



Town of Reading

16 Lowell Street, Reading, MA 01867

Community Planning & Development Commission

Andrew MacNichol *Community Development Director*

Direct: 781-942-6670

amacnichol@ci.reading.ma.us

readingma.gov/community-planning-and-development-commission

August 12, 2024

Major Modification to a Definitive Subdivision Plan DECISION of APPROVAL

Land of: 4 Cold Spring Road

Proposed Street Name: Grandview Road Extension

To the Town Clerk:

This is to certify, that at a public hearing of the Reading Community Planning and Development Commission (CPDC), which was opened on June 10, 2024 and closed on XXX, by a motion duly made and seconded, it was voted:

“We, the CPDC, as requested by Michael Salamone, under the Town of Reading’s Subdivision Rules & Regulations, and MGL Chapter 41 Sections 81K through 81GG, and under the Town of Reading General Bylaw Section 7.9 and CPDC Stormwater Management and Erosion Control Regulations, to consider the Major Modification to the previously approved 4-Lot Definitive Subdivision Plan for property located at 4 Cold Spring Road (Assessors Map 27, Lot 404), as shown on the plans prepared by Fodera Engineering dated May 10, 2024, in support of an application filed on May 1, 2023, do hereby vote XXX to _____ the said plans, inclusive of the waivers listed herein, subject to the Findings and Conditions below.”

MATERIALS:

The following documents and plans were submitted into the public record:

1. Modification Summary memo from Fodera Engineering, dated 5/13/24.
2. Certified Abutters List and Legal Notice, published in Daily Times Chronicle on 5/22/24 and 5/29/24.
3. Major Site Plan Modification Plan Set for Grandview Road Extension, for the land located on 4 Cold Spring Road, Reading, MA 01867, prepared for: Michael Salamone, prepared by: Fodera Engineering, dated 5/10/24, including the following:
 - a. Sheet C-0: Cover Sheet, dated 5/10/24;
 - b. Sheet SV-1: Existing Conditions Plan of Land, prepared by PFS Land Surveying Inc., dated 7/8/2020;
 - c. Sheet C-1: Plan of Land, dated 5/10/24;
 - d. Sheet C-2: Site and Tree Preservation, dated 5/10/24;
 - e. Sheet C-3: Erosion and Sediment Control Plan, dated 5/10/24;

- f. Sheet C-4: Grading and Drainage Plan, dated 5/10/24;
 - g. Sheet C-5: Utility and Roadway Profile Plan, dated 5/10/24;
 - h. Sheet C-6: Details Sheet 1, dated 5/10/24;
 - i. Sheet C-7: Details Sheet 2, dated 5/10/24;
4. Peak Rate of Discharge Summary, prepared by Fodera Engineering, dated 5/13/24
 5. Memo from Town Engineer to Community Development Director, dated 8/8/24
 6. Draft Decision, dated 8/12/24.

FINDINGS:

1. **Original Approval, 2021:** On February 8, 2021, the CPDC approved a Definitive Subdivision Plan for a 4-lot residential subdivision on the land of 4 Cold Spring Road. The existing single-family dwelling was to be retained within a new lot boundary and a net of 3 new house lots and homes created.
2. **Major Modification, 2023:** In March 2023 the Applicant submitted a Major Modification request to the CPDC to allow for modification of the drainage and stormwater system. The redesign lowered the grade of the proposed right-of-way extension and converted the approved underground infiltration system to an open detention pond. Associated modifications to limit of work/clearing, building footprints, utilities and landscape features were also included. The CPDC issued a Decision of Approval, with associated conditions, on August 14, 2023.
3. **Proposal:** The current proposal looks to maintain a number of the modifications approved in 2023 such as the limit of work/clearing, lowered right-of-way grades, building footprints, and landscape features. The Applicant proposes to modify the stormwater system from the approved detention pond and revert to an underground infiltration system, substantially similar to the 2021 approved design. The as-built roadway and drainage infrastructure are able to be maintained and connected to the proposed system with no further elevation changes necessary.
 - a. **Grading and Drainage:** Two double-wide catch basins will direct stormwater from the right-of-way to the infiltration gallery between Lot 2 and Lot 3. Lots 3 and 4 will maintain their own roof capture and infiltration systems for the individual dwellings. The system is designed with 23 rows and 105 chambers for future infiltration, the overall site shows reduction in peak rate of discharge for the 2-, 10-, 25- and 100-year storm events.
 - b. **Private easements:** A proposed drainage easement must be revised accordingly with the re-proposed infiltration gallery and its associated future maintenance.
4. **Conservation:** The proposed changes to the stormwater infiltration design have been reviewed by the Conservation Division.

WAIVERS:

No new waivers were requested or granted as part of this Modification Process.

The Applicant had previously requested, and the Commission had approved the following waivers from the Town of Reading Subdivision Regulations:

1. A waiver from Section 6.1.1.d.3 requiring the submittal of a full traffic study.

The development results in three (3) newly created single-family dwellings that would be located on a dead-end street. The Applicant feels that the additional vehicular

demand can be determined to have an insignificant impact to the surrounding neighborhood.

2. A waiver from Section 6.1.1.d.4 requiring the submission of an Environmental Impact Report. *A protected resource area on-site is found in the buffer zone of an inland vegetated wetland. The Applicant states that minor site grading will be performed no closer than ~75' from the wetland area and will be performed in accordance with local and state regulations. Stormwater control will be properly mitigated on site. There are no Historical properties within 500' of the site and the Applicant feels it can be determined that the project will have an insignificant impact on the protected environment.*
3. A waiver from Section 7.1.1(a) requiring the layout width of a right-of-way to be a minimum of 60'. A waiver has been requested to **reduce the right-of-way layout from 60' to 40'**. *The project is proposing to develop the existing unimproved way known as Grandview Avenue that has a width of 40'. The right-of-way will remain at 40' but the Applicant is proposing a cul-de-sac that satisfies the subdivision regulation requirements.*
4. A waiver from Section 7.1.2(a) requiring centerlines of opposing streets to be spaced a minimum of 150' apart. **A waiver has been requested to reduce the minimum spacing of 150' to 130'**. *The Applicant states that Ridge Road is located 130' east, however, the existing ways have been in existence prior to the Subdivision Regulations.*
5. A waiver from Section 7.1.3(a) requiring a minimum of a 30' wide paved way. A waiver has been requested to **reduce the minimum width requirement of 30' to 25'**. *The Applicant states the 25' roadway width would accommodate the existing 40' right-of-way best by allowing the inclusion of a one-sided 5' sidewalk and 5' wide vegetated strip. The remaining 5' within the right-of-way will be on the west side of the proposed roadway and be graded out onto the Town-owned land.*
6. A waiver from Section 7.1.3(b) requiring dimensions of the proposed roadway, curbing, tree lawns, and sidewalks be conforming to the cross section shown in Figure 1 of the Subdivision Regulations has been requested. *Figure 1 of the Subdivision Regulations displays a 60' wide right-of-way with two 5' sidewalks, two 10' wide vegetated strips and a 30' wide paved roadway. The Applicant states conforming to Figure 1 is unfeasible due to the proposed 40' right-way-way width.*
7. A waiver from Section 7.1.3(e) requiring side slopes, outside of the exterior street lines, be a maximum allowable slope of one foot horizontal to one foot vertical (1:1) has been requested. *The Applicant proposes to grade outside of right-of-way limits and onto Town-owned land. The proximity of the proposed road and grading plan prove that it would require a retaining wall to avoid this waiver request and the Applicant feels that grading into the Town property is more practical and beneficial.*

8. A waiver from Section 7.1.4(b) requiring that curb lines at all intersections provide a radius of not less than 30'. A waiver has been requested to **provide a 24' radius curb line at the northeastern corner of the proposed roadway intersection and to provide a 15' radius curb line at the western intersecting side.**

The Applicant states that the existing intersection at Cold Spring Road and the proposed road is limited in radial width due to the corner property boundary of 4 Cold Spring Road. The Applicant feels the 15' radius on the western intersecting side will be satisfactory due to the absence of a western roadway intersection.

9. A waiver from Section 7.1.5(e) requiring a landscape island to be installed within the cul-de-sac has been requested.

The Applicant states that a fully paved cul-de-sac turnaround will be provided for emergency access and feels that a landscaped island presents maintenance and plowing concerns.

10. A waiver from Section 7.2(a) requiring sidewalks to be constructed on both sides of the proposed street. The Applicant is proposing **a sidewalk on one side of the proposed street.**

The Applicant states that due to the proposed 40' right-of-way sidewalks on both sides are not practical and that a sidewalk will be provided on one side of the proposed road.

11. A waiver from Section 7.5.4 requiring a 20' slope easement to be provided beyond the road layout for appropriate grading behind the sidewalk. A waiver has been requested to **increase the easement from 20' to 30' on the west side of the road and into the Town owned land abutting the project site.**

The Applicant states that this waiver would benefit the proposed grading discussed in Waiver #7 above.

CONDITIONS:

General:

- 1) **Plan Modification:** Upon approval of a Major Modification, the Applicant shall submit one (1) paper copy and one (1) electronic copy, in a format acceptable to the Building Inspector, of the modified plan, as well as a letter issued by a registered professional engineer, registered architect or registered landscape architect certifying, under pains and penalties of perjury, that the modified plan is consistent in all aspects with the approved modification and that all conditions of approval have been satisfied.
- 2) **February 8, 2021 Approval:** All conditions listed in the February 8, 2021 approval remain in full force and effect to the extent that they are not rendered obsolete by the Major Modification herein.
- 3) **August 10, 2023 Approval:** All conditions listed in the August 10, 2023 Major Modification approval remain in full force and effect to the extent that they are not rendered obsolete by the Major Modification herein.
- 4) **Conservation:** The Applicant shall continue to coordinate with the Conservation Administrator to comply with the requests and conditions imposed of/by the Conservation Commission.

Stormwater Permit Conditions:

- 1) The Applicant shall notify the Community Development Director and Town Engineer before significant site milestones, such as installation of erosion and sediment control measures or completion of site clearing.
- 2) The Applicant shall conduct and document periodic inspections of all control measures (before, during and/or after construction) and submit reports to the Community Development Director and Town Engineer.
- 3) The Applicant shall post, before the start of land disturbance activity, a cash bond or other surety to secure the performance of the Permittee's obligations under the Stormwater Permit.
- 4) The Applicant shall record notice of the Operation & Maintenance Plan with the Registry of Deeds (or the Land Court for registered land).
- 5) The Applicant shall establish a dedicated source of funding for long-term operation and maintenance of stormwater control measures, if not conducted by the Town.
- 6) The Applicant shall submit, to the Community Development Director and Town Engineer, an annual certification documenting the work that has been done over the last 12 months to properly operate and maintain the stormwater control measures.
- 7) The Applicant shall notify the CPDC in writing of any change or alteration of a land-disturbing activity authorized in a Stormwater Permit before the change or alteration occurs. If the proposed change or alteration is minor, the Community Development Director, after coordinating with the Town Engineer, may authorize such change or alteration in writing with a copy to the CPDC. Otherwise, the Community Development Director shall forward the notification of change or alteration to the CPDC. If the CPDC determines that the change or alteration is significant, it may require the Permittee to apply for an amendment to the Stormwater Permit.
- 8) The Approval of the Stormwater Permit shall lapse two (2) years after the date of its issuance if construction pursuant thereto has not begun; provided however, that the CPDC may grant an extension of the two (2) year period, for a maximum of one (1) year, upon a finding of good cause, including the need to obtain other local, state, and federal permits duly applied for, at the written request of the applicant, if submitted to the CPDC at least thirty (30) days prior to the expiration of the two (2) year period.
- 9) The CPDC may, upon application by the Permittee, amend a Stormwater Permit. Any such amendment shall conform to the requirements of the Stormwater Management and Erosion Control Bylaw and Regulations.
- 10) Within 60 days of the completion of construction of the project, the Permittee shall submit to the Community Development Director and Town Engineer a record plan detailing the actual stormwater management system as installed. The as-built plan must depict all on-site controls, both structural and non-structural, designed to manage the stormwater associated with the completed site. Such plan shall be provided both in hard copy and as an electronic file. Upon review of the as-built plan, the Community Development Director and Town Engineer may approve it or may direct the Permittee to take any actions necessary to correct the plan or to comply with any outstanding requirements of the Stormwater Permit.

Prior to Plan Endorsement:

- 1) **Plan Revisions:** The Applicant shall revise the Site Plan pursuant to any conditions imposed herein and submit 2 full-size (24x36) copies of the revised plans to the Community Development Director for review and approval prior to the issuance of a Building Permit. Revisions include but are not limited to:
 - a. The applicant shall install a second catch basin within the cul-de-sac of lot 2 to mitigate ponding.
- 2) **Mylars:** The Applicant shall submit two (2) complete sets of mylar plans, and an electronic version, to the Community Development Director for endorsement by the CPDC.
- 3) **Electric Utility and Easement:** The proposed changes to the electric utility plan shall be approved by the Reading Municipal Light Department (RMLD). Locations of light poles, transformers, etc. shall be added to the plans and approved by RMLD.

Site Work, Road Work or Utility Work:

- 1) **Other Permits:** The Owner/Applicant is responsible for meeting all other requirements and obtaining all other permits as needed including but not limited to: Order of Conditions from the Conservation Commission, utility connections, street opening, and Jackie's Law excavation permits from the Engineering Department (prior to excavation).
- 2) **Recorded Plans:** The Applicant shall provide electronic copies of the recorded plans and all other recorded documents to the Community Development Director.
- 3) **Engineering Comments:** The Applicant shall coordinate with the Town Engineer to resolve any necessary outstanding comments.

Prior to the Issuance of a Building Permit for Lot 3 and Lot 4:

- 1) **Lot Two Conveyance:** The Applicant shall provide recorded proof to the Community Development Director that Lot 2 has been conveyed to the property owner of 4 Cold Spring Road.
- 2) **Shed Relocation/Removal:** The Applicant shall provide confirmation that the existing shed has been relocated and/or rebuilt to fit entirely within Lot 1 and meet zoning requirements.

Prior to the Issuance of Occupancy for Any Lot:

- 1) **Access Easement:** The Applicant shall provide a copy of the executed and recorded Access and Utility Easement established between Lot Three and Lot Four.
- 2) **Drainage Easement:** The Applicant shall provide a copy of the executed and recorded Access, Utility, and/or Drainage easement, necessary between Lot 1 and 2 and the future Homeowners Association to be established for Lots 3 and 4.
- 3) **Stormwater System Review:** The Applicant shall submit all post storm reports and inspections including detail of emergency overflow outlet usage and intensity. Should it be shown to discharge toward the abutting property to the east, berm or secondary containment shall be constructed.
- 4) **Closing Documents for Homeowners:** Additional reference to the Stormwater Operation and Management Plan shall include language that no structure, trees, fill and/or blockage of

the stormwater system within Lots Two and Three shall be allowed. Additional language as to the maintenance, cleaning and responsibilities to ensure the system works as designed shall be included.

- a. If deemed required, prior to the issuance of an Occupancy Permit for the future construction of a dwelling on Lot 2, draft documents prescribing Lot 2 to join the established Homeowners Association shall be submitted to the Community Development Director for review and approval.

Signed as to the accuracy of the vote as reflected in the minutes:

Andrew MacNichol, Community Development Director

Date

Cc: Applicant, Town Clerk, CPDC, Development Review Team, Building Inspector, planning file

Memo

To: Andrew MacNichol , Community Development Director
From: Alex Rozycki, PE Assistant Town Engineer
CC: Olivia Knightley, Senior Planner
Date: August 8, 2024
Re: Grandview Road Extension

Materials reviewed:

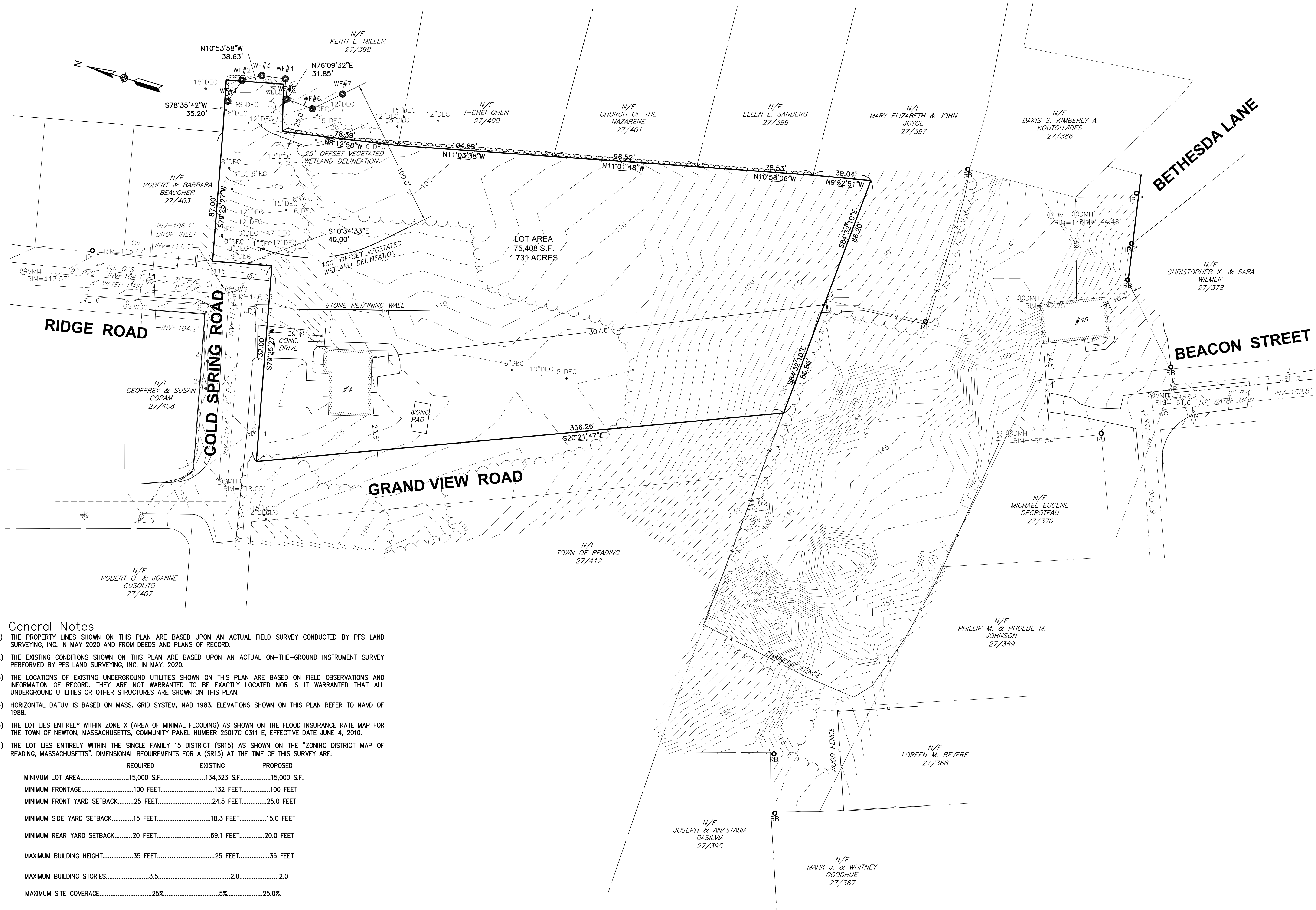
- Proposed Site Plans entitled; “Major Site Plan Modification- Grandview Road Subdivision prepared by Fodera Engineering revision date May 10 2024”
- Revision Comments, Definitive Subdivision – Grandview Road Extension; prepared by Fodera Engineering; dated May 13, 2024

The Engineering Division has reviewed the proposed site application for the proposed project and offers the following comments:

- No stormwater overflows shall be directed toward abutters to the east. If it is determined that the overflow outlet structure is discharging to abutters a berm or secondary containment shall be constructed to contain the water entirely within the subdivision.
- Potential for ponding near driveways, especially lot 2 future home. Engineering Department recommends implementing an additional catch basin to mitigate runoff being directed towards the property or regrading.
- A Sewer Connection I/I fee is required.
- The driveway curb cuts shall meet Town of Reading standard cross sections. The proposed elevations are unclear in these areas, all driveways will be approved individually.
- All utilities shall be approved materials and installed in accordance with the Department of Public Works Standards.
- Engineering Division shall be notified 72 hours in advance to mark out Town utilities.
- All water, sewer, curb cut, street opening and Jackie’s Law excavation permits shall be obtained at the Engineering Division prior to any excavations.
- All site work shall be inspected by the Engineering Division. The Applicant/Owner’s contractor shall submit a construction schedule of proposed work. All inspections shall be scheduled 48 hours in advance.
- An approved site as-built shall be submitted to the Engineering Division within 60 days of certificate of occupancy. The as-built shall be submitted in mylar and electronic ACAD format.

LEGEND

- ⊕ BM # BENCHMARK
- ▣ BOUND (CONC. STONE, LAND COURT, ETC.)
- ▣ CB CATCH BASIN - SQUARE
- ⊕ CB CATCH BASIN - ROUND
- ⊙ DSK DISK (CAVT. USC&GS, LAND COURT, ETC.)
- ⊙ DH DRILL HOLE
- ⊙ DMH DRAIN MANHOLE
- ⊙ EHH ELECTRIC HANDHOLE
- ⊙ EM ELECTRIC MANHOLE
- ⊙ EM ELECTRIC METER
- ⊙ GG GAS GATE
- ⊙ GM GAS METER
- ♿ HANDICAP SYMBOL
- ⊙ GUY WIRE ANCHOR
- ⊙ FIRE HYDRANT
- ☀ LIGHT
- OHW OVERHEAD WIRE
- ⊙ MAG MAG NAIL
- ⊙ MB MAIL BOX
- ⊙ OTHER MANHOLE
- ⊙ PB PULL BOX
- ⊙ PED PEDESTRIAN SIGNAL
- ⊙ SEWER MANHOLE
- ⊙ TELEPHONE MANHOLE
- ⊙ TRANSFORMER
- ⊙ # OF PARKING SPACES
- ⊙ TS TRAFFIC SIGNAL
- ⊙ TS TRAFFIC SIGNAL MAST ARM/SPAN WIRE POLE SIGN
- ⊙ ULT# UTILITY POLE W/LIGHT
- ⊙ UPL# UTILITY POLE
- ⊙ WG WATER GATE
- ⊙ WSO WATER SHUTOFF
- CHAIN LINK FENCE
- WOOD FENCE



General Notes

- 1) THE PROPERTY LINES SHOWN ON THIS PLAN ARE BASED UPON AN ACTUAL FIELD SURVEY CONDUCTED BY PFS LAND SURVEYING, 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 PFS LAND SURVEYING, 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 LOT LIES ENTIRELY WITHIN ZONE X (AREA OF MINIMAL FLOODING) AS SHOWN ON THE FLOOD INSURANCE RATE MAP FOR THE TOWN OF NEWTON, MASSACHUSETTS, COMMUNITY PANEL NUMBER 25017C 0311 E, EFFECTIVE DATE JUNE 4, 2010.
- 6) THE LOT LIES ENTIRELY WITHIN THE SINGLE FAMILY 15 DISTRICT (SR15) AS SHOWN ON THE "ZONING DISTRICT MAP OF READING, MASSACHUSETTS". DIMENSIONAL REQUIREMENTS FOR A (SR15) AT THE TIME OF THIS SURVEY ARE:

	REQUIRED	EXISTING	PROPOSED
MINIMUM LOT AREA.....	15,000 S.F.	134,323 S.F.	15,000 S.F.
MINIMUM FRONTAGE.....	100 FEET	132 FEET	100 FEET
MINIMUM FRONT YARD SETBACK.....	25 FEET	24.5 FEET	25.0 FEET
MINIMUM SIDE YARD SETBACK.....	15 FEET	18.3 FEET	15.0 FEET
MINIMUM REAR YARD SETBACK.....	20 FEET	69.1 FEET	20.0 FEET
MAXIMUM BUILDING HEIGHT.....	35 FEET	25 FEET	35 FEET
MAXIMUM BUILDING STORIES.....	3.5	2.0	2.0
MAXIMUM SITE COVERAGE.....	25%	5%	25.0%

- 7) THE WETLANDS SHOWN HEREON WERE FLAGGED BY LEC ENVIRONMENTAL IN JUNE 2020 AND LOCATED BY PFS LAND SURVEYING INC. IN JUNE 2020.

No.	Revision	Date	Apprv.
2	added tree locations in buffer zone	2-04-2021	BGP
1	updated well location	12-09-2020	BGP

Designed by BGP Drawn by BGP Checked by BGP
 CAD checked by BGP Approved by BGP
 Scale 1"=30' Date 7/8/2020

Existing Conditions
 4 Cold Spring Rd
 Reading, MA

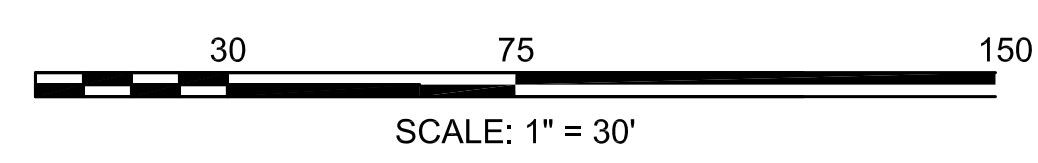
Issued for
 Review

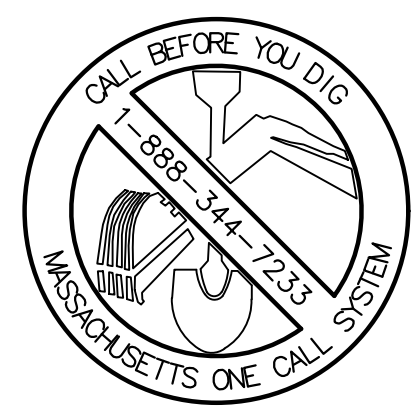
Drawing Title
Existing Conditions
 Plan of Land

Drawing Number
SV-1

Sheet
 1 of 1

Project Number





EARTHWORK VOLUME CALCULATIONS

APPROXIMATE OVERALL CUT & FILL ANALYSIS	
CUT VOLUME, BCY	±2,516 CY
FILL VOLUME, BCY	±1,607 CY
NET VOLUME, BCY (CUT)	±909 CF

NOTE: A MORE DETAILED ANALYSIS SHALL BE PERFORMED BY THE CONTRACTOR.

LEGEND

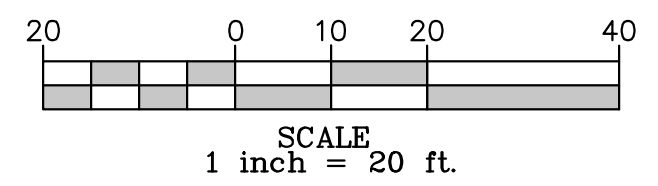
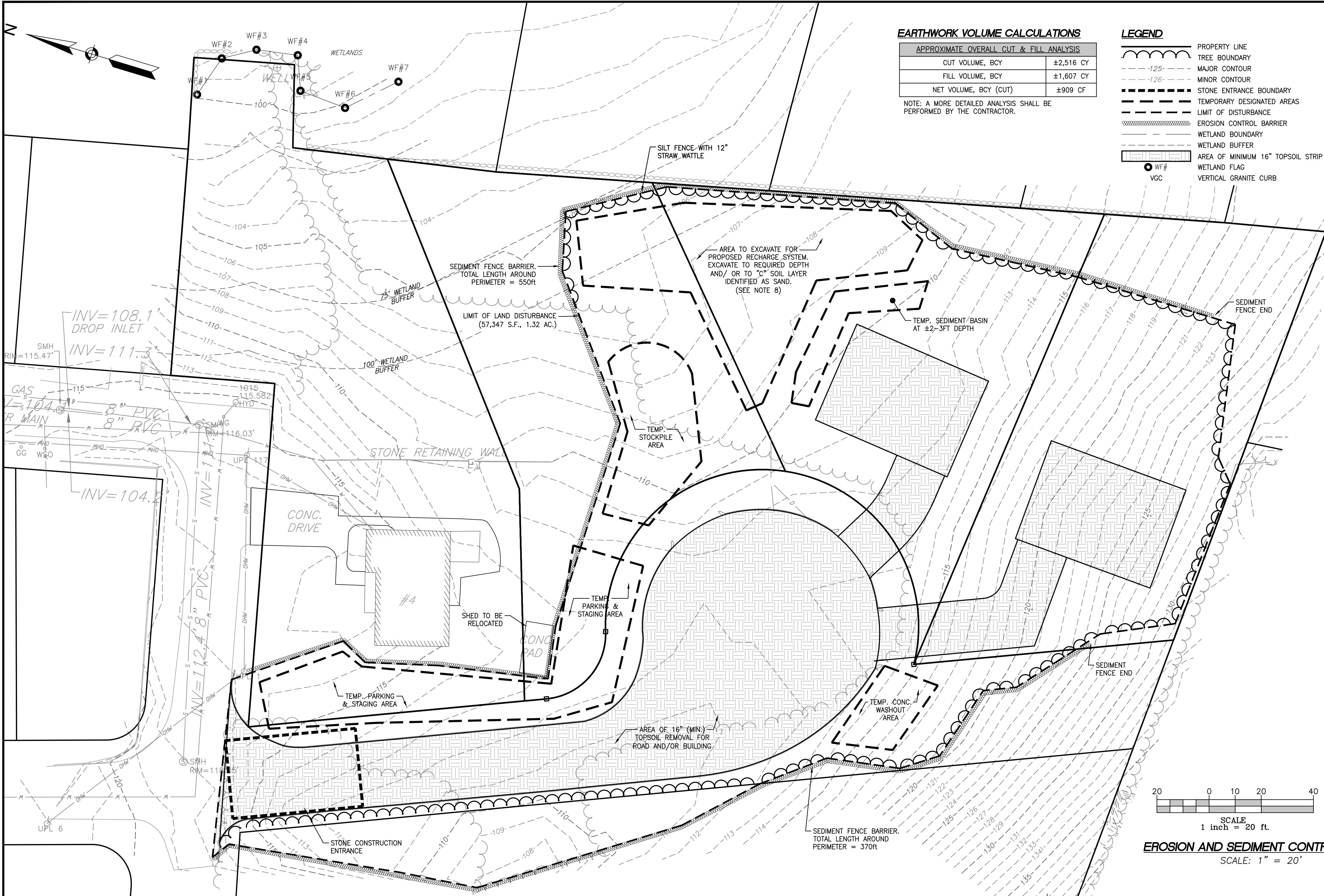
- PROPERTY LINE
- TREE BOUNDARY
- - - MAJOR CONTOUR
- - - MINOR CONTOUR
- - - STONE ENTRANCE BOUNDARY
- - - TEMPORARY DESIGNATED AREAS
- - - LIMIT OF DISTURBANCE
- EROSION CONTROL BARRIER
- WETLAND BOUNDARY
- WETLAND BUFFER
- AREA OF MINIMUM 16" TOPSOIL STRIP
- WETLAND FLAG
- VERTICAL GRANITE CURB
- WF#
- WGC

- EROSION CONTROL NOTES**
- PRIOR TO COMMENCING LAND DISTURBANCE ACTIVITY THE LIMITS OF LAND DISTURBANCE SHALL BE CLEARLY AND ACCURATELY DEMARCATED WITH STAKES, RIBBONS, OR OTHER APPROPRIATE MEANS.
 - INSTALL SEDIMENTATION AND EROSION CONTROL MEASURES PRIOR TO CLEARING GRADING AND DEMOLITION WORK. MAINTAIN ALL SEDIMENT AND EROSION CONTROL, AND TREE PROTECTION MEASURES UNTIL PERMANENT GROUND COVER IS ESTABLISHED.
 - ALL EROSION AND SEDIMENT CONTROL PRACTICES ARE SUBJECT TO FIELD MODIFICATIONS AT THE DIRECTION OF THE TOWN'S DPW ENGINEERING DEPARTMENT.
 - PRIOR TO ANY OTHER CONSTRUCTION, A STABILIZED CONSTRUCTION ENTRANCE SHALL BE CONSTRUCTED AT EACH ENTRY TO OR EXIT FROM THE SITE. CONTRACTOR SHALL MAINTAIN CONSTRUCTION ENTRANCE UNTIL SITE PAVING IS COMPLETE.
 - INLET PROTECTIONS SHALL BE INSTALLED ON ALL EXISTING CATCH BASINS AS INDICATED ON THE PLAN, AND IMMEDIATELY AFTER THE INSTALLATION OF ALL NEWLY INSTALLED INLETS.
 - THE CONSTRUCTION ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOW OF MUD ONTO THE ACCESSING ROADWAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH STONE, AS CONDITIONS DEMAND, AND REPAIR AND/OR CLEAN-OUT OF ANY STRUCTURES USED TO TRAP SEDIMENT. ALL MATERIALS SPILLED, DROPPED, WASHED, OR TRACKED BY VEHICLE OFF-SITE ONTO THE ROADWAY OR INTO STORM DRAINS MUST BE REMOVED.
 - IMMEDIATELY AFTER THE ESTABLISHMENT OF CONSTRUCTION ENTRANCES/EXITS, ALL PERIMETER EROSION CONTROL DEVICES AND STORM WATER MANAGEMENT DEVICES SHALL BE INSTALLED PRIOR TO ANY OTHER CONSTRUCTION.
 - ADD EROSION BARRIER AROUND PERIMETER OF PROPOSED RECHARGE AREA IF THE EXCAVATED PIT WILL REMAIN EXPOSED FOR MORE THAN TWO (2) DAYS, WEATHER PERMITTING. THE EXCAVATED PIT SHALL BE CLEAN OF ALL SEDIMENT.
 - EROSION CONTROL DEVICES SHALL BE INSTALLED BEFORE GROUND DISTURBANCE OCCURS. THE LOCATION OF SOME OF THE EROSION CONTROL DEVICES MAY HAVE TO BE ALTERED FROM THAT SHOWN ON THE APPROVED PLANS IF DRAINAGE PATTERNS DURING CONSTRUCTION ARE DIFFERENT FROM THE FINAL PROPOSED DRAINAGE PATTERNS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ACCOMPLISH EROSION CONTROL FOR ALL DRAINAGE PATTERNS CREATED AT VARIOUS STAGES DURING CONSTRUCTION. ANY DIFFICULTY IN CONTROLLING EROSION DURING ANY PHASE OF CONSTRUCTION SHALL BE REPORTED TO THE ENGINEER IMMEDIATELY.
 - THE CONSTRUCTION OF THE SITE WILL INITIATE WITH THE INSTALLATION OF EROSION CONTROL MEASURES SUFFICIENT TO CONTROL SEDIMENT DEPOSITS AND EROSION. ALL SEDIMENT CONTROL WILL BE MAINTAINED UNTIL ALL UPSTREAM GROUND WITHIN THE CONSTRUCTION AREA HAS BEEN COMPLETELY STABILIZED WITH PERMANENT VEGETATION AND ALL ROADS/DRIVES HAVE BEEN PAVED.
 - THE CONTRACTOR SHALL FURNISH AND MAINTAIN ALL NECESSARY BARRICADES WHILE IMPROVEMENTS ARE BEING MADE. TRAFFIC CONTROL MEASURES TO BE IN ACCORDANCE WITH LOCAL REGULATIONS AND OR MASSDOT.
 - ALL SILT BARRIERS MUST BE PLACED AS ACCESS IS OBTAINED DURING CLEARING. NO GRADING SHALL BE DONE UNTIL SILT BARRIER INSTALLATION AND DETENTION FACILITIES, IF REQUIRED, ARE CONSTRUCTED.
 - CONTRACTOR SHALL PERFORM EROSION CONTROL INSPECTIONS REGULARLY AND IMMEDIATELY FOLLOWING HEAVY RAIN STORMS TO ENSURE MEASURES ARE FUNCTIONING PROPERLY. REPAIR OR REPLACE FAILED SYSTEMS AT THE EARLIEST POSSIBLE DATE.
 - ANY DISTURBED AREA LEFT EXPOSED FOR A PERIOD GREATER THAN 14 DAYS SHALL BE STABILIZED WITH TEMPORARY SEEDING.
 - ALL DISTURBED AREAS, WITH NO SPECIFIED GROUND COVER ARE TO BE RESTORED WITH MINIMUM FOUR (4) INCHES OF TOPSOIL AND SEEDING.
 - PROPERTY MARKERS AND STREET LINE MONUMENTS SHALL BE PROPERLY PROTECTED AT ALL TIMES DURING CONSTRUCTION TO ENSURE INTEGRITY. IF DISTURBED, THEY SHALL BE REPLACED BY A REGISTERED SURVEYOR AT THE CONTRACTOR'S EXPENSE.
 - ALL EXCAVATION SHALL INCLUDE CLEARING, STRIPPING AND STOCKPILING TOPSOIL, REMOVING UNSUITABLE MATERIALS, THE CONSTRUCTION OF EMBANKMENTS, CONSTRUCTION FILLS, AND THE FINAL SHAPING AND TRIMMING TO THE LINES AND GRADES SHOWN ON THE PLANS.
 - ALL TREES, BRUSH, AND ORGANIC TOPSOIL AND OTHER OBJECTIONABLE MATERIAL SHALL BE REMOVED, UNLESS OTHERWISE SPECIFIED, AND DISPOSED OF AT AN OFF-SITE LOCATION, WITH THE EXCEPTION THAT ENOUGH TOPSOIL SHALL BE RETAINED FOR RE-Spread AND GENERAL LANDSCAPING. AREAS WHICH ARE TO BE FILLED SHALL BE COMPACTED TO A MINIMUM DENSITY OF 95% AS DETERMINED BY THE MODIFIED PROCTOR (ASTM D1557, METHOD C) COMPACTION TEST IN THE PAVED AREAS AND 90% IN THE OTHER AREAS.
 - SWEEP CLEAN THE BINDER COURSE PRIOR TO THE INSTALLATION OF THE FINAL BITUMINOUS CONCRETE SURFACE COURSE. EXCESSIVE CLEANING OF THE BINDER COURSE THAT MAY BE REQUIRED, AND IS NOT THE FAULT OF THE PAVING CONTRACTOR, SHALL BE PAID FOR ON A TIME AND MATERIAL BASIS BY PRIOR AGREEMENT WITH THE GENERAL CONTRACTOR.
 - THE TOWN'S ENGINEERING DIVISION SHALL BE NOTIFIED SEVENTY-TWO (72) HOURS PRIOR TO ANY EXCAVATION TO MARK OUT TOWN UTILITIES.
 - ALL WATER, SEWER, CURB CUT, STREET OPENING AND JACKIE'S LAW EXCAVATION PERMITS SHALL BE OBTAINED AT THE ENGINEERING DIVISION PRIOR TO ANY EXCAVATIONS.
 - ALL SITE WORK SHALL BE INSPECTED BY THE ENGINEERING DIVISION. THE APPLICANT/OWNER'S CONTRACTOR SHALL SUBMIT A CONSTRUCTION SCHEDULE OF PROPOSED WORK. ALL INSPECTIONS SHALL BE SCHEDULED 48 HOURS IN ADVANCE.

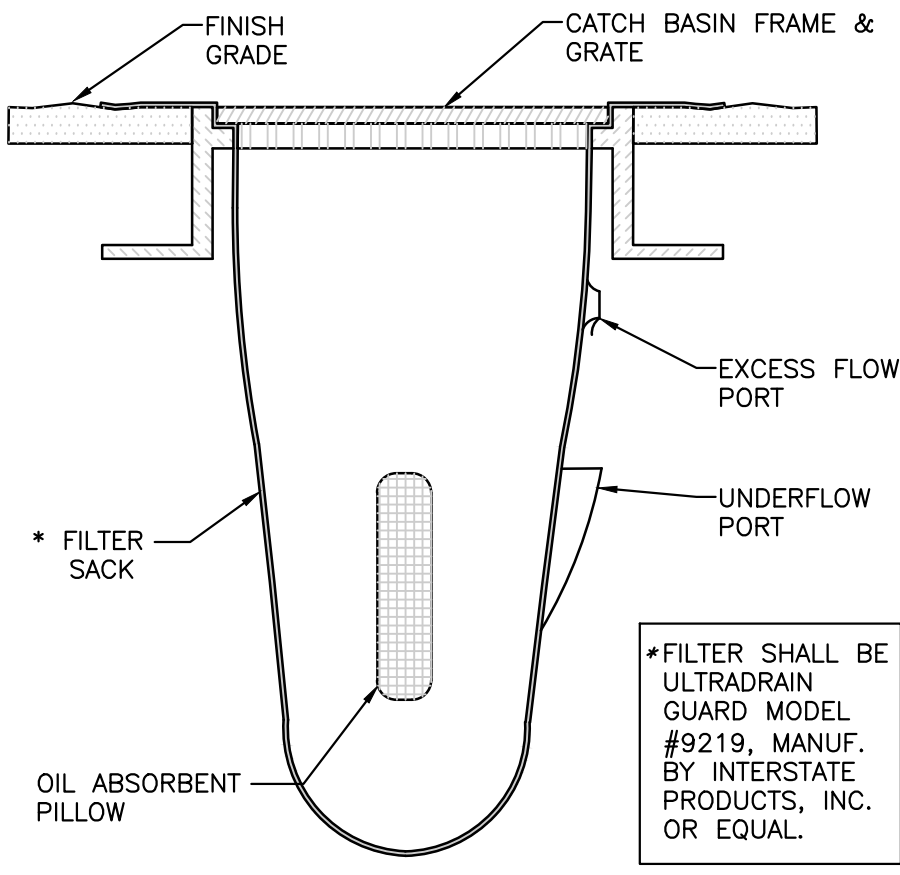
REVISION	DATE	BY

PROJECT LOCATION:
 LOTS 2, 3, & 4
 GRANDVIEW ROAD
 READING, MA 01867
 PARCEL ID:
 MAP 27, LOT 404

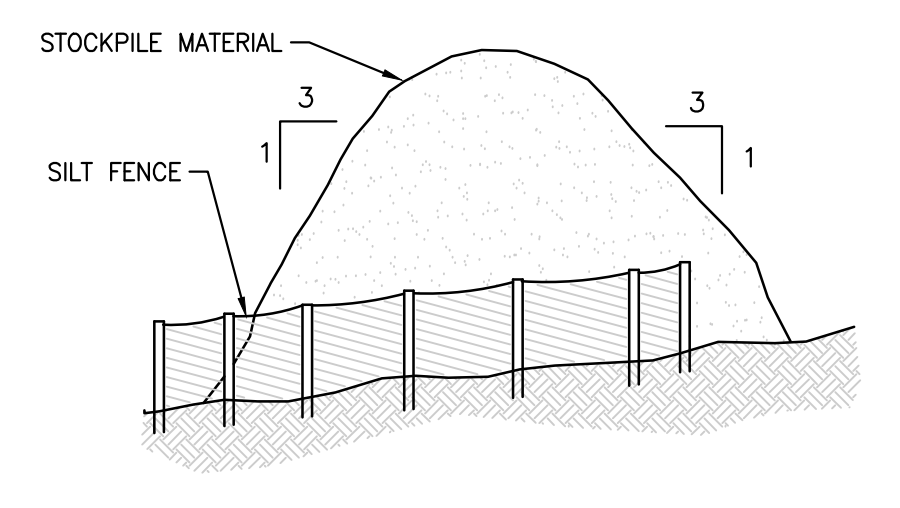
PLAN SET:
MAJOR SITE PLAN MODIFICATION
GRANDVIEW ROAD SUBDIVISION - PRIVATE WAY
(GRANDVIEW ROAD EXTENSION)
 MAY 10, 2024
 SCALE: 1" = 20'



EROSION AND SEDIMENT CONTROL PLAN
 SCALE: 1" = 20'

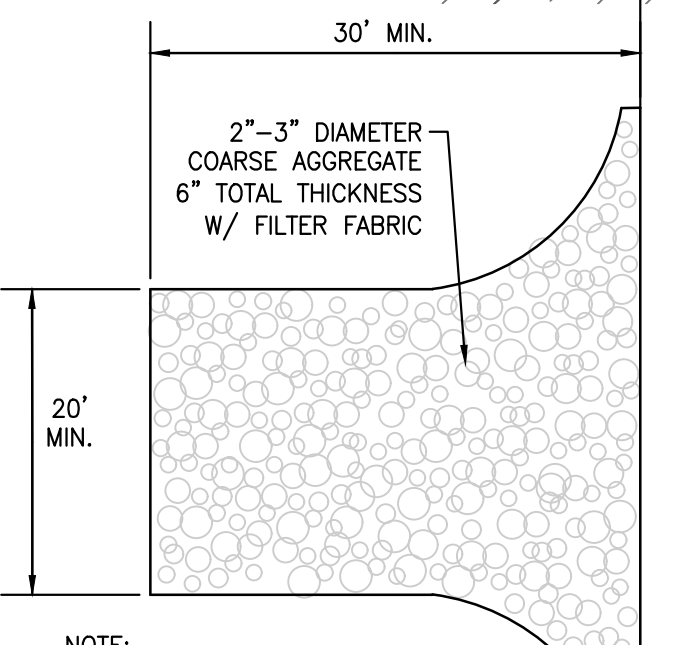


CATCH BASIN INLET PROTECTION
 N.T.S.



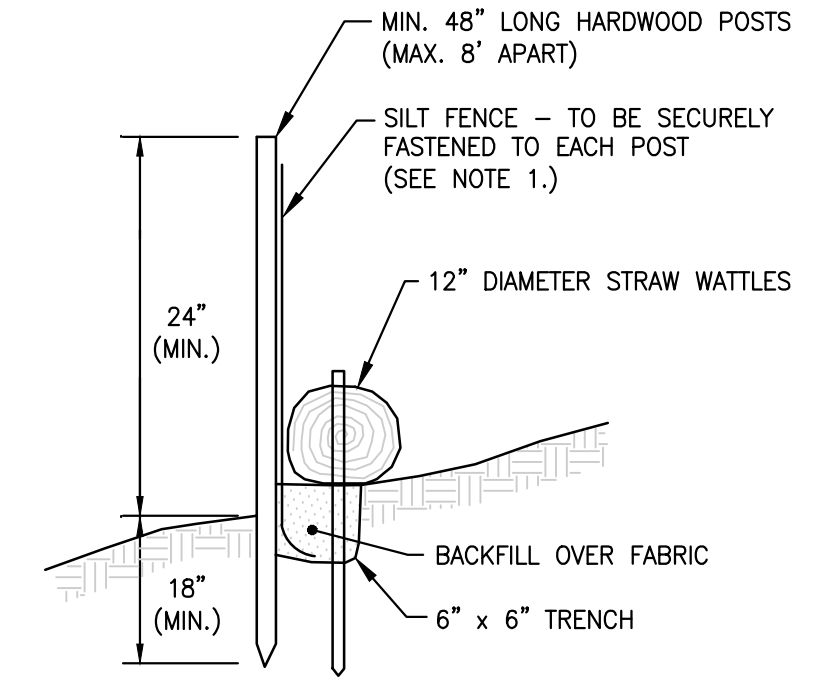
NOTES:
 1. STOCKPILE HEIGHTS MUST NOT EXCEED 35 FEET.
 2. STOCKPILE SLOPES MUST BE 3:1 OR FLATTER.

STOCKPILE DETAIL
 N.T.S.



NOTE:
 GRAVEL PAD IS REQUIRED TO PROVIDE BUFFER AREA WHERE VEHICLES CAN DROP MUD AND SEDIMENT TO AVOID TRANSPORTING IT ONTO PAVED ROADS, TO CONTROL EROSION FROM SURFACE RUNOFF AND TO HELP CONTROL DUST.

STONE CONSTRUCTION ENTRANCE
 N.T.S.



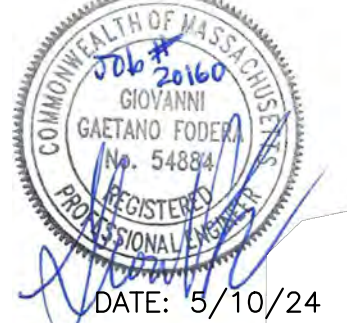
NOTES:
 1. WATTLES SHALL BE STAKED A MINIMUM OF 24 INCHES INTO THE GROUND WITH 2 INCHES OR LESS OF STAKE EXPOSED ABOVE WATTLE. STAKE SHALL BE A MAXIMUM OF 4 FEET APART AND WITHIN 2 FEET OF END OF WATTLE SECTIONS.

SILT FENCE/ STRAW WATTLE BARRIER
 N.T.S.

TOWN OF READING
 COMMUNITY PLANNING & DEVELOPMENT COMMISSION
 DATE: _____

FOR REGISTRY USE ONLY

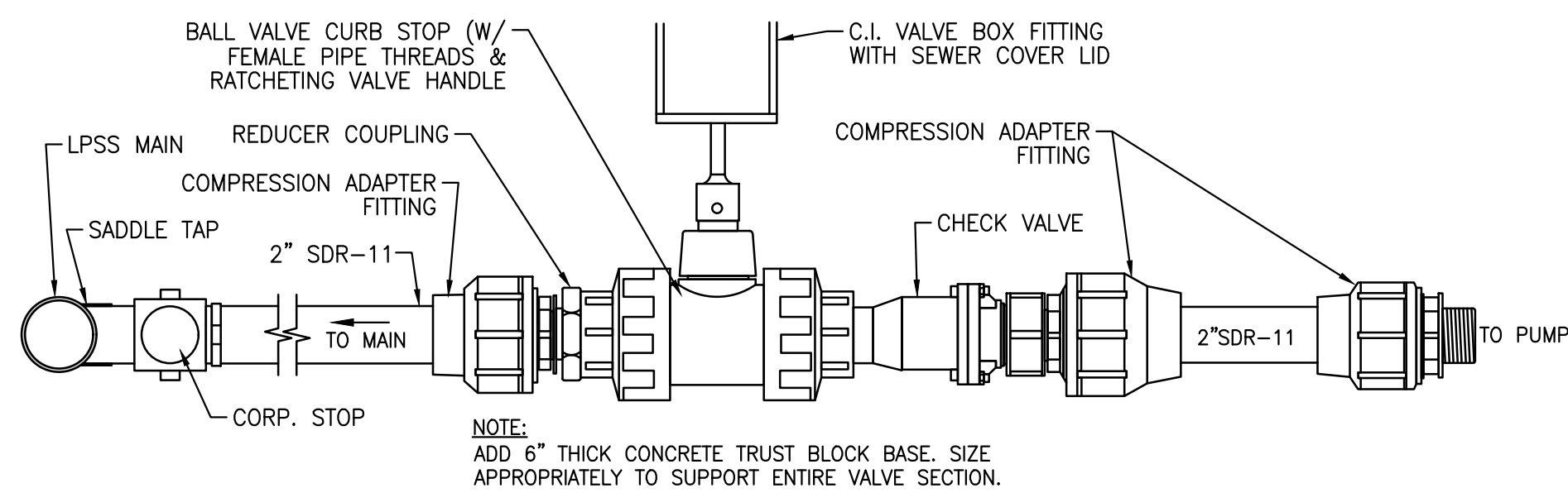
ENGINEER: **FODERA ENGINEERING**
 (617) 877-3293
 gfodera@foderaengineering.com
 28 Harbor St., Suite 204
 Danvers, MA 01923
 www.fodera.com



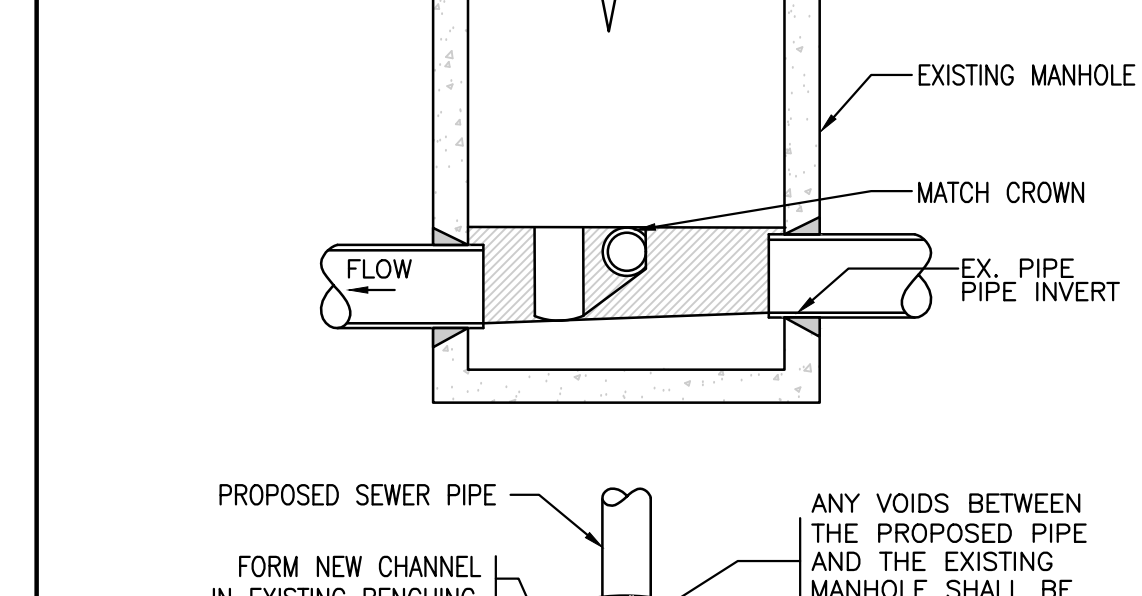
SURVEYOR: **PFS Land Surveying, Inc.**
 20 Balch Avenue
 Groveland, MA 01834
 P. 978.891.5203
 www.pfsland.com

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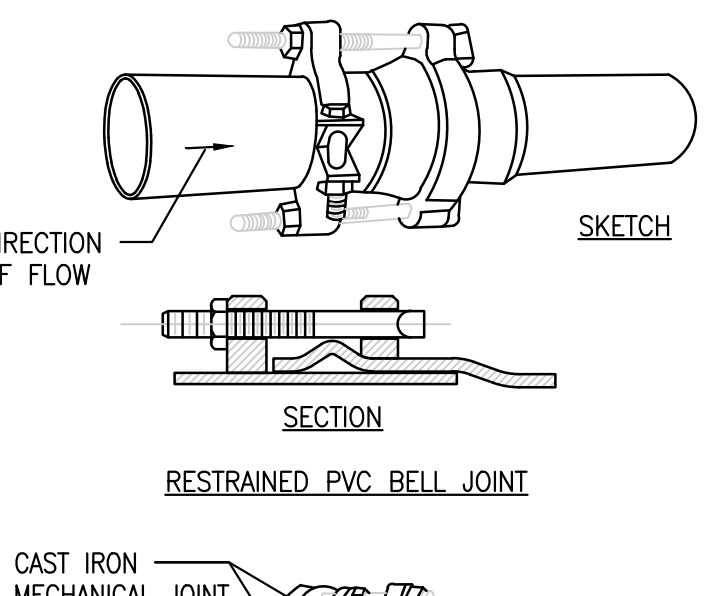
JOB NO.: 20160-149
 SHEET TITLE:
EROSION + SEDIMENT CONTROL PLAN
 SHEET NUMBER:
C-3



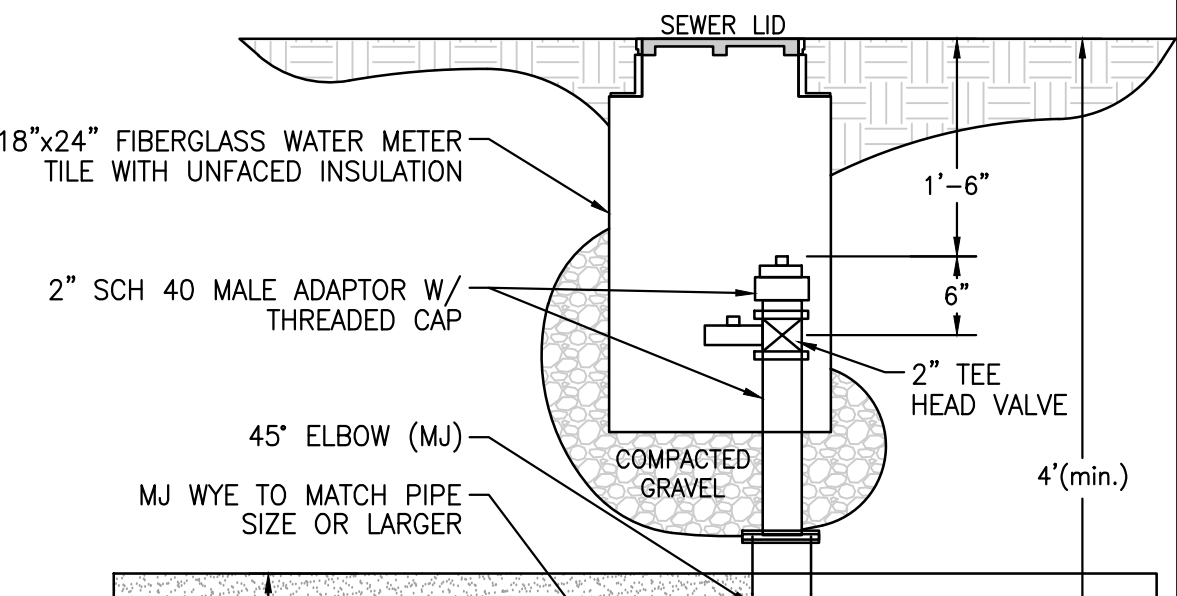
LOW PRESSURE SEWER SERVICE LATERAL VALVE AND CONNECTION
N.T.S.



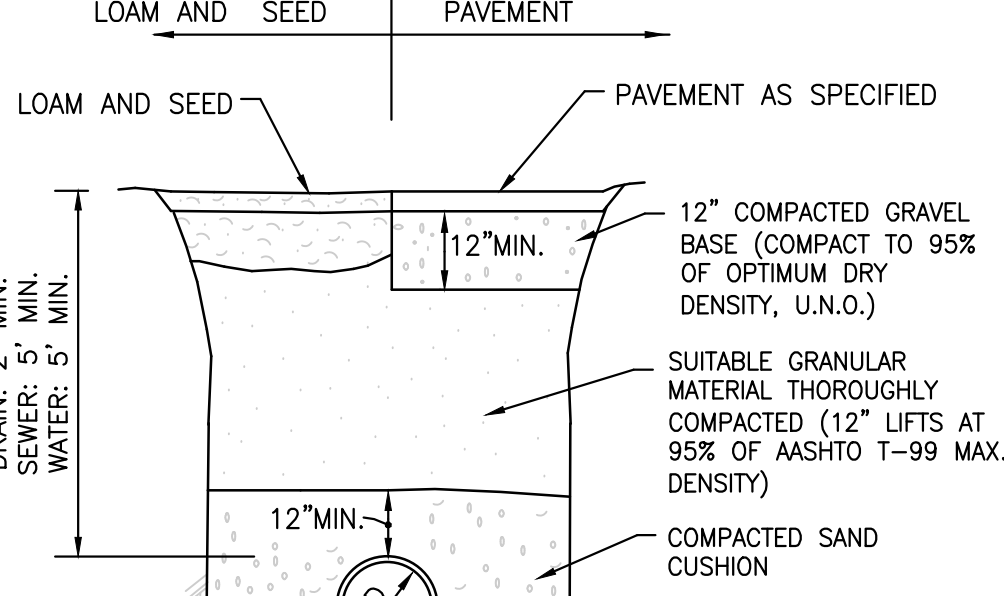
CONNECTION TO EXISTING SEWER MANHOLE
N.T.S.



RESTRAINED PVC BELL JOINT
N.T.S.



SEWER FORCE MAIN FLUSHING CONNECTION
N.T.S.

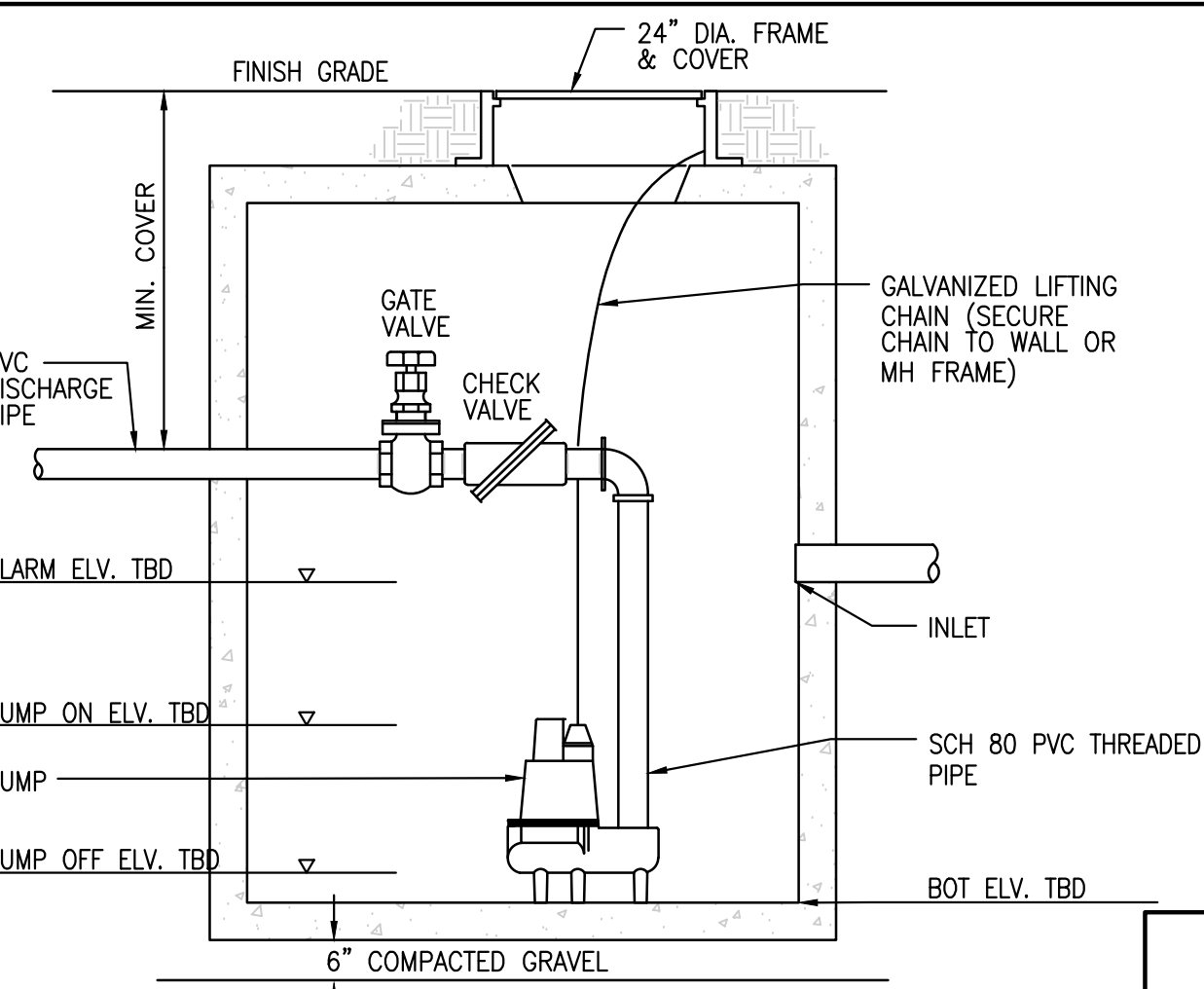


DRAIN/ SEWER/ WATER TRENCH AND BACKFILL DETAIL
N.T.S.

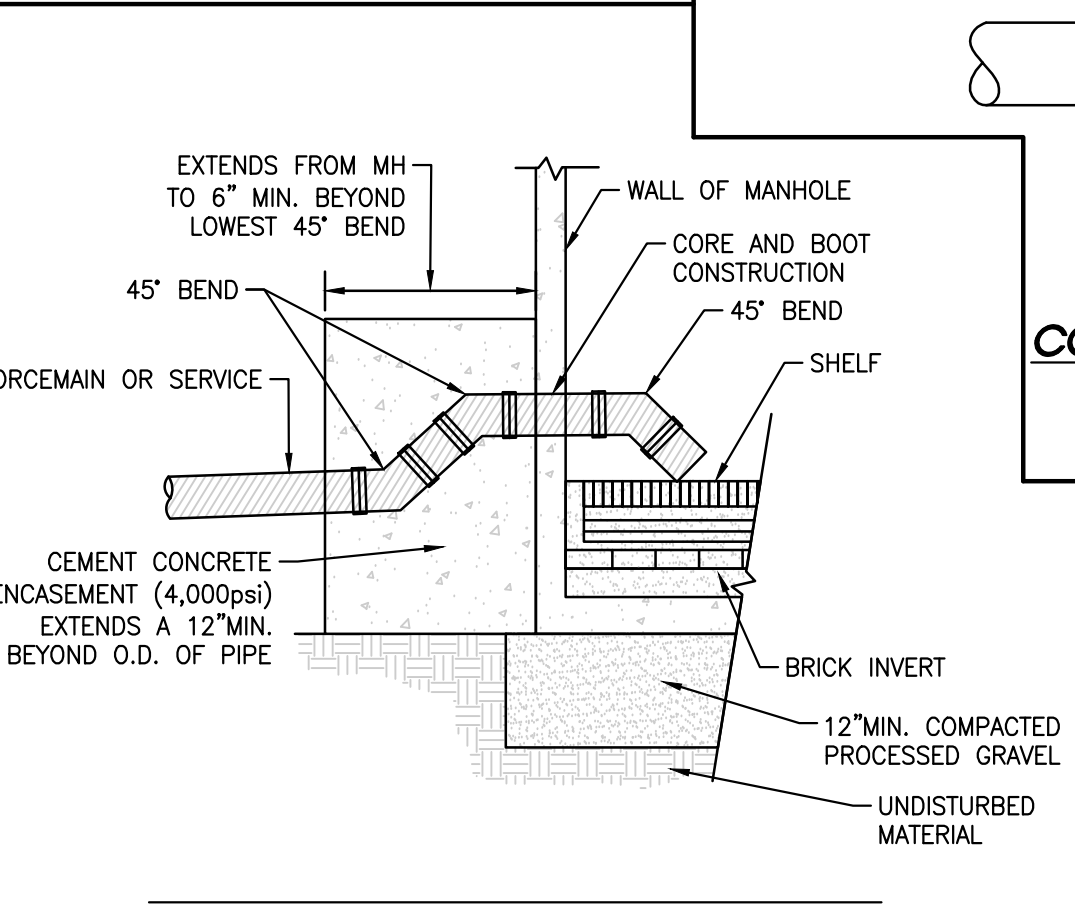


REVISION	DATE	BY

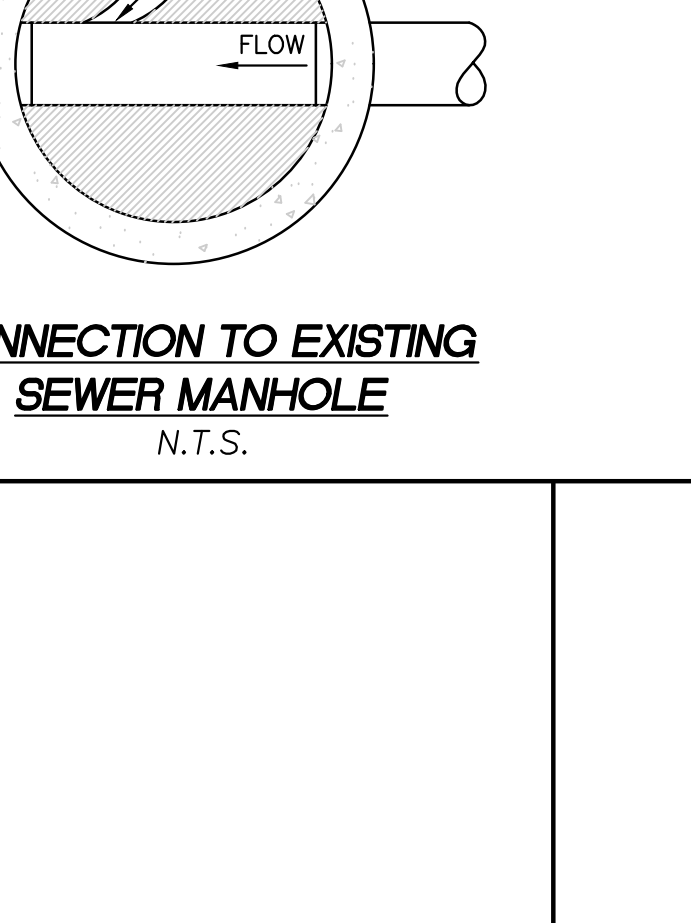
PROJECT LOCATION:
LOTS 2, 3, + 4
GRANDVIEW ROAD
READING, MA 01867
PARCEL ID:
MAP 27, LOT 404



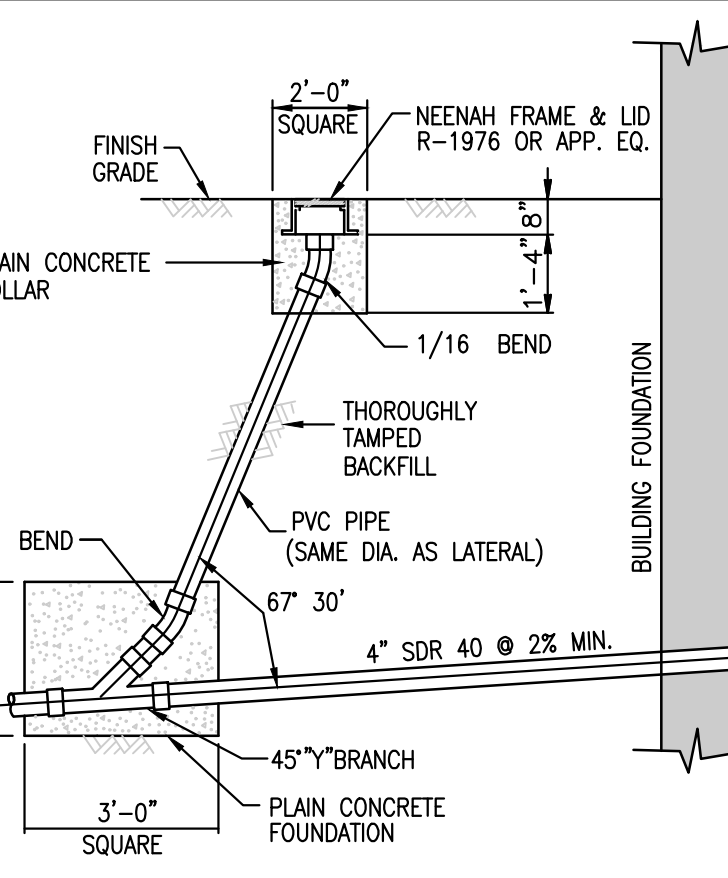
PUMP CHAMBER
N.T.S.



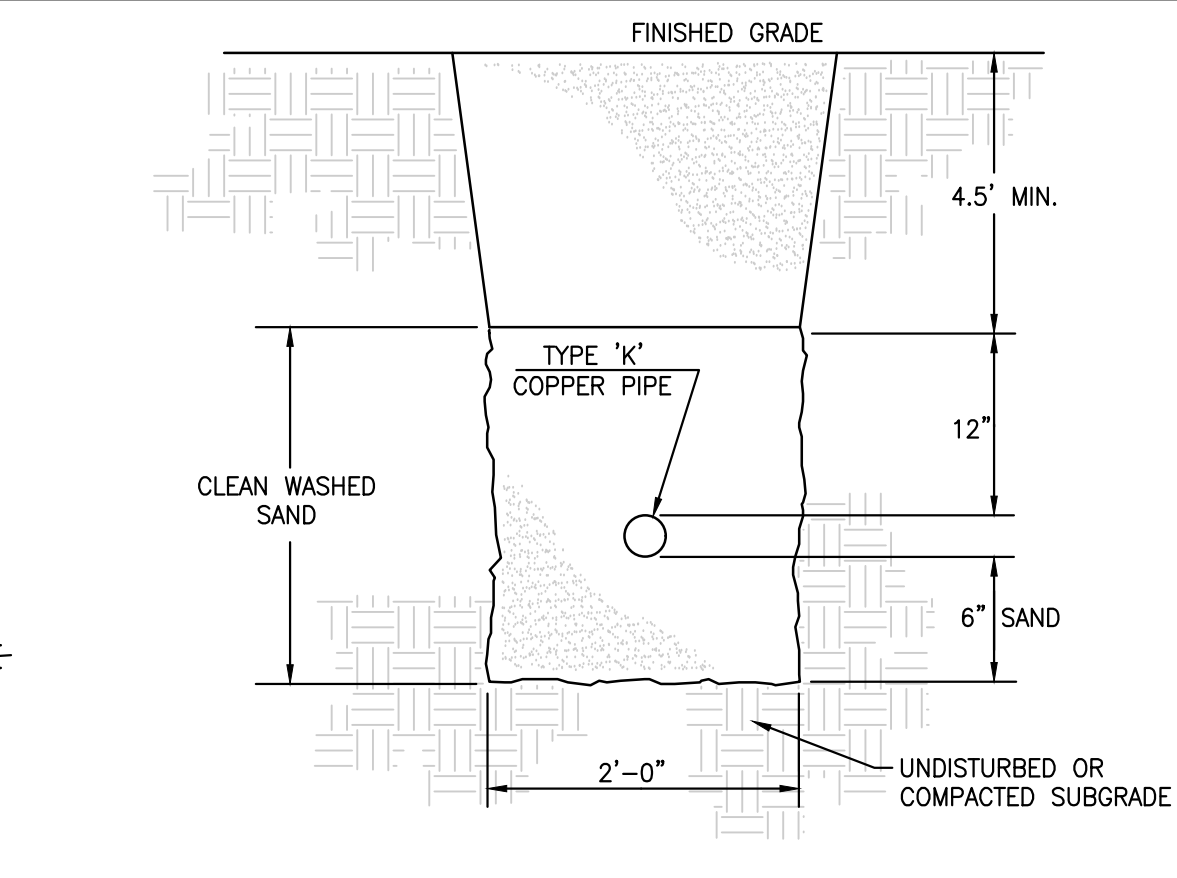
CONNECTION TO EXISTING SEWER MANHOLE
N.T.S.



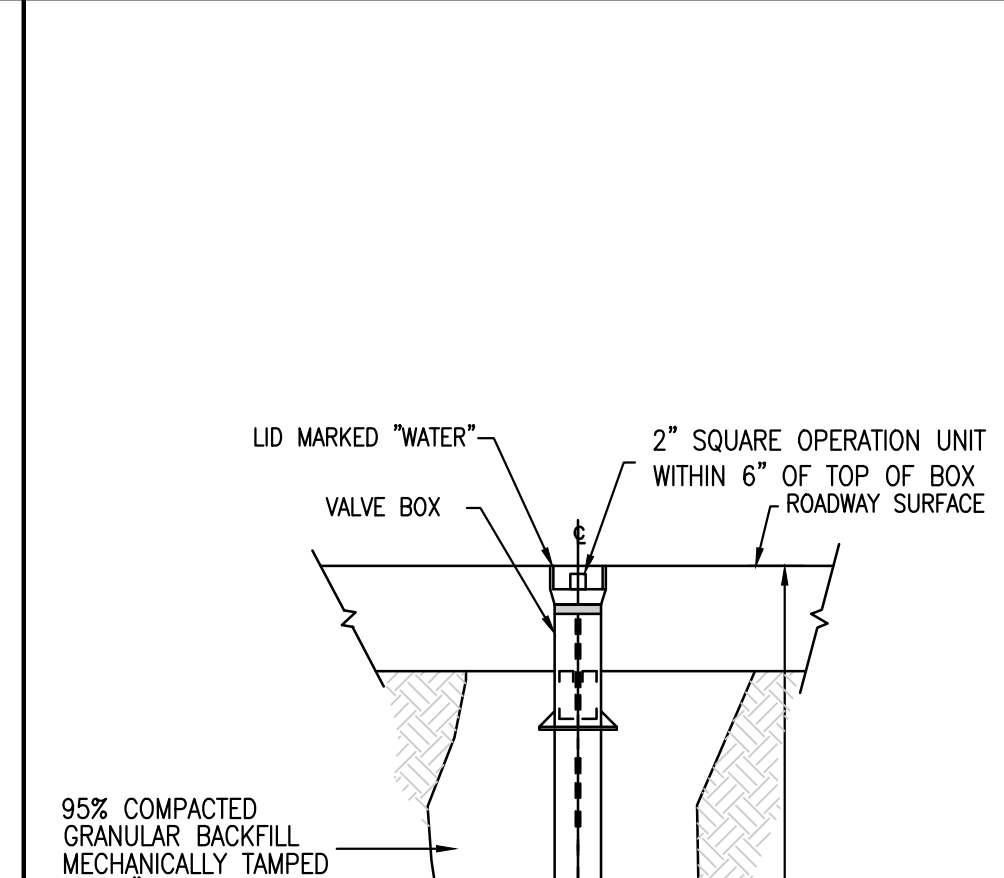
WATER SERVICE VALVE
N.T.S.



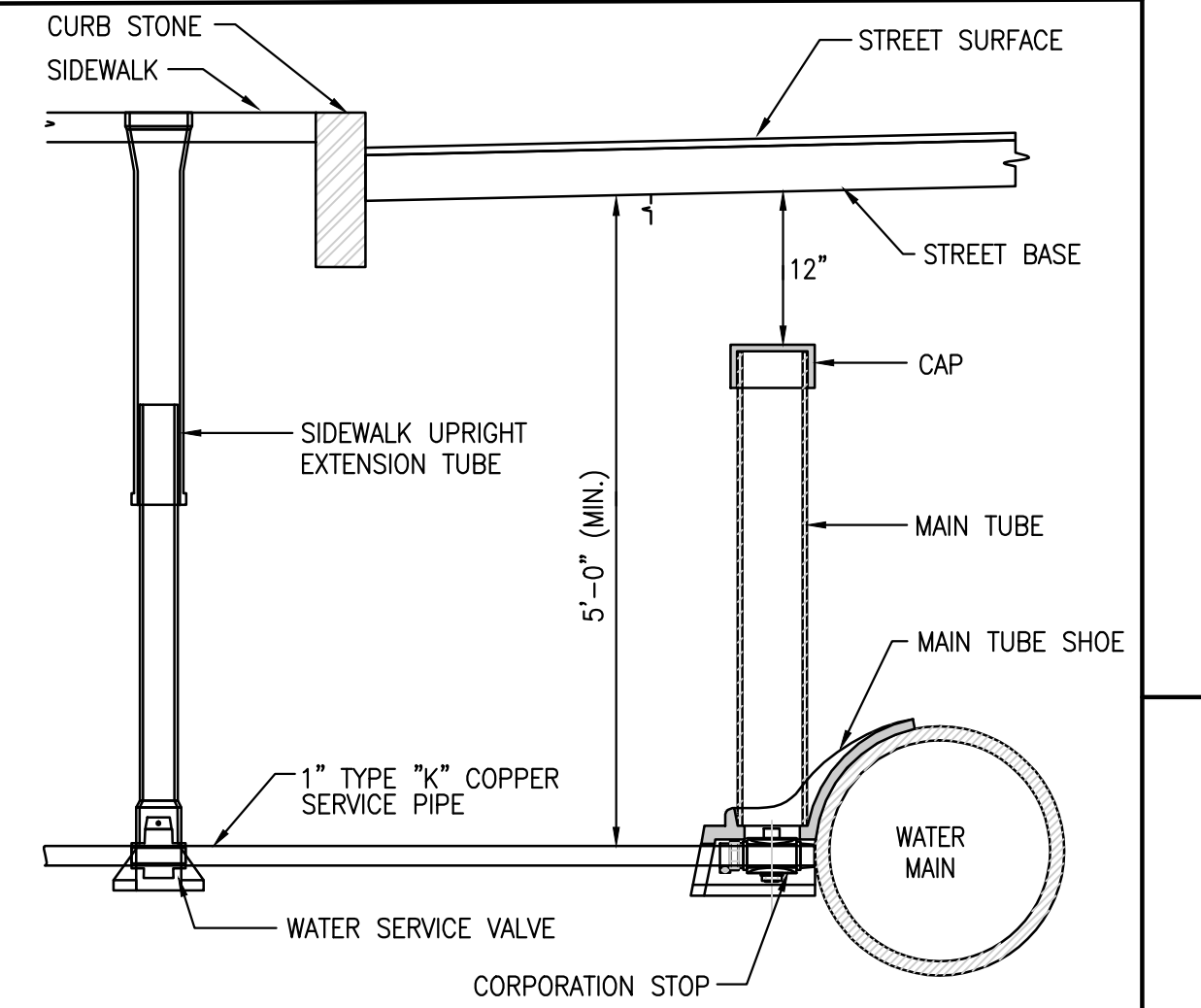
SEWER SERVICE AT BUILDING W/ CLEANOUT
N.T.S.



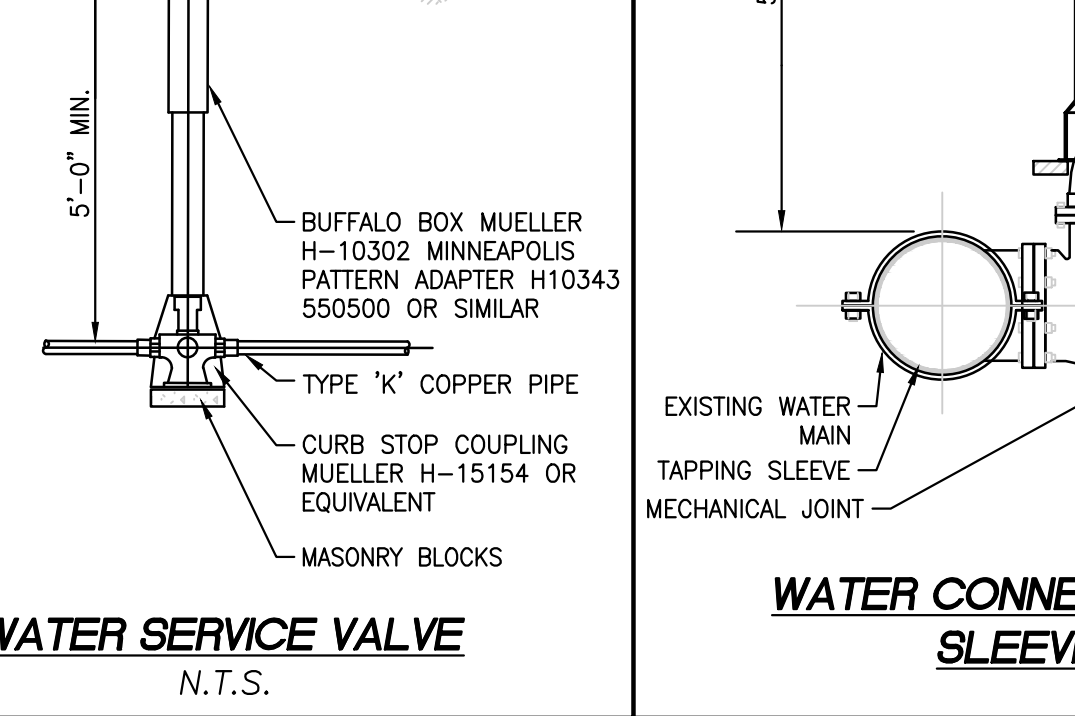
COPPER WATER SERVICE PIPE TRENCH
N.T.S.



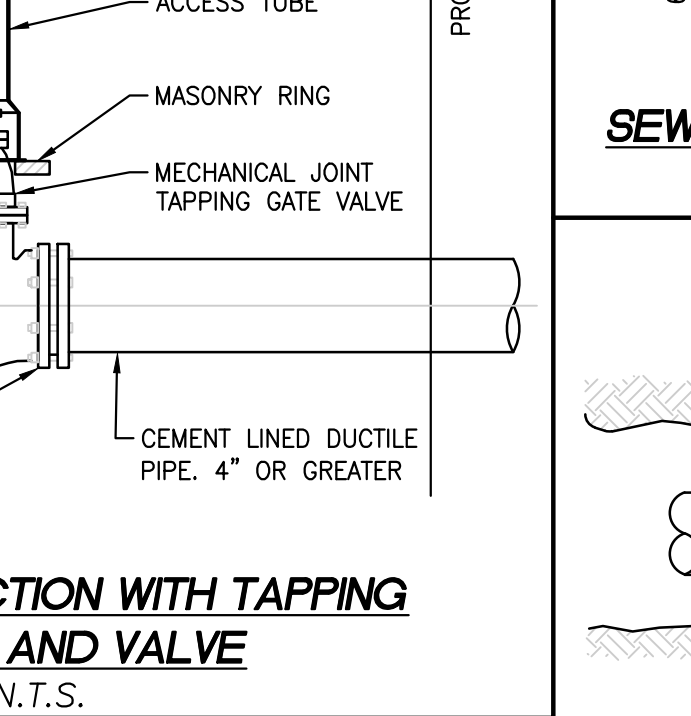
UNDERGROUND GATE VALVE
N.T.S.



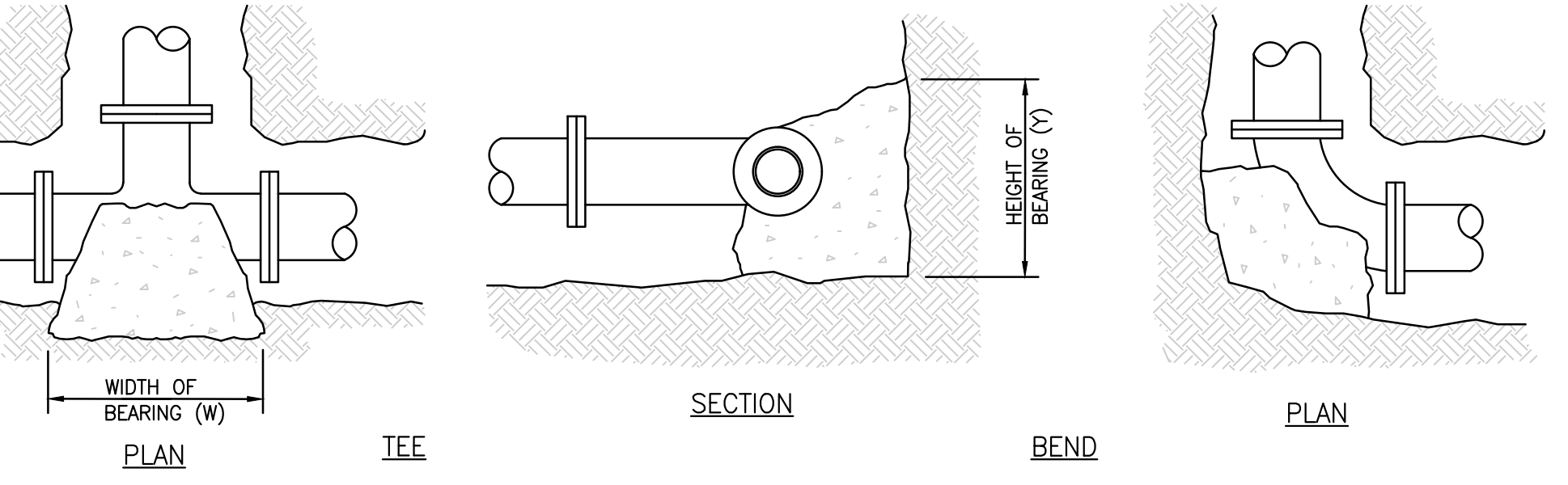
TYPICAL WATER SERVICE CONNECTION
N.T.S.



WATER CONNECTION WITH TAPPING SLEEVE AND VALVE
N.T.S.



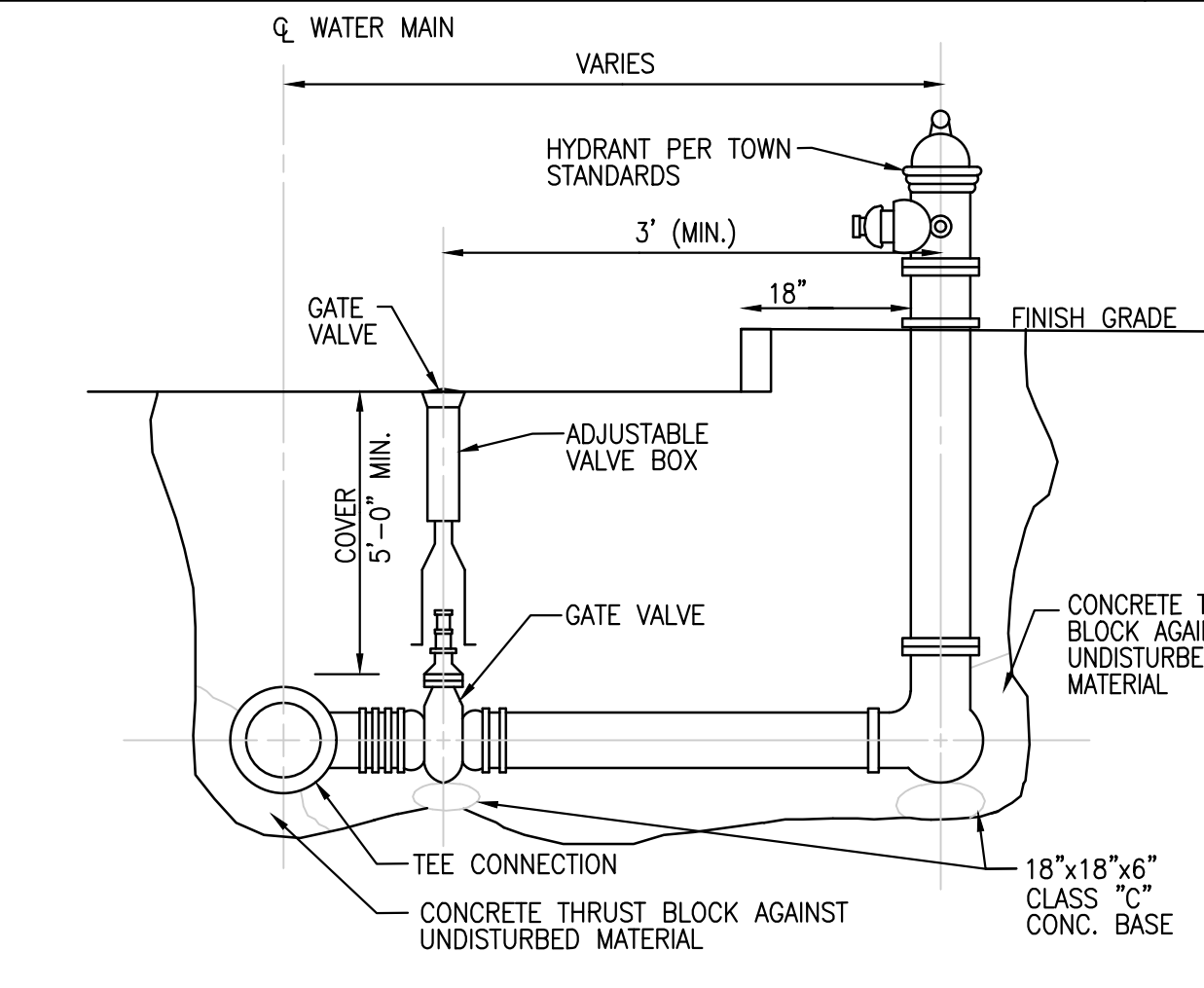
WATER MAIN CROSSING
N.T.S.



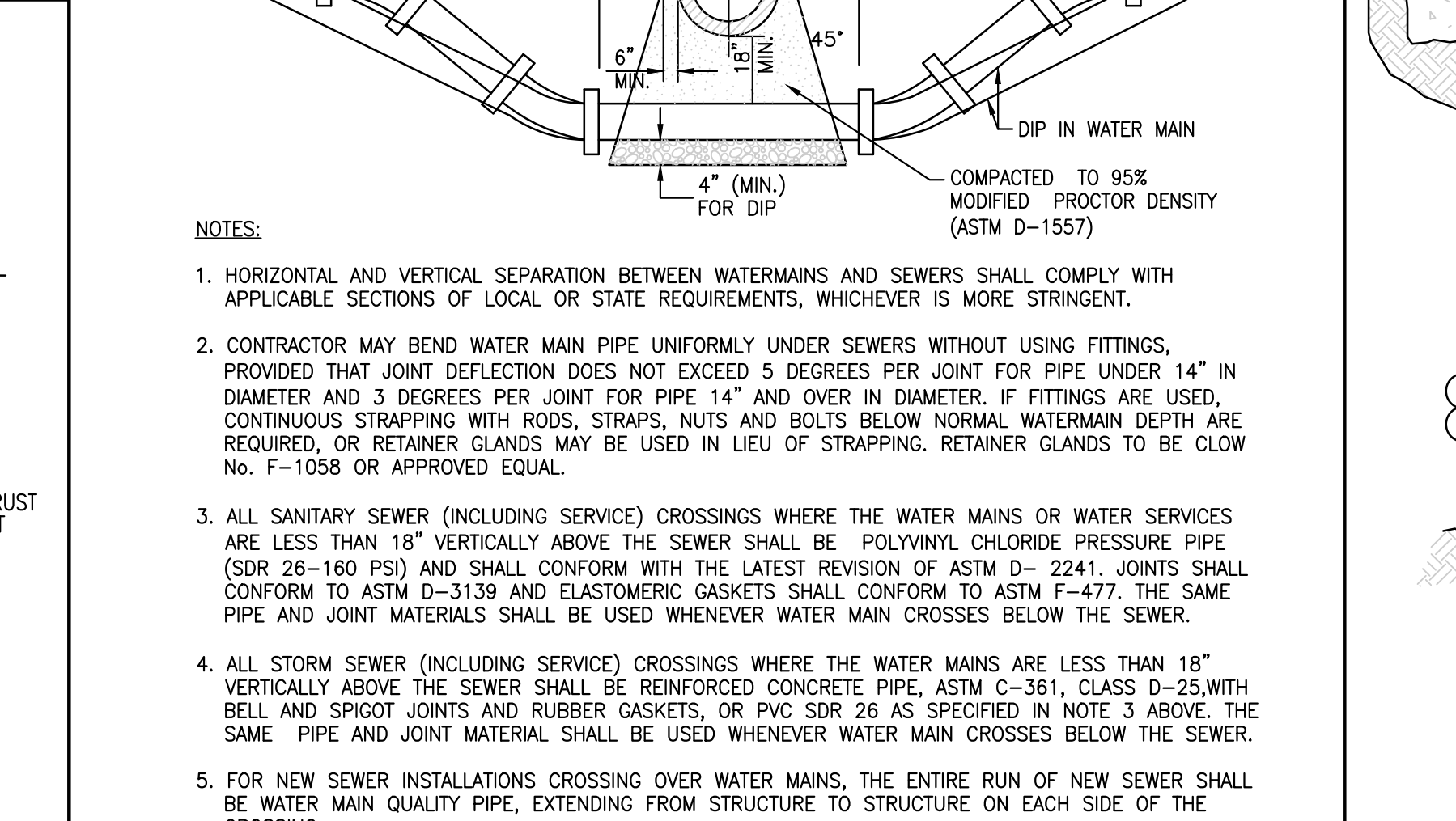
TRUST BLOCKS FOR WATER SYSTEM
N.T.S.

PIPE SIZE	MINIMUM THRUST BLOCK AREA REQUIRED (Y x W)	
	TEE, DEAD END, 90° BEND	45° & 22-8° BENDS
4" OR LESS	3 SQ. FEET	3 SQ. FEET
6"	4 SQ. FEET	3 SQ. FEET
8"	6 SQ. FEET	3 SQ. FEET
10"	9 SQ. FEET	5 SQ. FEET
12"	13 SQ. FEET	7 SQ. FEET
16"	23 SQ. FEET	12 SQ. FEET

- NOTES:
- THRUST BLOCKS TO EXTEND TO UNDISTURBED GROUND.
 - ALL CONCRETE SHALL BE CLASS B.
 - TABLE IS BASED ON 3000 LB./SQ. FT. SOIL. IF SOIL CONDITIONS ARE FOUND TO INDICATE SOIL BEARING LESS, THE AREAS SHALL BE INCREASED ACCORDINGLY.
 - AREAS FOR PIPES GREATER THAN 16" SHALL BE CALCULATED FOR EACH PROJECT.
 - FOR ALL NON BEARING VERTICAL SURFACES.



PROPOSED FIRE HYDRANT
N.T.S.



WATER MAIN CROSSING
N.T.S.

PLAN SET:
MAJOR SITE PLAN MODIFICATION
GRANDVIEW ROAD SUBDIVISION - PRIVATE WAY
(GRANDVIEW ROAD EXTENSION)

FOR REGISTRY USE ONLY

TOWN OF READING
COMMUNITY PLANNING & DEVELOPMENT COMMISSION
DATE: _____

ENGINEER: **FODERA ENGINEERING**
SURVEYOR: **PFS Land Surveying, Inc.**
(617)877-3293
gfodera@foderaengineering.com
28 Harbor St., Suite 204
Danvers, MA 01923
PROFESSIONAL SEAL

DATE: 5/10/24

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JOB NO.: 20160-149
SHEET TITLE:
DETAILS SHEET 1
SHEET NUMBER:
C-6

May 13, 2024

To: Andrew MacNichol, Community Development Director
Town of Reading
Community Planning and Development Commission
16 Lowell Street
Reading, MA 01867

**RE: GRANDVIEW ROAD SUBDIVISION
SITE PLAN MODIFICATIONS
4 COLD SPRING ROAD
READING, MA 01867**

To Mr. MacNichol,

The project at 4 Cold Spring Road known as Grandview Road Subdivision was originally approved by the Community Planning and Development Commission (CPDC) in 2021. A few years later, the project underwent a design modification to the stormwater system and roadway grading and was re-approved by the CPDC in 2023 as a Major Modification. The project commenced construction and the roadway with associated utilities were constructed along with the infiltration pond. However, the project has come to a halt and the plans have been modified so that the infiltration system matches the design from the 2021 original approved plans. Summaries of plan designs below:

2021 Approved Plans

- 4-Lot subdivision including the existing dwelling at 4 Cold Spring Road. Proposed to construct three (3) new houses along the approved roadway.
- Roadway cul-de-sac was designed at an approximate elevation of 113.
- Stormwater system consisted of multiple catch basins in the cul-de-sac and directed to an underground infiltration system within Lots 2 and 3.

2023 Approved Plans

- Property lines for the 4-lot subdivision remained unchanged. New proposal to keep Lot 2 undeveloped with potential for future development. Lots 3 and 4 will be developed as new single-family dwellings.
- Roadway cul-de-sac was regraded and lowered by two (2) feet to an approximate elevation of 111.
- Stormwater system was redesigned to collect runoff at the end of the cul-de-sac and empty out into an infiltration pond.

2024 Modified Plans

- Property lines remain unchanged, and Lot 2 will remain undeveloped with the potential for future development.
- Grading of roadway and cul-de-sac will remain unchanged and has been constructed according to the plans from 2023.
- Stormwater system will remain with catch basins at the end of the cul-de-sac but the infiltration pond will be modified to an underground infiltration system, similar to the approved plans in 2021.

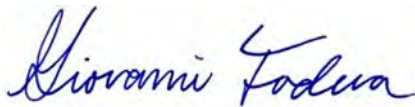
Additional modifications between 2021 and 2024 plans

- Increased building footprints.
 - Lot 3 will remain to have a separate roof runoff recharge system.
 - Lot 4 roof runoff previously was intended to be directed to the overall infiltration system. This has been modified to have a separate roof runoff recharge system on-site.
- Tree lines for Lots 3 & 4 were shifted back to create more lawn and less wooded surface.
- Although larger building footprints are implemented and the tree line creates more lawn and less wooded surface, there is no substantial change in runoff calculations. This is due to Lot 4 being modified to having its own roof runoff recharge system.
- The as-built roadway and drainage infrastructure are easily incorporated into the new drainage system with the associated elevations making a feasible design.

There are no new design waivers being requested for the modification.

Please accept this submittal as formal request for review. Please do not hesitate to call or email me shall you have any questions, comments, or concerns.

Sincerely yours,



Giovanni Fodera, PE, LSIT
President / Principal Engineer
FODERA Engineering

Attachments:

- Major Site Plan Modification – Grandview Road Subdivision, dated May 10, 2024.
- Post-Development Runoff Summary & Calculations, dated May 10, 2024.

Cc: Michael Salamone
Frank Lanzillo

May 13, 2024

Peak Rate of Discharge Summary

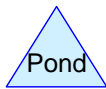
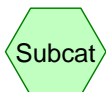
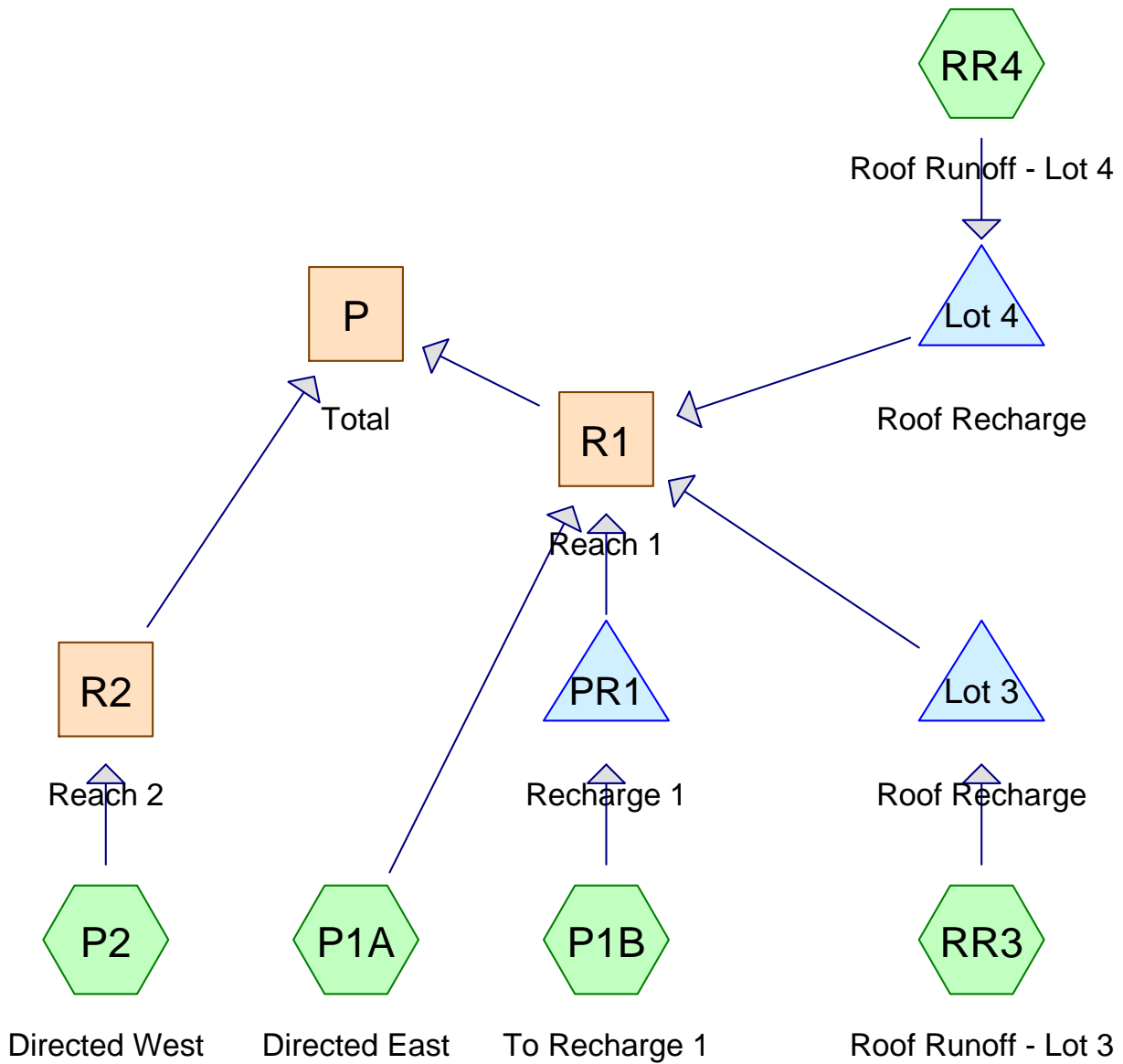
PEAK RATE OF DISCHARGE, cubic-feet per second						
Storm Intensity	Reach R1		Reach R2		Σ Reach R1 & R2	
	Pre-Conditions	Post-Conditions	Pre-Conditions	Post-Conditions	Pre-Conditions	Post-Conditions
2-year Storm 3.31"	0.24	0.01	0.52	0.03	0.65	0.03
10-year Storm 5.22"	1.40	0.31	1.29	0.07	2.57	0.34
25-year Storm 6.41"	2.38	0.73	1.81	0.09	4.05	0.78
100-year Storm 8.24"	4.12	*4.64	2.65	0.13	6.57	4.68

* Increase at R1 but sum of the overall site (same watershed area) is less in the post-conditions.

Sincerely yours,



Giovanni Fodera, PE, LSIT
 President / Principal Engineer
FODERA Engineering



Routing Diagram for 2024-05-10_POST-DRAINAGE
 Prepared by {enter your company name here}, Printed 5/13/2024
 HydroCAD® 10.10-4b s/n 11614 © 2020 HydroCAD Software Solutions LLC

2024-05-10_POST-DRAINAGE

Prepared by {enter your company name here}

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Post-Construction Runoff
Type III 24-hr 2-Year Rainfall=3.31"

Printed 5/13/2024

Page 2

Summary for Subcatchment P1A: Directed East

Runoff = 0.01 cfs @ 13.79 hrs, Volume= 0.007 af, Depth> 0.11"

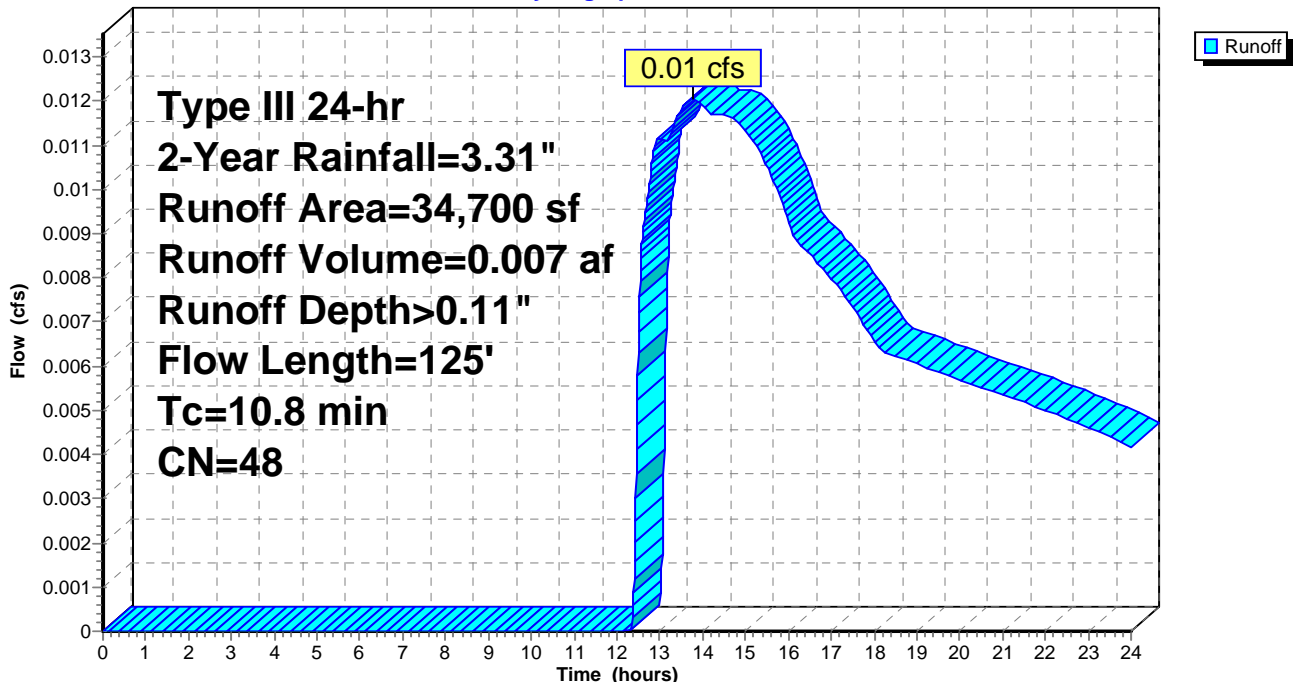
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.31"

Area (sf)	CN	Description
* 2,854	98	Impervious
14,380	39	>75% Grass cover, Good, HSG A
11,288	30	Woods, Good, HSG A
3,734	74	>75% Grass cover, Good, HSG C
111	70	Woods, Good, HSG C
2,333	80	>75% Grass cover, Good, HSG D
34,700	48	Weighted Average
31,846		91.78% Pervious Area
2,854		8.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	50	0.1400	0.08		Sheet Flow, Sheet Flow Woods Woods: Dense underbrush n= 0.800 P2= 3.10"
0.8	75	0.1067	1.63		Shallow Concentrated Flow, Concentrated Woods Woodland Kv= 5.0 fps
10.8	125	Total			

Subcatchment P1A: Directed East

Hydrograph



2024-05-10_POST-DRAINAGE

Prepared by {enter your company name here}

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Post-Construction Runoff
Type III 24-hr 2-Year Rainfall=3.31"

Printed 5/13/2024

Page 3

Summary for Subcatchment P1B: To Recharge 1

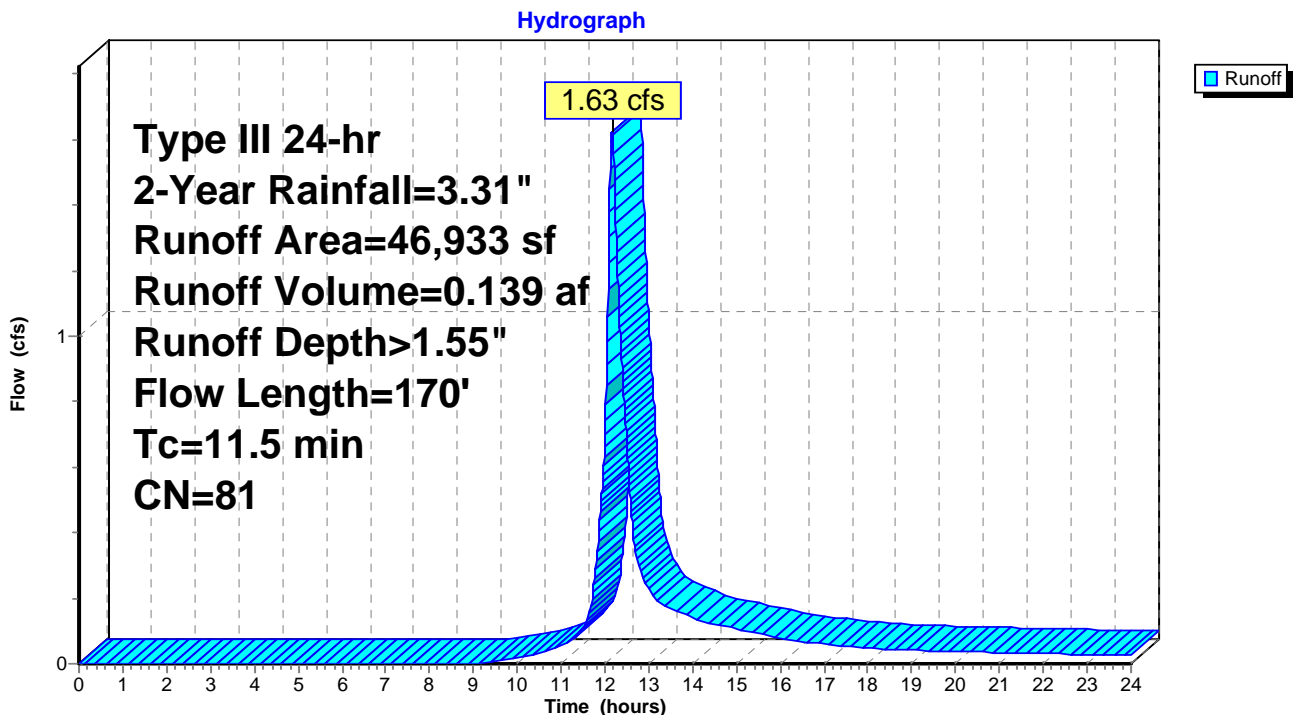
Runoff = 1.63 cfs @ 12.16 hrs, Volume= 0.139 af, Depth> 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.31"

Area (sf)	CN	Description
* 16,120	98	Impervious
989	39	>75% Grass cover, Good, HSG A
21,312	74	>75% Grass cover, Good, HSG C
8,215	70	Woods, Good, HSG C
297	80	>75% Grass cover, Good, HSG D
46,933	81	Weighted Average
30,813		65.65% Pervious Area
16,120		34.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	50	0.1400	0.08		Sheet Flow, Wood Sheet Flow Woods: Dense underbrush n= 0.800 P2= 3.10"
1.5	120	0.0750	1.37		Shallow Concentrated Flow, Woods Concentrated Flow Woodland Kv= 5.0 fps
11.5	170	Total			

Subcatchment P1B: To Recharge 1



2024-05-10_POST-DRAINAGE

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Post-Construction Runoff

Type III 24-hr 2-Year Rainfall=3.31"

Printed 5/13/2024

Page 4

Summary for Subcatchment P2: Directed West

Runoff = 0.03 cfs @ 12.08 hrs, Volume= 0.002 af, Depth> 1.29"

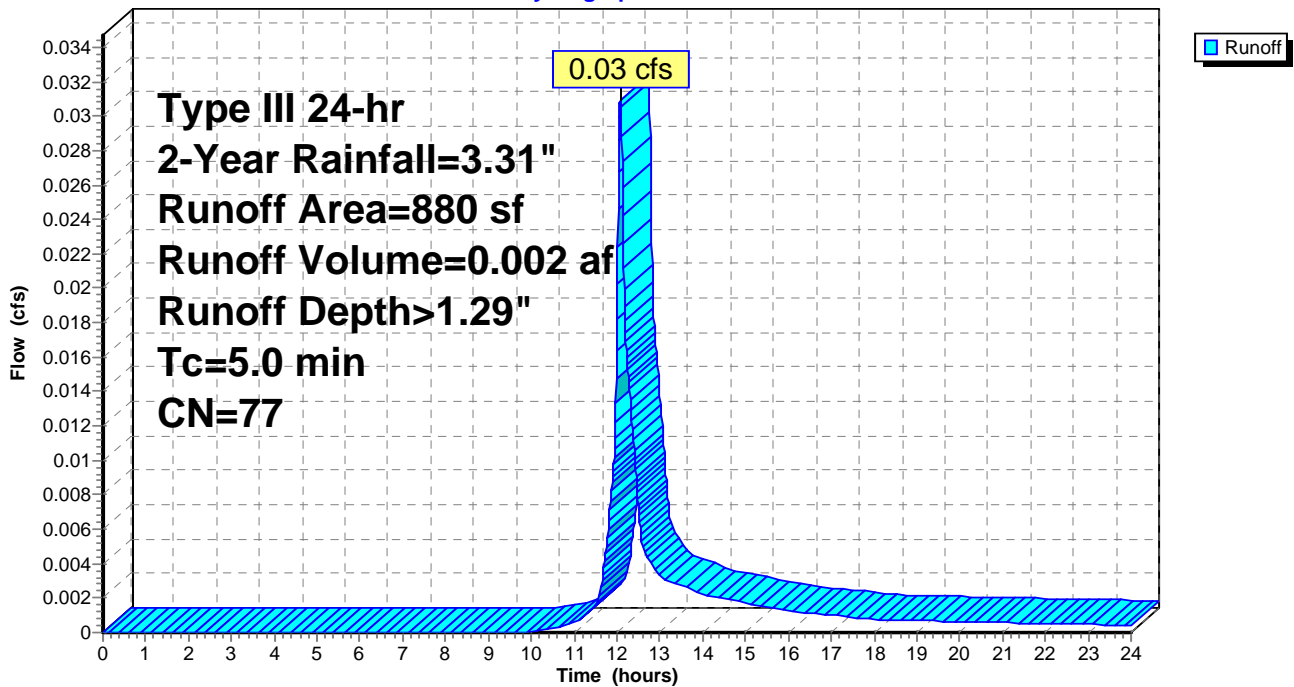
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.31"

Area (sf)	CN	Description
473	74	>75% Grass cover, Good, HSG C
407	80	>75% Grass cover, Good, HSG D
880	77	Weighted Average
880		100.00% Pervious Area

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

Subcatchment P2: Directed West

Hydrograph



2024-05-10_POST-DRAINAGE

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Post-Construction Runoff
Type III 24-hr 2-Year Rainfall=3.31"

Printed 5/13/2024

Page 5

Summary for Subcatchment RR3: Roof Runoff - Lot 3

Runoff = 0.19 cfs @ 12.07 hrs, Volume= 0.015 af, Depth> 3.08"

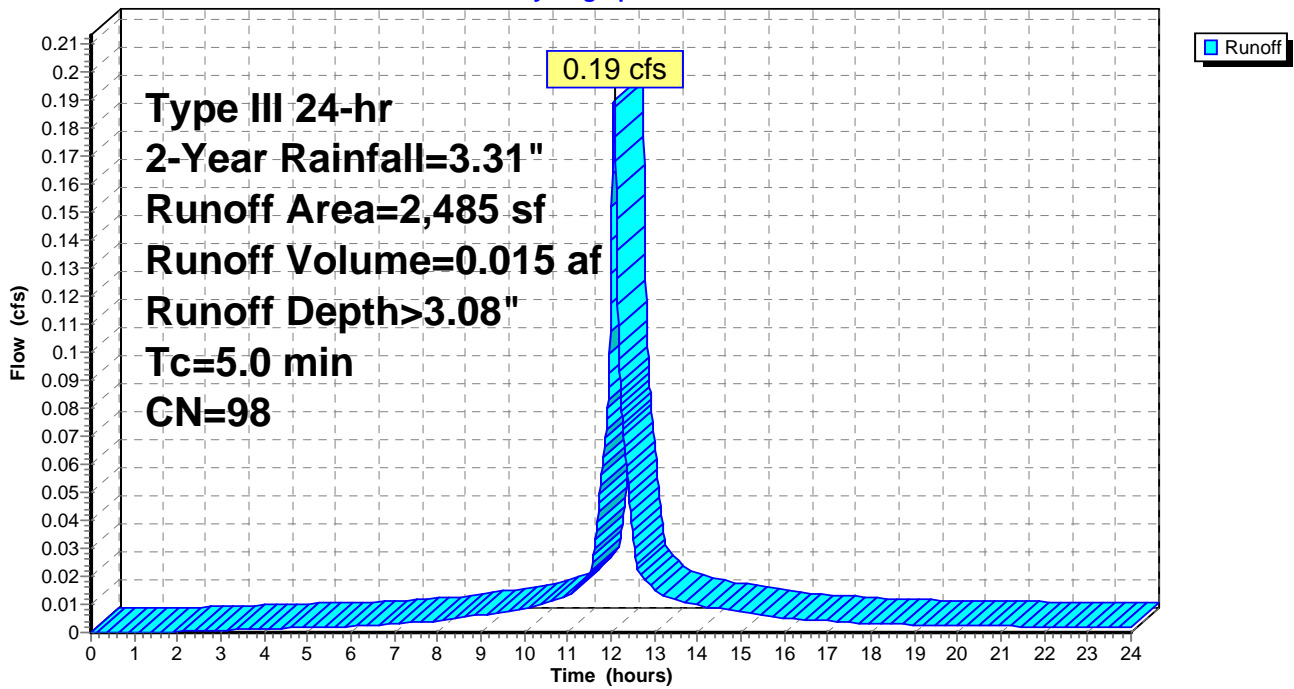
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.31"

Area (sf)	CN	Description
* 2,485	98	Roof
2,485		100.00% Impervious Area

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

Subcatchment RR3: Roof Runoff - Lot 3

Hydrograph



2024-05-10_POST-DRAINAGE

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Post-Construction Runoff
Type III 24-hr 2-Year Rainfall=3.31"

Printed 5/13/2024

Page 6

Summary for Subcatchment RR4: Roof Runoff - Lot 4

Runoff = 0.19 cfs @ 12.07 hrs, Volume= 0.015 af, Depth> 3.08"

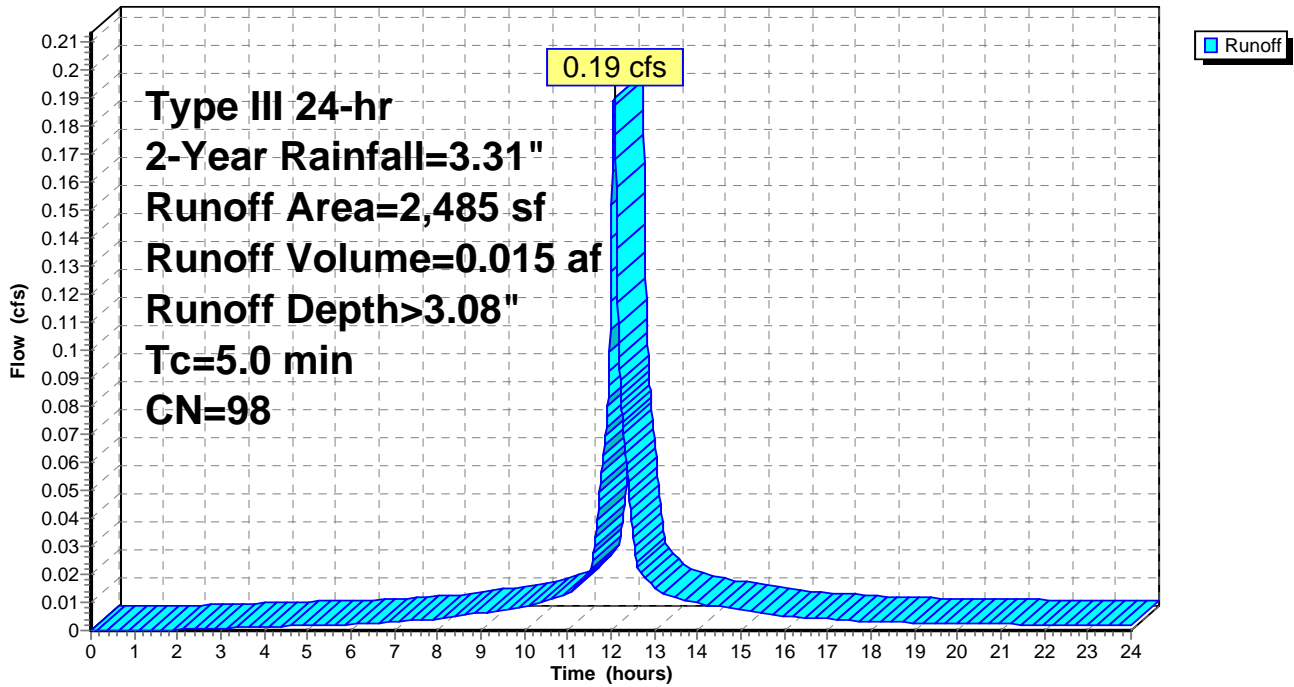
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.31"

Area (sf)	CN	Description
* 2,485	98	Roof
2,485		100.00% Impervious Area

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

Subcatchment RR4: Roof Runoff - Lot 4

Hydrograph



2024-05-10_POST-DRAINAGE

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Post-Construction Runoff
Type III 24-hr 2-Year Rainfall=3.31"

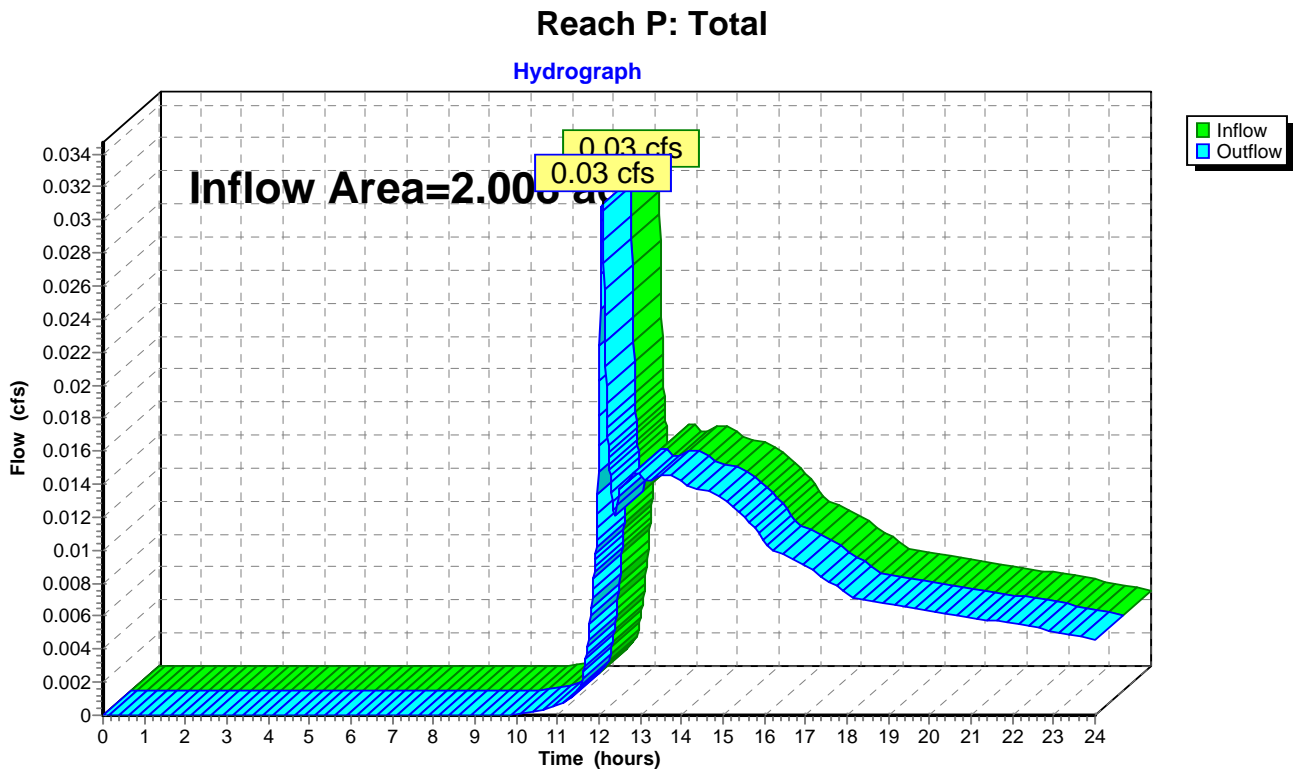
Printed 5/13/2024

Page 7

Summary for Reach P: Total

Inflow Area = 2.008 ac, 27.37% Impervious, Inflow Depth > 0.06" for 2-Year event
Inflow = 0.03 cfs @ 12.08 hrs, Volume= 0.009 af
Outflow = 0.03 cfs @ 12.08 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



2024-05-10_POST-DRAINAGE

Prepared by {enter your company name here}

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Post-Construction Runoff
Type III 24-hr 2-Year Rainfall=3.31"

Printed 5/13/2024

Page 8

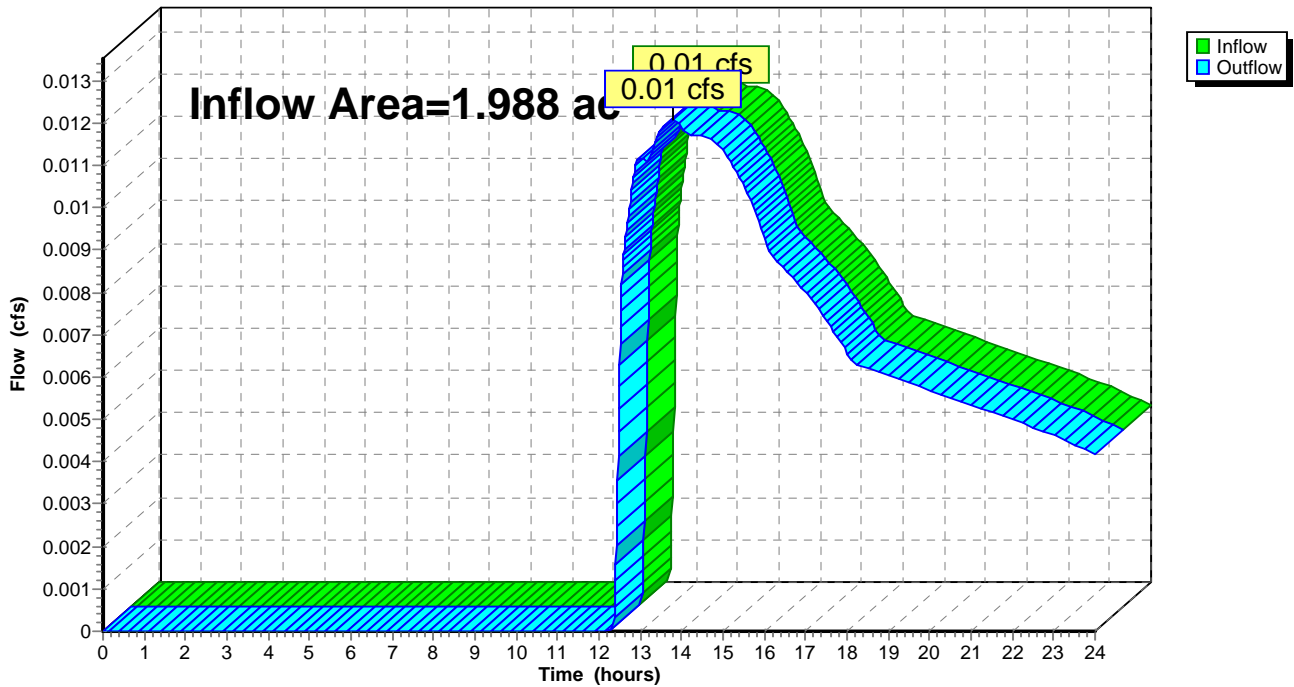
Summary for Reach R1: Reach 1

Inflow Area = 1.988 ac, 27.65% Impervious, Inflow Depth > 0.04" for 2-Year event
Inflow = 0.01 cfs @ 13.79 hrs, Volume= 0.007 af
Outflow = 0.01 cfs @ 13.79 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach R1: Reach 1

Hydrograph



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Post-Construction Runoff
Type III 24-hr 2-Year Rainfall=3.31"

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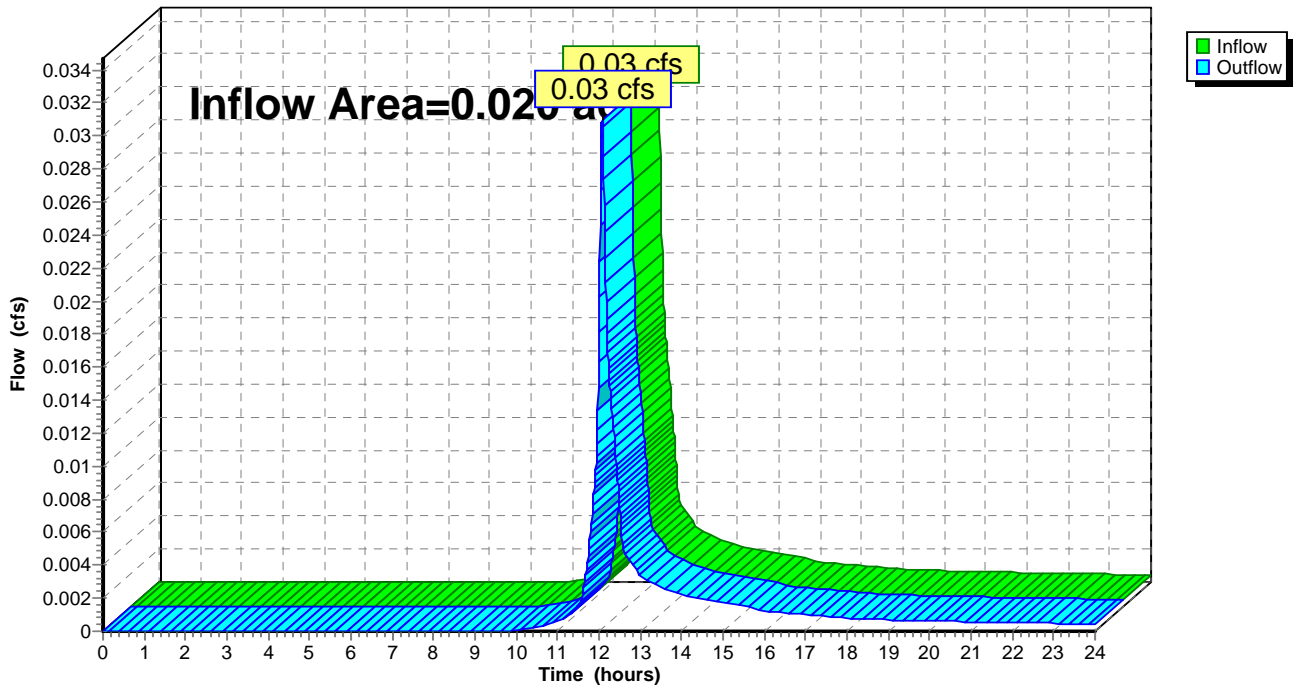
Summary for Reach R2: Reach 2

Inflow Area = 0.020 ac, 0.00% Impervious, Inflow Depth > 1.29" for 2-Year event
Inflow = 0.03 cfs @ 12.08 hrs, Volume= 0.002 af
Outflow = 0.03 cfs @ 12.08 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach R2: Reach 2

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Type III 24-hr 2-Year Rainfall=3.31"

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Summary for Pond Lot 3: Roof Recharge

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 3.08" for 2-Year event
Inflow = 0.19 cfs @ 12.07 hrs, Volume= 0.015 af
Outflow = 0.02 cfs @ 11.44 hrs, Volume= 0.015 af, Atten= 91%, Lag= 0.0 min
Discarded = 0.02 cfs @ 11.44 hrs, Volume= 0.015 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 104.13' @ 12.84 hrs Surf.Area= 0.007 ac Storage= 0.005 af

Plug-Flow detention time= 85.1 min calculated for 0.015 af (100% of inflow)
Center-of-Mass det. time= 84.4 min (838.7 - 754.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	103.00'	0.007 af	30.50'W x 10.50'L x 3.54'H Field A 0.026 af Overall - 0.009 af Embedded = 0.017 af x 40.0% Voids
#2A	103.50'	0.009 af	Cultec R-330XLHD x 6 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 6 rows
		0.016 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	103.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	108.00'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 11.44 hrs HW=103.05' (Free Discharge)
↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
↑2=Orifice/Grate (Controls 0.00 cfs)

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Post-Construction Runoff
Type III 24-hr 2-Year Rainfall=3.31"

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Pond Lot 3: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 6 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

1 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 8.50' Row Length +12.0" End Stone x 2 = 10.50' Base Length

6 Rows x 52.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.50' Base Width

6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

6 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 6 Rows = 380.0 cf Chamber Storage

1,134.2 cf Field - 380.0 cf Chambers = 754.2 cf Stone x 40.0% Voids = 301.7 cf Stone Storage

Chamber Storage + Stone Storage = 681.7 cf = 0.016 af

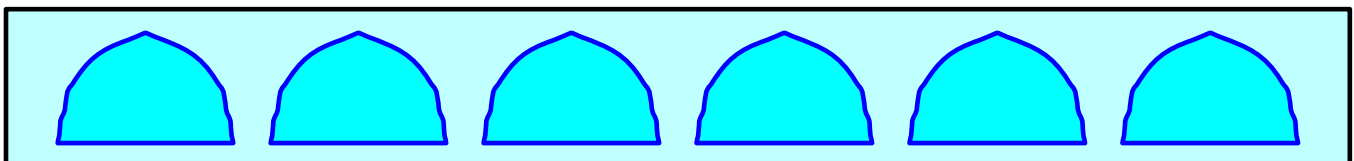
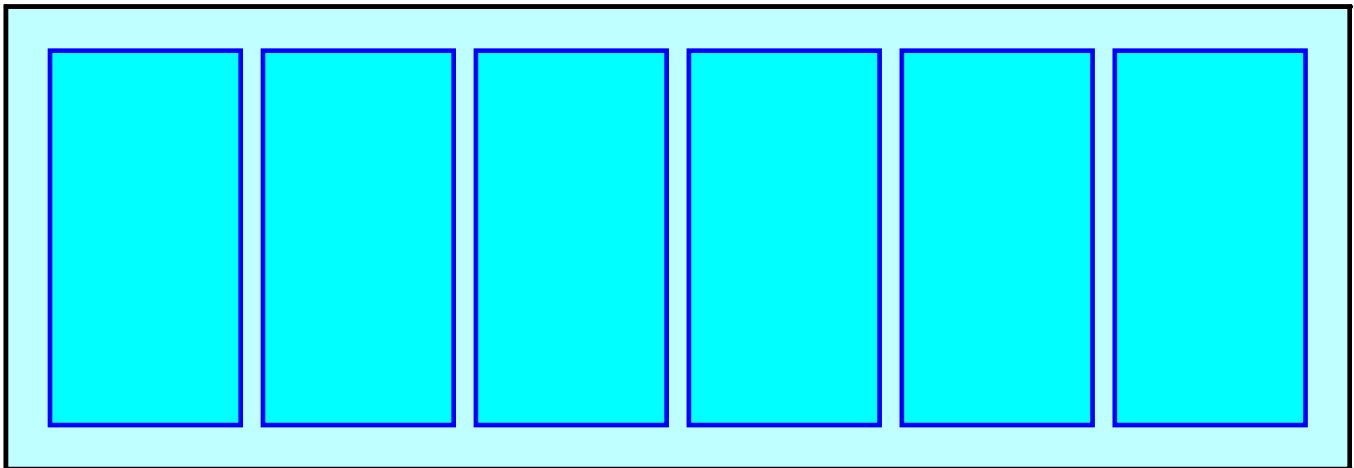
Overall Storage Efficiency = 60.1%

Overall System Size = 10.50' x 30.50' x 3.54'

6 Chambers

42.0 cy Field

27.9 cy Stone



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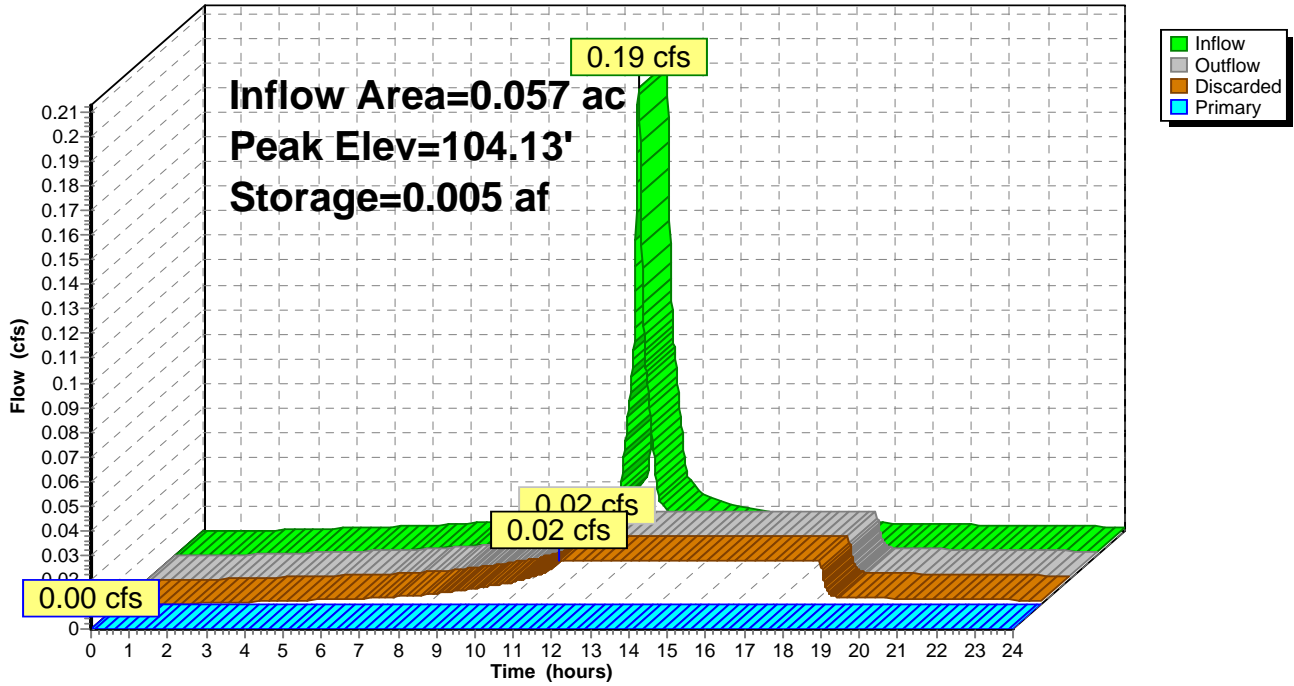
Post-Construction Runoff
Type III 24-hr 2-Year Rainfall=3.31"

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Pond Lot 3: Roof Recharge

Hydrograph



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Post-Construction Runoff

Type III 24-hr 2-Year Rainfall=3.31"

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Summary for Pond Lot 4: Roof Recharge

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 3.08" for 2-Year event
Inflow = 0.19 cfs @ 12.07 hrs, Volume= 0.015 af
Outflow = 0.02 cfs @ 11.44 hrs, Volume= 0.015 af, Atten= 91%, Lag= 0.0 min
Discarded = 0.02 cfs @ 11.44 hrs, Volume= 0.015 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 104.13' @ 12.84 hrs Surf.Area= 0.007 ac Storage= 0.005 af

Plug-Flow detention time= 85.1 min calculated for 0.015 af (100% of inflow)
Center-of-Mass det. time= 84.4 min (838.7 - 754.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	103.00'	0.007 af	30.50'W x 10.50'L x 3.54'H Field A 0.026 af Overall - 0.009 af Embedded = 0.017 af x 40.0% Voids
#2A	103.50'	0.009 af	Cultec R-330XLHD x 6 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 6 rows
		0.016 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	103.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	108.00'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 11.44 hrs HW=103.05' (Free Discharge)
↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
↑2=Orifice/Grate (Controls 0.00 cfs)

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Post-Construction Runoff
Type III 24-hr 2-Year Rainfall=3.31"

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Pond Lot 4: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 6 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

1 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 8.50' Row Length +12.0" End Stone x 2 = 10.50' Base Length

6 Rows x 52.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.50' Base Width

6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

6 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 6 Rows = 380.0 cf Chamber Storage

1,134.2 cf Field - 380.0 cf Chambers = 754.2 cf Stone x 40.0% Voids = 301.7 cf Stone Storage

Chamber Storage + Stone Storage = 681.7 cf = 0.016 af

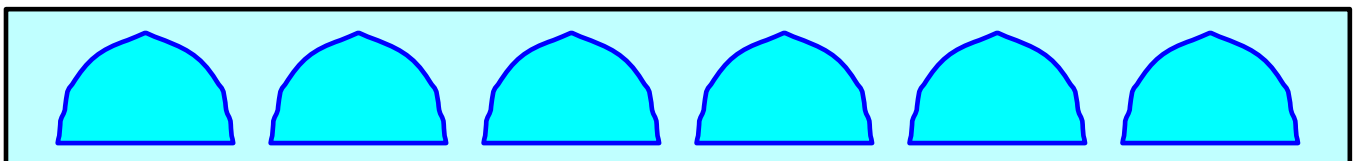
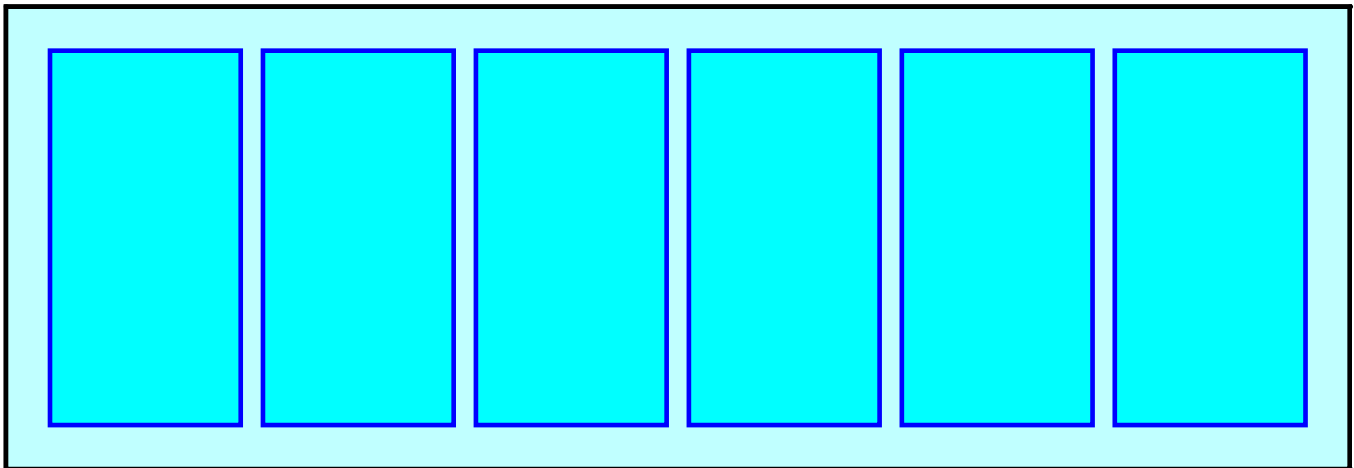
Overall Storage Efficiency = 60.1%

Overall System Size = 10.50' x 30.50' x 3.54'

6 Chambers

42.0 cy Field

27.9 cy Stone



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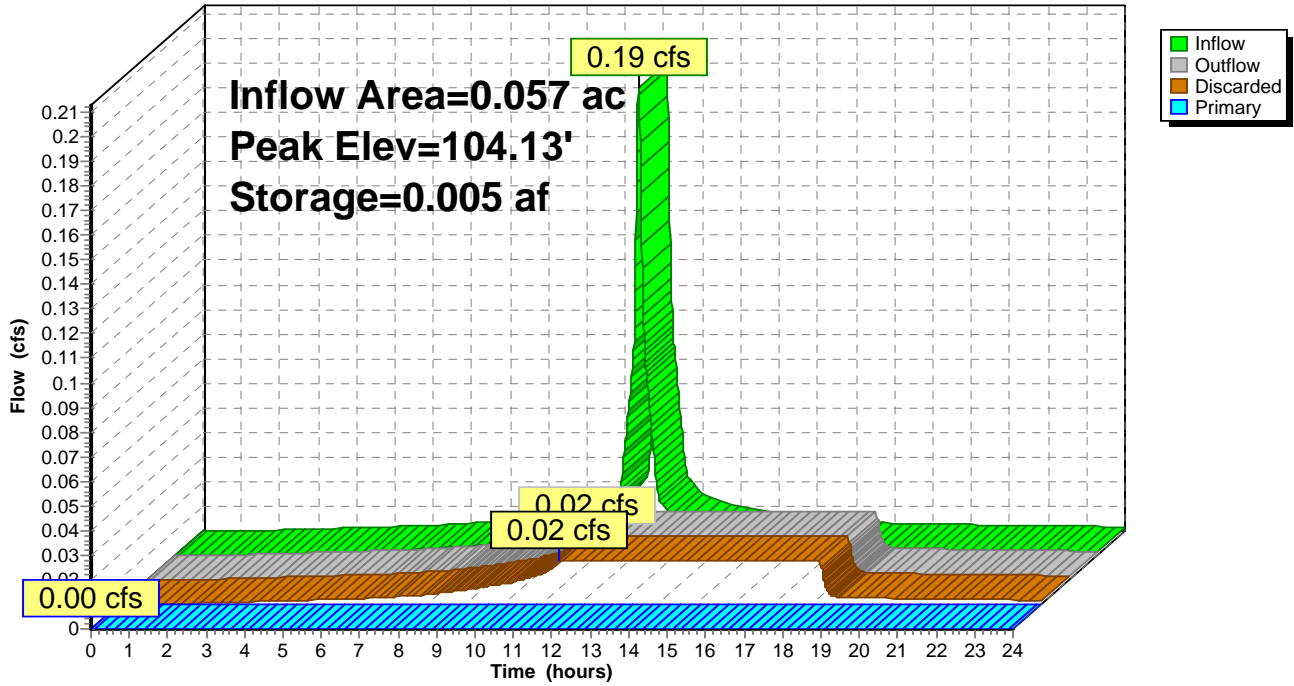
Post-Construction Runoff
Type III 24-hr 2-Year Rainfall=3.31"

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Pond Lot 4: Roof Recharge

Hydrograph



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Post-Construction Runoff

Type III 24-hr 2-Year Rainfall=3.31"

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Summary for Pond PR1: Recharge 1

Inflow Area = 1.077 ac, 34.35% Impervious, Inflow Depth > 1.55" for 2-Year event
Inflow = 1.63 cfs @ 12.16 hrs, Volume= 0.139 af
Outflow = 0.22 cfs @ 11.81 hrs, Volume= 0.139 af, Atten= 87%, Lag= 0.0 min
Discarded = 0.22 cfs @ 11.81 hrs, Volume= 0.139 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 103.92' @ 13.04 hrs Surf.Area= 0.089 ac Storage= 0.050 af

Plug-Flow detention time= 84.3 min calculated for 0.139 af (100% of inflow)
Center-of-Mass det. time= 83.4 min (924.8 - 841.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	103.00'	0.075 af	74.00'W x 52.50'L x 3.54'H Field A 0.316 af Overall - 0.130 af Embedded = 0.186 af x 40.0% Voids
#2A	103.50'	0.130 af	Cultec R-330XLHD x 105 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 15 rows
		0.204 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	103.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	108.00'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.22 cfs @ 11.81 hrs HW=103.05' (Free Discharge)
↑1=Exfiltration (Exfiltration Controls 0.22 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
↑2=Orifice/Grate (Controls 0.00 cfs)

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Post-Construction Runoff
Type III 24-hr 2-Year Rainfall=3.31"

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Pond PR1: Recharge 1 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 15 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

7 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 50.50' Row Length +12.0" End Stone x 2 = 52.50' Base Length

15 Rows x 52.0" Wide + 6.0" Spacing x 14 + 12.0" Side Stone x 2 = 74.00' Base Width

6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

105 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 15 Rows = 5,644.1 cf Chamber Storage

13,759.4 cf Field - 5,644.1 cf Chambers = 8,115.2 cf Stone x 40.0% Voids = 3,246.1 cf Stone Storage

Chamber Storage + Stone Storage = 8,890.2 cf = 0.204 af

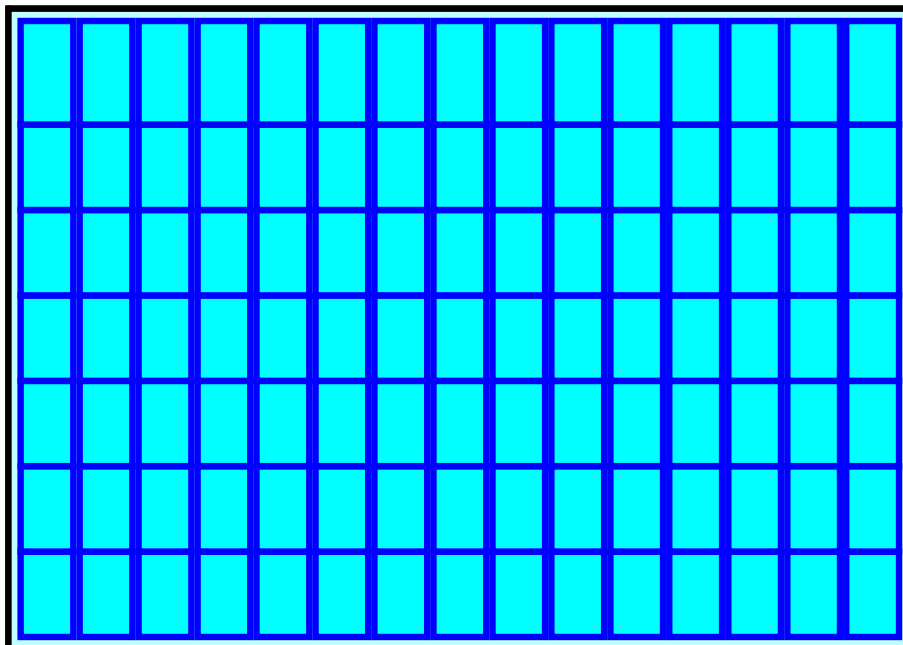
Overall Storage Efficiency = 64.6%

Overall System Size = 52.50' x 74.00' x 3.54'

105 Chambers

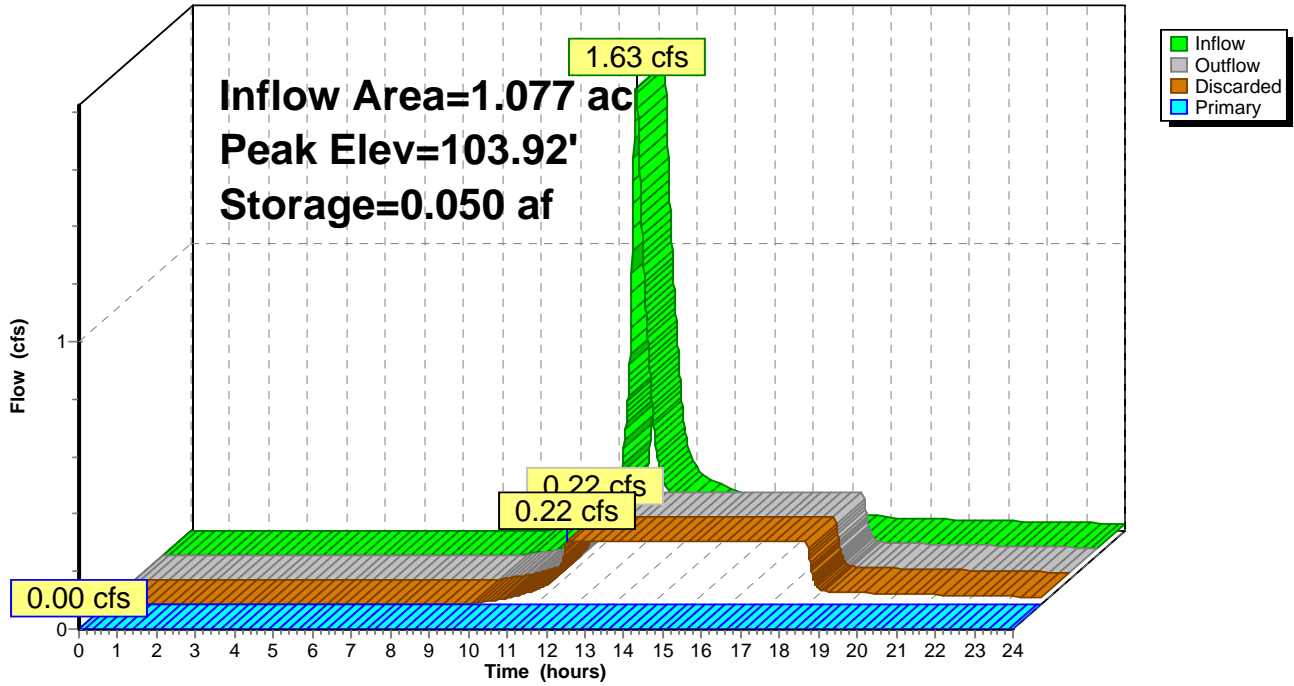
509.6 cy Field

300.6 cy Stone



Pond PR1: Recharge 1

Hydrograph



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Post-Construction Runoff
 Type III 24-hr 10-Year Rainfall=5.22"
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Summary for Subcatchment P1A: Directed East

Runoff = 0.31 cfs @ 12.22 hrs, Volume= 0.044 af, Depth> 0.67"

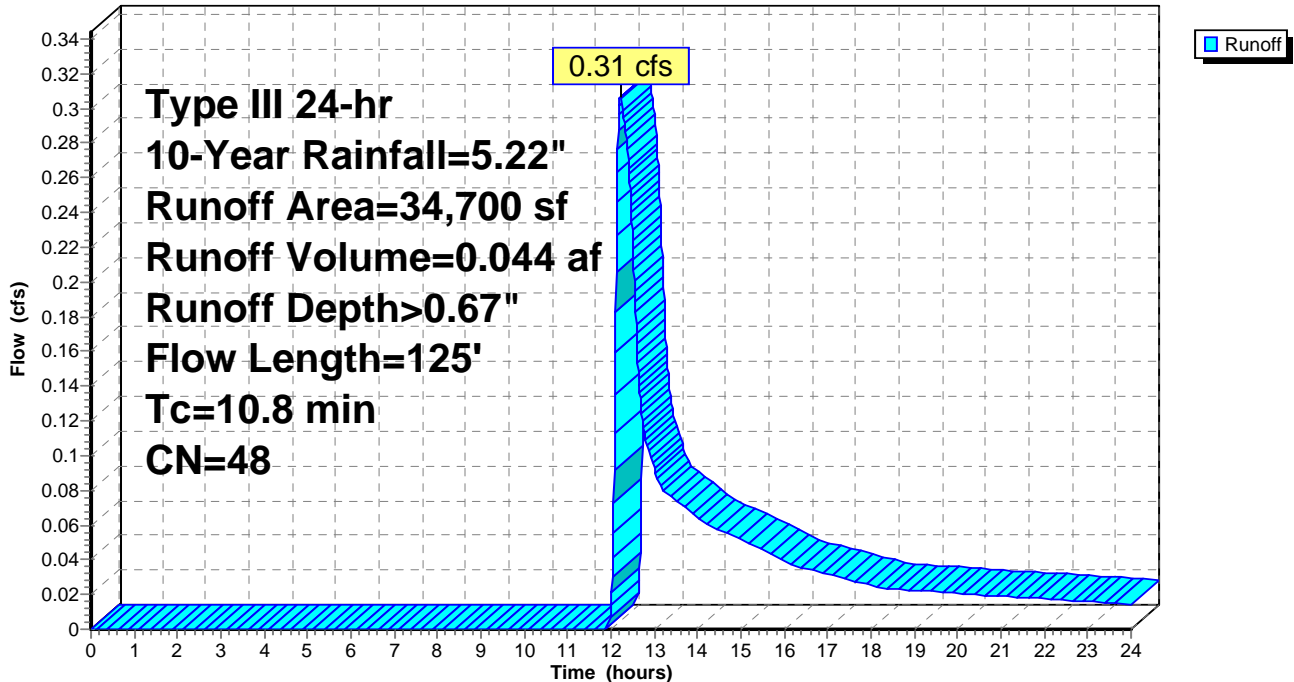
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
* 2,854	98	Impervious
14,380	39	>75% Grass cover, Good, HSG A
11,288	30	Woods, Good, HSG A
3,734	74	>75% Grass cover, Good, HSG C
111	70	Woods, Good, HSG C
2,333	80	>75% Grass cover, Good, HSG D
34,700	48	Weighted Average
31,846		91.78% Pervious Area
2,854		8.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	50	0.1400	0.08		Sheet Flow, Sheet Flow Woods Woods: Dense underbrush n= 0.800 P2= 3.10"
0.8	75	0.1067	1.63		Shallow Concentrated Flow, Concentrated Woods Woodland Kv= 5.0 fps
10.8	125	Total			

Subcatchment P1A: Directed East

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Summary for Subcatchment P1B: To Recharge 1

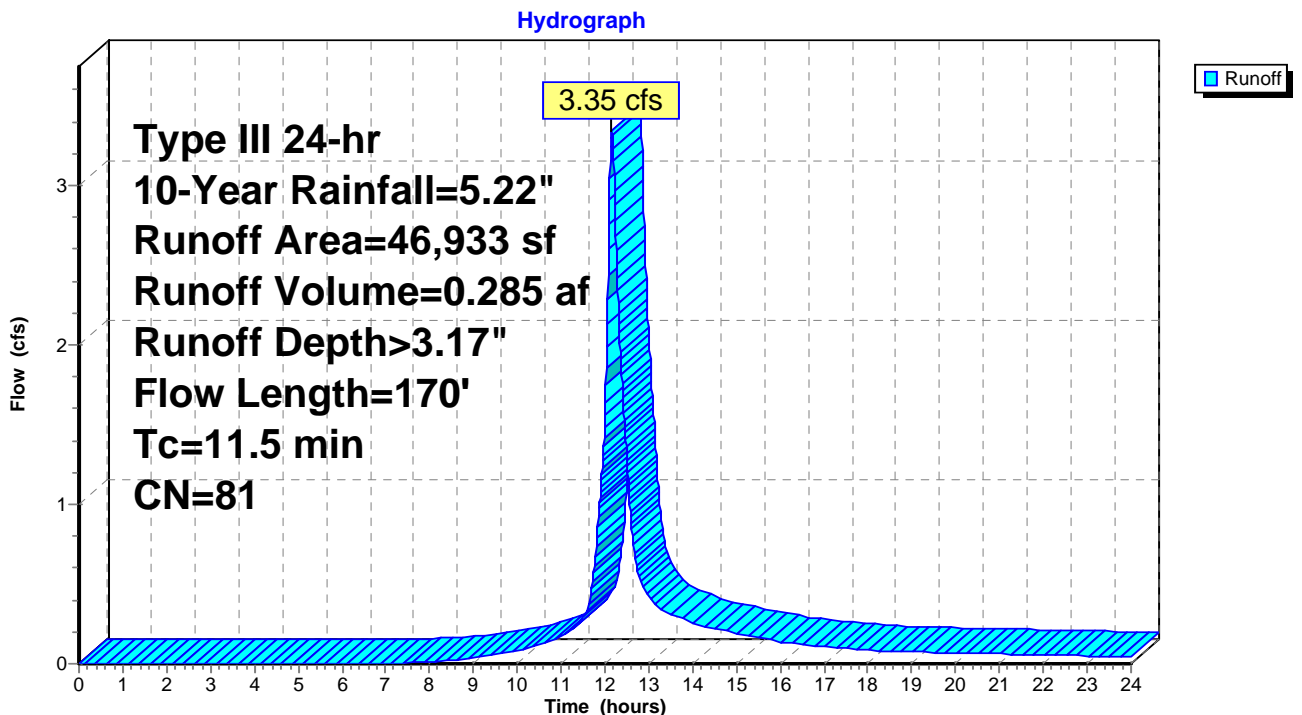
Runoff = 3.35 cfs @ 12.16 hrs, Volume= 0.285 af, Depth> 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
* 16,120	98	Impervious
989	39	>75% Grass cover, Good, HSG A
21,312	74	>75% Grass cover, Good, HSG C
8,215	70	Woods, Good, HSG C
297	80	>75% Grass cover, Good, HSG D
46,933	81	Weighted Average
30,813		65.65% Pervious Area
16,120		34.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	50	0.1400	0.08		Sheet Flow, Wood Sheet Flow Woods: Dense underbrush n= 0.800 P2= 3.10"
1.5	120	0.0750	1.37		Shallow Concentrated Flow, Woods Concentrated Flow Woodland Kv= 5.0 fps
11.5	170	Total			

Subcatchment P1B: To Recharge 1



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Summary for Subcatchment P2: Directed West

Runoff = 0.07 cfs @ 12.08 hrs, Volume= 0.005 af, Depth> 2.81"

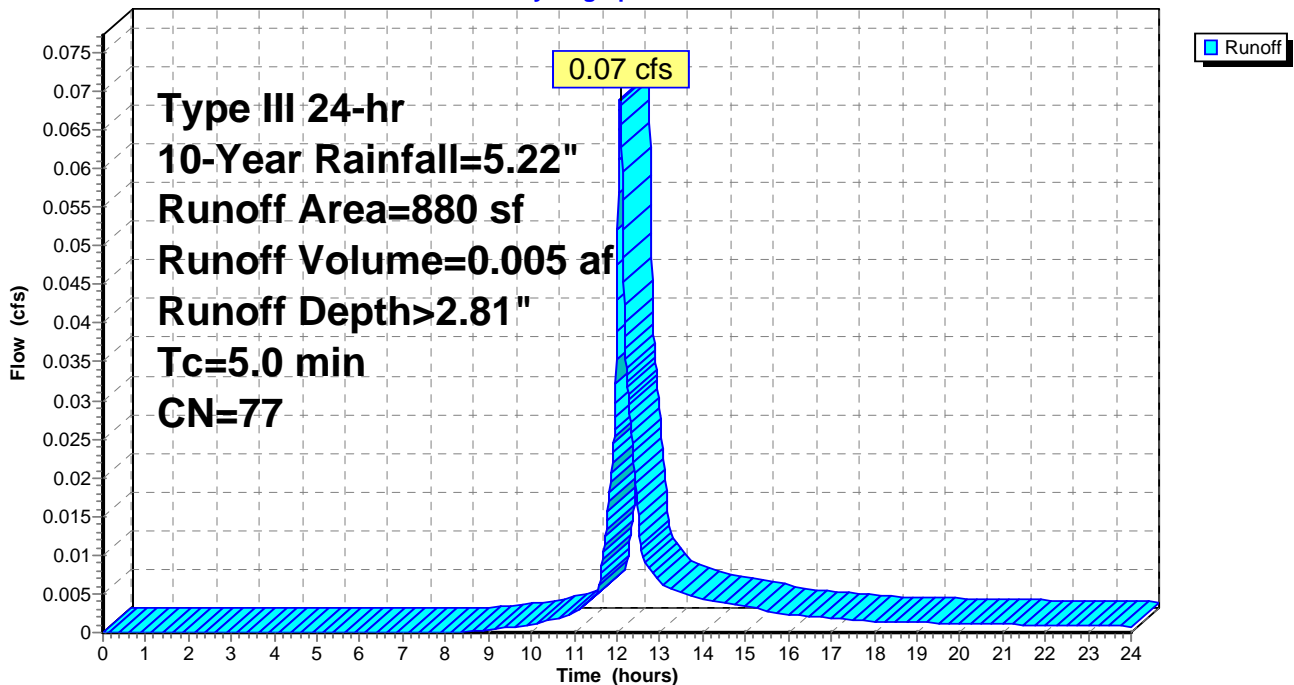
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
473	74	>75% Grass cover, Good, HSG C
407	80	>75% Grass cover, Good, HSG D
880	77	Weighted Average
880		100.00% Pervious Area

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

Subcatchment P2: Directed West

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Post-Construction Runoff

Type III 24-hr 10-Year Rainfall=5.22"

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Summary for Subcatchment RR3: Roof Runoff - Lot 3

Runoff = 0.30 cfs @ 12.07 hrs, Volume= 0.024 af, Depth> 4.98"

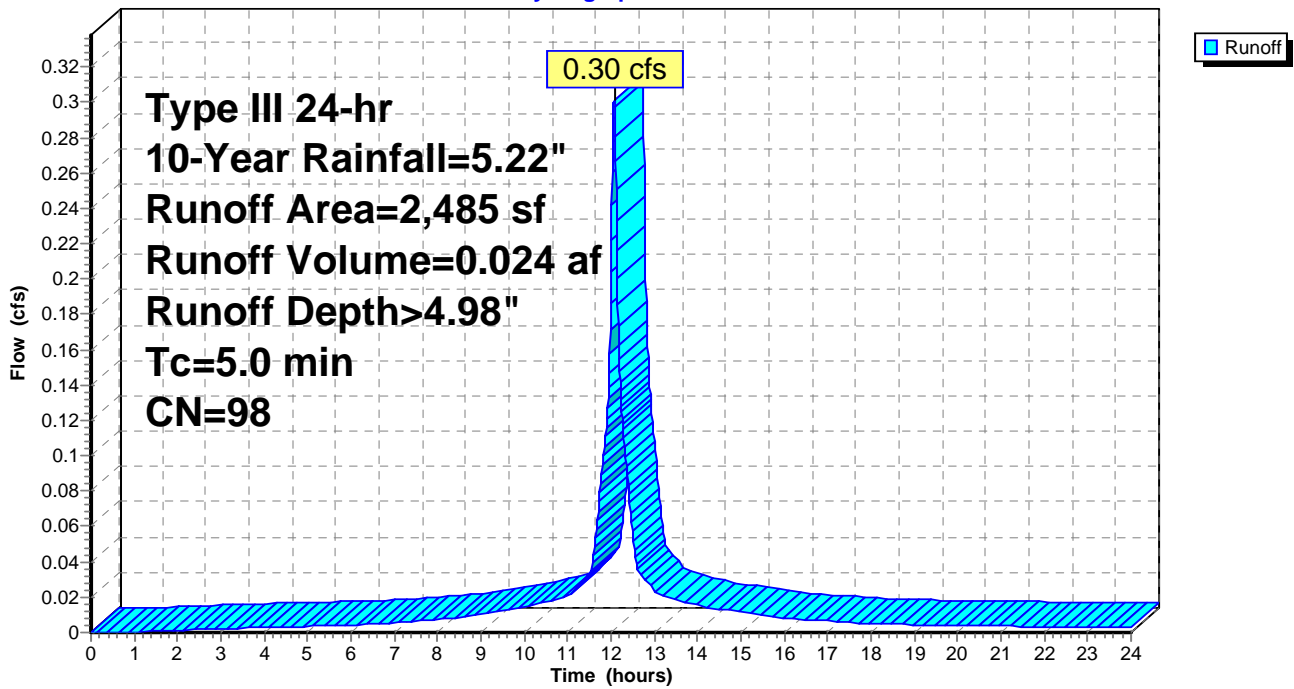
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
* 2,485	98	Roof
2,485		100.00% Impervious Area

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

Subcatchment RR3: Roof Runoff - Lot 3

Hydrograph



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Post-Construction Runoff
 Type III 24-hr 10-Year Rainfall=5.22"
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Summary for Subcatchment RR4: Roof Runoff - Lot 4

Runoff = 0.30 cfs @ 12.07 hrs, Volume= 0.024 af, Depth> 4.98"

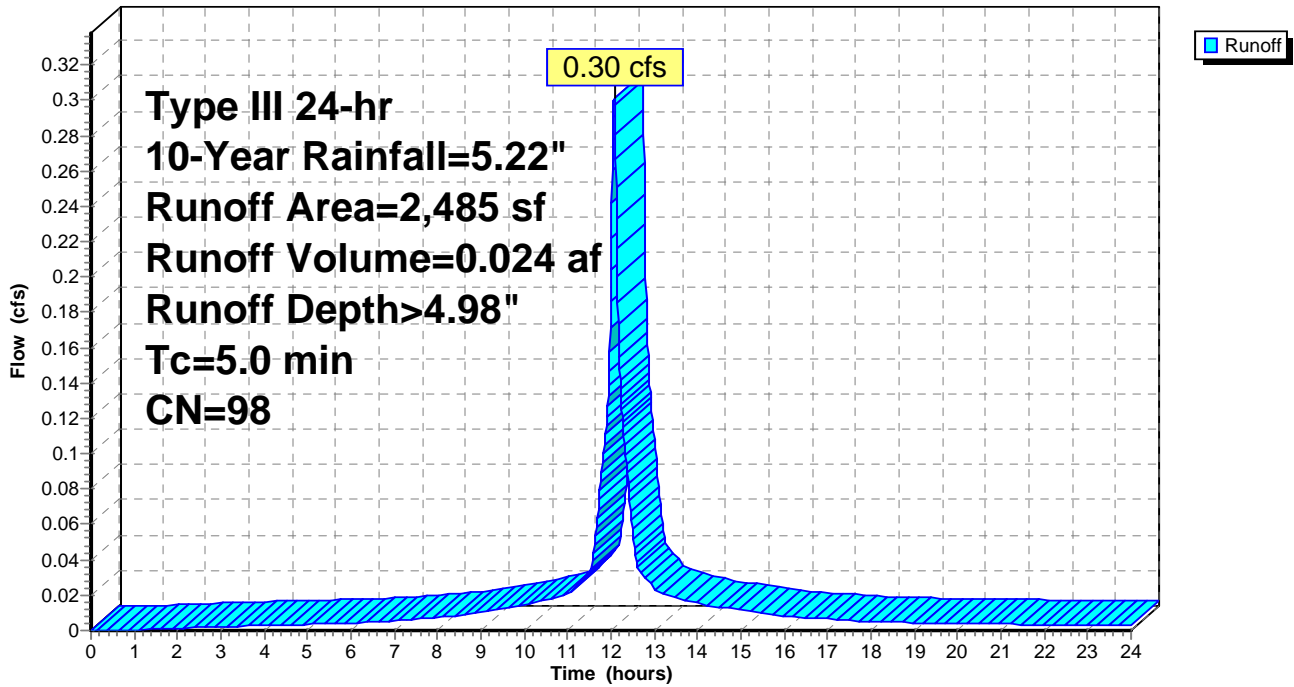
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
* 2,485	98	Roof
2,485		100.00% Impervious Area

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

Subcatchment RR4: Roof Runoff - Lot 4

Hydrograph



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Post-Construction Runoff
Type III 24-hr 10-Year Rainfall=5.22"

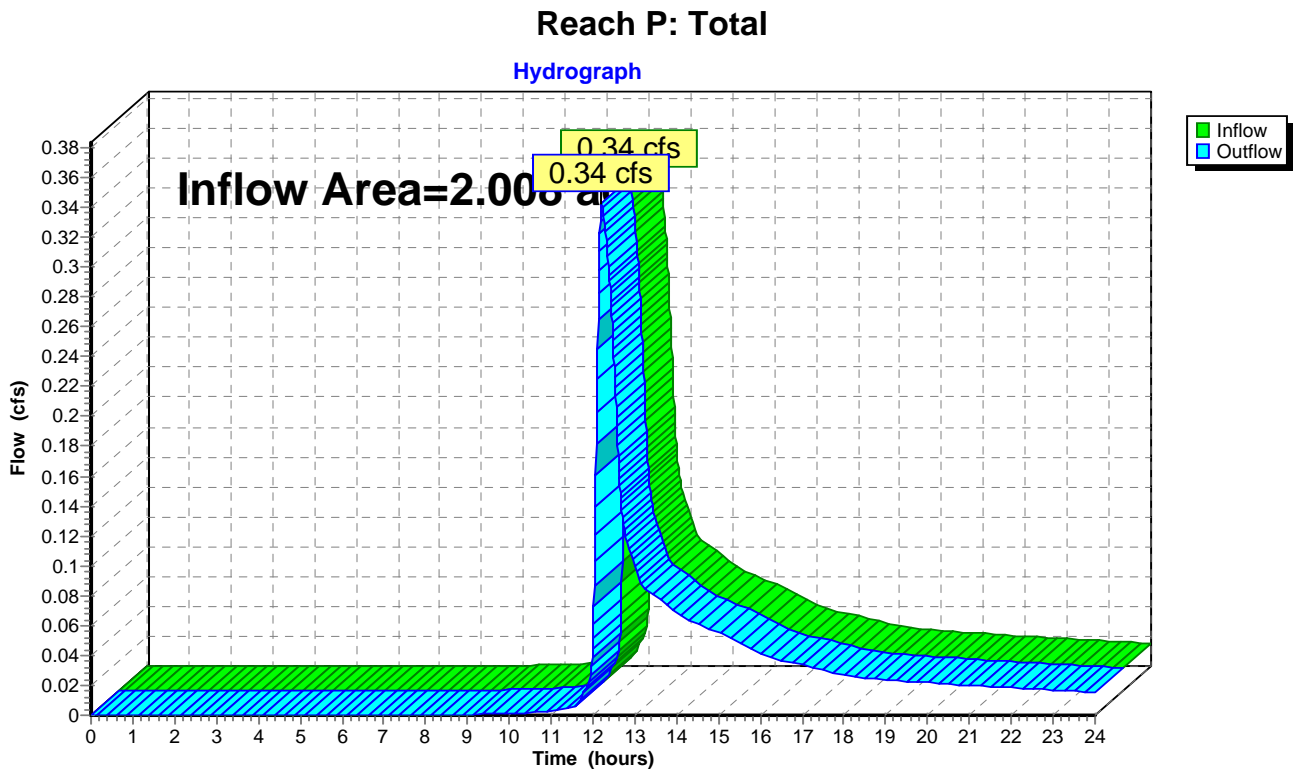
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Summary for Reach P: Total

Inflow Area = 2.008 ac, 27.37% Impervious, Inflow Depth > 0.29" for 10-Year event
Inflow = 0.34 cfs @ 12.21 hrs, Volume= 0.049 af
Outflow = 0.34 cfs @ 12.21 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



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Post-Construction Runoff

Type III 24-hr 10-Year Rainfall=5.22"

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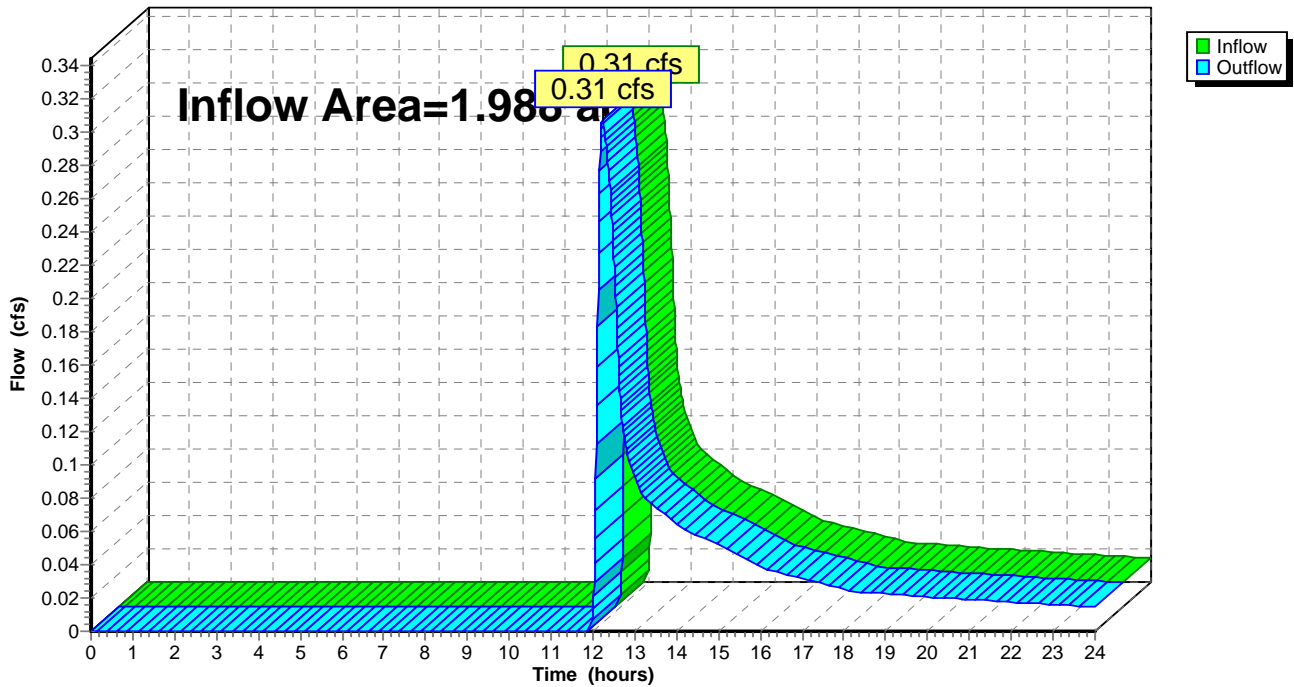
Summary for Reach R1: Reach 1

Inflow Area = 1.988 ac, 27.65% Impervious, Inflow Depth > 0.27" for 10-Year event
Inflow = 0.31 cfs @ 12.22 hrs, Volume= 0.044 af
Outflow = 0.31 cfs @ 12.22 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach R1: Reach 1

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Post-Construction Runoff
Type III 24-hr 10-Year Rainfall=5.22"

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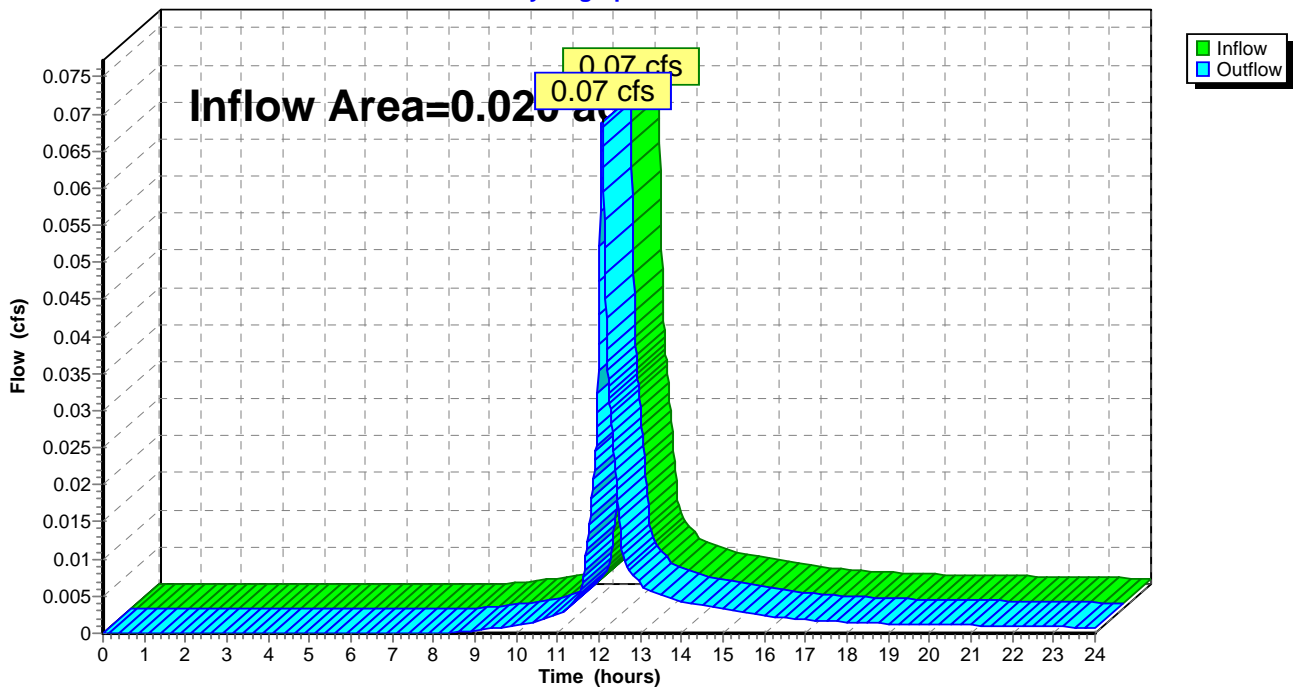
Summary for Reach R2: Reach 2

Inflow Area = 0.020 ac, 0.00% Impervious, Inflow Depth > 2.81" for 10-Year event
Inflow = 0.07 cfs @ 12.08 hrs, Volume= 0.005 af
Outflow = 0.07 cfs @ 12.08 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach R2: Reach 2

Hydrograph



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Post-Construction Runoff

Type III 24-hr 10-Year Rainfall=5.22"

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Summary for Pond Lot 3: Roof Recharge

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 4.98" for 10-Year event
 Inflow = 0.30 cfs @ 12.07 hrs, Volume= 0.024 af
 Outflow = 0.02 cfs @ 10.68 hrs, Volume= 0.024 af, Atten= 94%, Lag= 0.0 min
 Discarded = 0.02 cfs @ 10.68 hrs, Volume= 0.024 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 104.99' @ 13.63 hrs Surf.Area= 0.007 ac Storage= 0.010 af

Plug-Flow detention time= 184.2 min calculated for 0.024 af (100% of inflow)
 Center-of-Mass det. time= 183.5 min (929.4 - 745.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	103.00'	0.007 af	30.50'W x 10.50'L x 3.54'H Field A 0.026 af Overall - 0.009 af Embedded = 0.017 af x 40.0% Voids
#2A	103.50'	0.009 af	Cultec R-330XLHD x 6 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 6 rows
		0.016 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	103.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	108.00'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 10.68 hrs HW=103.05' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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Pond Lot 3: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 6 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

1 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 8.50' Row Length +12.0" End Stone x 2 = 10.50' Base Length

6 Rows x 52.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.50' Base Width

6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

6 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 6 Rows = 380.0 cf Chamber Storage

1,134.2 cf Field - 380.0 cf Chambers = 754.2 cf Stone x 40.0% Voids = 301.7 cf Stone Storage

Chamber Storage + Stone Storage = 681.7 cf = 0.016 af

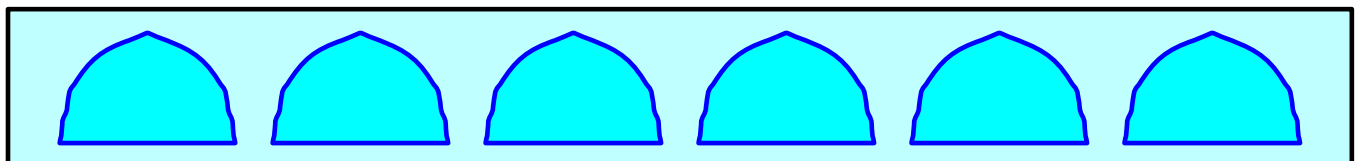
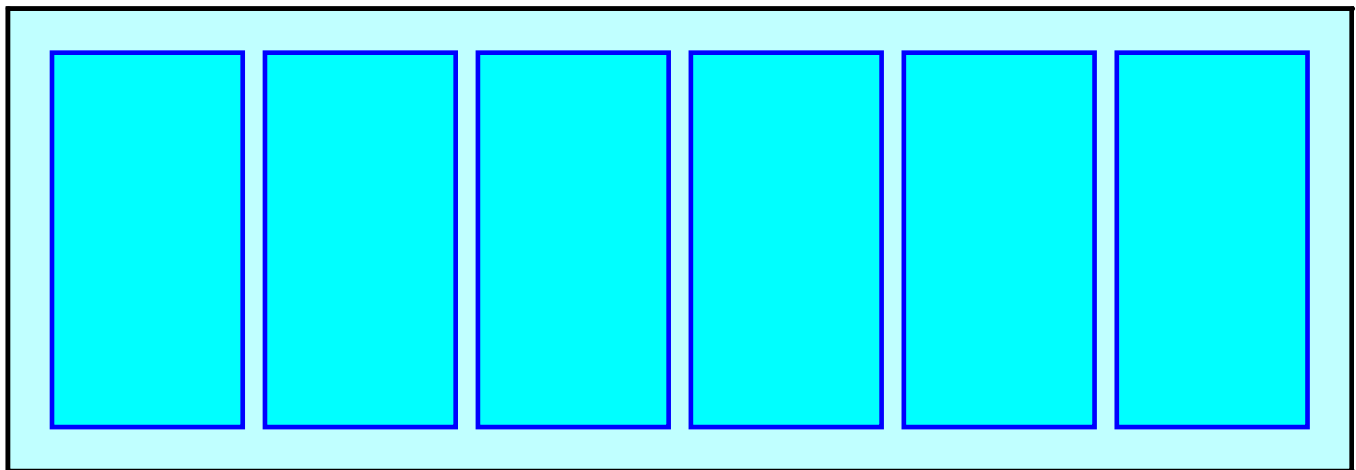
Overall Storage Efficiency = 60.1%

Overall System Size = 10.50' x 30.50' x 3.54'

6 Chambers

42.0 cy Field

27.9 cy Stone



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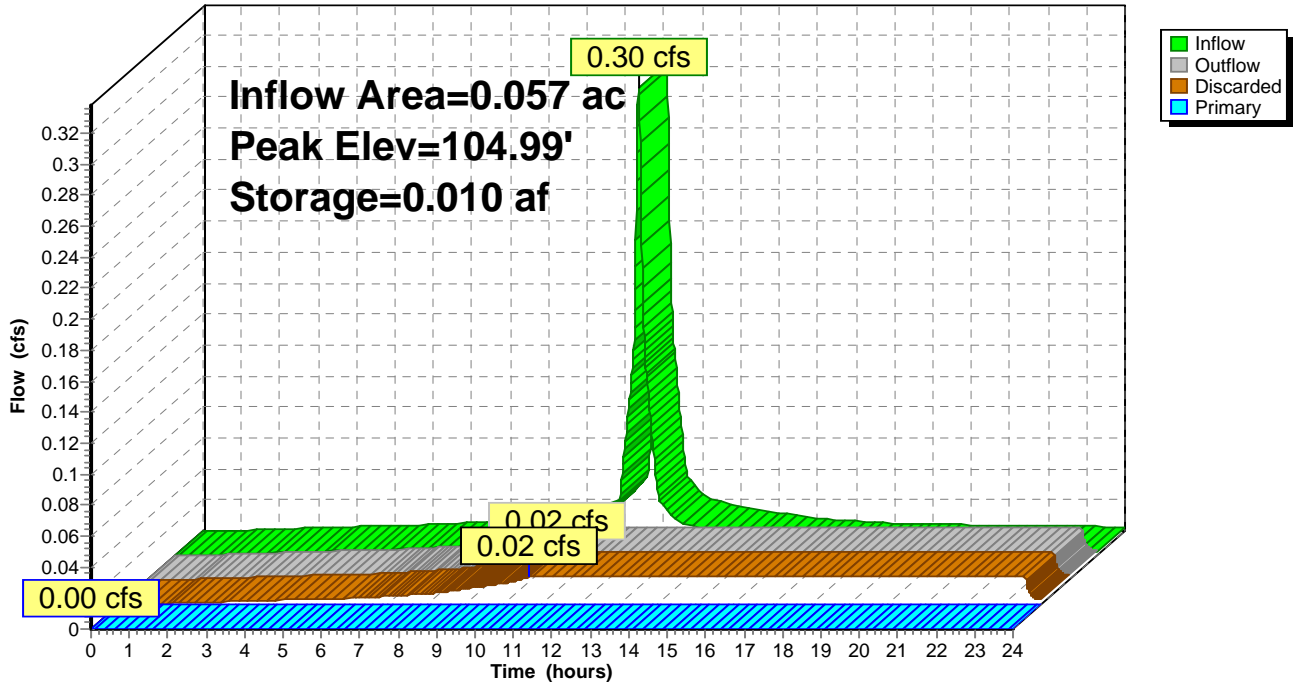
Post-Construction Runoff
Type III 24-hr 10-Year Rainfall=5.22"

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Pond Lot 3: Roof Recharge

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Post-Construction Runoff

Type III 24-hr 10-Year Rainfall=5.22"

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Summary for Pond Lot 4: Roof Recharge

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 4.98" for 10-Year event
 Inflow = 0.30 cfs @ 12.07 hrs, Volume= 0.024 af
 Outflow = 0.02 cfs @ 10.68 hrs, Volume= 0.024 af, Atten= 94%, Lag= 0.0 min
 Discarded = 0.02 cfs @ 10.68 hrs, Volume= 0.024 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 104.99' @ 13.63 hrs Surf.Area= 0.007 ac Storage= 0.010 af

Plug-Flow detention time= 184.2 min calculated for 0.024 af (100% of inflow)
 Center-of-Mass det. time= 183.5 min (929.4 - 745.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	103.00'	0.007 af	30.50'W x 10.50'L x 3.54'H Field A 0.026 af Overall - 0.009 af Embedded = 0.017 af x 40.0% Voids
#2A	103.50'	0.009 af	Cultec R-330XLHD x 6 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 6 rows
		0.016 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	103.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	108.00'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 10.68 hrs HW=103.05' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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Post-Construction Runoff
Type III 24-hr 10-Year Rainfall=5.22"

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Pond Lot 4: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 6 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

1 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 8.50' Row Length +12.0" End Stone x 2 = 10.50' Base Length

6 Rows x 52.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.50' Base Width

6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

6 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 6 Rows = 380.0 cf Chamber Storage

1,134.2 cf Field - 380.0 cf Chambers = 754.2 cf Stone x 40.0% Voids = 301.7 cf Stone Storage

Chamber Storage + Stone Storage = 681.7 cf = 0.016 af

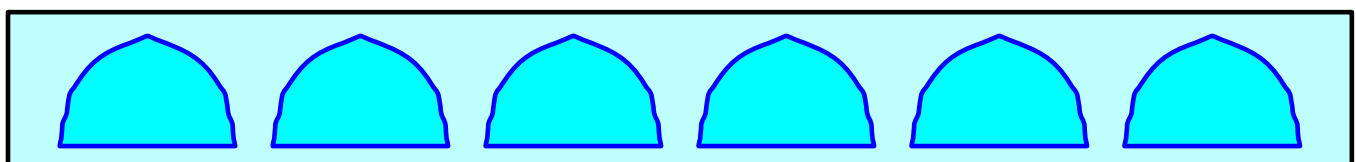
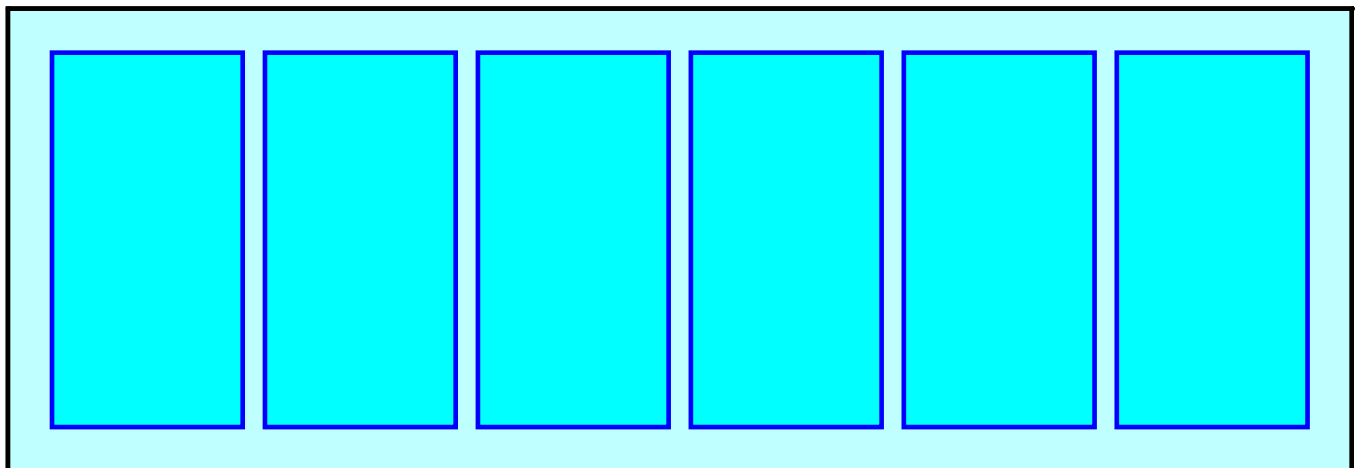
Overall Storage Efficiency = 60.1%

Overall System Size = 10.50' x 30.50' x 3.54'

6 Chambers

42.0 cy Field

27.9 cy Stone



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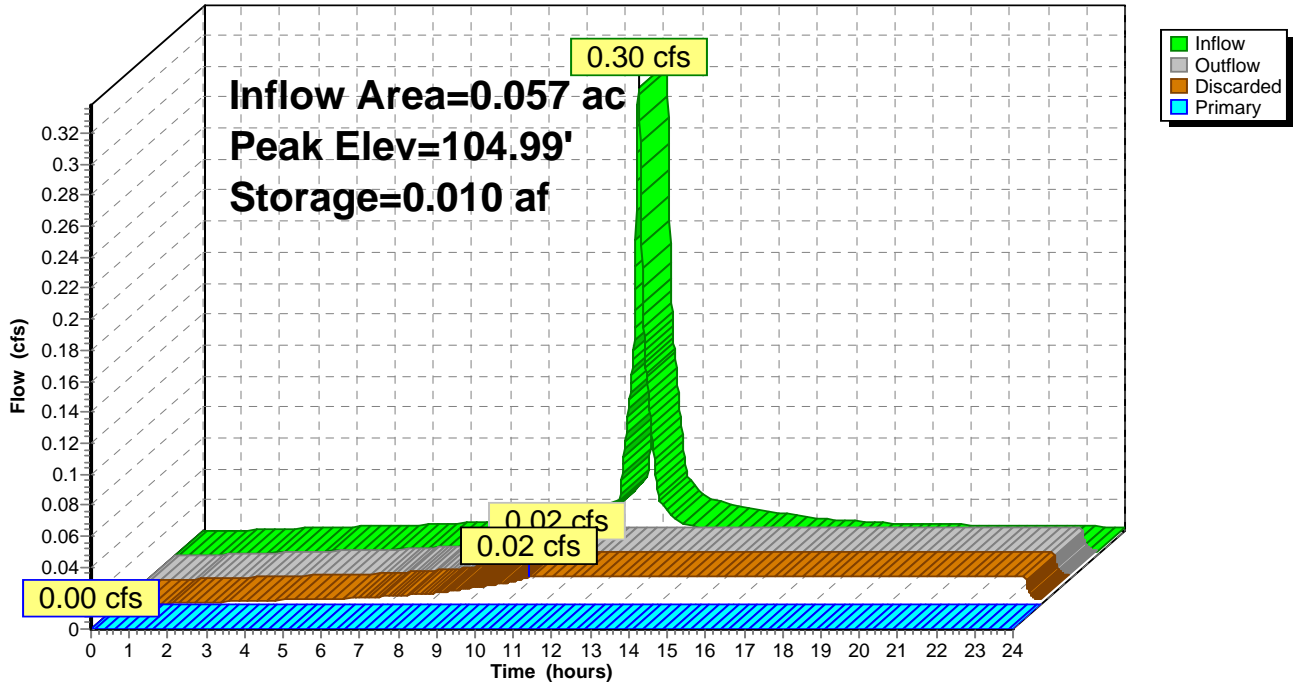
Post-Construction Runoff
Type III 24-hr 10-Year Rainfall=5.22"

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Pond Lot 4: Roof Recharge

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Post-Construction Runoff

Type III 24-hr 10-Year Rainfall=5.22"

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Summary for Pond PR1: Recharge 1

Inflow Area = 1.077 ac, 34.35% Impervious, Inflow Depth > 3.17" for 10-Year event
 Inflow = 3.35 cfs @ 12.16 hrs, Volume= 0.285 af
 Outflow = 0.22 cfs @ 11.36 hrs, Volume= 0.248 af, Atten= 94%, Lag= 0.0 min
 Discarded = 0.22 cfs @ 11.36 hrs, Volume= 0.248 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 105.12' @ 14.56 hrs Surf.Area= 0.089 ac Storage= 0.137 af

Plug-Flow detention time= 260.0 min calculated for 0.248 af (87% of inflow)
 Center-of-Mass det. time= 202.0 min (1,023.0 - 821.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	103.00'	0.075 af	74.00'W x 52.50'L x 3.54'H Field A 0.316 af Overall - 0.130 af Embedded = 0.186 af x 40.0% Voids
#2A	103.50'	0.130 af	Cultec R-330XLHD x 105 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 15 rows
		0.204 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	103.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	108.00'	12.0" Horiz. Orifice/Gate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.22 cfs @ 11.36 hrs HW=103.05' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.22 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
 ↑2=Orifice/Gate (Controls 0.00 cfs)

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Post-Construction Runoff
Type III 24-hr 10-Year Rainfall=5.22"

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Pond PR1: Recharge 1 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 15 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

7 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 50.50' Row Length +12.0" End Stone x 2 = 52.50' Base Length

15 Rows x 52.0" Wide + 6.0" Spacing x 14 + 12.0" Side Stone x 2 = 74.00' Base Width

6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

105 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 15 Rows = 5,644.1 cf Chamber Storage

13,759.4 cf Field - 5,644.1 cf Chambers = 8,115.2 cf Stone x 40.0% Voids = 3,246.1 cf Stone Storage

Chamber Storage + Stone Storage = 8,890.2 cf = 0.204 af

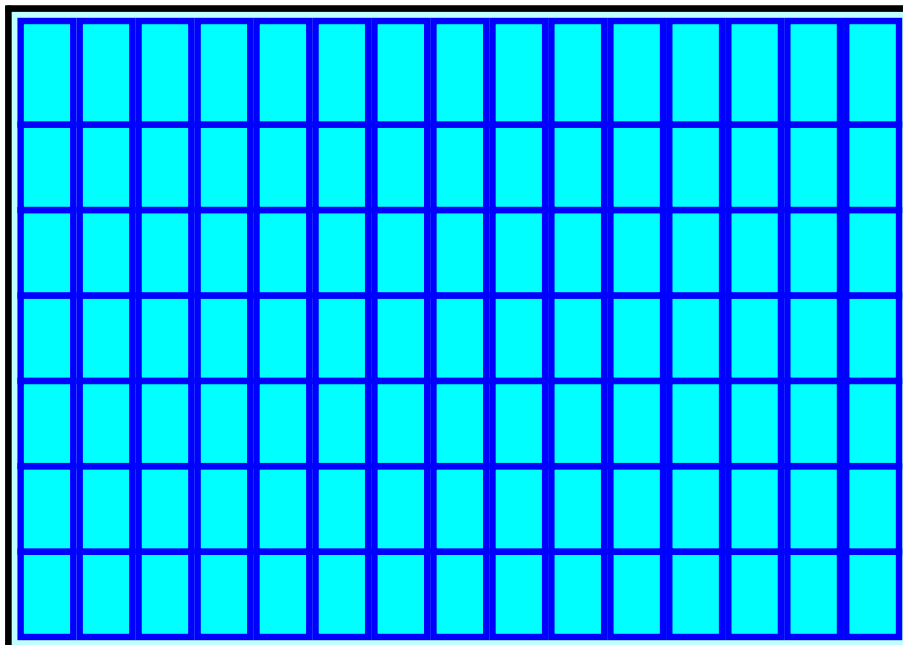
Overall Storage Efficiency = 64.6%

Overall System Size = 52.50' x 74.00' x 3.54'

105 Chambers

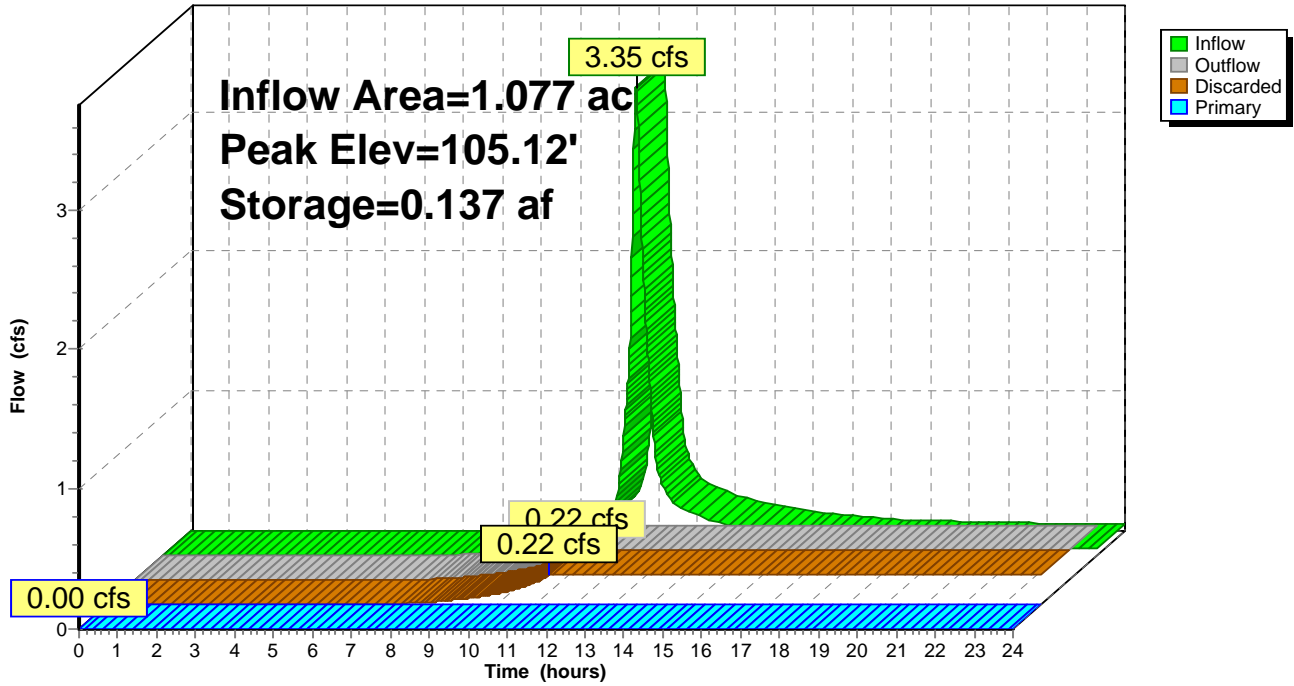
509.6 cy Field

300.6 cy Stone



Pond PR1: Recharge 1

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Post-Construction Runoff
 Type III 24-hr 25-Year Rainfall=6.41"
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Summary for Subcatchment P1A: Directed East

Runoff = 0.73 cfs @ 12.18 hrs, Volume= 0.079 af, Depth> 1.19"

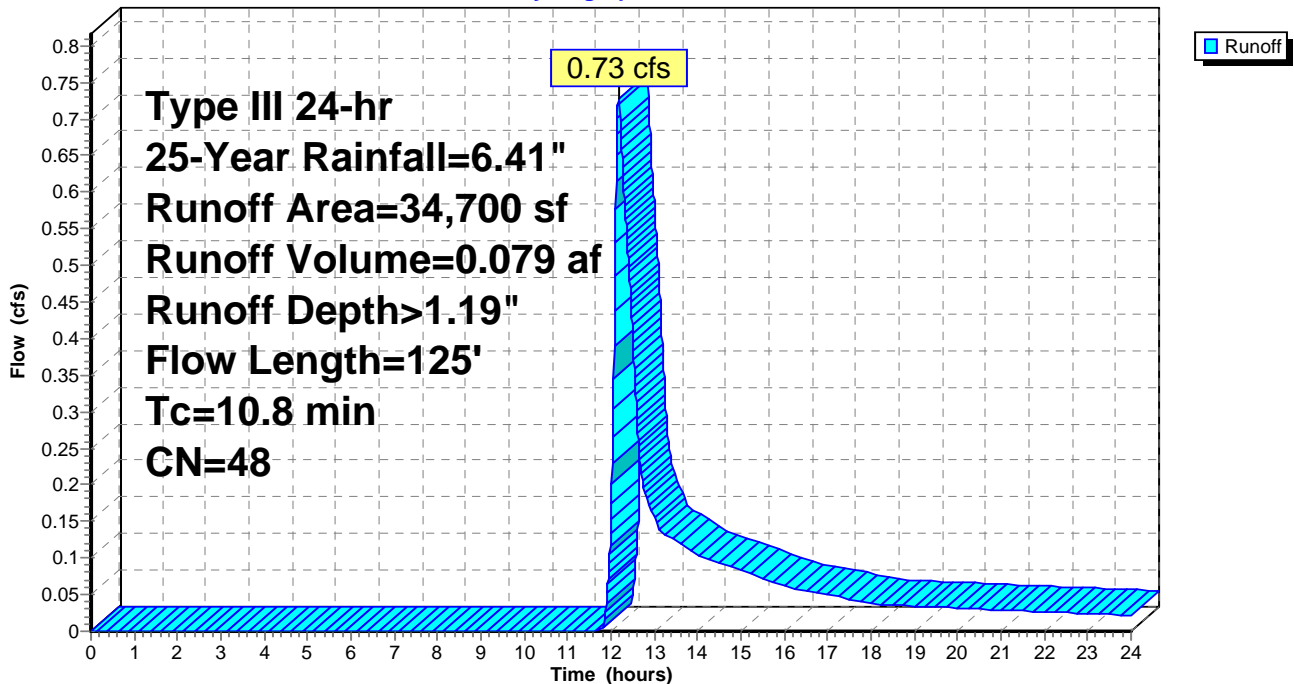
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 25-Year Rainfall=6.41"

Area (sf)	CN	Description
* 2,854	98	Impervious
14,380	39	>75% Grass cover, Good, HSG A
11,288	30	Woods, Good, HSG A
3,734	74	>75% Grass cover, Good, HSG C
111	70	Woods, Good, HSG C
2,333	80	>75% Grass cover, Good, HSG D
34,700	48	Weighted Average
31,846		91.78% Pervious Area
2,854		8.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	50	0.1400	0.08		Sheet Flow, Sheet Flow Woods Woods: Dense underbrush n= 0.800 P2= 3.10"
0.8	75	0.1067	1.63		Shallow Concentrated Flow, Concentrated Woods Woodland Kv= 5.0 fps
10.8	125	Total			

Subcatchment P1A: Directed East

Hydrograph



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Post-Construction Runoff
Type III 24-hr 25-Year Rainfall=6.41"

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Summary for Subcatchment P1B: To Recharge 1

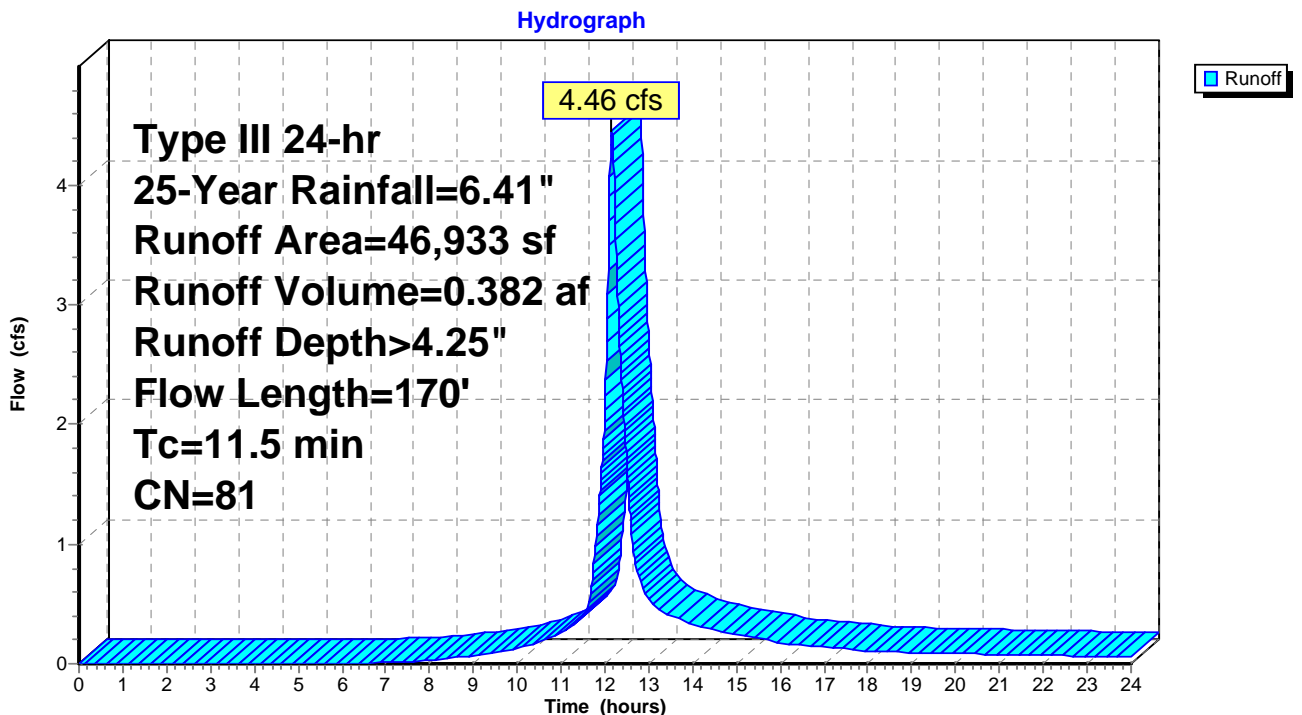
Runoff = 4.46 cfs @ 12.16 hrs, Volume= 0.382 af, Depth> 4.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

Area (sf)	CN	Description
* 16,120	98	Impervious
989	39	>75% Grass cover, Good, HSG A
21,312	74	>75% Grass cover, Good, HSG C
8,215	70	Woods, Good, HSG C
297	80	>75% Grass cover, Good, HSG D
46,933	81	Weighted Average
30,813		65.65% Pervious Area
16,120		34.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	50	0.1400	0.08		Sheet Flow, Wood Sheet Flow Woods: Dense underbrush n= 0.800 P2= 3.10"
1.5	120	0.0750	1.37		Shallow Concentrated Flow, Woods Concentrated Flow Woodland Kv= 5.0 fps
11.5	170	Total			

Subcatchment P1B: To Recharge 1



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 Type III 24-hr 25-Year Rainfall=6.41"

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Summary for Subcatchment P2: Directed West

Runoff = 0.09 cfs @ 12.07 hrs, Volume= 0.006 af, Depth> 3.84"

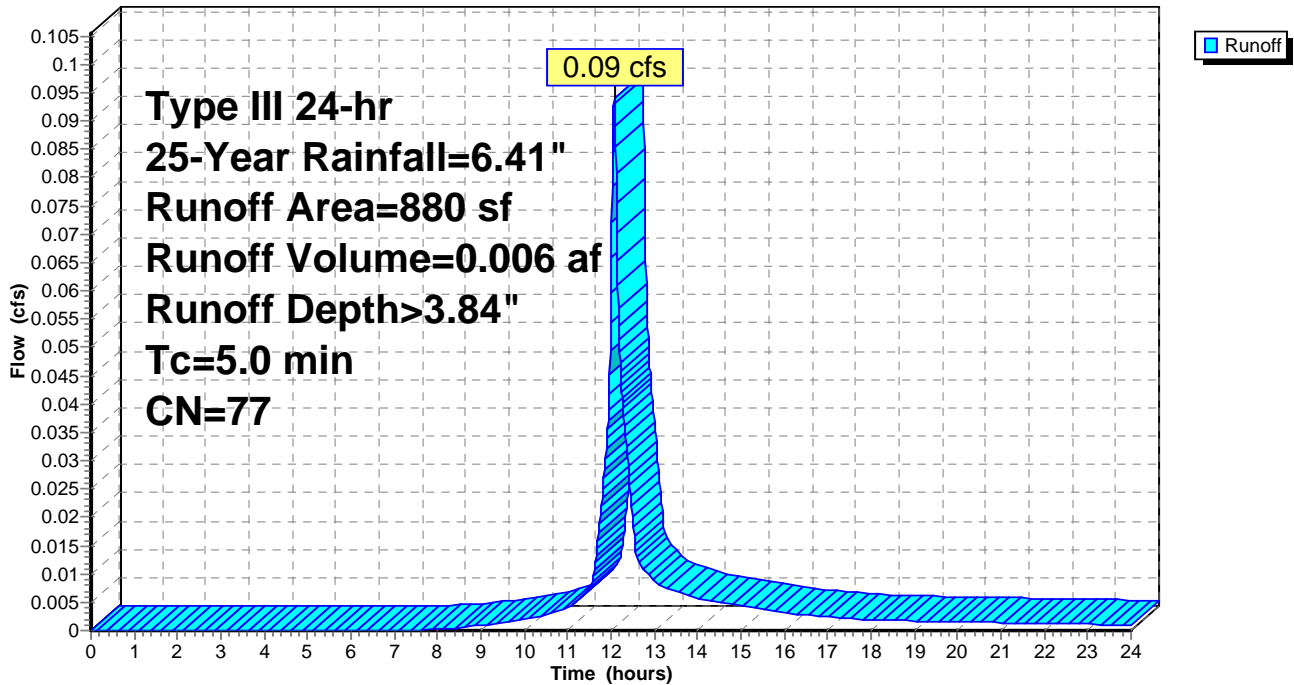
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 25-Year Rainfall=6.41"

Area (sf)	CN	Description
473	74	>75% Grass cover, Good, HSG C
407	80	>75% Grass cover, Good, HSG D
880	77	Weighted Average
880		100.00% Pervious Area

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

Subcatchment P2: Directed West

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Type III 24-hr 25-Year Rainfall=6.41"

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Summary for Subcatchment RR3: Roof Runoff - Lot 3

Runoff = 0.37 cfs @ 12.07 hrs, Volume= 0.029 af, Depth> 6.17"

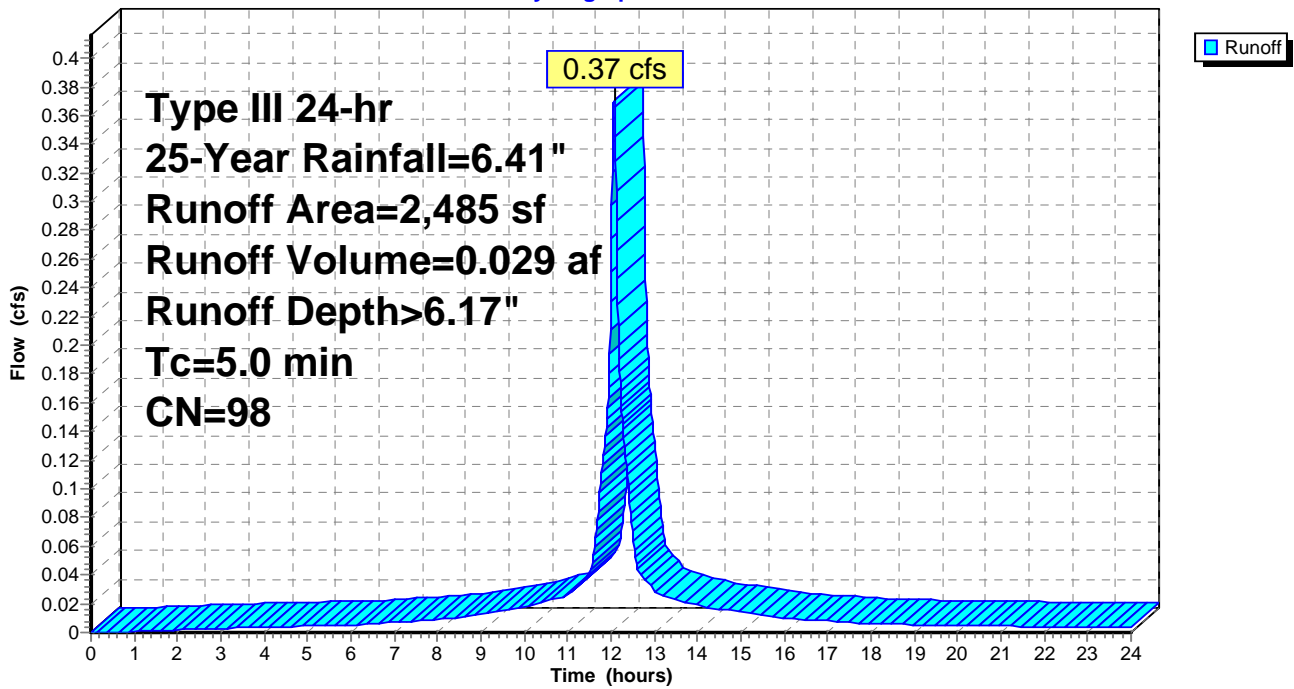
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

Area (sf)	CN	Description
* 2,485	98	Roof
2,485		100.00% Impervious Area

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

Subcatchment RR3: Roof Runoff - Lot 3

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Post-Construction Runoff
 Type III 24-hr 25-Year Rainfall=6.41"

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Summary for Subcatchment RR4: Roof Runoff - Lot 4

Runoff = 0.37 cfs @ 12.07 hrs, Volume= 0.029 af, Depth> 6.17"

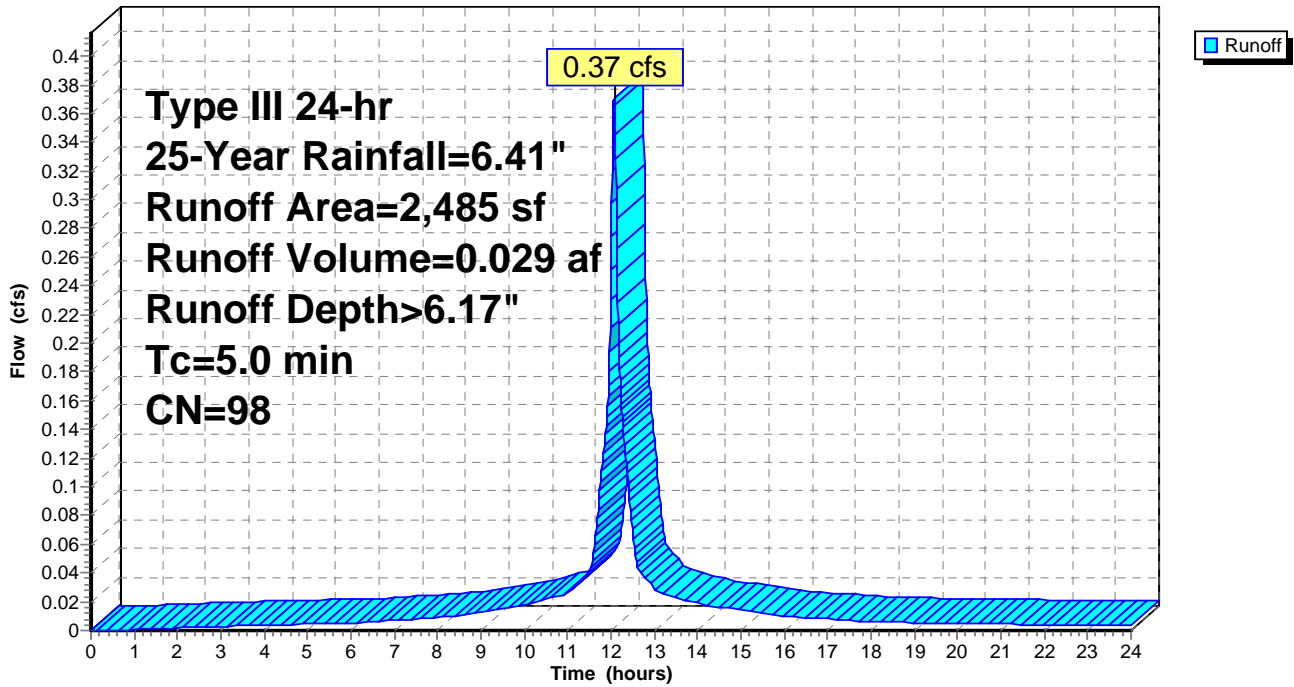
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 25-Year Rainfall=6.41"

Area (sf)	CN	Description
* 2,485	98	Roof
2,485		100.00% Impervious Area

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

Subcatchment RR4: Roof Runoff - Lot 4

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Post-Construction Runoff

Type III 24-hr 25-Year Rainfall=6.41"

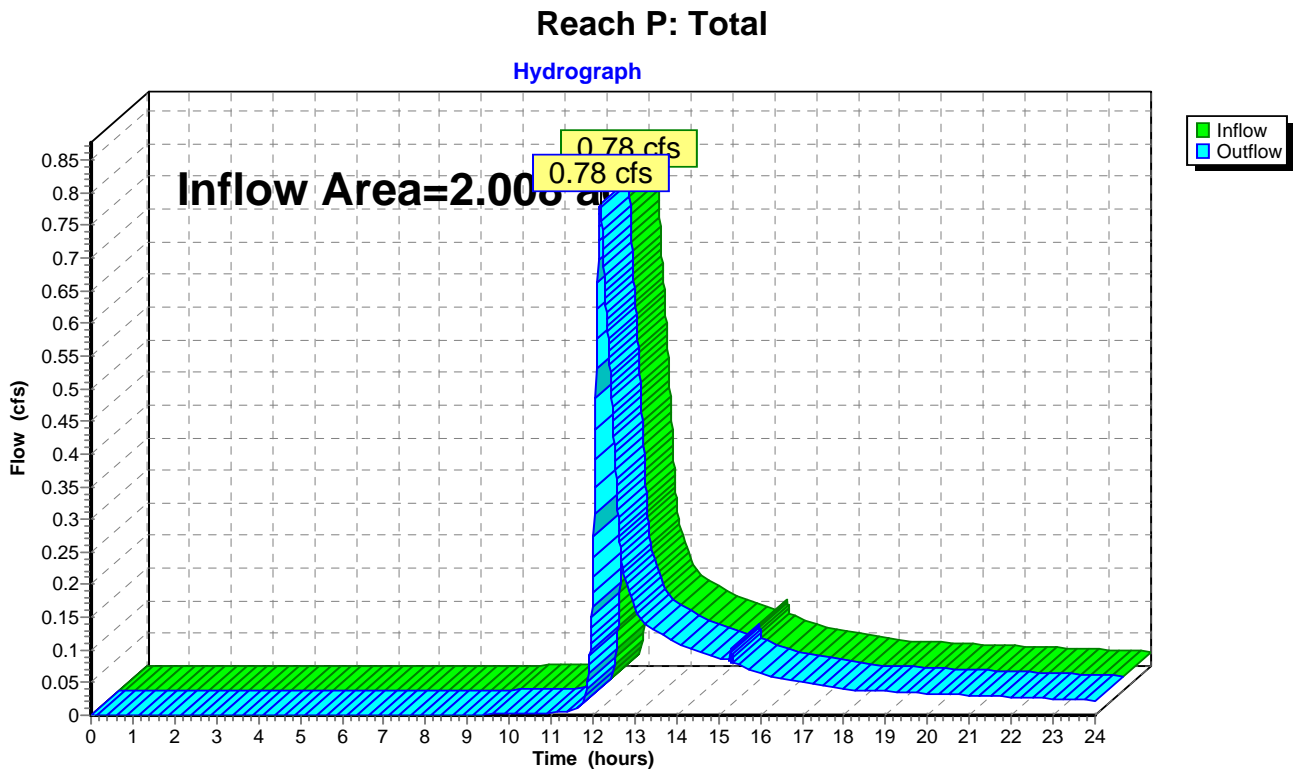
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Summary for Reach P: Total

Inflow Area = 2.008 ac, 27.37% Impervious, Inflow Depth > 0.51" for 25-Year event
Inflow = 0.78 cfs @ 12.18 hrs, Volume= 0.086 af
Outflow = 0.78 cfs @ 12.18 hrs, Volume= 0.086 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



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Type III 24-hr 25-Year Rainfall=6.41"

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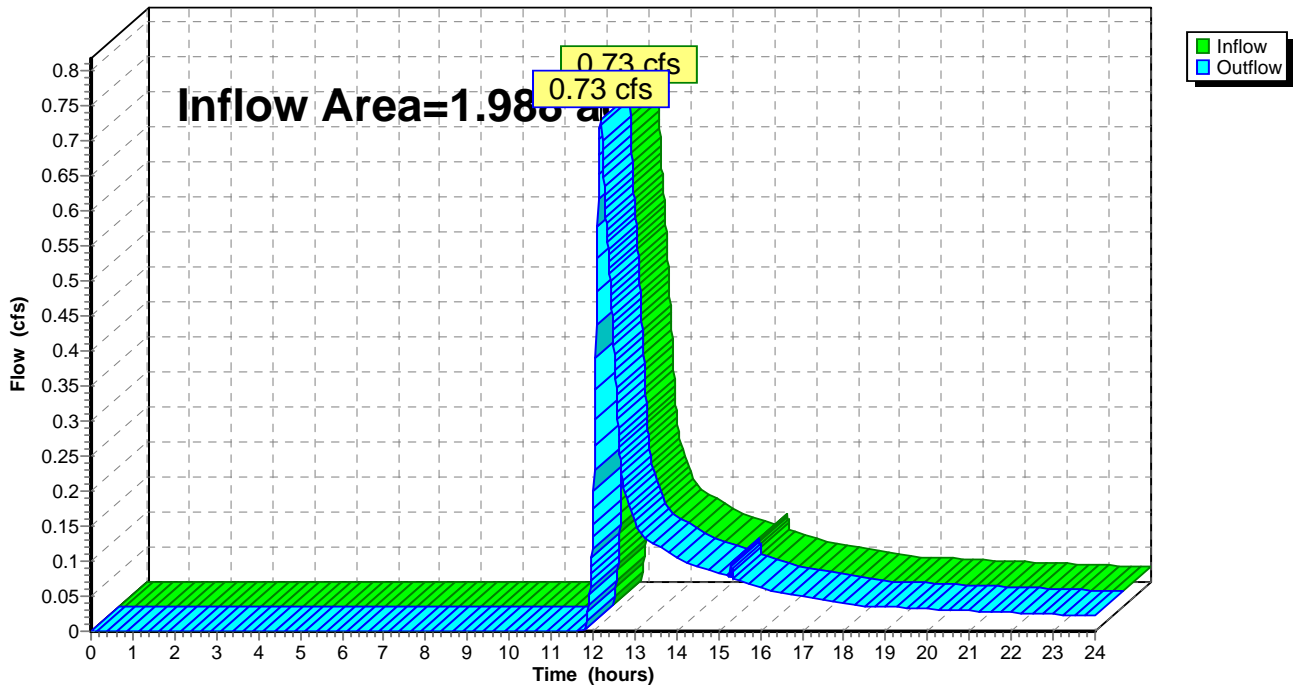
Summary for Reach R1: Reach 1

Inflow Area = 1.988 ac, 27.65% Impervious, Inflow Depth > 0.48" for 25-Year event
Inflow = 0.73 cfs @ 12.18 hrs, Volume= 0.079 af
Outflow = 0.73 cfs @ 12.18 hrs, Volume= 0.079 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach R1: Reach 1

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Type III 24-hr 25-Year Rainfall=6.41"

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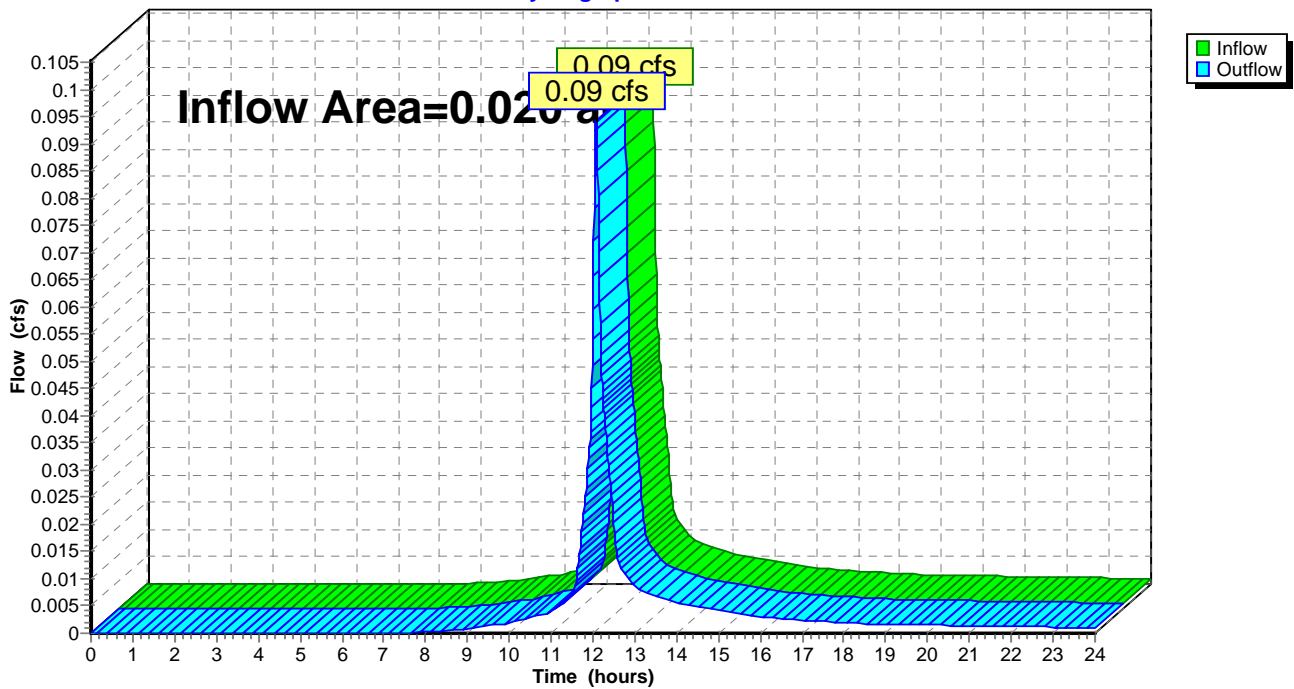
Summary for Reach R2: Reach 2

Inflow Area = 0.020 ac, 0.00% Impervious, Inflow Depth > 3.84" for 25-Year event
Inflow = 0.09 cfs @ 12.07 hrs, Volume= 0.006 af
Outflow = 0.09 cfs @ 12.07 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach R2: Reach 2

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Post-Construction Runoff
Type III 24-hr 25-Year Rainfall=6.41"
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Summary for Pond Lot 3: Roof Recharge

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 6.17" for 25-Year event
Inflow = 0.37 cfs @ 12.07 hrs, Volume= 0.029 af
Outflow = 0.02 cfs @ 10.18 hrs, Volume= 0.025 af, Atten= 95%, Lag= 0.0 min
Discarded = 0.02 cfs @ 10.18 hrs, Volume= 0.025 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 105.72' @ 14.12 hrs Surf.Area= 0.007 ac Storage= 0.013 af

Plug-Flow detention time= 235.3 min calculated for 0.025 af (86% of inflow)
Center-of-Mass det. time= 172.4 min (915.2 - 742.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	103.00'	0.007 af	30.50'W x 10.50'L x 3.54'H Field A 0.026 af Overall - 0.009 af Embedded = 0.017 af x 40.0% Voids
#2A	103.50'	0.009 af	Cultec R-330XLHD x 6 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 6 rows
		0.016 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	103.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	108.00'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 10.18 hrs HW=103.05' (Free Discharge)
↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
↑2=Orifice/Grate (Controls 0.00 cfs)

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Post-Construction Runoff
Type III 24-hr 25-Year Rainfall=6.41"

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Pond Lot 3: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 6 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

1 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 8.50' Row Length +12.0" End Stone x 2 = 10.50' Base Length

6 Rows x 52.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.50' Base Width

6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

6 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 6 Rows = 380.0 cf Chamber Storage

1,134.2 cf Field - 380.0 cf Chambers = 754.2 cf Stone x 40.0% Voids = 301.7 cf Stone Storage

Chamber Storage + Stone Storage = 681.7 cf = 0.016 af

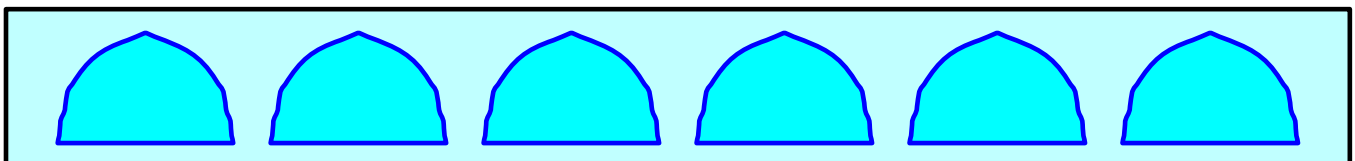
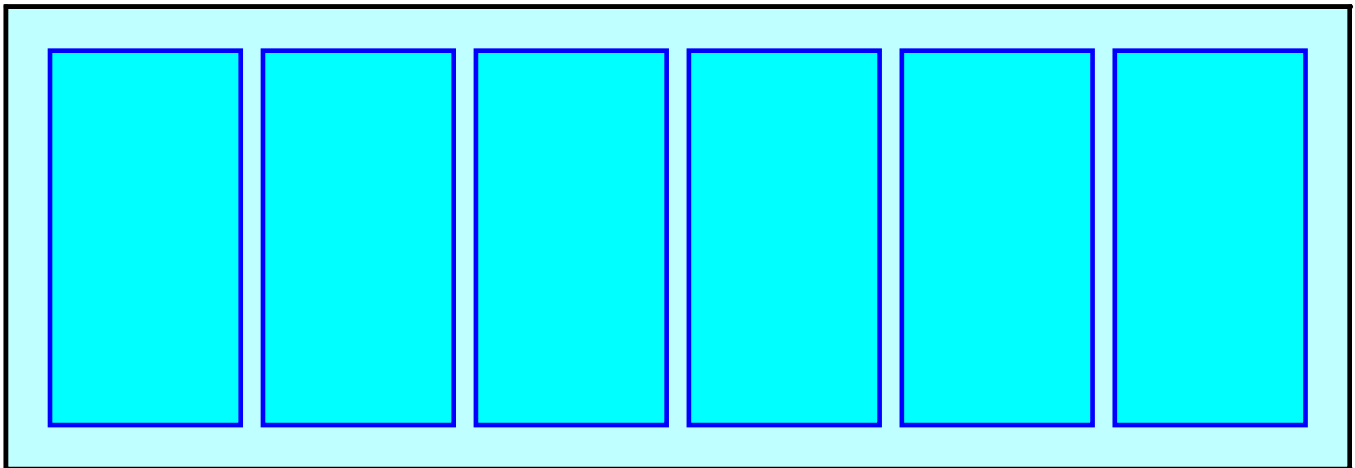
Overall Storage Efficiency = 60.1%

Overall System Size = 10.50' x 30.50' x 3.54'

6 Chambers

42.0 cy Field

27.9 cy Stone



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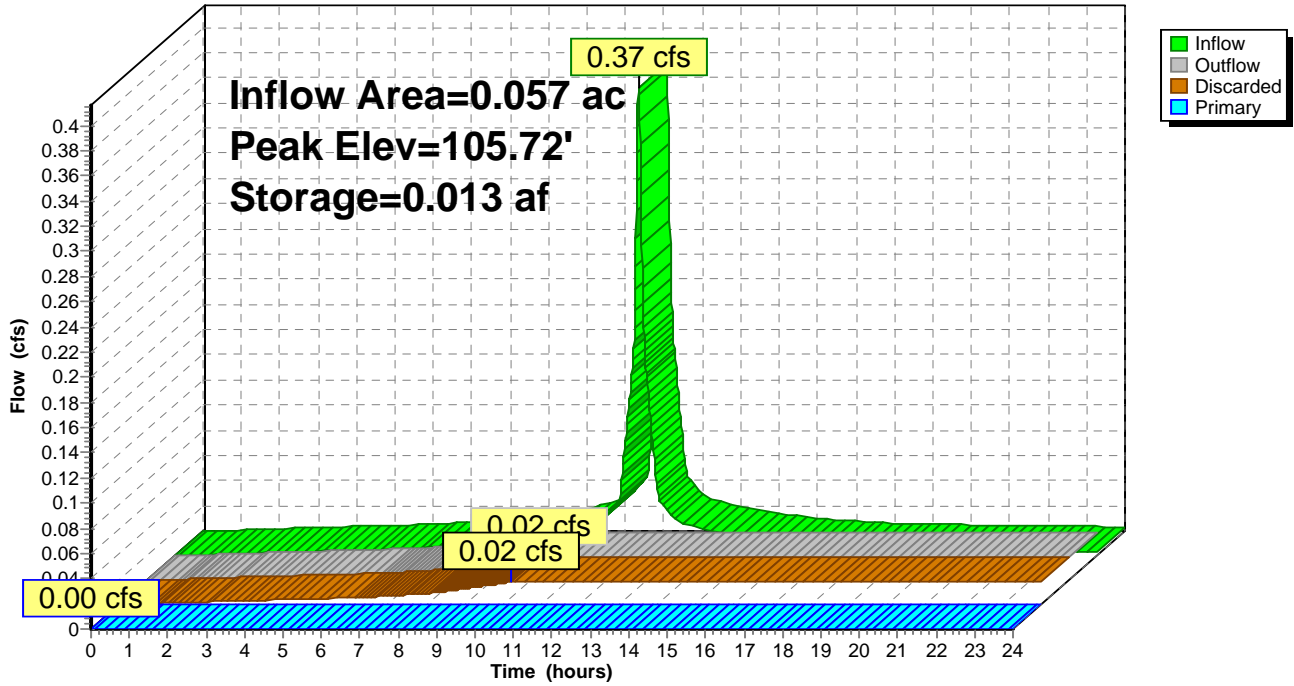
Post-Construction Runoff
Type III 24-hr 25-Year Rainfall=6.41"

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Pond Lot 3: Roof Recharge

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Post-Construction Runoff

Type III 24-hr 25-Year Rainfall=6.41"

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Summary for Pond Lot 4: Roof Recharge

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 6.17" for 25-Year event
Inflow = 0.37 cfs @ 12.07 hrs, Volume= 0.029 af
Outflow = 0.02 cfs @ 10.18 hrs, Volume= 0.025 af, Atten= 95%, Lag= 0.0 min
Discarded = 0.02 cfs @ 10.18 hrs, Volume= 0.025 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 105.72' @ 14.12 hrs Surf.Area= 0.007 ac Storage= 0.013 af

Plug-Flow detention time= 235.3 min calculated for 0.025 af (86% of inflow)
Center-of-Mass det. time= 172.4 min (915.2 - 742.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	103.00'	0.007 af	30.50'W x 10.50'L x 3.54'H Field A 0.026 af Overall - 0.009 af Embedded = 0.017 af x 40.0% Voids
#2A	103.50'	0.009 af	Cultec R-330XLHD x 6 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 6 rows
		0.016 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	103.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	108.00'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 10.18 hrs HW=103.05' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)

↑**2=Orifice/Grate** (Controls 0.00 cfs)

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Post-Construction Runoff
Type III 24-hr 25-Year Rainfall=6.41"

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Pond Lot 4: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 6 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

1 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 8.50' Row Length +12.0" End Stone x 2 = 10.50' Base Length

6 Rows x 52.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.50' Base Width

6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

6 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 6 Rows = 380.0 cf Chamber Storage

1,134.2 cf Field - 380.0 cf Chambers = 754.2 cf Stone x 40.0% Voids = 301.7 cf Stone Storage

Chamber Storage + Stone Storage = 681.7 cf = 0.016 af

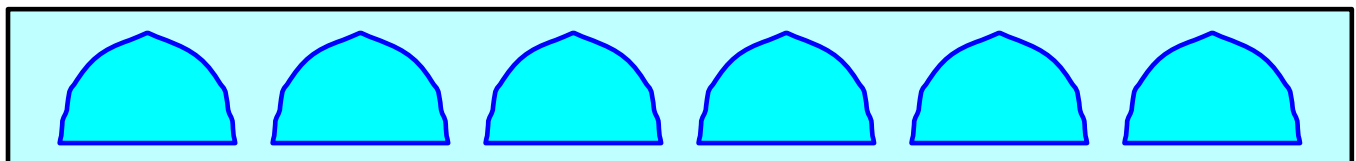
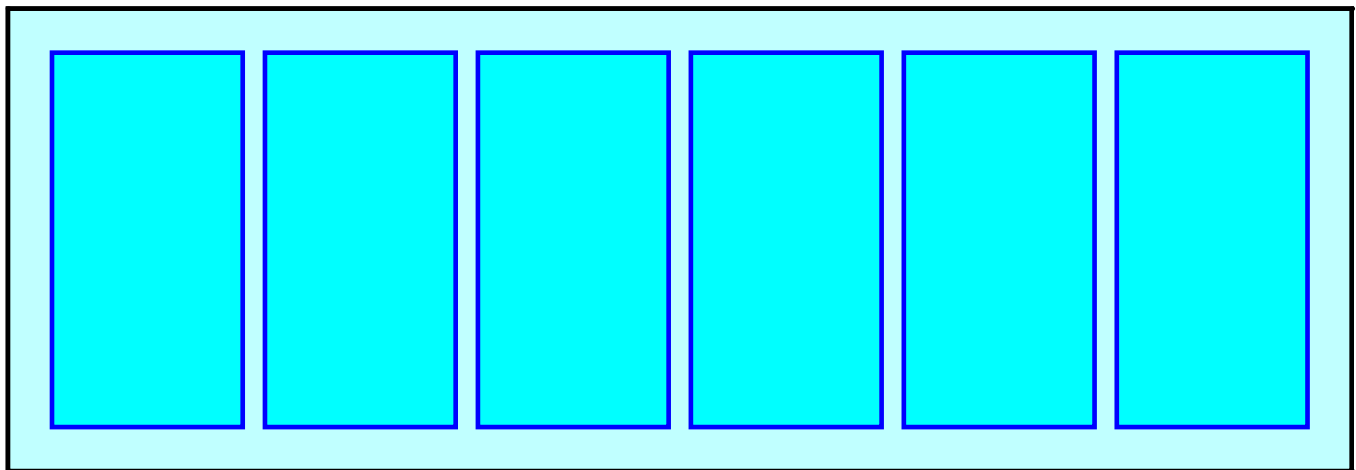
Overall Storage Efficiency = 60.1%

Overall System Size = 10.50' x 30.50' x 3.54'

6 Chambers

42.0 cy Field

27.9 cy Stone



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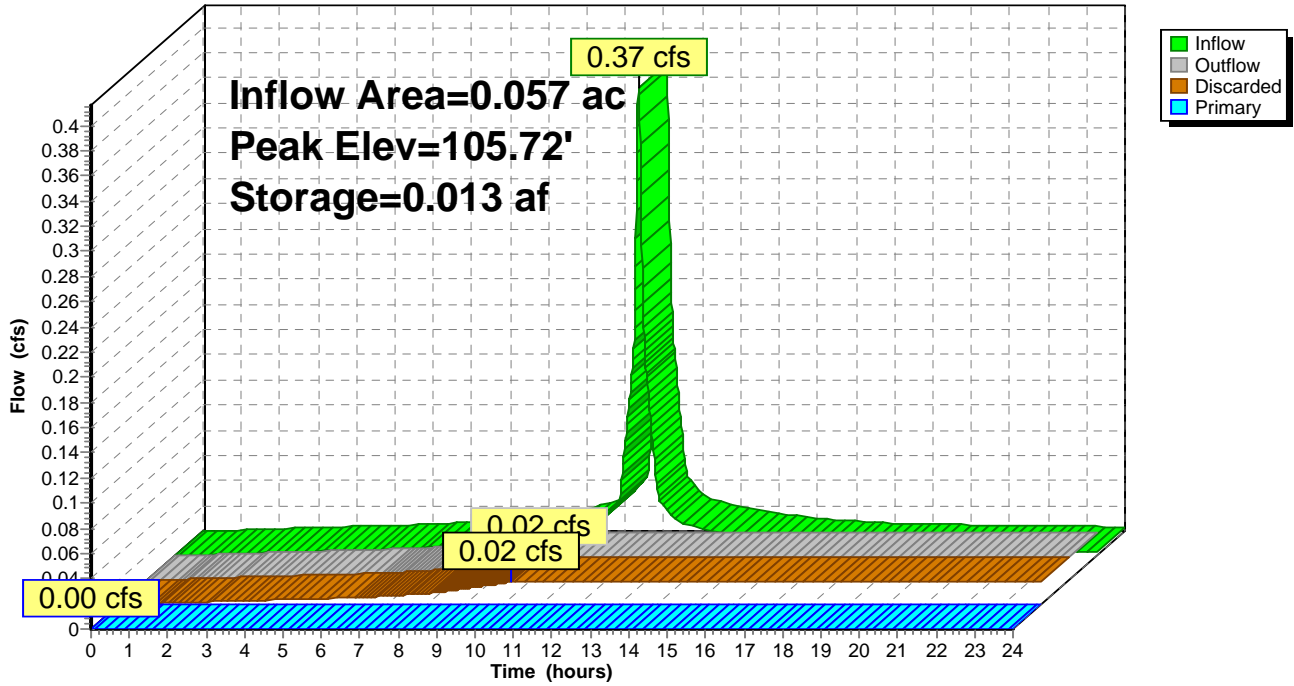
Post-Construction Runoff
Type III 24-hr 25-Year Rainfall=6.41"

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Pond Lot 4: Roof Recharge

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Post-Construction Runoff
Type III 24-hr 25-Year Rainfall=6.41"

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Summary for Pond PR1: Recharge 1

Inflow Area = 1.077 ac, 34.35% Impervious, Inflow Depth > 4.25" for 25-Year event
 Inflow = 4.46 cfs @ 12.16 hrs, Volume= 0.382 af
 Outflow = 0.24 cfs @ 15.26 hrs, Volume= 0.260 af, Atten= 95%, Lag= 186.3 min
 Discarded = 0.22 cfs @ 10.86 hrs, Volume= 0.260 af
 Primary = 0.02 cfs @ 15.26 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 108.01' @ 15.26 hrs Surf.Area= 0.089 ac Storage= 0.204 af

Plug-Flow detention time= 284.0 min calculated for 0.260 af (68% of inflow)
 Center-of-Mass det. time= 189.1 min (1,001.8 - 812.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	103.00'	0.075 af	74.00'W x 52.50'L x 3.54'H Field A 0.316 af Overall - 0.130 af Embedded = 0.186 af x 40.0% Voids
#2A	103.50'	0.130 af	Cultec R-330XLHD x 105 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 15 rows
		0.204 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	103.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	108.00'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.22 cfs @ 10.86 hrs HW=103.05' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.22 cfs)

Primary OutFlow Max=0.01 cfs @ 15.26 hrs HW=108.01' (Free Discharge)
 ↑2=Orifice/Grate (Weir Controls 0.01 cfs @ 0.32 fps)

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Post-Construction Runoff
Type III 24-hr 25-Year Rainfall=6.41"

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Pond PR1: Recharge 1 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 15 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

7 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 50.50' Row Length +12.0" End Stone x 2 = 52.50' Base Length

15 Rows x 52.0" Wide + 6.0" Spacing x 14 + 12.0" Side Stone x 2 = 74.00' Base Width

6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

105 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 15 Rows = 5,644.1 cf Chamber Storage

13,759.4 cf Field - 5,644.1 cf Chambers = 8,115.2 cf Stone x 40.0% Voids = 3,246.1 cf Stone Storage

Chamber Storage + Stone Storage = 8,890.2 cf = 0.204 af

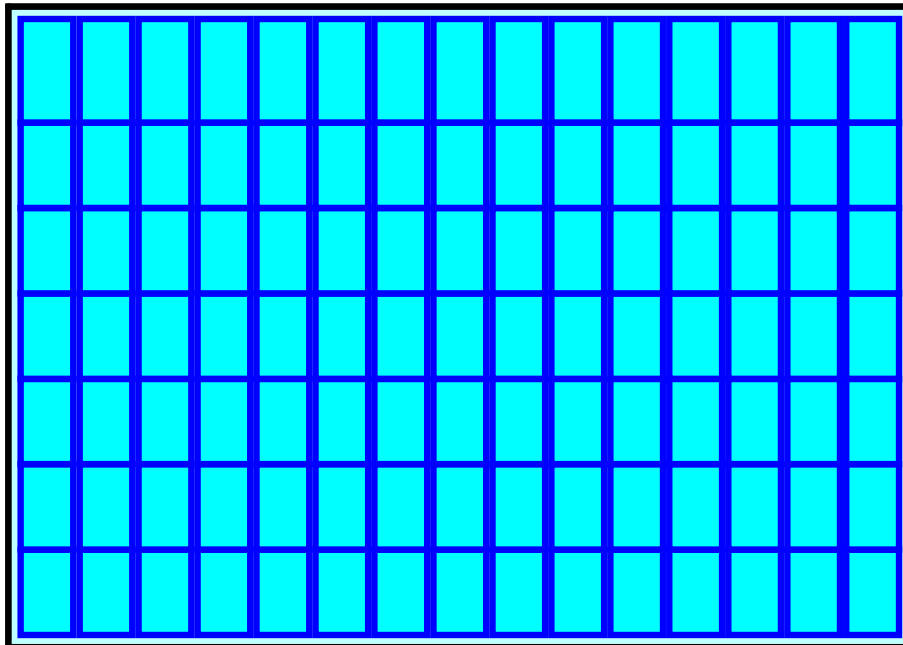
Overall Storage Efficiency = 64.6%

Overall System Size = 52.50' x 74.00' x 3.54'

105 Chambers

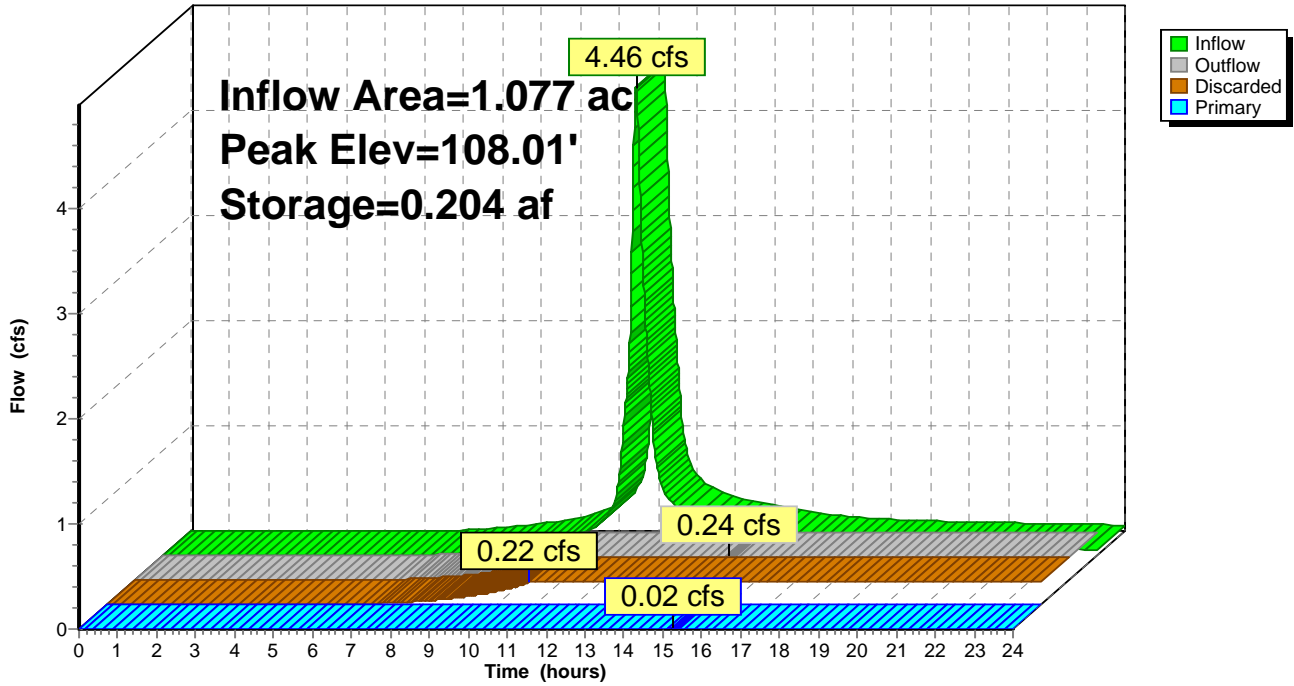
509.6 cy Field

300.6 cy Stone



Pond PR1: Recharge 1

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Post-Construction Runoff
 Type III 24-hr 100-Year Rainfall=8.24"
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Summary for Subcatchment P1A: Directed East

Runoff = 1.55 cfs @ 12.16 hrs, Volume= 0.144 af, Depth> 2.17"

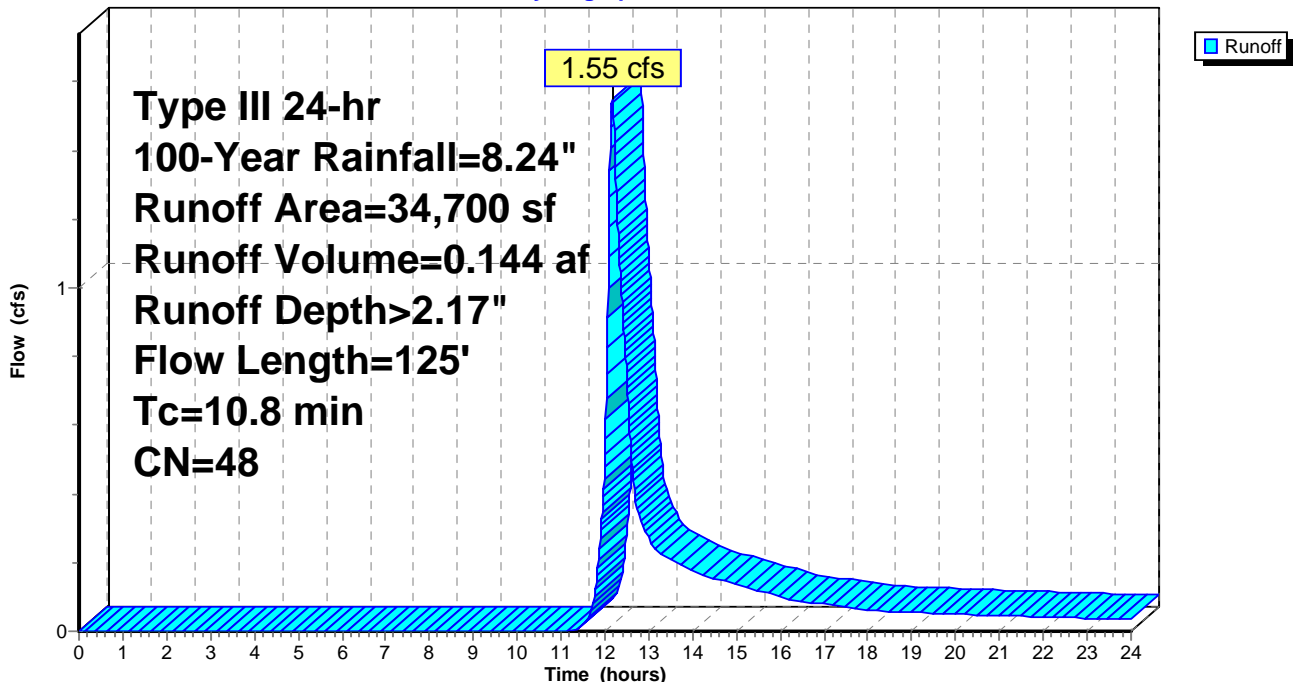
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-Year Rainfall=8.24"

Area (sf)	CN	Description
* 2,854	98	Impervious
14,380	39	>75% Grass cover, Good, HSG A
11,288	30	Woods, Good, HSG A
3,734	74	>75% Grass cover, Good, HSG C
111	70	Woods, Good, HSG C
2,333	80	>75% Grass cover, Good, HSG D
34,700	48	Weighted Average
31,846		91.78% Pervious Area
2,854		8.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	50	0.1400	0.08		Sheet Flow, Sheet Flow Woods Woods: Dense underbrush n= 0.800 P2= 3.10"
0.8	75	0.1067	1.63		Shallow Concentrated Flow, Concentrated Woods Woodland Kv= 5.0 fps
10.8	125	Total			

Subcatchment P1A: Directed East

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Type III 24-hr 100-Year Rainfall=8.24"

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Summary for Subcatchment P1B: To Recharge 1

Runoff = 6.18 cfs @ 12.15 hrs, Volume= 0.535 af, Depth> 5.96"

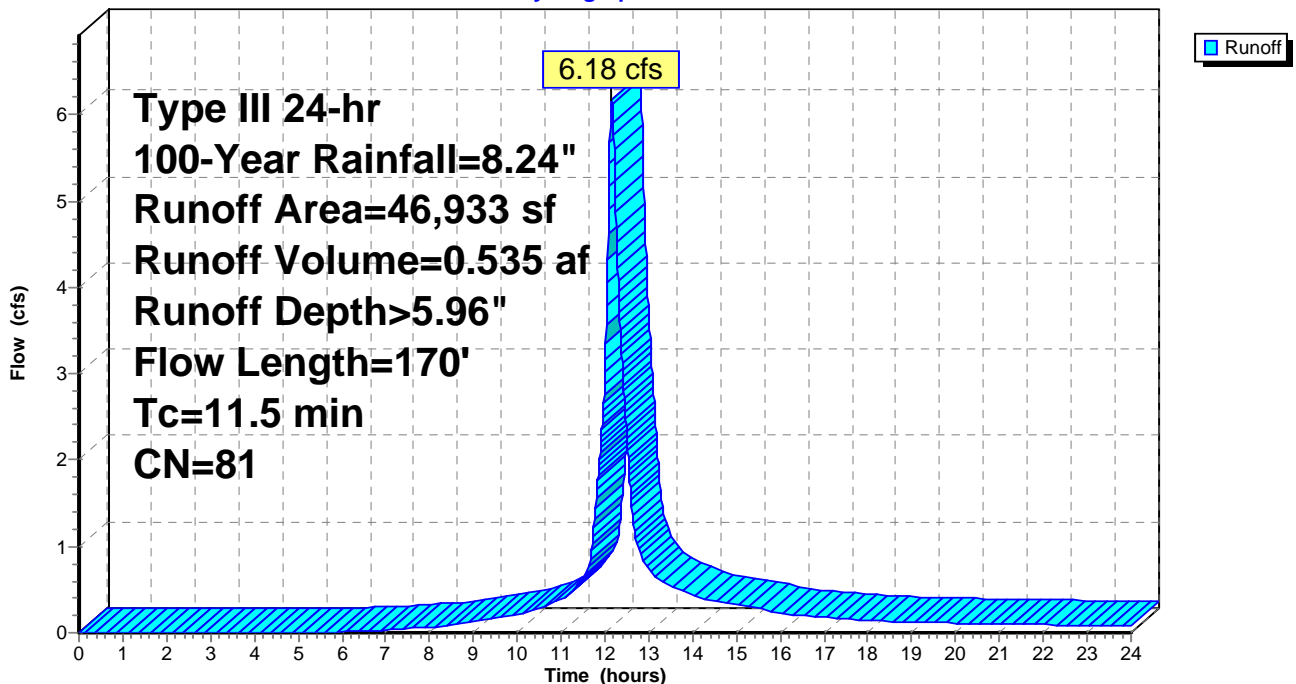
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.24"

Area (sf)	CN	Description
* 16,120	98	Impervious
989	39	>75% Grass cover, Good, HSG A
21,312	74	>75% Grass cover, Good, HSG C
8,215	70	Woods, Good, HSG C
297	80	>75% Grass cover, Good, HSG D
46,933	81	Weighted Average
30,813		65.65% Pervious Area
16,120		34.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	50	0.1400	0.08		Sheet Flow, Wood Sheet Flow Woods: Dense underbrush n= 0.800 P2= 3.10"
1.5	120	0.0750	1.37		Shallow Concentrated Flow, Woods Concentrated Flow Woodland Kv= 5.0 fps
11.5	170	Total			

Subcatchment P1B: To Recharge 1

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Post-Construction Runoff
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Summary for Subcatchment P2: Directed West

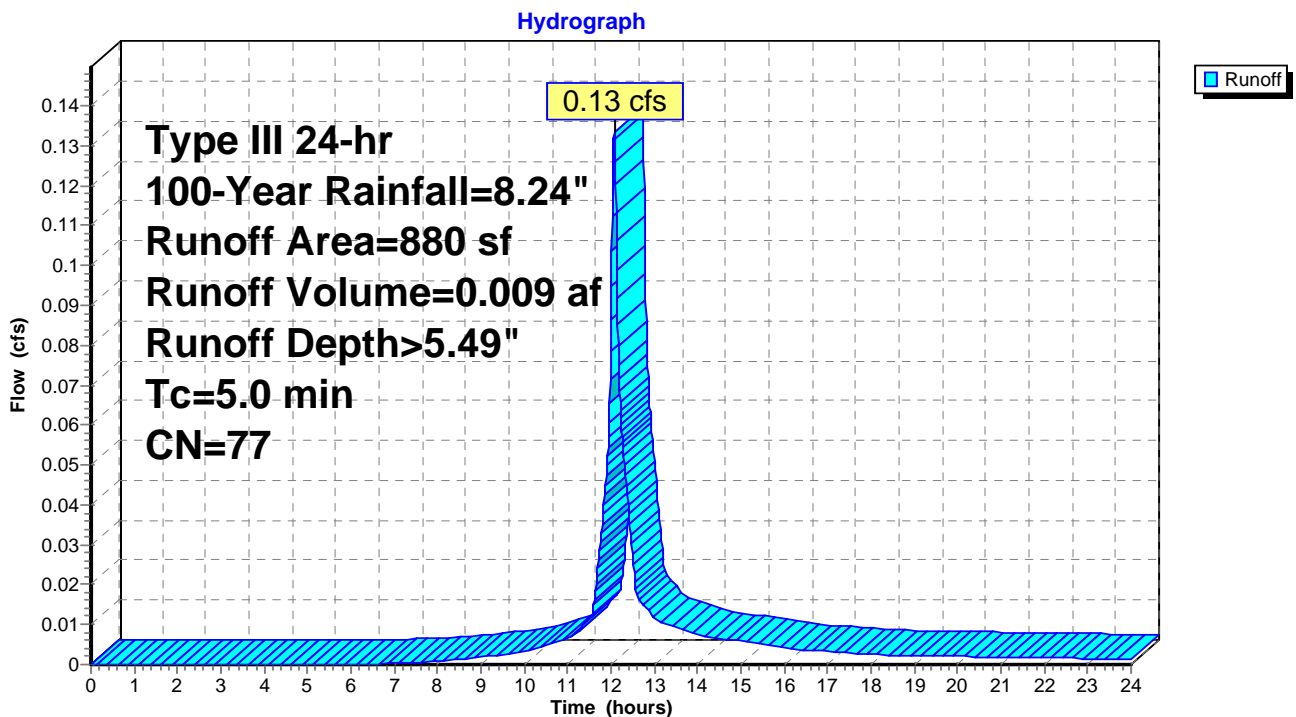
Runoff = 0.13 cfs @ 12.07 hrs, Volume= 0.009 af, Depth> 5.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-Year Rainfall=8.24"

Area (sf)	CN	Description
473	74	>75% Grass cover, Good, HSG C
407	80	>75% Grass cover, Good, HSG D
880	77	Weighted Average
880		100.00% Pervious Area

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

Subcatchment P2: Directed West



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Post-Construction Runoff
Type III 24-hr 100-Year Rainfall=8.24"
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Summary for Subcatchment RR3: Roof Runoff - Lot 3

Runoff = 0.48 cfs @ 12.07 hrs, Volume= 0.038 af, Depth> 7.99"

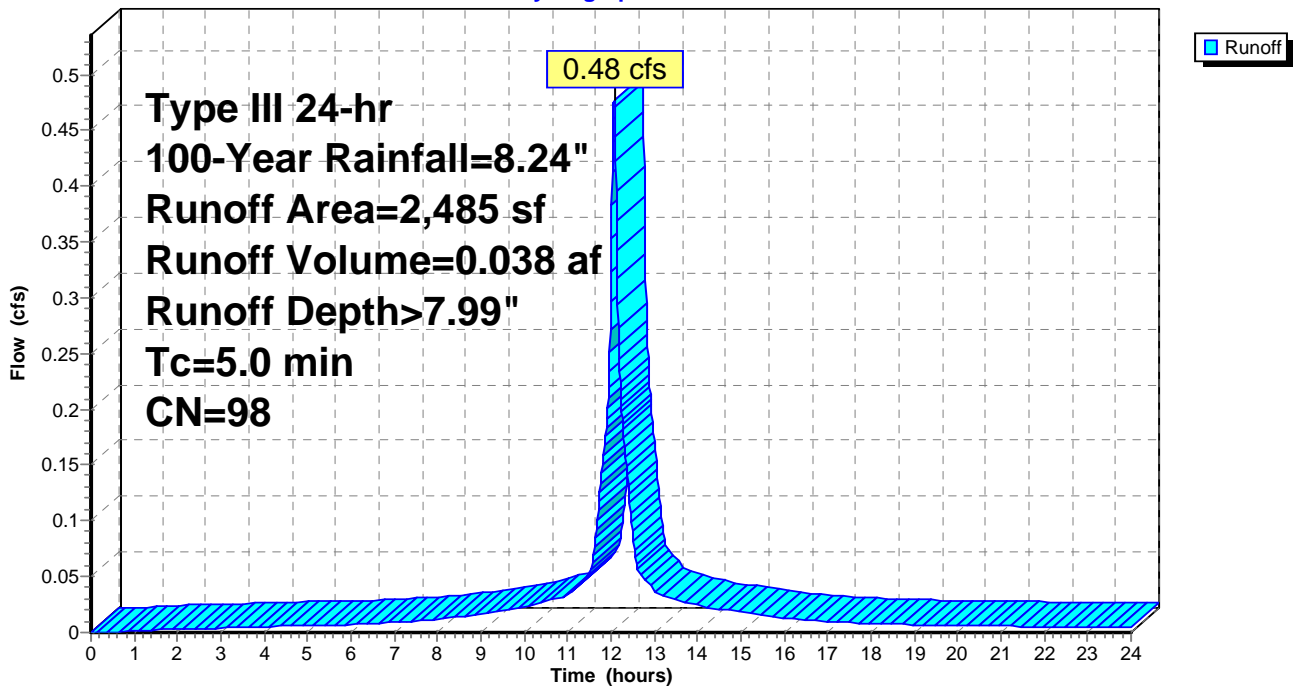
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.24"

Area (sf)	CN	Description
* 2,485	98	Roof
2,485		100.00% Impervious Area

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

Subcatchment RR3: Roof Runoff - Lot 3

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Post-Construction Runoff

Type III 24-hr 100-Year Rainfall=8.24"

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Summary for Subcatchment RR4: Roof Runoff - Lot 4

Runoff = 0.48 cfs @ 12.07 hrs, Volume= 0.038 af, Depth> 7.99"

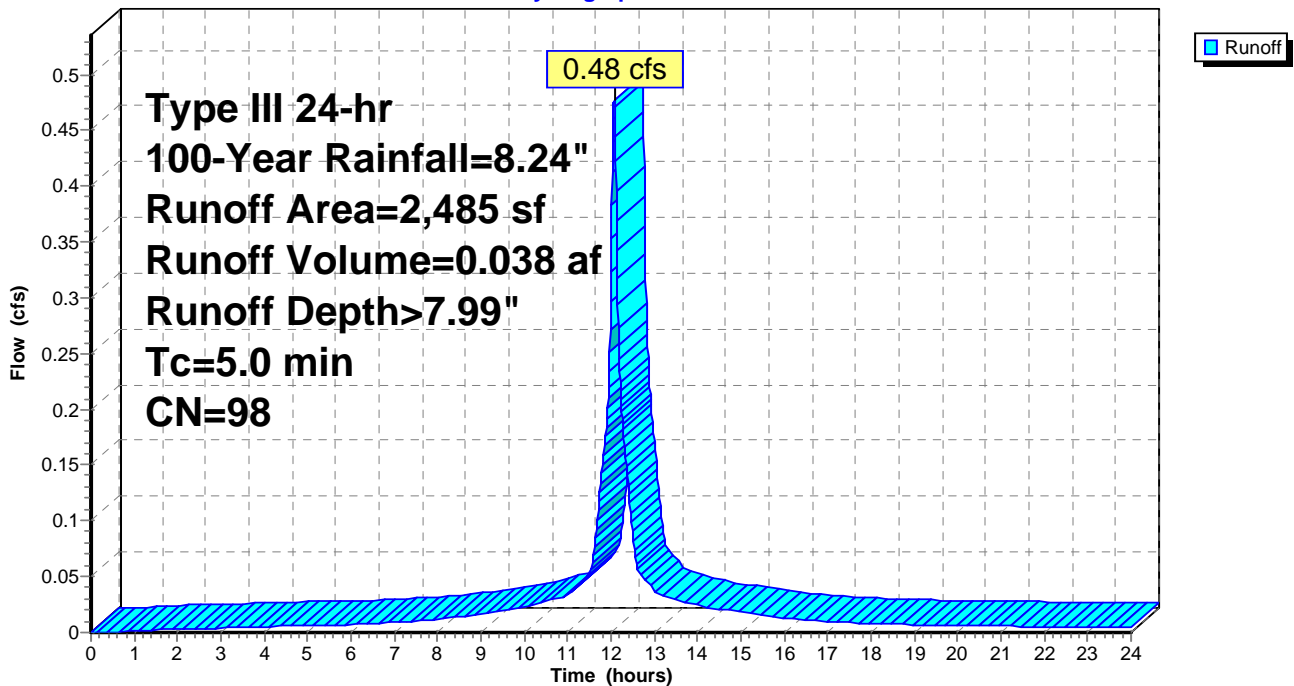
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.24"

Area (sf)	CN	Description
* 2,485	98	Roof
2,485		100.00% Impervious Area

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

Subcatchment RR4: Roof Runoff - Lot 4

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Post-Construction Runoff

Type III 24-hr 100-Year Rainfall=8.24"

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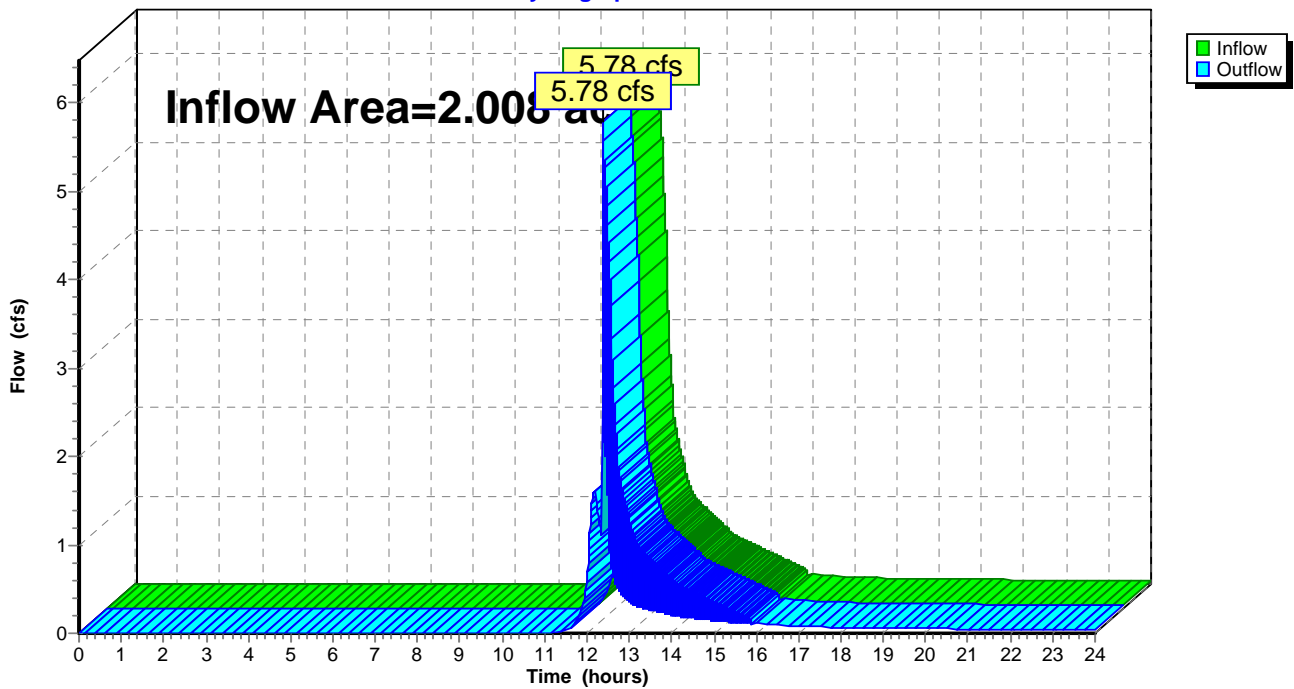
Summary for Reach P: Total

Inflow Area = 2.008 ac, 27.37% Impervious, Inflow Depth > 1.65" for 100-Year event
Inflow = 5.78 cfs @ 12.37 hrs, Volume= 0.276 af
Outflow = 5.78 cfs @ 12.37 hrs, Volume= 0.276 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach P: Total

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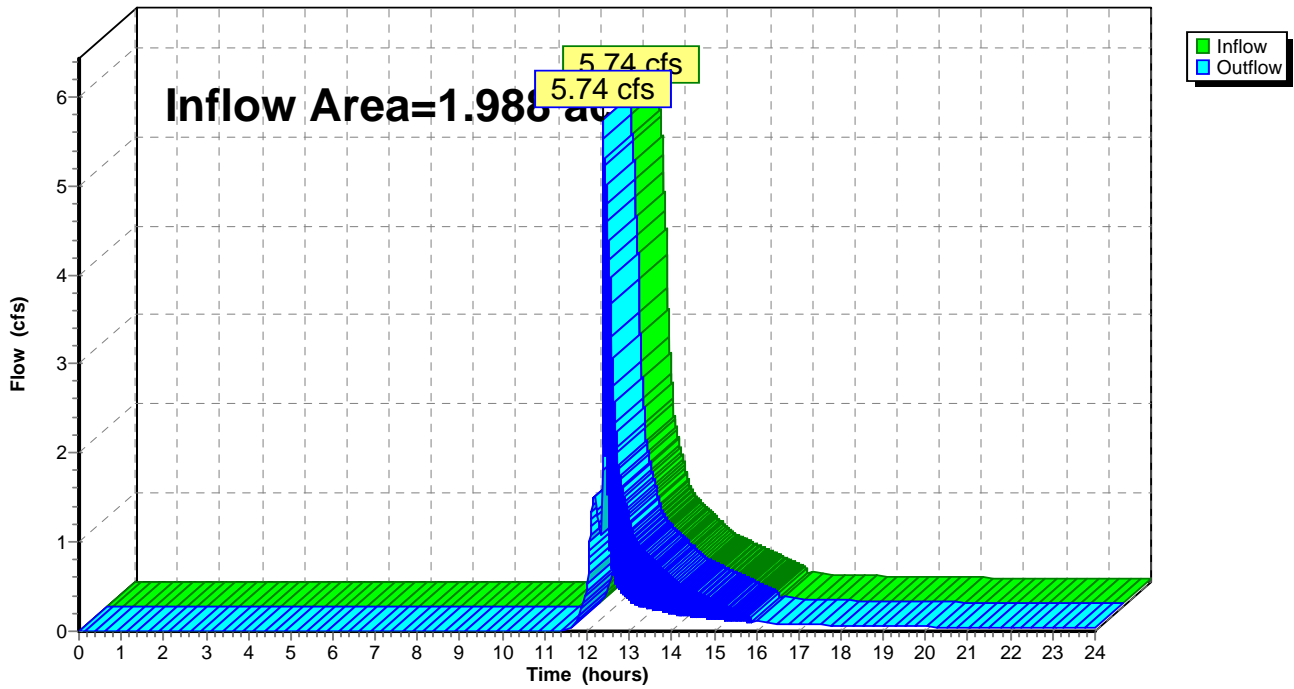
Summary for Reach R1: Reach 1

Inflow Area = 1.988 ac, 27.65% Impervious, Inflow Depth > 1.61" for 100-Year event
Inflow = 5.74 cfs @ 12.37 hrs, Volume= 0.267 af
Outflow = 5.74 cfs @ 12.37 hrs, Volume= 0.267 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach R1: Reach 1

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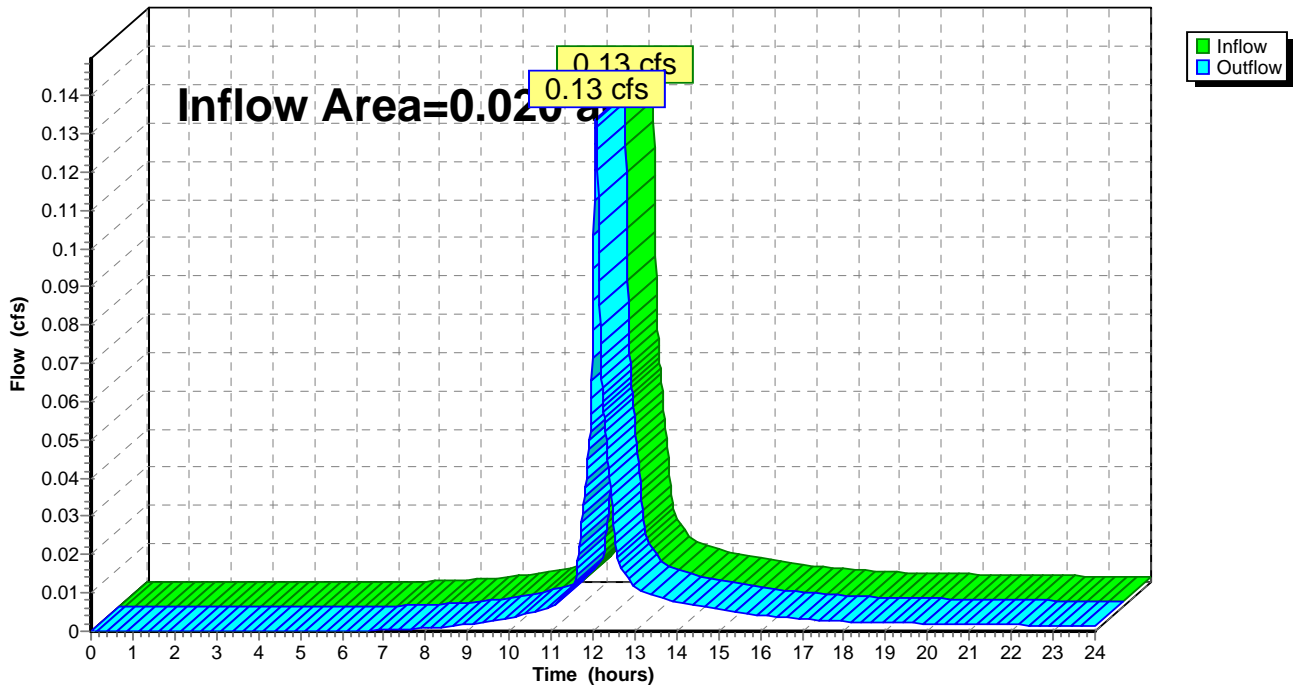
Summary for Reach R2: Reach 2

Inflow Area = 0.020 ac, 0.00% Impervious, Inflow Depth > 5.49" for 100-Year event
Inflow = 0.13 cfs @ 12.07 hrs, Volume= 0.009 af
Outflow = 0.13 cfs @ 12.07 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach R2: Reach 2

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Summary for Pond Lot 3: Roof Recharge

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 7.99" for 100-Year event
Inflow = 0.48 cfs @ 12.07 hrs, Volume= 0.038 af
Outflow = 0.16 cfs @ 12.42 hrs, Volume= 0.030 af, Atten= 67%, Lag= 21.1 min
Discarded = 0.02 cfs @ 9.27 hrs, Volume= 0.027 af
Primary = 0.14 cfs @ 12.42 hrs, Volume= 0.003 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 108.06' @ 12.42 hrs Surf.Area= 0.007 ac Storage= 0.016 af

Plug-Flow detention time= 216.4 min calculated for 0.030 af (79% of inflow)
Center-of-Mass det. time= 135.8 min (875.3 - 739.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	103.00'	0.007 af	30.50'W x 10.50'L x 3.54'H Field A 0.026 af Overall - 0.009 af Embedded = 0.017 af x 40.0% Voids
#2A	103.50'	0.009 af	Cultec R-330XLHD x 6 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 6 rows
		0.016 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	103.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	108.00'	12.0" Horiz. Orifice/Gate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 9.27 hrs HW=103.05' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.12 cfs @ 12.42 hrs HW=108.05' (Free Discharge)
↑**2=Orifice/Gate** (Weir Controls 0.12 cfs @ 0.74 fps)

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Post-Construction Runoff

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Pond Lot 3: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 6 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

1 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 8.50' Row Length +12.0" End Stone x 2 = 10.50' Base Length

6 Rows x 52.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.50' Base Width

6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

6 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 6 Rows = 380.0 cf Chamber Storage

1,134.2 cf Field - 380.0 cf Chambers = 754.2 cf Stone x 40.0% Voids = 301.7 cf Stone Storage

Chamber Storage + Stone Storage = 681.7 cf = 0.016 af

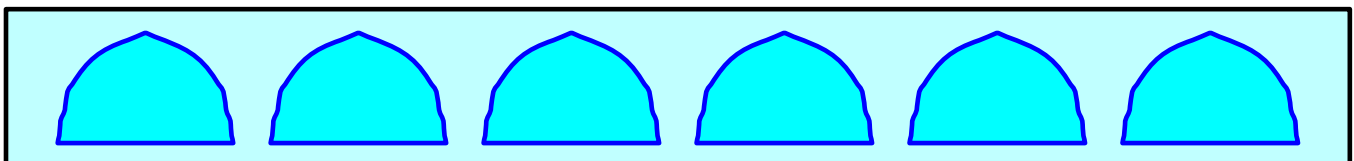
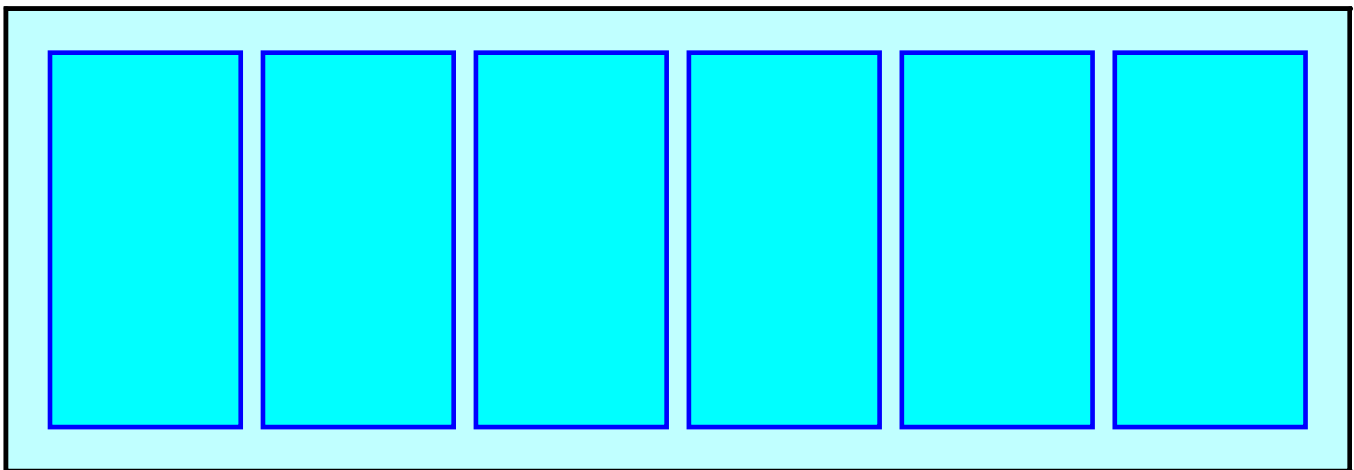
Overall Storage Efficiency = 60.1%

Overall System Size = 10.50' x 30.50' x 3.54'

6 Chambers

42.0 cy Field

27.9 cy Stone



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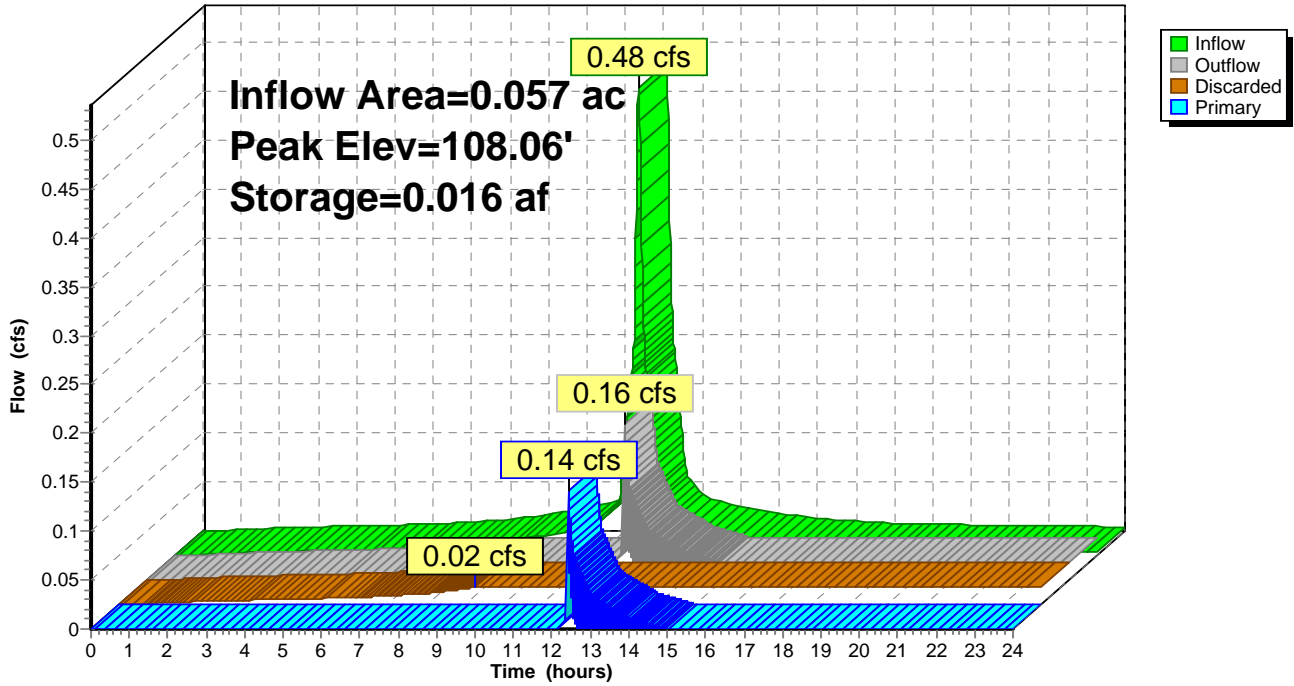
Post-Construction Runoff
Type III 24-hr 100-Year Rainfall=8.24"

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Pond Lot 3: Roof Recharge

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Summary for Pond Lot 4: Roof Recharge

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 7.99" for 100-Year event
Inflow = 0.48 cfs @ 12.07 hrs, Volume= 0.038 af
Outflow = 0.16 cfs @ 12.42 hrs, Volume= 0.030 af, Atten= 67%, Lag= 21.1 min
Discarded = 0.02 cfs @ 9.27 hrs, Volume= 0.027 af
Primary = 0.14 cfs @ 12.42 hrs, Volume= 0.003 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 108.06' @ 12.42 hrs Surf.Area= 0.007 ac Storage= 0.016 af

Plug-Flow detention time= 216.4 min calculated for 0.030 af (79% of inflow)
Center-of-Mass det. time= 135.8 min (875.3 - 739.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	103.00'	0.007 af	30.50'W x 10.50'L x 3.54'H Field A 0.026 af Overall - 0.009 af Embedded = 0.017 af x 40.0% Voids
#2A	103.50'	0.009 af	Cultec R-330XLHD x 6 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 6 rows
		0.016 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	103.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	108.00'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 9.27 hrs HW=103.05' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.12 cfs @ 12.42 hrs HW=108.05' (Free Discharge)
↑**2=Orifice/Grate** (Weir Controls 0.12 cfs @ 0.74 fps)

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Type III 24-hr 100-Year Rainfall=8.24"

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Pond Lot 4: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 6 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

1 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 8.50' Row Length +12.0" End Stone x 2 = 10.50' Base Length

6 Rows x 52.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.50' Base Width

6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

6 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 6 Rows = 380.0 cf Chamber Storage

1,134.2 cf Field - 380.0 cf Chambers = 754.2 cf Stone x 40.0% Voids = 301.7 cf Stone Storage

Chamber Storage + Stone Storage = 681.7 cf = 0.016 af

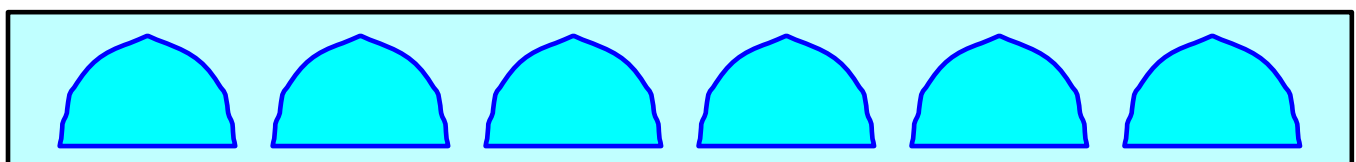
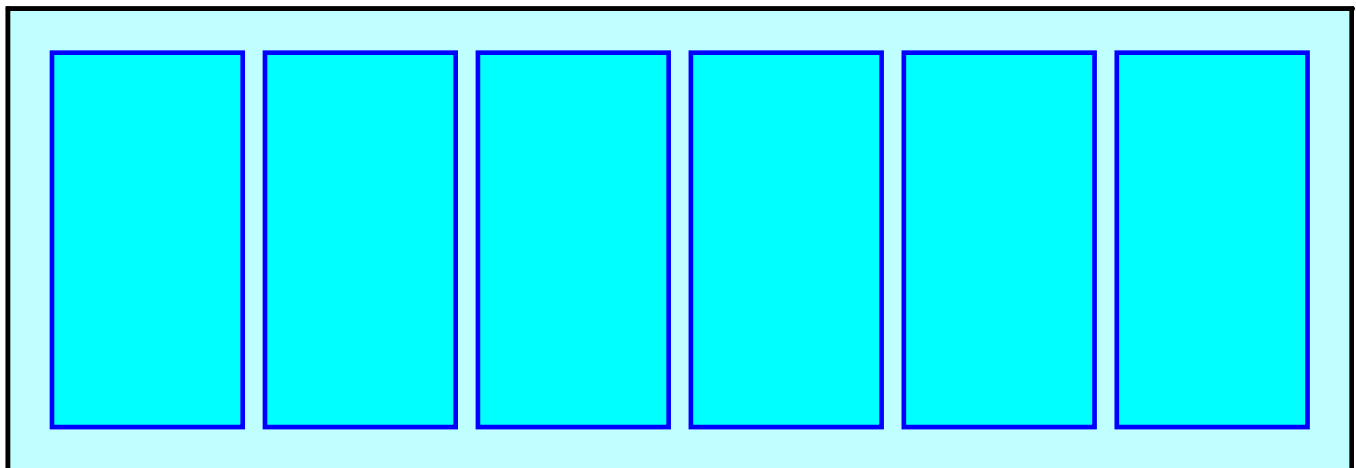
Overall Storage Efficiency = 60.1%

Overall System Size = 10.50' x 30.50' x 3.54'

6 Chambers

42.0 cy Field

27.9 cy Stone



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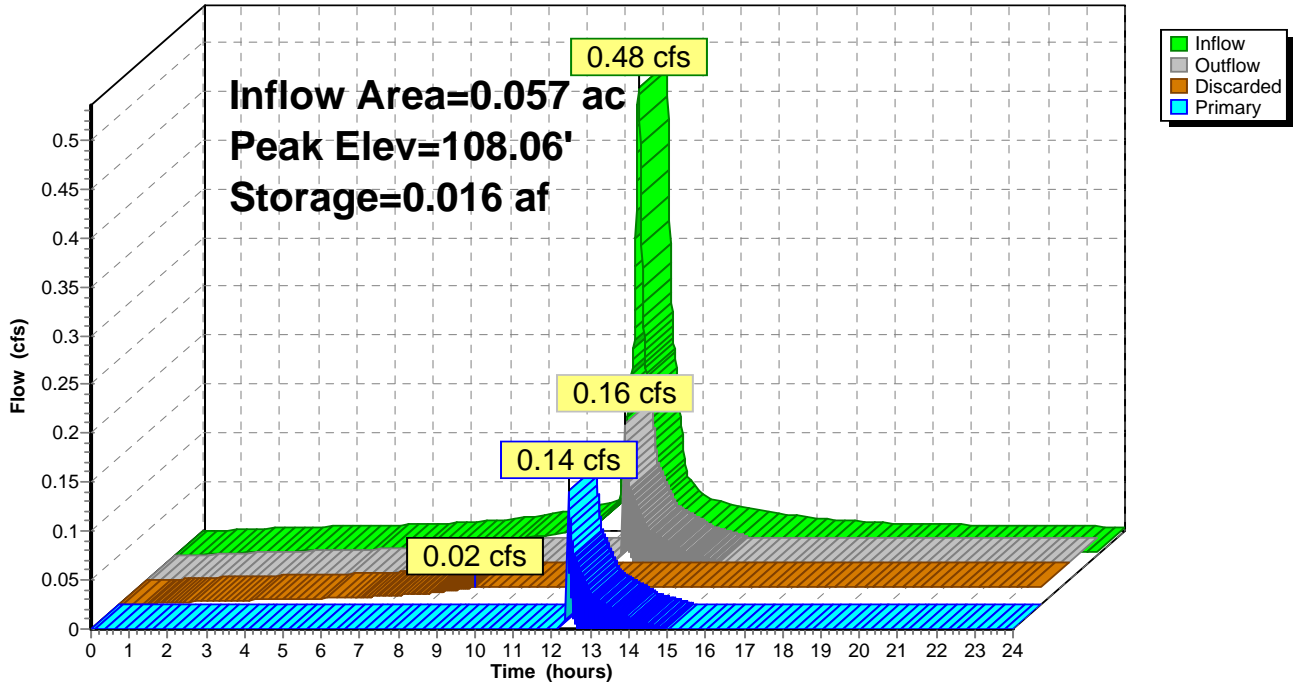
Post-Construction Runoff
Type III 24-hr 100-Year Rainfall=8.24"

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Pond Lot 4: Roof Recharge

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Summary for Pond PR1: Recharge 1

Inflow Area = 1.077 ac, 34.35% Impervious, Inflow Depth > 5.96" for 100-Year event
Inflow = 6.18 cfs @ 12.15 hrs, Volume= 0.535 af
Outflow = 4.96 cfs @ 12.37 hrs, Volume= 0.393 af, Atten= 20%, Lag= 13.0 min
Discarded = 0.22 cfs @ 10.11 hrs, Volume= 0.277 af
Primary = 4.74 cfs @ 12.37 hrs, Volume= 0.116 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 109.57' @ 12.37 hrs Surf.Area= 0.089 ac Storage= 0.204 af

Plug-Flow detention time= 202.2 min calculated for 0.393 af (73% of inflow)
Center-of-Mass det. time= 115.6 min (918.9 - 803.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	103.00'	0.075 af	74.00'W x 52.50'L x 3.54'H Field A 0.316 af Overall - 0.130 af Embedded = 0.186 af x 40.0% Voids
#2A	103.50'	0.130 af	Cultec R-330XLHD x 105 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 15 rows
		0.204 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	103.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	108.00'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.22 cfs @ 10.11 hrs HW=103.05' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.22 cfs)

Primary OutFlow Max=4.74 cfs @ 12.37 hrs HW=109.57' (Free Discharge)
↑**2=Orifice/Grate** (Orifice Controls 4.74 cfs @ 6.04 fps)

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Pond PR1: Recharge 1 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 15 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

7 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 50.50' Row Length +12.0" End Stone x 2 = 52.50' Base Length

15 Rows x 52.0" Wide + 6.0" Spacing x 14 + 12.0" Side Stone x 2 = 74.00' Base Width

6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

105 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 15 Rows = 5,644.1 cf Chamber Storage

13,759.4 cf Field - 5,644.1 cf Chambers = 8,115.2 cf Stone x 40.0% Voids = 3,246.1 cf Stone Storage

Chamber Storage + Stone Storage = 8,890.2 cf = 0.204 af

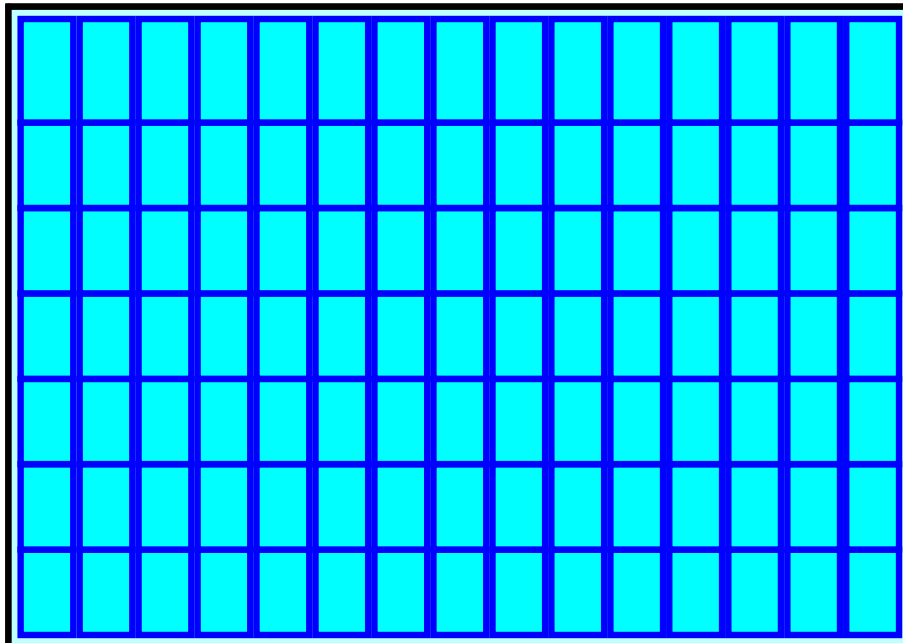
Overall Storage Efficiency = 64.6%

Overall System Size = 52.50' x 74.00' x 3.54'

105 Chambers

509.6 cy Field

300.6 cy Stone



Pond PR1: Recharge 1

Hydrograph

