Robinson+Cole

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

Also admitted in Massachusetts

November 30, 2015

Via Hand Delivery

Melanie A. Bachman
Acting Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Docket No. 456 – Application of Cellco Partnership d/b/a Verizon Wireless ("Cellco") for a Certificate of Environmental Compatibility and Public Need for the Construction of a Wireless Telecommunications Facility at 33 Keegan Road, Plymouth, Connecticut – Development and Management Plan**

Dear Ms. Bachman:

Enclosed please find fifteen (15) copies of the following:

1. Final Development and Management ("D&M") Plans for the approved telecommunications facility at 33 Keegan Road in Plymouth, Connecticut incorporating the Council's conditions of approval. Also enclosed are four (4) full size (24" x 36") sets of D&M plans.

   Please note: Cellco intends to install three (3) equipment cabinets and a diesel-fueled generator on a 12' x 26' concrete pad and eliminate the shelter from the plan. Cellco will also install a stand-alone roof canopy over the equipment pad.

2. Geotechnical and Geophysical Testing Report prepared by DET dated September 2015 and Revised to November 2015.

3. Tower and Foundation Design Plans prepared by Engineered Endeavors Incorporated.

4. Stormwater Analysis Report prepared by Centek Engineering, Inc.

Together, this information constitutes the final D&M Plan submission for the approved 33 Keegan Road facility in Plymouth.

We respectfully request that this information be reviewed and this matter be placed on the next available Siting Council agenda for approval. Please feel free to contact me if you have any questions or require additional information. Thank you.

Sincerely,

Kenneth C. Baldwin

KCB/kmd
Enclosures
Copy to:
Mayor David V. Merchant, Town of Plymouth (*via Federal Express*)
Anthony Befera, Verizon Wireless
Brian Paul, Verizon Wireless
Elizabeth Jamieson, Verizon Wireless

Cellco Partnership

d.b.a. verizon wireless

WIRELESS COMMUNICATIONS FACILITY
DEVELOPMENT AND MANAGEMENT PLAN
PLYMOUTH WEST RELO.
33 KEEGAN ROAD
PLYMOUTH, CT 06782

SITE DIRECTIONS

FROM:	99 EAST RIVER DRIVE EAST HARTFORD, CONNECTICUT	TO:	33 KEEGAN ROAD PLYMOUTH, CONNECTICUT

1.	HEAD EAST ON E RIVER DR TOWARD DARLIN ST	0.3 MI.
2.	TURN LEFT TO STAY ON E RIVER DR	400 FT.
3.	TAKE THE 1ST LEFT ONTO CONNECTICUT BLVD	0.2 MI.
4.	TURN LEFT TO MERGE ONTO I-84	13.5 MI.
5.	TAKE EXIT 33 FOR CT-72 W TOWARD BRISTOL	0.3 MI.
6.	KEEP LEFT AT THE FORK AND MERGE ONTO CT-72 W	0.1 MI.
7.	MERGE ONTO CT-72 W	3.9 MI.
8.	TURN RIGHT ONTO CT-72	0.4 MI.
9.	TAKE THE 3RD RIGHT ONTO RIVERSIDE AVE	0.9 MI.
10.	TAKE THE 3RD LEFT ONTO MAIN ST	259 FT.
11.	TAKE THE 1ST RIGHT ONTO SCHOOL ST	0.4 MI.
12.	SLIGHT RIGHT ONTO PARK ST	1.0 MI.
13.	CONTINUE ONTO TERRYVILLE RD	1.2 MI.
14.	CONTINUE ONTO S RIVERSIDE AVE	0.9 MI.
15.	SLIGHT LEFT ONTO US-6 W/MAIN ST	2.9 MI.
16.	TURN LEFT ONTO CT-262	0.6 MI.
17.	SLIGHT LEFT ONTO KEEGAN RD, AND THE DESTINATION WILL BE ON THE LEFT	0.3 MI.

GENERAL NOTES

1. PROPOSED ANTENNA LOCATIONS AND HEIGHTS PROVIDED BY CELLCO PARTNERSHIP.

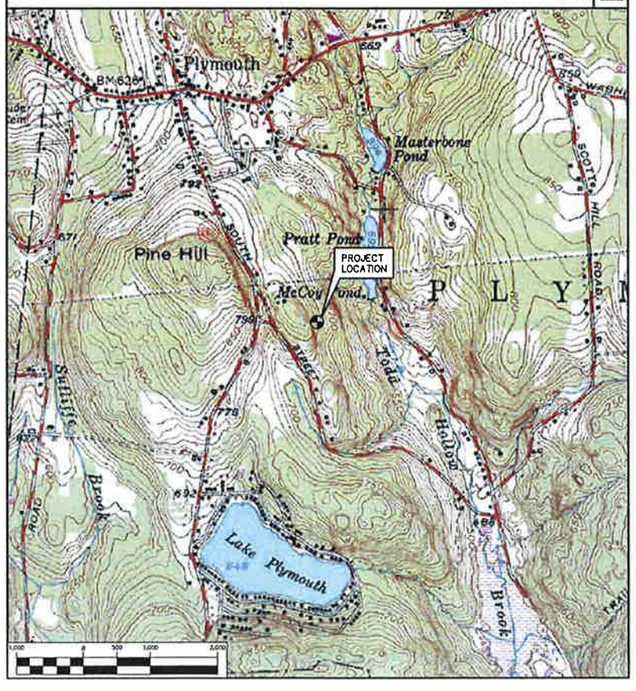
SITE INFORMATION

THE SCOPE OF WORK SHALL INCLUDE:

1. THE CONSTRUCTION OF A 50'x50' FENCED WIRELESS COMMUNICATIONS COMPOUND WITHIN A 100'x100' LEASE AREA.
2. A TOTAL OF UP TO TWELVE (12) DIRECTIONAL PANEL ANTENNAS ARE PROPOSED TO BE MOUNTED AT A CENTERLINE ELEVATION OF 140'-0"± AGL ON A 140'-0"± PROPOSED STEEL MONOPOLE TOWER.
3. TOTAL ACCESS DRIVE LENGTH IS 464'± OFF OF KEEGAN ROAD VIA A PROPOSED 12' WIDE GRAVEL ACCESS DRIVE.
4. POWER AND TELCO UTILITIES SHALL BE ROUTED UNDERGROUND FROM EXISTING RESPECTIVE DEMARCS TO THE PROPOSED UTILITY BACKBOARD LOCATED ADJACENT TO THE PROPOSED FENCED COMPOUND. FINAL DEMARC LOCATION AND UTILITY ROUTING TO PROPOSED BACKBOARD WILL BE VERIFIED/DETERMINED BY LOCAL UTILITY COMPANIES. UTILITIES WILL BE ROUTED UNDERGROUND FROM UTILITY BACKBOARD TO THE PROPOSED NOMINAL 12'x26' WIRELESS EQUIPMENT PAD LOCATED WITHIN FENCED COMPOUND AREA.
5. THE PROPOSED WIRELESS FACILITY INSTALLATION WILL BE DESIGNED IN ACCORDANCE WITH THE 2003 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2009 CONNECTICUT SUPPLEMENT.
6. THERE WILL NOT BE ANY LIGHTING UNLESS REQUIRED BY THE FCC OR THE FAA.
7. THERE WILL NOT BE ANY SIGNS OR ADVERTISING ON THE ANTENNAS OR EQUIPMENT.

VICINITY MAP

SCALE: 1" = 1000'



PROJECT SUMMARY

SITE NAME:	PLYMOUTH WEST RELO.
SITE ADDRESS:	33 KEEGAN ROAD PLYMOUTH, CT 06782
PROPERTY OWNER:	STEVEN A. WESTALL 41 KEEGAN ROAD PLYMOUTH, CT 06782
LESSEE/TENANT:	CELLCO PARTNERSHIP d.b.a. VERIZON WIRELESS 99 EAST RIVER DRIVE EAST HARTFORD, CT 06108
VERIZON SITE ACQUISITION CONTACT:	ALEKSEY TYURIN CELLCO PARTNERSHIP (860) 803-8213
LEGAL/REGULATORY COUNSEL:	KENNETH C. BALDWIN, ESQ. CELLCO PARTNERSHIP (860) 803-8213
TOWER COORDINATES:	LATITUDE 41°-39'-42.334" LONGITUDE 73°-02'-44.321" GROUND ELEVATION: 828.4'± A.M.S.L. COORDINATES AND GROUND ELEVATION REFERENCED FROM FAA 1-A SURVEY CERTIFICATION AS PREPARED BY MARTINEZ COUCH AND ASSOCIATES LLC, DATED JUNE 5, 2014, REVISED JANUARY 21, 2015.

SHEET INDEX

SHT. NO.	DESCRIPTION	REV. NO.
T-1	TITLE SHEET	1
C-1	PARTIAL SITE PLAN	1
C-1A	SITE UTILITY PLAN	1
C-2	COMPOUND PLAN, ELEVATION AND ANTENNA MOUNTING CONFIGURATION	1
C-3	SITE CONSTRUCTION, S&E CONTROL NOTES AND DETAILS	1
C-4	DRAINAGE CONTROL DETAILS AND SIGHTLINE PROFILE	1
C-5	SITE DETAILS	1
C-6	SITE DETAILS AND ENVIRONMENTAL NOTES	1
C-7	EQUIPMENT PAD AND ICE CANOPY DETAILS	1

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	11/24/15	HMR	DMD	DAM PLANS
0	11/17/15	HMR	DMD	DAM PLANS - ISSUED FOR CLIENT REVIEW

PROFESSIONAL ENGINEER

Cellco Partnership d.b.a. verizon wireless

CENTEK engineering
Centered on Solutions
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

Cellco Partnership d/b/a Verizon Wireless
WIRELESS COMMUNICATIONS FACILITY
PLYMOUTH WEST RELO.
33 KEEGAN ROAD
PLYMOUTH, CT 06782

DATE: 08/03/15
SCALE: AS NOTED
JOB NO. 13321.000

TITLE SHEET

T-1

Sheet No. 1 of 9

TRAFFIC CONTROL SIGNS			
Ⓐ	31-1601	QUANTITY – 1	NO LEFT TURN

ESTIMATED TREE REMOVAL SUMMARY

TREES PROPOSED TO BE REMOVED IN LOCATION ALONG PROPOSED CELLCO PARTNERSHIP ACCESS OR UTILITY EASEMENT	= 22
TREES PROPOSED TO BE REMOVED WITHIN AND AROUND THE PROPOSED CELLCO PARTNERSHIP LEASE AREA	= 6
TOTAL TREES PROPOSED TO BE REMOVED	= 28

SYMBOLS LEGEND

- PROPERTY LINE
- EASEMENT LINE (PROPOSED)
- EXISTING ROAD
- ACCESS DRIVE (PROPOSED)
- LEASE AREA (PROPOSED)
- 650 CONTOUR LINE
- 650 GRADING LINE
- UTILITY POLE
- EXISTING DECIDUOUS TREE
- EXISTING CONIFEROUS TREE
- EXISTING DICIDUOUS TREE TO BE REMOVED
- EXISTING CONIFEROUS TREE TO BE REMOVED
- COMPOST FILTER SOCK/STRAW WATTLE
- EXISTING TREE LINE
- FENCE LINE
- SPOT ELEVATION (PROPOSED)
- EXISTING STONE WALL
- WF# 1-04 WETLAND BOUNDARY
- SILTATION FENCE
- TLC TOP LEDGE CUT
- BLC BOTTOM LEDGE CUT

SURVEY NOTES

THIS SURVEY AND MAP HAS BEEN PREPARED IN ACCORDANCE WITH SECTIONS 20-300B-1 THRU 20-300B-20 OF THE REGULATIONS OF CONNECTICUT STATE AGENCIES – "MINIMUM STANDARDS FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" AS ENDORSED BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS, INC. ON SEPT. 26, 1996. IT IS A BOUNDARY & TOPOGRAPHIC MAP AND IS BASED UPON A DEPENDENT RESURVEY CONFORMING TO HORIZONTAL ACCURACY CLASS A-2 AND A VERTICAL ACCURACY OF CLASS T-2 AND IS INTENDED TO BE USED TO DEPICT A PROPOSED TELECOMMUNICATION SITE.

VERTICAL DATUM IS BASED ON NGVD 29.

COORDINATES REFER TO NAD 83.

PARCEL OWNER OF RECORD: STEVEN A. WESTALL
M.A.: 41 KEEGAN ROAD
PLYMOUTH, CT 06782

PARCEL AREA = 12.4± ACRES.

PARCEL ID: MAP 547, BLOCK 65 LOT 16A-1 PLYMOUTH ASSESSOR'S OFFICE.

PARCEL LIES WITHIN A RA1 ZONING DISTRICT.

DIVISION LINE BETWEEN LOTS 16A-1 & 16 IS BASED ON CORRECTED PLOT PLAN SKETCH SHOWING CURRENT PARCEL DIVISION LINE FOUND IN PLYMOUTH ZONING DEPARTMENT.

PARCEL IS NOT IN A FLOOD HAZARD ZONE ON THE FLOOD INSURANCE RATE MAP, TOWN OF PLYMOUTH, LITCHFIELD COUNTY, CONNECTICUT, PANEL 3 OF 10, COMMUNITY PANEL NUMBERS 0801138 0003 C, MAP REVISED NOVEMBER 6, 1998, BY FEDERAL EMERGENCY MANAGEMENT AGENCY.

NOT ALL IMPROVEMENTS SHOWN.

MAP REFERENCES

1) MAP SHOWING PROPERTY OF HOLLY M. WESTALL SOUTH STREET EXTENSION PLYMOUTH, CONN. SCALE: 1"=50', DATED: SEPT. 22, 1983. BY MATTSON ASSOCIATES LAND SURVEYORS & CIVIL ENGINEERS.

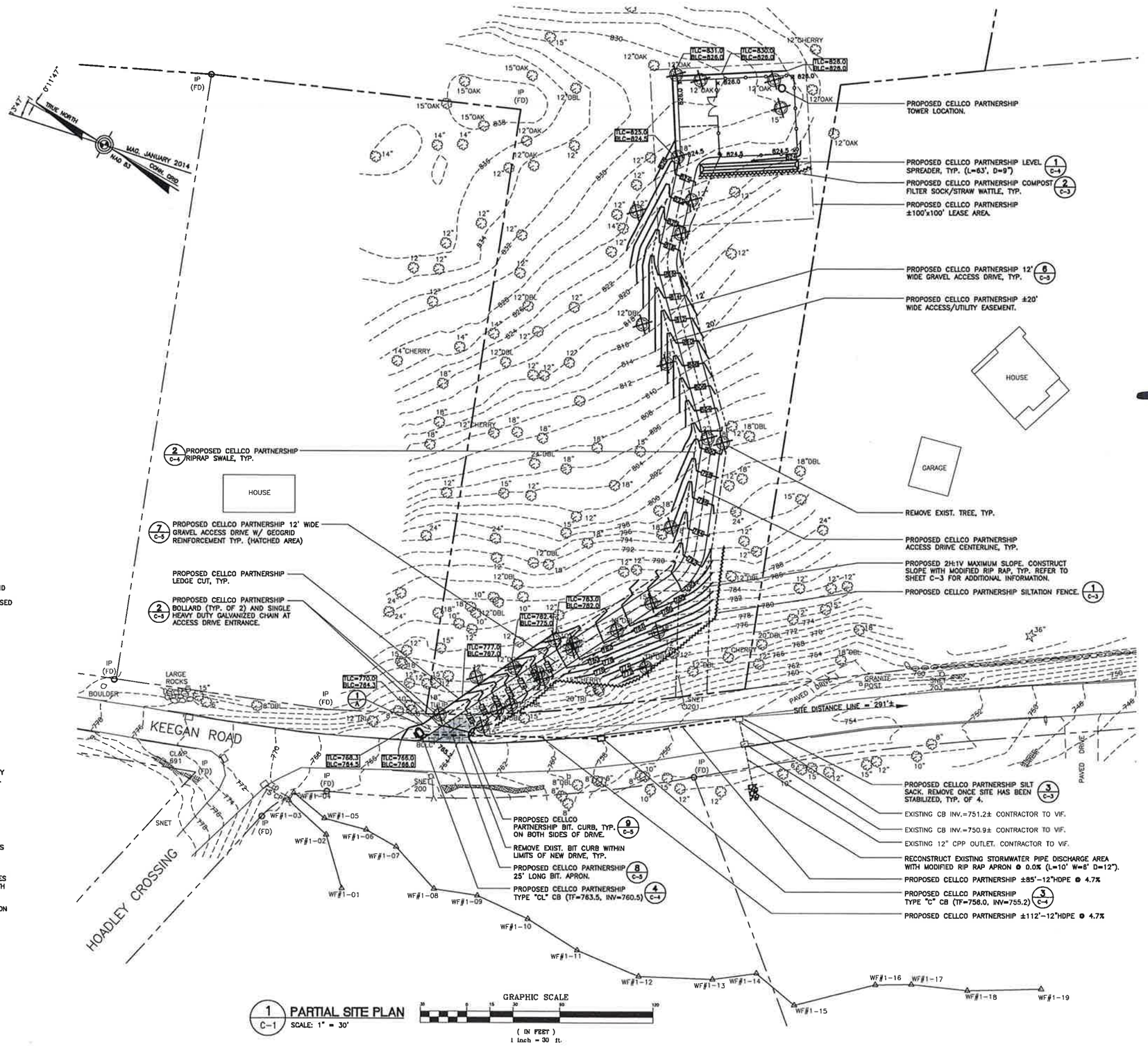
2) MAP SHOWING PROPERTY OF STEVEN A. WESTALL SOUTH STREET EXTENSION PLYMOUTH, CONN. SCALE: 1"=100', DATED: JULY 30, 1986. BY MATTSON ASSOCIATES LAND SURVEYORS & CIVIL ENGINEERS. THIS MAP WAS NOT FOUND IN THE PLYMOUTH LAND RECORDS, PLANNING OR ZONING DEPARTMENTS.

3) PROPERTY SURVEY MAP SHOWING REVISIONS TO LOT LINES PONDVIEW SUBDIVISION LOTS 1-1, 1-7, & 1-9 TERENCE FOLEY SOUTH STREET AND KEEGAN ROAD PLYMOUTH, CONN. SCALE 1" = 100' DATED: APRIL 22, 1999, BY ROBERT GREEN ASSOCIATES L.L.C. SURVEYORS & ENGINEERS.

TO MY KNOWLEDGE AND BELIEF THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON

THIS MAP IS NOT VALID WITHOUT A LIVE SIGNATURE AND SEAL

A. RAFAEL MARTINEZ LLS #18833 DATE



1/C-1 PARTIAL SITE PLAN
SCALE: 1" = 30'

GRAPHIC SCALE
30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	11/24/15	HAR	DMD	D&M PLANS
0	11/17/15	HAR	DMD	D&M PLANS – ISSUED FOR CLIENT REVIEW

CENTEK engineering
Centered on Solutions
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

Cellco Partnership d/b/a Verizon Wireless
WIRELESS COMMUNICATIONS FACILITY
PLYMOUTH WEST RELO.
33 KEEGAN ROAD
PLYMOUTH, CT 06782

DATE: 08/03/15
SCALE: AS NOTED
JOB NO. 13321.000

PARTIAL SITE PLAN

C-1

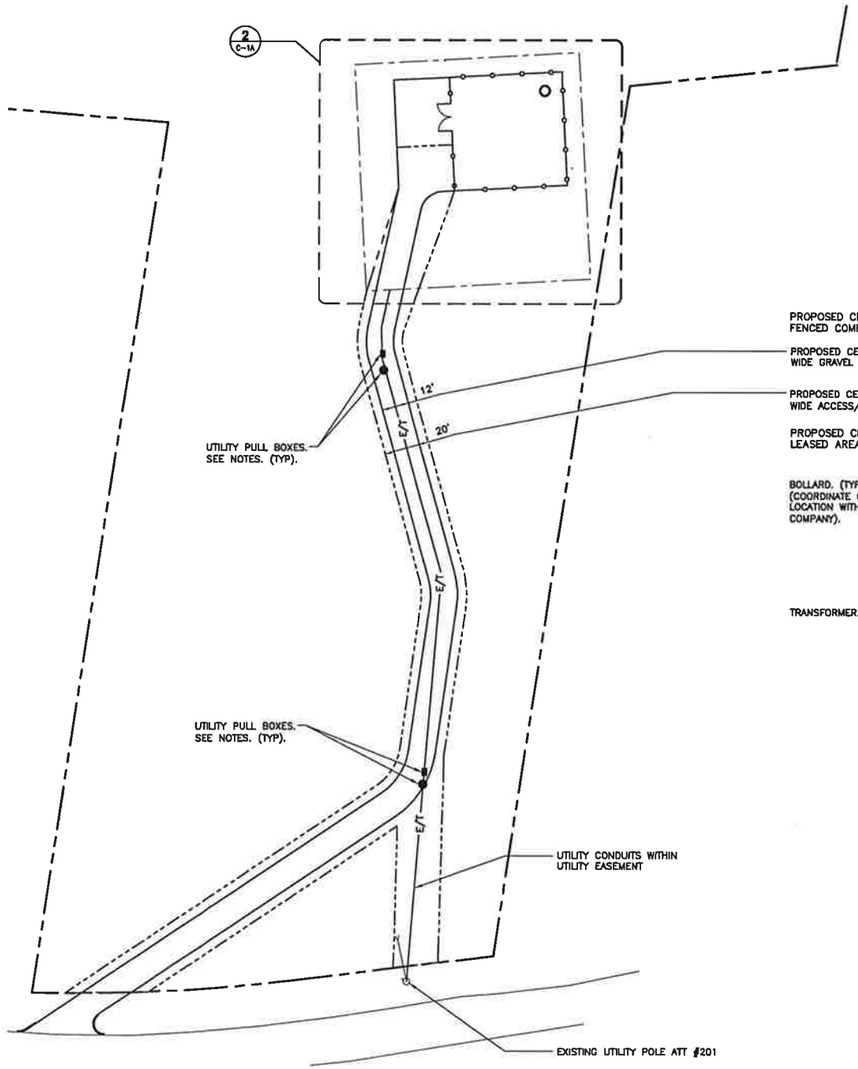
Sheet No. 2 of 9

ELECTRICAL LEGEND

SYMBOL	DESCRIPTION
———	PROPERTY LINE
———	ACCESS/ UTILITY EASEMENT LINE
● ■	UTILITY PULL BOX/SILO
○	UTILITY POLE
—T———T—	UNDERGROUND COMMUNICATION CONDUIT
—E———E—	UNDERGROUND ELECTRICAL CONDUIT
—o———o—	PERIMETER CHAIN LINK FENCE
———	ROAD

UTILITY NOTES

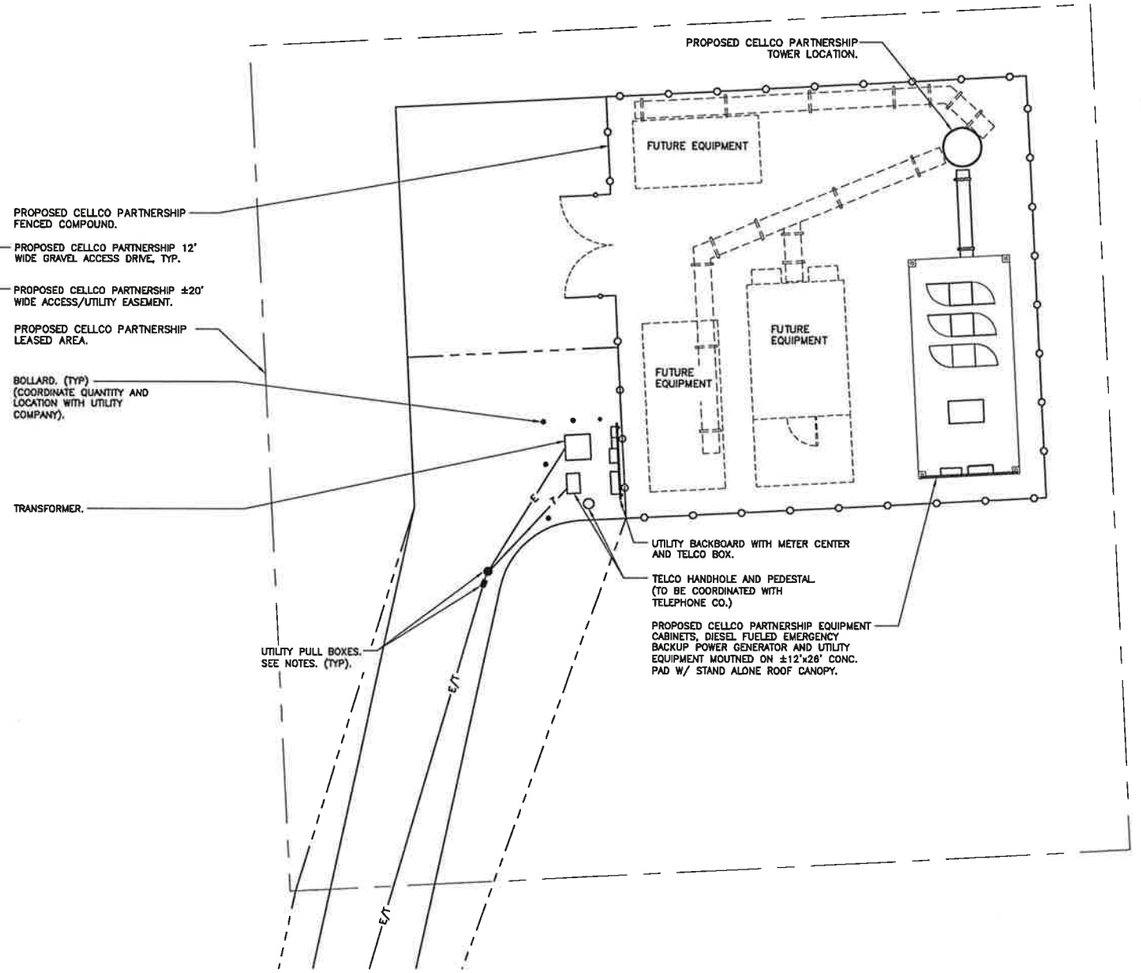
1. COORDINATE WITH OWNER FOR ALL EASEMENT DOCUMENTS.
2. UTILITY ROUTING SHOWN ON THIS PLAN IS SCHEMATIC. CONTRACTOR SHALL COORDINATE FINAL ROUTING WITH RESPECTIVE UTILITY COMPANIES PRIOR TO PERFORMING ANY UTILITY TRENCH WORK. ALL UTILITY CONDUITS AND PULL BOXES SHALL BE LOCATED WITHIN THE PROPOSED ACCESS/UTILITY EASEMENT.
3. UTILITY PULL BOXES/SILOS TO BE TRAFFIC RATED AND INSTALLED IN APPROXIMATE LOCATIONS SHOWN ON THIS PLAN, BUT NOT TO EXCEED 450' INTERVALS. CONTRACTOR TO COORDINATE FINAL PULL BOX LOCATIONS WITH RESPECTIVE LOCAL UTILITY COMPANIES.
4. CONTRACTOR SHALL COORDINATE ALL PERMITS AND PROCEDURES FOR CONDUIT INSTALLATION ALONG STREET.
5. PLAN IS FOR UTILITY ROUTING INFORMATION ONLY. SOME OTHER ELEMENTS NOT SHOWN FOR CLARITY. REFER TO CIVIL DRAWINGS FOR ALL OTHER EXISTING AND PROPOSED SITE INFORMATION.



1 C-1A SITE UTILITY PLAN
SCALE: 1"=30'

TRUE NORTH

GRAPHIC SCALE
30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.



2 C-1A PARTIAL SITE UTILITY PLAN
SCALE: 1/8"=1'-0"

TRUE NORTH

GRAPHIC SCALE
8 0 4 8 16 32
(IN FEET)
1/8 inch = 1 ft.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	11/24/15	HMR	DMD	D&M PLANS
0	11/17/15	HMR	DMD	D&M PLANS - ISSUED FOR CLIENT REVIEW

PROFESSIONAL ENGINEER

Cellco Partnership d/b/a Verizon Wireless

CENTEK engineering
Centered on Solutions
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

Cellco Partnership d/b/a Verizon Wireless
WIRELESS COMMUNICATIONS FACILITY

PLYMOUTH WEST RELO.

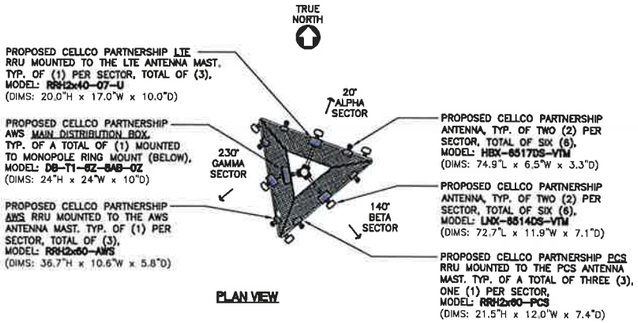
33 KEEGAN ROAD
PLYMOUTH, CT 06782

DATE: 06/03/15
SCALE: AS NOTED
JOB NO. 13321.000

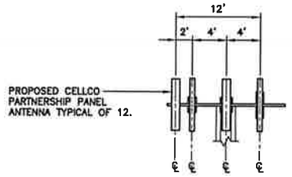
SITE UTILITY PLAN

C-1A

Sheet No. 3 of 9



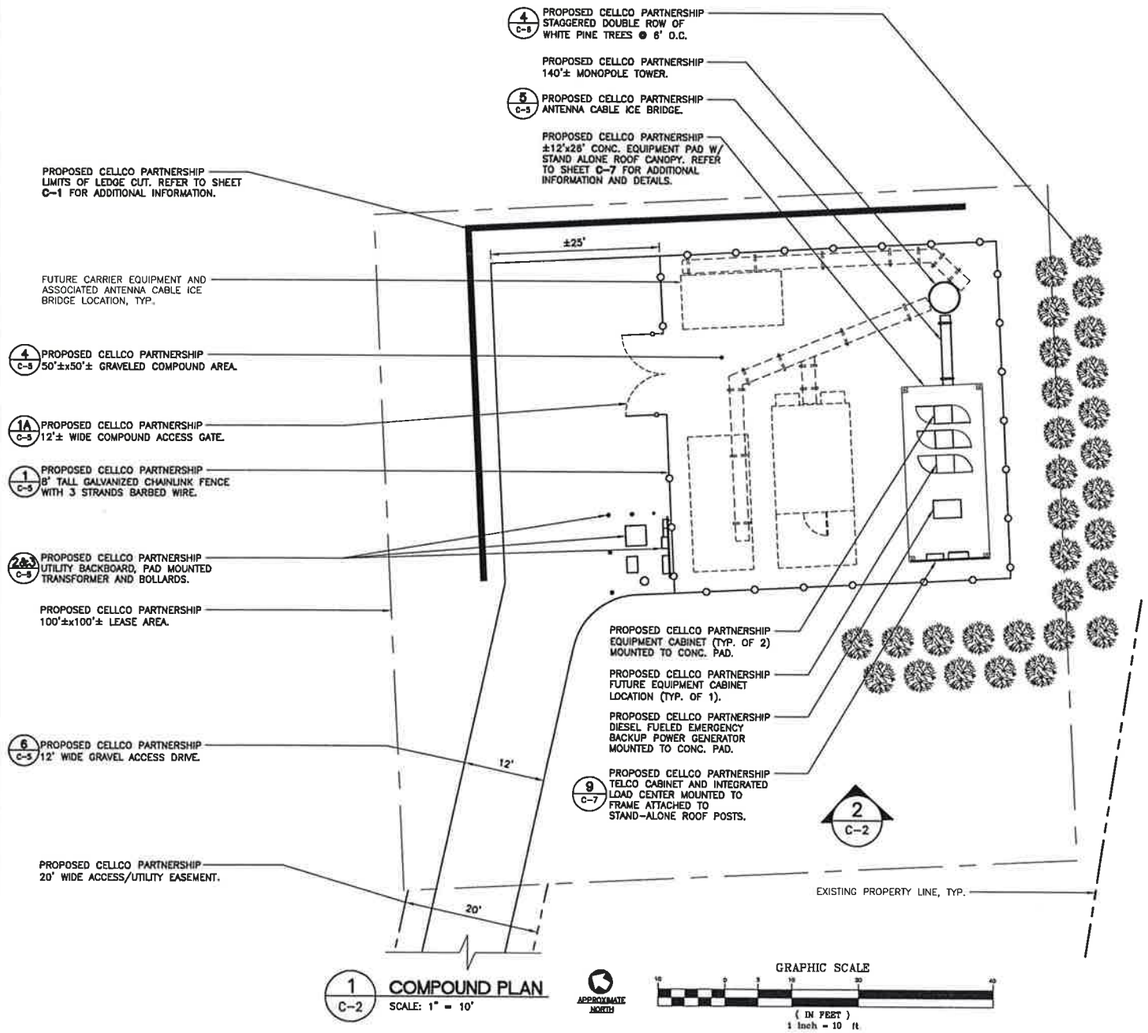
PLAN VIEW



TYPICAL SECTOR ELEVATION

3 / C-2 ANTENNA MOUNTING CONFIGURATION

SCALE: 1/8" = 1'

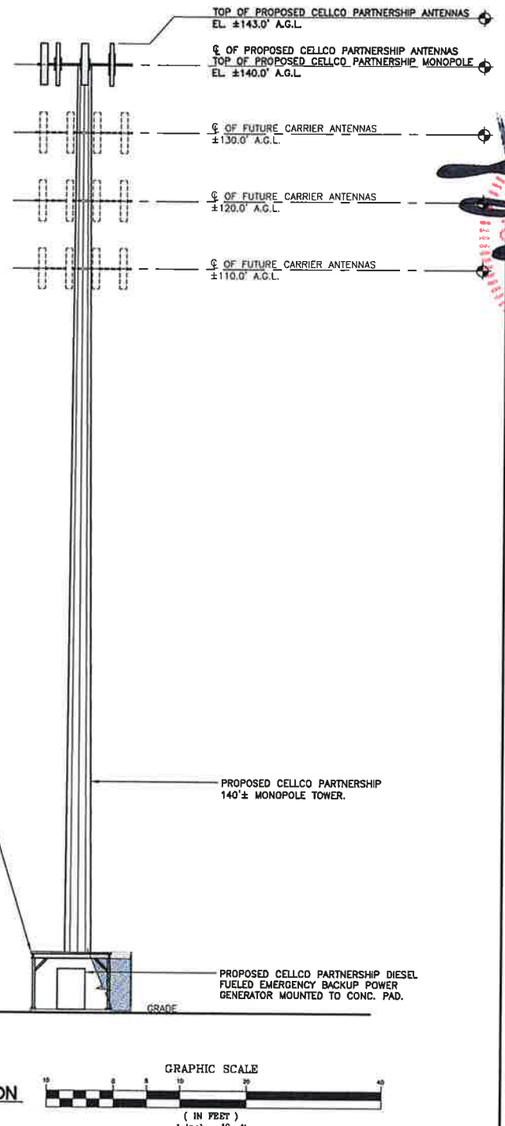


1 / C-2 COMPOUND PLAN

SCALE: 1" = 10'

APPROXIMATE NORTH

GRAPHIC SCALE
10 0 5 10 20 40
(IN FEET)
1 inch = 10 ft



TOWER AND GEOTECH NOTES:

1. 140' TALL MONOPOLE TOWER STRUCTURE (EXTENDABLE TO 160') DESIGNED AND MANUFACTURED BY VALMONT STRUCTURES.
2. REFER TO STRUCTURAL DESIGN ANALYSIS OF TOWER AND TOWER FOUNDATION AS PREPARED BY VALMONT STRUCUTRES DATED 09/10/15 PROJECT NUMBER: 301371
3. REFER TO GEOTECHNICAL EVALUATION AS PREPARED BY DESIGN EARTH TECHNOLOGY (DET), DATED SEPTEMBER 26, 2014, REVISED NOVEMBER 17, 2015. DET JOB NO. 2014.14.

2 / C-2 SOUTHWEST ELEVATION

SCALE: 1" = 10'

GRAPHIC SCALE
10 0 5 10 20 40
(IN FEET)
1 inch = 10 ft

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	11/24/15	HMR	DMD	DAM PLANS
0	11/17/15	HMR	DMD	DAM PLANS - ISSUED FOR CLIENT REVIEW

Cellco Partnership d/b/a Verizon Wireless

CENTEK engineering
Centered on Solutions
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

Cellco Partnership d/b/a Verizon Wireless
WIRELESS COMMUNICATIONS FACILITY
PLYMOUTH WEST RELO.
33 KEEGAN ROAD
PLYMOUTH, CT 06782

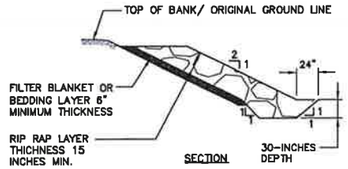
DATE:	08/03/15
SCALE:	AS NOTED
JOB NO.	13321.000

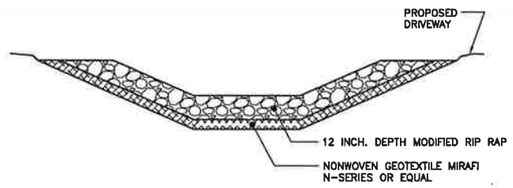
COMPOUND PLAN, ELEVATION AND ANTENNA MOUNTING CONFIG.

C-2

Sheet No. 4 of 9

RIP RAP STABILIZATION





5 C-3 **RIP RAP SLOPE STABILIZATION**
NOT TO SCALE

4 C-3 **RIP RAP DRAINAGE SWALE STABILIZATION**
NOT TO SCALE (TYPICAL)

STABILIZATION CRITERIA

1. CONTRACTOR SHALL IMPLEMENT RIP RAP SLOPE STABILIZATION & SWALE CONSTRICTION IN LOCATIONS WHERE LEDGE OR UNSTABLE SUBGRADES WITH LARGE AMOUNTS OF ROCK ARE PREVALENT OR AS SPECIFICALLY INDICATED ON THE PLANS.

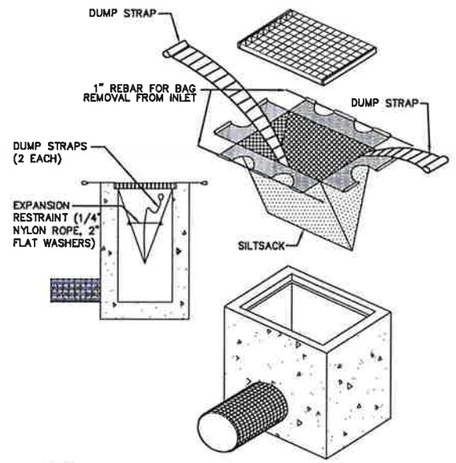
RIP RAP ON SLOPES AND CHANNELS

1. PREPARE THE SUBGRADE FOR RIP RAP, BEDDING, FILTER OR GEOTEXTILE TO THE REQUIRED LINES AND GRADES. COMPACT ANY FILL REQUIRED IN THE SUBGRADE IN 12-INCHES LIFTS TO 95% OF STANDARD PROCTOR DENSITY. REMOVE BRUSH, TREES, STUMPS, AND OTHER OBJECTIONABLE MATERIAL.
2. IMMEDIATELY AFTER SLOPE OR CHANNEL PREPARATION, INSTALL THE FILTER OR BEDDING MATERIALS. SPREAD THE FILTER OR BEDDING MATERIALS IN A UNIFORM LAYER TO THE SPECIFIED DEPTH.
3. IMMEDIATELY AFTER PLACEMENT OF THE FILTER BLANKET, BEDDING, PLACE THE RIP RAP TO ITS FULL COURSE THICKNESS IN ONE OPERATION SO THAT IT PRODUCES A DENSE WELL GRADED MASS OF STONE WITH A MINIMUM OF VOIDS. THE DESIRED DISTRIBUTION OF STONES THROUGHOUT THE MASS MAY BE OBTAINED BY SELECTIVE LOADING AT THE QUARRY, CONTROLLED DUMPING OF SUCCESSIVE LOADS DURING THE FINAL PLACING, OR BY A COMBINATION OF THESE METHODS. DO NOT PLACE RIP RAP IN LAYERS OR USE CHUTES OR SIMILAR METHODS TO DUMP THE RIP RAP WHICH ARE LIKELY TO CAUSE SEGREGATION OF THE VARIOUS STONES.
4. TAKE CARE NOT TO DISLODGE THE UNDERLYING MATERIAL WHEN PLACING THE STONES. WHEN PLACING RIP RAP ON A FILTER FABRIC TAKE CARE NOT TO DAMAGE THE FABRIC. IF DAMAGE OCCURS, REMOVE AND REPLACE THE DAMAGED SHEET. FOR LARGE STONE, 12 INCHES OR GREATER, USE A 6 INCH LAYER OF FILTER OR BEDDING MATERIAL TO PREVENT DAMAGE TO THE MATERIAL FROM PUNCTURE.
5. ENSURE THE FINISHED SLOPE OR CHANNEL IS FREE OF POCKETS OF SMALL STONES OR CLUSTERS OF LARGE STONES. HAND PLACING MAY BE NECESSARY TO ACHIEVE THE REQUIRED GRADES AND A GOOD DISTRIBUTION OF STONE SIZES. ENSURE THE FINAL THICKNESS OF THE RIP RAP BLANKET IS WITHIN PLUS OR MINUS 0.25 OF THE SPECIFIED THICKNESS.

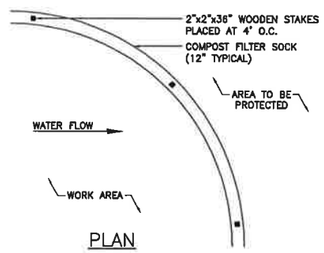
MAINTENANCE

VERIZON WIRELESS SHALL PERIODICALLY INSPECT RIP RAP STABILIZED SLOPES & CHANNELS DETERMINE IF HIGH FLOWS HAVE CAUSED SCOUR BENEATH THE RIP RAP OR FILTER BLANKET MATERIALS. REMOVE TREES THAT DEVELOP IN THE PROTECTED SLOPES.

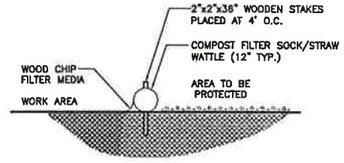
MODIFIED RIP RAP SIZE CHART	
STONE SIZE	% OF MASS
10" AND OVER	0
6" TO 10"	30-50
4" TO 6"	30-50
2" TO 4"	20-30
1" TO 2"	10-20
LEES THAN 1"	0-10



3 C-3 **SILTSACK AT CATCH BASIN**
NOT TO SCALE

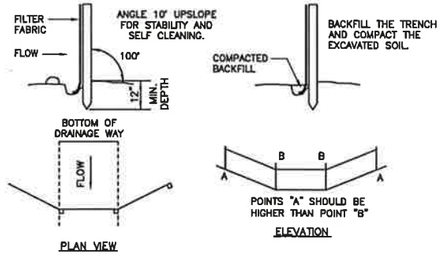


PLAN



SECTION

2 C-3 **TYP. COMPOST FILTER SOCK/ STRAW WATTLE DETAIL**
NOT TO SCALE



PLAN VIEW ELEVATION

SOURCE: U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, STORRS, CONNECTICUT

1 C-3 **PLACEMENT AND CONSTRUCTION OF SILTATION FENCE**
NOT TO SCALE

GENERAL CONSTRUCTION / PRE-CONSTRUCTION NOTES

1. PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION ACTIVITIES, A MANDITORY ON-SITE PRE-CONSTRUCTION MEETING SHALL BE CONDUCTED WITH THE VERIZON WIRELESS CONSTRUCTION MANAGER, CONTRACTOR'S CONSTRUCTION MANAGER, THE PROJECT EROSION AND SEDIMENTATION CONTROL/ENVIRONMENTAL MONITOR AND THE ENGINEER OF RECORD.

GENERAL CONSTRUCTION SEQUENCE

THIS IS A GENERAL CONSTRUCTION SEQUENCE OUTLINE SOME ITEMS OF WHICH MAY NOT APPLY TO PARTICULAR SITES.

1. CUT AND STUMP AREAS OF PROPOSED CONSTRUCTION.
2. INSTALL TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES AS REQUIRED.
3. REMOVE AND STOCKPILE TOPSOIL. STOCKPILE SHALL BE SEEDED TO PREVENT EROSION.
4. CONSTRUCT CLOSED DRAINAGE SYSTEM. PRECEPT CULVERT INLETS AND CATCH BASINS WITH SEDIMENTATION BARRIERS.
5. CONSTRUCT ROADWAYS AND PERFORM SITE GRADING, PLACING HAY BALES AND SILTATION FENCES AS REQUIRED TO CONTROL SOIL EROSION.
6. INSTALL UNDERGROUND UTILITIES.
7. BEGIN TEMPORARY AND PERMANENT SEEDING AND MULCHING. ALL CUT AND FILL SLOPES SHALL BE SEEDED OR MULCHED IMMEDIATELY AFTER THEIR CONSTRUCTION. NO AREA SHALL BE LEFT UNSTABILIZED FOR A TIME PERIOD OF MORE THAN 30 DAYS.
8. DAILY, OR AS REQUIRED, CONSTRUCT, INSPECT, AND IF NECESSARY, RECONSTRUCT TEMPORARY BERMS, DRAINS, DITCHES, SILT FENCES AND SEDIMENT TRAPS INCLUDING MULCHING AND SEEDING.
9. BEGIN EXCAVATION FOR AND CONSTRUCTION OF TOWERS AND PLATFORMS.
10. FINISH PAVING ALL ROADWAYS, DRIVES, AND PARKING AREAS.
11. COMPLETE PERMANENT SEEDING AND LANDSCAPING.
12. NO FLOW SHALL BE DIVERTED TO ANY WETLANDS UNTIL A HEALTHY STAND OF GRASS HAS BEEN ESTABLISHED IN REGARDED AREAS.
13. AFTER GRASS HAS BEEN FULLY GERMINATED IN ALL SEEDED AREAS, REMOVE ALL TEMPORARY EROSION CONTROL MEASURES.

SOIL EROSION AND SEDIMENT CONTROL SEQUENCE

1. ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES, SUCH AS CONSTRUCTION ENTRANCE / ANTI TRACKING PAD, SILTATION FENCE, AND SILTATION FENCE / HAY BALE SHALL BE IN PLACE PRIOR TO ANY GRADING ACTIVITY, INSTALLATION OF PROPOSED STRUCTURES OR UTILITIES. MEASURES SHALL BE LEFT IN PLACE AND MAINTAINED UNTIL CONSTRUCTION IS COMPLETED AND/OR AREA IS STABILIZED.
2. THE ENTRANCE TO THE PROJECT SITE IS TO BE PROTECTED BY STONE ANTI TRACKING PAD OF ASTM C-33, SIZE NO. 2 OR 3, OR D.O.T. 2" CRUSHED GRAVEL. THE STONE ANTI TRACKING PAD IS TO BE MAINTAINED AT ALL TIMES DURING THE CONSTRUCTION PERIOD.
3. LAND DISTURBANCE WILL BE KEPT TO A MINIMUM AND RESTABILIZATIONS WILL BE SCHEDULED AS SOON AS PRACTICAL.
4. ALL SOIL EROSION AND SEDIMENT CONTROL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE CONNECTICUT GUIDELINES FOR EROSION AND SEDIMENT CONTROL INCLUDING THE LATEST DATE FROM THE COUNCIL ON SOIL AND WATER CONSERVATION.
5. ANY ADDITIONAL EROSION/SEDIMENTATION CONTROL DEEMED NECESSARY BY TOWN STAFF DURING CONSTRUCTION, SHALL BE INSTALLED BY THE DEVELOPER. IN ADDITION, THE DEVELOPER SHALL BE RESPONSIBLE FOR THE REPAIR/REPLACEMENT/MAINTENANCE OF ALL EROSION CONTROL MEASURES UNTIL ALL DISTURBED AREAS ARE STABILIZED TO THE SATISFACTION OF THE TOWN STAFF.
6. IN ALL AREAS, REMOVAL OF TREES, BUSHES AND OTHER VEGETATION AS WELL AS DISTURBANCE OF THE SOIL IS TO BE KEPT TO AN ABSOLUTE MINIMUM WHILE ALLOWING PROPER DEVELOPMENT OF THE SITE. DURING CONSTRUCTION, EXPOSE AS SMALL AN AREA OF SOIL AS POSSIBLE FOR AS SHORT A TIME AS POSSIBLE.
7. SILTATION FENCE SHALL BE PLACED AS INDICATED BEFORE A CUT SLOPE HAS BEEN CREATED. SEDIMENT DEPOSITS SHOULD BE PERIODICALLY REMOVED FROM THE UPSTREAM SIDES OF SILTATION FENCE. THIS MATERIAL IS TO BE SPREAD AND STABILIZED IN AREAS NOT SUBJECT TO EROSION, OR TO BE USED IN AREAS WHICH ARE NOT TO BE PAVED OR BUILT ON. SILTATION FENCE IS TO BE REPLACED AS NECESSARY TO PROVIDE PROPER FILTERING ACTION. THE FENCE IS TO REMAIN IN PLACE AND BE MAINTAINED TO INSURE EFFICIENT SILTATION CONTROL UNTIL ALL AREAS ABOVE THE EROSION CHECKS ARE STABILIZED AND VEGETATION HAS BEEN ESTABLISHED.
8. SWALE DISCHARGE AREA WILL BE PROTECTED WITH RIP RAP SPLASH PAD/ ENERGY DISSIPATER.
9. ALL FILL AREAS SHALL BE COMPACTED SUFFICIENTLY FOR THEIR INTENDED PURPOSE AND AS REQUIRED TO REDUCE SLIPPING, EROSION OR EXCESS SATURATION.
10. THE SOIL SHALL NOT BE PLACED WHILE IN A FROZEN OR MUDDY CONDITION, WHEN THE SUBGRADE IS EXCESSIVELY WET, OR IN A CONDITION THAT MAY OTHERWISE BE DETRIMENTAL TO PROPER GRADING OR PROPOSED SODDING OR SEEDING.
11. AFTER CONSTRUCTION IS COMPLETE AND GROUND IS STABLE, REMOVE SILTS IN THE RIP RAP ENERGY DISSIPATERS. REMOVE OTHER EROSION AND SEDIMENT DEVICES.

CONSTRUCTION SPECIFICATIONS - SILT FENCE

1. THE GEOTEXTILE FABRIC SHALL MEET THE DESIGN CRITERIA FOR SILT FENCES.
2. THE FABRIC SHALL BE EMBEDDED A MINIMUM OF 8 INCHES INTO THE GROUND AND THE SOIL COMPACTED OVER THE EMBEDDED FABRIC.
3. WOVEN WIRE FENCE SHALL BE FASTENED SECURELY TO THE FENCE POSTS WITH WIRE TIES OR STAPLES.
4. FILTER CLOTH SHALL BE FASTENED SECURELY TO THE WOVEN WIRE FENCE WITH TIES SPACED EVERY 24 INCHES AT THE TOP, MID-SECTION AND BOTTOM.
5. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY 6 INCHES, FOLDED, AND STAPLED.
6. FENCE POSTS SHALL BE A MINIMUM OF 36 INCHES LONG AND DRIVEN A MINIMUM OF 16 INCHES INTO THE GROUND. WOOD POSTS SHALL BE OF SOUND QUALITY HARDWOOD AND SHALL HAVE A MINIMUM CROSS SECTIONAL AREA OF 3.0 SQUARE INCHES.
7. MAINTENANCE SHALL BE PERFORMED AS NEEDED TO PREVENT BUILD UP IN THE SILT FENCE DUE TO DEPOSITION OF SEDIMENT.

MAINTENANCE - SILT FENCE

1. SILT FENCES SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REPAIRS THAT ARE REQUIRED SHALL BE MADE IMMEDIATELY.
2. IF THE FABRIC ON A SILT FENCE SHOULD DECOMPOSE OR BECOME INEFFECTIVE DURING THE EXPECTED LIFE OF THE FENCE, THE FABRIC SHALL BE REPLACED PROMPTLY.
3. SEDIMENT SHOULD BE INSPECTED AFTER EVERY STORM EVENT. THE DEPOSITS SHOULD BE REMOVED WHEN THEY REACHED APPROXIMATELY ONE-HALF THE HEIGHT OF THE BARRIER.
4. SEDIMENT DEPOSITS THAT ARE REMOVED OR LEFT IN PLACE AFTER THE FABRIC HAS BEEN REMOVED SHALL BE GRADED TO CONFORM WITH THE EXISTING TOPOGRAPHY AND VEGETATED.

REV	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
2	11/24/15	HMR	DMD	DRAFT PLANS
1	11/17/15	HMR	DMD	DRAFT PLANS - ISSUED FOR CLIENT REVIEW

Cellco Partnership d/b/a Verizon Wireless

d.b.a. verizon wireless

CENTEK engineering
Centered on Solutions
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

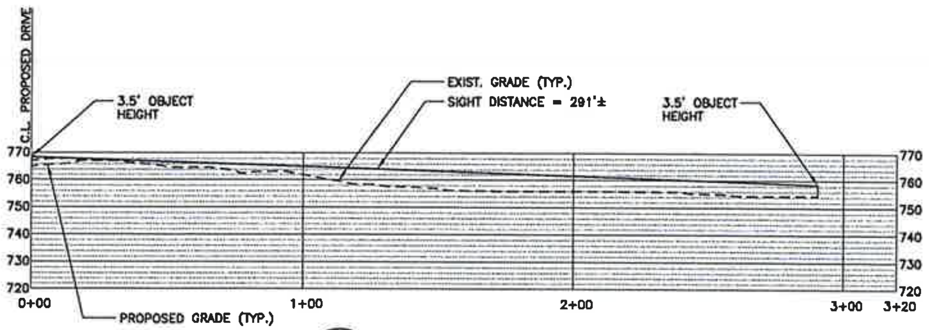
Cellco Partnership d/b/a Verizon Wireless
WIRELESS COMMUNICATIONS FACILITY
PLYMOUTH WEST RELO.
33 KEEGAN ROAD
PLYMOUTH, CT 06782

DATE: 08/03/15
SCALE: AS NOTED
JOB NO. 13321.000

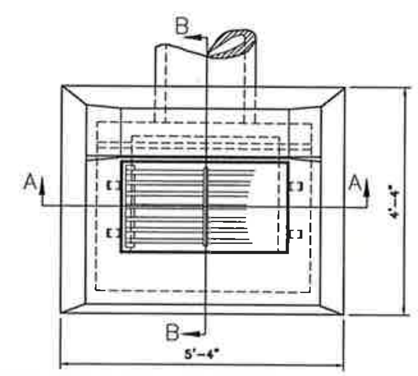
SITE CONSTRUCTION, S&E CONTROL NOTES AND DETAILS

C-3

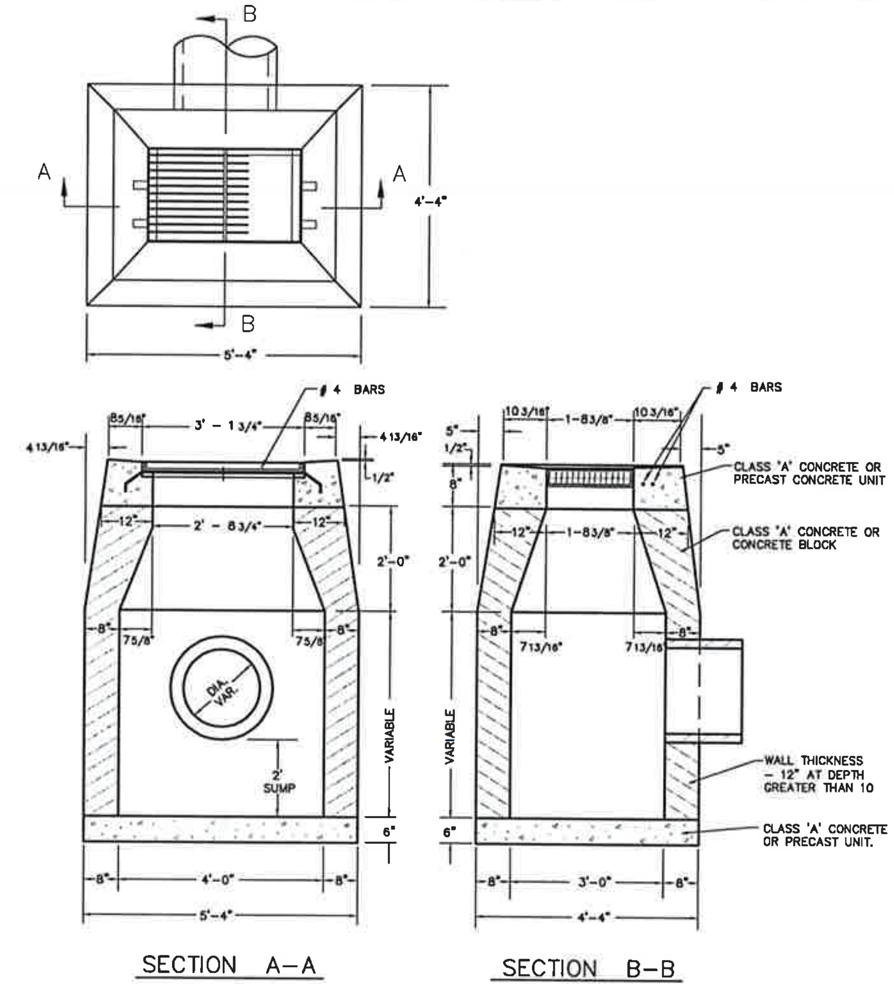
Sheet No. 5 of 9



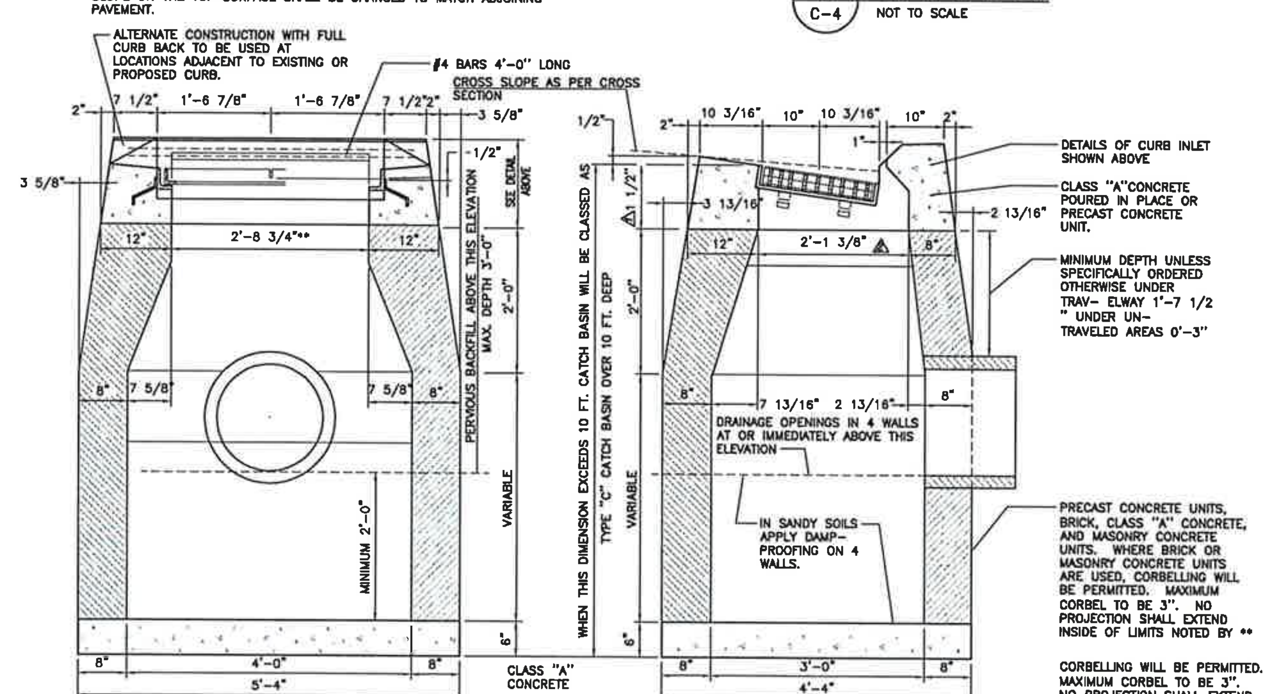
5 / C-4 **SIGHTLINE PROFILE**
NOT TO SCALE



NOTE: WHEN CATCH BASIN IS SET IN CONCRETE PAVEMENT THE 1/2 " SLOPE ON THE TOP SURFACE SHALL BE CHANGED TO MATCH ADJOINING PAVEMENT.



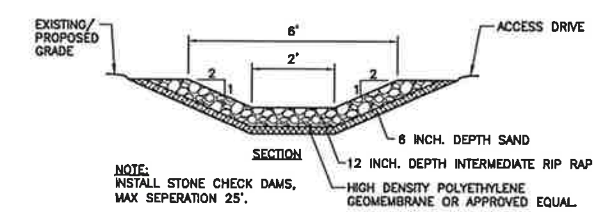
4 / C-4 **TYPE 'C-L' CB**
NOT TO SCALE



3 / C-4 **TYPE 'C' CATCH BASIN DETAIL**
NOT TO SCALE

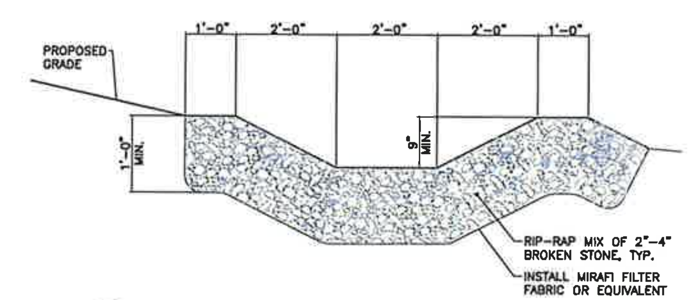
MODIFIED RIP RAP SIZE CHART

STONE SIZE	% OF MASS
10" AND OVER	0
6" TO 10"	30–50
4" TO 6"	30–50
2" TO 4"	20–30
1" TO 2"	10–20
LEES THAN 1"	0–10



NOTE:
INSTALL STONE CHECK DAMS, MAX SEPERATION 25'.

2 / C-4 **RIP RAP SWALE**
NOT TO SCALE



1 / C-4 **LEVEL SPREADER SECTION**
NOT TO SCALE

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	11/17/15	HMR	DMD	D&M PLANS – ISSUED FOR CLIENT REVIEW
1	11/...		DMD	D&M PLANS

PROFESSIONAL ENGINEER SEAL

Cellco Partnership d.b.a. verizon wireless

CENTEK engineering
Centered on Solutions
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

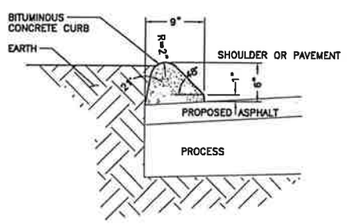
Cellco Partnership d/b/a Verizon Wireless
WIRELESS COMMUNICATIONS FACILITY
PLYMOUTH WEST RELO.
33 KEEGAN ROAD
PLYMOUTH, CT 06782

DATE: 08/03/15
SCALE: AS NOTED
JOB NO. 13321.000

DRAINAGE CONTROL DETAILS AND SIGHTLINE PROFILE

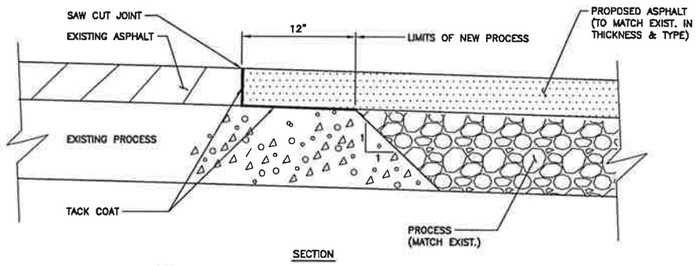
C-4

Sheet No. 8 of 9



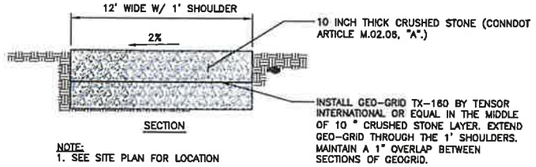
SECTION

9 / C-5 TYPICAL BIT. CURB DETAIL
NOT TO SCALE



SECTION

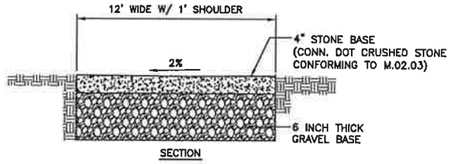
8 / C-5 PAVEMENT REPAIR (SAWCUT) DETAIL
NOT TO SCALE



SECTION

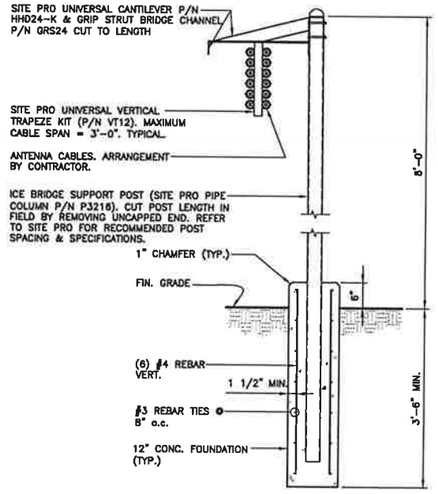
NOTE:
1. SEE SITE PLAN FOR LOCATION

7 / C-5 GRAVEL ACCESS DRIVE W/ GEOGRID REINFORCEMENT
NOT TO SCALE

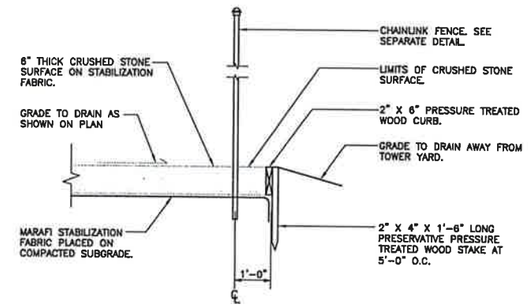


SECTION

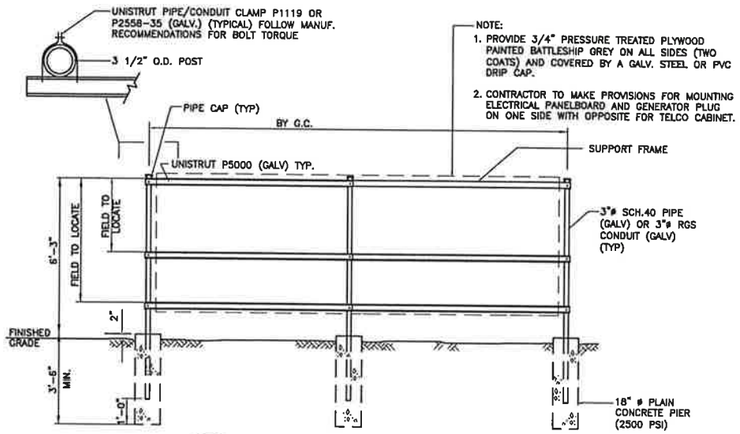
6 / C-5 GRAVEL SURFACE PARKING AREA AND ACCESS DRIVE
NOT TO SCALE



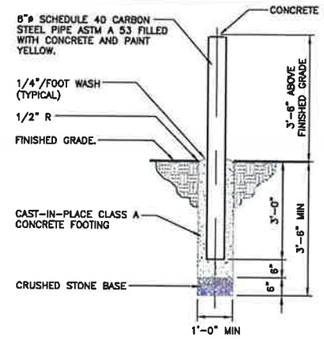
5 / C-5 ICE BRIDGE DETAIL
NOT TO SCALE



4 / C-5 COMPOUND SURFACING DETAIL
NOT TO SCALE



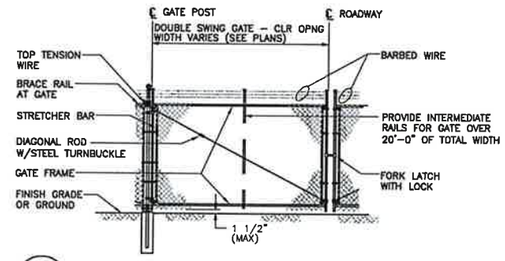
3 / C-5 UTILITY SUPPORT FRAME (TYP)
NOT TO SCALE



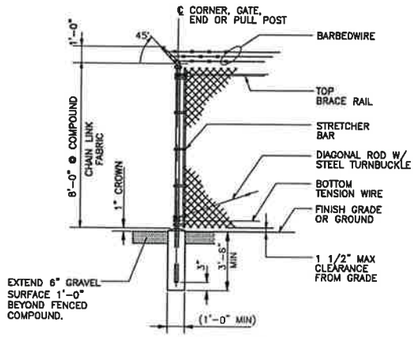
2 / C-5 BOLLARD DETAIL
NOT TO SCALE

WOVEN WIRE FENCE NOTES

1. GATE POST, CORNER, TERMINAL OR PULL POST 2 1/2" ø SCHEDULE 40 FOR GATE WIDTHS UP THRU 8 FEET OR 12 FEET FOR DOUBLE SWING GATE PER ASTM-F1083.
2. LINE POST: 2" ø SCHEDULE 40 PIPE PER ASTM-F1083.
3. GATE FRAME: 1 1/2" ø SCHEDULE 40 PIPE PER ASTM-F1083.
4. TOP RAIL & BRACE RAIL: 1 1/2" ø SCHEDULE 40 PIPE PER ASTM-F1083.
5. FABRIC: 12 GA. CORE WIRE SIZE 1-1/4" MESH, CONFORMING TO ASTM-A392.
6. TIE WIRE: MINIMUM 11 GA. GALVANIZED STEEL AT POSTS AND RAILS A SINGLE WRAP OF FABRIC TIE AND AT TENSION WIRE BY HOG RINGS SPACED MAX 24" INTERVALS.
7. TENSION WIRE: 7 GA. GALVANIZED STEEL.
8. BARBED WIRE: DOUBLE STRAND 12-1/2" O.D. TWISTED WIRE TO MATCH W/FABRIC 14 GA., 4 PT. BARBS SPACED ON APPROXIMATELY 5" CENTERS.
9. GATE LATCH: DROP DOWN LOCKABLE FORK LATCH AND LOCK, KEYED ALIKE FOR ALL SITES IN A GIVEN MTA.
10. LOCAL ORDINANCE OF BARBED WIRE PERMIT REQUIREMENT SHALL BE COMPLIED WITH IF REQUIRED.
11. COMPOUND FENCE HEIGHT = 8' VERTICAL + 1' BARBED WIRE VERTICAL DIMENSION.



1A / C-5 WOVEN WIRE SWING GATE-DOUBLE
NOT TO SCALE



TYPICAL SECTION

1 / C-5 WOVEN WIRE FENCE DETAIL
NOT TO SCALE

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	11/24/15	HMR	DMD	D&M PLANS
0	11/17/15	HMR	DMD	D&M PLANS - ISSUED FOR CLIENT REVIEW

Cellco Partnership d/b/a Verizon Wireless

CENTEK engineering
Centered on Solutions
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

Cellco Partnership d/b/a Verizon Wireless
WIRELESS COMMUNICATIONS FACILITY

PLYMOUTH WEST RELO.

33 KEEGAN ROAD
PLYMOUTH, CT 06782

DATE: 08/03/15
SCALE: AS NOTED
JOB NO. 13321.000

SITE DETAILS

C-5

Sheet No. 7 of 9

ENVIRONMENTAL NOTES

THE FOLLOWING PROTECTIVE MEASURES SATISFY REQUIREMENTS FROM THE CONNECTICUT DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION ("CTDEEP") WILDLIFE DIVISION AND FOLLOW PROTOCOLS DEVELOPED FROM PREVIOUS RARE SPECIES CONSULTATIONS AND STATE-APPROVED PROTECTION PLANS. THIS PROTECTION PROGRAM IS VALID UNTIL SEPTEMBER 2, 2016, ONE YEAR FROM THE DATE OF CTDEEP'S LETTER, AT WHICH POINT IF CONSTRUCTION HAS NOT BEEN INITIATED A NEW NATURAL DIVERSITY DATA BASE REVIEW REQUEST FROM CTDEEP IS REQUIRED.

WHIP-POOR-WILL PROTECTION PROGRAM

WHIP-POOR-WILL, A STATE SPECIES OF SPECIAL CONCERN, IS KNOWN TO OCCUR IN THE VICINITY OF THE PROJECT. IN ORDER TO AVOID POSSIBLE DISTURBANCE TO BREEDING WHIP-POOR-WILL, NO CONSTRUCTION ACTIVITIES SHALL OCCUR DURING THE NESTING PERIOD MAY 1ST THROUGH JULY 31ST.

BAT PROTECTION PROGRAM

THE PROPOSED CONSTRUCTION ACTIVITIES WILL RESULT IN THE CLEARING OF TREES, SHRUBS AND MATURE VEGETATION THAT HAS THE POTENTIAL TO SUPPORT ROOSTING AND BREEDING HABITAT FOR NORTHERN LONG-EARED BAT. NORTHERN LONG-EARED BAT IS A FEDERALLY-LISTED THREATENED SPECIES AND A STATE-LISTED ENDANGERED SPECIES.

IN ORDER TO LIMIT DISTURBANCE TO TREE ROOSTING AND BREEDING HABITAT UTILIZED BY NORTHERN LONG-EARED BAT, THE CONTRACTOR SHALL NOT PERFORM TREE CLEARING ACTIVITIES BETWEEN APRIL 15 AND AUGUST 31.

EASTERN BOX TURTLE AND WOOD TURTLE PROTECTION PROGRAM

EASTERN BOX TURTLE AND WOOD TURTLE, BOTH STATE SPECIAL CONCERN SPECIES AFFORDED PROTECTION UNDER THE CONNECTICUT ENDANGERED SPECIES ACT, ARE KNOWN TO OCCUR ON OR WITHIN THE VICINITY OF THE SITE. THE FOLLOWING PROTECTIVE MEASURES SATISFY REQUIREMENTS FROM THE CTDEEP WILDLIFE DIVISION AND FOLLOW PROTOCOLS DEVELOPED FROM PREVIOUS RARE SPECIES CONSULTATIONS AND STATE-APPROVED PROTECTION PLANS. THIS PROTECTION PLAN IS VALID UNTIL APRIL 20, 2016, ONE YEAR FROM THE DATE OF CTDEEP'S LETTER, AT WHICH POINT IF CONSTRUCTION HAS NOT BEEN INITIATED, A NEW NATURAL DIVERSITY DATA BASE REVIEW REQUEST FROM CTDEEP IS REQUIRED.

IT IS OF THE UTMOST IMPORTANCE THAT THE CONTRACTOR COMPLIES WITH THE REQUIREMENT FOR THE INSTALLATION OF PROTECTIVE MEASURES AND THE EDUCATION OF ITS EMPLOYEES AND SUBCONTRACTORS PERFORMING WORK ON THE PROJECT SITE IF WORK WILL OCCUR DURING THE EASTERN BOX TURTLE'S AND WOOD TURTLE'S ACTIVE PERIOD (APRIL 1 TO NOVEMBER 15). ALL-POINTS TECHNOLOGY CORPORATION, P.C. ("APT") WILL SERVE AS THE ENVIRONMENTAL MONITOR FOR THIS PROJECT TO ENSURE THAT EASTERN BOX TURTLE AND WOOD TURTLE PROTECTION MEASURES ARE IMPLEMENTED PROPERLY AND WILL PROVIDE AN EDUCATION SESSION ON THESE THREE RARE TURTLE SPECIES PRIOR TO THE START OF CONSTRUCTION ACTIVITIES. THE CONTRACTOR SHALL CONTACT DEAN GUSTAFSON, SENIOR ENVIRONMENTAL SCIENTIST AT APT, AT LEAST 5 BUSINESS DAYS PRIOR TO THE PRE-CONSTRUCTION MEETING. MR. GUSTAFSON CAN BE REACHED BY PHONE AT (860) 984-9515 OR VIA EMAIL AT DGUSTAFSON@ALLPOINTSTECH.COM.

THE PROPOSED TURTLE PROTECTION PROGRAM CONSISTS OF SEVERAL COMPONENTS: ISOLATION OF THE PROJECT PERIMETER; PERIODIC INSPECTION AND MAINTENANCE OF ISOLATION STRUCTURES; EDUCATION OF ALL CONTRACTORS AND SUB-CONTRACTORS PRIOR TO INITIATION OF WORK ON THE SITE; PROTECTIVE MEASURES; AND, REPORTING.

1. ISOLATION MEASURES & EROSION AND SEDIMENTATION CONTROLS
   A. PLASTIC NETTING USED IN A VARIETY OF EROSION CONTROL PRODUCTS (I.E., EROSION CONTROL BLANKETS, FIBER ROLLS [WATTLES], REINFORCED SILT FENCE) HAS BEEN FOUND TO ENTANGLE WILDLIFE, INCLUDING REPTILES, AMPHIBIANS, BIRDS AND SMALL MAMMALS. NO PERMANENT EROSION CONTROL PRODUCTS OR REINFORCED SILT FENCE WILL BE USED ON THE VERIZON WIRELESS PROJECT. TEMPORARY EROSION CONTROL PRODUCTS WILL USE EITHER EROSION CONTROL BLANKETS AND FIBER ROLLS COMPOSED OF PROCESSED FIBERS MECHANICALLY BOUND TOGETHER TO FORM A CONTINUOUS MATRIX (NET LESS) OR NETTING COMPOSED OF PLANAR WOVEN NATURAL BIODEGRADABLE FIBER TO AVOID/MINIMIZE WILDLIFE ENTANGLEMENT.

   B. INSTALLATION OF EROSION AND SEDIMENTATION CONTROLS (I.E., SILT FENCING), REQUIRED FOR EROSION CONTROL COMPLIANCE AND CREATION OF A BARRIER TO POSSIBLE MIGRATING/DISPERSING HERPETOFAUNA, SHALL BE PERFORMED BY THE CONTRACTOR FOLLOWING CLEARING ACTIVITIES AND PRIOR TO ANY EARTHWORK. THE ENVIRONMENTAL MONITOR WILL INSPECT THE WORK ZONE AREA PRIOR TO AND FOLLOWING EROSION CONTROL BARRIER INSTALLATION TO ENSURE THE AREA IS FREE OF EASTERN BOX TURTLES AND WOOD TURTLES AND SATISFACTORILY INSTALLED. THE INTENT OF THE BARRIER IS TO SEGREGATE THE MAJORITY OF THE WORK ZONE AND ISOLATE IT FROM FORAGING/MIGRATING/DISPERSING TURTLES. OFTENTIMES COMPLETE ISOLATION OF A WORK ZONE IS NOT FEASIBLE DUE TO ACCESSIBILITY NEEDS AND LOCATIONS OF STAGING/MATERIAL STORAGE AREAS, ETC. IN THOSE CIRCUMSTANCES, THE BARRIERS WILL BE POSITIONED TO DEFLECT MIGRATING/DISPERSAL ROUTES AWAY FROM THE WORK ZONE TO MINIMIZE POTENTIAL ENCOUNTERS WITH TURTLES.

   C. THE FENCING WILL CONSIST OF NON-REINFORCED CONVENTIONAL EROSION CONTROL WOVEN FABRIC, INSTALLED APPROXIMATELY SIX INCHES BELOW SURFACE GRADE AND STAKED AT SEVEN TO TEN-FOOT INTERVALS USING FOUR-FOOT OAK STAKES OR APPROVED EQUIVALENT. THE CONTRACTOR IS RESPONSIBLE FOR DAILY INSPECTIONS OF THE FENCING FOR TEARS OR BREECHES IN THE FABRIC AND ACCUMULATION LEVELS OF SEDIMENT, PARTICULARLY FOLLOWING STORM EVENTS OF 0.25 INCH OR GREATER. APT WILL PROVIDE PERIODIC INSPECTIONS OF THE FENCING THROUGHOUT THE DURATION OF CONSTRUCTION ACTIVITIES, GENERALLY ON A BIWEEKLY FREQUENCY OR MORE FREQUENTLY IF SITE CONDITIONS WARRANT.

   D. THE EXTENT OF THE BARRIER FENCING WILL BE AS SHOWN ON THE SITE PLANS. THE CONTRACTOR SHALL HAVE ADDITIONAL BARRIER FENCING SHOULD FIELD OR CONSTRUCTION CONDITIONS WARRANT EXTENDING THE FENCING AS DIRECTED BY APT.

   E. NO EQUIPMENT, VEHICLES OR CONSTRUCTION MATERIALS SHALL BE STORED OUTSIDE OF THE ISOLATION BARRIER FENCING.

   F. ALL SILT FENCING SHALL BE REMOVED WITHIN 30 DAYS OF COMPLETION OF WORK AND PERMANENT STABILIZATION OF SITE SOILS SO THAT REPTILE AND AMPHIBIAN MOVEMENT BETWEEN UPLANDS AND WETLANDS IS NOT RESTRICTED.

2. CONTRACTOR EDUCATION
   A. PRIOR TO WORK ON SITE, THE CONTRACTOR SHALL ATTEND AN EDUCATIONAL SESSION AT THE PRE-CONSTRUCTION MEETING WITH APT. THIS ORIENTATION AND EDUCATIONAL SESSION WILL CONSIST OF AN INTRODUCTORY MEETING WITH APT PROVIDING PHOTOS OF EASTERN BOX TURTLES AND WOOD TURTLES AND EMPHASIZING THE NON-AGGRESSIVE NATURE OF THESE TURTLES, THE ABSENCE OF NEED TO DESTROY ANIMALS THAT MIGHT BE ENCOUNTERED AND THE NEED TO FOLLOW PROTECTIVE MEASURES AS DESCRIBED IN SECTION 4 BELOW. WORKERS WILL ALSO BE PROVIDED INFORMATION REGARDING THE IDENTIFICATION OF OTHER TURTLE SPECIES THAT COULD BE ENCOUNTERED.

   B. THE EDUCATION SESSION WILL ALSO FOCUS ON MEANS TO DISCRIMINATE BETWEEN THE SPECIES OF CONCERN AND OTHER NATIVE SPECIES TO AVOID UNNECESSARY "FALSE ALARMS". ENCOUNTERS WITH ANY SPECIES OF TURTLES WILL BE DOCUMENTED.

   C. THE CONTRACTOR WILL BE PROVIDED WITH CELL PHONE AND EMAIL CONTACTS FOR APT PERSONNEL TO IMMEDIATELY REPORT ANY ENCOUNTERS WITH EASTERN BOX TURTLE, WOOD TURTLE OR OTHER TURTLE SPECIES. EDUCATIONAL POSTER MATERIALS WILL BE PROVIDED BY APT AND DISPLAYED ON THE JOB SITE TO MAINTAIN WORKER AWARENESS AS THE PROJECT PROGRESSES.

3. PETROLEUM MATERIALS STORAGE AND SPILL PREVENTION
   A. CERTAIN PRECAUTIONS ARE NECESSARY TO STORE PETROLEUM MATERIALS, REFUEL AND CONTAIN AND PROPERLY CLEAN UP ANY INADVERTENT FUEL OR PETROLEUM (I.E., OIL, HYDRAULIC FLUID, ETC.) SPILL DUE TO THE PROJECT'S LOCATION IN PROXIMITY TO SENSITIVE WETLANDS.

   B. A SPILL CONTAINMENT KIT CONSISTING OF A SUFFICIENT SUPPLY OF ABSORBENT PADS AND ABSORBENT MATERIAL WILL BE MAINTAINED BY THE CONTRACTOR AT THE CONSTRUCTION SITE THROUGHOUT THE DURATION OF THE PROJECT. IN ADDITION, A WASTE DRUM WILL BE KEPT ON SITE TO CONTAIN ANY USED ABSORBENT PADS/MATERIAL FOR PROPER AND TIMELY DISPOSAL OFF SITE IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL LAWS.

   C. THE FOLLOWING PETROLEUM AND HAZARDOUS MATERIALS STORAGE AND REFUELING RESTRICTIONS AND SPILL RESPONSE PROCEDURES WILL BE ADHERED TO BY THE CONTRACTOR.

      I. PETROLEUM AND HAZARDOUS MATERIALS STORAGE AND REFUELING
         A. REFUELING OF VEHICLES OR MACHINERY SHALL OCCUR A MINIMUM OF 100 FEET FROM WETLANDS OR WATERCOURSES AND SHALL TAKE PLACE ON AN IMPERVIOUS PAD WITH SECONDARY CONTAINMENT DESIGNED TO CONTAIN FUELS.

         B. ANY FUEL OR HAZARDOUS MATERIALS THAT MUST BE KEPT ON SITE SHALL BE STORED ON AN IMPERVIOUS SURFACE UTILIZING SECONDARY CONTAINMENT A MINIMUM OF 100 FEET FROM WETLANDS OR WATERCOURSES.

      II. INITIAL SPILL RESPONSE PROCEDURES
         A. STOP OPERATIONS AND SHUT OFF EQUIPMENT.

         B. REMOVE ANY SOURCES OF SPARK OR FLAME.

         C. CONTAIN THE SOURCE OF THE SPILL.

         D. DETERMINE THE APPROXIMATE VOLUME OF THE SPILL.

         E. IDENTIFY THE LOCATION OF NATURAL FLOW PATHS TO PREVENT THE RELEASE OF THE SPILL TO SENSITIVE NEARBY WATERWAYS OR WETLANDS.

         F. ENSURE THAT FELLOW WORKERS ARE NOTIFIED OF THE SPILL.

      III. SPILL CLEAN UP & CONTAINMENT
         A. OBTAIN SPILL RESPONSE MATERIALS FROM THE ON-SITE SPILL RESPONSE KIT. PLACE ABSORBENT MATERIALS DIRECTLY ON THE RELEASE AREA.

         B. LIMIT THE SPREAD OF THE SPILL BY PLACING ABSORBENT MATERIALS AROUND THE PERIMETER OF THE SPILL.

         C. ISOLATE AND ELIMINATE THE SPILL SOURCE.

         D. CONTACT THE APPROPRIATE LOCAL, STATE AND/OR FEDERAL AGENCIES, AS NECESSARY.

         E. CONTACT A DISPOSAL COMPANY TO PROPERLY DISPOSE OF CONTAMINATED MATERIALS.

      IV. REPORTING
         A. COMPLETE AN INCIDENT REPORT.

         B. SUBMIT A COMPLETED INCIDENT REPORT TO THE CONNECTICUT SITING COUNCIL.

4. TURTLE PROTECTIVE MEASURES
   A. PRIOR TO THE START OF CONSTRUCTION EACH DAY, THE CONTRACTOR SHALL SEARCH THE ENTIRE WORK AREA FOR TURTLES.

   B. IF A TURTLE IS FOUND, IT SHALL BE IMMEDIATELY MOVED, UNHARMED, BY CAREFULLY GRASPED IN BOTH HANDS, ONE ON EACH SIDE OF THE SHELL, BETWEEN THE TURTLE'S FORELIMBS AND THE HIND LIMBS, AND PLACED JUST OUTSIDE OF THE ISOLATION BARRIER IN THE APPROXIMATE DIRECTION IT WAS WALKING.

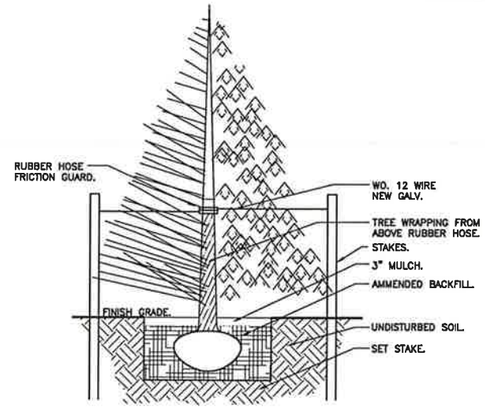
   C. SPECIAL CARE SHALL BE TAKEN BY THE CONTRACTOR DURING EARLY MORNING AND EVENING HOURS SO THAT POSSIBLE BASKING OR FORAGING TURTLES ARE NOT HARMED BY CONSTRUCTION ACTIVITIES.

5. HERBICIDE AND PESTICIDE RESTRICTIONS
   A. THE USE OF HERBICIDES AND PESTICIDES AT THE PROPOSED WIRELESS TELECOMMUNICATIONS FACILITY AND ALONG THE PROPOSED ACCESS DRIVE ARE STRICTLY PROHIBITED.

6. REPORTING
   A. MONTHLY INSPECTION REPORTS (BRIEF NARRATIVE AND APPLICABLE PHOTOS) WILL BE SUBMITTED TO THE CONNECTICUT SITING COUNCIL FOR COMPLIANCE VERIFICATION. ANY OBSERVATIONS OF TURTLES WILL BE INCLUDED IN THE REPORTS.

   B. FOLLOWING COMPLETION OF THE CONSTRUCTION PROJECT, APT WILL PROVIDE A SUMMARY REPORT TO CTDEEP DOCUMENTING THE MONITORING AND MAINTENANCE OF THE BARRIER FENCE AND EROSION CONTROL MEASURES.

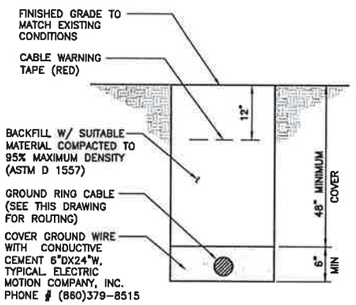
   C. ANY OBSERVATIONS OF EASTERN BOX TURTLE OR WOOD TURTLE WILL BE REPORTED TO CTDEEP BY APT, WITH PHOTO-DOCUMENTATION (IF POSSIBLE) AND WITH SPECIFIC INFORMATION ON THE LOCATION AND DISPOSITION OF THE ANIMAL.



TREE + SHRUB PLANTING SPECIFICATIONS:

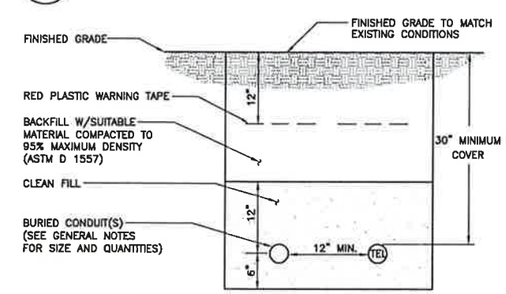
1. GUY WIRES (WO.12 NEW GALV.) SHALL BE REQUIRED FOR ALL TREES 3 GAL. AND LARGER.
2. SOIL MIX SHALL CONSIST OF: 3 PARTS TOP SOIL, 3 PART PEAT MOSS, 10 ONE PART COMPOSTED COW MANURE, AND 1 OZ. SOIL MOIST PER EVERY 12 IN. OF LINEAR DIM. OF ROOT BALL. COVER WITH LANDSCAPE FABRIC, AND A MINIMUM OF 3" CEDAR MULCH.
3. TREES 6' AND OVER SHALL BE STAKED WITH 2 OAK STAKES 2" X 2" X 6' AND GUY WIRE TO STAKES.
4. ALL TREES AND SHRUBS MUST MEET OR EXCEED STANDARDS SET BY THE NATIONAL ASSOCIATION OF NURSERYMEN, YEAR OF LATEST REVISION.

4 / C-6 **TYPICAL TREE PLANTING DETAIL**
NOT TO SCALE



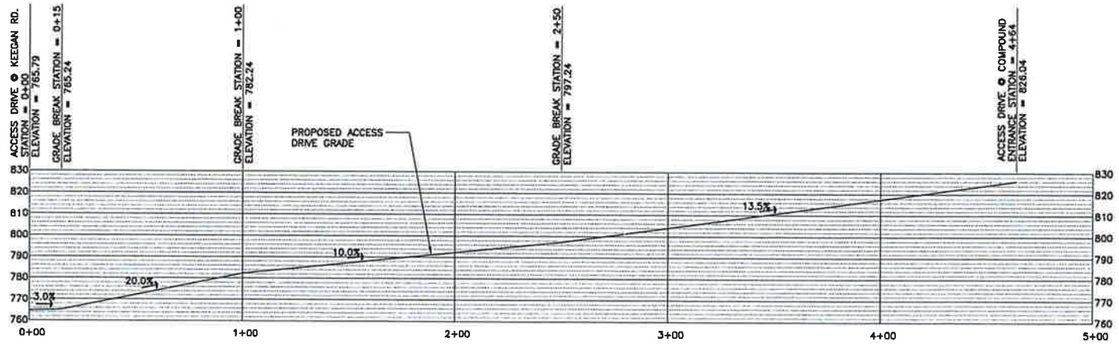
NOTES:
1. BACK FILL SHALL NOT CONTAIN ASHES, CINDERS, SHELLS, FROZEN MATERIAL, LOOSE DEBRIS OR STONES LARGER THAN 2" IN MAXIMUM DIMENSION.
2. WHERE EXISTING UTILITIES ARE LIKELY TO BE ENCOUNTERED, CONTRACTOR SHALL HAND DIG AND PROTECT EXISTING UTILITIES.

3 / C-6 **TYPICAL BURIAL GROUND CABLE DETAIL**
NOT TO SCALE



NOTES:
1. THE CLEAN FILL SHALL PASS THROUGH A 3/8" MESH SCREEN AND SHALL NOT CONTAIN SHARP STONES. OTHER BACKFILL SHALL NOT CONTAIN ASHES, CINDERS, SHELLS, FROZEN MATERIAL, LOOSE DEBRIS OR STONES LARGER THAN 2" IN MAXIMUM DIMENSION.
2. WHERE EXISTING UTILITIES ARE LIKELY TO BE ENCOUNTERED, CONTRACTOR SHALL HAND DIG AND PROTECT EXISTING UTILITIES.

2 / C-6 **TYPICAL ELECTRICAL/TEL TRENCH DETAIL**
NOT TO SCALE



1 / C-6 **ACCESS DRIVE PROFILE**
NOT TO SCALE

NO.	DATE	DRAWN BY	CH'K'D BY	DESCRIPTION
0	11/17/15	HMR	DMD	ZONING PLANS
1	11/24/15	HMR	DMD	ZONING PLANS - ISSUED FOR CLIENT REVIEW

CENTEK engineering
Centered on Solutions
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

Celco Partnership d/b/a Verizon Wireless
WIRELESS COMMUNICATIONS FACILITY

PLYMOUTH WEST RELO.

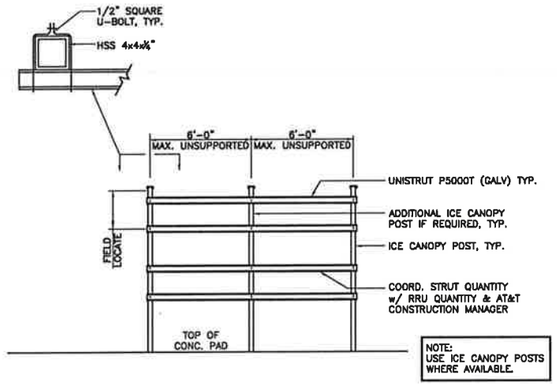
33 KEEGAN ROAD
PLYMOUTH, CT 06782

DATE: 08/03/15
SCALE: AS NOTED
JOB NO. 13321.000

SITE DETAILS AND ENVIRONMENTAL NOTES

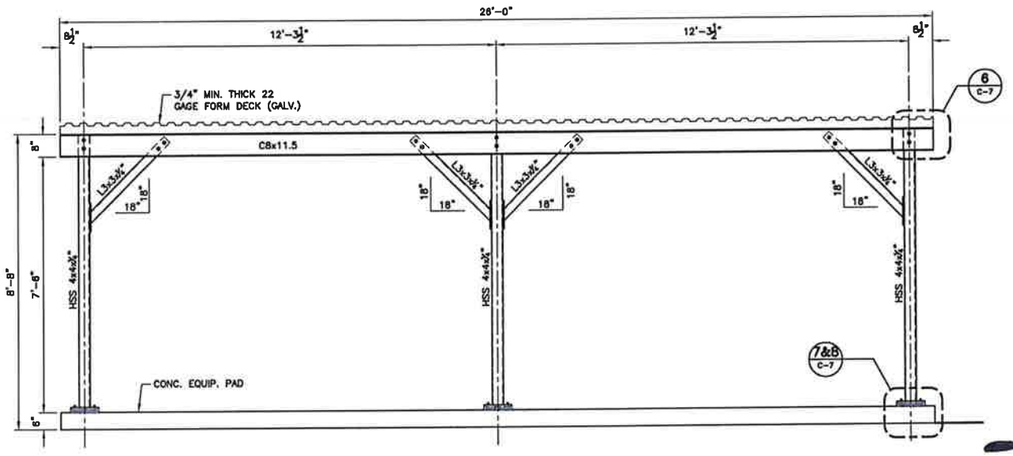
C-6

Sheet No. 8 of 9



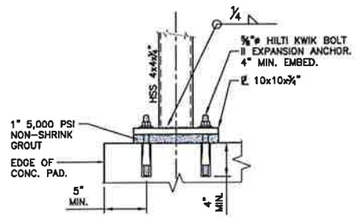
9 / C-7 TYPICAL EQUIPMENT MOUNTING FRAME DETAIL

NOT TO SCALE



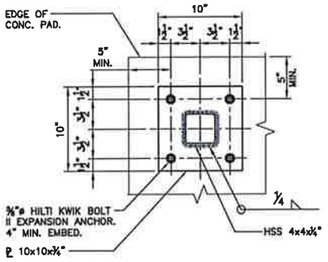
3 / C-7 SOUTHEAST CANOPY ELEVATION

1/2" = 1'-0"



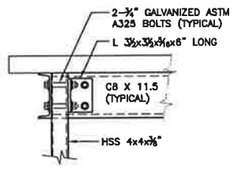
7 / C-7 CANOPY POST CONNECTION

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



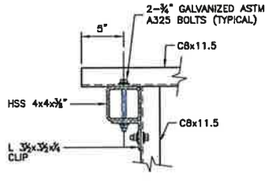
8 / C-7 CANOPY POST BASE PLATE

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



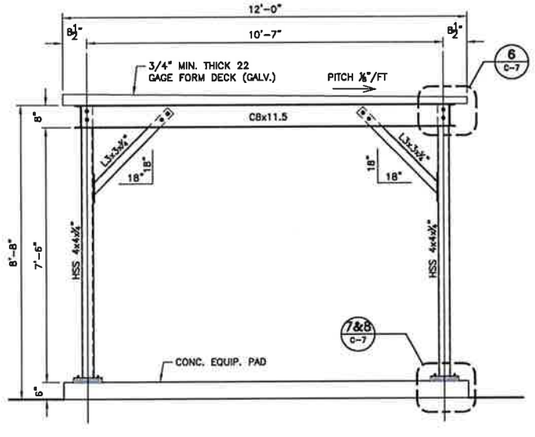
6 / C-7 CANOPY FRAME CONNECTION

SCALE: 1" = 1'-0"



5 / C-7 CANOPY FRAME CONNECTION

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



4 / C-7 SOUTHWEST CANOPY ELEVATION

1/2" = 1'-0"

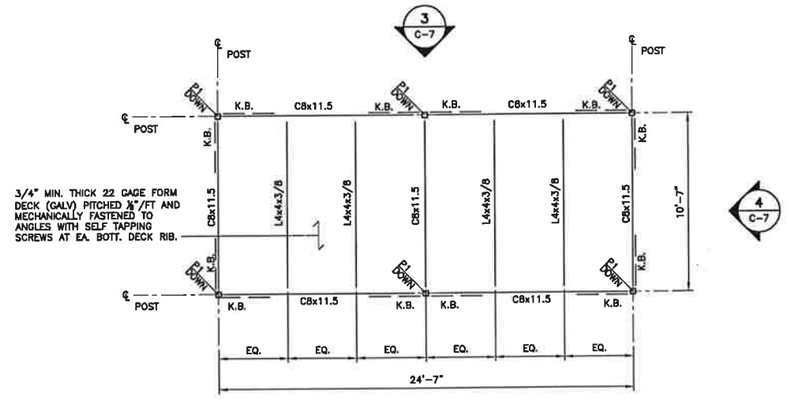
PLAN NOTES AND LEGEND

1. VERIFY ALL DIMENSIONS, ELEVATIONS, EXISTING FRAMING MEMBER SIZES AND GENERAL CONDITIONS PRIOR TO COMMENCEMENT OF WORK. NOTIFY ENGINEER OF RECORD OF ANY DISCREPANCIES BETWEEN THESE DRAWINGS AND EXISTING CONDITIONS.

ø1 INDICATES HSS4x4x1/4 ASTM A500 GR. B (F_y = 46ksi) STEEL POST.

INDICATES SPAN DIRECTION.

K.B. INDICATES L3x3x1/4 ASTM A36 (Fy=36 KSI) STEEL ANGLE

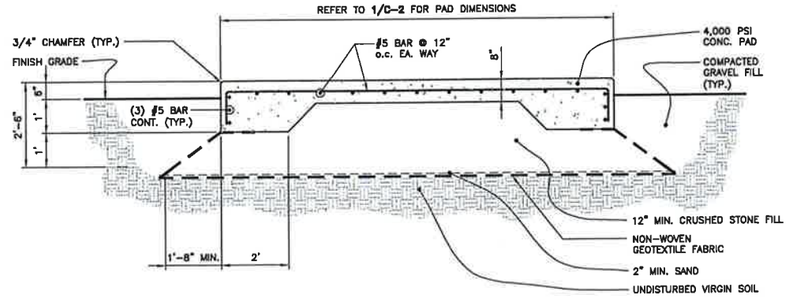


3/4" MIN. THICK 22 GAGE FORM DECK (GALV) PITCHED ⅛"/FT AND MECHANICALLY FASTENED TO ANGLES WITH SELF TAPPING SCREWS AT EA. BOTT. DECK RIB.

2 / C-7 PLAN - ROOF FRAMING

1/4" = 1'-0"

APPROXIMATE NORTH



1 / C-7 PLAN - EQUIPMENT PLATFORM

NOT TO SCALE

NOTE: REFER TO EQUIPMENT MANUFACTURER FOR RECOMMENDED HOLD-DOWN HARDWARE.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	11/24/15	HAR	DMD	D&M PLANS
0	11/17/15	HAR	DMD	D&M PLANS - ISSUED FOR CLIENT REVIEW

CENTEK engineering
Centered on Solutions
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

Cellco Partnership d/b/a Verizon Wireless

WIRELESS COMMUNICATIONS FACILITY

PLYMOUTH WEST RELO.

33 KEEGAN ROAD
PLYMOUTH, CT 06782

DATE: 08/03/15
SCALE: AS NOTED
JOB NO. 13321.000

EQUIPMENT PAD AND ICE CANOPY DETAILS

C-7

Sheet No. 9 of 9

DESIGN EARTH TECHNOLOGY

P.O. Box 187, Guilford, CT 06437
Phone/Fax: (203) 458-9806 ▪ Email: docdirt@aol.com

GENERAL CIVIL ENGINEERING ▪ GEOTECHNICAL ENGINEERING ▪ HYDROGEOLOGY ▪ HYDROLOGY AND HYDRAULICS ▪ TESTING—SOILS & MATERIALS ▪ CONSTRUCTION ENGINEERING

GEOTECHNICAL AND GEOPHYSICAL TESTING REPORT

PROPOSED VERIZON WIRELESS COMMUNICATIONS TOWER
PLYMOUTH WEST RELOCATION
55 KEEGAN ROAD
PLYMOUTH, CONNECTICUT

PREPARED FOR:

CENTEK ENGINEERING, Inc.

SEPTEMBER 2014
REVISED NOVEMBER 2015

DESIGN EARTH TECHNOLOGY

P.O. Box 187, Guilford, CT 06437
Phone/Fax: (203) 458-9806 ▪ Email: docdirt@aol.com

September 26, 2014
Revised November 17, 2015

Mr. Carlo F. Centore, P.E.
Centek Engineering, Inc.
63-2 North Branford Road
Branford, CT 06405

Re: Proposed Verizon Communications Tower
55 Keegan Road (Plymouth West Relocation)
Plymouth, Connecticut
DET Job No. 2014.14

Dear Mr. Centore:

Lawrence J. Marcik, Jr., P.E. dba **Design Earth Technology (DET)** has completed a geotechnical engineering study for the above referenced project. Included in this report is a summary of subsurface conditions, delineation of engineering characteristics of the foundation materials, and the implications of the conditions and characteristics with respect to the design and construction of the proposed communication facilities. This report was prepared under our agreement dated August 2, 2014 and your subsequent authorization.

The purpose of this study is to develop geotechnical engineering recommendations for the proposed foundation design and site development. The subsurface investigation and sampling program was conducted by **DET** for the sole purpose of obtaining subsurface information as part of a geotechnical study. No services were performed to evaluate subsurface environmental conditions; however, the client requested that as a courtesy, **DET** log any noticeable non-typical visual and/or odorous conditions from the soil and rock core samples.

SITE DESCRIPTION

The project site is located off of Keegan Road in Plymouth, Connecticut. The project location is shown on the attached "Location Plan, Figure No. 1". The general site area is located within a residential area. The proposed cell tower site is located on an undeveloped lot that is wooded with trees and brambles. Surface relief at the site is significant with elevations ranging from about El. 764 at Keegan Road to El. 830 near the proposed tower.

PROJECT DESCRIPTION

The proposed project consists of the installation and the site development of a new +/-143' high wireless communications mono-pole tower with the addition of wireless equipment structures.

SUBSURFACE EXPLORATION

Associated Borings Company, Inc. performed the subsurface exploration work on September 4th and 5th of 2014 and August 5th of 2015. Locations of the subsurface exploration are shown on Figure No. 2 and logs have been included in Appendix A. The subsurface exploration program consisted of a total of one (1) boring, four (4) bedrock verification probes at the tower site and forty two (42) bedrock verification probes (Power Drill Soundings) at the proposed roadway (access drive). All subsurface penetrations were conducted in the area of the proposed Verizon Wireless facilities and access drive. The center of tower location (alternate tower location) and centerline of access road were staked-out by your office.

Boring B-1 was drilled near the proposed "alternate center of tower location" (about 50' away from the current proposed tower location). The boring was advanced using hollow stem auger technique to 1' below existing grade where bedrock was encountered. Rock coring was performed from 1' to 21' below grade where coring was terminated.

Bedrock verification probes (Power Drill Soundings) were drilled in the vicinity of the proposed compound and along the roadway (access drive). All probes were advanced to refusal which is "assumed" to be possible bedrock or a large boulder. The probes depths range between 0' and 10' below existing ground surface.

The rock cores in borings B-1 were drilled using a standard NQ-2 size core bit resulting in the diameter of core sample being about ± 2". The coring was conducted using a standard wet core boring technique.

Bedrock verification probes were drilled using solid stem auger technique.

Standard Penetration Tests (SPT) of the soil were not performed in boring B-1 due to depth to bedrock (1').

Logs of the bedrock verification probes (Power Drill Soundings) and boring are included in Appendix A. See attached photo of the boring/coring process.

RESISTIVITY TESTING

In place soil resistivity testing was conducted by **DET** personnel on September 4, 2014 within the vicinity of the proposed tower facilities. Four test sections were established in different directions. Approximate test section locations are illustrated in Figure 2. All test sections were tested up to an electrode "A" spacing of 40 feet. Test results yielded resistivity values within acceptable ranges for the given soil/rock types and moisture conditions typically found in the New England geology.

It should be noted, however, that resistivity measurements are strongly influenced by local variations in surface conductivity caused by soil/rock weathering, soil/rock moisture content, soil temperature, rugged topography and existing subsurface manmade conductive materials. Attempts were made (where possible) during field operations to minimize some of these effects on the test results. Results of the resistivity tests are summarized in Table No. 1 with detailed calculations shown in Appendix B. See attached photograph of a typical test.

LABORATORY TESTING

The laboratory testing program consisted of three (3) Unconfined Compressive Strength of Intact Rock Core Specimens taken from boring B-1. Laboratory test data are attached in Appendix C.

SUBSURFACE CONDITIONS

Proposed Tower and Compound Area

Based upon our review of the testing program in the area of the proposed tower foundation, compound area, and access drive, the site is covered with a somewhat shallow layer of soil consisting of a topsoil layer underlain by silty subsoil, underlain by a silty glacial till. This silty subsoil and till generally consists of boulders, cobbles, gravel, sand, silt, clay in varying proportions and underlain by bedrock. The topsoil, subsoil, and till layers (total of all soil layers) varies from at surface to 10 feet deep from existing grades as observed in the boring and probes. Groundwater was not found in the boring or in any of the probes at time of drilling.

As indicated above, the bedrock surface at the site varies from at surface to 10 feet below ground surface in the area tested. According to the "Bedrock Geological Map of Connecticut", by John Rodgers dated 1985, the bedrock at the site is described as DSt. This DSt is called "The Straits Schist" which is a silvery to gray, coarse grained schist. This is a metamorphic type rock. A geologist was not retained to log the core samples obtained so no determination of specific rock type was made. To assess the engineering properties of the bedrock, rock cores were conducted in boring B-1. The rock cores were reviewed by this writer to determine "Rock Quality Designation" (RQD). The RQD values were conducted to measure the rock core quality of fracture frequency. The results of RQD varied from 55 to 100 at boring B-1. The average of all RQD tests is 84. For specific results of RQD, see Appendix C. The bedrock Rock Quality Classification is "good".

Uni-axial compressive strength of rock core samples were conducted on three (3) rock core samples with strengths of 1,600 psi, 1,400 psi and 2,100 psi (avg. 1,700 psi). For specific compressive strength information, see Appendix C.

GEOTECHNICAL DESIGN CONSIDERATIONS

Tower Foundation

It is recommended that the proposed tower be supported on a spread footing (mat foundation) bearing on suitable, competent (sound) rock. For these foundations, an allowable bearing pressure of 10 tons per square foot is recommended for the design. These allowable loading pressures can be increased by $^1/_3$ for seismic or wind loading. Settlement of the tower should be negligible if founded directly on (sound) bedrock. Because the current proposed tower location is about 50' away from the Alt. tower location (were the boring B1 was drilled), test pits and/or a boring should be performed before final tower foundation design/construction is to take place. This additional subsurface investigation is to verify soil/bedrock conditions at the current proposed tower location. If competent (sound) bedrock is not found or at a deeper depth, a mat foundation bearing on naturally dense soil could be proposed with a **much** lower allowable bearing pressure (this allowable bearing pressure to be determined at time of test pits and/or a boring).

All proposed foundations **must** bear on competent (sound) rock. The bottom of the excavation is to be carried down below any weathered and fractured rock to obtain competent (sound) rock bearing. If the Contractor over-excavates and/or over-blasts and competent (sound) rock is not obtained at the proposed bottom of foundation elevation, the Contractor shall excavate down to competent (sound) rock and remove all of the loose material and fill excavation to the proposed bottom of footing with 3,000 psi concrete (lean concrete).

Competent (Sound) Rock is defined as where no fragmentation is produced under heavy hammer blows or rock will not break down with the use of a single-tooth ripper on a D-8 Caterpillar Power Bulldozer or equal force.

All foundations that bear on sound bedrock shall have the following preparations (See Figure 3 for additional details):

⇒ Bedrock bearing surface shall be cleaned of any soil, loose rock fragments and any unsuitable bearing material. The bearing surface is to be air blown clean and/or swept clean.

⇒ Bedrock bearing surface shall be level.

⇒ Bedrock bearing surface to be observed by geotechnical engineer for approval.

As a result of the required seismic and wind loading, towers typically have portions of their foundation that undergo uplift and lateral loading. To address these issues, to resist this uplift and lateral loading, and to reduce the foundation size, **DET** recommends rock anchors. A pre-stress rock anchor system is to be used for design. A pre-stress rock anchor system is superior to the non-prestress system in that the prestressing of rock anchors minimizes foundation movement when stress is applied. Foundations are not allowed to move under constantly changing loading conditions. This will result in reducing the potential for long term fatigue of the rock anchor system.

The rock anchor system we recommend is the DYWIDAG System or approval equal. DYWIDAG rock anchors are post-tensioned tendons installed in drilled holes for which at least

the entire bond length is located in suitable rock. The anchor force is transmitted to the rock by bond between the grout body and the rock. The following information is for general consideration, but **DE**T recommends that the design of these anchors should be a joint effort between **DET** (geotechnical engineer) and the structural engineer.

⇒ All rock anchors are to be designed in accordance with the publication entitled, *Recommendations For Prestressed Rock and Soil Anchors,* by Post-Tensioning Institute lasted edition.

⇒ The anchor bolt system shall be corrosion protection "Class 1" (double corrosion protection) unless others conduct an environmental study to determine the aggressivity of the host soil/rock system.

⇒ The load carrying capacity of each anchor is to be verified by load testing after installation and prior to being placed in service.

⇒ The anchor system is to be designed using permanent anchor design criteria.

⇒ The working bond stress along the interface between rock and grout to be used for design shall be 60 psi.

⇒ The rock anchor pull-out cone has an angle of 30° with the center of the anchor and total cone angle of 60°. The resulting rock anchor pull-out cone must be evaluated for global stability when single and/or multiple anchors are used.

⇒ The point where the cone starts is taken at the midway distance of the bonded length.

Given the empirical nature of the design of these rock anchors, it is advisable that **DET** be retained to assist in the design of the rock anchor system.

Equipment Shelter

A spread footing is considered appropriate for the subsurface conditions at the proposed equipment shelter with the following foundation preparation requirements.

1. Remove all topsoil and till material down to bedrock. Remove bedrock and loose bedrock as required, to provide a level surface to construct the spread footing
2. If bedrock/till is over-excavated, use compacted ½" size crushed stone to fill and level the area. Note: Crushed stone leveling course **can not** be used in the tower foundation construction as it is to bear on sound bedrock.

With this foundation preparation requirements, use allowable bearing pressure of 2 tons per square foot for foundation design of the spread footing. Settlement of the spread footing will be negligible. The bottom of footing needs to be at least 42" below outside grades for frost protection.

EARTHQUAKE DESIGN (SEISMIC)

Seismic design requirements for the State of Connecticut are based on the Connecticut State Building Code, which incorporates the Seismic design Category approach from the International Building Code. The seismic design Category determination is based on a few category factors. One such category is the "Site Classification (soil type)". From our test borings, we consider that the site subsurface conditions match the General Description of "Rock". The site classification is therefore "B".

For transfer of ground shear into the natural undisturbed bedrock, the friction factor between the concrete and bedrock can be 0.60.

The proposed foundation is to bear on sound bedrock. This sound bedrock will not liquefy during a seismic event and needs not be addressed in the foundation design.

Passive earth pressure is not typically used in resisting sliding of structures due to the potential of this earthen material being removed in the future. If this material can be guaranteed to remain in place for the life of the structure, the following design parameters can be used for design:

⇒ Dry unit weight of gravel backfill soil should be 125 pound per cubic foot (pcf).
⇒ Ultimate passive earth pressure coefficient (K_p = 3.0)
⇒ A factor of safety of 3 is to be used in the design to obtain "allowable" passive pressure from ultimate passive pressure.

GEOTECHNICAL CONSTRUCTION CONSIDERATIONS

General

This section provides comments related to foundation construction and other geotechnical aspects of the project. It will aid personnel responsible for preparation of Contract Plans and Specifications and those involved with the actual construction and construction monitoring. The contractor **must** evaluate potential construction problems on the basis of his own knowledge and experience in the area and on the basis of similar projects in other localities, taking into consideration his own proposed construction methods and procedures. The contractor shall visit the site to become familiar with the topography, the rock out-cropping, and other features that will affect their work.

Excavation

Materials to be excavated are expected to be topsoil, subsoil, silty till and bedrock in the proposed compound area and access drive; hence excavation is expected to be very difficult when excavating bedrock. Bedrock is at ground surface to about 10' below ground surface in the area tested, so most excavations below this depth will be within the bedrock. This will be a major site issue for the contractor. It is anticipated that blasting will be required for rock excavation. Controlled blasting procedures are recommended. Blasting specifications should limit blast vibrations, air blast overpressure, and provide criteria for perimeter control. As an alternative to blasting, methods such as core cracker, hydraulic impact and hydraulic splitting have a track record of reducing vibration and air blast. Pre and post construction surveys of the surrounding structure should be performed to minimize damage claims.

In the access drive and shelter construction, if filling or cutting is required to develop the site, the cut/fill slopes should generally be no steeper than an inclination of 2(H):1(V).

Site soils are not expected to be stable on steep slopes for any appreciable length of time. It is recommended that un-braced excavations be laid back to a field determined safe slope. Temporary excavations should be laid back or braced to OSHA requirements.

Dewatering/Groundwater
Normal groundwater levels are expected to be at or below the proposed excavation at the soil/bedrock interface. Therefore, dewatering is expected to be limited to pumping of surface runoff, precipitation that enters the excavation, and localized groundwater. It is anticipated that dewatering will be performed by localized sump techniques.

Materials
Gravel backfill is material used to backfill the foundation/retaining walls and is to be obtained from off-site borrow sources. This material shall consist of inert material that is hard, durable stone and coarse stone, free from loam and clay, surface coatings and deleterious materials. These materials shall conform to the following gradation requirements (using washed sieve analysis):

Sieve Size	Percent Finer by Weight
1-1 1/2"	100
¾"	45 – 80
¼"	25 – 60
No. 10	15 – 45
No. 40	5 – 25
No. 100	0 – 10
No. 200	0 – 5

Placement and Compaction of Foundation Backfill

A. All backfill materials shall be placed in horizontal layers not exceeding 6". Each layer shall be spread evenly and thoroughly blade mixed during spreading to ensure uniformity of material in each layer. Each layer shall be evenly compacted with an approved hand operated compactor, making a minimum of at least five (5) passes.

B. In no case shall fill be placed over frozen material or snow. No fill material shall be placed, spread, or compacted during unfavorable weather conditions where soil moisture precludes achievement of the specified compaction. When the work is interrupted by heavy rains or snow, fill operations shall not be resumed until the moisture content and the density of the previously placed fill are as specified.

C. Gravel fill shall be compacted in individual layers (not exceeding 6") to 95% maximum dry density using ASTM D1557.

LIMITATIONS

Explorations
The analysis and recommendations submitted in this report are based in part upon the data obtained from a limited number of widely spaced subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction excavation. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report at that time.

The soil profiles described and shown in this report are generalized and are intended to convey trends in subsurface conditions. The boundaries between strata and bedrock are approximate and generalized. They have been developed by data that is limited in number and widely spaced.

Water level readings have been observed in the drill holes at times and under conditions stated on the boring logs and in this report. This data has been reviewed, analyzed, and interpretations made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, time of the year and other factors not evident at the time measurements were taken.

Designer Review
In the event that any changes in the design or location of the monopole or proposed site development, the conclusions and recommendations contained in this report shall not be considered valid unless these changes are reviewed by this office and conclusions of this report modified.

Construction
It is recommended that Design Earth Technology retained to provide geotechnical field monitoring services based on familiarity with the subsurface conditions, design concepts and specifications, technical expertise, and experience in monitoring of site development construction.

Use of This Report
This report has been prepared for specific application and use of the proposed Verizon Wireless Tower to be located off of Keegan Road, Plymouth, Connecticut and is in accordance with generally accepted soil and foundation engineering practices. No other warranty expressed or implied is made.

If you have any questions regarding the above information, please call.

Sincerely,

DESIGN EARTH TECHNOLOGY

L. Marcik L.P.E.

Lawrence J. Marcik, Jr., P.E.

FIGURES

JOB TITLE: GEOTECHNICAL REPORT FOR A PROPOSED VERIZON WIRELESS COMMUNICATIONS FACILITY AT 55 KEEGAN ROAD PLYMOUTH, CONNECTICUT

PREPARED FOR:

CENTEK ENGINEERING, INC.

DATE: SEPTEMBER 26, 2014

SCALE: NTS

SOURCE: U.S.G.S. QUADRANGLE THOMASTON

DESIGN EARTH TECHNOLOGY
P.O. Box 187 • Guilford, CT 06437
Phone/Fax: (203) 458-9806
Email: deedirt@aol.com

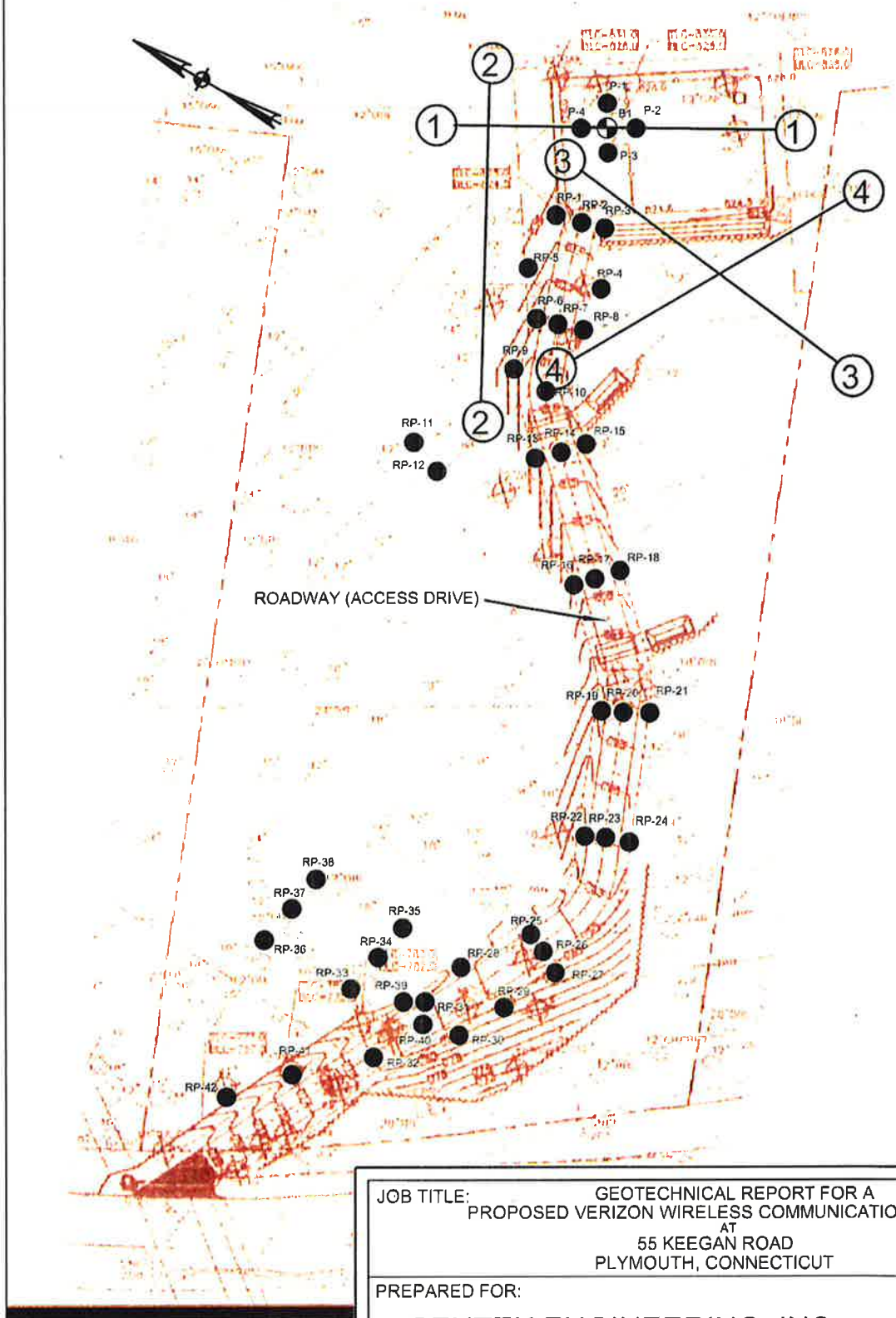
PROJECT No.: 2014-14

DRAWN: LJM

FIGURE No.: 1

FIGURE TITLE: LOCATION PLAN

CAD FILE: Location Plan



LEGEND

- P-1 — TYPICAL PROBE
- RP-1 — TYPICAL ROADWAY PROBE POWER DRILL SOUNDING
- B1 — BORING WITH ROCK CORES
- (2) — SECTION NUMBER RESISTIVITY TESTING

NOTE: PROBES & ROADWAY PROBES & ALTERNATE TOWER LOCATION ARE APPROXIMATE

JOB TITLE: GEOTECHNICAL REPORT FOR A PROPOSED VERIZON WIRELESS COMMUNICATIONS FACILITY AT 55 KEEGAN ROAD PLYMOUTH, CONNECTICUT

PREPARED FOR:

CENTEK ENGINEERING, INC.

DATE: NOVEMBER 1, 2015

SCALE: 1" = 60' +/-

DESIGN EARTH TECHNOLOGY
P.O. Box 187 • Guilford, CT 06437
Phone/Fax: (203) 458-9806
Email: docdirt@aol.com

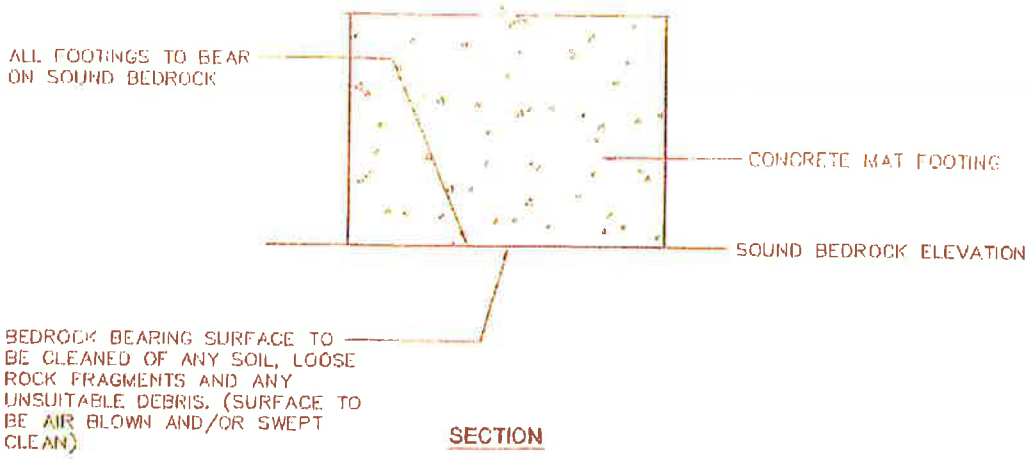
PROJECT No.: 2014-14

DRAWN: LJM

FIGURE No.: 2

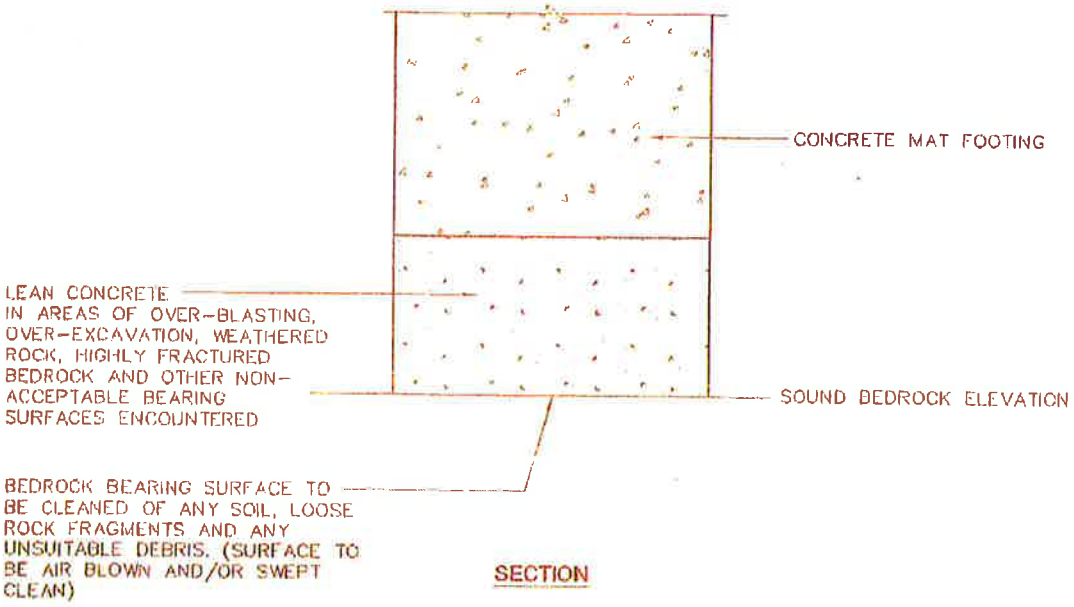
FIGURE TITLE: SKETCH OF LOCATIONS OF SUBSURFACE EXPLORATIONS

CAD FILE: Figures



FOUNDATION BEARING SURFACE PREPARATION AT DESIGNED ELEVATIONS

NOT TO SCALE



FOUNDATION BEARING SURFACE PREPARATION WHERE SOUND BEDROCK IS LOWER THAN DESIGNED ELEVATION

NOT TO SCALE

JOB TITLE: GEOTECHNICAL REPORT FOR A PROPOSED VERIZON WIRELESS COMMUNICATIONS FACILITY AT 55 KEEGAN ROAD PLYMOUTH, CONNECTICUT

PREPARED FOR:

CENTEK ENGINEERING, INC.

DATE: SEPTEMBER 26, 2014

SCALE: NTS

PROJECT No.: 2014-14

DRAWN: LJM

FIGURE No.: 3

CAD FILE: Figures

DESIGN EARTH TECHNOLOGY
P.O. Box 187 • Guilford, CT 06437
Phone/Fax: (203) 458-9806
Email: doedirt@aol.com

FIGURE TITLE: FOUNDATION DETAILS

TABLES

TABLE 1

PROPOSED VERIZON WIRELESS TOWER
PLYMOUTH WEST RELOCATION
55 KEEGAN ROAD
PLYMOUTH, CT

IN-SITU SOIL RESISTIVITY RESULTS[1]

Section No.

ELECTRODE SPACING (ft)	1	2	3	4
5	1,451,570	1,853,720	1,869,040	1,804,887
10	1,618,175	1,685,200	2,188,845	1,723,500
20	2,252,040	2,209,910	2,117,990	2,026,070
30	1,924,575	1,913,085	1,786,695	1,683,285
40	1,600,940	1,478,380	1,509,020	1,600,940

NOTES: 1. Resistivity values indicated are in OHM-CM

2. [1]Test completed using Wenner Four Probe Method with a Det 2/2 Auto Earth Tester as manufactured by Avo, Inc.

APPENDICES

APPENDIX A

Jaime Lloret	**TEST BORING REPORT**	SHEET 1 OF 1	
DRILLER	**ASSOCIATED BORINGS CO., INC.**		
Larry Marcik, Jr.	**119 MARGARET CIRCLE, NAUGATUCK, CT 06770**	CME-45B	
INSPECTOR	**Tel (203) 729-5435 Fax (203) 729-5116**	DRILLING EQUIPMENT	
	PROJECT NAME: Cell Tower 55 Keegan Road	Design Earth Technology	
SOILS ENGINEER	PROJECT NUMBER:	CLIENT	
Surface Elevation:	LOCATION: Plymouth, Connecticut		

		Auger	Casing	Sampler	Core Bar	
Date Started: 9/4/2014						Hole No. **B-1**
Date Finished: 9/4/2014	Type	HSA		SS	NQ-2	Line & Station
Groundwater Observations	Size I. D.	3 1/4 in		2 in		Offset
AT None ' AFTER 0 HRS	Hammer			140 lb	Bit	N Coordinate
AT ' AFTER HRS	Fall			30 in		E. Coordinate

DEPTH	Casing blows per foot	SAMPLE DEPTH IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0 - 6	6 - 12	12-18	18-24	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		1.0 - 6.0	1	60	59	C					12"	Topsoil
											1	Br. M-F Silty Sand
												Cored Run # 1
												From 1.0 feet to 6.0 feet
5												Recovery - 59"
		6.0 -11.0	2	60	57	C						RQD = 33/60 = 55%
											6	
												Cored Run # 2
												From 6.0 feet to 11.0 feet
10												Recovery - 57"
		11.0 - 16.0	3	60	60	C						RQD = 60/60 = 100%
											11	
												Cored Run #3
												From - 11.0 feet to 16.0 feet
15												Recovery - 60"
		16.0 - 21.0	4	60	60	C						RQD = 54/60 = 90%
											16	
												Cored Run # 4
												From - 16.0 feet to 21.0 feet
20												Recovery - 60"
												RQD = 56/60 = 93%
											21	
												End of Boring - 21.0
25												
30												
35												
40												

From Ground Surface to	Feet Used	Inch Casing Then	Inch Casing For	Feet
Footage in Earth 1.0	Footage in Rock 20.0	No. of Samples 0	Hole No. **B-1**	

SAMPLE TYPE CODING: D = DRIVEN C = CORE A = AUGER UP = UNDISTURBED PISTON

PROPORTIONS USED: TRACE = 1-10% LITTLE = 10-20% SOME = 20-35% AND = 35-50%

Jaime Lloret DRILLER Larry Marcik, Jr. INSPECTOR	**TEST BORING REPORT** **ASSOCIATED BORINGS CO., INC.** **119 MARGARET CIRCLE, NAUGATUCK, CT 06770** **Tel (203) 729-5435 Fax (203) 729-5116**	SHEET 1 OF 1 CME-45B DRILLING EQUIPMENT Design Earth Technology
DATE; 9/4/2014	PROJECT NAME: Cell Tower 55 Keegan Road PROJECT NUMBER: LOCATION: Plymouth, Connecticut	CLIENT

POWER DRILL SOUNDING REPORT

Station	Offset	Elev	Probe #	From	To	Remarks: Soil Encountered, Groundwater Depth, Refusal Etc.
			P-1	0.0	1.0	Soil
						Refusal - 1.0 End of Boring - 1.0 G.W.O. - None
			P-2	0.0	2.0	Soil
						Refusal - 2.0 End of Boring - 2.0 G.W.O. - None
			P-3	0.0	2.0	Soil
						Refusal - 2.0 End of Boring - 2.0 G.W.O. - None
			P-4	0.0	1.0	Soil
						Refusal - 1.0 End of Boring - 1.0 G.W.O. - None

PROPORTIONS USED: TRACE = 1-10% LITTLE = 10-20% SOME = 20-35% AND = 35-50%

Jaime Lloret DRILLER Larry Marcik, Jr. INSPECTOR	**TEST BORING REPORT** **ASSOCIATED BORINGS CO., INC.** **119 MARGARET CIRCLE, NAUGATUCK, CT 06770** **Tel (203) 729-5435 Fax (203) 729-5116**	SHEET 1 OF 2 CME-45B DRILLING EQUIPMENT Design Earth Technology CLIENT
DATE; 9/5/2014 & 8/5/2015	PROJECT NAME: Cell Tower 55 Keegan Road PROJECT NUMBER: LOCATION: Plymouth, Connecticut	

POWER DRILL SOUNDING REPORT

Station	Offset	Elev	Probe #	From	To	Remarks: Soil Encountered, Groundwater Depth, Refusal Etc.
			RP-1	0.0'	3.5'	Soil
						Refusal - 3.5' End of Probe - 3.5' G.W.O. - None
			RP-2	0.0'	5.0'	Soil
						Refusal - 5.0' End of Probe - 5.0' G.W.O. - None
			RP-3	0.0'	2.0'	Soil
						Refusal - 2.0' End of Probe - 2.0' G.W.O. - None
			RP-4	0.0'	5.0'	Soil
						Refusal - 5.0' End of Probe - 5.0' G.W.O. - None
			RP-5	0.0'	3.0'	Soil
						Refusal - 3.0' End of Probe - 3.0' G.W.O. - None
			RP-6	0.0'	4.5'	Soil
						Refusal - 4.5' End of Probe - 4.5' G.W.O. - None
			RP-7	0.0'	6.0'	Soil
						Refusal - 6.0' End of Probe - 6.0' G.W.O. - None
			RP-8	0.0'	6.0'	Soil
						Refusal - 6.0' End of Probe - 6.0' G.W.O. - None
			RP-9	0.0'	5.0'	Soil
						Refusal - 5.0' End of Probe - 5.0' G.W.O. - None
			RP-10	0.0'	1.5'	Soil
						Refusal - 1.5' End of Probe - 1.5' G.W.O. - None
			RP-11	0.0'	4.5'	Soil
						Refusal - 4.5' End of Probe - 4.5' G.W.O. - None
			RP-12	0.0'	2.5'	Soil
						Refusal - 2.5' End of Probe - 2.5' G.W.O. - None
			RP-13	0.0'	7.0'	Soil
						Refusal - 7.0' End of Probe - 7.0' G.W.O. - None
			RP-14	0.0'	7.0'	Soil
						Refusal - 7.0' End of Probe - 7.0' G.W.O. - None
			RP-15	0.0'	8.0'	Soil
						Refusal - 8.0' End of Probe - 8.0' G.W.O. - None
			RP-16	0.0'	10.0'	Soil
						Refusal - 10.0' End of Probe - 10.0' G.W.O. - None
			RP-17	0.0'	9.5'	Soil
						Refusal - 9.5' End of Probe - 9.5' G.W.O. - None
			RP-18	0.0'	10.0'	Soil
						Refusal - 10.0' End of Probe - 10.0' G.W.O. - None
			RP-19	0.0'	7.0'	Soil
						Refusal - 7.0' End of Probe - 7.0' G.W.O. - None
			RP-20	0.0'	8.5'	Soil
						Refusal - 8.5' End of Probe - 8.5' G.W.O. - None
			RP-21	0.0'	5.0'	Soil
						Refusal - 5.0' End of Probe - 5.0' G.W.O. - None
			RP-22	0.0'	4.5'	Soil
						Refusal - 4.5' End of Probe - 4.5' G.W.O. - None
			RP-23	0.0'	4.5'	Soil
						Refusal - 4.5' End of Probe - 4.5' G.W.O. - None

PROPORTIONS USED: TRACE = 1-10% LITTLE = 10-20% SOME = 20-35% AND = 35-50%

Jaime Lloret DRILLER Larry Marcik, Jr. INSPECTOR DATE; 9/5/2014 & 8/5/2015	**TEST BORING REPORT** **ASSOCIATED BORINGS CO., INC.** **119 MARGARET CIRCLE, NAUGATUCK, CT 06770** **Tel (203) 729-5435 Fax (203) 729-5116** PROJECT NAME: Cell Tower 55 Keegan Road PROJECT NUMBER: LOCATION: Plymouth, Connecticut	SHEET 2 OF 2 CME-45B DRILLING EQUIPMENT Design Earth Technology CLIENT

POWER DRILL SOUNDING REPORT

Station	Offset	Elev	Probe #	From	To	Remarks: Soil Encountered, Groundwater Depth, Refusal Etc.
			RP-24	0.0'	4.5'	Soil
						Refusal - 4.5' End of Probe - 4.5' G.W.O. - None
			RP-25	0.0'	5.0'	Soil
						Refusal - 5.0' End of Probe - 5.0' G.W.O. - None
			RP-26	0.0'	4.5'	Soil
						Refusal - 4.5' End of Probe - 4.5' G.W.O. - None
			RP-27	0.0'	8.0'	Soil
						Refusal - 8.0' End of Probe - 8.0' G.W.O. - None
			RP-28	0.0'	1.0'	Soil
						Refusal - 1.0' End of Probe - 1.0' G.W.O. - None
			RP-29	0.0'	3.0'	Soil
						Refusal - 3.0' End of Probe - 3.0' G.W.O. - None
			RP-30	0.0'	4.5	Soil
						Refusal - 4.5' End of Probe - 4.5' G.W.O. - None
			RP-31	0.0'	3.0'	Soil
						Refusal - 3.0' End of Probe - 3.0' G.W.O. - None
			RP-32	0.0'	0.0'	Soil
						Refusal - 0.0' End of Probe - 0.0' G.W.O. - None
			RP-33	0.0'	3.5'	Soil
						Refusal - 3.5' End of Probe - 3.5' G.W.O. - None
			RP-34	0.0'	1.0'	Soil
						Refusal - 1.0' End of Probe - 1.0' G.W.O. - None
			RP-35	0.0'	4.5'	Soil
						Refusal - 4.5' End of Probe - 4.5' G.W.O. - None
			RP-36	0.0'	6.0'	Soil
						Refusal - 6.0' End of Probe - 6.0' G.W.O. - None
			RP-37	0.0'	4.0'	Soil
						Refusal - 4.0' End of Probe - 4.0' G.W.O. - None
			RP-38	0.0'	7.0'	Soil
						Refusal - 7.0' End of Probe - 7.0' G.W.O. - None
			RP-39	0.0'	3.0'	Soil
						Refusal - 3.0' End of Probe - 3.0' G.W.O. - None
			RP-40	0.0'	2.0'	Soil
						Refusal - 2.0' End of Probe - 2.0' G.W.O. - None
			RP-41	0.0'	2.0'	Soil
						Refusal - 2.0' End of Probe - 2.0' G.W.O. - None
			RP-42	0.0'	5.5'	Soil
						Refusal - 5.5' End of Probe - 5.5' G.W.O. - None

PROPORTIONS USED: TRACE = 1-10% LITTLE = 10-20% SOME = 20-35% AND = 35-50%

APPENDIX B

RESISTIVITY DATA

SITE: Plymouth West Relo., 55 Keegan Road, Ct
DATE: September 4, 2014
SIGNATURE:

A=(FT)	5	10	20	30	40
FORMULA □ = (OHM-CM)	957.5*R	1915*R	3830*R	5745*R	7660*R
AREA 1 MEASURED R (OHM)	1,516	845	588	335	209
AREA 1 CALCULATED (OHM-CM)	1,451,570	1,618,175	2,252,040	1,924,575	1,600,940
AREA 2 MEASURED R (OHM)	1,936	880	577	333	193
AREA 2 CALCULATED (OHM-CM)	1,853,720	1,685,200	2,209,910	1,913,085	1,478,380
AREA 3 MEASURED R (OHM)	1,952	1,143	553	311	197
AREA 3 CALCULATED (OHM-CM)	1,869,040	2,188,845	2,117,990	1,786,695	1,509,020
AREA 4 MEASURED R (OHM)	1,885	900	529	293	209
AREA 4 CALCULATED (OHM-CM)	1,804,887	1,723,500	2,026,070	1,683,285	1,600,940

APPENDIX C

ROCK QUANTITY DESIGNATION

SUMMARY REPORT

PROJECT: Proposed Verizon Wireless Tower, Plymouth West Relo.
55 Keegan Road, Plymouth, Ct.

DET PROJECT NO.: 2014.14

MEASUREMENTS CONDUCTED BY: Lawrence J. Marcik, Jr., P.E.

BORING IDENTIFICATION AND CORE RUN DEPTH (ft)	CORE RUN LENGTH (in)	CORE RECOVERY LENGTH And % (in/%)	RQD (%)
B-1 Run #1 1' – 6'	60"	59/98	55
B-1 Run #2 6' – 11'	60"	57/95	100
B-1 Run #3 11' – 16'	60"	60/100	90
B-2 Run #1 16' – 21'	60"	60/100	93

UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMENS

SUMMARY REPORT

PROJECT: Proposed Verizon Wireless Communications Facility
55 Keegan Road, Plymouth, Connecticut

DET PROJECT NO.: 2014.14
DATE OF TEST: September 26, 2014
ROCK TYPE: Metamorphic Type Rock
TEST CONDUCTED BY: Lawrence J. Marcik, Jr., P.E.

CORE IDENTIFICATION	LOCATION OF SAMPLE	CORE DIAMETER (in.)	LENGTH OF CORE (in.)	COMPRESSIVE STRENGTH (psi)	TYPE OF FRACTURE
A	B-1, Run #2 Depth ±10'	1.98	4.52	1,600	Shear
B	B-1, Run #3 Depth ±15'	1.99	4.37	1,400	Shear
C	B-1, Run #4 Depth ±20'	1.98	4.34	2,100	Shear

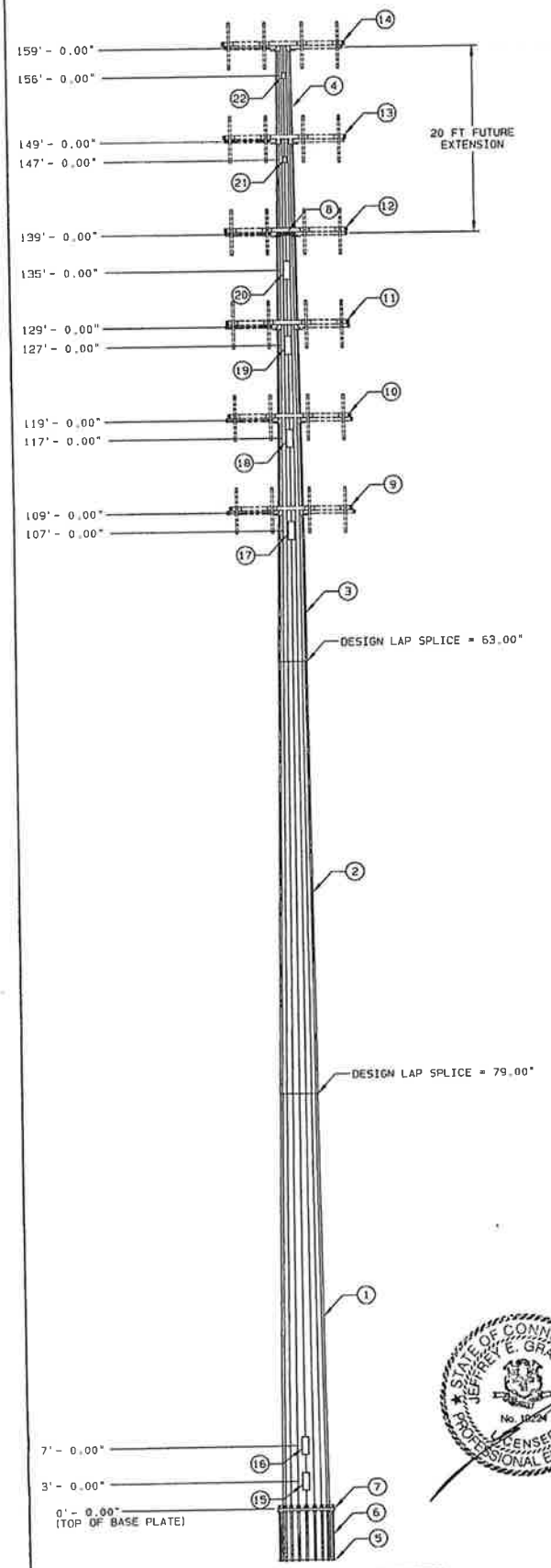
Notes: Not all ASTM procedures and reporting have been meet.

PHOTOGRAPHS

PHOTOGRAPHS

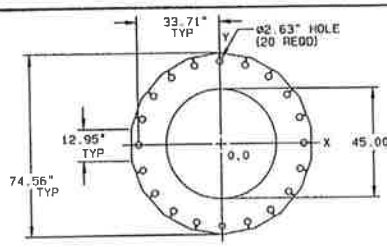
DRILLING BORING No. 1

TYPICAL RESISTIVITY TESTING



ITEM ID	NO. REQD	FEATURES	UNIT WEIGHT (LBS)	WEIGHT (LBS)
1	1	SECTION A VALMONT S-22 0.438" THK (A572 GR65)	12,882	12,882
2	1	SECTION B VALMONT S-22 0.438" THK (A572 GR65)	10,128	10,128
3	1	SECTION C VALMONT S-22 0.375" THK (A572 GR65)	5,518	5,518
4	1	SECTION D VALMONT S-22 0.250" THK (A572 GR65)	1,107	1,107
5	1	BOTTOM CAGE PLATE	133	133
6	20	2.25" ANCHOR BOLT, LENGTH=6.00' A615 GR75	104	2,072
7	1	BASE PLATE VALMONT S-56 3.000" THK (A572 GR50)	2,834	2,834
8	2	FLANGE PLATE	249	498
9	1	FUTURE CARRIER 3	2,383	2,383
10	1	FUTURE CARRIER 2	2,383	2,383
11	1	FUTURE CARRIER 1	2,383	2,383
12	1	14' SP1 LP PLATFORM	1,241	1,241
13	1	EXTENSION CARRIER 2	2,383	2,383
14	1	EXTENSION CARRIER 1	2,383	2,383
	1	TOP CAGE PLATE (REMOVE BEFORE SETTING POLE)	175	175
	12	BOLT 1.50" DIA		
	1	SAFETY CLIMBING CABLE (LENGTH = 149.00')	110	110
	3	GROUNDING LUG	2	6
		GALVANIZING	512	512
	118	STEP AND CLIP (VALMONT STANDARD)	1	59
15	3	HAND HOLE HVY (9" x 24")	66	198
16	3	HAND HOLE HVY (9" x 24")	66	198
17	3	HAND HOLE STD (9" x 24")	48	144
18	3	HAND HOLE STD (9" x 24")	48	144
19	3	HAND HOLE STD (9" x 24")	48	144
20	3	HAND HOLE STD (9" x 24")	48	144
21	3	HAND HOLE UR (6" x 18")		
22	3	HAND HOLE UR (6" x 18")		
	1	POLE CAP	18	18

HOLE COORDS (INCHES)	
X-COORD	Y-COORD
33.71	0.00
32.06	10.42
27.27	19.82
19.82	27.27
10.42	32.06
0.00	33.71



NOTES:
1. BASE PLATE THICKNESS = 3.000"
2. BASE PLATE ALLOWABLE STRESS (KSI) = 50
3. ANGLES ARE MEASURED CLOCKWISE FROM 0 DEGREES
4. MAXIMUM BOLT CIRCLE DIAMETER = 67.43"
5. MAXIMUM CAGE TEMPLATE DIAMETER = 73.43"

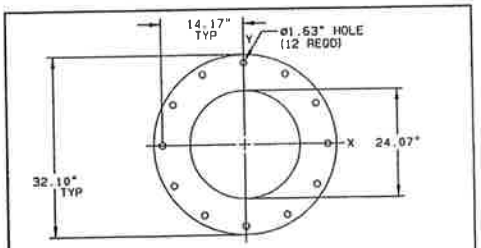
BASE PLATE / ANCHORAGE CHARACTERISTICS

NOTES:

1. FACTORED REACTIONS FOR FOUNDATION DESIGN.
   MOMENT = 69,272 IN-KIPS
   SHEAR = 40,446 #
   VERTICAL = 56,508 #
2. GALVANIZED PER ASTM A-123.
3. DESIGN CRITERIA: ANSI/TIA 222-G ADDENDUM 2
4. THIS STRUCTURE HAS BEEN DESIGNED FOR THE FOLLOWING LOADING:
   EXPOSURE CATEGORY = C
   STRUCTURE CLASSIFICATION = 2
   TOPOGRAPHY CATEGORY = 1
   WIND LOAD CASES ARE BASED ON 3 SECOND GUST AND 50 YEAR WIND RETURN PERIOD
   A. CASE 1: WIND = 98 MPH WIND SPEED
   B. CASE 2: WIND = 40 MPH ICE AND WIND SPEED
      DESIGN ICE THICKNESS = 1.00 INCH
   C. CASE 3: WIND = 60 MPH WIND SPEED
   D. EQUIPMENT

DESCRIPTION	MTG HT. (FT)	CENTROID HT. (FT)	WITHOUT ICE EPA (FT**2)	WITHOUT ICE WT (LBS)	WITH ICE EPA (FT**2)	WITH ICE WT (LBS)
1-DB-T1-6Z-8AB-0Z	139.00	139.00	5.60	50	11.20	100
1-EXTENSION CARRIER 1	159.00	159.00	99.72	2383	150.87	8582
1-EXTENSION CARRIER 2	149.00	149.00	99.72	2383	150.87	8582
1-FUTURE CARRIER 1	129.00	129.00	99.72	2383	150.87	8582
1-FUTURE CARRIER 2	119.00	119.00	99.72	2383	150.87	8582
1-FUTURE CARRIER 3	109.00	109.00	99.72	2383	150.87	8582
1-4FT LIGHTNING ROD	159.00	161.00	0.25	10	2.13	65
6-HBX-6517DS-VTM	139.00	139.00	24.06	246	35.94	1692
6-LNX-6514DS-VTM	139.00	139.00	36.00	366	48.24	2466
3-ALCATEL-LUCENT RRH2X40-07-U	139.00	139.00	3.57	150	5.28	435
6-ALCATEL-LUCENT RRH2X60-AWS	139.00	139.00	12.84	330	17.76	1110
1-14' SP1 LP PLATFORM	139.00	139.00	17.65	1241	32.45	2779

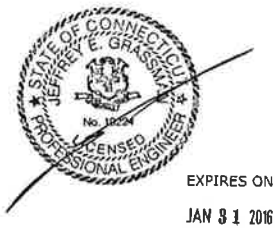
5. FEEDLINES ARE PLACED INTERIOR TO POLE SHAFT (UNLESS NOTED OTHERWISE).
6. TOTAL POLE HEIGHT IS 140 FT AGL
7. 20 FT FUTURE EXTENSION TO 160 FT AGL
8. ELEVATIONS ARE MEASURED FROM TOP OF BASE PLATE (APPROX 1 FT AGL)
9. POLE DESIGN MEETS TIA-222-F 80 MPH FASTEST MILE



NOTES:
1. FLANGE PLATE THICKNESS = 2.00"
2. FLANGE PLATE ALLOWABLE STRESS (KSI) = 50
3. FLANGE PLATE OUTSIDE DIAMETER = 32.10"
4. MAXIMUM BOLT CIRCLE DIAMETER = 28.35"
5. (12) 1.50" A325 BOLTS

FLANGE PLATE CHARACTERISTICS

SEP 24 2015



EXPIRES ON

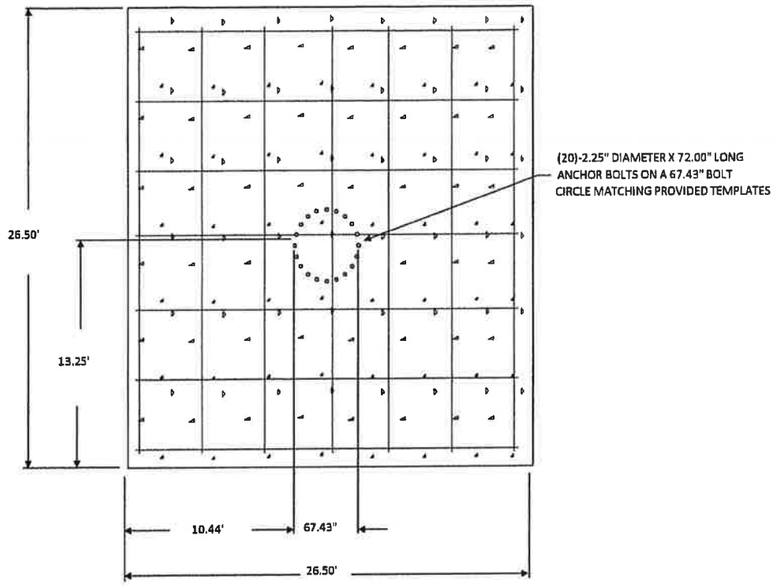
JAN 31 2016

SECTION INFORMATION					
ITEM ID	LENGTH	BASE OD	TOP OD	THK	MATL
1	52' - 0.00"	60.00"	45.73"	0.438"	A572 65 KSI
2	52' - 7.00"	48.41"	33.99"	0.438"	A572 65 KSI
3	46' - 3.00"	36.18"	23.49"	0.375"	A572 65 KSI
4	20' - 0.00"	23.49"	18.00"	0.250"	A572 65 KSI

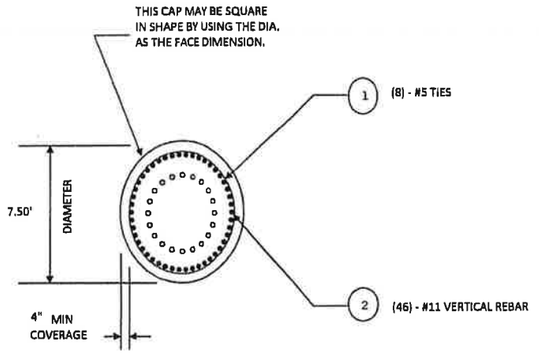
ORDER	PROJECT	FILE ID	SCALE	DATE	CHGD
301371	301371	301371	NONE	09/10/15	NAR

DESCRIPTION
VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371

valmont



SECTION A-A
No Scale



SECTION B-B
No Scale

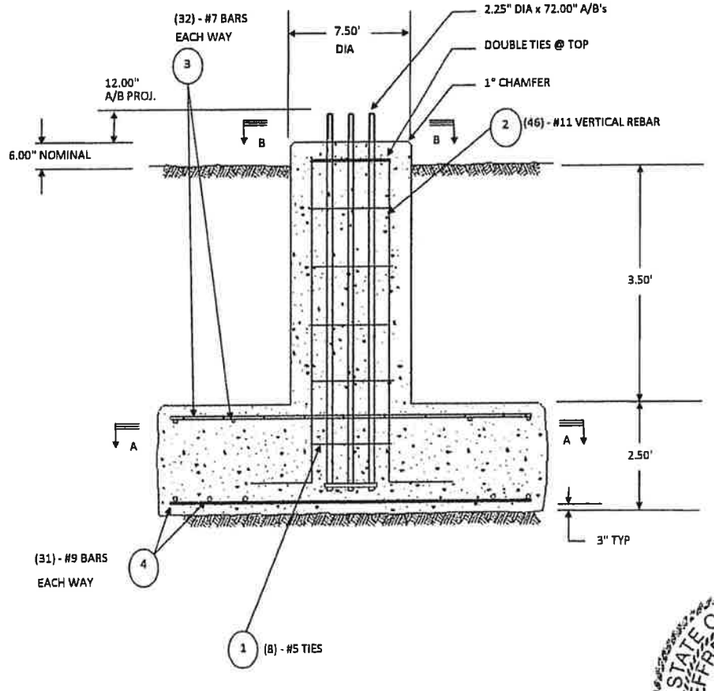
GENERAL NOTES: SLAB FOUNDATION

1. Prior to excavation, check the area for underground facilities.
2. All reinforcing shall be deformed bars conforming to ASTM A615 Grade 60 (60,000 psi min. yield) and shall be provided by the foundation contractor.
3. All concrete shall have a minimum compressive strength of 4000 psi @ 28 days. The requirement for the concrete shall be as given in the ACI "Building Code Requirements for Reinforced Concrete", ACI 318, the latest edition.
4. Trowel top of foundation smooth.
5. Concrete shall be placed against undisturbed soil to the depth indicated on the foundation drawing. The portion above grade shall be formed. If an area is excavated beyond the limits shown, this volume shall be filled with concrete or formed. After the forms are removed, the excess excavation shall be replaced and compacted.
6. Ground water was not encountered below grade during boring.
7. Foundation design based on vert. bearing pressure of 24000 psf.
8. Concrete is assumed to weigh 150 pcf.
9. Estimated concrete volume = **73.36 cubic yards total.**
10. Design Based on the following loads from installation drawing for order No: 301371.

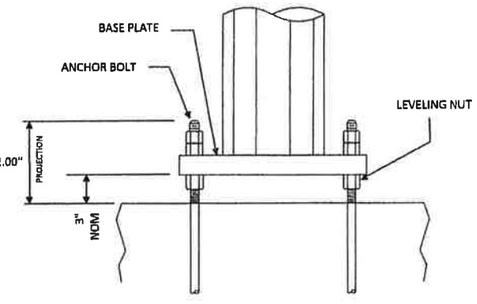
Factored Moment = 5773 FT-KIPS **Overturning Safety Factor = 1.23**
Factored Download = 42.4 KIPS **Max. Toe Bearing Pressure = 3.10 ksf**
Factored Shear = 48.5 KIPS

11. Backfill should be compacted to a density of 125 pct.
12. Anchor bolts to be ASTM A615, Gr. 75 ksi.
13. Reference: DET JOB NO. 2014.14 DATED 09/26/2014

14. Ref Soils Report for installation recommendations.
15. Auger refusal encountered at 1' below surface during boring.
16. Depth to rock varies across site, foundation to bear on competent bedrock.



ELEVATION
No Scale

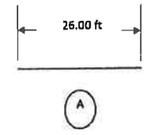


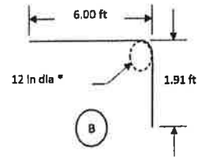
ANCHOR BOLT INSTALLATION
N.T.S.
EXTREME CARE SHOULD BE TAKEN TO ASSURE THAT ALL LEVELING NUTS ARE LEVEL WITH RESPECT TO EACH OTHER PRIOR TO ERECTION OF THE STRUCTURE

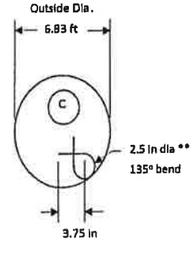
SEP 24 2015

STATE OF CONNECTICUT
JEFFREY E. GRASSMAN
No. 19224
LICENSED PROFESSIONAL ENGINEER

EXPIRES ON
JAN 31 2016







REINFORCEMENT STEEL SCHEDULE					
Sym	Type	Rebar Size	Rebar Spacing	Weight (lbs)	Qty
CAP TIES 1	C	#5	EQUAL	179	8
CAP VERTICAL REBAR 2	B	#11	——	1933	46
SLAB TOP STEEL 3	A	#7	10.06 in	3401	64
SLAB BOTTOM STEEL 4	A	#9	10.40 in	5481	62
TOTAL STEEL WEIGHT FOR COMPLETE FOUNDATION INSTALLATION =				10994	

Grade 60 Rebar					
Size	Ask #	Wt/ft	6db (in)	d* (in)	d** (in)
#3	11-97203	0.38	2.25	2.25	1.50
#4	11-97204	0.67	3.00	3.00	2.00
#5	11-97205	1.04	3.75	3.75	2.50
#6	11-97200	1.50	4.50	4.50	4.50
#7	11-97207	2.04	5.25	5.25	4.25
#8	11-97208	2.67	6.00	6.00	6.00
#9	11-97209	3.40	6.77	9.50	-
#10	11-97210	4.30	7.62	10.75	-
#11	11-97211	5.31	8.46	12.00	-

* Refers to ACI standard hook detail chart
** Refers to ACI stirrup hook detail chart

Rebar Lap Splice					
Rebar Size	Rebar Grade	Specified Concrete Strength	Overlap (Inches) Vert & Ties	Bottom Horiz	Top Horiz
#3	60	4000 psi	13	15	21
#4	60	4000 psi	18	20	29
#5	60	4000 psi	22	26	36
#6	60	4000 psi	26	33	46
#7	60	4000 psi	38	45	62
#8	60	4000 psi	43	59	82
#9	60	4000 psi	49	74	104
#10	60	4000 psi	58	95	132
#11	60	4000 psi	71	116	163

Splicing is an alternative to specified material listed in rebar schedule.
Lap Splice may be used on ties when Seismic Hook not required.

Rev	Description	Date	By/Ck

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES TOLERANCES ARE:
X°- X.X/X" - ± 1/8"
X.X/X" - ± 1/16"
X° - ± 1/8"
X" - ± 1/16"

valmont MICROFLECT
3575 25TH STREET SE SALEM, OR 97302
MAIN (503) 363-9767
FAX (503) 316-2040

By: NAR
Check: NAR
Date: 09/10/15

SLAB FOUNDATION LAYOUT
Customer VERIZON
Site PLYMOUTH WEST RELO, CT

S.O. 301371 | SIZE - B | Dwg No. B-142446 | Sheet 1 of 1

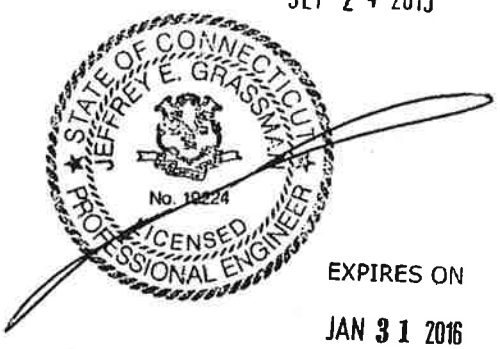
valmont

STRUCTURES

VALMONT MICROFLECT
3575 25th St. SE
Salem, OR 97302
PHONE: 1-800-547-2151
ENGINEER: Nathan Ross
Reviewed by: NR

COMMUNICATION POLE DESIGN CALCULATIONS

SEP 24 2015



EXPIRES ON

JAN 31 2016

VERIZON
VALMONT ORDER# 301371
SITE NAME: PLYMOUTH WEST RELO, CT
POLE HEIGHT: 159FT (140 FT EXT TO 160 FT AGL)

valmont STRUCTURES

9/10/15

ENGINEERING DATA

for

VERIZON
PLYMOUTH WEST RELO, CT
VALMONT QUOTATION 301371

1) STRUCTURE DESIGN CONFORMS TO EIA/TIA-222-G INCLUDING:
   98.0 MPH WIND (3 SECOND GUST, 50 YR. RETURN PERIOD)
   40.0 MPH ICE WIND (50 YR. RETURN PERIOD)
   DESIGN ICE THICKNESS = 1.00 INCHES
   EXPOSURE CATEGORY C
   STRUCTURE CLASSIFICATION II
   TOPOGRAPHIC CATEGORY 1
   60.0 MPH BASIC WIND SPEED WITH NO ICE FOR TWIST AND SWAY
2) FEEDLINES ARE ASSUMED TO BE PLACED INTERIOR TO THE POLE.
3) ALL MICROWAVE ASSUMED TO BE 6 GHz UNLESS OTHERWISE NOTED.
4) TOTAL POLE HEIGHT IS 140 FT AGL
5) 20 FT FUTURE EXTENSION TO 160 FT AGL
6) ELEVATIONS ARE MEASURED FROM TOP OF BASE PLATE (APPROX 1 FT AGL)
7) POLE DESIGN MEETS TIA-222-F 80 MPH FASTEST MILE
8) LOADING AS FOLLOWS:
   159.0' POLE
   1 - DB-T1-6Z-8AB-0Z @ 139.0
   1 - EXTENSION CARRIER 1 @ 159.0
   1 - EXTENSION CARRIER 2 @ 149.0
   1 - FUTURE CARRIER 1 @ 129.0
   1 - FUTURE CARRIER 2 @ 119.0
   1 - FUTURE CARRIER 3 @ 109.0
   1 - 4ft lightning rod @ 159.0
   6 - HBX-6517DS-VTM (w/PM) @ 139.0
   6 - LNX-6514DS-VTM (w/PM) @ 139.0
   3 - Alcatel-Lucent RRH2x40-07-U @ 139.0
   6 - Alcatel-Lucent RRH2X60-AWS @ 139.0
   1 - 14' SP1 LP Platform @ 139.0

STRUCTURE ANCHORAGE INFORMATION

POLE HEIGHT(FT):	159	NUMBER OF A.B.'s:	20
BOLT CIRCLE(IN):	67.43	DIA. OF A.B.'s(IN):	2.25
BASE VERTICAL(K):	56.59	LENGTH OF A.B.'s(IN):	72.00
BASE SHEAR(K):	48.45	PROJECTION LENGTH(IN):	12.00
BASE MOMENT(FT-K):	5773	TEMPLATE OD(IN):	70.93

valmont STRUCTURES

BY_____ DATE _____
CHKD. BY _____ DATE _____

SHEET NO. _____

9/10/15

ENGINEERING DATA

for

VERIZON
PLYMOUTH WEST RELO, CT
VALMONT QUOTATION 301371

EIA/TIA-222-G

BASIC WIND:	98.0 MPH	DESIGN ICE THICKNESS:	1. IN.
WIND & ICE:	40.0 MPH	EXPOSURE CATEGORY:	C
TWIST & SWAY:	60.0 MPH	STRUCTURE CLASS.:	II
S_S:	N/A	TOPOGRAPHIC CATEGORY:	1
S_1:	N/A		

QTY	DESCRIPTION	HEIGHT	DATA W.O. ICE EPA	DATA W.O. ICE WT	DATA W/ ICE EPA	DATA W/ ICE WT
1	DB-T1-6Z-8AB-0Z	@ 139.0 '	5.60	50	11.20	100
1	EXTENSION CARRIER 1	@ 159.0 '	99.72	2383	150.87	8582
1	EXTENSION CARRIER 2	@ 149.0 '	99.72	2383	150.87	8582
1	FUTURE CARRIER 1	@ 129.0 '	99.72	2383	150.87	8582
1	FUTURE CARRIER 2	@ 119.0 '	99.72	2383	150.87	8582
1	FUTURE CARRIER 3	@ 109.0 '	99.72	2383	150.87	8582
1	4ft lightning rod	@ 159.0 '	0.25	10	2.13	65
6	HBX-6517DS-VTM (w/PM)	@ 139.0 '	24.06	246	35.94	1692
6	LNX-6514DS-VTM (w/PM)	@ 139.0 '	36.00	366	48.24	2466
3	Alcatel-Lucent RRH2x40-07-U	@ 139.0 '	3.57	150	5.28	435
6	Alcatel-Lucent RRH2X60-AWS	@ 139.0 '	12.84	330	17.76	1110
1	14' SP1 LP Platform	@ 139.0 '	17.65	1241	32.45	2779

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

*** SUMMARY ***

Design Code: TIA-222-G Addendum 2

---------- DESIGN SUMMARY ----------

Height Above Base Plate (ft)	159.00	Ground Line Diameter (in)	60.000	Pole Shaft Weight (lbs)	29634
		Top Diameter (in)	18.000		
		Pole Taper (in/ft)	0.27437	Shape:	18 Sides

Connections Between Sections	/First/	/Second/	/Third/
Height Above Ground (ft)	52.00	98.00	139.00
Type	Slip Joint	Slip Joint	Flange Joint
Overlap Length (in)	79	63	0
Maximum Axial Force (lbs)	89991	73297	23125

Section Characteristics	/First/	/Second/	/Third/	/Fourth/
Base Diameter (in)	60.000	48.414	36.177	23.487
Top Diameter (in)	45.733	33.987	23.487	18.000
Thickness (in)	0.43750	0.43750	0.37500	0.25000
Length (ft)	52.000	52.583	46.250	20.000
Weight (lbs)	12882	10128	5518	1107
Yield Strength (ksi)	65.00	65.00	65.00	65.00

---------- ANALYSIS SUMMARY ----------

	Pt. of Fixity	Governing Level Sec.1	Governing Level Sec.2	Governing Level Sec.3	Governing Level Sec.4	Pole Top
Governing Load Case	WIND	WIND	WIND	WIND	WIND	WIND
Height (ft)	0.00	0.00	52.00	98.00	139.00	159.00
Resultant Moment (in-kips)	69271	69271	40262	17025	2338	0
Shear Force (lbs)	48530	48530	44286	39902	13445	6086
Axial Force (lbs)	53678	53678	34348	21089	5485	2045
Effective Yield Strength (ksi)	75.03	75.03	81.38	82.55	82.55	82.55
Combined Interaction Value	0.86	0.86	0.76	0.67	0.31	0.00
Total Deflection (in)	0.00	0.00	13.83	52.44	108.99	141.78

Note: Diameters are outside, measured across the flats
Forces and moments are reported in the local element coordinate system

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

---------- SUMMARY OF SECTION DIMENSIONS AS DETAILED ----------

Height Above Base Plate (ft) 159.00 Ground Line Diameter (in) 60.000 Pole Shaft Weight (lbs) 29634

Top Diameter (in) 18.000

Pole Taper (in/ft) 0.27437 Shape: 18 Sides

Connections Between Sections	/First/	/Second/	/Third/
Height Above Ground (ft)	52.00	98.00	139.00
Type	Slip Joint	Slip Joint	Flange Joint
Flange Thickness (in)			2.000
Weld Root Gap (in)			0.250

Theoretical Design Section Dimension	/First/	/Second/	/Third/	/Fourth/
Base Diameter (in)	60.000	48.414	36.177	23.487
Top Diameter (in)	45.733	33.987	23.487	18.000
Thickness (in)	0.43750	0.43750	0.37500	0.25000
Length (ft)	52.000	52.583	46.250	20.000

As Detailed Section Characteristic	/First/	/Second/	/Third/	/Fourth/
Base Diameter (in)	60.000	48.414	36.177	23.436
Top Diameter (in)	45.733	33.987	23.539	18.000
Thickness (in)	0.43750	0.43750	0.37500	0.25000
Length (ft)	52.000	52.583	46.063	19.813

Note: Diameter are outside, measured across the flats

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

*** POLE SHAFT POINT OF FIXITY REACTIONS ***

Loading Case Identifier	Moments About X-Axis (in-kips)	Moments About Y-Axis (in-kips)	Moments Resultant (X & Y) (in-kips)	Moments Torsional (in-kips)	Vertical Force (lbs)	Shear In X-Direction (lbs)	Shear In Y-Direction (lbs)	Shear Resultant (X & Y) (lbs)	Notes
WIND	53065	-44527	69271	0	53754	31141	37112	48446	
ICE + WIND	9889	-8298	12909	0	114452	5498	6552	8553	
T+S	11084	-9300	14469	0	43987	6540	7794	10174	

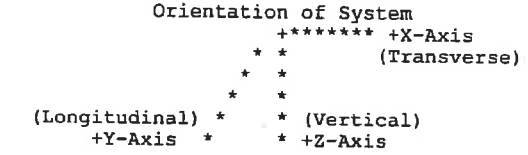
Note: Positive vertical force is downward.
Reactions are considered in the global coordinate system.

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

*** INPUT LOADS ***

Design Code TIA-222-G Addendum 2
Loading Case WIND

Basic Wind Velocity is 98.00 mph Ice Thickness 0.00
Wind Orientation is 50.0 Degrees Clockwise From +X Axis
Structure Weight Overload Factor is 1.200
Exposure C, Gust Factor 1.10
Structure Category 2, Topographic Category 1, Crest Height 0.00 ft
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis
Foundation Rotation of 0.00 Degrees
Elevation of structure base above surrounding terrain = 1.00 ft



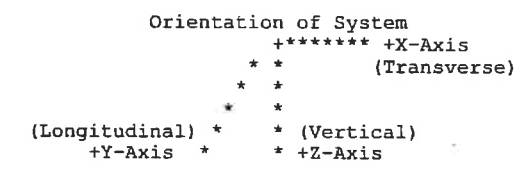
Load Number	Mounting Height (ft)	Load Height (ft)	Load Eccentricity (ft)	Orientation in XY Plane (Degrees)	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	EPA (ft^2)	
1	139.00	139.00	0.00	50.00	201	240	60	5.60	1-DB-T1-6Z-8A
2	159.00	159.00	0.00	50.00	3682	4388	2860	99.72	1-EXTENSION C
3	149.00	149.00	0.00	50.00	3632	4329	2860	99.72	1-EXTENSION C
4	129.00	129.00	0.00	50.00	3524	4200	2860	99.72	1-FUTURE CARR
5	119.00	119.00	0.00	50.00	3465	4130	2860	99.72	1-FUTURE CARR
6	109.00	109.00	0.00	50.00	3402	4055	2860	99.72	1-FUTURE CARR
7	159.00	161.00	0.00	50.00	9	11	12	0.25	1-4ft lightni
8	139.00	139.00	0.00	50.00	864	1029	295	24.06	6-HBX-6517DS-
9	139.00	139.00	0.00	50.00	1292	1540	439	36.00	6-LNX-6514DS-
10	139.00	139.00	0.00	50.00	128	153	180	3.57	3-Alcatel-Luc
11	139.00	139.00	0.00	50.00	461	549	396	12.84	6-Alcatel-Luc
12	139.00	139.00	0.00	50.00	634	755	1489	17.65	1-14' SPI LP

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

*** INPUT LOADS ***

Design Code TIA-222-G Addendum 2
Loading Case ICE + WIND

Basic Wind Velocity is 40.00 mph Ice Thickness 1.00
Wind Orientation is 50.0 Degrees Clockwise From +X Axis
Structure Weight Overload Factor is 1.200
Exposure C, Gust Factor 1.10
Structure Category 2, Topographic Category 1, Crest Height 0.00 ft
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis
Foundation Rotation of 0.00 Degrees
Elevation of structure base above surrounding terrain = 1.00 ft



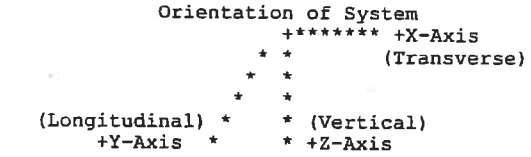
Load Number	Mounting Height (ft)	Load Height (ft)	Load Eccentricity (ft)	Orientation in XY Plane (Degrees)	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	EPA (ft^2)	
1	139.00	139.00	0.00	50.00	42	50	120	11.20	1-DB-T1-6Z-8A
2	159.00	159.00	0.00	50.00	580	691	10298	150.87	1-EXTENSION C
3	149.00	149.00	0.00	50.00	572	682	10298	150.87	1-EXTENSION C
4	129.00	129.00	0.00	50.00	555	662	10298	150.87	1-FUTURE CARR
5	119.00	119.00	0.00	50.00	546	651	10298	150.87	1-FUTURE CARR
6	109.00	109.00	0.00	50.00	536	639	10298	150.87	1-FUTURE CARR
7	159.00	161.00	0.00	50.00	8	10	78	2.13	1-4ft lightni
8	139.00	139.00	0.00	50.00	134	160	2030	35.94	6-HBX-6517DS-
9	139.00	139.00	0.00	50.00	180	215	2959	48.24	6-LNX-6514DS-
10	139.00	139.00	0.00	50.00	20	24	522	5.28	3-Alcatel-Luc
11	139.00	139.00	0.00	50.00	66	79	1332	17.76	6-Alcatel-Luc
12	139.00	139.00	0.00	50.00	121	145	3335	32.45	1-14' SP1 LP

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

*** INPUT LOADS ***

Design Code TIA-222-G Addendum 2
Loading Case T+S

Basic Wind Velocity is 60.00 mph Ice Thickness 0.00
Wind Orientation is 50.0 Degrees Clockwise From +X Axis
Structure Weight Overload Factor is 1.000
Exposure C, Gust Factor 1.10
Structure Category 2, Topographic Category 1, Crest Height 0.00 ft
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis
Foundation Rotation of 0.00 Degrees
Elevation of structure base above surrounding terrain = 1.00 ft



Load Number	Mounting Height (ft)	Load Height (ft)	Load Eccentricity (ft)	Orientation in XY Plane (Degrees)	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	EPA (ft^2)	
1	139.00	139.00	0.00	50.00	42	50	50	5.60	1-DB-T1-6Z-8A
2	159.00	159.00	0.00	50.00	772	920	2383	99.72	1-EXTENSION C
3	149.00	149.00	0.00	50.00	761	907	2383	99.72	1-EXTENSION C
4	129.00	129.00	0.00	50.00	739	880	2383	99.72	1-FUTURE CARR
5	119.00	119.00	0.00	50.00	726	866	2383	99.72	1-FUTURE CARR
6	109.00	109.00	0.00	50.00	713	850	2383	99.72	1-FUTURE CARR
7	159.00	161.00	0.00	50.00	2	2	10	0.25	1-4ft lightni
8	139.00	139.00	0.00	50.00	181	216	246	24.06	6-HBX-6517DS-
9	139.00	139.00	0.00	50.00	271	323	366	36.00	6-LNX-6514DS-
10	139.00	139.00	0.00	50.00	27	32	150	3.57	3-Alcatel-Luc
11	139.00	139.00	0.00	50.00	97	115	330	12.84	6-Alcatel-Luc
12	139.00	139.00	0.00	50.00	133	158	1241	17.65	1-14' SP1 LP

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

*** Properties ***

Connection Locations	Distance From Base (ft)	Diameter Across Flats (in)	Wall Thickness (in)	D/t Across Flats	w/t Across Flats	Moments of Inertia (in^4)	Area (in^2)
Top of Sect 4	159.00	18.000	0.2500	72.00	10.93	560	14.08
	154.00	19.372	0.2500	77.49	11.90	701	15.17
EPA 3	149.00	20.744	0.2500	82.97	12.87	863	16.26
	144.00	22.116	0.2500	88.46	13.84	1048	17.35
	139.00	23.487	0.2500	93.95	14.80	1257	18.44
Top of Sect 3	139.00	23.487	0.3750	62.63	9.28	1856	27.51
	134.00	24.859	0.3750	66.29	9.93	2207	29.14
EPA 4	129.00	26.231	0.3750	69.95	10.57	2599	30.77
	124.00	27.603	0.3750	73.61	11.22	3034	32.41
EPA 5	119.00	28.975	0.3750	77.27	11.86	3517	34.04
	114.00	30.347	0.3750	80.92	12.51	4047	35.67
EPA 6	109.00	31.719	0.3750	84.58	13.15	4629	37.31
	104.00	33.090	0.3750	88.24	13.80	5264	38.94
	99.00	34.462	0.3750	91.90	14.44	5954	40.57
	98.00	34.737	0.3750	92.63	14.57	6099	40.90
Top of Sect 2	98.00	33.987	0.4375	77.68	11.93	6623	46.59
	94.00	35.084	0.4375	80.19	12.38	7294	48.11
Base of Sect 3	92.75	35.427	0.4375	80.98	12.52	7513	48.59
	89.00	36.456	0.4375	83.33	12.93	8195	50.01
	84.00	37.828	0.4375	86.46	13.48	9168	51.92
	79.00	39.200	0.4375	89.60	14.04	10214	53.82
	74.00	40.572	0.4375	92.73	14.59	11337	55.73
	69.00	41.943	0.4375	95.87	15.14	12540	57.63
	64.00	43.315	0.4375	99.01	15.69	13825	59.54
	59.00	44.687	0.4375	102.14	16.25	15195	61.44
	54.00	46.059	0.4375	105.28	16.80	16652	63.35
	52.00	46.608	0.4375	106.53	17.02	17261	64.11
Top of Sect 1	52.00	45.733	0.4375	104.53	16.67	16298	62.90
	49.00	46.556	0.4375	106.41	17.00	17202	64.04
Base of Sect 2	45.42	47.539	0.4375	108.66	17.40	18326	65.40
	44.00	47.928	0.4375	109.55	17.55	18784	65.94
	39.00	49.300	0.4375	112.68	18.11	20459	67.85
	34.00	50.671	0.4375	115.82	18.66	22231	69.75
	29.00	52.043	0.4375	118.96	19.21	24102	71.66
	24.00	53.415	0.4375	122.09	19.76	26076	73.56
	19.00	54.787	0.4375	125.23	20.32	28155	75.47
	14.00	56.159	0.4375	128.36	20.87	30341	77.37

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

*** Properties ***

Connection Locations	Distance From Base (ft)	Diameter Across Flats (in)	Wall Thickness (in)	D/t Across Flats	w/t Across Flats	Moments of Inertia (in^4)	Area (in^2)
	9.00	57.531	0.4375	131.50	21.42	32638	79.28
	4.00	58.903	0.4375	134.63	21.98	35047	81.18
Pt of Fixity	0.00	60.000	0.4375	137.14	22.42	37058	82.71

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

Forces and Moments for Pole in the Local Element Coordinate System

Loading Case WIND

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
159.00	0	0	0	0	3912	4662	6086	2045
154.00	287	-241	375	0	4113	4901	6398	2348
149.00	589	-494	769	0	4330	5160	6736	2666
149.00	589	-494	769	0	8175	9742	12718	4744
144.00	1182	-992	1543	0	8397	10007	13063	5123
139.00	1791	-1503	2338	0	8642	10299	13445	5485
139.00	1791	-1503	2338	0	12419	14800	19320	7641
134.00	2689	-2256	3510	0	12676	15106	19720	8279
129.00	3606	-3025	4707	0	12964	15449	20168	8885
129.00	3606	-3025	4707	0	16665	19861	25926	11126
124.00	4808	-4034	6276	0	16934	20181	26344	11878
119.00	6030	-5060	7872	0	17247	20554	26832	12552
119.00	6030	-5060	7872	0	20862	24862	32455	14903
114.00	7533	-6321	9834	0	21136	25189	32882	15775
109.00	9057	-7599	11823	0	21472	25589	33405	16515
109.00	9057	-7599	11823	0	24990	29782	38878	18987
104.00	10856	-9109	14172	0	25266	30111	39306	19980
99.00	12675	-10636	16547	0	25576	30480	39789	20923
98.00	13042	-10943	17025	0	25648	30566	39902	21089
98.00	13042	-10943	17025	0	25611	30522	39844	21197
94.00	14516	-12181	18950	0	25909	30877	40307	22756
92.75	14980	-12570	19556	0	25975	30956	40410	23327
89.00	16381	-13745	21384	0	26182	31203	40732	24271
84.00	18267	-15328	23846	0	26475	31552	41188	25530
79.00	20174	-16928	26335	0	26771	31904	41648	26828
74.00	22102	-18546	28852	0	27069	32259	42112	28166
69.00	24052	-20182	31397	0	27369	32617	42578	29541
64.00	26023	-21836	33971	0	27669	32975	43046	30954
59.00	28016	-23508	36573	0	27971	33334	43515	32404
54.00	30031	-25199	39202	0	28303	33731	44032	33828
52.00	30843	-25880	40262	0	28466	33925	44286	34348
52.00	30843	-25880	40262	0	28411	33859	44200	34458
49.00	32067	-26908	41861	0	28602	34086	44497	36173
45.42	33541	-28144	43785	0	28859	34392	44896	38195
44.00	34127	-28636	44550	0	28895	34435	44952	38715
39.00	36207	-30382	47265	0	29170	34764	45381	40297
34.00	38307	-32144	50007	0	29442	35087	45803	41915
29.00	40427	-33922	52773	0	29707	35403	46215	43568
24.00	42565	-35716	55564	0	29964	35709	46615	45256
19.00	44721	-37525	58379	0	30210	36002	46998	46979

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

Forces and Moments for Pole in the Local Element Coordinate System

Loading Case WIND

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
14.00	46894	-39348	61215	0	30441	36278	47357	48737
9.00	49083	-41186	64073	0	30664	36544	47705	50530
4.00	51288	-43036	66952	0	30904	36830	48078	52340
0.00	53065	-44527	69271	0	31195	37176	48530	53678

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

Deflections and Stresses for Pole

Loading Case WIND

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Rotation (deg.)	Axial Interaction Term	Flexural Interaction Term	Shear Interaction Term	Torsion Interaction Term	Combined Stress Interaction	Effective Yield Strength (ksi)
159.00	91.1	108.6	141.8	7.2	8.01	0.00	0.00	0.03	0.00	0.01	82.55
154.00	85.8	102.2	133.4	6.6	7.97	0.00	0.07	0.03	0.00	0.07	82.55
149.00	80.4	95.9	125.1	6.0	7.89	0.00	0.13	0.03	0.00	0.13	82.55
149.00	80.4	95.9	125.1	6.0	7.89	0.00	0.13	0.05	0.00	0.13	82.55
144.00	75.2	89.6	117.0	5.5	7.74	0.00	0.22	0.05	0.00	0.23	82.55
139.00	70.1	83.5	109.0	4.9	7.54	0.00	0.30	0.05	0.00	0.31	82.55
139.00	70.1	83.5	109.0	4.9	7.54	0.00	0.20	0.05	0.00	0.21	82.55
134.00	65.0	77.5	101.2	4.4	7.37	0.00	0.27	0.05	0.00	0.28	82.55
129.00	60.2	71.7	93.6	3.9	7.17	0.00	0.32	0.05	0.00	0.33	82.55
129.00	60.2	71.7	93.6	3.9	7.17	0.01	0.32	0.06	0.00	0.33	82.55
124.00	55.4	66.0	86.2	3.5	6.94	0.01	0.39	0.06	0.00	0.40	82.55
119.00	50.8	60.6	79.1	3.1	6.68	0.01	0.44	0.05	0.00	0.45	82.55
119.00	50.8	60.6	79.1	3.1	6.68	0.01	0.44	0.07	0.00	0.45	82.55
114.00	46.4	55.4	72.3	2.7	6.41	0.01	0.50	0.06	0.00	0.51	82.55
109.00	42.2	50.3	65.7	2.3	6.11	0.01	0.55	0.06	0.00	0.56	82.55
109.00	42.2	50.3	65.7	2.3	6.11	0.01	0.55	0.07	0.00	0.57	82.55
104.00	38.2	45.6	59.5	2.0	5.80	0.01	0.61	0.07	0.00	0.62	82.55
99.00	34.4	41.0	53.6	1.7	5.47	0.01	0.65	0.07	0.00	0.67	82.55
98.00	33.7	40.2	52.4	1.6	5.41	0.01	0.66	0.07	0.00	0.67	82.55
98.00	33.7	40.2	52.4	1.6	5.41	0.01	0.60	0.06	0.00	0.61	82.55
94.00	30.9	36.8	48.0	1.4	5.16	0.01	0.62	0.06	0.00	0.63	82.55
92.75	30.0	35.8	46.7	1.4	5.09	0.01	0.63	0.06	0.00	0.64	82.55
89.00	27.5	32.8	42.8	1.2	4.85	0.01	0.65	0.06	0.00	0.66	82.55
84.00	24.3	29.0	37.9	1.0	4.55	0.01	0.67	0.05	0.00	0.68	82.55
79.00	21.4	25.5	33.3	0.8	4.24	0.01	0.69	0.05	0.00	0.70	82.55
74.00	18.6	22.2	29.0	0.7	3.94	0.01	0.71	0.05	0.00	0.72	82.55
69.00	16.1	19.2	25.0	0.5	3.64	0.01	0.72	0.05	0.00	0.73	82.55
64.00	13.7	16.4	21.4	0.4	3.34	0.01	0.73	0.05	0.00	0.74	82.55
59.00	11.6	13.8	18.0	0.3	3.05	0.01	0.74	0.05	0.00	0.75	82.29
54.00	9.6	11.5	15.0	0.2	2.77	0.01	0.75	0.05	0.00	0.76	81.64
52.00	8.9	10.6	13.8	0.2	2.66	0.01	0.75	0.05	0.00	0.76	81.38
52.00	8.9	10.6	13.8	0.2	2.66	0.01	0.78	0.05	0.00	0.79	81.80
49.00	7.8	9.4	12.2	0.2	2.49	0.01	0.79	0.05	0.00	0.80	81.41
45.42	6.7	8.0	10.4	0.1	2.28	0.01	0.79	0.05	0.00	0.80	80.94
44.00	6.3	7.5	9.8	0.1	2.20	0.01	0.79	0.05	0.00	0.80	80.75
39.00	4.9	5.8	7.6	0.1	1.92	0.01	0.80	0.05	0.00	0.81	80.10
34.00	3.7	4.4	5.7	0.1	1.65	0.01	0.81	0.05	0.00	0.82	79.45
29.00	2.7	3.2	4.1	0.0	1.39	0.01	0.82	0.04	0.00	0.83	78.80
24.00	1.8	2.1	2.8	0.0	1.14	0.01	0.82	0.04	0.00	0.83	78.15

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

Deflections and Stresses for Pole

Loading Case WIND

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Rotation (deg.)	Axial Interaction Term	Flexural Interaction Term	Shear Interaction Term	Torsion Interaction Term	Combined Stress Interaction	Effective Yield Strength (ksi)
19.00	1.1	1.3	1.7	0.0	0.89	0.01	0.83	0.04	0.00	0.84	77.50
14.00	0.6	0.7	0.9	0.0	0.64	0.01	0.83	0.04	0.00	0.84	76.85
9.00	0.2	0.3	0.4	0.0	0.41	0.01	0.84	0.04	0.00	0.85	76.20
4.00	0.0	0.1	0.1	0.0	0.18	0.01	0.84	0.04	0.00	0.85	75.55
0.00	0.0	0.0	0.0	0.0	0.00	0.01	0.84	0.04	0.00	0.86	75.03

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

Forces and Moments for Pole in the Local Element Coordinate System

Loading Case ICE + WIND

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
159.00	0	0	0	0	768	915	1194	10348
154.00	57	-48	75	0	821	978	1277	10913
149.00	118	-99	154	0	878	1047	1366	11518
149.00	118	-99	154	0	1621	1932	2523	21790
144.00	236	-198	308	0	1673	1994	2603	22438
139.00	358	-300	467	0	1736	2069	2700	23125
139.00	358	-300	467	0	2456	2927	3821	33400
134.00	536	-450	700	0	2510	2991	3905	34319
129.00	718	-602	937	0	2581	3076	4015	35287
129.00	718	-602	937	0	3276	3904	5096	45565
124.00	955	-801	1246	0	3324	3961	5171	46589
119.00	1195	-1003	1560	0	3399	4051	5288	47659
119.00	1195	-1003	1560	0	4062	4841	6319	57942
114.00	1488	-1249	1943	0	4139	4933	6439	59063
109.00	1784	-1497	2329	0	4181	4983	6504	60241
109.00	1784	-1497	2329	0	4808	5730	7480	70528
104.00	2131	-1788	2782	0	4889	5826	7606	71751
99.00	2480	-2081	3237	0	4921	5865	7656	73032
98.00	2550	-2140	3329	0	4906	5847	7633	73297
98.00	2550	-2140	3329	0	4881	5817	7594	73301
94.00	2832	-2376	3696	0	4961	5912	7717	75456
92.75	2920	-2450	3812	0	4959	5910	7715	76147
89.00	3186	-2674	4159	0	4997	5955	7774	77270
84.00	3543	-2973	4626	0	5037	6003	7836	78816
79.00	3903	-3275	5095	0	5018	5980	7806	80426
74.00	4265	-3579	5567	0	5051	6020	7859	82082
69.00	4629	-3884	6043	0	5086	6061	7912	83792
64.00	4996	-4192	6522	0	5120	6102	7966	85554
59.00	5365	-4502	7004	0	5155	6144	8020	87369
54.00	5737	-4814	7489	0	5206	6204	8099	89233
52.00	5886	-4939	7684	0	5241	6246	8154	89991
52.00	5886	-4939	7684	0	5214	6213	8111	89995
49.00	6111	-5128	7978	0	5235	6239	8144	92283
45.42	6381	-5355	8330	0	5276	6288	8208	95062
44.00	6489	-5445	8470	0	5264	6273	8189	95617
39.00	6868	-5763	8966	0	5292	6307	8233	97599
34.00	7249	-6083	9463	0	5320	6340	8276	99628
29.00	7633	-6405	9964	0	5347	6372	8318	101705
24.00	8018	-6728	10467	0	5372	6402	8358	103825
19.00	8405	-7053	10972	0	5396	6430	8394	105988

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

Forces and Moments for Pole in the Local Element Coordinate System

Loading Case ICE + WIND

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
14.00	8793	-7379	11479	0	5416	6455	8426	108189
9.00	9183	-7706	11988	0	5435	6477	8456	110421
4.00	9575	-8034	12499	0	5460	6508	8495	112671
0.00	9889	-8298	12909	0	5519	6578	8586	114450

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

Deflections and Stresses for Pole

Loading Case ICE + WIND *** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Rotation (deg.)	Axial Interaction Term	Flexural Interaction Term	Shear Interaction Term	Torsion Interaction Term	Combined Stress Interaction	Effective Yield Strength (ksi)
159.00	17.5	20.8	27.2	0.4	1.55	0.01	0.00	0.01	0.00	0.01	82.55
154.00	16.4	19.6	25.6	0.3	1.54	0.01	0.01	0.01	0.00	0.02	82.55
149.00	15.4	18.3	23.9	0.3	1.52	0.01	0.03	0.01	0.00	0.04	82.55
149.00	15.4	18.3	23.9	0.3	1.52	0.02	0.03	0.01	0.00	0.04	82.55
144.00	14.4	17.1	22.4	0.3	1.49	0.02	0.04	0.01	0.00	0.06	82.55
139.00	13.4	15.9	20.8	0.3	1.45	0.02	0.06	0.01	0.00	0.08	82.55
139.00	13.4	15.9	20.8	0.3	1.45	0.02	0.04	0.01	0.00	0.06	82.55
134.00	12.4	14.8	19.3	0.2	1.42	0.02	0.05	0.01	0.00	0.07	82.55
129.00	11.5	13.7	17.8	0.2	1.38	0.02	0.06	0.01	0.00	0.08	82.55
129.00	11.5	13.7	17.8	0.2	1.38	0.02	0.06	0.01	0.00	0.09	82.55
124.00	10.6	12.6	16.4	0.2	1.33	0.02	0.08	0.01	0.00	0.10	82.55
119.00	9.7	11.5	15.1	0.2	1.28	0.02	0.09	0.01	0.00	0.11	82.55
119.00	9.7	11.5	15.1	0.2	1.28	0.02	0.09	0.01	0.00	0.11	82.55
114.00	8.8	10.5	13.7	0.2	1.23	0.02	0.10	0.01	0.00	0.12	82.55
109.00	8.0	9.6	12.5	0.1	1.17	0.02	0.11	0.01	0.00	0.13	82.55
109.00	8.0	9.6	12.5	0.1	1.17	0.03	0.11	0.01	0.00	0.14	82.55
104.00	7.3	8.6	11.3	0.1	1.11	0.03	0.12	0.01	0.00	0.15	82.55
99.00	6.5	7.8	10.2	0.1	1.05	0.03	0.13	0.01	0.00	0.15	82.55
98.00	6.4	7.6	9.9	0.1	1.03	0.03	0.13	0.01	0.00	0.16	82.55
98.00	6.4	7.6	9.9	0.1	1.03	0.02	0.12	0.01	0.00	0.14	82.55
94.00	5.8	7.0	9.1	0.1	0.98	0.02	0.12	0.01	0.00	0.14	82.55
92.75	5.7	6.8	8.8	0.1	0.97	0.02	0.12	0.01	0.00	0.15	82.55
89.00	5.2	6.2	8.1	0.1	0.92	0.02	0.13	0.01	0.00	0.15	82.55
84.00	4.6	5.5	7.2	0.1	0.86	0.02	0.13	0.01	0.00	0.15	82.55
79.00	4.0	4.8	6.3	0.1	0.81	0.02	0.13	0.01	0.00	0.16	82.55
74.00	3.5	4.2	5.5	0.1	0.75	0.02	0.14	0.01	0.00	0.16	82.55
69.00	3.0	3.6	4.7	0.1	0.69	0.02	0.14	0.01	0.00	0.16	82.55
64.00	2.6	3.1	4.0	0.1	0.63	0.02	0.14	0.01	0.00	0.16	82.55
59.00	2.2	2.6	3.4	0.0	0.58	0.02	0.14	0.01	0.00	0.16	82.29
54.00	1.8	2.2	2.8	0.0	0.52	0.02	0.14	0.01	0.00	0.16	81.64
52.00	1.7	2.0	2.6	0.0	0.50	0.02	0.14	0.01	0.00	0.16	81.38
52.00	1.7	2.0	2.6	0.0	0.50	0.02	0.15	0.01	0.00	0.17	81.80
49.00	1.5	1.8	2.3	0.0	0.47	0.02	0.15	0.01	0.00	0.17	81.41
45.42	1.3	1.5	2.0	0.0	0.43	0.02	0.15	0.01	0.00	0.17	80.94
44.00	1.2	1.4	1.8	0.0	0.41	0.02	0.15	0.01	0.00	0.17	80.75
39.00	0.9	1.1	1.4	0.0	0.36	0.02	0.15	0.01	0.00	0.17	80.10
34.00	0.7	0.8	1.1	0.0	0.31	0.02	0.15	0.01	0.00	0.17	79.45
29.00	0.5	0.6	0.8	0.0	0.26	0.02	0.15	0.01	0.00	0.18	78.80
24.00	0.3	0.4	0.5	0.0	0.21	0.02	0.15	0.01	0.00	0.18	78.15

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

Deflections and Stresses for Pole

Loading Case ICE + WIND

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Rotation (deg.)	Axial Interaction Term	Flexural Interaction Term	Shear Interaction Term	Torsion Interaction Term	Combined Stress Interaction	Effective Yield Strength (ksi)
19.00	0.2	0.2	0.3	0.0	0.17	0.02	0.16	0.01	0.00	0.18	77.50
14.00	0.1	0.1	0.2	0.0	0.12	0.02	0.16	0.01	0.00	0.18	76.85
9.00	0.0	0.1	0.1	0.0	0.08	0.02	0.16	0.01	0.00	0.18	76.20
4.00	0.0	0.0	0.0	0.0	0.03	0.02	0.16	0.01	0.00	0.18	75.55
0.00	0.0	0.0	0.0	0.0	0.00	0.02	0.16	0.01	0.00	0.18	75.03

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

Forces and Moments for Pole in the Local Element Coordinate System

Loading Case T+S

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
159.00	0	0	0	0	818	975	1273	2357
154.00	60	-50	78	0	860	1024	1337	2606
149.00	123	-103	161	0	905	1078	1407	2873
149.00	123	-103	161	0	1708	2036	2658	5222
144.00	247	-207	322	0	1754	2090	2729	5510
139.00	374	-314	489	0	1805	2151	2808	5814
139.00	374	-314	489	0	2594	3091	4035	8166
134.00	562	-471	733	0	2646	3154	4117	8651
129.00	753	-632	983	0	2705	3224	4209	9160
129.00	753	-632	983	0	3479	4146	5412	11516
124.00	1004	-842	1311	0	3533	4211	5497	12059
119.00	1259	-1056	1643	0	3597	4287	5597	12624
119.00	1259	-1056	1643	0	4352	5187	6771	14985
114.00	1573	-1320	2053	0	4408	5254	6858	15585
109.00	1890	-1586	2468	0	4477	5336	6966	16205
109.00	1890	-1586	2468	0	5212	6212	8109	18571
104.00	2265	-1901	2957	0	5269	6279	8197	19229
99.00	2645	-2219	3453	0	5333	6355	8297	19911
98.00	2721	-2283	3552	0	5348	6373	8320	20050
98.00	2721	-2283	3552	0	5340	6364	8308	20055
94.00	3029	-2541	3954	0	5400	6436	8402	21269
92.75	3125	-2623	4080	0	5414	6452	8423	21660
89.00	3417	-2867	4461	0	5458	6504	8490	22297
84.00	3810	-3197	4974	0	5519	6577	8586	23174
79.00	4208	-3531	5493	0	5581	6651	8683	24083
74.00	4610	-3868	6018	0	5644	6727	8781	25025
69.00	5016	-4209	6548	0	5708	6802	8880	25999
64.00	5427	-4554	7085	0	5772	6879	8980	27005
59.00	5843	-4903	7628	0	5837	6956	9081	28043
54.00	6263	-5256	8176	0	5907	7040	9190	29112
52.00	6433	-5398	8398	0	5941	7080	9243	29545
52.00	6433	-5398	8398	0	5931	7069	9227	29550
49.00	6689	-5612	8731	0	5972	7117	9291	30865
45.42	6996	-5871	9133	0	6026	7181	9375	32463
44.00	7119	-5973	9293	0	6036	7193	9390	32785
39.00	7553	-6338	9860	0	6097	7266	9485	33933
34.00	7992	-6706	10433	0	6157	7337	9578	35113
29.00	8435	-7078	11011	0	6216	7408	9670	36325
24.00	8882	-7453	11595	0	6274	7477	9760	37569
19.00	9334	-7832	12184	0	6329	7543	9847	38846

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

Forces and Moments for Pole in the Local Element Coordinate System

Loading Case T+S

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
14.00	9789	-8214	12779	0	6382	7606	9929	40155
9.00	10248	-8599	13378	0	6434	7667	10009	41496
4.00	10711	-8987	13982	0	6488	7733	10094	42868
0.00	11084	-9300	14469	0	6549	7805	10189	43984

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

Deflections and Stresses for Pole

Loading Case T+S

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Rotation (deg.)	Axial Interaction Term	Flexural Interaction Term	Shear Interaction Term	Torsion Interaction Term	Combined Stress Interaction	Effective Yield Strength (ksi)
159.00	19.1	22.7	29.6	0.3	1.67	0.00	0.00	0.01	0.00	0.01	82.55
154.00	17.9	21.4	27.9	0.3	1.66	0.00	0.01	0.01	0.00	0.02	82.55
149.00	16.8	20.0	26.2	0.3	1.65	0.00	0.03	0.01	0.00	0.03	82.55
149.00	16.8	20.0	26.2	0.3	1.65	0.00	0.03	0.01	0.00	0.03	82.55
144.00	15.7	18.7	24.4	0.3	1.62	0.00	0.05	0.01	0.00	0.05	82.55
139.00	14.6	17.4	22.8	0.2	1.57	0.00	0.06	0.01	0.00	0.07	82.55
139.00	14.6	17.4	22.8	0.2	1.57	0.00	0.04	0.01	0.00	0.05	82.55
134.00	13.6	16.2	21.1	0.2	1.54	0.00	0.06	0.01	0.00	0.06	82.55
129.00	12.6	15.0	19.6	0.2	1.50	0.00	0.07	0.01	0.00	0.07	82.55
129.00	12.6	15.0	19.6	0.2	1.50	0.01	0.07	0.01	0.00	0.07	82.55
124.00	11.6	13.8	18.0	0.2	1.45	0.01	0.08	0.01	0.00	0.09	82.55
119.00	10.6	12.7	16.5	0.2	1.39	0.01	0.09	0.01	0.00	0.10	82.55
119.00	10.6	12.7	16.5	0.2	1.39	0.01	0.09	0.01	0.00	0.10	82.55
114.00	9.7	11.6	15.1	0.1	1.34	0.01	0.11	0.01	0.00	0.11	82.55
109.00	8.8	10.5	13.7	0.1	1.27	0.01	0.12	0.01	0.00	0.12	82.55
109.00	8.8	10.5	13.7	0.1	1.27	0.01	0.12	0.01	0.00	0.12	82.55
104.00	8.0	9.5	12.4	0.1	1.21	0.01	0.13	0.01	0.00	0.13	82.55
99.00	7.2	8.6	11.2	0.1	1.14	0.01	0.14	0.01	0.00	0.14	82.55
98.00	7.0	8.4	11.0	0.1	1.13	0.01	0.14	0.01	0.00	0.15	82.55
98.00	7.0	8.4	11.0	0.1	1.13	0.01	0.12	0.01	0.00	0.13	82.55
94.00	6.4	7.7	10.0	0.1	1.08	0.01	0.13	0.01	0.00	0.14	82.55
92.75	6.3	7.5	9.7	0.1	1.06	0.01	0.13	0.01	0.00	0.14	82.55
89.00	5.7	6.8	8.9	0.1	1.01	0.01	0.14	0.01	0.00	0.14	82.55
84.00	5.1	6.1	7.9	0.1	0.95	0.01	0.14	0.01	0.00	0.15	82.55
79.00	4.5	5.3	6.9	0.1	0.88	0.01	0.14	0.01	0.00	0.15	82.55
74.00	3.9	4.6	6.1	0.0	0.82	0.01	0.15	0.01	0.00	0.15	82.55
69.00	3.4	4.0	5.2	0.0	0.76	0.01	0.15	0.01	0.00	0.16	82.55
64.00	2.9	3.4	4.5	0.0	0.70	0.01	0.15	0.01	0.00	0.16	82.55
59.00	2.4	2.9	3.8	0.0	0.64	0.01	0.15	0.01	0.00	0.16	82.29
54.00	2.0	2.4	3.1	0.0	0.58	0.01	0.16	0.01	0.00	0.16	81.64
52.00	1.9	2.2	2.9	0.0	0.56	0.01	0.16	0.01	0.00	0.16	81.38
52.00	1.9	2.2	2.9	0.0	0.56	0.01	0.16	0.01	0.00	0.17	81.80
49.00	1.6	2.0	2.5	0.0	0.52	0.01	0.16	0.01	0.00	0.17	81.41
45.42	1.4	1.7	2.2	0.0	0.48	0.01	0.17	0.01	0.00	0.17	80.94
44.00	1.3	1.6	2.0	0.0	0.46	0.01	0.17	0.01	0.00	0.17	80.75
39.00	1.0	1.2	1.6	0.0	0.40	0.01	0.17	0.01	0.00	0.17	80.10
34.00	0.8	0.9	1.2	0.0	0.35	0.01	0.17	0.01	0.00	0.18	79.45
29.00	0.6	0.7	0.9	0.0	0.29	0.01	0.17	0.01	0.00	0.18	78.80
24.00	0.4	0.4	0.6	0.0	0.24	0.01	0.17	0.01	0.00	0.18	78.15

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

Deflections and Stresses for Pole

Loading Case T+S

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Rotation (deg.)	Axial Interaction Term	Flexural Interaction Term	Shear Interaction Term	Torsion Interaction Term	Combined Stress Interaction	Effective Yield Strength (ksi)
19.00	0.2	0.3	0.4	0.0	0.19	0.01	0.17	0.01	0.00	0.18	77.50
14.00	0.1	0.1	0.2	0.0	0.13	0.01	0.17	0.01	0.00	0.18	76.85
9.00	0.1	0.1	0.1	0.0	0.09	0.01	0.17	0.01	0.00	0.18	76.20
4.00	0.0	0.0	0.0	0.0	0.04	0.01	0.18	0.01	0.00	0.18	75.55
0.00	0.0	0.0	0.0	0.0	0.00	0.01	0.18	0.01	0.00	0.18	75.03

MINIMUM DEFLECTION RATIO // DEFLECTION LIMIT / DEFLECTION // IS

F L A N G E A N A L Y S I S Version IMPAX-16.9.2015

FLANGE FOR THE C - D JOINT : SIZED FOR SHAFT MOMENT CAPACITY

Input Data

Applied Reactions			
Resultant Moment	=	8,839	in-kips
Torsion	=	0	in-kips
Resultant Shear	=	0	lbs
Axial	=	0	lbs
Bolts			
Number of Bolts	=	12	
Bolt Diameter	=	1.50	in
Bolt Material	=	A325	
Bolt Circle	=	28.35	in
Flange			
Outside Diameter	=	32.10	in
Thickness	=	2.000	in
Yield Strength	=	50	ksi
Tensile Strength	=	65	ksi
Valmont Material Spec.	=	S-56	
Tube			
No. of sides	=	18	
Design Diameter	=	23.487	in
Detailed "C" Sect. Dia	=	23.539	in
Detailed "D" Sect. Dia	=	23.436	in
Thickness	=	0.3750	in
Thickness for M. Cap.	=	0.2500	in
Yield	=	65	ksi

Results

Bolts			
Maximum Bolt Axial Force	=	103,930	lbs
Maximum Bolt Shear	=	1,120	lbs
Tensile Strength	=	105	ksi
Combined Stress Ratio	=	0.88	
Flange			
Weight	=	249	lbs
Controlling Stress	=	Shear	
Maximum Stress Ratio	=	0.49	
Bending Stress Ratio	=	0.40	
Shear Stress Ratio	=	0.49	
Bearing Stress Ratio	=	0.01	

*** BOLT COORDINATES ***

BOLT NO.	X-COORD	Y-COORD		BOLT NO.	X-COORD	Y-COORD
1	14.17	0.00	*	2	12.28	7.09
3	7.09	12.28	*	4	0.00	14.17

BY VALMONT INDUSTRIES FOR: VERIZON 140' EXT TO 160' POLE, SITE: PLYMOUTH WEST RELO, CT 301371 DATE 09/10/2015
Fuse 1.13.0.0

*** ANCHOR BOLT CHARACTERISTICS GOVERNED BY LOADING CASE WIND ***

NUMBER OF BOLTS	DIAMETER (IN.)	LENGTH (IN.)	WEIGHT (LB.)	SHIPPED AS	PROJECTION LENGTH (IN.)	GALVANIZED LENGTH (IN.)	THREAD SIZE
20	2.250	72	2422	BOLTS, TEMPLATES	12.00	72.00	4.5-UNC-2A

STEEL SPECIF.	MAXIMUM BOLT FORCE (LB.)	MAXIMUM BOLT SHEAR FORCE (LB.)	FACTORED NOMINAL TENS. STRENGTH (LB.)	STRESS AREA (SQ. IN.)	INTERACTION VALUE	CONFIGURATION OF BOTTOM END
A615	208166	2422	260004	3.250	0.82	THREADED WITH HEAVY HEX HEAD NUT

NOTE: BOLT INTERACTION VALUE WAS CALCULATED BY DIVIDING SHEAR FORCE BY FACTOR RELATED TO DETAIL TYPE d] IN EIA-G SPECS.

*** BOLT COORDINATES AND FORCES ***

BOLT NO.	X-COORD	Y-COORD	MAX TENSION-LB	MAX FORCE-LB	*	BOLT NO.	X-COORD	Y-COORD	MAX TENSION-LB	MAX FORCE-LB
1	33.713	0.00	- 2688	2688	*	2	32.063	10.418	60807	66183
3	27.274	19.816	118091	123466	*	4	19.816	27.274	163548	168923
5	10.418	32.063	192733	198109	*	6	0.00	33.713	202790	208165

MAX. BOLT CIRCLE = 67.43 IN. TEMPLATE DIAMETER = 73.43 IN.

*** BASE PLATE CHARACTERISTICS GOVERNED BY LOADING CASE WIND ***

DRAWING NUMBER	OVERALL LENGTH (IN.)	OVERALL WIDTH (IN.)	THICKNESS (IN.)	ACTUAL WEIGHT (LB.)	RAW MATERIAL WEIGHT (LB.)	SIDE LENGTH (IN.)
SD18-99	73.43	74.56	3.0000	2834	4653	12.95

TOP WIDTH (IN.)	POLE DIAM. (MAJOR DIAM.) (IN.)	CRITICAL FAILURE MODE	TOTAL LENGTH OF FAIL MODE LINE (IN.)	EFFECTIVE LENGTH (IN.)	TOTAL MOMENT ALONG FAIL LINE (IN.-LB.)
12.95	60.00	1	74.46	60.55	3728737

STEEL SPECIF. VALMONT	STEEL SPECIF. OTHER	BENDING STRESS (PSI)	EFFECTIVE YIELD STRESS (PSI)	MAX. VERTICAL SHEAR STRESS (PSI)
S56	A572	41052	50000	11195

** LOADS AT POLE BASE IN THE GLOBAL COORDINATE SYSTEM ********** LOADING CASES **********

LOADING CASE IDENTIFICATION	WIND	ICE	T+S
MOMENT ABT. X-AXIS (IN-KIP)	53065	9889	11084
MOMENT ABT. Y-AXIS (IN-KIP)	- 44527	- 8298	- 9300
SHEAR FORCE (LB.)	48446	8553	10174
VERTICAL FORCE (LB.)	53754	114456	43987

]MAX CRITERION-	LOAD CASE
]MOMENT ABT. X	WIND
]MOMENT ABT. Y	WIND
]RES. MOMENT	WIND
]SHEAR FORCE	WIND
]BOLT FORCE	WIND
]BOLT TENSION	WIND

CENTEK engineering

Centered on Solutions℠

Stormwater Analysis Report

Proposed Verizon Wireless Wireless Communications Facility

Verizon Site Ref: Plymouth West Relo.

33 Keegan Road
Plymouth, CT 06782

Centek Project No. 13321.000

Date: November 17, 2015

verizon

Prepared for:

Verizon Wireless
99 East River Drive
East Hartford, CT 06108

63-2 North Branford Road, Branford, CT 06405 203.488.0580 Fax 203.488.8587 www.CentekEng.com

Table of Contents

PROJECT DESCRIPTION

Verizon Wireless is proposing to install a telecommunications facility at 33 Keegan Road, Plymouth, Connecticut. The proposed site will consist of the installation of 140' tall monopole tower within a 50' x 50' gravel compound. The design calls for one 12'x26' concrete pad with a stand-alone roof cover for Verizon's equipment. Additionally, the compound will be designed to accommodate three future carrier's equipment.

The compound will be accessed by a 464' long, 12' wide gravel access drive with a parking/turn around area at the fenced compound. The access drive will have a rip-rap swale along the northern shoulder that will direct runoff to a proposed catch basin at the access drive entrance. The access drive entrance will consist of a 25' long bituminous apron off of Keegan Road and then gravel for the remainder of the road to the compound.

All references made to existing and proposed site features are based on "D&M Plans – Issued for Client Review" (Rev. 0) prepared for Verizon Wireless by Centek Engineering, Inc., dated November 17, 2015.

During construction, erosion control measures will be installed and maintained throughout the construction period in accordance with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control. Construction shall be seasonally restricted from occurring between May 1st and July 31st to avoid potential disturbance of whip-poor-will (a state species of special concern) breeding.

The SCS TR-20 method is used to determine the pre and post-development storm runoff volume and peak discharge rates. Soils information was obtained from the United States Department of Agriculture-Natural Resources Conservation Service website (refer to Appendix B for soil survey map and legend).

DESIGN METHODOLOGY

The Hydrological Soil Group rating used in the analysis is B and D (from the National Cooperative Soil Survey) and the CN values used in the analysis range from 0.60 to 0.79 for wooded area (fair condition), 0.85 to 0.96 for gravel surfaces and 0.93 to 0.98 for impervious surfaces.

HydroCAD Version 10.0 was utilized to evaluate the runoff volume and peak discharge rates of the pre and post-development conditions. The 2-year, 10-year, 25-year, 50-year and 100-year storm frequencies were use in the analysis with the following 24-hour rainfall totals; 2-year, 3.2 inches; 10-year, 4.7 inches; 25-year, 5.5 inches; 50-year, 6.2 inches and 100-year, 7.0 inches (Litchfield County, Connecticut).

EXISTING DRAINAGE CONDITIONS

The current condition of the site is mostly woodlands with an abutting residence and associated paved access driveway. There are a significant amount of ledge outcroppings throughout the woodland drainage area. Also, the site is very steep off of Keegan Road with a slope of approximately 45-50% for the first 50' into the woods before mellowing out to approximately 20%. Keegan Road is located to the Southwest of the property and provides access to the site.

The total drainage area under consideration is approximately 2.84 acres. There is one point of interest (or outlet point) for the runoff from this drainage area. The point is located on the opposite side of Keegan Road (west side) and is a 12"Ø CPP that outlets into the woodlands. The outlet area is unprotected and there is evidence of erosion and sedimentation. The outlet pipe is connected to two parallel catch basins on Keegan Road.

Refer to Sheet DA-1 of Appendix E for the flow pattern and point of discharge. Using the software HydroCAD ver. 10.0, below are the run-off volumes and peak discharge rates for the 2-year, 10-year, 25-year, 50-year and 100-year storm frequencies.

TABLE 1: EXISTING CONDITIONS

	2-year Storm (cfs)	10-Year Storm (cfs)	25-Year Storm (cfs)	50-Year Storm (cfs)	100-Year Storm (cfs)
Outlet Point #1	2.64	5.92	7.85	9.61	11.66

Refer to Appendix C for the results.

PROPOSED DRAINAGE CONDITIONS

In the proposed conditions, Drainage Area #1 (from the existing conditions) will be divided into three smaller Drainage Areas (DA-1,2&3) due to the installation of two catch basins, one at the access drive entrance (CB-1) and one along Keegan Road (CB-2). The total drainage area under consideration for the proposed conditions is 3.17 acres due to the access drive construction.

Proposed DA-1 will consist of the proposed gravel access drive, associated rip-rap swale and woodland north of the access drive. All runoff in this area will be caught by the swale and directed to the proposed catch basin (CB-1) at the access drive entrance.

Proposed DA-2 will consist of all woodland north of CB-1, the abutting residence, associated access driveway and a small area south of the proposed access drive. Runoff from this area will make its way

to Keegan Road and along it to another proposed catch basin (CB-2). CB-1 and CB-2 will be connected by a 12"Ø CPP and CB-2 will be connected to the existing CB on the east side of Keegan Road.

Proposed DA-3 will consist of the woodland and proposed rip-rap bench that supports the access drive between CB-2 and the existing CB and south of the access drive. Runoff from this area will be taken to the existing CB on the east side of Keegan Road.

There is a small portion of the proposed construction that is not mentioned as part of the above drainage areas. The proposed 50'x50' gravel compound is south of the existing CB on Keegan Road, therefore the runoff from this area does not route to our outlet point in question. A level spreader will be constructed down gradient for the entire length of the compound and parking area to mitigate the unsubstantial increase in runoff from the construction of the gravel compound. After passing through the level spreader, runoff will continue to follow its existing drainage patterns.

As part of Verizon's proposed development, a modified rip-rap apron will be installed at the existing outlet pipe discharge area for outlet protection. The rip-rap apron will protect the outlet from future erosion and sedimentation as is currently experienced.

Refer to Sheet DA-2 of Appendix E for the flow patterns and possible points of discharge. Using the software HydroCAD ver. 10.0, below are the run-off volumes and peak discharge rates for the 2-year, 10-year, 25-year, 50-year and 100-year storm frequencies.

TABLE 2: PROPOSED CONDITIONS

	2-year Storm (cfs)	10-Year Storm (cfs)	25-Year Storm (cfs)	50-Year Storm (cfs)	100-Year Storm (cfs)
Outlet Point #1	2.54	5.69	7.55	9.24	11.22

Refer to Appendix D for the Proposed Condition results.

CONCLUSIONS

As a result of Verizon's proposed development, the runoff decreases for all storm events. The decrease is due to the rerouting of runoff with the proposed drainage swale and two proposed catch basins. The proposed drainage patterns allow the stormwater to reach the outlet point at different peak times resulting in the decrease in total runoff. See Table 3 for differences between existing and proposed flow conditions.

TABLE 3: PEAK FLOW COMPARISON

	2-year Storm (cfs)	10-Year Storm (cfs)	25-Year Storm (cfs)	50-Year Storm (cfs)	100-Year Storm (cfs)
Outlet Point #1	-0.10 (-3.79%)	-0.23 (-3.89%)	-0.30 (-3.82%)	-0.37 (-3.85%)	-0.44 (-3.77%)

Refer to Appendix C and D for the results.

APPENDIX A

Rainfall Information

Appendix B - Rainfall

RAINFALL – DURATION – FREQUENCY RELATIONSHIPS FOR CONNECTICUT

DURATION	RETURN FREQUENCY (Years)					
	2	5	10	25	50	100
Min	RAINFALL IN MM (INCHES)					
5	9.1(0.36)	11.4(0.45)	13.0(0.51)	15.2(0.60)	17.2(0.67)	18.5(0.73)
15	18.3(0.72)	22.6(0.89)	25.9(1.02)	30.5(1.20)	34.0(1.34)	37.6(1.48)
60	33.0(1.3)	43.2(1.7)	50.8(2.00)	58.4(2.30)	65.3(2.57)	71.1(2.80)
Hrs						
2	40.6(1.60)	54.6(2.15)	63.5(2.50)	72.4(2.85)	82.6(3.25)	91.4(3.60)
3	44.5(1.75)	61.0(2.40)	69.9(2.75)	82.6(3.25)	90.2(3.55)	101.6(4.00)
6	59.7(2.35)	74.9(2.95)	87.6(3.45)	101.6(4.00)	115.6(4.55)	127.0(5.00)
12	69.9(2.75)	90.2(3.55)	101.6(4.00)	123.2(4.85)	135.9(5.35)	152.4(6.00)
24	82.6(3.25)	106.7(4.20)	125.7(4.95)	146.1(5.75)	161.3(6.35)	177.8(7.00)
	24 HOUR RAINFALL BY COUNTY					
Fairfield	83.8(3.3)	109.2(4.3)	127.0(5.0)	144.8(5.7)	162.6(6.4)	182.9(7.2)
Hartford	81.3(3.2)	104.1(4.1)	119.4(4.7)	139.7(5.5)	157.5(6.2)	175.3(6.9)
Litchfield	**81.3(3.2)**	**104.1(4.1)**	**119.4(4.7)**	**139.7(5.5)**	**157.5(6.2)**	**177.8(7.0)**
Middlesex	83.8(3.3)	106.7(4.2)	127.0(5.0)	142.2(5.6)	160.0(6.3)	180.3(7.1)
New Haven	83.8(3.3)	106.7(4.2)	127.0(5.0)	142.2(5.6)	160.0(6.3)	180.3(7.1)
New London	86.4(3.4)	109.2(4.3)	127.0(5.0)	144.8(5.7)	160.0(6.3)	180.3(7.1)
Tolland	81.3(3.2)	104.1(4.1)	121.9(4.8)	139.7(5.5)	157.5(6.2)	175.3(6.9)
Windham	81.3(3.2)	106.7(4.2)	121.9(4.8)	139.7(5.5)	157.5(6.2)	175.3(6.9)

Sources:

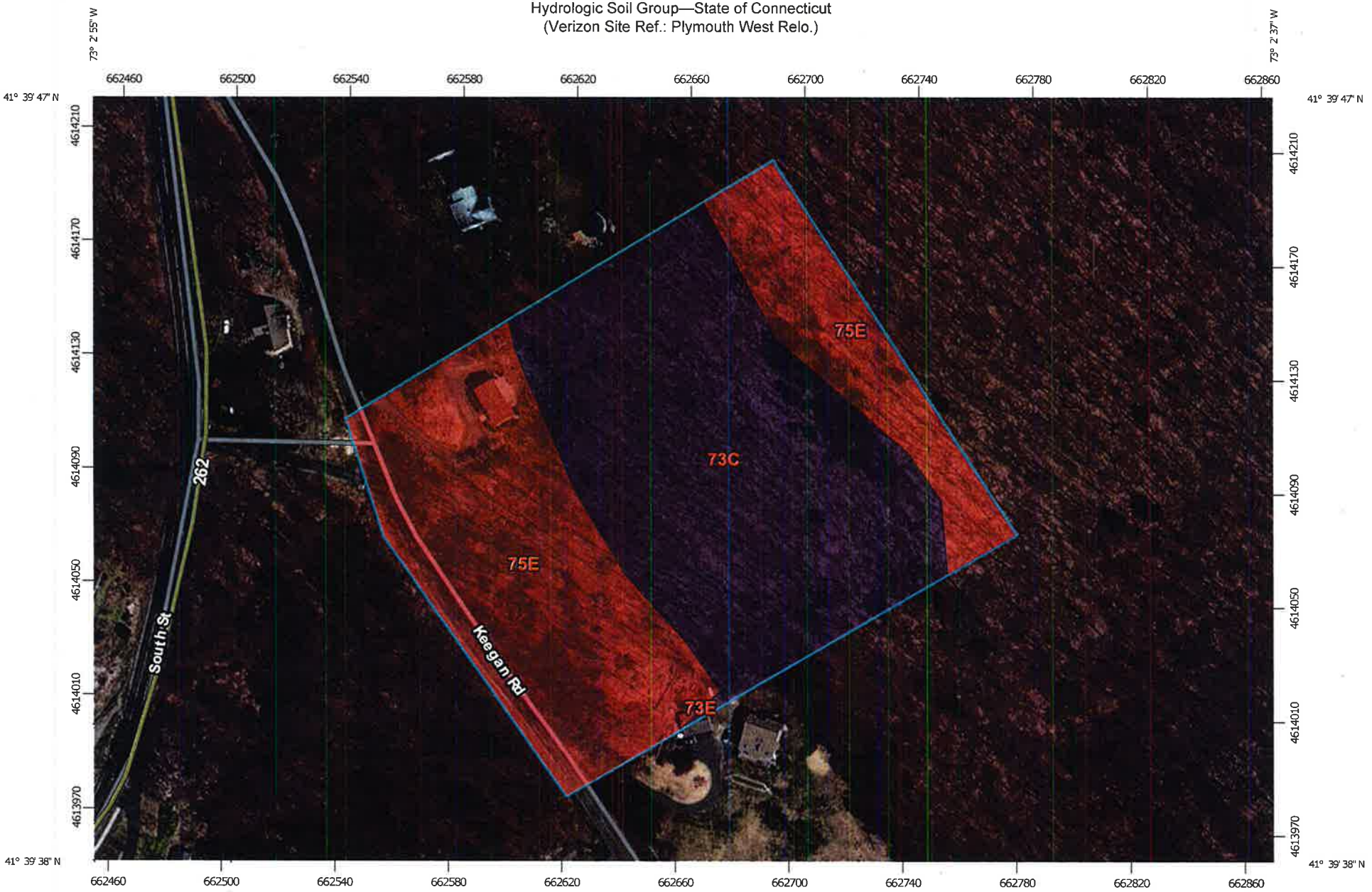
1. "Rainfall Frequency Atlas of the United States", Technical Paper No. 40, U.S. Department of Commerce, Weather Bureau.
2. NOAA Technical Memorandum "NWS Hydro-35", June 1977, U.S. Department of Commerce, National Weather Service.

Table B-1

APPENDIX B

Soils Report

Hydrologic Soil Group—State of Connecticut
(Verizon Site Ref.: Plymouth West Relo.)



Map Scale: 1:1,900 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut
Survey Area Data: Version 14, Sep 22, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 28, 2011—Apr 18, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — State of Connecticut (CT600)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	B	3.6	50.8%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	B	0.0	0.2%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	D	3.5	49.0%
Totals for Area of Interest			**7.1**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

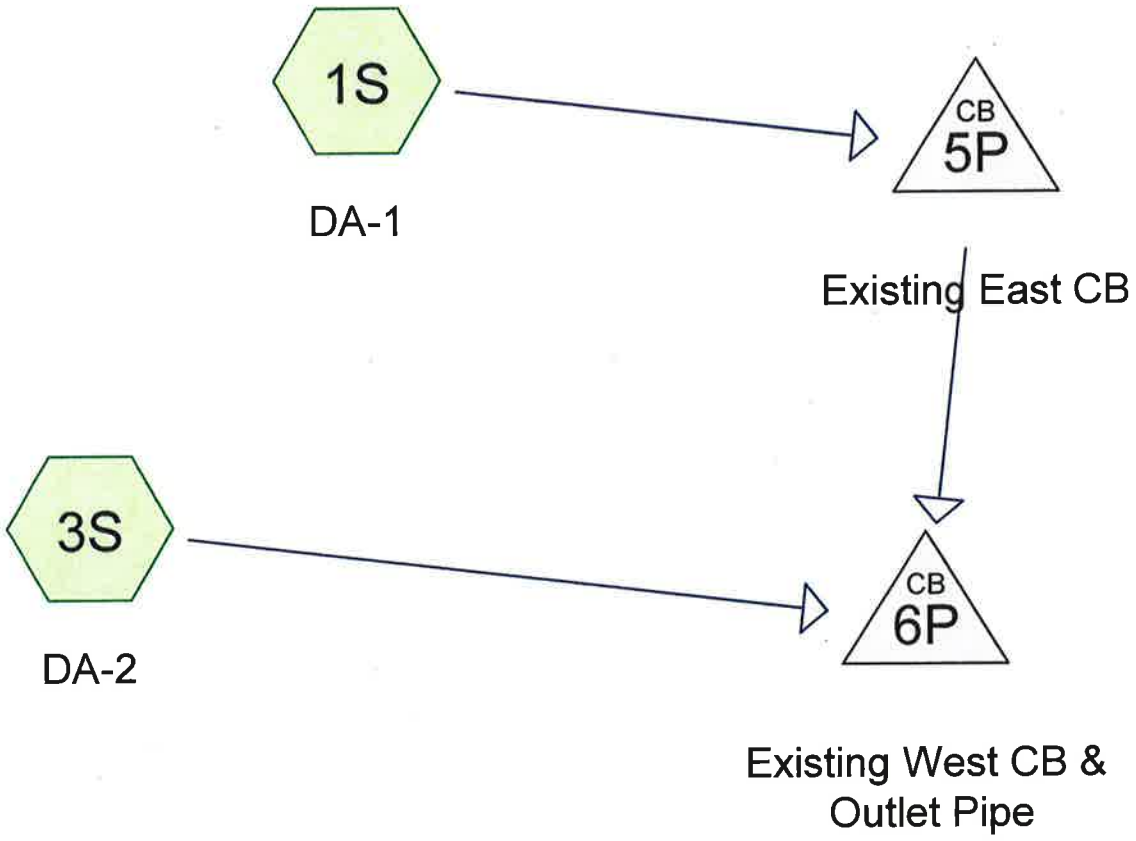
Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

APPENDIX C

Existing Drainage Conditions



Subcat Reach Pond Link

Routing Diagram for Existing Conditions
Prepared by Centek Engineering, Printed 11/17/2015
HydroCAD® 10.00 s/n 06614

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.157	98	Paved roads w/curbs & sewers, HSG D (1S, 3S)
0.080	93	Paved roads w/open ditches, 50% imp, HSG D (1S)
0.025	98	Roofs, HSG D (1S)
1.196	60	Woods, Fair, HSG B (1S)
1.383	79	Woods, Fair, HSG D (1S)
2.841	**73**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
1.196	HSG B	1S
0.000	HSG C	
1.645	HSG D	1S, 3S
0.000	Other	
2.841		**TOTAL AREA**

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	5P	751.20	750.90	13.0	0.0231	0.020	12.0	0.0	0.0
2	6P	750.90	750.00	25.0	0.0360	0.020	12.0	0.0	0.0

Summary for Subcatchment 1S: DA-1

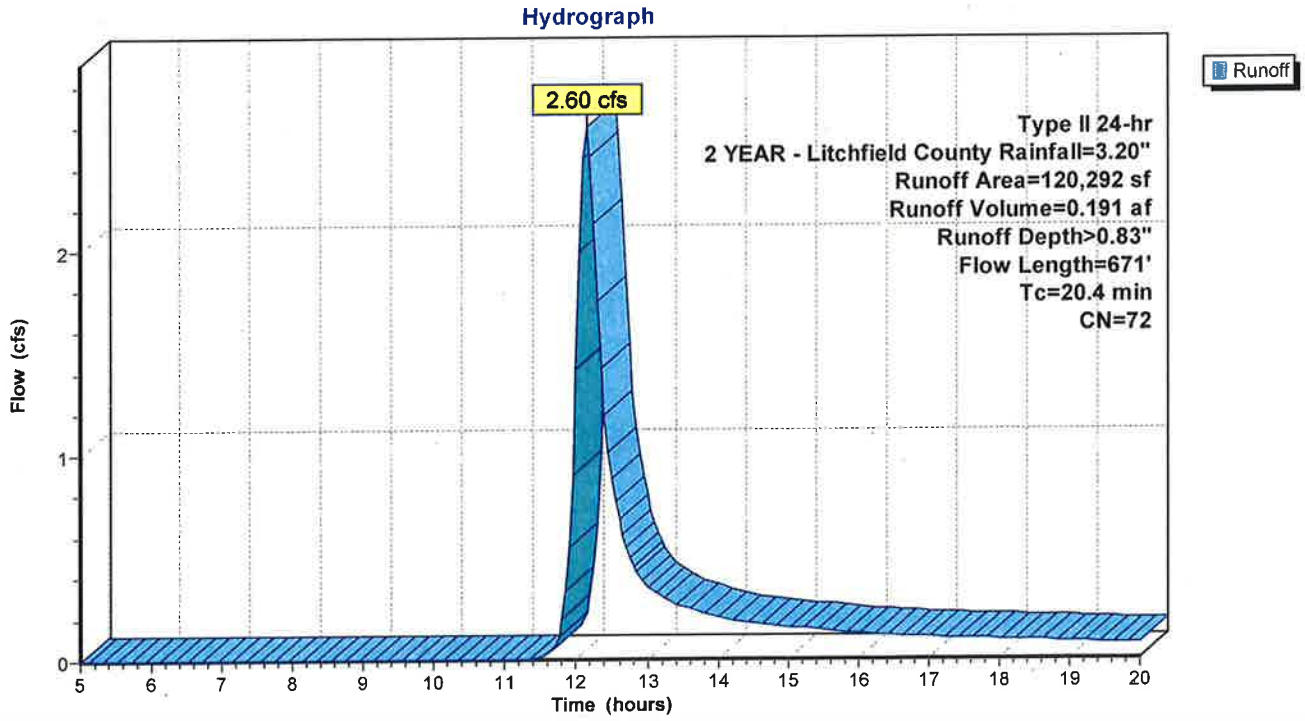
Runoff = 2.60 cfs @ 12.15 hrs, Volume= 0.191 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 YEAR - Litchfield County Rainfall=3.20"

Area (sf)	CN	Description
52,099	60	Woods, Fair, HSG B
60,260	79	Woods, Fair, HSG D
3,467	93	Paved roads w/open ditches, 50% imp, HSG D
1,104	98	Roofs, HSG D
3,362	98	Paved roads w/curbs & sewers, HSG D
120,292	72	Weighted Average
114,093		94.85% Pervious Area
6,200		5.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	200	0.1300	0.19		**Sheet Flow, First 200-ft thru woods** Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	297	0.2300	2.40		**Shallow Concentrated Flow, To street line** Woodland Kv= 5.0 fps
0.6	174	0.0500	4.54		**Shallow Concentrated Flow, Along street to CB** Paved Kv= 20.3 fps
20.4	671	Total			

Subcatchment 1S: DA-1



Summary for Subcatchment 3S: DA-2

[49] Hint: Tc<2dt may require smaller dt

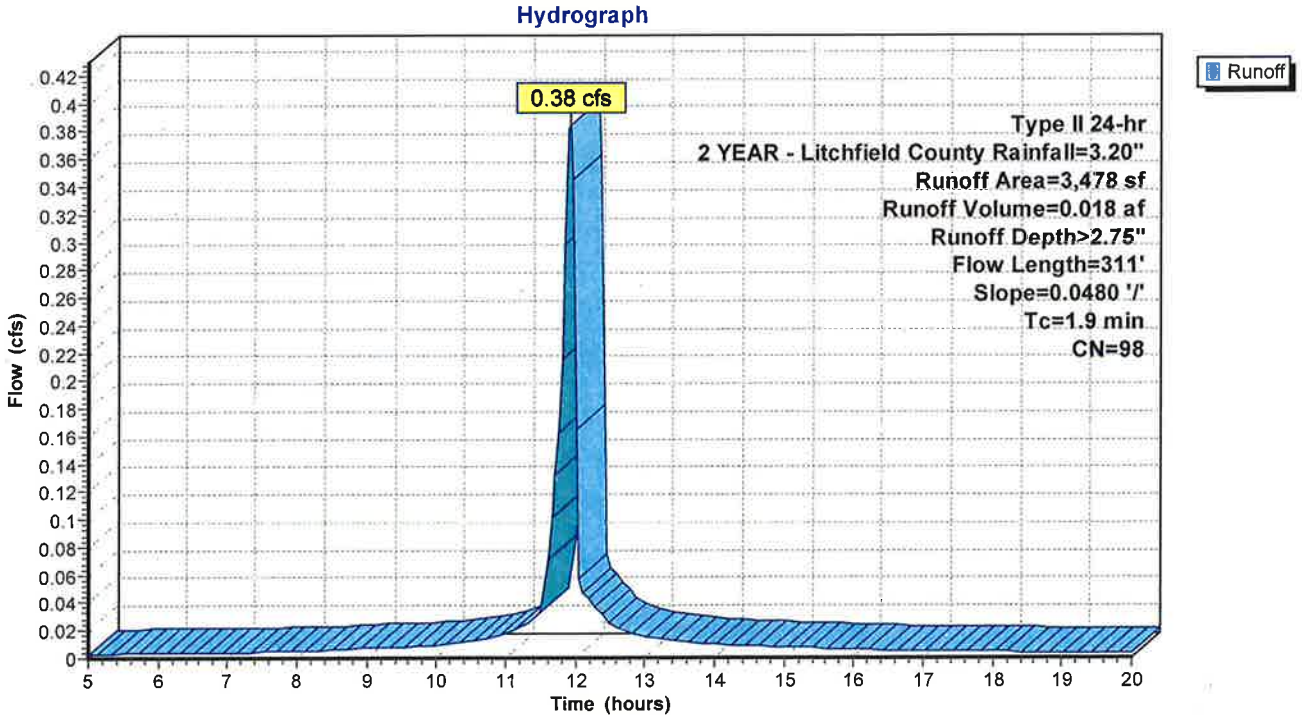
Runoff = 0.38 cfs @ 11.91 hrs, Volume= 0.018 af, Depth> 2.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 YEAR - Litchfield County Rainfall=3.20"

Area (sf)	CN	Description
3,478	98	Paved roads w/curbs & sewers, HSG D
3,478		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	200	0.0480	2.24		**Sheet Flow, First 200'** Smooth surfaces n= 0.011 P2= 3.20"
0.4	111	0.0480	4.45		**Shallow Concentrated Flow, Remainder of pavement to CB** Paved Kv= 20.3 fps
1.9	311	Total			

Subcatchment 3S: DA-2



Summary for Pond 5P: Existing East CB

[57] Hint: Peaked at 752.54' (Flood elevation advised)

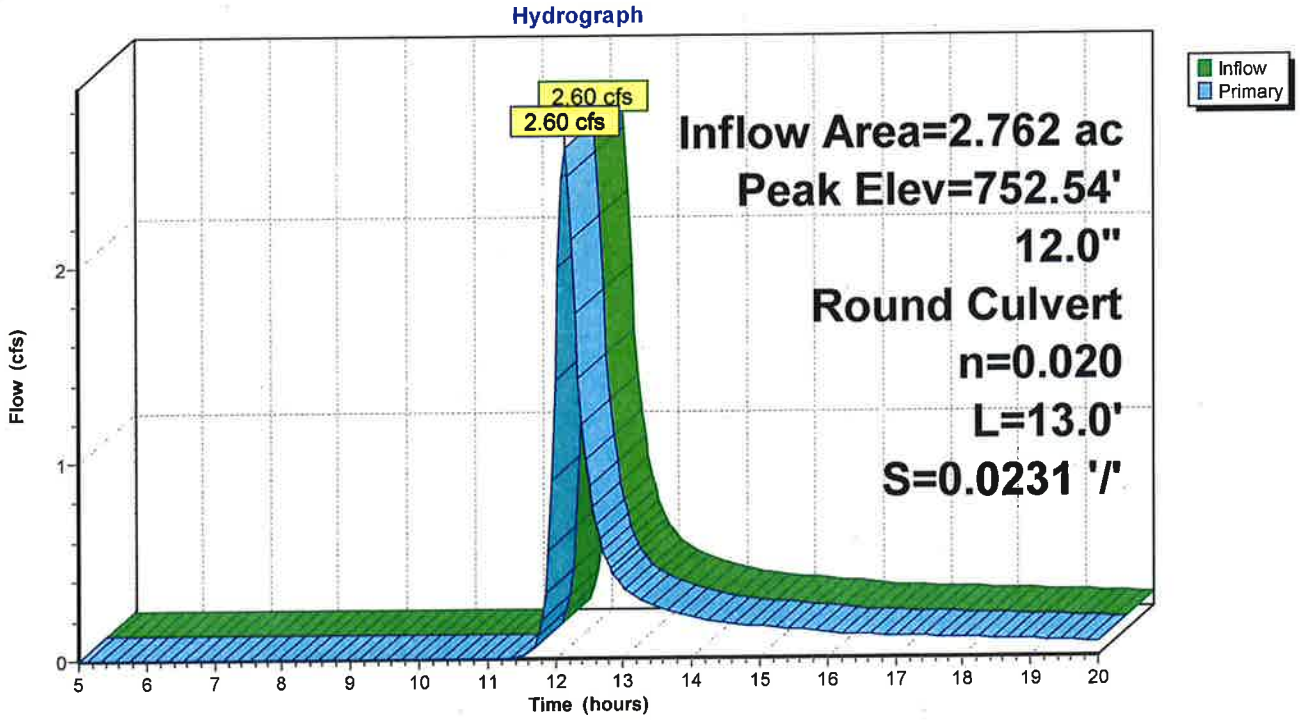
Inflow Area = 2.762 ac, 5.15% Impervious, Inflow Depth > 0.83" for 2 YEAR - Litchfield County event
Inflow = 2.60 cfs @ 12.15 hrs, Volume= 0.191 af
Outflow = 2.60 cfs @ 12.15 hrs, Volume= 0.191 af, Atten= 0%, Lag= 0.0 min
Primary = 2.60 cfs @ 12.15 hrs, Volume= 0.191 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 752.54' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	751.20'	**12.0" Round Culvert** L= 13.0' Ke= 1.000 Inlet / Outlet Invert= 751.20' / 750.90' S= 0.0231 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.60 cfs @ 12.15 hrs HW=752.54' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 2.60 cfs @ 3.30 fps)

Pond 5P: Existing East CB



Summary for Pond 6P: Existing West CB & Outlet Pipe

[82] Warning: Early inflow requires earlier time span
[57] Hint: Peaked at 752.27' (Flood elevation advised)
[79] Warning: Submerged Pond 5P Primary device # 1 INLET by 1.07'

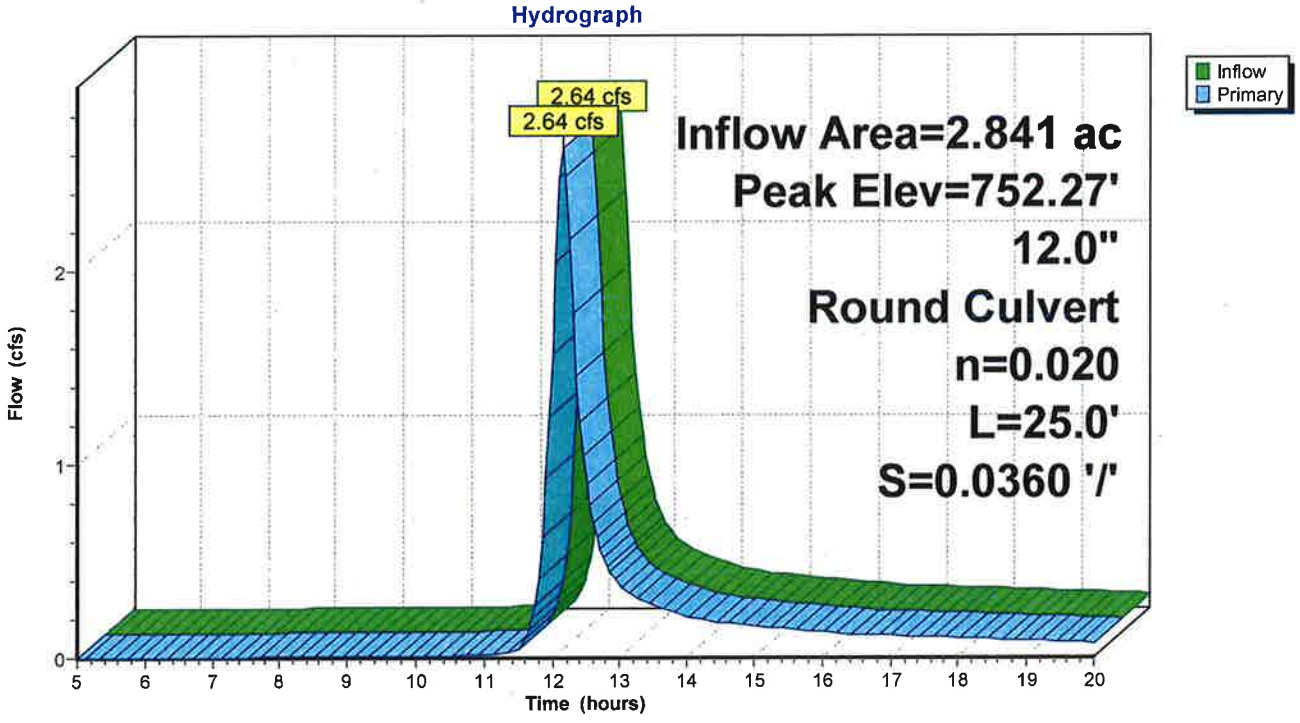
Inflow Area = 2.841 ac, 7.82% Impervious, Inflow Depth > 0.88" for 2 YEAR - Litchfield County event
Inflow = 2.64 cfs @ 12.15 hrs, Volume= 0.209 af
Outflow = 2.64 cfs @ 12.15 hrs, Volume= 0.209 af, Atten= 0%, Lag= 0.0 min
Primary = 2.64 cfs @ 12.15 hrs, Volume= 0.209 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 752.27' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	750.90'	**12.0" Round Culvert** L= 25.0' Ke= 1.000 Inlet / Outlet Invert= 750.90' / 750.00' S= 0.0360 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.64 cfs @ 12.15 hrs HW=752.27' (Free Discharge)
1=Culvert (Inlet Controls 2.64 cfs @ 3.36 fps)

Pond 6P: Existing West CB & Outlet Pipe



Summary for Subcatchment 1S: DA-1

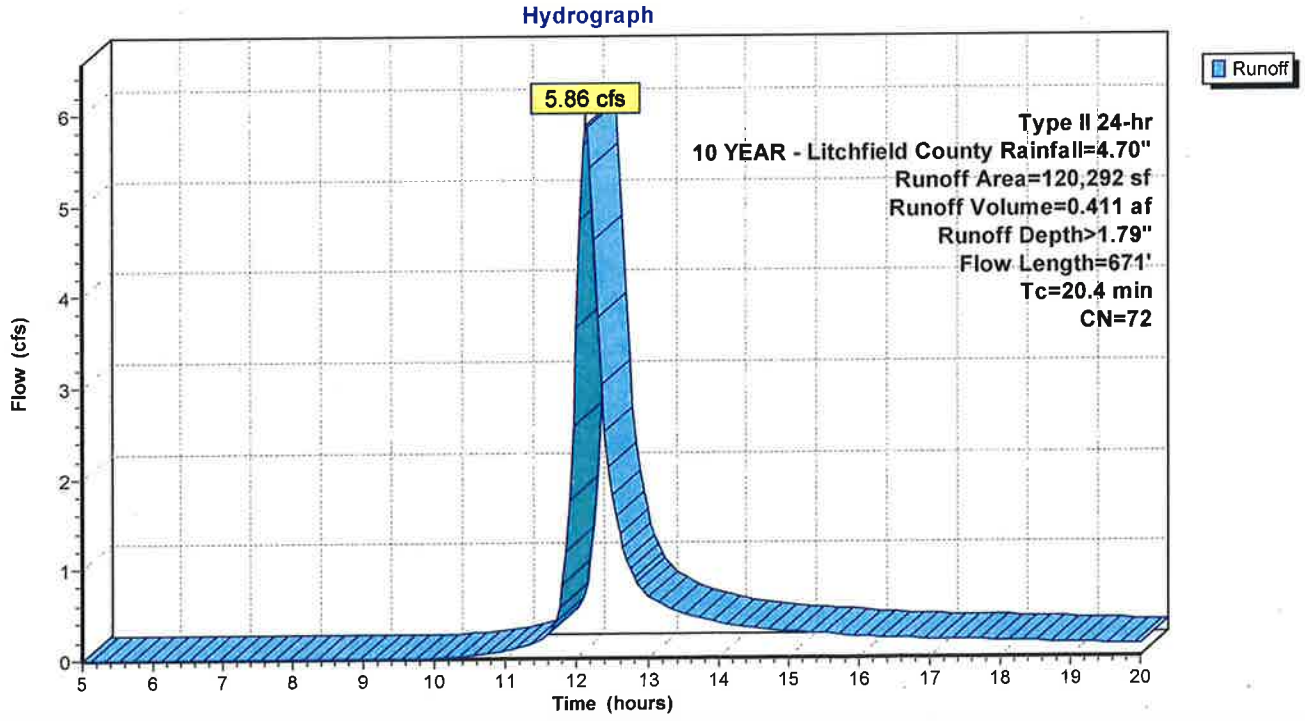
Runoff = 5.86 cfs @ 12.14 hrs, Volume= 0.411 af, Depth> 1.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 YEAR - Litchfield County Rainfall=4.70"

Area (sf)	CN	Description
52,099	60	Woods, Fair, HSG B
60,260	79	Woods, Fair, HSG D
3,467	93	Paved roads w/open ditches, 50% imp, HSG D
1,104	98	Roofs, HSG D
3,362	98	Paved roads w/curbs & sewers, HSG D
120,292	72	Weighted Average
114,093		94.85% Pervious Area
6,200		5.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	200	0.1300	0.19		**Sheet Flow, First 200-ft thru woods** Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	297	0.2300	2.40		**Shallow Concentrated Flow, To street line** Woodland Kv= 5.0 fps
0.6	174	0.0500	4.54		**Shallow Concentrated Flow, Along street to CB** Paved Kv= 20.3 fps
20.4	671	Total			

Subcatchment 1S: DA-1



Summary for Subcatchment 3S: DA-2

[49] Hint: Tc<2dt may require smaller dt

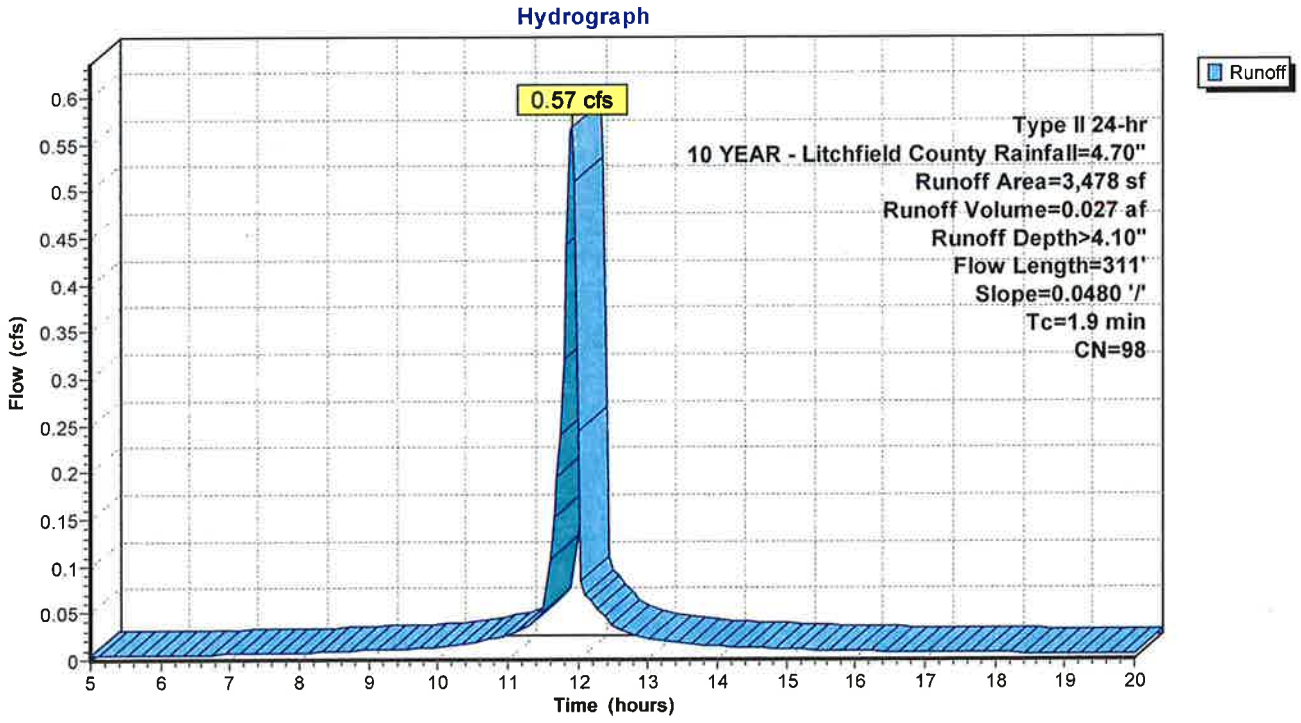
Runoff = 0.57 cfs @ 11.91 hrs, Volume= 0.027 af, Depth> 4.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 YEAR - Litchfield County Rainfall=4.70"

Area (sf)	CN	Description
3,478	98	Paved roads w/curbs & sewers, HSG D
3,478		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	200	0.0480	2.24		**Sheet Flow, First 200'** Smooth surfaces n= 0.011 P2= 3.20"
0.4	111	0.0480	4.45		**Shallow Concentrated Flow, Remainder of pavement to CB** Paved Kv= 20.3 fps
1.9	311	Total			

Subcatchment 3S: DA-2



Summary for Pond 5P: Existing East CB

[57] Hint: Peaked at 755.96' (Flood elevation advised)

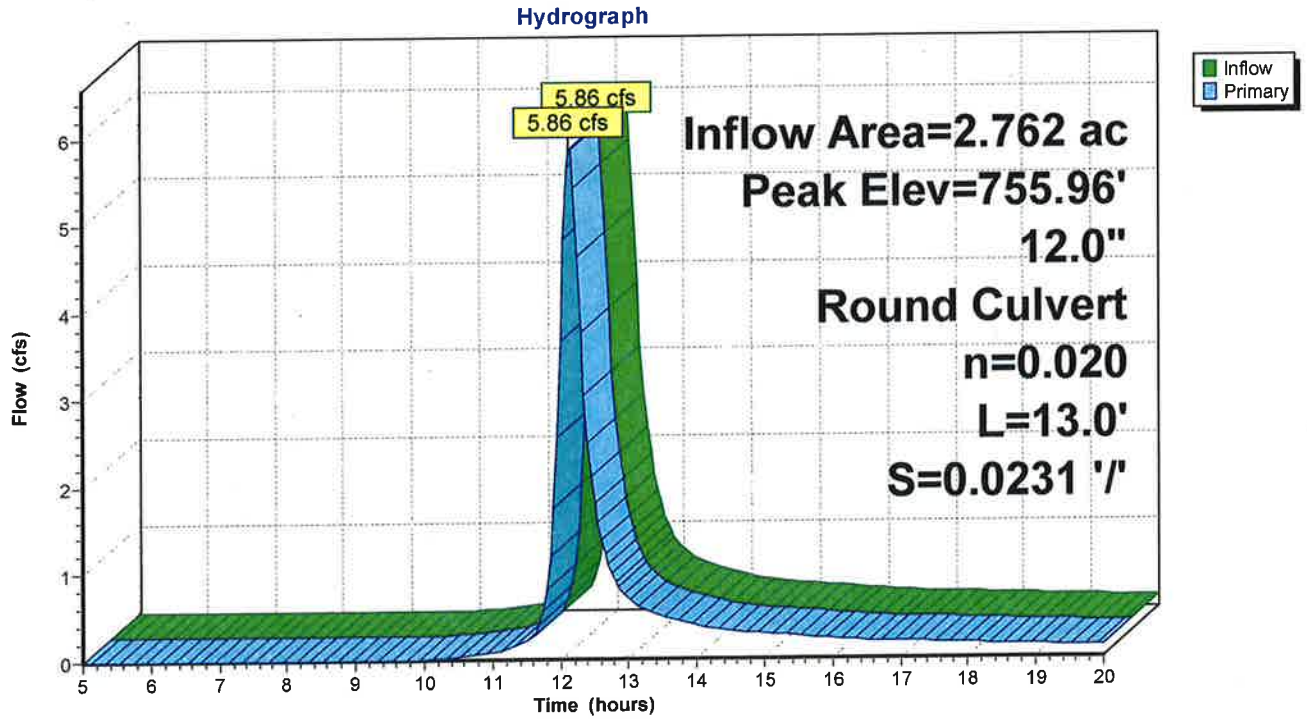
Inflow Area = 2.762 ac, 5.15% Impervious, Inflow Depth > 1.79" for 10 YEAR - Litchfield County event
Inflow = 5.86 cfs @ 12.14 hrs, Volume= 0.411 af
Outflow = 5.86 cfs @ 12.14 hrs, Volume= 0.411 af, Atten= 0%, Lag= 0.0 min
Primary = 5.86 cfs @ 12.14 hrs, Volume= 0.411 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 755.96' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	751.20'	**12.0" Round Culvert** L= 13.0' Ke= 1.000 Inlet / Outlet Invert= 751.20' / 750.90' S= 0.0231 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=5.81 cfs @ 12.14 hrs HW=755.89' (Free Discharge)
1=Culvert (Inlet Controls 5.81 cfs @ 7.39 fps)

Pond 5P: Existing East CB



Summary for Pond 6P: Existing West CB & Outlet Pipe

[57] Hint: Peaked at 755.76' (Flood elevation advised)
[81] Warning: Exceeded Pond 5P by 0.05' @ 11.95 hrs

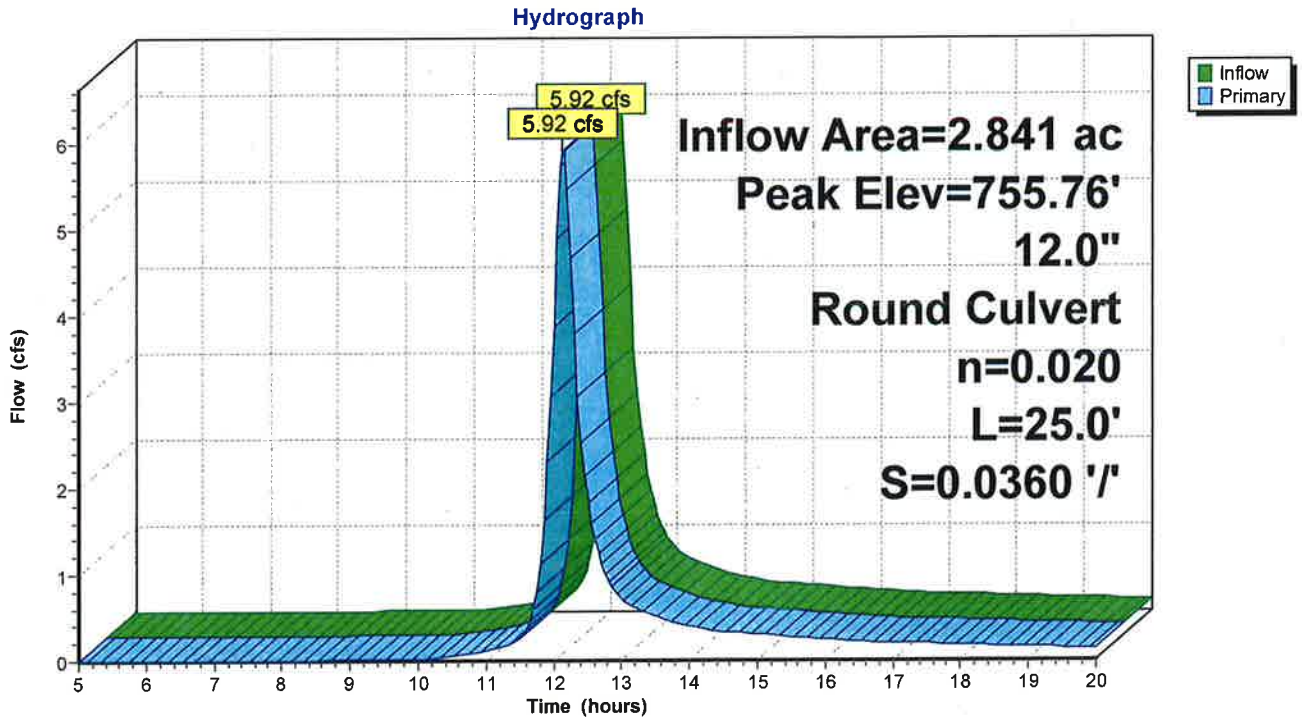
Inflow Area = 2.841 ac, 7.82% Impervious, Inflow Depth > 1.85" for 10 YEAR - Litchfield County event
Inflow = 5.92 cfs @ 12.14 hrs, Volume= 0.439 af
Outflow = 5.92 cfs @ 12.14 hrs, Volume= 0.439 af, Atten= 0%, Lag= 0.0 min
Primary = 5.92 cfs @ 12.14 hrs, Volume= 0.439 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 755.76' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	750.90'	**12.0" Round Culvert** L= 25.0' Ke= 1.000 Inlet / Outlet Invert= 750.90' / 750.00' S= 0.0360 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=5.87 cfs @ 12.14 hrs HW=755.69' (Free Discharge)
1=Culvert (Inlet Controls 5.87 cfs @ 7.48 fps)

Pond 6P: Existing West CB & Outlet Pipe



Summary for Subcatchment 1S: DA-1

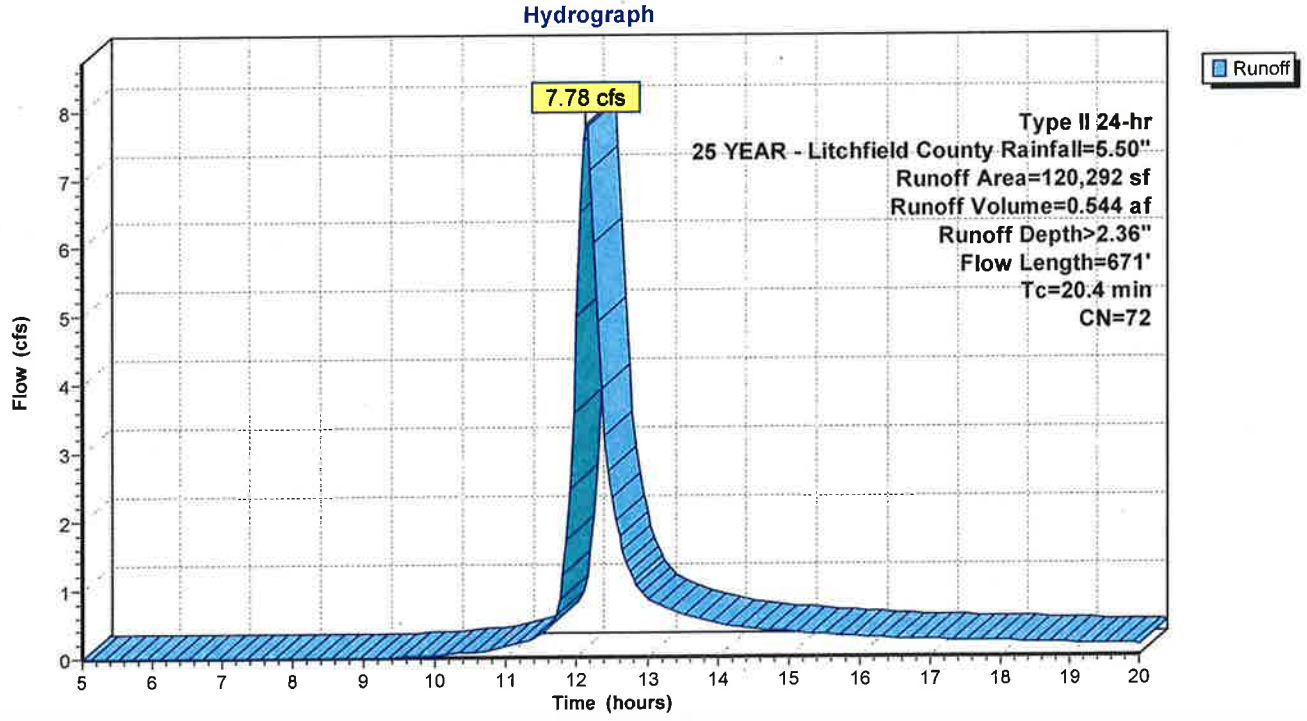
Runoff = 7.78 cfs @ 12.14 hrs, Volume= 0.544 af, Depth> 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25 YEAR - Litchfield County Rainfall=5.50"

Area (sf)	CN	Description
52,099	60	Woods, Fair, HSG B
60,260	79	Woods, Fair, HSG D
3,467	93	Paved roads w/open ditches, 50% imp, HSG D
1,104	98	Roofs, HSG D
3,362	98	Paved roads w/curbs & sewers, HSG D
120,292	72	Weighted Average
114,093		94.85% Pervious Area
6,200		5.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	200	0.1300	0.19		**Sheet Flow, First 200-ft thru woods** Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	297	0.2300	2.40		**Shallow Concentrated Flow, To street line** Woodland Kv= 5.0 fps
0.6	174	0.0500	4.54		**Shallow Concentrated Flow, Along street to CB** Paved Kv= 20.3 fps
20.4	671	Total			

Subcatchment 1S: DA-1



Summary for Subcatchment 3S: DA-2

[49] Hint: Tc<2dt may require smaller dt

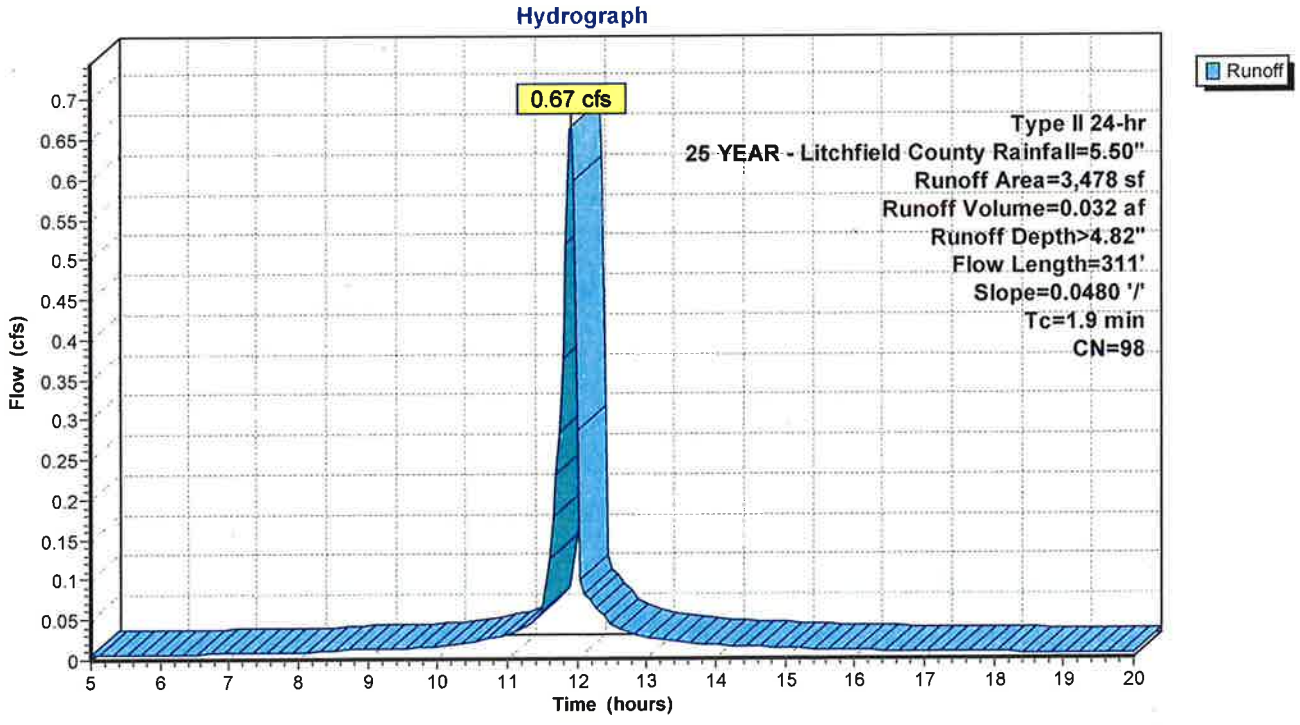
Runoff = 0.67 cfs @ 11.91 hrs, Volume= 0.032 af, Depth> 4.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25 YEAR - Litchfield County Rainfall=5.50"

Area (sf)	CN	Description
3,478	98	Paved roads w/curbs & sewers, HSG D
3,478		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	200	0.0480	2.24		**Sheet Flow, First 200'** Smooth surfaces n= 0.011 P2= 3.20"
0.4	111	0.0480	4.45		**Shallow Concentrated Flow, Remainder of pavement to CB** Paved Kv= 20.3 fps
1.9	311	Total			

Subcatchment 3S: DA-2



Summary for Pond 5P: Existing East CB

[57] Hint: Peaked at 759.21' (Flood elevation advised)

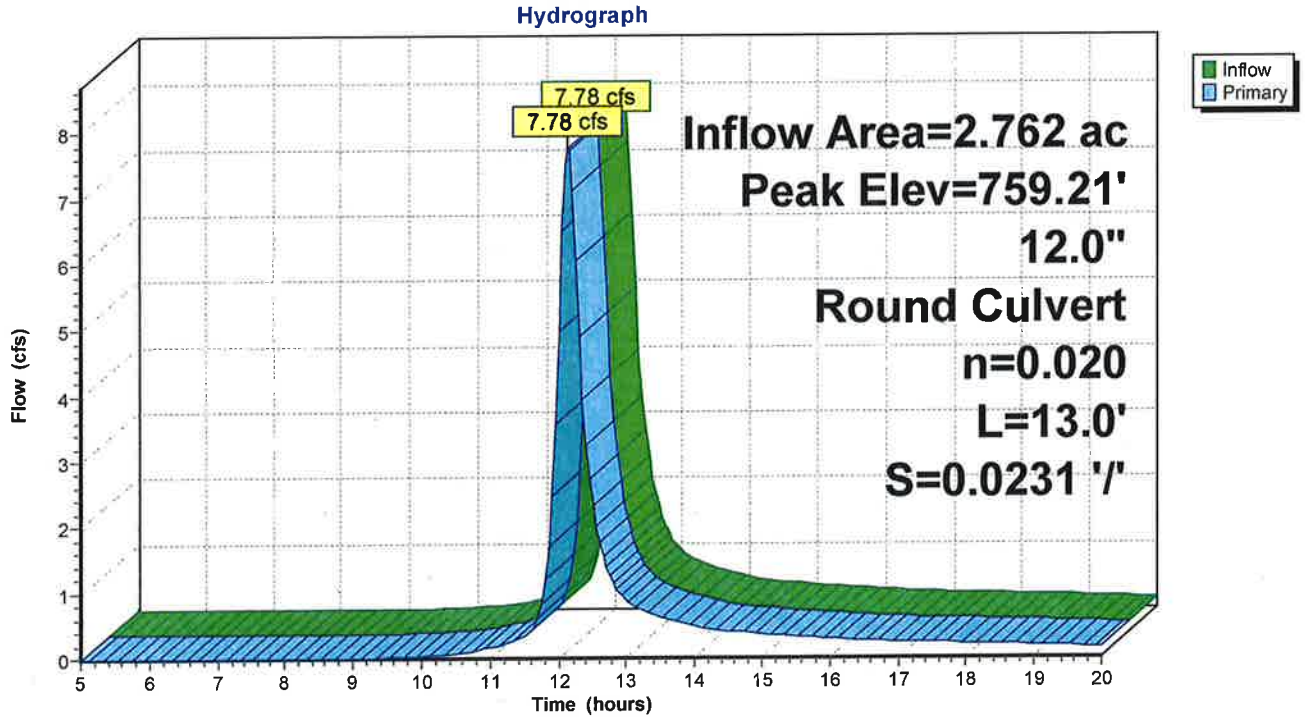
Inflow Area = 2.762 ac, 5.15% Impervious, Inflow Depth > 2.36" for 25 YEAR - Litchfield County event
Inflow = 7.78 cfs @ 12.14 hrs, Volume= 0.544 af
Outflow = 7.78 cfs @ 12.14 hrs, Volume= 0.544 af, Atten= 0%, Lag= 0.0 min
Primary = 7.78 cfs @ 12.14 hrs, Volume= 0.544 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 759.21' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	751.20'	**12.0" Round Culvert** L= 13.0' Ke= 1.000 Inlet / Outlet Invert= 751.20' / 750.90' S= 0.0231 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=7.70 cfs @ 12.14 hrs HW=759.07' (Free Discharge)
1=Culvert (Inlet Controls 7.70 cfs @ 9.80 fps)

Pond 5P: Existing East CB



Summary for Pond 6P: Existing West CB & Outlet Pipe

[57] Hint: Peaked at 759.06' (Flood elevation advised)
[81] Warning: Exceeded Pond 5P by 0.27' @ 11.95 hrs

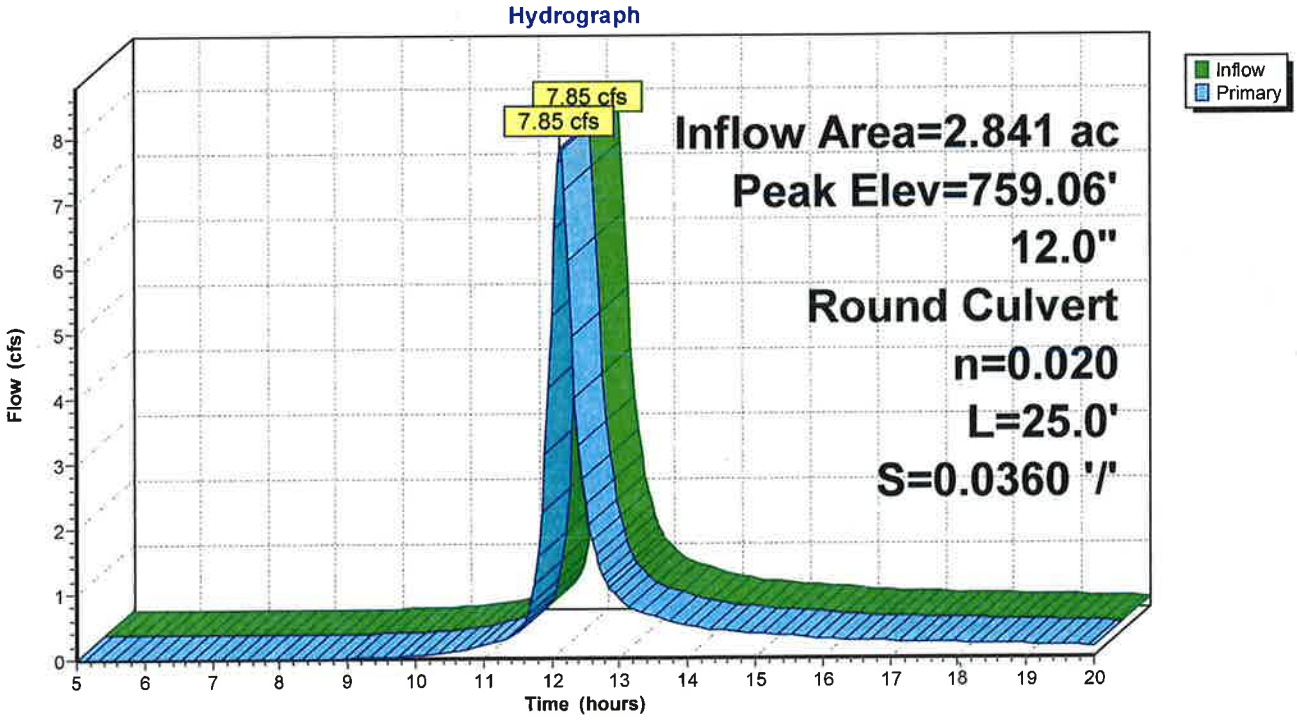
Inflow Area = 2.841 ac, 7.82% Impervious, Inflow Depth > 2.43" for 25 YEAR - Litchfield County event
Inflow = 7.85 cfs @ 12.14 hrs, Volume= 0.576 af
Outflow = 7.85 cfs @ 12.14 hrs, Volume= 0.576 af, Atten= 0%, Lag= 0.0 min
Primary = 7.85 cfs @ 12.14 hrs, Volume= 0.576 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 759.06' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	750.90'	**12.0" Round Culvert** L= 25.0' Ke= 1.000 Inlet / Outlet Invert= 750.90' / 750.00' S= 0.0360 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=7.77 cfs @ 12.14 hrs HW=758.91' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 7.77 cfs @ 9.90 fps)

Pond 6P: Existing West CB & Outlet Pipe



Summary for Subcatchment 1S: DA-1

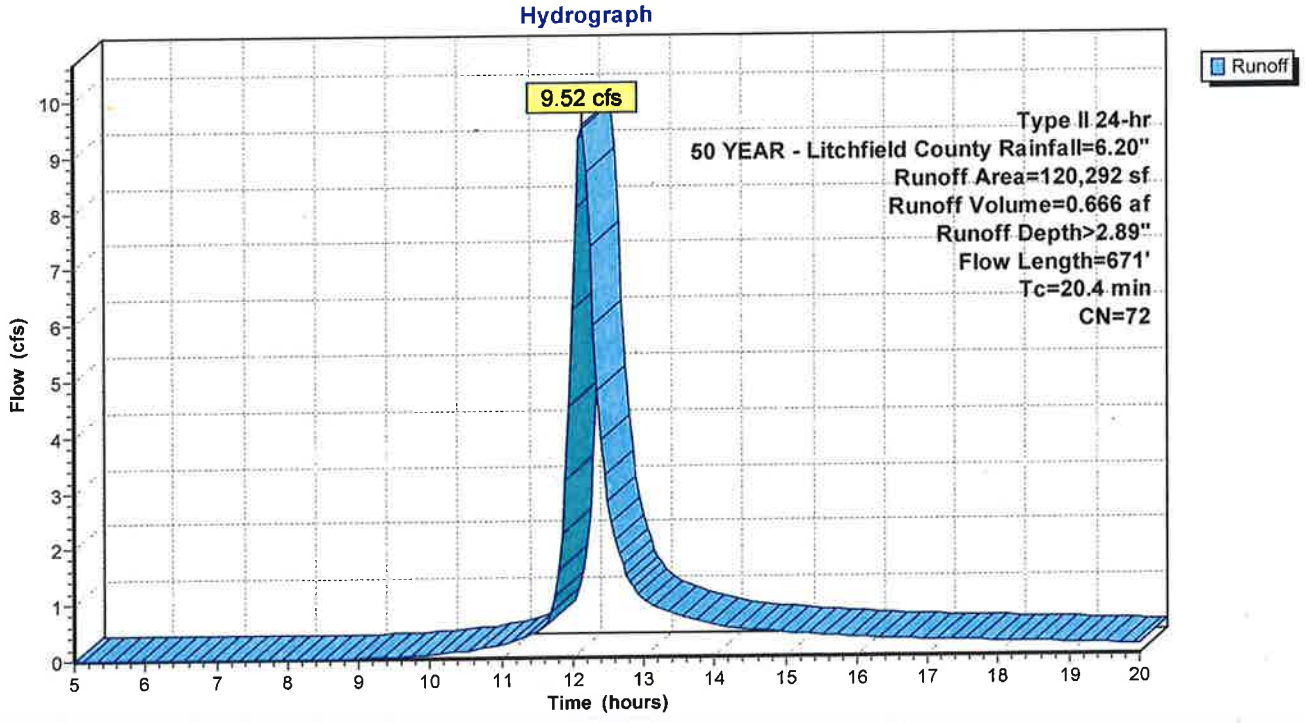
Runoff = 9.52 cfs @ 12.13 hrs, Volume= 0.666 af, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50 YEAR - Litchfield County Rainfall=6.20"

Area (sf)	CN	Description
52,099	60	Woods, Fair, HSG B
60,260	79	Woods, Fair, HSG D
3,467	93	Paved roads w/open ditches, 50% imp, HSG D
1,104	98	Roofs, HSG D
3,362	98	Paved roads w/curbs & sewers, HSG D
120,292	72	Weighted Average
114,093		94.85% Pervious Area
6,200		5.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	200	0.1300	0.19		**Sheet Flow, First 200-ft thru woods** Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	297	0.2300	2.40		**Shallow Concentrated Flow, To street line** Woodland Kv= 5.0 fps
0.6	174	0.0500	4.54		**Shallow Concentrated Flow, Along street to CB** Paved Kv= 20.3 fps
20.4	671	Total			

Subcatchment 1S: DA-1



Summary for Subcatchment 3S: DA-2

[49] Hint: Tc<2dt may require smaller dt

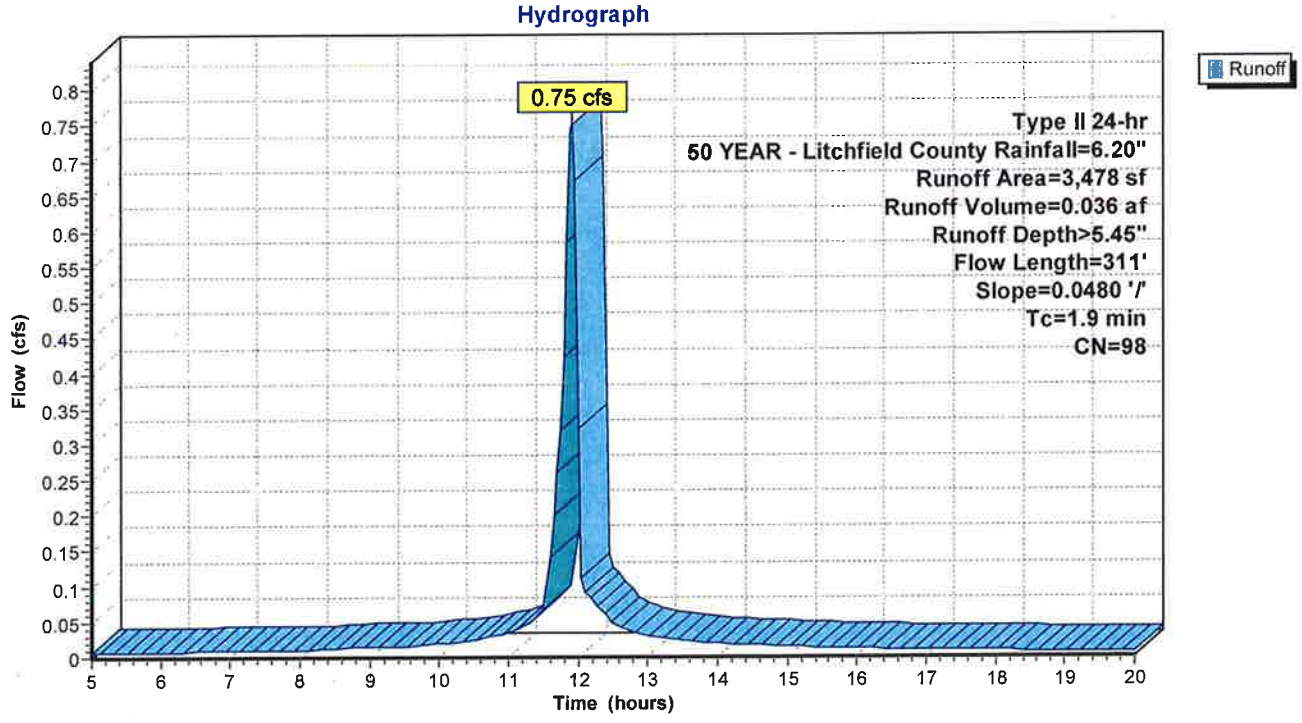
Runoff = 0.75 cfs @ 11.91 hrs, Volume= 0.036 af, Depth> 5.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50 YEAR - Litchfield County Rainfall=6.20"

Area (sf)	CN	Description
3,478	98	Paved roads w/curbs & sewers, HSG D
3,478		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	200	0.0480	2.24		**Sheet Flow, First 200'** Smooth surfaces n= 0.011 P2= 3.20"
0.4	111	0.0480	4.45		**Shallow Concentrated Flow, Remainder of pavement to CB** Paved Kv= 20.3 fps
1.9	311	Total			

Subcatchment 3S: DA-2



Summary for Pond 5P: Existing East CB

[57] Hint: Peaked at 762.96' (Flood elevation advised)

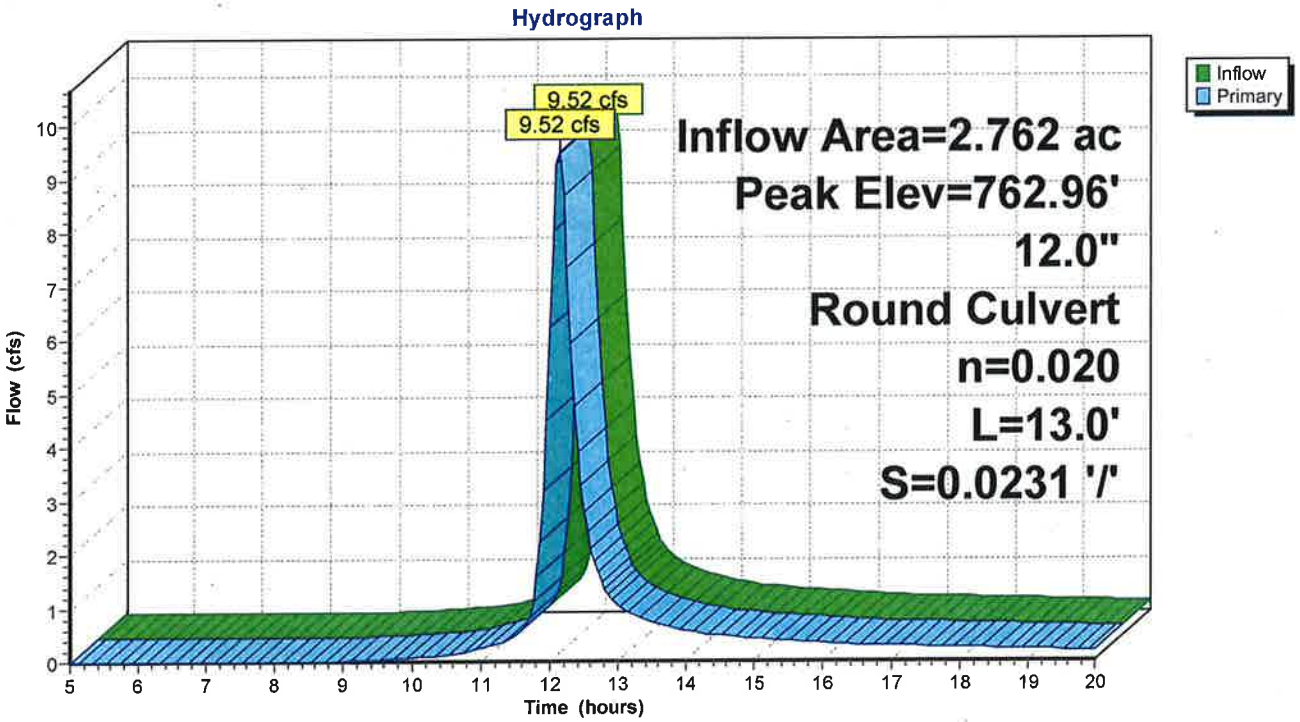
Inflow Area = 2.762 ac, 5.15% Impervious, Inflow Depth > 2.89" for 50 YEAR - Litchfield County event
Inflow = 9.52 cfs @ 12.13 hrs, Volume= 0.666 af
Outflow = 9.52 cfs @ 12.13 hrs, Volume= 0.666 af, Atten= 0%, Lag= 0.0 min
Primary = 9.52 cfs @ 12.13 hrs, Volume= 0.666 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 762.96' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	751.20'	**12.0" Round Culvert** L= 13.0' Ke= 1.000 Inlet / Outlet Invert= 751.20' / 750.90' S= 0.0231 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=9.42 cfs @ 12.13 hrs HW=762.72' (Free Discharge)
1=Culvert (Inlet Controls 9.42 cfs @ 11.99 fps)

Pond 5P: Existing East CB



Summary for Pond 6P: Existing West CB & Outlet Pipe

[57] Hint: Peaked at 762.87' (Flood elevation advised)
[81] Warning: Exceeded Pond 5P by 0.51' @ 11.95 hrs

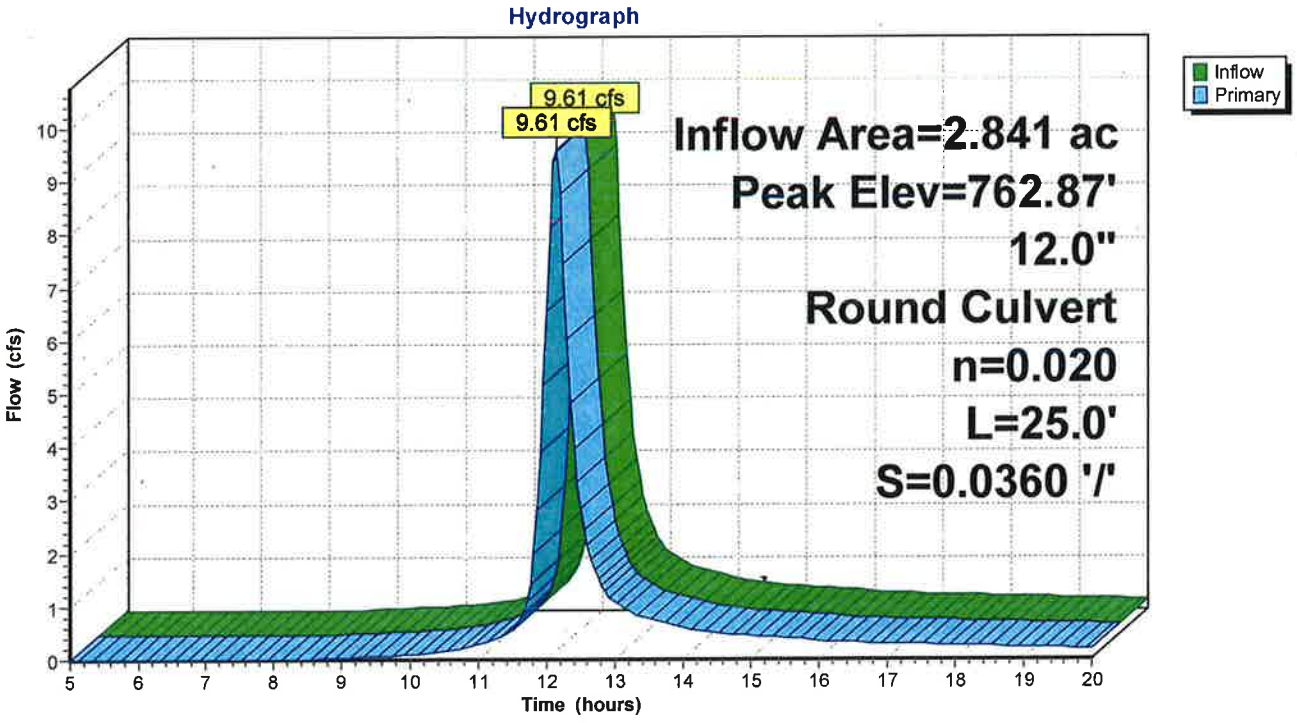
Inflow Area = 2.841 ac, 7.82% Impervious, Inflow Depth > 2.97" for 50 YEAR - Litchfield County event
Inflow = 9.61 cfs @ 12.13 hrs, Volume= 0.702 af
Outflow = 9.61 cfs @ 12.13 hrs, Volume= 0.702 af, Atten= 0%, Lag= 0.0 min
Primary = 9.61 cfs @ 12.13 hrs, Volume= 0.702 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 762.87' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	750.90'	**12.0" Round Culvert** L= 25.0' Ke= 1.000 Inlet / Outlet Invert= 750.90' / 750.00' S= 0.0360 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=9.50 cfs @ 12.13 hrs HW=762.63' (Free Discharge)
1=Culvert (Inlet Controls 9.50 cfs @ 12.10 fps)

Pond 6P: Existing West CB & Outlet Pipe



Summary for Subcatchment 1S: DA-1

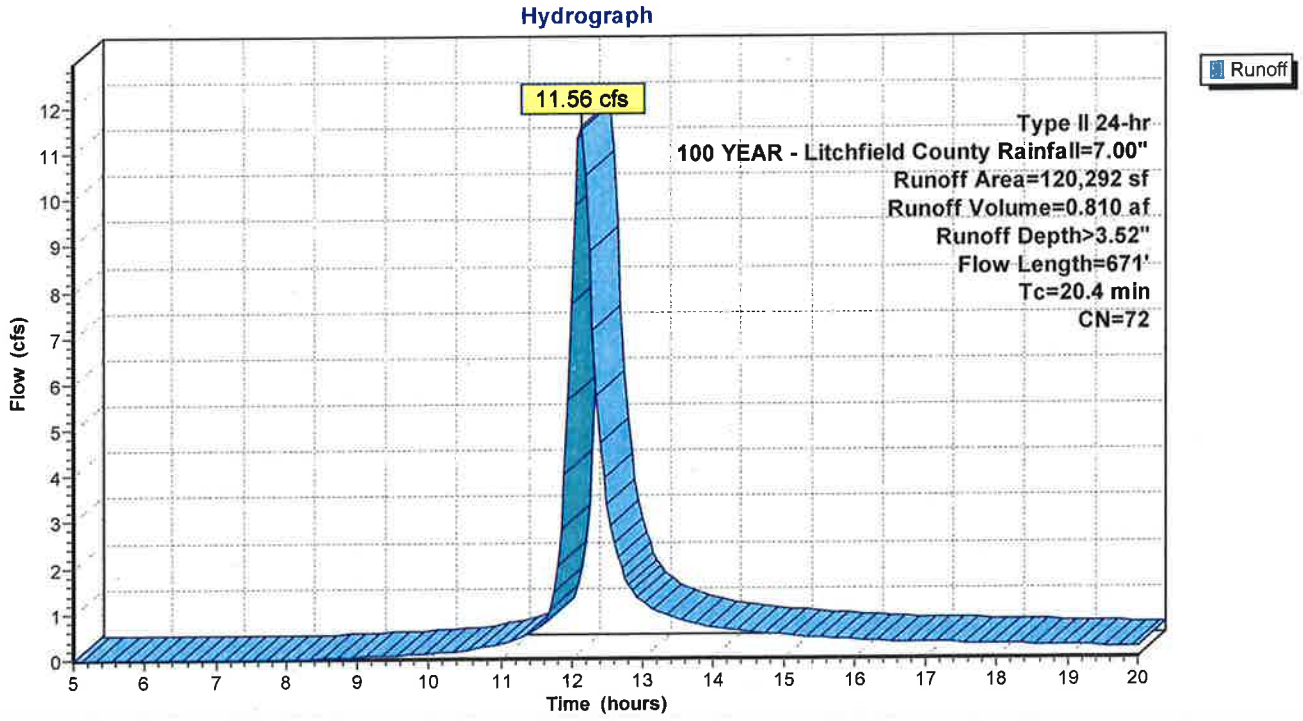
Runoff = 11.56 cfs @ 12.13 hrs, Volume= 0.810 af, Depth> 3.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 YEAR - Litchfield County Rainfall=7.00"

Area (sf)	CN	Description
52,099	60	Woods, Fair, HSG B
60,260	79	Woods, Fair, HSG D
3,467	93	Paved roads w/open ditches, 50% imp, HSG D
1,104	98	Roofs, HSG D
3,362	98	Paved roads w/curbs & sewers, HSG D
120,292	72	Weighted Average
114,093		94.85% Pervious Area
6,200		5.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	200	0.1300	0.19		**Sheet Flow, First 200-ft thru woods** Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	297	0.2300	2.40		**Shallow Concentrated Flow, To street line** Woodland Kv= 5.0 fps
0.6	174	0.0500	4.54		**Shallow Concentrated Flow, Along street to CB** Paved Kv= 20.3 fps
20.4	671	Total			

Subcatchment 1S: DA-1



Summary for Subcatchment 3S: DA-2

[49] Hint: Tc<2dt may require smaller dt

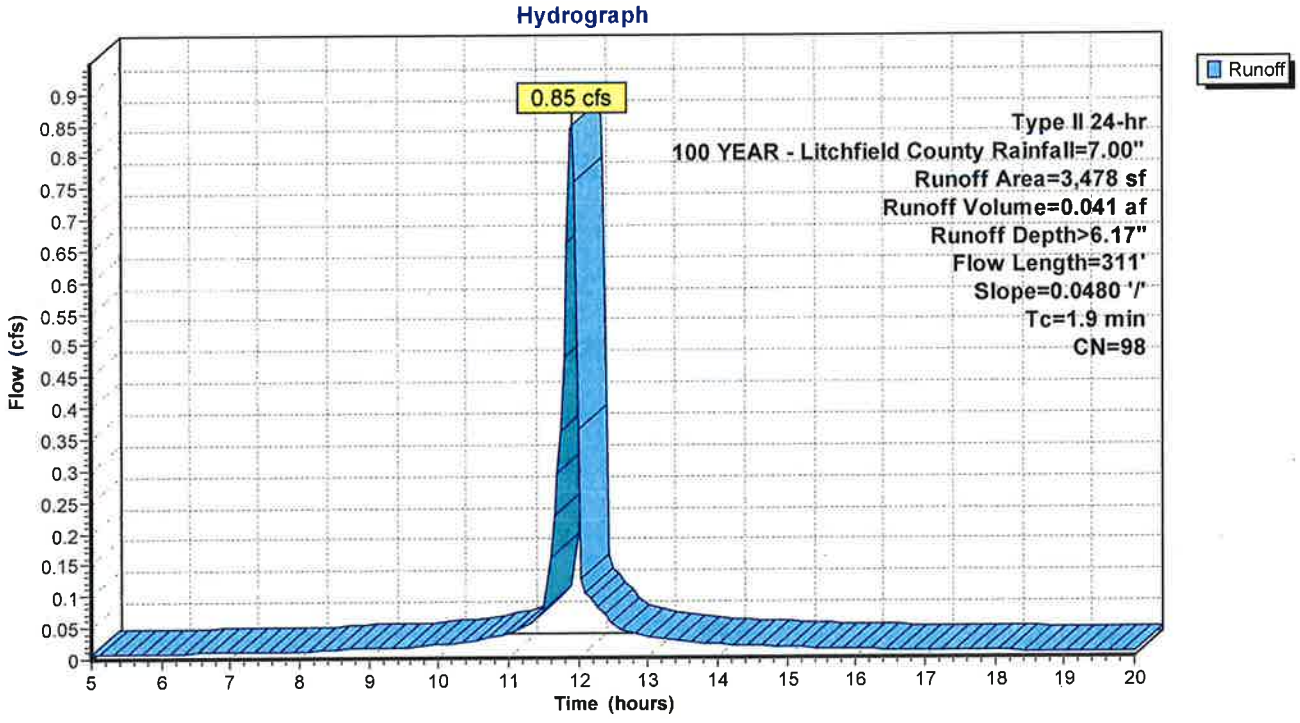
Runoff = 0.85 cfs @ 11.91 hrs, Volume= 0.041 af, Depth> 6.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 YEAR - Litchfield County Rainfall=7.00"

Area (sf)	CN	Description
3,478	98	Paved roads w/curbs & sewers, HSG D
3,478		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	200	0.0480	2.24		**Sheet Flow, First 200'** Smooth surfaces n= 0.011 P2= 3.20"
0.4	111	0.0480	4.45		**Shallow Concentrated Flow, Remainder of pavement to CB** Paved Kv= 20.3 fps
1.9	311	Total			

Subcatchment 3S: DA-2



Summary for Pond 5P: Existing East CB

[57] Hint: Peaked at 768.31' (Flood elevation advised)

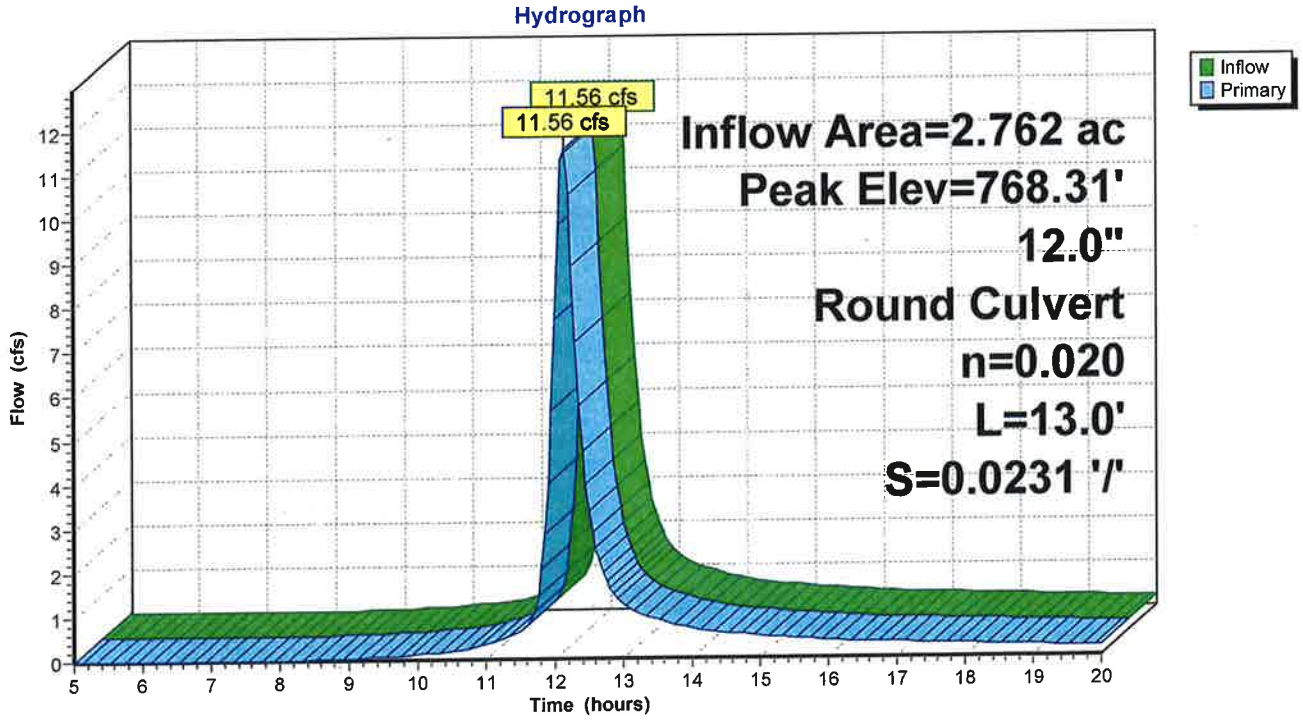
Inflow Area = 2.762 ac, 5.15% Impervious, Inflow Depth > 3.52" for 100 YEAR - Litchfield County event
Inflow = 11.56 cfs @ 12.13 hrs, Volume= 0.810 af
Outflow = 11.56 cfs @ 12.13 hrs, Volume= 0.810 af, Atten= 0%, Lag= 0.0 min
Primary = 11.56 cfs @ 12.13 hrs, Volume= 0.810 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 768.31' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	751.20'	**12.0" Round Culvert** L= 13.0' Ke= 1.000 Inlet / Outlet Invert= 751.20' / 750.90' S= 0.0231 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=11.43 cfs @ 12.13 hrs HW=767.94' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 11.43 cfs @ 14.55 fps)

Pond 5P: Existing East CB



Summary for Pond 6P: Existing West CB & Outlet Pipe

[57] Hint: Peaked at 768.29' (Flood elevation advised)
[81] Warning: Exceeded Pond 5P by 0.83' @ 11.95 hrs

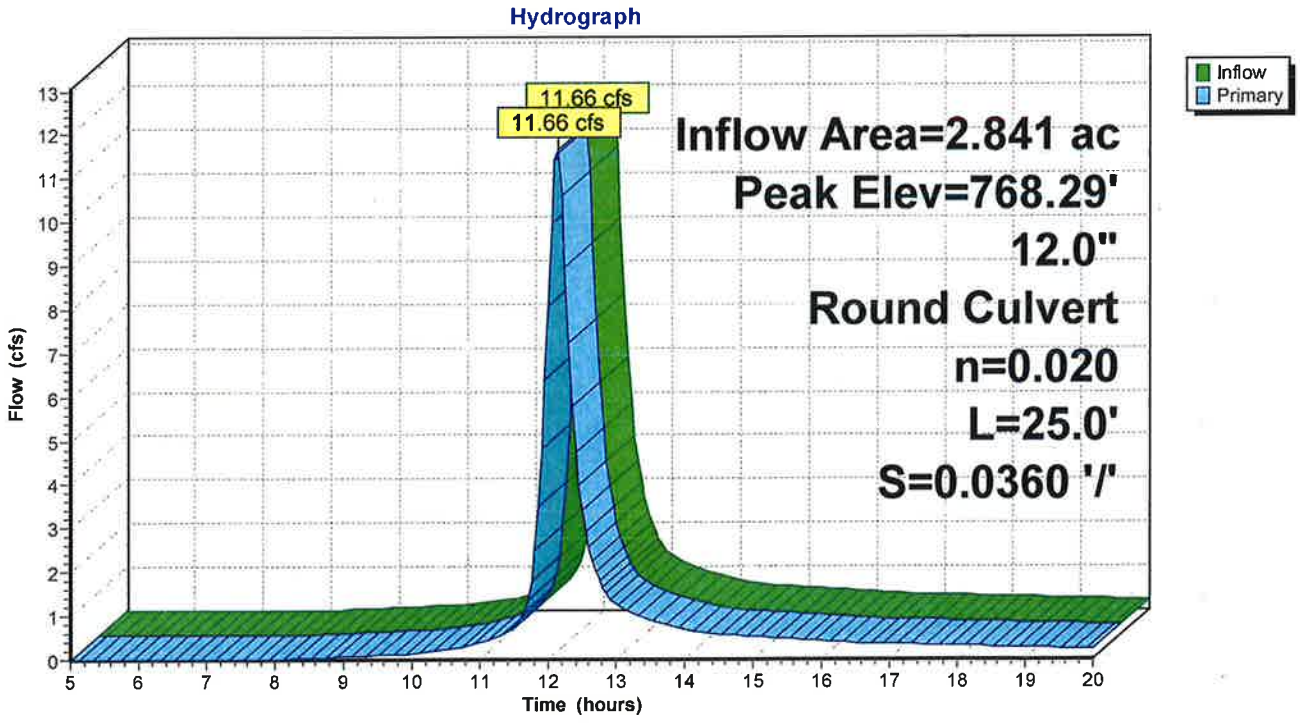
Inflow Area = 2.841 ac, 7.82% Impervious, Inflow Depth > 3.60" for 100 YEAR - Litchfield County event
Inflow = 11.66 cfs @ 12.13 hrs, Volume= 0.851 af
Outflow = 11.66 cfs @ 12.13 hrs, Volume= 0.851 af, Atten= 0%, Lag= 0.0 min
Primary = 11.66 cfs @ 12.13 hrs, Volume= 0.851 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 768.29' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	750.90'	**12.0" Round Culvert** L= 25.0' Ke= 1.000 Inlet / Outlet Invert= 750.90' / 750.00' S= 0.0360 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

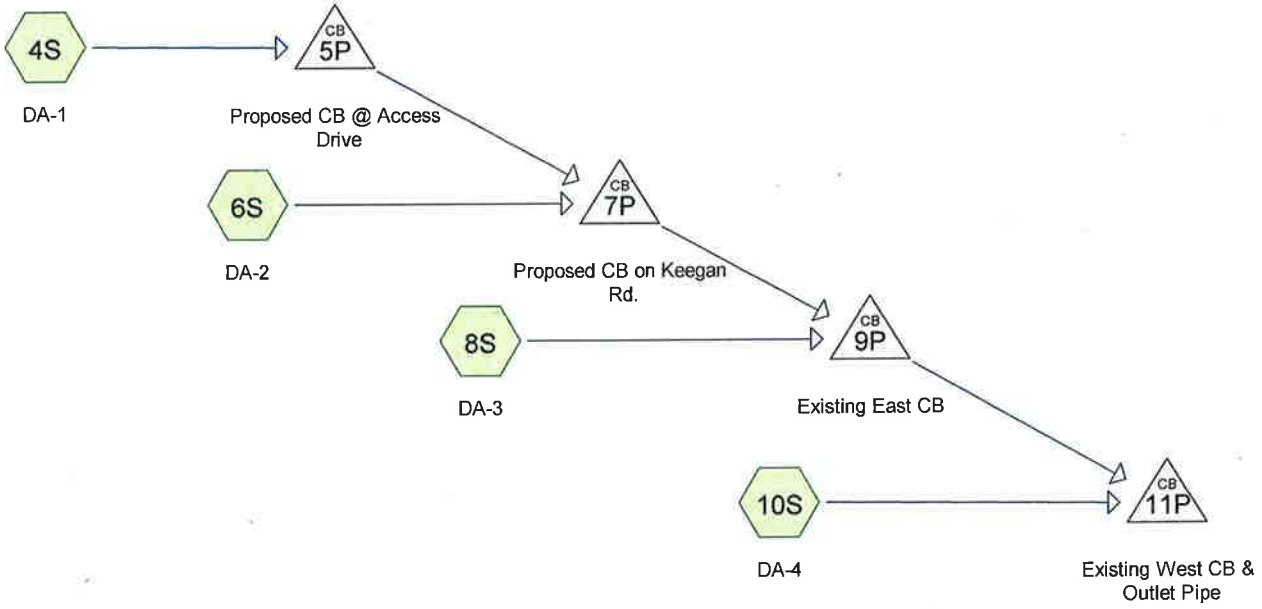
Primary OutFlow Max=11.53 cfs @ 12.13 hrs HW=767.92' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 11.53 cfs @ 14.68 fps)

Pond 6P: Existing West CB & Outlet Pipe



APPENDIX D

Proposed Drainage Conditions



Subcat Reach Pond Link

Routing Diagram for Proposed Conditions
Prepared by Centek Engineering, Printed 11/17/2015

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.143	85	Gravel roads, HSG B (4S)
0.141	91	Gravel roads, HSG D (4S)
0.060	96	Gravel surface, HSG D (6S, 8S)
0.166	98	Paved roads w/curbs & sewers, HSG D (6S, 8S, 10S)
0.080	93	Paved roads w/open ditches, 50% imp, HSG D (6S)
0.025	98	Unconnected roofs, HSG D (6S)
1.376	60	Woods, Fair, HSG B (4S, 6S)
1.182	79	Woods, Fair, HSG D (4S, 6S, 8S)
3.173	**73**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
1.519	HSG B	4S, 6S
0.000	HSG C	
1.654	HSG D	4S, 6S, 8S, 10S
0.000	Other	
3.173		**TOTAL AREA**

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	5P	760.50	755.20	112.0	0.0473	0.020	12.0	0.0	0.0
2	7P	755.20	751.20	85.0	0.0471	0.020	12.0	0.0	0.0
3	9P	751.20	750.90	13.0	0.0231	0.020	12.0	0.0	0.0
4	11P	750.90	750.00	25.0	0.0360	0.020	12.0	0.0	0.0

Summary for Subcatchment 4S: DA-1

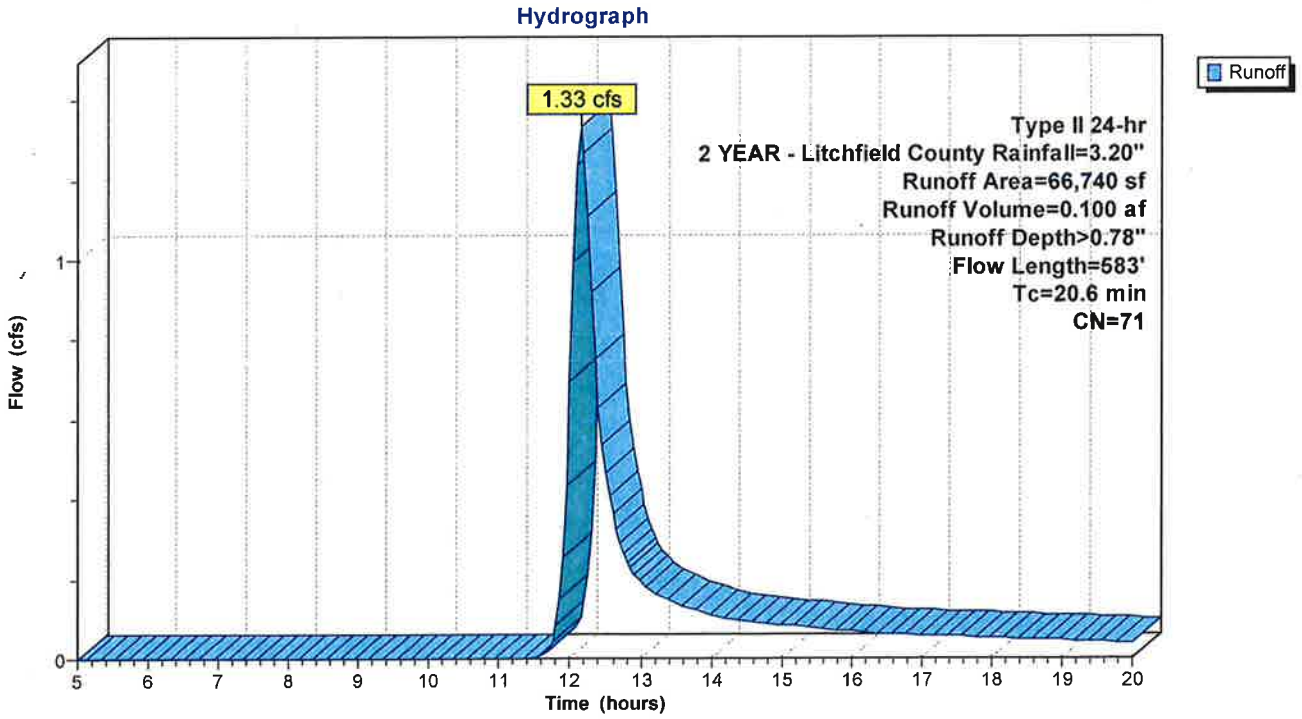
Runoff = 1.33 cfs @ 12.16 hrs, Volume= 0.100 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 YEAR - Litchfield County Rainfall=3.20"

Area (sf)	CN	Description
35,283	60	Woods, Fair, HSG B
19,078	79	Woods, Fair, HSG D
6,141	91	Gravel roads, HSG D
6,238	85	Gravel roads, HSG B
66,740	71	Weighted Average
66,740		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.6	200	0.1000	0.17		**Sheet Flow, First 200' thru woods** Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	107	0.1750	2.09		**Shallow Concentrated Flow, Thru Woods to Rip Rap Swale** Woodland Kv= 5.0 fps
0.1	276	0.1500	35.97	143.88	**Channel Flow, Thru Rip Rap Swale to Proposed CB** Area= 4.0 sf Perim= 4.0' r= 1.00' n= 0.016 Asphalt, rough
20.6	583	Total			

Subcatchment 4S: DA-1



Summary for Subcatchment 6S: DA-2

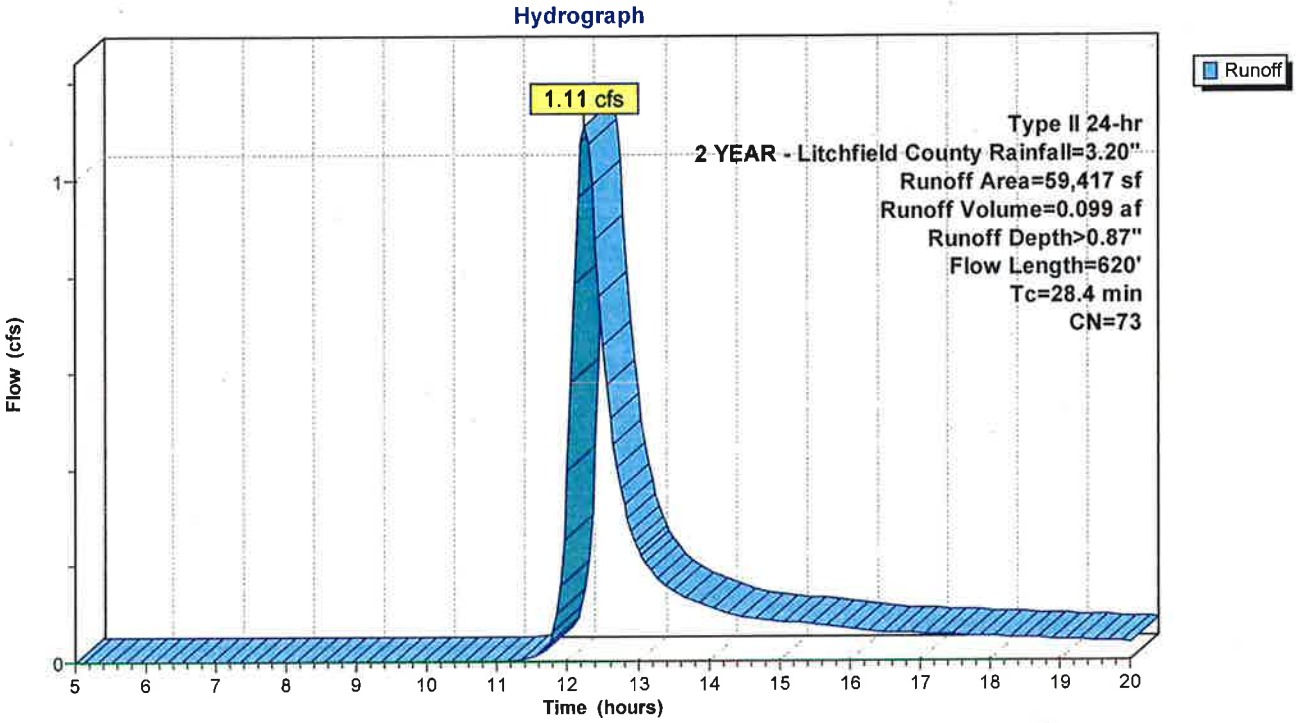
Runoff = 1.11 cfs @ 12.25 hrs, Volume= 0.099 af, Depth> 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 YEAR - Litchfield County Rainfall=3.20"

Area (sf)	CN	Description
27,221	79	Woods, Fair, HSG D
24,638	60	Woods, Fair, HSG B
3,467	93	Paved roads w/open ditches, 50% imp, HSG D
1,104	98	Unconnected roofs, HSG D
2,864	98	Paved roads w/curbs & sewers, HSG D
123	96	Gravel surface, HSG D
59,417	73	Weighted Average
53,716		90.40% Pervious Area
5,702		9.60% Impervious Area
1,104		19.36% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.9	200	0.0500	0.13		**Sheet Flow, First 200' thru woods** Woods: Light underbrush n= 0.400 P2= 3.20"
2.0	286	0.2300	2.40		**Shallow Concentrated Flow, Thru the woods to street line** Woodland Kv= 5.0 fps
0.5	134	0.0500	4.54		**Shallow Concentrated Flow, Along street to CB** Paved Kv= 20.3 fps
28.4	620	Total			

Subcatchment 6S: DA-2



Summary for Subcatchment 8S: DA-3

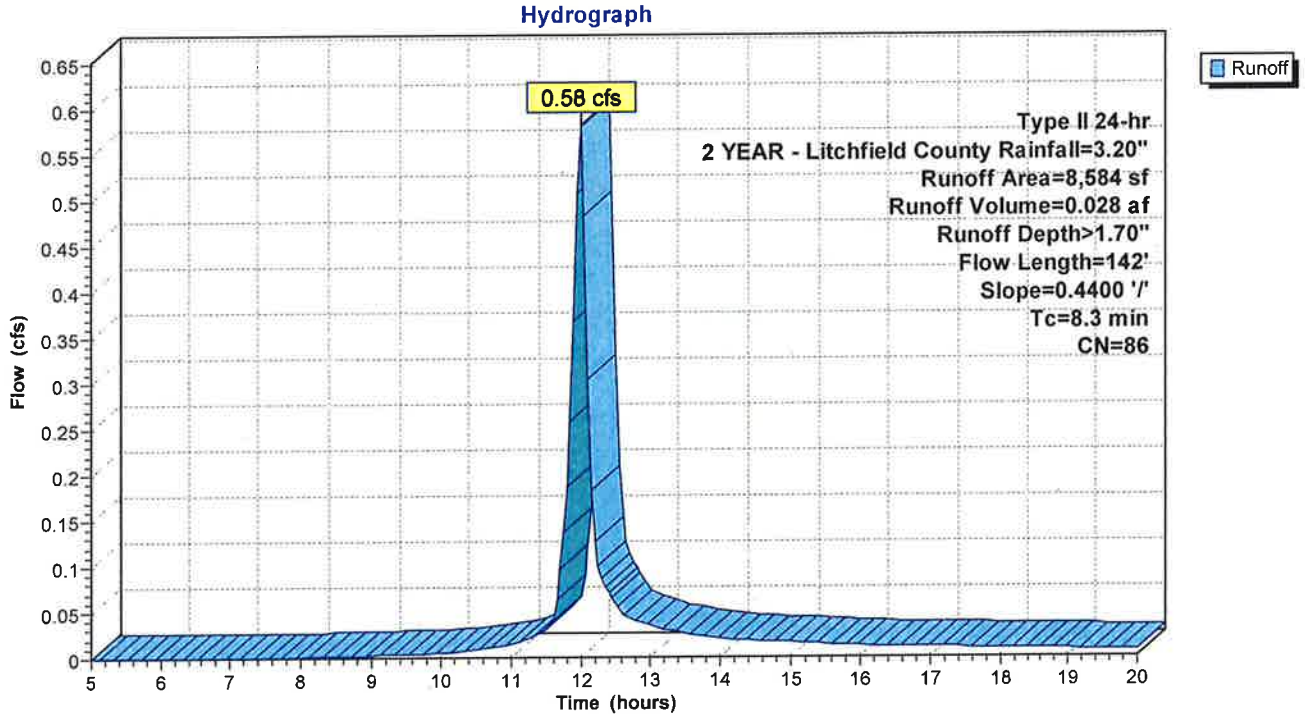
Runoff = 0.58 cfs @ 12.00 hrs, Volume= 0.028 af, Depth> 1.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 YEAR - Litchfield County Rainfall=3.20"

Area (sf)	CN	Description
2,495	96	Gravel surface, HSG D
5,192	79	Woods, Fair, HSG D
897	98	Paved roads w/curbs & sewers, HSG D
8,584	86	Weighted Average
7,687		89.55% Pervious Area
897		10.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	142	0.4400	0.29		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"

Subcatchment 8S: DA-3



Summary for Subcatchment 10S: DA-4

[49] Hint: Tc<2dt may require smaller dt

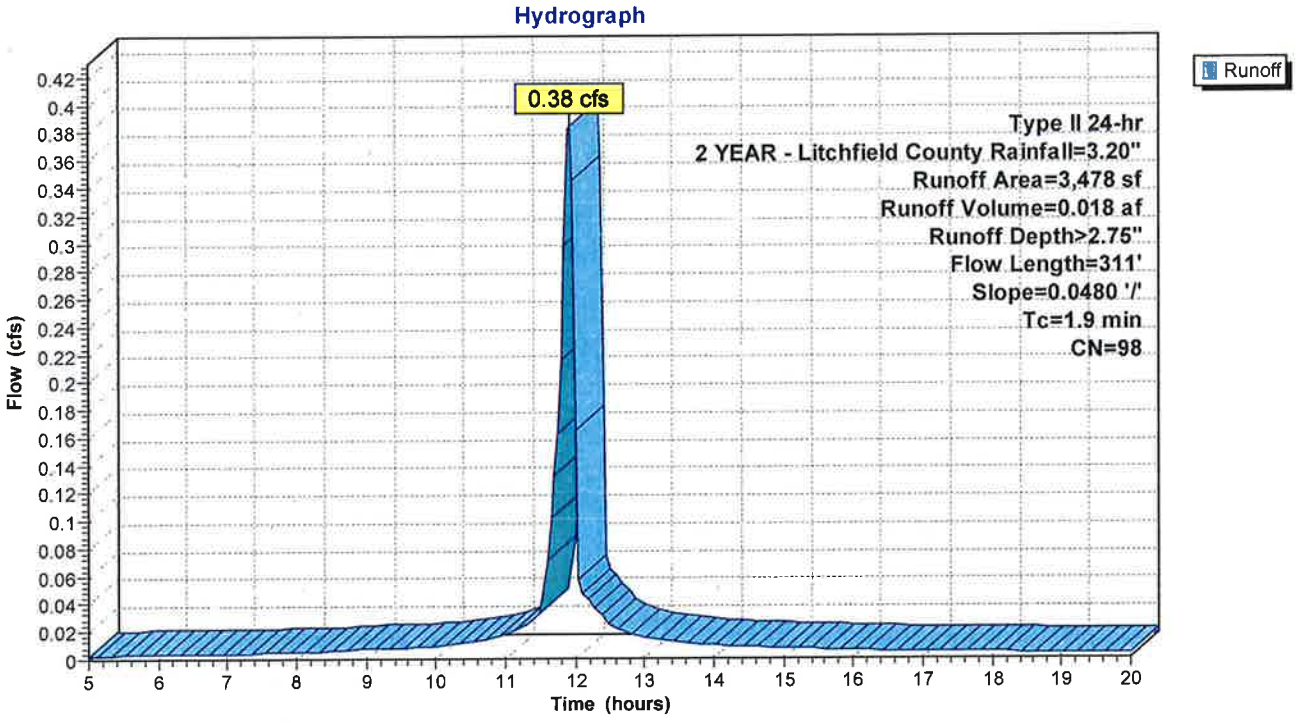
Runoff = 0.38 cfs @ 11.91 hrs, Volume= 0.018 af, Depth> 2.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 YEAR - Litchfield County Rainfall=3.20"

Area (sf)	CN	Description
3,478	98	Paved roads w/curbs & sewers, HSG D
3,478		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	200	0.0480	2.24		**Sheet Flow, First 200'** Smooth surfaces n= 0.011 P2= 3.20"
0.4	111	0.0480	4.45		**Shallow Concentrated Flow, Rest of Pavement** Paved Kv= 20.3 fps
1.9	311	Total			

Subcatchment 10S: DA-4



Summary for Pond 5P: Proposed CB @ Access Drive

[57] Hint: Peaked at 761.23' (Flood elevation advised)

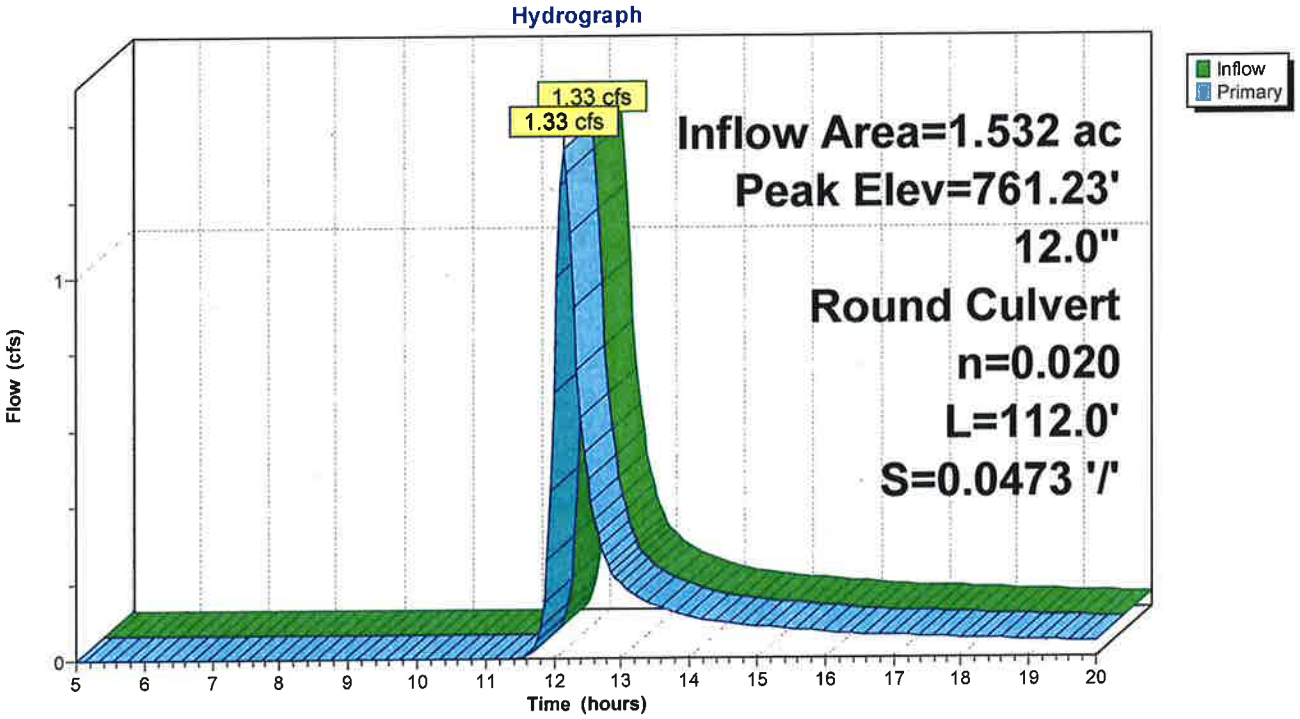
Inflow Area =	1.532 ac,	0.00% Impervious,	Inflow Depth >	0.78"	for 2 YEAR - Litchfield County event
Inflow =	1.33 cfs @	12.16 hrs,	Volume=	0.100 af	
Outflow =	1.33 cfs @	12.16 hrs,	Volume=	0.100 af,	Atten= 0%, Lag= 0.0 min
Primary =	1.33 cfs @	12.16 hrs,	Volume=	0.100 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 761.23' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	760.50'	**12.0" Round Culvert** L= 112.0' Ke= 1.000 Inlet / Outlet Invert= 760.50' / 755.20' S= 0.0473 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.33 cfs @ 12.16 hrs HW=761.23' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 1.33 cfs @ 2.17 fps)

Pond 5P: Proposed CB @ Access Drive



Summary for Pond 7P: Proposed CB on Keegan Rd.

[57] Hint: Peaked at 756.39' (Flood elevation advised)
[79] Warning: Submerged Pond 5P Primary device # 1 OUTLET by 1.18'

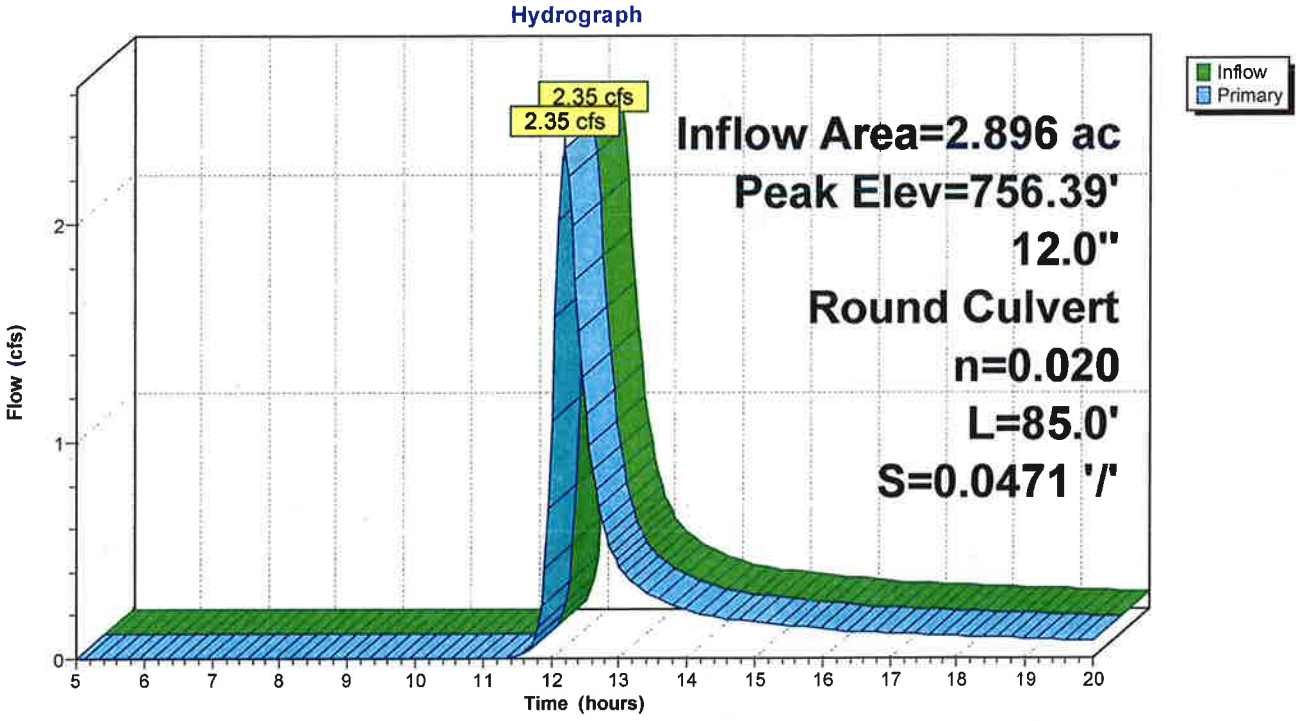
Inflow Area = 2.896 ac, 4.52% Impervious, Inflow Depth > 0.82" for 2 YEAR - Litchfield County event
Inflow = 2.35 cfs @ 12.19 hrs, Volume= 0.199 af
Outflow = 2.35 cfs @ 12.19 hrs, Volume= 0.199 af, Atten= 0%, Lag= 0.0 min
Primary = 2.35 cfs @ 12.19 hrs, Volume= 0.199 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 756.39' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	755.20'	**12.0" Round Culvert** L= 85.0' Ke= 1.000 Inlet / Outlet Invert= 755.20' / 751.20' S= 0.0471 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.34 cfs @ 12.19 hrs HW=756.38' (Free Discharge)
1=Culvert (Inlet Controls 2.34 cfs @ 2.97 fps)

Pond 7P: Proposed CB on Keegan Rd.



Summary for Pond 9P: Existing East CB

[57] Hint: Peaked at 752.47' (Flood elevation advised)
[79] Warning: Submerged Pond 7P Primary device # 1 OUTLET by 1.26'

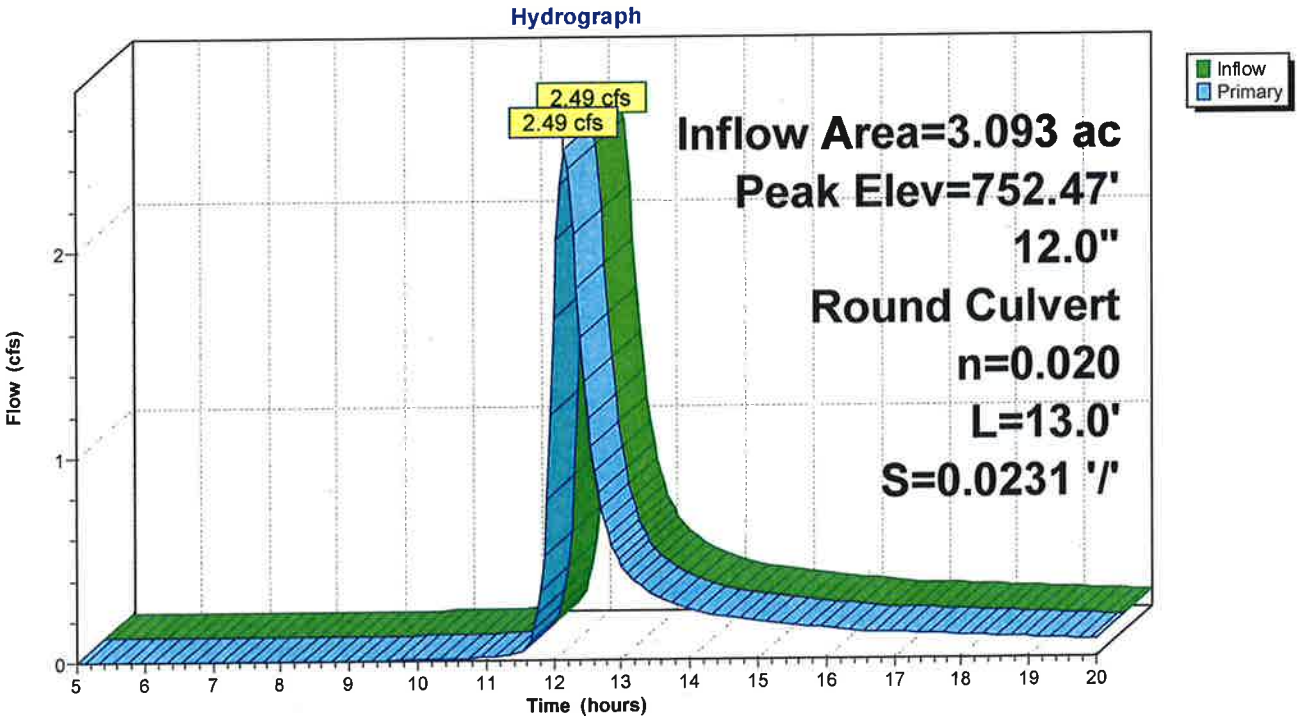
Inflow Area = 3.093 ac, 4.90% Impervious, Inflow Depth > 0.88" for 2 YEAR - Litchfield County event
Inflow = 2.49 cfs @ 12.17 hrs, Volume= 0.227 af
Outflow = 2.49 cfs @ 12.17 hrs, Volume= 0.227 af, Atten= 0%, Lag= 0.0 min
Primary = 2.49 cfs @ 12.17 hrs, Volume= 0.227 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 752.47' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	751.20'	**12.0" Round Culvert** L= 13.0' Ke= 1.000 Inlet / Outlet Invert= 751.20' / 750.90' S= 0.0231 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.48 cfs @ 12.17 hrs HW=752.46' (Free Discharge)
1=Culvert (Inlet Controls 2.48 cfs @ 3.15 fps)

Pond 9P: Existing East CB



Summary for Pond 11P: Existing West CB & Outlet Pipe

[82] Warning: Early inflow requires earlier time span
[57] Hint: Peaked at 752.20' (Flood elevation advised)
[79] Warning: Submerged Pond 9P Primary device # 1 INLET by 0.99'

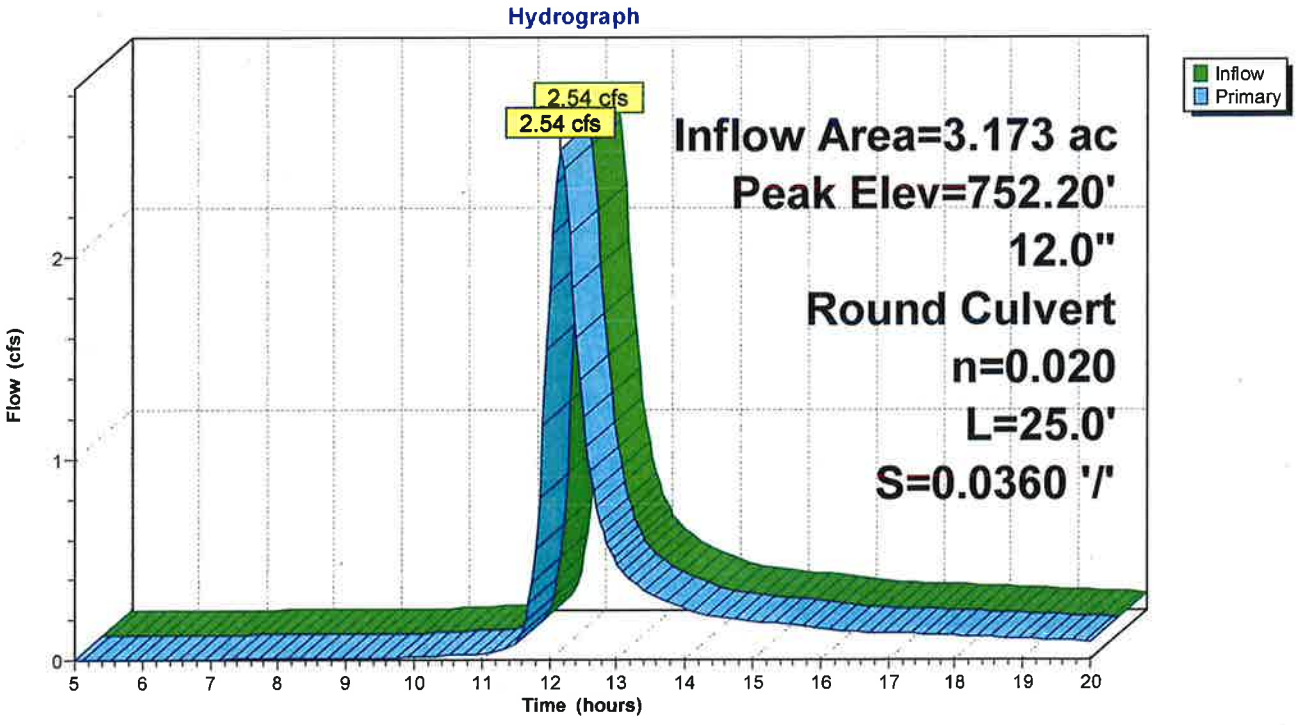
Inflow Area = 3.173 ac, 7.29% Impervious, Inflow Depth > 0.93" for 2 YEAR - Litchfield County event
Inflow = 2.54 cfs @ 12.17 hrs, Volume= 0.245 af
Outflow = 2.54 cfs @ 12.17 hrs, Volume= 0.245 af, Atten= 0%, Lag= 0.0 min
Primary = 2.54 cfs @ 12.17 hrs, Volume= 0.245 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 752.20' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	750.90'	**12.0" Round Culvert** L= 25.0' Ke= 1.000 Inlet / Outlet Invert= 750.90' / 750.00' S= 0.0360 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.52 cfs @ 12.17 hrs HW=752.19' (Free Discharge)
↑**1=Culvert** (Inlet Controls 2.52 cfs @ 3.21 fps)

Pond 11P: Existing West CB & Outlet Pipe



Summary for Subcatchment 4S: DA-1

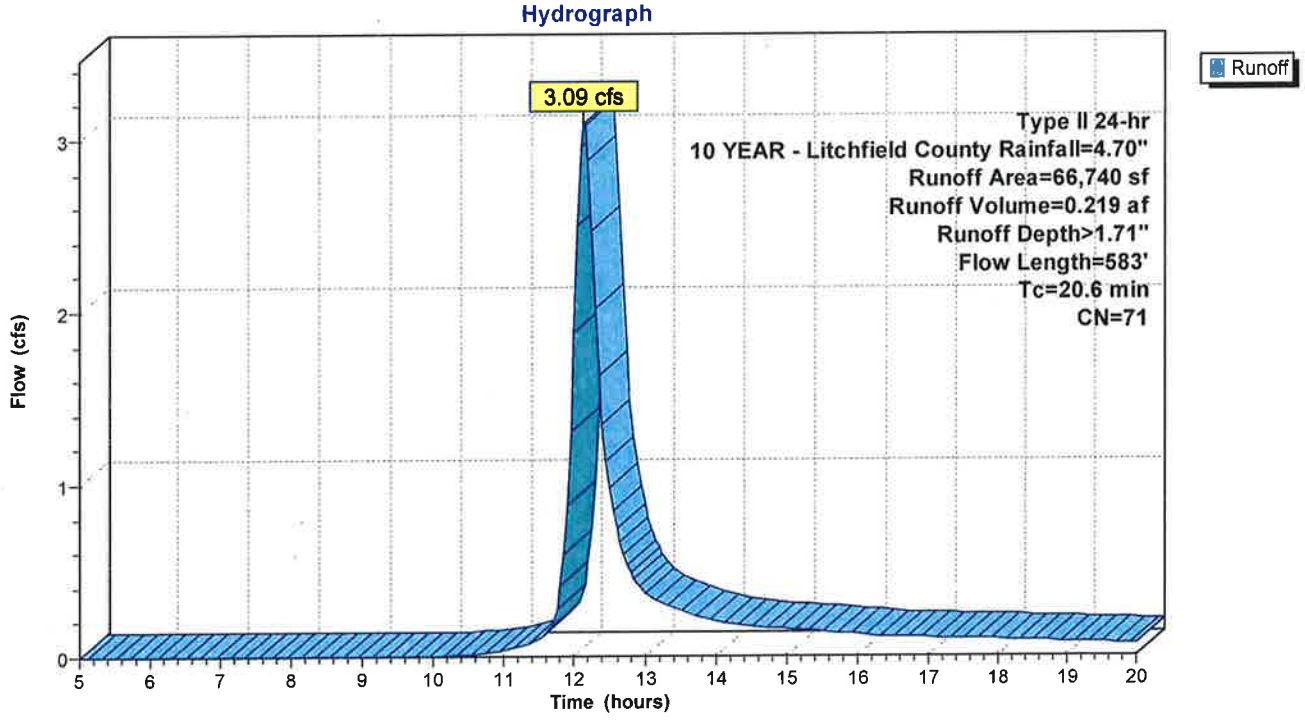
Runoff = 3.09 cfs @ 12.14 hrs, Volume= 0.219 af, Depth> 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 YEAR - Litchfield County Rainfall=4.70"

Area (sf)	CN	Description
35,283	60	Woods, Fair, HSG B
19,078	79	Woods, Fair, HSG D
6,141	91	Gravel roads, HSG D
6,238	85	Gravel roads, HSG B
66,740	71	Weighted Average
66,740		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.6	200	0.1000	0.17		**Sheet Flow, First 200' thru woods** Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	107	0.1750	2.09		**Shallow Concentrated Flow, Thru Woods to Rip Rap Swale** Woodland Kv= 5.0 fps
0.1	276	0.1500	35.97	143.88	**Channel Flow, Thru Rip Rap Swale to Proposed CB** Area= 4.0 sf Perim= 4.0' r= 1.00' n= 0.016 Asphalt, rough
20.6	583	Total			

Subcatchment 4S: DA-1



Summary for Subcatchment 6S: DA-2

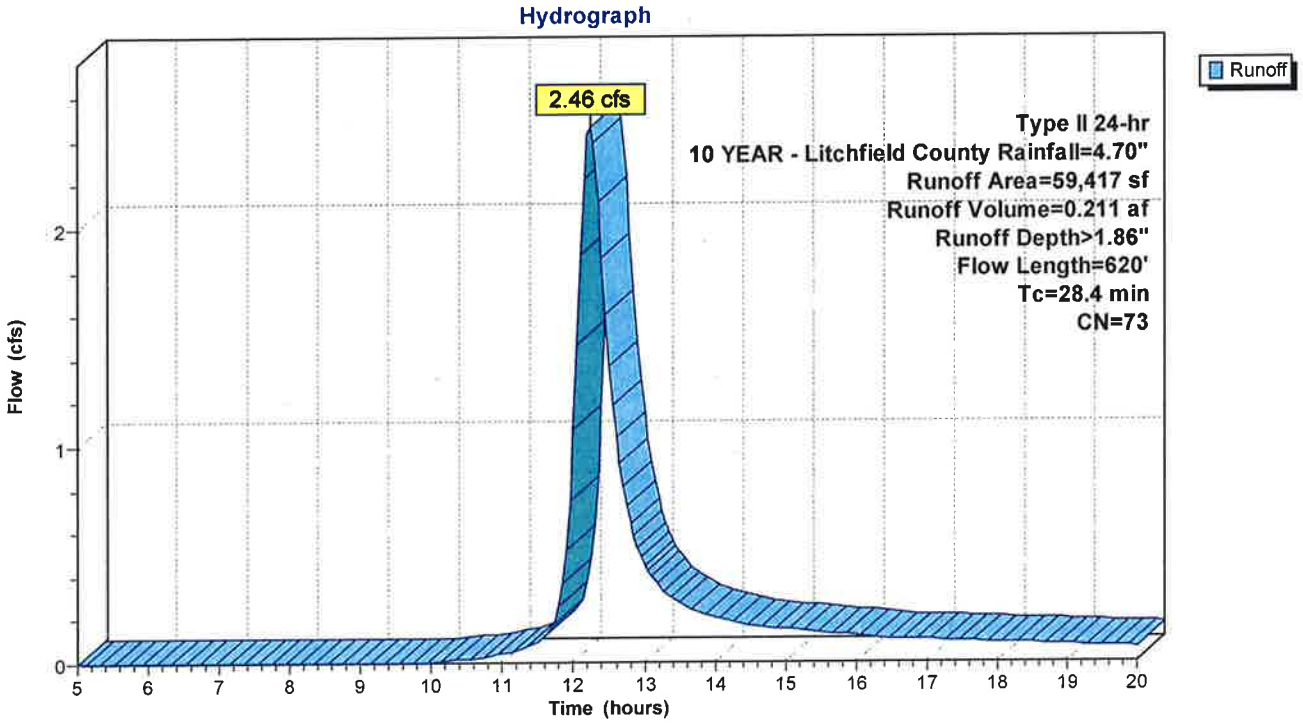
Runoff = 2.46 cfs @ 12.23 hrs, Volume= 0.211 af, Depth> 1.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 YEAR - Litchfield County Rainfall=4.70"

Area (sf)	CN	Description
27,221	79	Woods, Fair, HSG D
24,638	60	Woods, Fair, HSG B
3,467	93	Paved roads w/open ditches, 50% imp, HSG D
1,104	98	Unconnected roofs, HSG D
2,864	98	Paved roads w/curbs & sewers, HSG D
123	96	Gravel surface, HSG D
59,417	73	Weighted Average
53,716		90.40% Pervious Area
5,702		9.60% Impervious Area
1,104		19.36% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.9	200	0.0500	0.13		**Sheet Flow, First 200' thru woods** Woods: Light underbrush n= 0.400 P2= 3.20"
2.0	286	0.2300	2.40		**Shallow Concentrated Flow, Thru the woods to street line** Woodland Kv= 5.0 fps
0.5	134	0.0500	4.54		**Shallow Concentrated Flow, Along street to CB** Paved Kv= 20.3 fps
28.4	620	Total			

Subcatchment 6S: DA-2



Summary for Subcatchment 8S: DA-3

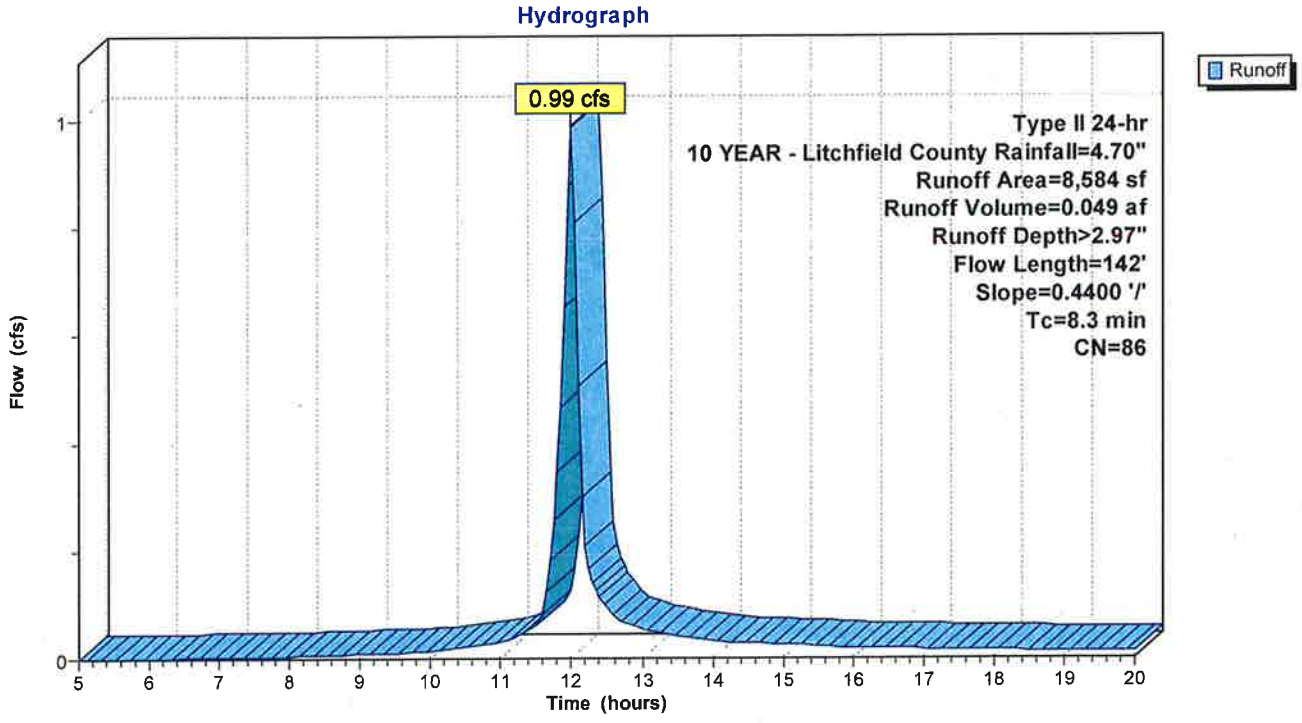
Runoff = 0.99 cfs @ 11.99 hrs, Volume= 0.049 af, Depth> 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 YEAR - Litchfield County Rainfall=4.70"

Area (sf)	CN	Description
2,495	96	Gravel surface, HSG D
5,192	79	Woods, Fair, HSG D
897	98	Paved roads w/curbs & sewers, HSG D
8,584	86	Weighted Average
7,687		89.55% Pervious Area
897		10.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	142	0.4400	0.29		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"

Subcatchment 8S: DA-3



Summary for Subcatchment 10S: DA-4

[49] Hint: Tc<2dt may require smaller dt

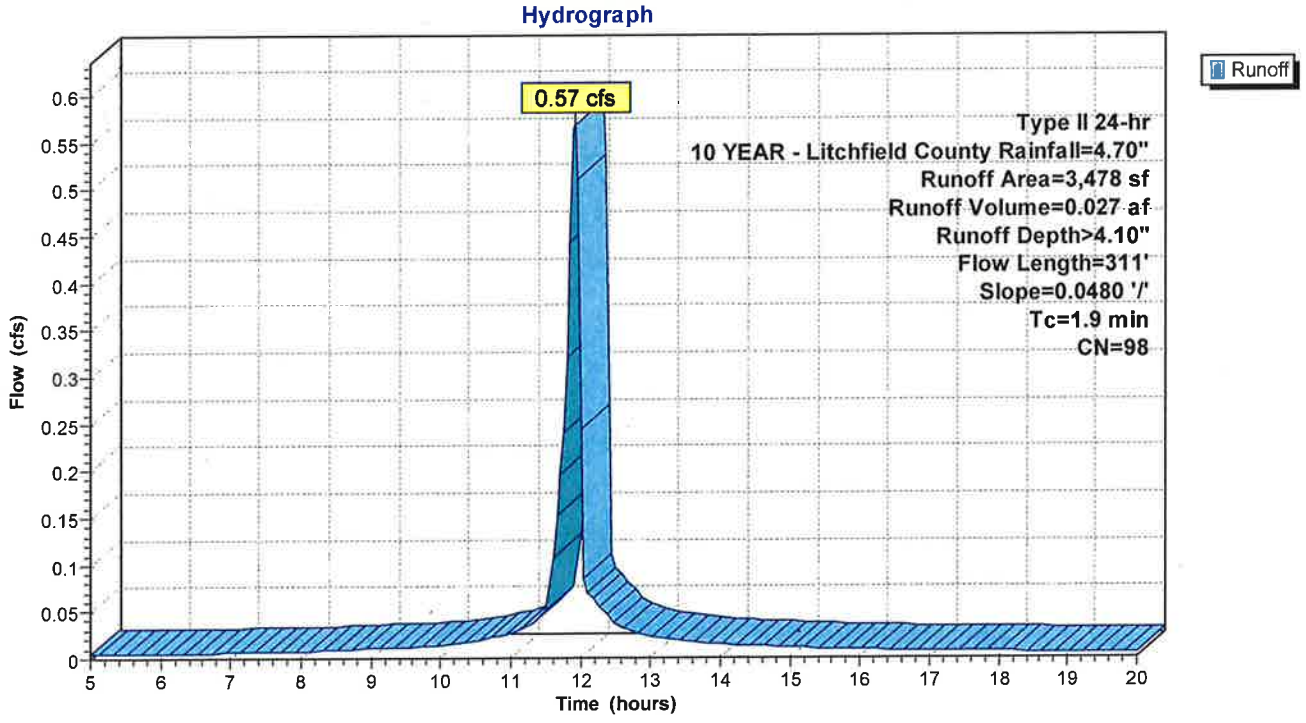
Runoff = 0.57 cfs @ 11.91 hrs, Volume= 0.027 af, Depth> 4.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 YEAR - Litchfield County Rainfall=4.70"

Area (sf)	CN	Description
3,478	98	Paved roads w/curbs & sewers, HSG D
3,478		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	200	0.0480	2.24		**Sheet Flow, First 200'** Smooth surfaces n= 0.011 P2= 3.20"
0.4	111	0.0480	4.45		**Shallow Concentrated Flow, Rest of Pavement** Paved Kv= 20.3 fps
1.9	311	Total			

Subcatchment 10S: DA-4



Summary for Pond 5P: Proposed CB @ Access Drive

[57] Hint: Peaked at 762.19' (Flood elevation advised)

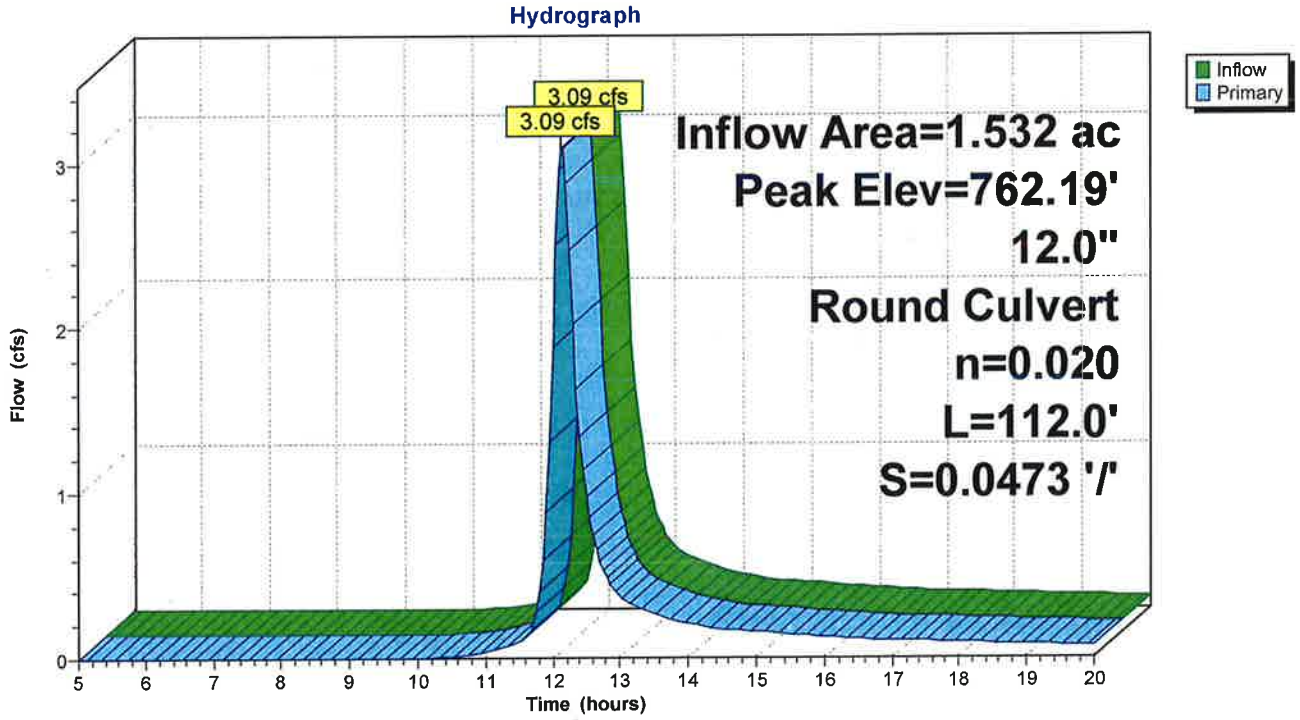
Inflow Area = 1.532 ac, 0.00% Impervious, Inflow Depth > 1.71" for 10 YEAR - Litchfield County event
Inflow = 3.09 cfs @ 12.14 hrs, Volume= 0.219 af
Outflow = 3.09 cfs @ 12.14 hrs, Volume= 0.219 af, Atten= 0%, Lag= 0.0 min
Primary = 3.09 cfs @ 12.14 hrs, Volume= 0.219 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 762.19' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	760.50'	**12.0" Round Culvert** L= 112.0' Ke= 1.000 Inlet / Outlet Invert= 760.50' / 755.20' S= 0.0473 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.07 cfs @ 12.14 hrs HW=762.17' (Free Discharge)
1=Culvert (Inlet Controls 3.07 cfs @ 3.91 fps)

Pond 5P: Proposed CB @ Access Drive



Summary for Pond 7P: Proposed CB on Keegan Rd.

[57] Hint: Peaked at 759.28' (Flood elevation advised)
[79] Warning: Submerged Pond 5P Primary device # 1 OUTLET by 4.01'

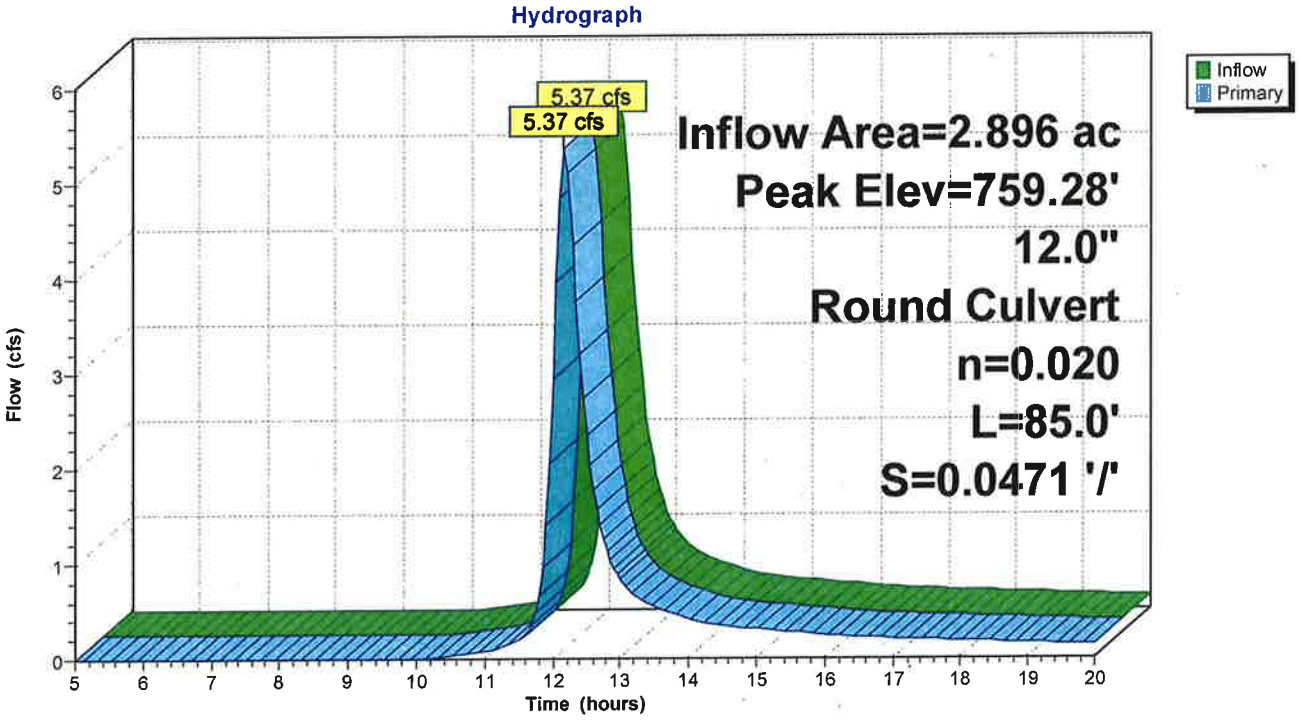
Inflow Area = 2.896 ac, 4.52% Impervious, Inflow Depth > 1.78" for 10 YEAR - Litchfield County event
Inflow = 5.37 cfs @ 12.17 hrs, Volume= 0.430 af
Outflow = 5.37 cfs @ 12.17 hrs, Volume= 0.430 af, Atten= 0%, Lag= 0.0 min
Primary = 5.37 cfs @ 12.17 hrs, Volume= 0.430 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 759.28' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	755.20'	**12.0" Round Culvert** L= 85.0' Ke= 1.000 Inlet / Outlet Invert= 755.20' / 751.20' S= 0.0471 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=5.31 cfs @ 12.17 hrs HW=759.21' (Free Discharge)
1=Culvert (Inlet Controls 5.31 cfs @ 6.76 fps)

Pond 7P: Proposed CB on Keegan Rd.



Summary for Pond 9P: Existing East CB

[57] Hint: Peaked at 755.64' (Flood elevation advised)
[79] Warning: Submerged Pond 7P Primary device # 1 INLET by 0.42'

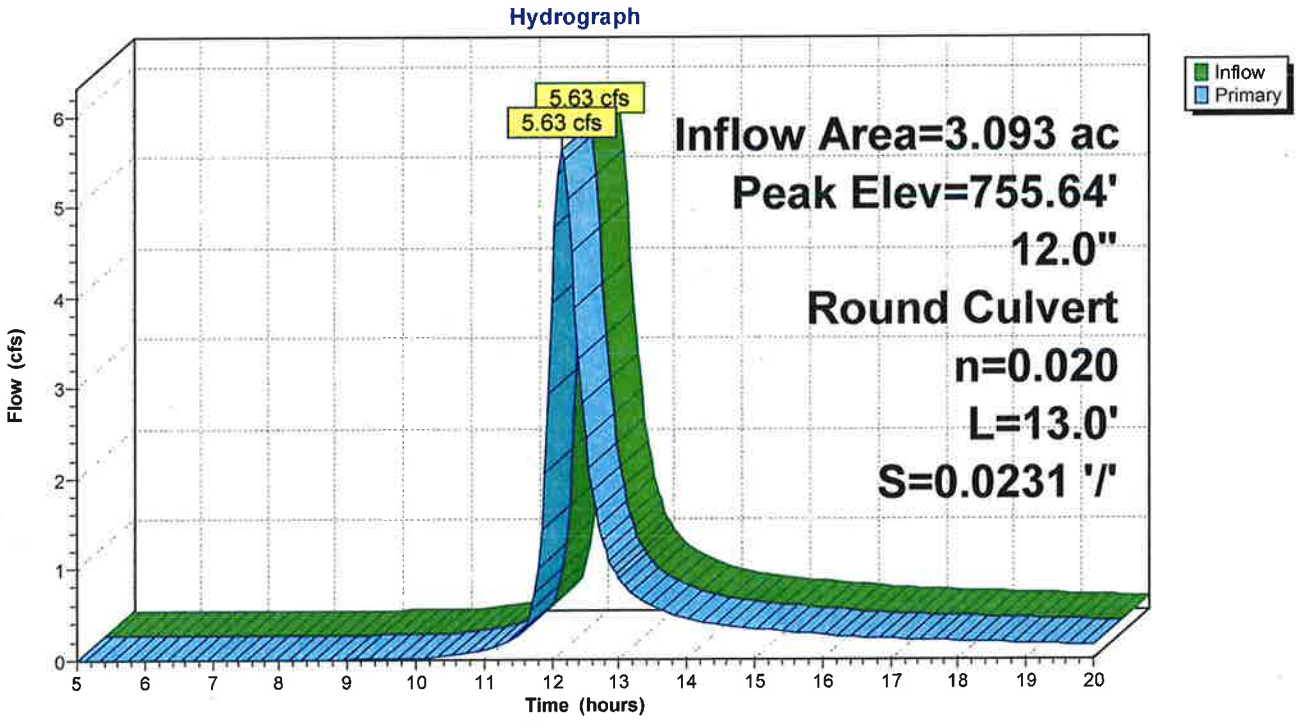
Inflow Area = 3.093 ac, 4.90% Impervious, Inflow Depth > 1.86" for 10 YEAR - Litchfield County event
Inflow = 5.63 cfs @ 12.16 hrs, Volume= 0.479 af
Outflow = 5.63 cfs @ 12.16 hrs, Volume= 0.479 af, Atten= 0%, Lag= 0.0 min
Primary = 5.63 cfs @ 12.16 hrs, Volume= 0.479 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 755.64' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	751.20'	**12.0" Round Culvert** L= 13.0' Ke= 1.000 Inlet / Outlet Invert= 751.20' / 750.90' S= 0.0231 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=5.60 cfs @ 12.16 hrs HW=755.59' (Free Discharge)
1=Culvert (Inlet Controls 5.60 cfs @ 7.12 fps)

Pond 9P: Existing East CB



Summary for Pond 11P: Existing West CB & Outlet Pipe

[57] Hint: Peaked at 755.43' (Flood elevation advised)
[81] Warning: Exceeded Pond 9P by 0.10' @ 11.95 hrs

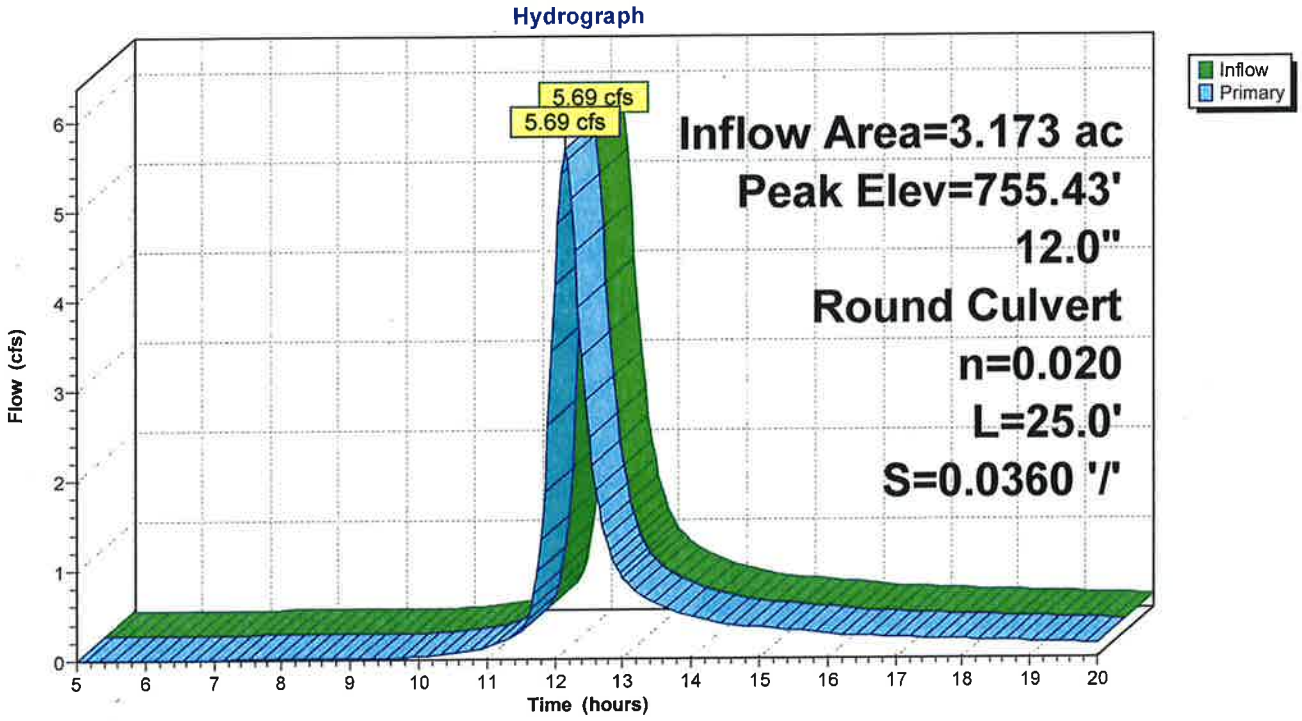
Inflow Area = 3.173 ac, 7.29% Impervious, Inflow Depth > 1.91" for 10 YEAR - Litchfield County event
Inflow = 5.69 cfs @ 12.16 hrs, Volume= 0.506 af
Outflow = 5.69 cfs @ 12.16 hrs, Volume= 0.506 af, Atten= 0%, Lag= 0.0 min
Primary = 5.69 cfs @ 12.16 hrs, Volume= 0.506 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 755.43' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	750.90'	**12.0" Round Culvert** L= 25.0' Ke= 1.000 Inlet / Outlet Invert= 750.90' / 750.00' S= 0.0360 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=5.66 cfs @ 12.16 hrs HW=755.38' (Free Discharge)
↳**1=Culvert** (Inlet Controls 5.66 cfs @ 7.21 fps)

Pond 11P: Existing West CB & Outlet Pipe



Summary for Subcatchment 4S: DA-1

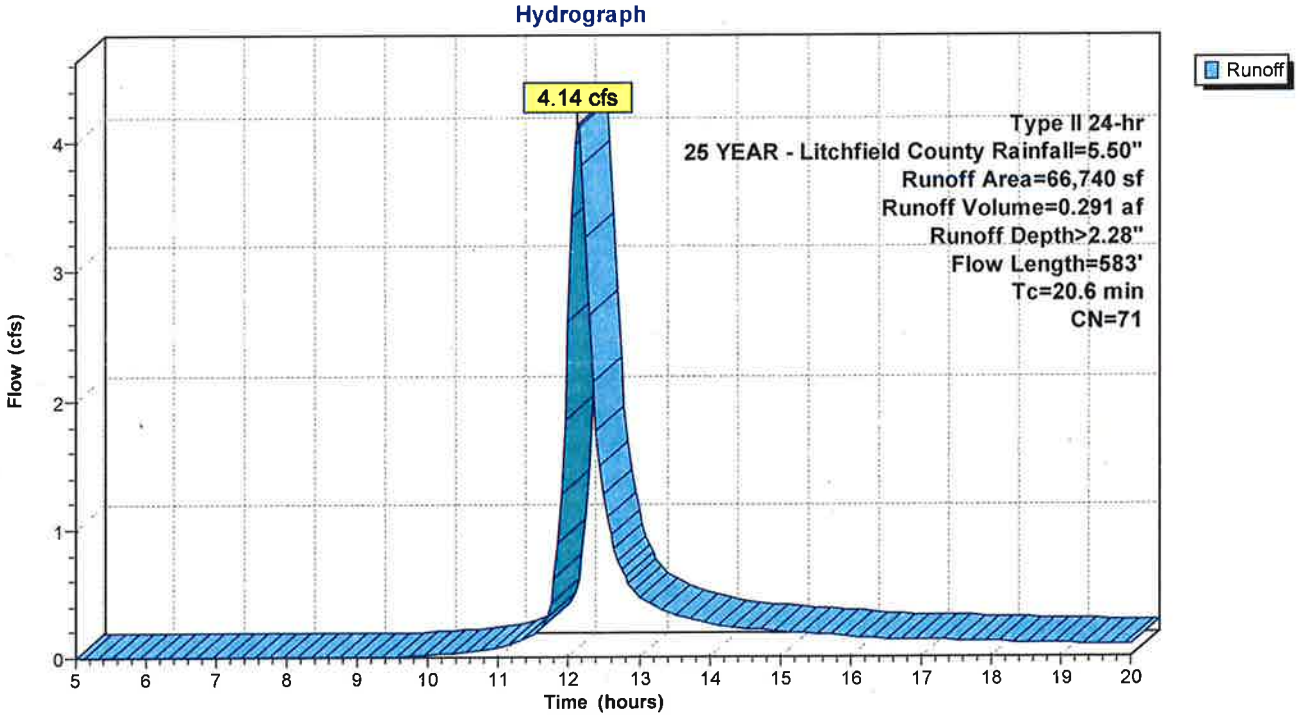
Runoff = 4.14 cfs @ 12.14 hrs, Volume= 0.291 af, Depth> 2.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25 YEAR - Litchfield County Rainfall=5.50"

Area (sf)	CN	Description
35,283	60	Woods, Fair, HSG B
19,078	79	Woods, Fair, HSG D
6,141	91	Gravel roads, HSG D
6,238	85	Gravel roads, HSG B
66,740	71	Weighted Average
66,740		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.6	200	0.1000	0.17		**Sheet Flow, First 200' thru woods** Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	107	0.1750	2.09		**Shallow Concentrated Flow, Thru Woods to Rip Rap Swale** Woodland Kv= 5.0 fps
0.1	276	0.1500	35.97	143.88	**Channel Flow, Thru Rip Rap Swale to Proposed CB** Area= 4.0 sf Perim= 4.0' r= 1.00' n= 0.016 Asphalt, rough
20.6	583	Total			

Subcatchment 4S: DA-1



Summary for Subcatchment 6S: DA-2

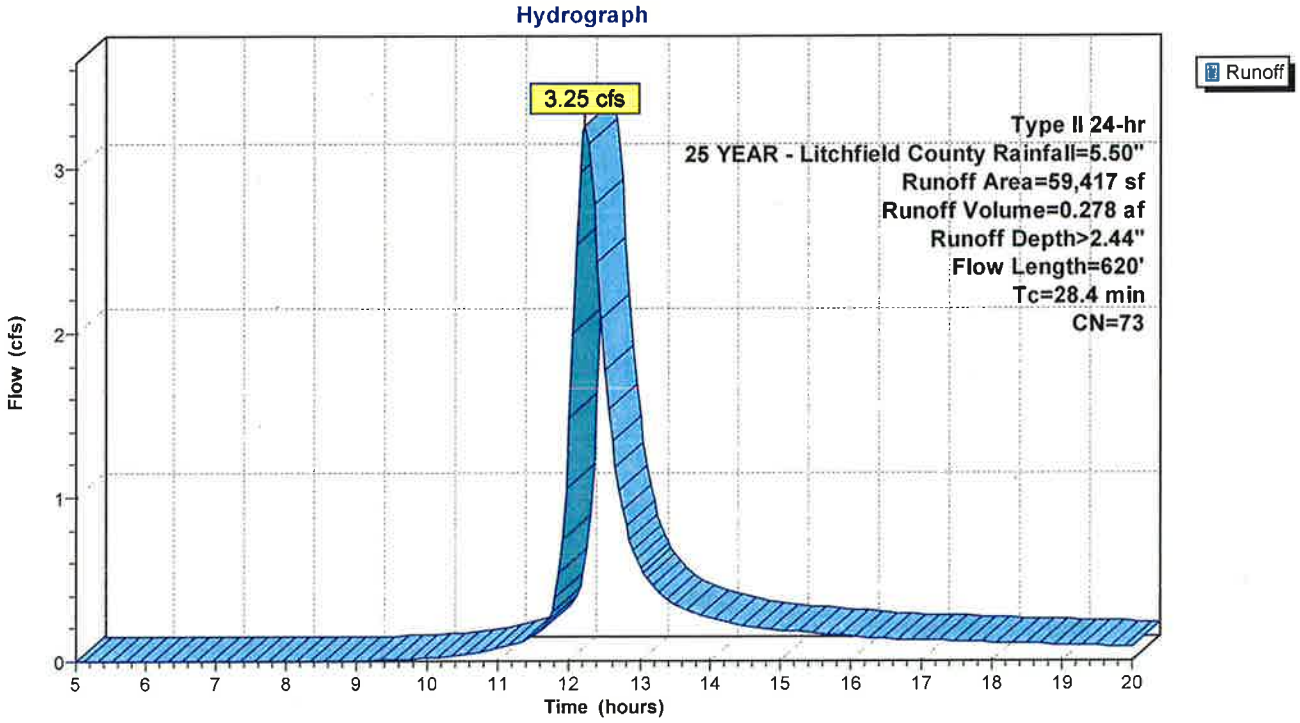
Runoff = 3.25 cfs @ 12.23 hrs, Volume= 0.278 af, Depth> 2.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25 YEAR - Litchfield County Rainfall=5.50"

Area (sf)	CN	Description
27,221	79	Woods, Fair, HSG D
24,638	60	Woods, Fair, HSG B
3,467	93	Paved roads w/open ditches, 50% imp, HSG D
1,104	98	Unconnected roofs, HSG D
2,864	98	Paved roads w/curbs & sewers, HSG D
123	96	Gravel surface, HSG D
59,417	73	Weighted Average
53,716		90.40% Pervious Area
5,702		9.60% Impervious Area
1,104		19.36% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.9	200	0.0500	0.13		**Sheet Flow, First 200' thru woods** Woods: Light underbrush n= 0.400 P2= 3.20"
2.0	286	0.2300	2.40		**Shallow Concentrated Flow, Thru the woods to street line** Woodland Kv= 5.0 fps
0.5	134	0.0500	4.54		**Shallow Concentrated Flow, Along street to CB** Paved Kv= 20.3 fps
28.4	620	Total			

Subcatchment 6S: DA-2



Summary for Subcatchment 8S: DA-3

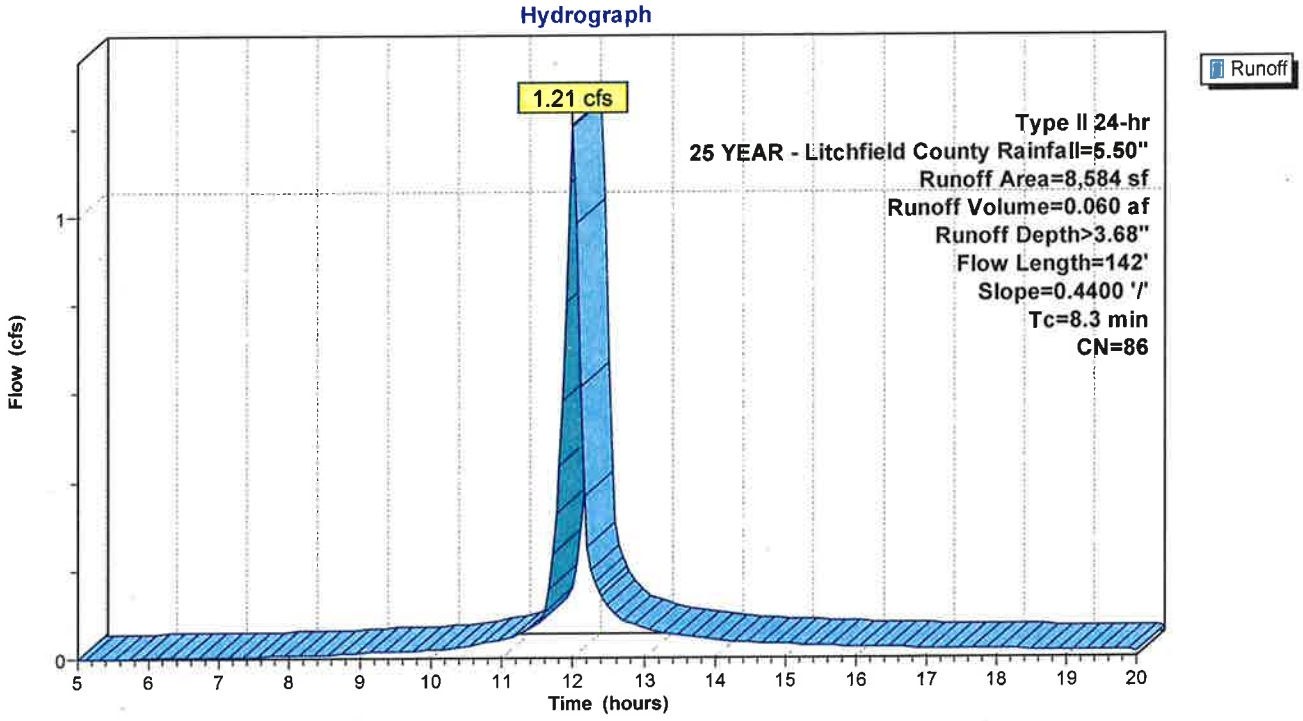
Runoff = 1.21 cfs @ 11.99 hrs, Volume= 0.060 af, Depth> 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25 YEAR - Litchfield County Rainfall=5.50"

Area (sf)	CN	Description
2,495	96	Gravel surface, HSG D
5,192	79	Woods, Fair, HSG D
897	98	Paved roads w/curbs & sewers, HSG D
8,584	86	Weighted Average
7,687		89.55% Pervious Area
897		10.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	142	0.4400	0.29		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"

Subcatchment 8S: DA-3



Summary for Subcatchment 10S: DA-4

[49] Hint: Tc<2dt may require smaller dt

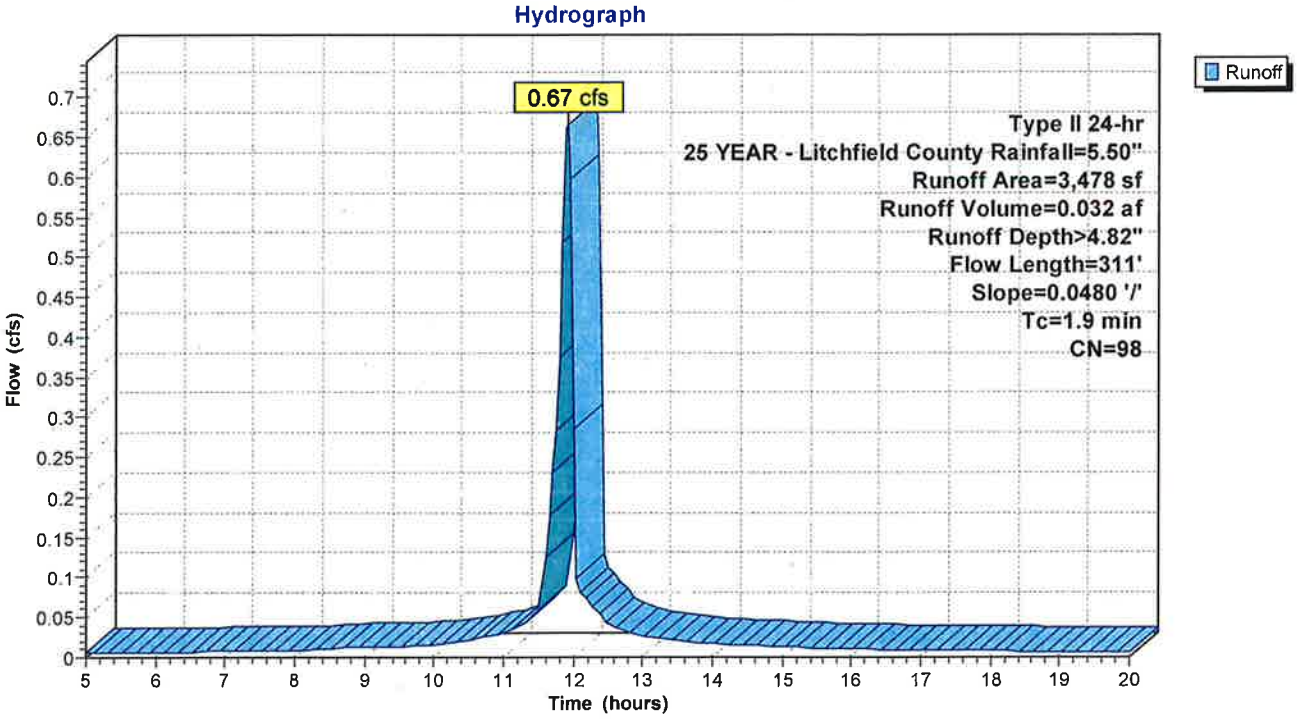
Runoff = 0.67 cfs @ 11.91 hrs, Volume= 0.032 af, Depth> 4.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25 YEAR - Litchfield County Rainfall=5.50"

Area (sf)	CN	Description
3,478	98	Paved roads w/curbs & sewers, HSG D
3,478		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	200	0.0480	2.24		**Sheet Flow, First 200'** Smooth surfaces n= 0.011 P2= 3.20"
0.4	111	0.0480	4.45		**Shallow Concentrated Flow, Rest of Pavement** Paved Kv= 20.3 fps
1.9	311	Total			

Subcatchment 10S: DA-4



Summary for Pond 5P: Proposed CB @ Access Drive

[57] Hint: Peaked at 763.13' (Flood elevation advised)

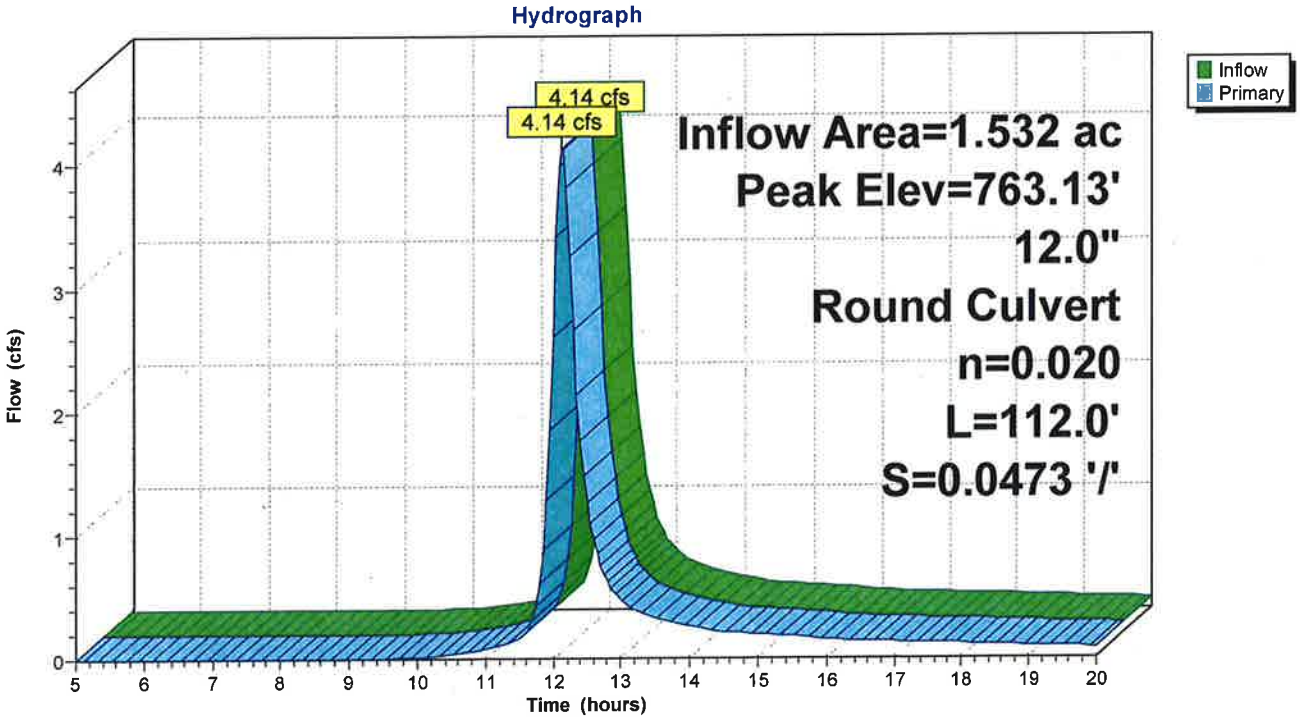
Inflow Area = 1.532 ac, 0.00% Impervious, Inflow Depth > 2.28" for 25 YEAR - Litchfield County event
Inflow = 4.14 cfs @ 12.14 hrs, Volume= 0.291 af
Outflow = 4.14 cfs @ 12.14 hrs, Volume= 0.291 af, Atten= 0%, Lag= 0.0 min
Primary = 4.14 cfs @ 12.14 hrs, Volume= 0.291 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 763.13' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	760.50'	**12.0" Round Culvert** L= 112.0' Ke= 1.000 Inlet / Outlet Invert= 760.50' / 755.20' S= 0.0473 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=4.10 cfs @ 12.14 hrs HW=763.09' (Free Discharge)
↑**1=Culvert** (Inlet Controls 4.10 cfs @ 5.22 fps)

Pond 5P: Proposed CB @ Access Drive



Summary for Pond 7P: Proposed CB on Keegan Rd.

[57] Hint: Peaked at 762.91' (Flood elevation advised)
[79] Warning: Submerged Pond 5P Primary device # 1 INLET by 2.26'

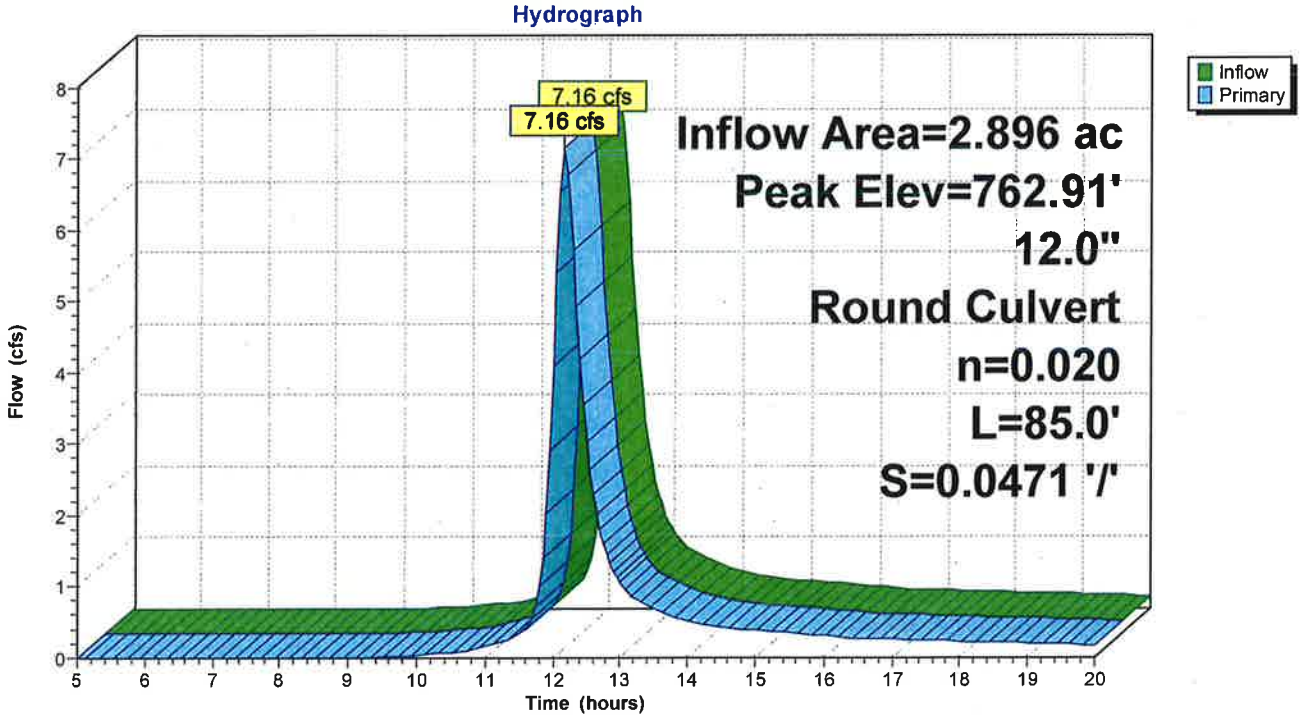
Inflow Area = 2.896 ac, 4.52% Impervious, Inflow Depth > 2.36" for 25 YEAR - Litchfield County event
Inflow = 7.16 cfs @ 12.17 hrs, Volume= 0.569 af
Outflow = 7.16 cfs @ 12.17 hrs, Volume= 0.569 af, Atten= 0%, Lag= 0.0 min
Primary = 7.16 cfs @ 12.17 hrs, Volume= 0.569 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 762.91' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	755.20'	**12.0" Round Culvert** L= 85.0' Ke= 1.000 Inlet / Outlet Invert= 755.20' / 751.20' S= 0.0471 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=7.08 cfs @ 12.17 hrs HW=762.69' (Free Discharge)
1=Culvert (Barrel Controls 7.08 cfs @ 9.01 fps)

Pond 7P: Proposed CB on Keegan Rd.



Summary for Pond 9P: Existing East CB

[57] Hint: Peaked at 758.65' (Flood elevation advised)
[79] Warning: Submerged Pond 7P Primary device # 1 INLET by 3.43'

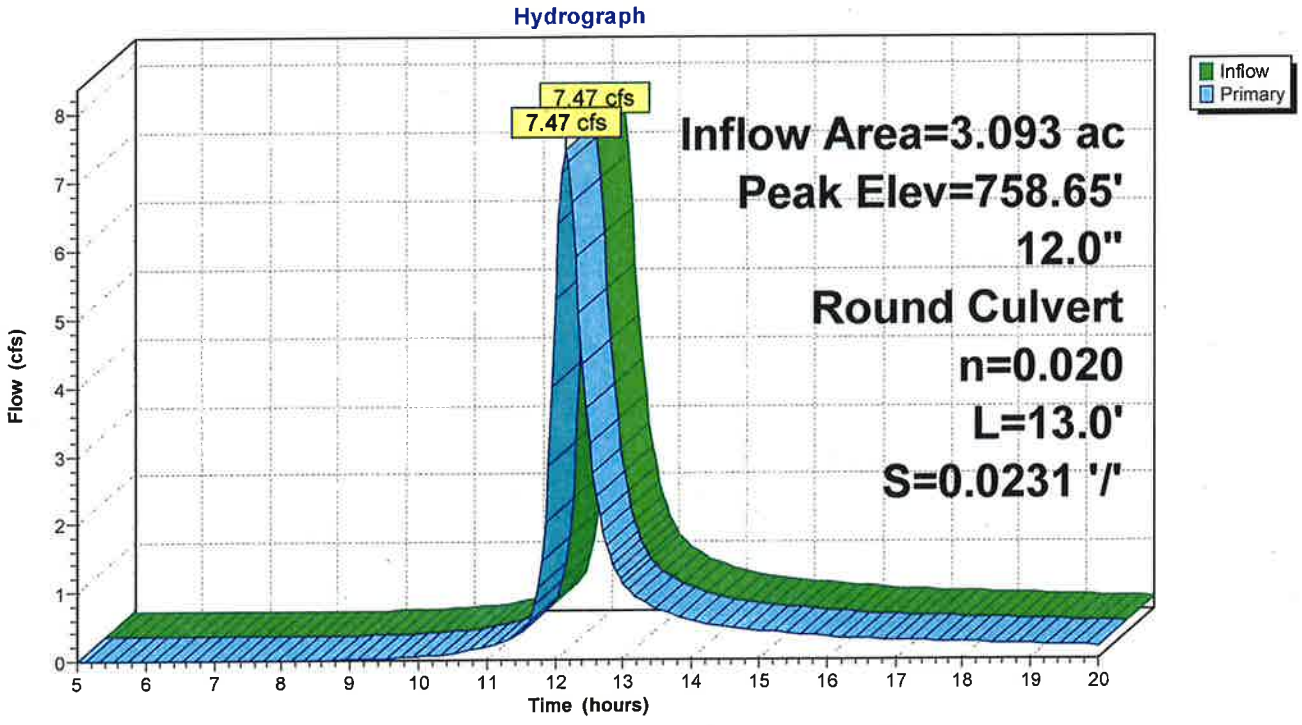
Inflow Area = 3.093 ac, 4.90% Impervious, Inflow Depth > 2.44" for 25 YEAR - Litchfield County event
Inflow = 7.47 cfs @ 12.16 hrs, Volume= 0.629 af
Outflow = 7.47 cfs @ 12.16 hrs, Volume= 0.629 af, Atten= 0%, Lag= 0.0 min
Primary = 7.47 cfs @ 12.16 hrs, Volume= 0.629 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 758.65' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	751.20'	**12.0" Round Culvert** L= 13.0' Ke= 1.000 Inlet / Outlet Invert= 751.20' / 750.90' S= 0.0231 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=7.44 cfs @ 12.16 hrs HW=758.59' (Free Discharge)
↳**1=Culvert** (Inlet Controls 7.44 cfs @ 9.48 fps)

Pond 9P: Existing East CB



Summary for Pond 11P: Existing West CB & Outlet Pipe

[57] Hint: Peaked at 758.49' (Flood elevation advised)
[81] Warning: Exceeded Pond 9P by 0.33' @ 11.95 hrs

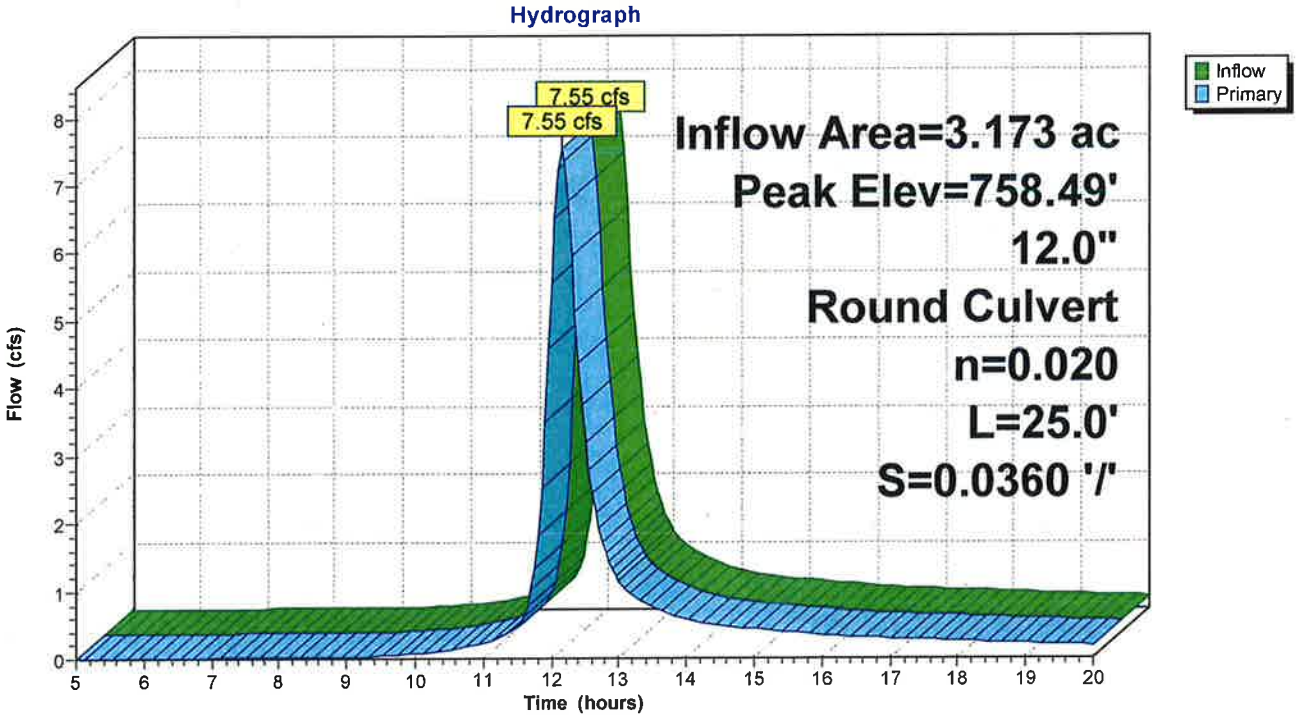
Inflow Area = 3.173 ac, 7.29% Impervious, Inflow Depth > 2.50" for 25 YEAR - Litchfield County event
Inflow = 7.55 cfs @ 12.16 hrs, Volume= 0.661 af
Outflow = 7.55 cfs @ 12.16 hrs, Volume= 0.661 af, Atten= 0%, Lag= 0.0 min
Primary = 7.55 cfs @ 12.16 hrs, Volume= 0.661 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 758.49' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	750.90'	**12.0" Round Culvert** L= 25.0' Ke= 1.000 Inlet / Outlet Invert= 750.90' / 750.00' S= 0.0360 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=7.52 cfs @ 12.16 hrs HW=758.43' (Free Discharge)
1=Culvert (Inlet Controls 7.52 cfs @ 9.57 fps)

Pond 11P: Existing West CB & Outlet Pipe



Summary for Subcatchment 4S: DA-1

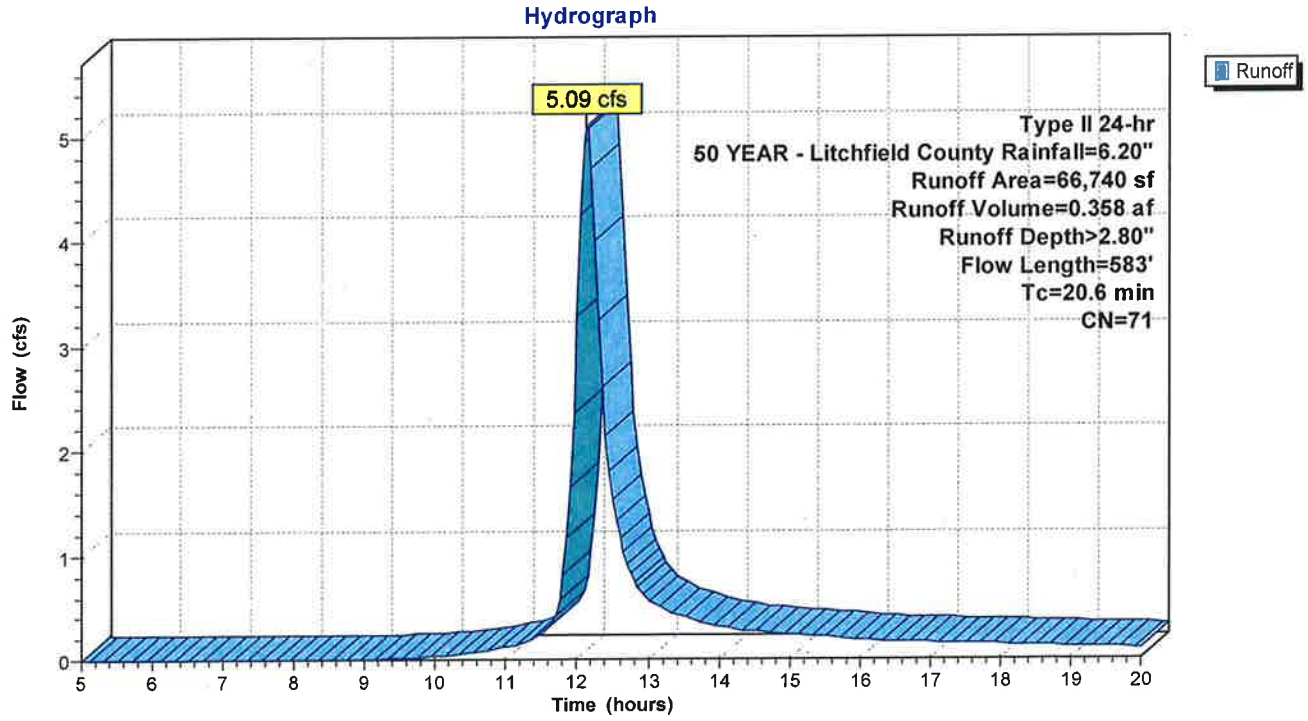
Runoff = 5.09 cfs @ 12.14 hrs, Volume= 0.358 af, Depth> 2.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50 YEAR - Litchfield County Rainfall=6.20"

Area (sf)	CN	Description
35,283	60	Woods, Fair, HSG B
19,078	79	Woods, Fair, HSG D
6,141	91	Gravel roads, HSG D
6,238	85	Gravel roads, HSG B
66,740	71	Weighted Average
66,740		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.6	200	0.1000	0.17		**Sheet Flow, First 200' thru woods** Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	107	0.1750	2.09		**Shallow Concentrated Flow, Thru Woods to Rip Rap Swale** Woodland Kv= 5.0 fps
0.1	276	0.1500	35.97	143.88	**Channel Flow, Thru Rip Rap Swale to Proposed CB** Area= 4.0 sf Perim= 4.0' r= 1.00' n= 0.016 Asphalt, rough
20.6	583	Total			

Subcatchment 4S: DA-1



Summary for Subcatchment 6S: DA-2

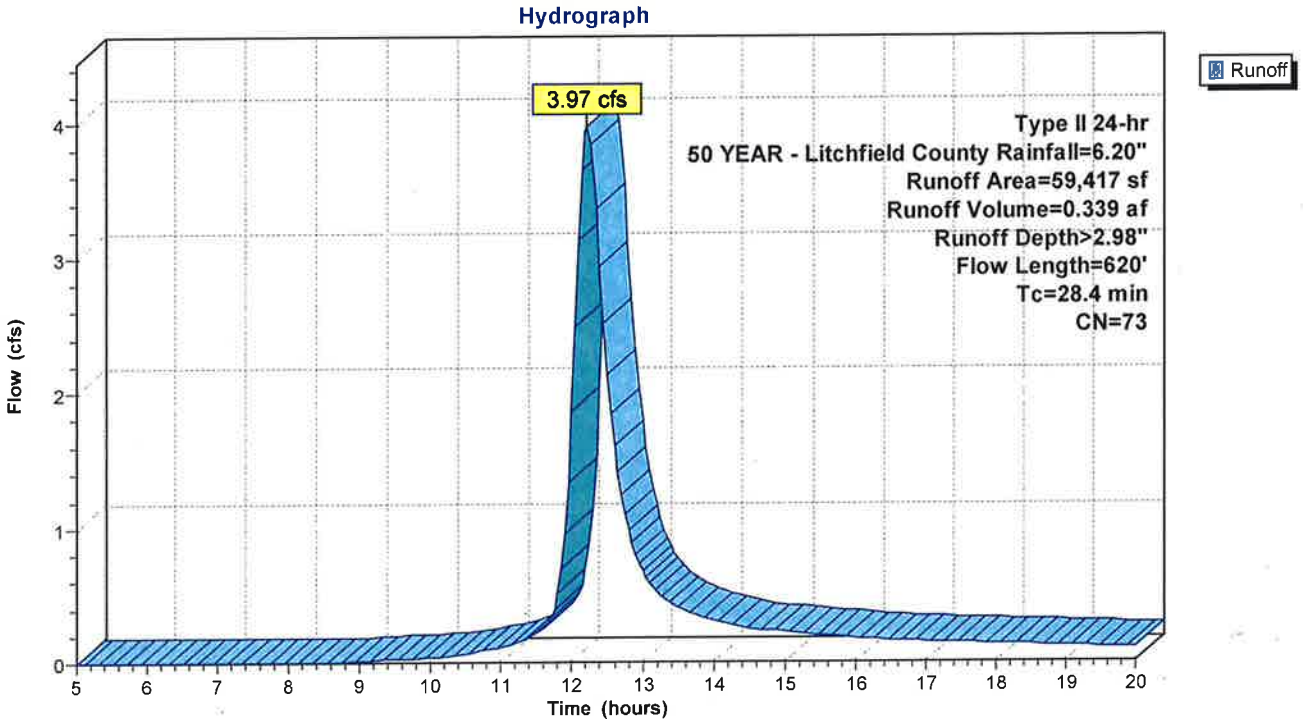
Runoff = 3.97 cfs @ 12.23 hrs, Volume= 0.339 af, Depth> 2.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50 YEAR - Litchfield County Rainfall=6.20"

Area (sf)	CN	Description
27,221	79	Woods, Fair, HSG D
24,638	60	Woods, Fair, HSG B
3,467	93	Paved roads w/open ditches, 50% imp, HSG D
1,104	98	Unconnected roofs, HSG D
2,864	98	Paved roads w/curbs & sewers, HSG D
123	96	Gravel surface, HSG D
59,417	73	Weighted Average
53,716		90.40% Pervious Area
5,702		9.60% Impervious Area
1,104		19.36% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.9	200	0.0500	0.13		**Sheet Flow, First 200' thru woods** Woods: Light underbrush n= 0.400 P2= 3.20"
2.0	286	0.2300	2.40		**Shallow Concentrated Flow, Thru the woods to street line** Woodland Kv= 5.0 fps
0.5	134	0.0500	4.54		**Shallow Concentrated Flow, Along street to CB** Paved Kv= 20.3 fps
28.4	620	Total			

Subcatchment 6S: DA-2



Summary for Subcatchment 8S: DA-3

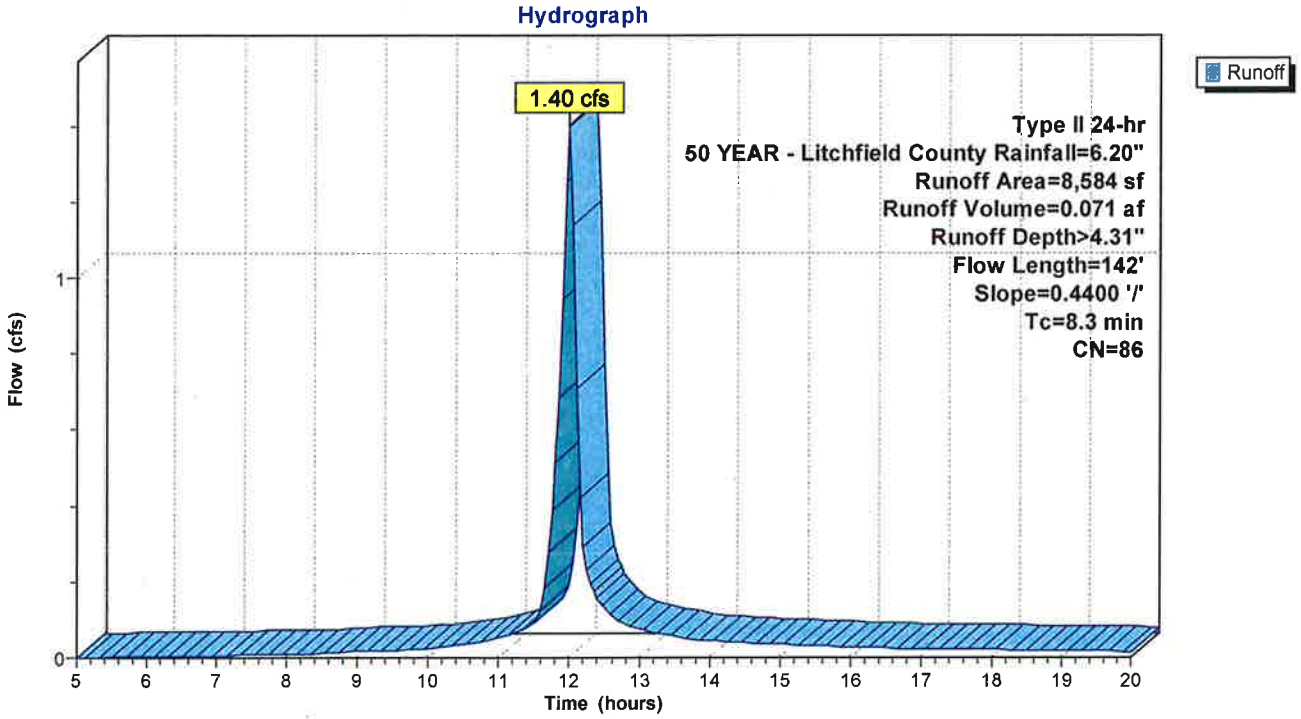
Runoff = 1.40 cfs @ 11.99 hrs, Volume= 0.071 af, Depth> 4.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50 YEAR - Litchfield County Rainfall=6.20"

Area (sf)	CN	Description
2,495	96	Gravel surface, HSG D
5,192	79	Woods, Fair, HSG D
897	98	Paved roads w/curbs & sewers, HSG D
8,584	86	Weighted Average
7,687		89.55% Pervious Area
897		10.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	142	0.4400	0.29		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"

Subcatchment 8S: DA-3



Summary for Subcatchment 10S: DA-4

[49] Hint: Tc<2dt may require smaller dt

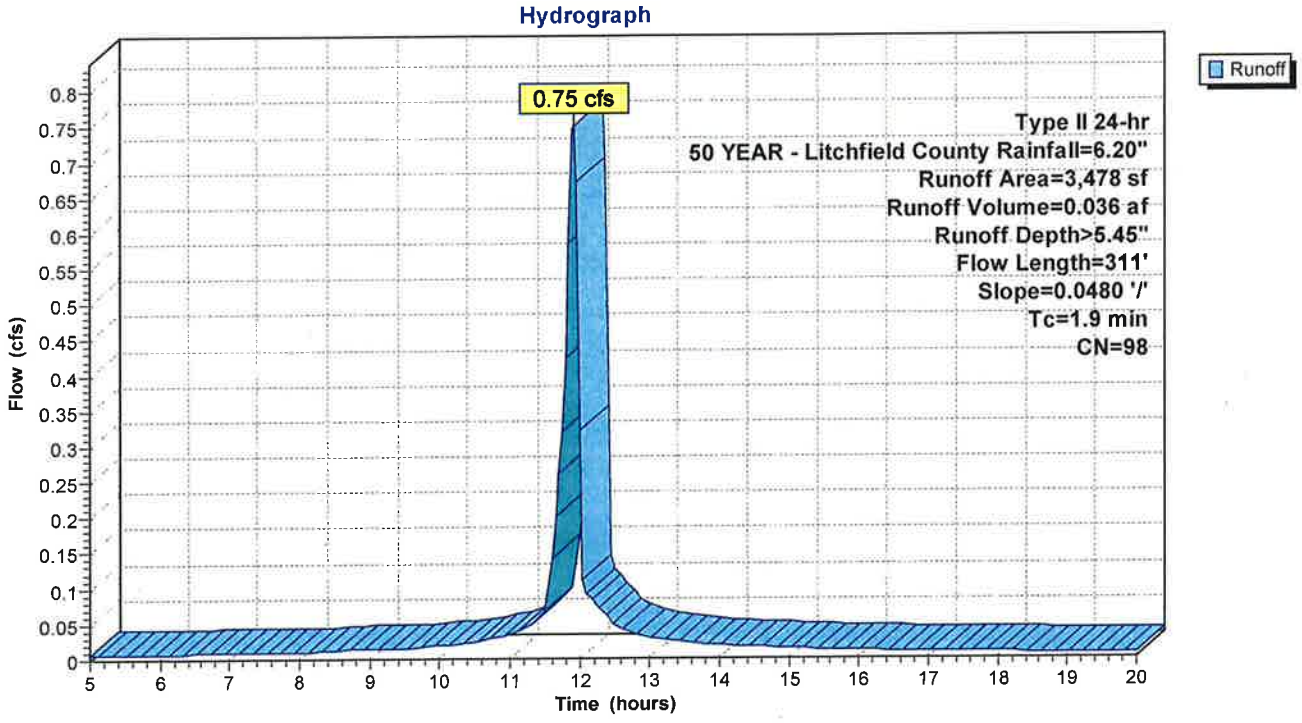
Runoff = 0.75 cfs @ 11.91 hrs, Volume= 0.036 af, Depth> 5.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50 YEAR - Litchfield County Rainfall=6.20"

Area (sf)	CN	Description
3,478	98	Paved roads w/curbs & sewers, HSG D
3,478		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	200	0.0480	2.24		**Sheet Flow, First 200'** Smooth surfaces n= 0.011 P2= 3.20"
0.4	111	0.0480	4.45		**Shallow Concentrated Flow, Rest of Pavement** Paved Kv= 20.3 fps
1.9	311	Total			

Subcatchment 10S: DA-4



Summary for Pond 5P: Proposed CB @ Access Drive

[57] Hint: Peaked at 764.22' (Flood elevation advised)

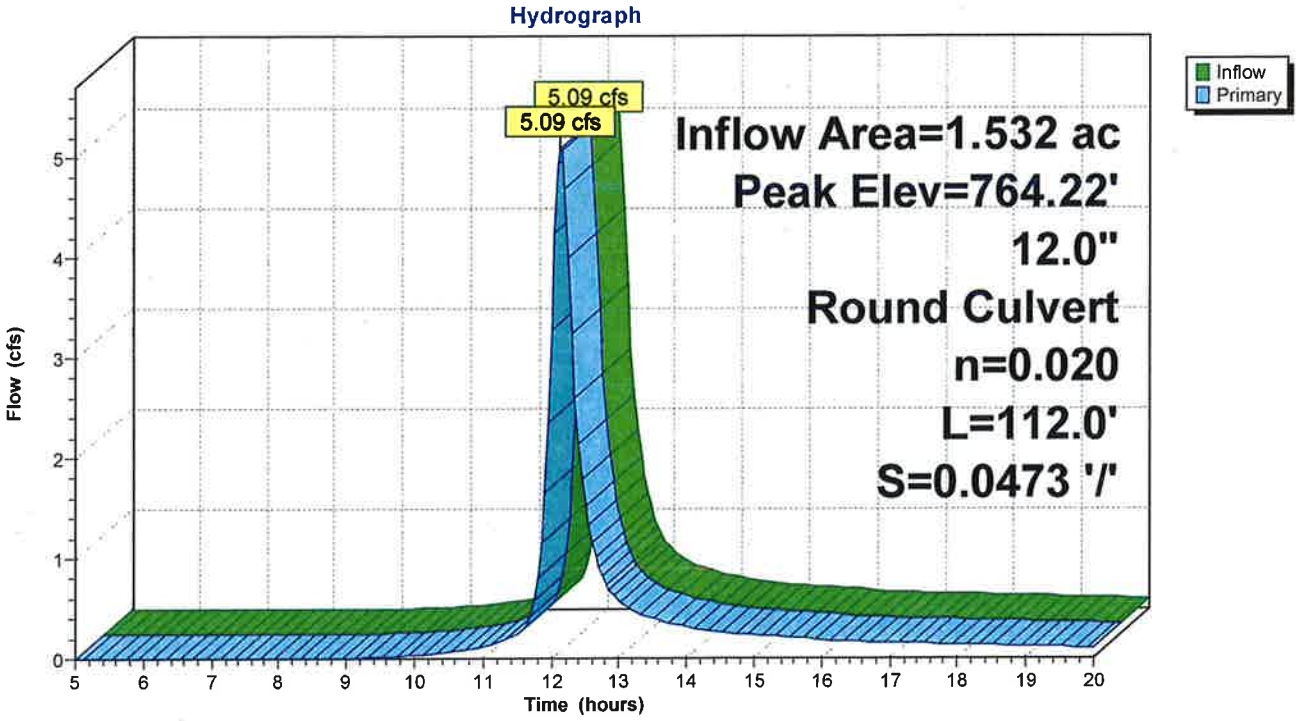
Inflow Area = 1.532 ac, 0.00% Impervious, Inflow Depth > 2.80" for 50 YEAR - Litchfield County event
Inflow = 5.09 cfs @ 12.14 hrs, Volume= 0.358 af
Outflow = 5.09 cfs @ 12.14 hrs, Volume= 0.358 af, Atten= 0%, Lag= 0.0 min
Primary = 5.09 cfs @ 12.14 hrs, Volume= 0.358 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 764.22' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	760.50'	**12.0" Round Culvert** L= 112.0' Ke= 1.000 Inlet / Outlet Invert= 760.50' / 755.20' S= 0.0473 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=5.04 cfs @ 12.14 hrs HW=764.16' (Free Discharge)
1=Culvert (Inlet Controls 5.04 cfs @ 6.42 fps)

Pond 5P: Proposed CB @ Access Drive



Summary for Pond 7P: Proposed CB on Keegan Rd.

[57] Hint: Peaked at 768.32' (Flood elevation advised)
[81] Warning: Exceeded Pond 5P by 4.04' @ 12.20 hrs

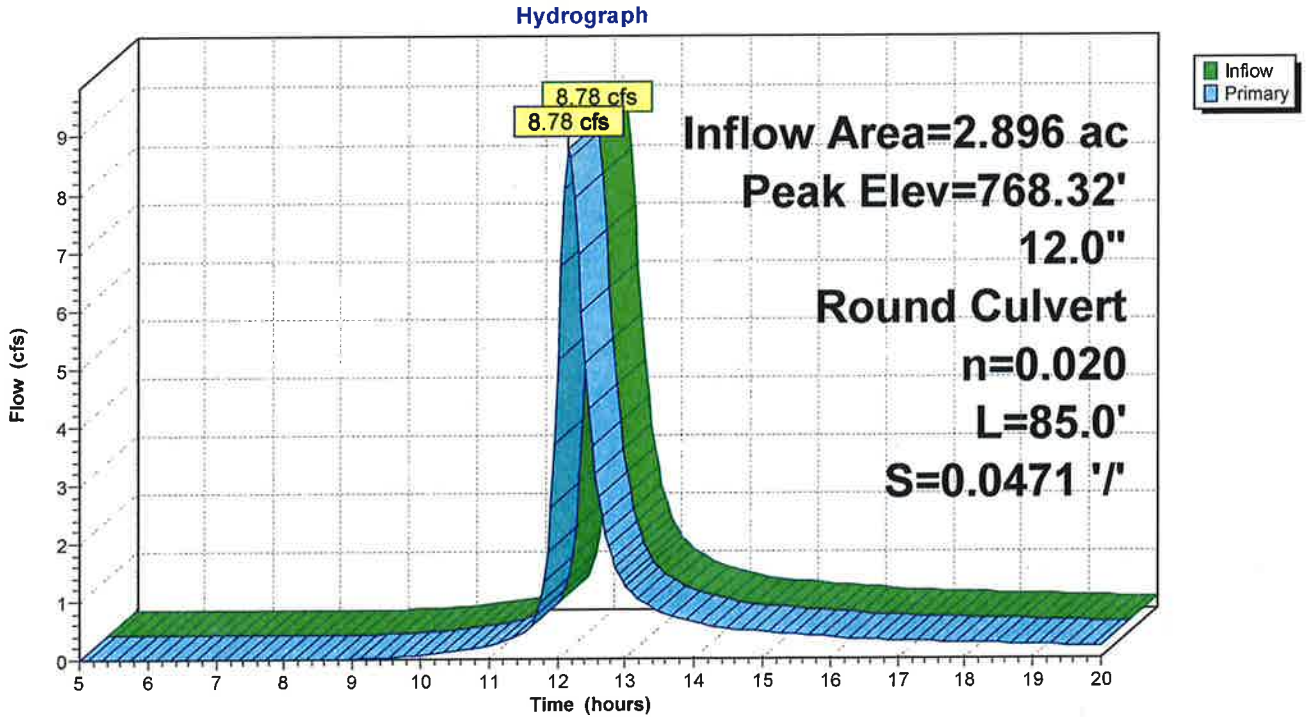
Inflow Area = 2.896 ac, 4.52% Impervious, Inflow Depth > 2.88" for 50 YEAR - Litchfield County event
Inflow = 8.78 cfs @ 12.17 hrs, Volume= 0.696 af
Outflow = 8.78 cfs @ 12.17 hrs, Volume= 0.696 af, Atten= 0%, Lag= 0.0 min
Primary = 8.78 cfs @ 12.17 hrs, Volume= 0.696 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 768.32' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	755.20'	**12.0" Round Culvert** L= 85.0' Ke= 1.000 Inlet / Outlet Invert= 755.20' / 751.20' S= 0.0471 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=8.69 cfs @ 12.17 hrs HW=768.01' (Free Discharge)
1=Culvert (Barrel Controls 8.69 cfs @ 11.06 fps)

Pond 7P: Proposed CB on Keegan Rd.



Summary for Pond 9P: Existing East CB

[57] Hint: Peaked at 762.11' (Flood elevation advised)
[79] Warning: Submerged Pond 7P Primary device # 1 INLET by 6.91'

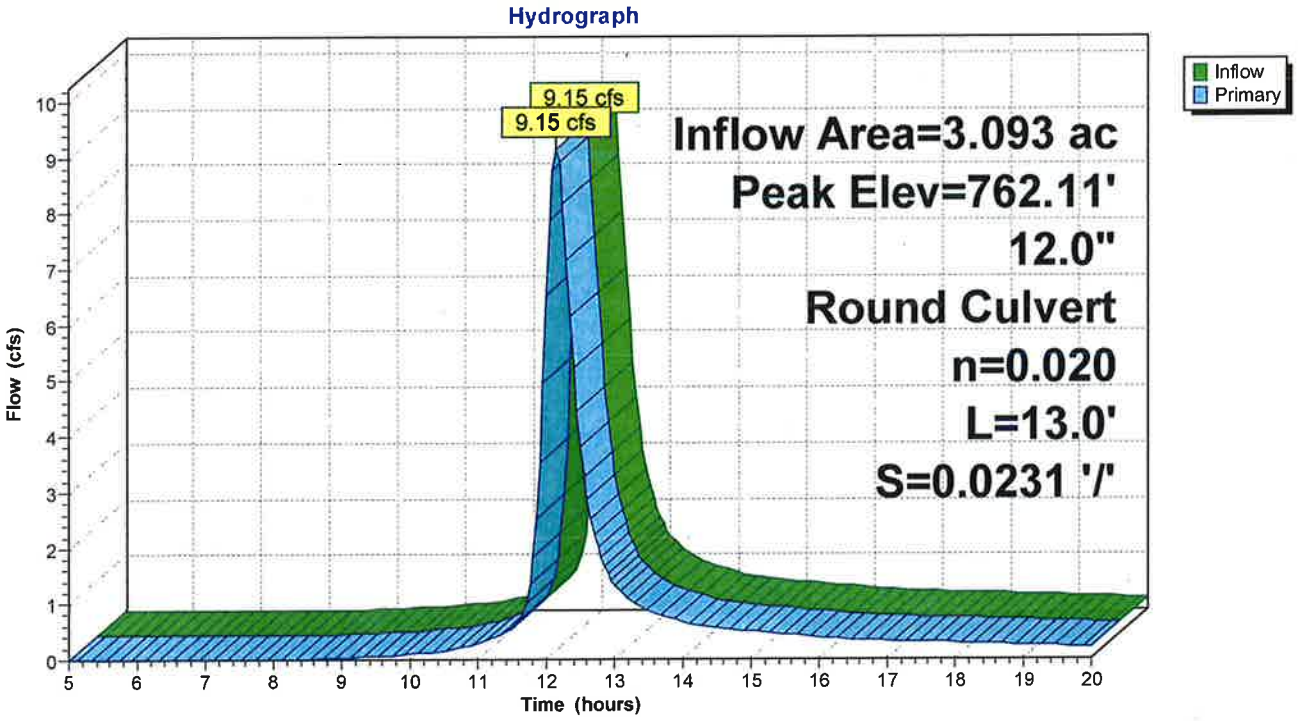
Inflow Area = 3.093 ac, 4.90% Impervious, Inflow Depth > 2.98" for 50 YEAR - Litchfield County event
Inflow = 9.15 cfs @ 12.16 hrs, Volume= 0.767 af
Outflow = 9.15 cfs @ 12.16 hrs, Volume= 0.767 af, Atten= 0%, Lag= 0.0 min
Primary = 9.15 cfs @ 12.16 hrs, Volume= 0.767 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 762.11' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	751.20'	**12.0" Round Culvert** L= 13.0' Ke= 1.000 Inlet / Outlet Invert= 751.20' / 750.90' S= 0.0231 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=9.12 cfs @ 12.16 hrs HW=762.05' (Free Discharge)
1=Culvert (Inlet Controls 9.12 cfs @ 11.62 fps)

Pond 9P: Existing East CB



Summary for Pond 11P: Existing West CB & Outlet Pipe

[57] Hint: Peaked at 762.01' (Flood elevation advised)
[81] Warning: Exceeded Pond 9P by 0.58' @ 11.95 hrs

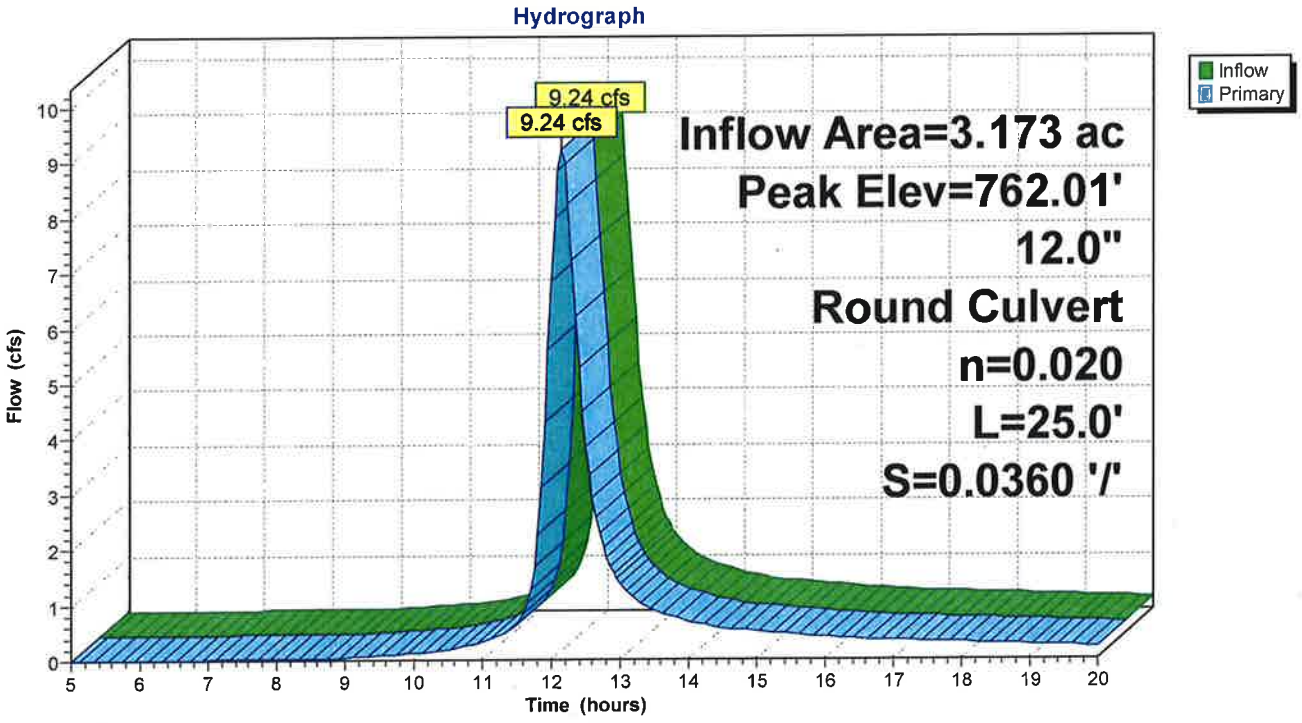
Inflow Area =	3.173 ac,	7.29% Impervious,	Inflow Depth >	3.04"	for 50 YEAR - Litchfield County event
Inflow =	9.24 cfs @	12.16 hrs,	Volume=	0.803 af	
Outflow =	9.24 cfs @	12.16 hrs,	Volume=	0.803 af,	Atten= 0%, Lag= 0.0 min
Primary =	9.24 cfs @	12.16 hrs,	Volume=	0.803 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 762.01' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	750.90'	**12.0" Round Culvert** L= 25.0' Ke= 1.000 Inlet / Outlet Invert= 750.90' / 750.00' S= 0.0360 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=9.21 cfs @ 12.16 hrs HW=761.95' (Free Discharge)
1=Culvert (Inlet Controls 9.21 cfs @ 11.73 fps)

Pond 11P: Existing West CB & Outlet Pipe



Summary for Subcatchment 4S: DA-1

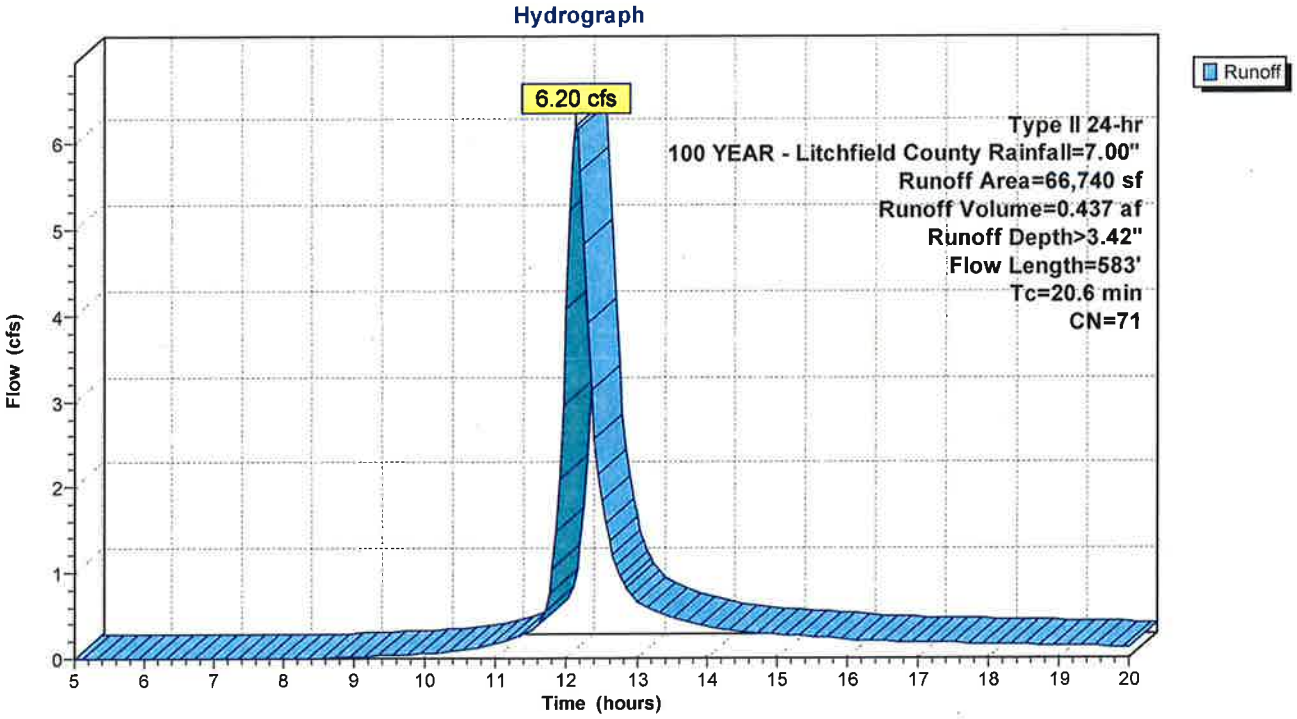
Runoff = 6.20 cfs @ 12.14 hrs, Volume= 0.437 af, Depth> 3.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 YEAR - Litchfield County Rainfall=7.00"

Area (sf)	CN	Description
35,283	60	Woods, Fair, HSG B
19,078	79	Woods, Fair, HSG D
6,141	91	Gravel roads, HSG D
6,238	85	Gravel roads, HSG B
66,740	71	Weighted Average
66,740		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.6	200	0.1000	0.17		**Sheet Flow, First 200' thru woods** Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	107	0.1750	2.09		**Shallow Concentrated Flow, Thru Woods to Rip Rap Swale** Woodland Kv= 5.0 fps
0.1	276	0.1500	35.97	143.88	**Channel Flow, Thru Rip Rap Swale to Proposed CB** Area= 4.0 sf Perim= 4.0' r= 1.00' n= 0.016 Asphalt, rough
20.6	583	Total			

Subcatchment 4S: DA-1



Summary for Subcatchment 6S: DA-2

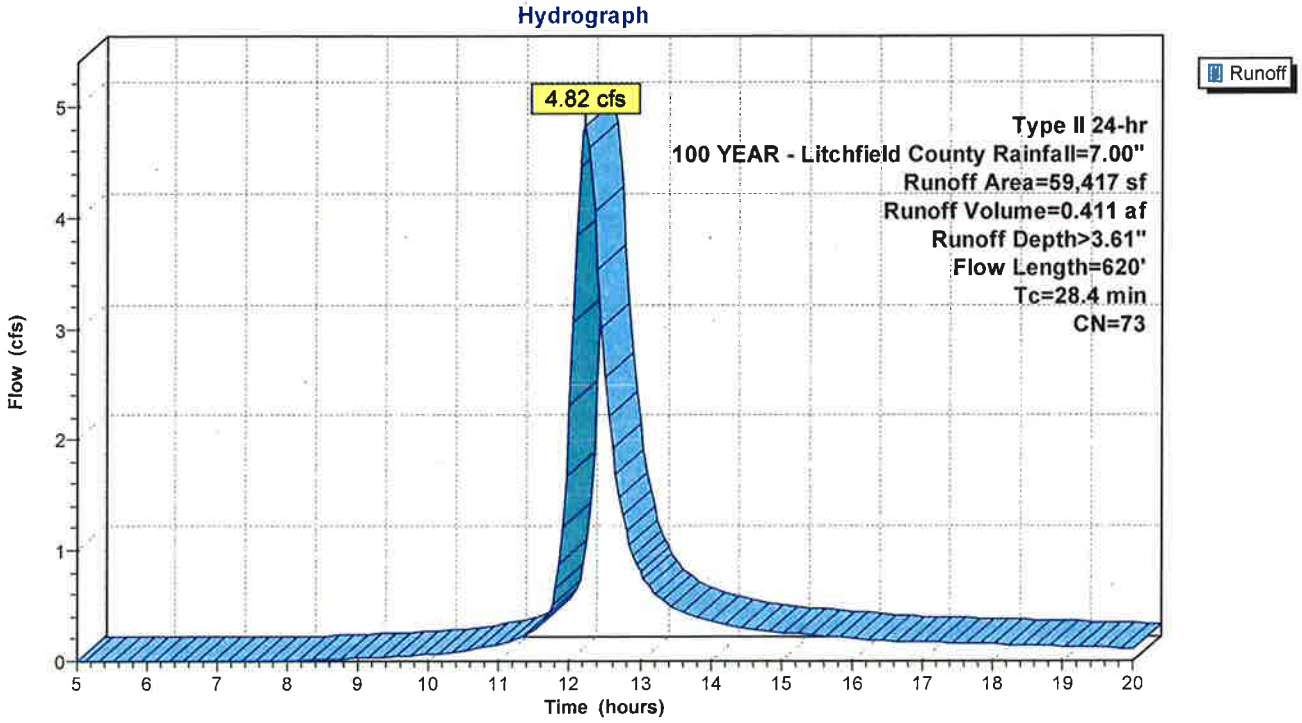
Runoff = 4.82 cfs @ 12.22 hrs, Volume= 0.411 af, Depth> 3.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 YEAR - Litchfield County Rainfall=7.00"

Area (sf)	CN	Description
27,221	79	Woods, Fair, HSG D
24,638	60	Woods, Fair, HSG B
3,467	93	Paved roads w/open ditches, 50% imp, HSG D
1,104	98	Unconnected roofs, HSG D
2,864	98	Paved roads w/curbs & sewers, HSG D
123	96	Gravel surface, HSG D
59,417	73	Weighted Average
53,716		90.40% Pervious Area
5,702		9.60% Impervious Area
1,104		19.36% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.9	200	0.0500	0.13		**Sheet Flow, First 200' thru woods** Woods: Light underbrush n= 0.400 P2= 3.20"
2.0	286	0.2300	2.40		**Shallow Concentrated Flow, Thru the woods to street line** Woodland Kv= 5.0 fps
0.5	134	0.0500	4.54		**Shallow Concentrated Flow, Along street to CB** Paved Kv= 20.3 fps
28.4	620	Total			

Subcatchment 6S: DA-2



Summary for Subcatchment 8S: DA-3

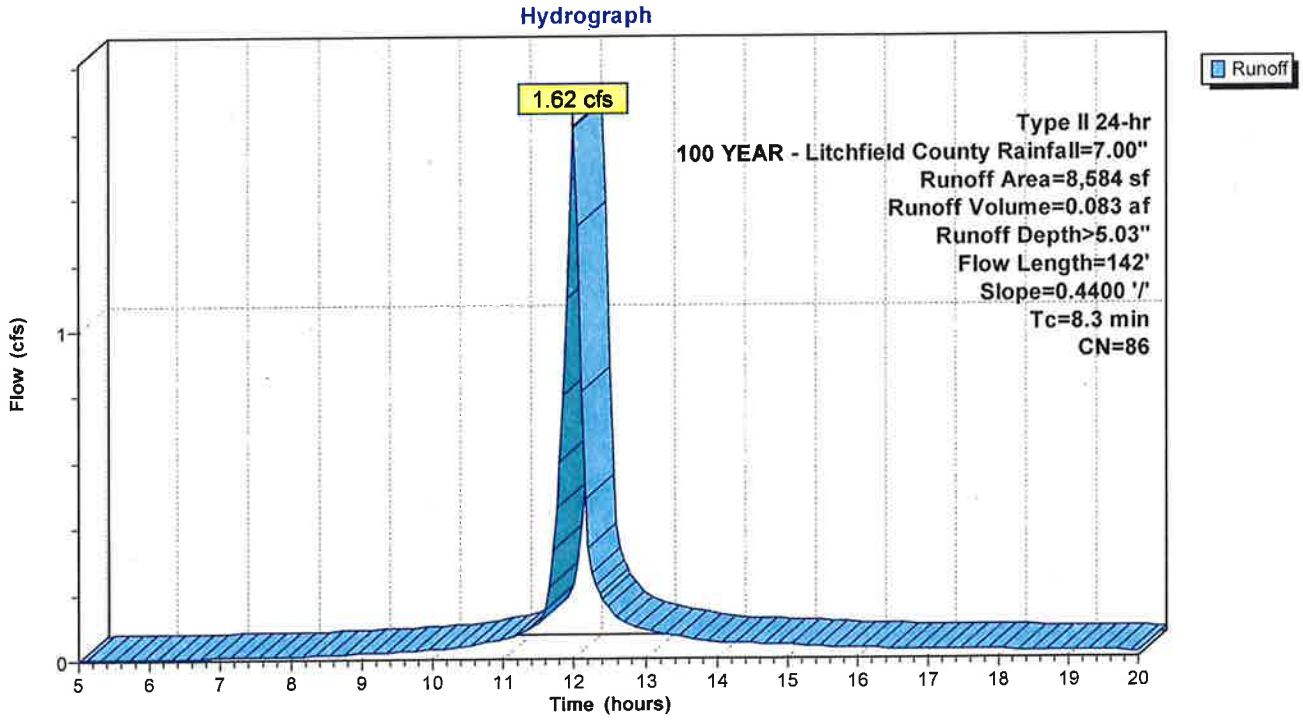
Runoff = 1.62 cfs @ 11.99 hrs, Volume= 0.083 af, Depth> 5.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 YEAR - Litchfield County Rainfall=7.00"

Area (sf)	CN	Description
2,495	96	Gravel surface, HSG D
5,192	79	Woods, Fair, HSG D
897	98	Paved roads w/curbs & sewers, HSG D
8,584	86	Weighted Average
7,687		89.55% Pervious Area
897		10.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	142	0.4400	0.29		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"

Subcatchment 8S: DA-3



Summary for Subcatchment 10S: DA-4

[49] Hint: Tc<2dt may require smaller dt

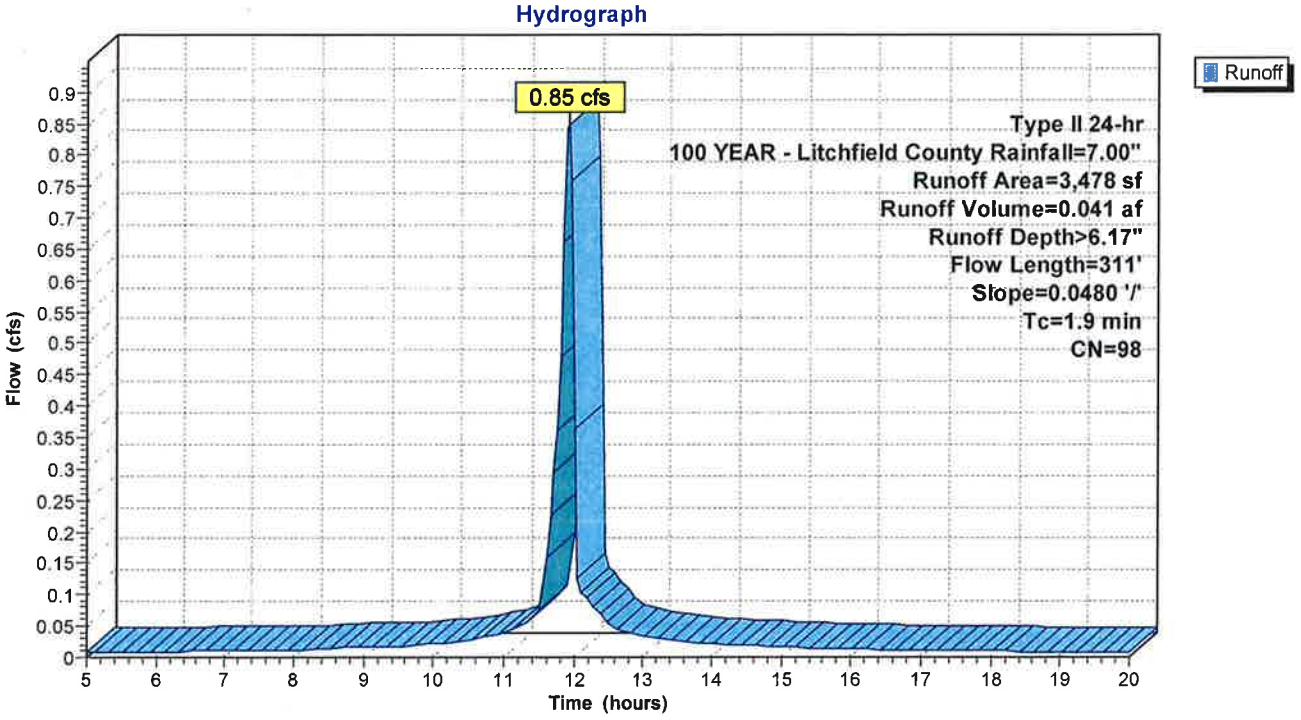
Runoff = 0.85 cfs @ 11.91 hrs, Volume= 0.041 af, Depth> 6.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 YEAR - Litchfield County Rainfall=7.00"

Area (sf)	CN	Description
3,478	98	Paved roads w/curbs & sewers, HSG D
3,478		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	200	0.0480	2.24		**Sheet Flow, First 200'** Smooth surfaces n= 0.011 P2= 3.20"
0.4	111	0.0480	4.45		**Shallow Concentrated Flow, Rest of Pavement** Paved Kv= 20.3 fps
1.9	311	Total			

Subcatchment 10S: DA-4



Summary for Pond 5P: Proposed CB @ Access Drive

[57] Hint: Peaked at 766.16' (Flood elevation advised)

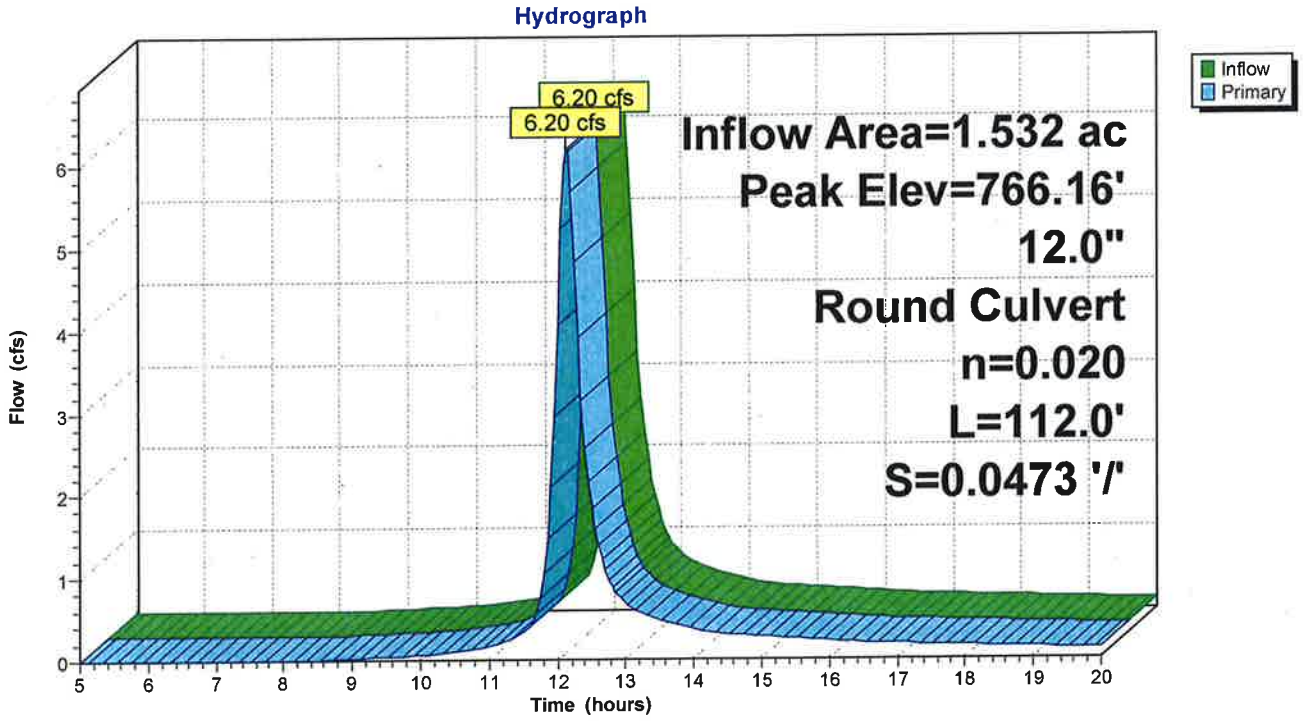
Inflow Area = 1.532 ac, 0.00% Impervious, Inflow Depth > 3.42" for 100 YEAR - Litchfield County event
Inflow = 6.20 cfs @ 12.14 hrs, Volume= 0.437 af
Outflow = 6.20 cfs @ 12.14 hrs, Volume= 0.437 af, Atten= 0%, Lag= 0.0 min
Primary = 6.20 cfs @ 12.14 hrs, Volume= 0.437 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 766.16' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	760.50'	**12.0" Round Culvert** L= 112.0' Ke= 1.000 Inlet / Outlet Invert= 760.50' / 755.20' S= 0.0473 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=6.14 cfs @ 12.14 hrs HW=766.00' (Free Discharge)
1=Culvert (Barrel Controls 6.14 cfs @ 7.82 fps)

Pond 5P: Proposed CB @ Access Drive



Summary for Pond 7P: Proposed CB on Keegan Rd.

[57] Hint: Peaked at 776.08' (Flood elevation advised)
[81] Warning: Exceeded Pond 5P by 10.13' @ 12.20 hrs

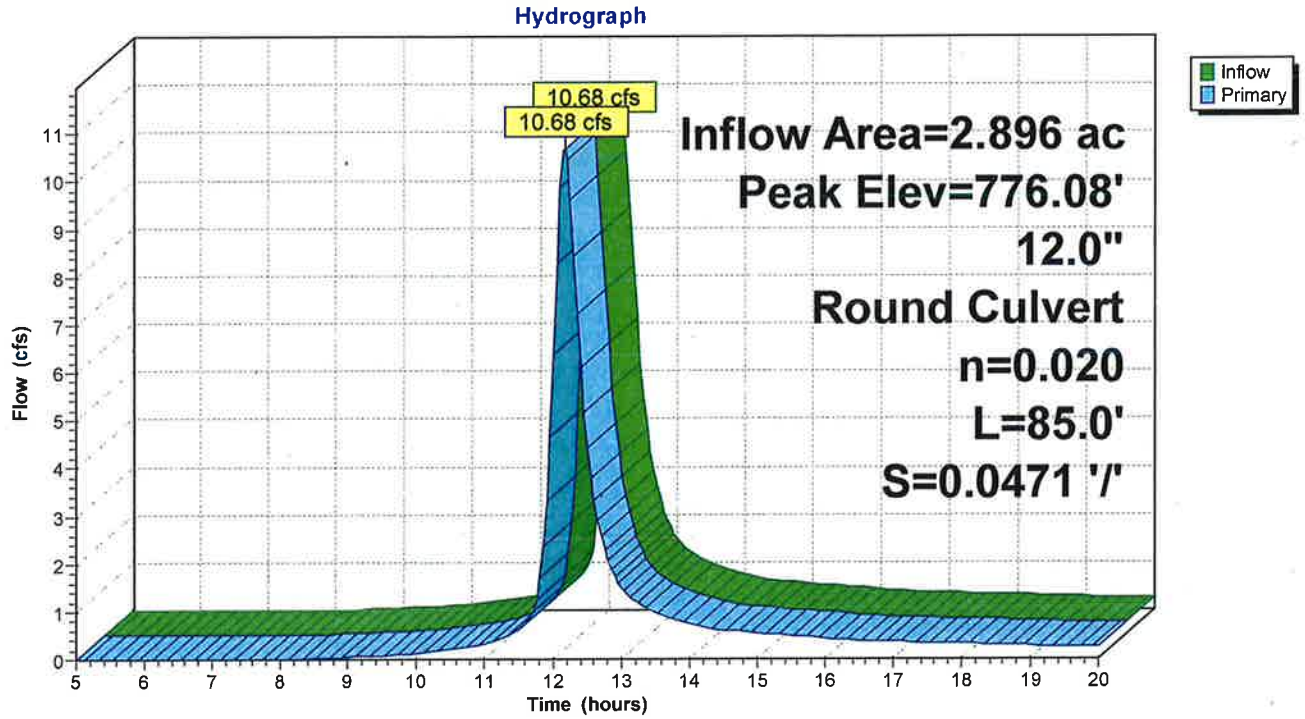
Inflow Area = 2.896 ac, 4.52% Impervious, Inflow Depth > 3.51" for 100 YEAR - Litchfield County event
Inflow = 10.68 cfs @ 12.17 hrs, Volume= 0.847 af
Outflow = 10.68 cfs @ 12.17 hrs, Volume= 0.847 af, Atten= 0%, Lag= 0.0 min
Primary = 10.68 cfs @ 12.17 hrs, Volume= 0.847 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 776.08' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	755.20'	**12.0" Round Culvert** L= 85.0' Ke= 1.000 Inlet / Outlet Invert= 755.20' / 751.20' S= 0.0471 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=10.58 cfs @ 12.17 hrs HW=775.64' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 10.58 cfs @ 13.47 fps)

Pond 7P: Proposed CB on Keegan Rd.



Summary for Pond 9P: Existing East CB

[57] Hint: Peaked at 767.08' (Flood elevation advised)
[79] Warning: Submerged Pond 7P Primary device # 1 INLET by 11.87'

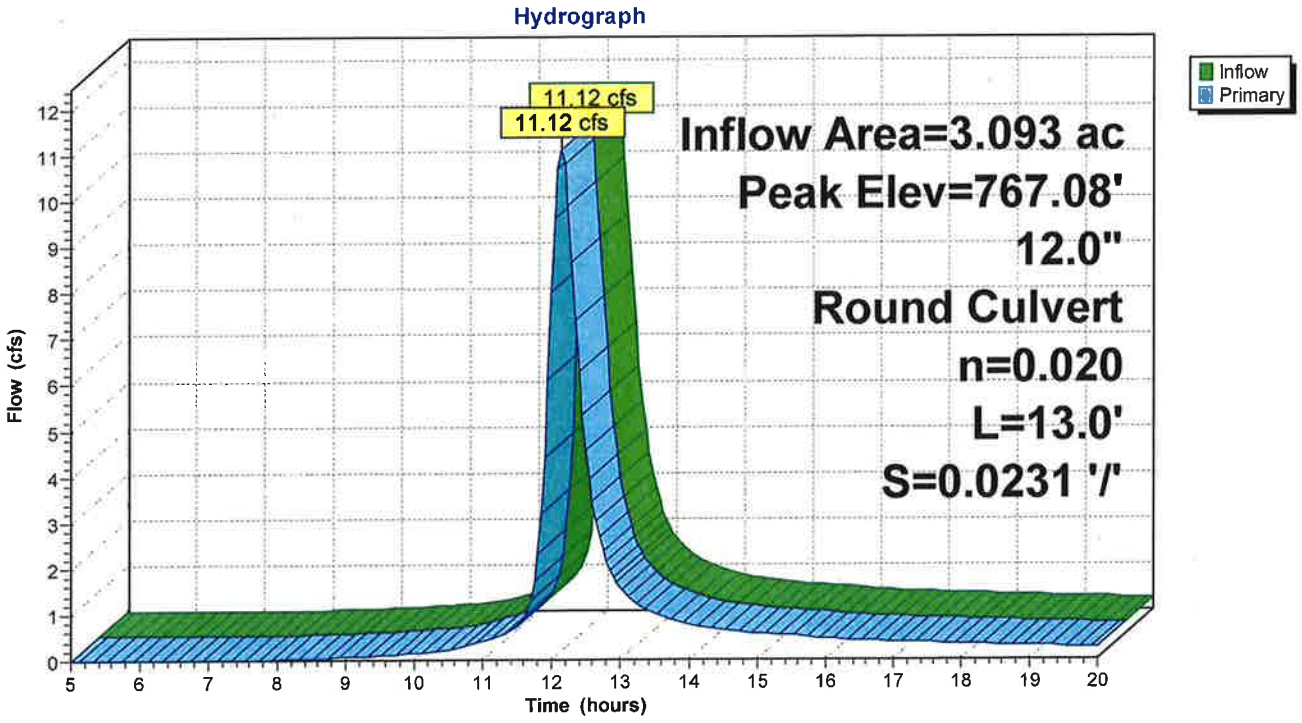
Inflow Area = 3.093 ac, 4.90% Impervious, Inflow Depth > 3.61" for 100 YEAR - Litchfield County event
Inflow = 11.12 cfs @ 12.15 hrs, Volume= 0.930 af
Outflow = 11.12 cfs @ 12.15 hrs, Volume= 0.930 af, Atten= 0%, Lag= 0.0 min
Primary = 11.12 cfs @ 12.15 hrs, Volume= 0.930 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 767.08' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	751.20'	**12.0" Round Culvert** L= 13.0' Ke= 1.000 Inlet / Outlet Invert= 751.20' / 750.90' S= 0.0231 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

Primary OutFlow Max=11.10 cfs @ 12.15 hrs HW=767.00' (Free Discharge)
1=Culvert (Inlet Controls 11.10 cfs @ 14.13 fps)

Pond 9P: Existing East CB



Summary for Pond 11P: Existing West CB & Outlet Pipe

[57] Hint: Peaked at 767.05' (Flood elevation advised)
[81] Warning: Exceeded Pond 9P by 0.92' @ 11.95 hrs

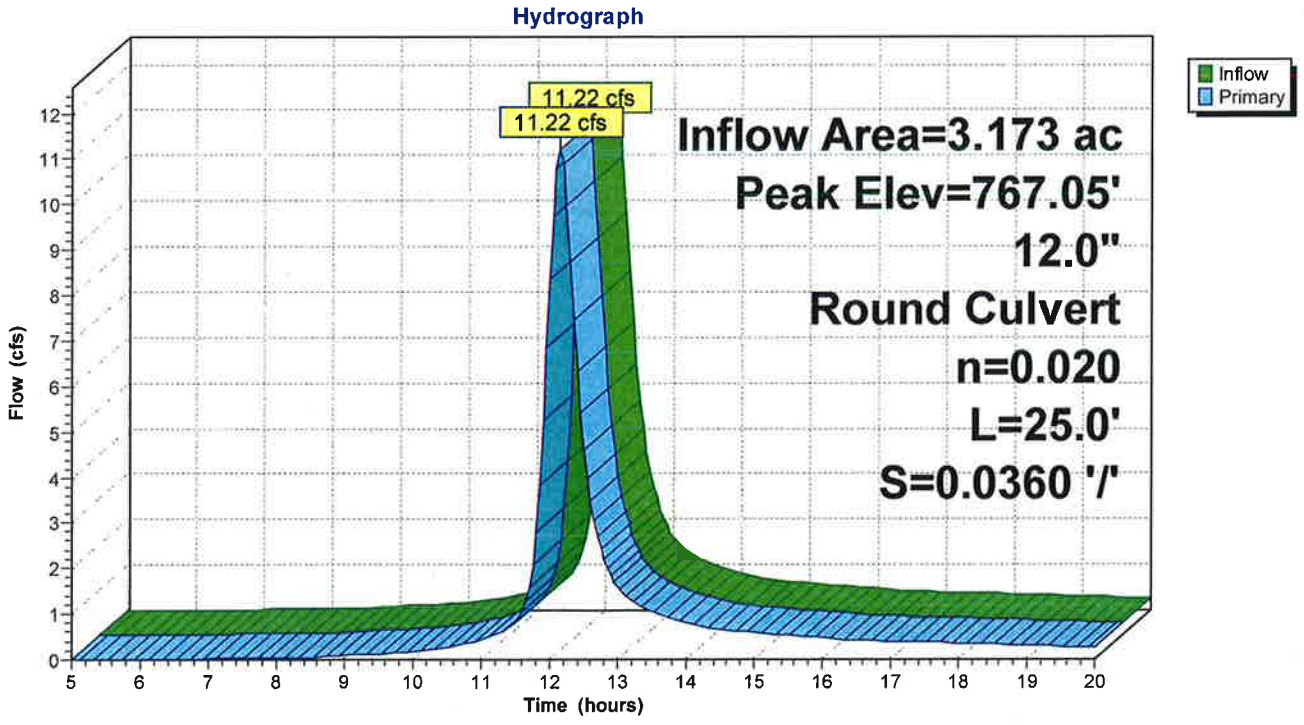
Inflow Area = 3.173 ac, 7.29% Impervious, Inflow Depth > 3.67" for 100 YEAR - Litchfield County event
Inflow = 11.22 cfs @ 12.15 hrs, Volume= 0.971 af
Outflow = 11.22 cfs @ 12.15 hrs, Volume= 0.971 af, Atten= 0%, Lag= 0.0 min
Primary = 11.22 cfs @ 12.15 hrs, Volume= 0.971 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 767.05' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	750.90'	**12.0" Round Culvert** L= 25.0' Ke= 1.000 Inlet / Outlet Invert= 750.90' / 750.00' S= 0.0360 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf

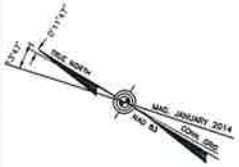
Primary OutFlow Max=11.20 cfs @ 12.15 hrs HW=766.98' (Free Discharge)
1=Culvert (Inlet Controls 11.20 cfs @ 14.25 fps)

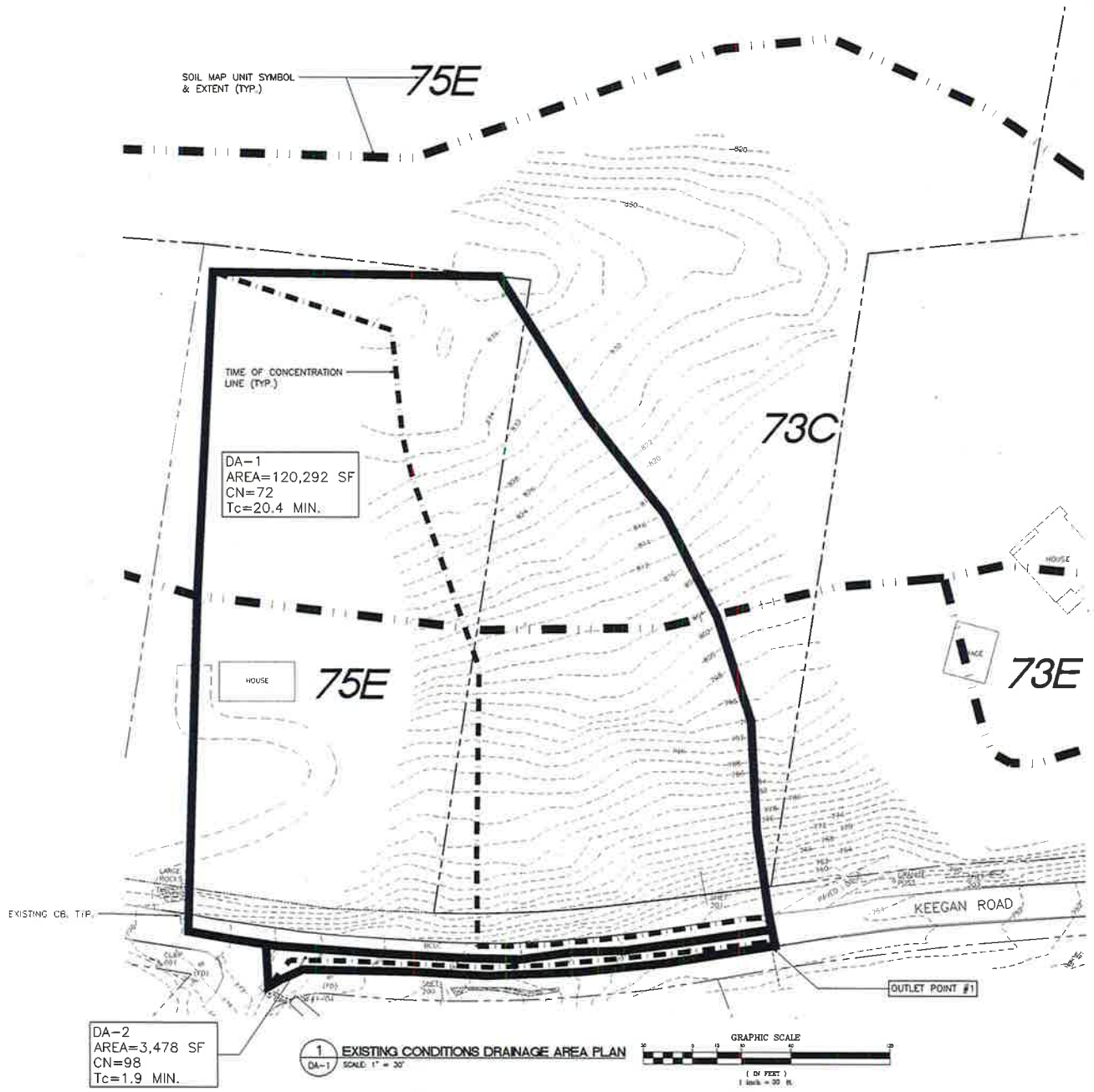
Pond 11P: Existing West CB & Outlet Pipe



APPENDIX E

Drainage Area Maps





1 DA-1 EXISTING CONDITIONS DRAINAGE AREA PLAN
SCALE: 1" = 30'

GRAPHIC SCALE
(IN FEET)
1 inch = 30 ft.

SOIL LEGEND

75E HOLLIS-CHATFIELD-ROCK OUTCROP COMPLEX, 15-45% SLOPES, VERY ROCKY (HSG D)
73C CHARLTON-CHATFIELD COMPLEX, 3-15% SLOPES, VERY ROCKY (HSG B)
73E CHARLTON-CHATFIELD COMPLEX, 15-45% SLOPES, VERY ROCKY (HSG B)

NOTES

1. DRAINAGE AREA MAP SUPPLEMENTED WITH EXISTING USGS MAPPING.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	11/17/15	MMR	DMD	STORMWATER ANALYSIS REPORT - DRAINAGE AREA MAPS

PROFESSIONAL ENGINEER SEAL

Cellco Partnership d.b.a Verizon Wireless

CENTEK engineering
Centered on Solutions
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

Cellco Partnership d.b.a verizonwireless

Cellco Partnership d/b/a Verizon Wireless
WIRELESS COMMUNICATIONS FACILITY

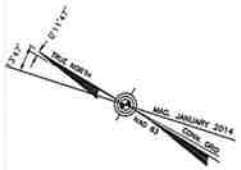
PLYMOUTH WEST RELO.
33 KEEGAN ROAD
PLYMOUTH, CT 06782

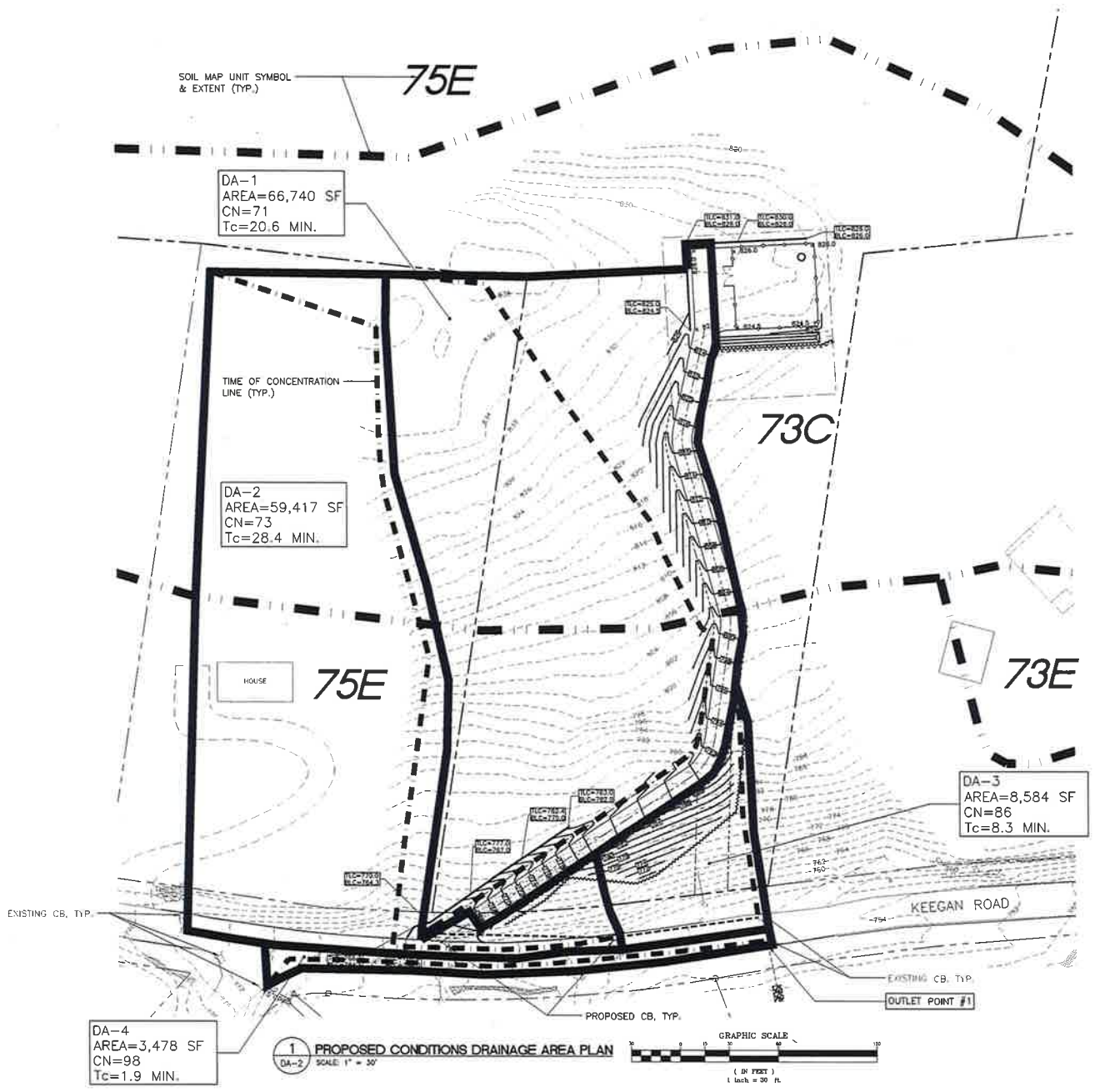
DATE: 11/03/15
SCALE: AS NOTED
JOB NO. 13321.000

EXISTING CONDITIONS DRAINAGE AREAS

DA-1

Sheet No. 1 of 2





1 DA-2 PROPOSED CONDITIONS DRAINAGE AREA PLAN
SCALE: 1" = 30'

GRAPHIC SCALE
(IN FEET)
1 inch = 30 ft.

SOIL LEGEND

75E HOLLIS-CHATFIELD-ROCK OUTCROP COMPLEX, 15-45% SLOPES, VERY ROCKY (HSG D)
73C CHARLTON-CHATFIELD COMPLEX, 3-15% SLOPES, VERY ROCKY (HSG B)
73E CHARLTON-CHATFIELD COMPLEX, 15-45% SLOPES, VERY ROCKY (HSG B)

NOTES

1. DRAINAGE AREA MAP SUPPLEMENTED WITH EXISTING USGS MAPPING.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	11/17/15	HJB	DMD	STORMWATER ANALYSIS REPORT - DRAINAGE AREA MAPS

PROFESSIONAL ENGINEER SEAL

Cellco Partnership d/b/a Verizon Wireless

CENTEK engineering
Centered on Solutions
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

Cellco Partnership d/b/a Verizon Wireless
WIRELESS COMMUNICATIONS FACILITY
PLYMOUTH WEST RELO.
33 KEEGAN ROAD
PLYMOUTH, CT 06782

DATE: 11/03/15
SCALE: AS NOTED
JOB NO. 13321.000

PROPOSED CONDITIONS DRAINAGE AREAS

DA-2

Sheet No. 1 of 1