TRANSMITTAL

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Date: 9/1/2020	**VHB Project No.:** 14925.00
Re: 138 Forest Street – Special Permit/Site Plan Review	

To: Janine Viarella
Building Department/Board of Appeals
71 Mt. Vernon Street
Winchester, MA 01890

We are sending you: ☒ Attached ☐ Under Separate cover via Regular Mail the following items:

☐ Shop drawings ☒ Prints ☒ Plans ☐ DVDs ☐ Specifications ☐ Copy of Letter ☐ ChgOd
☒ Other PDF File (Emailed to Town)

Copies	Date	No.	Description
20	09/01/2020	1-2	Cover Letter
20	09/01/2020	1-2	Form 2
20	09/01/2020	1	Form 2D
20	08/27/2020	Pages 1-3	138 Forest Street Storm Water Analysis/O&M (Full report provided in PDF)
20	09/01/2020	L1-L10	Site Plans-Cover Sheet, Survey/Tree Removal, Ex. Cond. Photos, Site Plan, Grading/Drainage, Planting Plan, Details
20	08/26/2020	A1-A5	Elevations and floor plans

These are transmitted as checked below:

☐ For approval
☒ For your use
☐ As requested
☐ For review and comment
☐ Returned prints on loan to VHB

☐ Approved as submitted
☐ Approved as noted
☐ Return for corrections
☐ For bids due

☐ Resubmit ____ Copies for approval
☐ Submit ____ Copies for distribution
☐ Return ____ Corrected prints

REMARKS:

VHB agrees to provide materials to the Client stored electronically. The Client recognizes that data, plans, specifications, reports, documents, or other information recorded on or transmitted as electronic media, including, but not limit to, CADD Documents (together, "Electronic Documents") are subject to undetectable alteration, either intentional or unintentional, due to, among other causes, transmission, conversion, media degradation, software error, or human alteration. Accordingly, the Electronic Documents are provided to the Client for informational purposes only and not as an end product. VHB makes no warranties, either express or implied, regarding the fitness or suitability of the Electronic Documents.

The Electronic Documents are instruments of professional service, and shall not be used, in whole or in part, for any project other than that for which they were created, without the express written consent of VHB and without suitable compensation to VHB. Accordingly, the Client agrees to waive any and all claims against VHB resulting in any way from the unauthorized alternation, misuse or reuse of the Electronic Documents, and to defend, indemnify, and hold VHB harmless for any claims, losses, damages, or costs, including attorney's fees, arising out of the alteration, misuse or reuse of any Electronic Documents.

Copy to: Tim O'Donnell

By: Erik J. Bednarek, VHB, Inc.

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September 1, 2020

Janine Viarella
Building Department/Board of Appeals
Town of Winchester
71 Mt. Vernon Street
Winchester, MA 01890

RE: 138 Forest Street – Special Permit/Site Plan Review

Attention Janine:

On behalf of the Client, Tim and Jacqueline O'Donnell, please accept our Application submission for 138 Forest Street including Forms 2/2D, Stormwater Analysis, and Site/Architecture Plans. We have mailed a hardcopy as stated in the Transmittal along with the digital PDF as required by the Town.

Tim and Jaqueline O'Donnell have been residents of Winchester for the past 7 years. They have three small children with limited space within the house and their exterior yard space poses many hazards for them. The front lawn is open to Forest Street and a steep slope with rotted timbers make up the back yard. Stormwater currently drains toward their foundation and large older trees loom over their house. Hemlock trees on the west side of their property have very high branching providing no effective screening. The Hemlocks are also highly susceptible to Hemlock Wooly Adelgid and most likely will need to be removed in the future.

The Client would now like to improve their property to provide a safer environment for their children to play and their curb appeal to complement the neighborhood. And improved grading of the back yard would allow for a more level scenario with their neighbor's backyards. The Client has initiated the services of VHB and other qualified subconsultants so they can integrate the project thoughtfully with sound technical guidance to support the design. Terraces have been proposed to transition the grading attractively and create functional spaces and enhancing views out and into the property. Materials for walls and stairs will be in scale with the residential character and complement the architecture of their new home. New mixed plantings (deciduous and evergreens) will be installed to attractively integrate the terraces into the landscape while also provide planted buffers to screen views into the property and out.

101 Walnut Street
PO Box 9151
Watertown, Massachusetts 02471
P 617.924.1770
F 617.924.2286

The design is reinforced with technical guidance of qualified professionals to assure we have provided a sound design according to Town requirements including: Professional survey (VHB), stormwater design and analysis (VHB) and Geotechnical tests/data (LGCI) and the walls will be engineered by a reputable wall manufacturer. Our planting plan incorporates native species blended with durable (non-invasive) species to provide an attractive display of flowers throughout the growing season while also providing attractive screening all year round.

Landscape lighting (shown on the digital PDF, Sheet L-3) will be used to enhance safe transitions between the various terraces and spaces while incorporating a tasteful low level of LED glow to various trees and landscape features. Fixtures will either be directed downward (Dark-sky) or equipped with hoods/shields to specifically direct light or glow away from neighbors. We will consult our lighting design with lighting specialist Eric Mitchell of Northeast Nursery who we have worked with for many years, to assure our lighting design will be attractive, soft and safe.

We would like to note that our PDF (digital submission) also contains the full 75-page stormwater report with calculations, supporting data and O&M plan. We will also be able to provide any other geotechnical data once we receive the full report from LGCI.

Thank you for your time to review our submission and we look forward to answering any of your questions at the next earliest available meeting time.

Warm regards,

Erik J. Bednarek

Landscape Architecture Group Leader

FORM 2D

Town of Winchester

MIDDLESEX COUNTY, MASSACHUSETTS

TOWN HALL
71 MOUNT VERNON STREET
WINCHESTER, MASSACHUSETTS 01890
(617) 721-7115

BOARD OF APPEALS

Date: September 1. 2020

To the Board of Appeal of the Town of Winchester:

The undersigned hereby petitions the Board of Appeal for the relief specified below.

Property Location 138 Forest Street / Winchester. MA Lot # Map 1 Block 20

Zoning District: B-RDB-10 Area of Lot: 30.628 SF Frontage: 103.08'

Street Frontage is: (X) Public Way ( ) Subdivision Control Way ( ) Private Way

Owner of Record: Timmothy P. and JAcqueline O'Donnell

Mailing Address: 138 Forest Street / Winchester. MA 01980 Tel. 617-797-6629

Date Deed Recorded: 07/12/2013 (Complete Deed Reference Below)

Middlesex South Registry of Deeds: Book 62232 Page 113

Middlesex South Registry District of the Land Court as Cert. of Title No. 152053

Present Use: Single family home

Proposed Use: Single family home

****

Relief Desired:

( ) Appeal (MGL Chp. 40A, Sect. 8), attach copy of decision or order being appealed.

( ) Special Permit in accordance with Zoning By-Law Sect.

(X) Special Permit/Site Plan Review in accordance with Zoning By-Law Sect. 5.2/9.5

( ) Dimensional Variance (MGL chp. 40A, Sect. 10) from Zoning By-Law Sect.

( ) Sign Permit under Chp. 9 of the General By-Laws of the Town of Winchester

Describe change, extension, alterations or modifications, etc. requested.

Demolish and replace existing house with new. Site and landscape improvements including:

Terraced walls. New lawn and pool areas. Harscape elements-fireplace. kitchen. patios. small seat walls

****

Petitioner: Tim O'Donnell Signature: Tim O'Donnell

Mailing Address: 138 Forest Street / Winchester. MA 01980 Tel. 617-797-6629

Petitioner is: (X) Owner ( ) Tenant ( ) Licensee ( ) Binding Optionee

Petition must be fully completed, typewritten or plainly printed in ink.

TOWN OF WINCHESTER
BOARD OF APPEAL
71 MOUNT VERNON STREET
WINCHESTER, MASSACHUSETTS 01890
(781) 721-7115

APPLICATION FOR ZONING HEARING

FORM 2

Application Date September 1, 2020

The undersigned hereby petitions the Board of Appeals for the following:

( ) Appeal ( ) Variance ( ) Special Permit Use (X) Special Permit/Site Plan Review

( ) Special Permit Sign ( ) Special Permit (Pre-existing non-conforming structure) ***( ) Site Plan Review***

Property Address 138 Forest Street / Winchester, MA 01890 Zoning District B-RDB-10

Area of Lot 30,628 SF Frontage 103.08' Street Frontage is

(X) Public Way ( ) Subdivision Control Way ( ) Private Way

Petitioner's Name Tim O'Donnell Address 138 Forest Street / Winchester, MA 01890

Name_____ Address_____

Name_____ Address_____

Brief Description of Work:

Redevelopment of site including demolition of existing house, replaced with new home. Site improvements to front and back yards including grading/filling of back yard, terraced retaining walls and landscape spaces with lawn and pool/jacuzzi areas, outdoor patios with gas fire place and outdoor kitchen, and complementary plantings. Low voltage landscape lighting maybe included for safety (stairs and pool walls) and to accentuate specific trees.

Applicants for an **Appeal** must complete **Form 2A**

Applicants for a **Variance** must complete **Form 2B**

Applicants for a **Special Permit Use** must complete **Form 2C**

Applicants for a **Special Permit/Site Plan Review *or Site Plan Review*** must complete **Form 2D**

Applicants for a **Special Permit Sign** must complete **Form 2E**

Applicants for a **Special Permit Pre-existing Nonconforming 1 or 2 Family** must complete **Form 2F**

Applicants for a **Special Permit Pre-existing Non-conforming Other** must complete **Form 2G**

FORM 2

The undersigned is (X) the owner of the subject property; or ( ) the holder of a written option to purchase the subject property, or ( ) the holder of a valid lease to the subject property. (Written authorization from the property owner must be submitted with the other application documents when the applicant is not the record owner of the property).

Record title to the subject property stands in the name (s) Tim O'Donnell

Address of owner of record 138 Forest Street / Winchester, MA 01980

Title Reference:

(Unregistered land) Middlesex County Registry of Deeds; Book 62232, Page 113

(Registered land) Land Court Certificate of Title No. 152053 Book 62232,

Page 113 Date of Recording: 07/12/2013

State briefly what building and structures currently exist on the premises:

Single family home and small dilapidated timber walls in the back yard

Attorney, agent, or other representative acting for petitioner:

Name_____ Address_____

Name_____ Address_____

Written evidence of agent's standing to represent petitioner may be requested.

Signed as a statement of fact under the pains and penalties of perjury, this _____ day of _____, 20____.

SIGNATURE (Petitioner/Agent)	SIGNATURE (Property Owner/Agent)
Address 138 Forest St	Address
Tel No. 617 797 6629	Tel No.
Email address simplyod@gmail.	Email address

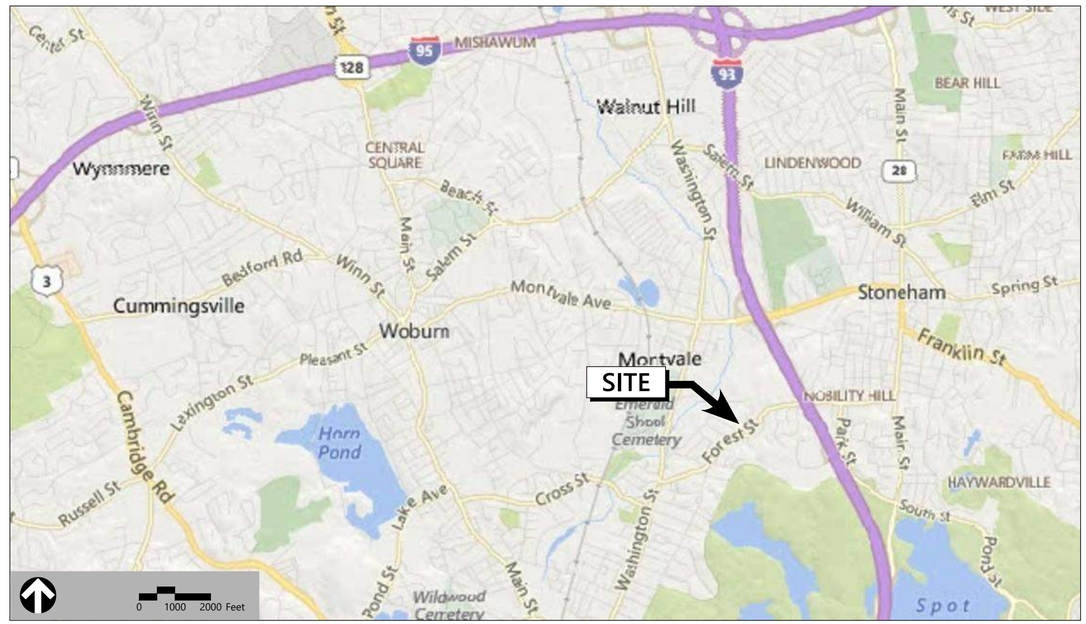
Note: Do not attempt to discuss the merits of your case with any member of the Board of Appeal at any time after filing this application and prior to the hearing thereon.

Site Plans

Issued for	Permitting
Date Issued	September 1, 2020
Latest Issue	September 1, 2020

O'Donnell Residence

138 Forest Street
Winchester, MA 01890



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PO Box 9151
Watertown, MA 02471
617.924.1770

Owner / Applicant

Timothy & Jacqueline O'Donnell
138 Forest Street
Winchester, MA, 01890

Assessor's Map: Map 1
Block 20

Sheet Index

No.	Drawing Title	Latest Issue
L-1	Existing Conditions and Tree Removal Plans	9/1/2020
L-2	Existing Conditions Photos	9/1/2020
L-3	Layout & Materials Plan	9/1/2020
L-4	Grading and Drainage Plan	9/1/2020
L-5	Planting Plan	9/1/2020
L-6	Site Details	9/1/2020
L-7	Site Details	9/1/2020
L-8	Site Details	9/1/2020
L-9	Outdoor Kitchen	9/1/2020
L-10	Planting Details	9/1/2020

Reference Drawings

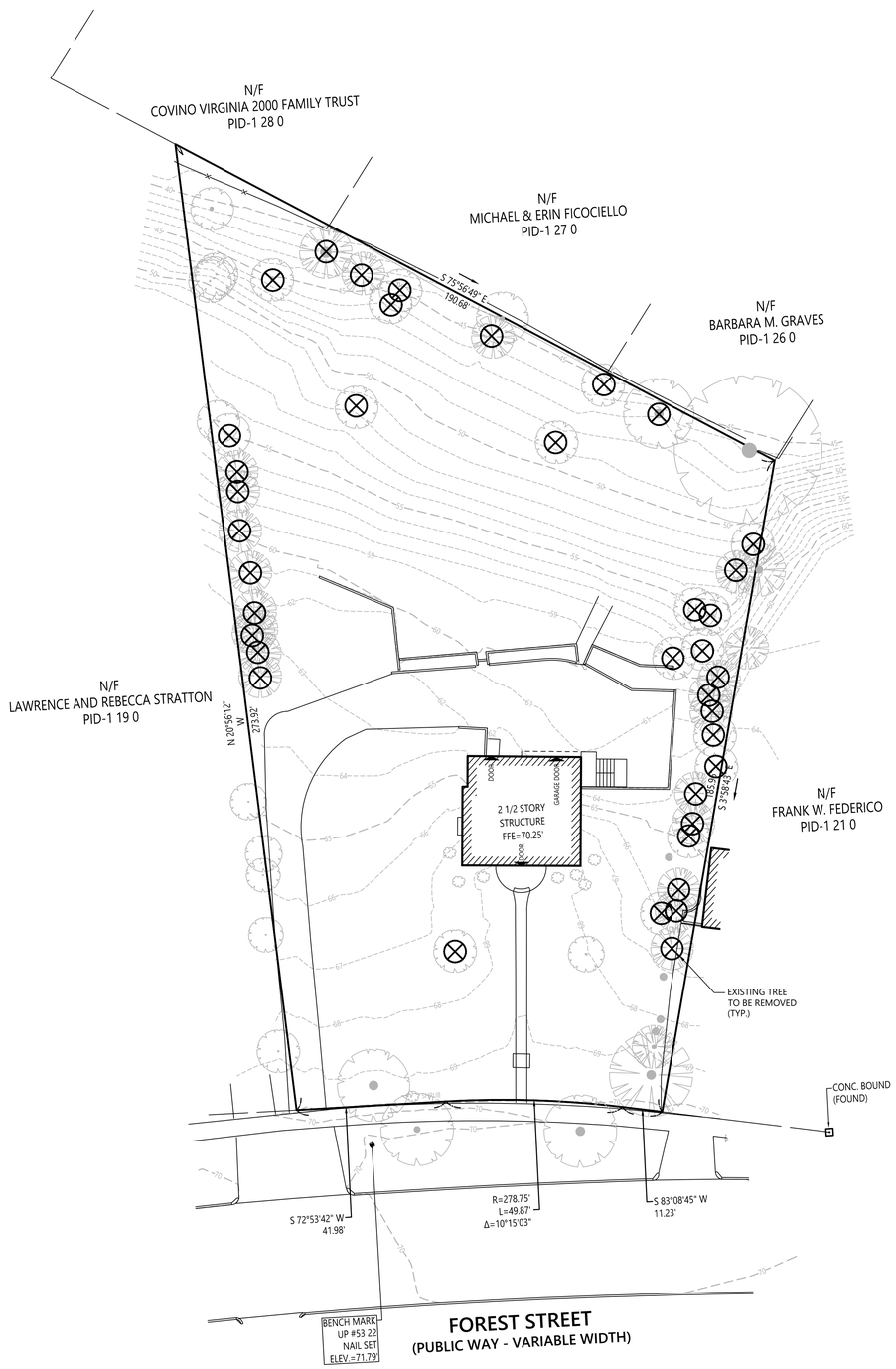
No.	Drawing Title	Latest Issue
A-1	Front & Left Elevations	8/26/2020
A-2	Rear & Right Elevations	8/26/2020
A-3	First Floor Plan	8/26/2020
A-4	Second Floor Plan	8/26/2020
A-5	Baseent Plan	8/26/2020

Architect
DNA-Architecture
745 Boylston Street
7th Floor
Boston, MA 02116
781.718.8009

Geotech
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Road
Suite 2
Billerica, MA 08162
978.330.5912

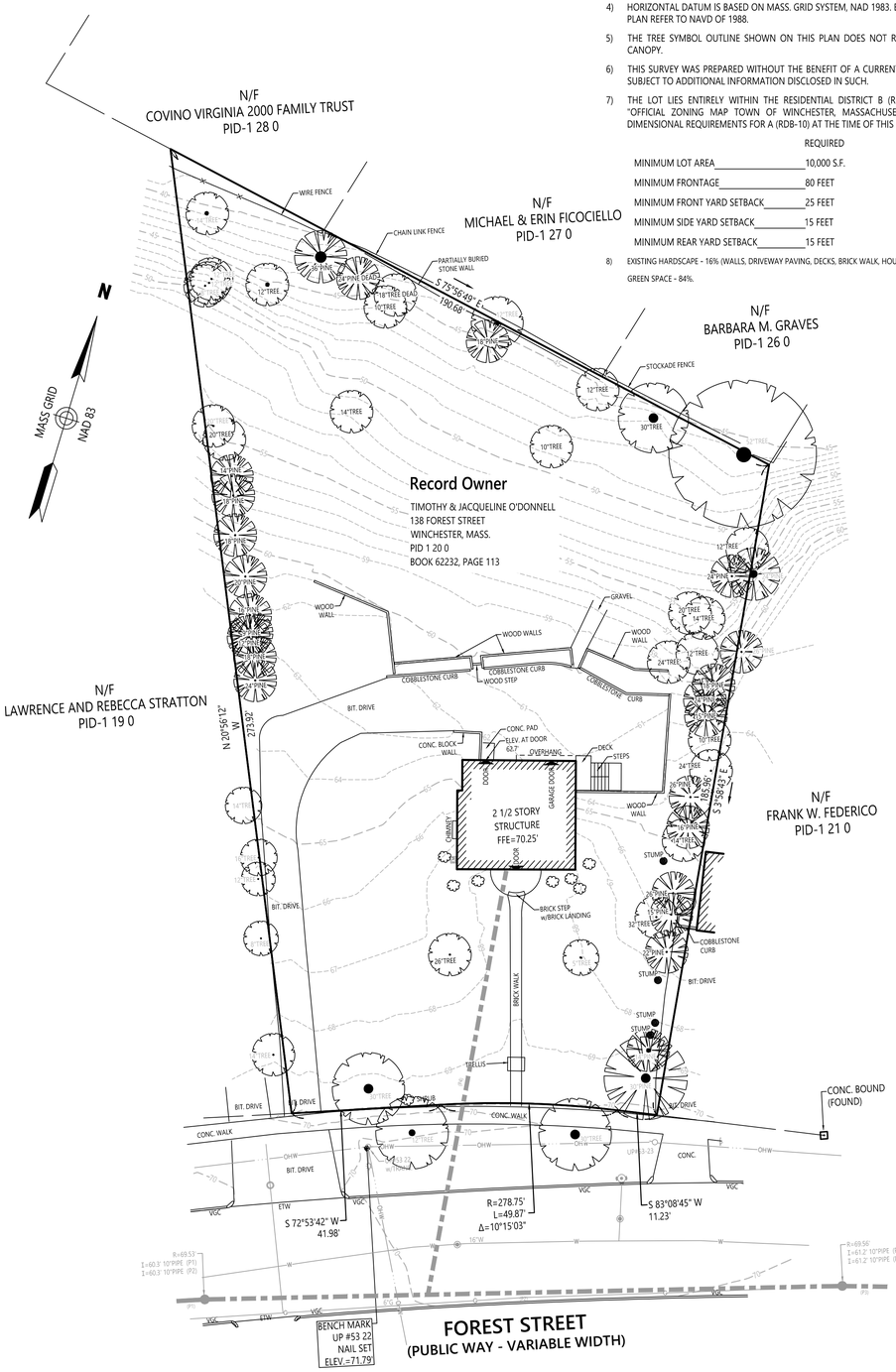
\\VHB\GBL\PROJ\WAT-LD\14925.00 138 FOREST ST WINCHESTER\CAD\LD\PLANSET\14925.00-COV 31 August 2020

VHB Project : 14925.00 O'Donnell Residence
Issued for : Permitting 09/01/2020



Tree Removal Plan

Scale: 1" = 20'



Existing Conditions Plan

Scale: 1" = 20'

0 10 20 40 Feet

General Notes

1) THE PROPERTY LINES SHOWN ON THIS PLAN ARE BASED UPON AN ACTUAL FIELD SURVEY CONDUCTED BY VHB, INC. IN MAY, 2020 AND FROM DEEDS AND PLANS OF RECORD.

2) THE EXISTING CONDITIONS SHOWN ON THIS PLAN ARE BASED UPON AN ACTUAL ON-THE-GROUND INSTRUMENT SURVEY PERFORMED BY VHB, INC. IN MAY, 2020.

3) THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES SHOWN ON THIS PLAN ARE BASED ON FIELD OBSERVATIONS AND INFORMATION OF RECORD. THEY ARE NOT WARRANTED TO BE EXACTLY LOCATED NOR IS IT WARRANTED THAT ALL UNDERGROUND UTILITIES OR OTHER STRUCTURES ARE SHOWN ON THIS PLAN.

4) HORIZONTAL DATUM IS BASED ON MASS. GRID SYSTEM, NAD 1983. ELEVATIONS SHOWN ON THIS PLAN REFER TO NAVD OF 1988.

5) THE TREE SYMBOL OUTLINE SHOWN ON THIS PLAN DOES NOT REPRESENT THE ACTUAL TREE CANOPY.

6) THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF A CURRENT TITLE REPORT AND MAY BE SUBJECT TO ADDITIONAL INFORMATION DISCLOSED IN SUCH.

7) THE LOT LIES ENTIRELY WITHIN THE RESIDENTIAL DISTRICT B (RDB-10) AS SHOWN ON THE "OFFICIAL ZONING MAP TOWN OF WINCHESTER, MASSACHUSETTS", UPDATED FALL, 2018. DIMENSIONAL REQUIREMENTS FOR A (RDB-10) AT THE TIME OF THIS SURVEY ARE:

	REQUIRED
MINIMUM LOT AREA	10,000 S.F.
MINIMUM FRONTAGE	80 FEET
MINIMUM FRONT YARD SETBACK	25 FEET
MINIMUM SIDE YARD SETBACK	15 FEET
MINIMUM REAR YARD SETBACK	15 FEET

8) EXISTING HARDSCAPE - 16% (WALLS, DRIVEWAY PAVING, DECKS, BRICK WALK, HOUSE)

GREEN SPACE - 84%.

Record Owner

TIMOTHY & JACQUELINE O'DONNELL
138 FOREST STREET
WINCHESTER, MASS.
PID 1 20 0
BOOK 62232, PAGE 113

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Legend

- DRAIN MANHOLE
- CATCH BASIN
- SEWER MANHOLE
- ELECTRIC MANHOLE
- TELEPHONE MANHOLE
- MANHOLE
- HH HAND HOLE
- WATER GATE
- FIRE HYDRANT
- GAS GATE
- BOLLARD w/LIGHT
- STREET SIGN
- LIGHT POLE
- UTILITY POLE
- GUY POLE
- GUY WIRE
- MONITORING WELL
- FLOOD LIGHT
- WELL
- MARSH
- F.F.E.=45.27' FINISHED FLOOR ELEVATION
- CNO COULD NOT OPEN
- NPV NO PIPES VISIBLE
- DYL DOUBLE YELLOW LINE
- DWL DASHED WHITE LINE
- SYL SINGLE YELLOW LINE
- LSA LANDSCAPED AREA
- EOP EDGE OF PAVEMENT
- CC CONCRETE CURB
- VGC VERTICAL GRANITE CURB
- SGE SLOPED GRANITE EDGE
- BB BITUMINOUS BERM
- BC BITUMINOUS CURB
- GUARD RAIL
- CHAIN LINK FENCE
- DRAINAGE LINE
- SEWER LINE
- OHW OVERHEAD WIRE
- E UNDERGROUND ELECTRIC
- T TELEPHONE LINE
- G GAS LINE
- W WATER LINE
- STONE WALL
- TREE LINE
- 100'BZ 100-FT BUFFER ZONE
- 100'RA 100-FT RIVER FRONT AREA
- 200'RA 200-FT RIVER FRONT AREA
- AF1-100 LIMIT MEAN ANNUAL HIGH WATER
- BF1-100 LIMIT OF BANK
- WF1-100 VEGETATED WETLAND BOUNDARY

O'Donnell Residence

138 Forest Street
Winchester, Massachusetts

No.	Revision	Date	Appvd.

Designed by | Checked by

Issued for: **Permitting**

Date: **Sept. 1, 2020**

Not Approved for Construction

Drawing Title

Existing Conditions Plan and Tree Removal Plan

Drawing Number

L-1

Sheet 1 of 10

Project Number

14925.00

COMMONWEALTH OF MASSACHUSETTS
RUSSELL J. BOUSQUET
NO. 35389
REGISTERED PROFESSIONAL ENGINEER

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1 - Driveway

2 - Front of house

3 - Right property line

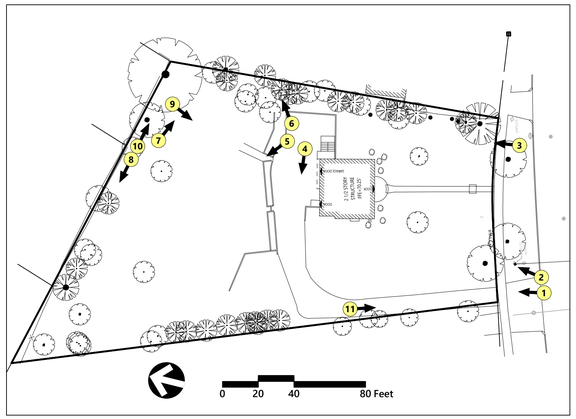


Photo Key Plan

4 - Existing parking area

5 - Existing back yard slope

6 - Right view to neighbor

7 - Right view to neighbor

8 - Northwest corner of property

9 - View back to house

10 - Northeast corner view

11 - View up driveway

O'Donnell Residence

138 Forest Street
Winchester, Massachusetts

No.	Revision	Date	Appvd.

Designed by
Checked by

Issued for
Permitting

Date
Sept. 1, 2020

Not Approved for Construction

Drawing Title
Existing Conditions Photos

Drawing Number
L-2

Sheet 2 of 10

Project Number
14925.00

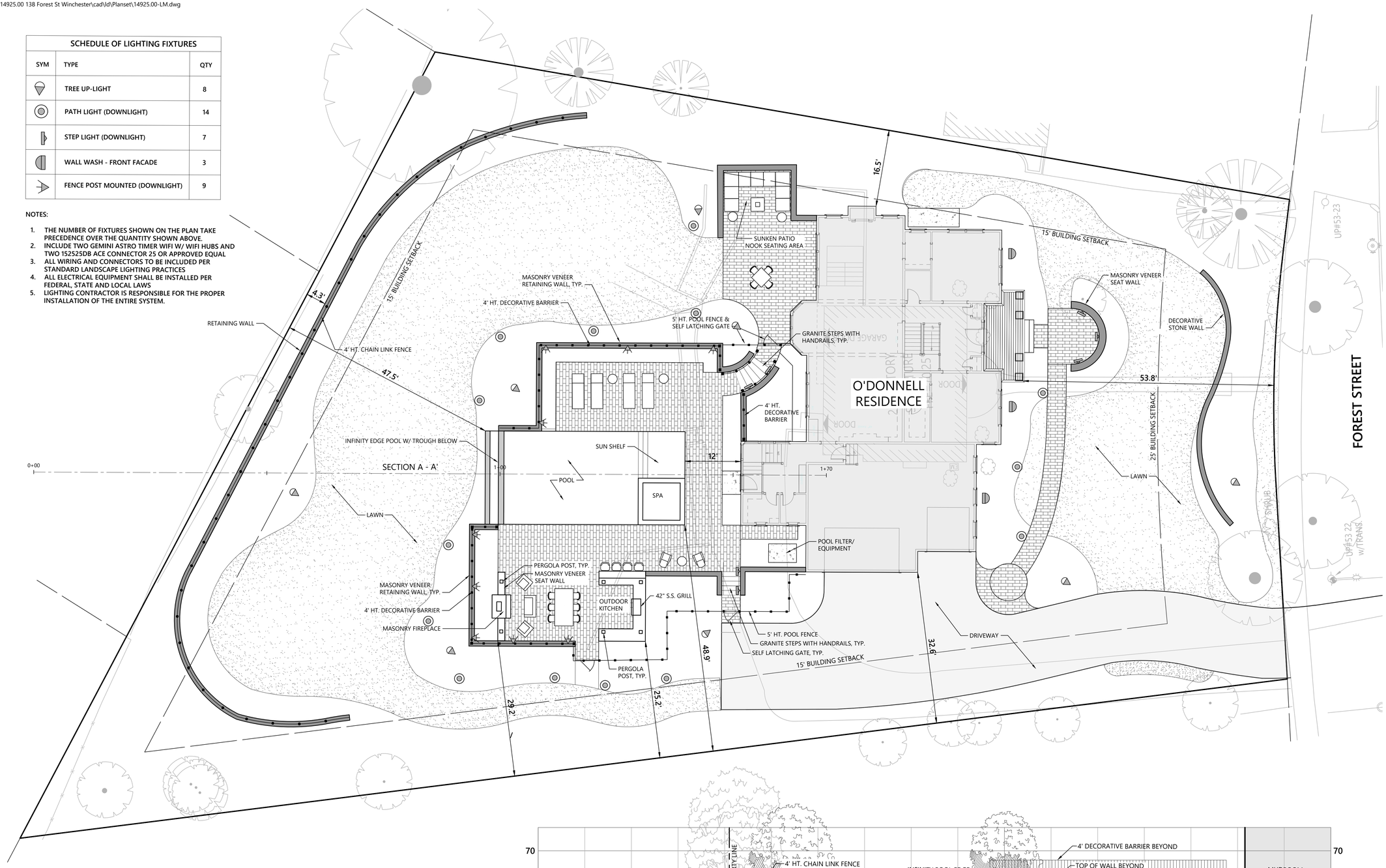
Saved Monday, August 31, 2020 11:05:33 AM WHAGEN Plotted Monday, August 31, 2020 12:32:56 PM Hagen, Win

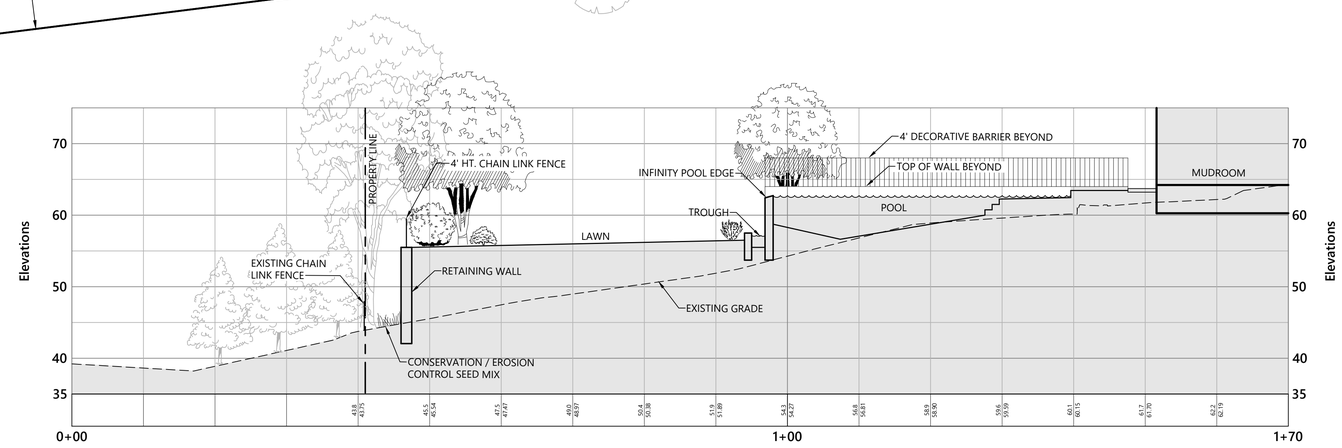
SCHEDULE OF LIGHTING FIXTURES

SYM	TYPE	QTY
	TREE UP-LIGHT	8
	PATH LIGHT (DOWNLIGHT)	14
	STEP LIGHT (DOWNLIGHT)	7
	WALL WASH - FRONT FACADE	3
	FENCE POST MOUNTED (DOWNLIGHT)	9

NOTES:

1. THE NUMBER OF FIXTURES SHOWN ON THE PLAN TAKE PRECEDENCE OVER THE QUANTITY SHOWN ABOVE.
2. INCLUDE TWO GEMINI ASTRO TIMER WIFI W/ WIFI HUBS AND TWO 152525DB ACE CONNECTOR 25 OR APPROVED EQUAL
3. ALL WIRING AND CONNECTORS TO BE INCLUDED PER STANDARD LANDSCAPE LIGHTING PRACTICES
4. ALL ELECTRICAL EQUIPMENT SHALL BE INSTALLED PER FEDERAL, STATE AND LOCAL LAWS
5. LIGHTING CONTRACTOR IS RESPONSIBLE FOR THE PROPER INSTALLATION OF THE ENTIRE SYSTEM.





SECTION A - A'

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0 5 10 20 Feet

O'Donnell Residence

138 Forest Street
Winchester, Massachusetts

No.	Revision	Date	Appvd.

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Issued for: Permitting

Date: Sept. 1, 2020

Not Approved for Construction

Drawing Title: Layout and Materials Plan

Drawing Number: L-3

Sheet 3 of 10

Project Number: 14925.00

Saved Monday, August 31, 2020 11:05:33 AM WHAGEN Plotted Tuesday, September 1, 2020 12:33:19 PM Hagen, Win

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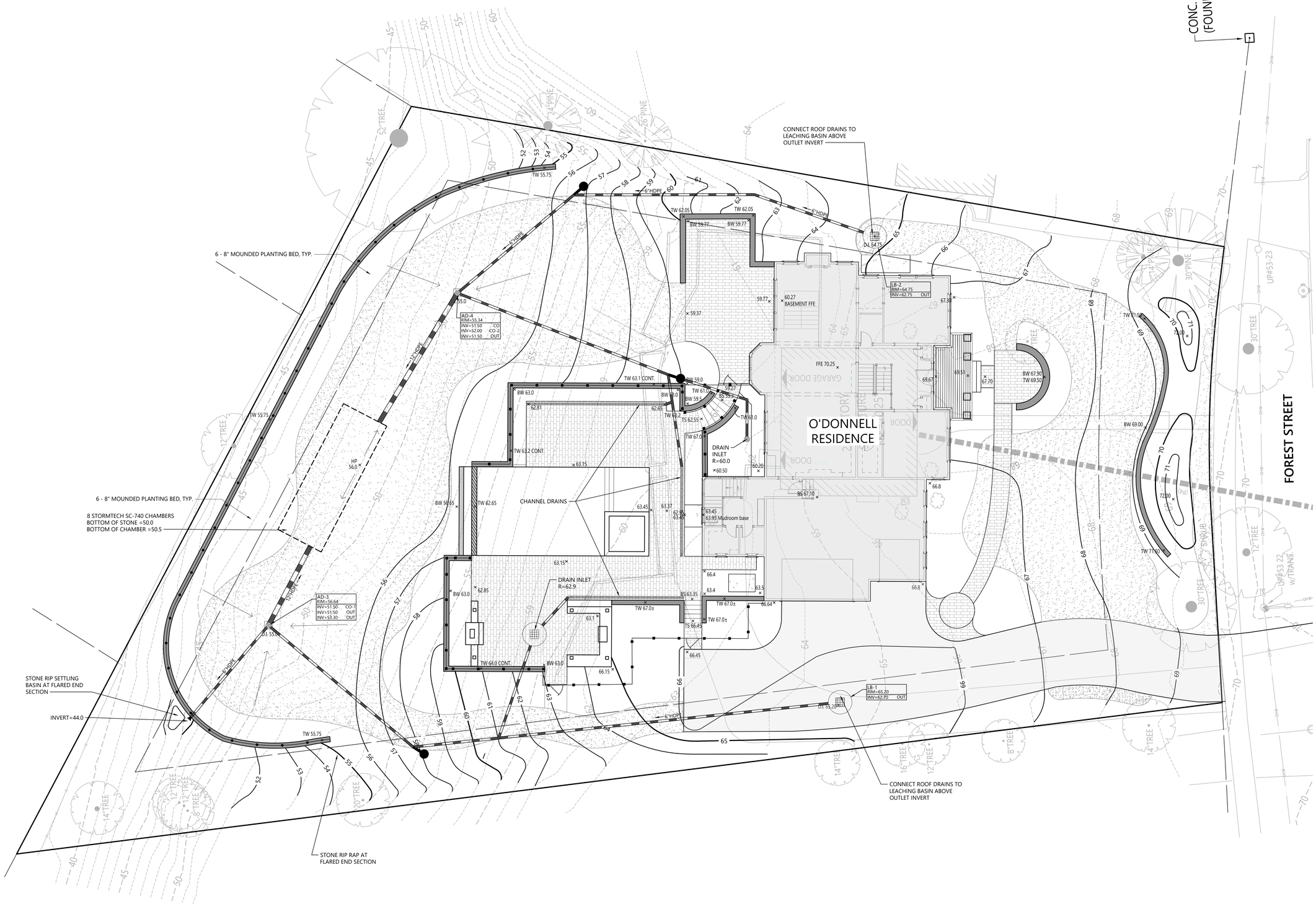

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O'Donnell Residence

138 Forest Street
Winchester, Massachusetts

No.	Revision	Date	Appvd.

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Issued for: Permitting

Date: Sept. 1, 2020

Not Approved for Construction

Drawing Title: Grading and Drainage Plan

Drawing Number: L-4

Sheet 4 of 10

Project Number: 14925.00

Saved Monday, August 31, 2020 11:15:59 AM WHAGEN Plotted Monday, August 31, 2020 12:33:29 PM Hagen, Win

Planting Notes

1. ALL PROPOSED PLANTING LOCATIONS SHALL BE STAKED AS SHOWN ON THE PLANS FOR FIELD REVIEW AND APPROVAL BY THE LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.
2. CONTRACTOR SHALL VERIFY LOCATIONS OF ALL BELOW GRADE AND ABOVE GROUND UTILITIES AND NOTIFY OWNERS REPRESENTATIVE OF CONFLICTS.
3. NO PLANT MATERIALS SHALL BE INSTALLED UNTIL ALL GRADING AND CONSTRUCTION HAS BEEN COMPLETED IN THE IMMEDIATE AREA. CONTRACTOR SHALL NOTIFY OWNER'S REPRESENTATIVE OF ANY CONFLICT.
4. A 3-INCH DEEP MULCH PER SPECIFICATION SHALL BE INSTALLED UNDER ALL TREES AND SHRUBS, AND IN ALL PLANTING BEDS, UNLESS OTHERWISE INDICATED ON THE PLANS, OR AS DIRECTED BY OWNER'S REPRESENTATIVE.
5. ALL TREES SHALL BE BALLED AND BURLAPPED, UNLESS OTHERWISE NOTED IN THE DRAWINGS OR SPECIFICATION, OR APPROVED BY THE OWNER'S REPRESENTATIVE.
6. FINAL QUANTITY FOR EACH PLANT TYPE SHALL BE AS GRAPHICALLY SHOWN ON THE PLAN. THIS NUMBER SHALL TAKE PRECEDENCE IN CASE OF ANY DISCREPANCY BETWEEN QUANTITIES SHOWN ON THE PLANT LIST AND ON THE PLAN. THE CONTRACTOR SHALL REPORT ANY DISCREPANCIES BETWEEN THE NUMBER OF PLANTS SHOWN ON THE PLANT LIST AND PLANT LABELS PRIOR TO BIDDING.
7. ANY PROPOSED PLANT SUBSTITUTIONS MUST BE REVIEWED BY LANDSCAPE ARCHITECT AND APPROVED IN WRITING BY THE OWNER'S REPRESENTATIVE.
8. ALL PLANT MATERIALS INSTALLED SHALL MEET THE SPECIFICATIONS OF THE "AMERICAN STANDARDS FOR NURSERY STOCK" BY THE AMERICAN ASSOCIATION OF NURSERYMEN AND CONTRACT DOCUMENTS.
9. ALL PLANT MATERIALS SHALL BE GUARANTEED FOR ONE YEAR FOLLOWING DATE OF FINAL ACCEPTANCE.
10. AREAS DESIGNATED "LOAM & SEED" SHALL RECEIVE MINIMUM 6" OF LOAM AND SPECIFIED SEED MIX. LAWNS OVER 2:1 SLOPE SHALL BE PROTECTED WITH EROSION CONTROL FABRIC.
11. ALL DISTURBED AREAS NOT OTHERWISE NOTED ON CONTRACT DOCUMENTS SHALL BE LOAM AND SEEDED OR MULCHED AS DIRECTED BY OWNER'S REPRESENTATIVE.
12. THIS PLAN IS INTENDED FOR PLANTING PURPOSES. REFER TO SITE / CIVIL DRAWINGS FOR ALL OTHER SITE CONSTRUCTION INFORMATION.

Tree Protection

1. EXISTING TREES TO REMAIN SHALL BE PROTECTED WITH TEMPORARY CONSTRUCTION FENCE. ERECT FENCE AT EDGE OF THE TREE DRIPLINE PRIOR TO START OF CONSTRUCTION.
2. CONTRACTOR SHALL NOT OPERATE VEHICLES WITHIN THE TREE PROTECTION AREA. CONTRACTOR SHALL NOT STORE VEHICLES OR MATERIALS, OR DISPOSE OF ANY WASTE MATERIALS, WITHIN THE TREE PROTECTION AREA.
3. DAMAGE TO EXISTING TREES CAUSED BY THE CONTRACTOR SHALL BE REPAIRED BY A CERTIFIED ARBORIST AT THE CONTRACTOR'S EXPENSE.

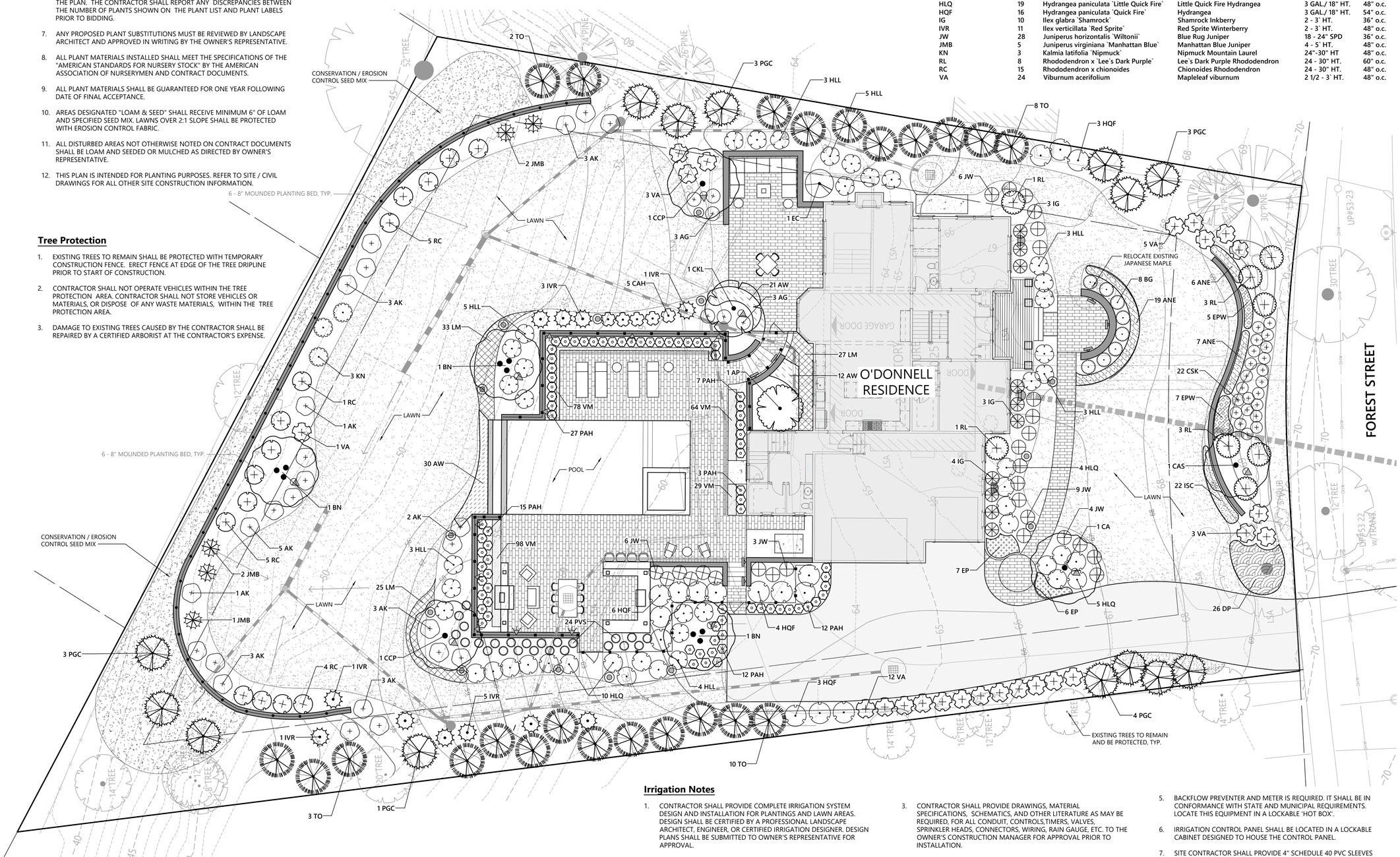
PLANT SCHEDULE

GRASSES	QTY	BOTANICAL NAME	COMMON NAME	SIZE	SPACING
PVS	24	Panicum virgatum `Shenandoah`	Shenendoah Switch Grass	#2 POT	24" o.c.
PAH	76	Pennisetum alopecuroides Hameln	Hameln Dwarf Fountain Grass	#1 POT	24" o.c.
PERENNIALS	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**	**SPACING**
ANE	32	Aster novae-angliae	New England Aster	#1 POT	24" o.c.
AW	63	Astilbe x `Verswhite` TM	Younique White Astilbe	#1 POT	18" o.c.
DP	26	Dennstaedtia punctilobula	Hay-scented Fern	#1 POT	24" o.c.
EP	13	Echinacea purpurea	Coneflower	#1 POT	24" o.c.
EPW	12	Echinacea x `Pow Wow White`	Pow Wow White	#1 POT	24" o.c.
ISC	22	Iberis sempervirens	Evergreen Candytuft	#1 POT	16" o.c.
GROUND COVERS	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**	**SPACING**
LM	85	Lamium maculatum	Spotted Dead Nettle	#1 POT	20" o.c.
VM	269	Vinca minor	Common Periwinkle	Bare Root	8" o.c.

PLANT SCHEDULE

DECIDUOUS TREES	QTY	BOTANICAL NAME	COMMON NAME	SIZE
BN	3	Betula nigra `Heritage`	Multi-Stem Heritage River Birch	12 -14` HT.
EVERGREEN TREES	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**
PGC	14	Picea glauca `Coerulea`	Coerulea White Spruce	7 - 8` HT.
TO	23	Thuja occidentalis `Nigra`	Dark American Arborvitae	6 - 7` HT.
ORNAMENTAL TREES	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**
AP	1	Acer palmatum dissectum `Red Dragon`	Red Dragon Japanese Maple	6 - 7` HT.
CA	1	Cornus alternifolia	Pagoda Dogwood	2 - 2 1/2" CAL.
CAS	1	Cornus florida `Appalachian Snow`	Dogwood Appalachian Snow	10 - 12` HT.
CCP	2	Cornus florida `Cherokee Princess`	Cherokee Princess Dogwood	10 - 12` HT.
CKL	1	Cornus kousa `Elizabeth Lustgarten`	Elizabeth Lustgarten Kousa Dogwood	4`-5` HT. MIN.

SHRUBS	QTY	BOTANICAL NAME	COMMON NAME	SIZE	SPACING
AG	6	Azalea x `Girard`s Pleasant White`	Girard`s Pleasant White Azalea	24 - 30" HT.	36" o.c.
AK	24	Azalea x `Karen`	Karen Azalea	18 - 24" SPD	48" o.c.
BG	8	Buxus x `Green Gem`	Green Gem Boxwood	15 - 18" HT	36" o.c.
CAH	5	Clethra alnifolia `Hummingbird`	`Hummingbird` Summersweet	18 - 24" HT.	36" o.c.
CSK	22	Cornus sericea `Kelseyi`	Kelseyi Dwarf Redtwig Dogwood	18 - 24" HT.	30" o.c.
EC	1	Enkianthus campanulatus	Enkianthus	24 - 30" HT.	72" o.c.
HLL	26	Hydrangea paniculata `Little Lime`	Little Lime Hydrangea	3 GAL./ 18" HT.	48" o.c.
HLQ	19	Hydrangea paniculata `Little Quick Fire`	Little Quick Fire Hydrangea	3 GAL./ 18" HT.	48" o.c.
HQF	16	Hydrangea paniculata `Quick Fire`	Hydrangea	3 GAL./ 18" HT.	54" o.c.
IG	10	Ilex glabra `Shamrock`	Shamrock Inkberry	2 - 3` HT.	36" o.c.
IVR	11	Ilex verticillata `Red Sprite`	Red Sprite Winterberry	2 - 3` HT.	48" o.c.
JW	28	Juniperus horizontalis `Wiltonii`	Blue Rug Juniper	18 - 24" SPD	36" o.c.
JMB	5	Juniperus virginiana `Manhattan Blue`	Manhattan Blue Juniper	4 - 5` HT.	48" o.c.
KN	3	Kalmia latifolia `Nipmuck`	Nipmuck Mountain Laurel	24"-30" HT	48" o.c.
RL	8	Rhododendron x `Lee`s Dark Purple`	Lee`s Dark Purple Rhododendron	24 - 30" HT.	60" o.c.
RC	15	Rhododendron x chionoides	Chionoides Rhododendron	24 - 30" HT.	48" o.c.
VA	24	Viburnum acerifolium	Mapleleaf viburnum	2 1/2 - 3` HT.	48" o.c.



Irrigation Notes

1. CONTRACTOR SHALL PROVIDE COMPLETE IRRIGATION SYSTEM DESIGN AND INSTALLATION FOR PLANTINGS AND LAWN AREAS. DESIGN SHALL BE CERTIFIED BY A PROFESSIONAL LANDSCAPE ARCHITECT, ENGINEER, OR CERTIFIED IRRIGATION DESIGNER. DESIGN PLANS SHALL BE SUBMITTED TO OWNER'S REPRESENTATIVE FOR APPROVAL.
2. CONTRACTOR SHALL PROVIDE ALL MATERIALS, LABOR, AND EQUIPMENT FOR THE COMPLETE INSTALLATION OF THE IRRIGATION SYSTEM.
3. CONTRACTOR SHALL PROVIDE DRAWINGS, MATERIAL SPECIFICATIONS, SCHEMATICS, AND OTHER LITERATURE AS MAY BE REQUIRED, FOR ALL CONDUIT, CONTROLS,TIMERS, VALVES, SPRINKLER HEADS, CONNECTORS, WIRING, RAIN GAUGE, ETC. TO THE OWNER'S CONSTRUCTION MANAGER FOR APPROVAL PRIOR TO INSTALLATION.
4. CONTRACTOR SHALL COORDINATE HIS WORK WITH THE GENERAL CONTRACTOR AND SUB CONTRACTORS.
5. BACKFLOW PREVENTER AND METER IS REQUIRED. IT SHALL BE IN CONFORMANCE WITH STATE AND MUNICIPAL REQUIREMENTS. LOCATE THIS EQUIPMENT IN A LOCKABLE 'HOT BOX'.
6. IRRIGATION CONTROL PANEL SHALL BE LOCATED IN A LOCKABLE CABINET DESIGNED TO HOUSE THE CONTROL PANEL.
7. SITE CONTRACTOR SHALL PROVIDE 4" SCHEDULE 40 PVC SLEEVES UNDER PAVEMENT TO PROVIDE ACCESS FOR IRRIGATION LINES TO ALL IRRIGATED AREAS.

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0 5 10 20 Feet

O'Donnell Residence

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Winchester, Massachusetts

No.	Revision	Date	Appvd.

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Issued for: Permitting
Date: Sept. 1, 2020

Not Approved for Construction

Drawing Title
Planting Plan

Drawing Number
L-5

Sheet 5 of 10

Project Number
14925.00

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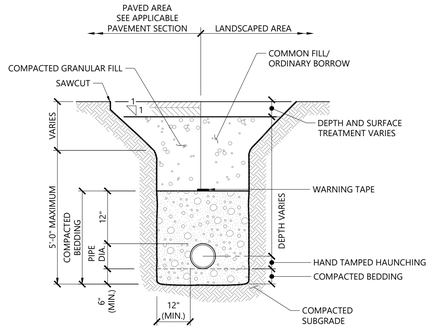


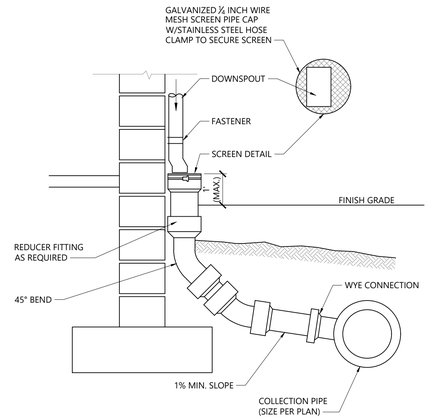
NOTES

1. WHERE UTILITY TRENCHES ARE CONSTRUCTED THROUGH DETENTION BASIN BERMS OR OTHER SUCH SPECIAL SECTIONS, PLACE TRENCH BACKFILL WITH MATERIALS SIMILAR TO THE SPECIAL SECTION REQUIREMENTS.
2. USE METALLIC TRACING/WARNING TAPE OVER ALL PIPES.

Utility Trench

1/16

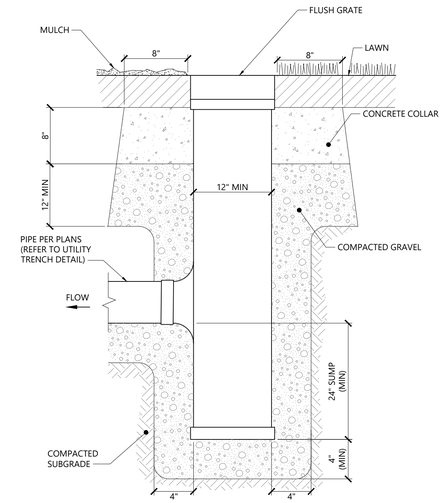
N.T.S. Source: VHB LD_300



Downspout Rain Leader

1/16

N.T.S. Source: VHB LD_195



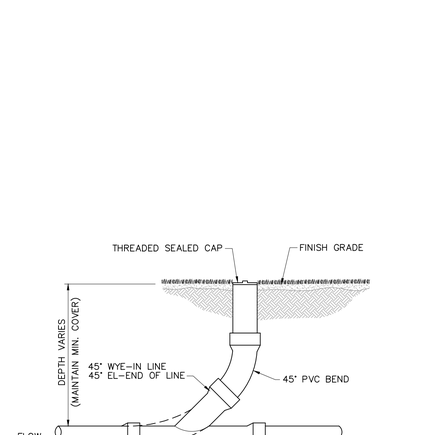
NOTES:

1. LANDSCAPE DRAINS SHALL BE NYLOPLAST 12" DRAIN BASIN, OR APPROVED EQUAL.
2. GRATES SHALL BE NYLOPLAST, 12" FLUSH GRATE MODEL OR APPROVED EQUAL AS SHOWN ON PLANS.

Area Drain (AD)

9/17

N.T.S. Source: VHB LD_197



NOTES

1. BASE SECTION SHALL BE PRECAST CONCRETE WITH MORTARED JOINTS OR CAST IN PLACE.
2. ALL COMPONENTS SHALL BE DESIGNED FOR HS-20 LOADING.
3. PROVIDE PRECAST OPENINGS FOR PIPES WITH 2" MAX. CLEARANCE TO OUTSIDE OF PIPE. MORTAR ALL PIPE CONNECTIONS.
4. JOINT SEALANT BETWEEN PRECAST SECTIONS SHALL BE PREFORMED BUTYL RUBBER.
5. FRAME AND COVER SHALL BE SET IN FULL MORTAR BED. ADJUST TO GRADE WITH CLAY BRICK AND MORTAR (2 BRICK COURSE MINIMUM, 5 BRICK COURSE MAXIMUM)

Leaching Basin

1/16

N.T.S. Source: VHB LD_180

Cleanout - Landscape Area

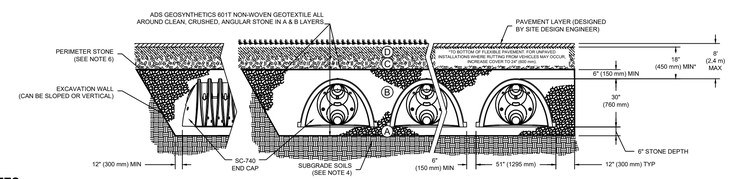
6/08

N.T.S. Source: VHB LD_302

ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[4] A-1, A-2-4, A-3 OR AASHTO M43[5] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[5] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[5] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. * *

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. SC-740 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS", OR ASTM F2922 "STANDARD SPECIFICATION FOR POLYETHYLENE (PE) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-740 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
5. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
6. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

Subsurface Detention/Infiltration (StormTech SC-740)

N.T.S. Source: StormTech

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Drawing Title
Site Details

Drawing Number
L-6

Sheet 6 of 10

Project Number
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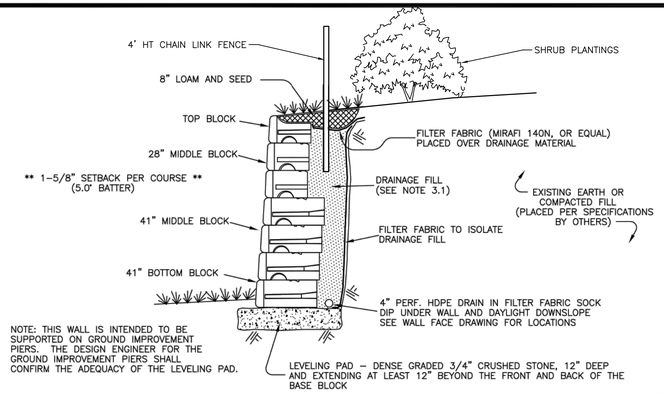


MAXIMUM APPLIED BEARING PRESSURE: WALL #1 – 2500 psf

TYPICAL SECTION – WALL #1
(TYPICAL DETAIL ONLY – SEE WALL FACE DRAWING FOR SPECIFIC BLOCK CONFIGURATIONS)

"REDI–ROCK" SEGMENTAL RETAINING WALL

COMPACTION NOTE: WHERE THE RETAINING WALL PASSES OVER ANY UTILITY LINES, COMPACTION OF THE SOIL WITHIN THE UTILITY TRENCH IS CRITICAL IN ORDER TO PREVENT SETTLEMENT OF THE WALL. COMPACTION OF ALL FILL MATERIAL IN UTILITY TRENCHES WHICH PASS UNDER THIS RETAINING WALL MUST BE AT LEAST 95% OF THE MAXIMUM DENSITY OF THE FILL MATERIAL.

COMPACTED FILL/BACKFILL
MASS DOT M1.03.0 TYPE A

SIEVE SIZE	% PASSING
6"	100%
1/2"	50–85%
#4	40–75%
#50	8–28%
#200	0–10%

NOTE: THE DESIGN ENGINEER MUST BE MADE AWARE WHENEVER THE PERCENT PASSING THE #200 SIEVE EXCEEDS 10%. GROUNDWATER CONTROL METHODS MAY BE REQUIRED.

IMPERVIOUS MATERIAL
GENERAL REQUIREMENTS

SIEVE SIZE	% PASSING
3"	100%
#4	80–100%
#40	50–90%
#100	40–80%
#200	30–80%

8" OF TOPSOIL IS AN ACCEPTABLE ALTERNATE FOR IMPERVIOUS FILL ALONG THE TOP OF THE WALL.

DESIGN ASSUMPTIONS

SOIL	SOIL UNIT WEIGHT	ϕ
COMPACTED FILL/BACKFILL	130	34
EXISTING SAND FILL	130	34
TILL	135	40

APPLIED SURCHARGE LOADING:
WALL #1 – 250 psf
WALL #7 – 100 psf
ALL OTHER WALLS: NONE

SEISMIC ACCELERATION = 0.12

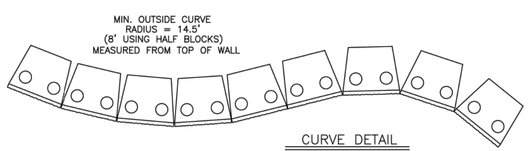
SLOPES: AS SHOWN ON GRADING PLAN

DRAINAGE FILL – ASTM #57 STONE
GRADATION REQUIREMENTS

SIEVE SIZE	% PASSING
1–1/2"	100
1"	95 – 100
1/2"	25 – 60
#4	0 – 10
#8	0 – 5
#200	0 – 2

MINIMUM FACTORS OF SAFETY

OVERTURNING	1.5
SLIDING	1.5
BEARING CAPACITY	2.0

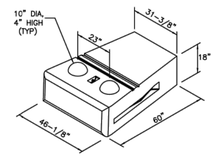


CURVE DETAIL
TYPICAL CURVES
(NOT TO SCALE)

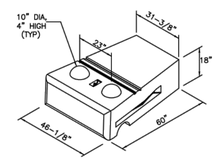
BLOCK SPECIFICATION NOTES:

1. ALL BLOCKS SHALL BE MANUFACTURED BY A LICENSED REDI–ROCK (TM) MANUFACTURER.
2. BLOCKS SHALL MEET THE MINIMUM REDI–ROCK SPECIFICATIONS OF 4000 psi WITH AN AIR CONTENT OF 4%–8%.
3. THE REDI–ROCK UNITS MAY UTILIZE EITHER THE SPLIT LIMESTONE OR COBBLESTONE FACE CONFIGURATION AS CHOSEN BY THE OWNER OR OWNER'S REPRESENTATIVE.

NOTE: HALF–BLOCKS HAVE THE SAME FEATURES AS SHOWN HERE FOR FULL BLOCKS BUT THEY ARE 23–1/16" WIDE, NOT THE FULL 46–1/8" WIDE.



60" BOTTOM BLOCK
NOT–TO–SCALE



60" MIDDLE BLOCK
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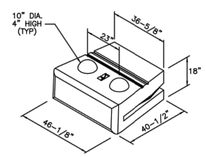
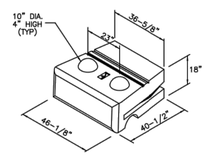
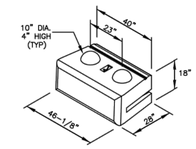


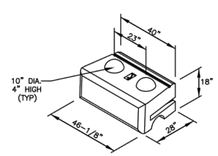
41" BOTTOM BLOCK
NOT–TO–SCALE



41" MIDDLE BLOCK
NOT–TO–SCALE



28" BOTTOM BLOCK
NOT–TO–SCALE



28" MIDDLE BLOCK
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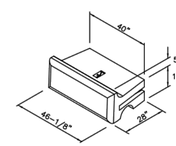
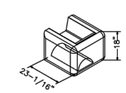
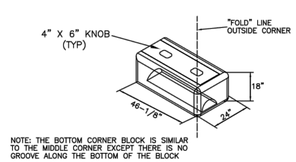


28" TOP BLOCK
NOT–TO–SCALE

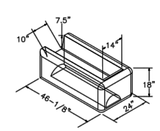


HALF GARDEN CORNER BLOCK
NOT–TO–SCALE



NOTE: THE BOTTOM CORNER BLOCK IS SIMILAR TO THE MIDDLE CORNER EXCEPT THERE IS NO GROOVE ALONG THE BOTTOM OF THE BLOCK

MIDDLE CORNER BLOCK
NOT–TO–SCALE



GARDEN CORNER BLOCK
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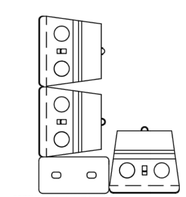
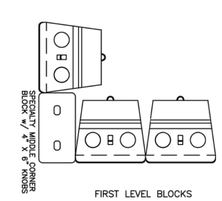


SPECIALTY MIDDLE CORNER BLOCK w/ 4" X 6" KNOBS

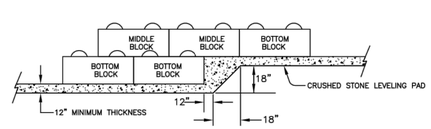
SECOND LEVEL BLOCKS



SPECIALTY MIDDLE CORNER BLOCK w/ 4" X 6" KNOBS

FIRST LEVEL BLOCKS

90° OUTSIDE CORNER
28" OR 41" BLOCKS
NOT–TO–SCALE



BASE STEP DETAIL
(NOT TO SCALE)

GENERAL NOTES:

1. SITE PREPARATION:
   - 1.1. STRIP ALL VEGETATION, ORGANIC SOILS AND UNSUITABLE FILL SOILS FROM THE WALL ALIGNMENT AREA.
   - 1.2. BENCH CUT ALL EXCAVATED SLOPES.
   - 1.3. DO NOT OVER EXCAVATE UNLESS DIRECTED TO DO SO BY THE OWNER'S SITE REPRESENTATIVE IN ORDER TO REMOVE UNSUITABLE SOIL.
   - 1.4. THE OWNER'S GEOTECHNICAL ENGINEER SHALL VERIFY THE COMPETENCY OF THE FOUNDATION SOILS AS WELL AS THE SOIL STRENGTH PARAMETERS LISTED UNDER "DESIGN ASSUMPTIONS".
2. LEVELING PAD & BOTTOM BLOCK:
   - 2.1. LEVELING PAD SHALL CONSIST OF DENSE GRADED 3/4" CRUSHED STONE, 12" THICK AND EXTENDING AT LEAST 12" TO EITHER SIDE OF THE BASE BLOCK.
   - 2.2. MINIMUM EMBEDMENT OF WALL BELOW FINISH GRADE SHALL BE AS INDICATED ON THE WALL FACE DRAWING.
   - 2.3. FOLLOW APPLICABLE PROVISIONS OF THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND WRITTEN SPECIFICATIONS, ESPECIALLY WITH REGARDS TO LEVELING OF BLOCKS AND BASE.
3. WALL DRAIN:
   - 3.1. DRAINAGE FILL SHALL CONSIST OF ASTM #57 SIZE CRUSHED STONE PLACED FOR A DEPTH OF AT LEAST 12" BEHIND THE WALL. A FILTER FABRIC (MIRAFI 140N OR EQUAL) SHALL BE PLACED OVER THE CUT OR FILL FACE BEHIND THE WALL TO PREVENT THE MIGRATION OF SOIL INTO THE DRAINAGE MATERIAL.
   - 3.2. THE 4" DIA. PERFORATED HDPE WALL DRAINS SHALL OUTLET TO DAYLIGHT OR BE TIED TO THE SITE DRAINAGE SYSTEM. SEE WALL FACE DRAWINGS FOR OUTLET LOCATIONS.
   - 3.3. DRAIN LINES (4" HDPE) WHICH PASS UNDER THE WALL BASE SHOULD BE CENTERED UNDER THE BASE BLOCK. THE PIPE TRENCH SHALL BE MINIMIZED SO THAT THE BASE BLOCK ACTS AS A LINTEL OVER THE PIPE AND TRENCH.
   - 3.4. PLACE A FILTER FABRIC (MIRAFI 140N, OR EQUAL) OVER THE DRAINAGE MATERIAL TO MINIMIZE SOIL MIGRATION FROM THE SURFACE MATERIAL (TOPSOIL OR IMPERVIOUS) INTO THE DRAINAGE MATERIAL.
4. BACKFILLING & COMPACTION:
   - 4.1. BACKFILL AND COMPACT THE FILL MATERIAL BEHIND THE WALL AS THE WALL IS INSTALLED.
   - 4.2. COMPACTION TESTS SHALL BE TAKEN AS THE WALL IS INSTALLED. THE MINIMUM NUMBER OF TESTS SHALL BE DETERMINED BY THE OWNER'S SITE REPRESENTATIVE.
   - 4.3. COMPACTION SHALL BE TO A MINIMUM OF 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY.
   - 4.4. RECOMMENDED COMPACTION EQUIPMENT WITHIN 15 FEET OF THE BACK OF THE WALL IS AS FOLLOWS:
     - 0 – 4 FEET HAND TAMP OR VIBRATORY PLATE COMPACTOR
     - 4 – 15 FEET NOTHING LARGER THAN TWO–DRUM, WALK–BEHIND VIBRATORY ROLLER
     - (LARGER ROLLERS CAN BE USED STATICALLY, PROVIDED LIFT SIZE DOES NOT COMPROMISE ACHIEVEMENT OF NECESSARY COMPACTION RATES.)
5. GENERAL WALL LAYOUT & CONSTRUCTION:
   - 5.1. FINAL WALL ALIGNMENT SHALL BE LOCATED IN THE FIELD BY THE OWNER'S SITE REPRESENTATIVE.
   - 5.2. PROVIDE LATERAL DRAINAGE SWALES TO DIRECT FLOWS AROUND THE ENDS OF THE WALL AND AWAY FROM THE WALL DURING CONSTRUCTION.
   - 5.3. TURF, OR SOME ACCEPTABLE FORM OF SOIL EROSION PROTECTION, SHOULD BE ESTABLISHED AT THE TOP OF THE WALL (WHERE REQUIRED) BY THE LANDSCAPE CONTRACTOR AS SOON AS THE WALL IS COMPLETED.
   - 5.4. ENDS OF THE RETAINING WALLS SHALL BE BLENDED INTO THE PROPOSED/EXISTING GRADE IN A MANNER SATISFACTORY TO THE OWNER'S SITE REPRESENTATIVE. AT THE ENDS OF A WALL WHERE BLENDING TAKES PLACE, THE ISSUE IS NOT A STRUCTURAL FACTOR BUT AN AESTHETIC FACTOR AND THE OWNER'S SITE REPRESENTATIVE IS QUALIFIED TO MAKE THIS JUDGEMENT.
   - 5.5. WHERE ANGLES IN THE WALL ARE SHOWN, THE CONTRACTOR MAY UTILIZE A CURVED SECTION AS DETAILED ON THIS SHEET. CURVED REDI–ROCK WALLS WORK WELL WITH INSIDE AND OUTSIDE CORNERS. OUTSIDE CORNERS/CURVES HAVE A MINIMUM 14'–6" RADIUS (AS MEASURED FROM THE TOP OF THE WALL) WITH STANDARD BLOCK AND A MINIMUM 8' RADIUS USING HALF BLOCKS. THE USE OF A CURVED SECTION RATHER THAN THE SHARP ANGLE DEPICTED ON THE SITE PLANS REQUIRES THE APPROVAL OF THE OWNER'S SITE REP.
   - 5.6. IF CONDITIONS ARE DIFFERENT THAN THOSE STATED IN THESE DRAWINGS AND SPECIFICATIONS, THE CONTRACTOR MUST CONTACT THE DESIGN ENGINEER PRIOR TO PROCEEDING WITH THE CONSTRUCTION OF THE WALL.
   - 5.7. THESE WALLS HAVE BEEN DESIGNED WITH CONSIDERATION OF SEISMIC LOADINGS.
   - 5.8. WALL CERTIFICATIONS: OCCASIONALLY A "SIGN OFF" BY THE DESIGN ENGINEER IS NEEDED AFTER COMPLETION OF WALL CONSTRUCTION. IF THIS SERVICE IS NEEDED ARRANGEMENTS MUST BE MADE WITH THE DESIGN ENGINEER PRIOR TO WALL CONSTRUCTION FOR A SERIES OF SITE VISITS TO OBSERVE WALL CONSTRUCTION. ACCEPTANCE LETTERS, SIGN OFFS, CERTIFICATIONS, WARRANTYS, ETC. WILL NOT BE PROVIDED WITHOUT PERIODIC SITE VISITS.

IT IS THE RESPONSIBILITY OF THE INSTALLER TO REVIEW THE NOTES AND DETAILS ON ALL SHEETS OF THIS PLAN SET

O'Donnell Residence
138 Forest Street
Winchester, Massachusetts

No.	Revision	Date	Appvd.

Designed by | Checked by
Issued for: Permitting
Date: Sept. 1, 2020

Not Approved for Construction

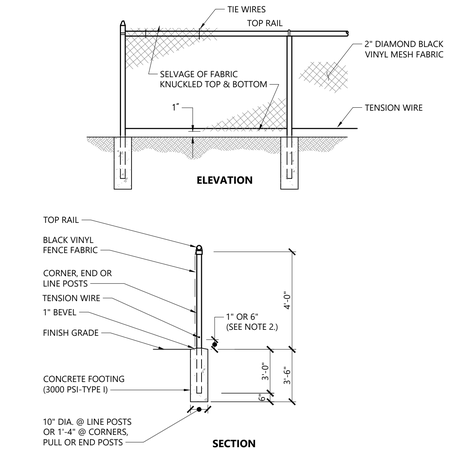
Drawing Title
Site Details

Drawing Number
L-7

Sheet 7 of 10

Project Number
14925.00

vhb.com
101 Walnut Street
PO Box 9151
Watertown, MA 02471
617.924.1770



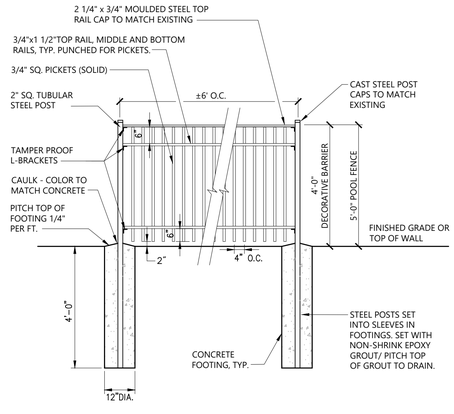
NOTE

1. MATERIALS TO BE SUPPLIED AND INSTALLED IN CONFORMANCE WITH "CHAIN LINK MANUFACTURER'S INSTITUTE" PRODUCT MANUAL.
2. PROVIDE 6" OF CLEARANCE BETWEEN THE BOTTOM OF FABRIC AND FINISH GRADE AROUND BMP IF AN ORDER OF CONDITIONS WAS ISSUED FOR THE PROJECT.

4' Ht. Chain Link Fence

1/16

N.T.S. Source: VHB REV LD_481

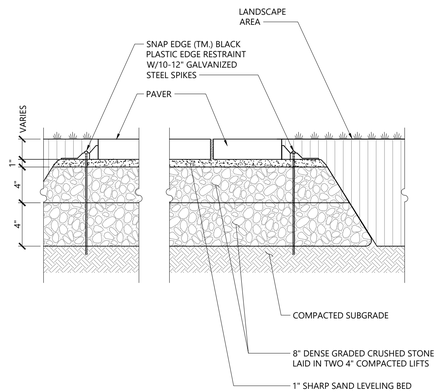


NOTES:
1. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS, BASED ON FIELD MEASUREMENTS, FOR APPROVAL PRIOR TO FABRICATION.
2. ALL STEEL SHALL BE HOT DIPPED GALVANIZED WITH FACTORY APPLIED EPOXY ENAMEL FINISH TO MATCH EXISTING FENCE.

4' Ht. Decorative Barrier / 5' Ht. Pool Fence

11/15

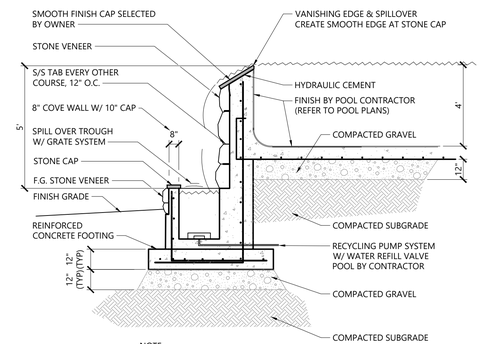
N.T.S. Source: VHB LD_



Pavers on Gravel

1/16

N.T.S. Source: VHB LD_824

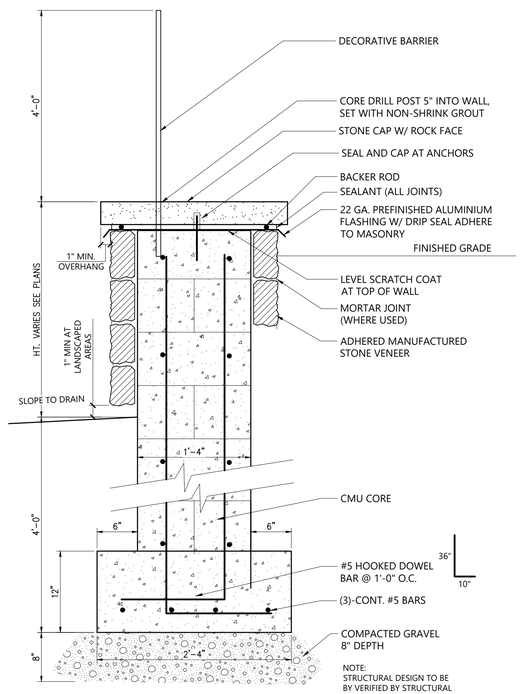


NOTE:
POOL CONTRACTOR TO PROVIDE FULL POOL PLANS FOR FINAL POOL PERMIT.

Infinity Pool Edge

8/20

N.T.S. Source: VHB LD_

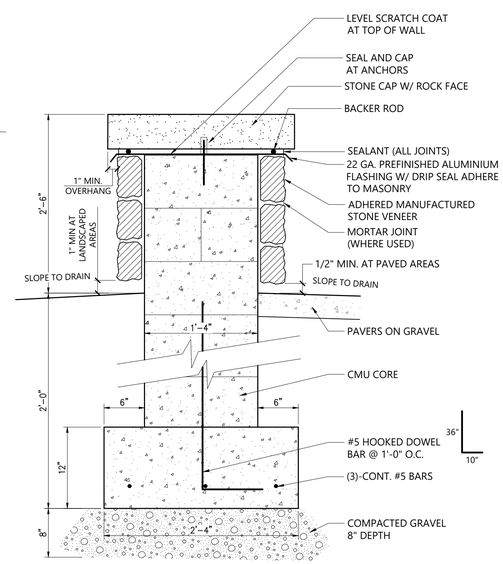


NOTE:
STRUCTURAL DESIGN TO BE BY VERIFIED BY STRUCTURAL ENGINEER.

Masonry Veneer Retaining Wall

1/17

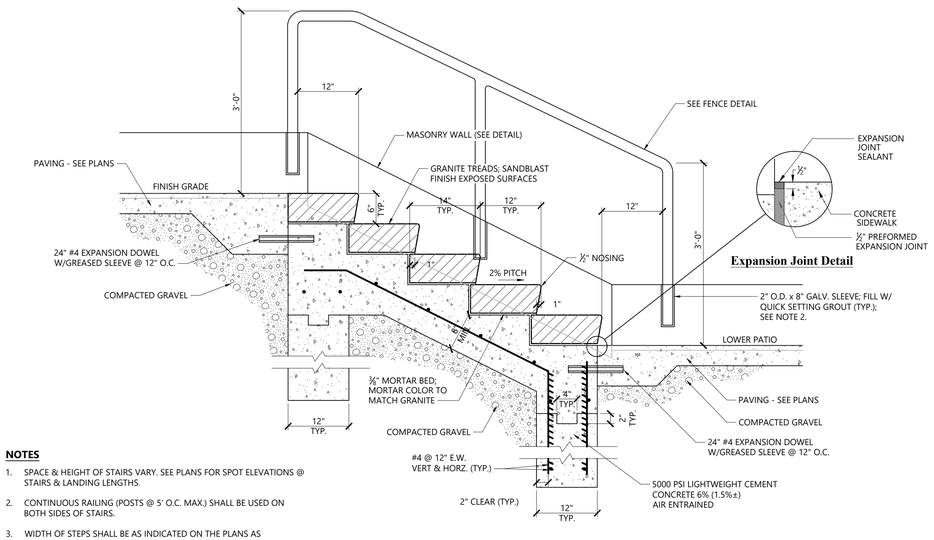
N.T.S. Source: VHB



Masonry Veneer Seat Wall

1/17

N.T.S. Source: VHB



NOTES

1. SPACE & HEIGHT OF STAIRS VARY. SEE PLANS FOR SPOT ELEVATIONS @ STAIRS & LANDING LENGTHS.
2. CONTINUOUS RAILING (POSTS @ 5' O.C. MAX.) SHALL BE USED ON BOTH SIDES OF STAIRS.
3. WIDTH OF STEPS SHALL BE AS INDICATED ON THE PLANS AS MEASURED BETWEEN INSIDE FACE OF CHEEK WALLS.

Granite Steps with Handrail

8/20

N.T.S. Source: VHB LD_

O'Donnell Residence

138 Forest Street
Winchester, Massachusetts

No.	Revision	Date	Appvd.

Designed by | Checked by

Issued for: **Permitting** | Date: **Sept. 1, 2020**

Not Approved for Construction

Drawing Title
Site Details

Drawing Number
L-8

Sheet 8 of 10

Project Number
14925.00

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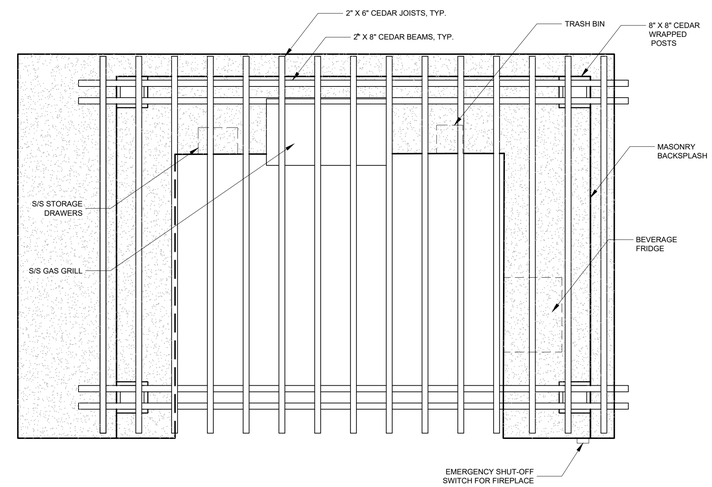
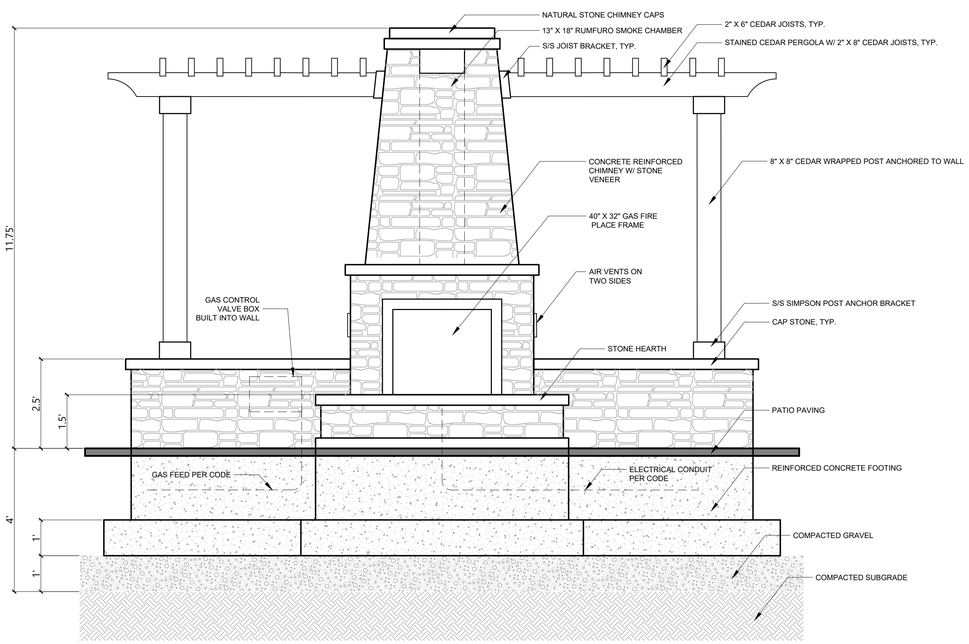
617.924.1770



PLAN VIEW

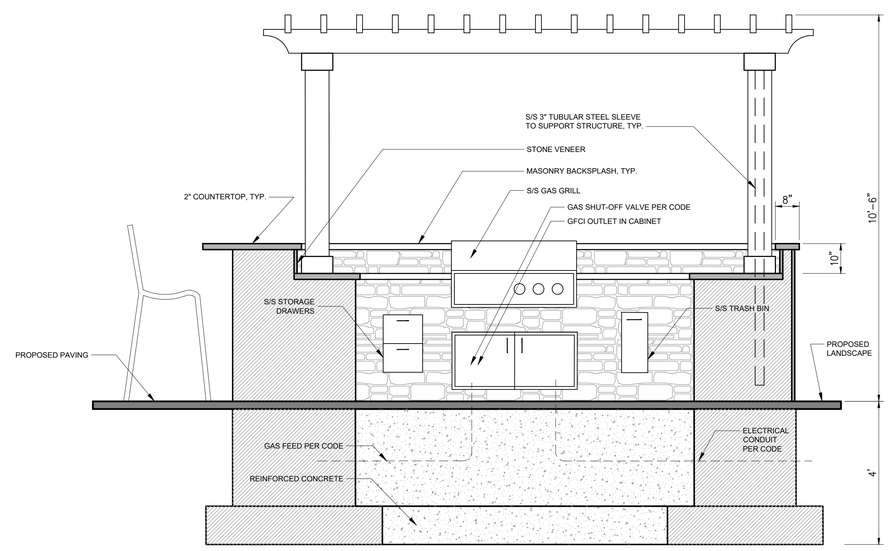


Masonry Fireplace

08/2020

Scale: 1/2" = 1'-0"

Source: VHB



Outdoor Kitchen

08/2020

Scale: 1/2" = 1'-0"

Source: VHB

0 1 2 4 Feet

O'Donnell Residence

138 Forest Street
Winchester, Massachusetts

No.	Revision	Date	Appvd.

Designed by

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Date: Sept. 1, 2020

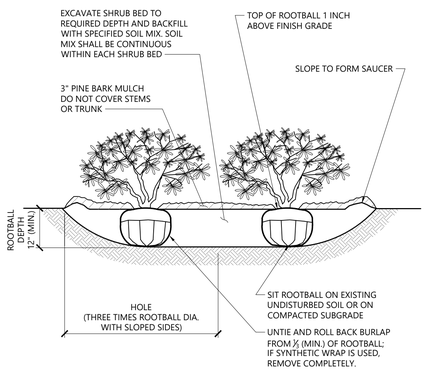
Not Approved for Construction

Drawing Title: Outdoor Kitchen

Drawing Number: L-9

Sheet of 10

Project Number: 14925.00

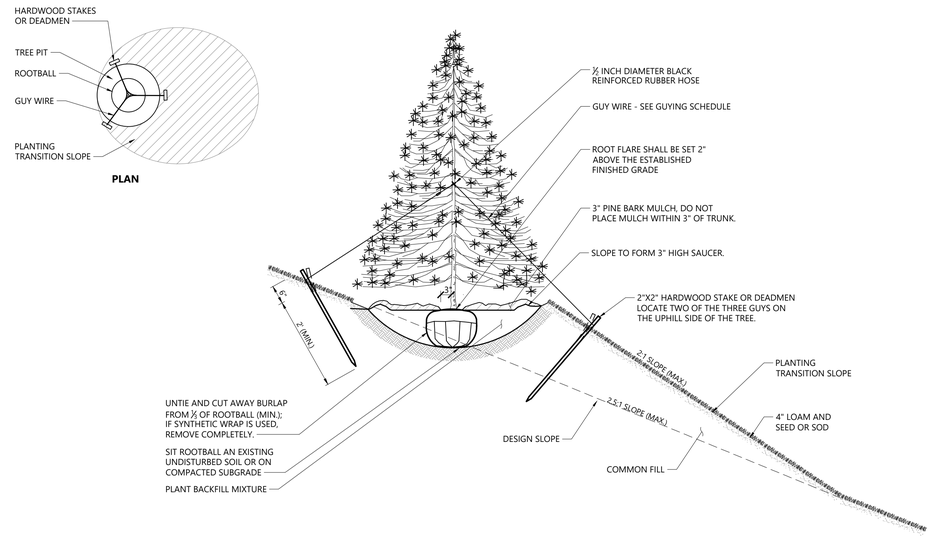


NOTES

1. LOOSEN ROOTS AT THE OUTER EDGE OF ROOTBALL OF CONTAINER GROWN SHRUBS.

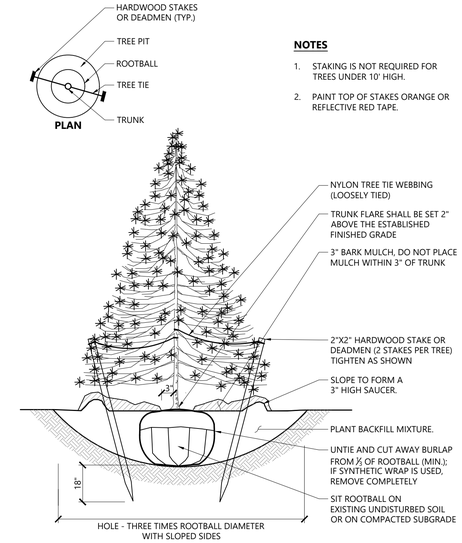
Shrub Bed Planting 1/16

N.T.S. Source: VHB LD_601



Tree Planting on Slope 1/16

N.T.S. Source: VHB LD_605



NOTES

1. STAKING IS NOT REQUIRED FOR TREES UNDER 10' HIGH.
2. PAINT TOP OF STAKES ORANGE OR REFLECTIVE RED TAPE.

Evergreen Tree Planting 1/16

N.T.S. Source: VHB LD_604

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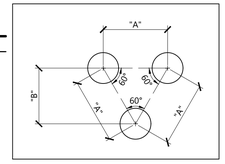
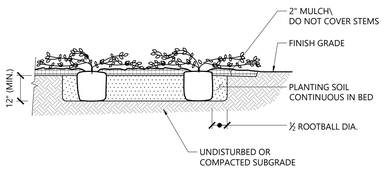
PLANT SPACING

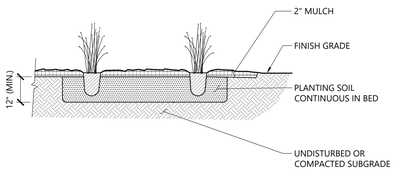
PLANT SPACING("A")	ROW SPACING ("B")
6 IN. O.C.	5 IN. O.C.
8 IN. O.C.	7 IN. O.C.
10 IN. O.C.	8 ½ IN. O.C.
12 IN. O.C.	10 ½ IN. O.C.
15 IN. O.C.	13 IN. O.C.
18 IN. O.C.	16 IN. O.C.
24 IN. O.C.	21 IN. O.C.





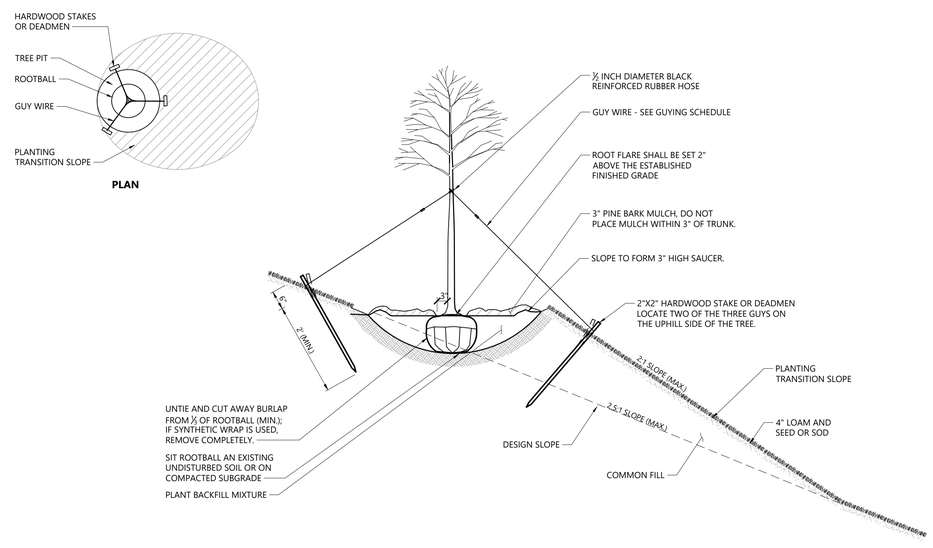
Ground Cover Planting 1/16

N.T.S. Source: VHB LD_615



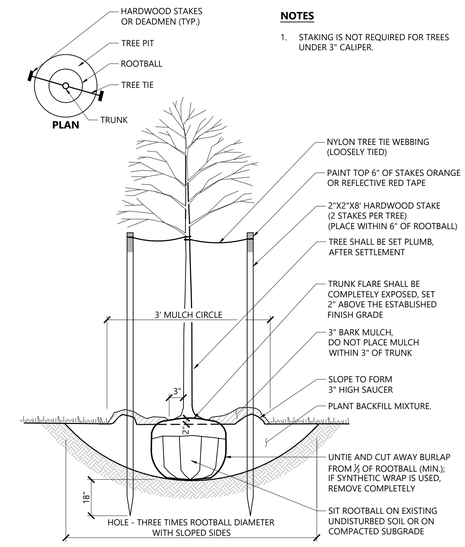
Perennial and Ornamental Grass Planting 1/16

N.T.S. Source: VHB LD_618



Tree Planting on Slope 5/17

N.T.S. Source: VHB LD_605d



NOTES

1. STAKING IS NOT REQUIRED FOR TREES UNDER 3" CALIPER.

Tree Planting (For Trees Under 4" Caliper) 9/18

N.T.S. Source: VHB LD_602

O'Donnell Residence

138 Forest Street
Winchester, Massachusetts

No.	Revision	Date	Appvd.

Designed by | Checked by

Issued for: Permitting
Date: Sept. 1, 2020

Not Approved for Construction

Drawing Title: Planting Details

Drawing Number: L-10

Sheet 10 of 10

Project Number: 14925.00

1 FRONT ELEVATION

2 LEFT ELEVATION

DNA ARCHITECTURE

DUSTIN NOLIN R.A.
1 HUNTINGTON AVE.
UNIT 707
BOSTON, MA 02116
781.718.8009
dustin@dna-architecture.com

O'DONNELL RESIDENCE
NEW CONSTRUCTION
#138 FOREST STREET
WINCHESTER, MA

SCALE: 1/4" =1-0"

DATE: 8/26/20
REV:

A1

1 REAR ELEVATION

2 RIGHT ELEVATION

DNA ARCHITECTURE

DUSTIN NOLIN R.A.
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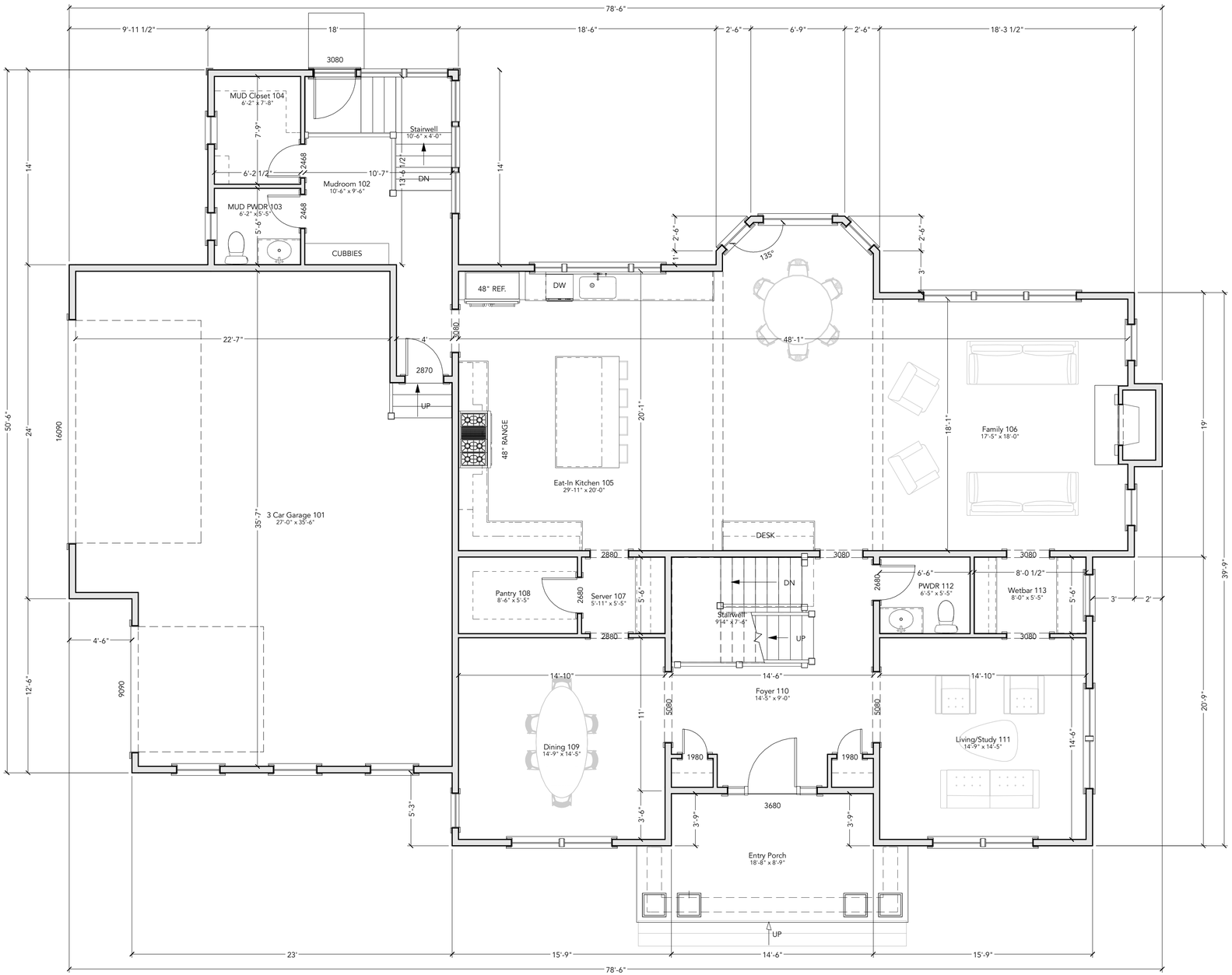
O'DONNELL RESIDENCE
NEW CONSTRUCTION
#138 FOREST STREET
WINCHESTER, MA

SCALE: 1/4"=1-0"

DATE: 8/26/20
REV:

A2



1 FIRST FLOOR PLAN

LIVING AREA: 2,235 S.F

DNA ARCHITECTURE

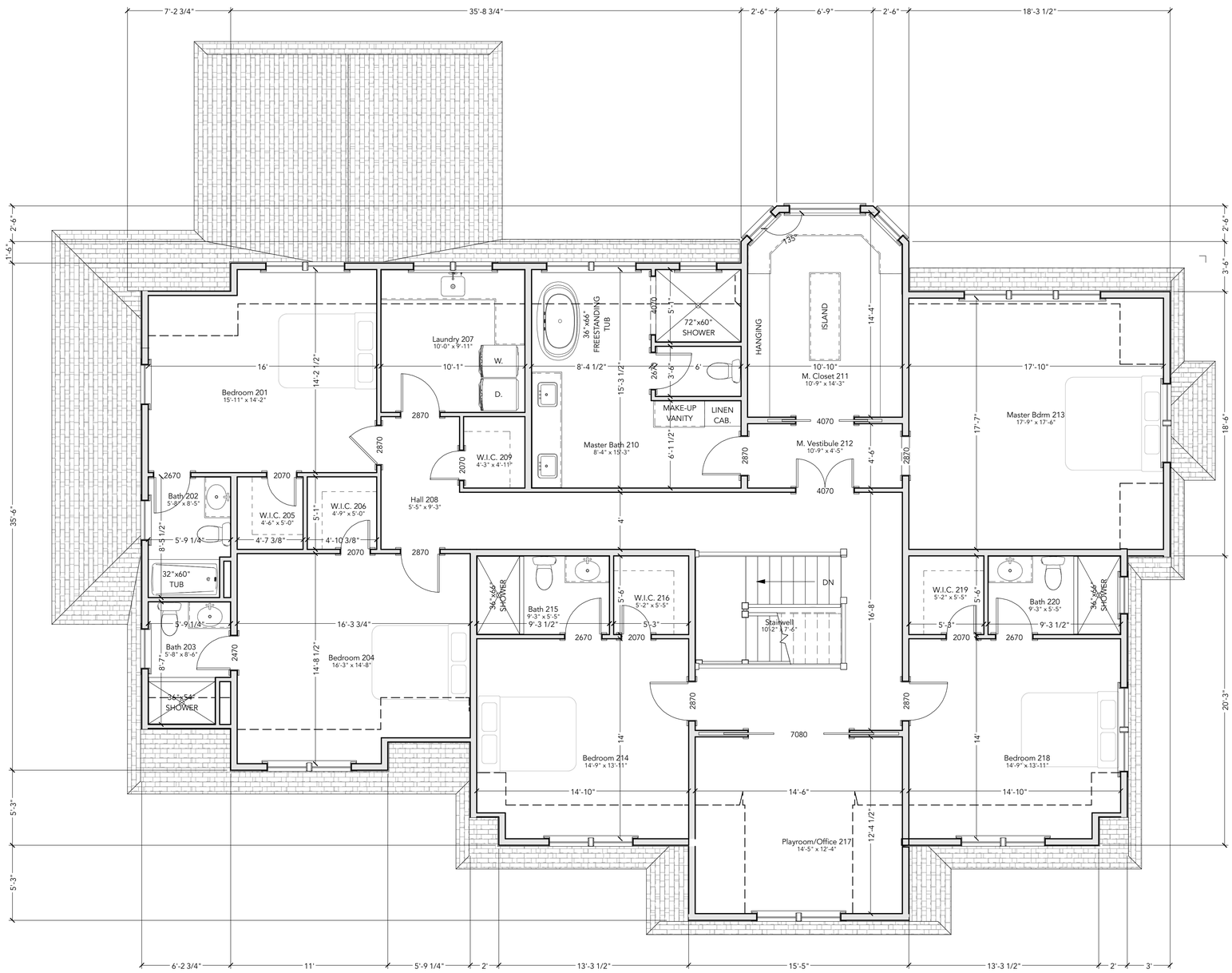
DUSTIN NOLIN R.A.
1 HUNTINGTON AVE.
UNIT 707
BOSTON, MA 02116
781.718.8009
dustin@dna-architecture.com

O'DONNELL RESIDENCE
NEW CONSTRUCTION
#138 FOREST STREET
WINCHESTER, MA

SCALE: 1/4" =1-0"

DATE: 8/26/20
REV:

A3



1 SECOND FLOOR PLAN

LIVING AREA: 2,735 S.F

DNA ARCHITECTURE

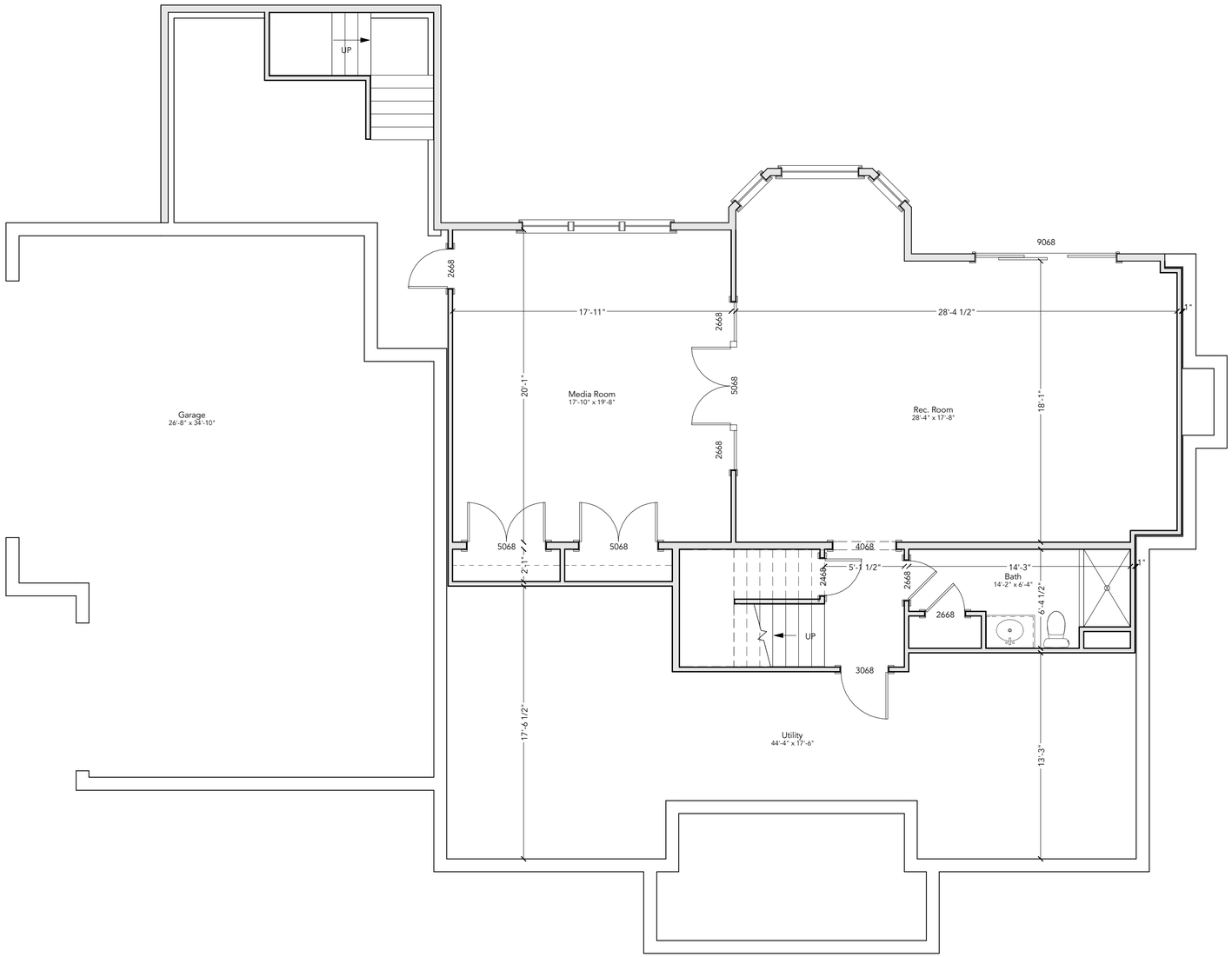
DUSTIN NOLIN R.A.
1 HUNTINGTON AVE.
UNIT 707
BOSTON, MA 02116
781.718.8009
dustin@dna-architecture.com

O'DONNELL RESIDENCE
NEW CONSTRUCTION
#138 FOREST STREET
WINCHESTER, MA

SCALE: 1/4"=1-0"

DATE: 8/26/20
REV:

A4



1 BASEMENT PLAN

DUSTIN NOLIN R.A.
1 HUNTINGTON AVE.
UNIT 707
BOSTON, MA 02116
781.718.8009
dustin@dna-architecture.com

O'DONNELL RESIDENCE
NEW CONSTRUCTION
#138 FOREST STREET
WINCHESTER, MA

SCALE:
1/4" =1-0"

DATE:
8/26/20
REV:

A5

Memorandum

To: Beth Rudolph, P.E.
Town Engineer
71 Mt. Vernon St.
Lower Level
Winchester, MA 01890

Date: August 27, 2020

Project #: 14925.00

From: Nicholas Skoly, PE

Re: 138 Forest Street Stormwater Analysis

On behalf of Tim O'Donnell, Vanasse Hangen Brustlin, Inc. (VHB) is pleased to submit the following memorandum to document the adherence to the Winchester Stormwater Regulations for the residential redevelopment at 138 Forest Street.The proposed stormwater management infrastructure includes best management practices (BMP's) for maintaining stormwater runoff rates and volumes and has been developed in compliance with the Massachusetts Stormwater Management Standards and the Ton of Winchester Storm Drain regulations, as applicable.

A HydroCAD model, using TR-20 methodology, was developed to evaluate the site's existing and proposed stormwater runoff response for the 2-, 10-, 25-, and 100-year storm events. As summarized in the following sections, the analysis for these storm events indicates that there will be no increase in peak discharge rates or runoff volumes resulting from the additional impervious area.

Project Description

Tim O'Donnell (Client) is proposing to redevelop his current residential property including tearing the existing house down and building a new large residential single family home with related site improvements (the Project) located at 138 Forest Street, Winchester, MA 01890 (the Site). VHB understands that Mr. O'Donnell (Owner) intends to demolish the existing house in order to redevelop the site with a new single family residence with associated landscape improvements including: Enhanced landscaping, new driveway, pool/jacuzzi, pool deck, walls/terraces, walkways, landscape lighting, planting areas and irrigation.

Stormwater Approach

The existing site currently grades from south to north with a steep slope. Grades on the site range from 70' on the southern edge (adjacent to Forest Street) to 45' on the northern property line. The site is limited to a residential building with sidewalks, driveway, parking, and landscaping. There are no existing stormwater controls in place and the site drains overland to the north. The existing building is proposed to be demolished and a new house constructed in its place. In additional to the house, a sidewalk, patios, driveway, a pool, and landscape improvements are proposed on the site. The proposed plan creates an increase in impervious area of approximately 5,150 sf (counting the pool as impervious surface)

The stormwater runoff in the proposed condition will be collected and routed through subsurface infiltration (leaching basins and stormtech infiltration chambers). In larger storms the subsurface systems will overflow and drain overland to the north, maintaining the existing drainage patterns. Based on NRCS soils and test pits performed on site, the soil is well graded sand and classified as A soils. The geotechnical engineer performed infiltration testing and observed an infiltration rate of 15.6 in/hr. Per the MA DEP stormwater regulations the design utilizes for an infiltration rate of 7.8

in/hr, half of the observed rate. The subsurface infiltration systems provide for approximately 985 cf of static storage which is equivalent to 1.1" over the impervious area on site.

Hydrologic Analysis

The rainfall runoff response of the Site under existing and proposed conditions was evaluated for storm events with recurrence intervals of 2-, 10-, 25-, and 100-years. Runoff coefficients for the pre- and post-development conditions, were determined using NRCS Technical Release 55 (TR-55) methodology as provided in HydroCAD. The HydroCAD model is based on NRCS Technical Release 20 (TR-20) Model for Project Formulation Hydrology. Printouts of the HydroCAD analyses are attached. Tables 1 and 2 below presents a summary of the existing and proposed conditions peak flow rates and runoff volumes.

Table 1
Peak Discharge Rates (cubic feet per second)

Design Point		2-year	10-year	25-year	100-year
Design Point 1:					
OffSite North					
	Existing	0.28	1.39	2.27	3.81
	Proposed	0.0	1.16	1.24	1.41

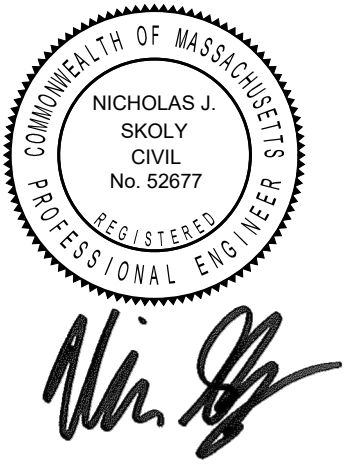


Table 2
Runoff Volumes (cubic feet)

Design Point		2-year	10-year	25-year	100-year
Design Point 1:					
Offsite North					
	Existing	1,088	3,549	5,492	8,904
	Proposed	1	1,222	2,708	5,130

Stormwater Management Summary

The stormwater management design includes BMPs for maintaining stormwater runoff rates and volumes and has been developed with guidance provided by the DEP and in accordance with the applicable Town and State requirements listed in previous sections of the memo. A hydrologic model was developed to evaluate the Site's existing and proposed stormwater runoff response and the results of the analysis indicate that the site has been designed such that there will be no increase in peak discharge rates or volumes between the pre- and post-development conditions for the storm events studied. In addition to the rates and volumes, the project has significantly increased water quality through infiltration compared to the untreated existing condition.

ATTACHMENTS:

Supporting Calculations:
Hydrologic Analysis
Operations & Maintenance Plan
Water Quality and Drawdown Calculations

Water Quality Volume Calculations

Project Name: 138 Forest Street | **Proj. No.:** 14925.00

Date: Aug-20

Project Location: Winchester | **Calculated by:** NJS

Detention Basin

Total Impervious Area= 0.24 Acres

Required:

	Runoff Depth to be Treated (in.)	Required Volume (c.f.)
Water Quality Volume:	0.5	436

Provided:

Basin 1P:	157 cf	provided below elevation 62.75 (Outlet Pipe)
Basin 2P:	141 cf	provided below elevation 62.7 (Outlet Pipe)
Basin 3P:	687 cf	provided below elevation 53.3 (Outlet Pipe)

Total Required WQV	**436 cf**
Total Provided WQV	**985 cf**

Stormwater Operation and Maintenance Plan

Project Information

Site

138 Forest Street
Winchester, MA

Owner

Mr. Tim O'Donnell
138 Forest Street
Winchester, MA 01890

Description of Stormwater Maintenance Measures

The following Operation and Maintenance (O&M) program is proposed to ensure the continued effectiveness of the stormwater management system. Attached to this plan are a Stormwater Best Management Practices Checklist and Maintenance Figure for use during the long term operation and maintenance of the stormwater management system.

Leaching Basins/Area Drains

- All leaching basins shall be inspected and cleaned a minimum of at least once per year.
- Sediment (if more than six inches deep) and/or floatable pollutants shall be pumped from the basin and disposed of at an approved offsite facility in accordance with all applicable regulations.
- Any structural damage or other indication of malfunction will be reported to the site manager and repaired as necessary
- During colder periods, the catch basin grates must be kept free of snow and ice.
- During warmer periods, the catch basin grates must be kept free of leaves, litter, sand, and debris.

Subsurface Infiltration System

- The subsurface infiltration systems will be inspected at least once each year by removing the manhole/access port covers and determining the thickness of sediment that has accumulated in the sediment removal row.
- If sediment is more than six inches deep, it must be suspended via flushing with clean water and removed.
- Manufacturer's specifications and instructions for cleaning the sediment removal row is provided as an attachment to this section.
- Emergency overflow pipes will be examined at least once each year and verified that no blockage has occurred.
- System will be observed after rainfalls to see if it is properly draining.

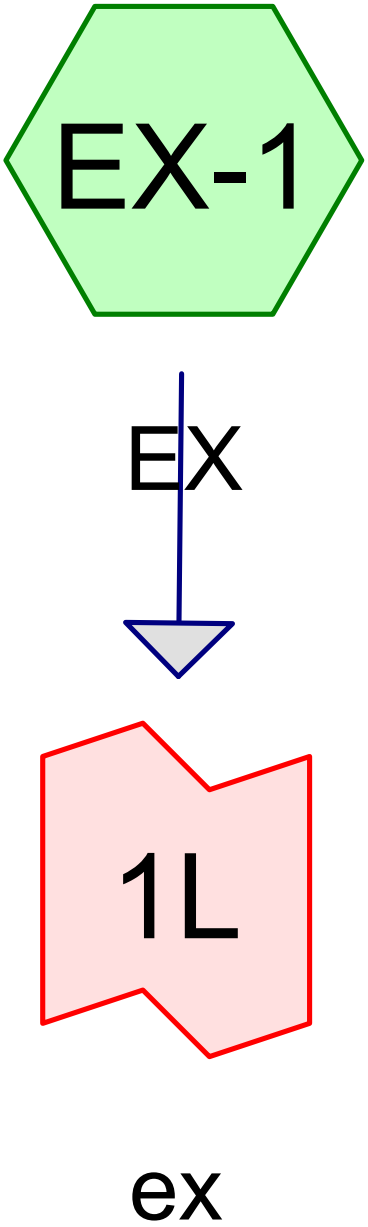
Stormwater Outfalls

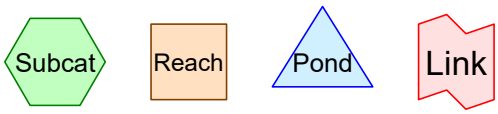
- Inspect outfall locations monthly for the first three months after construction to ensure proper functioning and correct any areas that have settled or experienced washouts.
- Inspect outfalls annually after initial three month period.
- Annual inspections should be supplemented after large storms, when washouts may occur.
- Maintain vegetation around outfalls to prevent blockages at the outfall.
- Maintain rip rap pad below each outfall and replace any washouts.

- Remove and dispose of any trash or debris at the outfall.

Roof Drain Leaders

- Perform routine roof inspections quarterly.
- Keep roofs clean and free of debris.
- Keep roof drainage systems clear.
- Keep roof access limited to authorized personnel.
- Clean inlets draining to the subsurface bed twice per year as necessary.





Routing Diagram for 14925.00-Stormwater
Prepared by VHB, Printed 8/26/2020
HydroCAD® 10.00-25 s/n 01038 © 2019 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
25,250	49	50-75% Grass cover, Fair, HSG A (EX-1)
1,200	96	Gravel surface, HSG A (EX-1)
5,250	98	Paved parking, HSG A (EX-1)
31,700	**59**	**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX-1: EX Runoff Area=31,700 sf 16.56% Impervious Runoff Depth=0.41"
Tc=0.0 min CN=59 Runoff=0.28 cfs 1,088 cf

Link 1L: ex Inflow=0.28 cfs 1,088 cf
Primary=0.28 cfs 1,088 cf

Total Runoff Area = 31,700 sf Runoff Volume = 1,088 cf Average Runoff Depth = 0.41"
83.44% Pervious = 26,450 sf 16.56% Impervious = 5,250 sf

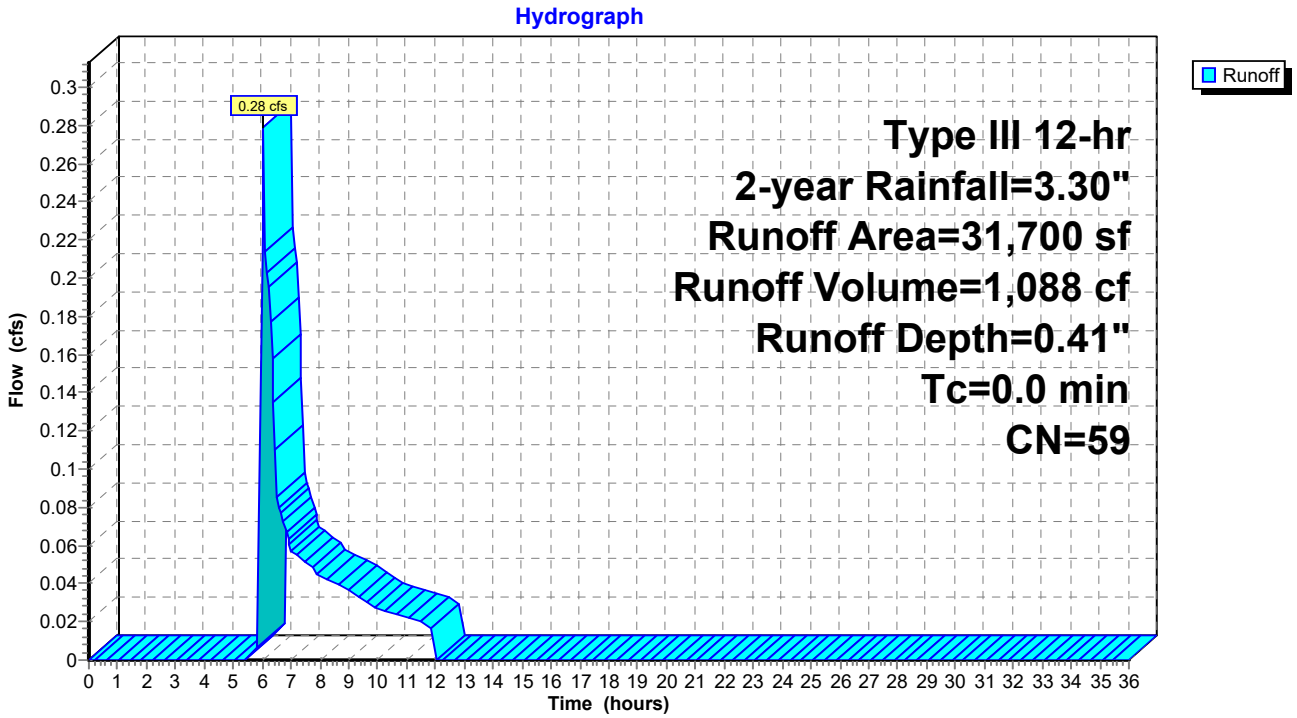
Summary for Subcatchment EX-1: EX

Runoff = 0.28 cfs @ 6.05 hrs, Volume= 1,088 cf, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 2-year Rainfall=3.30"

Area (sf)	CN	Description
5,250	98	Paved parking, HSG A
1,200	96	Gravel surface, HSG A
25,250	49	50-75% Grass cover, Fair, HSG A
31,700	59	Weighted Average
26,450		83.44% Pervious Area
5,250		16.56% Impervious Area

Subcatchment EX-1: EX

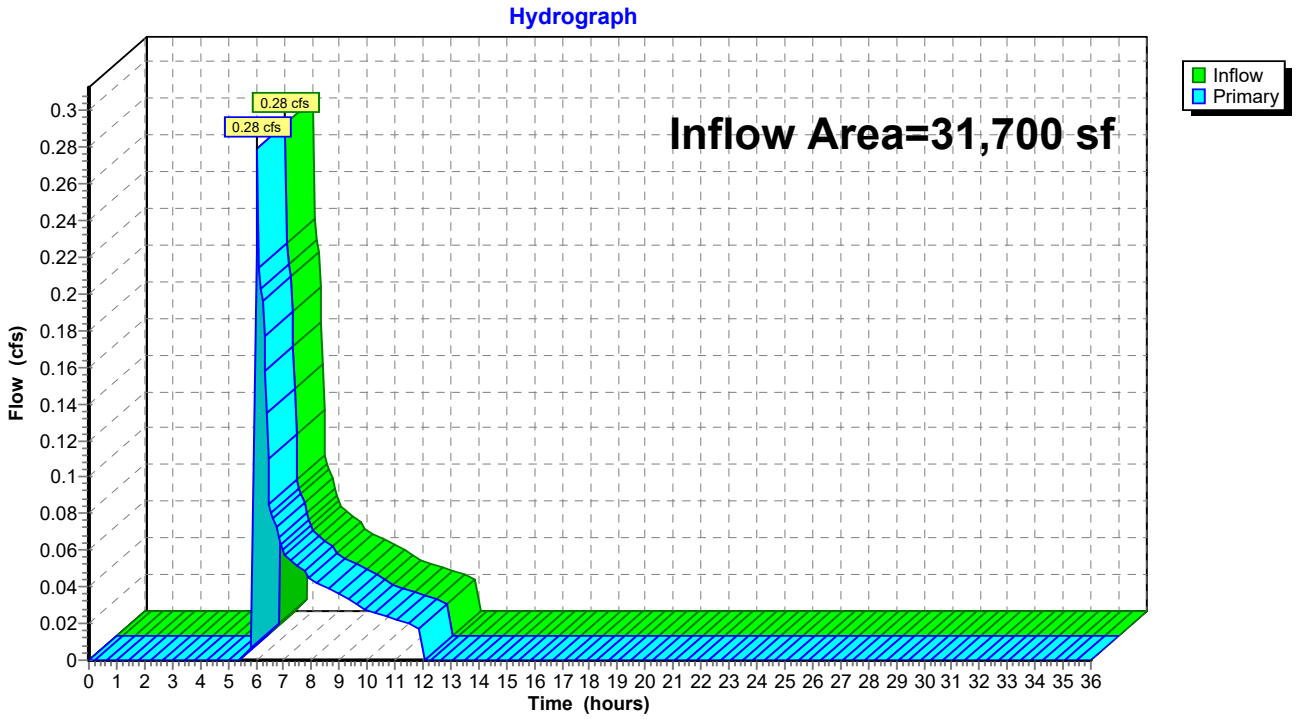


Summary for Link 1L: ex

Inflow Area = 31,700 sf, 16.56% Impervious, Inflow Depth = 0.41" for 2-year event
Inflow = 0.28 cfs @ 6.05 hrs, Volume= 1,088 cf
Primary = 0.28 cfs @ 6.05 hrs, Volume= 1,088 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link 1L: ex



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX-1: EX Runoff Area=31,700 sf 16.56% Impervious Runoff Depth=1.34"
Tc=0.0 min CN=59 Runoff=1.39 cfs 3,549 cf

Link 1L: ex Inflow=1.39 cfs 3,549 cf
Primary=1.39 cfs 3,549 cf

Total Runoff Area = 31,700 sf Runoff Volume = 3,549 cf Average Runoff Depth = 1.34"
83.44% Pervious = 26,450 sf 16.56% Impervious = 5,250 sf

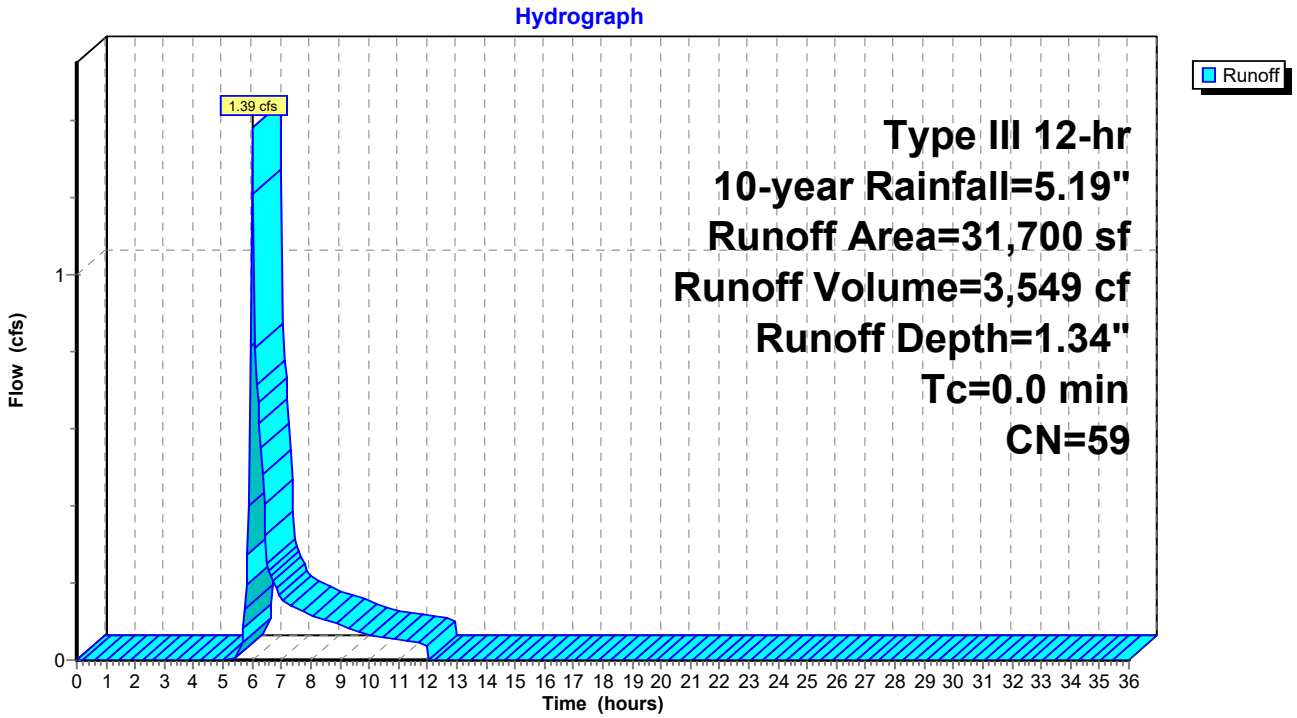
Summary for Subcatchment EX-1: EX

Runoff = 1.39 cfs @ 6.01 hrs, Volume= 3,549 cf, Depth= 1.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 10-year Rainfall=5.19"

Area (sf)	CN	Description
5,250	98	Paved parking, HSG A
1,200	96	Gravel surface, HSG A
25,250	49	50-75% Grass cover, Fair, HSG A
31,700	59	Weighted Average
26,450		83.44% Pervious Area
5,250		16.56% Impervious Area

Subcatchment EX-1: EX

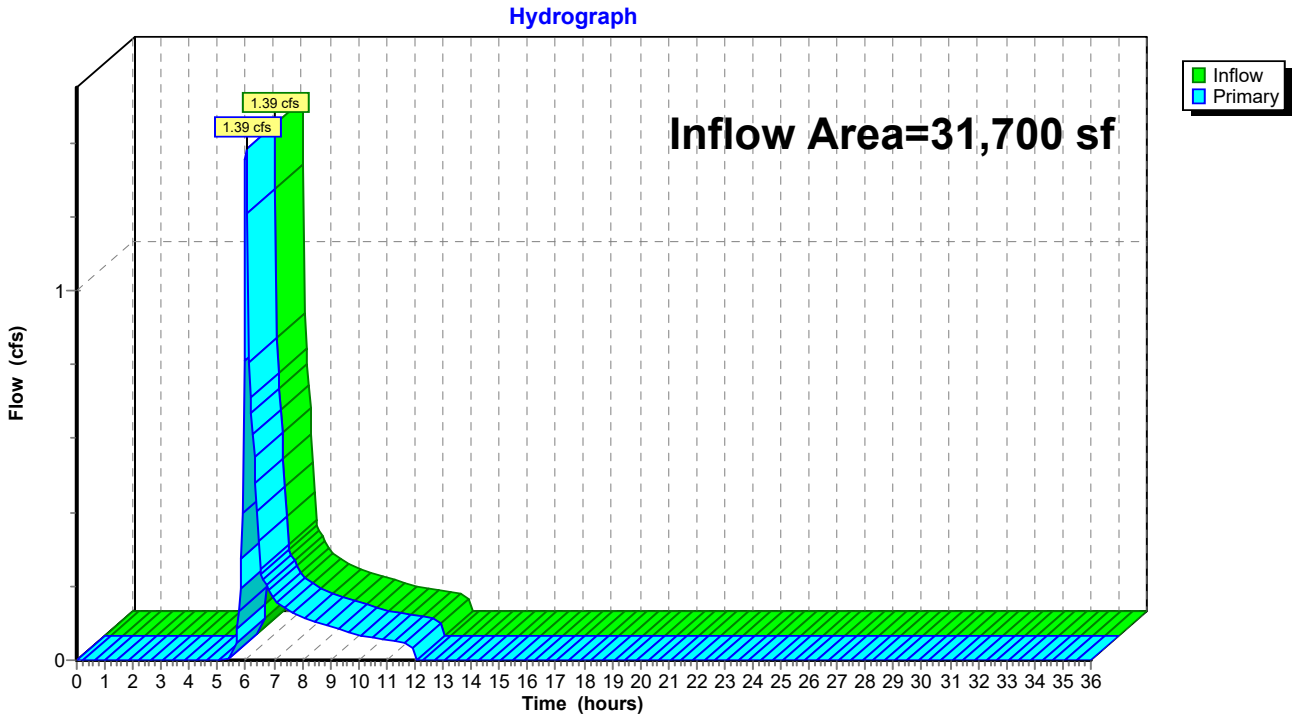


Summary for Link 1L: ex

Inflow Area = 31,700 sf, 16.56% Impervious, Inflow Depth = 1.34" for 10-year event
Inflow = 1.39 cfs @ 6.01 hrs, Volume= 3,549 cf
Primary = 1.39 cfs @ 6.01 hrs, Volume= 3,549 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link 1L: ex



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX-1: EX Runoff Area=31,700 sf 16.56% Impervious Runoff Depth=2.08"
Tc=0.0 min CN=59 Runoff=2.27 cfs 5,492 cf

Link 1L: ex Inflow=2.27 cfs 5,492 cf
Primary=2.27 cfs 5,492 cf

Total Runoff Area = 31,700 sf Runoff Volume = 5,492 cf Average Runoff Depth = 2.08"
83.44% Pervious = 26,450 sf 16.56% Impervious = 5,250 sf

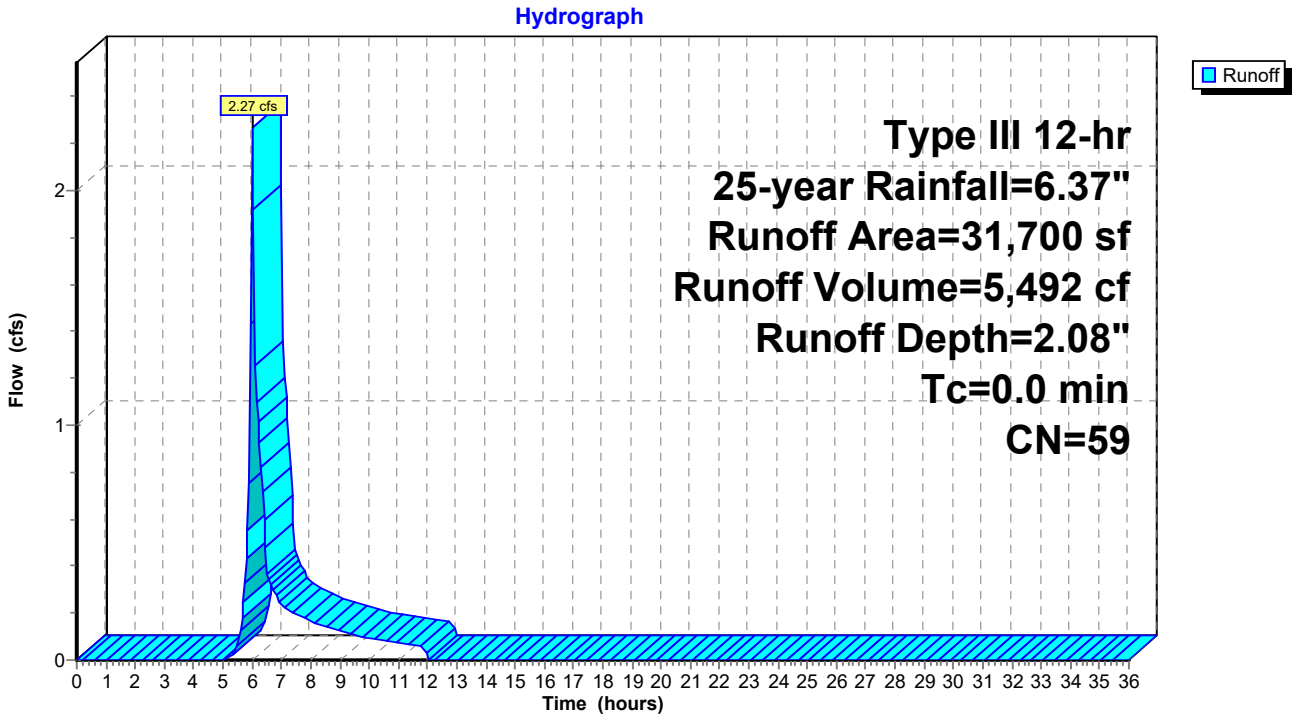
Summary for Subcatchment EX-1: EX

Runoff = 2.27 cfs @ 6.01 hrs, Volume= 5,492 cf, Depth= 2.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 25-year Rainfall=6.37"

Area (sf)	CN	Description
5,250	98	Paved parking, HSG A
1,200	96	Gravel surface, HSG A
25,250	49	50-75% Grass cover, Fair, HSG A
31,700	59	Weighted Average
26,450		83.44% Pervious Area
5,250		16.56% Impervious Area

Subcatchment EX-1: EX

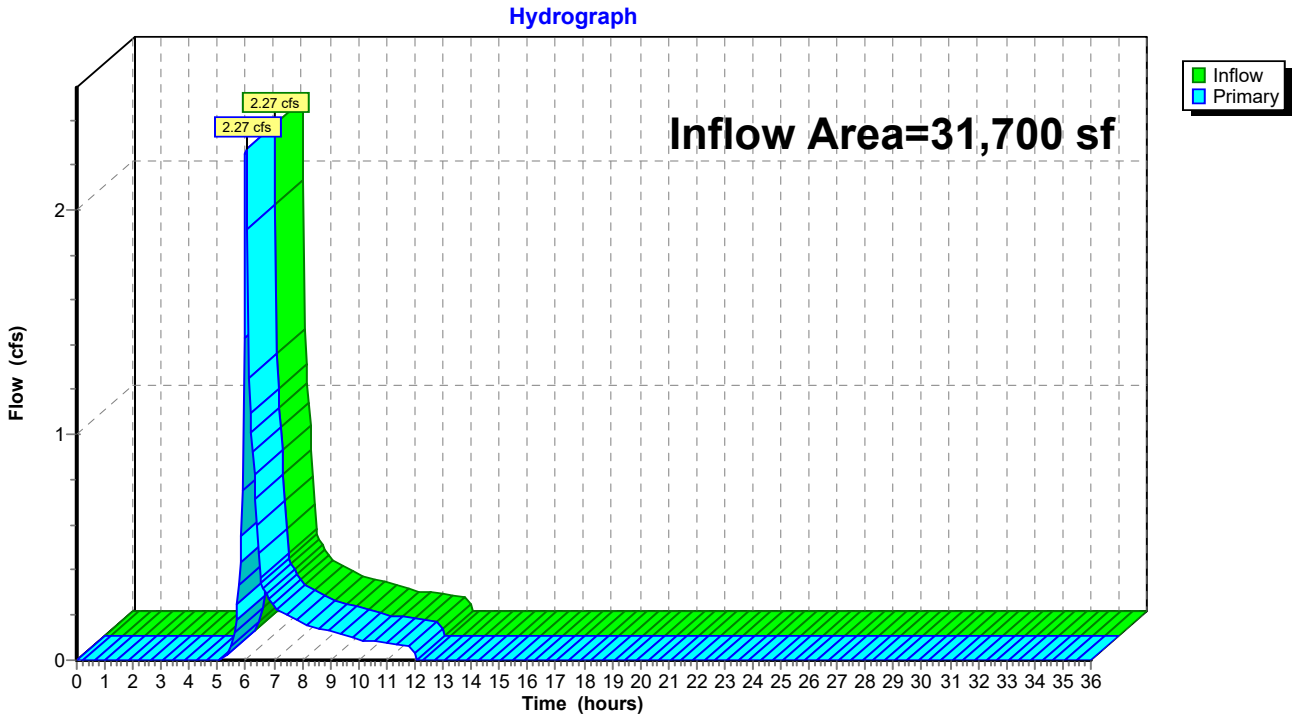


Summary for Link 1L: ex

Inflow Area = 31,700 sf, 16.56% Impervious, Inflow Depth = 2.08" for 25-year event
Inflow = 2.27 cfs @ 6.01 hrs, Volume= 5,492 cf
Primary = 2.27 cfs @ 6.01 hrs, Volume= 5,492 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link 1L: ex



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX-1: EX Runoff Area=31,700 sf 16.56% Impervious Runoff Depth=3.37"
Tc=0.0 min CN=59 Runoff=3.81 cfs 8,904 cf

Link 1L: ex Inflow=3.81 cfs 8,904 cf
Primary=3.81 cfs 8,904 cf

Total Runoff Area = 31,700 sf Runoff Volume = 8,904 cf Average Runoff Depth = 3.37"
83.44% Pervious = 26,450 sf 16.56% Impervious = 5,250 sf

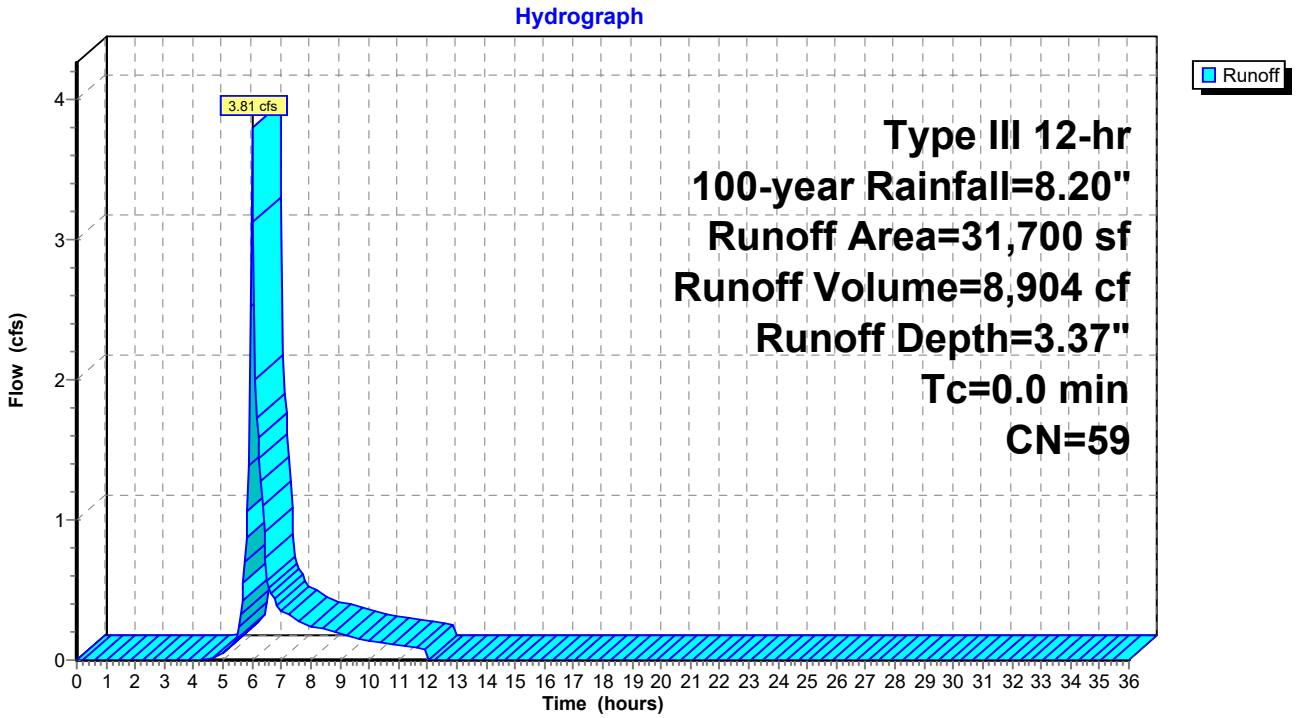
Summary for Subcatchment EX-1: EX

Runoff = 3.81 cfs @ 6.01 hrs, Volume= 8,904 cf, Depth= 3.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 100-year Rainfall=8.20"

Area (sf)	CN	Description
5,250	98	Paved parking, HSG A
1,200	96	Gravel surface, HSG A
25,250	49	50-75% Grass cover, Fair, HSG A
31,700	59	Weighted Average
26,450		83.44% Pervious Area
5,250		16.56% Impervious Area

Subcatchment EX-1: EX

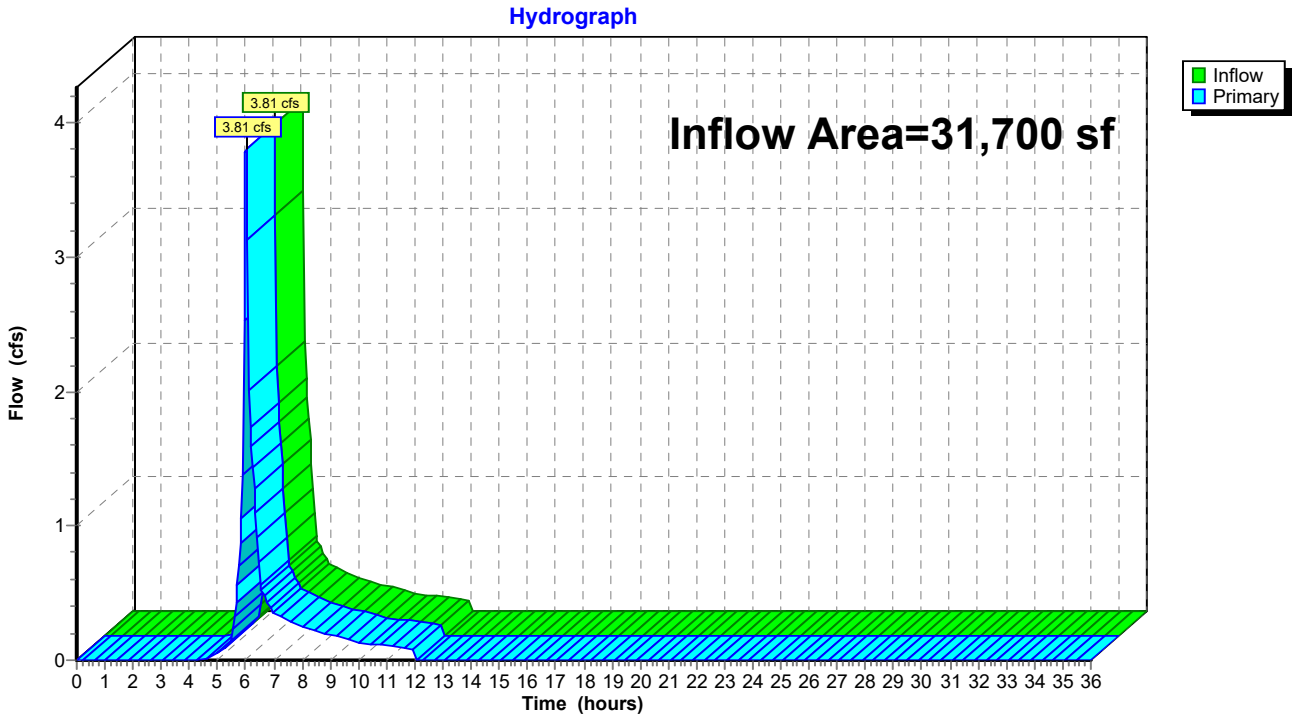


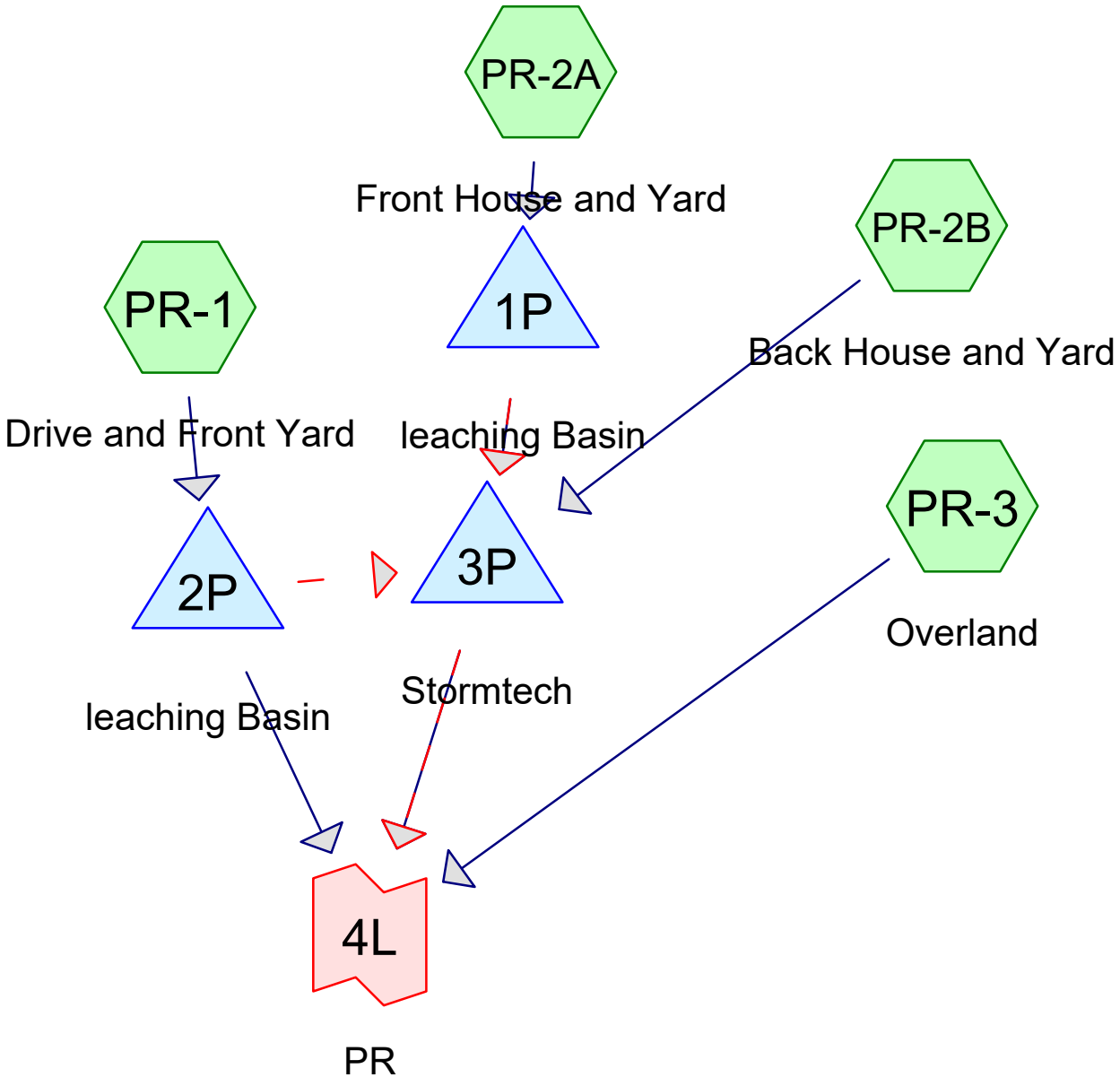
Summary for Link 1L: ex

Inflow Area = 31,700 sf, 16.56% Impervious, Inflow Depth = 3.37" for 100-year event
Inflow = 3.81 cfs @ 6.01 hrs, Volume= 8,904 cf
Primary = 3.81 cfs @ 6.01 hrs, Volume= 8,904 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link 1L: ex





Subcat Reach Pond Link

Routing Diagram for 14925.00-Stormwater
Prepared by VHB, Printed 8/26/2020
HydroCAD® 10.00-25 s/n 01038 © 2019 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
2,950	49	50-75% Grass cover, Fair, HSG A (PR-1)
18,350	39	>75% Grass cover, Good, HSG A (PR-2A, PR-2B, PR-3)
10,400	98	Paved parking, HSG A (PR-1, PR-2A, PR-2B)
31,700	**59**	**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR-1: Drive and Front Yard Runoff Area=7,400 sf 60.14% Impervious Runoff Depth=1.35"
Tc=0.0 min CN=78 Runoff=0.35 cfs 831 cf

SubcatchmentPR-2A: Front House and Runoff Area=3,900 sf 21.79% Impervious Runoff Depth=0.20"
Tc=0.0 min CN=52 Runoff=0.01 cfs 64 cf

SubcatchmentPR-2B: Back House and Runoff Area=16,250 sf 31.38% Impervious Runoff Depth=0.38"
Tc=0.0 min CN=58 Runoff=0.12 cfs 511 cf

SubcatchmentPR-3: Overland Runoff Area=4,150 sf 0.00% Impervious Runoff Depth=0.00"
Tc=0.0 min CN=39 Runoff=0.00 cfs 1 cf

Pond 1P: leaching Basin Peak Elev=57.81' Storage=1 cf Inflow=0.01 cfs 64 cf
Discarded=0.01 cfs 64 cf Primary=0.00 cfs 0 cf Secondary=0.00 cfs 0 cf Outflow=0.01 cfs 64 cf

Pond 2P: leaching Basin Peak Elev=63.17' Storage=156 cf Inflow=0.35 cfs 831 cf
Discarded=0.01 cfs 416 cf Primary=0.00 cfs 0 cf Secondary=0.44 cfs 415 cf Outflow=0.45 cfs 831 cf

Pond 3P: Stormtech Peak Elev=51.37' Storage=300 cf Inflow=0.56 cfs 926 cf
Discarded=0.06 cfs 926 cf Primary=0.00 cfs 0 cf Secondary=0.00 cfs 0 cf Outflow=0.06 cfs 926 cf

Link 4L: PR Inflow=0.00 cfs 1 cf
Primary=0.00 cfs 1 cf

Total Runoff Area = 31,700 sf Runoff Volume = 1,406 cf Average Runoff Depth = 0.53"
67.19% Pervious = 21,300 sf 32.81% Impervious = 10,400 sf

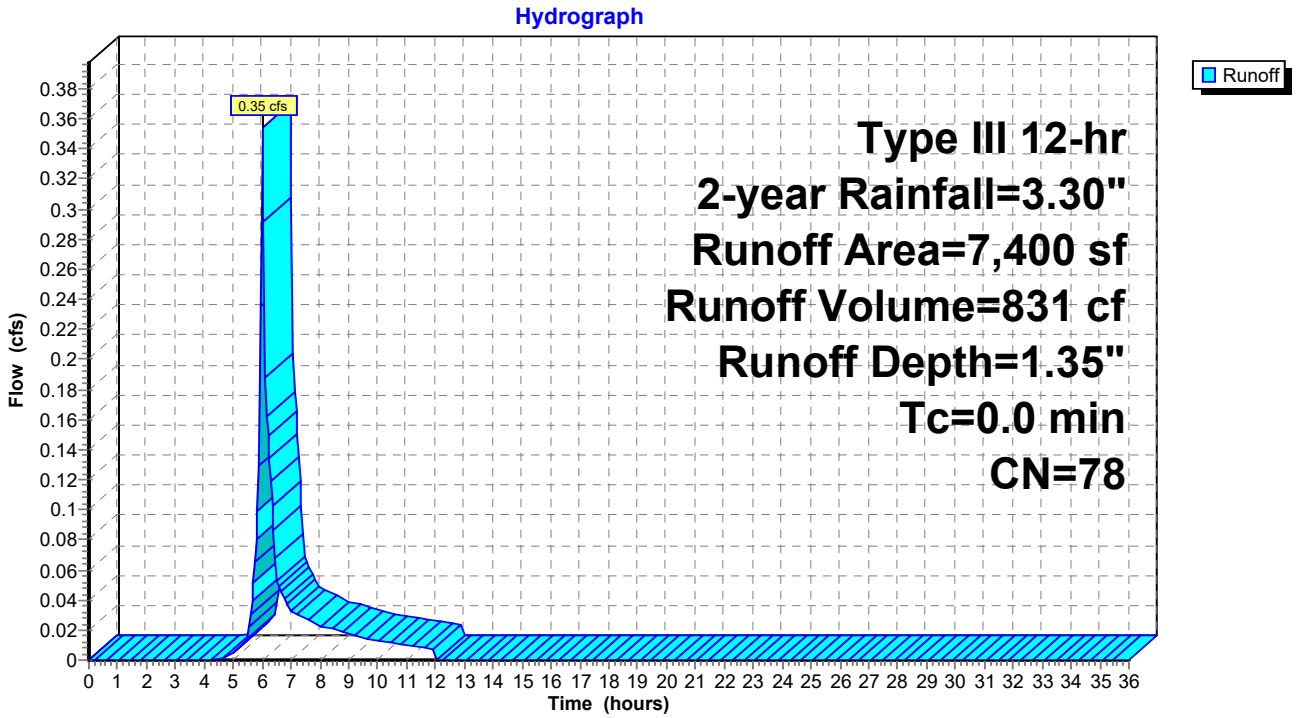
Summary for Subcatchment PR-1: Drive and Front Yard

Runoff = 0.35 cfs @ 6.01 hrs, Volume= 831 cf, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 2-year Rainfall=3.30"

Area (sf)	CN	Description
4,450	98	Paved parking, HSG A
0	96	Gravel surface, HSG A
2,950	49	50-75% Grass cover, Fair, HSG A
7,400	78	Weighted Average
2,950		39.86% Pervious Area
4,450		60.14% Impervious Area

Subcatchment PR-1: Drive and Front Yard



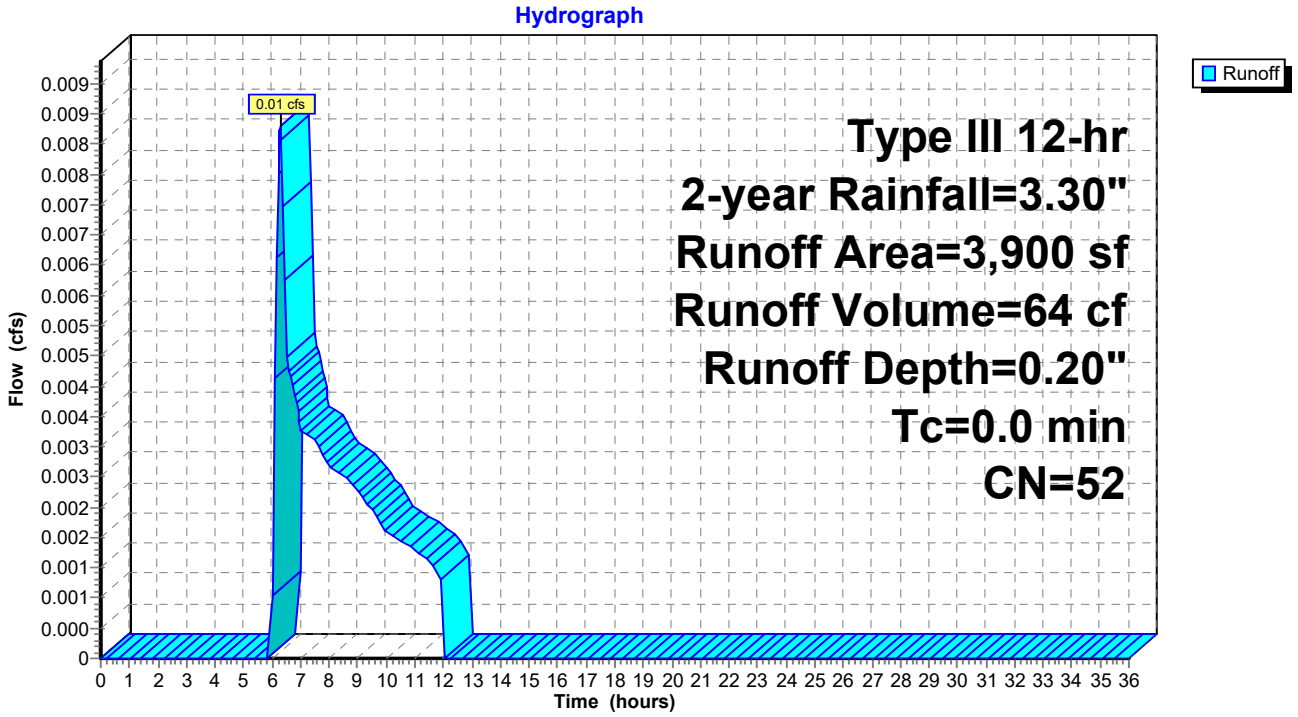
Summary for Subcatchment PR-2A: Front House and Yard

Runoff = 0.01 cfs @ 6.28 hrs, Volume= 64 cf, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 2-year Rainfall=3.30"

Area (sf)	CN	Description
850	98	Paved parking, HSG A
3,050	39	>75% Grass cover, Good, HSG A
3,900	52	Weighted Average
3,050		78.21% Pervious Area
850		21.79% Impervious Area

Subcatchment PR-2A: Front House and Yard



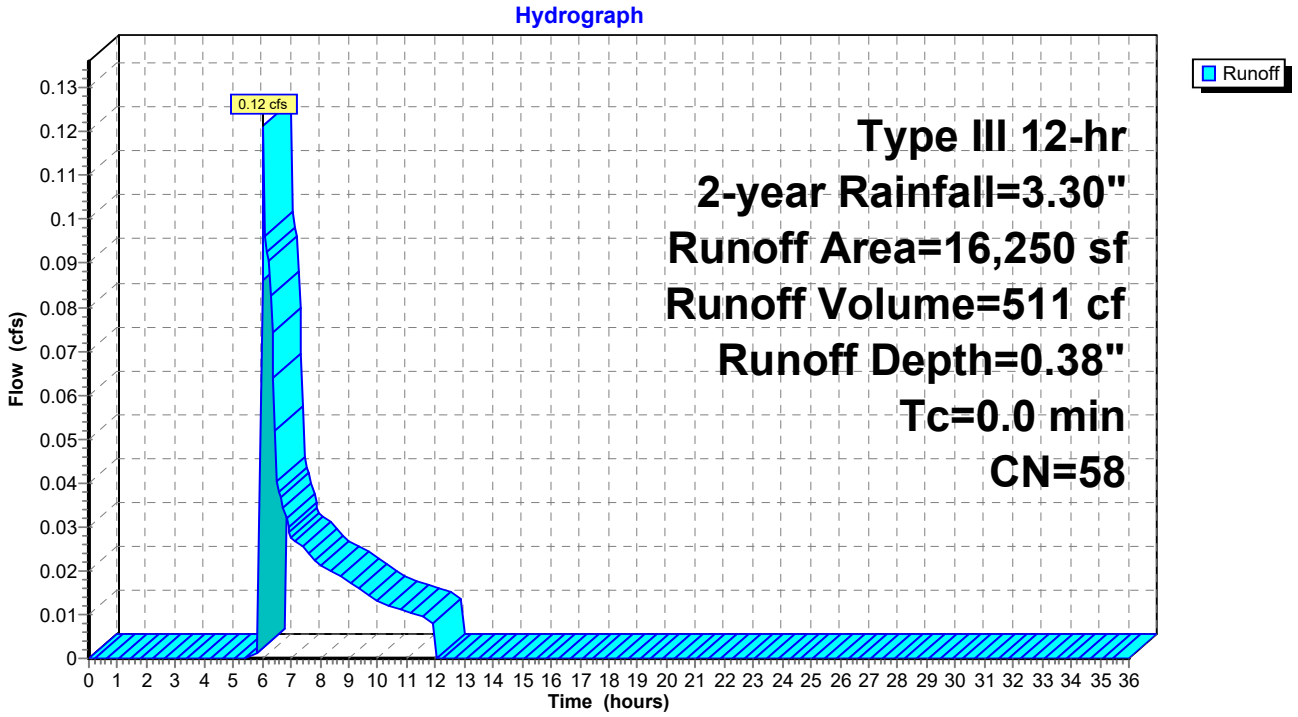
Summary for Subcatchment PR-2B: Back House and Yard

Runoff = 0.12 cfs @ 6.05 hrs, Volume= 511 cf, Depth= 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 2-year Rainfall=3.30"

Area (sf)	CN	Description
5,100	98	Paved parking, HSG A
11,150	39	>75% Grass cover, Good, HSG A
16,250	58	Weighted Average
11,150		68.62% Pervious Area
5,100		31.38% Impervious Area

Subcatchment PR-2B: Back House and Yard



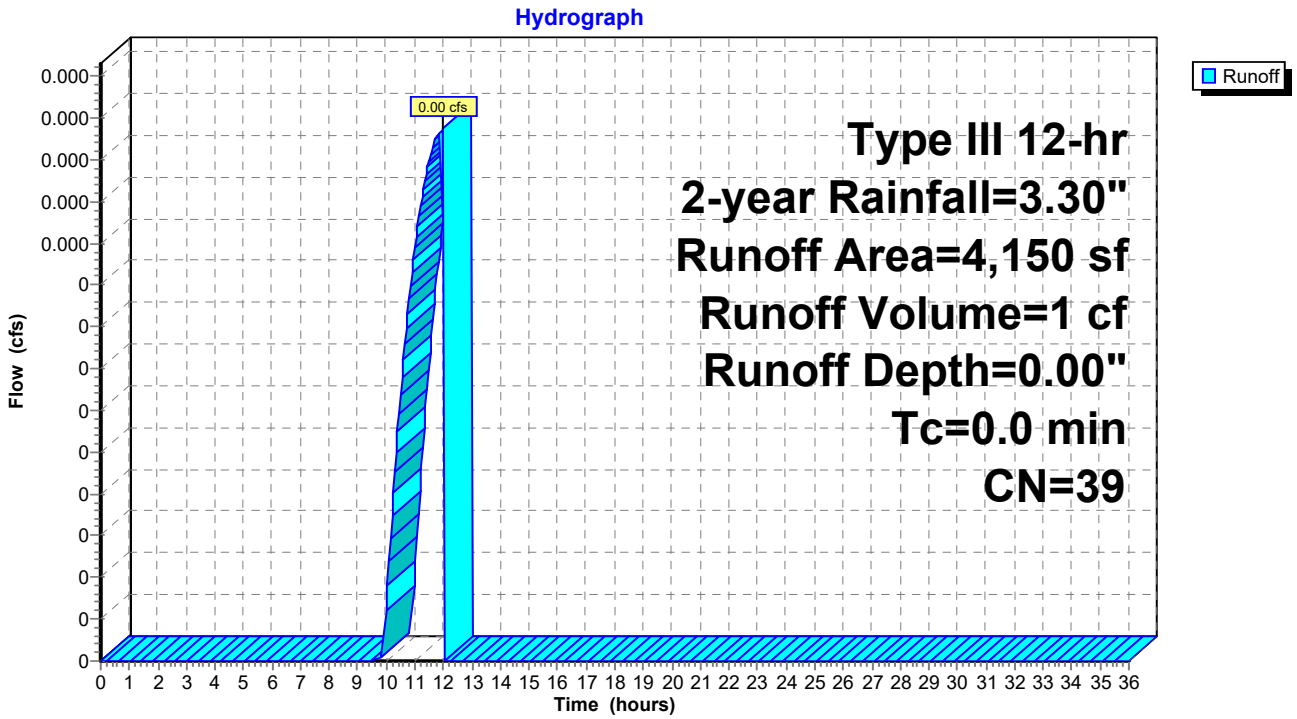
Summary for Subcatchment PR-3: Overland

Runoff = 0.00 cfs @ 11.95 hrs, Volume= 1 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 2-year Rainfall=3.30"

Area (sf)	CN	Description
0	98	Paved parking, HSG A
4,150	39	>75% Grass cover, Good, HSG A
4,150	39	Weighted Average
4,150		100.00% Pervious Area

Subcatchment PR-3: Overland



Summary for Pond 1P: leaching Basin

Inflow Area =	3,900 sf,	21.79% Impervious,	Inflow Depth =	0.20"	for 2-year event
Inflow =	0.01 cfs @	6.28 hrs,	Volume=	64 cf	
Outflow =	0.01 cfs @	6.33 hrs,	Volume=	64 cf,	Atten= 3%, Lag= 2.9 min
Discarded =	0.01 cfs @	6.33 hrs,	Volume=	64 cf	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 57.81' @ 6.33 hrs Surf.Area= 64 sf Storage= 1 cf

Plug-Flow detention time= 2.7 min calculated for 64 cf (100% of inflow)
Center-of-Mass det. time= 2.8 min (501.3 - 498.6)

Volume	Invert	Avail.Storage	Storage Description
#1	58.75'	75 cf	**4.00'D x 6.00'H LB** Inside #2
#2	57.75'	148 cf	**9.00'D x 7.00'H Vertical Cone/Cylinder** 445 cf Overall - 75 cf Embedded = 370 cf x 40.0% Voids
#3	64.75'	114 cf	**Surface (Prismatic)**Listed below (Recalc) -Impervious
		337 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.75	5	0	0
65.20	500	114	114

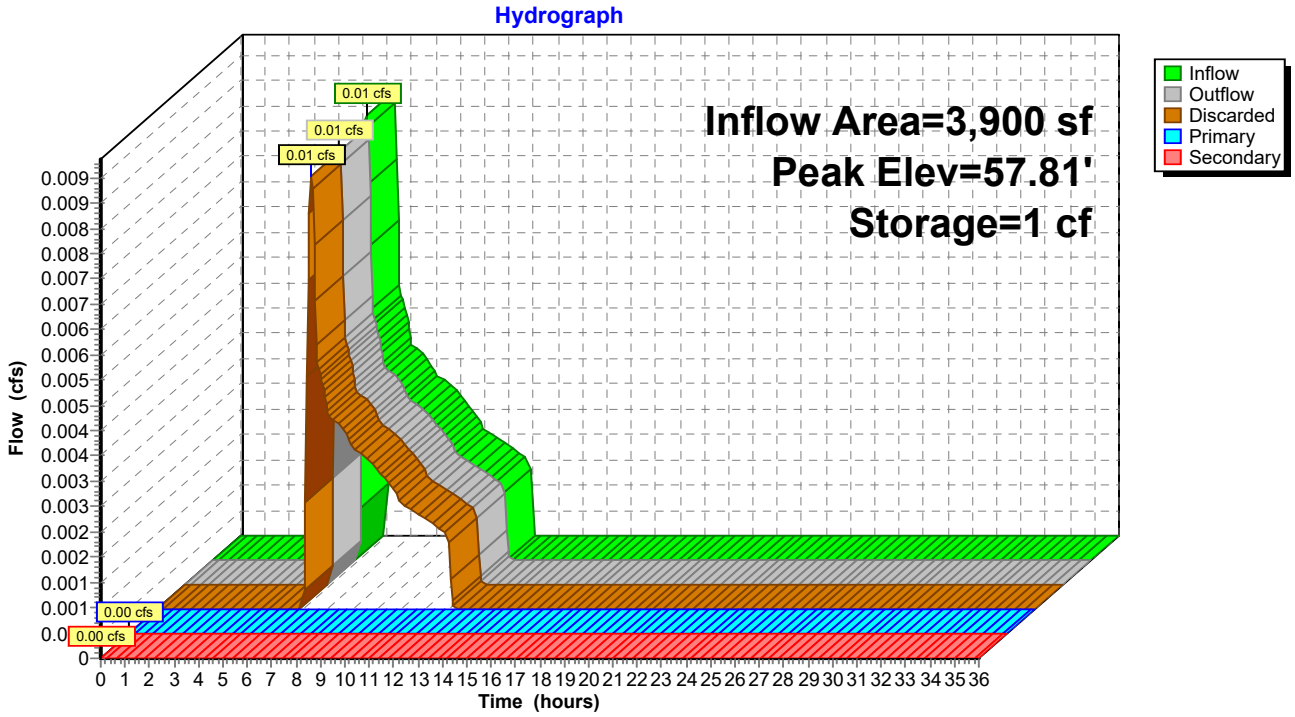
Device	Routing	Invert	Outlet Devices
#1	Discarded	57.75'	**7.800 in/hr Exfiltration over Surface area**
#2	Secondary	62.75'	**6.0" Round Culvert** L= 104.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 62.75' / 51.50' S= 0.1082 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Primary	64.75'	**15.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.01 cfs @ 6.33 hrs HW=57.81' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.75' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.75' (Free Discharge)
└─**2=Culvert** (Controls 0.00 cfs)

Pond 1P: leaching Basin



Summary for Pond 2P: leaching Basin

Inflow Area =	7,400 sf,	60.14% Impervious,	Inflow Depth =	1.35"	for 2-year event
Inflow =	0.35 cfs @	6.01 hrs,	Volume=	831 cf	
Outflow =	0.45 cfs @	6.05 hrs,	Volume=	831 cf,	Atten= 0%, Lag= 2.6 min
Discarded =	0.01 cfs @	5.45 hrs,	Volume=	416 cf	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	
Secondary =	0.44 cfs @	6.05 hrs,	Volume=	415 cf	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 63.17' @ 6.05 hrs Surf.Area= 64 sf Storage= 156 cf

Plug-Flow detention time= 77.7 min calculated for 830 cf (100% of inflow)
Center-of-Mass det. time= 77.8 min (505.7 - 427.9)

Volume	Invert	Avail.Storage	Storage Description
#1	59.20'	75 cf	**4.00'D x 6.00'H LB** Inside #2
#2	58.20'	148 cf	**9.00'D x 7.00'H Vertical Cone/Cylinder** 445 cf Overall - 75 cf Embedded = 370 cf x 40.0% Voids
#3	65.20'	202 cf	**Surface (Prismatic)**Listed below (Recalc) -Impervious
		425 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.20	5	0	0
66.00	500	202	202

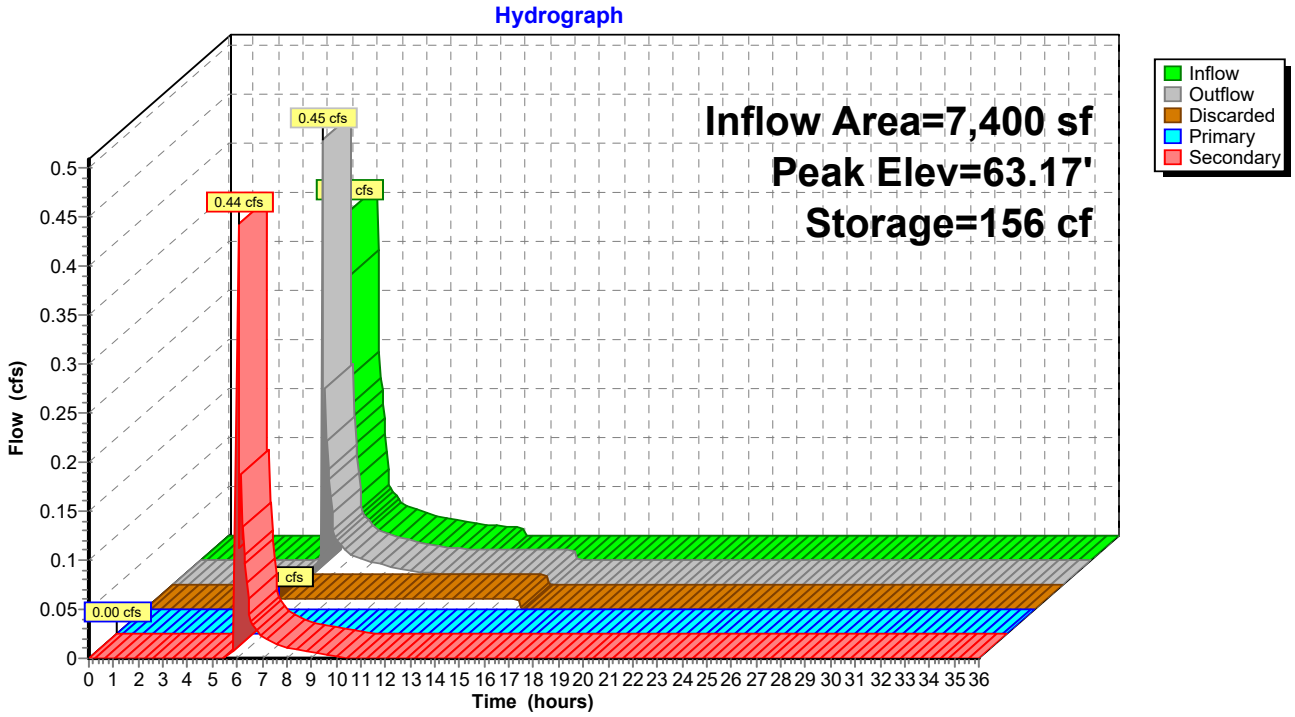
Device	Routing	Invert	Outlet Devices
#1	Discarded	58.20'	**7.800 in/hr Exfiltration over Surface area**
#2	Secondary	62.70'	**6.0" Round Culvert** L= 114.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 62.70' / 54.00' S= 0.0763 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Primary	65.80'	**15.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.01 cfs @ 5.45 hrs HW=58.28' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=58.20' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.43 cfs @ 6.05 hrs HW=63.16' (Free Discharge)
└─**2=Culvert** (Inlet Controls 0.43 cfs @ 2.31 fps)

Pond 2P: leaching Basin



Summary for Pond 3P: Stormtech

Inflow Area =	20,150 sf,	29.53% Impervious,	Inflow Depth =	0.55"	for 2-year event
Inflow =	0.56 cfs @	6.05 hrs,	Volume=	926 cf	
Outflow =	0.06 cfs @	6.05 hrs,	Volume=	926 cf,	Atten= 89%, Lag= 0.0 min
Discarded =	0.06 cfs @	6.05 hrs,	Volume=	926 cf	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 51.37' @ 6.76 hrs Surf.Area= 353 sf Storage= 300 cf

Plug-Flow detention time= 44.1 min calculated for 924 cf (100% of inflow)
Center-of-Mass det. time= 44.0 min (485.5 - 441.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	50.00'	347 cf	**11.00'W x 32.10'L x 3.50'H Field A** 1,236 cf Overall - 368 cf Embedded = 868 cf x 40.0% Voids
#2A	50.50'	368 cf	**ADS_StormTech SC-740 +Cap** x 8 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 8 Chambers in 2 Rows
#3	55.00'	2,042 cf	**Surface (Prismatic)** Listed below (Recalc)
		2,757 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.00	5	0	0
55.80	5,100	2,042	2,042

Device	Routing	Invert	Outlet Devices
#1	Discarded	50.00'	**7.800 in/hr Exfiltration over Surface area**
#2	Secondary	53.30'	**6.0" Round Culvert** L= 30.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 53.30' / 43.80' S= 0.3167 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Primary	55.80'	**5.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.06 cfs @ 6.05 hrs HW=50.43' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=50.00' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=50.00' (Free Discharge)
└─**2=Culvert** (Controls 0.00 cfs)

Pond 3P: Stormtech - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

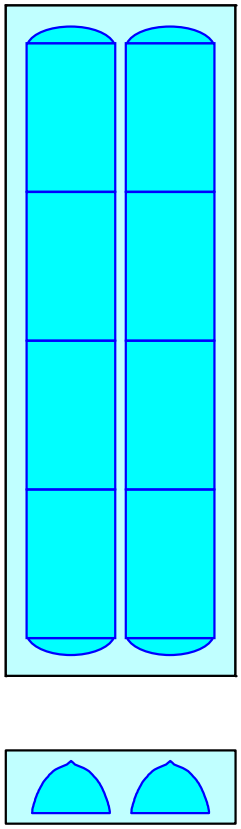
4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10' Base Length
2 Rows x 51.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.00' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

8 Chambers x 45.9 cf = 367.5 cf Chamber Storage

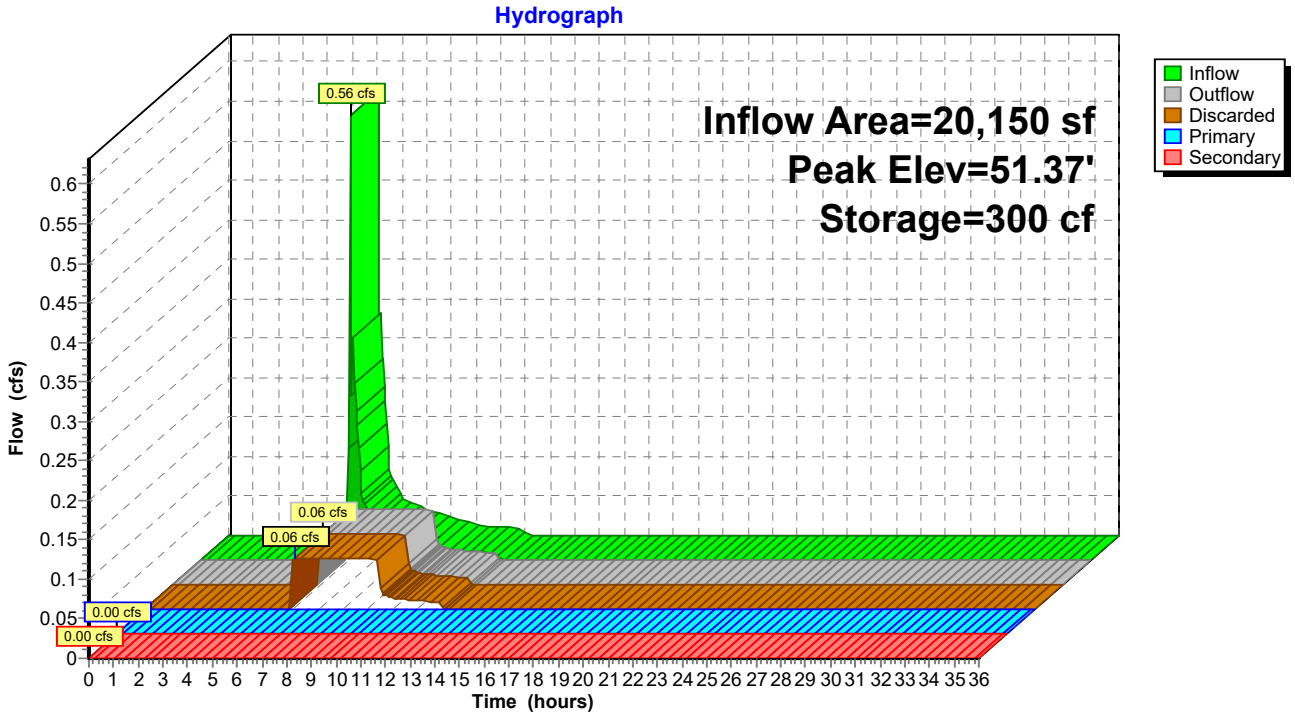
1,235.7 cf Field - 367.5 cf Chambers = 868.2 cf Stone x 40.0% Voids = 347.3 cf Stone Storage

Chamber Storage + Stone Storage = 714.8 cf = 0.016 af
Overall Storage Efficiency = 57.8%
Overall System Size = 32.10' x 11.00' x 3.50'

8 Chambers
45.8 cy Field
32.2 cy Stone



Pond 3P: Stormtech

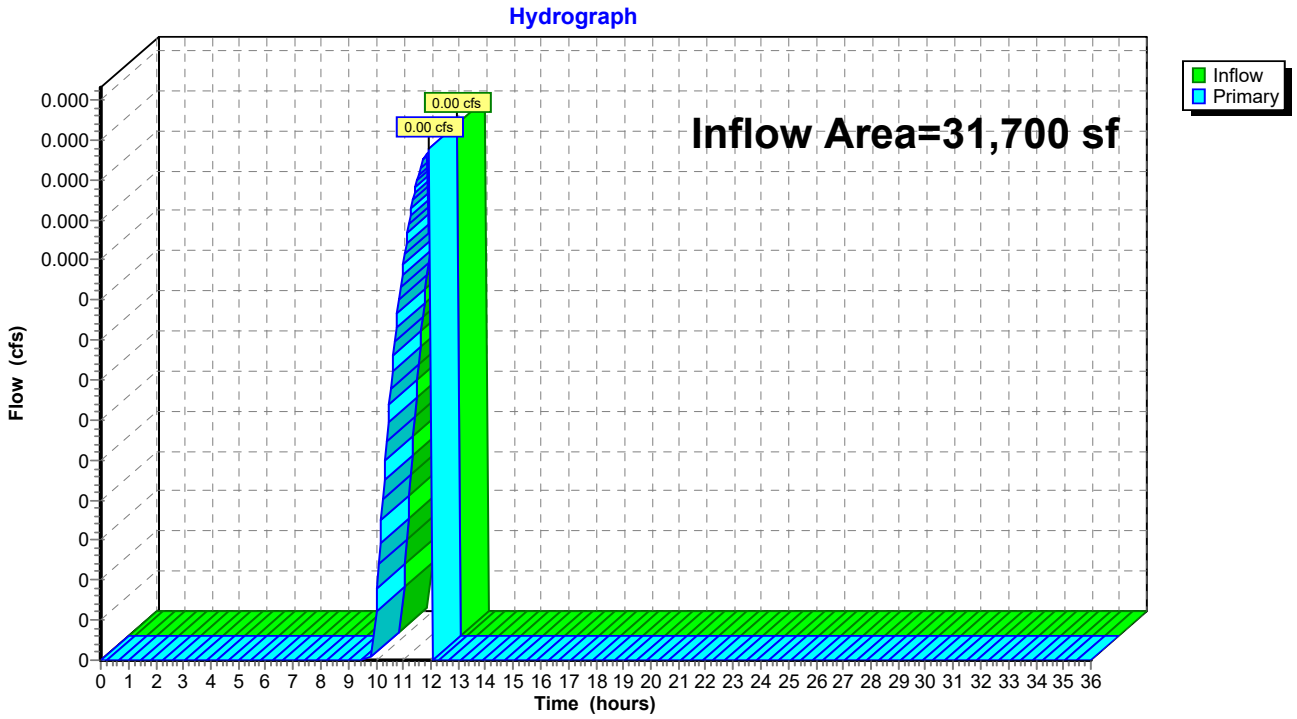


Summary for Link 4L: PR

Inflow Area = 31,700 sf, 32.81% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 11.95 hrs, Volume= 1 cf
Primary = 0.00 cfs @ 11.95 hrs, Volume= 1 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link 4L: PR



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR-1: Drive and Front Yard Runoff Area=7,400 sf 60.14% Impervious Runoff Depth=2.87"
Tc=0.0 min CN=78 Runoff=0.77 cfs 1,772 cf

SubcatchmentPR-2A: Front House and Runoff Area=3,900 sf 21.79% Impervious Runoff Depth=0.89"
Tc=0.0 min CN=52 Runoff=0.09 cfs 289 cf

SubcatchmentPR-2B: Back House and Runoff Area=16,250 sf 31.38% Impervious Runoff Depth=1.27"
Tc=0.0 min CN=58 Runoff=0.66 cfs 1,726 cf

SubcatchmentPR-3: Overland Runoff Area=4,150 sf 0.00% Impervious Runoff Depth=0.24"
Tc=0.0 min CN=39 Runoff=0.01 cfs 83 cf

Pond 1P: leaching Basin Peak Elev=61.10' Storage=103 cf Inflow=0.09 cfs 289 cf
Discarded=0.01 cfs 289 cf Primary=0.00 cfs 0 cf Secondary=0.00 cfs 0 cf Outflow=0.01 cfs 289 cf

Pond 2P: leaching Basin Peak Elev=63.52' Storage=168 cf Inflow=0.77 cfs 1,772 cf
Discarded=0.01 cfs 469 cf Primary=0.00 cfs 0 cf Secondary=0.72 cfs 1,303 cf Outflow=0.73 cfs 1,772 cf

Pond 3P: Stormtech Peak Elev=55.05' Storage=722 cf Inflow=1.38 cfs 3,029 cf
Discarded=0.11 cfs 1,890 cf Primary=0.00 cfs 0 cf Secondary=1.15 cfs 1,139 cf Outflow=1.26 cfs 3,029 cf

Link 4L: PR Inflow=1.16 cfs 1,222 cf
Primary=1.16 cfs 1,222 cf

Total Runoff Area = 31,700 sf Runoff Volume = 3,870 cf Average Runoff Depth = 1.47"
67.19% Pervious = 21,300 sf 32.81% Impervious = 10,400 sf

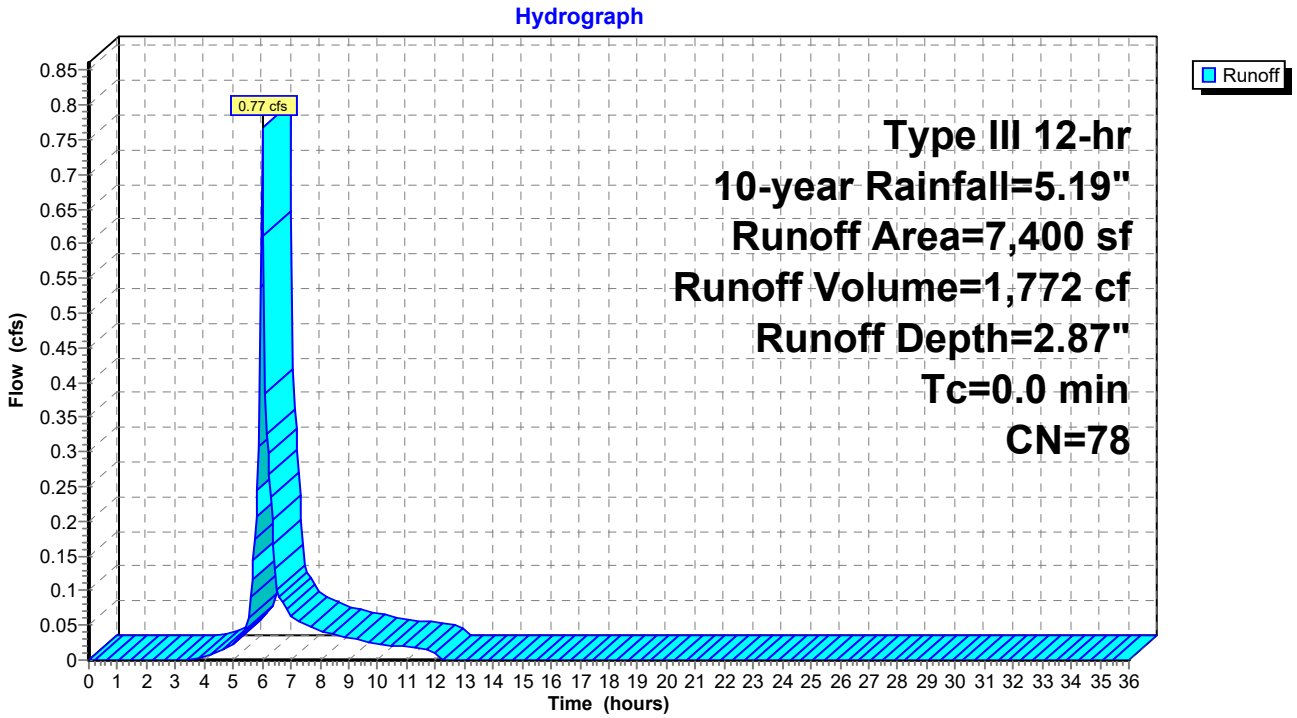
Summary for Subcatchment PR-1: Drive and Front Yard

Runoff = 0.77 cfs @ 6.00 hrs, Volume= 1,772 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 10-year Rainfall=5.19"

Area (sf)	CN	Description
4,450	98	Paved parking, HSG A
0	96	Gravel surface, HSG A
2,950	49	50-75% Grass cover, Fair, HSG A
7,400	78	Weighted Average
2,950		39.86% Pervious Area
4,450		60.14% Impervious Area

Subcatchment PR-1: Drive and Front Yard



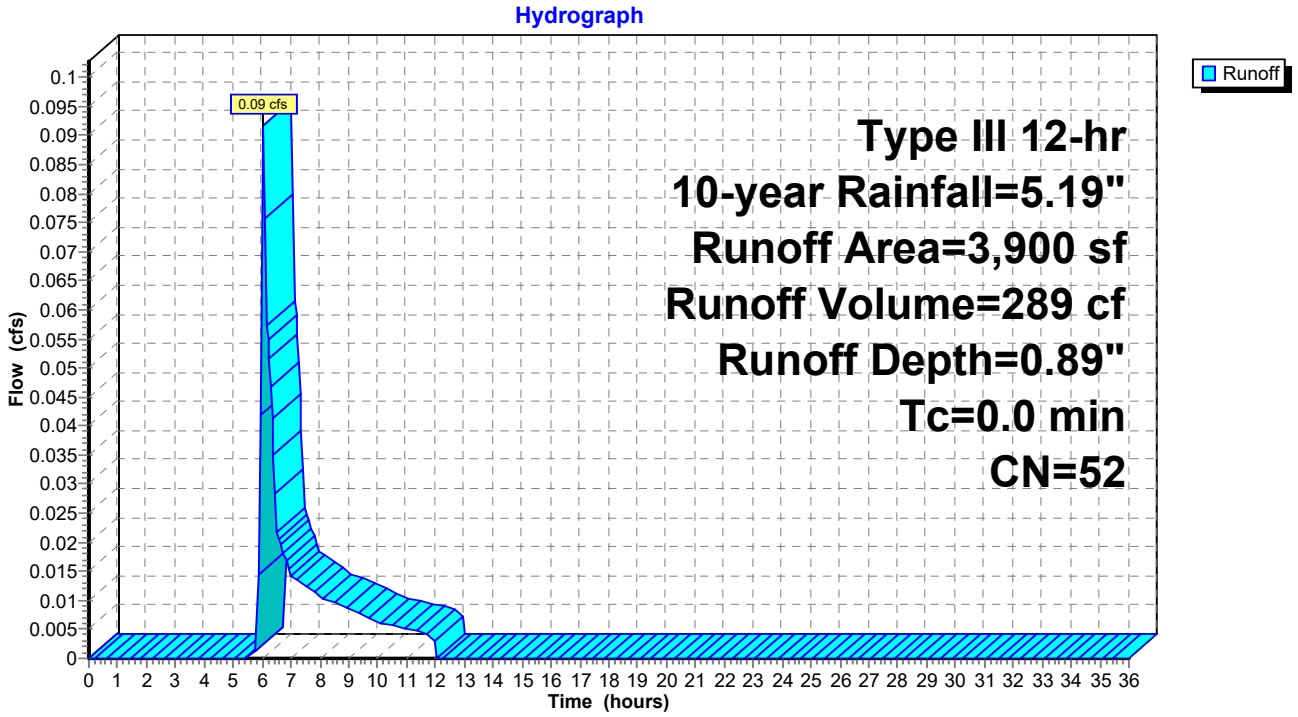
Summary for Subcatchment PR-2A: Front House and Yard

Runoff = 0.09 cfs @ 6.03 hrs, Volume= 289 cf, Depth= 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 10-year Rainfall=5.19"

Area (sf)	CN	Description
850	98	Paved parking, HSG A
3,050	39	>75% Grass cover, Good, HSG A
3,900	52	Weighted Average
3,050		78.21% Pervious Area
850		21.79% Impervious Area

Subcatchment PR-2A: Front House and Yard



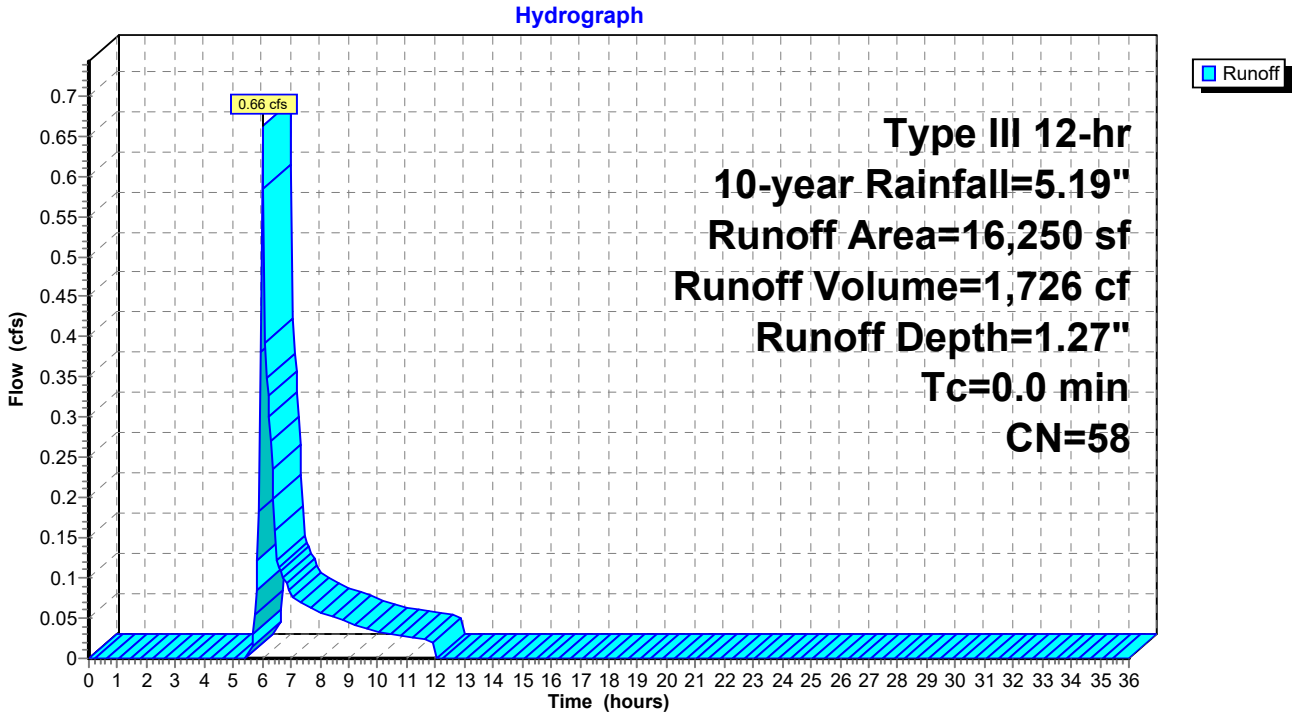
Summary for Subcatchment PR-2B: Back House and Yard

Runoff = 0.66 cfs @ 6.02 hrs, Volume= 1,726 cf, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 10-year Rainfall=5.19"

Area (sf)	CN	Description
5,100	98	Paved parking, HSG A
11,150	39	>75% Grass cover, Good, HSG A
16,250	58	Weighted Average
11,150		68.62% Pervious Area
5,100		31.38% Impervious Area

Subcatchment PR-2B: Back House and Yard



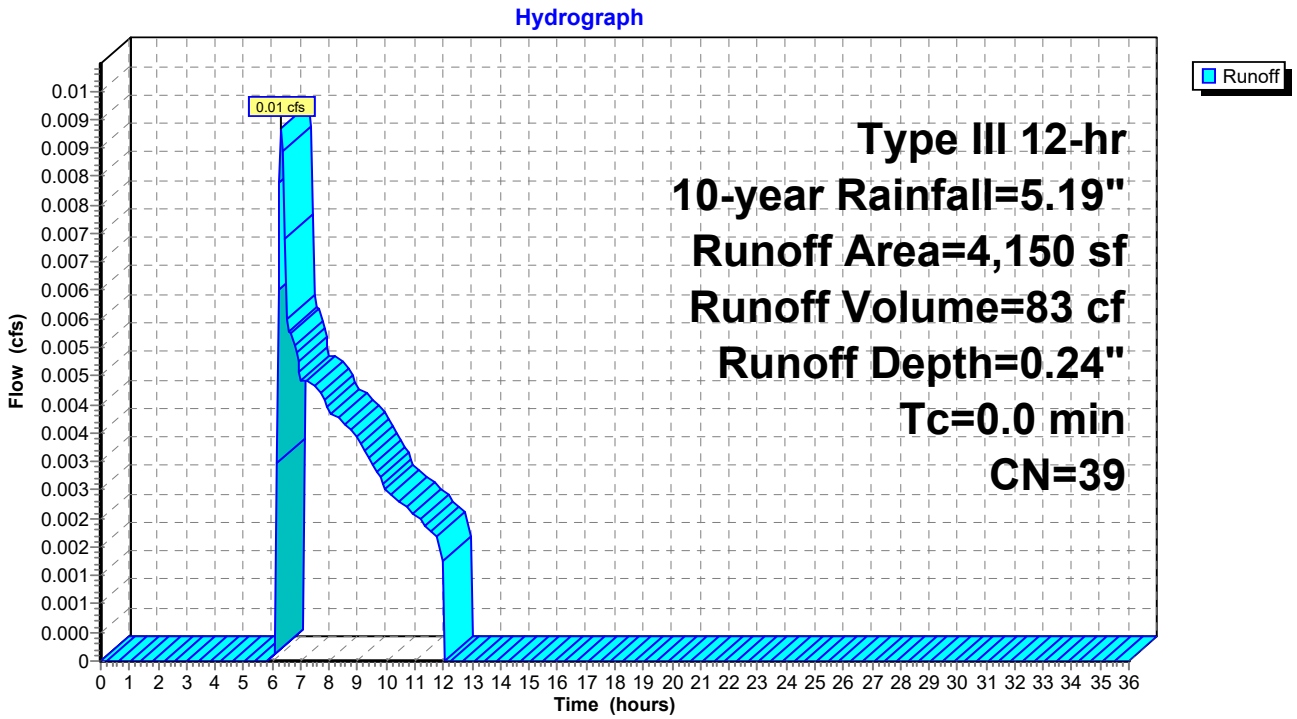
Summary for Subcatchment PR-3: Overland

Runoff = 0.01 cfs @ 6.33 hrs, Volume= 83 cf, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 10-year Rainfall=5.19"

Area (sf)	CN	Description
0	98	Paved parking, HSG A
4,150	39	>75% Grass cover, Good, HSG A
4,150	39	Weighted Average
4,150		100.00% Pervious Area

Subcatchment PR-3: Overland



Summary for Pond 1P: leaching Basin

Inflow Area =	3,900 sf,	21.79% Impervious,	Inflow Depth =	0.89"	for 10-year event
Inflow =	0.09 cfs @	6.03 hrs,	Volume=	289 cf	
Outflow =	0.01 cfs @	5.95 hrs,	Volume=	289 cf,	Atten= 87%, Lag= 0.0 min
Discarded =	0.01 cfs @	5.95 hrs,	Volume=	289 cf	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 61.10' @ 7.79 hrs Surf.Area= 64 sf Storage= 103 cf

Plug-Flow detention time= 104.9 min calculated for 289 cf (100% of inflow)
Center-of-Mass det. time= 104.8 min (562.7 - 457.8)

Volume	Invert	Avail.Storage	Storage Description
#1	58.75'	75 cf	**4.00'D x 6.00'H LB** Inside #2
#2	57.75'	148 cf	**9.00'D x 7.00'H Vertical Cone/Cylinder** 445 cf Overall - 75 cf Embedded = 370 cf x 40.0% Voids
#3	64.75'	114 cf	**Surface (Prismatic)**Listed below (Recalc) -Impervious
		337 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.75	5	0	0
65.20	500	114	114

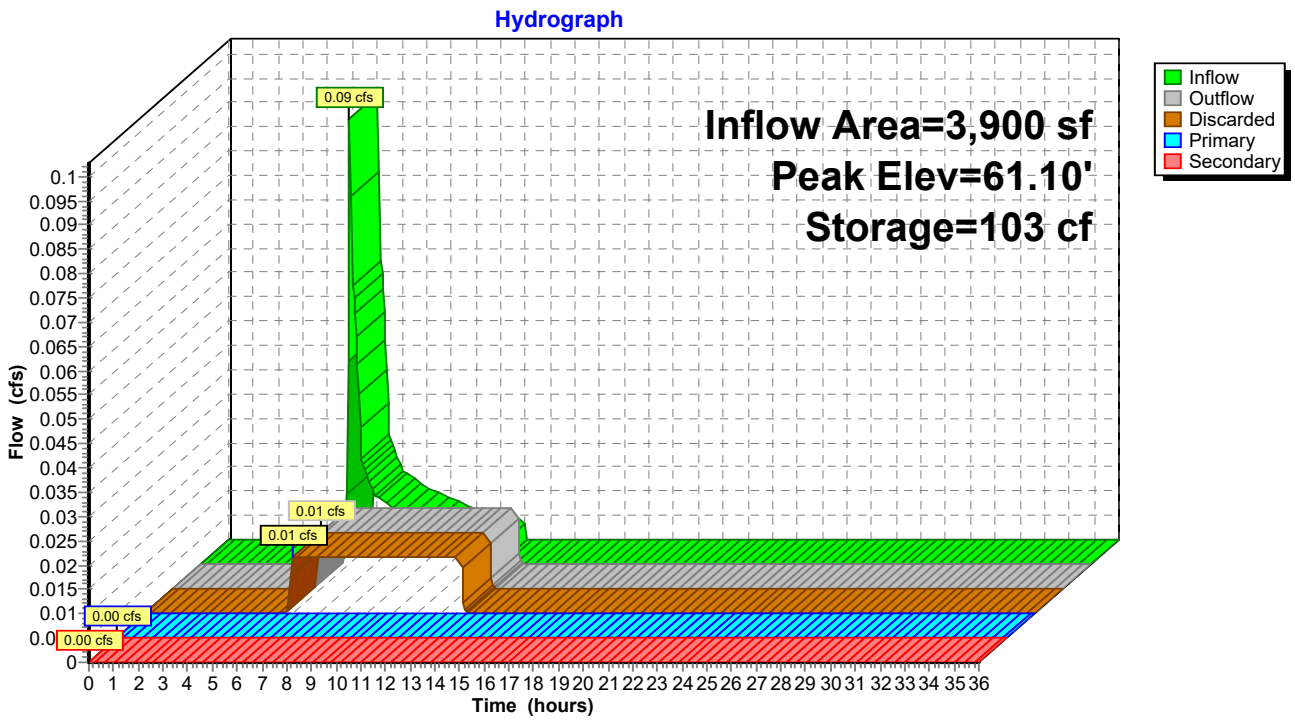
Device	Routing	Invert	Outlet Devices
#1	Discarded	57.75'	**7.800 in/hr Exfiltration over Surface area**
#2	Secondary	62.75'	**6.0" Round Culvert** L= 104.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 62.75' / 51.50' S= 0.1082 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Primary	64.75'	**15.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.01 cfs @ 5.95 hrs HW=57.93' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.75' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.75' (Free Discharge)
└─**2=Culvert** (Controls 0.00 cfs)

Pond 1P: leaching Basin



Summary for Pond 2P: leaching Basin

Inflow Area =	7,400 sf,	60.14% Impervious,	Inflow Depth =	2.87"	for 10-year event
Inflow =	0.77 cfs @	6.00 hrs,	Volume=	1,772 cf	
Outflow =	0.73 cfs @	6.02 hrs,	Volume=	1,772 cf,	Atten= 5%, Lag= 0.9 min
Discarded =	0.01 cfs @	4.55 hrs,	Volume=	469 cf	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	
Secondary =	0.72 cfs @	6.02 hrs,	Volume=	1,303 cf	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 63.52' @ 6.02 hrs Surf.Area= 64 sf Storage= 168 cf

Plug-Flow detention time= 39.9 min calculated for 1,770 cf (100% of inflow)
Center-of-Mass det. time= 40.1 min (455.5 - 415.3)

Volume	Invert	Avail.Storage	Storage Description
#1	59.20'	75 cf	**4.00'D x 6.00'H LB** Inside #2
#2	58.20'	148 cf	**9.00'D x 7.00'H Vertical Cone/Cylinder** 445 cf Overall - 75 cf Embedded = 370 cf x 40.0% Voids
#3	65.20'	202 cf	**Surface (Prismatic)**Listed below (Recalc) -Impervious
		425 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.20	5	0	0
66.00	500	202	202

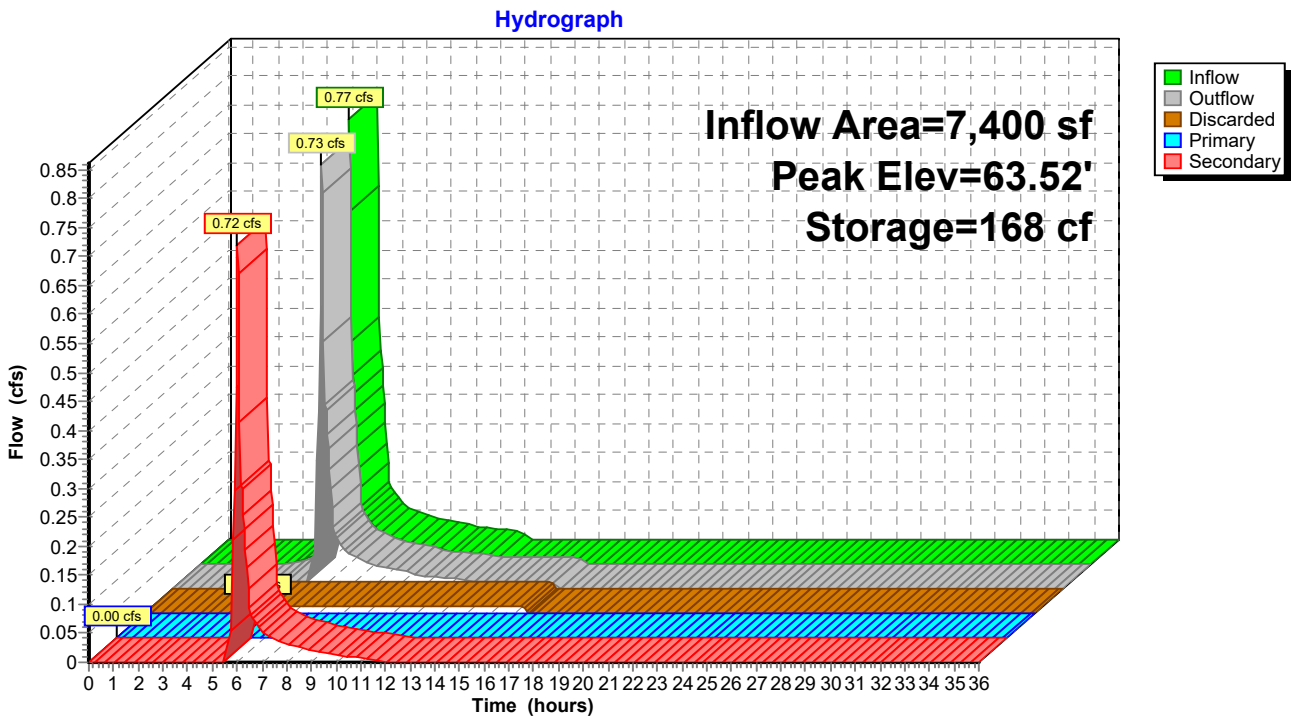
Device	Routing	Invert	Outlet Devices
#1	Discarded	58.20'	**7.800 in/hr Exfiltration over Surface area**
#2	Secondary	62.70'	**6.0" Round Culvert** L= 114.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 62.70' / 54.00' S= 0.0763 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Primary	65.80'	**15.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.01 cfs @ 4.55 hrs HW=58.28' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=58.20' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.69 cfs @ 6.02 hrs HW=63.48' (Free Discharge)
└─**2=Culvert** (Inlet Controls 0.69 cfs @ 3.51 fps)

Pond 2P: leaching Basin



Summary for Pond 3P: Stormtech

Inflow Area =	20,150 sf,	29.53% Impervious,	Inflow Depth =	1.80"	for 10-year event
Inflow =	1.38 cfs @	6.02 hrs,	Volume=	3,029 cf	
Outflow =	1.26 cfs @	6.10 hrs,	Volume=	3,029 cf,	Atten= 9%, Lag= 5.1 min
Discarded =	0.11 cfs @	6.10 hrs,	Volume=	1,890 cf	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	
Secondary =	1.15 cfs @	6.10 hrs,	Volume=	1,139 cf	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 55.05' @ 6.10 hrs Surf.Area= 646 sf Storage= 722 cf

Plug-Flow detention time= 86.5 min calculated for 3,025 cf (100% of inflow)
Center-of-Mass det. time= 86.5 min (516.2 - 429.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	50.00'	347 cf	**11.00'W x 32.10'L x 3.50'H Field A** 1,236 cf Overall - 368 cf Embedded = 868 cf x 40.0% Voids
#2A	50.50'	368 cf	**ADS_StormTech SC-740 +Cap** x 8 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 8 Chambers in 2 Rows
#3	55.00'	2,042 cf	**Surface (Prismatic)** Listed below (Recalc)
		2,757 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.00	5	0	0
55.80	5,100	2,042	2,042

Device	Routing	Invert	Outlet Devices
#1	Discarded	50.00'	**7.800 in/hr Exfiltration over Surface area**
#2	Secondary	53.30'	**6.0" Round Culvert** L= 30.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 53.30' / 43.80' S= 0.3167 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Primary	55.80'	**5.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.11 cfs @ 6.10 hrs HW=55.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=50.00' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=1.13 cfs @ 6.10 hrs HW=54.97' (Free Discharge)
└─**2=Culvert** (Inlet Controls 1.13 cfs @ 5.73 fps)

Pond 3P: Stormtech - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

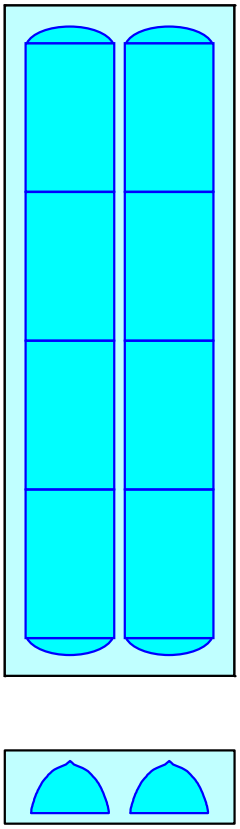
4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10' Base Length
2 Rows x 51.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.00' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

8 Chambers x 45.9 cf = 367.5 cf Chamber Storage

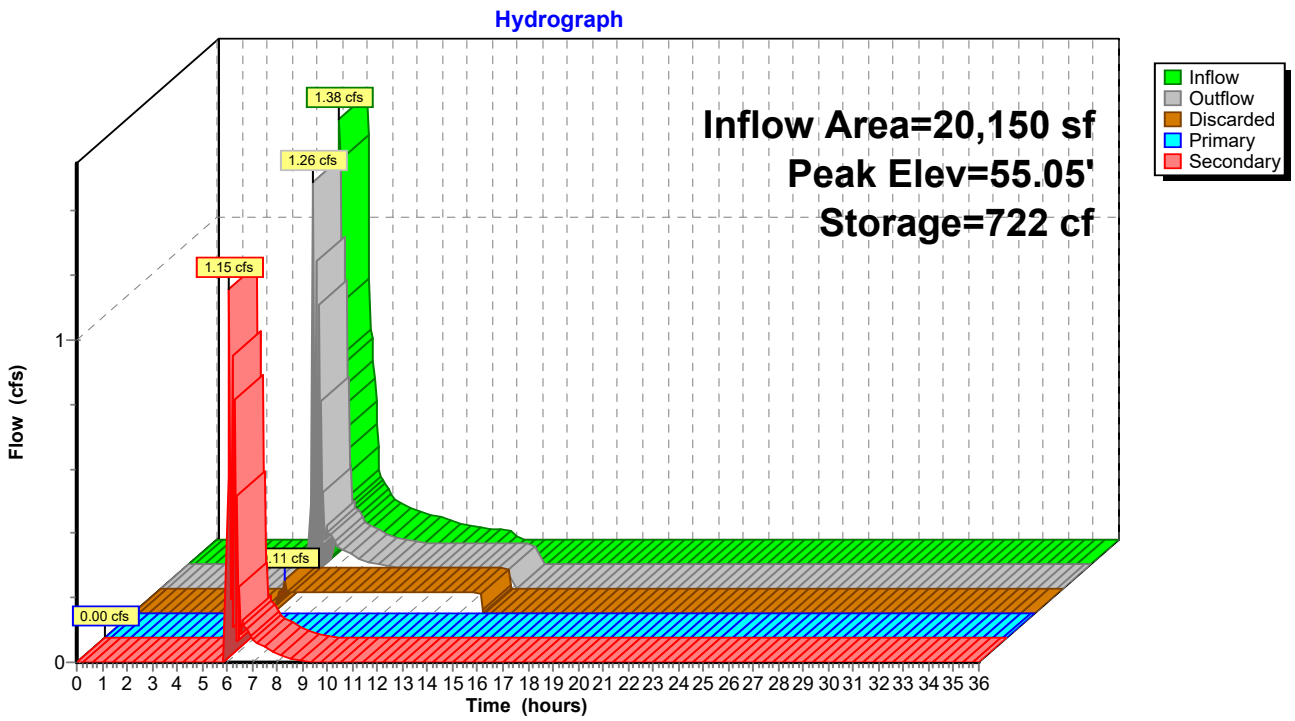
1,235.7 cf Field - 367.5 cf Chambers = 868.2 cf Stone x 40.0% Voids = 347.3 cf Stone Storage

Chamber Storage + Stone Storage = 714.8 cf = 0.016 af
Overall Storage Efficiency = 57.8%
Overall System Size = 32.10' x 11.00' x 3.50'

8 Chambers
45.8 cy Field
32.2 cy Stone



Pond 3P: Stormtech

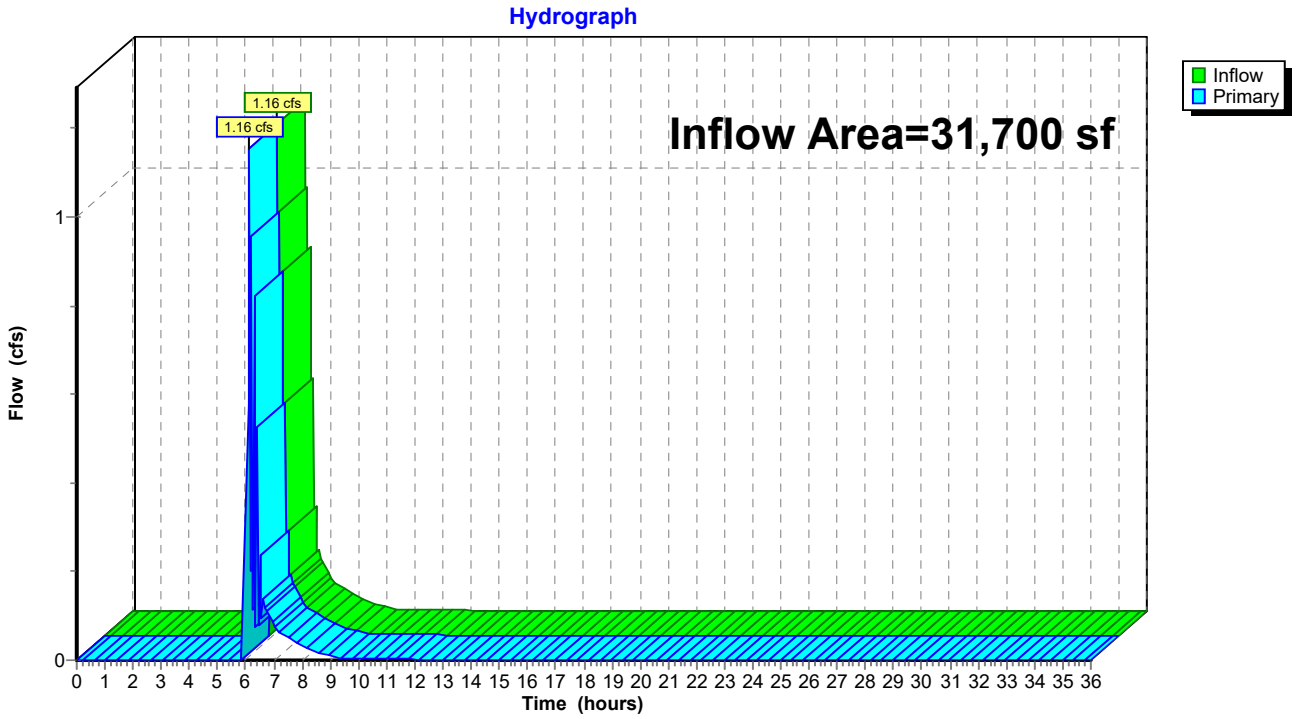


Summary for Link 4L: PR

Inflow Area = 31,700 sf, 32.81% Impervious, Inflow Depth = 0.46" for 10-year event
Inflow = 1.16 cfs @ 6.10 hrs, Volume= 1,222 cf
Primary = 1.16 cfs @ 6.10 hrs, Volume= 1,222 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link 4L: PR



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR-1: Drive and Front Yard Runoff Area=7,400 sf 60.14% Impervious Runoff Depth=3.91"
Tc=0.0 min CN=78 Runoff=1.04 cfs 2,410 cf

SubcatchmentPR-2A: Front House and Runoff Area=3,900 sf 21.79% Impervious Runoff Depth=1.49"
Tc=0.0 min CN=52 Runoff=0.18 cfs 484 cf

SubcatchmentPR-2B: Back House and Runoff Area=16,250 sf 31.38% Impervious Runoff Depth=1.99"
Tc=0.0 min CN=58 Runoff=1.11 cfs 2,697 cf

SubcatchmentPR-3: Overland Runoff Area=4,150 sf 0.00% Impervious Runoff Depth=0.56"
Tc=0.0 min CN=39 Runoff=0.03 cfs 192 cf

Pond 1P: leaching Basin Peak Elev=62.88' Storage=162 cf Inflow=0.18 cfs 484 cf
Discarded=0.01 cfs 386 cf Primary=0.00 cfs 0 cf Secondary=0.05 cfs 97 cf Outflow=0.06 cfs 484 cf

Pond 2P: leaching Basin Peak Elev=63.97' Storage=183 cf Inflow=1.04 cfs 2,410 cf
Discarded=0.01 cfs 490 cf Primary=0.00 cfs 0 cf Secondary=0.96 cfs 1,920 cf Outflow=0.97 cfs 2,410 cf

Pond 3P: Stormtech Peak Elev=55.20' Storage=843 cf Inflow=2.06 cfs 4,714 cf
Discarded=0.29 cfs 2,198 cf Primary=0.00 cfs 0 cf Secondary=1.21 cfs 2,516 cf Outflow=1.51 cfs 4,714 cf

Link 4L: PR Inflow=1.24 cfs 2,708 cf
Primary=1.24 cfs 2,708 cf

Total Runoff Area = 31,700 sf Runoff Volume = 5,783 cf Average Runoff Depth = 2.19"
67.19% Pervious = 21,300 sf 32.81% Impervious = 10,400 sf

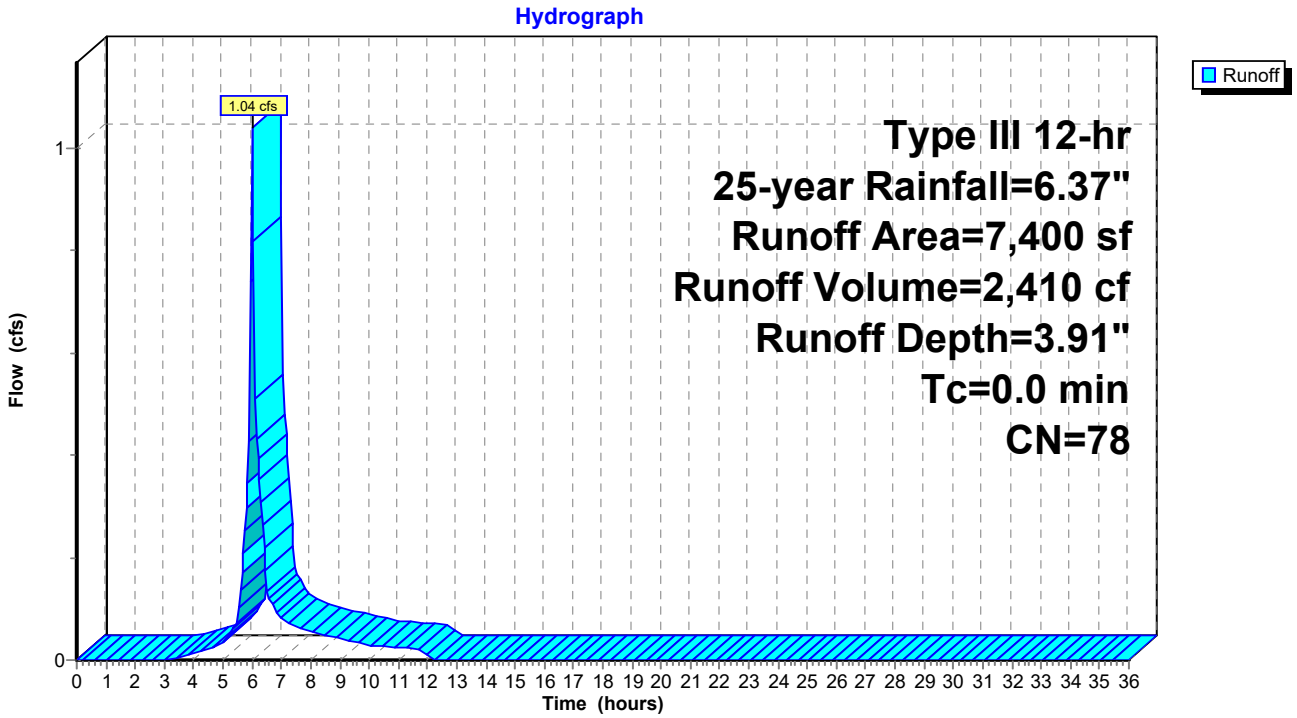
Summary for Subcatchment PR-1: Drive and Front Yard

Runoff = 1.04 cfs @ 6.00 hrs, Volume= 2,410 cf, Depth= 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 25-year Rainfall=6.37"

Area (sf)	CN	Description
4,450	98	Paved parking, HSG A
0	96	Gravel surface, HSG A
2,950	49	50-75% Grass cover, Fair, HSG A
7,400	78	Weighted Average
2,950		39.86% Pervious Area
4,450		60.14% Impervious Area

Subcatchment PR-1: Drive and Front Yard



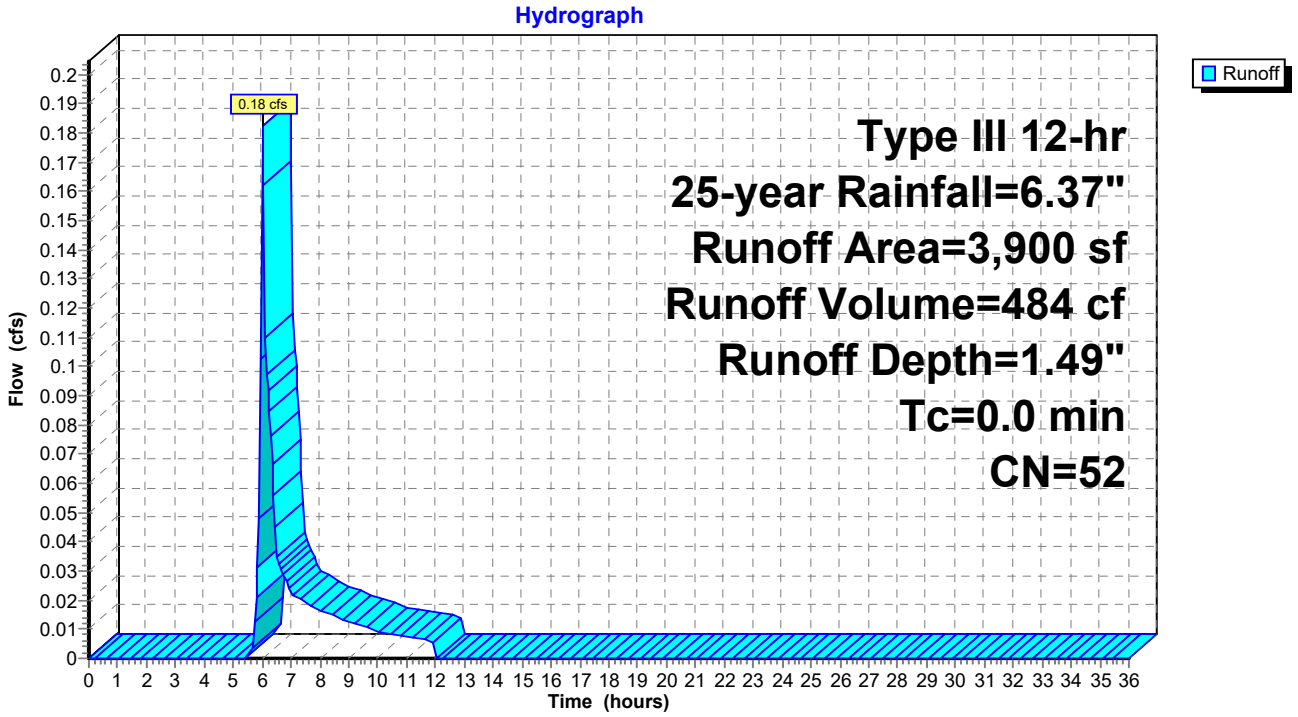
Summary for Subcatchment PR-2A: Front House and Yard

Runoff = 0.18 cfs @ 6.02 hrs, Volume= 484 cf, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 25-year Rainfall=6.37"

Area (sf)	CN	Description
850	98	Paved parking, HSG A
3,050	39	>75% Grass cover, Good, HSG A
3,900	52	Weighted Average
3,050		78.21% Pervious Area
850		21.79% Impervious Area

Subcatchment PR-2A: Front House and Yard



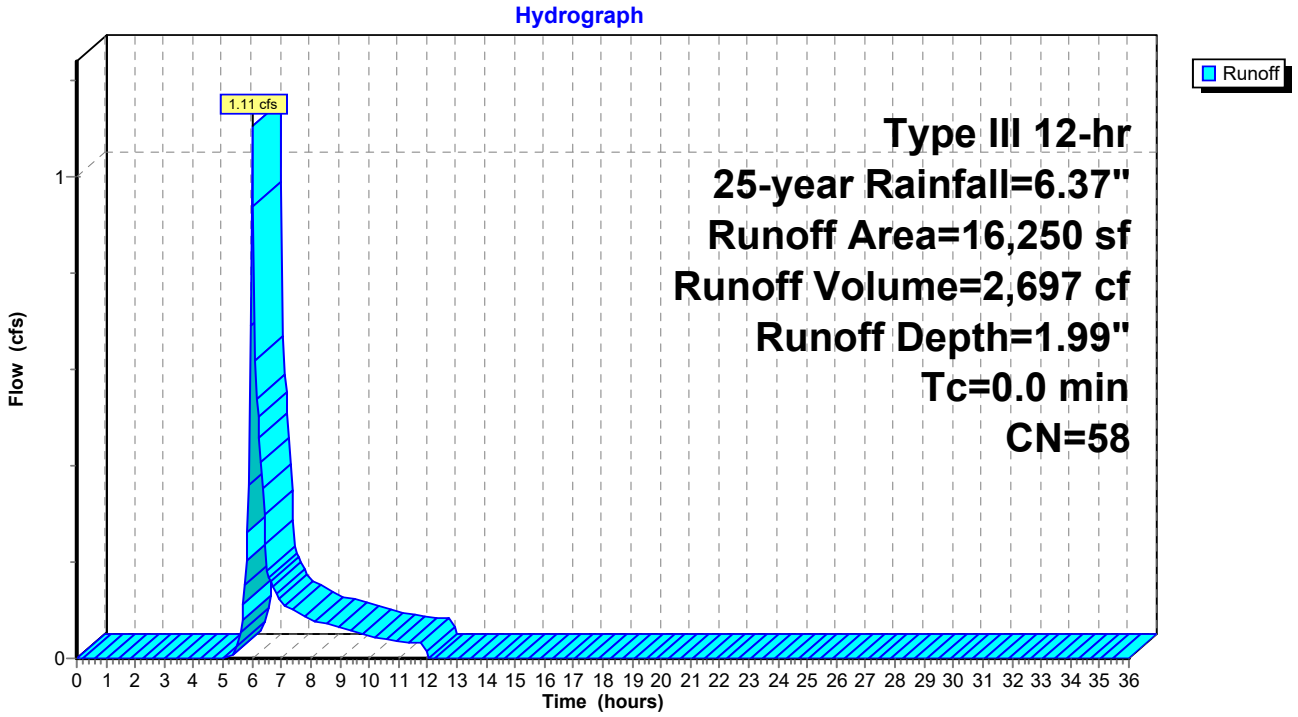
Summary for Subcatchment PR-2B: Back House and Yard

Runoff = 1.11 cfs @ 6.01 hrs, Volume= 2,697 cf, Depth= 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 25-year Rainfall=6.37"

Area (sf)	CN	Description
5,100	98	Paved parking, HSG A
11,150	39	>75% Grass cover, Good, HSG A
16,250	58	Weighted Average
11,150		68.62% Pervious Area
5,100		31.38% Impervious Area

Subcatchment PR-2B: Back House and Yard



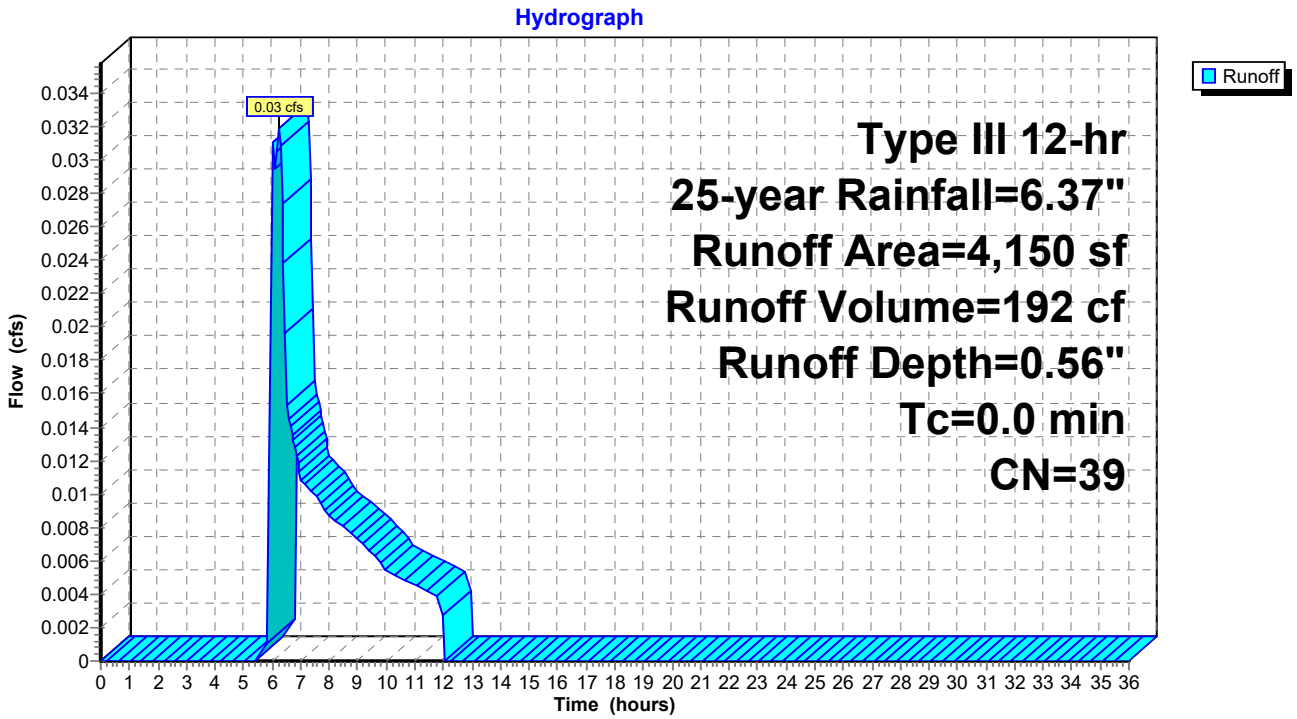
Summary for Subcatchment PR-3: Overland

Runoff = 0.03 cfs @ 6.22 hrs, Volume= 192 cf, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 25-year Rainfall=6.37"

Area (sf)	CN	Description
0	98	Paved parking, HSG A
4,150	39	>75% Grass cover, Good, HSG A
4,150	39	Weighted Average
4,150		100.00% Pervious Area

Subcatchment PR-3: Overland



Summary for Pond 1P: leaching Basin

Inflow Area =	3,900 sf,	21.79% Impervious,	Inflow Depth =	1.49"	for 25-year event
Inflow =	0.18 cfs @	6.02 hrs,	Volume=	484 cf	
Outflow =	0.06 cfs @	6.40 hrs,	Volume=	484 cf,	Atten= 65%, Lag= 22.9 min
Discarded =	0.01 cfs @	5.80 hrs,	Volume=	386 cf	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	
Secondary =	0.05 cfs @	6.40 hrs,	Volume=	97 cf	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 62.88' @ 6.40 hrs Surf.Area= 64 sf Storage= 162 cf

Plug-Flow detention time= 136.7 min calculated for 483 cf (100% of inflow)
Center-of-Mass det. time= 136.8 min (584.0 - 447.2)

Volume	Invert	Avail.Storage	Storage Description
#1	58.75'	75 cf	**4.00'D x 6.00'H LB** Inside #2
#2	57.75'	148 cf	**9.00'D x 7.00'H Vertical Cone/Cylinder** 445 cf Overall - 75 cf Embedded = 370 cf x 40.0% Voids
#3	64.75'	114 cf	**Surface (Prismatic)**Listed below (Recalc) -Impervious
		337 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.75	5	0	0
65.20	500	114	114

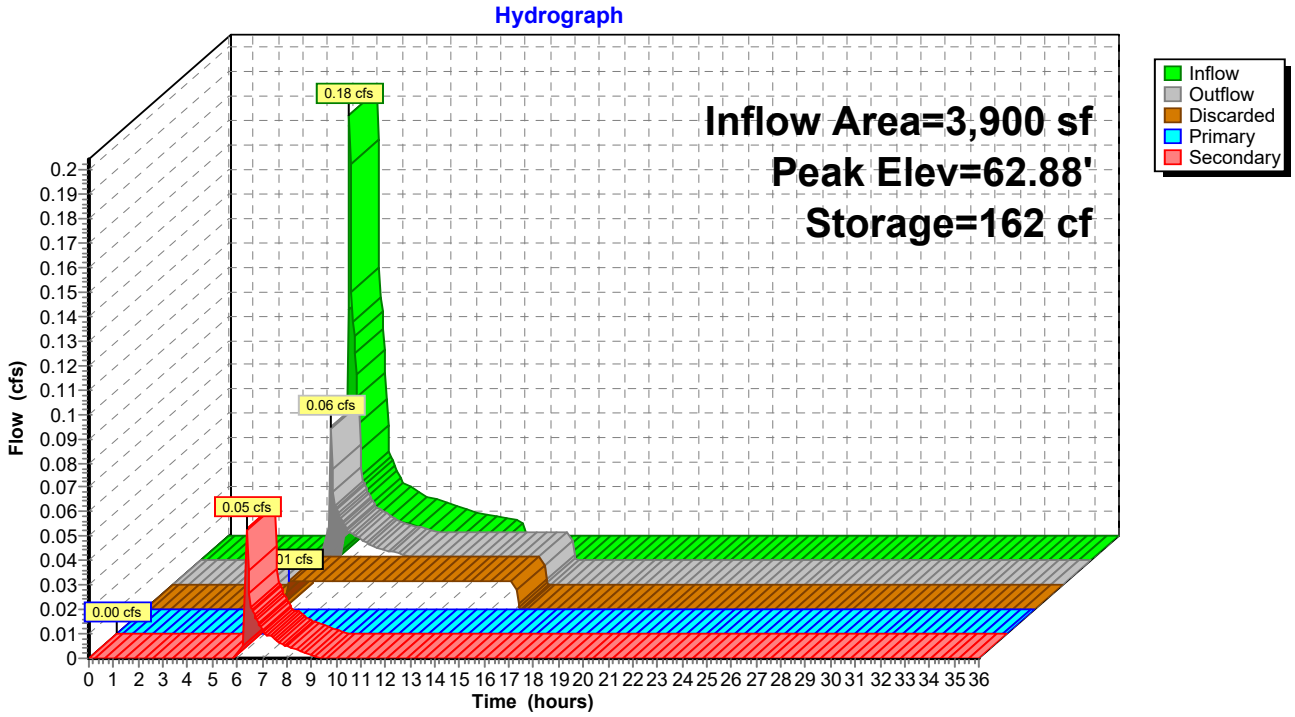
Device	Routing	Invert	Outlet Devices
#1	Discarded	57.75'	**7.800 in/hr Exfiltration over Surface area**
#2	Secondary	62.75'	**6.0" Round Culvert** L= 104.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 62.75' / 51.50' S= 0.1082 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Primary	64.75'	**15.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.01 cfs @ 5.80 hrs HW=57.85' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.75' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Secondary OutFlow Max=0.05 cfs @ 6.40 hrs HW=62.88' (Free Discharge)
└─**2=Culvert** (Inlet Controls 0.05 cfs @ 1.23 fps)

Pond 1P: leaching Basin



Summary for Pond 2P: leaching Basin

Inflow Area =	7,400 sf,	60.14% Impervious,	Inflow Depth =	3.91"	for 25-year event
Inflow =	1.04 cfs @	6.00 hrs,	Volume=	2,410 cf	
Outflow =	0.97 cfs @	6.02 hrs,	Volume=	2,410 cf,	Atten= 7%, Lag= 1.1 min
Discarded =	0.01 cfs @	4.05 hrs,	Volume=	490 cf	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	
Secondary =	0.96 cfs @	6.02 hrs,	Volume=	1,920 cf	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 63.97' @ 6.02 hrs Surf.Area= 64 sf Storage= 183 cf

Plug-Flow detention time= 30.7 min calculated for 2,406 cf (100% of inflow)
Center-of-Mass det. time= 31.0 min (441.2 - 410.3)

Volume	Invert	Avail.Storage	Storage Description
#1	59.20'	75 cf	**4.00'D x 6.00'H LB** Inside #2
#2	58.20'	148 cf	**9.00'D x 7.00'H Vertical Cone/Cylinder** 445 cf Overall - 75 cf Embedded = 370 cf x 40.0% Voids
#3	65.20'	202 cf	**Surface (Prismatic)**Listed below (Recalc) -Impervious
		425 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.20	5	0	0
66.00	500	202	202

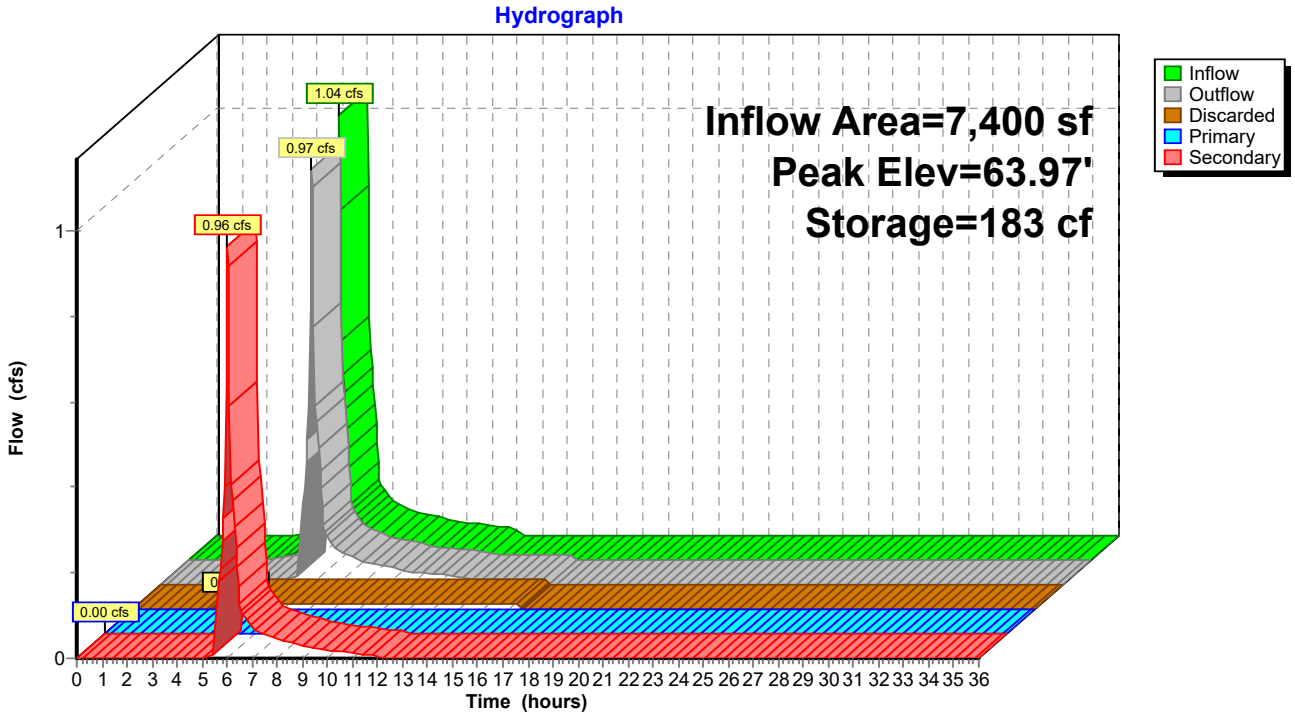
Device	Routing	Invert	Outlet Devices
#1	Discarded	58.20'	**7.800 in/hr Exfiltration over Surface area**
#2	Secondary	62.70'	**6.0" Round Culvert** L= 114.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 62.70' / 54.00' S= 0.0763 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Primary	65.80'	**15.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.01 cfs @ 4.05 hrs HW=58.28' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=58.20' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.92 cfs @ 6.02 hrs HW=63.90' (Free Discharge)
└─**2=Culvert** (Inlet Controls 0.92 cfs @ 4.70 fps)

Pond 2P: leaching Basin



Summary for Pond 3P: Stormtech

Inflow Area =	20,150 sf,	29.53% Impervious,	Inflow Depth =	2.81"	for 25-year event
Inflow =	2.06 cfs @	6.02 hrs,	Volume=	4,714 cf	
Outflow =	1.51 cfs @	6.08 hrs,	Volume=	4,714 cf,	Atten= 27%, Lag= 3.8 min
Discarded =	0.29 cfs @	6.08 hrs,	Volume=	2,198 cf	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	
Secondary =	1.21 cfs @	6.08 hrs,	Volume=	2,516 cf	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 55.20' @ 6.08 hrs Surf.Area= 1,629 sf Storage= 843 cf

Plug-Flow detention time= 63.6 min calculated for 4,707 cf (100% of inflow)
Center-of-Mass det. time= 63.8 min (489.0 - 425.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	50.00'	347 cf	**11.00'W x 32.10'L x 3.50'H Field A** 1,236 cf Overall - 368 cf Embedded = 868 cf x 40.0% Voids
#2A	50.50'	368 cf	**ADS_StormTech SC-740 +Cap** x 8 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 8 Chambers in 2 Rows
#3	55.00'	2,042 cf	**Surface (Prismatic)** Listed below (Recalc)
		2,757 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.00	5	0	0
55.80	5,100	2,042	2,042

Device	Routing	Invert	Outlet Devices
#1	Discarded	50.00'	**7.800 in/hr Exfiltration over Surface area**
#2	Secondary	53.30'	**6.0" Round Culvert** L= 30.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 53.30' / 43.80' S= 0.3167 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Primary	55.80'	**5.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.28 cfs @ 6.08 hrs HW=55.19' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=50.00' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=1.21 cfs @ 6.08 hrs HW=55.19' (Free Discharge)
└─**2=Culvert** (Inlet Controls 1.21 cfs @ 6.17 fps)

Pond 3P: Stormtech - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

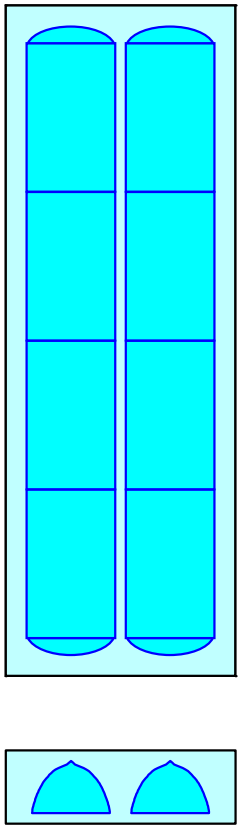
4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10' Base Length
2 Rows x 51.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.00' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

8 Chambers x 45.9 cf = 367.5 cf Chamber Storage

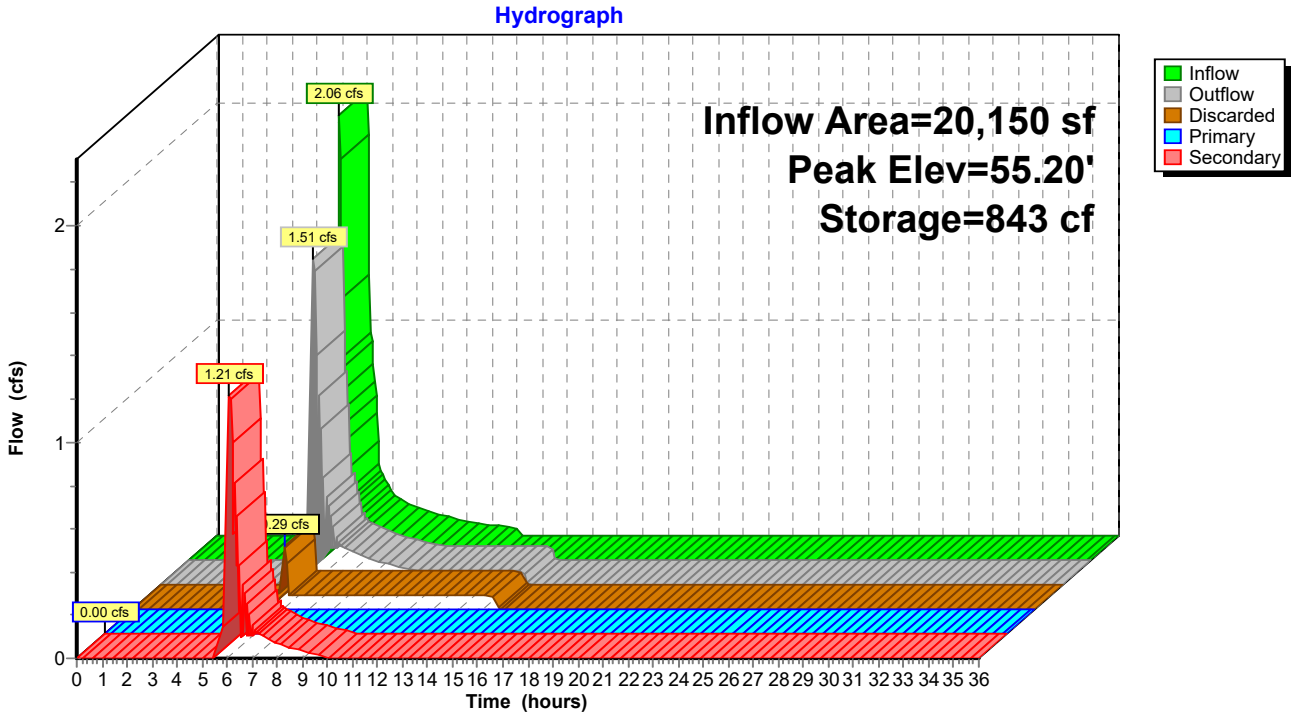
1,235.7 cf Field - 367.5 cf Chambers = 868.2 cf Stone x 40.0% Voids = 347.3 cf Stone Storage

Chamber Storage + Stone Storage = 714.8 cf = 0.016 af
Overall Storage Efficiency = 57.8%
Overall System Size = 32.10' x 11.00' x 3.50'

8 Chambers
45.8 cy Field
32.2 cy Stone



Pond 3P: Stormtech

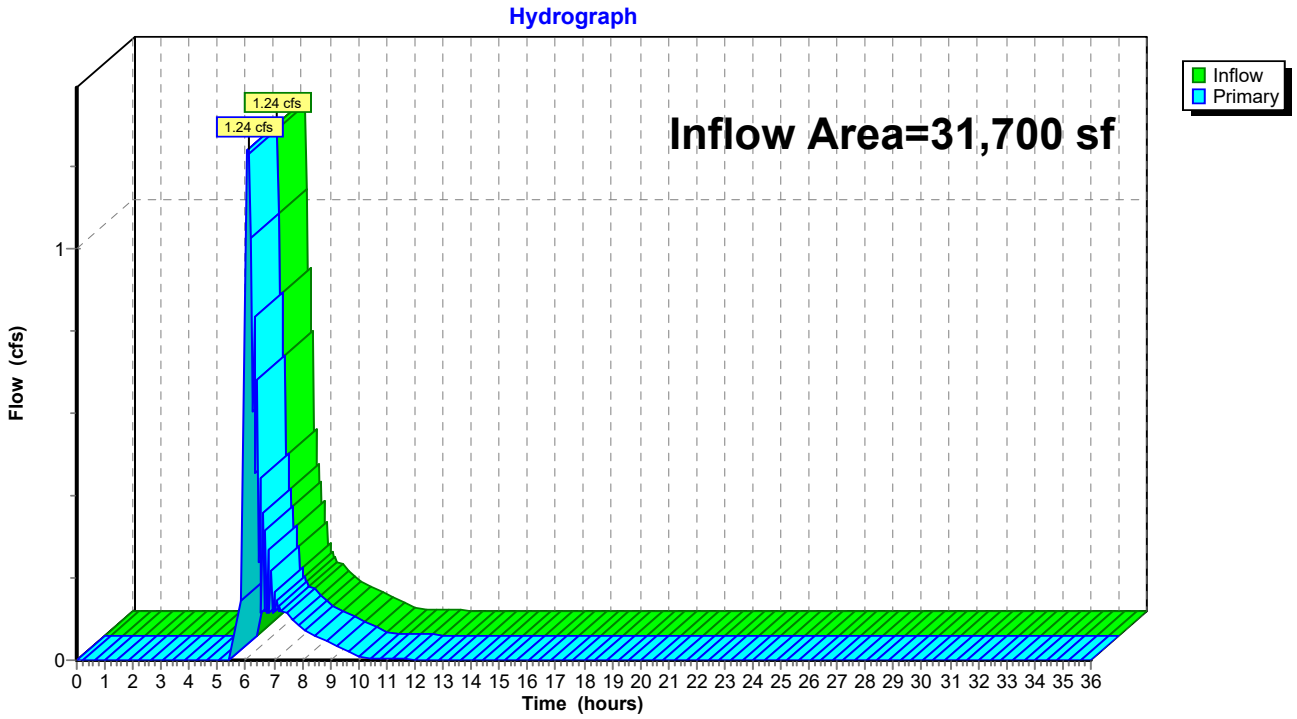


Summary for Link 4L: PR

Inflow Area = 31,700 sf, 32.81% Impervious, Inflow Depth = 1.03" for 25-year event
Inflow = 1.24 cfs @ 6.08 hrs, Volume= 2,708 cf
Primary = 1.24 cfs @ 6.08 hrs, Volume= 2,708 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link 4L: PR



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR-1: Drive and Front Yard Runoff Area=7,400 sf 60.14% Impervious Runoff Depth=5.58"
Tc=0.0 min CN=78 Runoff=1.47 cfs 3,439 cf

SubcatchmentPR-2A: Front House and Runoff Area=3,900 sf 21.79% Impervious Runoff Depth=2.59"
Tc=0.0 min CN=52 Runoff=0.35 cfs 842 cf

SubcatchmentPR-2B: Back House and Runoff Area=16,250 sf 31.38% Impervious Runoff Depth=3.26"
Tc=0.0 min CN=58 Runoff=1.88 cfs 4,412 cf

SubcatchmentPR-3: Overland Runoff Area=4,150 sf 0.00% Impervious Runoff Depth=1.24"
Tc=0.0 min CN=39 Runoff=0.13 cfs 429 cf

Pond 1P: leaching Basin Peak Elev=63.09' Storage=169 cf Inflow=0.35 cfs 842 cf
Discarded=0.01 cfs 423 cf Primary=0.00 cfs 0 cf Secondary=0.28 cfs 418 cf Outflow=0.29 cfs 842 cf

Pond 2P: leaching Basin Peak Elev=64.93' Storage=214 cf Inflow=1.47 cfs 3,439 cf
Discarded=0.01 cfs 513 cf Primary=0.00 cfs 0 cf Secondary=1.34 cfs 2,925 cf Outflow=1.35 cfs 3,439 cf

Pond 3P: Stormtech Peak Elev=55.46' Storage=1,386 cf Inflow=3.22 cfs 7,755 cf
Discarded=0.59 cfs 3,055 cf Primary=0.00 cfs 0 cf Secondary=1.31 cfs 4,700 cf Outflow=1.90 cfs 7,755 cf

Link 4L: PR Inflow=1.41 cfs 5,130 cf
Primary=1.41 cfs 5,130 cf

Total Runoff Area = 31,700 sf Runoff Volume = 9,122 cf Average Runoff Depth = 3.45"
67.19% Pervious = 21,300 sf 32.81% Impervious = 10,400 sf

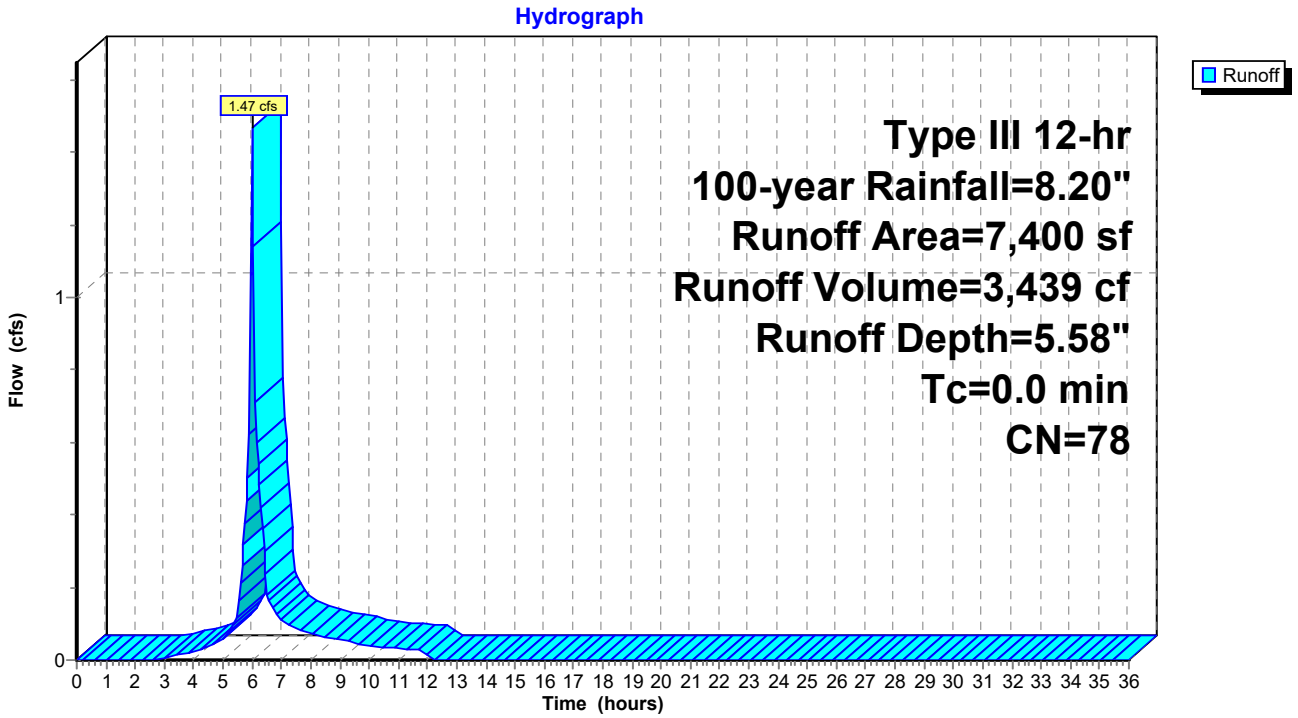
Summary for Subcatchment PR-1: Drive and Front Yard

Runoff = 1.47 cfs @ 6.00 hrs, Volume= 3,439 cf, Depth= 5.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 100-year Rainfall=8.20"

Area (sf)	CN	Description
4,450	98	Paved parking, HSG A
0	96	Gravel surface, HSG A
2,950	49	50-75% Grass cover, Fair, HSG A
7,400	78	Weighted Average
2,950		39.86% Pervious Area
4,450		60.14% Impervious Area

Subcatchment PR-1: Drive and Front Yard



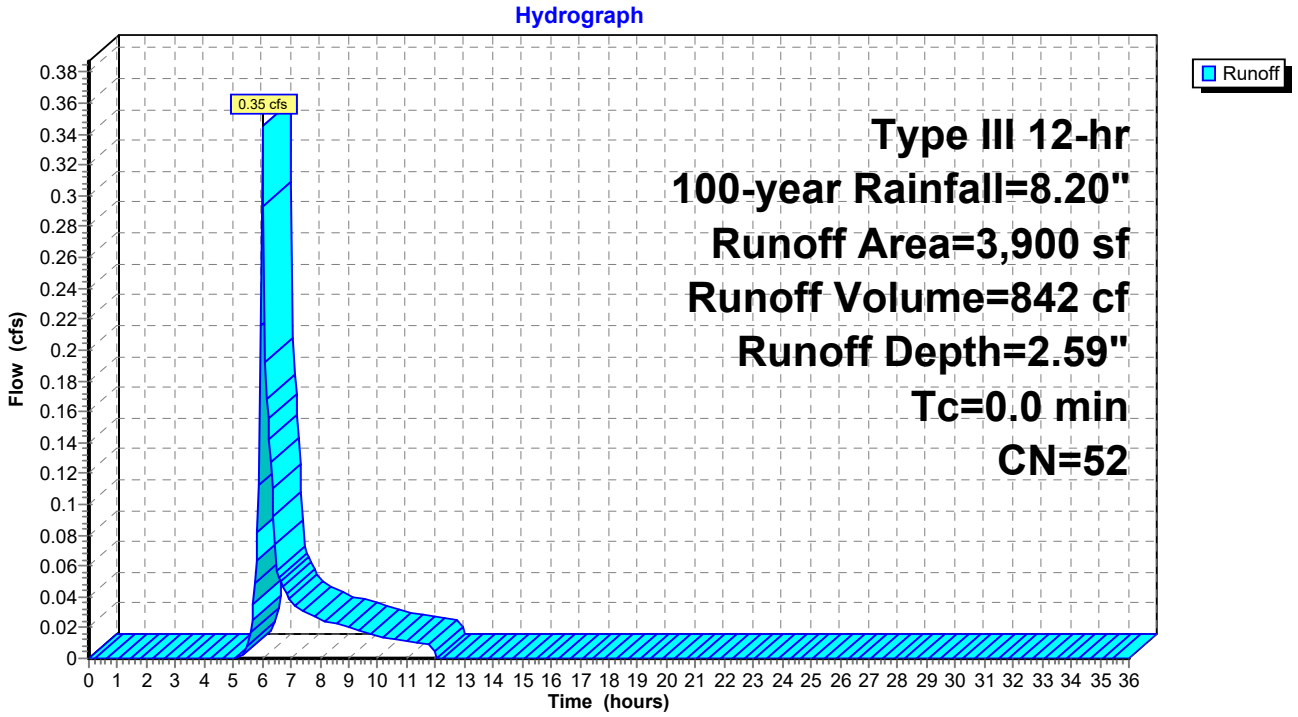
Summary for Subcatchment PR-2A: Front House and Yard

Runoff = 0.35 cfs @ 6.01 hrs, Volume= 842 cf, Depth= 2.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 100-year Rainfall=8.20"

Area (sf)	CN	Description
850	98	Paved parking, HSG A
3,050	39	>75% Grass cover, Good, HSG A
3,900	52	Weighted Average
3,050		78.21% Pervious Area
850		21.79% Impervious Area

Subcatchment PR-2A: Front House and Yard



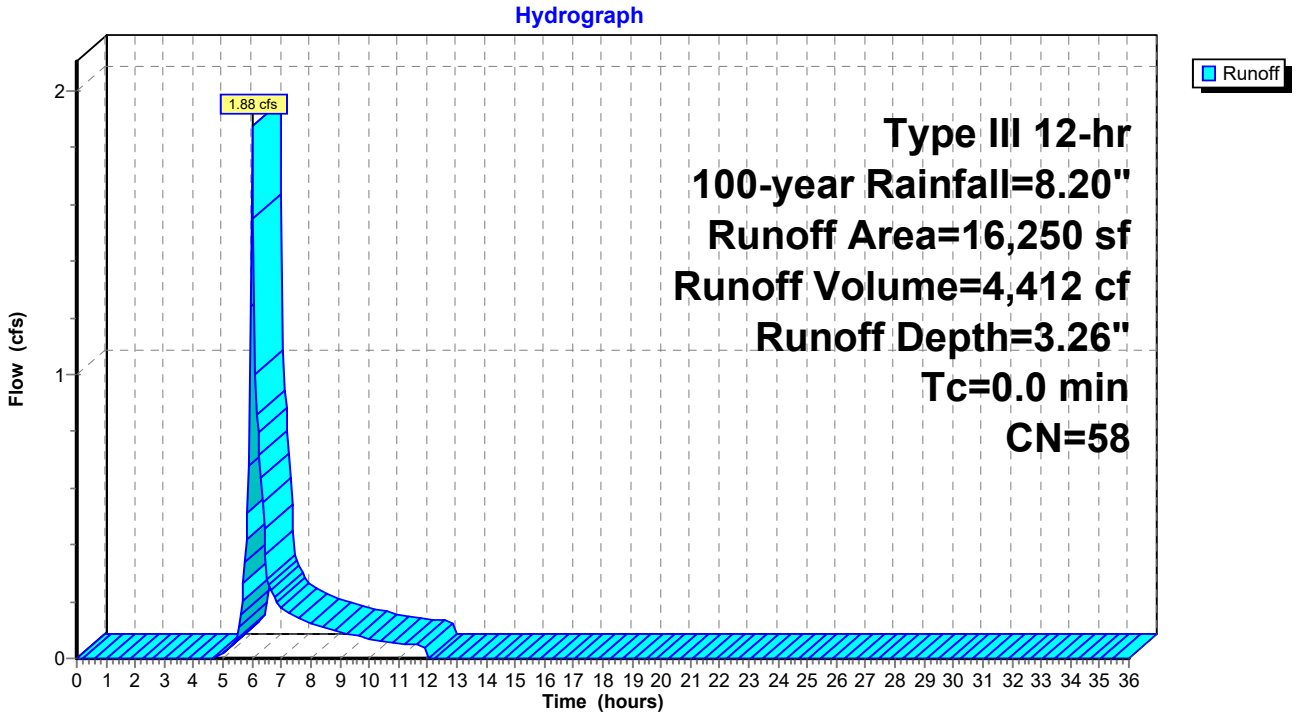
Summary for Subcatchment PR-2B: Back House and Yard

Runoff = 1.88 cfs @ 6.01 hrs, Volume= 4,412 cf, Depth= 3.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 100-year Rainfall=8.20"

Area (sf)	CN	Description
5,100	98	Paved parking, HSG A
11,150	39	>75% Grass cover, Good, HSG A
16,250	58	Weighted Average
11,150		68.62% Pervious Area
5,100		31.38% Impervious Area

Subcatchment PR-2B: Back House and Yard



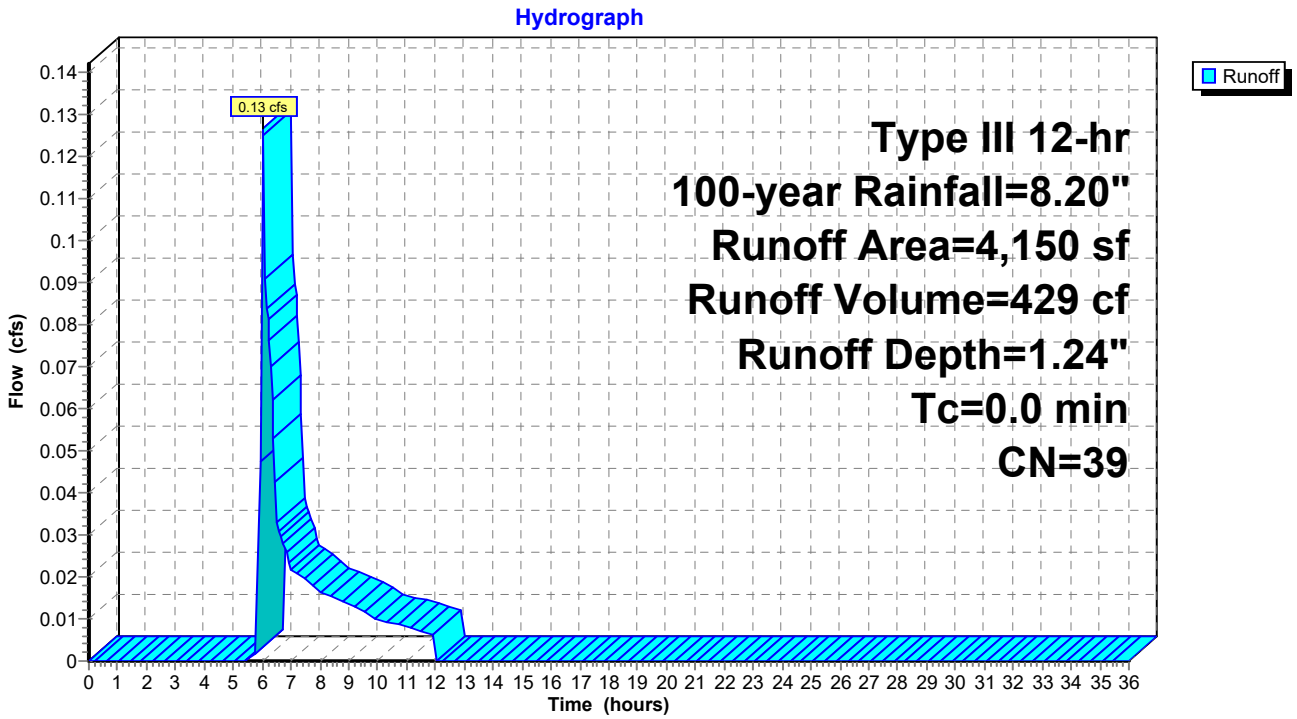
Summary for Subcatchment PR-3: Overland

Runoff = 0.13 cfs @ 6.03 hrs, Volume= 429 cf, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 12-hr 100-year Rainfall=8.20"

Area (sf)	CN	Description
0	98	Paved parking, HSG A
4,150	39	>75% Grass cover, Good, HSG A
4,150	39	Weighted Average
4,150		100.00% Pervious Area

Subcatchment PR-3: Overland



Summary for Pond 1P: leaching Basin

Inflow Area =	3,900 sf,	21.79% Impervious,	Inflow Depth =	2.59"	for 100-year event
Inflow =	0.35 cfs @	6.01 hrs,	Volume=	842 cf	
Outflow =	0.29 cfs @	6.10 hrs,	Volume=	842 cf,	Atten= 16%, Lag= 5.2 min
Discarded =	0.01 cfs @	5.60 hrs,	Volume=	423 cf	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	
Secondary =	0.28 cfs @	6.10 hrs,	Volume=	418 cf	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 63.09' @ 6.10 hrs Surf.Area= 64 sf Storage= 169 cf

Plug-Flow detention time= 88.9 min calculated for 841 cf (100% of inflow)
Center-of-Mass det. time= 89.1 min (526.1 - 437.0)

Volume	Invert	Avail.Storage	Storage Description
#1	58.75'	75 cf	**4.00'D x 6.00'H LB** Inside #2
#2	57.75'	148 cf	**9.00'D x 7.00'H Vertical Cone/Cylinder** 445 cf Overall - 75 cf Embedded = 370 cf x 40.0% Voids
#3	64.75'	114 cf	**Surface (Prismatic)**Listed below (Recalc) -Impervious
		337 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.75	5	0	0
65.20	500	114	114

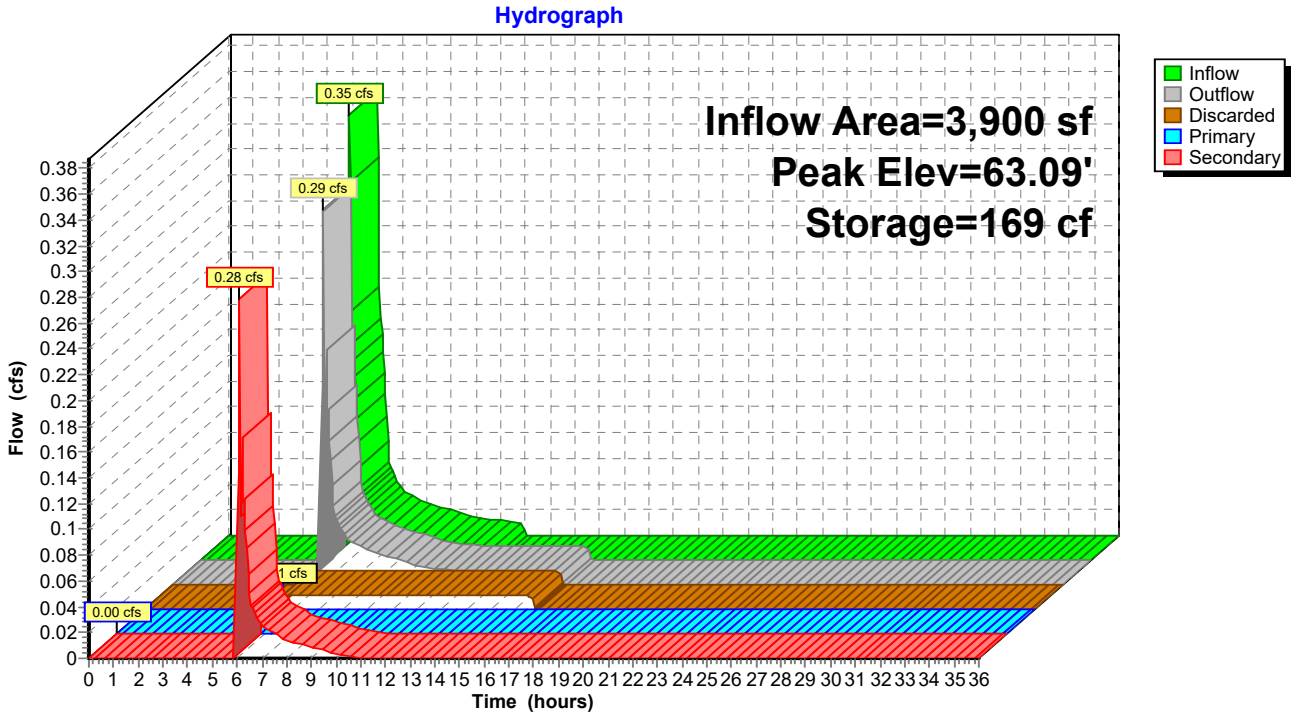
Device	Routing	Invert	Outlet Devices
#1	Discarded	57.75'	**7.800 in/hr Exfiltration over Surface area**
#2	Secondary	62.75'	**6.0" Round Culvert** L= 104.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 62.75' / 51.50' S= 0.1082 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Primary	64.75'	**15.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.01 cfs @ 5.60 hrs HW=57.83' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.75' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.27 cfs @ 6.10 hrs HW=63.08' (Free Discharge)
└─**2=Culvert** (Inlet Controls 0.27 cfs @ 1.96 fps)

Pond 1P: leaching Basin



Summary for Pond 2P: leaching Basin

Inflow Area =	7,400 sf,	60.14% Impervious,	Inflow Depth =	5.58"	for 100-year event
Inflow =	1.47 cfs @	6.00 hrs,	Volume=	3,439 cf	
Outflow =	1.35 cfs @	6.03 hrs,	Volume=	3,439 cf,	Atten= 8%, Lag= 1.5 min
Discarded =	0.01 cfs @	3.40 hrs,	Volume=	513 cf	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	
Secondary =	1.34 cfs @	6.03 hrs,	Volume=	2,925 cf	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 64.93' @ 6.03 hrs Surf.Area= 64 sf Storage= 214 cf

Plug-Flow detention time= 23.1 min calculated for 3,434 cf (100% of inflow)
Center-of-Mass det. time= 23.4 min (427.8 - 404.5)

Volume	Invert	Avail.Storage	Storage Description
#1	59.20'	75 cf	**4.00'D x 6.00'H LB** Inside #2
#2	58.20'	148 cf	**9.00'D x 7.00'H Vertical Cone/Cylinder** 445 cf Overall - 75 cf Embedded = 370 cf x 40.0% Voids
#3	65.20'	202 cf	**Surface (Prismatic)**Listed below (Recalc) -Impervious
		425 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.20	5	0	0
66.00	500	202	202

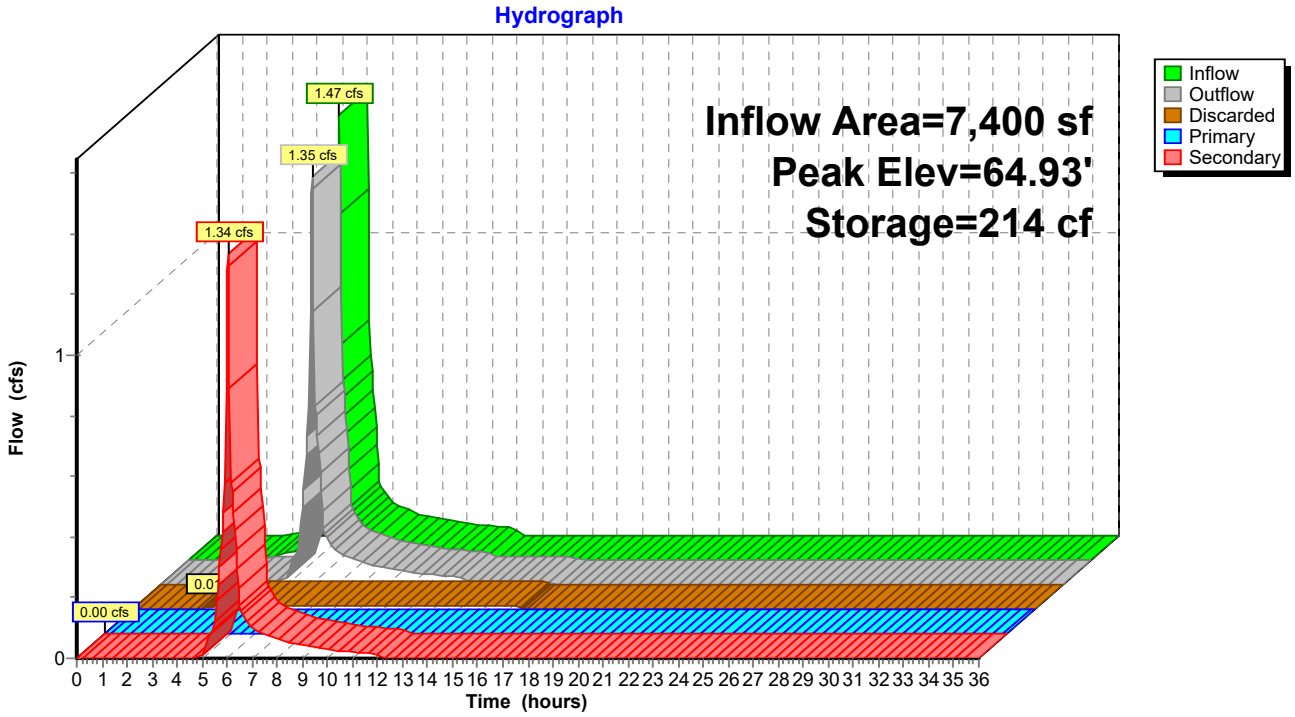
Device	Routing	Invert	Outlet Devices
#1	Discarded	58.20'	**7.800 in/hr Exfiltration over Surface area**
#2	Secondary	62.70'	**6.0" Round Culvert** L= 114.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 62.70' / 54.00' S= 0.0763 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Primary	65.80'	**15.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.01 cfs @ 3.40 hrs HW=58.28' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=58.20' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=1.29 cfs @ 6.03 hrs HW=64.80' (Free Discharge)
└─**2=Culvert** (Inlet Controls 1.29 cfs @ 6.55 fps)

Pond 2P: leaching Basin



Summary for Pond 3P: Stormtech

Inflow Area =	20,150 sf,	29.53% Impervious,	Inflow Depth =	4.62"	for 100-year event
Inflow =	3.22 cfs @	6.02 hrs,	Volume=	7,755 cf	
Outflow =	1.90 cfs @	6.12 hrs,	Volume=	7,755 cf,	Atten= 41%, Lag= 6.3 min
Discarded =	0.59 cfs @	6.12 hrs,	Volume=	3,055 cf	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	
Secondary =	1.31 cfs @	6.12 hrs,	Volume=	4,700 cf	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 55.46' @ 6.12 hrs Surf.Area= 3,277 sf Storage= 1,386 cf

Plug-Flow detention time= 43.9 min calculated for 7,744 cf (100% of inflow)
Center-of-Mass det. time= 44.1 min (463.5 - 419.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	50.00'	347 cf	**11.00'W x 32.10'L x 3.50'H Field A** 1,236 cf Overall - 368 cf Embedded = 868 cf x 40.0% Voids
#2A	50.50'	368 cf	**ADS_StormTech SC-740 +Cap** x 8 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 8 Chambers in 2 Rows
#3	55.00'	2,042 cf	**Surface (Prismatic)** Listed below (Recalc)
		2,757 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.00	5	0	0
55.80	5,100	2,042	2,042

Device	Routing	Invert	Outlet Devices
#1	Discarded	50.00'	**7.800 in/hr Exfiltration over Surface area**
#2	Secondary	53.30'	**6.0" Round Culvert** L= 30.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 53.30' / 43.80' S= 0.3167 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Primary	55.80'	**5.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.58 cfs @ 6.12 hrs HW=55.45' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.58 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=50.00' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=1.30 cfs @ 6.12 hrs HW=55.45' (Free Discharge)
└─**2=Culvert** (Inlet Controls 1.30 cfs @ 6.64 fps)

Pond 3P: Stormtech - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

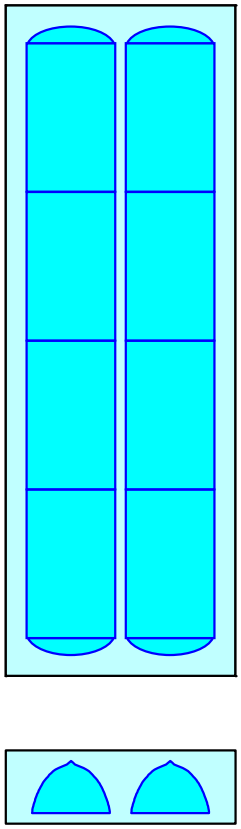
4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10' Base Length
2 Rows x 51.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.00' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

8 Chambers x 45.9 cf = 367.5 cf Chamber Storage

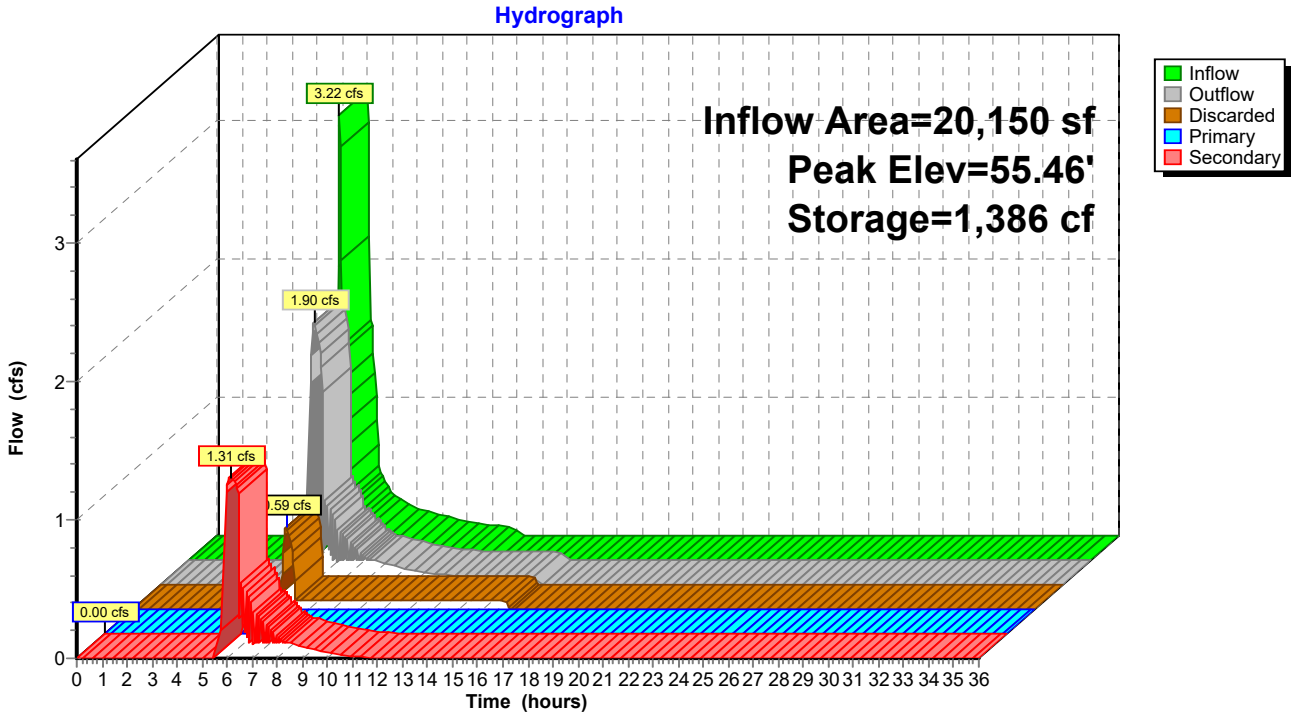
1,235.7 cf Field - 367.5 cf Chambers = 868.2 cf Stone x 40.0% Voids = 347.3 cf Stone Storage

Chamber Storage + Stone Storage = 714.8 cf = 0.016 af
Overall Storage Efficiency = 57.8%
Overall System Size = 32.10' x 11.00' x 3.50'

8 Chambers
45.8 cy Field
32.2 cy Stone

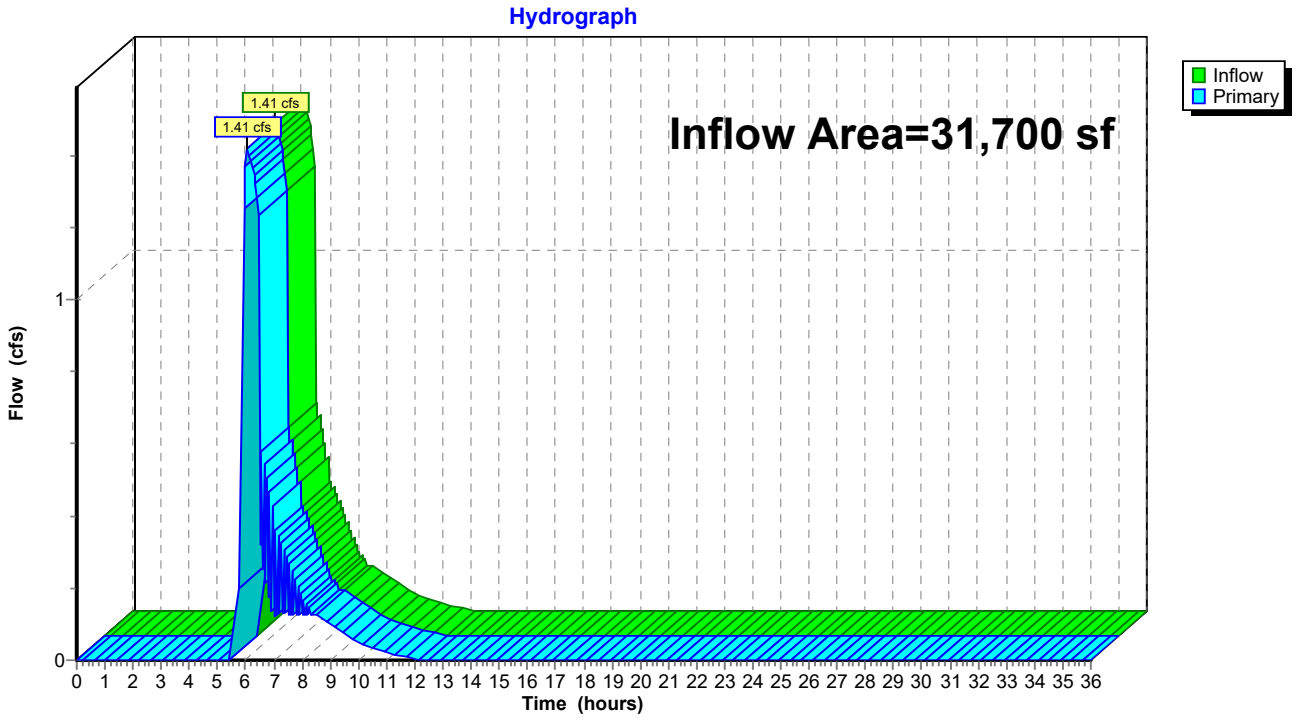


Pond 3P: Stormtech



Summary for Link 4L: PR

Inflow Area = 31,700 sf, 32.81% Impervious, Inflow Depth = 1.94" for 100-year event
Inflow = 1.41 cfs @ 6.06 hrs, Volume= 5,130 cf
Primary = 1.41 cfs @ 6.06 hrs, Volume= 5,130 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link 4L: PR