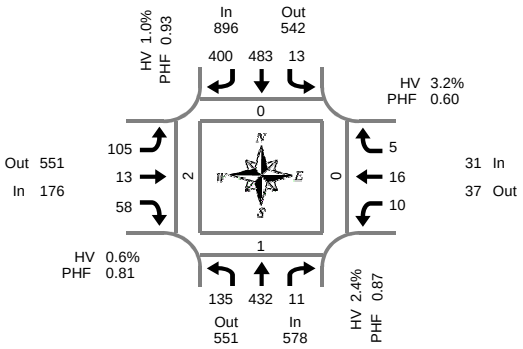


Approach	PHF	HV%	Volume
EB	0.85	1.2%	676
WB	0.50	10.5%	38
NB	0.81	5.0%	480
SB	0.71	5.4%	538
Intersection	0.80	3.8%	1,732

Count Period: 7:00 AM to 9:00 AM

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:10 PM to 5:10 PM

SW Hall Blvd & SW Sattler St

Wednesday, December 10, 2014
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	16	30	1	0	3	37	28	0	8	0	6	0	2	3	1	0	135	0	2	0	1
4:05 PM	9	37	0	1	2	39	31	0	16	1	7	0	0	0	1	0	143	0	0	0	0
4:10 PM	7	31	1	0	0	47	37	0	7	1	8	0	0	1	1	0	141	0	0	0	0
4:15 PM	9	45	2	1	0	38	21	0	14	1	9	0	0	0	1	0	140	0	0	0	1
4:20 PM	5	29	0	0	2	49	46	0	9	0	5	0	1	0	0	0	146	0	0	0	0
4:25 PM	16	29	1	0	1	35	22	0	8	1	4	0	1	5	0	0	123	0	0	0	0
4:30 PM	3	30	1	0	1	44	40	0	8	2	5	0	2	0	0	0	136	0	0	0	0
4:35 PM	14	40	2	0	1	32	33	0	11	3	2	0	1	2	2	0	143	0	0	0	0
4:40 PM	10	41	0	0	0	37	33	0	10	1	6	0	1	1	0	0	140	0	0	0	1
4:45 PM	15	32	1	1	2	49	24	0	12	0	4	0	1	0	0	0	140	0	1	0	0
4:50 PM	14	32	1	0	2	40	28	0	11	0	4	0	0	1	0	0	133	0	0	0	0
4:55 PM	15	32	0	0	2	41	37	0	8	0	5	0	0	1	0	0	141	0	0	0	0
5:00 PM	9	52	2	0	2	36	38	0	3	0	3	0	1	3	0	0	149	0	0	0	0
5:05 PM	18	39	0	0	0	35	41	0	4	4	3	0	2	2	1	0	149	0	0	0	0
5:10 PM	10	25	0	0	2	42	32	0	7	1	4	0	1	1	0	0	125	0	0	0	0
5:15 PM	12	31	0	0	2	46	26	0	8	0	1	0	1	1	0	0	128	0	0	0	0
5:20 PM	11	42	0	0	1	48	33	0	8	0	3	0	2	4	0	0	152	0	1	0	0
5:25 PM	20	37	1	0	1	23	36	1	9	0	3	0	2	1	3	0	136	0	0	0	1
5:30 PM	20	32	0	0	0	40	33	0	6	1	3	0	1	4	1	0	141	0	1	0	0
5:35 PM	10	29	2	0	1	52	31	0	5	0	5	0	0	4	1	0	140	0	0	0	0
5:40 PM	13	35	2	0	0	42	26	1	9	0	6	0	0	1	0	0	134	0	0	0	0
5:45 PM	12	27	1	0	1	45	32	0	9	0	4	0	1	2	0	0	134	0	0	0	1
5:50 PM	6	16	0	0	0	41	27	0	12	1	5	0	1	2	0	0	111	0	0	0	0
5:55 PM	13	34	2	0	2	30	22	0	9	0	5	0	0	2	1	0	120	0	0	0	0
Total Survey	287	807	20	3	28	968	757	2	211	17	110	0	21	41	13	0	3,280	0	5	0	5

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	32	98	2	1	5	123	96	0	31	2	21	0	2	4	3	0	419	0	2	0	1
4:15 PM	30	103	3	1	3	122	89	0	31	2	18	0	2	5	1	0	409	0	0	0	1
4:30 PM	27	111	3	0	2	113	106	0	29	6	13	0	4	3	2	0	419	0	0	0	1
4:45 PM	44	96	2	1	6	130	89	0	31	0	13	0	1	2	0	0	414	0	1	0	0
5:00 PM	37	116	2	0	4	113	111	0	14	5	10	0	4	6	1	0	423	0	0	0	0
5:15 PM	43	110	1	0	4	117	95	1	25	0	7	0	5	6	3	0	416	0	1	0	1
5:30 PM	43	96	4	0	1	134	90	1	20	1	14	0	1	9	2	0	415	0	1	0	0
5:45 PM	31	77	3	0	3	116	81	0	30	1	14	0	2	6	1	0	365	0	0	0	1
Total Survey	287	807	20	3	28	968	757	2	211	17	110	0	21	41	13	0	3,280	0	5	0	5

Peak Hour Summary
4:10 PM to 5:10 PM

By Approach	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Sattler St				Westbound SW Sattler St				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	578	551	1,129	2	896	542	1,438	0	176	551	727	0	31	37	68	0	1,681
%HV	2.4%				1.0%				0.6%				3.2%				1.5%
PHF	0.87				0.93				0.81				0.60				0.96

Pedestrians Crosswalk			
North	South	East	West
0	1	0	2

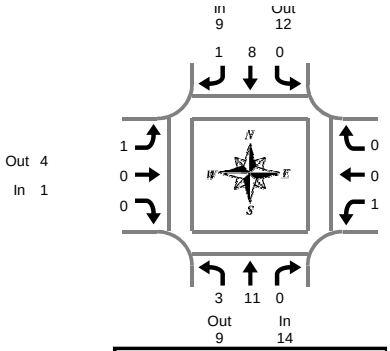
By Movement	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Sattler St				Westbound SW Sattler St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	135	432	11	578	13	483	400	896	105	13	58	176	10	16	5	31	1,681
%HV	2.2%	2.5%	0.0%	2.4%	0.0%	1.7%	0.3%	1.0%	1.0%	0.0%	0.0%	0.6%	10.0%	0.0%	0.0%	3.2%	1.5%
PHF	0.77	0.88	0.69	0.87	0.54	0.90	0.86	0.93	0.80	0.54	0.66	0.81	0.63	0.57	0.63	0.60	0.96

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	133	408	10	3	16	488	380	0	122	10	65	0	9	14	6	0	1,661	0	3	0	3
4:15 PM	138	426	10	2	15	478	395	0	105	13	54	0	11	16	4	0	1,665	0	1	0	2
4:30 PM	151	433	8	1	16	473	401	1	99	11	43	0	14	17	6	0	1,672	0	2	0	2
4:45 PM	167	418	9	1	15	494	385	2	90	6	44	0	11	23	6	0	1,668	0	3	0	1
5:00 PM	154	399	10	0	12	480	377	2	89	7	45	0	12	27	7	0	1,619	0	2	0	2

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



SW Hall Blvd & SW Sattler St

Wednesday, December 10, 2014
4:00 PM to 6:00 PM

Peak Hour Summary
4:10 PM to 5:10 PM

Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
4:05 PM	0	3	0	3	0	2	0	2	0	0	0	0	0	0	0	0	5
4:10 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
4:15 PM	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
4:20 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
4:25 PM	0	4	0	4	0	1	0	1	0	0	0	0	0	0	0	0	5
4:30 PM	0	1	0	1	0	1	0	1	0	0	0	0	1	0	0	1	3
4:35 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
4:40 PM	2	0	0	2	0	1	1	2	0	0	0	0	0	0	0	0	4
4:45 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
4:50 PM	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	2
4:55 PM	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	2
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:05 PM	1	0	0	1	0	1	0	1	1	0	0	1	0	0	0	0	3
5:10 PM	0	0	0	0	0	2	0	2	1	0	1	2	0	0	0	0	4
5:15 PM	0	1	0	1	0	2	0	2	0	0	0	0	0	0	0	0	3
5:20 PM	0	0	0	0	0	2	0	2	0	0	1	1	0	0	0	0	3
5:25 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:35 PM	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	2
5:40 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:50 PM	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
5:55 PM	0	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0	2
Total Survey	4	19	0	23	0	17	2	19	2	0	3	5	1	0	0	1	48

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	5	0	5	0	2	0	2	0	0	0	0	0	0	0	0	7
4:15 PM	0	7	0	7	0	1	0	1	0	0	0	0	0	0	0	0	8
4:30 PM	2	2	0	4	0	2	1	3	0	0	0	0	1	0	0	1	8
4:45 PM	0	1	0	1	0	4	0	4	0	0	0	0	0	0	0	0	5
5:00 PM	1	0	0	1	0	3	0	3	2	0	1	3	0	0	0	0	7
5:15 PM	0	2	0	2	0	4	0	4	0	0	1	1	0	0	0	0	7
5:30 PM	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	2
5:45 PM	1	2	0	3	0	0	0	0	0	0	1	1	0	0	0	0	4
Total Survey	4	19	0	23	0	17	2	19	2	0	3	5	1	0	0	1	48

Heavy Vehicle Peak Hour Summary
4:10 PM to 5:10 PM

By Approach	Northbound SW Hall Blvd			Southbound SW Hall Blvd			Eastbound SW Sattler St			Westbound SW Sattler St			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	14	9	23	9	12	21	1	4	5	1	0	1	25
PHF	0.50			0.56			0.25			0.25			0.69

By Movement	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Sattler St				Westbound SW Sattler St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	3	11	0	14	0	8	1	9	1	0	0	1	1	0	0	1	25
PHF	0.38	0.39	0.00	0.50	0.00	0.50	0.25	0.56	0.25	0.00	0.00	0.25	0.25	0.00	0.00	0.25	0.69

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

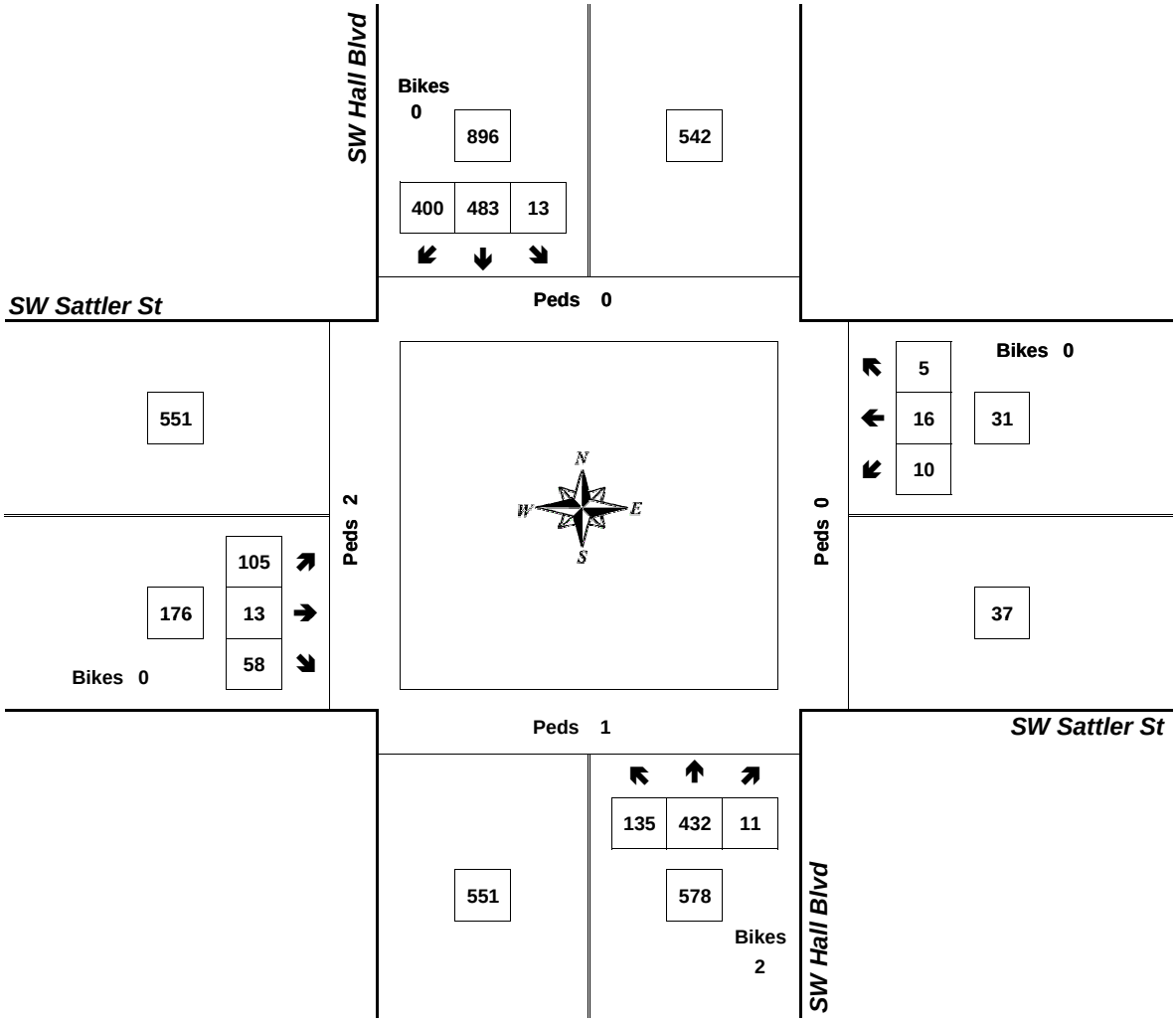
Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	2	15	0	17	0	9	1	10	0	0	0	0	1	0	0	1	28
4:15 PM	3	10	0	13	0	10	1	11	2	0	1	3	1	0	0	1	28
4:30 PM	3	5	0	8	0	13	1	14	2	0	2	4	1	0	0	1	27
4:45 PM	1	3	0	4	0	12	1	13	2	0	2	4	0	0	0	0	21
5:00 PM	2	4	0	6	0	8	1	9	2	0	3	5	0	0	0	0	20

Peak Hour Summary

Clay Carney
(503) 833-2740

SW Hall Blvd & SW Sattler St

4:10 PM to 5:10 PM
Wednesday, December 10, 2014

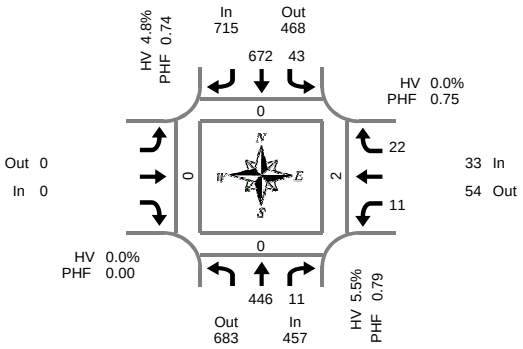


Approach	PHF	HV%	Volume
EB	0.81	0.6%	176
WB	0.60	3.2%	31
NB	0.87	2.4%	578
SB	0.93	1.0%	896
Intersection	0.96	1.5%	1,681

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
7:10 AM to 8:10 AM

SW Hall Blvd & SW Ashford St

Thursday, December 11, 2014
7:00 AM to 9:00 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Ashford St				Westbound SW Ashford St				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
7:00 AM		30	0	0	0	40		0				0	0		2	0	72	0	0	1	0
7:05 AM		24	0	0	0	35		0				0	1		1	0	61	0	0	0	0
7:10 AM		27	0	1	0	42		1				0	2		0	0	71	0	0	1	0
7:15 AM		30	2	0	0	60		1				0	0		1	0	93	0	0	0	0
7:20 AM		27	1	0	4	57		1				0	1		0	0	90	0	0	0	0
7:25 AM		39	0	0	1	67		0				0	1		2	0	110	0	0	0	0
7:30 AM		40	1	0	0	78		0				0	1		3	1	123	0	0	0	0
7:35 AM		53	0	0	4	76		1				0	2		2	0	137	0	0	1	0
7:40 AM		43	1	0	7	78		0				0	1		1	0	131	0	0	0	0
7:45 AM		47	1	0	3	68		0				0	1		2	0	122	0	0	0	0
7:50 AM		50	3	0	9	48		0				0	0		2	0	112	0	0	0	0
7:55 AM		30	2	0	7	34		0				0	0		1	0	74	0	0	0	0
8:00 AM		24	0	0	7	38		0				0	2		6	0	77	0	0	0	0
8:05 AM		36	0	0	1	26		0				0	0		2	0	65	0	0	0	0
8:10 AM		34	1	0	1	23		0				0	0		3	0	62	0	0	0	0
8:15 AM		35	1	0	2	30		0				0	0		2	0	70	0	0	0	0
8:20 AM		25	0	0	2	22		1				0	1		0	0	50	0	0	1	0
8:25 AM		17	1	0	0	24		0				0	0		0	0	42	0	0	0	0
8:30 AM		30	0	0	1	34		0				0	0		0	0	65	0	0	0	0
8:35 AM		32	0	1	0	30		0				0	0		0	0	62	0	0	0	0
8:40 AM		30	0	0	1	24		0				0	0		1	0	56	0	0	0	0
8:45 AM		28	0	0	1	35		0				0	0		1	0	65	0	0	0	0
8:50 AM		27	0	0	0	29		0				0	0		1	0	57	0	0	0	0
8:55 AM		17	1	0	1	21		0				0	0		0	0	40	0	0	0	0
Total Survey		775	15	2	52	1,019		5				0	13		33	1	1,907	0	0	4	0

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Ashford St				Westbound SW Ashford St				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
7:00 AM		81	0	1	0	117		1				0	3		3	0	204	0	0	2	0
7:15 AM		96	3	0	5	184		2				0	2		3	0	293	0	0	0	0
7:30 AM		136	2	0	11	232		1				0	4		6	1	391	0	0	1	0
7:45 AM		127	6	0	19	150		0				0	1		5	0	308	0	0	0	0
8:00 AM		94	1	0	9	87		0				0	2		11	0	204	0	0	0	0
8:15 AM		77	2	0	4	76		1				0	1		2	0	162	0	0	1	0
8:30 AM		92	0	1	2	88		0				0	0		1	0	183	0	0	0	0
8:45 AM		72	1	0	2	85		0				0	0		2	0	162	0	0	0	0
Total Survey		775	15	2	52	1,019		5				0	13		33	1	1,907	0	0	4	0

Peak Hour Summary
7:10 AM to 8:10 AM

By Approach	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Ashford St				Westbound SW Ashford St				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	457	683	1,140	1	715	468	1,183	4	0	0	0	0	33	54	87	1	1,205
%HV	5.5%				4.8%				0.0%				0.0%				4.9%
PHF	0.79				0.74				0.00				0.75				0.77

Pedestrians Crosswalk			
North	South	East	West
0	0	2	0

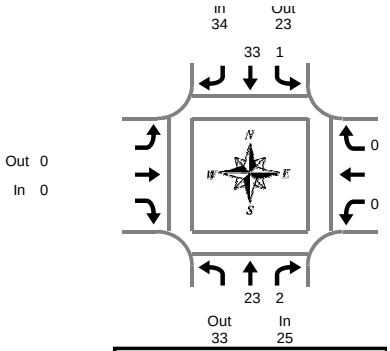
By Movement	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Ashford St				Westbound SW Ashford St				Total
		T	R	Total	L	T		Total				Total	L		R	Total	
Volume		446	11	457	43	672		715				0	11		22	33	1,205
%HV	NA	5.2%	18.2%	5.5%	2.3%	4.9%	NA	4.8%	NA	NA	NA	0.0%	0.0%	NA	0.0%	0.0%	4.9%
PHF		0.78	0.46	0.79	0.47	0.72		0.74				0.00	0.69		0.61	0.75	0.77

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Ashford St				Westbound SW Ashford St				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
7:00 AM		440	11	1	35	683		4				0	10		17	1	1,196	0	0	3	0
7:15 AM		453	12	0	44	653		3				0	9		25	1	1,196	0	0	1	0
7:30 AM		434	11	0	43	545		2				0	8		24	1	1,065	0	0	2	0
7:45 AM		390	9	1	34	401		1				0	4		19	0	857	0	0	1	0
8:00 AM		335	4	1	17	336		1				0	3		16	0	711	0	0	1	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



SW Hall Blvd & SW Ashford St

Thursday, December 11, 2014
7:00 AM to 9:00 AM

Peak Hour Summary
7:10 AM to 8:10 AM

Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Ashford St				Westbound SW Ashford St				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
7:00 AM		0	0	0	0	3		3				0	0		0	0	3
7:05 AM		0	0	0	0	5		5				0	0		0	0	5
7:10 AM		1	0	1	0	6		6				0	0		0	0	7
7:15 AM		3	0	3	0	4		4				0	0		0	0	7
7:20 AM		4	0	4	0	5		5				0	0		0	0	9
7:25 AM		5	0	5	0	3		3				0	0		0	0	8
7:30 AM		2	0	2	0	3		3				0	0		0	0	5
7:35 AM		5	0	5	0	1		1				0	0		0	0	6
7:40 AM		1	0	1	0	1		1				0	0		0	0	2
7:45 AM		0	1	1	0	1		1				0	0		0	0	2
7:50 AM		0	0	0	1	1		2				0	0		0	0	2
7:55 AM		0	1	1	0	3		3				0	0		0	0	4
8:00 AM		0	0	0	0	4		4				0	0		0	0	4
8:05 AM		2	0	2	0	1		1				0	0		0	0	3
8:10 AM		1	0	1	0	1		1				0	0		1	1	3
8:15 AM		2	0	2	0	1		1				0	0		0	0	3
8:20 AM		0	0	0	1	1		2				0	0		0	0	2
8:25 AM		1	0	1	0	0		0				0	0		0	0	1
8:30 AM		2	0	2	0	1		1				0	0		0	0	3
8:35 AM		1	0	1	0	0		0				0	0		0	0	1
8:40 AM		3	0	3	0	0		0				0	0		0	0	3
8:45 AM		2	0	2	0	0		0				0	0		0	0	2
8:50 AM		3	0	3	0	1		1				0	0		0	0	4
8:55 AM		0	0	0	0	1		1				0	0		0	0	1
Total Survey		38	2	40	2	47		49				0	0		1	1	90

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Ashford St				Westbound SW Ashford St				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
7:00 AM		1	0	1	0	14		14				0	0		0	0	15
7:15 AM		12	0	12	0	12		12				0	0		0	0	24
7:30 AM		8	0	8	0	5		5				0	0		0	0	13
7:45 AM		0	2	2	1	5		6				0	0		0	0	8
8:00 AM		3	0	3	0	6		6				0	0		1	1	10
8:15 AM		3	0	3	1	2		3				0	0		0	0	6
8:30 AM		6	0	6	0	1		1				0	0		0	0	7
8:45 AM		5	0	5	0	2		2				0	0		0	0	7
Total Survey		38	2	40	2	47		49				0	0		1	1	90

Heavy Vehicle Peak Hour Summary
7:10 AM to 8:10 AM

By Approach	Northbound SW Hall Blvd			Southbound SW Hall Blvd			Eastbound SW Ashford St			Westbound SW Ashford St			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	25	33	58	34	23	57	0	0	0	0	3	3	59
PHF	0.52			0.57			0.00			0.00			0.61

By Movement	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Ashford St				Westbound SW Ashford St				Total
		T	R	Total	L	T		Total				Total	L		R	Total	
Volume		23	2	25	1	33		34				0	0		0	0	59
PHF		0.48	0.25	0.52	0.25	0.55		0.57				0.00	0.00		0.00	0.00	0.61

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

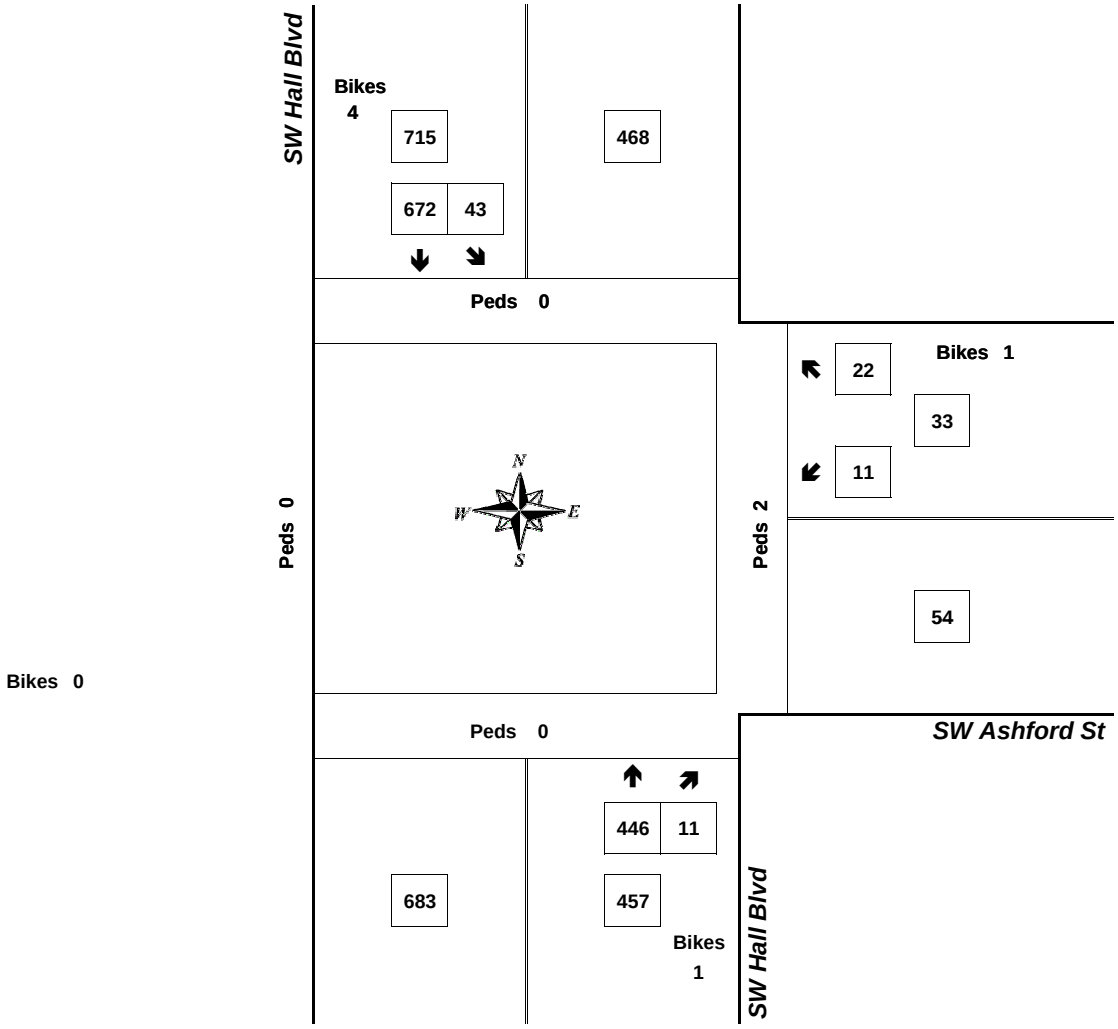
Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Ashford St				Westbound SW Ashford St				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
7:00 AM		21	2	23	1	36		37				0	0		0	0	60
7:15 AM		23	2	25	1	28		29				0	0		1	1	55
7:30 AM		14	2	16	2	18		20				0	0		1	1	37
7:45 AM		12	2	14	2	14		16				0	0		1	1	31
8:00 AM		17	0	17	1	11		12				0	0		1	1	30

Peak Hour Summary

Clay Carney
(503) 833-2740

SW Hall Blvd & SW Ashford St

7:10 AM to 8:10 AM
Thursday, December 11, 2014

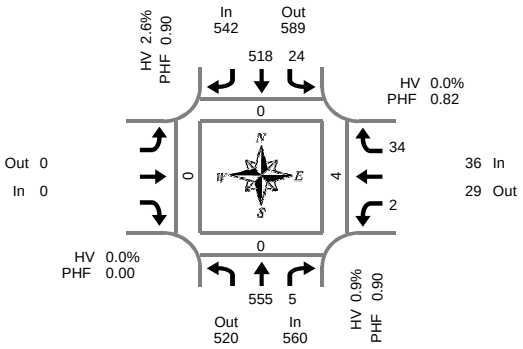


Approach	PHF	HV%	Volume
EB	0.00	0.0%	0
WB	0.75	0.0%	33
NB	0.79	5.5%	457
SB	0.74	4.8%	715
Intersection	0.77	4.9%	1,205

Count Period: 7:00 AM to 9:00 AM

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:45 PM to 5:45 PM

SW Hall Blvd & SW Ashford St

Wednesday, December 10, 2014
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Ashford St				Westbound SW Ashford St				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
4:00 PM		45	0	0	1	47		0				0	0		2	0	95	0	0	0	0
4:05 PM		47	0	2	0	46		0				0	0		1	0	94	0	0	0	0
4:10 PM		37	1	0	2	50		0				0	0		0	0	90	0	0	3	0
4:15 PM		52	1	0	1	50		0				0	1		3	0	108	0	0	0	0
4:20 PM		36	3	0	0	55		0				0	0		2	0	96	0	0	0	0
4:25 PM		41	0	0	0	41		0				0	0		1	0	83	0	0	0	0
4:30 PM		35	0	0	2	49		0				0	1		0	0	87	0	0	0	0
4:35 PM		52	0	0	0	39		0				0	0		2	0	93	0	0	0	0
4:40 PM		50	0	0	0	42		0				0	0		3	0	95	0	0	0	0
4:45 PM		48	0	1	2	48		0				0	0		1	0	99	0	0	1	0
4:50 PM		43	1	0	2	42		0				0	0		3	0	91	0	0	1	0
4:55 PM		42	0	0	3	43		0				0	1		1	0	90	0	0	0	0
5:00 PM		64	0	1	1	40		0				0	1		2	0	108	0	0	0	0
5:05 PM		49	0	0	2	37		0				0	0		5	0	93	0	0	0	0
5:10 PM		34	1	0	3	48		0				0	0		1	0	87	0	0	1	0
5:15 PM		37	0	0	2	42		0				0	0		5	0	86	0	0	1	0
5:20 PM		52	1	0	3	44		0				0	0		2	0	102	0	0	0	0
5:25 PM		55	0	0	0	30		0				0	0		4	0	89	0	0	0	0
5:30 PM		45	1	0	0	49		0				0	0		4	0	99	0	0	0	0
5:35 PM		39	0	1	3	45		0				0	0		3	0	90	0	0	0	0
5:40 PM		47	1	0	3	50		0				0	0		3	0	104	0	0	0	0
5:45 PM		38	0	0	0	49		0				0	1		1	0	89	0	0	0	0
5:50 PM		31	1	0	1	50		0				0	0		2	0	85	0	0	0	0
5:55 PM		35	0	0	1	31		0				0	1		3	0	71	0	0	0	0
Total Survey		1,054	11	5	32	1,067		0				0	6		54	0	2,224	0	0	7	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Ashford St				Westbound SW Ashford St				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
4:00 PM		129	1	2	3	143		0				0	0		3	0	279	0	0	3	0
4:15 PM		129	4	0	1	146		0				0	1		6	0	287	0	0	0	0
4:30 PM		137	0	0	2	130		0				0	1		5	0	275	0	0	0	0
4:45 PM		133	1	1	7	133		0				0	1		5	0	280	0	0	2	0
5:00 PM		147	1	1	6	125		0				0	1		8	0	288	0	0	1	0
5:15 PM		144	1	0	5	116		0				0	0		11	0	277	0	0	1	0
5:30 PM		131	2	1	6	144		0				0	0		10	0	293	0	0	0	0
5:45 PM		104	1	0	2	130		0				0	2		6	0	245	0	0	0	0
Total Survey		1,054	11	5	32	1,067		0				0	6		54	0	2,224	0	0	7	0

Peak Hour Summary
4:45 PM to 5:45 PM

By Approach	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Ashford St				Westbound SW Ashford St				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	560	520	1,080	3	542	589	1,131	0	0	0	0	0	36	29	65	0	1,138
%HV	0.9%				2.6%				0.0%				0.0%				1.7%
PHF	0.90				0.90				0.00				0.82				0.97

Pedestrians Crosswalk			
North	South	East	West
0	0	4	0

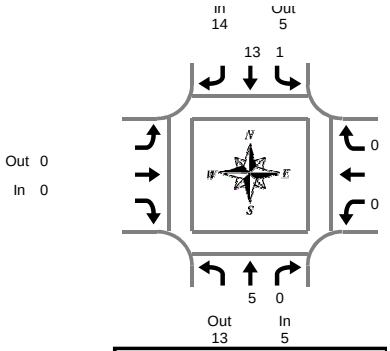
By Movement	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Ashford St				Westbound SW Ashford St				Total
		T	R	Total	L	T		Total				Total	L		R	Total	
Volume		555	5	560	24	518		542				0	2		34	36	1,138
%HV	NA	0.9%	0.0%	0.9%	4.2%	2.5%	NA	2.6%	NA	NA	NA	0.0%	0.0%	NA	0.0%	0.0%	1.7%
PHF		0.90	0.63	0.90	0.75	0.90		0.90				0.00	0.25		0.77	0.82	0.97

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Ashford St				Westbound SW Ashford St				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
4:00 PM		528	6	3	13	552		0				0	3		19	0	1,121	0	0	5	0
4:15 PM		546	6	2	16	534		0				0	4		24	0	1,130	0	0	3	0
4:30 PM		561	3	2	20	504		0				0	3		29	0	1,120	0	0	4	0
4:45 PM		555	5	3	24	518		0				0	2		34	0	1,138	0	0	4	0
5:00 PM		526	5	2	19	515		0				0	3		35	0	1,103	0	0	2	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:45 PM to 5:45 PM

SW Hall Blvd & SW Ashford St

Wednesday, December 10, 2014
4:00 PM to 6:00 PM

Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Ashford St				Westbound SW Ashford St				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
4:00 PM		0	0	0	0	1		1				0	0		1	1	2
4:05 PM		2	0	2	0	1		1				0	0		0	0	3
4:10 PM		1	0	1	0	0		0				0	0		0	0	1
4:15 PM		1	0	1	0	0		0				0	0		0	0	1
4:20 PM		1	0	1	0	0		0				0	0		0	0	1
4:25 PM		3	0	3	0	1		1				0	0		0	0	4
4:30 PM		2	0	2	0	1		1				0	0		0	0	3
4:35 PM		1	0	1	0	0		0				0	0		0	0	1
4:40 PM		2	0	2	0	1		1				0	0		0	0	3
4:45 PM		0	0	0	0	1		1				0	0		0	0	1
4:50 PM		1	0	1	0	1		1				0	0		0	0	2
4:55 PM		0	0	0	0	2		2				0	0		0	0	2
5:00 PM		1	0	1	0	0		0				0	0		0	0	1
5:05 PM		0	0	0	0	1		1				0	0		0	0	1
5:10 PM		0	0	0	0	3		3				0	0		0	0	3
5:15 PM		1	0	1	0	2		2				0	0		0	0	3
5:20 PM		0	0	0	1	2		3				0	0		0	0	3
5:25 PM		1	0	1	0	0		0				0	0		0	0	1
5:30 PM		1	0	1	0	0		0				0	0		0	0	1
5:35 PM		0	0	0	0	0		0				0	0		0	0	0
5:40 PM		0	0	0	0	1		1				0	0		0	0	1
5:45 PM		0	0	0	0	0		0				0	0		0	0	0
5:50 PM		2	0	2	0	0		0				0	0		0	0	2
5:55 PM		1	0	1	0	1		1				0	0		0	0	2
Total Survey		21	0	21	1	19		20				0	0		1	1	42

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Ashford St				Westbound SW Ashford St				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
4:00 PM		3	0	3	0	2		2				0	0		1	1	6
4:15 PM		5	0	5	0	1		1				0	0		0	0	6
4:30 PM		5	0	5	0	2		2				0	0		0	0	7
4:45 PM		1	0	1	0	4		4				0	0		0	0	5
5:00 PM		1	0	1	0	4		4				0	0		0	0	5
5:15 PM		2	0	2	1	4		5				0	0		0	0	7
5:30 PM		1	0	1	0	1		1				0	0		0	0	2
5:45 PM		3	0	3	0	1		1				0	0		0	0	4
Total Survey		21	0	21	1	19		20				0	0		1	1	42

Heavy Vehicle Peak Hour Summary
4:45 PM to 5:45 PM

By Approach	Northbound SW Hall Blvd			Southbound SW Hall Blvd			Eastbound SW Ashford St			Westbound SW Ashford St			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	5	13	18	14	5	19	0	0	0	0	1	1	19
PHF	0.63			0.44			0.00			0.00			0.53

By Movement	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Ashford St				Westbound SW Ashford St				Total
		T	R	Total	L	T		Total				Total	L		R	Total	
Volume		5	0	5	1	13		14				0	0		0	0	19
PHF		0.63	0.00	0.63	0.25	0.46		0.44				0.00	0.00		0.00	0.00	0.53

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

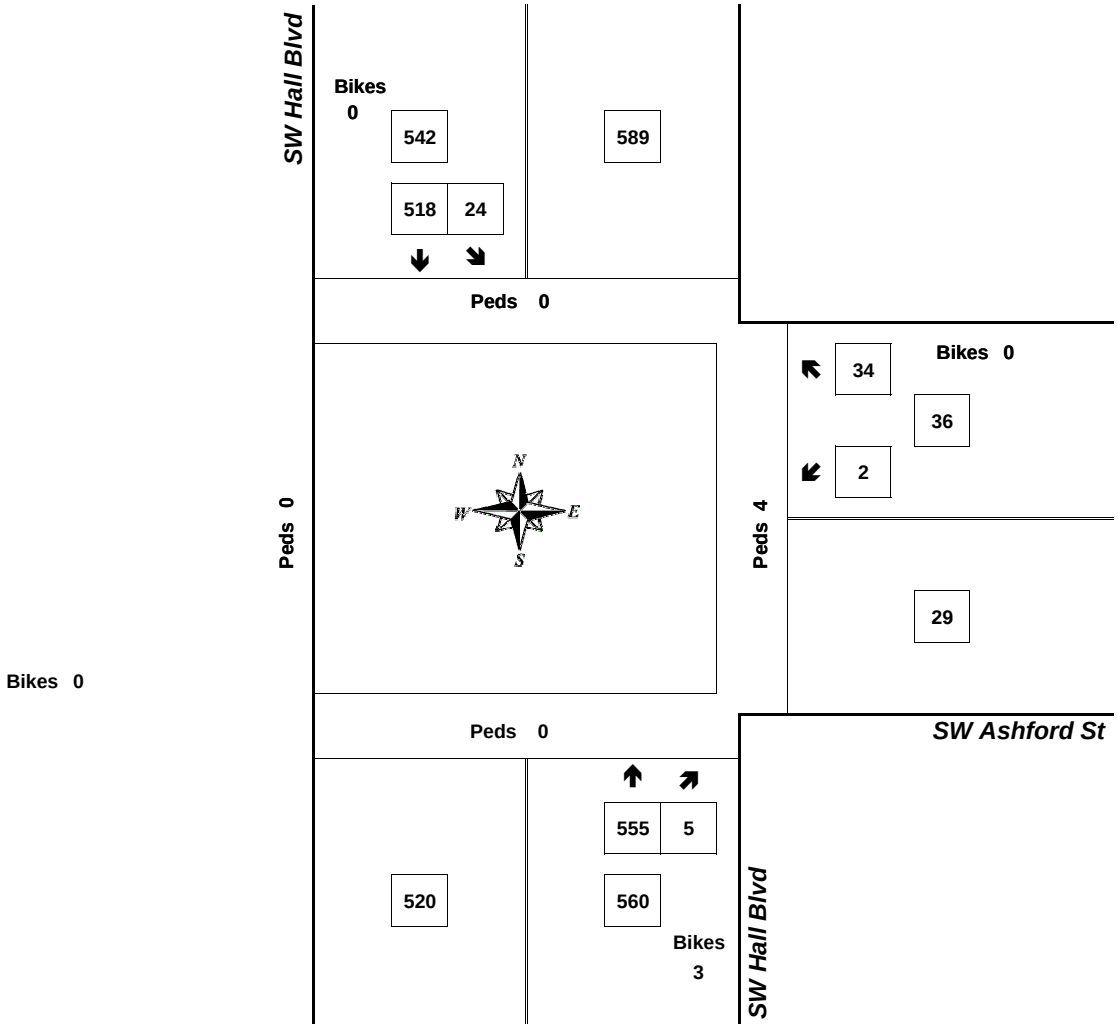
Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Ashford St				Westbound SW Ashford St				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
4:00 PM		14	0	14	0	9		9				0	0		1	1	24
4:15 PM		12	0	12	0	11		11				0	0		0	0	23
4:30 PM		9	0	9	1	14		15				0	0		0	0	24
4:45 PM		5	0	5	1	13		14				0	0		0	0	19
5:00 PM		7	0	7	1	10		11				0	0		0	0	18

Peak Hour Summary

Clay Carney
(503) 833-2740

SW Hall Blvd & SW Ashford St

4:45 PM to 5:45 PM
Wednesday, December 10, 2014

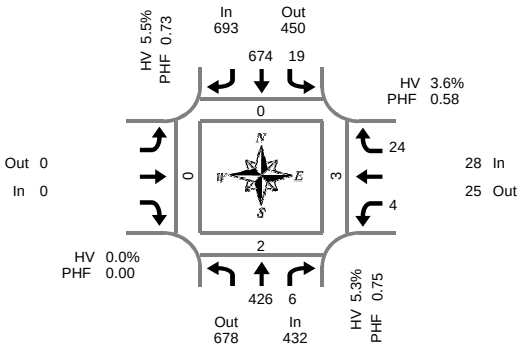


Approach	PHF	HV%	Volume
EB	0.00	0.0%	0
WB	0.82	0.0%	36
NB	0.90	0.9%	560
SB	0.90	2.6%	542
Intersection	0.97	1.7%	1,138

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
7:10 AM to 8:10 AM

SW Hall Blvd & SW Langtree St

Thursday, December 11, 2014
7:00 AM to 9:00 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Langtree St				Westbound SW Langtree St				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
7:00 AM		29	0	0	0	30		0				0	1		3	0	63	0	0	0	0
7:05 AM		20	1	0	0	34		0				0	0		3	0	58	0	1	1	0
7:10 AM		26	0	0	0	42		0				0	0		0	0	68	0	0	1	0
7:15 AM		27	0	0	0	62		1				0	0		2	0	91	0	0	0	0
7:20 AM		27	0	0	1	51		1				0	0		4	0	83	0	0	0	0
7:25 AM		40	0	0	0	65		0				0	0		1	0	106	0	0	0	0
7:30 AM		34	0	0	2	80		1				0	1		1	0	118	0	1	0	0
7:35 AM		46	0	0	0	74		1				0	2		5	0	127	0	0	0	0
7:40 AM		43	1	0	3	78		0				0	0		3	0	128	0	1	1	0
7:45 AM		51	1	0	2	67		0				0	0		1	0	122	0	0	1	0
7:50 AM		46	2	0	5	53		0				0	0		2	0	108	0	0	0	0
7:55 AM		33	2	0	2	31		0				0	1		2	0	71	0	0	0	0
8:00 AM		22	0	0	4	36		0				0	0		0	0	62	0	0	0	0
8:05 AM		31	0	0	0	35		0				0	0		3	0	69	0	0	0	0
8:10 AM		33	1	0	1	21		0				0	1		1	0	58	0	0	0	0
8:15 AM		34	0	0	0	31		0				0	0		2	0	67	0	0	0	0
8:20 AM		26	0	0	2	17		1				0	1		4	0	50	0	0	1	0
8:25 AM		17	0	0	3	24		0				0	0		2	0	46	0	0	0	0
8:30 AM		29	0	0	1	28		0				0	2		2	0	62	0	0	0	0
8:35 AM		32	0	1	0	38		0				0	0		0	0	70	0	0	0	0
8:40 AM		24	0	0	3	20		0				0	0		2	0	49	0	0	0	0
8:45 AM		27	0	0	0	32		0				0	0		1	0	60	0	1	0	0
8:50 AM		22	0	0	1	33		0				0	0		3	0	59	0	0	0	0
8:55 AM		25	0	0	0	21		0				0	0		1	0	47	0	0	0	0
Total Survey		744	8	1	30	1,003		5				0	9		48	0	1,842	0	4	5	0

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Langtree St				Westbound SW Langtree St				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
7:00 AM		75	1	0	0	106		0				0	1		6	0	189	0	1	2	0
7:15 AM		94	0	0	1	178		2				0	0		7	0	280	0	0	0	0
7:30 AM		123	1	0	5	232		2				0	3		9	0	373	0	2	1	0
7:45 AM		130	5	0	9	151		0				0	1		5	0	301	0	0	1	0
8:00 AM		86	1	0	5	92		0				0	1		4	0	189	0	0	0	0
8:15 AM		77	0	0	5	72		1				0	1		8	0	163	0	0	1	0
8:30 AM		85	0	1	4	86		0				0	2		4	0	181	0	0	0	0
8:45 AM		74	0	0	1	86		0				0	0		5	0	166	0	1	0	0
Total Survey		744	8	1	30	1,003		5				0	9		48	0	1,842	0	4	5	0

Peak Hour Summary
7:10 AM to 8:10 AM

By Approach	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Langtree St				Westbound SW Langtree St				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	432	678	1,110	0	693	450	1,143	4	0	0	0	0	28	25	53	0	1,153	0	2	3	0
%HV	5.3%				5.5%				0.0%				3.6%				5.4%				
PHF	0.75				0.73				0.00				0.58				0.76				

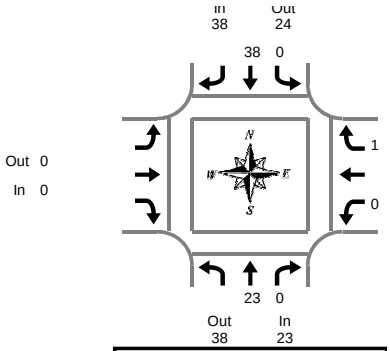
By Movement	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Langtree St				Westbound SW Langtree St				Total
		T	R	Total	L	T		Total				Total	L		R	Total	
Volume		426	6	432	19	674		693				0	4		24	28	1,153
%HV	NA	5.4%	0.0%	5.3%	0.0%	5.6%	NA	5.5%	NA	NA	NA	0.0%	0.0%	NA	4.2%	3.6%	5.4%
PHF		0.76	0.30	0.75	0.43	0.73		0.73				0.00	0.33		0.67	0.58	0.76

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Langtree St				Westbound SW Langtree St				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
7:00 AM		422	7	0	15	667		4				0	5		27	0	1,143	0	3	4	0
7:15 AM		433	7	0	20	653		4				0	5		25	0	1,143	0	2	2	0
7:30 AM		416	7	0	24	547		3				0	6		26	0	1,026	0	2	3	0
7:45 AM		378	6	1	23	401		1				0	5		21	0	834	0	0	2	0
8:00 AM		322	1	1	15	336		1				0	4		21	0	699	0	1	1	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



SW Hall Blvd & SW Langtree St

Thursday, December 11, 2014
7:00 AM to 9:00 AM

Peak Hour Summary
7:10 AM to 8:10 AM

Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Langtree St				Westbound SW Langtree St				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
7:00 AM		0	0	0	0	3		3				0	0		0	0	3
7:05 AM		0	0	0	0	2		2				0	0		0	0	2
7:10 AM		1	0	1	0	7		7				0	0		0	0	8
7:15 AM		2	0	2	0	5		5				0	0		0	0	7
7:20 AM		4	0	4	0	5		5				0	0		0	0	9
7:25 AM		6	0	6	0	4		4				0	0		0	0	10
7:30 AM		1	0	1	0	1		1				0	0		0	0	2
7:35 AM		4	0	4	0	3		3				0	0		0	0	7
7:40 AM		2	0	2	0	2		2				0	0		0	0	4
7:45 AM		2	0	2	0	0		0				0	0		0	0	2
7:50 AM		0	0	0	0	2		2				0	0		0	0	2
7:55 AM		0	0	0	0	1		1				0	0		1	1	2
8:00 AM		0	0	0	0	4		4				0	0		0	0	4
8:05 AM		1	0	1	0	4		4				0	0		0	0	5
8:10 AM		2	0	2	0	1		1				0	0		0	0	3
8:15 AM		2	0	2	0	1		1				0	0		0	0	3
8:20 AM		0	0	0	0	0		0				0	0		0	0	0
8:25 AM		0	0	0	1	0		1				0	0		0	0	1
8:30 AM		3	0	3	0	0		0				0	0		0	0	3
8:35 AM		1	0	1	0	1		1				0	0		0	0	2
8:40 AM		3	0	3	0	0		0				0	0		0	0	3
8:45 AM		2	0	2	0	0		0				0	0		0	0	2
8:50 AM		2	0	2	0	1		1				0	0		0	0	3
8:55 AM		1	0	1	0	0		0				0	0		0	0	1
Total Survey		39	0	39	1	47		48				0	0		1	1	88

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Langtree St				Westbound SW Langtree St				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
7:00 AM		1	0	1	0	12		12				0	0		0	0	13
7:15 AM		12	0	12	0	14		14				0	0		0	0	26
7:30 AM		7	0	7	0	6		6				0	0		0	0	13
7:45 AM		2	0	2	0	3		3				0	0		1	1	6
8:00 AM		3	0	3	0	9		9				0	0		0	0	12
8:15 AM		2	0	2	1	1		2				0	0		0	0	4
8:30 AM		7	0	7	0	1		1				0	0		0	0	8
8:45 AM		5	0	5	0	1		1				0	0		0	0	6
Total Survey		39	0	39	1	47		48				0	0		1	1	88

Heavy Vehicle Peak Hour Summary
7:10 AM to 8:10 AM

By Approach	Northbound SW Hall Blvd			Southbound SW Hall Blvd			Eastbound SW Langtree St			Westbound SW Langtree St			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	23	38	61	38	24	62	0	0	0	1	0	1	62
PHF	0.48			0.56			0.00			0.25			0.60

By Movement	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Langtree St				Westbound SW Langtree St				Total
		T	R	Total	L	T		Total				Total	L		R	Total	
Volume		23	0	23	0	38		38				0	0		1	1	62
PHF		0.48	0.00	0.48	0.00	0.56		0.56				0.00	0.00		0.25	0.25	0.60

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

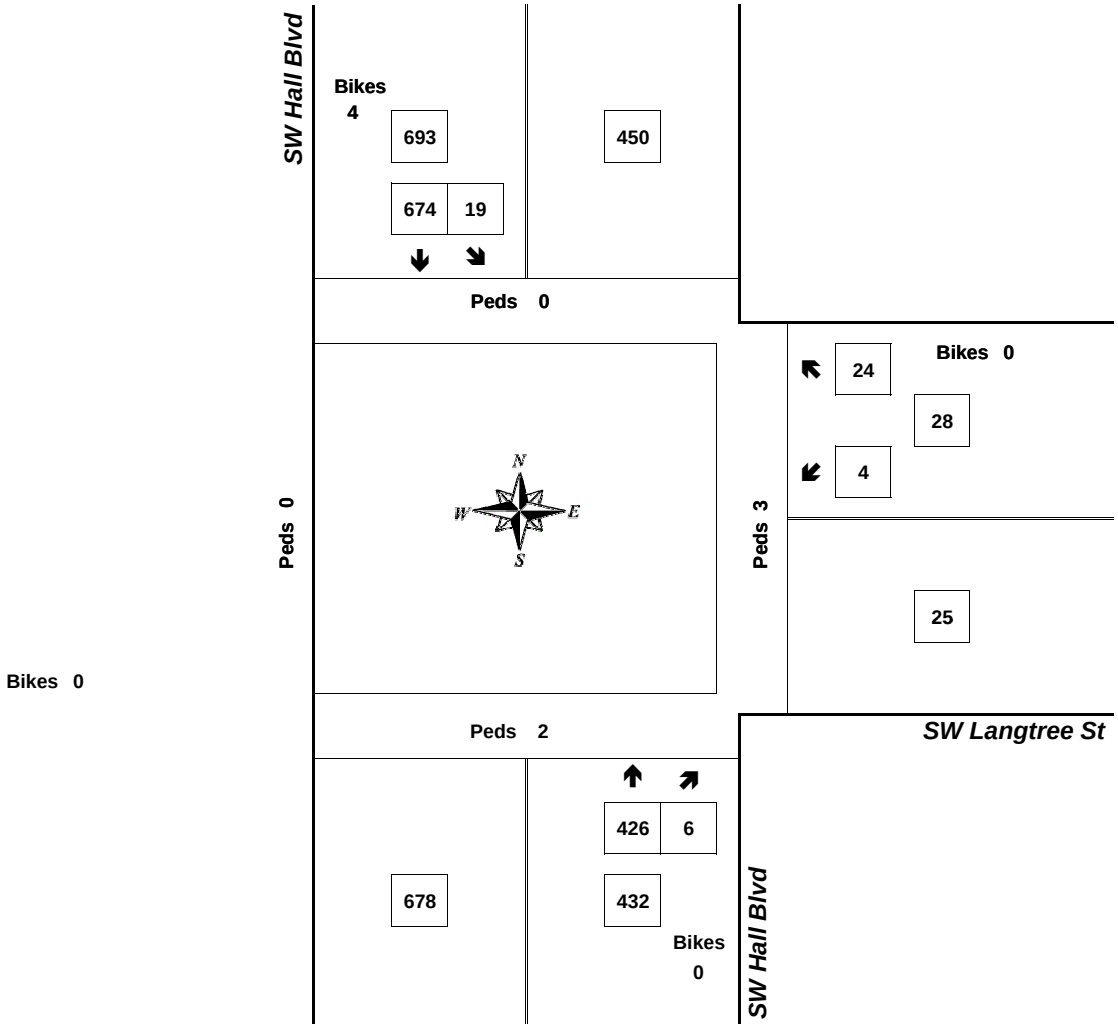
Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Langtree St				Westbound SW Langtree St				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
7:00 AM		22	0	22	0	35		35				0	0		1	1	58
7:15 AM		24	0	24	0	32		32				0	0		1	1	57
7:30 AM		14	0	14	1	19		20				0	0		1	1	35
7:45 AM		14	0	14	1	14		15				0	0		1	1	30
8:00 AM		17	0	17	1	12		13				0	0		0	0	30

Peak Hour Summary

Clay Carney
(503) 833-2740

SW Hall Blvd & SW Langtree St

7:10 AM to 8:10 AM
Thursday, December 11, 2014

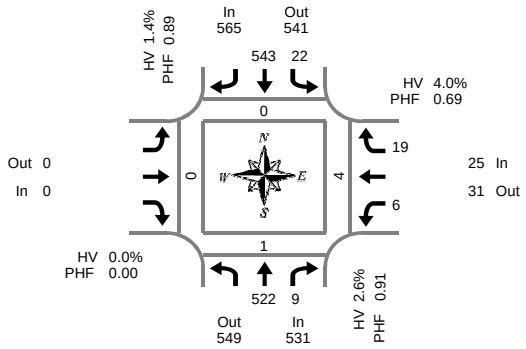


Approach	PHF	HV%	Volume
EB	0.00	0.0%	0
WB	0.58	3.6%	28
NB	0.75	5.3%	432
SB	0.73	5.5%	693
Intersection	0.76	5.4%	1,153

Count Period: 7:00 AM to 9:00 AM

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:00 PM to 5:00 PM

SW Hall Blvd & SW Langtree St

Wednesday, December 10, 2014
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Langtree St				Westbound SW Langtree St				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
4:00 PM		37	1	0	5	53		0				0	1		2	0	99	0	0	0	0
4:05 PM		45	1	1	1	42		0				0	1		1	0	91	0	0	0	0
4:10 PM		44	2	0	0	46		0				0	2		1	0	95	0	0	2	0
4:15 PM		50	1	0	3	52		0				0	0		3	0	109	0	1	2	0
4:20 PM		42	1	0	1	56		0				0	0		1	0	101	0	0	0	0
4:25 PM		29	1	0	0	47		0				0	1		0	0	78	0	0	0	0
4:30 PM		37	1	0	4	40		0				0	0		2	0	84	0	0	0	0
4:35 PM		53	0	0	2	32		0				0	0		1	0	88	0	0	0	0
4:40 PM		44	0	0	1	43		0				0	0		2	0	90	0	0	0	0
4:45 PM		49	0	0	1	44		0				0	1		4	0	99	0	0	0	0
4:50 PM		44	0	0	2	50		0				0	0		2	0	98	0	0	0	0
4:55 PM		48	1	0	2	38		0				0	0		0	0	89	0	0	0	0
5:00 PM		47	1	0	2	38		0				0	1		4	0	93	0	0	0	0
5:05 PM		54	1	0	3	31		0				0	1		2	0	92	0	0	0	0
5:10 PM		36	0	0	0	57		0				0	1		0	0	94	0	0	0	0
5:15 PM		43	1	0	0	35		0				0	0		1	0	80	0	0	2	0
5:20 PM		45	0	0	0	41		0				0	0		0	0	86	0	0	0	0
5:25 PM		48	1	0	2	40		0				0	1		4	0	96	0	0	0	0
5:30 PM		46	1	0	3	38		1				0	0		3	0	91	0	0	0	0
5:35 PM		41	1	1	2	43		0				0	2		4	0	93	0	0	0	0
5:40 PM		43	1	1	2	45		1				0	0		3	0	94	0	0	0	0
5:45 PM		39	0	0	1	51		0				0	1		1	0	93	0	0	0	0
5:50 PM		25	0	0	2	50		0				0	0		0	0	77	0	0	0	0
5:55 PM		44	0	0	0	35		0				0	0		5	0	84	0	0	0	0
Total Survey		1,033	16	3	39	1,047		2				0	13		46	0	2,194	0	1	6	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Langtree St				Westbound SW Langtree St				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
4:00 PM		126	4	1	6	141		0				0	4		4	0	285	0	0	2	0
4:15 PM		121	3	0	4	155		0				0	1		4	0	288	0	1	2	0
4:30 PM		134	1	0	7	115		0				0	0		5	0	262	0	0	0	0
4:45 PM		141	1	0	5	132		0				0	1		6	0	286	0	0	0	0
5:00 PM		137	2	0	5	126		0				0	3		6	0	279	0	0	0	0
5:15 PM		136	2	0	2	116		0				0	1		5	0	262	0	0	2	0
5:30 PM		130	3	2	7	126		2				0	2		10	0	278	0	0	0	0
5:45 PM		108	0	0	3	136		0				0	1		6	0	254	0	0	0	0
Total Survey		1,033	16	3	39	1,047		2				0	13		46	0	2,194	0	1	6	0

Peak Hour Summary
4:00 PM to 5:00 PM

By Approach	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Langtree St				Westbound SW Langtree St				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	531	549	1,080	1	565	541	1,106	0	0	0	0	0	25	31	56	0	1,121
%HV	2.6%				1.4%				0.0%				4.0%				2.1%
PHF	0.91				0.89				0.00				0.69				0.92

Pedestrians Crosswalk			
North	South	East	West
0	1	4	0

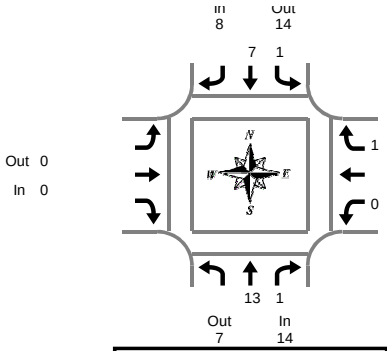
By Movement	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Langtree St				Westbound SW Langtree St				Total
		T	R	Total	L	T		Total				Total	L		R	Total	
Volume		522	9	531	22	543		565				0	6		19	25	1,121
%HV	NA	2.5%	11.1%	2.6%	4.5%	1.3%	NA	1.4%	NA	NA	NA	0.0%	0.0%	NA	5.3%	4.0%	2.1%
PHF		0.89	0.56	0.91	0.79	0.88		0.89				0.00	0.38		0.59	0.69	0.92

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Langtree St				Westbound SW Langtree St				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
4:00 PM		522	9	1	22	543		0				0	6		19	0	1,121	0	1	4	0
4:15 PM		533	7	0	21	528		0				0	5		21	0	1,115	0	1	2	0
4:30 PM		548	6	0	19	489		0				0	5		22	0	1,089	0	0	2	0
4:45 PM		544	8	2	19	500		2				0	7		27	0	1,105	0	0	2	0
5:00 PM		511	7	2	17	504		2				0	7		27	0	1,073	0	0	2	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:00 PM to 5:00 PM

SW Hall Blvd & SW Langtree St

Wednesday, December 10, 2014
4:00 PM to 6:00 PM

Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Langtree St				Westbound SW Langtree St				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
4:00 PM		0	1	1	1	0		1				0	0		0	0	2
4:05 PM		2	0	2	0	0		0				0	0		0	0	2
4:10 PM		1	0	1	0	1		1				0	0		0	0	2
4:15 PM		2	0	2	0	0		0				0	0		0	0	2
4:20 PM		1	0	1	0	0		0				0	0		0	0	1
4:25 PM		2	0	2	0	0		0				0	0		0	0	2
4:30 PM		3	0	3	0	2		2				0	0		0	0	5
4:35 PM		1	0	1	0	0		0				0	0		0	0	1
4:40 PM		0	0	0	0	1		1				0	0		0	0	1
4:45 PM		0	0	0	0	2		2				0	0		1	1	3
4:50 PM		1	0	1	0	1		1				0	0		0	0	2
4:55 PM		0	0	0	0	0		0				0	0		0	0	0
5:00 PM		0	0	0	0	2		2				0	0		0	0	2
5:05 PM		1	0	1	0	0		0				0	0		0	0	1
5:10 PM		0	0	0	0	4		4				0	0		0	0	4
5:15 PM		1	0	1	0	1		1				0	0		0	0	2
5:20 PM		0	0	0	0	2		2				0	0		0	0	2
5:25 PM		1	0	1	0	1		1				0	0		0	0	2
5:30 PM		0	0	0	0	0		0				0	0		0	0	0
5:35 PM		0	0	0	0	0		0				0	0		0	0	0
5:40 PM		0	0	0	0	1		1				0	0		0	0	1
5:45 PM		0	0	0	0	0		0				0	0		0	0	0
5:50 PM		1	0	1	0	0		0				0	0		0	0	1
5:55 PM		2	0	2	0	1		1				0	0		0	0	3
Total Survey		19	1	20	1	19		20				0	0		1	1	41

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Langtree St				Westbound SW Langtree St				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
4:00 PM		3	1	4	1	1		2				0	0		0	0	6
4:15 PM		5	0	5	0	0		0				0	0		0	0	5
4:30 PM		4	0	4	0	3		3				0	0		0	0	7
4:45 PM		1	0	1	0	3		3				0	0		1	1	5
5:00 PM		1	0	1	0	6		6				0	0		0	0	7
5:15 PM		2	0	2	0	4		4				0	0		0	0	6
5:30 PM		0	0	0	0	1		1				0	0		0	0	1
5:45 PM		3	0	3	0	1		1				0	0		0	0	4
Total Survey		19	1	20	1	19		20				0	0		1	1	41

Heavy Vehicle Peak Hour Summary
4:00 PM to 5:00 PM

By Approach	Northbound SW Hall Blvd			Southbound SW Hall Blvd			Eastbound SW Langtree St			Westbound SW Langtree St			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	14	7	21	8	14	22	0	0	0	1	2	3	23
PHF	0.58			0.50			0.00			0.25			0.72

By Movement	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Langtree St				Westbound SW Langtree St				Total
		T	R	Total	L	T		Total				Total	L		R	Total	
Volume		13	1	14	1	7		8				0	0		1	1	23
PHF		0.54	0.25	0.58	0.25	0.44		0.50				0.00	0.00		0.25	0.25	0.72

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

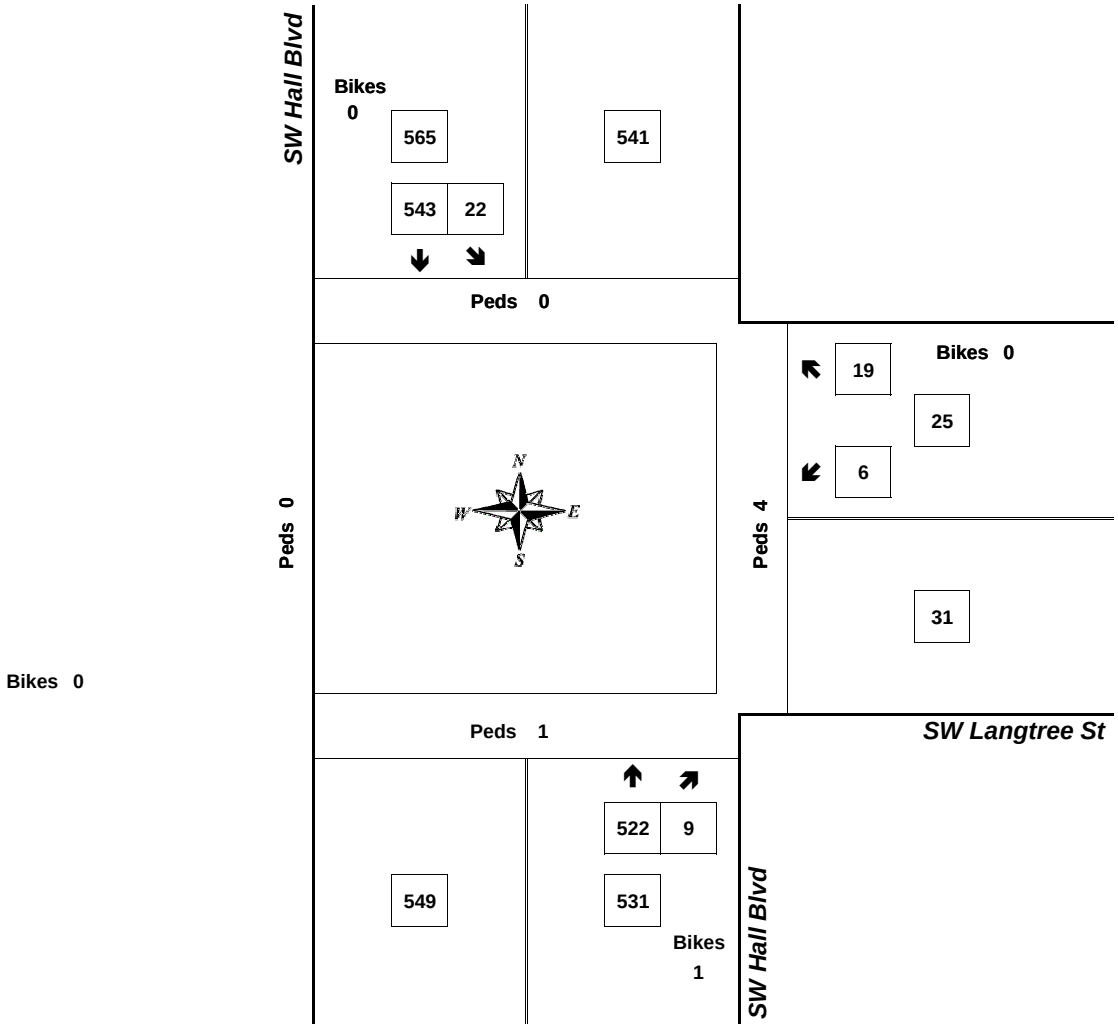
Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Langtree St				Westbound SW Langtree St				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
4:00 PM		13	1	14	1	7		8				0	0		1	1	23
4:15 PM		11	0	11	0	12		12				0	0		1	1	24
4:30 PM		8	0	8	0	16		16				0	0		1	1	25
4:45 PM		4	0	4	0	14		14				0	0		1	1	19
5:00 PM		6	0	6	0	12		12				0	0		0	0	18

Peak Hour Summary

Clay Carney
(503) 833-2740

SW Hall Blvd & SW Langtree St

4:00 PM to 5:00 PM
Wednesday, December 10, 2014

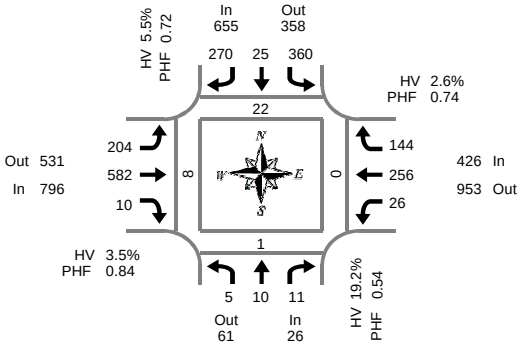


Approach	PHF	HV%	Volume
EB	0.00	0.0%	0
WB	0.69	4.0%	25
NB	0.91	2.6%	531
SB	0.89	1.4%	565
Intersection	0.92	2.1%	1,121

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
7:00 AM to 8:00 AM

SW Hall Blvd & SW Durham Rd

Thursday, December 11, 2014
7:00 AM to 9:00 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	1	0	1	0	20	2	9	0	15	62	0	0	3	12	7	0	132	0	0	0	0
7:05 AM	0	0	0	0	28	2	8	0	10	62	0	0	2	20	12	0	144	1	0	0	0
7:10 AM	0	0	0	0	20	2	17	0	18	68	3	0	3	22	6	1	159	0	0	0	0
7:15 AM	0	0	0	0	40	1	27	0	12	44	0	0	0	26	8	0	158	1	0	0	0
7:20 AM	0	1	0	0	25	1	23	0	15	45	0	0	3	29	6	0	148	0	0	0	0
7:25 AM	0	2	0	0	22	2	37	0	17	40	0	0	2	9	13	0	144	1	0	0	0
7:30 AM	1	0	0	0	40	1	32	0	21	39	0	0	3	21	12	0	170	4	0	0	2
7:35 AM	2	1	0	0	22	0	42	0	16	47	0	0	3	36	24	0	193	6	0	0	3
7:40 AM	0	3	2	0	44	3	42	0	19	39	3	0	2	21	9	0	187	7	0	0	1
7:45 AM	0	2	2	0	39	2	15	0	28	46	1	0	2	30	17	0	184	0	0	0	0
7:50 AM	1	0	2	0	33	3	11	0	26	52	2	0	3	15	15	0	163	2	0	0	2
7:55 AM	0	1	4	0	27	6	7	0	7	38	1	0	0	15	15	0	121	0	1	0	0
8:00 AM	0	0	1	0	29	1	7	0	9	36	1	0	0	24	11	0	119	2	0	0	0
8:05 AM	0	2	2	0	29	1	7	0	12	43	2	0	4	24	20	0	146	0	1	0	0
8:10 AM	1	1	4	0	14	0	6	0	12	55	1	0	1	19	14	0	128	0	0	0	0
8:15 AM	0	1	2	0	23	0	5	0	9	44	2	0	3	19	18	0	126	0	0	0	0
8:20 AM	0	1	1	0	18	0	5	1	9	40	1	0	1	22	10	0	108	0	0	0	0
8:25 AM	1	2	0	0	18	0	4	0	3	52	0	0	3	17	9	0	109	0	0	0	0
8:30 AM	0	1	1	0	26	2	9	0	11	33	2	1	0	21	13	0	119	0	0	0	0
8:35 AM	0	2	4	0	21	3	7	0	8	45	0	0	2	23	16	0	131	0	0	0	0
8:40 AM	2	0	1	0	15	0	4	0	7	54	0	0	1	23	16	0	123	0	0	0	0
8:45 AM	1	0	2	0	23	0	6	0	12	53	1	0	3	26	12	0	139	0	0	0	0
8:50 AM	3	1	3	0	26	3	9	0	7	46	2	0	3	18	15	0	136	0	0	0	0
8:55 AM	0	0	0	0	18	0	6	0	8	39	1	0	0	30	9	0	111	0	0	0	0
Total Survey	13	21	32	0	620	35	345	1	311	1,122	23	1	47	522	307	1	3,398	24	2	0	8

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	1	0	1	0	68	6	34	0	43	192	3	0	8	54	25	1	435	1	0	0	0
7:15 AM	0	3	0	0	87	4	87	0	44	129	0	0	5	64	27	0	450	2	0	0	0
7:30 AM	3	4	2	0	106	4	116	0	56	125	3	0	8	78	45	0	550	17	0	0	6
7:45 AM	1	3	8	0	99	11	33	0	61	136	4	0	5	60	47	0	468	2	1	0	2
8:00 AM	1	3	7	0	72	2	20	0	33	134	4	0	5	67	45	0	393	2	1	0	0
8:15 AM	1	4	3	0	59	0	14	1	21	136	3	0	7	58	37	0	343	0	0	0	0
8:30 AM	2	3	6	0	62	5	20	0	26	132	2	1	3	67	45	0	373	0	0	0	0
8:45 AM	4	1	5	0	67	3	21	0	27	138	4	0	6	74	36	0	386	0	0	0	0
Total Survey	13	21	32	0	620	35	345	1	311	1,122	23	1	47	522	307	1	3,398	24	2	0	8

Peak Hour Summary
7:00 AM to 8:00 AM

By Approach	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Durham Rd				Westbound SW Durham Rd				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	26	61	87	0	655	358	1,013	0	796	531	1,327	0	426	953	1,379	1	1,903
%HV	19.2%				5.5%				3.5%				2.6%				4.2%
PHF	0.54				0.72				0.84				0.74				0.84

Pedestrians Crosswalk			
North	South	East	West
22	1	0	8

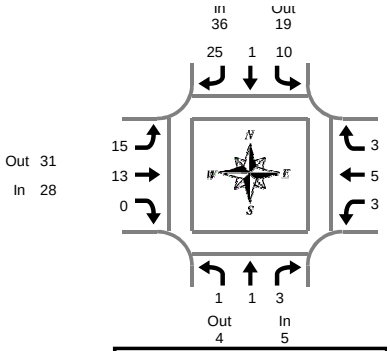
By Movement	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Durham Rd				Westbound SW Durham Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	5	10	11	26	360	25	270	655	204	582	10	796	26	256	144	426	1,903
%HV	20.0%	10.0%	27.3%	19.2%	2.8%	4.0%	9.3%	5.5%	7.4%	2.2%	0.0%	3.5%	11.5%	2.0%	2.1%	2.6%	4.2%
PHF	0.42	0.42	0.34	0.54	0.78	0.57	0.58	0.72	0.70	0.76	0.42	0.84	0.81	0.74	0.72	0.74	0.84

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	5	10	11	0	360	25	270	0	204	582	10	0	26	256	144	1	1,903	22	1	0	8
7:15 AM	5	13	17	0	364	21	256	0	194	524	11	0	23	269	164	0	1,861	23	2	0	8
7:30 AM	6	14	20	0	336	17	183	1	171	531	14	0	25	263	174	0	1,754	21	2	0	8
7:45 AM	5	13	24	0	292	18	87	1	141	538	13	1	20	252	174	0	1,577	4	2	0	2
8:00 AM	8	11	21	0	260	10	75	1	107	540	13	1	21	266	163	0	1,495	2	1	0	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
7:00 AM to 8:00 AM

SW Hall Blvd & SW Durham Rd

Thursday, December 11, 2014
7:00 AM to 9:00 AM

Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	0	0	0	0	0	1	2	3	0	1	0	1	0	0	0	0	4
7:05 AM	0	0	0	0	2	0	1	3	0	2	0	2	0	0	0	0	5
7:10 AM	0	0	0	0	2	0	5	7	1	1	0	2	0	1	0	1	10
7:15 AM	0	0	0	0	0	0	5	5	3	2	0	5	0	0	0	0	10
7:20 AM	0	0	0	0	0	0	6	6	3	1	0	4	1	1	0	2	12
7:25 AM	0	0	0	0	0	0	3	3	3	1	0	4	0	0	2	2	9
7:30 AM	0	0	0	0	1	0	0	1	2	1	0	3	1	0	0	1	5
7:35 AM	1	0	0	1	2	0	1	3	2	1	0	3	0	0	1	1	8
7:40 AM	0	1	2	3	2	0	1	3	0	1	0	1	1	1	0	2	9
7:45 AM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1
7:50 AM	0	0	1	1	1	0	1	2	0	1	0	1	0	1	0	1	5
7:55 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	2
8:00 AM	0	0	0	0	4	0	1	5	0	0	0	0	0	2	0	2	7
8:05 AM	0	0	0	0	2	0	2	4	0	1	0	1	0	3	2	5	10
8:10 AM	0	0	1	1	0	0	1	1	0	0	0	0	0	2	1	3	5
8:15 AM	0	0	0	0	0	0	1	1	0	0	1	1	0	0	2	2	4
8:20 AM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1
8:25 AM	0	0	0	0	1	0	0	1	1	1	0	2	1	2	0	3	6
8:30 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2	2	3
8:35 AM	0	0	1	1	1	0	0	1	0	0	0	0	0	3	1	4	6
8:40 AM	0	0	0	0	0	0	0	0	2	1	0	3	0	1	1	2	5
8:45 AM	0	0	0	0	0	0	0	0	1	2	0	3	0	1	1	2	5
8:50 AM	0	0	1	1	1	0	0	1	2	1	0	3	0	2	1	3	8
8:55 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	2	0	2	3
Total Survey	1	1	6	8	19	1	30	50	21	21	2	44	4	23	14	41	143

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	0	0	0	0	4	1	8	13	1	4	0	5	0	1	0	1	19
7:15 AM	0	0	0	0	0	0	14	14	9	4	0	13	1	1	2	4	31
7:30 AM	1	1	2	4	5	0	2	7	4	3	0	7	2	1	1	4	22
7:45 AM	0	0	1	1	1	0	1	2	1	2	0	3	0	2	0	2	8
8:00 AM	0	0	1	1	6	0	4	10	0	1	0	1	0	7	3	10	22
8:15 AM	0	0	0	0	1	0	1	2	1	1	2	4	1	2	2	5	11
8:30 AM	0	0	1	1	1	0	0	1	2	2	0	4	0	4	4	8	14
8:45 AM	0	0	1	1	1	0	0	1	3	4	0	7	0	5	2	7	16
Total Survey	1	1	6	8	19	1	30	50	21	21	2	44	4	23	14	41	143

Heavy Vehicle Peak Hour Summary
7:00 AM to 8:00 AM

By Approach	Northbound SW Hall Blvd			Southbound SW Hall Blvd			Eastbound SW Durham Rd			Westbound SW Durham Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	5	4	9	36	19	55	28	31	59	11	26	37	80
PHF	0.31			0.50			0.54			0.55			0.63

By Movement	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Durham Rd				Westbound SW Durham Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	1	1	3	5	10	1	25	36	15	13	0	28	3	5	3	11	80
PHF	0.25	0.25	0.25	0.31	0.50	0.25	0.39	0.50	0.42	0.65	0.00	0.54	0.38	0.63	0.25	0.55	0.63

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

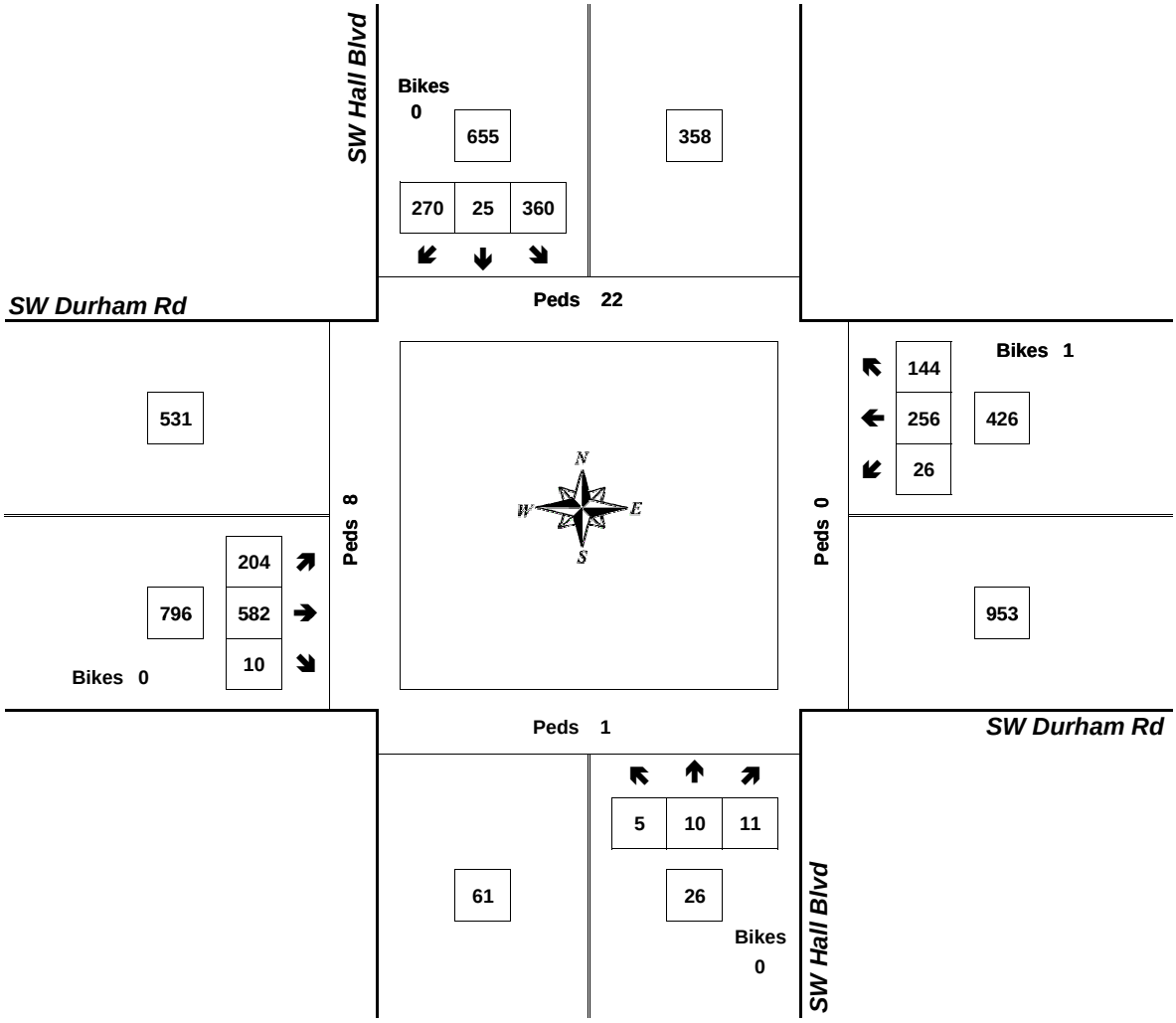
Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	1	1	3	5	10	1	25	36	15	13	0	28	3	5	3	11	80
7:15 AM	1	1	4	6	12	0	21	33	14	10	0	24	3	11	6	20	83
7:30 AM	1	1	4	6	13	0	8	21	6	7	2	15	3	12	6	21	63
7:45 AM	0	0	3	3	9	0	6	15	4	6	2	12	1	15	9	25	55
8:00 AM	0	0	3	3	9	0	5	14	6	8	2	16	1	18	11	30	63

Peak Hour Summary

Clay Carney
(503) 833-2740

SW Hall Blvd & SW Durham Rd

7:00 AM to 8:00 AM
Thursday, December 11, 2014

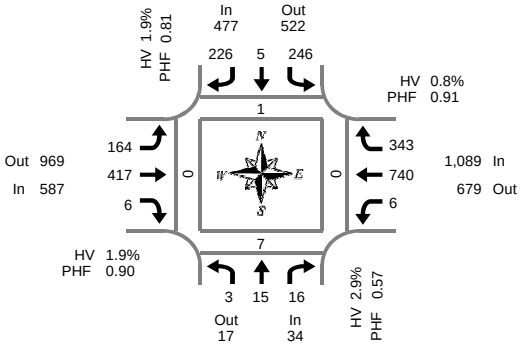


Approach	PHF	HV%	Volume
EB	0.84	3.5%	796
WB	0.74	2.6%	426
NB	0.54	19.2%	26
SB	0.72	5.5%	655
Intersection	0.84	4.2%	1,903

Count Period: 7:00 AM to 9:00 AM

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:55 PM to 5:55 PM

SW Hall Blvd & SW Durham Rd

Wednesday, December 10, 2014
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	1	3	0	30	1	21	0	7	38	1	0	1	52	33	0	188	1	0	0	0
4:05 PM	0	3	0	1	21	1	20	0	18	29	1	0	1	57	26	1	177	3	0	0	4
4:10 PM	1	3	1	0	28	1	24	0	12	32	1	0	1	47	22	0	173	3	0	0	0
4:15 PM	3	3	2	0	22	0	17	0	22	42	0	0	1	53	26	0	191	1	0	0	0
4:20 PM	2	1	4	0	34	2	21	0	19	35	0	0	0	39	22	0	179	1	0	0	0
4:25 PM	1	1	1	0	25	2	14	0	10	28	0	0	0	61	22	1	165	0	0	0	0
4:30 PM	2	1	3	0	30	2	14	0	13	41	0	0	0	59	23	0	188	1	0	0	0
4:35 PM	0	0	3	0	20	1	12	0	10	31	1	0	0	60	39	0	177	1	0	0	0
4:40 PM	1	0	0	0	21	1	14	0	19	54	0	0	1	53	27	0	191	0	0	0	0
4:45 PM	1	2	2	1	21	0	18	0	9	25	0	0	0	46	29	0	153	1	0	0	2
4:50 PM	0	2	2	0	27	1	22	0	9	39	0	0	1	44	27	0	174	0	0	0	0
4:55 PM	0	3	0	0	18	0	20	0	8	34	1	0	0	63	32	0	179	1	0	0	0
5:00 PM	0	6	2	0	15	0	17	0	21	29	1	0	1	55	32	0	179	0	2	0	0
5:05 PM	1	0	3	0	20	0	13	0	18	45	1	0	0	63	33	0	197	0	1	0	0
5:10 PM	0	1	0	0	24	0	23	0	10	37	1	0	2	59	22	0	179	0	1	0	0
5:15 PM	0	1	0	0	19	0	19	0	10	37	0	0	0	71	29	0	186	0	1	0	0
5:20 PM	1	0	1	0	16	0	20	0	18	33	2	0	1	58	36	0	186	0	0	0	0
5:25 PM	0	1	4	1	15	2	13	0	11	20	0	0	0	69	35	0	170	0	0	0	0
5:30 PM	0	0	3	0	20	1	13	0	17	47	0	0	1	61	24	0	187	0	1	0	0
5:35 PM	0	2	0	0	13	0	29	0	10	33	0	0	0	56	27	0	170	0	0	0	0
5:40 PM	1	0	0	0	31	0	15	1	13	31	0	0	1	63	31	0	186	0	1	0	0
5:45 PM	0	1	3	0	22	2	23	0	13	33	0	0	0	61	22	0	180	0	0	0	0
5:50 PM	0	0	0	0	33	0	21	0	15	38	0	0	0	61	20	0	188	0	0	0	0
5:55 PM	0	0	0	0	13	0	14	0	9	24	0	0	1	79	24	0	164	0	0	0	0
Total Survey	14	32	37	3	538	17	437	1	321	835	10	0	13	1,390	663	2	4,307	13	7	0	6

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	1	7	4	1	79	3	65	0	37	99	3	0	3	156	81	1	538	7	0	0	4
4:15 PM	6	5	7	0	81	4	52	0	51	105	0	0	1	153	70	1	535	2	0	0	0
4:30 PM	3	1	6	0	71	4	40	0	42	126	1	0	1	172	89	0	556	2	0	0	0
4:45 PM	1	7	4	1	66	1	60	0	26	98	1	0	1	153	88	0	506	2	0	0	2
5:00 PM	1	7	5	0	59	0	53	0	49	111	3	0	3	177	87	0	555	0	4	0	0
5:15 PM	1	2	5	1	50	2	52	0	39	90	2	0	1	198	100	0	542	0	1	0	0
5:30 PM	1	2	3	0	64	1	57	1	40	111	0	0	2	180	82	0	543	0	2	0	0
5:45 PM	0	1	3	0	68	2	58	0	37	95	0	0	1	201	66	0	532	0	0	0	0
Total Survey	14	32	37	3	538	17	437	1	321	835	10	0	13	1,390	663	2	4,307	13	7	0	6

Peak Hour Summary
4:55 PM to 5:55 PM

By Approach	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Durham Rd				Westbound SW Durham Rd				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	34	17	51	1	477	522	999	1	587	969	1,556	0	1,089	679	1,768	0	2,187
%HV	2.9%				1.9%				1.9%				0.8%				1.4%
PHF	0.57				0.81				0.90				0.91				0.97

Pedestrians Crosswalk			
North	South	East	West
1	7	0	0

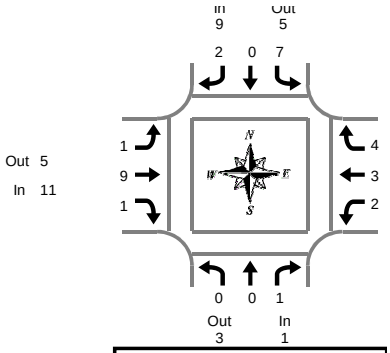
By Movement	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Durham Rd				Westbound SW Durham Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	3	15	16	34	246	5	226	477	164	417	6	587	6	740	343	1,089	2,187
%HV	0.0%	0.0%	6.3%	2.9%	2.8%	0.0%	0.9%	1.9%	0.6%	2.2%	16.7%	1.9%	33.3%	0.4%	1.2%	0.8%	1.4%
PHF	0.75	0.42	0.50	0.57	0.72	0.42	0.84	0.81	0.84	0.88	0.50	0.90	0.50	0.93	0.86	0.91	0.97

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	11	20	21	2	297	12	217	0	156	428	5	0	6	634	328	2	2,135	13	0	0	6
4:15 PM	11	20	22	1	277	9	205	0	168	440	5	0	6	655	334	1	2,152	6	4	0	2
4:30 PM	6	17	20	2	246	7	205	0	156	425	7	0	6	700	364	0	2,159	4	5	0	2
4:45 PM	4	18	17	2	239	4	222	1	154	410	6	0	7	708	357	0	2,146	2	7	0	2
5:00 PM	3	12	16	1	241	5	220	1	165	407	5	0	7	756	335	0	2,172	0	7	0	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:55 PM to 5:55 PM

SW Hall Blvd & SW Durham Rd

Wednesday, December 10, 2014
4:00 PM to 6:00 PM

Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	2	0	2	3
4:05 PM	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	2
4:10 PM	0	0	0	0	1	0	0	1	0	3	0	3	0	2	1	3	7
4:15 PM	0	1	0	1	0	0	0	0	1	1	0	2	0	1	0	1	4
4:20 PM	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	1	2
4:25 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	5	5	6
4:30 PM	0	0	0	0	2	0	1	3	1	2	0	3	0	2	1	3	9
4:35 PM	0	0	0	0	0	0	0	0	1	0	0	1	0	2	1	3	4
4:40 PM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
4:45 PM	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	2
4:50 PM	0	0	0	0	1	0	0	1	0	0	0	0	0	2	1	3	4
4:55 PM	0	0	0	0	1	0	0	1	0	1	0	1	0	0	0	0	2
5:00 PM	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1
5:05 PM	0	0	0	0	0	0	0	0	1	1	0	2	0	0	0	0	2
5:10 PM	0	0	0	0	1	0	1	2	0	3	0	3	1	0	0	1	6
5:15 PM	0	0	0	0	1	0	0	1	0	1	0	1	0	0	1	1	3
5:20 PM	0	0	0	0	1	0	1	2	0	0	1	1	1	0	0	1	4
5:25 PM	0	0	0	0	1	0	0	1	0	1	0	1	0	0	1	1	3
5:30 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
5:35 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:40 PM	0	0	0	0	1	0	0	1	0	0	0	0	0	2	0	2	3
5:45 PM	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	1	2
5:50 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2	2	3
5:55 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Total Survey	0	1	1	2	14	0	4	18	4	19	1	24	2	15	14	31	75

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	0	0	0	1	0	0	1	0	6	0	6	0	4	1	5	12
4:15 PM	0	1	0	1	1	0	0	1	1	2	0	3	0	1	6	7	12
4:30 PM	0	0	0	0	2	0	2	4	2	2	0	4	0	4	2	6	14
4:45 PM	0	0	0	0	4	0	0	4	0	1	0	1	0	2	1	3	8
5:00 PM	0	0	0	0	2	0	1	3	1	4	0	5	1	0	0	1	9
5:15 PM	0	0	0	0	3	0	1	4	0	2	1	3	1	0	2	3	10
5:30 PM	0	0	0	0	1	0	0	1	0	1	0	1	0	2	0	2	4
5:45 PM	0	0	1	1	0	0	0	0	0	1	0	1	0	2	2	4	6
Total Survey	0	1	1	2	14	0	4	18	4	19	1	24	2	15	14	31	75

Heavy Vehicle Peak Hour Summary
4:55 PM to 5:55 PM

By Approach	Northbound SW Hall Blvd			Southbound SW Hall Blvd			Eastbound SW Durham Rd			Westbound SW Durham Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	1	3	4	9	5	14	11	5	16	9	17	26	30
PHF	0.25			0.45			0.46			0.45			0.58

By Movement	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Durham Rd				Westbound SW Durham Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	0	0	1	1	7	0	2	9	1	9	1	11	2	3	4	9	30
PHF	0.00	0.00	0.25	0.25	0.58	0.00	0.25	0.45	0.25	0.45	0.25	0.46	0.25	0.25	0.50	0.45	0.58

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

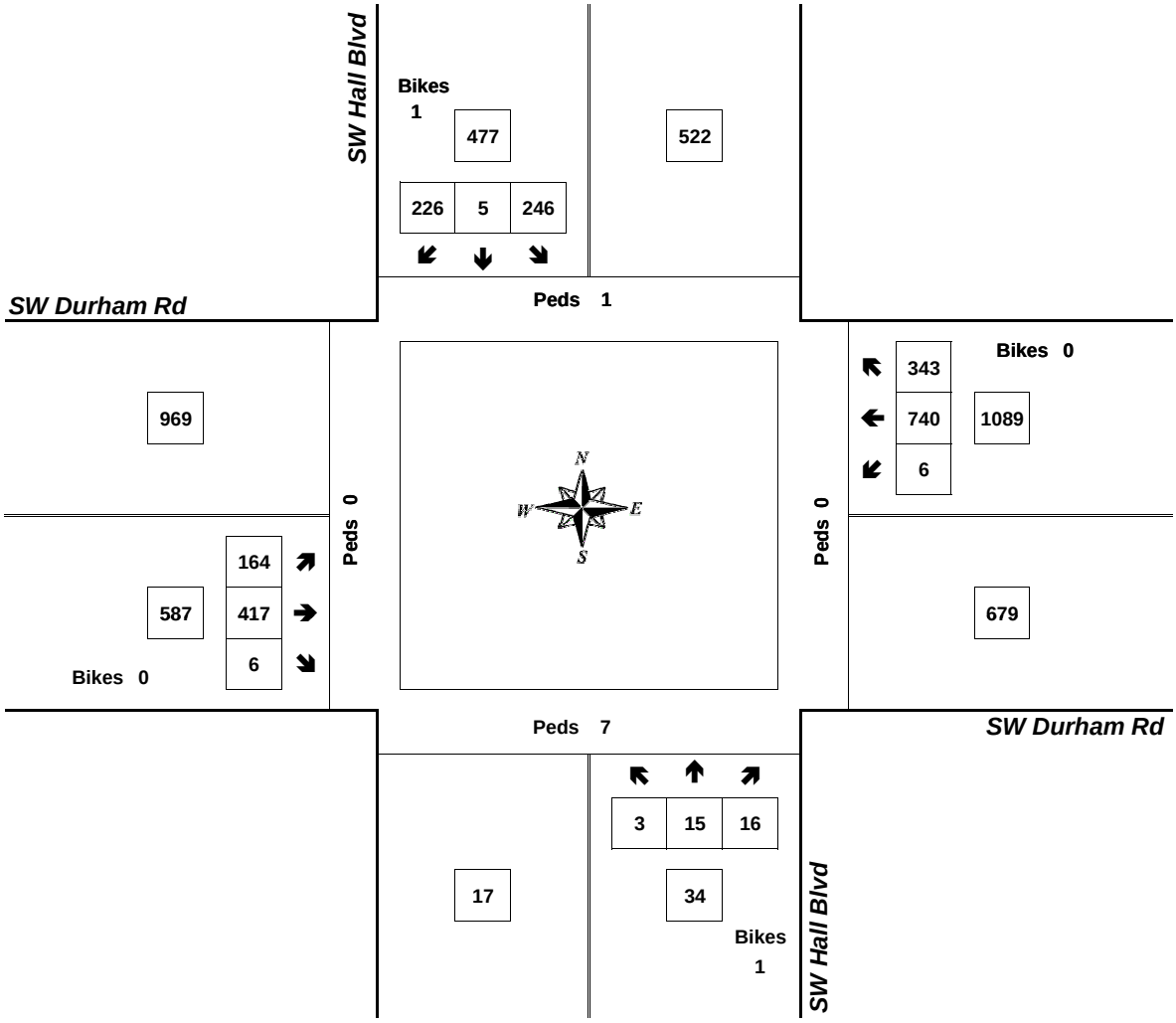
Interval Start Time	Northbound SW Hall Blvd				Southbound SW Hall Blvd				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	1	0	1	8	0	2	10	3	11	0	14	0	11	10	21	46
4:15 PM	0	1	0	1	9	0	3	12	4	9	0	13	1	7	9	17	43
4:30 PM	0	0	0	0	11	0	4	15	3	9	1	13	2	6	5	13	41
4:45 PM	0	0	0	0	10	0	2	12	1	8	1	10	2	4	3	9	31
5:00 PM	0	0	1	1	6	0	2	8	1	8	1	10	2	4	4	10	29

Peak Hour Summary

Clay Carney
(503) 833-2740

SW Hall Blvd & SW Durham Rd

4:55 PM to 5:55 PM
Wednesday, December 10, 2014

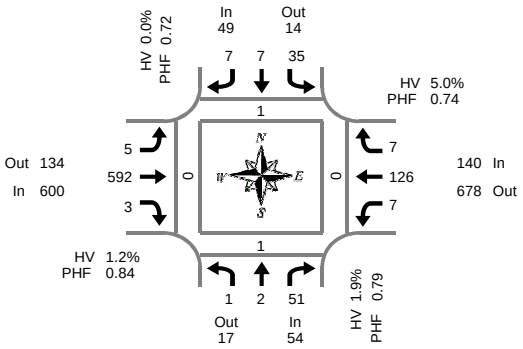


Approach	PHF	HV%	Volume
EB	0.90	1.9%	587
WB	0.91	0.8%	1,089
NB	0.57	2.9%	34
SB	0.81	1.9%	477
Intersection	0.97	1.4%	2,187

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
7:15 AM to 8:15 AM

SW Applewood Ave & SW Sattler St

Thursday, December 11, 2014
7:00 AM to 9:00 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Applewood Ave				Southbound SW Applewood Ave				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	0	0	1	0	2	0	0	0	0	24	2	0	0	5	0	0	34	0	0	0	0
7:05 AM	0	0	3	0	2	0	0	0	0	24	0	0	0	1	0	0	30	0	0	0	0
7:10 AM	0	0	4	0	5	0	0	0	0	29	0	0	0	3	1	0	42	0	0	0	0
7:15 AM	0	0	3	0	6	1	0	0	1	40	1	0	0	8	0	0	60	0	0	0	0
7:20 AM	0	0	6	0	2	1	1	0	0	38	0	0	2	5	0	0	55	0	0	0	0
7:25 AM	0	0	5	0	6	0	0	0	0	48	0	0	0	11	0	0	70	0	0	0	0
7:30 AM	0	0	4	0	1	0	0	0	0	65	0	0	0	6	0	0	76	0	0	0	0
7:35 AM	0	0	3	0	6	2	0	0	0	49	0	0	0	13	2	0	75	0	0	0	0
7:40 AM	0	0	5	0	4	1	1	0	0	55	0	0	0	12	0	0	78	0	0	0	0
7:45 AM	0	0	6	0	0	0	0	0	1	57	0	0	2	14	1	0	81	0	0	0	0
7:50 AM	0	0	2	0	2	2	0	0	0	65	1	0	0	16	1	0	89	0	0	0	0
7:55 AM	1	2	2	0	2	0	0	0	0	53	0	0	1	11	1	0	73	0	1	0	0
8:00 AM	0	0	10	0	2	0	2	0	0	42	0	0	0	12	0	0	68	1	0	0	0
8:05 AM	0	0	2	0	2	0	2	0	2	35	0	0	1	10	0	0	54	0	0	0	0
8:10 AM	0	0	3	0	2	0	1	0	1	45	1	0	1	8	2	0	64	0	0	0	0
8:15 AM	0	0	3	0	0	0	0	0	1	35	1	1	0	9	1	0	50	0	0	0	0
8:20 AM	0	0	4	0	4	0	0	0	0	30	0	0	0	5	0	0	43	0	2	0	0
8:25 AM	1	0	1	0	1	0	1	0	0	30	0	0	1	14	0	0	49	0	0	0	0
8:30 AM	0	0	0	0	2	0	0	0	0	30	0	0	0	11	0	0	43	0	1	0	0
8:35 AM	0	0	1	0	2	0	2	0	0	28	1	0	0	4	1	0	39	0	0	0	0
8:40 AM	0	0	3	0	1	0	1	0	1	27	0	0	1	15	0	0	49	0	0	0	0
8:45 AM	0	0	1	0	4	0	1	0	0	34	0	0	0	12	0	0	52	0	0	0	0
8:50 AM	0	0	2	0	2	0	0	0	0	37	0	0	0	9	1	0	51	0	0	0	0
8:55 AM	0	0	0	0	2	0	0	0	0	16	0	1	0	13	1	0	32	0	0	0	0
Total Survey	2	2	74	0	62	7	12	0	7	936	7	2	9	227	12	0	1,357	1	4	0	0

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Applewood Ave				Southbound SW Applewood Ave				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	0	0	8	0	9	0	0	0	0	77	2	0	0	9	1	0	106	0	0	0	0
7:15 AM	0	0	14	0	14	2	1	0	1	126	1	0	2	24	0	0	185	0	0	0	0
7:30 AM	0	0	12	0	11	3	1	0	0	169	0	0	0	31	2	0	229	0	0	0	0
7:45 AM	1	2	10	0	4	2	0	0	1	175	1	0	3	41	3	0	243	0	1	0	0
8:00 AM	0	0	15	0	6	0	5	0	3	122	1	0	2	30	2	0	186	1	0	0	0
8:15 AM	1	0	8	0	5	0	1	0	1	95	1	1	1	28	1	0	142	0	2	0	0
8:30 AM	0	0	4	0	5	0	3	0	1	85	1	0	1	30	1	0	131	0	1	0	0
8:45 AM	0	0	3	0	8	0	1	0	0	87	0	1	0	34	2	0	135	0	0	0	0
Total Survey	2	2	74	0	62	7	12	0	7	936	7	2	9	227	12	0	1,357	1	4	0	0

Peak Hour Summary
7:15 AM to 8:15 AM

By Approach	Northbound SW Applewood Ave				Southbound SW Applewood Ave				Eastbound SW Sattler St				Westbound SW Sattler St				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	54	17	71	0	49	14	63	0	600	134	734	0	140	678	818	0	843
%HV	1.9%				0.0%				1.2%				5.0%				1.8%
PHF	0.79				0.72				0.84				0.74				0.85

Pedestrians Crosswalk			
North	South	East	West
1	1	0	0

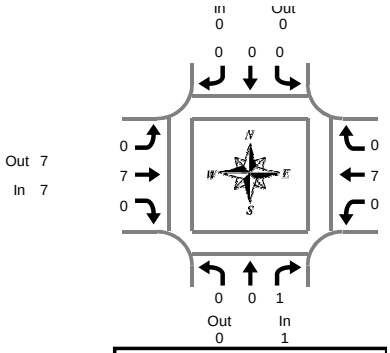
By Movement	Northbound SW Applewood Ave				Southbound SW Applewood Ave				Eastbound SW Sattler St				Westbound SW Sattler St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	1	2	51	54	35	7	7	49	5	592	3	600	7	126	7	140	843
%HV	0.0%	0.0%	2.0%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	1.2%	0.0%	5.6%	0.0%	5.0%	1.8%
PHF	0.25	0.25	0.85	0.79	0.63	0.58	0.35	0.72	0.42	0.84	0.75	0.84	0.58	0.75	0.58	0.74	0.85

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Applewood Ave				Southbound SW Applewood Ave				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	1	2	44	0	38	7	2	0	2	547	4	0	5	105	6	0	763	0	1	0	0
7:15 AM	1	2	51	0	35	7	7	0	5	592	3	0	7	126	7	0	843	1	1	0	0
7:30 AM	2	2	45	0	26	5	7	0	5	561	3	1	6	130	8	0	800	1	3	0	0
7:45 AM	2	2	37	0	20	2	9	0	6	477	4	1	7	129	7	0	702	1	4	0	0
8:00 AM	1	0	30	0	24	0	10	0	5	389	3	2	4	122	6	0	594	1	3	0	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
7:15 AM to 8:15 AM

SW Applewood Ave & SW Sattler St

Thursday, December 11, 2014
7:00 AM to 9:00 AM

Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Applewood Ave				Southbound SW Applewood Ave				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
7:05 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:10 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
7:20 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:25 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
7:30 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	2
7:35 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
7:40 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2
7:45 AM	0	0	1	1	0	0	0	0	0	1	0	1	0	1	0	1	3
7:50 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
7:55 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
8:00 AM	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	2
8:05 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:10 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:20 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
8:25 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	3
8:35 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
8:40 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:50 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
8:55 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	0	0	1	1	0	0	0	0	0	8	0	8	0	13	0	13	22

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Applewood Ave				Southbound SW Applewood Ave				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2
7:30 AM	0	0	0	0	0	0	0	0	0	2	0	2	0	3	0	3	5
7:45 AM	0	0	1	1	0	0	0	0	0	2	0	2	0	2	0	2	5
8:00 AM	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	3
8:15 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	4
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Total Survey	0	0	1	1	0	0	0	0	0	8	0	8	0	13	0	13	22

Heavy Vehicle Peak Hour Summary
7:15 AM to 8:15 AM

By Approach	Northbound SW Applewood Ave			Southbound SW Applewood Ave			Eastbound SW Sattler St			Westbound SW Sattler St			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	1	0	1	0	0	0	7	7	14	7	8	15	15
PHF	0.25			0.00			0.58			0.44			0.63

By Movement	Northbound SW Applewood Ave				Southbound SW Applewood Ave				Eastbound SW Sattler St				Westbound SW Sattler St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	0	0	1	1	0	0	0	0	0	7	0	7	0	7	0	7	15
PHF	0.00	0.00	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.58	0.00	0.58	0.00	0.44	0.00	0.44	0.63

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

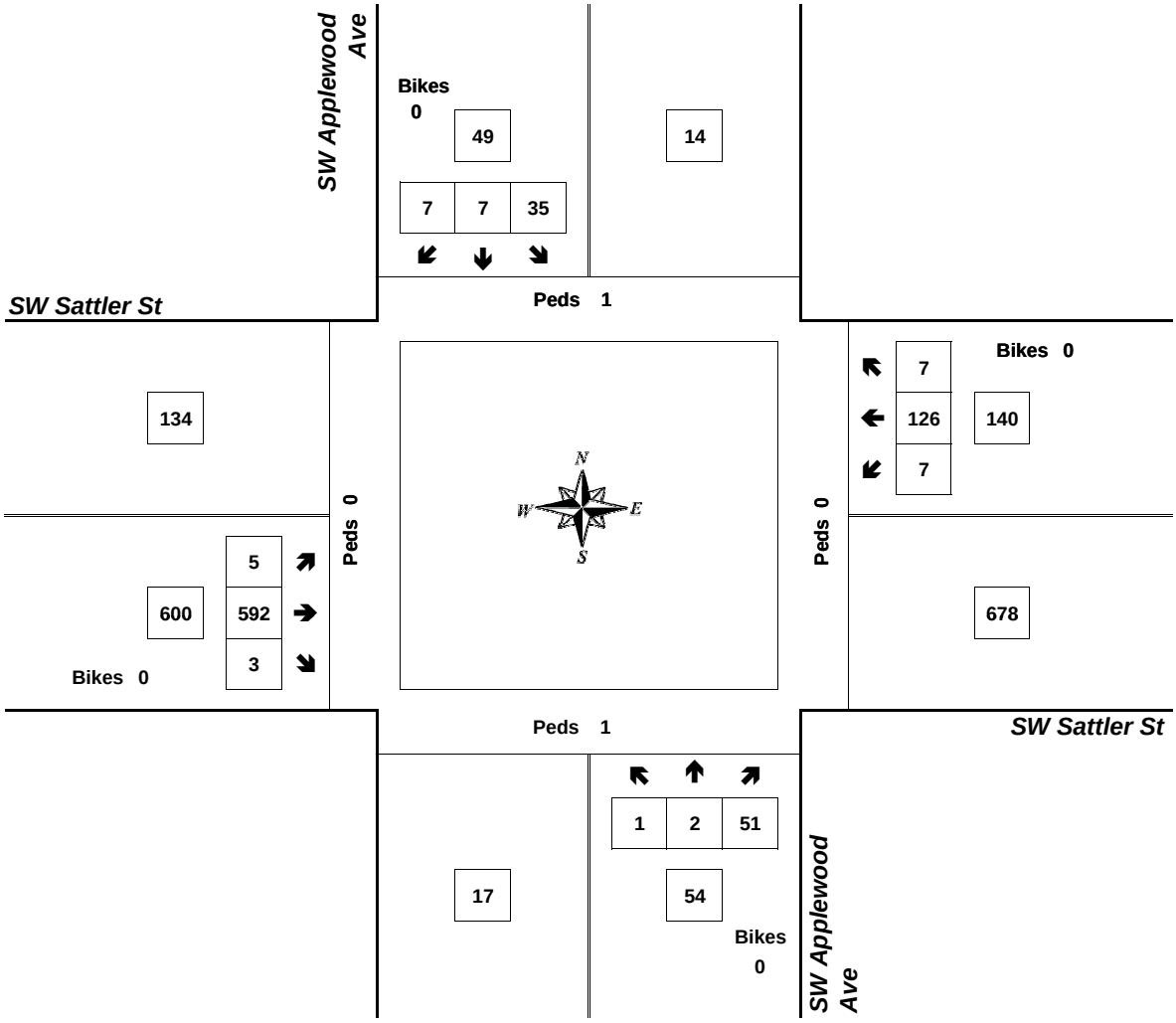
Interval Start Time	Northbound SW Applewood Ave				Southbound SW Applewood Ave				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	0	0	1	1	0	0	0	0	0	4	0	4	0	8	0	8	13
7:15 AM	0	0	1	1	0	0	0	0	0	7	0	7	0	7	0	7	15
7:30 AM	0	0	1	1	0	0	0	0	0	8	0	8	0	5	0	5	14
7:45 AM	0	0	1	1	0	0	0	0	0	6	0	6	0	6	0	6	13
8:00 AM	0	0	0	0	0	0	0	0	0	4	0	4	0	5	0	5	9

Peak Hour Summary

Clay Carney
(503) 833-2740

SW Applewood Ave & SW Sattler St

7:15 AM to 8:15 AM
Thursday, December 11, 2014

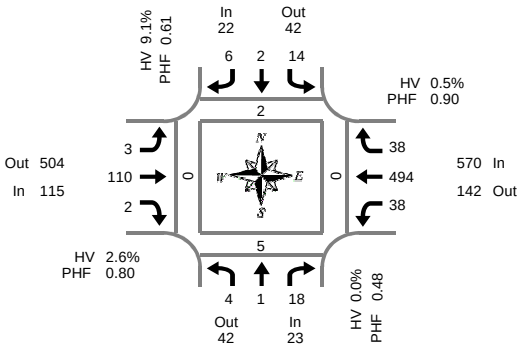


Approach	PHF	HV%	Volume
EB	0.84	1.2%	600
WB	0.74	5.0%	140
NB	0.79	1.9%	54
SB	0.72	0.0%	49
Intersection	0.85	1.8%	843

Count Period: 7:00 AM to 9:00 AM

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:55 PM to 5:55 PM

SW Applewood Ave & SW Sattler St

Wednesday, December 10, 2014
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Applewood Ave				Southbound SW Applewood Ave				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	0	1	0	0	0	0	0	0	10	0	0	2	44	1	0	58	0	0	0	0
4:05 PM	0	0	3	0	5	0	1	0	0	15	0	0	1	46	0	0	71	0	1	0	0
4:10 PM	0	1	2	0	1	0	0	0	0	16	0	0	3	38	0	0	61	0	1	0	0
4:15 PM	0	0	2	0	3	0	0	0	0	20	0	0	2	29	3	0	59	0	1	0	0
4:20 PM	0	0	0	0	2	0	1	0	0	14	1	0	2	42	1	0	63	0	0	0	0
4:25 PM	0	0	0	0	2	0	0	0	2	10	0	0	0	38	2	0	54	0	0	0	0
4:30 PM	0	0	0	0	1	0	0	0	0	16	0	0	2	43	3	0	65	0	0	0	0
4:35 PM	0	0	1	0	2	0	0	0	0	13	0	0	3	38	3	0	60	0	0	0	0
4:40 PM	0	0	2	0	2	0	0	0	0	10	0	0	5	44	1	0	64	0	0	0	0
4:45 PM	0	0	0	0	1	0	0	0	0	14	0	0	1	33	3	0	52	0	1	0	0
4:50 PM	0	0	1	0	2	0	1	0	0	11	0	0	4	36	3	0	58	0	0	0	0
4:55 PM	0	0	3	0	1	0	0	0	0	8	1	0	5	42	1	0	61	0	0	0	0
5:00 PM	0	0	2	0	0	0	1	0	0	4	0	0	3	46	3	0	59	0	1	0	0
5:05 PM	0	0	2	0	0	0	0	0	0	10	0	0	5	48	5	0	70	0	2	0	0
5:10 PM	0	0	0	0	2	0	0	0	0	10	0	0	1	43	2	0	58	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	1	8	1	0	3	35	3	0	51	0	0	0	0
5:20 PM	0	0	1	0	2	0	0	0	0	8	0	0	3	38	3	0	55	0	1	0	0
5:25 PM	0	0	2	0	2	0	0	0	1	7	0	0	2	48	8	0	70	0	0	0	0
5:30 PM	0	0	1	0	1	0	1	0	1	9	0	0	6	40	4	0	63	0	1	0	0
5:35 PM	0	0	0	0	2	0	3	0	0	10	0	0	2	45	3	0	65	0	0	0	0
5:40 PM	1	0	3	0	1	1	0	0	0	12	0	0	1	38	4	0	61	1	0	0	0
5:45 PM	1	0	2	0	1	1	0	0	0	7	0	0	3	37	2	0	54	1	0	0	0
5:50 PM	2	1	2	0	2	0	1	0	0	17	0	0	4	34	0	0	63	0	0	0	0
5:55 PM	0	0	0	0	2	0	1	0	0	12	1	0	4	33	2	0	55	0	0	0	0
Total Survey	4	2	30	0	37	2	10	0	5	271	4	0	67	958	60	0	1,450	2	9	0	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Applewood Ave				Southbound SW Applewood Ave				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	1	6	0	6	0	1	0	0	41	0	0	6	128	1	0	190	0	2	0	0
4:15 PM	0	0	2	0	7	0	1	0	2	44	1	0	4	109	6	0	176	0	1	0	0
4:30 PM	0	0	3	0	5	0	0	0	0	39	0	0	10	125	7	0	189	0	0	0	0
4:45 PM	0	0	4	0	4	0	1	0	0	33	1	0	10	111	7	0	171	0	1	0	0
5:00 PM	0	0	4	0	2	0	1	0	0	24	0	0	9	137	10	0	187	0	3	0	0
5:15 PM	0	0	3	0	4	0	0	0	2	23	1	0	8	121	14	0	176	0	1	0	0
5:30 PM	1	0	4	0	4	1	4	0	1	31	0	0	9	123	11	0	189	1	1	0	0
5:45 PM	3	1	4	0	5	1	2	0	0	36	1	0	11	104	4	0	172	1	0	0	0
Total Survey	4	2	30	0	37	2	10	0	5	271	4	0	67	958	60	0	1,450	2	9	0	0

Peak Hour Summary
4:55 PM to 5:55 PM

By Approach	Northbound SW Applewood Ave				Southbound SW Applewood Ave				Eastbound SW Sattler St				Westbound SW Sattler St				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	23	42	65	0	22	42	64	0	115	504	619	0	570	142	712	0	730
%HV	0.0%				9.1%				2.6%				0.5%				1.1%
PHF	0.48				0.61				0.80				0.90				0.92

Pedestrians Crosswalk			
North	South	East	West
2	5	0	0

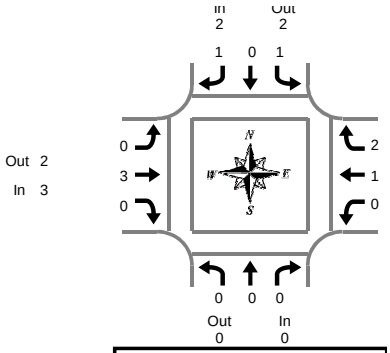
By Movement	Northbound SW Applewood Ave				Southbound SW Applewood Ave				Eastbound SW Sattler St				Westbound SW Sattler St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	4	1	18	23	14	2	6	22	3	110	2	115	38	494	38	570	730
%HV	0.0%	0.0%	0.0%	0.0%	7.1%	0.0%	16.7%	9.1%	0.0%	2.7%	0.0%	2.6%	0.0%	0.2%	5.3%	0.5%	1.1%
PHF	0.25	0.25	0.64	0.48	0.70	0.25	0.38	0.61	0.38	0.76	0.50	0.80	0.73	0.90	0.63	0.90	0.92

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Applewood Ave				Southbound SW Applewood Ave				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	1	15	0	22	0	3	0	2	157	2	0	30	473	21	0	726	0	4	0	0
4:15 PM	0	0	13	0	18	0	3	0	2	140	2	0	33	482	30	0	723	0	5	0	0
4:30 PM	0	0	14	0	15	0	2	0	2	119	2	0	37	494	38	0	723	0	5	0	0
4:45 PM	1	0	15	0	14	1	6	0	3	111	2	0	36	492	42	0	723	1	6	0	0
5:00 PM	4	1	15	0	15	2	7	0	3	114	2	0	37	485	39	0	724	2	5	0	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:55 PM to 5:55 PM

SW Applewood Ave & SW Sattler St

Wednesday, December 10, 2014
4:00 PM to 6:00 PM

Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Applewood Ave				Southbound SW Applewood Ave				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:05 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:10 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:20 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:25 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:35 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
4:40 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:50 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:55 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:05 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	2
5:10 PM	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
5:20 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
5:25 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:35 PM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	2
5:40 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:50 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
5:55 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
Total Survey	0	0	0	0	1	0	1	2	0	4	0	4	0	3	3	6	12

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Applewood Ave				Southbound SW Applewood Ave				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3	3
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	1	0	0	1	0	1	0	1	0	0	1	1	3
5:15 PM	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	2
5:30 PM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	2
5:45 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	2
Total Survey	0	0	0	0	1	0	1	2	0	4	0	4	0	3	3	6	12

Heavy Vehicle Peak Hour Summary
4:55 PM to 5:55 PM

By Approach	Northbound SW Applewood Ave			Southbound SW Applewood Ave			Eastbound SW Sattler St			Westbound SW Sattler St			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	0	0	0	2	2	4	3	2	5	3	4	7	8
PHF	0.00			0.50			0.38			0.75			0.50

By Movement	Northbound SW Applewood Ave				Southbound SW Applewood Ave				Eastbound SW Sattler St				Westbound SW Sattler St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	0	0	0	0	1	0	1	2	0	3	0	3	0	1	2	3	8
PHF	0.00	0.00	0.00	0.00	0.25	0.00	0.25	0.50	0.00	0.38	0.00	0.38	0.00	0.25	0.50	0.75	0.50

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

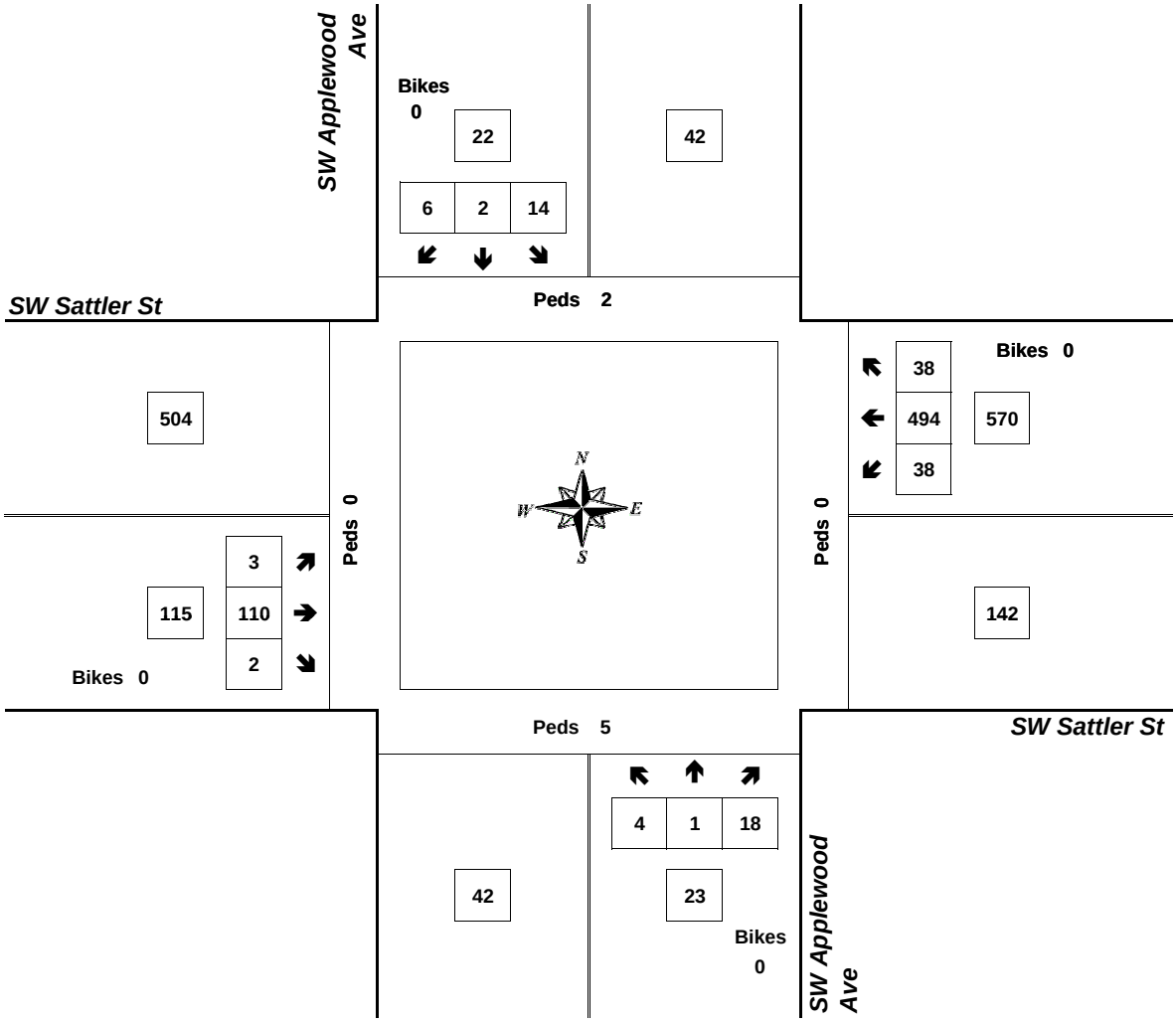
Interval Start Time	Northbound SW Applewood Ave				Southbound SW Applewood Ave				Eastbound SW Sattler St				Westbound SW Sattler St				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3	3
4:15 PM	0	0	0	0	1	0	0	1	0	1	0	1	0	2	2	4	6
4:30 PM	0	0	0	0	1	0	0	1	0	3	0	3	0	2	2	4	8
4:45 PM	0	0	0	0	1	0	1	2	0	3	0	3	0	0	2	2	7
5:00 PM	0	0	0	0	1	0	1	2	0	4	0	4	0	1	2	3	9

Peak Hour Summary

Clay Carney
(503) 833-2740

SW Applewood Ave & SW Sattler St

4:55 PM to 5:55 PM
Wednesday, December 10, 2014

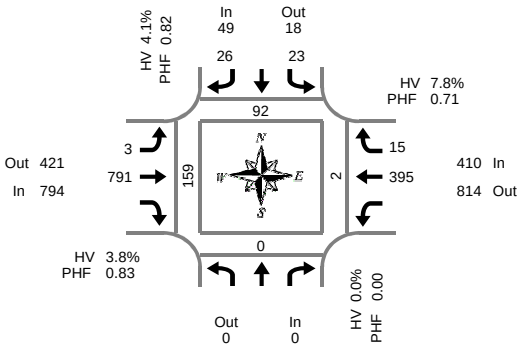


Approach	PHF	HV%	Volume
EB	0.80	2.6%	115
WB	0.90	0.5%	570
NB	0.48	0.0%	23
SB	0.61	9.1%	22
Intersection	0.92	1.1%	730

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
7:00 AM to 8:00 AM

SW 88th Ave & SW Durham Rd

Thursday, December 11, 2014
7:00 AM to 9:00 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW 88th Ave				Southbound SW 88th Ave				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total	Pedestrians Crosswalk			
				Bikes	L		R	Bikes	L	T		Bikes		T	R	Bikes		North	South	East	West
7:00 AM				0	2		1	0	0	80		0		18	0	0	101	0	0	0	0
7:05 AM				0	3		4	0	0	70		0		12	1	0	90	1	0	0	1
7:10 AM				0	0		1	0	0	88		0		27	2	1	118	3	0	0	3
7:15 AM				0	3		2	0	1	71		0		37	1	0	115	5	0	0	10
7:20 AM				0	0		0	0	0	54		0		40	0	0	94	11	0	0	15
7:25 AM				0	2		4	0	0	57		0		33	2	0	98	13	0	0	23
7:30 AM				0	3		3	0	0	62		0		32	0	0	100	11	0	0	14
7:35 AM				0	1		1	0	0	58		0		47	1	0	108	17	0	0	27
7:40 AM				0	2		4	0	0	52		0		38	3	0	99	17	0	2	32
7:45 AM				0	3		3	0	1	65		0		54	1	0	127	11	0	0	23
7:50 AM				0	2		1	0	0	77		0		33	2	0	115	0	0	0	3
7:55 AM				0	2		2	0	1	57		0		24	2	0	88	3	0	0	8
8:00 AM				0	1		2	0	1	39		0		28	0	0	71	0	0	0	1
8:05 AM				0	0		0	0	0	47		0		26	0	0	73	2	0	1	2
8:10 AM				0	0		1	0	1	59		0		24	1	0	86	8	0	0	9
8:15 AM				0	0		2	0	0	56		0		26	0	0	84	1	0	0	1
8:20 AM				0	0		0	0	0	50		0		33	0	0	83	1	0	0	2
8:25 AM				0	0		0	0	1	41		0		20	0	0	62	1	0	0	0
8:30 AM				0	0		0	0	0	45		0		35	0	0	80	1	0	0	0
8:35 AM				0	0		1	0	0	56		0		26	1	0	84	0	0	0	1
8:40 AM				0	0		1	0	0	55		0		28	0	0	84	1	0	0	0
8:45 AM				0	0		0	0	0	66		0		34	1	0	101	3	0	0	1
8:50 AM				0	0		0	0	0	61		0		33	1	0	95	1	0	0	1
8:55 AM				0	0		0	0	0	49		0		33	0	0	82	0	0	0	0
Total Survey				0	24		33	0	6	1,415		0		741	19	1	2,238	111	0	3	177

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW 88th Ave				Southbound SW 88th Ave				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total	Pedestrians Crosswalk			
				Bikes	L		R	Bikes	L	T		Bikes		T	R	Bikes		North	South	East	West
7:00 AM				0	5		6	0	0	238		0		57	3	1	309	4	0	0	4
7:15 AM				0	5		6	0	1	182		0		110	3	0	307	29	0	0	48
7:30 AM				0	6		8	0	0	172		0		117	4	0	307	45	0	2	73
7:45 AM				0	7		6	0	2	199		0		111	5	0	330	14	0	0	34
8:00 AM				0	1		3	0	2	145		0		78	1	0	230	10	0	1	12
8:15 AM				0	0		2	0	1	147		0		79	0	0	229	3	0	0	3
8:30 AM				0	0		2	0	0	156		0		89	1	0	248	2	0	0	1
8:45 AM				0	0		0	0	0	176		0		100	2	0	278	4	0	0	2
Total Survey				0	24		33	0	6	1,415		0		741	19	1	2,238	111	0	3	177

Peak Hour Summary
7:00 AM to 8:00 AM

By Approach	Northbound SW 88th Ave				Southbound SW 88th Ave				Eastbound SW Durham Rd				Westbound SW Durham Rd				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	0	0	0	0	49	18	67	0	794	421	1,215	0	410	814	1,224	1	1,253
%HV	0.0%				4.1%				3.8%				7.8%				5.1%
PHF	0.00				0.82				0.83				0.71				0.92

Pedestrians Crosswalk			
North	South	East	West
92	0	2	159

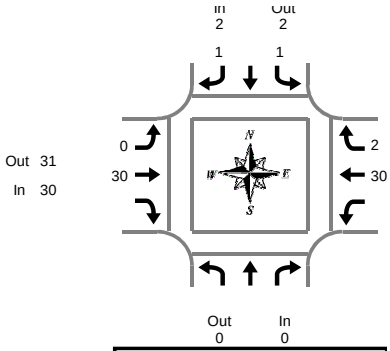
By Movement	Northbound SW 88th Ave				Southbound SW 88th Ave				Eastbound SW Durham Rd				Westbound SW Durham Rd				Total
				Total	L		R	Total	L	T		Total		T	R	Total	
Volume				0	23		26	49	3	791		794		395	15	410	1,253
%HV	NA	NA	NA	0.0%	4.3%	NA	3.8%	4.1%	0.0%	3.8%	NA	3.8%	NA	7.6%	13.3%	7.8%	5.1%
PHF				0.00	0.82		0.81	0.82	0.38	0.83		0.83		0.71	0.63	0.71	0.92

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW 88th Ave				Southbound SW 88th Ave				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total	Pedestrians Crosswalk			
				Bikes	L		R	Bikes	L	T		Bikes		T	R	Bikes		North	South	East	West
7:00 AM				0	23		26	0	3	791		0		395	15	1	1,253	92	0	2	159
7:15 AM				0	19		23	0	5	698		0		416	13	0	1,174	98	0	3	167
7:30 AM				0	14		19	0	5	663		0		385	10	0	1,096	72	0	3	122
7:45 AM				0	8		13	0	5	647		0		357	7	0	1,037	29	0	1	50
8:00 AM				0	1		7	0	3	624		0		346	4	0	985	19	0	1	18

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



SW 88th Ave & SW Durham Rd

Thursday, December 11, 2014
7:00 AM to 9:00 AM

Peak Hour Summary
7:00 AM to 8:00 AM

Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW 88th Ave				Southbound SW 88th Ave				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total
				Total	L		R	Total	L	T		Total		T	R	Total	
7:00 AM				0	0		0	0	0	1		1		0	0	0	1
7:05 AM				0	0		0	0	0	1		1		1	0	1	2
7:10 AM				0	0		0	0	0	3		3		3	0	3	6
7:15 AM				0	1		0	1	0	5		5		7	0	7	13
7:20 AM				0	0		0	0	0	5		5		7	0	7	12
7:25 AM				0	0		1	1	0	4		4		3	1	4	9
7:30 AM				0	0		0	0	0	0		0		2	0	2	2
7:35 AM				0	0		0	0	0	6		6		0	0	0	6
7:40 AM				0	0		0	0	0	2		2		3	1	4	6
7:45 AM				0	0		0	0	0	1		1		0	0	0	1
7:50 AM				0	0		0	0	0	1		1		0	0	0	1
7:55 AM				0	0		0	0	0	1		1		4	0	4	5
8:00 AM				0	0		0	0	0	1		1		1	0	1	2
8:05 AM				0	0		0	0	0	0		0		5	0	5	5
8:10 AM				0	0		0	0	0	1		1		2	0	2	3
8:15 AM				0	0		1	1	0	0		0		3	0	3	4
8:20 AM				0	0		0	0	0	0		0		0	0	0	0
8:25 AM				0	0		0	0	0	0		0		2	0	2	2
8:30 AM				0	0		0	0	0	1		1		0	0	0	1
8:35 AM				0	0		0	0	0	0		0		1	0	1	1
8:40 AM				0	0		0	0	0	1		1		2	0	2	3
8:45 AM				0	0		0	0	0	3		3		2	0	2	5
8:50 AM				0	0		0	0	0	4		4		1	0	1	5
8:55 AM				0	0		0	0	0	1		1		3	0	3	4
Total Survey				0	1		2	3	0	42		42		52	2	54	99

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW 88th Ave				Southbound SW 88th Ave				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total
				Total	L		R	Total	L	T		Total		T	R	Total	
7:00 AM				0	0		0	0	0	5		5		4	0	4	9
7:15 AM				0	1		1	2	0	14		14		17	1	18	34
7:30 AM				0	0		0	0	0	8		8		5	1	6	14
7:45 AM				0	0		0	0	0	3		3		4	0	4	7
8:00 AM				0	0		0	0	0	2		2		8	0	8	10
8:15 AM				0	0		1	1	0	0		0		5	0	5	6
8:30 AM				0	0		0	0	0	2		2		3	0	3	5
8:45 AM				0	0		0	0	0	8		8		6	0	6	14
Total Survey				0	1		2	3	0	42		42		52	2	54	99

Heavy Vehicle Peak Hour Summary
7:00 AM to 8:00 AM

By Approach	Northbound SW 88th Ave			Southbound SW 88th Ave			Eastbound SW Durham Rd			Westbound SW Durham Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	0	0	0	2	2	4	30	31	61	32	31	63	64
PHF	0.00			0.25			0.54			0.44			0.47

By Movement	Northbound SW 88th Ave				Southbound SW 88th Ave				Eastbound SW Durham Rd				Westbound SW Durham Rd				Total
				Total	L		R	Total	L	T		Total		T	R	Total	
Volume				0	1		1	2	0	30		30		30	2	32	64
PHF				0.00	0.25		0.25	0.25	0.00	0.54		0.54		0.44	0.50	0.44	0.47

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

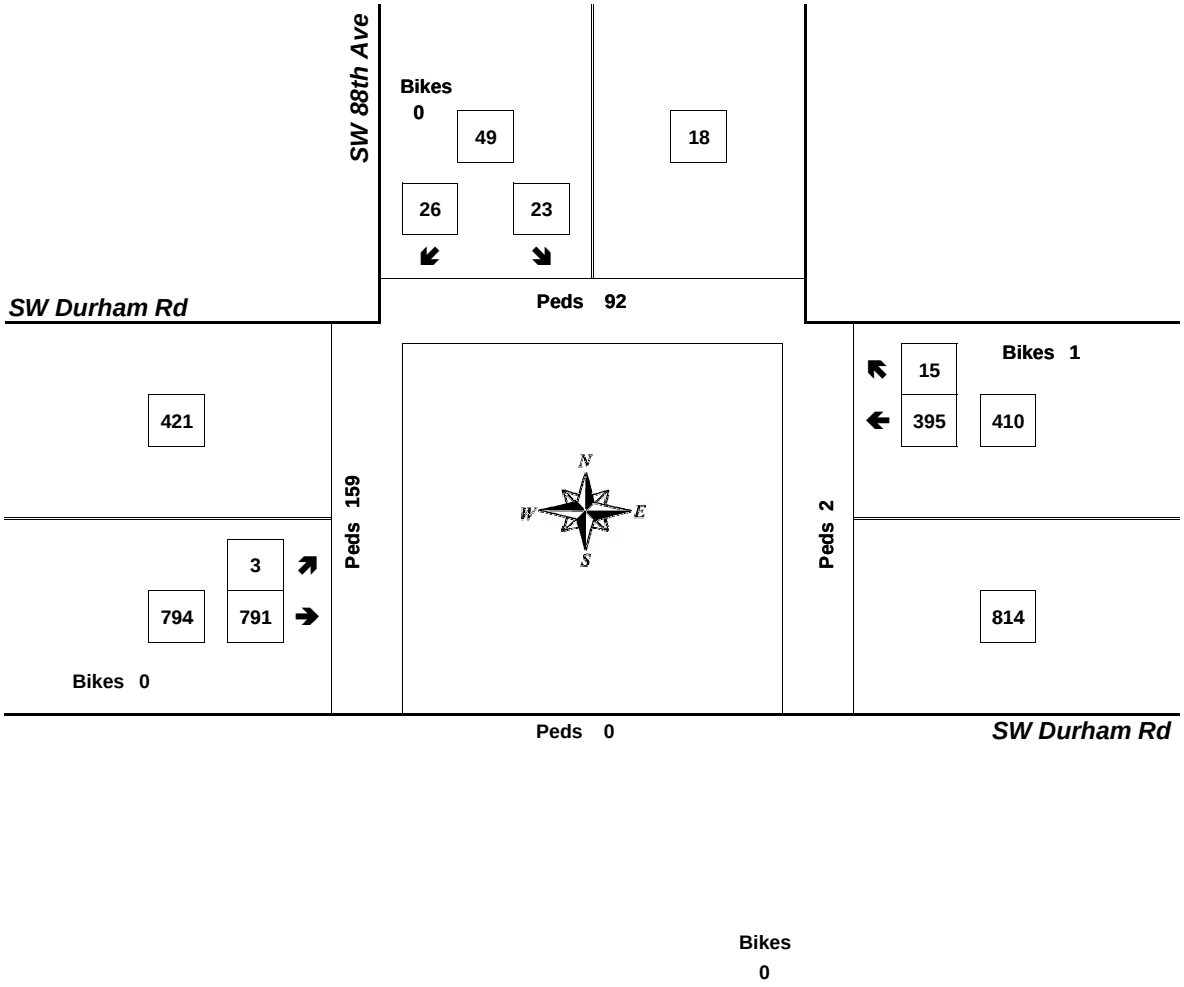
Interval Start Time	Northbound SW 88th Ave				Southbound SW 88th Ave				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total
				Total	L		R	Total	L	T		Total		T	R	Total	
7:00 AM				0	1		1	2	0	30		30		30	2	32	64
7:15 AM				0	1		1	2	0	27		27		34	2	36	65
7:30 AM				0	0		1	1	0	13		13		22	1	23	37
7:45 AM				0	0		1	1	0	7		7		20	0	20	28
8:00 AM				0	0		1	1	0	12		12		22	0	22	35

Peak Hour Summary

Clay Carney
(503) 833-2740

SW 88th Ave & SW Durham Rd

7:00 AM to 8:00 AM
Thursday, December 11, 2014

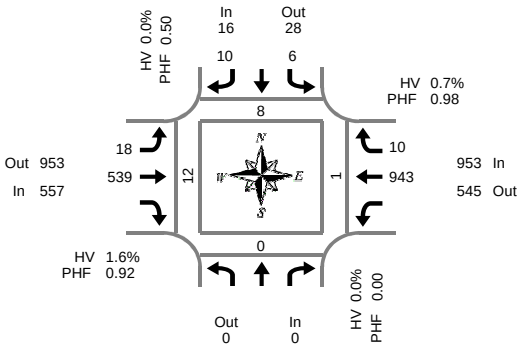


Approach	PHF	HV%	Volume
EB	0.83	3.8%	794
WB	0.71	7.8%	410
NB	0.00	0.0%	0
SB	0.82	4.1%	49
Intersection	0.92	5.1%	1,253

Count Period: 7:00 AM to 9:00 AM

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
5:00 PM to 6:00 PM

SW 88th Ave & SW Durham Rd

Wednesday, December 10, 2014
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW 88th Ave				Southbound SW 88th Ave				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total	Pedestrians Crosswalk			
				Bikes	L		R	Bikes	L	T		Bikes		T	R	Bikes		North	South	East	West
4:00 PM				0	0		1	0	2	43		0		70	1	0	117	4	0	0	4
4:05 PM				0	0		1	0	0	39		0		73	1	0	114	2	0	0	2
4:10 PM				0	0		0	0	0	57		0		79	0	0	136	1	0	0	1
4:15 PM				0	0		0	0	2	44		0		70	2	0	118	1	0	0	1
4:20 PM				0	0		0	0	1	53		0		62	1	0	117	0	0	0	0
4:25 PM				0	0		2	0	1	42		0		75	0	1	120	1	0	0	1
4:30 PM				0	0		0	0	1	47		0		66	5	0	119	0	0	0	0
4:35 PM				0	0		1	0	1	42		0		79	2	0	125	0	0	0	0
4:40 PM				0	0		0	0	1	61		0		68	2	0	132	0	0	0	0
4:45 PM				0	0		0	0	3	43		0		57	1	0	104	0	0	0	0
4:50 PM				0	2		1	0	0	44		0		71	1	0	119	2	0	0	1
4:55 PM				0	0		0	0	0	43		0		71	2	0	116	0	0	0	0
5:00 PM				0	0		0	0	1	38		0		80	1	0	120	0	0	0	0
5:05 PM				0	2		2	0	0	57		0		85	1	0	147	1	0	0	2
5:10 PM				0	1		1	0	3	45		0		71	0	0	121	0	0	0	1
5:15 PM				0	1		1	0	3	44		0		85	0	1	134	3	0	0	0
5:20 PM				0	0		0	0	0	51		0		73	1	0	125	0	0	0	1
5:25 PM				0	1		1	0	0	32		0		78	1	0	113	0	0	0	2
5:30 PM				0	0		2	0	2	53		0		78	2	0	137	0	0	0	2
5:35 PM				0	0		0	0	1	46		0		78	1	0	126	4	0	1	3
5:40 PM				0	0		2	0	2	43		0		75	0	0	122	0	0	0	0
5:45 PM				0	0		1	0	2	42		0		76	1	0	122	0	0	0	0
5:50 PM				0	1		0	0	2	50		0		81	1	0	135	0	0	0	1
5:55 PM				0	0		0	0	2	38		0		83	1	0	124	0	0	0	0
Total Survey				0	8		16	0	30	1,097		0		1,784	28	2	2,963	19	0	1	22

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW 88th Ave				Southbound SW 88th Ave				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total	Pedestrians Crosswalk			
				Bikes	L		R	Bikes	L	T		Bikes		T	R	Bikes		North	South	East	West
4:00 PM				0	0		2	0	2	139		0		222	2	0	367	7	0	0	7
4:15 PM				0	0		2	0	4	139		0		207	3	1	355	2	0	0	2
4:30 PM				0	0		1	0	3	150		0		213	9	0	376	0	0	0	0
4:45 PM				0	2		1	0	3	130		0		199	4	0	339	2	0	0	1
5:00 PM				0	3		3	0	4	140		0		236	2	0	388	1	0	0	3
5:15 PM				0	2		2	0	3	127		0		236	2	1	372	3	0	0	3
5:30 PM				0	0		4	0	5	142		0		231	3	0	385	4	0	1	5
5:45 PM				0	1		1	0	6	130		0		240	3	0	381	0	0	0	1
Total Survey				0	8		16	0	30	1,097		0		1,784	28	2	2,963	19	0	1	22

Peak Hour Summary
5:00 PM to 6:00 PM

By Approach	Northbound SW 88th Ave				Southbound SW 88th Ave				Eastbound SW Durham Rd				Westbound SW Durham Rd				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	0	0	0	0	16	28	44	0	557	953	1,510	0	953	545	1,498	1	1,526
%HV	0.0%				0.0%				1.6%				0.7%				1.0%
PHF	0.00				0.50				0.92				0.98				0.95

Pedestrians Crosswalk			
North	South	East	West
8	0	1	12

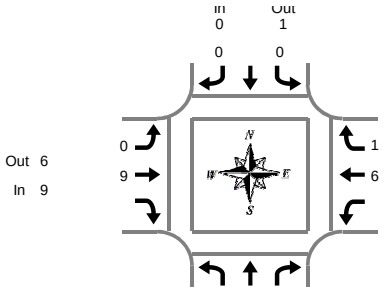
By Movement	Northbound SW 88th Ave				Southbound SW 88th Ave				Eastbound SW Durham Rd				Westbound SW Durham Rd				Total
				Total	L		R	Total	L	T		Total		T	R	Total	
Volume				0	6		10	16	18	539		557		943	10	953	1,526
%HV	NA	NA	NA	0.0%	0.0%	NA	0.0%	0.0%	0.0%	1.7%	NA	1.6%	NA	0.6%	10.0%	0.7%	1.0%
PHF				0.00	0.38		0.63	0.50	0.75	0.92		0.92		0.98	0.63	0.98	0.95

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW 88th Ave				Southbound SW 88th Ave				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total	Pedestrians Crosswalk			
				Bikes	L		R	Bikes	L	T		Bikes		T	R	Bikes		North	South	East	West
4:00 PM				0	2		6	0	12	558		0		841	18	1	1,437	11	0	0	10
4:15 PM				0	5		7	0	14	559		0		855	18	1	1,458	5	0	0	6
4:30 PM				0	7		7	0	13	547		0		884	17	1	1,475	6	0	0	7
4:45 PM				0	7		10	0	15	539		0		902	11	1	1,484	10	0	1	12
5:00 PM				0	6		10	0	18	539		0		943	10	1	1,526	8	0	1	12

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



SW 88th Ave & SW Durham Rd

Wednesday, December 10, 2014
4:00 PM to 6:00 PM

Peak Hour Summary
5:00 PM to 6:00 PM

Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW 88th Ave				Southbound SW 88th Ave				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total
				Total	L		R	Total	L	T		Total		T	R	Total	
4:00 PM				0	0		0	0	0	0		0		0	0	0	0
4:05 PM				0	0		0	0	0	6		6		2	0	2	8
4:10 PM				0	0		0	0	0	2		2		1	0	1	3
4:15 PM				0	0		0	0	0	3		3		1	0	1	4
4:20 PM				0	0		0	0	0	0		0		0	0	0	0
4:25 PM				0	0		0	0	0	0		0		0	0	0	0
4:30 PM				0	0		0	0	0	2		2		2	0	2	4
4:35 PM				0	0		0	0	0	2		2		2	0	2	4
4:40 PM				0	0		0	0	0	0		0		1	0	1	1
4:45 PM				0	0		0	0	0	0		0		0	0	0	0
4:50 PM				0	0		0	0	0	0		0		1	0	1	1
4:55 PM				0	0		0	0	0	1		1		1	0	1	2
5:00 PM				0	0		0	0	0	0		0		1	0	1	1
5:05 PM				0	0		0	0	0	2		2		0	0	0	2
5:10 PM				0	0		0	0	0	2		2		1	0	1	3
5:15 PM				0	0		0	0	0	1		1		0	0	0	1
5:20 PM				0	0		0	0	0	1		1		1	0	1	2
5:25 PM				0	0		0	0	0	1		1		0	0	0	1
5:30 PM				0	0		0	0	0	1		1		0	0	0	1
5:35 PM				0	0		0	0	0	0		0		0	0	0	0
5:40 PM				0	0		0	0	0	0		0		2	0	2	2
5:45 PM				0	0		0	0	0	0		0		0	0	0	0
5:50 PM				0	0		0	0	0	1		1		0	1	1	2
5:55 PM				0	0		0	0	0	0		0		1	0	1	1
Total Survey				0	0		0	0	0	25		25		17	1	18	43

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW 88th Ave				Southbound SW 88th Ave				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total
				Total	L		R	Total	L	T		Total		T	R	Total	
4:00 PM				0	0		0	0	0	8		8		3	0	3	11
4:15 PM				0	0		0	0	0	3		3		1	0	1	4
4:30 PM				0	0		0	0	0	4		4		5	0	5	9
4:45 PM				0	0		0	0	0	1		1		2	0	2	3
5:00 PM				0	0		0	0	0	4		4		2	0	2	6
5:15 PM				0	0		0	0	0	3		3		1	0	1	4
5:30 PM				0	0		0	0	0	1		1		2	0	2	3
5:45 PM				0	0		0	0	0	1		1		1	1	2	3
Total Survey				0	0		0	0	0	25		25		17	1	18	43

Heavy Vehicle Peak Hour Summary
5:00 PM to 6:00 PM

By Approach	Northbound SW 88th Ave			Southbound SW 88th Ave			Eastbound SW Durham Rd			Westbound SW Durham Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	0	0	0	0	1	1	9	6	15	7	9	16	16
PHF	0.00			0.00			0.45			0.58			0.67

By Movement	Northbound SW 88th Ave				Southbound SW 88th Ave				Eastbound SW Durham Rd				Westbound SW Durham Rd				Total
				Total	L		R	Total	L	T		Total		T	R	Total	
Volume				0	0		0	0	0	9		9		6	1	7	16
PHF				0.00	0.00		0.00	0.00	0.00	0.45		0.45		0.75	0.25	0.58	0.67

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

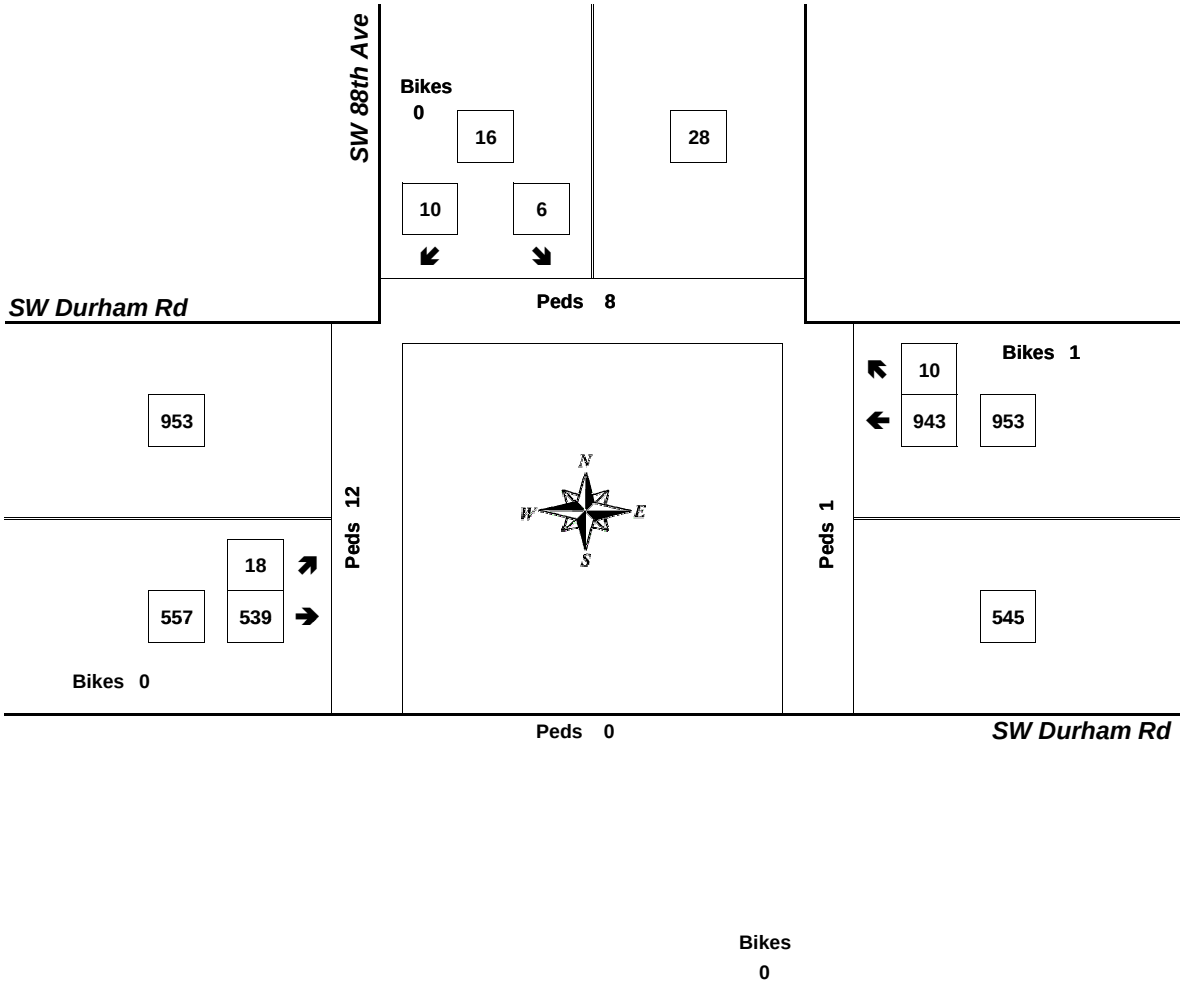
Interval Start Time	Northbound SW 88th Ave				Southbound SW 88th Ave				Eastbound SW Durham Rd				Westbound SW Durham Rd				Interval Total
				Total	L		R	Total	L	T		Total		T	R	Total	
4:00 PM				0	0		0	0	0	16		16		11	0	11	27
4:15 PM				0	0		0	0	0	12		12		10	0	10	22
4:30 PM				0	0		0	0	0	12		12		10	0	10	22
4:45 PM				0	0		0	0	0	9		9		7	0	7	16
5:00 PM				0	0		0	0	0	9		9		6	1	7	16

Peak Hour Summary

Clay Carney
(503) 833-2740

SW 88th Ave & SW Durham Rd

5:00 PM to 6:00 PM
Wednesday, December 10, 2014



Approach	PHF	HV%	Volume
EB	0.92	1.6%	557
WB	0.98	0.7%	953
NB	0.00	0.0%	0
SB	0.50	0.0%	16
Intersection	0.95	1.0%	1,526

Count Period: 4:00 PM to 6:00 PM

TRIP GENERATION CALCULATIONS

Land Use: Single-Family Detached Housing
Land Use Code: 210
Variable: Dwelling Units
Variable Value: 62

AM PEAK HOUR

Trip Rate: 0.75

	Enter	Exit	Total
Directional Distribution	25%	75%	
Trip Ends	**12**	**35**	**47**

PM PEAK HOUR

Trip Rate: 1.00

	Enter	Exit	Total
Directional Distribution	63%	37%	
Trip Ends	**39**	**23**	**62**

WEEKDAY

Trip Rate: 9.52

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**295**	**295**	**590**

SATURDAY

Trip Rate: 9.91

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**307**	**307**	**614**

Source: TRIP GENERATION, Ninth Edition

TRIP GENERATION CALCULATIONS

Land Use: Single-Family Detached Housing
Land Use Code: 210
Variable: Dwelling Units
Variable Value: 80

AM PEAK HOUR

Trip Rate: 0.75

	Enter	Exit	Total
Directional Distribution	25%	75%	
Trip Ends	**15**	**45**	**60**

PM PEAK HOUR

Trip Rate: 1.00

	Enter	Exit	Total
Directional Distribution	63%	37%	
Trip Ends	**50**	**30**	**80**

WEEKDAY

Trip Rate: 9.52

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**381**	**381**	**762**

SATURDAY

Trip Rate: 9.91

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**396**	**396**	**792**

Source: TRIP GENERATION, Ninth Edition

TRIP GENERATION CALCULATIONS

Land Use: Single-Family Detached Housing
Land Use Code: 210
Variable: Dwelling Units
Variable Value: 67

AM PEAK HOUR

Trip Rate: 0.75

	Enter	Exit	Total
Directional Distribution	25%	75%	
Trip Ends	**13**	**37**	**50**

PM PEAK HOUR

Trip Rate: 1.00

	Enter	Exit	Total
Directional Distribution	63%	37%	
Trip Ends	**42**	**25**	**67**

WEEKDAY

Trip Rate: 9.52

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**319**	**319**	**638**

SATURDAY

Trip Rate: 9.91

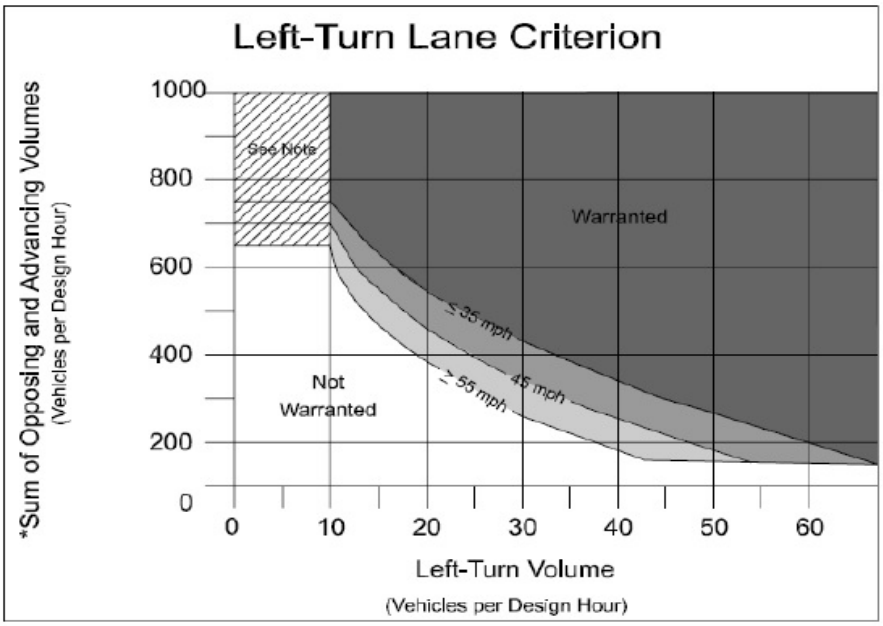
	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**332**	**332**	**664**

Source: TRIP GENERATION, Ninth Edition

Project: 15010 - Heritage Crossing
Intersection: Sw Hall Boulevard at SW Ashford Street
Date: 9/29/2015
Scenario: 2017 Background plus Site Trips

Speed? 40 mph

AM Peak Hour		**PM Peak Hour**	
Left-Turn Volume	10	Left-Turn Volume	32
Approaching DHV	469	Approaching DHV	581
# of Advancing Through Lanes	1	# of Advancing Through Lanes	1
Opposing DHV	720	Opposing DHV	569
# of Opposing Through Lanes	1	# of Opposing Through Lanes	1
O+A DHV	**1189**	**O+A DHV**	**1150**
Lane Needed?	**No**	Lane Needed?	**Yes**



Source: Oregon DOT Analysis Procedures Manual 2008

*(Advancing Vol/ # of Advancing Through Lanes)+
(Opposing Vol/ # of Opposing Through Lanes)

Note: The criterion is not met from zero to ten left turn vehicles per hour, but careful consideration should be given to installing a left turn lane due to the increased potential for accidents in the through lanes. While the turn volumes are low, the adverse safety and operational impacts may require installation of a left turn. The final determination will be based on a field study.

OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANAYLYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF TIGARD, WASHINGTON COUNTY

HALL BLVD at SATTLER ST, City of Tigard, Washington County, 01/01/2009 to 12/31/2013

Total crash records: 6

SER# INVEST	SPEED	ALCOHOL	DRUGS	SCHOOL	WORK	DATE DAY TIME	CLASS DIST FROM	CITY STREET FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYPE (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CONTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH COLL SVRTY	V#	SPCL USE TRLR QTY OWNER TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACT	EVENT	CAUSE
07347	N	N	N	N	N	12/20/2012	16	SW HALL BLVD	INTER	CROSS	N	N	CLD	BIKE	01	NONE 0	TURN-R											02
CITY						TH		SW SATTLER ST	N		TRF SIGNAL	N	WET	TURN		PRVTE	N -W									016		00
						4P			06	0		N	DUSK	INJ		PSNGR CAR		01	DRVR	NONE	69	M	OR-Y OR<25		027	000		02
																	- STRGHT E W	01	BIKE	INJC	23	M		I XWLK	000	000		00
07001	Y	N	N	N	N	12/13/2010	16	SW HALL BLVD	INTER	CROSS	N	N	CLD	ANGL-STP	01	NONE 0	TURN-R											32,08,01
CITY						MO		SW SATTLER ST	S		TRF SIGNAL	N	WET	TURN		PRVTE	W -S									088		00
						6A			06	0		N	DLIT	PDO		PSNGR CAR		01	DRVR	NONE	57	M	OR-Y OR<25		052,001,047	017		32,08,01
															02	NONE 0	STOP											
																PRVTE	S -N									011		00
																PSNGR CAR		01	DRVR	NONE	62	F	OR-Y OR<25		000	000		00
06589	Y	N	N	N	N	11/22/2011	16	SW HALL BLVD	INTER	CROSS	N	N	RAIN	ANGL-STP	01	NONE 0	TURN-L											01
CITY						TU		SW SATTLER ST	W		TRF SIGNAL	N	WET	TURN		PRVTE	S -W									088		00
						3P			06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	19	F	OR-Y OR<25		047,080	017		01
															02	NONE 0	STOP											
																PUBLC	W -E									012		00
																SCHL BUS		01	DRVR	NONE	48	M	OR-Y OR<25		000	000		00
05820	N	N	N			10/11/2013	19	SW HALL BLVD	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											07
NONE						FR	0	SW SATTLER ST	W		TRF SIGNAL	N	DRY	REAR		PRVTE	W -E									000		00
						7A			06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	40	M	OR-Y OR<25		026	000		07
															02	NONE 0	STOP											
																PRVTE	W -E									011		00
																PSNGR CAR		01	DRVR	NONE	41	M	OR-Y OR<25		000	000		00
06613	N	N	N			11/14/2013	19	SW HALL BLVD	INTER	3-LEG	N	N	CLD	S-STRGHT	01	NONE 0	STRGHT											07
NONE						TH	0	SW SATTLER ST	W		TRF SIGNAL	N	WET	REAR		PRVTE	W -E									000		00
						7A			06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	16	F	OR-Y OR<25		042	000		07
															02	NONE 0	STRGHT											
																PRVTE	W -E									006		00
																PSNGR CAR		01	DRVR	NONE	62	F	OR-Y OR<25		000	000		00
01296	N	N	N	N	N	03/09/2011	16	SW HALL BLVD	INTER	CROSS	N	N	RAIN	O-1TURN	01	NONE 0	STRGHT											02
CITY						WE		SW SATTLER ST	CN		TRF SIGNAL	N	WET	TURN		PRVTE	N -S									000		00
						5P			01	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	64	M	OR-Y OR<25		000	000		00
															02	NONE 0	TURN-L											
																PRVTE	S -W									000		00
																PSNGR CAR		01	DRVR	INJC	16	F	OR-Y OR<25		004,028	000		02

Disclaimer: The information contained in this report is compiled from individual driver and police crash reports submitted to the Oregon Department of Transportation as required in ORS 811.720. The Crash Analysis and Reporting Unit is committed to providing the highest quality crash data to customers. However, because submittal of crash report forms is the responsibility of the individual driver, the Crash Analysis and Reporting Unit can not guarantee that all qualifying crashes are represented nor can assurances be made that all details pertaining to a single crash are accurate. Note: Legislative changes to DMV's vehicle crash reporting requirement, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANAYLYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF TIGARD, WASHINGTON COUNTY

HALL BLVD at ROSS ST, City of Tigard, Washington County, 01/01/2009 to 12/31/2013

Total crash records: 1

SER# INVEST	SPEDCSL	AUGHK	DRSCLW	DATE DAY TIME	CLASS DIST FROM	CITY STREET FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYPE (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CONTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH COLL SVRTY	V#	SPCL USE TRLR QTY OWNER TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACT	EVENT	CAUSE
05967	N	N	N	10/31/2012	16	SW HALL BLVD	INTER	CROSS	N	Y	RAIN	FIX OBJ	01	NONE 0	TURN-L										053	08
CITY				WE		SW ROSS ST	N		TRF SIGNAL	N	WET	FIX		PRVTE	W -N									000	055	00
				7A			05	0		N	DAWN	PDO		PSNGR CAR		01	DRVR	NONE	58	M	SUSP OR<25		001,080,081	088		08

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OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANAYLYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF TIGARD, WASHINGTON COUNTY

HALL BLVD at ASHFORD ST, City of Tigard, Washington County, 01/01/2009 to 12/31/2013

No Rows to Display

SER# INVEST	SPEED	ALCOHOL	DRUG	SCHOOL	WORK	DATE DAY TIME	CLASS DIST FROM	CITY STREET FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYPE (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CONTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH COLL SVRTY	V#	SPCL USE TRLR QTY OWNER TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACT	EVENT	CAUSE

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OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANAYLYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF TIGARD, WASHINGTON COUNTY

HALL BLVD at LANGTREE ST, City of Tigard, Washington County, 01/01/2009 to 12/31/2013

Total crash records: 2

SER# / INVEST	SPEDCLKN	DATE / DAY / TIME	CLASS / DIST FROM	CITY STREET / FIRST STREET / SECOND STREET	RD CHAR / DIRECT / LOCTN	INT-TYPE (MEDIAN) / LEGS (#LANES)	INT-REL / TRAF-CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	V#	SPCL USE / TRLR QTY / OWNER / TYPE	MOVE / FROM / TO	P#	PRTC / TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACT	EVENT	CAUSE
03106	N N N N N	06/15/2012	16	SW HALL BLVD	INTER	3-LEG	N	N	CLR	S-1TURN	01	NONE 0	STRGHT											32
CITY		FR		SW LANGTREE ST	CN		STOP SIGN	N	DRY	TURN		PRVTE	S -N									000		00
		11A			04	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	24	F	OR-Y OR<25		052,042	000		32
											01	NONE 0	STRGHT											
												PRVTE	S -N									000		00
												PSNGR CAR		02	PSNG	NO<5	02	M			000	000		00
											02	NONE 0	TURN-R											
												PRVTE	S -E									000		00
												PSNGR CAR		01	DRVR	INJC	33	F	OR-Y OR<25		000	000		00
03212	N N N	06/17/2013	16	SW HALL BLVD	INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE 0	TURN-L											02
NO RPT		MO		SW LANGTREE ST	CN		STOP SIGN	N	DRY	TURN		PRVTE	E -S									000		00
		5P			02	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	19	M	OR-Y OR<25		028	000		02
											02	NONE 0	STRGHT											
												PRVTE	S -N									000		00
												PSNGR CAR		01	DRVR	NONE	00	M	OR-Y OR>25		000	000		00

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OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANAYLYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF TIGARD, WASHINGTON COUNTY

HALL BLVD at DURHAM RD, City of Tigard, Washington County, 01/01/2009 to 12/31/2013

Total crash records: 13

SER# INVEST	SPEDCLKW	DATE DAY TIME	CLASS DIST FROM	CITY STREET FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYPE (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CONTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH COLL SVRTY	V#	SPCL USE TRLR QTY OWNER TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACT	EVENT	CAUSE
05919	N N N	11/17/2009	16	SW DURHAM RD	INTER	3-LEG	N	N	CLR	S-1STOP	01	NONE 0	STRGHT										013	07
NONE		TU		SW HALL BLVD	N		TRF SIGNAL	N	DRY	REAR		PRVTE	N -S									000		00
		3P			06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	M	OR-Y OR<25		026	000		07
											02	NONE 0	STOP											
												PRVTE	N -S									011	013	00
												PSNGR CAR		01	DRVR	NONE	52	F	OR-Y OR<25		000	000		00
											03	NONE 0	STOP											
												PRVTE	N -S									022		00
												PSNGR CAR		01	DRVR	NONE	00	F	OR-Y OR<25		000	000		00
06426	N N N N N	12/15/2009	16	SW DURHAM RD	INTER	CROSS	N	N	CLD	ANGL-OTH	01	NONE 0	TURN-R											08
CITY		TU		SW HALL BLVD	N		TRF SIGNAL	N	WET	TURN		PRVTE	E -N									000		00
		10P			06	0		N	DLIT	INJ		PSNGR CAR		01	DRVR	NONE	16	F	OR-Y OR<25		001,007	000		08
											02	NONE 0	STRGHT											
												PRVTE	N -S									006		00
												PSNGR CAR		01	DRVR	NONE	46	M	OR-Y OR<25		000	000		00
											02	NONE 0	STRGHT											
												PRVTE	N -S									006		00
												PSNGR CAR		02	PSNG	INJC	50	F			000	000		00
06223	N N N	12/02/2009	16	SW DURHAM RD	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											07
NONE		WE 0		SW HALL BLVD	E		TRF SIGNAL	N	DRY	REAR		PRVTE	E -W									000		00
		12P			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	57	F	OR-Y OR<25		014,026	000		07
											02	NONE 0	STOP											
												PRVTE	E -W									011		00
												PSNGR CAR		01	DRVR	INJC	61	F	OR-Y OR<25		000	000		00
01895	N N N	04/17/2010	16	SW DURHAM RD	INTER	CROSS	N	N	UNK	S-1STOP	01	UNKN 9	STRGHT											07
NONE		SA 0		SW HALL BLVD	E		TRF SIGNAL	N	UNK	REAR		UNKN	E -W									000		00
		1P			06	0		N	DAY	PDO		UNKNOWN		01	DRVR	NONE	00	F	OR-Y UNK		026	000		07
											02	NONE 0	STOP											
												PRVTE	E -W									011		00
												PSNGR CAR		01	DRVR	NONE	49	M	OR-Y OR<25		000	000		00
01985	N N N N N	04/26/2010	16	SW DURHAM RD	INTER	CROSS	N	N	RAIN	S-1STOP	01	NONE 0	STRGHT										013	07,16
CITY		MO 0		SW HALL BLVD	E		TRF SIGNAL	N	WET	REAR		PRVTE	E -W									000		00
		4P			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	INJC	46	M	OR-Y OR<25		043,026	025		07,16
											02	NONE 0	STOP											
												PRVTE	E -W									011	013	00
												PSNGR CAR		01	DRVR	NONE	54	F	OR-Y OR<25		000	000		00
											03	NONE 0	STOP											
												PRVTE	E -W									022		00
												PSNGR CAR		01	DRVR	NONE	63	F	OR-Y		000	000		00

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OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANAYLYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF TIGARD, WASHINGTON COUNTY

HALL BLVD at DURHAM RD, City of Tigard, Washington County, 01/01/2009 to 12/31/2013

Total crash records: 13

SER# INVEST	SPEDCLDK	DATE DAY TIME	CLASS DIST FROM	CITY STREET FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYPE (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CONTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH COLL SVRTY	V#	SPCL USE TRLR QTY OWNER TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACT	EVENT	CAUSE
03406	N N N N N	07/03/2012	16	SW DURHAM RD	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT						OR>25					07
CITY		TU	0	SW HALL BLVD	E		TRF SIGNAL	N	DRY	REAR		PRVTE	E -W									000		00
		4P			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	53	F	OR-Y		043,026	000		07
																			OR<25					
											02	NONE 0	STOP											
												PRVTE	E -W									011		00
												PSNGR CAR		01	DRVR	INJC	43	M	OR-Y		000	000		00
																			OR<25					
05971	N N N N N	10/31/2012	16	SW DURHAM RD	INTER	CROSS	N	N	CLD	S-1STOP	01	NONE 0	STRGHT											07
CITY		WE	0	SW HALL BLVD	E		TRF SIGNAL	N	WET	REAR		PRVTE	E -W									000		00
		5P			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	26	M	OR-Y		043,026	000		07
																			OR<25					
											02	NONE 0	STOP											
												PRVTE	E -W									011		00
												PSNGR CAR		01	DRVR	INJB	65	M	OR-Y		000	000		00
																			OR<25					
01795	N N N	04/09/2013	16	SW DURHAM RD	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											07
NONE		TU	0	SW HALL BLVD	E		TRF SIGNAL	N	DRY	REAR		PRVTE	E -W									000		00
		9A			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	00	F	OR-Y		026	000		07
																			UNK					
											02	NONE 0	STOP											
												PRVTE	E -W									011		00
												PSNGR CAR		01	DRVR	INJC	18	F	OR-Y		000	000		00
																			OR<25					
03647	N N N N N	07/09/2013	16	SW DURHAM RD	INTER	CROSS	N	N	CLR	BIKE	01	NONE 0	STRGHT											04
CITY		TU	0	SW HALL BLVD	E		TRF SIGNAL	N	DRY	ANGL		PRVTE	E -W									000		00
		10P			06	0		N	DLIT	INJ		PSNGR CAR		01	DRVR	NONE	22	M	OR-Y		000	000		00
																			OR<25					
													-											
													STRGHT	01	BIKE	INJB	33	M		I XWLK	020	000		04
													N S											
01672	N N N N N	04/06/2010	16	SW DURHAM RD	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											07
CITY		TU		SW HALL BLVD	W		TRF SIGNAL	N	DRY	REAR		PRVTE	W -E									000		00
		5P			06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	16	F	OR-Y		043	000		07
																			OR<25					
											02	NONE 0	STOP											
												PRVTE	W -E									011		00
												PSNGR CAR		01	DRVR	NONE	32	F	OTH-Y		000	000		00
																			N-RES					
04434	N N N	08/21/2010	16	SW DURHAM RD	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	TURN-R											04
NONE		SA		SW HALL BLVD	CN		TRF SIGNAL	N	DRY	TURN		PRVTE	N -W									000		00
		4P			01	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	81	F	OR-Y		020	000		04
																			OR<25					
											02	NONE 0	STRGHT											
												PRVTE	E -W									000		00
												PSNGR CAR		01	DRVR	INJC	31	F	OR-Y		000	000		00
																			OR<25					
02647	N N N N N	05/22/2012	16	SW DURHAM RD	INTER	CROSS	N	N	RAIN	O-1TURN	01	NONE 0	TURN-L											02

Disclaimer: The information contained in this report is compiled from individual driver and police crash reports submitted to the Oregon Department of Transportation as required in ORS 811.720. The Crash Analysis and Reporting Unit is committed to providing the highest quality crash data to customers. However, because submittal of crash report forms is the responsibility of the individual driver, the Crash Analysis and Reporting Unit can not guarantee that all qualifying crashes are represented nor can assurances be made that all details pertaining to a single crash are accurate. Note: Legislative changes to DMV's vehicle crash reporting requirement, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANAYLYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF TIGARD, WASHINGTON COUNTY

HALL BLVD at DURHAM RD, City of Tigard, Washington County, 01/01/2009 to 12/31/2013

Total crash records: 13

SER# / INVEST	S P E D / A L C / R U G / S C S / W O H / C R K	DATE / DAY / TIME	CLASS / DIST / FROM	CITY STREET / FIRST STREET / SECOND STREET	RD CHAR / DIRECT / LOCTN	INT-TYPE (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	V#	SPCL USE / TRLR QTY / OWNER / TYPE	MOVE / FROM / TO	P#	PRTC / TYPE	INJ / SVRTY	A G E	S E X	LICNS / RES	PED LOC	ERROR	ACT	EVENT	CAUSE
CITY		TU		SW HALL BLVD	CN		TRF SIGNAL	N	WET	TURN		PRVTE	W -N									000		00
		8A			02	0		N	DAY	INJ		PSNGR CAR		01	DRVR	INJC	41	F	OR-Y		004,028	000		02
																			OR<25					
											02	NONE 0	STRGHT											
												PRVTE	E -W									001		00
												PSNGR CAR		01	DRVR	INJC	36	F	OR-Y		000	000		00
																			OR<25					
07399	N N N	12/18/2013	16	SW DURHAM RD	INTER	CROSS	N	N	CLR	O-1TURN	01	NONE 0	STRGHT											02
NONE		WE		SW HALL BLVD	CN		TRF SIGNAL	N	DRY	TURN		PRVTE	E -W									000		00
		3P			02	0		N	DAY	INJ		PSNGR CAR		01	DRVR	INJB	21	F	OR-Y		000	000		00
																			OR<25					
											02	NONE 0	TURN-L											
												PRVTE	W -N									000		00
												PSNGR CAR		01	DRVR	NONE	27	F	OTH-Y		028	000		02
																			N-RES					

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.89		1.00	0.89		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1783	1669		1626	1498		1719	1803		1702	1755	
Flt Permitted	0.74	1.00		0.39	1.00		0.13	1.00		0.33	1.00	
Satd. Flow (perm)	1384	1669		675	1498		240	1803		588	1755	
Volume (vph)	380	71	214	14	6	18	58	401	8	7	480	67
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	475	89	268	18	8	22	72	501	10	9	600	84
RTOR Reduction (vph)	0	110	0	0	14	0	0	1	0	0	5	0
Lane Group Flow (vph)	475	247	0	18	16	0	72	510	0	9	679	0
Confl. Peds. (#/hr)	1					1	1		1	1		1
Heavy Vehicles (%)	1%	1%	1%	11%	11%	11%	5%	5%	5%	6%	6%	6%
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	31.9	31.9		32.4	32.4		42.5	39.7		38.3	37.6	
Effective Green, g (s)	32.4	32.4		32.4	32.4		43.0	40.2		38.8	38.1	
Actuated g/C Ratio	0.38	0.38		0.38	0.38		0.50	0.47		0.45	0.45	
Clearance Time (s)	4.5	4.5		4.0	4.0		4.0	4.5		4.0	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	526	634		256	569		170	850		277	784	
v/s Ratio Prot		0.15			0.01		c0.01	0.28		0.00	c0.39	
v/s Ratio Perm	c0.34			0.03			0.20			0.01		
v/c Ratio	0.90	0.39		0.07	0.03		0.42	0.60		0.03	0.87	
Uniform Delay, d1	25.0	19.2		16.9	16.6		15.7	16.6		13.6	21.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	18.7	0.4		0.1	0.0		1.7	1.2		0.0	9.9	
Delay (s)	43.7	19.6		17.0	16.6		17.4	17.8		13.6	31.2	
Level of Service	D	B		B	B		B	B		B	C	
Approach Delay (s)		33.4			16.7			17.8			31.0	
Approach LOS		C			B			B			C	

Intersection Summary			
HCM Average Control Delay	28.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	85.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	70.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	11	22	446	11	43	672
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	13	26	525	13	51	791
Pedestrians	2					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						782
pX, platoon unblocked	0.69					
vC, conflicting volume	1425	533			540	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1616	533			540	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	83	95			95	
cM capacity (veh/h)	75	546			1012	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	39	538	51	791
Volume Left	13	0	51	0
Volume Right	26	13	0	0
cSH	176	1700	1012	1700
Volume to Capacity	0.22	0.32	0.05	0.47
Queue Length 95th (ft)	20	0	4	0
Control Delay (s)	31.2	0.0	8.7	0.0
Lane LOS	D		A	
Approach Delay (s)	31.2	0.0	0.5	
Approach LOS	D			

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	45.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	4	24	426	6	19	674
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Hourly flow rate (vph)	5	32	561	8	25	887
Pedestrians	3					2
Lane Width (ft)	12.0					12.0
Walking Speed (ft/s)	4.0					4.0
Percent Blockage	0					0
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1078			1132
pX, platoon unblocked	0.73	0.98			0.98	
vC, conflicting volume	1504	569			571	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1655	562			564	
tC, single (s)	6.4	6.2			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.3	
p0 queue free %	93	94			97	
cM capacity (veh/h)	76	512			969	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	37	568	25	887
Volume Left	5	0	25	0
Volume Right	32	8	0	0
cSH	281	1700	969	1700
Volume to Capacity	0.13	0.33	0.03	0.52
Queue Length 95th (ft)	11	0	2	0
Control Delay (s)	19.7	0.0	8.8	0.0
Lane LOS	C		A	
Approach Delay (s)	19.7	0.0	0.2	
Approach LOS	C			

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	46.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97		1.00		1.00	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85		0.94		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99		0.95	1.00	
Satd. Flow (prot)	1735	1818		1733	1827	1513		1516		1703	1491	
Flt Permitted	0.35	1.00		0.18	1.00	1.00		0.99		0.95	1.00	
Satd. Flow (perm)	639	1818		333	1827	1513		1516		1703	1491	
Volume (vph)	200	537	13	25	272	156	4	12	13	370	23	267
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	238	639	15	30	324	186	5	14	15	440	27	318
RTOR Reduction (vph)	0	1	0	0	0	124	0	15	0	0	220	0
Lane Group Flow (vph)	238	653	0	30	324	62	0	19	0	440	125	0
Confl. Peds. (#/hr)	2		23	23		2	8					8
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	17%	17%	17%	6%	6%	6%
Turn Type	pm+pt			pm+pt		Perm	Split			Split		
Protected Phases	5	2		1	6		4	4		8	8	
Permitted Phases	2			6		6						
Actuated Green, G (s)	36.0	30.1		25.5	23.6	23.6		1.9		21.8	21.8	
Effective Green, g (s)	36.5	30.6		26.0	24.1	24.1		1.9		22.3	22.3	
Actuated g/C Ratio	0.50	0.42		0.36	0.33	0.33		0.03		0.31	0.31	
Clearance Time (s)	4.0	4.5		4.0	4.5	4.5		4.0		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	447	765		156	606	502		40		522	457	
v/s Ratio Prot	c0.06	c0.36		0.01	0.18			c0.01		c0.26	0.08	
v/s Ratio Perm	0.21			0.06		0.04						
v/c Ratio	0.53	0.85		0.19	0.53	0.12		0.48		0.84	0.27	
Uniform Delay, d1	11.5	19.0		16.6	19.7	16.9		34.9		23.6	19.1	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2	1.2	9.1		0.6	0.9	0.1		9.0		11.8	0.3	
Delay (s)	12.7	28.2		17.2	20.7	17.0		43.9		35.4	19.4	
Level of Service	B	C		B	C	B		D		D	B	
Approach Delay (s)		24.0			19.2			43.9			28.3	
Approach LOS		C			B			D			C	

Intersection Summary			
HCM Average Control Delay	24.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	72.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.88		1.00	0.97		1.00	1.00		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1783	1652		1752	1773		1770	1855		1787	1733	
Flt Permitted	0.74	1.00		0.71	1.00		0.18	1.00		0.49	1.00	
Satd. Flow (perm)	1394	1652		1308	1773		330	1855		916	1733	
Volume (vph)	105	13	58	10	16	5	135	432	11	13	483	400
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	109	14	60	10	17	5	141	450	11	14	503	417
RTOR Reduction (vph)	0	52	0	0	4	0	0	1	0	0	30	0
Lane Group Flow (vph)	109	22	0	10	18	0	141	460	0	14	890	0
Confl. Peds. (#/hr)	1					1	2					2
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	1%	1%	1%	3%	3%	3%	2%	2%	2%	1%	1%	1%
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	9.9	9.9		10.4	10.4		59.9	56.4		54.3	53.6	
Effective Green, g (s)	10.4	10.4		10.4	10.4		60.4	56.9		54.8	54.1	
Actuated g/C Ratio	0.13	0.13		0.13	0.13		0.75	0.71		0.68	0.68	
Clearance Time (s)	4.5	4.5		4.0	4.0		4.0	4.5		4.0	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	181	215		170	230		312	1319		635	1172	
v/s Ratio Prot		0.01			0.01		c0.02	0.25		0.00	c0.51	
v/s Ratio Perm	c0.08			0.01			0.32			0.01		
v/c Ratio	0.60	0.10		0.06	0.08		0.45	0.35		0.02	0.76	
Uniform Delay, d1	32.8	30.7		30.5	30.6		8.1	4.4		4.0	8.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.5	0.2		0.1	0.1		1.0	0.2		0.0	2.9	
Delay (s)	38.4	30.9		30.7	30.7		9.1	4.6		4.0	11.5	
Level of Service	D	C		C	C		A	A		A	B	
Approach Delay (s)		35.4			30.7			5.7			11.4	
Approach LOS		D			C			A			B	

Intersection Summary			
HCM Average Control Delay	12.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	79.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	4	23	549	6	15	536
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	4	24	572	6	16	558
Pedestrians	5					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						782
pX, platoon unblocked						
vC, conflicting volume	1170	580			583	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1170	580			583	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	95			98	
cM capacity (veh/h)	209	512			987	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	28	578	16	558
Volume Left	4	0	16	0
Volume Right	24	6	0	0
cSH	422	1700	987	1700
Volume to Capacity	0.07	0.34	0.02	0.33
Queue Length 95th (ft)	5	0	1	0
Control Delay (s)	14.1	0.0	8.7	0.0
Lane LOS	B		A	
Approach Delay (s)	14.1	0.0	0.2	
Approach LOS	B			

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	39.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	6	22	541	9	21	517
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	7	24	595	10	23	568
Pedestrians	4					1
Lane Width (ft)	12.0					12.0
Walking Speed (ft/s)	4.0					4.0
Percent Blockage	0					0
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1078			1132
pX, platoon unblocked						
vC, conflicting volume	1218	604			608	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1218	604			608	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	95			98	
cM capacity (veh/h)	192	492			967	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	31	604	23	568
Volume Left	7	0	23	0
Volume Right	24	10	0	0
cSH	369	1700	967	1700
Volume to Capacity	0.08	0.36	0.02	0.33
Queue Length 95th (ft)	7	0	2	0
Control Delay (s)	15.6	0.0	8.8	0.0
Lane LOS	C		A	
Approach Delay (s)	15.6	0.0	0.3	
Approach LOS	C			

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	39.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97		0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		0.99	1.00	1.00		1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85		0.95		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99		0.95	1.00	
Satd. Flow (prot)	1755	1859		1760	1863	1537		1723		1770	1501	
Flt Permitted	0.16	1.00		0.47	1.00	1.00		0.99		0.95	1.00	
Satd. Flow (perm)	302	1859		875	1863	1537		1723		1770	1501	
Volume (vph)	170	435	5	5	643	334	12	22	23	281	10	206
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	177	453	5	5	670	348	12	23	24	293	10	215
RTOR Reduction (vph)	0	0	0	0	0	119	0	21	0	0	169	0
Lane Group Flow (vph)	177	458	0	5	670	229	0	38	0	293	56	0
Confl. Peds. (#/hr)	3		9	9		3	2					2
Confl. Bikes (#/hr)						1			1			
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	6%
Bus Blockages (#/hr)	2	0	0	0	0	0	0	0	0	0	0	0
Turn Type	pm+pt			pm+pt		Perm	Split			Split		
Protected Phases	5	2		1	6		4	4		8	8	
Permitted Phases	2			6		6						
Actuated Green, G (s)	53.7	49.1		42.4	41.8	41.8		3.5		19.1	19.1	
Effective Green, g (s)	54.2	49.6		42.9	42.3	42.3		4.0		19.1	19.1	
Actuated g/C Ratio	0.61	0.56		0.48	0.47	0.47		0.04		0.21	0.21	
Clearance Time (s)	4.0	4.5		4.0	4.5	4.5		4.5		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	312	1033		426	882	728		77		379	321	
v/s Ratio Prot	c0.05	0.25		0.00	c0.36			c0.02		c0.17	0.04	
v/s Ratio Perm	0.29			0.01		0.15						
v/c Ratio	0.57	0.44		0.01	0.76	0.31		0.49		0.77	0.17	
Uniform Delay, d1	13.3	11.7		12.1	19.3	14.5		41.7		33.1	28.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2	2.4	0.3		0.0	3.8	0.2		4.9		9.4	0.3	
Delay (s)	15.7	12.0		12.1	23.1	14.8		46.6		42.5	28.9	
Level of Service	B	B		B	C	B		D		D	C	
Approach Delay (s)		13.0			20.2			46.6			36.6	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM Average Control Delay	22.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	89.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	75.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.89		1.00	0.89		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1782	1669		1626	1493		1719	1803		1702	1753	
Flt Permitted	0.74	1.00		0.38	1.00		0.12	1.00		0.32	1.00	
Satd. Flow (perm)	1381	1669		646	1493		213	1803		567	1753	
Volume (vph)	403	75	227	15	6	19	62	405	8	7	485	71
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	504	94	284	19	8	24	78	506	10	9	606	89
RTOR Reduction (vph)	0	108	0	0	15	0	0	1	0	0	6	0
Lane Group Flow (vph)	504	270	0	19	17	0	78	515	0	9	689	0
Confl. Peds. (#/hr)	1					1	1		1	1		1
Heavy Vehicles (%)	1%	1%	1%	11%	11%	11%	5%	5%	5%	6%	6%	6%
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	34.7	34.7		35.2	35.2		44.1	41.3		39.9	39.2	
Effective Green, g (s)	35.2	35.2		35.2	35.2		44.6	41.8		40.4	39.7	
Actuated g/C Ratio	0.39	0.39		0.39	0.39		0.50	0.47		0.45	0.44	
Clearance Time (s)	4.5	4.5		4.0	4.0		4.0	4.5		4.0	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	542	655		254	586		153	840		264	776	
v/s Ratio Prot		0.16			0.01		c0.02	0.29		0.00	c0.39	
v/s Ratio Perm	c0.36			0.03			0.24			0.02		
v/c Ratio	0.93	0.41		0.07	0.03		0.51	0.61		0.03	0.89	
Uniform Delay, d1	26.1	19.7		17.1	16.8		17.3	17.9		14.6	23.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	22.4	0.4		0.1	0.0		2.7	1.3		0.1	12.0	
Delay (s)	48.5	20.2		17.2	16.8		20.0	19.2		14.6	35.0	
Level of Service	D	C		B	B		B	B		B	D	
Approach Delay (s)		36.4			16.9			19.3			34.7	
Approach LOS		D			B			B			C	

Intersection Summary			
HCM Average Control Delay	30.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	89.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	11	23	451	12	46	679
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	13	27	531	14	54	799
Pedestrians	2					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						782
pX, platoon unblocked	0.68					
vC, conflicting volume	1447	540			547	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1656	540			547	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	81	95			95	
cM capacity (veh/h)	69	541			1006	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	40	545	54	799
Volume Left	13	0	54	0
Volume Right	27	14	0	0
cSH	169	1700	1006	1700
Volume to Capacity	0.24	0.32	0.05	0.47
Queue Length 95th (ft)	22	0	4	0
Control Delay (s)	32.8	0.0	8.8	0.0
Lane LOS	D		A	
Approach Delay (s)	32.8	0.0	0.6	
Approach LOS	D			

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	45.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	4	25	431	6	20	681
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Hourly flow rate (vph)	5	33	567	8	26	896
Pedestrians	3					2
Lane Width (ft)	12.0					12.0
Walking Speed (ft/s)	4.0					4.0
Percent Blockage	0					0
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1078			1132
pX, platoon unblocked	0.73	0.97			0.97	
vC, conflicting volume	1523	576			578	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1647	561			564	
tC, single (s)	6.4	6.2			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.3	
p0 queue free %	93	93			97	
cM capacity (veh/h)	76	504			953	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	38	575	26	896
Volume Left	5	0	26	0
Volume Right	33	8	0	0
cSH	284	1700	953	1700
Volume to Capacity	0.13	0.34	0.03	0.53
Queue Length 95th (ft)	11	0	2	0
Control Delay (s)	19.6	0.0	8.9	0.0
Lane LOS	C		A	
Approach Delay (s)	19.6	0.0	0.3	
Approach LOS	C			

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97		1.00		1.00	0.96	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85		0.94		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99		0.95	1.00	
Satd. Flow (prot)	1735	1817		1736	1827	1513		1510		1703	1489	
Flt Permitted	0.33	1.00		0.16	1.00	1.00		0.99		0.95	1.00	
Satd. Flow (perm)	595	1817		295	1827	1513		1510		1703	1489	
Volume (vph)	212	570	14	27	289	166	4	12	14	393	23	283
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	252	679	17	32	344	198	5	14	17	468	27	337
RTOR Reduction (vph)	0	1	0	0	0	133	0	17	0	0	231	0
Lane Group Flow (vph)	252	695	0	32	344	65	0	19	0	468	133	0
Confl. Peds. (#/hr)	2		23	23		2	8					8
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	17%	17%	17%	6%	6%	6%
Turn Type	pm+pt			pm+pt		Perm	Split			Split		
Protected Phases	5	2		1	6		4	4		8	8	
Permitted Phases	2			6		6						
Actuated Green, G (s)	36.9	31.0		26.2	24.3	24.3		1.9		23.2	23.2	
Effective Green, g (s)	37.4	31.5		26.7	24.8	24.8		1.9		23.7	23.7	
Actuated g/C Ratio	0.50	0.42		0.36	0.33	0.33		0.03		0.32	0.32	
Clearance Time (s)	4.0	4.5		4.0	4.5	4.5		4.0		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	427	763		142	604	500		38		538	471	
v/s Ratio Prot	c0.07	c0.38		0.01	0.19			c0.01		c0.27	0.09	
v/s Ratio Perm	0.23			0.07		0.04						
v/c Ratio	0.59	0.91		0.23	0.57	0.13		0.51		0.87	0.28	
Uniform Delay, d1	12.3	20.4		17.8	20.7	17.6		36.1		24.2	19.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2	2.2	15.0		0.8	1.2	0.1		11.1		14.0	0.3	
Delay (s)	14.5	35.4		18.6	21.9	17.7		47.2		38.2	19.6	
Level of Service	B	D		B	C	B		D		D	B	
Approach Delay (s)		29.8			20.3			47.2			30.1	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM Average Control Delay	27.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.88		1.00	0.97		1.00	1.00		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1783	1652		1752	1776		1770	1855		1787	1730	
Flt Permitted	0.74	1.00		0.70	1.00		0.16	1.00		0.49	1.00	
Satd. Flow (perm)	1393	1652		1300	1776		296	1855		920	1730	
Volume (vph)	111	14	62	11	17	5	143	437	12	14	488	424
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	116	15	65	11	18	5	149	455	12	15	508	442
RTOR Reduction (vph)	0	57	0	0	4	0	0	1	0	0	31	0
Lane Group Flow (vph)	116	23	0	11	19	0	149	466	0	15	919	0
Confl. Peds. (#/hr)	1					1	2					2
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	1%	1%	1%	3%	3%	3%	2%	2%	2%	1%	1%	1%
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	10.1	10.1		10.6	10.6		62.9	58.7		55.9	55.2	
Effective Green, g (s)	10.6	10.6		10.6	10.6		63.4	59.2		56.4	55.7	
Actuated g/C Ratio	0.13	0.13		0.13	0.13		0.77	0.72		0.68	0.68	
Clearance Time (s)	4.5	4.5		4.0	4.0		4.0	4.5		4.0	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	179	212		167	228		303	1331		636	1168	
v/s Ratio Prot		0.01			0.01		c0.03	0.25		0.00	c0.53	
v/s Ratio Perm	c0.08			0.01			0.35			0.02		
v/c Ratio	0.65	0.11		0.07	0.08		0.49	0.35		0.02	0.79	
Uniform Delay, d1	34.2	31.8		31.6	31.7		9.5	4.4		4.2	9.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.8	0.2		0.2	0.2		1.3	0.2		0.0	3.6	
Delay (s)	42.0	32.0		31.8	31.8		10.7	4.6		4.2	12.9	
Level of Service	D	C		C	C		B	A		A	B	
Approach Delay (s)		37.9			31.8			6.0			12.7	
Approach LOS		D			C			A			B	

Intersection Summary			
HCM Average Control Delay	13.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	82.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	82.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	4	24	555	6	16	542
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	4	25	578	6	17	565
Pedestrians	5					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						782
pX, platoon unblocked						
vC, conflicting volume	1184	586			589	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1184	586			589	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	95			98	
cM capacity (veh/h)	205	508			982	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	29	584	17	565
Volume Left	4	0	17	0
Volume Right	25	6	0	0
cSH	419	1700	982	1700
Volume to Capacity	0.07	0.34	0.02	0.33
Queue Length 95th (ft)	6	0	1	0
Control Delay (s)	14.2	0.0	8.7	0.0
Lane LOS	B		A	
Approach Delay (s)	14.2	0.0	0.3	
Approach LOS	B			

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	6	23	547	10	22	522
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	7	25	601	11	24	574
Pedestrians	4					1
Lane Width (ft)	12.0					12.0
Walking Speed (ft/s)	4.0					4.0
Percent Blockage	0					0
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1078			1132
pX, platoon unblocked						
vC, conflicting volume	1233	612			616	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1233	612			616	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	95			97	
cM capacity (veh/h)	188	488			961	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	32	612	24	574
Volume Left	7	0	24	0
Volume Right	25	11	0	0
cSH	367	1700	961	1700
Volume to Capacity	0.09	0.36	0.03	0.34
Queue Length 95th (ft)	7	0	2	0
Control Delay (s)	15.7	0.0	8.8	0.0
Lane LOS	C		A	
Approach Delay (s)	15.7	0.0	0.4	
Approach LOS	C			

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	39.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97		0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		0.99	1.00	1.00		1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85		0.95		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99		0.95	1.00	
Satd. Flow (prot)	1755	1859		1761	1863	1536		1723		1770	1499	
Flt Permitted	0.13	1.00		0.44	1.00	1.00		0.99		0.95	1.00	
Satd. Flow (perm)	248	1859		823	1863	1536		1723		1770	1499	
Volume (vph)	180	462	5	5	682	354	13	22	24	298	10	219
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	188	481	5	5	710	369	14	23	25	310	10	228
RTOR Reduction (vph)	0	0	0	0	0	119	0	21	0	0	178	0
Lane Group Flow (vph)	188	486	0	5	710	250	0	41	0	310	60	0
Confl. Peds. (#/hr)	3		9	9		3	2					2
Confl. Bikes (#/hr)						1			1			
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	6%
Bus Blockages (#/hr)	2	0	0	0	0	0	0	0	0	0	0	0
Turn Type	pm+pt			pm+pt		Perm	Split			Split		
Protected Phases	5	2		1	6		4	4		8	8	
Permitted Phases	2			6		6						
Actuated Green, G (s)	57.6	53.0		45.8	45.2	45.2		4.5		21.0	21.0	
Effective Green, g (s)	58.1	53.5		46.3	45.7	45.7		5.0		21.0	21.0	
Actuated g/C Ratio	0.60	0.56		0.48	0.48	0.48		0.05		0.22	0.22	
Clearance Time (s)	4.0	4.5		4.0	4.5	4.5		4.5		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	282	1035		402	886	730		90		387	328	
v/s Ratio Prot	c0.06	0.26		0.00	c0.38			c0.02		c0.18	0.04	
v/s Ratio Perm	0.35			0.01		0.16						
v/c Ratio	0.67	0.47		0.01	0.80	0.34		0.46		0.80	0.18	
Uniform Delay, d1	16.0	12.8		13.0	21.4	15.8		44.2		35.6	30.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2	5.8	0.3		0.0	5.3	0.3		3.7		11.3	0.3	
Delay (s)	21.8	13.1		13.0	26.6	16.1		47.9		46.9	30.8	
Level of Service	C	B		B	C	B		D		D	C	
Approach Delay (s)		15.5			23.0			47.9			39.9	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM Average Control Delay	25.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	96.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	79.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.89		1.00	0.89		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1782	1672		1626	1493		1719	1804		1702	1752	
Flt Permitted	0.74	1.00		0.39	1.00		0.11	1.00		0.30	1.00	
Satd. Flow (perm)	1381	1672		669	1493		201	1804		537	1752	
Volume (vph)	408	75	217	15	6	19	58	421	8	7	490	73
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	510	94	271	19	8	24	72	526	10	9	612	91
RTOR Reduction (vph)	0	103	0	0	15	0	0	1	0	0	6	0
Lane Group Flow (vph)	510	262	0	19	17	0	72	535	0	9	697	0
Confl. Peds. (#/hr)	1					1	1		1	1		1
Heavy Vehicles (%)	1%	1%	1%	11%	11%	11%	5%	5%	5%	6%	6%	6%
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	35.1	35.1		35.6	35.6		44.8	41.9		40.4	39.7	
Effective Green, g (s)	35.6	35.6		35.6	35.6		45.3	42.4		40.9	40.2	
Actuated g/C Ratio	0.39	0.39		0.39	0.39		0.50	0.47		0.45	0.44	
Clearance Time (s)	4.5	4.5		4.0	4.0		4.0	4.5		4.0	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	542	656		263	586		149	843		251	777	
v/s Ratio Prot		0.16			0.01		c0.02	0.30		0.00	c0.40	
v/s Ratio Perm	c0.37			0.03			0.23			0.02		
v/c Ratio	0.94	0.40		0.07	0.03		0.48	0.64		0.04	0.90	
Uniform Delay, d1	26.5	19.8		17.2	16.9		17.6	18.3		14.9	23.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	24.8	0.4		0.1	0.0		2.5	1.6		0.1	13.0	
Delay (s)	51.3	20.2		17.3	17.0		20.0	19.9		14.9	36.4	
Level of Service	D	C		B	B		C	B		B	D	
Approach Delay (s)		38.3			17.1			19.9			36.1	
Approach LOS		D			B			B			D	

Intersection Summary			
HCM Average Control Delay	32.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	90.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	15	0	28	11	0	23	10	447	12	46	669	5
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	18	0	33	13	0	27	12	526	14	54	787	6
Pedestrians					2							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					4.0							
Percent Blockage					0							
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											782	
pX, platoon unblocked	0.67	0.67	0.67	0.67	0.67		0.67					
vC, conflicting volume	1475	1464	790	1487	1460	535	793			542		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1704	1688	688	1722	1682	535	693			542		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	60	100	89	67	100	95	98			95		
cM capacity (veh/h)	44	58	301	40	59	544	608			1010		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	51	40	12	540	54	793
Volume Left	18	13	12	0	54	0
Volume Right	33	27	0	14	0	6
cSH	98	106	608	1700	1010	1700
Volume to Capacity	0.51	0.38	0.02	0.32	0.05	0.47
Queue Length 95th (ft)	57	38	1	0	4	0
Control Delay (s)	75.0	57.9	11.0	0.0	8.8	0.0
Lane LOS	F	F	B		A	
Approach Delay (s)	75.0	57.9	0.2		0.6	
Approach LOS	F	F				

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	48.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	4	25	437	6	20	699
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Hourly flow rate (vph)	5	33	575	8	26	920
Pedestrians	3					2
Lane Width (ft)	12.0					12.0
Walking Speed (ft/s)	4.0					4.0
Percent Blockage	0					0
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1078			1132
pX, platoon unblocked	0.73	0.96			0.96	
vC, conflicting volume	1554	584			586	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1679	567			569	
tC, single (s)	6.4	6.2			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.3	
p0 queue free %	93	93			97	
cM capacity (veh/h)	73	497			943	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	38	583	26	920
Volume Left	5	0	26	0
Volume Right	33	8	0	0
cSH	276	1700	943	1700
Volume to Capacity	0.14	0.34	0.03	0.54
Queue Length 95th (ft)	12	0	2	0
Control Delay (s)	20.1	0.0	8.9	0.0
Lane LOS	C		A	
Approach Delay (s)	20.1	0.0	0.2	
Approach LOS	C			

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97		1.00		1.00	0.96	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85		0.94		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99		0.95	1.00	
Satd. Flow (prot)	1735	1817		1736	1827	1513		1510		1703	1488	
Flt Permitted	0.32	1.00		0.16	1.00	1.00		0.99		0.95	1.00	
Satd. Flow (perm)	586	1817		296	1827	1513		1510		1703	1488	
Volume (vph)	213	563	14	27	287	171	4	12	14	409	23	285
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	254	670	17	32	342	204	5	14	17	487	27	339
RTOR Reduction (vph)	0	1	0	0	0	138	0	17	0	0	228	0
Lane Group Flow (vph)	254	686	0	32	342	66	0	19	0	487	138	0
Confl. Peds. (#/hr)	2		23	23		2	8					8
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	17%	17%	17%	6%	6%	6%
Turn Type	pm+pt			pm+pt		Perm	Split			Split		
Protected Phases	5	2		1	6		4	4		8	8	
Permitted Phases	2			6		6						
Actuated Green, G (s)	36.9	30.9		26.2	24.2	24.2		2.0		24.4	24.4	
Effective Green, g (s)	37.4	31.4		26.7	24.7	24.7		2.0		24.9	24.9	
Actuated g/C Ratio	0.49	0.41		0.35	0.32	0.32		0.03		0.33	0.33	
Clearance Time (s)	4.0	4.5		4.0	4.5	4.5		4.0		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	418	748		141	591	490		40		556	486	
v/s Ratio Prot	c0.07	c0.38		0.01	0.19			c0.01		c0.29	0.09	
v/s Ratio Perm	0.23			0.07		0.04						
v/c Ratio	0.61	0.92		0.23	0.58	0.13		0.49		0.88	0.28	
Uniform Delay, d1	12.9	21.2		18.4	21.5	18.2		36.6		24.2	19.1	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2	2.5	15.9		0.8	1.4	0.1		9.0		14.4	0.3	
Delay (s)	15.4	37.2		19.2	22.8	18.4		45.7		38.6	19.4	
Level of Service	B	D		B	C	B		D		D	B	
Approach Delay (s)		31.3			21.1			45.7			30.4	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM Average Control Delay	28.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	76.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.88		1.00	0.97		1.00	1.00		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1783	1658		1752	1776		1770	1855		1787	1732	
Flt Permitted	0.74	1.00		0.71	1.00		0.15	1.00		0.48	1.00	
Satd. Flow (perm)	1393	1658		1310	1776		276	1855		903	1732	
Volume (vph)	114	14	55	11	17	5	131	448	12	14	506	429
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	119	15	57	11	18	5	136	467	12	15	527	447
RTOR Reduction (vph)	0	50	0	0	4	0	0	1	0	0	29	0
Lane Group Flow (vph)	119	22	0	11	19	0	136	478	0	15	945	0
Confl. Peds. (#/hr)	1					1	2					2
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	1%	1%	1%	3%	3%	3%	2%	2%	2%	1%	1%	1%
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	9.9	9.9		10.4	10.4		62.1	58.1		55.5	54.8	
Effective Green, g (s)	10.4	10.4		10.4	10.4		62.6	58.6		56.0	55.3	
Actuated g/C Ratio	0.13	0.13		0.13	0.13		0.77	0.72		0.69	0.68	
Clearance Time (s)	4.5	4.5		4.0	4.0		4.0	4.5		4.0	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	177	211		167	226		285	1331		627	1172	
v/s Ratio Prot		0.01			0.01		c0.02	0.26		0.00	c0.55	
v/s Ratio Perm	c0.09			0.01			0.34			0.02		
v/c Ratio	0.67	0.11		0.07	0.08		0.48	0.36		0.02	0.81	
Uniform Delay, d1	34.0	31.5		31.4	31.4		9.8	4.4		4.1	9.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	9.6	0.2		0.2	0.2		1.3	0.2		0.0	4.1	
Delay (s)	43.7	31.8		31.5	31.6		11.1	4.6		4.1	13.5	
Level of Service	D	C		C	C		B	A		A	B	
Approach Delay (s)		39.2			31.6			6.0			13.4	
Approach LOS		D			C			A			B	

Intersection Summary			
HCM Average Control Delay	13.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	81.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	83.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	11	0	18	4	0	24	32	543	6	16	535	18
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	11	0	19	4	0	25	33	566	6	17	557	19
Pedestrians					5							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					4.0							
Percent Blockage					0							
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											782	
pX, platoon unblocked												
vC, conflicting volume	1257	1244	567	1250	1250	574	576			577		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1257	1244	567	1250	1250	574	576			577		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	100	96	97	100	95	97			98		
cM capacity (veh/h)	135	165	523	138	164	516	997			992		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	30	29	33	572	17	576
Volume Left	11	4	33	0	17	0
Volume Right	19	25	0	6	0	19
cSH	250	371	997	1700	992	1700
Volume to Capacity	0.12	0.08	0.03	0.34	0.02	0.34
Queue Length 95th (ft)	10	6	3	0	1	0
Control Delay (s)	21.4	15.5	8.7	0.0	8.7	0.0
Lane LOS	C	C	A		A	
Approach Delay (s)	21.4	15.5	0.5		0.2	
Approach LOS	C	C				

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	6	23	567	10	22	533
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	7	25	623	11	24	586
Pedestrians	4					1
Lane Width (ft)	12.0					12.0
Walking Speed (ft/s)	4.0					4.0
Percent Blockage	0					0
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1078			1132
pX, platoon unblocked						
vC, conflicting volume	1267	634			638	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1267	634			638	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	95			97	
cM capacity (veh/h)	179	474			943	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	32	634	24	586
Volume Left	7	0	24	0
Volume Right	25	11	0	0
cSH	354	1700	943	1700
Volume to Capacity	0.09	0.37	0.03	0.34
Queue Length 95th (ft)	7	0	2	0
Control Delay (s)	16.2	0.0	8.9	0.0
Lane LOS	C		A	
Approach Delay (s)	16.2	0.0	0.4	
Approach LOS	C			

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	40.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97		0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		0.99	1.00	1.00		1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85		0.95		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99		0.95	1.00	
Satd. Flow (prot)	1755	1859		1761	1863	1536		1723		1770	1499	
Flt Permitted	0.13	1.00		0.45	1.00	1.00		0.99		0.95	1.00	
Satd. Flow (perm)	248	1859		825	1863	1536		1723		1770	1499	
Volume (vph)	182	458	5	5	674	372	13	22	24	308	10	220
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	190	477	5	5	702	388	14	23	25	321	10	229
RTOR Reduction (vph)	0	0	0	0	0	127	0	21	0	0	178	0
Lane Group Flow (vph)	190	482	0	5	702	261	0	41	0	321	61	0
Confl. Peds. (#/hr)	3		9	9		3	2					2
Confl. Bikes (#/hr)						1			1			
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	6%
Bus Blockages (#/hr)	2	0	0	0	0	0	0	0	0	0	0	0
Turn Type	pm+pt			pm+pt		Perm	Split			Split		
Protected Phases	5	2		1	6		4	4		8	8	
Permitted Phases	2			6		6						
Actuated Green, G (s)	57.1	52.5		45.3	44.7	44.7		4.5		21.6	21.6	
Effective Green, g (s)	57.6	53.0		45.8	45.2	45.2		5.0		21.6	21.6	
Actuated g/C Ratio	0.60	0.55		0.48	0.47	0.47		0.05		0.22	0.22	
Clearance Time (s)	4.0	4.5		4.0	4.5	4.5		4.5		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	280	1024		399	875	722		90		397	337	
v/s Ratio Prot	c0.06	0.26		0.00	c0.38			c0.02		c0.18	0.04	
v/s Ratio Perm	0.35			0.01		0.17						
v/c Ratio	0.68	0.47		0.01	0.80	0.36		0.46		0.81	0.18	
Uniform Delay, d1	16.1	13.1		13.3	21.7	16.3		44.3		35.3	30.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2	6.4	0.3		0.0	5.4	0.3		3.7		11.5	0.3	
Delay (s)	22.5	13.4		13.3	27.1	16.6		47.9		46.8	30.4	
Level of Service	C	B		B	C	B		D		D	C	
Approach Delay (s)		16.0			23.3			47.9			39.8	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM Average Control Delay	25.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	96.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Intersection: 1: SW Sattler Street & SW Hall Blvd

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	259	512	52	53	128	294	53	545
Average Queue (ft)	162	140	9	15	38	136	7	240
95th Queue (ft)	258	355	38	45	80	248	32	474
Link Distance (ft)		1140		920		720		569
Upstream Blk Time (%)								2
Queuing Penalty (veh)								0
Storage Bay Dist (ft)	230		90		125		100	
Storage Blk Time (%)	4	1	0		0	8		25
Queuing Penalty (veh)	14	3	0		0	5		2

Intersection: 2: SW Ashford Street & SW Hall Blvd

Movement	EB	WB	NB	SB	SB
Directions Served	LR	LR	L	L	TR
Maximum Queue (ft)	65	61	33	46	15
Average Queue (ft)	24	24	4	13	1
95th Queue (ft)	54	52	22	40	13
Link Distance (ft)	317	597	298		720
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)				130	
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 3: SW Langtree Street & SW Hall Blvd

Movement	WB	NB	SB	SB
Directions Served	LR	TR	L	T
Maximum Queue (ft)	54	10	36	79
Average Queue (ft)	18	1	6	7
95th Queue (ft)	46	8	25	75
Link Distance (ft)	568	997		298
Upstream Blk Time (%)				0
Queuing Penalty (veh)				1
Storage Bay Dist (ft)			125	
Storage Blk Time (%)				0
Queuing Penalty (veh)				0

Intersection: 4: SW Durham Road & SW Hall Blvd

Movement	EB	EB	WB	WB	WB	NB	SB	SB
Directions Served	L	TR	L	T	R	LTR	L	TR
Maximum Queue (ft)	310	581	60	263	168	72	250	510
Average Queue (ft)	96	238	21	121	49	25	165	144
95th Queue (ft)	196	457	51	221	116	59	263	471
Link Distance (ft)		1206		1327		626		997
Upstream Blk Time (%)								1
Queuing Penalty (veh)								5
Storage Bay Dist (ft)	290		230		165		215	
Storage Blk Time (%)	0	4		2	0		6	0
Queuing Penalty (veh)	0	9		5	0		21	1

Nework Summary

Network wide Queuing Penalty: 64

Intersection: 1: SW Sattler Street & SW Hall Blvd

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	166	95	40	64	139	182	77	584
Average Queue (ft)	75	37	7	18	77	73	11	305
95th Queue (ft)	135	73	29	50	135	142	50	550
Link Distance (ft)		1140		920		720		569
Upstream Blk Time (%)								3
Queuing Penalty (veh)								0
Storage Bay Dist (ft)	230		90		125		100	
Storage Blk Time (%)				0	2	1		21
Queuing Penalty (veh)				0	9	1		3

Intersection: 2: Ashford Street & SW Hall Blvd

Movement	EB	WB	NB	SB	SB
Directions Served	LR	LR	L	L	TR
Maximum Queue (ft)	57	45	35	35	8
Average Queue (ft)	22	20	11	4	0
95th Queue (ft)	49	47	34	22	6
Link Distance (ft)	466	597	299		720
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)				130	
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 3: SW Langtree Street & SW Hall Blvd

Movement	WB	NB	SB	SB
Directions Served	LR	TR	L	T
Maximum Queue (ft)	46	26	48	6
Average Queue (ft)	19	1	10	0
95th Queue (ft)	43	12	36	0
Link Distance (ft)	568	997		299
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			125	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: SW Durham Road & SW Hall Blvd

Movement	EB	EB	WB	WB	WB	NB	SB	SB
Directions Served	L	TR	L	T	R	LTR	L	TR
Maximum Queue (ft)	189	294	34	1262	196	111	240	406
Average Queue (ft)	105	145	3	823	137	45	180	127
95th Queue (ft)	175	253	18	1521	244	92	262	290
Link Distance (ft)		1206		1327		626		997
Upstream Blk Time (%)				7				
Queuing Penalty (veh)				0				
Storage Bay Dist (ft)	290		230		165		215	
Storage Blk Time (%)		0		32	0		7	0
Queuing Penalty (veh)		0		119	3		16	1

Nework Summary

Network wide Queuing Penalty: 151

Exhibit R: Storm Drainage Report

HERITAGE CROSSING SUBDIVISION
TIGARD, OREGON

PRELIMINARY STORMWATER REPORT

DATE:	September 29, 2015
CLIENT:	Venture Properties, LLC. 4230 SW Galewood Street, Suite 100 Tigard, OR 97035
ENGINEERING CONTACT:	Paul Sellke, PE, GE PaulS@aks-eng.com
ENGINEERING FIRM:	AKS Engineering & Forestry, LLC

AKS ENGINEERING & FORESTRY

12965 SW Herman Road, Suite 100
Tualatin, OR 97062
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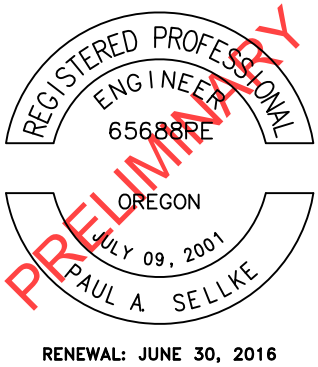

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PRELIMINARY STORMWATER REPORT
HERITAGE CROSSING SUBDIVISION
TIGARD, OREGON

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 by which the proposed stormwater system will be designed; and present the results of the preliminary analysis.

2.0 PROJECT LOCATION/DESCRIPTION

The proposed residential subdivision will be located at the property identified as 15435 SW Hall Boulevard, Tigard, Oregon 97224. The 9.10-acre parcel (Tax Lot 400, 2S 1 11DA) is situated on the west side of SW Hall Boulevard, east of SW Empire Terrace, south of SW Bellflower Street, and north of SW Hamlet Street in the city of Tigard, Washington County, Oregon.

The proposed project creates a 62-residential lot subdivision for single-family detached homes. Site improvements will include the construction of public streets and a stormwater quality facility in Tract A. Underground utilities constructed with the development will include a stormwater collection and conveyance system.

3.0 REGULATORY DESIGN CRITERIA

3.1 STORMWATER QUANTITY

Per *Clean Water Services (CWS) Design and Construction Standards Manual for Sanitary Sewer and Surface Water Management (R&O 07-20), Section 4.03 Water Quantity Control Requirements*, on-site detention is required when any of the following conditions exist:

1. *There is an identified downstream deficiency and the District or City determines that detention rather than conveyance system enlargement is the more effective solution.*

2. *There is an identified regional detention site within the boundary of the development.*

3. *Water quantity facilities are required by District-adopted watershed management plans or adopted subbasin master plans.*

A downstream analysis has been performed (see attached HydroCAD calculations and Section 6.3 for additional information) and a downstream deficiency has been identified at the intersection of SW Hall Boulevard and SW Durham Road. Therefore, the proposed project will provide stormwater detention per Clean Water Service's *Design and Construction for Sanitary Sewer and Surface Water Management Manual (R&O 07-20).*

3.2 STORMWATER QUALITY

Stormwater quality management for this project will be provided by utilizing an extended dry basin, which has been designed per the requirements of the Clean Water Services *Design and Construction Standards for Sanitary Sewer and Surface Water Management (R&O 07-20).*

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 8.5 computer software aided in the analysis. Representative CN numbers are obtained from the *Technical Release 55* and are included in Appendix G.

5.0 DESIGN PARAMETERS

5.1 DESIGN STORMS

Per CWS requirements, the stormwater analysis utilizes the 24-hour storm for the evaluation and design of the existing and proposed stormwater facilities. The following 24-hour rainfall intensities were used as the design storm for each recurrence interval:

Table 5.1

Recurrence Interval (Years)	Total Precipitation Depth (Inches)
2	2.50
10	3.45
25	3.90

5.2 PRE-DEVELOPED SITE CONDITIONS

5.2.1 Site Topography

Existing on-site grades generally vary from 1% to 2%, with a high point at +/- 202 feet, located in the northwest property corner, and a low point of +/- 189 feet, located near the southeast property corner. The site generally slopes from the northwest towards the low point located in the southeast property corner.

5.2.2 Land Use

The existing site consists of a single-family residential house, with associated outbuildings, paved driveway, and landscaping areas, surrounded by a farmed field.

5.3 SOIL TYPE

The soils beneath the project site and the associated drainage basins are classified as Aloha, Daytonk, and Huberly Silt Loams, according to the USDA Soil Survey for Washington County. The following table outlines the Hydrologic Soil Group rating for each soil type:

Table 5.3

NRCS Map Unit Identification	NRCS Soil Classification	Hydrologic Soil Group Rating
1	Aloha Silt Loam	C/D
15	Dayton Silt Loam	D
22	Huberly Silt Loam	C/D

For this project, the hydraulic analysis utilized the Hydrologic Soil Group rating of D for the soils anticipated across the project site and its associated drainage basins. Information on the soil types are included in the NRCS Soil Resource Report, which is attached as Appendix F at the end 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 the public streets and stormwater quality facility. Additionally, gently sloped residential building pads will be constructed adjacent to the public right-of-way.

5.4.2 Land Use

The site land use will remain single-family residential with the construction of a new 62-lot subdivision, with associated streets, sidewalk, and underground utilities.

5.4.3 Post-Developed Input Parameters

See HydroCAD Analysis in the attached appendices.

5.4.4 Description of Off-Site Contributing Basins

No off-site contributory basins drain onto the subject site. The surrounding subdivisions/properties drain towards and utilize their respective existing storm drainage systems and facilities.

6.0 DESIGN METHODOLOGY

6.1 PROPOSED STORMWATER CONDUIT SIZING AND INLET SPACING

The proposed on-site curb inlets have been spaced per CWS requirements to properly convey stormwater runoff. The proposed storm system pipes will be sized using Manning's equation to convey the peak flows from the 25-year storm event and will be addressed within the final stormwater report.

The proposed curb inlet locations within SW Hall Boulevard have been established per the requirements of the 2014 Oregon Department of Transportation (ODOT) Hydraulics Manual (Chapter 13, Appendix D, Inlet Capacity and Spacing). Per ODOT design requirements (Table A in Appendix D), the maximum stormwater flow width, measured away from the curb, for a roadway designated 45 miles per hour or slower is 2 feet into the vehicle travel lane. The proposed inlet spacing on SW Hall Boulevard meets this ODOT requirement as all stormwater

runoff will be contained within the 5.5 to 6.0 foot shoulder and below the allowable depth (see Appendix E of this report for detailed calculations).

6.2 PROPOSED STORMWATER QUALITY CONTROL FACILTY DESIGN

An extended dry basin has been designed per *Clean Water Services Design and Construction Standards for Sanitary Sewer and Surface Water Management (R&O 07-20)* to provide water quality treatment for the proposed site. To treat the runoff from impervious surfaces, the water quality flows will be routed through the extended dry basin located within Tract A (southeast corner of the project). The extended dry basin has been designed per CWS Section 4.05.6 *(R&O 07-20).*

A portion of the project site will be situated at grades and elevations that will not allow stormwater runoff to be directed and discharged into the proposed extended dry basin. Approximately 9,589 square feet of impervious sidewalk and road area will sheet flow and be conveyed to the east and north within the SW Hall Boulevard and SW Applewood Avenue rights-of-way. This untreatable area will be compensated for by redirecting and treating approximately 9,680 square feet of untreated existing SW Hall Boulevard impervious area within the proposed extended dry basin.

The water quality volume will be routed through the proposed extended dry basin, which will provide water quality treatment per CWS standards. The extended dry basin will discharge into the existing storm drain system within SW Hall Boulevard. Detailed calculations and checks against CWS criteria are included in the appendices of this report and typical construction cross-section and maintenance notes are included in Figure 6.

6.3 DOWNSTREAM ANALYSIS

A downstream analysis has been performed to assess the adequacy of downstream drainage systems. The proposed project will direct stormwater runoff towards two different downstream systems, located to the north and southeast. The majority of the subject site will maintain the pre-developed drainage pattern, discharging towards the southeast into the SW Hall Boulevard storm drain system. A portion of the subject site's stormwater runoff will be redirected towards the north into the SW Applewood Avenue storm system.

6.3.1 North System

The proposed project will direct stormwater runoff from the intersection of SW Applewood Street and SW Schmidt Loop north to the existing catch basins, located within a low point. The proposed area will direct storm runoff from approximately 5,053 square feet of impervious area (Basin 8S). Therefore, a downstream analysis of the SW Applewood storm system is not required as the new impervious area is negligible and less than 5,280 square feet (per CWS Section 2.04.2, Subsection m.3A).

6.3.2 Southeast System

The majority of the proposed site will direct stormwater runoff towards the southeast existing conveyance system located within SW Hall Boulevard. A downstream deficiency has been identified at a section of 24-inch storm drain beneath the intersection of SW Hall Boulevard and

SW Durham Road, approximately 1,100 feet south of the proposed site discharge point. Therefore, the proposed project will provide stormwater detention per CWS standards.

See the following section for additional detail regarding the proposed stormwater detention design, which meets CWS standards and criteria.

6.4 PROPOSED STORMWATER QUANTITY CONTROL FACILITY DESIGN

The downstream analysis identified a downstream deficiency and the proposed stormwater facility is designed to provide stormwater detention during storm events per CWS standards. The following table outlines the results of the detention pond outflow, which limits the post-development peak flows to less than pre-development peak flows for each storm event:

Table 6.4

Recurrence Interval (Years)	Peak Pre-Development Flows (cfs)	Peak Post-Development Flows (cfs)	Peak Increase or (Decrease) (cfs)
2	1.06	0.74	(0.32)
10	2.18	1.87	(0.31)
25	2.77	2.72	(0.05)

The extended dry basin has been designed per CWS requirements with 1-foot freeboard during the 25-year storm event and a permanent pool storage depth of 0.4 feet.

The proposed extended dry basin has sufficient capacity to detain the required post-developed site flows to the pre-developed site flows and meets the requirements established by Clean Water Service's *Design and Construction for Sanitary Sewer and Surface Water Management Manual (R&O 07-20)*.

SCALE 1" = 300 FEET

300 0 120 180 240 300

FIGURE 1: VICINITY MAP DATE: 09-28-2015

HERITAGE CROSSING SUBDIVISION

DRAWN BY: DS	CHECKED BY: PAS	DWG: 3876 VICINITY	JOB: 3876

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD SUITE 100
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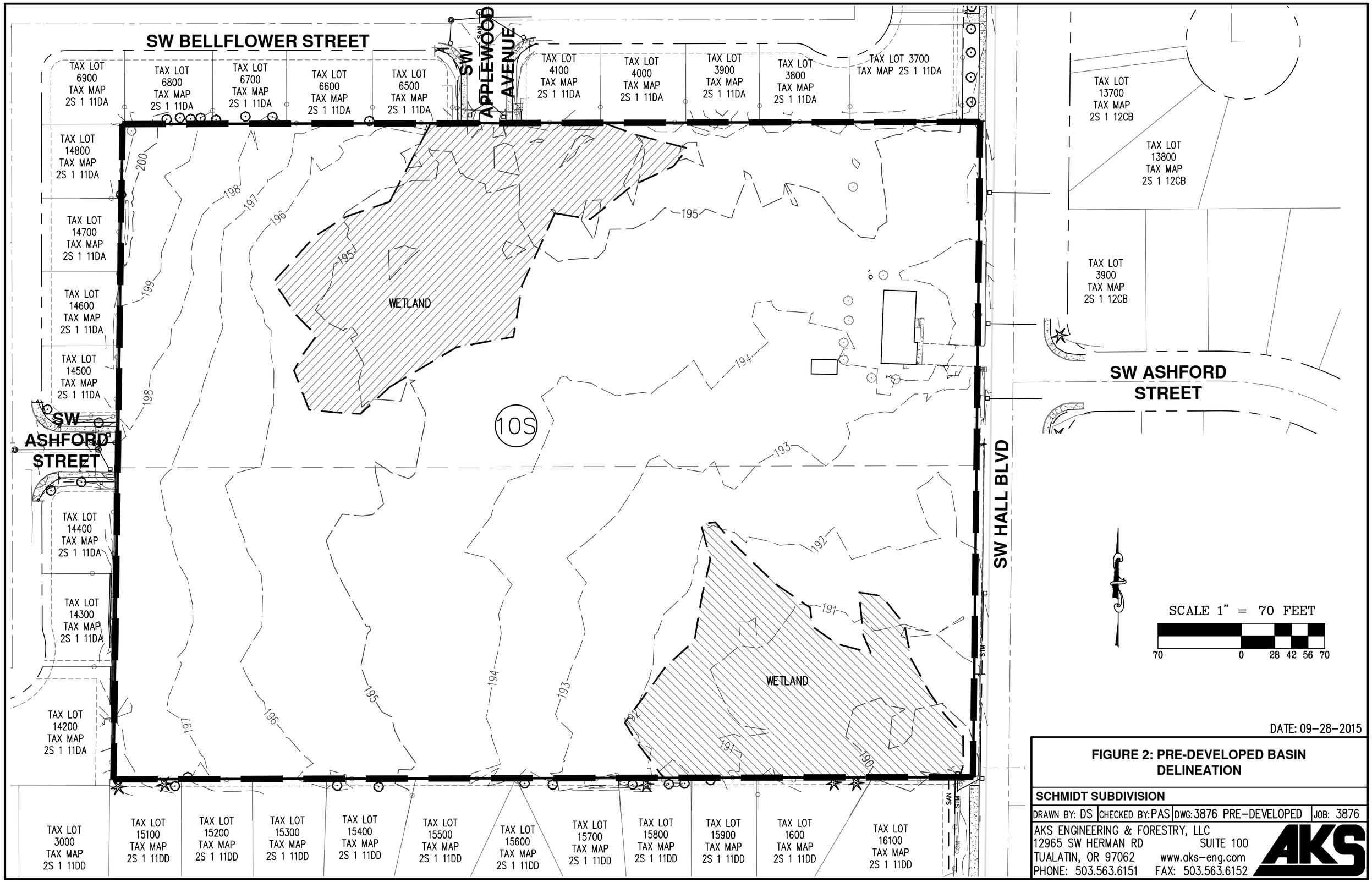

DATE: 09-28-2015

FIGURE 2: PRE-DEVELOPED BASIN DELINEATION

SCHMIDT SUBDIVISION

DRAWN BY: DS	CHECKED BY: PAS	DWG: 3876 PRE-DEVELOPED	JOB: 3876

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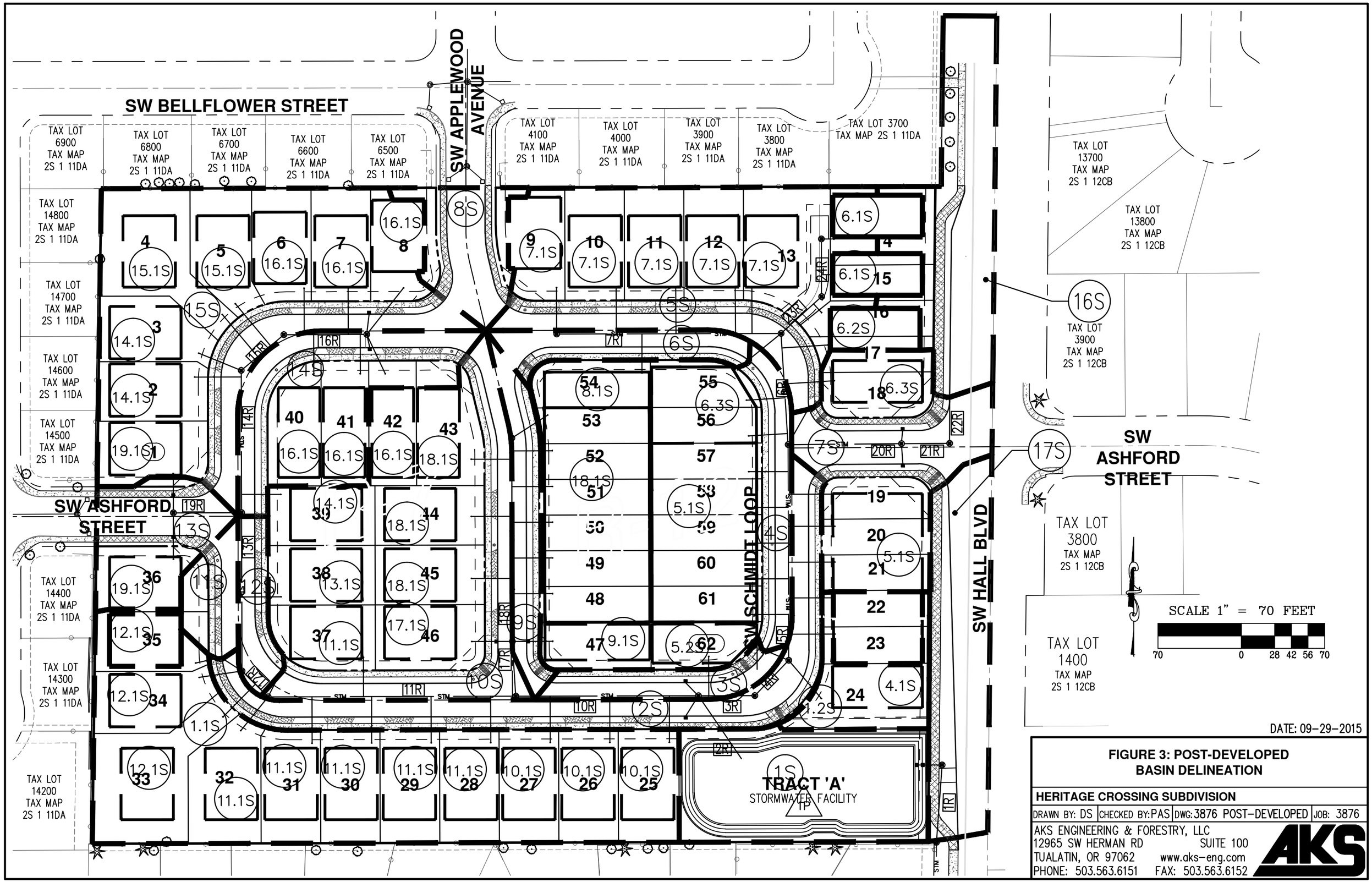
SW BELLFLOWER STREET
SW APPLEWOOD AVENUE
SW ASHFORD STREET
SW SCHMIDT LOOP
SW HALL BLVD
SW ASHFORD STREET
TAX LOT 6900 TAX MAP 2S 1 11DA
TAX LOT 6800 TAX MAP 2S 1 11DA
TAX LOT 6700 TAX MAP 2S 1 11DA
TAX LOT 6600 TAX MAP 2S 1 11DA
TAX LOT 6500 TAX MAP 2S 1 11DA
TAX LOT 4100 TAX MAP 2S 1 11DA
TAX LOT 4000 TAX MAP 2S 1 11DA
TAX LOT 3900 TAX MAP 2S 1 11DA
TAX LOT 3800 TAX MAP 2S 1 11DA
TAX LOT 3700 TAX MAP 2S 1 11DA
TAX LOT 13700 TAX MAP 2S 1 12CB
TAX LOT 13800 TAX MAP 2S 1 12CB
TAX LOT 3900 TAX MAP 2S 1 12CB
TAX LOT 3800 TAX MAP 2S 1 12CB
TAX LOT 1400 TAX MAP 2S 1 12CB
TAX LOT 14800 TAX MAP 2S 1 11DA
TAX LOT 14700 TAX MAP 2S 1 11DA
TAX LOT 14600 TAX MAP 2S 1 11DA
TAX LOT 14500 TAX MAP 2S 1 11DA
TAX LOT 14400 TAX MAP 2S 1 11DA
TAX LOT 14300 TAX MAP 2S 1 11DA
TAX LOT 14200 TAX MAP 2S 1 11DA
TRACT 'A'
STORMWATER FACILITY
SCALE 1" = 70 FEET
70 0 28 42 56 70
DATE: 09-29-2015
FIGURE 3: POST-DEVELOPED BASIN DELINEATION
HERITAGE CROSSING SUBDIVISION
DRAWN BY: DS
CHECKED BY: PAS
DWG: 3876 POST-DEVELOPED
JOB: 3876
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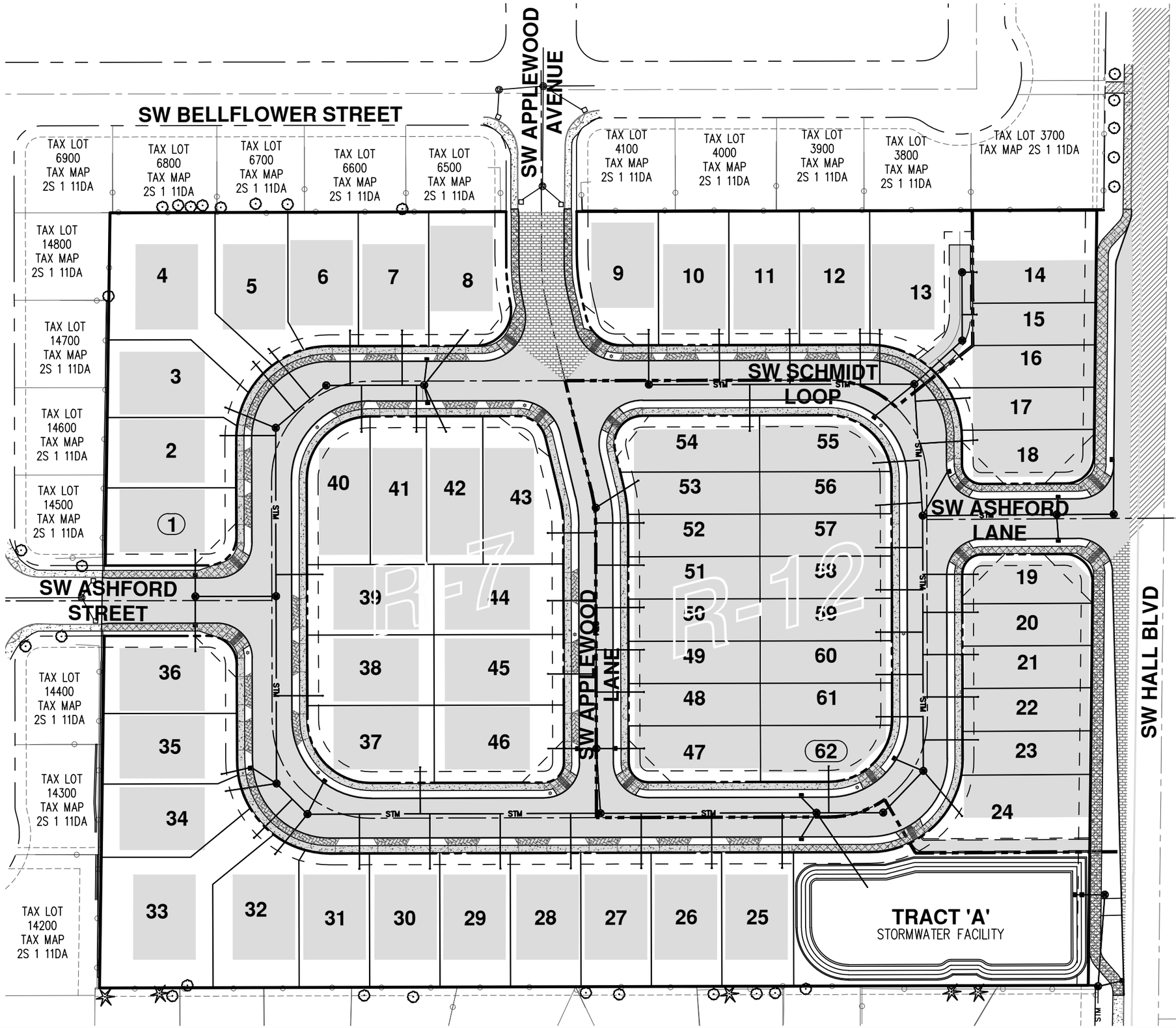

POST-DEVELOPED IMPERVIOUS AREA TABLE

PROPOSED IMPERVIOUS AREA RECEIVING TREATMENT	268,430 SF
PROPOSED UNTREATABLE IMPERVIOUS AREA	9,589 SF
EXISTING UNTREATED IMPERVIOUS AREA RECEIVING TREATMENT WITHIN PROPOSED FACILITY	9,680 SF
REQUIRED IMPERVIOUS AREA TO TREAT	278,019 SF
IMPERVIOUS AREA TREATMENT PROVIDED	278,110 SF
NET TOTAL	+91 SF

— INDICATES PROPOSED IMPERVIOUS AREA RECEIVING TREATMENT
*MAXIMUM IMPERVIOUS AREA OF 2,640 SQ. FT. PER LOT IS ASSUMED

— INDICATES PROPOSED IMPERVIOUS AREA UNABLE TO BE TREATED

— INDICATES EXISTING UNTREATED IMPERVIOUS AREA TO BE TREATED WITHIN THE PROPOSED FACILITY

SCALE 1" = 70 FEET

70 0 28 42 56 70

DATE: 09-29-2015

FIGURE 4: WATER QUALITY TREATMENT

HERITAGE CROSSING SUBDIVISION

DRAWN BY: DS | CHECKED BY: PAS | DWG: 3876 TREATMENT | JOB: 3876

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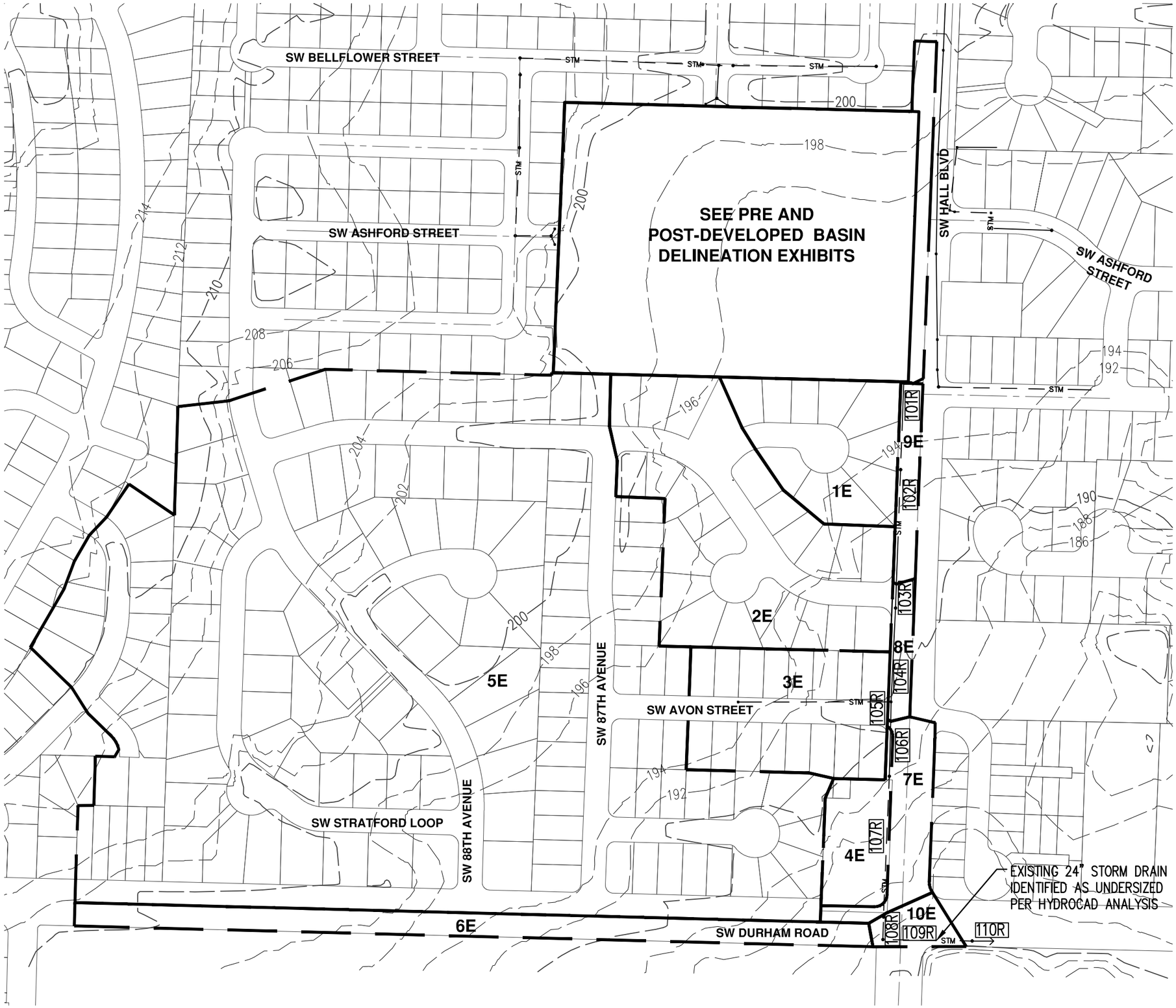

SCALE 1" = 200 FEET

200 0 80 120 160 200

DATE: 09-28-2015

FIGURE 5: DOWNSTREAM BASIN DELINEATION

HERITAGE CROSSING SUBDIVISION

DRAWN BY: DS	CHECKED BY: PAS	DWG: 3876 DOWNSTREAM	JOB: 3876

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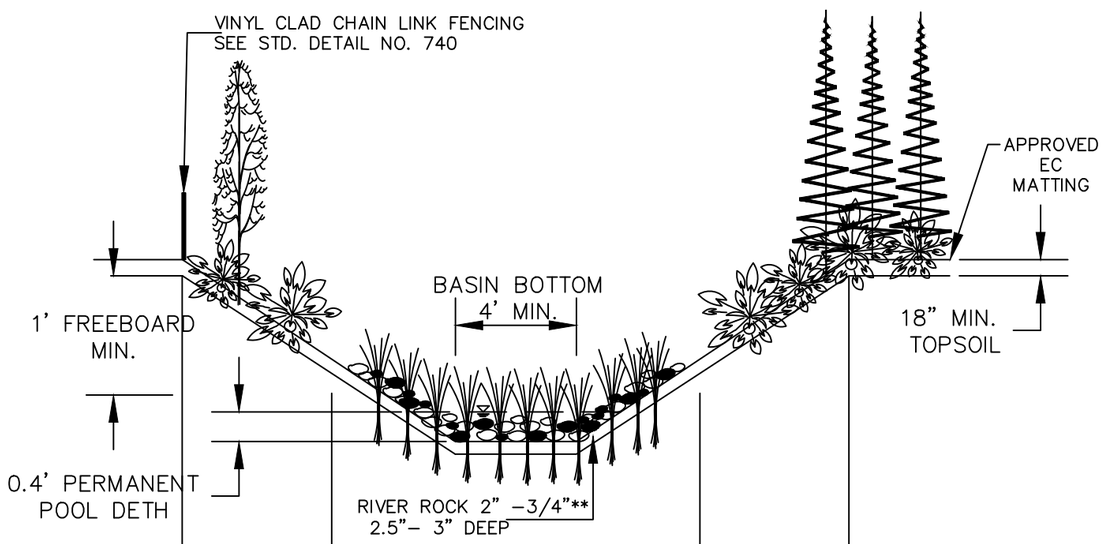

BASIN AREA	FREEBOARD AREA	TREATMENT AREA 4' MINIMUM WIDTH			FREEBOARD AREA	BUFFER/MITIGATION AREA
EC MATTING	ECONOJUTE*	COCONUT FIBER OR GEOJUTE PLUS*			ECONOJUTE*	ECONOJUTE* (S> 20%)
SEED MIX	LOW GROW MIX SEE NOTE #5	NONE			LOW GROW MIX SEE NOTE #5	AS APPROVED BY DISTRICT OR CITY
MAX. SLOPE	3:1	3:1	FLAT BOTTOM	3:1	3:1	NA

* OR AS APPROVED
** IF REQUIRED

NOTES:
1. REFER TO APPENDIX A, CWS DESIGN & CONSTRUCTION STANDARDS, FOR LANDSCAPING REQUIREMENTS INCLUDING TREE PLACEMENT, TOPSOIL AND PLANTING SPECIFICATIONS.
2. PROVIDE IRRIGATION AS APPROVED BY CWS.
3. JUTE MATTING– GEOJUTE PLUS IN TREATMENT AREA, ECONOJUTE FOR ALL OTHER AREAS, OR SIMILIAR FABRICS. COCONUT FIBER IS ALSO ACCEPTABLE.
4. 18–INCHES OF TOPSOIL SHALL BE PLACED THROUGHOUT THE WATER QUALITY TRACT.
5. FREEBOARD AREA SEED MIX, DWARF TALL FESCUE 40%, DWARF PERENIAL RYE 30%, CREEPING RED FESCUE 25%, COLONIAL BENT GRASS 5%. APPLY AT A RATE OF 120# / ACRE.

WATER QUALITY EXTENDED DRY BASIN
NTS

CONSTRUCTION

1. WATER QUALITY BASIN SHALL BE OVER–EXCAVATED AND FILLED TO FINAL GRADE WITH 18–INCH AMENDED TOPSOIL. TOPSOIL AMENDMENTS SHALL BE GARDEN COMPOST, NOT CONVENTIONAL FERTILIZER AMENDMENTS.
2. A BIODEGRADABLE EROSION CONTROL MATTING SHALL BE PLACED OVER THE TOPSOIL THROUGHOUT THE BASIN CROSS SECTION, FABRIC SHALL BE HELD IN PLACE IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION REQUIREMENTS. ANCHOR SPACING SHALL BE BASED ON 3 FPS FLOW OVER THE FABRIC.
   A. UP TO HIGH WATER MARK – HIGH–DENSITY JUTE MATTING (GEOJUTE PLUS OR OTHER APPROVED EQUAL)
   B. ALL OTHER AREAS – LOW–DENSITY JUTE MATTING (ECONOJUTE OR OTHER APPROVED EQUAL)
3. IF REQUIRED, 2.5–3 INCHES OF 2"–$\frac{3}{4}$" RIVER RUN ROCK SHALL BE PLACED OVER THE MATTING EVENLY THROUGHOUT THE LENGTH AND WIDTH OF THE BASIN.
4. PLANT MATERIALS SHALL BE PLACED IN ACCORDANCE WITH THE PLAN AND PLANT TABLE AS SHOWN ON APPROVED PLANS.
   A. SATURATED ZONE (FLAT BOTTOM TO 0.4' PERMANENT POOL) – PLANTED WITH RUSHES, SEDGES, AND OTHER WETLAND SPECIES (OXYGENATORS).
   B. TRANSITION ZONE (PERMANENT POOL TO HIGH WATER MARK) – PLANTED WITH SEDGES, RUSHES, PERENNIALS, FERN AND SHRUBS WHICH TOLERATE MOIST CONDITIONS.
   C. DRY ZONE (ABOVE HIGH WATER MARK) – PLANTED WITH SELF–SUSTAINING, LOW MAINTENANCE GRASS, PERENNIALS AND SHRUBS.
5. EXTENDED DRY BASIN PLANTINGS CAN BE DEEMED "SUBSTANTIALLY COMPLETE" ONCE ACTIVE GREEN GROWTH HAS OCCURRED TO AN AVERAGE GROWTH OF 3" AND PLANT DENSITY IS AN AVERAGE OF APPROX. 6 PLANTS (MINIMUM 1–INCH PLUGS OR EQUIVALENT) PER SQUARE FOOT.
6. THE FACILITY SHALL BE DEEMED ACCEPTABLE TO BEGIN THE MAINTENANCE PERIOD WHEN PLANT GROWTH AND DENSITY MATCHES THE ENGINEER'S DESIGN AS SHOWN ON THE APPROVED PLANS AND ALL OTHER REQUIREMENTS HAVE BEEN MET. THE ENGINEER MUST CERTIFY THE FACILITY TO BE FUNCTIONAL, IN ACCORDANCE WITH THE APPROVED PLAN DESIGN TO BEGIN THE TWO–YEAR MAINTENANCE PERIOD.

MAINTENANCE

1. THE PERMITTEE IS RESPONSIBLE FOR THE MAINTENANCE OF THIS FACILITY FOR A MINIMUM OF TWO YEARS FOLLOWING CONSTRUCTION AND ACCEPTANCE OF THIS FACILITY PER CHAPTER 2.
2. IRRIGATION IS TO BE PROVIDED PER SEPARATE IRRIGATION PLAN AS APPROVED.
   NOTE: IRRIGATION NEEDS ARE TO BE MET USING A TEMPORARY IRRIGATION SYSTEM WITH A TIMER DURING THE DRY SEASON. SYSTEMS SHOULD BE WINTERIZED DURING THE WET SEASON TO ASSURE LONGEVITY AND GUARD AGAINST DAMAGE FROM FREEZING TEMPERATURES. WATER SOURCE SHALL BE AS SHOWN ON THE APPROVED PLANS.
3. ENGINEER OR OWNERS REPRESENTATIVE IS TO VISIT AND EVALUATE THE SITE A MINIMUM OF ONCE ANNUALLY (FALL). THE LANDSCAPING SHALL BE EVALUATED AND REPLANTED AS NECESSARY TO ENSURE A MINIMUM OF 80% SURVIVAL RATE OF THE REQUIRED VEGETATION AND 90% AERIAL COVERAGE.
4. THE FACILITY SHALL BE RE–EXCAVATED AND PLANTED IF SILTATION GREATER THAN 4 INCHES IN DEPTH OCCURS WITHIN THE TWO–YEAR MAINTENANCE PERIOD.

WATER QUALITY EXTENDED DRY BASIN
CONSTRUCTION & MAINTENANCE NOTES

DATE: 09–29–2015

FIGURE: 6 EXTENDED DRY BASIN DETAILS

HERITAGE CROSSING SUBDIVISION

DRAWN BY: DS	CHECKED BY: PAS	DWG: 3876 POND DETAILS	JOB: 3876

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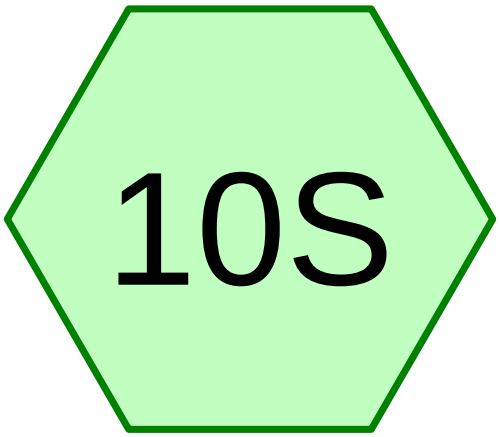
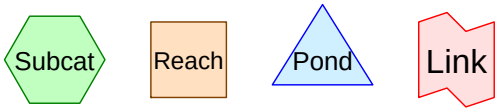
APPENDIX A

PRE-DEVELOPED AND POST-DEVELOPED SITE 2-YEAR YEAR STORM EVENT ANALYSIS

PRE-DEVELOPED SITE



Pre-Developed Onsite



Drainage Diagram for 3876 HERITAGE, PRE-DEVELOPED
Prepared by AKS Engineering & Forestry (PAS), Printed 9/29/2015
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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
303,703	80	Pasture/grassland/range, Good, HSG D (10S)
13,855	84	50-75% Grass cover, Fair, HSG D (10S)
75,894	84	Wetland Area (10S)
1,986	98	Existing House & Outbuildings (10S)
1,085	98	Sidewalks & concrete pad areas (10S)
396,523		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points x 3
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10S: Pre-Developed Onsite Runoff Area=396,523 sf 0.77% Impervious Runoff Depth>0.93"
Flow Length=379' Tc=37.3 min CN=81/98 Runoff=1.06 cfs 30,759 cf

Total Runoff Area = 396,523 sf Runoff Volume = 30,759 cf Average Runoff Depth = 0.93"
99.23% Pervious = 393,452 sf 0.77% Impervious = 3,071 sf

Summary for Subcatchment 10S: Pre-Developed Onsite

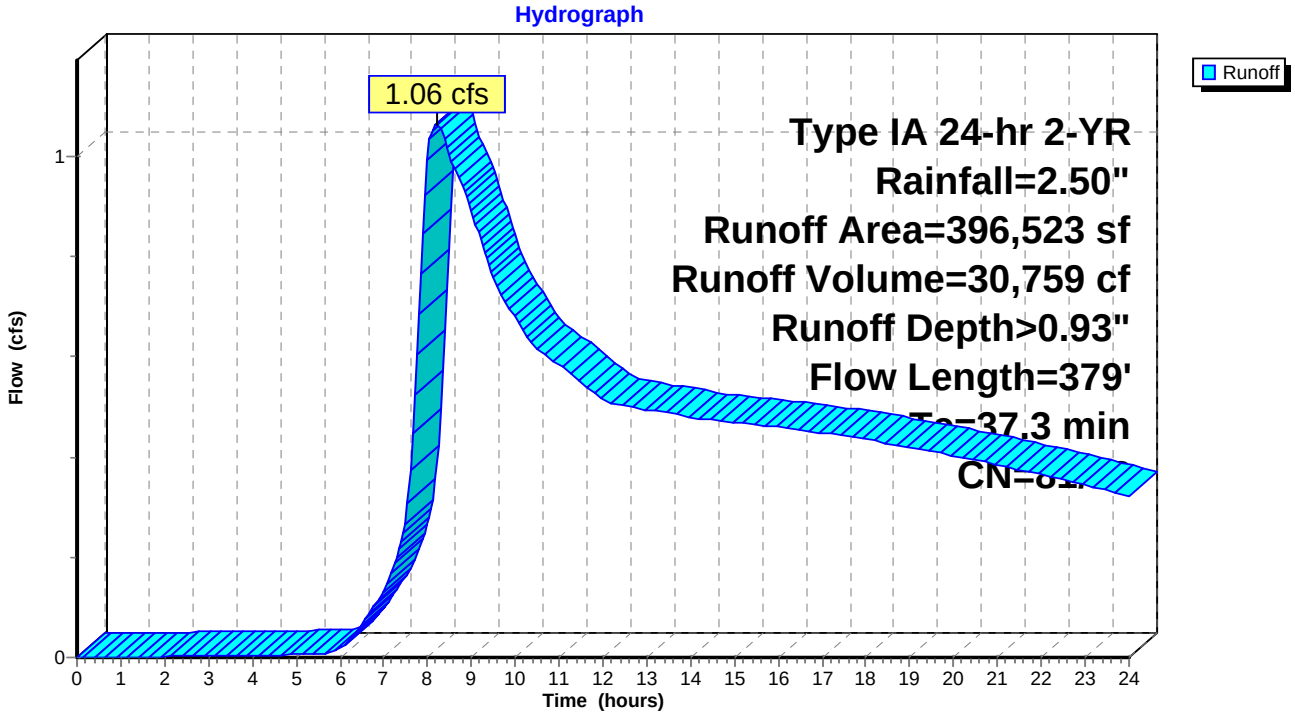
Runoff = 1.06 cfs @ 8.21 hrs, Volume= 30,759 cf, Depth> 0.93"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

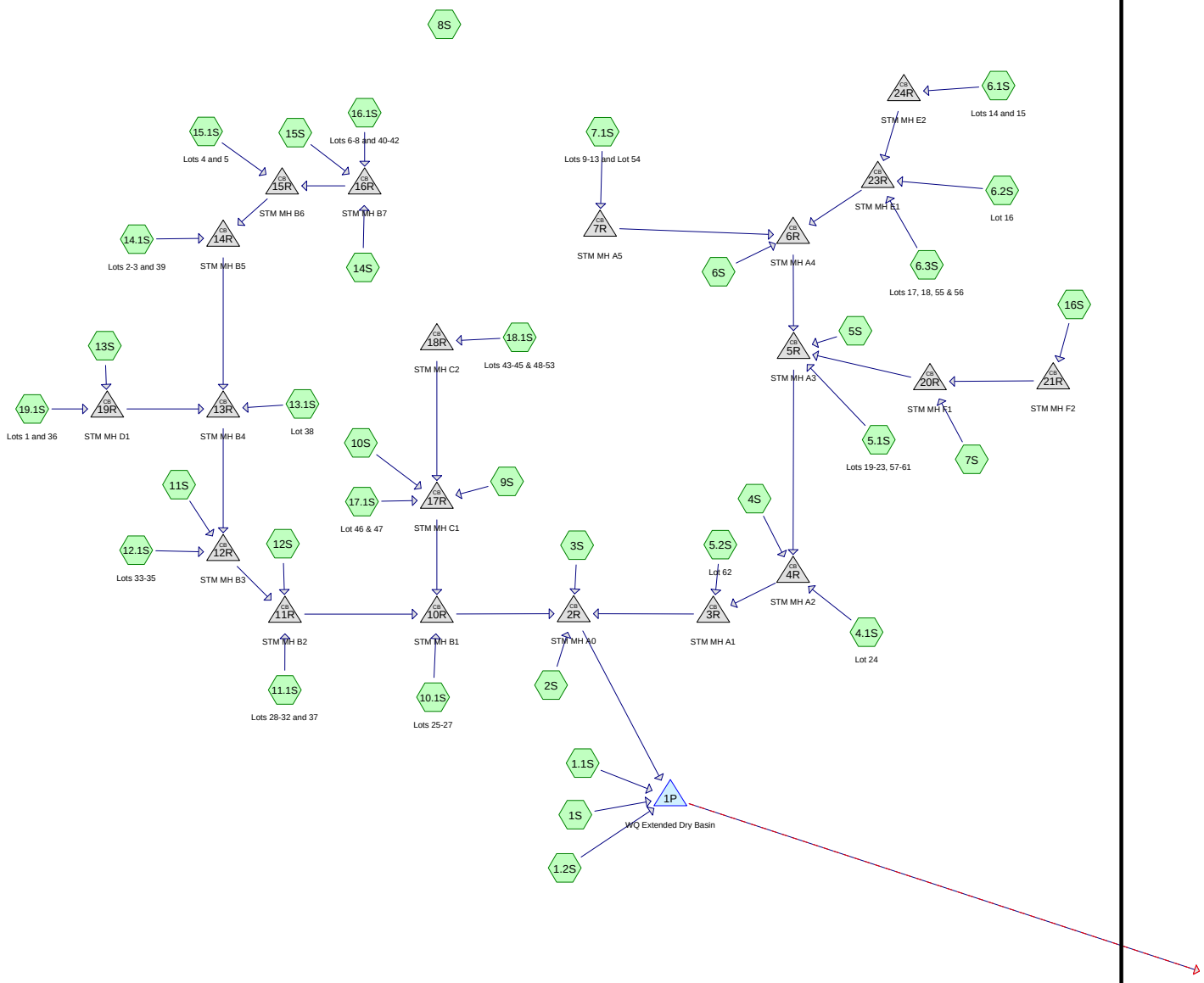
	Area (sf)	CN	Description
	303,703	80	Pasture/grassland/range, Good, HSG D
*	1,986	98	Existing House & Outbuildings
*	1,085	98	Sidewalks & concrete pad areas
	13,855	84	50-75% Grass cover, Fair, HSG D
*	75,894	84	Wetland Area
	396,523	81	Weighted Average
	393,452	81	Pervious Area
	3,071	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.2	300	0.0100	0.14		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.50"
2.1	79	0.0080	0.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
37.3	379	Total			

Subcatchment 10S: Pre-Developed Onsite



POST-DEVELOPED SITE



Drainage Diagram for 3876 HERITAGE, POST-DEVELOPED, MIXED
Prepared by AKS Engineering & Forestry (PAS), Printed 9/29/2015
HydroCAD® 8.50 s/n 005096 © 2007 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
111,161	80	>75% Grass cover, Good, HSG D (1.1S,1.2S,2S,3S,4S,5S,6S,7S,8S,9S,10S,11S,12S,13S,14S
5,280	98	1 Lot @ 2640 sf (6.2S,13.1S)
5,280	98	1 Lots @ 2640 sf (4.1S,5.2S)
26,400	98	10 Lots @ 2640 sf (5.1S)
21,120	98	2 Lots @ 2640 sf (6.1S,15.1S,17.1S,19.1S)
23,760	98	3 Lots @ 2640 sf (10.1S,12.1S,14.1S)
10,560	98	4 Lots @ 2640 sf (6.3S)
47,520	98	6 Lots @ 2640 sf (7.1S,11.1S,16.1S)
23,760	98	9 Lots @ 2640 sf (18.1S)
1,458	98	Existing SW Hall Blvd Pavement (7S)
8,223	98	Existing SW Hall Boulevard (16S)
1,426	98	Pedestrian Access (16S)
980	98	Pedestrian Path (1.2S)
16,967	98	Pond surface/WQ access (1S)
1,848	98	SW Hall Widening (16S)
88,581	98	Street/Sidewalk/Etc. (2S,3S,4S,5S,6S,7S,8S,9S,10S,11S,12S,13S,14S,15S)
394,324		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points x 3
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1.1S: Runoff Area=37,143 sf 0.00% Impervious Runoff Depth>0.87"
Flow Length=300' Slope=0.0100 '/' Tc=35.2 min CN=80/0 Runoff=0.09 cfs 2,690 cf

Subcatchment1.2S: Runoff Area=6,608 sf 14.83% Impervious Runoff Depth>1.09"
Tc=5.0 min CN=80/98 Runoff=0.04 cfs 601 cf

Subcatchment1S: Runoff Area=16,967 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=0/98 Runoff=0.22 cfs 3,205 cf

Subcatchment2S: Runoff Area=18,351 sf 82.42% Impervious Runoff Depth>2.02"
Tc=5.0 min CN=80/98 Runoff=0.21 cfs 3,095 cf

Subcatchment3S: Runoff Area=4,978 sf 79.53% Impervious Runoff Depth>1.98"
Tc=5.0 min CN=80/98 Runoff=0.06 cfs 823 cf

Subcatchment4.1S: Lot 24 Runoff Area=2,640 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=0/98 Runoff=0.03 cfs 499 cf

Subcatchment4S: Runoff Area=6,429 sf 75.28% Impervious Runoff Depth>1.93"
Tc=5.0 min CN=80/98 Runoff=0.07 cfs 1,032 cf

Subcatchment5.1S: Lots 19-23, 57-61 Runoff Area=26,400 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=0/98 Runoff=0.35 cfs 4,987 cf

Subcatchment5.2S: Lot 62 Runoff Area=2,640 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=0/98 Runoff=0.03 cfs 499 cf

Subcatchment5S: Runoff Area=23,432 sf 38.90% Impervious Runoff Depth>1.42"
Tc=5.0 min CN=80/98 Runoff=0.18 cfs 2,779 cf

Subcatchment6.1S: Lots 14 and 15 Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=0/98 Runoff=0.07 cfs 997 cf

Subcatchment6.2S: Lot 16 Runoff Area=2,640 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=0/98 Runoff=0.03 cfs 499 cf

Subcatchment6.3S: Lots 17, 18, 55 & 56 Runoff Area=10,560 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=0/98 Runoff=0.14 cfs 1,995 cf

Subcatchment6S: Runoff Area=5,622 sf 79.19% Impervious Runoff Depth>1.98"
Tc=5.0 min CN=80/98 Runoff=0.06 cfs 927 cf

Subcatchment7.1S: Lots 9-13 and Lot 54 Runoff Area=15,840 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=0/98 Runoff=0.21 cfs 2,992 cf

Subcatchment7S: Runoff Area=10,246 sf 80.17% Impervious Runoff Depth>1.99"
Tc=5.0 min CN=80/98 Runoff=0.12 cfs 1,702 cf

Subcatchment8S: Runoff Area=9,397 sf 53.77% Impervious Runoff Depth>1.63"
Tc=5.0 min CN=80/98 Runoff=0.08 cfs 1,275 cf

Subcatchment9S: Runoff Area=6,803 sf 72.79% Impervious Runoff Depth>1.89"
Tc=5.0 min CN=80/98 Runoff=0.07 cfs 1,072 cf

Subcatchment10.1S: Lots 25-27 Runoff Area=7,920 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=0/98 Runoff=0.10 cfs 1,496 cf

Subcatchment10S: Runoff Area=10,606 sf 89.60% Impervious Runoff Depth>2.12"
Tc=5.0 min CN=80/98 Runoff=0.13 cfs 1,877 cf

Subcatchment11.1S: Lots 28-32 and 37 Runoff Area=15,840 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=0/98 Runoff=0.21 cfs 2,992 cf

Subcatchment11S: Runoff Area=4,142 sf 52.51% Impervious Runoff Depth>1.61"
Tc=5.0 min CN=80/98 Runoff=0.04 cfs 556 cf

Subcatchment12.1S: Lots 33-35 Runoff Area=7,920 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=0/98 Runoff=0.10 cfs 1,496 cf

Subcatchment12S: Runoff Area=3,982 sf 88.35% Impervious Runoff Depth>2.11"
Tc=5.0 min CN=80/98 Runoff=0.05 cfs 699 cf

Subcatchment13.1S: Lot 38 Runoff Area=2,640 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=0/98 Runoff=0.03 cfs 499 cf

Subcatchment13S: Runoff Area=7,162 sf 65.64% Impervious Runoff Depth>1.79"
Tc=5.0 min CN=80/98 Runoff=0.07 cfs 1,070 cf

Subcatchment14.1S: Lots 2-3 and 39 Runoff Area=7,920 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=0/98 Runoff=0.10 cfs 1,496 cf

Subcatchment14S: Runoff Area=12,555 sf 50.55% Impervious Runoff Depth>1.58"
Tc=5.0 min CN=80/98 Runoff=0.11 cfs 1,657 cf

Subcatchment15.1S: Lots 4 and 5 Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=0/98 Runoff=0.07 cfs 997 cf

Subcatchment15S: Runoff Area=28,463 sf 28.41% Impervious Runoff Depth>1.28"
Tc=5.0 min CN=80/98 Runoff=0.19 cfs 3,032 cf

Subcatchment16.1S: Lots 6-8 and 40-42 Runoff Area=15,840 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=0/98 Runoff=0.21 cfs 2,992 cf

Subcatchment16S: Runoff Area=17,758 sf 64.74% Impervious Runoff Depth>1.78"
Tc=5.0 min CN=80/98 Runoff=0.18 cfs 2,634 cf

Subcatchment17.1S: Lot 46 & 47 Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=0/98 Runoff=0.07 cfs 997 cf

Subcatchment18.1S: Lots 43-45 & 48-53 Runoff Area=23,760 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=0/98 Runoff=0.31 cfs 4,488 cf

Subcatchment 19.1S: Lots 1 and 36 Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=0/98 Runoff=0.07 cfs 997 cf

Pond 1P: WQ Extended Dry Basin Peak Elev=188.89' Storage=29,970 cf Inflow=4.02 cfs 60,371 cf
Outflow=0.74 cfs 31,663 cf

Pond 2R: STM MH A0 Peak Elev=188.89' Inflow=3.69 cfs 53,875 cf
18.0" x 64.1' Culvert Outflow=3.69 cfs 53,875 cf

Pond 3R: STM MH A1 Peak Elev=188.89' Inflow=1.47 cfs 21,541 cf
15.0" x 47.4' Culvert Outflow=1.47 cfs 21,541 cf

Pond 4R: STM MH A2 Peak Elev=188.90' Inflow=1.44 cfs 21,043 cf
15.0" x 41.0' Culvert Outflow=1.44 cfs 21,043 cf

Pond 5R: STM MH A3 Peak Elev=189.36' Inflow=1.33 cfs 19,512 cf
15.0" x 181.1' Culvert Outflow=1.33 cfs 19,512 cf

Pond 6R: STM MH A4 Peak Elev=189.71' Inflow=0.52 cfs 7,410 cf
12.0" x 93.5' Culvert Outflow=0.52 cfs 7,410 cf

Pond 7R: STM MH A5 Peak Elev=190.46' Inflow=0.21 cfs 2,992 cf
12.0" x 188.4' Culvert Outflow=0.21 cfs 2,992 cf

Pond 10R: STM MH B1 Peak Elev=188.90' Inflow=1.94 cfs 28,415 cf
15.0" x 153.1' Culvert Outflow=1.94 cfs 28,415 cf

Pond 11R: STM MH B2 Peak Elev=189.60' Inflow=1.25 cfs 18,484 cf
12.0" x 208.1' Culvert Outflow=1.25 cfs 18,484 cf

Pond 12R: STM MH B3 Peak Elev=189.83' Inflow=1.00 cfs 14,793 cf
12.0" x 30.8' Culvert Outflow=1.00 cfs 14,793 cf

Pond 13R: STM MH B4 Peak Elev=190.47' Inflow=0.85 cfs 12,741 cf
12.0" x 132.9' Culvert Outflow=0.85 cfs 12,741 cf

Pond 14R: STM MH B5 Peak Elev=191.10' Inflow=0.68 cfs 10,175 cf
12.0" x 127.7' Culvert Outflow=0.68 cfs 10,175 cf

Pond 15R: STM MH B6 Peak Elev=191.38' Inflow=0.57 cfs 8,679 cf
12.0" x 30.6' Culvert Outflow=0.57 cfs 8,679 cf

Pond 16R: STM MH B7 Peak Elev=191.82' Inflow=0.50 cfs 7,682 cf
12.0" x 69.6' Culvert Outflow=0.50 cfs 7,682 cf

Pond 17R: STM MH C1 Peak Elev=188.91' Inflow=0.59 cfs 8,434 cf
12.0" x 46.1' Culvert Outflow=0.59 cfs 8,434 cf

Pond 18R: STM MH C2 Peak Elev=189.43' Inflow=0.31 cfs 4,488 cf
12.0" x 170.7' Culvert Outflow=0.31 cfs 4,488 cf

Pond 19R: STM MH D1 Peak Elev=192.24' Inflow=0.14 cfs 2,067 cf
12.0" x 57.3' Culvert Outflow=0.14 cfs 2,067 cf

Pond 20R: STM MH F1 Peak Elev=189.67' Inflow=0.29 cfs 4,336 cf
12.0" x 95.2' Culvert Outflow=0.29 cfs 4,336 cf

Pond 21R: STM MH F2 Peak Elev=189.95' Inflow=0.18 cfs 2,634 cf
12.0" x 40.4' Culvert Outflow=0.18 cfs 2,634 cf

Pond 23R: STM MH E1 Peak Elev=189.93' Inflow=0.24 cfs 3,491 cf
12.0" x 46.0' Culvert Outflow=0.24 cfs 3,491 cf

Pond 24R: STM MH E2 Peak Elev=190.17' Inflow=0.07 cfs 997 cf
12.0" x 48.4' Culvert Outflow=0.07 cfs 997 cf

Total Runoff Area = 394,324 sf Runoff Volume = 61,646 cf Average Runoff Depth = 1.88"
28.19% Pervious = 111,161 sf 71.81% Impervious = 283,163 sf

Summary for Subcatchment 1.1S:

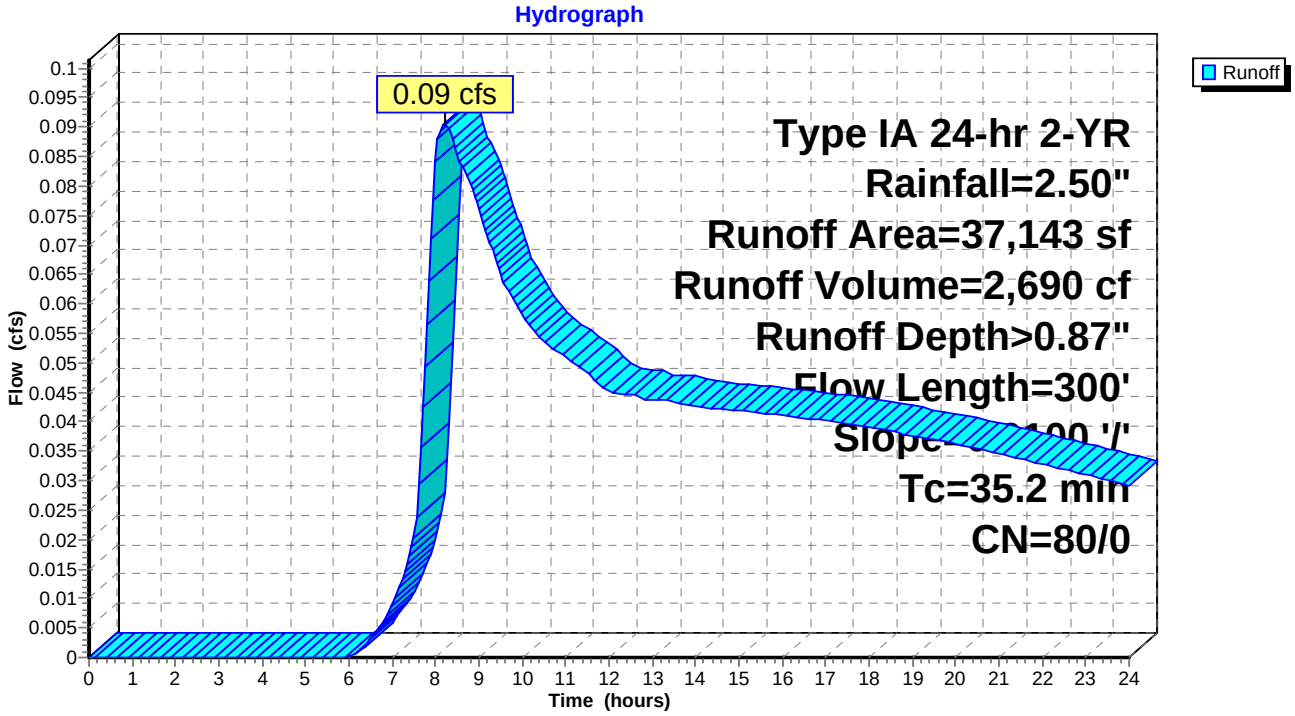
Runoff = 0.09 cfs @ 8.21 hrs, Volume= 2,690 cf, Depth> 0.87"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

Area (sf)	CN	Description
37,143	80	>75% Grass cover, Good, HSG D
37,143	80	Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.2	300	0.0100	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.50"

Subcatchment 1.1S:



Summary for Subcatchment 1.2S:

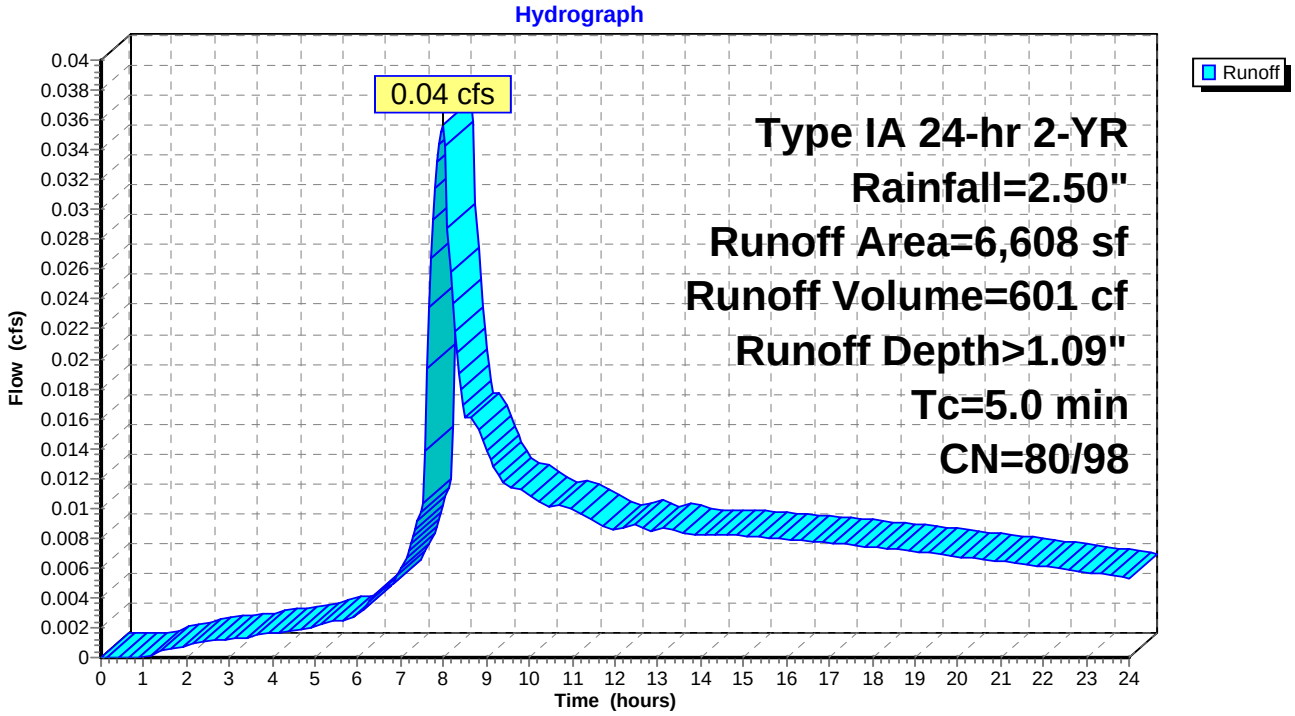
Runoff = 0.04 cfs @ 7.98 hrs, Volume= 601 cf, Depth> 1.09"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	980	98	Pedestrian Path
	5,628	80	>75% Grass cover, Good, HSG D
	6,608	83	Weighted Average
	5,628	80	Pervious Area
	980	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1.2S:



Summary for Subcatchment 1S:

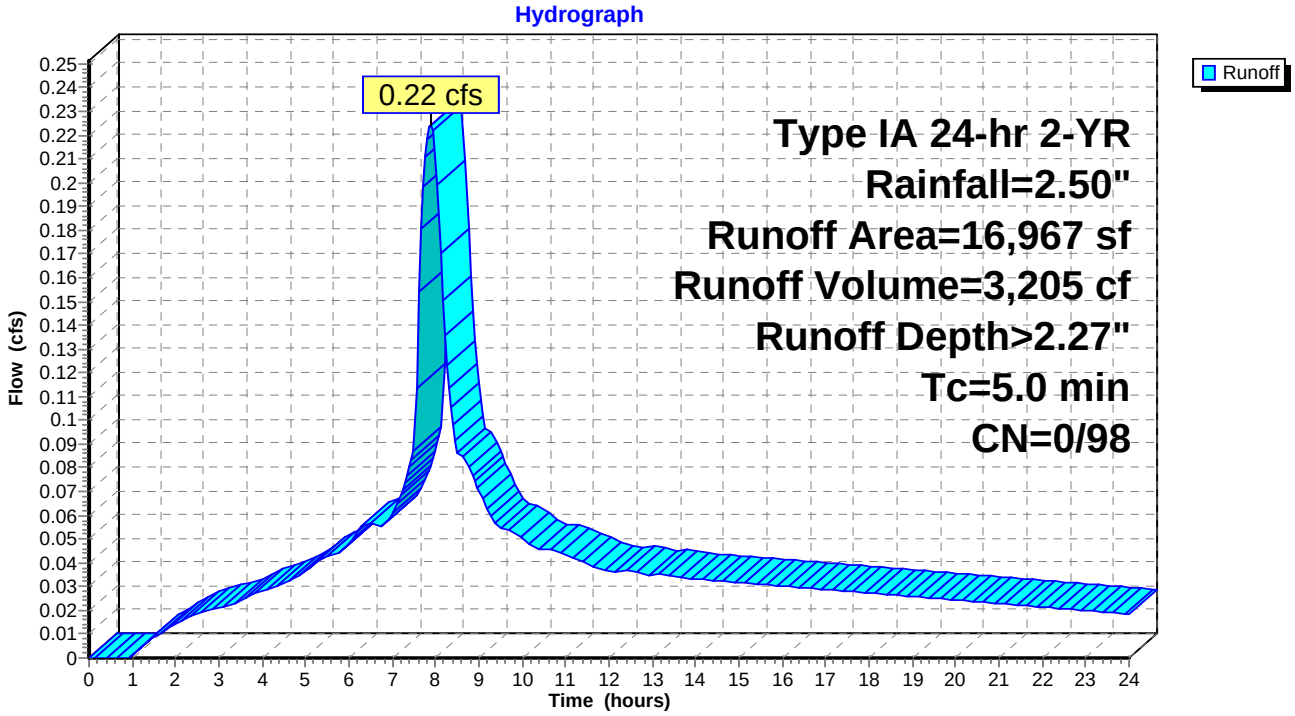
Runoff = 0.22 cfs @ 7.90 hrs, Volume= 3,205 cf, Depth> 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	16,967	98	Pond surface/WQ access
	16,967	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S:



Summary for Subcatchment 2S:

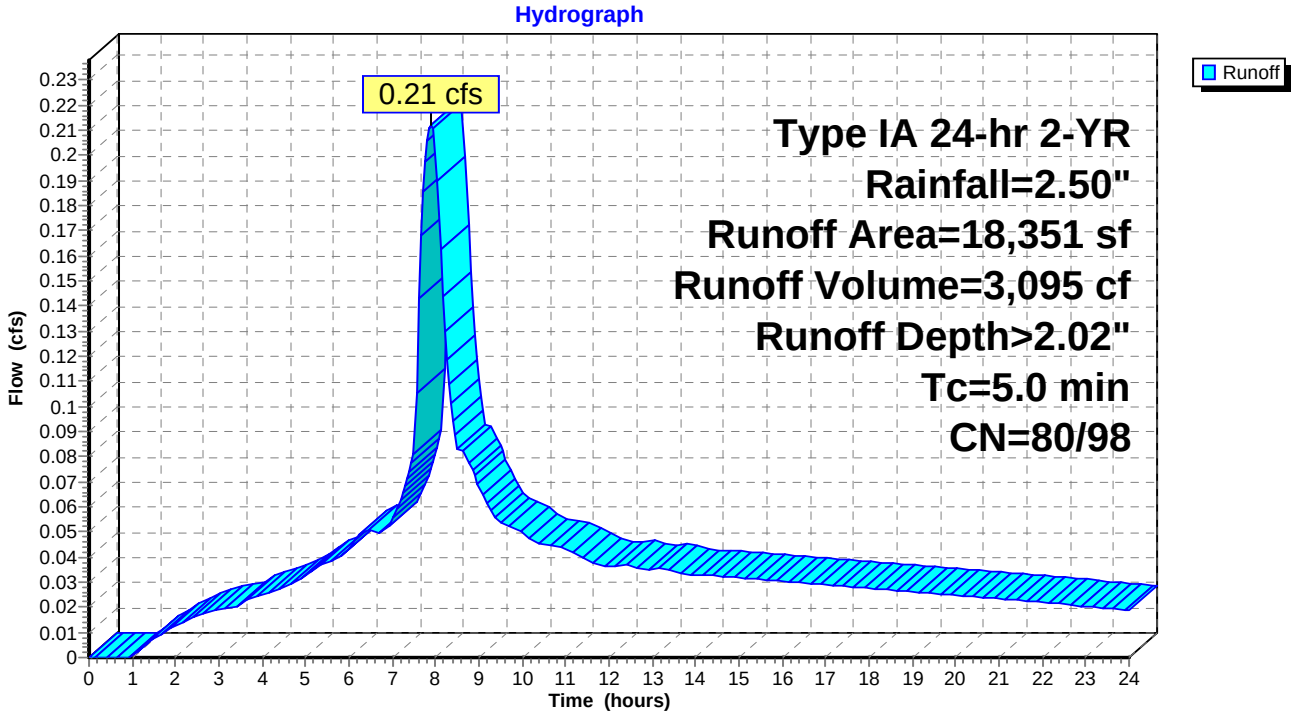
Runoff = 0.21 cfs @ 7.91 hrs, Volume= 3,095 cf, Depth> 2.02"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	15,125	98	Street/Sidewalk/Etc.
	3,226	80	>75% Grass cover, Good, HSG D
	18,351	95	Weighted Average
	3,226	80	Pervious Area
	15,125	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2S:



Summary for Subcatchment 3S:

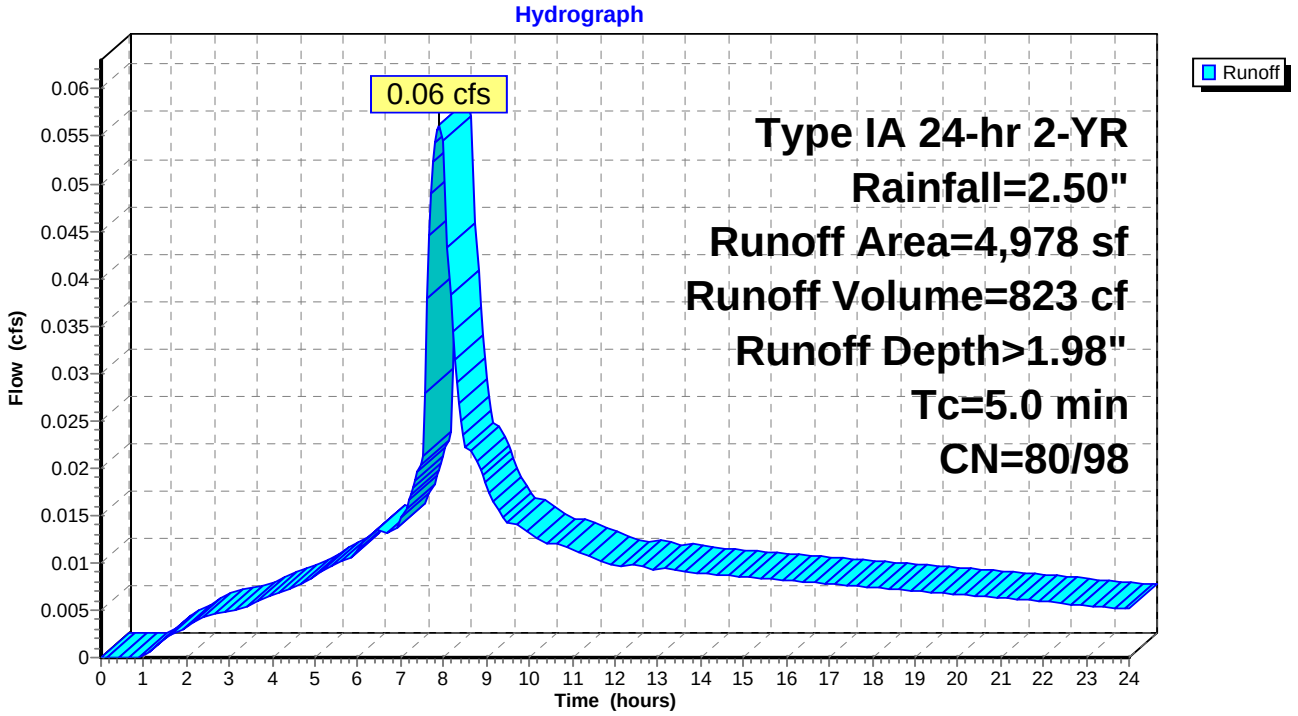
Runoff = 0.06 cfs @ 7.91 hrs, Volume= 823 cf, Depth> 1.98"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	3,959	98	Street/Sidewalk/Etc.
	1,019	80	>75% Grass cover, Good, HSG D
	4,978	94	Weighted Average
	1,019	80	Pervious Area
	3,959	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S:



Summary for Subcatchment 4.1S: Lot 24

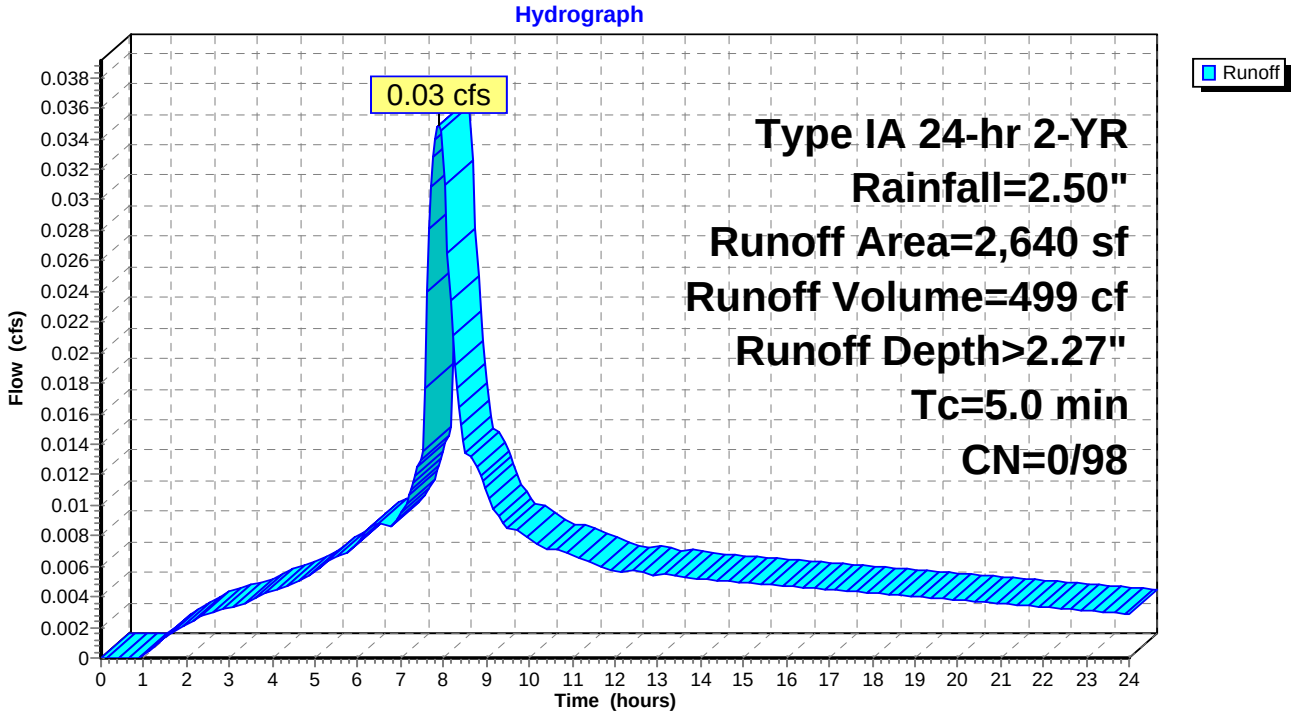
Runoff = 0.03 cfs @ 7.90 hrs, Volume= 499 cf, Depth> 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	2,640	98	1 Lots @ 2640 sf
	2,640	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4.1S: Lot 24



Summary for Subcatchment 4S:

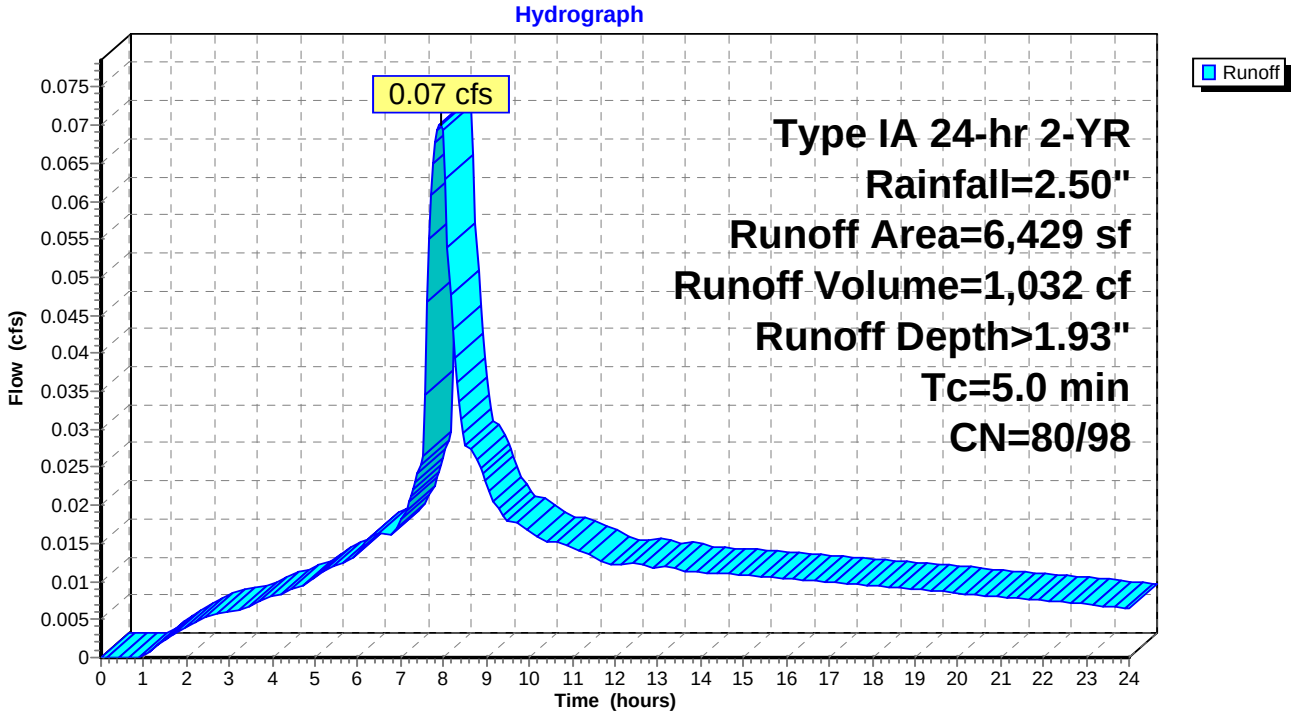
Runoff = 0.07 cfs @ 7.92 hrs, Volume= 1,032 cf, Depth> 1.93"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	4,840	98	Street/Sidewalk/Etc.
	1,589	80	>75% Grass cover, Good, HSG D
	6,429	94	Weighted Average
	1,589	80	Pervious Area
	4,840	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4S:



Summary for Subcatchment 5.1S: Lots 19-23, 57-61

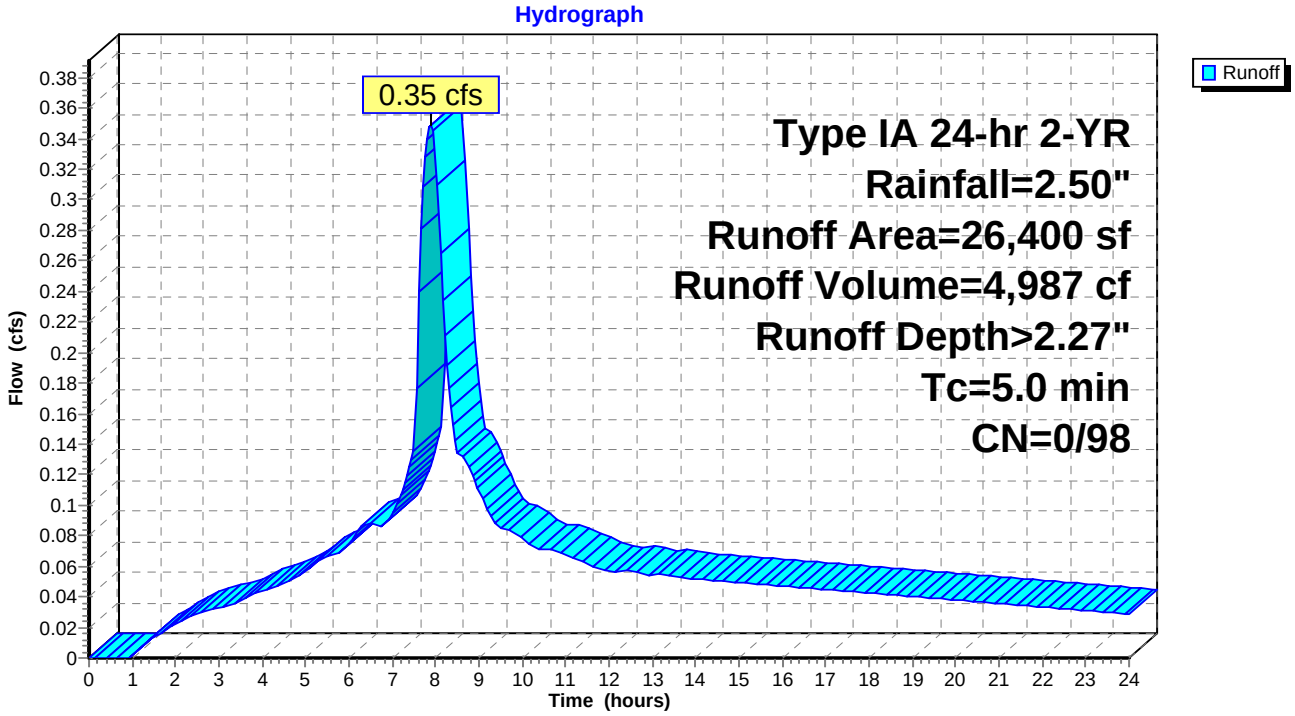
Runoff = 0.35 cfs @ 7.90 hrs, Volume= 4,987 cf, Depth> 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	26,400	98	10 Lots @ 2640 sf
	26,400	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5.1S: Lots 19-23, 57-61



Summary for Subcatchment 5.2S: Lot 62

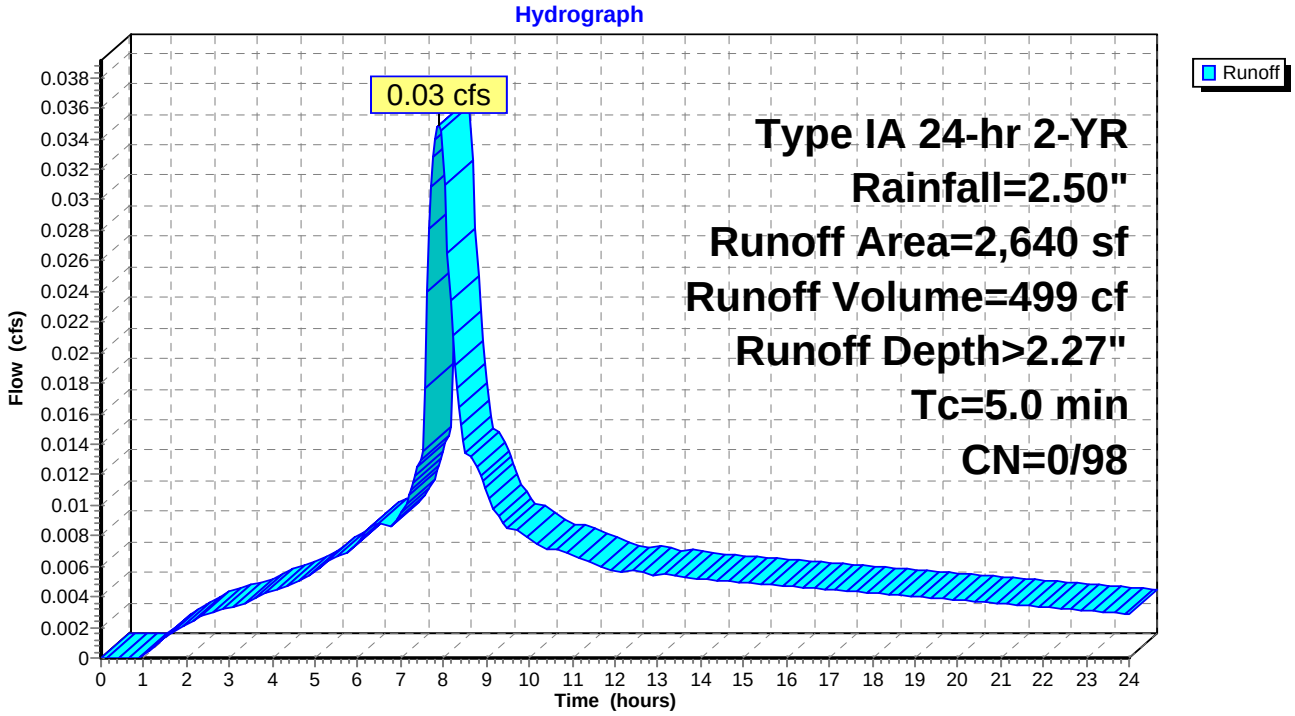
Runoff = 0.03 cfs @ 7.90 hrs, Volume= 499 cf, Depth> 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	2,640	98	1 Lots @ 2640 sf
	2,640	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5.2S: Lot 62



Summary for Subcatchment 5S:

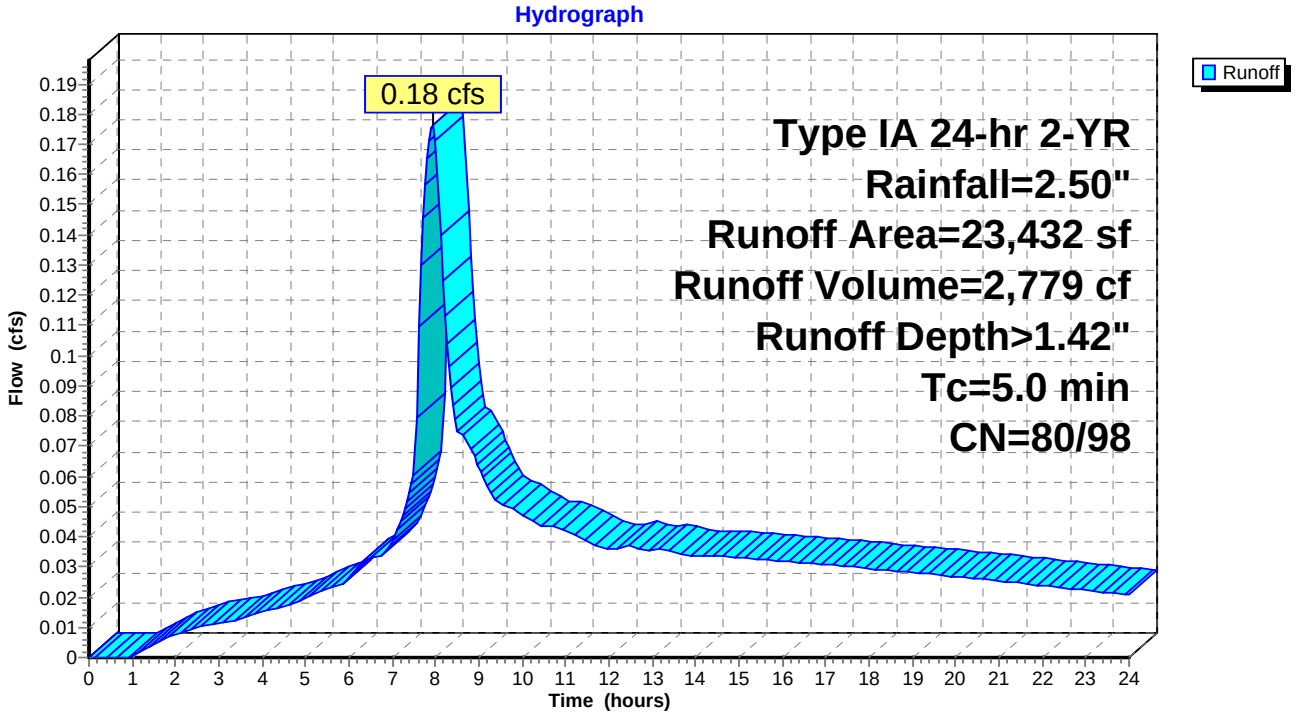
Runoff = 0.18 cfs @ 7.96 hrs, Volume= 2,779 cf, Depth> 1.42"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	9,115	98	Street/Sidewalk/Etc.
	14,317	80	>75% Grass cover, Good, HSG D
	23,432	87	Weighted Average
	14,317	80	Pervious Area
	9,115	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5S:



Summary for Subcatchment 6.1S: Lots 14 and 15

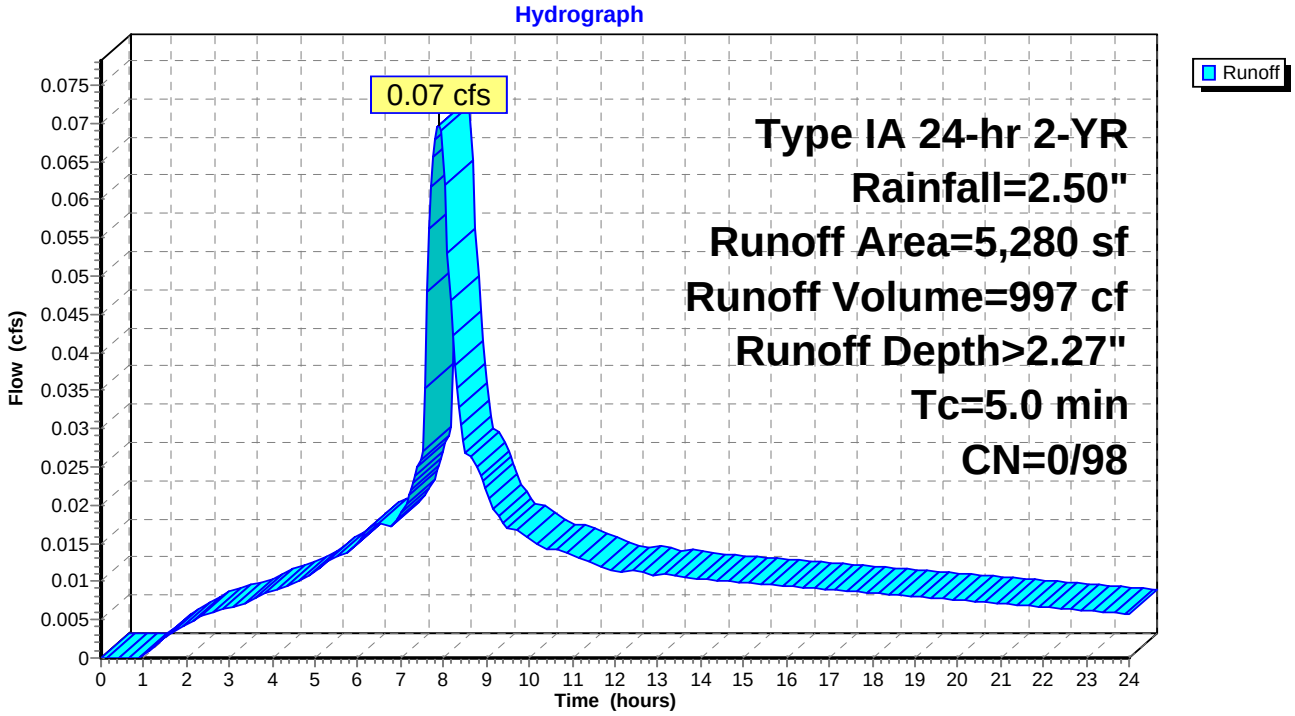
Runoff = 0.07 cfs @ 7.90 hrs, Volume= 997 cf, Depth> 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	5,280	98	2 Lots @ 2640 sf
	5,280	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6.1S: Lots 14 and 15



Summary for Subcatchment 6.2S: Lot 16

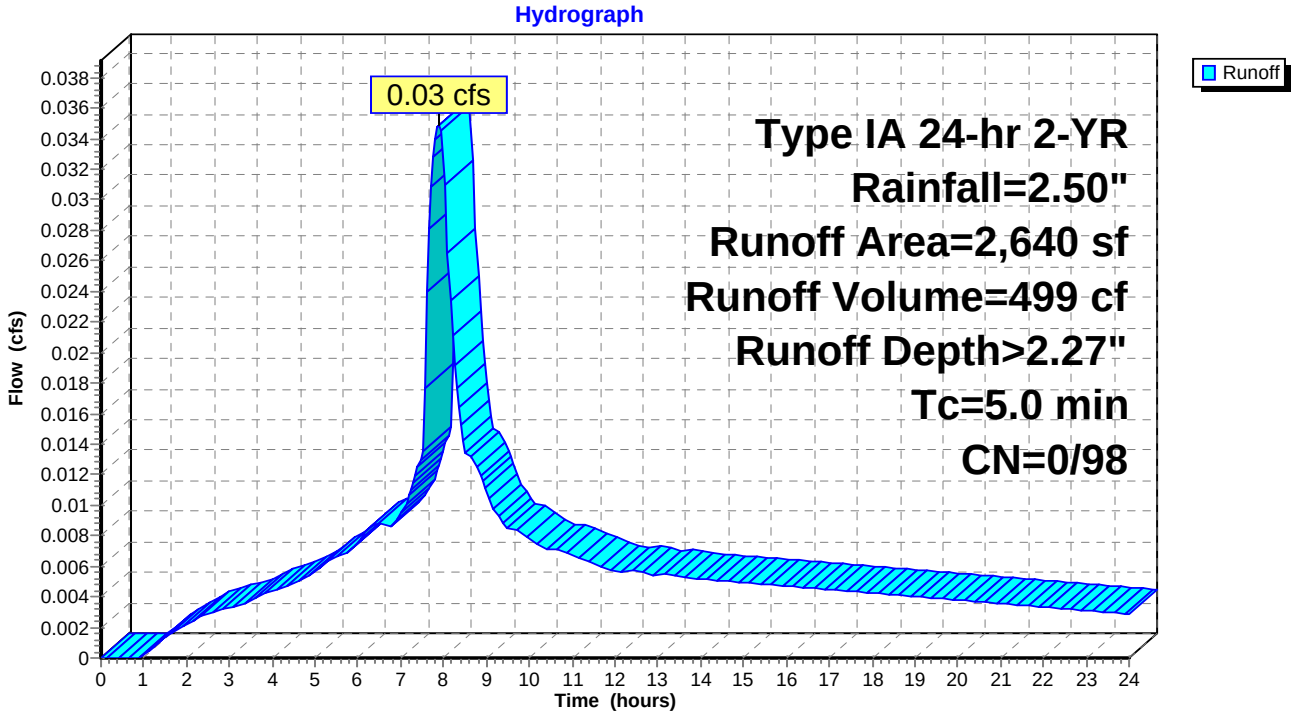
Runoff = 0.03 cfs @ 7.90 hrs, Volume= 499 cf, Depth> 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	2,640	98	1 Lot @ 2640 sf
	2,640	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6.2S: Lot 16



Summary for Subcatchment 6.3S: Lots 17, 18, 55 & 56

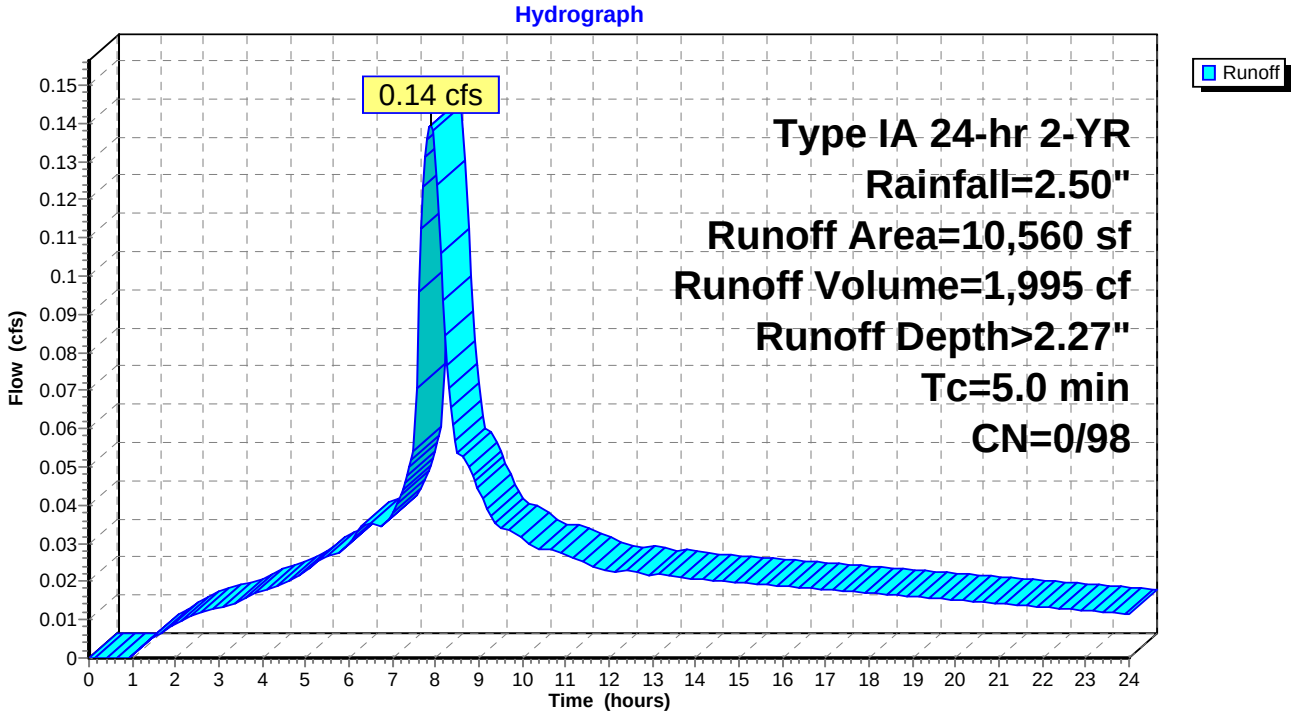
Runoff = 0.14 cfs @ 7.90 hrs, Volume= 1,995 cf, Depth> 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	10,560	98	4 Lots @ 2640 sf
	10,560	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6.3S: Lots 17, 18, 55 & 56



Summary for Subcatchment 6S:

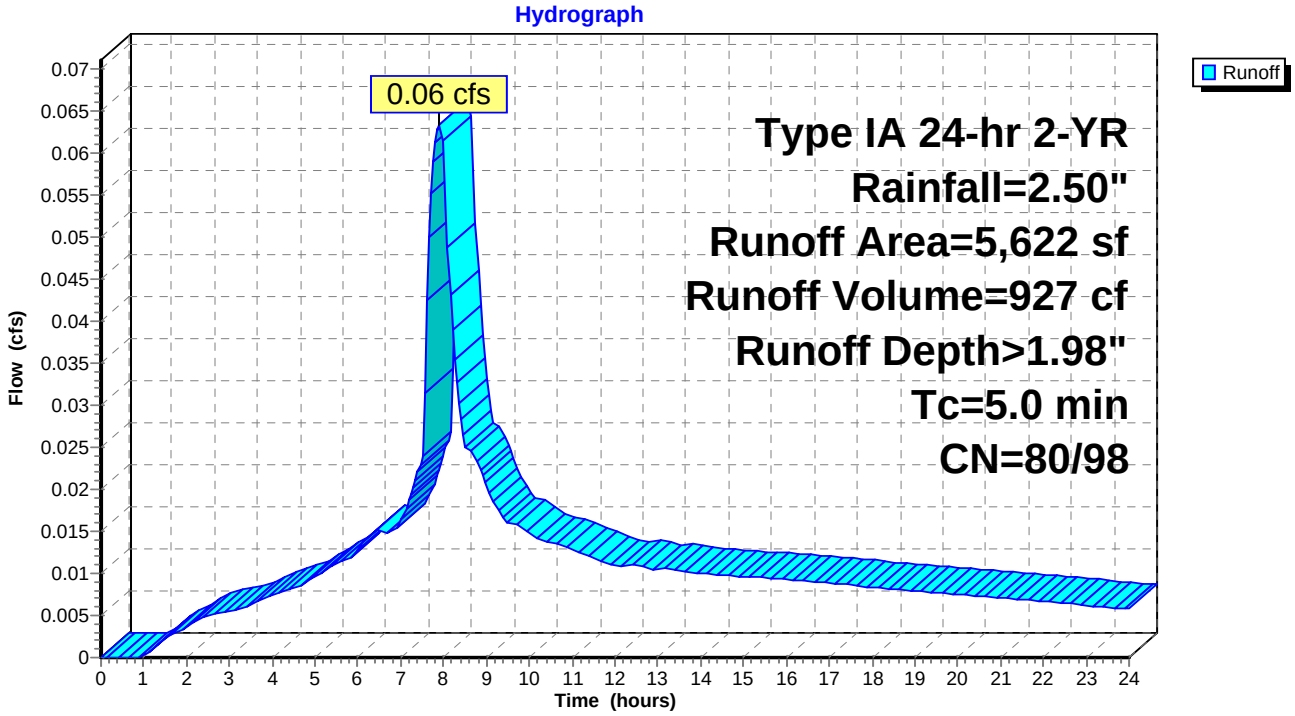
Runoff = 0.06 cfs @ 7.91 hrs, Volume= 927 cf, Depth> 1.98"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	4,452	98	Street/Sidewalk/Etc.
	1,170	80	>75% Grass cover, Good, HSG D
	5,622	94	Weighted Average
	1,170	80	Pervious Area
	4,452	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6S:



Summary for Subcatchment 7.1S: Lots 9-13 and Lot 54

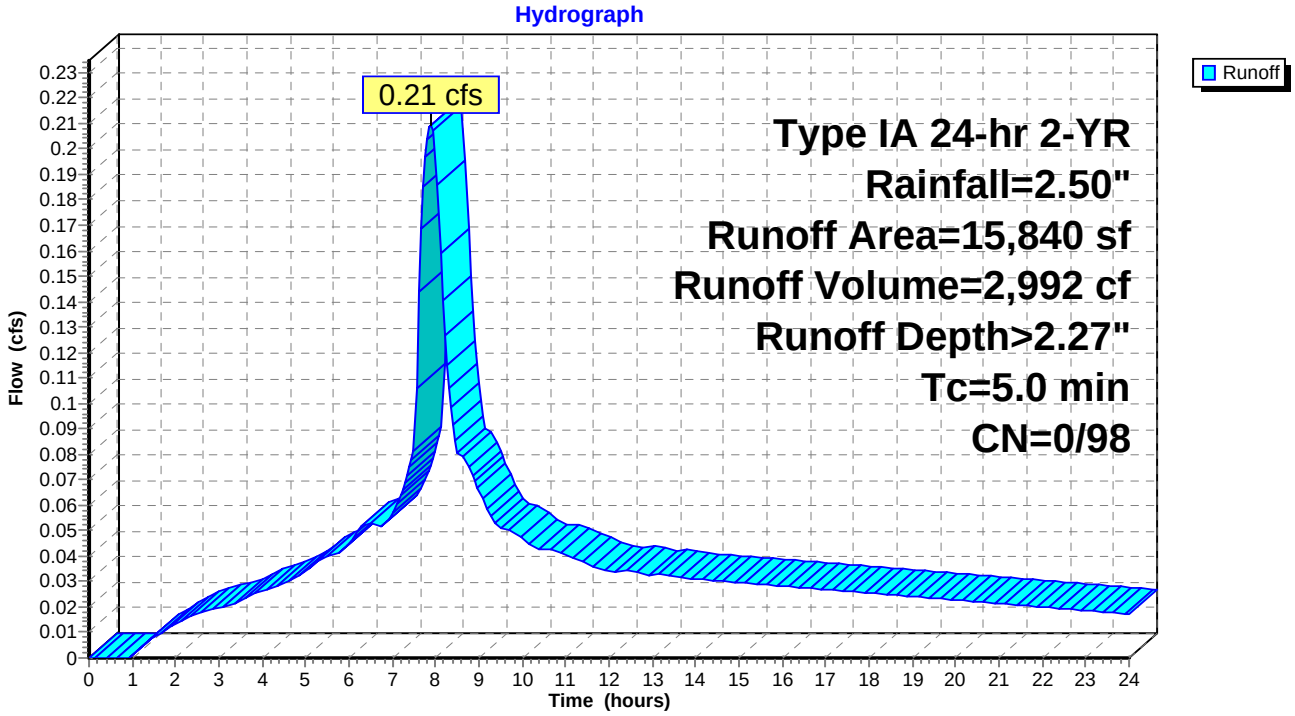
Runoff = 0.21 cfs @ 7.90 hrs, Volume= 2,992 cf, Depth> 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	15,840	98	6 Lots @ 2640 sf
	15,840	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 7.1S: Lots 9-13 and Lot 54



Summary for Subcatchment 7S:

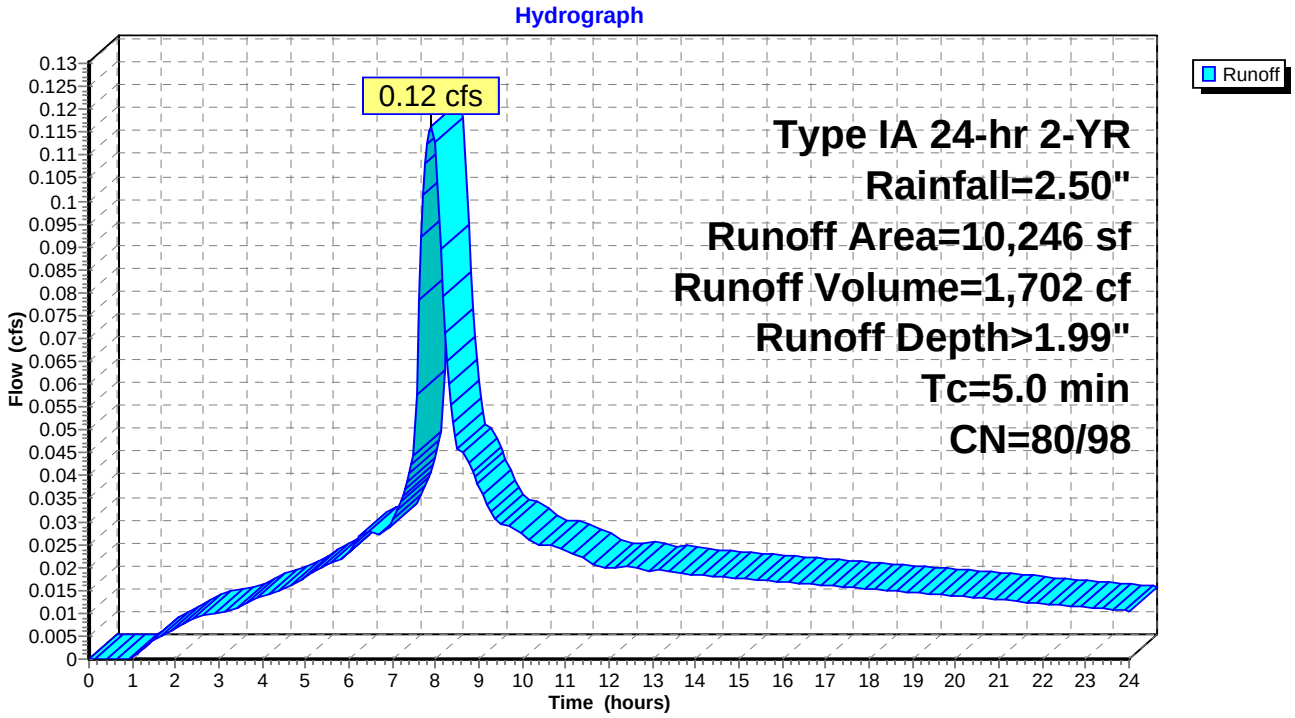
Runoff = 0.12 cfs @ 7.91 hrs, Volume= 1,702 cf, Depth> 1.99"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	6,756	98	Street/Sidewalk/Etc.
	2,032	80	>75% Grass cover, Good, HSG D
*	1,458	98	Existing SW Hall Blvd Pavement
	10,246	94	Weighted Average
	2,032	80	Pervious Area
	8,214	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 7S:



Summary for Subcatchment 8S:

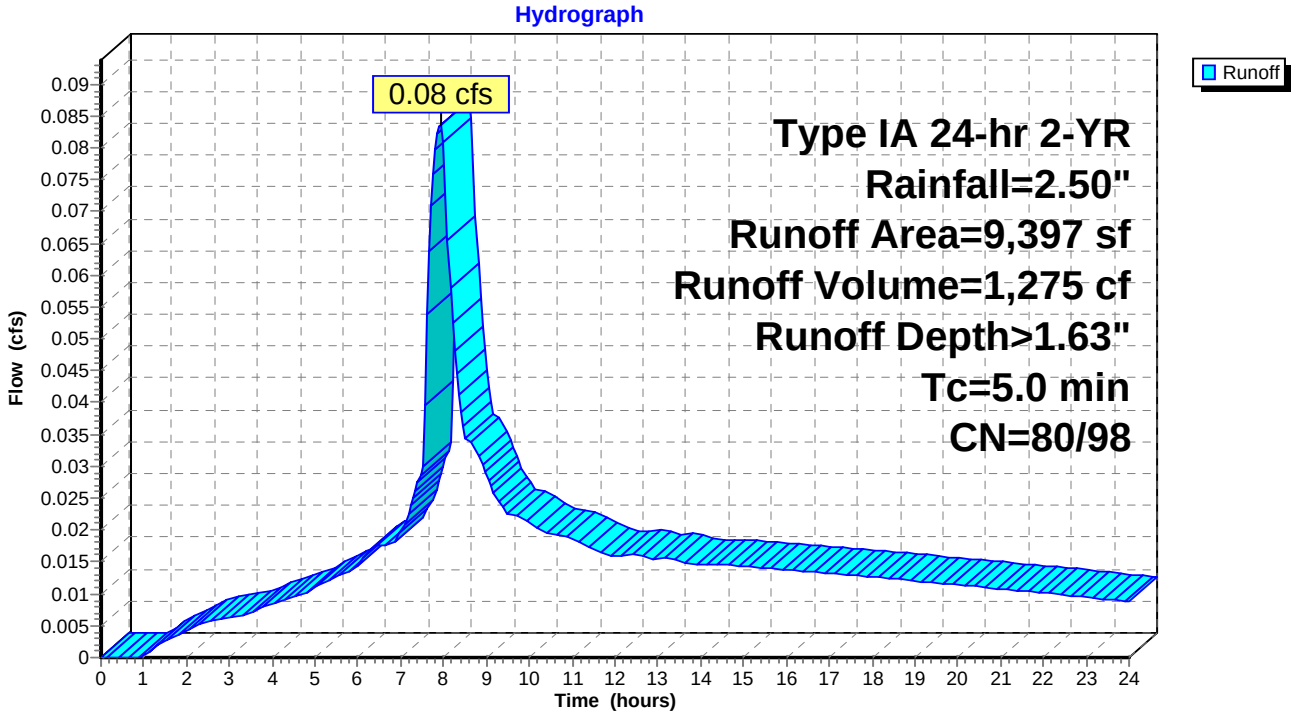
Runoff = 0.08 cfs @ 7.94 hrs, Volume= 1,275 cf, Depth> 1.63"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	5,053	98	Street/Sidewalk/Etc.
	4,344	80	>75% Grass cover, Good, HSG D
	9,397	90	Weighted Average
	4,344	80	Pervious Area
	5,053	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8S:



Summary for Subcatchment 9S:

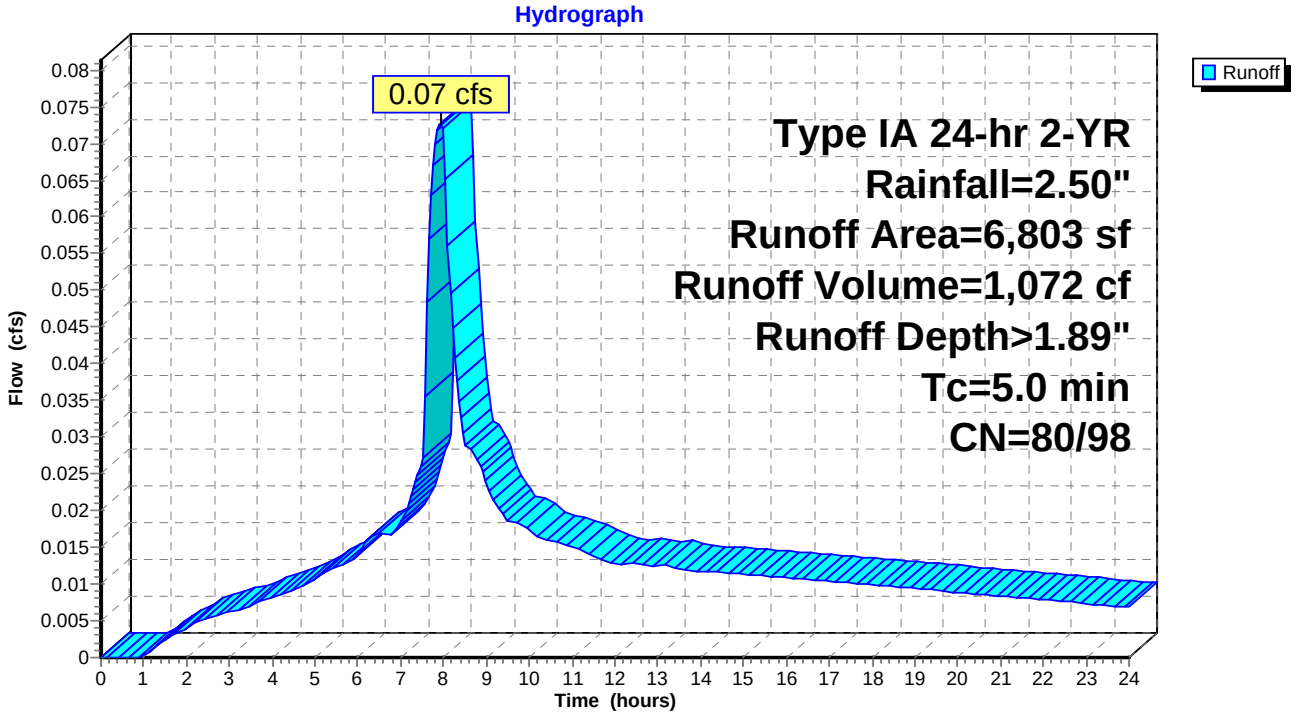
Runoff = 0.07 cfs @ 7.92 hrs, Volume= 1,072 cf, Depth> 1.89"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	4,952	98	Street/Sidewalk/Etc.
	1,851	80	>75% Grass cover, Good, HSG D
	6,803	93	Weighted Average
	1,851	80	Pervious Area
	4,952	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 9S:



Summary for Subcatchment 10.1S: Lots 25-27

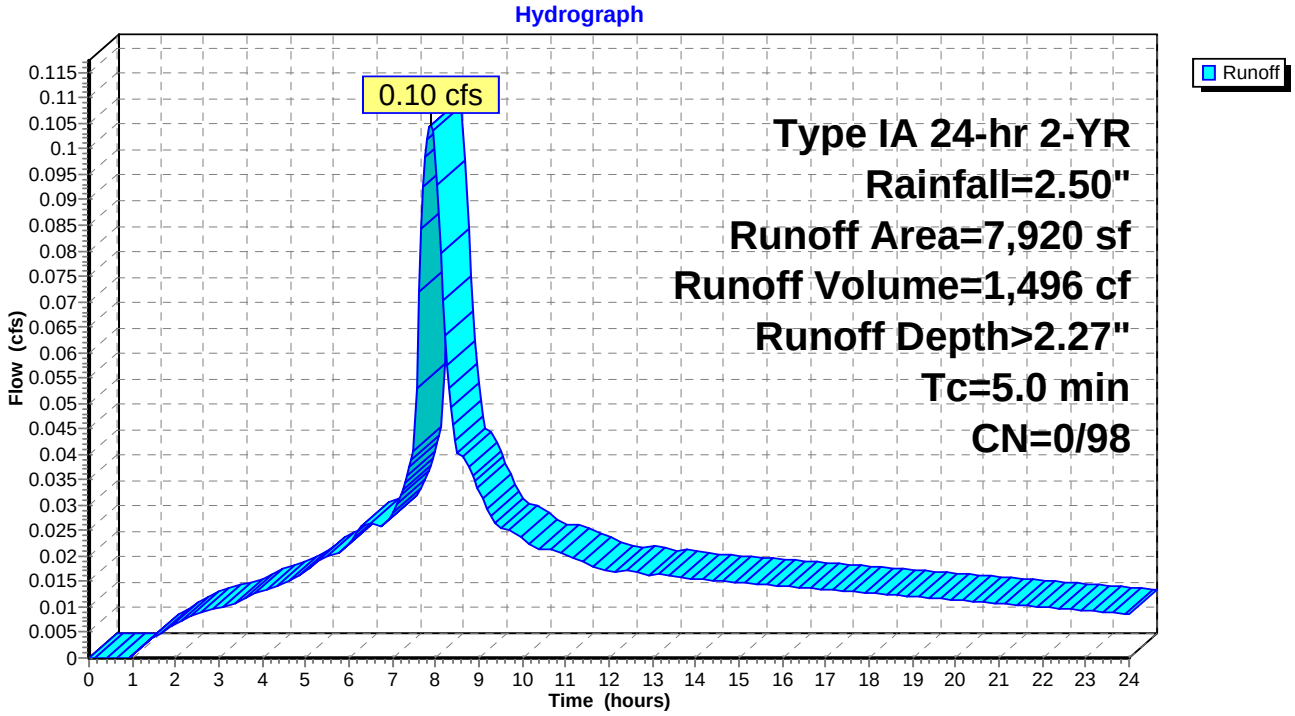
Runoff = 0.10 cfs @ 7.90 hrs, Volume= 1,496 cf, Depth> 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	7,920	98	3 Lots @ 2640 sf
	7,920	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10.1S: Lots 25-27



Summary for Subcatchment 10S:

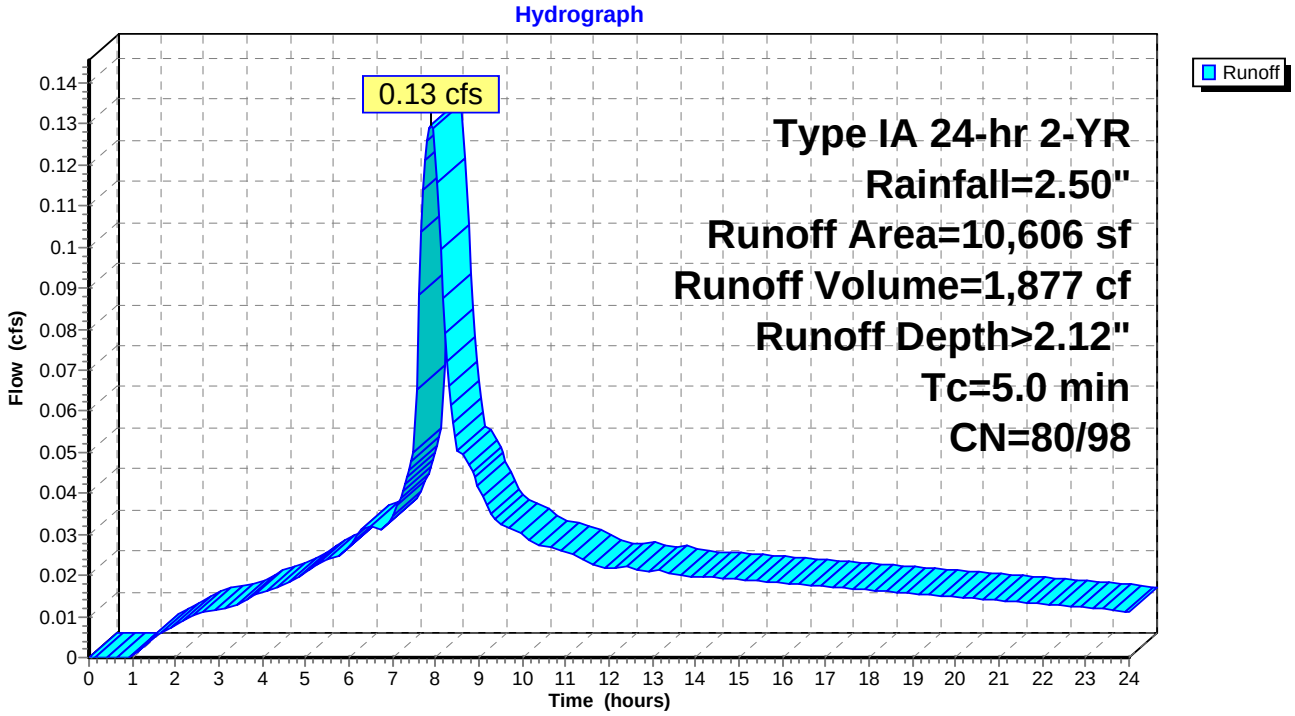
Runoff = 0.13 cfs @ 7.91 hrs, Volume= 1,877 cf, Depth> 2.12"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	9,503	98	Street/Sidewalk/Etc.
	1,103	80	>75% Grass cover, Good, HSG D
	10,606	96	Weighted Average
	1,103	80	Pervious Area
	9,503	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10S:



Summary for Subcatchment 11.1S: Lots 28-32 and 37

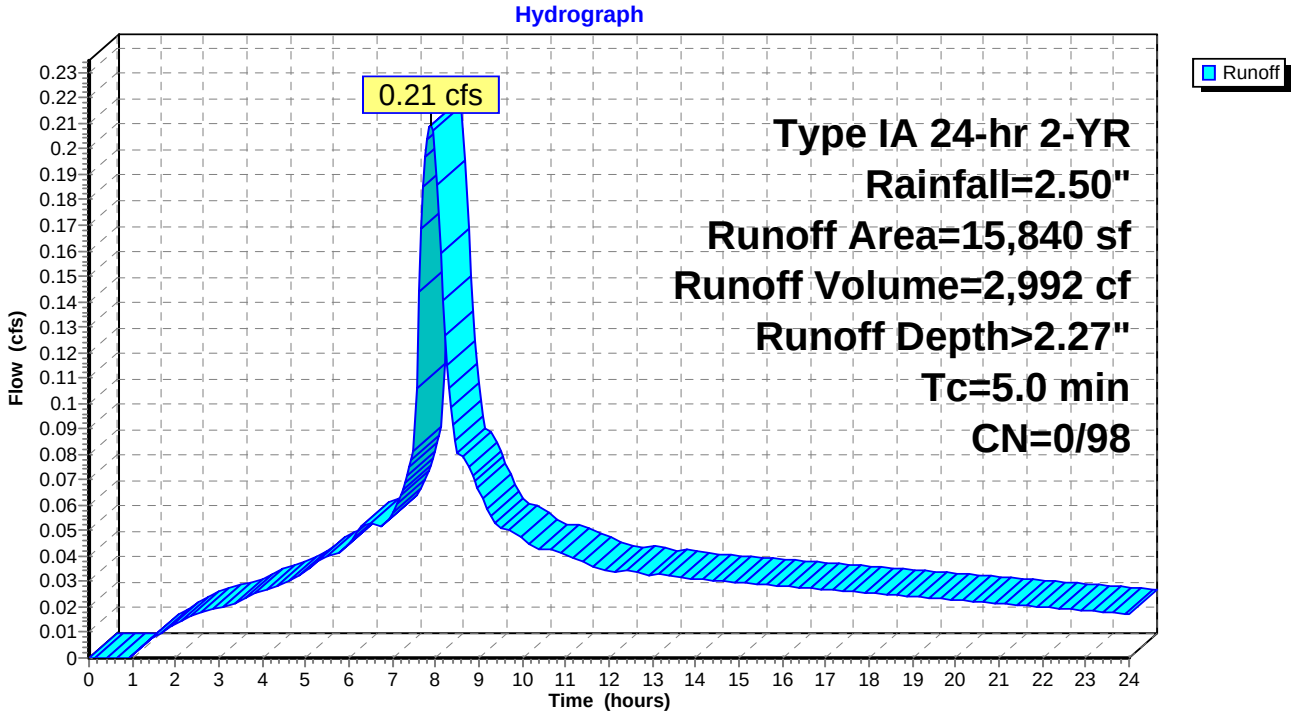
Runoff = 0.21 cfs @ 7.90 hrs, Volume= 2,992 cf, Depth> 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	15,840	98	6 Lots @ 2640 sf
	15,840	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 11.1S: Lots 28-32 and 37



Summary for Subcatchment 11S:

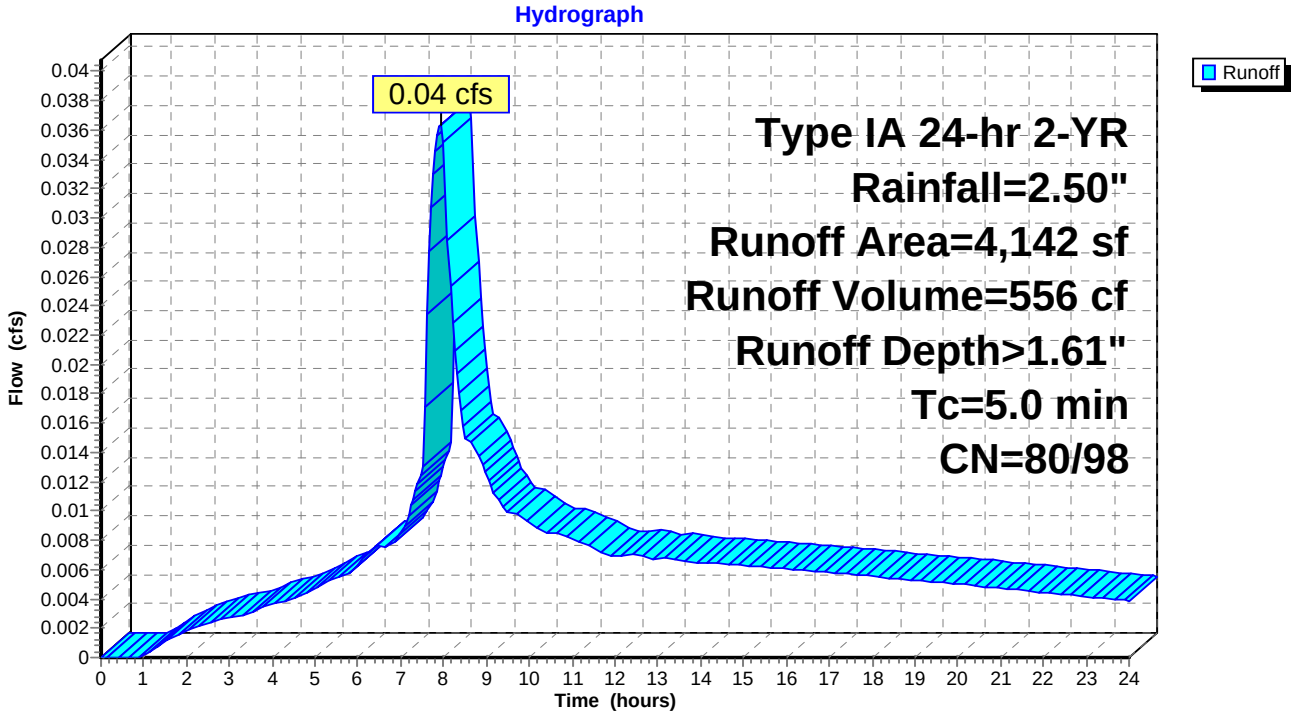
Runoff = 0.04 cfs @ 7.94 hrs, Volume= 556 cf, Depth> 1.61"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	2,175	98	Street/Sidewalk/Etc.
	1,967	80	>75% Grass cover, Good, HSG D
	4,142	89	Weighted Average
	1,967	80	Pervious Area
	2,175	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 11S:



Summary for Subcatchment 12.1S: Lots 33-35

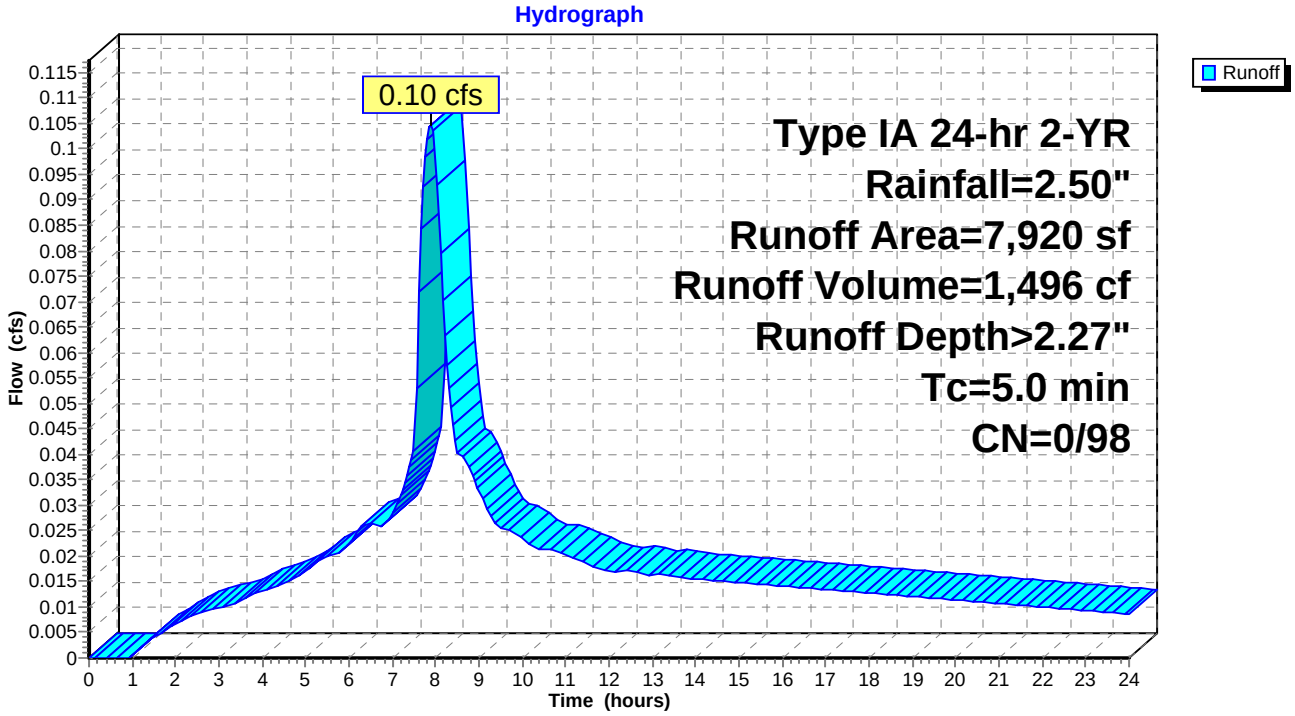
Runoff = 0.10 cfs @ 7.90 hrs, Volume= 1,496 cf, Depth> 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	7,920	98	3 Lots @ 2640 sf
	7,920	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 12.1S: Lots 33-35



Summary for Subcatchment 12S:

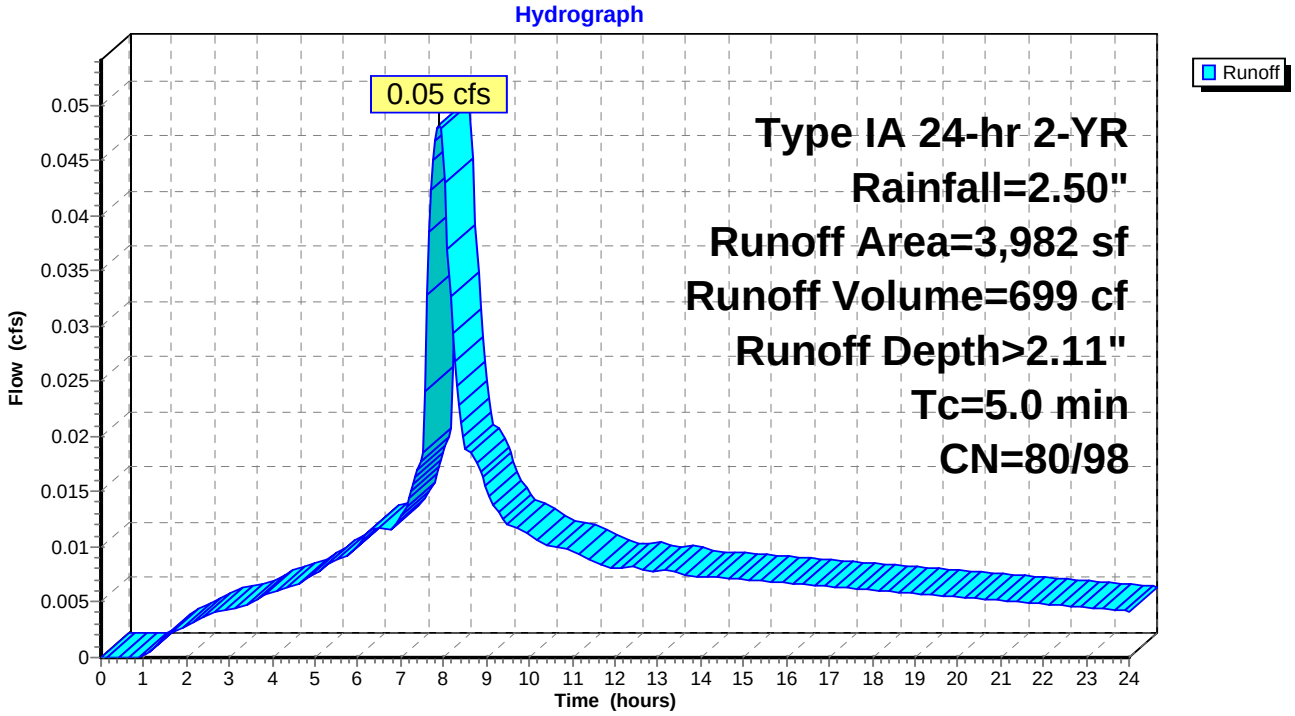
Runoff = 0.05 cfs @ 7.91 hrs, Volume= 699 cf, Depth> 2.11"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	3,518	98	Street/Sidewalk/Etc.
	464	80	>75% Grass cover, Good, HSG D
	3,982	96	Weighted Average
	464	80	Pervious Area
	3,518	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 12S:



Summary for Subcatchment 13.1S: Lot 38

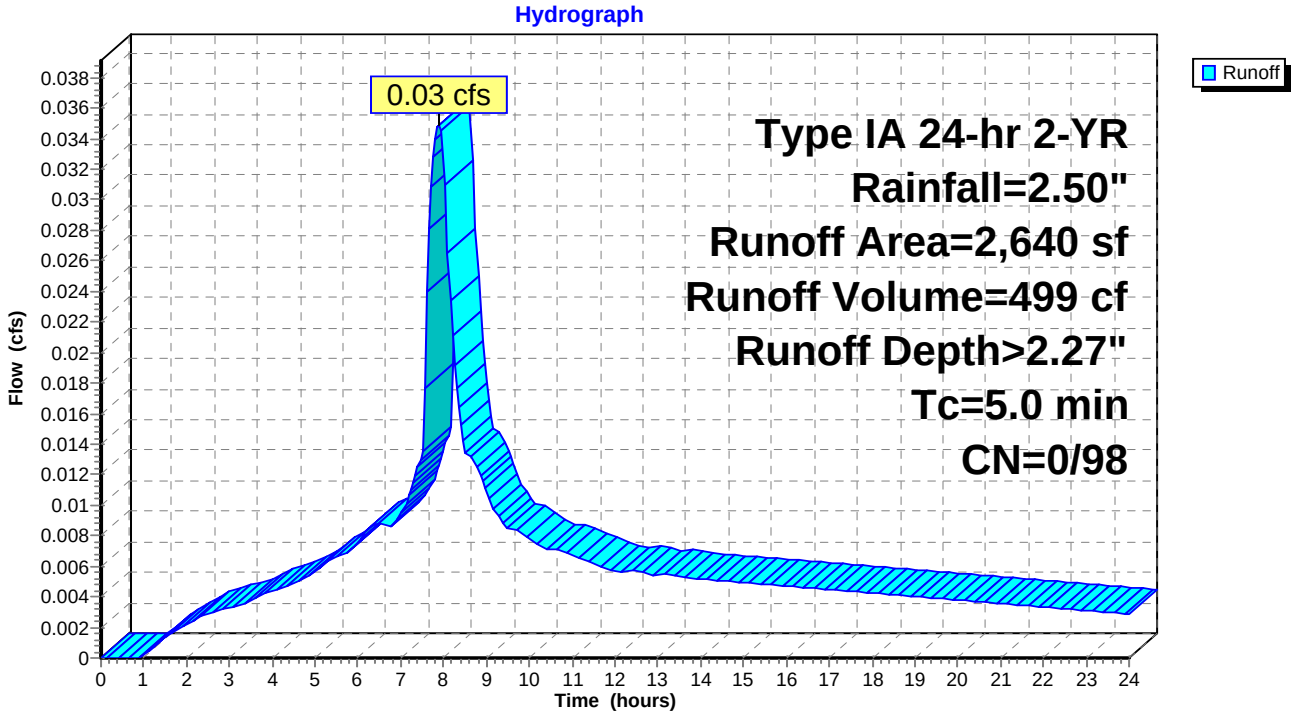
Runoff = 0.03 cfs @ 7.90 hrs, Volume= 499 cf, Depth> 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	2,640	98	1 Lot @ 2640 sf
	2,640	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 13.1S: Lot 38



Summary for Subcatchment 13S:

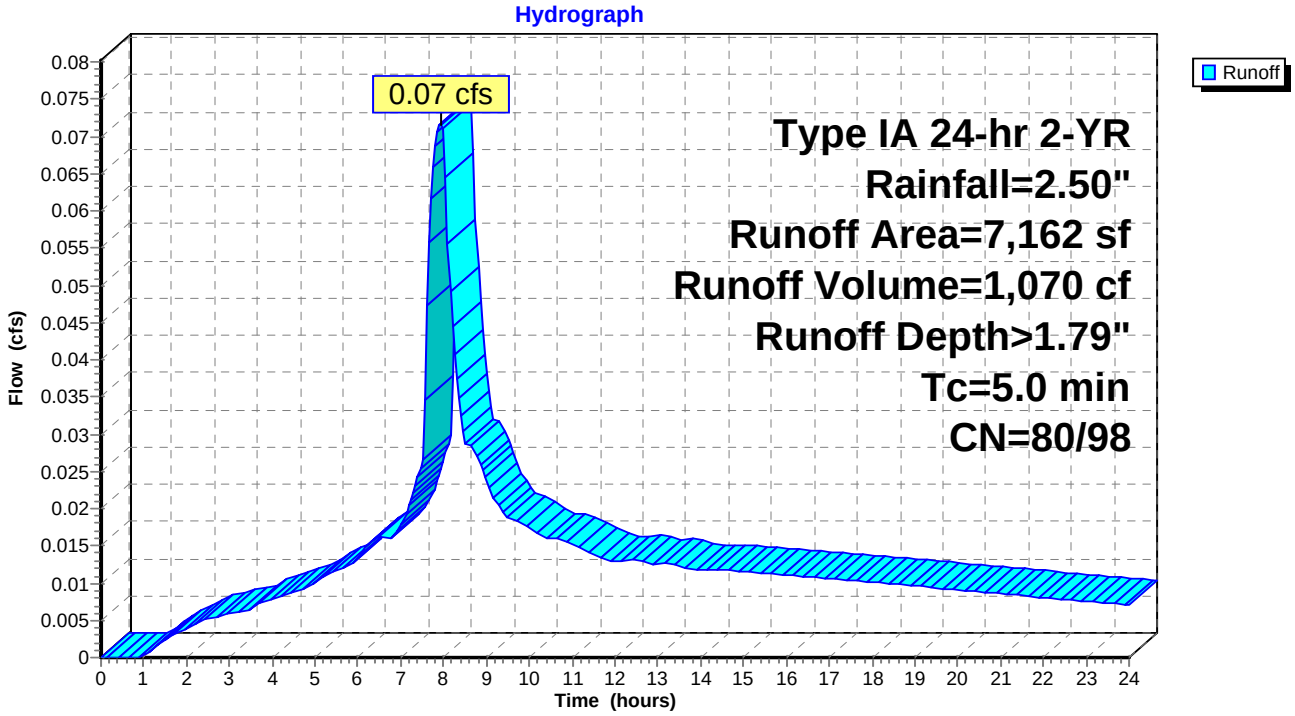
Runoff = 0.07 cfs @ 7.92 hrs, Volume= 1,070 cf, Depth> 1.79"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	4,701	98	Street/Sidewalk/Etc.
	2,461	80	>75% Grass cover, Good, HSG D
	7,162	92	Weighted Average
	2,461	80	Pervious Area
	4,701	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 13S:



Summary for Subcatchment 14.1S: Lots 2-3 and 39

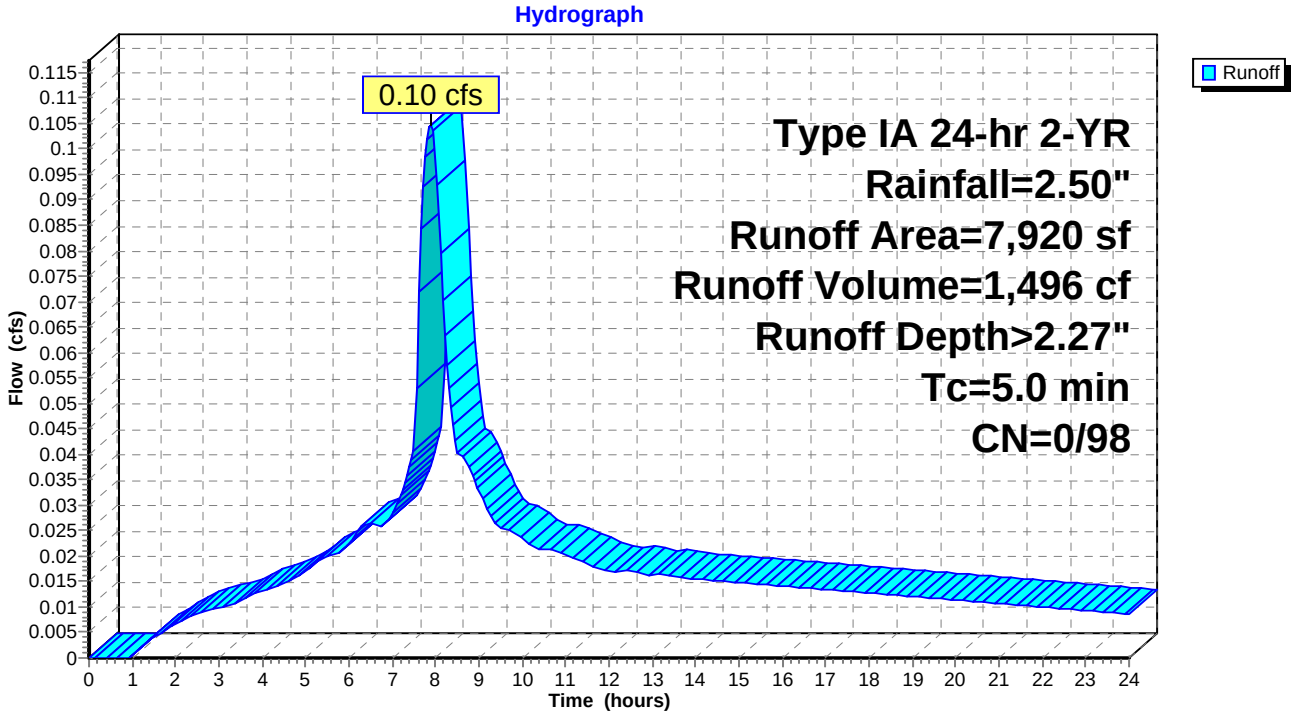
Runoff = 0.10 cfs @ 7.90 hrs, Volume= 1,496 cf, Depth> 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	7,920	98	3 Lots @ 2640 sf
	7,920	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 14.1S: Lots 2-3 and 39



Summary for Subcatchment 14S:

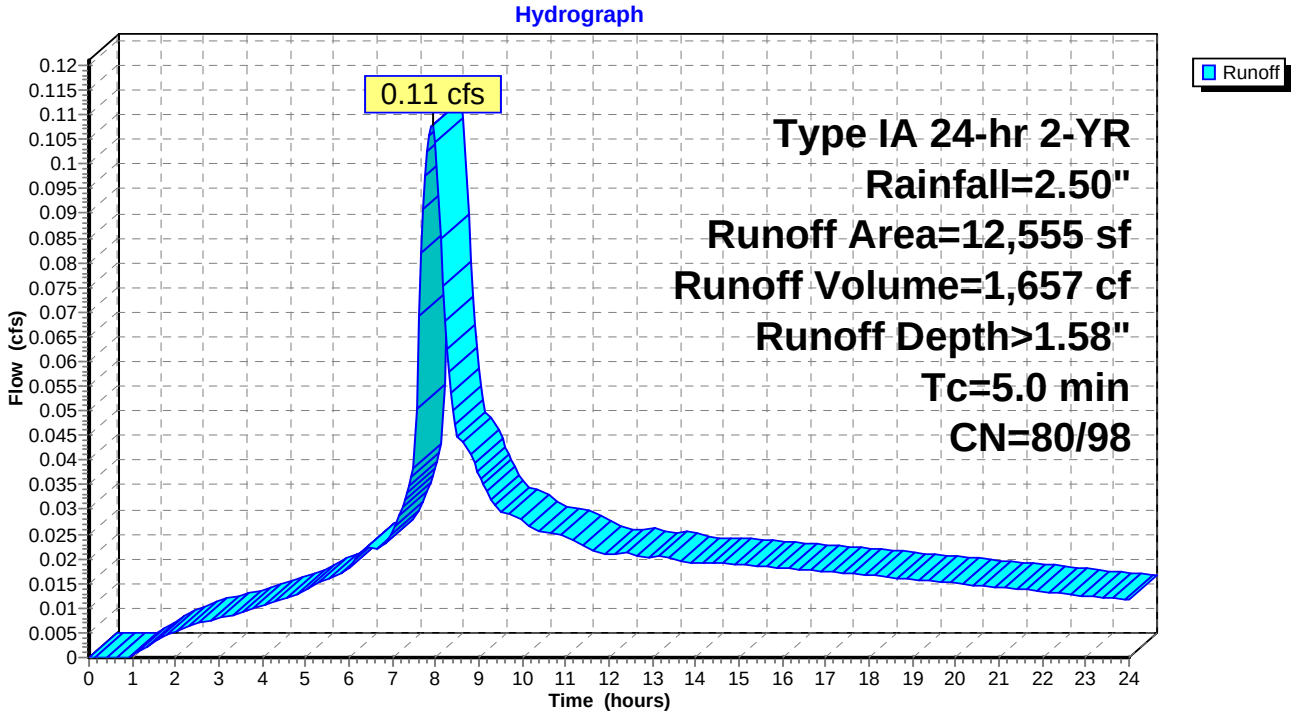
Runoff = 0.11 cfs @ 7.94 hrs, Volume= 1,657 cf, Depth> 1.58"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	6,346	98	Street/Sidewalk/Etc.
	6,209	80	>75% Grass cover, Good, HSG D
	12,555	89	Weighted Average
	6,209	80	Pervious Area
	6,346	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 14S:



Summary for Subcatchment 15.1S: Lots 4 and 5

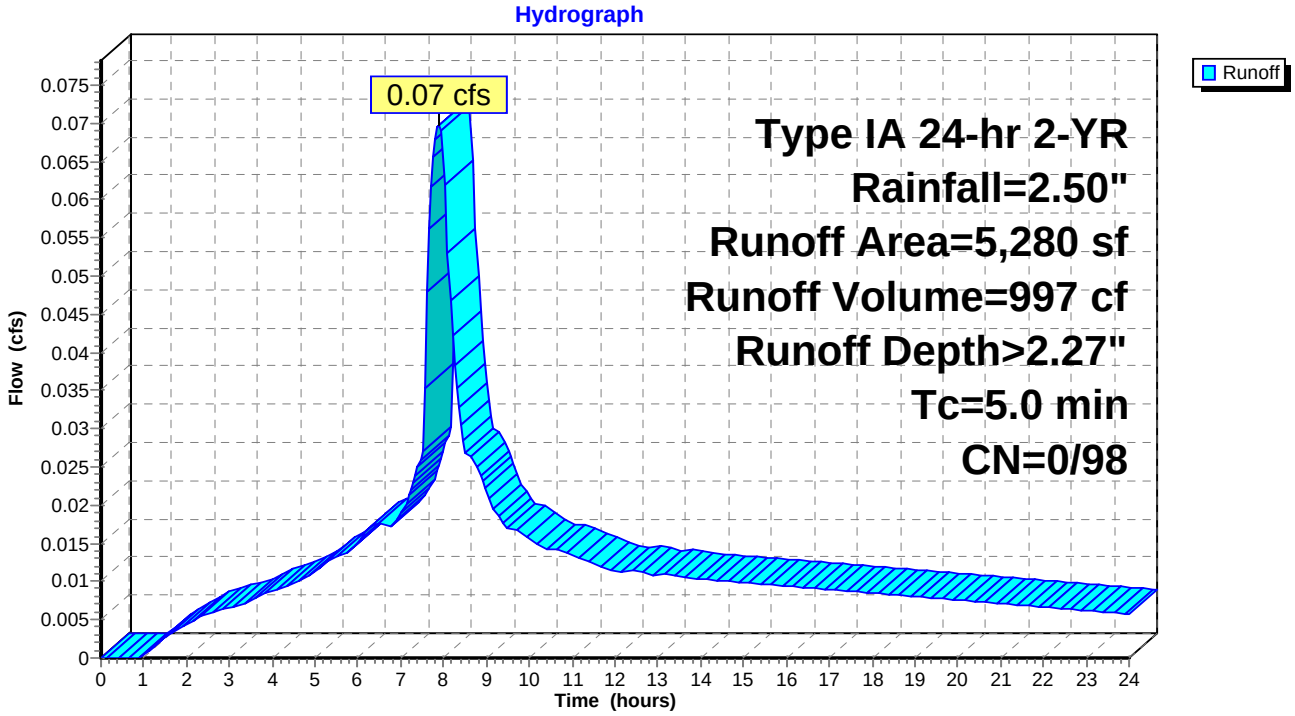
Runoff = 0.07 cfs @ 7.90 hrs, Volume= 997 cf, Depth> 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	5,280	98	2 Lots @ 2640 sf
	5,280	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 15.1S: Lots 4 and 5



Summary for Subcatchment 15S:

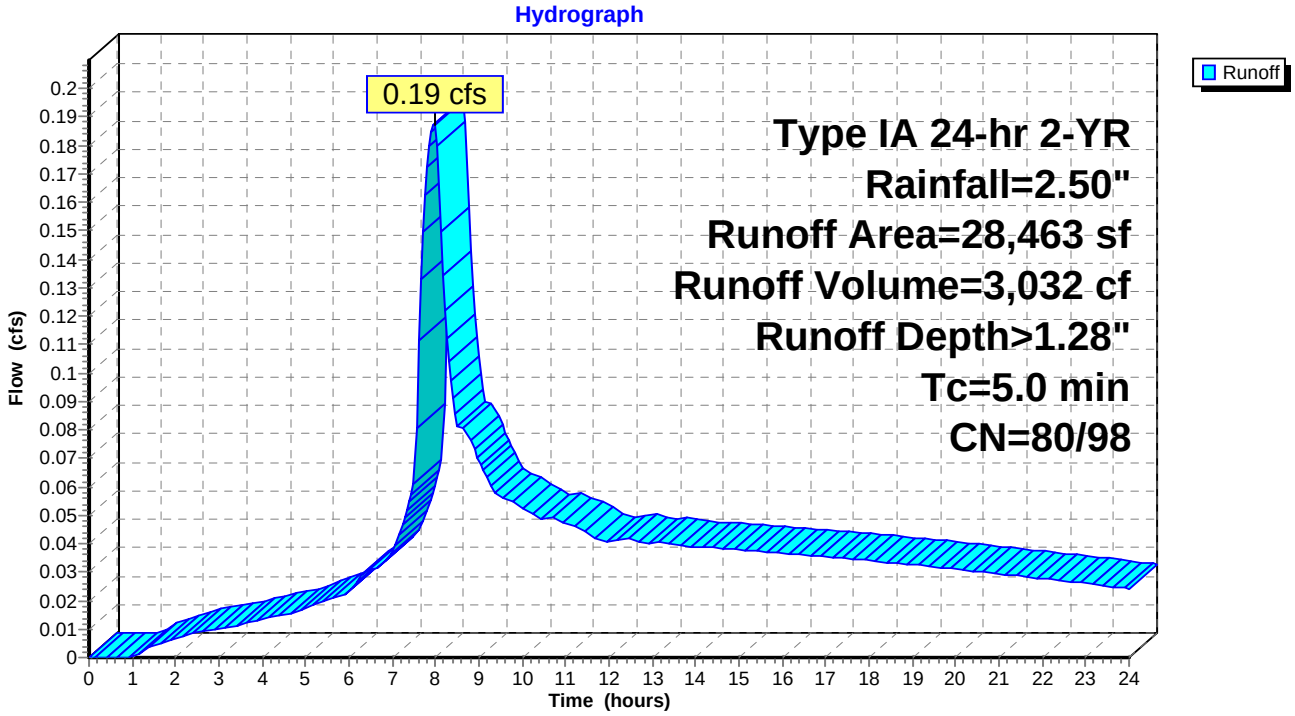
Runoff = 0.19 cfs @ 7.97 hrs, Volume= 3,032 cf, Depth> 1.28"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	8,086	98	Street/Sidewalk/Etc.
	20,377	80	>75% Grass cover, Good, HSG D
	28,463	85	Weighted Average
	20,377	80	Pervious Area
	8,086	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 15S:



Summary for Subcatchment 16.1S: Lots 6-8 and 40-42

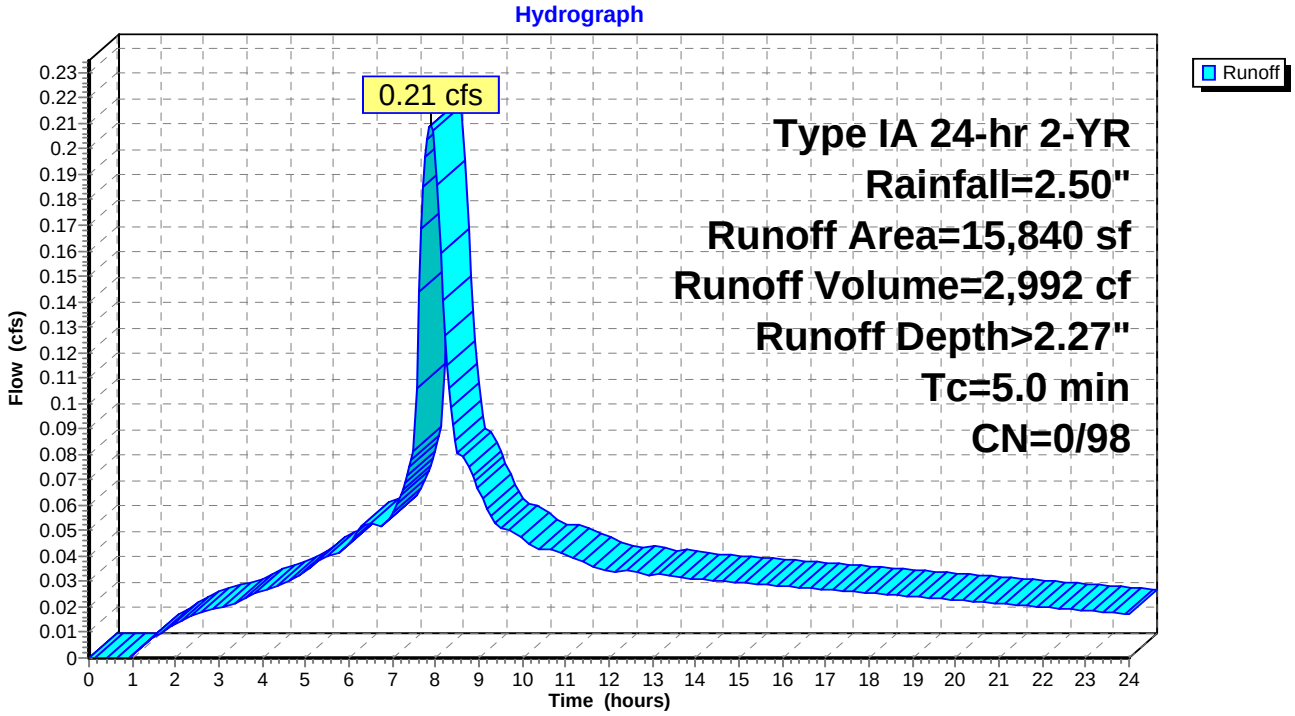
Runoff = 0.21 cfs @ 7.90 hrs, Volume= 2,992 cf, Depth> 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	15,840	98	6 Lots @ 2640 sf
	15,840	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 16.1S: Lots 6-8 and 40-42



Summary for Subcatchment 16S:

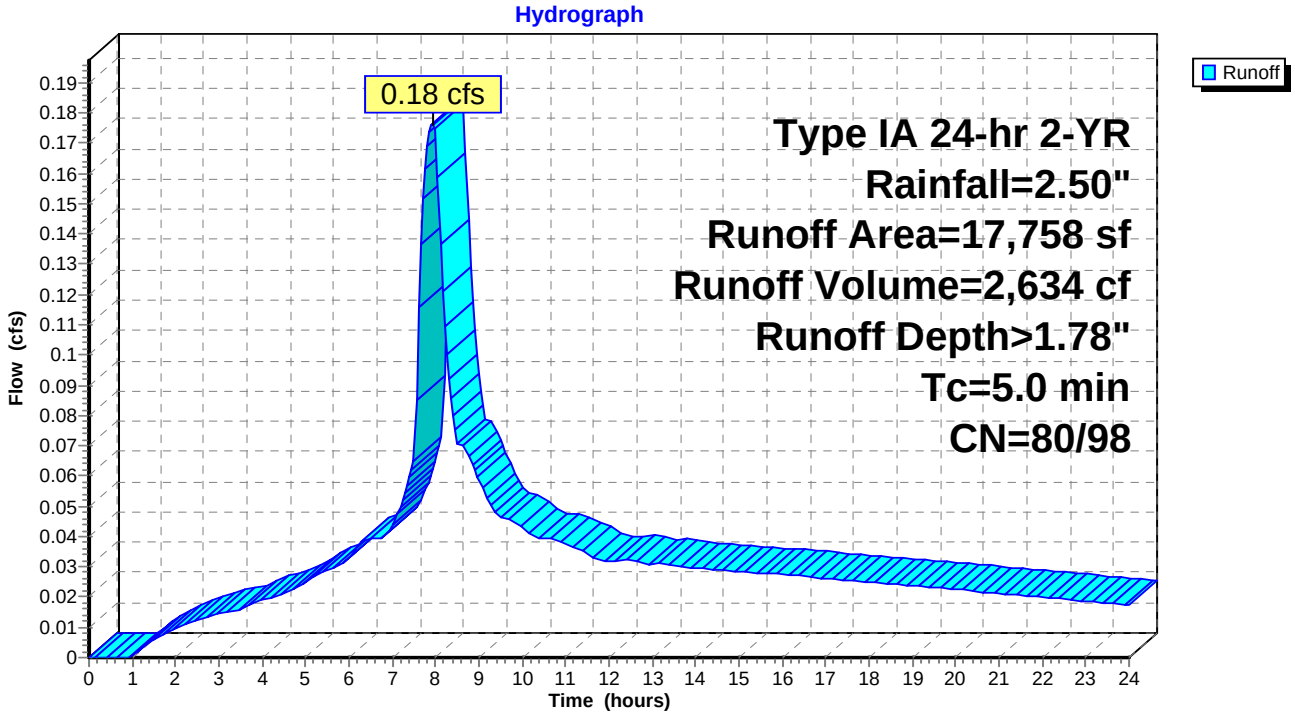
Runoff = 0.18 cfs @ 7.93 hrs, Volume= 2,634 cf, Depth> 1.78"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	1,426	98	Pedestrian Access
	6,261	80	>75% Grass cover, Good, HSG D
*	8,223	98	Existing SW Hall Boulevard
*	1,848	98	SW Hall Widening
	17,758	92	Weighted Average
	6,261	80	Pervious Area
	11,497	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 16S:



Summary for Subcatchment 17.1S: Lot 46 & 47

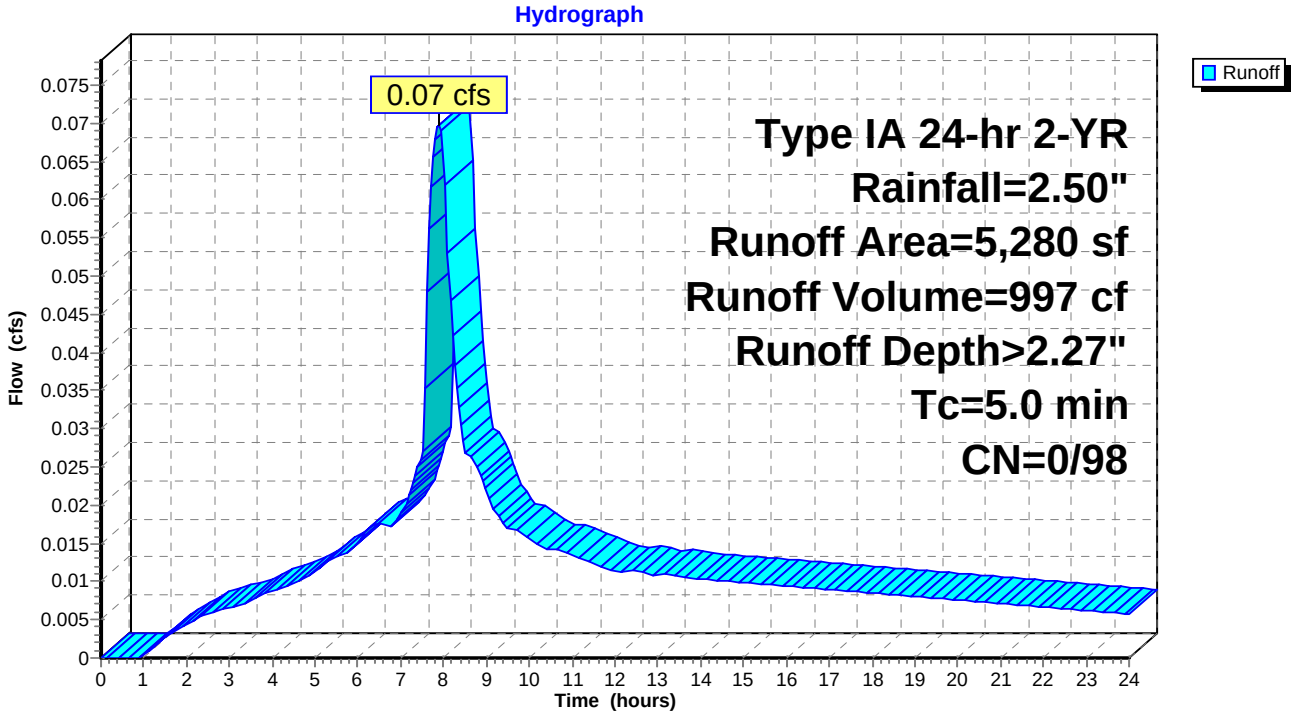
Runoff = 0.07 cfs @ 7.90 hrs, Volume= 997 cf, Depth> 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	5,280	98	2 Lots @ 2640 sf
	5,280	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 17.1S: Lot 46 & 47



Summary for Subcatchment 18.1S: Lots 43-45 & 48-53

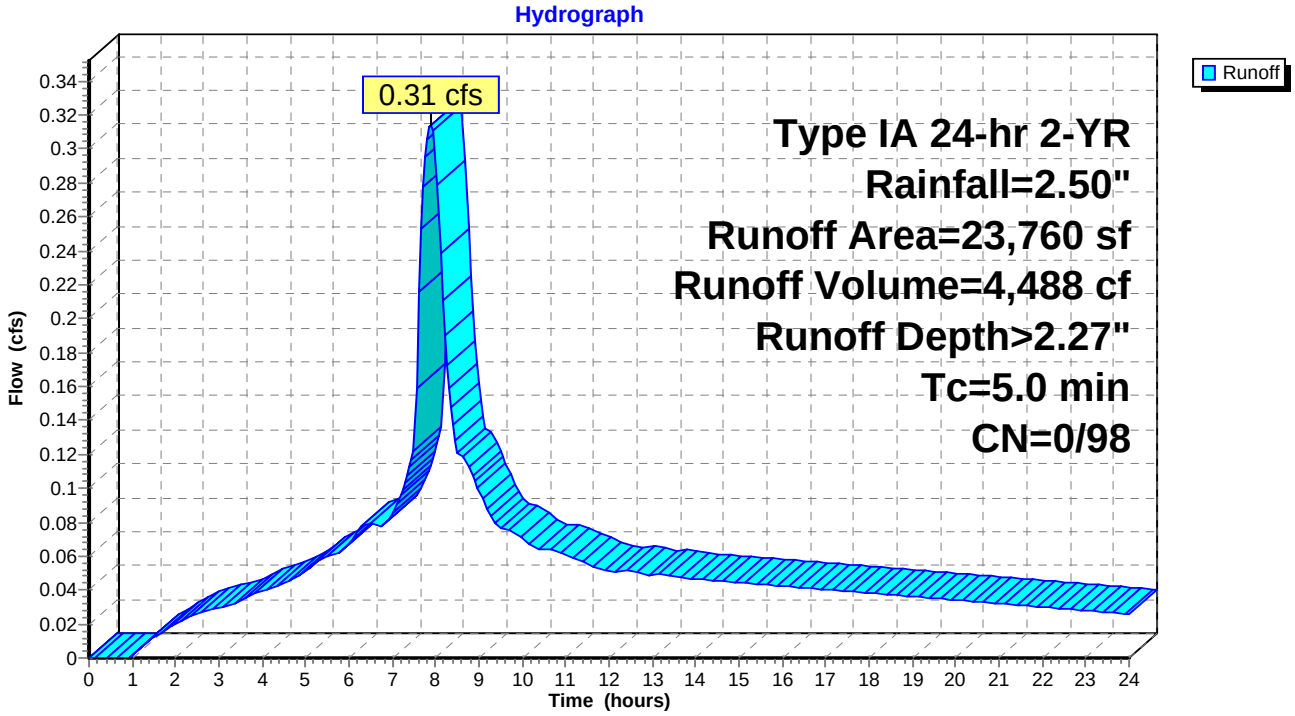
Runoff = 0.31 cfs @ 7.90 hrs, Volume= 4,488 cf, Depth> 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	23,760	98	9 Lots @ 2640 sf
	23,760	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 18.1S: Lots 43-45 & 48-53



Summary for Subcatchment 19.1S: Lots 1 and 36

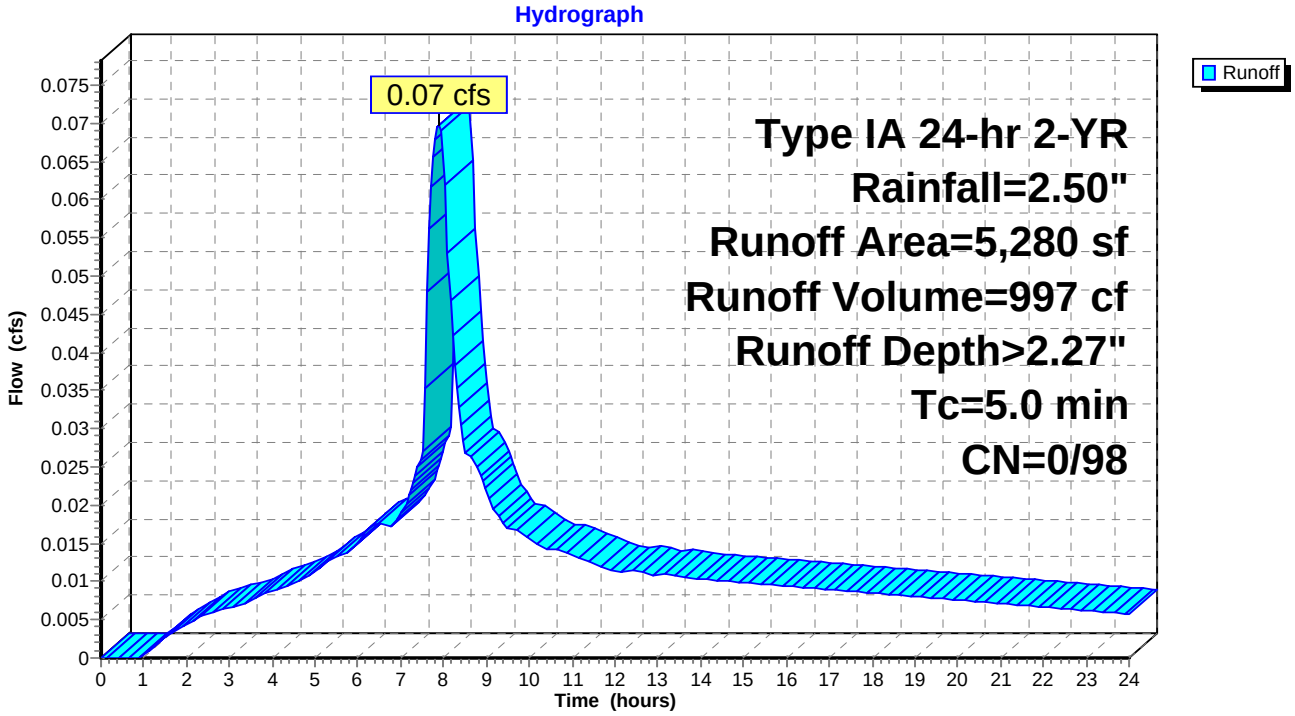
Runoff = 0.07 cfs @ 7.90 hrs, Volume= 997 cf, Depth> 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

	Area (sf)	CN	Description
*	5,280	98	2 Lots @ 2640 sf
	5,280	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 19.1S: Lots 1 and 36



Summary for Pond 1P: WQ Extended Dry Basin

Inflow Area = 384,927 sf, 72.25% Impervious, Inflow Depth > 1.88" for 2-YR event
Inflow = 4.02 cfs @ 7.92 hrs, Volume= 60,371 cf
Outflow = 0.74 cfs @ 11.74 hrs, Volume= 31,663 cf, Atten= 82%, Lag= 229.2 min
Primary = 0.74 cfs @ 11.74 hrs, Volume= 31,663 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 188.89' @ 11.74 hrs Surf.Area= 14,866 sf Storage= 29,970 cf
Flood Elev= 190.75' Surf.Area= 17,158 sf Storage= 52,607 cf

Plug-Flow detention time= 525.4 min calculated for 31,597 cf (52% of inflow)
Center-of-Mass det. time= 264.6 min (961.0 - 696.3)

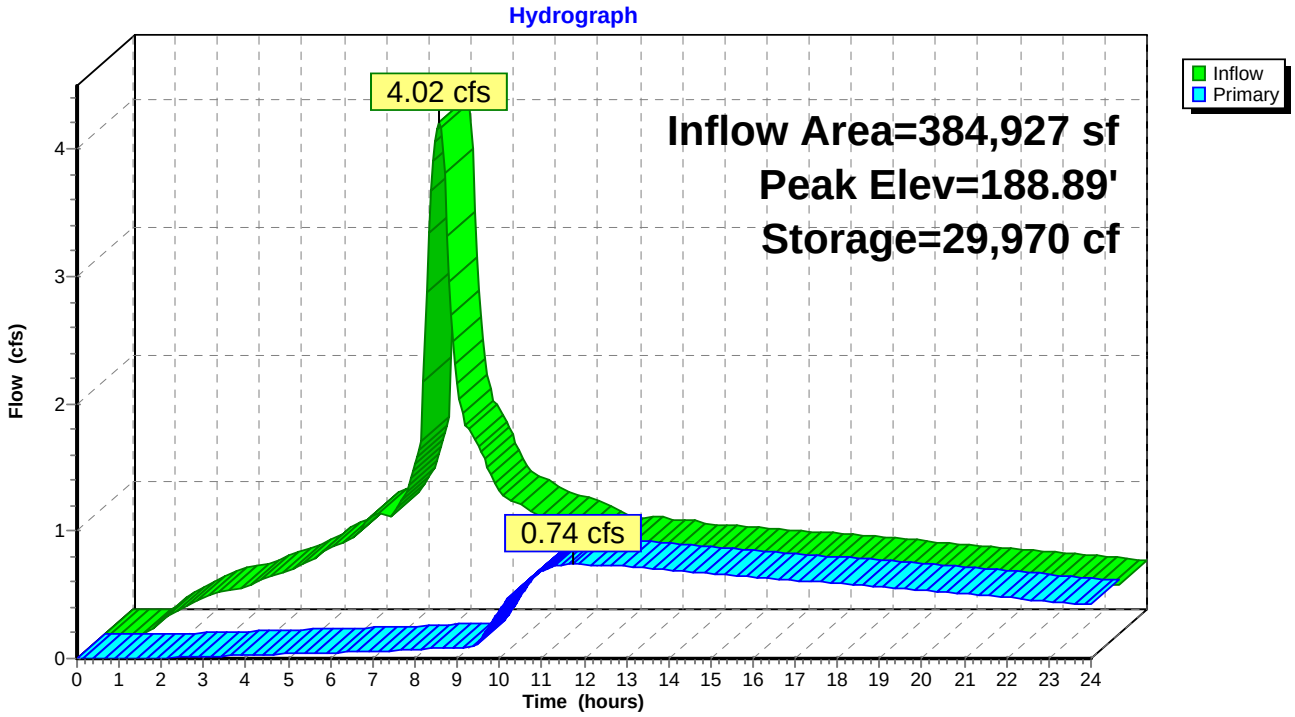
Volume	Invert	Avail.Storage	Storage Description
#1	186.60'	52,607 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
186.60	11,407	0	0
187.00	11,989	4,679	4,679
188.00	13,486	12,738	17,417
189.00	15,044	14,265	31,682
190.00	16,661	15,853	47,534
190.30	17,158	5,073	52,607

Device	Routing	Invert	Outlet Devices
#1	Device 2	186.60'	**2.0' long (Profile 17) Broad-Crested Rectangular Weir** Head (feet) 0.49 0.98 1.48 1.97 2.46 2.95 Coef. (English) 2.84 3.13 3.26 3.30 3.31 3.31
#2	Device 4	186.60'	**1.5" Vert. WQ Orifice** C= 0.620
#3	Device 4	188.65'	**2.0' long (Profile 17) Broad-Crested Rectangular Weir** Head (feet) 0.49 0.98 1.48 1.97 2.46 2.95 Coef. (English) 2.84 3.13 3.26 3.30 3.31 3.31
#4	Primary	186.53'	**18.0" x 12.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 186.49' S= 0.0033 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.74 cfs @ 11.74 hrs HW=188.89' TW=186.57' (Dynamic Tailwater)
└─**4=Culvert** (Passes 0.74 cfs of 10.23 cfs potential flow)
  ├─**2=WQ Orifice** (Orifice Controls 0.09 cfs @ 7.42 fps)
  │ └─**1=Broad-Crested Rectangular Weir** (Passes 0.09 cfs of 22.85 cfs potential flow)
  └─**3=Broad-Crested Rectangular Weir** (Weir Controls 0.65 cfs @ 1.38 fps)

Pond 1P: WQ Extended Dry Basin



Summary for Pond 2R: STM MH A0

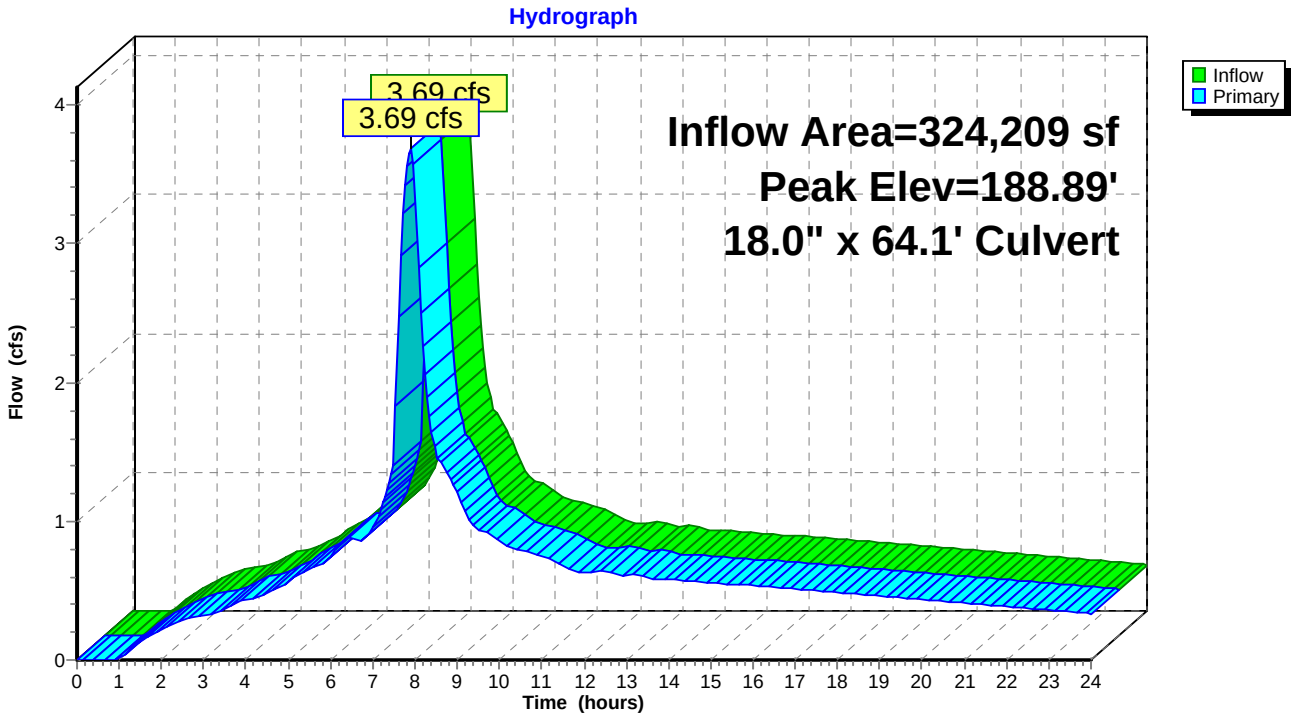
Inflow Area =	324,209 sf,	80.25% Impervious,	Inflow Depth >	1.99"	for 2-YR event
Inflow =	3.69 cfs @	7.91 hrs,	Volume=	53,875 cf	
Outflow =	3.69 cfs @	7.91 hrs,	Volume=	53,875 cf,	Atten= 0%, Lag= 0.0 min
Primary =	3.69 cfs @	7.91 hrs,	Volume=	53,875 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 188.89' @ 11.67 hrs
Flood Elev= 191.68'

Device	Routing	Invert	Outlet Devices
#1	Primary	186.99'	**18.0" x 64.1' long Culvert** Ke= 0.500 Outlet Invert= 186.73' S= 0.0041 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=3.68 cfs @ 7.91 hrs HW=188.31' TW=187.97' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 3.68 cfs @ 2.98 fps)

Pond 2R: STM MH A0



Summary for Pond 3R: STM MH A1

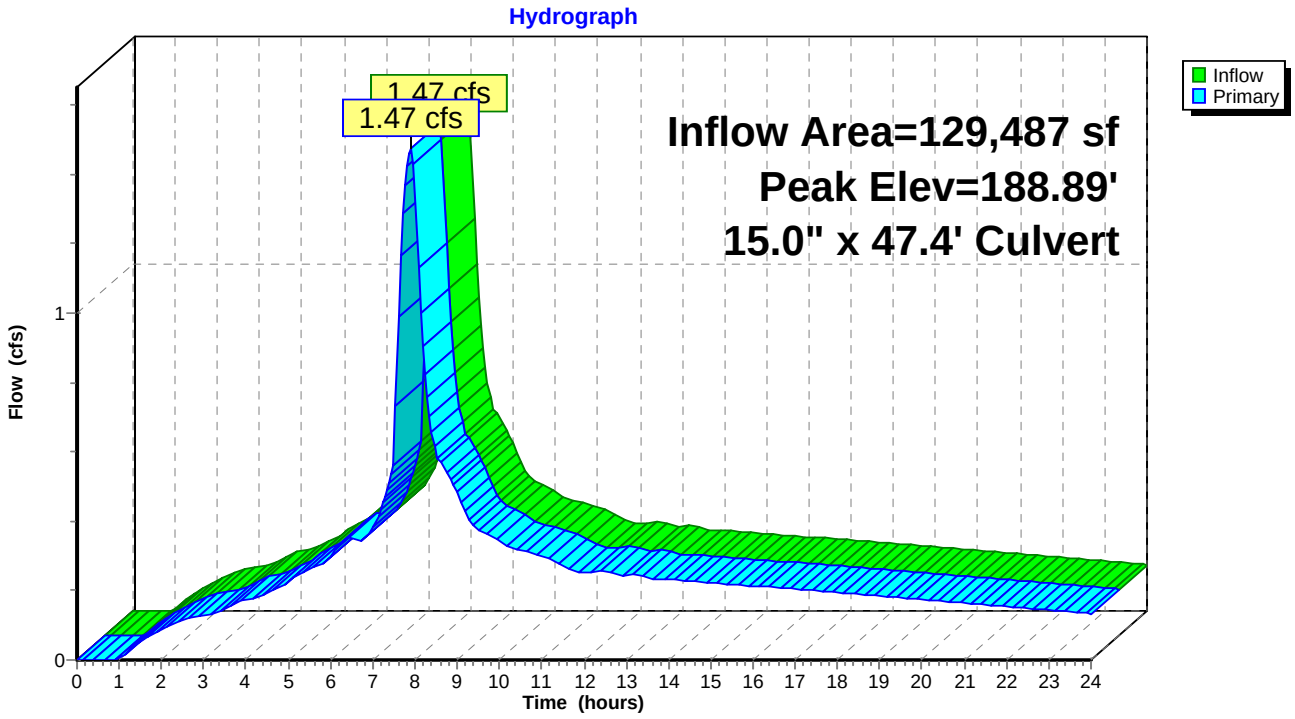
Inflow Area =	129,487 sf,	80.41% Impervious,	Inflow Depth >	2.00"	for 2-YR event
Inflow =	1.47 cfs @	7.91 hrs,	Volume=	21,541 cf	
Outflow =	1.47 cfs @	7.91 hrs,	Volume=	21,541 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.47 cfs @	7.91 hrs,	Volume=	21,541 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 188.89' @ 11.64 hrs
Flood Elev= 192.11'

Device	Routing	Invert	Outlet Devices
#1	Primary	187.38'	**15.0" x 47.4' long Culvert** Ke= 0.500 Outlet Invert= 187.19' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=1.47 cfs @ 7.91 hrs HW=188.43' TW=188.31' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.47 cfs @ 1.81 fps)

Pond 3R: STM MH A1



Summary for Pond 4R: STM MH A2

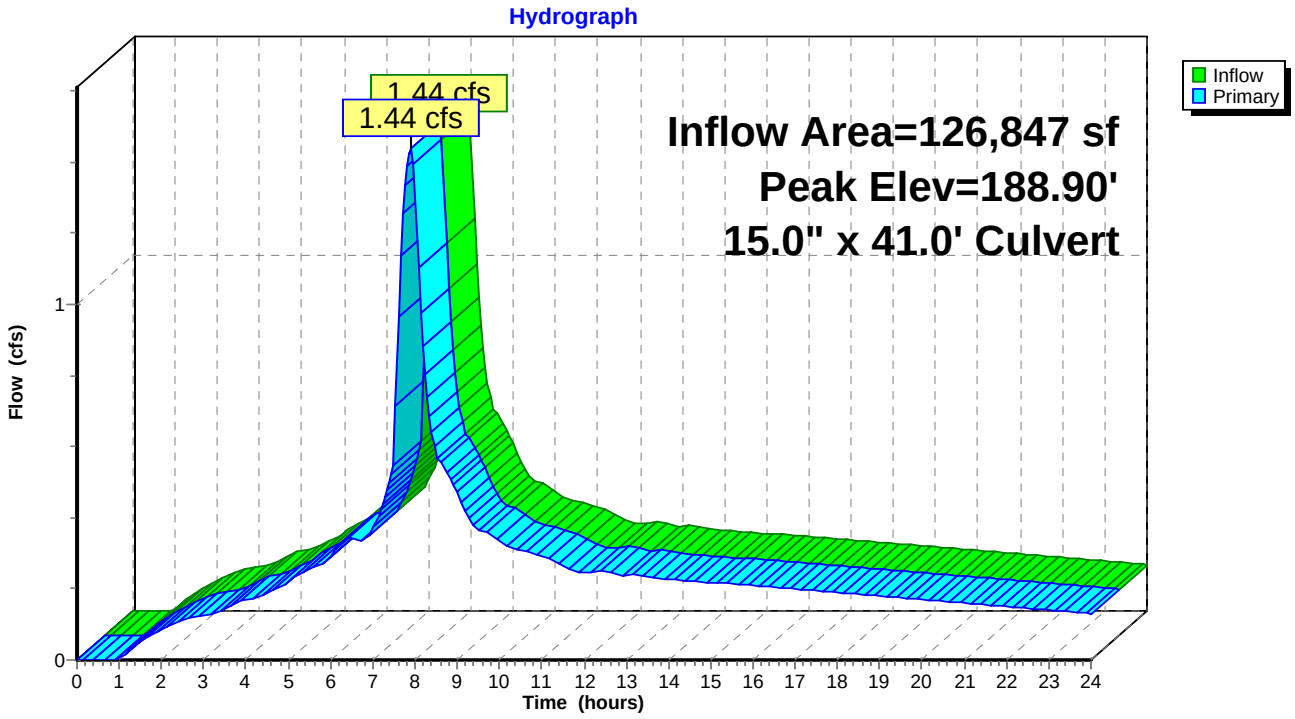
Inflow Area =	126,847 sf,	80.00% Impervious,	Inflow Depth >	1.99"	for 2-YR event
Inflow =	1.44 cfs @	7.91 hrs,	Volume=	21,043 cf	
Outflow =	1.44 cfs @	7.91 hrs,	Volume=	21,043 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.44 cfs @	7.91 hrs,	Volume=	21,043 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 188.90' @ 11.67 hrs
Flood Elev= 192.36'

Device	Routing	Invert	Outlet Devices
#1	Primary	187.74'	**15.0" x 41.0' long Culvert** Ke= 0.500 Outlet Invert= 187.58' S= 0.0039 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=1.35 cfs @ 7.91 hrs HW=188.60' TW=188.43' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.35 cfs @ 2.11 fps)

Pond 4R: STM MH A2



Summary for Pond 5R: STM MH A3

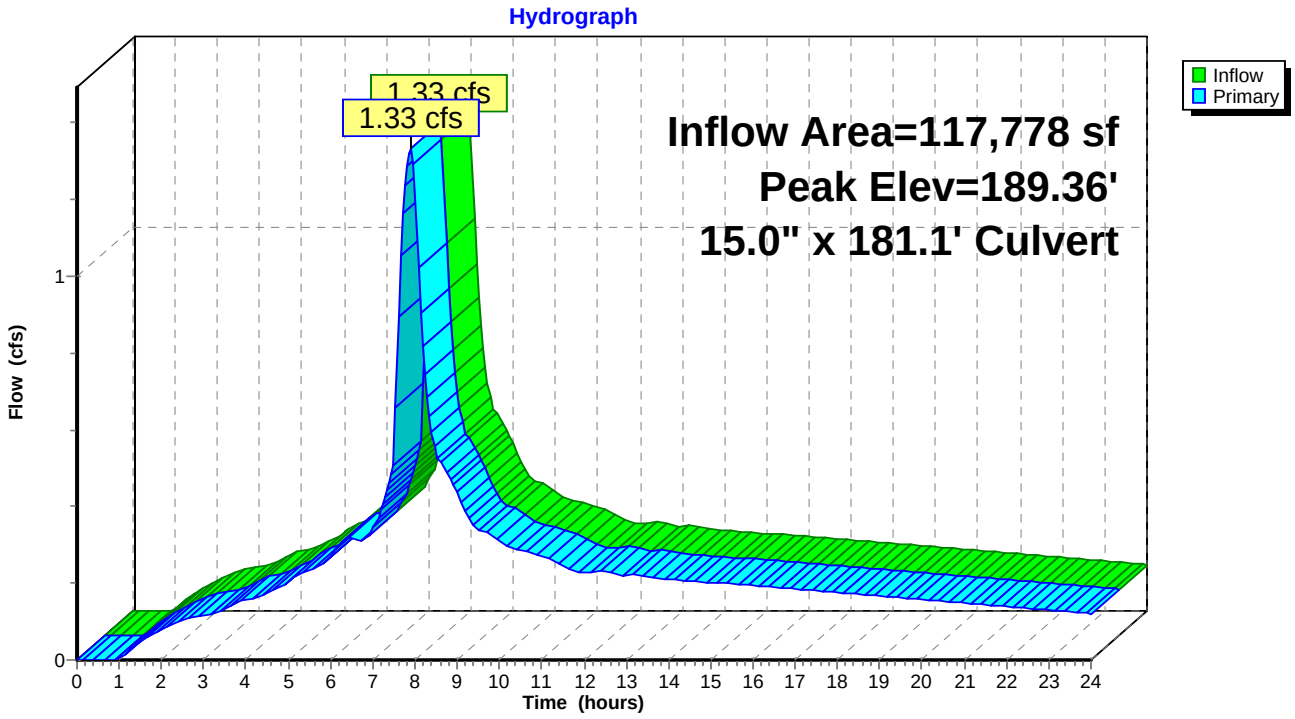
Inflow Area =	117,778 sf,	79.81% Impervious,	Inflow Depth >	1.99"	for 2-YR event
Inflow =	1.33 cfs @	7.91 hrs,	Volume=	19,512 cf	
Outflow =	1.33 cfs @	7.91 hrs,	Volume=	19,512 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.33 cfs @	7.91 hrs,	Volume=	19,512 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.36' @ 7.95 hrs
Flood Elev= 193.63'

Device	Routing	Invert	Outlet Devices
#1	Primary	188.66'	**15.0" x 181.1' long Culvert** Ke= 0.500 Outlet Invert= 187.94' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=1.33 cfs @ 7.91 hrs HW=189.36' TW=188.60' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 1.33 cfs @ 2.74 fps)

Pond 5R: STM MH A3



Summary for Pond 6R: STM MH A4

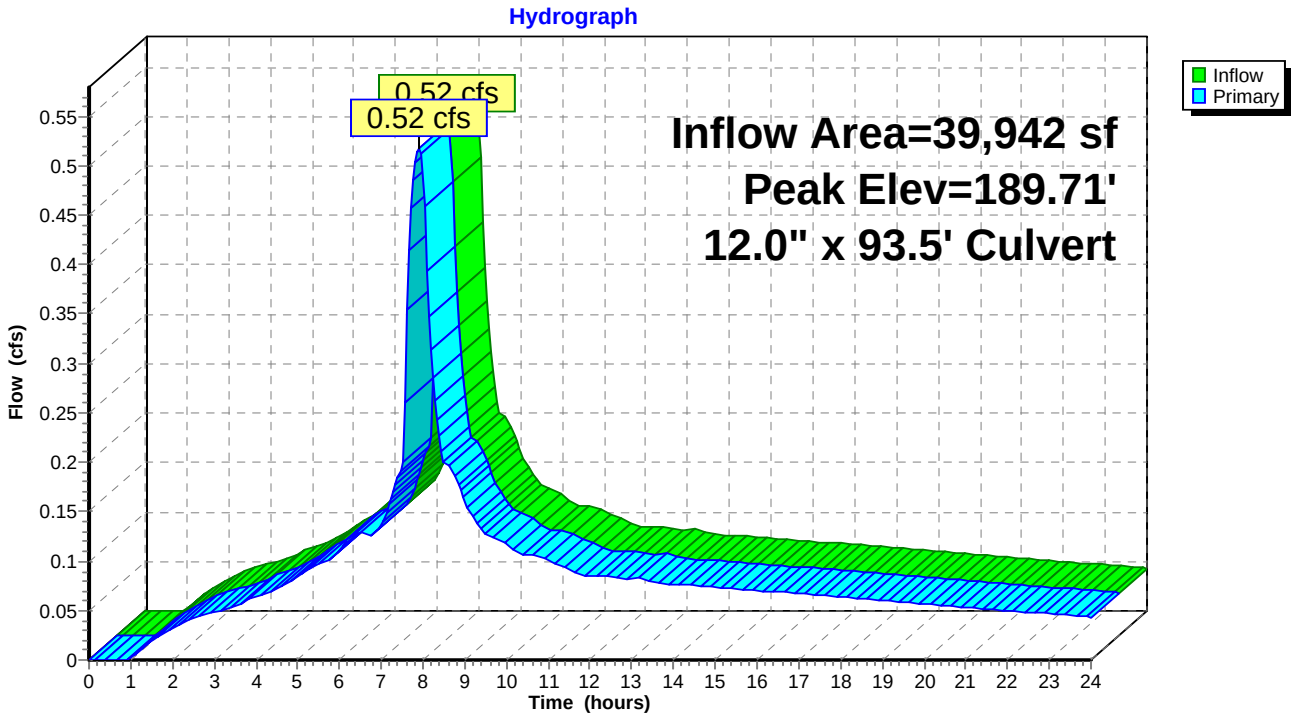
Inflow Area = 39,942 sf, 97.07% Impervious, Inflow Depth > 2.23" for 2-YR event
Inflow = 0.52 cfs @ 7.90 hrs, Volume= 7,410 cf
Outflow = 0.52 cfs @ 7.90 hrs, Volume= 7,410 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.52 cfs @ 7.90 hrs, Volume= 7,410 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.71' @ 7.92 hrs
Flood Elev= 194.32'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.23'	**12.0" x 93.5' long Culvert** Ke= 0.500 Outlet Invert= 188.86' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.52 cfs @ 7.90 hrs HW=189.71' TW=189.36' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.52 cfs @ 2.03 fps)

Pond 6R: STM MH A4



Summary for Pond 7R: STM MH A5

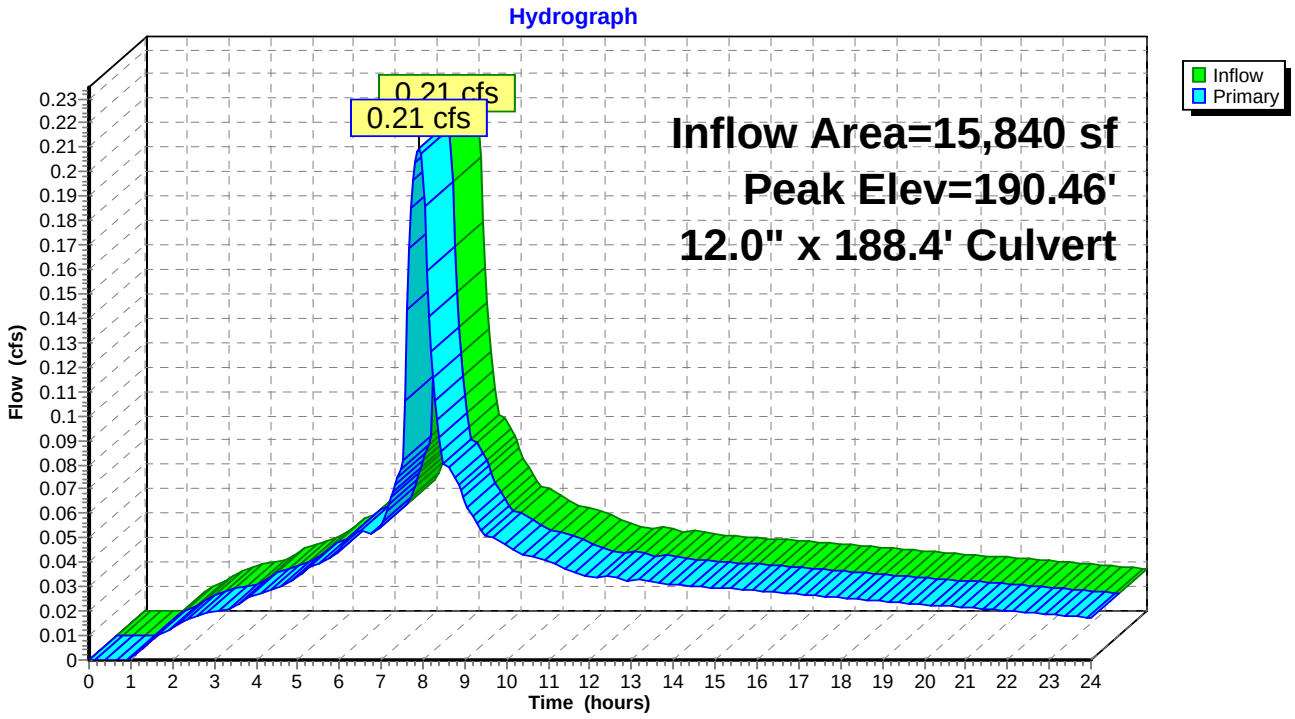
Inflow Area = 15,840 sf,100.00% Impervious, Inflow Depth > 2.27" for 2-YR event
Inflow = 0.21 cfs @ 7.90 hrs, Volume= 2,992 cf
Outflow = 0.21 cfs @ 7.90 hrs, Volume= 2,992 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.21 cfs @ 7.90 hrs, Volume= 2,992 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.46' @ 7.90 hrs
Flood Elev= 196.04'

Device	Routing	Invert	Outlet Devices
#1	Primary	190.18'	**12.0" x 188.4' long Culvert** Ke= 0.500 Outlet Invert= 189.43' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.21 cfs @ 7.90 hrs HW=190.46' TW=189.71' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.21 cfs @ 1.73 fps)

Pond 7R: STM MH A5



Summary for Pond 10R: STM MH B1

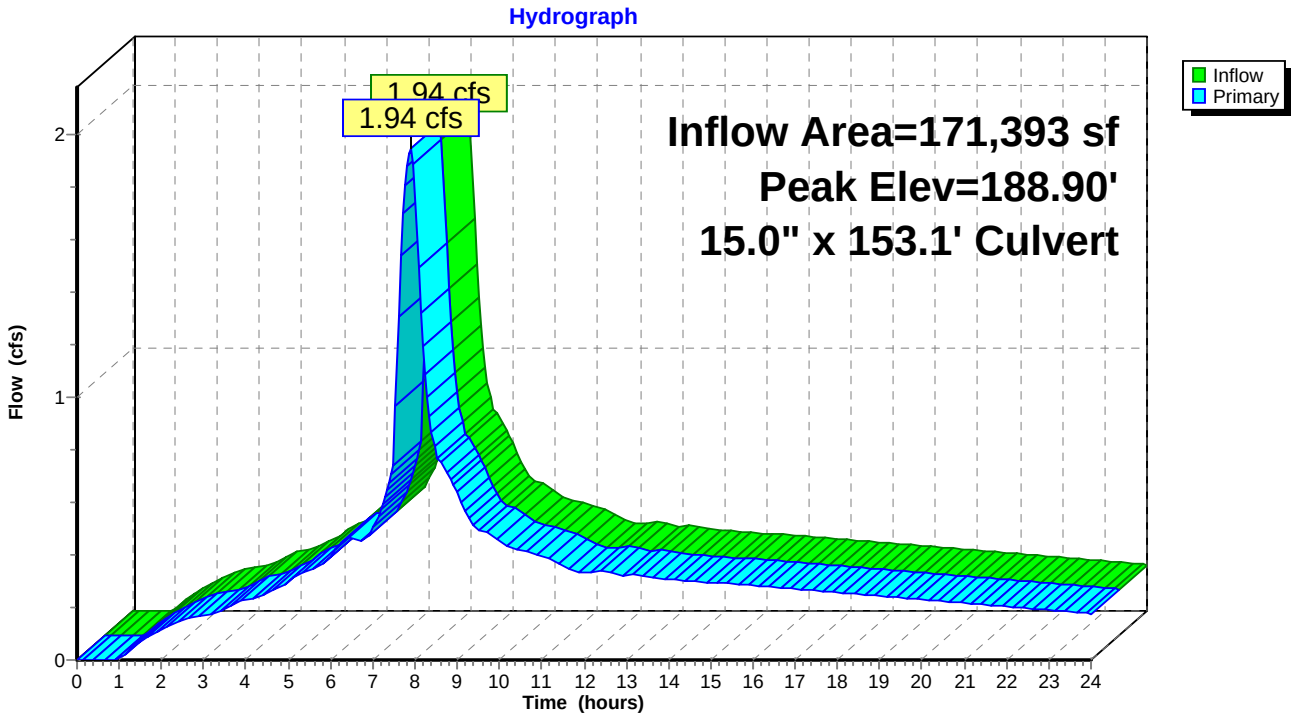
Inflow Area = 171,393 sf, 79.91% Impervious, Inflow Depth > 1.99" for 2-YR event
Inflow = 1.94 cfs @ 7.91 hrs, Volume= 28,415 cf
Outflow = 1.94 cfs @ 7.91 hrs, Volume= 28,415 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.94 cfs @ 7.91 hrs, Volume= 28,415 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 188.90' @ 11.52 hrs
Flood Elev= 193.43'

Device	Routing	Invert	Outlet Devices
#1	Primary	187.80'	**15.0" x 153.1' long Culvert** Ke= 0.500 Outlet Invert= 187.19' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=1.94 cfs @ 7.91 hrs HW=188.78' TW=188.31' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 1.94 cfs @ 2.57 fps)

Pond 10R: STM MH B1



Summary for Pond 11R: STM MH B2

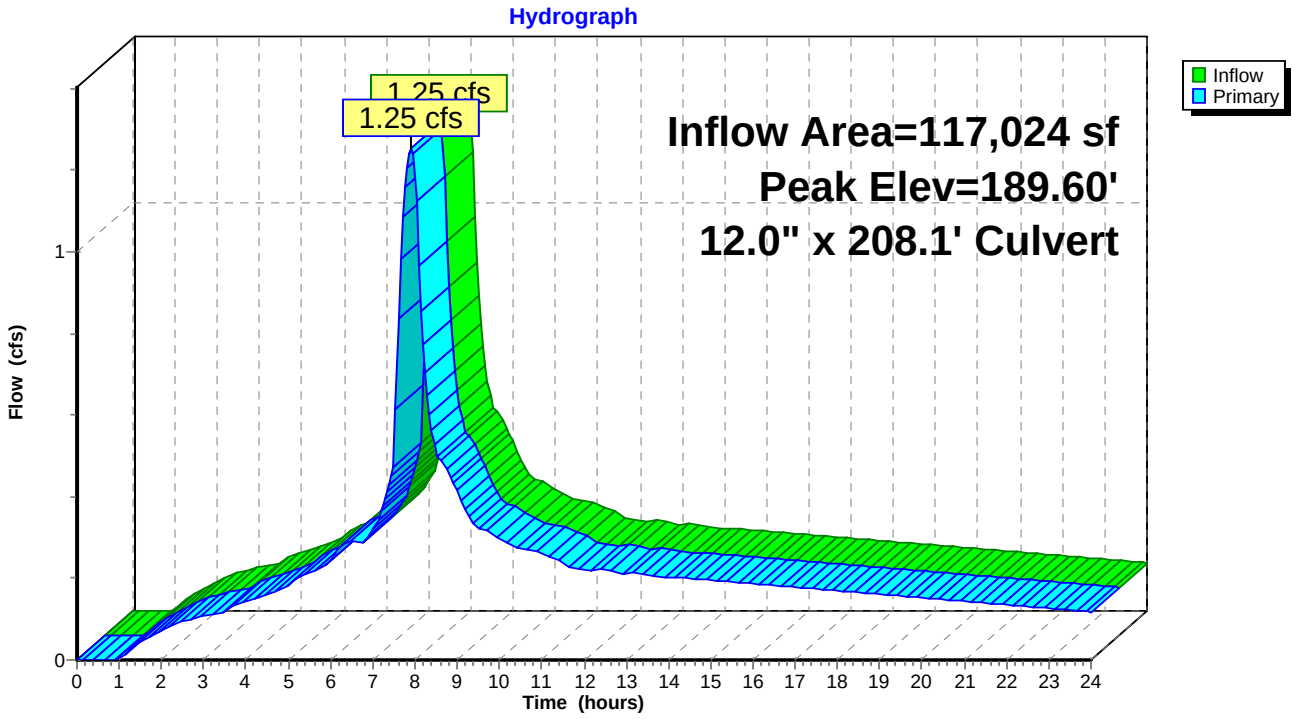
Inflow Area = 117,024 sf, 73.10% Impervious, Inflow Depth > 1.90" for 2-YR event
Inflow = 1.25 cfs @ 7.92 hrs, Volume= 18,484 cf
Outflow = 1.25 cfs @ 7.92 hrs, Volume= 18,484 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.25 cfs @ 7.92 hrs, Volume= 18,484 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.60' @ 7.94 hrs
Flood Elev= 196.38'

Device	Routing	Invert	Outlet Devices
#1	Primary	188.83'	**12.0" x 208.1' long Culvert** Ke= 0.500 Outlet Invert= 188.00' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=1.24 cfs @ 7.92 hrs HW=189.60' TW=188.79' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 1.24 cfs @ 2.66 fps)

Pond 11R: STM MH B2



Summary for Pond 12R: STM MH B3

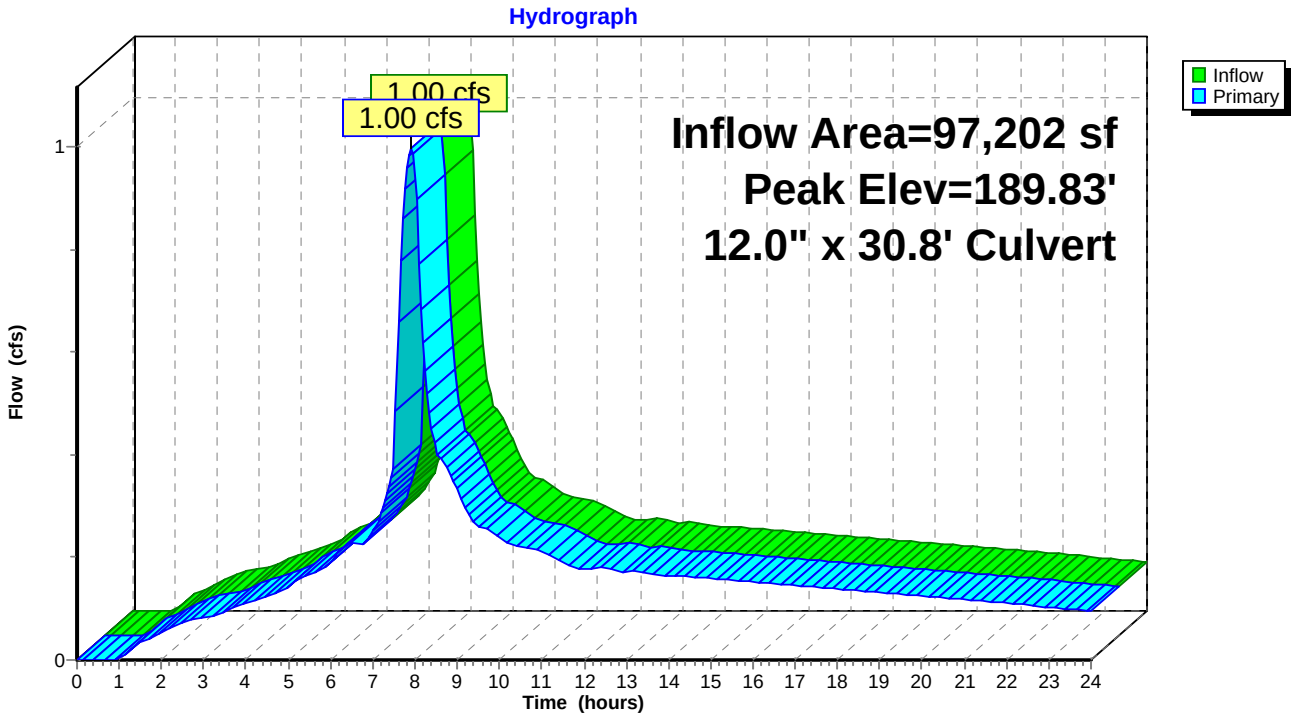
Inflow Area = 97,202 sf, 68.09% Impervious, Inflow Depth > 1.83" for 2-YR event
Inflow = 1.00 cfs @ 7.92 hrs, Volume= 14,793 cf
Outflow = 1.00 cfs @ 7.92 hrs, Volume= 14,793 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.00 cfs @ 7.92 hrs, Volume= 14,793 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.83' @ 7.93 hrs
Flood Elev= 196.86'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.15'	**12.0" x 30.8' long Culvert** Ke= 0.500 Outlet Invert= 189.03' S= 0.0039 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.99 cfs @ 7.92 hrs HW=189.83' TW=189.60' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.99 cfs @ 2.47 fps)

Pond 12R: STM MH B3



Summary for Pond 13R: STM MH B4

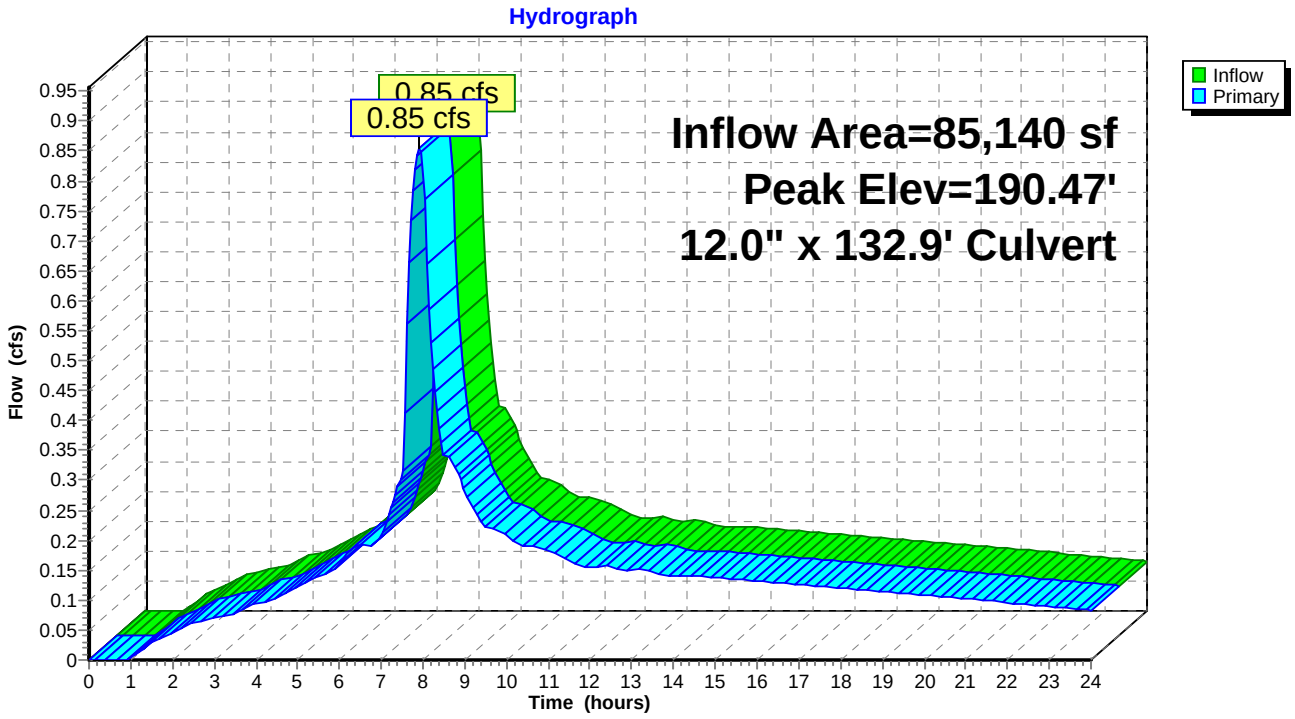
Inflow Area = 85,140 sf, 65.88% Impervious, Inflow Depth > 1.80" for 2-YR event
Inflow = 0.85 cfs @ 7.92 hrs, Volume= 12,741 cf
Outflow = 0.85 cfs @ 7.92 hrs, Volume= 12,741 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.85 cfs @ 7.92 hrs, Volume= 12,741 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.47' @ 7.93 hrs
Flood Elev= 198.44'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.88'	**12.0" x 132.9' long Culvert** Ke= 0.500 Outlet Invert= 189.35' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.85 cfs @ 7.92 hrs HW=190.46' TW=189.83' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.85 cfs @ 2.57 fps)

Pond 13R: STM MH B4



Summary for Pond 14R: STM MH B5

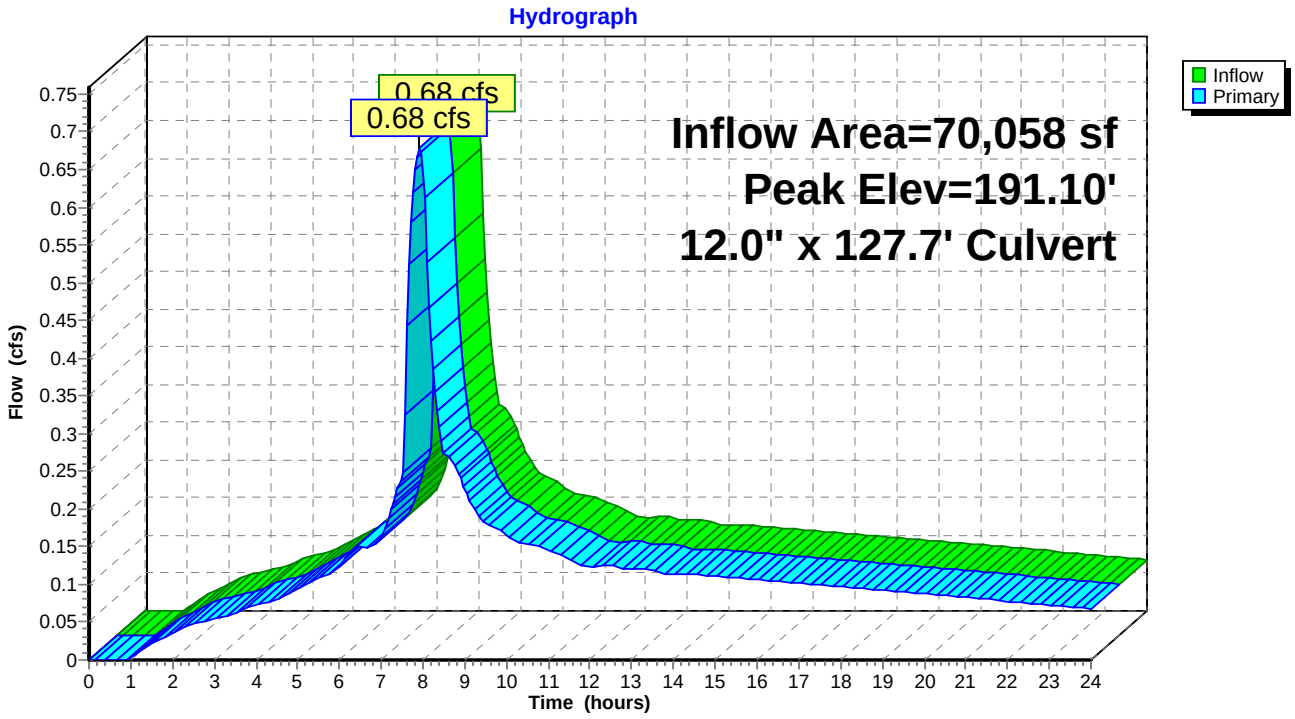
Inflow Area = 70,058 sf, 62.05% Impervious, Inflow Depth > 1.74" for 2-YR event
Inflow = 0.68 cfs @ 7.93 hrs, Volume= 10,175 cf
Outflow = 0.68 cfs @ 7.93 hrs, Volume= 10,175 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.68 cfs @ 7.93 hrs, Volume= 10,175 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 191.10' @ 7.93 hrs
Flood Elev= 196.96'

Device	Routing	Invert	Outlet Devices
#1	Primary	190.59'	**12.0" x 127.7' long Culvert** Ke= 0.500 Outlet Invert= 190.08' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.68 cfs @ 7.93 hrs HW=191.10' TW=190.46' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.68 cfs @ 2.47 fps)

Pond 14R: STM MH B5



Summary for Pond 15R: STM MH B6

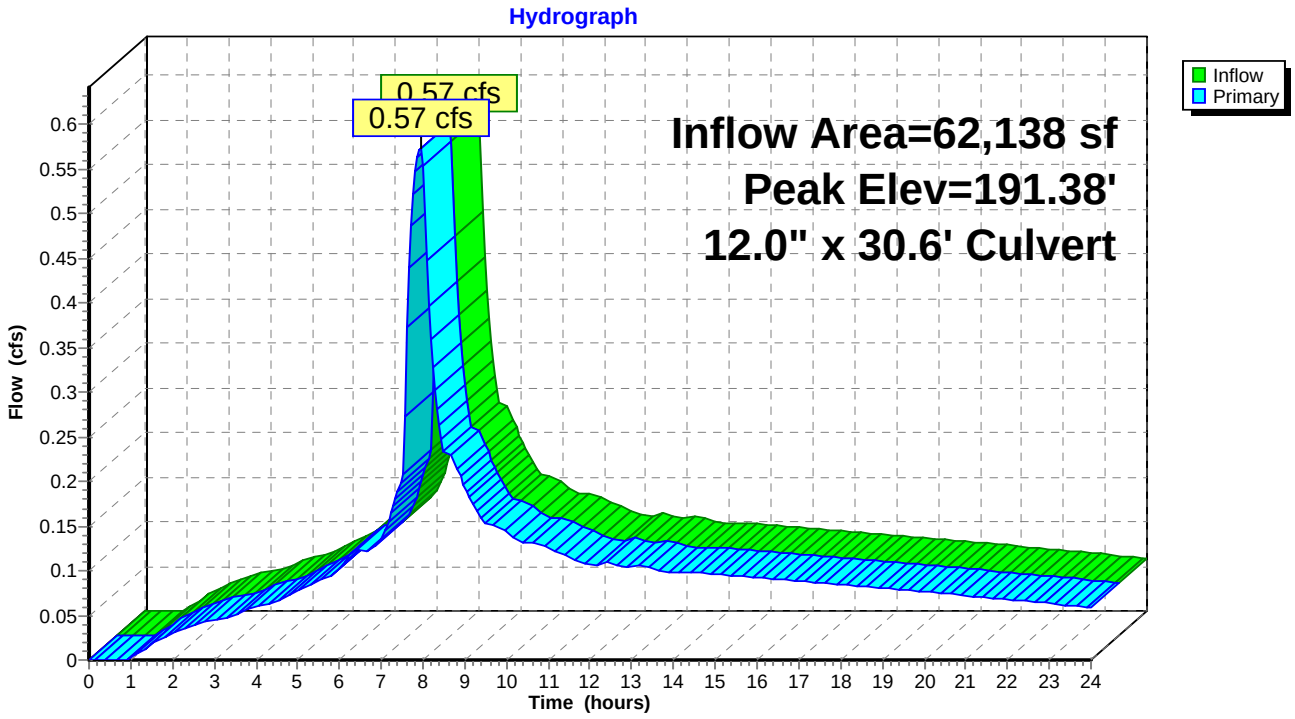
Inflow Area = 62,138 sf, 57.21% Impervious, Inflow Depth > 1.68" for 2-YR event
Inflow = 0.57 cfs @ 7.93 hrs, Volume= 8,679 cf
Outflow = 0.57 cfs @ 7.93 hrs, Volume= 8,679 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.57 cfs @ 7.93 hrs, Volume= 8,679 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 191.38' @ 7.93 hrs
Flood Elev= 196.54'

Device	Routing	Invert	Outlet Devices
#1	Primary	190.91'	**12.0" x 30.6' long Culvert** Ke= 0.500 Outlet Invert= 190.79' S= 0.0039 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.57 cfs @ 7.93 hrs HW=191.38' TW=191.10' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.57 cfs @ 2.32 fps)

Pond 15R: STM MH B6



Summary for Pond 16R: STM MH B7

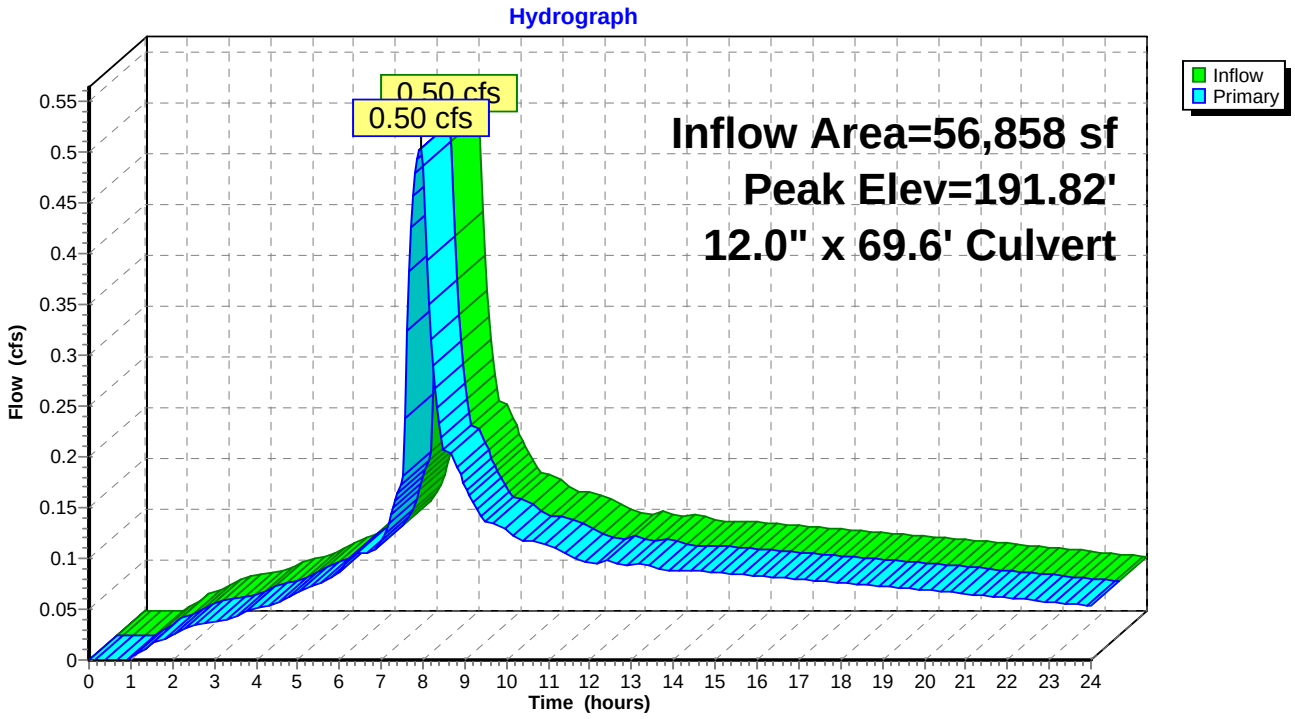
Inflow Area = 56,858 sf, 53.24% Impervious, Inflow Depth > 1.62" for 2-YR event
Inflow = 0.50 cfs @ 7.94 hrs, Volume= 7,682 cf
Outflow = 0.50 cfs @ 7.94 hrs, Volume= 7,682 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.50 cfs @ 7.94 hrs, Volume= 7,682 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 191.82' @ 7.94 hrs
Flood Elev= 195.55'

Device	Routing	Invert	Outlet Devices
#1	Primary	191.39'	**12.0" x 69.6' long Culvert** Ke= 0.500 Outlet Invert= 191.11' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.50 cfs @ 7.94 hrs HW=191.82' TW=191.38' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.50 cfs @ 2.28 fps)

Pond 16R: STM MH B7



Summary for Pond 17R: STM MH C1

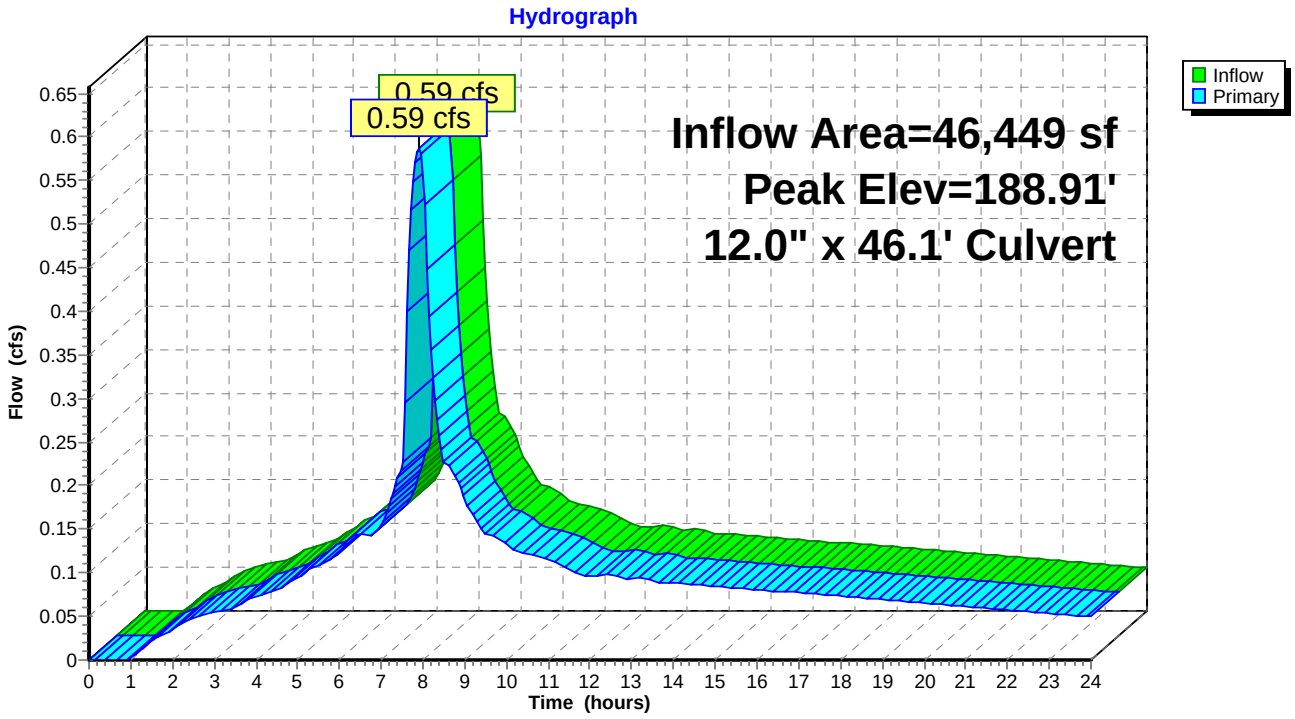
Inflow Area = 46,449 sf, 93.64% Impervious, Inflow Depth > 2.18" for 2-YR event
Inflow = 0.59 cfs @ 7.90 hrs, Volume= 8,434 cf
Outflow = 0.59 cfs @ 7.90 hrs, Volume= 8,434 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.59 cfs @ 7.90 hrs, Volume= 8,434 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 188.91' @ 11.54 hrs
Flood Elev= 192.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	188.19'	**12.0" x 46.1' long Culvert** Ke= 0.500 Outlet Invert= 188.00' S= 0.0041 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.55 cfs @ 7.90 hrs HW=188.87' TW=188.78' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.55 cfs @ 1.37 fps)

Pond 17R: STM MH C1



Summary for Pond 18R: STM MH C2

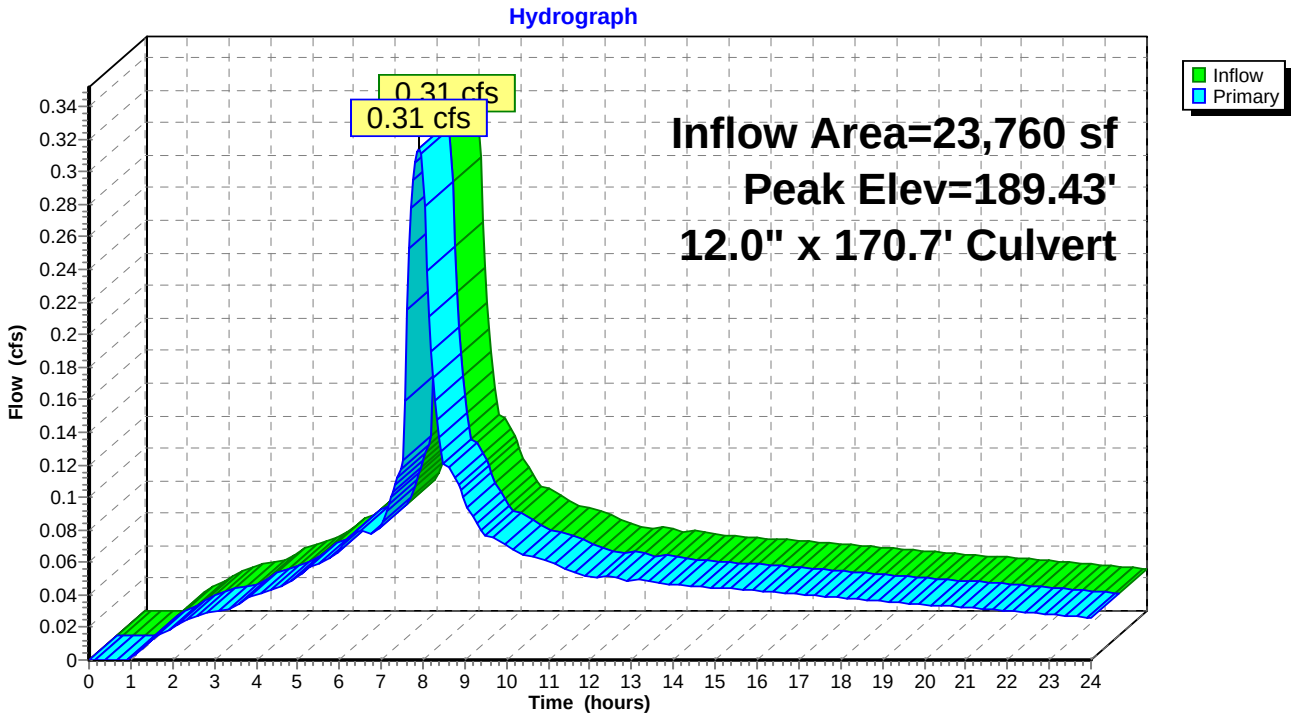
Inflow Area = 23,760 sf,100.00% Impervious, Inflow Depth > 2.27" for 2-YR event
Inflow = 0.31 cfs @ 7.90 hrs, Volume= 4,488 cf
Outflow = 0.31 cfs @ 7.90 hrs, Volume= 4,488 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.31 cfs @ 7.90 hrs, Volume= 4,488 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.43' @ 7.93 hrs
Flood Elev= 194.84'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.06'	**12.0" x 170.7' long Culvert** Ke= 0.500 Outlet Invert= 188.38' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.31 cfs @ 7.90 hrs HW=189.43' TW=188.87' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.31 cfs @ 1.79 fps)

Pond 18R: STM MH C2



Summary for Pond 19R: STM MH D1

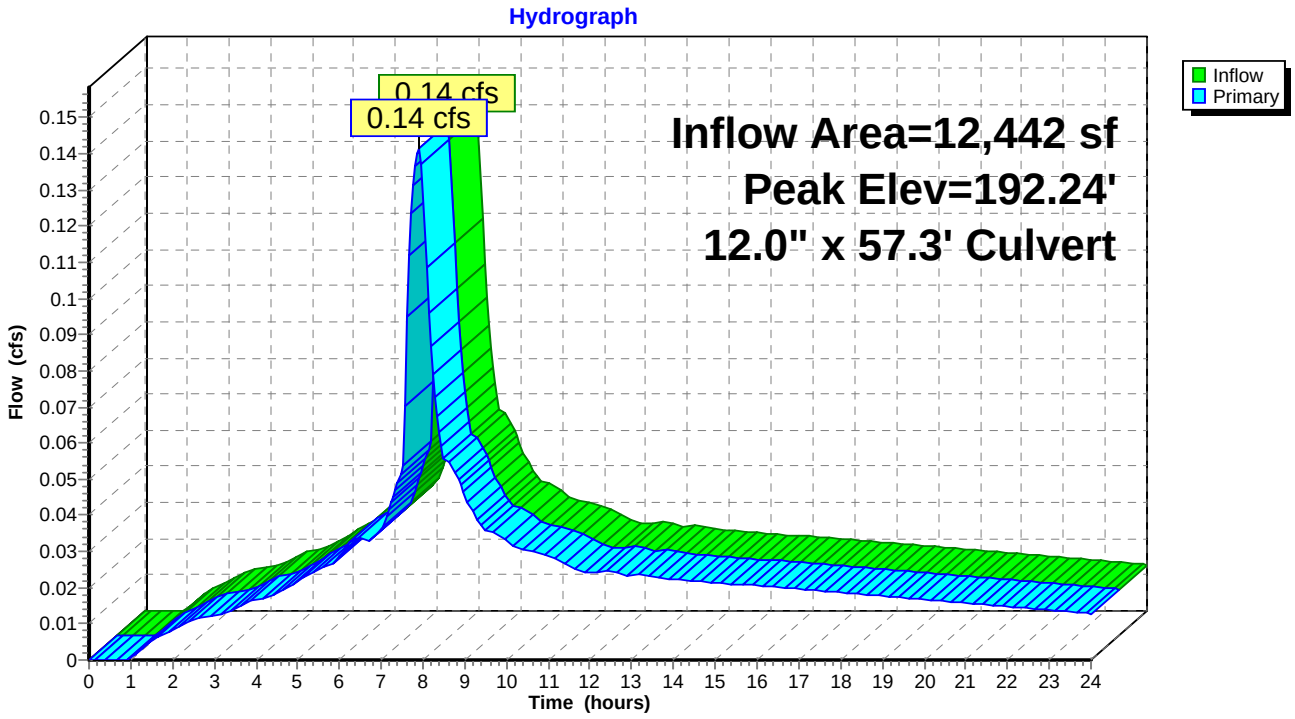
Inflow Area = 12,442 sf, 80.22% Impervious, Inflow Depth > 1.99" for 2-YR event
Inflow = 0.14 cfs @ 7.91 hrs, Volume= 2,067 cf
Outflow = 0.14 cfs @ 7.91 hrs, Volume= 2,067 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.14 cfs @ 7.91 hrs, Volume= 2,067 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 192.24' @ 7.91 hrs
Flood Elev= 197.51'

Device	Routing	Invert	Outlet Devices
#1	Primary	192.04'	**12.0" x 57.3' long Culvert** Ke= 0.500 Outlet Invert= 191.58' S= 0.0080 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.14 cfs @ 7.91 hrs HW=192.24' TW=190.46' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.14 cfs @ 1.97 fps)

Pond 19R: STM MH D1



Summary for Pond 20R: STM MH F1

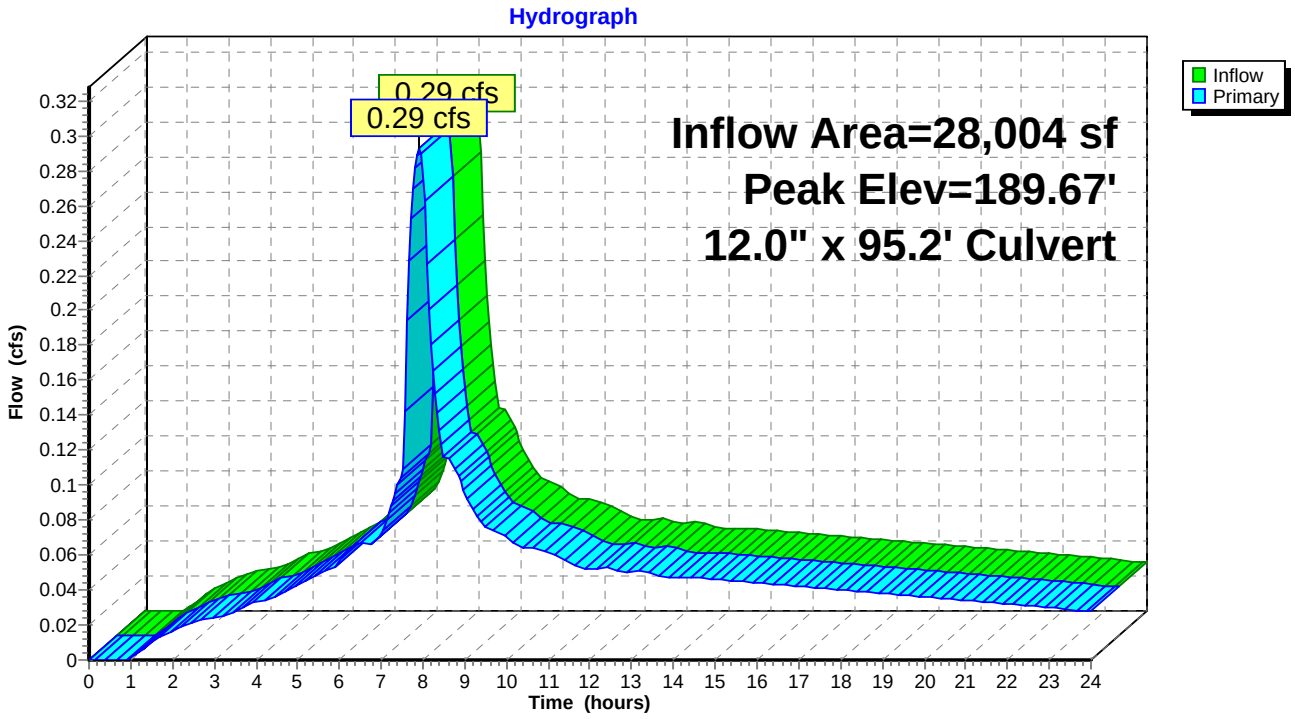
Inflow Area = 28,004 sf, 70.39% Impervious, Inflow Depth > 1.86" for 2-YR event
Inflow = 0.29 cfs @ 7.92 hrs, Volume= 4,336 cf
Outflow = 0.29 cfs @ 7.92 hrs, Volume= 4,336 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.29 cfs @ 7.92 hrs, Volume= 4,336 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.67' @ 7.93 hrs
Flood Elev= 193.76'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.31'	**12.0" x 95.2' long Culvert** Ke= 0.500 Outlet Invert= 188.93' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.29 cfs @ 7.92 hrs HW=189.67' TW=189.36' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.29 cfs @ 1.70 fps)

Pond 20R: STM MH F1



Summary for Pond 21R: STM MH F2

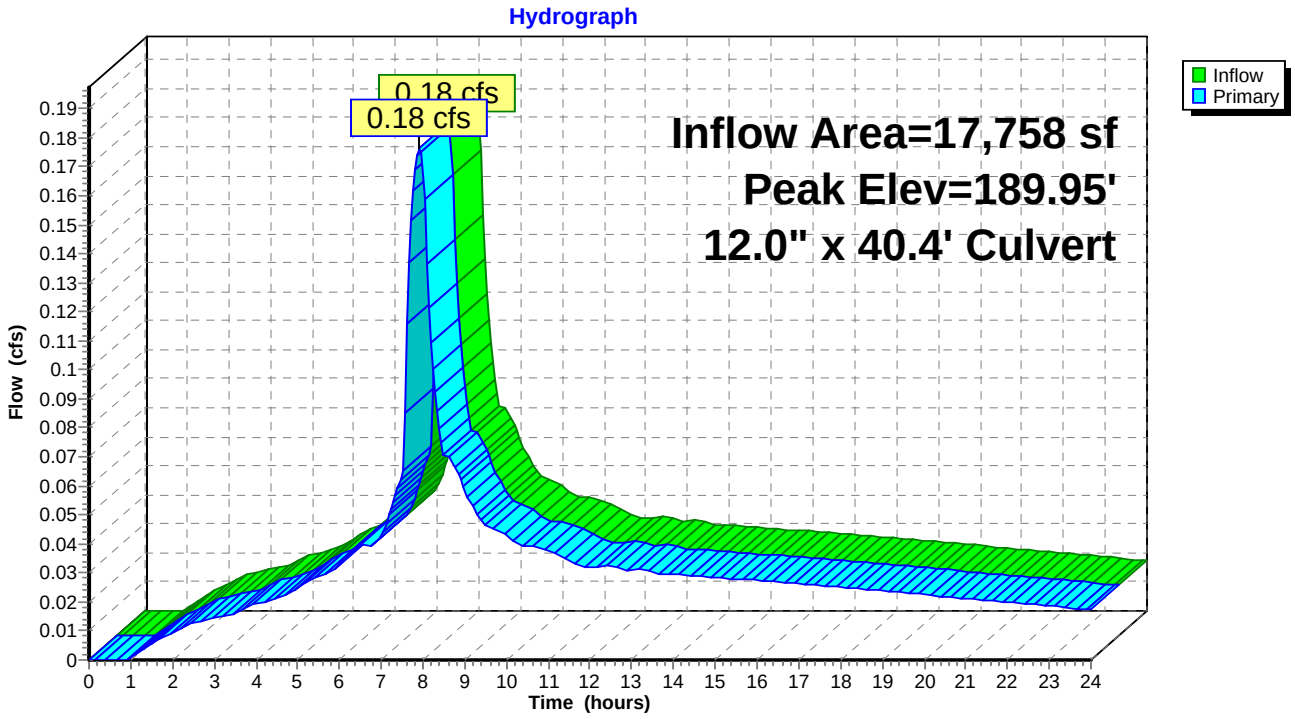
Inflow Area = 17,758 sf, 64.74% Impervious, Inflow Depth > 1.78" for 2-YR event
Inflow = 0.18 cfs @ 7.93 hrs, Volume= 2,634 cf
Outflow = 0.18 cfs @ 7.93 hrs, Volume= 2,634 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.18 cfs @ 7.93 hrs, Volume= 2,634 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.95' @ 7.93 hrs
Flood Elev= 193.33'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.71'	**12.0" x 40.4' long Culvert** Ke= 0.500 Outlet Invert= 189.51' S= 0.0050 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.18 cfs @ 7.93 hrs HW=189.95' TW=189.67' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.18 cfs @ 1.79 fps)

Pond 21R: STM MH F2



Summary for Pond 23R: STM MH E1

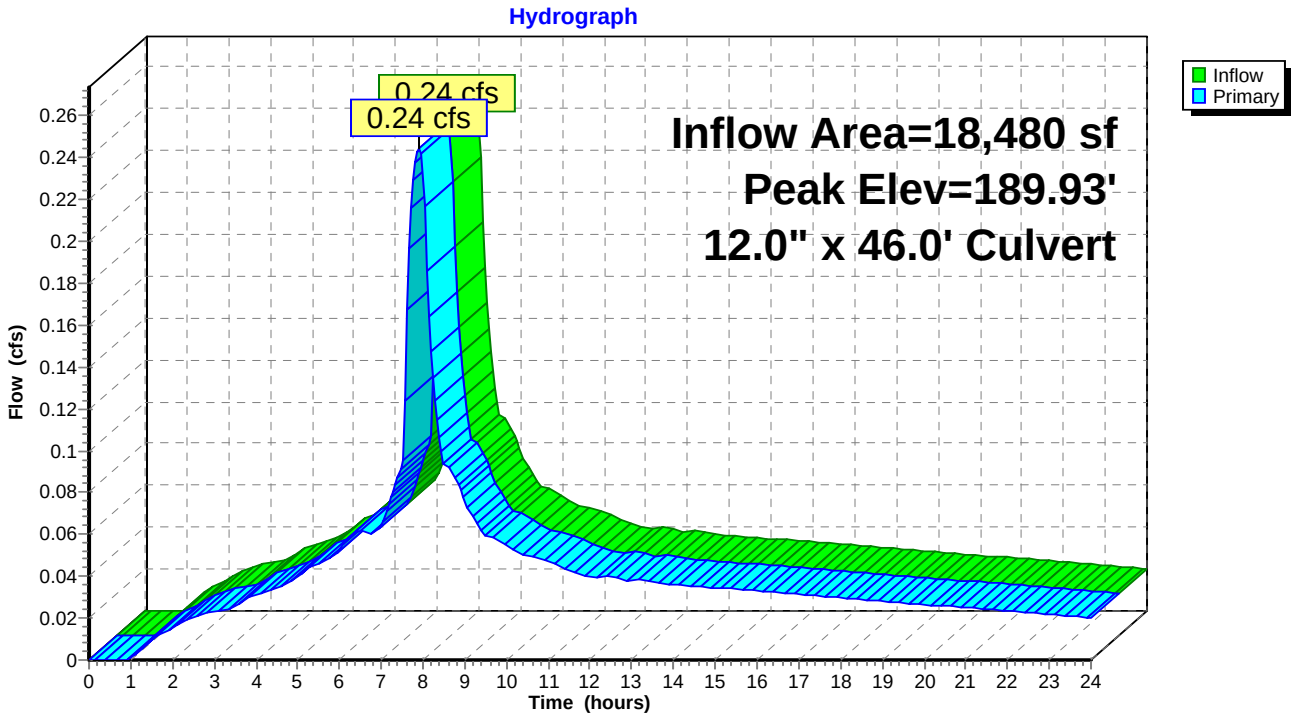
Inflow Area = 18,480 sf,100.00% Impervious, Inflow Depth > 2.27" for 2-YR event
Inflow = 0.24 cfs @ 7.90 hrs, Volume= 3,491 cf
Outflow = 0.24 cfs @ 7.90 hrs, Volume= 3,491 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.24 cfs @ 7.90 hrs, Volume= 3,491 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.93' @ 7.91 hrs
Flood Elev= 194.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.62'	**12.0" x 46.0' long Culvert** Ke= 0.500 Outlet Invert= 189.44' S= 0.0039 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.24 cfs @ 7.90 hrs HW=189.93' TW=189.71' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.24 cfs @ 1.75 fps)

Pond 23R: STM MH E1



Summary for Pond 24R: STM MH E2

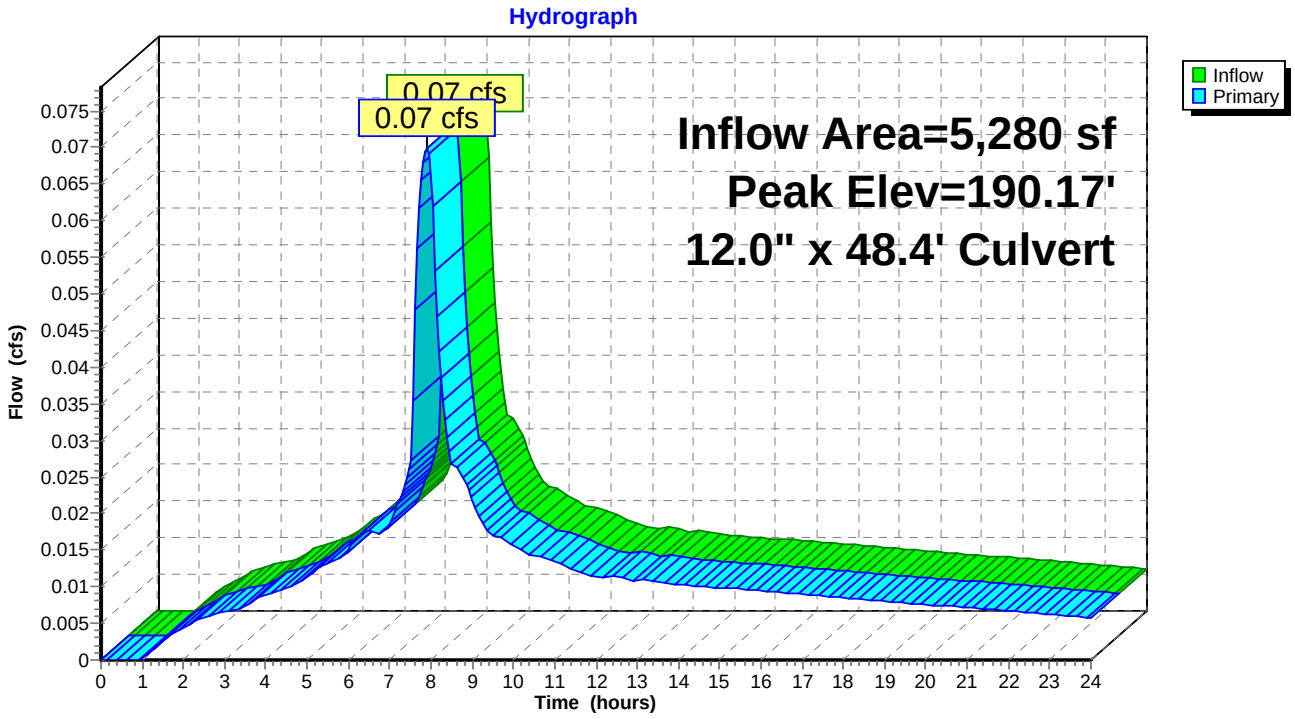
Inflow Area = 5,280 sf,100.00% Impervious, Inflow Depth > 2.27" for 2-YR event
Inflow = 0.07 cfs @ 7.90 hrs, Volume= 997 cf
Outflow = 0.07 cfs @ 7.90 hrs, Volume= 997 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.07 cfs @ 7.90 hrs, Volume= 997 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.17' @ 7.90 hrs
Flood Elev= 194.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	190.01'	**12.0" x 48.4' long Culvert** Ke= 0.500 Outlet Invert= 189.82' S= 0.0039 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.07 cfs @ 7.90 hrs HW=190.17' TW=189.93' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.07 cfs @ 1.29 fps)

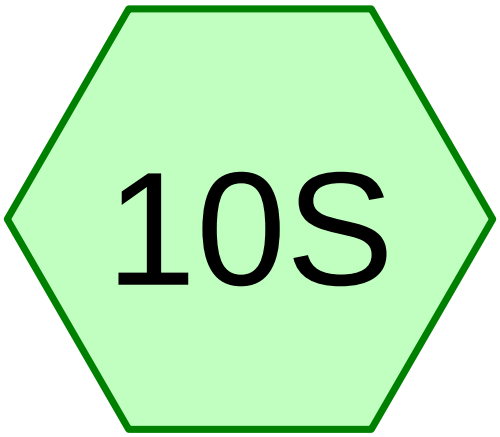
Pond 24R: STM MH E2



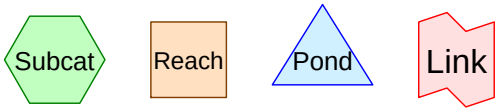
APPENDIX B

PRE-DEVELOPED AND POST-DEVELOPED SITE 10-YEAR YEAR STORM EVENT ANALYSIS

PRE-DEVELOPED SITE



Pre-Developed Onsite



Drainage Diagram for 3876 HERITAGE, PRE-DEVELOPED
Prepared by AKS Engineering & Forestry (PAS), Printed 9/29/2015
HydroCAD® 8.50 s/n 005096 © 2007 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
303,703	80	Pasture/grassland/range, Good, HSG D (10S)
13,855	84	50-75% Grass cover, Fair, HSG D (10S)
75,894	84	Wetland Area (10S)
1,986	98	Existing House & Outbuildings (10S)
1,085	98	Sidewalks & concrete pad areas (10S)
396,523		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points x 3
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10S: Pre-Developed Onsite Runoff Area=396,523 sf 0.77% Impervious Runoff Depth>1.65"
Flow Length=379' Tc=37.3 min CN=81/98 Runoff=2.18 cfs 54,393 cf

Total Runoff Area = 396,523 sf Runoff Volume = 54,393 cf Average Runoff Depth = 1.65"
99.23% Pervious = 393,452 sf 0.77% Impervious = 3,071 sf

Summary for Subcatchment 10S: Pre-Developed Onsite

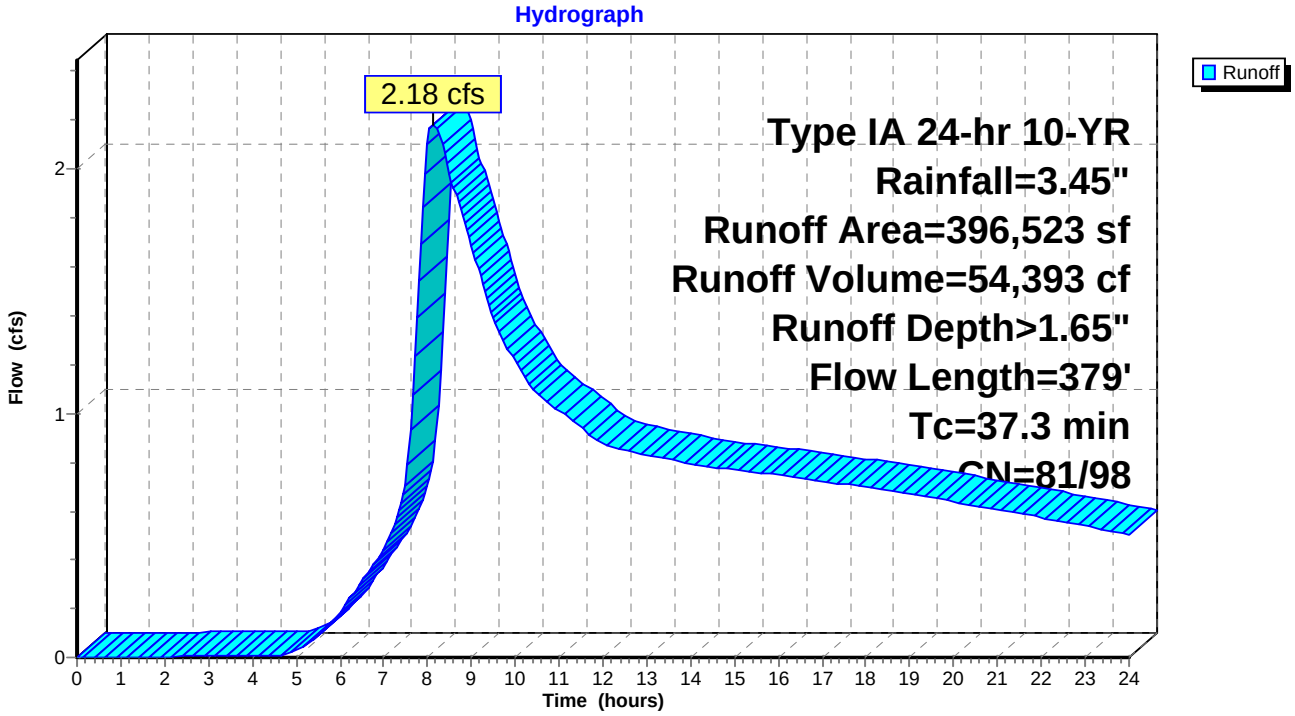
Runoff = 2.18 cfs @ 8.14 hrs, Volume= 54,393 cf, Depth> 1.65"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

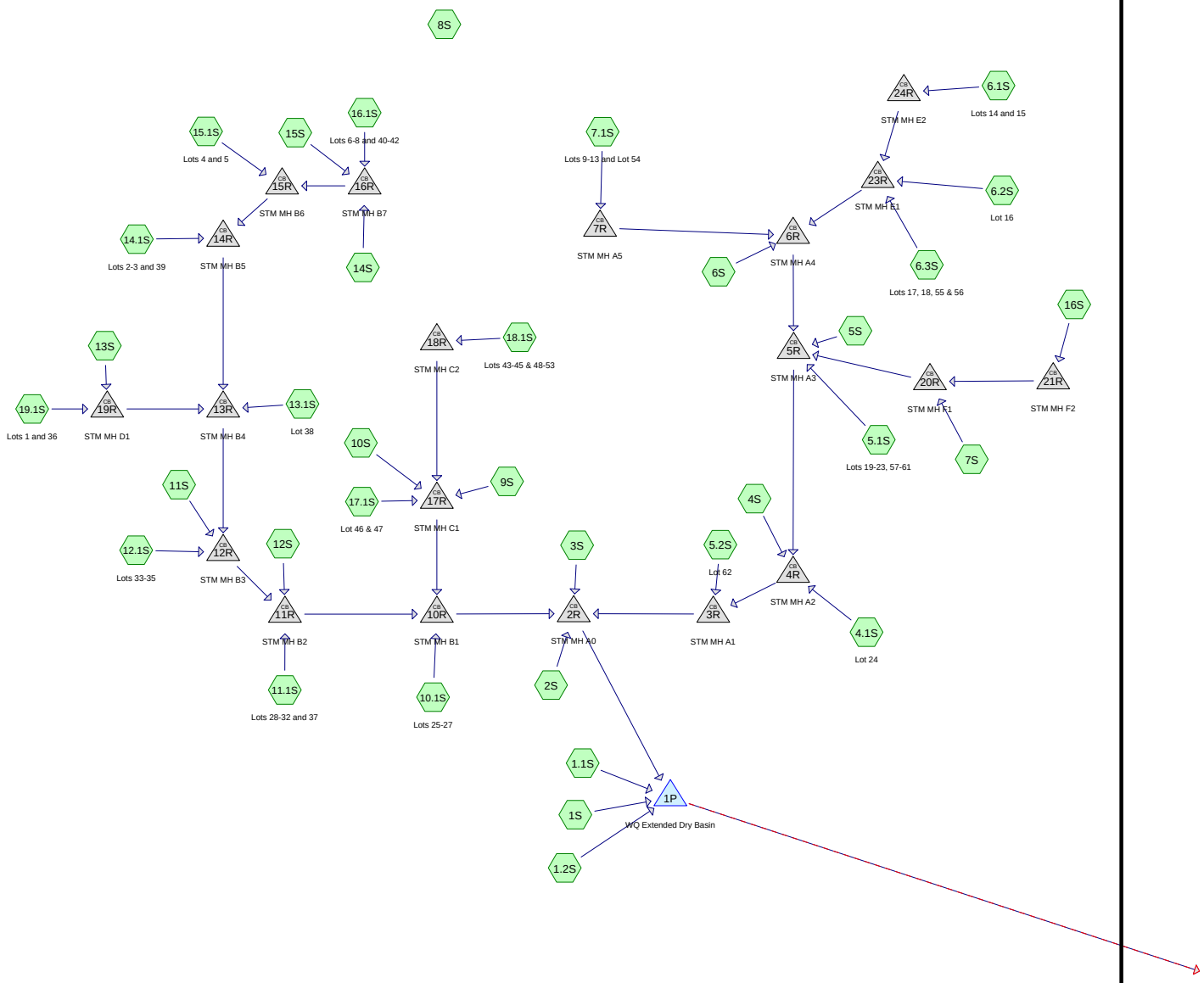
	Area (sf)	CN	Description
	303,703	80	Pasture/grassland/range, Good, HSG D
*	1,986	98	Existing House & Outbuildings
*	1,085	98	Sidewalks & concrete pad areas
	13,855	84	50-75% Grass cover, Fair, HSG D
*	75,894	84	Wetland Area
	396,523	81	Weighted Average
	393,452	81	Pervious Area
	3,071	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.2	300	0.0100	0.14		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.50"
2.1	79	0.0080	0.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
37.3	379	Total			

Subcatchment 10S: Pre-Developed Onsite



POST-DEVELOPED SITE



Drainage Diagram for 3876 HERITAGE, POST-DEVELOPED, MIXED
Prepared by AKS Engineering & Forestry (PAS), Printed 9/29/2015
HydroCAD® 8.50 s/n 005096 © 2007 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
111,161	80	>75% Grass cover, Good, HSG D (1.1S,1.2S,2S,3S,4S,5S,6S,7S,8S,9S,10S,11S,12S,13S,14S
5,280	98	1 Lot @ 2640 sf (6.2S,13.1S)
5,280	98	1 Lots @ 2640 sf (4.1S,5.2S)
26,400	98	10 Lots @ 2640 sf (5.1S)
21,120	98	2 Lots @ 2640 sf (6.1S,15.1S,17.1S,19.1S)
23,760	98	3 Lots @ 2640 sf (10.1S,12.1S,14.1S)
10,560	98	4 Lots @ 2640 sf (6.3S)
47,520	98	6 Lots @ 2640 sf (7.1S,11.1S,16.1S)
23,760	98	9 Lots @ 2640 sf (18.1S)
1,458	98	Existing SW Hall Blvd Pavement (7S)
8,223	98	Existing SW Hall Boulevard (16S)
1,426	98	Pedestrian Access (16S)
980	98	Pedestrian Path (1.2S)
16,967	98	Pond surface/WQ access (1S)
1,848	98	SW Hall Widening (16S)
88,581	98	Street/Sidewalk/Etc. (2S,3S,4S,5S,6S,7S,8S,9S,10S,11S,12S,13S,14S,15S)
394,324		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points x 3
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1.1S: Runoff Area=37,143 sf 0.00% Impervious Runoff Depth>1.57"
Flow Length=300' Slope=0.0100 '/' Tc=35.2 min CN=80/0 Runoff=0.19 cfs 4,845 cf

Subcatchment1.2S: Runoff Area=6,608 sf 14.83% Impervious Runoff Depth>1.83"
Tc=5.0 min CN=80/98 Runoff=0.07 cfs 1,009 cf

Subcatchment1S: Runoff Area=16,967 sf 100.00% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=0/98 Runoff=0.31 cfs 4,540 cf

Subcatchment2S: Runoff Area=18,351 sf 82.42% Impervious Runoff Depth>2.93"
Tc=5.0 min CN=80/98 Runoff=0.31 cfs 4,476 cf

Subcatchment3S: Runoff Area=4,978 sf 79.53% Impervious Runoff Depth>2.88"
Tc=5.0 min CN=80/98 Runoff=0.08 cfs 1,195 cf

Subcatchment4.1S: Lot 24 Runoff Area=2,640 sf 100.00% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=0/98 Runoff=0.05 cfs 706 cf

Subcatchment4S: Runoff Area=6,429 sf 75.28% Impervious Runoff Depth>2.81"
Tc=5.0 min CN=80/98 Runoff=0.10 cfs 1,506 cf

Subcatchment5.1S: Lots 19-23, 57-61 Runoff Area=26,400 sf 100.00% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=0/98 Runoff=0.49 cfs 7,065 cf

Subcatchment5.2S: Lot 62 Runoff Area=2,640 sf 100.00% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=0/98 Runoff=0.05 cfs 706 cf

Subcatchment5S: Runoff Area=23,432 sf 38.90% Impervious Runoff Depth>2.22"
Tc=5.0 min CN=80/98 Runoff=0.29 cfs 4,339 cf

Subcatchment6.1S: Lots 14 and 15 Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=0/98 Runoff=0.10 cfs 1,413 cf

Subcatchment6.2S: Lot 16 Runoff Area=2,640 sf 100.00% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=0/98 Runoff=0.05 cfs 706 cf

Subcatchment6.3S: Lots 17, 18, 55 & 56 Runoff Area=10,560 sf 100.00% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=0/98 Runoff=0.20 cfs 2,826 cf

Subcatchment6S: Runoff Area=5,622 sf 79.19% Impervious Runoff Depth>2.87"
Tc=5.0 min CN=80/98 Runoff=0.09 cfs 1,347 cf

Subcatchment7.1S: Lots 9-13 and Lot 54 Runoff Area=15,840 sf 100.00% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=0/98 Runoff=0.29 cfs 4,239 cf

Subcatchment7S: Runoff Area=10,246 sf 80.17% Impervious Runoff Depth>2.89"
Tc=5.0 min CN=80/98 Runoff=0.17 cfs 2,468 cf

Subcatchment8S: Runoff Area=9,397 sf 53.77% Impervious Runoff Depth>2.46"
Tc=5.0 min CN=80/98 Runoff=0.13 cfs 1,929 cf

Subcatchment9S: Runoff Area=6,803 sf 72.79% Impervious Runoff Depth>2.77"
Tc=5.0 min CN=80/98 Runoff=0.11 cfs 1,571 cf

Subcatchment10.1S: Lots 25-27 Runoff Area=7,920 sf 100.00% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=0/98 Runoff=0.15 cfs 2,119 cf

Subcatchment10S: Runoff Area=10,606 sf 89.60% Impervious Runoff Depth>3.04"
Tc=5.0 min CN=80/98 Runoff=0.19 cfs 2,689 cf

Subcatchment11.1S: Lots 28-32 and 37 Runoff Area=15,840 sf 100.00% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=0/98 Runoff=0.29 cfs 4,239 cf

Subcatchment11S: Runoff Area=4,142 sf 52.51% Impervious Runoff Depth>2.44"
Tc=5.0 min CN=80/98 Runoff=0.06 cfs 843 cf

Subcatchment12.1S: Lots 33-35 Runoff Area=7,920 sf 100.00% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=0/98 Runoff=0.15 cfs 2,119 cf

Subcatchment12S: Runoff Area=3,982 sf 88.35% Impervious Runoff Depth>3.02"
Tc=5.0 min CN=80/98 Runoff=0.07 cfs 1,003 cf

Subcatchment13.1S: Lot 38 Runoff Area=2,640 sf 100.00% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=0/98 Runoff=0.05 cfs 706 cf

Subcatchment13S: Runoff Area=7,162 sf 65.64% Impervious Runoff Depth>2.65"
Tc=5.0 min CN=80/98 Runoff=0.11 cfs 1,585 cf

Subcatchment14.1S: Lots 2-3 and 39 Runoff Area=7,920 sf 100.00% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=0/98 Runoff=0.15 cfs 2,119 cf

Subcatchment14S: Runoff Area=12,555 sf 50.55% Impervious Runoff Depth>2.41"
Tc=5.0 min CN=80/98 Runoff=0.17 cfs 2,522 cf

Subcatchment15.1S: Lots 4 and 5 Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=0/98 Runoff=0.10 cfs 1,413 cf

Subcatchment15S: Runoff Area=28,463 sf 28.41% Impervious Runoff Depth>2.05"
Tc=5.0 min CN=80/98 Runoff=0.32 cfs 4,868 cf

Subcatchment16.1S: Lots 6-8 and 40-42 Runoff Area=15,840 sf 100.00% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=0/98 Runoff=0.29 cfs 4,239 cf

Subcatchment16S: Runoff Area=17,758 sf 64.74% Impervious Runoff Depth>2.64"
Tc=5.0 min CN=80/98 Runoff=0.26 cfs 3,907 cf

Subcatchment17.1S: Lot 46 & 47 Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=0/98 Runoff=0.10 cfs 1,413 cf

Subcatchment18.1S: Lots 43-45 & 48-53 Runoff Area=23,760 sf 100.00% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=0/98 Runoff=0.44 cfs 6,358 cf

Subcatchment 19.1S: Lots 1 and 36 Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=0/98 Runoff=0.10 cfs 1,413 cf

Pond 1P: WQ Extended Dry Basin Peak Elev=189.11' Storage=33,360 cf Inflow=5.88 cfs 88,514 cf
Outflow=1.87 cfs 59,093 cf

Pond 2R: STM MH A0 Peak Elev=189.15' Inflow=5.34 cfs 78,119 cf
18.0" x 64.1' Culvert Outflow=5.34 cfs 78,119 cf

Pond 3R: STM MH A1 Peak Elev=189.23' Inflow=2.13 cfs 31,229 cf
15.0" x 47.4' Culvert Outflow=2.13 cfs 31,229 cf

Pond 4R: STM MH A2 Peak Elev=189.28' Inflow=2.09 cfs 30,522 cf
15.0" x 41.0' Culvert Outflow=2.09 cfs 30,522 cf

Pond 5R: STM MH A3 Peak Elev=189.72' Inflow=1.93 cfs 28,310 cf
15.0" x 181.1' Culvert Outflow=1.93 cfs 28,310 cf

Pond 6R: STM MH A4 Peak Elev=189.92' Inflow=0.73 cfs 10,531 cf
12.0" x 93.5' Culvert Outflow=0.73 cfs 10,531 cf

Pond 7R: STM MH A5 Peak Elev=190.53' Inflow=0.29 cfs 4,239 cf
12.0" x 188.4' Culvert Outflow=0.29 cfs 4,239 cf

Pond 10R: STM MH B1 Peak Elev=189.51' Inflow=2.82 cfs 41,220 cf
15.0" x 153.1' Culvert Outflow=2.82 cfs 41,220 cf

Pond 11R: STM MH B2 Peak Elev=190.02' Inflow=1.84 cfs 27,070 cf
12.0" x 208.1' Culvert Outflow=1.84 cfs 27,070 cf

Pond 12R: STM MH B3 Peak Elev=190.20' Inflow=1.48 cfs 21,828 cf
12.0" x 30.8' Culvert Outflow=1.48 cfs 21,828 cf

Pond 13R: STM MH B4 Peak Elev=190.70' Inflow=1.27 cfs 18,865 cf
12.0" x 132.9' Culvert Outflow=1.27 cfs 18,865 cf

Pond 14R: STM MH B5 Peak Elev=191.26' Inflow=1.02 cfs 15,161 cf
12.0" x 127.7' Culvert Outflow=1.02 cfs 15,161 cf

Pond 15R: STM MH B6 Peak Elev=191.51' Inflow=0.87 cfs 13,042 cf
12.0" x 30.6' Culvert Outflow=0.87 cfs 13,042 cf

Pond 16R: STM MH B7 Peak Elev=191.94' Inflow=0.78 cfs 11,629 cf
12.0" x 69.6' Culvert Outflow=0.78 cfs 11,629 cf

Pond 17R: STM MH C1 Peak Elev=189.45' Inflow=0.83 cfs 12,031 cf
12.0" x 46.1' Culvert Outflow=0.83 cfs 12,031 cf

Pond 18R: STM MH C2 Peak Elev=189.65' Inflow=0.44 cfs 6,358 cf
12.0" x 170.7' Culvert Outflow=0.44 cfs 6,358 cf

Pond 19R: STM MH D1 Peak Elev=192.28' Inflow=0.20 cfs 2,998 cf
12.0" x 57.3' Culvert Outflow=0.20 cfs 2,998 cf

Pond 20R: STM MH F1 Peak Elev=189.87' Inflow=0.43 cfs 6,375 cf
12.0" x 95.2' Culvert Outflow=0.43 cfs 6,375 cf

Pond 21R: STM MH F2 Peak Elev=190.04' Inflow=0.26 cfs 3,907 cf
12.0" x 40.4' Culvert Outflow=0.26 cfs 3,907 cf

Pond 23R: STM MH E1 Peak Elev=190.05' Inflow=0.34 cfs 4,945 cf
12.0" x 46.0' Culvert Outflow=0.34 cfs 4,945 cf

Pond 24R: STM MH E2 Peak Elev=190.22' Inflow=0.10 cfs 1,413 cf
12.0" x 48.4' Culvert Outflow=0.10 cfs 1,413 cf

Total Runoff Area = 394,324 sf Runoff Volume = 90,443 cf Average Runoff Depth = 2.75"
28.19% Pervious = 111,161 sf 71.81% Impervious = 283,163 sf

Summary for Subcatchment 1.1S:

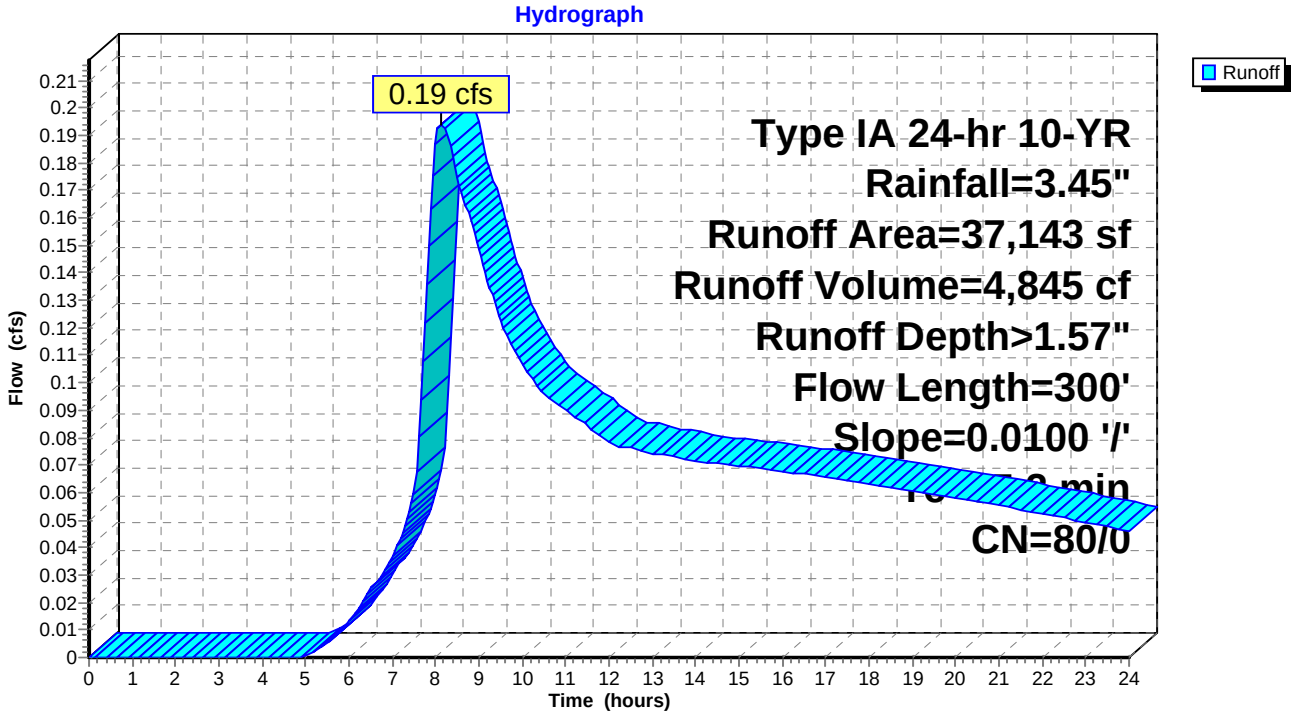
Runoff = 0.19 cfs @ 8.13 hrs, Volume= 4,845 cf, Depth> 1.57"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

Area (sf)	CN	Description
37,143	80	>75% Grass cover, Good, HSG D
37,143	80	Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.2	300	0.0100	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.50"

Subcatchment 1.1S:



Summary for Subcatchment 1.2S:

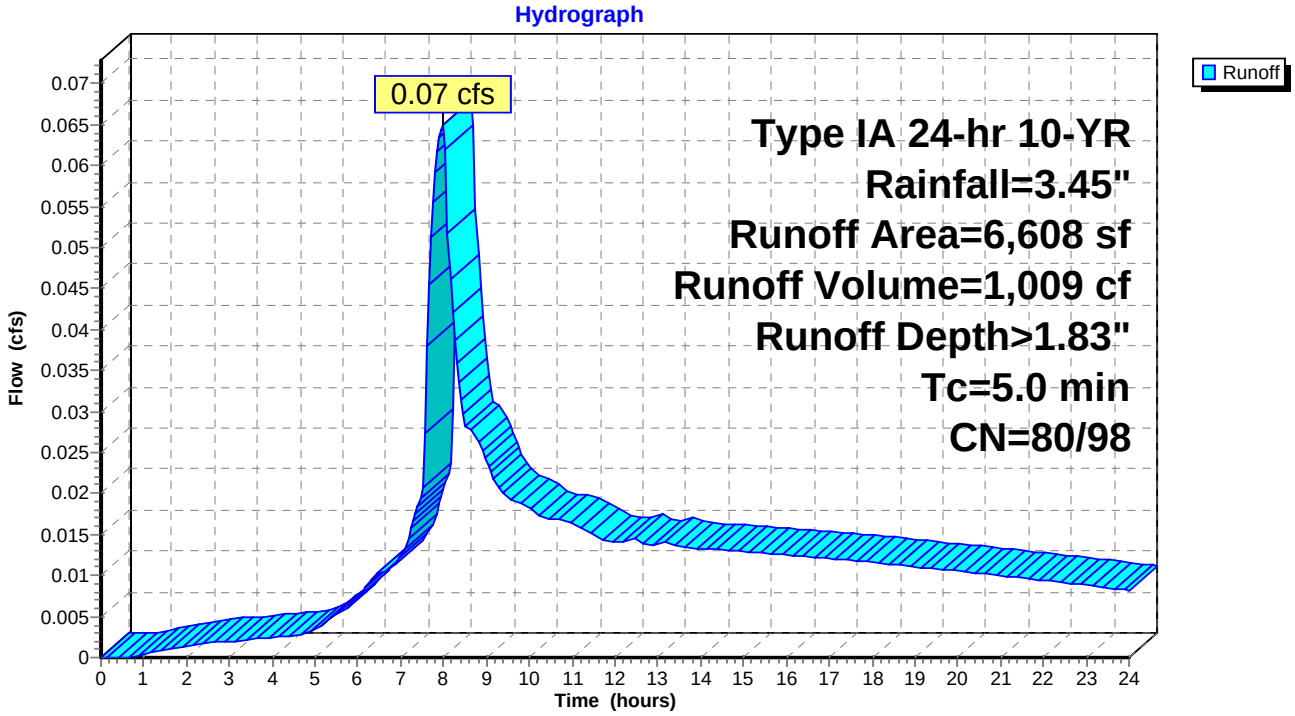
Runoff = 0.07 cfs @ 7.98 hrs, Volume= 1,009 cf, Depth> 1.83"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	980	98	Pedestrian Path
	5,628	80	>75% Grass cover, Good, HSG D
	6,608	83	Weighted Average
	5,628	80	Pervious Area
	980	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1.2S:



Summary for Subcatchment 1S:

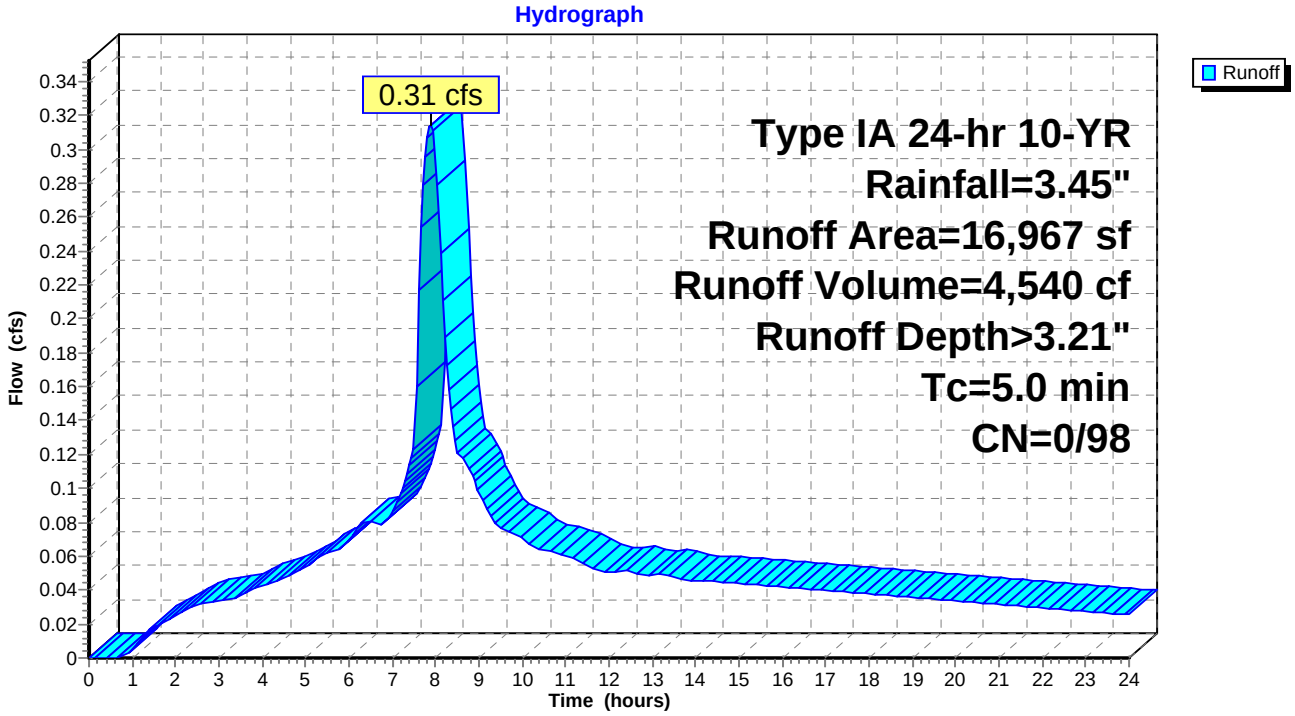
Runoff = 0.31 cfs @ 7.90 hrs, Volume= 4,540 cf, Depth> 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	16,967	98	Pond surface/WQ access
	16,967	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S:



Summary for Subcatchment 2S:

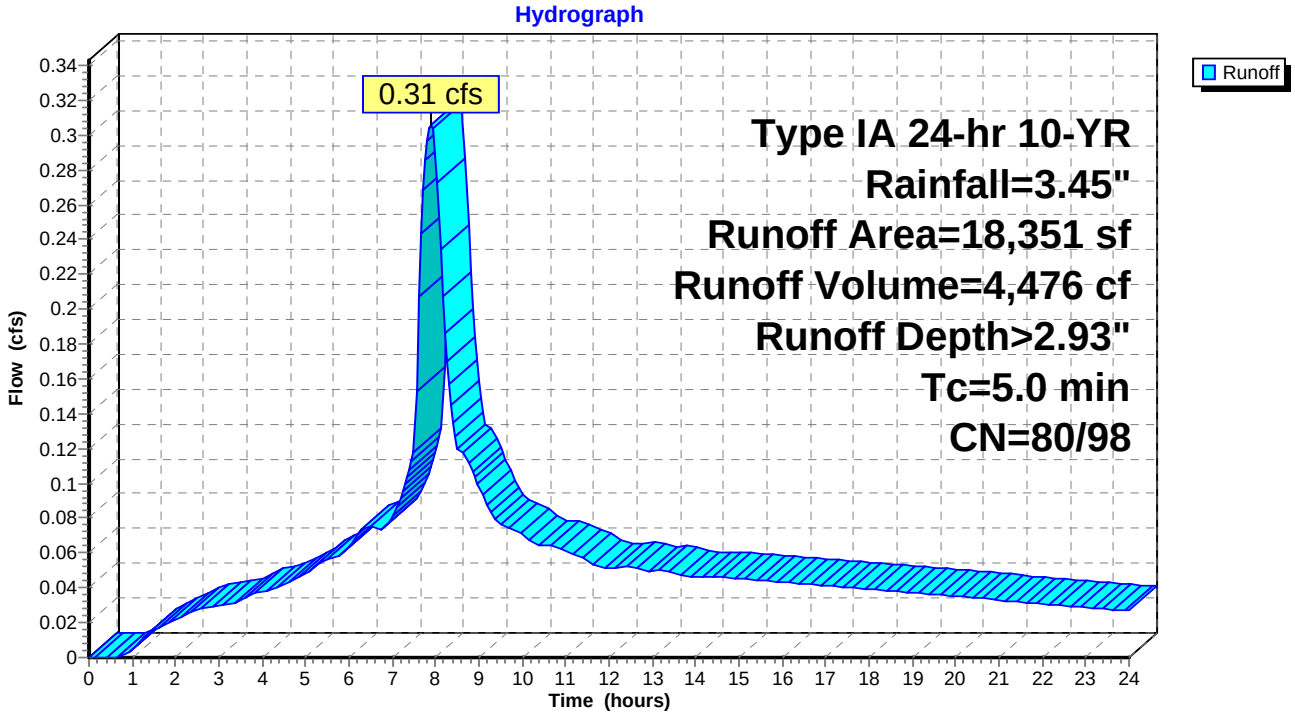
Runoff = 0.31 cfs @ 7.91 hrs, Volume= 4,476 cf, Depth> 2.93"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	15,125	98	Street/Sidewalk/Etc.
	3,226	80	>75% Grass cover, Good, HSG D
	18,351	95	Weighted Average
	3,226	80	Pervious Area
	15,125	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2S:



Summary for Subcatchment 3S:

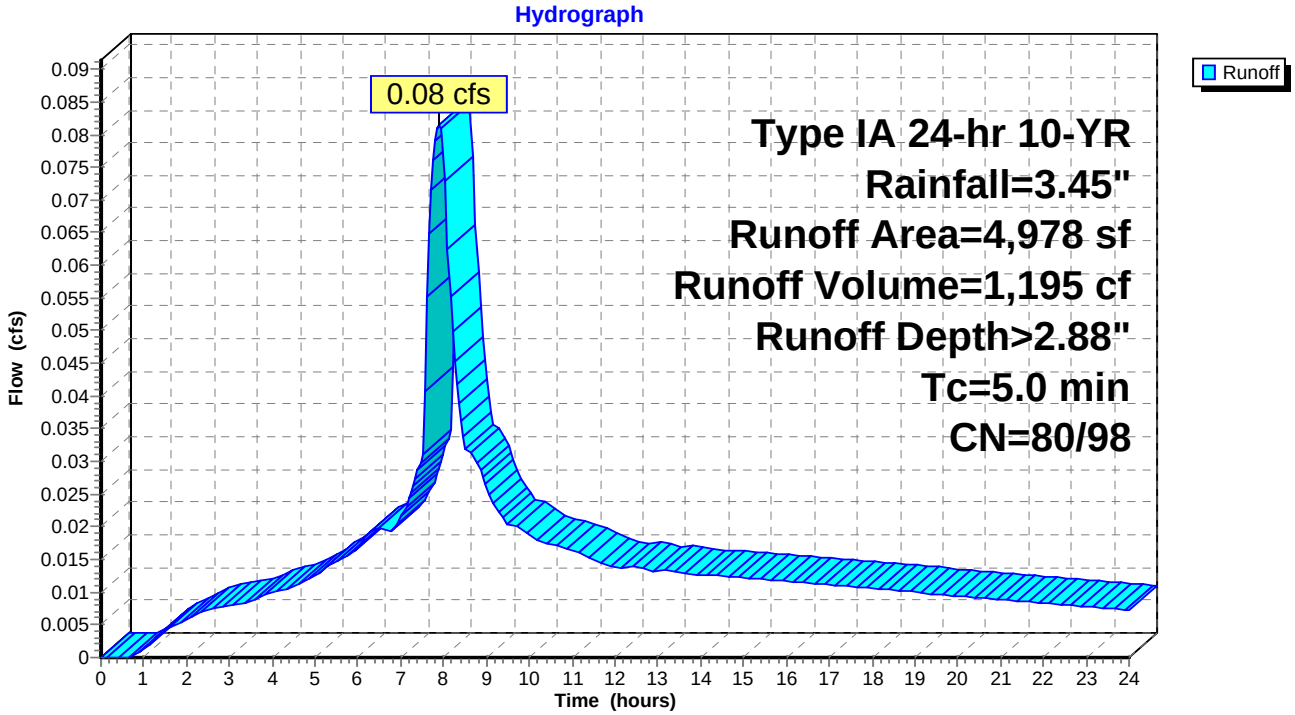
Runoff = 0.08 cfs @ 7.91 hrs, Volume= 1,195 cf, Depth> 2.88"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	3,959	98	Street/Sidewalk/Etc.
	1,019	80	>75% Grass cover, Good, HSG D
	4,978	94	Weighted Average
	1,019	80	Pervious Area
	3,959	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S:



Summary for Subcatchment 4.1S: Lot 24

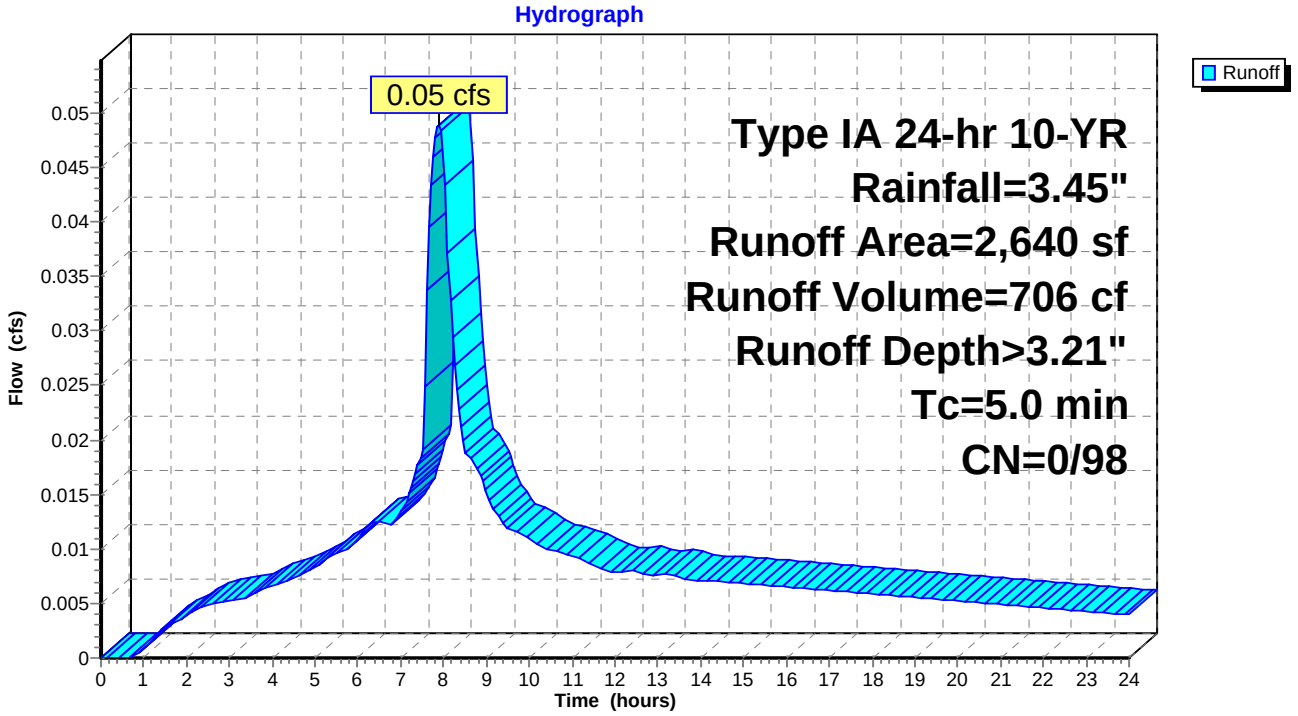
Runoff = 0.05 cfs @ 7.90 hrs, Volume= 706 cf, Depth> 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	2,640	98	1 Lots @ 2640 sf
	2,640	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4.1S: Lot 24



Summary for Subcatchment 4S:

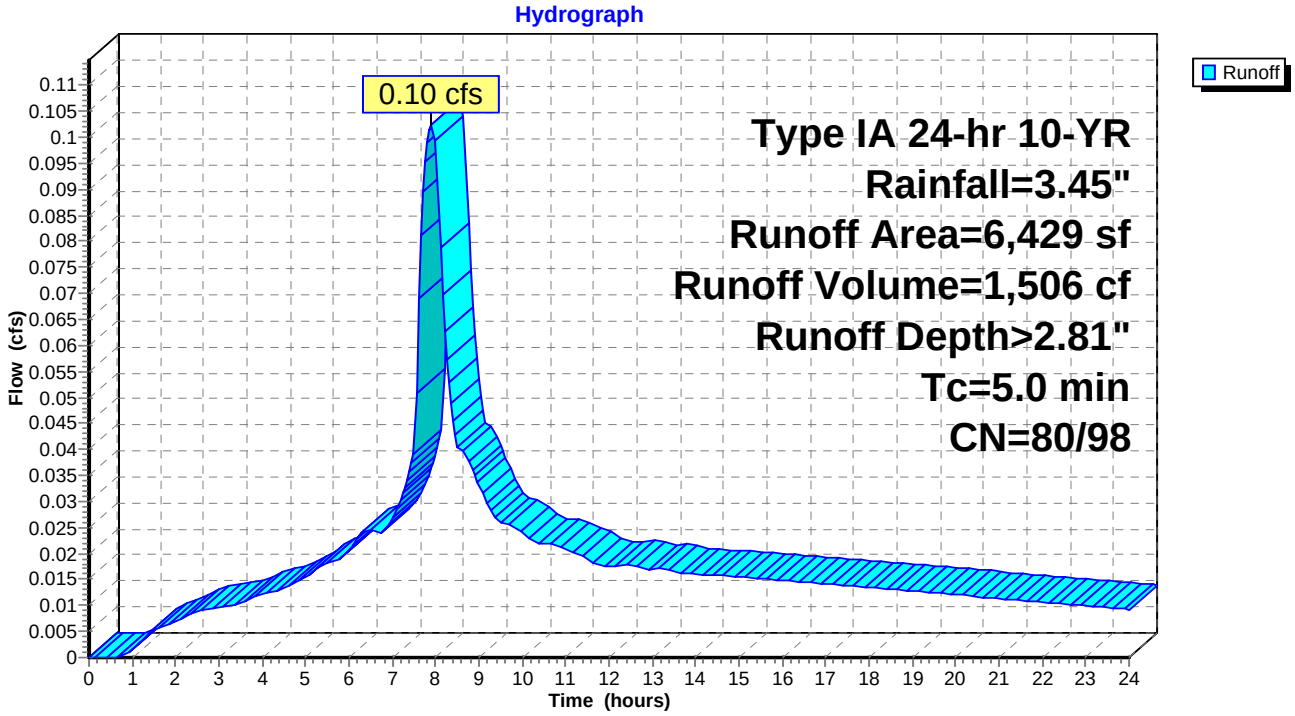
Runoff = 0.10 cfs @ 7.91 hrs, Volume= 1,506 cf, Depth> 2.81"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	4,840	98	Street/Sidewalk/Etc.
	1,589	80	>75% Grass cover, Good, HSG D
	6,429	94	Weighted Average
	1,589	80	Pervious Area
	4,840	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4S:



Summary for Subcatchment 5.1S: Lots 19-23, 57-61

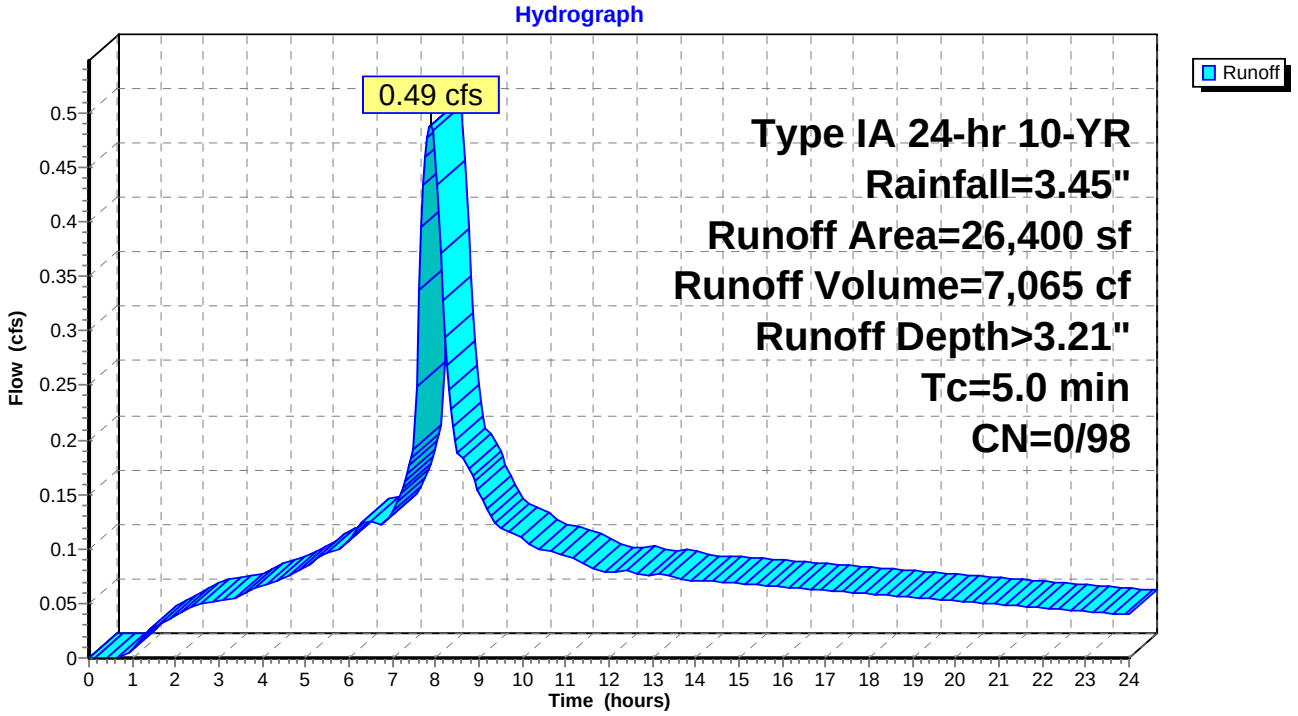
Runoff = 0.49 cfs @ 7.90 hrs, Volume= 7,065 cf, Depth> 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	26,400	98	10 Lots @ 2640 sf
	26,400	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5.1S: Lots 19-23, 57-61



Summary for Subcatchment 5.2S: Lot 62

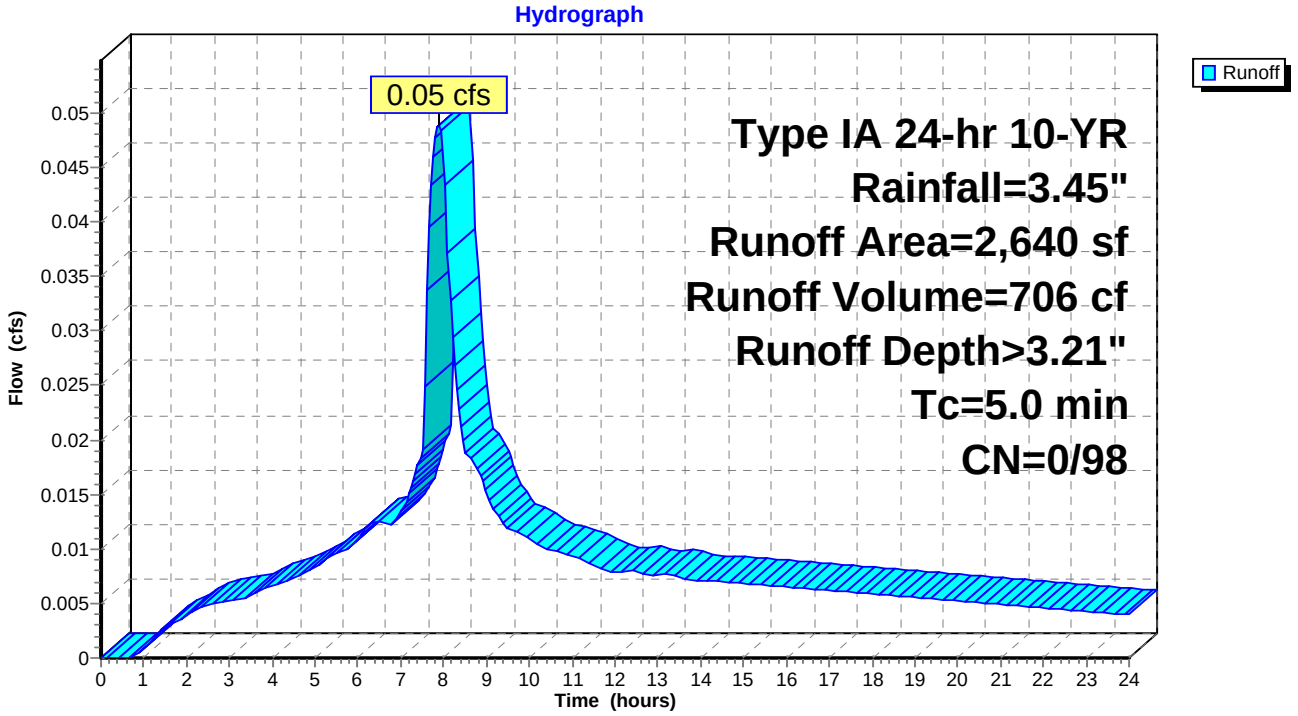
Runoff = 0.05 cfs @ 7.90 hrs, Volume= 706 cf, Depth> 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	2,640	98	1 Lots @ 2640 sf
	2,640	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5.2S: Lot 62



Summary for Subcatchment 5S:

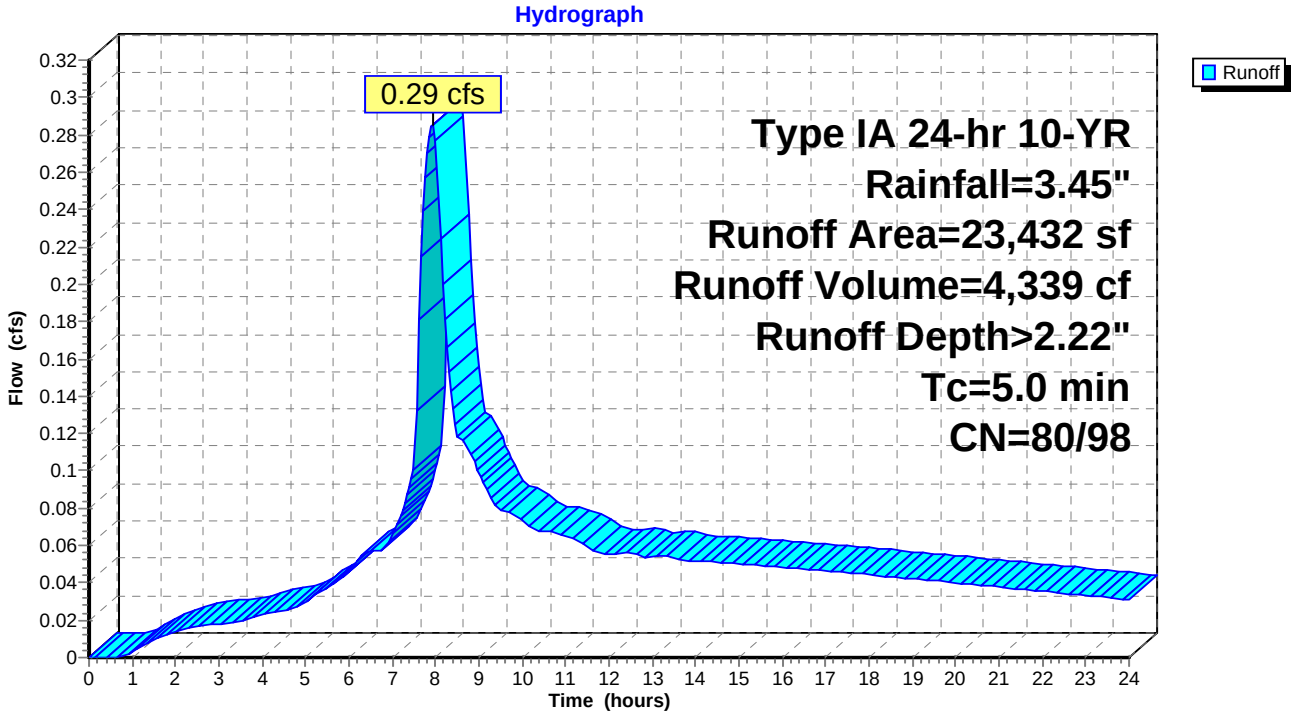
Runoff = 0.29 cfs @ 7.94 hrs, Volume= 4,339 cf, Depth> 2.22"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	9,115	98	Street/Sidewalk/Etc.
	14,317	80	>75% Grass cover, Good, HSG D
	23,432	87	Weighted Average
	14,317	80	Pervious Area
	9,115	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5S:



Summary for Subcatchment 6.1S: Lots 14 and 15

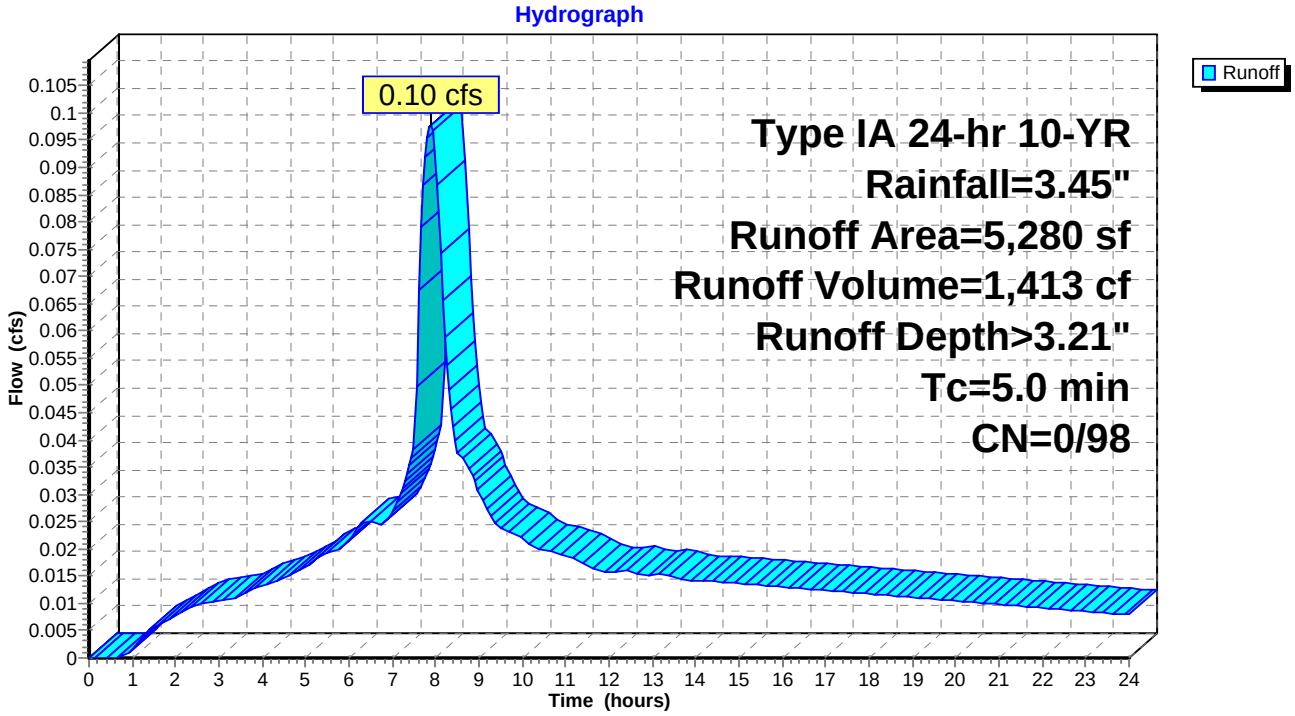
Runoff = 0.10 cfs @ 7.90 hrs, Volume= 1,413 cf, Depth> 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	5,280	98	2 Lots @ 2640 sf
	5,280	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6.1S: Lots 14 and 15



Summary for Subcatchment 6.2S: Lot 16

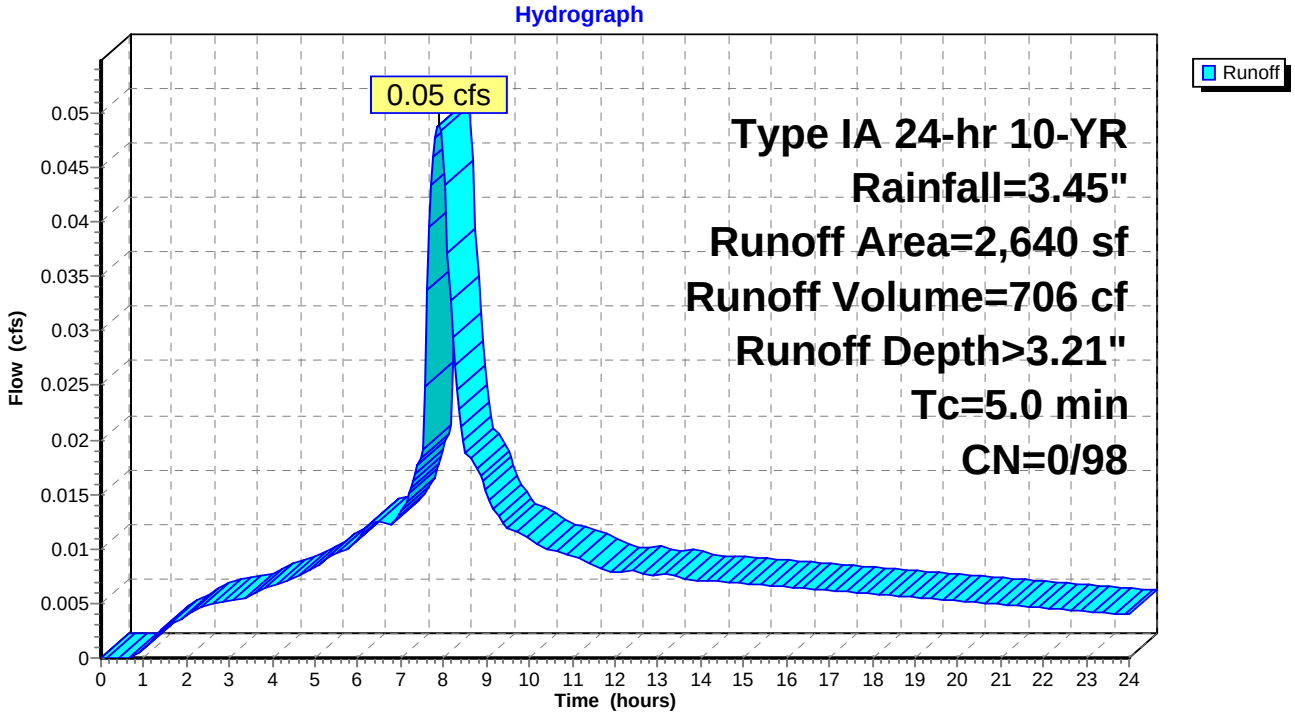
Runoff = 0.05 cfs @ 7.90 hrs, Volume= 706 cf, Depth> 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	2,640	98	1 Lot @ 2640 sf
	2,640	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6.2S: Lot 16



Summary for Subcatchment 6.3S: Lots 17, 18, 55 & 56

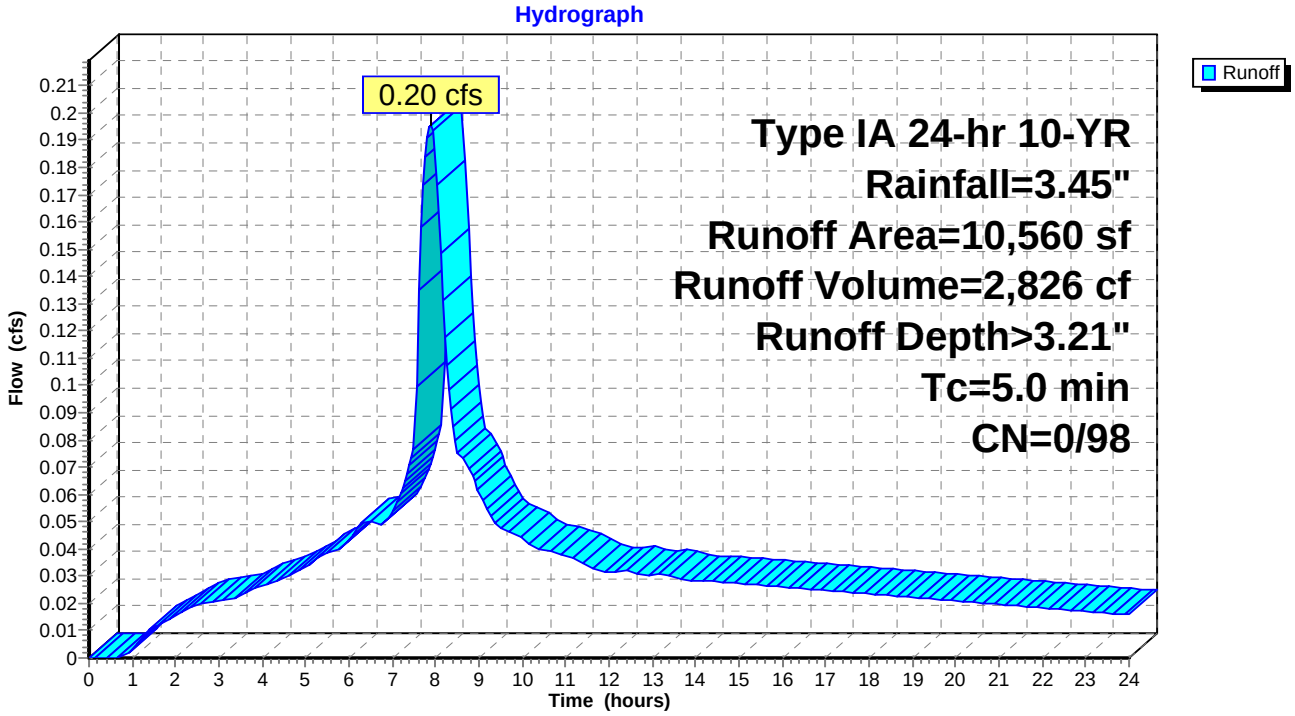
Runoff = 0.20 cfs @ 7.90 hrs, Volume= 2,826 cf, Depth> 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	10,560	98	4 Lots @ 2640 sf
	10,560	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6.3S: Lots 17, 18, 55 & 56



Summary for Subcatchment 6S:

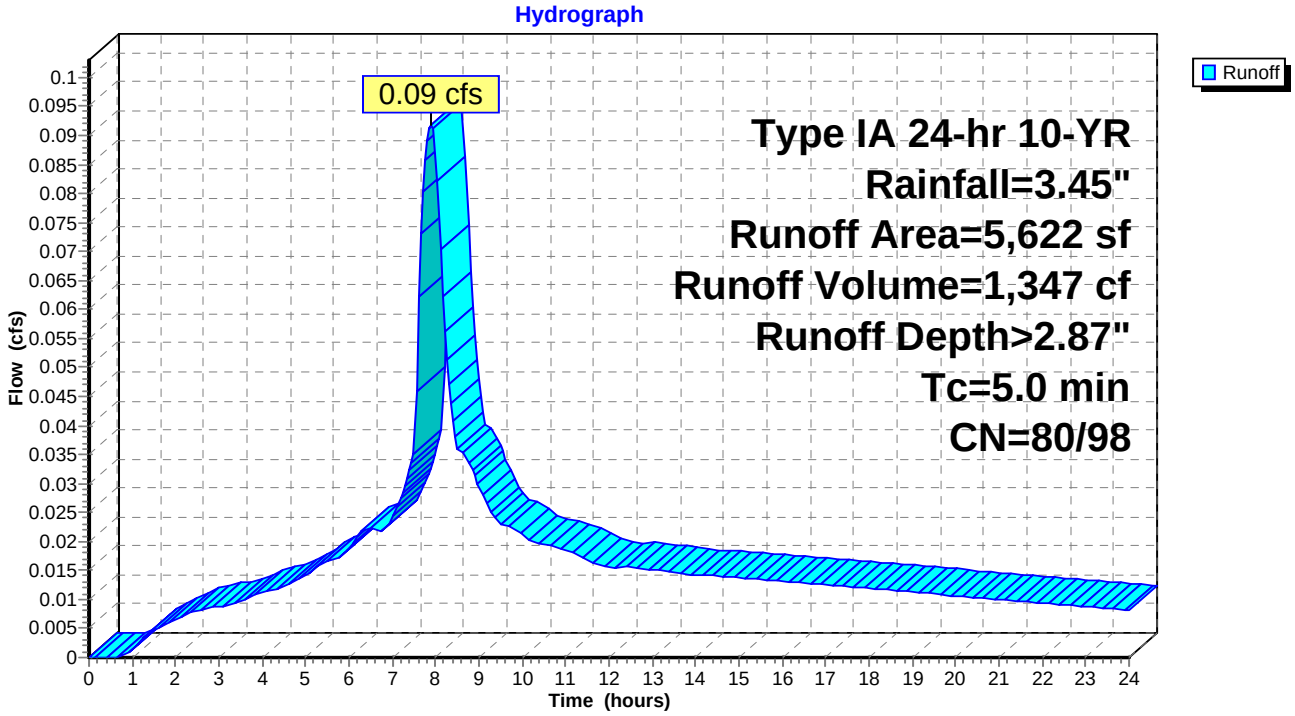
Runoff = 0.09 cfs @ 7.91 hrs, Volume= 1,347 cf, Depth> 2.87"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	4,452	98	Street/Sidewalk/Etc.
	1,170	80	>75% Grass cover, Good, HSG D
	5,622	94	Weighted Average
	1,170	80	Pervious Area
	4,452	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6S:



Summary for Subcatchment 7.1S: Lots 9-13 and Lot 54

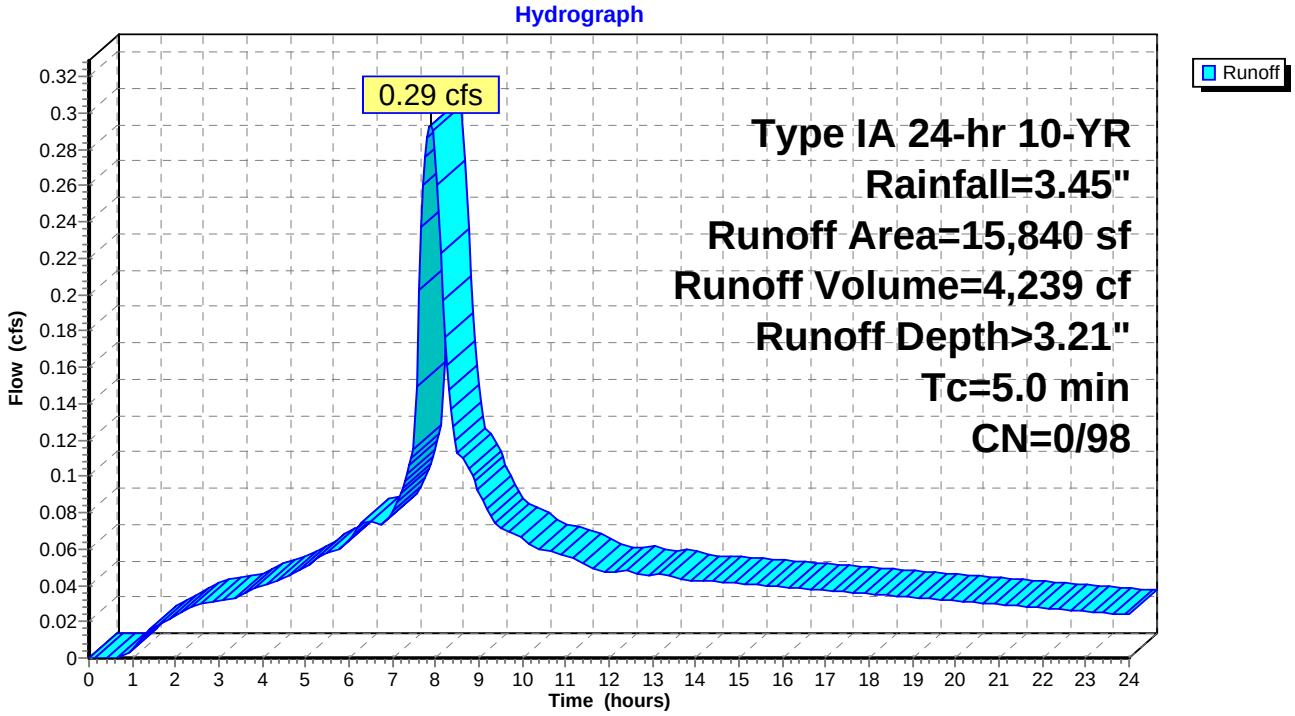
Runoff = 0.29 cfs @ 7.90 hrs, Volume= 4,239 cf, Depth> 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	15,840	98	6 Lots @ 2640 sf
	15,840	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 7.1S: Lots 9-13 and Lot 54



Summary for Subcatchment 7S:

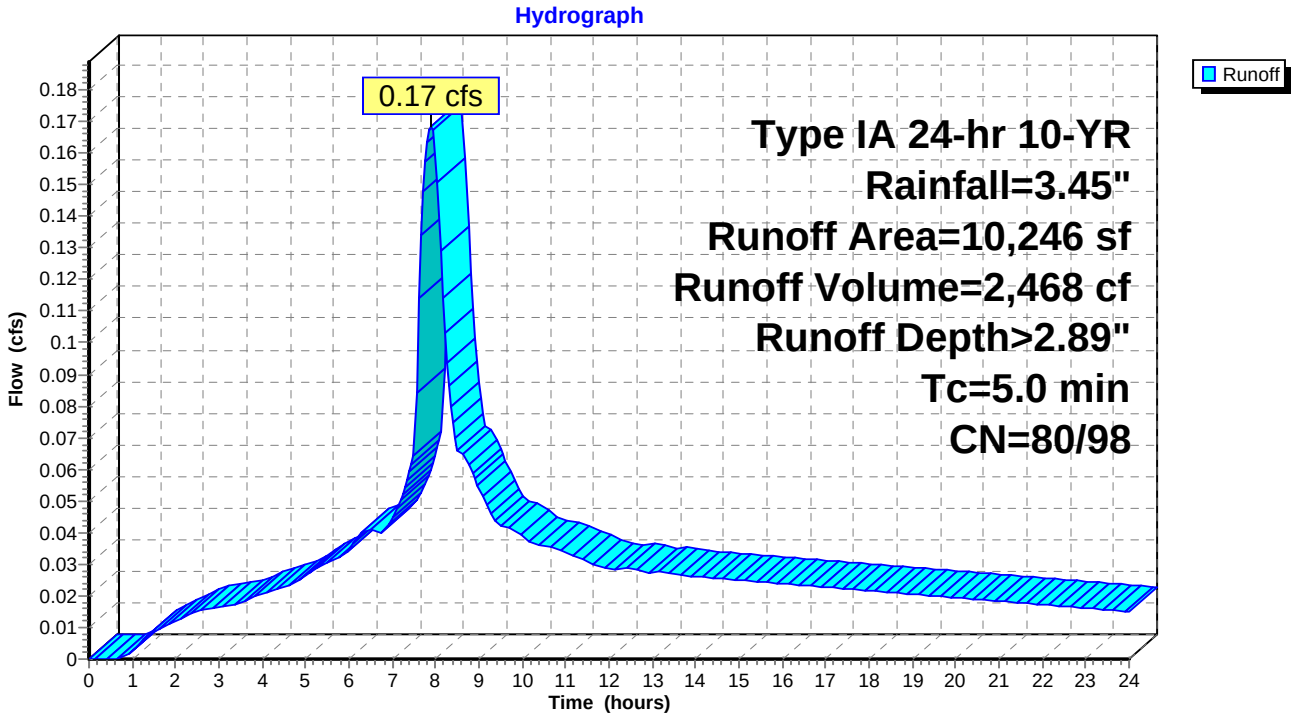
Runoff = 0.17 cfs @ 7.91 hrs, Volume= 2,468 cf, Depth> 2.89"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	6,756	98	Street/Sidewalk/Etc.
	2,032	80	>75% Grass cover, Good, HSG D
*	1,458	98	Existing SW Hall Blvd Pavement
	10,246	94	Weighted Average
	2,032	80	Pervious Area
	8,214	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 7S:



Summary for Subcatchment 8S:

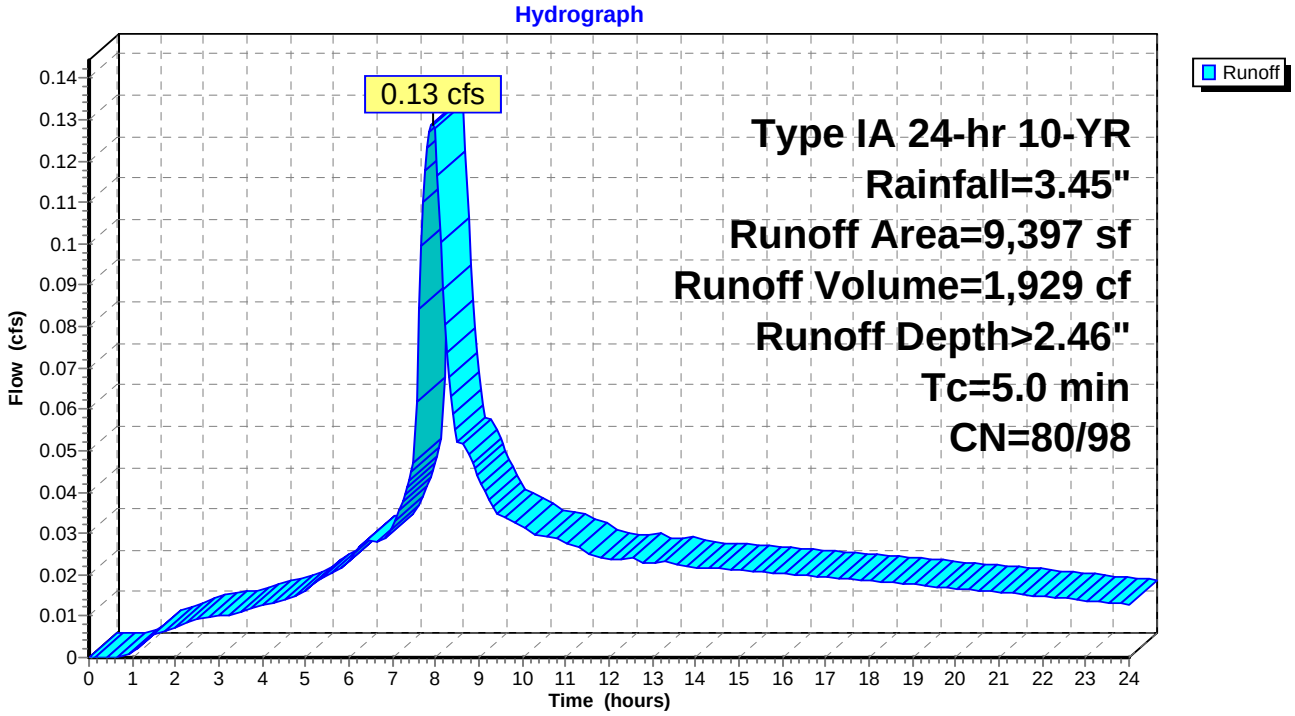
Runoff = 0.13 cfs @ 7.93 hrs, Volume= 1,929 cf, Depth> 2.46"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	5,053	98	Street/Sidewalk/Etc.
	4,344	80	>75% Grass cover, Good, HSG D
	9,397	90	Weighted Average
	4,344	80	Pervious Area
	5,053	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8S:



Summary for Subcatchment 9S:

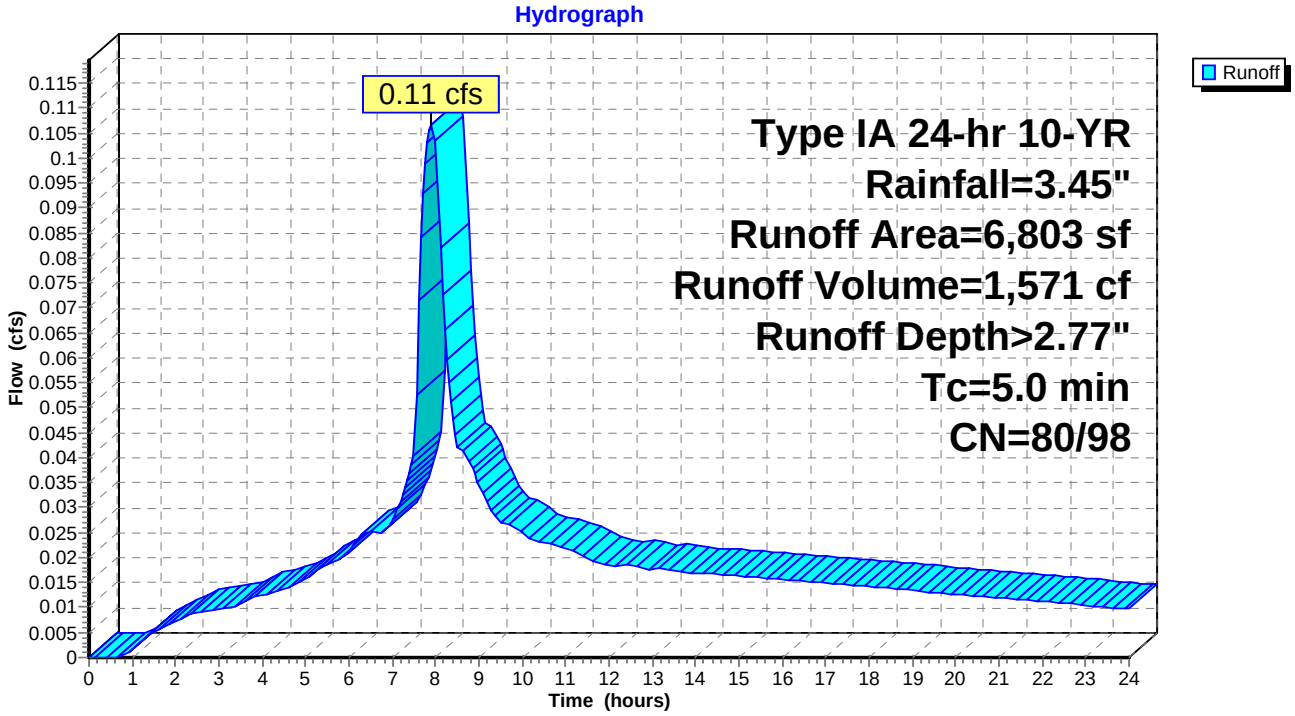
Runoff = 0.11 cfs @ 7.91 hrs, Volume= 1,571 cf, Depth> 2.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	4,952	98	Street/Sidewalk/Etc.
	1,851	80	>75% Grass cover, Good, HSG D
	6,803	93	Weighted Average
	1,851	80	Pervious Area
	4,952	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 9S:



Summary for Subcatchment 10.1S: Lots 25-27

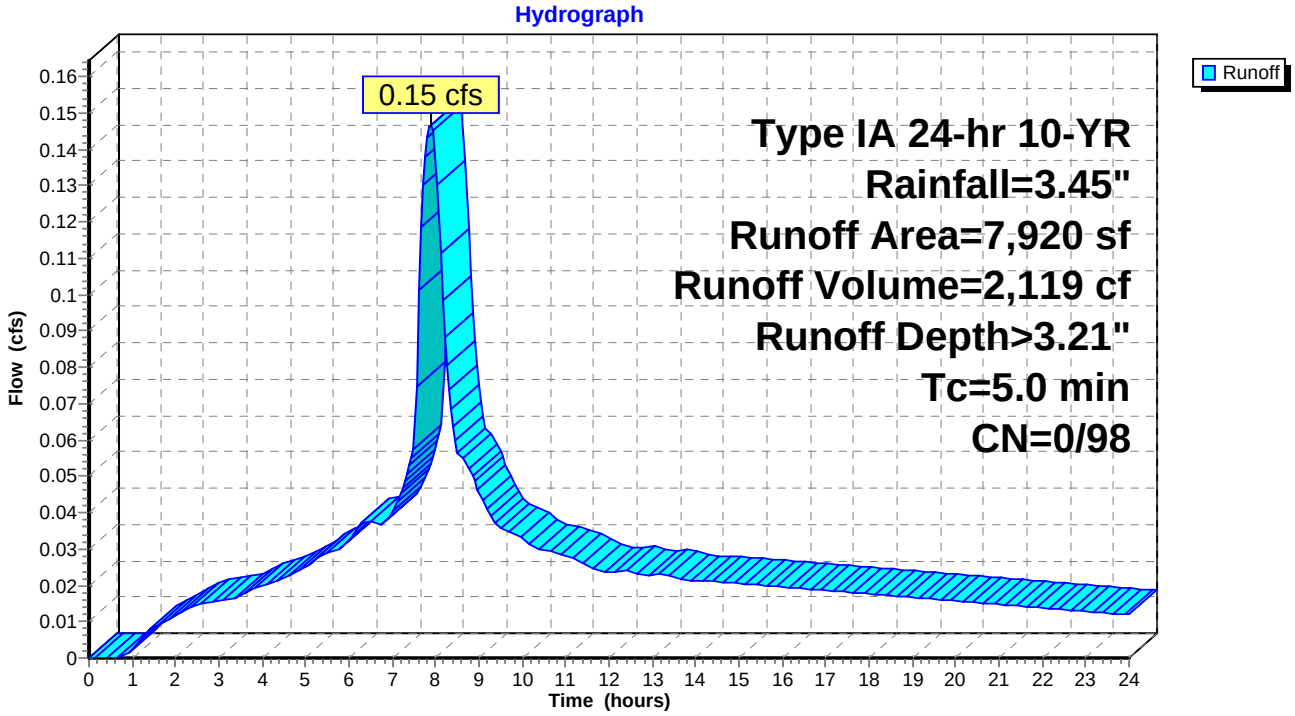
Runoff = 0.15 cfs @ 7.90 hrs, Volume= 2,119 cf, Depth> 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	7,920	98	3 Lots @ 2640 sf
	7,920	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10.1S: Lots 25-27



Summary for Subcatchment 10S:

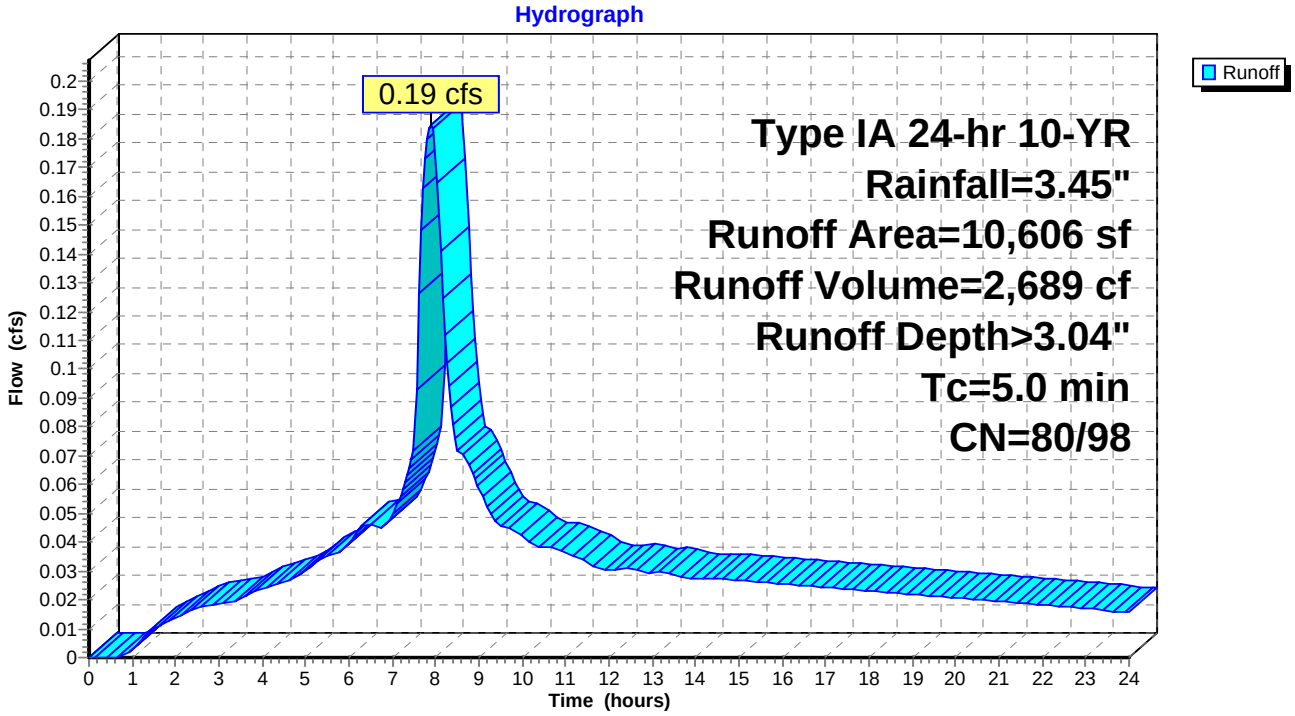
Runoff = 0.19 cfs @ 7.90 hrs, Volume= 2,689 cf, Depth> 3.04"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	9,503	98	Street/Sidewalk/Etc.
	1,103	80	>75% Grass cover, Good, HSG D
	10,606	96	Weighted Average
	1,103	80	Pervious Area
	9,503	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10S:



Summary for Subcatchment 11.1S: Lots 28-32 and 37

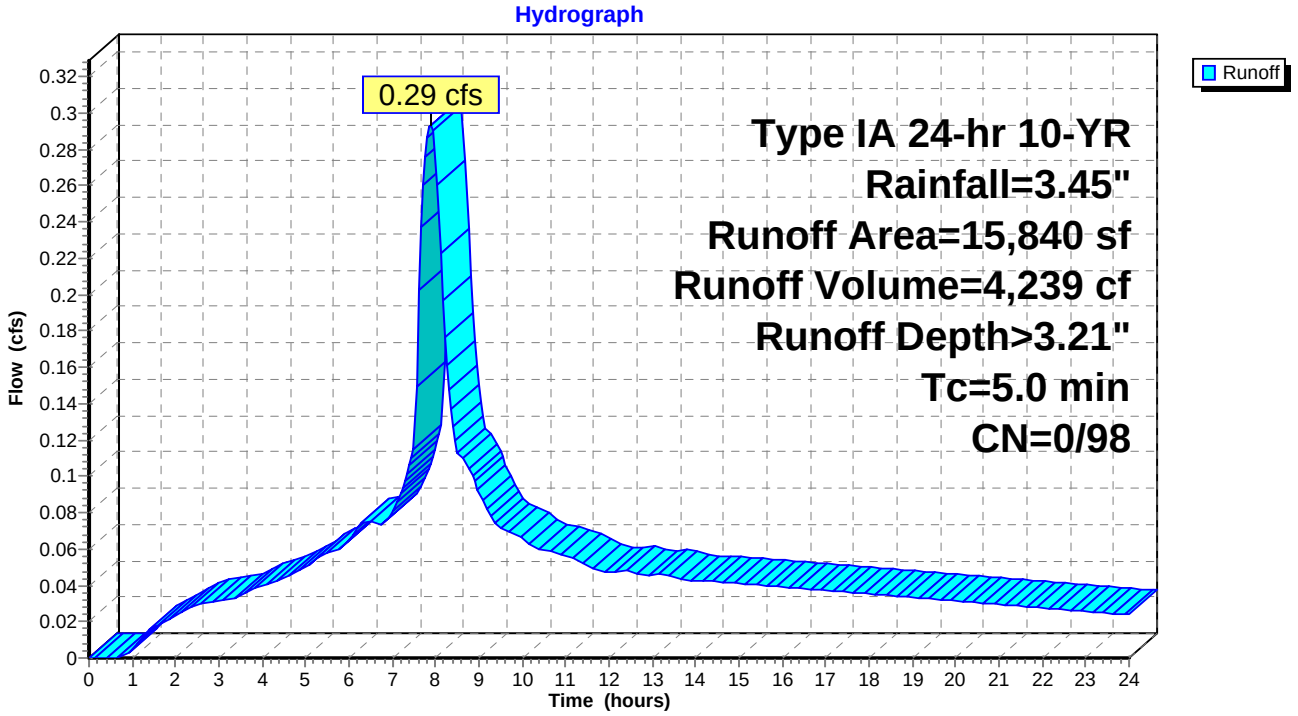
Runoff = 0.29 cfs @ 7.90 hrs, Volume= 4,239 cf, Depth> 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	15,840	98	6 Lots @ 2640 sf
	15,840	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 11.1S: Lots 28-32 and 37



Summary for Subcatchment 11S:

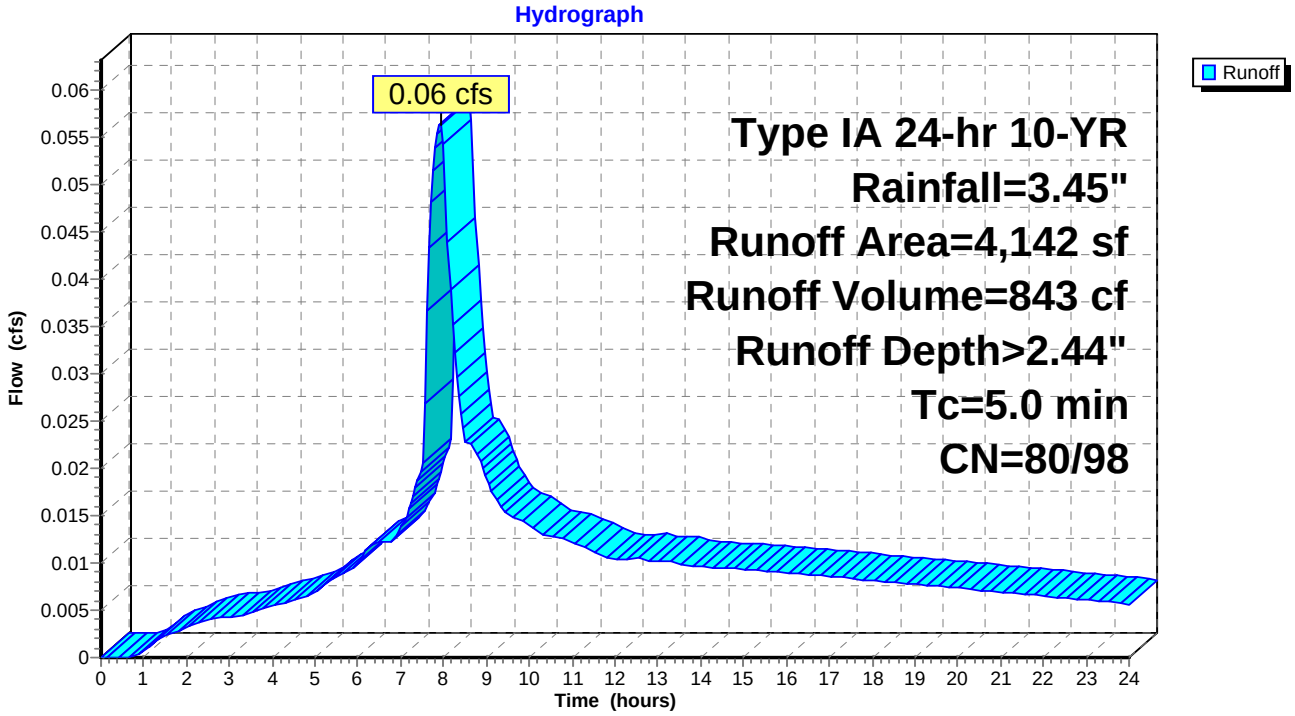
Runoff = 0.06 cfs @ 7.93 hrs, Volume= 843 cf, Depth> 2.44"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	2,175	98	Street/Sidewalk/Etc.
	1,967	80	>75% Grass cover, Good, HSG D
	4,142	89	Weighted Average
	1,967	80	Pervious Area
	2,175	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 11S:



Summary for Subcatchment 12.1S: Lots 33-35

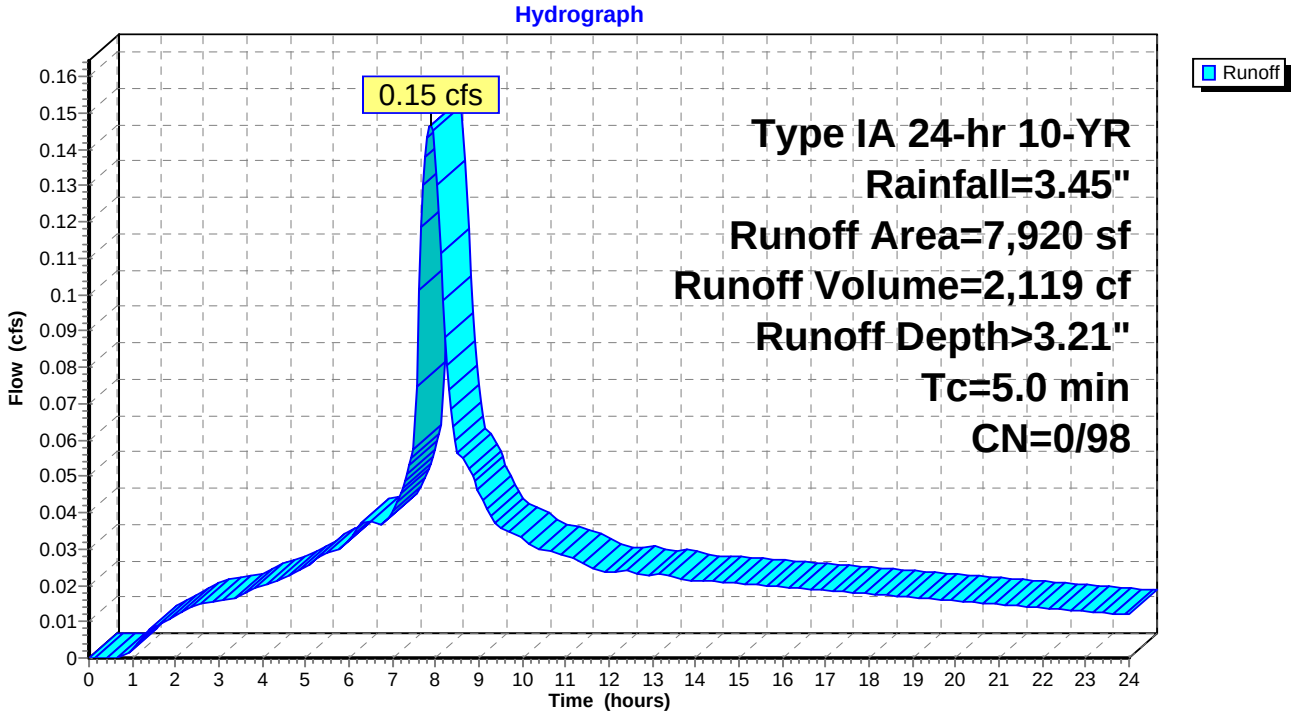
Runoff = 0.15 cfs @ 7.90 hrs, Volume= 2,119 cf, Depth> 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	7,920	98	3 Lots @ 2640 sf
	7,920	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 12.1S: Lots 33-35



Summary for Subcatchment 12S:

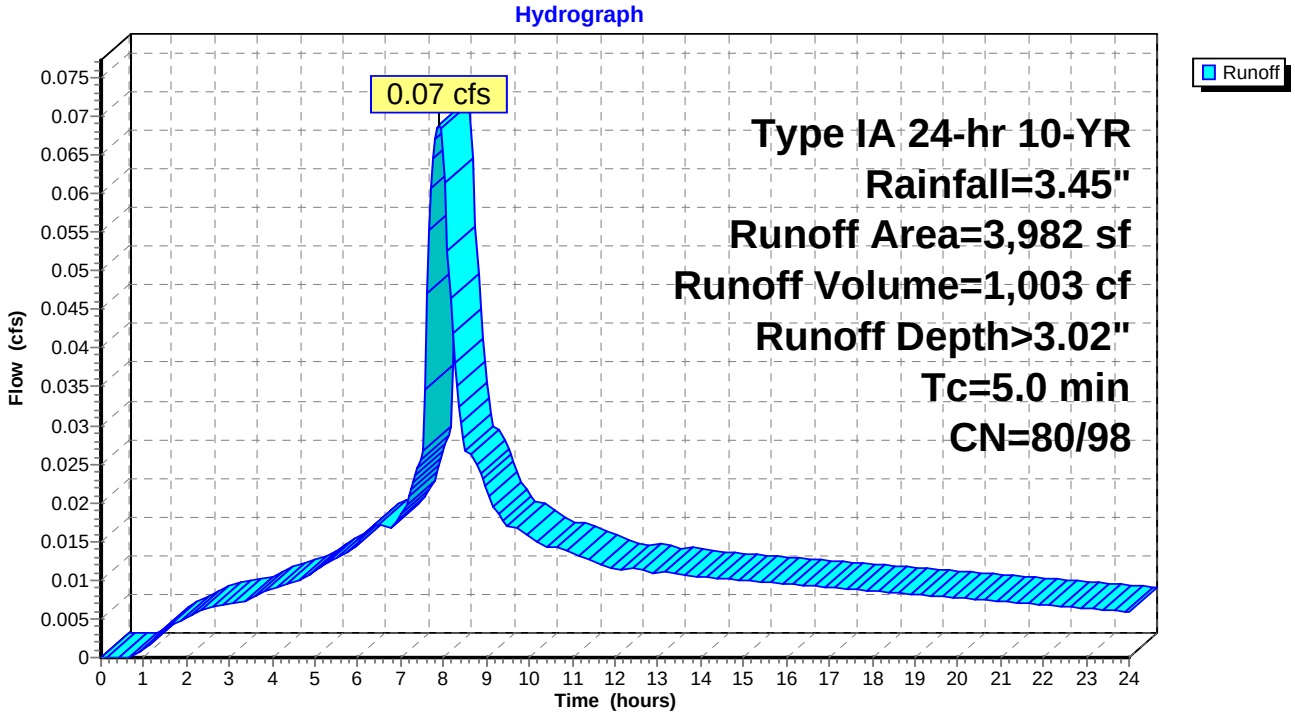
Runoff = 0.07 cfs @ 7.90 hrs, Volume= 1,003 cf, Depth> 3.02"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	3,518	98	Street/Sidewalk/Etc.
	464	80	>75% Grass cover, Good, HSG D
	3,982	96	Weighted Average
	464	80	Pervious Area
	3,518	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 12S:



Summary for Subcatchment 13.1S: Lot 38

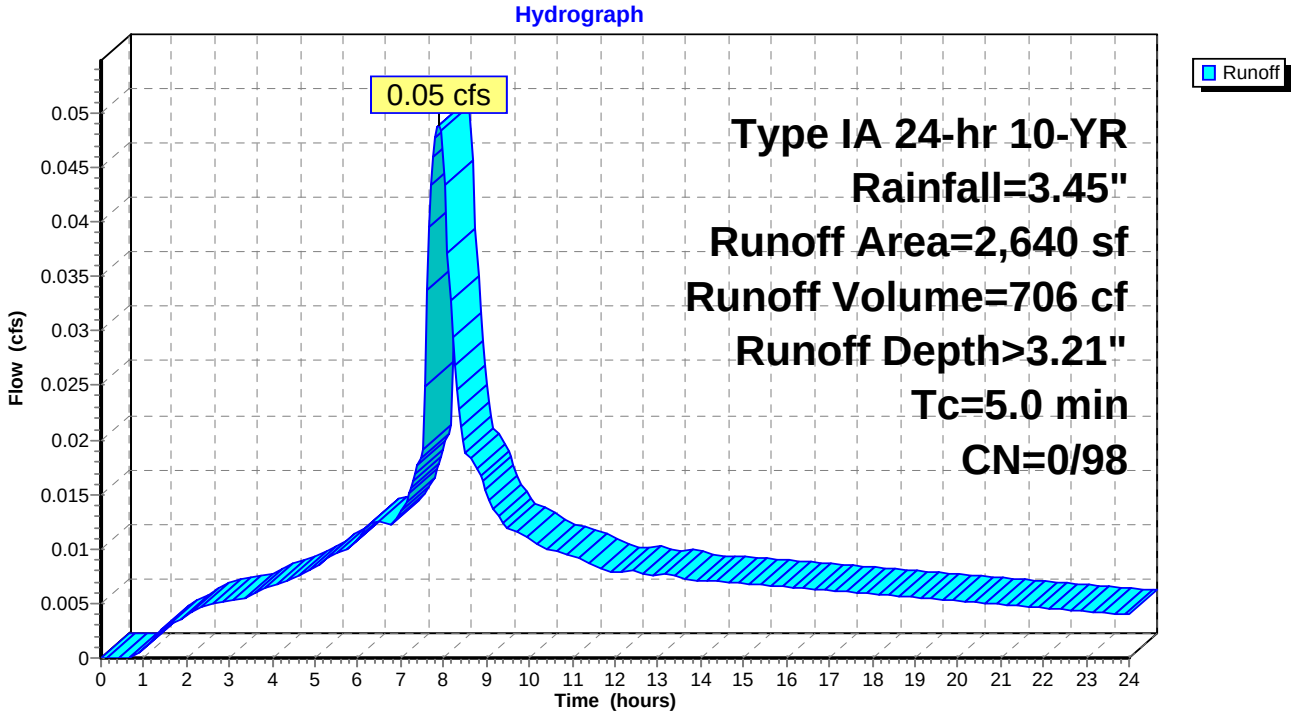
Runoff = 0.05 cfs @ 7.90 hrs, Volume= 706 cf, Depth> 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	2,640	98	1 Lot @ 2640 sf
	2,640	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 13.1S: Lot 38



Summary for Subcatchment 13S:

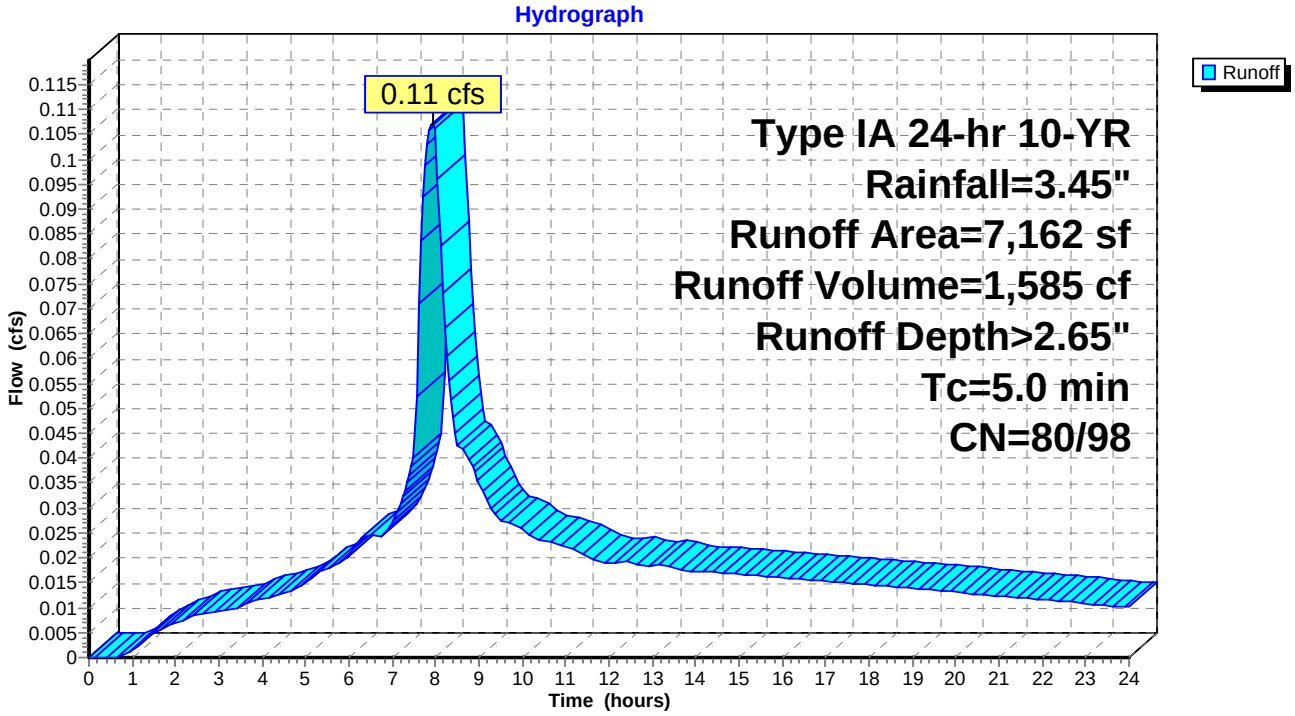
Runoff = 0.11 cfs @ 7.92 hrs, Volume= 1,585 cf, Depth> 2.65"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	4,701	98	Street/Sidewalk/Etc.
	2,461	80	>75% Grass cover, Good, HSG D
	7,162	92	Weighted Average
	2,461	80	Pervious Area
	4,701	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 13S:



Summary for Subcatchment 14.1S: Lots 2-3 and 39

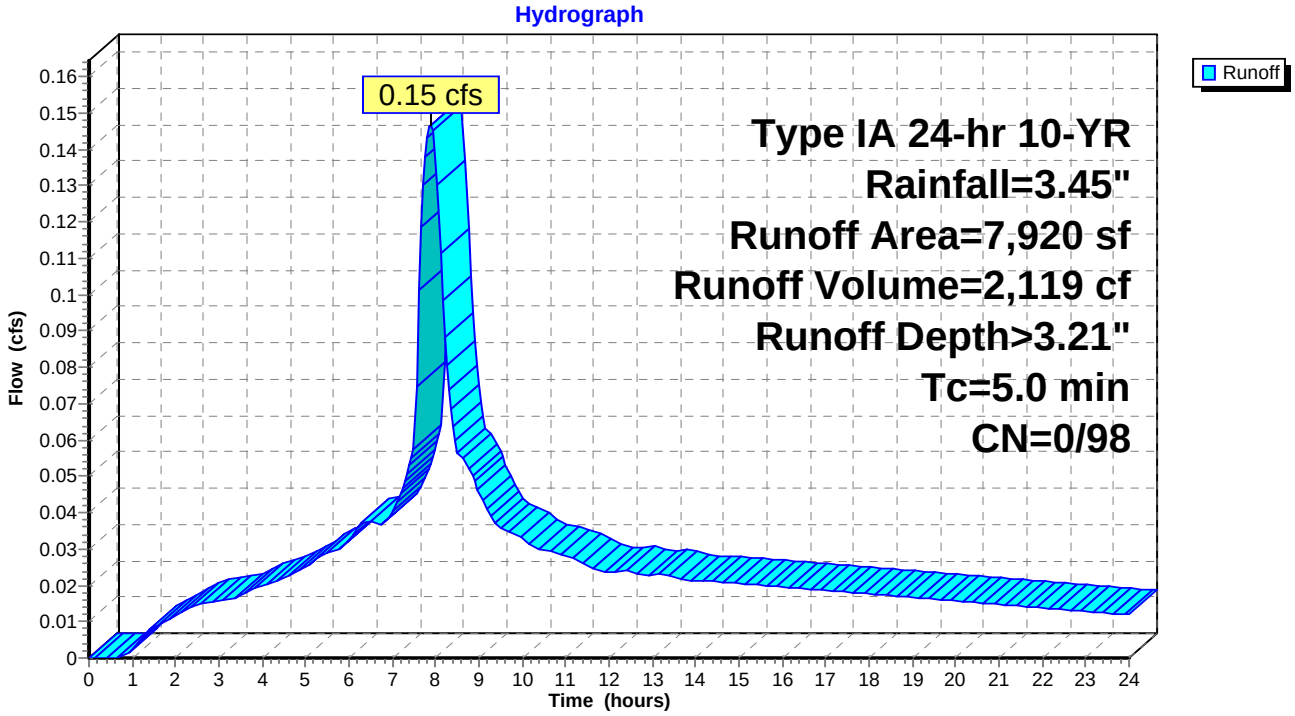
Runoff = 0.15 cfs @ 7.90 hrs, Volume= 2,119 cf, Depth> 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	7,920	98	3 Lots @ 2640 sf
	7,920	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 14.1S: Lots 2-3 and 39



Summary for Subcatchment 14S:

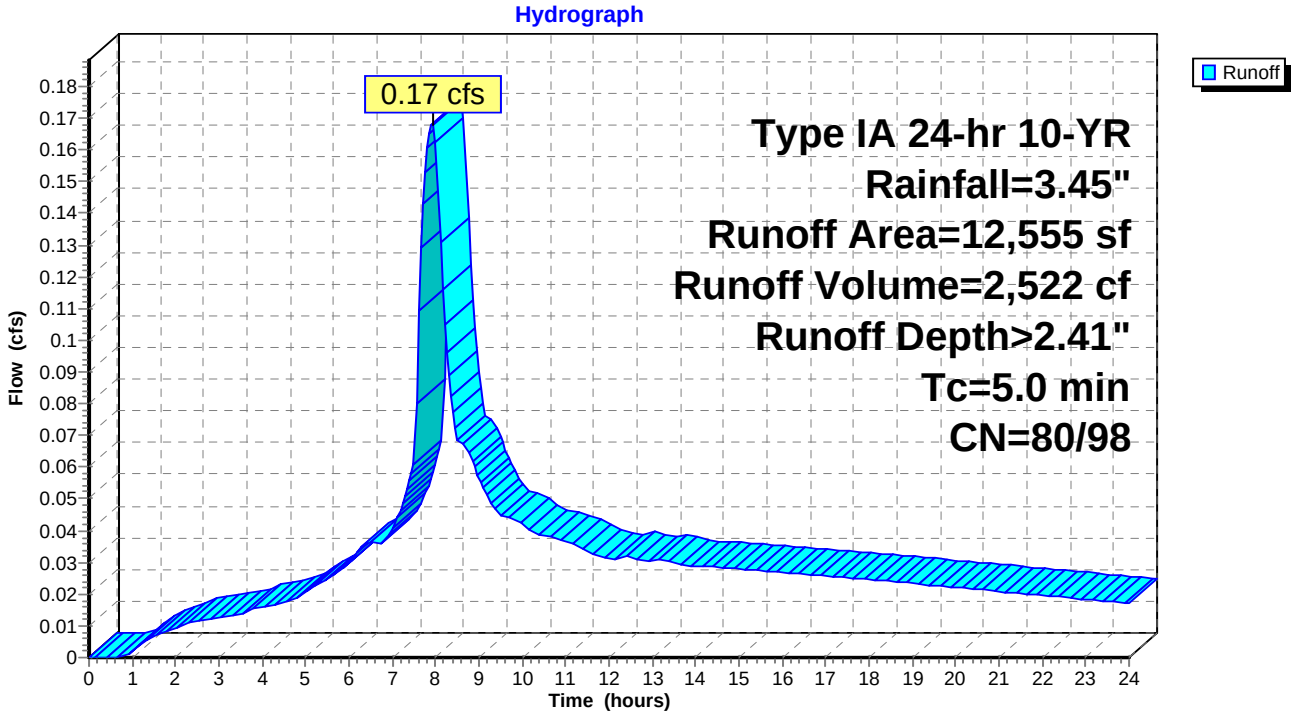
Runoff = 0.17 cfs @ 7.93 hrs, Volume= 2,522 cf, Depth> 2.41"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	6,346	98	Street/Sidewalk/Etc.
	6,209	80	>75% Grass cover, Good, HSG D
	12,555	89	Weighted Average
	6,209	80	Pervious Area
	6,346	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 14S:



Summary for Subcatchment 15.1S: Lots 4 and 5

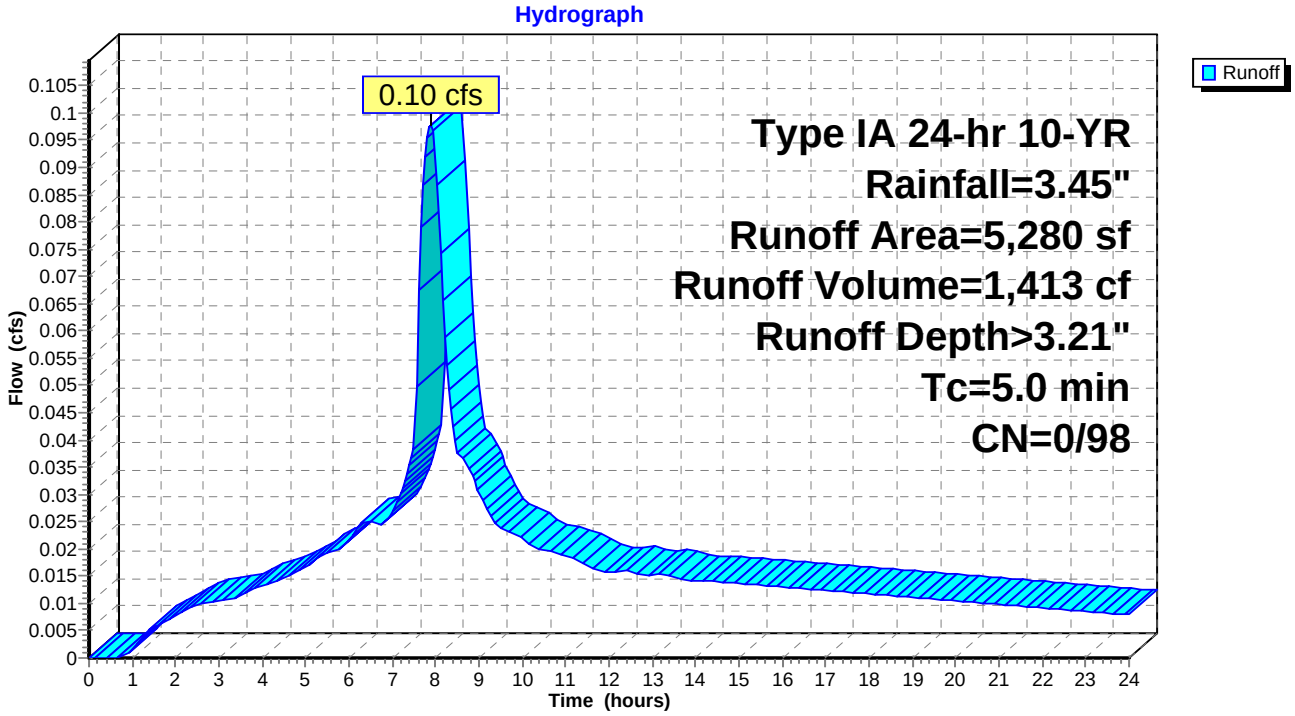
Runoff = 0.10 cfs @ 7.90 hrs, Volume= 1,413 cf, Depth> 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	5,280	98	2 Lots @ 2640 sf
	5,280	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 15.1S: Lots 4 and 5



Summary for Subcatchment 15S:

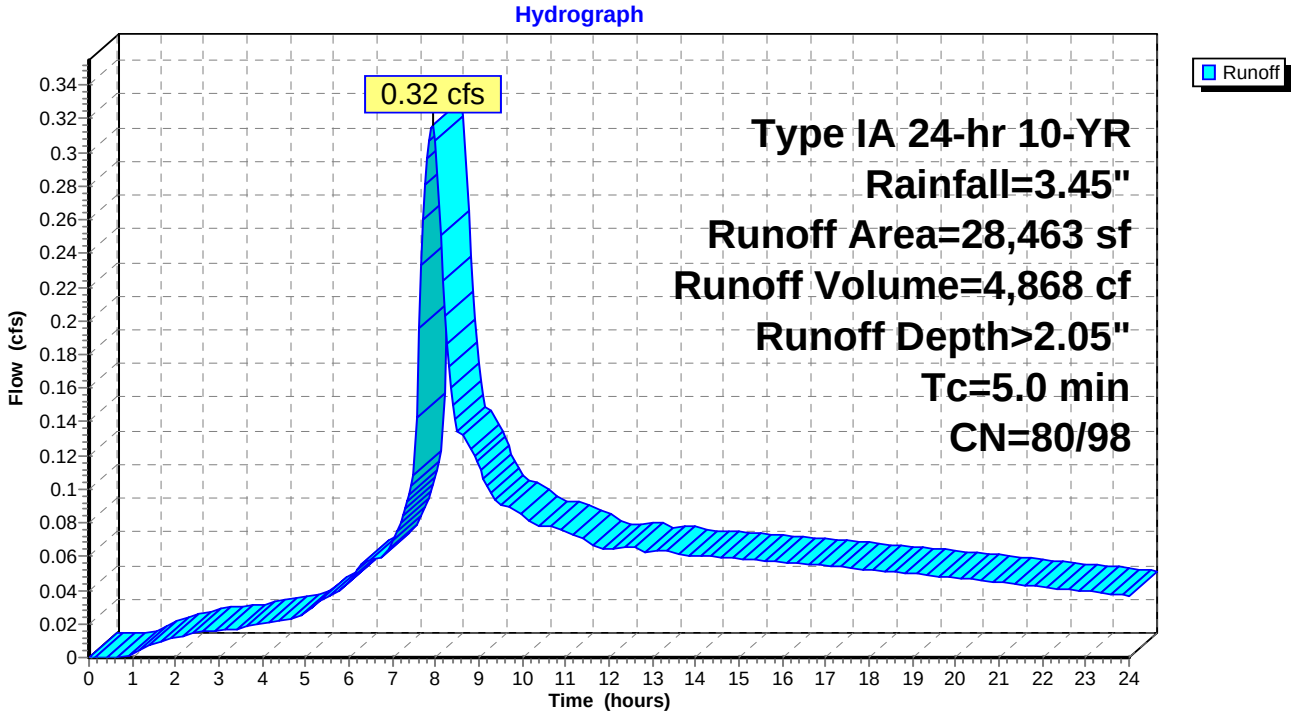
Runoff = 0.32 cfs @ 7.96 hrs, Volume= 4,868 cf, Depth> 2.05"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	8,086	98	Street/Sidewalk/Etc.
	20,377	80	>75% Grass cover, Good, HSG D
	28,463	85	Weighted Average
	20,377	80	Pervious Area
	8,086	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 15S:



Summary for Subcatchment 16.1S: Lots 6-8 and 40-42

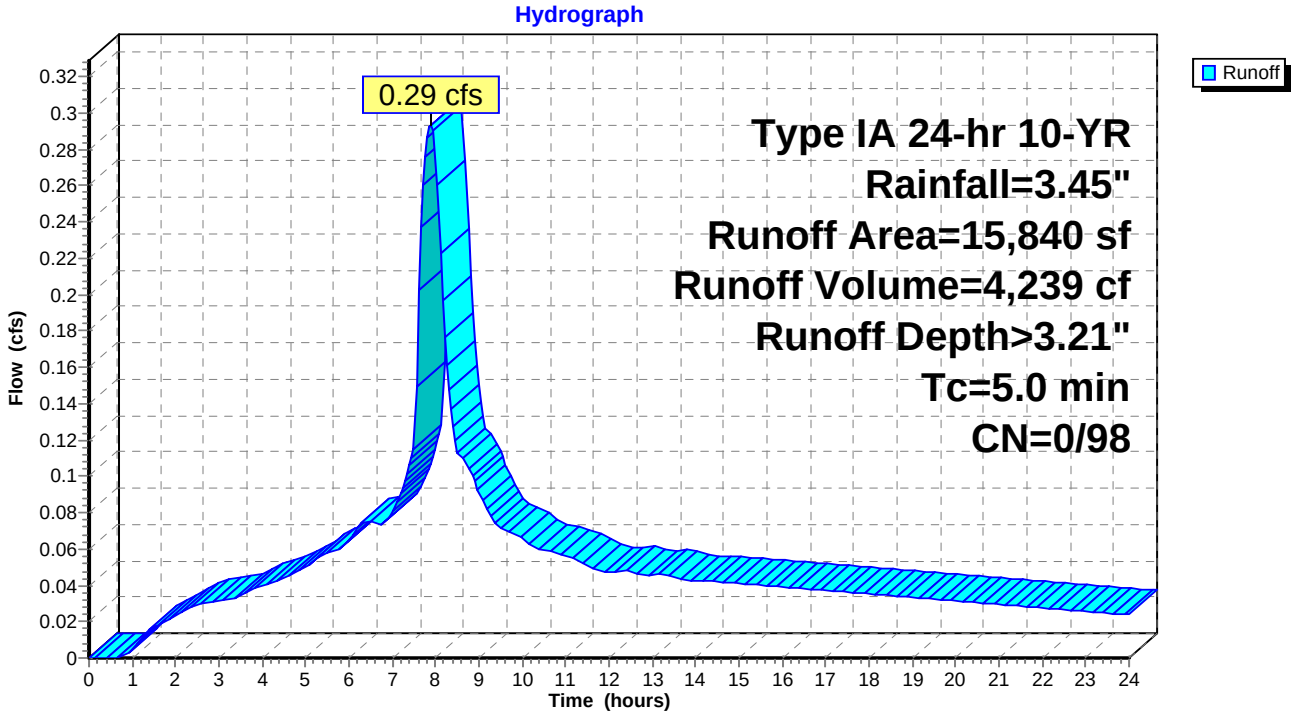
Runoff = 0.29 cfs @ 7.90 hrs, Volume= 4,239 cf, Depth> 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	15,840	98	6 Lots @ 2640 sf
	15,840	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 16.1S: Lots 6-8 and 40-42



Summary for Subcatchment 16S:

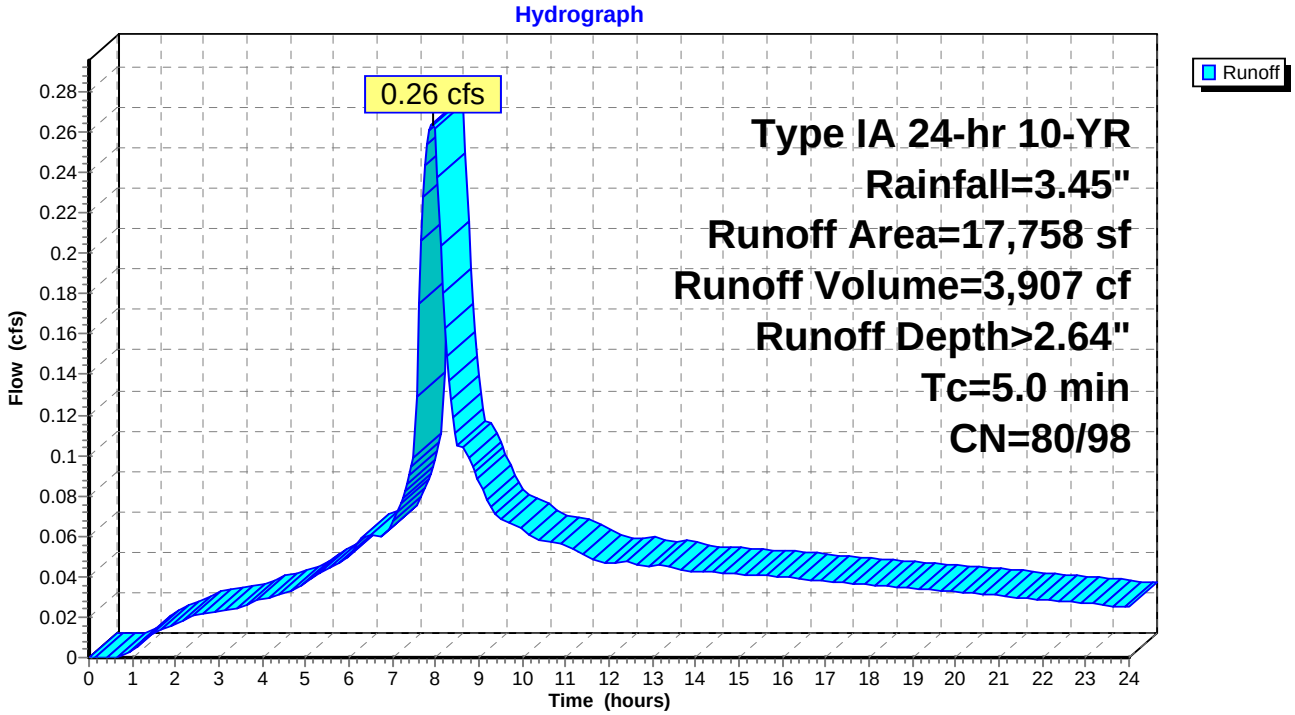
Runoff = 0.26 cfs @ 7.92 hrs, Volume= 3,907 cf, Depth> 2.64"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	1,426	98	Pedestrian Access
	6,261	80	>75% Grass cover, Good, HSG D
*	8,223	98	Existing SW Hall Boulevard
*	1,848	98	SW Hall Widening
	17,758	92	Weighted Average
	6,261	80	Pervious Area
	11,497	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 16S:



Summary for Subcatchment 17.1S: Lot 46 & 47

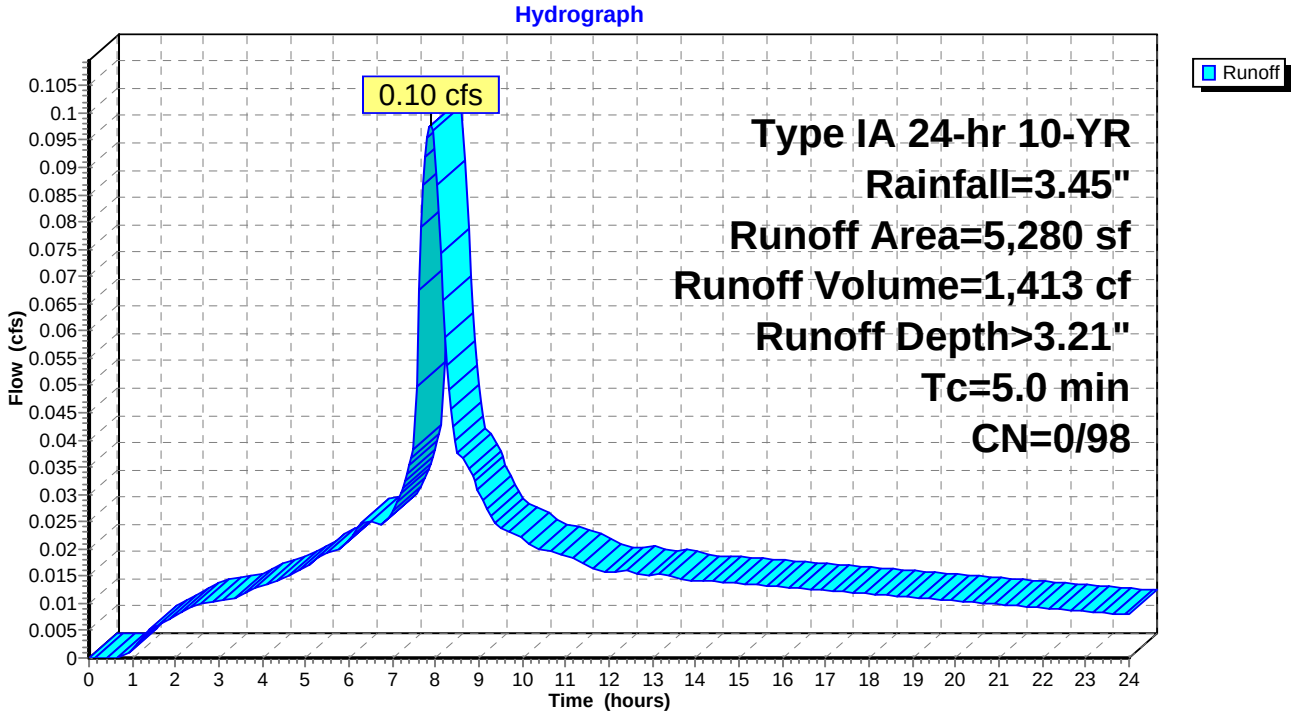
Runoff = 0.10 cfs @ 7.90 hrs, Volume= 1,413 cf, Depth> 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	5,280	98	2 Lots @ 2640 sf
	5,280	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 17.1S: Lot 46 & 47



Summary for Subcatchment 18.1S: Lots 43-45 & 48-53

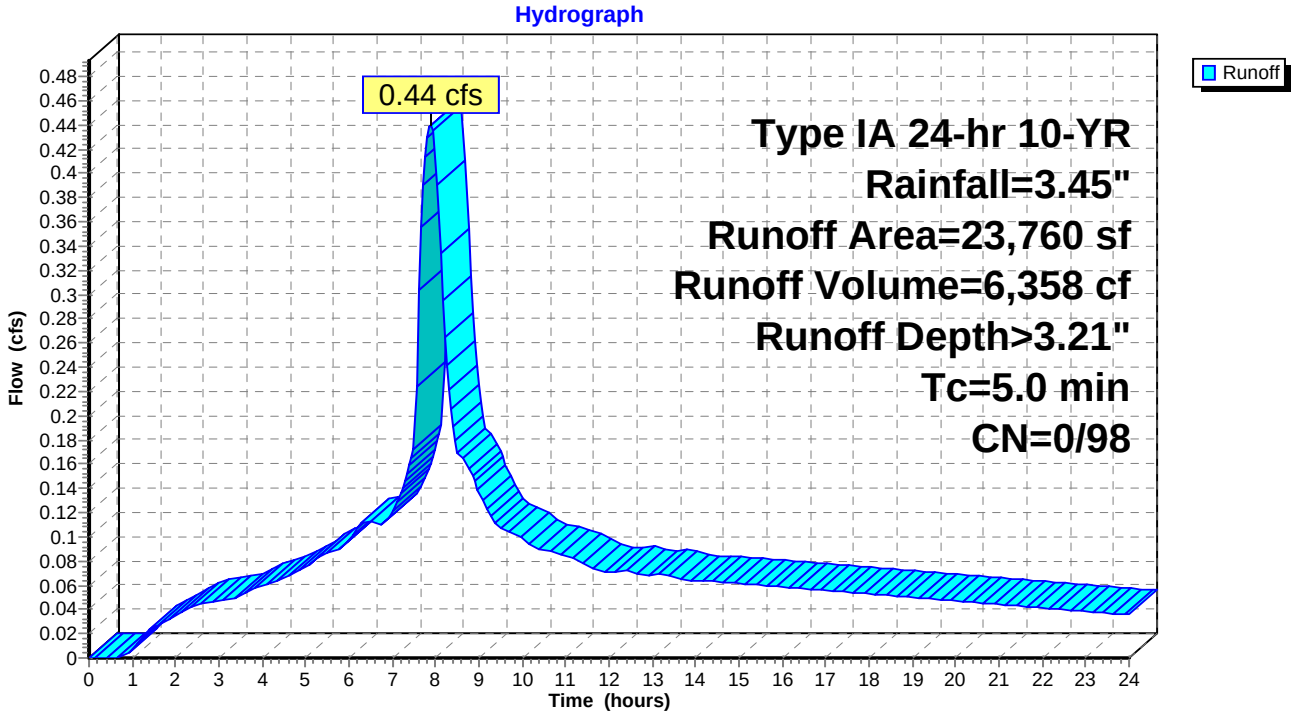
Runoff = 0.44 cfs @ 7.90 hrs, Volume= 6,358 cf, Depth> 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	23,760	98	9 Lots @ 2640 sf
	23,760	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 18.1S: Lots 43-45 & 48-53



Summary for Subcatchment 19.1S: Lots 1 and 36

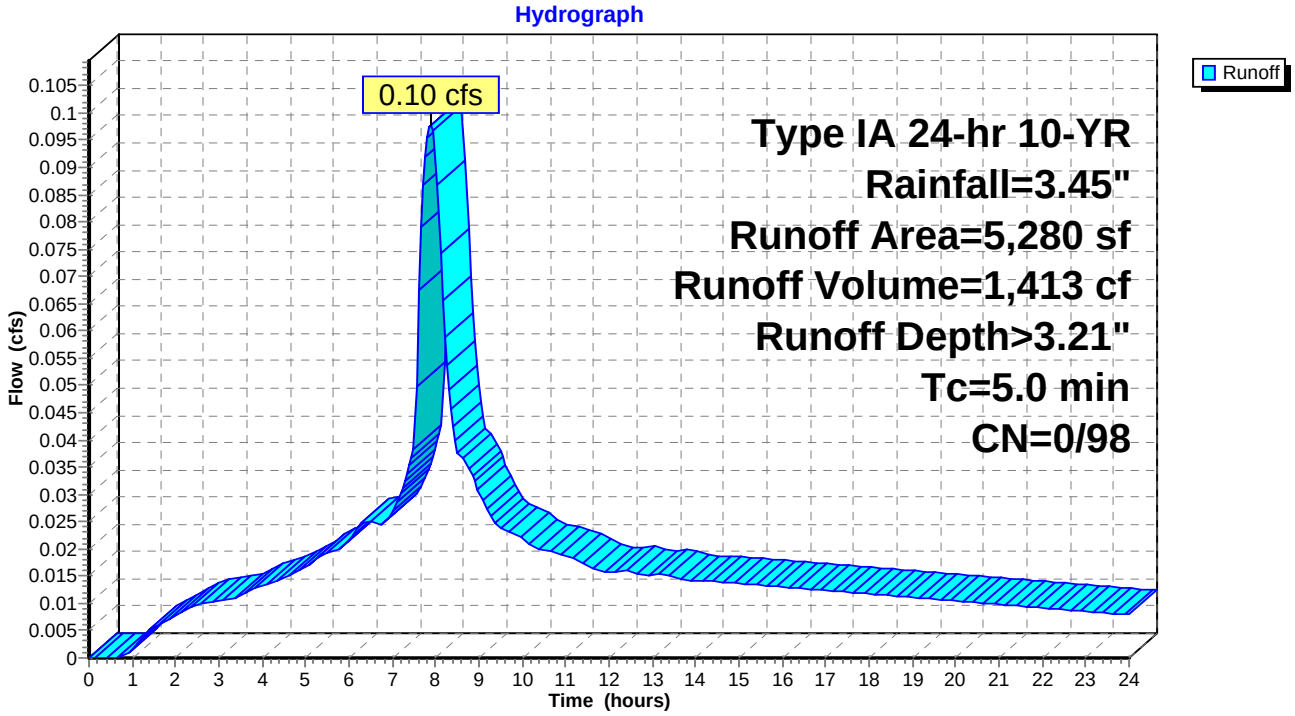
Runoff = 0.10 cfs @ 7.90 hrs, Volume= 1,413 cf, Depth> 3.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-YR Rainfall=3.45"

	Area (sf)	CN	Description
*	5,280	98	2 Lots @ 2640 sf
	5,280	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 19.1S: Lots 1 and 36



Summary for Pond 1P: WQ Extended Dry Basin

Inflow Area = 384,927 sf, 72.25% Impervious, Inflow Depth > 2.76" for 10-YR event
Inflow = 5.88 cfs @ 7.92 hrs, Volume= 88,514 cf
Outflow = 1.87 cfs @ 9.09 hrs, Volume= 59,093 cf, Atten= 68%, Lag= 70.6 min
Primary = 1.87 cfs @ 9.09 hrs, Volume= 59,093 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.11' @ 9.09 hrs Surf.Area= 15,223 sf Storage= 33,360 cf
Flood Elev= 190.75' Surf.Area= 17,158 sf Storage= 52,607 cf

Plug-Flow detention time= 383.2 min calculated for 59,093 cf (67% of inflow)
Center-of-Mass det. time= 181.7 min (869.6 - 687.9)

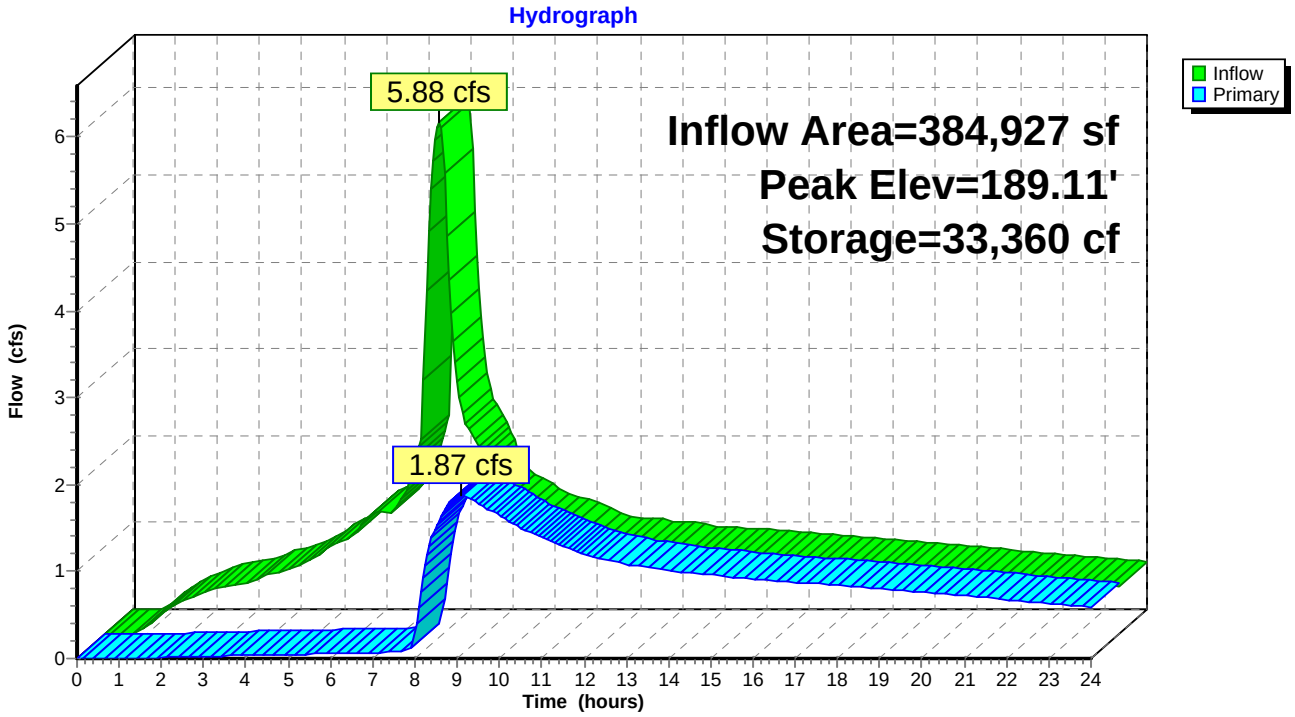
Volume	Invert	Avail.Storage	Storage Description
#1	186.60'	52,607 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
186.60	11,407	0	0
187.00	11,989	4,679	4,679
188.00	13,486	12,738	17,417
189.00	15,044	14,265	31,682
190.00	16,661	15,853	47,534
190.30	17,158	5,073	52,607

Device	Routing	Invert	Outlet Devices
#1	Device 2	186.60'	**2.0' long (Profile 17) Broad-Crested Rectangular Weir** Head (feet) 0.49 0.98 1.48 1.97 2.46 2.95 Coef. (English) 2.84 3.13 3.26 3.30 3.31 3.31
#2	Device 4	186.60'	**1.5" Vert. WQ Orifice** C= 0.620
#3	Device 4	188.65'	**2.0' long (Profile 17) Broad-Crested Rectangular Weir** Head (feet) 0.49 0.98 1.48 1.97 2.46 2.95 Coef. (English) 2.84 3.13 3.26 3.30 3.31 3.31
#4	Primary	186.53'	**18.0" x 12.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 186.49' S= 0.0033 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=1.87 cfs @ 9.09 hrs HW=189.11' TW=186.78' (Dynamic Tailwater)
└─**4=Culvert** (Passes 1.87 cfs of 11.45 cfs potential flow)
  ├─**2=WQ Orifice** (Orifice Controls 0.09 cfs @ 7.59 fps)
  │ └─**1=Broad-Crested Rectangular Weir** (Passes 0.09 cfs of 26.14 cfs potential flow)
  └─**3=Broad-Crested Rectangular Weir** (Weir Controls 1.78 cfs @ 1.93 fps)

Pond 1P: WQ Extended Dry Basin



Summary for Pond 2R: STM MH A0

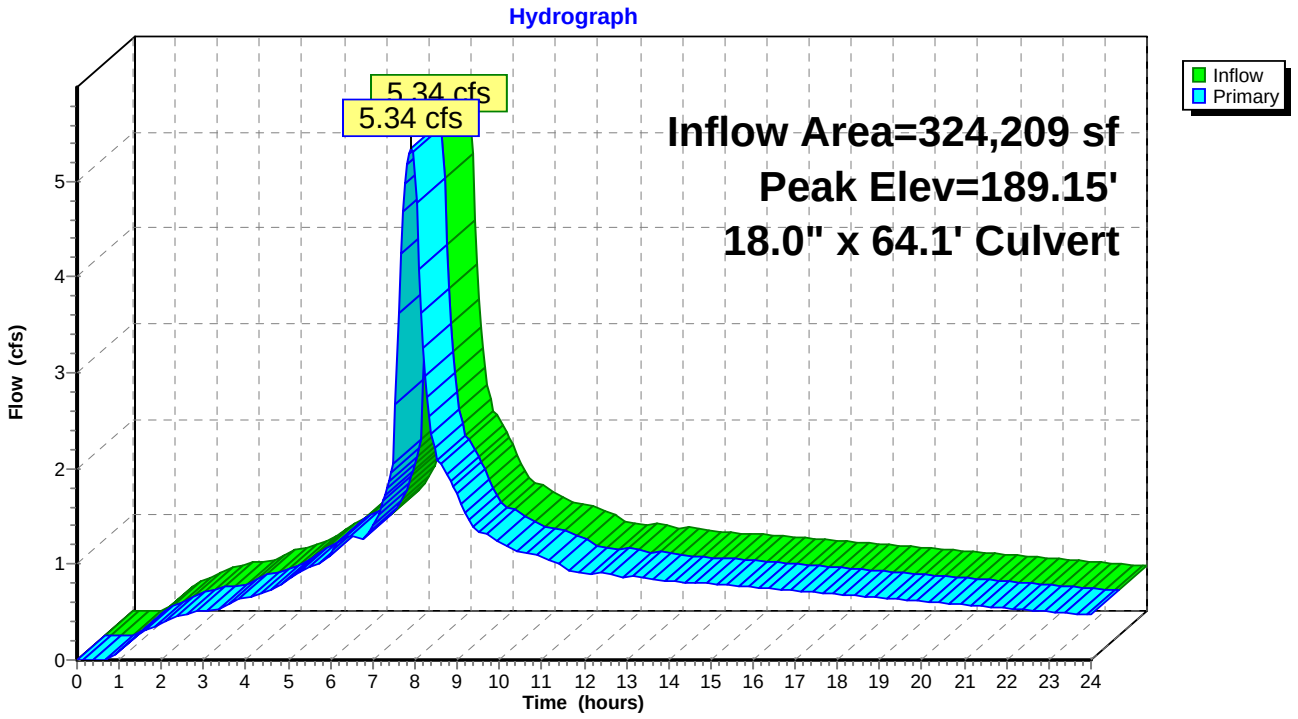
Inflow Area =	324,209 sf,	80.25% Impervious,	Inflow Depth >	2.89"	for 10-YR event
Inflow =	5.34 cfs @	7.91 hrs,	Volume=	78,119 cf	
Outflow =	5.34 cfs @	7.91 hrs,	Volume=	78,119 cf,	Atten= 0%, Lag= 0.0 min
Primary =	5.34 cfs @	7.91 hrs,	Volume=	78,119 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.15' @ 8.93 hrs
Flood Elev= 191.68'

Device	Routing	Invert	Outlet Devices
#1	Primary	186.99'	**18.0" x 64.1' long Culvert** Ke= 0.500 Outlet Invert= 186.73' S= 0.0041 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=5.33 cfs @ 7.91 hrs HW=188.99' TW=188.60' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 5.33 cfs @ 3.02 fps)

Pond 2R: STM MH A0



Summary for Pond 3R: STM MH A1

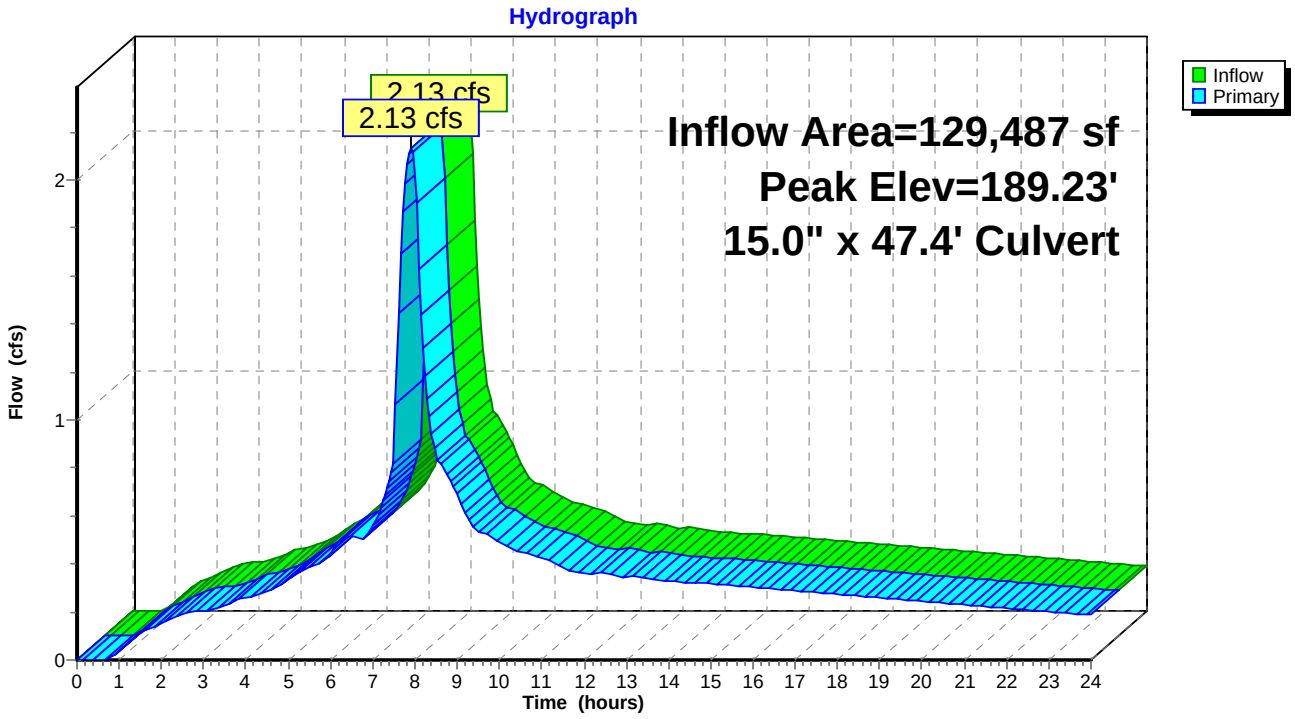
Inflow Area = 129,487 sf, 80.41% Impervious, Inflow Depth > 2.89" for 10-YR event
Inflow = 2.13 cfs @ 7.91 hrs, Volume= 31,229 cf
Outflow = 2.13 cfs @ 7.91 hrs, Volume= 31,229 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.13 cfs @ 7.91 hrs, Volume= 31,229 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.23' @ 8.01 hrs
Flood Elev= 192.11'

Device	Routing	Invert	Outlet Devices
#1	Primary	187.38'	**15.0" x 47.4' long Culvert** Ke= 0.500 Outlet Invert= 187.19' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=2.13 cfs @ 7.91 hrs HW=189.12' TW=188.99' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 2.13 cfs @ 1.74 fps)

Pond 3R: STM MH A1



Summary for Pond 4R: STM MH A2

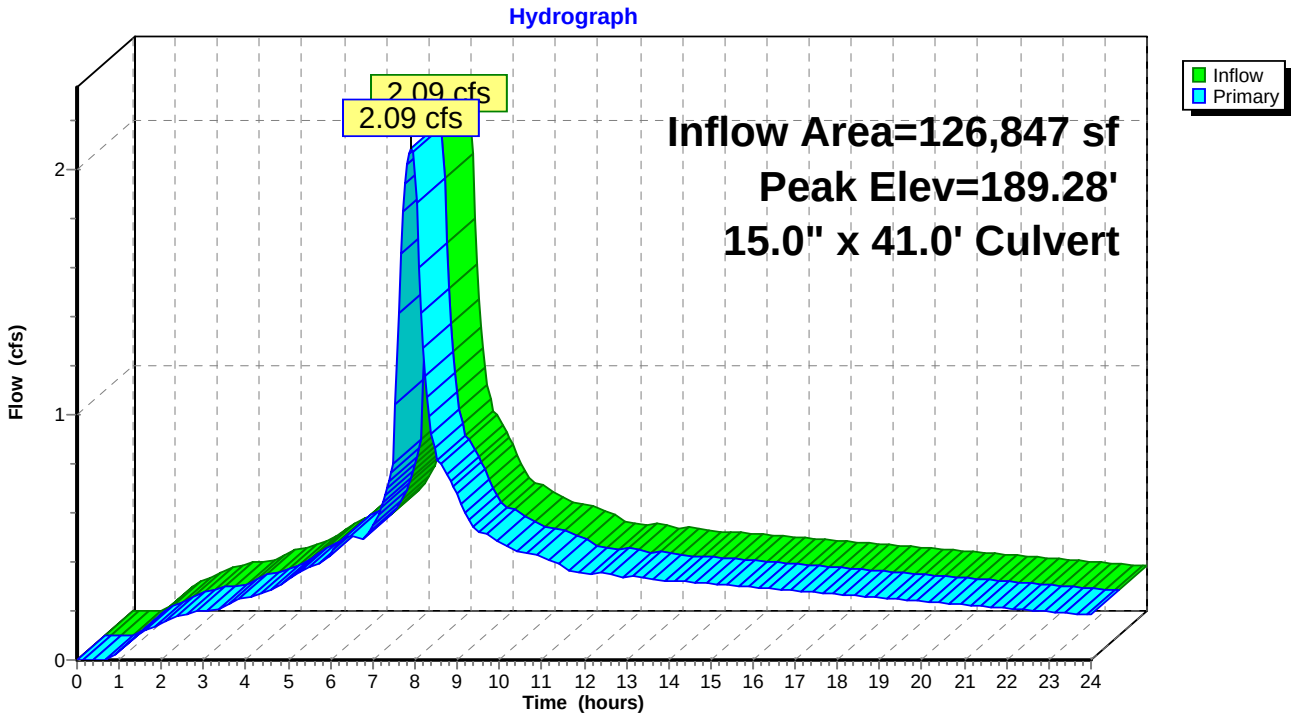
Inflow Area =	126,847 sf,	80.00% Impervious,	Inflow Depth >	2.89"	for 10-YR event
Inflow =	2.09 cfs @	7.91 hrs,	Volume=	30,522 cf	
Outflow =	2.09 cfs @	7.91 hrs,	Volume=	30,522 cf,	Atten= 0%, Lag= 0.0 min
Primary =	2.09 cfs @	7.91 hrs,	Volume=	30,522 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.28' @ 8.00 hrs
Flood Elev= 192.36'

Device	Routing	Invert	Outlet Devices
#1	Primary	187.74'	**15.0" x 41.0' long Culvert** Ke= 0.500 Outlet Invert= 187.58' S= 0.0039 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=1.35 cfs @ 7.91 hrs HW=189.18' TW=189.12' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.35 cfs @ 1.10 fps)

Pond 4R: STM MH A2



Summary for Pond 5R: STM MH A3

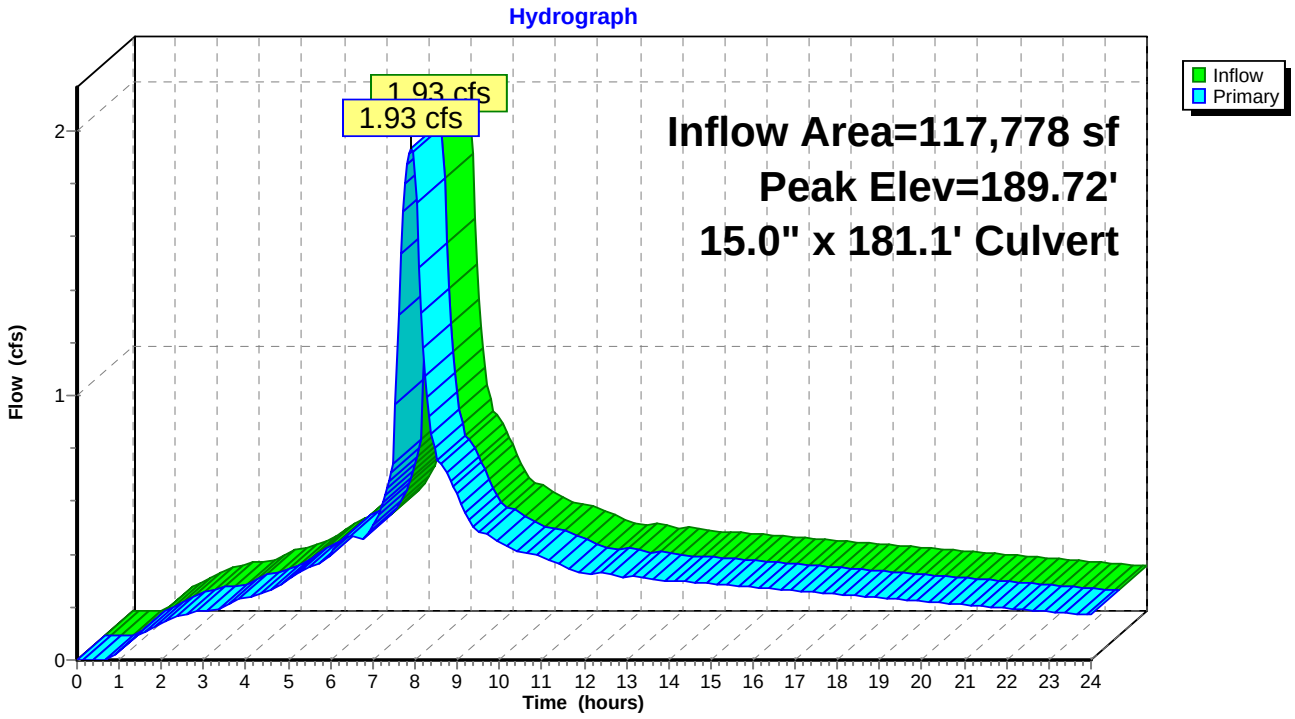
Inflow Area =	117,778 sf,	79.81% Impervious,	Inflow Depth >	2.88"	for 10-YR event
Inflow =	1.93 cfs @	7.91 hrs,	Volume=	28,310 cf	
Outflow =	1.93 cfs @	7.91 hrs,	Volume=	28,310 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.93 cfs @	7.91 hrs,	Volume=	28,310 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.72' @ 8.00 hrs
Flood Elev= 193.63'

Device	Routing	Invert	Outlet Devices
#1	Primary	188.66'	**15.0" x 181.1' long Culvert** Ke= 0.500 Outlet Invert= 187.94' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=1.92 cfs @ 7.91 hrs HW=189.67' TW=189.18' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.92 cfs @ 2.48 fps)

Pond 5R: STM MH A3



Summary for Pond 6R: STM MH A4

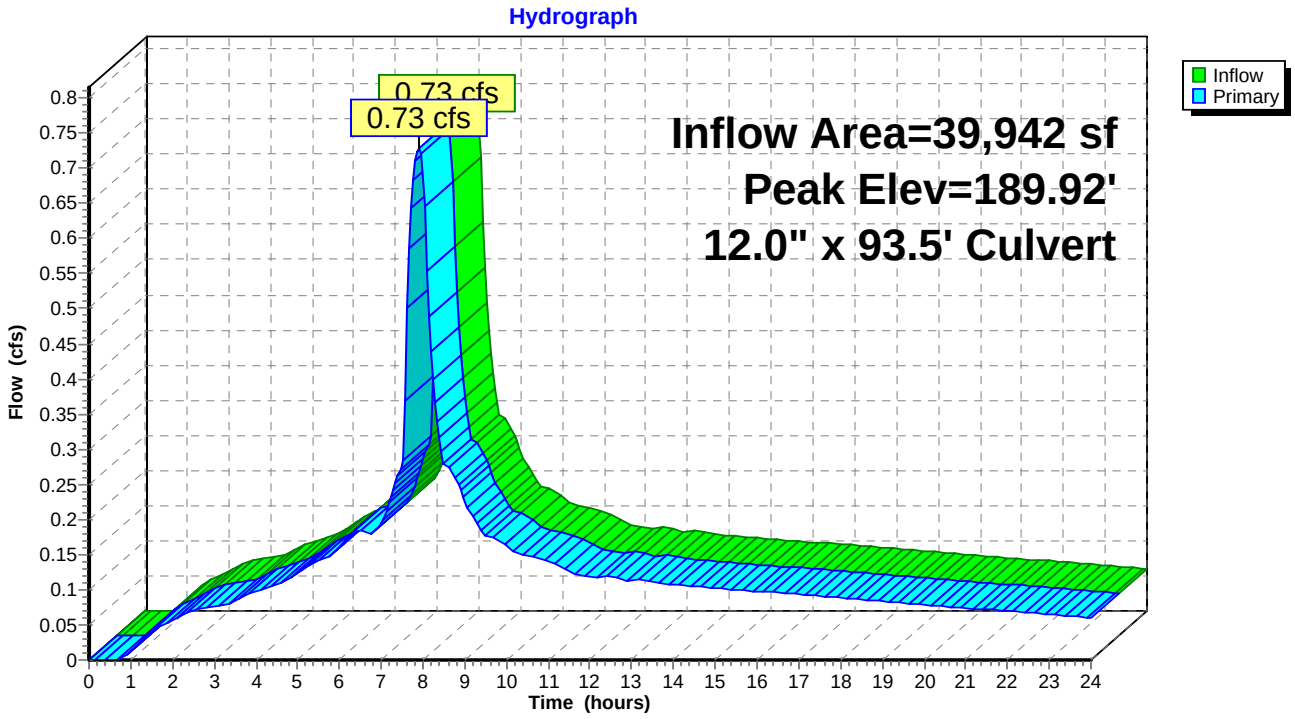
Inflow Area = 39,942 sf, 97.07% Impervious, Inflow Depth > 3.16" for 10-YR event
Inflow = 0.73 cfs @ 7.90 hrs, Volume= 10,531 cf
Outflow = 0.73 cfs @ 7.90 hrs, Volume= 10,531 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.73 cfs @ 7.90 hrs, Volume= 10,531 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.92' @ 7.99 hrs
Flood Elev= 194.32'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.23'	**12.0" x 93.5' long Culvert** Ke= 0.500 Outlet Invert= 188.86' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.73 cfs @ 7.90 hrs HW=189.90' TW=189.66' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.73 cfs @ 1.85 fps)

Pond 6R: STM MH A4



Summary for Pond 7R: STM MH A5

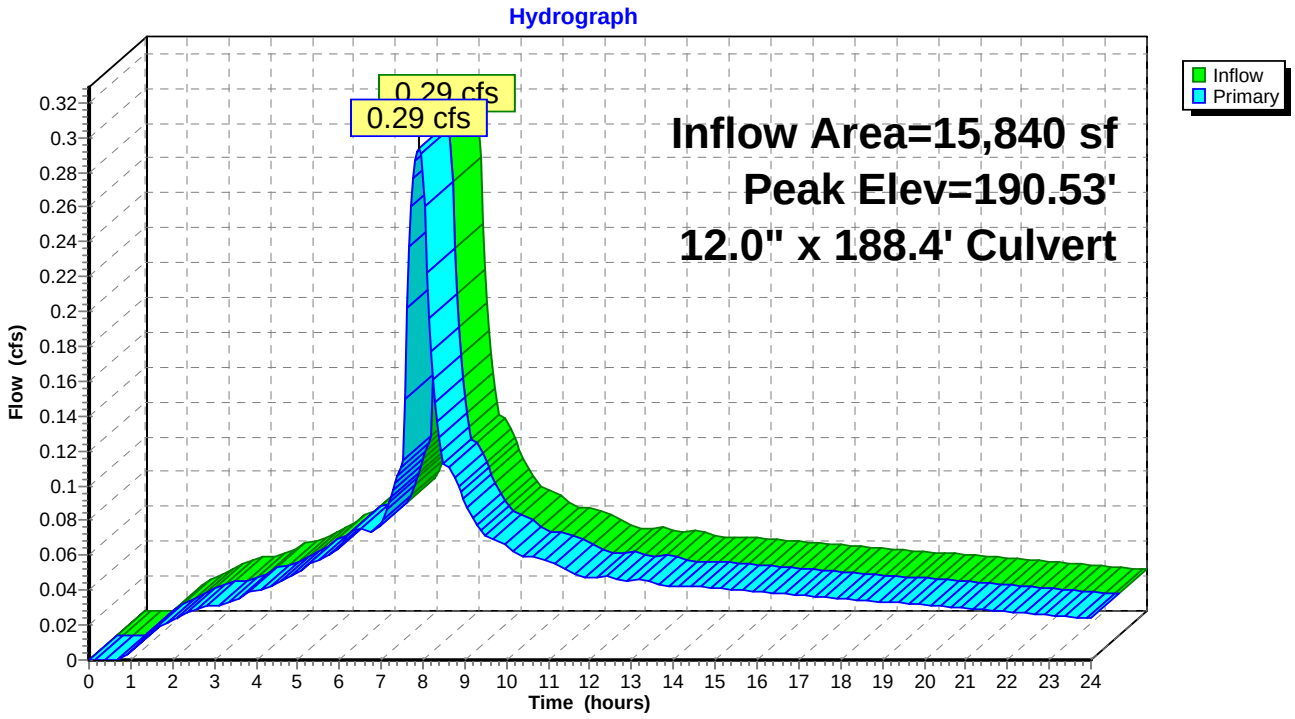
Inflow Area = 15,840 sf,100.00% Impervious, Inflow Depth > 3.21" for 10-YR event
Inflow = 0.29 cfs @ 7.90 hrs, Volume= 4,239 cf
Outflow = 0.29 cfs @ 7.90 hrs, Volume= 4,239 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.29 cfs @ 7.90 hrs, Volume= 4,239 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.53' @ 7.93 hrs
Flood Elev= 196.04'

Device	Routing	Invert	Outlet Devices
#1	Primary	190.18'	**12.0" x 188.4' long Culvert** Ke= 0.500 Outlet Invert= 189.43' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.29 cfs @ 7.90 hrs HW=190.53' TW=189.90' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.29 cfs @ 1.77 fps)

Pond 7R: STM MH A5



Summary for Pond 10R: STM MH B1

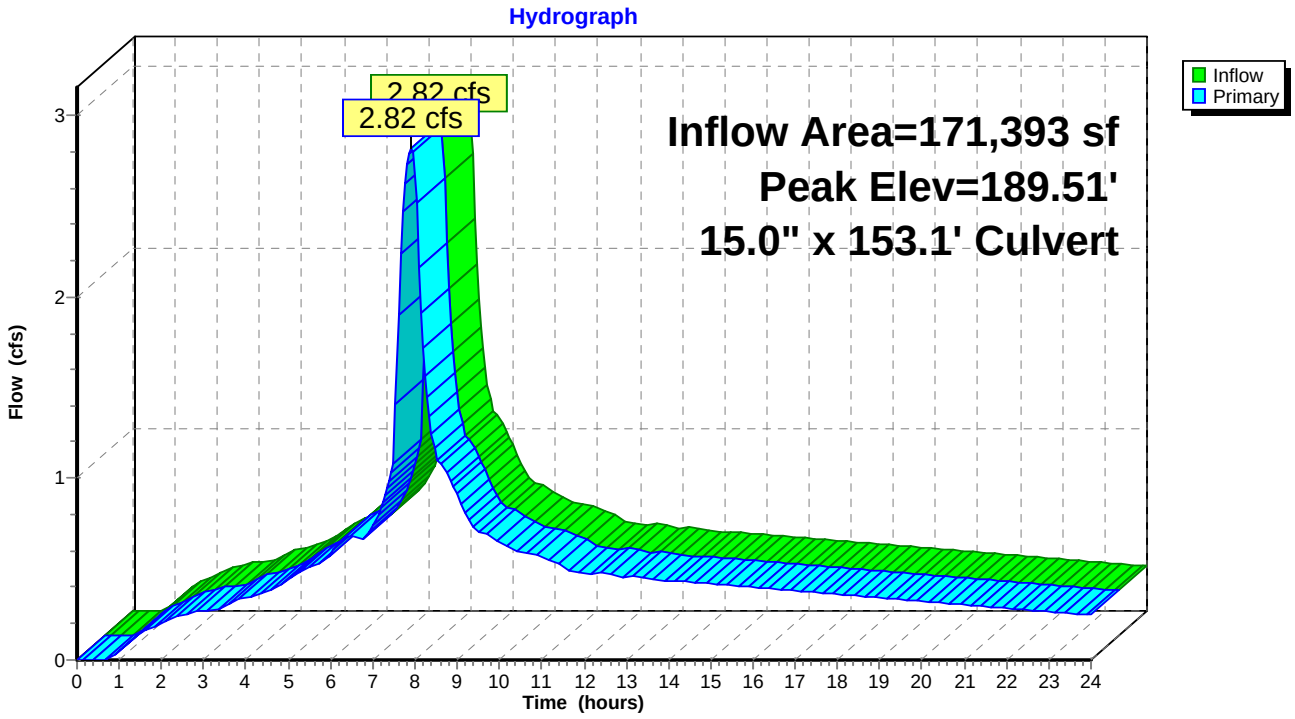
Inflow Area = 171,393 sf, 79.91% Impervious, Inflow Depth > 2.89" for 10-YR event
Inflow = 2.82 cfs @ 7.91 hrs, Volume= 41,220 cf
Outflow = 2.82 cfs @ 7.91 hrs, Volume= 41,220 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.82 cfs @ 7.91 hrs, Volume= 41,220 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.51' @ 8.00 hrs
Flood Elev= 193.43'

Device	Routing	Invert	Outlet Devices
#1	Primary	187.80'	**15.0" x 153.1' long Culvert** Ke= 0.500 Outlet Invert= 187.19' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=2.82 cfs @ 7.91 hrs HW=189.38' TW=188.99' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 2.82 cfs @ 2.35 fps)

Pond 10R: STM MH B1



Summary for Pond 11R: STM MH B2

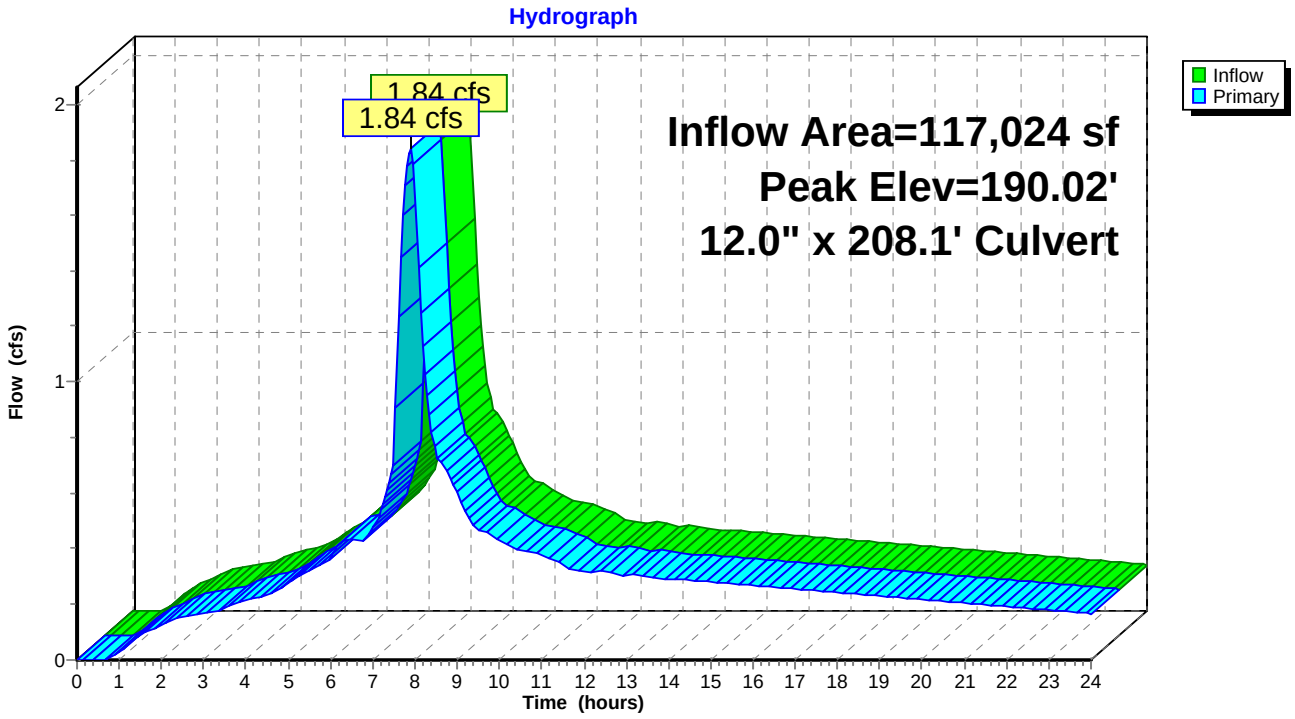
Inflow Area = 117,024 sf, 73.10% Impervious, Inflow Depth > 2.78" for 10-YR event
Inflow = 1.84 cfs @ 7.91 hrs, Volume= 27,070 cf
Outflow = 1.84 cfs @ 7.91 hrs, Volume= 27,070 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.84 cfs @ 7.91 hrs, Volume= 27,070 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.02' @ 7.98 hrs
Flood Elev= 196.38'

Device	Routing	Invert	Outlet Devices
#1	Primary	188.83'	**12.0" x 208.1' long Culvert** Ke= 0.500 Outlet Invert= 188.00' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=1.75 cfs @ 7.91 hrs HW=189.98' TW=189.38' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.75 cfs @ 2.42 fps)

Pond 11R: STM MH B2



Summary for Pond 12R: STM MH B3

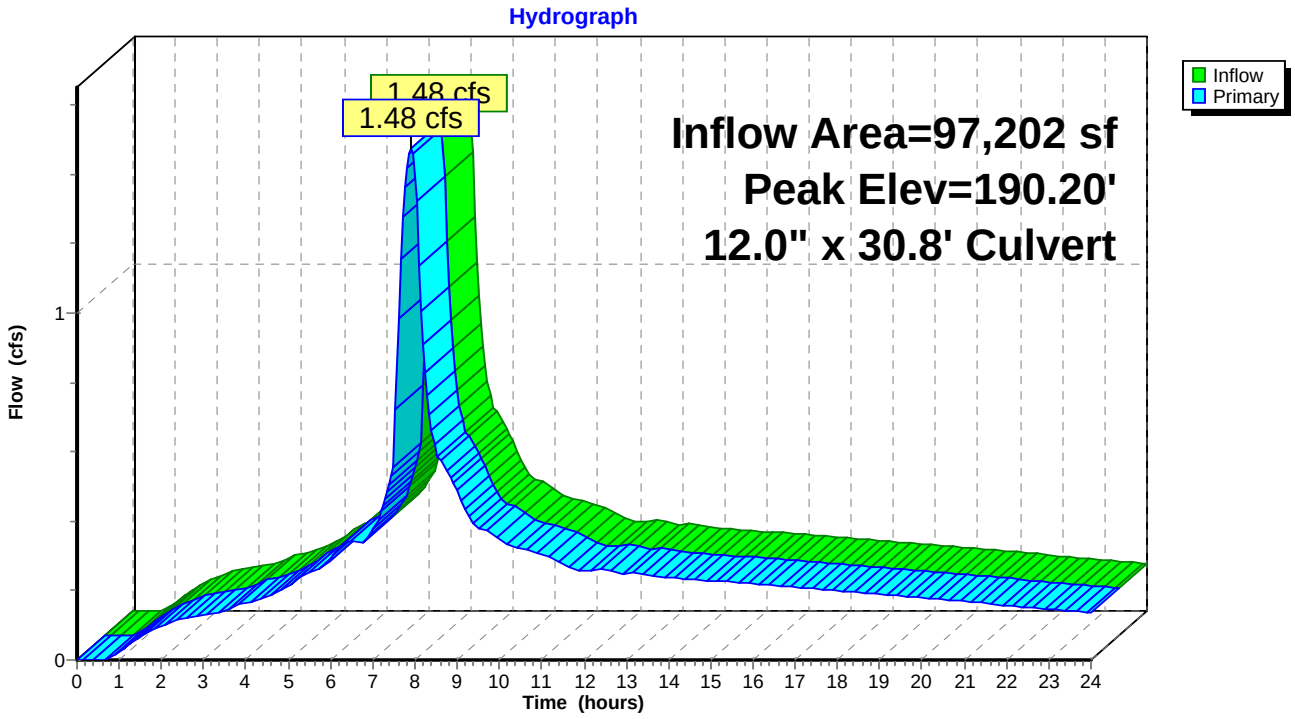
Inflow Area = 97,202 sf, 68.09% Impervious, Inflow Depth > 2.69" for 10-YR event
Inflow = 1.48 cfs @ 7.92 hrs, Volume= 21,828 cf
Outflow = 1.48 cfs @ 7.92 hrs, Volume= 21,828 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.48 cfs @ 7.92 hrs, Volume= 21,828 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.20' @ 7.98 hrs
Flood Elev= 196.86'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.15'	**12.0" x 30.8' long Culvert** Ke= 0.500 Outlet Invert= 189.03' S= 0.0039 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=1.47 cfs @ 7.92 hrs HW=190.17' TW=189.98' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 1.47 cfs @ 2.29 fps)

Pond 12R: STM MH B3



Summary for Pond 13R: STM MH B4

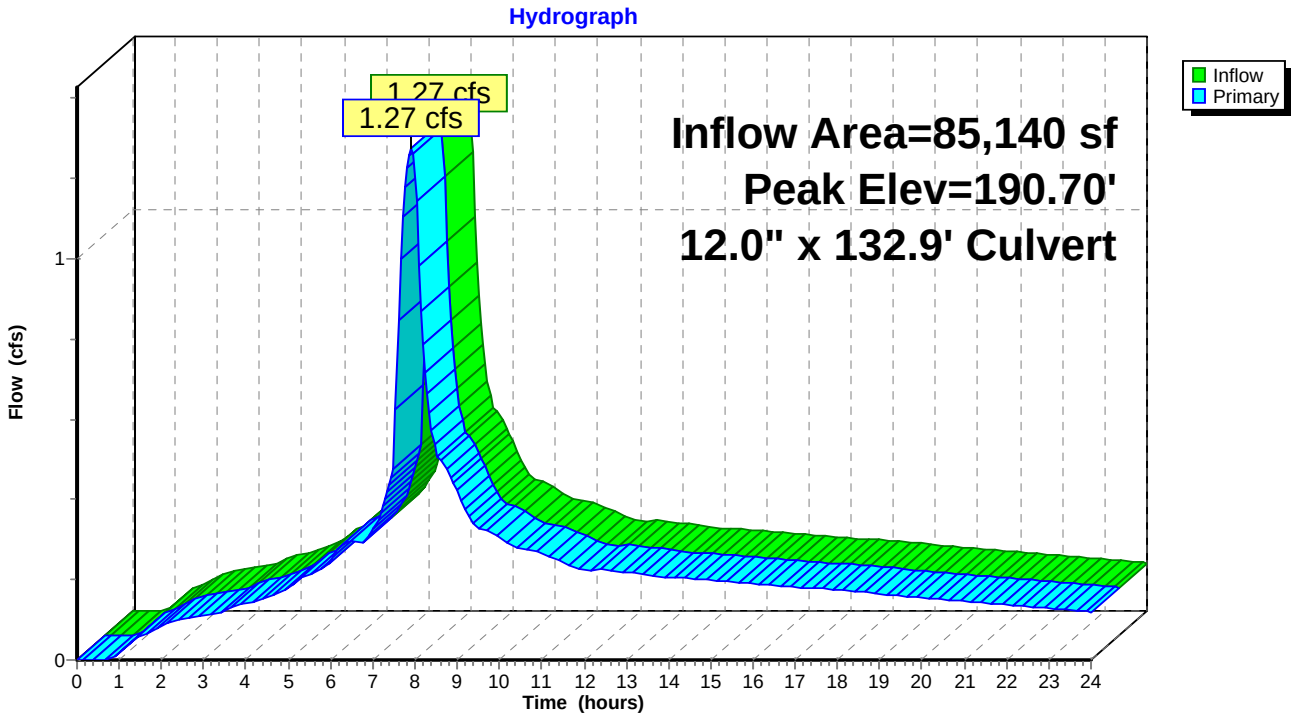
Inflow Area = 85,140 sf, 65.88% Impervious, Inflow Depth > 2.66" for 10-YR event
Inflow = 1.27 cfs @ 7.92 hrs, Volume= 18,865 cf
Outflow = 1.27 cfs @ 7.92 hrs, Volume= 18,865 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.27 cfs @ 7.92 hrs, Volume= 18,865 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.70' @ 7.98 hrs
Flood Elev= 198.44'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.88'	**12.0" x 132.9' long Culvert** Ke= 0.500 Outlet Invert= 189.35' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=1.27 cfs @ 7.92 hrs HW=190.69' TW=190.17' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 1.27 cfs @ 2.56 fps)

Pond 13R: STM MH B4



Summary for Pond 14R: STM MH B5

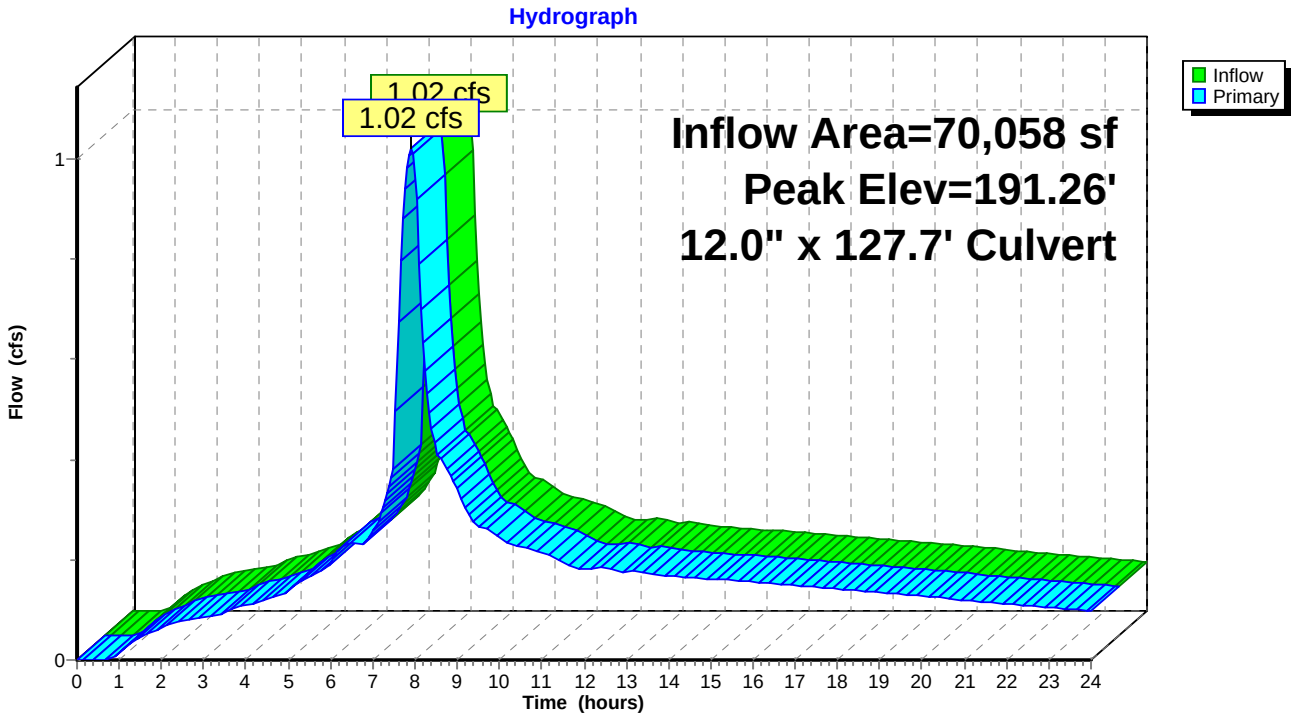
Inflow Area = 70,058 sf, 62.05% Impervious, Inflow Depth > 2.60" for 10-YR event
Inflow = 1.02 cfs @ 7.92 hrs, Volume= 15,161 cf
Outflow = 1.02 cfs @ 7.92 hrs, Volume= 15,161 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.02 cfs @ 7.92 hrs, Volume= 15,161 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 191.26' @ 7.94 hrs
Flood Elev= 196.96'

Device	Routing	Invert	Outlet Devices
#1	Primary	190.59'	**12.0" x 127.7' long Culvert** Ke= 0.500 Outlet Invert= 190.08' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=1.01 cfs @ 7.92 hrs HW=191.26' TW=190.69' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 1.01 cfs @ 2.58 fps)

Pond 14R: STM MH B5



Summary for Pond 15R: STM MH B6

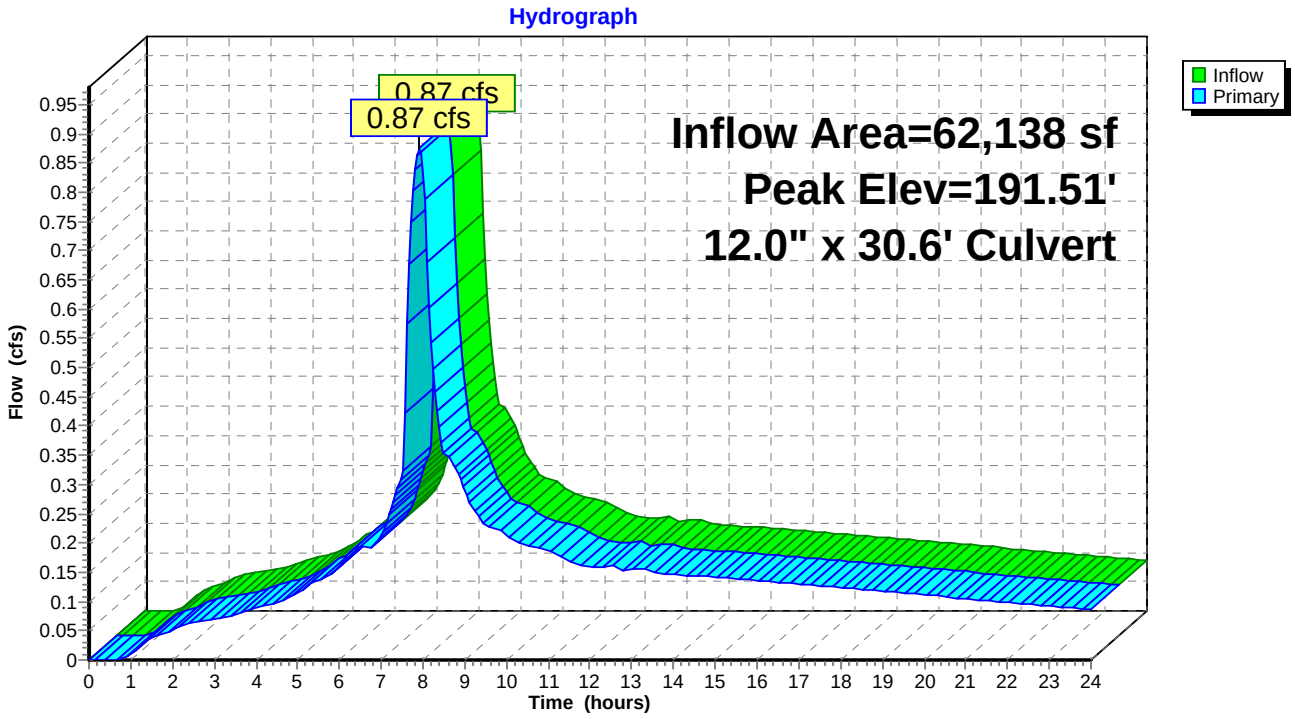
Inflow Area = 62,138 sf, 57.21% Impervious, Inflow Depth > 2.52" for 10-YR event
Inflow = 0.87 cfs @ 7.93 hrs, Volume= 13,042 cf
Outflow = 0.87 cfs @ 7.93 hrs, Volume= 13,042 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.87 cfs @ 7.93 hrs, Volume= 13,042 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 191.51' @ 7.94 hrs
Flood Elev= 196.54'

Device	Routing	Invert	Outlet Devices
#1	Primary	190.91'	**12.0" x 30.6' long Culvert** Ke= 0.500 Outlet Invert= 190.79' S= 0.0039 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.87 cfs @ 7.93 hrs HW=191.51' TW=191.26' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.87 cfs @ 2.54 fps)

Pond 15R: STM MH B6



Summary for Pond 16R: STM MH B7

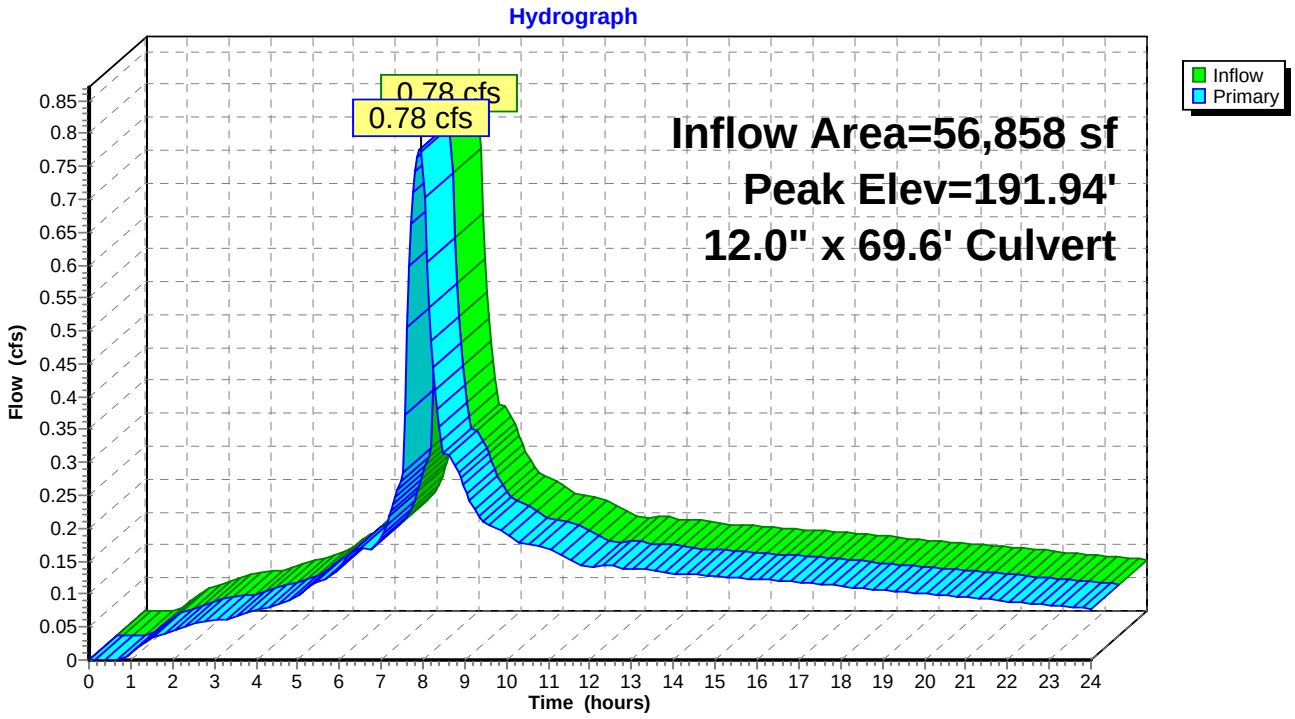
Inflow Area = 56,858 sf, 53.24% Impervious, Inflow Depth > 2.45" for 10-YR event
Inflow = 0.78 cfs @ 7.93 hrs, Volume= 11,629 cf
Outflow = 0.78 cfs @ 7.93 hrs, Volume= 11,629 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.78 cfs @ 7.93 hrs, Volume= 11,629 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 191.94' @ 7.93 hrs
Flood Elev= 195.55'

Device	Routing	Invert	Outlet Devices
#1	Primary	191.39'	**12.0" x 69.6' long Culvert** Ke= 0.500 Outlet Invert= 191.11' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.78 cfs @ 7.93 hrs HW=191.94' TW=191.51' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.78 cfs @ 2.55 fps)

Pond 16R: STM MH B7



Summary for Pond 17R: STM MH C1

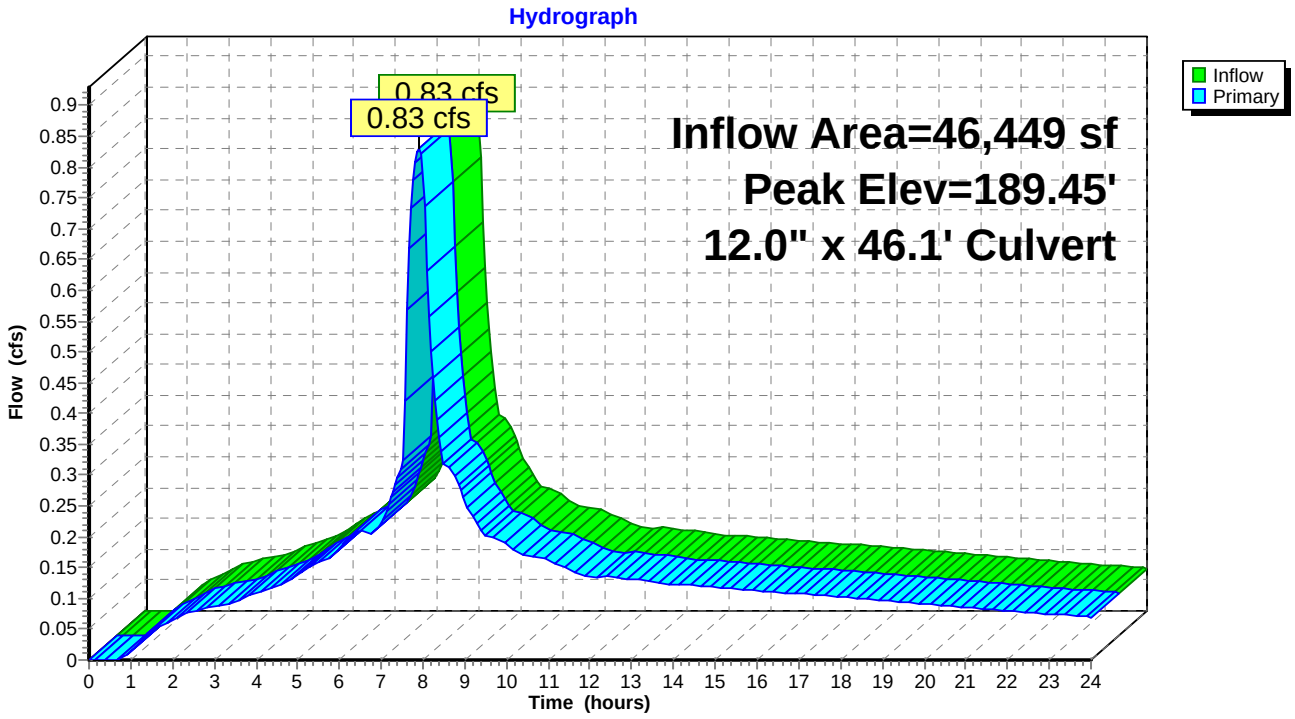
Inflow Area = 46,449 sf, 93.64% Impervious, Inflow Depth > 3.11" for 10-YR event
Inflow = 0.83 cfs @ 7.90 hrs, Volume= 12,031 cf
Outflow = 0.83 cfs @ 7.90 hrs, Volume= 12,031 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.83 cfs @ 7.90 hrs, Volume= 12,031 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.45' @ 8.00 hrs
Flood Elev= 192.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	188.19'	**12.0" x 46.1' long Culvert** Ke= 0.500 Outlet Invert= 188.00' S= 0.0041 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.00 cfs @ 7.90 hrs HW=189.36' TW=189.36' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)

Pond 17R: STM MH C1



Summary for Pond 18R: STM MH C2

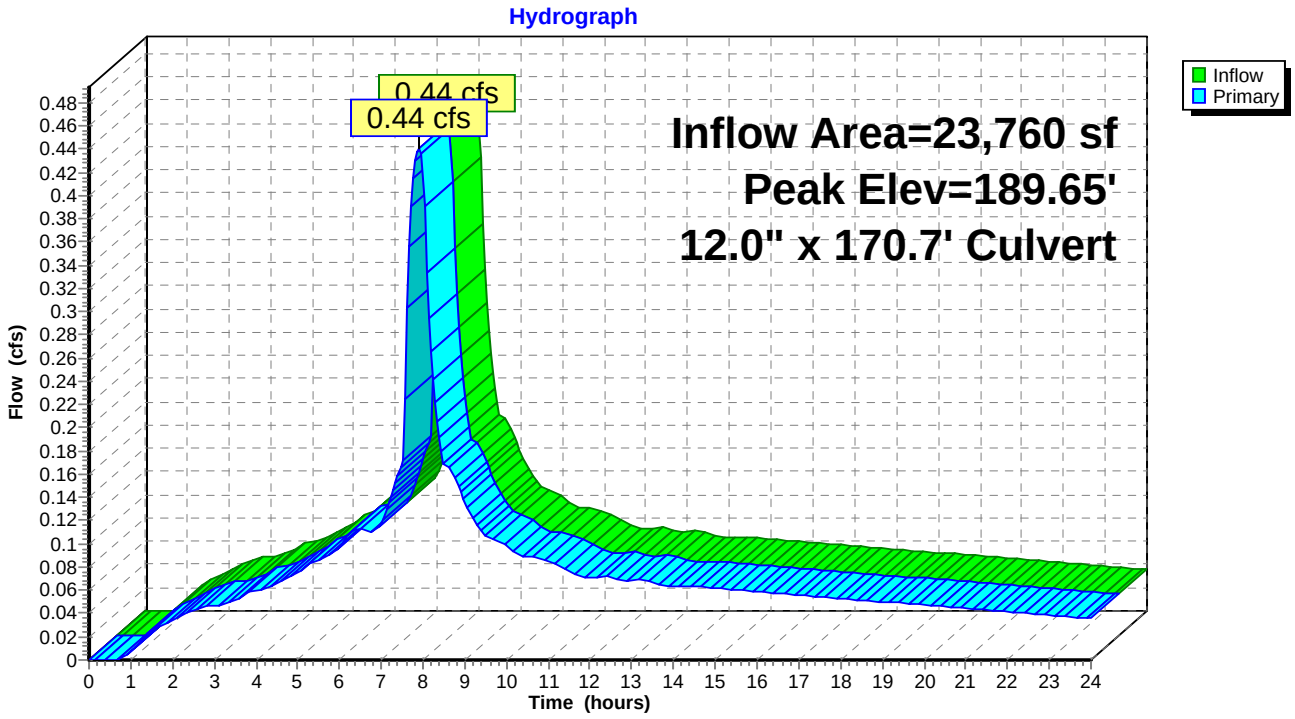
Inflow Area = 23,760 sf,100.00% Impervious, Inflow Depth > 3.21" for 10-YR event
Inflow = 0.44 cfs @ 7.90 hrs, Volume= 6,358 cf
Outflow = 0.44 cfs @ 7.90 hrs, Volume= 6,358 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.44 cfs @ 7.90 hrs, Volume= 6,358 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.65' @ 8.00 hrs
Flood Elev= 194.84'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.06'	**12.0" x 170.7' long Culvert** Ke= 0.500 Outlet Invert= 188.38' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.44 cfs @ 7.90 hrs HW=189.61' TW=189.35' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.44 cfs @ 1.44 fps)

Pond 18R: STM MH C2



Summary for Pond 19R: STM MH D1

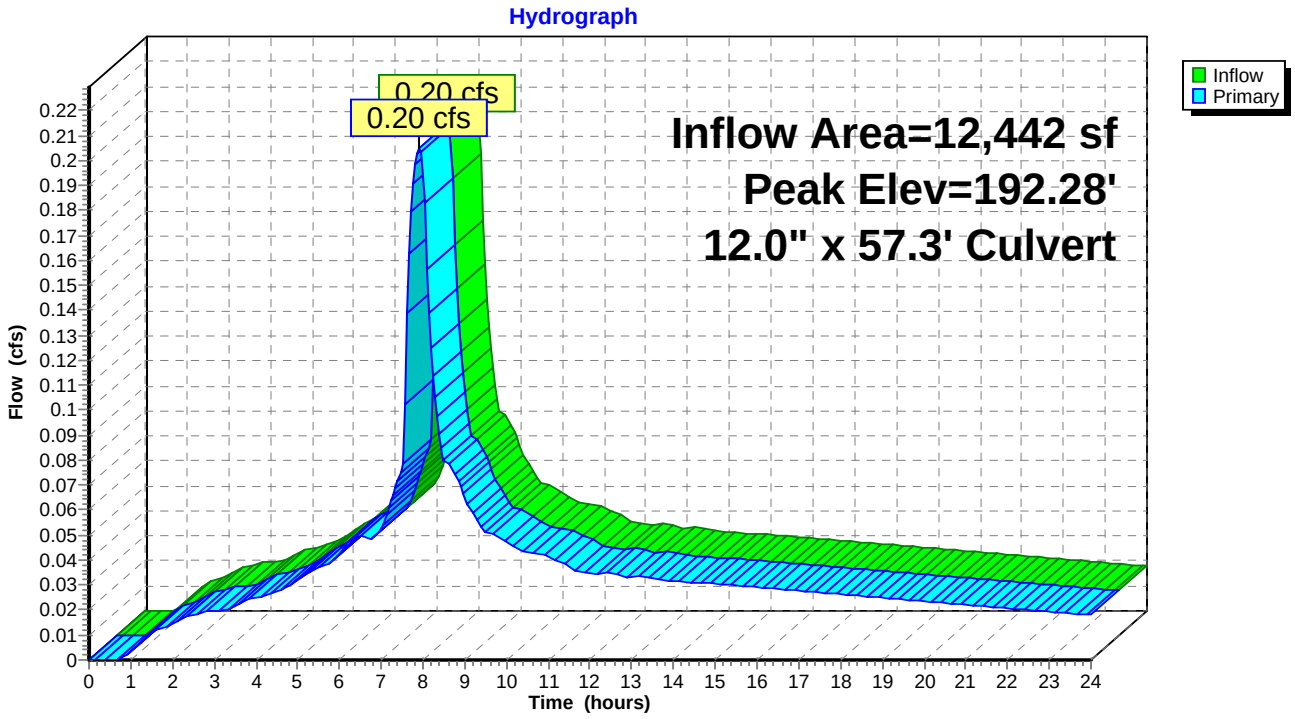
Inflow Area = 12,442 sf, 80.22% Impervious, Inflow Depth > 2.89" for 10-YR event
Inflow = 0.20 cfs @ 7.91 hrs, Volume= 2,998 cf
Outflow = 0.20 cfs @ 7.91 hrs, Volume= 2,998 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.20 cfs @ 7.91 hrs, Volume= 2,998 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 192.28' @ 7.91 hrs
Flood Elev= 197.51'

Device	Routing	Invert	Outlet Devices
#1	Primary	192.04'	**12.0" x 57.3' long Culvert** Ke= 0.500 Outlet Invert= 191.58' S= 0.0080 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.20 cfs @ 7.91 hrs HW=192.28' TW=190.68' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.20 cfs @ 2.18 fps)

Pond 19R: STM MH D1



Summary for Pond 20R: STM MH F1

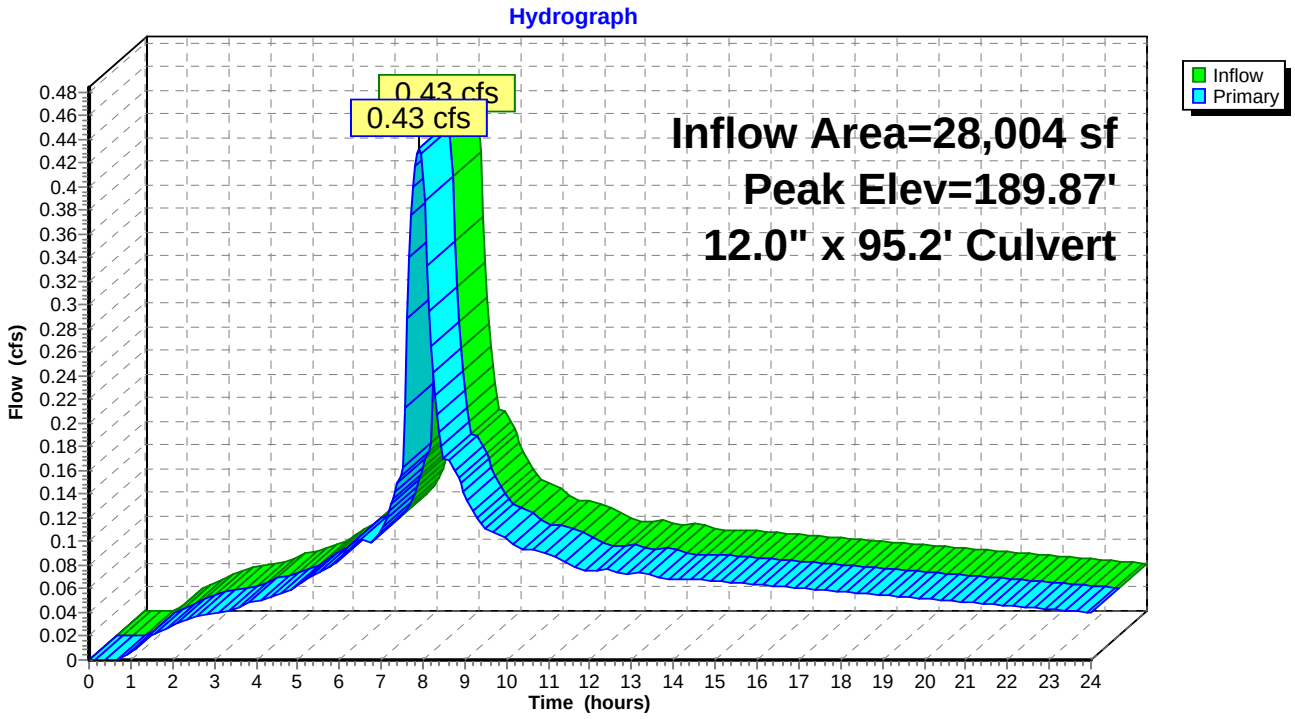
Inflow Area = 28,004 sf, 70.39% Impervious, Inflow Depth > 2.73" for 10-YR event
Inflow = 0.43 cfs @ 7.92 hrs, Volume= 6,375 cf
Outflow = 0.43 cfs @ 7.92 hrs, Volume= 6,375 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.43 cfs @ 7.92 hrs, Volume= 6,375 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.87' @ 7.99 hrs
Flood Elev= 193.76'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.31'	**12.0" x 95.2' long Culvert** Ke= 0.500 Outlet Invert= 188.93' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.43 cfs @ 7.92 hrs HW=189.84' TW=189.67' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.43 cfs @ 1.47 fps)

Pond 20R: STM MH F1



Summary for Pond 21R: STM MH F2

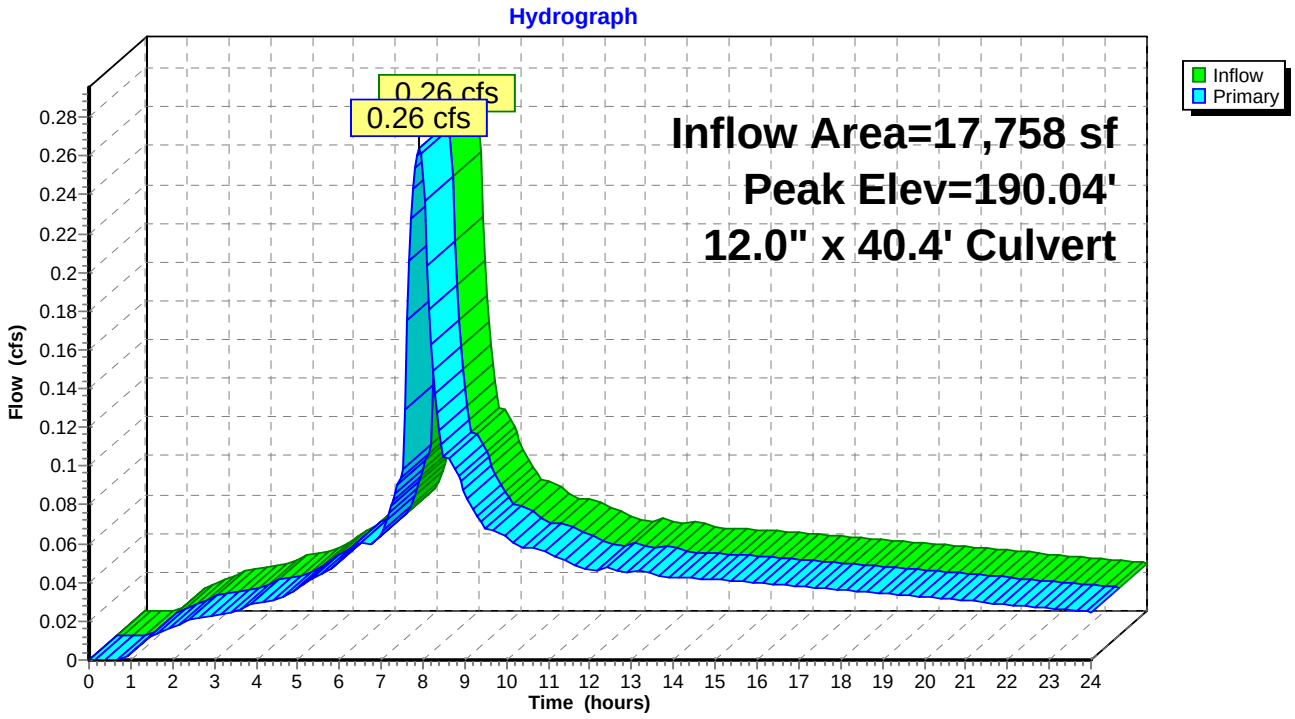
Inflow Area = 17,758 sf, 64.74% Impervious, Inflow Depth > 2.64" for 10-YR event
Inflow = 0.26 cfs @ 7.92 hrs, Volume= 3,907 cf
Outflow = 0.26 cfs @ 7.92 hrs, Volume= 3,907 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.26 cfs @ 7.92 hrs, Volume= 3,907 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.04' @ 7.98 hrs
Flood Elev= 193.33'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.71'	**12.0" x 40.4' long Culvert** Ke= 0.500 Outlet Invert= 189.51' S= 0.0050 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.25 cfs @ 7.92 hrs HW=190.04' TW=189.85' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.25 cfs @ 1.72 fps)

Pond 21R: STM MH F2



Summary for Pond 23R: STM MH E1

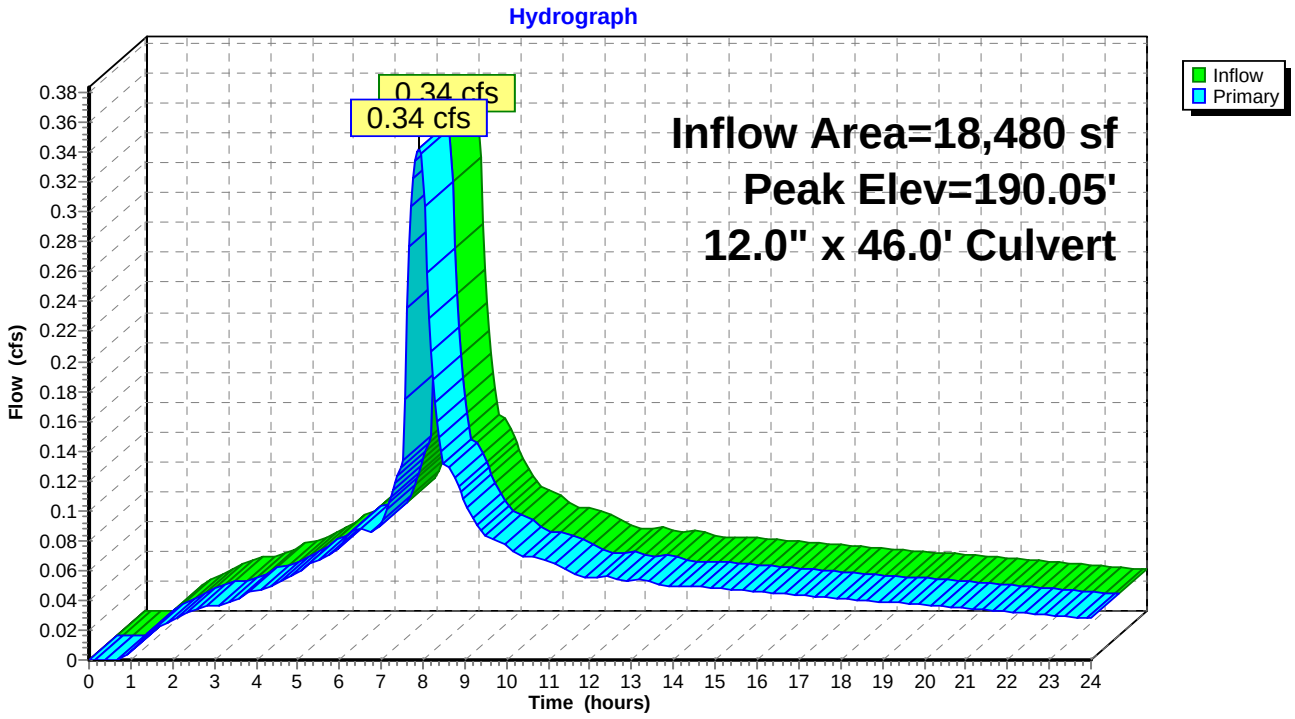
Inflow Area = 18,480 sf,100.00% Impervious, Inflow Depth > 3.21" for 10-YR event
Inflow = 0.34 cfs @ 7.90 hrs, Volume= 4,945 cf
Outflow = 0.34 cfs @ 7.90 hrs, Volume= 4,945 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.34 cfs @ 7.90 hrs, Volume= 4,945 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.05' @ 7.98 hrs
Flood Elev= 194.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.62'	**12.0" x 46.0' long Culvert** Ke= 0.500 Outlet Invert= 189.44' S= 0.0039 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.33 cfs @ 7.90 hrs HW=190.04' TW=189.90' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.33 cfs @ 1.56 fps)

Pond 23R: STM MH E1



Summary for Pond 24R: STM MH E2

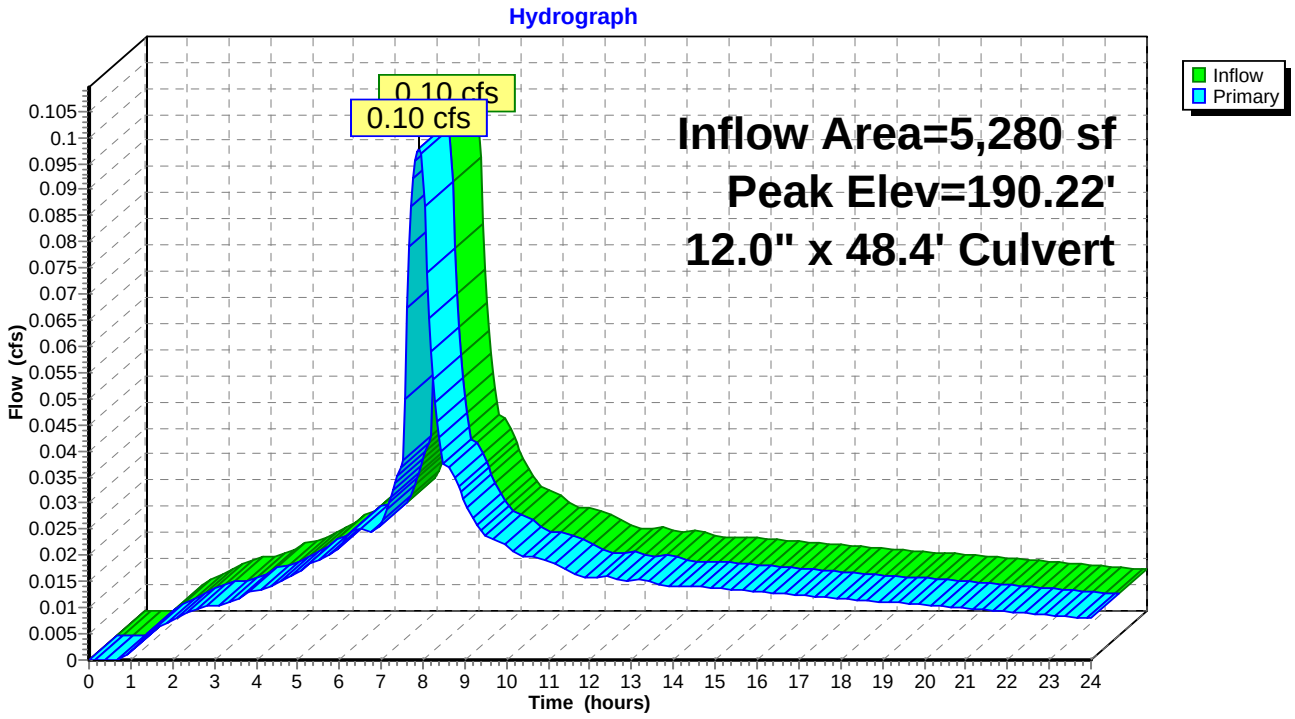
Inflow Area = 5,280 sf,100.00% Impervious, Inflow Depth > 3.21" for 10-YR event
Inflow = 0.10 cfs @ 7.90 hrs, Volume= 1,413 cf
Outflow = 0.10 cfs @ 7.90 hrs, Volume= 1,413 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.10 cfs @ 7.90 hrs, Volume= 1,413 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.22' @ 7.95 hrs
Flood Elev= 194.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	190.01'	**12.0" x 48.4' long Culvert** Ke= 0.500 Outlet Invert= 189.82' S= 0.0039 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.10 cfs @ 7.90 hrs HW=190.21' TW=190.04' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.10 cfs @ 1.27 fps)

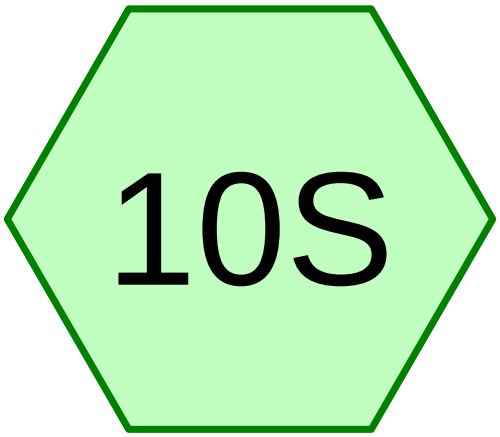
Pond 24R: STM MH E2



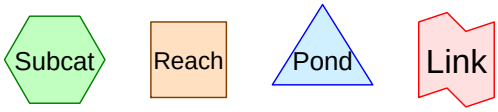
APPENDIX C

PRE-DEVELOPED, POST-DEVELOPED SITE AND DOWNSTREAM 25-YEAR YEAR STORM EVENT ANALYSIS

PRE-DEVELOPED SITE



Pre-Developed Onsite



Drainage Diagram for 3876 HERITAGE, PRE-DEVELOPED
Prepared by AKS Engineering & Forestry (PAS), Printed 9/29/2015
HydroCAD® 8.50 s/n 005096 © 2007 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
303,703	80	Pasture/grassland/range, Good, HSG D (10S)
13,855	84	50-75% Grass cover, Fair, HSG D (10S)
75,894	84	Wetland Area (10S)
1,986	98	Existing House & Outbuildings (10S)
1,085	98	Sidewalks & concrete pad areas (10S)
396,523		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points x 3
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10S: Pre-Developed Onsite Runoff Area=396,523 sf 0.77% Impervious Runoff Depth>2.01"
Flow Length=379' Tc=37.3 min CN=81/98 Runoff=2.77 cfs 66,431 cf

Total Runoff Area = 396,523 sf Runoff Volume = 66,431 cf Average Runoff Depth = 2.01"
99.23% Pervious = 393,452 sf 0.77% Impervious = 3,071 sf

Summary for Subcatchment 10S: Pre-Developed Onsite

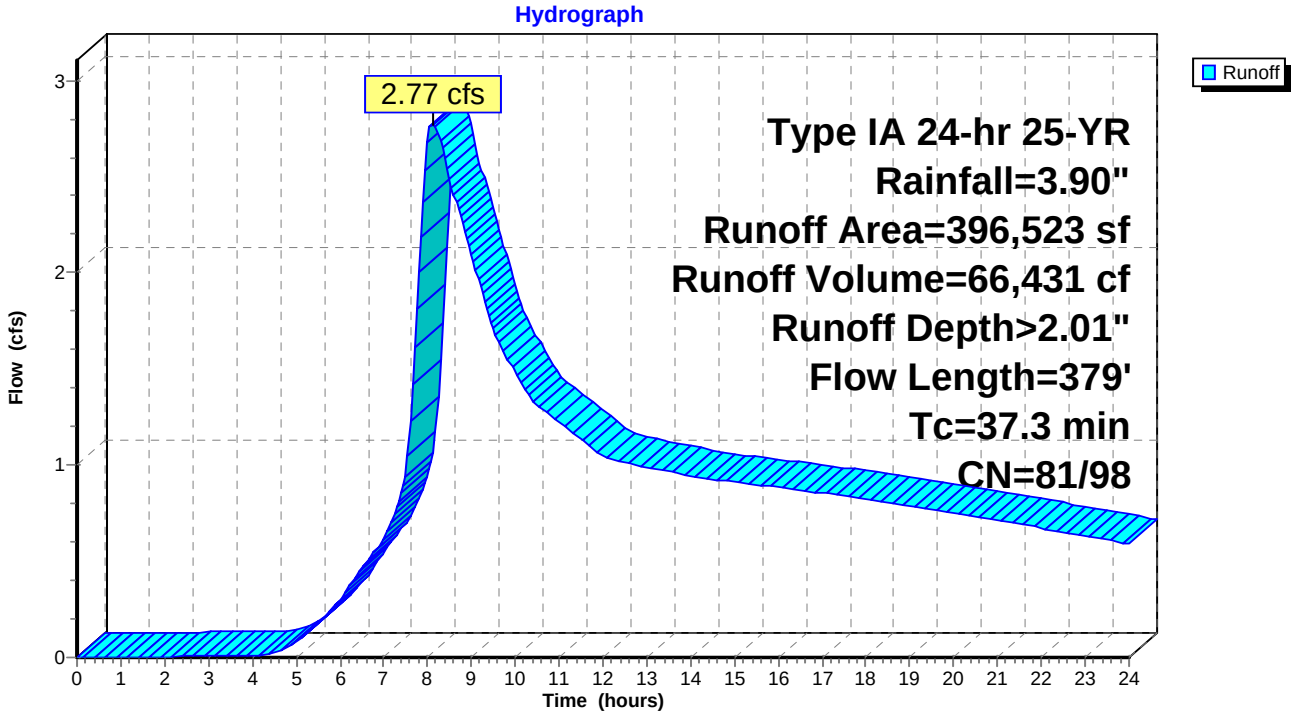
Runoff = 2.77 cfs @ 8.12 hrs, Volume= 66,431 cf, Depth> 2.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

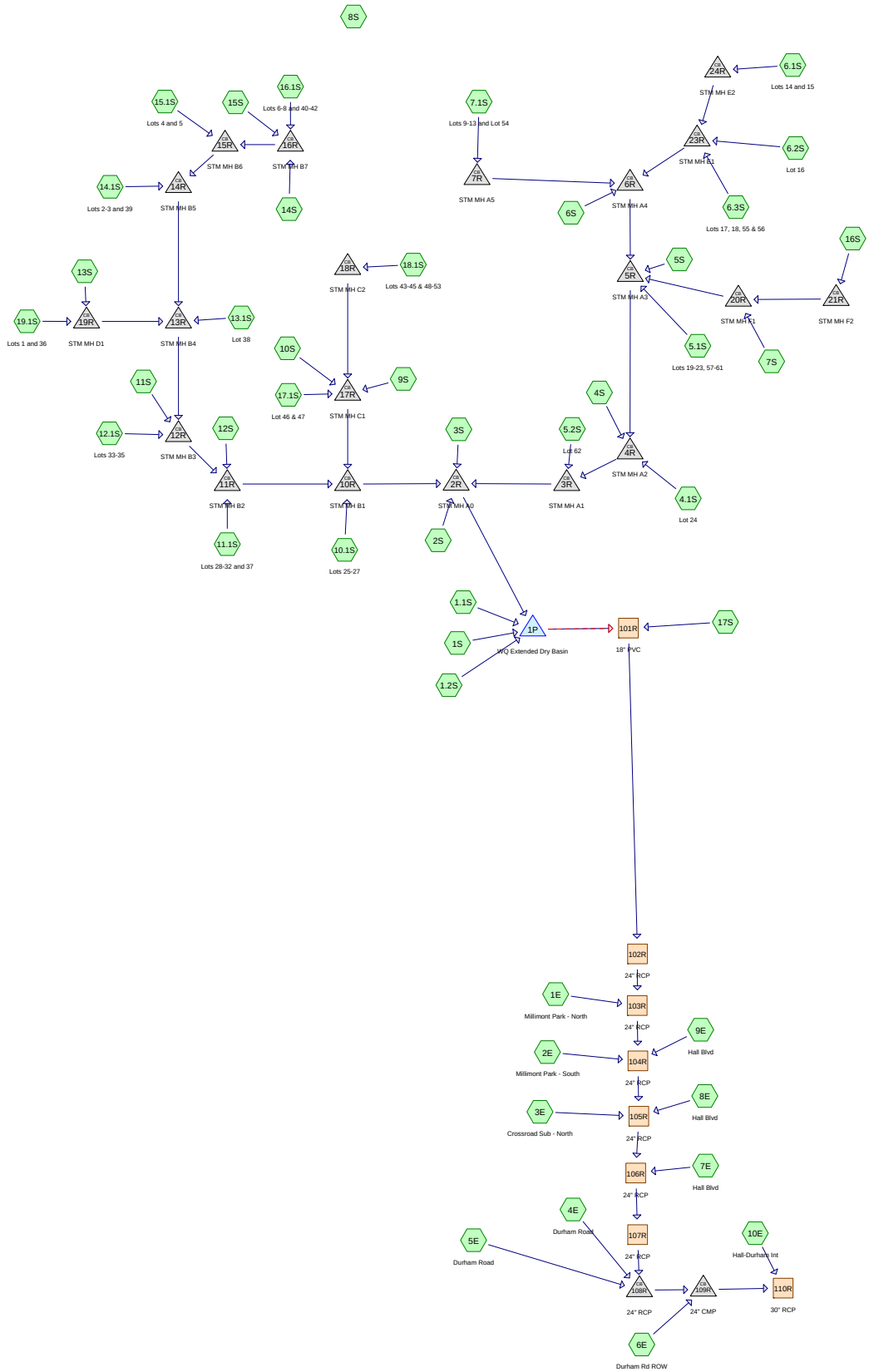
	Area (sf)	CN	Description
	303,703	80	Pasture/grassland/range, Good, HSG D
*	1,986	98	Existing House & Outbuildings
*	1,085	98	Sidewalks & concrete pad areas
	13,855	84	50-75% Grass cover, Fair, HSG D
*	75,894	84	Wetland Area
	396,523	81	Weighted Average
	393,452	81	Pervious Area
	3,071	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.2	300	0.0100	0.14		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.50"
2.1	79	0.0080	0.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
37.3	379	Total			

Subcatchment 10S: Pre-Developed Onsite



POST-DEVELOPED SITE



Subcat Reach Pond Link

Drainage Diagram for 3876 HERITAGE, POST-DEVELOPED, MIXED

Prepared by AKS Engineering & Forestry (PAS), Printed 9/29/2015

HydroCAD® 8.50 s/n 005096 © 2007 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
1,043,160	80	>75% Grass cover, Good, HSG D (1.1S,1.2S,1E,2E,2S,3E,3S,4E,4S,5E,5S,6E,6S,7S,8S,9S,1
5,280	98	1 Lot @ 2640 sf (6.2S,13.1S)
5,280	98	1 Lots @ 2640 sf (4.1S,5.2S)
2,640	98	1 lot @ 2640 sf (4E)
26,400	98	10 Lots @ 2640 sf (5.1S)
26,400	98	10 lots @ 2640 sf (1E)
361,680	98	137 lots @ 2640 sf (5E)
42,240	98	16 lots @ 2640 sf (3E)
21,120	98	2 Lots @ 2640 sf (6.1S,15.1S,17.1S,19.1S)
63,360	98	24 lots @ 2640 sf (2E)
23,760	98	3 Lots @ 2640 sf (10.1S,12.1S,14.1S)
10,560	98	4 Lots @ 2640 sf (6.3S)
47,520	98	6 Lots @ 2640 sf (7.1S,11.1S,16.1S)
23,760	98	9 Lots @ 2640 sf (18.1S)
47,692	98	Durham Rd, Paved roads w/curbs & sewers (6E)
1,458	98	Existing SW Hall Blvd Pavement (7S)
7,756	98	Existing SW Hall Blvd. Pavement (17S)
8,223	98	Existing SW Hall Boulevard (16S)
24,637	98	Hall Blvd, Paved roads w/curbs & sewers (7E,8E,9E)
283,531	98	Paved parking & roofs (5E)
116,274	98	Paved roads w/curbs & sewers (1E,2E,3E,4E,10E)
3,890	98	Pedestrian Access (16S,17S)
980	98	Pedestrian Path (1.2S)
16,967	98	Pond surface/WQ access (1S)
1,975	98	SW Hall Blvd Widening (17S)
1,848	98	SW Hall Widening (16S)
88,581	98	Street/Sidewalk/Etc. (2S,3S,4S,5S,6S,7S,8S,9S,10S,11S,12S,13S,14S,15S)
2,306,972		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points x 3
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1.1S: Runoff Area=37,143 sf 0.00% Impervious Runoff Depth>1.92"
Flow Length=300' Slope=0.0100 '/' Tc=35.2 min CN=80/0 Runoff=0.25 cfs 5,951 cf

Subcatchment 1.2S: Runoff Area=6,608 sf 14.83% Impervious Runoff Depth>2.21"
Tc=5.0 min CN=80/98 Runoff=0.08 cfs 1,215 cf

Subcatchment 1E: Millimont Park - North Runoff Area=81,952 sf 47.53% Impervious Runoff Depth>2.76"
Tc=5.0 min CN=80/98 Runoff=1.26 cfs 18,881 cf

Subcatchment 1S: Runoff Area=16,967 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.36 cfs 5,174 cf

Subcatchment 2E: Millimont Park - South Runoff Area=203,986 sf 52.30% Impervious Runoff Depth>2.85"
Tc=5.0 min CN=80/98 Runoff=3.25 cfs 48,378 cf

Subcatchment 2S: Runoff Area=18,351 sf 82.42% Impervious Runoff Depth>3.36"
Tc=5.0 min CN=80/98 Runoff=0.35 cfs 5,138 cf

Subcatchment 3E: Crossroad Sub - North Runoff Area=102,500 sf 58.62% Impervious Runoff Depth>2.95"
Tc=5.0 min CN=80/98 Runoff=1.70 cfs 25,230 cf

Subcatchment 3S: Runoff Area=4,978 sf 79.53% Impervious Runoff Depth>3.31"
Tc=5.0 min CN=80/98 Runoff=0.09 cfs 1,373 cf

Subcatchment 4.1S: Lot 24 Runoff Area=2,640 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.06 cfs 805 cf

Subcatchment 4E: Durham Road Runoff Area=71,696 sf 47.14% Impervious Runoff Depth>2.76"
Tc=5.0 min CN=80/98 Runoff=1.10 cfs 16,478 cf

Subcatchment 4S: Runoff Area=6,429 sf 75.28% Impervious Runoff Depth>3.24"
Tc=5.0 min CN=80/98 Runoff=0.12 cfs 1,735 cf

Subcatchment 5.1S: Lots 19-23, 57-61 Runoff Area=26,400 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.56 cfs 8,050 cf

Subcatchment 5.2S: Lot 62 Runoff Area=2,640 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.06 cfs 805 cf

Subcatchment 5E: Durham Road Runoff Area=1,321,206 sf 48.84% Impervious Runoff Depth>2.79"
Tc=5.0 min CN=80/98 Runoff=20.57 cfs 306,837 cf

Subcatchment 5S: Runoff Area=23,432 sf 38.90% Impervious Runoff Depth>2.62"
Tc=5.0 min CN=80/98 Runoff=0.34 cfs 5,111 cf

Subcatchment 6.1S: Lots 14 and 15 Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.11 cfs 1,610 cf

Subcatchment 6.2S: Lot 16 Runoff Area=2,640 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.06 cfs 805 cf

Subcatchment 6.3S: Lots 17, 18, 55 & 56 Runoff Area=10,560 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.22 cfs 3,220 cf

Subcatchment 6E: Durham Rd ROW Runoff Area=76,881 sf 62.03% Impervious Runoff Depth>3.01"
Tc=5.0 min CN=80/98 Runoff=1.30 cfs 19,297 cf

Subcatchment 6S: Runoff Area=5,622 sf 79.19% Impervious Runoff Depth>3.30"
Tc=5.0 min CN=80/98 Runoff=0.11 cfs 1,548 cf

Subcatchment 7.1S: Lots 9-13 and Lot 54 Runoff Area=15,840 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.33 cfs 4,830 cf

Subcatchment 7E: Hall Blvd Runoff Area=1,811 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.04 cfs 552 cf

Subcatchment 7S: Runoff Area=10,246 sf 80.17% Impervious Runoff Depth>3.32"
Tc=5.0 min CN=80/98 Runoff=0.19 cfs 2,836 cf

Subcatchment 8E: Hall Blvd Runoff Area=8,766 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.18 cfs 2,673 cf

Subcatchment 8S: Runoff Area=9,397 sf 53.77% Impervious Runoff Depth>2.87"
Tc=5.0 min CN=80/98 Runoff=0.15 cfs 2,248 cf

Subcatchment 9E: Hall Blvd Runoff Area=14,060 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.30 cfs 4,287 cf

Subcatchment 9S: Runoff Area=6,803 sf 72.79% Impervious Runoff Depth>3.20"
Tc=5.0 min CN=80/98 Runoff=0.12 cfs 1,811 cf

Subcatchment 10.1S: Lots 25-27 Runoff Area=7,920 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.17 cfs 2,415 cf

Subcatchment 10E: Hall-Durham Int Runoff Area=14,009 sf 81.33% Impervious Runoff Depth>3.34"
Tc=5.0 min CN=80/98 Runoff=0.27 cfs 3,900 cf

Subcatchment 10S: Runoff Area=10,606 sf 89.60% Impervious Runoff Depth>3.48"
Tc=5.0 min CN=80/98 Runoff=0.21 cfs 3,077 cf

Subcatchment 11.1S: Lots 28-32 and 37 Runoff Area=15,840 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.33 cfs 4,830 cf

Subcatchment 11S: Runoff Area=4,142 sf 52.51% Impervious Runoff Depth>2.85"
Tc=5.0 min CN=80/98 Runoff=0.07 cfs 984 cf

Subcatchment 12.1S: Lots 33-35 Runoff Area=7,920 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.17 cfs 2,415 cf

Subcatchment 12S: Runoff Area=3,982 sf 88.35% Impervious Runoff Depth>3.46"
Tc=5.0 min CN=80/98 Runoff=0.08 cfs 1,148 cf

Subcatchment 13.1S: Lot 38 Runoff Area=2,640 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.06 cfs 805 cf

Subcatchment 13S: Runoff Area=7,162 sf 65.64% Impervious Runoff Depth>3.07"
Tc=5.0 min CN=80/98 Runoff=0.12 cfs 1,834 cf

Subcatchment 14.1S: Lots 2-3 and 39 Runoff Area=7,920 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.17 cfs 2,415 cf

Subcatchment 14S: Runoff Area=12,555 sf 50.55% Impervious Runoff Depth>2.82"
Tc=5.0 min CN=80/98 Runoff=0.20 cfs 2,946 cf

Subcatchment 15.1S: Lots 4 and 5 Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.11 cfs 1,610 cf

Subcatchment 15S: Runoff Area=28,463 sf 28.41% Impervious Runoff Depth>2.44"
Tc=5.0 min CN=80/98 Runoff=0.38 cfs 5,784 cf

Subcatchment 16.1S: Lots 6-8 and 40-42 Runoff Area=15,840 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.33 cfs 4,830 cf

Subcatchment 16S: Runoff Area=17,758 sf 64.74% Impervious Runoff Depth>3.06"
Tc=5.0 min CN=80/98 Runoff=0.31 cfs 4,525 cf

Subcatchment 17.1S: Lot 46 & 47 Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.11 cfs 1,610 cf

Subcatchment 17S: Runoff Area=15,781 sf 77.28% Impervious Runoff Depth>3.27"
Tc=5.0 min CN=80/98 Runoff=0.29 cfs 4,303 cf

Subcatchment 18.1S: Lots 43-45 & 48-53 Runoff Area=23,760 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.50 cfs 7,245 cf

Subcatchment 19.1S: Lots 1 and 36 Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.11 cfs 1,610 cf

Reach 101R: 18" PVC Avg. Depth=0.71' Max Vel=3.46 fps Inflow=2.83 cfs 76,674 cf
D=18.0" n=0.013 L=33.7' S=0.0036 '/' Capacity=6.27 cfs Outflow=2.83 cfs 76,664 cf

Reach 102R: 24" RCP Avg. Depth=0.52' Max Vel=4.40 fps Inflow=2.83 cfs 76,664 cf
D=24.0" n=0.013 L=186.7' S=0.0073 '/' Capacity=19.38 cfs Outflow=2.83 cfs 76,619 cf

Reach 103R: 24" RCP Avg. Depth=0.55' Max Vel=4.76 fps Inflow=3.37 cfs 95,501 cf
D=24.0" n=0.013 L=266.0' S=0.0079 '/' Capacity=20.15 cfs Outflow=3.37 cfs 95,431 cf

Reach 104R: 24" RCP Avg. Depth=0.76' Max Vel=5.71 fps Inflow=6.24 cfs 148,096 cf
D=24.0" n=0.013 L=208.0' S=0.0082 '/' Capacity=20.45 cfs Outflow=6.23 cfs 148,027 cf

Reach 105R: 24" RCP Avg. Depth=0.90' Max Vel=5.87 fps Inflow=8.05 cfs 175,929 cf
D=24.0" n=0.013 L=37.0' S=0.0073 '/' Capacity=19.33 cfs Outflow=8.04 cfs 175,915 cf

Reach 106R: 24" RCP Avg. Depth=0.88' Max Vel=6.07 fps Inflow=8.08 cfs 176,468 cf
D=24.0" n=0.013 L=113.0' S=0.0080 '/' Capacity=20.19 cfs Outflow=8.07 cfs 176,426 cf

Reach 107R: 24" RCP Avg. Depth=0.88' Max Vel=6.07 fps Inflow=8.07 cfs 176,426 cf
D=24.0" n=0.013 L=275.0' S=0.0080 '/' Capacity=20.23 cfs Outflow=8.05 cfs 176,324 cf

Reach 110R: 30" RCP Avg. Depth=1.82' Max Vel=8.15 fps Inflow=31.21 cfs 522,836 cf
D=30.0" n=0.013 L=168.0' S=0.0075 '/' Capacity=35.52 cfs Outflow=31.17 cfs 522,705 cf

Pond 1P: WQ Extended Dry Basin Peak Elev=189.24' Storage=35,337 cf Inflow=6.78 cfs 102,103 cf
Outflow=2.72 cfs 72,372 cf

Pond 2R: STM MH A0 Peak Elev=189.51' Inflow=6.13 cfs 89,763 cf
18.0" x 64.1' Culvert Outflow=6.13 cfs 89,763 cf

Pond 3R: STM MH A1 Peak Elev=189.68' Inflow=2.45 cfs 35,881 cf
15.0" x 47.4' Culvert Outflow=2.45 cfs 35,881 cf

Pond 4R: STM MH A2 Peak Elev=189.77' Inflow=2.40 cfs 35,076 cf
15.0" x 41.0' Culvert Outflow=2.40 cfs 35,076 cf

Pond 5R: STM MH A3 Peak Elev=190.07' Inflow=2.22 cfs 32,536 cf
15.0" x 181.1' Culvert Outflow=2.22 cfs 32,536 cf

Pond 6R: STM MH A4 Peak Elev=190.18' Inflow=0.83 cfs 12,013 cf
12.0" x 93.5' Culvert Outflow=0.83 cfs 12,013 cf

Pond 7R: STM MH A5 Peak Elev=190.59' Inflow=0.33 cfs 4,830 cf
12.0" x 188.4' Culvert Outflow=0.33 cfs 4,830 cf

Pond 10R: STM MH B1 Peak Elev=190.04' Inflow=3.24 cfs 47,372 cf
15.0" x 153.1' Culvert Outflow=3.24 cfs 47,372 cf

Pond 11R: STM MH B2 Peak Elev=190.88' Inflow=2.12 cfs 31,212 cf
12.0" x 208.1' Culvert Outflow=2.12 cfs 31,212 cf

Pond 12R: STM MH B3 Peak Elev=191.08' Inflow=1.71 cfs 25,234 cf
12.0" x 30.8' Culvert Outflow=1.71 cfs 25,234 cf

Pond 13R: STM MH B4 Peak Elev=191.40' Inflow=1.48 cfs 21,835 cf
12.0" x 132.9' Culvert Outflow=1.48 cfs 21,835 cf

Pond 14R: STM MH B5 Peak Elev=191.59' Inflow=1.19 cfs 17,586 cf
12.0" x 127.7' Culvert Outflow=1.19 cfs 17,586 cf

Pond 15R: STM MH B6 Peak Elev=191.74' Inflow=1.02 cfs 15,171 cf
12.0" x 30.6' Culvert Outflow=1.02 cfs 15,171 cf

Pond 16R: STM MH B7 Peak Elev=192.05' Inflow=0.91 cfs 13,561 cf
12.0" x 69.6' Culvert Outflow=0.91 cfs 13,561 cf

Pond 17R: STM MH C1 Peak Elev=190.04' Inflow=0.95 cfs 13,744 cf
12.0" x 46.1' Culvert Outflow=0.95 cfs 13,744 cf

Pond 18R: STM MH C2
Peak Elev=190.10' Inflow=0.50 cfs 7,245 cf
12.0" x 170.7' Culvert Outflow=0.50 cfs 7,245 cf

Pond 19R: STM MH D1
Peak Elev=192.29' Inflow=0.24 cfs 3,444 cf
12.0" x 57.3' Culvert Outflow=0.24 cfs 3,444 cf

Pond 20R: STM MH F1
Peak Elev=190.13' Inflow=0.50 cfs 7,361 cf
12.0" x 95.2' Culvert Outflow=0.50 cfs 7,361 cf

Pond 21R: STM MH F2
Peak Elev=190.17' Inflow=0.31 cfs 4,525 cf
12.0" x 40.4' Culvert Outflow=0.31 cfs 4,525 cf

Pond 23R: STM MH E1
Peak Elev=190.21' Inflow=0.39 cfs 5,635 cf
12.0" x 46.0' Culvert Outflow=0.39 cfs 5,635 cf

Pond 24R: STM MH E2
Peak Elev=190.28' Inflow=0.11 cfs 1,610 cf
12.0" x 48.4' Culvert Outflow=0.11 cfs 1,610 cf

Pond 108R: 24" RCP
Peak Elev=184.96' Inflow=29.64 cfs 499,639 cf
24.0" x 40.0' Culvert Outflow=29.64 cfs 499,639 cf

Pond 109R: 24" CMP
Peak Elev=181.12' Inflow=30.94 cfs 518,936 cf
24.0" x 30.0' Culvert Outflow=30.94 cfs 518,936 cf

Total Runoff Area = 2,306,972 sf Runoff Volume = 555,167 cf Average Runoff Depth = 2.89"
45.22% Pervious = 1,043,160 sf 54.78% Impervious = 1,263,812 sf

Summary for Subcatchment 1.1S:

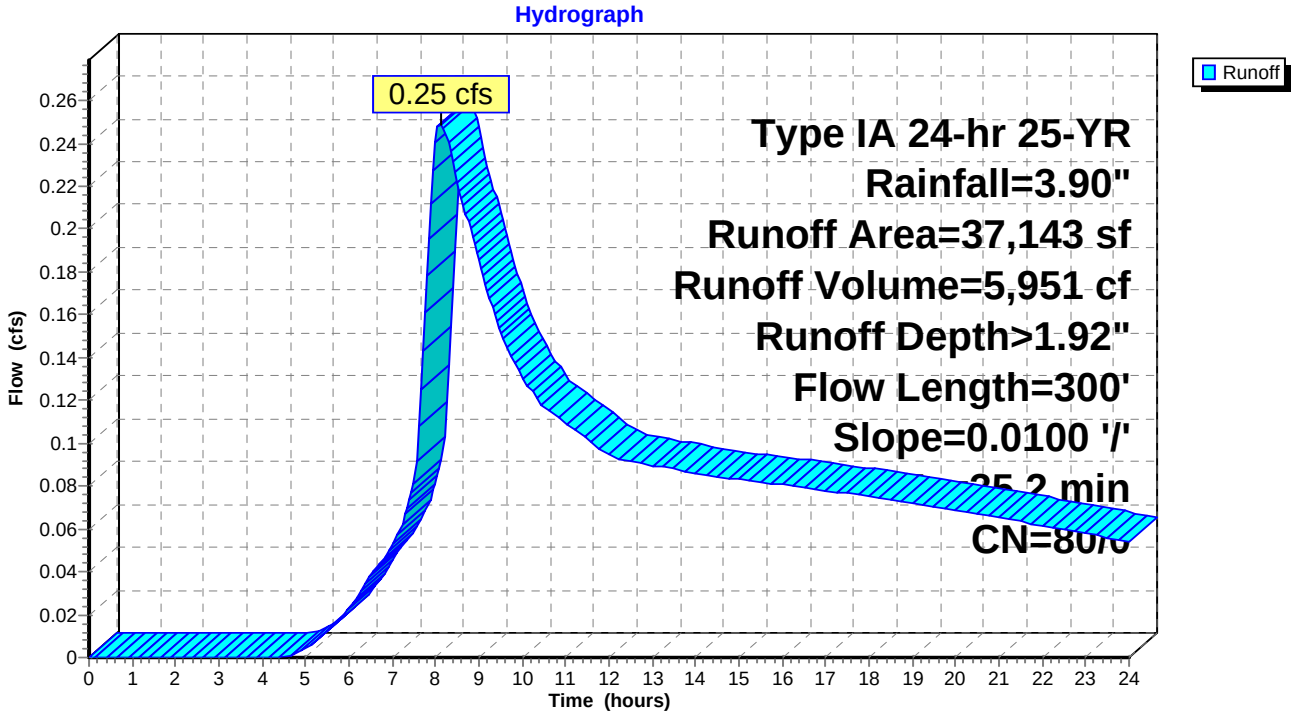
Runoff = 0.25 cfs @ 8.11 hrs, Volume= 5,951 cf, Depth> 1.92"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

Area (sf)	CN	Description
37,143	80	>75% Grass cover, Good, HSG D
37,143	80	Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.2	300	0.0100	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.50"

Subcatchment 1.1S:



Summary for Subcatchment 1.2S:

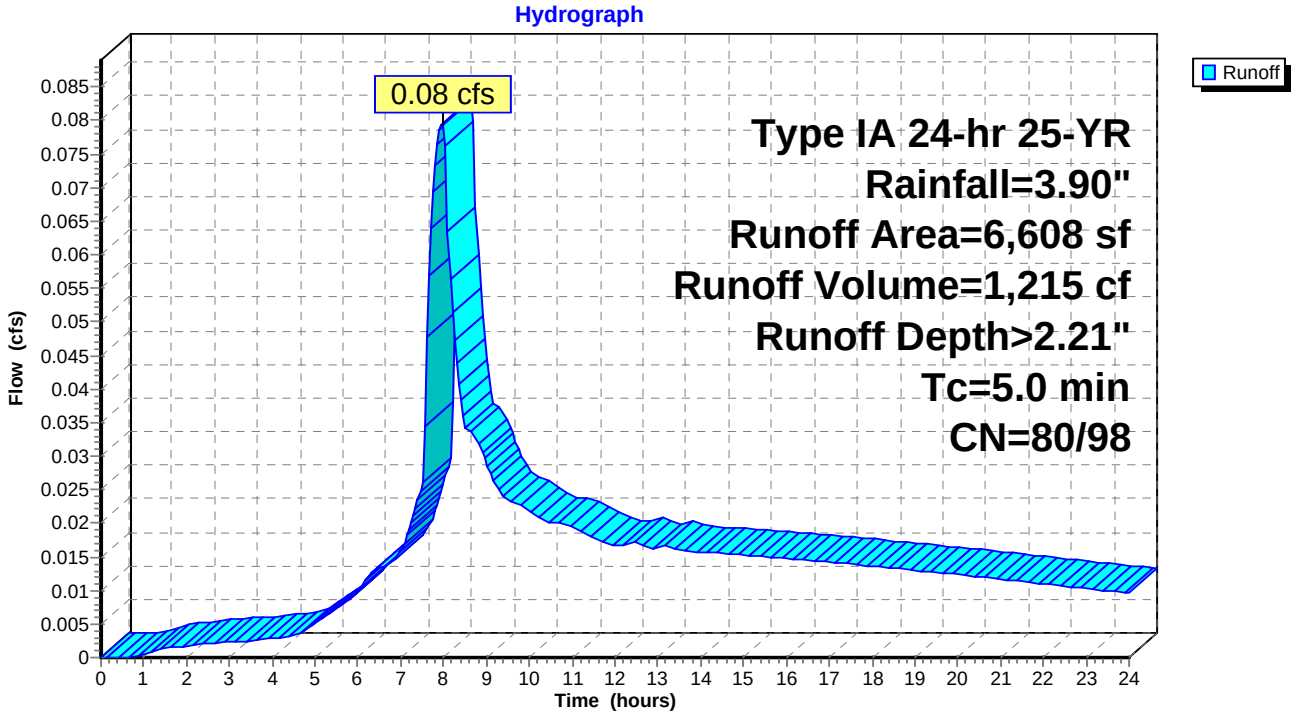
Runoff = 0.08 cfs @ 7.97 hrs, Volume= 1,215 cf, Depth> 2.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	980	98	Pedestrian Path
	5,628	80	>75% Grass cover, Good, HSG D
	6,608	83	Weighted Average
	5,628	80	Pervious Area
	980	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1.2S:



Summary for Subcatchment 1E: Millimont Park - North

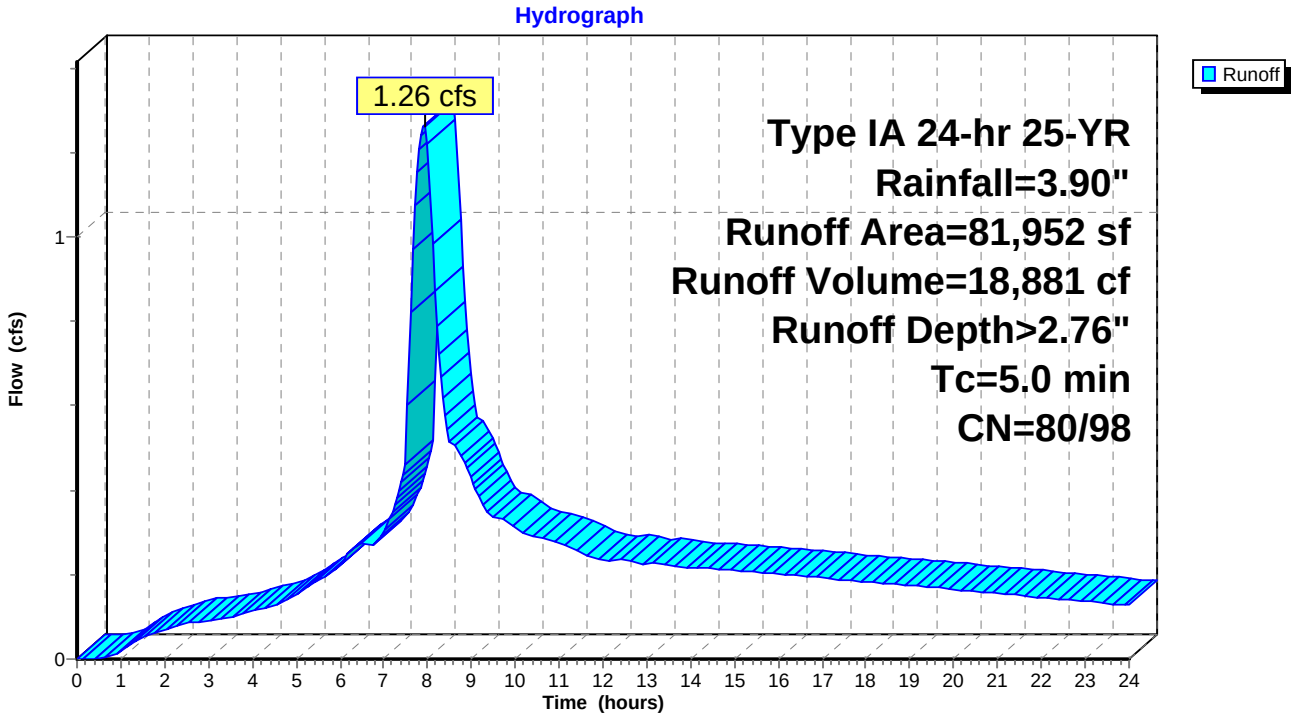
Runoff = 1.26 cfs @ 7.93 hrs, Volume= 18,881 cf, Depth> 2.76"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
	12,555	98	Paved roads w/curbs & sewers
*	26,400	98	10 lots @ 2640 sf
	42,997	80	>75% Grass cover, Good, HSG D
	81,952	89	Weighted Average
	42,997	80	Pervious Area
	38,955	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1E: Millimont Park - North



Summary for Subcatchment 1S:

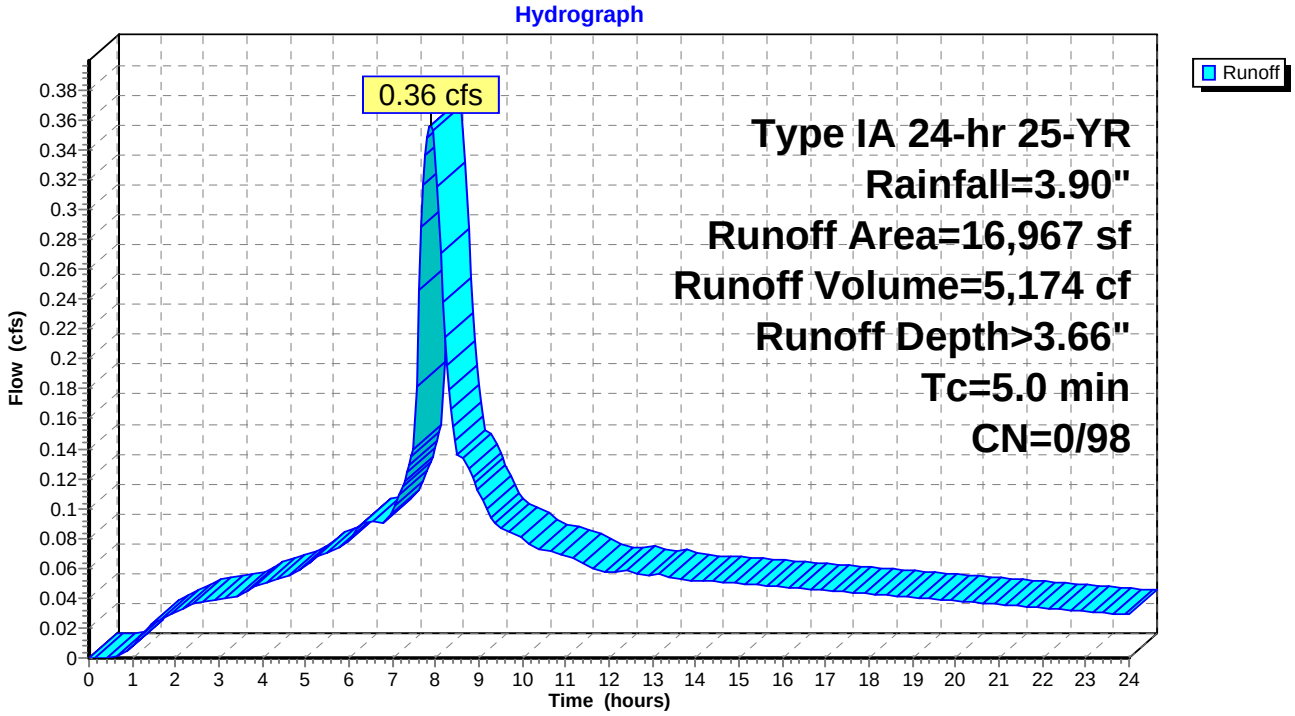
Runoff = 0.36 cfs @ 7.90 hrs, Volume= 5,174 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	16,967	98	Pond surface/WQ access
	16,967	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S:



Summary for Subcatchment 2E: Millimont Park - South

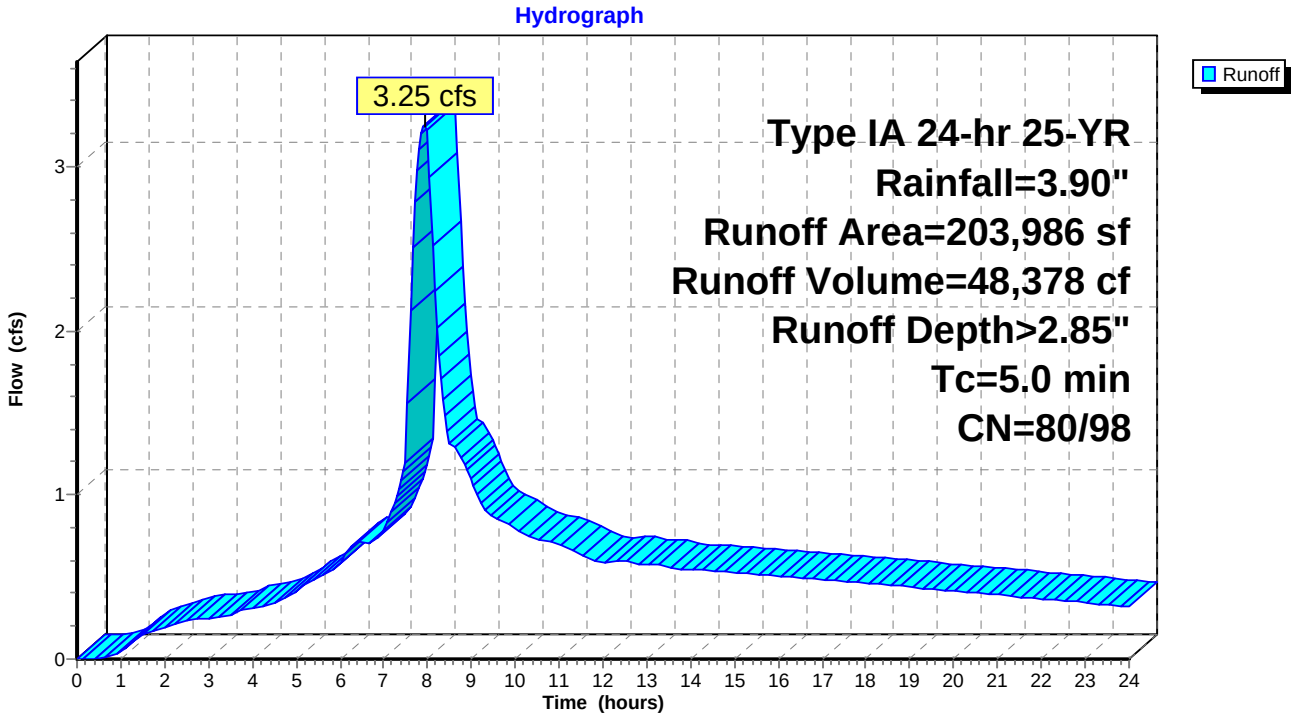
Runoff = 3.25 cfs @ 7.93 hrs, Volume= 48,378 cf, Depth> 2.85"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
	43,323	98	Paved roads w/curbs & sewers
*	63,360	98	24 lots @ 2640 sf
	97,303	80	>75% Grass cover, Good, HSG D
	203,986	89	Weighted Average
	97,303	80	Pervious Area
	106,683	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2E: Millimont Park - South



Summary for Subcatchment 2S:

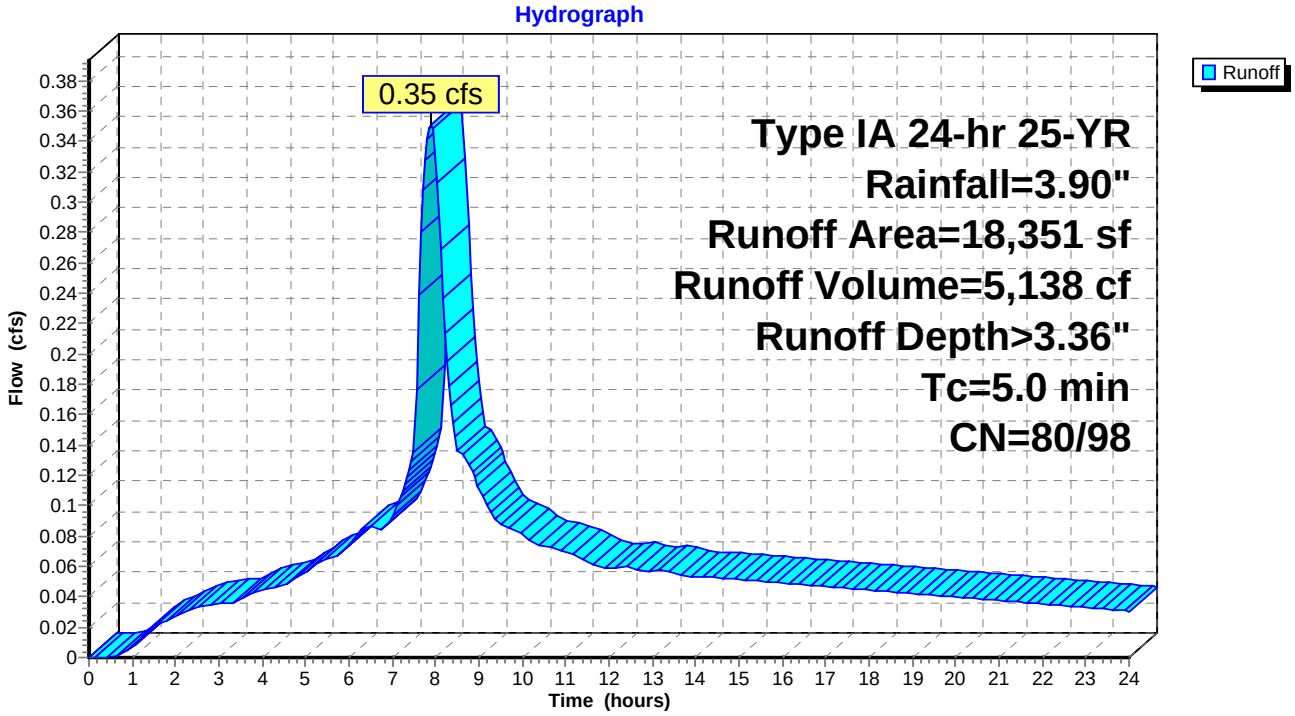
Runoff = 0.35 cfs @ 7.91 hrs, Volume= 5,138 cf, Depth> 3.36"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	15,125	98	Street/Sidewalk/Etc.
	3,226	80	>75% Grass cover, Good, HSG D
	18,351	95	Weighted Average
	3,226	80	Pervious Area
	15,125	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2S:



Summary for Subcatchment 3E: Crossroad Sub - North

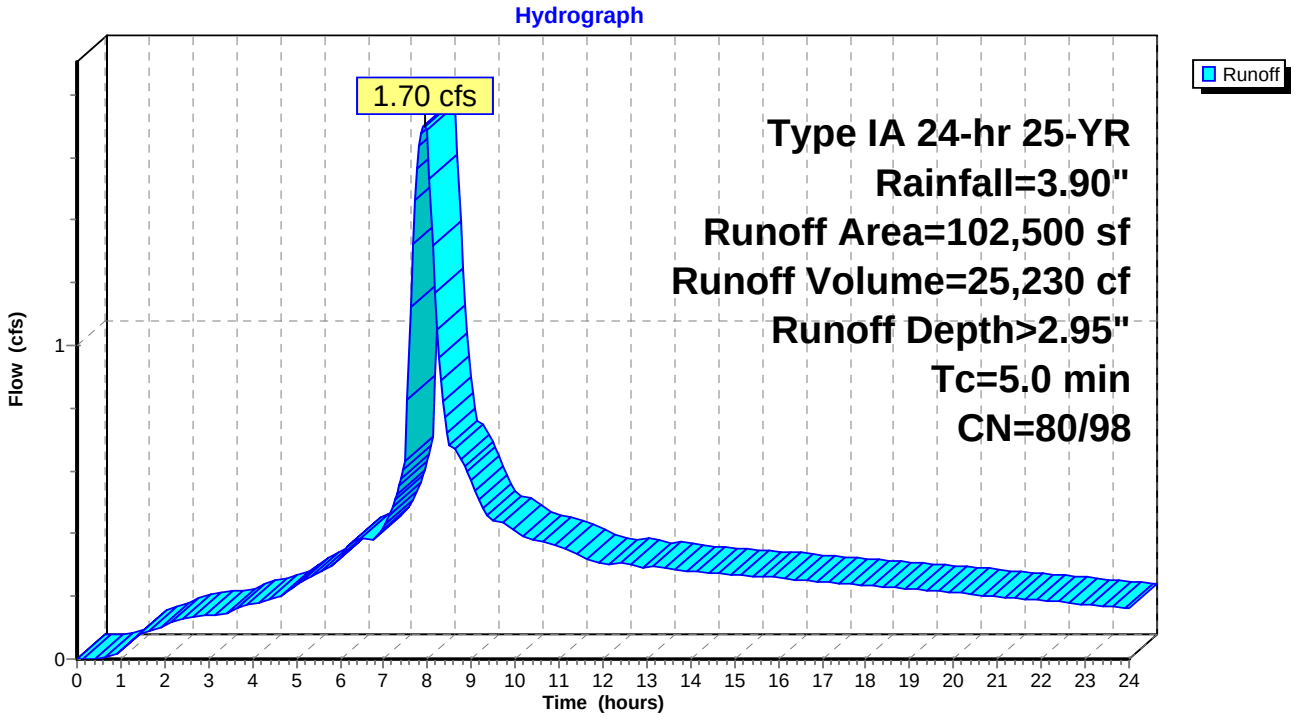
Runoff = 1.70 cfs @ 7.92 hrs, Volume= 25,230 cf, Depth> 2.95"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
	17,845	98	Paved roads w/curbs & sewers
*	42,240	98	16 lots @ 2640 sf
	42,415	80	>75% Grass cover, Good, HSG D
	102,500	91	Weighted Average
	42,415	80	Pervious Area
	60,085	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3E: Crossroad Sub - North



Summary for Subcatchment 3S:

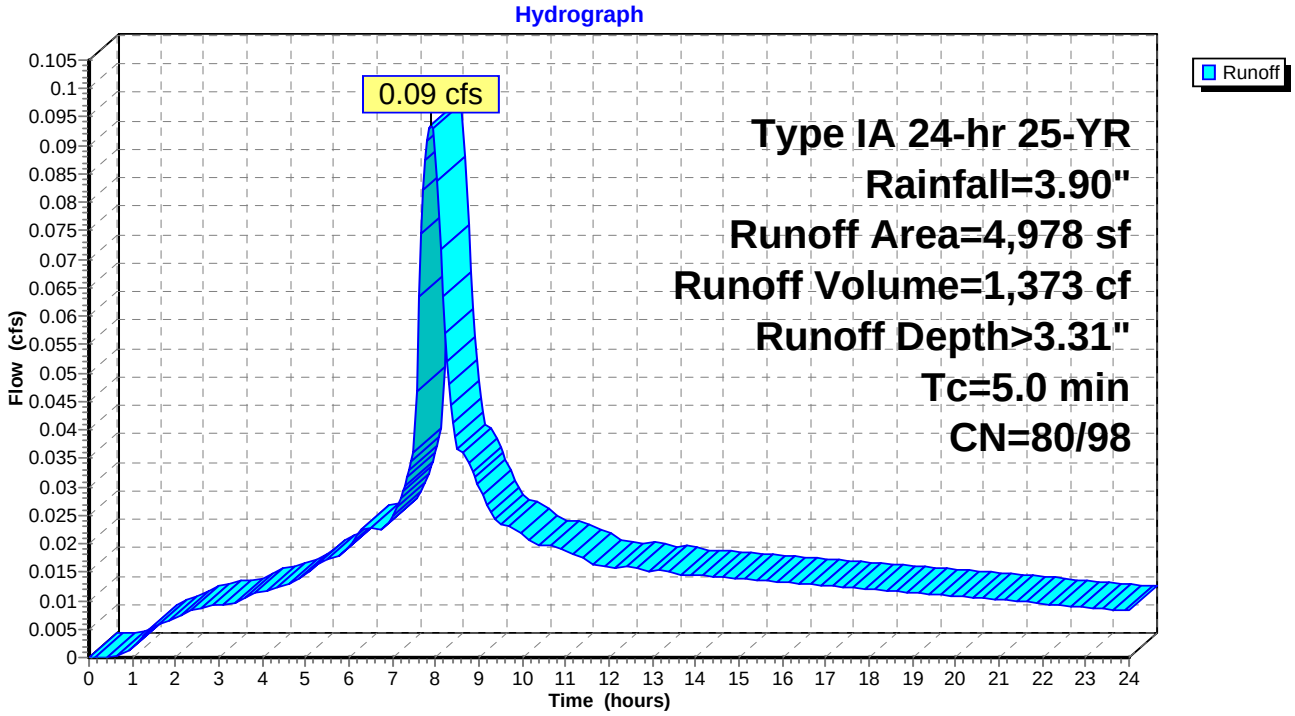
Runoff = 0.09 cfs @ 7.91 hrs, Volume= 1,373 cf, Depth> 3.31"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	3,959	98	Street/Sidewalk/Etc.
	1,019	80	>75% Grass cover, Good, HSG D
	4,978	94	Weighted Average
	1,019	80	Pervious Area
	3,959	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S:



Summary for Subcatchment 4.1S: Lot 24

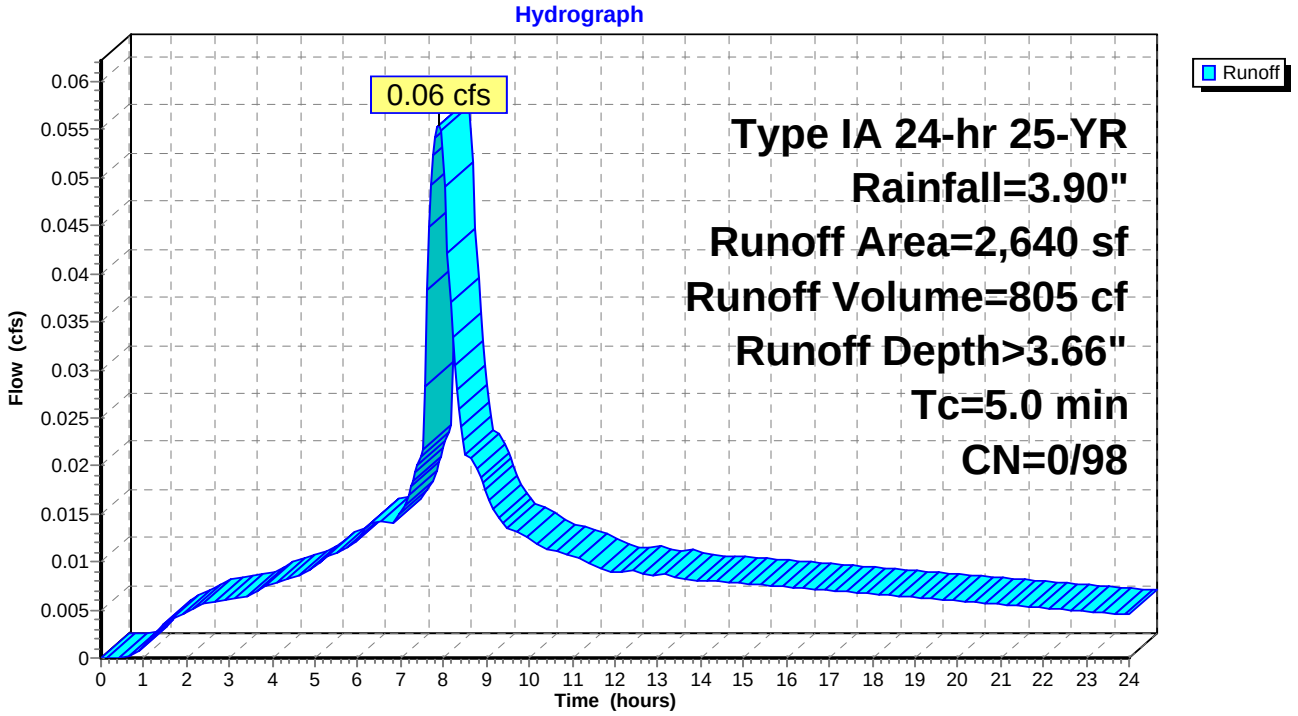
Runoff = 0.06 cfs @ 7.90 hrs, Volume= 805 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	2,640	98	1 Lots @ 2640 sf
	2,640	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4.1S: Lot 24



Summary for Subcatchment 4E: Durham Road

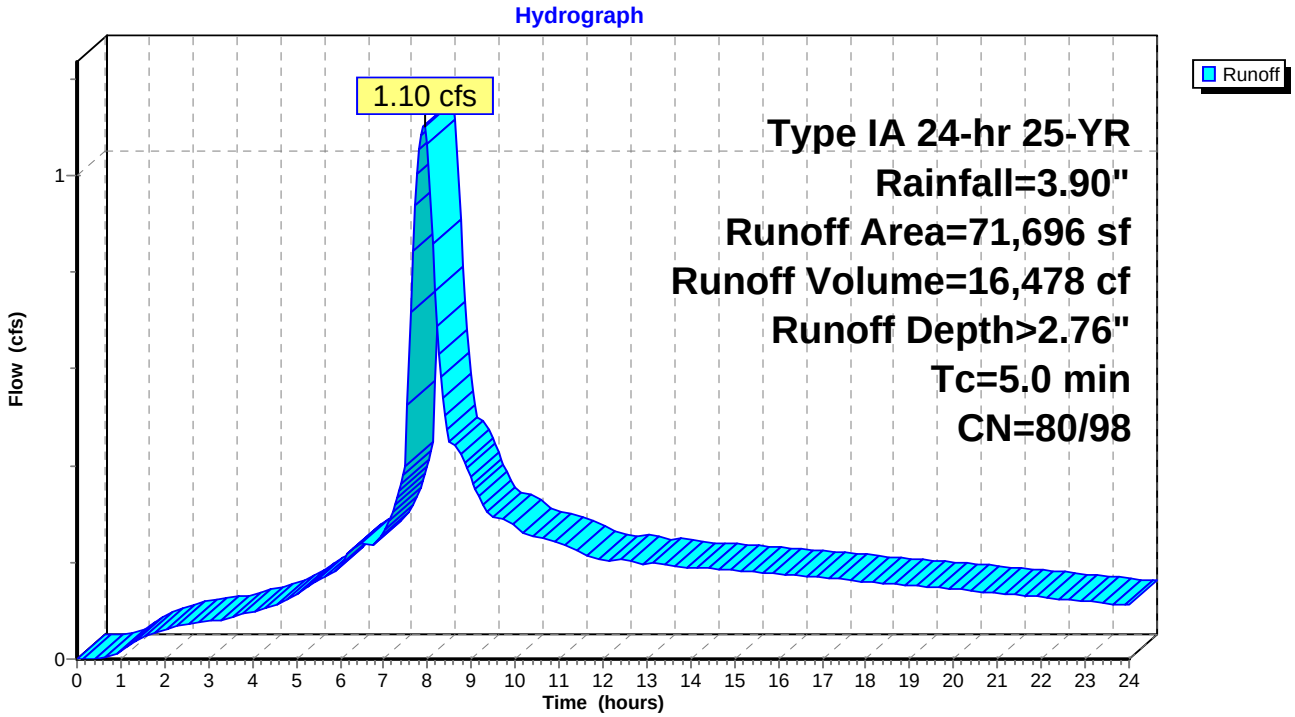
Runoff = 1.10 cfs @ 7.93 hrs, Volume= 16,478 cf, Depth> 2.76"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
	31,157	98	Paved roads w/curbs & sewers
*	2,640	98	1 lot @ 2640 sf
	37,899	80	>75% Grass cover, Good, HSG D
	71,696	88	Weighted Average
	37,899	80	Pervious Area
	33,797	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4E: Durham Road



Summary for Subcatchment 4S:

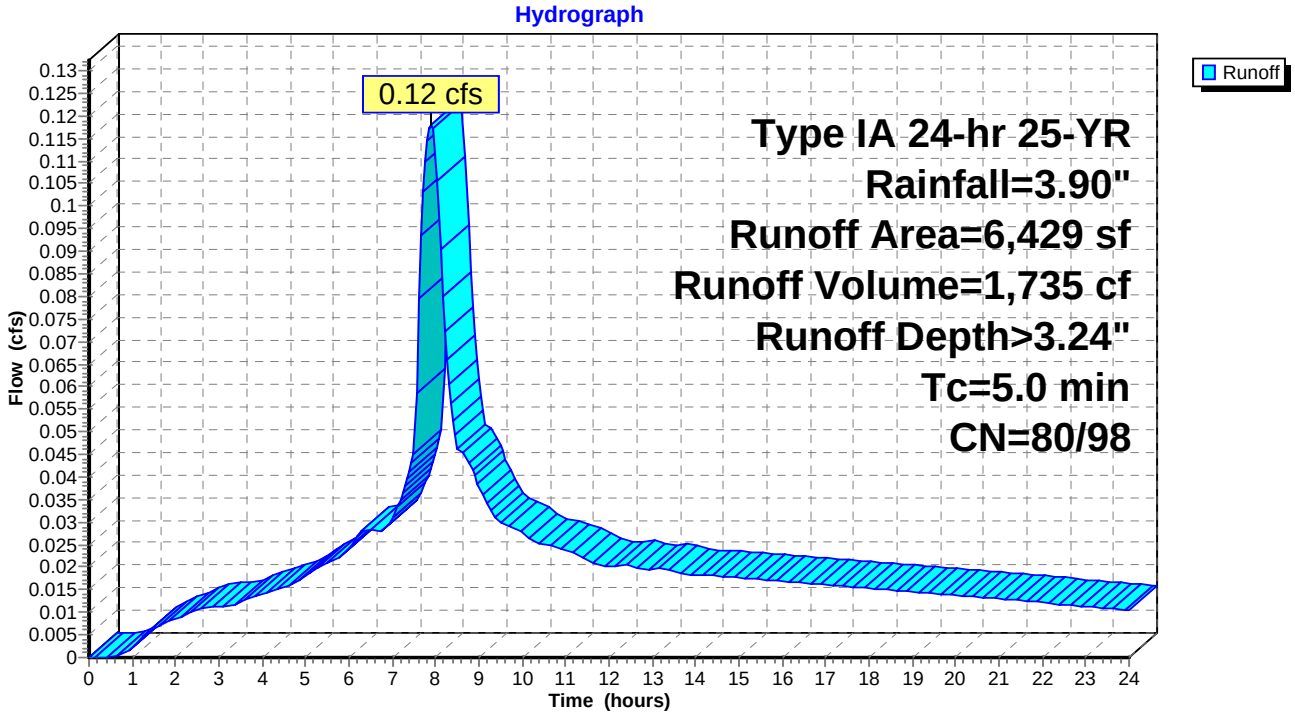
Runoff = 0.12 cfs @ 7.91 hrs, Volume= 1,735 cf, Depth> 3.24"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	4,840	98	Street/Sidewalk/Etc.
	1,589	80	>75% Grass cover, Good, HSG D
	6,429	94	Weighted Average
	1,589	80	Pervious Area
	4,840	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4S:



Summary for Subcatchment 5.1S: Lots 19-23, 57-61

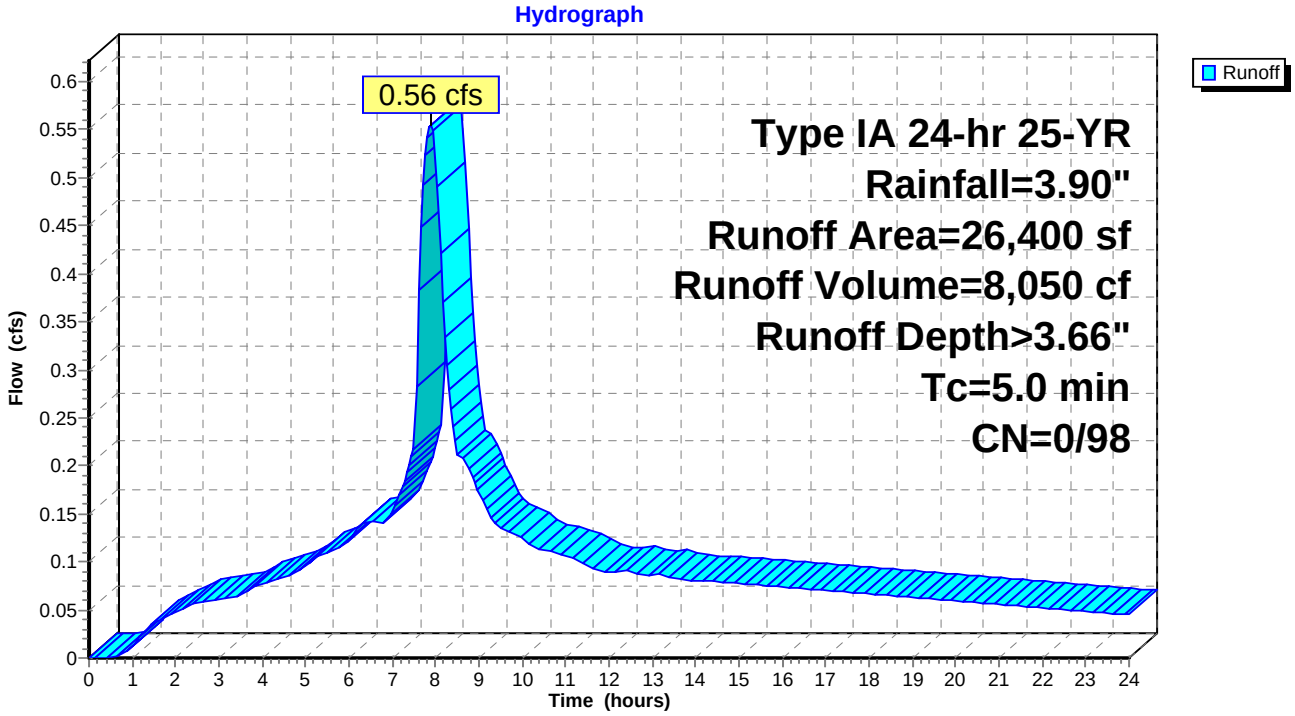
Runoff = 0.56 cfs @ 7.90 hrs, Volume= 8,050 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	26,400	98	10 Lots @ 2640 sf
	26,400	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5.1S: Lots 19-23, 57-61



Summary for Subcatchment 5.2S: Lot 62

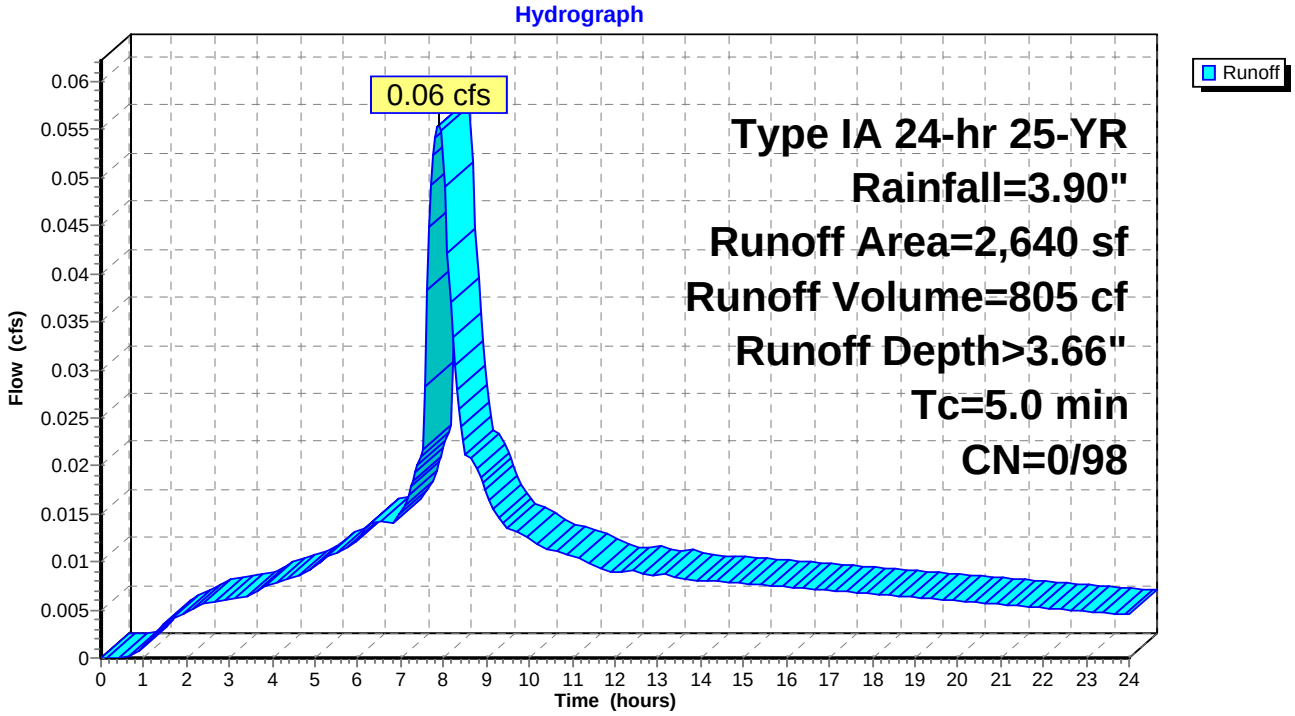
Runoff = 0.06 cfs @ 7.90 hrs, Volume= 805 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	2,640	98	1 Lots @ 2640 sf
	2,640	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5.2S: Lot 62



Summary for Subcatchment 5E: Durham Road

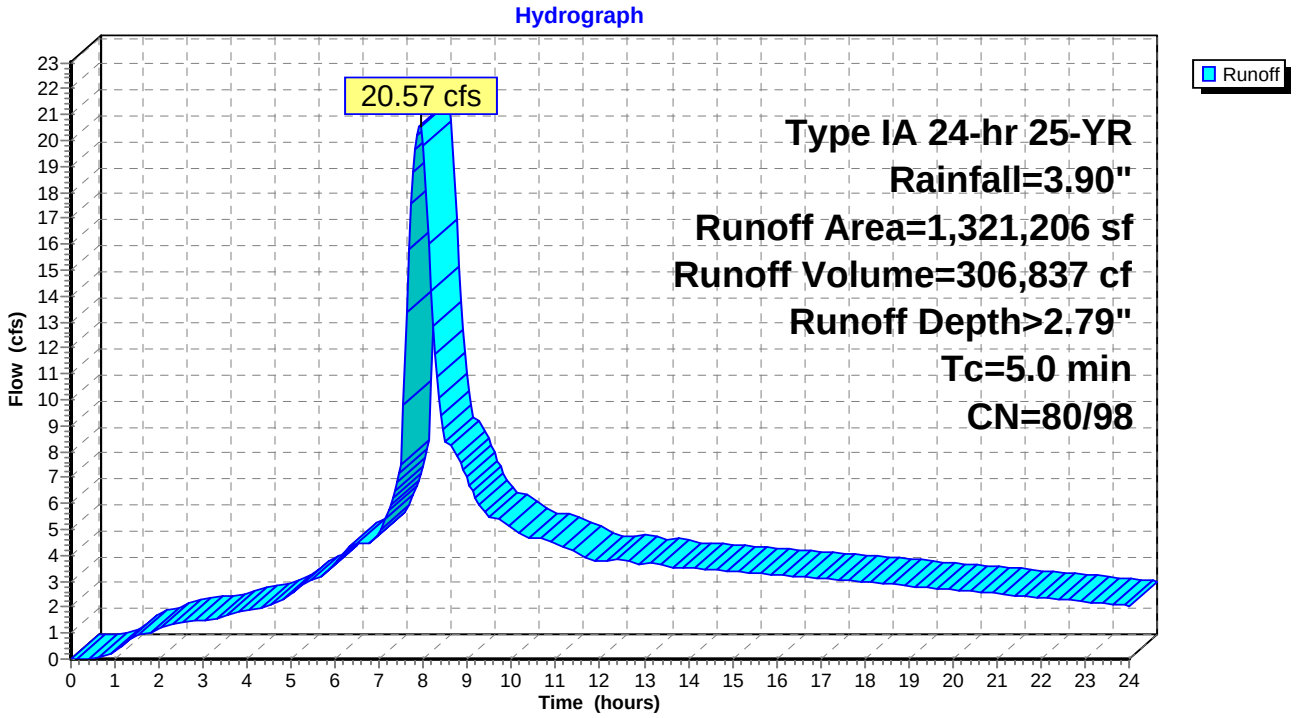
Runoff = 20.57 cfs @ 7.93 hrs, Volume= 306,837 cf, Depth> 2.79"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
	283,531	98	Paved parking & roofs
*	361,680	98	137 lots @ 2640 sf
	675,995	80	>75% Grass cover, Good, HSG D
	1,321,206	89	Weighted Average
	675,995	80	Pervious Area
	645,211	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5E: Durham Road



Summary for Subcatchment 5S:

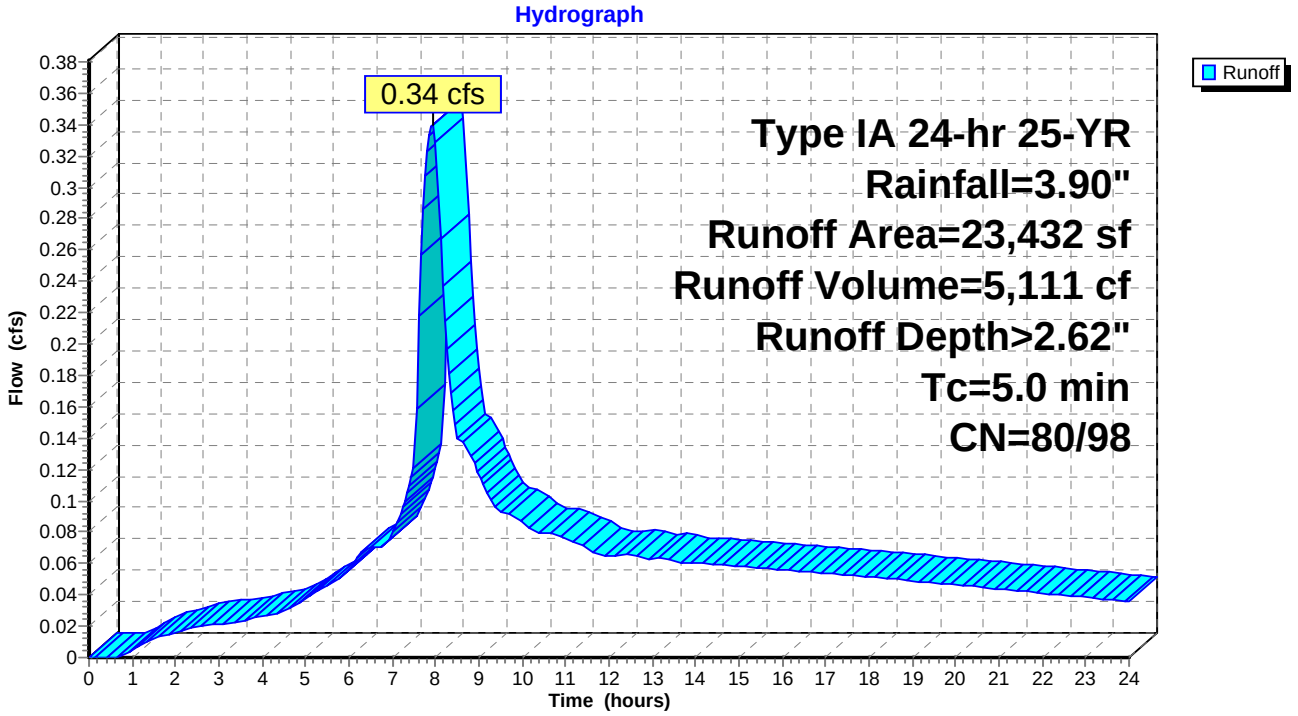
Runoff = 0.34 cfs @ 7.94 hrs, Volume= 5,111 cf, Depth> 2.62"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	9,115	98	Street/Sidewalk/Etc.
	14,317	80	>75% Grass cover, Good, HSG D
	23,432	87	Weighted Average
	14,317	80	Pervious Area
	9,115	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5S:



Summary for Subcatchment 6.1S: Lots 14 and 15

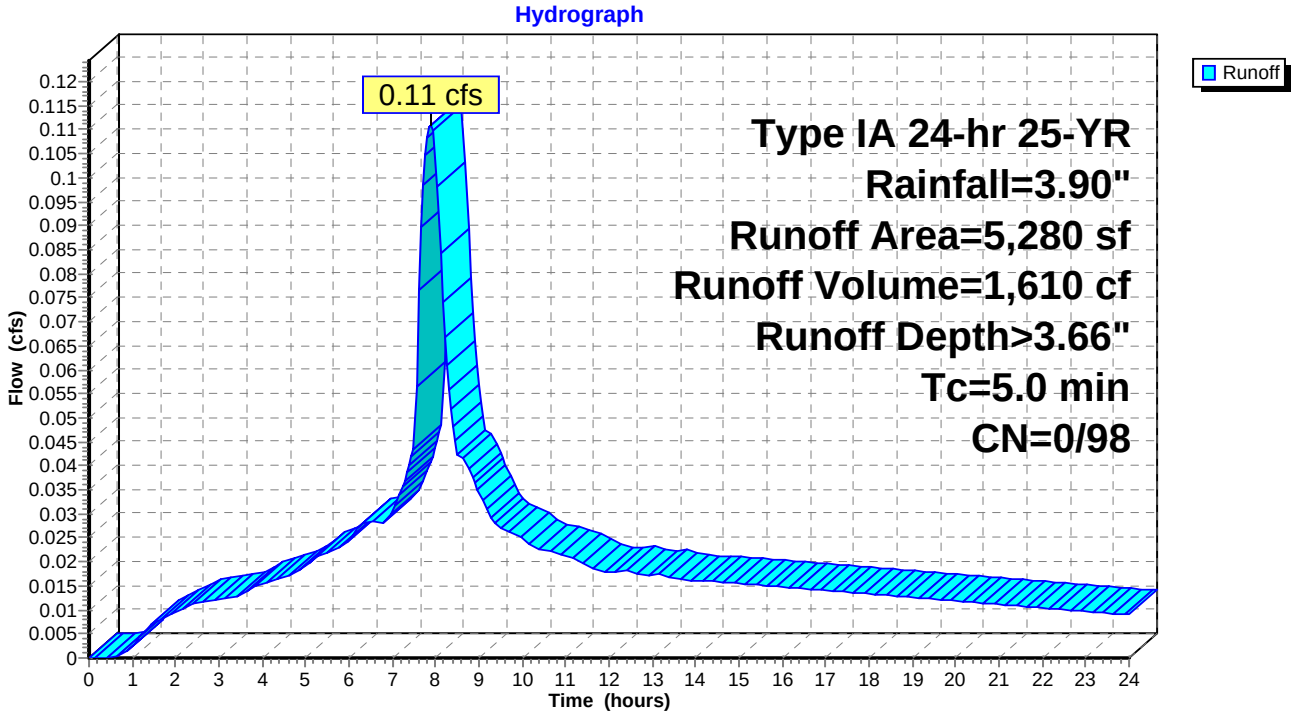
Runoff = 0.11 cfs @ 7.90 hrs, Volume= 1,610 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	5,280	98	2 Lots @ 2640 sf
	5,280	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6.1S: Lots 14 and 15



Summary for Subcatchment 6.2S: Lot 16

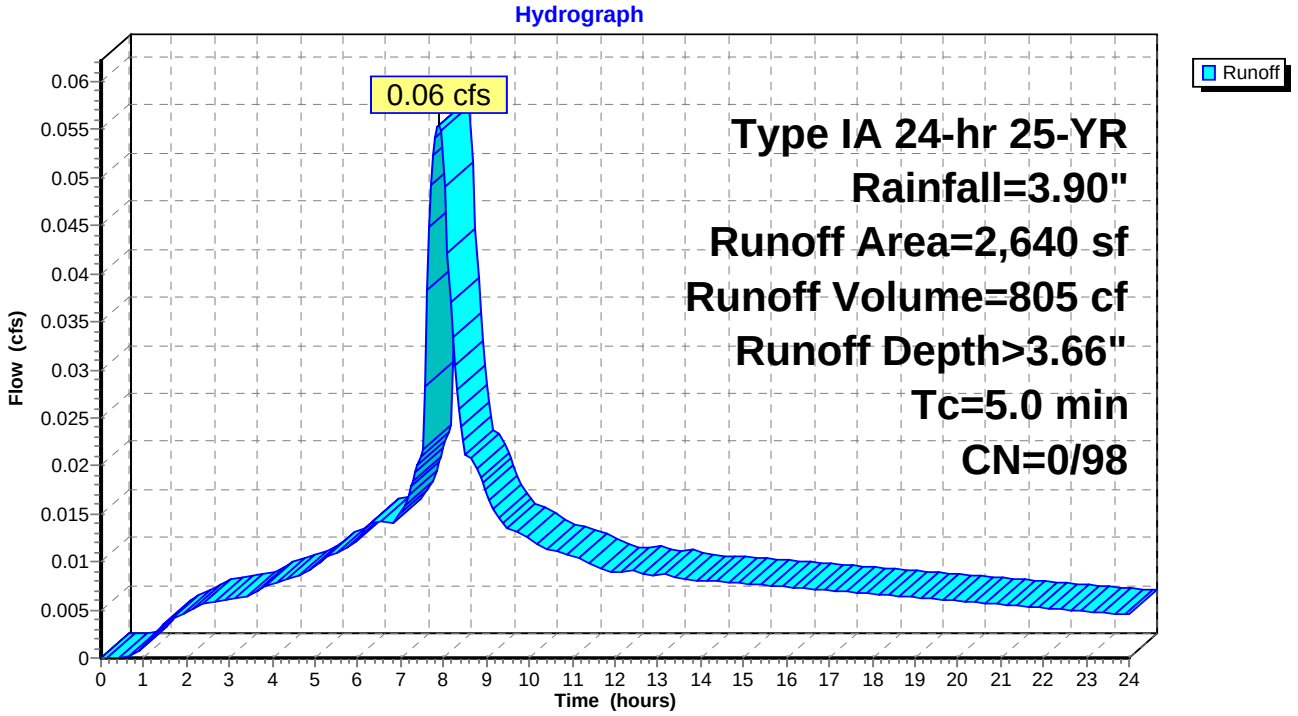
Runoff = 0.06 cfs @ 7.90 hrs, Volume= 805 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	2,640	98	1 Lot @ 2640 sf
	2,640	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6.2S: Lot 16



Summary for Subcatchment 6.3S: Lots 17, 18, 55 & 56

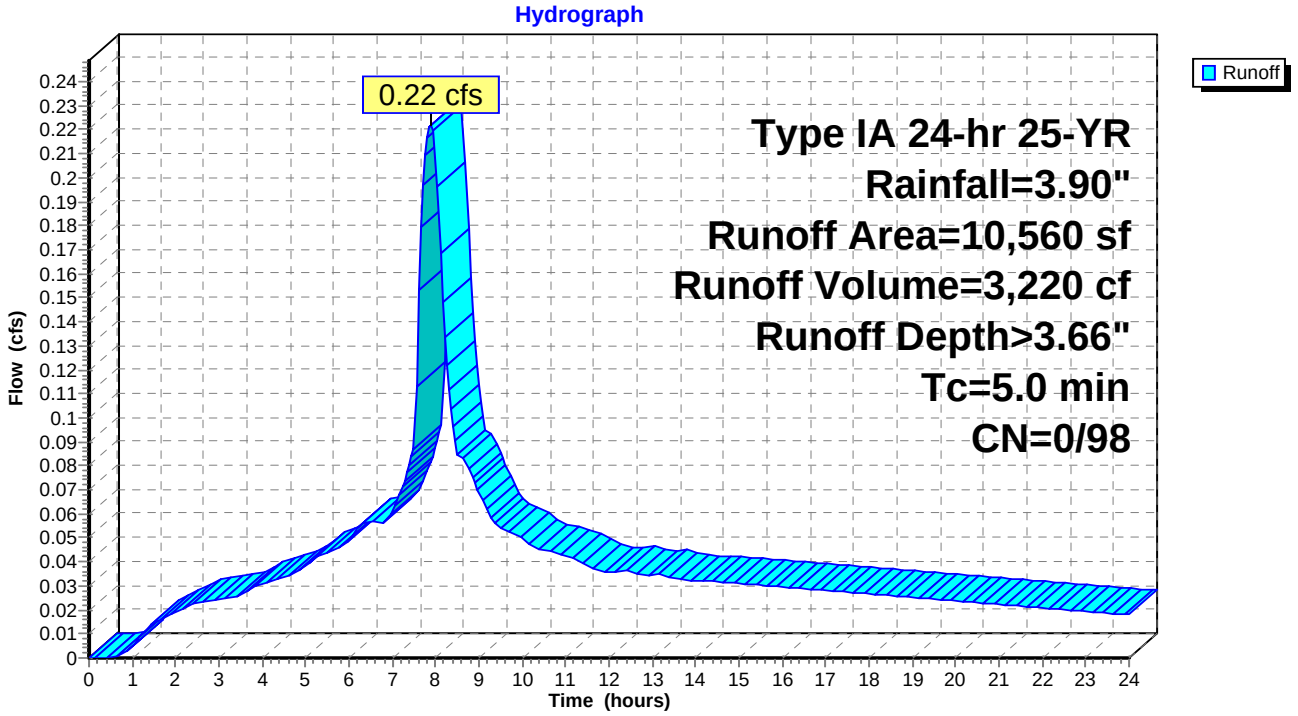
Runoff = 0.22 cfs @ 7.90 hrs, Volume= 3,220 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	10,560	98	4 Lots @ 2640 sf
	10,560	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6.3S: Lots 17, 18, 55 & 56



Summary for Subcatchment 6E: Durham Rd ROW

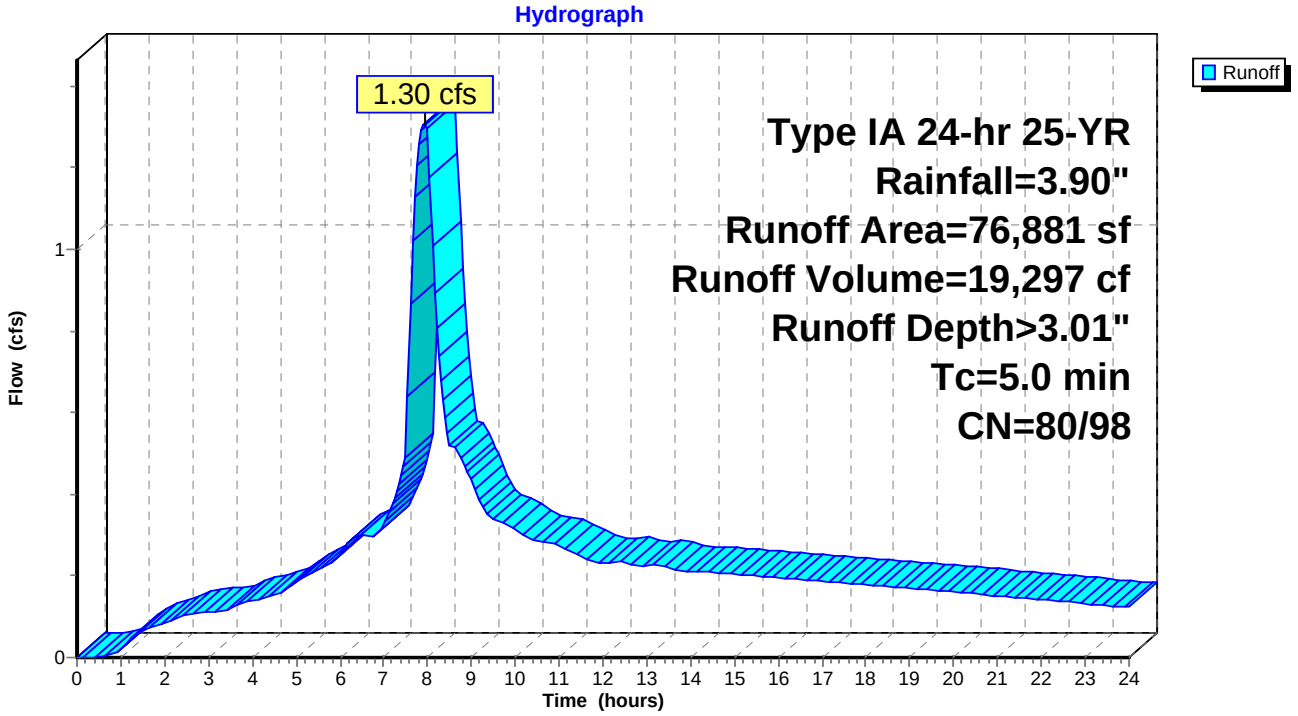
Runoff = 1.30 cfs @ 7.92 hrs, Volume= 19,297 cf, Depth> 3.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	47,692	98	Durham Rd, Paved roads w/curbs & sewers
	29,189	80	>75% Grass cover, Good, HSG D
	76,881	91	Weighted Average
	29,189	80	Pervious Area
	47,692	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6E: Durham Rd ROW



Summary for Subcatchment 6S:

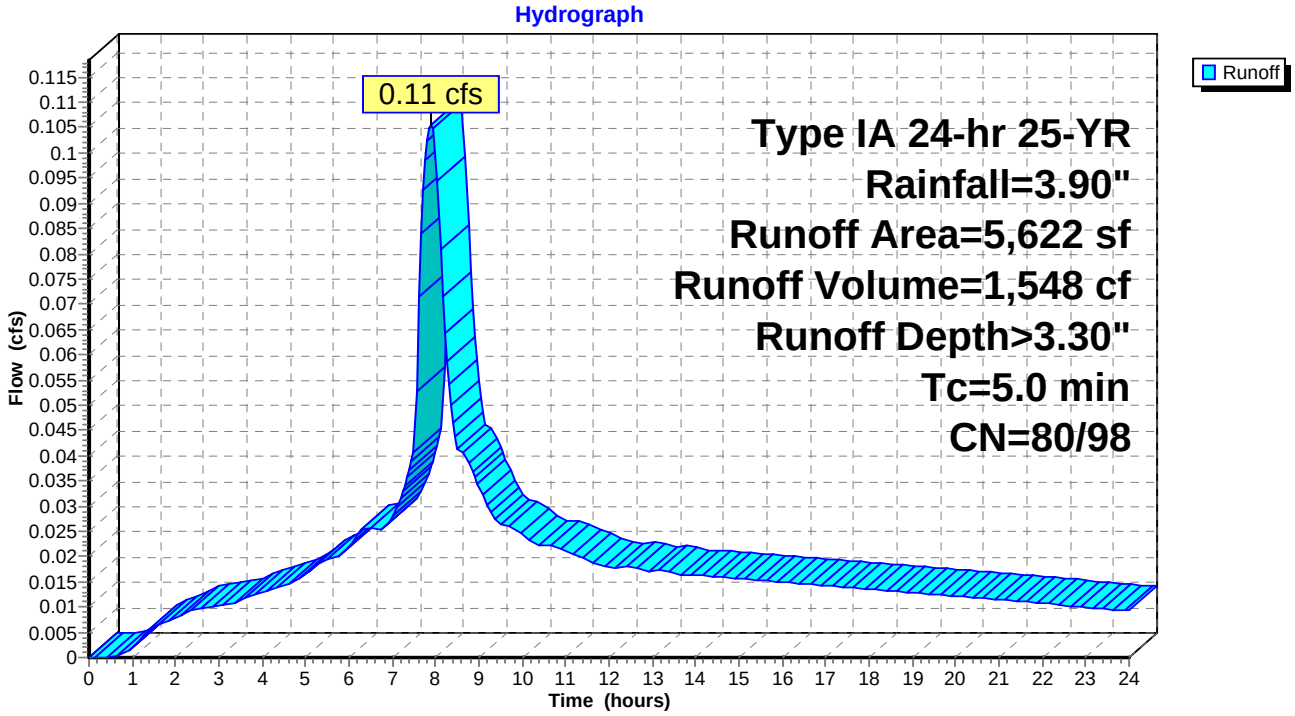
Runoff = 0.11 cfs @ 7.91 hrs, Volume= 1,548 cf, Depth> 3.30"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	4,452	98	Street/Sidewalk/Etc.
	1,170	80	>75% Grass cover, Good, HSG D
	5,622	94	Weighted Average
	1,170	80	Pervious Area
	4,452	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6S:



Summary for Subcatchment 7.1S: Lots 9-13 and Lot 54

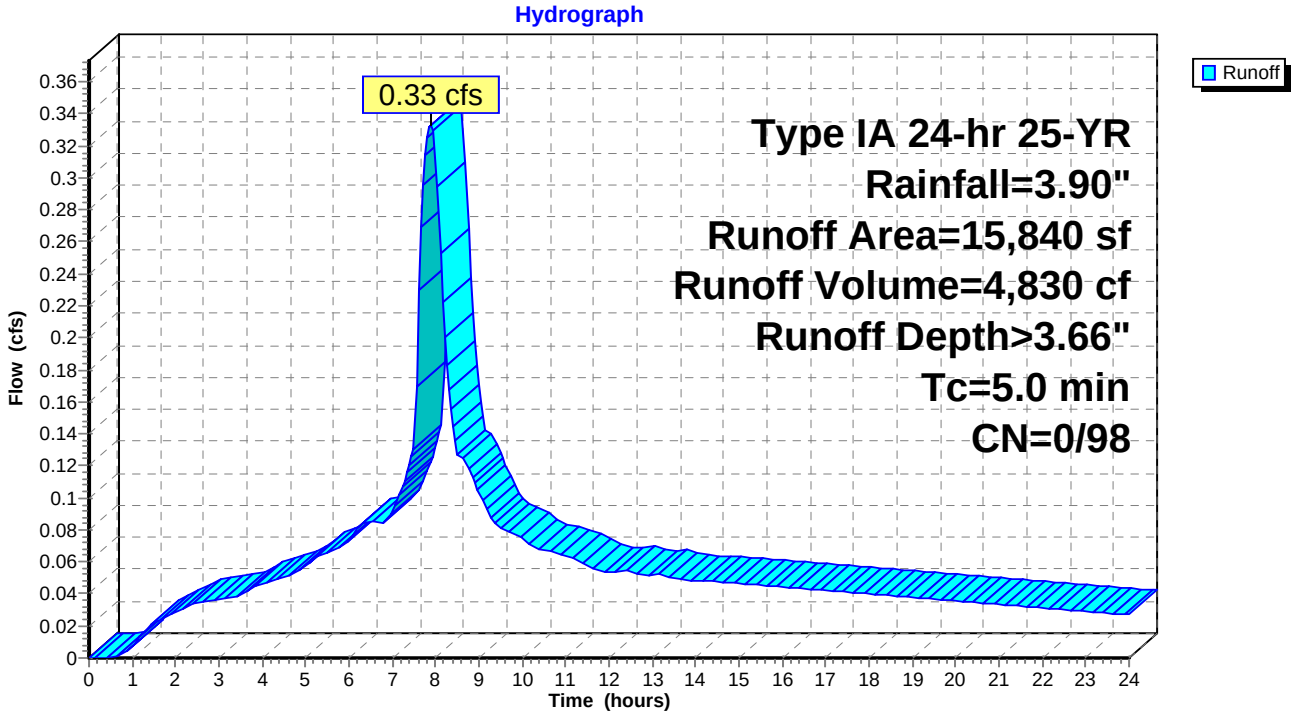
Runoff = 0.33 cfs @ 7.90 hrs, Volume= 4,830 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	15,840	98	6 Lots @ 2640 sf
	15,840	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 7.1S: Lots 9-13 and Lot 54



Summary for Subcatchment 7E: Hall Blvd

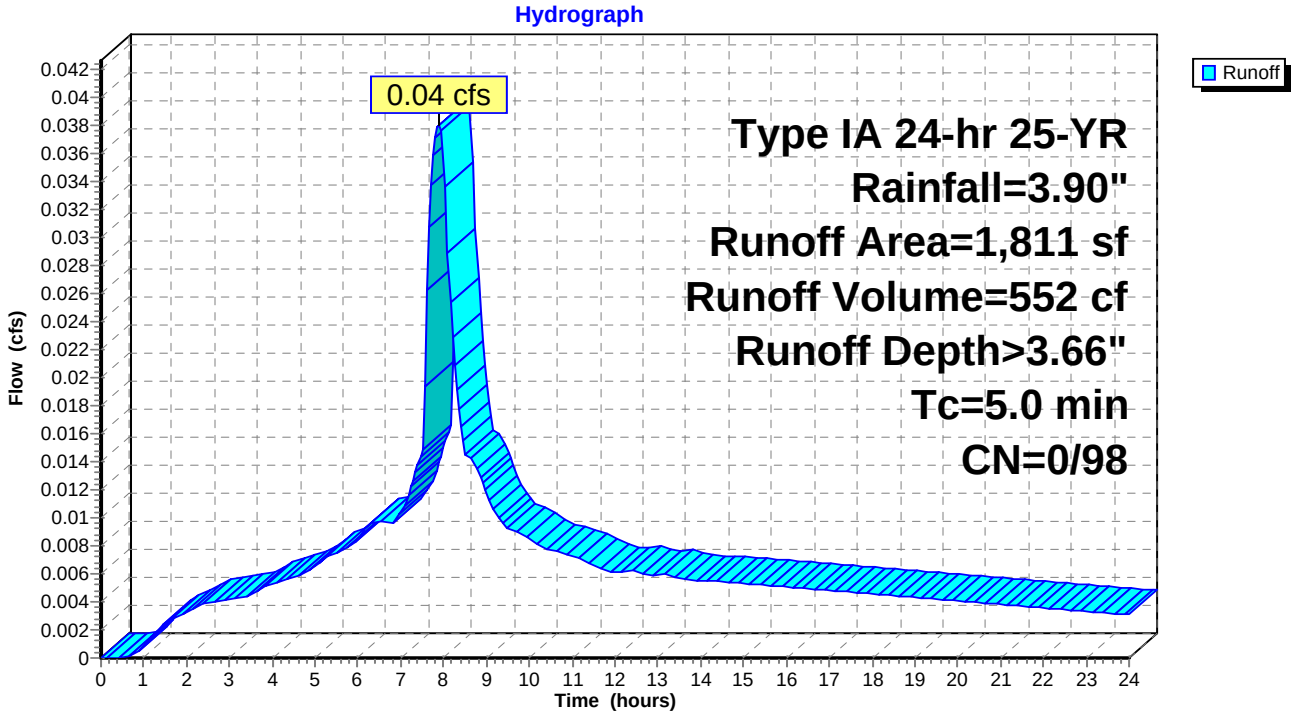
Runoff = 0.04 cfs @ 7.90 hrs, Volume= 552 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	1,811	98	Hall Blvd, Paved roads w/curbs & sewers
	1,811	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 7E: Hall Blvd



Summary for Subcatchment 7S:

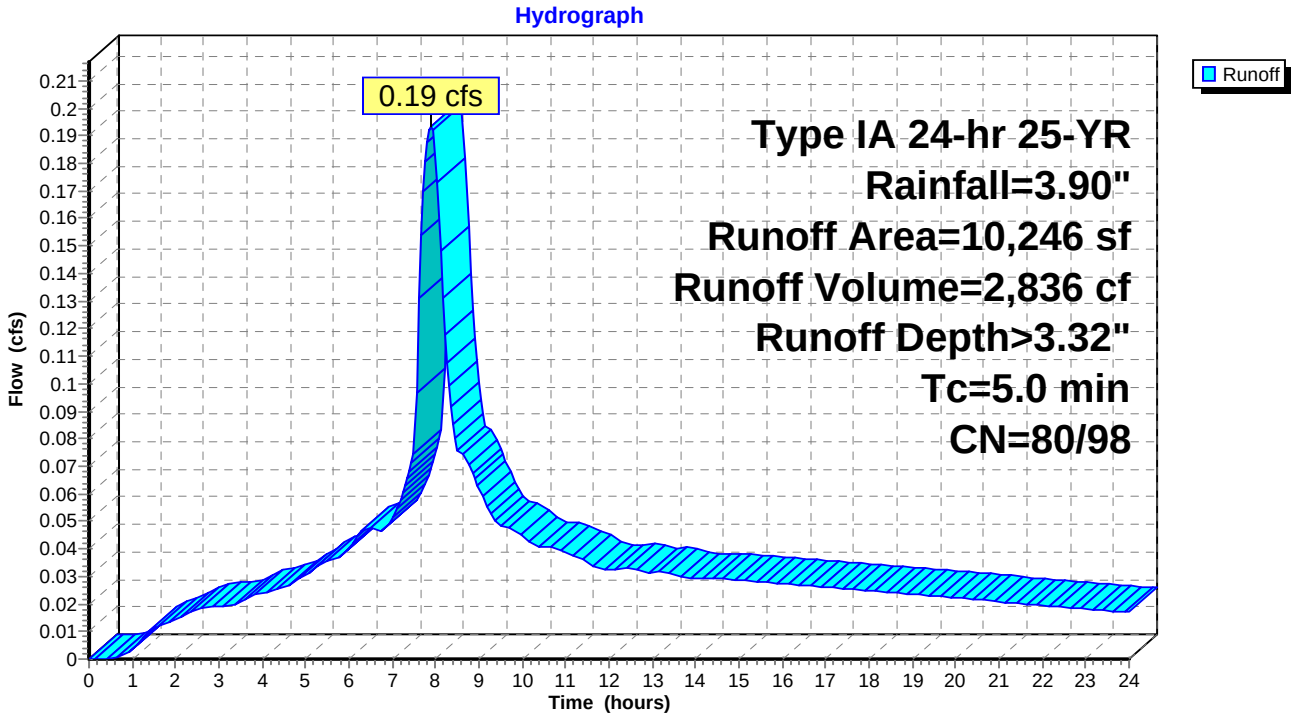
Runoff = 0.19 cfs @ 7.91 hrs, Volume= 2,836 cf, Depth> 3.32"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	6,756	98	Street/Sidewalk/Etc.
	2,032	80	>75% Grass cover, Good, HSG D
*	1,458	98	Existing SW Hall Blvd Pavement
	10,246	94	Weighted Average
	2,032	80	Pervious Area
	8,214	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 7S:



Summary for Subcatchment 8E: Hall Blvd

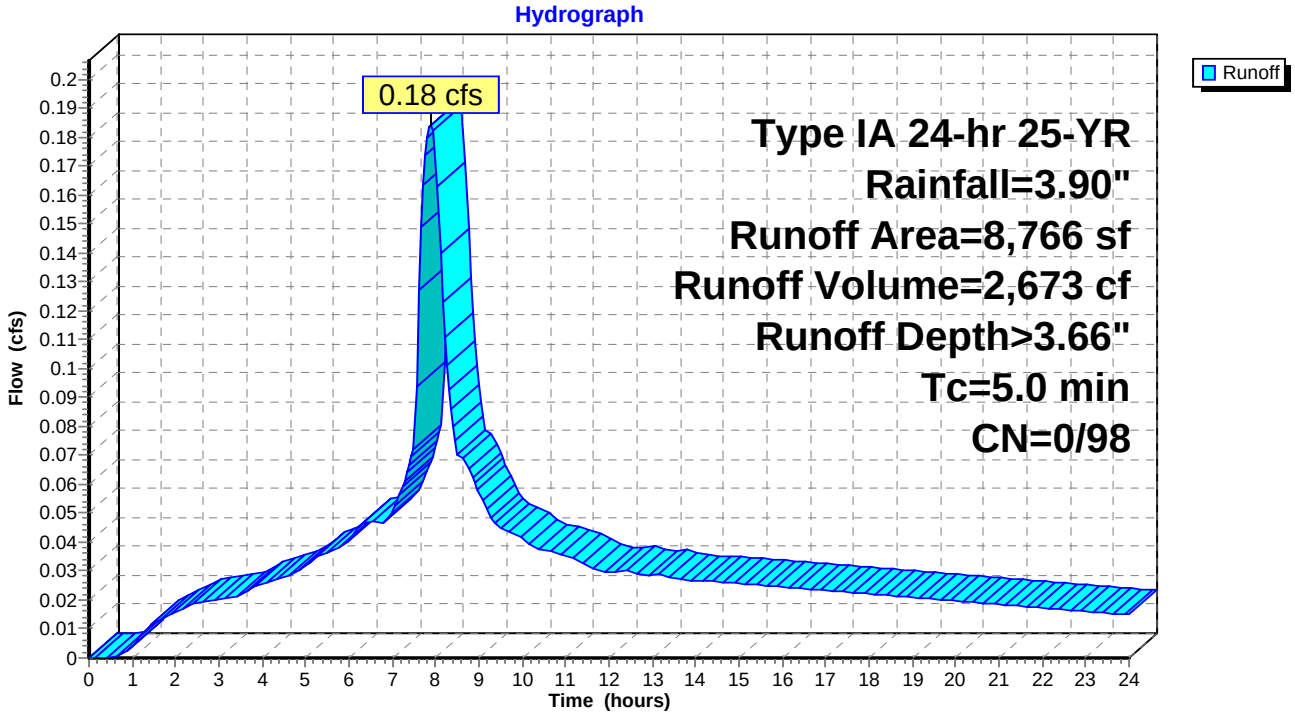
Runoff = 0.18 cfs @ 7.90 hrs, Volume= 2,673 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	8,766	98	Hall Blvd, Paved roads w/curbs & sewers
	8,766	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8E: Hall Blvd



Summary for Subcatchment 8S:

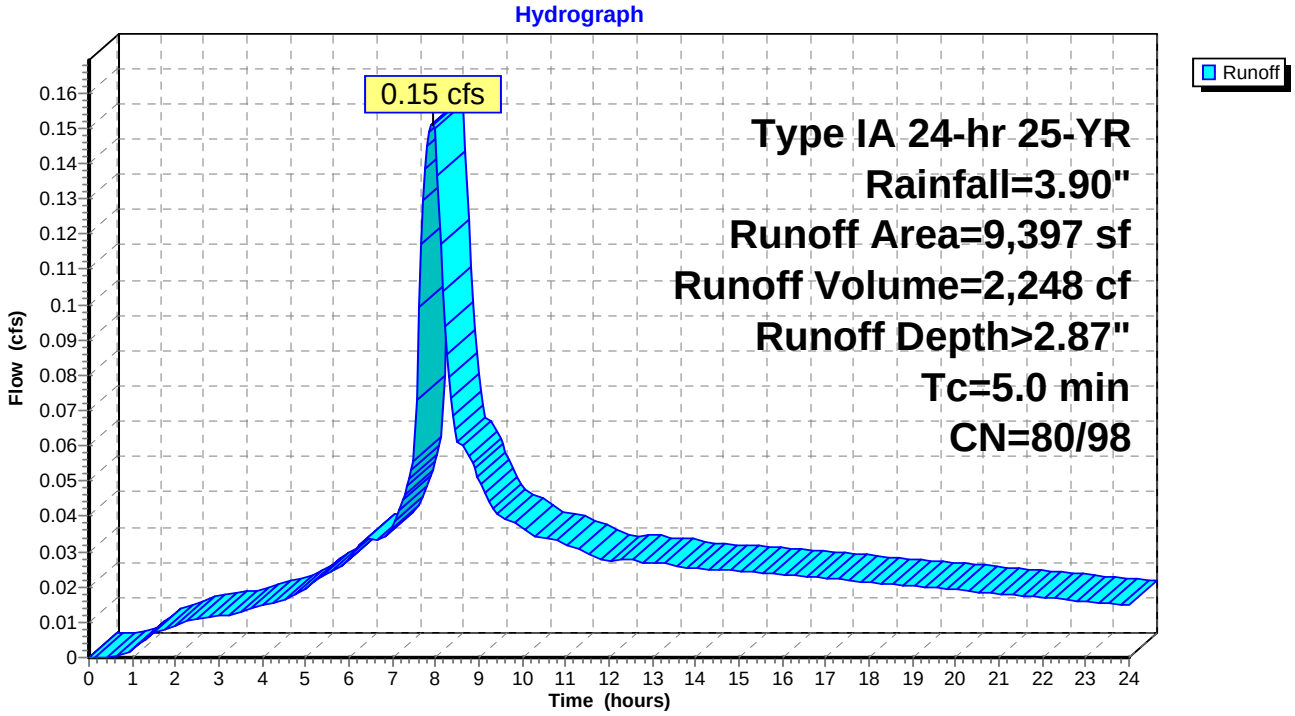
Runoff = 0.15 cfs @ 7.93 hrs, Volume= 2,248 cf, Depth> 2.87"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	5,053	98	Street/Sidewalk/Etc.
	4,344	80	>75% Grass cover, Good, HSG D
	9,397	90	Weighted Average
	4,344	80	Pervious Area
	5,053	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8S:



Summary for Subcatchment 9E: Hall Blvd

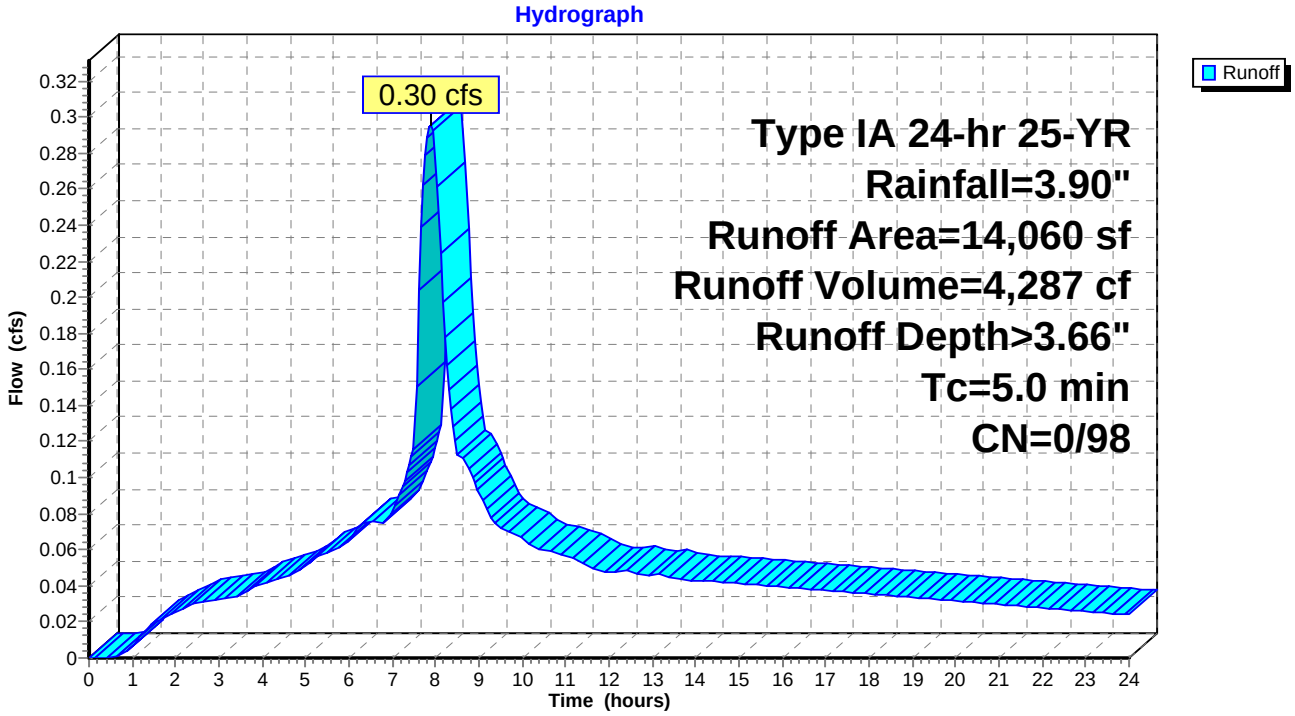
Runoff = 0.30 cfs @ 7.90 hrs, Volume= 4,287 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	14,060	98	Hall Blvd, Paved roads w/curbs & sewers
	14,060	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 9E: Hall Blvd



Summary for Subcatchment 9S:

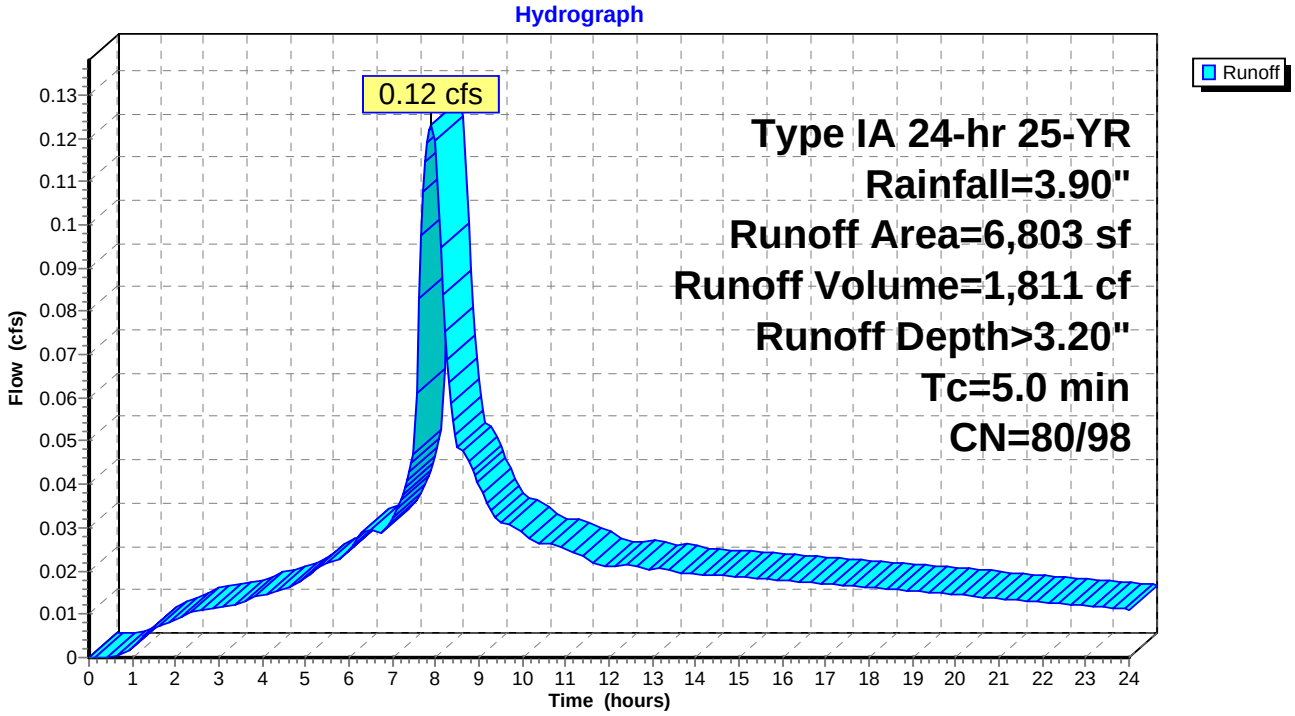
Runoff = 0.12 cfs @ 7.91 hrs, Volume= 1,811 cf, Depth> 3.20"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	4,952	98	Street/Sidewalk/Etc.
	1,851	80	>75% Grass cover, Good, HSG D
	6,803	93	Weighted Average
	1,851	80	Pervious Area
	4,952	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 9S:



Summary for Subcatchment 10.1S: Lots 25-27

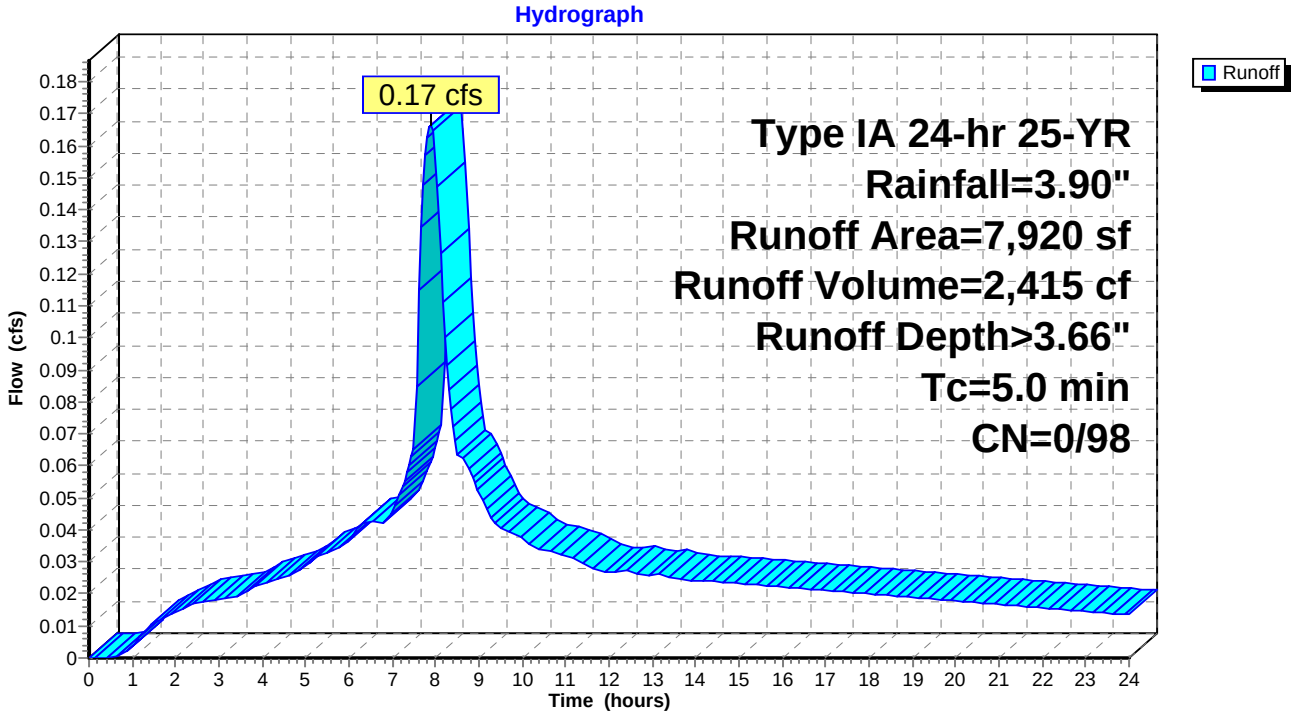
Runoff = 0.17 cfs @ 7.90 hrs, Volume= 2,415 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	7,920	98	3 Lots @ 2640 sf
	7,920	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10.1S: Lots 25-27



Summary for Subcatchment 10E: Hall-Durham Int

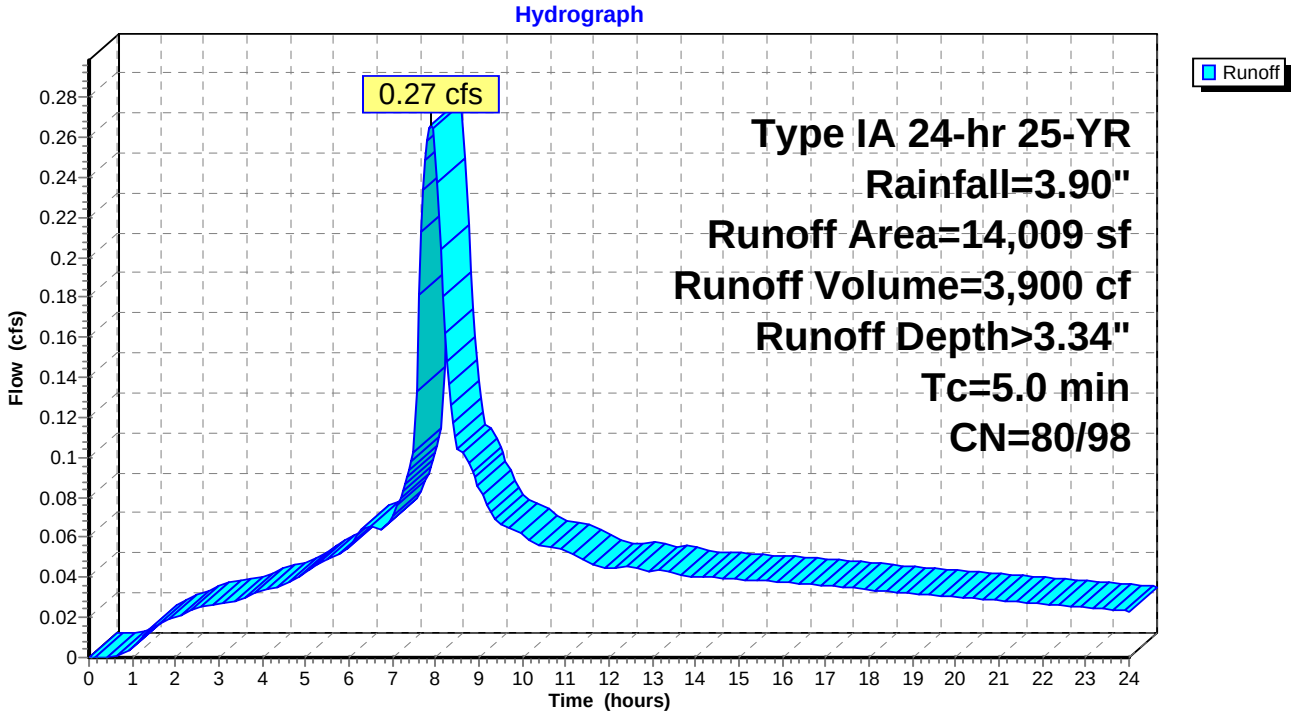
Runoff = 0.27 cfs @ 7.91 hrs, Volume= 3,900 cf, Depth> 3.34"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

Area (sf)	CN	Description
11,394	98	Paved roads w/curbs & sewers
2,615	80	>75% Grass cover, Good, HSG D
14,009	95	Weighted Average
2,615	80	Pervious Area
11,394	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10E: Hall-Durham Int



Summary for Subcatchment 10S:

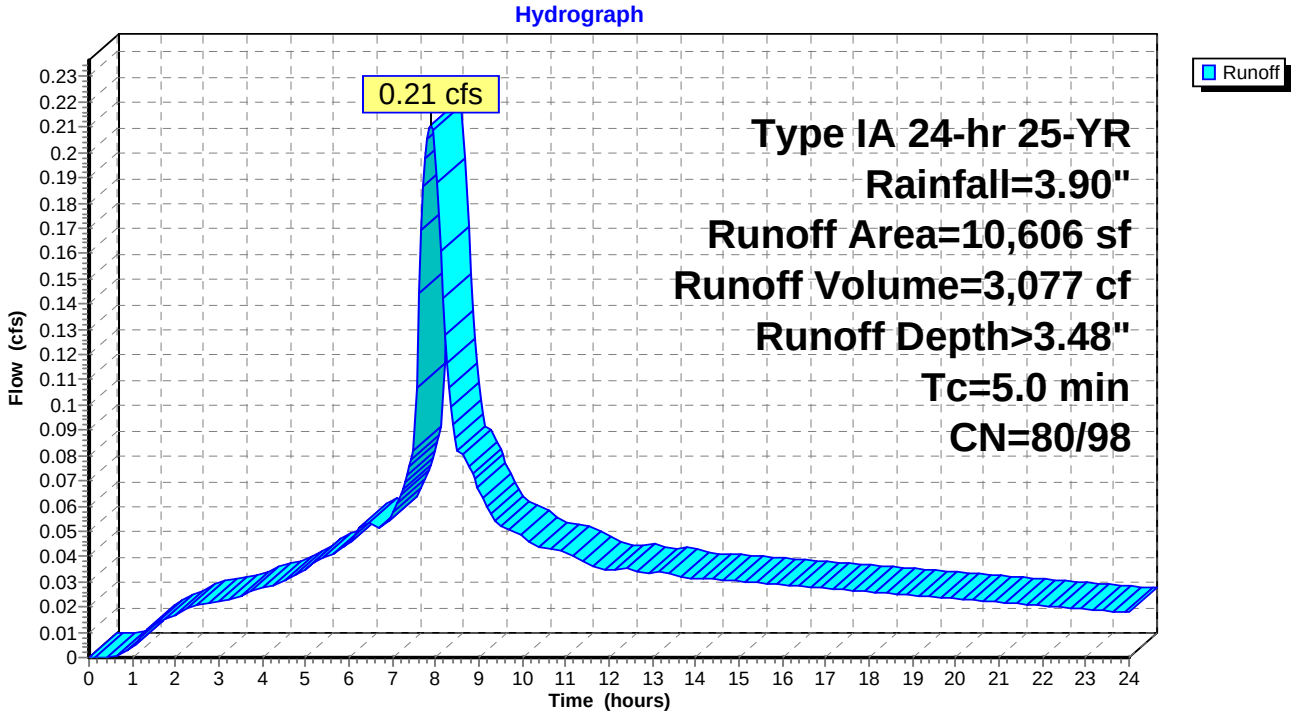
Runoff = 0.21 cfs @ 7.90 hrs, Volume= 3,077 cf, Depth> 3.48"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	9,503	98	Street/Sidewalk/Etc.
	1,103	80	>75% Grass cover, Good, HSG D
	10,606	96	Weighted Average
	1,103	80	Pervious Area
	9,503	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10S:



Summary for Subcatchment 11.1S: Lots 28-32 and 37

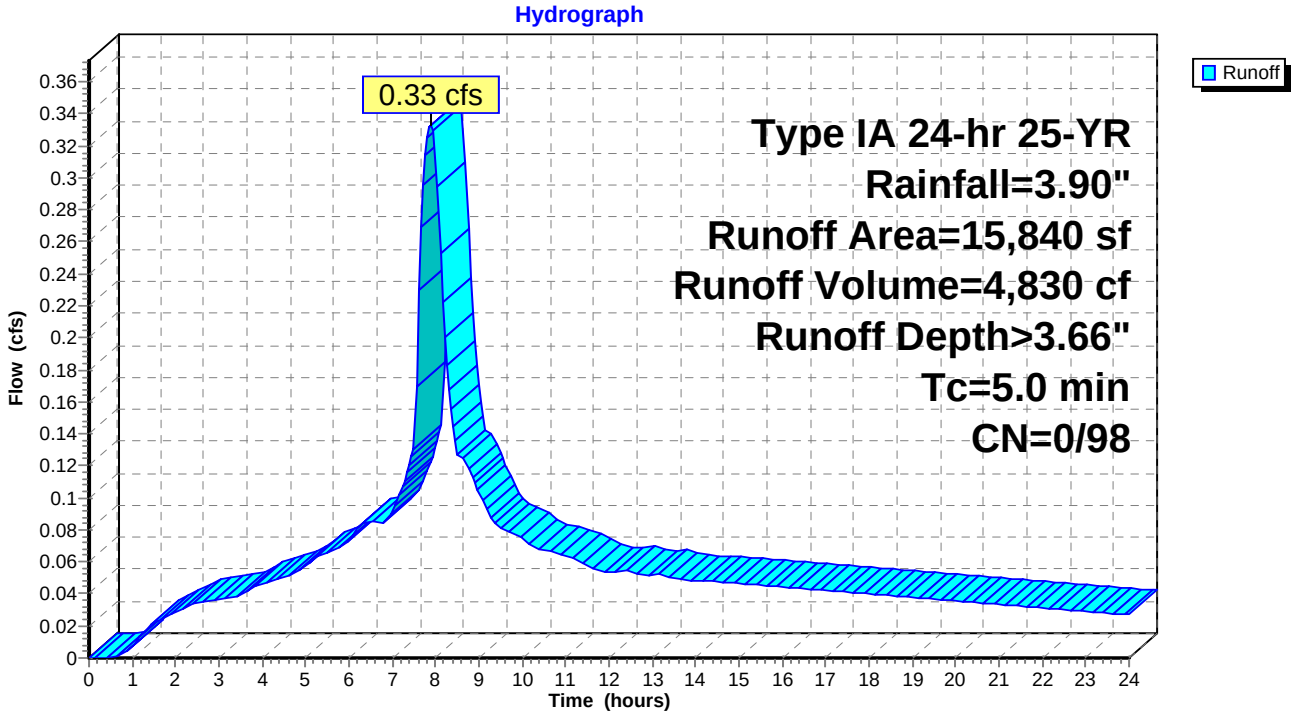
Runoff = 0.33 cfs @ 7.90 hrs, Volume= 4,830 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	15,840	98	6 Lots @ 2640 sf
	15,840	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 11.1S: Lots 28-32 and 37



Summary for Subcatchment 11S:

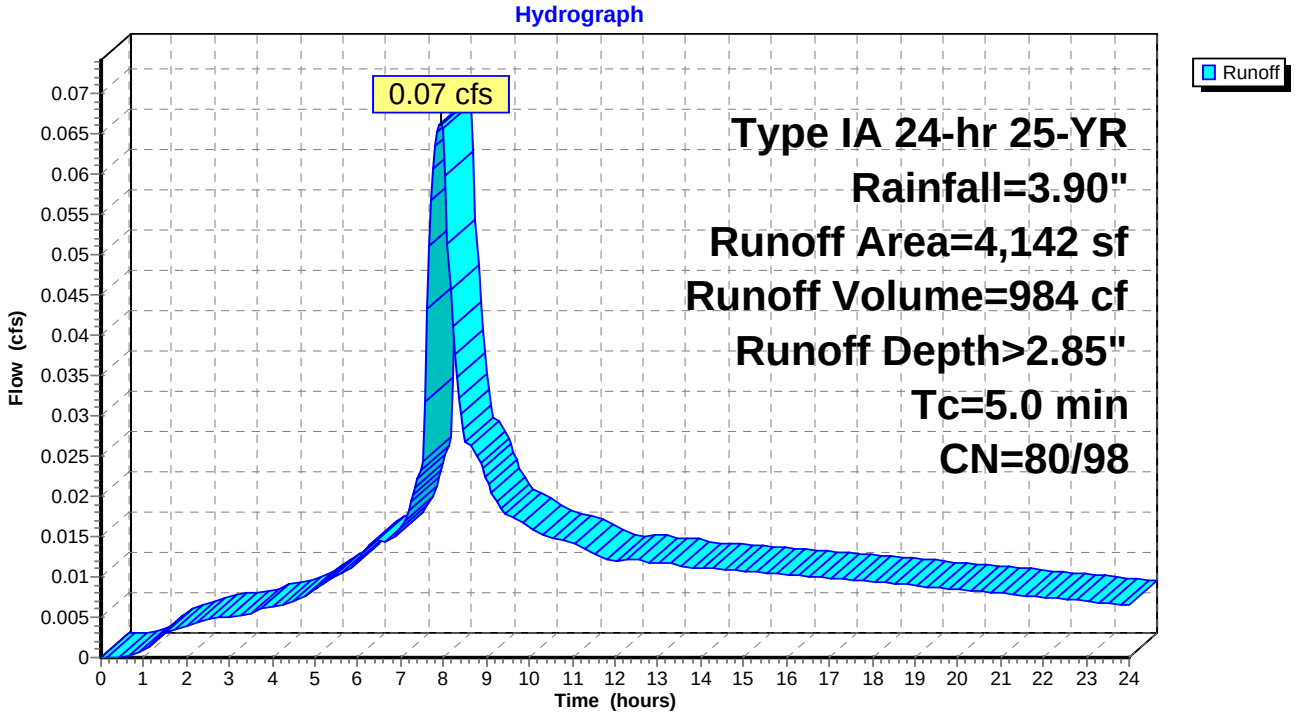
Runoff = 0.07 cfs @ 7.93 hrs, Volume= 984 cf, Depth> 2.85"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	2,175	98	Street/Sidewalk/Etc.
	1,967	80	>75% Grass cover, Good, HSG D
	4,142	89	Weighted Average
	1,967	80	Pervious Area
	2,175	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 11S:



Summary for Subcatchment 12.1S: Lots 33-35

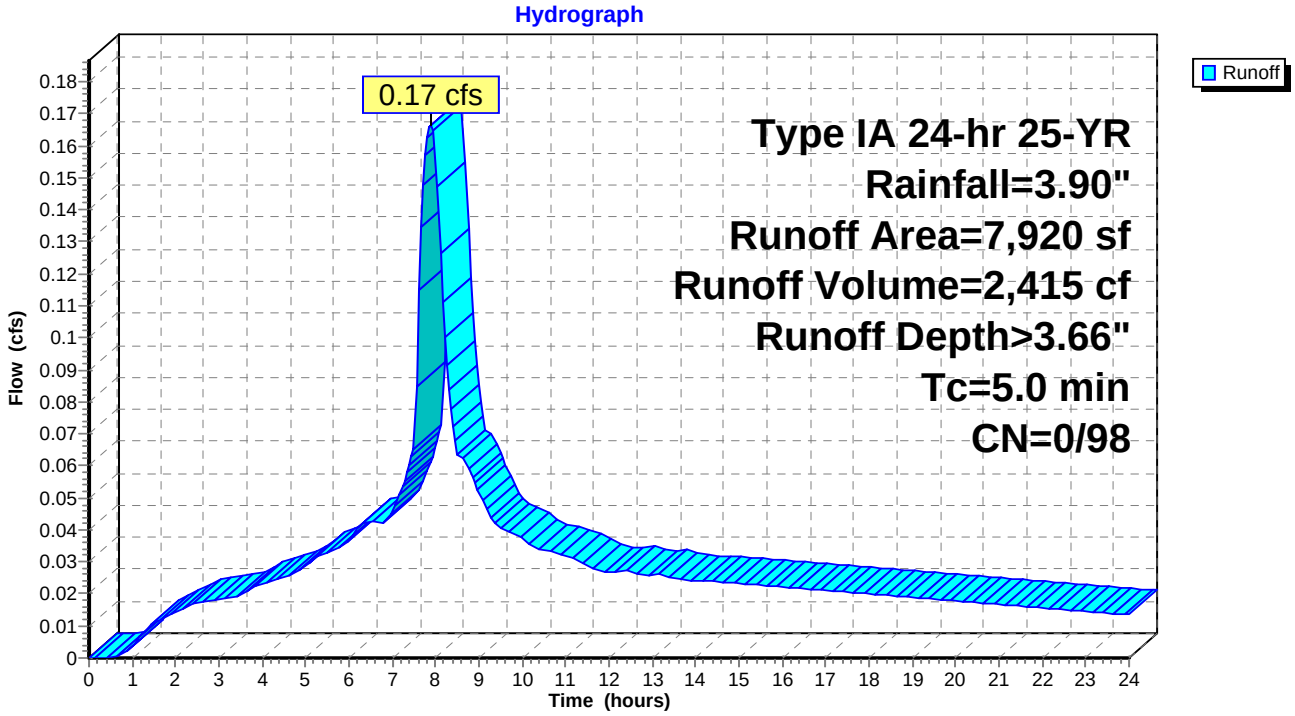
Runoff = 0.17 cfs @ 7.90 hrs, Volume= 2,415 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	7,920	98	3 Lots @ 2640 sf
	7,920	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 12.1S: Lots 33-35



Summary for Subcatchment 12S:

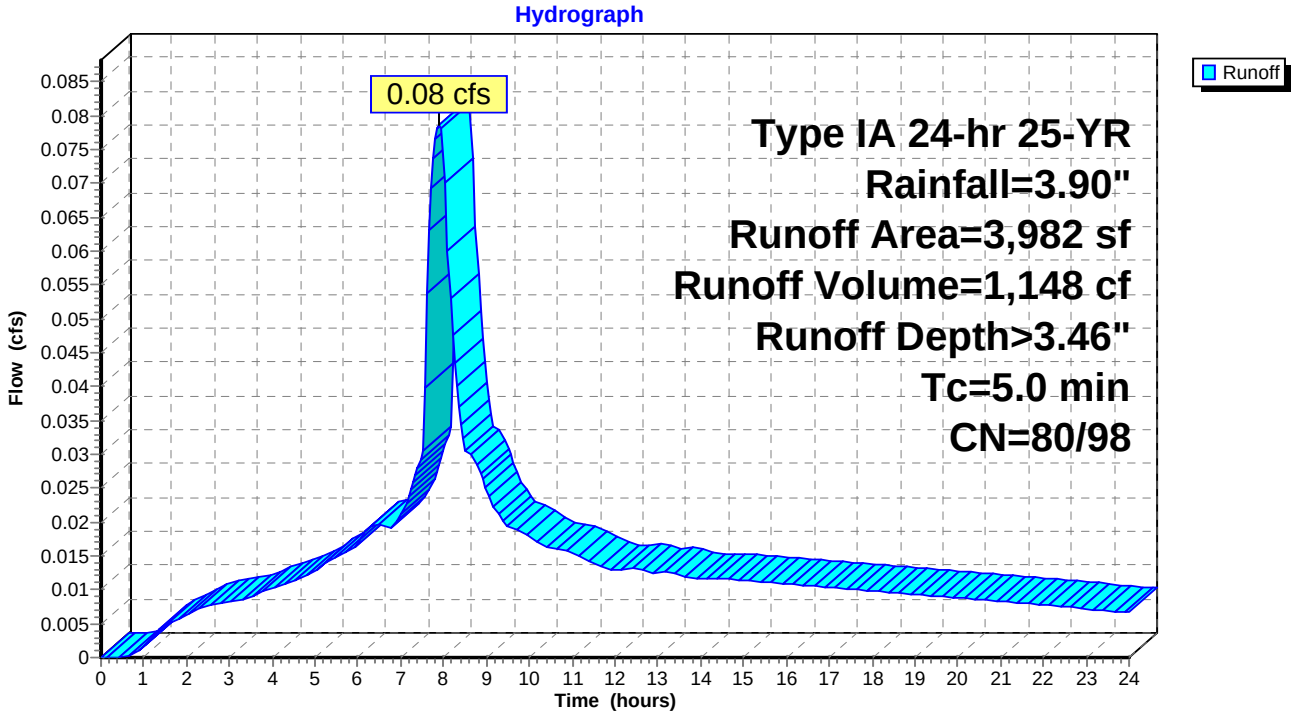
Runoff = 0.08 cfs @ 7.90 hrs, Volume= 1,148 cf, Depth> 3.46"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	3,518	98	Street/Sidewalk/Etc.
	464	80	>75% Grass cover, Good, HSG D
	3,982	96	Weighted Average
	464	80	Pervious Area
	3,518	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 12S:



Summary for Subcatchment 13.1S: Lot 38

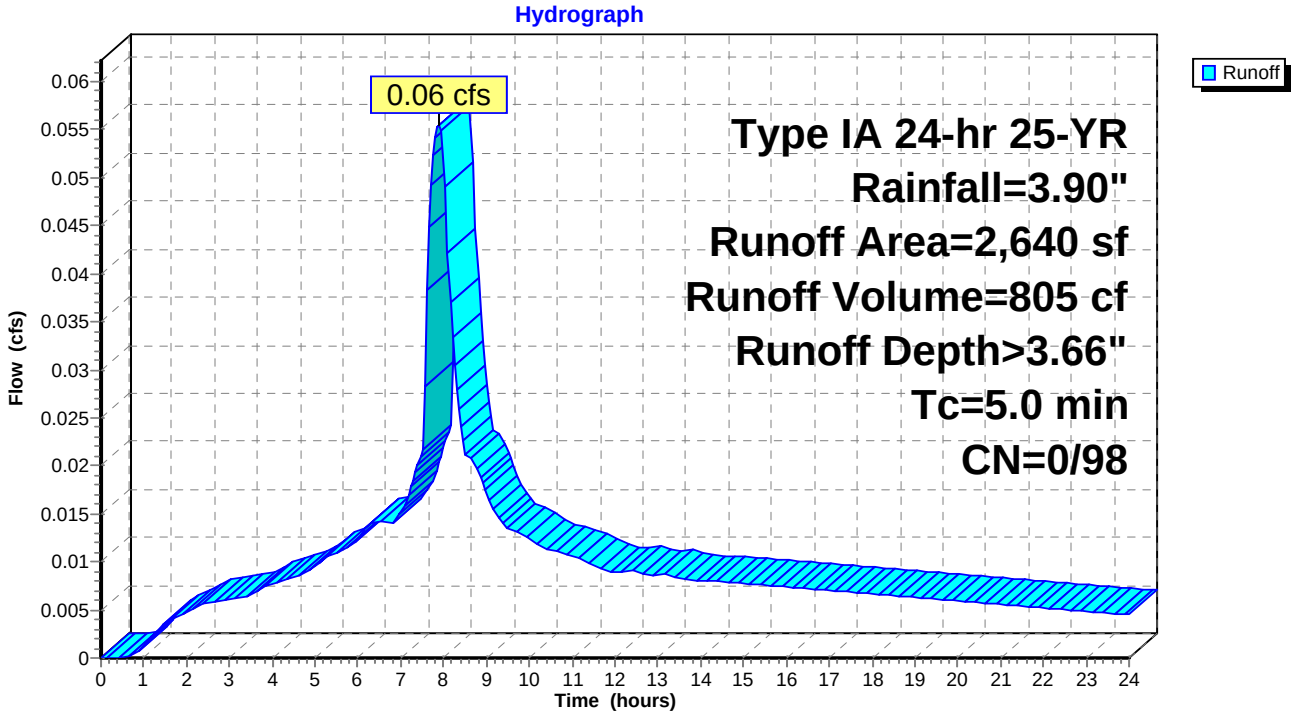
Runoff = 0.06 cfs @ 7.90 hrs, Volume= 805 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	2,640	98	1 Lot @ 2640 sf
	2,640	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 13.1S: Lot 38



Summary for Subcatchment 13S:

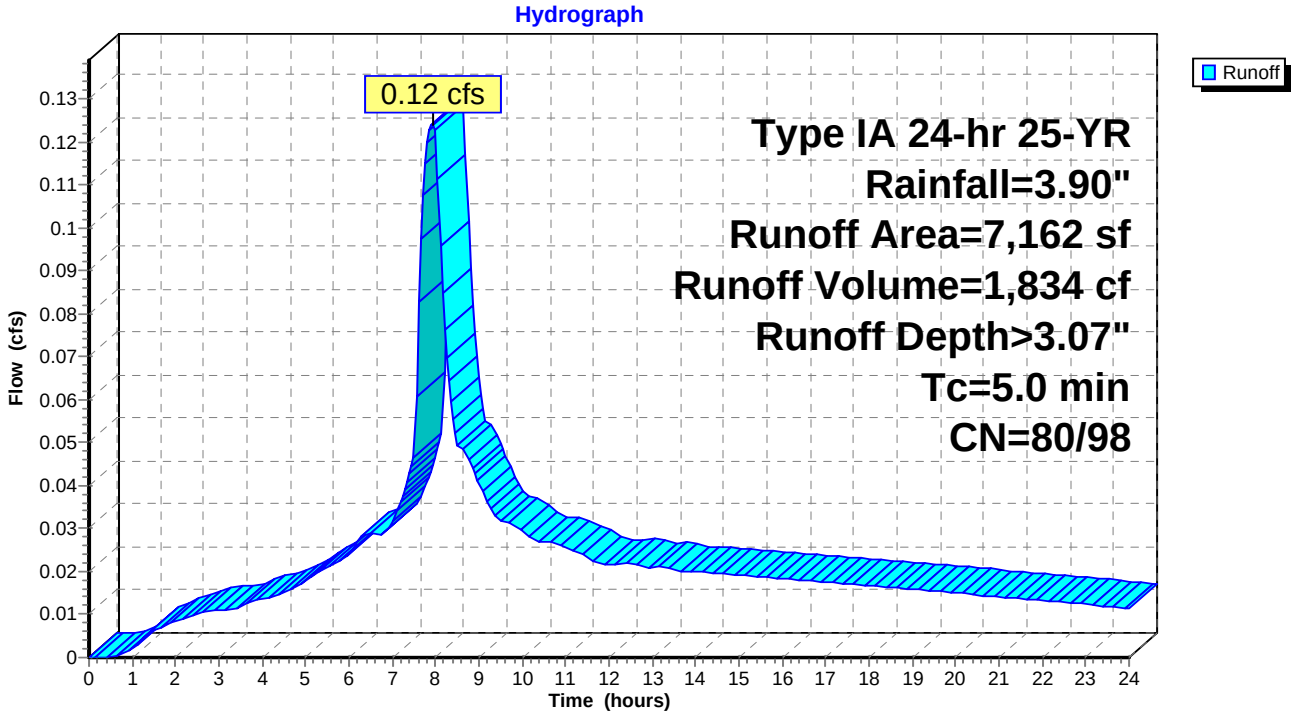
Runoff = 0.12 cfs @ 7.92 hrs, Volume= 1,834 cf, Depth> 3.07"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	4,701	98	Street/Sidewalk/Etc.
	2,461	80	>75% Grass cover, Good, HSG D
	7,162	92	Weighted Average
	2,461	80	Pervious Area
	4,701	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 13S:



Summary for Subcatchment 14.1S: Lots 2-3 and 39

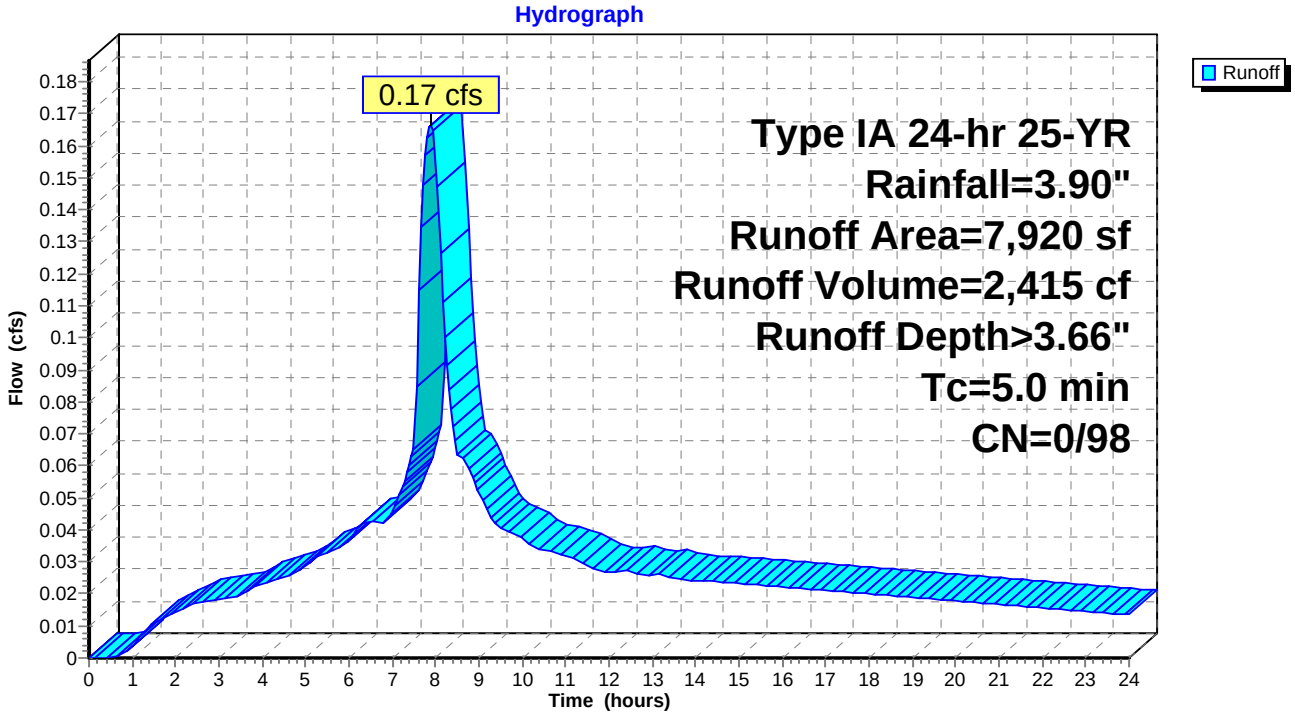
Runoff = 0.17 cfs @ 7.90 hrs, Volume= 2,415 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	7,920	98	3 Lots @ 2640 sf
	7,920	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 14.1S: Lots 2-3 and 39



Summary for Subcatchment 14S:

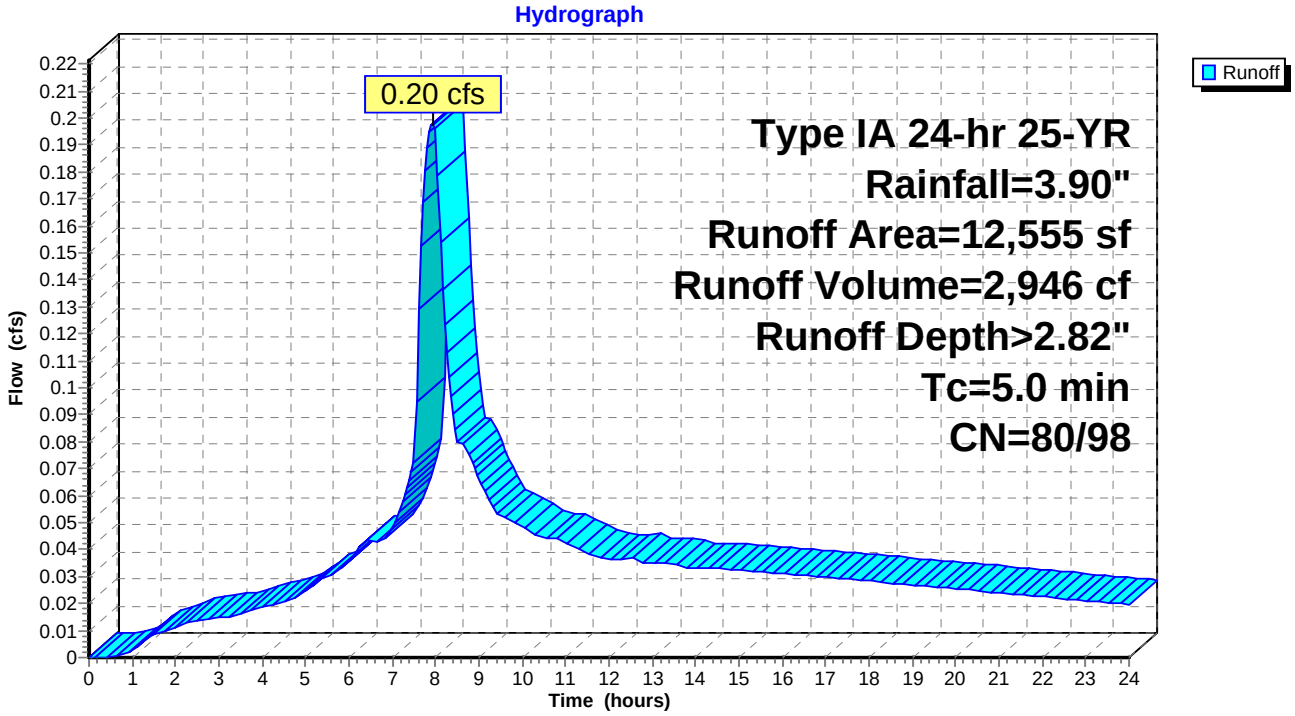
Runoff = 0.20 cfs @ 7.93 hrs, Volume= 2,946 cf, Depth> 2.82"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	6,346	98	Street/Sidewalk/Etc.
	6,209	80	>75% Grass cover, Good, HSG D
	12,555	89	Weighted Average
	6,209	80	Pervious Area
	6,346	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 14S:



Summary for Subcatchment 15.1S: Lots 4 and 5

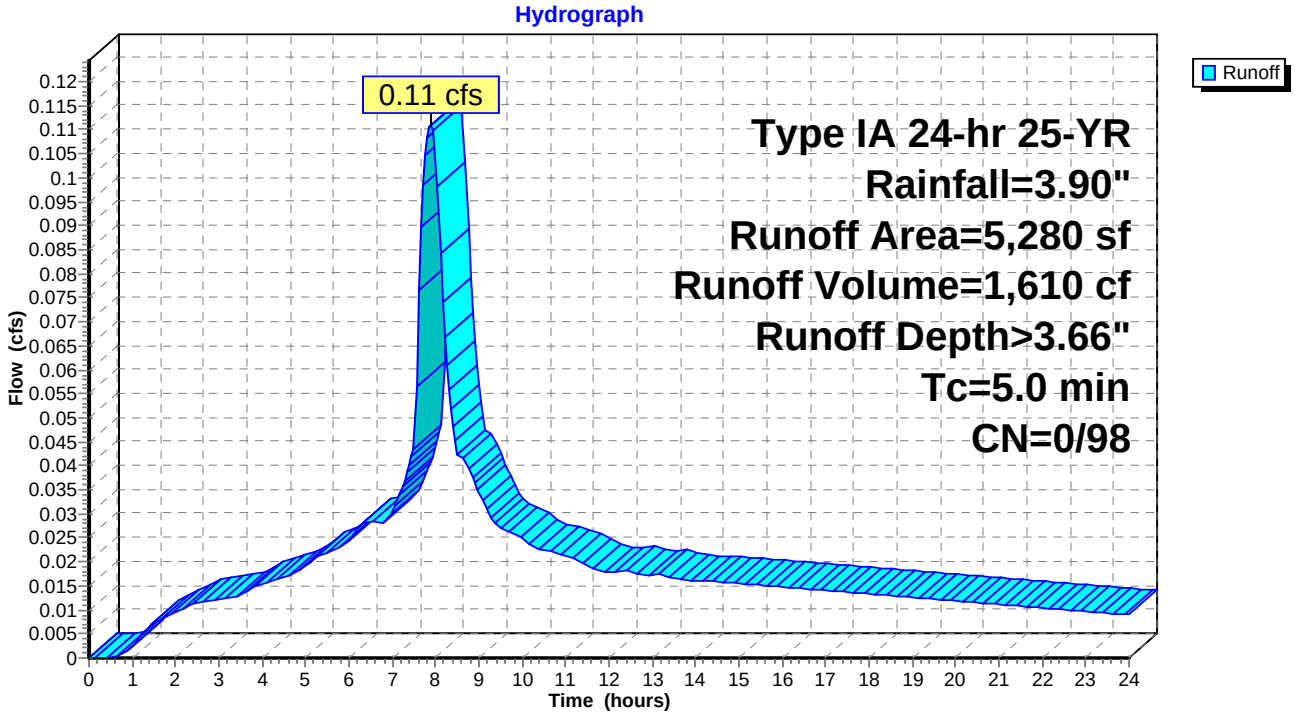
Runoff = 0.11 cfs @ 7.90 hrs, Volume= 1,610 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	5,280	98	2 Lots @ 2640 sf
	5,280	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 15.1S: Lots 4 and 5



Summary for Subcatchment 15S:

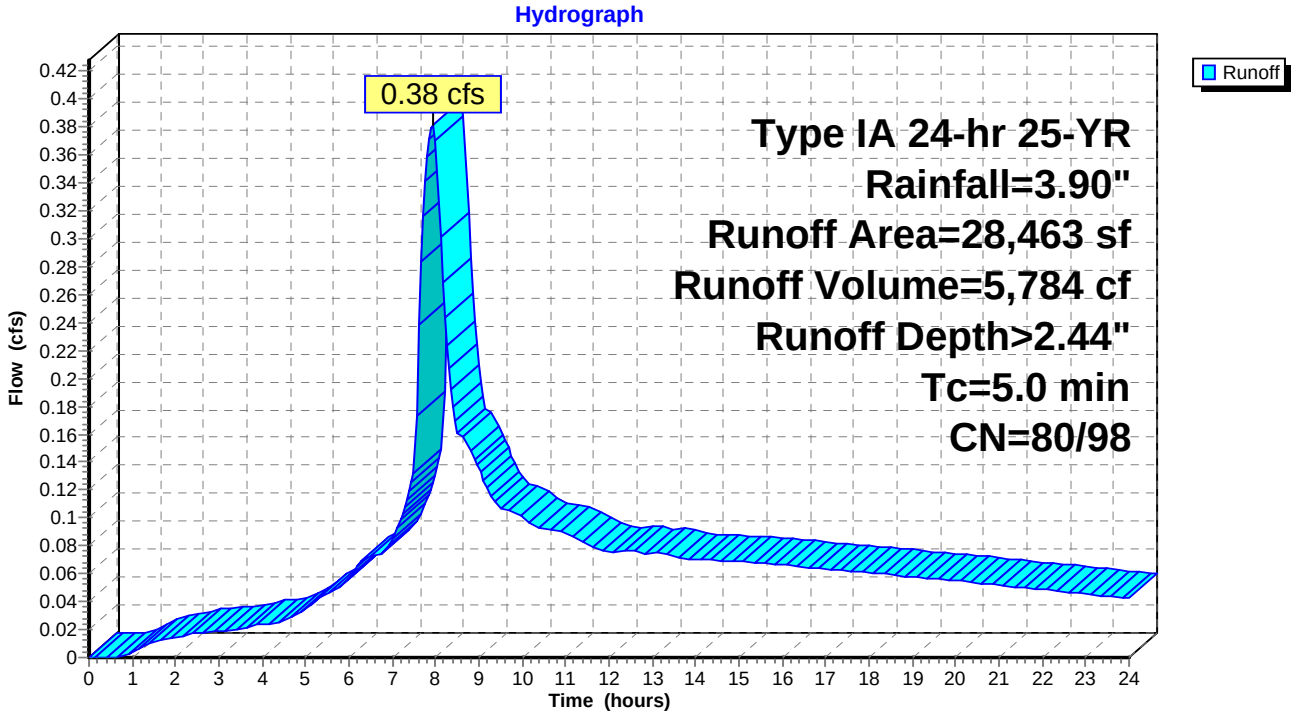
Runoff = 0.38 cfs @ 7.95 hrs, Volume= 5,784 cf, Depth> 2.44"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	8,086	98	Street/Sidewalk/Etc.
	20,377	80	>75% Grass cover, Good, HSG D
	28,463	85	Weighted Average
	20,377	80	Pervious Area
	8,086	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 15S:



Summary for Subcatchment 16.1S: Lots 6-8 and 40-42

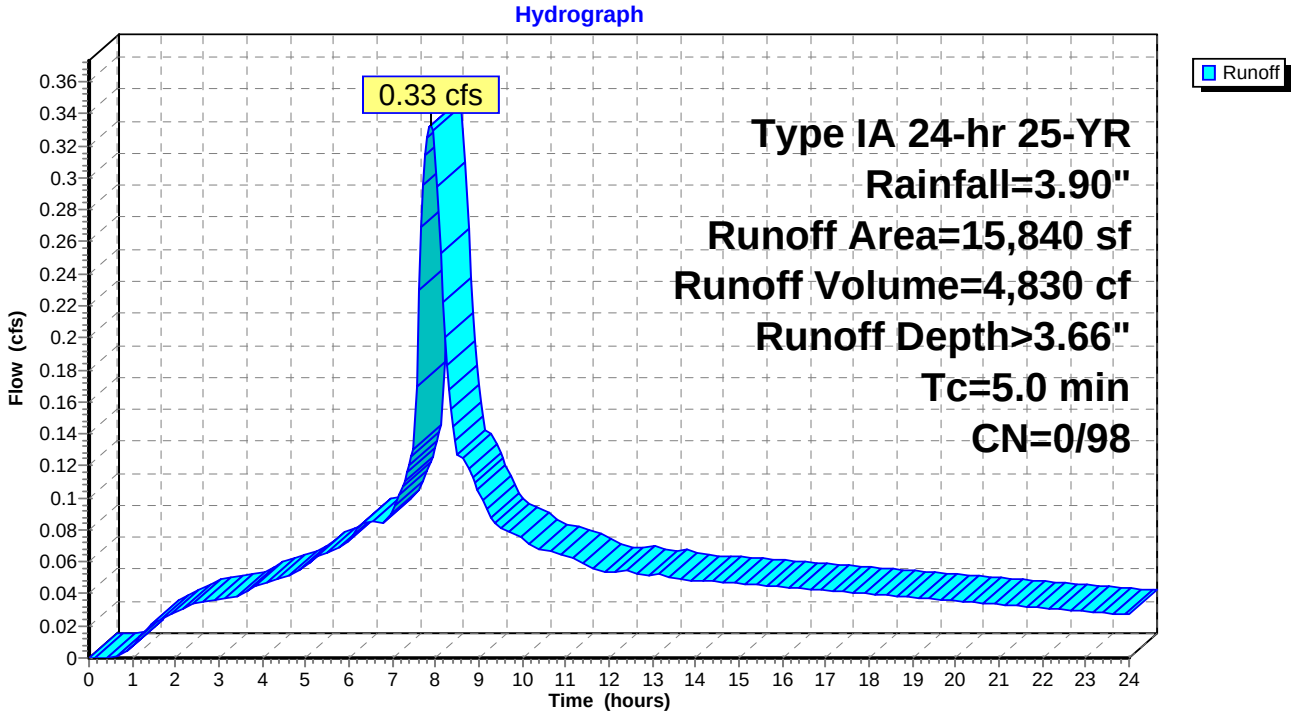
Runoff = 0.33 cfs @ 7.90 hrs, Volume= 4,830 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	15,840	98	6 Lots @ 2640 sf
	15,840	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 16.1S: Lots 6-8 and 40-42



Summary for Subcatchment 16S:

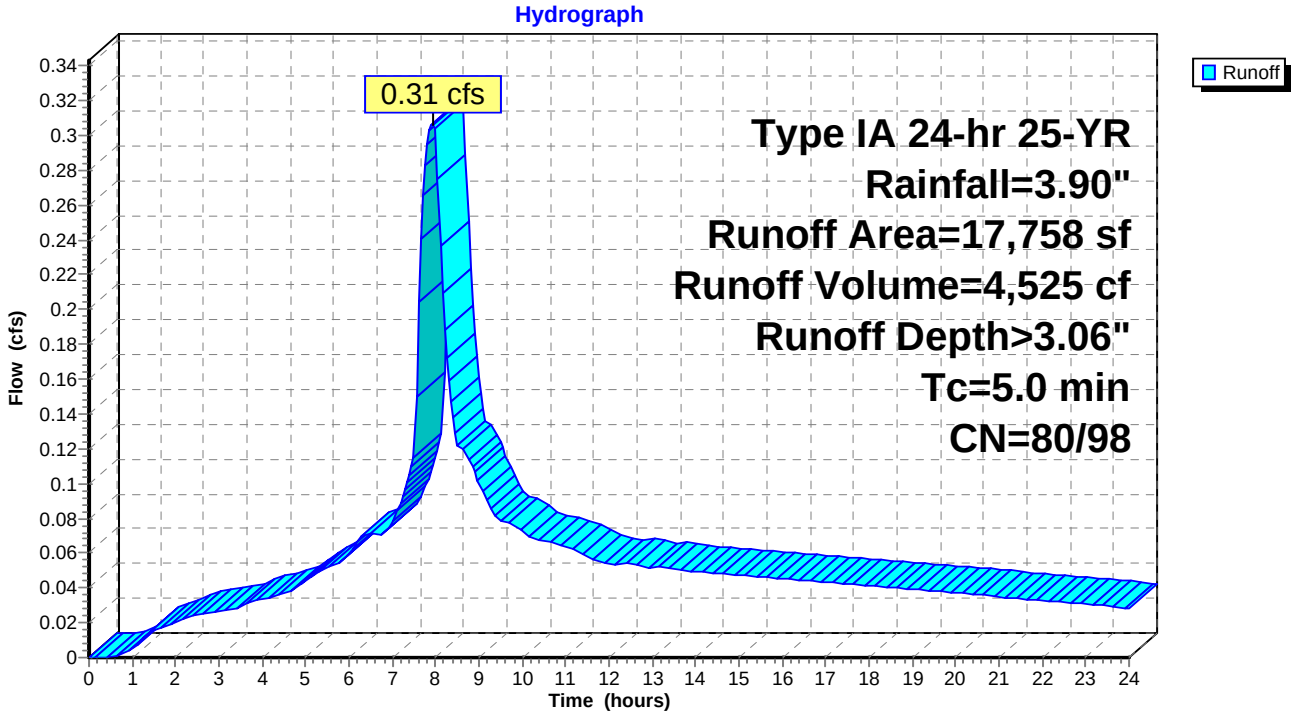
Runoff = 0.31 cfs @ 7.92 hrs, Volume= 4,525 cf, Depth> 3.06"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	1,426	98	Pedestrian Access
	6,261	80	>75% Grass cover, Good, HSG D
*	8,223	98	Existing SW Hall Boulevard
*	1,848	98	SW Hall Widening
	17,758	92	Weighted Average
	6,261	80	Pervious Area
	11,497	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 16S:



Summary for Subcatchment 17.1S: Lot 46 & 47

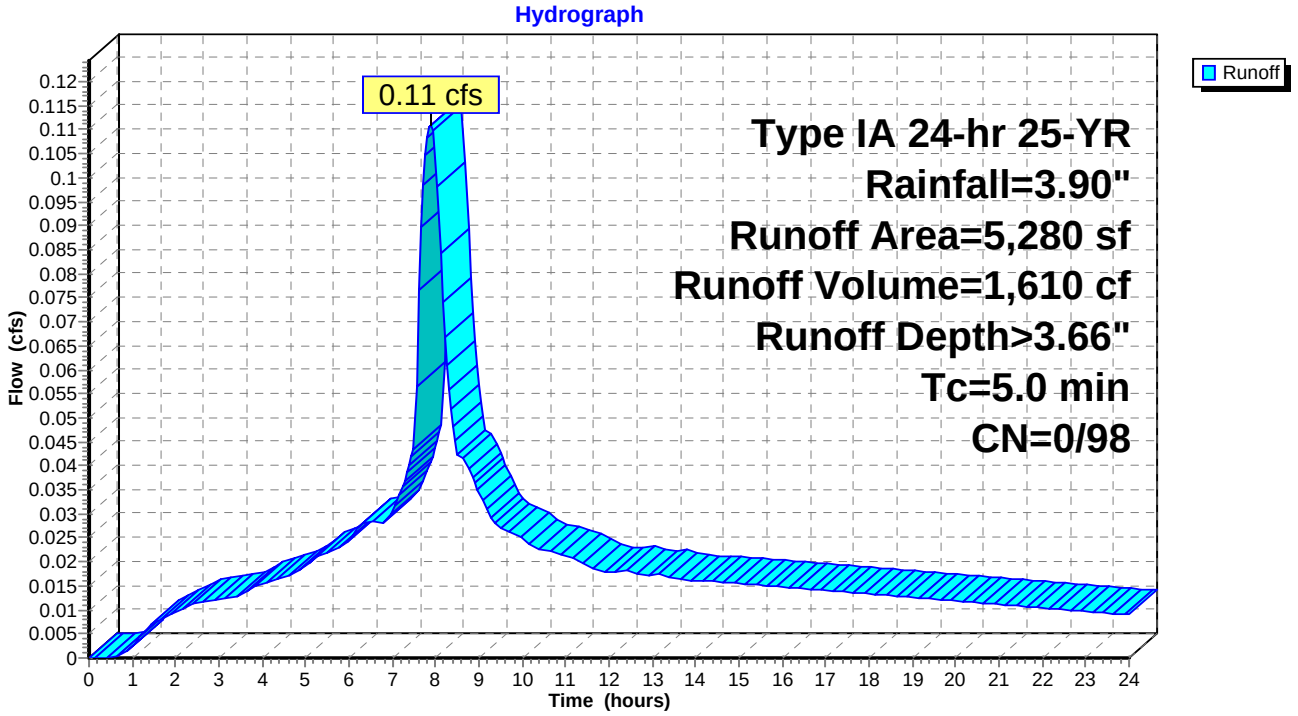
Runoff = 0.11 cfs @ 7.90 hrs, Volume= 1,610 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	5,280	98	2 Lots @ 2640 sf
	5,280	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 17.1S: Lot 46 & 47



Summary for Subcatchment 17S:

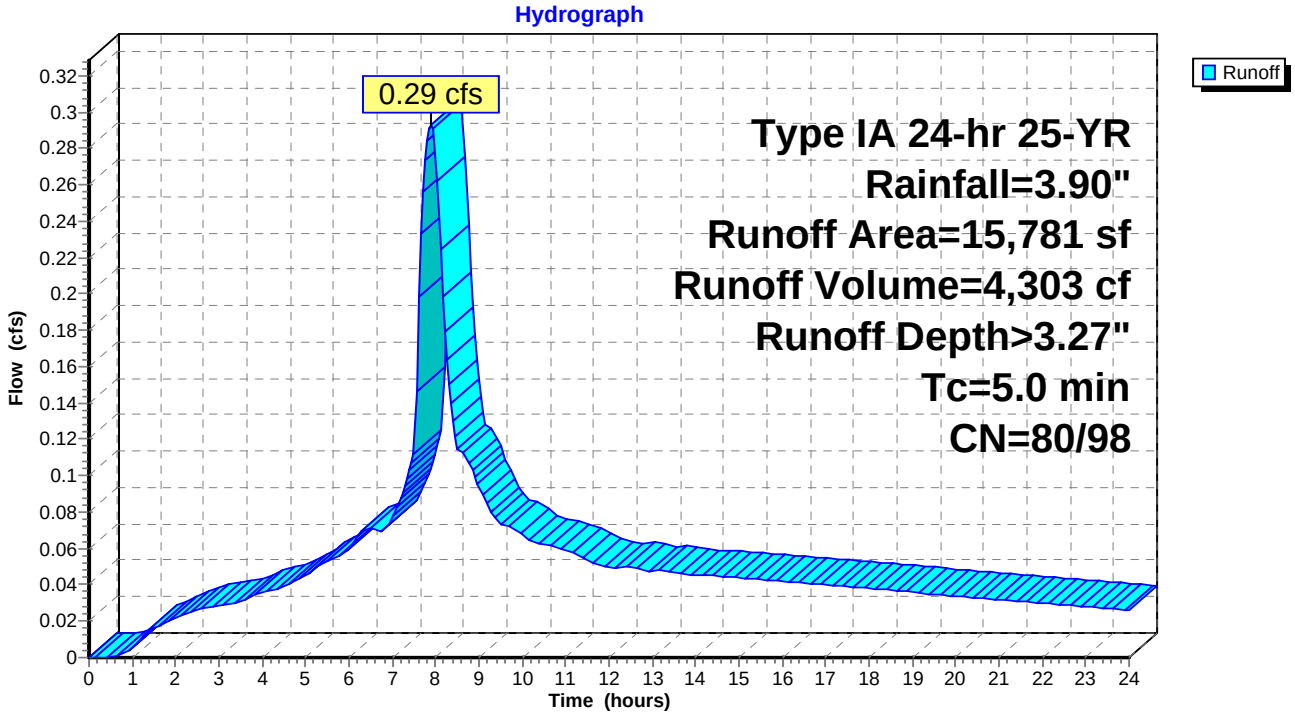
Runoff = 0.29 cfs @ 7.91 hrs, Volume= 4,303 cf, Depth> 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	2,464	98	Pedestrian Access
*	1,975	98	SW Hall Blvd Widening
*	7,756	98	Existing SW Hall Blvd. Pavement
	3,586	80	>75% Grass cover, Good, HSG D
	15,781	94	Weighted Average
	3,586	80	Pervious Area
	12,195	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 17S:



Summary for Subcatchment 18.1S: Lots 43-45 & 48-53

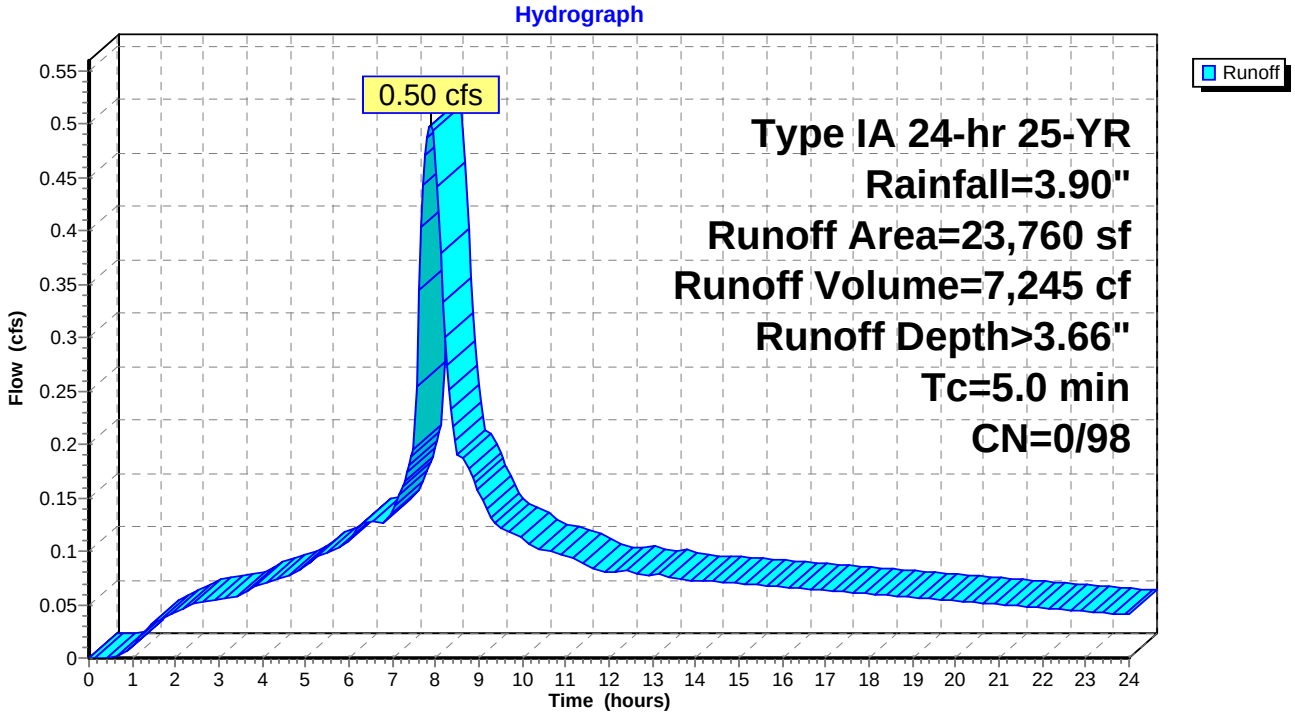
Runoff = 0.50 cfs @ 7.90 hrs, Volume= 7,245 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	23,760	98	9 Lots @ 2640 sf
	23,760	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 18.1S: Lots 43-45 & 48-53



Summary for Subcatchment 19.1S: Lots 1 and 36

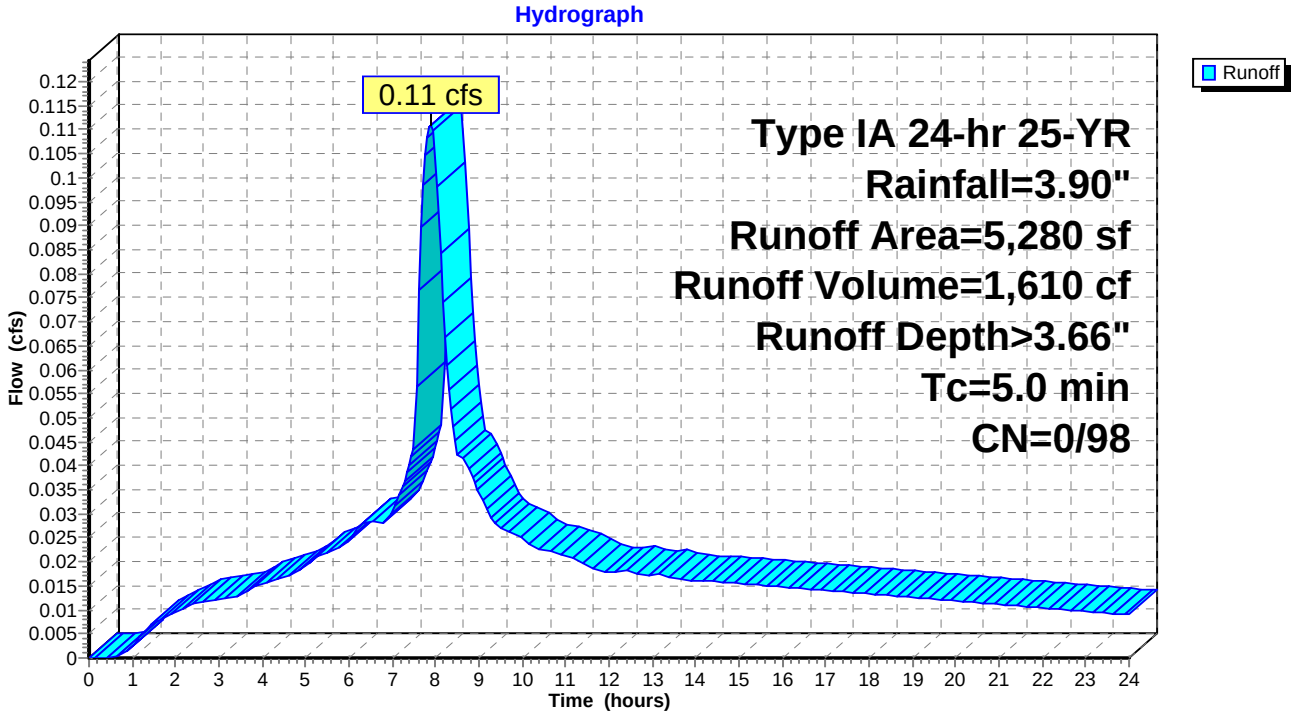
Runoff = 0.11 cfs @ 7.90 hrs, Volume= 1,610 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	5,280	98	2 Lots @ 2640 sf
	5,280	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 19.1S: Lots 1 and 36



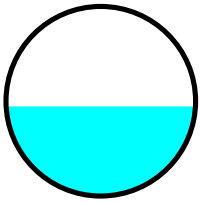
Summary for Reach 101R: 18" PVC

Inflow Area = 400,708 sf, 72.45% Impervious, Inflow Depth > 2.30" for 25-YR event
Inflow = 2.83 cfs @ 8.64 hrs, Volume= 76,674 cf
Outflow = 2.83 cfs @ 8.65 hrs, Volume= 76,664 cf, Atten= 0%, Lag= 0.2 min

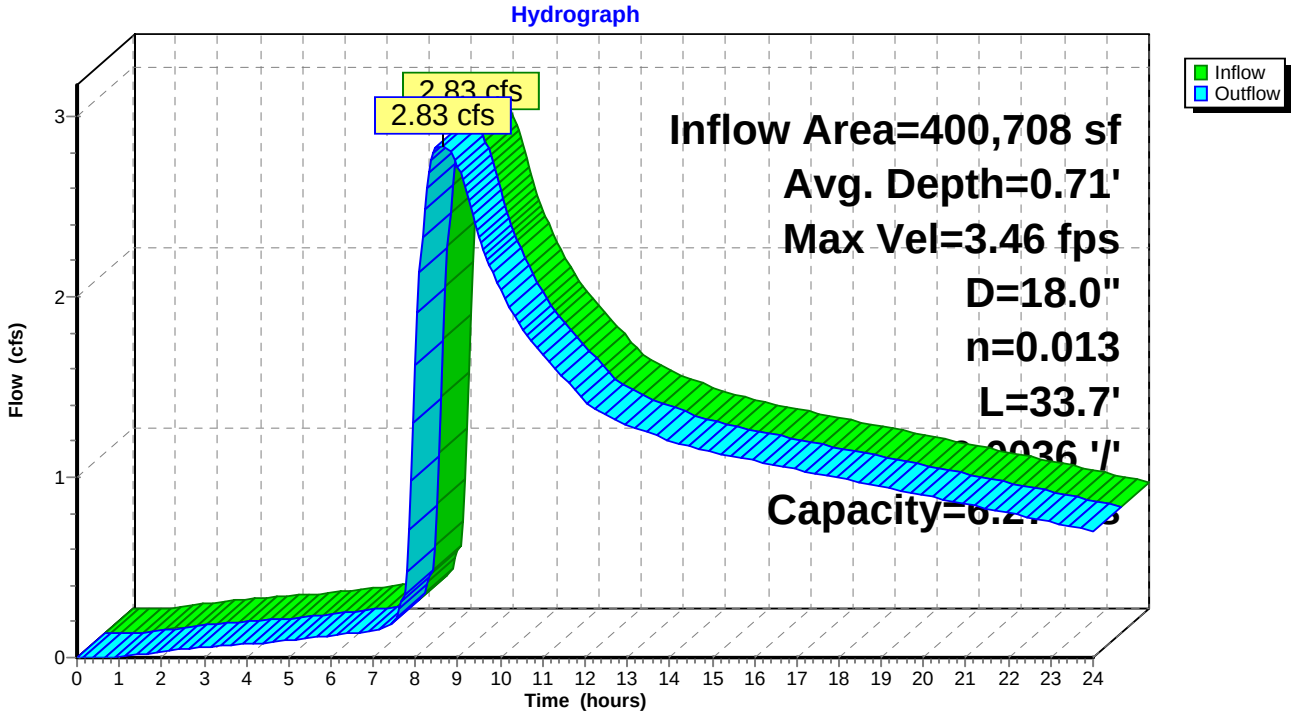
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 3.46 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.26 fps, Avg. Travel Time= 0.2 min

Peak Storage= 28 cf @ 8.65 hrs, Average Depth at Peak Storage= 0.71'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 6.27 cfs

18.0" Diameter Pipe, n= 0.013
Length= 33.7' Slope= 0.0036 '/'
Inlet Invert= 186.21', Outlet Invert= 186.09'



Reach 101R: 18" PVC



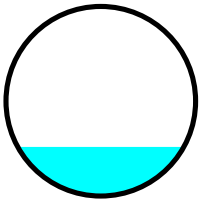
Summary for Reach 102R: 24" RCP

Inflow Area = 400,708 sf, 72.45% Impervious, Inflow Depth > 2.30" for 25-YR event
Inflow = 2.83 cfs @ 8.65 hrs, Volume= 76,664 cf
Outflow = 2.83 cfs @ 8.66 hrs, Volume= 76,619 cf, Atten= 0%, Lag= 0.5 min

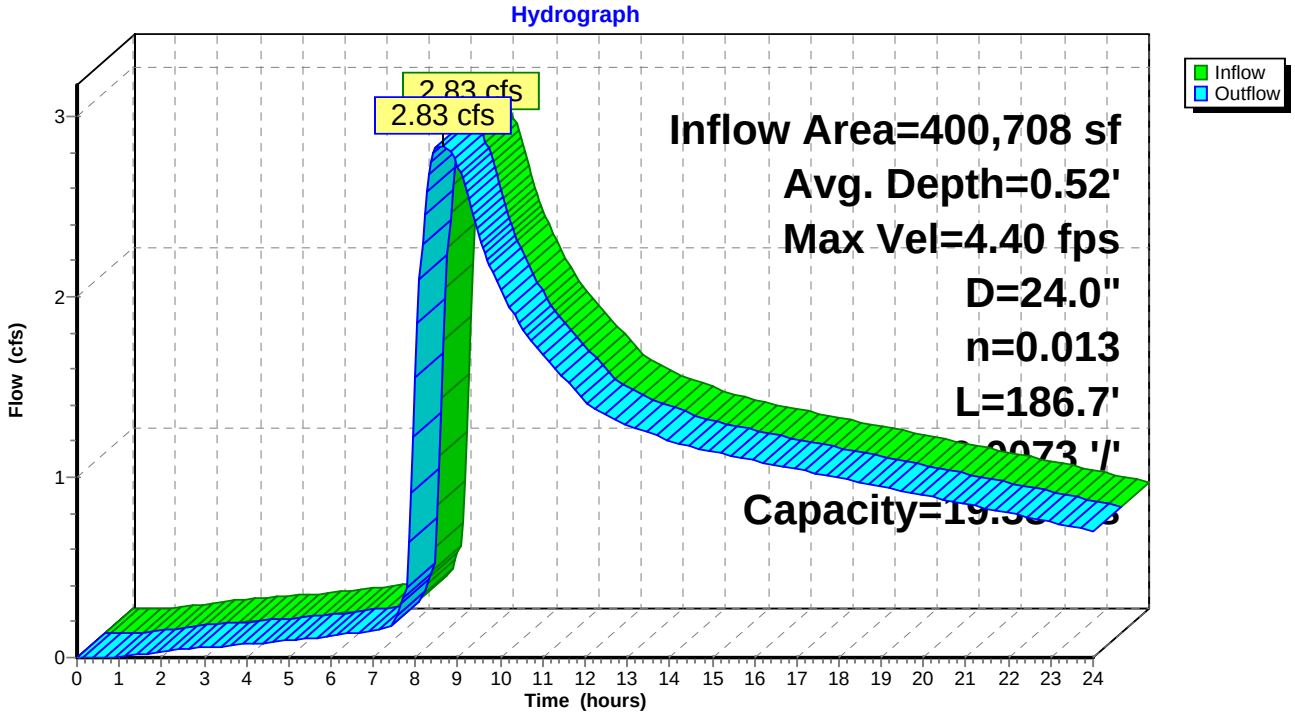
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 4.40 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 2.83 fps, Avg. Travel Time= 1.1 min

Peak Storage= 120 cf @ 8.66 hrs, Average Depth at Peak Storage= 0.52'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 19.38 cfs

24.0" Diameter Pipe, n= 0.013
Length= 186.7' Slope= 0.0073 '/'
Inlet Invert= 185.89', Outlet Invert= 184.52'



Reach 102R: 24" RCP



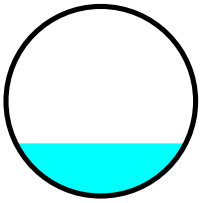
Summary for Reach 103R: 24" RCP

Inflow Area = 482,660 sf, 68.22% Impervious, Inflow Depth > 2.37" for 25-YR event
Inflow = 3.37 cfs @ 8.39 hrs, Volume= 95,501 cf
Outflow = 3.37 cfs @ 8.40 hrs, Volume= 95,431 cf, Atten= 0%, Lag= 0.7 min

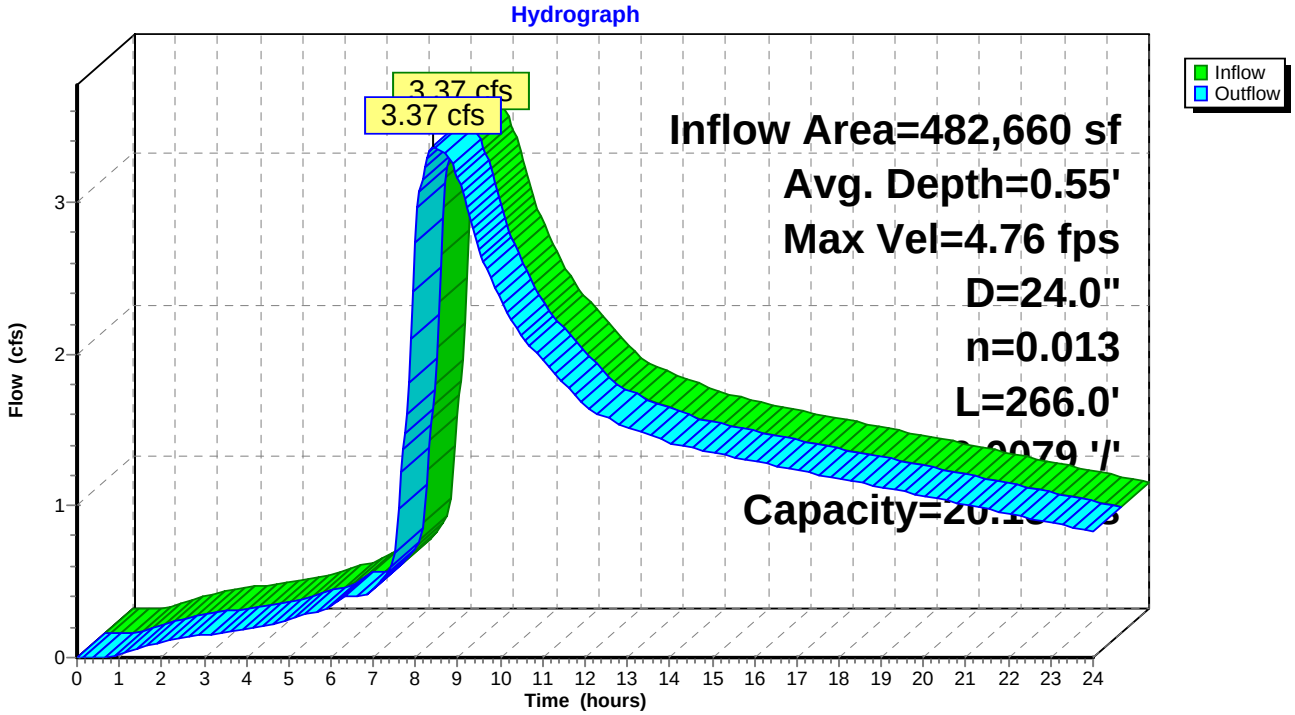
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 4.76 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 3.20 fps, Avg. Travel Time= 1.4 min

Peak Storage= 188 cf @ 8.40 hrs, Average Depth at Peak Storage= 0.55'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 20.15 cfs

24.0" Diameter Pipe, n= 0.013
Length= 266.0' Slope= 0.0079 '/'
Inlet Invert= 184.30', Outlet Invert= 182.19'



Reach 103R: 24" RCP



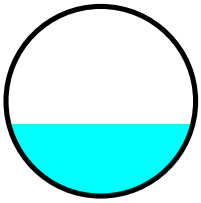
Summary for Reach 104R: 24" RCP

Inflow Area = 700,706 sf, 64.22% Impervious, Inflow Depth > 2.54" for 25-YR event
Inflow = 6.24 cfs @ 8.02 hrs, Volume= 148,096 cf
Outflow = 6.23 cfs @ 8.03 hrs, Volume= 148,027 cf, Atten= 0%, Lag= 0.7 min

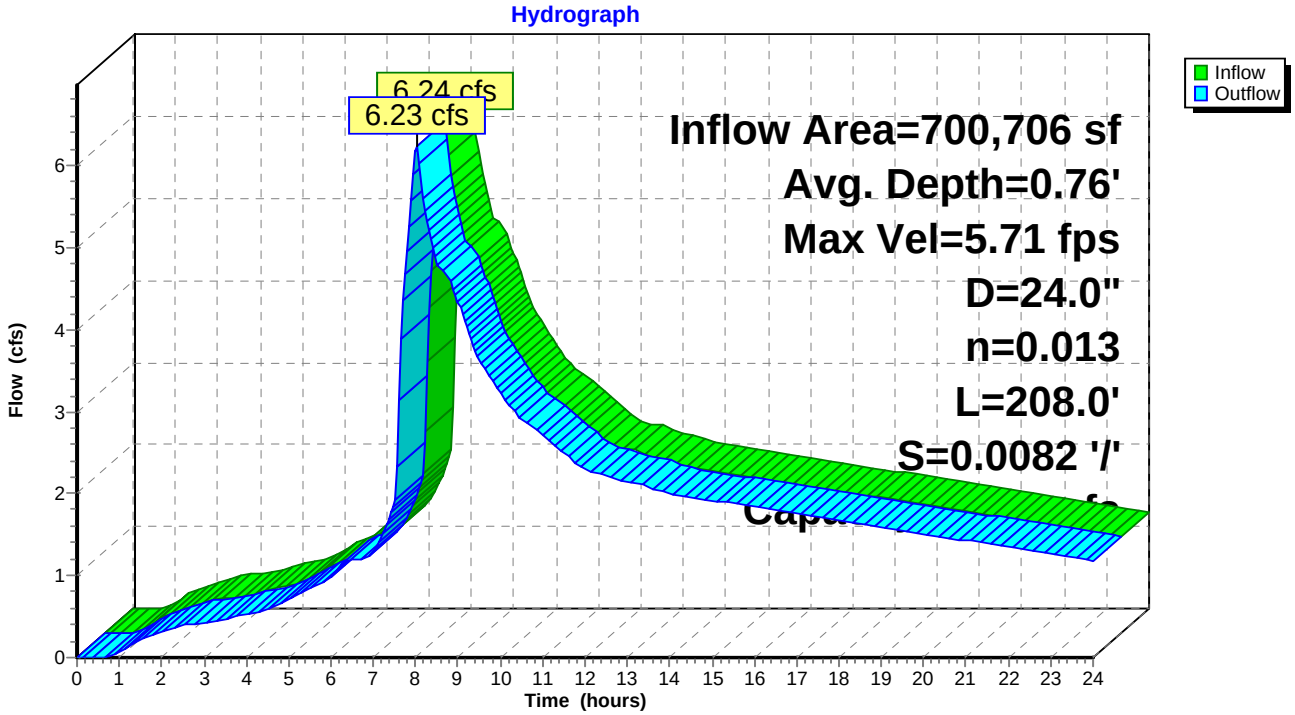
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 5.71 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 3.77 fps, Avg. Travel Time= 0.9 min

Peak Storage= 227 cf @ 8.03 hrs, Average Depth at Peak Storage= 0.76'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 20.45 cfs

24.0" Diameter Pipe, n= 0.013
Length= 208.0' Slope= 0.0082 '/'
Inlet Invert= 181.99', Outlet Invert= 180.29'



Reach 104R: 24" RCP



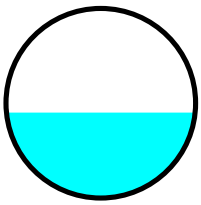
Summary for Reach 105R: 24" RCP

Inflow Area = 811,972 sf, 63.90% Impervious, Inflow Depth > 2.60" for 25-YR event
Inflow = 8.05 cfs @ 8.01 hrs, Volume= 175,929 cf
Outflow = 8.04 cfs @ 8.01 hrs, Volume= 175,915 cf, Atten= 0%, Lag= 0.1 min

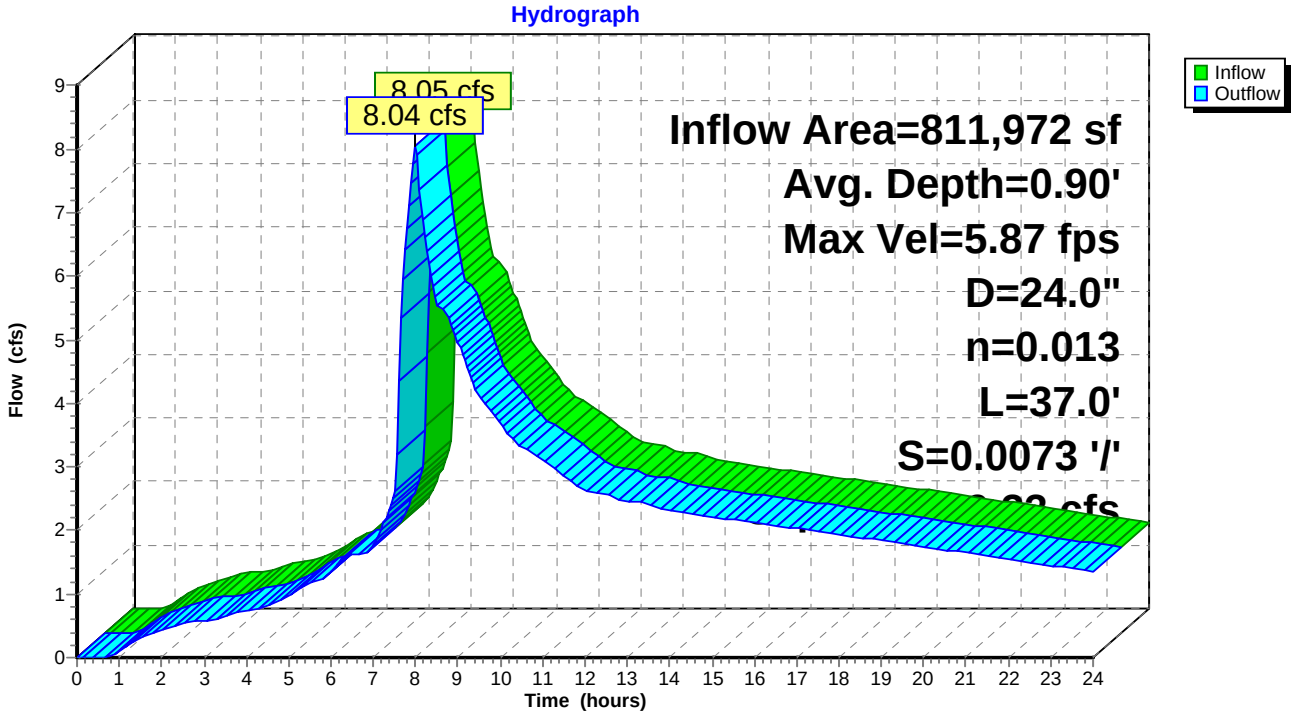
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 5.87 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.81 fps, Avg. Travel Time= 0.2 min

Peak Storage= 51 cf @ 8.01 hrs, Average Depth at Peak Storage= 0.90'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 19.33 cfs

24.0" Diameter Pipe, n= 0.013
Length= 37.0' Slope= 0.0073 '/'
Inlet Invert= 180.29', Outlet Invert= 180.02'



Reach 105R: 24" RCP



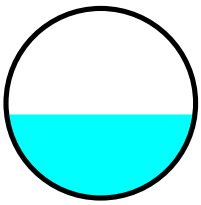
Summary for Reach 106R: 24" RCP

Inflow Area = 813,783 sf, 63.98% Impervious, Inflow Depth > 2.60" for 25-YR event
Inflow = 8.08 cfs @ 8.01 hrs, Volume= 176,468 cf
Outflow = 8.07 cfs @ 8.01 hrs, Volume= 176,426 cf, Atten= 0%, Lag= 0.3 min

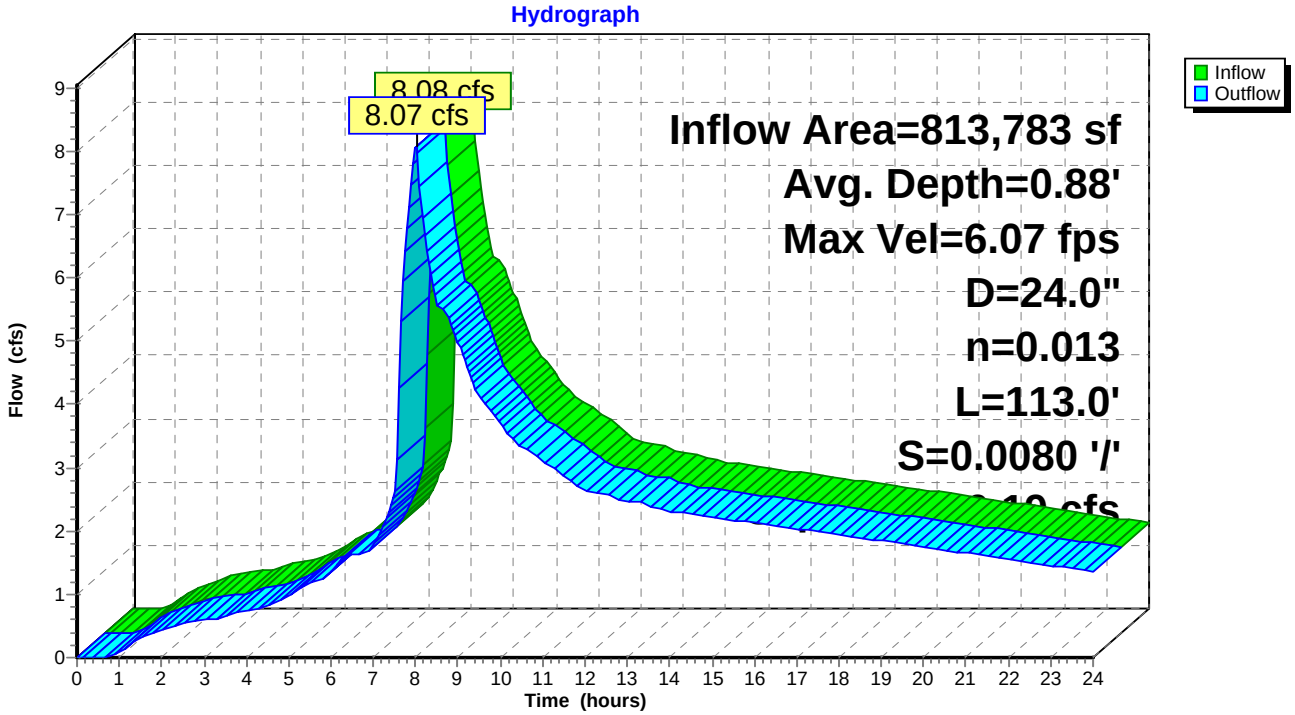
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 6.07 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.94 fps, Avg. Travel Time= 0.5 min

Peak Storage= 150 cf @ 8.01 hrs, Average Depth at Peak Storage= 0.88'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 20.19 cfs

24.0" Diameter Pipe, n= 0.013
Length= 113.0' Slope= 0.0080 '/'
Inlet Invert= 179.99', Outlet Invert= 179.09'



Reach 106R: 24" RCP



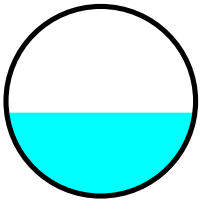
Summary for Reach 107R: 24" RCP

Inflow Area = 813,783 sf, 63.98% Impervious, Inflow Depth > 2.60" for 25-YR event
Inflow = 8.07 cfs @ 8.01 hrs, Volume= 176,426 cf
Outflow = 8.05 cfs @ 8.02 hrs, Volume= 176,324 cf, Atten= 0%, Lag= 0.8 min

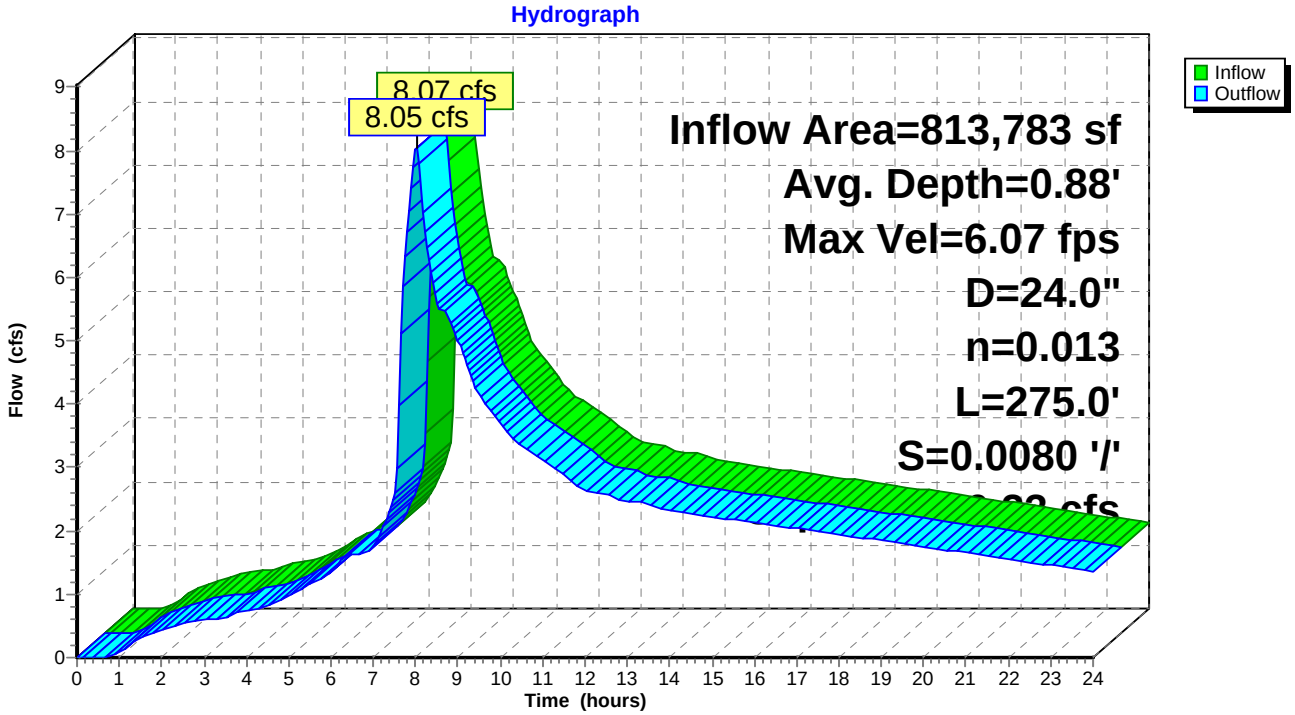
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 6.07 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 3.95 fps, Avg. Travel Time= 1.2 min

Peak Storage= 364 cf @ 8.02 hrs, Average Depth at Peak Storage= 0.88'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 20.23 cfs

24.0" Diameter Pipe, n= 0.013
Length= 275.0' Slope= 0.0080 '/'
Inlet Invert= 178.89', Outlet Invert= 176.69'



Reach 107R: 24" RCP



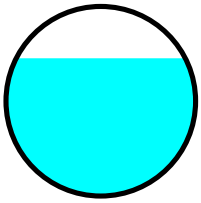
Summary for Reach 110R: 30" RCP

Inflow Area = 2,297,575 sf, 54.79% Impervious, Inflow Depth > 2.73" for 25-YR event
Inflow = 31.21 cfs @ 7.98 hrs, Volume= 522,836 cf
Outflow = 31.17 cfs @ 7.98 hrs, Volume= 522,705 cf, Atten= 0%, Lag= 0.1 min

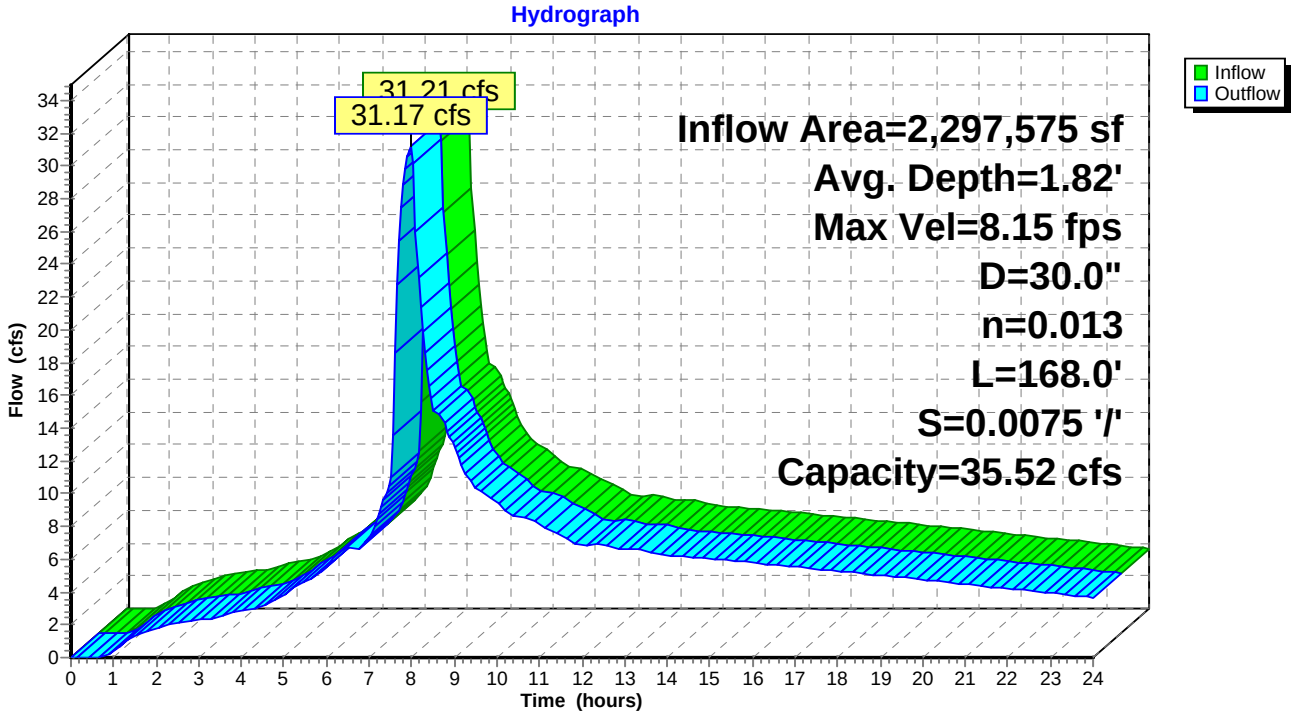
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 8.15 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 5.17 fps, Avg. Travel Time= 0.5 min

Peak Storage= 642 cf @ 7.98 hrs, Average Depth at Peak Storage= 1.82'
Bank-Full Depth= 2.50', Capacity at Bank-Full= 35.52 cfs

30.0" Diameter Pipe, n= 0.013
Length= 168.0' Slope= 0.0075 '/'
Inlet Invert= 175.12', Outlet Invert= 173.86'



Reach 110R: 30" RCP



Summary for Pond 1P: WQ Extended Dry Basin

Inflow Area = 384,927 sf, 72.25% Impervious, Inflow Depth > 3.18" for 25-YR event
Inflow = 6.78 cfs @ 7.92 hrs, Volume= 102,103 cf
Outflow = 2.72 cfs @ 8.67 hrs, Volume= 72,372 cf, Atten= 60%, Lag= 44.9 min
Primary = 2.72 cfs @ 8.67 hrs, Volume= 72,372 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.24' @ 8.67 hrs Surf.Area= 15,432 sf Storage= 35,337 cf
Flood Elev= 190.75' Surf.Area= 17,158 sf Storage= 52,607 cf

Plug-Flow detention time= 341.8 min calculated for 72,221 cf (71% of inflow)
Center-of-Mass det. time= 160.8 min (845.6 - 684.8)

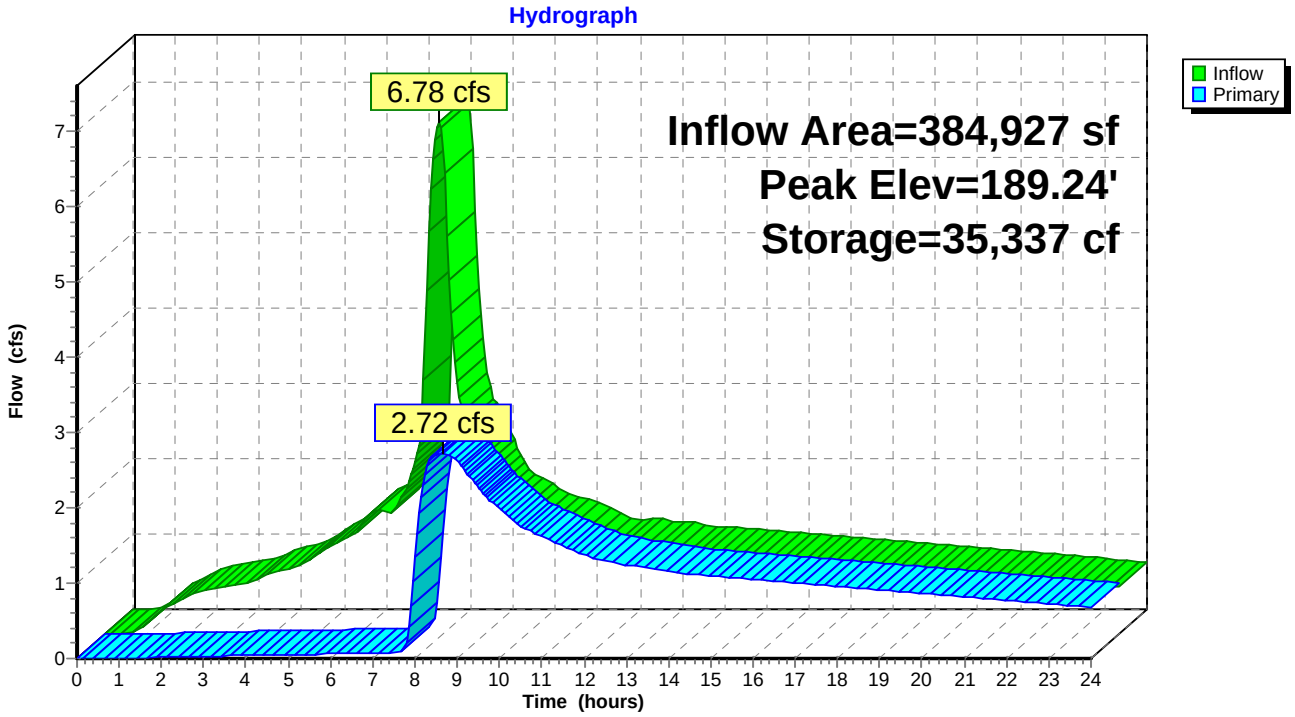
Volume	Invert	Avail.Storage	Storage Description
#1	186.60'	52,607 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
186.60	11,407	0	0
187.00	11,989	4,679	4,679
188.00	13,486	12,738	17,417
189.00	15,044	14,265	31,682
190.00	16,661	15,853	47,534
190.30	17,158	5,073	52,607

Device	Routing	Invert	Outlet Devices
#1	Device 2	186.60'	**2.0' long (Profile 17) Broad-Crested Rectangular Weir** Head (feet) 0.49 0.98 1.48 1.97 2.46 2.95 Coef. (English) 2.84 3.13 3.26 3.30 3.31 3.31
#2	Device 4	186.60'	**1.5" Vert. WQ Orifice** C= 0.620
#3	Device 4	188.65'	**2.0' long (Profile 17) Broad-Crested Rectangular Weir** Head (feet) 0.49 0.98 1.48 1.97 2.46 2.95 Coef. (English) 2.84 3.13 3.26 3.30 3.31 3.31
#4	Primary	186.53'	**18.0" x 12.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 186.49' S= 0.0033 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=2.72 cfs @ 8.67 hrs HW=189.24' TW=186.92' (Dynamic Tailwater)
- **4=Culvert** (Passes 2.72 cfs of 11.91 cfs potential flow)
  - **2=WQ Orifice** (Orifice Controls 0.09 cfs @ 7.58 fps)
    - **1=Broad-Crested Rectangular Weir** (Passes 0.09 cfs of 27.93 cfs potential flow)
  - **3=Broad-Crested Rectangular Weir** (Weir Controls 2.63 cfs @ 2.23 fps)

Pond 1P: WQ Extended Dry Basin



Summary for Pond 2R: STM MH A0

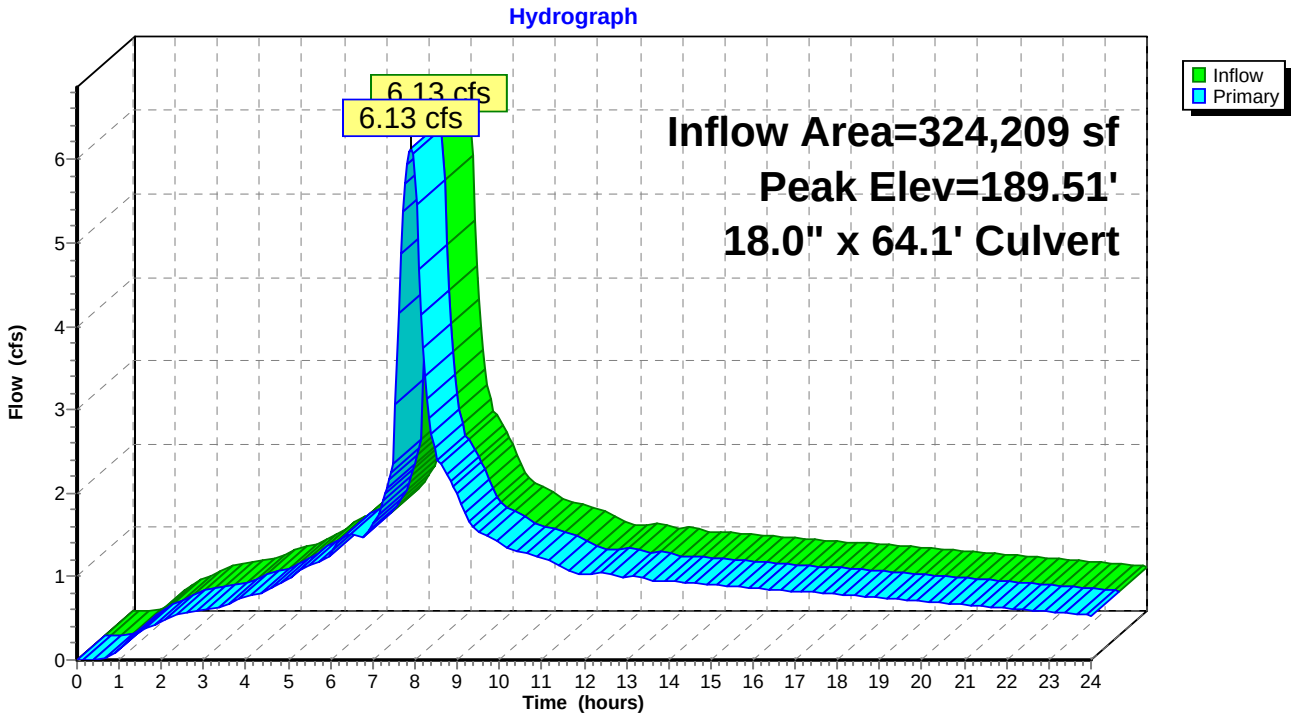
Inflow Area =	324,209 sf,	80.25% Impervious,	Inflow Depth >	3.32"	for 25-YR event
Inflow =	6.13 cfs @	7.91 hrs,	Volume=	89,763 cf	
Outflow =	6.13 cfs @	7.91 hrs,	Volume=	89,763 cf,	Atten= 0%, Lag= 0.0 min
Primary =	6.13 cfs @	7.91 hrs,	Volume=	89,763 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.51' @ 8.01 hrs
Flood Elev= 191.68'

Device	Routing	Invert	Outlet Devices
#1	Primary	186.99'	**18.0" x 64.1' long Culvert** Ke= 0.500 Outlet Invert= 186.73' S= 0.0041 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=6.13 cfs @ 7.91 hrs HW=189.41' TW=188.89' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 6.13 cfs @ 3.47 fps)

Pond 2R: STM MH A0



Summary for Pond 3R: STM MH A1

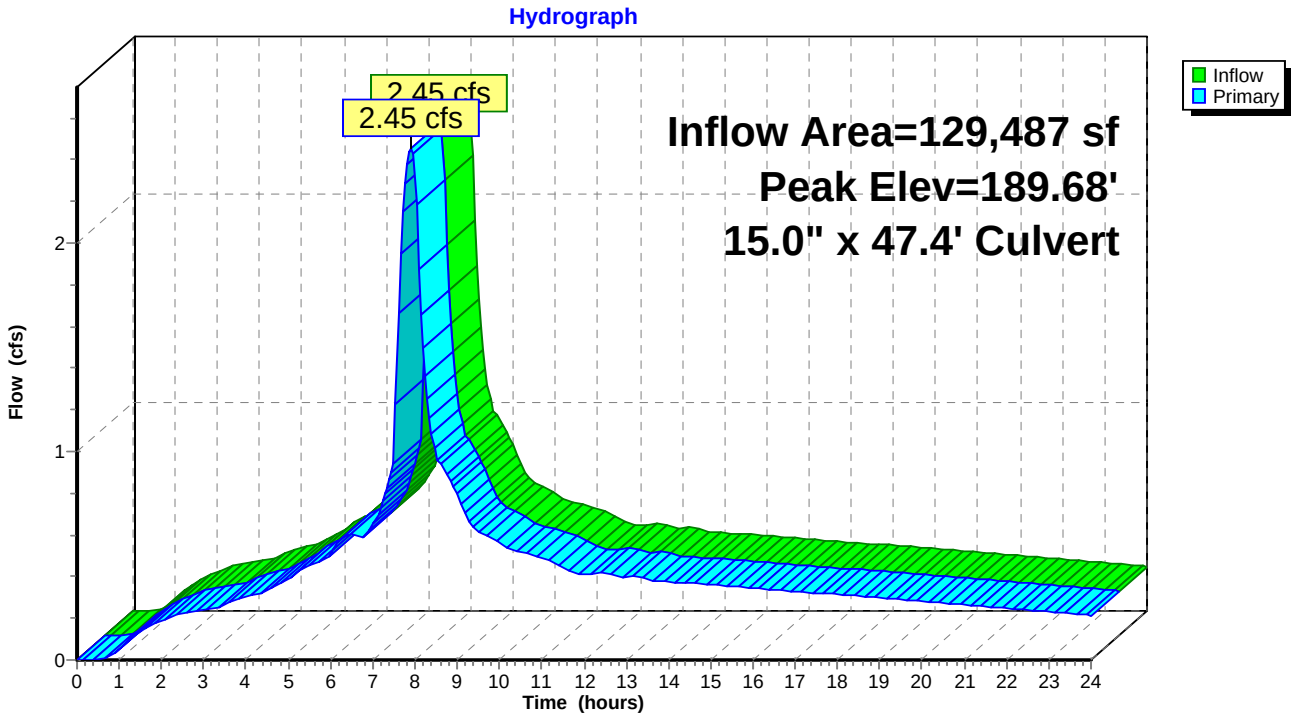
Inflow Area =	129,487 sf,	80.41% Impervious,	Inflow Depth >	3.33"	for 25-YR event
Inflow =	2.45 cfs @	7.91 hrs,	Volume=	35,881 cf	
Outflow =	2.45 cfs @	7.91 hrs,	Volume=	35,881 cf,	Atten= 0%, Lag= 0.0 min
Primary =	2.45 cfs @	7.91 hrs,	Volume=	35,881 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.68' @ 8.00 hrs
Flood Elev= 192.11'

Device	Routing	Invert	Outlet Devices
#1	Primary	187.38'	**15.0" x 47.4' long Culvert** Ke= 0.500 Outlet Invert= 187.19' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=2.45 cfs @ 7.91 hrs HW=189.58' TW=189.41' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.45 cfs @ 2.00 fps)

Pond 3R: STM MH A1



Summary for Pond 4R: STM MH A2

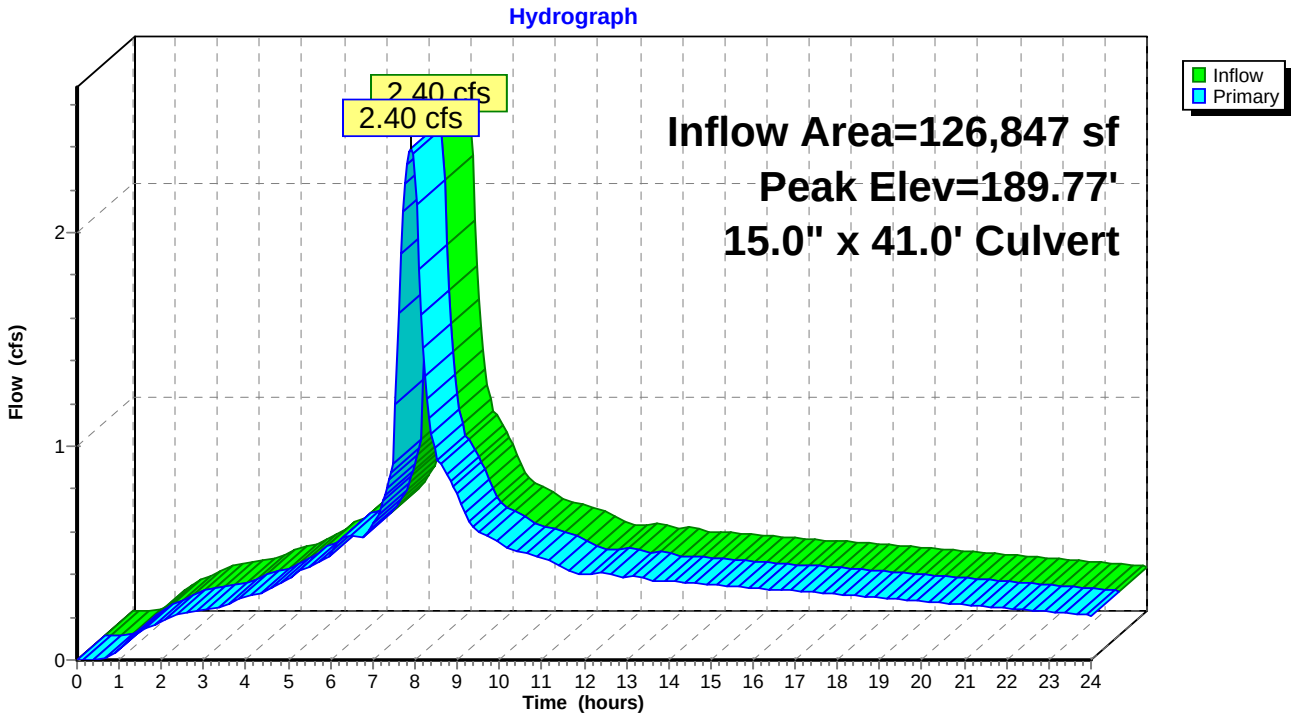
Inflow Area =	126,847 sf,	80.00% Impervious,	Inflow Depth >	3.32"	for 25-YR event
Inflow =	2.40 cfs @	7.91 hrs,	Volume=	35,076 cf	
Outflow =	2.40 cfs @	7.91 hrs,	Volume=	35,076 cf,	Atten= 0%, Lag= 0.0 min
Primary =	2.40 cfs @	7.91 hrs,	Volume=	35,076 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.77' @ 7.99 hrs
Flood Elev= 192.36'

Device	Routing	Invert	Outlet Devices
#1	Primary	187.74'	**15.0" x 41.0' long Culvert** Ke= 0.500 Outlet Invert= 187.58' S= 0.0039 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=1.77 cfs @ 7.91 hrs HW=189.67' TW=189.58' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.77 cfs @ 1.44 fps)

Pond 4R: STM MH A2



Summary for Pond 5R: STM MH A3

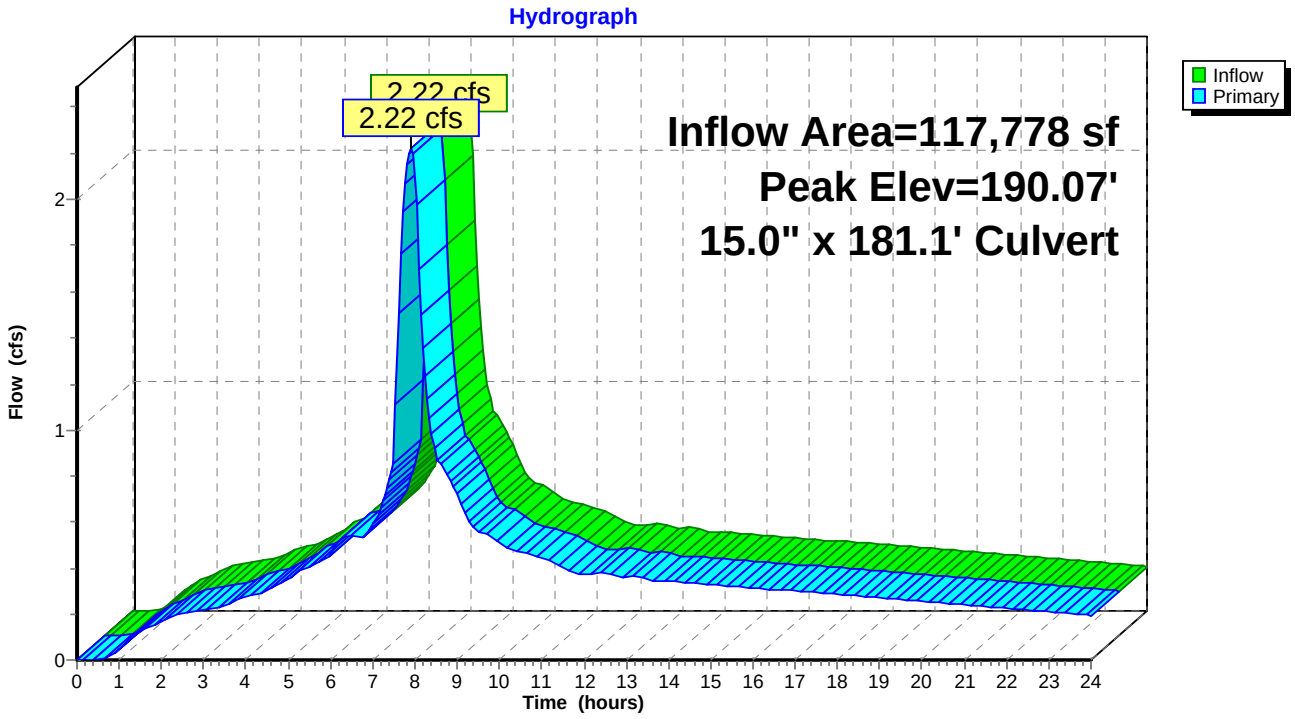
Inflow Area =	117,778 sf,	79.81% Impervious,	Inflow Depth >	3.31"	for 25-YR event
Inflow =	2.22 cfs @	7.91 hrs,	Volume=	32,536 cf	
Outflow =	2.22 cfs @	7.91 hrs,	Volume=	32,536 cf,	Atten= 0%, Lag= 0.0 min
Primary =	2.22 cfs @	7.91 hrs,	Volume=	32,536 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.07' @ 8.00 hrs
Flood Elev= 193.63'

Device	Routing	Invert	Outlet Devices
#1	Primary	188.66'	**15.0" x 181.1' long Culvert** Ke= 0.500 Outlet Invert= 187.94' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=2.20 cfs @ 7.91 hrs HW=189.99' TW=189.67' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 2.20 cfs @ 2.09 fps)

Pond 5R: STM MH A3



Summary for Pond 6R: STM MH A4

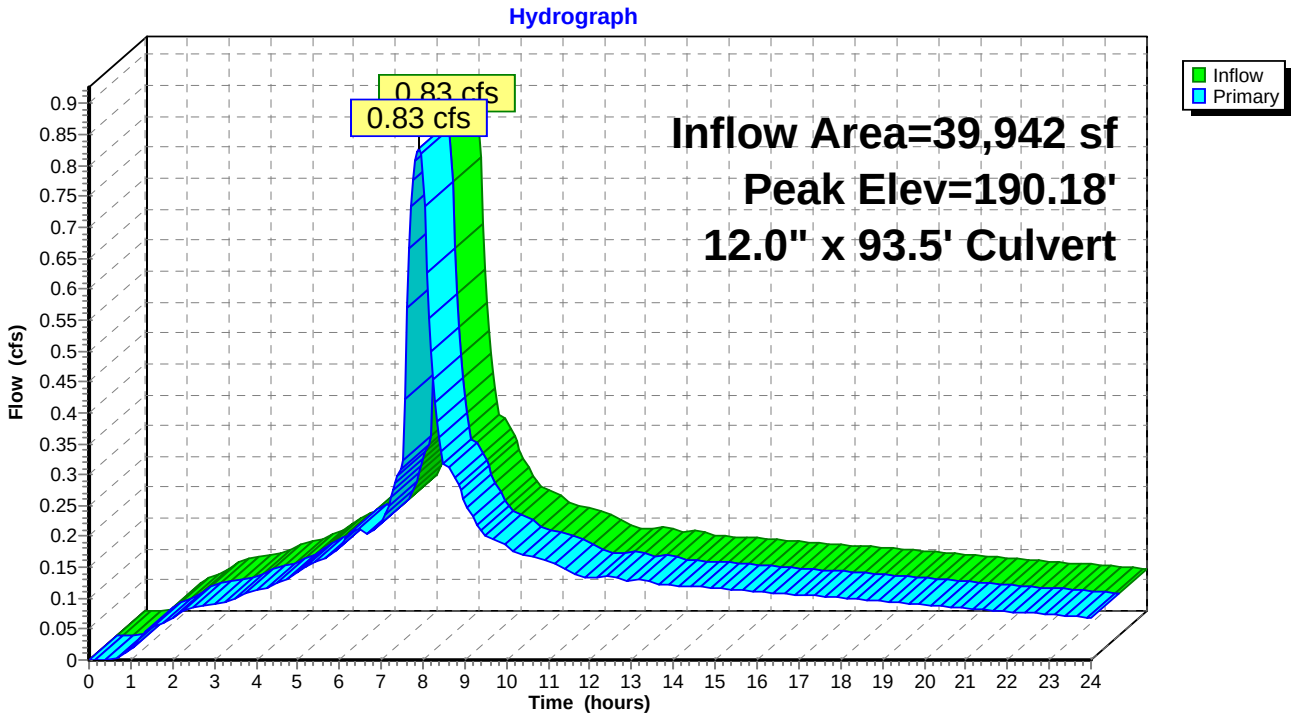
Inflow Area = 39,942 sf, 97.07% Impervious, Inflow Depth > 3.61" for 25-YR event
Inflow = 0.83 cfs @ 7.90 hrs, Volume= 12,013 cf
Outflow = 0.83 cfs @ 7.90 hrs, Volume= 12,013 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.83 cfs @ 7.90 hrs, Volume= 12,013 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.18' @ 8.00 hrs
Flood Elev= 194.32'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.23'	**12.0" x 93.5' long Culvert** Ke= 0.500 Outlet Invert= 188.86' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.82 cfs @ 7.90 hrs HW=190.11' TW=189.98' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.82 cfs @ 1.49 fps)

Pond 6R: STM MH A4



Summary for Pond 7R: STM MH A5

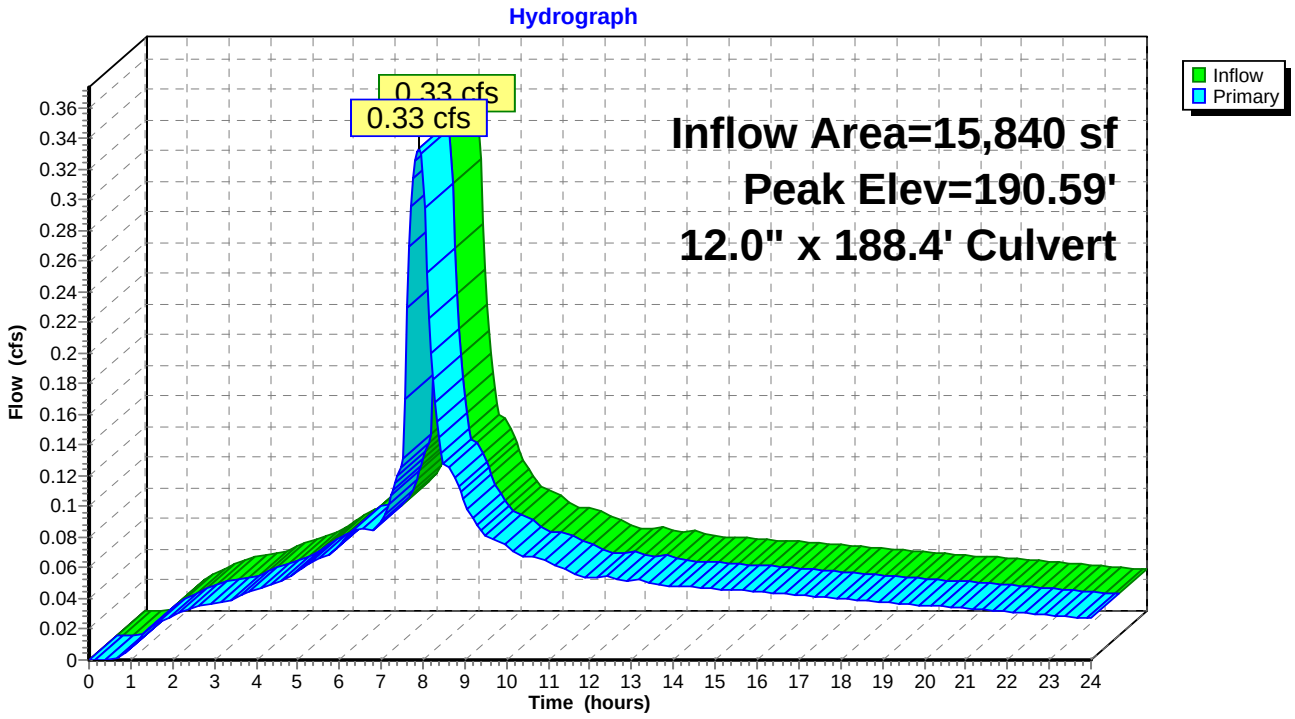
Inflow Area = 15,840 sf,100.00% Impervious, Inflow Depth > 3.66" for 25-YR event
Inflow = 0.33 cfs @ 7.90 hrs, Volume= 4,830 cf
Outflow = 0.33 cfs @ 7.90 hrs, Volume= 4,830 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.33 cfs @ 7.90 hrs, Volume= 4,830 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.59' @ 7.98 hrs
Flood Elev= 196.04'

Device	Routing	Invert	Outlet Devices
#1	Primary	190.18'	**12.0" x 188.4' long Culvert** Ke= 0.500 Outlet Invert= 189.43' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.32 cfs @ 7.90 hrs HW=190.58' TW=190.11' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.32 cfs @ 1.63 fps)

Pond 7R: STM MH A5



Summary for Pond 10R: STM MH B1

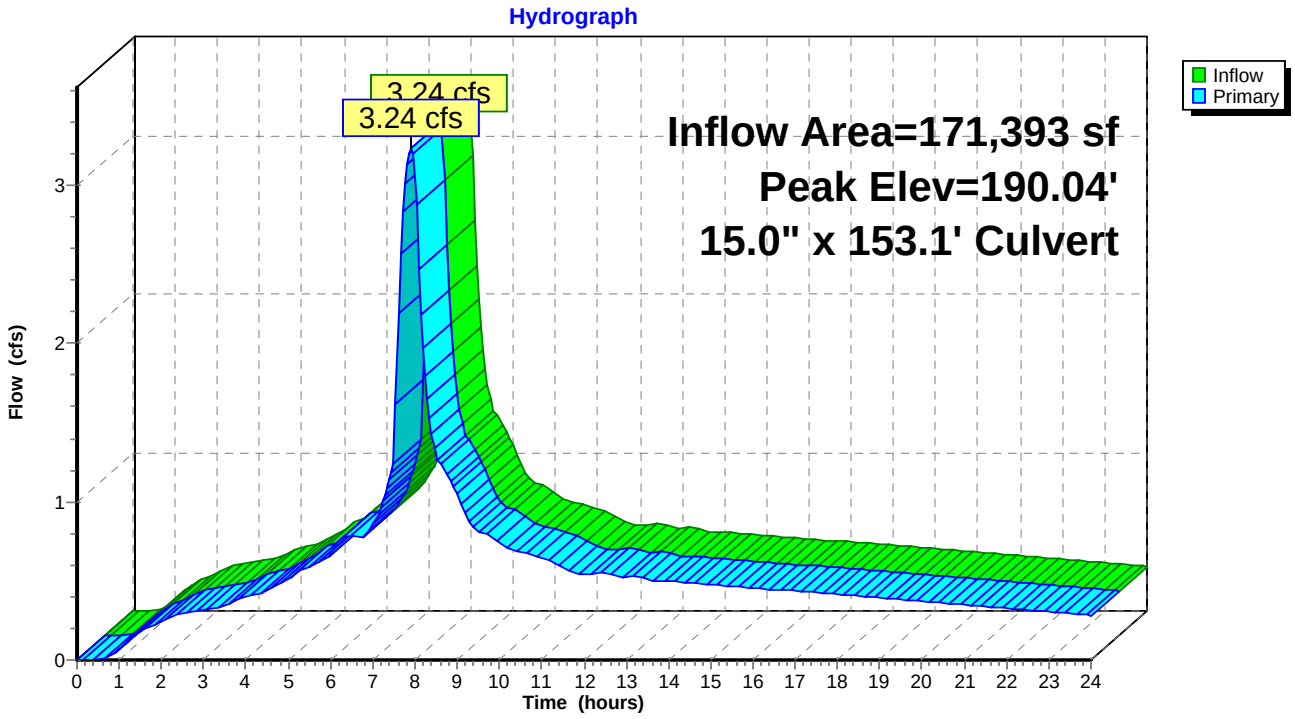
Inflow Area =	171,393 sf,	79.91% Impervious,	Inflow Depth >	3.32"	for 25-YR event
Inflow =	3.24 cfs @	7.91 hrs,	Volume=	47,372 cf	
Outflow =	3.24 cfs @	7.91 hrs,	Volume=	47,372 cf,	Atten= 0%, Lag= 0.0 min
Primary =	3.24 cfs @	7.91 hrs,	Volume=	47,372 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.04' @ 7.99 hrs
Flood Elev= 193.43'

Device	Routing	Invert	Outlet Devices
#1	Primary	187.80'	**15.0" x 153.1' long Culvert** Ke= 0.500 Outlet Invert= 187.19' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=3.23 cfs @ 7.91 hrs HW=189.95' TW=189.41' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 3.23 cfs @ 2.63 fps)

Pond 10R: STM MH B1



Summary for Pond 11R: STM MH B2

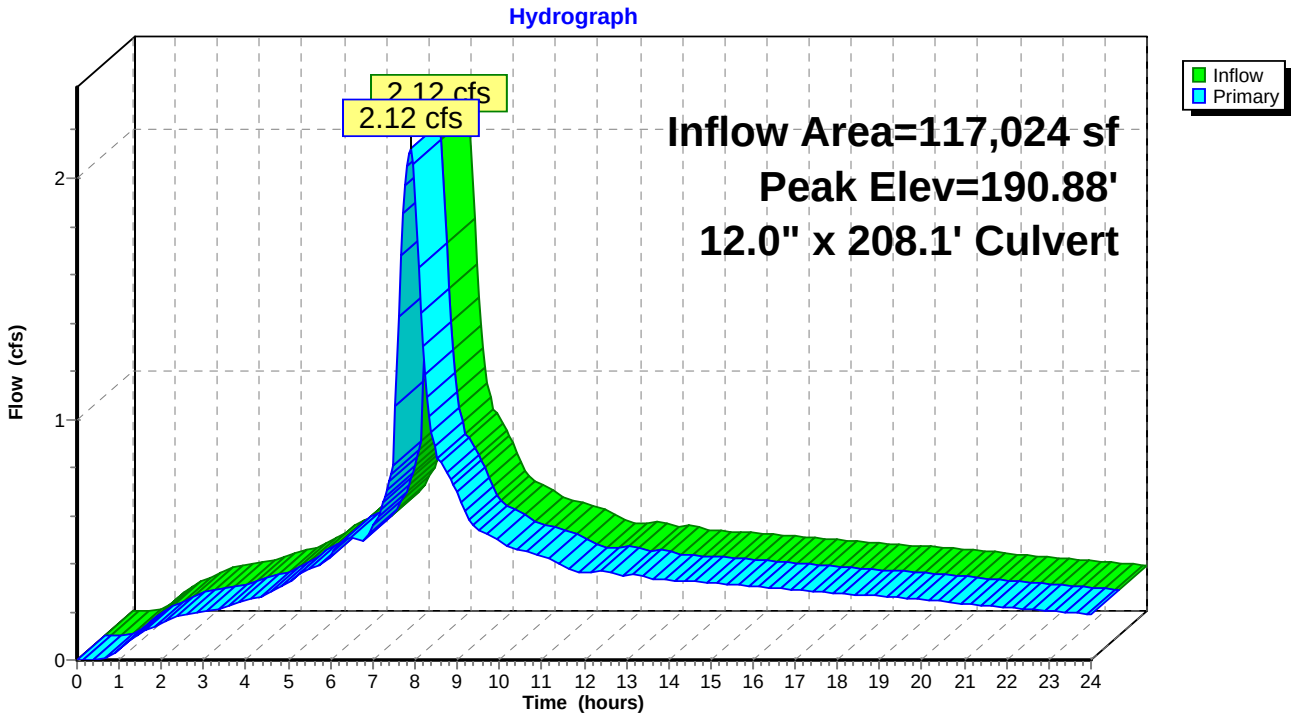
Inflow Area =	117,024 sf,	73.10% Impervious,	Inflow Depth >	3.20"	for 25-YR event
Inflow =	2.12 cfs @	7.91 hrs,	Volume=	31,212 cf	
Outflow =	2.12 cfs @	7.91 hrs,	Volume=	31,212 cf,	Atten= 0%, Lag= 0.0 min
Primary =	2.12 cfs @	7.91 hrs,	Volume=	31,212 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.88' @ 7.98 hrs
Flood Elev= 196.38'

Device	Routing	Invert	Outlet Devices
#1	Primary	188.83'	**12.0" x 208.1' long Culvert** Ke= 0.500 Outlet Invert= 188.00' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=2.03 cfs @ 7.91 hrs HW=190.79' TW=189.96' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 2.03 cfs @ 2.59 fps)

Pond 11R: STM MH B2



Summary for Pond 12R: STM MH B3

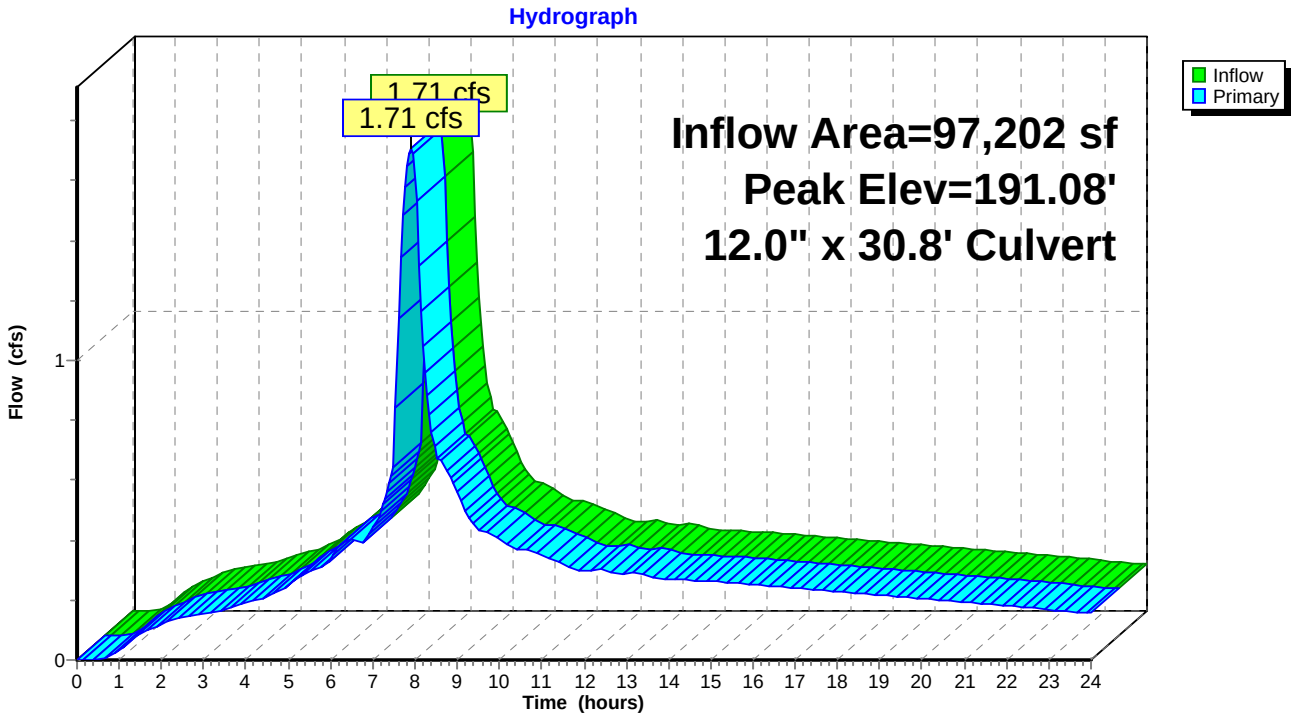
Inflow Area =	97,202 sf,	68.09% Impervious,	Inflow Depth >	3.12"	for 25-YR event
Inflow =	1.71 cfs @	7.92 hrs,	Volume=	25,234 cf	
Outflow =	1.71 cfs @	7.92 hrs,	Volume=	25,234 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.71 cfs @	7.92 hrs,	Volume=	25,234 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 191.08' @ 7.98 hrs
Flood Elev= 196.86'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.15'	**12.0" x 30.8' long Culvert** Ke= 0.500 Outlet Invert= 189.03' S= 0.0039 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=1.69 cfs @ 7.92 hrs HW=191.00' TW=190.80' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.69 cfs @ 2.15 fps)

Pond 12R: STM MH B3



Summary for Pond 13R: STM MH B4

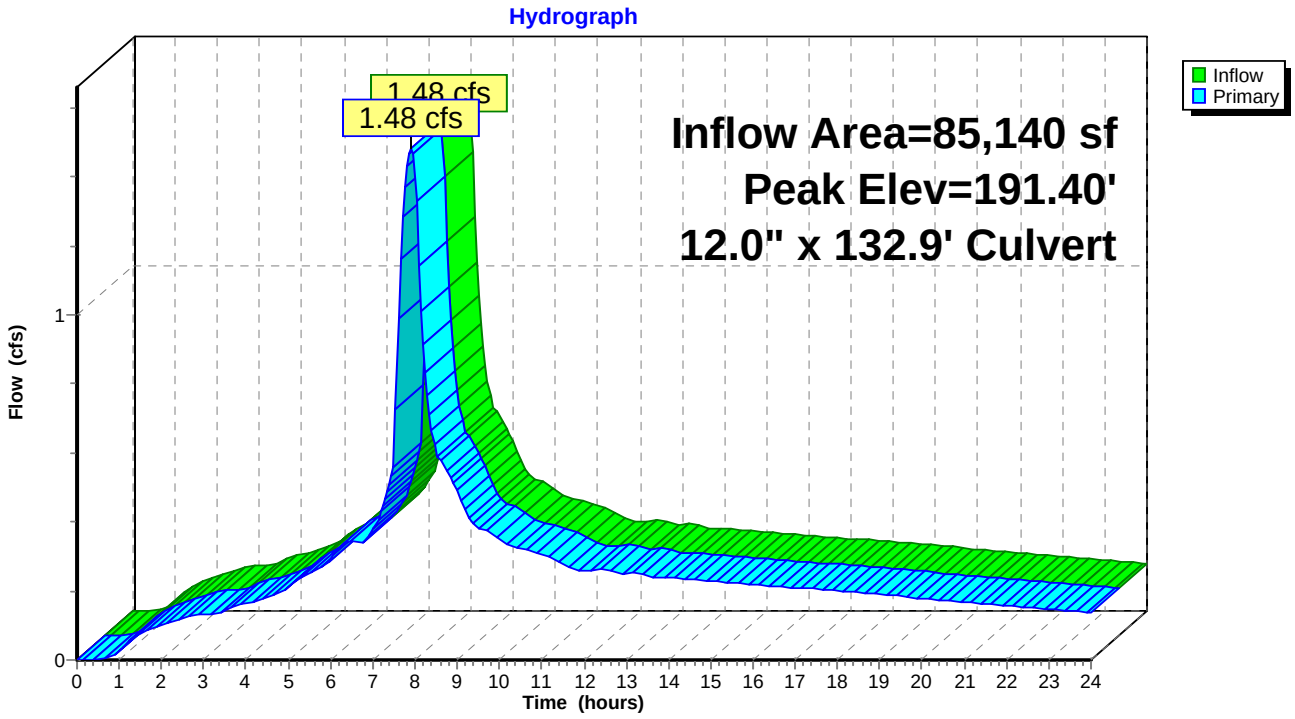
Inflow Area =	85,140 sf,	65.88% Impervious,	Inflow Depth >	3.08"	for 25-YR event
Inflow =	1.48 cfs @	7.92 hrs,	Volume=	21,835 cf	
Outflow =	1.48 cfs @	7.92 hrs,	Volume=	21,835 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.48 cfs @	7.92 hrs,	Volume=	21,835 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 191.40' @ 7.98 hrs
Flood Elev= 198.44'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.88'	**12.0" x 132.9' long Culvert** Ke= 0.500 Outlet Invert= 189.35' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=1.47 cfs @ 7.92 hrs HW=191.31' TW=191.00' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 1.47 cfs @ 1.87 fps)

Pond 13R: STM MH B4



Summary for Pond 14R: STM MH B5

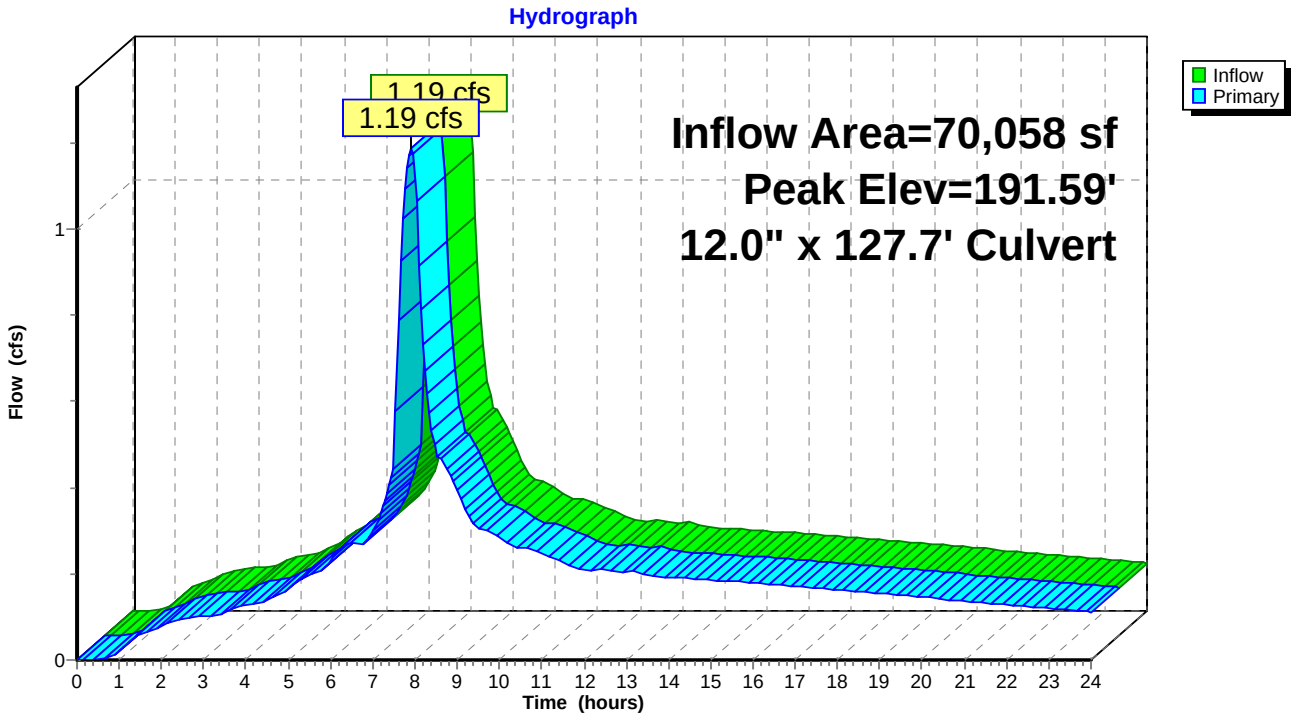
Inflow Area =	70,058 sf,	62.05% Impervious,	Inflow Depth >	3.01"	for 25-YR event
Inflow =	1.19 cfs @	7.92 hrs,	Volume=	17,586 cf	
Outflow =	1.19 cfs @	7.92 hrs,	Volume=	17,586 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.19 cfs @	7.92 hrs,	Volume=	17,586 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 191.59' @ 7.99 hrs
Flood Elev= 196.96'

Device	Routing	Invert	Outlet Devices
#1	Primary	190.59'	**12.0" x 127.7' long Culvert** Ke= 0.500 Outlet Invert= 190.08' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.98 cfs @ 7.92 hrs HW=191.52' TW=191.31' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.98 cfs @ 1.67 fps)

Pond 14R: STM MH B5



Summary for Pond 15R: STM MH B6

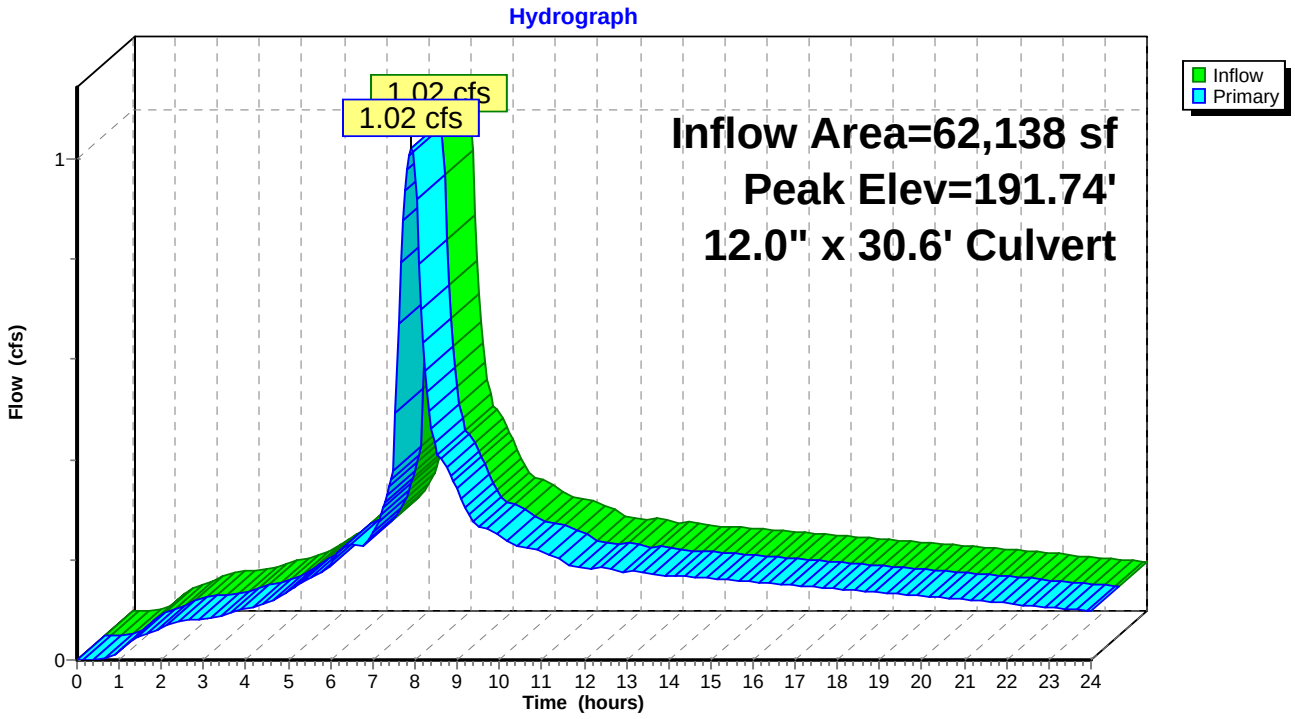
Inflow Area = 62,138 sf, 57.21% Impervious, Inflow Depth > 2.93" for 25-YR event
Inflow = 1.02 cfs @ 7.92 hrs, Volume= 15,171 cf
Outflow = 1.02 cfs @ 7.92 hrs, Volume= 15,171 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.02 cfs @ 7.92 hrs, Volume= 15,171 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 191.74' @ 7.99 hrs
Flood Elev= 196.54'

Device	Routing	Invert	Outlet Devices
#1	Primary	190.91'	**12.0" x 30.6' long Culvert** Ke= 0.500 Outlet Invert= 190.79' S= 0.0039 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=1.00 cfs @ 7.92 hrs HW=191.69' TW=191.52' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 1.00 cfs @ 2.10 fps)

Pond 15R: STM MH B6



Summary for Pond 16R: STM MH B7

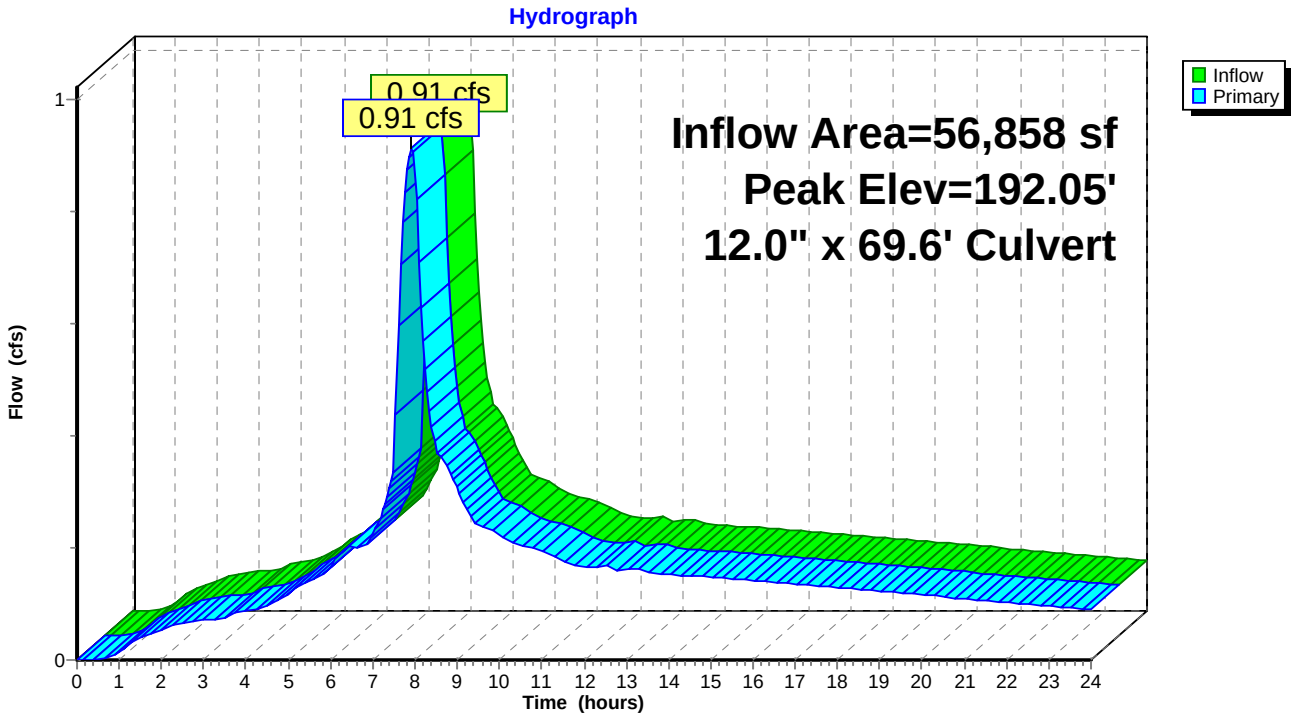
Inflow Area = 56,858 sf, 53.24% Impervious, Inflow Depth > 2.86" for 25-YR event
Inflow = 0.91 cfs @ 7.93 hrs, Volume= 13,561 cf
Outflow = 0.91 cfs @ 7.93 hrs, Volume= 13,561 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.91 cfs @ 7.93 hrs, Volume= 13,561 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 192.05' @ 7.99 hrs
Flood Elev= 195.55'

Device	Routing	Invert	Outlet Devices
#1	Primary	191.39'	**12.0" x 69.6' long Culvert** Ke= 0.500 Outlet Invert= 191.11' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.90 cfs @ 7.93 hrs HW=192.03' TW=191.69' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.90 cfs @ 2.42 fps)

Pond 16R: STM MH B7



Summary for Pond 17R: STM MH C1

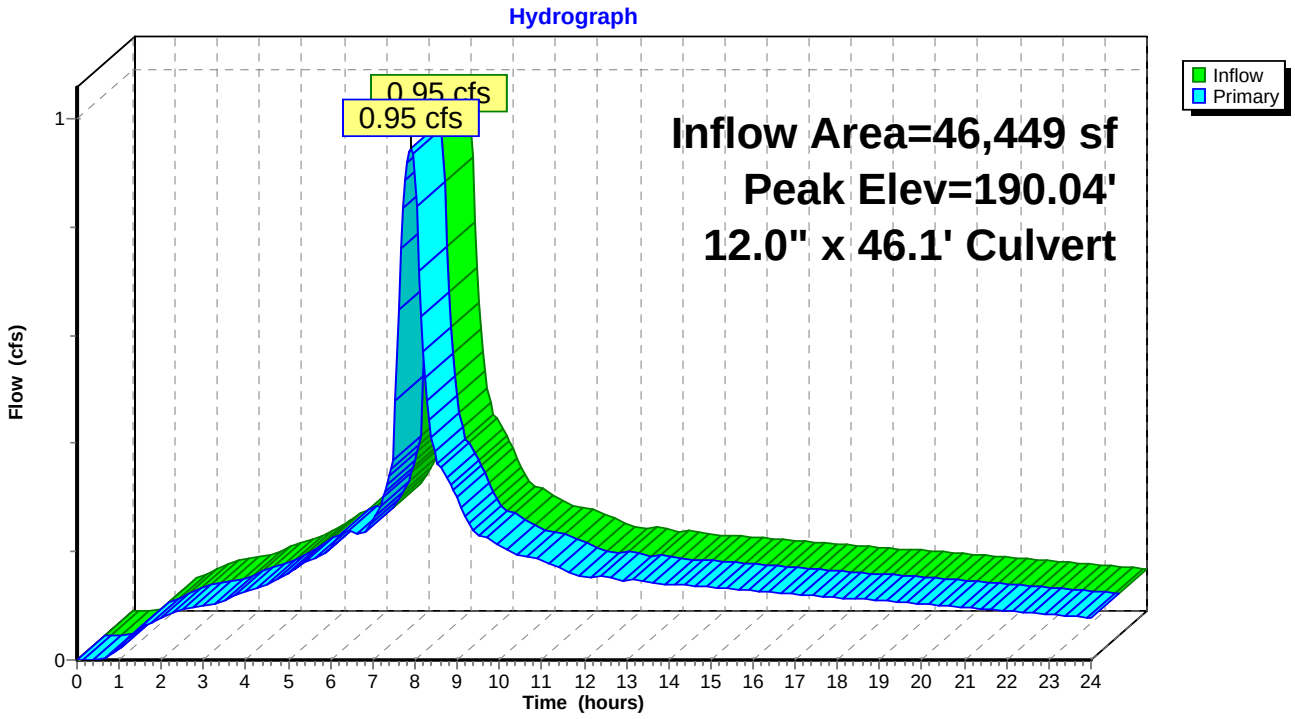
Inflow Area = 46,449 sf, 93.64% Impervious, Inflow Depth > 3.55" for 25-YR event
Inflow = 0.95 cfs @ 7.90 hrs, Volume= 13,744 cf
Outflow = 0.95 cfs @ 7.90 hrs, Volume= 13,744 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.95 cfs @ 7.90 hrs, Volume= 13,744 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.04' @ 7.99 hrs
Flood Elev= 192.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	188.19'	**12.0" x 46.1' long Culvert** Ke= 0.500 Outlet Invert= 188.00' S= 0.0041 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.00 cfs @ 7.90 hrs HW=189.93' TW=189.94' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)

Pond 17R: STM MH C1



Summary for Pond 18R: STM MH C2

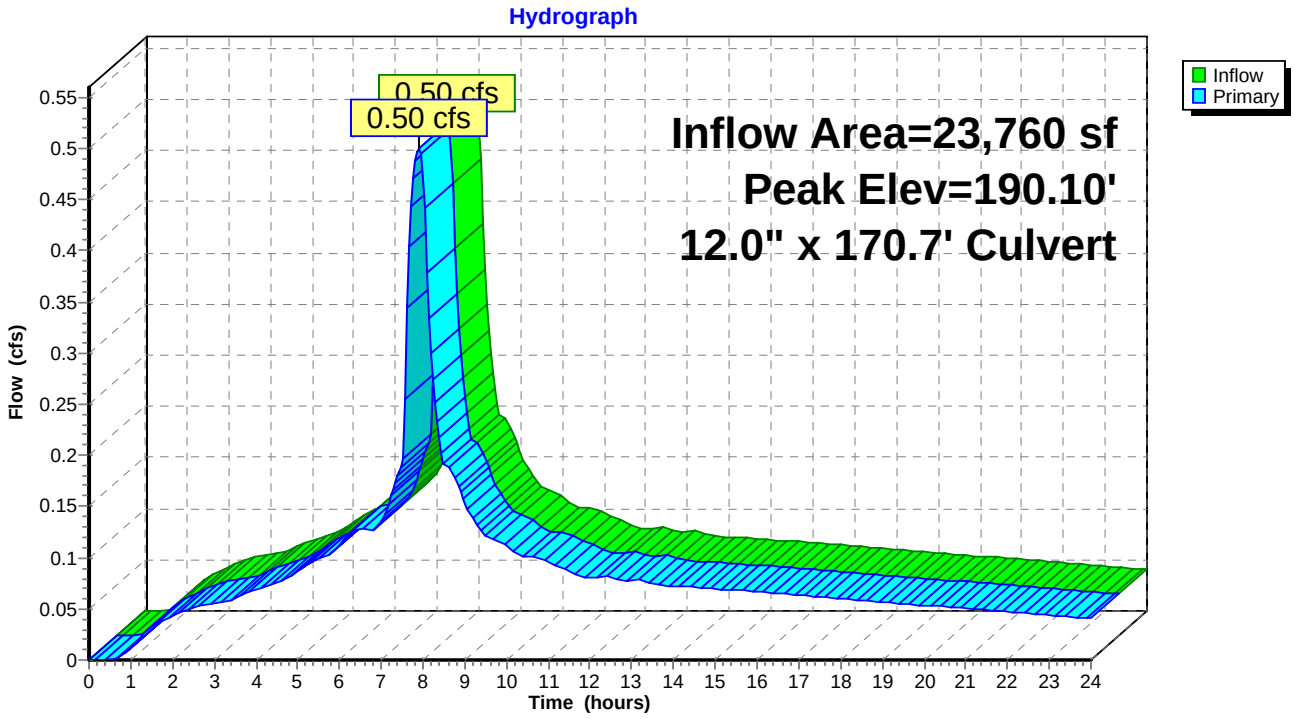
Inflow Area = 23,760 sf,100.00% Impervious, Inflow Depth > 3.66" for 25-YR event
Inflow = 0.50 cfs @ 7.90 hrs, Volume= 7,245 cf
Outflow = 0.50 cfs @ 7.90 hrs, Volume= 7,245 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.50 cfs @ 7.90 hrs, Volume= 7,245 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.10' @ 8.00 hrs
Flood Elev= 194.84'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.06'	**12.0" x 170.7' long Culvert** Ke= 0.500 Outlet Invert= 188.38' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.46 cfs @ 7.90 hrs HW=189.98' TW=189.93' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.46 cfs @ 0.80 fps)

Pond 18R: STM MH C2



Summary for Pond 19R: STM MH D1

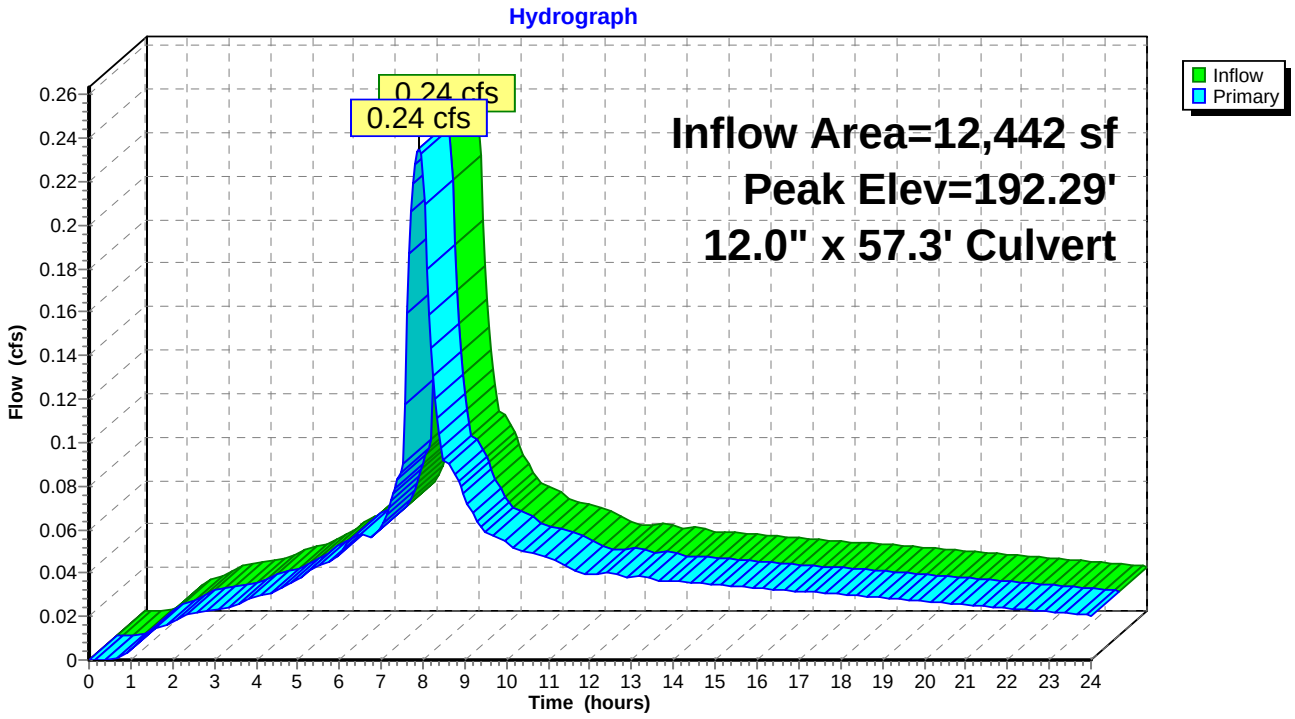
Inflow Area = 12,442 sf, 80.22% Impervious, Inflow Depth > 3.32" for 25-YR event
Inflow = 0.24 cfs @ 7.91 hrs, Volume= 3,444 cf
Outflow = 0.24 cfs @ 7.91 hrs, Volume= 3,444 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.24 cfs @ 7.91 hrs, Volume= 3,444 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 192.29' @ 7.91 hrs
Flood Elev= 197.51'

Device	Routing	Invert	Outlet Devices
#1	Primary	192.04'	**12.0" x 57.3' long Culvert** Ke= 0.500 Outlet Invert= 191.58' S= 0.0080 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.24 cfs @ 7.91 hrs HW=192.29' TW=191.29' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.24 cfs @ 2.27 fps)

Pond 19R: STM MH D1



Summary for Pond 20R: STM MH F1

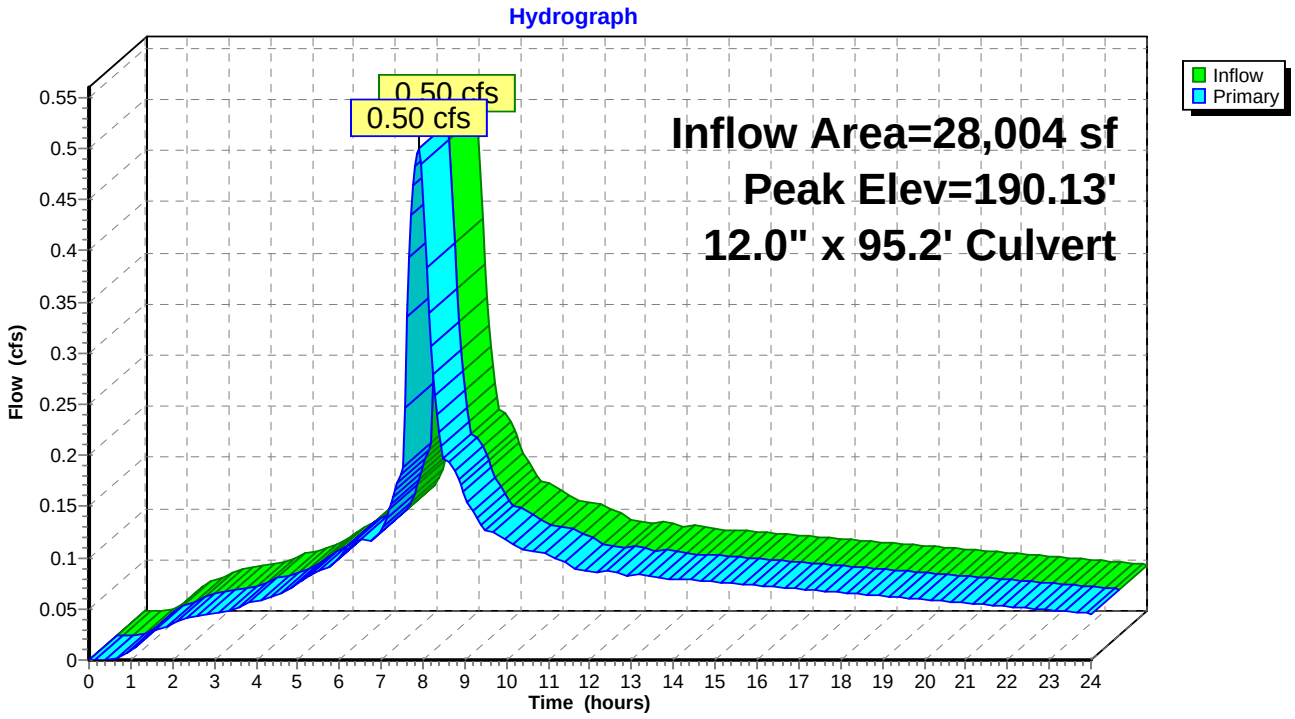
Inflow Area = 28,004 sf, 70.39% Impervious, Inflow Depth > 3.15" for 25-YR event
Inflow = 0.50 cfs @ 7.91 hrs, Volume= 7,361 cf
Outflow = 0.50 cfs @ 7.91 hrs, Volume= 7,361 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.50 cfs @ 7.91 hrs, Volume= 7,361 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.13' @ 8.00 hrs
Flood Elev= 193.76'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.31'	**12.0" x 95.2' long Culvert** Ke= 0.500 Outlet Invert= 188.93' S= 0.0040 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.50 cfs @ 7.91 hrs HW=190.07' TW=190.00' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.50 cfs @ 1.07 fps)

Pond 20R: STM MH F1



Summary for Pond 21R: STM MH F2

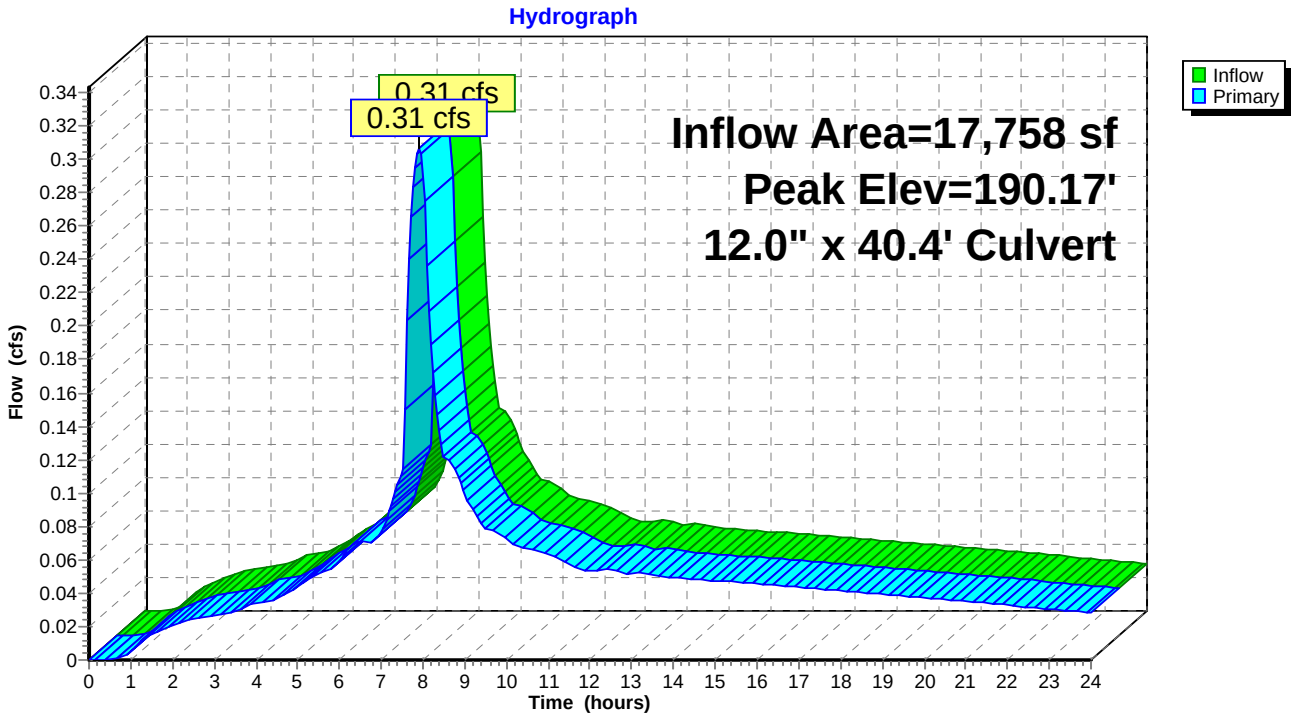
Inflow Area = 17,758 sf, 64.74% Impervious, Inflow Depth > 3.06" for 25-YR event
Inflow = 0.31 cfs @ 7.92 hrs, Volume= 4,525 cf
Outflow = 0.31 cfs @ 7.92 hrs, Volume= 4,525 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.31 cfs @ 7.92 hrs, Volume= 4,525 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.17' @ 8.00 hrs
Flood Elev= 193.33'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.71'	**12.0" x 40.4' long Culvert** Ke= 0.500 Outlet Invert= 189.51' S= 0.0050 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.24 cfs @ 7.92 hrs HW=190.14' TW=190.08' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.24 cfs @ 1.10 fps)

Pond 21R: STM MH F2



Summary for Pond 23R: STM MH E1

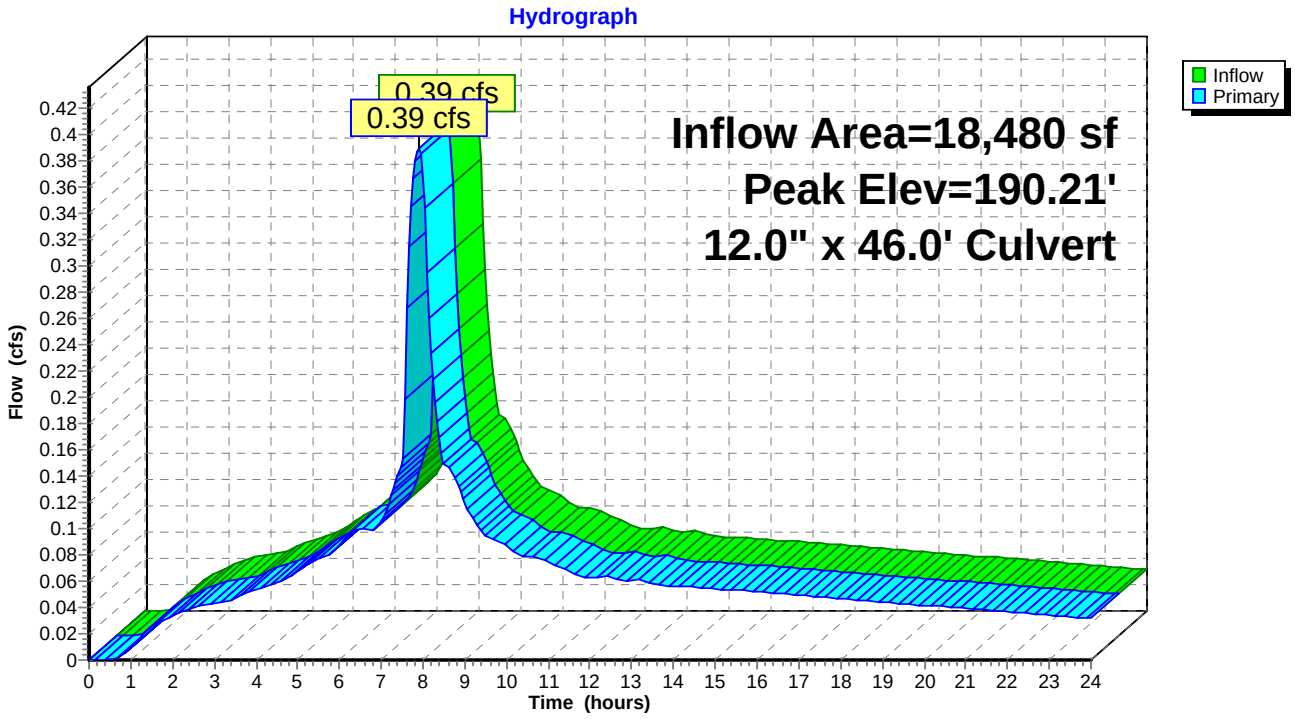
Inflow Area =	18,480 sf,100.00% Impervious, Inflow Depth > 3.66" for 25-YR event				
Inflow =	0.39 cfs @	7.90 hrs,	Volume=	5,635 cf	
Outflow =	0.39 cfs @	7.90 hrs,	Volume=	5,635 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.39 cfs @	7.90 hrs,	Volume=	5,635 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.21' @ 8.00 hrs
Flood Elev= 194.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.62'	**12.0" x 46.0' long Culvert** Ke= 0.500 Outlet Invert= 189.44' S= 0.0039 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.30 cfs @ 7.90 hrs HW=190.16' TW=190.11' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.30 cfs @ 0.99 fps)

Pond 23R: STM MH E1



Summary for Pond 24R: STM MH E2

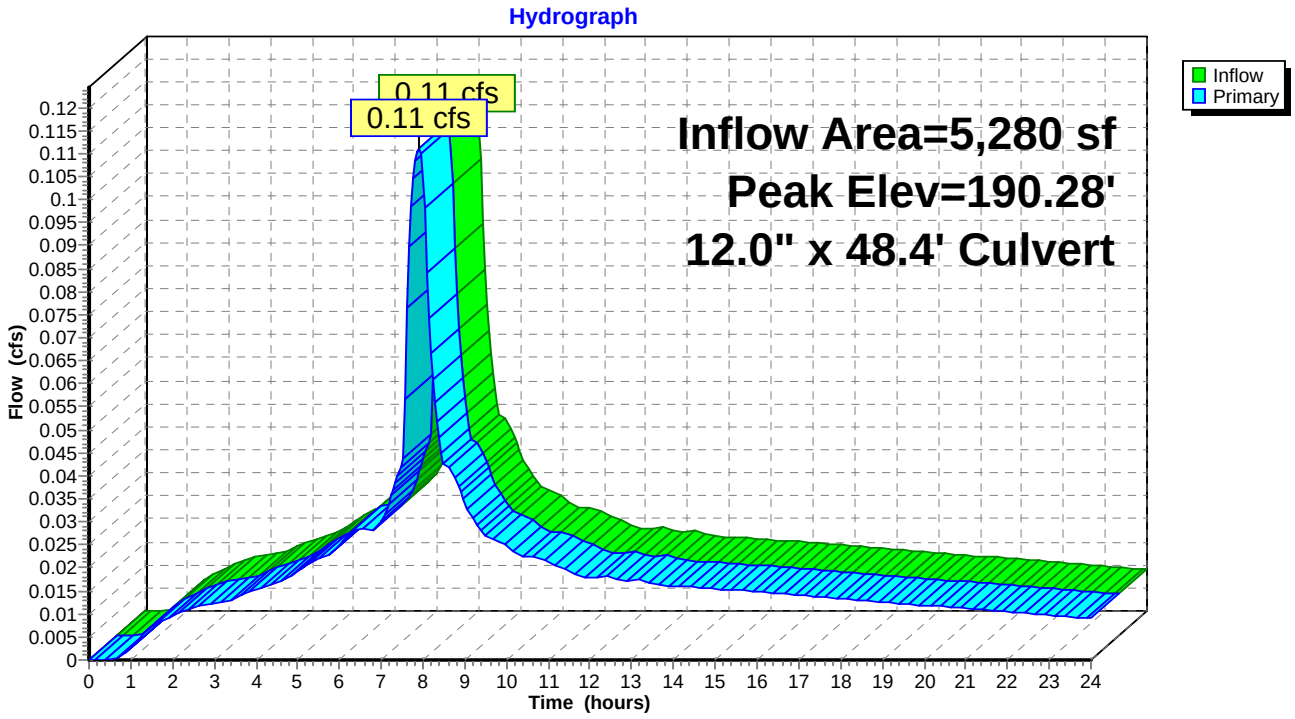
Inflow Area = 5,280 sf,100.00% Impervious, Inflow Depth > 3.66" for 25-YR event
Inflow = 0.11 cfs @ 7.90 hrs, Volume= 1,610 cf
Outflow = 0.11 cfs @ 7.90 hrs, Volume= 1,610 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.11 cfs @ 7.90 hrs, Volume= 1,610 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.28' @ 8.01 hrs
Flood Elev= 194.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	190.01'	**12.0" x 48.4' long Culvert** Ke= 0.500 Outlet Invert= 189.82' S= 0.0039 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=0.11 cfs @ 7.90 hrs HW=190.26' TW=190.16' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.11 cfs @ 1.05 fps)

Pond 24R: STM MH E2



Summary for Pond 108R: 24" RCP

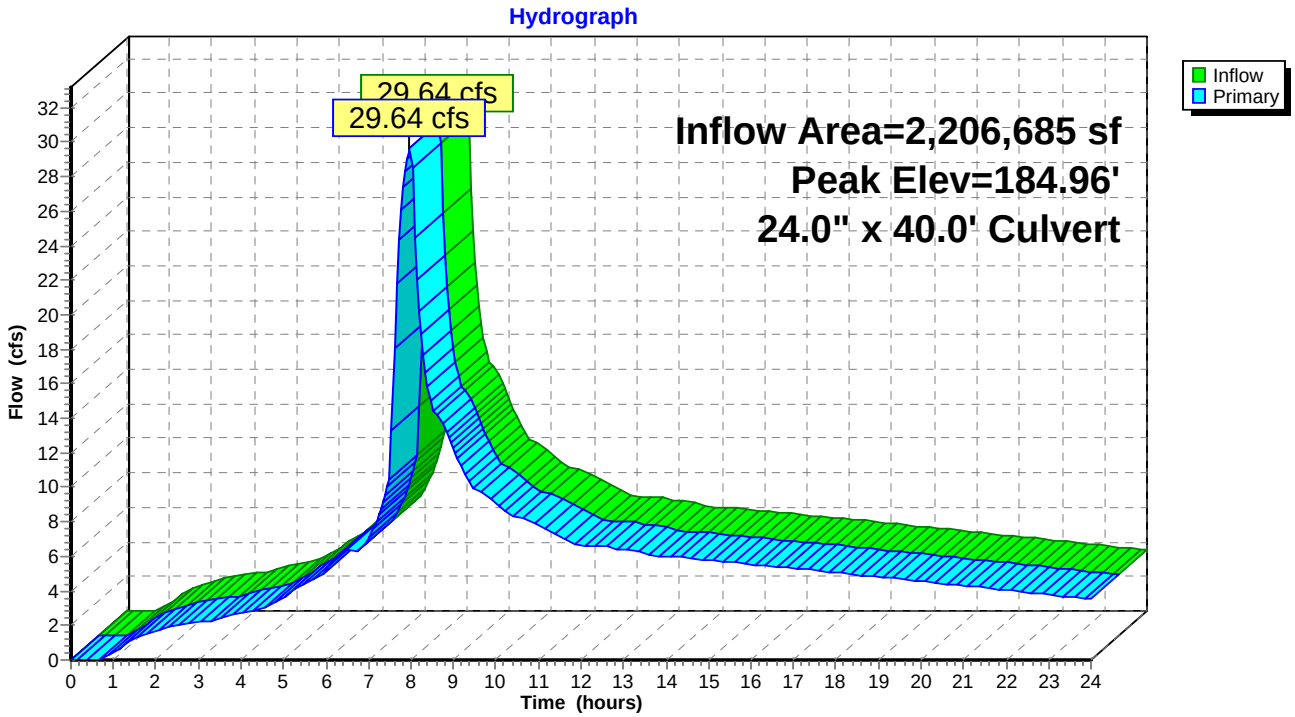
Inflow Area = 2,206,685 sf, 54.37% Impervious, Inflow Depth > 2.72" for 25-YR event
Inflow = 29.64 cfs @ 7.98 hrs, Volume= 499,639 cf
Outflow = 29.64 cfs @ 7.98 hrs, Volume= 499,639 cf, Atten= 0%, Lag= 0.0 min
Primary = 29.64 cfs @ 7.98 hrs, Volume= 499,639 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 184.96' @ 7.98 hrs
Flood Elev= 179.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	176.49'	**24.0" x 40.0' long Culvert** Square-edged headwall, Ke= 0.500 Outlet Invert= 176.17' S= 0.0080 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=29.41 cfs @ 7.98 hrs HW=184.83' TW=181.05' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 29.41 cfs @ 9.36 fps)

Pond 108R: 24" RCP



Summary for Pond 109R: 24" CMP

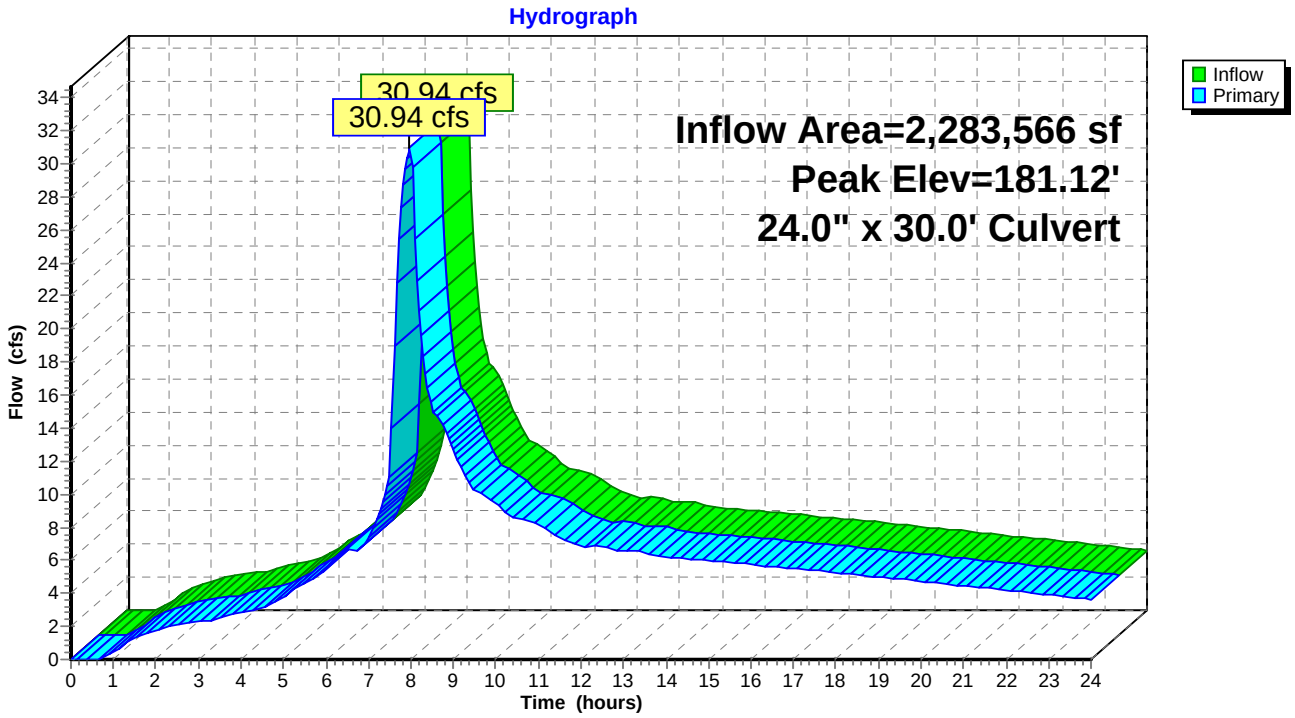
Inflow Area =	2,283,566 sf,	54.62% Impervious,	Inflow Depth >	2.73"	for 25-YR event
Inflow =	30.94 cfs @	7.98 hrs,	Volume=	518,936 cf	
Outflow =	30.94 cfs @	7.98 hrs,	Volume=	518,936 cf,	Atten= 0%, Lag= 0.0 min
Primary =	30.94 cfs @	7.98 hrs,	Volume=	518,936 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 181.12' @ 7.98 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	175.54'	**24.0" x 30.0' long Culvert** Square-edged headwall, Ke= 0.500 Outlet Invert= 175.32' S= 0.0073 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=30.70 cfs @ 7.98 hrs HW=181.05' TW=176.93' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 30.70 cfs @ 9.77 fps)

Pond 109R: 24" CMP



APPENDIX D

STORMWATER QUALITY CALCULATIONS

STORMWATER QUALITY CALCULATIONS

Client:	Venture
Project:	Heritage Crossing Subdivision
AKS Job No.:	3876
Date:	9/29/2015
Done By:	DS
Checked By:	PAS

IMPERVIOUS AREA

Total Site Area:	9.10	acres
Total Site Area:	396,522	square feet (sf)
Number of Lots:	62	
Impervious Area Per Lot:	2,640	sf

Total Impervious Lot Area:	163,680	sf
Road & Sidewalk Impervious Area:	114,339	sf
Total Impervious Area:	278,019	sf

WATER QUALITY VOLUME (WQV)

(Per CWS 4.05.6b - R&O 07-20)

$$WQV = \frac{0.36'' \text{ X Area (ft)}}{12'' \text{ per ft}} = \mathbf{8341} \ \textbf{cubic feet}$$

WATER QUALITY FLOW (WQF)

(Per CWS 4.05.6b - R&O 07-20)

$$WQF = \frac{WQV \text{ (sf)}}{48*60*60} = \mathbf{0.58} \ \textbf{cfs}$$

WATER QUALITY MANHOLE SUMP VOLUME CALCULATIONS

(Per CWS 4.06.1b - R&O 07-20)

CWS Criteria: Sump Volume = 20 cubic feet per 1.0 cfs of flow

Calculated 25-year Flow through WQ Manhole =	**6.11**	**cfs**	
Calculated Manhole Sump Volume =	**122.2**	**cubic feet**	
Calculated Manhole Sump Depth (72" Dia. Manhole) =	**4.3**	**ft**	< 5 feet maximum

EXTENDED DRY BASIN DESIGN & CALCULATIONS

Hydraulic Design Criteria (Per CWS 4.06.3 - R&O 07-20)

Permanent Pool Depth: 0.4 ft
Permanent Pool covers bottom of basin
Design Detention Volume: 1.0 x Water Quality Volume (WQV)
Water Quality Drawdown Time: 48 hours
Maximum Depth of WQ Pool: 4 ft
Avoid direct flow across WQ pond to avoid short circuiting

Extended Dry Basin Sizing Design:

Bottom Slope (ft/ft)	Minimum Bottom Width (ft)	Side Slopes H:V	Top of Pond Elev. (ft)	Perm. Pool Depth (ft)	Pool Bottom Area (sf)	Bottom of Pool Elev. (ft)
0.0	32	3.0	190.5	0.4	11,407	186.6

Water Quality Flow Hydraulic Calculations:

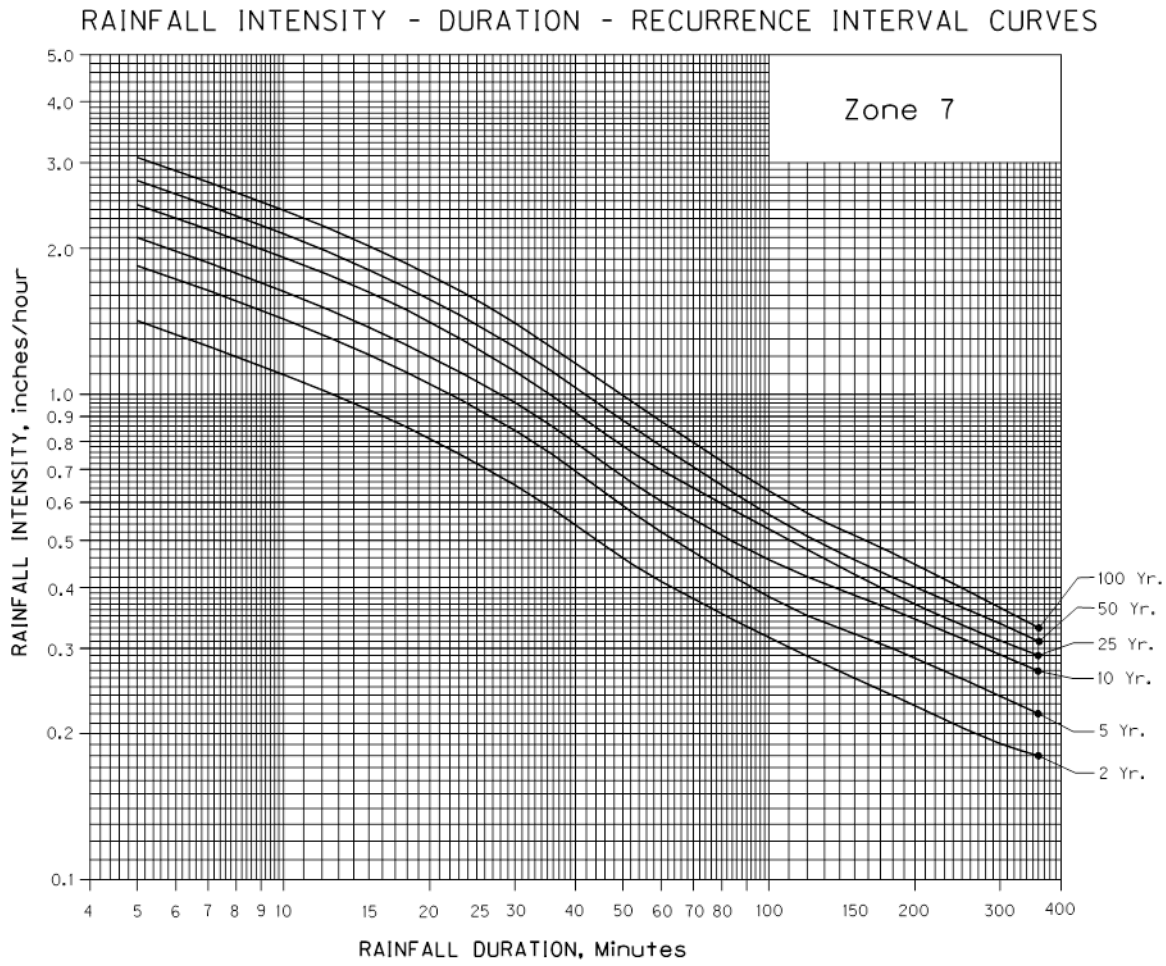
Q (cfs)	Pool Elev. at WQV (ft)	Orifice CL Height (ft)	Calculated Orifice Diameter (in)	Max. Pool Elev., 25-yr Flow (ft)	Calculated Pond WQV (cubic feet)	Calculated WQV Pool Depth (ft)
0.05	187.30	0.06	1.47	189.24	8343	0.70

Check Against CWS Design Criteria:

	Calculated		Meet CWS Criteria?			
Minimum Freeboard:	1.3	feet	**Yes**	more than	1	foot
Minimum Bottom Width:	32	feet	**Yes**	greater than	4	feet
Maximum Pool Depth at WQV:	0.7	feet	**Yes**	less than	4	feet
Detained Water Quality Volume:	8343	cubic feet	**Yes**	greater than	8341	cf

APPENDIX E

ODOT CURB INLET SPACING CALCULATIONS


RAINFALL INTENSITY - DURATION - RECURRENCE INTERVAL CURVES
Zone 7
RAINFALL INTENSITY, inches/hour
5.0
4.0
3.0
2.0
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
4
5
6
7
8
9
10
15
20
25
30
40
50
60
70
80
100
150
200
300
400
RAINFALL DURATION, Minutes
100 Yr.
50 Yr.
25 Yr.
10 Yr.
5 Yr.
2 Yr.

ODOT Gutter Flow

Last Modified: *10/15/2014*

SUBJECT	Heritage Crossing Subdivsion	**BY**	DS/PAS	**DATE**	9/29/2015
PROJECT NO.	3876				

Catch Basin Information

Street & Gutter:

n = **0.016**

Depressed gutter cross slope, S_W = **0.083** ft/ft

Street section slope, S_S = **0.020** ft/ft

Catch Basin ID	Catch Basin Type	ODOT Inlet ID	Equivalent Grate Type	Next to Curb (Y/N)	% Clogged	Width, W	Curb Opening Length / Grate Length, L	Perimeter, P	Open Area, A	Height, h	Depression, a
						ft	ft	ft	ft^2	ft	in
SW Hall Boulevard West Side - Prior to intersection											
1	**Curb Inlet On Grade**	**6** CG-48	-	Y	30%	1.50	4.00	-	1.32	0.33	2.50
SW Hall Boulevard West Side - Past the intersection											
2	**Curb Inlet On Grade**	**6** CG-48	-	Y	30%	1.50	4.00	-	1.32	0.33	2.50

ODOT Gutter Flow

Last Modified: *10/15/2014*

SUBJECT	Heritage Crossing Subdivsion	**BY**	DS/PAS	**DATE**	9/29/2015
PROJECT NO.	3876				

On Grade Inlet Flow Computation

Hydrologic Flow:

10-Year Intensity, I = **2.10** in/hr

Impervious C = **0.90**

Pervious C = **0.30**

Catch Basin ID	Impervious Basin Area	Pervious Basin Area	Longitudinal Gutter Slope, S	Flow Width,T	Frontal flow intercepted to total frontal flow, Rf	Peak Runoff Plus Bypass Flow	Bypass Flow,Q_{BP}	Intercept Flow, Q_i	Total Gutter Flow, Q	Partial Gutter Flow, Q_P	Depressed Gutter Flow, Qw	Depth,d	Depth 2 ,d_2	Average Gutter Velocity, v	Required Curb Opening Length,L_T	Frontal Flow to Total Gutter Flow, Eo	Efficiency, E
	ac	ac	ft/ft	ft	ft	cfs	cfs	cfs	cfs	cfs	cfs	ft	ft	fps	ft		
SW Hall Boulevard West Side - Prior to intersection																	
1	**0.264**	**0.144**	**0.010**	4.763	**1.000**	0.590	0.000	0.589	0.589	0.120	0.470	0.190	0.065	1.980	3.864	0.797	1.000
SW Hall Boulevard West Side - Past the intersection																	
2	**0.280**	**0.082**	**0.010**	4.721	**1.000**	0.581	0.000	0.581	0.581	0.116	0.465	0.189	0.064	1.976	3.833	0.801	1.000

ODOT Gutter Flow Diagram

Last Modified: *10/15/2014*

SUBJECT	Heritage Crossing Subdivsion	**BY**	DS/PAS	**DATE**	9/29/2015
PROJECT NO.	3876				

Depth:

$$d = T_S * S_S + W * S_W$$

$$d_2 = T_S * S_S$$

Total Gutter Flow:

$$Q_T = Q_P + Q_W$$

Velocity:

$$V = \frac{Q}{A}$$

$$V = \frac{2 * Q_T}{W * (d + d_2) + \frac{d_2^2}{S_S}}$$

Depressed Gutter Flow:

$$Q_W = \left(\frac{0.56}{n * S_W}\right) * S^{0.5} * (d^{2.67} - d_2^{2.67})$$

Parital Gutter Flow:

$$Q_P = \left(\frac{0.56}{n}\right) * S_S^{1.67} * S^{0.5} * T^{2.67}$$

Intercept Flow on Grade:

$$Q_i = E \times Q_T$$

Intercept Flow in Sag (Grate):

$$Q_i = 3 \times P \times d^{1.5}$$

or

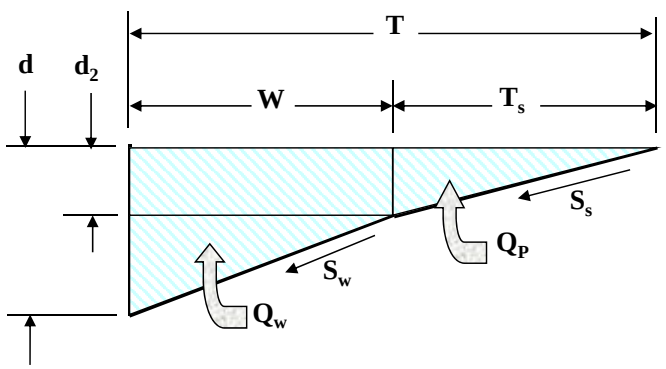
$$Q_i = 0.67 \times A \times (2 \times g \times d)^{0.5}$$

Intercept Flow in Sag (Curb):

$$Q_i = 3 \times L \times d^{1.5}$$

or

$$Q_i = 0.67 \times A \times \left[2 \times g \times \left(d_i - \frac{h}{2}\right)\right]^{0.5}$$



gravity, g = 32.2 ft/s^2

APPENDIX F

USDA-NRCS SOIL RESOURCE REPORT

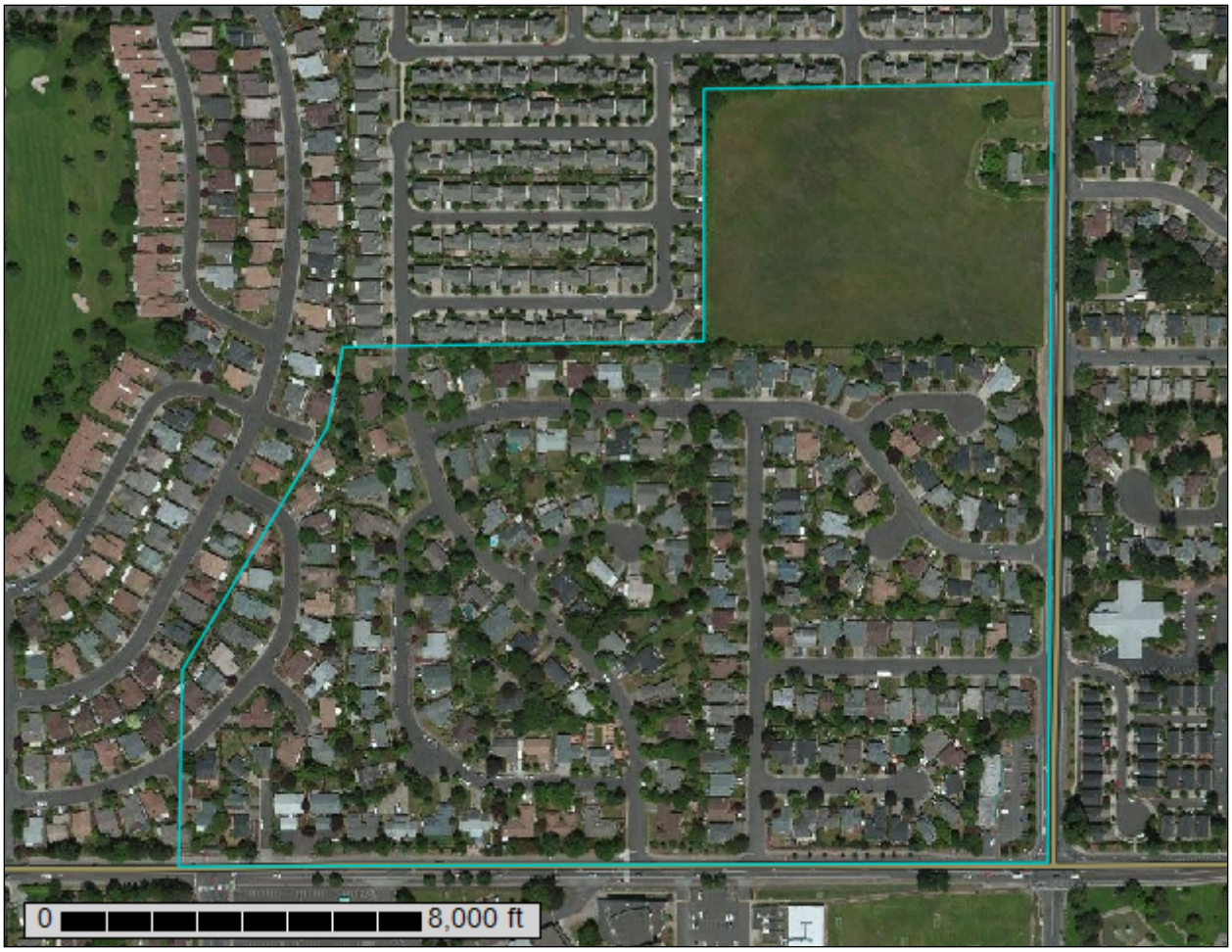
United States Department of Agriculture

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 Washington County, Oregon



September 2, 2014

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 (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

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

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

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

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How Soil Surveys Are Made

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

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

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

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

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

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

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

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

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

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

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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Custom Soil Resource Report
Soil Map

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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: Washington County, Oregon
Survey Area Data: Version 11, Dec 4, 2013

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

Date(s) aerial images were photographed: Jul 8, 2010—Sep 4, 2011

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

Washington County, Oregon (OR067)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
1	Aloha silt loam	38.0	72.6%
15	Dayton silt loam	11.3	21.6%
22	Huberly silt loam	3.0	5.8%
Totals for Area of Interest		**52.3**	**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.

Washington County, Oregon

1—Aloha silt loam

Map Unit Setting

National map unit symbol: 21x8
Elevation: 150 to 250 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 160 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Aloha and similar soils: 90 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Aloha

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old loamy alluvium

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 46 inches: silt loam
H3 - 46 to 65 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 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D

Minor Components

Huberly

Percent of map unit: 1 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

15—Dayton silt loam

Map Unit Setting

National map unit symbol: 21xn
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: Farmland of statewide importance

Map Unit Composition

Dayton and similar soils: 90 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dayton

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old alluvium

Typical profile

H1 - 0 to 16 inches: silt loam
H2 - 16 to 39 inches: clay
H3 - 39 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: 12 to 24 inches to abrupt textural change
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 0 to 24 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D

Minor Components

Verboort

Percent of map unit: 2 percent
Landform: Flood plains

Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

22—Huberly silt loam

Map Unit Setting

National map unit symbol: 21y9
Elevation: 150 to 300 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

Huberly and similar soils: 90 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Huberly

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 25 inches: silt loam
H3 - 25 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 20 to 30 inches to fragipan
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D

Minor Components

Verboort

Percent of map unit: 3 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

Soil Information for All Uses

Soil Properties and Qualities

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

Soil Qualities and Features

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

Hydrologic Soil Group (Schmidt Subdivision)

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

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

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

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

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

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

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

Map—Hydrologic Soil Group (Schmidt Subdivision)

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

Streams and Canals

Transportation

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

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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: Washington County, Oregon
Survey Area Data: Version 11, Dec 4, 2013

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

Date(s) aerial images were photographed: Jul 8, 2010—Sep 4, 2011

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

Table—Hydrologic Soil Group (Schmidt Subdivision)

Hydrologic Soil Group— Summary by Map Unit — Washington County, Oregon (OR067)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
1	Aloha silt loam	C/D	38.0	72.6%
15	Dayton silt loam	D	11.3	21.6%
22	Huberly silt loam	C/D	3.0	5.8%
Totals for Area of Interest			**52.3**	**100.0%**

Rating Options—Hydrologic Soil Group (Schmidt Subdivision)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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APPENDIX G

TR55 RUNOFF CURVE NUMBERS

TR55 RUNOFF CURVE NUMBERS

Table 2-2a Runoff curve numbers for urban areas [1]

Cover description: Cover type and hydrologic condition	Average percent impervious area [2]	Curve numbers for hydrologic soil group: A	B	C	D
Fully developed urban areas (vegetation established)					
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
Developing urban areas					
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 2-2c 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 *Poor:* <50%) ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: > 75% ground cover and lightly or only occasionally grazed.
3 *Poor:* <50% ground cover.
Fair: 50 to 75% ground cover.
Good: >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 *Poor:* Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.