Robinson+Cole

MICHAEL S. GIAIMO

53 State Street, 32nd Floor
Boston, MA 02109
Main (617) 557-5900
Fax (617) 557-5999
mgiaimo@rc.com
Direct (617) 557-5959

Via Electronic Mail to: jeffrey.ribeiro@capecodcommission.org

February 18, 2026

Cape Cod Commission
c/o Mr. Jeffrey Ribeiro, Regulatory Planner
3225 Main Street
Barnstable, MA 02630

Re:	Application for Development of Regional Impact
Applicant:	Cellco Partnership d/b/a Verizon Wireless ("Verizon")
Owner:	Verizon New England, Inc.
Property:	524 Great Neck Road North
Map/Parcel:	67-4-0
Zoning:	C-1 and Wireless Facility Overlay District
Proposed Use:	Personal Wireless Service Facility ("PWSF")

Dear Mr. Ribeiro:

In supplement to the materials filed with the above-referenced Application, and as requested by the Commission and its staff and its consultant, please accept this supplemental filing with the following materials:

- Supplemental RF information responsive to Isotrope's January 22, 2026 report, prepared by C Squared Systems, LLC, dated February 17, 2026;
- Stormwater Report, prepared by Dewberry Engineers Inc., revised February 12, 2026;
- Photosimulations, prepared by Dewberry Engineers Inc., depicting the PWSF at a height of 150 feet A.G.L.;
- Photosimulations, prepared by Dewberry Engineers Inc., depicting the PWSF at the proposed height of 130 feet A.G.L. with Verizon's wireless equipment at a centerline height of 126 feet A.G.L. and wireless equipment of hypothetical future collocators at centerline heights of 116 feet A.G.L., 106 feet A.G.L., and 96 feet A.G.L.

The supplemental RF information included in this filing, along with the RF Report at Tab 6 of the Application, demonstrates that Verizon experiences both coverage and capacity issues in nearby

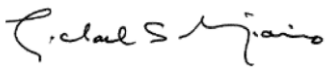
areas of Mashpee and needs the proposed PWSF in order to address these issues and support the heavy, widespread usage of the Verizon network in this area. The proposed tower height of 130 feet A.G.L. with Verizon's antennas at a centerline height of 126 feet A.G.L. will allow Verizon to improve wireless coverage along all frequency bands it is licensed by the FCC to operate on. It will also address an existing capacity deficiency that impacts Verizon's effective coverage in this area of Mashpee. It will do this by offloading excess demand from the north-facing sector of the existing "Mashpee South" site to address a capacity constraint that currently affects Verizon service within central Mashpee, particularly along Route 28 (Falmouth Road), Route 151 (Nathan Ellis Highway), Great Neck Road North and the surrounding roads, neighborhoods, businesses and shopping areas. The proposed PWSF will allow Verizon to enhance service and increase overall spectrum efficiency to support the heavy widespread usage in the area. There are no feasible alternative sites or technologies that will allow Verizon to address the coverage and capacity issues with its existing network in this area of Mashpee. Verizon needs the proposed tower height of 130 feet A.G.L. in order to achieve the necessary coverage and capacity improvements and still allow for collocation by other carriers at lower heights.

The applicant appreciates the Commission's careful review of this Application and respectfully requests that the Commission approve the proposed PWSF with a tower height of 130 feet as proposed in the Application.

The Application concerns a personal wireless services facility within the meaning of the Federal Telecommunications Act ("TCA"), 47 U.S.C. § 332(c)(7)(C)(ii), and it is submitted with a full reservation of the Applicants' rights under federal, state and local law.

Thank you for your attention to this matter and I look forward to the continued hearing on Monday, March 2nd.

Sincerely,



Michael S. Giaimo
Attorney for Cellco Partnership d/b/a Verizon Wireless

Enclosures

C Squared Systems, LLC
65 Dartmouth Drive
Auburn, NH 03032
Phone: (603) 644 2800
support@csquaredsystems.com

February 17, 2026

VIA EMAIL

Cape Cod Commission
c/o Jeffrey Ribiero, AICP
Regulatory Planner
3225 Main Street
Barnstable, MA 02630

SUBJECT: VERIZON / 524 GREAT NECK NORTH ROAD TELECOMMUNICATIONS FACILITY
RESPONSES TO REQUESTS FOR ADDITIONAL INFORMATION RELATED TO ISOTROPE'S REVIEW

Dear Mr. Ribiero:

This letter and attachments have been prepared by C Squared Systems on behalf of Verizon in response to the Cape Cod Commission's request for additional information during the public Subcommittee hearing held on February 2, 2026, and related to Isotrope's *Initial Review of Application for DRI* dated January 22, 2026 ("Isotrope Report"). The requests pertaining to C Squared's RF Report dated May 23, 2023 ("RF Report") or to the technical need and design of the proposed facility are discussed below. The RF Report includes maps labeled as Attachments A – G. For continuity, the additional maps included here are sequentially labeled as an extension to that initial set of attachments.

In the "Application Requirements:" section of the Isotrope Report, the DRI Review requirements are summarized and include comments on each. Four questions are posed with respect to the following requirement:

Demonstration of a coverage and/or capacity problem requiring a solution

Those questions and our responses are as follows:

1. *Is drive data collected in 2021 the most recent and accurate drive data available?*

   Yes. C Squared performed a drive test to satisfy the related DRI requirements when originally engaged on the project. A more recent drive test has not been performed. As discussed in the response to the next question, this data can still be considered accurate since there have been no substantive changes to Verizon's network in the area that would materially impact the 2021 drive data in the RF Report.

2. *The RF report was done in May, 2023. Do the report, the drive data and the prediction plots reflect current operating conditions (sites on air, operating parameters and bands, etc.)?*

   We have reviewed Verizon's current network and site configurations in the area around the proposed site. No new sites or configuration changes on existing sites have been identified that would materially impact the propagation plots or drive data presented in the RF Report.

C Squared Systems, LLC
65 Dartmouth Drive
Auburn, NH 03032
Phone: (603) 644 2800
support@csquaredsystems.com

3. *Verizon is building and attaching to a number of small cells on Cape Cod, yet this report contains no indication that any small cells exist in the area shown on the plots. Does this remain the case? Are any proposed or approved for the future that would be in the area of the plots?*

   As mentioned during the public meeting on February 2, Verizon does not operate any small cells in the area around the proposed site in the view of the RF Report maps, nor are any currently proposed or approved.

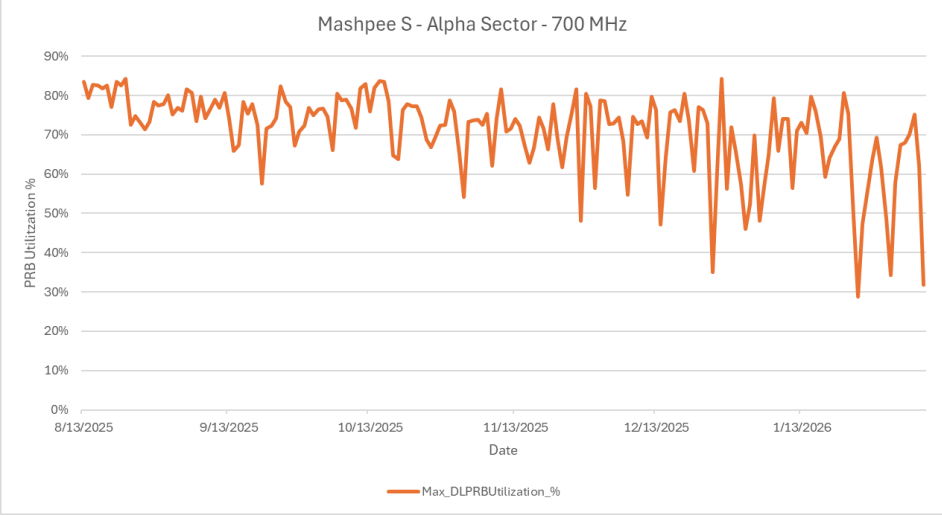
4. *Based on both the drive data and predictions provided, the area of the proposed site appears to be well covered by Verizon at 700 MHz. There are areas of predicted and measured substandard coverage at 2100 MHz. We do not see any data or claims to support a "network capacity" concern or argument supporting this site. Therefore, can we conclude the applicant's justification/demonstration of need for this site is as a 2100 MHz coverage enhancement only?*

   The proposed site is needed to both improve coverage at all frequency bands and to address an existing capacity deficiency. Both coverage and capacity are intertwined to some extent, however.

   The propagation maps and drive data present a single threshold of RSRP (Reference Signal Received Power) coverage, for both the 700 MHz and 2100 MHz bands that Verizon's LTE network is licensed by the FCC to operate on. While not included in the plots for simplicity, Verizon also uses its FCC licenses in the 850 MHz and 1900 MHz bands to support its LTE network in this area. As explained in the RF Report, the coverage range from a given site is greater for the lower frequencies (700 and 850 MHz) than it is for the higher frequencies (1900 and 2100 MHz). As such, the RF Report maps show that 2100 MHz coverage throughout much of the area fails to meet the -95 dBm threshold, even though 700 MHz coverage mostly does meet this threshold.

   Users located in areas with moderate or marginal 700 MHz coverage and poor 2100 MHz coverage will anchor primarily on the 700 MHz layer and cannot leverage the use of LTE channels on multiple frequencies (or carriers), known as carrier aggregation. Network traffic in these areas is directed to and concentrated on the 700 MHz frequency band which has less bandwidth and capacity than the 2100 MHz band.

   Shown below is the % PRB (Physical Resource Block) Utilization of the "Mashpee S" alpha sector currently providing service to the areas along Route 28, Route 151, Great Neck Road, and the Mashpee Commons (see Attachment C of the RF Report). The data points consist of the busiest hour between 8 a.m – 5 p.m. for each day over a span of 180 days (8/13/2025 – 2/8/2026) show that the % PRB Utilization consistently exceeds 70% and often exceeds 80%.



   The proposed site is needed to both offload this sector of the "Mashpee S" site and improve coverage at all frequency bands to enhance service and increase overall spectrum efficiency to support the heavy, widespread usage in the area.

C Squared Systems, LLC
65 Dartmouth Drive
Auburn, NH 03032
Phone: (603) 644 2800
support@csquaredsystems.com

The Isotrope Report later groups the following two requirements together on page 2 of its report:

- **Demonstration that proposed location and height will solve (the) problem And**
- **Demonstration that proposed height is minimum necessary to achieve coverage of target area.**

and comments as follows:

> *We do not see any plots of lower height to demonstrate that the proposed height is the minimum necessary to meet the applicant's needs. Please provide them.*

Attachments H and I illustrate the 700 MHz and 2100 MHz coverage for Verizon with antennas on the proposed site at a reduced height of 106' and 86' AGL, respectively. As these heights are in reference to the antenna centerline, they correspond to a tower height of 110' and 90'. Both can be viewed in comparison to Attachment B of the RF Report, which illustrates the coverage of the proposed site with the proposed 126' antenna centerline. From these maps of a single coverage threshold, there are subtle reductions in the areas covered at 700 MHz, with more noticeable reductions at 2100 MHz, as the tower height is decreased.

The coverage levels and quality of service experienced by users are not uniform above and below the -95 dBm coverage threshold shown. The levels vary in the sense that users located in the green or yellow areas with coverage levels significantly stronger than the -95 dBm threshold will have better service and reliability in more locations (i.e. indoors) than users located closer to the threshold boundary, where coverage would be at or just above this minimum threshold.

User experience is strongly correlated with RSRP and other related RF metrics such that users in areas with strong coverage generally achieve higher quality service with better throughput and lower latency due to higher modulation and coding schemes that can be supported in favorable RF conditions.

Attachments J and K illustrate the RSRP coverage differences at 700 MHz when comparing 126' to 106', and 126' to 86' antenna centerlines, respectively. Attachment J shows that if its antennas were lowered to 106' AGL, Verizon would suffer a loss of 2-4 dB to the west of the site along Route 151 and to the residential areas between Old Barnstable Road and Route 151. If lowering its antennas to 86' AGL, this area of reduced coverage expands and includes coverage losses of 4-8 dB, and as high as 10 dB along Route 151 as shown by Attachment K. Please note that these plots exclude areas with very strong coverage (> -75 dBm) and very weak coverage (< -115 dBm) to focus on areas in between where the stronger coverage would support improved wireless service as described above.

Attachments L and M are similar to Attachments J and K, except they are based on Verizon's 2100 MHz coverage. The impacts of a lower tower height are more pronounced and impact larger areas than shown at 700 MHz.

Based on this analysis, a reduced tower height will have a tangible, negative impact on Verizon's ability to provide wireless services throughout this area and reduce the potential for future tenants with similar coverage and capacity needs to locate antennas below Verizon on the tower. Therefore, we respectfully request that the Commission vote in favor of the proposed tower height of 130', allowing Verizon to locate its antennas at a centerline of 126' AGL. If the tower were to be designed with only Verizon in mind and to minimize the visual impact compared to the proposed height, a slight tower height reduction of 10' would still allow Verizon to largely satisfy its coverage and capacity needs in the area.

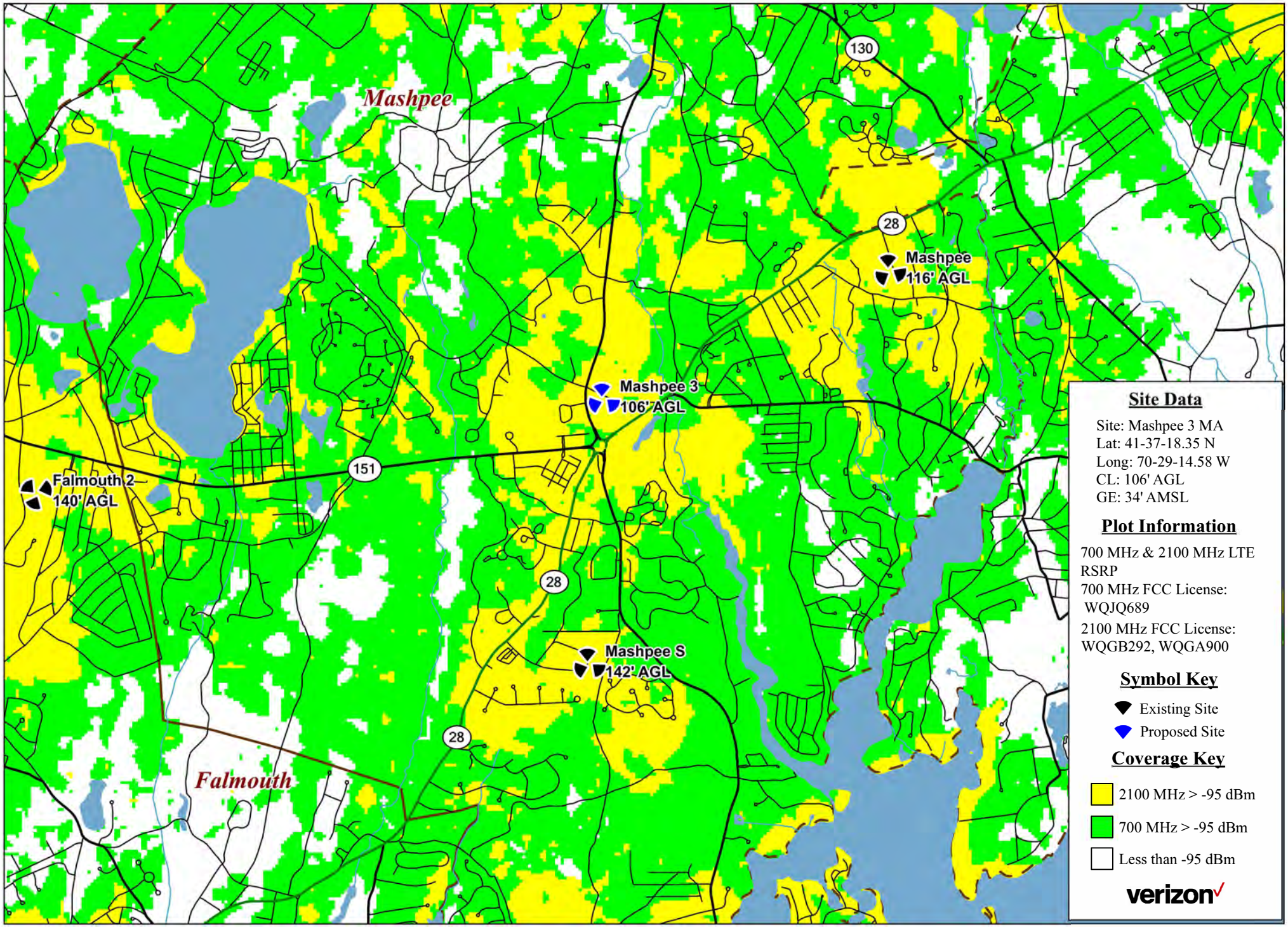
Sincerely,

Keith Vellante

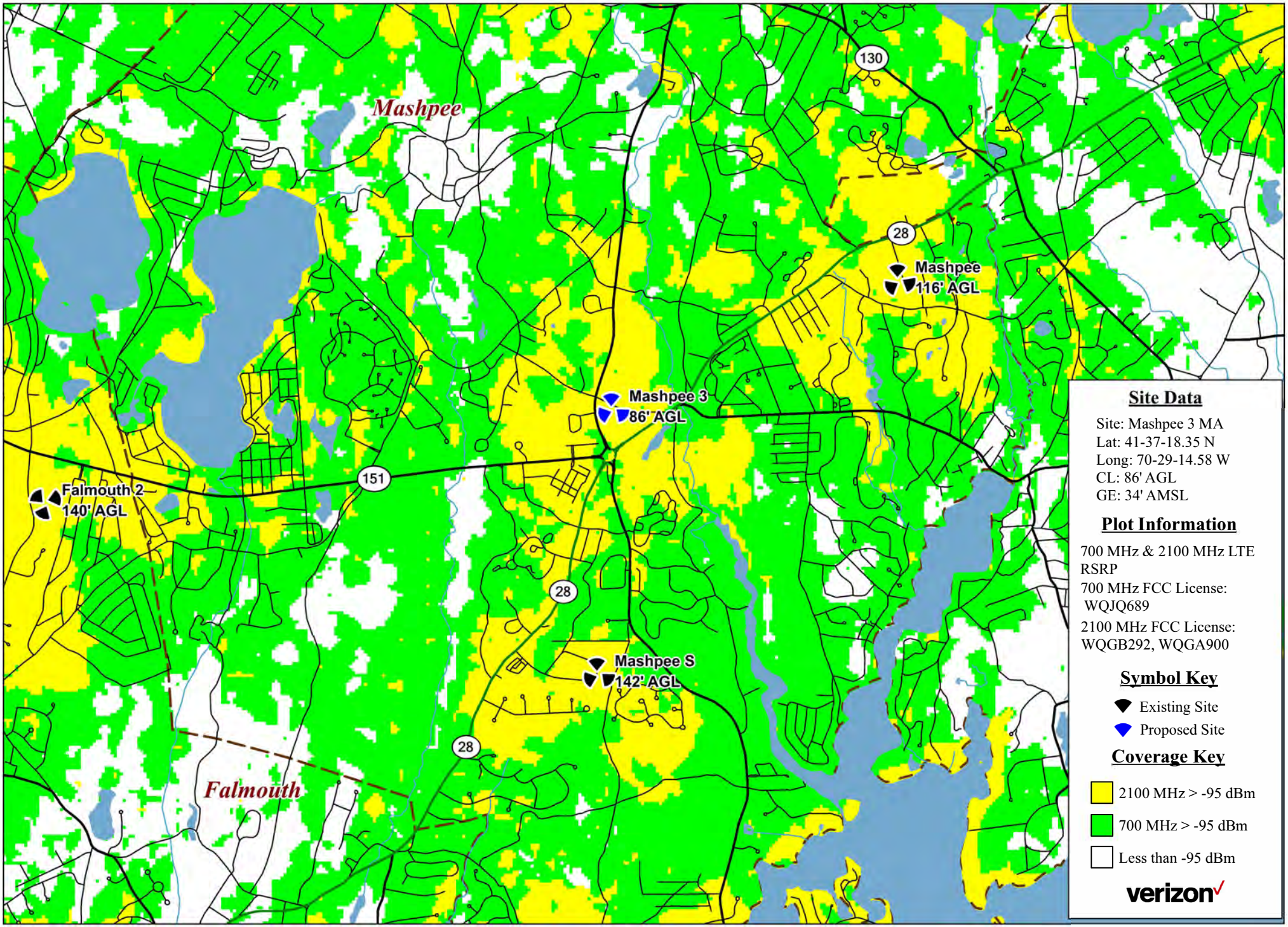
Keith Vellante
RF Engineer
C Squared Systems, LLC
Contractor to Verizon Wireless

Enclosures (6)

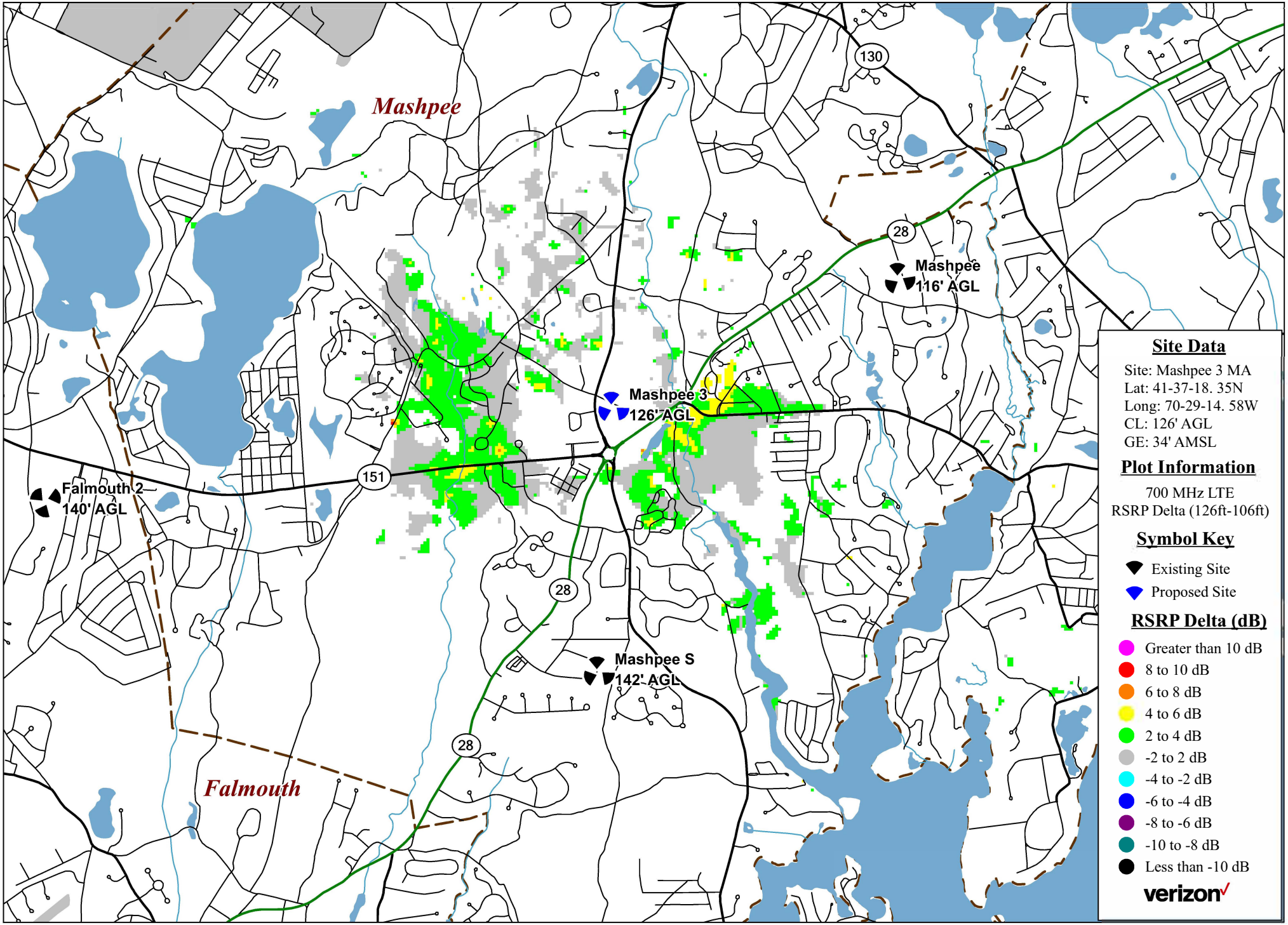
Attachment H:
Mashpee 3 MA - 700 & 2100 MHz LTE Coverage with Proposed Site at 106' AGL



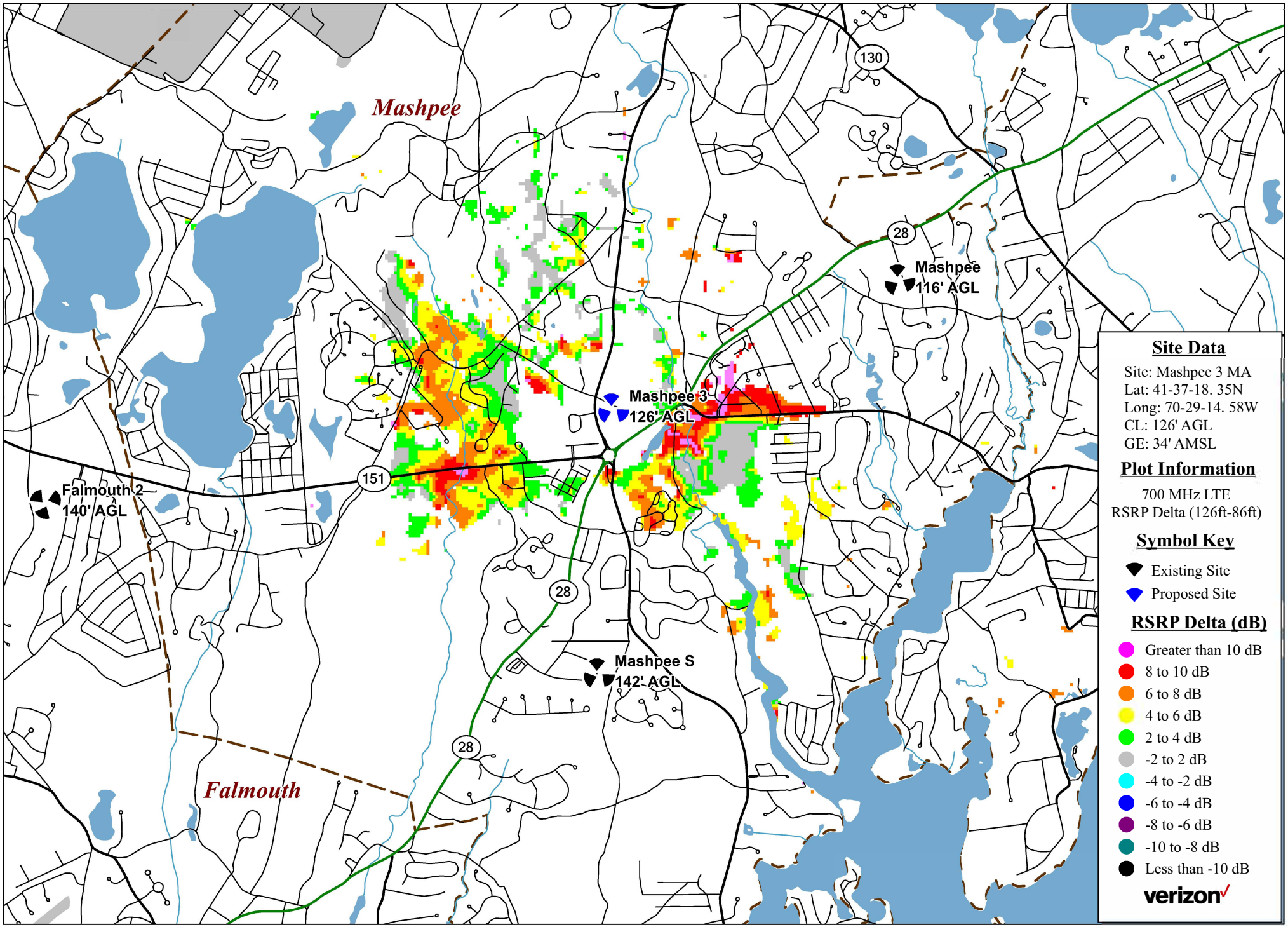
Attachment I:
Mashpee 3 MA - 700 & 2100 MHz LTE Coverage with Proposed Site at 86' AGL



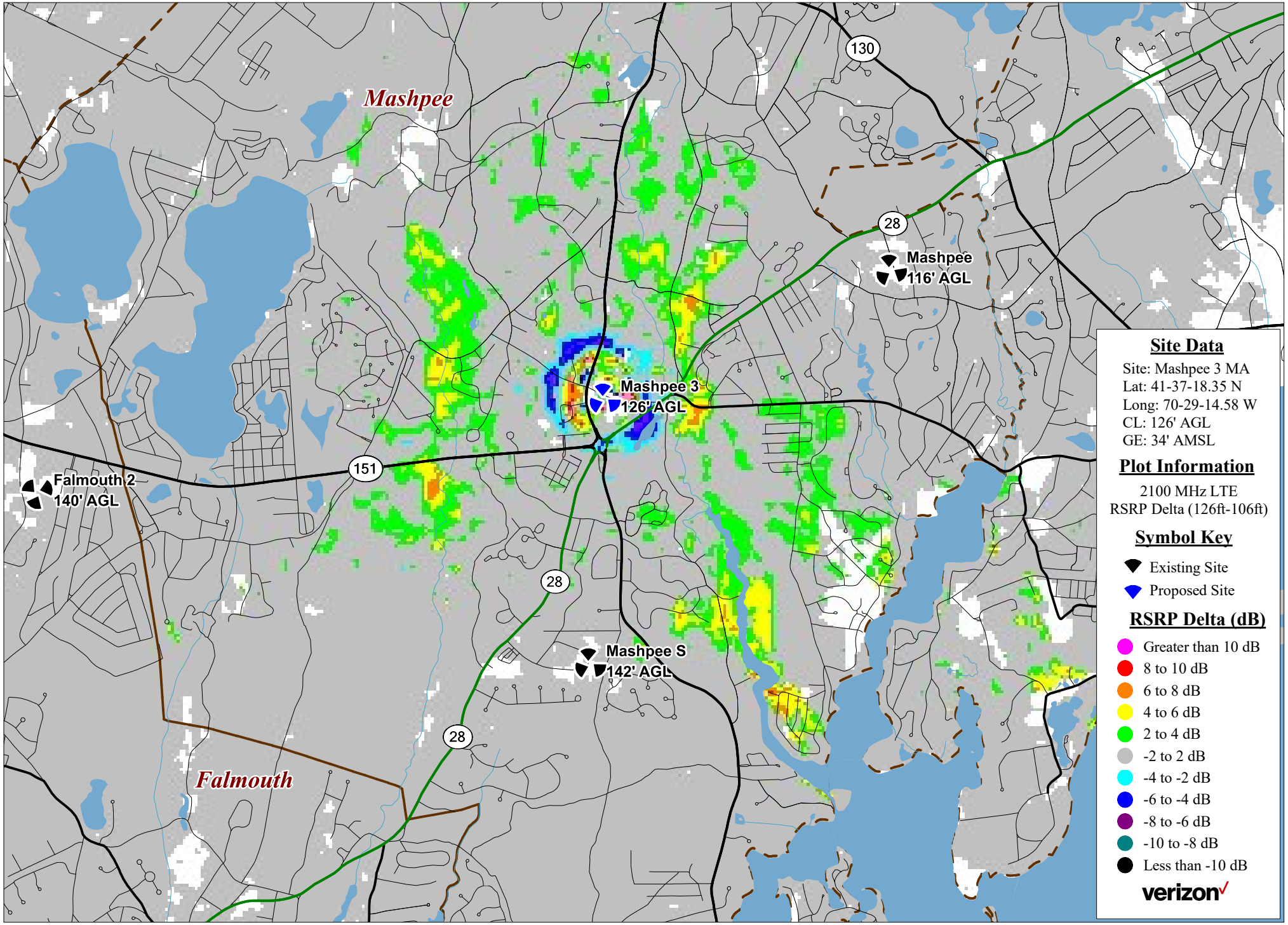
Attachment J:
Mashpee 3 MA - 700 MHz LTE RSRP Delta (126' - 106') where RSRP < -75 dBm and > -115 dBm



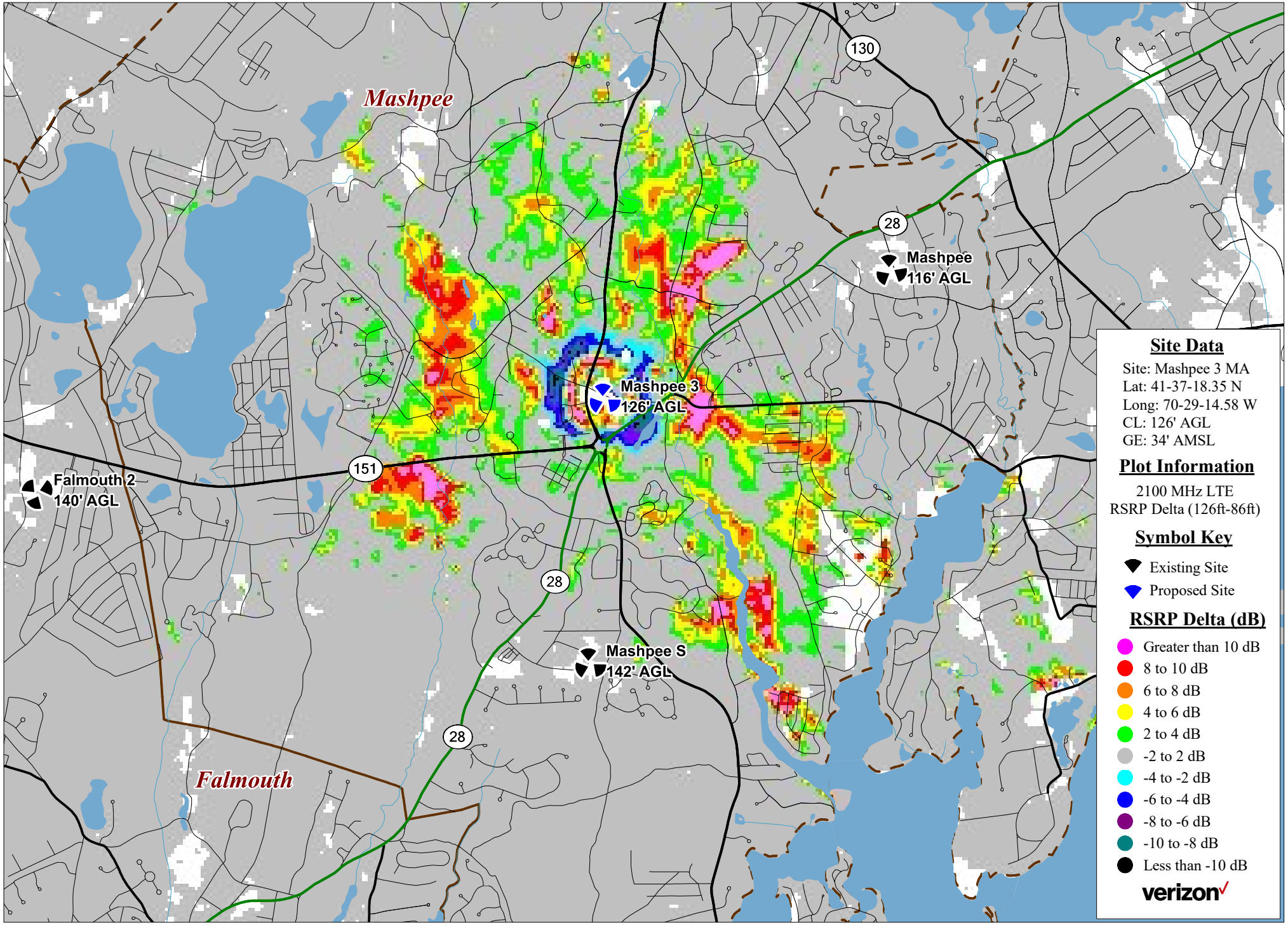
Attachment K:
Mashpee 3 MA - 700 MHz LTE RSRP Delta (126' - 86') where RSRP < -75 dBm and > -115 dBm

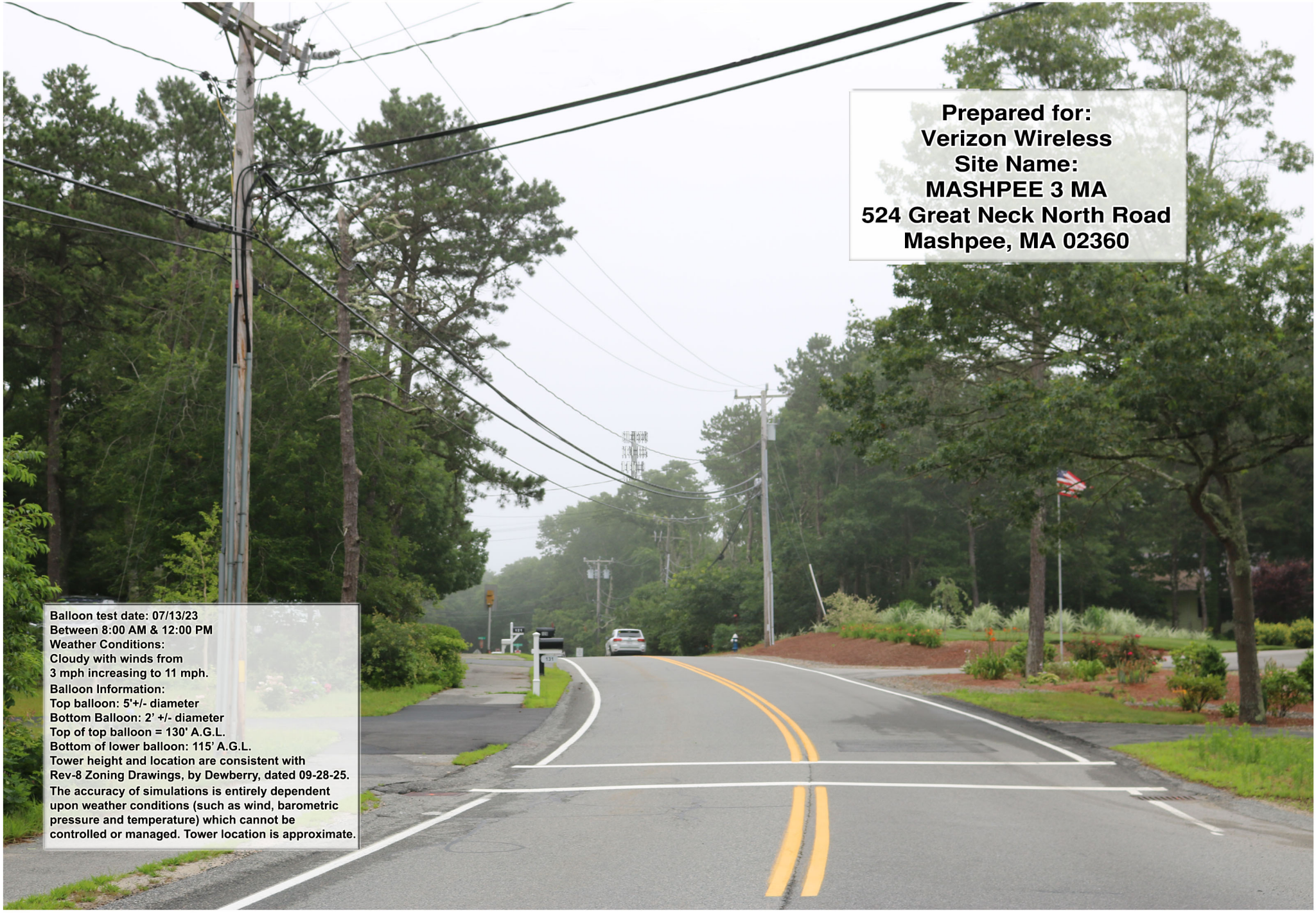


Attachment L:
Mashpee 3 MA - 2100 MHz LTE RSRP Delta (126' - 106') where RSRP < -75 dBm and > -115 dBm



Attachment M:
Mashpee 3 MA - 2100 MHz LTE RSRP Delta (126' - 86') where RSRP < -75 dBm and > -115 dBm

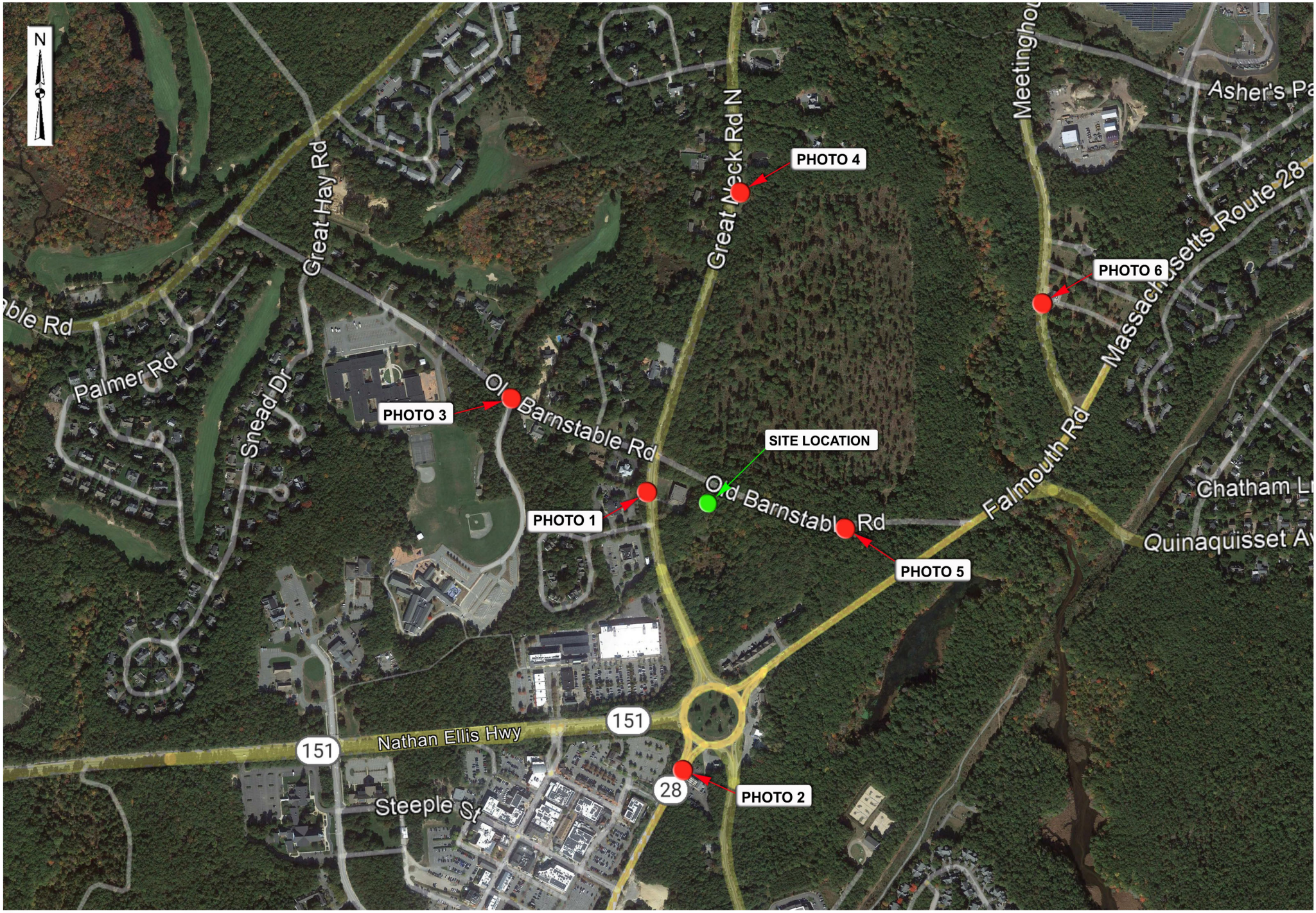




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MASHPEE 3 MA
524 Great Neck North Road
Mashpee, MA 02360

Dewberry



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MASHPEE 3 MA
524 Great Neck North Road
Mashpee, MA 02360

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Existing View



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MASHPEE 3 MA

View Facing East From Great Neck Rd N

PHOTO 1A

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Proposed View



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MASHPEE 3 MA

View Facing East From Great Neck Rd N

PHOTO 1B

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MASHPEE 3 MA

View Facing North From Falmouth Road

PHOTO 2A

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MASHPEE 3 MA

View Facing North From Falmouth Road

PHOTO 2B

Dewberry



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MASHPEE 3 MA

View Facing Southeast From Old Barnstable Road

PHOTO 3A

Dewberry



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MASHPEE 3 MA

View Facing Southeast From Old Barnstable Road

PHOTO 3B

Dewberry



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MASHPEE 3 MA

View Facing South From Great Neck Road N

PHOTO 4

Dewberry



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MASHPEE 3 MA

View Facing West From Old Barnstable Road

PHOTO 5A

Dewberry



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MASHPEE 3 MA

View Facing West From Old Barnstable Road

PHOTO 5B

Dewberry



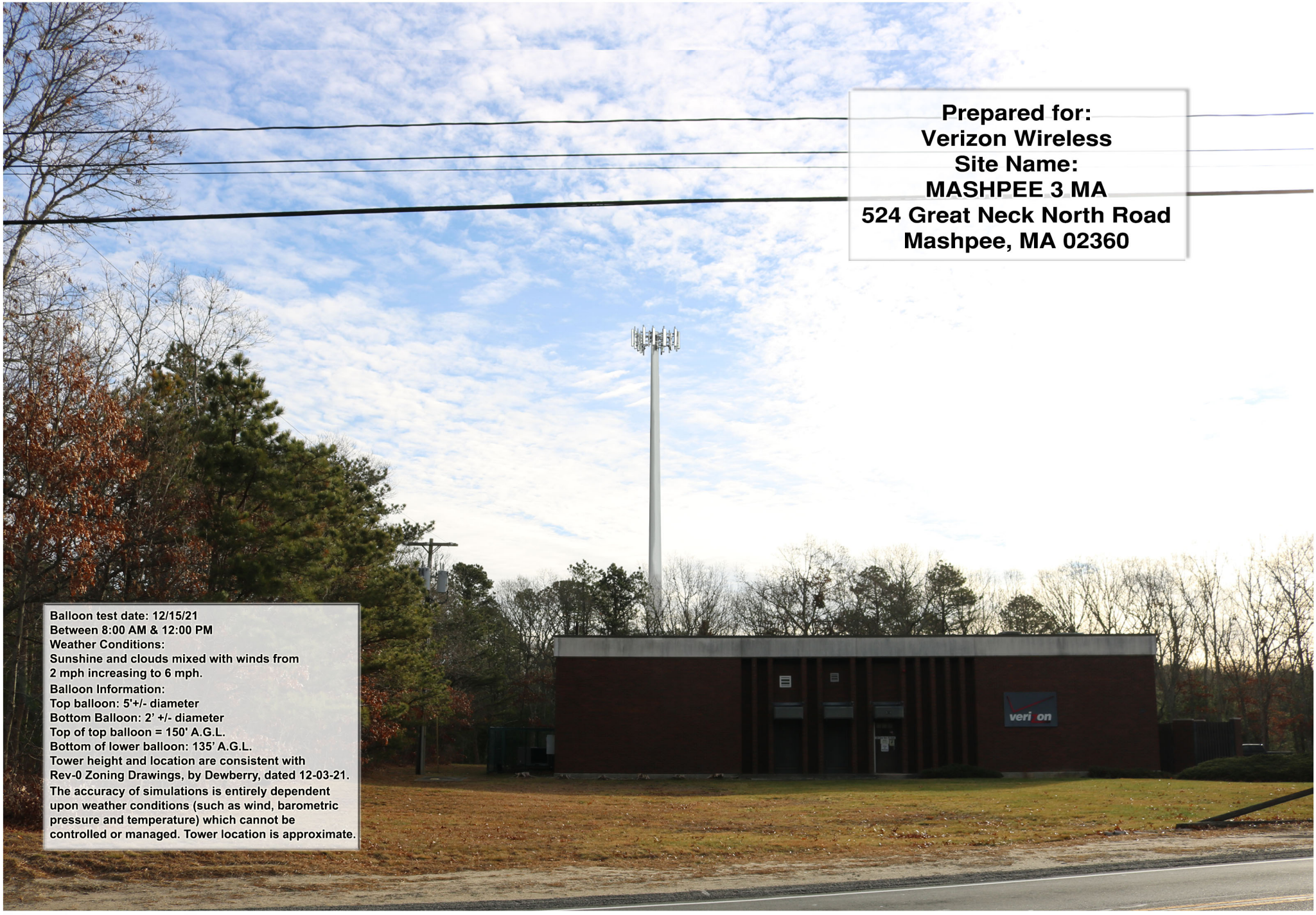
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MASHPEE 3 MA

View Facing Southwest From Meetinghouse Road

PHOTO 6

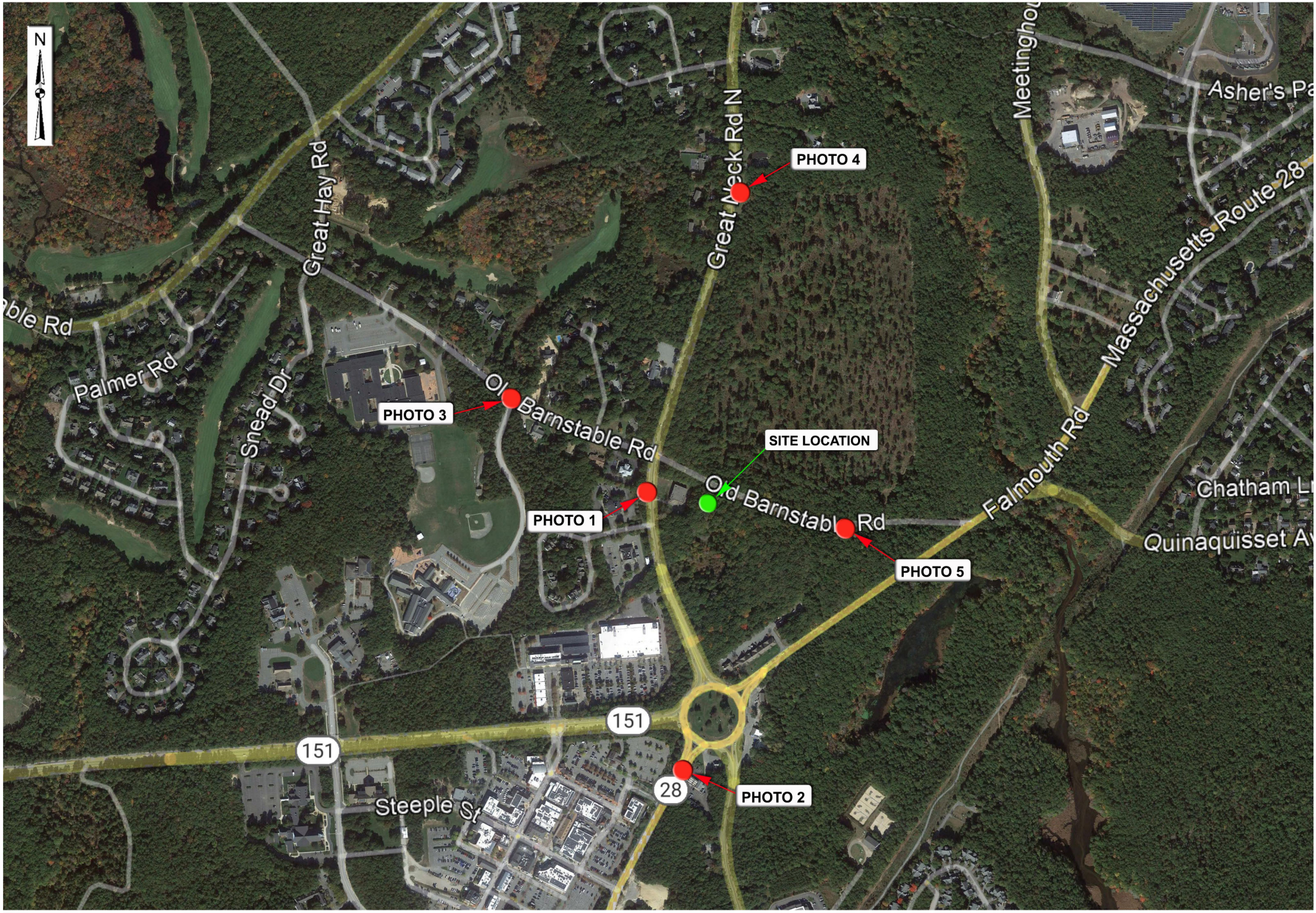
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MASHPEE 3 MA
524 Great Neck North Road
Mashpee, MA 02360

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MASHPEE 3 MA
524 Great Neck North Road
Mashpee, MA 02360

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MASHPEE 3 MA

View Facing East From Great Neck Rd N

PHOTO 1A

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MASHPEE 3 MA

View Facing East From Great Neck Rd N

PHOTO 1B

Dewberry



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MASHPEE 3 MA

View Facing North From Falmouth Road

PHOTO 2A

Dewberry



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MASHPEE 3 MA

View Facing North From Falmouth Road

PHOTO 2B

(Page 6 of 12)

Dewberry

Existing View



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MASHPEE 3 MA

View Facing Southeast From Old Barnstable Road

PHOTO 3A

Dewberry

Proposed View



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MASHPEE 3 MA

View Facing Southeast From Old Barnstable Road

PHOTO 3B

Dewberry

Existing View



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MASHPEE 3 MA

View Facing South From Great Neck Road N

PHOTO 4A

Dewberry



verizon WIRELESS

MASHPEE 3 MA

View Facing South From Great Neck Road N

PHOTO 4B

Dewberry



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MASHPEE 3 MA

View Facing West From Old Barnstable Road

PHOTO 5A

Dewberry



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MASHPEE 3 MA

View Facing West From Old Barnstable Road

PHOTO 5B

Dewberry

STORMWATER REPORT

Mashpee 3 MA

524 Great Neck Road North

Mashpee, MA 02360

February 12, 2026



INFORMATION PREPARED FOR:
VERIZON WIRELESS
51 ALDER STREET
MEDWAY, MA 02053

SUBMITTED TO:
TOWN OF MASHPEE, MA
16 GREAT NECK ROAD NORTH
MASHPEE, MA 02649

Dewberry

Dewberry Engineers Inc.
99 Summer Street, Suite 700
Boston, MA 02110-1200

617.695.3400
617.695.3310 fax
www.dewberry.com

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Figure 2 – Proposed Drainage Area Plan

Appendices

Appendix A – NRCS Soil Map Survey & Depth to Water Table

Appendix B –Rainfall Data

Appendix C – Pre-development Hydrological Analysis

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Appendix E – Zoning Drawings

Appendix F – MA DEP Stormwater Standard Calculations

Appendix G – TSS Removal Work Sheet

PROJECT DESCRIPTION

Verizon Wireless is proposing to develop a telecommunications facility located off Great Neck Road North in Mashpee, MA. The development will consist of installing telecommunications and supporting equipment within a 50ft. by 50ft. (approx. 2,500 s.f.) gravel compound. To access the proposed gravel compound from the existing paved driveway, a 25± ft. long new gravel access driveway will be constructed. This new access driveway will be behind an existing Verizon building structure. In order to show the overall stormwater effect of the proposed work on the existing watershed, Dewberry Engineers Inc., (Dewberry) has completed the following drainage analysis of the existing and proposed conditions.

EXISTING DRAINAGE CONDITIONS

The watershed area that was taken into consideration for this analysis is 3.34± acres and is located east from Great Neck Road North. The watershed's highpoint is located on the northwest corner of the locus property near Great Neck Road North and Old Barnstable Road. Besides the existing paved driveway, grass areas, and Verizon building, the area around the locus property is composed of primarily wooded forest with underbrush. Refer to Figure 1 for the watershed area and flow patterns.

The watershed's boundary begins near the high point at the northwest corner of the locus property near Great Neck Road North and Old Barnstable Road. At Old Barnstable Road, the watershed runs southeast. The watershed turns west and continues southwest until it reaches the delineated wetland at the wooded area. The wetland forms the south boundary. The watershed continues towards Great Neck Road North which acts as the western boundary.

The existing runoff flows from the high point across an existing wooded area near the existing Verizon building. The runoff continues gradually downhill southeast through the wooded area until it reaches the delineated wetland to the south. Since the objective of this analysis is to determine if the peak discharges would be affected between the pre-post construction conditions, by analyzing the watershed at the wetland area, we can determine if there will be any changes to the flows prior to entering the existing wetland. This wetland area was taken as the Point of Analysis for this watershed. Refer to Figure 1 for the existing topographic map and flow patterns.

According to USDA soil maps of the area, the watershed is primarily composed of fine sandy loam, loamy coarse sand and fine sandy loam with hydrologic soil groups (HSG) A & B ratings. See Appendix A for soil map survey.

PROPOSED DRAINAGE CONDITIONS

In the proposed condition, the telecommunications compound will be accessed by the existing paved driveway/parking area off of Great Neck Road North. The existing driveway wraps around the existing Verizon building towards the building's rear. At the rear driveway, a new gravel driveway segment will be used to access the compound. The proposed access driveway will have a total length of approximately 25± feet. In the proposed condition, the access driveway and proposed compound will be covered with compacted gravel. Refer to Figure 2 for proposed watershed area and flow patterns.

The new compound and access driveway will not affect the watershed flow patterns from the highpoint to the new compound segment. Once the runoff reaches the new driveway/compound area, it will be routed around the compound by proposed drainage swales before entering a proposed infiltration trench and reconnecting to the existing flow patterns. The drainage channel begins at Point 4 and will continue southeast of the compound until reaching Point 5. Once the runoff is discharged from the drainage swale at point 5, the flow will pass through a proposed 25' long infiltration trench (Appendix F). After the infiltration trench, flow will gradually flow downhill toward the wetland, similar to the existing condition pattern. Refer to Figure 2 for time of concentration flow path.

PRE/POST DRAINAGE RESULTS & ANALYSIS

The primary change between the existing and proposed conditions is the small increase in land cover represented by the improvements made to the gravel access driveway and new compound. Since the 2,871± s.f. increase in surface cover is minimal in comparison to the overall watershed of 145,670± s.f., the effect from the surface cover change is negligible. Additionally, with the placement of the drainage channels and infiltration trench around the compound runoff will allow more time to dissipate runoff along the route. This results in a peak discharge reduction in the proposed condition. This is evident when comparing the 10-year, 25-year. 50-year and 100-year storms in the pre/post conditions. See Table 1 & 2 below.

Type III 24-hour storm events were modeled using rainfall data from the Northeast Regional Climate Center (NRCC) data base version 1.12 obtained online. Rainfall values for the locus area were used: 4.9 inches, 6.1 inches, 7.3, and 8.6 inches for the 10-year, 25-year, 50-year, and 100-year storm events respectively. See Appendix B for rainfall data.

Using the software HydroCAD ver. 9.0, the watershed run-off volume and peak discharge rates for the 10-year, 25-year, 50-year, and 100-year 24-hour storm events are as follows:

TABLE 1: PRE-DEVELOPMENT CONDITIONS

10-year Storm (24 hrs)		25-year Storm (24 hrs)		50-year Storm (24 hrs)		100-year Storm (24 hrs)	
Run-off	Peak	Run-off	Peak	Run-off	Peak	Run-off	Peak

Volume	Discharge	Volume	Discharge	Volume	Discharge	Volume	Discharge
0.13 af	0.53 cfs	0.25 af	1.28 cfs	0.40 af	2.24 cfs	0.59 af	3.48 cfs

Refer to Appendix C for the detailed results.

TABLE 2: POST-DEVELOPMENT CONDITIONS

10-year Storm (24 hrs)		25-year Storm (24 hrs)		50-year Storm (24 hrs)		100-year Storm (24 hrs)	
Run-off Volume	Peak Discharge	Run-off Volume	Peak Discharge	Run-off Volume	Peak Discharge	Run-off Volume	Peak Discharge
0.13 af	0.45 cfs	0.26 af	1.01 cfs	0.42 af	1.73 cfs	0.61 af	2.64 cfs

Refer to Appendix D for the detailed results.

CONCLUSION

Overall, due to the size of the existing watershed (3.34± acres) compared to the size of the area being impacted by the proposed access driveway and compound (0.07± acres), there is minimal effect between the existing and proposed conditions for the watershed. With the placement of the access driveway and stormwater features, the proposed design allows runoff from the nearby hill more time to dissipate as it proceeds toward the point of analysis. This provides a slight decrease in the peak discharge rates in the 10-year, 25-year, 50-year, and 100-year events. Therefore, the watershed will still see an overall decrease in the peak discharges between the existing and proposed conditions.

DESIGN METHODOLOGY

Per the requirements of the Town of Mashpee Site Plan and Special Permit Regulations and Procedures Section 174-27.2 Stormwater Management, the stormwater analysis and supporting documents were prepared in accordance with Massachusetts Stormwater Management Standards Volume 1 Chapter 1. The following are the Massachusetts Department of Environmental Protection standards accompanied by an explanation of how each standard pertains to this project. Required calculations for each standard can be found in Appendix F:

MADEP Standard 1*: No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*

The proposed design implements best management practices prior to any wetland areas and mitigates runoff to avoid high discharge velocities. Additionally, the way flow proceeds across the watershed is not conducive to creating high velocities and thus, erosion. The proposed installation will require minimal maintenance visits, reducing the potential for collecting contaminants.

MADEP Standard 2: *Stormwater management systems shall be designed so that the post-development peak discharge rates do not exceed pre-development discharge rates.*

This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

As stated in the Proposed Drainage section of this report, peak discharges for the 10-year, 25-year, 50-year and 100-year 24-hour storms do not increase between the pre and post conditions. This can be attributed to the minimal change in land cover proposed, stormwater features and the use of the existing topography to avoid changing the existing flow paths for the surrounding area. See Existing/Proposed Drainage Results and Analysis for further explanation.

MADEP Standard 3: *Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.*

Per Massachusetts Stormwater Standards, the required recharge volume shall be calculated, accounting for the runoff created by the proposed site changes. For the purposes of calculations for this standard, the proposed gravel driveway and compound area were utilized. As described previously, an infiltration trench shall be installed for infiltration and groundwater recharge purposes (See Appendix F for detailed recharge/infiltration calculations).

Additionally, as stated in MA DEP Vol. 3 Ch. 1 Pg. 37, when one BMP structure is used for both TSS removal and infiltration, the item must be sized to treat both the required recharge volume and water quality treatment volume. Looking at the calculations provided in Standard 4 for water quality treatment volume (See Appendix F), it is shown the recharge volumes are larger than the water quality volume. Therefore, the recharge volume values were used to size the proposed infiltration trench accordingly.

In order to maximize the separation between the existing groundwater and the bottom of the proposed infiltration trench, the infiltration trench shall be constructed at the minimum depth of 3 feet. Groundwater Depth was gathered from NRCS soil data for the area. See Appendix F for additional information. This will allow for the maximum infiltration of runoff and will minimize the 72-hour drawdown times observed (See Appendix F).

MADEP Standard 4: *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids.*

In the long-term, the following procedures shall be utilized to prevent pollution and source control:

- Good housekeeping
- Routine inspections and maintenance of stormwater BMP's
- Spill prevention
- Maintenance of lawns, gardens, and other landscaped items
- Material storage

As part of the TSS removal, the primary BMP utilized is the proposed infiltration trench. As specified in the Massachusetts BMP Design Manual, each infiltration trench will require pretreatment. In this particular case, a peastone gravel diaphragm shall be installed between the proposed gravel areas and infiltration trench. This shall capture runoff as sheet flow directly from the proposed impervious surface and treat it before entering the infiltration trench.

As required by the MA DEP standards, the overall site shall meet an 80% TSS threshold. The BMP train of peastone diaphragm to infiltration trench will treat all the impervious areas. See Appendix G for detailed TSS removal calculations for each BMP.

MADEP Standard 5: *For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If, through source control and/or pollution prevention, all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L.c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.*

Not Applicable, the site does not have potential for higher pollutant loads and does not require source control.

MADEP Standard 6: *Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention*

measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1. or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of the public water supply.

Not Applicable, the proposed development is not in the vicinity of any water bodies used for public water supply, public use, or commercial purposes.

MADEP Standard 7: *A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.*

As stated previously, the proposed development is in accordance with applicable Stormwater Management Standards and town bylaws and regulations.

MADEP Standard 8: *A plan to control construction-related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.*

During construction, silt-fences shall be provided along the downhill side of the proposed compound. Erosion and sediment control will be provided in accordance with the notes provided in "General Notes" on the site plans. The site shall be stabilized before stakes are removed. (See Appendix E).

The general contractor or designated stormwater management inspector shall perform inspections every 7 calendar days, or at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.25 inches or greater. The following inspection and maintenance practices will be used to maintain erosion and sediment controls.

- Accumulated sediment will be removed from silt fencing when it has reached one-third the height of the fence

- Silt fences will be inspected for a depth of sediment, for tears, to see if fabric is securely attached to fence posts and to see that the fence posts are firmly in the ground.

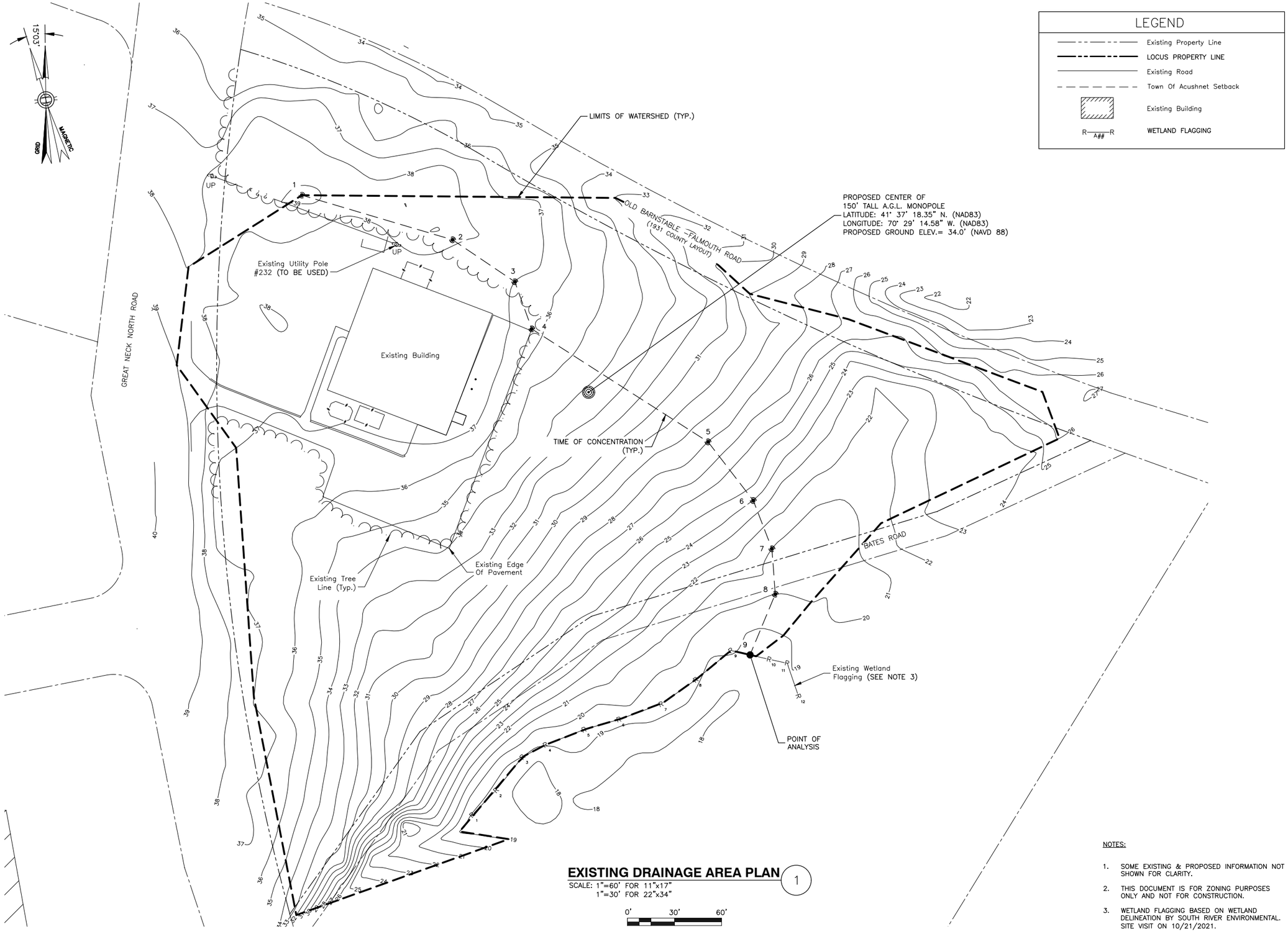
MADEP Standard 9: *A Long -Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.*

All storm water features on site requiring maintenance shall be inspected after all major storm events and during regularly scheduled maintenance visits. This includes the proposed drainage swales, pea gravel diaphragm, and infiltration trench. Maintenance shall include removing accumulated sediment, debris, leaves, grass, and tree seedlings from the surface of these storm water features as specified in the Massachusetts DEP BMP storm water handbook.

MADEP Standard 10: *All illicit discharges to the stormwater management system are prohibited.*

There are no illicit discharges within the area of concern.

FIGURE 1



EXISTING DRAINAGE AREA PLAN 1

SCALE: 1"=60' FOR 11"x17"
1"=30' FOR 22"x34"

0' 30' 60'

NOTES:

1. SOME EXISTING & PROPOSED INFORMATION NOT SHOWN FOR CLARITY.
2. THIS DOCUMENT IS FOR ZONING PURPOSES ONLY AND NOT FOR CONSTRUCTION.
3. WETLAND FLAGGING BASED ON WETLAND DELINEATION BY SOUTH RIVER ENVIRONMENTAL. SITE VISIT ON 10/21/2021.

verizon WIRELESS

VERIZON WIRELESS
900 CHELMSFORD STREET
TOWER 2 FLOOR 5
LOWELL, MA 01581

MASHPEE 3 MA

REFERENCE DRAWINGS

B	04/28/23	FOR COMMENT
A	10/10/22	FOR COMMENT

Dewberry®

Dewberry Engineers Inc.
99 SUMMER STREET
SUITE 700
BOSTON, MA 02110
PHONE: 617.695.3400
FAX: 617.695.3310

DRAWN BY:	OAS
REVIEWED BY:	OAS
CHECKED BY:	DAS
PROJECT NUMBER:	50121487
JOB NUMBER:	50121783

SITE NUMBER

396927

SITE ADDRESS

524 GREAT NECK NORTH RD.
MASHPEE, MA 02360

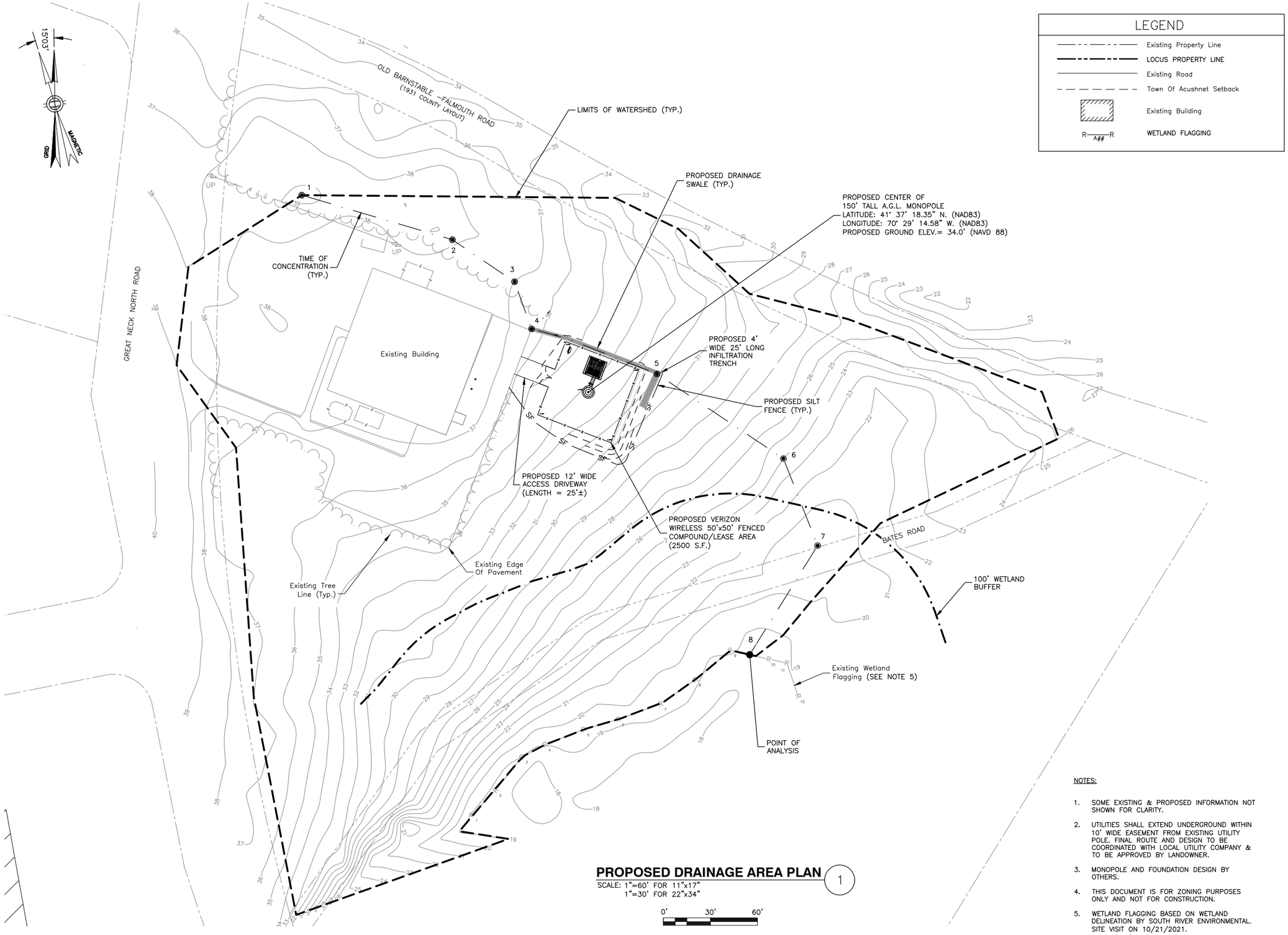
SHEET TITLE

EXISTING DRAINAGE AREA PLAN

SHEET NUMBER

SW-1

FIGURE 2



LEGEND

- Existing Property Line
- LOCUS PROPERTY LINE
- Existing Road
- Town Of Acushnet Setback
- Existing Building
- R—A##—R WETLAND FLAGGING

PROPOSED DRAINAGE AREA PLAN 1

SCALE: 1"=60' FOR 11"x17"
1"=30' FOR 22"x34"

0' 30' 60'

NOTES:

1. SOME EXISTING & PROPOSED INFORMATION NOT SHOWN FOR CLARITY.
2. UTILITIES SHALL EXTEND UNDERGROUND WITHIN 10' WIDE EASEMENT FROM EXISTING UTILITY POLE. FINAL ROUTE AND DESIGN TO BE COORDINATED WITH LOCAL UTILITY COMPANY & TO BE APPROVED BY LANDOWNER.
3. MONOPOLE AND FOUNDATION DESIGN BY OTHERS.
4. THIS DOCUMENT IS FOR ZONING PURPOSES ONLY AND NOT FOR CONSTRUCTION.
5. WETLAND FLAGGING BASED ON WETLAND DELINEATION BY SOUTH RIVER ENVIRONMENTAL. SITE VISIT ON 10/21/2021.

verizon WIRELESS

VERIZON WIRELESS
900 CHELMSFORD STREET
TOWER 2 FLOOR 5
LOWELL, MA 01581

MASHPEE 3 MA

REFERENCE DRAWINGS

B	04/28/23	FOR COMMENT
A	10/10/22	FOR COMMENT

Dewberry®

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99 SUMMER STREET
SUITE 700
BOSTON, MA 02110
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DRAWN BY:	OAS
REVIEWED BY:	OAS
CHECKED BY:	DAS
PROJECT NUMBER:	50121487
JOB NUMBER:	50121783

SITE NUMBER

396927

SITE ADDRESS

524 GREAT NECK NORTH RD.
MASHPEE, MA 02360

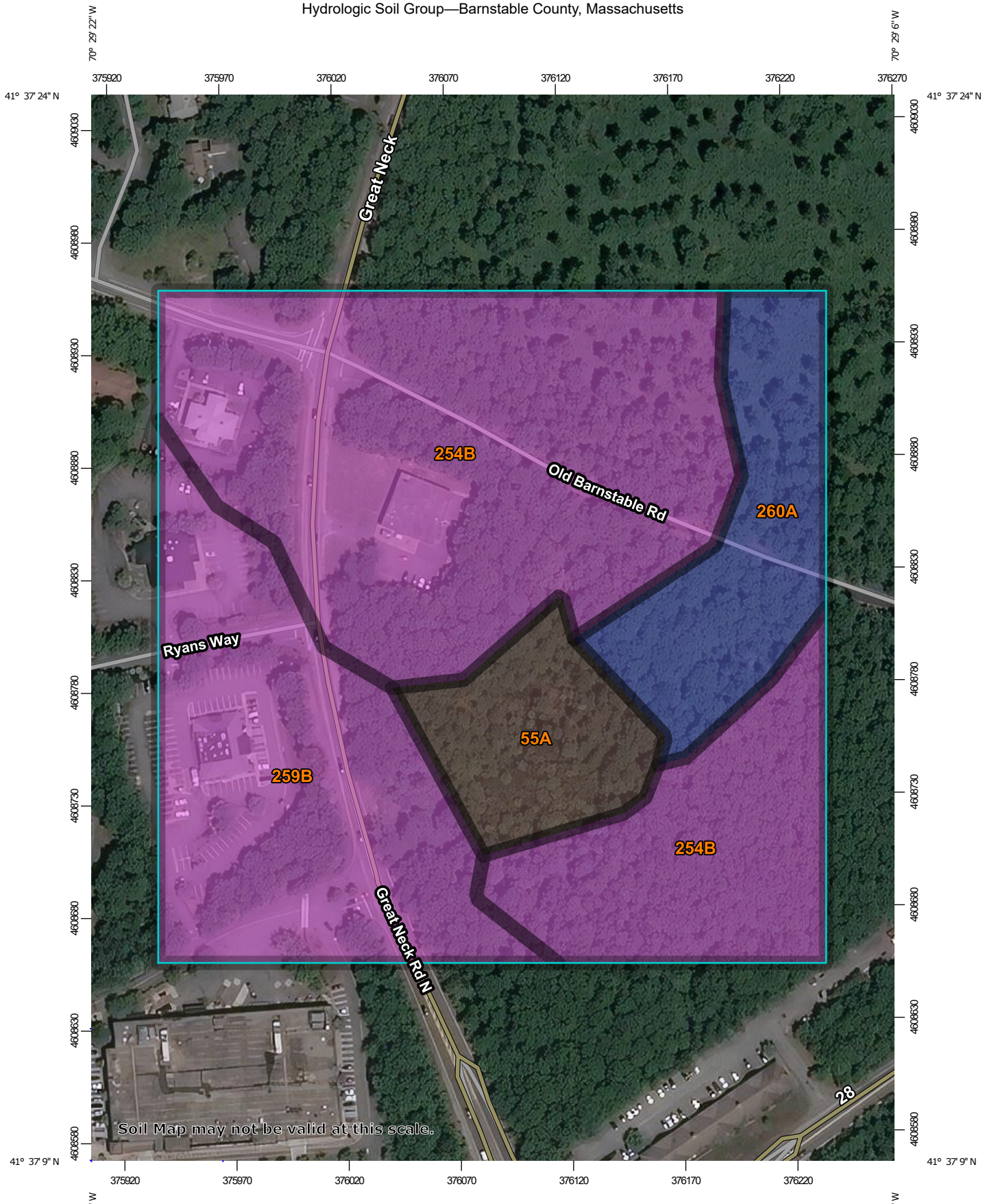
SHEET TITLE

PROPOSED DRAINAGE AREA PLAN

SHEET NUMBER

SW–2

APPENDIX A


70° 29' 22" W
70° 29' 6" W
41° 37' 24" N
41° 37' 9" N
375920
375970
376020
376070
376120
376170
376220
376270
4609030
4608980
4608930
4608880
4608830
4608780
4608730
4608680
4608630
4608580
Great Neck
Old Barnstable Rd
Ryans Way
Great Neck Rd N
28
254B
260A
55A
259B
254B
Soil Map may not be valid at this scale.
Map Scale: 1:2,310 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 30 60 120 180
Feet
0 100 200 400 600
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N 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 1:25,000.

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:
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: Barnstable County, Massachusetts
Survey Area Data: Version 18, Sep 1, 2021

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

Date(s) aerial images were photographed: Jul 10, 2018—Nov 17, 2018

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

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
55A	Freetown coarse sand, 0 to 3 percent slopes, sanded surface	B/D	1.9	8.6%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	A	11.9	53.9%
259B	Carver loamy coarse sand, 3 to 8 percent slopes	A	5.5	25.0%
260A	Sudbury fine sandy loam, 0 to 3 percent slopes	B	2.8	12.5%
Totals for Area of Interest			**22.1**	**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

Depth to Water Table—Barnstable County, Massachusetts



Map Scale: 1:2,060 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- Not rated or not available

Soil Rating Lines

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- Not rated or not available

Soil Rating Points

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- 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 1:25,000.

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:
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: Barnstable County, Massachusetts
Survey Area Data: Version 19, Sep 9, 2022

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

Date(s) aerial images were photographed: Sep 5, 2020—Sep 7, 2020

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.

Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
55A	Freetown coarse sand, 0 to 3 percent slopes, sanded surface	0	1.9	12.4%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	>200	8.8	57.5%
259B	Carver loamy coarse sand, 3 to 8 percent slopes	>200	2.5	16.3%
260A	Sudbury fine sandy loam, 0 to 3 percent slopes	68	2.1	13.8%
Totals for Area of Interest			**15.2**	**100.0%**

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

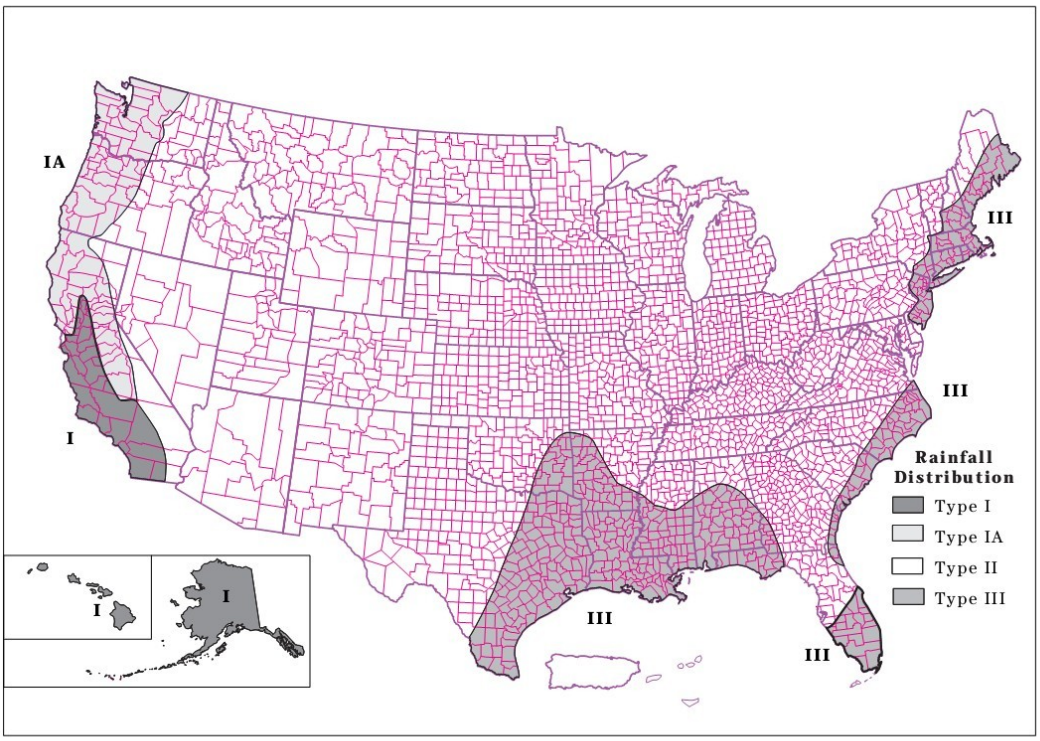
Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December

APPENDIX B

Figure B-2 Approximate geographic boundaries for NRCS (SCS) rainfall distributions



Rainfall data sources

This section lists the most current 24-hour rainfall data published by the National Weather Service (NWS) for various parts of the country. Because NWS Technical Paper 40 (TP-40) is out of print, the 24-hour rainfall maps for areas east of the 105th meridian are included here as figures B-3 through B-8. For the area generally west of the 105th meridian, TP-40 has been superseded by NOAA Atlas 2, the Precipitation-Frequency Atlas of the Western United States, published by the National Ocean and Atmospheric Administration.

East of 105th meridian

Hershfield, D.M. 1961. Rainfall frequency atlas of the United States for durations from 30 minutes to 24 hours and return periods from 1 to 100 years. U.S. Dept. Commerce, Weather Bur. Tech. Pap. No. 40. Washington, DC. 155 p.

West of 105th meridian

Miller, J.F., R.H. Frederick, and R.J. Tracey. 1973. Precipitation-frequency atlas of the Western United States. Vol. I Montana; Vol. II, Wyoming; Vol III, Colorado; Vol. IV, New Mexico; Vol V, Idaho; Vol. VI, Utah; Vol. VII, Nevada; Vol. VIII, Arizona; Vol. IX, Washington; Vol. X, Oregon; Vol. XI, California. U.S. Dept. of Commerce, National Weather Service, NOAA Atlas 2. Silver Spring, MD.

Alaska

Miller, John F. 1963. Probable maximum precipitation and rainfall-frequency data for Alaska for areas to 400 square miles, durations to 24 hours and return periods from 1 to 100 years. U.S. Dept. of Commerce, Weather Bur. Tech. Pap. No. 47. Washington, DC. 69 p.

Hawaii

Weather Bureau. 1962. Rainfall-frequency atlas of the Hawaiian Islands for areas to 200 square miles, durations to 24 hours and return periods from 1 to 100 years. U.S. Dept. Commerce, Weather Bur. Tech. Pap. No. 43. Washington, DC. 60 p.

Puerto Rico and Virgin Islands

Weather Bureau. 1961. Generalized estimates of probable maximum precipitation and rainfall-frequency data for Puerto Rico and Virgin Islands for areas to 400 square miles, durations to 24 hours, and return periods from 1 to 100 years. U.S. Dept. Commerce, Weather Bur. Tech. Pap. No. 42. Washington, DC. 94 P.

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	Massachusetts
Location	
Longitude	70.487 degrees West
Latitude	41.622 degrees North
Elevation	0 feet
Date/Time	Tue, 27 Sep 2022 09:59:59 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.29	0.45	0.56	0.73	0.91	1.15	**1yr**	0.79	1.14	1.34	1.71	2.18	2.81	3.19	**1yr**	2.49	3.06	3.54	4.01	4.62	**1yr**
2yr	0.37	0.56	0.70	0.93	1.16	1.47	**2yr**	1.01	1.38	1.70	2.12	2.66	3.33	3.72	**2yr**	2.95	3.58	4.08	4.79	5.44	**2yr**
5yr	0.44	0.69	0.86	1.15	1.47	1.87	**5yr**	1.27	1.77	2.16	2.70	3.35	4.16	4.69	**5yr**	3.68	4.51	5.07	5.91	6.62	**5yr**
10yr	0.50	0.79	1.00	1.36	1.77	2.25	**10yr**	1.52	2.13	2.61	3.25	4.01	4.93	5.58	**10yr**	4.36	5.37	5.98	6.93	7.68	**10yr**
25yr	0.60	0.95	1.21	1.68	2.24	2.88	**25yr**	1.93	2.73	3.34	4.15	5.09	6.17	7.02	**25yr**	5.46	6.75	7.44	8.56	9.35	**25yr**
50yr	0.69	1.11	1.42	1.99	2.68	3.46	**50yr**	2.31	3.30	4.03	4.98	6.07	7.31	8.37	**50yr**	6.47	8.05	8.79	10.05	10.85	**50yr**
100yr	0.80	1.29	1.66	2.36	3.21	4.17	**100yr**	2.77	3.99	4.85	5.98	7.25	8.67	9.97	**100yr**	7.68	9.59	10.38	11.81	12.59	**100yr**
200yr	0.92	1.50	1.95	2.79	3.85	5.02	**200yr**	3.32	4.82	5.84	7.18	8.66	10.29	11.89	**200yr**	9.11	11.43	12.26	13.87	14.63	**200yr**
500yr	1.13	1.86	2.42	3.50	4.90	6.40	**500yr**	4.23	6.20	7.45	9.14	10.95	12.91	15.00	**500yr**	11.43	14.42	15.30	17.18	17.84	**500yr**

Lower Confidence Limits

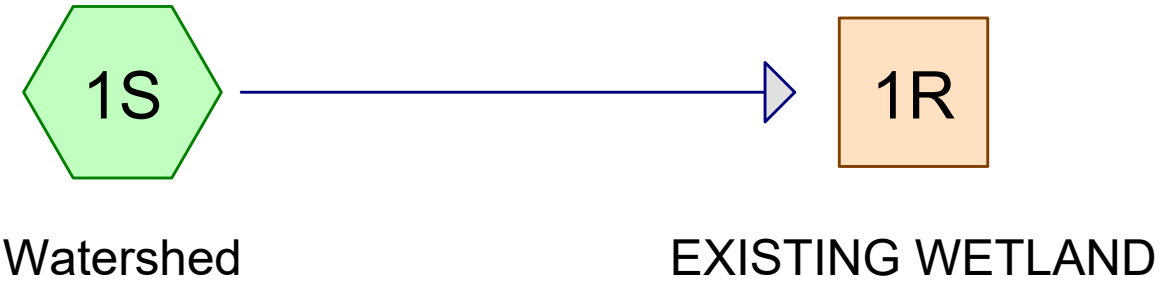
	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.25	0.39	0.47	0.64	0.78	0.92	**1yr**	0.68	0.90	1.10	1.53	1.99	2.45	2.93	**1yr**	2.17	2.82	3.33	3.33	4.32	**1yr**
2yr	0.35	0.54	0.67	0.91	1.12	1.37	**2yr**	0.96	1.34	1.56	2.10	2.64	3.24	3.61	**2yr**	2.87	3.47	3.97	4.67	5.31	**2yr**
5yr	0.41	0.63	0.78	1.06	1.35	1.64	**5yr**	1.17	1.60	1.92	2.52	3.12	3.88	4.38	**5yr**	3.44	4.21	4.76	5.55	6.23	**5yr**
10yr	0.45	0.69	0.86	1.20	1.55	1.85	**10yr**	1.34	1.81	2.19	2.84	3.51	4.44	5.02	**10yr**	3.93	4.83	5.40	6.31	7.03	**10yr**
25yr	0.52	0.79	0.98	1.40	1.85	2.16	**25yr**	1.59	2.11	2.53	3.28	4.05	5.27	6.05	**25yr**	4.67	5.82	6.42	7.49	8.21	**25yr**
50yr	0.57	0.87	1.09	1.57	2.11	2.42	**50yr**	1.82	2.37	2.80	3.63	4.49	5.97	6.98	**50yr**	5.28	6.72	7.32	8.53	9.26	**50yr**
100yr	0.65	0.98	1.22	1.77	2.42	2.69	**100yr**	2.09	2.63	3.12	4.01	4.94	6.77	8.05	**100yr**	5.99	7.74	8.37	9.69	10.43	**100yr**
200yr	0.72	1.08	1.37	1.98	2.77	2.98	**200yr**	2.39	2.91	3.46	4.38	5.46	7.65	9.28	**200yr**	6.77	8.93	9.56	11.05	11.76	**200yr**
500yr	0.83	1.24	1.60	2.32	3.30	3.38	**500yr**	2.85	3.30	3.96	4.95	6.24	8.93	11.24	**500yr**	7.91	10.81	11.40	13.10	13.77	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.33	0.51	0.62	0.83	1.02	1.30	**1yr**	0.88	1.27	1.54	2.05	2.56	3.05	3.40	**1yr**	2.70	3.27	3.76	4.29	4.88	**1yr**
2yr	0.38	0.59	0.73	0.99	1.22	1.51	**2yr**	1.05	1.48	1.70	2.34	2.92	3.45	3.85	**2yr**	3.05	3.70	4.22	4.94	5.60	**2yr**
5yr	0.49	0.75	0.93	1.28	1.62	1.98	**5yr**	1.40	1.93	2.31	2.94	3.61	4.43	4.99	**5yr**	3.92	4.80	5.41	6.29	7.01	**5yr**
10yr	0.59	0.91	1.13	1.58	2.04	2.48	**10yr**	1.76	2.42	2.89	3.57	4.35	5.39	6.15	**10yr**	4.77	5.91	6.65	7.56	8.34	**10yr**
25yr	0.77	1.17	1.45	2.08	2.73	3.34	**25yr**	2.36	3.27	3.91	4.70	5.61	7.00	8.05	**25yr**	6.19	7.74	8.62	9.65	10.49	**25yr**
50yr	0.94	1.42	1.77	2.55	3.43	4.21	**50yr**	2.96	4.11	4.92	5.77	6.82	8.54	9.86	**50yr**	7.56	9.48	10.50	11.62	12.48	**50yr**
100yr	1.15	1.73	2.17	3.14	4.30	5.30	**100yr**	3.71	5.18	6.22	7.09	8.31	10.45	12.09	**100yr**	9.25	11.62	12.80	14.02	14.86	**100yr**
200yr	1.41	2.12	2.68	3.88	5.41	6.67	**200yr**	4.67	6.52	7.86	8.75	10.12	12.80	14.81	**200yr**	11.33	14.24	15.59	16.90	17.70	**200yr**
500yr	1.85	2.76	3.55	5.15	7.32	9.07	**500yr**	6.32	8.86	10.75	11.58	13.15	16.79	19.37	**500yr**	14.86	18.63	20.27	21.61	22.30	**500yr**

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APPENDIX C



Subcat Reach Pond Link

Drainage Diagram for MASHPEE 3 MA EXISTING DRAINAGE
Prepared by Dewberry Engineers Inc., Printed 4/20/2023
HydroCAD® 9.00 s/n 06113 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.343	36	Woods, Fair, HSG A (1S)
0.339	49	50-75% Grass cover, Fair, HSG A (1S)
0.240	79	Woods, Fair, HSG D (1S)
0.049	83	Paved roads w/open ditches, 50% imp, HSG A (1S)
0.210	98	Paved parking, HSG A (1S)
0.163	98	Roofs, HSG A (1S)
3.344		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
3.104	HSG A	1S
0.000	HSG B	
0.000	HSG C	
0.240	HSG D	1S
0.000	Other	
3.344		**TOTAL AREA**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Watershed Runoff Area=145,670 sf 11.88% Impervious Runoff Depth>0.46"
Flow Length=462' Tc=56.3 min CN=48 Runoff=0.53 cfs 0.127 af

Reach 1R: EXISTING WETLAND Inflow=0.53 cfs 0.127 af
Outflow=0.53 cfs 0.127 af

Total Runoff Area = 3.344 ac Runoff Volume = 0.127 af Average Runoff Depth = 0.46"
88.12% Pervious = 2.947 ac 11.88% Impervious = 0.397 ac

Summary for Subcatchment 1S: Watershed

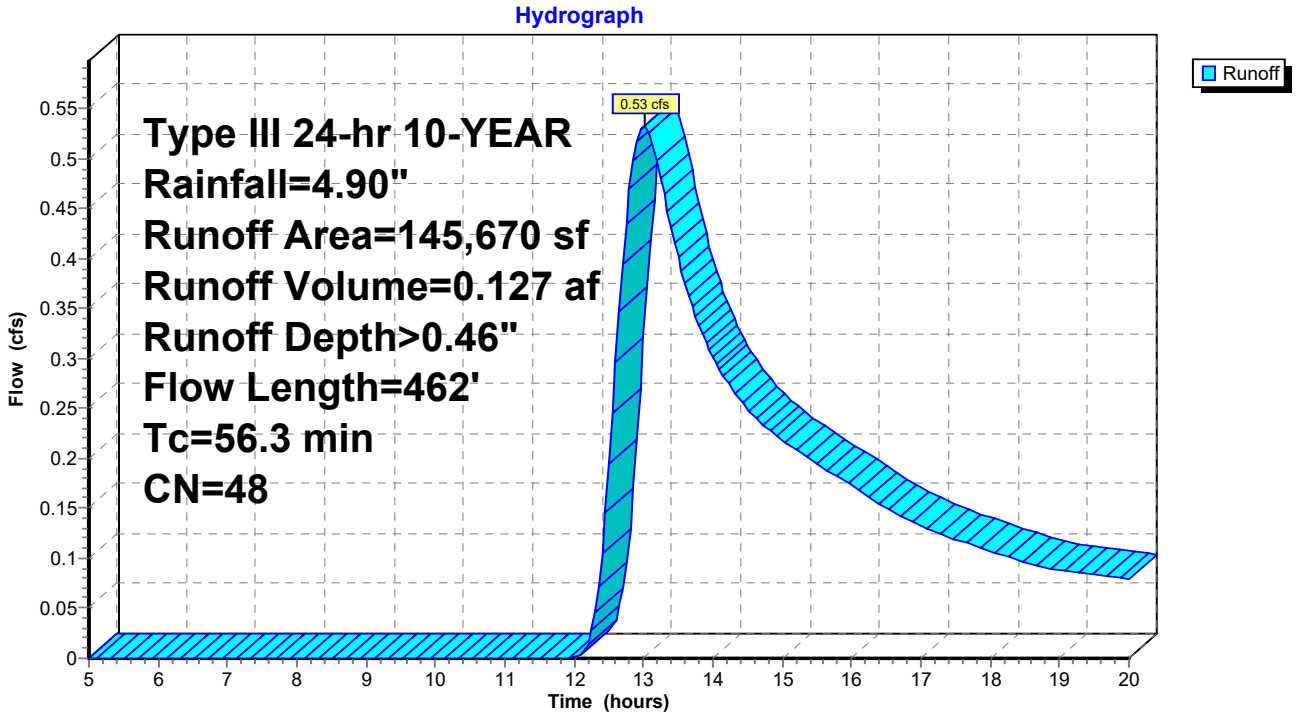
Runoff = 0.53 cfs @ 13.01 hrs, Volume= 0.127 af, Depth> 0.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.90"

Area (sf)	CN	Description
9,150	98	Paved parking, HSG A
7,091	98	Roofs, HSG A
14,768	49	50-75% Grass cover, Fair, HSG A
102,067	36	Woods, Fair, HSG A
10,475	79	Woods, Fair, HSG D
2,119	83	Paved roads w/open ditches, 50% imp, HSG A
145,670	48	Weighted Average
128,370		88.12% Pervious Area
17,301		11.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
50.7	100	0.0100	0.03		**Sheet Flow, 1-2** Woods: Light underbrush n= 0.400 P2= 1.00"
1.1	48	0.0200	0.71		**Shallow Concentrated Flow, 2-3** Woodland Kv= 5.0 fps
0.6	32	0.0313	0.88		**Shallow Concentrated Flow, 3-4** Woodland Kv= 5.0 fps
1.8	133	0.0601	1.23		**Shallow Concentrated Flow, 4-5** Woodland Kv= 5.0 fps
0.5	47	0.0851	1.46		**Shallow Concentrated Flow, 5-6** Woodland Kv= 5.0 fps
0.4	33	0.0910	1.51		**Shallow Concentrated Flow, 6-7** Woodland Kv= 5.0 fps
0.5	28	0.0350	0.94		**Shallow Concentrated Flow, 7-8** Woodland Kv= 5.0 fps
0.7	41	0.0350	0.94		**Shallow Concentrated Flow, 8-9** Woodland Kv= 5.0 fps
56.3	462	Total			

Subcatchment 1S: Watershed



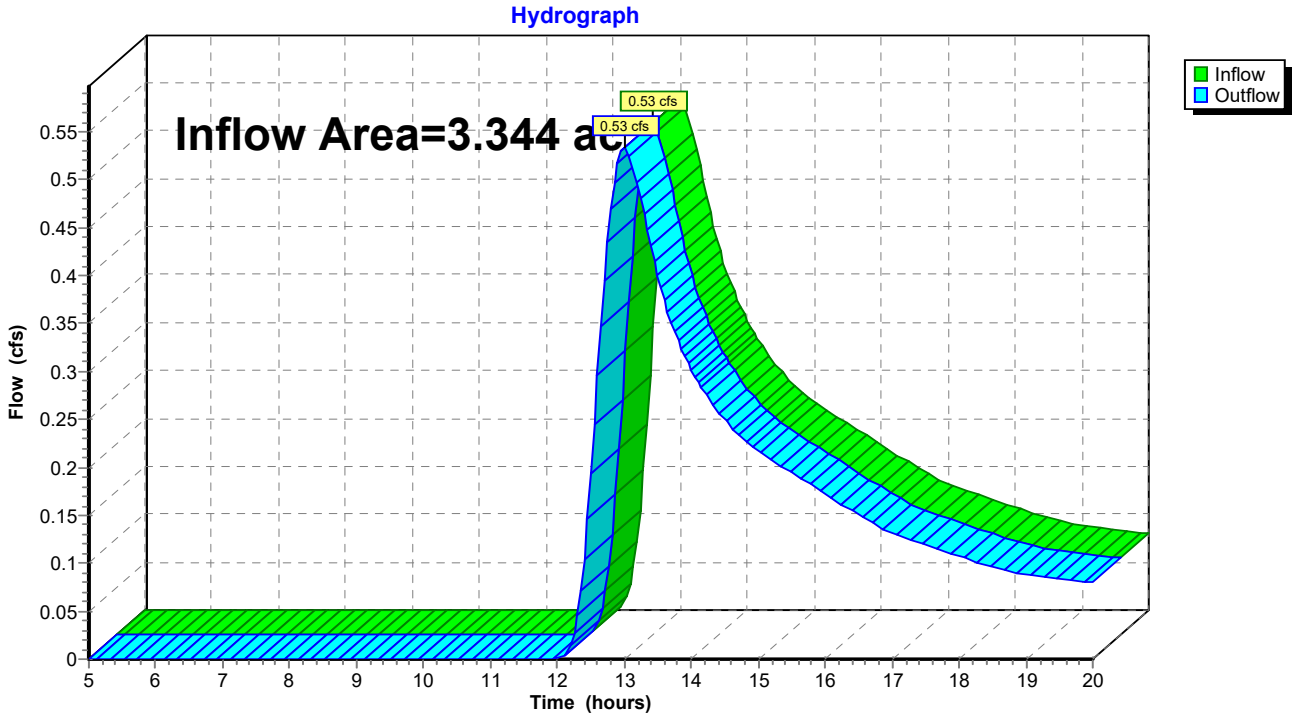
Summary for Reach 1R: EXISTING WETLAND

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

Inflow Area = 3.344 ac, 11.88% Impervious, Inflow Depth > 0.46" for 10-YEAR event
Inflow = 0.53 cfs @ 13.01 hrs, Volume= 0.127 af
Outflow = 0.53 cfs @ 13.01 hrs, Volume= 0.127 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 1R: EXISTING WETLAND



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Watershed Runoff Area=145,670 sf 11.88% Impervious Runoff Depth>0.90"
Flow Length=462' Tc=56.3 min CN=48 Runoff=1.28 cfs 0.250 af

Reach 1R: EXISTING WETLAND Inflow=1.28 cfs 0.250 af
Outflow=1.28 cfs 0.250 af

Total Runoff Area = 3.344 ac Runoff Volume = 0.250 af Average Runoff Depth = 0.90"
88.12% Pervious = 2.947 ac 11.88% Impervious = 0.397 ac

Summary for Subcatchment 1S: Watershed

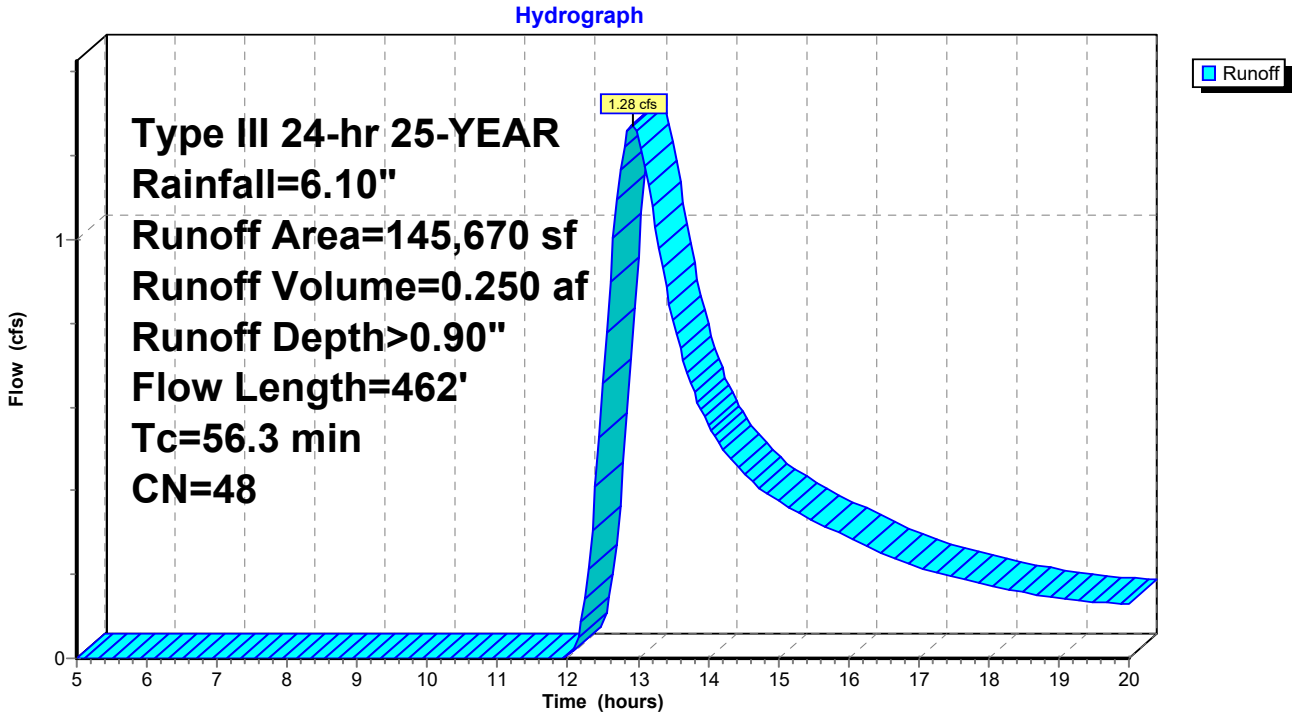
Runoff = 1.28 cfs @ 12.92 hrs, Volume= 0.250 af, Depth> 0.90"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YEAR Rainfall=6.10"

Area (sf)	CN	Description
9,150	98	Paved parking, HSG A
7,091	98	Roofs, HSG A
14,768	49	50-75% Grass cover, Fair, HSG A
102,067	36	Woods, Fair, HSG A
10,475	79	Woods, Fair, HSG D
2,119	83	Paved roads w/open ditches, 50% imp, HSG A
145,670	48	Weighted Average
128,370		88.12% Pervious Area
17,301		11.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
50.7	100	0.0100	0.03		**Sheet Flow, 1-2** Woods: Light underbrush n= 0.400 P2= 1.00"
1.1	48	0.0200	0.71		**Shallow Concentrated Flow, 2-3** Woodland Kv= 5.0 fps
0.6	32	0.0313	0.88		**Shallow Concentrated Flow, 3-4** Woodland Kv= 5.0 fps
1.8	133	0.0601	1.23		**Shallow Concentrated Flow, 4-5** Woodland Kv= 5.0 fps
0.5	47	0.0851	1.46		**Shallow Concentrated Flow, 5-6** Woodland Kv= 5.0 fps
0.4	33	0.0910	1.51		**Shallow Concentrated Flow, 6-7** Woodland Kv= 5.0 fps
0.5	28	0.0350	0.94		**Shallow Concentrated Flow, 7-8** Woodland Kv= 5.0 fps
0.7	41	0.0350	0.94		**Shallow Concentrated Flow, 8-9** Woodland Kv= 5.0 fps
56.3	462	Total			

Subcatchment 1S: Watershed



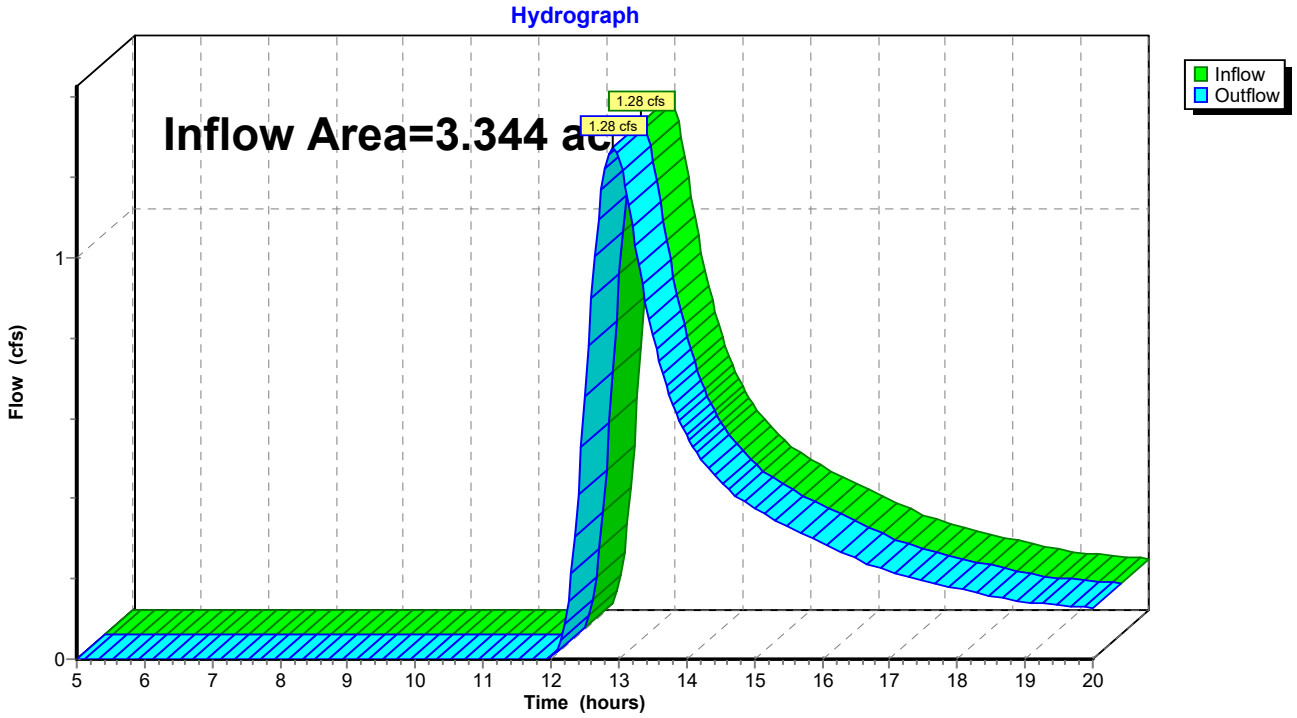
Summary for Reach 1R: EXISTING WETLAND

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

Inflow Area = 3.344 ac, 11.88% Impervious, Inflow Depth > 0.90" for 25-YEAR event
Inflow = 1.28 cfs @ 12.92 hrs, Volume= 0.250 af
Outflow = 1.28 cfs @ 12.92 hrs, Volume= 0.250 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 1R: EXISTING WETLAND



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Watershed Runoff Area=145,670 sf 11.88% Impervious Runoff Depth>1.44"
Flow Length=462' Tc=56.3 min CN=48 Runoff=2.24 cfs 0.401 af

Reach 1R: EXISTING WETLAND Inflow=2.24 cfs 0.401 af
Outflow=2.24 cfs 0.401 af

Total Runoff Area = 3.344 ac Runoff Volume = 0.401 af Average Runoff Depth = 1.44"
88.12% Pervious = 2.947 ac 11.88% Impervious = 0.397 ac

Summary for Subcatchment 1S: Watershed

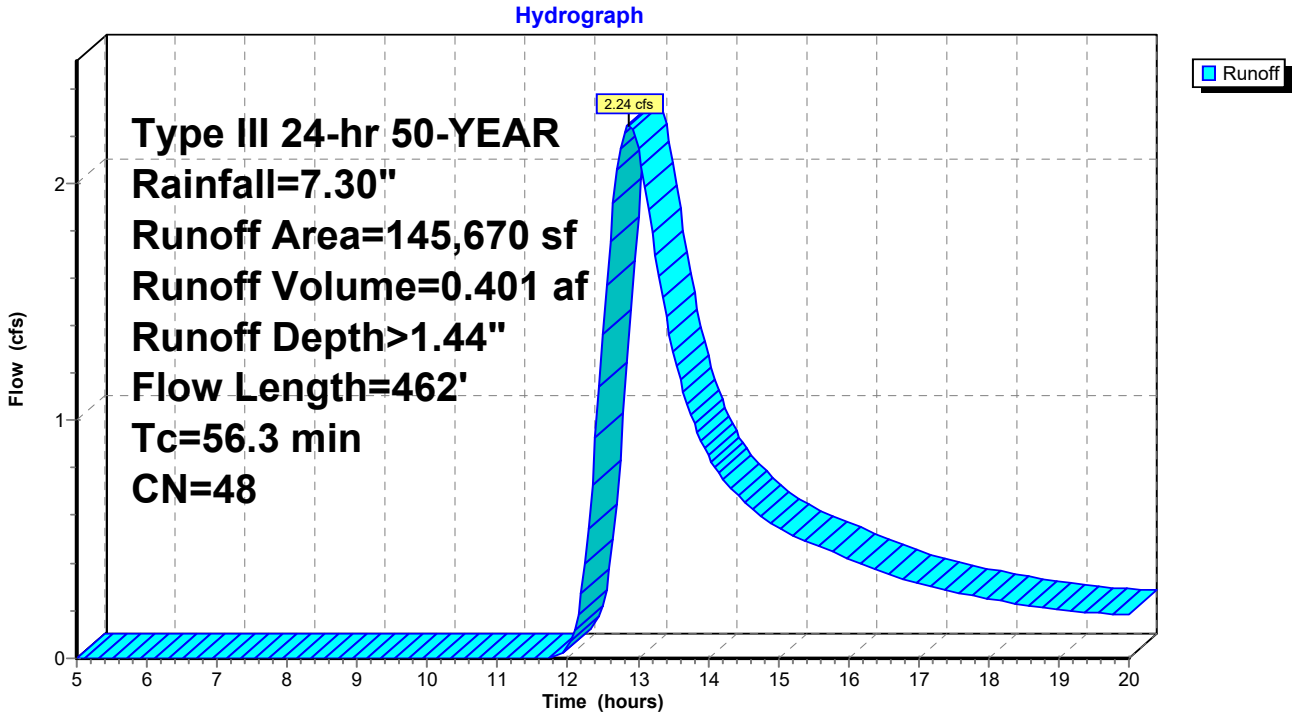
Runoff = 2.24 cfs @ 12.87 hrs, Volume= 0.401 af, Depth> 1.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YEAR Rainfall=7.30"

Area (sf)	CN	Description
9,150	98	Paved parking, HSG A
7,091	98	Roofs, HSG A
14,768	49	50-75% Grass cover, Fair, HSG A
102,067	36	Woods, Fair, HSG A
10,475	79	Woods, Fair, HSG D
2,119	83	Paved roads w/open ditches, 50% imp, HSG A
145,670	48	Weighted Average
128,370		88.12% Pervious Area
17,301		11.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
50.7	100	0.0100	0.03		**Sheet Flow, 1-2** Woods: Light underbrush n= 0.400 P2= 1.00"
1.1	48	0.0200	0.71		**Shallow Concentrated Flow, 2-3** Woodland Kv= 5.0 fps
0.6	32	0.0313	0.88		**Shallow Concentrated Flow, 3-4** Woodland Kv= 5.0 fps
1.8	133	0.0601	1.23		**Shallow Concentrated Flow, 4-5** Woodland Kv= 5.0 fps
0.5	47	0.0851	1.46		**Shallow Concentrated Flow, 5-6** Woodland Kv= 5.0 fps
0.4	33	0.0910	1.51		**Shallow Concentrated Flow, 6-7** Woodland Kv= 5.0 fps
0.5	28	0.0350	0.94		**Shallow Concentrated Flow, 7-8** Woodland Kv= 5.0 fps
0.7	41	0.0350	0.94		**Shallow Concentrated Flow, 8-9** Woodland Kv= 5.0 fps
56.3	462	Total			

Subcatchment 1S: Watershed



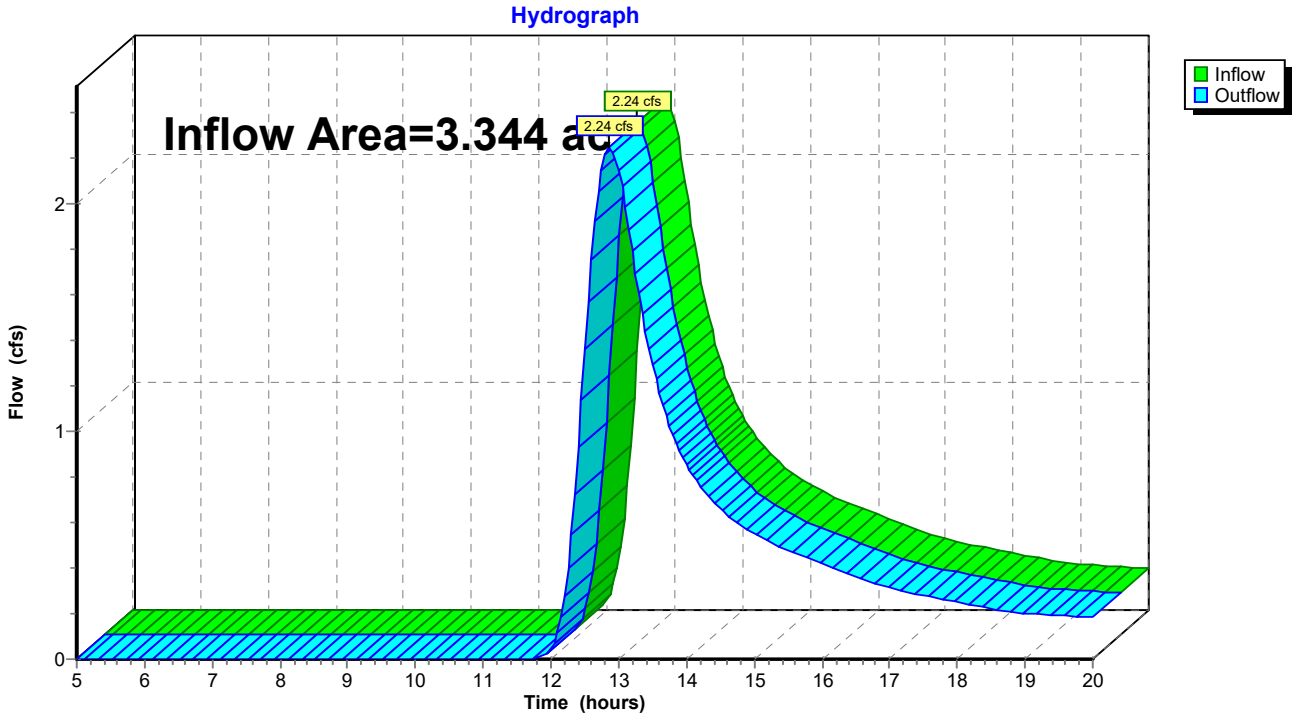
Summary for Reach 1R: EXISTING WETLAND

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

Inflow Area = 3.344 ac, 11.88% Impervious, Inflow Depth > 1.44" for 50-YEAR event
Inflow = 2.24 cfs @ 12.87 hrs, Volume= 0.401 af
Outflow = 2.24 cfs @ 12.87 hrs, Volume= 0.401 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 1R: EXISTING WETLAND



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Watershed Runoff Area=145,670 sf 11.88% Impervious Runoff Depth>2.12"
Flow Length=462' Tc=56.3 min CN=48 Runoff=3.48 cfs 0.590 af

Reach 1R: EXISTING WETLAND Inflow=3.48 cfs 0.590 af
Outflow=3.48 cfs 0.590 af

Total Runoff Area = 3.344 ac Runoff Volume = 0.590 af Average Runoff Depth = 2.12"
88.12% Pervious = 2.947 ac 11.88% Impervious = 0.397 ac

Summary for Subcatchment 1S: Watershed

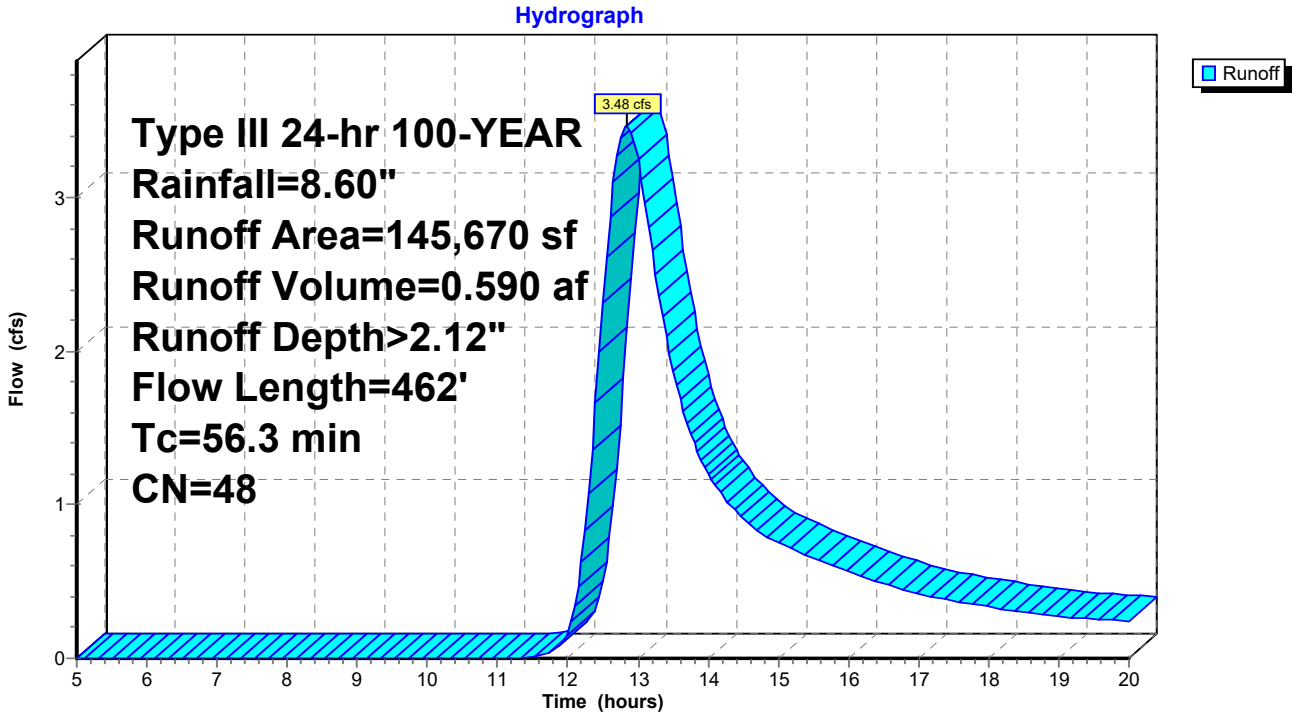
Runoff = 3.48 cfs @ 12.84 hrs, Volume= 0.590 af, Depth> 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=8.60"

Area (sf)	CN	Description
9,150	98	Paved parking, HSG A
7,091	98	Roofs, HSG A
14,768	49	50-75% Grass cover, Fair, HSG A
102,067	36	Woods, Fair, HSG A
10,475	79	Woods, Fair, HSG D
2,119	83	Paved roads w/open ditches, 50% imp, HSG A
145,670	48	Weighted Average
128,370		88.12% Pervious Area
17,301		11.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
50.7	100	0.0100	0.03		**Sheet Flow, 1-2** Woods: Light underbrush n= 0.400 P2= 1.00"
1.1	48	0.0200	0.71		**Shallow Concentrated Flow, 2-3** Woodland Kv= 5.0 fps
0.6	32	0.0313	0.88		**Shallow Concentrated Flow, 3-4** Woodland Kv= 5.0 fps
1.8	133	0.0601	1.23		**Shallow Concentrated Flow, 4-5** Woodland Kv= 5.0 fps
0.5	47	0.0851	1.46		**Shallow Concentrated Flow, 5-6** Woodland Kv= 5.0 fps
0.4	33	0.0910	1.51		**Shallow Concentrated Flow, 6-7** Woodland Kv= 5.0 fps
0.5	28	0.0350	0.94		**Shallow Concentrated Flow, 7-8** Woodland Kv= 5.0 fps
0.7	41	0.0350	0.94		**Shallow Concentrated Flow, 8-9** Woodland Kv= 5.0 fps
56.3	462	Total			

Subcatchment 1S: Watershed



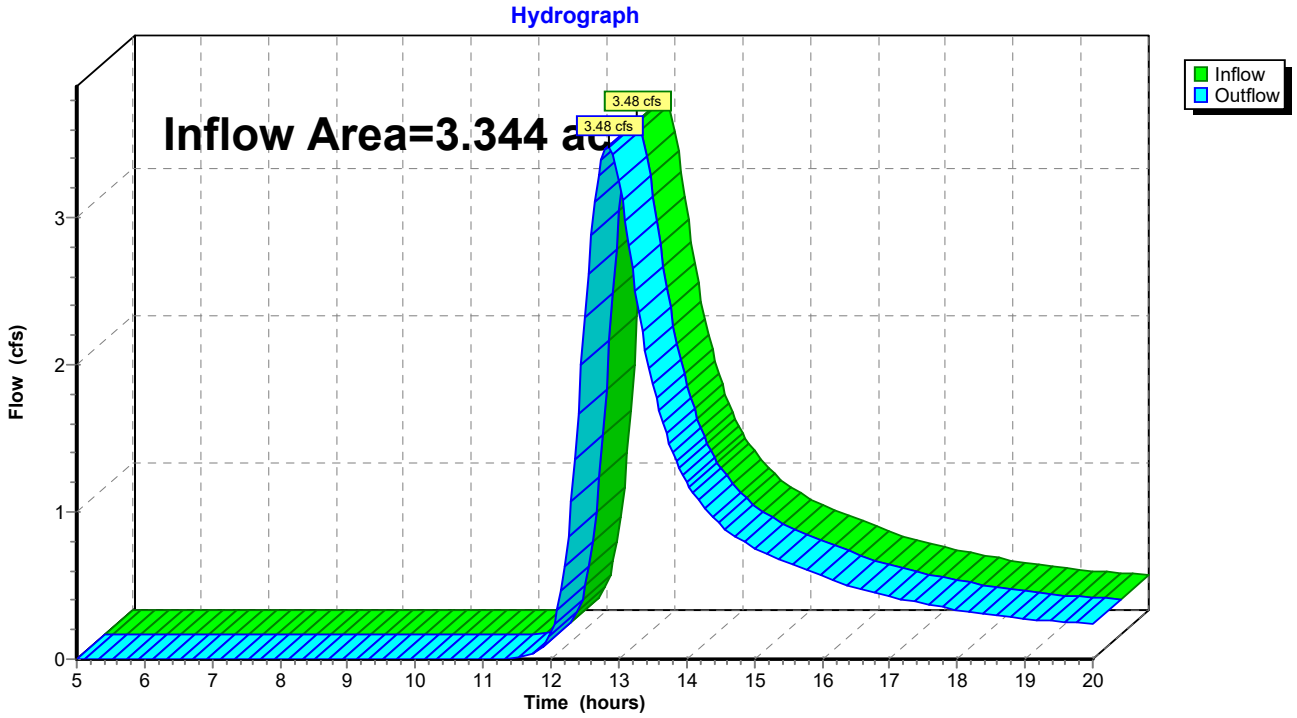
Summary for Reach 1R: EXISTING WETLAND

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

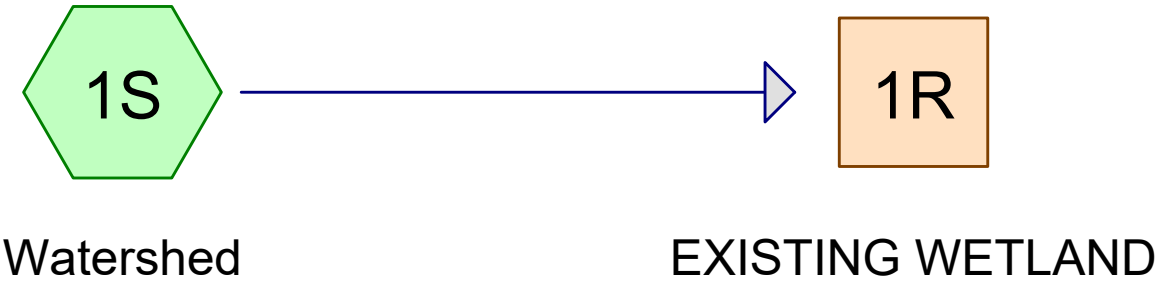
Inflow Area = 3.344 ac, 11.88% Impervious, Inflow Depth > 2.12" for 100-YEAR event
Inflow = 3.48 cfs @ 12.84 hrs, Volume= 0.590 af
Outflow = 3.48 cfs @ 12.84 hrs, Volume= 0.590 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 1R: EXISTING WETLAND



APPENDIX D



Subcat Reach Pond Link

Drainage Diagram for MASHPEE 3 MA PROPOSED DRAINAGE
Prepared by Dewberry Engineers Inc., Printed 4/20/2023
HydroCAD® 9.00 s/n 06113 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.270	36	Woods, Fair, HSG A (1S)
0.339	49	50-75% Grass cover, Fair, HSG A (1S)
0.073	76	Gravel Driveway & Compound (1S)
0.240	79	Woods, Fair, HSG D (1S)
0.049	83	Paved roads w/open ditches, 50% imp, HSG A (1S)
0.210	98	Paved parking, HSG A (1S)
0.163	98	Roofs, HSG A (1S)
3.344		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
3.031	HSG A	1S
0.000	HSG B	
0.000	HSG C	
0.240	HSG D	1S
0.073	Other	1S
3.344		**TOTAL AREA**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Watershed Runoff Area=145,670 sf 11.88% Impervious Runoff Depth>0.49"
Flow Length=507' Tc=94.0 min CN=49 Runoff=0.45 cfs 0.136 af

Reach 1R: EXISTING WETLAND Inflow=0.45 cfs 0.136 af
Outflow=0.45 cfs 0.136 af

Total Runoff Area = 3.344 ac Runoff Volume = 0.136 af Average Runoff Depth = 0.49"
88.12% Pervious = 2.947 ac 11.88% Impervious = 0.397 ac

Summary for Subcatchment 1S: Watershed

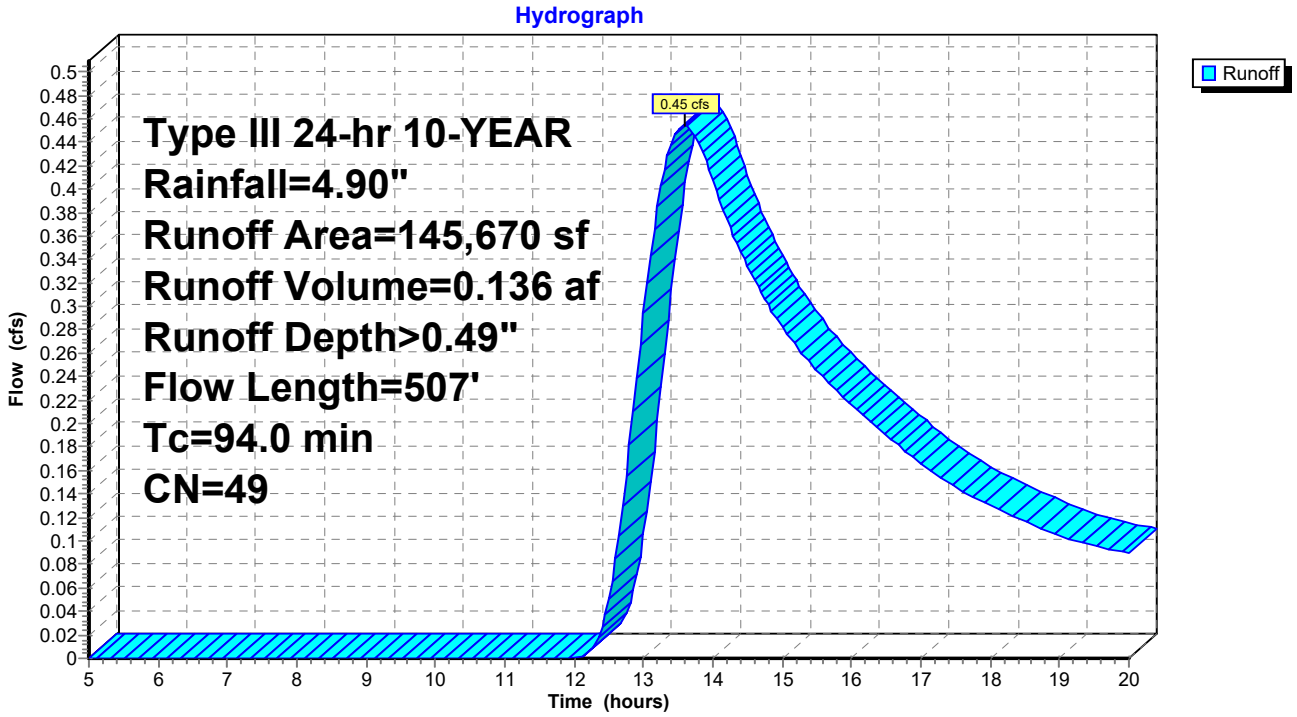
Runoff = 0.45 cfs @ 13.60 hrs, Volume= 0.136 af, Depth> 0.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.90"

	Area (sf)	CN	Description
	9,150	98	Paved parking, HSG A
	7,091	98	Roofs, HSG A
	14,768	49	50-75% Grass cover, Fair, HSG A
	98,881	36	Woods, Fair, HSG A
	10,475	79	Woods, Fair, HSG D
	2,119	83	Paved roads w/open ditches, 50% imp, HSG A
*	3,186	76	Gravel Driveway & Compound
	145,670	49	Weighted Average
	128,370		88.12% Pervious Area
	17,301		11.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
50.7	100	0.0100	0.03		**Sheet Flow, 1-2** Woods: Light underbrush n= 0.400 P2= 1.00"
1.1	48	0.0200	0.71		**Shallow Concentrated Flow, 2-3** Woodland Kv= 5.0 fps
0.6	32	0.0313	0.88		**Shallow Concentrated Flow, 3-4** Woodland Kv= 5.0 fps
0.6	85	0.0600	2.36	0.94	**Parabolic Channel, 4-5** W=3.00' D=0.20' Area=0.4 sf Perim=3.0' n= 0.040 Earth, cobble bottom, clean sides
38.4	100	0.0800	0.04		**Sheet Flow, 5-6** Woods: Dense underbrush n= 0.800 P2= 1.00"
0.8	60	0.0580	1.20		**Shallow Concentrated Flow, 6-7** Woodland Kv= 5.0 fps
1.8	82	0.0240	0.77		**Shallow Concentrated Flow, 7-8** Woodland Kv= 5.0 fps
94.0	507	Total			

Subcatchment 1S: Watershed



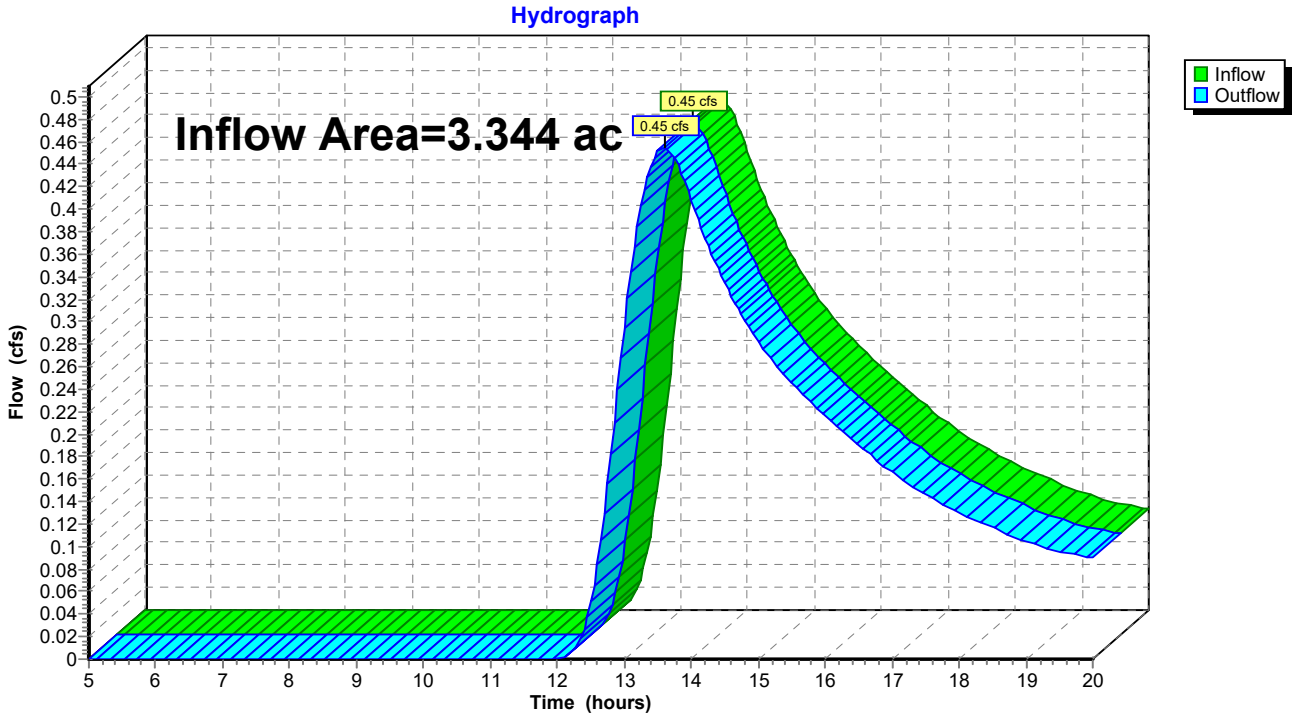
Summary for Reach 1R: EXISTING WETLAND

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

Inflow Area = 3.344 ac, 11.88% Impervious, Inflow Depth > 0.49" for 10-YEAR event
Inflow = 0.45 cfs @ 13.60 hrs, Volume= 0.136 af
Outflow = 0.45 cfs @ 13.60 hrs, Volume= 0.136 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 1R: EXISTING WETLAND



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Watershed Runoff Area=145,670 sf 11.88% Impervious Runoff Depth>0.94"
Flow Length=507' Tc=94.0 min CN=49 Runoff=1.01 cfs 0.262 af

Reach 1R: EXISTING WETLAND Inflow=1.01 cfs 0.262 af
Outflow=1.01 cfs 0.262 af

Total Runoff Area = 3.344 ac Runoff Volume = 0.262 af Average Runoff Depth = 0.94"
88.12% Pervious = 2.947 ac 11.88% Impervious = 0.397 ac

Summary for Subcatchment 1S: Watershed

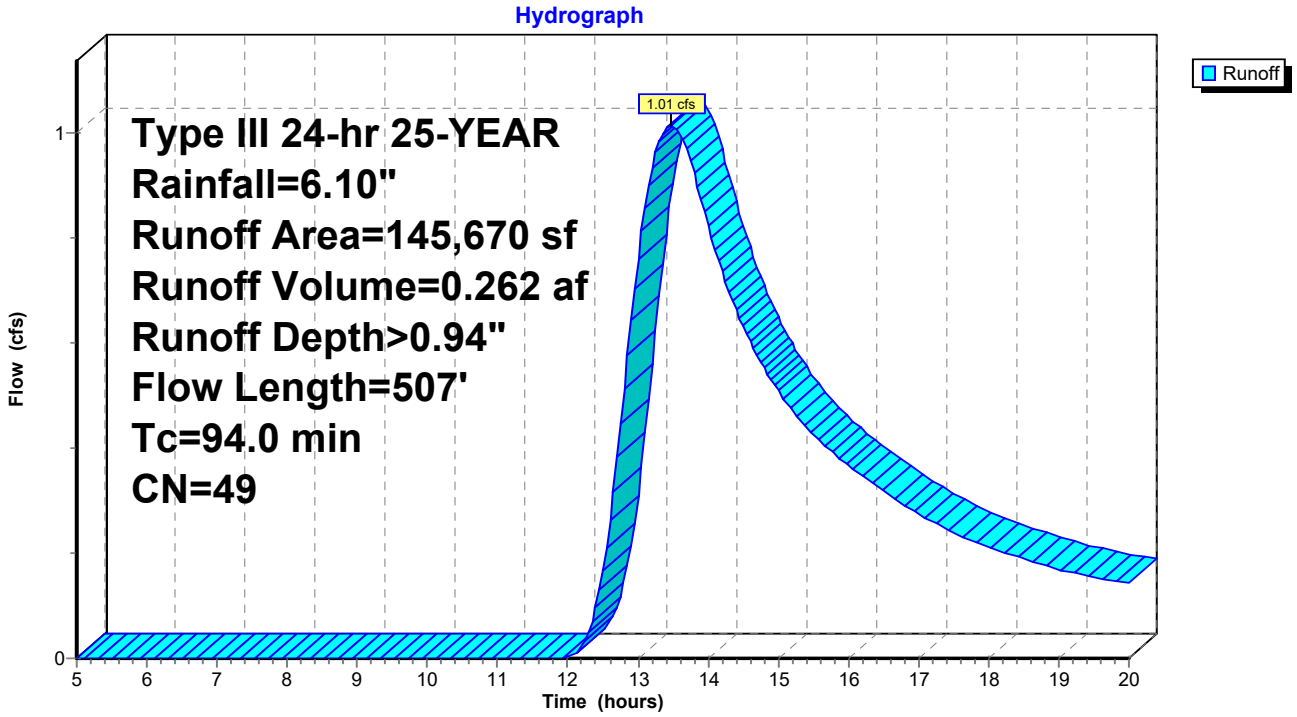
Runoff = 1.01 cfs @ 13.48 hrs, Volume= 0.262 af, Depth> 0.94"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YEAR Rainfall=6.10"

	Area (sf)	CN	Description
	9,150	98	Paved parking, HSG A
	7,091	98	Roofs, HSG A
	14,768	49	50-75% Grass cover, Fair, HSG A
	98,881	36	Woods, Fair, HSG A
	10,475	79	Woods, Fair, HSG D
	2,119	83	Paved roads w/open ditches, 50% imp, HSG A
*	3,186	76	Gravel Driveway & Compound
	145,670	49	Weighted Average
	128,370		88.12% Pervious Area
	17,301		11.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
50.7	100	0.0100	0.03		**Sheet Flow, 1-2** Woods: Light underbrush n= 0.400 P2= 1.00"
1.1	48	0.0200	0.71		**Shallow Concentrated Flow, 2-3** Woodland Kv= 5.0 fps
0.6	32	0.0313	0.88		**Shallow Concentrated Flow, 3-4** Woodland Kv= 5.0 fps
0.6	85	0.0600	2.36	0.94	**Parabolic Channel, 4-5** W=3.00' D=0.20' Area=0.4 sf Perim=3.0' n= 0.040 Earth, cobble bottom, clean sides
38.4	100	0.0800	0.04		**Sheet Flow, 5-6** Woods: Dense underbrush n= 0.800 P2= 1.00"
0.8	60	0.0580	1.20		**Shallow Concentrated Flow, 6-7** Woodland Kv= 5.0 fps
1.8	82	0.0240	0.77		**Shallow Concentrated Flow, 7-8** Woodland Kv= 5.0 fps
94.0	507	Total			

Subcatchment 1S: Watershed



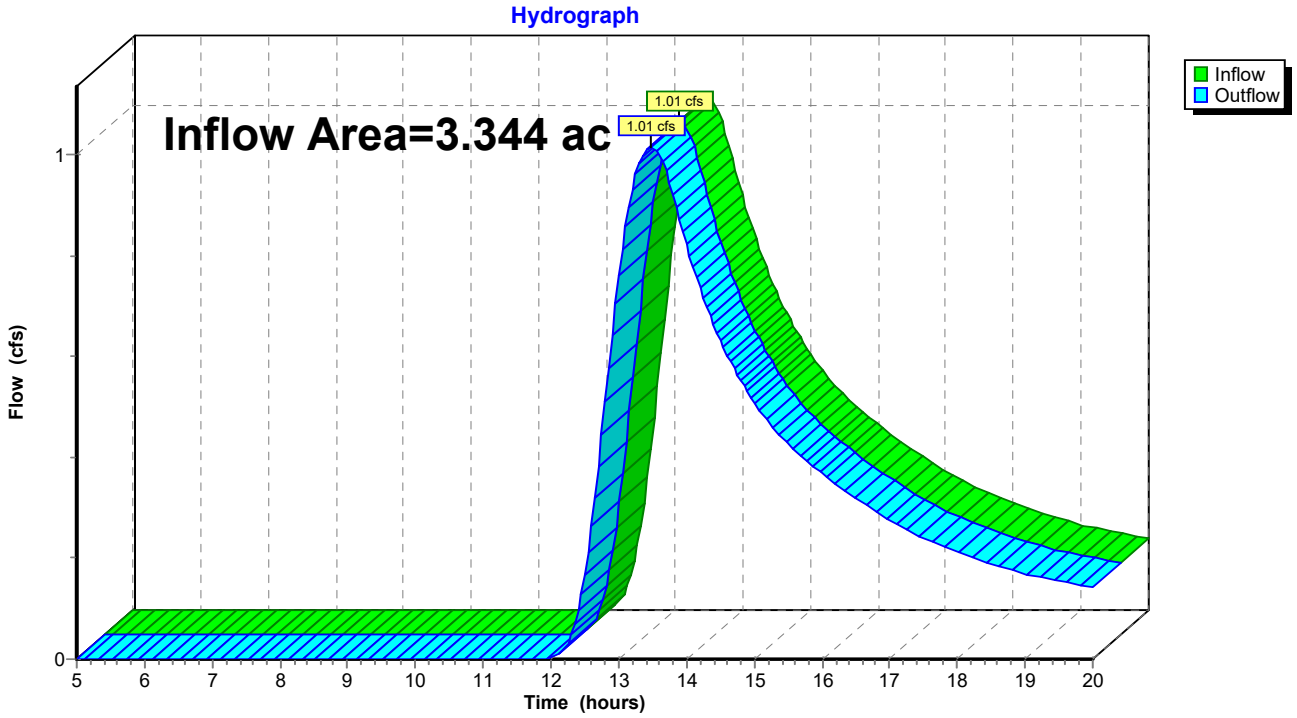
Summary for Reach 1R: EXISTING WETLAND

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

Inflow Area = 3.344 ac, 11.88% Impervious, Inflow Depth > 0.94" for 25-YEAR event
Inflow = 1.01 cfs @ 13.48 hrs, Volume= 0.262 af
Outflow = 1.01 cfs @ 13.48 hrs, Volume= 0.262 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 1R: EXISTING WETLAND



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Watershed Runoff Area=145,670 sf 11.88% Impervious Runoff Depth>1.49"
Flow Length=507' Tc=94.0 min CN=49 Runoff=1.73 cfs 0.415 af

Reach 1R: EXISTING WETLAND Inflow=1.73 cfs 0.415 af
Outflow=1.73 cfs 0.415 af

Total Runoff Area = 3.344 ac Runoff Volume = 0.415 af Average Runoff Depth = 1.49"
88.12% Pervious = 2.947 ac 11.88% Impervious = 0.397 ac

Summary for Subcatchment 1S: Watershed

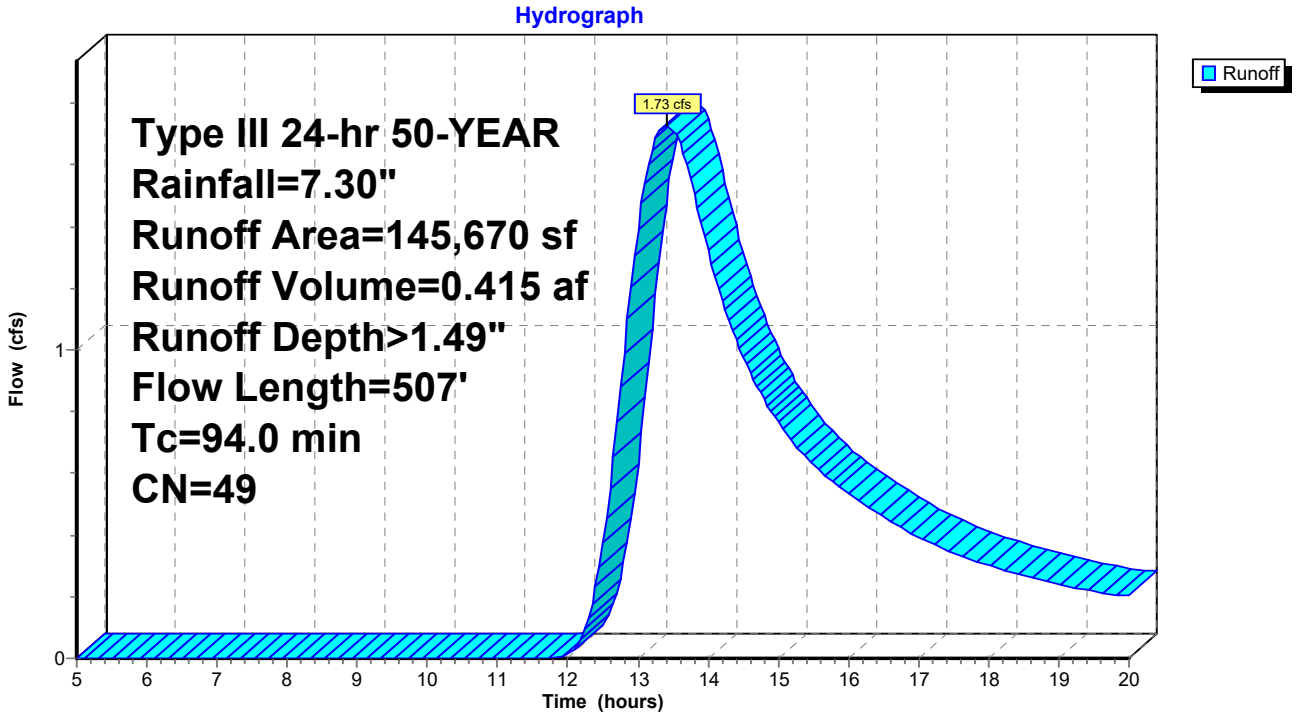
Runoff = 1.73 cfs @ 13.42 hrs, Volume= 0.415 af, Depth> 1.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YEAR Rainfall=7.30"

	Area (sf)	CN	Description
	9,150	98	Paved parking, HSG A
	7,091	98	Roofs, HSG A
	14,768	49	50-75% Grass cover, Fair, HSG A
	98,881	36	Woods, Fair, HSG A
	10,475	79	Woods, Fair, HSG D
	2,119	83	Paved roads w/open ditches, 50% imp, HSG A
*	3,186	76	Gravel Driveway & Compound
	145,670	49	Weighted Average
	128,370		88.12% Pervious Area
	17,301		11.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
50.7	100	0.0100	0.03		**Sheet Flow, 1-2** Woods: Light underbrush n= 0.400 P2= 1.00"
1.1	48	0.0200	0.71		**Shallow Concentrated Flow, 2-3** Woodland Kv= 5.0 fps
0.6	32	0.0313	0.88		**Shallow Concentrated Flow, 3-4** Woodland Kv= 5.0 fps
0.6	85	0.0600	2.36	0.94	**Parabolic Channel, 4-5** W=3.00' D=0.20' Area=0.4 sf Perim=3.0' n= 0.040 Earth, cobble bottom, clean sides
38.4	100	0.0800	0.04		**Sheet Flow, 5-6** Woods: Dense underbrush n= 0.800 P2= 1.00"
0.8	60	0.0580	1.20		**Shallow Concentrated Flow, 6-7** Woodland Kv= 5.0 fps
1.8	82	0.0240	0.77		**Shallow Concentrated Flow, 7-8** Woodland Kv= 5.0 fps
94.0	507	Total			

Subcatchment 1S: Watershed



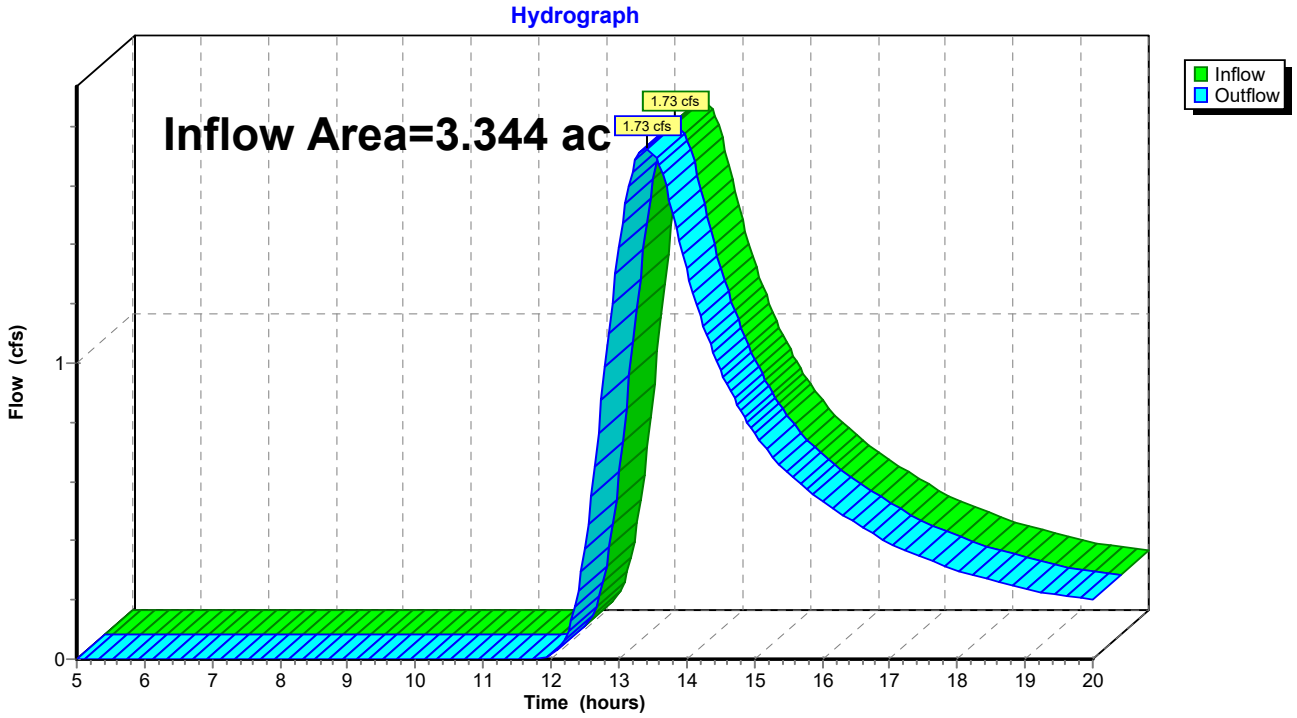
Summary for Reach 1R: EXISTING WETLAND

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

Inflow Area = 3.344 ac, 11.88% Impervious, Inflow Depth > 1.49" for 50-YEAR event
Inflow = 1.73 cfs @ 13.42 hrs, Volume= 0.415 af
Outflow = 1.73 cfs @ 13.42 hrs, Volume= 0.415 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 1R: EXISTING WETLAND



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Watershed Runoff Area=145,670 sf 11.88% Impervious Runoff Depth>2.18"
Flow Length=507' Tc=94.0 min CN=49 Runoff=2.64 cfs 0.607 af

Reach 1R: EXISTING WETLAND Inflow=2.64 cfs 0.607 af
Outflow=2.64 cfs 0.607 af

Total Runoff Area = 3.344 ac Runoff Volume = 0.607 af Average Runoff Depth = 2.18"
88.12% Pervious = 2.947 ac 11.88% Impervious = 0.397 ac

Summary for Subcatchment 1S: Watershed

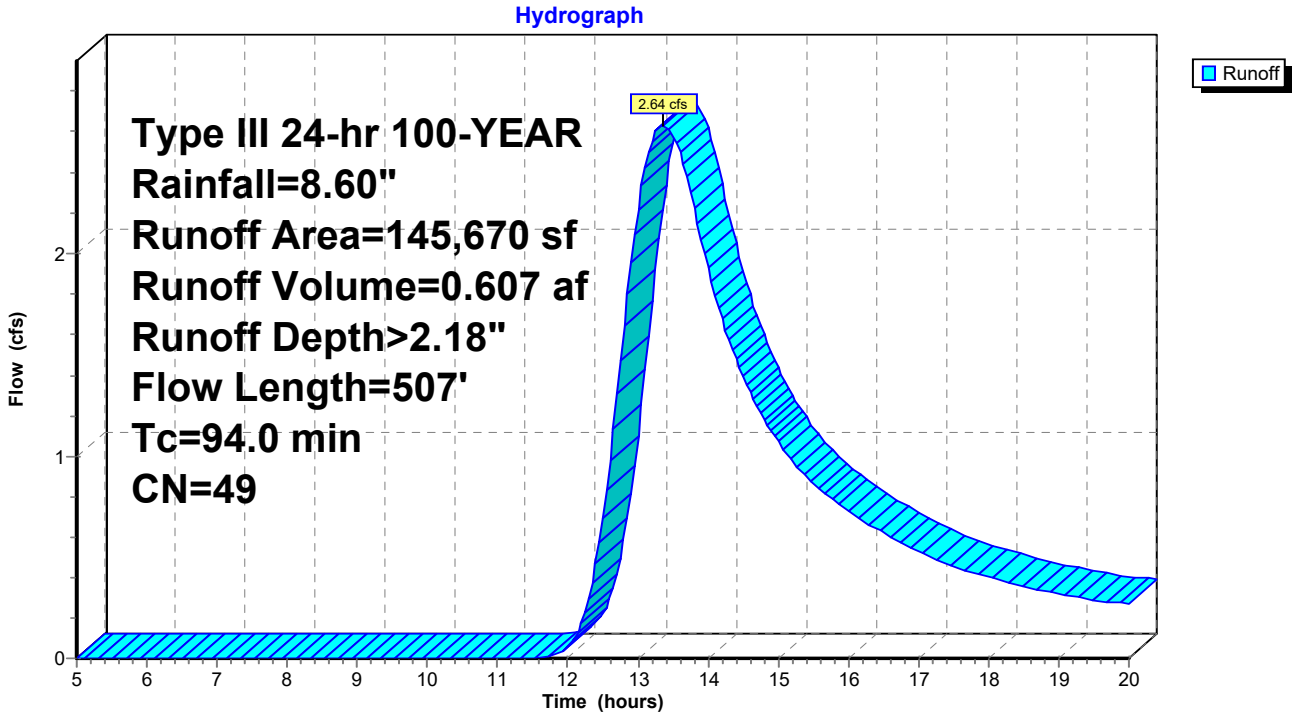
Runoff = 2.64 cfs @ 13.35 hrs, Volume= 0.607 af, Depth> 2.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=8.60"

	Area (sf)	CN	Description
	9,150	98	Paved parking, HSG A
	7,091	98	Roofs, HSG A
	14,768	49	50-75% Grass cover, Fair, HSG A
	98,881	36	Woods, Fair, HSG A
	10,475	79	Woods, Fair, HSG D
	2,119	83	Paved roads w/open ditches, 50% imp, HSG A
*	3,186	76	Gravel Driveway & Compound
	145,670	49	Weighted Average
	128,370		88.12% Pervious Area
	17,301		11.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
50.7	100	0.0100	0.03		**Sheet Flow, 1-2** Woods: Light underbrush n= 0.400 P2= 1.00"
1.1	48	0.0200	0.71		**Shallow Concentrated Flow, 2-3** Woodland Kv= 5.0 fps
0.6	32	0.0313	0.88		**Shallow Concentrated Flow, 3-4** Woodland Kv= 5.0 fps
0.6	85	0.0600	2.36	0.94	**Parabolic Channel, 4-5** W=3.00' D=0.20' Area=0.4 sf Perim=3.0' n= 0.040 Earth, cobble bottom, clean sides
38.4	100	0.0800	0.04		**Sheet Flow, 5-6** Woods: Dense underbrush n= 0.800 P2= 1.00"
0.8	60	0.0580	1.20		**Shallow Concentrated Flow, 6-7** Woodland Kv= 5.0 fps
1.8	82	0.0240	0.77		**Shallow Concentrated Flow, 7-8** Woodland Kv= 5.0 fps
94.0	507	Total			

Subcatchment 1S: Watershed



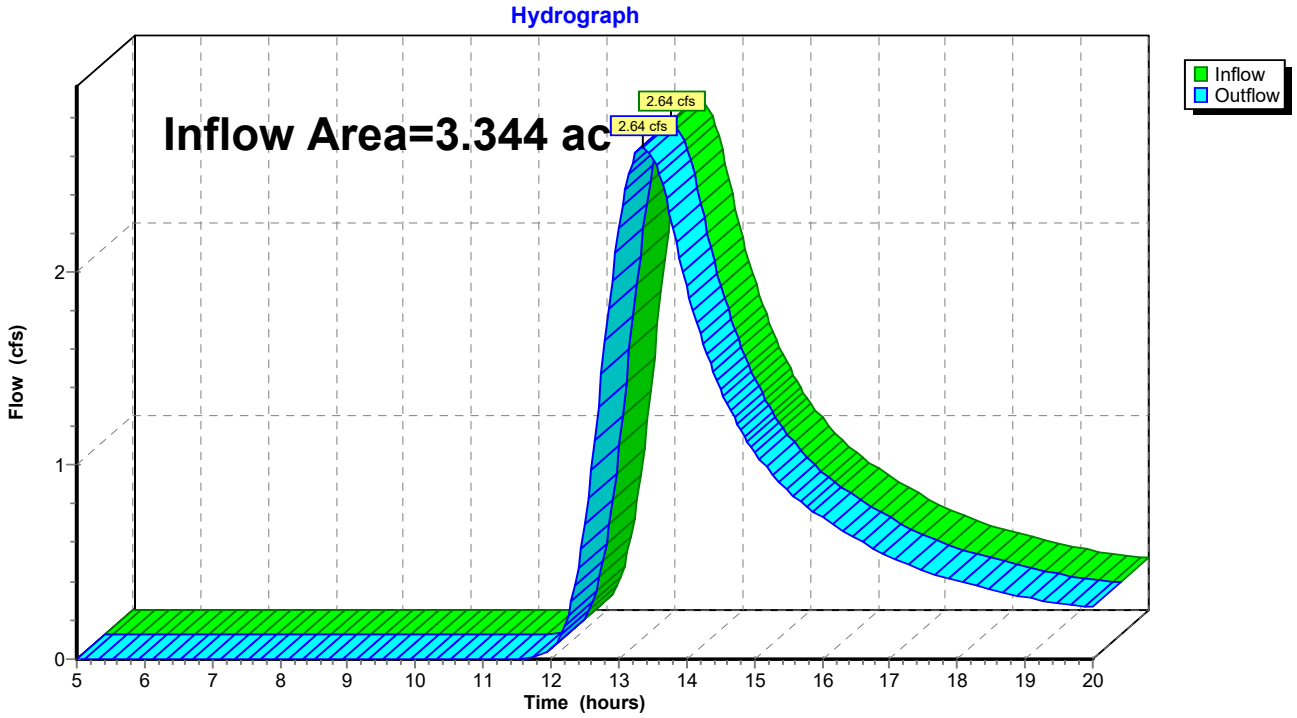
Summary for Reach 1R: EXISTING WETLAND

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

Inflow Area = 3.344 ac, 11.88% Impervious, Inflow Depth > 2.18" for 100-YEAR event
Inflow = 2.64 cfs @ 13.35 hrs, Volume= 0.607 af
Outflow = 2.64 cfs @ 13.35 hrs, Volume= 0.607 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 1R: EXISTING WETLAND



APPENDIX E

APPENDIX F

MADEP Standard 3: *Loss of annual recharge to groundwater shall be eliminated or minimized through the use of environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum the annual recharge from the post-development site shall approximate the annual recharge from the pre-development conditions based on soil type. This standard is met when the stormwater management system is designed to infiltrate the required discharge volume as determined in accordance with the Massachusetts Stormwater Handbook.*

Required Recharge Volume Calculations:

Infiltration Trench: This value for the section of the trench located towards the southeast of the proposed compound area:

$R_{volume} = F \times A_{impervious}$

F = Target Depth Factor (0.6 inch for Soil Type A) (Documenting Compliance with the Massachusetts Stormwater Management Standards, Volume 3 Page 16)

R_{volume} = (0.60in/12in per ft) x (2,871 sf) = 143.55 cf

Required Excavation Volume Calculations:

Infiltration Trench: This value for the section of the trench located towards the southeast of the proposed compound area. $R_{volume} > V_{wq}$= Recharge Volume Controls. See MADEP Standard 4 for V_{wq} (Water Quality Volume) Calculations.

$V_{excavated} = R_{volume} / n$

n= porosity (0.40 for voids between stones, per MA DEP Vol. 2 Chp. 2 page 97)

$V_{excavated}$ = (143.55cf / 0.40) = 358.87 cf

Required Drawdown Calculations:

As required by MA DEP BMP design standards, an infiltration trench must be between 3-7 feet deep. In order to maximize the separation between the bottom of the trench and the groundwater, all infiltration trenches shall be constructed at a depth of 4 feet. Based on the NRCS Soil Map Survey, the water table is > 200 cm (6.5 ft) below ground level (Appendix A). Using 4ft as our standard infiltration trench depth, we are able to calculate the bottom area required for each infiltration trench as follows:

**Infiltration Trench:* (358.87cf / 4ft) = 89.72 sf

Length of proposed infiltration trench = 25.0 ft

Required width = 89.72sf / 25.0 ft = 3.58ft ≈ 4.00 ft

Adjusted A_{bottom} = 25.0ft x 4.00ft = 100.0 sf

Using these as the areas of the bottom of the proposed infiltration trenches (A_{bottom}), we are able to calculate the drawdown time.

Infiltration Trench: This value for the section of the trench located towards the southeast of the proposed compound area:

$T_{drawdown} = R_{volume} / (k)(A_{bottom})$

k = Rawls Rate of Infiltration (1.02 in/hr for Soil Type B Table 2.3.3 1982 Rawls Rate Volume 3: Documenting Compliance with the Massachusetts Stormwater Management Standards Ch1 Page 22)

T = 358.87 cf /((1.02 in/hr)/12 in/ft) x 100.0 sf) =42.2 hrs <72 hour-requirement (OK)

MADEP Standard 4: *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids.*

See Appendix G for detailed TSS removal calculations worksheets for each BMP.

Water Quality Volume Calculations:

Infiltration Trench: This value for the section of the trench located towards the southeast of the proposed compound area:

$V_{wq} = D_{wq} \times A_{impervious}$

V_{wq} = Water Quality Volume
D_{wq} = Water Quality Depth (0.5 in for discharges not within Wellhead Protection Areas)

V_{wq} = ((0.5 in) / (12 in/ft)) x (2,871sf) = 119.63 cf (Smaller than recharge value, utilize recharge volumes for infiltration trench sizing)

APPENDIX G

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Mashpee, MA

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Infiltration Trench With Pea Stone Pretreatment	0.80	1.00	0.80	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20

Total TSS Removal = 80%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: VZW Mashpee 3 MA
Prepared By: Oscar Suarez
Date: 4/28/2023

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1