

Appendix F

STORMWATER POLLUTION  
PREVENTION PLAN





## **STORMWATER POLLUTION PREVENTION PLAN**

**For**

**PATTERSON CROSSING RETAIL CENTER  
Town of Patterson and Kent, New York**

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## CONTENTS

	<b>PAGE</b>
<b>1.0 INTRODUCTION .....</b>	<b>1</b>
1.1 Project Description.....	1
1.2 Existing Stormwater Runoff Conditions .....	1
1.3 Proposed Stormwater Runoff Conditions .....	2
<b>2.0 STORMWATER MANAGEMENT .....</b>	<b>3</b>
2.1 Quantitative Analysis .....	4
2.2 Qualitative Analysis .....	5
<b>3.0 STORMWATER CONVEYANCE SYSTEM .....</b>	<b>7</b>
<b>4.0 EROSION AND SEDIMENT CONTROL.....</b>	<b>7</b>
4.1 Temporary Erosion and Sediment Control Facilities .....	7
4.2 Permanent Erosion and Sediment Control Facilities.....	8
<b>5.0 MAINTENANCE AND IMPLEMENTATION.....</b>	<b>8</b>
5.1 Construction Phase .....	8
5.2 Long Term Maintenance Plan .....	9

### APPENDICES

Appendix A	Pre-Development Computer Data
Appendix B	Post-Development Computer Data
Appendix C	Annual Pollutant Loading Rate Calculations

### FIGURES

Figure 1: Location Map
Figure 2: Pre-Development Drainage Map
Figure 3: Post-Development Drainage Map
Figure 4: Soils Map

## 1.0 INTRODUCTION

### 1.1 Project Description

The subject project is located on a 90.5± acre parcel located in both the Town of Patterson and Kent adjacent to Interstate 84 and New York State Route 311. The parcel is located such that the majority of the property is located in the Town of Patterson (see Figure 1 for a location map). The property is designated as Tax Map Parcel No. 22.-3-1, 32.-2-2, 33.-2-23 and 34.-2-3 in the Town of Patterson, and 22.-2-48 in the Town of Kent. The parcel is zoned as I- (Industrial), and R-4- (Residential) in the Town of Patterson, and C- (Commercial) in the Town of Kent.

The parcel is located in both the Middle Branch Reservoir and East Branch Reservoir basins, with the majority of the site draining to the East Branch Reservoir basin. The subject parcel consists of woods and brush throughout the majority of the property. The only development on the subject property is the existing telecommunications facility located in the southwest portion of the property. There is an existing NYSEG right of way in the southeast portion of the property that is to remain undisturbed. The property ranges in elevation from elevation 624 adjacent to the Middle Branch of Croton River to elevation 894 on the crest of the knoll near the existing telecommunications facility. The slopes throughout the proposed project range from flat to generally steep slopes. The soil types on the property are generally characterized as moderately deep, well-drained soils. Figure 4 provides a breakdown of the soil types and a listing of these soils in accordance with the *Soils Survey of Putnam and Westchester Counties*. A Town of Kent regulated wetland is located adjacent to the Middle Branch Croton River in the properties northwest corner. In addition to the onsite wetland there are also a couple of watercourses on the property that have been delineated by the New York City Department of Environmental Protection. All of the watercourses drain off of the property towards NYS Route 311 before merging and entering the Middle Branch of Croton River.

The subject parcel is proposed to be developed as a retail center. The retail center will consist of four (4) buildings with nine (9) users and associated parking for each. Access to the site will be provided by a proposed access road off of NYS Route 311. Improvements associated with the proposed access road for the site include the proposed widening of NYS Route 311. This widening is necessary to mitigate traffic safety issues involved with the proposed access to the site. There is an additional emergency access to the site off of Concord Road. The emergency access drive will enter the site in the same location as the existing access drive for the telecommunications facility. Water will be supplied to the project by drilled wells and wastewater generated will be treated with a subsurface sewage treatment system.

The development will include stormwater management improvements, which will convey runoff to, and through, a series of stormwater management practices. The proposed practices will treat the stormwater runoff in the post development so that the offsite drainage conditions will not be significantly altered from the pre development conditions. The project will also include stormwater improvements to reduce the total phosphorous in the runoff thereby contributing to regionally desired non-point phosphorus reductions.

### 1.2 Existing Stormwater Runoff Conditions

The existing stormwater runoff from the subject parcel currently drains to two reservoir basins. Approximately 70 acres drains to the East Branch Reservoir and approximately 20 acres drains to the Middle Branch Reservoir. Three subcatchments and their associated design points / lines were chosen to assess the stormwater runoff discharging from the site, as shown in Figure 2. Subcatchments PRE 1 and PRE 2 are located in the East Branch Reservoir basin, while subcatchment PRE 3 is located in the Middle Branch Reservoir basin.

The stormwater runoff from subcatchment PRE 1 currently sheets off of the ridgeline along the western property line across the property from west to east. The stormwater runoff from subcatchment PRE 1 discharges to a cut-off swale located along the property's boundary with I-84. The cut-off swale conveys the runoff to another swale that discharges down the slope adjacent to I-84, to Design Point 1. The drainage from Design Point 1 crosses underneath I-84 with an ultimate discharge point into the off-site wetland located southeast of the I-84 / Fair Street crossing.

The stormwater runoff discharging from subcatchment PRE 2 is very similar to that of subcatchment PRE 1 in that the runoff sheets off of the high point in the property towards the eastern

property line. The runoff sheets across the property and discharges into a cut-off swale at the top of the slope adjacent to I-84. The cut-off swale drains to the south to an existing catch basin in Fair Street. The catch basin is the collection point for all of the stormwater runoff generated from subcatchment PRE 2, therefore it was chosen as Design Point 2. The catch basin chosen is located in the existing stormwater collection system in Fair Street. The system in Fair Street joins up with the main drainage line system of I-84 before discharging to the wetland located to the southeast of the I-84, Fair Street crossing.

The stormwater runoff from the third and final subcatchment PRE 3 discharges to Design Line 3. The design line is located along the southern side of the Middle Branch of Croton River in the northwest property corner. This design line was chosen to assess possible impacts to the river. The Middle Branch of the Croton River is classified a class C (T) stream per the NYSDEC. This classification designates the river a trout protected waterbody. There are three distinct components to the stormwater runoff discharging to Design Line 3. The three components of the stormwater runoff discharging to the design line are the stormwater sheeting off of the hillside directly into the river, the piped runoff from NYS Route 311 and the I-84 exit ramps, and the runoff transported in the watercourse / eroded ditch flowing from a developed section of Lake Carmel, down the hillside adjacent to the river.

One of the two existing watercourses flagged by the NYCDEP, currently drains the Lake Carmel residential development located along the ridgeline at the western property line. The stormwater runoff from Concord Road is piped onto the subject property before discharging to the surface at the origin of the ditch / watercourse. The unmitigated runoff has caused massive erosion along the length of the channel, ultimately resulting in an eroded 6' to 8' deep drainage ditch. This eroded ditch is a direct source of sediment being discharged into the Middle Branch Croton River and the north end of Lake Carmel. Over the years thousands of tons of sediment have been eroded out of this area forming the unstable drainage ditch down the hillside.

### 1.3 Proposed Stormwater Runoff Conditions

The proposed stormwater management system has been designed to maintain the existing drainage boundaries between the two reservoir basins. In general the stormwater draining to the East Branch and Middle Branch reservoirs will continue to drain there in the post development condition. The post development drainage areas are shown on Figure 3. The stormwater discharging to Design Point 1 consists of the majority of the development on the site. The stormwater runoff will be collected in the proposed drainage system and conveyed to the ponds for treatment. The treatment train for the bulk of the development (subcatchments 1.1S, 1.2S, 1.3S) is three stormwater ponds in series (1.1P -> 1.2P -> 1.4P). A smaller portion of the development, subcatchment 1.3S, discharges to Design Point 1 after treatment in two ponds in series (1.3P -> 1.4P). The last pond in both treatment trains, pond 1.4P, has been designed as a wet extended detention pond (P-3) per the *New York State Department of Environmental Conservation Stormwater Management Design Manual* (design manual). Additionally ponds 1.1P and 1.2P have been designed as extended detention dry ponds, while pond 1.3P has been design as micropool extended detention ponds (P-1) per the design manual. The proposed stormwater management practices will provide the necessary pollutant removals while attenuating the peak stormwater flows to predevelopment levels to Design Point 1.

The proposed stormwater runoff discharging to Design Point 2 will continue to sheet down the hillside from west to east in the proposed condition. The peak stormwater flows have been reduced in the post-development condition due to a reduction in area draining to the design point. A portion of subcatchment PRE 2 has been diverted in the post-development condition to Design Point 1 to treat the proposed development. The reduction in drainage area to Design Point 2, despite the change in ground cover for the proposed septic area, results in a reduction in peak flows and an overall reduction in pollutant loading. The reduction in phosphorous discharging to Design Point 2 creates a TMDL benefit to the receiving waters.

As in the existing condition there are three components to the post-development stormwater runoff discharging to Design Line 3. The first component of the runoff is generated from the proposed developed portion of the site. The treatment train for the building pad near the entrance to the site, (subcatchments 3.1S), is two stormwater ponds in series (3.1P -> 3.2P). The access road and adjacent side slopes, subcatchment 3.2S, will be treated only in pond 3.2P. Both ponds 3.1P and 3.2P have been designed as a micropool extended detention ponds (P-1) in accordance with the NYSDEC design manual. Subcatchment 3.3S, the lower portion of the access road below pond 3.2P, is proposed to be treated in pond 3.3P. Pond 3.3P has been designed as a "pocket pond" (P-5) in accordance with the NYSDEC design manual. The outlet from ponds 3.2P and 3.3P will discharge into the proposed

renovated collection system on the southern side of NYS Route 311. As part of the proposed development, it is proposed to replace the existing collection system along NYS Route 311 to allow for the proposed road safety improvements to NYS Route 311. As previously stated the watercourse running parallel to Route 311 is fed by a combination of swales and drainage pipes carrying runoff from the interstate and state highway. It is proposed to replace the existing pipe system from the proposed access road west to the Middle Branch Croton River, while piping the existing watercourse and providing a stable discharge point to the river.

The second component of the stormwater runoff discharging to Design Line 3 is the untreated area discharging directly to the design line namely subcatchments 3.5S and 3.6S. The drainage area to the watercourse found in subcatchment 3.5S will be maintained allowing for continued flow to discharge directly to Design Line 3. Subcatchment 3.6S is the untreated area that will remain unaltered by the proposed development of the site. Subcatchment 3.6S mainly consists of the drainage area immediately adjacent to Interstate 84 and NYS Route 311.

The third component of stormwater runoff discharging to Design Line 3 is the runoff produced by the existing Lake Carmel residential development along Concord Road. It is proposed to stabilize and repair the highly eroded ditch / watercourse as mentioned in the pre-development drainage conditions. Repair of this highly eroded watercourse channel will alleviate the transport of suspended sediment and pollutants to the river and Lake Carmel. The restoration of this watercourse channel will provide an added benefit to the reservoir basin in general and Lake Carmel more specifically. It is proposed to stabilize the upper section of the ditch with the creation of a riprap channel. From the rip rapped section of the channel the stormwater will be collected in a drain inlet and piped to pond 3.4P. Although this pond is not required for the proposed development, it is offered to further mitigate down stream impacts and rectify a chronic source of sediment to Lake Carmel. This pond has been designed as a micropool extended detention ponds (P-1), per the NYSDEC design manual. The stormwater from the existing development will be treated in the pond and will outlet into a proposed swale. The proposed swale downhill of pond 3.4P will discharge to the existing NYCDEP flagged watercourse in subcatchment 3.5S. These improvements will alleviate the erosion problems caused by the unmitigated stormwater discharging in the ditch, while continuing to feed the watercourse tributary to the Middle Branch of the Croton River. The treatment of this previously untreated runoff will provide a TMDL benefit to the watershed.

Appropriate measures to address thermal impacts have been taken into account in the design of the stormwater ponds discharging to Design Line 3. The classification of the Middle Branch of the Croton River as a trout protected waterbody per the NYSDEC necessitates variations in the design of the stormwater ponds. The classifications of the ponds discharging to the design line are micropool extended detentions ponds. These ponds have relatively small permanent pools, thus reducing the possibility for increased thermal impacts to the river. Micropool extended detention ponds are the recommended practice for discharge into trout protected waterbodies per the NYSDEC design manual. Additionally the attenuation for the 1-year 24-hour design storm has been reduced from 24 hours to 12 hours, per provisions found in the design manual. The stormwater for the 1-year storm is released over a shorter period of time to eliminate the potential for increased temperature of stormwater runoff discharging to the trout stream. All of the stormwater ponds discharging to Design Line 3 are located on a north-facing slope, thus reducing the amount of direct sunlight on the permanent pools. Additionally the areas on the northern slopes of each of the ponds have been left undisturbed to provide additional shading of the permanent pools. The siting of the ponds along with the design aspects of the ponds have taken into account the provisions set forth in the NYSDEC design manual to help reduce the thermal impacts on the receiving trout stream.

## **2.0 STORMWATER MANAGEMENT**

The stormwater management on the subject project has been designed in compliance with the New York City Department of Environmental Protection (NYCDEP) requirements. Water quality on this project has been addressed to meet the standards with a combination of swales and stormwater ponds designed in series. Additionally 24-hour plug flow detention of the 2-year, 24-hour storm has been provided with the stormwater management practices to meet the NYCDEP requirements. Attenuation in the stormwater practices has been provided for the 10, 25, and 100-year, 24-hour design storms to meet the requirements of the NYCDEP.

The stormwater management on the subject project has also been design in accordance with the New York State Department of Environmental Conservation (NYSDEC) requirements. Multiple series of stormwater ponds have been designed to meet the water quality volume treatment requirements for the NYSDEC. Detention of the one-year center of mass for the 1-year, 24-hour design storm for 24 hours has been provided in the stormwater practices discharging to Design Line 1, to meet the NYSDEC requirements for Stream Channel Protection  $C_{p_v}$ . Additionally detention of the center of mass for the 1-year, 24-hour design storm for 12 hours has been provided in the stormwater practices discharging to Design Line 3. The shorter detention time for stormwater practices discharging to Design Line 3 is attributed to the requirements set forth in the design manual for stormwater practices discharging to trout protected streams. Attenuation of the 10-year and 100-year, 24-hour design storm has been provided to meet the NYSDEC requirements for Overbank Flood Control ( $Q_r$ ) and Extreme Flood Control ( $Q_t$ ) respectively.

**2.1 Quantitative Analysis**

The “HydroCAD” Stormwater Modeling System,” by Applied Microcomputer Systems of Chocorua, New Hampshire, was used to model and assess the stormwater flows for the subject project. HydroCAD is a computer-aided design program for modeling the hydrology and hydraulics of stormwater runoff. It is based primarily on hydrology techniques developed by the United States Department of Agriculture, Soil Conservation Service (USDA, SCS) TR-20 method combined with standard hydraulic calculations. The program was used to analyze the 1-year, 2-year, 10-year, 25-year and 100-year, 24-hour design storms. Peak flows were calculated for both the pre-development condition and the post-development condition. The input requirements for the HydroCAD computer program are as follows:

Subcatchments (contributing watershed/sub-watersheds)

- Design storm rainfall in inches
- CN (runoff curve number) values which are based on soil type and land use/ground cover
- Tc (time of concentration) flow path information

Stormwater Ponds

- Surface area at appropriate elevations
- Flood elevation
- Outlet structure information

The following is a general description of the input data used to calculate the pre- and post-development stormwater runoff values. For detailed information for each subcatchment and pond, see Appendices A & B.

The precipitation values for the various design storms analyzed were obtained from the local County Soil and Water Conservation District office. The values provided are for 24-hour design storms in Putnam County.

<b>Design Storm</b>	<b>24-Hour Rainfall</b>
1-Year	2.8”
2-Year	3.5”
10-Year	5.0”
25-Year	6.0”
100-Year	7.5”

The CN (runoff curve number) values utilized in this report were referenced from the USDA, SCS publication *Urban Hydrology for Small Watersheds*. The following is a summary of the various land uses/ground covers and their associated CN values utilized in this report.

<b>Land Use/Ground Cover</b>	<b>CN Value</b>
>75% Grass Cover, C Soil	74
Woods, C Soil	70

Land Use/Ground Cover	CN Value
1-Acre Lots 20% Impervious, C Soil	79
Suburban Shopping Center, C Soil	90
Paved Parking and Roofs	98

The hydrologic soils groups for the project consist of mainly of C soils. The soils on the site consist of Chatfield – Charlton complex (CsD, CrC), Paxton Fine Sandy Loam (PnB, PnC, PnD), Woodbridge Loam (WdB), Ridgebury Loam (RdB), Udorthents (Ub, Uc), and Urban Land – Paxton (UpC).

The quantitative analysis performed for the subject project involves the assessment of two design points and one design line as shown on Figure 3. The following table summarizes the calculated pre-development and post-development peak stormwater runoff flows:

**PEAK FLOW SUMMARY (C.F.S.)**

24-HOUR DESIGN STORM								
	2-YEAR		10-YEAR		25-YEAR		100-YEAR	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Design Point 1 (Interstate 84)	20.88	1.51	43.81	24.35	60.68	49.02	87.30	78.74
Design Point 2 (Fair Street)	22.86	21.00	49.08	44.20	68.51	61.25	99.33	88.15
Design Point 3 (Middle Branch of Croton River)	35.38	25.16	68.46	45.53	92.14	78.24	128.87	128.18

As seen by the above summary, the post-development peak flows for the 2-, 10-, 25-, and 100-year design storms have been attenuated to be less than the pre-development peak flows.

**2.2. Qualitative Analysis**

Estimates of pre-development and post-development discharges of BOD, TP, TN, and TSS have been calculated for the subject project. The pollutant loading coefficient method was utilized to calculate the annual export of the above-mentioned pollutants. The New York State Department of Environmental Conservation (NYSDEC) publication *Reducing the Impacts of Stormwater Runoff from New Development* was referenced to determine appropriate loading rates for BOD. The publication *Fundamentals of Urban Runoff Management: Technical and Institutional Issues* produced by the Terrene Institute was referenced to determine appropriate loading rates for TP, TN and TSS. The appropriate loading rates were then utilized to calculate the annual pollutant export values. Variables involved with this calculation include soil type and land use/ground cover characteristics.

The following table summarizes the pollutant loading rates utilized for the subject project.

**SUMMARY OF POLLUTANT LOADING RATES (LBS/ACRE/YEAR)**

Land Use/Ground Cover	BOD	TP	TN	TSS
Forest	7.0	0.10	1.8	77.0
Grass	7.0	0.12	3.7	308.0
Commercial	163.0	0.71	4.6	717.0
Single Family Residential (Low Density)	23.0	0.49	3.6	178.0
Road	163.0	1.00	2.1	447.0

The primary treatment for stormwater runoff discharging from the subject project will be stormwater basins. A monitored outlet is proposed to discharge the 2-year, 24-hour storm over 24 hours or more as required by the NYCDEP regulations. In addition to stormwater ponds, dry grass swales will be utilized to treat stormwater runoff.

The following pollutant removal efficiencies are referenced from the publication *Reducing the Impacts of Stormwater Runoff from New Development*, prepared by the NYSDEC. The pollutant removal efficiencies for the Design 2 extended detention pond can be applied for the ponds containing permanent pools. The detention of the 2-year 24-hour design storm for all of the ponds with permanent pools takes place above the permanent pool elevation.

**LONG TERM POLLUTANT REMOVAL EFFICIENCIES**

Treatment Method	BOD	TP	TN	TSS
Design 2 Extended Detention Basins	40%-60%	40%-60%	20%-40%	80%-100%
Grass Swale	20%-40%	20%-40%	20%-40%	20%-40%

The following table summarizes the estimated pre-development and post-development annual pollutant loads (calculated in Appendix D) calculated for the subject project.

**ANNUAL POLLUTANT SUMMARY TO DESIGN POINT 1**

	Annual Loads (lb/yr)			
	BOD	TP	TN	TSS
<b>Pre-Development Annual Pollutant Loads</b>	327.5	5.41	73.8	3265.0
<b>Post-Development Annual Pollutant Loads</b>	1403.0 to 486.2	6.90 to 2.45	109.0 to 51.8	483.4 to 0.0

**ANNUAL POLLUTANT SUMMARY TO DESIGN POINT 2**

	Annual Loads (lb/yr)			
	BOD	TP	TN	TSS
<b>Pre-Development Annual Pollutant Loads</b>	260.4	3.72	67.0	2864.0
<b>Post-Development Annual Pollutant Loads</b>	189.0	2.89	66.7	4273.5

**ANNUAL POLLUTANT SUMMARY TO DESIGN LINE 3**

	Annual Loads (lb/yr)			
	BOD	TP	TN	TSS
<b>Pre-Development Annual Pollutant Loads</b>	1399.7	12.29	116.1	9048.0
<b>Post-Development Annual Pollutant Loads</b>	1782.9 to 1508.1	12.73 to 11.03	123.2 to 103.1	8138.4 to 7330.0

As seen by the above summary, the post-development pollutant loads are approximately equal to or less than the pre-development pollutants of concern as required by the NYCDEP regulations. In the summary below the added benefit for the treatment of the stormwater runoff discharging from Concord Road has been removed from the post development pollutant loads. As seen in the following summary the post-development pollutant loads are approximately equal to or less than the pre-development loads as required even after the removal of the off-site area proposed to be treated.

**ANNUAL POLLUTANT SUMMARY TO DESIGN LINE 3 DISCOUNTING BENEFIT PROVIDED BY STORMWATER POND 3.4P**

	Annual Loads (lb/yr)			
	BOD	TP	TN	TSS
<b>Pre-Development Annual Pollutant Loads</b>	1399.7	12.29	116.1	9048.0
<b>Post-Development Annual Pollutant Loads</b>	1812.6 to 1552.6	13.44 to 12.09	125.3 to 107.9	8648.0 to 7967.0

The NYSDEC SPDES General Permit GP-02-01 requires that the Water Quality Volume (WQ<sub>v</sub>) be treated in order to provide pollutant removal. The water quality volume is directly related to the amount of impervious cover proposed on the project area. The treatment of the water quality volume discharging to Design Point 1 will be accomplished in the permanent pool of pond 1.4P. Three (3) stormwater ponds will be used as pre-treatment practices prior to treatment of the water quality volume in pond 1.4P. The pre-treatment for pond 1.4P consists of one (1) micropool extended detention ponds (1.3P), and two (2) extended detention dry ponds (1.1P and 1.2P).

The treatment of the water quality volume at Design Line 3 will be accomplished within the permanent pools of ponds 3.2P, 3.3P and 3.4P. Pretreatment practices prior to discharge into pond 3.2P consist of a grass swale and the micropool extended detention pond 3.1P. By meeting the Water Quality Volume requirements through employment of the pocket ponds, micropools, and the extended detention ponds, the water quality objectives of the NYSDEC have been met.

**3.0 STORMWATER CONVEYANCE SYSTEM**

The stormwater conveyance systems for the project consist of grass swales, drain inlets, and HDPE pipe. The systems will be sized utilizing the Rational Method. The Rational Method is a standard method used by engineers to develop flow rates for sizing conveyance systems. The Rational Method calculates flows based on a one-hour design storm. The conveyance systems will be sized to convey, at a minimum, the 100-year design storm.

**4.0 EROSION AND SEDIMENT CONTROL**

Erosion and sediment control will be accomplished by four basic principles: diversion of clean water, containment of sediment, treatment of dirty water, and stabilization of disturbed areas. Diversion of clean water will be accomplished with swales. This diverted water will be safely conveyed around the construction area as necessary and discharged downstream of the disturbed areas. Sediment will be contained with the use of silt fence at the toe of disturbed slopes and excavation of temporary sediment basins. Disturbed areas will be permanently stabilized within 14 days of final grading to limit the required length of time that the temporary facilities must be utilized.

**4.1 Temporary Erosion and Sediment Control Facilities**

Temporary erosion and sediment control facilities will be installed and maintained as required to reduce the impacts to off-site properties. In general, the following temporary methods and materials will be used to control erosion and sedimentation from the project site:

- Stabilized Construction Entrance
- Diversion Swales
- Silt Fence Barriers
- Stone Check Dams
- Storm Drain Inlet Protection
- Sediment Basins

A stabilized construction entrance will be installed at the entrance to the site as shown on the plan. The design drawings will include details to guide the contractor in the construction of this entrance. The intent of the stabilized construction entrance is to prevent the “tracking” of soil from the site. Dust control will be accomplished with water sprinkling trucks if required. During dry periods, sprinkler trucks will wet all exposed earth surfaces as required to prevent the transport of air-borne particles to adjoining properties.

Stormwater from areas uphill of the subject development area will be diverted. During construction stormwater from areas of disturbance will be diverted through the use of grass swales to other practices such as filter barriers and/or sediment basins. Stone check dams will be installed in the grass swales to reduce runoff velocities and filter sediment picked up from the swale's bottom.

Siltation barriers constructed of geosynthetic filter cloth will be installed liberally at the toe of all disturbed slopes. The intent of these barriers is to contain silt and sediment at the source and inhibit its transport by stormwater runoff. The siltation barriers will also help reduce the rate of runoff by creating numerous filters through which the stormwater must pass. Siltation barriers will also be installed around catch basins and drain inlets. The intent of these barriers is to prevent silt and sedimentation from entering the stormwater collection system.

The stormwater ponds will also act as temporary sediment basins during construction of the proposed road and utilities. Most stormwater runoff from disturbed areas will be directed to the sediment basins. These basins will be sized in accordance with the publication, *New York Guidelines for Urban Erosion and Sediment Control*, printed by the Empire State Chapter Soil and Water Conservation Society.

#### 4.2 Permanent Erosion and Sediment Control Facilities

Permanent erosion and sediment control will be accomplished by diverting stormwater runoff from steep slopes, controlling/reducing stormwater runoff velocities and volumes, and vegetative and structural surface stabilization. All of the permanent facilities are relatively maintenance free and only require periodic inspections.

The temporary sediment basins will be cleaned of all sediment and debris, excavated to their final elevations and dimensions and stabilized with the vegetation as indicated on the plans. Riprap aprons will be used at the discharge end of all piped drainage systems. Runoff velocities will be reduced to levels that are non-erosive to the receiving waterbodies through use of these aprons.

Other than the actual buildings and driveway surfaces, the primary method for permanently stabilizing disturbed surfaces at the subject site is with vegetation. The vegetation will control stormwater runoff by preventing soil erosion, reducing runoff volume and velocities, and providing a filter medium. Permanent seeding should optimally be undertaken in the spring from March 21<sup>st</sup> through May 20<sup>th</sup> and in late summer from August 15<sup>th</sup> to October 15<sup>th</sup>. The stormwater basins will allow for settlement of suspended sediment that is generated by stormwater runoff from the site. These facilities provide a central collection area for sediment deposition and eventual disposal.

## 5.0 IMPLEMENTATION AND MAINTENANCE

### 5.1 Construction Phase

Details associated with the implementation and maintenance of the proposed stormwater facilities and erosion control measures during construction will be shown on the project plans. A construction sequence will be provided to guide the contractor in the installation of the erosion control measures as well as the site plan features. The erosion control plan will include associated details and notes to aid the contractor in implementing the plan.

The stormwater ponds have been designed to limit the routine maintenance requirements. Initially the basins will require regular maintenance until the permanent vegetation is established. Permanent vegetation is considered established when 80% of the final plant density is established. Vegetation should be inspected every 30 days and after a rain event of 1/2" or greater until established, after which inspection should take place on a quarterly basis. Damaged areas should be immediately re-seeded and re-mulched. The floor of the ponds will be planted with a seed mixture that contains plants that are tolerant of occasional flooding. The seed mixtures contain several plant species that vary slightly in their needs for survival. It is expected that not all of the species will survive within each basin due to variations within each basin such as water, nutrients, and light. During the initial year of planting, the plants may require watering to germinate and become established. Note that several seedings may be required during the first year to completely establish vegetation within the ponds. After the initial year of establishment, the ponds do not need to be fertilized or watered. A natural selection process will occur over the first few years, such that the species within the seed mixture most suitable to the conditions will survive.

### 5.2 Long Term Maintenance Plan

The stormwater facilities for the subject project have been designed to minimize the required maintenance. This section discusses the minimum maintenance requirements to insure long-term performance of the stormwater facilities. Initially the stormwater facilities will require an increased maintenance and inspection schedule until all portions of the site are stable. Generally the stormwater facilities consist of either collection/conveyance components or treatment components.

The stormwater collection and conveyance systems are composed of concrete drain inlets with cast iron frames and grates, high-density polyethylene pipe, and grass and rip rap swales. Minimal maintenance is typically required for these facilities. Each spring the paved areas will be cleaned to remove the winter's accumulation of traction sand. After this is completed, all drain inlet sumps will be cleaned. All pipes will be checked for debris and blockages and cleaned as required. During the cleaning process, the drain inlets and pipes will be inspected for structural integrity and overall condition; repairs and/or replacement will be made as required. Swales will be inspected for debris, blockages and erosion and shall be cleaned and repaired as required.

Once the desired vegetative cover is established in the ponds, only limited maintenance is required. The basins and outlet structures should be inspected after major storm events and semi-annually. During the inspections, the following should be checked:

- Evidence of clogging of outlet structure.
- Erosion of the flow path through the pond.
- Subsidence, erosion, cracking or tree growth on the embankment/berm.
- Condition of the emergency spillway.
- Accumulation of sediment around the outlet structure.
- Adequacy of upstream/downstream channel erosion control measures.
- Erosion of the basin bed and banks.
- Sources of erosion in the contributory drainage, which should be stabilized.

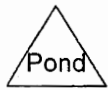
Access to the ponds will be through stabilized pond accesses. The accesses are proposed to be graded to final grades and seeded and mulched in accordance with the Erosion & Sedimentation Control Notes. The grass swales, the graded pond accesses, and the side slopes and berms of the ponds should be mowed annually to prevent the establishment of woody plants within the swales, accesses, or pond berms. The bottoms of the ponds should not be mowed. During the mowing operations, debris and litter should be removed from all parts of the swales, accesses, and ponds. Accumulated sediment will need to be removed from the swales and ponds approximately every 10 to 20 years, or when 50 percent of their capacity has been reached.



**APPENDIX A**

**Pre-Development Computer Data**





**Patterson Crossing Pre Development**

Type III 24-hr 2-year Rainfall=3.50"

Prepared by Insite Engineering, Surveying & Landscape Architecture,P.C>  
HydroCAD® 7.00 s/n 002171 © 1986-2003 Applied Microcomputer Systems

**Subcatchment PRE 1:**

Runoff = 20.88 cfs @ 12.61 hrs, Volume= 3.236 af, Depth= 1.06"

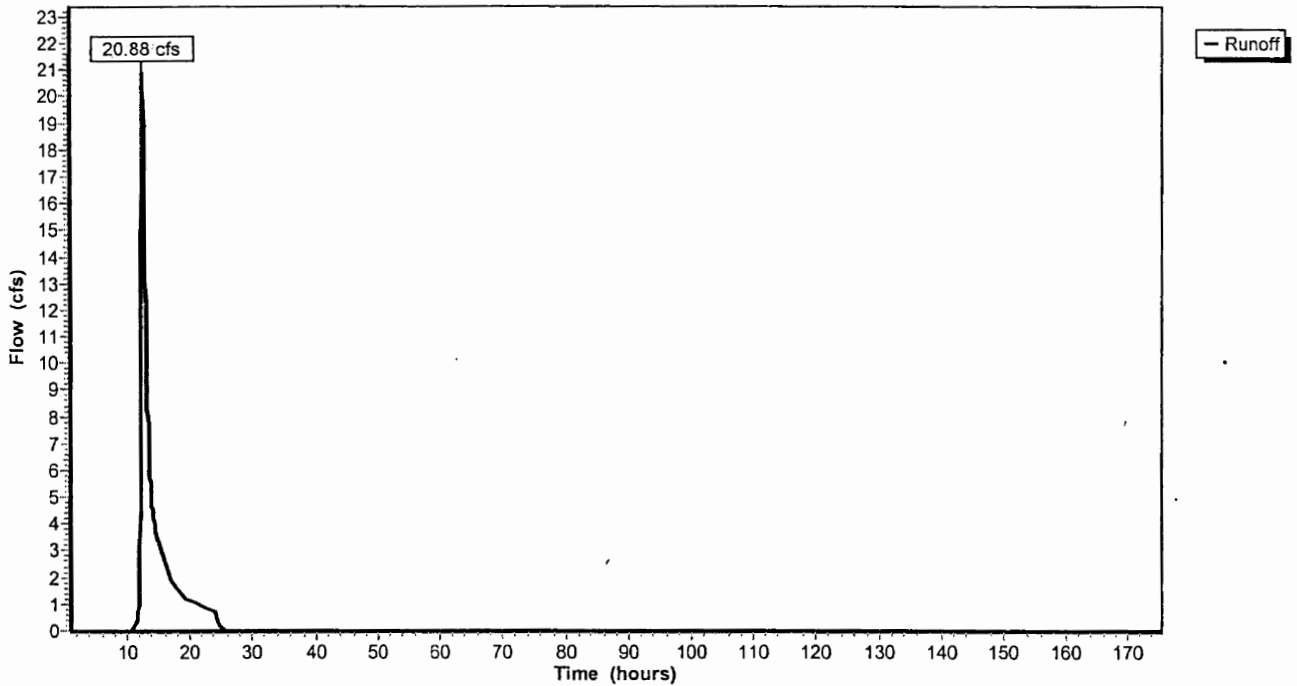
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
32.000	70	Woods, Good, HSG C
4.500	79	1 acre lots, 20% imp, HSG C
36.500	71	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.0					Direct Entry,

**Subcatchment PRE 1:**

Hydrograph



**Patterson Crossing Pre Development**

Type III 24-hr 2-year Rainfall=3.50"

Prepared by Insite Engineering, Surveying & Landscape Architecture,P.C>  
HydroCAD® 7.00 s/n 002171 © 1986-2003 Applied Microcomputer Systems

**Subcatchment PRE 2:**

Runoff = 22.86 cfs @ 12.47 hrs, Volume= 3.125 af, Depth= 1.01"

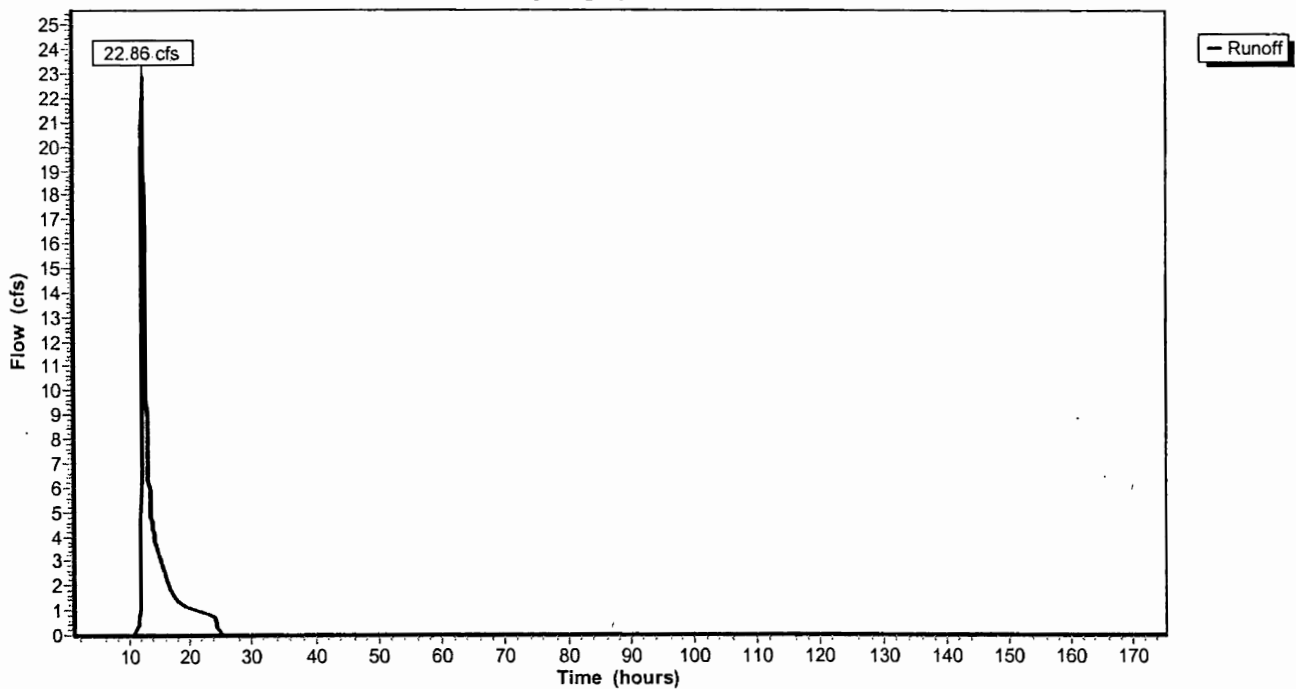
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
37.200	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					Direct Entry,

**Subcatchment PRE 2:**

Hydrograph



# Patterson Crossing Pre Development

Type III 24-hr 2-year Rainfall=3.50"

Prepared by Insite Engineering, Surveying & Landscape Architecture, P.C.  
HydroCAD® 7.00 s/n 002171 © 1986-2003 Applied Microcomputer Systems

## Subcatchment PRE 3:

Runoff = 35.38 cfs @ 12.59 hrs, Volume= 5.283 af, Depth= 1.30"

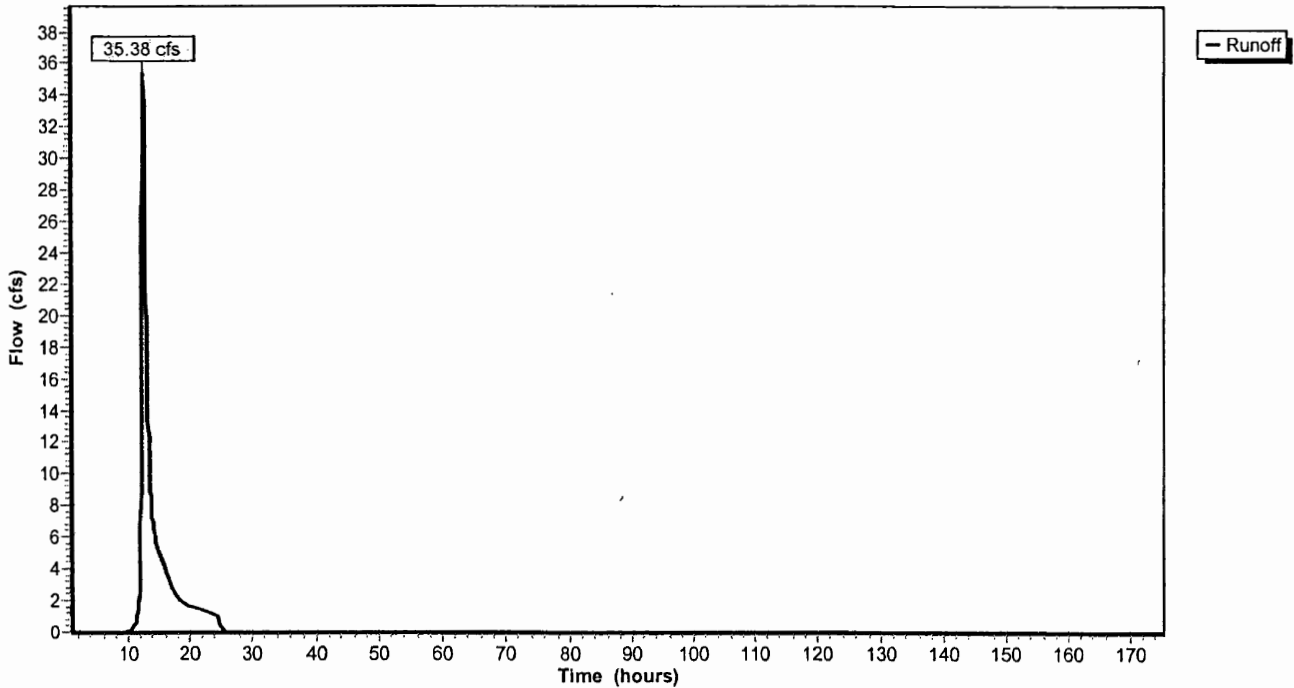
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
28.100	70	Woods, Good, HSG C
6.500	98	Paved parking & roofs
2.800	79	1 acre lots, 20% imp, HSG C
11.300	74	>75% Grass cover, Good, HSG C
48.700	75	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.0					Direct Entry,

## Subcatchment PRE 3:

Hydrograph



# Patterson Crossing Pre Development

Type III 24-hr 10-year Rainfall=5.00"

Prepared by Insite Engineering, Surveying & Landscape Architecture,P.C>  
HydroCAD® 7.00 s/n 002171 © 1986-2003 Applied Microcomputer Systems

## Subcatchment PRE 1:

Runoff = 43.81 cfs @ 12.58 hrs, Volume= 6.438 af, Depth= 2.12"

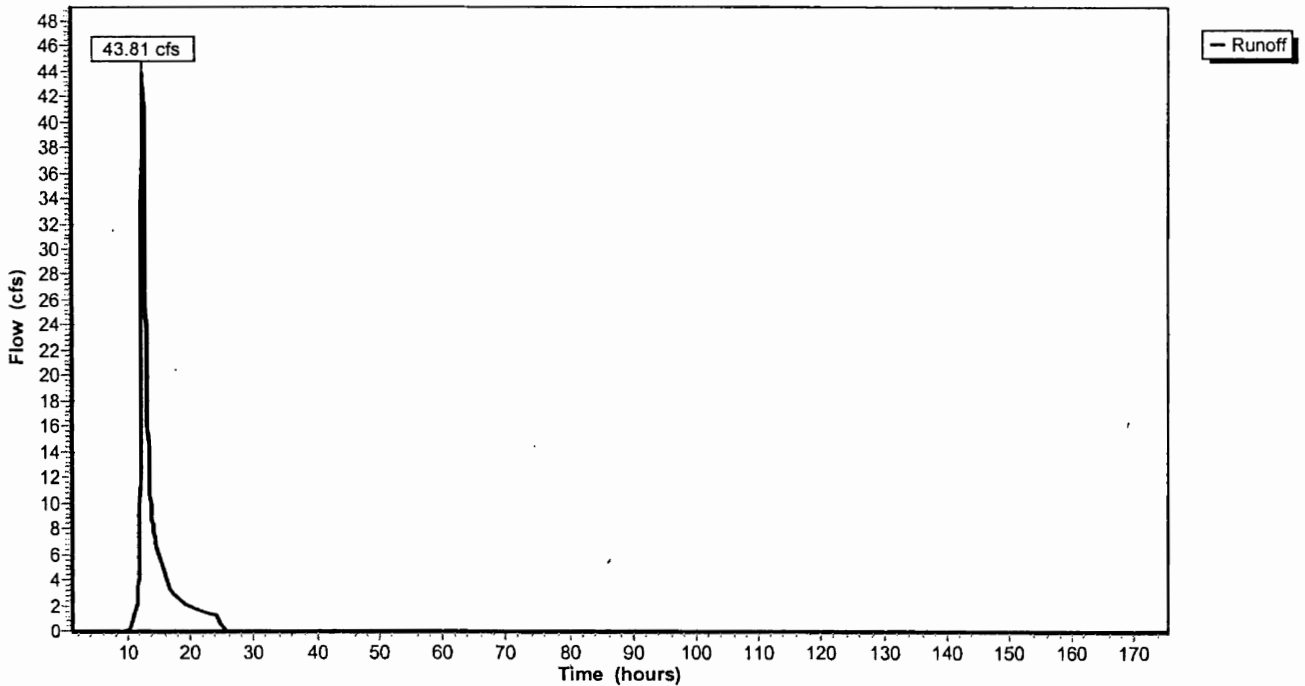
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-year Rainfall=5.00"

Area (ac)	CN	Description
32.000	70	Woods, Good, HSG C
4.500	79	1 acre lots, 20% imp, HSG C
36.500	71	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.0					Direct Entry,

## Subcatchment PRE 1:

Hydrograph



**Patterson Crossing Pre Development**

Type III 24-hr 10-year Rainfall=5.00"

Prepared by Insite Engineering, Surveying & Landscape Architecture,P.C>  
HydroCAD® 7.00 s/n 002171 © 1986-2003 Applied Microcomputer Systems

**Subcatchment PRE 2:**

Runoff = 49.08 cfs @ 12.44 hrs, Volume= 6.313 af, Depth= 2.04"

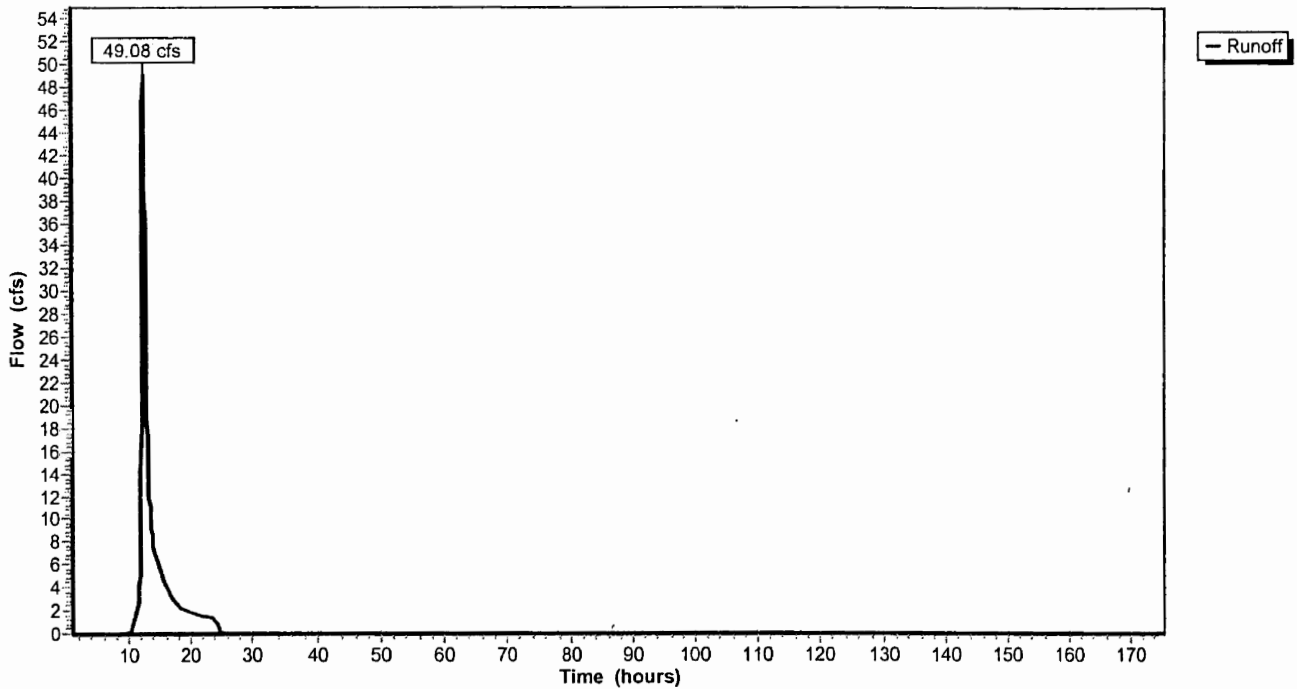
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-year Rainfall=5.00"

Area (ac)	CN	Description
37.200	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					Direct Entry,

**Subcatchment PRE 2:**

Hydrograph



# Patterson Crossing Pre Development

Type III 24-hr 10-year Rainfall=5.00"

Prepared by Insite Engineering, Surveying & Landscape Architecture,P.C>

HydroCAD® 7.00 s/n 002171 © 1986-2003 Applied Microcomputer Systems

## Subcatchment PRE 3:

Runoff = 68.46 cfs @ 12.57 hrs, Volume= 9.940 af, Depth= 2.45"

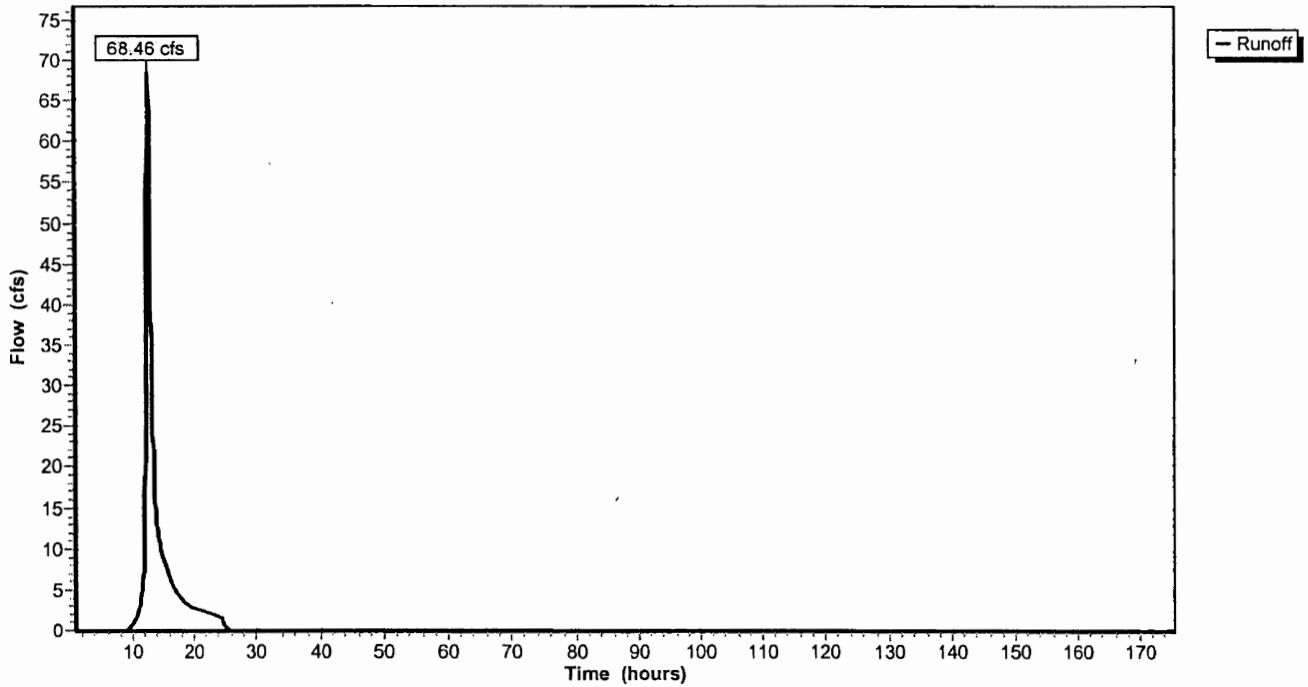
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-year Rainfall=5.00"

Area (ac)	CN	Description
28.100	70	Woods, Good, HSG C
6.500	98	Paved parking & roofs
2.800	79	1 acre lots, 20% imp, HSG C
11.300	74	>75% Grass cover, Good, HSG C
48.700	75	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.0					Direct Entry,

## Subcatchment PRE 3:

Hydrograph



# Patterson Crossing Pre Development

Type III 24-hr 25-year Rainfall=6.00"

Prepared by Insite Engineering, Surveying & Landscape Architecture, P.C.

HydroCAD® 7.00 s/n 002171 © 1986-2003 Applied Microcomputer Systems

## Subcatchment PRE 1:

Runoff = 60.68 cfs @ 12.57 hrs, Volume= 8.817 af, Depth= 2.90"

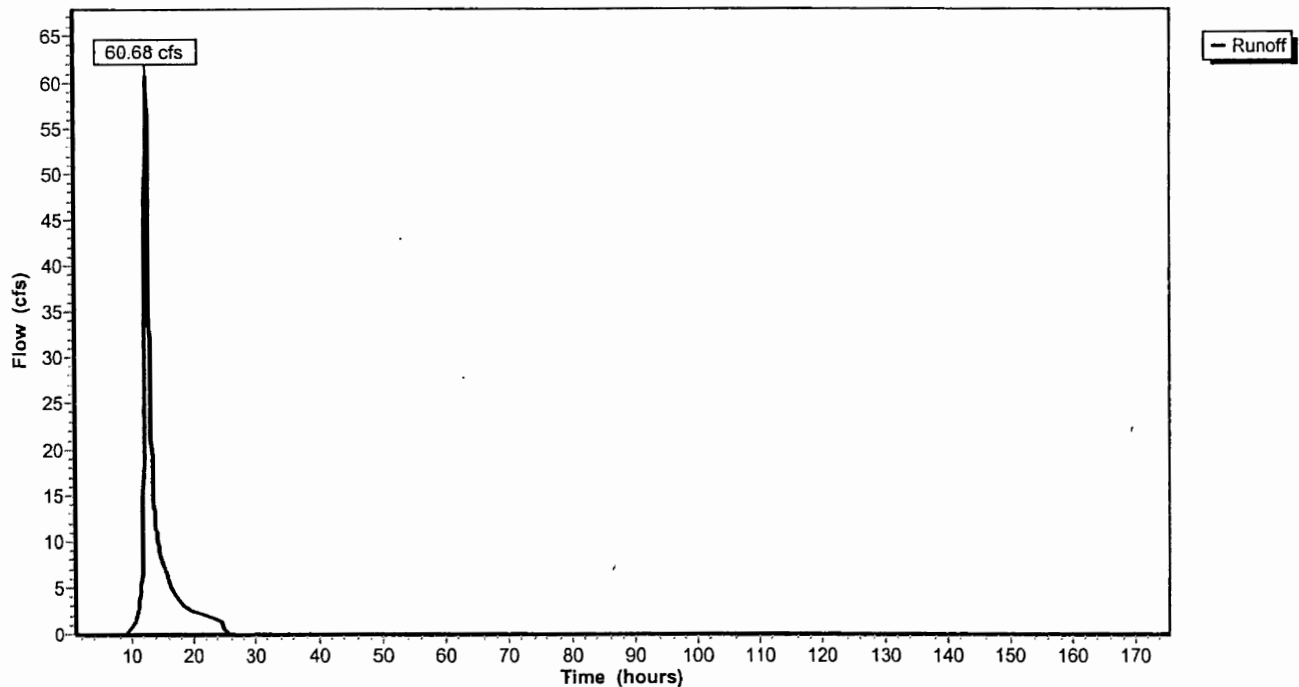
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-year Rainfall=6.00"

Area (ac)	CN	Description
32.000	70	Woods, Good, HSG C
4.500	79	1 acre lots, 20% imp, HSG C
36.500	71	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.0					Direct Entry,

## Subcatchment PRE 1:

Hydrograph



# Patterson Crossing Pre Development

Type III 24-hr 25-year Rainfall=6.00"

Prepared by Insite Engineering, Surveying & Landscape Architecture,P.C>

HydroCAD® 7.00 s/n 002171 © 1986-2003 Applied Microcomputer Systems

## Subcatchment PRE 2:

Runoff = 68.51 cfs @ 12.43 hrs, Volume= 8.696 af, Depth= 2.81"

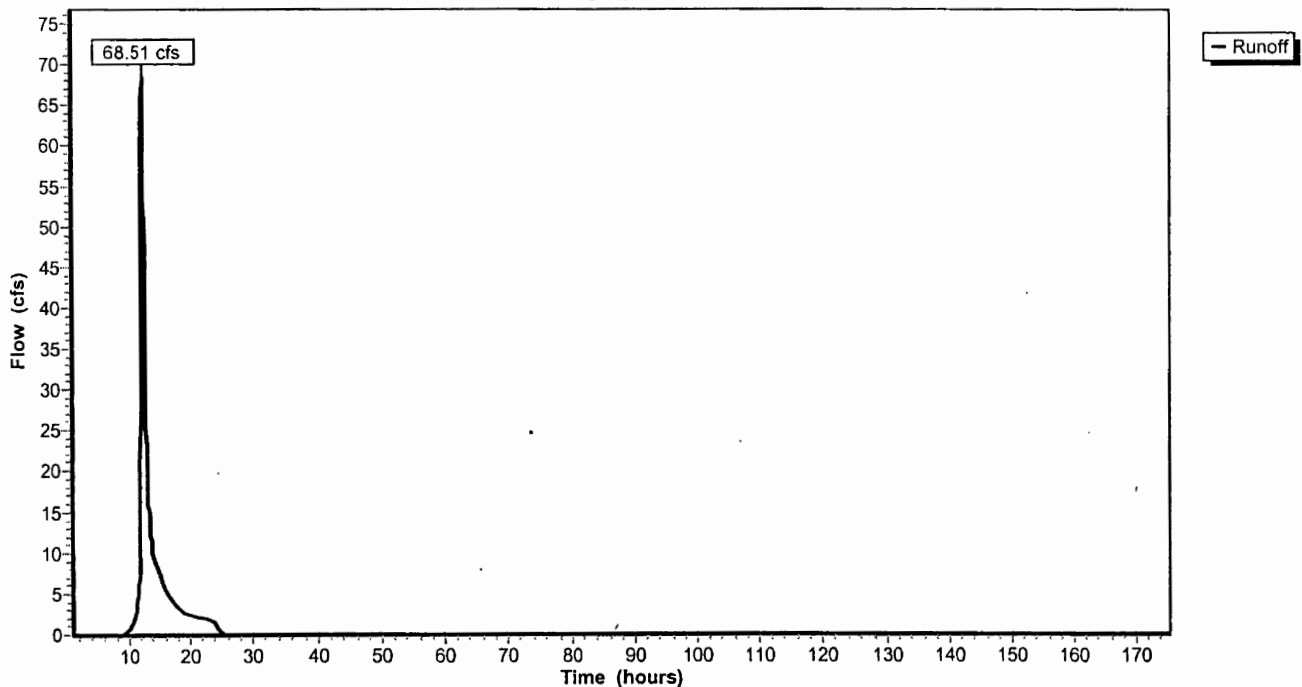
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-year Rainfall=6.00"

Area (ac)	CN	Description
37.200	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					Direct Entry,

## Subcatchment PRE 2:

Hydrograph



**Patterson Crossing Pre Development**

Type III 24-hr 25-year Rainfall=6.00"

Prepared by Insite Engineering, Surveying & Landscape Architecture,P.C>

HydroCAD® 7.00 s/n 002171 © 1986-2003 Applied Microcomputer Systems

**Subcatchment PRE 3:**

Runoff = 92.14 cfs @ 12.56 hrs, Volume= 13.320 af, Depth= 3.28"

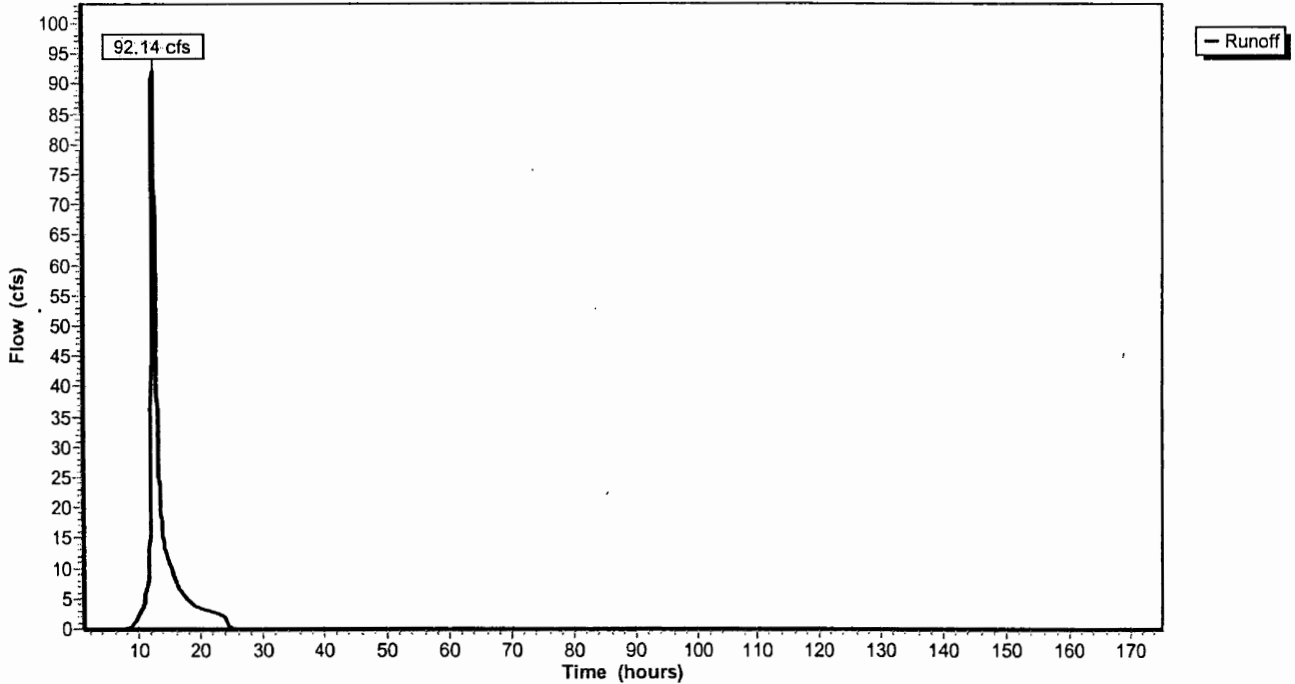
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-year Rainfall=6.00"

Area (ac)	CN	Description
28.100	70	Woods, Good, HSG C
6.500	98	Paved parking & roofs
2.800	79	1 acre lots, 20% imp, HSG C
11.300	74	>75% Grass cover, Good, HSG C
48.700	75	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.0					Direct Entry,

**Subcatchment PRE 3:**

Hydrograph



# Patterson Crossing Pre Development

Type III 24-hr 100-year Rainfall=7.50"

Prepared by Insite Engineering, Surveying & Landscape Architecture,P.C.  
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## Subcatchment PRE 1:

Runoff = 87.30 cfs @ 12.56 hrs, Volume= 12.617 af, Depth= 4.15"

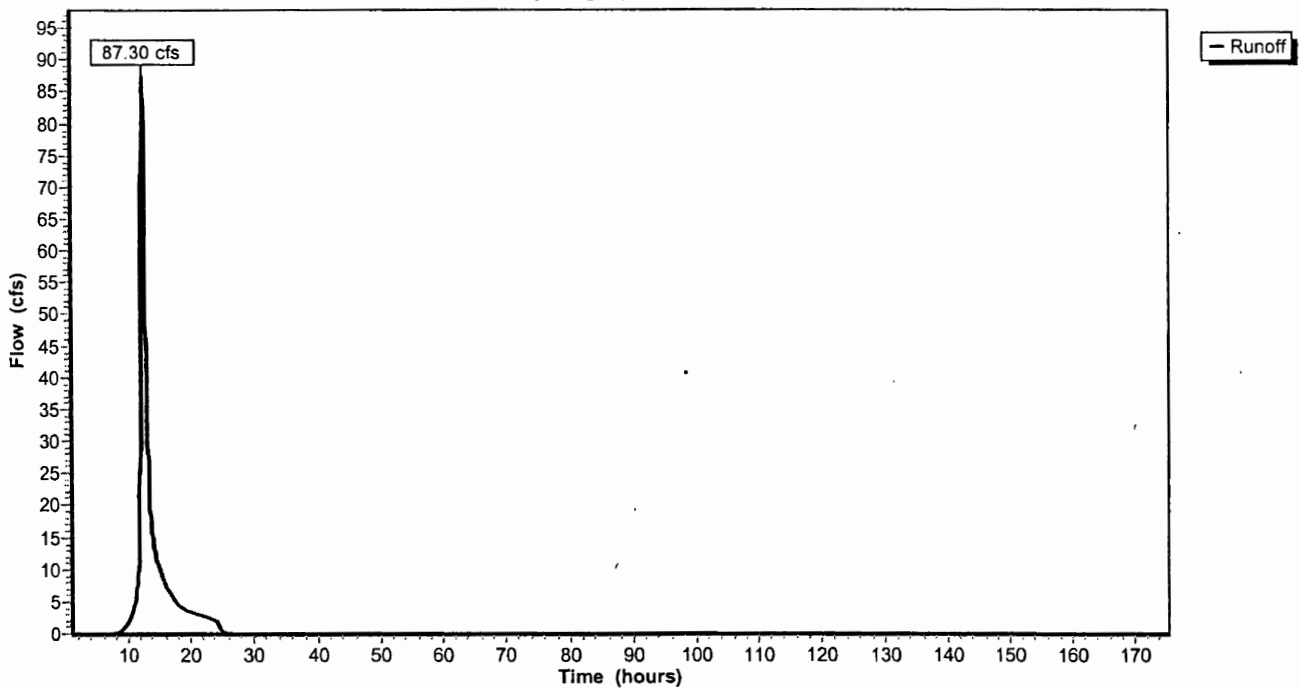
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-year Rainfall=7.50"

Area (ac)	CN	Description
32.000	70	Woods, Good, HSG C
4.500	79	1 acre lots, 20% imp, HSG C
36.500	71	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.0					Direct Entry,

## Subcatchment PRE 1:

Hydrograph



**Patterson Crossing Pre Development**

Type III 24-hr 100-year Rainfall=7.50"

Prepared by Insite Engineering, Surveying & Landscape Architecture,P.C>  
HydroCAD® 7.00 s/n 002171 © 1986-2003 Applied Microcomputer Systems

**Subcatchment PRE 2:**

Runoff = 99.33 cfs @ 12.42 hrs, Volume= 12.517 af, Depth= 4.04"

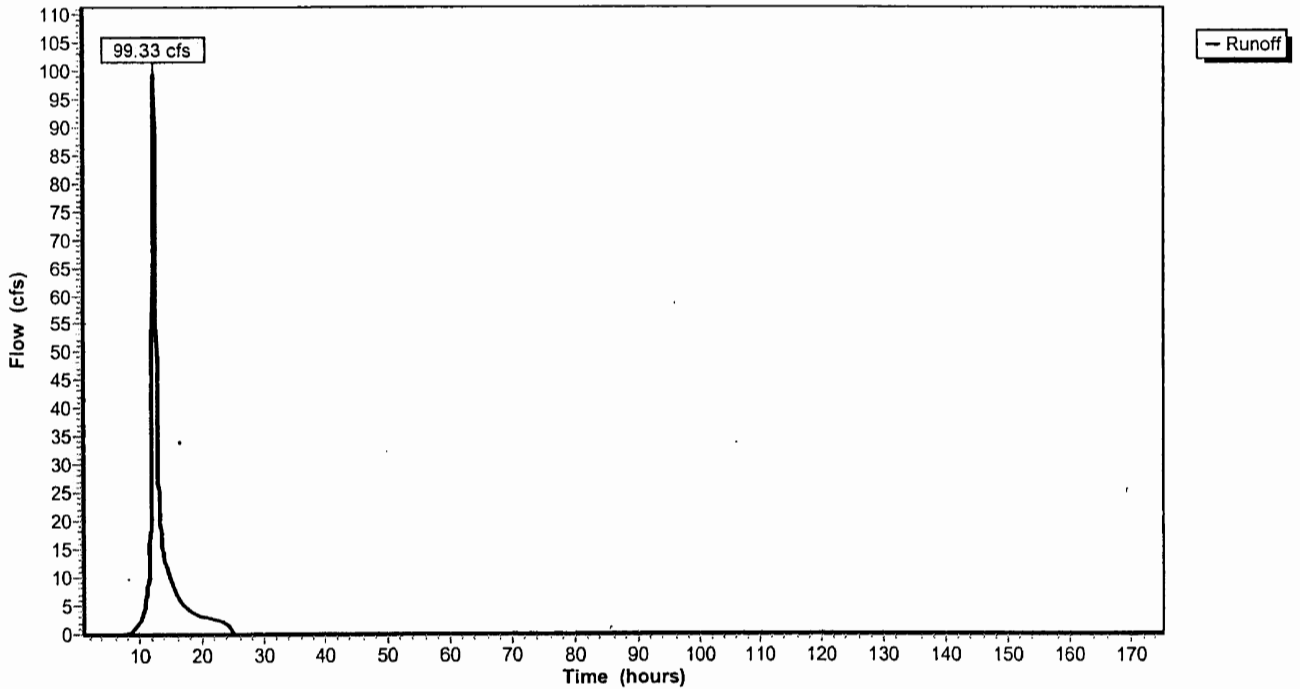
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-year Rainfall=7.50"

Area (ac)	CN	Description
37.200	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					Direct Entry,

**Subcatchment PRE 2:**

Hydrograph



# Patterson Crossing Pre Development

Type III 24-hr 100-year Rainfall=7.50"

Prepared by Insite Engineering, Surveying & Landscape Architecture, P.C.

HydroCAD® 7.00 s/n 002171 © 1986-2003 Applied Microcomputer Systems

## Subcatchment PRE 3:

Runoff = 128.87 cfs @ 12.55 hrs, Volume= 18.640 af, Depth= 4.59"

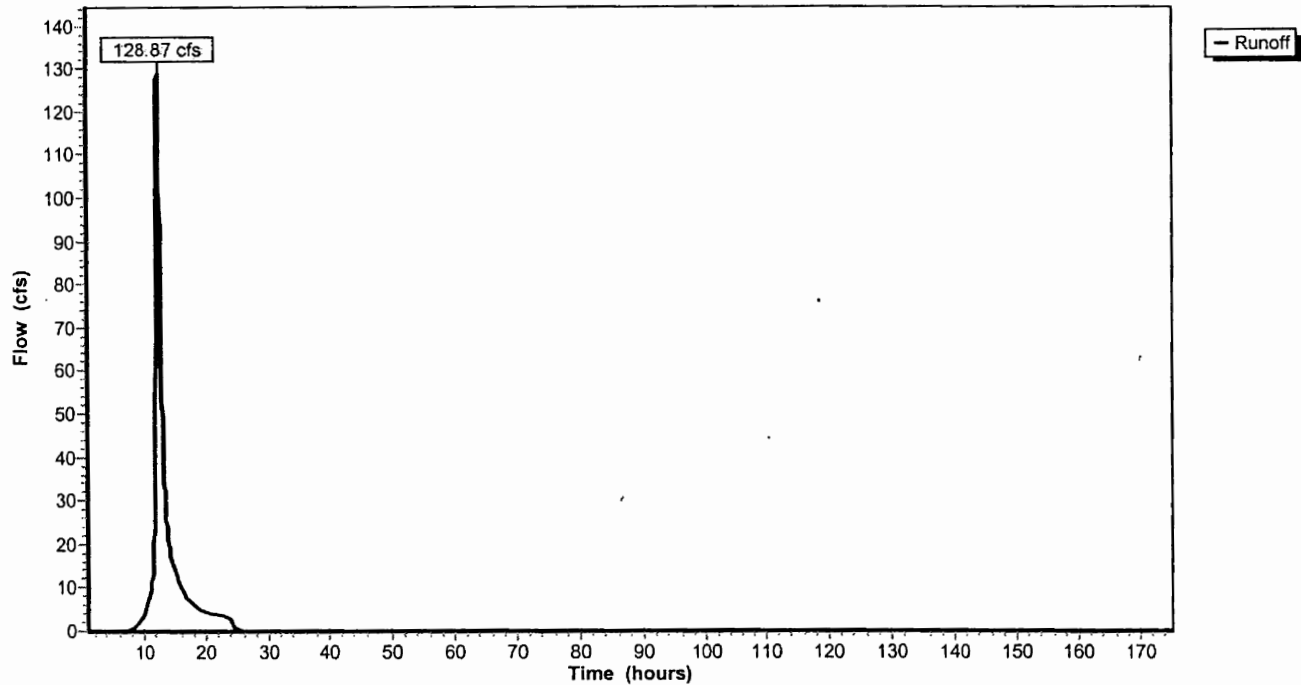
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-year Rainfall=7.50"

Area (ac)	CN	Description
28.100	70	Woods, Good, HSG C
6.500	98	Paved parking & roofs
2.800	79	1 acre lots, 20% imp, HSG C
11.300	74	>75% Grass cover, Good, HSG C
48.700	75	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.0					Direct Entry,

## Subcatchment PRE 3:

Hydrograph

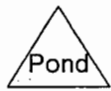
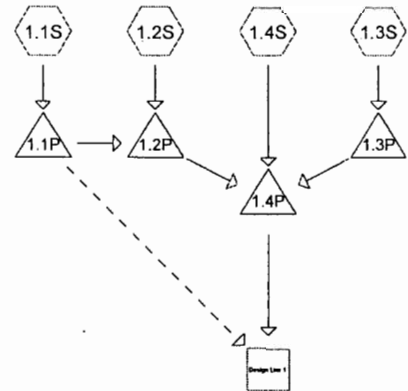
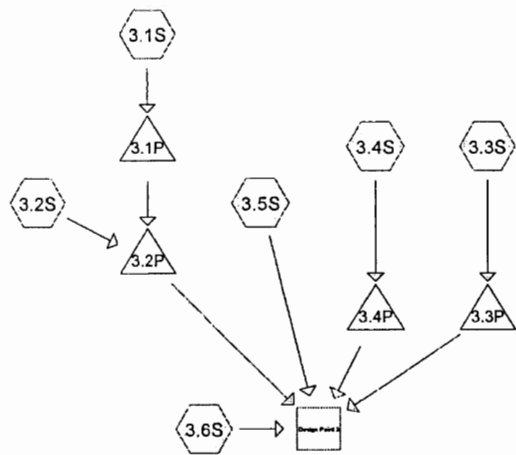




**APPENDIX B**

**Post-Development Computer Data**





**Drainage Diagram for Patterson Crossing Post Development**  
 Prepared by Insite Engineering, Surveying & Landscape Architecture, P.C.  
 HydroCAD® 7.00 s/n 002171 © 1986-2003 Applied Microcomputer Systems

**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

Prepared by Insite Engineering, Surveying, and Landscape Architecture, P.C.  
HydroCAD® 7.10 s/n 002171 © 2005 HydroCAD Software Solutions LLC

**Subcatchment 1.1S:**

Runoff = 40.49 cfs @ 12.28 hrs, Volume= 4.291 af, Depth= 1.49"

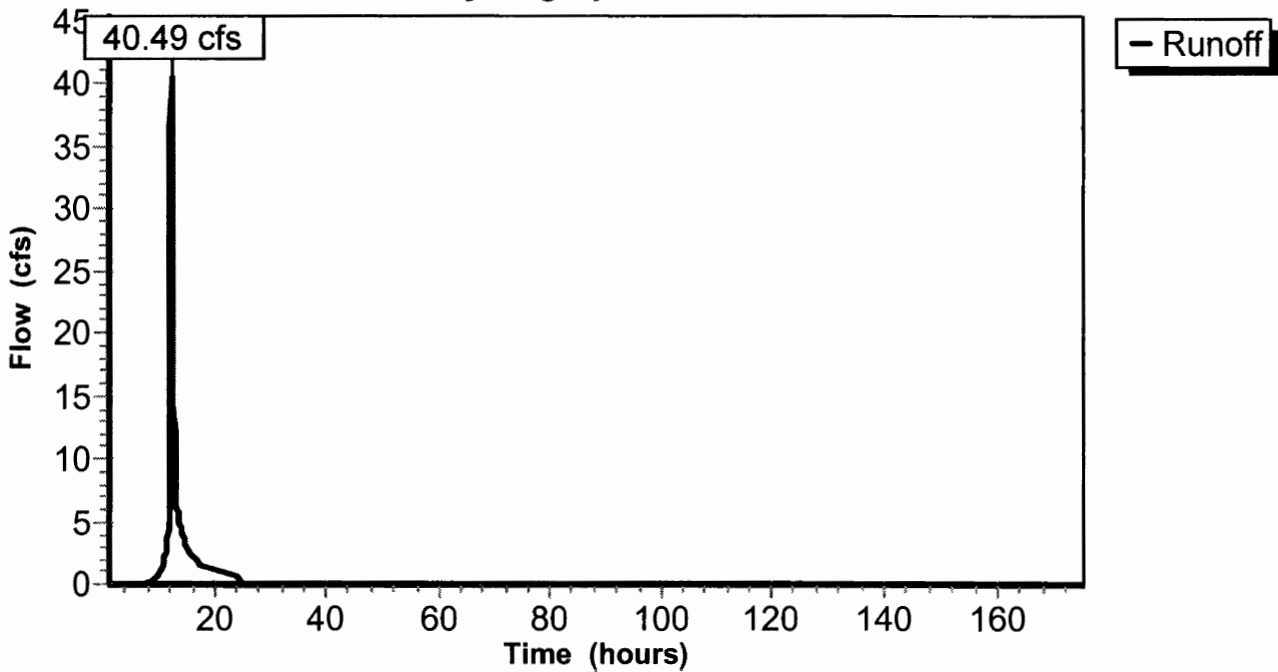
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1-year Rainfall=2.80"

Area (ac)	CN	Description
26.000	90	Suburban Shopping Center
6.000	70	Woods, Good, HSG C
1.500	79	1 acre lots, 20% imp, HSC C
1.000	74	>75% Grass cover, Good, HSG C
34.500	86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

**Subcatchment 1.1S:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

Prepared by Insite Engineering, Surveying, and Landscape Architecture, P.C.  
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**Subcatchment 1.2S:**

[49] Hint:  $T_c < 2dt$  may require smaller dt

Runoff = 0.85 cfs @ 12.09 hrs, Volume= 0.065 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1-year Rainfall=2.80"

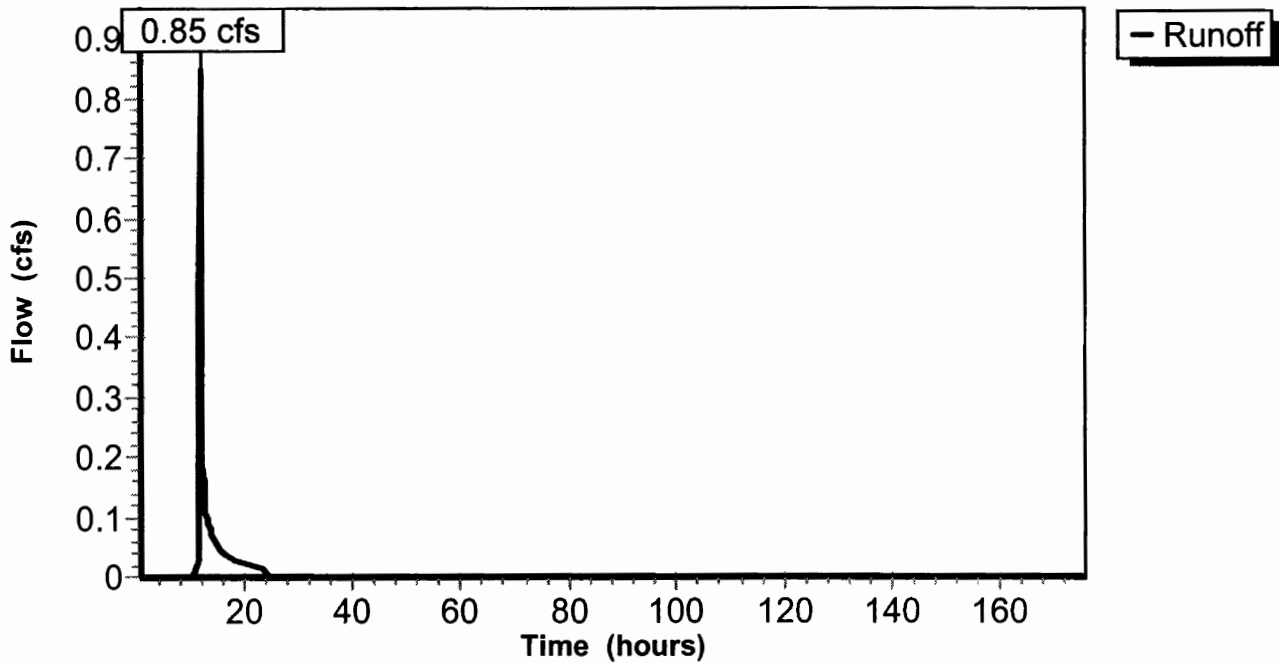
Area (ac)	CN	Description
1.000	74	>75% Grass cover, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

**Subcatchment 1.2S:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

Prepared by Insite Engineering, Surveying, and Landscape Architecture, P.C.  
HydroCAD® 7.10 s/n 002171 © 2005 HydroCAD Software Solutions LLC

**Subcatchment 1.3S:**

Runoff = 13.28 cfs @ 12.28 hrs, Volume= 1.410 af, Depth= 1.42"

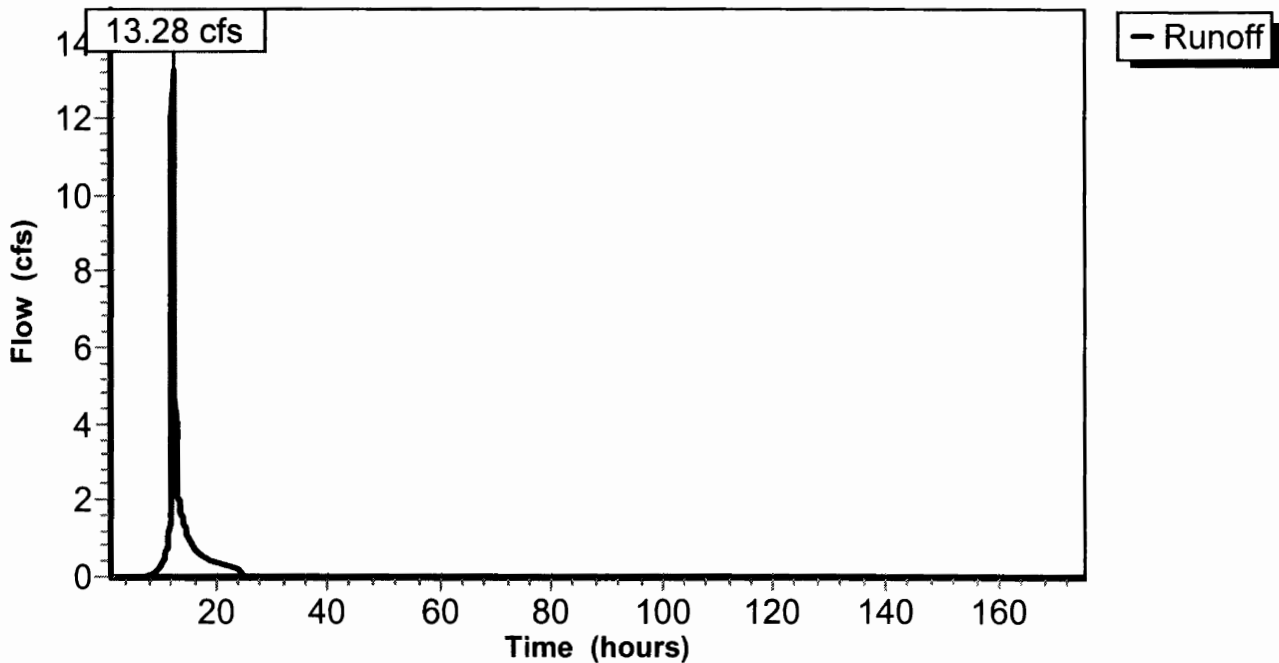
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1-year Rainfall=2.80"

Area (ac)	CN	Description
7.400	90	Suburban Shopping Center
3.000	79	1 acre lots, 20% imp, HSG C
1.500	74	>75% Grass cover, Good, HSG C
11.900	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

**Subcatchment 1.3S:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

Prepared by Insite Engineering, Surveying, and Landscape Architecture, P.C.  
HydroCAD® 7.10 s/n 002171 © 2005 HydroCAD Software Solutions LLC

**Subcatchment 1.4S:**

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

Runoff = 0.85 cfs @ 12.09 hrs, Volume= 0.065 af, Depth= 0.78"

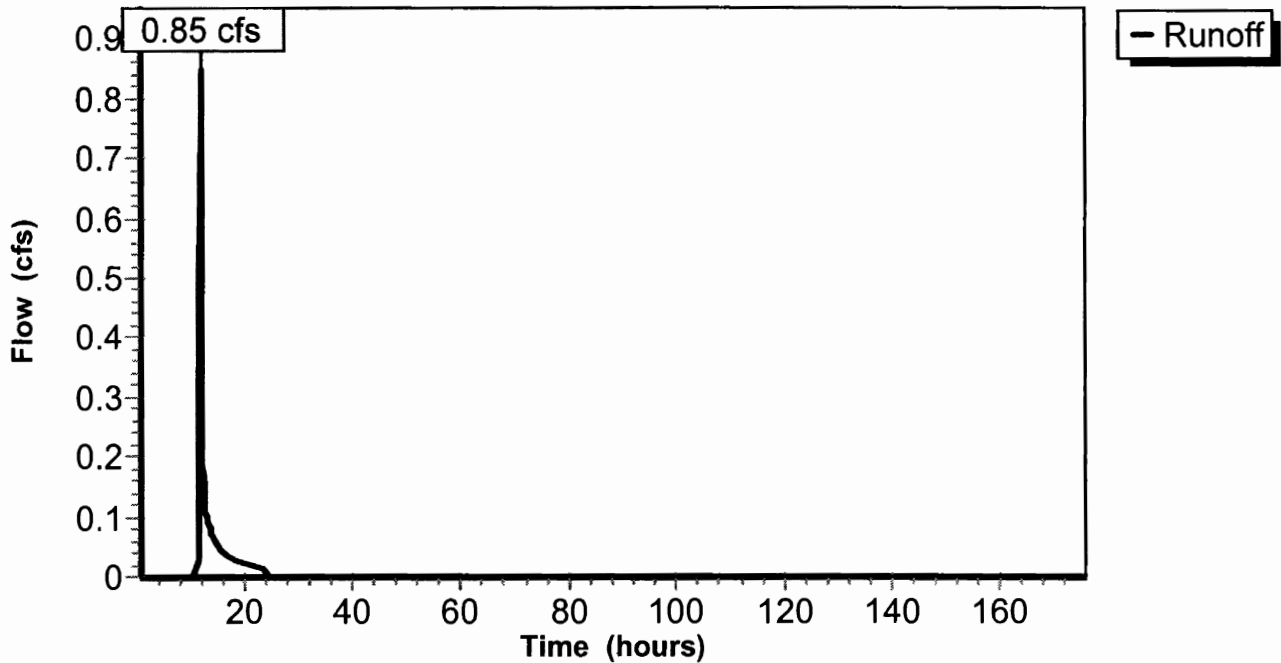
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs,  $dt= 0.05$  hrs  
Type III 24-hr 1-year Rainfall=2.80"

Area (ac)	CN	Description
1.000	74	>75% Grass cover, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

**Subcatchment 1.4S:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

Prepared by Insite Engineering, Surveying, and Landscape Architecture, P.C.  
 HydroCAD® 7.10 s/n 002171 © 2005 HydroCAD Software Solutions LLC

**Pond 1.1P:**

Inflow Area = 34.500 ac, Inflow Depth = 1.49" for 1-year event  
 Inflow = 40.49 cfs @ 12.28 hrs, Volume= 4.291 af  
 Outflow = 3.45 cfs @ 14.71 hrs, Volume= 3.440 af, Atten= 91%, Lag= 145.8 min  
 Primary = 3.45 cfs @ 14.71 hrs, Volume= 3.440 af  
 Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Peak Elev= 781.37' @ 14.71 hrs Surf.Area= 38,271 sf Storage= 124,959 cf  
 Plug-Flow detention time= 2,115.8 min calculated for 3.440 af (80% of inflow)  
 Center-of-Mass det. time= 2,038.1 min ( 2,879.6 - 841.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	774.00'	239,800 cf	<b>Custom Stage Data (Prismatid)</b> listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
774.00	2,800	0	0
776.00	8,500	11,300	11,300
778.00	15,000	23,500	34,800
780.00	27,000	42,000	76,800
782.00	43,500	70,500	147,300
784.00	49,000	92,500	239,800

Device	Routing	Invert	Outlet Devices
#1	Primary	778.00'	<b>3.5" Vert. Orifice/Grate</b> C= 0.300
#2	Primary	781.10'	<b>8.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Secondary	782.00'	<b>28.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=3.41 cfs @ 14.71 hrs HW=781.37' (Free Discharge)  
 1=Orifice/Grate (Orifice Controls 0.29 cfs @ 4.3 fps)  
 2=Broad-Crested Rectangular Weir (Weir Controls 3.12 cfs @ 1.5 fps)

**Secondary OutFlow** Max=0.00 cfs @ 1.00 hrs HW=774.00' (Free Discharge)  
 3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

**Patterson Crossing Post Development**

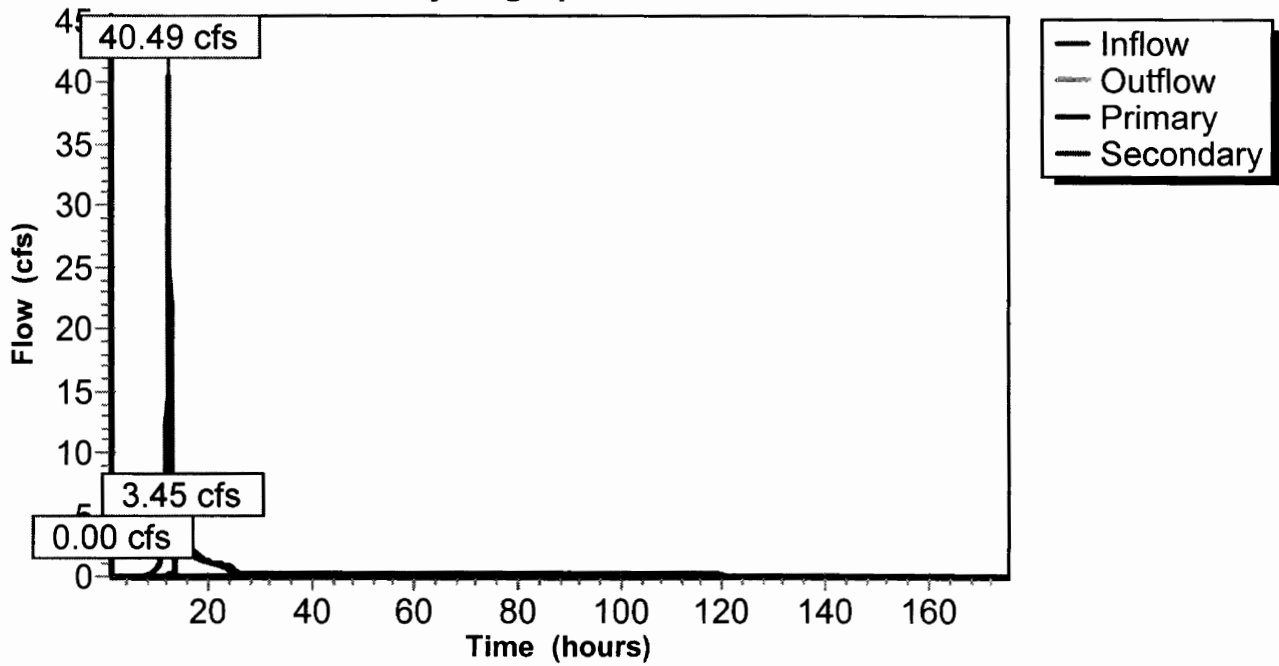
Type III 24-hr 1-year Rainfall=2.80"

Prepared by Insite Engineering, Surveying, and Landscape Architecture, P.C.

HydroCAD® 7.10 s/n 002171 © 2005 HydroCAD Software Solutions LLC

**Pond 1.1P:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

Prepared by Insite Engineering, Surveying, and Landscape Architecture, P.C.

HydroCAD® 7.10 s/n 002171 © 2005 HydroCAD Software Solutions LLC

**Pond 1.2P:**

Inflow Area = 35.500 ac, Inflow Depth > 1.18" for 1-year event  
 Inflow = 3.52 cfs @ 14.70 hrs, Volume= 3.506 af  
 Outflow = 0.41 cfs @ 25.27 hrs, Volume= 3.504 af, Atten= 88%, Lag= 634.4 min  
 Primary = 0.41 cfs @ 25.27 hrs, Volume= 3.504 af  
 Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Peak Elev= 771.49' @ 25.27 hrs Surf.Area= 16,758 sf Storage= 57,518 cf  
 Plug-Flow detention time= 1,493.3 min calculated for 3.504 af (100% of inflow)  
 Center-of-Mass det. time= 1,490.8 min ( 4,333.0 - 2,842.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	766.00'	126,400 cf	<b>Custom Stage Data (Prismatid)</b> listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
766.00	3,800	0	0
768.00	8,700	12,500	12,500
770.00	13,100	21,800	34,300
772.00	18,000	31,100	65,400
774.00	21,000	39,000	104,400
775.00	23,000	22,000	126,400

Device	Routing	Invert	Outlet Devices
#1	Primary	765.00'	<b>3.5" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	772.50'	<b>10.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.41 cfs @ 25.27 hrs HW=771.49' (Free Discharge)  
 ↳1=**Orifice/Grate** (Orifice Controls 0.41 cfs @ 6.1 fps)

**Secondary OutFlow** Max=0.00 cfs @ 1.00 hrs HW=766.00' (Free Discharge)  
 ↳2=**Broad-Crested Rectangular Weir** Controls 0.00 cfs)

**Patterson Crossing Post Development**

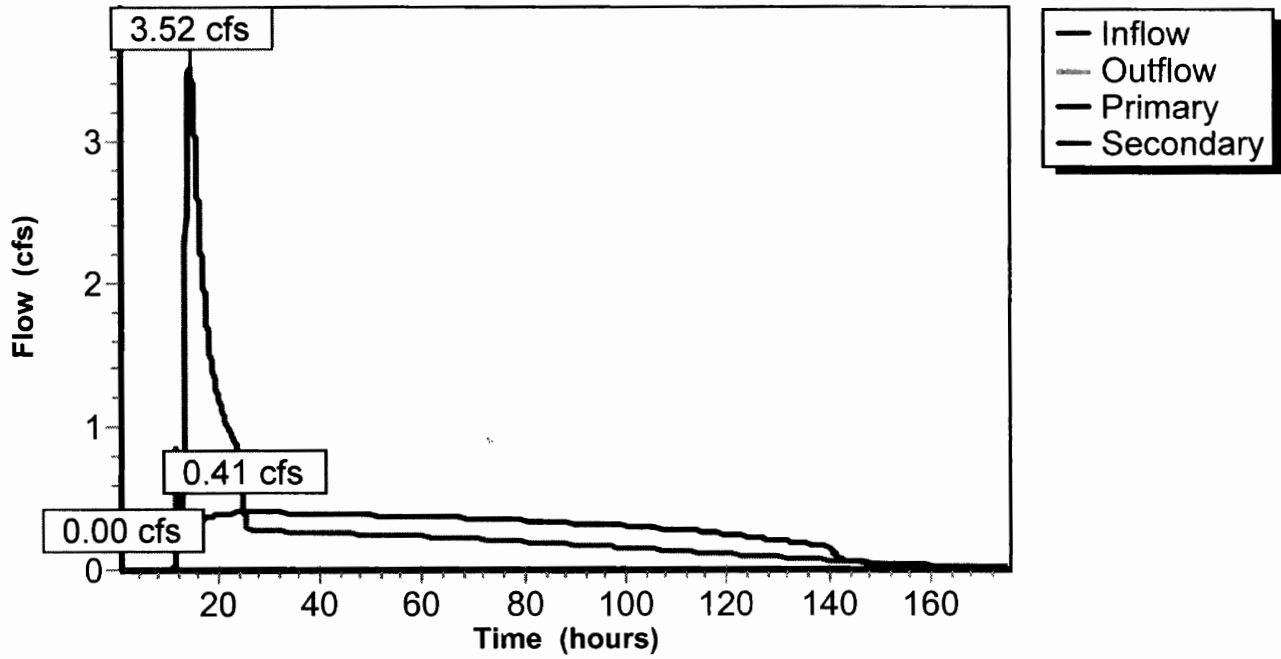
Type III 24-hr 1-year Rainfall=2.80"

Prepared by Insite Engineering, Surveying, and Landscape Architecture, P.C.

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**Pond 1.2P:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Pond 1.3P:**

Inflow Area = 11.900 ac, Inflow Depth = 1.42" for 1-year event  
 Inflow = 13.28 cfs @ 12.28 hrs, Volume= 1.410 af  
 Outflow = 0.29 cfs @ 22.57 hrs, Volume= 1.406 af, Atten= 98%, Lag= 617.2 min  
 Primary = 0.29 cfs @ 22.57 hrs, Volume= 1.406 af  
 Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 764.00' Surf.Area= 3,200 sf Storage= 7,900 cf  
 Peak Elev= 767.36' @ 22.57 hrs Surf.Area= 20,742 sf Storage= 56,983 cf (49,083 cf above start)  
 Plug-Flow detention time= 2,313.4 min calculated for 1.225 af (87% of inflow)  
 Center-of-Mass det. time= 1,979.4 min ( 2,824.6 - 845.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	760.00'	176,100 cf	<b>Custom Stage Data (Prismatid)</b> listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
760.00	900	0	0
762.00	1,900	2,800	2,800
764.00	3,200	5,100	7,900
766.00	18,500	21,700	29,600
768.00	21,800	40,300	69,900
770.00	26,500	48,300	118,200
772.00	31,400	57,900	176,100

Device	Routing	Invert	Outlet Devices
#1	Primary	764.00'	<b>3.5" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	770.00'	<b>8.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.29 cfs @ 22.57 hrs HW=767.36' (Free Discharge)  
 ↑1=**Orifice/Grate** (Orifice Controls 0.29 cfs @ 4.3 fps)

**Secondary OutFlow** Max=0.00 cfs @ 1.00 hrs HW=764.00' (Free Discharge)  
 ↑2=**Broad-Crested Rectangular Weir** Controls 0.00 cfs)

**Patterson Crossing Post Development**

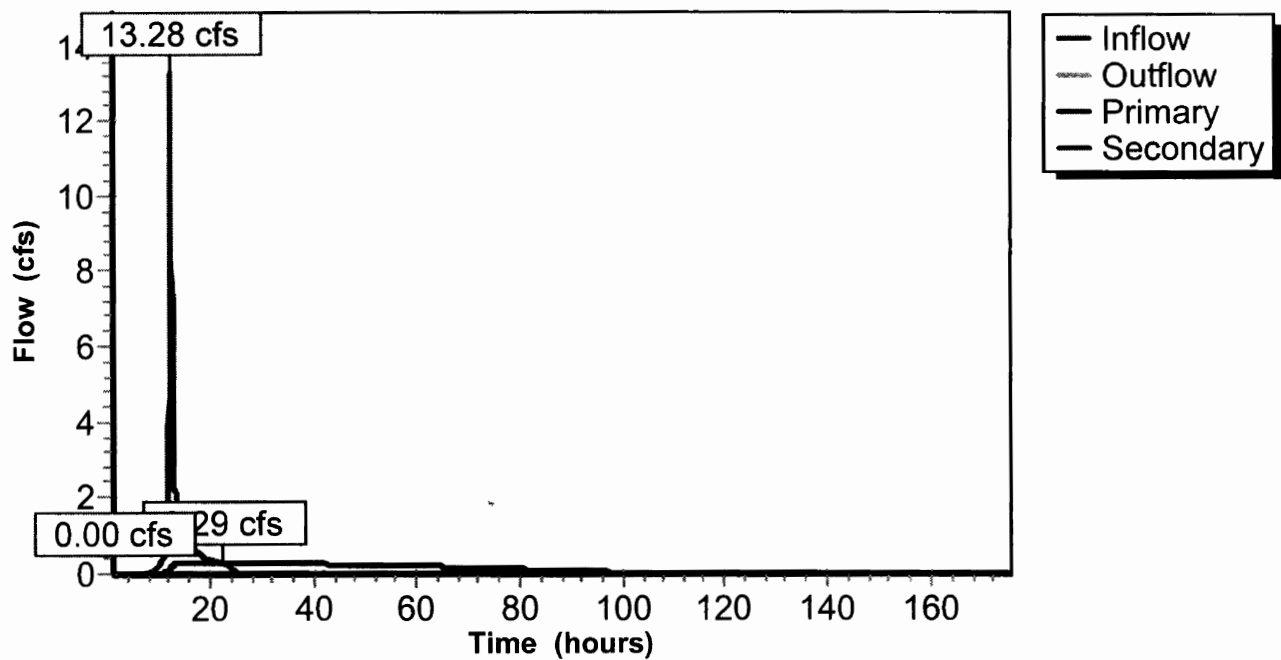
Type III 24-hr 1-year Rainfall=2.80"

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**Pond 1.3P:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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Inflow Area = 48.400 ac, Inflow Depth > 1.23" for 1-year event  
 Inflow = 1.10 cfs @ 12.10 hrs, Volume= 4.976 af  
 Outflow = 0.48 cfs @ 74.78 hrs, Volume= 4.779 af, Atten= 56%, Lag= 3,761.0 min  
 Primary = 0.48 cfs @ 74.78 hrs, Volume= 4.779 af  
 Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 760.00' Surf.Area= 30,000 sf Storage= 100,800 cf  
 Peak Elev= 761.70' @ 74.78 hrs Surf.Area= 34,678 sf Storage= 156,508 cf (55,708 cf above start)  
 Plug-Flow detention time= 5,185.6 min calculated for 2.465 af (50% of inflow)  
 Center-of-Mass det. time= 1,453.1 min ( 5,314.3 - 3,861.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	754.00'	242,600 cf	<b>Custom Stage Data (Prismatid)</b> listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
754.00	4,800	0	0
756.00	12,500	17,300	17,300
758.00	20,500	33,000	50,300
760.00	30,000	50,500	100,800
762.00	35,500	65,500	166,300
764.00	40,800	76,300	242,600

Device	Routing	Invert	Outlet Devices
#1	Primary	760.00'	<b>5.5" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	762.00'	<b>16.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.48 cfs @ 74.78 hrs HW=761.70' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.48 cfs @ 2.9 fps)

**Secondary OutFlow** Max=0.00 cfs @ 1.00 hrs HW=760.00' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir Controls 0.00 cfs)

**Patterson Crossing Post Development**

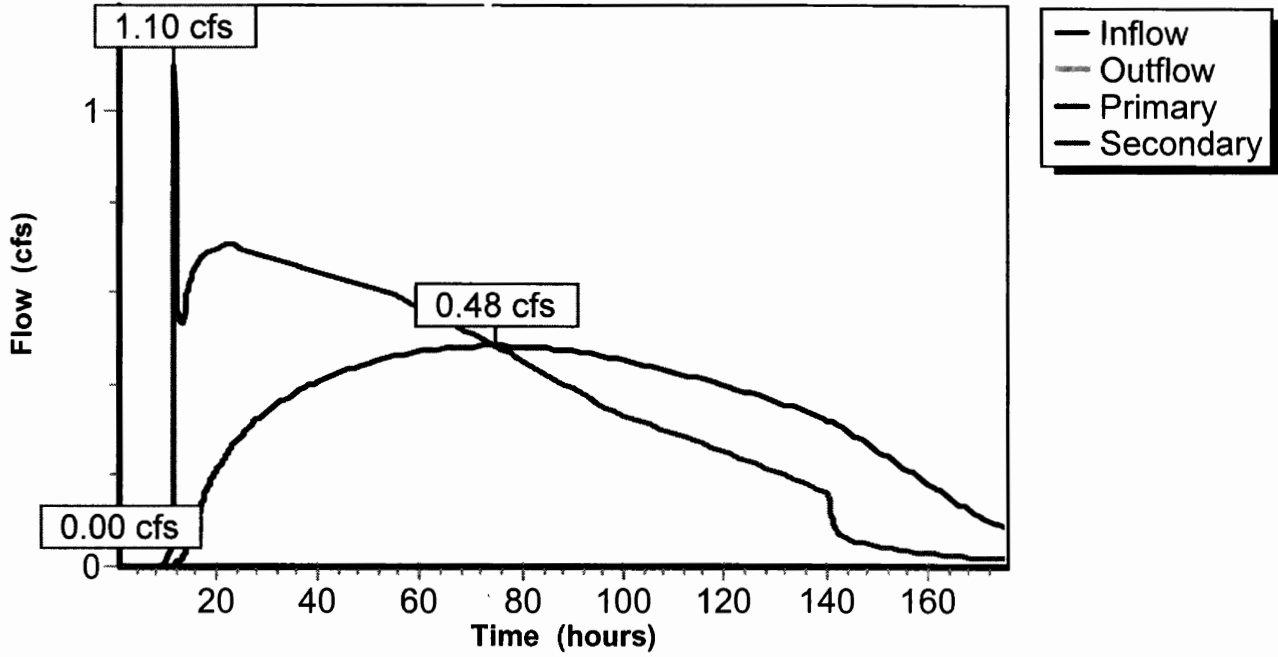
Type III 24-hr 1-year Rainfall=2.80"

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**Pond 1.4P:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Reach Design Line 1:**

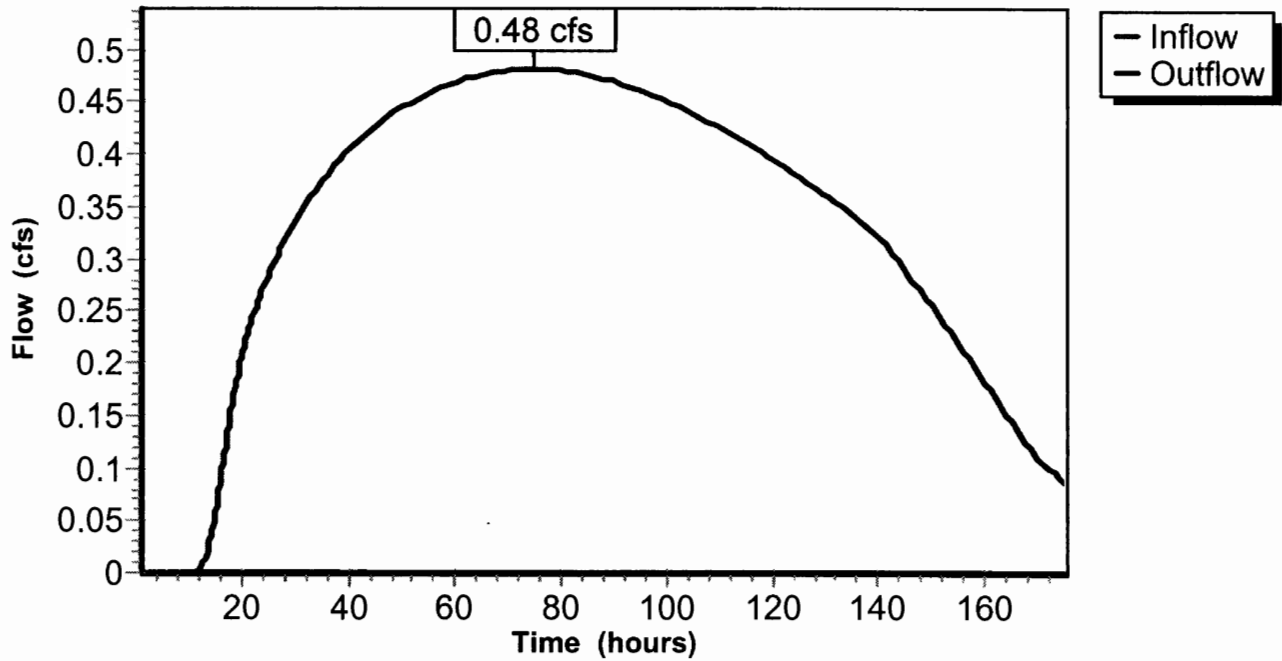
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 48.400 ac, Inflow Depth > 1.18" for 1-year event  
Inflow = 0.48 cfs @ 74.78 hrs, Volume= 4.779 af  
Outflow = 0.48 cfs @ 74.78 hrs, Volume= 4.779 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs

**Reach Design Line 1:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Subcatchment 2.0S:**

Runoff = 11.80 cfs @ 12.32 hrs, Volume= 1.458 af, Depth= 0.65"

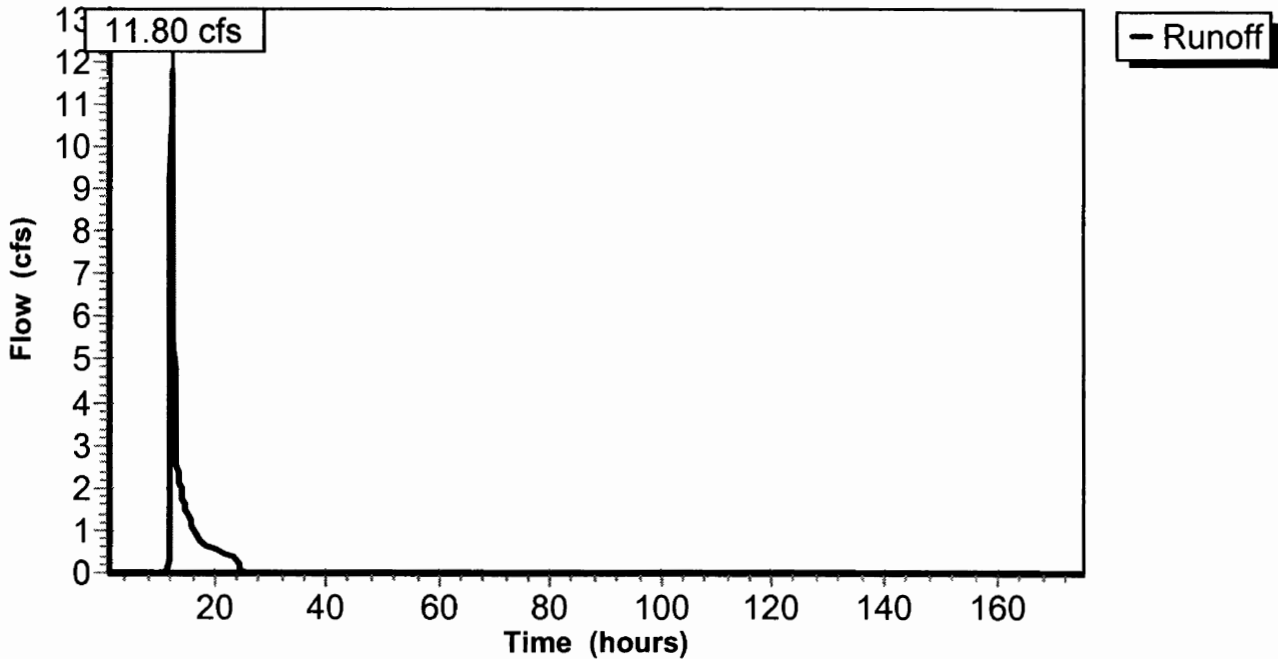
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1-year Rainfall=2.80"

Area (ac)	CN	Description
17.500	70	Woods, Good, HSG C
9.500	74	>75% Grass cover, Good, HSG C
27.000	71	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

**Subcatchment 2.0S:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Reach Design Point 2:**

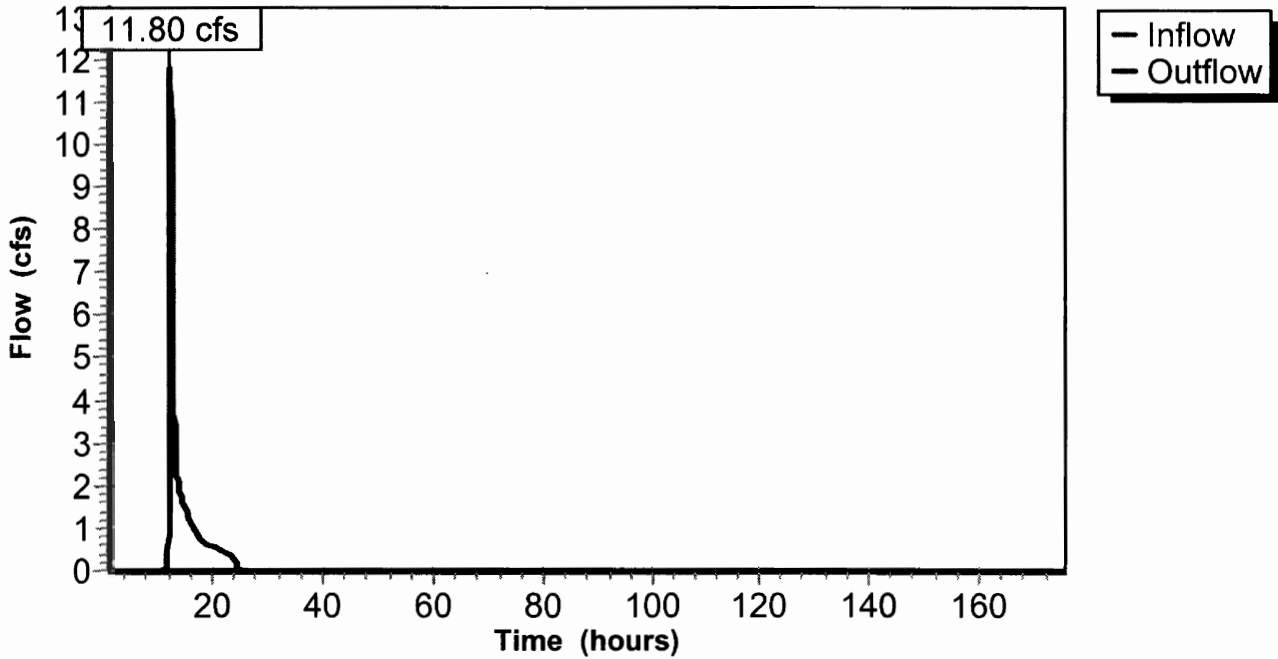
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 27.000 ac, Inflow Depth = 0.65" for 1-year event  
Inflow = 11.80 cfs @ 12.32 hrs, Volume= 1.458 af  
Outflow = 11.80 cfs @ 12.32 hrs, Volume= 1.458 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs

**Reach Design Point 2:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Subcatchment 3.1S:**

Runoff = 9.02 cfs @ 12.21 hrs, Volume= 0.858 af, Depth= 1.29"

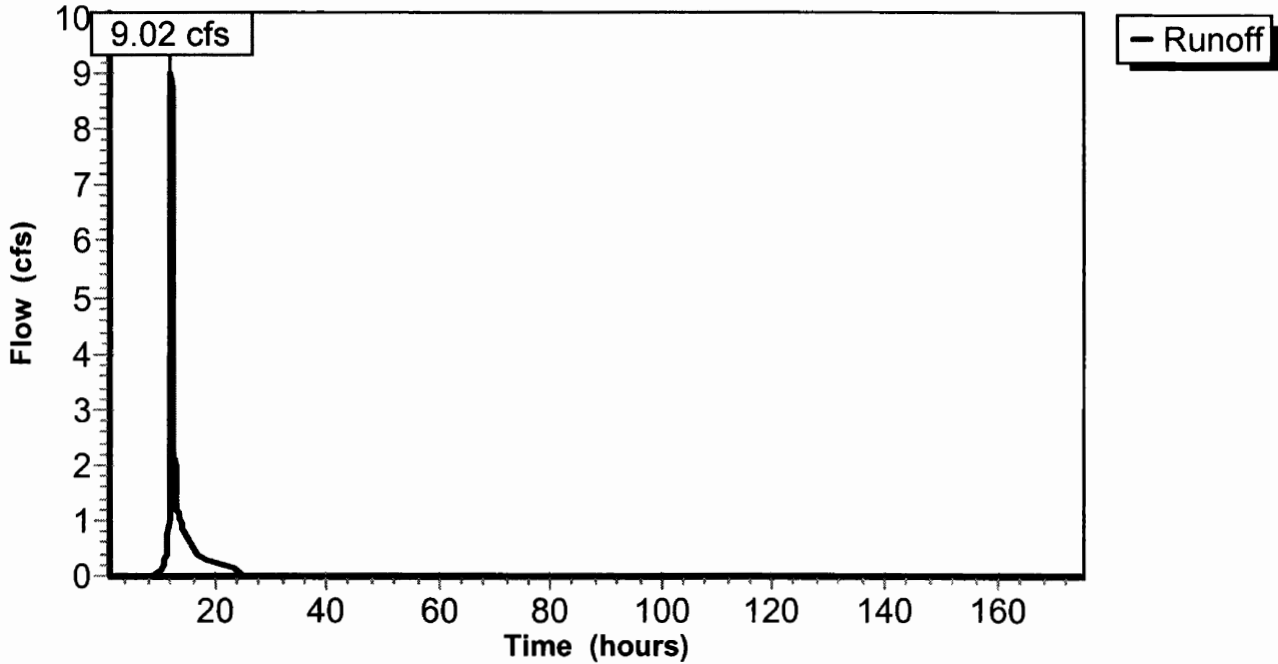
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1-year Rainfall=2.80"

Area (ac)	CN	Description
5.000	90	Suburban Shopping Center
3.000	70	Woods, Good, HSG C
8.000	83	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry,

**Subcatchment 3.1S:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Subcatchment 3.2S:**

Runoff = 5.73 cfs @ 12.30 hrs, Volume= 0.647 af, Depth= 0.88"

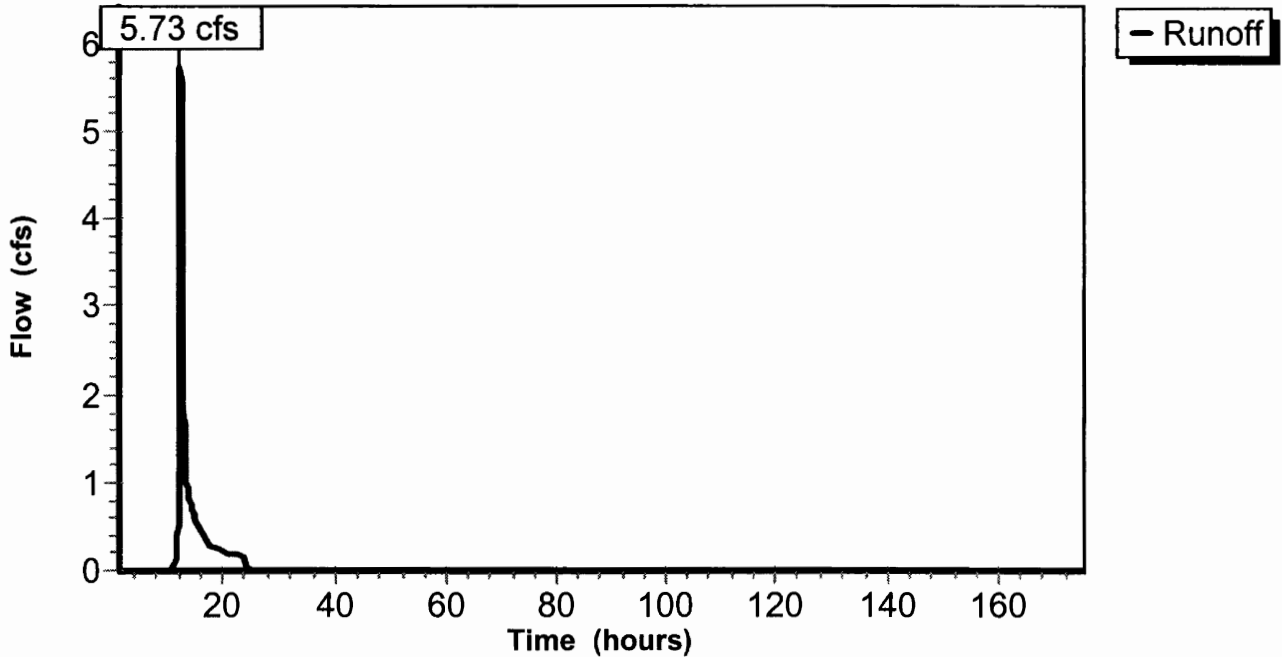
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1-year Rainfall=2.80"

Area (ac)	CN	Description
3.100	74	>75% Grass cover, Good, HSG C
3.900	70	Woods, Good, HSG C
1.800	90	Suburban Shopping Center
8.800	76	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

**Subcatchment 3.2S:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Subcatchment 3.3S:**

Runoff = 1.10 cfs @ 12.15 hrs, Volume= 0.092 af, Depth= 1.22"

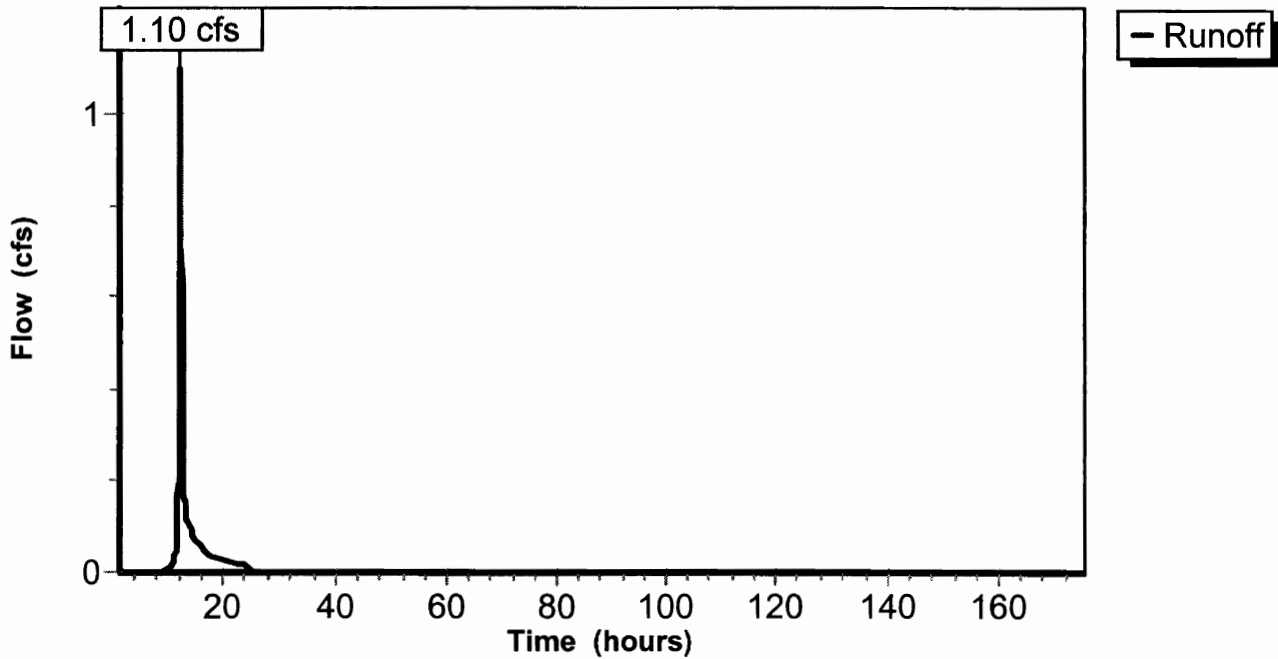
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1-year Rainfall=2.80"

Area (ac)	CN	Description
0.300	98	Paved parking & roofs
0.600	74	>75% Grass cover, Good, HSG C
0.900	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

**Subcatchment 3.3S:**

**Hydrograph**



# Patterson Crossing Post Development

Type III 24-hr 1-year Rainfall=2.80"

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## Subcatchment 3.4S:

Runoff = 2.73 cfs @ 12.30 hrs, Volume= 0.309 af, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs

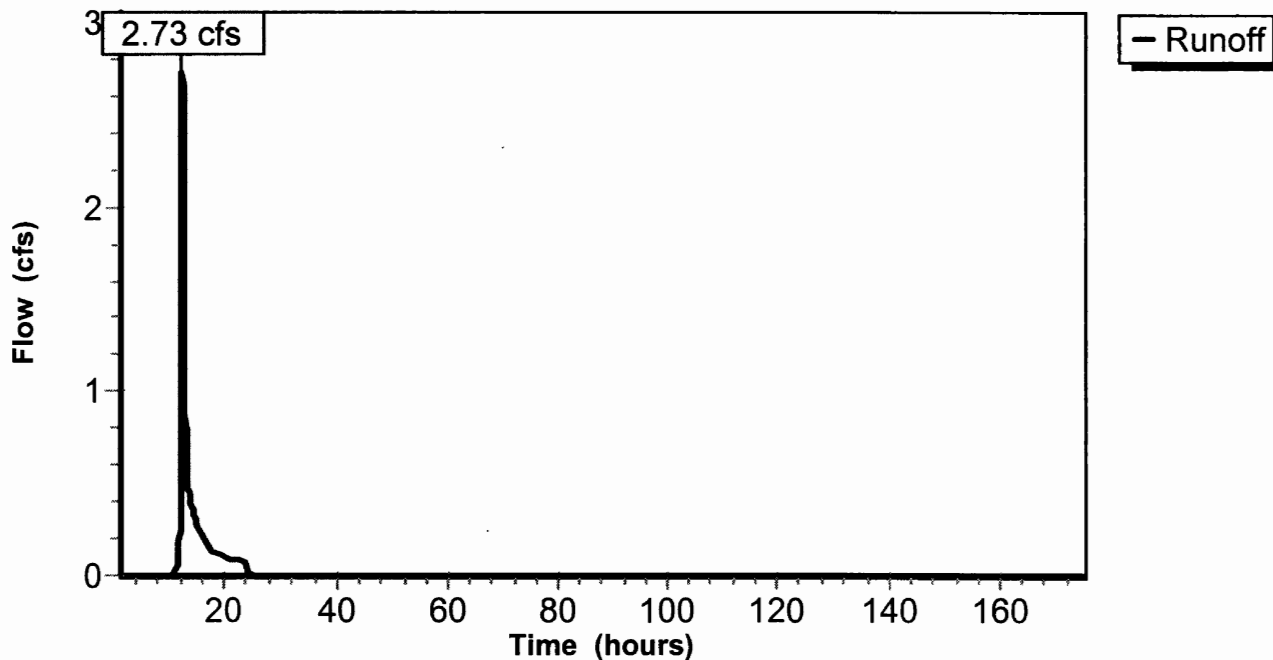
Type III 24-hr 1-year Rainfall=2.80"

Area (ac)	CN	Description
2.800	79	1 acre lots, 20% imp, HSG C
1.400	70	Woods, Good, HSG C
4.200	76	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

## Subcatchment 3.4S:

### Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Subcatchment 3.5S:**

Runoff = 0.36 cfs @ 12.17 hrs, Volume= 0.035 af, Depth= 0.61"

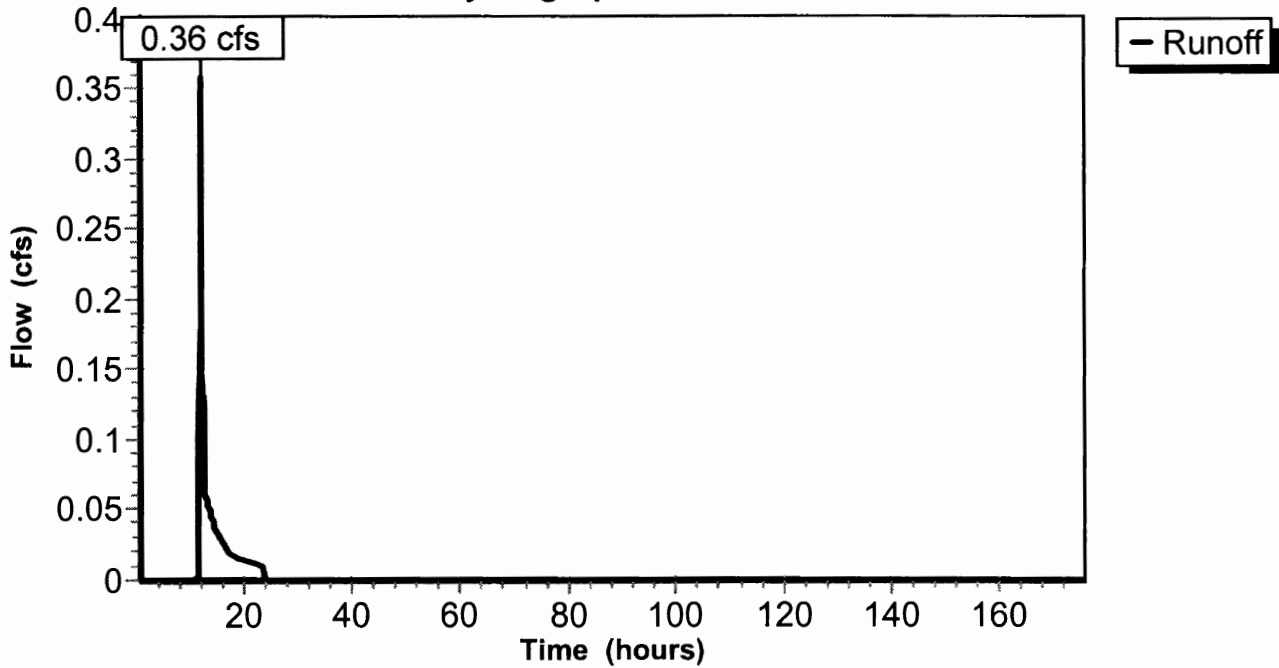
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1-year Rainfall=2.80"

Area (ac)	CN	Description
0.700	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

**Subcatchment 3.5S:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Subcatchment 3.6S:**

Runoff = 15.92 cfs @ 12.59 hrs, Volume= 2.376 af, Depth= 1.04"

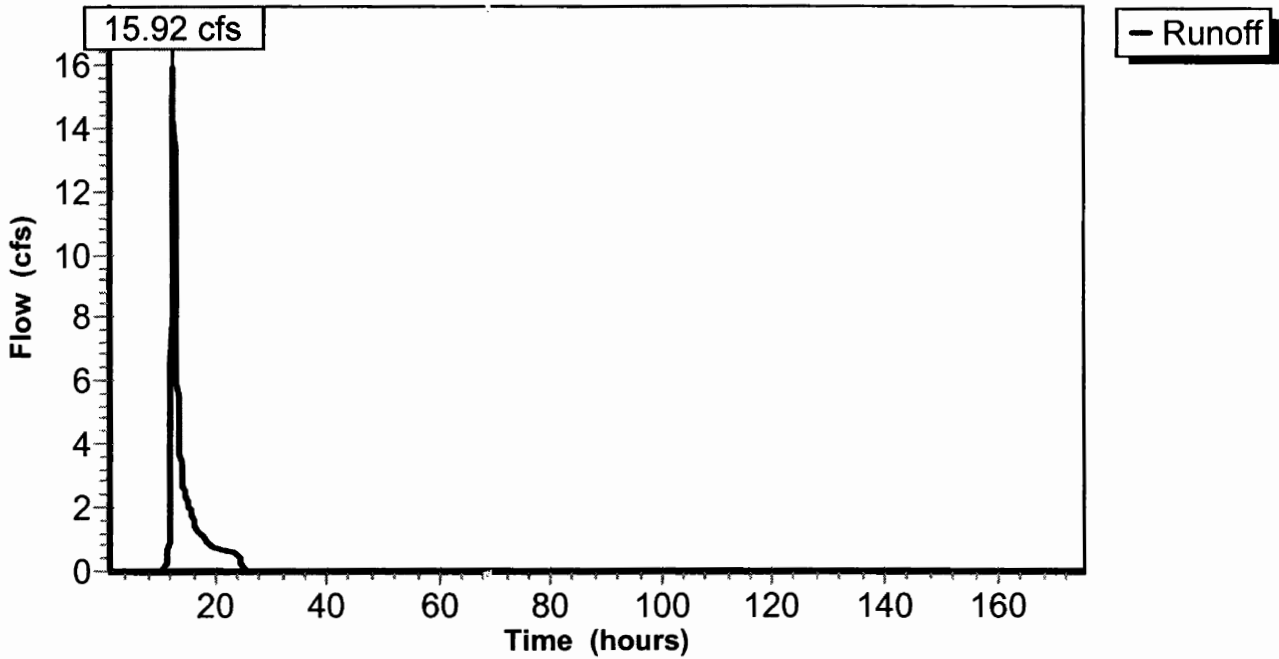
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1-year Rainfall=2.80"

Area (ac)	CN	Description
9.300	70	Woods, Good, HSG C
6.700	98	Paved parking & roofs
11.300	74	>75% Grass cover, Good, HSG C
27.300	79	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.0					Direct Entry,

**Subcatchment 3.6S:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Pond 3.1P:**

Inflow Area = 8.000 ac, Inflow Depth = 1.29" for 1-year event  
 Inflow = 9.02 cfs @ 12.21 hrs, Volume= 0.858 af  
 Outflow = 0.35 cfs @ 17.35 hrs, Volume= 0.858 af, Atten= 96%, Lag= 308.0 min  
 Primary = 0.35 cfs @ 17.35 hrs, Volume= 0.858 af  
 Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 718.00' Surf.Area= 7,000 sf Storage= 9,900 cf  
 Peak Elev= 720.47' @ 17.35 hrs Surf.Area= 12,857 sf Storage= 35,259 cf (25,359 cf above start)  
 Plug-Flow detention time= 1,358.6 min calculated for 0.631 af (74% of inflow)  
 Center-of-Mass det. time= 961.6 min ( 1,809.3 - 847.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	714.00'	110,300 cf	<b>Custom Stage Data (Prismatid)</b> listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
714.00	400	0	0
716.00	1,250	1,650	1,650
718.00	7,000	8,250	9,900
720.00	11,600	18,600	28,500
722.00	16,900	28,500	57,000
724.00	24,000	40,900	97,900
724.50	25,600	12,400	110,300

Device	Routing	Invert	Outlet Devices
#1	Primary	718.00'	<b>4.2" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	722.00'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.35 cfs @ 17.35 hrs HW=720.47' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.35 cfs @ 3.7 fps)

**Secondary OutFlow** Max=0.00 cfs @ 1.00 hrs HW=718.00' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir Control: 0.00 cfs)

**Patterson Crossing Post Development**

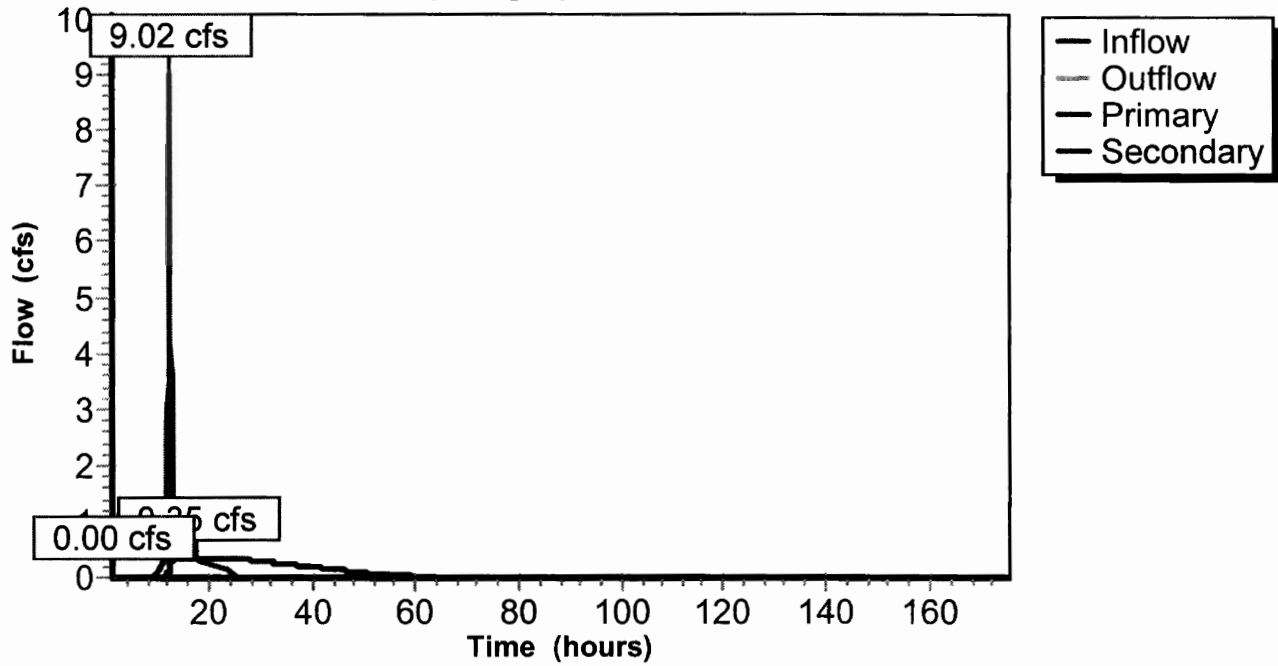
Type III 24-hr 1-year Rainfall=2.80"

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**Pond 3.1P:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Pond 3.2P:**

Inflow Area = 16.800 ac, Inflow Depth = 1.08" for 1-year event  
 Inflow = 5.97 cfs @ 12.31 hrs, Volume= 1.505 af  
 Outflow = 0.41 cfs @ 24.27 hrs, Volume= 1.505 af, Atten= 93%, Lag= 718.1 min  
 Primary = 0.41 cfs @ 24.27 hrs, Volume= 1.505 af  
 Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 664.00' Surf.Area= 3,900 sf Storage= 9,500 cf  
 Peak Elev= 667.00' @ 24.27 hrs Surf.Area= 12,452 sf Storage= 36,260 cf (26,760 cf above start)  
 Plug-Flow detention time= 1,347.5 min calculated for 1.287 af (85% of inflow)  
 Center-of-Mass det. time= 864.1 min ( 2,272.4 - 1,408.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	660.00'	81,700 cf	<b>Custom Stage Data (Prismatid)</b> listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
660.00	800	0	0
662.00	2,400	3,200	3,200
664.00	3,900	6,300	9,500
666.00	10,400	14,300	23,800
668.00	14,500	24,900	48,700
670.00	18,500	33,000	81,700

Device	Routing	Invert	Outlet Devices
#1	Primary	664.00'	<b>4.3" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	668.00'	<b>10.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.41 cfs @ 24.27 hrs HW=667.00' (Free Discharge)  
 ↑1=**Orifice/Grate** (Orifice Controls 0.41 cfs @ 4.0 fps)

**Secondary OutFlow** Max=0.00 cfs @ 1.00 hrs HW=664.00' (Free Discharge)  
 ↑2=**Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

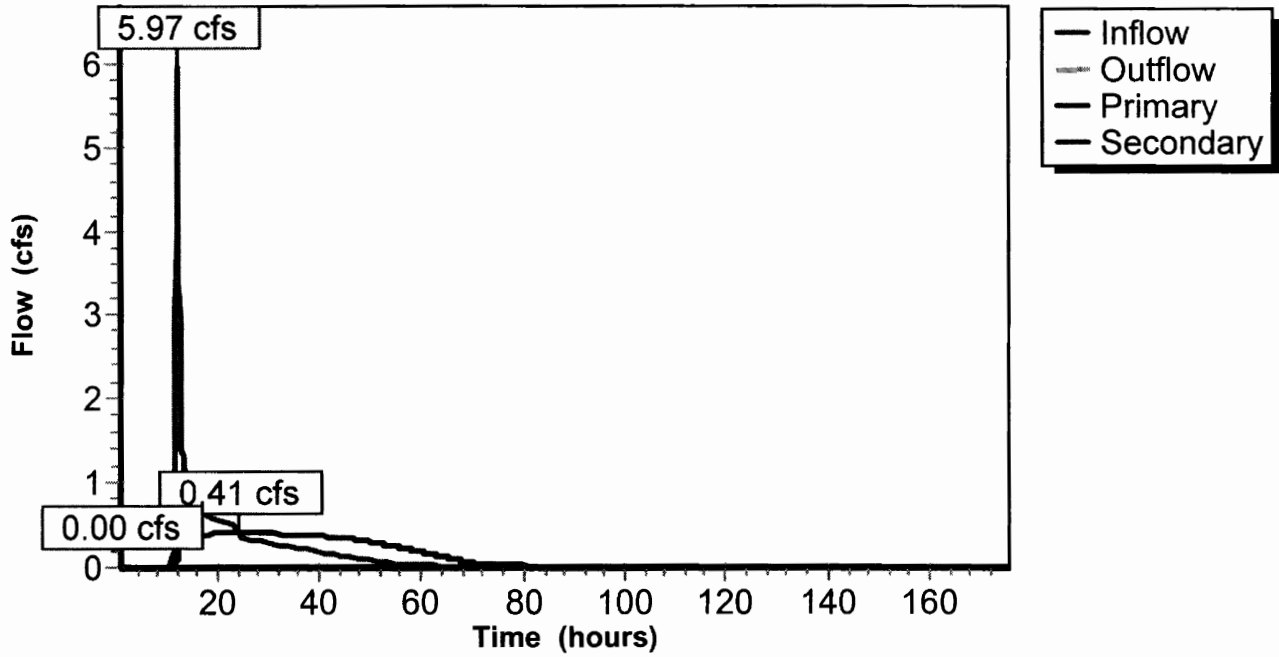
**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Pond 3.2P:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Pond 3.3P:**

Inflow Area = 0.900 ac, Inflow Depth = 1.22" for 1-year event  
 Inflow = 1.10 cfs @ 12.15 hrs, Volume= 0.092 af  
 Outflow = 0.04 cfs @ 16.86 hrs, Volume= 0.092 af, Atten= 96%, Lag= 282.6 min  
 Primary = 0.04 cfs @ 16.86 hrs, Volume= 0.092 af  
 Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 662.00' Surf.Area= 1,100 sf Storage= 2,120 cf  
 Peak Elev= 663.64' @ 16.86 hrs Surf.Area= 1,918 sf Storage= 4,739 cf (2,619 cf above start)  
 Plug-Flow detention time= 1,523.7 min calculated for 0.043 af (47% of inflow)  
 Center-of-Mass det. time= 821.0 min ( 1,667.6 - 846.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	658.00'	12,420 cf	<b>Custom Stage Data (Prismatid)</b> listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
658.00	20	0	0
660.00	500	520	520
662.00	1,100	1,600	2,120
664.00	2,100	3,200	5,320
666.00	5,000	7,100	12,420

Device	Routing	Invert	Outlet Devices
#1	Primary	662.00'	<b>1.6" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	664.50'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.04 cfs @ 16.86 hrs HW=663.64' (Free Discharge)  
 ↑1=**Orifice/Grate** (Orifice Controls 0.04 cfs @ 3.0 fps)

**Secondary OutFlow** Max=0.00 cfs @ 1.00 hrs HW=662.00' (Free Discharge)  
 ↑2=**Broad-Crested Rectangular Weir** Controls 0.00 cfs)

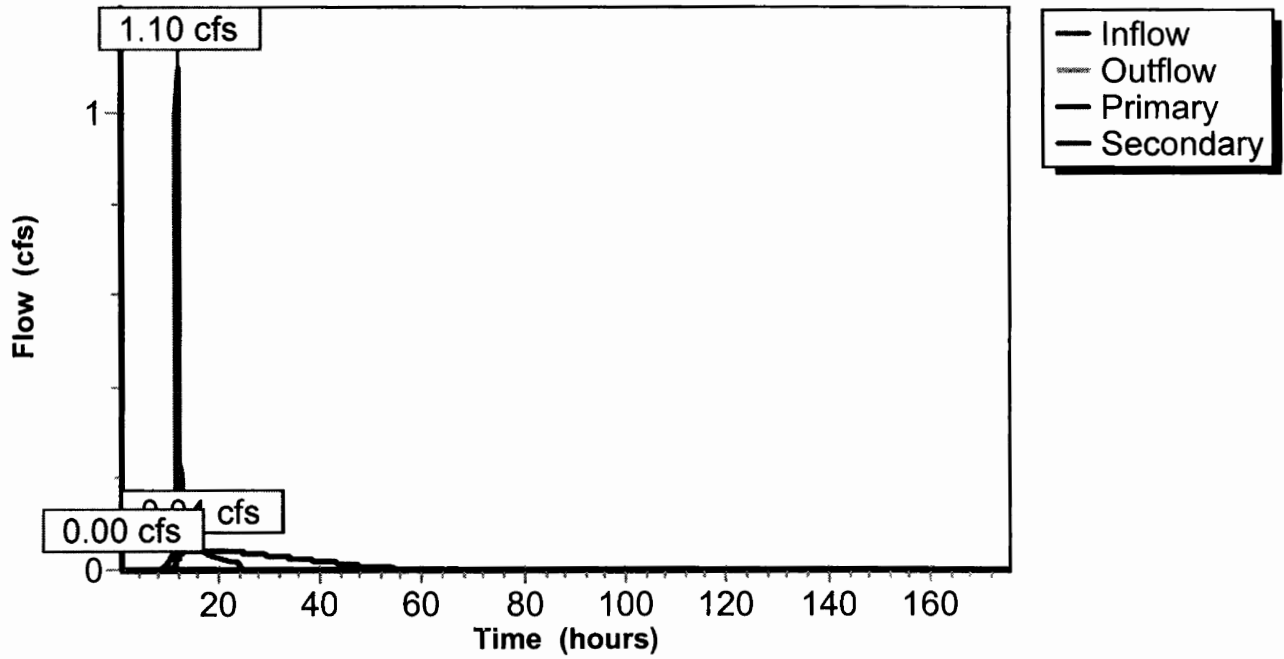
**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Pond 3.3P:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Pond 3.4P:**

Inflow Area = 4.200 ac, Inflow Depth = 0.88" for 1-year event  
 Inflow = 2.73 cfs @ 12.30 hrs, Volume= 0.309 af  
 Outflow = 0.17 cfs @ 16.70 hrs, Volume= 0.309 af, Atten= 94%, Lag= 263.9 min  
 Primary = 0.17 cfs @ 16.70 hrs, Volume= 0.309 af  
 Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 756.00' Surf.Area= 6,000 sf Storage= 13,800 cf  
 Peak Elev= 757.08' @ 16.70 hrs Surf.Area= 7,621 sf Storage= 21,906 cf (8,106 cf above start)  
 Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= 731.8 min ( 1,608.6 - 876.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	752.00'	49,800 cf	<b>Custom Stage Data (Prismatid)</b> listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
752.00	800	0	0
754.00	3,500	4,300	4,300
756.00	6,000	9,500	13,800
758.00	9,000	15,000	28,800
760.00	12,000	21,000	49,800

Device	Routing	Invert	Outlet Devices
#1	Primary	756.00'	<b>3.7" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	758.50'	<b>10.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.17 cfs @ 16.70 hrs HW=757.08' (Free Discharge)  
 ↑1=**Orifice/Grate** (Orifice Controls 0.17 cfs @ 2.3 fps)

**Secondary OutFlow** Max=0.00 cfs @ 1.00 hrs HW=756.00' (Free Discharge)  
 ↑2=**Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

**Patterson Crossing Post Development**

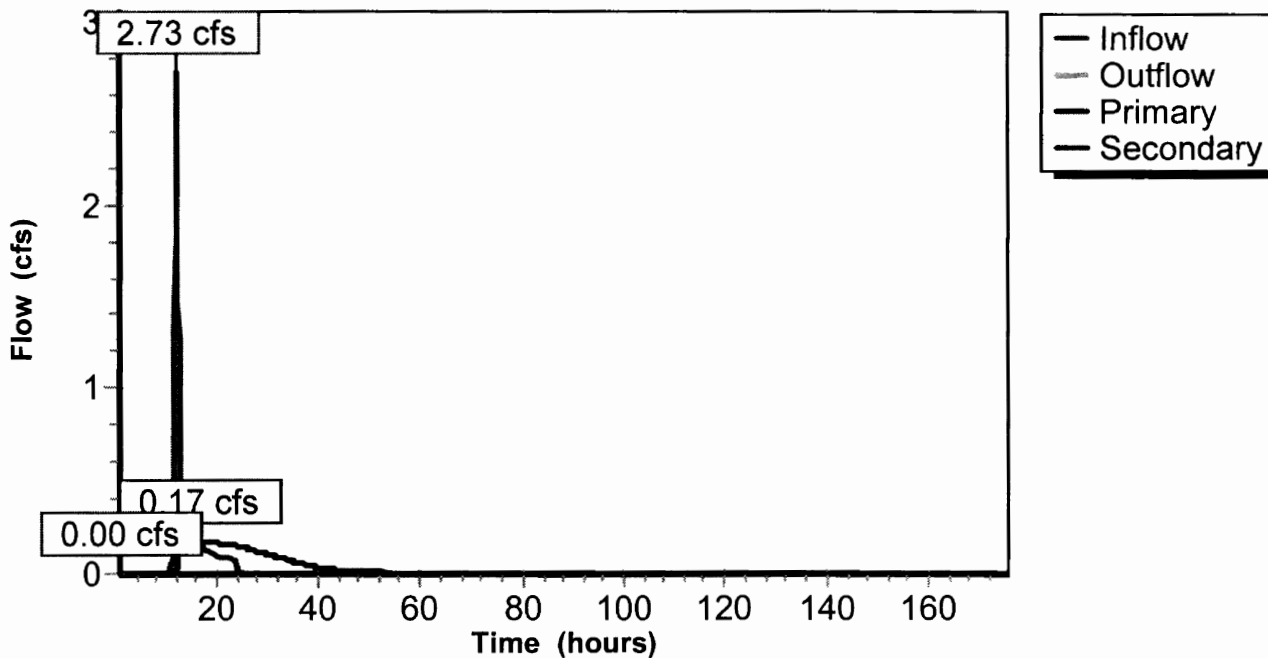
Type III 24-hr 1-year Rainfall=2.80"

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**Pond 3.4P:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Reach Design Point 3:**

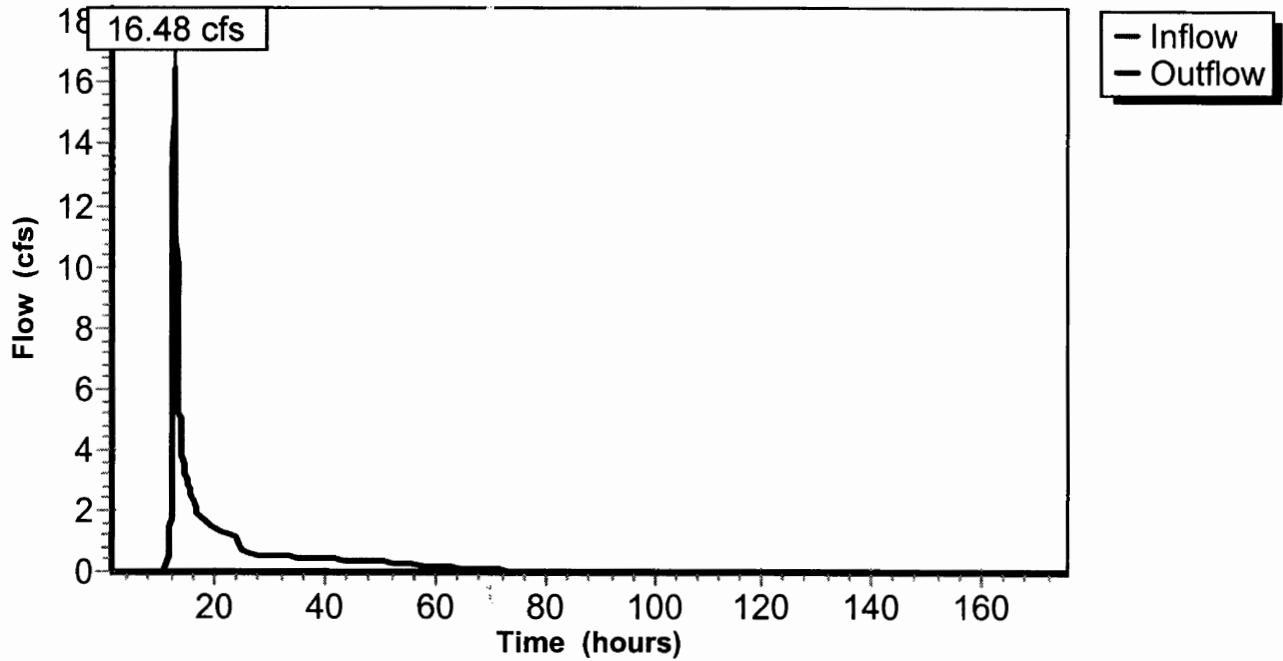
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 49.900 ac, Inflow Depth = 1.04" for 1-year event  
Inflow = 16.48 cfs @ 12.59 hrs, Volume= 4.317 af  
Outflow = 16.48 cfs @ 12.59 hrs, Volume= 4.317 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs

**Reach Design Point 3:**

**Hydrograph**



# Patterson Crossing Post Development

Type III 24-hr 1-year Rainfall=2.80"

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## Subcatchment 3.6S:

Runoff = 15.92 cfs @ 12.59 hrs, Volume= 2.376 af, Depth= 1.04"

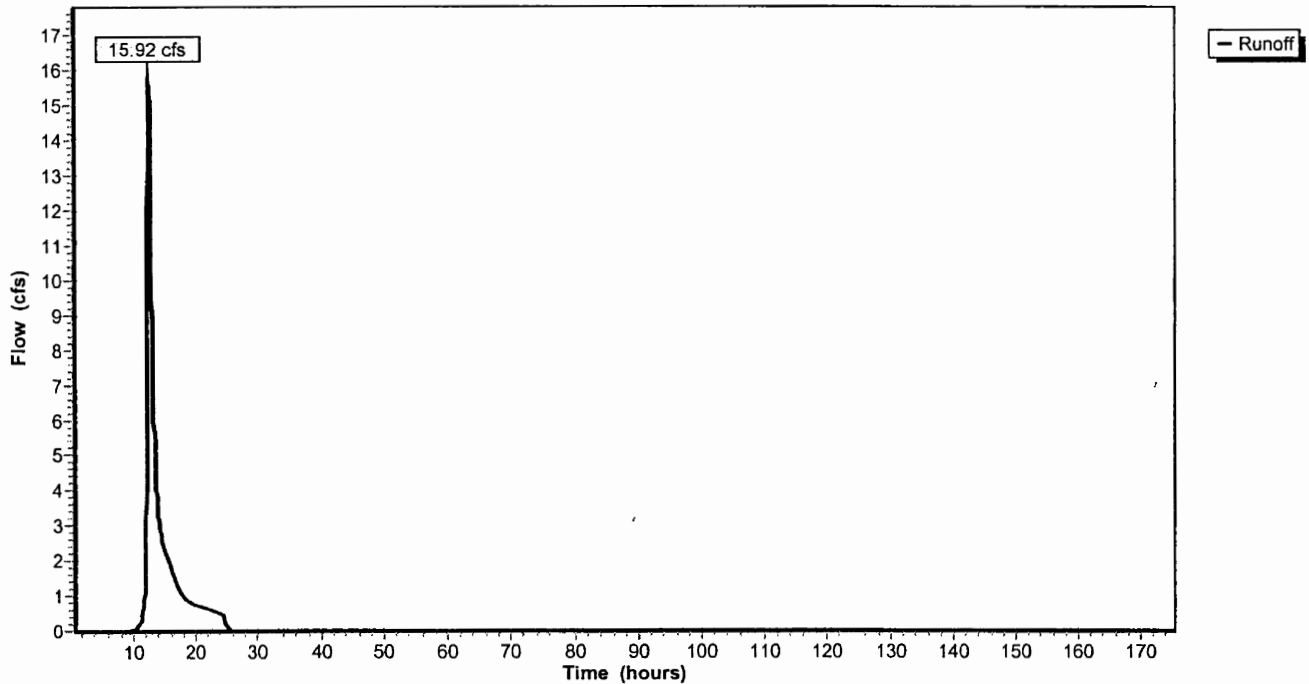
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1-year Rainfall=2.80"

Area (ac)	CN	Description
9.300	70	Woods, Good, HSG C
6.700	98	Paved parking & roofs
11.300	74	>75% Grass cover, Good, HSG C
27.300	79	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.0					Direct Entry,

## Subcatchment 3.6S:

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Pond 3.1P:**

Inflow Area = 8.000 ac, Inflow Depth = 1.29" for 1-year event  
 Inflow = 9.02 cfs @ 12.21 hrs, Volume= 0.858 af  
 Outflow = 0.35 cfs @ 17.35 hrs, Volume= 0.858 af, Atten= 96%, Lag= 308.0 min  
 Primary = 0.35 cfs @ 17.35 hrs, Volume= 0.858 af  
 Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 718.00' Surf.Area= 7,000 sf Storage= 9,900 cf  
 Peak Elev= 720.47' @ 17.35 hrs Surf.Area= 12,857 sf Storage= 35,259 cf (25,359 cf above start)  
 Plug-Flow detention time= 1,358.6 min calculated for 0.631 af (74% of inflow)  
 Center-of-Mass det. time= 961.6 min ( 1,809.3 - 847.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	714.00'	110,300 cf	<b>Custom Stage Data (Prismatic)</b> listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
714.00	400	0	0
716.00	1,250	1,650	1,650
718.00	7,000	8,250	9,900
720.00	11,600	18,600	28,500
722.00	16,900	28,500	57,000
724.00	24,000	40,900	97,900
724.50	25,600	12,400	110,300

Device	Routing	Invert	Outlet Devices
#1	Primary	718.00'	<b>4.2" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	722.00'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.35 cfs @ 17.35 hrs HW=720.47' (Free Discharge)

↑1=Orifice/Grate (Orifice Controls 0.35 cfs @ 3.7 fps)

**Secondary OutFlow** Max=0.00 cfs @ 1.00 hrs HW=718.00' (Free Discharge)

↑2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Patterson Crossing Post Development**

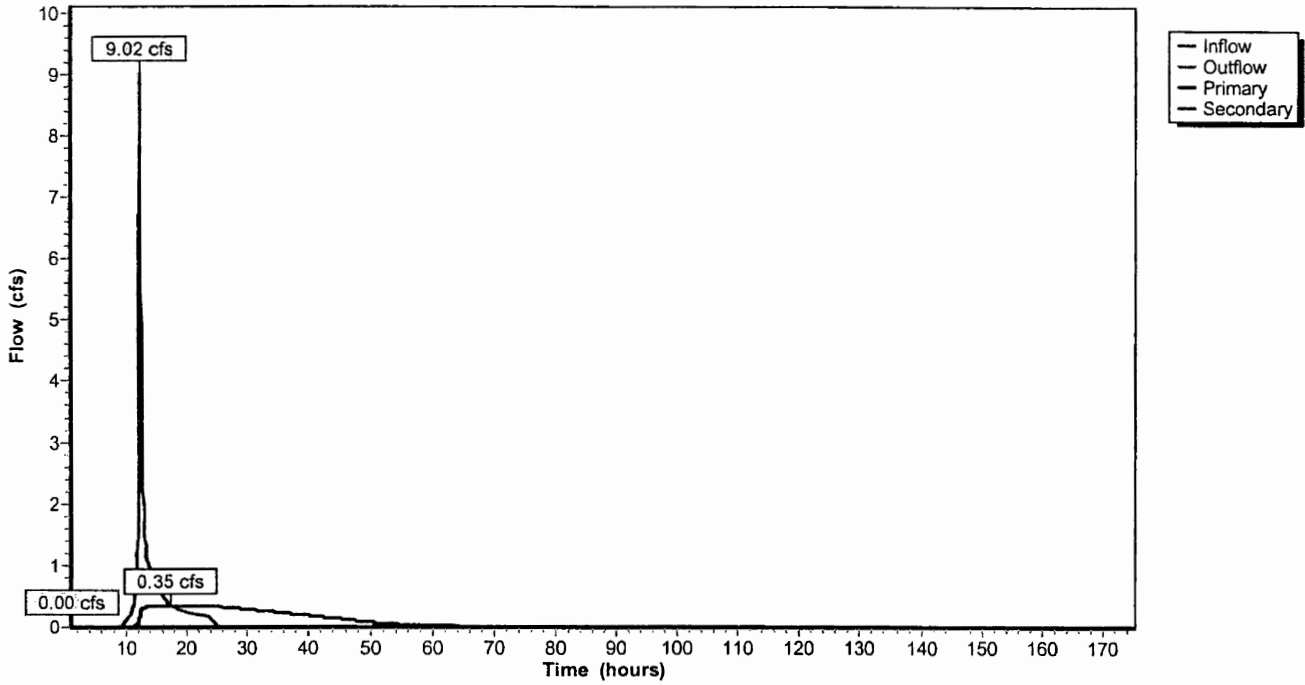
Type III 24-hr 1-year Rainfall=2.80"

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**Pond 3.1P:**

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Pond 3.2P:**

Inflow Area = 16.800 ac, Inflow Depth = 1.08" for 1-year event  
 Inflow = 5.97 cfs @ 12.31 hrs, Volume= 1.505 af  
 Outflow = 0.41 cfs @ 24.27 hrs, Volume= 1.505 af, Atten= 93%, Lag= 718.1 min  
 Primary = 0.41 cfs @ 24.27 hrs, Volume= 1.505 af  
 Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 664.00' Surf.Area= 3,900 sf Storage= 9,500 cf  
 Peak Elev= 667.00' @ 24.27 hrs Surf.Area= 12,452 sf Storage= 36,260 cf (26,760 cf above start)  
 Plug-Flow detention time= 1,347.5 min calculated for 1.287 af (85% of inflow)  
 Center-of-Mass det. time= 864.1 min ( 2,272.4 - 1,408.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	660.00'	81,700 cf	<b>Custom Stage Data (Prismatic)</b> Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
660.00	800	0	0
662.00	2,400	3,200	3,200
664.00	3,900	6,300	9,500
666.00	10,400	14,300	23,800
668.00	14,500	24,900	48,700
670.00	18,500	33,000	81,700

Device	Routing	Invert	Outlet Devices
#1	Primary	664.00'	<b>4.3" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	668.00'	<b>10.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.41 cfs @ 24.27 hrs HW=667.00' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.41 cfs @ 4.0 fps)

**Secondary OutFlow** Max=0.00 cfs @ 1.00 hrs HW=664.00' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Patterson Crossing Post Development**

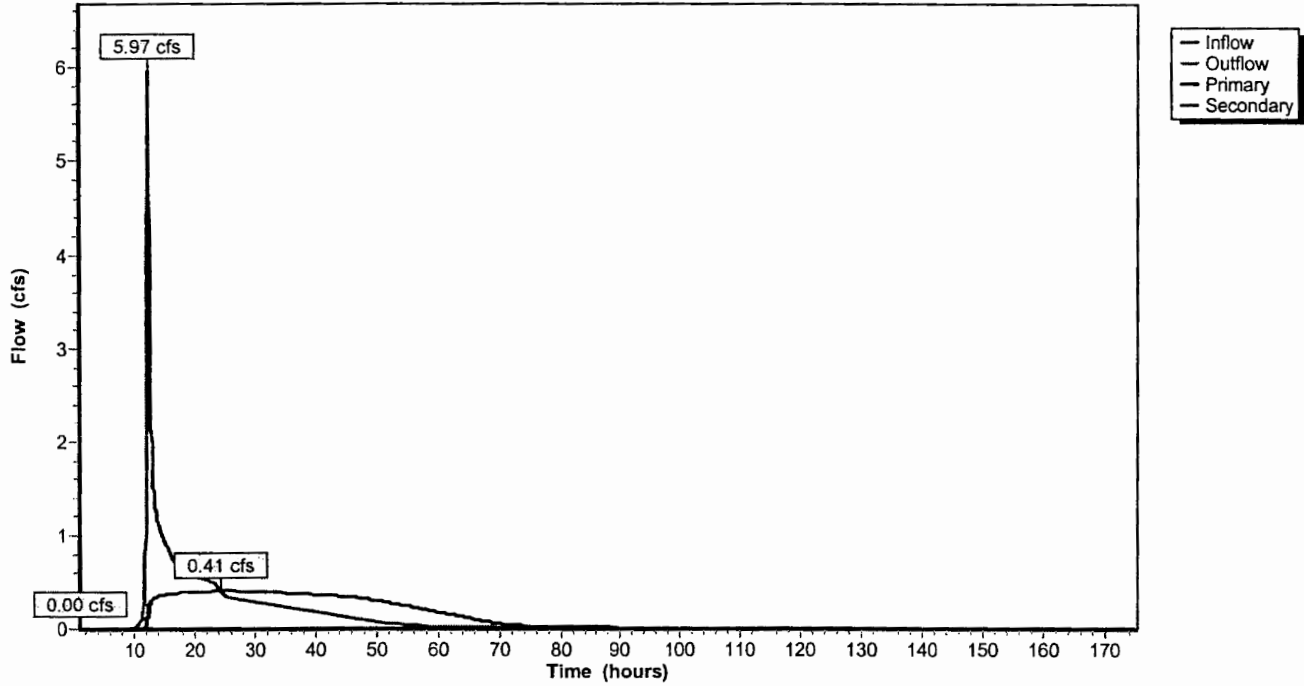
Type III 24-hr 1-year Rainfall=2.80"

Prepared by Insite Engineering, Surveying & Landscape Architecture,P.C>

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**Pond 3.2P:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 1-year Rainfall=2.80"

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## Pond 3.3P:

Inflow Area = 0.900 ac, Inflow Depth = 1.22" for 1-year event  
Inflow = 1.10 cfs @ 12.15 hrs, Volume= 0.092 af  
Outflow = 0.04 cfs @ 16.86 hrs, Volume= 0.092 af, Atten= 96%, Lag= 282.6 min  
Primary = 0.04 cfs @ 16.86 hrs, Volume= 0.092 af  
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Starting Elev= 662.00' Surf.Area= 1,100 sf Storage= 2,120 cf  
Peak Elev= 663.64' @ 16.86 hrs Surf.Area= 1,918 sf Storage= 4,739 cf (2,619 cf above start)  
Plug-Flow detention time= 1,523.7 min calculated for 0.043 af (47% of inflow)  
Center-of-Mass det. time= 821.0 min ( 1,667.6 - 846.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	658.00'	12,420 cf	<b>Custom Stage Data (Prismatic)</b> Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
658.00	20	0	0
660.00	500	520	520
662.00	1,100	1,600	2,120
664.00	2,100	3,200	5,320
666.00	5,000	7,100	12,420

Device	Routing	Invert	Outlet Devices
#1	Primary	662.00'	<b>1.6" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	664.50'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.04 cfs @ 16.86 hrs HW=663.64' (Free Discharge)  
↑1=Orifice/Grate (Orifice Controls 0.04 cfs @ 3.0 fps)

**Secondary OutFlow** Max=0.00 cfs @ 1.00 hrs HW=662.00' (Free Discharge)  
↑2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Patterson Crossing Post Development**

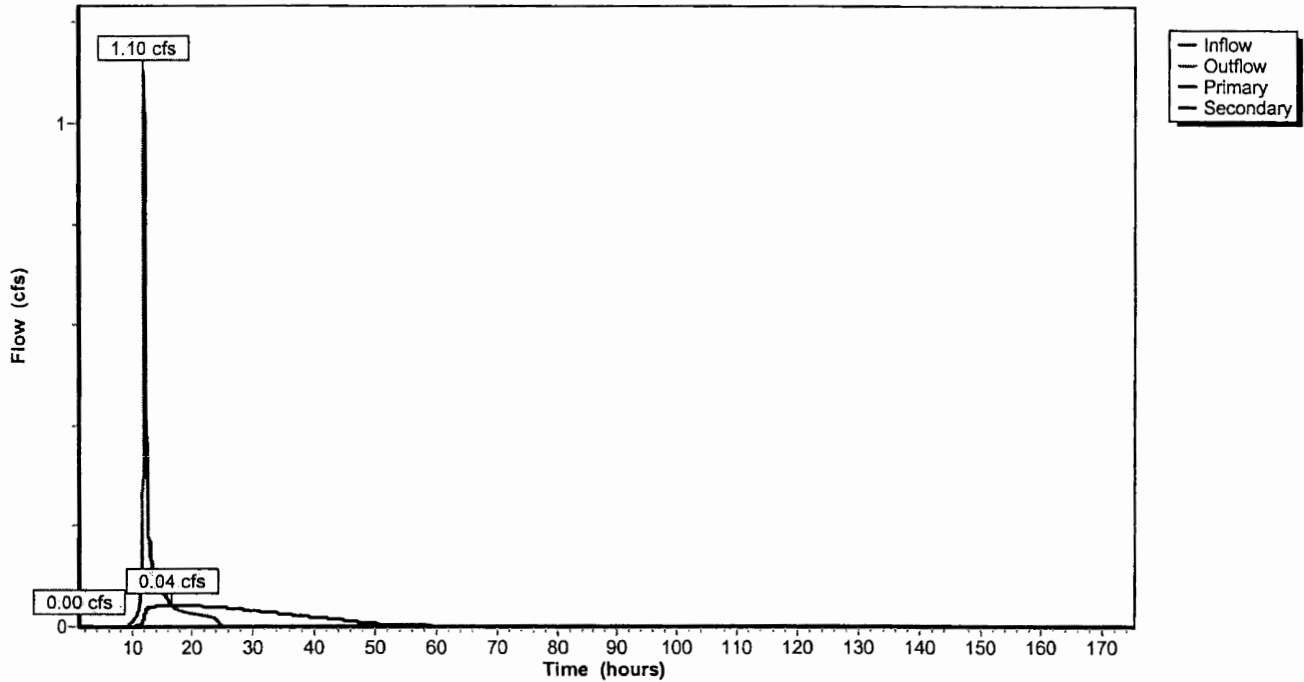
Type III 24-hr 1-year Rainfall=2.80"

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**Pond 3.3P:**

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 1-year Rainfall=2.80"

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**Pond 3.4P:**

Inflow Area = 4.200 ac, Inflow Depth = 0.88" for 1-year event  
 Inflow = 2.73 cfs @ 12.30 hrs, Volume= 0.309 af  
 Outflow = 0.17 cfs @ 16.70 hrs, Volume= 0.309 af, Atten= 94%, Lag= 263.9 min  
 Primary = 0.17 cfs @ 16.70 hrs, Volume= 0.309 af  
 Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 756.00' Surf.Area= 6,000 sf Storage= 13,800 cf  
 Peak Elev= 757.08' @ 16.70 hrs Surf.Area= 7,621 sf Storage= 21,906 cf (8,106 cf above start)  
 Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= 731.8 min ( 1,608.6 - 876.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	752.00'	49,800 cf	<b>Custom Stage Data (Prismatic)</b> Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
752.00	800	0	0
754.00	3,500	4,300	4,300
756.00	6,000	9,500	13,800
758.00	9,000	15,000	28,800
760.00	12,000	21,000	49,800

Device	Routing	Invert	Outlet Devices
#1	Primary	756.00'	<b>3.7" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	758.50'	<b>10.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.17 cfs @ 16.70 hrs HW=757.08' (Free Discharge)

↑1=Orifice/Grate (Orifice Controls 0.17 cfs @ 2.3 fps)

**Secondary OutFlow** Max=0.00 cfs @ 1.00 hrs HW=756.00' (Free Discharge)

↑2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Patterson Crossing Post Development**

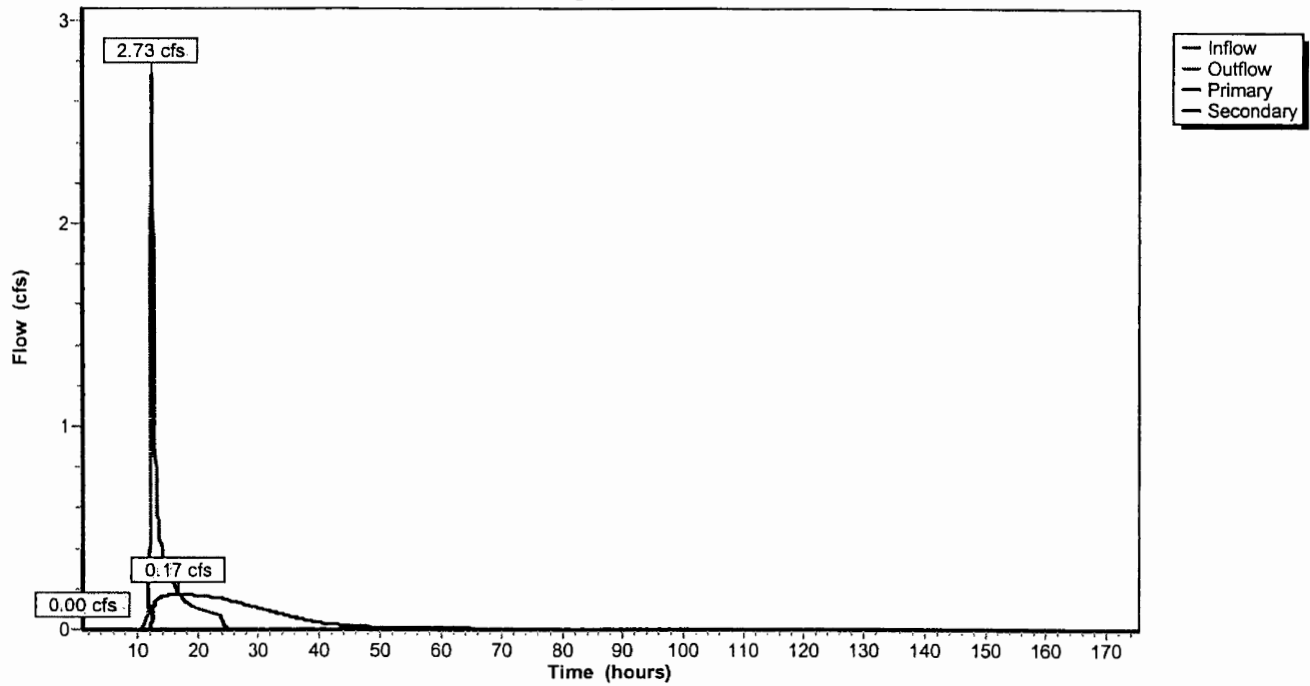
Type III 24-hr 1-year Rainfall=2.80"

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**Pond 3.4P:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 1-year Rainfall=2.80"

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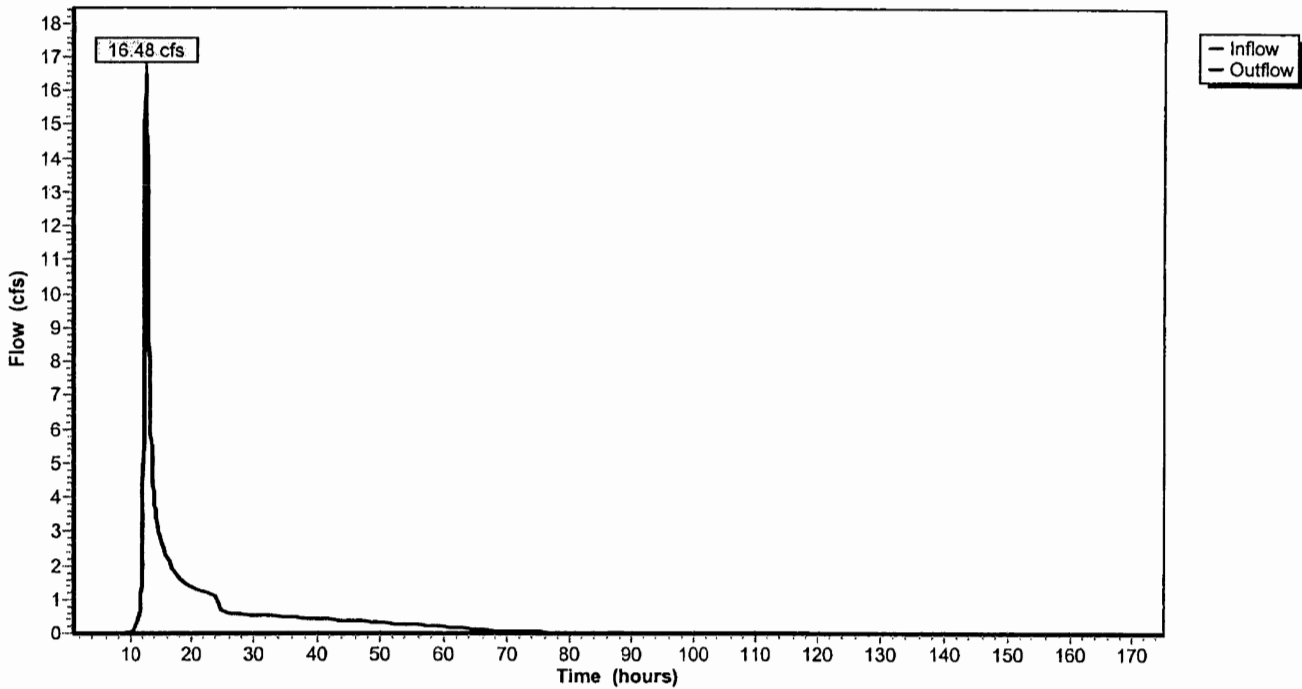
## Reach Design Point 3:

Inflow Area = 49.900 ac, Inflow Depth = 1.04" for 1-year event  
Inflow = 16.48 cfs @ 12.59 hrs, Volume= 4.317 af  
Outflow = 16.48 cfs @ 12.59 hrs, Volume= 4.317 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs

## Reach Design Point 3:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 2-year Rainfall=3.50"

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## Subcatchment 1.1S:

Runoff = 57.11 cfs @ 12.27 hrs, Volume= 6.033 af, Depth= 2.10"

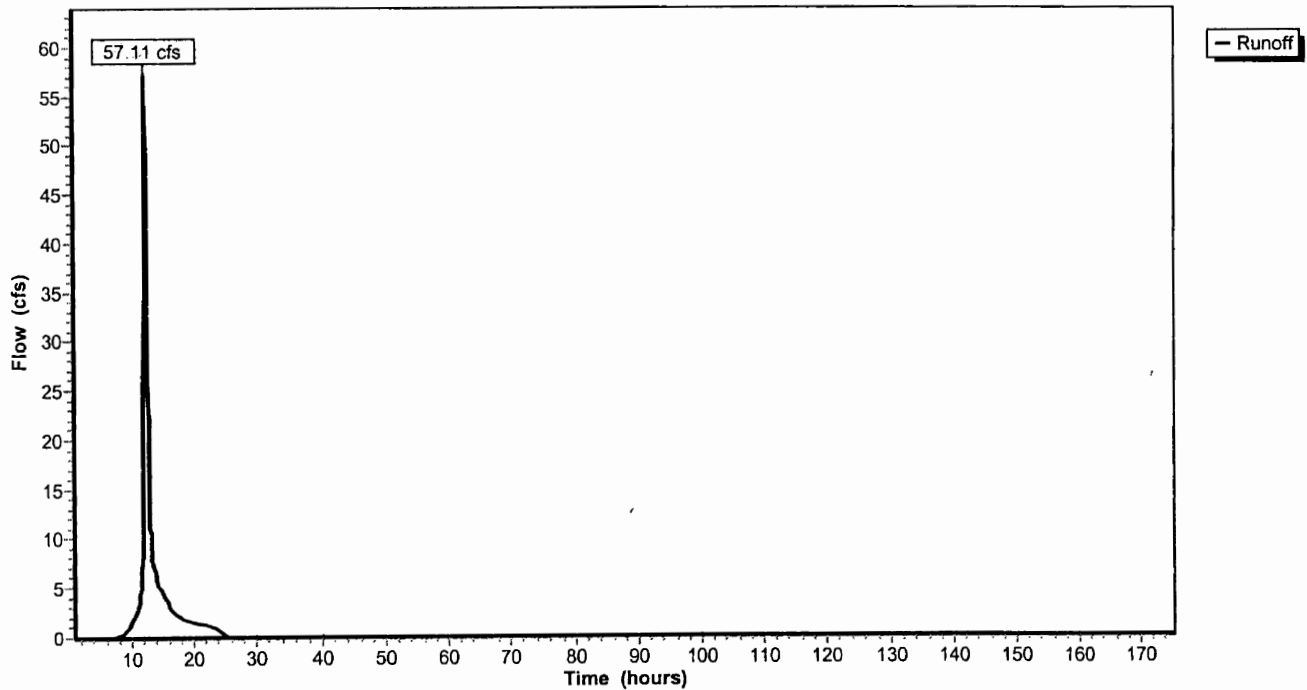
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
26.000	90	Suburban Shopping Center
6.000	70	Woods, Good, HSG C
1.500	79	1 acre lots, 20% imp, HSG C
1.000	74	>75% Grass cover, Good, HSG C
34.500	86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

## Subcatchment 1.1S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 2-year Rainfall=3.50"

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## Subcatchment 1.2S:

Runoff = 1.41 cfs @ 12.09 hrs, Volume= 0.103 af, Depth= 1.24"

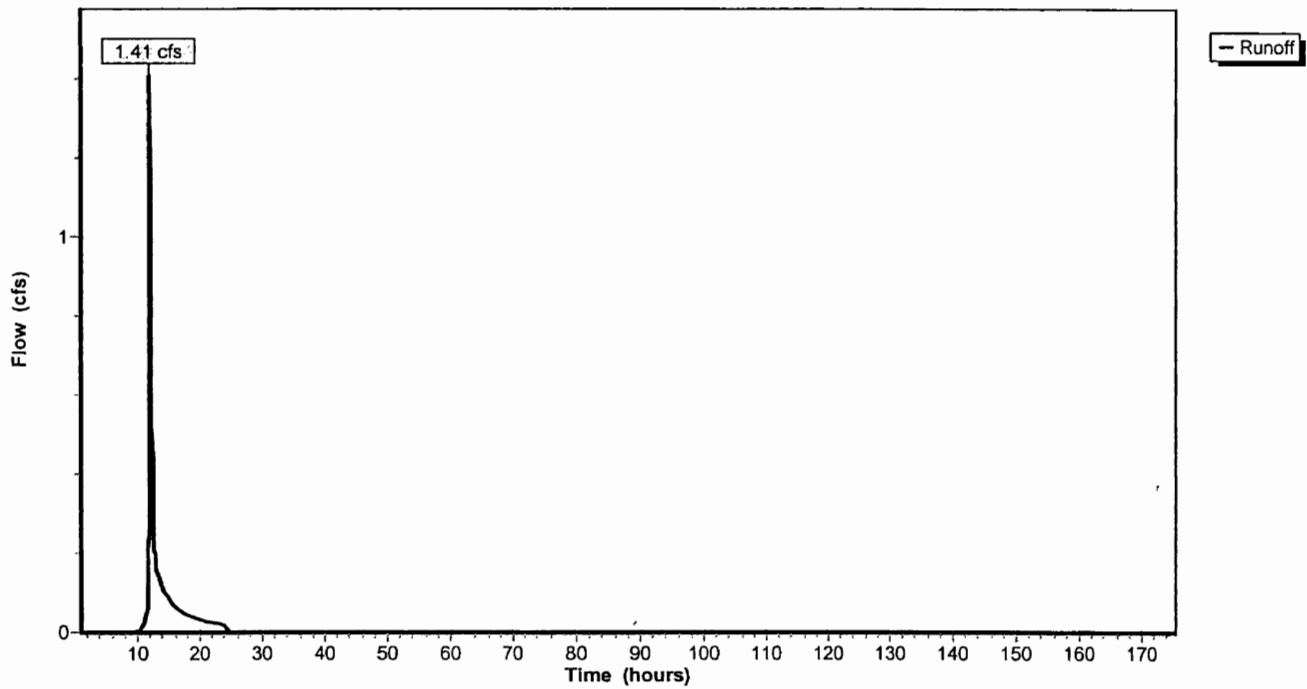
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
1.000	74	>75% Grass cover, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

## Subcatchment 1.2S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 2-year Rainfall=3.50"

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## Subcatchment 1.3S:

Runoff = 18.89 cfs @ 12.28 hrs, Volume= 2.000 af, Depth= 2.02"

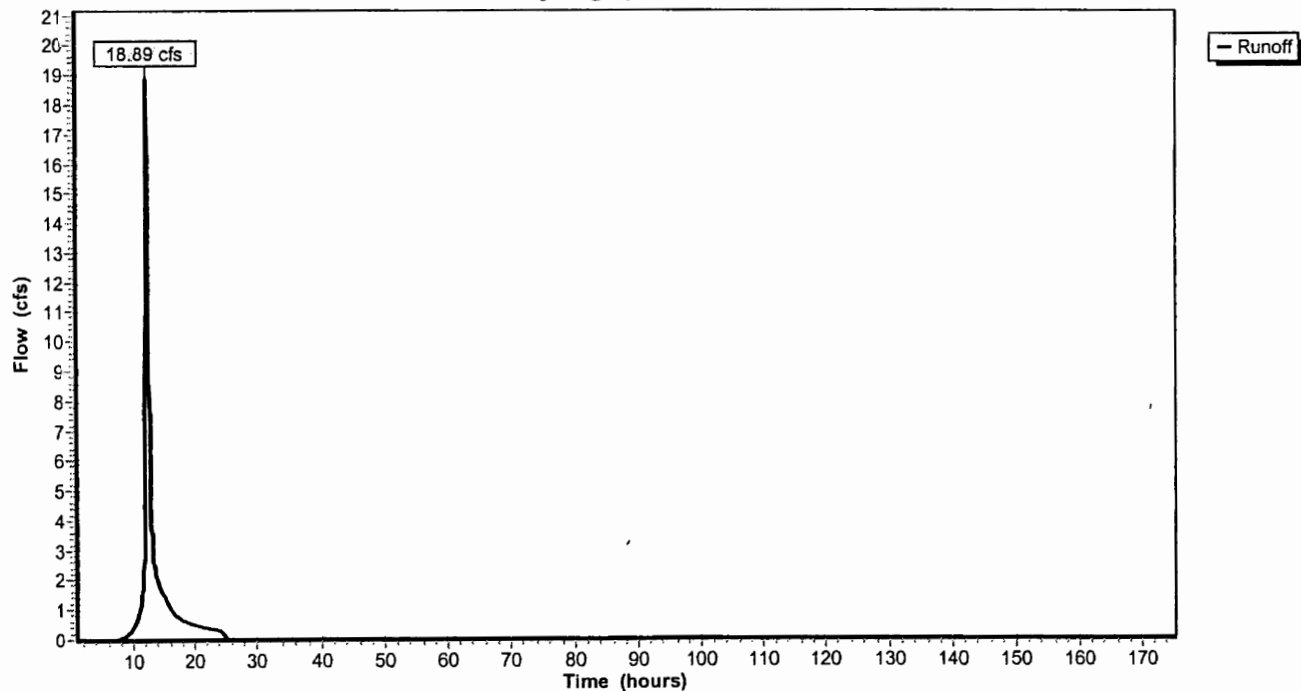
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
7.400	90	Suburban Shopping Center
3.000	79	1 acre lots, 20% imp, HSG C
1.500	74	>75% Grass cover, Good, HSG C
11.900	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

## Subcatchment 1.3S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 2-year Rainfall=3.50"

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## Subcatchment 1.4S:

Runoff = 1.41 cfs @ 12.09 hrs, Volume= 0.103 af, Depth= 1.24"

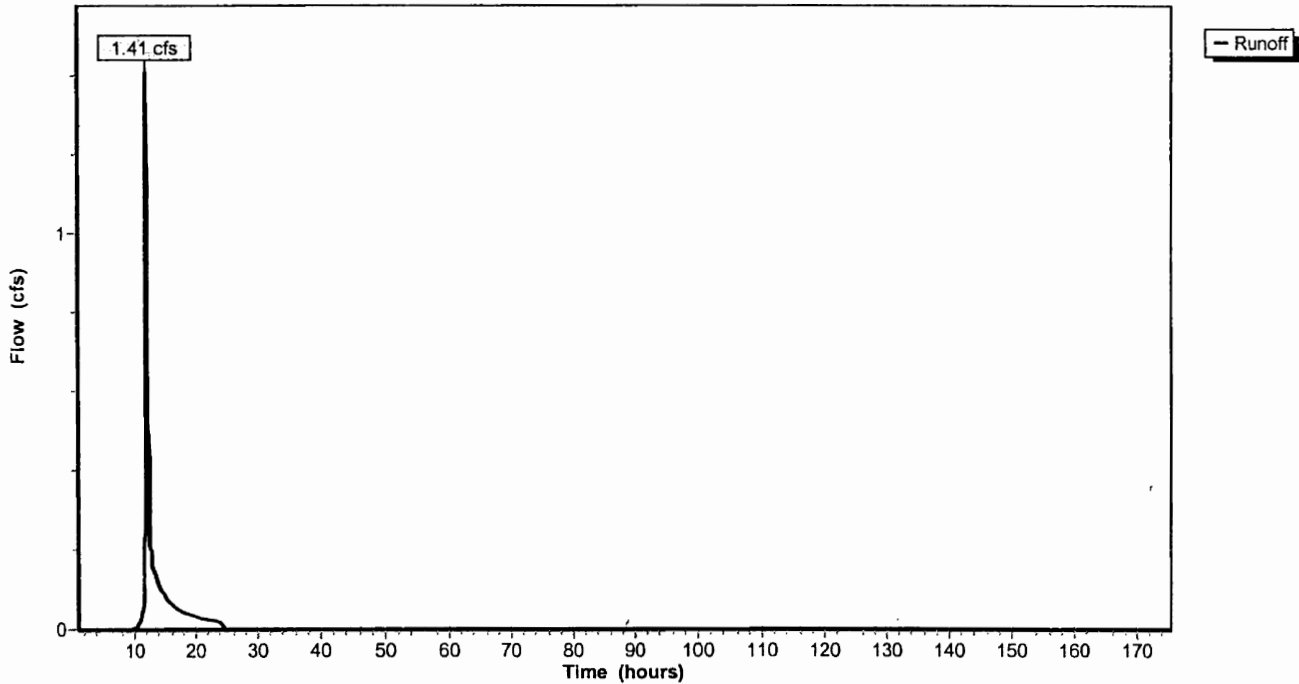
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
1.000	74	>75% Grass cover, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

## Subcatchment 1.4S:

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 2-year Rainfall=3.50"

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**Pond 1.1P:**

Inflow Area = 34.500 ac, Inflow Depth = 2.10" for 2-year event  
 Inflow = 56.19 cfs @ 12.29 hrs, Volume= 6.033 af  
 Outflow = 14.02 cfs @ 12.89 hrs, Volume= 5.182 af, Atten= 75%, Lag= 36.4 min  
 Primary = 14.02 cfs @ 12.89 hrs, Volume= 5.182 af  
 Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Peak Elev= 781.76' @ 12.89 hrs Surf.Area= 41,560 sf Storage= 139,010 cf  
 Plug-Flow detention time= 1,441.4 min calculated for 5.182 af (86% of inflow)  
 Center-of-Mass det. time= 1,379.4 min ( 2,211.7 - 832.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	774.00'	239,800 cf	<b>Custom Stage Data (Prismatic)</b> Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
774.00	2,800	0	0
776.00	8,500	11,300	11,300
778.00	15,000	23,500	34,800
780.00	27,000	42,000	76,800
782.00	43,500	70,500	147,300
784.00	49,000	92,500	239,800

Device	Routing	Invert	Outlet Devices
#1	Primary	778.00'	<b>3.5" Vert. Orifice/Grate</b> C= 0.300
#2	Primary	781.10'	<b>8.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Secondary	782.00'	<b>28.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=13.96 cfs @ 12.89 hrs HW=781.76' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.31 cfs @ 4.6 fps)  
 ↓2=Broad-Crested Rectangular Weir (Weir Controls 13.65 cfs @ 2.6 fps)

**Secondary OutFlow** Max=0.00 cfs @ 1.00 hrs HW=774.00' (Free Discharge)  
 ↑3=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Patterson Crossing Post Development**

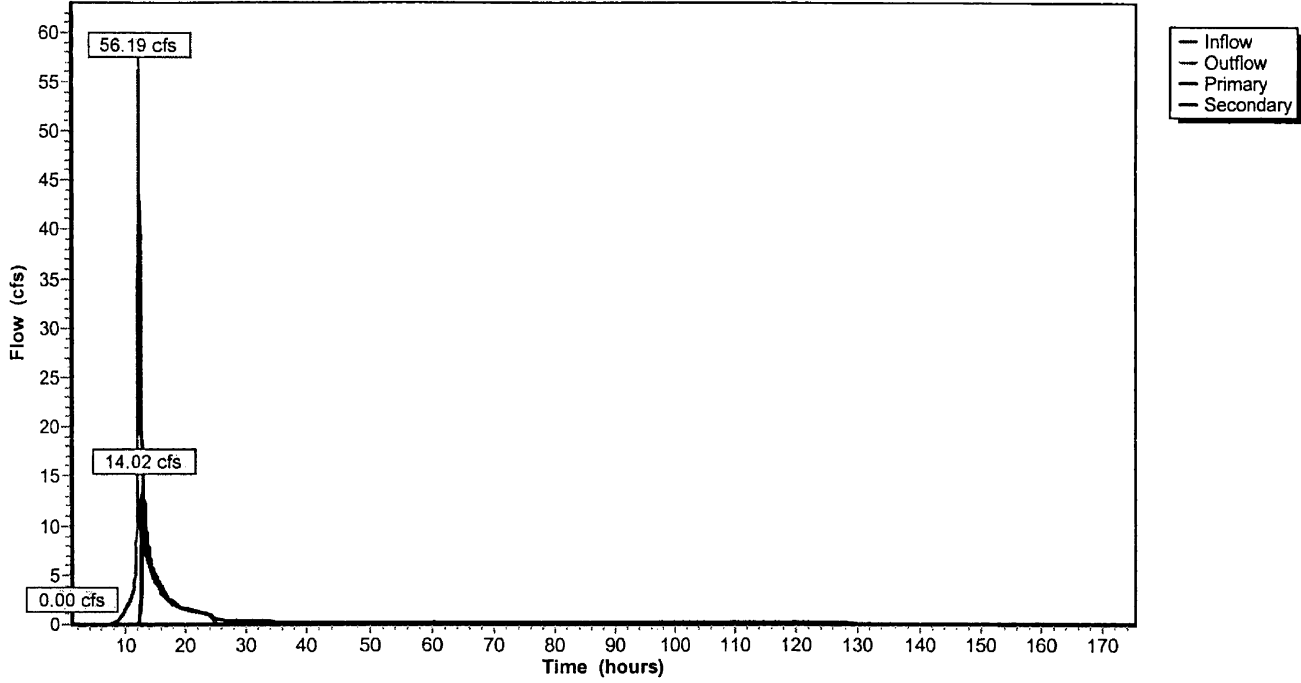
Type III 24-hr 2-year Rainfall=3.50"

Prepared by Insite Engineering, Surveying & Landscape Architecture,P.C>

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**Pond 1.1P:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 2-year Rainfall=3.50"

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## Pond 1.2P:

Inflow Area = 35.500 ac, Inflow Depth > 1.79" for 2-year event  
 Inflow = 14.21 cfs @ 12.89 hrs, Volume= 5.285 af  
 Outflow = 3.89 cfs @ 15.89 hrs, Volume= 5.284 af, Atten= 73%, Lag= 180.2 min  
 Primary = 0.44 cfs @ 15.89 hrs, Volume= 4.016 af  
 Secondary = 3.45 cfs @ 15.89 hrs, Volume= 1.268 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Peak Elev= 772.75' @ 15.89 hrs Surf.Area= 19,118 sf Storage= 79,934 cf  
 Plug-Flow detention time= 1,450.9 min calculated for 5.284 af (100% of inflow)  
 Center-of-Mass det. time= 1,449.1 min ( 3,634.3 - 2,185.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	766.00'	126,400 cf	<b>Custom Stage Data (Prismatic)</b> Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
766.00	3,800	0	0
768.00	8,700	12,500	12,500
770.00	13,100	21,800	34,300
772.00	18,000	31,100	65,400
774.00	21,000	39,000	104,400
775.00	23,000	22,000	126,400

Device	Routing	Invert	Outlet Devices
#1	Primary	765.00'	<b>3.5" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	772.50'	<b>10.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.44 cfs @ 15.89 hrs HW=772.75' (Free Discharge)  
 ↳1=Orifice/Grate (Orifice Controls 0.44 cfs @ 6.6 fps)

**Secondary OutFlow** Max=3.44 cfs @ 15.89 hrs HW=772.75' (Free Discharge)  
 ↳2=Broad-Crested Rectangular Weir (Weir Controls 3.44 cfs @ 1.4 fps)

# Patterson Crossing Post Development

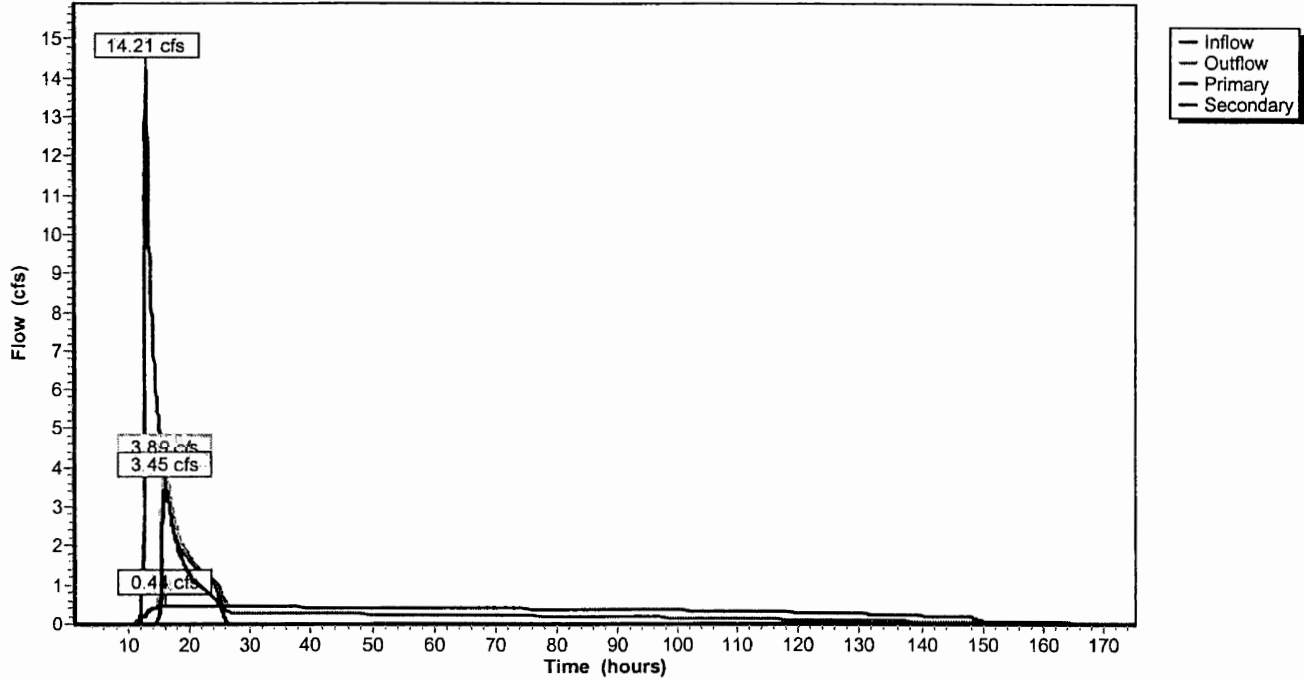
Type III 24-hr 2-year Rainfall=3.50"

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## Pond 1.2P:

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 2-year Rainfall=3.50"

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**Pond 1.3P:**

Inflow Area = 11.900 ac, Inflow Depth = 2.02" for 2-year event  
 Inflow = 19.09 cfs @ 12.27 hrs, Volume= 2.000 af  
 Outflow = 0.33 cfs @ 23.76 hrs, Volume= 1.993 af, Atten= 98%, Lag= 689.2 min  
 Primary = 0.33 cfs @ 23.76 hrs, Volume= 1.993 af  
 Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 764.00' Surf.Area= 3,200 sf Storage= 7,900 cf  
 Peak Elev= 768.43' @ 23.76 hrs Surf.Area= 22,814 sf Storage= 80,320 cf (72,420 cf above start)  
 Plug-Flow detention time= 2,716.3 min calculated for 1.812 af (91% of inflow)  
 Center-of-Mass det. time= 2,433.7 min ( 3,268.4 - 834.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	760.00'	176,100 cf	<b>Custom Stage Data (Prismatic)</b> Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
760.00	900	0	0
762.00	1,900	2,800	2,800
764.00	3,200	5,100	7,900
766.00	18,500	21,700	29,600
768.00	21,800	40,300	69,900
770.00	26,500	48,300	118,200
772.00	31,400	57,900	176,100

Device	Routing	Invert	Outlet Devices
#1	Primary	764.00'	<b>3.5" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	770.00'	<b>8.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.33 cfs @ 23.76 hrs HW=768.43' (Free Discharge)  
 ↳1=Orifice/Grate (Orifice Controls 0.33 cfs @ 5.0 fps)

**Secondary OutFlow** Max=0.00 cfs @ 1.00 hrs HW=764.00' (Free Discharge)  
 ↳2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Patterson Crossing Post Development**

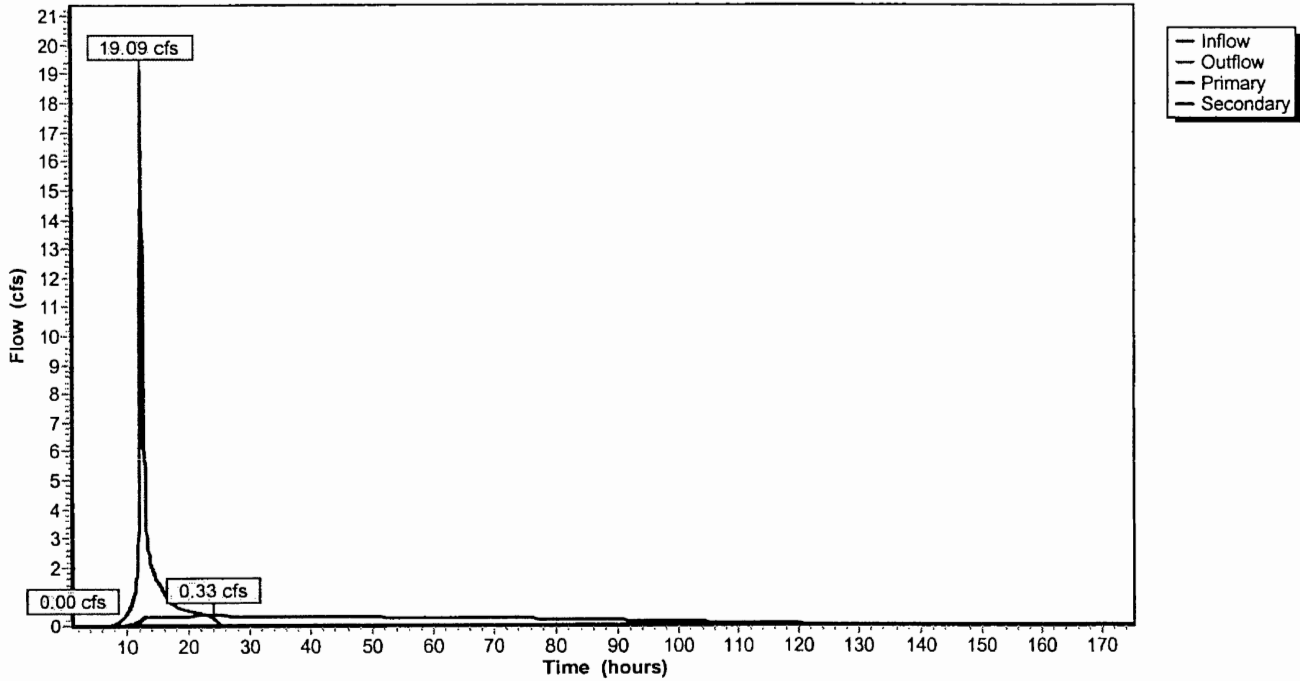
Type III 24-hr 2-year Rainfall=3.50"

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**Pond 1.3P:**

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 2-year Rainfall=3.50"

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**Pond 1.4P:**

Inflow Area = 48.400 ac, Inflow Depth > 1.83" for 2-year event  
 Inflow = 4.28 cfs @ 15.89 hrs, Volume= 7.380 af  
 Outflow = 1.51 cfs @ 23.64 hrs, Volume= 7.075 af, Atten= 65%, Lag= 464.8 min  
 Primary = 0.54 cfs @ 23.64 hrs, Volume= 6.094 af  
 Secondary = 0.97 cfs @ 23.64 hrs, Volume= 0.981 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 760.00' Surf.Area= 30,000 sf Storage= 100,800 cf  
 Peak Elev= 762.07' @ 23.64 hrs Surf.Area= 35,682 sf Storage= 168,920 cf (68,120 cf above start)  
 Plug-Flow detention time= 4,220.6 min calculated for 4.759 af (64% of inflow)  
 Center-of-Mass det. time= 1,370.0 min ( 4,866.6 - 3,496.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	754.00'	242,600 cf	<b>Custom Stage Data (Prismatic)</b> Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
754.00	4,800	0	0
756.00	12,500	17,300	17,300
758.00	20,500	33,000	50,300
760.00	30,000	50,500	100,800
762.00	35,500	65,500	166,300
764.00	40,800	76,300	242,600

Device	Routing	Invert	Outlet Devices
#1	Primary	760.00'	<b>5.5" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	762.00'	<b>16.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.54 cfs @ 23.64 hrs HW=762.07' (Free Discharge)  
 ↳1=Orifice/Grate (Orifice Controls 0.54 cfs @ 3.3 fps)

**Secondary OutFlow** Max=0.81 cfs @ 23.64 hrs HW=762.07' (Free Discharge)  
 ↳2=Broad-Crested Rectangular Weir (Weir Controls 0.81 cfs @ 0.7 fps)

# Patterson Crossing Post Development

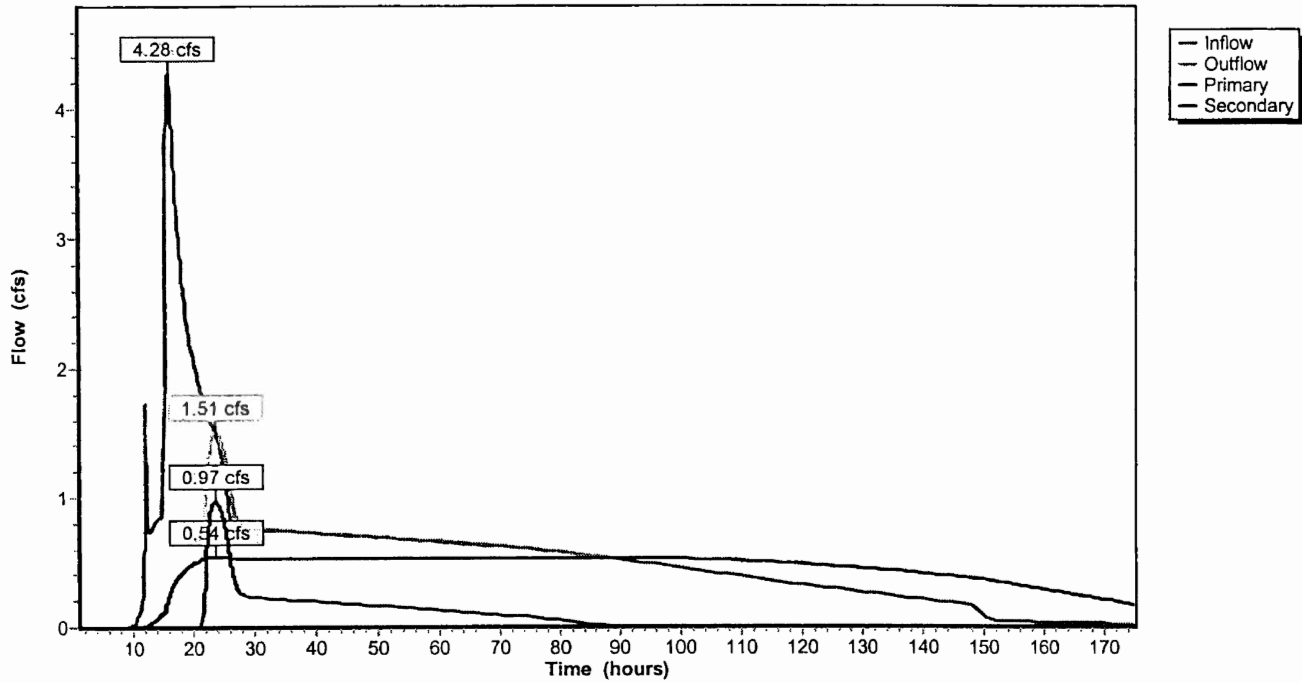
Type III 24-hr 2-year Rainfall=3.50"

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## Pond 1.4P:

### Hydrograph



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Type III 24-hr 2-year Rainfall=3.50"

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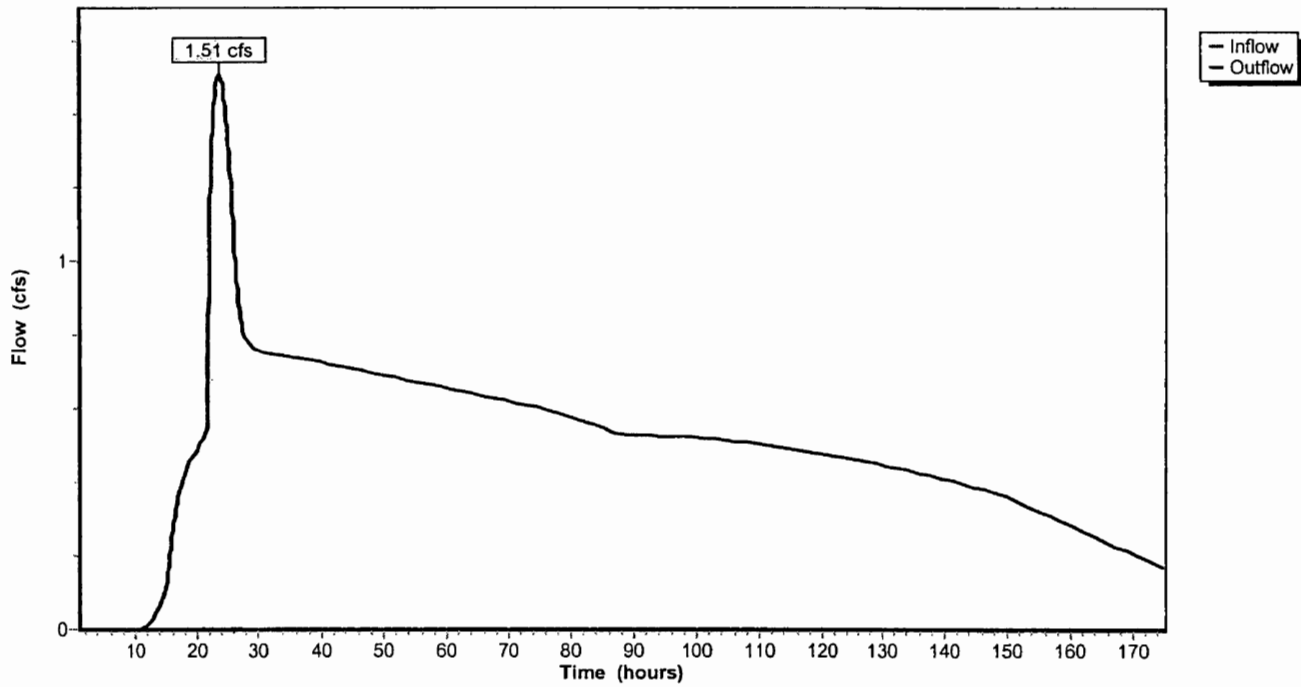
## Reach Design Line 1:

Inflow Area = 48.400 ac, Inflow Depth > 1.75" for 2-year event  
Inflow = 1.51 cfs @ 23.64 hrs, Volume= 7.075 af  
Outflow = 1.51 cfs @ 23.64 hrs, Volume= 7.075 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs

## Reach Design Line 1:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 2-year Rainfall=3.50"

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## Subcatchment 2.0S:

Runoff = 21.00 cfs @ 12.31 hrs, Volume= 2.393 af, Depth= 1.06"

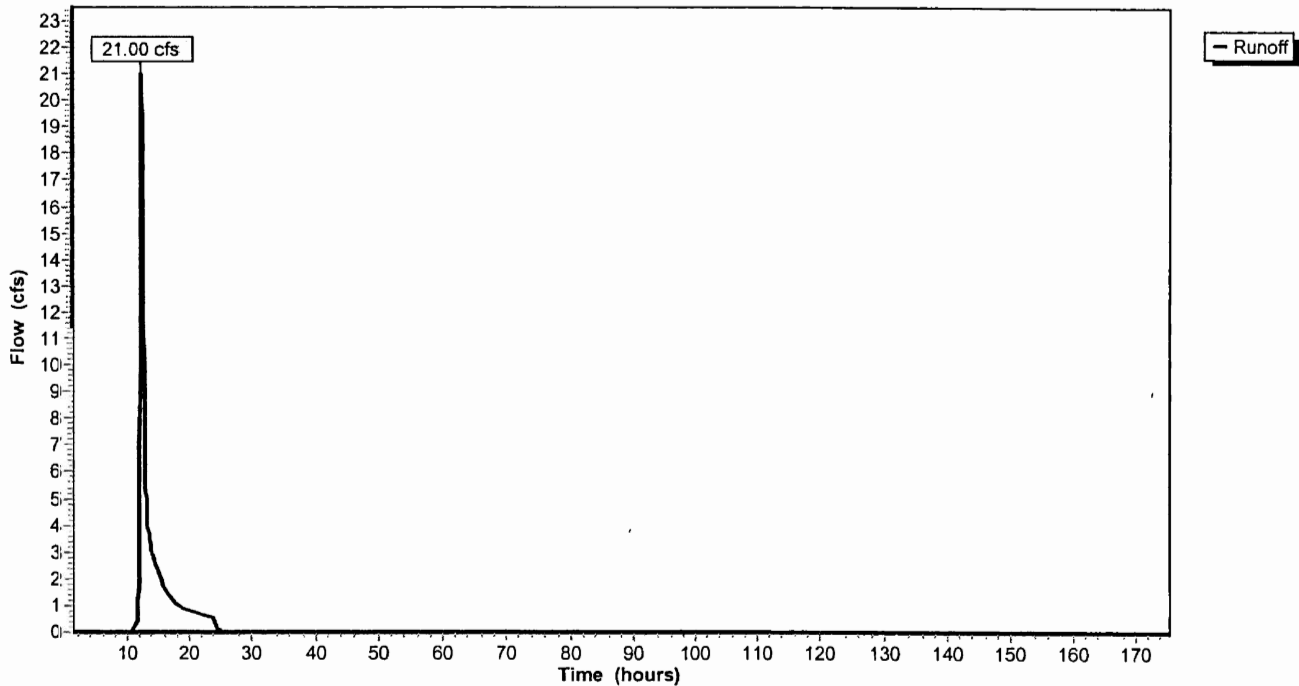
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
17.500	70	Woods, Good, HSG C
9.500	74	>75% Grass cover, Good, HSG C
27.000	71	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

## Subcatchment 2.0S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 2-year Rainfall=3.50"

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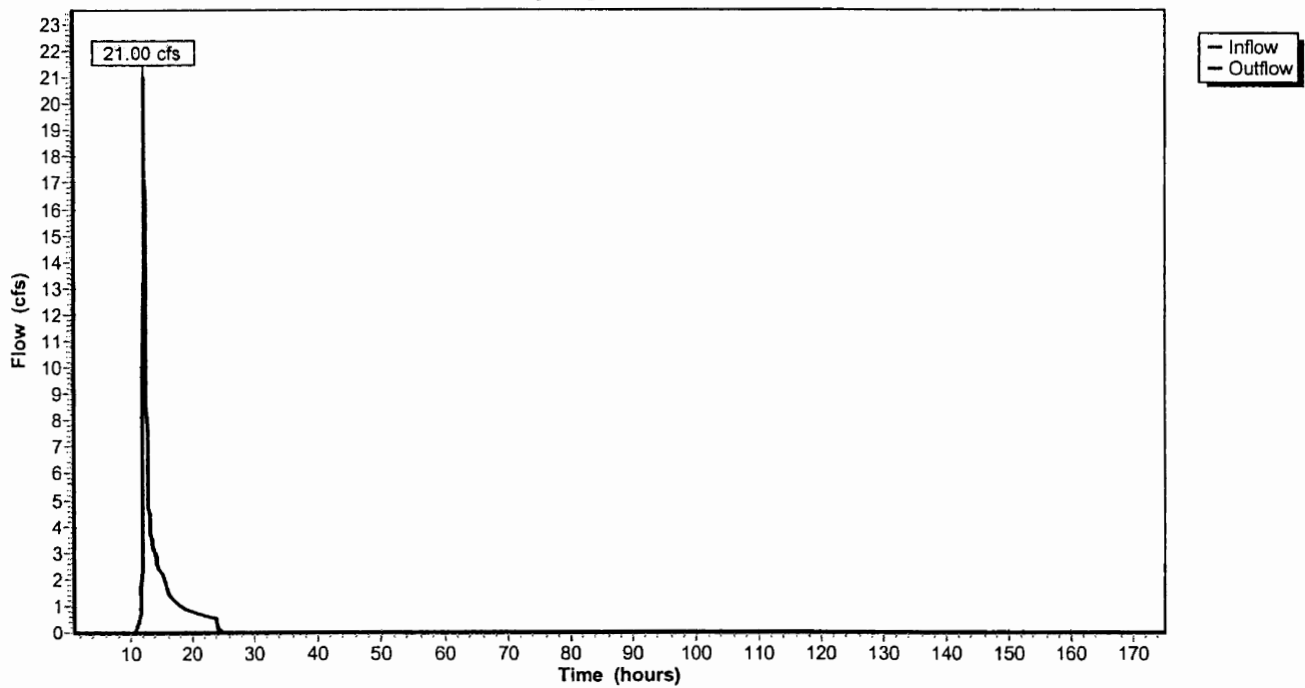
## Reach Design Point 2:

Inflow Area = 27.000 ac, Inflow Depth = 1.06" for 2-year event  
Inflow = 21.00 cfs @ 12.31 hrs, Volume= 2.393 af  
Outflow = 21.00 cfs @ 12.31 hrs, Volume= 2.393 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs

## Reach Design Point 2:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 2-year Rainfall=3.50"

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## Subcatchment 3.1S:

Runoff = 13.13 cfs @ 12.21 hrs, Volume= 1.239 af, Depth= 1.86"

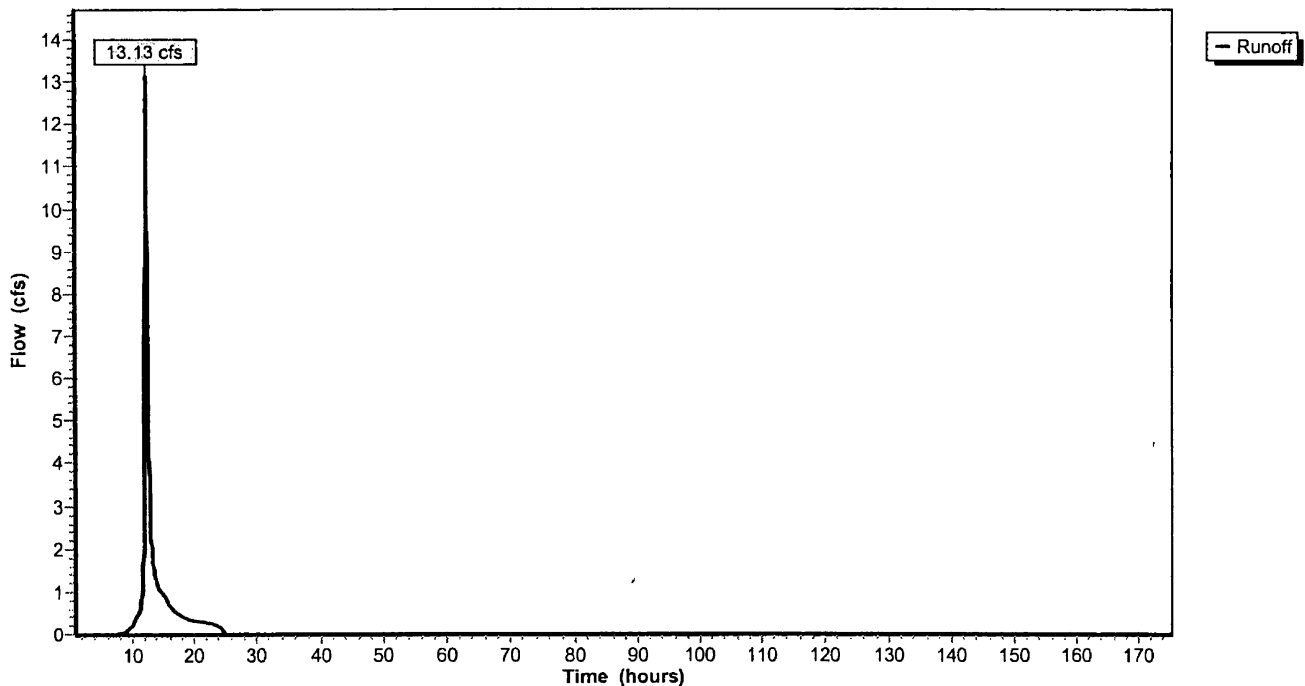
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
5.000	90	Suburban Shopping Center
3.000	70	Woods, Good, HSG C
8.000	83	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry,

## Subcatchment 3.1S:

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 2-year Rainfall=3.50"

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**Subcatchment 3.2S:**

Runoff = 9.20 cfs @ 12.29 hrs, Volume= 1.001 af, Depth= 1.37"

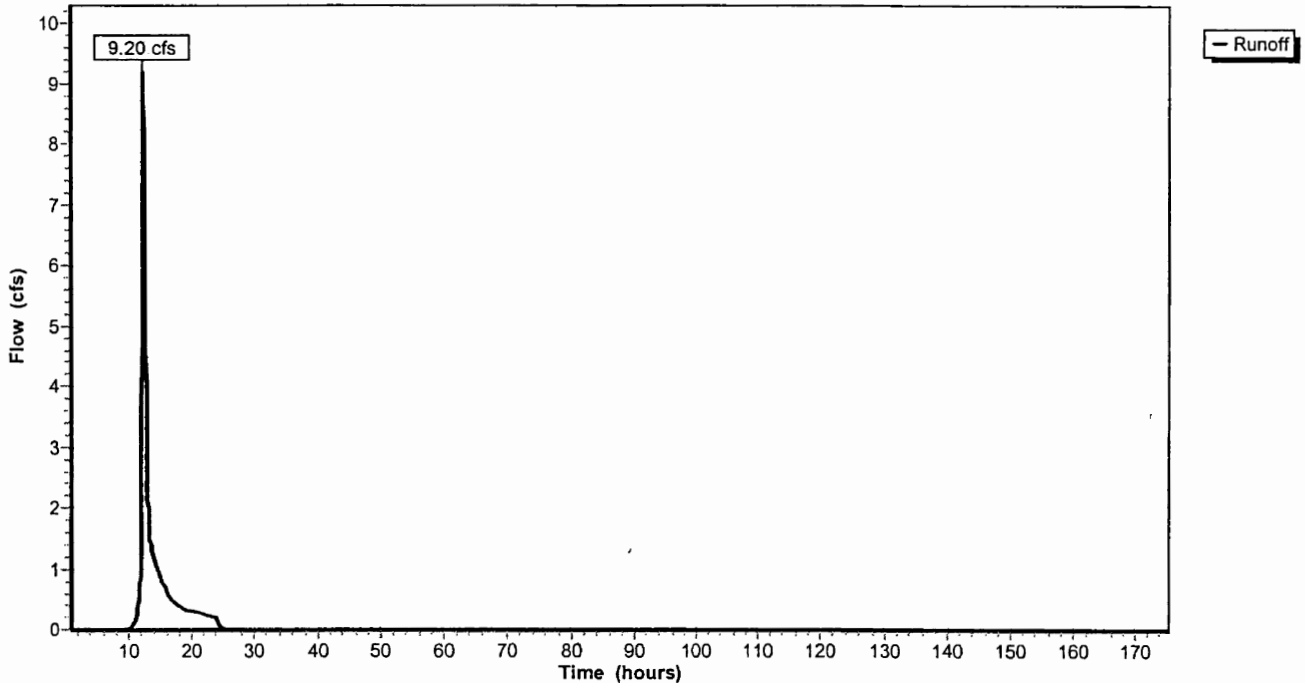
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
3.100	74	>75% Grass cover, Good, HSG C
3.900	70	Woods, Good, HSG C
1.800	90	Suburban Shopping Center
8.800	76	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

**Subcatchment 3.2S:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 2-year Rainfall=3.50"

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## Subcatchment 3.3S:

Runoff = 1.62 cfs @ 12.15 hrs, Volume= 0.134 af, Depth= 1.78"

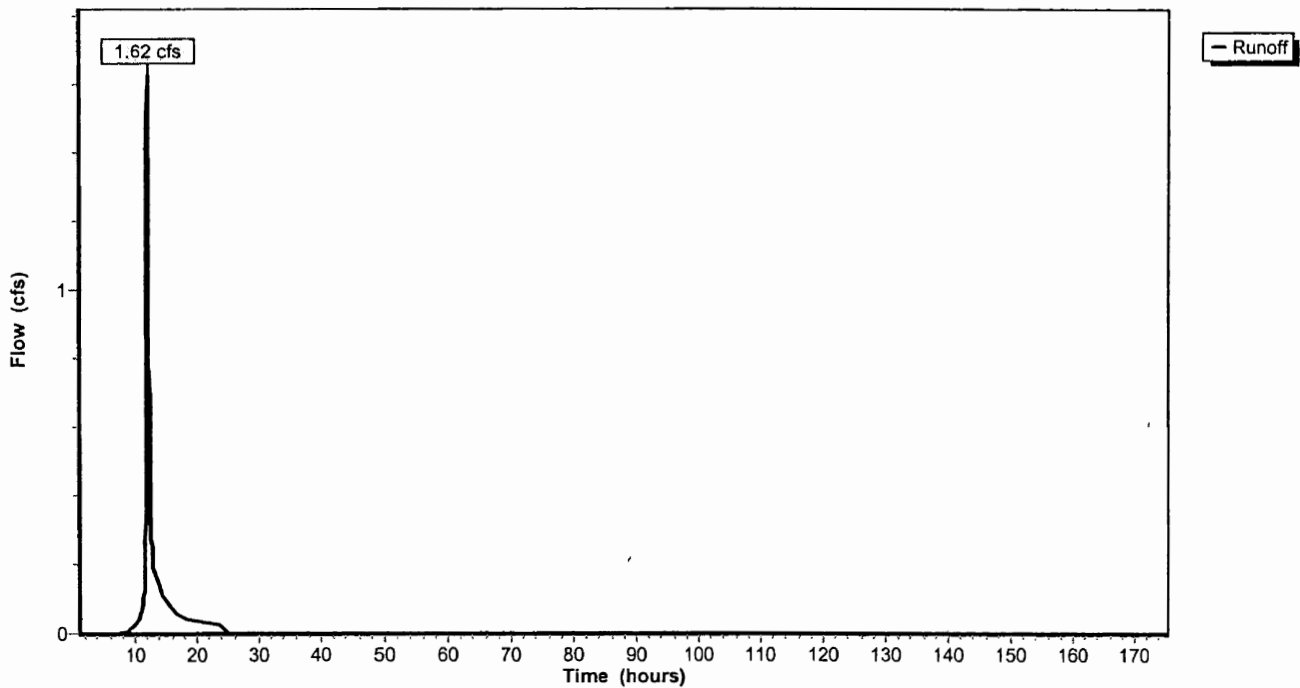
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
0.300	98	Paved parking & roofs
0.600	74	>75% Grass cover, Good, HSG C
0.900	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

## Subcatchment 3.3S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 2-year Rainfall=3.50"

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## Subcatchment 3.4S:

Runoff = 4.39 cfs @ 12.29 hrs, Volume= 0.478 af, Depth= 1.37"

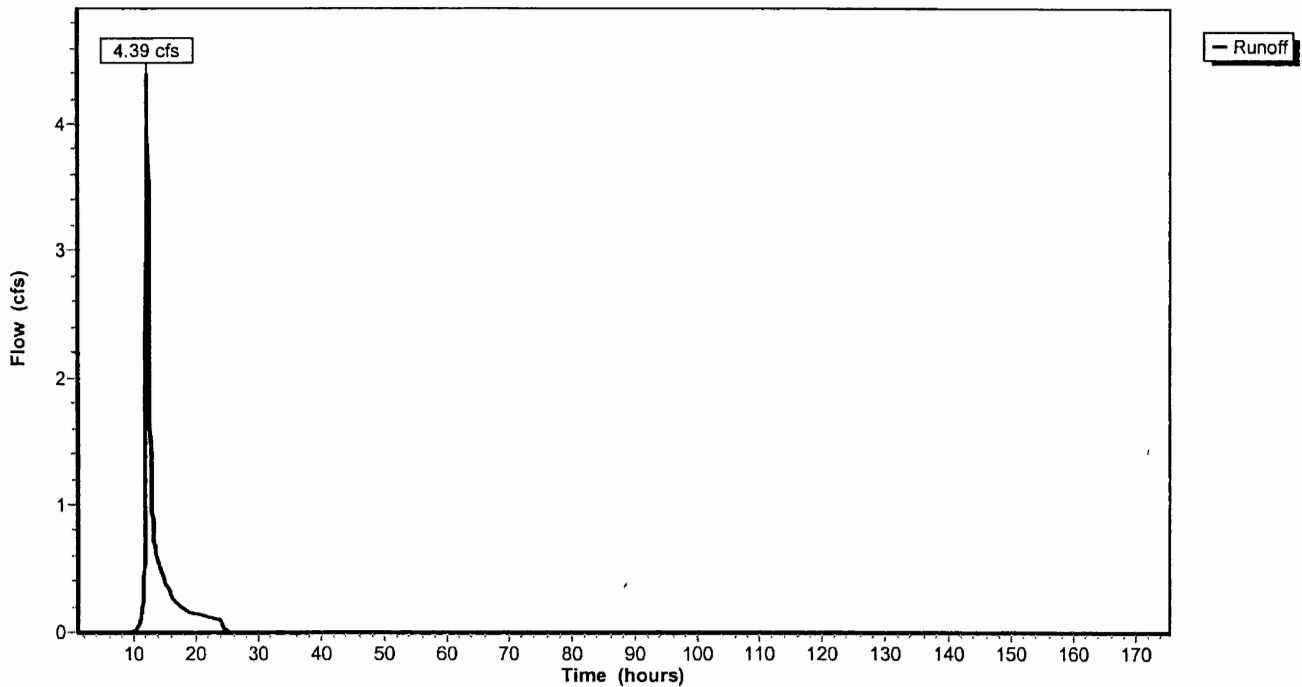
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
2.800	79	1 acre lots, 20% imp, HSG C
1.400	70	Woods, Good, HSG C
4.200	76	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

## Subcatchment 3.4S:

Hydrograph



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Type III 24-hr 2-year Rainfall=3.50"

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## Subcatchment 3.5S:

Runoff = 0.66 cfs @ 12.16 hrs, Volume= 0.059 af, Depth= 1.01"

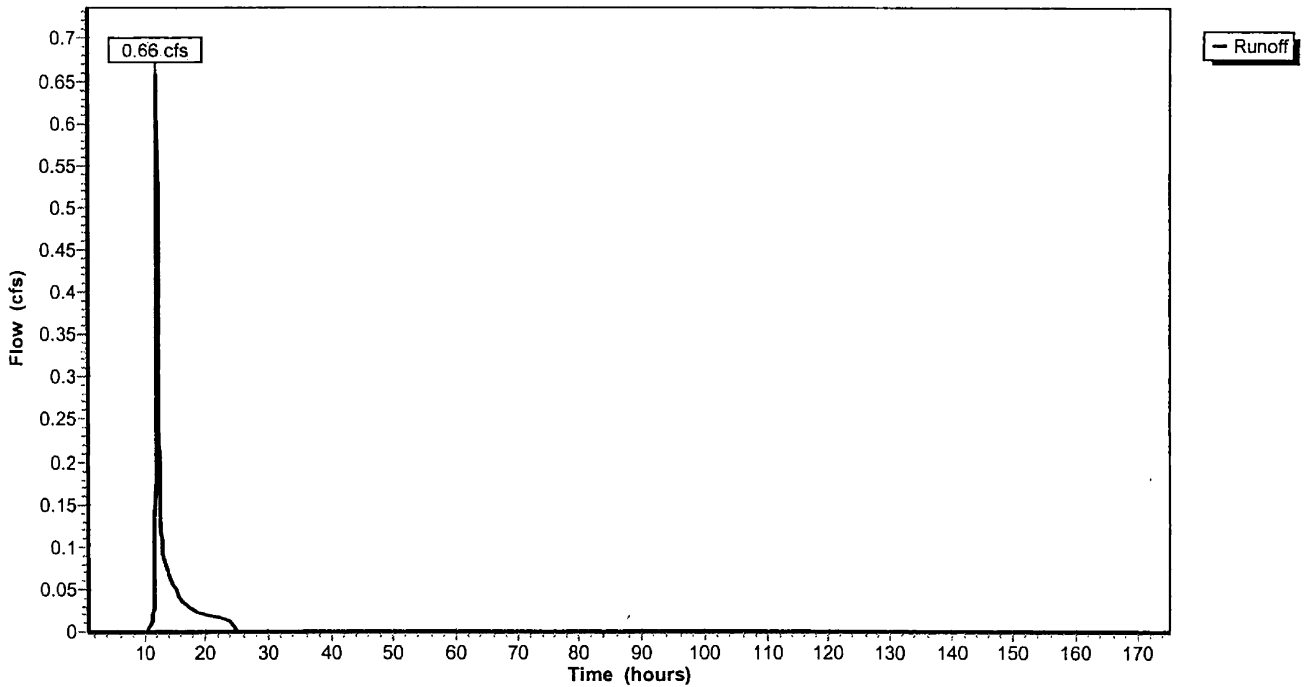
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
0.700	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

## Subcatchment 3.5S:

Hydrograph



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Type III 24-hr 2-year Rainfall=3.50"

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## Subcatchment 3.6S:

Runoff = 24.38 cfs @ 12.57 hrs, Volume= 3.563 af, Depth= 1.57"

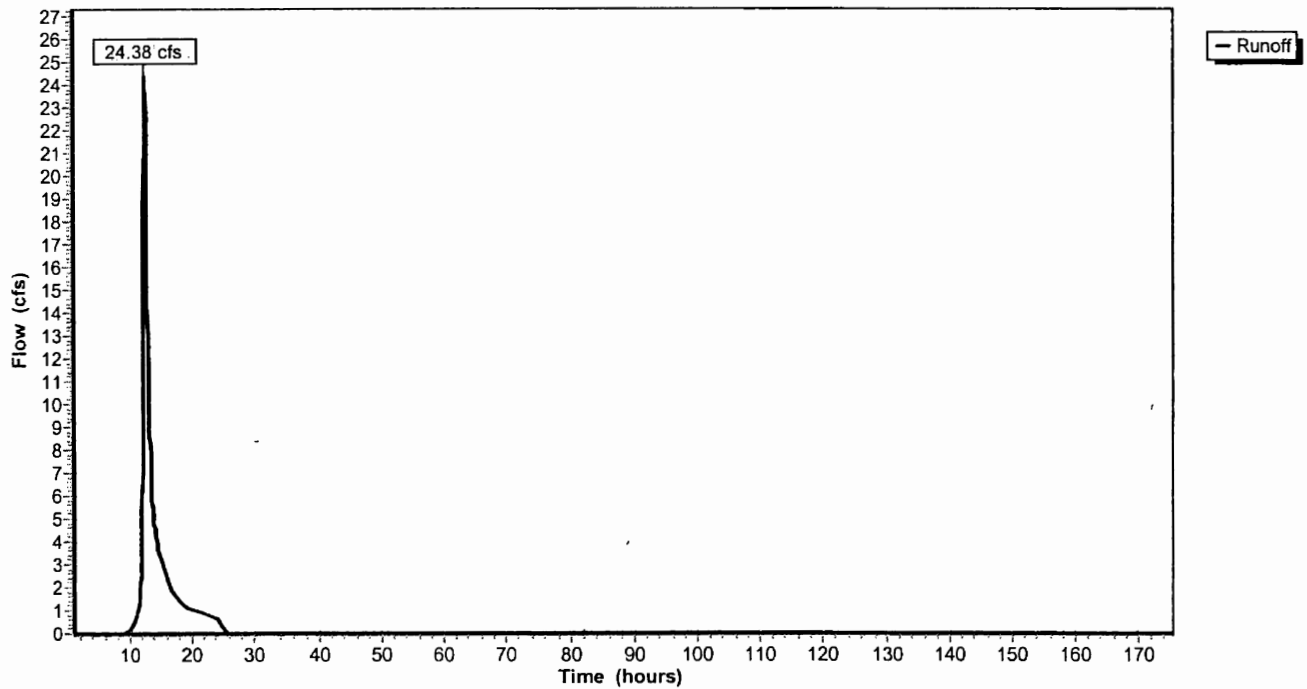
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
9.300	70	Woods, Good, HSG C
6.700	98	Paved parking & roofs
11.300	74	>75% Grass cover, Good, HSG C
27.300	79	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.0					Direct Entry,

## Subcatchment 3.6S:

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 2-year Rainfall=3.50"

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**Pond 3.1P:**

Inflow Area = 8.000 ac, Inflow Depth = 1.86" for 2-year event  
 Inflow = 13.13 cfs @ 12.21 hrs, Volume= 1.239 af  
 Outflow = 0.42 cfs @ 17.85 hrs, Volume= 1.239 af, Atten= 97%, Lag= 338.1 min  
 Primary = 0.42 cfs @ 17.85 hrs, Volume= 1.239 af  
 Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 718.00' Surf.Area= 7,000 sf Storage= 9,900 cf  
 Peak Elev= 721.41' @ 17.85 hrs Surf.Area= 15,328 sf Storage= 48,549 cf (38,649 cf above start)  
 Plug-Flow detention time= 1,483.2 min calculated for 1.012 af (82% of inflow)  
 Center-of-Mass det. time= 1,165.1 min ( 2,002.2 - 837.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	714.00'	110,300 cf	<b>Custom Stage Data (Prismatic)</b> Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
714.00	400	0	0
716.00	1,250	1,650	1,650
718.00	7,000	8,250	9,900
720.00	11,600	18,600	28,500
722.00	16,900	28,500	57,000
724.00	24,000	40,900	97,900
724.50	25,600	12,400	110,300

Device	Routing	Invert	Outlet Devices
#1	Primary	718.00'	<b>4.2" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	722.00'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.42 cfs @ 17.85 hrs HW=721.41' (Free Discharge)

↑1=**Orifice/Grate** (Orifice Controls 0.42 cfs @ 4.3 fps)

**Secondary OutFlow** Max=0.00 cfs @ 1.00 hrs HW=718.00' (Free Discharge)

↑2=**Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

**Patterson Crossing Post Development**

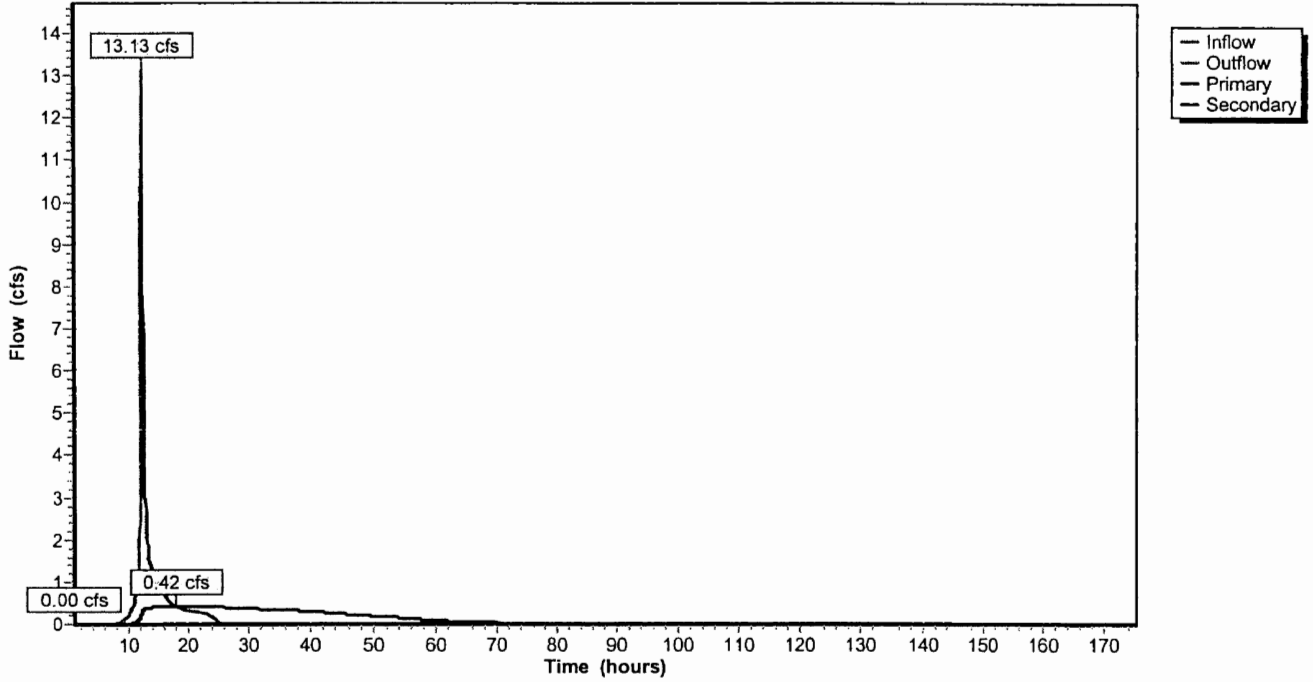
Type III 24-hr 2-year Rainfall=3.50"

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**Pond 3.1P:**

Hydrograph



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Type III 24-hr 2-year Rainfall=3.50"

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## Pond 3.2P:

Inflow Area = 16.800 ac, Inflow Depth = 1.60" for 2-year event  
 Inflow = 9.51 cfs @ 12.29 hrs, Volume= 2.240 af  
 Outflow = 0.67 cfs @ 21.46 hrs, Volume= 2.239 af, Atten= 93%, Lag= 549.7 min  
 Primary = 0.48 cfs @ 21.46 hrs, Volume= 2.179 af  
 Secondary = 0.20 cfs @ 21.46 hrs, Volume= 0.061 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 664.00' Surf.Area= 3,900 sf Storage= 9,500 cf  
 Peak Elev= 668.02' @ 21.46 hrs Surf.Area= 14,544 sf Storage= 49,065 cf (39,565 cf above start)  
 Plug-Flow detention time= 1,457.8 min calculated for 2.021 af (90% of inflow)  
 Center-of-Mass det. time= 1,058.8 min ( 2,552.0 - 1,493.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	660.00'	81,700 cf	<b>Custom Stage Data (Prismatic)</b> Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
660.00	800	0	0
662.00	2,400	3,200	3,200
664.00	3,900	6,300	9,500
666.00	10,400	14,300	23,800
668.00	14,500	24,900	48,700
670.00	18,500	33,000	81,700

Device	Routing	Invert	Outlet Devices
#1	Primary	664.00'	<b>4.3" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	668.00'	<b>10.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.48 cfs @ 21.46 hrs HW=668.02' (Free Discharge)  
 ↳1=Orifice/Grate (Orifice Controls 0.48 cfs @ 4.7 fps)

**Secondary OutFlow** Max=0.09 cfs @ 21.46 hrs HW=668.02' (Free Discharge)  
 ↳2=Broad-Crested Rectangular Weir (Weir Controls 0.09 cfs @ 0.4 fps)

**Patterson Crossing Post Development**

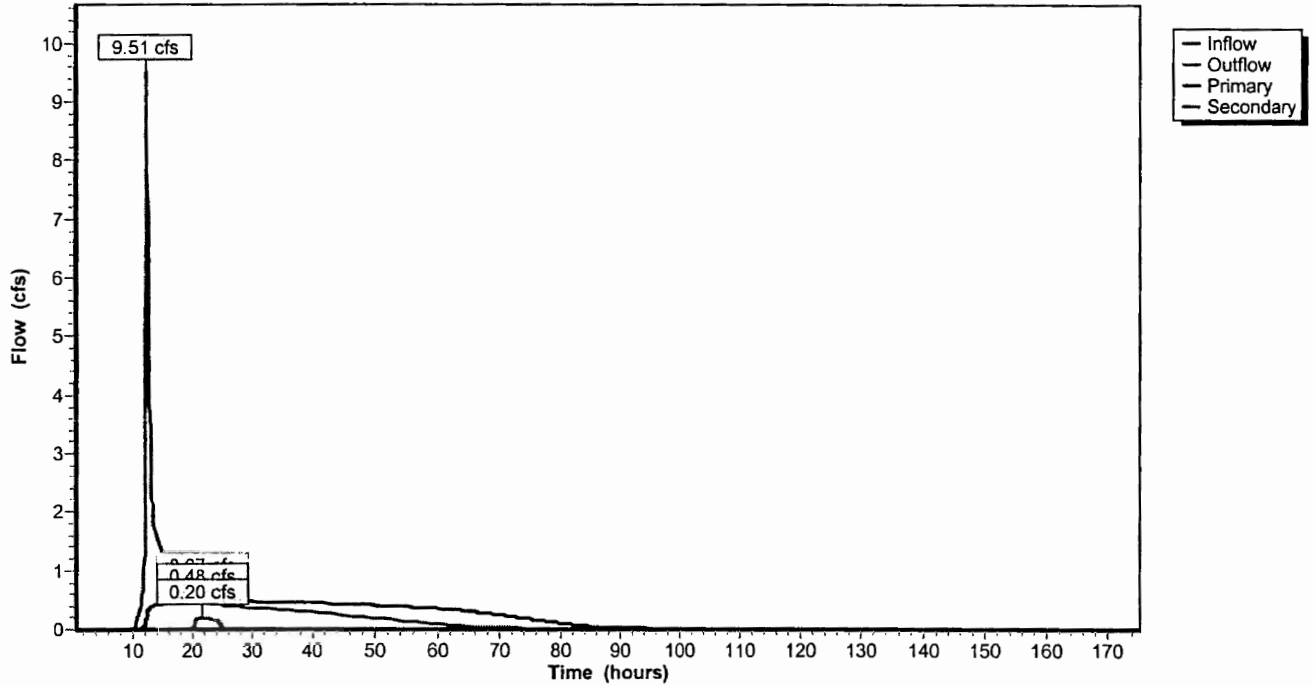
Type III 24-hr 2-year Rainfall=3.50"

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**Pond 3.2P:**

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 2-year Rainfall=3.50"

Prepared by Insite Engineering, Surveying &amp; Landscape Architecture,P.C&gt;

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**Pond 3.3P:**

Inflow Area = 0.900 ac, Inflow Depth = 1.78" for 2-year event  
 Inflow = 1.62 cfs @ 12.15 hrs, Volume= 0.134 af  
 Outflow = 0.05 cfs @ 17.48 hrs, Volume= 0.134 af, Atten= 97%, Lag= 319.8 min  
 Primary = 0.05 cfs @ 17.48 hrs, Volume= 0.134 af  
 Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 662.00' Surf.Area= 1,100 sf Storage= 2,120 cf  
 Peak Elev= 664.24' @ 17.48 hrs Surf.Area= 2,445 sf Storage= 6,166 cf (4,046 cf above start)  
 Plug-Flow detention time= 1,555.1 min calculated for 0.085 af (64% of inflow)  
 Center-of-Mass det. time= 1,007.0 min ( 1,842.7 - 835.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	658.00'	12,420 cf	<b>Custom Stage Data (Prismatic)</b> listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
658.00	20	0	0
660.00	500	520	520
662.00	1,100	1,600	2,120
664.00	2,100	3,200	5,320
666.00	5,000	7,100	12,420

Device	Routing	Invert	Outlet Devices
#1	Primary	662.00'	<b>1.6" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	664.50'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.05 cfs @ 17.48 hrs HW=664.24' (Free Discharge)  
 ↳1=Orifice/Grate (Orifice Controls 0.05 cfs @ 3.5 fps)

**Secondary OutFlow** Max=0.00 cfs @ 1.00 hrs HW=662.00' (Free Discharge)  
 ↳2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Patterson Crossing Post Development**

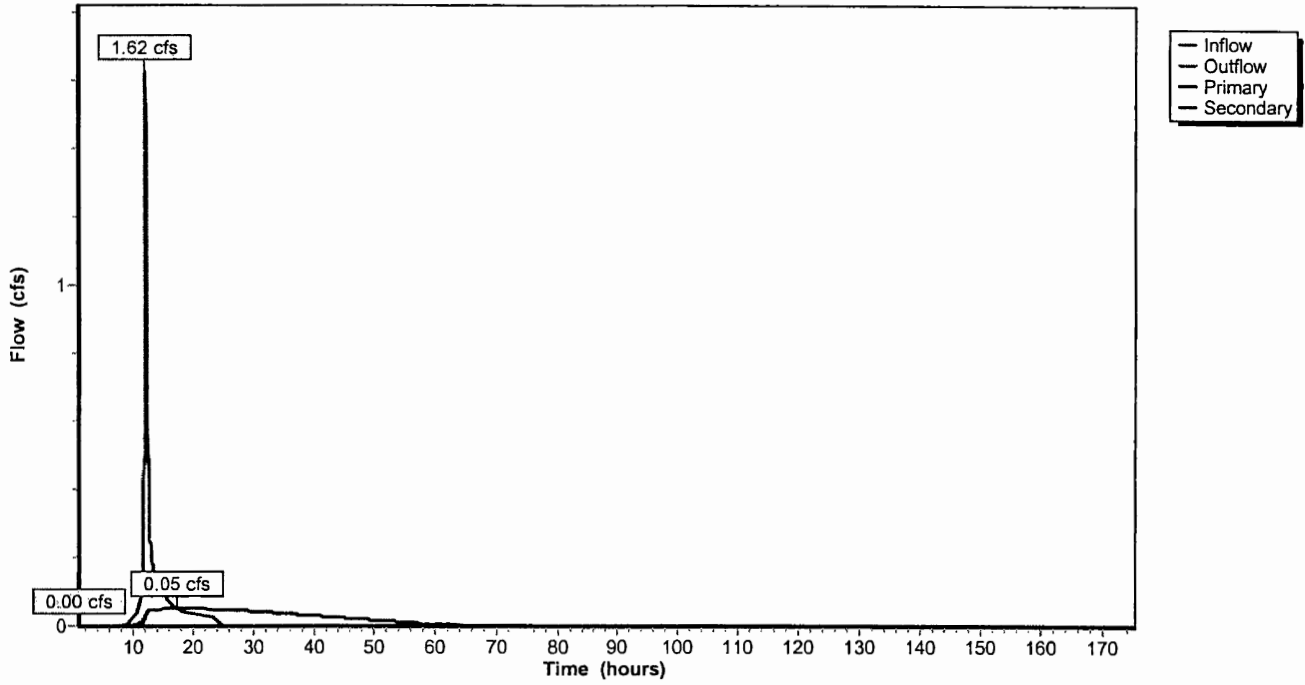
Type III 24-hr 2-year Rainfall=3.50"

Prepared by Insite Engineering, Surveying & Landscape Architecture,P.C>

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**Pond 3.3P:**

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**Patterson Crossing Post Development**

Type III 24-hr 2-year Rainfall=3.50"

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**Pond 3.4P:**

Inflow Area = 4.200 ac, Inflow Depth = 1.37" for 2-year event  
 Inflow = 4.39 cfs @ 12.29 hrs, Volume= 0.478 af  
 Outflow = 0.23 cfs @ 17.03 hrs, Volume= 0.478 af, Atten= 95%, Lag= 284.2 min  
 Primary = 0.23 cfs @ 17.03 hrs, Volume= 0.478 af  
 Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 756.00' Surf.Area= 6,000 sf Storage= 13,800 cf  
 Peak Elev= 757.79' @ 17.03 hrs Surf.Area= 8,680 sf Storage= 27,200 cf (13,400 cf above start)  
 Plug-Flow detention time= 1,827.2 min calculated for 0.161 af (34% of inflow)  
 Center-of-Mass det. time= 835.8 min ( 1,699.3 - 863.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	752.00'	49,800 cf	<b>Custom Stage Data (Prismatic)</b> Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
752.00	800	0	0
754.00	3,500	4,300	4,300
756.00	6,000	9,500	13,800
758.00	9,000	15,000	28,800
760.00	12,000	21,000	49,800

Device	Routing	Invert	Outlet Devices
#1	Primary	756.00'	<b>3.7" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	758.50'	<b>10.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.23 cfs @ 17.03 hrs HW=757.79' (Free Discharge)  
 ↳1=Orifice/Grate (Orifice Controls 0.23 cfs @ 3.1 fps)

**Secondary OutFlow** Max=0.00 cfs @ 1.00 hrs HW=756.00' (Free Discharge)  
 ↳2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Patterson Crossing Post Development**

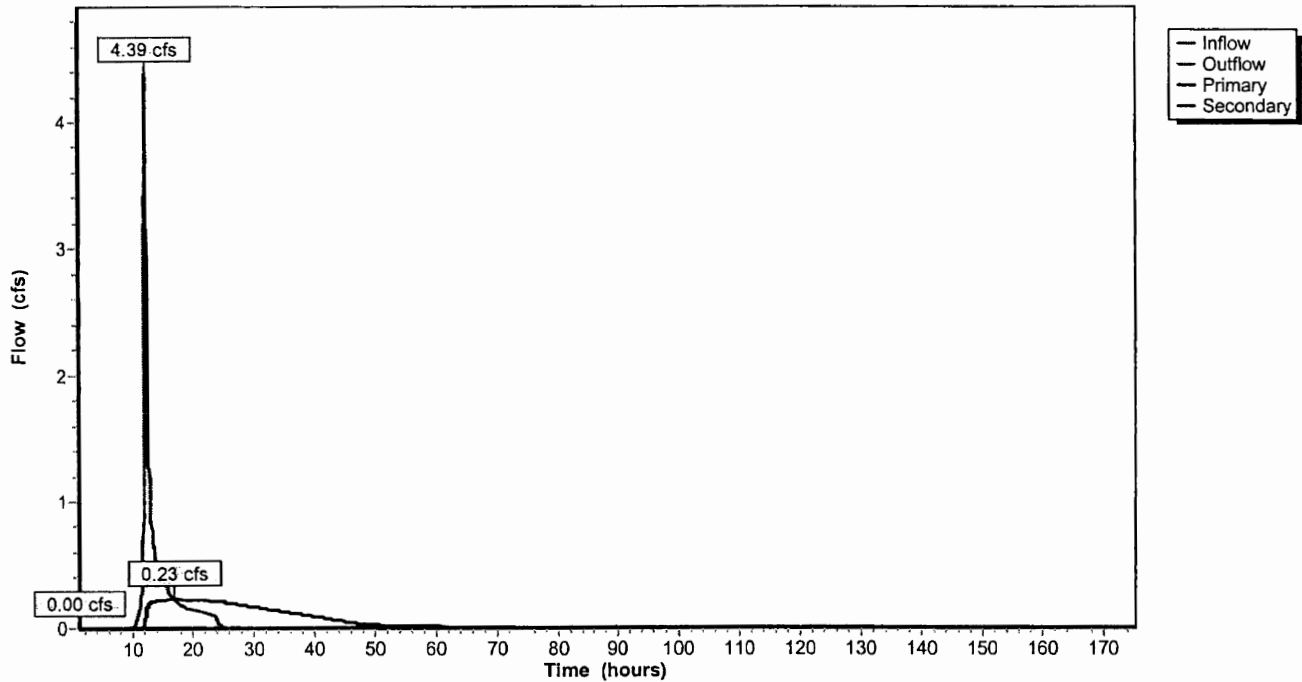
Type III 24-hr 2-year Rainfall=3.50"

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**Pond 3.4P:**

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 2-year Rainfall=3.50"

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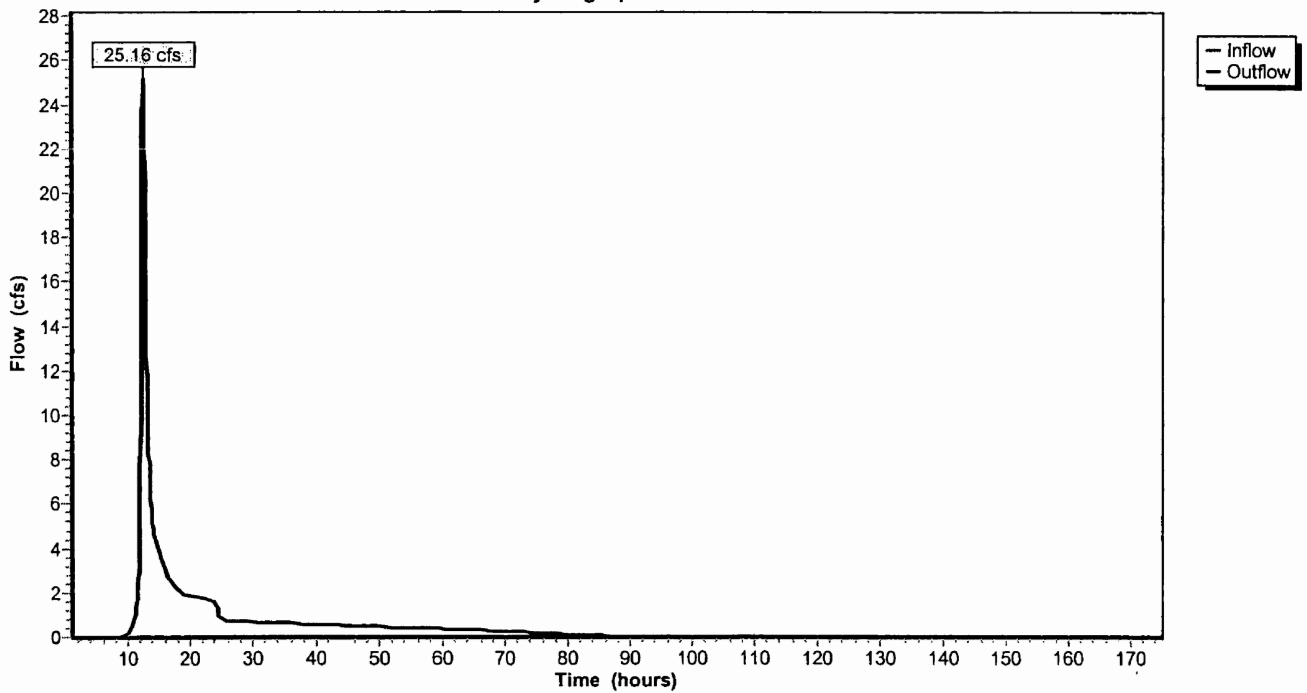
**Reach Design Point 3:**

Inflow Area = 49.900 ac, Inflow Depth = 1.56" for 2-year event  
Inflow = 25.16 cfs @ 12.57 hrs, Volume= 6.472 af  
Outflow = 25.16 cfs @ 12.57 hrs, Volume= 6.472 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs

**Reach Design Point 3:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 10-year Rainfall=5.00"

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## Subcatchment 1.1S:

Runoff = 93.46 cfs @ 12.27 hrs, Volume= 9.968 af, Depth= 3.47"

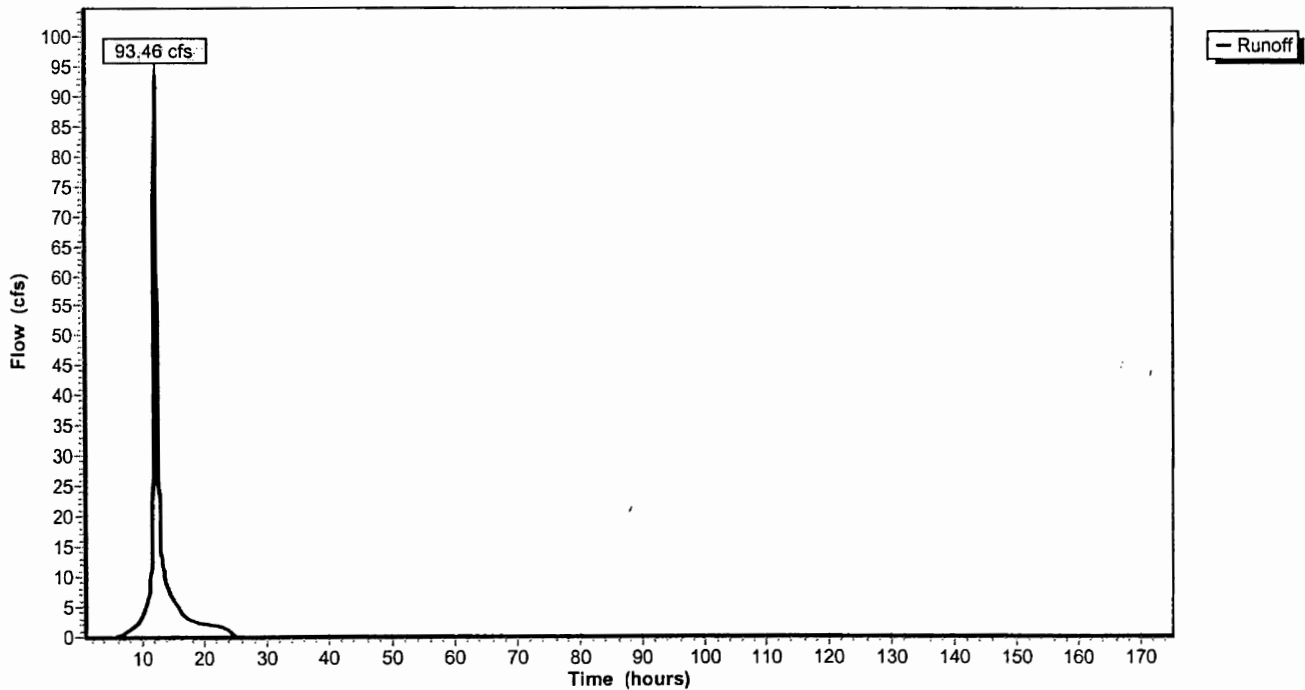
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-year Rainfall=5.00"

Area (ac)	CN	Description
26.000	90	Suburban Shopping Center
6.000	70	Woods, Good, HSG C
1.500	79	1 acre lots, 20% imp, HSG C
1.000	74	>75% Grass cover, Good, HSG C
34.500	86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

## Subcatchment 1.1S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 10-year Rainfall=5.00"

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## Subcatchment 1.2S:

Runoff = 2.76 cfs @ 12.08 hrs, Volume= 0.197 af, Depth= 2.36"

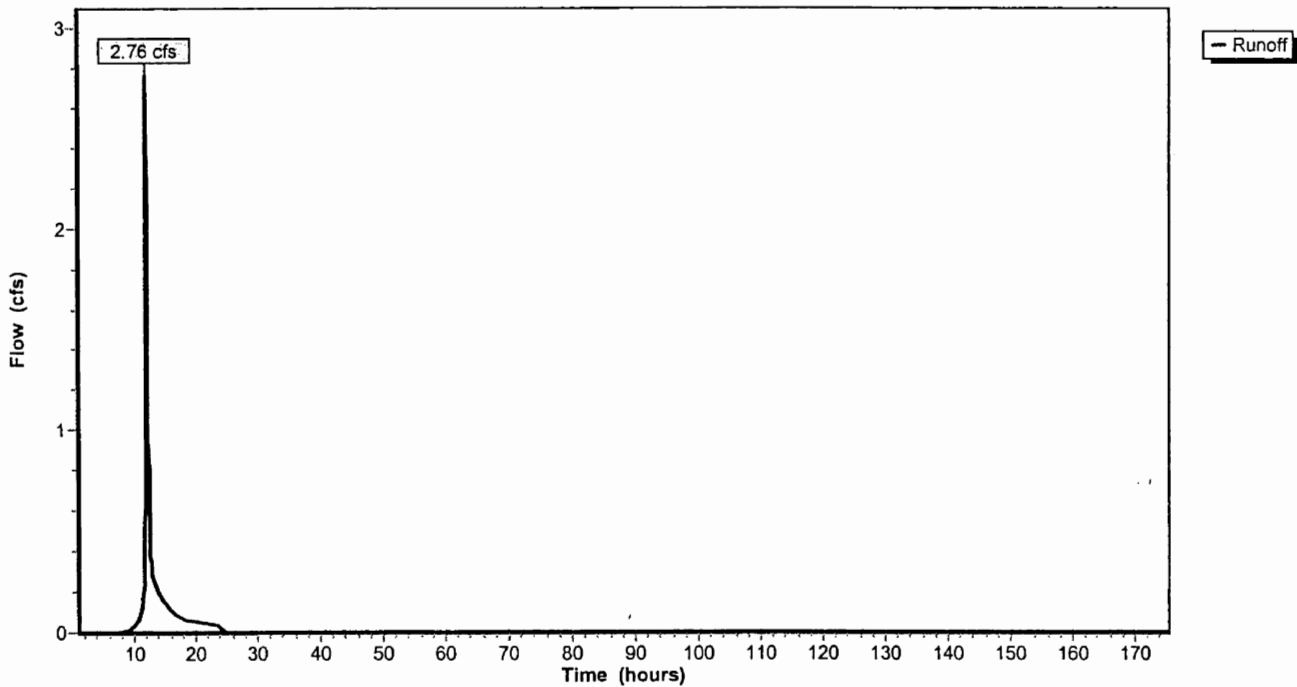
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-year Rainfall=5.00"

Area (ac)	CN	Description
1.000	74	>75% Grass cover, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

## Subcatchment 1.2S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 10-year Rainfall=5.00"

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## Subcatchment 1.3S:

Runoff = 31.41 cfs @ 12.27 hrs, Volume= 3.340 af, Depth= 3.37"

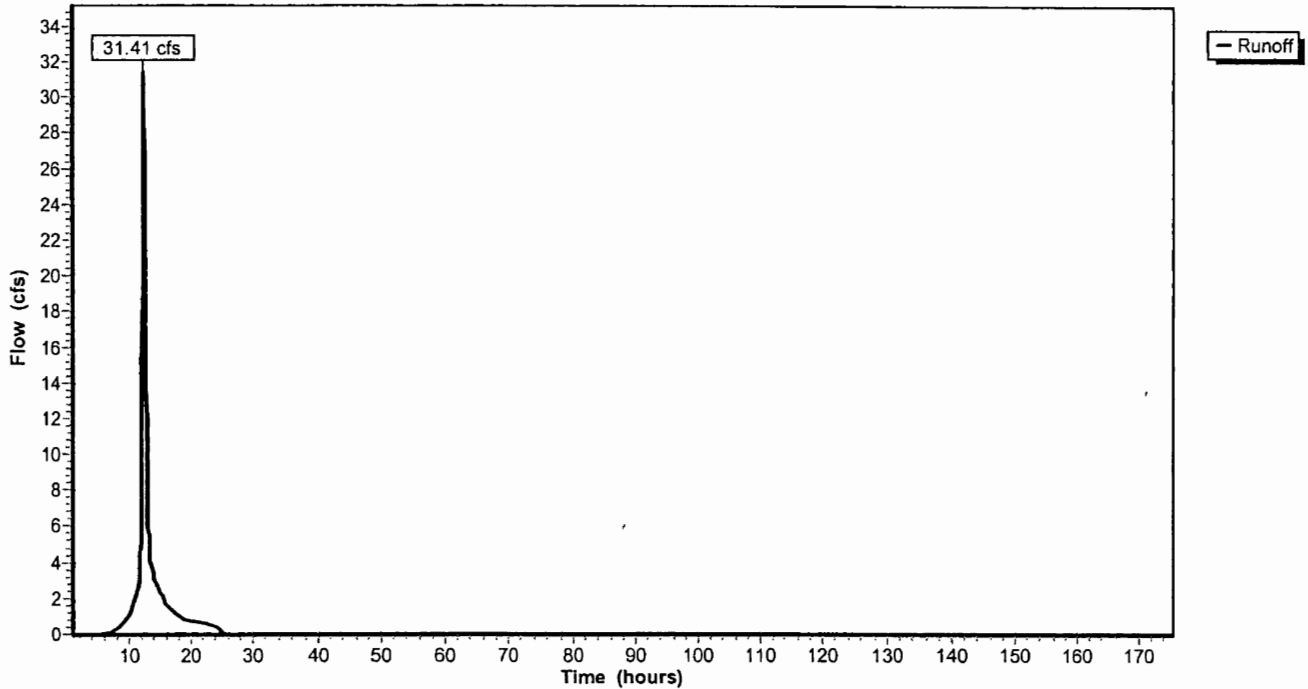
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-year Rainfall=5.00"

Area (ac)	CN	Description
7.400	90	Suburban Shopping Center
3.000	79	1 acre lots, 20% imp, HSG C
1.500	74	>75% Grass cover, Good, HSG C
11.900	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

## Subcatchment 1.3S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 10-year Rainfall=5.00"

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## Subcatchment 1.4S:

Runoff = 2.76 cfs @ 12.08 hrs, Volume= 0.197 af, Depth= 2.36"

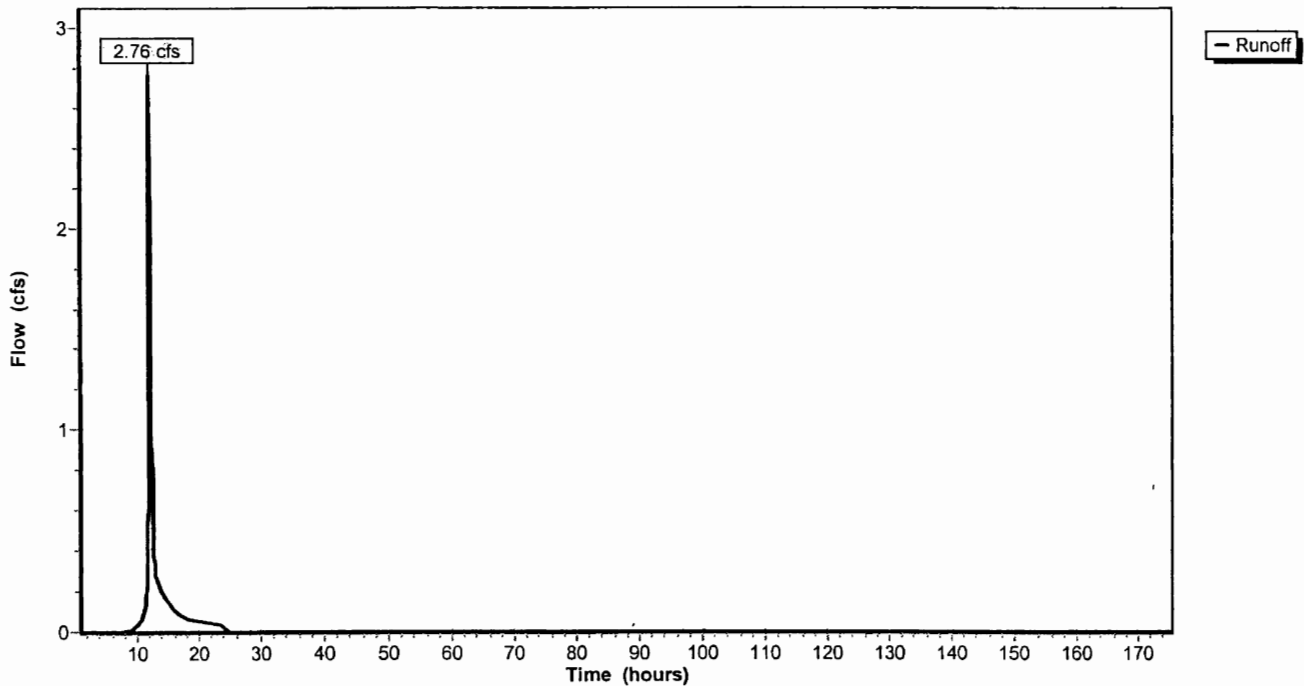
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-year Rainfall=5.00"

Area (ac)	CN	Description
1.000	74	>75% Grass cover, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

## Subcatchment 1.4S:

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 10-year Rainfall=5.00"

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**Pond 1.1P:**

Inflow Area = 34.500 ac, Inflow Depth = 3.47" for 10-year event  
 Inflow = 91.94 cfs @ 12.28 hrs, Volume= 9.968 af  
 Outflow = 65.85 cfs @ 12.49 hrs, Volume= 9.116 af, Atten= 28%, Lag= 12.5 min  
 Primary = 41.55 cfs @ 12.49 hrs, Volume= 8.370 af  
 Secondary = 24.29 cfs @ 12.49 hrs, Volume= 0.746 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Peak Elev= 782.44' @ 12.49 hrs Surf.Area= 44,710 sf Storage= 167,651 cf  
 Plug-Flow detention time= 849.0 min calculated for 9.116 af (91% of inflow)  
 Center-of-Mass det. time= 805.9 min ( 1,624.0 - 818.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	774.00'	239,800 cf	<b>Custom Stage Data (Prismatic)</b> listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
774.00	2,800	0	0
776.00	8,500	11,300	11,300
778.00	15,000	23,500	34,800
780.00	27,000	42,000	76,800
782.00	43,500	70,500	147,300
784.00	49,000	92,500	239,800

Device	Routing	Invert	Outlet Devices
#1	Primary	778.00'	<b>3.5" Vert. Orifice/Grate</b> C= 0.300
#2	Primary	781.10'	<b>8.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Secondary	782.00'	<b>28.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=41.42 cfs @ 12.49 hrs HW=782.44' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.33 cfs @ 5.0 fps)  
 ↓2=Broad-Crested Rectangular Weir (Weir Controls 41.09 cfs @ 3.8 fps)

**Secondary OutFlow** Max=23.92 cfs @ 12.49 hrs HW=782.44' (Free Discharge)  
 ↑3=Broad-Crested Rectangular Weir (Weir Controls 23.92 cfs @ 2.0 fps)

# Patterson Crossing Post Development

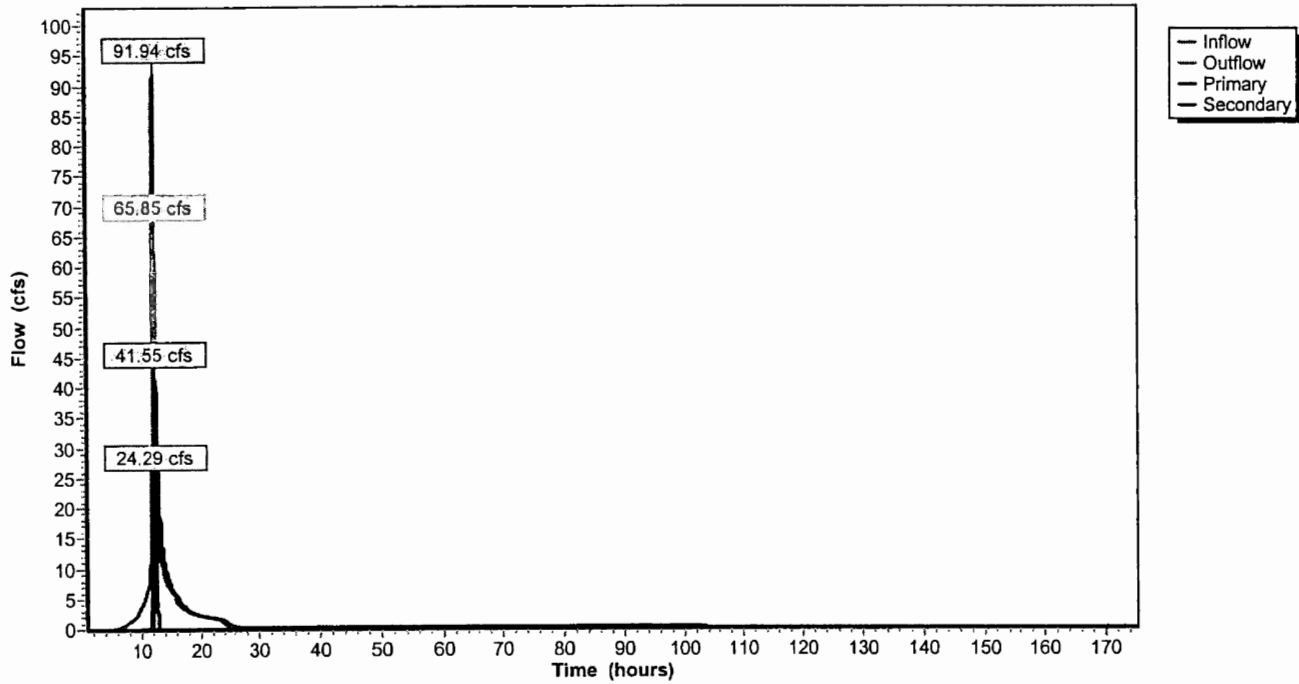
Type III 24-hr 10-year Rainfall=5.00"

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## Pond 1.1P:

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 10-year Rainfall=5.00"

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**Pond 1.2P:**

Inflow Area = 35.500 ac, Inflow Depth > 2.90" for 10-year event  
 Inflow = 42.24 cfs @ 12.48 hrs, Volume= 8.567 af  
 Outflow = 21.82 cfs @ 13.14 hrs, Volume= 8.566 af, Atten= 48%, Lag= 39.6 min  
 Primary = 0.46 cfs @ 13.14 hrs, Volume= 4.058 af  
 Secondary = 21.36 cfs @ 13.14 hrs, Volume= 4.508 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Peak Elev= 773.25' @ 13.14 hrs Surf.Area= 19,882 sf Storage= 89,865 cf  
 Plug-Flow detention time= 917.3 min calculated for 8.566 af (100% of inflow)  
 Center-of-Mass det. time= 916.1 min ( 2,597.7 - 1,681.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	766.00'	126,400 cf	<b>Custom Stage Data (Prismatic)</b> listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
766.00	3,800	0	0
768.00	8,700	12,500	12,500
770.00	13,100	21,800	34,300
772.00	18,000	31,100	65,400
774.00	21,000	39,000	104,400
775.00	23,000	22,000	126,400

Device	Routing	Invert	Outlet Devices
#1	Primary	765.00'	<b>3.5" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	772.50'	<b>10.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.46 cfs @ 13.14 hrs HW=773.25' (Free Discharge)↑**1=Orifice/Grate** (Orifice Controls 0.46 cfs @ 6.9 fps)**Secondary OutFlow** Max=21.27 cfs @ 13.14 hrs HW=773.25' (Free Discharge)↑**2=Broad-Crested Rectangular Weir** (Weir Controls 21.27 cfs @ 2.8 fps)

**Patterson Crossing Post Development**

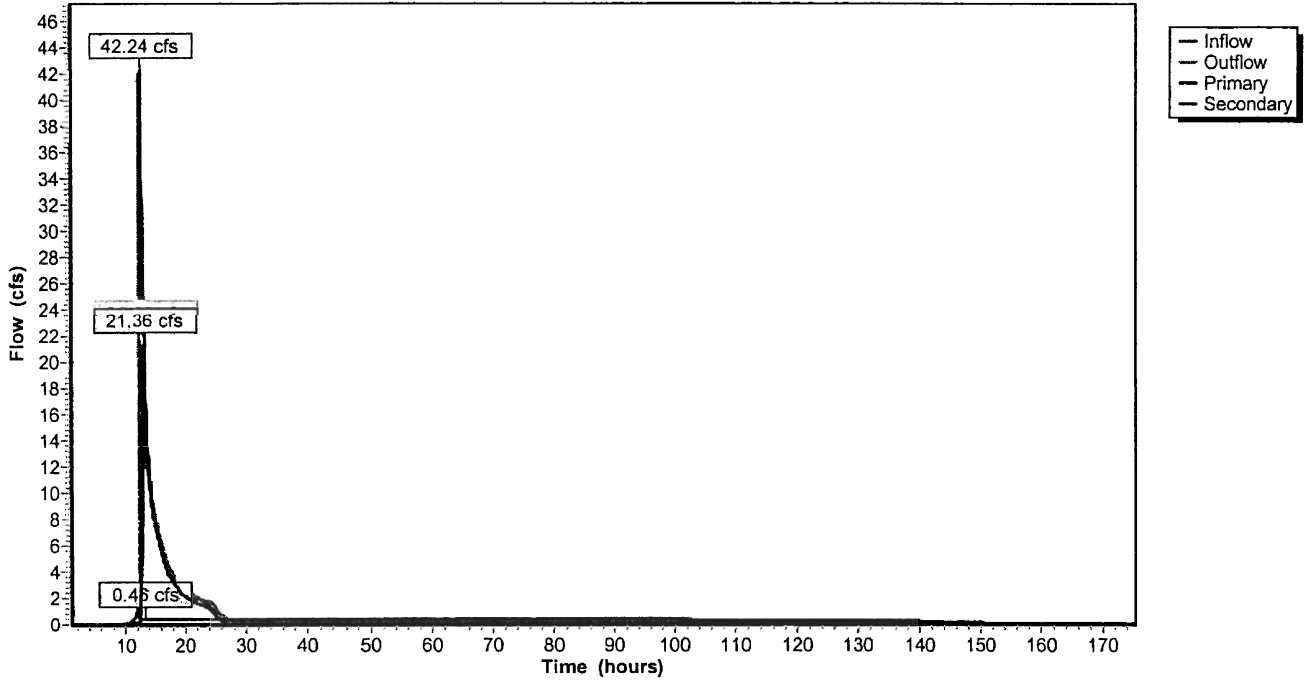
Type III 24-hr 10-year Rainfall=5.00"

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**Pond 1.2P:**

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**Patterson Crossing Post Development**

Type III 24-hr 10-year Rainfall=5.00"

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**Pond 1.3P:**

Inflow Area = 11.900 ac, Inflow Depth = 3.37" for 10-year event  
 Inflow = 31.66 cfs @ 12.27 hrs, Volume= 3.340 af  
 Outflow = 1.35 cfs @ 16.58 hrs, Volume= 3.324 af, Atten= 96%, Lag= 258.6 min  
 Primary = 0.39 cfs @ 16.58 hrs, Volume= 2.950 af  
 Secondary = 0.95 cfs @ 16.58 hrs, Volume= 0.374 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 764.00' Surf.Area= 3,200 sf Storage= 7,900 cf  
 Peak Elev= 770.12' @ 16.58 hrs Surf.Area= 26,784 sf Storage= 121,554 cf (113,654 cf above start)  
 Plug-Flow detention time= 2,950.6 min calculated for 3.142 af (94% of inflow)  
 Center-of-Mass det. time= 2,761.5 min ( 3,581.7 - 820.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	760.00'	176,100 cf	<b>Custom Stage Data (Prismatic)</b> listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
760.00	900	0	0
762.00	1,900	2,800	2,800
764.00	3,200	5,100	7,900
766.00	18,500	21,700	29,600
768.00	21,800	40,300	69,900
770.00	26,500	48,300	118,200
772.00	31,400	57,900	176,100

Device	Routing	Invert	Outlet Devices
#1	Primary	764.00'	<b>3.5" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	770.00'	<b>8.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.39 cfs @ 16.58 hrs HW=770.12' (Free Discharge)

↑**1=Orifice/Grate** (Orifice Controls 0.39 cfs @ 5.9 fps)

**Secondary OutFlow** Max=0.88 cfs @ 16.58 hrs HW=770.12' (Free Discharge)

↑**2=Broad-Crested Rectangular Weir** (Weir Controls 0.88 cfs @ 1.0 fps)

# Patterson Crossing Post Development

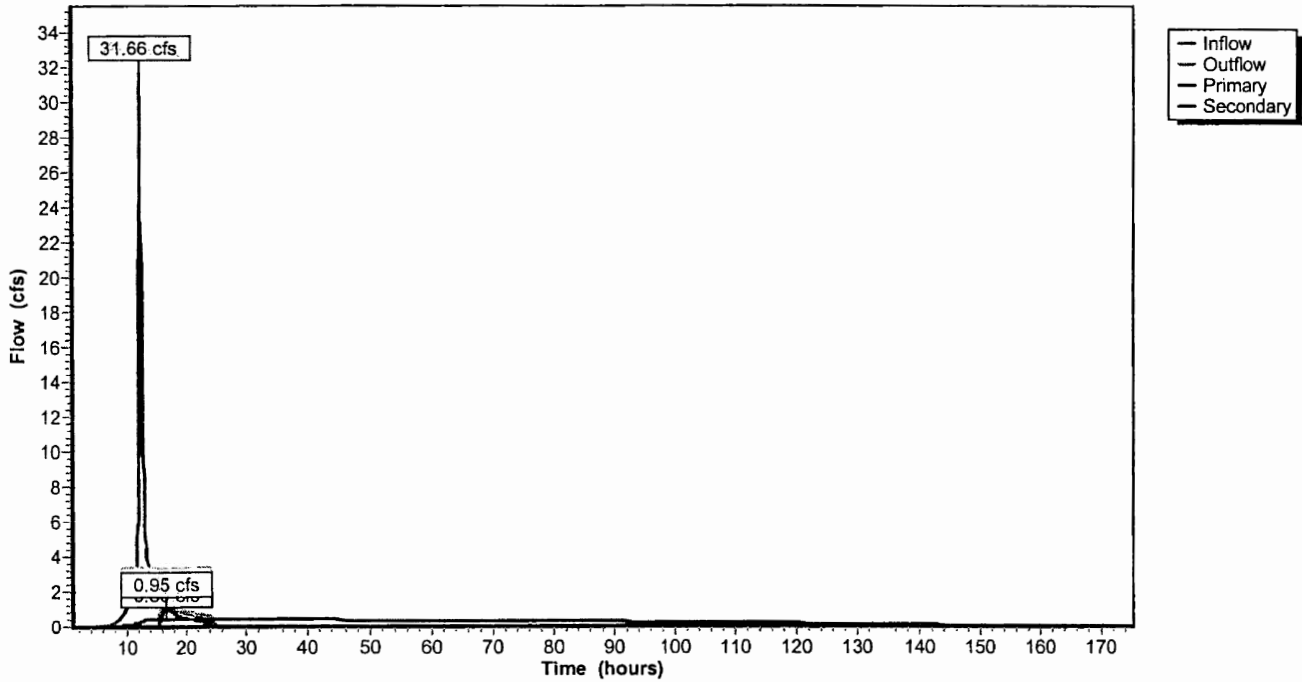
Type III 24-hr 10-year Rainfall=5.00"

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## Pond 1.3P:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 10-year Rainfall=5.00"

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## Pond 1.4P:

Inflow Area = 48.400 ac, Inflow Depth > 3.00" for 10-year event  
 Inflow = 22.44 cfs @ 13.14 hrs, Volume= 12.087 af  
 Outflow = 9.80 cfs @ 14.51 hrs, Volume= 11.653 af, Atten= 56%, Lag= 82.2 min  
 Primary = 0.58 cfs @ 14.51 hrs, Volume= 6.593 af  
 Secondary = 9.23 cfs @ 14.51 hrs, Volume= 5.060 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 760.00' Surf.Area= 30,000 sf Storage= 100,800 cf  
 Peak Elev= 762.34' @ 14.51 hrs Surf.Area= 36,400 sf Storage= 179,260 cf (78,460 cf above start)  
 Plug-Flow detention time= 2,633.4 min calculated for 9.336 af (77% of inflow)  
 Center-of-Mass det. time= 846.7 min ( 3,686.3 - 2,839.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	754.00'	242,600 cf	<b>Custom Stage Data (Prismatic)</b> listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
754.00	4,800	0	0
756.00	12,500	17,300	17,300
758.00	20,500	33,000	50,300
760.00	30,000	50,500	100,800
762.00	35,500	65,500	166,300
764.00	40,800	76,300	242,600

Device	Routing	Invert	Outlet Devices
#1	Primary	760.00'	<b>5.5" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	762.00'	<b>16.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.58 cfs @ 14.51 hrs HW=762.34' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 0.58 cfs @ 3.5 fps)

**Secondary OutFlow** Max=9.13 cfs @ 14.51 hrs HW=762.34' (Free Discharge)

↑ **2=Broad-Crested Rectangular Weir** (Weir Controls 9.13 cfs @ 1.7 fps)

**Patterson Crossing Post Development**

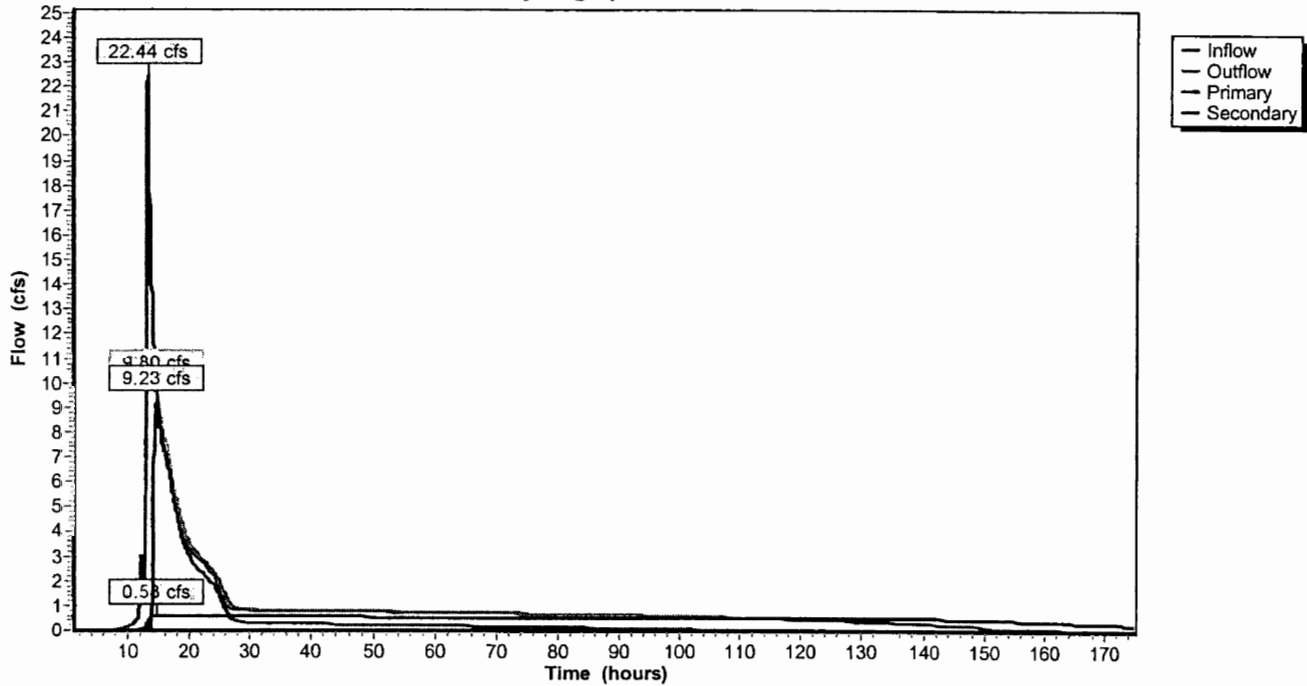
Type III 24-hr 10-year Rainfall=5.00"

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**Pond 1.4P:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 10-year Rainfall=5.00"

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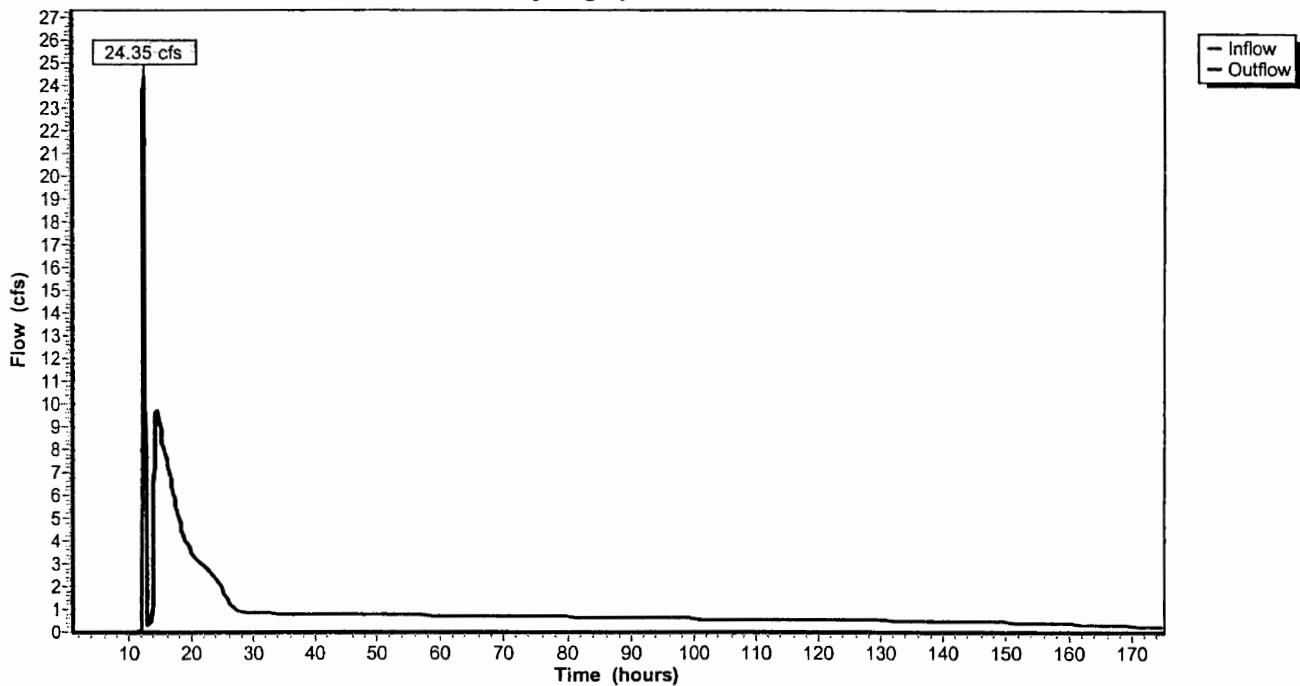
## Reach Design Line 1:

Inflow Area = 48.400 ac, Inflow Depth > 3.07" for 10-year event  
Inflow = 24.35 cfs @ 12.49 hrs, Volume= 12.399 af  
Outflow = 24.35 cfs @ 12.49 hrs, Volume= 12.399 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs

## Reach Design Line 1:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 10-year Rainfall=5.00"

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## Subcatchment 2.0S:

Runoff = 44.20 cfs @ 12.29 hrs, Volume= 4.762 af, Depth= 2.12"

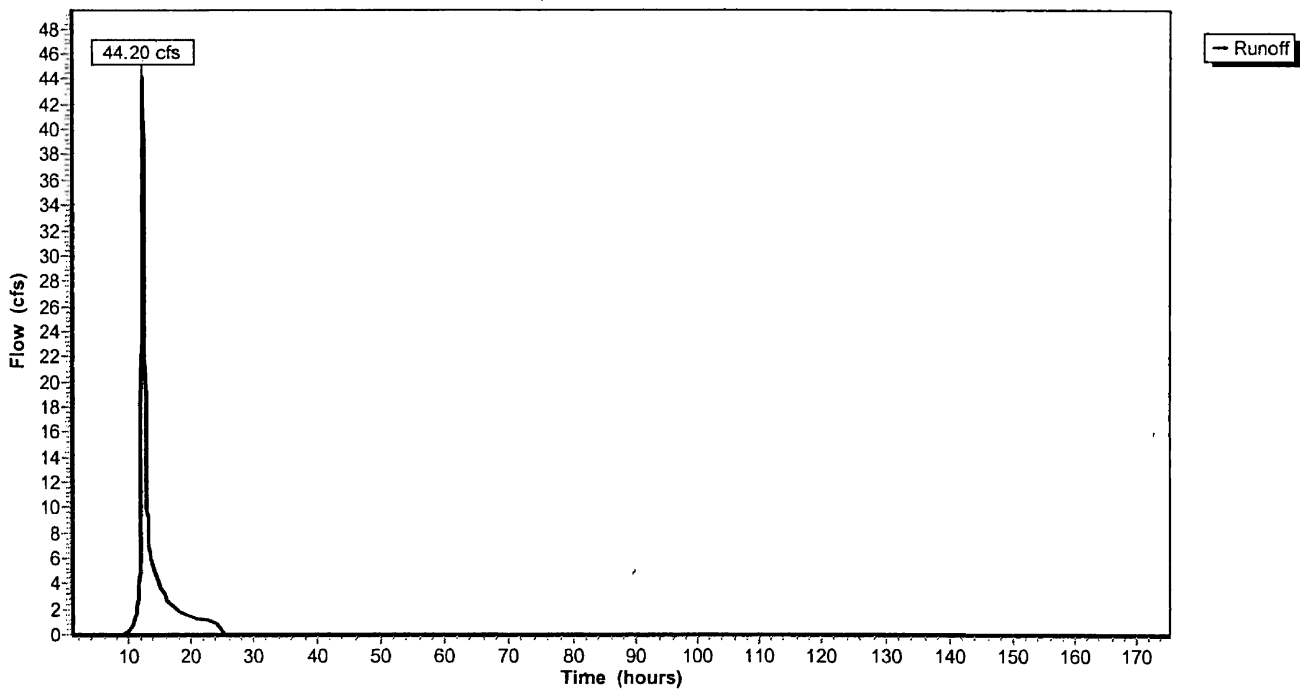
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-year Rainfall=5.00"

Area (ac)	CN	Description
17.500	70	Woods, Good, HSG C
9.500	74	>75% Grass cover, Good, HSG C
27.000	71	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

## Subcatchment 2.0S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 10-year Rainfall=5.00"

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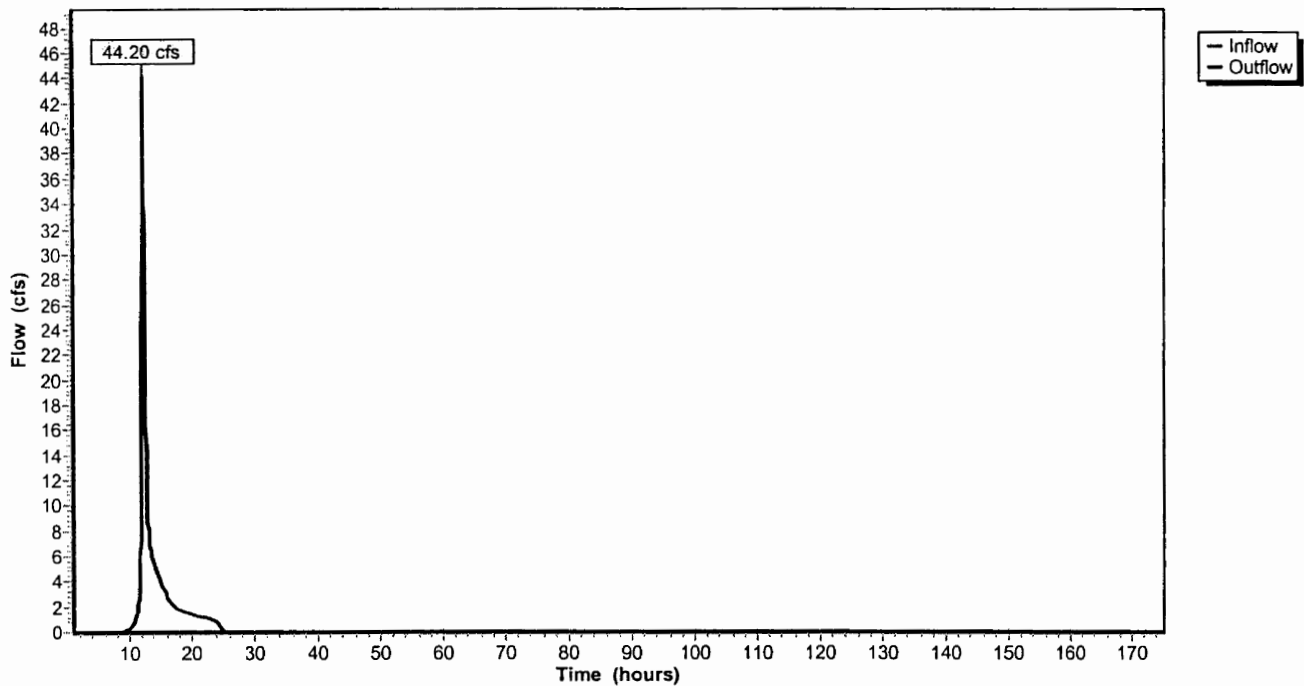
## Reach Design Point 2:

Inflow Area = 27.000 ac, Inflow Depth = 2.12" for 10-year event  
Inflow = 44.20 cfs @ 12.29 hrs, Volume= 4.762 af  
Outflow = 44.20 cfs @ 12.29 hrs, Volume= 4.762 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs

## Reach Design Point 2:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 10-year Rainfall=5.00"

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## Subcatchment 3.1S:

Runoff = 22.38 cfs @ 12.21 hrs, Volume= 2.116 af, Depth= 3.17"

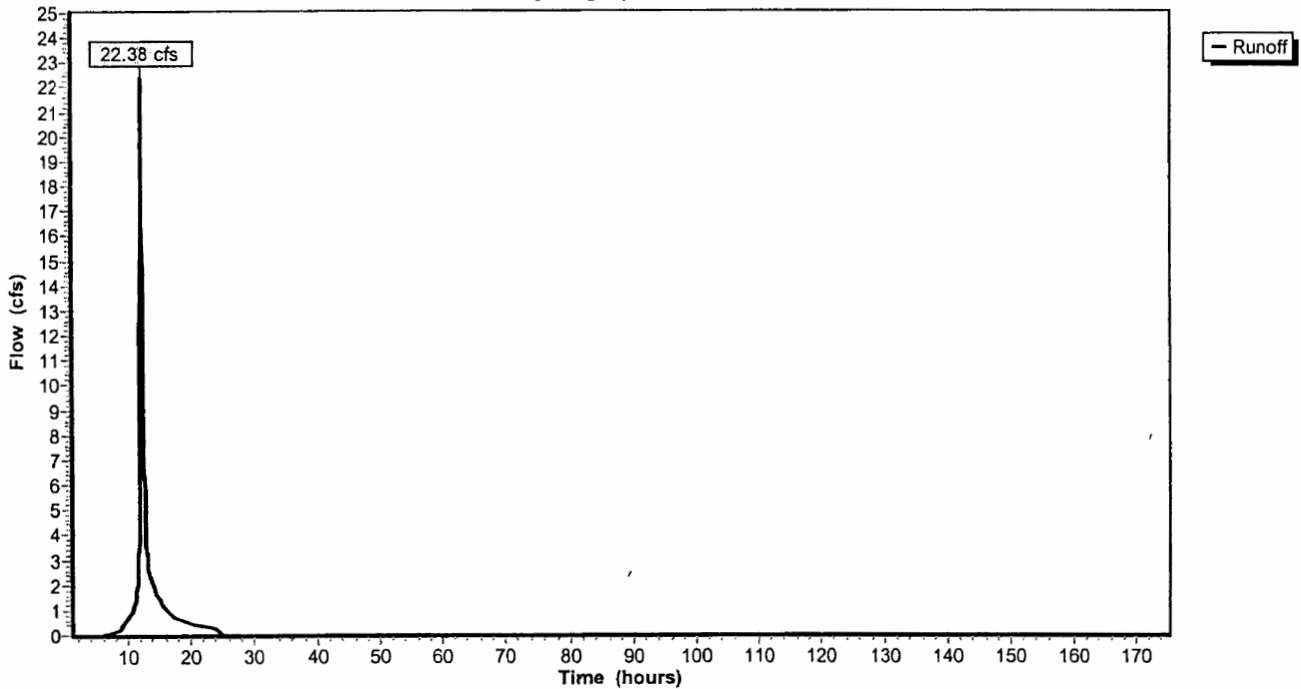
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-year Rainfall=5.00"

Area (ac)	CN	Description
5.000	90	Suburban Shopping Center
3.000	70	Woods, Good, HSG C
8.000	83	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry,

## Subcatchment 3.1S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 10-year Rainfall=5.00"

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## Subcatchment 3.2S:

Runoff = 17.51 cfs @ 12.28 hrs, Volume= 1.859 af, Depth= 2.54"

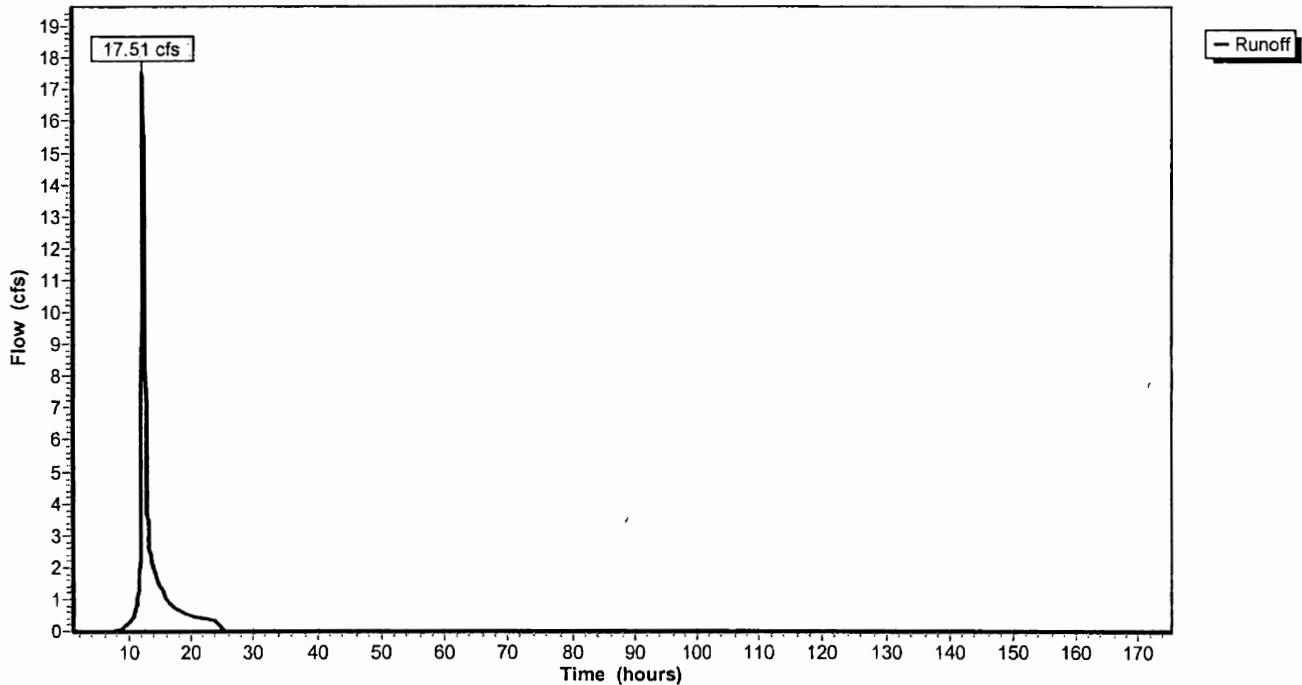
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-year Rainfall=5.00"

Area (ac)	CN	Description
3.100	74	>75% Grass cover, Good, HSG C
3.900	70	Woods, Good, HSG C
1.800	90	Suburban Shopping Center
8.800	76	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

## Subcatchment 3.2S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 10-year Rainfall=5.00"

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## Subcatchment 3.3S:

Runoff = 2.80 cfs @ 12.14 hrs, Volume= 0.231 af, Depth= 3.08"

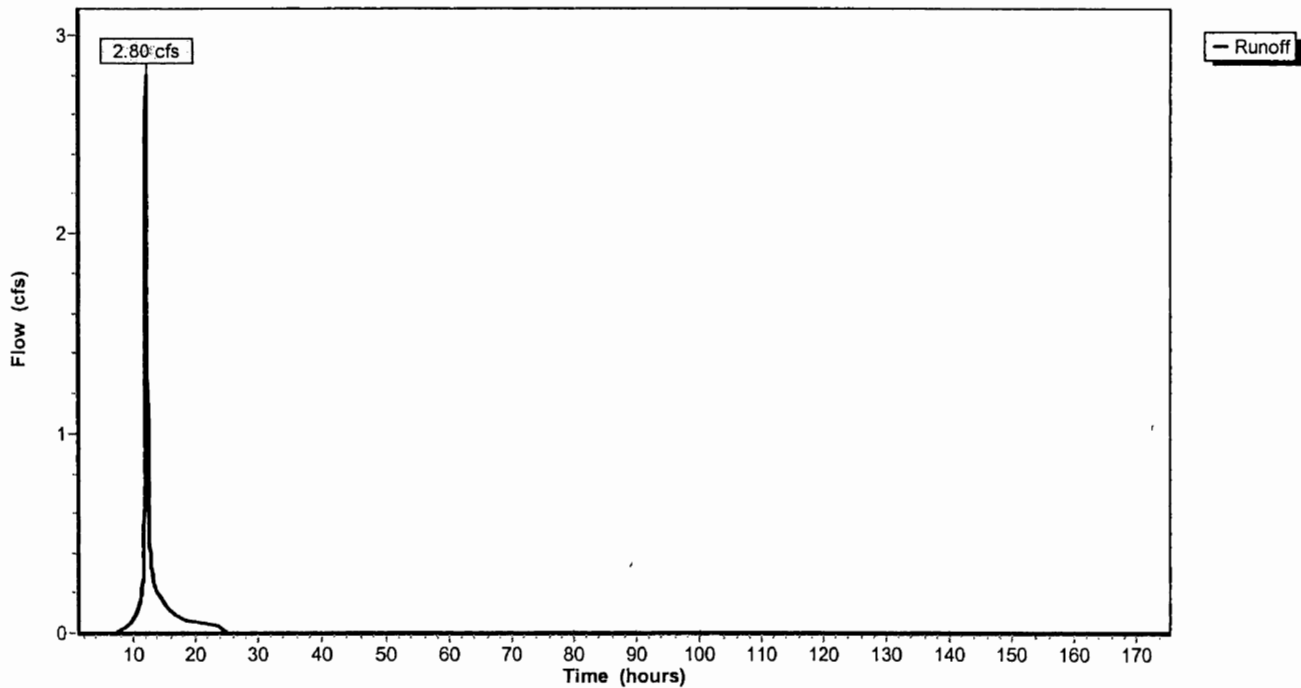
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-year Rainfall=5.00"

Area (ac)	CN	Description
0.300	98	Paved parking & roofs
0.600	74	>75% Grass cover, Good, HSG C
0.900	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

## Subcatchment 3.3S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 10-year Rainfall=5.00"

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## Subcatchment 3.4S:

Runoff = 8.36 cfs @ 12.28 hrs, Volume= 0.887 af, Depth= 2.54"

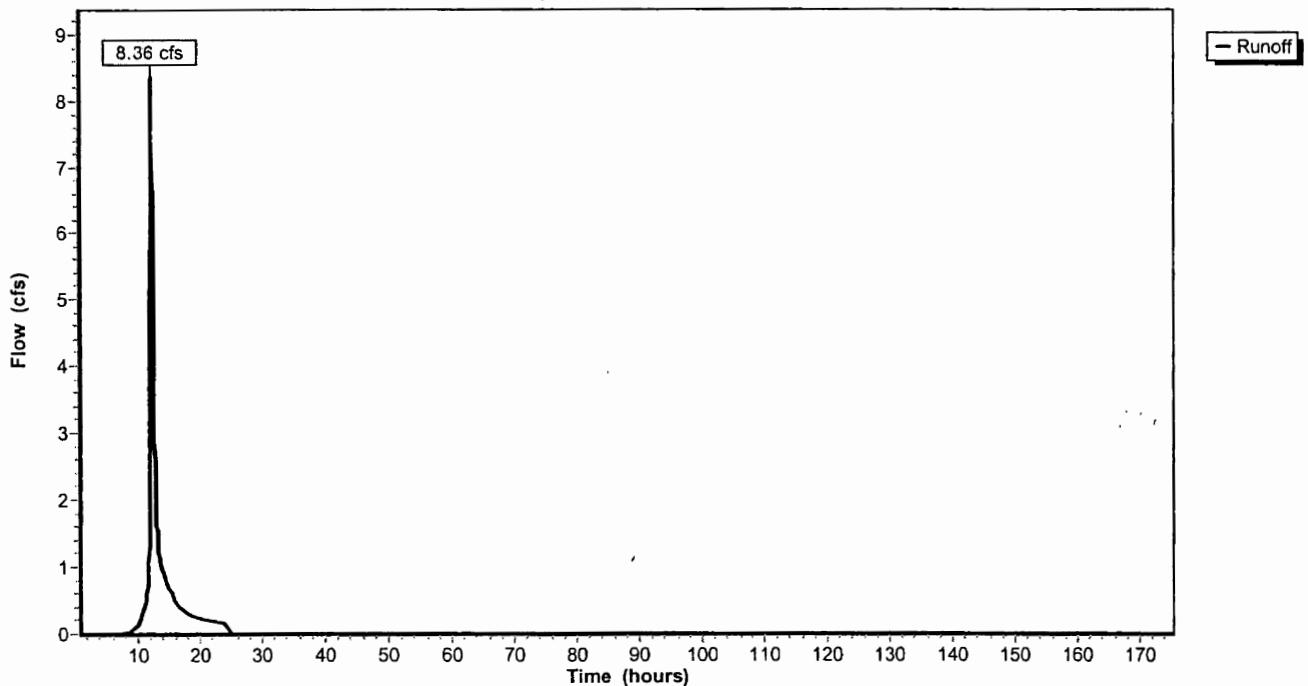
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-year Rainfall=5.00"

Area (ac)	CN	Description
2.800	79	1 acre lots, 20% imp, HSG C
1.400	70	Woods, Good, HSG C
4.200	76	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

## Subcatchment 3.4S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 10-year Rainfall=5.00"

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## Subcatchment 3.5S:

Runoff = 1.42 cfs @ 12.15 hrs, Volume= 0.119 af, Depth= 2.04"

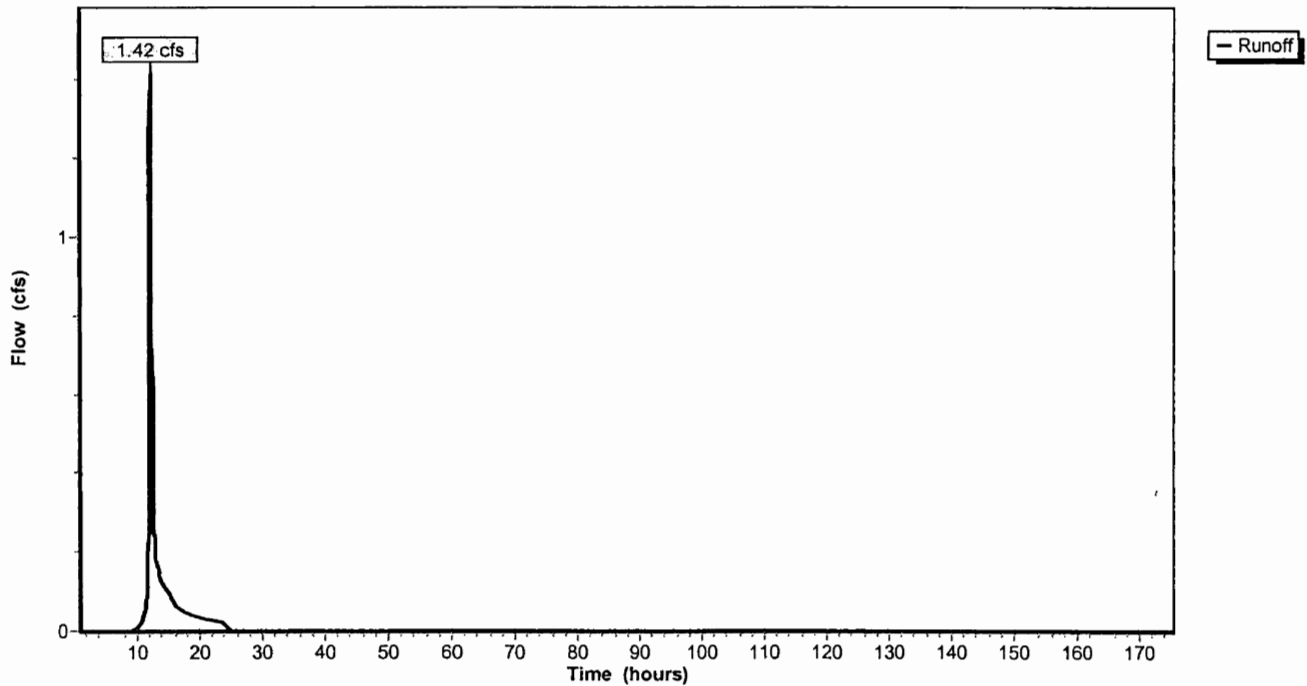
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-year Rainfall=5.00"

Area (ac)	CN	Description
0.700	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

## Subcatchment 3.5S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 10-year Rainfall=5.00"

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## Subcatchment 3.6S:

Runoff = 44.11 cfs @ 12.56 hrs, Volume= 6.374 af, Depth= 2.80"

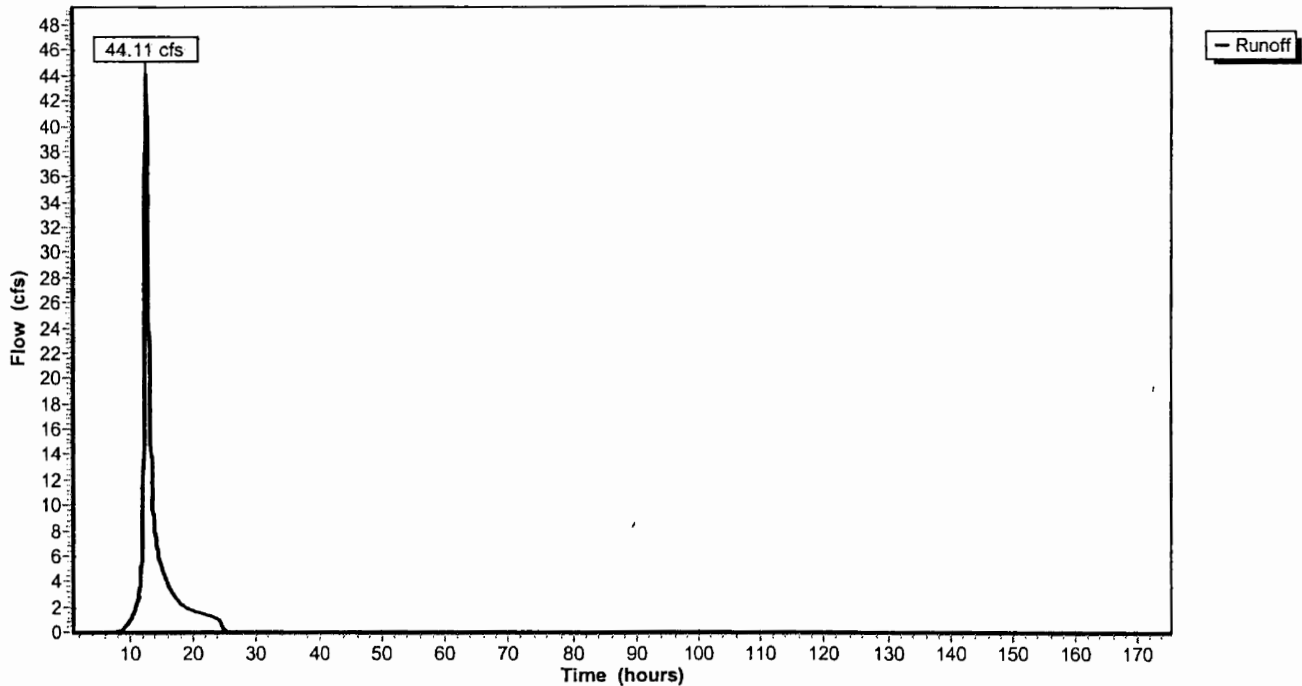
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-year Rainfall=5.00"

Area (ac)	CN	Description
9.300	70	Woods, Good, HSG C
6.700	98	Paved parking & roofs
11.300	74	>75% Grass cover, Good, HSG C
27.300	79	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.0					Direct Entry,

## Subcatchment 3.6S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 10-year Rainfall=5.00"

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## Pond 3.1P:

Inflow Area = 8.000 ac, Inflow Depth = 3.17" for 10-year event  
 Inflow = 22.38 cfs @ 12.21 hrs, Volume= 2.116 af  
 Outflow = 2.18 cfs @ 13.67 hrs, Volume= 2.116 af, Atten= 90%, Lag= 87.6 min  
 Primary = 0.47 cfs @ 13.67 hrs, Volume= 1.567 af  
 Secondary = 1.70 cfs @ 13.67 hrs, Volume= 0.549 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 718.00' Surf.Area= 7,000 sf Storage= 9,900 cf  
 Peak Elev= 722.38' @ 13.67 hrs Surf.Area= 18,245 sf Storage= 64,745 cf (54,845 cf above start)  
 Plug-Flow detention time= 1,162.4 min calculated for 1.888 af (89% of inflow)  
 Center-of-Mass det. time= 988.4 min ( 1,810.2 - 821.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	714.00'	110,300 cf	<b>Custom Stage Data (Prismatic)</b> Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
714.00	400	0	0
716.00	1,250	1,650	1,650
718.00	7,000	8,250	9,900
720.00	11,600	18,600	28,500
722.00	16,900	28,500	57,000
724.00	24,000	40,900	97,900
724.50	25,600	12,400	110,300

Device	Routing	Invert	Outlet Devices
#1	Primary	718.00'	<b>4.2" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	722.00'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.47 cfs @ 13.67 hrs HW=722.38' (Free Discharge)

↑**1=Orifice/Grate** (Orifice Controls 0.47 cfs @ 4.9 fps)

**Secondary OutFlow** Max=1.69 cfs @ 13.67 hrs HW=722.38' (Free Discharge)

↑**2=Broad-Crested Rectangular Weir** (Weir Controls 1.69 cfs @ 1.8 fps)

**Patterson Crossing Post Development**

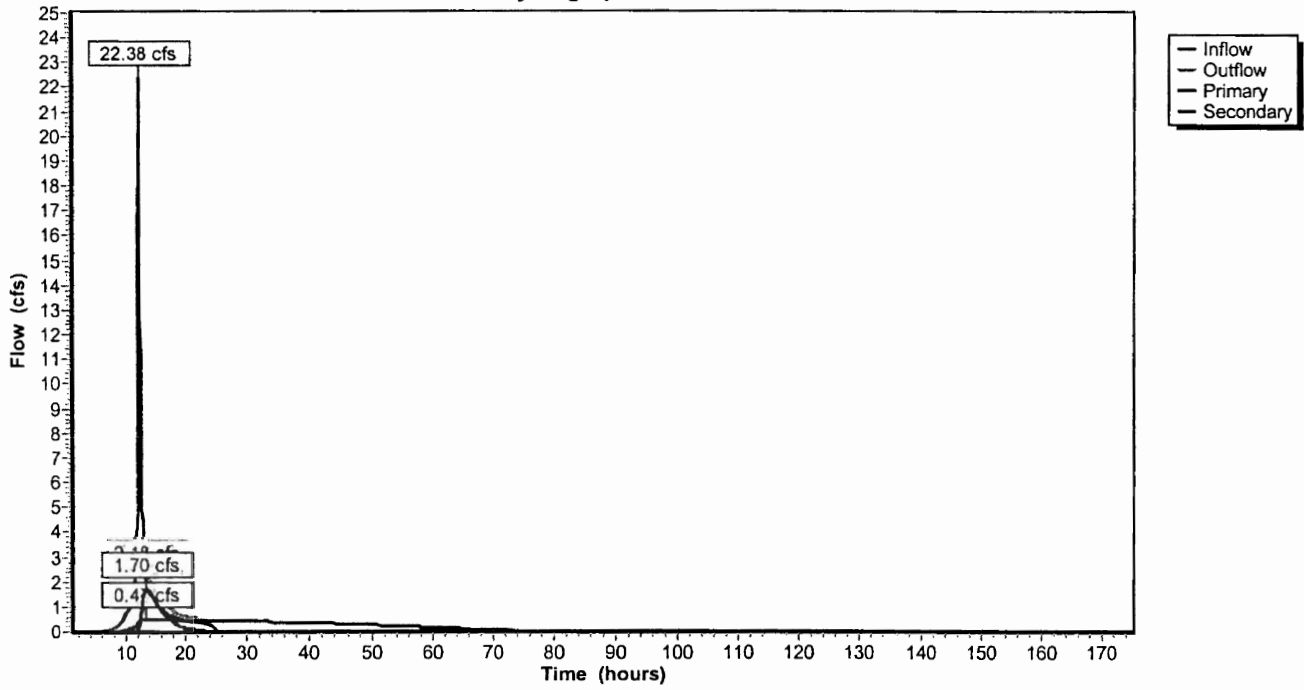
Type III 24-hr 10-year Rainfall=5.00"

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**Pond 3.1P:**

Hydrograph



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Type III 24-hr 10-year Rainfall=5.00"

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## Pond 3.2P:

Inflow Area = 16.800 ac, Inflow Depth = 2.84" for 10-year event  
 Inflow = 17.91 cfs @ 12.28 hrs, Volume= 3.975 af  
 Outflow = 5.07 cfs @ 13.12 hrs, Volume= 3.974 af, Atten= 72%, Lag= 50.3 min  
 Primary = 0.49 cfs @ 13.12 hrs, Volume= 2.478 af  
 Secondary = 4.58 cfs @ 13.12 hrs, Volume= 1.496 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 664.00' Surf.Area= 3,900 sf Storage= 9,500 cf  
 Peak Elev= 668.29' @ 13.12 hrs Surf.Area= 15,089 sf Storage= 53,558 cf (44,058 cf above start)  
 Plug-Flow detention time= 933.0 min calculated for 3.755 af (94% of inflow)  
 Center-of-Mass det. time= 706.8 min ( 2,065.7 - 1,358.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	660.00'	81,700 cf	<b>Custom Stage Data (Prismatic)</b> , listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
660.00	800	0	0
662.00	2,400	3,200	3,200
664.00	3,900	6,300	9,500
666.00	10,400	14,300	23,800
668.00	14,500	24,900	48,700
670.00	18,500	33,000	81,700

Device	Routing	Invert	Outlet Devices
#1	Primary	664.00'	<b>4.3" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	668.00'	<b>10.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.49 cfs @ 13.12 hrs HW=668.29' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.49 cfs @ 4.9 fps)

**Secondary OutFlow** Max=4.56 cfs @ 13.12 hrs HW=668.29' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 4.56 cfs @ 1.5 fps)

**Patterson Crossing Post Development**

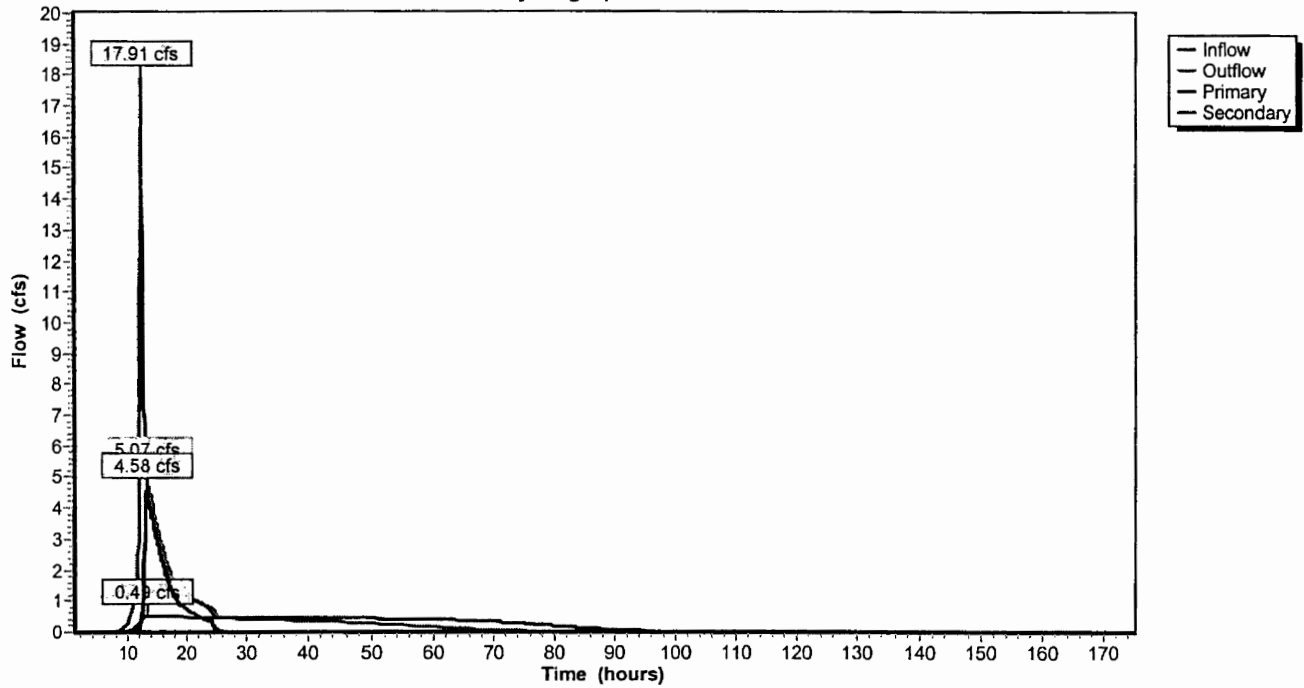
Type III 24-hr 10-year Rainfall=5.00"

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**Pond 3.2P:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 10-year Rainfall=5.00"

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## Pond 3.3P:

Inflow Area = 0.900 ac, Inflow Depth = 3.08" for 10-year event  
 Inflow = 2.80 cfs @ 12.14 hrs, Volume= 0.231 af  
 Outflow = 0.40 cfs @ 12.82 hrs, Volume= 0.231 af, Atten= 86%, Lag= 40.6 min  
 Primary = 0.05 cfs @ 12.82 hrs, Volume= 0.168 af  
 Secondary = 0.35 cfs @ 12.82 hrs, Volume= 0.063 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 662.00' Surf.Area= 1,100 sf Storage= 2,120 cf  
 Peak Elev= 664.63' @ 12.82 hrs Surf.Area= 3,019 sf Storage= 7,570 cf (5,450 cf above start)  
 Plug-Flow detention time= 1,165.9 min calculated for 0.182 af (79% of inflow)  
 Center-of-Mass det. time= 849.4 min ( 1,669.4 - 820.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	658.00'	12,420 cf	<b>Custom Stage Data (Prismatic)</b> Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
658.00	20	0	0
660.00	500	520	520
662.00	1,100	1,600	2,120
664.00	2,100	3,200	5,320
666.00	5,000	7,100	12,420

Device	Routing	Invert	Outlet Devices
#1	Primary	662.00'	<b>1.6" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	664.50'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.05 cfs @ 12.82 hrs HW=664.63' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.05 cfs @ 3.9 fps)

**Secondary OutFlow** Max=0.34 cfs @ 12.82 hrs HW=664.63' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 0.34 cfs @ 1.0 fps)

**Patterson Crossing Post Development**

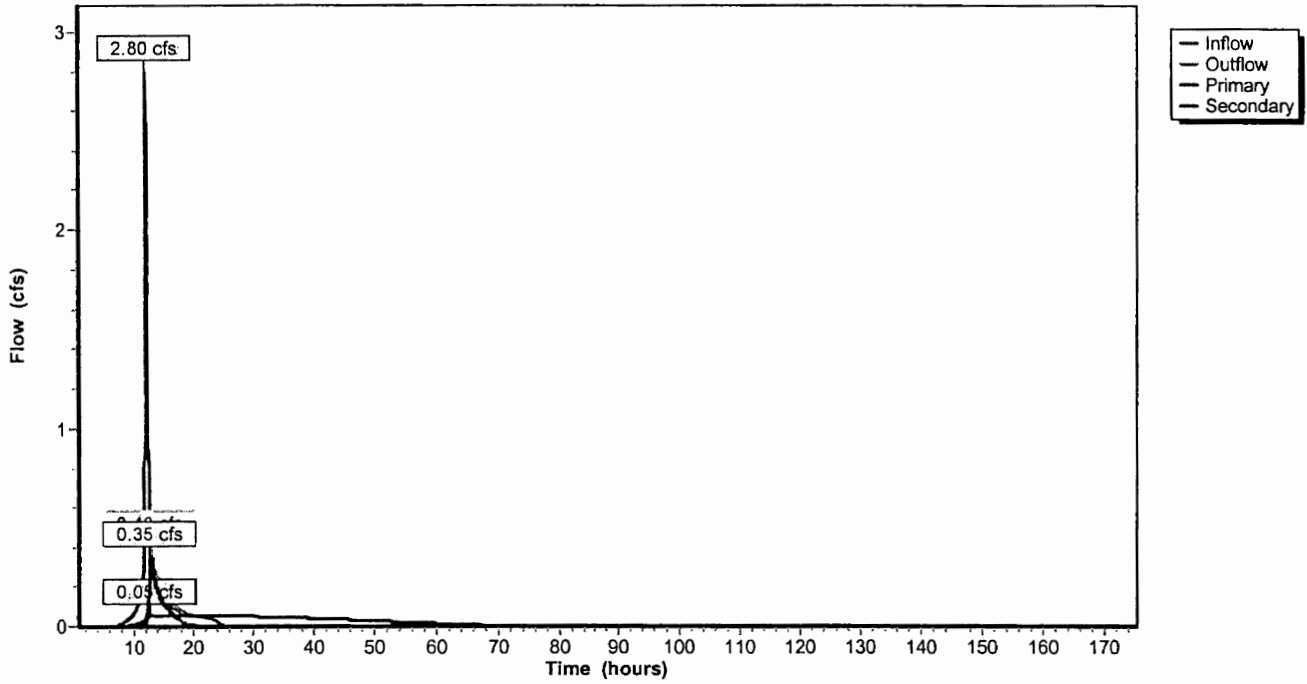
Type III 24-hr 10-year Rainfall=5.00"

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**Pond 3.3P:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 10-year Rainfall=5.00"

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## Pond 3.4P:

Inflow Area = 4.200 ac, Inflow Depth = 2.54" for 10-year event  
Inflow = 8.36 cfs @ 12.28 hrs, Volume= 0.887 af  
Outflow = 1.20 cfs @ 13.34 hrs, Volume= 0.887 af, Atten= 86%, Lag= 63.6 min  
Primary = 0.28 cfs @ 13.34 hrs, Volume= 0.714 af  
Secondary = 0.92 cfs @ 13.34 hrs, Volume= 0.173 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Starting Elev= 756.00' Surf.Area= 6,000 sf Storage= 13,800 cf  
Peak Elev= 758.60' @ 13.34 hrs Surf.Area= 9,898 sf Storage= 35,085 cf (21,285 cf above start)  
Plug-Flow detention time= 1,330.5 min calculated for 0.571 af (64% of inflow)  
Center-of-Mass det. time= 803.0 min ( 1,648.3 - 845.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	752.00'	49,800 cf	<b>Custom Stage Data (Prismatic)</b> Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
752.00	800	0	0
754.00	3,500	4,300	4,300
756.00	6,000	9,500	13,800
758.00	9,000	15,000	28,800
760.00	12,000	21,000	49,800

Device	Routing	Invert	Outlet Devices
#1	Primary	756.00'	<b>3.7" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	758.50'	<b>10.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.28 cfs @ 13.34 hrs HW=758.60' (Free Discharge)  
↑1=Orifice/Grate (Orifice Controls 0.28 cfs @ 3.8 fps)

**Secondary OutFlow** Max=0.87 cfs @ 13.34 hrs HW=758.60' (Free Discharge)  
↑2=Broad-Crested Rectangular Weir (Weir Controls 0.87 cfs @ 0.9 fps)

**Patterson Crossing Post Development**

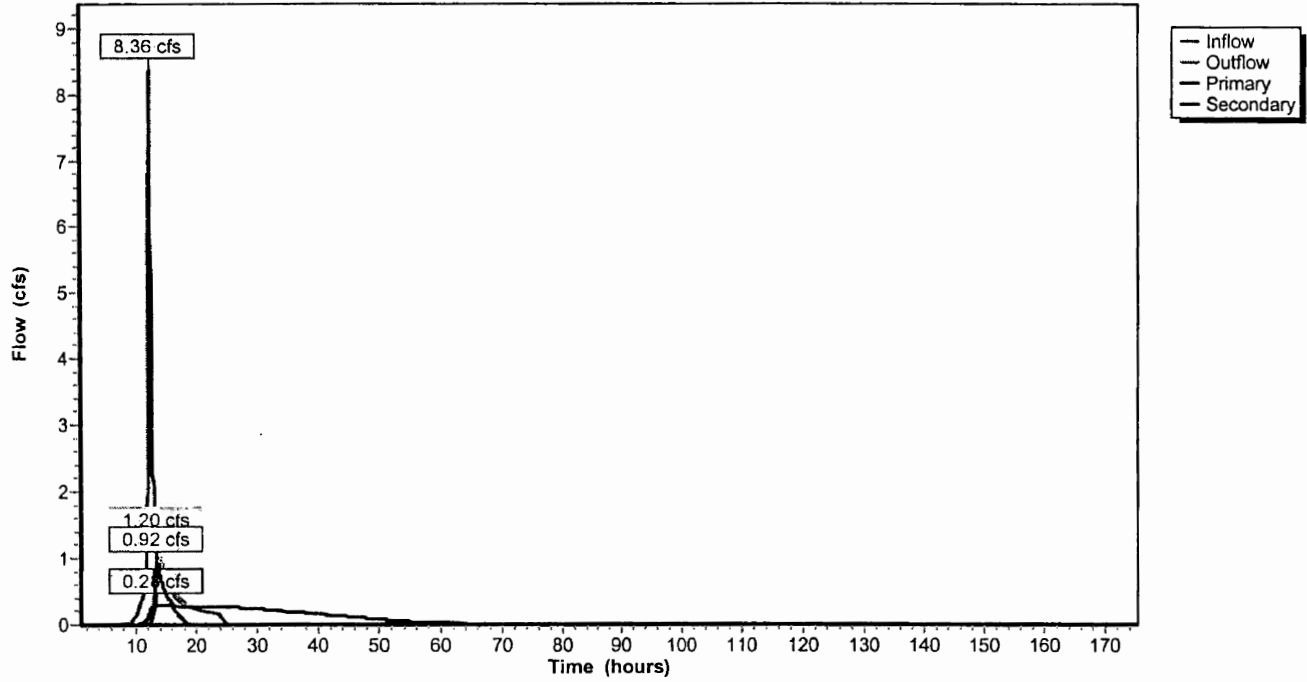
Type III 24-hr 10-year Rainfall=5.00"

Prepared by Insite Engineering, Surveying & Landscape Architecture,P.C>

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**Pond 3.4P:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 10-year Rainfall=5.00"

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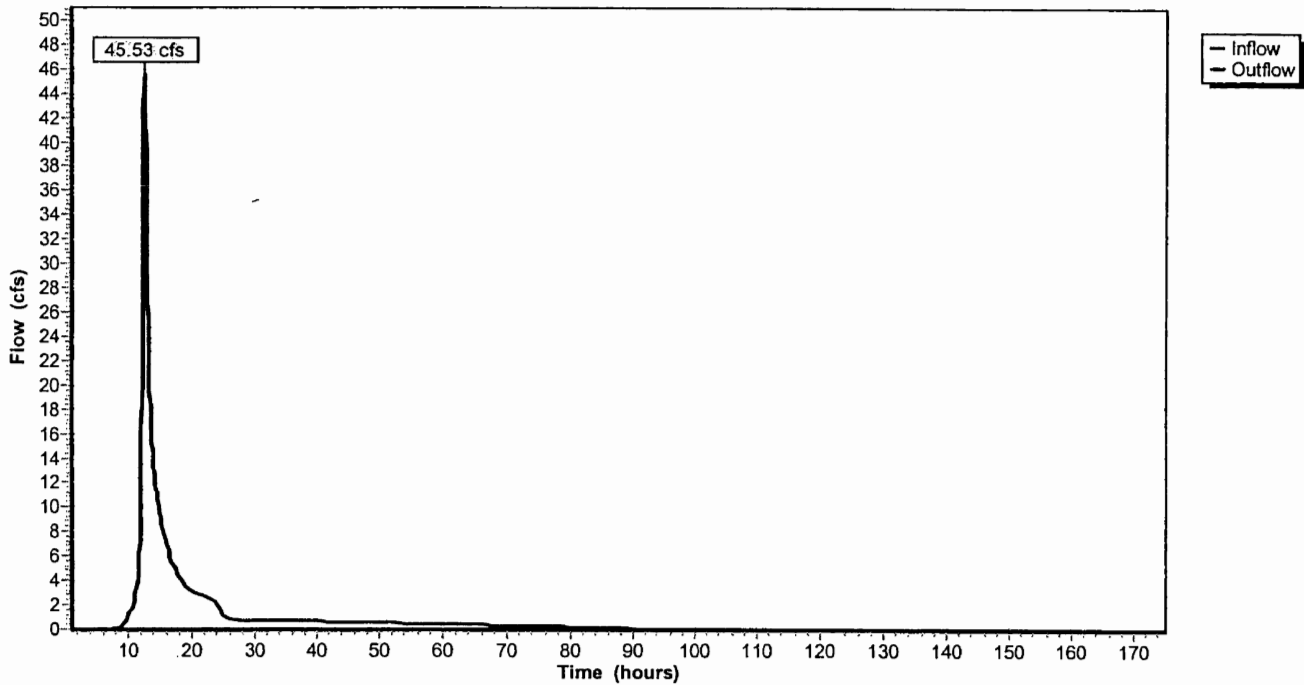
## Reach Design Point 3:

Inflow Area = 49.900 ac, Inflow Depth = 2.79" for 10-year event  
Inflow = 45.53 cfs @ 12.56 hrs, Volume= 11.585 af  
Outflow = 45.53 cfs @ 12.56 hrs, Volume= 11.585 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs

## Reach Design Point 3:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 25-year Rainfall=6.00"

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## Subcatchment 1.1S:

Runoff = 117.87 cfs @ 12.27 hrs, Volume= 12.677 af, Depth= 4.41"

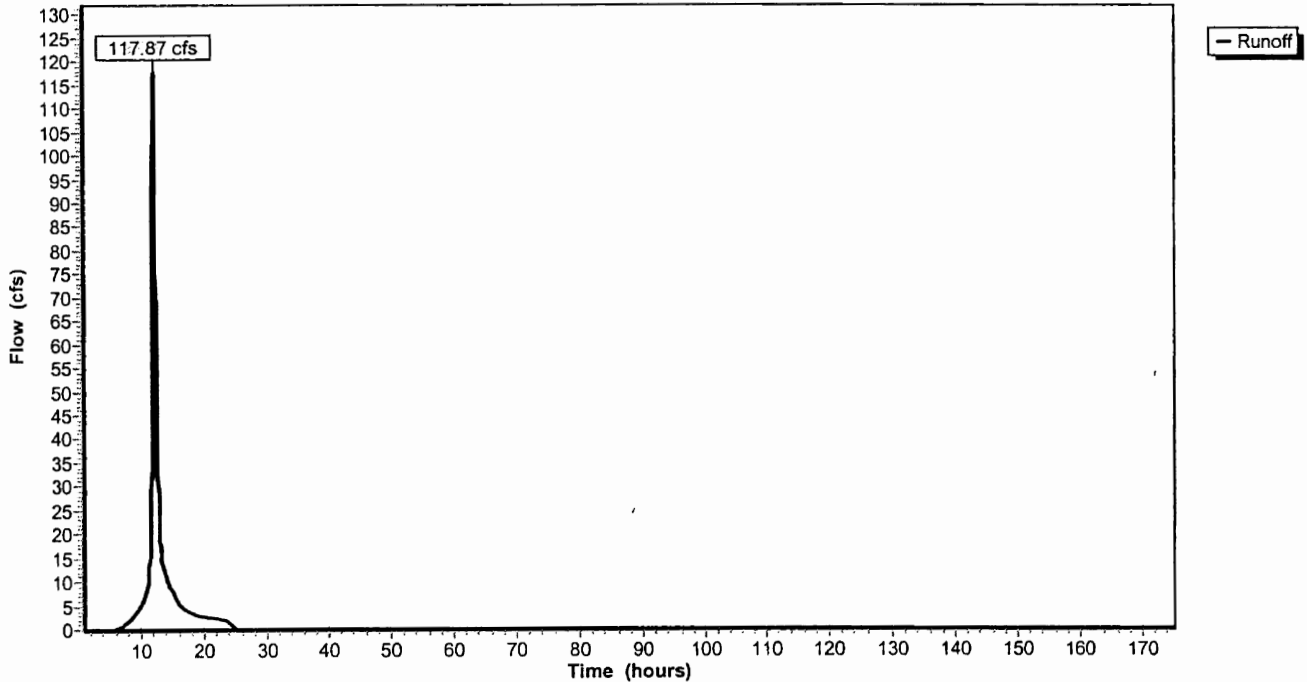
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-year Rainfall=6.00"

Area (ac)	CN	Description
26.000	90	Suburban Shopping Center
6.000	70	Woods, Good, HSG C
1.500	79	1 acre lots, 20% imp, HSG C
1.000	74	>75% Grass cover, Good, HSG C
34.500	86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

## Subcatchment 1.1S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 25-year Rainfall=6.00"

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## Subcatchment 1.2S:

Runoff = 3.74 cfs @ 12.08 hrs, Volume= 0.265 af, Depth= 3.18"

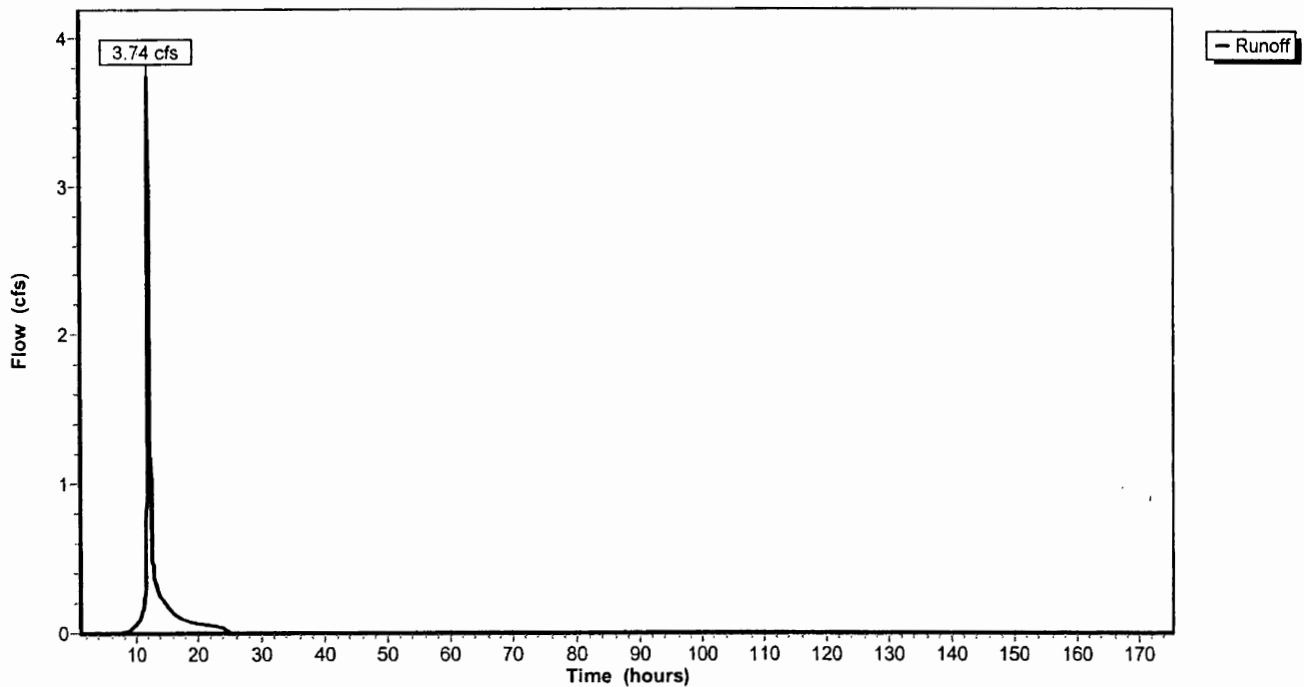
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-year Rainfall=6.00"

Area (ac)	CN	Description
1.000	74	>75% Grass cover, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

## Subcatchment 1.2S:

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 25-year Rainfall=6.00"

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**Subcatchment 1.3S:**

Runoff = 39.83 cfs @ 12.27 hrs, Volume= 4.267 af, Depth= 4.30"

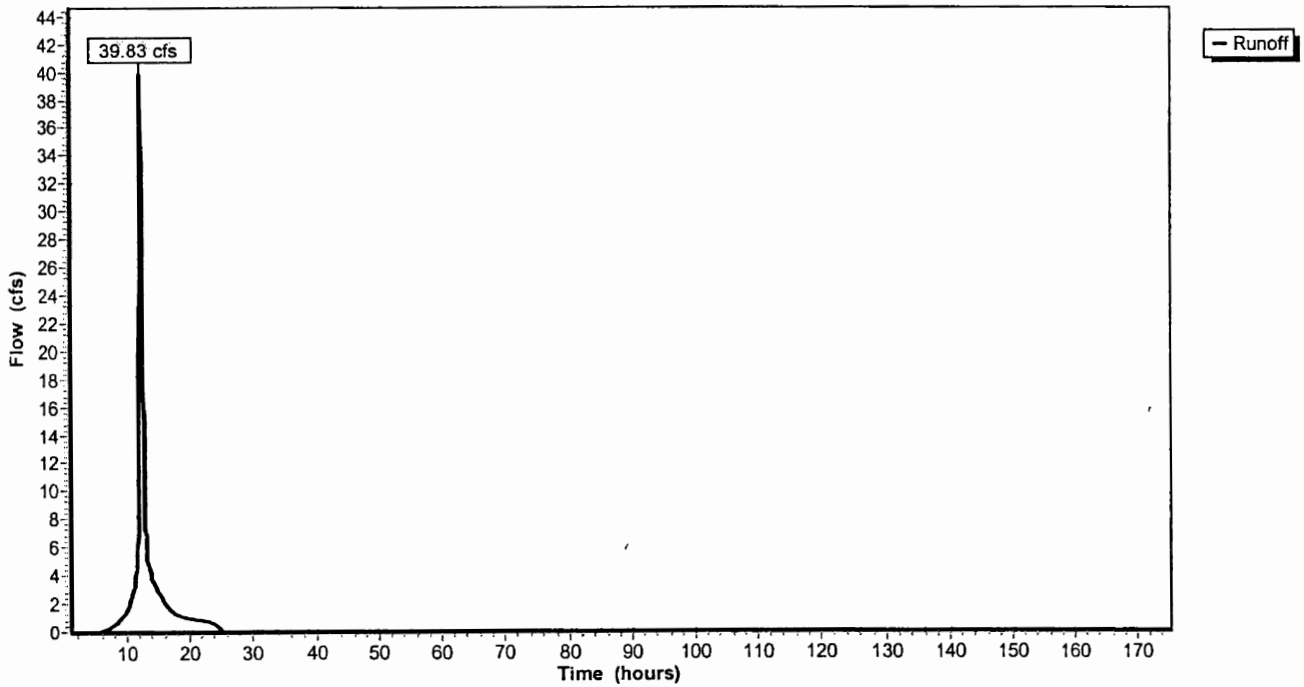
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-year Rainfall=6.00"

Area (ac)	CN	Description
7.400	90	Suburban Shopping Center
3.000	79	1 acre lots, 20% imp, HSG C
1.500	74	>75% Grass cover, Good, HSG C
11.900	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

**Subcatchment 1.3S:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 25-year Rainfall=6.00"

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## Subcatchment 1.4S:

Runoff = 3.74 cfs @ 12.08 hrs, Volume= 0.265 af, Depth= 3.18"

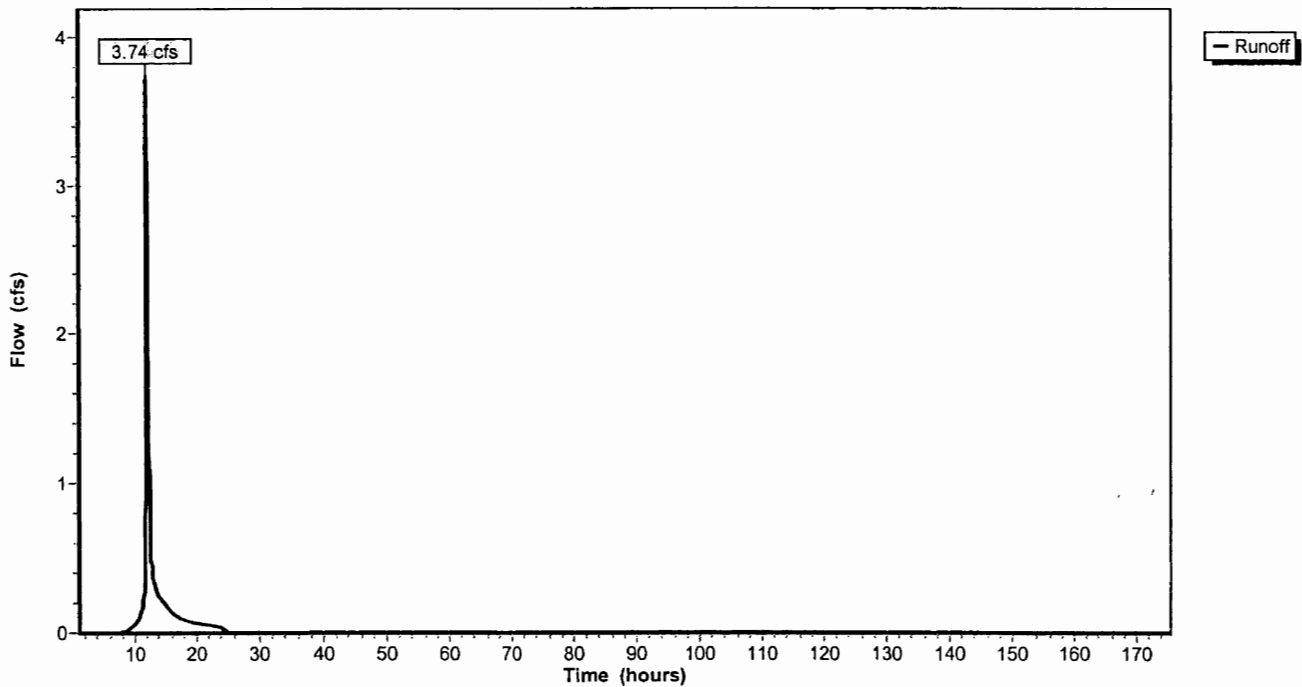
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-year Rainfall=6.00"

Area (ac)	CN	Description
1.000	74	>75% Grass cover, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

## Subcatchment 1.4S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 25-year Rainfall=6.00"

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## Pond 1.1P:

Inflow Area = 34.500 ac, Inflow Depth = 4.41" for 25-year event  
 Inflow = 115.96 cfs @ 12.28 hrs, Volume= 12.677 af  
 Outflow = 101.65 cfs @ 12.39 hrs, Volume= 11.825 af, Atten= 12%, Lag= 7.0 min  
 Primary = 52.72 cfs @ 12.39 hrs, Volume= 10.093 af  
 Secondary = 48.93 cfs @ 12.39 hrs, Volume= 1.733 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Peak Elev= 782.67' @ 12.39 hrs Surf.Area= 45,349 sf Storage= 178,396 cf  
 Plug-Flow detention time= 665.1 min calculated for 11.822 af (93% of inflow)  
 Center-of-Mass det. time= 631.8 min ( 1,443.2 - 811.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	774.00'	239,800 cf	<b>Custom Stage Data (Prismatic)</b> listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
774.00	2,800	0	0
776.00	8,500	11,300	11,300
778.00	15,000	23,500	34,800
780.00	27,000	42,000	76,800
782.00	43,500	70,500	147,300
784.00	49,000	92,500	239,800

Device	Routing	Invert	Outlet Devices
#1	Primary	778.00'	<b>3.5" Vert. Orifice/Grate</b> C= 0.300
#2	Primary	781.10'	<b>8.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Secondary	782.00'	<b>28.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=52.62 cfs @ 12.39 hrs HW=782.67' (Free Discharge)

- └1=Orifice/Grate (Orifice Controls 0.34 cfs @ 5.1 fps)
- └2=Broad-Crested Rectangular Weir (Weir Controls 52.28 cfs @ 4.2 fps)

**Secondary OutFlow** Max=48.54 cfs @ 12.39 hrs HW=782.67' (Free Discharge)

- └3=Broad-Crested Rectangular Weir (Weir Controls 48.54 cfs @ 2.6 fps)

**Patterson Crossing Post Development**

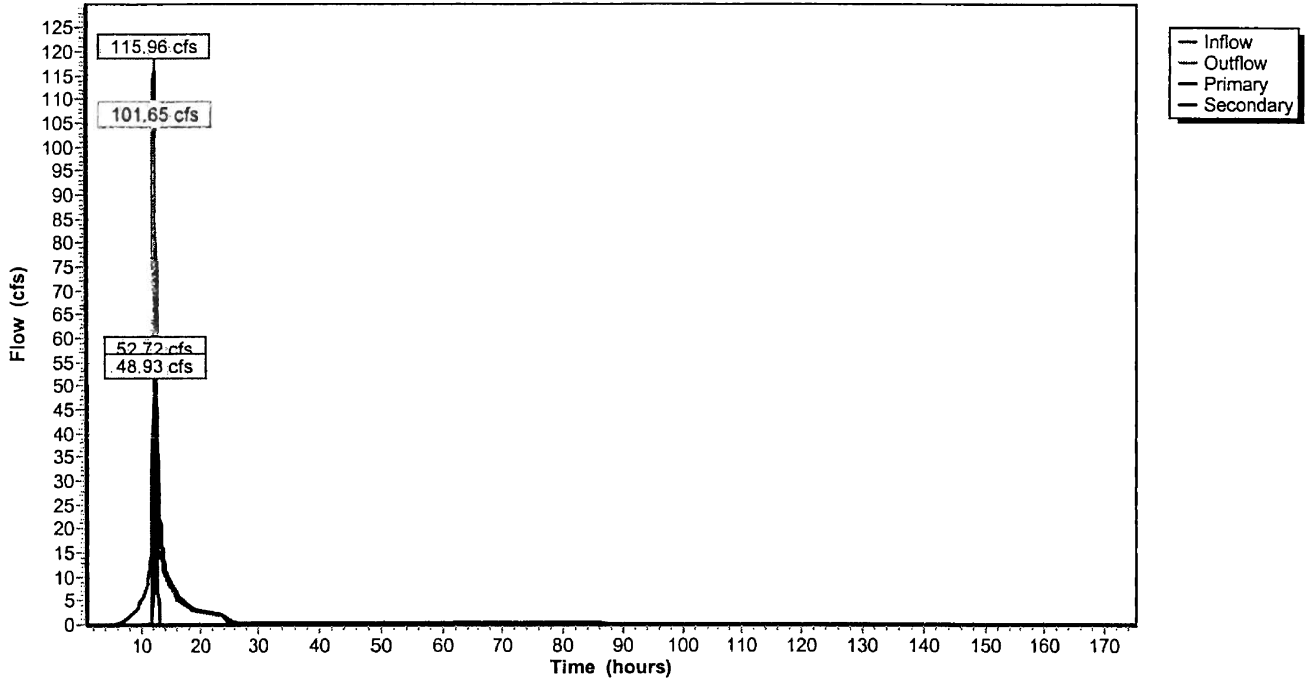
Type III 24-hr 25-year Rainfall=6.00"

Prepared by Insite Engineering, Surveying & Landscape Architecture, P.C.

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**Pond 1.1P:**

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 25-year Rainfall=6.00"

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**Pond 1.2P:**

Inflow Area = 35.500 ac, Inflow Depth > 3.50" for 25-year event  
 Inflow = 53.97 cfs @ 12.39 hrs, Volume= 10.358 af  
 Outflow = 32.92 cfs @ 12.86 hrs, Volume= 10.357 af, Atten= 39%, Lag= 28.0 min  
 Primary = 0.46 cfs @ 12.86 hrs, Volume= 4.076 af  
 Secondary = 32.45 cfs @ 12.86 hrs, Volume= 6.281 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Peak Elev= 773.49' @ 12.86 hrs Surf.Area= 20,228 sf Storage= 94,360 cf  
 Plug-Flow detention time= 763.9 min calculated for 10.357 af (100% of inflow)  
 Center-of-Mass det. time= 762.9 min ( 2,306.2 - 1,543.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	766.00'	126,400 cf	<b>Custom Stage Data (Prismatic)</b> listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
766.00	3,800	0	0
768.00	8,700	12,500	12,500
770.00	13,100	21,800	34,300
772.00	18,000	31,100	65,400
774.00	21,000	39,000	104,400
775.00	23,000	22,000	126,400

Device	Routing	Invert	Outlet Devices
#1	Primary	765.00'	<b>3.5" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	772.50'	<b>10.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.46 cfs @ 12.86 hrs HW=773.48' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.46 cfs @ 7.0 fps)

**Secondary OutFlow** Max=32.39 cfs @ 12.86 hrs HW=773.48' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 32.39 cfs @ 3.3 fps)

**Patterson Crossing Post Development**

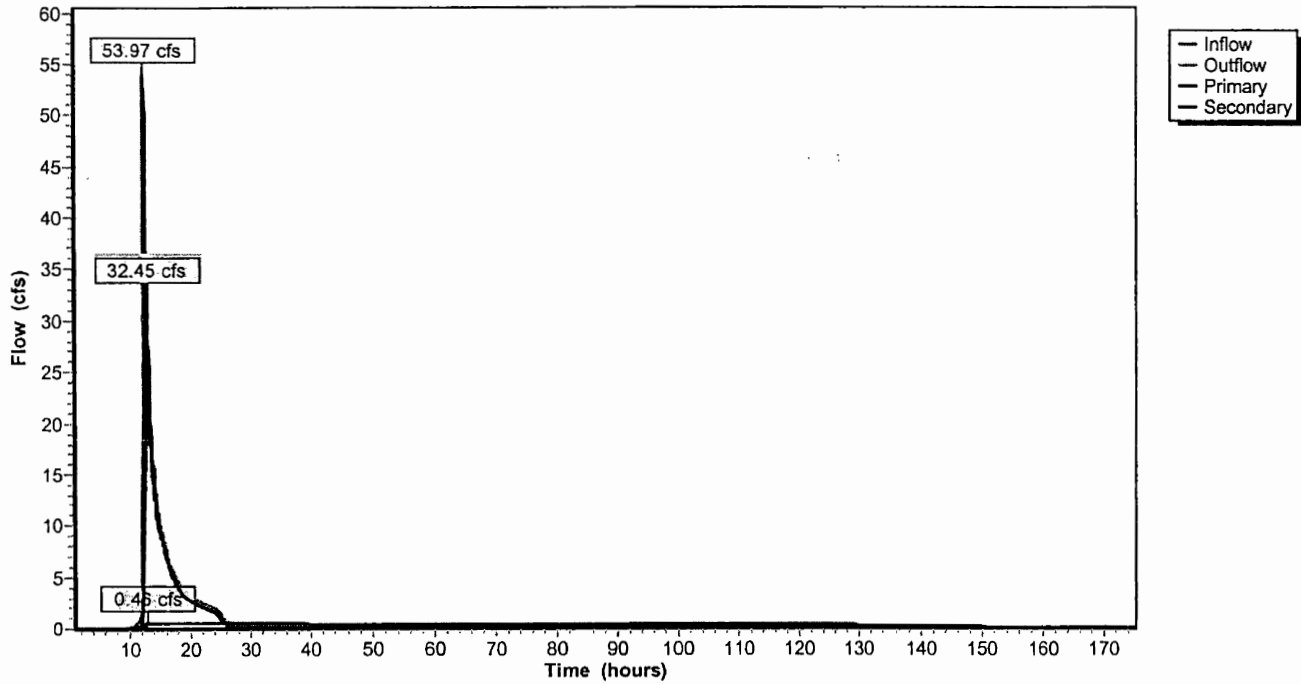
Type III 24-hr 25-year Rainfall=6.00"

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**Pond 1.2P:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 25-year Rainfall=6.00"

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## Pond 1.3P:

Inflow Area = 11.900 ac, Inflow Depth = 4.30" for 25-year event  
Inflow = 40.13 cfs @ 12.26 hrs, Volume= 4.267 af  
Outflow = 4.24 cfs @ 13.67 hrs, Volume= 4.251 af, Atten= 89%, Lag= 84.5 min  
Primary = 0.40 cfs @ 13.67 hrs, Volume= 2.979 af  
Secondary = 3.84 cfs @ 13.67 hrs, Volume= 1.272 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs

Starting Elev= 764.00' Surf.Area= 3,200 sf Storage= 7,900 cf

Peak Elev= 770.30' @ 13.67 hrs Surf.Area= 27,240 sf Storage= 126,950 cf (119,050 cf above start)

Plug-Flow detention time= 2,319.9 min calculated for 4.068 af (95% of inflow)

Center-of-Mass det. time= 2,194.9 min ( 3,008.2 - 813.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	760.00'	176,100 cf	<b>Custom Stage Data (Prismatic)</b> listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
760.00	900	0	0
762.00	1,900	2,800	2,800
764.00	3,200	5,100	7,900
766.00	18,500	21,700	29,600
768.00	21,800	40,300	69,900
770.00	26,500	48,300	118,200
772.00	31,400	57,900	176,100

Device	Routing	Invert	Outlet Devices
#1	Primary	764.00'	<b>3.5" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	770.00'	<b>8.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.40 cfs @ 13.67 hrs HW=770.30' (Free Discharge)

↳ **1=Orifice/Grate** (Orifice Controls 0.40 cfs @ 6.0 fps)

**Secondary OutFlow** Max=3.80 cfs @ 13.67 hrs HW=770.30' (Free Discharge)

↳ **2=Broad-Crested Rectangular Weir** (Weir Controls 3.80 cfs @ 1.6 fps)

**Patterson Crossing Post Development**

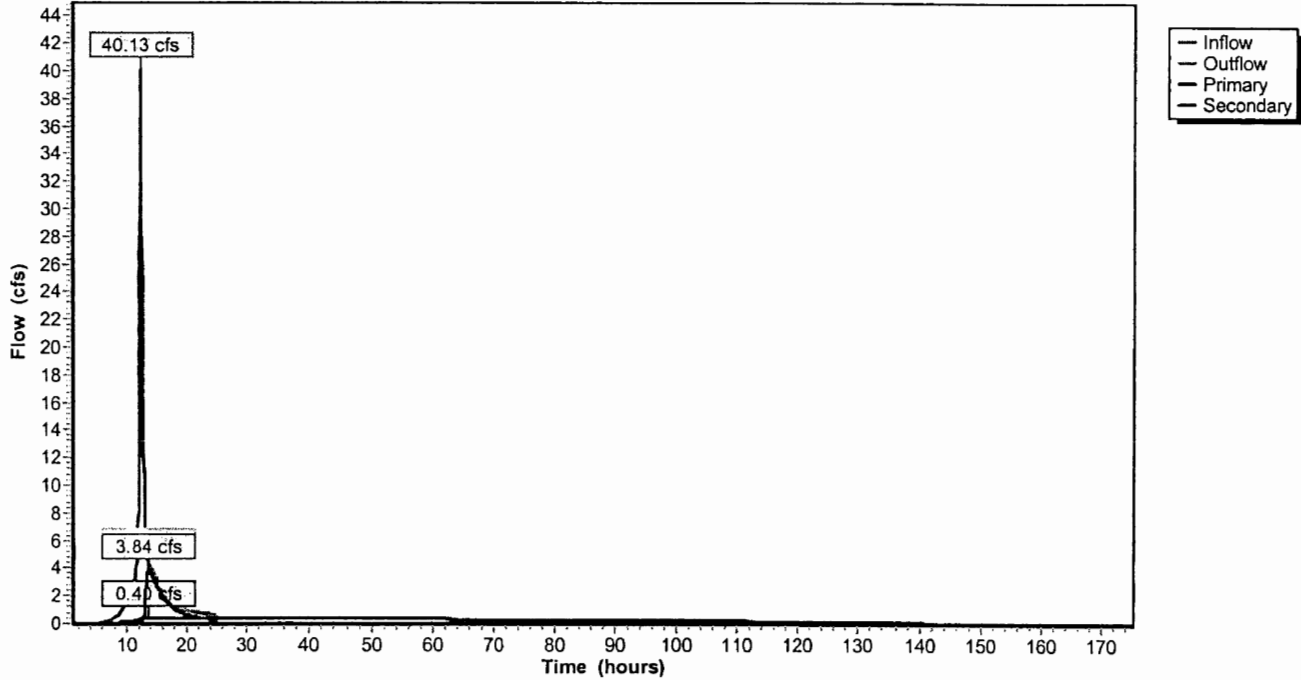
Type III 24-hr 25-year Rainfall=6.00"

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**Pond 1.3P:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 25-year Rainfall=6.00"

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## Pond 1.4P:

Inflow Area = 48.400 ac, Inflow Depth > 3.69" for 25-year event  
Inflow = 34.07 cfs @ 12.88 hrs, Volume= 14.873 af  
Outflow = 21.81 cfs @ 13.65 hrs, Volume= 14.436 af, Atten= 36%, Lag= 46.0 min  
Primary = 0.61 cfs @ 13.65 hrs, Volume= 6.626 af  
Secondary = 21.20 cfs @ 13.65 hrs, Volume= 7.810 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Starting Elev= 760.00' Surf.Area= 30,000 sf Storage= 100,800 cf  
Peak Elev= 762.57' @ 13.65 hrs Surf.Area= 37,014 sf Storage= 188,094 cf (87,294 cf above start)  
Plug-Flow detention time= 2,056.6 min calculated for 12.122 af (81% of inflow)  
Center-of-Mass det. time= 677.7 min ( 3,158.1 - 2,480.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	754.00'	242,600 cf	<b>Custom Stage Data (Prismatic)</b> listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
754.00	4,800	0	0
756.00	12,500	17,300	17,300
758.00	20,500	33,000	50,300
760.00	30,000	50,500	100,800
762.00	35,500	65,500	166,300
764.00	40,800	76,300	242,600

Device	Routing	Invert	Outlet Devices
#1	Primary	760.00'	<b>5.5" Vert. Orifice/Grate C= 0.300</b>
#2	Secondary	762.00'	<b>16.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.61 cfs @ 13.65 hrs HW=762.57' (Free Discharge)  
↑1=Orifice/Grate (Orifice Controls 0.61 cfs @ 3.7 fps)

**Secondary OutFlow** Max=21.11 cfs @ 13.65 hrs HW=762.57' (Free Discharge)  
↑2=Broad-Crested Rectangular Weir (Weir Controls 21.11 cfs @ 2.3 fps)

**Patterson Crossing Post Development**

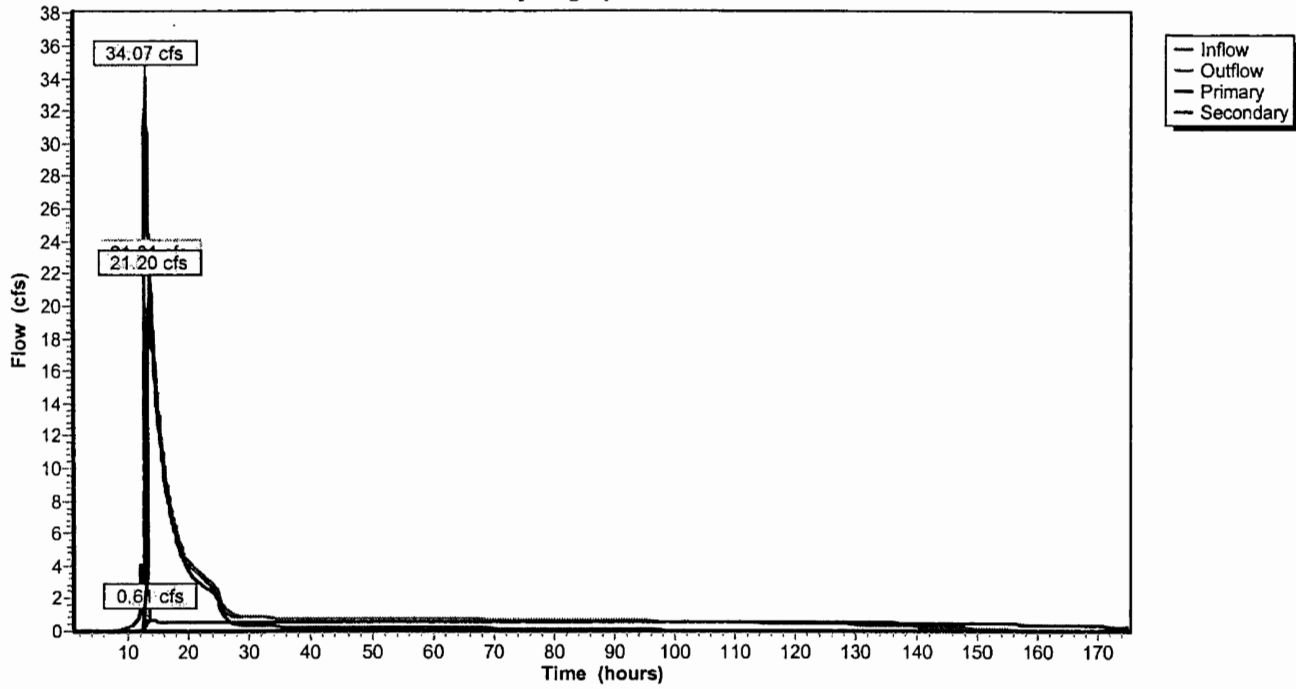
Type III 24-hr 25-year Rainfall=6.00"

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**Pond 1.4P:**

Hydrograph



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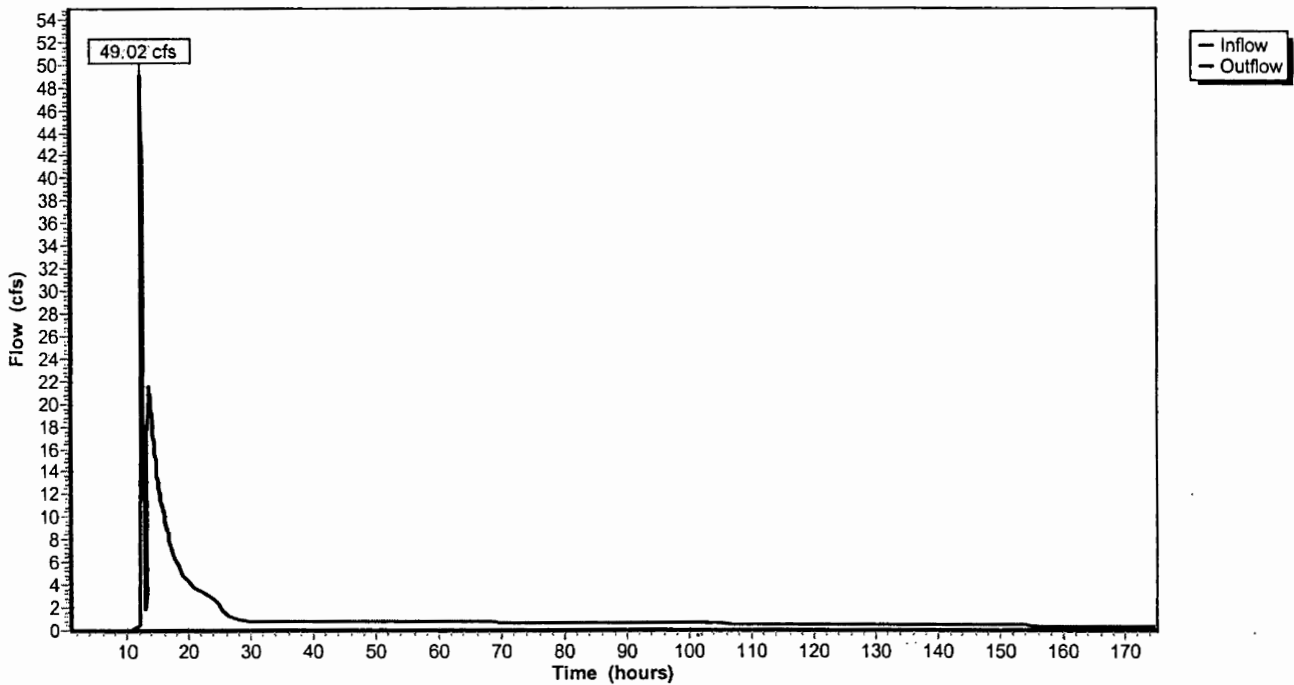
## Reach Design Line 1:

Inflow Area = 48.400 ac, Inflow Depth > 4.01" for 25-year event  
Inflow = 49.02 cfs @ 12.39 hrs, Volume= 16.168 af  
Outflow = 49.02 cfs @ 12.39 hrs, Volume= 16.168 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs

## Reach Design Line 1:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 25-year Rainfall=6.00"

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## Subcatchment 2.0S:

Runoff = 61.25 cfs @ 12.28 hrs, Volume= 6.522 af, Depth= 2.90"

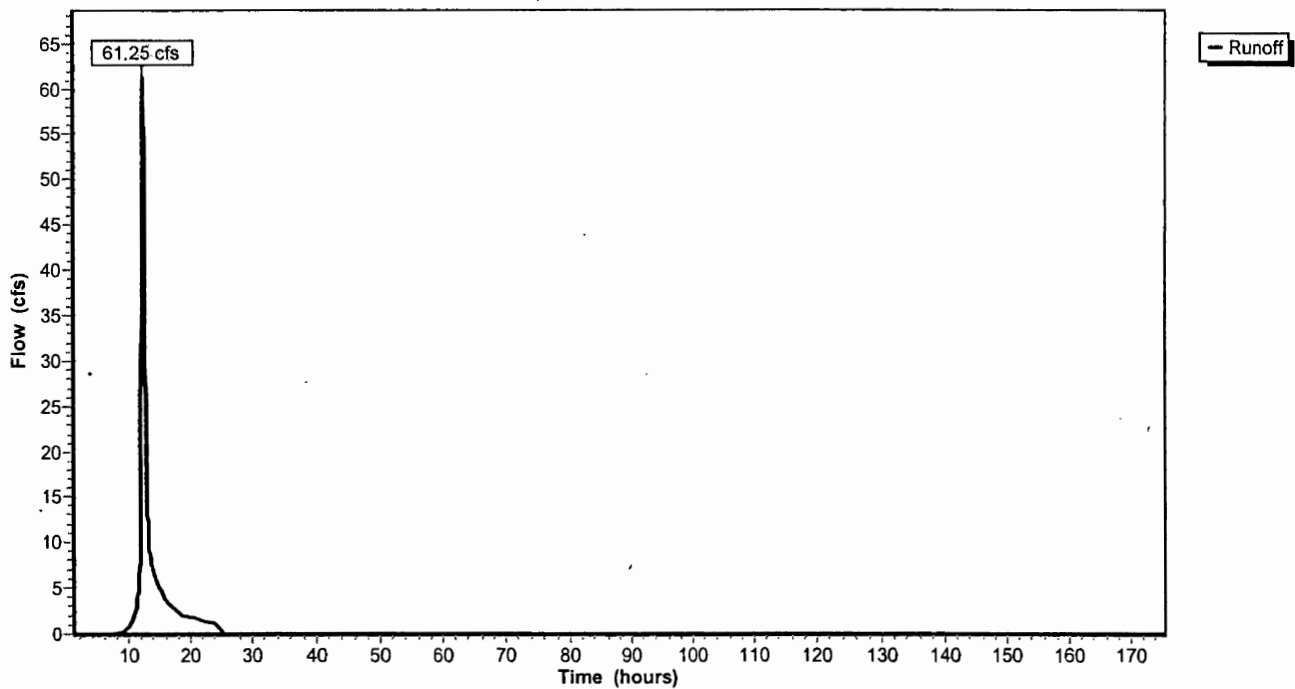
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-year Rainfall=6.00"

Area (ac)	CN	Description
17.500	70	Woods, Good, HSG C
9.500	74	>75% Grass cover, Good, HSG C
27.000	71	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

## Subcatchment 2.0S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 25-year Rainfall=6.00"

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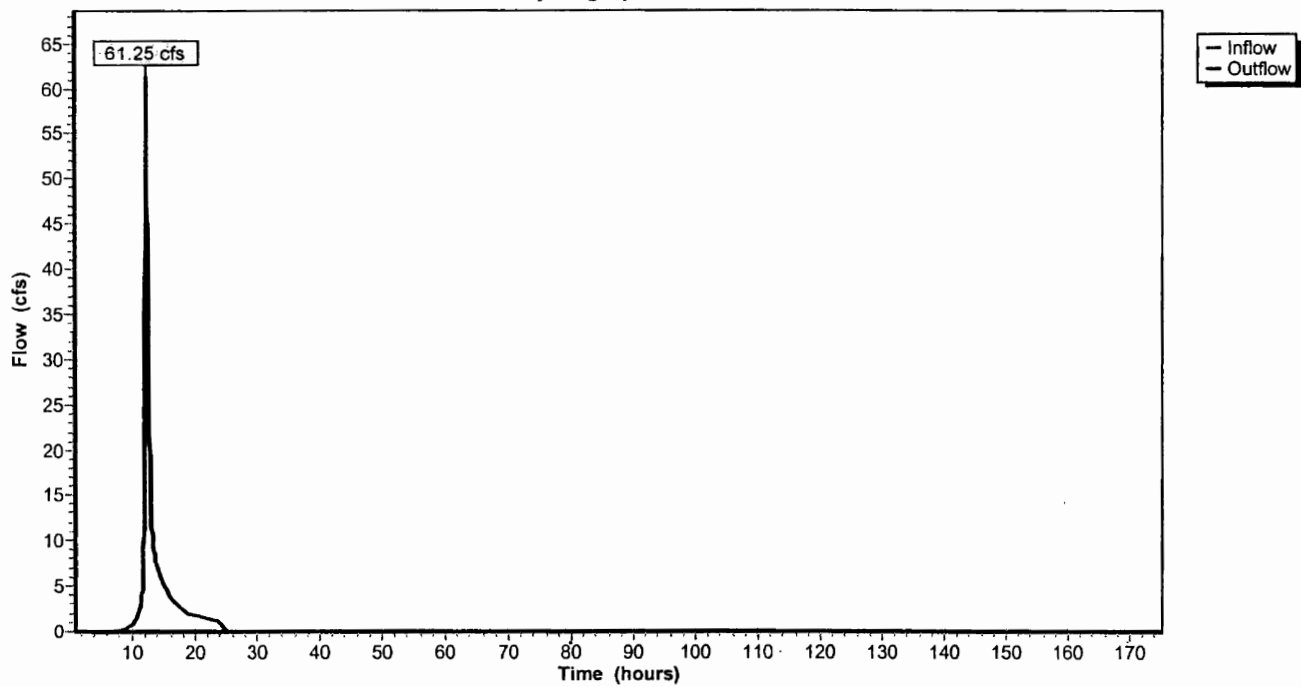
## Reach Design Point 2:

Inflow Area = 27.000 ac, Inflow Depth = 2.90" for 25-year event  
Inflow = 61.25 cfs @ 12.28 hrs, Volume= 6.522 af  
Outflow = 61.25 cfs @ 12.28 hrs, Volume= 6.522 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs

## Reach Design Point 2:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 25-year Rainfall=6.00"

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## Subcatchment 3.1S:

Runoff = 28.67 cfs @ 12.20 hrs, Volume= 2.728 af, Depth= 4.09"

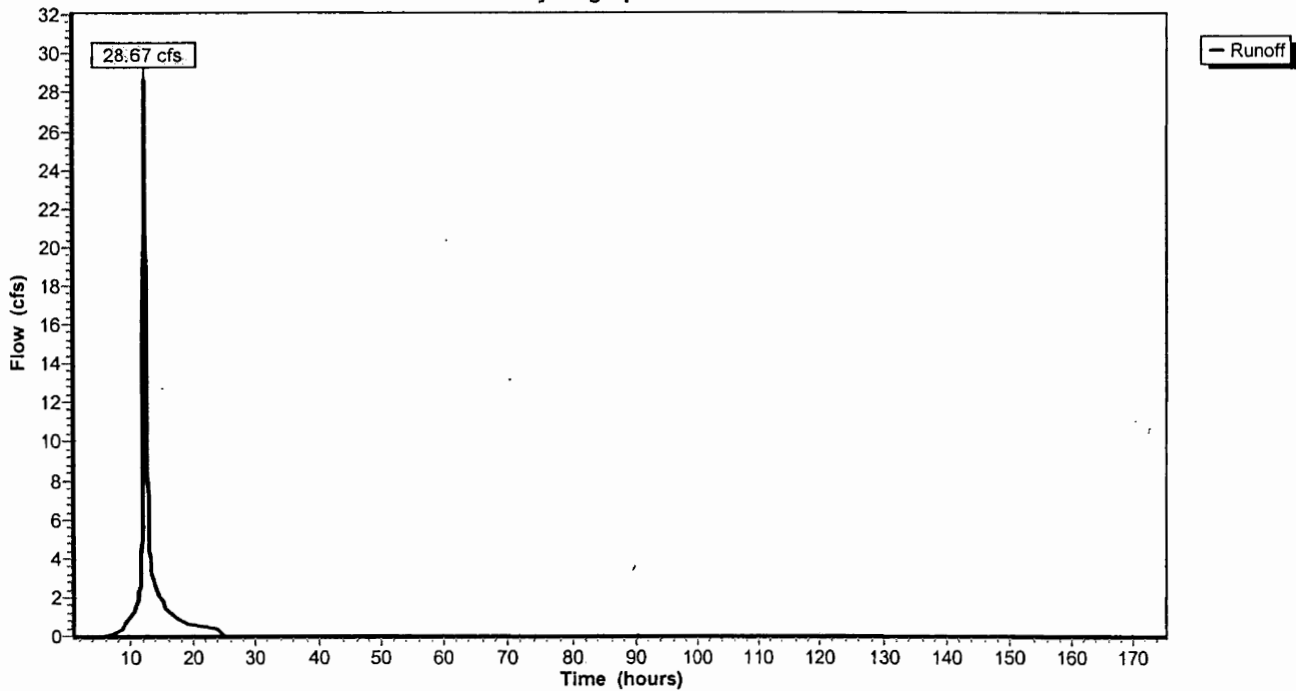
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-year Rainfall=6.00"

Area (ac)	CN	Description
5.000	90	Suburban Shopping Center
3.000	70	Woods, Good, HSG C
8.000	83	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry,

## Subcatchment 3.1S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 25-year Rainfall=6.00"

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## Subcatchment 3.2S:

Runoff = 23.42 cfs @ 12.28 hrs, Volume= 2.479 af, Depth= 3.38"

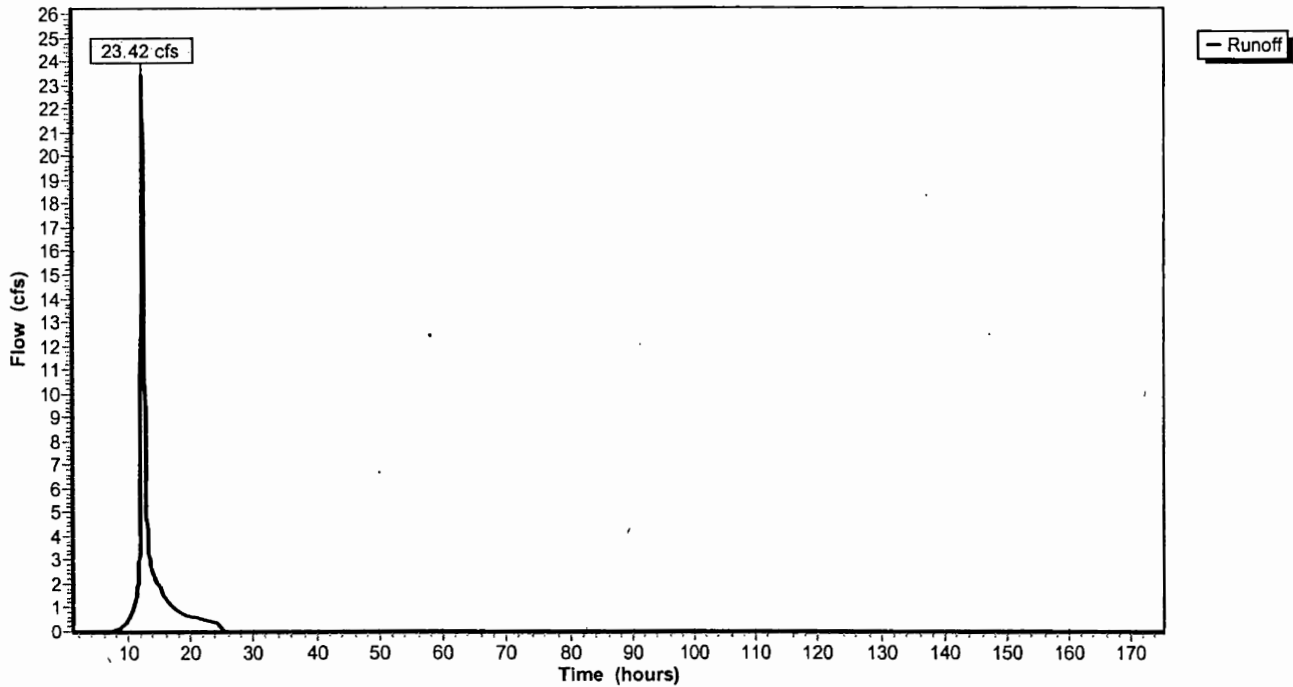
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-year Rainfall=6.00"

Area (ac)	CN	Description
3.100	74	>75% Grass cover, Good, HSG C
3.900	70	Woods, Good, HSG C
1.800	90	Suburban Shopping Center
8.800	76	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

## Subcatchment 3.2S:

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 25-year Rainfall=6.00"

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**Subcatchment 3.3S:**

Runoff = 3.60 cfs @ 12.14 hrs, Volume= 0.299 af, Depth= 3.99"

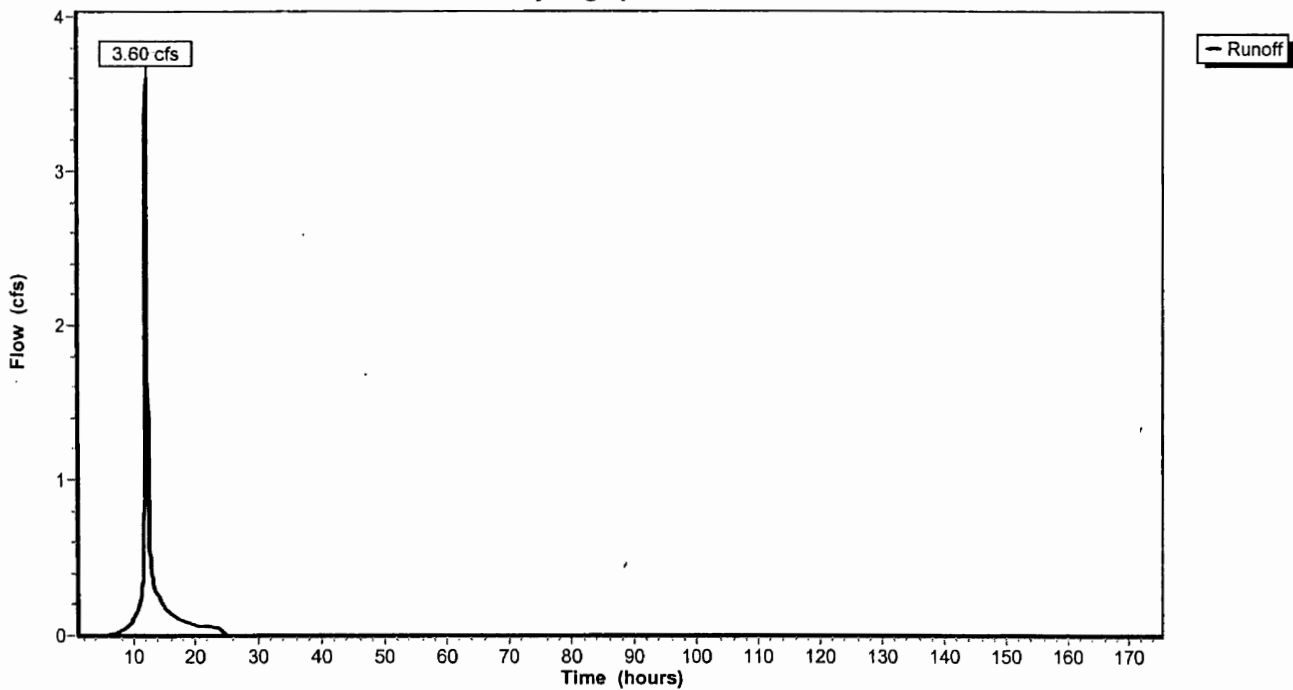
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-year Rainfall=6.00"

Area (ac)	CN	Description
0.300	98	Paved parking & roofs
0.600	74	>75% Grass cover, Good, HSG C
0.900	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

**Subcatchment 3.3S:**

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 25-year Rainfall=6.00"

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**Subcatchment 3.4S:**

Runoff = 11.18 cfs @ 12.28 hrs, Volume= 1.183 af, Depth= 3.38"

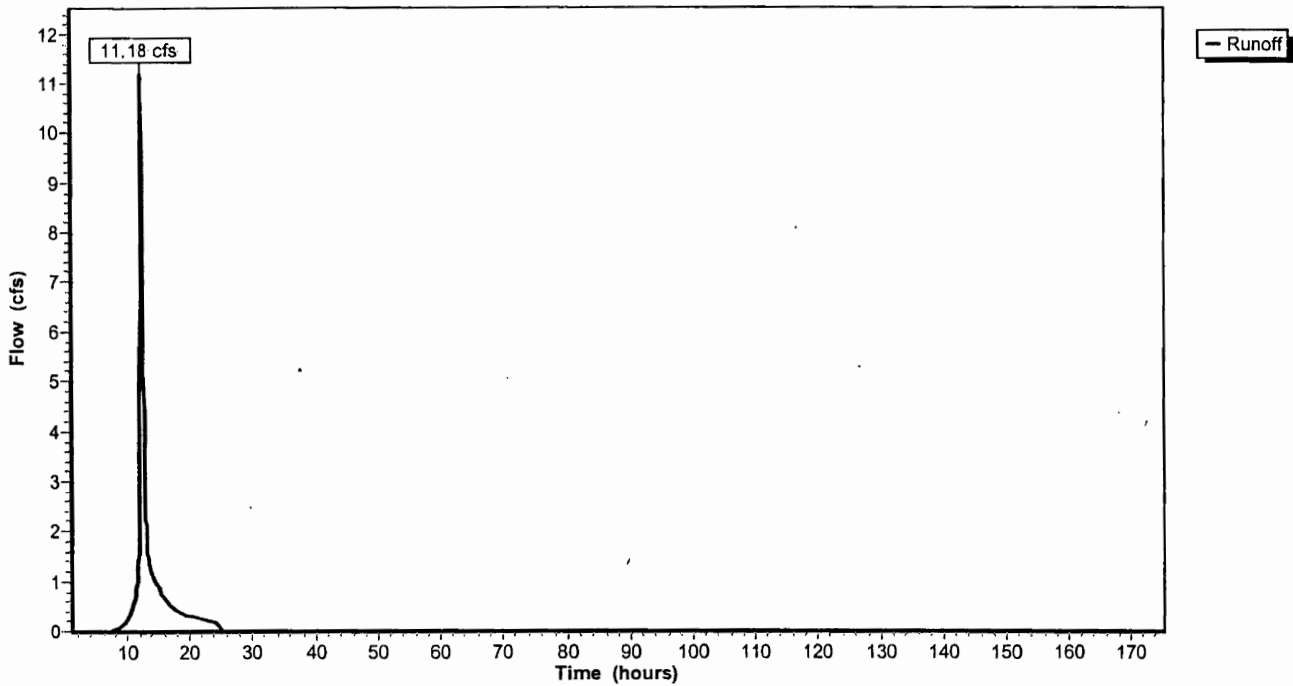
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-year Rainfall=6.00"

Area (ac)	CN	Description
2.800	79	1 acre lots, 20% imp, HSG C
1.400	70	Woods, Good, HSG C
4.200	76	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

**Subcatchment 3.4S:**

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 25-year Rainfall=6.00"

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**Subcatchment 3.5S:**

Runoff = 1.98 cfs @ 12.15 hrs, Volume= 0.164 af, Depth= 2.81"

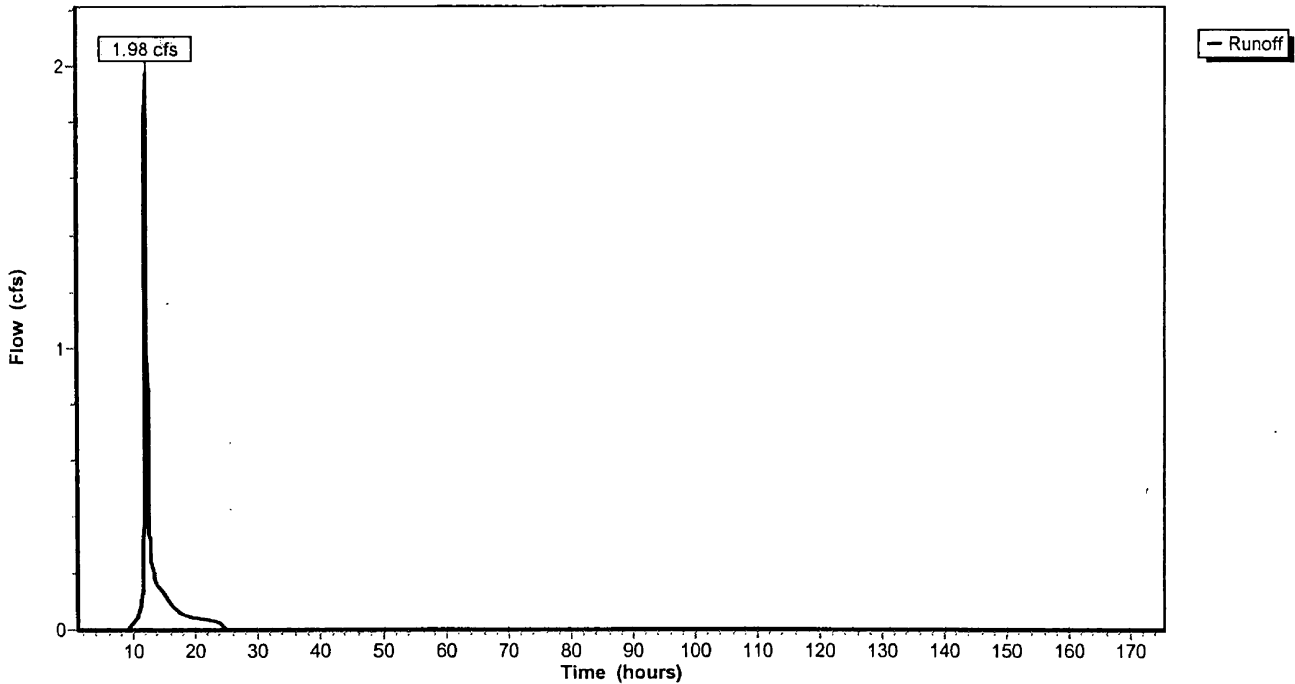
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-year Rainfall=6.00"

Area (ac)	CN	Description
0.700	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

**Subcatchment 3.5S:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 25-year Rainfall=6.00"

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## Subcatchment 3.6S:

Runoff = 57.88 cfs @ 12.55 hrs, Volume= 8.371 af, Depth= 3.68"

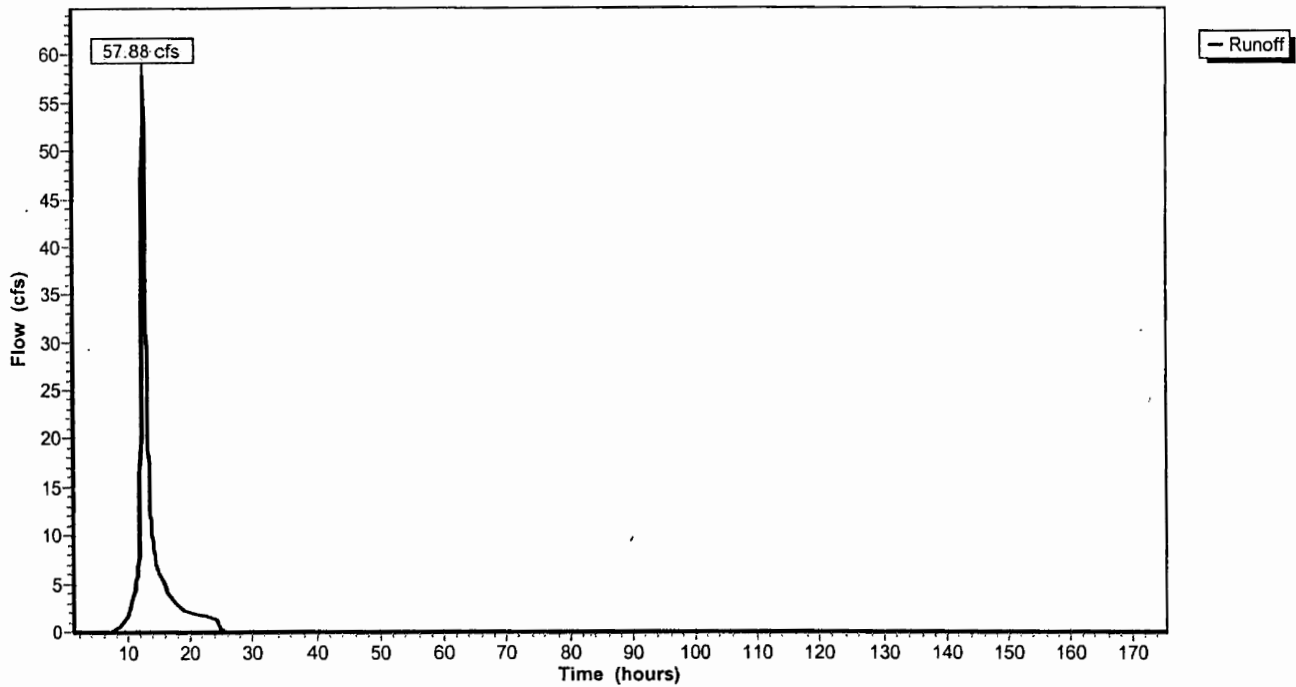
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-year Rainfall=6.00"

Area (ac)	CN	Description
9.300	70	Woods, Good, HSG C
6.700	98	Paved parking & roofs
11.300	74	>75% Grass cover, Good, HSG C
27.300	79	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.0					Direct Entry,

## Subcatchment 3.6S:

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 25-year Rainfall=6.00"

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**Pond 3.1P:**

Inflow Area = 8.000 ac, Inflow Depth = 4.09" for 25-year event  
 Inflow = 28.67 cfs @ 12.20 hrs, Volume= 2.728 af  
 Outflow = 6.06 cfs @ 12.76 hrs, Volume= 2.727 af, Atten= 79%, Lag= 33.6 min  
 Primary = 0.50 cfs @ 12.76 hrs, Volume= 1.606 af  
 Secondary= 5.56 cfs @ 12.76 hrs, Volume= 1.121 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 718.00' Surf.Area= 7,000 sf Storage= 9,900 cf  
 Peak Elev= 722.77' @ 12.76 hrs Surf.Area= 19,647 sf Storage= 72,822 cf (62,922 cf above start)  
 Plug-Flow detention time= 918.1 min calculated for 2.500 af (92% of inflow)  
 Center-of-Mass det. time= 796.0 min ( 1,610.6 - 814.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	714.00'	110,300 cf	<b>Custom Stage Data (Prismatic)</b> Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
714.00	400	0	0
716.00	1,250	1,650	1,650
718.00	7,000	8,250	9,900
720.00	11,600	18,600	28,500
722.00	16,900	28,500	57,000
724.00	24,000	40,900	97,900
724.50	25,600	12,400	110,300

Device	Routing	Invert	Outlet Devices
#1	Primary	718.00'	<b>4.2" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	722.00'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.50 cfs @ 12.76 hrs HW=722.77' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.50 cfs @ 5.2 fps)

**Secondary OutFlow** Max=5.56 cfs @ 12.76 hrs HW=722.77' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 5.56 cfs @ 2.9 fps)

**Patterson Crossing Post Development**

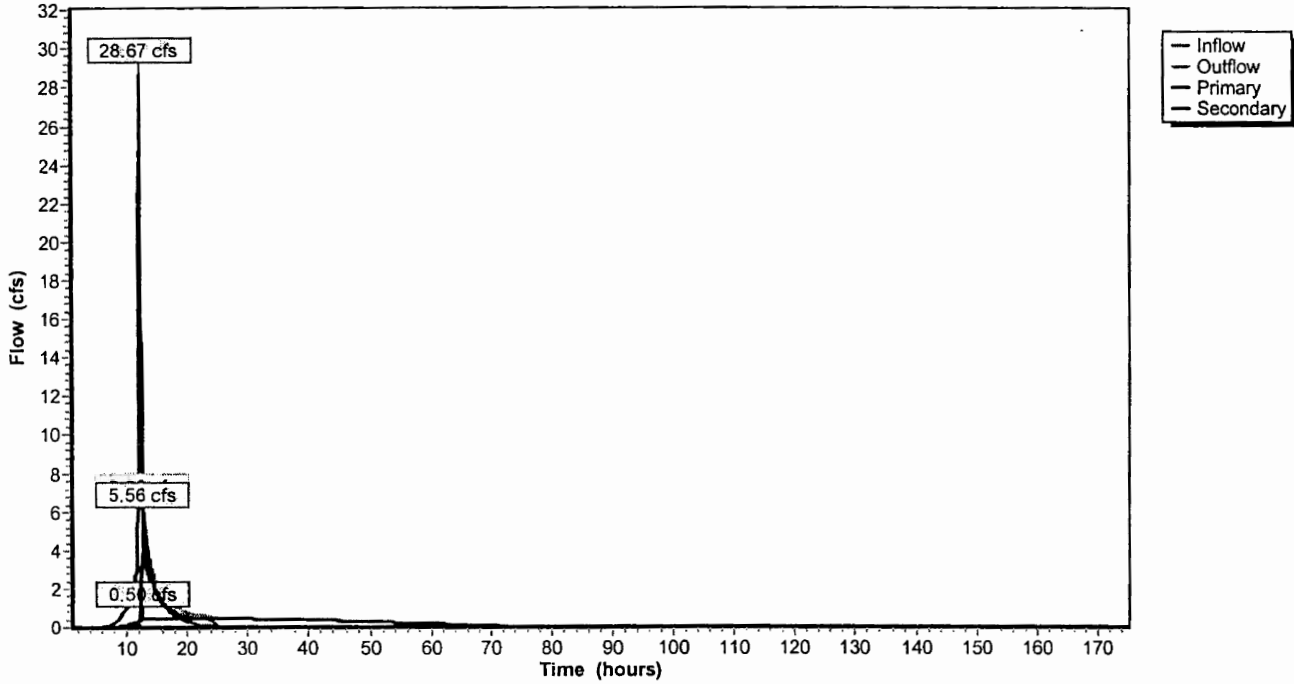
Type III 24-hr 25-year Rainfall=6.00"

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**Pond 3.1P:**

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# Patterson Crossing Post Development

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## Pond 3.2P:

Inflow Area = 16.800 ac, Inflow Depth = 3.72" for 25-year event  
 Inflow = 23.79 cfs @ 12.28 hrs, Volume= 5.206 af  
 Outflow = 15.96 cfs @ 12.68 hrs, Volume= 5.205 af, Atten= 33%, Lag= 23.8 min  
 Primary = 0.51 cfs @ 12.68 hrs, Volume= 2.515 af  
 Secondary = 15.45 cfs @ 12.68 hrs, Volume= 2.690 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 664.00' Surf.Area= 3,900 sf Storage= 9,500 cf  
 Peak Elev= 668.63' @ 12.68 hrs Surf.Area= 15,752 sf Storage= 59,028 cf (49,528 cf above start)  
 Plug-Flow detention time= 715.7 min calculated for 4.986 af (96% of inflow)  
 Center-of-Mass det. time= 550.0 min ( 1,792.3 - 1,242.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	660.00'	81,700 cf	<b>Custom Stage Data (Prismatic)</b> Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
660.00	800	0	0
662.00	2,400	3,200	3,200
664.00	3,900	6,300	9,500
666.00	10,400	14,300	23,800
668.00	14,500	24,900	48,700
670.00	18,500	33,000	81,700

Device	Routing	Invert	Outlet Devices
#1	Primary	664.00'	<b>4.3" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	668.00'	<b>10.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.51 cfs @ 12.68 hrs HW=668.62' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.51 cfs @ 5.1 fps)

**Secondary OutFlow** Max=15.34 cfs @ 12.68 hrs HW=668.62' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 15.34 cfs @ 2.5 fps)

**Patterson Crossing Post Development**

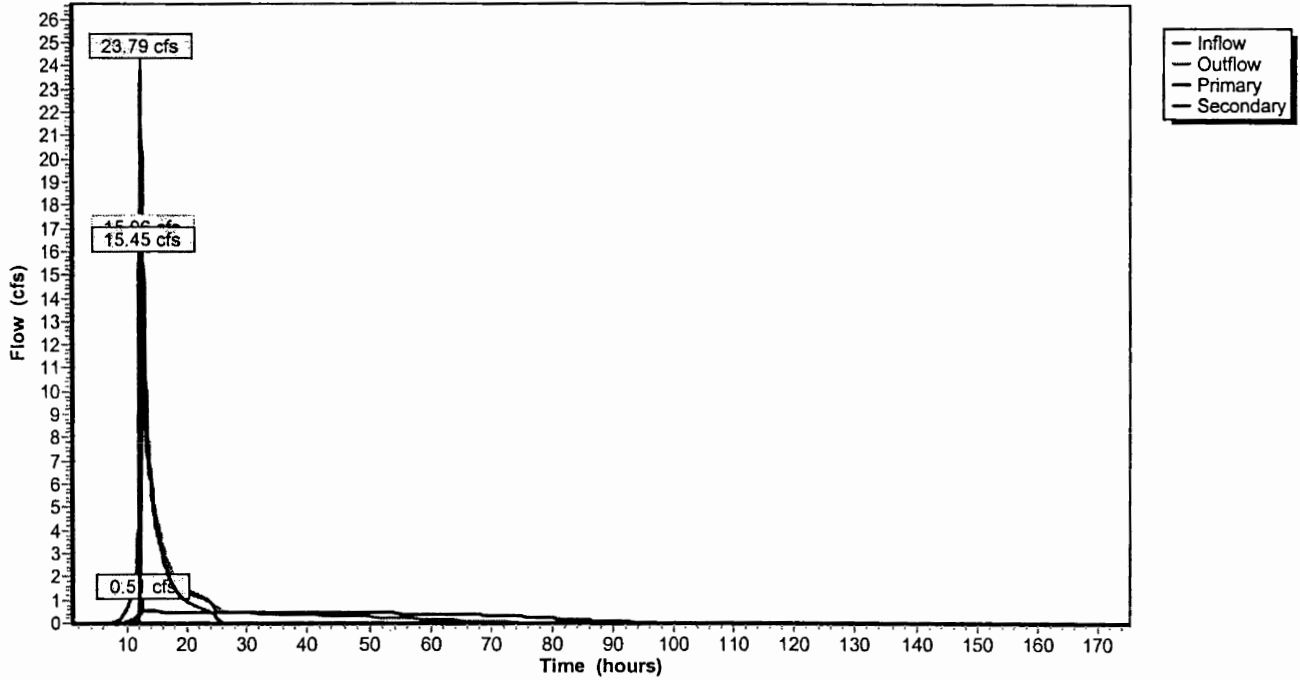
Type III 24-hr 25-year Rainfall=6.00"

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**Pond 3.2P:**

**Hydrograph**



**Patterson Crossing Post Development**

Type III 24-hr 25-year Rainfall=6.00"

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**Pond 3.3P:**

Inflow Area = 0.900 ac, Inflow Depth = 3.99" for 25-year event  
 Inflow = 3.60 cfs @ 12.14 hrs, Volume= 0.299 af  
 Outflow = 1.29 cfs @ 12.48 hrs, Volume= 0.299 af, Atten= 64%, Lag= 20.4 min  
 Primary = 0.06 cfs @ 12.48 hrs, Volume= 0.172 af  
 Secondary = 1.23 cfs @ 12.48 hrs, Volume= 0.127 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 662.00' Surf.Area= 1,100 sf Storage= 2,120 cf  
 Peak Elev= 664.81' @ 12.48 hrs Surf.Area= 3,272 sf Storage= 8,191 cf (6,071 cf above start)  
 Plug-Flow detention time= 892.6 min calculated for 0.250 af (84% of inflow)  
 Center-of-Mass det. time= 678.0 min ( 1,490.7 - 812.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	658.00'	12,420 cf	<b>Custom Stage Data (Prismatic)</b> Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
658.00	20	0	0
660.00	500	520	520
662.00	1,100	1,600	2,120
664.00	2,100	3,200	5,320
666.00	5,000	7,100	12,420

Device	Routing	Invert	Outlet Devices
#1	Primary	662.00'	<b>1.6" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	664.50'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.06 cfs @ 12.48 hrs HW=664.81' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.06 cfs @ 4.0 fps)

**Secondary OutFlow** Max=1.22 cfs @ 12.48 hrs HW=664.81' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 1.22 cfs @ 1.6 fps)

**Patterson Crossing Post Development**

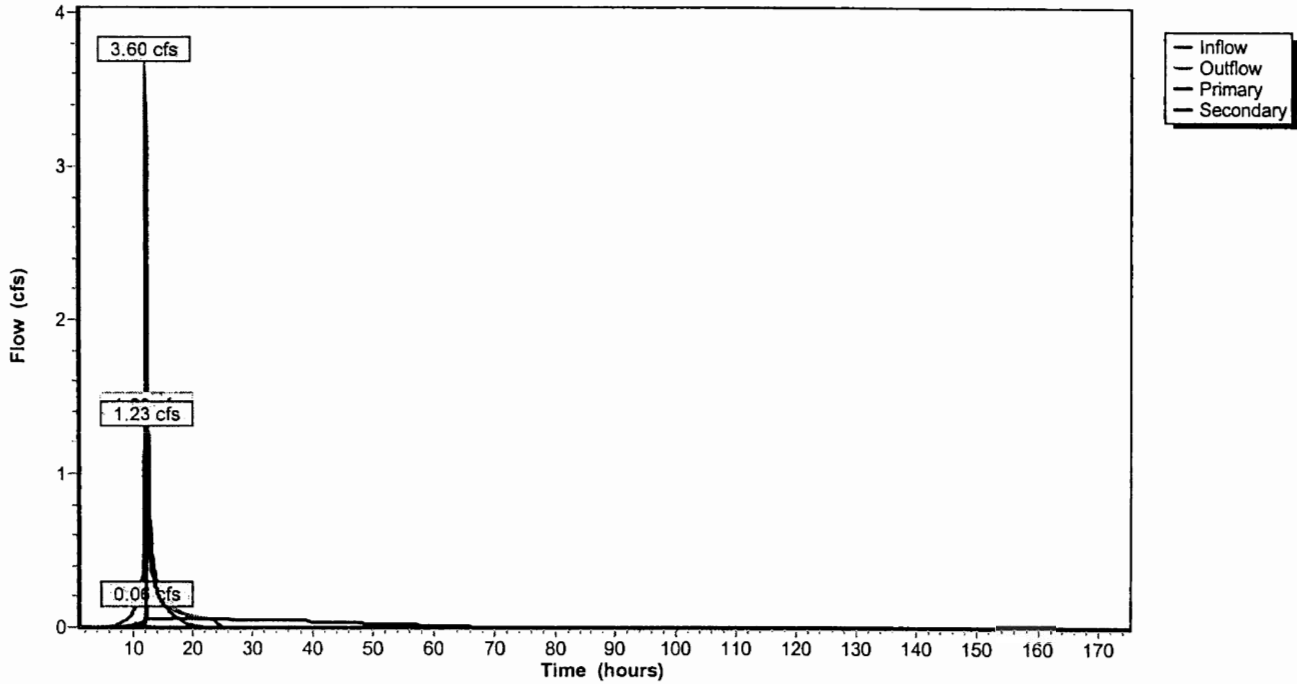
Type III 24-hr 25-year Rainfall=6.00"

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**Pond 3.3P:**

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 25-year Rainfall=6.00"

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**Pond 3.4P:**

Inflow Area = 4.200 ac, Inflow Depth = 3.38" for 25-year event  
 Inflow = 11.18 cfs @ 12.28 hrs, Volume= 1.183 af  
 Outflow = 4.70 cfs @ 12.69 hrs, Volume= 1.183 af, Atten= 58%, Lag= 24.5 min  
 Primary = 0.29 cfs @ 12.69 hrs, Volume= 0.743 af  
 Secondary = 4.41 cfs @ 12.69 hrs, Volume= 0.440 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 756.00' Surf.Area= 6,000 sf Storage= 13,800 cf  
 Peak Elev= 758.79' @ 12.69 hrs Surf.Area= 10,181 sf Storage= 37,065 cf (23,265 cf above start)  
 Plug-Flow detention time= 978.0 min calculated for 0.866 af (73% of inflow)  
 Center-of-Mass det. time= 633.2 min ( 1,470.2 - 837.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	752.00'	49,800 cf	<b>Custom Stage Data (Prismatic)</b> listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
752.00	800	0	0
754.00	3,500	4,300	4,300
756.00	6,000	9,500	13,800
758.00	9,000	15,000	28,800
760.00	12,000	21,000	49,800

Device	Routing	Invert	Outlet Devices
#1	Primary	756.00'	<b>3.7" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	758.50'	<b>10.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.29 cfs @ 12.69 hrs HW=758.79' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.29 cfs @ 3.9 fps)

**Secondary OutFlow** Max=4.36 cfs @ 12.69 hrs HW=758.79' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 4.36 cfs @ 1.5 fps)

# Patterson Crossing Post Development

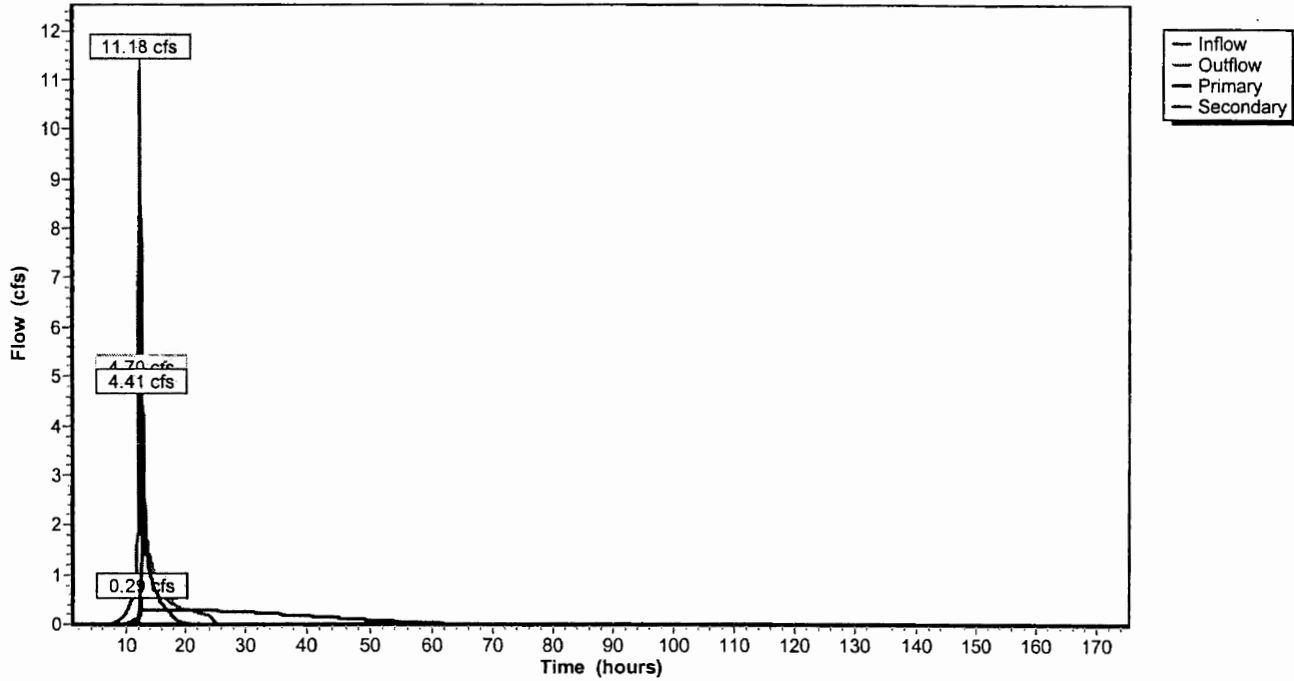
Type III 24-hr 25-year Rainfall=6.00"

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## Pond 3.4P:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 25-year Rainfall=6.00"

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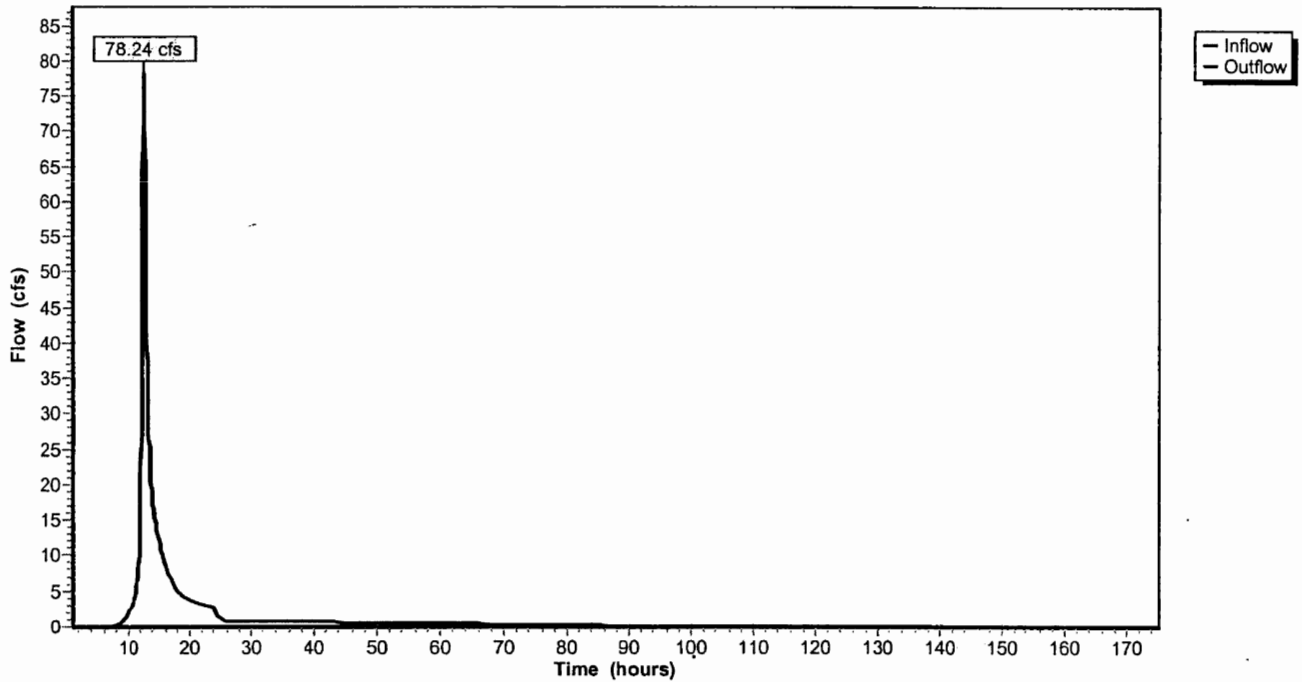
## Reach Design Point 3:

Inflow Area = 49.900 ac, Inflow Depth = 3.66" for 25-year event  
Inflow = 78.24 cfs @ 12.61 hrs, Volume= 15.222 af  
Outflow = 78.24 cfs @ 12.61 hrs, Volume= 15.222 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs

## Reach Design Point 3:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 100-year Rainfall=7.50"

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## Subcatchment 1.1S:

Runoff = 154.40 cfs @ 12.27 hrs, Volume= 16.812 af, Depth= 5.85"

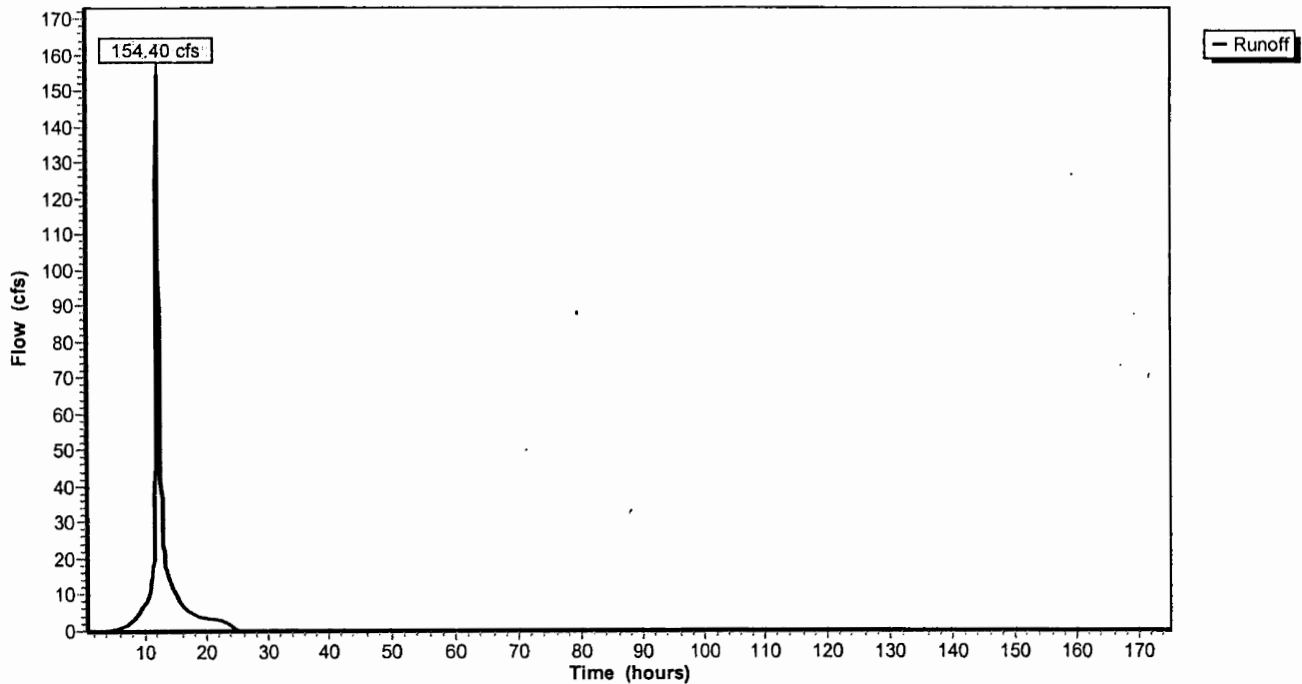
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-year Rainfall=7.50"

Area (ac)	CN	Description
26.000	90	Suburban Shopping Center
6.000	70	Woods, Good, HSG C
1.500	79	1 acre lots, 20% imp, HSG C
1.000	74	>75% Grass cover, Good, HSG C
34.500	86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

## Subcatchment 1.1S:

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 100-year Rainfall=7.50"

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**Subcatchment 1.2S:**

Runoff = 5.25 cfs @ 12.08 hrs, Volume= 0.373 af, Depth= 4.48"

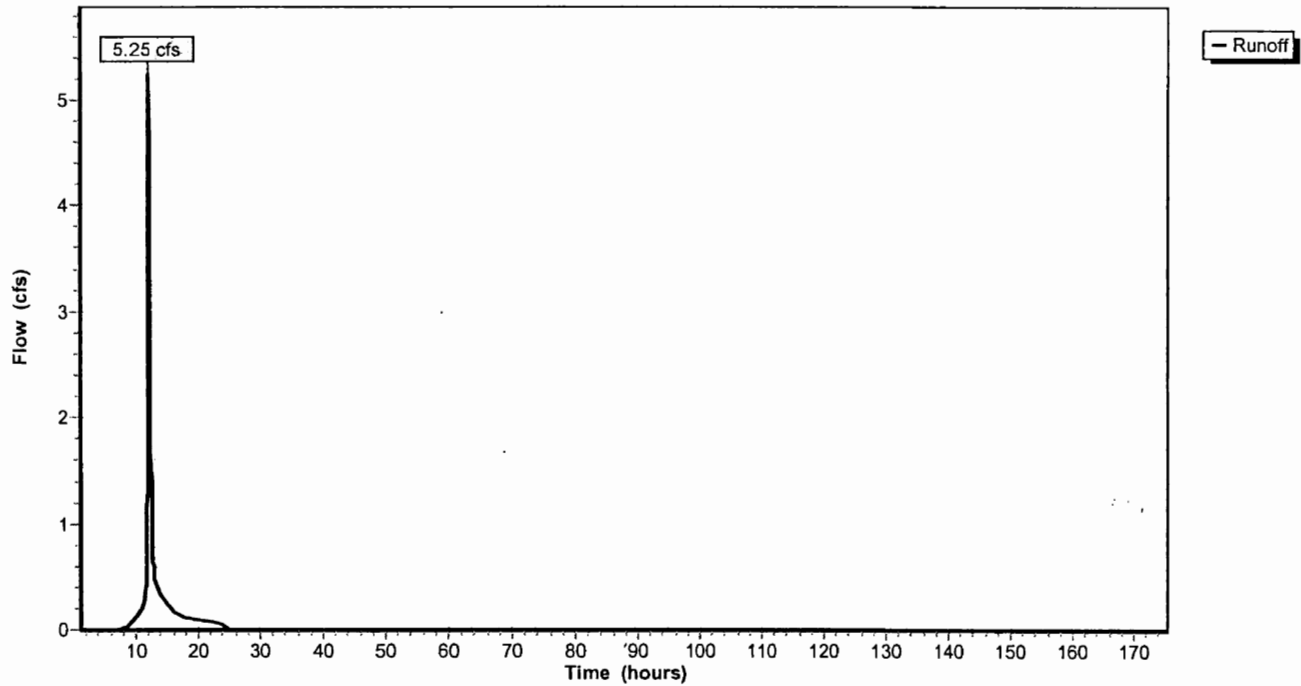
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-year Rainfall=7.50"

Area (ac)	CN	Description
1.000	74	>75% Grass cover, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

**Subcatchment 1.2S:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 100-year Rainfall=7.50"

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## Subcatchment 1.3S:

Runoff = 52.45 cfs @ 12.27 hrs, Volume= 5.684 af, Depth= 5.73"

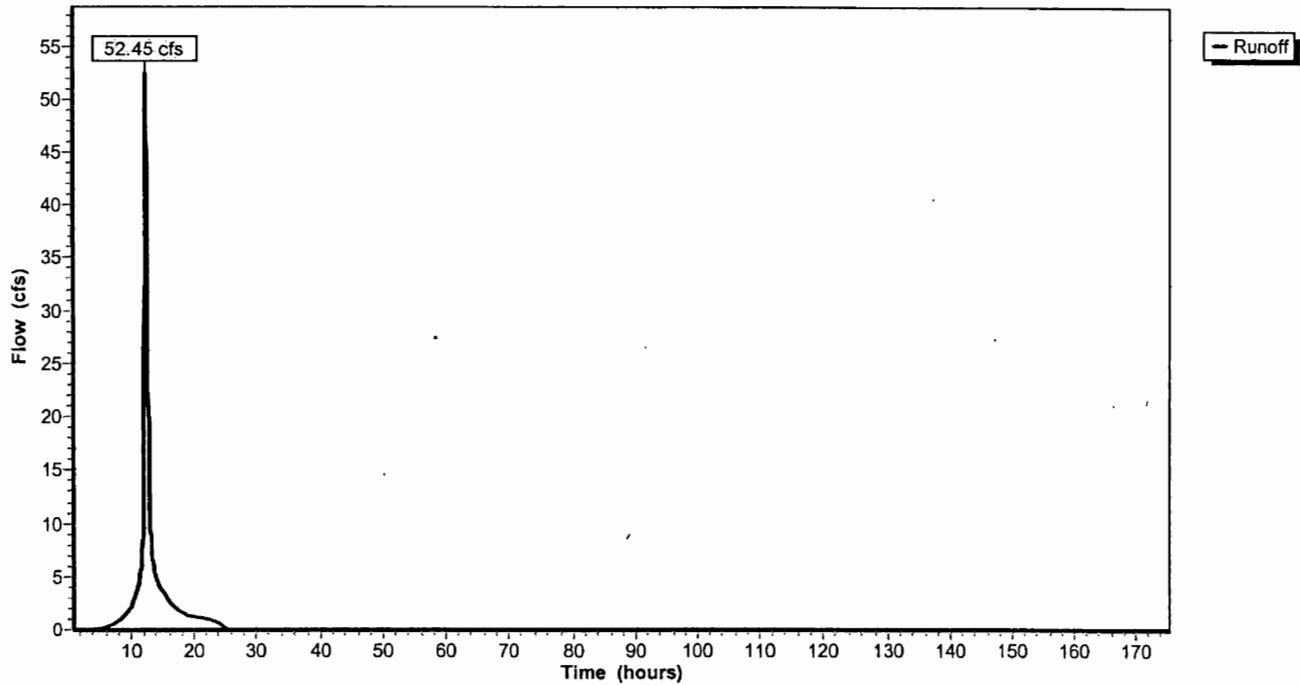
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-year Rainfall=7.50"

Area (ac)	CN	Description
7.400	90	Suburban Shopping Center
3.000	79	1 acre lots, 20% imp, HSG C
1.500	74	>75% Grass cover, Good, HSG C
11.900	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

## Subcatchment 1.3S:

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 100-year Rainfall=7.50"

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**Subcatchment 1.4S:**

Runoff = 5.25 cfs @ 12.08 hrs, Volume= 0.373 af, Depth= 4.48"

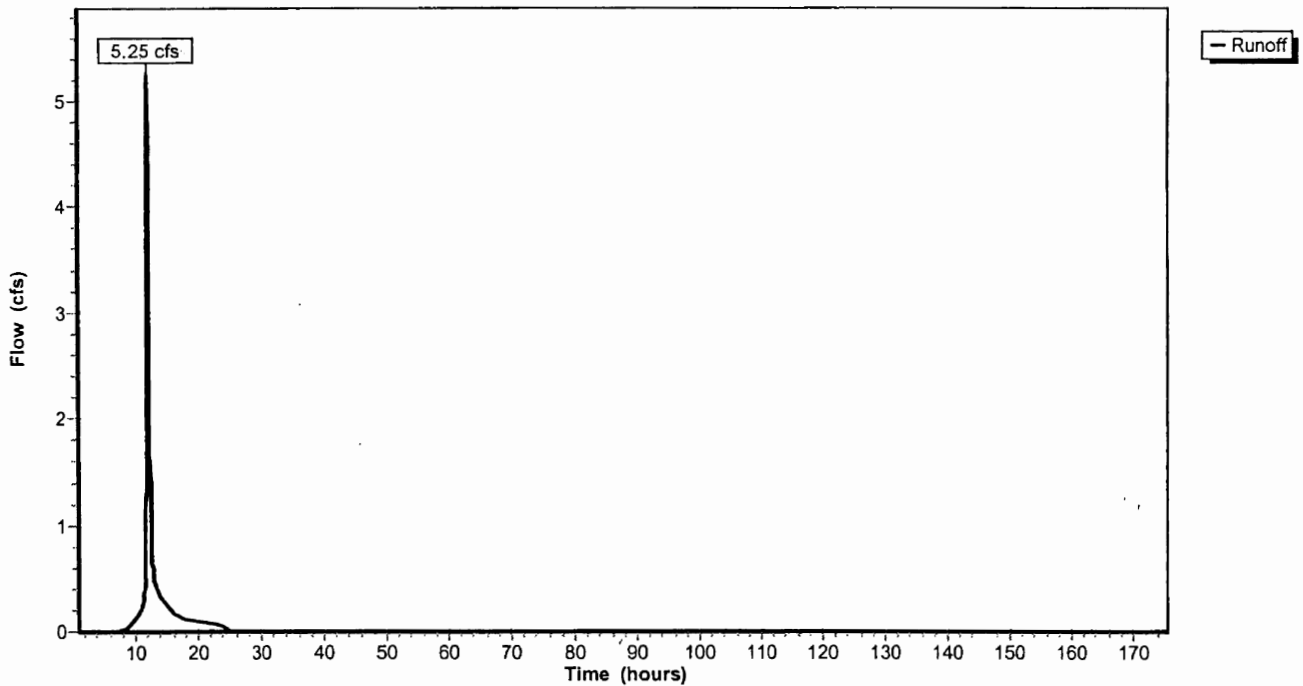
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-year Rainfall=7.50"

Area (ac)	CN	Description
1.000	74	>75% Grass cover, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

**Subcatchment 1.4S:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 100-year Rainfall=7.50"

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## Pond 1.1P:

Inflow Area = 34.500 ac, Inflow Depth = 5.85" for 100-year event  
Inflow = 152.22 cfs @ 12.27 hrs, Volume= 16.812 af  
Outflow = 142.84 cfs @ 12.35 hrs, Volume= 15.960 af, Atten= 6%, Lag= 4.6 min  
Primary = 64.26 cfs @ 12.35 hrs, Volume= 12.638 af  
Secondary = 78.57 cfs @ 12.35 hrs, Volume= 3.322 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Peak Elev= 782.90' @ 12.35 hrs Surf.Area= 45,963 sf Storage= 188,726 cf  
Plug-Flow detention time= 508.1 min calculated for 15.960 af (95% of inflow)  
Center-of-Mass det. time= 479.7 min ( 1,283.2 - 803.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	774.00'	239,800 cf	<b>Custom Stage Data (Prismatic)</b> listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
774.00	2,800	0	0
776.00	8,500	11,300	11,300
778.00	15,000	23,500	34,800
780.00	27,000	42,000	76,800
782.00	43,500	70,500	147,300
784.00	49,000	92,500	239,800

Device	Routing	Invert	Outlet Devices
#1	Primary	778.00'	<b>3.5" Vert. Orifice/Grate</b> C= 0.300
#2	Primary	781.10'	<b>8.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Secondary	782.00'	<b>28.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=64.24 cfs @ 12.35 hrs HW=782.90' (Free Discharge)

↑1=Orifice/Grate (Orifice Controls 0.35 cfs @ 5.2 fps)

↑2=Broad-Crested Rectangular Weir (Weir Controls 63.89 cfs @ 4.4 fps)

**Secondary OutFlow** Max=78.49 cfs @ 12.35 hrs HW=782.90' (Free Discharge)

↑3=Broad-Crested Rectangular Weir (Weir Controls 78.49 cfs @ 3.1 fps)

**Patterson Crossing Post Development**

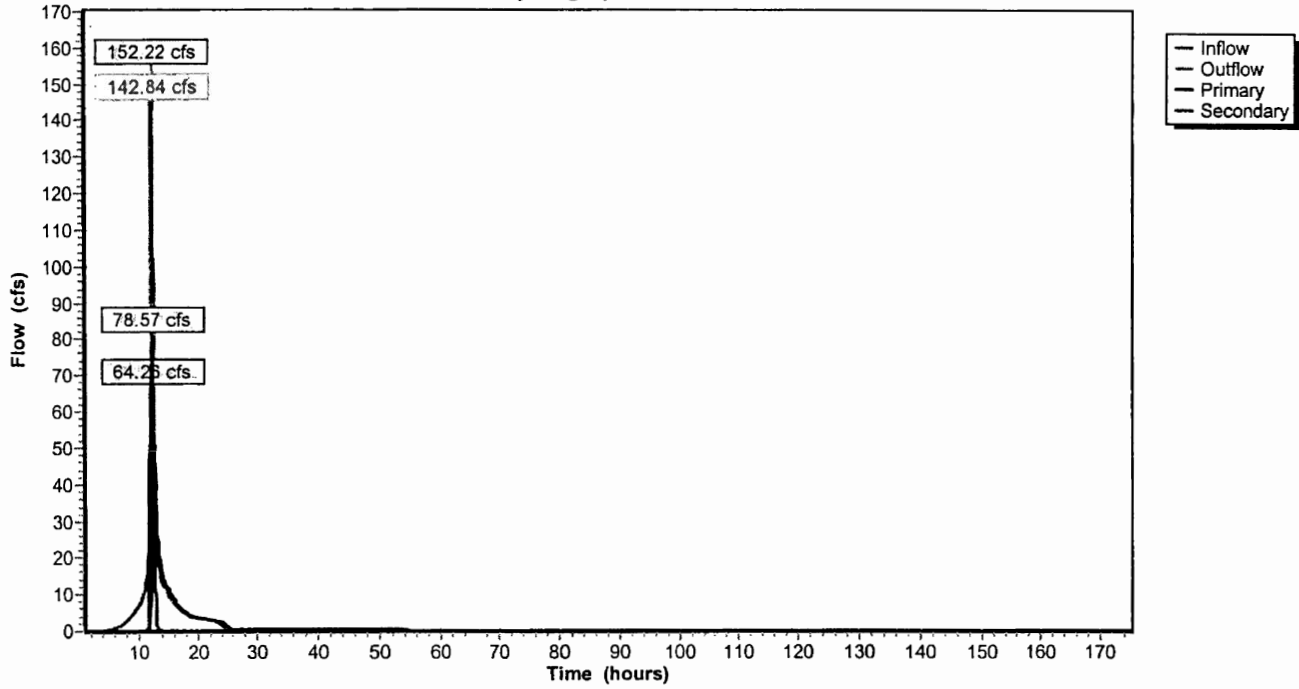
Type III 24-hr 100-year Rainfall=7.50"

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**Pond 1.1P:**

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**Patterson Crossing Post Development**

Type III 24-hr 100-year Rainfall=7.50"

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**Pond 1.2P:**

Inflow Area = 35.500 ac, Inflow Depth > 4.40" for 100-year event  
 Inflow = 66.18 cfs @ 12.35 hrs, Volume= 13.011 af  
 Outflow = 51.51 cfs @ 12.61 hrs, Volume= 13.010 af, Atten= 22%, Lag= 15.9 min  
 Primary = 0.47 cfs @ 12.61 hrs, Volume= 4.101 af  
 Secondary = 51.03 cfs @ 12.61 hrs, Volume= 8.910 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Peak Elev= 773.83' @ 12.61 hrs Surf.Area= 20,748 sf Storage= 101,122 cf  
 Plug-Flow detention time= 613.2 min calculated for 13.010 af (100% of inflow)  
 Center-of-Mass det. time= 612.4 min ( 2,019.1 - 1,406.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	766.00'	126,400 cf	<b>Custom Stage Data (Prismatic)</b> , listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
766.00	3,800	0	0
768.00	8,700	12,500	12,500
770.00	13,100	21,800	34,300
772.00	18,000	31,100	65,400
774.00	21,000	39,000	104,400
775.00	23,000	22,000	126,400

Device	Routing	Invert	Outlet Devices
#1	Primary	765.00'	<b>3.5" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	772.50'	<b>10.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.47 cfs @ 12.61 hrs HW=773.83' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.47 cfs @ 7.1 fps)

**Secondary OutFlow** Max=50.87 cfs @ 12.61 hrs HW=773.83' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 50.87 cfs @ 3.8 fps)

**Patterson Crossing Post Development**

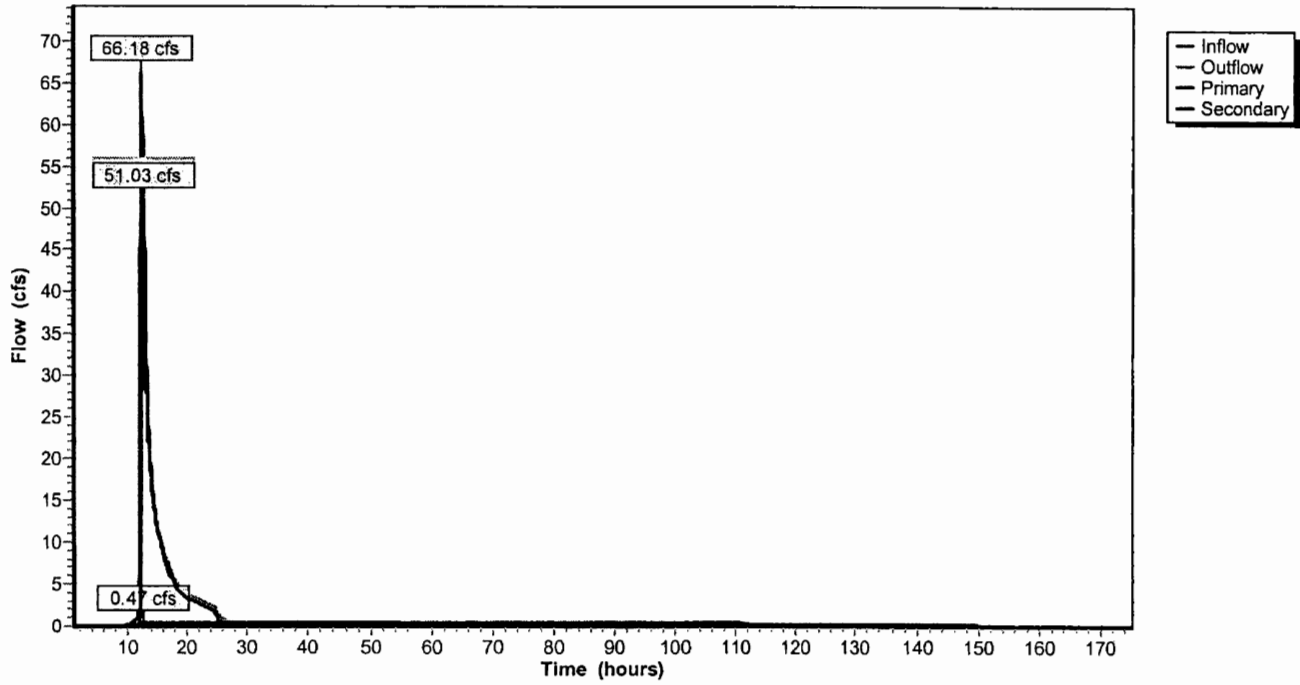
Type III 24-hr 100-year Rainfall=7.50"

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**Pond 1.2P:**

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 100-year Rainfall=7.50"

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**Pond 1.3P:**

Inflow Area = 11.900 ac, Inflow Depth = 5.73" for 100-year event  
 Inflow = 52.85 cfs @ 12.26 hrs, Volume= 5.684 af  
 Outflow = 18.09 cfs @ 12.72 hrs, Volume= 5.668 af, Atten= 66%, Lag= 27.2 min  
 Primary = 0.41 cfs @ 12.72 hrs, Volume= 3.010 af  
 Secondary = 17.67 cfs @ 12.72 hrs, Volume= 2.659 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 764.00' Surf.Area= 3,200 sf Storage= 7,900 cf  
 Peak Elev= 770.77' @ 12.72 hrs Surf.Area= 28,384 sf Storage= 140,457 cf (132,557 cf above start)  
 Plug-Flow detention time= 1,748.7 min calculated for 5.487 af (97% of inflow)  
 Center-of-Mass det. time= 1,669.7 min ( 2,475.0 - 805.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	760.00'	176,100 cf	<b>Custom Stage Data (Prismatic)</b> listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
760.00	900	0	0
762.00	1,900	2,800	2,800
764.00	3,200	5,100	7,900
766.00	18,500	21,700	29,600
768.00	21,800	40,300	69,900
770.00	26,500	48,300	118,200
772.00	31,400	57,900	176,100

Device	Routing	Invert	Outlet Devices
#1	Primary	764.00'	<b>3.5" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	770.00'	<b>8.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.41 cfs @ 12.72 hrs HW=770.77' (Free Discharge)  
 ↳1=Orifice/Grate (Orifice Controls 0.41 cfs @ 6.2 fps)

**Secondary OutFlow** Max=17.52 cfs @ 12.72 hrs HW=770.77' (Free Discharge)  
 ↳2=Broad-Crested Rectangular Weir (Weir Controls 17.52 cfs @ 2.9 fps)

**Patterson Crossing Post Development**

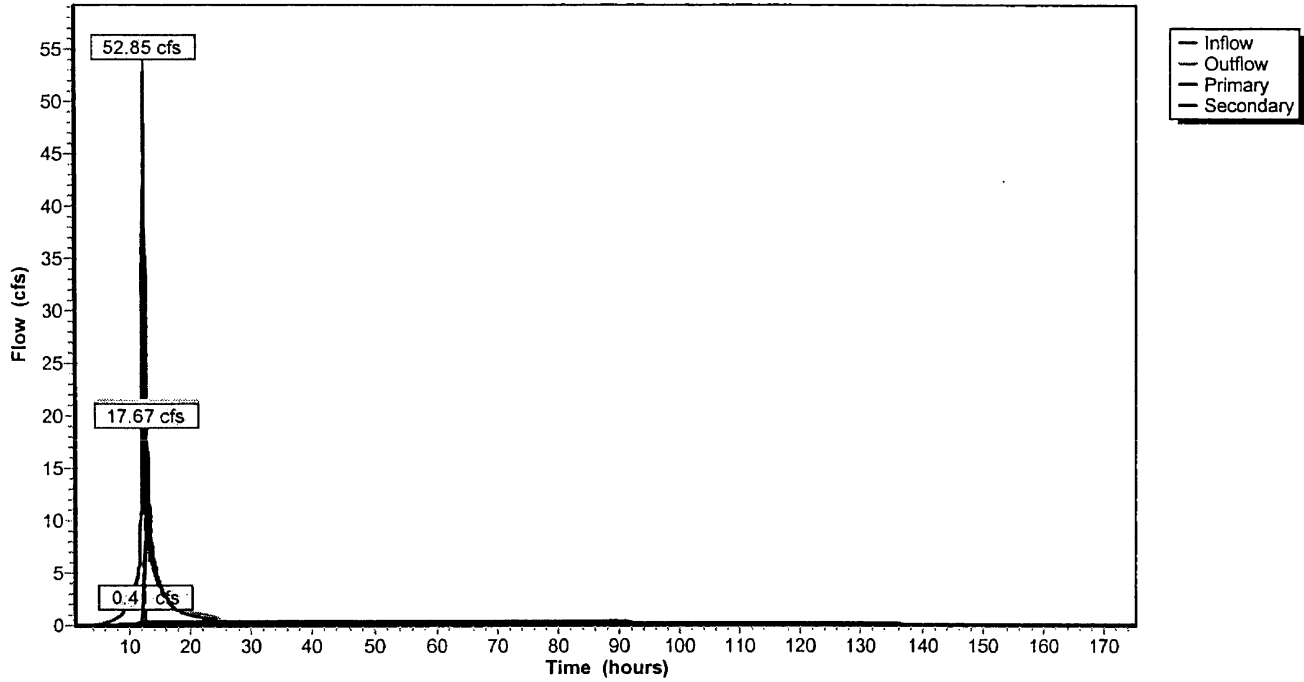
Type III 24-hr 100-year Rainfall=7.50"

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**Pond 1.3P:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 100-year Rainfall=7.50"

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## Pond 1.4P:

Inflow Area = 48.400 ac, Inflow Depth > 4.72" for 100-year event  
Inflow = 69.01 cfs @ 12.65 hrs, Volume= 19.052 af  
Outflow = 49.01 cfs @ 13.01 hrs, Volume= 18.610 af, Atten= 29%, Lag= 21.6 min  
Primary = 0.65 cfs @ 13.01 hrs, Volume= 6.659 af  
Secondary = 48.36 cfs @ 13.01 hrs, Volume= 11.952 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Starting Elev= 760.00' Surf.Area= 30,000 sf Storage= 100,800 cf  
Peak Elev= 762.94' @ 13.01 hrs Surf.Area= 37,990 sf Storage= 202,152 cf (101,352 cf above start)  
Plug-Flow detention time= 1,544.5 min calculated for 16.296 af (86% of inflow)  
Center-of-Mass det. time= 521.5 min ( 2,652.6 - 2,131.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	754.00'	242,600 cf	<b>Custom Stage Data (Prismatic)</b> Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
754.00	4,800	0	0
756.00	12,500	17,300	17,300
758.00	20,500	33,000	50,300
760.00	30,000	50,500	100,800
762.00	35,500	65,500	166,300
764.00	40,800	76,300	242,600

Device	Routing	Invert	Outlet Devices
#1	Primary	760.00'	<b>5.5" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	762.00'	<b>16.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.65 cfs @ 13.01 hrs HW=762.94' (Free Discharge)  
↑1=Orifice/Grate (Orifice Controls 0.65 cfs @ 4.0 fps)

**Secondary OutFlow** Max=48.21 cfs @ 13.01 hrs HW=762.94' (Free Discharge)  
↑2=Broad-Crested Rectangular Weir (Weir Controls 48.21 cfs @ 3.2 fps)

**Patterson Crossing Post Development**

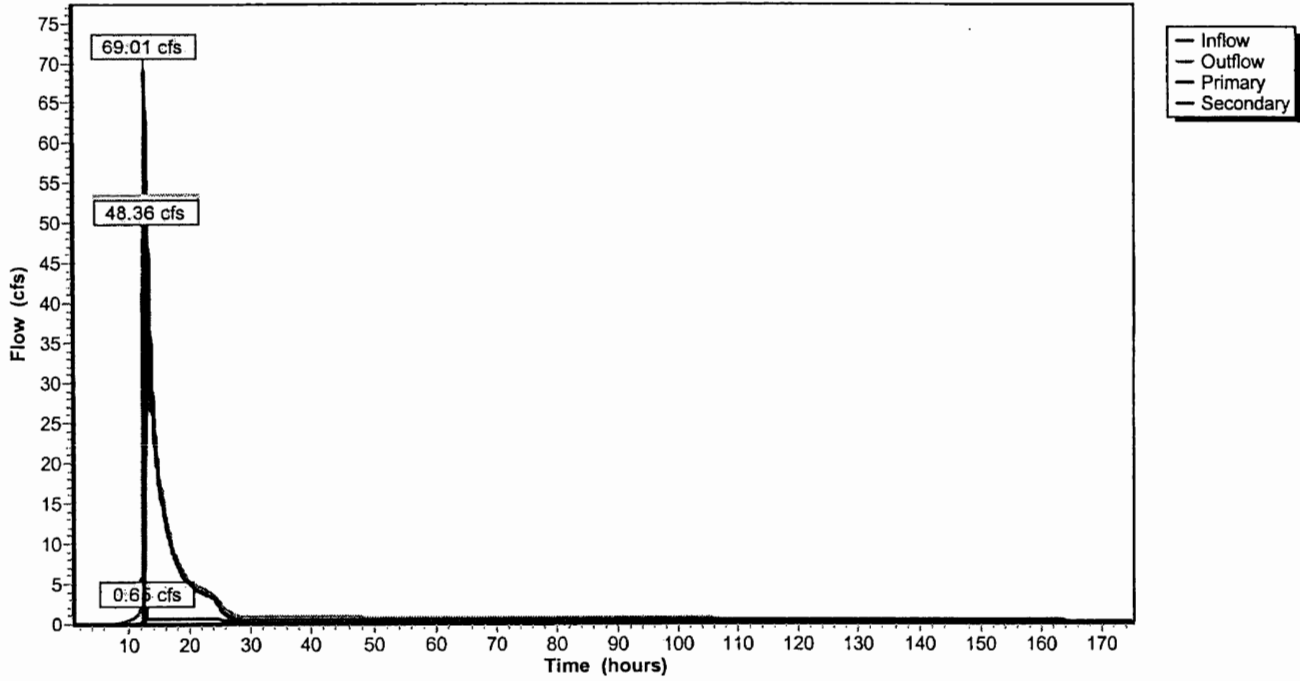
Type III 24-hr 100-year Rainfall=7.50"

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**Pond 1.4P:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 100-year Rainfall=7.50"

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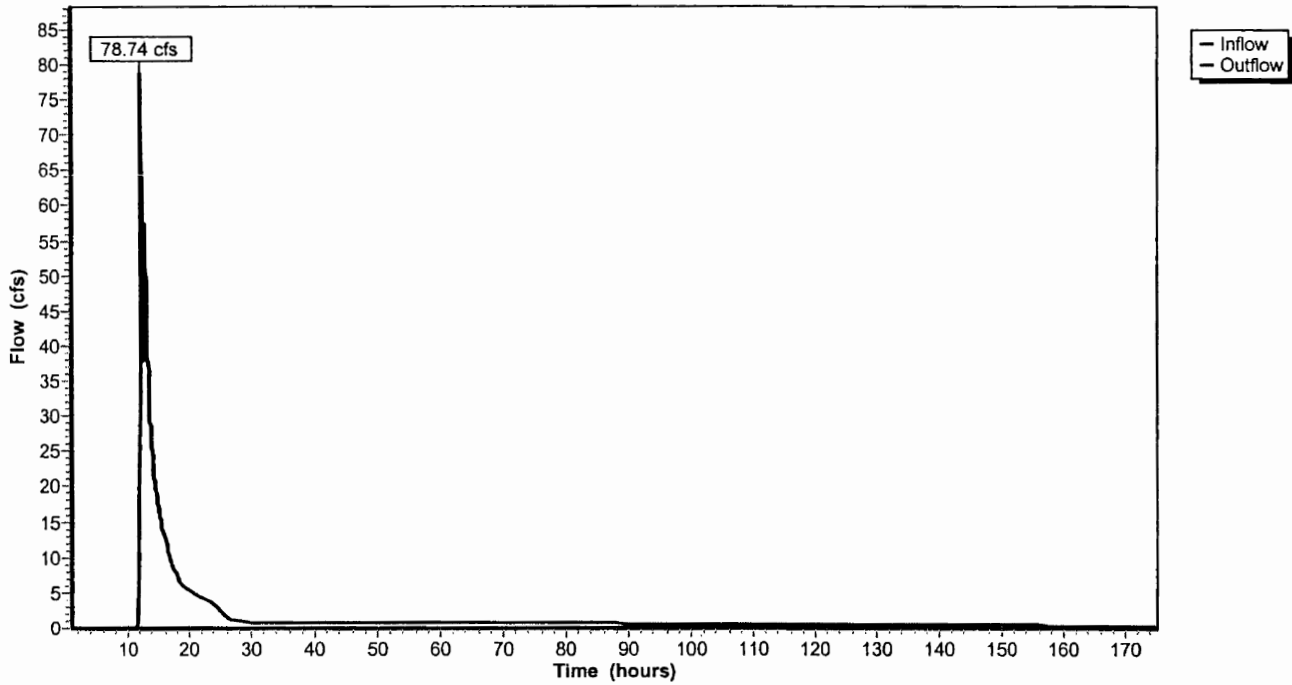
## Reach Design Line 1:

Inflow Area = 48.400 ac, Inflow Depth > 5.44" for 100-year event  
Inflow = 78.74 cfs @ 12.35 hrs, Volume= 21.933 af  
Outflow = 78.74 cfs @ 12.35 hrs, Volume= 21.933 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs

## Reach Design Line 1:

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 100-year Rainfall=7.50"

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**Subcatchment 2.0S:**

Runoff = 88.15 cfs @ 12.28 hrs, Volume= 9.333 af, Depth= 4.15"

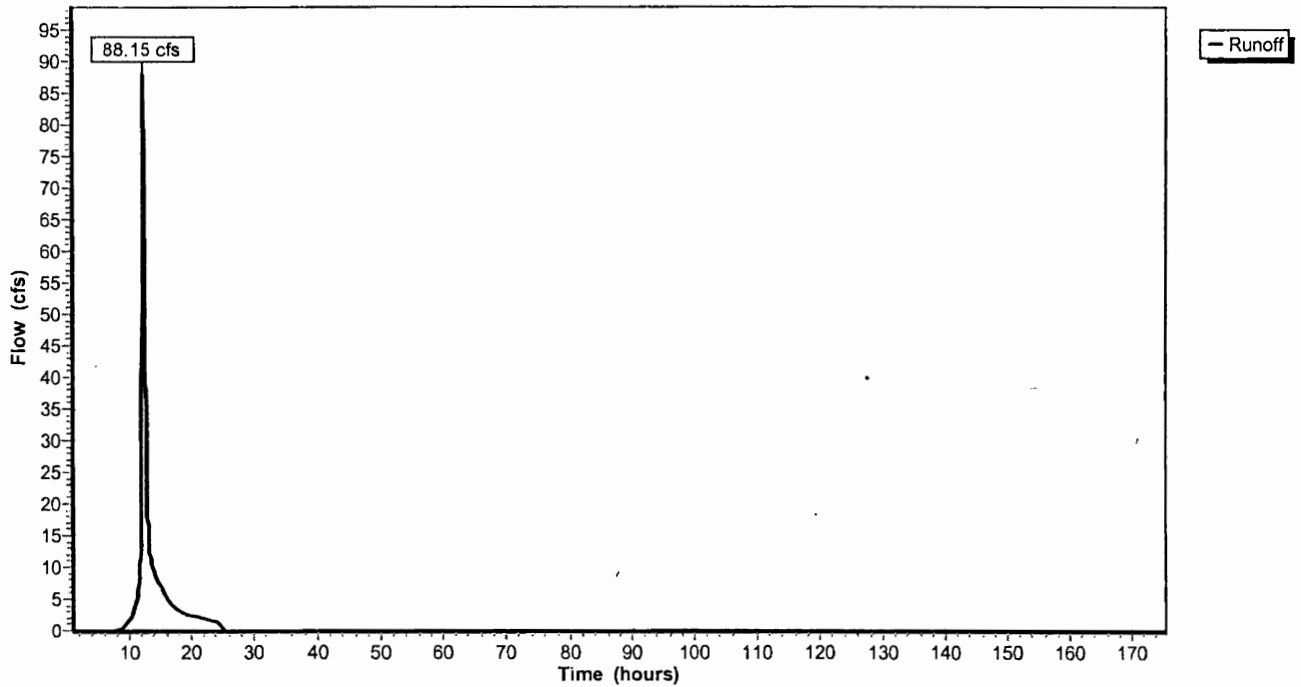
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-year Rainfall=7.50"

Area (ac)	CN	Description
17.500	70	Woods, Good, HSG C
9.500	74	>75% Grass cover, Good, HSG C
27.000	71	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

**Subcatchment 2.0S:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 100-year Rainfall=7.50"

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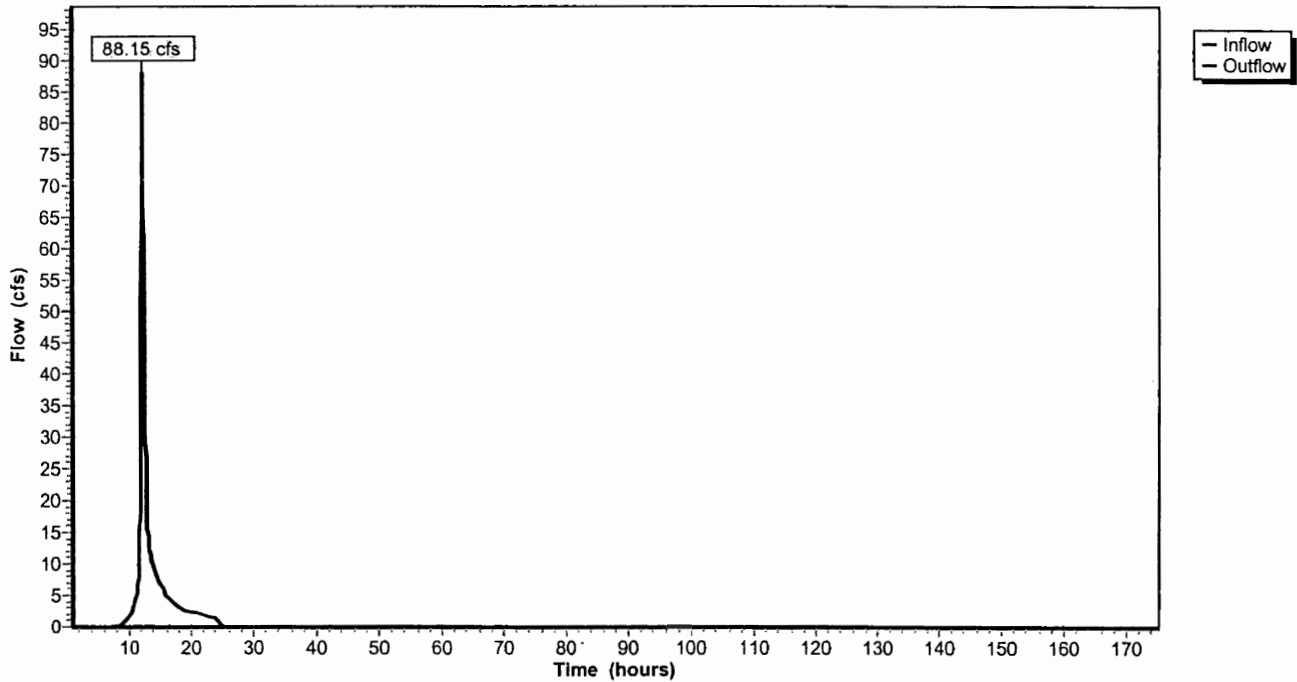
## Reach Design Point 2:

Inflow Area = 27.000 ac, Inflow Depth = 4.15" for 100-year event  
Inflow = 88.15 cfs @ 12.28 hrs, Volume= 9.333 af  
Outflow = 88.15 cfs @ 12.28 hrs, Volume= 9.333 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs

## Reach Design Point 2:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 100-year Rainfall=7.50"

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## Subcatchment 3.1S:

Runoff = 38.15 cfs @ 12.20 hrs, Volume= 3.667 af, Depth= 5.50"

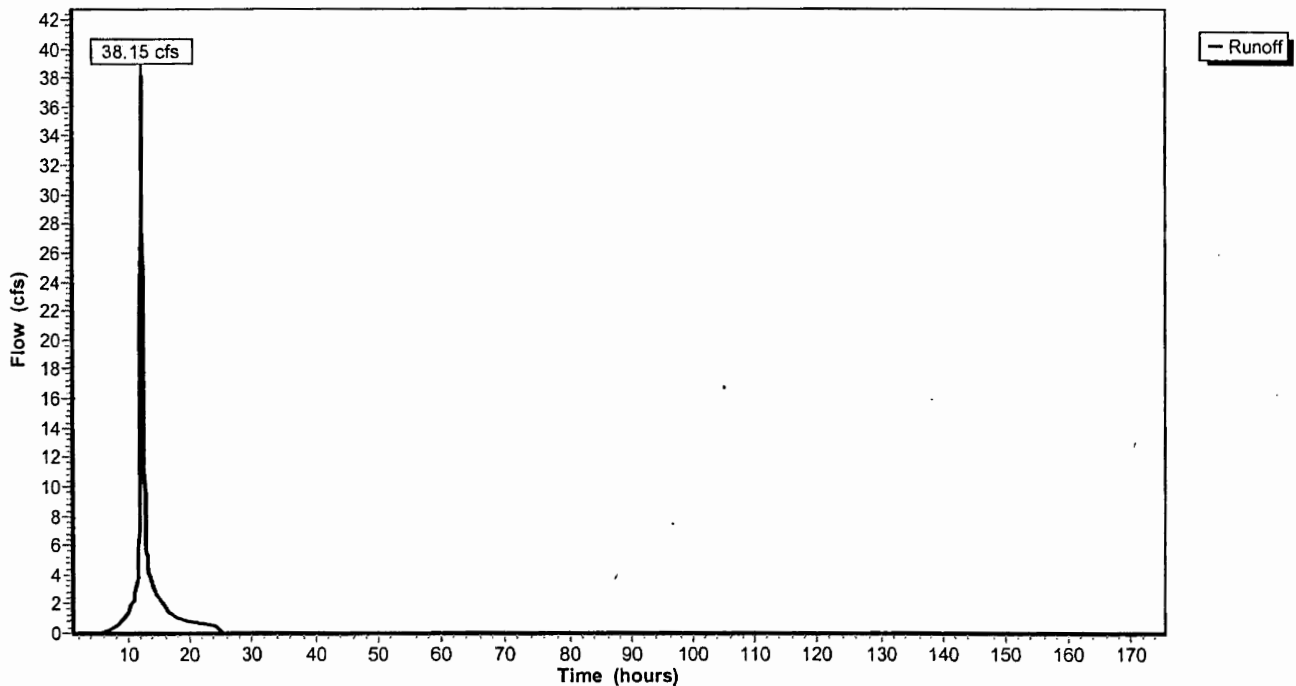
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-year Rainfall=7.50"

Area (ac)	CN	Description
5.000	90	Suburban Shopping Center
3.000	70	Woods, Good, HSG C
8.000	83	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry,

## Subcatchment 3.1S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 100-year Rainfall=7.50"

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## Subcatchment 3.2S:

Runoff = 32.61 cfs @ 12.27 hrs, Volume= 3.450 af, Depth= 4.71"

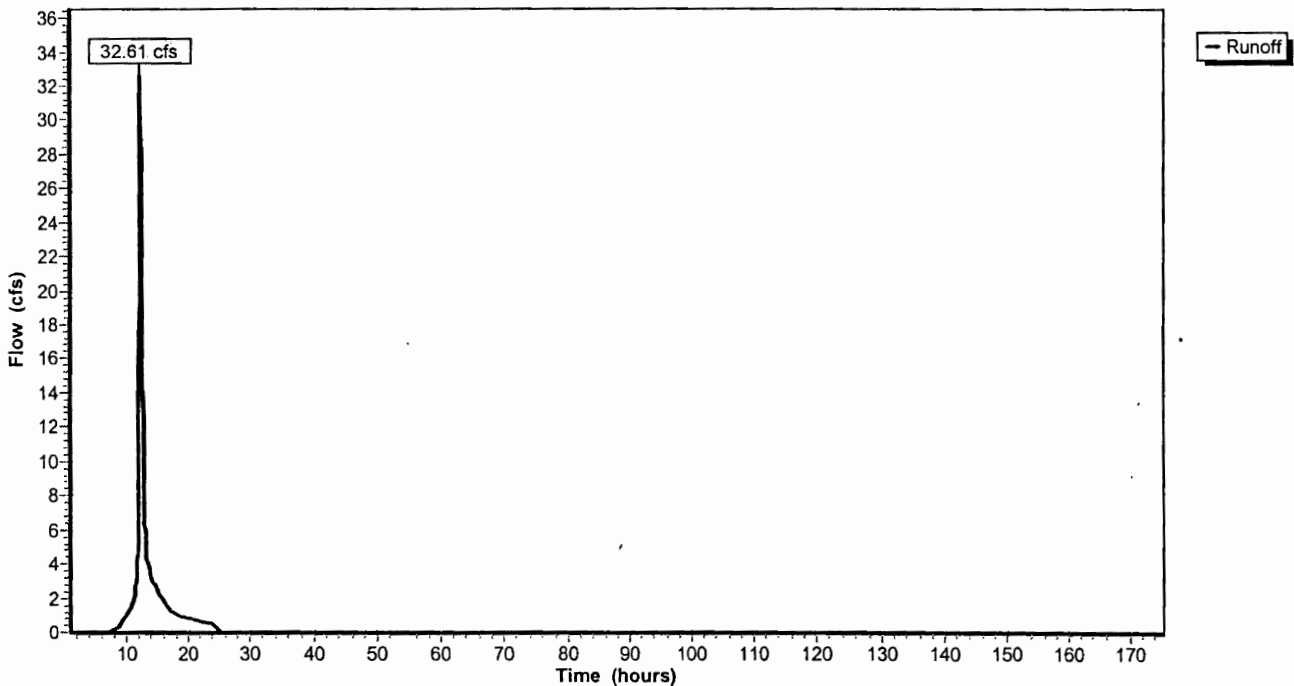
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-year Rainfall=7.50"

Area (ac)	CN	Description
3.100	74	>75% Grass cover, Good, HSG C
3.900	70	Woods, Good, HSG C
1.800	90	Suburban Shopping Center
8.800	76	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

## Subcatchment 3.2S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 100-year Rainfall=7.50"

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## Subcatchment 3.3S:

Runoff = 4.82 cfs @ 12.14 hrs, Volume= 0.404 af, Depth= 5.39"

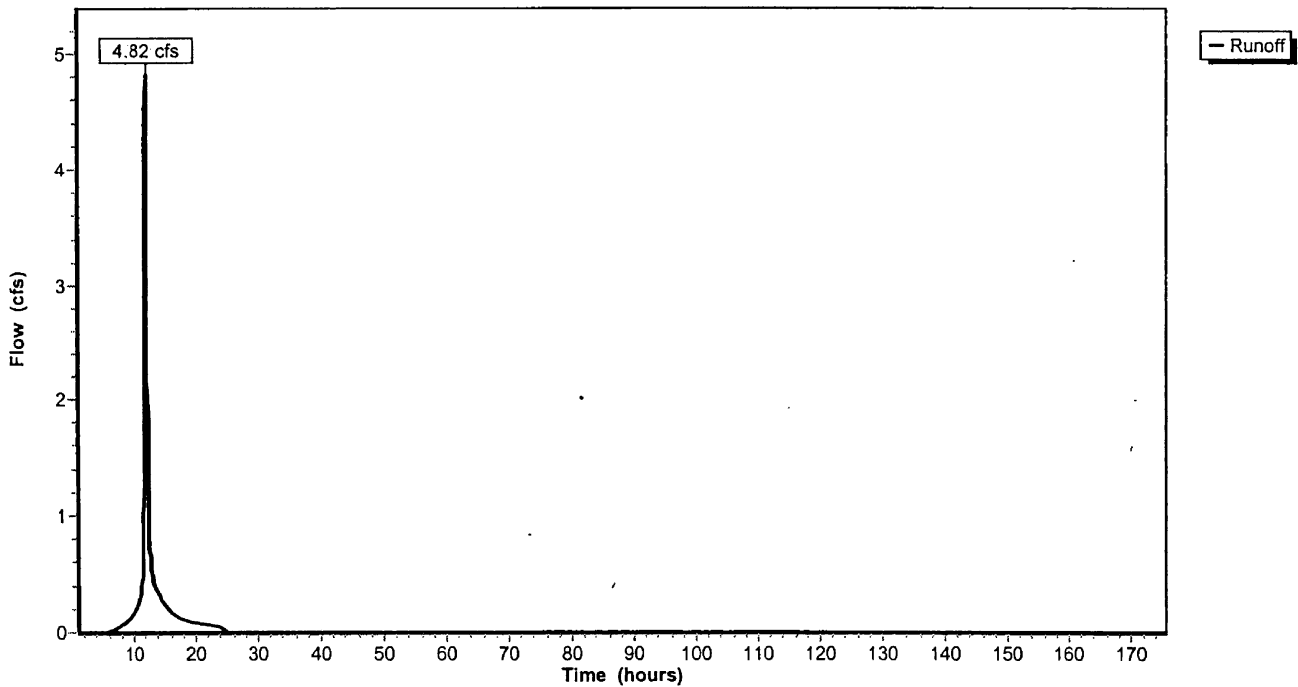
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-year Rainfall=7.50"

Area (ac)	CN	Description
0.300	98	Paved parking & roofs
0.600	74	>75% Grass cover, Good, HSG C
0.900	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

## Subcatchment 3.3S:

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 100-year Rainfall=7.50"

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## Subcatchment 3.4S:

Runoff = 15.57 cfs @ 12.27 hrs, Volume= 1.647 af, Depth= 4.71"

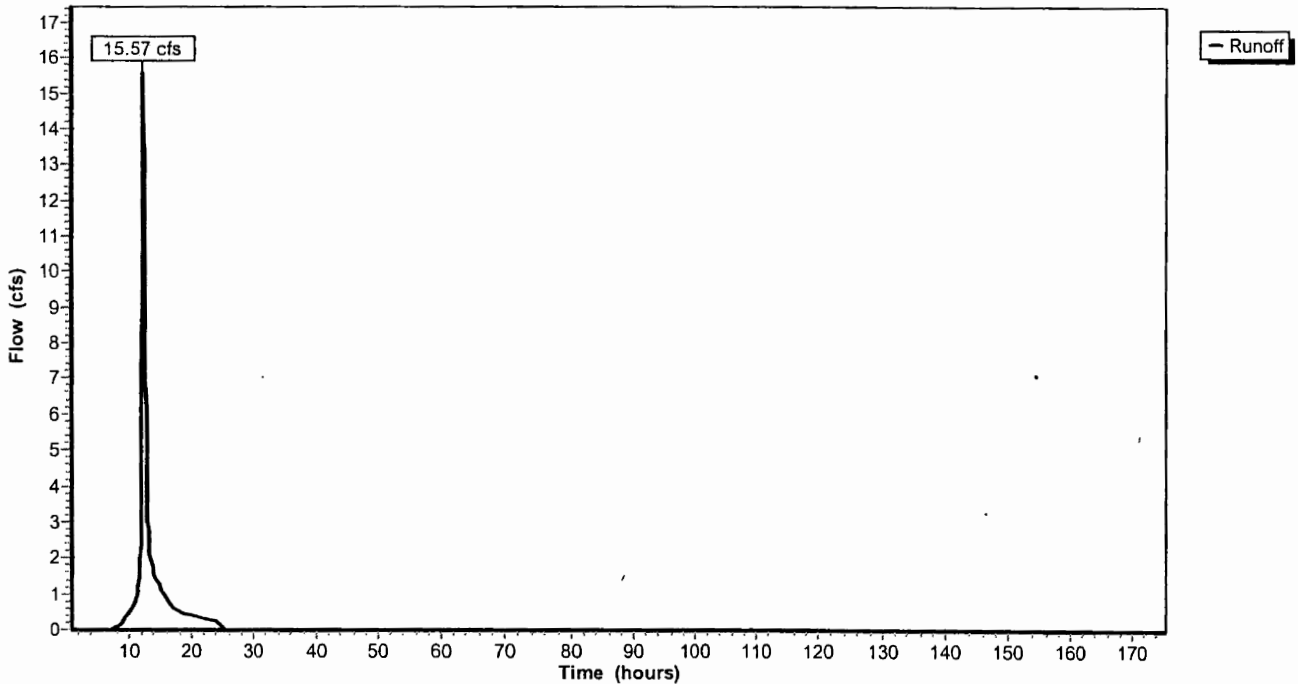
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-year Rainfall=7.50"

Area (ac)	CN	Description
2.800	79	1 acre lots, 20% imp, HSG C
1.400	70	Woods, Good, HSG C
4.200	76	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry,

## Subcatchment 3.4S:

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 100-year Rainfall=7.50"

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**Subcatchment 3.5S:**

Runoff = 2.86 cfs @ 12.15 hrs, Volume= 0.236 af, Depth= 4.04"

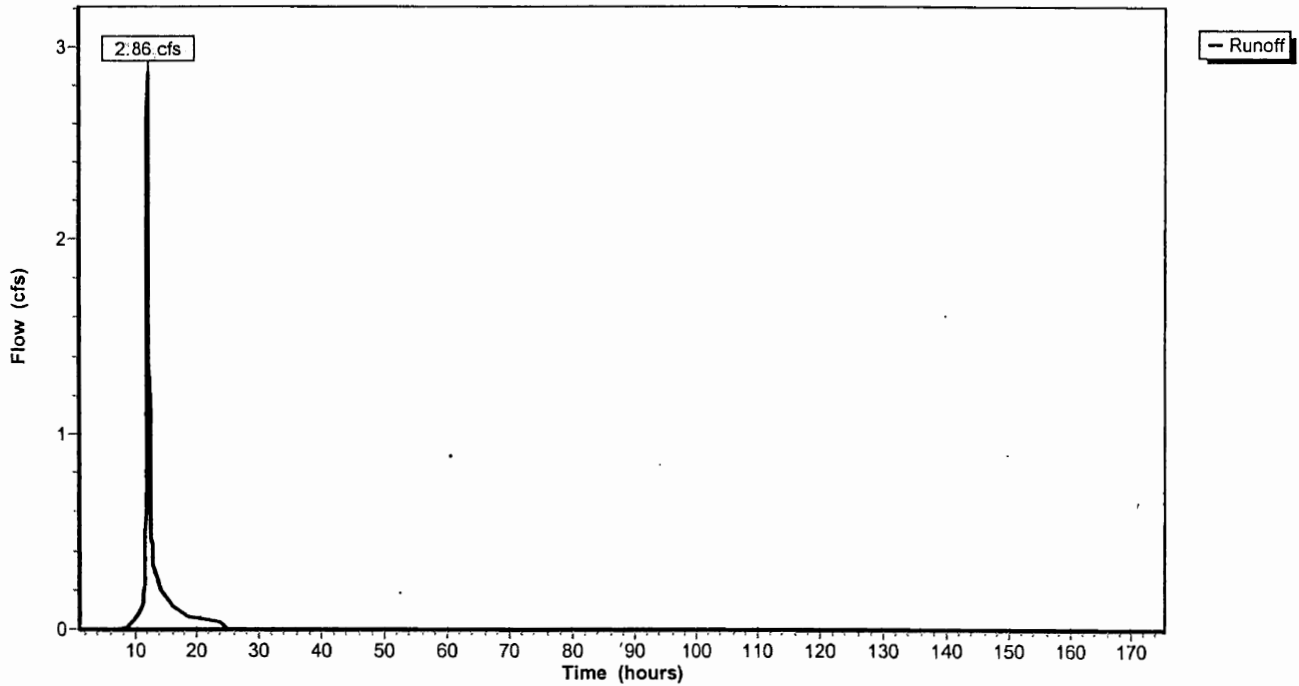
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-year Rainfall=7.50"

Area (ac)	CN	Description
0.700	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

**Subcatchment 3.5S:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 100-year Rainfall=7.50"

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## Subcatchment 3.6S:

Runoff = 78.91 cfs @ 12.54 hrs, Volume= 11.475 af, Depth= 5.04"

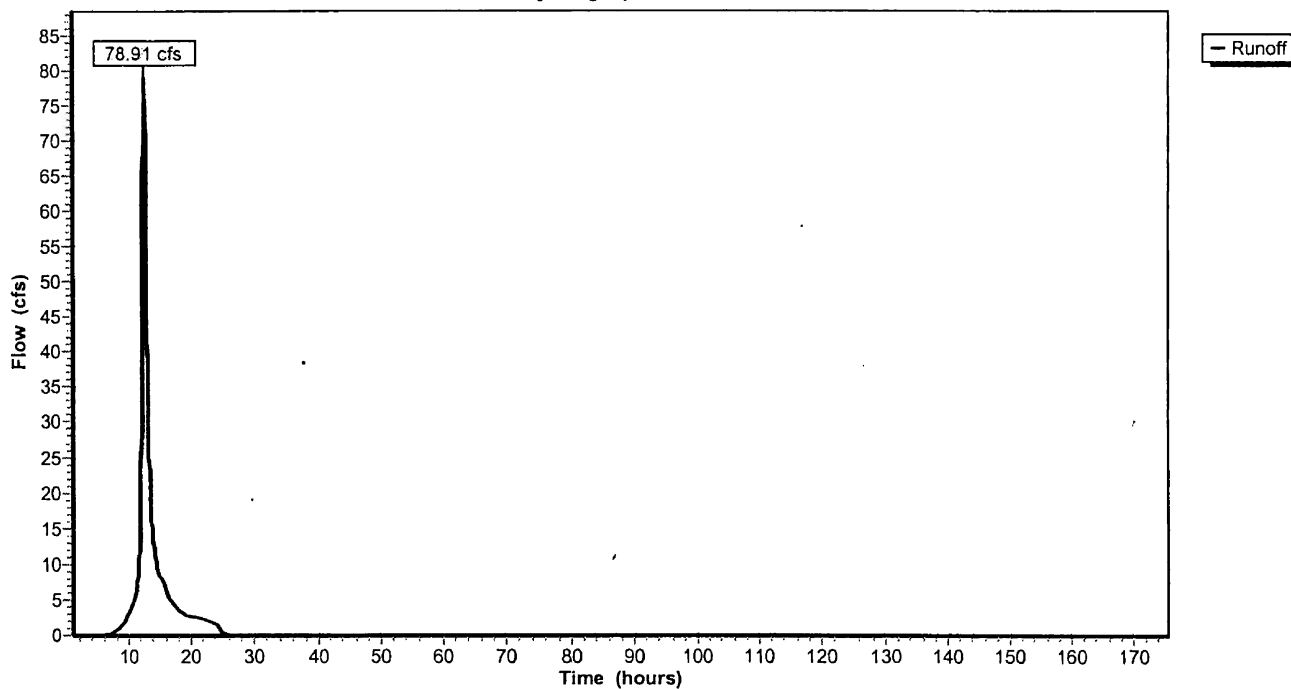
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-year Rainfall=7.50"

Area (ac)	CN	Description
9.300	70	Woods, Good, HSG C
6.700	98	Paved parking & roofs
11.300	74	>75% Grass cover, Good, HSG C
27.300	79	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.0					Direct Entry,

## Subcatchment 3.6S:

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 100-year Rainfall=7.50"

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**Pond 3.1P:**

Inflow Area = 8.000 ac, Inflow Depth = 5.50" for 100-year event  
 Inflow = 38.15 cfs @ 12.20 hrs, Volume= 3.667 af  
 Outflow = 14.08 cfs @ 12.58 hrs, Volume= 3.667 af, Atten= 63%, Lag= 22.9 min  
 Primary = 0.53 cfs @ 12.58 hrs, Volume= 1.653 af  
 Secondary = 13.55 cfs @ 12.58 hrs, Volume= 2.014 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 718.00' Surf.Area= 7,000 sf Storage= 9,900 cf  
 Peak Elev= 723.39' @ 12.58 hrs Surf.Area= 21,821 sf Storage= 85,349 cf (75,449 cf above start)  
 Plug-Flow detention time= 698.5 min calculated for 3.440 af (94% of inflow)  
 Center-of-Mass det. time= 617.5 min ( 1,423.8 - 806.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	714.00'	110,300 cf	<b>Custom Stage Data (Prismatic)</b> Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
714.00	400	0	0
716.00	1,250	1,650	1,650
718.00	7,000	8,250	9,900
720.00	11,600	18,600	28,500
722.00	16,900	28,500	57,000
724.00	24,000	40,900	97,900
724.50	25,600	12,400	110,300

Device	Routing	Invert	Outlet Devices
#1	Primary	718.00'	<b>4.2" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	722.00'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.53 cfs @ 12.58 hrs HW=723.38' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.53 cfs @ 5.5 fps)

**Secondary OutFlow** Max=13.52 cfs @ 12.58 hrs HW=723.38' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 13.52 cfs @ 3.9 fps)

**Patterson Crossing Post Development**

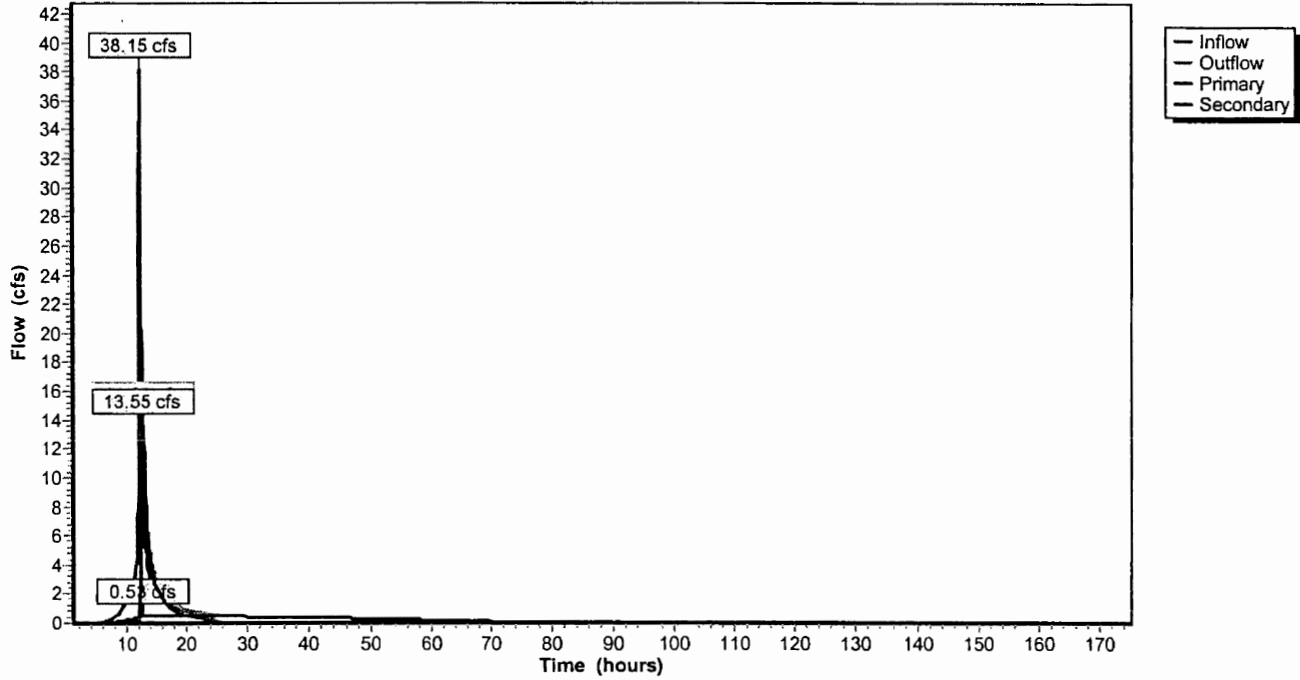
Type III 24-hr 100-year Rainfall=7.50"

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**Pond 3.1P:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 100-year Rainfall=7.50"

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## Pond 3.2P:

Inflow Area = 16.800 ac, Inflow Depth = 5.08" for 100-year event  
Inflow = 40.02 cfs @ 12.34 hrs, Volume= 7.118 af  
Outflow = 35.37 cfs @ 12.51 hrs, Volume= 7.117 af, Atten= 12%, Lag= 10.2 min  
Primary = 0.53 cfs @ 12.51 hrs, Volume= 2.561 af  
Secondary = 34.84 cfs @ 12.51 hrs, Volume= 4.556 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
Starting Elev= 664.00' Surf.Area= 3,900 sf Storage= 9,500 cf  
Peak Elev= 669.03' @ 12.51 hrs Surf.Area= 16,564 sf Storage= 65,729 cf (56,229 cf above start)  
Plug-Flow detention time= 529.6 min calculated for 6.899 af (97% of inflow)  
Center-of-Mass det. time= 411.3 min ( 1,546.1 - 1,134.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	660.00'	81,700 cf	<b>Custom Stage Data (Prismatic)</b> Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
660.00	800	0	0
662.00	2,400	3,200	3,200
664.00	3,900	6,300	9,500
666.00	10,400	14,300	23,800
668.00	14,500	24,900	48,700
670.00	18,500	33,000	81,700

Device	Routing	Invert	Outlet Devices
#1	Primary	664.00'	<b>4.3" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	668.00'	<b>10.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.53 cfs @ 12.51 hrs HW=669.03' (Free Discharge)

↑1=Orifice/Grate (Orifice Controls 0.53 cfs @ 5.3 fps)

**Secondary OutFlow** Max=34.71 cfs @ 12.51 hrs HW=669.03' (Free Discharge)

↑2=Broad-Crested Rectangular Weir (Weir Controls 34.71 cfs @ 3.4 fps)

**Patterson Crossing Post Development**

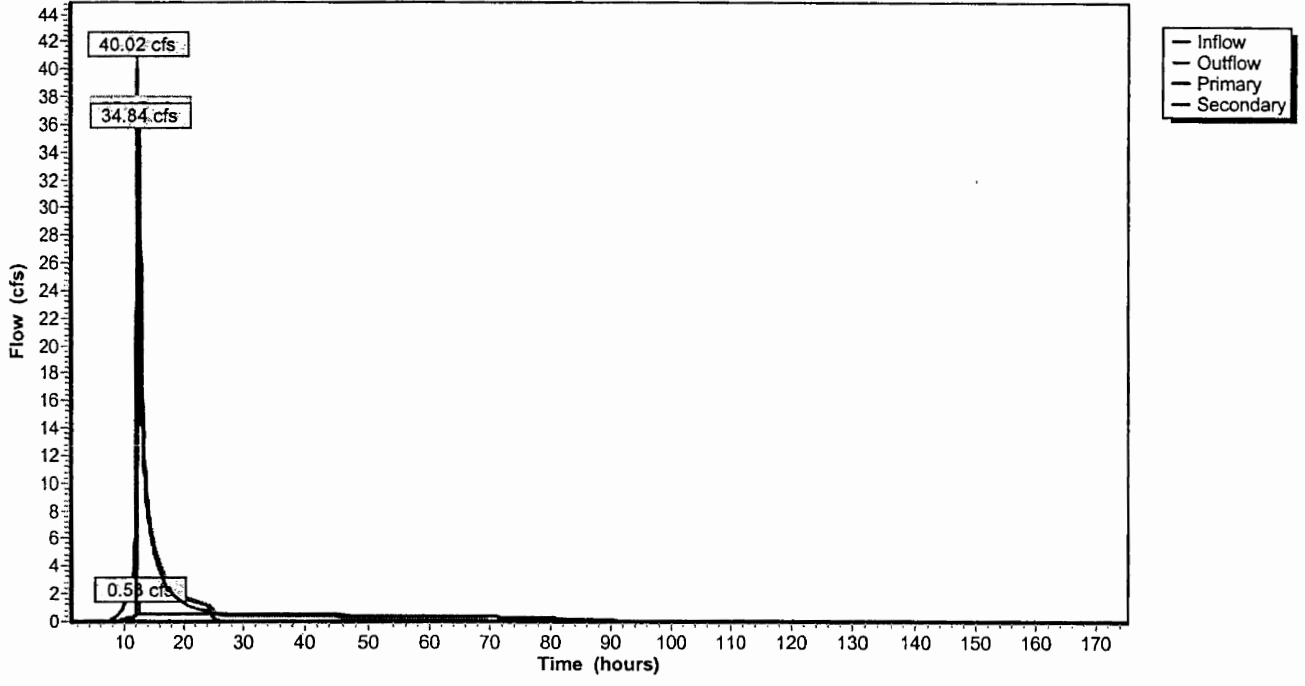
Type III 24-hr 100-year Rainfall=7.50"

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**Pond 3.2P:**

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 100-year Rainfall=7.50"

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**Pond 3.3P:**

Inflow Area = 0.900 ac, Inflow Depth = 5.39" for 100-year event  
 Inflow = 4.82 cfs @ 12.14 hrs, Volume= 0.404 af  
 Outflow = 2.88 cfs @ 12.31 hrs, Volume= 0.404 af, Atten= 40%, Lag= 10.0 min  
 Primary = 0.06 cfs @ 12.31 hrs, Volume= 0.176 af  
 Secondary = 2.83 cfs @ 12.31 hrs, Volume= 0.228 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 662.00' Surf.Area= 1,100 sf Storage= 2,120 cf  
 Peak Elev= 665.02' @ 12.31 hrs Surf.Area= 3,578 sf Storage= 8,938 cf (6,818 cf above start)  
 Plug-Flow detention time= 653.0 min calculated for 0.355 af (88% of inflow)  
 Center-of-Mass det. time= 516.1 min ( 1,320.3 - 804.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	658.00'	12,420 cf	<b>Custom Stage Data (Prismatic)</b> listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
658.00	20	0	0
660.00	500	520	520
662.00	1,100	1,600	2,120
664.00	2,100	3,200	5,320
666.00	5,000	7,100	12,420

Device	Routing	Invert	Outlet Devices
#1	Primary	662.00'	<b>1.6" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	664.50'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.06 cfs @ 12.31 hrs HW=665.02' (Free Discharge)  
 ↑1=**Orifice/Grate** (Orifice Controls 0.06 cfs @ 4.1 fps)

**Secondary OutFlow** Max=2.80 cfs @ 12.31 hrs HW=665.02' (Free Discharge)  
 ↑2=**Broad-Crested Rectangular Weir** (Weir Controls 2.80 cfs @ 2.2 fps)

**Patterson Crossing Post Development**

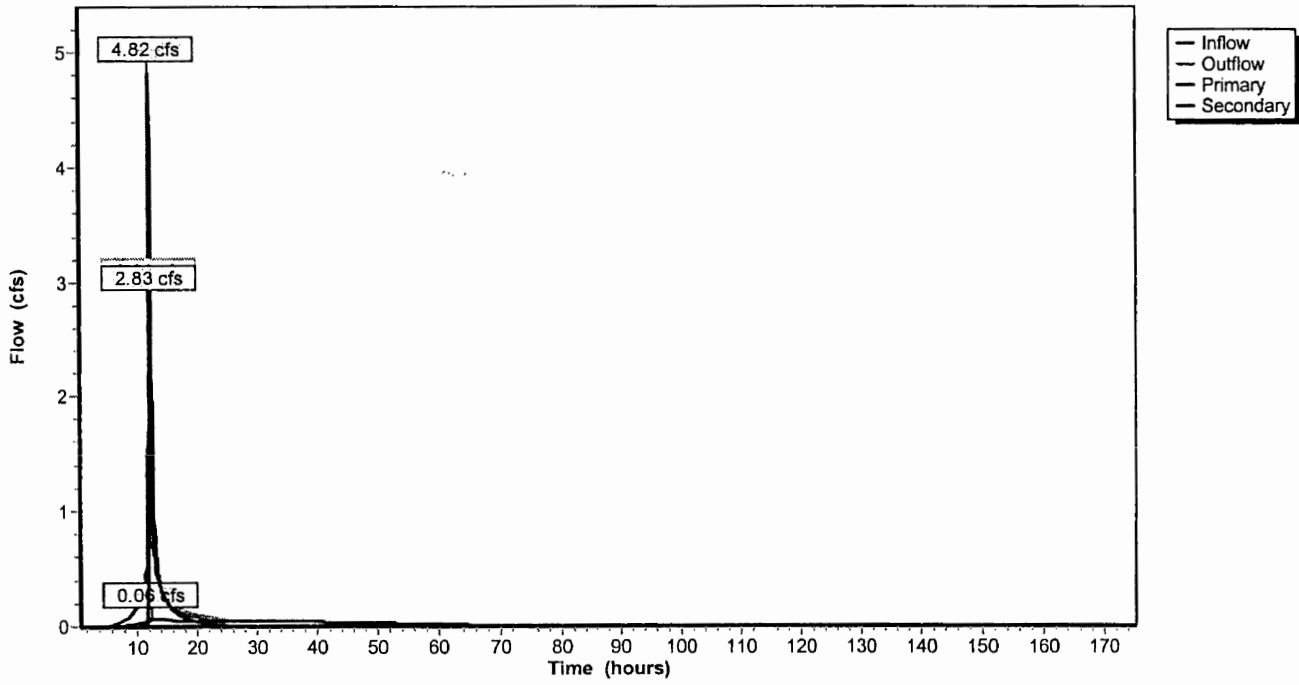
Type III 24-hr 100-year Rainfall=7.50"

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**Pond 3.3P:**

Hydrograph



**Patterson Crossing Post Development**

Type III 24-hr 100-year Rainfall=7.50"

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**Pond 3.4P:**

Inflow Area = 4.200 ac, Inflow Depth = 4.71" for 100-year event  
 Inflow = 15.57 cfs @ 12.27 hrs, Volume= 1.647 af  
 Outflow = 11.30 cfs @ 12.47 hrs, Volume= 1.647 af, Atten= 27%, Lag= 12.0 min  
 Primary = 0.30 cfs @ 12.47 hrs, Volume= 0.768 af  
 Secondary = 11.00 cfs @ 12.47 hrs, Volume= 0.879 af

Routing by Stor-Ind method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs  
 Starting Elev= 756.00' Surf.Area= 6,000 sf Storage= 13,800 cf  
 Peak Elev= 759.01' @ 12.47 hrs Surf.Area= 10,515 sf Storage= 39,407 cf (25,607 cf above start)  
 Plug-Flow detention time= 681.1 min calculated for 1.330 af (81% of inflow)  
 Center-of-Mass det. time= 473.1 min ( 1,300.6 - 827.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	752.00'	49,800 cf	<b>Custom Stage Data (Prismatic)</b> Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
752.00	800	0	0
754.00	3,500	4,300	4,300
756.00	6,000	9,500	13,800
758.00	9,000	15,000	28,800
760.00	12,000	21,000	49,800

Device	Routing	Invert	Outlet Devices
#1	Primary	756.00'	<b>3.7" Vert. Orifice/Grate</b> C= 0.300
#2	Secondary	758.50'	<b>10.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.30 cfs @ 12.47 hrs HW=759.01' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.30 cfs @ 4.1 fps)

**Secondary OutFlow** Max=10.82 cfs @ 12.47 hrs HW=759.01' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 10.82 cfs @ 2.1 fps)

**Patterson Crossing Post Development**

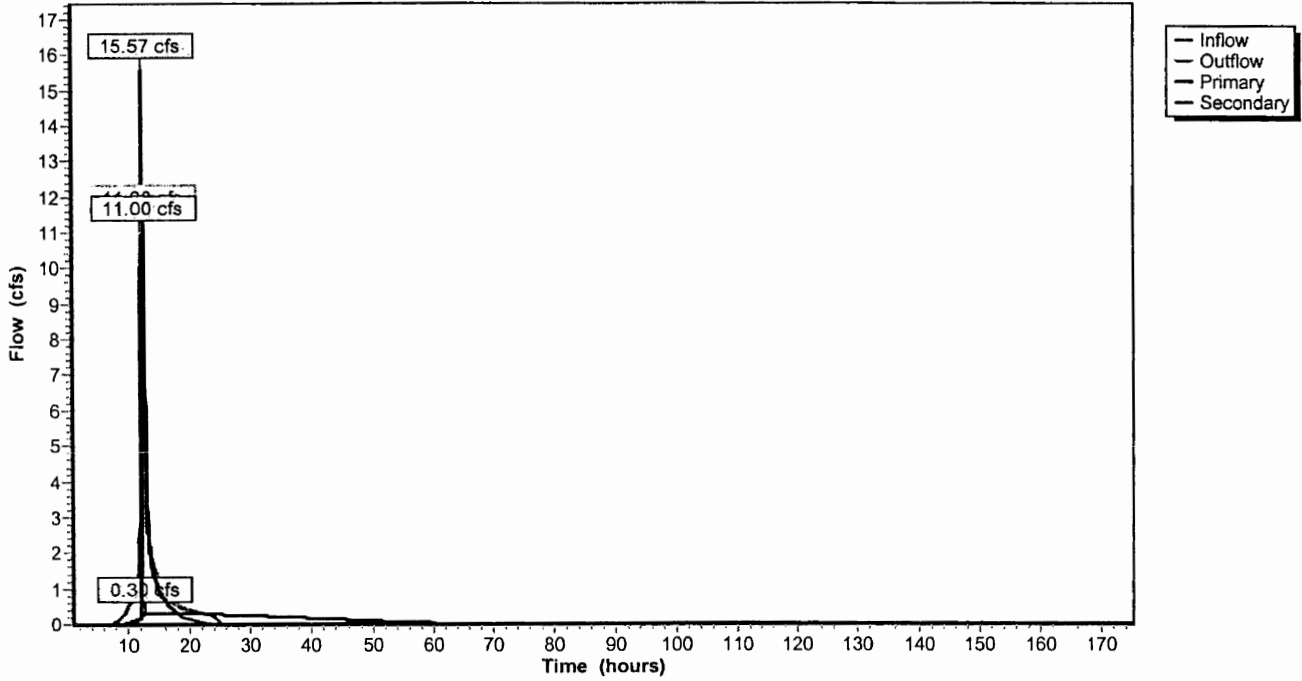
Type III 24-hr 100-year Rainfall=7.50"

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**Pond 3.4P:**

Hydrograph



# Patterson Crossing Post Development

Type III 24-hr 100-year Rainfall=7.50"

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## Reach Design Point 3:

Inflow Area = 49.900 ac, Inflow Depth = 5.02" for 100-year event

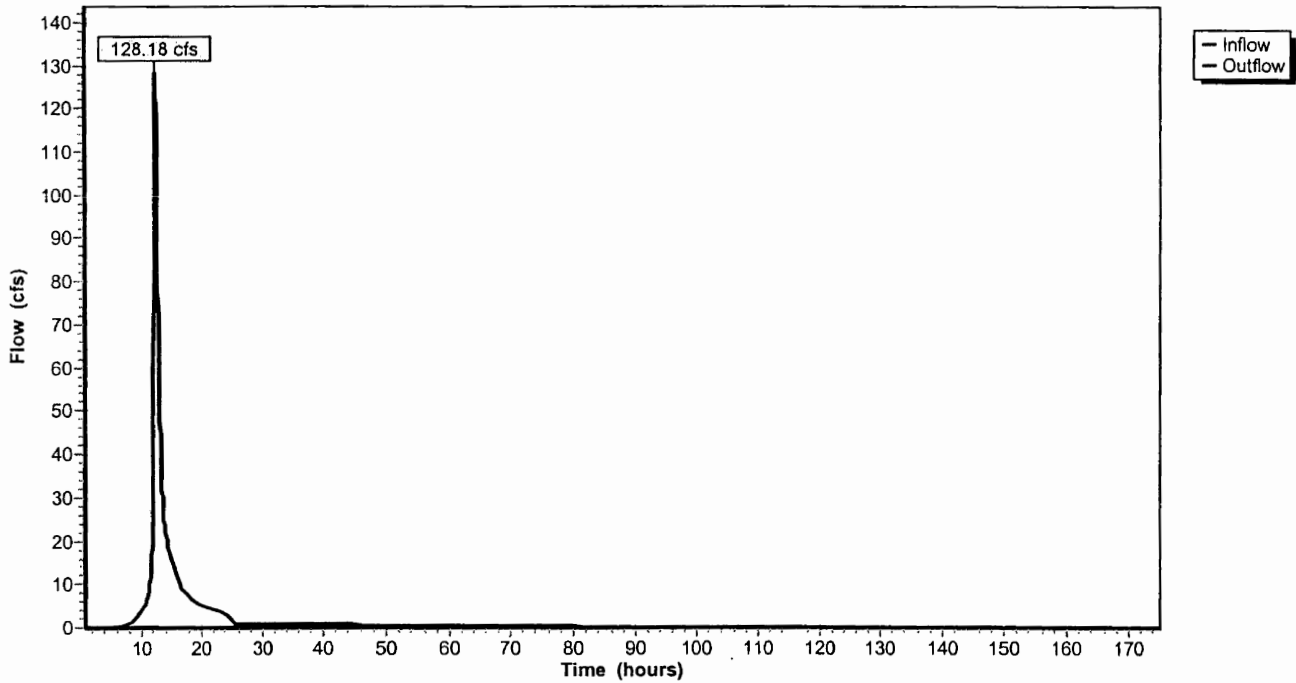
Inflow = 128.18 cfs @ 12.51 hrs, Volume= 20.878 af

Outflow = 128.18 cfs @ 12.51 hrs, Volume= 20.878 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-175.00 hrs, dt= 0.05 hrs

## Reach Design Point 3:

Hydrograph





**APPENDIX C**  
**Annual Pollutant Loading Rate Calculations**



**PRE-DEVELOPMENT ANNUAL POLLUTANT LOADS DESIGN POINT 1**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Forest	32.00	7.0	0.10	1.8	77.0	224.0	3.20	57.6	2464.0
Single Family (Low Density)	4.50	23.0	0.49	3.6	178.0	103.5	2.21	16.2	801.0
<b>TOTAL</b>						<b>327.5</b>	<b>5.41</b>	<b>73.8</b>	<b>3265.0</b>

**POST-DEVELOPMENT ANNUAL POLLUTANT LOADS**

**1.1S**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Commercial	26.00	163.0	0.71	4.6	717.0	4238.0	18.46	119.6	18642.0
Forest	6.00	7.0	0.10	1.8	77.0	42.0	0.60	10.8	462.0
Single Family (Low Density)	1.50	23.0	0.49	3.6	178.0	34.5	0.74	5.4	267.0
Grass	1.00	7.0	0.12	3.7	308.0	7.0	0.12	3.7	308.0
<b>TOTAL</b>						<b>4321.5</b>	<b>19.92</b>	<b>139.5</b>	<b>19679.0</b>

**DESIGN 2 EXTENDED DETENTION BASIN (1.1) POLLUTANT REMOVAL EFFICIENCIES**

40%	40%	20%	80%
to	to	to	to
60%	60%	40%	100%

**SUBTOTALS**

2592.9	11.95	111.6	3935.8
to	to	to	to
1728.6	7.97	83.7	0.0

**DESIGN 2 EXTENDED DETENTION BASIN (1.2) POLLUTANT REMOVAL EFFICIENCIES**

40%	40%	20%	80%
to	to	to	to
60%	60%	40%	100%

**SUBTOTALS**

1555.7	7.17	89.3	787.2
to	to	to	to
691.4	3.19	50.2	0.0

**DESIGN 2 EXTENDED DETENTION BASIN (1.4) POLLUTANT REMOVAL EFFICIENCIES**

40%	40%	20%	80%
to	to	to	to
60%	60%	40%	100%

**TOTALS AFTER TREATMENT**

933.4	4.30	71.4	157.4
to	to	to	to
276.6	1.27	30.1	0.0

**1.2S**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Grass	1.00	7.0	0.12	3.7	308.0	7.0	0.12	3.7	308.0
<b>TOTAL</b>						<b>7.0</b>	<b>0.12</b>	<b>3.7</b>	<b>308.0</b>

**DESIGN 2 EXTENDED DETENTION BASIN (1.2) POLLUTANT REMOVAL EFFICIENCIES**

40%	40%	20%	80%
to	to	to	to
60%	60%	40%	100%

**SUBTOTALS**

4.2	0.07	3.0	61.6
to	to	to	to
2.8	0.05	2.2	0.0

**DESIGN 2 EXTENDED DETENTION BASIN (1.4) POLLUTANT REMOVAL EFFICIENCIES**

40%	40%	20%	80%
to	to	to	to
60%	60%	40%	100%

**SUBTOTALS**

2.5	0.04	2.4	12.3
to	to	to	to
1.1	0.02	1.3	0.0

**1.3S**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Commercial	7.40	163.0	0.71	4.6	717.0	1206.2	5.25	34.0	5305.8
Grass	1.50	7.0	0.12	3.7	308.0	10.5	0.18	5.6	462.0
Single Family (Low Density)	3.00	23.0	0.49	3.6	178.0	69.0	1.47	10.8	534.0
<b>TOTAL</b>						1285.7	6.90	50.4	6301.8
<b>DESIGN 2 EXTENDED DETENTION BASIN (1.3) POLLUTANT REMOVAL EFFICIENCIES</b>						40%	40%	20%	80%
						to	to	to	to
<b>SUBTOTALS</b>						60%	60%	40%	100%
						771.4	4.14	40.3	1260.4
<b>DESIGN 2 EXTENDED DETENTION BASIN (1.4) POLLUTANT REMOVAL EFFICIENCIES</b>						40%	40%	20%	80%
						to	to	to	to
<b>TOTALS AFTER TREATMENT</b>						60%	60%	40%	100%
						462.9	2.49	32.2	252.1
<b>TOTALS AFTER TREATMENT</b>						to	to	to	to
						205.7	1.10	18.1	0.0

**1.4S**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Grass	1.00	7.0	0.12	3.7	308.0	7.0	0.12	3.7	308.0
<b>TOTAL</b>						7.0	0.12	3.7	308.0
<b>DESIGN 2 EXTENDED DETENTION BASIN (1.4) POLLUTANT REMOVAL EFFICIENCIES</b>						40%	40%	20%	80%
						to	to	to	to
<b>SUBTOTALS</b>						60%	60%	40%	100%
						4.2	0.07	3.0	61.6
<b>TOTALS AFTER TREATMENT</b>						to	to	to	to
						2.8	0.05	2.2	0.0
<b>TOTALS AFTER TREATMENT</b>						1403.0	6.90	109.0	483.4
						to	to	to	to
<b>TOTALS AFTER TREATMENT</b>						486.2	2.45	51.8	0.0

**PRE-DEVELOPMENT ANNUAL POLLUTANT LOADS DESIGN POINT 2****PRE 2**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Forest	37.20	7.0	0.10	1.8	77.0	260.4	3.72	67.0	2864.4
<b>TOTAL</b>						260.4	3.72	67.0	2864.4

**POST-DEVELOPMENT ANNUAL POLLUTANT LOADS DESIGN POINT 2****2.0S**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Forest	17.50	7.0	0.10	1.8	77.0	122.5	1.75	31.5	1347.5
Grass	9.50	7.0	0.12	3.7	308.0	66.5	1.14	35.2	2926.0
<b>TOTAL</b>						189.0	2.89	66.7	4273.5

**PRE-DEVELOPMENT ANNUAL POLLUTANT LOADS DESIGN LINE 3**

**PRE 3**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Forest	28.10	7.0	0.10	1.8	77.0	196.7	2.81	50.6	2163.7
Grass	11.30	7.0	0.12	3.7	308.0	79.1	1.36	41.8	3480.4
Road	6.50	163.0	1.00	2.1	447.0	1059.5	6.50	13.7	2905.5
Single Family (High Density)	2.80	23.0	0.58	3.6	178.0	64.4	1.62	10.1	498.4
<b>TOTAL</b>						1399.7	12.29	116.1	9048.0

**POST-DEVELOPMENT ANNUAL POLLUTANT LOADS DESIGN LINE 3**

**3.1S**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Commercial	5.00	163.0	0.71	4.6	717.0	815.0	3.55	23.0	3585.0
Grass	3.00	7.0	0.12	3.7	308.0	21.0	0.36	11.1	924.0
<b>TOTAL</b>						836.0	3.91	34.1	4509.0
<b>DESIGN 2 EXTENDED DETENTION BASIN (3.1) POLLUTANT REMOVAL EFFICIENCIES</b>						40%	40%	20%	80%
						to	to	to	to
<b>DESIGN 2 EXTENDED DETENTION BASIN (3.2) POLLUTANT REMOVAL EFFICIENCIES</b>						60%	60%	40%	100%
						501.6	2.3	27.3	901.8
<b>SUBTOTALS</b>						to	to	to	to
						334.4	1.6	20.5	0.0
<b>DESIGN 2 EXTENDED DETENTION BASIN (3.2) POLLUTANT REMOVAL EFFICIENCIES</b>						40%	40%	20%	80%
						to	to	to	to
<b>TOTALS AFTER TREATMENT</b>						60%	60%	40%	100%
						301.0	1.4	21.8	180.4
<b>TOTALS AFTER TREATMENT</b>						to	to	to	to
						133.8	0.6	12.3	0.0

**3.2S**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Commercial	1.80	163.0	0.71	4.6	717.0	293.4	1.28	8.3	1290.6
Forest	3.10	7.0	0.10	1.8	77.0	21.7	0.31	5.6	238.7
Grass	3.90	7.0	0.12	3.7	308.0	27.3	0.47	14.4	1201.2
<b>TOTAL</b>						342.4	2.1	28.3	2730.5
<b>GRASS SWALE POLLUTANT REMOVAL EFFICIENCIES</b>						20%	20%	20%	20%
						to	to	to	to
<b>DESIGN 2 EXTENDED DETENTION BASIN (3.2) POLLUTANT REMOVAL EFFICIENCIES</b>						40%	40%	40%	40%
						273.9	1.64	22.6	2184.4
<b>SUBTOTALS</b>						to	to	to	to
						205.4	1.23	17.0	1638.3
<b>DESIGN 2 EXTENDED DETENTION BASIN (3.2) POLLUTANT REMOVAL EFFICIENCIES</b>						40%	40%	20%	80%
						to	to	to	to
<b>TOTALS AFTER TREATMENT</b>						60%	60%	40%	100%
						164.4	0.99	18.1	436.9
<b>TOTALS AFTER TREATMENT</b>						to	to	to	to
						82.2	0.49	10.2	0.0

**3.3S**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Road	0.30	163.0	1.00	2.1	447.0	48.9	0.30	0.6	134.1
Grass	0.60	7.0	0.12	3.7	308.0	4.2	0.07	2.2	184.8
<b>TOTAL</b>						53.1	0.4	2.9	318.9
<b>DESIGN 2 EXTENDED DETENTION BASIN (3.3) POLLUTANT REMOVAL EFFICIENCIES</b>						40%	40%	20%	80%
						to	to	to	to
						60%	60%	40%	100%
						31.9	0.22	2.3	63.8
<b>TOTALS AFTER TREATMENT</b>						21.2	0.15	1.7	0.0

**3.4S**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Single Family (High Density)	2.80	23.0	0.58	3.6	178.0	64.4	1.62	10.1	498.4
Forest	1.40	7.0	0.10	1.8	77.0	9.8	0.14	0.2	138.6
<b>TOTAL</b>						74.2	1.76	10.3	637.0
<b>DESIGN 2 EXTENDED DETENTION BASIN (3.4) POLLUTANT REMOVAL EFFICIENCIES</b>						40%	40%	20%	80%
						to	to	to	to
						60%	60%	40%	100%
						44.5	1.06	8.2	127.4
<b>SUBTOTALS</b>						29.7	0.71	6.2	0.0

**3.5S**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Forest	0.70	7.0	0.10	1.8	77.0	4.9	0.07	0.2	138.6

**3.6S**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Road	6.70	163.0	1.00	2.1	447.0	1092.1	6.70	14.1	2994.9
Forest	9.30	7.0	0.10	1.8	77.0	65.1	0.93	16.7	716.1
Grass	11.30	7.0	0.12	3.7	308.0	79.1	1.36	41.8	3480.4
<b>TOTAL</b>						1236.3	8.99	72.6	7191.4
<b>TOTALS AFTER TREATMENT</b>						1782.9	12.73	123.2	8138.4
						to	to	to	to
						1508.1	11.03	103.1	7330.0
<b>Totals after Treatment Minus treatment of the Lake Carmel TMDL Benefit Subcatchment 3.4S</b>									
<b>TOTAL</b>						1399.7	12.29	116.1	9048.0
<b>POST DEVELOPMENT TOTALS AFTER TREATMENT</b>						1812.6	13.44	125.3	8648.0
						to	to	to	to
						1552.6	12.09	107.2	7967.0



## APPENDIX D

### Project and Owner Information

#### **Site Data:**

Patterson Crossing Retail center  
NYS Route 311  
Patterson and Kent NY

Tax Map Number: 22.-3-1, 32.-2-2, 33.-2-23 and 34.-2-3 in the Town of Patterson,  
22.-2-48 in the Town of Kent.

Area: 90.5±

#### **Owner Information:**

Hudson Valley Realty Corp.  
1699 Route 6, Suite 1  
Carmel, New York 10512  
845-228-1400

#### **Party Responsible for Implementation of the Stormwater Pollution Prevention Plan:**

Contractor to be determined at time of construction

#### **Party Responsible for Inspection of the Stormwater Pollution Prevention Plan:**

Inspector to be determined at time of construction



**APPENDIX E**

**NYSDEC SPDES for Construction Activities Construction Site Log Book**



**STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM  
FOR CONSTRUCTION ACTIVITIES**

**CONSTRUCTION SITE LOG BOOK**

**Table of Contents**

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I. Pre-Construction Meeting Documents.

- a. Preamble to Site Assessment and Inspections
- b. Operator's Certification
- c. Qualified Professional's Credentials & Certification
- d. Contractors Certification
- e. Pre-Construction Site Assessment Checklist

a.

II. Construction Duration Inspections

- a. Directions
- b. Modification to the SWPPP

III. Monthly Summary Reports

a

Properly completing forms such as those contained in this document meet the inspection requirement of NYSDEC SPDES GP for Construction Activities. Completed forms shall be kept on site at all times and made available to authorities upon request.

## I. PRE-CONSTRUCTION MEETING DOCUMENTS

Project Name \_\_\_\_\_  
Permit No. \_\_\_\_\_ Date of Authorization \_\_\_\_\_  
Name of Operator \_\_\_\_\_  
Prime Contractor \_\_\_\_\_

**a. Preamble to Site Assessment and Inspections** -The Following Information To Be Read By All Person's Involved in The Construction of Stormwater Related Activities:

The Operator agrees to have a qualified professional<sup>1</sup> conduct an assessment of the site prior to the commencement of construction<sup>2</sup> and certify in this inspection report that the appropriate erosion and sediment controls described in the SWPPP have been adequately installed or implemented to ensure overall preparedness of the site for the commencement of construction.

Prior to the commencement of construction, the Operator shall certify in this site logbook that the SWPPP has been prepared in accordance with the State's standards and meets all Federal, State and local erosion and sediment control requirements.

When construction starts, site inspections shall be conducted by the qualified professional at least every 7 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater (Construction Duration Inspections). The Operator shall maintain a record of all inspection reports in this site logbook. The site logbook shall be maintained on site and be made available to the permitting authorities upon request. The Operator shall post at the site, in a publicly accessible location, a summary of the site inspection activities on a monthly basis (Monthly Summary Report).

Prior to filing the Notice of Termination or the end of permit term, the Operator shall have a qualified professional perform a final site inspection. The qualified professional shall certify that the site has undergone final stabilization<sup>3</sup> using either vegetative or structural stabilization methods and that all temporary erosion and sediment controls (such as silt fencing) not needed for long-term erosion control have been removed. In addition, the Operator must identify and certify that all permanent structures described in the SWPPP have been constructed and provide the owner(s) with an operation and maintenance plan that ensures the structure(s) continuously functions as designed.

1 "Qualified Professional means a person knowledgeable in the principles and practice of erosion and sediment controls, such as a Certified Professional in Erosion and Sediment Control (CPESC), soil scientist, licensed engineer or someone working under the direction and supervision of a licensed engineer (person must have experience in the principles and practices of erosion and sediment control).

2 "Commencement of construction" means the initial removal of vegetation and disturbance of soils associated with clearing, grading or excavating activities or other construction activities.

3 "Final stabilization" means that all soil-disturbing activities at the site have been completed and a uniform, perennial vegetative cover with a density of eighty (80) percent has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed on all unpaved areas and areas not covered by permanent structures.

**b. Operators Certification**

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. Further, I hereby certify that the SWPPP meets all Federal, State, and local erosion and sediment control requirements. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to Section 210.45 of the Penal Law. "

**Name (please print):** \_\_\_\_\_

**Title** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Address:** \_\_\_\_\_

**Phone:** \_\_\_\_\_ **Email:** \_\_\_\_\_

**Signature:** \_\_\_\_\_

**c. Qualified Professional's Credentials & Certification**

“ I hereby certify that I meet the criteria set forth in the General Permit to conduct site inspections for this project and that the appropriate erosion and sediment controls described in the SWPPP and as described in the following Pre-construction Site Assessment Checklist have been adequately installed or implemented, ensuring the overall preparedness of this site for the commencement of construction.”

**Name (please print):** \_\_\_\_\_

**Title** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Address:** \_\_\_\_\_

**Phone:** \_\_\_\_\_ **Email:** \_\_\_\_\_

**Signature:** \_\_\_\_\_

**d. Contractors Certification Statement**

“I certify under penalty of law that I understand and agree to comply with the terms and conditions of the Stormwater Pollution Prevention Plan for the construction site identified in such plans as a condition of authorization to discharge storm water. I also understand that the operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System (“SPDES”) General Permit for Storm Water Discharges from Construction Activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards.

---

Signature of Contractor

Date

Name of Contractor

\_\_\_\_\_

Street Address

\_\_\_\_\_

City, State, Zip

\_\_\_\_\_

Telephone No.

\_\_\_\_\_

A copy of this statement shall be retained as part of the Stormwater Pollution Prevention Plan (SPPP) for a period off at least three (3) years after the subject property is stabilized.

**e. Pre-construction Site Assessment Checklist (NOTE: Provide comments below as necessary)**

**1. Notice of Intent, SWPPP, and Contractors Certification:**

**Yes No NA**

- Has a Notice of Intent been filed with the NYS Department of Conservation?
- Is the SWPPP on-site? Where? \_\_\_\_\_
- Is the Plan current? What is the latest revision date? \_\_\_\_\_
- Is a copy of the NOI (with brief description) onsite? Where? \_\_\_\_\_
- Have all contractors involved with stormwater related activities signed a contractor's certification?

## Pre-construction Site Assessment Checklist (continued)

### 2. Resource Protection

#### Yes No NA

- Are construction limits clearly flagged or fenced?
- Important trees and associated rooting zones, on-site septic system absorption fields, existing vegetated areas suitable for filter strips, especially in perimeter areas, have been flagged for protection.
- Creek crossings installed prior to land-disturbing activity, including clearing and blasting.

### 3. Surface Water Protection

#### Yes No NA

- Clean stormwater runoff has been diverted from areas to be disturbed.
- Bodies of water located either on site or in the vicinity of the site have been identified and protected.
- Appropriate practices to protect on-site or downstream surface water are installed.
- Are clearing and grading operations divided into areas <5 acres?

### 4. Stabilized Construction Entrance

#### Yes No NA

- A temporary construction entrance to capture mud and debris from construction vehicles before they enter the public highway has been installed.
- Other access areas (entrances, construction routes, equipment parking areas) are stabilized immediately as work takes place with gravel or other cover.
- Sediment tracked onto public streets is removed or cleaned on a regular basis.

### 5. Perimeter Sediment Controls

#### Yes No NA

- Silt fence material and installation comply with the standard drawing and specifications.
- Silt fences are installed at appropriate spacing intervals
- Sediment/detention basin was installed as first land disturbing activity.
- Sediment traps and barriers are installed.

### 6. Pollution Prevention for Waste and Hazardous Materials

#### Yes No NA

- The Operator or designated representative has been assigned to implement the spill prevention avoidance and response plan.
- The plan is contained in the SWPPP on page \_\_\_\_\_
- Appropriate materials to control spills are onsite. Where? \_\_\_\_\_

## II. CONSTRUCTION DURATION INSPECTIONS

### a. Directions:

**Inspection Forms will be filled out during the entire construction phase of the project.**

Required Elements:

(1) On a site map, indicate the extent of all disturbed site areas and drainage pathways. Indicate site areas that are expected to undergo initial disturbance or significant site work within the next 14-day period;

(2) Indicate on a site map all areas of the site that have undergone temporary or permanent stabilization;

(3) Indicate all disturbed site areas that have not undergone active site work during the previous 14-day period;

Inspect all sediment control practices and record the approximate degree of sediment accumulation as a percentage of sediment storage volume (for example, 10 percent, 20 percent, 50 percent);

(5) Inspect all erosion and sediment control practices and record all maintenance requirements such as verifying the integrity of barrier or diversion systems (earthen berms or silt fencing) and containment systems (sediment basins and sediment traps). Identify any evidence of rill or gully erosion occurring on slopes and any loss of stabilizing vegetation or seeding/mulching. Document any excessive deposition of sediment or ponding water along barrier or diversion systems. Record the depth of sediment within containment structures, any erosion near outlet and overflow structures, and verify the ability of rock filters around perforated riser pipes to pass water; and

(6) Immediately report to the Operator any deficiencies that are identified with the implementation of the SWPPP.

**SITE PLAN/SKETCH**

\_\_\_\_\_  
**Inspector (print name)**

\_\_\_\_\_  
**Date of Inspection**

\_\_\_\_\_  
**Qualified Professional (print name)**

\_\_\_\_\_  
**Qualified Professional Signature**

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the forms is accurate and complete.

**Maintaining Water Quality**

**Yes No NA**

- Is there an increase in turbidity causing a substantial visible contrast to natural conditions?
- Is there residue from oil and floating substances, visible oil film, or globules or grease?
- All disturbance is within the limits of the approved plans.
- Have receiving lake/bay, stream, and/or wetland been impacted by silt from project?

**Housekeeping**

**1. General Site Conditions**

**Yes No NA**

- Is construction site litter and debris appropriately managed?
- Are facilities and equipment necessary for implementation of erosion and sediment control in working order and/or properly maintained?
- Is construction impacting the adjacent property?
- Is dust adequately controlled?

**2. Temporary Stream Crossing**

**Yes No NA**

- Maximum diameter pipes necessary to span creek without dredging are installed.
- Installed non-woven geotextile fabric beneath approaches.
- Is fill composed of aggregate (no earth or soil)?
- Rock on approaches is clean enough to remove mud from vehicles & prevent sediment from entering stream during high flow.

**Runoff Control Practices**

**1. Excavation Dewatering**

**Yes No NA**

- Upstream and downstream berms (sandbags, inflatable dams, etc.) are installed per plan.
- Clean water from upstream pool is being pumped to the downstream pool.
- Sediment laden water from work area is being discharged to a silt-trapping device.
- Constructed upstream berm with one-foot minimum freeboard.

**2. Level Spreader**

**Yes No NA**

- Installed per plan.
- Constructed on undisturbed soil, not on fill, receiving only clear, non-sediment laden flow.
- Flow sheets out of level spreader without erosion on downstream edge.

**3. Interceptor Dikes and Swales**

**Yes No NA**

- Installed per plan with minimum side slopes 2H:1V or flatter.
- Stabilized by geotextile fabric, seed, or mulch with no erosion occurring.
- Sediment-laden runoff directed to sediment trapping structure

**CONSTRUCTION DURATION INSPECTIONS**  
**Runoff Control Practices (continued)**

4. Stone Check Dam

Yes No NA

- Is channel stable? (flow is not eroding soil underneath or around the structure).
- Check is in good condition (rocks in place and no permanent pools behind the structure).
- Has accumulated sediment been removed?.

5. Rock Outlet Protection

Yes No NA

- Installed per plan.
- Installed concurrently with pipe installation.

**Soil Stabilization**

1. Topsoil and Spoil Stockpiles

Yes No NA

- Stockpiles are stabilized with vegetation and/or mulch.
- Sediment control is installed at the toe of the slope.

2. Revegetation

Yes No NA

- Temporary seedings and mulch have been applied to idle areas.
- 4 inches minimum of topsoil has been applied under permanent seedings

**Sediment Control**

1. Stabilized Construction Entrance

Yes No NA

- Stone is clean enough to effectively remove mud from vehicles.
- Installed per standards and specifications?
- Does all traffic use the stabilized entrance to enter and leave site?
- Is adequate drainage provided to prevent ponding at entrance?

2. Silt Fence

Yes No NA

- Installed on Contour, 10 feet from toe of slope (not across conveyance channels).
  - Joints constructed by wrapping the two ends together for continuous support.
  - Fabric buried 6 inches minimum.
  - Posts are stable, fabric is tight and without rips or frayed areas.
- Sediment accumulation is \_\_\_% of design capacity.

**Sediment Control (continued)**

**3. Storm Drain Inlet Protection (Use for Stone & Block; Filter Fabric; Curb; or, Excavated practices)**

**Yes No NA**

- Installed concrete blocks lengthwise so open ends face outward, not upward.
  - Placed wire screen between No. 3 crushed stone and concrete blocks.
  - Drainage area is 1 acre or less.
  - Excavated area is 900 cubic feet.
  - Excavated side slopes should be 2:1.
  - 2" x 4" frame is constructed and structurally sound.
  - Posts 3-foot maximum spacing between posts.
  - Fabric is embedded 1 to 1.5 feet below ground and secured to frame/posts with staples at max 8-inch spacing.
  - Posts are stable, fabric is tight and without rips or frayed areas.
- Sediment accumulation \_\_\_% of design capacity.

**4. Temporary Sediment Trap**

**Yes No NA**

- Outlet structure is constructed per the approved plan or drawing.
  - Geotextile fabric has been placed beneath rock fill.
- Sediment accumulation is \_\_\_% of design capacity.

**5. Temporary Sediment Basin**

**Yes No NA**

- Basin and outlet structure constructed per the approved plan.
  - Basin side slopes are stabilized with seed/mulch.
  - Drainage structure flushed and basin surface restored upon removal of sediment basin facility.
- Sediment accumulation is \_\_\_% of design capacity.

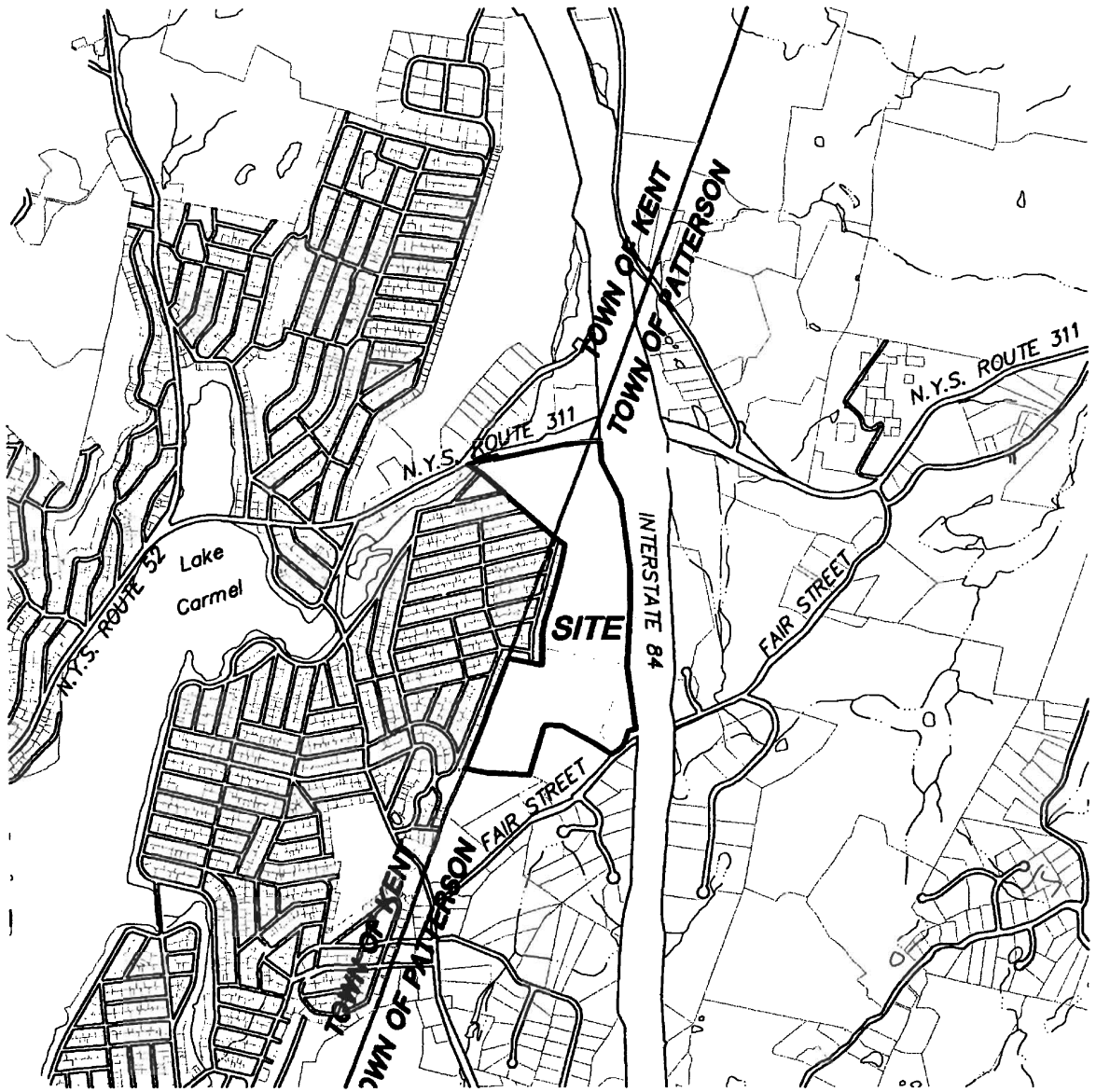
Note: Not all erosion and sediment control practices are included in this listing. Add additional pages to this list as required by site specific design.  
Construction inspection checklists for post-development stormwater management practices can be found in Appendix F of the New York Stormwater Management Design Manual.





## **FIGURES**





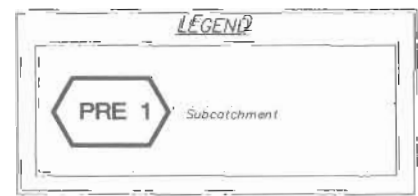
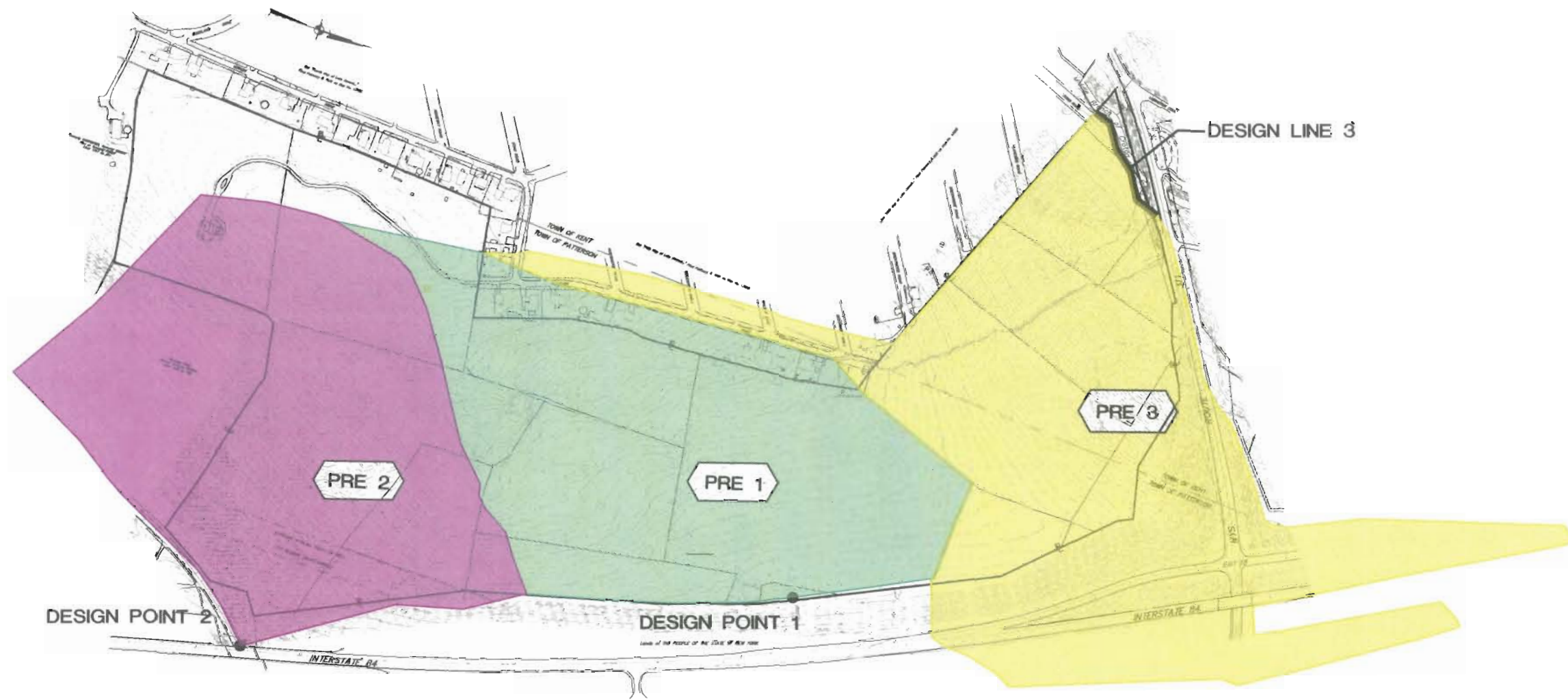
PROJECT: **PATTERSON CROSSING**  
N.Y.S. ROUTE 311, TOWN OF KENT & PATTERSON,  
PUTNAM COUNTY, NEW YORK

DRAWING: **LOCATION MAP**

**INSITE**  
ENGINEERING, SURVEYING &  
LANDSCAPE ARCHITECTURE, P.C.  
3 Garrett Place • Carmel, New York 10512  
Phone (845) 225-9690 • Fax (845) 225-9717  
www.insite-eng.com

DATE: 4-18-05  
SCALE: 1' = 2000'  
PROJECT NO.: 01124.100  
FIGURE: 1

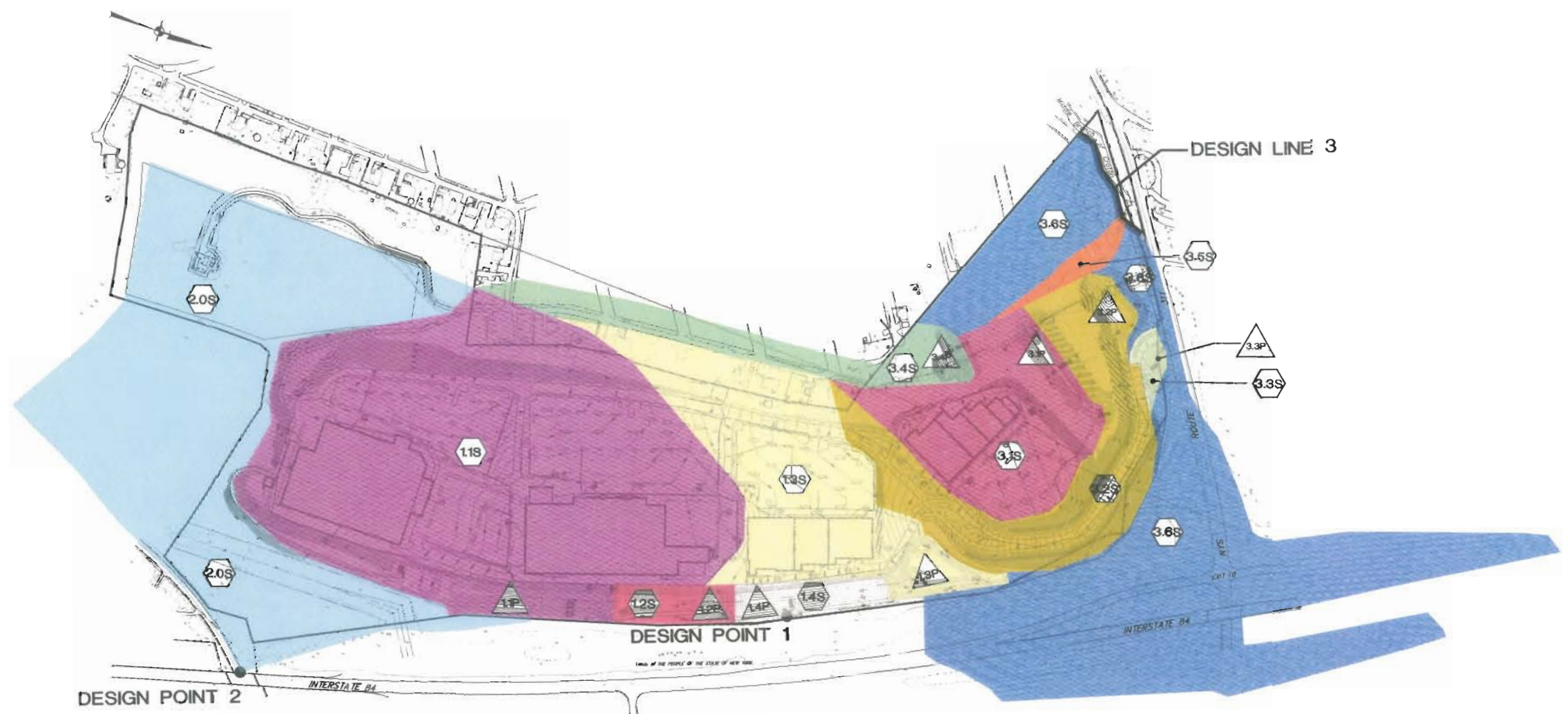




DATE		REVISION		FIGURE NO.	
<b>INSITE</b> ENGINEERING, SURVEYING & LANDSCAPE ARCHITECTURE, P.C.		300 West Plaza Carmel, NY 10517 (845) 225-9690 (845) 225-9777 fax www.insite-ny.com		2	
PROJECT: <b>PATTERSON CROSSING</b>					
DRAWING: <b>PRE DEVELOPMENT DRAINAGE MAP</b>					
PROJECT NO.	01/24/1001	PROJECT MANAGER	JJC		
DATE	9-12-05	DRAWN BY	ZMP		
SCALE	1" = 200'	CHECKED BY			

ALTERATION OF THIS DOCUMENT, UNLESS UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, IS AN VIOLATION OF SECTION 2209 OF ARTICLE 148 OF THE EDUCATION LAW.





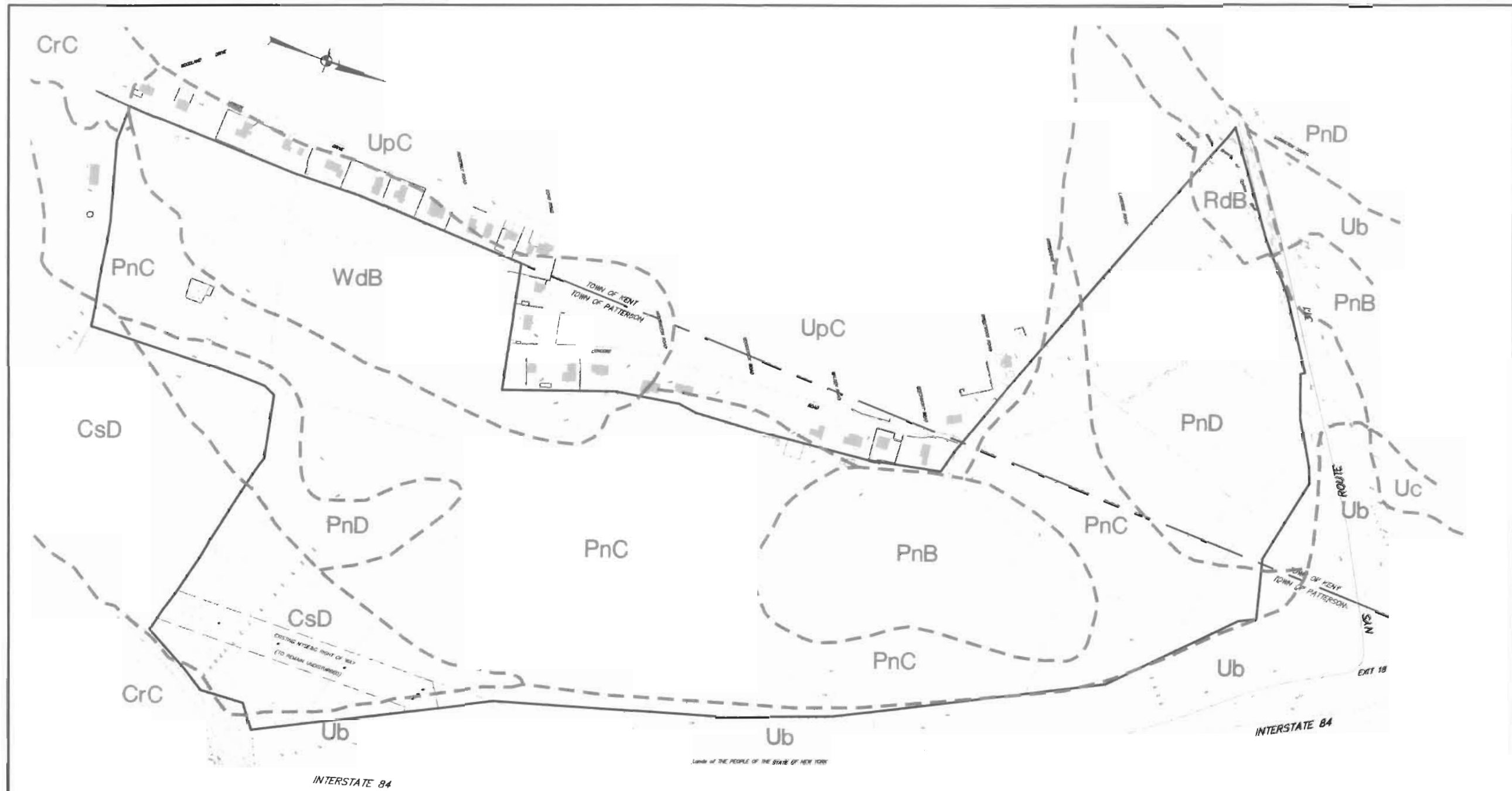
**LEGEND**

1A	Sublot/Admitt
1.1P	Pond

NO.	DATE	REVISION	BY
 <b>INSITE</b> ENGINEERING, SURVEYING & LANDSCAPE ARCHITECTURE, P.C.			
PROJECT: <b>PATTERSON CROSSING</b>			
DRAWING: <b>POST-DEVELOPMENT DRAINAGE MAP</b>			
PROJECT NO.	01124.100	PROJECT MANAGER	JUG
DATE	9-12-05	DRAWN BY	ZMP
SCALE	1" = 200'	CHECKED BY	
			FIGURE NO. <b>3</b>

ALTERATION OF THIS DOCUMENT, UNLESS UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, IS A VIOLATION OF SECTION 1209 OF ARTICLE 145 OF THE EDUCATION LAW.





Lands of THE PEOPLE OF THE STATE OF NEW YORK

SOILS LEGEND		
SOILS	DESCRIPTION	HYDROLOGICAL GROUP
CrC	Chariton-Chatfield complex, rolling, very rocky	B
CaD	Chatfield-Chariton complex, hilly, very rocky	B
PnB	Paxton fine sandy loam, 2% to 8% slopes	C
PnC	Paxton fine sandy loam, 8% to 15% slopes	C
PnD	Paxton fine sandy loam, 15% to 25% slopes	C
RdB	Ridgebury loam, 3% to 8% slopes	C
Ub	Udorthents, smoothed	-
Uc	Udorthents, wet substratum	-
UpC	Urban land-Paxton complex, 8% to 15% slopes	C
WdB	Woodbridge loam, 3% to 8% slopes	C

NO.	DATE	REVISION	BY
 <b>INSITE</b> ENGINEERING, SURVEYING & LANDSCAPE ARCHITECTURE, P.C.			
PROJECT: <b>PATTERSON CROSSING</b> <small>Forms of Patterson &amp; Kent Putnam County, New York</small>			
DRAWING: <b>SOILS MAP</b>			
PROJECT NO.	01124.100	PROJECT MANAGER	JJC
DATE	9-12-05	DRAWN BY	ZMP
SCALE	1" = 160'	CHECKED BY	
			FIGURE NO. <b>4</b>

ALTERATION OF THIS DOCUMENT UNLESS UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, IS A VIOLATION OF SECTION 2209 OF ARTICLE 145 OF THE EDUCATION LAW



Appendix G

WATER SYSTEM REPORT





## **WATER SYSTEM REPORT**

**For**

**PATTERSON CROSSING**

**Town of Patterson and Town of Kent, New York**

**September 12, 2005**

Prepared by:  
Insite Engineering, Surveying & Landscape Architecture, P.C.  
3 Garrett Place  
Carmel, New York 10512



# CONTENTS

	<b>PAGE</b>
<b>1.0 INTRODUCTION</b> .....	<b>1</b>
<b>2.0 DESIGN FLOW</b> .....	<b>1</b>
<b>3.0 WATER SYSTEM DESCRIPTION</b> .....	<b>2</b>
3.1 Water Source .....	2
3.2 Treatment System/Control Building.....	2
3.3 Storage Facilities .....	2
3.4 Distribution System.....	2



**1.0 INTRODUCTION**

The subject project is located on a 90.5± acre parcel located in both the Town of Patterson and Town of Kent adjacent to Interstate 84 and New York State Route 311. The majority of the property is located in the Town of Patterson. The property is designated as Tax Map Parcel No. 22.-3-1, 32.-2-2, 33.-2-23 and 34.-2-3 in the Town of Patterson and 22.-2-48 in the Town of Kent. The parcel is zoned as I-(Industrial), and R-4-(Residential) in the Town of Patterson and C-(Commercial) in the Town of Kent. The subject parcel consists of woods and brush throughout the majority of the property. The only development on the subject property is the existing telecommunications facility located in the southeast portion of the property. The subject parcel is proposed to be developed as a retail center. The retail center will consist of four (4) buildings with nine (9) users and associated parking for each. Access to the site will be provided by a proposed access road off of New York State Route 311. The water supply for the proposed project will be provided by two drilled wells. Please see report titled "Patterson Crossing Water Supply Report" prepared by Tim Miller Associates, Inc. for details associated with the development of the water source. This report discusses the general components of the water system for the project.

**2.0 DESIGN FLOW**

The potable water design flow for the subject project is based on actual water usage for the proposed users. The potable design flow is proposed to be 50% greater than the actual flows to provide a factor of safety. The majority of the proposed users are dry retail such that water usage is limited to primarily restroom usage. The wholesale warehouse which is proposed to include food sales will require significantly more potable water flow as shown below.

Wholesale warehouse store	=	3,500 GPD <sup>1</sup>
Home improvement center	=	750 GPD <sup>1</sup>
Clothing store	=	250 GPD <sup>2</sup>
Sporting goods store	=	500 GPD <sup>2</sup>
Electronics store	=	800 GPD <sup>1</sup>
Home goods store	=	360 GPD <sup>1</sup>
Retail store	=	250 GPD <sup>2</sup>
Retail store	=	250 GPD <sup>2</sup>
Coffee shop	=	<u>500 GPD<sup>2</sup></u>
Total Usage	=	7,160 GPD
Factor of Safety 1.5 x usage		
<b>Total Potable Water Design Flow</b>		<b>7,160 x 1.5 = 10,740 GPD(7.5 GPM)</b>
<b>Total Fire Flow Requirement</b>		<b>2,250 GPM for 2 Hours<sup>3</sup></b>

<sup>1</sup>Actual flows based on corporate requirements or flow usage data provided by client.

<sup>2</sup>Anticipated flows are estimated based on projection of employee population and customer usage.

<sup>3</sup>Fire flow requirement based on corporate requirements of largest building under single event demand.

### **3.0 WATER SYSTEM DESCRIPTION**

#### **3.1 Water Source**

The source water for the project will be provided by two drilled bedrock wells (see report titled "Patterson Crossing Water Supply Report" prepared by Tim Miller Associates, Inc. for details). These wells have been drilled and can provide the required quantity and quality of water necessary for the project. Meters will be installed to record total usage from each supply well. The two supply wells will have submersible pumps that will pump the water to a treatment/control building.

#### **3.2 Treatment System/Control Building**

A control/treatment building is proposed in the southeastern portion of the site. The discharge from the two supply wells will be piped to this building. The building will contain meters, raw water sampling spigots, and chlorinator equipment for each well source. At this time no other treatment is proposed. Adjacent to the control/treatment building will be a vented potable water storage tank to provide a minimum of 15 minutes of chlorine contact time at peak design flow, supplemental storage to meet the peak flow requirements, and cycling of the well pumps. Two booster pumps will be located in the control building to provide pressure for the potable distribution system. A hydro-pneumatic tank will be installed adjacent to the control building to cycle the potable water system booster pumps. A fire pump will also be installed in the control building to supply the fire protection distribution system. A separate fire protection water storage tank will be installed adjacent to the control building to provide water for the fire pump. The fire pump will provide the minimum fire flow of 2,250 gpm. An emergency generator will be located in or adjacent to the control building to provide emergency power for the fire pump.

#### **3.3 Storage Facilities**

Three water storage tanks are proposed to provide both potable and fire protection water storage. A 10,000 gallon vented potable water storage tank is proposed to provide chlorine contact, supplemental storage during peak flows, and cycling of the well supply pumps. A 2,000 gallon hydro-pneumatic tank will be utilized to cycle the potable water system booster pumps. A 270,000 gallon vented storage tank will be utilized for fire protection. This tank will be filled from the potable system with an air gap or appropriate backflow prevention device.

#### **3.4 Distribution System**

Two separate distribution systems are proposed. One distribution system will provide potable water and the other will provide fire protection. The potable system will be pressurized by booster pumps that will deliver water to the four buildings and nine users. The potable water distribution system will be 4" PVC Class 200 with isolation valves. The fire protection system will be pressurized by a fire pump. The fire protection distribution system will consist of a 12" PVC Class 200 main with fire hydrants as required by the corporate users and/or local agency having jurisdiction.

Appendix H

PATTERSON CROSSING WATER  
SUPPLY REPORT



# Patterson Crossing Water Supply Report

Patterson Crossing  
State Route 311  
Town of Patterson/ Town of Kent, Putnam County, New York

Prepared for:

Town of Patterson Planning Board  
Patterson Town Hall  
1142 Route 311  
Patterson, NY 12563

Prepared by:

Tim Miller Associates, Inc.  
10 North Street  
Cold Spring, New York 10516  
(845) 265-4400

*with*

SSEC, Inc.  
4 Deer Trail  
Cornwall, New York 12518  
(845) 534-3816

Issue Date: July 27, 2005

**PATTERSON CROSSING WATER SUPPLY REPORT**  
Route 311, Town of Patterson/ Town of Kent, New York

TABLE OF CONTENTS

		PAGE
1.0	Background	1
2.0	Geology	1
3.0	Private Well Monitoring	1
4.0	Test Procedure	2
5.0	Water Quality	3
6.0	Weather During Test Period	3
7.0	Pumping Test Results	5
8.0	Conclusion	5

Figure 1                      Location Map

Figure 2                      Well Locations

Appendix A                   Well logs

Appendix B                   Off-Site Monitoring Request Letter, Survey and List of Recipients

Appendix C                   Water Quality Analytical Results

Appendix D                   Pumping Test Data/Charts

## **1.0 BACKGROUND**

This report was prepared to summarize the results of a groundwater testing study conducted in January 2005, associated with the proposed Patterson Crossing Retail Center development. The proposed development is located on 90.5 acres, within the Town of Patterson and the Town of Kent, Putnam County, New York. The project location is shown in Figure 1 – Location Map.

The property is located directly west of Interstate 84 and south of NYS Route 311. Single-family residential development is located to the west of the project site. The project involves a proposed commercial retail development consisting of approximately 403,610 square foot of retail development and associated parking and infrastructure on land that is currently undeveloped woodlands. No public water or sewer infrastructure is available to service the project site or nearby properties. The project proposes the use of new on-site wells and a wastewater treatment facility to service the proposed development.

Based upon the proposed uses, water demand for the development has been estimated at approximately 13,700 gallons per day or approximately 9.5 gallons per minute.

## **2.0 GEOLOGY**

The Patterson Crossing project site is located within the New England Physiographic Province, an area characterized by Pre-Cambrian to Ordovician aged bedrock. Area topography is controlled by the outcropping of resistive bedrock zones that are oriented in a northeast/southwest direction due to tectonic compression from the southeast.

The glacial advance and recession, which extensively modified the area, left behind glacial deposits and landforms including kames, drumlins, eskers, and outwash plains. These deposits vary in composition from tightly cemented clay, silt, sand and gravel with little permeability (till) to well-sorted sand and gravel with high water producing potential (outwash). Typically the till was deposited by the advancing glacier while the outwash is deposited by the receding (melting) ice. The outwash deposits are found along present and former stream channels, which drained the melting ice. The till was deposited generally everywhere the advancing glacier made contact with the ground surface. Till is usually found in direct contact with the underlying bedrock since the advancing glacier generally removed any loose deposits.

The project area appears to be covered by varying thicknesses of till, ranging from no till where bedrock outcrops are present, to more than 70 feet below ground surface (ft bgs) in the kame areas on the eastern and northern portions of the property. There appears to be no significant water producing unconsolidated deposits within the property boundaries, other than several small springs.

During the drilling of the production wells for this project, Wells PW-1 and PW-2, bedrock was encountered at 7 feet bgs at PW-1 and 1 foot bgs at PW-2. The overburden materials encountered at both sites consisted of mostly glacial contact till. The material was water poor although pockets of saturated sand were found. Well logs for each of the on-site wells are available in Appendix A.

## **3.0 PRIVATE WELL MONITORING**

### **Establishment of Off-Site Well Monitoring Locations**

The initial step in the off-site well monitoring program involved contacting surrounding property owners (those adjoining or across abutting roadways), and encouraging them to participate in the well testing program. In addition, a questionnaire regarding the construction and performance of their respective private wells was included in the monitoring request. Letters explaining the testing



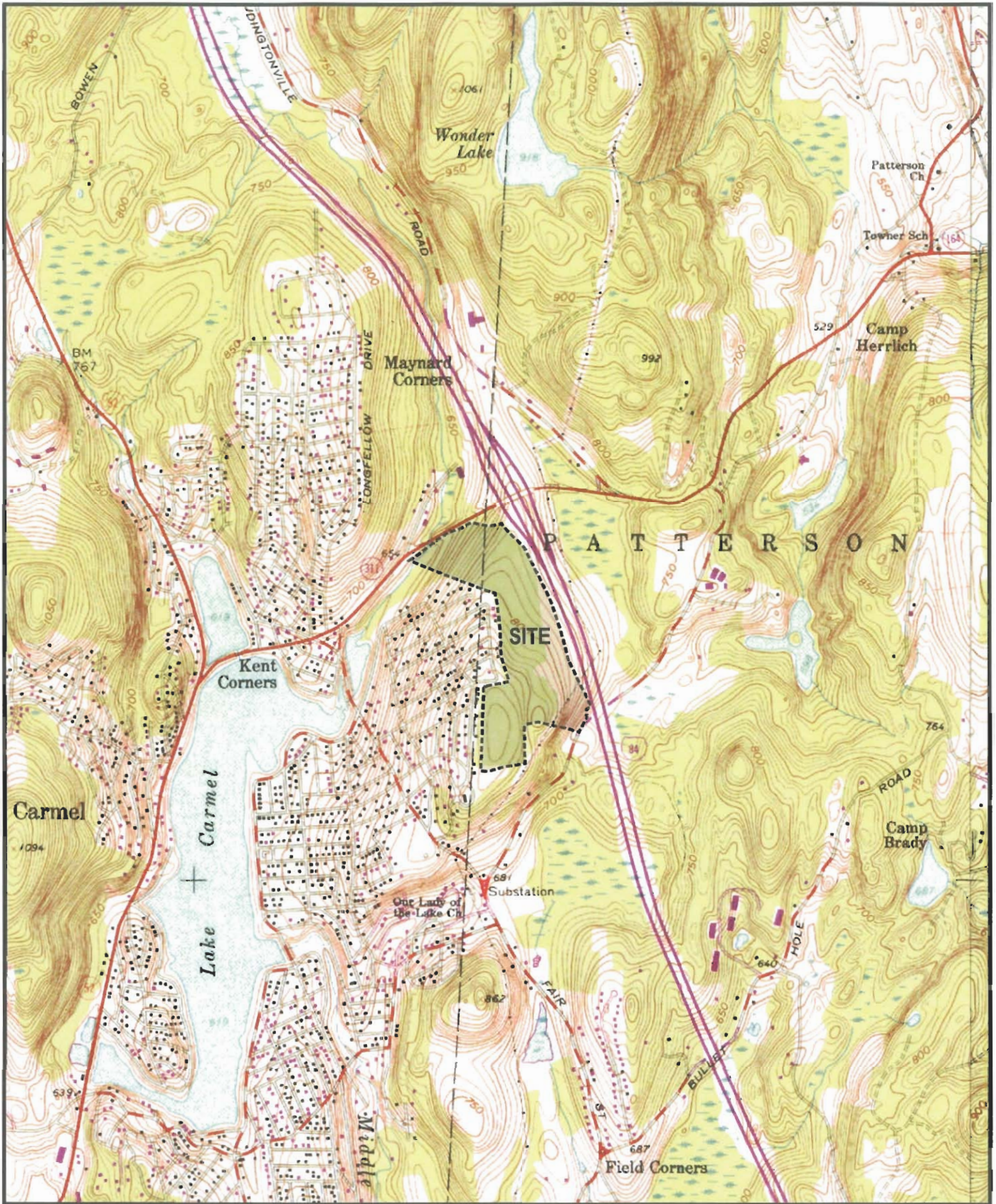


Figure 1 - Site Location Map  
 Patterson Crossing Retail Center  
 Town of Patterson and Town of Kent,  
 Putnam County, New York  
 Source: USDOT Planimetric Map, Lake Carmel Quad  
 Scale: 1 inch = 2,000 feet

File 04031 01/05/05

W:Patterson Crossing\Sergio's well test report\Figure 1.cdr

Tim Miller Associates, Inc., 10 North Street, Cold Spring, New York 10516 (845) 265-4400 Fax (845) 265-4418



procedure and the well survey, was mailed on November 23, 2004 to 39 neighboring property owners by certified, return receipt mail. A copy of the letter and survey are attached in Appendix B, as well as a list of the recipients of the mailing.

A total of 13 positive responses were received and well monitoring was conducted at eight of these locations. Of the five residences not monitored, three of the wells were buried or in inaccessible pits. Two (2) locations were adjacent to other positive respondents, making the monitoring of those wells redundant.

The following eight off-site wells were monitored during the well test. Figure 2 shows the locations of these properties.

- Lot 33.2-22. Kevin & Marie Kroger, 701 Fair Street
- Lot 22.84-1-29. Harry & Susan Bourtelos, 60 Vernon Drive
- Lot 33.28-1-13. Matthew & Patricia Dzubak, 50 Vernon Drive
- Lot 22.76-2-7. Martha & Gus Berglund, 88 Concord Road
- Lot 33.28-1-16. Anthony Jr. & Darlene Della Bovie, 38 Vernon Drive
- Lot 22-2-34. Daniel & Karea Doyle, 459 Horsepound Road
- Lots 23-1-1 and 23-1-3. Shaw Welding c/o Bill & Pam Shaw, 761 Fair Street
- Lot 22-84-2-1. Grace & Lynn Hill, 77 Echo Road

Residents who responded positively to the monitoring request were then notified, and with their permission, data loggers were installed in their wells to monitor water levels. Digital data loggers were programmed to record water level data over the period of the pumping test. The well monitoring started a minimum of 48 hours before the pumping test, continued through the pumping test, and for eight days after the pumping of the on-site wells had stopped.

## **1.0 TEST PROCEDURE**

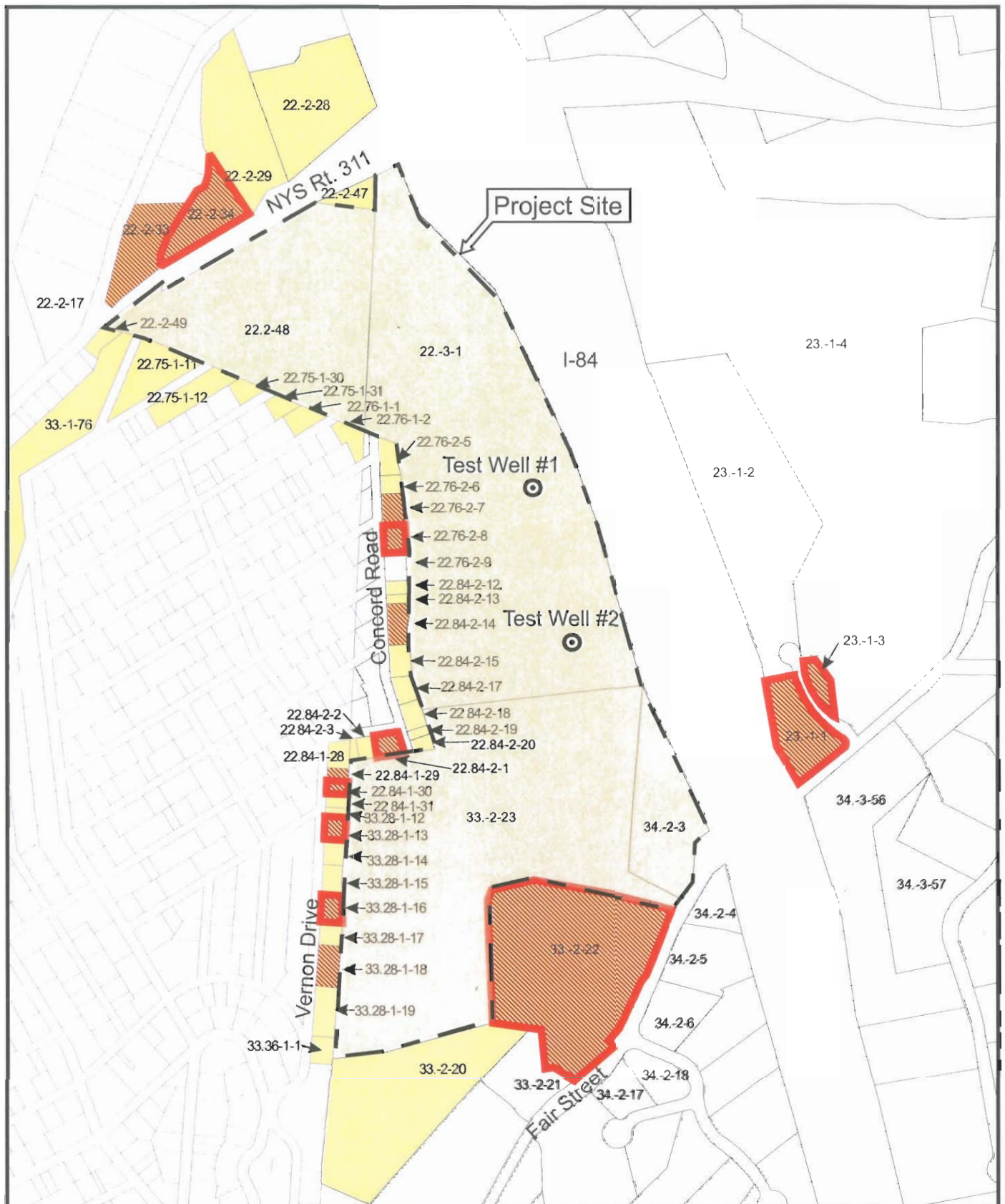
Two on-site wells were pump tested for the project. The on-site test wells were pumped for 72 hours at a rate of 22 gallons per minute each for the duration of the 72-hour pump test. The test was run from January 17, 2005 to January 20, 2005. The two on-site test wells and a total of eight off-site wells were monitored using digital data loggers. A map of the on-site test well locations and off-site monitoring well locations is shown Figure 2.

The data loggers were set to collect water level information from off-site monitoring wells for a minimum of 48 hours prior to the start of the pumping test and for a minimum period of 24 hours after the conclusion of the test. The sampling interval was set to 60 minutes between readings. The data loggers in the on-site test wells were set to collect data at a two-minute interval for the duration of the test. Back-up manual readings were also collected.

Water level measurements were recorded to the nearest 0.01-foot. A log of weather conditions was maintained during the test.

The water pumped from the on-site test wells was diverted towards the nearest surface water body overland to the west (near I-84) through silt fencing and straw bales. Flow rates from each on-site test wells were measured using a combination of direct read (Blue and White Corp.) flow meters and periodic bucket/stopwatch readings.





**Legend**

	Properties monitored during pump test
	Properties consenting to monitoring
	Properties sent letter request for monitoring
	Properties in Town of Kent
	Properties in Town of Patterson

**Figure 2 - Well Monitoring Locations**  
**Patterson Crossing Retail Center**  
 Town of Patterson and Town of Kent  
 Putnam County, New York  
 Base Map: Putnam County GIS Department  
 Scale: 1 inch = 600 feet

File 04031 01/10/05  
 W:\Patterson Crossing\Sergio's well test report\Figure 2.cdr



On-site test well "PW-1" was started first with well "PW-2" started two hours later. A minimum of 48 hours of background data was collected from the off-site monitoring wells prior to the start of the pumping test. The test continued for 72 hours and achieved the minimum required stabilization of 6 hours as per the New York State Department of Health and the Putnam County Department of Health requirements.

Stabilization is defined as an unchanged water level within the on-site test wells accompanied by a constant pumping rate. If the on-site test wells did not stabilize for the minimum 6-hour period, the test would have continued until the wells stabilized for the required duration. The pumps were removed at the conclusion of the test and the on-site test wells resealed.

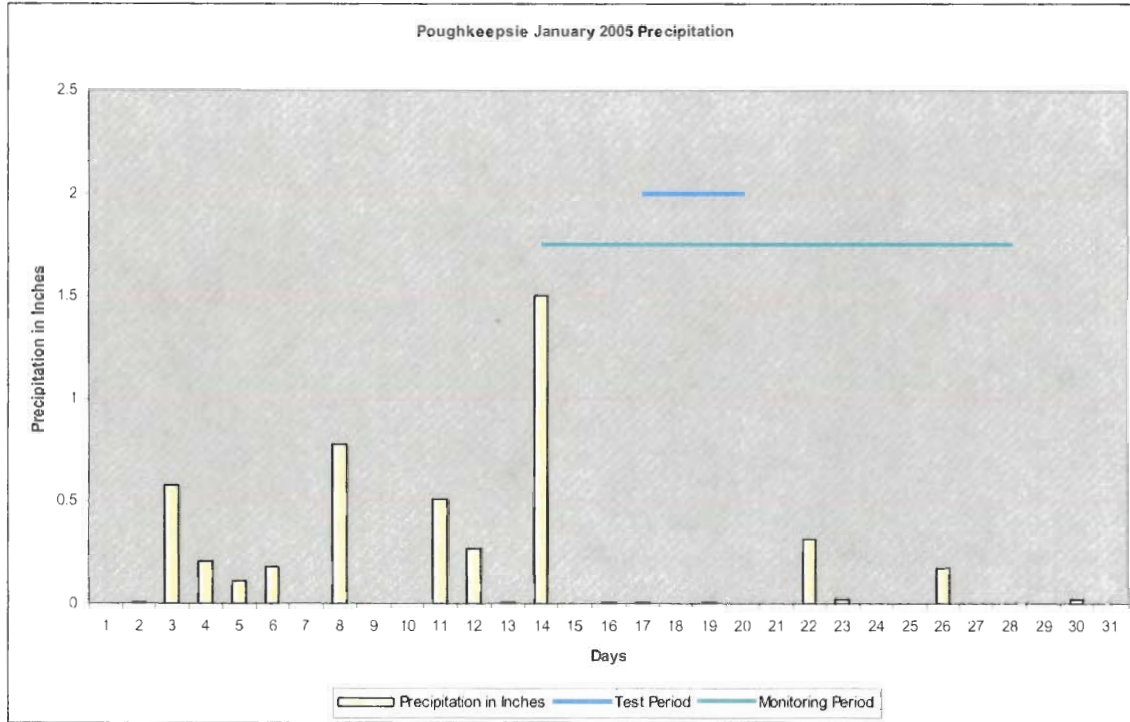
## **5.0 WATER QUALITY**

A set of water samples were collected from each test well just before the test was shut down. The samples were transported (same day) in iced coolers to a New York State certified laboratory for analysis using the parameters specified by the Putnam County Department of Health. The quality of the water sampled on the property meets the New York State Drinking Water Standards. The analytical report supplied by the laboratory is available in Appendix C.

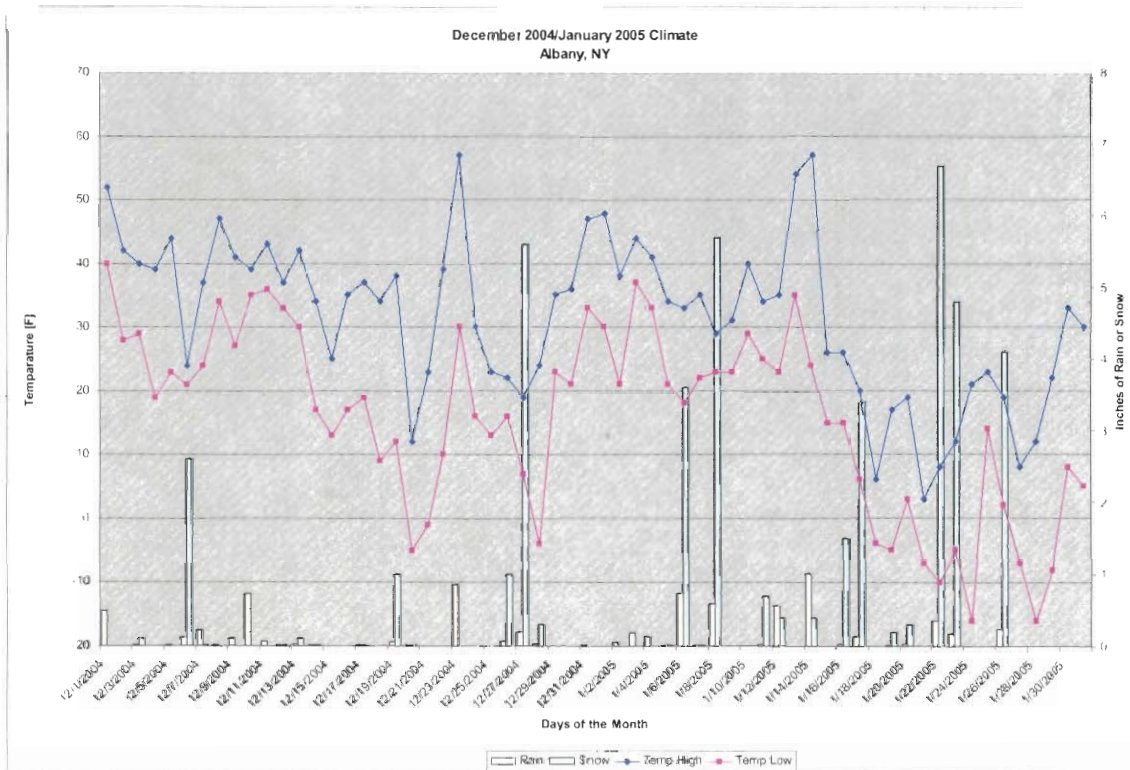
## **6.0 WEATHER DURING TEST PERIOD**

The closest local climatic data for the Patterson/Carmel area was obtained from the Poughkeepsie weather station. The data, presented in the chart below, also shows the test and monitoring periods. A regional climatic chart showing the Albany, N.Y. data for December and January is presented for comparison. Based on this data and on observations during the test, there was no significant precipitation during the test period. The precipitation that occurred in the early part of January prior to the test period occurred as snow and due to the cold conditions did not thaw until after the test period. Therefore, the snowfall in early January had no influence on the test results.





**Figure 1, Poughkeepsie Rain Data for January**



**Figure 2, Albany Climatic Data for December and January**



## 7.0 PUMPING TEST RESULTS

The two production wells were pumped at a constant rate of 22 gallons per minute for the duration of the test (72 hours). The data plots for the test wells indicate that the wells are suitable as production wells for pumping rates of 22 gallons per minute, or less. Both wells stabilized for the minimum required 6 hours before the pumps were shut off and the wells were allowed to recover. The recovery plots (following the conclusion of the pumping test) indicate that the supplying bedrock fractures recharge within a similar period of time as was required to complete the drawdown test. The test charts below [Figures 4 and 5] also show the pumping rate and pumping period. The drawdown and recovery plots were combined for clarity.

The PW-1 chart shows that the water level drawdown during the test was approximately 275 feet below the zero starting point. Stabilization started during the third day of pumping with the final 8 hourly readings shown in Table 1. The test on PW-2 indicates that this well is more productive than PW-1 since the drawdown in this well was limited to about 60 feet.

**Table 1, Stabilized Pumping Period**

<i>Elapsed Min.</i>	<i>PW-1</i>	<i>Elapsed Min.</i>	<i>PW-2</i>
3900	-274.09	3994.00	-60.82
3960	-274.05	4054.00	-60.87
4020	-274.04	4114.00	-60.89
4080	-274.05	4174.00	-60.89
4140	-274.08	4234.00	-60.90
4200	-274.07	4294.00	-60.94
4260	-274.07	4354.00	-60.91
4320	-274.03	4414.00	-60.81

The water level data developed from the homeowner wells all indicate that the pumping of the Patterson Crossing wells had no discernable impact on any of the monitored homeowner wells. The charts for the on-site and off-site wells are available in Appendix D.

## 8.0 CONCLUSION

The Patterson Crossing well installation and pumping tests show that the developed water supply meets the requirements established by the project engineer and also meets the regulatory minimums set by the New York State Department of Health and the Putnam County Department of Health. The water supply available to the project substantially exceeds the project water demand, based upon the 72 hour pumping test. The water quality of the wells meets New York State Drinking Water Standards. As stated above, the pumping test also shows that there is no discernable impact to the surrounding private wells.



Appendix A

Well Logs



**PUTNAM COUNTY DEPARTMENT OF HEALTH  
DIVISION OF ENVIRONMENTAL HEALTH SERVICES**

**WELL COMPLETION REPORT**

<b>Well Location</b>	Street Address: <u>RT 311</u> <u>WELL 1 PATTERSON (MISSING) PATTERSON</u>	Town/Village:	Tax Grid # Map      Block      Lot(s)			
<b>Well Owner:</b>	Name: <u>PAUL CAMARIZO</u> Address: <u>1099 RT 6 GATE 1, CARROLL NY 10912</u>					
<b>Use of Well:</b>	<input type="checkbox"/> Residential <input type="checkbox"/> Public Supply <input type="checkbox"/> Air cond/heat pump <input type="checkbox"/> Irrigation <input checked="" type="checkbox"/> Business <input type="checkbox"/> Farm <input type="checkbox"/> Test/monitoring <input type="checkbox"/> Other(specify) <input type="checkbox"/> Industrial <input type="checkbox"/> Institutional <input type="checkbox"/> Standby					
<b>Drilling Equipment</b>	<input type="checkbox"/> Rotary <input type="checkbox"/> Cable percussion <input checked="" type="checkbox"/> Compressed air percussion <input type="checkbox"/> Other (specify)					
<b>Well Type</b>	<input type="checkbox"/> Screened <input type="checkbox"/> Open end casing <input checked="" type="checkbox"/> Open hole in bedrock <input type="checkbox"/> Other					
<b>Casing Details</b>	Total length	<u>31</u> ft.	Materials: <input checked="" type="checkbox"/> Steel <input type="checkbox"/> Plastic <input type="checkbox"/> Other			
	Length below grade	<u>30</u> ft.	Joints: <input type="checkbox"/> Welded <input checked="" type="checkbox"/> Threaded <input type="checkbox"/> Other			
	Diameter	<u>6</u> in.	Seal: <input checked="" type="checkbox"/> Cement grout <input type="checkbox"/> Bentonite <input type="checkbox"/> Other			
	Weight per foot	<u>14</u> lb/ft.	Drive shoe: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No      Liner: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
<b>Screen Details</b>		Diameter (in)	Slot Size	Length(ft)	Depth to Screen (ft)	Developed?
	First					<input type="checkbox"/> Yes <input type="checkbox"/> No
	Second					Hours _____
<b>Well Yield Test</b>	<input type="checkbox"/> Bailed <input checked="" type="checkbox"/> Pumped <input checked="" type="checkbox"/> Compressed Air				Hours <u>6</u>	Yield <u>20</u> gpm
<b>Depth Data</b>	Measure from land surface-static (specify ft) <u>50' +/-</u>		During yield test (ft) <u>TOTAL PUMP DEPTH</u> <u>20 gpm</u>	Depth of completed well in feet <u>305</u>		
<b>Well Log</b> If more detailed information descriptions or sieve analyses are available, please attach.	<b>Depth From Surface</b>		<b>Water</b>	<b>Well</b>	<b>Formation</b>	
	ft.	ft.	<b>Bearing</b>	<b>Diameter(in)</b>	<b>Description</b>	
	Land Surface	<u>2</u>			<u>ORGANIC SOIL</u>	
	<u>2</u>	<u>70</u>			<u>SANDY CLAY TILL</u>	
	<u>70</u>	<u>305</u>			<u>HARD DARK GRAY GNEISS</u> <u>with Quartz + Biotite</u>	
					<u>WELL WAS PUMP TESTED</u> <u>FOR 72 HRS</u>	
<b>If yield was tested at different depths during drilling. list:</b>	<b>Feet</b>	<b>Gallons Per Minute</b>		<b>Pump/Storage Tank Information</b>		
	<u>320'</u>	<u>16 gpm</u>		Pump Type _____	Capacity _____	
	<u>410</u>	<u>37 gpm</u>		Depth _____	Model _____	
	<u>640</u>	<u>17 gpm</u>		Voltage _____	HP _____	
	<u>total</u>	<u>20 gpm</u>		Tank Type _____	Volume _____	
<b>Date Well Completed</b>	<b>Putnam County Certification No.</b>	<b>Date of Report</b>	<b>Well Driller (signature)</b>			
<u>10/13/04</u>	<u>003</u>	<u>5/24/05</u>	<u>[Signature]</u>			

NOTE: Exact location of well with distances to at least two permanent landmarks to be provided on a separate sheet plan.

Well Driller's Name: BOB PATTERSON WELL CO, INC.      Address: 1099 RT 6 2  
 Signature: [Signature]      Date: CARROLL NY 10912  
5/24/05

White copy: HD File; Yellow copy - Building Inspector; Pink copy - Owner; Orange copy - Well driller  
 (346) 226 3190

**PUTNAM COUNTY DEPARTMENT OF HEALTH  
DIVISION OF ENVIRONMENTAL HEALTH SERVICES**

**WELL COMPLETION REPORT**

<b>Well Location</b>	Street Address: <u>RT 31</u> <u>WELL # 2 PATTERSON CROOKS PATTERSON</u>	Town/Village: <u>PATTERSON</u>	Tax Grid # Map Block Lot(s)			
<b>Well Owner:</b>	Name: <u>PAUL CAMARDA 1099 RT 6 SUITE 1, CAMEL, NY 10912</u>	Address:				
<b>Use of Well:</b>	<input type="checkbox"/> Residential <input type="checkbox"/> Public Supply <input type="checkbox"/> Air cond/heat pump <input type="checkbox"/> Irrigation <input type="checkbox"/> 1-primary Business <input type="checkbox"/> Farm <input type="checkbox"/> Test/monitoring <input type="checkbox"/> Other(specify) <input type="checkbox"/> 2-secondary Industrial <input type="checkbox"/> Institutional <input type="checkbox"/> Standby					
<b>Drilling Equipment</b>	<input type="checkbox"/> Rotary <input type="checkbox"/> Cable percussion <input checked="" type="checkbox"/> Compressed air percussion <input type="checkbox"/> Other (specify)					
<b>Well Type</b>	<input type="checkbox"/> Screened <input type="checkbox"/> Open end casing <input checked="" type="checkbox"/> Open hole in bedrock <input type="checkbox"/> Other					
<b>Casing Details</b>	Total length	<u>51</u> ft.	Materials: <input checked="" type="checkbox"/> Steel <input type="checkbox"/> Plastic <input type="checkbox"/> Other			
	Length below grade	<u>50</u> ft.	Joints: <input type="checkbox"/> Welded <input checked="" type="checkbox"/> Threaded <input type="checkbox"/> Other			
	Diameter	<u>6</u> in.	Seal: <input checked="" type="checkbox"/> Cement grout <input type="checkbox"/> Bentonite <input type="checkbox"/> Other			
	Weight per foot	<u>19</u> lb/ft.	Drive shoe: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No    Lincr: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
<b>Screen Details</b>		Diameter (in)	Slot Size	Length(ft)	Depth to Screen (ft)	Developed?
	First					<input type="checkbox"/> Yes <input type="checkbox"/> No
	Second					Hours _____
<b>Well Yield Test</b>	<input type="checkbox"/> Bailed <input checked="" type="checkbox"/> Pumped <input checked="" type="checkbox"/> Compressed Air				Hours <u>6</u>	Yield <u>20</u> gpm
<b>Depth Data</b>	Measure from land surface-static (specify ft)		During yield test(ft)		Depth of completed well in feet	
	<u>61'</u>		<u>total DRINK DOWN</u>		<u>705</u>	
<b>Well Log</b> If more detailed information descriptions or sieve analyses are available, please attach.	<b>Depth From Surface</b>		<b>Water</b>	<b>Well</b>	<b>Formation</b>	
	ft.	ft.	<b>Bearing</b>	<b>Diameter(In)</b>	<b>Description</b>	
	Land Surface	<u>2</u>			<u>ORGANIC SOIL</u>	
	<u>2</u>	<u>10</u>			<u>SANDY CLAY TILL</u>	
	<u>10</u>	<u>705</u>			<u>HARD DARK GRAY GNEISS</u>	
					<u>Quartz + Biotite</u>	
					<u>Pump Tested 72 HRS</u>	
<b>If yield was tested at different depths during drilling, list:</b>	<b>Feet</b>		<b>Gallons Per Minute</b>		<b>Pump/Storage Tank Information</b>	
	<u>230'</u>		<u>5 gpm</u>		Pump Type _____	Capacity _____
	<u>290'</u>		<u>5 gpm</u>		Depth _____	Model _____
	<u>340'</u>		<u>7 gpm</u>		Voltage _____	HP _____
	<u>570'</u>		<u>3 gpm</u>		Tank Type _____	Volume _____
<u>TOTAL</u>		<u>28 gpm</u>				
<b>Date Well Completed</b>	<b>Putnam County Certification No.</b>	<b>Date of Report</b>	<b>Well Driller (signature)</b>			
<u>11/8/04</u>	<u>003</u>	<u>5/24/05</u>	<u>[Signature]</u>			

NOTE: Exact location of well with distances to at least two permanent landmarks to be provided on a separate site plan.

Well Driller's Name: ROYD ARTESIAN WELL CO.  
 Signature: [Signature]

Address: 1099 RT 62 CAMEL, NY 10912  
 Date: 5/24/05  
(845) 225-3196

Appendix B

Off-Site Monitoring Request Letter,  
Survey, and List of Recipients



**TIM  
MILLER  
ASSOCIATES, INC.**

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*10 North Street, Cold Spring, NY 10516 (845) 265-4400 265-4418 fax www.timmillerassociates.com*

November 23, 2004

**RE: Patterson Crossing Retail Center  
Well Drilling and Testing**

Dear Property Owner:

The applicant for the proposed Patterson Crossing Retail Center has engaged our firm to evaluate the groundwater supply system for the project and to evaluate any potential off-site impacts. The results of this review will be provided to the Town as part of the environmental review process. We seek your cooperation in enabling us to conduct the groundwater testing program.

The proposed Patterson Crossing Retail Center includes 439,500 square feet of retail space on 90.46 acres. Access to the site will be provided from NYS Route 311, approximately 650 feet west of the Patterson/Kent Town line. Water to the site will be supplied from groundwater wells with an anticipated daily usage of 15,675 gallons per day. The applicant is evaluating various options to address wastewater disposal. The applicant is required to pre-drill a number of wells on the site and test them as part of securing Health Department approvals.

As an initial step in this process, we are sending questionnaires to homes in the vicinity of the project to collect basic information on existing wells, including water quantity and quality. We encourage you to fill out as much information on the form and submit it to us in the enclosed pre-stamped envelope within ten (10) days of the receipt of this letter.

The second part of the groundwater program involves conducting a pump test of the on-site wells while simultaneously monitoring water levels in a select number of private wells in the project vicinity. To that end, we request that you indicate on the attached letter whether you would be willing to allow your well to be monitored while we pump the project's wells. Consent does not mean that your well will be monitored; but we need to secure consent before finalizing the testing program.

November 23, 2004

If your well is selected to be monitored, the process will not exceed a period of two weeks. The monitoring procedure will require the insertion of an electronic water level monitoring probe that is disinfected prior to entry into your well to measure the water level in your well. The probe is a 1.5-inch diameter by 16-inch long stainless steel and Teflon device attached to a calibrated coaxial cable.

A technician experienced in this work will visit the well to install and then periodically monitor the probe, typically each day during the testing period. Collection of the water level information typically takes about 15 minutes per visit. We will endeavor not to disturb you during the monitoring visits, which will take place outside of your house. After the conclusion of the testing, the technician will remove the probe and properly close your well.

Well monitoring has no detrimental effects - it assesses water levels in your well before, during and after the proposed wells are pump tested. Although no effects are anticipated, the applicant will be responsible for any damage to your well as a result of the monitoring program, but will not be responsible for any pre-existing conditions.

Occasionally, especially in older wells or wells with high iron and/or manganese, insertion of a test probe will cause the well water to become temporarily cloudy. This is due to the agitation of fine particles that have settled in the well over time. This condition typically clears within 24 hours and is not a health concern.

By consenting to allow us to monitor your well, you will help protect existing water supplies during the development, construction and long-term occupancy of the project. The monitoring data from your well will be made available to you upon request, at no charge, and may prove useful to you in ascertaining existing conditions of your well.

The sponsor of the project has made a significant effort to select sites for the wells on this property so that there would be no adverse impact on your wells. Monitoring provides us with vital information that will allow us to confirm that we have indeed selected well locations that will not affect your well. We want to be doubly sure that we safeguard the proper performance of your wells by choosing the right locations for our wells. To accomplish this, we need your help to gather the necessary data through this monitoring process.

By checking the first line below and signing this letter, you hereby agree to permit TMA and its agents to enter upon your property, with prior notice, for the purpose of monitoring your well. If you do not want your well monitored, please check the second line.

Please sign and print your name, address and telephone number below. Please mail this page, along with the completed questionnaire in the enclosed envelope by December 4, 2004. If you have any questions about this process please feel free to call me at (845) 265-

November 23, 2004

4400, or the project sponsor, Paul Camarda, at (845) 228-1400. Thank you for your kind cooperation in this matter.

Sincerely,

Jon Dahlgren  
Senior Environmental Geologist  
TIM MILLER ASSOCIATES, INC.

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**Please check one:**

**I agree to permit my well to be monitored as described above.**

**I do not agree to allow my well to be monitored.**

**Signature** \_\_\_\_\_

**Print Name** \_\_\_\_\_ **Date** \_\_\_\_\_

**Address** \_\_\_\_\_ **Zip** \_\_\_\_\_

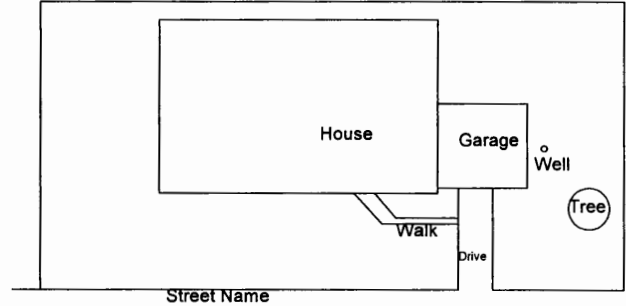
**Eve. Telephone** \_\_\_\_\_ **Day Telephone** \_\_\_\_\_

**Email** \_\_\_\_\_

This questionnaire is being sent to homeowners within the vicinity of the proposed Patterson Crossing Retail Center Project on Route 311 in the Towns of Carmel and Patterson, NY, in conjunction with a well monitoring program for the Project.

Please answer the questions below, if you can. If you do not have the necessary information or are unsure how to answer a question, please indicate so.

Please provide a sketch of your property, including well and septic location, as in the example. Use the back of this page for your sketch.



Name \_\_\_\_\_

Address \_\_\_\_\_

Telephone Number (indicate whether day or evening number) \_\_\_\_\_

What year was your well installed?

What is the total depth of your well?

What is the approximate depth to the water table, if known?

Does your well tap the bedrock or sand and gravel aquifer?

How much casing was used during the installation of your well?

Is the top of your well above ground, in a well pit, buried, or other?

What is the approximate depth to water-bearing fractures, if known?

Does your well have a submersible pump, a jet pump or a centrifugal pump?

What is the approximate yield of your well?

How far is your well from your or your neighbor's septic leaching field?

Does your well ever run dry?

During high usage times

During dry weather periods

Because of mechanical/electrical problems

Does your well have water quality problems?

Bacterial

Sulfur

Iron

Hardness

Cloudiness

Taste

Chemical

Additional Comments:



**Patterson Crossing Well Monitoring  
Summary Table**

<b>Recipient</b>	<b>Response</b>	<b>Monitored/Not Monitored</b>
<b>22.76-2-5</b> Elisabeth S. Cafiero or Current Resident 98 Concord Road Carmel, NY 10512	No	Not Monitored
<b>22.76-2-6</b> Ann Osbourn, C/O Partenio or Current Resident 94 Concord Road Carmel, NY 10512	No Response	Not Monitored
<b>22.76-2-7</b> Martha & Gus Berglund or Current Resident 88 Concord Road Carmel, NY 10512	Yes	Not Monitored since it was adjacent to a property that was monitored. The well was within approximately 100 ft. of a monitored well.
<b>22.76-2-8</b> Kathleen & John Mulvihill or Current Resident 84 Concord Road Carmel, NY 10512	Yes	Monitored
<b>22.84-2-12</b> Christine Lippus & Kenneth S. Berkman or Current Resident 175 West 87th Street, Apt. 28C New York, NY 10024	No Response	Not Monitored
<b>22.84-2-13</b> Camille D. & Paul W. Caley or Current Resident 6905 Vallon Drive Palos Verdes Peninsula, CA 90274	No Response	Not Monitored
<b>22.84-2-14</b> Michael Rosco or Current Resident 70 Concord Road Carmel, NY 10512	Yes	Not Monitored due to well design. Well located in pit.
<b>22.84-2-15</b> Ronald & Donna Charbonneau or Current Resident 64 Concord Road Carmel, NY 10512	No	Not Monitored
<b>22.84-2-17</b> Marie Kovacs or Current Resident 58 Concord Road Carmel, NY 10512	No Response	Not Monitored

**Patterson Crossing Well Monitoring  
Summary Table**

<u>Recipient</u>	<u>Response</u>	<u>Monitored/Not Monitored</u>
<b>22.84-2-18</b>	No Response	Not Monitored
Daniel & Sheila Enkler or Current Resident		
54 Concord Road Carmel, NY 10512		
<b>22.84-2-19</b>	No Response	Not Monitored
Gilbert Rios or Current Resident		
50 Concord Road Carmel, NY 10512		
<b>22.84-2-1</b>	Yes	Monitored
<b>Grace &amp; Lynn Hill or Current Resident</b>		
<b>77 Echo Road Carmel, NY 10512</b>		
<b>22.84-2-20</b>	No Response	Not Monitored
Gilbert & Amelia Rios or Current Resident		
37 Woodstock Road Carmel, NY 10512		
<b>22.84-2-2</b>	No Response	Not Monitored
Ronald & Kathleen Fetky or Current Resident		
73 Echo Road Carmel, NY 10512		
<b>22.84-2-3, 22.84-1-28</b>	No Response	Not Monitored
Erica McCall or Current Resident		
64 Vernon Drive Carmel, NY 10512		
<b>33-2-22</b>	Yes	Monitored
<b>Kevin &amp; Marie Kroger or Current Resident</b>		
<b>701 Fair Street Carmel, NY 10512</b>		
<b>33-2-20</b>	No Response	Not Monitored
Robert Jr. & Pamela Fuhst or Current Resident		
10 Vernon Drive Lake Carmel, NY 10512		
<b>22-2-47</b>	No Response	Not Monitored
NY State Atty General		
State of New York The Capital Albany, NY 12224		

**Patterson Crossing Well Monitoring  
Summary Table**

<u>Recipient</u>	<u>Response</u>	<u>Monitored/Not Monitored</u>
<b>22-2-49</b>	No Response	Not Monitored
James A. Zappolo or Current Resident		
Route 311 Carmel, NY 10512		
<b>33-1-76</b>	No Response	Not Monitored
Park District		
Town of Kent		
531 Route 52 Kent Lakes, NY 10512		
<b>22.75-1-11, 22.75-1-12</b>	No Response	Not Monitored
Town of Kent		
35-406		
531 Route 52 Kent Lakes, NY 10512		
<b>22.75-1-30</b>	No Response	Not Monitored
Carmine Formisano or Current Resident		
1420 Croton Lake Road Yorktown, NY 10598		
<b>22.75-1-31</b>	No Response	Not Monitored
Thomas F. Kelly or Current Resident		
41 Calebs Way Greenport, NY 11944		
<b>22.76-1-1</b>	No Response	Not Monitored
Jeanette Snizek or Current Resident		
58 Brentwood Road Carmel, NY 10512		
<b>22.76-1-2</b>	No Response	Not Monitored
William S. & Barbara T. Misicka		
or Current Resident		
61 Brentwood Road Carmel, NY 10512		
<b>22.84-1-29</b>	Yes	Not Monitored since it was adjacent to a property that was monitored. The well was within approximately 100 ft. of a monitored well.
Harry & Susan Bourletos or Current Resident		
60 Vernon Drive Carmel, NY 10512		
<b>22.84-1-30</b>	Yes	Monitored
Natalie & Joseph Colella		
or Current Resident		
247 Ressique Street Stormville, NY 12582		
located at 68 Vernon Drive Carmel, NY 10512		

**Patterson Crossing Well Monitoring  
Summary Table**

<b>Recipient</b>	<b>Response</b>	<b>Monitored/Not Monitored</b>
<b>22.84-1-31, 33.28-1-12</b> Charles R. Palmieri & Charles Palmieri Jr. or Current Resident 56 Vernon Drive Carmel, NY 10512	No Response	Not Monitored
<b>33.28-1-13</b> <b>Matthew &amp; Patricia Dzubak</b> or Current Resident 50 Vernon Drive Carmel, NY 10512	Yes	Monitored
<b>33.28-1-14</b> Patrick & Beth O'Malley or Current Resident 46 Vernon Drive Carmel, NY 10512	No Response	Not Monitored
<b>33.28-1-15</b> Patrick Groves or Current Resident P.O. Box 591 Shenorock, NY 10587	No Response	Not Monitored
<b>33.28-1-16</b> <b>Anthony Jr. &amp; Darlene Della Bovie</b> or Current Resident 38 Vernon Drive Carmel, NY 10512	Yes	Monitored
<b>33.28-1-17</b> Patrick L. & Alma L. Jennings or Current Resident 32 Vernon Drive Carmel, NY 10512	No Response	Not Monitored
<b>33.28-1-18</b> James F. & Rita M. Miller or Current Resident 26 Vernon Drive Carmel, NY 10512	Yes	Not Monitored due to well design. Well located in pit.
<b>33.28-1-19</b> Wesley & Loretta Dzedzic or Current Resident 18 Vernon Drive Carmel, NY 10512	No Response	Not Monitored

**Patterson Crossing Well Monitoring  
Summary Table**

<u>Recipient</u>	<u>Response</u>	<u>Monitored/Not Monitored</u>
<b>33.36-1-1</b> Paul Cameron or Current Resident 16 Vernon Drive Carmel, NY 10512	No Response	Not Monitored
<b>22.-2-28, 22.-2-29</b> Sumpio Zappolo or Current Resident 233 Smadbeck Avenue Carmel, NY 10512	No Response	Not Monitored
<b>22-2-34</b> Daniel & Karee Doyle or Current Resident 459 Horsepound Road Carmel, NY 10512	Yes	Monitored
<b>22-2-33</b> Richard Viebrock or Current Resident 164 Route 311 Carmel, NY 10512	Yes	Not Monitored due to well design. Well located in pit.
<b>23-1-1/23-1-3</b> Shaw Welding, Attn. Bill & Pam Shaw 761 Fair Street Carmel, NY 10512	Verbal Yes	Monitored



Appendix C

Water Quality Analytical Results



# ANALYTICAL REPORT

JOB NUMBER: 244322

Prepared For:

Tim Miller Associates, Inc.  
10 NORTH STREET  
COLD SPRING, NY 10516

Attention: John Dahlgren

Date: 02/17/2005

*J. Kull*

Signature

Name: STL-Newburgh

Title:

*2/17/05*

Date

315 Fullerton Avenue  
Newburgh, NY 12550

PHONE: (845) 562-0890  
FAX..: (845) 562-0841

STL Newburgh is a part of Severn Trent Laboratories, Inc.

SEVERN  
TRENT **STL**

NYSDOH 10142

NJDEP 73015

CTDOHS PH-0554

EPA NY049

PA 68-378

M-NY049

STL Newburgh  
315 Fullerton Avenue  
Newburgh, NY 12550  
Tel (845) 562-0890  
Fax (845) 562-0841



**SAMPLE INFORMATION**  
Date: 02/17/2005

Job Number.: 244322	Project Number.....: 20000586
Customer...: Tim Miller Associates, Inc.	Customer Project ID....: PATTERSON CROSSING
Attn.....: John Dahlgren	Project Description....:

Laboratory Sample ID	Customer Sample ID	Sample Matrix	Date Sampled	Time Sampled	Date Received	Time Received
244322-1	SE Well	Pot. Water	01/12/2005	09:30	01/12/2005	11:10
244322-2	NW Well	Pot. Water	01/12/2005	10:00	01/12/2005	11:10

LABORATORY TEST RESULTS

Job Number: 244322

Date: 02/17/2005

CUSTOMER: Tim Miller Associates, Inc.

PROJECT: PATTERSON CROSSING

ATTN: John Dahlgren

Customer Sample ID: SE Well  
 Date Sampled.....: 01/12/2005  
 Time Sampled.....: 09:30  
 Sample Matrix.....: Pot. Water

Laboratory Sample ID: 244322-1  
 Date Received.....: 01/12/2005  
 Time Received.....: 11:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	Q	FLAGS	REPORTING LIMIT	UNITS	ANALYZED	TECH
SM18 9223	Coliform, Total	Absent			POS/NEG	/100ml	01/12/05	mwr
SM18 9223	E. Coliform	Absent			POS/NEG	/100ml	01/12/05	mwr
EPA 180.1	Turbidity Assessment - Metals	Negative				Pos/Neg	01/14/05	mwr
EPA 245.1	Mercury (Hg)	0.20	U		0.20	ug/L	01/14/05	lms
EPA 504	Extraction by method 504	Complete						mad
SM18 2120B	Color	2.5			2.5	Pt/Co	01/13/05	rmc
SM18 2150B	Odor	1			1	T.O.N.	01/13/05	rmc
SM18 4500CNE	Cyanide, Total	0.0100	U		0.0100	mg/L	01/17/05	bg
SM18 4500FC	Fluoride	0.20	U		0.20	mg/L	01/13/05	rmc
SM18 4500N02B	Nitrite as N (NO2-N)	0.01	U		0.01	mg/L	01/14/05	jpp
525.2	525.2 Semi-volatile Subcontract	Complete				* Text	01/26/05	jmr
600/R-93-116	Asbestos Subcontract	Complete					01/28/05	jmr
EPA 900.0	Gross alpha/beta Subcontract	Complete				* Text	02/16/05	jmr
515.1	Herbicide (Drinking Water) Subcontract	Complete				ug/L	01/26/05	jmr
EPA 531.1	Method 531.1 Subcontract	Complete				Text	01/26/05	jmr
EPA 903	Radium 226 Subcontract	Complete					02/16/05	jmr
EPA 904.0	Radium 228 Subcontract	Complete				* Text	02/16/05	jmr
EPA 908.1	Uranium (Fluorimetric) Subcontract	Complete					02/16/05	jmr
EPA 504	GC Micro-Extractable Volatiles							
	1,2-Dibromoethane (EDB)	0.020	U		0.020	ug/L	01/26/05	ljc
	1,2-Dibromo-3-chloropropane	0.020	U		0.020	ug/L	01/26/05	ljc

\* In Description = Dry Wgt.



LABORATORY TEST RESULTS

Job Number: 244322

Date: 02/17/2005

CUSTOMER: Tim Miller Associates, Inc.

PROJECT: PATTERSON CROSSING

ATTN: John Dahlgren

Customer Sample ID: SE Well  
 Date Sampled.....: 01/12/2005  
 Time Sampled.....: 09:30  
 Sample Matrix.....: Pot. Water

Laboratory Sample ID: 244322-1  
 Date Received.....: 01/12/2005  
 Time Received.....: 11:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	Q	FLAGS	REPORTING LIMIT	UNITS	ANALYZED	TECH
EPA 200.7	Metals Analysis (ICP) Beryllium (Be)	1.0	U		1.0	ug/L	01/18/05	mad
EPA 200.8	Metals Analysis (ICP-MS)							
	Antimony (Sb)	0.40	U		0.40	ug/L	01/17/05	mad
	Arsenic (As)	1.4	U		1.4	ug/L	01/17/05	mad
	Barium (Ba)	12.3			0.40	ug/L	01/17/05	mad
	Cadmium (Cd)	0.30	U		0.30	ug/L	01/17/05	mad
	Chromium (Cr)	0.45			0.30	ug/L	01/17/05	mad
	Nickel (Ni)	0.59			0.50	ug/L	01/17/05	mad
	Selenium (Se)	3.0	U		3.0	ug/L	01/17/05	mad
	Thallium (Tl)	0.30	U		0.30	ug/L	01/17/05	mad
EPA 502.2	Volatile Organics							
	Benzene	0.50	U		0.50	ug/L	01/21/05	ems
	Ethylbenzene	0.50	U		0.50	ug/L	01/21/05	ems
	Toluene	0.50	U		0.50	ug/L	01/21/05	ems
	o-Xylene	0.50	U		0.50	ug/L	01/21/05	ems
	m&p-Xylenes	0.50	U		0.50	ug/L	01/21/05	ems
	Naphthalene	0.50	U		0.50	ug/L	01/21/05	ems
	Methyl-tert-butyl-ether (MTBE)	1.0	U		1.0	ug/L	01/21/05	ems
	Chlorobenzene	0.50	U		0.50	ug/L	01/21/05	ems
	1,2-Dichlorobenzene	0.50	U		0.50	ug/L	01/21/05	ems
	1,3-Dichlorobenzene	0.50	U		0.50	ug/L	01/21/05	ems
	1,4-Dichlorobenzene	0.50	U		0.50	ug/L	01/21/05	ems
	Chloromethane	0.50	U		0.50	ug/L	01/21/05	ems
	Bromomethane	0.50	U		0.50	ug/L	01/21/05	ems
	Dichlorodifluoromethane	0.50	U		0.50	ug/L	01/21/05	ems
	Vinyl chloride	0.50	U		0.50	ug/L	01/21/05	ems
	Chloroethane	0.50	U		0.50	ug/L	01/21/05	ems
	Methylene chloride	1.0	U		1.0	ug/L	01/21/05	ems
	Trichlorofluoromethane	0.50	U		0.50	ug/L	01/21/05	ems
	1,1-Dichloroethene	0.50	U		0.50	ug/L	01/21/05	ems
	Bromochloromethane	0.50	U		0.50	ug/L	01/21/05	ems
	1,1-Dichloroethane	0.50	U		0.50	ug/L	01/21/05	ems
	trans-1,2-Dichloroethene	0.50	U		0.50	ug/L	01/21/05	ems
	cis-1,2-Dichloroethene	0.50	U		0.50	ug/L	01/21/05	ems
	Chloroform	0.50	U		0.50	ug/L	01/21/05	ems
	1,2-Dichloroethane	0.50	U		0.50	ug/L	01/21/05	ems
	2,2-Dichloropropane	0.50	U		0.50	ug/L	01/21/05	ems
	1,2-Dibromoethane (EDB)	0.50	U		0.50	ug/L	01/21/05	ems
	1,1,1-Trichloroethane	0.50	U		0.50	ug/L	01/21/05	ems
	Carbon tetrachloride	0.50	U		0.50	ug/L	01/21/05	ems
	Bromodichloromethane	0.50	U		0.50	ug/L	01/21/05	ems
	1,2-Dichloropropane	0.50	U		0.50	ug/L	01/21/05	ems
	1,1-Dichloropropene	0.50	U		0.50	ug/L	01/21/05	ems
	Trichloroethene	0.50	U		0.50	ug/L	01/21/05	ems
	1,3-Dichloropropane	0.50	U		0.50	ug/L	01/21/05	ems
	Dibromochloromethane	0.50	U		0.50	ug/L	01/21/05	ems

\* In Description = Dry Wgt.



LABORATORY TEST RESULTS

Job Number: 244322

Date: 02/17/2005

CUSTOMER: Tim Miller Associates, Inc.

PROJECT: PATTERSON CROSSING

ATTN: John Dahlgren

Customer Sample ID: SE Well  
 Date Sampled.....: 01/12/2005  
 Time Sampled.....: 09:30  
 Sample Matrix.....: Pot. Water

Laboratory Sample ID: 244322-1  
 Date Received.....: 01/12/2005  
 Time Received.....: 11:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	Q	FLAGS	REPORTING LIMIT	UNITS	ANALYZED	TECH	
EPA 300.0	Dibromomethane	0.50	U		0.50	ug/L	01/21/05	ems	
	Bromoform	0.50	U		0.50	ug/L	01/21/05	ems	
	1,1,1,2-Tetrachloroethane	0.50	U		0.50	ug/L	01/21/05	ems	
	1,2,3-Trichloropropane	0.50	U		0.50	ug/L	01/21/05	ems	
	1,1,2,2-Tetrachloroethane	0.50	U		0.50	ug/L	01/21/05	ems	
	Tetrachloroethene	0.50	U		0.50	ug/L	01/21/05	ems	
	Bromobenzene	0.50	U		0.50	ug/L	01/21/05	ems	
	2-Chlorotoluene	0.50	U		0.50	ug/L	01/21/05	ems	
	4-Chlorotoluene	0.50	U		0.50	ug/L	01/21/05	ems	
	cis-1,3-Dichloropropene	0.50	U		0.50	ug/L	01/21/05	ems	
	trans-1,3-Dichloropropene	0.50	U		0.50	ug/L	01/21/05	ems	
	1,2-Dibromo-3-chloropropane	0.50	U		0.50	ug/L	01/21/05	ems	
	Isopropylbenzene	0.50	U		0.50	ug/L	01/21/05	ems	
	Styrene	0.50	U		0.50	ug/L	01/21/05	ems	
	n-Propylbenzene	0.50	U		0.50	ug/L	01/21/05	ems	
	tert-Butylbenzene	0.50	U		0.50	ug/L	01/21/05	ems	
	sec-Butylbenzene	0.50	U		0.50	ug/L	01/21/05	ems	
	1,3,5-Trimethylbenzene	0.50	U		0.50	ug/L	01/21/05	ems	
	p-Isopropyltoluene	0.50	U		0.50	ug/L	01/21/05	ems	
	1,2,4-Trimethylbenzene	0.50	U		0.50	ug/L	01/21/05	ems	
	n-Butylbenzene	0.50	U		0.50	ug/L	01/21/05	ems	
	Hexachlorobutadiene	0.50	U		0.50	ug/L	01/21/05	ems	
	1,2,4-Trichlorobenzene	0.50	U		0.50	ug/L	01/21/05	ems	
	1,2,3-Trichlorobenzene	0.50	U		0.50	ug/L	01/21/05	ems	
	1,1,2-Trichloroethane	0.50	U		0.50	ug/L	01/21/05	ems	
		Ion Chromatography Analysis							
		Nitrate as N (NO3-N)	0.600			0.500	mg/L	01/12/05	bg
	Sulfate	14.3			5.00	mg/L	01/12/05	bg	

\* In Description = Dry Wgt.



LABORATORY TEST RESULTS

Job Number: 244322

Date: 02/17/2005

CUSTOMER: Tim Miller Associates, Inc.

PROJECT: PATTERSON CROSSING

ATTN: John Dahlgren

Customer Sample ID: NW Well  
 Date Sampled.....: 01/12/2005  
 Time Sampled.....: 10:00  
 Sample Matrix.....: Pot. Water

Laboratory Sample ID: 244322-2  
 Date Received.....: 01/12/2005  
 Time Received.....: 11:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	Q	FLAGS	REPORTING LIMIT	UNITS	ANALYZED	TECH
SM18 9223	Coliform, Total	Absent			POS/NEG	/100ml	01/12/05	mwr
SM18 9223	E. Coliform	Absent			POS/NEG	/100ml	01/12/05	mwr
EPA 180.1	Turbidity Assessment - Metals	Negative				Pos/Neg	01/14/05	mwr
EPA 245.1	Mercury (Hg)	0.20	U		0.20	ug/L	01/14/05	lms
EPA 504	Extraction by method 504	Complete						mad
SM18 2120B	Color	2.5			2.5	Pt/Co	01/13/05	rmc
SM18 2150B	Odor	1			1	T.O.N.	01/13/05	rmc
SM18 4500CNE	Cyanide, Total	0.0100	U		0.0100	mg/L	01/17/05	bg
SM18 4500FC	Fluoride	0.24			0.20	mg/L	01/13/05	rmc
SM18 4500NO2B	Nitrite as N (NO2-N)	0.11			0.05	mg/L	01/14/05	jpp
525.2	525.2 Semi-volatile Subcontract	Complete				* Text	01/26/05	jmr
600/R-93-116	Asbestos Subcontract	Complete					01/28/05	jmr
EPA 900.0	Gross alpha/beta Subcontract	Complete				* Text	02/16/05	jmr
515.1	Herbicide (Drinking Water) Subcontract	Complete				ug/L	01/26/05	jmr
EPA 531.1	Method 531.1 Subcontract	Complete				Text	01/26/05	jmr
EPA 903	Radium 226 Subcontract	Complete					02/16/05	jmr
EPA 904.0	Radium 228 Subcontract	Complete				* Text	02/16/05	jmr
EPA 908.1	Uranium (Fluorimetric) Subcontract	Complete					02/16/05	jmr
EPA 504	GC Micro-Extractable Volatiles							
	1,2-Dibromoethane (EDB)	0.020	U		0.020	ug/L	01/26/05	ljc
	1,2-Dibromo-3-chloropropane	0.020	U		0.020	ug/L	01/26/05	ljc

\* In Description = Dry Wgt.

LABORATORY TEST RESULTS

Job Number: 244322

Date: 02/17/2005

CUSTOMER: Tim Miller Associates, Inc.

PROJECT: PATTERSON CROSSING

ATTN: John Dahlgren

Customer Sample ID: NW Well  
 Date Sampled.....: 01/12/2005  
 Time Sampled.....: 10:00  
 Sample Matrix.....: Pot. Water

Laboratory Sample ID: 244322-2  
 Date Received.....: 01/12/2005  
 Time Received.....: 11:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	Q	FLAGS	REPORTING LIMIT	UNITS	ANALYZED	TECH
EPA 200.7	Metals Analysis (ICP) Beryllium (Be)	1.0		U	1.0	ug/L	01/18/05	mad
EPA 200.8	Metals Analysis (ICP-MS)							
	Antimony (Sb)	0.40		U	0.40	ug/L	01/17/05	mad
	Arsenic (As)	1.4		U	1.4	ug/L	01/17/05	mad
	Barium (Ba)	36.5		U	0.40	ug/L	01/17/05	mad
	Cadmium (Cd)	0.30		U	0.30	ug/L	01/17/05	mad
	Chromium (Cr)	1.3		U	0.30	ug/L	01/17/05	mad
	Nickel (Ni)	1.4		U	0.50	ug/L	01/17/05	mad
	Selenium (Se)	3.0		U	3.0	ug/L	01/17/05	mad
	Thallium (Tl)	0.30		U	0.30	ug/L	01/17/05	mad
EPA 502.2	Volatile Organics							
	Benzene	0.50		U	0.50	ug/L	01/21/05	ems
	Ethylbenzene	0.50		U	0.50	ug/L	01/21/05	ems
	Toluene	0.50		U	0.50	ug/L	01/21/05	ems
	o-Xylene	0.50		U	0.50	ug/L	01/21/05	ems
	m&p-Xylenes	0.50		U	0.50	ug/L	01/21/05	ems
	Naphthalene	0.50		U	0.50	ug/L	01/21/05	ems
	Methyl-tert-butyl-ether (MTBE)	1.0		U	1.0	ug/L	01/21/05	ems
	Chlorobenzene	0.50		U	0.50	ug/L	01/21/05	ems
	1,2-Dichlorobenzene	0.50		U	0.50	ug/L	01/21/05	ems
	1,3-Dichlorobenzene	0.50		U	0.50	ug/L	01/21/05	ems
	1,4-Dichlorobenzene	0.50		U	0.50	ug/L	01/21/05	ems
	Chloromethane	0.50		U	0.50	ug/L	01/21/05	ems
	Bromomethane	0.50		U	0.50	ug/L	01/21/05	ems
	Dichlorodifluoromethane	0.50		U	0.50	ug/L	01/21/05	ems
	Vinyl chloride	0.50		U	0.50	ug/L	01/21/05	ems
	Chloroethane	0.50		U	0.50	ug/L	01/21/05	ems
	Methylene chloride	1.0		U	1.0	ug/L	01/21/05	ems
	Trichlorofluoromethane	0.50		U	0.50	ug/L	01/21/05	ems
	1,1-Dichloroethene	0.50		U	0.50	ug/L	01/21/05	ems
	Bromochloromethane	0.50		U	0.50	ug/L	01/21/05	ems
	1,1-Dichloroethane	0.50		U	0.50	ug/L	01/21/05	ems
	trans-1,2-Dichloroethene	0.50		U	0.50	ug/L	01/21/05	ems
	cis-1,2-Dichloroethene	0.50		U	0.50	ug/L	01/21/05	ems
	Chloroform	0.50		U	0.50	ug/L	01/21/05	ems
	1,2-Dichloroethane	0.50		U	0.50	ug/L	01/21/05	ems
	2,2-Dichloropropane	0.50		U	0.50	ug/L	01/21/05	ems
	1,2-Dibromoethane (EDB)	0.50		U	0.50	ug/L	01/21/05	ems
	1,1,1-Trichloroethane	0.50		U	0.50	ug/L	01/21/05	ems
	Carbon tetrachloride	0.50		U	0.50	ug/L	01/21/05	ems
	Bromodichloromethane	0.50		U	0.50	ug/L	01/21/05	ems
	1,2-Dichloropropane	0.50		U	0.50	ug/L	01/21/05	ems
	1,1-Dichloropropene	0.50		U	0.50	ug/L	01/21/05	ems
	Trichloroethene	0.50		U	0.50	ug/L	01/21/05	ems
	1,3-Dichloropropane	0.50		U	0.50	ug/L	01/21/05	ems
	Dibromochloromethane	0.50		U	0.50	ug/L	01/21/05	ems

\* In Description = Dry Wgt.



LABORATORY TEST RESULTS

Job Number: 244322

Date: 02/17/2005

CUSTOMER: Tim Miller Associates, Inc.

PROJECT: PATTERSON CROSSING

ATTN: John Dahlgren

Customer Sample ID: NW Well  
 Date Sampled.....: 01/12/2005  
 Time Sampled.....: 10:00  
 Sample Matrix.....: Pot. Water

Laboratory Sample ID: 244322-2  
 Date Received.....: 01/12/2005  
 Time Received.....: 11:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	Q	FLAGS	REPORTING LIMIT	UNITS	ANALYZED	TECH
	Dibromomethane	0.50	U		0.50	ug/L	01/21/05	ems
	Bromoform	0.50	U		0.50	ug/L	01/21/05	ems
	1,1,1,2-Tetrachloroethane	0.50	U		0.50	ug/L	01/21/05	ems
	1,2,3-Trichloropropane	0.50	U		0.50	ug/L	01/21/05	ems
	1,1,2,2-Tetrachloroethane	0.50	U		0.50	ug/L	01/21/05	ems
	Tetrachloroethene	0.50	U		0.50	ug/L	01/21/05	ems
	Bromobenzene	0.50	U		0.50	ug/L	01/21/05	ems
	2-Chlorotoluene	0.50	U		0.50	ug/L	01/21/05	ems
	4-Chlorotoluene	0.50	U		0.50	ug/L	01/21/05	ems
	cis-1,3-Dichloropropene	0.50	U		0.50	ug/L	01/21/05	ems
	trans-1,3-Dichloropropene	0.50	U		0.50	ug/L	01/21/05	ems
	1,2-Dibromo-3-chloropropane	0.50	U		0.50	ug/L	01/21/05	ems
	Isopropylbenzene	0.50	U		0.50	ug/L	01/21/05	ems
	Styrene	0.50	U		0.50	ug/L	01/21/05	ems
	n-Propylbenzene	0.50	U		0.50	ug/L	01/21/05	ems
	tert-Butylbenzene	0.50	U		0.50	ug/L	01/21/05	ems
	sec-Butylbenzene	0.50	U		0.50	ug/L	01/21/05	ems
	1,3,5-Trimethylbenzene	0.50	U		0.50	ug/L	01/21/05	ems
	p-Isopropyltoluene	0.50	U		0.50	ug/L	01/21/05	ems
	1,2,4-Trimethylbenzene	0.50	U		0.50	ug/L	01/21/05	ems
	n-Butylbenzene	0.50	U		0.50	ug/L	01/21/05	ems
	Hexachlorobutadiene	0.50	U		0.50	ug/L	01/21/05	ems
	1,2,4-Trichlorobenzene	0.50	U		0.50	ug/L	01/21/05	ems
	1,2,3-Trichlorobenzene	0.50	U		0.50	ug/L	01/21/05	ems
	1,1,2-Trichloroethane	0.50	U		0.50	ug/L	01/21/05	ems
EPA 300.0	Ion Chromatography Analysis							
	Nitrate as N (NO3-N)	0.500	U		0.500	mg/L	01/12/05	bg
	Sulfate	17.2			5.00	mg/L	01/12/05	bg

\* In Description = Dry Wgt.

QUALITY ASSURANCE METHODS

REFERENCES AND NOTES

Report Date: 02/17/2005

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements will be noted in a case narrative.  
Report Comments

- 1) All pages of this report are integral parts of the analytical data. Therefore, this report should be reproduced only in its entirety.
- 2) Soil, sediment and sludge sample results are reported on a "dry weight" basis.
- 3) Reporting limits are adjusted for sample size used, dilutions and moisture content if applicable.

Glossary of flags and qualifiers.

Inorganic Qualifiers (Q-Column)

- U Indicates that the compound was analyzed for but not detected.
- 1 Result fails applicable drinking water standards.
- \* Duplicate analysis not within control limits.
- N Spiked sample recovery not within control limits.
- E Indicates an estimated value because of the presence of interferences.
- W Post digestion spike for furnace AA analysis is out of the control limits (85-115%) while sample absorbance is less than 50% of spike absorbance.
- + Correlation coefficient for the MSA is less than 0.995
- B The reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).

Organic Qualifiers (Q-Column)

- U Indicates that the compound was analyzed for but not detected.
- J Indicates an estimated value. This compound meets the identification criteria, but the result is less than the specified detection limit.
- B Indicates that the analyte was found in both the sample and its associated laboratory blank.
- D Indicates all compounds identified in an analysis at a secondary dilution factor.
- E Indicates that the analyte in an analysis has exceeded the linear calibration range.
- RE Indicates a re-analyzed sample

Glossary of Terms

Surrogates (Surrogate Standards) - an organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process. For semi-volatiles, volatiles and pesticides/Arochlors, surrogate compounds are added to every blank, sample, matrix sample, matrix spike, matrix sample duplicate, matrix spike blank, and standard. These are used to evaluate analytical efficiency by measuring recovery. Poor surrogate recovery may indicate a problem with the sample composition.

Matrix Spike - an aliquot of a sample (water or soil) fortified (spiked) with known quantities of specific compounds (target analytes) and subjected to the entire analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery. The spiking occurs prior to sample preparation and analysis. Poor spike recovery may indicate a problem with the sample composition.

Internal Standards - an organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process. For GC/MS semi-volatiles and volatiles, internal standards are added to every blank, sample, matrix spike, matrix spike duplicate, matrix spike blank, and standard. Internal standard responses outside of established limits will adversely affect the quantitation and final concentration of target compounds.

LABORATORY CHRONICLE

Job Number: 244322

Date: 02/17/2005

CUSTOMER: Tim Miller Associates, Inc.

PROJECT: PATTERSON CROSSING

ATTN: John Dahlgren

Lab ID: 244322-1		Client ID: SE Well		Date Recvd: 01/12/2005		Sample Date: 01/12/2005		
METHOD	DESCRIPTION	RUN#	BATCH#	PREP BT	#(S)	DATE/TIME ANALYZED	DILUTION	
525.2	525.2 Semi-volatile	1	84025			01/26/2005	0000	
600/R-93-116	Asbestos	1	84170			01/28/2005	0000	
SM18 2120B	Color	1	83183			01/13/2005	1650	
SM18 4500CNE	Cyanide, Total	1	83500			01/17/2005	0720	
EPA 504	Extraction by Method 504	1	83932					
SM18 4500FC	Fluoride (ISE)	1	83167			01/13/2005	1400	
EPA 504	GC Micro-Extractable Volatiles	1	84398			01/26/2005	0000	
EPA 900.0	Gross alpha/beta	1	85189			02/16/2005	0000	
515.1	Herbicide (Drinking Water)	1	84027			01/26/2005	0000	
EPA 200.7	ICP Acid Digestion	1	83245					
EPA 300.0	Ion Chromatography Analysis	1	83157			01/12/2005	1526	
EPA 245.1	Mercury (CVAA)	1	83233			01/14/2005	1052	
EPA 200.7	Metals Analysis (ICP)	1	83491			01/18/2005	1338	
EPA 200.8	Metals Analysis (ICP-MS)	1	83374			01/17/2005	1518	
EPA505	Method 505 Pesticides	1	84024			01/26/2005	0000	
EPA 531.1	Method 531.1	1	84026			01/26/2005	0000	
SM18 4500N02B	Nitrite, Spectrophotometric	1	83212			01/14/2005	0300	
SM18 2150B	Odor	1	83182			01/13/2005	1650	
EPA 903	Radium 226	1	85190			02/16/2005	0000	
EPA 904.0	Radium 228	1	85191			02/16/2005	0000	
SM18 9223	Total/E. Coliform (Colilert)	1	83161			01/12/2005	1610	
EPA 180.1	Turbidity Assessment - Metals	1	83108			01/14/2005	0948	
EPA 908.1	Uranium (Fluorimetric)	1	85192			02/16/2005	0000	
EPA 502.2	Volatile Organics	1	83839			01/21/2005	0000	

Lab ID: 244322-2		Client ID: NW Well		Date Recvd: 01/12/2005		Sample Date: 01/12/2005		
METHOD	DESCRIPTION	RUN#	BATCH#	PREP BT	#(S)	DATE/TIME ANALYZED	DILUTION	
525.2	525.2 Semi-volatile	1	84025			01/26/2005	0000	
600/R-93-116	Asbestos	1	84170			01/28/2005	0000	
SM18 2120B	Color	1	83183			01/13/2005	1650	
SM18 4500CNE	Cyanide, Total	1	83500			01/17/2005	0720	
EPA 504	Extraction by Method 504	1	83932					
SM18 4500FC	Fluoride (ISE)	1	83167			01/13/2005	1406	
EPA 504	GC Micro-Extractable Volatiles	1	84398			01/26/2005	0000	
EPA 900.0	Gross alpha/beta	1	85189			02/16/2005	0000	
515.1	Herbicide (Drinking Water)	1	84027			01/26/2005	0000	
EPA 200.7	ICP Acid Digestion	1	83245					
EPA 300.0	Ion Chromatography Analysis	1	83157			01/12/2005	1536	
EPA 245.1	Mercury (CVAA)	1	83233			01/14/2005	1054	
EPA 200.7	Metals Analysis (ICP)	1	83491			01/18/2005	1403	
EPA 200.8	Metals Analysis (ICP-MS)	1	83374			01/17/2005	1520	
EPA505	Method 505 Pesticides	1	84024			01/26/2005	0000	
EPA 531.1	Method 531.1	1	84026			01/26/2005	0000	
SM18 4500N02B	Nitrite, Spectrophotometric	1	83212			01/14/2005	0300	
SM18 2150B	Odor	1	83182			01/13/2005	1650	
EPA 903	Radium 226	1	85190			02/16/2005	0000	
EPA 904.0	Radium 228	1	85191			02/16/2005	0000	
SM18 9223	Total/E. Coliform (Colilert)	1	83161			01/12/2005	1610	
EPA 180.1	Turbidity Assessment - Metals	1	83108			01/14/2005	0959	
EPA 908.1	Uranium (Fluorimetric)	1	85192			02/16/2005	0000	
EPA 502.2	Volatile Organics	1	83839			01/21/2005	0000	

STL Newburgh is a part of Severn Trent Laboratories, Inc.



NYSDOH 10142

NJDEP 73015

CTDOHS PH-0554

EPA NY049

PA 68-378

M-NY049

**STL Newburgh**  
 315 Fullerton Avenue  
 Newburgh, NY 12550  
 Tel (845) 562-0890  
 Fax (845) 562-0841

# CHAIN OF CUSTODY

315 Fullerton Avenue  
Newburgh, NY 12550  
TEL (845) 562-0890  
FAX (845) 562-0841

CUSTOMER NAME: JM MILLER ASSOCIATES  
 ADDRESS: 10 NORTH STREET  
 CITY, STATE, ZIP: COLD SPRING NY  
 NAME OF CONTACT: JOHN DALGIAN PHONE NO: 845 265 4400  
 PROJECT LOCATION: PATERSON CROSSING  
 PROJECT NUMBER / P.O. NO.: \_\_\_\_\_

**NOTE: SAMPLE TEMPERATURE UPON RECEIPT MUST BE 4° ± 2°C.**

REPORT # (Lab Use Only): 244322  
 SAMPLE TEMP: 11.8° C  
 SAMPLE REC'D ON ICE: Y    N     
 PH CHECK: Y    N     
 CHLORINE (RESIDUAL): Y    N     
 REVIEWED BY: [Signature]  
**NY PUBLIC WATER SUPPLIES**  
 SOURCE ID: \_\_\_\_\_  
 ELRP TYPE: \_\_\_\_\_  
 FEDERAL ID: \_\_\_\_\_

REPORT TYPE: STANDARD  ISRA   
 NJ REG  NYASP A  B  CLP   
 OTHER: \_\_\_\_\_  
 TURNAROUND:  NORMAL   
 QUICK  VERBAL

Matrix: DW = DRINKING WATER S = SOIL G = OIL  
 WW = WASTE WATER SL = SLUDGE GW = GROUND WATER

STL #	SAMPLING DATE	TIME	AM	PM	COMP	GRAB	MATRIX	CLIENT I.D.	Total Number of Containers	40ml Glass HCL	Liter Amber	250ml Amber	Liter Amber Organic Washed	250ml Plastic Nitric Acid	250ml Plastic Sodium Hydroxide	Liter Plastic	Liter Plastic	250ml Plastic	125ml Plastic Sterile	2 oz. Qorpak	250ml Plastic NaOH / ZN AC	
	1-12	9:30 A					H <sub>2</sub> O	SE WELL	26													
	1-12	10 A					H <sub>2</sub> O	NW WELL	26													

**ANALYSIS REQUESTED**  
 SUBPRT 5.1 (Both Locations)  
 Dioxin, 515.1 525.2, 549  
 Inorganics I & II 548,  
 Bacteria, Asbestos,  
 Gross Alpha/Beta, Rad 226,  
 Rad 228, Uranium,  
 547, 502.2, 504, 531.1  
 505, Nitrate  
 Spoke with John Dalgian  
 and certain test not needed  
 and will not be run - ~~PT~~

SAMPLES SUBMITTED FOR ANALYSIS WILL BE SUBJECT TO THE STL TERMS AND CONDITIONS OF SALE (SHORT FORM) UNLESS ALTERNATE TERMS ARE AGREED IN WRITING.  
 RELINQUISHED BY: \_\_\_\_\_ COMPANY: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ COMPANY: \_\_\_\_\_ DATE: 1/12/05 TIME: 11:05 AM  
 SAMPLED BY: \_\_\_\_\_ COMPANY: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_  
 RELINQUISHED BY: SEVERN TRENT COMPANY: SMIRNILE LO SEC DATE: 1-12-05 TIME: 11:10 AM  
 RECEIVED BY: [Signature] COMPANY: STL DATE: 1/12/05 TIME: 1110

## SUBCONTRACT CHAIN OF CUSTODY

01/12/2005

STL-Newburgh

STL Project Manager: STL-Newburgh Project Manager  
 Telephone: (845) 562-0890  
 PO/Job#: 244322  
 Client: Tim Miller Associates, Inc.  
 Project Name: PATTERSON CROSSING  
 Penalty Job: Y/N  
 Certification:  
 SDG Complete:  
 VTSR Date: 01/12/2005  
 Verbal Due Date:  
 Report Type: Standard  
 EDD Type:  
 QC Billable: Y/N

Samp#	Sample I.D.	Sampled
1	SE Well	01/12/2005
2	NW Well	01/12/2005

Please run QC on the following sample(s):

Mthds	Method Description	525	515.1	Analytical Mthd
	Sample Distribution		#of	Unit Price Extended
				Total Cost

Matrix: DW

Bottle Type & Number: 2 Amber Thio sulfate, 2 Amber Thio Sulfite,

Per Location

Ship to: STL Savannah  
 Ship Date: 01/12/2005

Special Instructions:

Sending Laboratory: STL Newburgh  
 Date: 01/12/2005

*Julian Agosto*

Receiving Laboratory: \_\_\_\_\_ Date: \_\_\_\_\_

PLEASE SEND A CONFIRMATION REPORT UPON SAMPLE RECEIPT.

[SUBCON-1]

SUBCONTRACT CHANIN OF CUSTODY

01/12/2005

STL-Newburgh

STL Project Manager: STL-Newburgh Project Manager  
 Telephone: (845) 562-0890  
 PO/Job#: 244322  
 Client: Tim Miller Associates, Inc.  
 Project Name: PATTERSON CROSSING  
 Penalty Job: Y/N  
 Certification:  
 SDG Complete:  
 VTSR Date: 01/12/2005  
 Verbal Due Date:  
 Report Type: Standard  
 EDD Type:  
 QC Billable: Y/N

Samp#	Sample I.D.	Sampled
1	SE Well	01/12/2005
2	NW Well	01/12/2005

Please run QC on the following sample(s):

Mthds	Method Description	Asbestos #of	Analytical Mthd Unit Price	Extended
	Sample Distribution			
				Total Cost

Matrix: DW  
 Bottle Type & Number: 1 Plastic Liter Per Location

Ship To: Stl Bellerica  
 Ship Date: 01/12/2005

Special Instructions:

Sending Laboratory: STL Newburgh *Wilson Eposito*  
 Date: 01/12/2005

Receiving Laboratory: \_\_\_\_\_ Date: \_\_\_\_\_

PLEASE SEND A SAMPLE CONFIRMATION REPORT UPON SAMPLE RECEIPT.

SUBCONTRACT CHAIN OF CUSTODY

01/12/2005

STL-Newburgh

STL Project Manager: STL-Newburgh Project Manager  
 Telephone: (845) 562-0890  
 PO/Job#: 244322  
 Client: Tim Miller Associates, Inc.  
 Project Name: PATTERSON CROSSING  
 Penalty Job: Y/N  
 Certification:  
 SDG Complete:  
 VTSR Date: 01/12/2005  
 Verbal Due Date:  
 Report Type: Standard  
 EDD Type:  
 QC Billable: Y/N

Samp#	Sample I.D.	Sampled
1	SE Well	01/12/2005
2	NW Well	01/12/2005

Please run QC on the following sample(s):

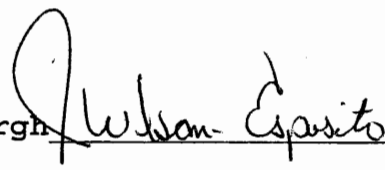
Mthds	Method Description	Radio	Gross/Alpha	Beta	226/228 Uranium
Analytical Mthd	Sample Distribution	#of	Unit Price	Extended	
					Total Cost

Matrix: DW  
 Bottle Type & Number: 3 Nitric Liters  
 Per Location

Ship To: STL St Louis  
 Ship Date: 01/12/2005

Special Instructions:

Sending Laboratory: STL Newburgh  
 Date: 01/12/2005



Receiving Laboratory: \_\_\_\_\_ Date: \_\_\_\_\_

PLEASE SEND A CONFIRMATION REPORT UPON SAMPLE RECEIPT.

SUBCONTRACT CHAIN OF CUSTODY

01/12/2005

STL-Newburgh

STL Project Manager: STL-Newburgh Project Manager  
 Telephone: (845) 562-0890  
 PO/Job#: 244322  
 Client: Tim Miller Associates, Inc.  
 Project Name: PATTERSON CROSSING  
 Penalty Job: Y/N  
 Certification:  
 SDG Complete:  
 VTSR Date: 01/12/2005  
 Verbal Due Date:  
 Report Type: Standard  
 EDD Type:  
 QC Billable: Y/N

Samp#	Sample I.D.	Sampled
1	SE Well	01/12/2005
2	NW Well	01/12/2005

Please run QC on the following sample(s):

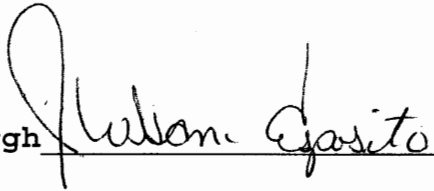
Mthds	Method Description	505, 531.1	Analytical Mthd
	Sample Distribution	#of	Unit Price Extended
			Total Cost

Matrix: DW  
 Bottle Type & Number: 4 Vials Thio (Per Location)

Ship To: H2M  
 Ship Date: 01/12/2005

Special Instructions:

Sending Laboratory: STL Newburgh  
 Date: 01/12/2005



Receiving Laboratory: \_\_\_\_\_ Date: \_\_\_\_\_

PLEASE SEND A CONFIRMATION REPORT UPON SAMPLE RECEIPT.



STL St. Louis  
13715 Rider Trail North  
Earth City, MO 63045

Tel: 314 298 8566 Fax: 314 298 8757  
www.stl-inc.com

## **ANALYTICAL REPORT**

**Tim Miller Associates, Inc.**

**Lot #: F5A170124**

**Rick Bayer**

**STL Newburgh  
315 Fullerton Avenue  
Newburgh, NY 12550**

**SEVERN TRENT LABORATORIES, INC.**



**David Rekosh  
Project Manager**

**February 4, 2005**



**Case Narrative**  
**LOT NUMBER: F5A170124**

This report contains the analytical results for the two samples received under chain of custody by STL St. Louis on January 17, 2005. These samples are associated with your Tim Miller Associates, Inc. project.

The analytical results included in this report meet all applicable quality control procedure requirements.

The test results in this report meet all NELAP requirements for parameters in which accreditations are held by STL St. Louis. Any exceptions to NELAP requirements are noted in the case narrative. The case narrative is an integral part of this report.

All chemical analysis results are based upon sample as received, wet weight, unless noted otherwise. All radiochemistry results are based upon sample as dried and ground with the exception of tritium, unless requested wet weight by the client.

Observations/Nonconformances

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

There were no observations or nonconformances associated with the analysis of these samples.

**METHODS SUMMARY**

F5A170124

<u>PARAMETER</u>	<u>ANALYTICAL METHOD</u>	<u>PREPARATION METHOD</u>
Gross Alpha/Beta by GFPC	EPA 900.0 MOD	EPA 900.0
Radium-226 by GFPC	EPA 903.0 MOD	
Radium-228 by GFPC	EPA 904 MOD	
Total Uranium By Laser Ph osphorimetry	ASTM 5174-91	

**References:**

ASTM      Annual Book Of ASTM Standards.

EPA      "EASTERN ENVIRONMENTAL RADIATION FACILITY RADIOCHEMISTRY  
PROCEDURES MANUAL" US EPA    EPA 520/5-84-006 AUGUST 1984

**SAMPLE SUMMARY****F5A170124**

<u>WO #</u>	<u>SAMPLE#</u>	<u>CLIENT SAMPLE ID</u>	<u>SAMPLED DATE</u>	<u>SAMP TIME</u>
G2PN6	001	SE WELL	01/12/05	
G2PN9	002	NW WELL	01/12/05	

**NOTE (S) :**

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

## STL NEWBURGH

Client Sample ID: SE WELL

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F5A170124-001  
 Work Order: G2PN6  
 Matrix: WATER

Date Collected: 01/12/05 0000  
 Date Received: 01/17/05 0830

Parameter	Result	Qual	Total Uncert. (2 $\sigma$ +/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
<b>GROSS A/B BY GFPC EPA 900.0 MOD</b>					<b>900.0 MOD</b>			
Gross Alpha	2.9	J	1.2	1.3	01/24/05	01/28/05	5024397	
Gross Beta	5.9		1.4	1.8	01/24/05	01/28/05	5024397	
<b>RA-226 BY EPA-903.0 MOD</b>					<b>903.0 MOD</b>			
Radium (226)	0.62	J	0.23	0.26	01/18/05	02/02/05	5018087	93
<b>RA-228 BY GFPC EPA 904 MOD</b>					<b>904 MOD</b>			
Radium 228	2.18		0.54	0.69	01/18/05	02/02/05	5018088	89
<b>Total Uranium by KPA ASTM 5174-91</b>					<b>5174-91</b>			
Total Uranium	0.0931	U	0.0096	0.31	01/19/05	01/20/05	5019194	

**NOTE(S)**

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

U Result is less than the sample detection limit.

STL ST. LOUIS

STL NEWBURGH

Client Sample ID: SE WELL DUP

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F5A170124-001X  
Work Order: G2PN6  
Matrix: WATER

Date Collected: 01/12/05 0000  
Date Received: 01/17/05 0830

Parameter	Result	Qual	Total Uncert. (2 $\sigma$ +/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD					pCi/L	900.0 MOD		
Gross Alpha	2.1	J	1.1	1.4	01/24/05	01/28/05	5024397	
Gross Beta	4.9		1.4	1.9	01/24/05	01/28/05	5024397	

**NOTE(S)**

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

## STL NEWBURGH

Client Sample ID: NW WELL

## Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F5A170124-002  
 Work Order: G2PN9  
 Matrix: WATER

Date Collected: 01/12/05 0000  
 Date Received: 01/17/05 0830

Parameter	Result	Qual	Total Uncert. (2 $\sigma$ +/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
<b>GROSS A/B BY GFPC EPA 900.0 MOD</b>					<b>900.0 MOD</b>			
Gross Alpha	0.8	U	1.2	2.0	01/24/05	01/28/05	5024397	
Gross Beta	6.1		1.5	1.8	01/24/05	01/28/05	5024397	
<b>RA-226 BY EPA-903.0 MOD</b>					<b>903.0 MOD</b>			
Radium (226)	0.23	J	0.14	0.18	01/18/05	02/02/05	5018087	99
<b>RA-228 BY GFPC EPA 904 MOD</b>					<b>904 MOD</b>			
Radium 228	1.05		0.43	0.64	01/18/05	02/02/05	5018088	93
<b>Total Uranium by KPA ASTM 5174-91</b>					<b>5174-91</b>			
Total Uranium	0.406	J	0.042	0.31	01/19/05	01/20/05	5019194	

**NOTE(S)**

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

U Result is less than the sample detection limit.

## METHOD BLANK REPORT

## Severn Trent Laboratories - Radiochemistry

Client Lot ID: F5A170124  
 Matrix: WATER

Parameter	Result	Qual	Total Uncert. (2 $\sigma$ +/-)	MDC	Prep Date	Lab Sample ID		
						Analysis Date	Batch #	Yld %
<b>GROSS A/B BY GFPC EPA 900.0 MOD</b>				<b>pCi/L</b>	<b>900.0 MOD</b>	<b>F5A240000-397B</b>		
Gross Alpha	-0.2	U	0.0	1.1	01/24/05	01/28/05	5024397	
Gross Beta	0.1	U	0.0	2.0	01/24/05	01/28/05	5024397	
<b>RA-226 BY EPA-903.0 MOD</b>				<b>pCi/L</b>	<b>903.0 MOD</b>	<b>F5A180000-087B</b>		
Radium (226)	0.08	U	0.11	0.19	01/18/05	02/02/05	5018087	98
<b>RA-228 BY GFPC EPA 904 MOD</b>				<b>pCi/L</b>	<b>904 MOD</b>	<b>F5A180000-088B</b>		
Radium 228	0.26	U	0.34	0.56	01/18/05	02/02/05	5018088	93
<b>Total Uranium by KFA ASTM 5174-91</b>				<b>ug/L</b>	<b>5174-91</b>	<b>F5A190000-194B</b>		
Total Uranium	0.755	J	0.097	0.31	01/19/05	01/20/05	5019194	

## NOTE(S)

Data are incomplete without the case narrative.

MDC is determined using instrument performance only

Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

U Result is less than the sample detection limit.

## DUPLICATE EVALUATION REPORT

## Severn Trent Laboratories - Radiochemistry

Client Lot ID: F5A170124  
 Matrix: WATER

Date Sampled: 01/12/05  
 Date Received: 01/17/05

Parameter	SAMPLE Result	Total Uncert. (2 $\sigma$ +/-)	% Yld	DUPLICATE Result	Total Uncert. (2 $\sigma$ +/-)	% Yld	QC Sample ID	
							Precision	
GROSS A/B BY GFPC EPA 900.0 MOD			pCi/L	900.0 MOD			F5A170124-001	
Gross Alpha	2.9 J	1.2		2.1 J	1.1		31	%RPD
Gross Beta	5.9	1.4		4.9	1.4		18	%RPD
	Batch #:	5024397 (Sample)		5024397 (Duplicate)				

## NOTE(S)

Data are incomplete without the case narrative.

Calculations are performed before rounding to avoid round-off error in calculated results

J Result is greater than sample detection limit but less than stated reporting limit.

## Laboratory Control Sample Report

## Severn Trent Laboratories - Radiochemistry

Client Lot ID: F5A170124

Matrix: WATER

Parameter	Spike Amount	Result	Total Uncert. (2 $\sigma$ +/-)	MDC	% Yld	% Rec	Lab Sample ID QC Control Limits
<b>Total Uranium by KPA ASTM 5174-91</b>			<b>ug/L</b>	<b>5174-91</b>			<b>F5A190000-194C</b>
Total Uranium	40.0	42.5	5.0	0.3		106	(86 - 108)
	Batch #:	5019194		Analysis Date:	01/20/05		
<b>GROSS A/B BY GFPC EPA 900.0 MOD</b>			<b>pCi/L</b>	<b>900.0 MOD</b>			<b>F5A240000-397C</b>
Gross Beta	104	90.6	0.0	1.9		87	(74 - 125)
	Batch #:	5024397		Analysis Date:	01/28/05		
<b>GROSS A/B BY GFPC EPA 900.0 MOD</b>			<b>pCi/L</b>	<b>900.0 MOD</b>			<b>F5A240000-397C</b>
Gross Alpha	51.4	46.4	0.0	2.6		90	(70 - 130)
	Batch #:	5024397		Analysis Date:	01/28/05		

**NOTE(S)**

MDC is determined by instrument performance only  
Calculations are performed before rounding to avoid round-off error in calculated results

## MATRIX SPIKE REPORT

## Severn Trent Laboratories - Radiochemistry

Client Lot Id: F5A170124  
 Matrix: WATER

Date Sampled: 01/12/05  
 Date Received: 01/17/05

Parameter	Spike Amount	Spike Result	Total Uncert. (2σ +/-)	Spike Yld.	Sample Result	Total Uncert. (2σ +/-)	QC Sample ID		QC Control Limits
							%YLD	%REC	
<b>GROSS A/B BY GFPC EPA 900.0 MOD</b>			<b>pCi/L</b>	<b>900.0 MOD</b>		<b>F5A170124-001</b>			
Gross Alpha	51.4	38.0	5.2		2.9	1.2	68	(50 - 150)	
	Batch #:	5024397		Analysis Date:	01/28/05				
<b>GROSS A/B BY GFPC EPA 900.0 MOD</b>			<b>pCi/L</b>	<b>900.0 MOD</b>		<b>F5A170124-001</b>			
Gross Beta	104	100	11		5.9	1.4	90	(50 - 150)	
	Batch #:	5024397		Analysis Date:	01/28/05				

**NOTE(S)**

Data are incomplete without the case narrative.

Calculations are performed before rounding to avoid round-off errors in calculated results.

**MATRIX SPIKE/MATRIX SPIKE DUPLICATE REPORT**

**Severn Trent Laboratories - Radiochemistry**

Client Lot ID: F5A180227  
 Matrix: WATER

Date Sampled: 01/17/05 0930  
 Date Received: 01/18/05 0900

Parameter	Spike Amount	SPIKE Result	Total Uncert. (2σ +/-)	Spike Yld	SAMPLE Result	Total Uncert. (2σ +/-)	QC Sample ID		QC Control Limits
							% Yld	%Rec	
<b>Total Uranium by KPA ASTM 5</b>			<b>ug/L</b>	<b>5174-91</b>			<b>F5A180227-001</b>		
Total Uranium	40.0	42.4	5.0		2.66	0.27		99	(50 - 150)
	Spk2 40.0	42.8	5.1		2.66	0.27		100	(50 - 150)
							<b>Precision:</b>	1	%RPD
		<b>Batch #:</b> 5019194		<b>Analysis date:</b>	01/20/05				

**NOTE(S)**

Data are incomplete without the case narrative.

Calculations are performed before rounding to avoid round-off error in calculated results

Laboratory Control Sample/LCS Duplicate Report

Severn Trent Laboratories - Radiochemistry

Client Lot ID: F5A170124  
 Matrix: WATER

Parameter	Spike Amount	Result	Total Uncert. (2 $\sigma$ +/-)	% Yld	% Rec	Lab Sample ID	
						QC Control Limits	Precision
<b>RA-226 BY EPA-903.0 MOD</b>		<b>pCi/L</b>	<b>903.0 MOD</b>		<b>F5A180000-087C</b>		
Radium (226)	11.2	11.6	1.4	100	104	(60 - 150)	
Spk 2	11.2	11.4	1.3	99	102	(60 - 150)	2 %RPD
Batch #: 5018087		Analysis Date: 02/02/05					
<b>RA-228 BY GFPC EPA 904 MOD</b>		<b>pCi/L</b>	<b>904 MOD</b>		<b>F5A180000-088C</b>		
Radium 228	5.69	6.22	0.85	94	109	(60 - 149)	
Spk 2	5.69	5.21	0.74	99	92	(60 - 149)	18 %RPD
Batch #: 5018088		Analysis Date: 02/02/05					

**NOTE(S)**

Calculations are performed before rounding to avoid round-off error in calculated results

**F5A170124**

**CLIENT ANALYSIS SUMMARY**

Project Manager: DPR      Quote #: 48402      SDG:  
 Project: RAD Testing  
 PO#: Report to: Rick Bayer  
 Client: 420      STL NEWBURGH

Storage Loc: RAD14  
 Date Received: 2005-01-17  
 Analytical Due Date: 2005-02-09  
 Report Due Date: 2005-02-11  
 Report Type: B      Standard Report  
 EDD Code: 00

#SMPS in LOT: 2

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	I
1	SE WELL			2005-01-12 / 0	G2PN6	WATER
<b>SAMPLE COMMENTS:</b>						
XX	Y9	EPA 900.0 MOD	GROSS A/B BY GFPC EPA 900.0 MOD	FR	Evaporative Preparation, Total	01 STANDARD TEST SET PROT: A WRK LOC 06
XX	Z4	EPA 904 MOD	RA-228 BY GFPC EPA 904 MOD	G3	Precipitate, Separation - 14 day Ingrowth	01 STANDARD TEST SET PROT: A WRK LOC 06
XX	ZD	ASTM 5174-91	Total Uranium by KPA ASTM 5174-91	G9	Evaporative Digestion -> Rehydration	01 STANDARD TEST SET PROT: A WRK LOC 06
XX	ZY	EPA 903.0 MOD	RA-226 BY EPA-903.0 MOD	G3	Precipitate, Separation - 14 day Ingrowth	01 STANDARD TEST SET PROT: A WRK LOC 06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	I
2	NW WELL			2005-01-12 / 0	G2PN9	WATER
<b>SAMPLE COMMENTS:</b>						
XX	Y9	EPA 900.0 MOD	GROSS A/B BY GFPC EPA 900.0 MOD	FR	Evaporative Preparation, Total	01 STANDARD TEST SET PROT: A WRK LOC 06
XX	Z4	EPA 904 MOD	RA-228 BY GFPC EPA 904 MOD	G3	Precipitate, Separation - 14 day Ingrowth	01 STANDARD TEST SET PROT: A WRK LOC 06
XX	ZD	ASTM 5174-91	Total Uranium by KPA ASTM 5174-91	G9	Evaporative Digestion -> Rehydration	01 STANDARD TEST SET PROT: A WRK LOC 06
XX	ZY	EPA 903.0 MOD	RA-226 BY EPA-903.0 MOD	G3	Precipitate, Separation - 14 day Ingrowth	01 STANDARD TEST SET PROT: A WRK LOC 06

STL ST. LOUIS  
01/12/2005

SUBCONTRACT CHAIN OF CUSTODY

STL-Newburgh

STL Project Manager: STL-Newburgh Project Manager  
Telephone: (845) 562-0890  
PO/Job#: 244322  
Client: Tim Miller Associates, Inc.  
Project Name: PATTERSON CROSSING  
Penalty Job: Y/N  
Certification:  
SDG Complete:  
VTSR Date: 01/12/2005  
Verbal Due Date:  
Report Type: Standard  
EDD Type:  
QC Billable: Y/N

Samp#	Sample I.D.	Sampled
1	SE Well	01/12/2005 344
2	NW Well	01/12/2005 ↓

Please run QC on the following sample(s):

Mthds	Method Description	Radio	Gross/Alpha	Beta	226/228 Uranium
Analytical Mthd	Sample Distribution	#of	Unit Price	Extended	
					Total Cost

Matrix: DW  
Bottle Type & Number: 3 Nitric Liters  
Per Location

Ship To: STL St Louis  
Ship Date: 01/12/2005

Special Instructions:

Sending Laboratory: STL Newburgh  
Date: 01/12/2005

*J Wilson-Espino*

Receiving Laboratory: *Jill Clarke*

Date: 1.17.05 0830

PLEASE SEND A CONFIRMATION REPORT UPON SAMPLE RECEIPT.



Lot No: F5A170124

Condition Upon Receipt Form  
St. Louis Laboratory

Client: STL Newburgh

Date: 1.17.05 Time: 0830

Quote No: 48402

Initiated by: [Signature]

Shipper/No: UPS 1ZX248720347950650

COC/RFA Numbers: \_\_\_\_\_

Condition/Variance (Circled) and "N/A" for not applicable):

1.	<input checked="" type="radio"/> Y <input type="radio"/> N	Sample received in undamaged condition?	7.	<input checked="" type="radio"/> Y <input type="radio"/> N	Sample received with Chain of Custody?
2.	<input type="radio"/> Y <input checked="" type="radio"/> N	Sample received within 4-C ± 2-C*?	8.	<input checked="" type="radio"/> Y <input type="radio"/> N	Chain of Custody matches sample IDs on containers?
		Record <u>Ambient</u>	9.	<input type="radio"/> Y <input type="radio"/> N <input checked="" type="radio"/> N/A	Custody seal received intact on cooler.?
3.	<input type="radio"/> Y <input type="radio"/> N <input checked="" type="radio"/> N/A	Sample received with proper pH '1'?	10.	<input type="radio"/> Y <input type="radio"/> N <input checked="" type="radio"/> N/A	Custody seal tamper evident on cooler.?
4.	<input checked="" type="radio"/> Y <input type="radio"/> N	If N/A - Was pH taken by original STL lab?	11.	<input type="radio"/> Y <input type="radio"/> N <input checked="" type="radio"/> N/A	Custody seal on bottles received intact?
5.	<input checked="" type="radio"/> Y <input type="radio"/> N	Sample received in proper containers?	12.	<input type="radio"/> Y <input type="radio"/> N <input checked="" type="radio"/> N/A	Custody seal tamper evident on bottles?
6.	<input checked="" type="radio"/> Y <input type="radio"/> N	Sample volume sufficient for analysis?	13.	<input checked="" type="radio"/> Y <input type="radio"/> N	Was CUR (equivalent) rec' d from original STL lab?

\* Temperature Variance Does Not Affect the Following Analyses:

Rad

For DOE-AL (Pantex, LANL, Sandia) sites, verify pH all containers received, except for VOA, TOX, and soils.

Notes:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Corrective Action:

- Client's Name: \_\_\_\_\_ Informed by: \_\_\_\_\_ By: \_\_\_\_\_
- Sample(s) processed "as is". \_\_\_\_\_
- Sample(s) on hold until: \_\_\_\_\_ If released, notify: \_\_\_\_\_

Project Management Review: [Signature] Date: 1/17/05

THIS FORM MUST BE COMPLETED AT THE TIME THE ITEMS ARE BEING CHECKED  
IF ANY ITEM IS COMPLETED BY SOMEONE OTHER THAN THE INITIATOR, THEN THAT PERSON IS REQUIRED TO APPLY THEIR  
INITIALS AND THE DATE NEXT TO THAT ITEM



## Analytical Report

For: Mr. Richard Bayer  
STL Newburgh  
315 Fullerton Avenue  
Newburgh, NY 12550  
CC:

Order Number: S540342  
SDG Number:  
Client Project ID: 244322  
Project: Tim Miller Associates, Inc./Patterson Crossing  
Report Date: 01/24/2005  
Sampled By: Client  
Sample Received Date: 01/13/2005  
Requisition Number:  
Purchase Order: 244322

Gloria D. Fulwood

Gloria D. Fulwood, Project Manager  
gfulwood@stl-inc.com  
01/24/2005

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

## Sample Summary

Order: S540342  
Date Received: 01/13/2005

Client: STL Newburgh  
Project: Tim Miller Associates, Inc./Patterson Crossing

Client Sample ID	Lab Sample ID	Matrix	Date Sampled
SE Well	S540342*1	Liquid	01/12/2005
NW Well	S540342*2	Liquid	01/12/2005

Analytical Data Report

Lab Sample ID	Description	Matrix	Date Received	Date Sampled	SDG#
40342-1	SE Well	Liquid	01/13/05	01/12/05	
40342-2	NW Well	Liquid	01/13/05	01/12/05	

Parameter	Units	Lab Sample IDs	
		40342-1	40342-2

DW-525.2 (Expanded) (525.2)

Hexachlorocyclopentadiene	ug/l	<2.0	<2.0
Propachlor	ug/l	<0.20	<0.20
Hexachlorobenzene	ug/l	<0.20	<0.20
Simazine	ug/l	<0.50	<0.50
Atrazine	ug/l	<0.20	<0.20
Metribuzin	ug/l	<0.20	<0.20
Alachlor	ug/l	<0.20	<0.20
Metolachlor	ug/l	<0.20	<0.20
Butachlor	ug/l	<0.50	<0.50
bis(2-Ethylhexyl)adipate	ug/l	<0.50	<0.50
bis(2-Ethylhexyl)phthalate	ug/l	<2.0	<2.0
Benzo(a)pyrene	ug/l	<0.20	<0.20
Dilution Factor		1	1
Prep Date		01/17/05	01/17/05
Analysis Date		01/18/05	01/18/05
Batch ID		0117B	0117B
Analyst		KH	KH

Chlorinated Herbicides (515.1)

Dicamba	ug/l	<0.059	<0.059
2,4-D	ug/l	<0.12	<0.12
Dalapon	ug/l	<0.89	<0.89
Dinoseb	ug/l	<0.034	<0.034
Pentachlorophenol	ug/l	<0.090	<0.090
Picloram	ug/l	<0.096	<0.096
2,4,5-TP (Silvex)	ug/l	<0.030	<0.030
Dilution Factor		1	1
Prep Date		01/19/05	01/19/05
Analysis Date		01/21/05	01/21/05
Batch ID		0119Q	0119Q
Analyst		JCK	JCK

Analytical Data Report

Lab Sample ID	Description	Matrix	Date Received	Date Sampled	SDG#
40342-3	Method Blank	Liquid	01/13/05		
40342-4	Lab Control Standard % Recovery	Liquid	01/13/05		
40342-5	Reporting Limit (RL)	Liquid	01/13/05		
40342-6	Method Detection Limit (MDL)	Liquid	01/13/05		
40342-7	Precision (%RPD)	Liquid	01/13/05		

Parameter	Units	Lab Sample IDs				
		40342-3	40342-4	40342-5	40342-6	40342-7

DW-525.2 (Expanded) (525.2)

Hexachlorocyclopentadiene	ug/l	<2.0	112 %	2.0	0.50	1.8 %
Propachlor	ug/l	<0.20	108 %	0.20	0.096	3.6 %
Hexachlorobenzene	ug/l	<0.20	94 %	0.20	0.058	2.1 %
Simazine	ug/l	<0.50	100 %	0.50	0.11	2.0 %
Atrazine	ug/l	<0.20	94 %	0.20	0.087	2.2 %
Metribuzin	ug/l	<0.20	84 %	0.20	0.085	4.9 %
Alachlor	ug/l	<0.20	108 %	0.20	0.076	1.9 %
Metolachlor	ug/l	<0.20	110 %	0.20	0.065	1.8 %
Butachlor	ug/l	<0.50	120 %	0.50	0.084	0 %
bis(2-Ethylhexyl)adipate	ug/l	<0.50	114 %	0.50	0.094	1.7 %
bis(2-Ethylhexyl)phthalate	ug/l	<2.0	128 %	2.0	1.0	1.6 %
Benzo(a)pyrene	ug/l	<0.20	106 %	0.20	0.038	0 %
Dilution Factor		1	1			
Prep Date		01/17/05	01/17/05			
Analysis Date		01/18/05	01/18/05			
Batch ID		0117B	0117B			0117B
Analyst		KH	KH			

Chlorinated Herbicides (515.1)

Dicamba	ug/l	<0.059	100 %	0.50	0.059	0 %
2,4-D	ug/l	<0.12	120 %	0.50	0.12	4.2 %
Dalapon	ug/l	<0.89	120 %	10	0.89	40 %*Z
Dinoseb	ug/l	<0.034	95 %	3.0	0.034	0 %
Pentachlorophenol	ug/l	<0.090	120 %	1.0	0.090	0 %
Picloram	ug/l	<0.096	100 %	0.50	0.096	10 %

Analytical Data Report

Lab Sample ID	Description	Matrix	Date Received	Date Sampled	SDG#
40342-3	Method Blank	Liquid	01/13/05		
40342-4	Lab Control Standard % Recovery	Liquid	01/13/05		
40342-5	Reporting Limit (RL)	Liquid	01/13/05		
40342-6	Method Detection Limit (MDL)	Liquid	01/13/05		
40342-7	Precision (%RPD)	Liquid	01/13/05		

Parameter	Units	Lab Sample IDs				
		40342-3	40342-4	40342-5	40342-6	40342-7

Chlorinated Herbicides (315.1)

2,4,5-TP (Silvex)	ug/l	<0.030	100 %	0.50	0.030	5.1 %
Dilution Factor		1	1			
Prep Date		01/19/05	01/19/05			
Analysis Date		01/21/05	01/21/05			
Batch ID		0119Q	0119Q			0119Q
Analyst		JCK	JCK			

Order Number: S540342

These test results meet all the requirements of NELAC. All questions regarding this test report should be directed to the STL Project Manager who signed this test report.

Z = Relative Percent Difference (%RPD) outside control limits.

# H2M LABS, INC.

575 Broad Hollow Road, Melville NY 11747  
(631) 694-3040 . FAX: (631) 420-8436 NYSDOH ID# 10478

**SEVERN TRENT LABORATORIES**  
**315 FULLERTON AVENUE**  
**NEWBURGH, NEW YORK 12550**  
**Attn To :**

## LABORATORY RESULTS

Lab No. : **0501303-001A**

Sample Information...

Type : Potable Water

Origin :

Routine

Federal ID

Client ID. : **244322-1**

Collected : 1/12/2005

Point No :

**SE Well**

Received : 1/13/2005 9:15:00 AM

Location :

Collected By : CLIENT

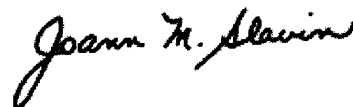
Copy : **Rick Bayer**

CC

<u>Parameter(s)</u>	<u>Results</u>	<u>Qualifier</u>	<u>D.F.</u>	<u>Units</u>	<u>Limit</u>	<u>Method Number</u>	<u>Analyzed</u>
Lindane	< 0.025		1	µg/L	0.2	E505	01/20/2005 8:32 AM
Heptachlor	< 0.025		1	µg/L	0.4	E505	01/20/2005 8:32 AM
Aldrin	< 0.025		1	µg/L		E505	01/20/2005 8:32 AM
Heptachlor epoxide	< 0.025		1	µg/L	0.2	E505	01/20/2005 8:32 AM
Dieldrin	< 0.050		1	µg/L		E505	01/20/2005 8:32 AM
Endrin	< 0.050		1	µg/L	2	E505	01/20/2005 8:32 AM
Methoxychlor	< 0.25		1	µg/L	40	E505	01/20/2005 8:32 AM
Toxaphene	< 2.5		1	µg/L	3	E505	01/20/2005 8:32 AM
Chlordane	< 0.50		1	µg/L	2	E505	01/20/2005 8:32 AM
Total PCBs	< 0.50		1	µg/L	0.5	E505	01/20/2005 8:32 AM
Aldicarb sulfoxide	< 1.0		1	µg/L	4	E531.1	01/13/2005 11:11 PM
Aldicarb sulfone	< 1.0		1	µg/L	2	E531.1	01/13/2005 11:11 PM
Oxamyl	< 1.0		1	µg/L	200	E531.1	01/13/2005 11:11 PM
Methomyl	< 1.0		1	µg/L	50	E531.1	01/13/2005 11:11 PM
3-Hydroxycarbofuran	< 1.0		1	µg/L	50	E531.1	01/13/2005 11:11 PM
Aldicarb	< 1.0		1	µg/L	3	E531.1	01/13/2005 11:11 PM
Carbaryl	< 1.0		1	µg/L	50	E531.1	01/13/2005 11:11 PM

Result(s) reported meet(s) Regulatory Limit(s).  
Result(s) flagged with \* Exceed Regulatory Limit(s). Limit noted.  
D.F. = Dilution Factor

Date Reported : 1/24/2005



# H2M LABS, INC.

575 Broad Hollow Road, Melville NY 11747  
(631) 694-3040. FAX: (631) 420-8436 NYSDOH ID# 10478

## LABORATORY RESULTS

SEVERN TRENT LABORATORIES  
315 FULLERTON AVENUE  
NEWBURGH, NEW YORK 12550  
Attn To :

Lab No. : 0501303-002A

Sample Information...  
Type : Potable Water  
Origin :  
Routine

Federal ID

Client ID. : 244322-2

Collected : 1/12/2005

Point No :

NW Well

Received : 1/13/2005 9:15:00 AM

Location :

Collected By : CLIENT

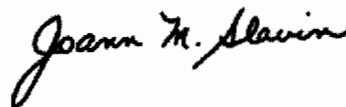
Copy : Rick Bayer

CC

Parameter(s)	Results	Qualifier	D.F.	Units	Limit	Method Number	Analyzed
Lindane	< 0.025		1	µg/L	0.2	E505	01/20/2005 9:25 AM
Heptachlor	< 0.025		1	µg/L	0.4	E505	01/20/2005 9:25 AM
Aldrin	< 0.025		1	µg/L		E505	01/20/2005 9:25 AM
Heptachlor epoxide	< 0.025		1	µg/L	0.2	E505	01/20/2005 9:25 AM
Dieldrin	< 0.050		1	µg/L		E505	01/20/2005 9:25 AM
Endrin	< 0.050		1	µg/L	2	E505	01/20/2005 9:25 AM
Methoxychlor	< 0.25		1	µg/L	40	E505	01/20/2005 9:25 AM
Toxaphene	< 2.5		1	µg/L	3	E505	01/20/2005 9:25 AM
Chlordane	< 0.50		1	µg/L	2	E505	01/20/2005 9:25 AM
Total PCBs	< 0.50		1	µg/L	0.5	E505	01/20/2005 9:25 AM
Aldicarb sulfoxide	< 1.0		1	µg/L	4	E531.1	01/14/2005 12:14 AM
Aldicarb sulfone	< 1.0		1	µg/L	2	E531.1	01/14/2005 12:14 AM
Oxamyl	< 1.0		1	µg/L	200	E531.1	01/14/2005 12:14 AM
Methomyl	< 1.0		1	µg/L	50	E531.1	01/14/2005 12:14 AM
3-Hydroxycarbofuran	< 1.0		1	µg/L	50	E531.1	01/14/2005 12:14 AM
Aldicarb	< 1.0		1	µg/L	3	E531.1	01/14/2005 12:14 AM
Carbofuran	< 1.0		1	µg/L	40	E531.1	01/14/2005 12:14 AM
Carbaryl	< 1.0		1	µg/L	50	E531.1	01/14/2005 12:14 AM

Result(s) reported meet(s) Regulatory Limit(s).  
Result(s) flagged with \* Exceed Regulatory Limit(s). Limit noted.  
D.F. = Dilution Factor

Date Reported : 1/24/2005



Laboratory Manager



**Fax message**

**To: Kelly Prior**                      **From: Aimee Cormier**  
**Company: STL Newburgh**              **Date: January 27, 2005**  
**Fax: (845) 562-0794**                  **Pages: 2**  
**Subject: TEM Water Asbestos Results**

This message contains information intended only for the use of the person named above. It may also be confidential and/or privileged. If you are not the intended recipient of this message you are hereby notified that you must not disseminate, copy or take any action in reliance on it. If you have received this message in error please contact STL at 866-STL-LABS. The views expressed in this fax are not necessarily those of the company STL.

**Severn Trent Laboratories Inc.**  
STL Billerica • 148 Rangeway Road, N. Billerica, MA 01862  
Tel 978 667 1400 Fax 978 667 7871 • [www.stl-inc.com](http://www.stl-inc.com)





# STL

Doug Tawse  
STL Newburgh  
315 Fullerton Avenue  
Newburgh, NY 12550

STL Billerica  
148 Rangeway Road  
N. Billerica, MA 01862

Tel: 978 667 1400 Fax: 978 667 7871  
www.stl-inc.com

Dear Doug:

January 27, 2005

Please find enclosed results for two (2) samples, Billing Ref: 244322, STL Job #222285, which you submitted for asbestos analysis by Transmission Electron Microscopy (TEM).

The results are listed according to the NYELAP Certification Manual and USEPA Phase II Primary and Secondary Drinking Water Regulations EPA Method 100.2 (" $<$ " is equal to the value of the detection limit).

CLIENT SAMPLE ID	A (million fibers/liter)	DATE FILTERED	DATE ANALYZED
SE Well	<0.198	01/13/05; 11:28	01/27/05; 11:18
NW Well	<0.198	01/13/05; 11:38	01/26/05; 10:35

The final maximum contaminant level goal (MCLG) and maximum contaminant level (MCL) for asbestos in water is 7.0 Million fibers/liter.

STL Billerica is accredited by NYELAP (#10838) and the Commonwealth of Massachusetts (#M-MA038) for asbestos analysis of water samples

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted above.

Severn Trent Laboratories is not responsible for incorrect sampling procedures since these water samples were not collected by our lab personnel. STL is only responsible for the analysis and reporting of submitted samples. Accreditation in no way constitutes or implies product certification, approval, or endorsement by NELAC. This report relates only to the specific samples tested herein. The enclosed report shall not be reproduced except in full, without the written approval of STL.

Should you have further questions, or need additional information, please feel free to contact Client Services or me at any time.

Sincerely,

Ernest T. Dobi, Ph.D.  
Manager-Microscopy Service



SUBCONTRACT CHANIN OF CUSTODY

01/12/2005

STL-Newburgh

STL Project Manager: STL-Newburgh Project Manager  
 Telephone: (845) 562-0890  
 PO/Job#: 244322  
 Client: Tim Miller Associates, Inc.  
 Project Name: PATTERSON CROSSING  
 Penalty Job: Y/N  
 Certification:  
 SDG Complete:  
 VTSR Date: 01/12/2005  
 Verbal Due Date:  
 Report Type: Standard  
 EDD Type:  
 QC Billable: Y/N

Samp#	Sample I.D.	Sampled
1	SE Well	01/12/2005
2	NW Well	01/12/2005

Please run QC on the following sample(s):

Mthds	Method Description	Asbestos #of	Analytical Mthd Unit Price	Extended
	Sample Distribution			
				Total Cost

Matrix: DW  
 Bottle Type & Number: 1 Plastic Liter Per Location

Ship To: Stl Bellerica  
 Ship Date: 01/12/2005

Special Instructions:

Sending Laboratory: STL Newburgh *Wilson Episto*  
 Date: 01/12/2005

Receiving Laboratory: \_\_\_\_\_ Date: \_\_\_\_\_

PLEASE SEND A SAMPLE CONFIRMATION REPORT UPON SAMPLE RECEIPT.

SUBCONTRACT CHAIN OF CUSTODY

01/12/2005

STL-Newburgh

STL Project Manager: STL-Newburgh Project Manager  
 Telephone: (845) 562-0890  
 PO/Job#: 244322  
 Client: Tim Miller Associates, Inc.  
 Project Name: PATTERSON CROSSING  
 Penalty Job: Y/N  
 Certification:  
 SDG Complete:  
 VTSR Date: 01/12/2005  
 Verbal Due Date:  
 Report Type: Standard  
 EDD Type:  
 QC Billable: Y/N

Samp#	Sample I.D.	Sampled
1	SE Well	01/12/2005
2	NW Well	01/12/2005

Please run QC on the following sample(s):

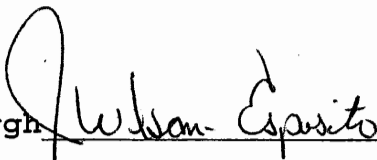
Mthds	Method Description	Radio	Gross/Alpha	Beta	226/228 Uranium
Analytical Mthd	Sample Distribution	#of	Unit Price	Extended	
					Total Cost

Matrix: DW  
 Bottle Type & Number: 3 Nitric Liters  
 Per Location

Ship To: STL St Louis  
 Ship Date: 01/12/2005

Special Instructions:

Sending Laboratory: STL Newburgh  
 Date: 01/12/2005



Receiving Laboratory: \_\_\_\_\_ Date: \_\_\_\_\_

PLEASE SEND A CONFIRMATION REPORT UPON SAMPLE RECEIPT.

SUBCONTRACT CHAIN OF CUSTODY

01/12/2005

STL-Newburgh

STL Project Manager: STL-Newburgh Project Manager  
 Telephone: (845) 562-0890  
 PO/Job#: 244322  
 Client: Tim Miller Associates, Inc.  
 Project Name: PATTERSON CROSSING  
 Penalty Job: Y/N  
 Certification:  
 SDG Complete:  
 VTSR Date: 01/12/2005  
 Verbal Due Date:  
 Report Type: Standard  
 EDD Type:  
 QC Billable: Y/N

Samp#	Sample I.D.	Sampled
1	SE Well	01/12/2005
2	NW Well	01/12/2005

Please run QC on the following sample(s):

Mthds	Method Description	505, 531.1	Analytical Mthd
	Sample Distribution	#of	Unit Price Extended
			Total Cost

Matrix: DW  
 Bottle Type & Number: 4 Vials Thio (Per Location)

Ship To: H2M  
 Ship Date: 01/12/2005

Special Instructions:

Sending Laboratory: STL Newburgh *Julian Gasito*  
 Date: 01/12/2005

Receiving Laboratory: \_\_\_\_\_ Date: \_\_\_\_\_

PLEASE SEND A CONFIRMATION REPORT UPON SAMPLE RECEIPT.

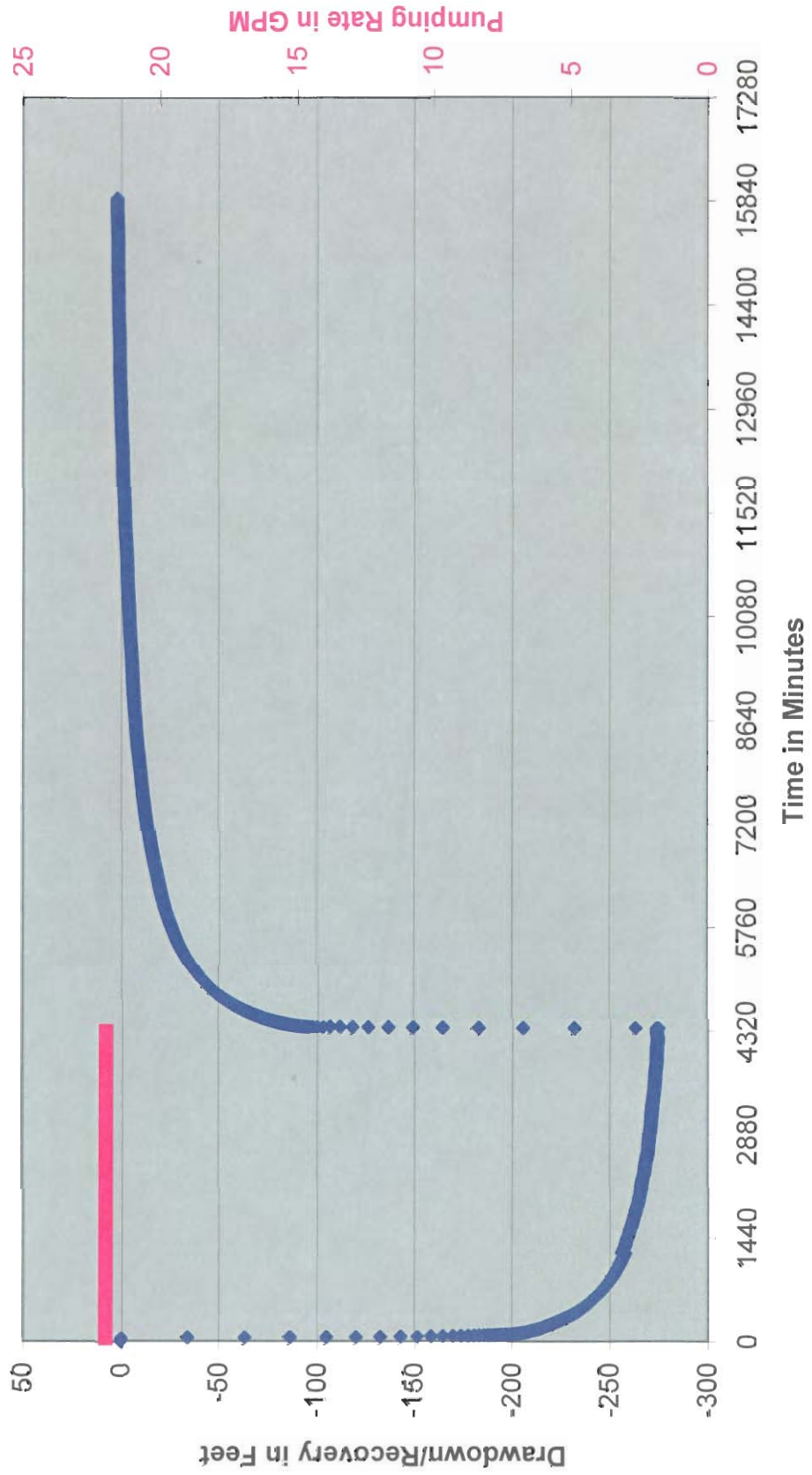


Appendix D  
Pumping Test Data/Charts

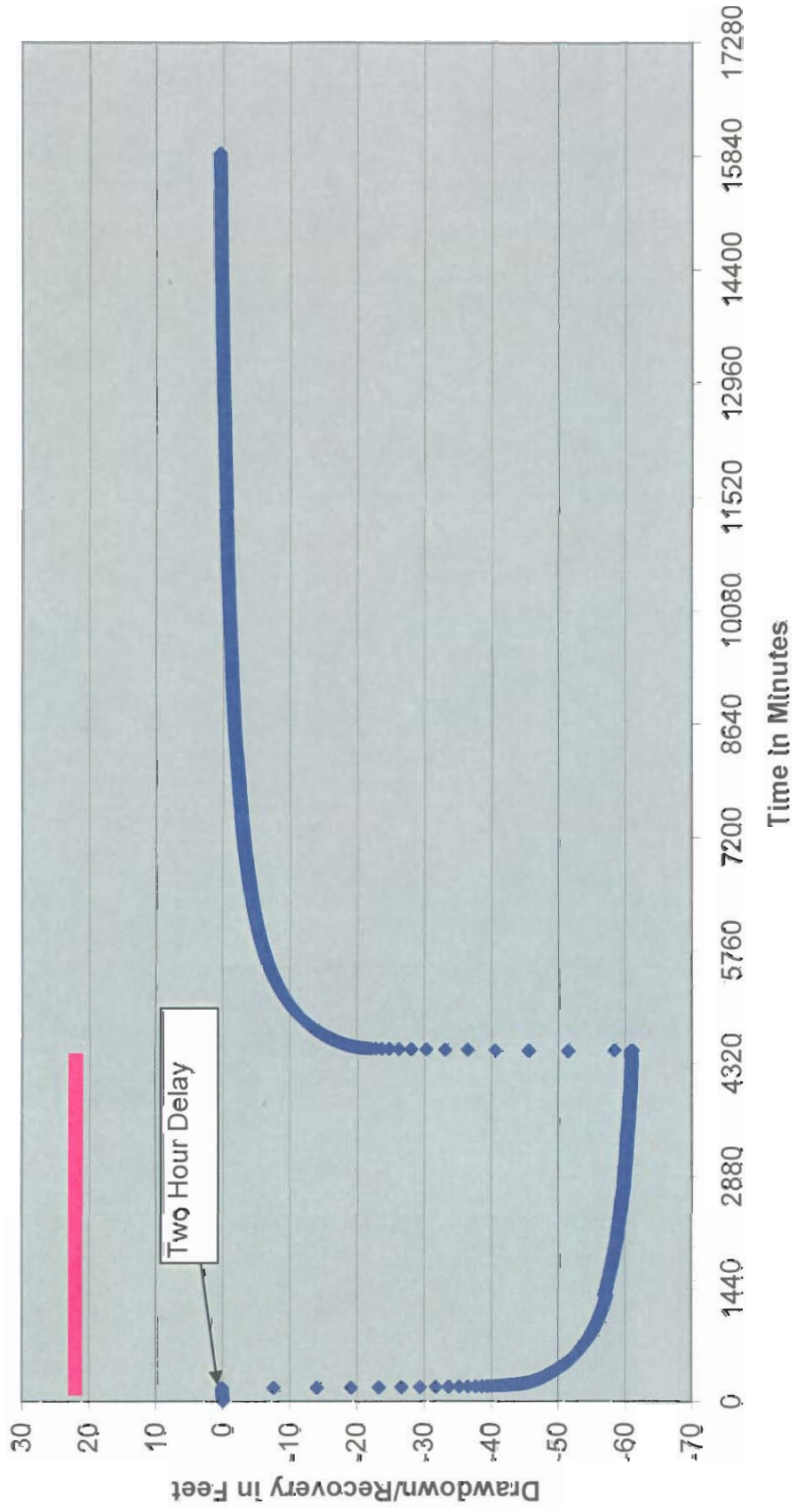


# Patterson Crossing

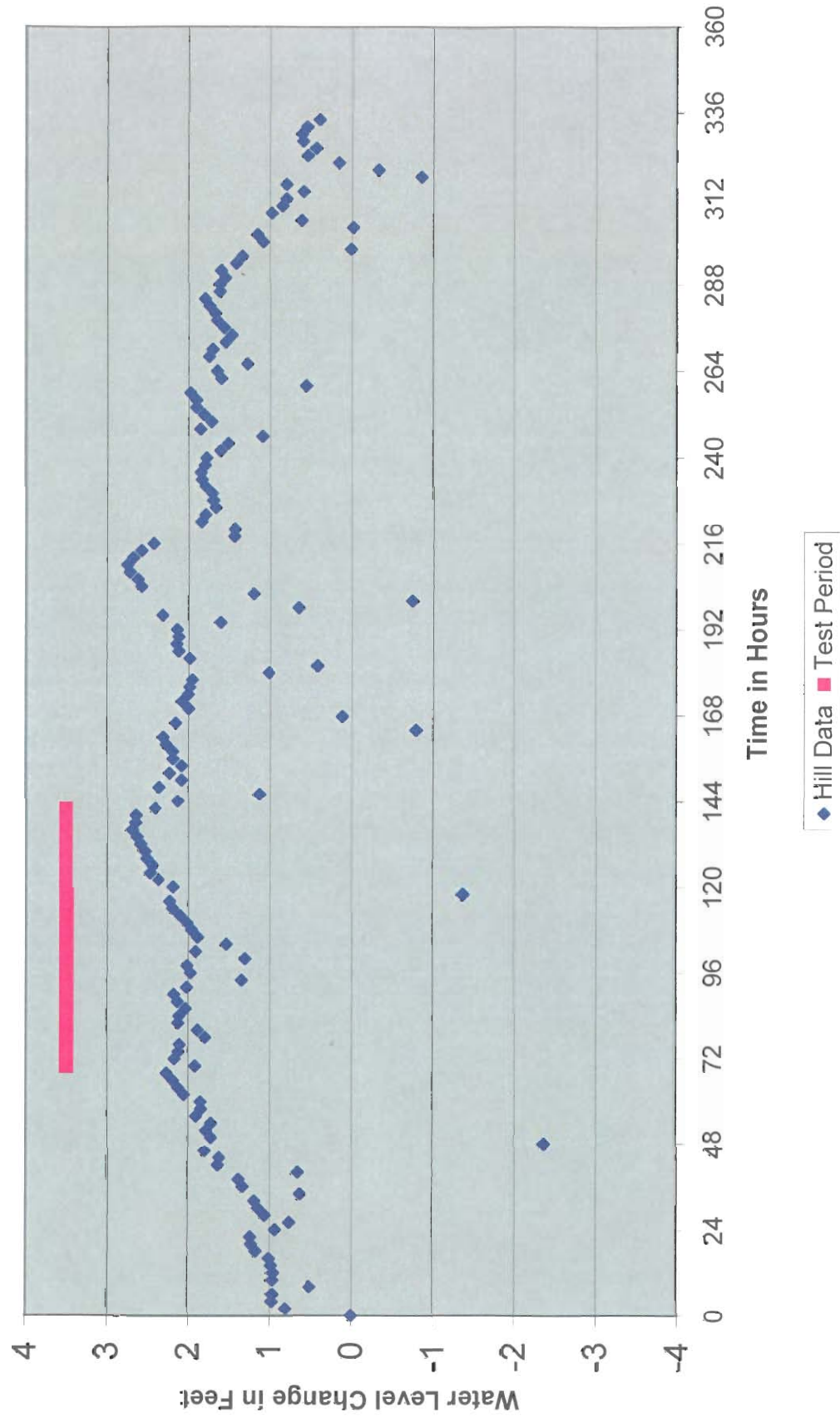
72 Hour Pumping Test on Well 1  
Pumping Period 1-17-2005 to 1-20-2005  
Monitoring Period 1-17-2005 to 1-28-2005



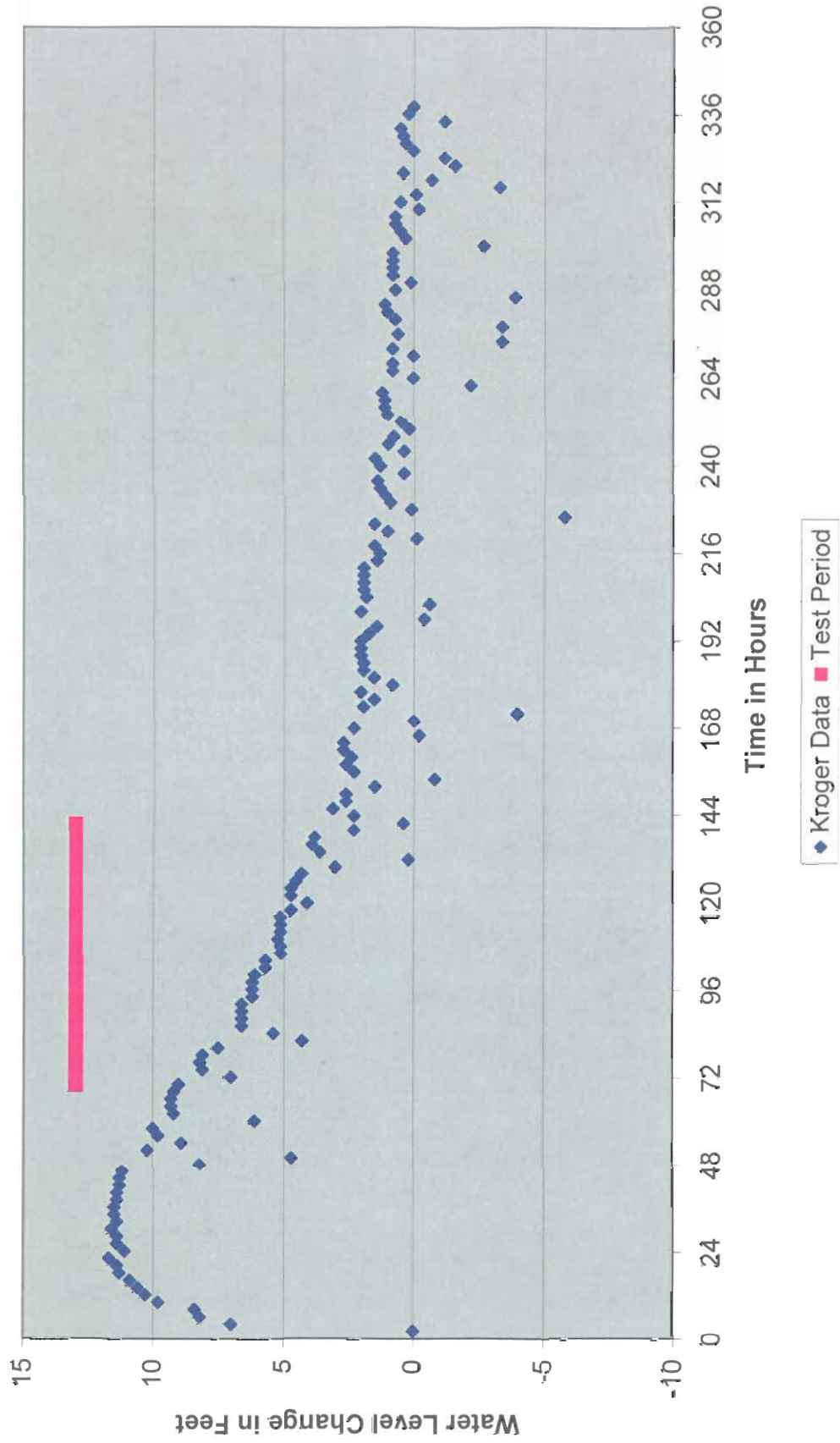
**Patterson Crossing**  
72 Hour Pumping Test on Well 2  
Pumping Period 1-17-2005 to 1-20-2005  
Monitoring Period 1-17-2005 to 1-28-2005



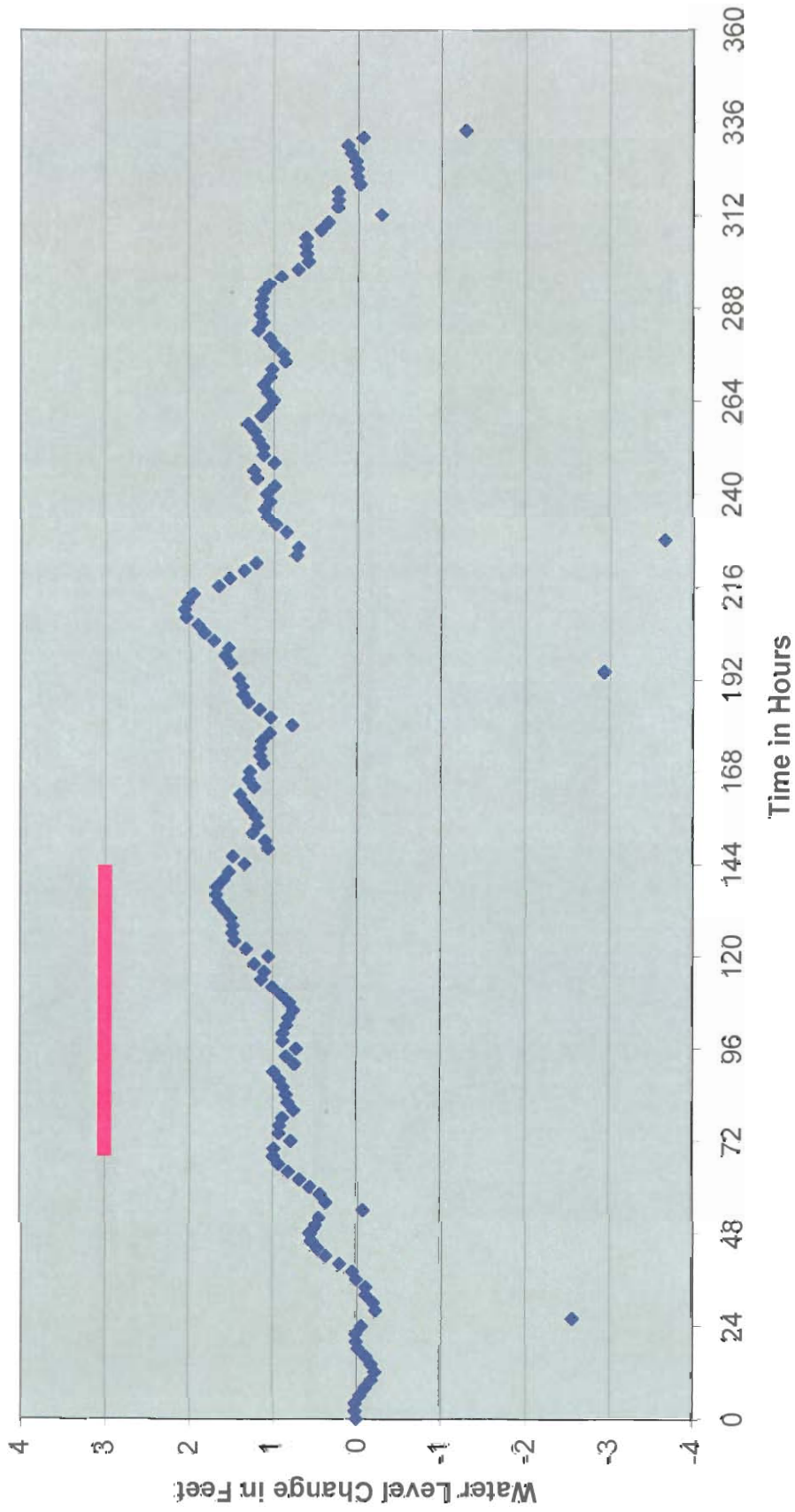
Patterson Crossing  
72 Hour Pumping Test  
Hill Well Data 1-14-2005 to 1-28-2005



**Patterson Crossing**  
**72 Hour Pumping Test**  
**Kroger Well Data 1-14-2005 to 1-28-2005**

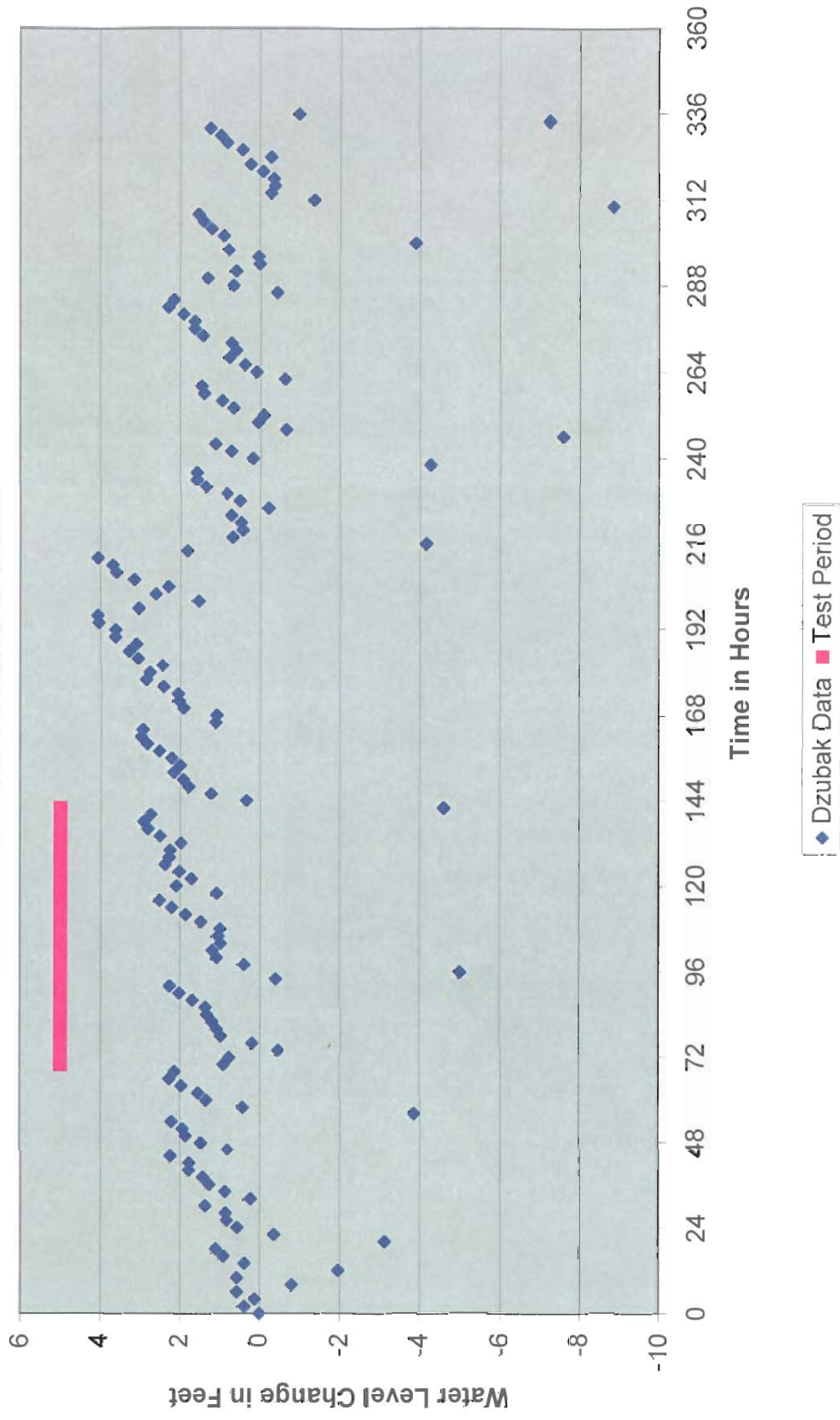


**Patterson Crossing**  
**72 Hour Pumping Test**  
**Callella Well Data 1-14-2005 to 1-28-2005**

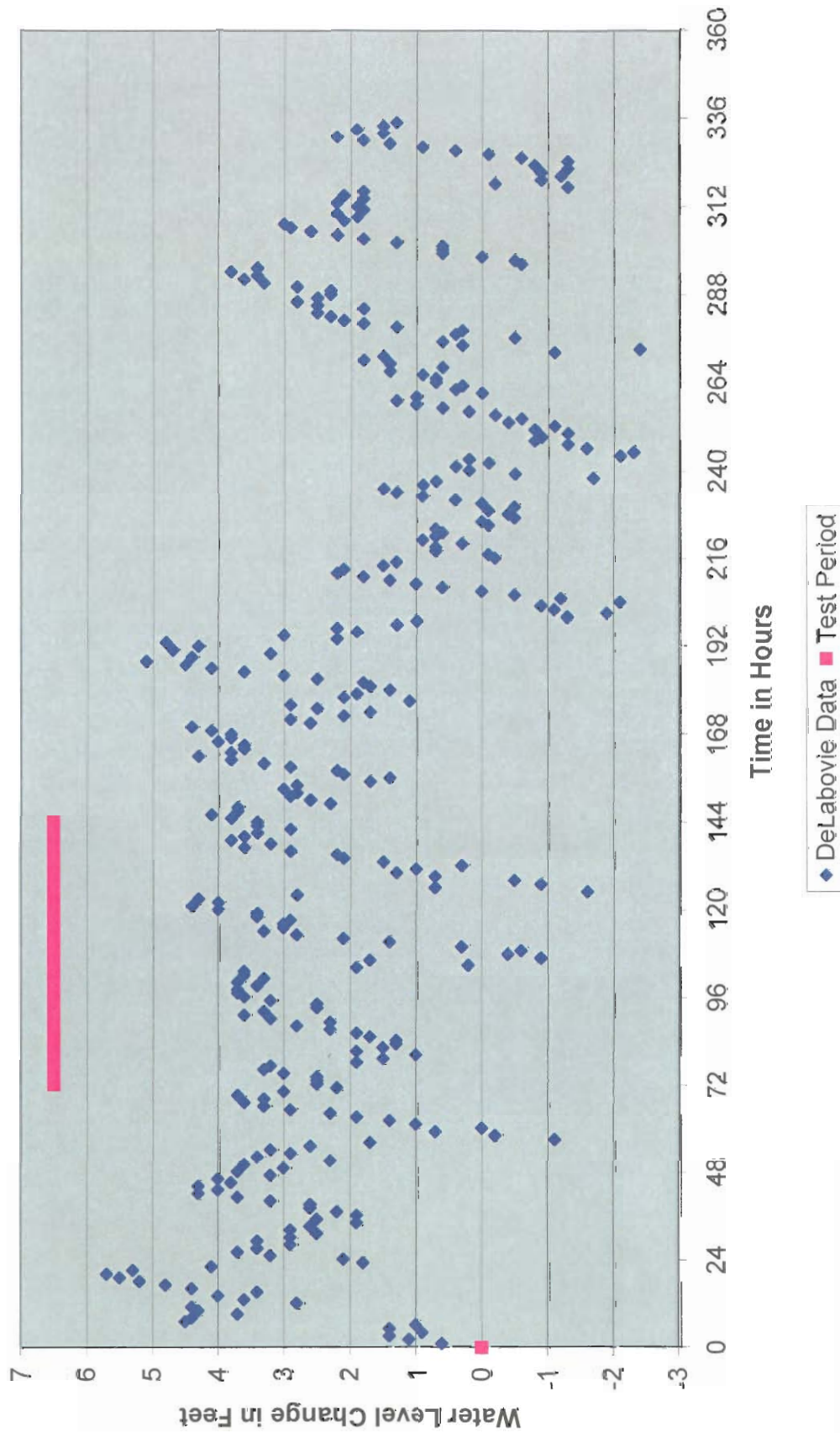


◆ Callella Data ■ Test Period

**Patterson Crossing**  
**72 Hour Pumping Test**  
**Dzubak Well Data 1-14-2005 to 1-28-2005**



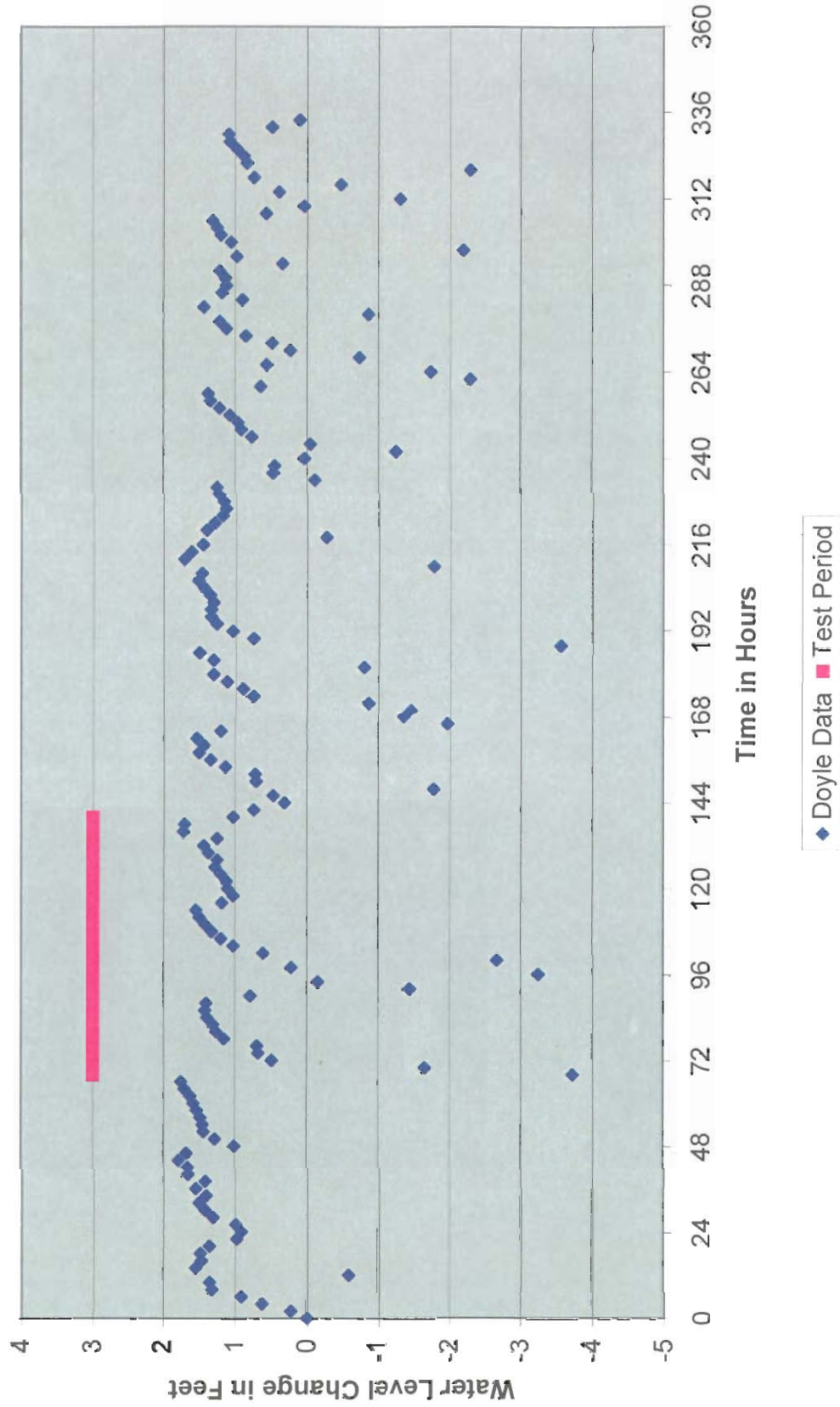
**Patterson Crossing**  
72 Hour Pumping Test  
DeLabovie Well Data 1-14-2005 to 1-28-2005



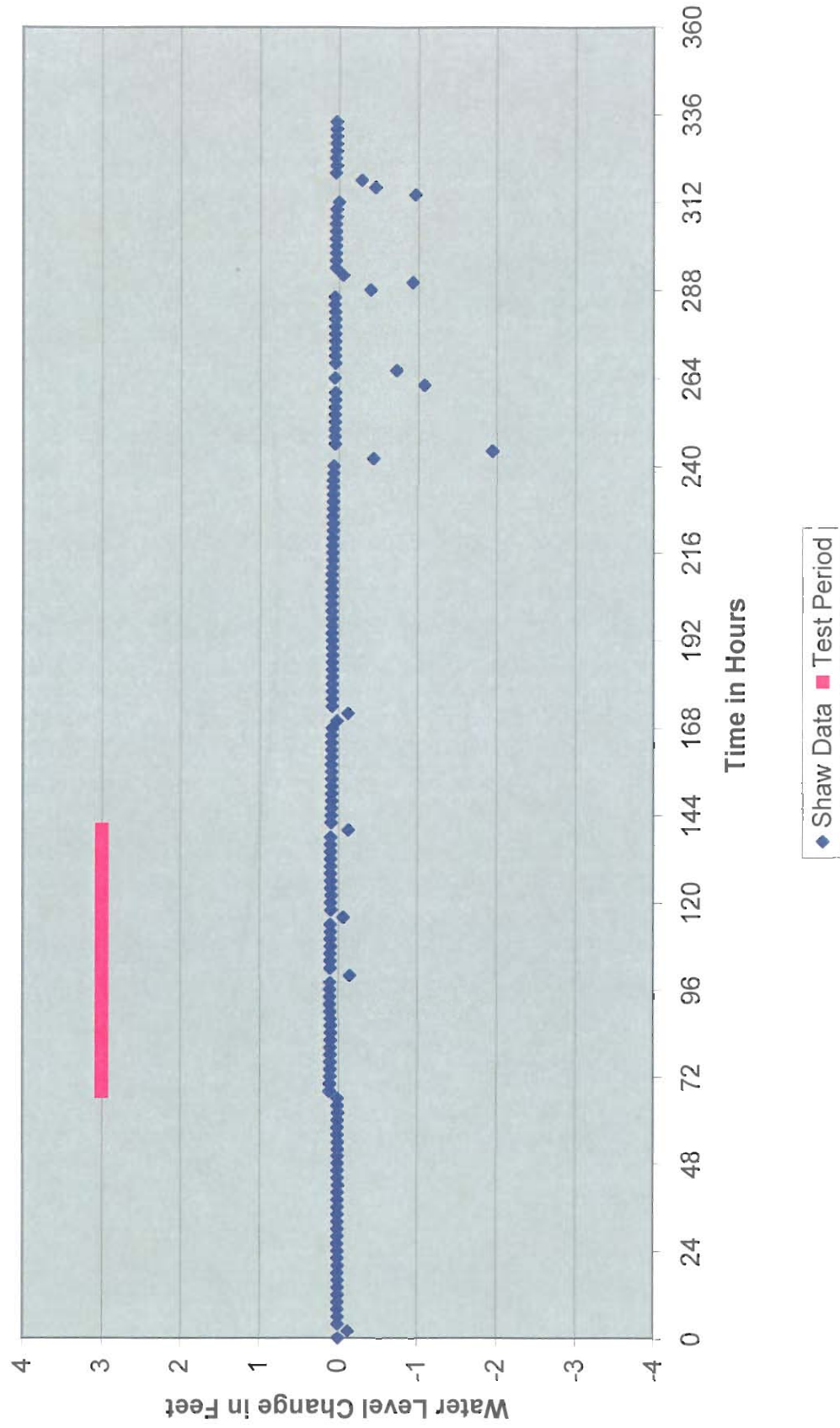
# Patterson Crossing

72 Hour Pumping Test

Doyle Well Data 1-14-2005 to 1-28-2005



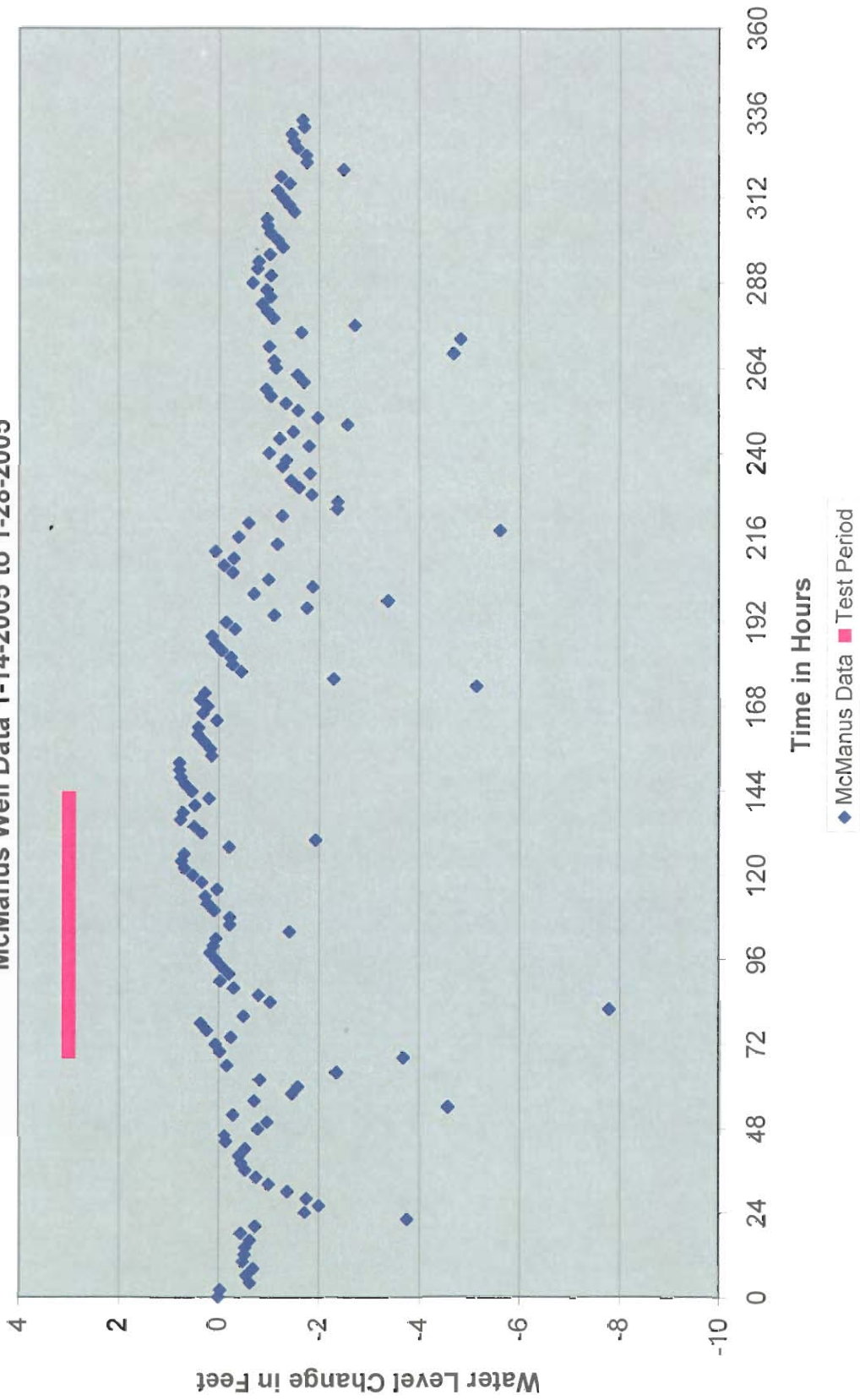
**Patterson Crossing**  
72 Hour Pumping Test  
Shaw Data 1-14-2005 to 1-28-2005



# Paterson Crossing

## 72 Hour Pumping Test

### McManus Well Data 1-14-2005 to 1-28-2005



Appendix I

AIR QUALITY  
TECHNICAL REPORT



**APPENDIX F**

**PATTERSON CROSSING RETAIL CENTER  
DRAFT GENERIC ENVIRONMENTAL IMPACT STATEMENT**

**AIR QUALITY TECHNICAL REPORT**

Prepared for:

**Tim Miller Associates, Inc.**

10 North Street

Cold Spring, New York 10516

Prepared by:



**RTP Environmental Associates, Inc.**

400 Post Avenue

Westbury, New York 11590

**August 2005**



**PATTERSON CROSSING RETAIL CENTER  
DRAFT GENERIC ENVIRONMENTAL IMPACT STATEMENT**

**TABLE OF CONTENTS**

<u>Description</u>	<u>Page No.</u>
1.0 INTRODUCTION	1
2.0 EXISTING AIR QUALITY	2
2.1 Site Description	2
2.2 Sensitive Land Uses	3
2.3 Air Quality Standards	4
2.3.1 Ambient Air Quality Standards	4
2.3.2 State Implementation Plan	6
2.3.3 Area Attainment Status	7
2.4 Existing Site Characteristics and Air Quality	7
2.4.1 Climate and Meteorology	7
2.4.2 Existing Air Quality	9
3.0 POTENTIAL AIR QUALITY IMPACTS	13
3.1 Potential Traffic Related Impacts	13
3.1.1 Methodology	13
3.1.2 Determination of Level 1 CO Microscale Analysis	13
3.1.2.1 Level of Service Screening Analysis	14
3.1.2.2 Capture Criteria Screening Analysis	15
3.1.2.3 Volume Threshold Screening Analysis	17
3.1.3 CO Microscale Analysis	22
3.1.3.1 Existing Conditions	25
3.1.3.2 Anticipated Impacts	29
3.1.4 PM10/PM2.5, NO <sub>x</sub> and VOC Impacts	31
3.1.5 Mesoscale Analysis	32
3.1.6 Conformity Determination	32
3.2 Stationary Source and Other Air Quality Impacts	32
3.3 Construction and other Air Quality Impacts	33
4.0 PROPOSED MITIGATION	35
4.1 Traffic Related Proposed Mitigation	35
4.2 Operational Related Mitigation	35
4.3 Constructed Related Mitigation	35
5.0 PROJECT ALTERNATIVE AIR QUALITY IMPACTS	36

REFERENCES

**PATTERSON CROSSING RETAIL CENTER  
DRAFT GENERIC ENVIRONMENTAL IMPACT STATEMENT**

**TABLE OF CONTENTS (CONT'D.)**

List of Tables and Figures

<u>Description</u>	<u>Page No.</u>
Table 1 National and New York State Ambient Air Quality Standards	5
Table 2 NYSDEC Air Monitoring Sites	10
Table 3 Level of Service (LOS) Screening Analysis	16
Table 4 Capture Criteria Screening Analysis	18
Table 5 No Build and Build (2010) Vehicle Emission Rates	21
Table 6 Volume Threshold Screening Analysis	23
Table 7 Input Parameter Values for CAL3QHC	26
Table 8 Predicted 1-Hour and 8-Hour Carbon Monoxide Concentrations (ppm)	28
Figure 1 Aerial View of Proposed Project Site	3
Figure 2 NYSDOT's MOBILE6.2 Interactive Emission Factor Generator	20
Figure 3 Aerial View of Analyzed Intersection	24
Figure 4 Intersection Modeling Layout	27

ATTACHMENT F.1 Generated MOBILE6.2 Emission Factors

ATTACHMENT F.2 CAL3QHC Model Runs

# **PATTERSON CROSSING RETAIL CENTER DRAFT ENVIRONMENTAL IMPACT STATEMENT**

## **1.0 INTRODUCTION**

The proposed action, the Patterson Crossing Retail Center Project, has been analyzed to define the potential impacts on air quality resources of the area surrounding the project site. Air quality impacts are expected from project generated traffic on area roadways and from general construction and operating activities. The amount of traffic and its distribution have been defined in Appendix K of the DEIS. Traffic analysis data were used in an extensive screening analysis to determine the level of air quality analysis appropriate to the proposed action. Based on the screening analysis, none of the roadway intersections analyzed warranted a microscale air quality analysis. However, one intersection was analyzed for Carbon Monoxide (CO) impacts to determine future air concentrations in order to make comparisons with current traffic related air quality concentrations. A traffic intersection that displayed high traffic volumes in combination with a poor level of service (LOS) is typically associated with maximum CO impacts. The analysis was designed to define air quality levels during the completion year in the area of maximum projected traffic volumes. In addition, an analysis was performed to define air quality levels for Existing and the proposed completion year without the project to determine the net difference between Existing, Build and No Build cases. Construction and operating air quality impacts are also addressed in this report. Section 2.0 discusses the existing air quality at the proposed project site; Section 3.0 contains project related air quality impact analyses; and Section 4.0 discusses proposed mitigation measures that will be used to mitigate air quality impacts.

## **2.0 EXISTING AIR QUALITY**

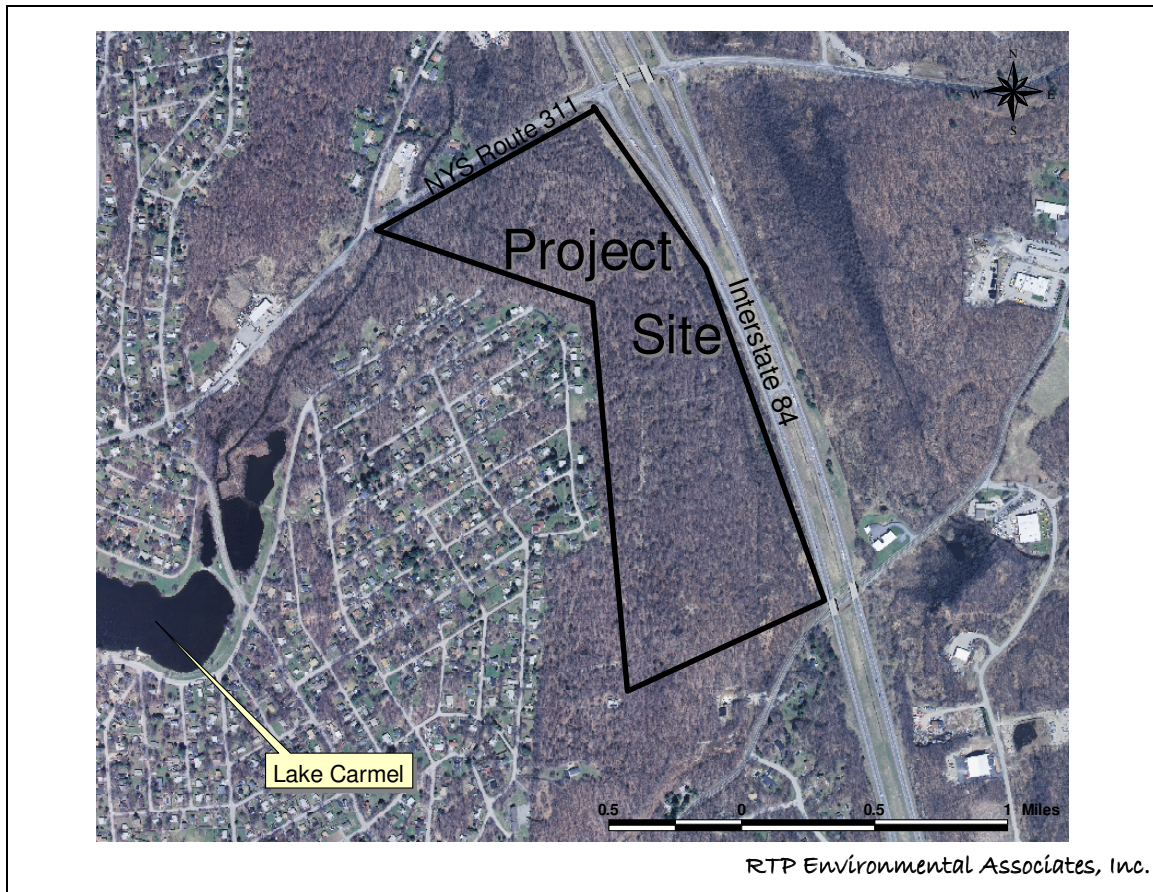
The quality of ambient air is commonly defined by the major criteria air pollutants regulated by the US Environmental Protection Agency (USEPA) and the New York State Department of Environmental Conservation (NYSDEC). Baseline air quality conditions at and in the vicinity of the project site were characterized from measured data available from nearby monitoring stations.

### **2.1 SITE DESCRIPTION**

The proposed Patterson Crossing Retail Center Project is located in north-central Putnam County at the junction of New York State (NYS) Route 311 and Interstate 84, Exit 18 in the Towns of Patterson and Kent (73 acres in Patterson and 17 acres in Kent). The site is located in the vicinity of both rural and suburban land uses approximately 50 miles north of New York City. Federal and State air regulations apply to this project. Specifically, the project is regulated by the USEPA and NYSDEC with respect to air quality standards and guidelines. Putnam County is located within Region II of the USEPA and Region 3 of the NYSDEC.

The proposed site is currently undeveloped. It is located at the southwest corner of two major roadways, NYS Route 311 which borders the site on the northwest and Interstate 84 along the north and east. A developed residential area borders the project site to the south and west. Residential, commercial and recreational areas exist in the vicinity of the project site. An aerial view of the proposed project site is provided as Figure 1. In terms of air quality, the site lies within a Level II NYSDEC classification zone. A Level II classification zone is defined as “predominately single and two family residences, small farms, and limited commercial services and industrial development” (NYSDEC 6 NYCRR Part 256.1).

**Figure 1**  
**Aerial View of Proposed Project Site**



## 2.2 SENSITIVE LAND USES

Areas that are particularly sensitive to air pollution are typically referred to as “Sensitive Land Uses” and include residences, hospitals, schools, parks, nursing homes and places of worship among others. Ambient air quality standards define sensitive receptors as an area where the general public has access, including roadways, sidewalks, and railways.

The nature of this project is the development of a large, retail shopping center consisting of four separate buildings which will provide approximately 405,850 square feet of retail space. Stores will include a large wholesale warehouse store and a large home improvement center as well as parking and roadways. A café is also proposed at the site.

The Hamlet of Lake Carmel is the nearest community, located within one (1) mile southwest of the site. The Hamlet of Lake Carmel, located in the Town of Kent, is centered on an artificial lake built in the 1920s. According to U.S. Census data for the year 2000, Lake Carmel's population was approximately 8,663. Nearby sensitive receptors include numerous residential areas, which include community parks, schools and places of worship.

## 2.3 AIR QUALITY REGULATIONS

Air quality issues center on the major criteria pollutants regulated by the USEPA and the NYSDEC. The six (6) major criteria pollutants include nitrogen oxides (NO<sub>x</sub>), ozone (O<sub>3</sub>), lead (Pb), sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), and fine particulate matter (typically as PM<sub>10</sub> and/or PM<sub>2.5</sub>). A variety of sources in this area, both natural and anthropogenic, contribute to air pollution. Some of the sources include stationary sources (factories, power plants, and residential wood burning stoves), mobile sources (cars, trucks, buses, trains, and planes), and natural sources (vegetation, wildfires and windblown dust). The following standards and procedures have been developed to maintain a healthful environment.

### 2.3.1 Ambient Air Quality Standards

National and New York State Ambient Air Quality Standards (NAAQS and SAAQS) have been issued in accordance with the Clean Air Act and Clean Air Act Amendments for common pollutants considered harmful to public health and the environment.

The USEPA has promulgated both primary and secondary NAAQS for the criteria pollutants. Primary standards protect human health, while secondary standards protect public welfare, and these are provided in Table 1.

**Table 1**  
**National and New York State Ambient Air Quality Standards**

Pollutant	Averaging Period	NAAQS		New York SAAQS
		Primary	Secondary	
Oxides of Nitrogen (NO <sub>x</sub> )	Annual	100 µg/m <sup>3</sup>	100 µg/m <sup>3</sup>	0.05 ppm
Sulfur Dioxide (SO <sub>2</sub> )	3-hour	---	1300 µg/m <sup>3</sup>	0.50 ppm
	24-hour	365 µg/m <sup>3</sup>	---	0.14 ppm
	Annual	80 µg/m <sup>3</sup>	---	0.03 ppm
Carbon Monoxide (CO)	1-hour	40 µg/m <sup>3</sup>	40 µg/m <sup>3</sup>	35 ppm
	8-hour	10 µg/m <sup>3</sup>	10 µg/m <sup>3</sup>	9 ppm
Fine Particulate Matter (PM10)	24-hour	150 µg/m <sup>3</sup>	---	---
	Annual	50 µg/m <sup>3</sup>	---	---
Fine Particulate Matter (PM2.5)	24-hour	65 µg/m <sup>3</sup>	---	---
	Annual	15 µg/m <sup>3</sup>	---	---
Ozone (O <sub>3</sub> )	1-hour	235 µg/m <sup>3</sup>	---	0.12 ppm
	8-hour	157 µg/m <sup>3</sup>	---	0.08 ppm
Lead	3 consecutive months	1.5 µg/m <sup>3</sup>	---	---

Notes: Annual averaging period means the average of emissions for any 12 consecutive month periods, a 12-month also known as rolling average.

A primary NAAQS does not exist for this averaging period, therefore the secondary NAAQS was utilized.

µg/m<sup>3</sup> = microgram per cubic meter

ppm = parts per million

The NYSDEC has adopted these limits under 6 NYCRR Subpart 257. The Clean Air Fine Particle Rules (dealing with PM2.5 designations and implementation) has recently designated areas whose air does not meet the health-based standards for fine-particulate pollution. This will require states to submit plans for reducing the levels of particulate pollution in areas where the fine-particle standards are not met.

The National and State ambient air quality standards applicable to the project site and surrounding area are provided in Table 1. It should be noted that there are two (2) applicable particulate standards, one for particulate matter 10 microns or less (PM10) and the other to regulate particulate matter 2.5 microns or less (PM2.5). In addition, New York State has adopted ambient air quality standards for photochemical oxidants, non-methane hydrocarbons, fluorides, beryllium, and hydrogen sulfide, although ambient monitoring for these pollutants is not currently conducted. Projects that emit criteria pollutants must consider all potential emissions as part of permitting activities and project impacts cannot cause an exceedance of either the NAAQS or SAAQS.

### 2.3.2 State Implementation Plan

If a State does not meet or contributes to exceedances of a NAAQS, it must develop a State Implementation Plan (SIP). The SIP is a federally approved and enforceable plan developed by the State to attain and/or maintain applicable portions of the NAAQS. SIP procedures are outlined in the Code of Federal Regulations and fall under USEPA's jurisdiction, including enforcement. According to information obtained on the NYSDEC website:

*“We are charged with developing the State Implementation Plans (SIPs) to address continuing air pollution problems in New York State. SIPs are required for areas of the state that are in non-attainment of the National Ambient Air Quality Standards (NAAQS) for one of the criteria contaminants.*

*At the present time, the state is under mandate to develop SIPs to address ozone, carbon monoxide, and particulate matter of less than 10 microns. The bureau is also working with the USEPA to formulate standard practices for regional haze and fine particulate SIPs. Fine particulates are less than 2.5 microns, or micrometers, in size.”*

### 2.3.3 Area Attainment Status

The USEPA has used ambient air quality standards to classify all areas of the country as attainment, non-attainment or unclassified. If an area is attainment or unclassified for a particular pollutant, then new major sources of air pollution or major modifications of existing sources of air pollution require permitting under the Prevention of Significant Deterioration (PSD) Attainment Area provision program. However, if an area is designated non-attainment for a given pollutant, then new major sources or major modifications of existing sources of the non-attainment pollutant is subject to Non-Attainment Area (NAA) provisions under New Source Review (NSR). The NAA provisions have more stringent requirements for source emission rates and require emissions offsets.

The proposed project is located in the EPA Region II Air Quality classification area. This region is designated as either attainment or unclassified for SO<sub>2</sub>, NO<sub>2</sub>, CO, Pb, PM<sub>10</sub> and PM<sub>2.5</sub>. The area is designated as a moderate non-attainment area for O<sub>3</sub>.

## 2.4 EXISTING SITE CHARACTERISTICS AND AIR QUALITY

The meteorological, climatic and ambient air quality data presented in this section have been summarized from data provided by Federal, State and local governmental agencies. The climate of the area is based on historic data recorded over several years at local National Weather Service (NWS) meteorological collection sites. The air quality data is measured by NYSDEC. These data along with the applicable regulations provide a summary of current conditions surrounding the site and the framework within which the proposed facility must operate.

### 2.4.1 Climate and Meteorology

The climate of Putnam County is broadly classified as “humid-continental”. The climate is dominated by continental influences, which means that air masses and weather systems affecting the County have their origin principally over North America. The influence of

the Hudson Valley and Atlantic Ocean is also significant. The primary characteristics of the climate are an extended period of freeze-free temperatures, a reduced range of daily and seasonal temperatures and a precipitation distribution that is fairly uniform throughout the year.

Climatological data are recorded by the NWS and records are maintained by the National Oceanic and Atmospheric Administration (NOAA). The project site is located in NWS zone NYZ068 where meteorological data is collected at five locations including Danbury, CT (KDXR); Montgomery, NY (KMGJ); Newburgh, NY (KSWF); Poughkeepsie, NY (KPOU); and White Plains, NY (KHPN). The local NWS site nearest the proposed project is at Danbury Municipal Airport in Danbury, Connecticut. However, the extent of meteorological records for this station is unknown. Meteorological records collected at Poughkeepsie, NY (Dutchess County Airport) is the second closest NWS station to the project site as has climatological data dating back to 1932. Although historic weather data is available for the Poughkeepsie station, no Local Climatological Data Publications are available for this site (or any of the five meteorology stations in the Putnam County zone). Therefore, mean and extreme data presented below are based on data measured at the Central Park, New York City meteorological collection station, the nearest station to the project site where Local Climatological Data Publications are available.

### Temperature

Major influences on the temperature pattern of Putnam County include the Hudson River and associated valley to the west and the Atlantic Ocean and Long Island Sound to the south. The proximity of the river, ocean and the Sound moderates temperature and reduces seasonal temperature extremes. This influence causes winter temperatures to be milder than those of areas further inland at similar latitudes to the west; summer temperatures are similarly cooler. Lower elevations associated with the Hudson River Valley can also impact temperature fluctuations in and around the valley. The annual average temperature of the general area is 61.7° F. Seasonal extreme temperatures occur in January and July, with the average monthly temperatures of 32.1° F and 76.5° F, respectively. The normal minimum temperature in January is 26.2° F, with a record low of -15.0° F. In July, the normal maximum temperature is 84.2° F, with a record high of

106.0° F. These readings are similar to what might be expected at the site, however, they are influenced by the presence of New York City. Since Putnam County is located further inland and further north than New York City, temperatures are likely to be slightly colder than the data recorded at Central Park.

#### Relative Humidity

The general area has a diurnal humidity pattern. The highest average relative humidity in the area generally occurs in the early morning hours. This early morning maximum tends to gradually decrease to a minimum level at about mid-day to early afternoon. As the air is heated, the relative humidity decreases and as air cools relative humidity increases, assuming the amount of moisture in the air remains the same. The humidity values throughout the County are typically high due to the influences of nearby water bodies.

#### Precipitation

The prevailing weather systems throughout Putnam County provide abundant and fairly uniform precipitation throughout the year. Heavy precipitation events result mostly from storms which move northeastward along, or in close proximity to, the east coast. Total precipitation averages 49.69 inches per year.

#### Wind

The prevailing westerly winds of the mid-latitudes dominate general air movements in these areas. The dominance of the northwest wind is most pronounced in the winter months when polar air masses tend to dominate. In the summer months, however, predominant wind direction becomes southwesterly, when tropical air masses prevail.

#### 2.4.2 Existing Air Quality

Ambient air monitoring is conducted by the NYSDEC at several stations throughout New York State. Air quality monitoring stations provide existing air quality for local areas. The existing air quality is often considered background air quality, meaning the air quality prior to a new project. The stations listed in Table 2 are considered background monitors for the proposed project.

A summary of the air quality data collected at these locations, including the New York State and Federal ambient air quality standards (AAQS) for each pollutant, is provided below. The data was obtained from the NYSDEC 2003 (latest available as of July 2005) Ambient Air Quality Report (NYSDEC, 2003); it primarily summarizes data from 1993 to 2003 and provides a comparison of the three most recent years of available data to Federal and State regulations.

**Table 2**  
**NYSDEC Air Monitoring Sites**

Station	Site Number	Parameter(s)
<b>Putnam County</b>		
Mount Ninham	3951-01	SO <sub>2</sub> , PM10 <sup>1</sup> , Ozone
<b>Bronx County</b>		
NY Botanical Gardens <sup>2</sup>	7094-06	CO, NOx
<b>Orange County</b>		
Newburgh	3502-04 (C) (M)	PM2.5
Wallkill		Lead
<b>Ulster County</b>		
Belleayre Mt.	5565-03	PM10

Notes:

<sup>1</sup>PM10 sampling was discontinued in 1998/1999.

<sup>2</sup>Sampling was initiated in 1995.

(C) = Continuous emissions monitoring

(M) = Manual emissions monitoring

Although air monitoring sites have been selected based on their proximity to the project site, the data collected from each site may not be representative of the background air quality in and around the project site. Background pollutant levels at the site are expected to be slightly lower than monitoring data collected in industrial and urban areas, and slightly higher than monitoring data collected in rural, more remote areas.

**Carbon Monoxide (CO)** – The nearest monitor for carbon monoxide is located at the NY Botanical Gardens Station in Bronx County. A review of the NYSDEC 2003 Ambient Air Quality Report indicates that the 1-hour and 8-hour measured

CO concentrations during 2003 complied with applicable standards; 35 ppm and 9 ppm, respectively. Earlier data (2000-2002) also indicates that measured CO concentrations complied with applicable standards.

**Ozone** – The nearest ozone monitoring location is Mount Ninham in Central Putnam County (Site 3951-01). During the period of 2001 through 2003, the site exceeded the New York State/Federal AAQS which states that the "4<sup>th</sup> highest daily maximum 8-hour average is not to exceed an average of 0.08 ppm during the last three (3) years". This average value for 2001 to 2003 was 0.093 which exceeds the standard. The area remains in non-attainment (moderate) of the ozone standard. Therefore, the State continues to closely regulate sources of NO<sub>x</sub> and VOCs, which are precursors to ozone formation. Measured 1-hour ozone concentrations did not exceed the 1-hour standard in 2003.

**Inhalable Particulates (PM10)** - Small airborne particles that are present in the ambient air less than 10 microns in diameter are designated as PM10. The Mount Ninham monitoring site is the closest to the project with PM10 data. However, this station discontinued PM10 monitoring in 1998. Therefore, more recent data was also analyzed from the second nearest PM10 monitoring station (Belleayre Mt. 5565-03). According to NYSDEC reports for both stations, there were no exceedances of the New York State or Federal Primary/Secondary 24-hour AAQS of 150  $\mu\text{g}/\text{m}^3$  or the annual 50  $\mu\text{g}/\text{m}^3$  standard.

**Inhalable Particulates (PM2.5)** - Small airborne particles that are present in the ambient air less than 2.5 microns in diameter are designated as PM2.5. The nearest monitoring site which obtains PM2.5 data is in Newburgh, NY (Site 3502-04). At this site, PM2.5 data is collected using both the Federal Reference Method (EPA) and TEOM (Tapered Element Oscillating Microbalance) methodology. Information provided by NYSDEC indicate no exceedances of New York State or Federal Primary/Secondary 24-hour AAQS of 65  $\mu\text{g}/\text{m}^3$  or the annual 15  $\mu\text{g}/\text{m}^3$  standards at this station.

Many neighboring counties in the vicinity of the project site have recently been designated as PM<sub>2.5</sub> non-attainment areas by the EPA. At this time, Putnam County remains in attainment for ambient PM<sub>2.5</sub> concentrations.

**Nitrogen Dioxide (NO<sub>2</sub>)** – The nearest NO<sub>2</sub> monitoring station to the project site is located in Bronx County at NY Botanical Gardens (Site 7094-06). The annual average NO<sub>2</sub> concentrations from 1995 through 2003 indicates that there were no exceedances of the New York State/Federal AAQS of 0.05 ppm (annual mean) at this station.

**Sulfur Dioxide (SO<sub>2</sub>)** – SO<sub>2</sub> data is collected at the Mount Ninham station. The sulfur dioxide concentrations recorded indicate that ambient air concentrations are well within the standards for 3-hour, 24-hour and annual regulatory averaging periods.

**Lead** – Lead ambient air concentrations are collected at many locations in the vicinity of Wallkill/Scotchtown in central Orange County. Recorded lead data from this cluster of monitoring stations indicate that ambient lead concentrations are well within standards.

### **3.0 POTENTIAL AIR QUALITY IMPACTS**

#### **3.1 POTENTIAL TRAFFIC RELATED IMPACTS**

##### **3.1.1 Methodology**

The proposed project is expected to generate emissions of CO, NO<sub>x</sub>, VOCs, PM10 and PM2.5, which are associated primarily with project related traffic. Thus, an air quality analysis was performed to determine traffic related impacts at various traffic intersections surrounding the proposed site. Evaluation of air quality impacts included 2010 No Build and Build traffic conditions for the PM and Saturday Peak hour. An evaluation of 2004 existing traffic related air quality impacts was also performed.

New York State Department of Transportation (NYSDOT) methodology was used to evaluate air quality impacts. There are two types of traffic related air quality analyses that can be required for a proposed project of this type; microscale analysis and mesoscale analysis. The NYSDOT Environmental Procedures Manual (EPM), Chapter 1.1 (January 2001) details the criteria for determining if a project requires either air quality analysis. A microscale analysis focuses on carbon monoxide impacts, where as a mesoscale analysis focuses on VOC, NO<sub>x</sub>, PM10 as well as CO impacts.

##### **3.1.2 Determination of Level 1 Carbon Monoxide Microscale Analysis**

Traffic related carbon monoxide impacts are typically localized, and therefore, high carbon monoxide concentrations are generally limited to within a relatively short distance of busy roadways. Consequently, the carbon monoxide air quality analysis is designed to predict concentrations on a localized (microscale) basis. The determination for a required microscale analysis for roadway intersections containing project related traffic is based on the consideration of various criteria. The criteria is evaluated in the form of an extensive 3-step screening process. The analysis includes a Level of Service screen, a Capture Criteria screen and a Volume Threshold screen. The outcome of the screening analysis will establish the need for a microscale air quality analysis. The screening

analysis was applied to each of the following signalized and unsignalized intersections (build scenario configuration):

Signalized Intersections:

- NYS Route 311 at NYS Route 52
- NYS Route 311 at Terry Hill Road
- NYS Route 311 at Site Access
- NYS Route 311 at NYS Route 164
- NYS Route 311 at Eastbound Interstate 84 Ramps
- NYS Route 311 at Westbound Interstate 84 Ramps
- NYS Route 311 at Fair Street

Unsignalized Intersections:

- Horse Pound Road at NYS Route 52
- Barrett Hill Road at NYS Route 52
- NYS Route 311 at Longfellow Drive
- NYS Route 311 at Ludington Court
- NYS Route 311 at Ludingtonville Road (CR43)
- Terry Hill Road at Fair Street

3.1.2.1 Level of Service Screening Analysis

A Level of Service (LOS) screen is the first screening step. The LOS defines the overall traffic operating ability of an intersection (a complete definition of LOS can be found in the Highway Capacity Manual [Transportation Research Board, 2000]). The LOS can range over six categories, A through F, and is based on traffic volume, intersection geometry and signal timing/phasing (if intersection contains traffic signal). Project traffic engineers have calculated traffic LOS for each intersection listed above. LOS was calculated for each intersection approach, as well as the intersection as a whole (for signalized intersections only). For two-way stop intersections, overall intersection LOS is not calculated and therefore, the worst-case approach LOS was used to define the overall intersection LOS. Only the overall LOS was used in the following LOS screening analysis.

Table 3 lists each intersection with its corresponding LOS for each of the two traffic study periods (PM and Saturday peak hours). Based on the NYSDOT EPM, intersections with an overall projected LOS of A, B or C under Build conditions are generally excluded from a microscale analysis. Intersections with an overall LOS of D or worse must be further evaluated by additional screening criteria procedures. Intersections in Table 3 depicted by bold text, represent a LOS of D or worse, and therefore, were subject to additional screening.

### 3.1.2.2 Capture Criteria Screening Analysis

The capture criteria screening analysis is the second screening step. The intersections that have been identified as having a LOS of D, E or F, were subjected to the NYSDOT capture criteria. The capture criteria applies to the difference from No Build to Build traffic conditions at selected intersections. Namely:

- 1) A 10% or more reduction in source receptor distance (meaning the straight line distance between the edge of the travel lane closest to the receptor closest to the roadway);
- 2) A 10% or more increase (Build-No Build) in traffic volume per intersection approach;
- 3) A 10% increase in vehicle emissions due to changes in speed, vehicle mix, etc.;
- 4) An increase in the number of queued lanes (i.e., the addition of a lane at an intersection that is subject to passing through a traffic signal); and
- 5) A 20% reduction in speed, when the Build estimated average is at 30 mph or less.

If any intersection meets *any* one of the applicable criteria above, the intersection will be subject to a volume threshold screening analysis, the third and final microscale analysis determination.

Table 3

Level of Service (LOS) Screening Analysis

Signalized Intersections		Intersection	Peak Hour	LOS	Intersection	Peak Hour	LOS
1		NYS Route 311 @ NYS Route 52	PM	C	5 NYS Route 311 @ EB Interstate 84 Ramps*	PM	B
			SAT	C		SAT	C
2		NYS Route 311 @ Terry Hill Road*	PM	C	6 NYS Route 311 @ WB Interstate 84 Ramps*	PM	B
			SAT	C		SAT	C
3		NYS Route 311 @ Site Access	PM	B	7 NYS Route 311 @ Fair Street*	PM	B
			SAT	C		SAT	B
4		NYS Route 311 @ NYS Route 164*	PM	C			
			SAT	B			

Un-Signalized Intersections

Un-Signalized Intersections		Intersection	Peak Hour	Build LOS	Intersection	Peak Hour	Build LOS
8		Horse Pound Road @ NYS Route 52*	PM	D	11 NYS Route 311 @ Ludington Court	PM	C
			SAT	D		SAT	C
9		Barrett Hill Road @ NYS Route 52*	PM	D	12 NYS Route 311 @ Ludingtonville Road (CR 43)	PM	C
			SAT	D		SAT	C
10		NYS Route 311 @ Longfellow Drive	PM	E	13 Terry Hill Road @ Fair Street	PM	B
			SAT	D		SAT	B

Notes:

- The intersections presented above represent Build (2010) conditions. Intersections denoted with an asterisk will undergo improvements to mitigate local traffic conditions. The improvements will be made regardless of project completion.
- Intersections with a LOS of D or worse are subject to a capture screening analysis, denoted in bold.
- Intersections with a LOS of C or better do not need a CO microscale analysis.
- Un-signalized intersections are operated by a two-way stop sign.

As proposed, vehicle emissions are not expected to increase from Existing to Build Conditions (NYSDOT, 2005) and a 20% reduction of speed for Build conditions (regardless of roadway speed less than 30 mph) is not expected (based on vehicle speed data obtained from the NYSDEC for 2004 and 2010). In addition, traffic data indicates that no modifications will be made to the roadways when comparing the No Build and Build conditions. There will be no reduction in source receptor distance and no increase in queued lanes, therefore, capture criteria numbers 1 and 4 no longer apply. Only capture criteria number 2 applies to the intersections that have passed the LOS screening analysis in this case.

Although no roadway modifications are proposed to accommodate the project alone (besides site access), modifications to the local roadway network are expected in the future. These modifications are expected, regardless of the project's installation.

Table 4 presents data on each intersection for capture criteria associated with a 10% or more increase in traffic volume. Traffic volume data per approach for both the No Build and Build traffic conditions are presented. Intersections that had at least one traffic period (PM or Saturday Peak hour) that showed an increase in traffic volume of 10% or more, per approach, are depicted in bold. These intersections will be subject to a volume threshold screening analysis.

### 3.1.2.3 Volume Threshold Screening Analysis

The volume threshold screening analysis is the third and final screening step. Since two (2) intersections (intersection numbers 9 and 10 from Table 3) met applicable capture criteria number 2 above, NYSDOT EPM traffic volume and emission factor charts were used to perform a volume threshold screening analysis. The vehicle threshold tables (Tables 3a, 3b and 3c from the NYSDOT EPM) integrate the volume threshold with localized emission factors.

**Table 4**  
**Capture Criteria Screening Analysis**

Intersection	Peak Hour	Build LOS	No Build w/ Improvements (2010)			Total No Build			Build w/ Improvements (2010)			Total Build			% Volume Increase Per Approach				Total % Increase
			EB	WB	NB	SB	Volume	EB	WB	NB	SB	Volume	EB	WB	NB	SB			
8 Horse Pound Road @ NYS Route 52*	PM	D	57	0	1115	690	1862	57	0	1165	752	1974	0.0	0.0	4.3	8.2	5.7		
	SAT	D	78	0	912	862	1852	78	0	989	931	1998	0.0	0.0	7.8	7.4	7.3		
<b>9 Barrett Hill Road @ NYS Route 52*</b>	<b>PM</b>	D	56	0	986	745	1787	62	0	1092	870	2024	9.7	0.0	9.7	14.4	11.7		
	SAT	D	63	0	763	741	1567	71	0	925	894	1890	11.3	0.0	17.5	17.1	17.1		
<b>10 NYS Route 311 @ Longfellow Drive</b>	<b>PM</b>	E	545	760	0	29	1334	707	941	0	29	1677	22.9	19.2	0.0	0.0	20.5		
	SAT	D	478	446	0	53	977	724	668	0	53	1445	34.0	33.2	0.0	0.0	32.4		

**Notes:**

- Intersections depicted in bold exceed the 10% or more traffic volume capture criteria threshold, and are therefore, subject to additional screening.
- Only the peak hour with the maximum traffic volume will be subject to further screening.
- Intersections depicted with an asterisks will undergo roadway configuration changes which will result in the addition of a queued lane(s) and/or a reduction in source-receptor distance.

The first step is to obtain local vehicle emission rates. Vehicle CO emission rates for Putnam County were determined by using NYSDOT MOBILE6.2 CO emission factor guidance. The NYSDOT interactive MOBILE6.2 CO Emission Factor Tables, Look up and Calculation Program for Microscale Analysis was used to obtain existing (2004) and No Build and Build year (2010) carbon monoxide vehicular emission rates for Putnam County. Figure 2 shows an example output screen of the interactive NYSDOT MOBILE6.2 Calculation Program. The NYSDOT MOBILE6.2 Calculation Program will generate representative composite vehicle CO emission rates based on the following input parameters: the County the project is located in, Existing or Build year, road functional class and vehicle speeds. The program, in this case, was used to calculate vehicle CO emission rates by multiplying MOBILE6.2 emission factors for each vehicular type by Putnam County's vehicle mix fractions. In order to obtain all appropriate emission rates to complete the volume threshold screening analysis, roadway classifications and vehicle speeds must be determined for each intersection under consideration. From the two (2) intersections that were screened, roadway types were classified as either urban minor arterials or urban collectors (road functional Class 16 and 17, respectively). Since vehicle speeds data were not analyzed by the traffic engineers, Existing and Build speed data were obtained from Mr. Walter Pienta of the NYSDEC - Mobile Source Planning Division. Table 5 represents the MOBILE6.2 CO emission rate calculations per roadway type and vehicle speeds. Idle emission rates (0 mph) were also determined.

The next step in the screening analysis is to determine the threshold volumes that match the worst-case CO emission rates established in the previous step. From Table 5, the worst-case free-flow CO emission rate of 7.69 grams/vehicle miles traveled (VMT) (12.2 mph) was used to determine volume thresholds. Table 3b in the NYSDOT EPM provides threshold volumes for various sets of free-flow CO emission rates. They are applicable to any two-way stop, without a traffic signal intersection approach (i.e., total eastbound traffic). The table represents the total number of vehicles for any single approach to the intersection that match the site-specific CO free-flow emission rates. Since NYSDOT EPM Table 3b provides CO emission rates in 2.5 grams/VMT increments, the estimated

Figure 2

NYS DOT's MOBILE6.2 Interactive Emission Factor Generator

**New York State Department Of Transportation**

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**MOBILE6.2 CO Emission Factor Tables**  
**Look Up and Calculation Program for Microscale Analysis**

**Please Select**

County: Putnam Analysis Year: 2010 Road Functional Class: 17/19 Vehicle Speed: 10

NYSDOT Default Vehicle Mix? Yes If no, please specify and click ok. The sum of the vehicle mix has to be 100%

Veh. Type	Veh. %	CO	Veh. Type	Veh. %	CO
LDGV	56.24	7.20	LDDT34	0.62	1.06
LDGT1	6.31	7.28	HDDV2B	0.09	1.30
LDGT2	21.10	7.63	HDDV3	0.07	1.61
LDGT3	8.42	6.49	HDDV4	0.07	2.24
LDGT4	3.96	6.57	HDDV5	0.06	2.57
HDGV2B	0.75	22.95	HDDV6	0.06	2.63
HDGV3	0.32	30.65	HDDV7	0.16	3.30
HDGV4	0.12	27.40	HDDV8A	0.34	6.74
HDGV5	0.13	49.72	HDDV8B	0.30	6.94
HDGV6	0.07	64.13	HDGB	0.06	86.92
HDGV7	0.10	75.55	HDDBT	0.13	13.91
HDGV8A	0.13	105.53	HDDBS	0.13	4.32
LDDV	0.13	1.75	MC	0.00	27.93
LDDT12	0.13	1.16	Total	100.0	7.69

Project Descriptions (limited to 140 characters):

Source: ([www.dot.state.ny.us/eab/tools/mobile6/co/cotables.html](http://www.dot.state.ny.us/eab/tools/mobile6/co/cotables.html))

RTP Environmental Associates, Inc.

worst-case free-flow CO emission rate of 7.69 grams/VMT will be adjusted to the applicable CO emission rate of 7.5 grams/VMT. Therefore, from NYSDOT EPM Table 3b, the volume threshold per approach for a free-flow CO emission rate of 7.5 grams/VMT is 7,795 vehicles.

The final step of the volume threshold screening analysis is to compare the 7,795 vehicles per approach threshold with the predicted Build Condition traffic volumes for each intersection approach. Table 6 presents predicted Build traffic conditions for each approach for the two intersections screened. The approach volumes projected per intersection were compared with the threshold approach volume of 7,795 vehicles to see if a microscale CO analysis was needed for that intersection. If any one of the intersection approaches meets or exceeds the applicable volume threshold of 7,795, then a CO impact assessment is necessary.

**Table 5**  
**No Build and Build (2010) Vehicle Emission Rates**

Vehicle Type	Putnam County Vehicle Distribution (%)		CO Emission Factors for Road Functional Class 14/16 (g/VMT)*		Putnam County Vehicle Distribution (%)		CO Emission Factors for Road Functional Class 17/19 (g/VMT)*		CO Emission Rates for Road Functional Class 14/16 (g/VMT)*		CO Emission Rates for Road Functional Class 17/19 (g/VMT)*	
	Functional Class 14/16	Functional Class 17/19	0 mph	19.0 mph	Functional Class 17/19	Functional Class 14/16	0 mph	12.2 mph	0 mph	19.0 mph	0 mph	12.2 mph
LDGV	55.96	56.24	60.58	5.45	56.24	60.58	7.20	33.901	3.050	34.070	4.049	
LDGT1	6.28	6.31	58.25	5.51	6.31	58.25	7.28	3.658	0.346	3.676	0.459	
LDGT2	21.00	21.10	60.93	5.80	21.10	60.93	7.63	12.795	1.218	12.856	1.610	
LDGT3	7.83	8.42	52.98	4.93	8.42	52.98	6.49	4.148	0.386	4.461	0.546	
LDGT4	3.69	3.96	53.58	4.99	3.96	53.58	6.57	1.977	0.184	2.122	0.260	
HGGV2B	1.06	0.75	107.93	11.98	0.75	107.93	22.95	1.144	0.127	0.809	0.172	
HGGV3	0.45	0.32	144.15	16.00	0.32	144.15	30.65	0.649	0.072	0.461	0.098	
HGGV4	0.19	0.12	128.85	14.30	0.12	128.85	27.40	0.245	0.027	0.155	0.033	
HGGV5	0.20	0.13	233.82	25.96	0.13	233.82	49.72	0.468	0.052	0.304	0.065	
HGGV6	0.09	0.07	301.60	33.48	0.07	301.60	64.13	0.271	0.030	0.211	0.045	
HGGV7	0.14	0.10	355.30	39.44	0.10	355.30	75.55	0.497	0.055	0.355	0.076	
HGGV8A	0.19	0.13	496.30	55.09	0.13	496.30	105.53	0.943	0.105	0.645	0.137	
LDDV	0.13	0.13	7.76	0.95	0.13	7.76	1.75	0.010	0.001	0.010	0.002	
LDDT12	0.13	0.13	5.15	0.63	0.13	5.15	1.16	0.007	0.001	0.007	0.002	
LDDT34	0.58	0.62	4.72	0.58	0.62	4.72	1.06	0.027	0.003	0.029	0.007	
HDDV2B	0.13	0.09	5.79	0.71	0.09	5.79	1.30	0.008	0.001	0.005	0.001	
HDDV3	0.10	0.07	7.15	0.88	0.07	7.15	1.61	0.007	0.001	0.005	0.001	
HDDV4	0.09	0.07	9.95	1.22	0.07	9.95	2.24	0.009	0.001	0.007	0.002	
HDDV5	0.08	0.06	11.43	1.40	0.06	11.43	2.57	0.009	0.001	0.007	0.002	
HDDV6	0.09	0.06	11.68	1.43	0.06	11.68	2.63	0.011	0.001	0.007	0.002	
HDDV7	0.23	0.16	14.65	1.80	0.16	14.65	3.30	0.034	0.004	0.023	0.005	
HDDV8A	0.49	0.34	29.91	3.67	0.34	29.91	6.74	0.147	0.018	0.102	0.023	
HDDV8B	0.42	0.30	30.84	3.79	0.30	30.84	6.94	0.130	0.016	0.093	0.021	
HDGB	0.09	0.06	408.77	45.38	0.06	408.77	86.92	0.368	0.041	0.245	0.052	
HDDBT	0.18	0.13	61.80	7.58	0.13	61.80	13.91	0.111	0.014	0.080	0.018	
HDDBS	0.18	0.13	19.20	2.36	0.13	19.20	4.32	0.035	0.004	0.025	0.006	
MC	0.00	0.00	252.33	13.64	0.00	252.33	27.93	0.000	0.000	0.000	0.000	
<b>Total</b>										<b>61.61</b>	<b>5.76</b>	<b>7.69</b>

**Notes:**  
 \* Road Functional Class 14/16 represents urban principal and minor arterials and Road Functional Class 17/19 represents urban collector and local roadways.  
 All emissions data is in g/VMT (grams per vehicle mile traveled) except for 0 mph emission factors which are in g/h (grams per hour).  
 - vehicle distribution and emission factor data obtained from NYSDOT's MOBILE6.2 CO Emission Factor Tables Look Up and Calculation Program for Microscale Analysis Web Application (<http://www.dot.state.ny.us/eaab/tools/mobile6/co/cotable.html>).  
 - Vehicle speed data received from Mr. Walter Pienta of the NYSDEC Mobile Source Planning Division.

Table 6 shows that none of the Build traffic approach volumes are greater than 7,795 vehicles. Therefore, all intersections passed the screening analysis, meaning, none of the intersections required a microscale CO impact analysis. Nevertheless, one intersection was chosen for CO modeling to ensure that applicable CO air quality standards will not be exceeded based on additional traffic generated by the proposed project.

The intersection of NYS Route 311 at Interstate-84 Eastbound Ramps (Exit 18) was selected for CO modeling based on its proximity to the project site, high traffic volume expected and future roadway modifications. Figure 3 shows this intersection in relation to the project site.

The CO microscale analysis for this intersection included the worst-case scenario of the Existing (2004), No Build (2010) and Build (2010), and therefore, the analysis estimated the maximum CO levels expected for the proposed project. Since the traffic data analyzed for this intersection suggest that the PM peak hour will provide the highest traffic volumes, the microscale analysis was only performed for PM peak traffic conditions.

### 3.1.3 CO Microscale Analysis

A carbon monoxide microscale air quality analysis requires the use of a predictive model for air pollutant emissions associated with the mobile sources being evaluated. As stated earlier, the current emissions model recommended by the NYSDEC and NYSDOT is MOBILE6.2. MOBILE6.2 emission factors were obtained through the NYSDOT's interactive emission factor generator (NYSDOT, 2005). Generated emission factors were checked with MOBILE6.2 Emission Factor Table EF3 from the NYSDOT's EPM for quality control purposes.

Table 6

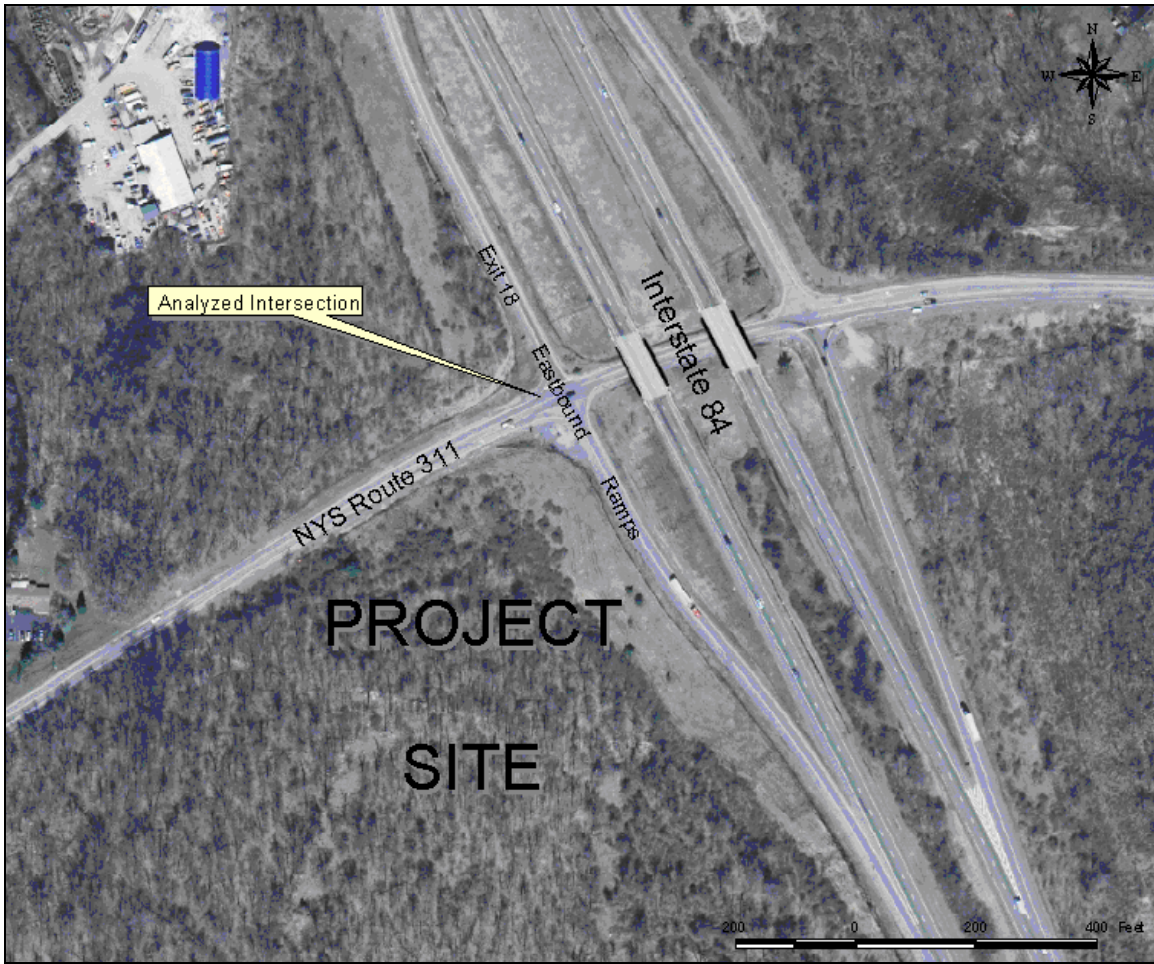
Volume Threshold Screening Analysis

Intersection	Peak Hour	Roadway Type	2010 Speeds for Putnam County	Emission Factors		Threshold Volume (per approach)	Actual Build Volume per approach			
				Free-Flow	Queued		EB	WB	NB	SB
Barrett Hill Road @ NYS Route 52	PM	U_MJC/U_MNA (17/16)	12.2/19.0	7.69/5.76	60.77/61.61	7795	62	0	1092	870
NYS Route 311 @ Longfellow Drive	PM	U_MNA/U_MJC (16/17)	19.0/12.2	5.76/7.69	61.61/60.77	7795	707	941	0	29

Notes:

- Putnam County speed data obtained from NYSDEC, Office of Mobile Source Planning.
- Table 3.b represents threshold volumes for two-way intersection with no traffic signal.
- Table is located in the NYSDOT Environmental Procedures Manual (EPM), Chapter 1.1 (January 2001).
- Bold depicts worst case emission factors.
- U\_MJC - Urban Collector.
- U\_MNA - Urban Minor Arterial.

**Figure 3**  
**Aerial View of Analyzed Intersection**



Orthoimage Source: New York State GIS Clearinghouse

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Emission factors were generated for Existing (2004) traffic conditions and No Build and Build (2010) traffic conditions (Attachment F.1). Parameters used to generate site specific emission factors for the intersection of NYS Route 311 at Interstate 84 EB Ramps (Exit 18) include; Putnam County vehicle class distributions, urban minor arterial and urban collector roadway classification (Class 16 and 17, respectively) and vehicle speeds for evening (PM peak) traffic conditions. Evening traffic speeds were obtained for 2004 and 2010 from the NYSDEC Mobile Source Planning Division.

The atmospheric dispersion model recommended for use in this project by the NYSDEC and NYSDOT was CAL3QHC. CAL3QHC Version 2 (dated 95221) is an approved USEPA mobile source air dispersion model. CAL3QHC is a line source dispersion model for evaluating transportation related air quality impacts. The model applies Gaussian diffusion theory and uses standardized meteorological conditions and vehicle roadway and receptor configurations to provide estimates of hourly concentrations for the pollutant(s) of interest. CAL3QHC provides conservative estimates of air quality concentrations. A more refined version of the model (CAL3QHCR) is available if predicted concentration impacts exceed applicable air quality standards for carbon monoxide.

The dispersion model was configured to conservatively estimate air quality impacts for existing traffic conditions (year 2004), future conditions without the project (No Build, year 2010) and future conditions with the project (Build, year 2010). The model has standardized default assumptions in addition to user supplied data. In this case, the supplemental input variables used are provided in Table 7. Figure 4 provides an aerial layout of the various individual roadway links and receptor configuration for the NYS Route 311 at Interstate 84 EB Ramps.

The specific period of the day analyzed for the intersection was based on total traffic (vehicles per hour). Evening (PM) peak hour traffic volumes were used to determine worst-case air quality conditions.

#### 3.1.3.1 Existing Conditions

The air quality impacts associated with the Existing Condition (year 2004) were estimated using the above referenced models and input variables. The detailed model results are presented in Attachment F.2. The model results provide the hourly impacts only. These impacts plus the 1-hour background CO concentration for Putnam County (3.1 ppm) can be directly compared to the 1-hour Federal and State Air Quality Standard of 35 ppm for CO. The maximum hourly CO values for existing traffic conditions are provided in Table 8.

**Table 7**

**Input Parameter Values for CAL3QHC**

---

**Meteorological Variables:**

Averaging Time:	60 minutes
Surface Roughness:	108 centimeters
Wind Speed:	1 meter per second
Stability Class:	E (rural/suburban)
Mixing Height:	1,000 meters
Wind Direction:	Every 5° relative to center of intersection

**Roadway Variables:**

Individual link coordinates and link length maximum of approximately 1,000 feet.  
Traffic volume and lanes per link as per traffic engineering analysis.  
Traffic speeds as per NYSDOT/NYSDEC.  
Average signal cycle length, lost clearance (signalized intersection only).  
Time, saturation flow rate, signal type, arrival rate as per engineering traffic analysis (signalized intersection only).  
Source height at Reference Grade Level.  
Mixing zone width: 10 feet on each side of free flow links except where roadway width exceeds roadway length.  
Queue length determined by CAL3QHC Model.

**Emission Variables:**

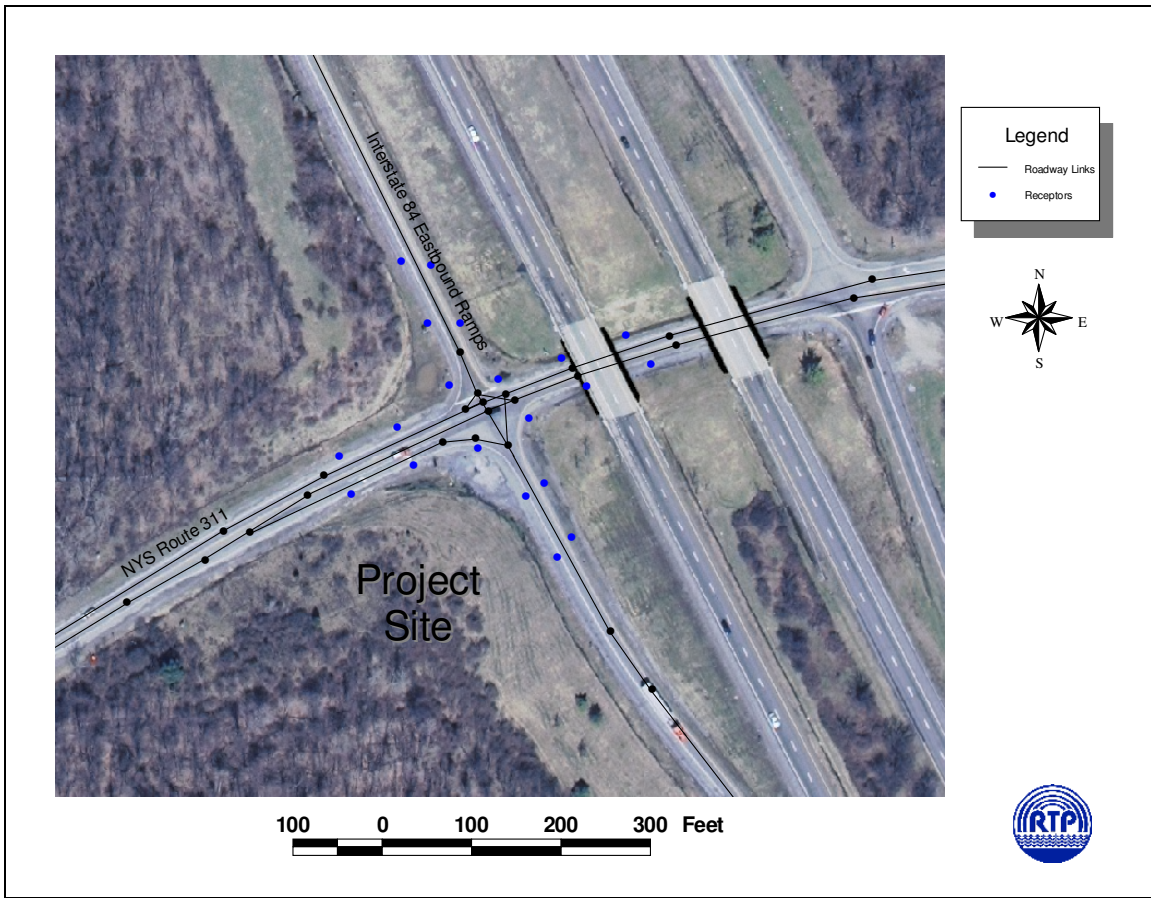
Composite Free Flow Emission Factors per link based on Putnam County vehicle distribution and NYSDEC derived speeds (MOBILE6.2).  
Idle Emission Factor per queue link defined by Putnam County vehicle distribution and NYSDEC derived speeds (MOBILE6.2) (signalized intersection only).

**Receptor Variables:**

Receptor Height:	1.8 meters
Receptor Location:	Sidewalk receptors are located a minimum of ten (10) feet from the road's edge to avoid mixing zone interference.

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**Figure 4**  
**Intersection Modeling Layout**



Orthoimage Source: New York State GIS Clearinghouse

The maximum estimated 1-hour CO receptor concentration is well below the Federal and State standard of 35 ppm. The highest concentration predicted, 0.9 ppm, occurred at a sidewalk receptor (R5) on the northeast side of NYS Route 311. Although sidewalks are not currently present at this intersection, sidewalk receptors were placed along the edge of the mixing zone (10 feet from edge of lane) in order to capture maximum air quality impacts. This predicted peak value is presented in Table 8. The predicted existing traffic impact value was added to the background CO value for Putnam County (3.1 ppm) to obtain a maximum predicted total 1-hour CO concentration value of 4.0 ppm which is well below the Federal and State air quality standard.

Table 8

Predicted 1-Hour and 8-Hour Carbon Monoxide Concentrations (ppm)

<b>NYS Route 311 @ Interstate 84 EB Ramps</b>	<b>1-Hour Background*</b>	<b>Project 1-Hour Maximum CO Impact</b>	<b>Combined Peak 1-Hour CO Impact</b>	<b>1-Hour NAAQS Standard</b>
Existing Traffic	3.1	0.9	4.0	35.0
No Build Traffic	3.1	3.0	6.1	35.0
Build Traffic	3.1	3.3	6.4	35.0
<b>NYS Route 311 @ Interstate 84 EB Ramps</b>	<b>8-Hour Background*</b>	<b>Project 8-Hour Maximum CO Impact**</b>	<b>Combined Peak 8-Hour CO Impact</b>	<b>8-Hour NAAQS Standard</b>
Existing Traffic	2.2	0.6	2.8	9.0
No Build Traffic	2.2	2.1	4.3	9.0
Build Traffic	2.2	2.3	4.5	9.0

Notes:

- \*NYS DOT CO background value for Putnam County.

- \*\* 8-hour maximum impact was computed by multiplying the 1-hour impact by a persistence factor of 0.7 (NYS DOT Environmental Procedures Manual).

The maximum estimated 8-hour CO receptor concentration for Existing Conditions is also presented in Table 8. NYSDOT EPM recommends that the 8-hour value be derived by multiplying the 1-hour value by 0.7. When Existing traffic impacts are combined with the applicable 8-hour background concentration of 2.2 ppm for Putnam County, the combined maximum CO receptor concentration of 2.8 ppm is also well within the Federal and State standard of a ppm. The 8-hour maximum impact occurred at the same receptor location as the 1-hour maximum impact. It is unlikely that an individual will be exposed at this location for a full 8-hour period since they would have to remain stationary at the receptor location for the full 8-hour interval when the wind was within a 5° wind direction sector at an average speed of 1.0 meters per second under a stable (E) atmosphere (how the model has interpreted the maximum impact). All other receptors have lower concentrations, in fact, the receptor concentrations decrease dramatically as the distance of the receptor from the intersection and individual links increases. Traffic related CO impacts are considered very localized with high CO concentrations within a relatively short distance of busy roadway intersections. The concentrations at a building receptor would be more realistic for estimating the 8-hour CO concentration exposures to humans. The maximum existing 8-hour combined CO concentration for all receptors near or at buildings are below the sidewalk receptor values. Individuals would more likely be exposed to the concentration for a period of eight (8) hours at the receptor locations at or near a building located in the vicinity of the project site.

#### 3.1.3.2 Anticipated Impacts

The anticipated impacts on air quality were estimated using the same models used to evaluate existing conditions. Traffic data were developed for a future year 2010 signifying project completion. For the year 2010, two model scenarios were run at the selected intersection of NYS Route 311 at Interstate 84 EB Ramps, one with projected 2010 traffic volumes only (No Build Case) and one with project traffic added to the projected 2010 traffic volumes (Build Case).

Table 8 contains the maximum expected CO for the year 2010 without the project or No Build Case. Again, the 1-hour background values are added to the predicted traffic maximum CO impacts to provide the total CO peak concentration at the maximum impact point. As shown, the peak combined CO 1-hour value, 6.1 ppm, occurred at a sidewalk receptor (R7) on the southeast side of NYS Route 311. This value is well below the 35 ppm Federal and State air quality standard. The peak 8-hour values are based on the 1-hour values for predicted traffic impacts multiplied by 0.7 as in the case for existing conditions. The peak 8-hour combined traffic and background value, 4.3 ppm, again occurred at the same sidewalk receptor location as the 1-hour maximum impact. This value is also below the current Federal and State 8-hour standard of 9 ppm.

Table 8 also provides the maximum expected CO impact for the year 2010 with the proposed project traffic included or the Build Case. The 1-hour reference background value was added to the projected traffic impacts with the project to yield a value of 6.4 ppm for the worst case sidewalk receptor. This value is again well below the 35 ppm 1-hour Federal and State CO standard. The 8-hour peak concentration value is also presented in Table 8. The peak combined 8-hour value is 4.5 ppm. This value is also well below the Federal and State ambient 8-hour standard for CO.

As stated earlier, although sidewalks are not present at the analyzed intersection, sidewalk receptors were used to predict worst-case CO impacts along the roadway mixing zone (10 feet from edge of lane). Therefore the Existing, No Build and Build CO modeling analysis produced likely conservative worst-case impacts.

The increase in CO impacts from existing traffic conditions to No Build traffic conditions is attributed to the increase in vehicles based on natural population growth and background development, as well as the physical modification of the intersection which includes the installation of an automated traffic signal. Once an intersection becomes signalized, CO vehicle emissions in the vicinity of the intersection tend to increase based on the introduction of idling vehicles and the stop-and-go nature of approaching and departing traffic at a signalized intersection. This increase in CO impacts is predicted by the model.

The increase in CO impacts from No Build traffic conditions to Build conditions is solely attributed to an increase in vehicles in connection with the proposed project. Model results predict that the increase in the 1-hour CO impact based on the increased project related traffic, will only be 0.3 ppm.

Often times, as part of the CO microscale analysis presented above, an additional step is taken to provide data on sensitive receptors such as schools, hospitals, retirement communities, etc. in the vicinity of the proposed project (within a few hundred feet). Since no sensitive receptors were identified in the immediate surrounding area of the project site, CO concentrations were not predicted at sensitive receptor locations.

#### 3.1.4 PM10/PM2.5, NO<sub>x</sub>, VOC and O<sub>3</sub> Impacts

A common source of Fine Particulate Matter (PM10 and PM2.5) in the vicinity of busy intersections is the heavy duty truck running on diesel fuel. Light duty trucks as well as medium duty trucks typically run on gasoline. Where as, heavy duty trucks typically run on diesel fuel. The vehicle class distribution for Putnam County shows that there are very few heavy duty trucks on Putnam area roadways. Since no vehicle specific data was collected by the traffic engineers, the vehicle class distribution is expected to be the same at NYS Route 311 at Interstate 84 EB Ramps as it is for the rest of the County. With such low heavy duty truck volumes, project PM10/PM2.5 emissions are expected to be minimal compared to existing emissions.

Vehicles utilizing the proposed development would also emit NO<sub>x</sub> and VOCs. As in the case with fine particulates, the emissions from the vehicles utilizing the proposed development are expected to have an insignificant impact on ambient concentrations of NO<sub>x</sub> or VOCs in the general area. This will likely result in an insignificant impact on ozone (O<sub>3</sub>) levels.

### 3.1.5 Mesoscale Air Quality Analysis

In addition to a microscale air quality analysis, the NYSDEC and NYSDOT can require a mesoscale air quality analysis to determine the relative change in regional pollutants expected as a result of a proposed project. Based on NYSDOT EPM guidance, in order for a project to need a mesoscale analysis, the project must generate 10 percent or more vehicle miles traveled (VMT) over a large area, (Putnam County). Based on a total peak PM and Saturday trip generation rate of 1,865 trips per hour from the traffic analysis (obtained from traffic engineers), the project would not exceed 10 percent of the trips generated in the general area surrounding the project site. Therefore, a mesoscale analysis is not formally required for the proposed development.

### 3.1.6 Conformity Determination

The proposed project is in a moderate ozone non-attainment area. As detailed in 6NYCRR Part 240, the proposed action does not involve approval, funding or implementation of the Federal Highway Administration/Federal Transit Administration (FHWA/FTA), and therefore, is exempt from a Conformity Determination under Part 240. In addition, based on the above microscale analyses, the project will only cause minor contributes to any new localized CO levels surrounding the project site.

## 3.2 STATIONARY SOURCE AND OTHER AIR QUALITY IMPACTS

The operation of the proposed facilities will include point and fugitive sources of air pollution (stationary sources) that will result in minor increases in the overall atmospheric air pollutant burden. Heating and air conditioning systems release small amounts of air pollutants that when compared to the regional burden are insignificant and should not cause an exacerbation of applicable standards or guidelines.

The proposed project will have an insignificant air quality impact on other air quality related values such as visibility impairment, acid deposition, impacts on soils or impacts

on vegetation. The relative air pollution burden added by the construction and operation of the project is insignificant when compared to the current and future background sources.

### 3.3 CONSTRUCTION RELATED AIR QUALITY IMPACTS

Air quality impacts associated with the construction of the proposed facility is anticipated. These impacts result from the operation of equipment during construction, and site grading activities.

Impacts to air quality from project construction activities are anticipated to be short-term and relatively insignificant. The Patterson Crossing Retail Center Project will require land clearing activities, site grading and construction. It is estimated that the entire construction process will take between 24 and 36 months and will result in the disturbance of approximately 68.4 acres.

Heavy construction is a source of temporary fine particulate matter (PM10) a component of dust emissions that can impact local air quality. Dust is generated by, but not limited to, land clearing, ground excavation, and earth moving. In addition, the use of heavy equipment and the emissions generated from off-road engines can add to potential local impacts. The temporary and site specific nature of construction activities make it difficult to estimate potential emissions. Further, the varied nature of construction and phasing of activities make emission estimates increasingly difficult. Construction also utilizes different types of controls that are also useful in the reduction of fugitive dust emissions. Typical dust suppression, such as the use of water trucks, covered storage piles and disturbed soils, and covered trucks can greatly reduce construction dust impacts. In addition, other site controls, such as storm water pollution prevention activities and good housekeeping, can reduce site dust generation. Storm water pollution prevention activities, such as phased construction activities, minimizing the extent of disturbed soils, stabilizing soils, gravel road beds, wheel washes, etc. can provide benefits to both off-site

water and air impacts. Regular equipment maintenance and upkeep can also reduce negative impacts from on-site equipment usage.

Emissions data for heavy construction operations have been developed by the U.S. Environmental Protection Agency (USEPA). Published emission factors specific to construction were utilized to determine potential air quality impacts associated with the proposed project. The USEPA emission factor for total uncontrolled suspended particulates (TSP) is based on one (1) set of field studies and are considered appropriate for construction operations with medium activity level, moderate silt contents, and semiarid climate. It is anticipated that this site will have medium activity level. According to the Soil Survey of Putnam County, the site has a moderate silt content. However, Putnam County is hardly a semiarid climate and is more accurately described as humid-continental. Documentation for the USEPA emission factor indicates that it is highly conservative and will overestimate both TSP and PM10 emissions. However, the current lack of specific construction activity information (material transfers, soil cut and fill, etc.) has necessitated that the emission factor of 1.2 tons of TSP per acre per month be utilized to conservatively describe project activities (USEPA, 1995).

Typically, PM10 comprises less than 25% of TSP. As such, a conservative uncontrolled PM10 emission factor for the site was estimated at 0.6 tons per year per month of activity. Further, dust suppression and best management practices will further control fugitive dust. For example, the use of a water truck on facility roads has been shown to reduce fugitive road emissions by more than 95%. As such, a conservative control of 75% was utilized to reflect moderate or typical overall controls at the site. Based on this information, it is estimated that the site will generate 0.15 tons of PM10 per acre per month of activity, or 10.26 tons per month (if all 68.4 acres is simultaneously under construction, which is not expected under proposed construction phasing). Over an 24 month period, the total PM10 emissions are conservatively estimated at 246.24 tons. Over a 36 month period, the total PM10 emissions are conservatively estimated at 369.36 tons. Considering the period of time, expected construction phasing and the distribution of these emissions over the entire site, expected air quality impacts are expected to be minimal and not exceed air quality standards.

## **4.0 PROPOSED MITIGATION**

### **4.1 TRAFFIC RELATED PROPOSED MITIGATION**

The air quality analysis of the proposed project has focused on CO impacts from traffic generated by the project which based on experience is the critical impact from an air quality perspective. The analyses show that the existing conditions for year 2004 along with the No Build and Build Conditions for year 2010 do not cause a violation of the current regulatory standards. Therefore, no mitigation measures would be required beyond those anticipated in the traffic analysis. The traffic analysis did modify signalization and made a number of lane improvements at many intersections. Based on the air quality analysis of the intersection with the highest emission rates, the proposed changes will be adequate to maintain air quality standards.

### **4.2 OPERATIONAL RELATED MITIGATION**

Operation of the proposed facilities, including point and fugitive sources, will cause minor increases to the overall atmospheric burden. Operational emissions also include vehicles arriving, parking and departing the site and delivery truck movements. For all deliveries, truck idle time will be limited to five (5) minutes or less. Since operational air pollution emissions are not expected to influence the regional air quality burden, other mitigation measures are not proposed during facility operations.

### **4.3 CONSTRUCTION RELATED MITIGATION**

The proposed project would produce minimal incremental emissions at and around the project area. Since no adverse effects to air quality are expected from the proposed project, monitoring has not been included as a component of proposed project activities. Further, mitigation measures, beyond a typical dust suppression plan, should not be necessary since the air quality impacts will be short-term and relatively small.

## **5.0 PROJECT ALTERNATIVE AIR QUALITY IMPACTS**

There are several project alternatives that are being proposed as potential options to the proposed development. The alternatives for this site are presented in Section 5 of the DGEIS. The alternatives include a no action case, a modification of the proposed plan to concentrate the proposed buildings on the west side of the property with parking on the east side (increase in retail space), a plan to construct a multistory parking facility and a plan to develop the site for light industrial use.

The no action case would maintain ambient air quality at current levels. The remaining alternatives would have a slightly different impact on air quality when compared to the proposed action. The alternative with the most negative air quality impact would be the alternative building layout option. This option would increase the retail square footage, thereby potentially increasing air quality impacts associated with an increase in traffic volume. Air quality impacts from this alternative would be within applicable standards.

Construction and operational air quality impacts associated with the various alternative proposals would be similar to the proposed action based on the relatively small differences between possible options and the other major sources contributing to air quality levels in the adjoining areas.

## REFERENCES

NYSDEC, 2003. New York State 2003 Ambient Air Quality Report.  
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NYSDOT, 2001. Environmental Procedure Manual, Chapter 1.1. NYSDOT Environmental Analysis Bureau, Albany, New York.

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Transportation Research Board, 2000. Highway Capacity Manual. National Research Council, Washington, D.C.

USEPA, 1995. Heavy Construction Operations: Dust Emission Factors. AP42, Fifth Edition, Volume 1, Chapter 13: Miscellaneous Sources. Research Triangle Park, North Carolina.



**ATTACHMENT F.1**  
**GENERATED MOBILE6.2**  
**EMISSION FACTORS**





# New York State Department Of Transportation

[Site Index](#)  
 [Telephone Numbers](#)  
 [E-Mail NYSDOT](#)  
 [Publications](#)  
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**Please Select**

County:   
 Analysis Year:   
 Road Functional Class:   
 Vehicle Speed:

NYSDOT Default Vehicle Mix? Yes   
 If no, please specify and click . The sum of the vehicle mix has to be 100%

Veh. Type	Veh. %	CO	Veh. Type	Veh. %	CO
LDGV	55.96	120.57	LDDT34	0.58	7.21
LDGT1	6.28	129.25	HDDV2B	0.13	11.29
LDGT2	21.00	128.75	HDDV3	0.10	13.32
LDGT3	7.83	114.18	HDDV4	0.09	15.79
LDGT4	3.69	115.15	HDDV5	0.08	20.02
HdGV2B	1.06	150.43	HDDV6	0.09	20.73
HdGV3	0.45	253.90	HDDV7	0.23	24.88
HdGV4	0.19	192.18	HDDV8A	0.49	52.66
HdGV5	0.20	507.22	HDDV8B	0.42	55.16
HdGV6	0.09	764.35	HDGB	0.09	1023.17
HdGV7	0.14	889.10	HDDBT	0.18	80.16
HdGV8A	0.19	1308.25	HDDBS	0.18	29.09
LDDV	0.13	8.93	MC	0.00	252.80
LDDT12	0.13	7.25	<b>Total</b>	<b>100.0</b>	<b>126.15</b>

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# New York State Department Of Transportation

[Site Index](#)  
 [Telephone Numbers](#)  
 [E-Mail NYSDOT](#)  
 [Publications](#)  
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## MOBILE6.2 CO Emission Factor Tables Look Up and Calculation Program for Microscale Analysis

### Please Select

County:   
 Analysis Year:   
 Road Functional Class:   
 Vehicle Speed:

NYSDOT Default Vehicle Mix? Yes   
 If no, please specify and click  . The sum of the vehicle mix has to be 100%

Veh. Type	Veh. %	CO	Veh. Type	Veh. %	CO
LDGV	55.96	10.90	LDDT34	0.58	0.89
LDGT1	6.28	11.82	HDDV2B	0.13	1.39
LDGT2	21.00	11.80	HDDV3	0.10	1.63
LDGT3	7.83	10.43	HDDV4	0.09	1.94
LDGT4	3.69	10.53	HDDV5	0.08	2.46
HdGV2B	1.06	16.70	HDDV6	0.09	2.54
HdGV3	0.45	28.19	HDDV7	0.23	3.05
HdGV4	0.19	21.33	HDDV8A	0.49	6.46
HdGV5	0.20	56.31	HDDV8B	0.42	6.77
HdGV6	0.09	84.85	HDGB	0.09	113.58
HdGV7	0.14	98.70	HDDBT	0.18	9.84
HdGV8A	0.19	145.23	HDDBS	0.18	3.57
LDDV	0.13	1.10	MC	0.00	13.66
LDDT12	0.13	0.89	<b>Total</b>	<b>100.0</b>	<b>11.68</b>

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# New York State Department Of Transportation

[Site Index](#)
[Telephone Numbers](#)
[E-Mail NYSDOT](#)
[Publications](#)
[Search NYSDOT](#)

## MOBILE6.2 CO Emission Factor Tables Look Up and Calculation Program for Microscale Analysis

**Please Select**

County: 
 Analysis Year: 
 Road Functional Class: 
 Vehicle Speed:

NYSDOT Default Vehicle Mix? Yes  No 
 If no, please specify and click . The sum of the vehicle mix has to be 100%

Veh. Type	Veh. %	CO	Veh. Type	Veh. %	CO
LDGV	56.24	120.57	LDDT34	0.62	7.21
LDGT1	6.31	129.25	HDDV2B	0.09	11.29
LDGT2	21.10	128.75	HDDV3	0.07	13.32
LDGT3	8.42	114.18	HDDV4	0.07	15.79
LDGT4	3.96	115.15	HDDV5	0.06	20.02
HDBGV2B	0.75	150.43	HDDV6	0.06	20.73
HDBGV3	0.32	253.90	HDDV7	0.16	24.88
HDBGV4	0.12	192.18	HDDV8A	0.34	52.66
HDBGV5	0.13	507.22	HDDV8B	0.30	55.16
HDBGV6	0.07	764.35	HDGB	0.06	1023.17
HDBGV7	0.10	889.10	HDDBT	0.13	80.16
HDBGV8A	0.13	1308.25	HDDBS	0.13	29.09
LDDV	0.13	8.93	MC	0.00	252.80
LDDT12	0.13	7.25	<b>Total</b>	<b>100.0</b>	<b>124.52</b>

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[Site Index](#)  
 [Telephone Numbers](#)  
 [E-Mail NYSDOT](#)  
 [Publications](#)  
 [Search NYSDOT](#)

## MOBILE6.2 CO Emission Factor Tables

### Look Up and Calculation Program for Microscale Analysis

**Please Select**

County:   
 Analysis Year:   
 Road Functional Class:   
 Vehicle Speed:

NYSDOT Default Vehicle Mix? Yes   
 If no, please specify and click  . The sum of the vehicle mix has to be 100%

Veh. Type	Veh. %	CO	Veh. Type	Veh. %	CO
LDGV	56.24	25.87	LDDT34	0.62	2.35
LDGT1	6.31	27.92	HDDV2B	0.09	3.69
LDGT2	21.10	27.73	HDDV3	0.07	4.35
LDGT3	8.42	24.60	HDDV4	0.07	5.16
LDGT4	3.96	24.81	HDDV5	0.06	6.54
HDBGV2B	0.75	48.08	HDDV6	0.06	6.77
HDBGV3	0.32	81.15	HDDV7	0.16	8.12
HDBGV4	0.12	61.42	HDDV8A	0.34	17.20
HDBGV5	0.13	162.12	HDDV8B	0.30	18.01
HDBGV6	0.07	244.29	HDGB	0.06	327.01
HDBGV7	0.10	284.16	HDDBT	0.13	26.18
HDBGV8A	0.13	418.13	HDDBS	0.13	9.50
LDDV	0.13	2.92	MC	0.00	58.25
LDDT12	0.13	2.37	<b>Total</b>	<b>100.0</b>	<b>27.53</b>

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# New York State Department Of Transportation

[Site Index](#)
[Telephone Numbers](#)
[E-Mail NYSDOT](#)
[Publications](#)
[Search NYSDOT](#)

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County: 
 Analysis Year: 
 Road Functional Class: 
 Vehicle Speed:

NYSDOT Default Vehicle Mix?  Yes  No 
 If no, please specify and click . The sum of the vehicle mix has to be 100%

Veh. Type	Veh. %	CO	Veh. Type	Veh. %	CO
LDGV	56.24	14.50	LDDT34	0.62	1.62
LDGT1	6.31	15.72	HDDV2B	0.09	2.54
LDGT2	21.10	15.65	HDDV3	0.07	3.00
LDGT3	8.42	13.85	HDDV4	0.07	3.56
LDGT4	3.96	13.98	HDDV5	0.06	4.51
HdGV2B	0.75	31.99	HDDV6	0.06	4.67
HdGV3	0.32	53.99	HDDV7	0.16	5.60
HdGV4	0.12	40.86	HDDV8A	0.34	11.86
HdGV5	0.13	107.86	HDDV8B	0.30	12.42
HdGV6	0.07	162.53	HDGB	0.06	217.56
HdGV7	0.10	189.06	HDDBT	0.13	18.05
HdGV8A	0.13	278.18	HDDBS	0.13	6.55
LDDV	0.13	2.01	MC	0.00	27.98
LDDT12	0.13	1.63	<b>Total</b>	<b>100.0</b>	<b>15.71</b>

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# New York State Department Of Transportation

[Site Index](#)  
 [Telephone Numbers](#)  
 [E-Mail NYSDOT](#)  
 [Publications](#)  
 [Search NYSDOT](#)

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County:   
 Analysis Year:   
 Road Functional Class:   
 Vehicle Speed:

NYSDOT Default Vehicle Mix?  Yes  No  
 If no, please specify and click . The sum of the vehicle mix has to be 100%

Veh. Type	Veh. %	CO	Veh. Type	Veh. %	CO
LDGV	55.96	60.58	LDDT34	0.58	4.72
LDGT1	6.28	58.25	HDDV2B	0.13	5.79
LDGT2	21.00	60.93	HDDV3	0.10	7.15
LDGT3	7.83	52.98	HDDV4	0.09	9.95
LDGT4	3.69	53.58	HDDV5	0.08	11.43
HDBGV2B	1.06	107.93	HDDV6	0.09	11.68
HDBGV3	0.45	144.15	HDDV7	0.23	14.65
HDBGV4	0.19	128.85	HDDV8A	0.49	29.91
HDBGV5	0.20	233.82	HDDV8B	0.42	30.84
HDBGV6	0.09	301.60	HDGB	0.09	408.77
HDBGV7	0.14	355.30	HDDBT	0.18	61.80
HDBGV8A	0.19	496.30	HDDBS	0.18	19.20
LDDV	0.13	7.76	MC	0.00	252.33
LDDT12	0.13	5.15	<b>Total</b>	<b>100.0</b>	<b>61.61</b>

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[Site Index](#)
[Telephone Numbers](#)
[E-Mail NYSDOT](#)
[Publications](#)
[Search NYSDOT](#)

## MOBILE6.2 CO Emission Factor Tables

### Look Up and Calculation Program for Microscale Analysis

**Please Select**

County: 
 Analysis Year: 
 Road Functional Class: 
 Vehicle Speed:

NYSDOT Default Vehicle Mix?  Yes  No 
 If no, please specify and click . The sum of the vehicle mix has to be 100%

Veh. Type	Veh. %	CO	Veh. Type	Veh. %	CO
LDGV	55.96	5.45	LDDT34	0.58	0.58
LDGT1	6.28	5.51	HDDV2B	0.13	0.71
LDGT2	21.00	5.80	HDDV3	0.10	0.88
LDGT3	7.83	4.93	HDDV4	0.09	1.22
LDGT4	3.69	4.99	HDDV5	0.08	1.40
HdGV2B	1.06	11.98	HDDV6	0.09	1.43
HdGV3	0.45	16.00	HDDV7	0.23	1.80
HdGV4	0.19	14.30	HDDV8A	0.49	3.67
HdGV5	0.20	25.96	HDDV8B	0.42	3.79
HdGV6	0.09	33.48	HDGB	0.09	45.38
HdGV7	0.14	39.44	HDDBT	0.18	7.58
HdGV8A	0.19	55.09	HDDBS	0.18	2.36
LDDV	0.13	0.95	MC	0.00	13.64
LDDT12	0.13	0.63	<b>Total</b>	<b>100.0</b>	<b>5.76</b>

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[Site Index](#)  
 [Telephone Numbers](#)  
 [E-Mail NYSDOT](#)  
 [Publications](#)  
 [Search NYSDOT](#)

## MOBILE6.2 CO Emission Factor Tables

### Look Up and Calculation Program for Microscale Analysis

**Please Select**

County:   
 Analysis Year:   
 Road Functional Class:   
 Vehicle Speed:

NYSDOT Default Vehicle Mix?  Yes  No  
 If no, please specify and click . The sum of the vehicle mix has to be 100%

Veh. Type	Veh. %	CO	Veh. Type	Veh. %	CO
LDGV	56.24	60.58	LDDT34	0.62	4.72
LDGT1	6.31	58.25	HDDV2B	0.09	5.79
LDGT2	21.10	60.93	HDDV3	0.07	7.15
LDGT3	8.42	52.98	HDDV4	0.07	9.95
LDGT4	3.96	53.58	HDDV5	0.06	11.43
HDBGV2B	0.75	107.93	HDDV6	0.06	11.68
HDBGV3	0.32	144.15	HDDV7	0.16	14.65
HDBGV4	0.12	128.85	HDDV8A	0.34	29.91
HDBGV5	0.13	233.82	HDDV8B	0.30	30.84
HDBGV6	0.07	301.60	HDGB	0.06	408.77
HDBGV7	0.10	355.30	HDDBT	0.13	61.80
HDBGV8A	0.13	496.30	HDDBS	0.13	19.20
LDDV	0.13	7.76	MC	0.00	252.33
LDDT12	0.13	5.15	<b>Total</b>	<b>100.0</b>	<b>60.77</b>

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# New York State Department of Transportation

[Site Index](#)
[Telephone Numbers](#)
[E-Mail NYSDOT](#)
[Publications](#)
[Search NYSDOT](#)

## MOBILE6.2 CO Emission Factor Tables Look Up and Calculation Program for Microscale Analysis

**Please Select**

County: 
 Analysis Year: 
 Road Functional Class: 
 Vehicle Speed:

NYSDOT Default Vehicle Mix?  Yes  No 
 If no, please specify and click . The sum of the vehicle mix has to be 100%

Veh. Type	Veh. %	CO	Veh. Type	Veh. %	CO
LDGV	56.24	12.92	LDDT34	0.62	1.54
LDGT1	6.31	12.78	HDDV2B	0.09	1.89
LDGT2	21.10	13.36	HDDV3	0.07	2.33
LDGT3	8.42	11.48	HDDV4	0.07	3.25
LDGT4	3.96	11.62	HDDV5	0.06	3.73
HdGV2B	0.75	34.49	HDDV6	0.06	3.81
HdGV3	0.32	46.07	HDDV7	0.16	4.78
HdGV4	0.12	41.18	HDDV8A	0.34	9.77
HdGV5	0.13	74.74	HDDV8B	0.30	10.07
HdGV6	0.07	96.39	HDGB	0.06	130.65
HdGV7	0.10	113.56	HDDBT	0.13	20.18
HdGV8A	0.13	158.62	HDDBS	0.13	6.27
LDDV	0.13	2.54	MC	0.00	58.14
LDDT12	0.13	1.68	<b>Total</b>	<b>100.0</b>	<b>13.47</b>

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# New York State Department Of Transportation

[Site Index](#)   
 [Telephone Numbers](#)   
 [E-Mail NYSDOT](#)   
 [Publications](#)   
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County:    
 Analysis Year:    
 Road Functional Class:    
 Vehicle Speed:

NYSDOT Default Vehicle Mix?  Yes  No   
 If no, please specify and click  . The sum of the vehicle mix has to be 100%

Veh. Type	Veh. %	CO	Veh. Type	Veh. %	CO
LDGV	56.24	7.20	LDDT34	0.62	1.06
LDGT1	6.31	7.28	HDDV2B	0.09	1.30
LDGT2	21.10	7.63	HDDV3	0.07	1.61
LDGT3	8.42	6.49	HDDV4	0.07	2.24
LDGT4	3.96	6.57	HDDV5	0.06	2.57
HDBGV2B	0.75	22.95	HDDV6	0.06	2.63
HDBGV3	0.32	30.65	HDDV7	0.16	3.30
HDBGV4	0.12	27.40	HDDV8A	0.34	6.74
HDBGV5	0.13	49.72	HDDV8B	0.30	6.94
HDBGV6	0.07	64.13	HDGB	0.06	86.92
HDBGV7	0.10	75.55	HDDBT	0.13	13.91
HDBGV8A	0.13	105.53	HDDBS	0.13	4.32
LDDV	0.13	1.75	MC	0.00	27.93
LDDT12	0.13	1.16	<b>Total</b>	<b>100.0</b>	<b>7.69</b>

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**ATTACHMENT F.2**  
CAL3QHC MODEL RUNS



										PC_PB			
'NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (EX)'						60.	108.	0.	0.	29	0.3048	1	1
'R1-SDWK1	'		-56.	161.	1.8								
'R2-SDWK2	'		-24.	96.	1.8								
'R3-SDWK3	'		8.	31.	1.8								
'R4-SDWK4	'		84.	59.	1.8								
'R5-SDWK5	'		156.	83.	1.8								
'R6-SDWK6	'		188.	41.	1.8								
'R7-SDWK7	'		115.	18.	1.8								
'R8-SDWK8	'		43.	-22.	1.8								
'R9-SDWK9	'		68.	-83.	1.8								
'R10-SDWK10	'		101.	-143.	1.8								
'R11-SDWK11	'		75.	-173.	1.8								
'R12-SDWK12	'		37.	-105.	1.8								
'R13-SDWK13	'		-12.	-54.	1.8								
'R14-SDWK14	'		-62.	-66.	1.8								
'R15-SDWK15	'		-145.	-106.	1.8								
'R16-SDWK16	'		-166.	-50.	1.8								
'R17-SDWK17	'		-101.	-20.	1.8								
'R18-SDWK18	'		-32.	15.	1.8								
'R19-SDWK19	'		-65.	94.	1.8								
'R20-SDWK20	'		-98.	161.	1.8								
'R21	'		-559.	257.	1.8								
'R22	'		-981.	163.	1.8								
'R23	'		-1009.	50.	1.8								
'R24	'		-851.	-331.	1.8								
'R25	'		-573.	489.	1.8								
'R26	'		738.	660.	1.8								
'R27	'		939.	489.	1.8								
'R28	'		1110.	416.	1.8								
'R29	'		1331.	166.	1.8								
'NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS'						36	1	0	'C'				
1													
'PC_APPR1-EB	'	'AG'	3.	-5.	-199.	-99.	345.	11.68	0.	32.			
1													
'PC_APPR2-EB	'	'AG'	-199.	-99.	-314.	-171.	436.	11.68	0.	32.			
1													
'PC_APPR3-EB	'	'AG'	-314.	-171.	-401.	-219.	436.	11.68	0.	32.			
1													
'PC_APPR4-EB	'	'AG'	-401.	-219.	-526.	-297.	436.	11.68	0.	32.			
1													
'PC_APPR5-EB	'	'AG'	-526.	-297.	-860.	-505.	436.	11.68	0.	32.			
1													
'PC_DEP1-EB	'	'AG'	3.	-5.	33.	7.	267.	11.68	0.	32.			
1													
'PC_DEP2-EB	'	'AG'	33.	7.	103.	34.	370.	11.68	0.	32.			
1													
'PC_DEP3-EB	'	'AG'	103.	34.	213.	69.	370.	11.68	0.	32.			
1													
'PC_DEP4-EB	'	'AG'	213.	69.	412.	121.	370.	11.68	0.	32.			
1													
'PC_DEP5-EB	'	'AG'	412.	121.	631.	155.	370.	11.68	0.	32.			
1													
'PC_DEP6-EB	'	'AG'	631.	155.	978.	163.	370.	11.68	0.	32.			
1													
'PC_RTAPPR1-EB	'	'AG'	-12.	-35.	-48.	-39.	91.	11.68	0.	32.			
1													
'PC_RTAPPR2-EB	'	'AG'	-48.	-39.	-263.	-141.	91.	11.68	0.	32.			
1													
'PC_RTDEP-EB	'	'AG'	-12.	-35.	25.	-44.	91.	11.68	0.	12.			
1													
'PC_APPR1-WB	'	'AG'	23.	14.	97.	44.	625.	11.68	0.	32.			
1													
'PC_APPR2-WB	'	'AG'	97.	44.	206.	79.	625.	11.68	0.	32.			
1													
'PC_APPR3-WB	'	'AG'	206.	79.	433.	142.	625.	11.68	0.	32.			
1													
'PC_APPR4-WB	'	'AG'	433.	142.	646.	173.	625.	11.68	0.	32.			
1													
'PC_APPR5-WB	'	'AG'	646.	173.	975.	177.	625.	11.68	0.	32.			
1													
'PC_DEP1-WB	'	'AG'	23.	14.	-22.	-3.	484.	11.68	0.	32.			
1													
'PC_DEP2-WB	'	'AG'	-22.	-3.	-181.	-77.	588.	11.68	0.	32.			
1													
'PC_DEP3-WB	'	'AG'	-181.	-77.	-294.	-140.	588.	11.68	0.	32.			
1													
'PC_DEP4-WB	'	'AG'	-294.	-140.	-867.	-494.	588.	11.68	0.	32.			
1													
'PC_LTDEP-WB	'	'AG'	23.	14.	25.	-44.	75.	11.68	0.	12.			

		PC_PB								
1										
'PC_APPR1-SB	'	'AG'	-9.	15.	-28.	60.	210.	27.53	0.	32.
1										
'PC_APPR2-SB	'	'AG'	-28.	90.	-251.	513.	210.	15.71	0.	32.
1										
'PC_APPR3-SB	'	'AG'	-251.	513.	-931.	936.	210.	15.71	0.	32.
1										
'PC_DEP1-SB	'	'AG'	-9.	15.	25.	-44.	3.	15.71	0.	32.
1										
'PC_DEP2-SB	'	'AG'	25.	-44.	140.	-252.	169.	15.71	0.	32.
1										
'PC_DEP3-SB	'	'AG'	140.	-252.	186.	-317.	169.	15.71	0.	32.
1										
'PC_DEP4-SB	'	'AG'	186.	-317.	332.	-507.	169.	15.71	0.	32.
1										
'PC_DEP5-SB	'	'AG'	332.	-507.	418.	-625.	169.	15.71	0.	32.
1										
'PC_DEP6-SB	'	'AG'	418.	-625.	467.	-700.	169.	15.71	0.	32.
1										
'PC_DEP7-SB	'	'AG'	467.	-700.	578.	-894.	169.	15.71	0.	32.
1										
'PC_RTDEP-SB	'	'AG'	-9.	15.	-22.	-3.	104.	15.71	0.	12.
1										
'PC_LTDEP-SB	'	'AG'	-9.	15.	33.	7.	103.	15.71	0.	12.
1.0	00.	5	1000.	0.	'Y'	5	0	72		

'NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (PNB)'	60.	108.	0.	0.	29	0.3048	1	1
'R1-SDWK1	-56.	161.	1.8					
'R2-SDWK2	-24.	96.	1.8					
'R3-SDWK3	5.	36.	1.8					
'R4-SDWK4	85.	65.	1.8					
'R5-SDWK5	156.	89.	1.8					
'R6-SDWK6	189.	40.	1.8					
'R7-SDWK7	118.	13.	1.8					
'R8-SDWK8	43.	-22.	1.8					
'R9-SDWK9	68.	-83.	1.8					
'R10-SDWK10	101.	-143.	1.8					
'R11-SDWK11	75.	-173.	1.8					
'R12-SDWK12	37.	-105.	1.8					
'R13-SDWK13	-12.	-54.	1.8					
'R14-SDWK14	-62.	-66.	1.8					
'R15-SDWK15	-145.	-106.	1.8					
'R16-SDWK16	-166.	-50.	1.8					
'R17-SDWK17	-101.	-20.	1.8					
'R18-SDWK18	-44.	10.	1.8					
'R19-SDWK19	-76.	87.	1.8					
'R20-SDWK20	-108.	153.	1.8					
'R21	-559.	257.	1.8					
'R22	-981.	163.	1.8					
'R23	-1009.	50.	1.8					
'R24	-851.	-331.	1.8					
'R25	-573.	489.	1.8					
'R26	738.	660.	1.8					
'R27	939.	489.	1.8					
'R28	1110.	416.	1.8					
'R29	1331.	166.	1.8					

'NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS'	53	1	0	'C'						
1										
'PC_APPR1-EB	'	'AG'	3.	-5.	-199.	-99.	381.	5.76	0.	32.
1										
'PC_APPR2-EB	'	'AG'	-199.	-99.	-314.	-171.	381.	5.76	0.	32.
1										
'PC_APPR3-EB	'	'AG'	-314.	-171.	-401.	-219.	485.	5.76	0.	32.
1										
'PC_APPR4-EB	'	'AG'	-401.	-219.	-526.	-297.	485.	5.76	0.	32.
1										
'PC_APPR5-EB	'	'AG'	-526.	-297.	-860.	-505.	485.	5.76	0.	32.
1										
'PC_DEP1-EB	'	'AG'	3.	-5.	35.	2.	381.	5.76	0.	32.
1										
'PC_DEP2-EB	'	'AG'	35.	2.	213.	69.	517.	5.76	0.	32.
1										
'PC_DEP3-EB	'	'AG'	213.	69.	412.	121.	517.	5.76	0.	32.
1										
'PC_DEP4-EB	'	'AG'	412.	121.	631.	155.	517.	5.76	0.	32.
1										
'PC_DEP5-EB	'	'AG'	631.	155.	978.	163.	517.	5.76	0.	32.
2										

						PC_PB					
'PC_QMAIN1-EB	'	'AG	'	-51.	-31.	-199.	-99.	0.	12.	1	
60	28	0.		381	61.61	1600	1	3			
2											
'PC_QMAIN2-EB	'	'AG	'	-199.	-99.	-314.	-171.	0.	12.	1	
60	28	0.		381	61.61	1600	1	3			
2											
'PC_QMAIN3-EB	'	'AG	'	-314.	-171.	-401.	-219.	0.	12.	1	
60	28	0.		485	61.61	1600	1	3			
2											
'PC_QMAIN4-EB	'	'AG	'	-401.	-219.	-526.	-297.	0.	12.	1	
60	28	0.		485	61.61	1600	1	3			
2											
'PC_QMAIN5-EB	'	'AG	'	-526.	-297.	-860.	-505.	0.	12.	1	
60	28	0.		485	61.61	1600	1	3			
2											
'PC_QRIGHT-EB	'	'AG	'	-48.	-39.	-263.	-141.	0.	12.	1	
60	28	0.		104	61.61	1600	1	3			
1											
'PC_RTAPPR1-EB	'	'AG	'	-12.	-35.	-48.	-39.	104.	5.76	0.	32.
1											
'PC_RTAPPR2-EB	'	'AG	'	-48.	-39.	-263.	-141.	104.	5.76	0.	32.
1											
'PC_RTDEP-EB	'	'AG	'	-12.	-35.	25.	-44.	104.	5.76	0.	32.
1											
'PC_APPR1-WB	'	'AG	'	-27.	-6.	21.	20.	545.	5.76	0.	32.
1											
'PC_APPR2-WB	'	'AG	'	21.	20.	95.	50.	545.	5.76	0.	32.
1											
'PC_APPR3-WB	'	'AG	'	95.	50.	206.	79.	545.	5.76	0.	32.
1											
'PC_APPR4-WB	'	'AG	'	206.	79.	433.	142.	628.	5.76	0.	32.
1											
'PC_APPR5-WB	'	'AG	'	433.	142.	646.	173.	628.	5.76	0.	32.
1											
'PC_APPR6-WB	'	'AG	'	646.	173.	975.	177.	628.	5.76	0.	32.
1											
'PC_DEP1-WB	'	'AG	'	-27.	-6.	-181.	-77.	713.	5.76	0.	32.
1											
'PC_DEP2-WB	'	'AG	'	-181.	-77.	-294.	-140.	713.	5.76	0.	32.
1											
'PC_DEP3-WB	'	'AG	'	-294.	-140.	-683.	-379.	713.	5.76	0.	32.
1											
'PC_DEP4-WB	'	'AG	'	-683.	-379.	-867.	-474.	713.	5.76	0.	32.
2											
'PC_QMAIN1-WB	'	'AG	'	21.	20.	95.	50.	0.	12.	1	
60	49	0.		545	61.61	1600	1	5			
2											
'PC_QMAIN2-WB	'	'AG	'	95.	50.	206.	79.	0.	12.	1	
60	49	0.		545	61.61	1600	1	5			
2											
'PC_QMAIN3-WB	'	'AG	'	206.	79.	433.	142.	0.	12.	1	
60	49	0.		628	61.61	1600	1	5			
2											
'PC_QMAIN4-WB	'	'AG	'	433.	142.	646.	173.	0.	12.	1	
60	49	0.		628	61.61	1600	1	5			
2											
'PC_QMAIN5-WB	'	'AG	'	646.	173.	975.	177.	0.	12.	1	
60	49	0.		628	61.61	1600	1	5			
2											
'PC_QLEFT-WB	'	'AG	'	25.	8.	206.	79.	0.	12.	1	
60	49	0.		83	61.61	1600	1	5			
1											
'PC_LTDEP-WB	'	'AG	'	25.	8.	25.	-44.	83.	5.76	0.	32.
1											
'PC_APPR1-SB	'	'AG	'	25.	-44.	-13.	24.	3.	7.69	0.	32.
1											
'PC_APPR2-SB	'	'AG	'	-13.	24.	-28.	60.	139.	7.69	0.	32.
1											
'PC_APPR3-SB	'	'AG	'	-28.	60.	-251.	513.	307.	7.69	0.	32.
1											
'PC_APPR4-SB	'	'AG	'	-251.	513.	-391.	936.	307.	7.69	0.	32.
1											
'PC_DEP1-SB	'	'AG	'	25.	-44.	140.	-252.	190.	7.69	0.	32.
1											
'PC_DEP2-SB	'	'AG	'	140.	-252.	186.	-317.	190.	7.69	0.	32.
1											
'PC_DEP3-SB	'	'AG	'	186.	-317.	332.	-507.	190.	7.69	0.	32.
1											
'PC_DEP4-SB	'	'AG	'	332.	-507.	418.	-625.	190.	7.69	0.	32.

PC_PB											
1	'PC_DEP5-SB	'	'AG'	418.	-625.	467.	-700.	190.	7.69	0.	32.
1	'PC_DEP6-SB	'	'AG'	467.	-700.	578.	-894.	190.	7.69	0.	32.
2	'PC_QMAIN1-SB	'	'AG'	-13.	24.	-28.	60.	0.	12.	1	
	60	43	0.	139	60.77	1600	1	3			
2	'PC_QMAIN2-SB	'	'AG'	-28.	60.	-251.	513.	0.	12.	1	
	60	43	0.	307	60.77	1600	1	3			
2	'PC_QMAIN3-SB	'	'AG'	-251.	513.	-391.	936.	0.	12.	1	
	60	43	0.	307	60.77	1600	1	3			
2	'PC_QRIGHT-SB	'	'AG'	-24.	19.	-110.	199.	0.	12.	1	
	60	43	0.	168	60.77	1600	1	3			
1	'PC_RTAPPR-SB	'	'AG'	-24.	19.	-110.	199.	168.	7.69	0.	32.
1	'PC_RTDEP-SB	'	'AG'	-24.	19.	-27.	-7.	168.	7.69	0.	12.
1	'PC_LTDEP-SB	'	'AG'	-13.	24.	35.	2.	136.	7.69	0.	32.
1.0	00.	5	1000.	0.	'Y'	5	0	72			

'NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (PB)'	60.	108.	0.	0.	29	0.3048	1	1
'R1-SDWK1	-56.	161.	1.8					
'R2-SDWK2	-24.	96.	1.8					
'R3-SDWK3	5.	36.	1.8					
'R4-SDWK4	85.	65.	1.8					
'R5-SDWK5	156.	89.	1.8					
'R6-SDWK6	189.	40.	1.8					
'R7-SDWK7	118.	13.	1.8					
'R8-SDWK8	43.	-22.	1.8					
'R9-SDWK9	68.	-83.	1.8					
'R10-SDWK10	101.	-143.	1.8					
'R11-SDWK11	75.	-173.	1.8					
'R12-SDWK12	37.	-105.	1.8					
'R13-SDWK13	-12.	-54.	1.8					
'R14-SDWK14	-62.	-66.	1.8					
'R15-SDWK15	-145.	-106.	1.8					
'R16-SDWK16	-166.	-50.	1.8					
'R17-SDWK17	-101.	-20.	1.8					
'R18-SDWK18	-44.	10.	1.8					
'R19-SDWK19	-76.	87.	1.8					
'R20-SDWK20	-108.	153.	1.8					
'R21	-559.	257.	1.8					
'R22	-981.	163.	1.8					
'R23	-1009.	50.	1.8					
'R24	-851.	-331.	1.8					
'R25	-573.	489.	1.8					
'R26	738.	660.	1.8					
'R27	939.	489.	1.8					
'R28	1110.	416.	1.8					
'R29	1331.	166.	1.8					

'NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS'	53	1	0	'C'							
1	'PC_APPR1-EB	'	'AG'	3.	-5.	-199.	-99.	562.	5.76	0.	32.
1	'PC_APPR2-EB	'	'AG'	-199.	-99.	-314.	-171.	562.	5.76	0.	32.
1	'PC_APPR3-EB	'	'AG'	-314.	-171.	-401.	-219.	928.	5.76	0.	32.
1	'PC_APPR4-EB	'	'AG'	-401.	-219.	-526.	-297.	928.	5.76	0.	32.
1	'PC_APPR5-EB	'	'AG'	-526.	-297.	-860.	-505.	928.	5.76	0.	32.
1	'PC_DEP1-EB	'	'AG'	3.	-5.	35.	2.	562.	5.76	0.	32.
1	'PC_DEP2-EB	'	'AG'	35.	2.	213.	69.	698.	5.76	0.	32.
1	'PC_DEP3-EB	'	'AG'	213.	69.	412.	121.	698.	5.76	0.	32.
1	'PC_DEP4-EB	'	'AG'	412.	121.	631.	155.	698.	5.76	0.	32.
1	'PC_DEP5-EB	'	'AG'	631.	155.	978.	163.	698.	5.76	0.	32.
2	'PC_QMAIN1-EB	'	'AG'	-51.	-31.	-199.	-99.	0.	12.	1	
	60	28	0.	562	61.61	1600	1	3			

PC_PB											
2	'PC_QMAIN2-EB	'	'AG	'	-199.	-99.	-314.	-171.	0.	12.	1
	60	28	0.	562	61.61	1600	1	3			
2	'PC_QMAIN3-EB	'	'AG	'	-317.	-171.	-401.	-219.	0.	12.	1
	60	28	0.	928	61.61	1600	1	3			
2	'PC_QMAIN4-EB	'	'AG	'	-401.	-219.	-526.	-297.	0.	12.	1
	60	28	0.	928	61.61	1600	1	3			
2	'PC_QMAIN5-EB	'	'AG	'	-526.	-297.	-860.	-505.	0.	12.	1
	60	28	0.	928	61.61	1600	1	3			
2	'PC_QRIGHT-EB	'	'AG	'	-48.	-39.	-263.	-141.	0.	12.	1
	60	28	0.	366	61.61	1600	1	3			
1	'PC_RIGHTAPPR1-EB	'	'AG	'	-12.	-35.	-48.	-39.	366.	5.76	0.
	1										32.
1	'PC_RIGHTAPPR2-EB	'	'AG	'	-48.	-39.	-263.	-141.	366.	5.76	0.
	1										32.
1	'PC_RIGHTDEP-EB	'	'AG	'	-12.	-35.	25.	-44.	366.	5.76	0.
	1										32.
1	'PC_APPR1-WB	'	'AG	'	-27.	-6.	21.	20.	859.	5.76	0.
	1										32.
1	'PC_APPR2-WB	'	'AG	'	21.	20.	95.	50.	859.	5.76	0.
	1										32.
1	'PC_APPR3-WB	'	'AG	'	95.	50.	206.	79.	859.	5.76	0.
	1										32.
1	'PC_APPR4-WB	'	'AG	'	206.	79.	433.	142.	942.	5.76	0.
	1										32.
1	'PC_APPR5-WB	'	'AG	'	433.	142.	646.	173.	942.	5.76	0.
	1										32.
1	'PC_APPR6-WB	'	'AG	'	646.	173.	975.	177.	942.	5.76	0.
	1										32.
1	'PC_DEP1-WB	'	'AG	'	-27.	-6.	-181.	-77.	1111.	5.76	0.
	1										32.
1	'PC_DEP2-WB	'	'AG	'	-181.	-77.	-294.	-140.	1111.	5.76	0.
	1										32.
1	'PC_DEP3-WB	'	'AG	'	-294.	-140.	-683.	-379.	1111.	5.76	0.
	1										32.
1	'PC_DEP4-WB	'	'AG	'	-683.	-379.	-867.	-474.	1111.	5.76	0.
	1										32.
2	'PC_QMAIN1-WB	'	'AG	'	21.	20.	95.	50.	0.	12.	1
	60	49	0.	859	61.61	1600	1	5			
2	'PC_QMAIN2-WB	'	'AG	'	95.	50.	206.	79.	0.	12.	1
	60	49	0.	859	61.61	1600	1	5			
2	'PC_QMAIN3-WB	'	'AG	'	206.	79.	433.	142.	0.	12.	1
	60	49	0.	942	61.61	1600	1	5			
2	'PC_QMAIN4-WB	'	'AG	'	433.	142.	646.	173.	0.	12.	1
	60	49	0.	942	61.61	1600	1	5			
2	'PC_QMAIN5-WB	'	'AG	'	646.	173.	975.	177.	0.	12.	1
	60	49	0.	942	61.61	1600	1	5			
2	'PC_QLEFT-WB	'	'AG	'	25.	8.	206.	79.	0.	12.	1
	60	49	0.	83	61.61	1600	1	5			
1	'PC_LEFTDEP-WB	'	'AG	'	25.	8.	25.	-44.	83.	5.76	0.
	1										32.
1	'PC_APPR1-SB	'	'AG	'	25.	-44.	-13.	24.	3.	7.69	0.
	1										32.
1	'PC_APPR2-SB	'	'AG	'	-13.	24.	-28.	60.	139.	7.69	0.
	1										32.
1	'PC_APPR3-SB	'	'AG	'	-28.	60.	-251.	513.	391.	7.69	0.
	1										32.
1	'PC_APPR4-SB	'	'AG	'	-251.	513.	-391.	936.	391.	7.69	0.
	1										32.
1	'PC_DEP1-SB	'	'AG	'	25.	-44.	140.	-252.	452.	7.69	0.
	1										32.
1	'PC_DEP2-SB	'	'AG	'	140.	-252.	186.	-317.	452.	7.69	0.
	1										32.
1	'PC_DEP3-SB	'	'AG	'	186.	-317.	332.	-507.	452.	7.69	0.
	1										32.
1	'PC_DEP4-SB	'	'AG	'	332.	-507.	418.	-625.	452.	7.69	0.
	1										32.
1	'PC_DEP5-SB	'	'AG	'	418.	-625.	467.	-700.	452.	7.69	0.
	1										32.

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                                PC_PB
1
'PC_DEP6-SB      ' 'AG '    467.  -700.  578.  -894.  452.   7.69   0.   32.
2
'PC_QMAIN1-SB   ' 'AG '   -13.   24.  -28.   60.    0.   12.   1
    60    43    0.   139   60.77  60.   1600   1   3
2
'PC_QMAIN2-SB   ' 'AG '   -28.   60. -251.  513.    0.   12.   1
    60    43    0.   391   60.77  60.   1600   1   3
2
'PC_QMAIN3-SB   ' 'AG '  -251.  513. -391.  936.    0.   12.   1
    60    43    0.   391   60.77  60.   1600   1   3
2
'PC_QRIGHT-SB   ' 'AG '   -24.   19. -110.  199.    0.   12.   1
    60    43    0.   252   60.77  60.   1600   1   3
1
'PC_RIGHTAPPR-SB ' 'AG '   -24.   19. -110.  199.  252.   7.69   0.   32.
1
'PC_RIGHTDEP-SB ' 'AG '   -24.   19.  -27.   -7.   252.   7.69   0.   12.
1
'PC_LEFTDEP-SB  ' 'AG '   -13.   24.  35.   2.    136.   7.69   0.   32.
1.0 00. 5 1000. 0. 'Y' 5 0 72

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CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221

PAGE 1

JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS ( RUN: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS

DATE : 8/ 2/ 5  
TIME : 14:33:54

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM  
U = 1.0 M/S CLAS = 5 (E) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION		*	LINK COORDINATES (FT)				*	LENGTH	BRG TYPE	VPH	EF	
H	W V/C QUEUE	*	X1	Y1	X2	Y2	*	(FT)	(DEG)			
(G/MI)	(FT) (FT)	(VEH)										
1.	PC_APPR1-EB	*	3.0	-5.0	-199.0	-99.0	*	223.	245.	AG	345.	11.7
.0	32.0											
2.	PC_APPR2-EB	*	-199.0	-99.0	-314.0	-171.0	*	136.	238.	AG	436.	11.7
.0	32.0											
3.	PC_APPR3-EB	*	-314.0	-171.0	-401.0	-219.0	*	99.	241.	AG	436.	11.7
.0	32.0											
4.	PC_APPR4-EB	*	-401.0	-219.0	-526.0	-297.0	*	147.	238.	AG	436.	11.7
.0	32.0											
5.	PC_APPR5-EB	*	-526.0	-297.0	-860.0	-505.0	*	393.	238.	AG	436.	11.7
.0	32.0											
6.	PC_DEP1-EB	*	3.0	-5.0	33.0	7.0	*	32.	68.	AG	267.	11.7
.0	32.0											
7.	PC_DEP2-EB	*	33.0	7.0	103.0	34.0	*	75.	69.	AG	370.	11.7
.0	32.0											
8.	PC_DEP3-EB	*	103.0	34.0	213.0	69.0	*	115.	72.	AG	370.	11.7
.0	32.0											
9.	PC_DEP4-EB	*	213.0	69.0	412.0	121.0	*	206.	75.	AG	370.	11.7
.0	32.0											
10.	PC_DEP5-EB	*	412.0	121.0	631.0	155.0	*	222.	81.	AG	370.	11.7
.0	32.0											
11.	PC_DEP6-EB	*	631.0	155.0	978.0	163.0	*	347.	89.	AG	370.	11.7
.0	32.0											
12.	PC_RTAPPR1-EB	*	-12.0	-35.0	-48.0	-39.0	*	36.	264.	AG	91.	11.7
.0	32.0											
13.	PC_RTAPPR2-EB	*	-48.0	-39.0	-263.0	-141.0	*	238.	245.	AG	91.	11.7
.0	32.0											
14.	PC_RTDEP-EB	*	-12.0	-35.0	25.0	-44.0	*	38.	104.	AG	91.	11.7
.0	12.0											
15.	PC_APPR1-WB	*	23.0	14.0	97.0	44.0	*	80.	68.	AG	625.	11.7
.0	32.0											
16.	PC_APPR2-WB	*	97.0	44.0	206.0	79.0	*	114.	72.	AG	625.	11.7

PC_PB										
.0	32.0									
	17. PC_APPR3-WB	*	206.0	79.0	433.0	142.0	*	236.	74. AG	625. 11.7
.0	32.0									
	18. PC_APPR4-WB	*	433.0	142.0	646.0	173.0	*	215.	82. AG	625. 11.7
.0	32.0									
	19. PC_APPR5-WB	*	646.0	173.0	975.0	177.0	*	329.	89. AG	625. 11.7
.0	32.0									
	20. PC_DEP1-WB	*	23.0	14.0	-22.0	-3.0	*	48.	249. AG	484. 11.7
.0	32.0									
	21. PC_DEP2-WB	*	-22.0	-3.0	-181.0	-77.0	*	175.	245. AG	588. 11.7
.0	32.0									
	22. PC_DEP3-WB	*	-181.0	-77.0	-294.0	-140.0	*	129.	241. AG	588. 11.7
.0	32.0									
	23. PC_DEP4-WB	*	-294.0	-140.0	-867.0	-494.0	*	674.	238. AG	588. 11.7
.0	32.0									
	24. PC_LTDEP-WB	*	23.0	14.0	25.0	-44.0	*	58.	178. AG	75. 11.7
.0	12.0									
	25. PC_APPR1-SB	*	-9.0	15.0	-28.0	60.0	*	49.	337. AG	210. 27.5
.0	32.0									
	26. PC_APPR2-SB	*	-28.0	90.0	-251.0	513.0	*	478.	332. AG	210. 15.7
.0	32.0									
	27. PC_APPR3-SB	*	-251.0	513.0	-931.0	936.0	*	801.	302. AG	210. 15.7
.0	32.0									
	28. PC_DEP1-SB	*	-9.0	15.0	25.0	-44.0	*	68.	150. AG	3. 15.7
.0	32.0									
	29. PC_DEP2-SB	*	25.0	-44.0	140.0	-252.0	*	238.	151. AG	169. 15.7
.0	32.0									
	30. PC_DEP3-SB	*	140.0	-252.0	186.0	-317.0	*	80.	145. AG	169. 15.7
.0	32.0									
	31. PC_DEP4-SB	*	186.0	-317.0	332.0	-507.0	*	240.	142. AG	169. 15.7
.0	32.0									
	32. PC_DEP5-SB	*	332.0	-507.0	418.0	-625.0	*	146.	144. AG	169. 15.7
.0	32.0									
	33. PC_DEP6-SB	*	418.0	-625.0	467.0	-700.0	*	90.	147. AG	169. 15.7
.0	32.0									
	34. PC_DEP7-SB	*	467.0	-700.0	578.0	-894.0	*	224.	150. AG	169. 15.7
.0	32.0									
	35. PC_RTDEP-SB	*	-9.0	15.0	-22.0	-3.0	*	22.	216. AG	104. 15.7
.0	12.0									
	36. PC_LTDEP-SB	*	-9.0	15.0	33.0	7.0	*	43.	101. AG	103. 15.7
.0	12.0									

PAGE 2

JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (

RUN: NYS ROUTE 311 @ INTERSTATE 84 EB

RAMPS

DATE : 8/ 2/ 5

TIME : 14:33:54

ADDITIONAL QUEUE LINK PARAMETERS

ARRIVAL	LINK DESCRIPTION	* CYCLE	RED	CLEARANCE	APPROACH	SATURATION	IDLE	SIGNAL
RATE		* LENGTH	TIME	LOST TIME	VOL	FLOW RATE	EM FAC	TYPE
		* (SEC)	(SEC)	(SEC)	(VPH)	(VPH)	(gm/hr)	

RECEPTOR LOCATIONS

RECEPTOR	* X	Y	Z	* Z
1. R1-SDWK1	* -56.0	161.0	1.8	* 1.8
2. R2-SDWK2	* -24.0	96.0	1.8	* 1.8
3. R3-SDWK3	* 8.0	31.0	1.8	* 1.8
4. R4-SDWK4	* 84.0	59.0	1.8	* 1.8
5. R5-SDWK5	* 156.0	83.0	1.8	* 1.8
6. R6-SDWK6	* 188.0	41.0	1.8	* 1.8
7. R7-SDWK7	* 115.0	18.0	1.8	* 1.8
8. R8-SDWK8	* 43.0	-22.0	1.8	* 1.8
9. R9-SDWK9	* 68.0	-83.0	1.8	* 1.8
10. R10-SDWK10	* 101.0	-143.0	1.8	* 1.8
11. R11-SDWK11	* 75.0	-173.0	1.8	* 1.8
12. R12-SDWK12	* 37.0	-105.0	1.8	* 1.8
13. R13-SDWK13	* -12.0	-54.0	1.8	* 1.8
14. R14-SDWK14	* -62.0	-66.0	1.8	* 1.8
15. R15-SDWK15	* -145.0	-106.0	1.8	* 1.8
16. R16-SDWK16	* -166.0	-50.0	1.8	* 1.8

			PC_PB		
17. R17-SDWK17	*	-101.0	-20.0	1.8	*
18. R18-SDWK18	*	-32.0	15.0	1.8	*
19. R19-SDWK19	*	-65.0	94.0	1.8	*
20. R20-SDWK20	*	-98.0	161.0	1.8	*
21. R21	*	-559.0	257.0	1.8	*
22. R22	*	-981.0	163.0	1.8	*
23. R23	*	-1009.0	50.0	1.8	*
24. R24	*	-851.0	-331.0	1.8	*
25. R25	*	-573.0	489.0	1.8	*
26. R26	*	738.0	660.0	1.8	*
27. R27	*	939.0	489.0	1.8	*
28. R28	*	1110.0	416.0	1.8	*
29. R29	*	1331.0	166.0	1.8	*

PAGE 3

JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (

RUN: NYS ROUTE 311 @ INTERSTATE 84 EB

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND \* CONCENTRATION  
 ANGLE \* (PPM)  
 (DEGR)\* REC1 REC2 REC3 REC4 REC5 REC6 REC7 REC8 REC9 REC10 REC11 REC12 REC13 REC14 REC15 REC16  
 REC17 REC18 REC19 REC20

ANGLE	WIND	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	*	.1	.1	.0	.0	.0	.4	.4	.3	.2	.0	.2	.2	.3	.4	.3	.0				
.1		.3	.1	.1	.0	.0	.4	.4	.3	.2	.1	.1	.2	.3	.3	.3	.0				
5.	*	.1	.1	.0	.0	.0	.4	.4	.3	.2	.1	.1	.2	.3	.3	.3	.0				
.1		.2	.1	.1	.0	.0	.4	.4	.3	.2	.1	.1	.3	.3	.3	.3	.0				
10.	*	.1	.1	.0	.0	.0	.4	.4	.3	.2	.1	.1	.3	.3	.3	.3	.0				
.1		.2	.1	.1	.0	.0	.4	.4	.3	.2	.1	.1	.2	.3	.3	.3	.0				
15.	*	.1	.0	.0	.0	.0	.5	.4	.3	.1	.1	.2	.3	.2	.4	.3	.0				
.0		.2	.1	.1	.0	.0	.5	.4	.3	.1	.1	.2	.2	.3	.4	.3	.0				
20.	*	.1	.0	.0	.0	.0	.5	.4	.3	.1	.1	.2	.2	.3	.4	.3	.0				
.0		.2	.1	.1	.0	.0	.4	.5	.3	.2	.0	.1	.2	.2	.4	.5	.0				
25.	*	.1	.0	.0	.0	.0	.4	.5	.3	.2	.0	.1	.2	.2	.4	.5	.0				
.0		.2	.1	.1	.0	.0	.4	.5	.3	.2	.0	.1	.2	.2	.4	.5	.0				
30.	*	.1	.0	.0	.0	.0	.4	.5	.3	.2	.1	.1	.2	.2	.4	.5	.0				
.0		.2	.1	.1	.0	.0	.4	.5	.3	.2	.1	.1	.2	.2	.4	.5	.0				
35.	*	.1	.0	.0	.0	.0	.6	.5	.4	.2	.1	.2	.2	.2	.3	.5	.0				
.0		.2	.1	.1	.0	.0	.6	.5	.4	.2	.1	.2	.2	.2	.3	.5	.0				
40.	*	.1	.0	.0	.0	.0	.5	.5	.3	.3	.1	.2	.2	.2	.4	.5	.0				
.0		.2	.1	.1	.0	.0	.5	.5	.3	.3	.1	.2	.2	.2	.4	.5	.0				
45.	*	.1	.0	.0	.0	.0	.4	.5	.4	.1	.1	.2	.2	.3	.3	.5	.0				
.1		.2	.1	.1	.0	.0	.4	.5	.4	.1	.1	.2	.2	.3	.3	.5	.0				
50.	*	.1	.1	.0	.0	.0	.5	.5	.4	.1	.0	.1	.2	.3	.3	.4	.1				
.1		.2	.1	.1	.0	.0	.5	.5	.4	.1	.0	.1	.2	.3	.3	.4	.1				
55.	*	.1	.1	.0	.0	.0	.6	.6	.4	.1	.0	.1	.2	.5	.3	.3	.1				
.2		.2	.1	.1	.0	.0	.6	.6	.4	.1	.0	.1	.2	.5	.3	.3	.1				
60.	*	.1	.1	.0	.1	.0	.6	.7	.3	.1	.0	.1	.2	.3	.3	.2	.2				
.2		.2	.1	.1	.1	.0	.6	.7	.3	.1	.0	.1	.2	.3	.3	.2	.2				
65.	*	.1	.1	.3	.2	.1	.7	.6	.4	.0	.0	.1	.1	.2	.2	.1	.3				
.4		.4	.1	.1	.3	.3	.6	.6	.2	.0	.0	.1	.1	.1	.1	.0	.5				
70.	*	.1	.1	.3	.3	.3	.6	.6	.2	.0	.0	.1	.1	.1	.1	.0	.5				
.7		.6	.1	.1	.3	.3	.6	.6	.2	.0	.0	.1	.1	.1	.1	.0	.5				
75.	*	.1	.1	.6	.8	.6	.3	.4	.1	.0	.0	.1	.1	.0	.0	.0	.5				
.8		.9	.1	.1	.6	.8	.6	.3	.4	.1	.0	.1	.1	.0	.0	.0	.5				
80.	*	.1	.1	.8	.8	.7	.2	.3	.0	.0	.0	.1	.1	.0	.0	.0	.5				
.6		.9	.2	.1	.8	.8	.7	.2	.3	.0	.0	.1	.1	.0	.0	.0	.5				
85.	*	.1	.1	.7	.7	.7	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.6				
.6		.8	.2	.1	.7	.7	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.6				
90.	*	.1	.2	.6	.7	.7	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.6				
.5		.6	.3	.1	.6	.7	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.6				
95.	*	.2	.2	.5	.6	.7	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.6				
.5		.6	.3	.2	.5	.6	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.6				
100.	*	.2	.1	.4	.5	.6	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.6				
.4		.6	.1	.4	.5	.6	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.6				
105.	*	.2	.2	.4	.6	.6	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.4				
.4		.5	.2	.4	.6	.6	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.4				
110.	*	.2	.2	.4	.5	.6	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.4				

																	PC_PB	
.4	.4	.1	.2															
115.	*	.2	.2	.3	.5	.4	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.4	
.4	.4	.1	.2															
120.	*	.2	.1	.4	.4	.4	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.4	
.4	.3	.1	.1															
125.	*	.1	.2	.4	.4	.4	.0	.0	.0	.0	.0	.1	.2	.1	.0	.0	.4	
.4	.3	.2	.1															
130.	*	.2	.2	.4	.4	.4	.0	.0	.0	.0	.0	.1	.2	.1	.0	.0	.4	
.4	.3	.2	.2															
135.	*	.2	.2	.4	.4	.4	.0	.0	.0	.0	.0	.1	.2	.1	.0	.0	.4	
.4	.4	.1	.1															
140.	*	.3	.1	.3	.5	.4	.0	.0	.0	.0	.0	.1	.2	.1	.0	.0	.4	
.4	.4	.2	.1															
145.	*	.3	.1	.3	.5	.4	.0	.0	.0	.1	.0	.1	.1	.1	.0	.0	.4	
.4	.4	.2	.0															
150.	*	.2	.1	.5	.4	.4	.0	.0	.1	.1	.1	.1	.1	.0	.0	.0	.4	
.4	.4	.2	.0															
155.	*	.2	.2	.4	.4	.4	.0	.0	.1	.1	.1	.1	.1	.0	.0	.0	.4	
.4	.4	.1	.0															
160.	*	.3	.3	.4	.4	.4	.0	.0	.1	.2	.1	.0	.0	.0	.0	.0	.4	
.4	.4	.1	.0															
165.	*	.4	.3	.4	.4	.4	.0	.0	.1	.2	.1	.0	.0	.0	.0	.0	.4	
.4	.3	.2	.1															
170.	*	.3	.3	.4	.4	.4	.0	.0	.1	.2	.2	.0	.0	.0	.0	.0	.4	
.4	.3	.2	.1															
175.	*	.3	.3	.3	.4	.4	.0	.0	.1	.2	.2	.0	.0	.0	.0	.0	.4	
.4	.3	.2	.1															
180.	*	.3	.4	.3	.4	.4	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.4	
.4	.3	.2	.1															
185.	*	.3	.4	.4	.4	.4	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.4	
.4	.3	.2	.1															
190.	*	.3	.4	.3	.4	.4	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.4	
.4	.4	.2	.1															
195.	*	.3	.4	.3	.4	.4	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.4	
.4	.4	.2	.1															
200.	*	.2	.4	.3	.4	.4	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.4	
.4	.4	.2	.0															
205.	*	.2	.3	.3	.4	.4	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.5	
.4	.4	.2	.0															

PAGE 4

JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (

RUN: NYS ROUTE 311 @ INTERSTATE 84 EB

WIND \* CONCENTRATION  
 ANGLE \* (PPM)  
 (DEGR) \* REC1 REC2 REC3 REC4 REC5 REC6 REC7 REC8 REC9 REC10 REC11 REC12 REC13 REC14 REC15 REC16  
 REC17 REC18 REC19 REC20  
 REC21 REC22 REC23 REC24 REC25 REC26 REC27 REC28 REC29

-----*																	
210.	*	.1	.3	.5	.4	.4	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.6
.6	.4	.1	.0														
215.	*	.1	.3	.5	.5	.4	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.6
.6	.6	.2	.1														
220.	*	.2	.2	.7	.5	.5	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.7
.6	.6	.2	.1														
225.	*	.2	.4	.7	.6	.7	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.8
.8	.6	.2	.1														
230.	*	.2	.3	.8	.7	.6	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.7
.8	.7	.1	.1														
235.	*	.2	.2	.9	.8	.9	.0	.0	.0	.1	.1	.0	.0	.0	.1	.1	.7
.7	.8	.1	.0														
240.	*	.1	.2	.9	.7	.8	.1	.1	.1	.1	.1	.0	.0	.1	.1	.2	.6
.7	.6	.1	.0														
245.	*	.1	.1	.8	.6	.7	.1	.4	.2	.2	.1	.0	.1	.1	.3	.3	.4
.4	.4	.0	.0														
250.	*	.1	.1	.3	.4	.4	.5	.4	.4	.2	.2	.0	.1	.4	.5	.4	.2
.3	.2	.0	.0														
255.	*	.1	.1	.3	.3	.2	.5	.4	.4	.2	.2	.1	.1	.5	.6	.5	.1
.1	.1	.0	.0														
260.	*	.1	.2	.2	.1	.1	.6	.6	.4	.2	.2	.1	.1	.3	.5	.5	.0
.0	.0	.0	.0														
265.	*	.1	.2	.2	.1	.0	.5	.7	.4	.2	.2	.1	.2	.3	.5	.5	.0
.0	.0	.0	.0														
270.	*	.1	.2	.2	.0	.0	.5	.5	.3	.3	.1	.1	.1	.3	.6	.5	.0
.0	.0	.0	.0														

									PC_PB									
275.	*	.1	.2	.2	.0	.0	.5	.4	.3	.3	.1	.0	.1	.3	.5	.5	.0	
.0		.0	.0	.0														
280.	*	.1	.2	.2	.0	.0	.5	.4	.3	.3	.1	.0	.2	.3	.5	.5	.0	
.0		.0	.0	.0														
285.	*	.1	.2	.2	.0	.0	.4	.4	.3	.3	.1	.0	.2	.3	.5	.4	.0	
.0		.0	.0	.0														
290.	*	.2	.2	.2	.0	.0	.5	.4	.4	.3	.2	.0	.2	.3	.3	.3	.0	
.0		.0	.0	.0														
295.	*	.2	.2	.2	.1	.0	.5	.4	.3	.3	.2	.1	.2	.3	.3	.2	.0	
.0		.0	.0	.0														
300.	*	.2	.2	.2	.1	.0	.4	.3	.3	.3	.2	.1	.2	.3	.3	.3	.0	
.0		.0	.0	.0														
305.	*	.2	.2	.2	.1	.0	.4	.4	.3	.3	.2	.1	.2	.3	.3	.3	.0	
.0		.0	.0	.0														
310.	*	.3	.3	.2	.1	.0	.4	.5	.3	.2	.3	.1	.2	.3	.3	.3	.0	
.0		.0	.0	.0														
315.	*	.3	.3	.3	.1	.0	.4	.6	.3	.1	.2	.1	.2	.3	.3	.3	.0	
.0		.0	.0	.0														
320.	*	.3	.3	.2	.1	.0	.4	.5	.4	.2	.1	.1	.2	.3	.3	.2	.0	
.0		.0	.0	.0														
325.	*	.3	.3	.2	.0	.0	.4	.4	.5	.3	.1	.1	.2	.3	.3	.3	.0	
.0		.0	.0	.0														
330.	*	.3	.4	.2	.0	.0	.4	.4	.4	.3	.2	.1	.0	.2	.3	.3	.0	
.0		.1	.1	.1														
335.	*	.3	.3	.1	.0	.0	.4	.4	.4	.2	.1	.1	.2	.3	.3	.3	.0	
.0		.1	.1	.1														
340.	*	.3	.3	.1	.0	.0	.4	.4	.3	.1	.1	.1	.3	.3	.3	.3	.0	
.0		.2	.1	.1														
345.	*	.2	.2	.1	.0	.0	.4	.4	.3	.1	.1	.2	.2	.4	.4	.3	.0	
.0		.2	.2	.2														
350.	*	.1	.2	.0	.0	.0	.4	.4	.3	.2	.1	.2	.1	.5	.4	.3	.0	
.1		.2	.2	.2														
355.	*	.1	.1	.0	.0	.0	.4	.4	.3	.2	.0	.3	.2	.3	.4	.3	.0	
.1		.2	.1	.2														
360.	*	.1	.1	.0	.0	.0	.4	.4	.3	.2	.0	.2	.2	.3	.4	.3	.0	
.1		.3	.1	.1														

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MAX	*	.4	.4	.9	.8	.9	.7	.7	.5	.3	.3	.3	.3	.5	.6	.5	.8
.8		.9	.3	.2													
DEGR.	*	165	180	235	235	235	65	265	325	40	310	355	10	55	255	25	225
225		75	90	95													

PAGE 5

JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (

RUN: NYS ROUTE 311 @ INTERSTATE 84 EB

RAMPS

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29
0.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
5.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
10.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
15.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
20.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
25.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
30.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
35.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
40.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
45.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
50.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
55.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
60.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
65.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
70.	*	.0	.0	.0	.1	.0	.0	.0	.0	.0
75.	*	.0	.0	.0	.1	.0	.0	.0	.0	.0
80.	*	.0	.0	.0	.1	.0	.0	.0	.0	.0

	PC_PB								
85.	*	.0	.0	.0	.1	.0	.0	.0	.0
90.	*	.0	.0	.0	.2	.0	.0	.0	.0
95.	*	.0	.0	.0	.2	.0	.0	.0	.0
100.	*	.0	.0	.0	.2	.0	.0	.0	.0
105.	*	.0	.0	.0	.2	.0	.0	.0	.0
110.	*	.0	.0	.0	.2	.0	.0	.0	.0
115.	*	.0	.0	.0	.2	.0	.0	.0	.0
120.	*	.0	.0	.0	.2	.0	.0	.0	.0
125.	*	.0	.0	.0	.2	.0	.0	.0	.0
130.	*	.0	.0	.0	.2	.0	.0	.0	.0
135.	*	.0	.0	.0	.2	.0	.0	.0	.0
140.	*	.0	.0	.0	.2	.0	.0	.0	.0
145.	*	.0	.0	.0	.2	.0	.0	.0	.0
150.	*	.0	.0	.0	.2	.0	.0	.0	.0
155.	*	.0	.0	.0	.2	.0	.0	.0	.0
160.	*	.0	.0	.0	.2	.0	.0	.0	.0
165.	*	.0	.0	.0	.2	.0	.0	.0	.0
170.	*	.0	.0	.0	.2	.0	.0	.0	.0
175.	*	.0	.0	.0	.2	.0	.0	.0	.0
180.	*	.0	.0	.0	.1	.0	.0	.0	.0
185.	*	.0	.0	.0	.1	.0	.0	.0	.0
190.	*	.0	.0	.0	.0	.0	.0	.1	.0
195.	*	.0	.0	.0	.0	.0	.0	.1	.0
200.	*	.0	.0	.0	.0	.0	.0	.1	.0
205.	*	.0	.0	.0	.0	.0	.0	.1	.0

PAGE 6

JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (

RUN: NYS ROUTE 311 @ INTERSTATE 84 EB

RAMPS  
WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29
210.	*	.0	.0	.0	.0	.0	.0	.1	.0	.0
215.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
220.	*	.0	.0	.0	.0	.0	.0	.0	.1	.0
225.	*	.0	.0	.0	.0	.0	.0	.0	.1	.0
230.	*	.0	.0	.0	.0	.0	.0	.0	.1	.0
235.	*	.0	.0	.0	.0	.0	.0	.0	.1	.0
240.	*	.0	.0	.0	.0	.0	.0	.0	.1	.0
245.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
250.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
255.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
260.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
265.	*	.0	.0	.0	.0	.0	.0	.0	.0	.1
270.	*	.0	.0	.0	.0	.0	.0	.0	.0	.1
275.	*	.0	.0	.0	.0	.0	.0	.0	.0	.1
280.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
285.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
290.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
295.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
300.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
305.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
310.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
315.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
320.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
325.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
330.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
335.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
340.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
345.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
350.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
355.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
360.	*	.0	.0	.0	.0	.0	.0	.0	.0	.0
MAX DEGR.	*	.0	.0	.0	.2	.0	.0	.1	.1	.1
	*	0	0	0	90	0	0	190	220	265

THE HIGHEST CONCENTRATION OF .90 PPM OCCURRED AT RECEPTOR REC5 .

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221

PAGE 1

JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (

RUN: NYS ROUTE 311 @ INTERSTATE 84 EB

PC\_PB

RAMPS

DATE : 8/ 3/ 5  
 TIME : 8:54:20

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM  
 U = 1.0 M/S CLAS = 5 (E) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

H	W	V/C	LINK DESCRIPTION	* (VEH)	X1	Y1	X2	Y2	* (FT)	LENGTH (FT)	BRG TYPE (DEG)	VPH	EF
.0	32.0		1. PC_APPR1-EB	*	3.0	-5.0	-199.0	-99.0	*	223.	245. AG	381.	5.8
.0	32.0		2. PC_APPR2-EB	*	-199.0	-99.0	-314.0	-171.0	*	136.	238. AG	381.	5.8
.0	32.0		3. PC_APPR3-EB	*	-314.0	-171.0	-401.0	-219.0	*	99.	241. AG	485.	5.8
.0	32.0		4. PC_APPR4-EB	*	-401.0	-219.0	-526.0	-297.0	*	147.	238. AG	485.	5.8
.0	32.0		5. PC_APPR5-EB	*	-526.0	-297.0	-860.0	-505.0	*	393.	238. AG	485.	5.8
.0	32.0		6. PC_DEP1-EB	*	3.0	-5.0	35.0	2.0	*	33.	78. AG	381.	5.8
.0	32.0		7. PC_DEP2-EB	*	35.0	2.0	213.0	69.0	*	190.	69. AG	517.	5.8
.0	32.0		8. PC_DEP3-EB	*	213.0	69.0	412.0	121.0	*	206.	75. AG	517.	5.8
.0	32.0		9. PC_DEP4-EB	*	412.0	121.0	631.0	155.0	*	222.	81. AG	517.	5.8
.0	32.0		10. PC_DEP5-EB	*	631.0	155.0	978.0	163.0	*	347.	89. AG	517.	5.8
.0	12.0	.48 3.0	11. PC_QMAIN1-EB	*	-51.0	-31.0	-104.0	-55.4	*	58.	245. AG	77.	100.0
.0	12.0	.48 3.0	12. PC_QMAIN2-EB	*	-199.0	-99.0	-248.4	-130.0	*	58.	238. AG	77.	100.0
.0	12.0	.61 3.8	13. PC_QMAIN3-EB	*	-314.0	-171.0	-379.0	-206.9	*	74.	241. AG	77.	100.0
.0	12.0	.61 3.8	14. PC_QMAIN4-EB	*	-401.0	-219.0	-464.0	-258.3	*	74.	238. AG	77.	100.0
.0	12.0	.61 3.8	15. PC_QMAIN5-EB	*	-526.0	-297.0	-589.0	-336.3	*	74.	238. AG	77.	100.0
.0	12.0	.13 .8	16. PC_ORIGHT-EB	*	-48.0	-39.0	-62.4	-45.8	*	16.	245. AG	77.	100.0
.0	32.0		17. PC_RTAPPR1-EB	*	-12.0	-35.0	-48.0	-39.0	*	36.	264. AG	104.	5.8
.0	32.0		18. PC_RTAPPR2-EB	*	-48.0	-39.0	-263.0	-141.0	*	238.	245. AG	104.	5.8
.0	32.0		19. PC_RTDEP-EB	*	-12.0	-35.0	25.0	-44.0	*	38.	104. AG	104.	5.8
.0	32.0		20. PC_APPR1-WB	*	-27.0	-6.0	21.0	20.0	*	55.	62. AG	545.	5.8
.0	32.0		21. PC_APPR2-WB	*	21.0	20.0	95.0	50.0	*	80.	68. AG	545.	5.8
.0	32.0		22. PC_APPR3-WB	*	95.0	50.0	206.0	79.0	*	115.	75. AG	545.	5.8
.0	32.0		23. PC_APPR4-WB	*	206.0	79.0	433.0	142.0	*	236.	74. AG	628.	5.8
.0	32.0		24. PC_APPR5-WB	*	433.0	142.0	646.0	173.0	*	215.	82. AG	628.	5.8
.0	32.0		25. PC_APPR6-WB	*	646.0	173.0	975.0	177.0	*	329.	89. AG	628.	5.8
.0	32.0		26. PC_DEP1-WB	*	-27.0	-6.0	-181.0	-77.0	*	170.	245. AG	713.	5.8
.0	32.0		27. PC_DEP2-WB	*	-181.0	-77.0	-294.0	-140.0	*	129.	241. AG	713.	5.8
.0	32.0		28. PC_DEP3-WB	*	-294.0	-140.0	-683.0	-379.0	*	457.	238. AG	713.	5.8
.0	32.0		29. PC_DEP4-WB	*	-683.0	-379.0	-867.0	-474.0	*	207.	243. AG	713.	5.8

				PC_PB							
.0	30.	PC_QMAIN1-WB	*	21.0	20.0	3066.4	1254.6	*	3286.	68.	AG 135. 100.0
.0	12.0	2.28 166.9									
.0	31.	PC_QMAIN2-WB	*	95.0	50.0	3274.5	880.7	*	3286.	75.	AG 135. 100.0
.0	12.0	2.28 166.9									
.0	32.	PC_QMAIN3-WB	*	206.0	79.0	4199.9	1187.4	*	4145.	74.	AG 135. 100.0
.0	12.0	2.63 210.6									
.0	33.	PC_QMAIN4-WB	*	433.0	142.0	4534.7	739.0	*	4145.	82.	AG 135. 100.0
.0	12.0	2.63 210.6									
.0	34.	PC_QMAIN5-WB	*	646.0	173.0	4790.6	223.4	*	4145.	89.	AG 135. 100.0
.0	12.0	2.63 210.6									
.0	35.	PC_QLEFT-WB	*	25.0	8.0	45.7	16.1	*	22.	69.	AG 135. 100.0
.0	12.0	.35 1.1									
.0	36.	PC_LTDEP-WB	*	25.0	8.0	25.0	-44.0	*	52.	180.	AG 83. 5.8
.0	32.0										
.0	37.	PC_APPR1-SB	*	25.0	-44.0	-13.0	24.0	*	78.	331.	AG 3. 7.7
.0	32.0										
.0	38.	PC_APPR2-SB	*	-13.0	24.0	-28.0	60.0	*	39.	337.	AG 139. 7.7
.0	32.0										
.0	39.	PC_APPR3-SB	*	-28.0	60.0	-251.0	513.0	*	505.	334.	AG 307. 7.7
.0	32.0										
.0	40.	PC_APPR4-SB	*	-251.0	513.0	-391.0	936.0	*	446.	342.	AG 307. 7.7
.0	32.0										
.0	41.	PC_DEP1-SB	*	25.0	-44.0	140.0	-252.0	*	238.	151.	AG 190. 7.7
.0	32.0										
.0	42.	PC_DEP2-SB	*	140.0	-252.0	186.0	-317.0	*	80.	145.	AG 190. 7.7
.0	32.0										
.0	43.	PC_DEP3-SB	*	186.0	-317.0	332.0	-507.0	*	240.	142.	AG 190. 7.7
.0	32.0										
.0	44.	PC_DEP4-SB	*	332.0	-507.0	418.0	-625.0	*	146.	144.	AG 190. 7.7
.0	32.0										

PAGE 2

JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (

RUN: NYS ROUTE 311 @ INTERSTATE 84 EB

RAMPS

DATE : 8/ 3/ 5  
TIME : 8:54:20

LINK VARIABLES

LINK DESCRIPTION		*	LINK COORDINATES (FT)				*	LENGTH	BRG TYPE	VPH	EF
H	W	V/C QUEUE	X1	Y1	X2	Y2	(FT)	(DEG)			
(G/MI)	(FT)	(FT)	(VEH)								
.0	45.	PC_DEP5-SB	*	418.0	-625.0	467.0	-700.0	*	90.	147.	AG 190. 7.7
.0	32.0										
.0	46.	PC_DEP6-SB	*	467.0	-700.0	578.0	-894.0	*	224.	150.	AG 190. 7.7
.0	32.0										
.0	47.	PC_QMAIN1-SB	*	-13.0	24.0	-25.6	54.2	*	33.	337.	AG 117. 100.0
.0	12.0	.35 1.7									
.0	48.	PC_QMAIN2-SB	*	-28.0	60.0	-64.2	133.6	*	82.	334.	AG 117. 100.0
.0	12.0	.77 4.2									
.0	49.	PC_QMAIN3-SB	*	-251.0	513.0	-276.8	590.9	*	82.	342.	AG 117. 100.0
.0	12.0	.77 4.2									
.0	50.	PC_ORTIGHT-SB	*	-24.0	19.0	-41.0	54.6	*	40.	334.	AG 117. 100.0
.0	12.0	.42 2.0									
.0	51.	PC_RTAPPR-SB	*	-24.0	19.0	-110.0	199.0	*	199.	334.	AG 168. 7.7
.0	32.0										
.0	52.	PC_RTDEP-SB	*	-24.0	19.0	-27.0	-7.0	*	26.	187.	AG 168. 7.7
.0	12.0										
.0	53.	PC_LTDEP-SB	*	-13.0	24.0	35.0	2.0	*	53.	115.	AG 136. 7.7
.0	32.0										

PAGE 3

JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (

RUN: NYS ROUTE 311 @ INTERSTATE 84 EB

RAMPS

DATE : 8/ 3/ 5  
TIME : 8:54:20

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION		*	CYCLE	RED	CLEARANCE	APPROACH	SATURATION	IDLE	SIGNAL
ARRIVAL			LENGTH	TIME	LOST TIME	VOL	FLOW RATE	EM FAC	TYPE
RATE									

	*	(SEC)	(SEC)	PC_PB (SEC)	(VPH)	(VPH)	(gm/hr)	
3	*	60	28	.0	381	1600	61.61	1
3	*	60	28	.0	381	1600	61.61	1
3	*	60	28	.0	485	1600	61.61	1
3	*	60	28	.0	485	1600	61.61	1
3	*	60	28	.0	485	1600	61.61	1
3	*	60	28	.0	104	1600	61.61	1
5	*	60	49	.0	545	1600	61.61	1
5	*	60	49	.0	545	1600	61.61	1
5	*	60	49	.0	628	1600	61.61	1
5	*	60	49	.0	628	1600	61.61	1
5	*	60	49	.0	628	1600	61.61	1
5	*	60	49	.0	83	1600	61.61	1
3	*	60	43	.0	139	1600	60.77	1
3	*	60	43	.0	307	1600	60.77	1
3	*	60	43	.0	307	1600	60.77	1
3	*	60	43	.0	168	1600	60.77	1

RECEPTOR LOCATIONS

RECEPTOR	*	X	Y	Z	*
1. R1-SDWK1	*	-56.0	161.0	1.8	*
2. R2-SDWK2	*	-24.0	96.0	1.8	*
3. R3-SDWK3	*	5.0	36.0	1.8	*
4. R4-SDWK4	*	85.0	65.0	1.8	*
5. R5-SDWK5	*	156.0	89.0	1.8	*
6. R6-SDWK6	*	189.0	40.0	1.8	*
7. R7-SDWK7	*	118.0	13.0	1.8	*
8. R8-SDWK8	*	43.0	-22.0	1.8	*
9. R9-SDWK9	*	68.0	-83.0	1.8	*
10. R10-SDWK10	*	101.0	-143.0	1.8	*
11. R11-SDWK11	*	75.0	-173.0	1.8	*
12. R12-SDWK12	*	37.0	-105.0	1.8	*
13. R13-SDWK13	*	-12.0	-54.0	1.8	*
14. R14-SDWK14	*	-62.0	-66.0	1.8	*
15. R15-SDWK15	*	-145.0	-106.0	1.8	*
16. R16-SDWK16	*	-166.0	-50.0	1.8	*
17. R17-SDWK17	*	-101.0	-20.0	1.8	*
18. R18-SDWK18	*	-44.0	10.0	1.8	*
19. R19-SDWK19	*	-76.0	87.0	1.8	*
20. R20-SDWK20	*	-108.0	153.0	1.8	*
21. R21	*	-559.0	257.0	1.8	*
22. R22	*	-981.0	163.0	1.8	*
23. R23	*	-1009.0	50.0	1.8	*
24. R24	*	-851.0	-331.0	1.8	*
25. R25	*	-573.0	489.0	1.8	*
26. R26	*	738.0	660.0	1.8	*
27. R27	*	939.0	489.0	1.8	*
28. R28	*	1110.0	416.0	1.8	*
29. R29	*	1331.0	166.0	1.8	*

PAGE 4

JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (

RUN: NYS ROUTE 311 @ INTERSTATE 84 EB

MODEL RESULTS

REMARKS : In search of the angle corresponding to

PC\_PB  
the maximum concentration, only the first  
angle, of the angles with same maximum  
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND \* CONCENTRATION  
ANGLE \* (PPM)  
(DEGR) \* REC1 REC2 REC3 REC4 REC5 REC6 REC7 REC8 REC9 REC10 REC11 REC12 REC13 REC14 REC15 REC16  
REC17 REC18 REC19 REC20

\*-----\*

0.	*	.0	.0	.0	.0	.0	.7	.6	.6	.1	.2	.2	.3	.5	.6	.2	.0
.0		.6	.2	.2													
5.	*	.0	.0	.0	.0	.0	.7	.6	.5	.1	.2	.2	.2	.3	.7	.2	.0
.0		.6	.3	.2													
10.	*	.0	.0	.0	.0	.0	.7	.8	.5	.2	.2	.3	.2	.1	.7	.2	.0
.1		.7	.3	.2													
15.	*	.0	.0	.0	.0	.0	.9	.8	.5	.4	.2	.3	.2	.2	.8	.2	.0
.1		.7	.4	.2													
20.	*	.0	.0	.0	.0	.0	.9	.8	.5	.4	.2	.3	.4	.2	.7	.3	.0
.1		.6	.4	.2													
25.	*	.0	.0	.0	.0	.0	1.1	.8	.5	.4	.3	.3	.4	.2	.6	.3	.0
.1		.7	.4	.2													
30.	*	.0	.0	.0	.0	.0	1.0	.8	.6	.5	.3	.4	.4	.3	.4	.3	.1
.1		.5	.4	.2													
35.	*	.0	.0	.0	.0	.0	1.1	.8	.6	.5	.3	.4	.4	.4	.4	.3	.1
.2		.5	.4	.2													
40.	*	.0	.0	.0	.0	.0	1.2	.9	.6	.5	.4	.4	.6	.7	.3	.3	.1
.2		.5	.3	.1													
45.	*	.0	.0	.0	.0	.0	1.5	1.1	.7	.5	.4	.5	.6	.6	.4	.4	.1
.3		.5	.3	.1													
50.	*	.0	.0	.0	.0	.1	1.5	1.3	1.0	.6	.7	.6	.7	.7	.5	.6	.1
.2		.5	.3	.1													
55.	*	.0	.0	.1	.1	.2	1.6	1.6	1.0	.8	.7	.8	.8	.8	.8	.8	.3
.3		.5	.4	.1													
60.	*	.0	.1	.5	.5	.6	1.9	1.7	1.3	.8	.8	.9	.9	1.1	1.0	.7	.5
.8		.9	.5	.2													
65.	*	.1	.3	1.0	1.1	1.2	1.9	1.7	1.4	1.1	.8	.8	1.0	1.2	1.2	.9	1.1
1.2		1.4	.6	.3													
70.	*	.3	.6	1.6	1.9	1.9	1.9	1.9	1.5	.8	.8	.8	.9	1.2	1.2	1.1	1.4
1.4		1.9	.9	.5													
75.	*	.6	1.0	2.2	2.5	2.6	1.8	1.4	1.0	.8	.5	.5	.7	1.0	.9	.8	1.6
1.7		2.3	1.2	.6													
80.	*	.9	1.2	2.5	2.9	3.0	1.3	1.0	.8	.6	.2	.3	.6	.6	.6	.5	1.4
1.5		2.0	1.5	1.0													
85.	*	1.0	1.3	1.9	2.7	2.8	.6	.6	.5	.2	.2	.2	.3	.3	.3	.2	1.0
.9		1.5	1.6	1.1													
90.	*	1.0	1.1	1.3	2.2	2.5	.3	.2	.1	.1	.1	.1	.2	.1	.1	.1	.5
.6		.9	1.3	1.1													
95.	*	.8	.8	.9	1.8	2.2	.1	.1	.0	.0	.0	.1	.1	.0	.0	.0	.4
.4		.5	1.1	1.0													
100.	*	.7	.5	.7	1.4	1.7	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.4
.4		.2	1.0	.7													
105.	*	.4	.4	.7	1.3	1.6	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.3
.4		.1	.7	.6													
110.	*	.3	.3	.7	1.2	1.2	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.3
.5		.1	.7	.5													
115.	*	.2	.3	.7	1.1	1.2	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.3
.6		.2	.6	.6													
120.	*	.2	.2	.7	1.0	1.1	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.3
.6		.2	.6	.6													
125.	*	.2	.2	.7	1.0	1.1	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.3
.6		.3	.5	.5													
130.	*	.1	.2	.6	.9	1.1	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.3
.5		.3	.5	.6													
135.	*	.1	.1	.6	.9	1.1	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.3
.5		.2	.4	.5													
140.	*	.1	.2	.4	.9	1.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.3
.5		.2	.4	.6													
145.	*	.1	.2	.3	.9	1.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.3
.5		.2	.4	.3													
150.	*	.2	.2	.3	.9	.9	.0	.0	.0	.1	.0	.0	.1	.0	.0	.0	.3
.5		.2	.2	.3													
155.	*	.2	.0	.3	.7	1.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.3
.5		.2	.1	.2													
160.	*	.5	.1	.2	.7	1.0	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.3
.5		.2	.0	.0													

		PC_PB															
165.	*	.6	.1	.2	.6	.9	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.3
.5		.2	.1	.0													
170.	*	.7	.5	.1	.6	.9	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.3
.4		.2	.1	.0													
175.	*	.6	.5	.1	.6	1.0	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.3
.4		.2	.2	.0													
180.	*	.5	.6	.1	.6	1.0	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.3
.4		.2	.2	.0													
185.	*	.4	.6	.1	.6	1.0	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.3
.4		.5	.2	.0													
190.	*	.4	.7	.1	.6	1.0	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.3
.4		.5	.1	.0													
195.	*	.3	.8	.1	.6	1.1	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.2
.3		.5	.1	.0													
200.	*	.3	.7	.2	.6	1.1	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.3
.3		.5	.1	.0													
205.	*	.2	.6	.2	.7	1.1	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.4
.3		.5	.1	.0													

PAGE 5

JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (

RUN: NYS ROUTE 311 @ INTERSTATE 84 EB

RAMPS

WIND \* CONCENTRATION  
 ANGLE \* (PPM)  
 (DEGR) \* REC1 REC2 REC3 REC4 REC5 REC6 REC7 REC8 REC9 REC10 REC11 REC12 REC13 REC14 REC15 REC16  
 REC17 REC18 REC19 REC20  
 REC21 REC22 REC23 REC24 REC25 REC26 REC27 REC28 REC29

		-----*																
210.	*	.2	.6	.3	.9	1.2	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.4	
.3		.5	.0	.0														
215.	*	.1	.5	.4	.9	1.2	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.3	
.3		.4	.0	.0														
220.	*	.1	.5	.4	.8	1.2	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.5	
.3		.4	.0	.0														
225.	*	.1	.4	.5	.8	1.3	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.6	
.3		.4	.0	.0														
230.	*	.1	.4	.6	.7	1.3	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.6	
.5		.4	.1	.0														
235.	*	.1	.4	.5	.8	1.3	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.5	
.5		.4	.0	.0														
240.	*	.1	.4	.4	.4	1.0	.0	.0	.0	.1	.1	.0	.0	.0	.1	.1	.3	
.4		.3	.0	.0														
245.	*	.1	.4	.5	.4	.9	.1	.0	.0	.1	.1	.0	.0	.1	.1	.1	.2	
.3		.1	.0	.0														
250.	*	.1	.4	.6	.4	.5	.1	.2	.2	.1	.1	.0	.0	.1	.2	.3	.1	
.1		.1	.0	.0														
255.	*	.1	.4	.5	.2	.2	.3	.2	.3	.1	.1	.0	.0	.0	.2	.4	.0	
.0		.0	.0	.0														
260.	*	.1	.4	.5	.2	.1	.3	.3	.3	.1	.1	.0	.0	.2	.3	.4	.0	
.0		.0	.0	.0														
265.	*	.1	.4	.5	.3	.1	.5	.3	.3	.1	.1	.0	.0	.3	.3	.3	.0	
.0		.0	.0	.0														
270.	*	.1	.4	.5	.1	.1	.6	.3	.3	.1	.1	.0	.0	.3	.2	.3	.0	
.0		.0	.0	.0														
275.	*	.1	.4	.5	.1	.1	.8	.7	.2	.1	.1	.0	.0	.4	.3	.2	.0	
.0		.0	.0	.0														
280.	*	.1	.4	.5	.1	.1	.9	.7	.2	.2	.1	.0	.0	.4	.3	.3	.0	
.0		.0	.0	.0														
285.	*	.1	.5	.5	.1	.0	1.0	.5	.2	.3	.1	.0	.1	.4	.3	.2	.0	
.0		.0	.0	.0														
290.	*	.1	.5	.5	.1	.0	.8	.6	.1	.2	.1	.0	.1	.4	.3	.2	.0	
.0		.0	.0	.0														
295.	*	.1	.5	.4	.1	.0	.8	.6	.3	.2	.1	.0	.2	.4	.4	.2	.0	
.0		.0	.0	.0														
300.	*	.1	.4	.4	.0	.0	.8	.6	.3	.1	.1	.0	.2	.3	.4	.2	.0	
.0		.0	.0	.0														
305.	*	.1	.4	.5	.0	.0	.8	.6	.4	.1	.1	.0	.2	.3	.4	.2	.0	
.0		.0	.0	.0														
310.	*	.1	.4	.5	.0	.0	.7	.5	.5	.1	.1	.0	.1	.2	.4	.2	.0	
.0		.0	.0	.0														
315.	*	.2	.4	.5	.0	.0	.7	.4	.5	.2	.1	.0	.0	.2	.4	.2	.0	
.0		.0	.0	.0														
320.	*	.2	.3	.4	.0	.0	.7	.5	.7	.2	.1	.0	.0	.2	.4	.2	.0	
.0		.0	.0	.0														
325.	*	.2	.3	.4	.0	.0	.7	.4	.7	.1	.1	.0	.0	.2	.4	.2	.0	

		PC_PB															
.0	.0	.0	.0														
330.	*	.1	.2	.3	.0	.0	.7	.4	.5	.2	.2	.0	.2	.2	.4	.2	.0
.0	.0	.0	.0														
335.	*	.1	.1	.2	.0	.0	.7	.6	.5	.3	.1	.1	.3	.5	.4	.2	.0
.0	.1	.1	.1														
340.	*	.1	.1	.2	.0	.0	.7	.6	.5	.2	.1	.1	.2	.5	.4	.2	.0
.0	.3	.2	.1														
345.	*	.0	.0	.0	.0	.0	.7	.6	.6	.2	.1	.2	.2	.5	.4	.2	.0
.0	.3	.2	.1														
350.	*	.0	.0	.0	.0	.0	.7	.6	.6	.1	.1	.2	.2	.6	.6	.2	.0
.0	.5	.2	.1														
355.	*	.0	.0	.0	.0	.0	.7	.6	.6	.1	.1	.2	.2	.5	.7	.2	.0
.0	.5	.2	.1														
360.	*	.0	.0	.0	.0	.0	.7	.6	.6	.1	.2	.2	.3	.5	.6	.2	.0
.0	.6	.2	.2														

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MAX	*	1.0	1.3	2.5	2.9	3.0	1.9	1.9	1.5	1.1	.8	.9	1.0	1.2	1.2	1.1	1.6
1.7	2.3	1.6	1.1														
DEGR.	*	85	85	80	80	80	65	70	70	65	60	60	65	65	65	70	75
75	75	85	85														

PAGE 6  
 JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (                      RUN: NYS ROUTE 311 @ INTERSTATE 84 EB  
 RAMPS

MODEL RESULTS  
 -----

REMARKS : In search of the angle corresponding to  
 the maximum concentration, only the first  
 angle, of the angles with same maximum  
 concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29
0.	*	.0	.0	.0	.0	.0	.0	.0	.2	.8
5.	*	.0	.0	.0	.0	.0	.0	.0	.3	.8
10.	*	.0	.0	.0	.0	.0	.0	.0	.3	.8
15.	*	.0	.0	.0	.0	.0	.0	.0	.3	.8
20.	*	.0	.0	.0	.0	.0	.0	.0	.3	.9
25.	*	.0	.0	.0	.0	.0	.0	.0	.3	.9
30.	*	.0	.0	.0	.0	.0	.0	.0	.3	.9
35.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.0
40.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.0
45.	*	.0	.0	.0	.0	.0	.0	.0	.4	1.0
50.	*	.0	.0	.0	.0	.0	.0	.0	.4	1.0
55.	*	.0	.0	.0	.0	.0	.0	.0	.5	1.2
60.	*	.0	.0	.0	.1	.0	.0	.0	.5	1.3
65.	*	.0	.0	.0	.3	.0	.0	.1	.4	1.3
70.	*	.0	.0	.0	.4	.0	.0	.2	.5	1.2
75.	*	.2	.2	.3	.6	.0	.1	.5	.5	1.3
80.	*	.4	.4	.5	.5	.1	.2	.6	.7	1.1
85.	*	.5	.5	.5	.2	.4	.3	.8	.8	1.0
90.	*	.5	.5	.5	.1	.5	.4	.8	.9	.7
95.	*	.5	.5	.0	.1	.5	.5	.9	.8	.5
100.	*	.5	.0	.0	.0	.5	.5	.6	.8	.2
105.	*	.2	.0	.0	.0	.5	.5	.6	.8	.1
110.	*	.0	.0	.0	.0	.3	.5	.6	.7	.0
115.	*	.0	.0	.0	.1	.2	.5	.6	.6	.0
120.	*	.0	.0	.0	.1	.0	.5	.6	.6	.0
125.	*	.0	.0	.0	.1	.0	.5	.6	.6	.0
130.	*	.0	.0	.0	.1	.0	.5	.6	.6	.0
135.	*	.0	.0	.0	.1	.0	.5	.6	.6	.0
140.	*	.0	.0	.0	.1	.0	.5	.6	.6	.0
145.	*	.0	.0	.0	.1	.0	.5	.6	.6	.0
150.	*	.0	.0	.0	.1	.0	.5	.6	.6	.0
155.	*	.0	.0	.0	.1	.0	.5	.6	.6	.0
160.	*	.0	.0	.0	.1	.0	.5	.6	.6	.0
165.	*	.0	.0	.0	.1	.0	.5	.6	.6	.0
170.	*	.0	.0	.0	.1	.0	.5	.6	.6	.0
175.	*	.0	.0	.0	.0	.0	.5	.6	.6	.0
180.	*	.0	.0	.0	.0	.0	.5	.6	.6	.0

								PC_PB	
185.	*	.0	.0	.0	.0	.0	.4	.6	.0
190.	*	.0	.0	.0	.0	.0	.4	.6	.0
195.	*	.0	.0	.0	.0	.0	.4	.6	.0
200.	*	.0	.0	.0	.0	.0	.4	.6	.0
205.	*	.0	.0	.0	.0	.0	.4	.6	.0

PAGE 7

JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (

RUN: NYS ROUTE 311 @ INTERSTATE 84 EB

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29
210.	*	.0	.0	.0	.0	.0	.3	.6	.6	.0
215.	*	.0	.0	.0	.0	.0	.3	.6	.6	.0
220.	*	.0	.0	.0	.0	.0	.3	.6	.6	.0
225.	*	.0	.0	.0	.0	.0	.2	.5	.6	.0
230.	*	.0	.0	.0	.0	.0	.0	.6	.6	.0
235.	*	.0	.0	.0	.0	.0	.0	.6	.7	.0
240.	*	.0	.0	.0	.0	.0	.0	.4	.8	.0
245.	*	.0	.0	.0	.0	.0	.0	.4	.7	.0
250.	*	.0	.0	.0	.0	.0	.0	.1	.8	.0
255.	*	.0	.0	.0	.0	.0	.0	.0	.6	.1
260.	*	.0	.0	.0	.0	.0	.0	.0	.4	.4
265.	*	.0	.0	.0	.0	.0	.0	.0	.4	.8
270.	*	.0	.0	.0	.0	.0	.0	.0	.4	1.1
275.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.3
280.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.3
285.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.2
290.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.2
295.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.1
300.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.1
305.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.0
310.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.0
315.	*	.0	.0	.0	.0	.0	.0	.0	.2	1.0
320.	*	.0	.0	.0	.0	.0	.0	.0	.2	1.0
325.	*	.0	.0	.0	.0	.0	.0	.0	.2	1.0
330.	*	.0	.0	.0	.0	.0	.0	.0	.2	.8
335.	*	.0	.0	.0	.0	.0	.0	.0	.2	.8
340.	*	.0	.0	.0	.0	.0	.0	.0	.2	.8
345.	*	.0	.0	.0	.0	.0	.0	.0	.2	.8
350.	*	.0	.0	.0	.0	.0	.0	.0	.2	.8
355.	*	.0	.0	.0	.0	.0	.0	.0	.2	.8
360.	*	.0	.0	.0	.0	.0	.0	.0	.2	.8
MAX DEGR.	*	.5	.5	.5	.6	.5	.5	.9	.9	1.3
	*	85	85	80	75	90	95	95	90	65

THE HIGHEST CONCENTRATION OF 3.00 PPM OCCURRED AT RECEPTOR REC5 .

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221

PAGE 1

JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (

RUN: NYS ROUTE 311 @ INTERSTATE 84 EB

DATE : 8/ 3/ 5  
TIME : 8:54:44

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S      VD = .0 CM/S      Z0 = 108. CM  
U = 1.0 M/S      CLAS = 5 (E)      ATIM = 60. MINUTES      MIXH = 1000. M      AMB = .0 PPM

LINK VARIABLES

H	W	V/C QUEUE	LINK DESCRIPTION	* LINK COORDINATES (FT)	* LENGTH (FT)	BRG TYPE (DEG)	VPH	EF
(G/MI)	(FT)	(FT)	(VEH)	X1      Y1      X2      Y2				

PC\_PB

1. PC_APPR1-EB	*	3.0	-5.0	-199.0	-99.0 *	223.	245.	AG	562.	5.8
.0 32.0										
2. PC_APPR2-EB	*	-199.0	-99.0	-314.0	-171.0 *	136.	238.	AG	562.	5.8
.0 32.0										
3. PC_APPR3-EB	*	-314.0	-171.0	-401.0	-219.0 *	99.	241.	AG	928.	5.8
.0 32.0										
4. PC_APPR4-EB	*	-401.0	-219.0	-526.0	-297.0 *	147.	238.	AG	928.	5.8
.0 32.0										
5. PC_APPR5-EB	*	-526.0	-297.0	-860.0	-505.0 *	393.	238.	AG	928.	5.8
.0 32.0										
6. PC_DEP1-EB	*	3.0	-5.0	35.0	2.0 *	33.	78.	AG	562.	5.8
.0 32.0										
7. PC_DEP2-EB	*	35.0	2.0	213.0	69.0 *	190.	69.	AG	698.	5.8
.0 32.0										
8. PC_DEP3-EB	*	213.0	69.0	412.0	121.0 *	206.	75.	AG	698.	5.8
.0 32.0										
9. PC_DEP4-EB	*	412.0	121.0	631.0	155.0 *	222.	81.	AG	698.	5.8
.0 32.0										
10. PC_DEP5-EB	*	631.0	155.0	978.0	163.0 *	347.	89.	AG	698.	5.8
.0 32.0										
11. PC_QMAIN1-EB	*	-51.0	-31.0	-129.2	-66.9 *	86.	245.	AG	77.	100.0
.0 12.0 .70 4.4										
12. PC_QMAIN2-EB	*	-199.0	-99.0	-271.9	-144.7 *	86.	238.	AG	77.	100.0
.0 12.0 .70 4.4										
13. PC_QMAIN3-EB	*	-317.0	-171.0	-1682.2	-951.1 *	1572.	240.	AG	77.	100.0
.0 12.0 1.16 79.9										
14. PC_QMAIN4-EB	*	-401.0	-219.0	-1735.0	-1051.4 *	1572.	238.	AG	77.	100.0
.0 12.0 1.16 79.9										
15. PC_QMAIN5-EB	*	-526.0	-297.0	-1860.7	-1128.2 *	1572.	238.	AG	77.	100.0
.0 12.0 1.16 79.9										
16. PC_ORIGHT-EB	*	-48.0	-39.0	-98.6	-63.0 *	56.	245.	AG	77.	100.0
.0 12.0 .46 2.8										
17. PC_RIGHTAPPR1-EB	*	-12.0	-35.0	-48.0	-39.0 *	36.	264.	AG	366.	5.8
.0 32.0										
18. PC_RIGHTAPPR2-EB	*	-48.0	-39.0	-263.0	-141.0 *	238.	245.	AG	366.	5.8
.0 32.0										
19. PC_RIGHTDEP-EB	*	-12.0	-35.0	25.0	-44.0 *	38.	104.	AG	366.	5.8
.0 32.0										
20. PC_APPR1-WB	*	-27.0	-6.0	21.0	20.0 *	55.	62.	AG	859.	5.8
.0 32.0										
21. PC_APPR2-WB	*	21.0	20.0	95.0	50.0 *	80.	68.	AG	859.	5.8
.0 32.0										
22. PC_APPR3-WB	*	95.0	50.0	206.0	79.0 *	115.	75.	AG	859.	5.8
.0 32.0										
23. PC_APPR4-WB	*	206.0	79.0	433.0	142.0 *	236.	74.	AG	942.	5.8
.0 32.0										
24. PC_APPR5-WB	*	433.0	142.0	646.0	173.0 *	215.	82.	AG	942.	5.8
.0 32.0										
25. PC_APPR6-WB	*	646.0	173.0	975.0	177.0 *	329.	89.	AG	942.	5.8
.0 32.0										
26. PC_DEP1-WB	*	-27.0	-6.0	-181.0	-77.0 *	170.	245.	AG	1111.	5.8
.0 32.0										
27. PC_DEP2-WB	*	-181.0	-77.0	-294.0	-140.0 *	129.	241.	AG	1111.	5.8
.0 32.0										
28. PC_DEP3-WB	*	-294.0	-140.0	-683.0	-379.0 *	457.	238.	AG	1111.	5.8
.0 32.0										
29. PC_DEP4-WB	*	-683.0	-379.0	-867.0	-474.0 *	207.	243.	AG	1111.	5.8
.0 32.0										
30. PC_QMAIN1-WB	*	21.0	20.0	6077.1	2475.2 *	6535.	68.	AG	135.	100.0
.0 12.0 3.59 332.0										
31. PC_QMAIN2-WB	*	95.0	50.0	6417.6	1701.8 *	6535.	75.	AG	135.	100.0
.0 12.0 3.59 332.0										
32. PC_QMAIN3-WB	*	206.0	79.0	7330.2	2056.2 *	7394.	74.	AG	135.	100.0
.0 12.0 3.94 375.6										
33. PC_QMAIN4-WB	*	433.0	142.0	7749.4	1206.8 *	7394.	82.	AG	135.	100.0
.0 12.0 3.94 375.6										
34. PC_QMAIN5-WB	*	646.0	173.0	8039.0	262.9 *	7394.	89.	AG	135.	100.0
.0 12.0 3.94 375.6										
35. PC_QLEFT-WB	*	25.0	8.0	45.7	16.1 *	22.	69.	AG	135.	100.0
.0 12.0 .35 1.1										
36. PC_LEFTDEP-WB	*	25.0	8.0	25.0	-44.0 *	52.	180.	AG	83.	5.8
.0 32.0										
37. PC_APPR1-SB	*	25.0	-44.0	-13.0	24.0 *	78.	331.	AG	3.	7.7
.0 32.0										
38. PC_APPR2-SB	*	-13.0	24.0	-28.0	60.0 *	39.	337.	AG	139.	7.7
.0 32.0										
39. PC_APPR3-SB	*	-28.0	60.0	-251.0	513.0 *	505.	334.	AG	391.	7.7
.0 32.0										

				PC_PB									
.0	40.	PC_APPR4-SB	*	-251.0	513.0	-391.0	936.0	*	446.	342.	AG	391.	7.7
.0	32.0												
.0	41.	PC_DEP1-SB	*	25.0	-44.0	140.0	-252.0	*	238.	151.	AG	452.	7.7
.0	32.0												
.0	42.	PC_DEP2-SB	*	140.0	-252.0	186.0	-317.0	*	80.	145.	AG	452.	7.7
.0	32.0												
.0	43.	PC_DEP3-SB	*	186.0	-317.0	332.0	-507.0	*	240.	142.	AG	452.	7.7
.0	32.0												
.0	44.	PC_DEP4-SB	*	332.0	-507.0	418.0	-625.0	*	146.	144.	AG	452.	7.7
.0	32.0												

PAGE 2

JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (

RUN: NYS ROUTE 311 @ INTERSTATE 84 EB

DATE : 8/ 3/ 5  
TIME : 8:54:44

LINK VARIABLES

H	W	V/C	LINK DESCRIPTION	* (VEH)	X1	Y1	X2	Y2	* (FT)	BRG (DEG)	TYPE	VPH	EF	
(G/MI)	(FT)	(FT)												
.0	45.		PC_DEP5-SB	*	418.0	-625.0	467.0	-700.0	*	90.	147.	AG	452.	7.7
.0	32.0													
.0	46.		PC_DEP6-SB	*	467.0	-700.0	578.0	-894.0	*	224.	150.	AG	452.	7.7
.0	32.0													
.0	47.	.35	PC_QMAIN1-SB	*	-13.0	24.0	-25.6	54.2	*	33.	337.	AG	117.	100.0
.0	12.0	1.7												
.0	48.	.98	PC_QMAIN2-SB	*	-28.0	60.0	-104.7	215.9	*	174.	334.	AG	117.	100.0
.0	12.0	8.8												
.0	49.	.98	PC_QMAIN3-SB	*	-251.0	513.0	-305.6	678.0	*	174.	342.	AG	117.	100.0
.0	12.0	8.8												
.0	50.	.63	PC_QRIGHT-SB	*	-24.0	19.0	-49.5	72.5	*	59.	334.	AG	117.	100.0
.0	12.0	3.0												
.0	51.		PC_RIGHTAPPR-SB	*	-24.0	19.0	-110.0	199.0	*	199.	334.	AG	252.	7.7
.0	32.0													
.0	52.		PC_RIGHTDEP-SB	*	-24.0	19.0	-27.0	-7.0	*	26.	187.	AG	252.	7.7
.0	12.0													
.0	53.		PC_LEFTDEP-SB	*	-13.0	24.0	35.0	2.0	*	53.	115.	AG	136.	7.7
.0	32.0													

PAGE 3

JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (

RUN: NYS ROUTE 311 @ INTERSTATE 84 EB

DATE : 8/ 3/ 5  
TIME : 8:54:44

ADDITIONAL QUEUE LINK PARAMETERS

ARRIVAL RATE	LINK DESCRIPTION	* (SEC)	CYCLE (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE
3	11.		60	28	.0	562	1600	61.61	1
3	12.		60	28	.0	562	1600	61.61	1
3	13.		60	28	.0	928	1600	61.61	1
3	14.		60	28	.0	928	1600	61.61	1
3	15.		60	28	.0	928	1600	61.61	1
3	16.		60	28	.0	366	1600	61.61	1
5	30.		60	49	.0	859	1600	61.61	1
5	31.		60	49	.0	859	1600	61.61	1
5	32.		60	49	.0	942	1600	61.61	1

					PC_PB					
5	33.	PC_QMAIN4-WB	*	60	49	.0	942	1600	61.61	1
5	34.	PC_QMAIN5-WB	*	60	49	.0	942	1600	61.61	1
5	35.	PC_QLEFT-WB	*	60	49	.0	83	1600	61.61	1
5	47.	PC_QMAIN1-SB	*	60	43	.0	139	1600	60.77	1
3	48.	PC_QMAIN2-SB	*	60	43	.0	391	1600	60.77	1
3	49.	PC_QMAIN3-SB	*	60	43	.0	391	1600	60.77	1
3	50.	PC_QRIGHT-SB	*	60	43	.0	252	1600	60.77	1

RECEPTOR LOCATIONS

RECEPTOR	*	X	COORDINATES (FT)	Y	Z	*
1. R1-SDWK1	*	-56.0	161.0	1.8	*	
2. R2-SDWK2	*	-24.0	96.0	1.8	*	
3. R3-SDWK3	*	5.0	36.0	1.8	*	
4. R4-SDWK4	*	85.0	65.0	1.8	*	
5. R5-SDWK5	*	156.0	89.0	1.8	*	
6. R6-SDWK6	*	189.0	40.0	1.8	*	
7. R7-SDWK7	*	118.0	13.0	1.8	*	
8. R8-SDWK8	*	43.0	-22.0	1.8	*	
9. R9-SDWK9	*	68.0	-83.0	1.8	*	
10. R10-SDWK10	*	101.0	-143.0	1.8	*	
11. R11-SDWK11	*	75.0	-173.0	1.8	*	
12. R12-SDWK12	*	37.0	-105.0	1.8	*	
13. R13-SDWK13	*	-12.0	-54.0	1.8	*	
14. R14-SDWK14	*	-62.0	-66.0	1.8	*	
15. R15-SDWK15	*	-145.0	-106.0	1.8	*	
16. R16-SDWK16	*	-166.0	-50.0	1.8	*	
17. R17-SDWK17	*	-101.0	-20.0	1.8	*	
18. R18-SDWK18	*	-44.0	10.0	1.8	*	
19. R19-SDWK19	*	-76.0	87.0	1.8	*	
20. R20-SDWK20	*	-108.0	153.0	1.8	*	
21. R21	*	-559.0	257.0	1.8	*	
22. R22	*	-981.0	163.0	1.8	*	
23. R23	*	-1009.0	50.0	1.8	*	
24. R24	*	-851.0	-331.0	1.8	*	
25. R25	*	-573.0	489.0	1.8	*	
26. R26	*	738.0	660.0	1.8	*	
27. R27	*	939.0	489.0	1.8	*	
28. R28	*	1110.0	416.0	1.8	*	
29. R29	*	1331.0	166.0	1.8	*	

PAGE 4

JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS (

RUN: NYS ROUTE 311 @ INTERSTATE 84 EB

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND \* CONCENTRATION  
 ANGLE \* (PPM)  
 (DEGR) \* REC1 REC2 REC3 REC4 REC5 REC6 REC7 REC8 REC9 REC10 REC11 REC12 REC13 REC14 REC15 REC16  
 REC17 REC18 REC19 REC20

ANGLE	*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	*	.0	.0	.0	.0	.0	.7	.6	.6	.3	.2	.3	.4	.5	1.1	.4	.0				
.2		.8	.5	.3																	
5.	*	.0	.0	.0	.0	.0	.7	.7	.5	.3	.2	.3	.4	.4	1.1	.4	.0				
.2		.7	.5	.4																	
10.	*	.0	.0	.0	.0	.0	.8	.9	.5	.3	.2	.4	.5	.3	.9	.5	.0				
.2		.7	.5	.4																	
15.	*	.0	.0	.0	.0	.0	1.0	.9	.5	.4	.2	.4	.5	.4	1.0	.6	.1				

																	PC_PB																
.2	.8	.5	.4																														
20.	*	.0	.0	.0	.0	.0	1.1	.9	.5	.5	.2	.4	.6	.3	1.0	.6	.1																
.1	.6	.5	.5																														
25.	*	.0	.0	.0	.0	.0	1.2	.9	.6	.5	.3	.3	.5	.5	.9	.6	.1																
.2	.7	.5	.5																														
30.	*	.0	.0	.0	.0	.0	1.1	.9	.7	.6	.3	.4	.6	.6	.7	.7	.1																
.2	.6	.5	.5																														
35.	*	.0	.0	.0	.0	.0	1.2	.9	.8	.7	.4	.4	.6	.5	.6	.7	.1																
.2	.6	.5	.5																														
40.	*	.0	.0	.0	.0	.0	1.3	.9	.9	.6	.5	.4	.7	.8	.6	.8	.1																
.2	.6	.4	.4																														
45.	*	.0	.0	.0	.0	.0	1.6	1.1	.8	.6	.4	.5	.6	.8	.7	.8	.2																
.3	.6	.4	.4																														
50.	*	.0	.0	.0	.0	.1	1.6	1.4	1.1	.7	.7	.6	.8	1.0	.9	.8	.2																
.2	.6	.4	.4																														
55.	*	.0	.0	.1	.1	.2	1.8	1.7	1.2	.9	.7	.8	1.0	1.0	1.0	1.0	.3																
.4	.6	.4	.4																														
60.	*	.0	.1	.5	.5	.6	2.1	1.9	1.6	.8	.8	.9	.9	1.3	1.0	1.2	.8																
.8	.9	.5	.4																														
65.	*	.1	.4	1.2	1.2	1.2	2.4	2.0	1.6	1.2	.9	1.0	1.2	1.5	1.2	1.2	1.1																
1.5	1.7	.7	.5																														
70.	*	.4	.8	1.9	2.0	1.9	2.3	2.0	1.6	1.1	.8	.9	1.2	1.4	1.4	1.2	1.6																
1.9	2.2	1.1	.8																														
75.	*	.7	1.2	2.5	2.8	2.9	1.8	1.7	1.3	.8	.5	.6	.9	1.1	1.1	.9	1.9																
2.1	2.6	1.6	1.1																														
80.	*	.9	1.4	2.8	3.0	3.3	1.3	1.2	.9	.6	.5	.5	.7	1.0	.9	.6	1.7																
1.8	2.4	1.6	1.3																														
85.	*	1.1	1.6	2.1	3.0	3.1	.6	.6	.6	.3	.2	.3	.4	.7	.5	.3	1.4																
1.4	1.7	1.8	1.5																														
90.	*	1.0	1.3	1.6	2.4	2.6	.3	.3	.2	.1	.1	.2	.2	.3	.2	.1	1.1																
.7	1.3	1.6	1.5																														
95.	*	.9	1.0	1.0	1.9	2.3	.1	.1	.1	.0	.0	.1	.1	.1	.1	.0	.9																
.6	.7	1.1	1.3																														
100.	*	.8	.6	.8	1.5	1.8	.0	.0	.0	.0	.0	.2	.1	.1	.1	.0	.8																
.5	.5	1.1	1.0																														
105.	*	.4	.6	.8	1.3	1.8	.0	.0	.0	.0	.0	.2	.2	.1	.1	.0	.7																
.6	.4	1.0	.8																														
110.	*	.3	.5	.8	1.3	1.5	.0	.0	.0	.0	.0	.2	.2	.1	.1	.0	.6																
.6	.5	1.0	.7																														
115.	*	.2	.5	.8	1.2	1.3	.0	.0	.0	.0	.0	.2	.2	.1	.1	.0	.6																
.8	.4	1.0	.7																														
120.	*	.2	.4	.7	1.1	1.2	.0	.0	.0	.0	.0	.2	.2	.1	.1	.0	.6																
.8	.3	.8	.7																														
125.	*	.2	.4	.8	1.1	1.2	.0	.0	.0	.0	.0	.2	.2	.1	.1	.0	.5																
.9	.4	.8	.6																														
130.	*	.1	.4	.7	1.1	1.2	.0	.0	.0	.0	.0	.2	.2	.1	.0	.0	.4																
.8	.4	.7	.6																														
135.	*	.1	.3	.7	1.0	1.2	.0	.0	.0	.0	.0	.2	.2	.1	.0	.0	.4																
.7	.4	.6	.7																														
140.	*	.1	.3	.5	1.0	1.1	.0	.0	.0	.0	.0	.3	.2	.1	.0	.0	.4																
.7	.5	.7	.6																														
145.	*	.1	.3	.4	.9	1.1	.0	.0	.0	.1	.1	.2	.2	.1	.0	.0	.4																
.7	.4	.6	.4																														
150.	*	.3	.3	.6	.9	1.0	.0	.0	.1	.1	.2	.1	.1	.0	.0	.0	.5																
.8	.4	.4	.3																														
155.	*	.2	.2	.5	.9	1.1	.0	.0	.1	.2	.1	.1	.1	.0	.0	.0	.5																
.8	.3	.3	.2																														
160.	*	.5	.3	.4	.8	1.1	.0	.0	.1	.2	.2	.0	.1	.0	.0	.0	.5																
.8	.3	.1	.2																														
165.	*	.6	.3	.4	.7	1.0	.0	.0	.2	.2	.2	.0	.0	.0	.0	.0	.4																
.7	.3	.1	.1																														
170.	*	.9	.6	.4	.7	1.0	.0	.0	.2	.2	.2	.0	.0	.0	.0	.0	.4																
.7	.3	.1	.1																														
175.	*	.8	.6	.3	.7	1.1	.0	.0	.2	.2	.2	.0	.0	.0	.0	.0	.4																
.7	.3	.3	.1																														
180.	*	.9	.6	.2	.8	1.1	.0	.0	.1	.2	.2	.0	.0	.0	.0	.0	.4																
.7	.4	.3	.1																														
185.	*	.9	.8	.3	.8	1.1	.0	.1	.1	.2	.2	.0	.0	.0	.0	.0	.4																
.7	.5	.2	.1																														
190.	*	.7	.9	.3	.8	1.1	.0	.1	.1	.2	.2	.0	.0	.0	.0	.0	.4																
.7	.5	.2	.1																														
195.	*	.7	1.2	.3	.8	1.2	.0	.1	.1	.2	.2	.0	.0	.0	.0	.0	.5																
.7	.6	.2	.0																														
200.	*	.7	1.1	.3	.7	1.2	.0	.1	.1	.2	.2	.0	.0	.0	.0	.0	.5																
.7	.6	.1	.0																														
205.	*	.6	1.1	.4	.8	1.2	.0	.1	.1	.1	.1	.0	.0	.0	.0	.0	.6																
.6	.8	.1	.0																														

WIND \* CONCENTRATION  
 ANGLE \* (PPM)  
 (DEGR) \* REC1 REC2 REC3 REC4 REC5 REC6 REC7 REC8 REC9 REC10 REC11 REC12 REC13 REC14 REC15 REC16  
 REC17 REC18 REC19 REC20  
 REC21 REC22 REC23 REC24 REC25 REC26 REC27 REC28 REC29

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210.	*	.5	1.0	.4	.9	1.3	.0	.1	.1	.1	.1	.0	.0	.0	.0	.8
.6		.8	.1	.0												
215.	*	.5	.8	.6	1.0	1.3	.0	.0	.1	.1	.1	.0	.0	.0	.0	.8
.6		.8	.2	.2												
220.	*	.8	.8	.7	1.0	1.3	.0	.0	.1	.1	.1	.0	.0	.0	.0	.9
.6		.8	.3	.3												
225.	*	.9	1.1	.8	.9	1.4	.0	.0	.0	.1	.1	.0	.0	.0	.0	1.0
.9		.7	.5	.4												
230.	*	.9	1.0	1.1	1.1	1.5	.0	.0	.1	.1	.1	.0	.0	.0	.2	1.0
1.2		1.2	.4	.3												
235.	*	.8	1.0	1.2	1.3	1.8	.0	.2	.4	.1	.1	.0	.0	.3	.3	1.2
1.1		1.1	.4	.3												
240.	*	.5	.8	1.2	1.2	1.7	.4	.3	.5	.4	.1	.0	.3	.4	.5	.9
1.0		.8	.3	.0												
245.	*	.5	.5	.9	1.1	1.3	.4	.6	.6	.4	.4	.3	.3	.4	.8	.7
.7		.7	.0	.0												
250.	*	.5	.5	.6	.5	.7	.5	.6	.9	.5	.4	.3	.4	.6	.8	1.0
.4		.2	.0	.0												
255.	*	.5	.5	.5	.3	.5	.4	.4	.8	.4	.5	.3	.3	.8	.7	.6
.1		.1	.0	.0												
260.	*	.5	.5	.6	.2	.2	.5	.5	.5	.3	.4	.3	.2	.6	.6	.6
.0		.0	.0	.0												
265.	*	.5	.5	.6	.3	.1	.7	.6	.5	.1	.3	.2	.0	.6	.6	.6
.0		.0	.0	.0												
270.	*	.5	.5	.6	.2	.1	.8	.6	.4	.2	.1	.1	.1	.8	.7	.6
.0		.0	.0	.0												
275.	*	.5	.5	.6	.2	.1	.9	.7	.2	.4	.1	.0	.0	.8	.8	.6
.0		.0	.0	.0												
280.	*	.5	.5	.7	.1	.1	.9	.8	.3	.5	.2	.0	.1	.9	.8	.5
.0		.0	.0	.0												
285.	*	.6	.6	.6	.1	.1	1.0	.7	.4	.6	.2	.0	.3	.7	.8	.5
.0		.0	.0	.0												
290.	*	.6	.6	.6	.1	.1	1.1	.8	.4	.5	.3	.0	.4	.6	.8	.3
.0		.0	.0	.0												
295.	*	.6	.6	.6	.2	.1	1.1	.7	.3	.4	.3	.0	.4	.6	.8	.3
.0		.0	.0	.0												
300.	*	.7	.7	.6	.2	.0	1.1	.7	.3	.4	.3	.1	.4	.5	.8	.4
.0		.0	.0	.0												
305.	*	.6	.7	.7	.2	.0	1.0	.8	.4	.3	.3	.1	.3	.5	.8	.4
.0		.0	.0	.0												
310.	*	.6	.7	.7	.2	.0	.9	.8	.5	.1	.3	.1	.1	.4	.8	.4
.0		.0	.0	.0												
315.	*	.5	.7	.8	.1	.0	.9	.6	.7	.3	.2	.1	.1	.3	.8	.4
.0		.0	.0	.0												
320.	*	.4	.6	.7	.0	.0	.7	.5	.9	.4	.3	.0	.1	.3	.8	.3
.0		.0	.0	.0												
325.	*	.4	.5	.7	.0	.0	.7	.6	.9	.5	.3	.1	.2	.3	.8	.3
.0		.0	.0	.0												
330.	*	.3	.4	.5	.0	.0	.8	.7	.7	.4	.3	.2	.4	.5	.8	.4
.0		.0	.1	.0												
335.	*	.2	.2	.3	.0	.0	.8	.7	.7	.4	.3	.4	.4	.6	.8	.4
.0		.3	.3	.1												
340.	*	.1	.2	.2	.0	.0	.8	.7	.8	.3	.1	.3	.5	.8	.8	.4
.0		.5	.3	.2												
345.	*	.0	.0	.1	.0	.0	.8	.7	.6	.3	.1	.4	.2	1.1	1.0	.4
.0		.5	.4	.2												
350.	*	.0	.0	.0	.0	.0	.8	.7	.6	.3	.1	.3	.3	.9	1.0	.4
.1		.7	.4	.3												
355.	*	.0	.0	.0	.0	.0	.7	.6	.6	.3	.1	.3	.3	.6	1.0	.4
.2		.7	.5	.3												
360.	*	.0	.0	.0	.0	.0	.7	.6	.6	.3	.2	.3	.4	.5	1.1	.4
.2		.8	.5	.3												

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MAX	*	1.1	1.6	2.8	3.0	3.3	2.4	2.0	1.6	1.2	.9	1.0	1.2	1.5	1.4	1.2	1.9
2.1		2.6	1.8	1.5													

DEGR. \* 85 85 80 80 80 65 65 PC\_PB 65 65 65 65 65 70 60 75  
 75 75 85 85

PAGE 6  
 JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS ( RUN: NYS ROUTE 311 @ INTERSTATE 84 EB  
 RAMPS

MODEL RESULTS  
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REMARKS : In search of the angle corresponding to  
 the maximum concentration, only the first  
 angle, of the angles with same maximum  
 concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* * *	CONCENTRATION (PPM)								
		REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29
0.	*	.0	.0	.0	.0	.0	.0	.0	.2	.8
5.	*	.0	.0	.0	.0	.0	.0	.0	.3	.8
10.	*	.0	.0	.0	.0	.0	.0	.0	.3	.8
15.	*	.0	.0	.0	.0	.0	.0	.0	.3	.8
20.	*	.0	.0	.0	.0	.0	.0	.0	.3	.9
25.	*	.0	.0	.0	.0	.0	.0	.0	.3	.9
30.	*	.0	.0	.0	.0	.0	.0	.0	.3	.9
35.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.0
40.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.0
45.	*	.0	.0	.0	.0	.0	.0	.0	.4	1.0
50.	*	.0	.0	.0	.0	.0	.0	.0	.4	1.0
55.	*	.0	.0	.0	.0	.0	.0	.0	.5	1.2
60.	*	.0	.0	.0	.1	.0	.0	.1	.5	1.3
65.	*	.0	.0	.0	.4	.1	.0	.2	.6	1.4
70.	*	.1	.1	.1	.8	.1	.1	.4	.7	1.4
75.	*	.3	.3	.4	.7	.2	.2	.5	.7	1.3
80.	*	.4	.4	.5	.7	.4	.3	.8	.8	1.3
85.	*	.5	.5	.5	.6	.4	.4	.8	.9	1.1
90.	*	.5	.5	.5	.5	.5	.5	.9	.9	.9
95.	*	.5	.5	.1	.5	.5	.5	.9	.9	.5
100.	*	.5	.0	.0	.5	.5	.5	.7	.8	.2
105.	*	.2	.0	.0	.4	.5	.5	.6	.8	.1
110.	*	.0	.0	.0	.5	.3	.5	.6	.7	.0
115.	*	.0	.0	.0	.5	.2	.5	.6	.6	.0
120.	*	.0	.0	.0	.5	.0	.5	.6	.6	.0
125.	*	.0	.0	.0	.5	.0	.5	.6	.6	.0
130.	*	.0	.0	.0	.5	.0	.5	.6	.6	.0
135.	*	.0	.0	.0	.5	.0	.5	.6	.6	.0
140.	*	.0	.0	.0	.5	.0	.5	.6	.6	.0
145.	*	.0	.0	.0	.5	.0	.5	.6	.6	.0
150.	*	.0	.0	.0	.5	.0	.5	.6	.6	.0
155.	*	.0	.0	.0	.5	.0	.5	.6	.6	.0
160.	*	.0	.0	.0	.5	.0	.5	.6	.6	.0
165.	*	.0	.0	.0	.5	.0	.5	.6	.6	.0
170.	*	.0	.0	.0	.5	.0	.5	.6	.6	.0
175.	*	.0	.0	.0	.5	.0	.5	.6	.6	.0
180.	*	.0	.0	.0	.4	.0	.5	.6	.6	.0
185.	*	.0	.0	.0	.4	.0	.4	.6	.6	.0
190.	*	.0	.0	.0	.3	.0	.4	.6	.6	.0
195.	*	.0	.0	.0	.3	.0	.4	.6	.6	.0
200.	*	.0	.0	.0	.3	.0	.4	.6	.6	.0
205.	*	.0	.0	.0	.3	.0	.4	.6	.6	.0

PAGE 7  
 JOB: NYS ROUTE 311 @ INTERSTATE 84 EB RAMPS ( RUN: NYS ROUTE 311 @ INTERSTATE 84 EB  
 RAMPS

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* * *	CONCENTRATION (PPM)								
		REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29
210.	*	.0	.0	.0	.3	.0	.3	.6	.6	.0
215.	*	.0	.0	.0	.3	.0	.3	.6	.6	.0
220.	*	.0	.0	.0	.3	.0	.3	.6	.6	.0
225.	*	.0	.0	.0	.3	.0	.2	.5	.7	.0

								PC_PB		
230.	*	.0	.0	.0	.3	.0	.0	.6	.7	.0
235.	*	.0	.0	.0	.2	.0	.0	.6	.7	.0
240.	*	.0	.0	.0	.0	.0	.0	.4	.8	.0
245.	*	.0	.0	.0	.0	.0	.0	.4	.7	.0
250.	*	.0	.0	.0	.0	.0	.0	.1	.8	.0
255.	*	.0	.0	.0	.0	.0	.0	.0	.6	.1
260.	*	.0	.0	.0	.0	.0	.0	.0	.4	.4
265.	*	.0	.0	.0	.0	.0	.0	.0	.4	.8
270.	*	.0	.0	.0	.0	.0	.0	.0	.4	1.2
275.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.3
280.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.3
285.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.2
290.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.2
295.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.1
300.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.1
305.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.0
310.	*	.0	.0	.0	.0	.0	.0	.0	.3	1.0
315.	*	.0	.0	.0	.0	.0	.0	.0	.2	1.0
320.	*	.0	.0	.0	.0	.0	.0	.0	.2	1.0
325.	*	.0	.0	.0	.0	.0	.0	.0	.2	1.0
330.	*	.0	.0	.0	.0	.0	.0	.0	.2	.8
335.	*	.0	.0	.0	.0	.0	.0	.0	.2	.8
340.	*	.0	.0	.0	.0	.0	.0	.0	.2	.8
345.	*	.0	.0	.0	.0	.0	.0	.0	.2	.8
350.	*	.0	.0	.0	.0	.0	.0	.0	.2	.8
355.	*	.0	.0	.0	.0	.0	.0	.0	.2	.8
360.	*	.0	.0	.0	.0	.0	.0	.0	.2	.8
-----*										
MAX	*	.5	.5	.5	.8	.5	.5	.9	.9	1.4
DEGR.	*	85	85	80	70	90	90	90	85	65

THE HIGHEST CONCENTRATION OF 3.30 PPM OCCURRED AT RECEPTOR REC5 .

