Arlington Conservation Commission

Date: Thursday, July 24, 2025
Time: 7:00 PM
Location: Conducted by Remote Participation.

Please register in advance for this meeting. Reference materials, instructions, and access information for this specific meeting will be available 48 hours prior to the meeting on the Commission's agenda and minutes page. This meeting will be conducted in a remote format consistent with An Act Extending Certain COVID-19 Measures Adopted During the State of Emergency, which further extends certain COVID-19 measures regarding remote participation in public meetings until June 30, 2027. Please note: Not all items listed may in fact be discussed and other items not listed may be brought up for discussion to the extent permitted by law. This agenda includes those matters which can be reasonably anticipated to be discussed at the meeting.

Agenda

1. Administrative
   a. Review 7/10/25 Meeting Minutes.
   b. Correspondence Received.
2. Discussion
   a. 102-104 Milton Street Certificate of Compliance Request.
   b. Symmes Woods Forest Management Plan Outline.
   c. Enforcement Order: 66-66R Dudley Street/993 Massachusetts Avenue.
   d. Water Bodies Working Group.
   e. CPA Committee Liaison.
   f. Tree Committee Update.
   g. Recreation Department Update.
3. Hearings

Notice of Intent: 16-38 Drake Road (Drake Village) (DEP #091-0371) (Continuation).

Notice of Intent: 16-38 Drake Road (Drake Village) (DEP #091-0371) (Continuation).
The Arlington Conservation Commission will hold a public hearing to consider a Notice of Intent under the Wetlands Protection Act and Arlington Bylaw for Wetlands Protection for sewer line replacement and repaving of the drive aisle and parking area at the Drake Village Complex at 16-38 Drake Road.

Town of Arlington, Massachusetts

Correspondence Received.

Summary:
Correspondence Received.

ATTACHMENTS:

	Type	File Name	Description
🗋	Reference Material	Correspondence_Received_-_Artifical_Turf_-_Craig_Breen.pdf	Correspondence Received - Artifical Turf - Craig Breen.pdf
🗋	Reference Material	Correspondence_Received_-_Fishing_Line_-_Asia_Kepka.pdf	Correspondence Received - Fishing Line - Asia Kepka.pdf
🗋	Reference Material	Correspondence_Received_-_Fishing_Line_-_Ceilidh_Yurenka.pdf	Correspondence Received - Fishing Line - Ceilidh Yurenka.pdf
🗋	Reference Material	Correspondence_Received_-_Thorndike_Place_-_Elizabeth_Pyle.pdf	Correspondence Received - Thorndike Place - Elizabeth Pyle.pdf

David Morgan

From: Craig Breen <breen.craig@gmail.com>
Sent: Friday, June 27, 2025 1:34 PM
To: ctirone@readingma.gov; Susan Chapnick; Brian McBride; nstevens@mcgregorlaw.com; dwhite@gilbertwhite.com; dkaplan31@gmail.com; mikeg125@gmail.com; David Morgan; jranderson@town.arlington.ma.su
Cc: Jeff Thielman; Jim Feeney; Sexy Sandra; Elizabeth Homan
Subject: Clarification Regarding Order of Condition #57

Categories: ConCom Correspondence

Dear Members of the Arlington Conservation Commission (ACC),

We hope this message finds you well.

We are writing to express concern regarding comments made during last night's meeting that appeared to place responsibility on the Arlington High School (AHS) Building Committee for not adhering to Order of Condition #57—specifically, for not instructing the testing lab to focus on one half of the MCP reporting limits. While we fully support the importance of environmental compliance and transparency, it is essential to consider the technical context and limitations surrounding this particular order.

Order #57, as written, combines two distinct and technically incompatible elements in this instance: EPA Method 8270D and the MassDEP MCP S-1/GW-1 reporting limits (which are meant to be halved). This incompatibility is not something that would reasonably be known or anticipated by the AHS Building Committee, as it requires specialized environmental testing expertise. It is our understanding that this issue was already known to the ACC, particularly in light of the Spy Pond poured-in-place rubber permitting process in 2023.

Given this prior knowledge, it would have been both appropriate and constructive for the ACC to proactively communicate this incompatibility to the AHS Building Committee—or to any town permit applicant—at the time it was discovered, if not earlier. To now suggest that the AHS Building Committee failed in its responsibilities due to this technical oversight is, frankly, inappropriate and unhelpful.

This approach risks undermining collaborative efforts and contributes to confusion, project delays, and unnecessary costs due to repeated testing. A more cooperative and transparent process would better serve the interests of the town and all stakeholders involved.

We would be remiss not to highlight this issue, as the implications for future permit applicants—as well as for town taxpayers—should not be understated. Thank you for your attention to this matter. We remain committed to working together in the best interest of the Arlington community.

Sincerely,

Craig Breen & Sandra Rifai

David Morgan

From: Asia Kepka <asiakepka@gmail.com>
Sent: Thursday, June 26, 2025 6:02 PM
To: ConComm
Subject: Re: Hill's Pond at Menotomy Rocks

Categories: ConCom Correspondence

Most recent find at Walden Pond where rare turtle was spotted in past few days and where many swim with their families . Floating in the water near the edge of the. Despite my experience with handling this stuff I stood no chance against 9 hooks . No animal would be able to get out of fishing line without getting injured .

Sincerely

Asia Kepka

Sent from my iPhone

On Jun 26, 2025, at 2:01 PM, Asia Kepka <asiakepka@gmail.com> wrote:

Attachment available until Jul 26, 2025

Dear Members of Conservation Commission

I'm a 27 year resident of East Arlington. As i watch on going negative human impact on our diminishing eco system i try to do my part and participate in removal of trash , fishing lines and hooks in various bodies of water. That includes Hill's Pond , which is the place where beautiful heron recently drowned. Despite many passionate conversations on social media there have not been any action from residents who oppose pause on fishing there. I have encouraged creation of volunteer group that can manage regular and emergency clean up like at Horn Pond. It is still the job of volunteers who don't fish to clean up after fishing enthusiasts. Fishing community has not stepped up after many years of polluting our shared natural resource and it's time to pause the activity responsible to pain and suffering of wildlife.
As a dog owner i am bound to obey rules created due to some dogs behaviors . My dog is amazing. Loves other dogs and humans. Yet , i am punished by actions of aggressive dogs. I understand some fishing enthusiasts have nostalgia preventing them from fishing less than mile away at Spy Pond. I can understand that. We all have nostalgia towards many things . Wants are not needs . Wildlife needs this body of water to survive. Humans want entertainment. I vote for sustainability that will create vibrant healthy pond which is ultimate long-lasting legacy. Not a web of fishing lines suffocating birds and turtles.

Here is my single trip to HP on May 23rd 2025.

Click to Download

IMG_4598.MOV

218.4 MB

Sincerely

Asia Kepka
17 Silk st

Dear Arlington Town Meeting Members,
We write in support of efforts to pause recreational fishing at Hills Pond at Menotomy Rocks Park. We have been greatly distressed to hear about the amount of fishing line waste at the pond. Not only does it endanger the wildlife there, it poses a dire environmental risk to our waterways. As folks that work and own a store dedicated to reducing plastic waste in Arlington, we are deeply concerned about the prevalence of dangerous fishing line and gear in Hills Pond.

Plastic fishing waste that is polluting our waterways breaks down into microplastics, which then enter the water cycle and the food chain. Before breaking down they are a hazard to the fish and birds who ingest them or get entangled in them, and after breaking down they remain in our environment. Fishing line, nets, and gear make up a significant portion of the waste in our oceans.

Volunteer clean-up efforts have proved fruitless in the face of this problem. The time has come to take more concerted action to protect our wildlife and town ecosystem from the waste left by people using the pond for recreational fishing.

Respectfully,

Ceilidh Yurenka and the Team at YES! Your Eco Source

212A Mass Ave
Arlington, MA 02474

From:	Elizabeth Pyle
To:	Pendergast, Georgia (DEP)
Cc:	Stephanie Kiefer; David Morgan; ConComm; heidi.zisch@mass.gov; Daniel Hill; Scott horsley; Michael Mobile
Subject:	Arlington 091-0356 - Thorndike Place - Dorothy Road
Date:	Friday, June 27, 2025 1:44:22 PM
Attachments:	FINAL_MMA_Summary_Modeling_Letter_6-26-25.pdf Thorndike_Arlington_Issue_Summary_Letter_Pkg 6-27-25 (with Exhibits A-K).pdf

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Dear Analyst Pendergast,

On behalf of the Arlington Land Trust ("ALT"), I have attached two comment letters concerning the Request for Superseding Order of Conditions filed by Arlington Land Realty LLC concerning the proposed Thorndike Place development (the "Project") located off of Dorothy Road in Arlington, Massachusetts.

First, the attached letter from Dr. Michael Mobile at McDonald Morrissey Associates, LLC ("MMA") dated June 26, 2025 (FINAL_MMA_Summary_Modeling_Letter_6-26-25) contains MMA's analysis of why BSC Group's modeling approach for the Project is incorrect, explaining that if mounding from multiple systems and interference from the building foundations is taken into account, that mounding would rise above the bottom of the proposed Project's infiltration systems. This decreases the capacity of the infiltration systems, such that the Applicant cannot show that compliance with Stormwater Standard 2 has been met. MMA's analysis also models the recommendations for mitigation that the GZA GeoEnvironmental, Inc. ("GZA") peer reviewer made to the Arlington Conservation Commission, and concludes that they will not be effective.

Second, the attached letter from Hill Law dated June 27, 2025 (Thorndike_Arlington_Issue_Summary_Letter_Pkg 2-27-25) provides additional information and a summary of key findings identified by ALT consultants Scott Horsley and Michael Mobile regarding deficiencies in the design of the Project's stormwater management system that arose during the most recent peer review period before the Arlington Conservation Commission, with supporting documentation at Exhibits A-K.

To facilitate your review, I have attached a full copy of this letter below, along with a Dropbox link to the both letters being submitted today and the separate Exhibits A-K:

https://www.dropbox.com/t/uOIPYcLlEARjpSEf

Please kindly confirm receipt of this information, and please also let us know if you have any difficulty accessing any of these documents, or if you would like us to provide you with paper copies. Please also feel free to contact us if you have any questions, or if you need any additional information.

Thank you in advance for your consideration of these comments.

Sincerely yours,

Elizabeth Pyle
Hill Law

McDonald Morrissey Associates, LLC
GROUND WATER HYDROLOGISTS

June 26, 2025

Elizabeth M. Pyle
Hill Law
Six Beacon Street, Suite 600
Boston, MA 02108

RE: **Thorndike Place, Dorothy Road, Arlington, Massachusetts**
Summary of MMA's Numerical Model Mounding Analysis

Dear Attorney Pyle,

McDonald Morrissey Associates, LLC ("MMA") is providing this letter to (1) explain key deficiencies in BSC Group's ("BSC's") analytical modeling approach for the proposed Thorndike Place development (the "Project") located off of Dorothy Road in Arlington, Massachusetts (the "Site"); and (2) assess the potential effectiveness of the recommendations presented in the GZA GeoEnvironmental, Inc. ("GZA") peer review of the Project to the Arlington Conservation Commission (the "Commission").

Background

MMA determined that the Applicant's representative, BSC, applied an equation presented by Hantush[1] (referred to herein as the "Hantush analytical model") to evaluate groundwater mounding impacts from the proposed stormwater infiltration system inappropriately and unreliably for multiple reasons, as explained herein. Specifically, due to the simplifying assumptions Hantush applied in developing his solution to the groundwater flow equation, the Hantush analytical model inherently cannot account for or represent the horizontal flow barriers that would interact with and affect groundwater mounding generated by the Applicant's proposed stormwater system. Furthermore, though the additive effect from multiple, simultaneously active infiltration systems can be approximated using the Hantush analytical model, this is simply ignored in BSC's mounding analysis approach.

The consequential deficiencies noted above were acknowledged by GZA in their review letter dated January 28, 2025. In that letter, GZA claimed that potential impacts to stormwater infiltration stemming from groundwater mounding would be mitigated if two actions were implemented: (1) installation of a groundwater underdrain system adjacent to Infiltration System 1 (INF-1), and (2) removal and replacement of the organic (i.e., peat) deposits present below the areal footprint of INF-1 with clean fill to the system bottom. Under these conditions, GZA claimed that mounding from INF-1 would not be

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[1] Hantush, M.S., 1967. *Growth and decay of groundwater mounds in response to uniform percolation*. Water Resources Research, v.3, p. 227-234.

expected to adversely impact conditions at nearby Infiltration System 7 (INF-7). However, GZA provided no analysis to support this claim.

Explanation of MMA's numerical MODFLOW modeling analysis

To illustrate the limitations of BSC's approach—and to assess GZA's claim—MMA expanded on BSC's mounding analysis by employing a numerical MODFLOW model in place of the Hantush analytical model. The numerical approach is more robust and flexible than analytical modeling, due to a finite-difference approach that is not constrained by simplifying assumptions that deviate from realistic physical and hydrogeologic conditions at the Site. In this application, we leveraged MODFLOW's capabilities to simulate: three-dimensional groundwater flow; horizontal flow barriers; cumulative mounding effects; horizontal drains to which groundwater would discharge under proposed conditions; and spatially variable hydraulic properties of subsurface materials.

The MODFLOW model was developed using the USGS MODFLOW-NWT code[2]. To maintain consistency with the assumption of infinite lateral aquifer extent that applies to the Hantush analytical model, the MODFLOW model domain was extended a significant distance beyond the Project area/Site such that local hydraulic stresses would not result in head (i.e., simulated groundwater level or potential) changes at the limits of the model domain. More appropriate and realistic boundary conditions could be represented using MODFLOW; however, those conditions could influence the model results. This action would be appropriate under the objective of independently developing a reliable site-specific groundwater flow model. However, the Applicant and GZA have claimed BSC's existing analysis demonstrates compliance with applicable requirements; therefore, the purpose of MMA's modeling exercise is currently limited to assessing certain key methodological deficiencies.

Aquifer properties such as horizontal hydraulic conductivity, horizontal-to-vertical anisotropy, and storativity were assigned values consistent with those used in BSC's modeling and associated stated assumptions. Recharge generated by Infiltration Systems 1 through 7 only (i.e., the proposed rain garden was intentionally omitted) was represented using the MODFLOW River (RIV) package, which establishes head-dependent boundary conditions. The RIV package was used to define sources of groundwater (i.e., incoming fluxes) that were equal to the infiltration rates claimed for Infiltration Systems 1 through 7 by BSC when simulated groundwater levels reside below the system bottoms[3]. However, due the head-dependent formulation, when applied recharge causes the simulated water table to mound above the system bottoms, infiltration rates decrease, approximating an adverse hydraulic impact condition that is

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[2] Niswonger, R.G., Panday, Sorab, and Ibaraki, Motomu, 2011, *MODFLOW-NWT, A Newton formulation for MODFLOW-2005:* U.S. Geological Survey Techniques and Methods 6-A37, 44 p., https://doi.org/10.3133/tm6A37

[3] Infiltration system bottoms were conservatively represented with the MODFLOW River package based on bottom elevations claimed by BSC, as opposed to using the bottom-of-stone elevations based on the Applicant's current plan set.

commonly noted in various subject guidance and applicable peer reviewed literature. For example, as noted in a state-of-science review authored by the U.S. Environmental Protection Agency (USEPA)[4], "*…once the groundwater table (or capillary fringe) intersects the bottom of the infiltration system due to short-term mounding, the infiltration pathway shifts from a downward flux through the unsaturated zone to a lateral flux out of the perimeter of the system* [separate citations omitted]. *This can significantly reduce overall drainage rates, as shown through extensive physical modeling and field observations…"*.

The MODFLOW simulations were designed to span a single, 72-hour transient stress period. Initial head conditions were uniformly set to elevation 4.0 feet, in accordance with BSC's claimed Estimated Seasonal High Groundwater ("ESHGW") condition. The bottom of the active model domain was set to elevation -12.0-feet, thus making the total initial saturated thickness represented in the MODFLOW model equal to the value of 16.0-feet used by BSC in their own mounding analyses[5].

Modeling three scenarios using MODFLOW

Three scenarios were simulated using the MODFLOW model:

1. Infiltration System 7 (INF-7) only. This scenario is intended to demonstrate that the MODFLOW model, absent the modifications noted in the scenarios below, is producing mounding predictions that are generally comparable to those produced using the Hantush analytical model (i.e., it acts as a "control case" to show the MODFLOW model is not representing a different set of conditions).

2. Infiltration Systems 1 through 7 actively infiltrating stormwater, with boundaries that can act as barriers to horizontal groundwater flow added at the positions of certain proposed building foundations (i.e., the townhomes down to elevation 3.0-feet, which corresponds to the reported basement elevation, and the main building/main building parking garage down to elevation 6.0-feet, which corresponds to the reported garage floor elevation)[6].

3. Infiltration Systems 1 through 7 actively infiltrating stormwater, horizontal boundaries added, an underdrain located between INF-1 and the main building parking garage at elevation 4.0-feet, and placement of clean fill over the eastern three quarters of Infiltration System 1's areal footprint down to elevation 0.0-feet, approximately coinciding with the bottom elevation of the observed peat deposits[5]. *Thus, Scenario 3 is intended to assess the influence of GZA's recommendations for mitigating groundwater mounding impacts.* Though the extent of the peat deposits is currently unknown, in MMA's opinion, the assumed extent represented in the model is reasonable and likely conservative based on

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[4] USEPA, 2021. *Enhanced Aquifer Recharge of Stormwater in the United State: State of Science Review*. EPA/600/R-21/037F.
[5] Refer to BSC's *Stormwater Report*, revised date of December 2024.
[6] Refer to Applicant Plan Set, prepared by BSC, revised date of December 10, 2024.

currently available information. Various values of horizontal hydraulic conductivity (Kh)—all reflecting general increases in permeability relative to BSC's interpretation of native site soils—are applied to the assumed fill area.

In scenarios 2 and 3, additional model layers were added, and the regions of the model domain coinciding with the foundations of the townhomes and the main building/main building parking garage were inactivated (i.e., MODFLOW IBOUND array values set to 0). This action establishes no-flow boundaries along the perimeters and bases of the foundations, so groundwater cannot flow horizontally or vertically through those areas.

In scenario 3, the underdrain adjacent to INF-1 was represented using the MODFLOW Drain (DRN) package[7], with individual DRN conductances set to an arbitrarily high value. In effect, this method of representing the underdrain conservatively promotes outflow to the drain, as details on its proposed design and capacity have not been provided. Additionally, within the assumed footprint of the peat layer (i.e., based on logs for borings MA-1 and MA-2[5]) the horizontal hydraulic conductivity was increased over a range of values to approximate excavation of the presumably lower-permeability peat deposits and overlying materials and replacement with clean fill presumed to have a relatively high permeability. The locations of these modifications are shown in **Figure 1** below.

[7] Refer to https://water.usgs.gov/ogw/modflow-nwt/MODFLOW-NWT-Guide/drn.html for details on the MODFLOW DRN package.

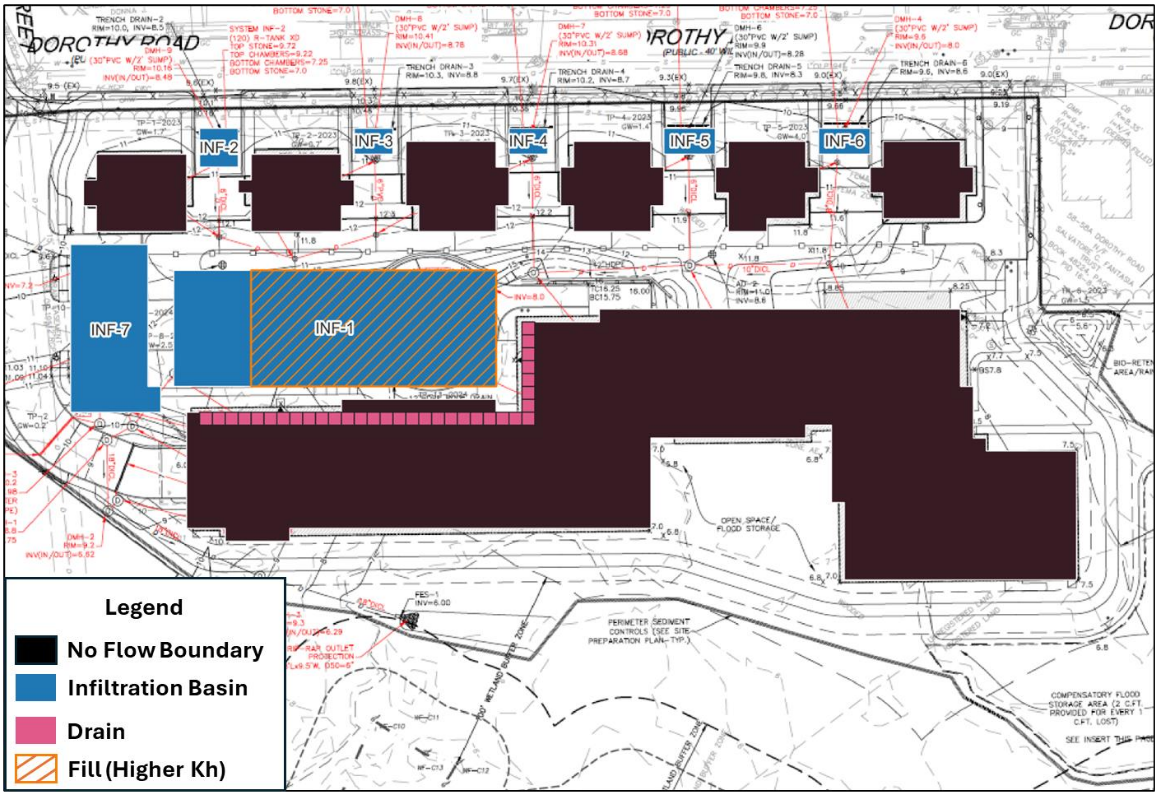


Figure 1 – Location of model boundary features represented in MMA's numerical model mounding analysis.

<u>Scenario 1:</u>

Again, Scenario 1 is a "control case" intended to demonstrate that the MODFLOW model is reliably producing mounding predictions that are comparable to those produced using the Hantush analytical model. **Figures 2 and 3**, below, illustrate mounding height predictions for INF-7 after 1.25 days of active infiltration (i.e., only at INF-7) using the Hantush analytical model and the MODFLOW model, respectively. In the case of the Hantush analytical model, inputs are generally consistent with inputs used by BSC for INF-7[5] with the exceptions of the recharge rate and infiltration period duration[8], both of which have been revised to address BSC's input errors highlighted by GZA in their review letter dated Jan. 28, 2025.

[8] The infiltration period duration of 1.25 days differs slightly from GZA's adjusted duration of 1.23 days in order to provide a more exact match to the timing interval of output reporting used in the MODFLOW model.

use consistent units (e.g. feet & days **or** inches & hours)

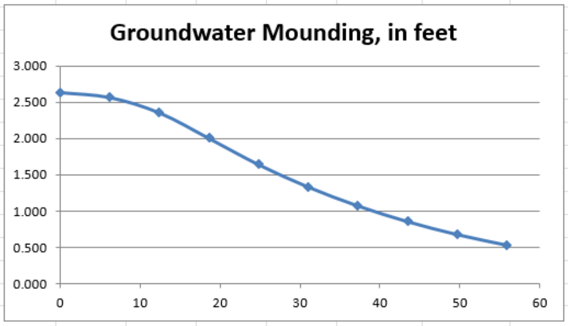
Input Values			Conversion Table	
			inch/hour	feet/day
0.5400	*R*	Recharge (infiltration) rate (feet/day)	0.67	1.33
0.080	Sy	Specific yield, Sy (dimensionless, between 0 and 1)		
5.40	K	Horizontal hydraulic conductivity, Kh (feet/day)*	2.00	4.00
17.225	x	1/2 length of basin (x direction, in feet)		
35.150	y	1/2 width of basin (y direction, in feet)	hours	days
1.250	t	duration of infiltration period (days)	36	1.50
16.000	hi(0)	initial thickness of saturated zone (feet)		

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

18.637	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
2.637	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
2.637	0
2.568	6.21
2.358	12.42
2.006	18.63
1.644	24.84
1.336	31.05
1.077	37.26
0.861	43.47
0.682	49.68
0.536	56

Re-Calculate Now



Disclaimer

Figure 2 – Mounding height predictions from the Hantush analytical model, INF-7 only.

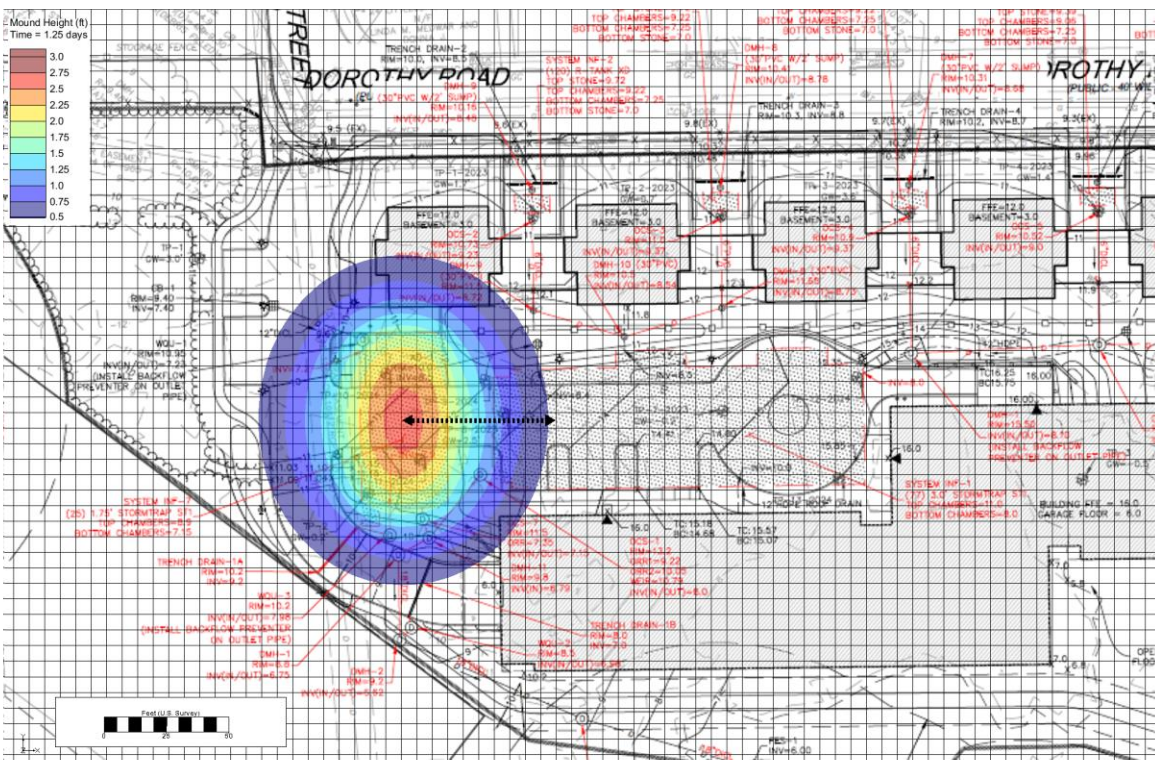


Figure 3 – Mounding height predictions from the MODFLOW model, INF-7 only.

Figure 4, below, directly compares the mounding height predictions from the two models along the represented—or selected, in the case of the MODFLOW model (see the dashed black line in **Figure 3**)—transect.

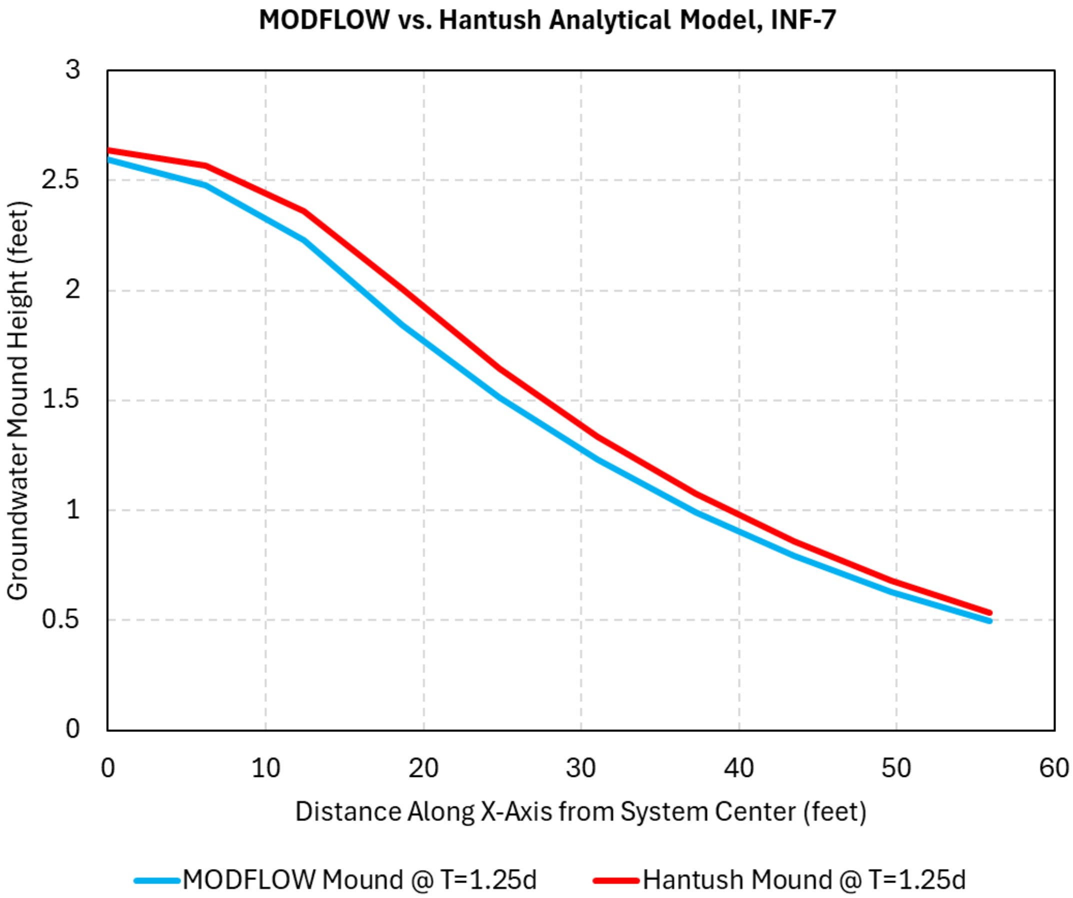


Figure 4 – Comparison of the MODFLOW and Hantush analytical models

As **Figure 4** shows, the two models produce very similar results, with MODFLOW generating mounding height predictions that are slightly lower than the Hantush analytical model. In terms of peak mounding height, this outcome is consistent with results produced by a separate study led by the U.S. Geological Survey that directly compared the Hantush analytical model and MODFLOW[9]. **Thus, the results of the Scenario 1 simulation demonstrate the MODFLOW model can be reliably applied as an extension of the Applicant's analysis to address MMA's stated objectives, which are to illustrate certain deficiencies in BSC's mounding analysis approach and assess GZA's recommended mitigation measures.**

[9] Carleton, G.B., 2010, Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins: U.S. Geological Survey Scientific Investigations Report 2010-5102, 64 p

Scenario 2:

The purpose of the Scenario 2 simulation is to consider additive mounding from multiple, simultaneously active infiltration systems and to assess the impact of lateral barriers to flow due to proposed building foundations. **Figure 5**, below, illustrate mounding simulation results for selected locations within Infiltration Systems 1 through 7 based on Scenario 2 conditions (to account for additive mounding and interference from proposed building foundations) using the MODFLOW model.

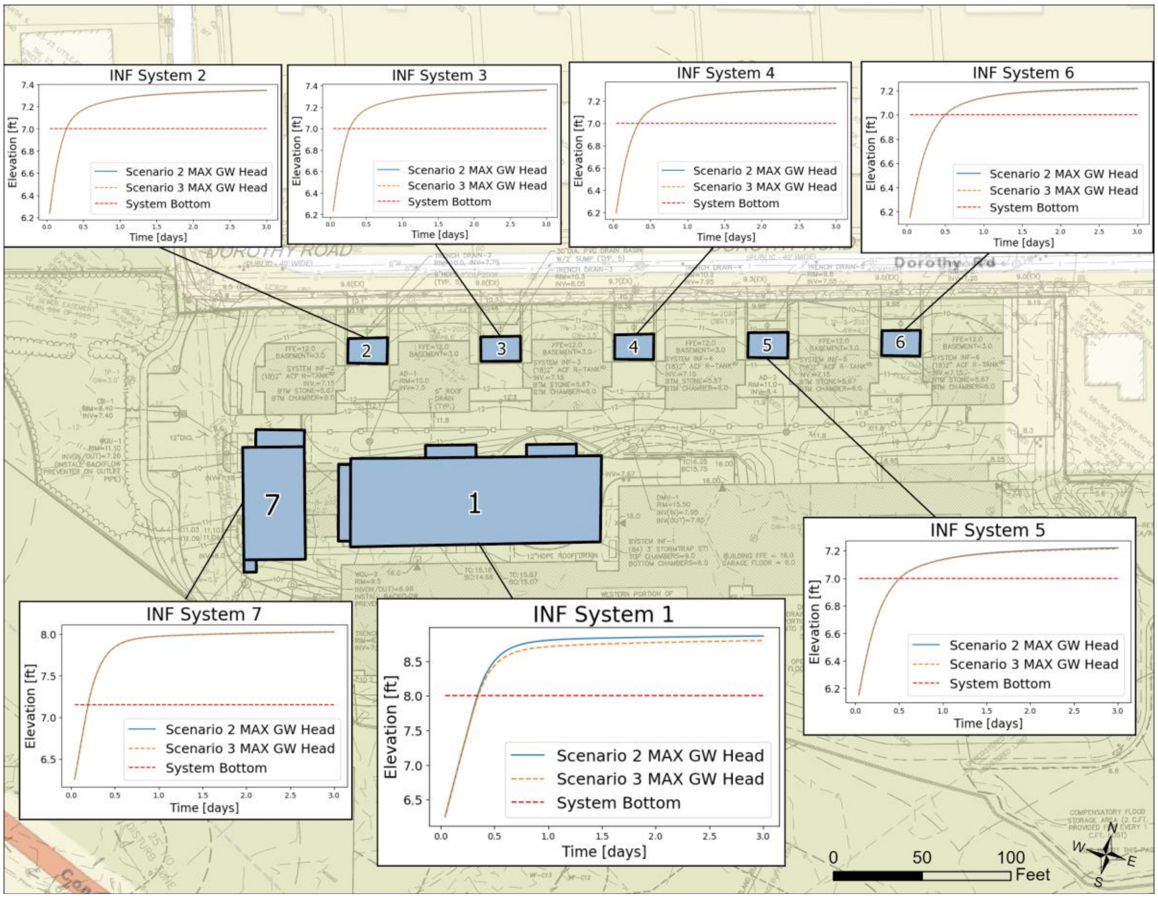


Figure 5 – Simulated maximum groundwater heads within each infiltration basin under Scenario 2 conditions, along with the bottom elevation of the infiltration system.

As indicated by **Figure 5**, the simulated water table rises to and exceeds BSC's claimed system bottom elevations for all seven proposed infiltration systems, after approximately less than 12 hours of active infiltration. Modeled heads display asymptotic conditions as a result of the head-dependent (i.e., RIV package) representation of infiltration, which causes infiltration rates to decrease after simulated heads exceed system bottom elevations. In other words, infiltration rates are being reduced due to severe groundwater mounding below the systems, and groundwater levels/potentials at the systems stop rising. As noted previously, this is an approximation of the magnitude of rate decrease, but **the model's prediction of critical concern—that differs drastically**

from BSC's current analysis and conclusions—is that water table conditions will exceed system bottoms, when additive mounding from multiple systems and lateral interference from building foundations are considered. BSC is on record as stating an objective of their proposed stormwater design is to prevent this very condition[5]. Yet these results suggest that if BSC's mounding analysis had addressed the two previously noted methodological deficiencies, it would have been unacceptable under their own stated criteria.

<u>Scenario 3:</u>

The purpose of the Scenario 3 simulation is to assess the impact(s) of GZA's suggested mitigation measures. **Figures 6 and 7**, below, provide time series of simulated heads for INF-1 and INF-7 under Scenario 3 conditions that are comparable to the plots shown in **Figure 5**.

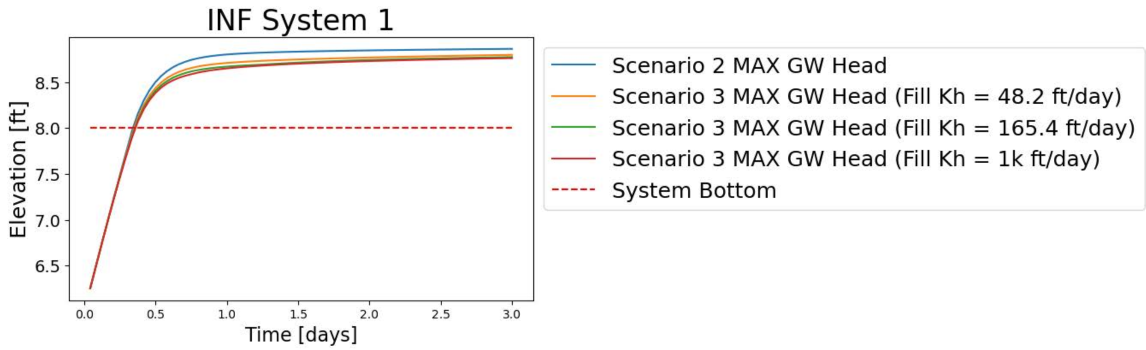


Figure 6 – Simulated maximum groundwater heads within INF-1 under Scenario 3 conditions along with the bottom elevation of the infiltration system.

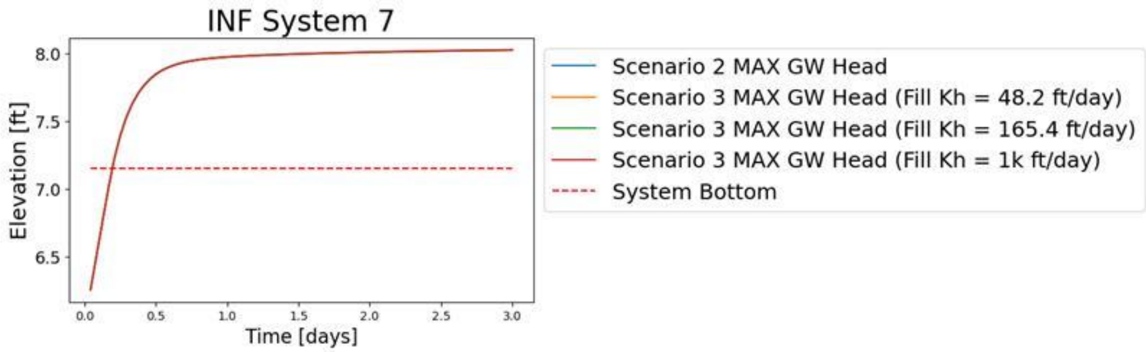


Figure 7 – Simulated maximum groundwater heads within INF-7 under Scenario 3 conditions along with the bottom elevation of the infiltration system.

As indicated by **Figure 6 and 7**, **the Scenario 3 simulations suggest GZA's proposed mitigation measures would be generally ineffective, particularly with respect to preventing groundwater mounding from rising to and above the bottom of INF-7**. (Note that the Scenario 3 results reflect only adjustments/increases to hydraulic conductivity values within the assumed peat excavation area. INF-1 infiltration rates in this area were not adjusted because the Applicant has not provided information supporting infiltration rate assumptions for the fill area and an associated updated HydroCAD analysis. Updated Scenario 3 simulations can be performed by MMA should appropriate new information be made available. However, based on currently available information, MMA believes the current simulations are conservative, as an increased infiltration rate would presumably exacerbate mounding and potentially accelerate the timing of heads arriving at system bottom elevations.)

Conclusions

1. As shown in Scenario 1, the MODFLOW model developed by MMA is a reasonable extension of the Applicant's own method (i.e., BSC's Hantush analytical model) of evaluating groundwater mounding caused by infiltration from the proposed stormwater system during design storm events.

2. As shown in Scenario 2, if the Applicant's analysis considered additive effects from multiple, simultaneously active systems and lateral interference from building foundations, it would show mounding rising above proposed system bottoms. That prediction would violate BSC's own claimed design objectives, and it would invalidate the key assumption relied upon in BSC's HydroCAD modeling and system drainage time calculations (i.e., use of constant, unimpacted exfiltration/infiltration rates), thus rendering calculations based on that assumption unreliable.

3. As shown in Scenario 3, MMA's simulations suggest that GZA's proposed mitigation measures would be ineffective, particularly with respect to preventing groundwater mounding from rising to and above the bottom of INF-7.

4. If groundwater mounding rises to or above the bottoms of proposed infiltration systems, as predicted under Scenarios 2 and 3, infiltration rates will be materially reduced, likely resulting in increased peak rates of system outflow (i.e., runoff) under post-development conditions and prolonged system drainage times. BSC's analysis does not properly assess adverse effects to system performance due to groundwater mounding, and GZA's recommendations have not been shown to be effective with respect to mitigating against such effects. Thus, the Applicant has not provided an analysis that demonstrates the proposed stormwater design complies with the requirements listed in the Massachusetts Stormwater Handbook (e.g., compliance with Stormwater Standard 2).

Disclaimers/Limitations

MMA does not present the MODFLOW model described herein as a site-specific analysis that is specifically appropriate for design or permitting purposes. Its sole purpose is to highlight key deficiencies in BSC's analytical modeling approach and to assess the recommendations presented in GZA's peer review, as noted above. Additionally, the comments presented herein are preliminary and based on information made available to MMA as of the indicated transmittal date. MMA therefore reserves the right to amend and/or extend this commentary based on expanded review and/or review of new information provided by the Applicant or other interested parties.

Sincerely,

Michael Mobile, Ph.D., CGWP
President, McDonald Morrissey Associates, LLC

MAM/
Z:\1_Projects\Arlington\Thorndike_Place\7_Reports_and_Memos\Draft_Summary_of_Issues_5-27-25\FINAL_MMA_Summary_Modeling_Letter_6-26-25.docx

HILL LAW

June 27, 2025

By EMAIL: georgia.pendergast@mass.gov

Georgia Pendergast, Environmental Analyst
MassDEP Wetlands Program
150 Presidential Way
Woburn, MA 01801

Re: Request for Superseding Order of Conditions
Thorndike Place, Dorothy Road, Arlington, Massachusetts
DEP File #091-0356

Dear Ms. Pendergast:

On behalf of the Arlington Land Trust ("ALT"), we are writing to provide you with additional information and a summary of key findings identified by our consultants Scott Horsley and Michael Mobile, PhD, CGWP regarding deficiencies in the planned stormwater infiltration system for the proposed Thorndike Place development (the "Project") located off of Dorothy Road in Arlington, Massachusetts (the "Site"). Our comments, which include a summary of the key issues that arose during the most recent peer review period before the Arlington Conservation Commission (the "Commission"), are outlined below. Supporting documentation, including Dr. Mobile's and Mr. Horsley's analyses that were presented to the Commission, are also attached to this letter as Exhibits A-K.

I. Summary of Key Issues Arising During the Most Recent Peer Review Period Before the Commission.

A. Mobile and Horsley July 8, 2024 Comments.

In their joint letter to the Commission dated July 8, 2024 (Exhibit A), Mr. Horsley and Dr. Mobile flagged key issues that needed to be addressed to ensure that the Applicant's stormwater design complied with applicable requirements, including those identified in the Massachusetts Stormwater Handbook ("MSH"). As you know, the Stormwater Handbook and its requirements have the same weight of law as the state stormwater regulations listed at 310 CMR 10.05(6)(k), because they are specifically referenced in the regulations. "When a project is subject to the [stormwater] standards, all stormwater is regulated according to the 'best management practices [BMPs] to attenuate pollutants and to provide a setback from the receiving waters and wetlands in accordance with the following Stormwater Management Standards *as further defined and specified in the Massachusetts Stormwater Handbook*.'" Matter of Bosworth, OADR

Docket No. WET-2015-015, Recommended Final Decision (February 17, 2016), 23 DEPR 25, 28-29, adopted as Final Decision (March 14, 2016), 23 DEPR 25 (2016) *quoting*, 310 CMR 10.05(6)(k) and 310 CMR 10.05(6)(b) ("The Order of Conditions shall impose such conditions as are necessary to meet the performance standards set forth in . . . the Stormwater Management Standards provided in 310 CMR 10.05(6)(k) through (q).") (emphasis added). As explained in the Mobile-Horsley July 8, 2024 letter, which includes a Table detailing areas of noncompliance with the MSH, the following issues with Project remained unaddressed:

- **Estimated Seasonal High Groundwater ("ESHGW")** – the Applicant's bases, methods, and results of estimating seasonal high groundwater conditions at the Site were unreliable.

- **Groundwater Mounding Analysis** – In conducting their groundwater mounding analysis, BSC failed to properly account for the potential for adverse hydraulic effects on the stormwater systems due to combined groundwater mounding from multiple systems.

See Exhibit A.

B. Mobile and Horsley August 23, 2024 Comments.

Next, the Commission's peer reviewer, GZA Geoenvironmental Inc. ("GZA") provided comments on a revised Project design to the Commission on August 1, 2024. Exhibit B. On August 23, 2024, ALT consultants Mr. Horsley and Dr. Mobile replied to GZA's comments regarding Site subsurface conditions, the Applicant's claimed Estimated Seasonal High Groundwater (ESHGW) condition, and the Applicant's groundwater mounding evaluation. See Exhibit C. Mr. Horsley's and Dr. Mobile's reviews flagged the following issues:

- **Groundwater Mounding Analysis** – The Applicant's consultant, BSC Group's ("BSC's"), use of the required recharge volume as a basis for the recharge rate and duration in their groundwater mounding analysis did not comply with the Massachusetts Stormwater Handbook (MSH). As a result, BSC's mounding analysis did not demonstrate the proposed stormwater infiltration systems would operate as intended during storm events.

- **ESHGW** – Groundwater measurements made by BSC at the Site, when adjusted based on the Frimpter method *and the Lexington USGS index well selected by BSC*, exceeded the proposed ESHGW elevation of 4.0 feet.

- **Conclusion** – Mr. Horsley and Dr. Mobile found that "more information was needed to reliably identify '*the highest groundwater elevation'* in a manner consistent with the guidance presented in the MSH."

See Exhibit C, p. 2.

C. Mobile and Horsley November 4, 2024 Comments.

The Applicant then submitted additional information to the Commission from BSC dated October 4, 2024, which GZA reviewed on October 22, 2024.[1] Dr. Mobile's then provided a technical review of these materials dated November 4, 2024 (Exhibit D), which found that:

- **Infiltration Rates Were Overstated by BSC**– BSC's infiltration rate was erroneously high ("a factor of two higher than the maximum applicable rate of 0.27 inches/hour listed in the MSH"). As a result, "BSC's HydroCAD model is overstating the ability of the proposed system [Infiltration System 1] to infiltrate stormwater." (Exhibit D, p.3).

- **The Applicant's Subsequent Analyses for MSH Compliance Were Unreliable** – Results from BSC's HydroCAD model, which included the overstated infiltration rate for Infiltration System 1, served as inputs for subsequent analyses. Therefore, BSC did not produce reliable analyses (including post-development runoff rate calculations and mounding analysis calculations) that demonstrated compliance with Stormwater Standard 2 and the MSH.

See Exhibit D, p. 4.

In his November 4, 2024 letter (Exhibit E), Mr. Horsley further reviewed BSC's October 4, 2024 report and GZA's August 1, 2024 peer review (Exhibit B), and raised the following additional concerns:

- **Site Hydrology –** The Project would increase net recharge by reducing evapotranspiration and concentrating infiltration, likely raising groundwater levels on-Site, on abutting properties, and in the adjacent wetland. This potential for "groundwater flooding" was raised during ZBA Comprehensive Permit review, but remained unaddressed.

- **Problems with System Design and Function –** Redirecting all stormwater to one infiltration system (Infiltration System 1), which was proposed at that time, amplifies mounding impacts. Using BSC's input values, Mr. Horsley found that groundwater could rise and flood the system, potentially elevating wetland levels.

See Exhibit E, pp. 1-2.

D. Mobile January 15, 2025 Comments.

In a letter dated January 15, 2025 (Exhibit F), Dr. Mobile presented the results of his review of BSC's calculations in their stormwater report (revised in December 2024) and

[1] We can provide copies of these documents upon request.

their January 3, 2025 letter. These materials detailed revisions and assumptions made regarding Site features, as well as calculations based on those features. The results of Dr. Mobile's peer review are summarized as follows:

- **Infiltration System Inputs to Model** – Certain Project features continued to selectively use erroneously high infiltration rates of 0.52 in/hr, while other, smaller systems utilized lower infiltration rates of 0.27 in/hr (Mobile, Jan. 15, 2025). Exhibit F, p. 2.

- **ESHGW** – BSC adjusted the elevation for Infiltration System 1 to claim vertical separation of exactly 4.0 feet between the infiltration system's chamber bottoms and the proposed ESHGW condition. There remained less than 4.0 ft of vertical separation between the bottom of the proposed stone base layer and the proposed ESHGW. Exhibit F, pp. 2-3. This approach is inconsistent with MassDEP's view on appropriate methodology (see 24 School Street, Wayland Denial Superseding Order of Conditions, Exhibit G, pp. 2-3, stating that: "The required two (2) feet of separation between the seasonal high groundwater and the bottom of the infiltration system should be measured from the bottom of the stone layer.").

- Additionally, BSC failed to acknowledge the "significant degrees of spatial and temporal variability in water table conditions at the site" and claimed a mounding analysis for Infiltration System 1 was unnecessary even though "previously presented information suggest[ed] 4 feet of vertical separation [was] unlikely to be adequate in terms of preventing groundwater mounding from adversely impacting System 1." Exhibit F, p. 3.

- **Additive Effects of Groundwater Mounding** – By asserting that a groundwater mounding analysis at Infiltration System 1 was no longer required, BSC ignored the potential additive effects of mounding at nearby infiltration basins – especially the effects at nearby Infiltration System 7. Exhibit F, p. 3.

- **Modeling Discrepancies** – BSC's Hantush analytical model used infiltration rates inconsistent with BSC's own HydroCAD predictions. Additionally, BSC's model had limited ability to adequately represent Site- and Project-specific complexities. Consequently, BSC's analysis ignores the possibility that subsurface structures may act as barriers to lateral groundwater flow and interfere with mounding during storm events. Dr. Mobile recommended that a more robust and flexible modeling approach (e.g., MODFLOW) be pursued. Exhibit F, p. 4.

E. Horsley and Mobile February 3, 2025 Comments.

In his February 3, 2025 letter (Exhibit H), Mr. Horsley reviewed updated materials from BSC and GZA and raised the following concerns:

- **ESHGW –** Mr. Horsley again disputed BSC's use of 4.0 feet for the ESHGW condition, stating it disregarded MassDEP-approved methods in the MSH, and that it conflicted with local well data. He noted that BSC relied on "weeping water" observations in TP-9, instead of redox features or USGS comparisons, as required in the MSH. Whitestone identified redox features at elevation 5.8' in TP-7, which were dismissed by BSC, who claimed they were indicative of a perched condition. Mr. Horsley also explained that BSC's periodic measurements missed peak spring levels that were confirmed by both USGS wells and the data from the Arlington Land Trust wells located on Town-owned land on Dorothy Road next to the Project Site (the "ALT Wells"), which supported a more accurate ESHGW range of 5.0–5.8 feet. See ALT Well data, Exhibit H, p. 4, March through April 2024 data).

- Mr. Horsley further argued that the Applicant's 4.0-foot ESHGW estimate was being used to bypass the need for a mounding analysis. Exhibit H.

In Dr. Mobile's February 3, 2025 letter (Exhibit I), and in a subsequent presentation to the Conservation Commission dated February 5, 2025 (Exhibit J), Dr. Mobile also provided the following comments on GZA's January 28, 2025 technical review letter:

- **GZA Groundwater Mounding Analysis** – The groundwater mounding analysis performed by GZA showed a groundwater mound rising to within approximately 0.5 feet of the bottom of Infiltration System 7, but it disregarded the additive influence of groundwater mounding due to Infiltration System 1 and the influence(s) of subsurface structures.

- **BSC Groundwater Mounding Analysis** – BSC's unexplained use of an infiltration rate of 0.52 in/hr for certain proposed features (including Infiltration System 1) still had not been acknowledged or corrected.

- **ESHGW Estimation** – The Applicant's 4.0-foot vertical separation between Infiltration System 1 and BSC's claimed ESHGW (so as to avoid a groundwater mounding analysis) should not be credited. If the ESHGW were established in accordance with MSH requirements, it would have been above BSC's claimed elevation, and a mounding analysis for Infiltration System 1 would be required under the revised design.

- **Infiltration System Performance** –Dr. Mobile's analysis showed the importance of accounting for groundwater mounding when evaluating infiltration system operation. Additive mounding from multiple, simultaneously active infiltration systems should be considered together to ensure the system will function as designed, and subsurface flow barriers should also be accounted for.

See Exhibits I-J.

II. Mobile and Horsley Conclusions regarding final Project design.

As shown by the review of the Project history summarized above, the Applicant has failed to prove that the Project's stormwater management system is a viable design that complies with the Massachusetts Stormwater Standards and the MSH. The following issues remain unresolved and are consequential:

- **Determination of ESHGW** – The Applicant's proposed ESHGW elevation of 4.0-feet is poorly supported and uncertain. Numerous lines of evidence indicate higher groundwater elevations occur regularly (e.g., annually) in various areas of the Site, including in the areas where the primary infiltration systems for the Project are proposed to be constructed. As confirmed by groundwater elevation measurements from the ALT wells as recently as late May 2025, the actual measured groundwater elevations next to the Site again exceeded the Applicant's estimated seasonal high groundwater condition of 4.0-feet over a period spanning multiple days. See ALT Well data, March 18, 2024 to May 26, 2025, Exhibit K.[2] The ALT wells are located on Town-owned land on Dorothy Road, close to the Project Site. As shown on Exhibit K, this is the second year in a row that the ALT walls next to the Site have documented groundwater exceeding the 4.0-foot elevation over a period of multiple days, indicating that this condition is likely to occur annually, and is not an anomaly. Accordingly, the Applicant's ESHGW conditions are an unreliable baseline for claiming a groundwater mounding analysis is unnecessary for certain proposed infiltration systems.

- **Basis for Evaluating Vertical Separation** – The Applicant has evaluated vertical separation distances between infiltration structures and the ESHGW condition based on proposed bottom elevations of chambers rather than the bottom elevation of the underlying crushed stone layer. This approach is inconsistent with MassDEP's view on appropriate methodology (see 24 School Street, Wayland Denial Superseding Order of Conditions, Exhibit G, pp. 2-3, "The required two (2) feet of separation between the seasonal high groundwater and the bottom of the infiltration system should be measured from the bottom of the stone layer."). This is consequential, because based on the current proposed design, measuring from the bottom-of-stone elevation would negate the Applicant's claim that a mounding analysis is not required for Infiltration System 1.

- **Mounding Analysis Must be Reliable** – BSC has made numerous failed attempts to use modeling methods to evaluate groundwater mounding associated with their proposed stormwater system designs. They have used erroneous and unsupported inputs, applied modeling methods that rely on assumptions that do not match Site conditions, and failed to represent applicable physical complexities, such as additive mounding and barriers to lateral groundwater flow. Simply put, the groundwater mounding analyses conducted and presented by the Applicant to date are flawed, not representative, and thus unreliable in

[2] The raw transducer data records for the ALT Wells can be supplied upon request.

demonstrating anything with respect to the proposed Project, let alone compliance with MSH requirements. See correspondence from Dr. Mobile dated June 26, 2025, filed herewith. The Applicant has not presented a reliable model consistent with Site conditions to illustrate that groundwater mounding will not reduce infiltration rates to the point where Stormwater Standard 2 is violated, and that would not prevent the proposed infiltration systems from draining within 72-hours during/following storm events. See MSH, Vol. 3. Ch. 1, p. 29.

- **No Support for Recommended Mitigation Measures** – The recommendations presented by GZA to address potential adverse effects from groundwater mounding on the performance of the infiltration systems, Infiltration System 7 specifically, are purely speculative. In fact, Dr. Mobile's information-only modeling exercise suggests they would have a negligible effect on Infiltration System 7's performance. See MMA correspondence dated June 26, 2025, filed herewith. Thus, GZA's recommendations should be viewed as unsupported, unreliable, and certainly inadequate in addressing the totality of the concerns highlighted above.

III. <u>Conclusion</u>

For all the reasons set forth above, the Department should not issue a Superseding Order of Conditions for the proposed Project as currently designed. In order to determine an accurate groundwater elevation – which is the crucial foundation of the design for the stormwater management system – we request that the Department require the Applicant to conduct continuous groundwater monitoring on the Site during the 2026 spring season, so that peak groundwater elevations can be recorded. We further request that the Department conduct its own evaluation of ESHGW elevations based on the Handbook's criteria, including correlation to nearby USGS wells. The analysis should further consider the data at Exhibit K from Arlington Land Trust (ALT) wells next to the Site, which employed continuous groundwater monitoring and found that groundwater exceeded the 4.0-elevation in two consecutive spring seasons. Finally, the Department should require the Applicant to conduct a reliably and physically representative groundwater mounding analysis to evaluate the cumulative impacts of mounding on the performance of the proposed infiltration systems.

Thank you for your consideration of these comments, and please feel free to contact us if you have any questions, or if you would like to discuss our consultants' analyses further.

Very truly yours,

/s/ Elizabeth M. Pyle

Elizabeth M. Pyle

Enclosures (Exhibits A-K)

Exhibit A

July 8, 2024

Town of Arlington, Massachusetts Conservation Commission
C/O Mr. Charles Tirone, Chair
730 Mass Ave. Annex
Arlington, MA 02

VIA EMAIL

RE: Thorndike Place, Dorothy Road, Arlington, Massachusetts – Summary of Key Issues in Response to BSC Letter Dated June 10, 2024

Dear Chairman Tirone and Commission Members,

This letter transmits a table summarizing several key issues identified through our reviews of information presented by BSC Group on behalf of Arlington Land Realty, LLC (collectively referred to herein as "the Applicant"). The critical issues presented in the table pertain to the Applicant's calculations and assessments of the following:

- Estimated Seasonal High Groundwater (ESHGW)
- Groundwater Mounding Due to Proposed Stormwater Infiltration

Most importantly, the table highlights how the Applicant is misinterpreting guidelines within the Massachusetts Stormwater Handbook (MSH) relating to conducting their groundwater mounding analysis. The misinterpretation leads to an analysis that fails to properly evaluate the potential for adverse hydraulic effects due to groundwater mounding. This position has been confirmed by senior stormwater compliance representatives at MassDEP, who—as shown through documented communications—agree that the Applicant's current analysis is inappropriately designed.

To ensure the Applicant's stormwater design demonstrably complies with the Stormwater Standards and adheres to the guidelines set forth within the MSH, the issues summarized in this letter must be addressed.

Sincerely,

Scott W. Horsley
Water Resources Consultant

Michael Mobile, Ph.D., CGWP
President – McDonald Morrissey Associates, LLC

Attachments:

A) Table 1 - Summary of Issues in Response to BSC Letter Dated June 10, 2024

MAM/SWH
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Table 1 - Summary of Issues in Response to BSC Letter Dated June 10, 2024

Index	Issue	Description	Non-Compliance Aspect	Key Reference Document(s)
1	Est. Seasonal High Groundwater (**ESHGW**) Information/data basis	• Applicant's proposed ESHGW elevation is unreliable and inconsistent with the Mass. Stormwater Handbook definition (Vol. 3, Ch. 1, p. 12). • No reliable redoximorphic features were observed/reported at the proposed location of the large stormwater infiltration area (INF-1). • Applicant's groundwater level measurements missed recent high conditions, as evidenced by groundwater measured at El. 4.4 feet (approx.) in abutter's monitoring well on Dorothy Road during 3/29/24. **Bottom Line: upward adjustment to Applicant's currently proposed ESHGW condition is warranted.**	Mass. Stormwater Handbook (Vol. 3, Ch. 1.)	Horsley letter - May 16, 2024 Link: https://www.arlingtonma.gov/home/showpublisheddocument/70437/638542142240130000
2	**ESHGW** Erroneous Frimpter adjustment attempt	• Applicant's previous attempt at applying "Frimpter" upward adjustments to measured water levels was shown to be erroneous. • When corrected, the results of a "Frimpter" adjustment no longer supported Applicant's claim that a 4-foot ESHGW elevation is reliable. • Rather than correcting their calculations and continuing to use the same approach (i.e., Frimpter), Applicant is now claiming/suggesting an adjustment is no longer necessary. **Bottom Line: upward adjustment to Applicant's currently proposed ESHGW condition is warranted.**	Mass. Stormwater Handbook (Vol. 3, Ch. 1.)	MMA letter - March 29, 2024 Link: https://www.arlingtonma.gov/home/showpublisheddocument/69439/638476657294300000 MMA update - May 16, 2024 Link: https://www.arlingtonma.gov/home/showpublisheddocument/70435/638542142234370000 Horsley letter - May 16, 2024 Link: https://www.arlingtonma.gov/home/showpublisheddocument/70437/638542142240130000
3	**ESHGW** Acceptable vertical separation(s)	• Applicant's proposed ESHGW condition is unrelable and does not conform with recommended MassDEP methods. • Any upward adjustment to the ESHGW would require modification(s) to Applicant's proposed stormwater design. **Bottom Line: following establishment of a reliable and representative ESHGW condition, Applicant should demonstrate how the required minimum vertical offset is being provided for all proposed stormwater infiltration systems.**	Mass. Stormwater Handbook (Vol. 1, Ch. 1.)	MMA letter - March 29, 2024 Link: https://www.arlingtonma.gov/home/showpublisheddocument/69439/638476657294300000 MMA update - May 16, 2024 Link: https://www.arlingtonma.gov/home/showpublisheddocument/70435/638542142234370000 Horsley letter - May 16, 2024 Link: https://www.arlingtonma.gov/home/showpublisheddocument/70437/638542142240130000
4	**Groundwater Mounding** Approach and design	• Applicant is misinterpreting guidance provided within the Mass. Stormwater Handbook relative to conducting a stormwater-focused groundwater mounding analysis. • Applicant continues to limit their modeling to the Required Recharge Volume even though they plan to infiltrate significantly greater volumes during storm events. • Applicant's analysis of their proposed design does not take into account severe groundwater mounding during storm events (or any associated reductions in stormwater infiltration rates). • Not representing such reductions in HydroCAD, as is the case relative to Applicant's current analysis (i.e., their HydroCAD simuations assume unimpacted, free infiltration/drainage), renders assessments of compliance with Stormwater Standard 2 non-conservative and invalid. **Bottom Line: <u>this position has been confirmed through communications with senior stormwater compliance representatives at MassDEP</u>. As reinforced by MassDEP, Applicant should be using the total volume and duration of infiltration predicted for the largest storm that the proposed system is designed to attenuate (i.e., the 100-year, 24-hour storm) as input to their groundwater mounding calculations.**	Stormwater Standard 2 Mass. Stormwater Handbook (Vol. 3, Ch. 1.)	Horsley letter - May 16, 2024 Link: https://www.arlingtonma.gov/home/showpublisheddocument/70437/638542142240130000 MMA letter - April 26, 2024 Link: https://arlington.novusagenda.com/agendapublic/AttachmentViewer.ashx?AttachmentID=21193&ItemID=17989 MMA presentation - May 2, 2024 Link: https://www.arlingtonma.gov/home/showpublisheddocument/70129/638512982819900000
5	**Groundwater Mounding** Acceptable mounding predictions	• Severe groundwater mounding during storm events may reduce infiltration rates, which will likely translate to increased rates of system overflow. **Bottom Line: to illustrate the proposed system will meet pre-to-post runoff rate requirements under Stormwater Standard 2, Applicant should provide a physically representative analysis that complies with MassDEP expectations and shows:** **1. groundwater mounding during storm events will not impact infiltration rates (i.e., will not reach the proposed stormwater infiltration system bottoms), and/or** **2. the effect of groundwater mounding will not reduce infiltration rates to the point where post-development runoff rates exceed pre-development runoff rates.**	Stormwater Standard 2 Mass. Stormwater Handbook (Vol. 3, Ch. 1.)	Horsley letter - May 16, 2024 Link: https://www.arlingtonma.gov/home/showpublisheddocument/70437/638542142240130000 MMA letter - April 26, 2024 Link: https://arlington.novusagenda.com/agendapublic/AttachmentViewer.ashx?AttachmentID=21193&ItemID=17989 MMA presentation - May 2, 2024 Link: https://www.arlingtonma.gov/home/showpublisheddocument/70129/638512982819900000

Exhibit B

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August 1, 2024
File No. 03.0035410.00

David Morgan
Environmental Planner and Conservation Agent
Arlington Town Hall
730 Massachusetts Avenue
Arlington, Massachusetts 02467

Re: Peer Review of Stormwater Mound Evaluation and Design Groundwater Elevation
Proposed Thorndike Place Residential Development
Arlington, Massachusetts

Dear Mr. Morgan:

In accordance with your request, GZA GeoEnvironmental, Inc. (GZA) performed a peer review of groundwater monitoring and stormwater mounding analysis performed by the BSC Group (BSC) associated with the proposed Thorndike Place residential development in Arlington, Massachusetts (the "Site"). BSC performed their work on behalf of the Applicant (Arlington Land Realty, LLC). This letter report is subject to the Limitations provided in Appendix A.

BACKGROUND

Thorndike Place (the "Project") is a proposed multifamily development in Arlington located south of Dorothy Road. The Arlington Conservation Commission is reviewing a Wetlands Notice of Intent application (NOI) for the Project and is seeking a peer review of associated materials for compliance with Massachusetts Stormwater Standards No. 2 and No. 3, specifically regarding the stormwater groundwater mound analysis.

The proposed development includes 78,629 square feet (1.8 acres) of impervious paved and rooftop area within the 17.7-acre parcel of land. Most of the stormwater runoff will be directed to a large central stormwater infiltration system. That stormwater infiltration system is planned to be 196 feet long, 41.5 feet wide, with the bottom of the infiltration system located 2 feet above the seasonal high groundwater table.

The reported seasonal high "design" groundwater table is elevation 4.0 feet and the bottom of the stormwater infiltration system at elevation 6.0 feet. When the water level in the stormwater infiltration basin rises 1.5 feet (to elevation 7.5 feet) during large storm events it will begin to overflow through a stormwater outlet structure.

In addition, there are five smaller (driveway) stormwater infiltration areas (each with dimensions about 21 feet long and 14 feet wide) located just south of Dorothy Road.

The most recent BSC Site Plans and updated Stormwater Report are dated September 6, 2023. On behalf of the Conservation Commission, Hatch Associates Consultants Inc. (Hatch) peer reviewed those plans and report and provided comments. BSC responded with additional information in letters dated January 24, 2024, February 13, 2024, February 28, 2024, March 13, 2024, April 24, 2024, and June 10, 2024. BSC's June 10, 2024 letter provided additional information on soil testing and estimated seasonal high groundwater levels and an updated groundwater mound analysis.

On behalf of others, Scott Horsley from Water Resource Consultant (Horsley) provided a letter dated May 16, 2024 to the Conservation Commission expressing concerns regarding the seasonal high groundwater elevation and the stormwater groundwater mound analysis. Similarly, Michael Mobile from McDonald Morrissy Associates, LLC (MMA) provided letters dated April 26, 2024, and May 16, 2024, and a draft presentation dated May 2, 2024 expressing the same concerns.

A Hatch letter report dated May 28, 2024 agreed with the BSC design groundwater elevation of 4.0 feet, but expressed additional concern regarding the groundwater mound analysis and the required drawdown time for the smaller (driveway) infiltration systems.

SUBSURFACE CONDITIONS

A total of 13 test pits (TP-1 to TP-13) were performed on behalf of BSC to depths ranging from 6 to 11 feet below grade at the Site. The soil was generally comprised of a sandy loam fill to a depth of about 8 feet underlain by fine sandy loam. For design purposes Hydrologic Soil Group C (silt loam) was used.

DESIGN SEASONAL HIGH-WATER TABLE

The Massachusetts Stormwater Handbook states:

> *Seasonal high groundwater represents the highest groundwater elevation. Depth to seasonal high groundwater may be identified based on redox features in the soil. When redox features are not available, installation of temporary push point wells or piezometers should be considered. Ideally, such wells should be monitored in the spring when the groundwater is highest and the results compared to nearby groundwater wells monitored by the USGS to estimate whether regional groundwater is below normal, normal or above normal.*

Redox features were observed in test pit TP-3 at elevation 3.6 feet and TP-5 at elevation 4.0 feet. These two test pits are located along Dorothy Road in the area where the five smaller (driveway) stormwater infiltration areas are planned. There were no redox features observed in the fill strata in the area planned for the large central stormwater infiltration system. As a result, water levels were measured by BSC in observation wells installed in this area at test pit TP-7 on April 1, 17, and 24, 2024 and test pit TP-9 on April 17 and 24, 2024. The groundwater levels peaked in both wells on April 17, 2024 at elevation 3.5 feet at TP-7 and elevation 4.0 feet at TP-9. Our review of the USGS historical groundwater elevation data at four Middlesex County wells (Wayland MA-WKW-2R, Concord MA-CTW-167R, Acton MA-ACW-158, and Wilmington MA-XMW-78) revealed that the April 2024 groundwater levels were the highest seasonal water levels observed over the past 10 years. Therefore, we conclude that the seasonal high water table elevation of 4.0 feet used by BSC is for “above normal” groundwater conditions and is suitable to be used for stormwater design for this project. As noted above, GZA’s opinion on design groundwater elevation findings are consistent with the opinion expressed by Hatch and BSC.

Note that we did not use USGS well Lexington MA-LTW-104 (which was used by MMA and Horsley) in our analysis because that well is in a sand and gravel aquifer with a very shallow water table. Those conditions are not present at the Site. In addition, that USGS well is more effected by individual rainfall events than by seasonal variations of the groundwater table, which is not typical of other USGS wells in the area.

GROUNDWATER MOUND EVALUATION

The Massachusetts Stormwater Handbook states:

Mounding analysis is required when the vertical separation from the bottom of an exfiltration system to seasonal high groundwater is less than four (4) feet and the recharge system is proposed to attenuate the peak discharge from a 10-year or higher 24-hour storm (e.g., 10-year, 25 year, or 100-year 24- hour storm). In such cases, the mounding analysis must demonstrate that the Required Recharge Volume (e.g., infiltration basin storage) is fully dewatered with 72 hours (so the next storm can be stored for exfiltration).

The proposed bottom of the exfiltration system is 2 feet from the seasonal high groundwater table and the system is designed to attenuate the peak discharge from the 10, 25, and 100 year 24- hour storms, therefore a groundwater mounding analysis is required.

The groundwater mound that will develop beneath the stormwater infiltration system is dependent on the horizontal hydraulic conductivity of the aquifer (Kh), the thickness of the aquifer (H), the specific yield of the aquifer (S), the length and width of the infiltration area, the applied recharge rate to the infiltration area, and the duration of discharge.

BSC's latest groundwater mound evaluations are provided in their June 10, 2024 letter report. They used a Kh of 5.4 feet per day, which was based on a Rawls vertical hydraulic conductivity (Kv) of 0.54 feet per day (i.e., 0.27-inches per hour) for silt loam and assuming an anisotropic ratio of 10 to 1 (i.e., Kh to Kv). They also assumed that the initial saturated thickness of the aquifer was 5 feet. The transmissivity (T) of the aquifer is Kh times the saturated thickness, which would be 27 feet squared per day. It is GZA's opinion that the assumed transmissivity (T) of 27 feet squared per day used by BSC is a reasonable value to be used in the groundwater mound evaluation for the soil conditions at this Site. BSC assumed a specific yield (S) of 0.08, which again GZA believes is reasonable for the soil conditions encountered at the Site.

The large main stormwater infiltration system is planned to be about 196 feet long and 41.5 feet wide. Per BSC's Stormwater Report the Required Recharge Volume for the Hydrologic Soil Group C is 1,638 cubic feet. The bottom area of the large stormwater infiltration system is 8,134 square feet. Dividing the required recharge volume of 1,638 by the bottom area of 8,134 results in a static water height of 0.2014 feet (or 2.42-inches).

If the stormwater infiltration system was instantaneously filled with the required recharge volume of 1,638 cubic feet and then discharged out of the system at the Kv design rate of 0.27-inches per hour (0.54 feet per day), it would take 8.96 hours to drain (i.e., 0.374 days). GZA's initial groundwater mound analysis using the Hantush method and the values listed above (Large Infiltration System V-1) is provided in Appendix B and indicates that maximum groundwater mound would be 2.27 feet.

However, it is more likely that the required recharge volume would flow out of the infiltration basin over the duration of one day. GZA's second groundwater mound analysis (Large Infiltration System V-2) assumed the same conditions as the Large Infiltration System V-1 except the duration was one day and the applied recharge was 0.2014 feet per day. The resulting maximum groundwater mound would be 1.85 feet (see Appendix B).

It is GZA's opinion that the Required Recharge Volume of 1,638 cubic feet can be infiltrated into the ground, without causing excessive groundwater mounding. However, for stormwater volumes larger than 1,638 cubic feet the rate of groundwater infiltration will decrease significantly, and the groundwater mound will extend into the bottom of the infiltration system.

When the groundwater mound is below the bottom of the infiltration system the water flows out at a vertical hydraulic gradient of 1.0 feet per foot, which allows flow out at the Rawls Kv rate of 0.54 feet per day (0.27-inches per hour). With the bottom area of 8,134 square feet, the flow out of the infiltration system would be 3.05 cubic feet per minute. However, once the groundwater mound extends into the bottom of the infiltration bed (i.e., after about 1,638 cubic feet of discharge), the hydraulic gradient forcing flow vertically out of the infiltration system will decrease by about an order of magnitude (10 to1 ratio), resulting in flow out of the infiltration system of about 0.3 cubic feet per minute. At that point the flow rate will be similar to flow out of a large diameter well. An example calculation of the decrease in flow rate is provided in Appendix B, assuming a Kh of 5.4 feet per day, initial saturated thickness of 5 feet, a 2-foot separation from the bottom of the infiltration system to the seasonal high groundwater table and a radius of influence of 120 feet.

The BSC Stormwater report indicates that for storms with a 2-year frequency, or larger, the stormwater infiltration system will store up to 10,497 cubic feet of water within the basin (between the stormwater outfall invert elevation of 7.5 feet and the bottom of the infiltration basin at 6.0 feet). Due to the decrease in exfiltration flow rate associated with stormwater mounding (described above), the stormwater infiltration chamber will not empty within the required 72-hour period. Assuming the flow rate decreases to about 0.3 cubic feet per minute, only about 1,300 cubic feet of additional water would drain in the 72-hour period. Also, many of the smaller stormwater events would not exfiltrate within the 72-hour period.

The Massachusetts Stormwater Handbook has a footnote 21 in Volume 3, Chapter 1, page 25 with respect to the "Drawdown within 72 hours" requirement that states:

> *In some cases, the infiltration structure may be designed to treat the Required Water Quality Volume and/or to attenuate peak discharges in addition to infiltrating the Required Recharge Volume. In that event, the storage volume of the structure must be used in the formula for determining drawdown time in place of the Required Recharge Volume.*

As noted above, the Required Recharge Volume is 1,638 cubic feet, but the main stormwater infiltration system has a storage volume of 10,497 cubic feet. It is GZA's opinion that the large main stormwater infiltration system would need to be redesigned to allow drainage of the system within 72-hours to meet the requirements of the MassDEP Stormwater Handbook, and to account for the impacts of groundwater mounding during storm events which result in greater than 1638 cubic feet of stormwater runoff. The redesign should also address peak flow rates that discharge to the stormwater outfall control system.

The five smaller (driveway) stormwater infiltration areas are planned to be 21 feet long and 14 feet wide. Per BSC's Stormwater Report the recharge volume during the 100-year storm event for these systems is up to 883 cubic feet. Dividing that recharge volume by the bottom area of 294 feet results in a water height of 3.0 feet (or 36-inches). Using the Kv design rate of 0.27-inches per hour, it would take 133.3 hours (i.e., 5.55 days) to drain the recharge basin. This exceeds the MassDEP Stormwater Handbook requirement of draining within 72 hours. These smaller infiltration systems would need to be redesigned and then a groundwater mound analysis should be performed to redesign these stormwater management systems.

CONCLUSIONS

GZA agrees with BSC and Hatch that the design seasonal high groundwater elevation for the stormwater infiltrations systems should be 4.0 feet.

Although GZA believes the Required Recharge Volume of 1,638 cubic feet can be infiltrated into the ground without causing excessive groundwater mounding, larger volumes of storm water runoff will not drain within the required 72-hour period. It is GZA's opinion that for stormwater volumes larger than the Required Recharge Volume, the rate of groundwater infiltration will decrease significantly, and the groundwater mound will extend into the bottom of the large main infiltration system. In GZA's opinion both the large main stormwater infiltration system and the smaller driveway stormwater infiltrations systems would need to be redesigned to account for the impacts of groundwater mounding during large storm events and to meet the MassDEP Stormwater Manual's maximum allowable drainage standard of 72-hours.

We trust this information satisfies your current needs. If you have any questions or comments, please feel free to contact the undersigned at (401) 374-2317 or via email at anthony.urbano@gza.com.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Anthony B. Urbano, P.E.
Senior Project Manager

Steven T. D'Ambrosio, P.E.
Consultant/Reviewer

Todd Greene, P.E. (RI)
Principal

Attachments: Attachment A – Limitations
Attachment B – Calculations

Jobs/env/35410.ABU/reports/35410-letter-report.docx

ATTACHMENT A

LIMITATIONS

USE OF REPORT

1. GZA GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

STANDARD OF CARE

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in the Proposal for Services and/or Report and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. Conditions other than described in this report may be found at the subject location(s).

3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made. Specifically, GZA does not and cannot represent that the Site contains no hazardous material, oil, or other latent condition beyond that observed by GZA during its study. Additionally, GZA makes no warranty that any response action or recommended action will achieve all of its objectives or that the findings of this study will be upheld by a local, state or federal agency.

4. In conducting our work, GZA relied upon certain information made available by public agencies, Client and/or others. GZA did not attempt to independently verify the accuracy or completeness of that information. Inconsistencies in this information which we have noted, if any, are discussed in the Report.

SUBSURFACE CONDITIONS

5. The generalized soil profile(s) provided in our Report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs. The nature and extent of variations between these explorations may not become evident until further exploration or construction. If variations or other latent conditions then become evident, it will be necessary to reevaluate the conclusions and recommendations of this report.

6. Water level readings have been made, as described in this Report, in and monitoring wells at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this report. Fluctuations in the level of the groundwater however occur due to temporal or spatial variations in areal recharge rates, tidal fluctuations, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The observed water table may be other than indicated in the Report.

COMPLIANCE WITH CODES AND REGULATIONS

7. We used reasonable care in identifying and interpreting applicable codes and regulations necessary to execute our scope of work. These codes and regulations are subject to various, and possibly contradictory, interpretations. Interpretations and compliance with codes and regulations by other parties is beyond our control.

SCREENING AND ANALYTICAL TESTING

8. GZA collected environmental samples at the locations identified in the Report. These samples were analyzed for the specific parameters identified in the report. Additional constituents, for which analyses were not conducted, may be present in soil, groundwater, surface water, sediment and/or air. Future Site activities and uses may result in a requirement for additional testing.

9. Our interpretation of field screening and laboratory data is presented in the Report. Unless otherwise noted, we relied upon the laboratory's QA/QC program to validate these data.

10. Variations in the types and concentrations of contaminants observed at a given location or time may occur due to release mechanisms, disposal practices, changes in flow paths, and/or the influence of various physical, chemical, biological or radiological processes. Subsequently observed concentrations may be other than indicated in the Report.

INTERPRETATION OF DATA

11. Our opinions are based on available information as described in the Report, and on our professional judgment. Additional observations made over time, and/or space, may not support the opinions provided in the Report.

ADDITIONAL INFORMATION

12. In the event that the Client or others authorized to use this report obtain additional information on environmental or hazardous waste issues at the Site not contained in this report, such information shall be brought to GZA's attention forthwith. GZA will evaluate such information and, on the basis of this evaluation, may modify the conclusions stated in this report.

ADDITIONAL SERVICES

13. GZA recommends that we be retained to provide services during any future investigations, design, implementation activities, construction, and/or property development/ redevelopment at the Site. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

ATTACHMENT B

CALCULATIONS

Large Infiltration System V-1

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values

0.5400	*R*	**Recharge (infiltration) rate (feet/day)**
0.080	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
5.40	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
98.000	x	**1/2 length of basin (x direction, in feet)**
20.750	y	**1/2 width of basin (y direction, in feet)**
0.374	t	**duration of infiltration period (days)**
5.000	hi(0)	**initial thickness of saturated zone (feet)**

Conversion Table

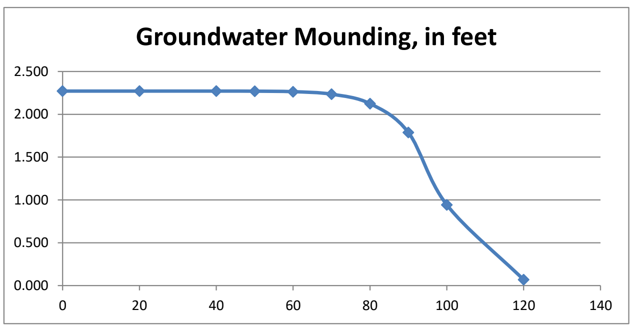
inch/hour	feet/day
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

7.271	h(max)	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
2.271	Δh(max)	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
2.271	0
2.271	20
2.271	40
2.270	50
2.264	60
2.235	70
2.125	80
1.788	90
0.943	100
0.069	120

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Large Infiltration System V-2

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
0.2014	***R***	**Recharge (infiltration) rate (feet/day)**
0.080	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
5.40	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
98.000	**x**	**1/2 length of basin (x direction, in feet)**
20.750	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
5.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

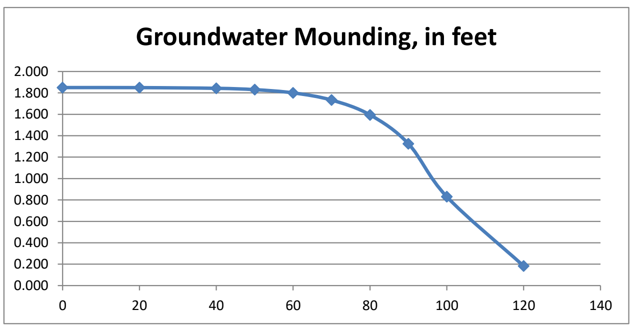
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

6.850	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
1.850	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
1.850	**0**
1.849	**20**
1.843	**40**
1.830	**50**
1.800	**60**
1.733	**70**
1.595	**80**
1.325	**90**
0.830	**100**
0.183	**120**

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

GZA GeoEnvironmental Inc.

188 Valley St, Providence
Rhode Island 02909

Project Thorndike Place
Arlington, MA

Date: 7/24/2024
Sheet 1 of 1
By: ABU

File No. 35410.00

Estimate steady state flow to a well extracting ground water from a water table aquifer,

$H := 7$	Static head from bottom of aquifer (Ft)
$hw := 5$	Depth of water in a fully penetrating extraction well (Ft)
$k := 5.4$	Hydraulic Conductivity (Ft/Day)
$R := 120$	Radius, or cone of influance (Ft/Day)
$Rw := 51$	Radius of extraction well (Ft)
Qw	Ground water extraction rate (Cubic Ft/Day)

$$Qw := \frac{\pi \cdot k \cdot \left(H^2 - hw^2\right)}{\ln\left(\frac{R}{Rw}\right)}$$

Theim-Dupuit Equation [1]

$Qw = 475.829$ Cubic Ft/Day $\quad Qgpm := Qw \cdot \frac{7.5}{1440} \quad Qgpm = 2.48$ GPM

$r := Rw, 13 .. R$

$$s(r) := -(H - hw) + \frac{Qw \cdot \ln\left(\frac{r}{Rw}\right)}{\pi \cdot k \cdot (H + hw)}$$

1. Ground Water Manual, U.S. Department of the Interior, Revised edition 1981, P.30

Exhibit C

August 23, 2024

Town of Arlington, Massachusetts Conservation Commission
C/O Mr. Charles Tirone, Chair
730 Mass Ave. Annex
Arlington, MA 02476

VIA EMAIL

RE: Thorndike Place, Dorothy Road, Arlington, Massachusetts – Response to GZA Peer Review of Stormwater Mound Evaluation and Design Groundwater Elevation

Dear Chairman Tirone and Commission Members,

We have reviewed GZA GeoEnvironmental, Inc.'s (GZA's) August 1, 2024 peer review summary letter and are providing the following comments:

Groundwater/Stormwater Mounding Analysis:

GZA's review, like our own recent reviews, finds that BSC's groundwater mounding analysis improperly considers an infiltration volume much smaller than the actual volume that is proposed. They refer to this quantity as the "*required recharge volume*", which is the minimum amount of stormwater that they are required to infiltrate. However, due to the expansive size of the project and related impervious surfaces, the proposed stormwater system would attempt to infiltrate much larger volumes during storm events. As a result, BSC's groundwater mounding analysis is not useful. It does not demonstrate that the systems will operate as intended during storm events, nor does it provide any support for claimed compliance with Stormwater Standard 2 and the 72-hour drainage time requirement noted in the Massachusetts Stormwater Handbook (MSH).

In identifying this problem and assessing its implications, GZA correctly concludes the proposed infiltration systems must be redesigned. We fully support this overarching conclusion; however, we respectfully request clarification from GZA relative to the following statement: "*In GZA's opinion both the large main stormwater infiltration system and the smaller driveway infiltrations* (sic) *systems would need to be redesigned to account for the impacts of groundwater mounding during large storm events and to meet the MassDEP Stormwater Manual's maximum allowable drainage standard of 72-hours*". On Page 4 of their letter, GZA notes the following, which we interpret as a reference to Stormwater Standard 2, which addresses peak rate control: "*...redesign should also address peak flow rates that discharge to the stormwater outfall control system*". Thus, we feel it is important for GZA's conclusion(s) to be extended to specifically state that any new/updated design must comply with the Stormwater Standards—Standard 2, in particular—in addition to the 72-hour drainage time requirement defined within the MSH.

Seasonal High Groundwater Condition:

Relative to GZA's comments on the seasonal high groundwater condition proposed by BSC, we respectfully seek clarification on their approach and conclusion. GZA presents the MSH definition of seasonal high groundwater as "*the highest groundwater elevation*", yet their conclusion refers to BSC's proposed elevation of 4.0-feet as being "*above normal*" and thus finds it to be, in their opinion, "*suitable to be used for stormwater design for this project*". Is the 4.0-foot groundwater elevation viewed by GZA as simply being "*above normal*", or is it the maximum/highest condition, which would be consistent with the MSH definition?

If the answer is "*above normal*", the pertinent follow up question would be: why is GZA's basis for "*suitable"* seemingly different from MassDEP's, as represented by the MSH? Conversely, if GZA does view the 4.0-foot elevation as "*the highest groundwater elevation*" at the site, how do they explain the results of correctly applying the so-called "Frimpter" adjustment method that specifically attempts to estimate a maximum site-specific groundwater elevation based on a historical record of measurements associated with a U.S. Geological Survey (USGS) index well? GZA should note that, to date, we have only used Frimpter method results to highlight BSC's methodological errors (i.e., in implementing their own Frimpter and generally illustrate the point that groundwater levels do exceed the proposed ESHGW elevation of 4.0-feet. Therefore, GZA's comments pertaining to the representativeness of certain USGS index wells are not germane, as any nearby index well would produce the same outcome (i.e., an adjusted seasonal high groundwater elevation exceeding 4.0-feet).

Furthermore, as reported in multiple prior comment letters, water level data have been collected at a nearby monitoring well that we installed on the adjacent town-owed parcel on Dorothy Road (approximately 100-feet from proposed primary stormwater infiltration system INF-1). The data collected from this well reflect a peak groundwater elevation during the March 19 – April 20 period of 4.4-feet occurring during March 29, 2024. BSC's groundwater level measurements were taken on April 1, 17, and 24 when water levels had receded relative to the peak condition.

To reach a resolution on this issue at the site, we believe one key question must be reasonably answered: how far above 4.0-feet does the highest groundwater elevation extend? Our position on this matter is simple—more information is needed to reliably identify "*the highest groundwater elevation*" in a manner consistent with the guidance presented in the MSH.

Sincerely,

Scott W. Horsley
Water Resources Consultant

Michael Mobile, Ph.D., CGWP
President – McDonald Morrissey Associates, LLC

Exhibit D

McDonald Morrissey ASSOCIATES, LLC
GROUND WATER HYDROLOGISTS

November 4, 2024

Town of Arlington Conservation Commission
Attn: Mr. Charles Tirone, Chairperson
730 Massachusetts Avenue
Arlington, MA 02476

RE: **Thorndike Place, Dorothy Road, Arlington, Massachusetts – Preliminary Review of New Applicant and Reviewer Information**

Dear Mr. Tirone and Commission Members,

McDonald Morrissey Associates, LLC (MMA) is providing this letter in response to The Arlington Land Trust's request for a preliminary technical review of new materials presented by BSC Group (BSC) on behalf of Arlington Land Realty, LLC (Applicant) and by GZA GeoEnvironmental, Inc. (GZA), who provided a limited peer review of those new materials. In conducting our review, MMA primarily focused on information presented in the following documents:

- *Electronic PDF file titled "Thorndike_Place_-_BSC_Revised_Stormwater_Calculations_09092024.pdf*
- Letter to the Town of Arlington Conservation Commission from Dominic Rinaldi of BSC Group, Inc. *RE: Response to GZA Peer Review Comments – Thorndike Place Residential Development.* Dated October 4, 2024.

Our preliminary review of the new materials finds that BSC's HydroCAD model uses an incorrect infiltration rate that is inconsistent with Massachusetts Stormwater Handbook (MSH) requirements[1]. In effect, BSC appears to have erroneously assumed the native soils at the site can accept infiltrated stormwater at twice the rate dictated for these materials by the MSH. Though the maximum predicted infiltration rates are generally small compared to predicted peak runoff rates, the faulty assumption does undermine the reliability of the analysis being used by BSC to claim compliance with Stormwater Standard 2 (i.e., attenuation of peak, post-development runoff rates). But perhaps more importantly, because output from the HydroCAD model should be used as input to other required calculations, the error prevents BSC from performing a groundwater mounding analysis representative of the 100-year, 24-hour storm event and from showing the proposed infiltration system will fully dewater within a 72-hour period, as required by the MSH.

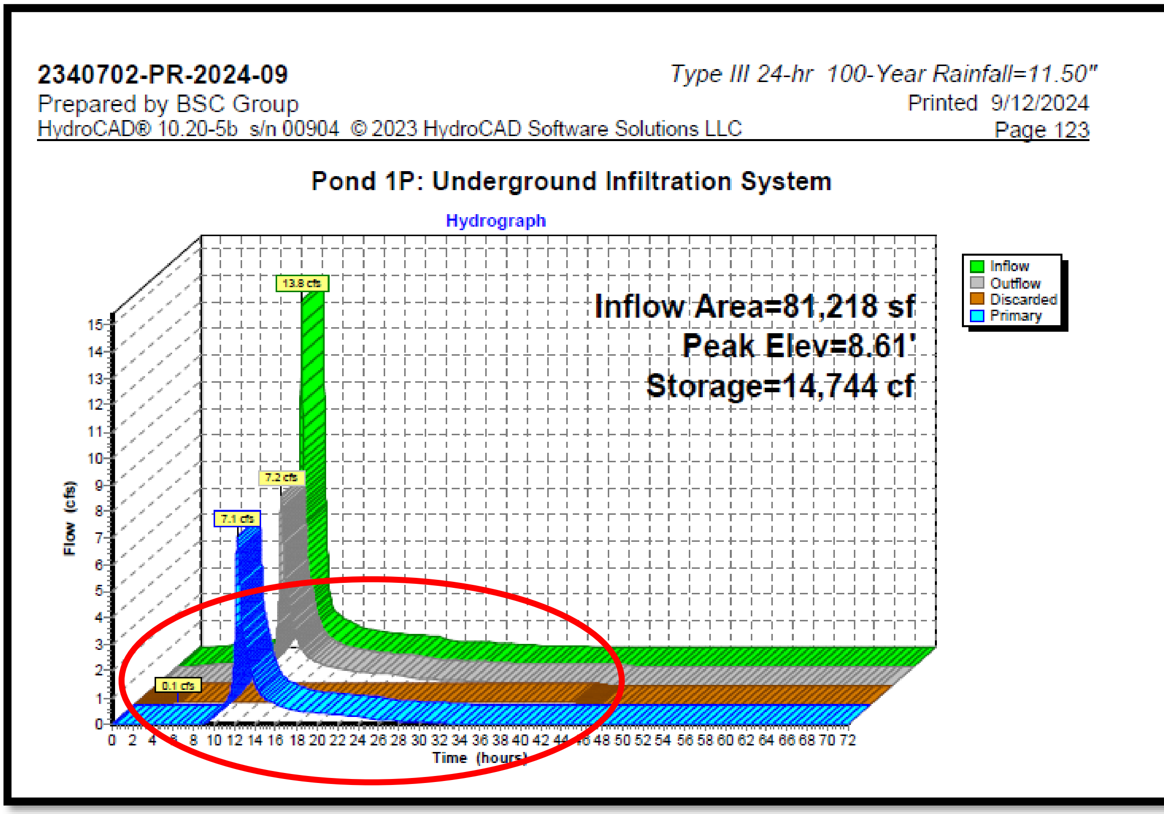
[1] Refer to Volume 3, Chapter 1, page 22 – *Table 2.3.3. 1982 Rawls Rates.*

The error can be confirmed by independently estimating the infiltration rate assumed by BSC using information obtained directly from BSC's latest post-development HydroCAD calculations (i.e., Attachment C to the October 4, 2024 letter identified above). Specifically, the assumed infiltration rate can be calculated by dividing the predicted cumulative volume of infiltrated water for a selected design storm event by the infiltration duration for that same event, both values being readily extracted from BSC's reported HydroCAD output:

Cumulative Volume of Infiltrated Water (100-year, 24-hour storm) – 14,852 cubic feet:

```
2340702-PR-2024-09                                  Type III 24-hr  100-Year Rainfall=11.50"
Prepared by BSC Group                                                    Printed  9/12/2024
HydroCAD® 10.20-5b  s/n 00904  © 2023 HydroCAD Software Solutions LLC             Page 122

              Summary for Pond 1P: Underground Infiltration System

Inflow Area =       81,218 sf,  77.83% Impervious,  Inflow Depth = 10.56"   for  100-Year event
Inflow      =      13.8 cfs @  12.09 hrs,  Volume=        71,490 cf
Outflow     =       7.2 cfs @  12.24 hrs,  Volume=        71,488 cf,  Atten= 48%,  Lag= 9.4 min
Discarded   =       0.1 cfs @   4.26 hrs,  Volume=        14,852 cf
Primary     =       7.1 cfs @  12.24 hrs,  Volume=        56,636 cf
   Routed to Link 1L : Towards Wetlands

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 8.61' @ 12.24 hrs   Surf.Area= 8,137 sf   Storage= 14,744 cf

Plug-Flow detention time= 113.7 min calculated for 71,478 cf (100% of inflow)
Center-of-Mass det. time= 113.6 min ( 1,031.2 - 917.6 )

Volume      Invert    Avail.Storage   Storage Description
  #1         6.50'       17,495 cf    6.89'W x 14.06'L x 2.50'H StormTrap ST-1 Units (Irregular Shape) x 84
                                      20,343 cf Overall  x 86.0% Voids

Device   Routing        Invert   Outlet Devices
  #1     Discarded       6.50'   0.520 in/hr Exfiltration over Surface area
  #2     Primary         6.80'   18.0"  Round Culvert
                                 L= 190.0'   CPP, square edge headwall,  Ke= 0.500
                                 Inlet / Outlet Invert= 6.80' / 6.00'   S= 0.0042 '/'   Cc= 0.900
                                 n= 0.013,  Flow Area= 1.77 sf
  #3     Device 2        6.80'   12.0" Vert. Orifice/Grate   C= 0.600   Limited to weir flow at low heads
  #4     Device 2        8.25'   4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.1 cfs @ 4.26 hrs  HW=6.53'   (Free Discharge)
  └1=Exfiltration (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=7.1 cfs @ 12.24 hrs  HW=8.61'   (Free Discharge)
  └2=Culvert (Passes 7.1 cfs of 7.3 cfs potential flow)
     ├3=Orifice/Grate (Orifice Controls 4.3 cfs @ 5.50 fps)
     └4=Sharp-Crested Rectangular Weir (Weir Controls 2.7 cfs @ 1.95 fps)
```

Infiltration Duration (100-year, 24-hour storm) – 40.5 hours (approx.):



Note: the predicted duration of infiltration is illustrated by the slightly raised portion of the burnt orange "Discarded" time series, which extends from approximately hour 4 through hour 44.5 of the 72-hour simulation period.

Using the two HydroCAD predictions shown above, the *volumetric* infiltration rate (volume per unit time) is estimated as follows:

***14,852 cubic feet** / **40.5 hours** = 366.7 cubic feet/hour*

The volumetric infiltration rate can be converted to a flux (i.e., assumed infiltration rate in length or depth per unit time) by dividing the above result by the bottom area of the system (8,137 square feet), as reported by BSC:

366.7 cubic feet/hour / 8,137 square feet = 0.045 feet/hour = 0.54 inches/hour

The result presented above indicates BSC's assumed infiltration rate is a factor of two higher than the maximum applicable rate of 0.27 inches/hour listed in the MSH. Thus, BSC's HydroCAD model is overstating the ability of the proposed system to infiltrate stormwater. Notably, GZA identified a similar discrepancy when reviewing BSC's revised groundwater mounding and drainage time calculations; however, their recognition of the issue did not appear to extend to BSC's HydroCAD simulations.

As noted previously, BSC's erroneously high infiltration rate assumption is consequential in multiple ways:

1. It invalidates the results of BSC's HydroCAD simulations and resultant post-development runoff rate calculations, as reduced stormwater infiltration rates would presumably lead to changes in predicted routing through the system (e.g., likely increases in post-development runoff rates in certain cases). Thus, BSC has not produced a reliable analysis that demonstrates compliance with Stormwater Standard 2.

2. It prevents drainage time and mounding analysis calculations representative of design storm conditions from being produced, as the inputs needed for these calculations (e.g., predicted cumulative infiltration volume and infiltration duration) are derived from HydroCAD simulations that utilize the faulty infiltration rate assumption. Thus, BSC has not produced a reliable groundwater mounding analysis representative of the 100-year, 24-hour design storm event, nor has BSC illustrated the proposed infiltration system will drain within a 72-hour period after storm events, as recommended by the MSH[2].

The review described herein is preliminary and based on information made available to MMA as of the indicated transmittal date. MMA therefore reserves the right to amend and/or extend this commentary based on expanded review and/or review of new information provided by the Applicant or other interested parties.

Sincerely,

Michael Mobile, Ph.D., CGWP
President, McDonald Morrissey Associates, LLC

MAM/
Z:\1_Projects\Arlington\Thorndike_Place\7_Reports_and_Memos\FINAL_MMA_Review_Letter_11-4-24rev1.docx

[2] Refer to Volume 2, Chapter 2, page 105.

Exhibit E

Scott Horsley
Water Resources Consultant
65 Little Road • Cotuit, MA 02635 • 508-364-7818

November 4, 2024

Mr. Charles Tirone, Chairperson
Town of Arlington
Conservation Commission
730 Massachusetts Avenue
Arlington, MA 02476

RE: Thorndike Place

Dear Chairperson Tirone and Conservation Commissioners:

I have reviewed the recent reports prepared by BSC (October 4, 2024) and peer reviewer GZA (August 1, 2024) and offer the following comments. In addition to the comments that I have previously submitted I believe that the proposed project will significantly alter the site hydrology by increasing the net recharge rate which will result in higher water levels throughout the site, on abutting properties, and within the adjacent wetland. This issue was identified as "groundwater flooding" during the ZBA Comprehensive Permit review but has not been evaluated.

Increased (post-development) recharge rates will result from clearing of existing vegetation, the corresponding reduction of evapotranspiration (ET) rates and the infiltration of stormwater from impervious surfaces. The post-development, higher recharge rates will result in a higher water table. This has not been evaluated or incorporated into the site design. These elevated (post-development) groundwater levels will compromise the planned infiltration system, cause groundwater flooding on abutting properties, and will impact the adjacent wetland.

The revised plans prepared by BSC eliminate the previously proposed infiltration systems along Dorothy Road and now concentrate the stormwater infiltration into one location (INF-1). This exacerbates the groundwater mounding impacts. I have prepared an updated groundwater mounding analysis which shows that the proposed infiltration system will be inundated with groundwater and unable to function as proposed and will raise groundwater levels in the adjacent wetland.

To evaluate the impacts of this concentrated infiltration system I have prepared an updated groundwater mounding analysis to determine the cumulative impacts of smaller storms throughout a 90-day period[1]. I have utilized the input data for hydraulic conductivity, specific yield and saturated thickness directly from BSC's Response to GZA Peer Review dated October 4, 2024 (Attachment E). I have applied a cumulative runoff rate of 40 inches/year (or 10 inches for the 90-day period)[2]. This analysis shows that the proposed infiltration system will be inundated with a groundwater mound of approximately 4.6 feet and will be unable to function as proposed (see Figure 1).

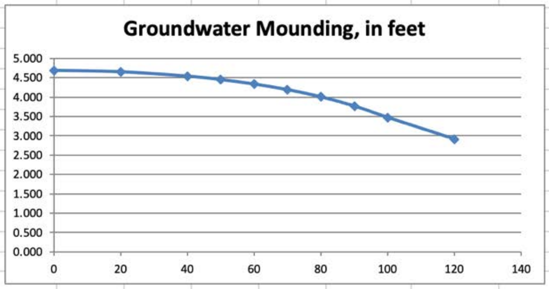
---

[1] MADEP recommends using a 90-day duration for groundwater mounding calculations to simulate long-term steady-state conditions (MADEP Guidance Document, "Guidelines for the Design, Construction, Operation, and Maintenance of Small Wastewater Treatment Facilities with Land Disposal" June 2018 (page 21).
[2] Continuous Rainfall-Runoff Simulation Analysis. US EPA (Mark Voorhees) performed modeling using the Stormwater Management Model (SWMM) model for Massachusetts.

0.0710	*R*	Recharge (infiltration) rate (feet/day)	0.67	1.33	
0.080	Sy	Specific yield, Sy (dimensionless, between 0 and 1)			
5.40	K	Horizontal hydraulic conductivity, Kh (feet/day)*	2.00	4.00	In the repo
98.420	x	1/2 length of basin (x direction, in feet)			SIR 2010-!
20.670	y	1/2 width of basin (y direction, in feet)	hours	days	assumed t
90.000	t	duration of infiltration period (days)	36	1.50	conductivi
5.000	hi(0)	initial thickness of saturated zone (feet)			
9.685	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)			
4.685	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)			

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
4.685	0
4.648	20
4.535	40
4.446	50
4.331	60
4.185	70
4.001	80
3.763	90
3.470	100
2.910	120

Re-Calculate Now



Disclaimer

Figure 1 - Groundwater Mounding at Stormwater Infiltration System (Steady-State Conditions)

In summary, the post-development groundwater mounding associated with cumulative recharge associated with smaller storms will raise groundwater levels throughout the site. Utilizing the Hantush modeling inputs provided by BSC these conditions will cause water level increases of several feet at the wetland boundary. MADEP commonly applies a guideline of 0.1 feet as a maximum acceptable alteration in wetlands.

Thank you for the opportunity to provide these comments. Please contact me directly with any questions that you might have.

Sincerely,

Scott W. Horsley
Water Resources Consultant

Exhibit F

McDonald Morrissey ASSOCIATES, LLC
GROUND WATER HYDROLOGISTS

January 15, 2025

Town of Arlington Conservation Commission
Attn: Mr. Charles Tirone, Chairperson
730 Massachusetts Avenue
Arlington, MA 02476

RE: **Thorndike Place, Dorothy Road, Arlington, Massachusetts – Preliminary Review of New Applicant Information**

Dear Mr. Tirone and Commission Members,

McDonald Morrissey Associates, LLC (MMA) is providing this letter in response to The Arlington Land Trust's request for a preliminary technical review of new materials presented by BSC Group (BSC) on behalf of Arlington Land Realty, LLC (Applicant). In conducting our review, MMA primarily focused on the following documents:

- *Stormwater Report, Thorndike Place, Dorothy Road, Arlington, MA*. Prepared by BSC Group, Inc., revised December 2024. Note: this reference extends to the associated "calculations only" version of the stormwater report presented as an electronic file named "2024-12_Revised_Stormwater-Calcs_Only.pdf"

- Letter to the Town of Arlington Conservation Commission from Dominic Rinaldi of BSC Group, Inc. *RE: Revisions to Stormwater Management/Response to Peer Review, Thorndike Place Residential Development*. Dated January 3, 2025.

MMA's preliminary review of the new materials has resulted in a set of initial observations, which are summarized as follows:

- The new design does away with the concept of temporarily storing significant quantities of stormwater on the roof of the main building, but the smaller infiltration systems located between the proposed townhomes along the northern boundary of the property have returned.

- System 1, which was created by dividing the primary stormwater infiltration system included in prior design iterations into two subareas, has been elevated such that BSC is now claiming 4-feet of vertical separation between the bottom of the system and estimated seasonal high groundwater (ESHGW) is provided. Based on this change, BSC claims they are absolved of the responsibility of performing a groundwater mounding analysis for System 1 according to Volume 3, Chapter 1 of the Massachusetts Stormwater Handbook (MSH). It is worth noting that, according to BSC's HydroCAD modeling, System 1 would be responsible for approximately 84% of cumulative infiltration across the seven proposed subsurface structures and the rain garden during storm events under post-development conditions.

- Groundwater mounding analyses are performed by BSC for the other, smaller proposed stormwater infiltration structures (i.e., Systems 2 through 7 and the rain garden). BSC presents the analyses as being reliable predictions of mounding generated during the 100-year, 24-hour storm event; however, they are fundamentally flawed for a variety of reasons, including the following: 1. any additive effects from simultaneous infiltration by other systems, including System 1, are ignored; and 2. the inputs used by BSC are inconsistent with the infiltration rates and durations used/predicted by their own HydroCAD model.

- Correcting only the two issues described above causes predicted groundwater mounding to rise well above the bottoms of Systems 1 and 7 during all considered design storm events, ranging from the 2-year, 24-hour storm event to the 100-year, 24-hour storm event (refer to **Attachment A**).

The following section provides additional technical detail and discussion related to the initial observations presented above:

- In describing the HydroCAD modeling, BSC's Stormwater Report claims the following: *"…the infiltration rate for silt loam (0.27-inches per hour* [in/hr]*) has been used in the infiltration system design to account for the materials found being primarily fill*". This statement is inaccurate, as certain features (e.g., System 1) selectively utilize a 0.52 in/hr infiltration rate, while other, smaller infiltration systems rely on the 0.27 in/hr infiltration rate. Though the same issue was previously highlighted in a prior review letter authored by MMA[1], it appears to remain unaddressed by BSC.

- BSC's revised design includes raising the bottom of System 1 to elevation (El.) +8-feet, thus creating a claimed vertical separation (i.e., that BSC measures from the chamber bottoms, not the bottom of the proposed stone layer) of exactly 4-feet relative to the proposed ESHGW condition at El. +4-feet. Rather than providing an obvious functional benefit, this modification appears to intentionally target a detail contained in the MSH. Specifically, as noted in Volume 3, Chapter 1 of the MSH, a groundwater mounding analysis requirement is triggered when a proposed system is intended to attenuate peak discharges for certain storm events (i.e., equal to or greater in magnitude than the 10-year, 24-hour event) <u>and less than 4-feet of vertical separation from ESHGW is provided</u>. While BSC is now claiming a groundwater mounding analysis for System 1 can be avoided under the letter of the MSH, the following considerations should be noted:

[1] Letter to the Town of Arlington Conservation Commission from McDonald Morrissey Associates, LLC. *RE: Thorndike Place, Dorothy Road, Arlington, Massachusetts – Preliminary Review of New Applicant and Reviewer Information*. Dated November 4, 2024.

- BSC inappropriately treats their proposed ESHGW elevation as a highly certain condition, disregarding evidence illustrating significant degrees of spatial and temporal variability in water table conditions at the site. Under prior proposed design iterations, a groundwater mounding analysis—albeit flawed in a variety of ways—was being performed by BSC for each significant infiltration structure. In MMA's opinion, this approach allowed for a minor amount of leeway relative to the specific ESHGW elevation, particularly given the severity (i.e., significant heights) of groundwater mounding predicted for design storm events using BSC's selected method. BSC's new approach now unreasonably relies on the uncertain ESHGW condition as a means of avoiding conducting an important analysis for a controlling (i.e., in terms of infiltration volume) structure, particularly since previously presented information suggests 4-feet of vertical separation is unlikely to be adequate in terms of preventing groundwater mounding from adversely impacting System 1[2].

- Though the MSH clearly identifies the criteria defining the mounding analysis requirement, it does not say groundwater mounding should be completely ignored in cases where larger (i.e., 4-feet or greater) vertical separations are provided. Hydraulic responses to infiltration, such as groundwater mounding heights, are governed by site-specific characteristics including aquifer properties (e.g., hydraulic conductivity, storativity, etc.). A single/common threshold (e.g., 4-foot vertical separation distance) may be conservative and therefore applicable in most cases, but it would be technically invalid to assume it would be universally applicable. The pre-existing evidence highlighting concerns over adverse effects associated with groundwater mounding[3] should be a cause for more careful analysis to verify the viability of the proposed design, as opposed to being treated as motivation to sidestep such efforts.

- By completely ignoring groundwater mounding caused by System 1 infiltration, BSC has compromised the results of groundwater mounding analyses performed for other proposed infiltration systems, particularly System 7. Effects from infiltration sources that are simultaneously active and located in close proximity to one another are generally additive and must be handled accordingly. The very U.S. Geological Survey (USGS) study that produced the spreadsheet used by BSC to perform their groundwater mounding analyses[4] states the following: "*…groundwater mounding associated with two or more nearby infiltration basins can be*

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[2] Letter to The Arlington Land Trust from McDonald Morrissey Associates, LLC. *RE: Thorndike Place, Dorothy Road, Arlington, Massachusetts – Preliminary Review of Applicant's Groundwater Mounding Analysis*. Dated April 26, 2024

[3] Letter to The Arlington Land Trust from McDonald Morrissey Associates, LLC. *RE: Thorndike Place, Dorothy Road, Arlington, Massachusetts – Preliminary Review of Applicant's Groundwater Mounding Analysis*. Dated April 26, 2024.

[4] Carleton, G.B., 2010, *Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins*: U.S. Geological Survey Scientific Investigations Report 2010-5102, 64 p.

conservatively estimated by simulating the basins separately then adding together the mounding at any given location associated with each individual basin". MMA will be prepared to elaborate on this point during the next public hearing, which is currently scheduled for January 16, 2025.

- Regarding BSC's application of the Hantush analytical model for conducting mounding analyses for infiltration systems other than System 1, MMA currently believes the most notable deficiency is the failure to account for additive mounding effects caused by simultaneous infiltration from multiple systems, as discussed above. However, additional deficiencies are also evident. For example, the applied infiltration (i.e., "recharge") rates and durations used by BSC are inexplicably inconsistent with their own HydroCAD predictions. The inconsistency is best evidenced by the fact that, in many cases, the assigned rates of recharge significantly exceed the claimed assumed infiltration capacity of site soils (i.e., 0.27 in/hr). Furthermore, site-specific and project-specific complexities, such as building foundations acting as barriers to lateral groundwater flow, continue to limit the applicability and representativeness of the idealized Hantush analytical model that is used by BSC. In consideration of these limitations, MMA reiterates our previously stated perspective that a more robust and flexible numerical modeling approach (e.g., MODFLOW) should be pursued to provide more reliable predictions of post-development groundwater mounding during storm events.

The review described herein is preliminary and based on information made available to MMA as of the indicated transmittal date. MMA therefore reserves the right to amend and/or extend this commentary based on expanded review and/or review of new information provided by the Applicant or other interested parties.

Sincerely,

Michael Mobile, Ph.D., CGWP
President, McDonald Morrissey Associates, LLC

Attachment: (A) MOUNDSOLV Summary Reports

MAM/
\\mma-server\Data\1_Projects\Arlington\Thorndike_Place\7_Reports_and_Memos\Comment_Letter_1-14-25\FINAL_MMA_Review_Letter_1-15-25.docx

Attachment A:

MOUNDSOLV Summary Reports

2-Year, 24-Hour Storm Event

System 7 Infiltration Volume = 1,379 cu. ft. (HydroCAD)
System 7 Infiltration Duration = 25.3 hrs @ 0.27 in/hr
System 1 Infiltration Volume = 13,377 cu. ft. (HydroCAD)
System 1 Infiltration Duration = 41.4 hrs @ 0.52 in/hr

MOUNDSOLV
Groundwater Mounding Analysis For A Sloping Water-Table Aquifer Zlotnik et al. (2017) Solution

Solution Method

Zlotnik et al. (2017) transient solution for a rectangular source (linearization method 2)

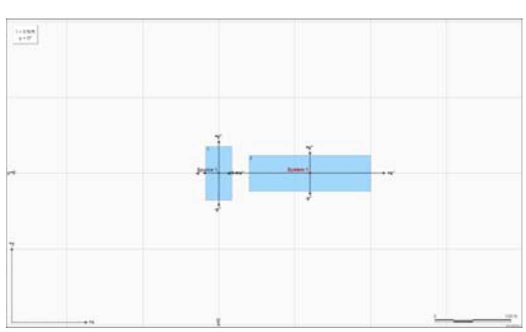
Site Description

Aquifer Data

Property	Value
Horizontal hydraulic conductivity, *K* (ft/d)	5.4
Specific yield, *Sy*	0.08
Initial saturated thickness, h_0 (ft)	16
Maximum allowable water-table rise, *σ* (ft)	4
Dip, *i* (ft/ft)	0
Slope rotation from x axis, *γ* (°)	0

Recharge Sources

Property	Source 1	Source 2
X coordinate at center, *X* (ft)	0	120
Y coordinate at center, *Y* (ft)	0	0
Dimension along x* axis, *L* (ft)	34.45	160
Dimension along y* axis, *W* (ft)	70.3	46.62
Rotation from slope direction, *ϕ* (°)	0	0
Recharge rate, *Q* (ft^3/d)	1307.7909	7757.568
Infiltration rate, *q* (ft/d)	0.54	1.04

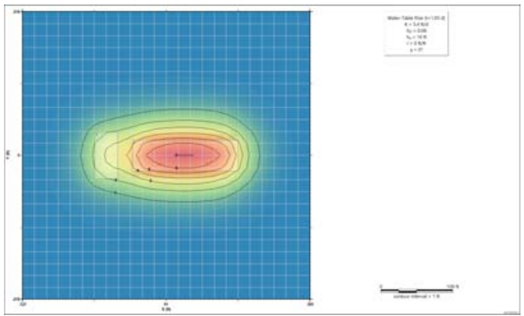


Map of recharge source.

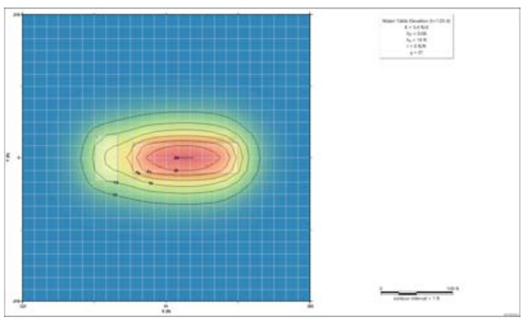
Monitoring Points

Elapsed Time, t = 1.05 d

Name	x (ft)	y (ft)	s (ft)	h (ft)	z (ft)
Source 1	0	0	3.152	19.15	0
System 1	120	0	7.065	23.06	0



Contour plot of water-table rise.

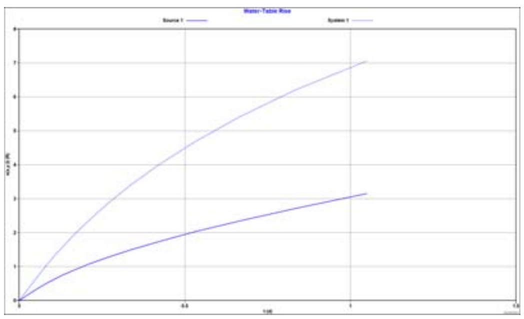


Contour plot of water-table elevation.

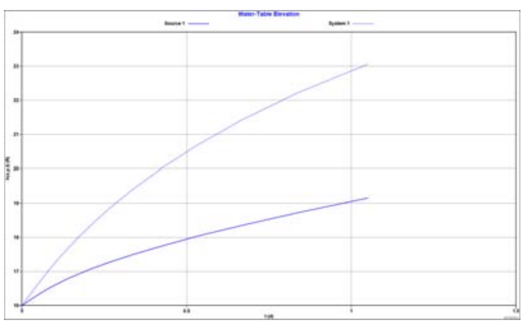
Time Series Data

Time	Source 1		System 1	
(d)	s (ft)	h (ft)	s (ft)	h (ft)
0	0	16	0	16
0.003062	0.02067	16.02	0.0398	16.04
0.006889	0.0465	16.05	0.08956	16.09
0.01167	0.07879	16.08	0.1517	16.15
0.01765	0.119	16.12	0.2295	16.23
0.02513	0.1689	16.17	0.3266	16.33
0.03447	0.2299	16.23	0.4476	16.45
0.04615	0.3035	16.3	0.5973	16.6
0.06075	0.391	16.39	0.7809	16.78

0.079	0.4935	16.49	1.003	17
0.1018	0.6122	16.61	1.269	17.27
0.1303	0.748	16.75	1.583	17.58
0.166	0.9021	16.9	1.949	17.95
0.2105	1.076	17.08	2.372	18.37
0.2662	1.272	17.27	2.854	18.85
0.3358	1.494	17.49	3.401	19.4
0.4228	1.745	17.75	4.012	20.01
0.5316	2.03	18.03	4.688	20.69
0.6676	2.356	18.36	5.427	21.43
0.8376	2.727	18.73	6.221	22.22
1.05	3.152	19.15	7.065	23.06



Time-series plot of water-table rise.



Time-series plot of water-table elevation.

Profile Data

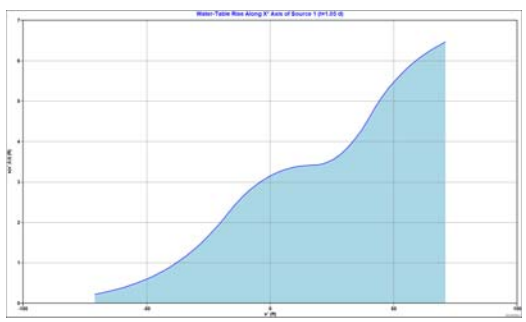
Profile Along X Axis for Source 1 at Elapsed Time, t = 1.05 d*

x* (ft)	s (ft)	h (ft)	z (ft)
-71	0.2256	16.23	0
-68.16	0.2593	16.26	0

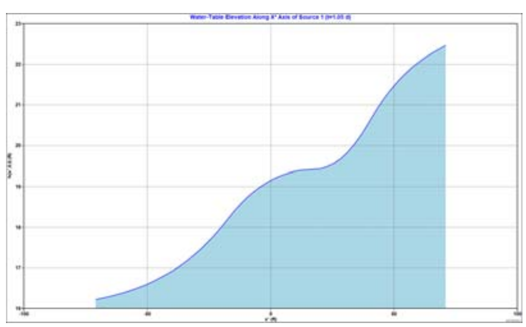
-65.32	0.2975	16.3	0
-62.48	0.3405	16.34	0
-59.64	0.3888	16.39	0
-56.8	0.4431	16.44	0
-53.96	0.5039	16.5	0
-51.12	0.5718	16.57	0
-48.28	0.6476	16.65	0
-45.44	0.7319	16.73	0
-42.6	0.8256	16.83	0
-39.76	0.9294	16.93	0
-36.92	1.044	17.04	0
-34.08	1.171	17.17	0
-31.24	1.31	17.31	0
-28.4	1.463	17.46	0
-25.56	1.631	17.63	0
-22.72	1.815	17.82	0
-19.88	2.015	18.02	0
-17.04	2.233	18.23	0
-14.2	2.444	18.44	0
-11.36	2.629	18.63	0
-8.52	2.791	18.79	0
-5.68	2.931	18.93	0
-2.84	3.051	19.05	0
0	3.152	19.15	0
2.84	3.235	19.24	0
5.68	3.302	19.3	0
8.52	3.353	19.35	0
11.36	3.389	19.39	0
14.2	3.411	19.41	0
17.04	3.419	19.42	0
19.88	3.433	19.43	0
22.72	3.481	19.48	0
25.56	3.565	19.56	0
28.4	3.685	19.69	0
31.24	3.845	19.84	0

34.08	4.044	20.04	0
36.92	4.285	20.28	0
39.76	4.569	20.57	0
42.6	4.862	20.86	0
45.44	5.121	21.12	0
48.28	5.349	21.35	0
51.12	5.552	21.55	0
53.96	5.732	21.73	0
56.8	5.892	21.89	0
59.64	6.035	22.03	0
62.48	6.163	22.16	0
65.32	6.277	22.28	0
68.16	6.379	22.38	0
71	6.471	22.47	0

The axes of Source 1 (x, y*) are rotated 0°*
from the axes of mapping coordinate system (x, y)



Profile of water-table rise along x axis of Source 1.*



Profile of water-table elevation along x axis of Source 1.*

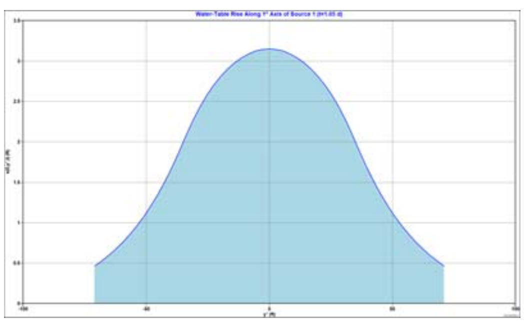
Profile Along Y* Axis for Source 1 at Elapsed Time, t = 1.05 d

y* (ft)	**s (ft)**	**h (ft)**	**z (ft)**

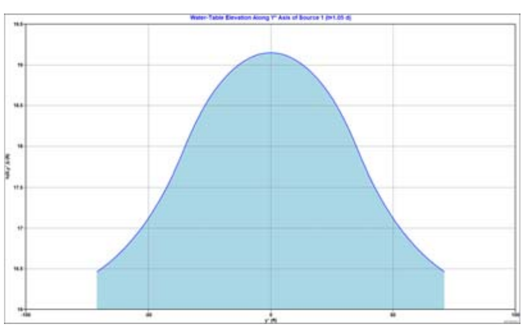
-71	0.4641	16.46	0
-68.16	0.5262	16.53	0
-65.32	0.5954	16.6	0
-62.48	0.6724	16.67	0
-59.64	0.7578	16.76	0
-56.8	0.8524	16.85	0
-53.96	0.9571	16.96	0
-51.12	1.073	17.07	0
-48.28	1.201	17.2	0
-45.44	1.342	17.34	0
-42.6	1.498	17.5	0
-39.76	1.671	17.67	0
-36.92	1.861	17.86	0
-34.08	2.067	18.07	0
-31.24	2.257	18.26	0
-28.4	2.424	18.42	0
-25.56	2.57	18.57	0
-22.72	2.698	18.7	0
-19.88	2.807	18.81	0
-17.04	2.9	18.9	0
-14.2	2.978	18.98	0
-11.36	3.041	19.04	0
-8.52	3.09	19.09	0
-5.68	3.124	19.12	0
-2.84	3.145	19.14	0
0	3.152	19.15	0
2.84	3.145	19.14	0
5.68	3.124	19.12	0
8.52	3.09	19.09	0
11.36	3.041	19.04	0
14.2	2.978	18.98	0
17.04	2.9	18.9	0
19.88	2.807	18.81	0
22.72	2.698	18.7	0
25.56	2.57	18.57	0

28.4	2.424	18.42	0
31.24	2.257	18.26	0
34.08	2.067	18.07	0
36.92	1.861	17.86	0
39.76	1.671	17.67	0
42.6	1.498	17.5	0
45.44	1.342	17.34	0
48.28	1.201	17.2	0
51.12	1.073	17.07	0
53.96	0.9571	16.96	0
56.8	0.8524	16.85	0
59.64	0.7578	16.76	0
62.48	0.6724	16.67	0
65.32	0.5954	16.6	0
68.16	0.5262	16.53	0
71	0.4641	16.46	0

The axes of Source 1 (x, y*) are rotated 0° from the axes of mapping coordinate system (x, y)*



Profile of water-table rise along y axis of Source 1.*

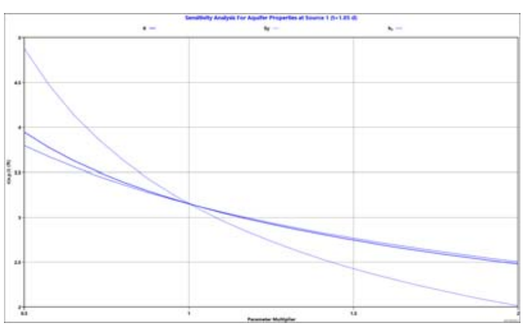


Profile of water-table elevation along y axis of Source 1.*

Sensitivity Data

Source 1, x=0 ft, y=0 ft

Parameter	Water-Table Rise (ft)		
Multiplier	K	Sy	h_0
0.5	3.943	4.876	3.797
0.575	3.772	4.47	3.672
0.65	3.628	4.14	3.559
0.725	3.502	3.865	3.457
0.8	3.392	3.632	3.364
0.875	3.294	3.431	3.279
0.95	3.206	3.256	3.201
1.025	3.126	3.102	3.128
1.1	3.053	2.965	3.061
1.175	2.986	2.843	2.998
1.25	2.924	2.732	2.939
1.325	2.866	2.632	2.884
1.4	2.813	2.54	2.832
1.475	2.762	2.456	2.783
1.55	2.715	2.378	2.737
1.625	2.671	2.306	2.694
1.7	2.629	2.24	2.652
1.775	2.589	2.177	2.613
1.85	2.551	2.119	2.575
1.925	2.515	2.065	2.539
2	2.481	2.014	2.505



Sensitivity plot for water-table rise.

Notation

h is water-table elevation above datum[1]

h_0 is aquifer saturated thickness prior to mounding

i is dip of aquifer
K is horizontal hydraulic conductivity
L is dimension of recharge source parallel to x^* axis
q is infiltration rate (= Q / $L \cdot W$)
Q is recharge rate
s is water-table rise above static water table
Sy is specific yield
t is time since start of recharge
t_0 is time when recharge stops
W is dimension of recharge source parallel to y^* axis
x, y are mapping Cartesian coordinate axes
x^*, y^* are recharge source Cartesian coordinate axes
z is elevation above datum[1]
γ is angle between x axis and dip direction
ϕ is angle between dip direction and x^* axis of recharge source
σ is maximum acceptable water-table rise

[1]*Elevation datum is the base of aquifer beneath the center of primary recharge source*

100-Year, 24-Hour Storm Event

System 7 Infiltration Volume = 1,621 cu. ft. (HydroCAD)

System 7 Infiltration Duration = 29.7 hrs @ 0.27 in/hr

System 1 Infiltration Volume = 15,354 cu. ft. (HydroCAD)

System 1 Infiltration Duration = 47.5 hrs @ 0.52 in/hr

MOUNDSOLV
Groundwater Mounding Analysis For A Sloping Water-Table Aquifer Zlotnik et al. (2017) Solution

Solution Method

Zlotnik et al. (2017) transient solution for a rectangular source (linearization method 2)

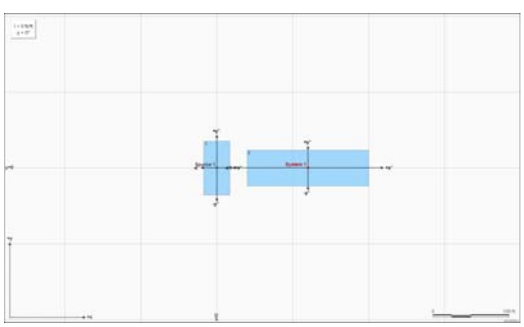
Site Description

Aquifer Data

Property	Value
Horizontal hydraulic conductivity, *K* (ft/d)	5.4
Specific yield, *Sy*	0.08
Initial saturated thickness, h_0 (ft)	16
Maximum allowable water-table rise, *σ* (ft)	4
Dip, *i* (ft/ft)	0
Slope rotation from x axis, *γ* (°)	0

Recharge Sources

Property	Source 1	Source 2
X coordinate at center, *X* (ft)	0	120
Y coordinate at center, *Y* (ft)	0	0
Dimension along x* axis, *L* (ft)	34.45	160
Dimension along y* axis, *W* (ft)	70.3	46.62
Rotation from slope direction, *ϕ* (°)	0	0
Recharge rate, *Q* (ft^3/d)	1307.7909	7757.568
Infiltration rate, *q* (ft/d)	0.54	1.04

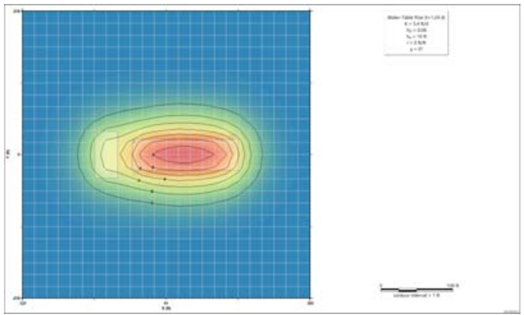


Map of recharge source.

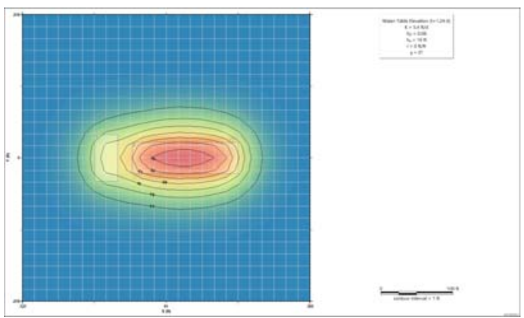
Monitoring Points

Elapsed Time, t = 1.24 d

Name	x (ft)	y (ft)	s (ft)	h (ft)	z (ft)
Source 1	0	0	3.503	19.5	0
System 1	120	0	7.714	23.71	0



Contour plot of water-table rise.

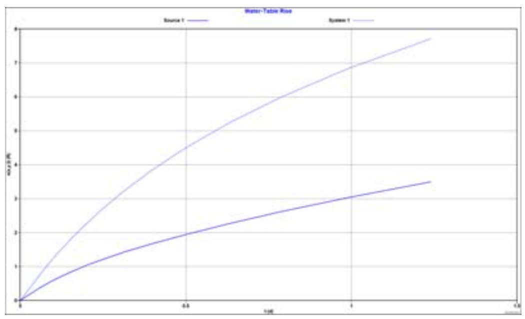


Contour plot of water-table elevation.

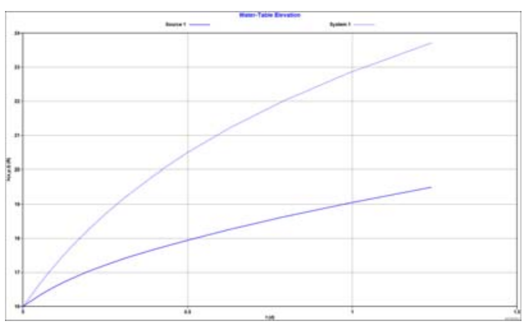
Time Series Data

Time	Source 1		System 1	
(d)	s (ft)	h (ft)	s (ft)	h (ft)
0	0	16	0	16
0.003616	0.02441	16.02	0.047	16.05
0.008135	0.05491	16.05	0.1058	16.11
0.01379	0.09303	16.09	0.1792	16.18
0.02085	0.1404	16.14	0.271	16.27
0.02967	0.1988	16.2	0.3855	16.39
0.04071	0.2696	16.27	0.5278	16.53
0.0545	0.3541	16.35	0.7029	16.7
0.07174	0.4536	16.45	0.9159	16.92

0.09329	0.569	16.57	1.172	17.17
0.1202	0.7013	16.7	1.474	17.47
0.1539	0.8516	16.85	1.828	17.83
0.196	1.021	17.02	2.238	18.24
0.2486	1.213	17.21	2.707	18.71
0.3144	1.428	17.43	3.238	19.24
0.3966	1.672	17.67	3.835	19.83
0.4994	1.949	17.95	4.497	20.5
0.6278	2.263	18.26	5.221	21.22
0.7884	2.623	18.62	6.004	22
0.9891	3.034	19.03	6.837	22.84
1.24	3.503	19.5	7.714	23.71



Time-series plot of water-table rise.



Time-series plot of water-table elevation.

Profile Data

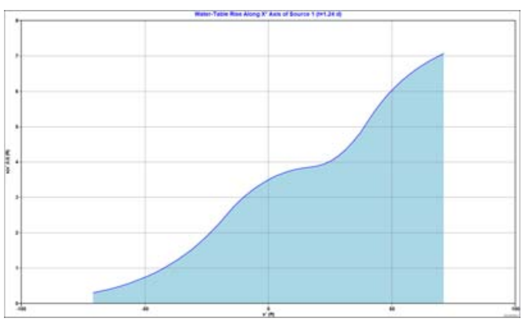
Profile Along X Axis for Source 1 at Elapsed Time, t = 1.24 d*

x* (ft)	s (ft)	h (ft)	z (ft)
-71	0.3052	16.31	0
-68.16	0.3462	16.35	0

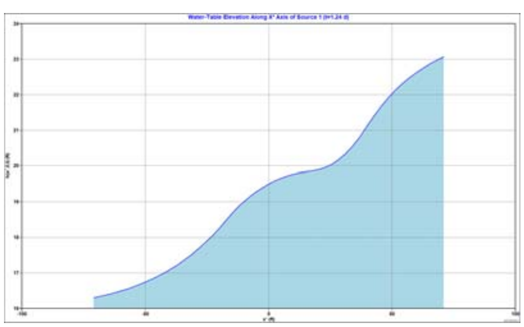
-65.32	0.3919	16.39	0
-62.48	0.4429	16.44	0
-59.64	0.4997	16.5	0
-56.8	0.5627	16.56	0
-53.96	0.6326	16.63	0
-51.12	0.7101	16.71	0
-48.28	0.7956	16.8	0
-45.44	0.8901	16.89	0
-42.6	0.9941	16.99	0
-39.76	1.109	17.11	0
-36.92	1.234	17.23	0
-34.08	1.372	17.37	0
-31.24	1.523	17.52	0
-28.4	1.687	17.69	0
-25.56	1.867	17.87	0
-22.72	2.062	18.06	0
-19.88	2.275	18.27	0
-17.04	2.505	18.5	0
-14.2	2.727	18.73	0
-11.36	2.926	18.93	0
-8.52	3.1	19.1	0
-5.68	3.254	19.25	0
-2.84	3.388	19.39	0
0	3.503	19.5	0
2.84	3.601	19.6	0
5.68	3.683	19.68	0
8.52	3.75	19.75	0
11.36	3.801	19.8	0
14.2	3.838	19.84	0
17.04	3.861	19.86	0
19.88	3.89	19.89	0
22.72	3.952	19.95	0
25.56	4.049	20.05	0
28.4	4.182	20.18	0
31.24	4.352	20.35	0

34.08	4.562	20.56	0
36.92	4.812	20.81	0
39.76	5.103	21.1	0
42.6	5.403	21.4	0
45.44	5.669	21.67	0
48.28	5.904	21.9	0
51.12	6.113	22.11	0
53.96	6.299	22.3	0
56.8	6.466	22.47	0
59.64	6.615	22.61	0
62.48	6.748	22.75	0
65.32	6.869	22.87	0
68.16	6.977	22.98	0
71	7.074	23.07	0

The axes of Source 1 (x, y*) are rotated 0° from the axes of mapping coordinate system (x, y)*



Profile of water-table rise along x axis of Source 1.*



Profile of water-table elevation along x axis of Source 1.*

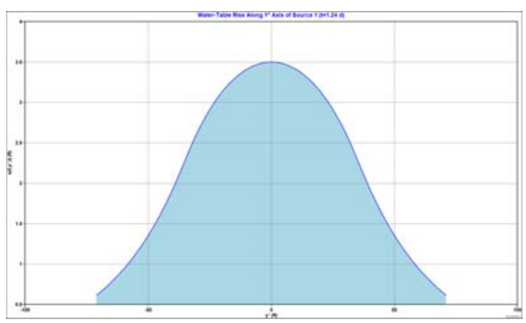
Profile Along Y* Axis for Source 1 at Elapsed Time, t = 1.24 d

y* (ft)	s (ft)	h (ft)	z (ft)

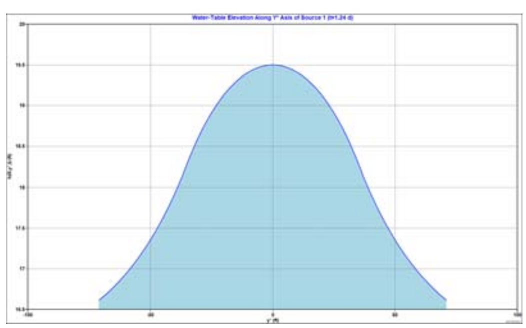
-71	0.6139	16.61	0
-68.16	0.687	16.69	0
-65.32	0.7675	16.77	0
-62.48	0.8559	16.86	0
-59.64	0.9529	16.95	0
-56.8	1.059	17.06	0
-53.96	1.176	17.18	0
-51.12	1.303	17.3	0
-48.28	1.442	17.44	0
-45.44	1.595	17.6	0
-42.6	1.762	17.76	0
-39.76	1.945	17.94	0
-36.92	2.145	18.14	0
-34.08	2.36	18.36	0
-31.24	2.559	18.56	0
-28.4	2.734	18.73	0
-25.56	2.887	18.89	0
-22.72	3.022	19.02	0
-19.88	3.137	19.14	0
-17.04	3.236	19.24	0
-14.2	3.319	19.32	0
-11.36	3.386	19.39	0
-8.52	3.437	19.44	0
-5.68	3.474	19.47	0
-2.84	3.496	19.5	0
0	3.503	19.5	0
2.84	3.496	19.5	0
5.68	3.474	19.47	0
8.52	3.437	19.44	0
11.36	3.386	19.39	0
14.2	3.319	19.32	0
17.04	3.236	19.24	0
19.88	3.137	19.14	0
22.72	3.022	19.02	0
25.56	2.887	18.89	0

28.4	2.734	18.73	0
31.24	2.559	18.56	0
34.08	2.36	18.36	0
36.92	2.145	18.14	0
39.76	1.945	17.94	0
42.6	1.762	17.76	0
45.44	1.595	17.6	0
48.28	1.442	17.44	0
51.12	1.303	17.3	0
53.96	1.176	17.18	0
56.8	1.059	17.06	0
59.64	0.9529	16.95	0
62.48	0.8559	16.86	0
65.32	0.7675	16.77	0
68.16	0.687	16.69	0
71	0.6139	16.61	0

The axes of Source 1 (x, y*) are rotated 0°*
from the axes of mapping coordinate system (x, y)



Profile of water-table rise along y axis of Source 1.*

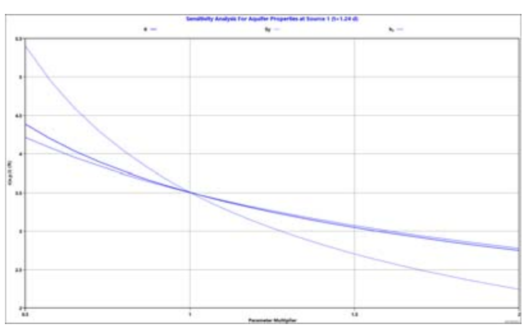


Profile of water-table elevation along y axis of Source 1.*

Sensitivity Data

Source 1, x=0 ft, y=0 ft

Parameter Multiplier	Water-Table Rise (ft) K	Sy	h_0
0.5	4.387	5.4	4.214
0.575	4.197	4.956	4.078
0.65	4.035	4.593	3.955
0.725	3.895	4.291	3.843
0.8	3.772	4.034	3.74
0.875	3.663	3.812	3.646
0.95	3.564	3.619	3.558
1.025	3.474	3.449	3.477
1.1	3.393	3.298	3.402
1.175	3.318	3.162	3.331
1.25	3.248	3.039	3.265
1.325	3.183	2.928	3.204
1.4	3.123	2.827	3.146
1.475	3.067	2.733	3.091
1.55	3.014	2.648	3.039
1.625	2.964	2.568	2.99
1.7	2.916	2.495	2.943
1.775	2.872	2.426	2.899
1.85	2.829	2.362	2.856
1.925	2.789	2.302	2.816
2	2.75	2.245	2.778



Sensitivity plot for water-table rise.

Notation

h is water-table elevation above datum[1]

h_0 is aquifer saturated thickness prior to mounding

i is dip of aquifer
K is horizontal hydraulic conductivity
L is dimension of recharge source parallel to *x** axis
q is infiltration rate (= *Q* / *L*·*W*)
Q is recharge rate
s is water-table rise above static water table
Sy is specific yield
t is time since start of recharge
t_0 is time when recharge stops
W is dimension of recharge source parallel to *y** axis
x, *y* are mapping Cartesian coordinate axes
*x**, *y** are recharge source Cartesian coordinate axes
z is elevation above datum[1]
γ is angle between *x* axis and dip direction
ϕ is angle between dip direction and *x** axis of recharge source
σ is maximum acceptable water-table rise

[1]*Elevation datum is the base of aquifer beneath the center of primary recharge source*

Report generated by MOUNDSOLV v4.0 on 14 Jan 2025 at 22:34:47
MOUNDSOLV (www.aqtesolv.com)

Exhibit G

RECEIVED
JUN 18 2019
WAYLAND CONSERVATION COMMISSION

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Northeast Regional Office • 205B Lowell Street, Wilmington MA 01887 • 978-694-3200

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Kathleen A. Theoharides
Secretary

Martin Suuberg
Commissioner

JUL 16 2019

Chris D'Antonio
Windsor Place, LLC
73 Pelham Island Road
Wayland, MA 01778

RE: WETLANDS/WAYLAND
DEP FILE# 322-0897
24 School Street
Superseding Order of Conditions
Affirmation of Denial

Dear Mr. D'Antonio:

Following an in-depth review of the file referenced above, and in accordance with Massachusetts General Laws, Chapter 131, Section 40, the Northeast Regional Office of the Massachusetts Department of Environmental Protection, Wetlands Program (MassDEP), is issuing the enclosed Superseding Order of Conditions (SOC) denying the project by **affirming** the Wayland Conservation Commission's (the Commission) Order of Conditions (OOC). MassDEP's denial is based upon: 1) information and plans submitted; 2) information gathered during the site inspection; and 3) reasons MassDEP has deemed necessary to protect the statutory interests identified in the Wetlands Protection Act.

The project proposal is for the demolition of an existing single-family house, garage, barn and driveways and the construction of 12 townhouses filed under MGL Chapter 40B along with on-site parking, a septic system and stormwater management system on an approximately 0.86 acre (37,865 square feet) lot.

MassDEP's review of the file and site inspection confirms that the project site is adjacent to the following resource areas subject to protection under the Act: Bordering Vegetated Wetlands (BVW) and Bank of an intermittent stream. In accordance with the Wetlands Protection Act and its Regulations, the aforementioned areas are presumed to be significant to the statutory interests identified in the attached SOC. The project is within the Buffer Zones only. No wetland alteration is proposed.

An Order of Conditions was issued by the Commission on October 4, 2018 denying the project. The denial was based on both a lack of information pursuant to 310 CMR 10.05(6)(c) and the Commission's opinion that the proposed project cannot be conditioned to meet the performance standards pursuant to 310 CMR 10.53, 10.54, 10.55 and 10.56. The Commission's primary concern is that the project is too large for the lot and that impacts from the proposed project, specifically the discharge of septic leachate and stormwater, will adversely affect the adjacent wetland resource areas.

You filed an appeal of the Commission's Order on October 18, 2018 based on your opinion that only a portion of the proposed project is located in the buffer zones of the BVW and Bank and that the project will not involve the removing, filling, dredging or altering of BVW or Bank. It is your opinion that the project will fully meet the stormwater standards.

On November 6, 2018, MassDEP held a site visit that was attended by you and your representatives and members of the Commission. The site is in a state of abandonment and the house in disrepair. The lot slopes gradually down from School Street towards the BVW bordering an intermittent stream. The property line varies from 20 feet to approximately 55 feet from the BVW boundary. The intermittent stream is tributary to Snake Brook which eventually flows into Lake Cochituate.

Construction debris appears to have been dumped just off site of the property line near the BVW. Large tree trunks were observed in the wetland. Although the property is zoned as single family residential, according to information provided by the town, a chimney cleaning and repair company was permitted to run a business from this address from the years 2000 to 2013. The Commission believes that material from the chimney business may have also been buried with the construction debris.

Based on the Notice of Intent, after the demolition of the existing structures on the site, a 7.5-foot-high, 220-foot-long retaining wall will be built on the down-slope property line and fill will be used to raise the grade approximately seven (7) feet near the wall with fill tapering back towards School Street. Two buildings are proposed on the site with seven (7) townhouses in the building adjacent to the retaining wall and five (5) townhouses in the building adjacent to School Street. An on-site septic system is proposed at the north end of the lot with an 86-foot by 72-foot leach field that will have a projected daily hydraulic loading of 2860 gallons per day. The leach field will be set back from the wetland by a distance that ranges from 62.5 feet to 96 feet. The system had not been approved by the Board of Health at the time of MassDEP's review.

The proposed stormwater management system is made up of two treatment trains. The primary treatment train captures runoff from the parking areas and a portion of the roof surfaces and consists of catch basins discharging to 450i Stormceptors which then discharge to a 32-foot by 52-foot subsurface galley infiltration system. Overflow from the system will discharge to a level spreader located in the buffer zone. The proposed subsurface infiltration system will be located under the driveway between the buildings; there will be between one (1) and three (3) feet of fill and asphalt placed on top of the infiltration galleys. The second treatment train consists of a landscaped infiltration basin with overflow discharge to a level spreader.

In accordance with the MA Stormwater Handbook (Volume 2, Chapter 2), two (2) feet of separation is required between seasonal high groundwater and the bottom of the infiltration system. In addition, at least six (6) inches of a crushed, washed stone layer is required between the infiltrative surface and the bottom of the galleys. The required two (2) feet of separation between the seasonal high groundwater and the bottom of the infiltration system should be measured from the bottom of the stone layer.

In order to meet the required two (2) feet of separation, the applicant has designed the infiltration system without the six (6) inches of stone and with the galleys resting directly on the soil with only a layer of filter fabric separating the galleys from the soil. It is MassDEP's opinion that this design does not meet the Stormwater Standards.

As designed, the proposed infiltration system has the capacity to store and recharge up to the 2-year storm event. Storm events in excess of the 2-year storm will pass directly through the infiltration system and discharge through a level spreader located approximately 40 feet from the BVW. The Stormwater Handbook specifies that subsurface systems should be designed to function off-line by placing a bypass structure upgradient of the system to convey high flows around it during large storms. It is MassDEP's opinion that the proposed design could lead to failure of the infiltration system by discharging untreated stormwater through the system without pre-treatment. Failure of the infiltration system could result in flooding on the site as well as erosion into the BVW, possible downstream flooding and discharge of untreated stormwater.

MassDEP is also concerned about the impact of dead and live loads on the galleys and the surface they sit upon. Dead loads, such as the weight of the overlying soils, are static forces that are relatively constant for an extended time. Live loads, such as the weight of a loaded moving truck, are usually variable and have the potential to crush the galleys or to push them into the subsurface soils, especially as no crushed stone layer is proposed.

The applicant has provided a hydraulic mounding analysis of the project site because of the hydraulic loading from both the septic system (2860 gallons per day) and the stormwater infiltration system and the proximity of these systems to each other. The USGS Hantush method was used to predict the effect of the groundwater mounds on the infiltration system and the septic leach field resulting from the 100 year storm event. Because of the constraints on the site such as the size of the lot, the retaining wall and the amount of hydraulic loading, it was the opinion of the Commission that a more robust analysis of the hydraulic loading using the USGS MODFLOW method should be used to model site conditions to determine if the proposed project is capable of protecting the interests of the BVW. MassDEP agrees that this information is necessary to properly evaluate the proposed project.

Pursuant to the Regulations at 310 CMR 10.05(7)(h), "When the request for a Superseding Order concerns an Order prohibiting work and issued pursuant to 310 CMR 10.05(6)(c), the Department shall limit its review to the information submitted to the conservation commission. If the Department determines that insufficient information was submitted, it shall affirm the denial and instruct the applicant to refile with the conservation commission and include the appropriate information."

MassDEP agrees with the Commission that the information submitted by the applicant was not adequate to allow an evaluation of the proposal. It is MassDEP's position that the enclosed Superseding Order of Conditions denying the project as proposed is without prejudice and in no way prohibits the applicant from filing a new Notice of Intent. If a new Notice of Intent is filed, the applicant is encouraged to include the use of the USGS MODFLOW method and provide design calculations for live and dead loads

In addition, based on a review of the information provided by the applicant, information gathered at the site visit and consideration of all issues raised through the appeal, it is MassDEP's opinion that the project, as currently proposed, does not meet the Stormwater Standards in accordance with 310 CMR 10.05(6)(k).

It is MassDEP's position that the enclosed Superseding Order of Conditions affirming the denial issued by the Commission serves to protect the statutory interests identified in the Wetlands Protection Act, M.G.L. Chapter 131, Section 40. However, MassDEP reserves the right, should there be further proceedings in this case, to raise additional issues and present further evidence as may be appropriate. Should you or any concerned party dispute these findings, your attention is directed to the language at the end of the enclosed Superseding Order specifying the rights and procedures for appeal.

If you have any questions concerning this Superseding Order, please contact Gary Bogue at 978-694-3372 or by email gary.bogue@state.ma.us.

Sincerely,

Rachel Freed

Rachel Freed, Deputy Regional Director
Bureau of Water Resources-NERO

cc: Wayland Conservation Commission, Town Hall, 41 Cochituate Road, Wayland, MA 01778
Desheng Wang, Creative Land & Water Engineering, LLC, PO Box 584, Southborough, MA 01772

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
Superseding Order of Conditions-DENIAL
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

MassDEP File Number:
322-0897
Provided by DEP

A. General Information

1. From: **MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION**

   Northeast
   Regional Office

2. This issuance is for (check one):

   ☒ Superseding Order of Condition--**DENIAL**

   ☐ Amended Superseding Order of Conditions--**DENIAL**

3. To: Applicant:

   Chris D'Antonio
   Name
   7 3 Pelham Island Road
   Mailing Address
   Wayland MA 01778
   City/Town State Zip Code

   Property Owner (if different from applicant):

   Windsor Place LLC
   Name
   73 Pelham Island Road
   Mailing Address
   Wayland MA 01778
   City/Town State Zip Code

4. Project Location:

   24 School Street
   Street Address
   Wayland
   City/Town
   52
   Assessors Map/Plat Number
   189
   Parcel/Lot Number
   Latitude: ____
   Longitude: ____

5. Property recorded at the Registry of Deeds for:

   Southern Middlesex
   County
   69050
   Book
   394
   Page

   Certificate (if registered land)

6. Dates:

   9/7/2017
   Date Notice of Intent Filed

   Date Public Hearing Closed
   10/4/2018
   Date of Issuance(local Order of Conditions)

7. Final Plans and Other Documents (attach additional plan references as needed):

   Proposed Plans 24 School Street Wayland (5 pages)
   Plan Title
   8/21/2018
   Date [Revised]
   METROWEST ENGINEERING, INC.
   Prepared By:
   Robert A. Gemma, RPE & PLS
   Signed and Stamped By:
   Existing Conditions Site Plan 5/23/2017 Prepared by METROWEST ENGINEERING, INC.
   Additional Plan or Document Title

B. Findings

1. Findings pursuant to the Massachusetts Wetlands Protection Act:

   Following the review of the above-referenced Notice of Intent and based on the information provided in this application, the Department finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act. Check all that apply:

   ☒ Public Water Supply ☐ Land Containing Shellfish ☒ Prevention of Pollution

   ☒ Private Water Supply ☒ Fisheries ☒ Protection of Wildlife Habitat

   ☒ Groundwater Supply ☒ Storm Damage Prevention ☒ Flood Control

2. *The Department hereby finds the project, as proposed, is:*

Denied without prejudice because:

a. ☒ the proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations to protect those interests checked above. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect these interests, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is set forth below:**

   The project as proposed does not meet the Stormwater Standards in accordance with 310 CMR 10.05(6)(k).

b. ☒ the information submitted by the Applicant is not sufficient to describe the site, the work, or the effect of the work on the interest identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the Act's interests, and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is set forth below:**

   As set forth in the Commission's denial:

   The hydraulic analysis using the USGS MODFLOW is necessary to evaluate the proposed project impacts.

C. ISSUANCE

This Order is valid for three years from the date of issuance.

Issued by: **Northeast Regional Office**
Massachusetts Department of Environmental Protection

Rachel Freed
Signature of Deputy Regional Director, BWR

Rachel Freed
Printed Name of Deputy Regional Director, BWR

This Order is issued to the applicant as follows:

☐ by hand delivery on ☒ by certified mail #

Date of Issuance: JUL 16 2019

D. Notice of Appeal Rights

Appeal Rights and Time Limits

The applicant, the landowner, any person aggrieved by this Superseding Order, Determination or the reviewable decision as defined at 310 CMR 10.04, who previously participated in the proceedings leading to the reviewable decision, the Conservation Commission, or any ten (10) residents of the city or town where the land is located if at least one resident was previously a participant in the permit proceeding, are hereby notified of their right to appeal this reviewable decision pursuant to M.G.L. c.30A, S. 10, provided the request is made by certified mail or hand delivery to the Department, along with the appropriate filing fee and a MassDEP Fee Transmittal Form within ten (10) business days of the date of issuance of this Superseding Order or Determination, and addressed to

Case Administrator
Office of Appeals & Dispute Resolution
Department of Environmental Protection
One Winter Street - 2nd Floor
Boston, MA 02108

A copy of the request (hereinafter also referred to as Appeal Notice) shall at the same time be sent by certified mail or hand delivery to the Conservation Commission, the applicant, the person that requested the Superseding Order or Determination, and the issuing office of the MassDEP at:

Department of Environmental Protection
Northeast Regional Office
Wetlands Program
Wilmington, MA 01887

In the event that a ten-resident group requested the Superseding Order or Determination, the Appeal Notice shall be served on the designated representative of ten-resident group, whose name and contact information is included in this reviewable decision (when relevant).

D. Notice of Appeal Rights (continued)

Contents of Appeal Notice

An Appeal Notice shall comply with the Department's Rules for Adjudicatory Proceedings, 310 CMR 1.01(6) and 310 CMR 10.05(7)(j), and shall contain the following information:

(a) the MassDEP Wetlands File Number, name of the applicant, landowner if different from applicant, and address of the project;
(b) the complete name, mailing address, email address, and fax and telephone numbers of the party filing the Appeal Notice; if represented by consultant or counsel, the name, fax and telephone numbers, email address, and mailing address of the representative; if a ten residents group, the same information of the group's designated representative.
(c) if the Appeal Notice is filed by a ten (10) resident group, then a demonstration of participation by at least one resident in the previous proceedings that led to this Reviewable Decision;
(d) if the Appeal Notice is filed by an aggrieved person, then a demonstration of participation in the previous proceedings that lead to this Reviewable Decision and sufficient written facts to demonstrate status as a person aggrieved;
(e) the names, telephone and fax numbers, email addresses, and mailing addresses of all other interested parties, if known;
(f) a clear and concise statement of the alleged errors in the Department's decision and how each alleged error is inconsistent with 310 CMR 10.00 and does not contribute to the protection of the interests identified in the Wetlands Protection Act, M.G.L. c.131, S. 40, including reference to the statutory or regulatory provisions that the party filing the Appeal Notice alleges has been violated by the Department's Decision, and the relief sought, including any specific desired changes to the Department's decision;

(g) a copy of the Department's Reviewable Decision that is being appealed and a copy of the underlying Conservation Commission decision if the Reviewable Decision affirms the Conservation Commission decision;
(h) a statement that a copy of the request has been sent by certified mail or hand delivery to the applicant and the conservation commission; and
(i) if asserting a matter that is Major and Complex, as defined at 310 CMR 10.04(1), a statement requesting that the Presiding Officer make a designation of Major and Complex, with specific reasons supporting the request.

Filing Fee and Address

A copy of the Appeal Notice along with a MassDEP Fee Transmittal Form and a valid check or money order payable to the Commonwealth of Massachusetts in the amount of one hundred dollars ($100) must be mailed to:

Commonwealth of Massachusetts
Department of Environmental Protection
Commonwealth Master Lockbox
Box 4062
Boston, MA 02211

The request will be dismissed if the filing fee is not paid, unless the appellant is exempt or granted a waiver. The filing fee is not required if the appellant is a city or town (or municipal agency), county, district of the Commonwealth of Massachusetts, or a municipal housing authority. The Department may waive the adjudicatory hearing filing fee pursuant to 310 CMR 4.06(2) for a person who shows that paying the fee will create an undue financial hardship. A person seeking a waiver must file an affidavit setting forth the facts believed to support the claim of undue financial hardship together with the hearing request as provided above.

Exhibit H

Scott Horsley
Water Resources Consultant
65 Little Road • Cotuit, MA 02635 • 508-364-7818

February 3, 2025

Mr. Charles Tirone, Chairperson
Town of Arlington
Conservation Commission
730 Massachusetts Avenue
Arlington, MA 02476

RE: Thorndike Place

Dear Mr. Tirone and Conservation Commissioners:

I have reviewed the recent reports prepared by BSC and peer reviewer GZA and offer the following comments. I continue to disagree with the suggested use of 4.0 feet as an appropriate seasonal high groundwater level. I have consistently questioned this value since the beginning of my reviews that I have provided to the town (2021). It is not based upon MADEP Handbook recommended methods and is inconsistent with other water level measurements in the area (including the wetland).

The applicant is now using this suggested value of 4.0 feet to avoid providing a groundwater mounding analysis of the stormwater infiltration system. They have adjusted the bottom of the infiltration system to elevation 8.0 and are claiming because they have 4-feet vertical separation that they are no longer obligated to provide a groundwater mounding analysis of that system.

We respectfully ask the Arlington Conservation Commission and GZA to reconsider the determination of estimated seasonal high groundwater (ESHGW) elevation of 4.0 which is used as the foundation for the site design. There are multiple lines of evidence that suggest that this value of 4.0 is not reliable and likely understates the required design elevation. Specifically, we request a fresh look at test pit data provided by the town's consultant Whitestone, the applicability of the water level data provided at the USGS Lexington well and our own wells installed along Dorothy Road on behalf of the Arlington Land Trust (ALT). These multiple lines of evidence are as follows.

1. The MADEP Handbook: The MADEP Handbook provides two accepted methods to determine estimated seasonal high groundwater (ESHGW). These include 1) the identification of redoximorphic (redox) features (exhibited as water stains in the soils), and 2) measured water levels during the Spring months that are then compared (and adjusted if necessary) with USGS index wells (see Figure 1 below). These methods were not followed by the applicant in identifying the ESHGW elevation. They did not use the redox features which were identified by Whitestone and they did not compare (and adjust) their groundwater level measurements with USGS wells.

> *Determining Seasonal High Groundwater*
>
> Seasonal high groundwater represents the highest groundwater elevation. Depth to seasonal high groundwater may be identified based on redox features in the soil (see Fletcher and Venneman listed in References). When redox features are not available, installation of temporary push point wells or piezometers should be considered. Ideally, such wells should be monitored in the spring when groundwater is highest and results compared to nearby groundwater wells monitored by the USGS to estimate whether regional groundwater is below normal, normal or above normal (see: http://ma.water.usgs.gov).

Figure 1 – Excerpt from MADEP Stormwater Handbook, Volume 3, Chapter 1

2. The Whitestone Report: Two test pits were conducted May 18, 2023 by the town's contractor Whitestone within the proposed infiltration system INF-1. TP-7 in this report identified redox features at a depth of 32 inches (elevation 5.8). However, this was discounted as "likely perched". Yet, no confining layers that might create a perched condition are noted in any of the four test pits within the proposed area of infiltration system 1P. This observation of redox features complies the methods recommended in the MADEP Stormwater Handbook to determine seasonal high groundwater and deserves further consideration as a reasonable indication of ESHGW.

3. Measured Water Levels: BSC conducted two additional test pits within the area of the infiltration system INF-1 on April 17, 2024. Neither of these test pits exhibited redox features. Therefore, BSC observed the depth of "weeping water" in the test pit TP-9 at 90 inches (7.5 feet) and simply subtracted this from the test pit grade elevation (11.47 feet) and calculated a value of 3.97 feet (see Table 1 below). Based upon this they assumed the ESHGW elevation of 4.0.

"Weeping water" refers to temporarily observed water seeping (or weeping) from the sidewalls of the test pit at the time of the excavation. This is not an acceptable method to identify ESHGW. Rather, this simply shows a minimum level observed at the time of the test pit excavation.

Table 1 – Water Level Measurements and ESHGW estimates (BSC, April 17, 2024)

Test Pit	Existing Grade	Total Depth (in.)	Depth Fill (in.)	Depth Standing GW (in.)	Depth Weeping GW (in)	Depth to Redox (in.)	ESHGW
TP-7	8.92	114	108	110	n/a	n/a	-0.24
TP-8	11.83	120	120	n/a	112	n/a	2.50
TP-9	11.47	118	100	116	90	n/a	3.97
TP-10	11.27	130	130	126	94	n/a	3.44
TP-11	11.09	114	114	111	93	n/a	3.34
TP-12	8.37	76	76	68	53	n/a	3.95
TP-13	7.96	74	74	67	57	n/a	3.21

4. Comparison with USGS Wells: As stated earlier (and shown above in Figure 1), the MADEP Handbook recommends comparing observed groundwater levels with USGS wells. However, no such comparison (or adjustment) was made by BSC with USGS index wells.

Figure 2 shows a comparison of water levels measured in a well installed by BSC at the location of TP-9 (red dots) with the USGS Lexington well hydrograph during the 2024 spring period. This comparison shows that BSC water level measurements were reported on dates that missed all of the peak levels recorded at the USGS well during the Spring 2024 period. The highest groundwater levels were observed at the USGS well on March 24, 29, and April 4. Had BSC used a continuous recorder (as I recommended in my earlier comment letters) they would have likely recorded higher levels, consistent with the USGS well).

This comparison shows that the highest water level measured by BSC was on April 1 when the USGS well was more than one foot below its peak high measurement on March 10. This suggests that the ESHGW would be at least 5.0 feet. This would be consistent with the redox level of 5.8 feet reported by Whitestone.

This same variance in groundwater levels is further corroborated with our own water level measurements at the Arlington Land Trust well located on Dorothy Road which showed a peak elevation on March 29, 2024 and a similar decline throughout much of April to a level of approximately 1-foot lower on April 17 when the test pits were excavated (see figure 3). This suggests that the relative groundwater level fluctuations over this period are consistent with the USGS Lexington well (which showed a 1-foot decline during this same period).

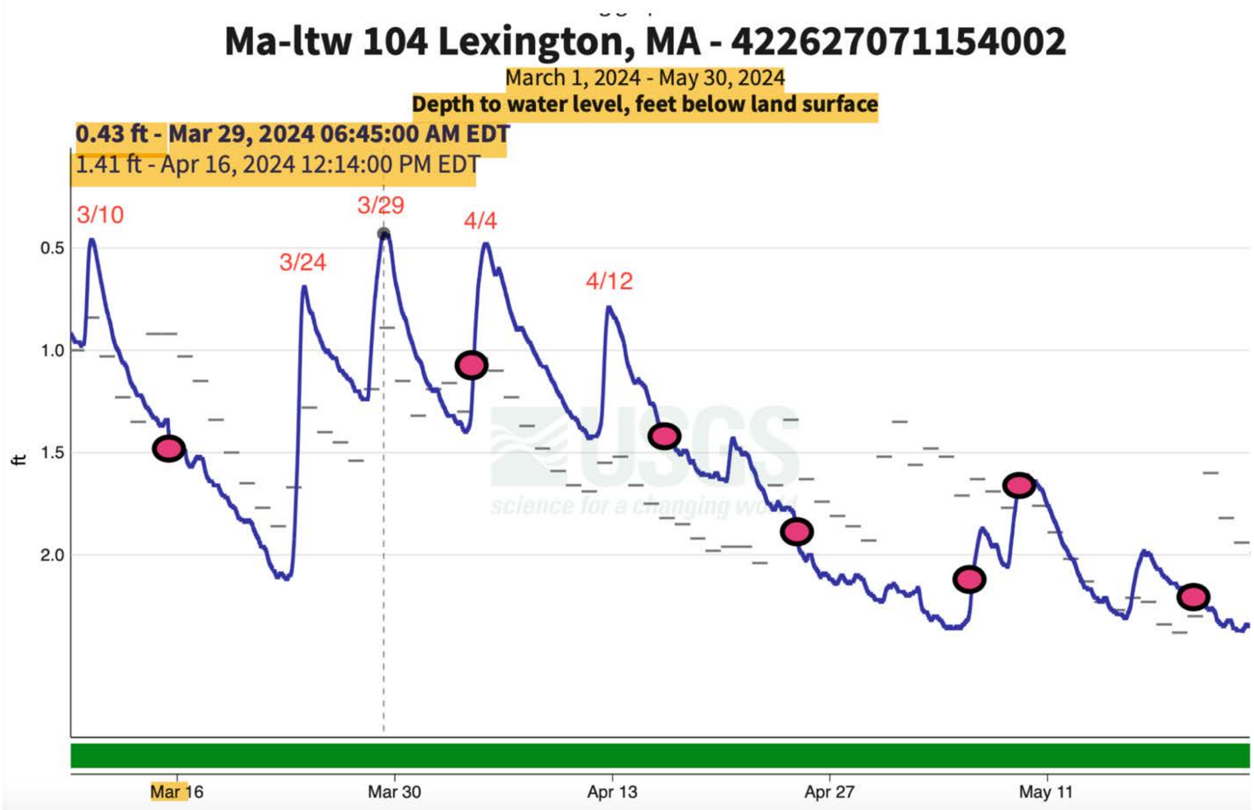


Figure 2 - Hydrograph for USGS Lexington Index Well (March - April 2024)

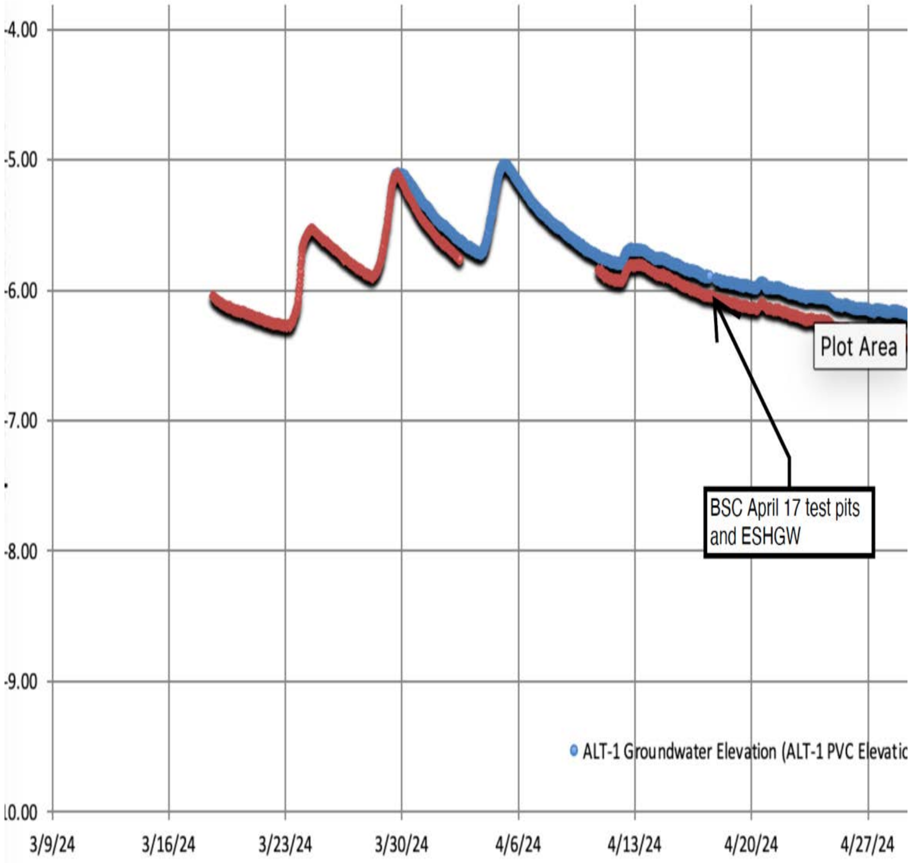


Figure 3 - Hydrograph for Arlington Land Trust (ALT) Monitoring Wells at Dorothy Road (March - April 2024)

5. Summary

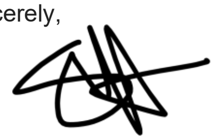
In summary, I believe that:

a) the applicant underestimates seasonal high groundwater conditions and a value of 5.0 – 5.8 feet should be utilized rather than 4.0 feet. This provides a more realistic and conservative value.

b) a groundwater mounding analysis is required and should be evaluated for the revise infiltration system #1. This has not been provided by the applicant.

Thank you for the opportunity to provide these comments. Please contact me directly with any questions that you might have.

Sincerely,



Scott W. Horsley
Water Resources Consultant

Exhibit I

McDonald Morrissey Associates, LLC
GROUND WATER HYDROLOGISTS

February 3, 2025

Town of Arlington Conservation Commission
Attn: Mr. Charles Tirone, Chairperson
730 Massachusetts Avenue
Arlington, MA 02476

RE: **Thorndike Place, Dorothy Road, Arlington, Massachusetts – Preliminary Comments on GZA Peer Review**

Dear Mr. Tirone and Commission Members,

McDonald Morrissey Associates, LLC (MMA) is providing this letter to relay comments that respond to certain elements of the January 28, 2025 technical review letter pertaining to the subject line project that was issued to the Commission by GZA GeoEnvironmental, Inc. (GZA)[1]. These comments are as follows:

- Consistent with MMA's January 15, 2025 letter, GZA acknowledges that simultaneous infiltration from other nearby systems (e.g., System 1) would result in groundwater mounding that could interfere—and be additive on top of—mounding generated by System 7. After correcting erroneous inputs used by BSC, GZA performs their own mounding calculation for System 7 using the Hantush analytical model (i.e., BSC's selected mounding analysis method). GZA's results show a groundwater mound rising to within approximately 0.5 feet of the bottom of System 7, but this result ignores the additive influence of System 1. As demonstrated in MMA's January 15, 2025 letter, if the additive System 1 influence is considered using a comparable modeling method to BSC's, there is clear evidence of groundwater mounding rising well above the bottom of System 7. Thus, at a minimum, additional analysis is necessary to support GZA's claim that groundwater mounding will not adversely impact the drainage time of System 7, nor the rate control capability of the overall stormwater system, to the point of violating MSH requirements.

- MMA generally agrees with GZA's view on the need for consistency between initial infiltration rate and duration inputs to mounding analyses and HydroCAD assumptions and output for the 100-year, 24-hour design storm event. However, MMA notes that GZA does not acknowledge—nor seek correction of—unjustified/unsupported infiltration rates used by BSC in their HydroCAD model. As stated in MMA's January 15, 2025 letter, BSC inexplicably uses an infiltration rate of 0.52 inches per hour (in/hr) for certain proposed features, including System 1;

[1] Letter to Mr. David Morgan, Town of Arlington, from Anthony B. Urbano, GZA GeoEnvironmental, Inc. *RE: Response to January 2025 Redesign, Peer Review of Stormwater Mound Evaluation, Proposed Thorndike Place Residential Development, Arlington, Massachusetts*. Dated January 28, 2025.

whereas, BSC has only claimed to justify the use of an infiltration rate of 0.27 in/hr. This issue must be corrected and HydroCAD simulations must be reperformed to generate representative results that can be used as inputs to subsequent mounding analyses.

- MMA acknowledges GZA's recommendations regarding peat removal and underdrain design. However, MMA notes neither action has been accounted for in any mounding analysis performed to date, including the calculations presented in GZA's letter. The ultimate influence of certain modifications would depend on specific design characteristics and site conditions (e.g., drain position, capacity, lateral extent of peat deposits, etc.). It would therefore be premature and speculative to rely on any mitigating function associated with these modifications, though MMA notes we are not suggesting any such claim is being made by GZA or BSC.

- MMA reiterates our disagreement with GZA's opinion on the "suitability" of BSC's claimed estimated seasonal high groundwater (ESHGW) condition of elevation 4.0-feet[2]. In our opinion, if established in accordance with Massachusetts Stormwater Handbook (MSH) requirements, the resultant ESHGW condition would reside above this elevation, and a mounding analysis for System 1 would continue to be required under the revised design. Furthermore, based on information presented to date, and under the assumption that BSC would apply the same analytical technique(s) used to date, MMA sees no evidence that such an analysis would be successful in demonstrating compliance with certain applicable MSH requirements.

The comments presented herein are preliminary and based on information made available to MMA as of the indicated transmittal date. MMA therefore reserves the right to amend and/or extend this commentary based on expanded review and/or review of new information provided by the Applicant or other interested parties.

Sincerely,

Michael Mobile, Ph.D., CGWP
President, McDonald Morrissey Associates, LLC

MAM/
Z:\1_Projects\Arlington\Thorndike_Place\7_Reports_and_Memos\Comment_on_GZA_2-3-25\FINAL_MMA_Review_Letter_2-3-25.docx

---

[2] Refer to Letter to Mr. David Morgan, Town of Arlington, from Anthony B. Urbano, GZA GeoEnvironmental, Inc. *RE: Peer Review of Stormwater Mound Evaluation and Design Groundwater Elevation, Proposed Thorndike Place Residential Development, Arlington, Massachusetts*. Dated August 1, 2024.

Exhibit J

Additive Mounding Impacts – Numerical Example

- Not to be used by others to support any current or future proposed design. Reliable site-specific modeling would require additional effort (e.g., calibration) and supporting information/data.

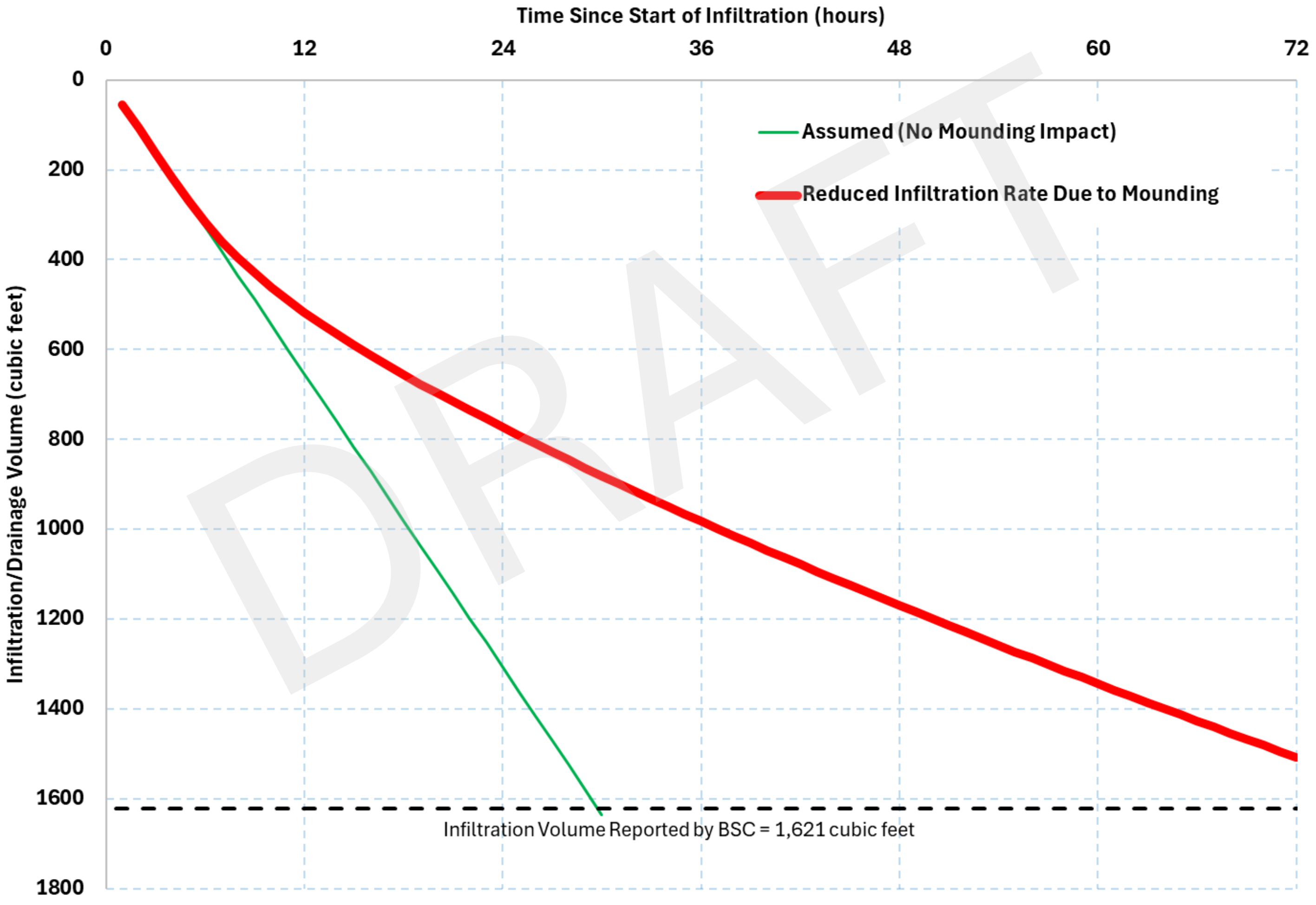
- **Intent: if the mounding analysis were to account for effects from other systems and subsurface barriers, what would it generally show?**

- Relies on nearly identical set of assumptions BSC accepted in using Hantush (e.g., quasi-infinite aquifer extent, aquifer properties, etc.)

- Allows for representation of all simultaneously active infiltration systems (rain garden excluded), local lateral boundaries (foundations) w/ accurate vertical extent, etc.

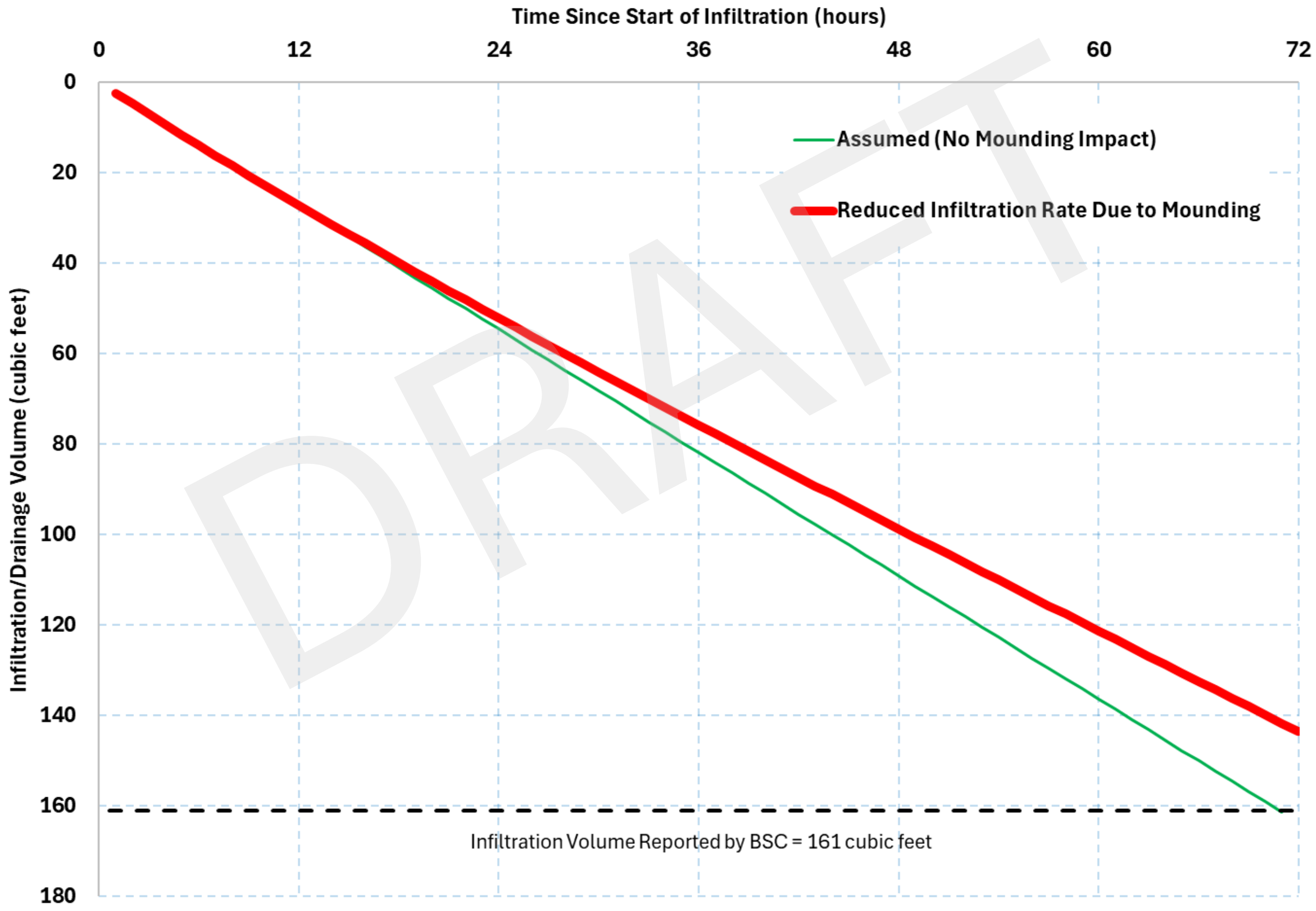
- Can approximate adverse effects of mounding on infiltration rates using head-dependent boundary conditions rather than specified flows at infiltration systems.

Numerical Example – System 7



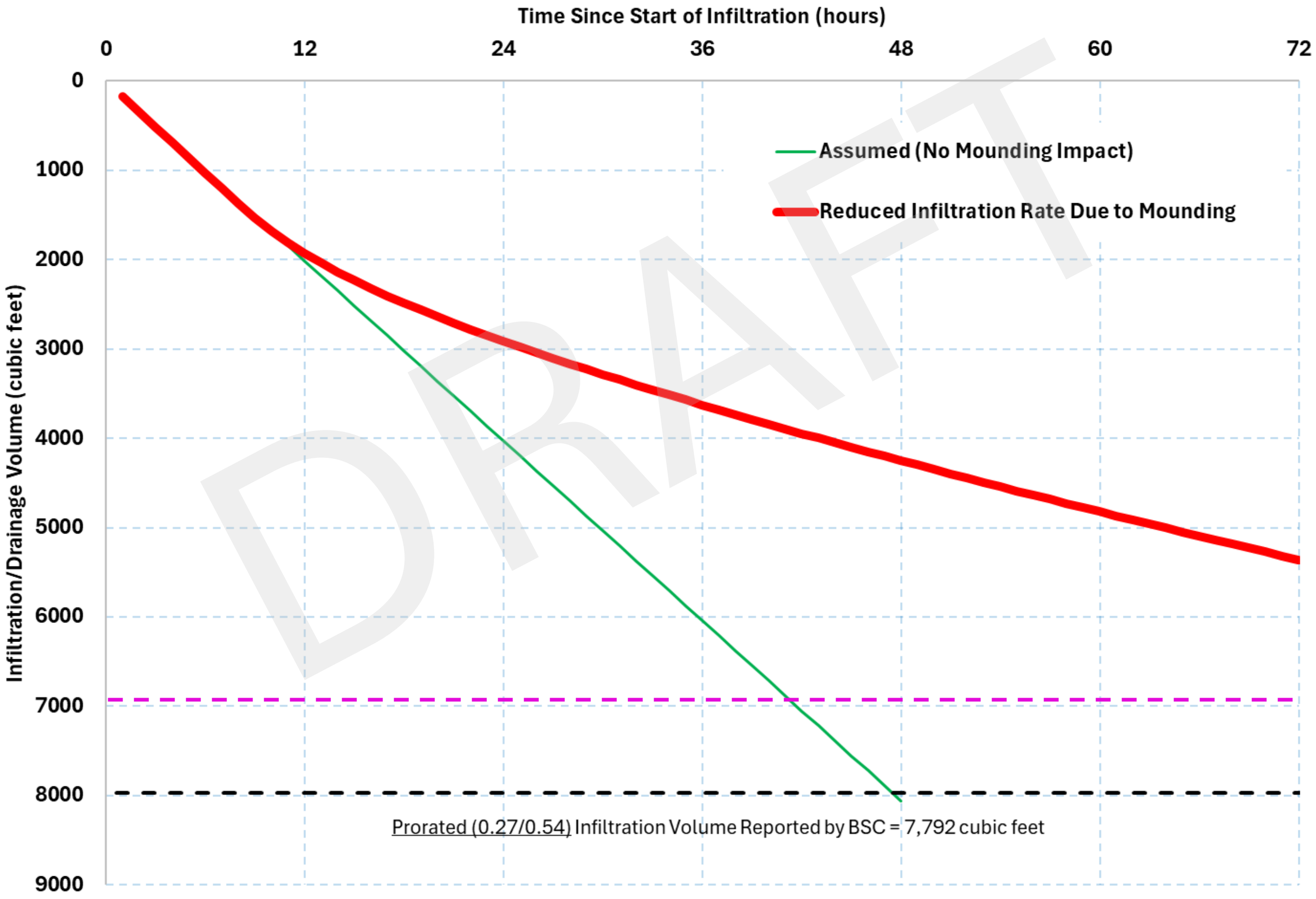
McDonald Morrissey ASSOCIATES, LLC
GROUND WATER HYDROLOGISTS

Numerical Example – System 2 (Townhomes)



McDonald Morrissey ASSOCIATES, LLC
GROUND WATER HYDROLOGISTS

Numerical Example – System 1



2-Year, 24-Hour Storm
Prorated (0.27/0.54) Infiltration Volume Reported by BSC = 6,946 cubic feet

McDonald Morrissey Associates, LLC
GROUND WATER HYDROLOGISTS

From:	Michael Mobile
To:	David Morgan; ConComm; Chuck Tirone; Susan Chapnick
Cc:	Chris Leich; Scott horsley
Subject:	RE: Thorndike Place - Comment Letters on GZA Review
Date:	Wednesday, February 5, 2025 12:39:53 PM
Attachments:	image001.png image002.png MMA_Numerical_Example_Slides_2-6-25.pdf

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Good Afternoon David and Commission Members,

I have attached a supplement to my latest comment letter, dated February 3, 2025. The slides, which I hope to present during tomorrow night's meeting, summarize a numerical modeling (i.e., MODFLOW) example that further supports the points raised in my latest letter and prior letters.

Consistent with industry-standard practice, I am sharing the electronic model files to facilitate reviews of the inputs and results. A directory containing a ZIP archive and a README, which must be reviewed prior to extracting files from the archive, is accessible via the following link: https://tinyurl.com/wnmjhuc5

Please acknowledge this email and the attached materials have been received.

Much appreciated,

Mike

Michael Mobile, Ph.D., CGWP
McDonald Morrissey Associates, LLC
46 S. Main Street, Suite 3, Concord, NH 03301 (**NEW ADDRESS**)
MikeMobile@McDonaldMorrissey.com
Office: 603-228-2280
Mobile: 603-493-5560

McDonald Morrissey ASSOCIATES, LLC
GROUND WATER HYDROLOGISTS

View my LinkedIn Profile

this transmission, including any attachments, without reading or saving in any manner. Thank you.

From: Michael Mobile
Sent: Monday, February 3, 2025 4:10 PM
To: David Morgan <dmorgan@town.arlington.ma.us>; ConComm <ConComm@town.arlington.ma.us>; Chuck Tirone <ctirone@ci.reading.ma.us>; s.chapnick@comcast.net
Cc: Chris Leich <cmleich@comcast.net>; Scott horsley <scotthorsley208@gmail.com>
Subject: Thorndike Place - Comment Letters on GZA Review

Good Afternoon David and Commission Members,

I have attached two comment letters that pertain to the proposed Thorndike Place project. Please acknowledge they have been received.

Thank you,

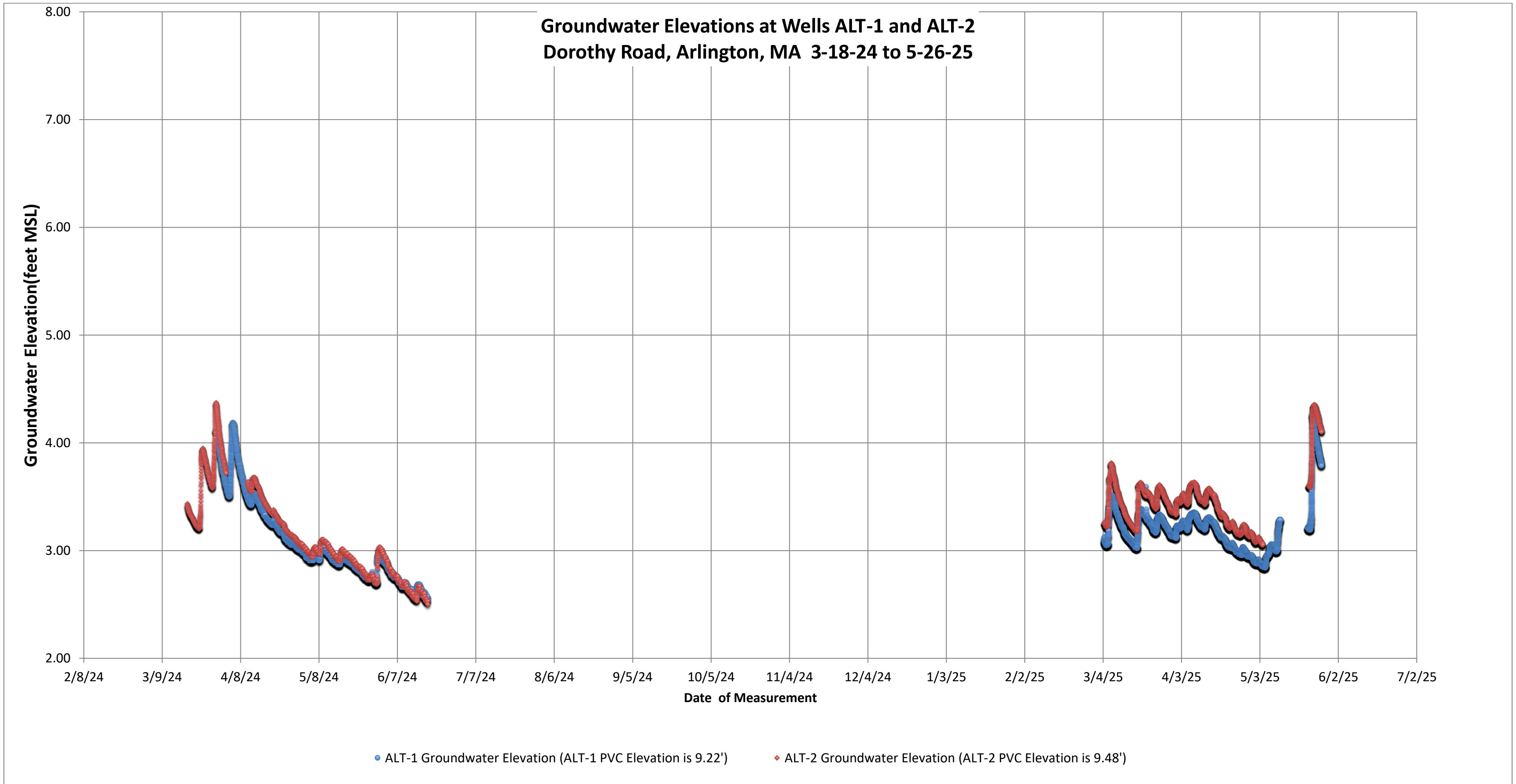
Mike

Michael Mobile, Ph.D., CGWP
McDonald Morrissey Associates, LLC
46 S. Main Street, Suite 3, Concord, NH 03301 (**NEW ADDRESS**)
MikeMobile@McDonaldMorrissey.com
Office: 603-228-2280
Mobile: 603-493-5560

McDonald Morrissey ASSOCIATES, LLC
GROUND WATER HYDROLOGISTS

View my LinkedIn Profile

Exhibit K



Note: data gap due to battery depletion in measurement equipment. No data were recorded during this period.

Town of Arlington, Massachusetts

102-104 Milton Street Certificate of Compliance Request.

Summary:
102-104 Milton Street Certificate of Compliance Request.

ATTACHMENTS:

	Type	File Name	Description
🗋	Reference Material	102-104_Milton_St_COC_Request_Package.pdf	102-104 Milton St COC Request Package.pdf

Gala Simon Associates, Inc.
Civil Engineers
394 Lowell Street, Suite 18
Lexington, MA 02420
www.gsadesign.com
Tel: 781-676-2962

April 14, 2022

Town of Arlington Conservation Commission
730 Massachusetts Avenue, Annex
Arlington, MA 02476

RE: ***102-104 Milton Street, Arlington, MA*** ***DEP File #091-0328***

Dear Members of the Conservation Commission:

Request for a Certificate of Compliance is hereby made, on behalf of Albert Azatyants, for the above referenced project. Reference is made to an As-Built Plan prepared by this office and dated April13, 2022.

The following are exceptions to the record plan dated April 12, 2021 and revised through May 7, 2021:

1. The impervious driveway was removed and built of porous pavers.
2. Only a section of the rear crawl space was built at elevation 4 resulting from an adjustment made during construction of the floor. The flood storage requirements are met for DEP and the Town of Arlington By-Law.
3. Both patios were built at approximately the same elevation. Site grading was adjusted to allow floodwaters to enter the crawl space.

Representation is hereby made, to the best of my knowledge and belief that all conditions, both general and special, except as noted above, and delineated in the Order of Conditions issued May 24, 2021 have been substantially met.

Sincerely,

Alberto M. Gala, P.E.
Civil Engineer

WPA Form 8A – Request for Certificate of Compliance

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

DEP File Number:

091-0328
Provided by DEP

A. Project Information

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

1. This request is being made by:

Albert Azatyants
Name

377 Somerville Avenue
Mailing Address

Somerville	MA	02143
City/Town	State	Zip Code

617-690-9969
Phone Number

2. This request is in reference to work regulated by a final Order of Conditions issued to:

Stephan Bilharz
Applicant

05/24/2121	091-0328
Dated	DEP File Number

Upon completion of the work authorized in an Order of Conditions, the property owner must request a Certificate of Compliance from the issuing authority stating that the work or portion of the work has been satisfactorily completed.

3. The project site is located at:

102-104 Milton Street	Arlington
Street Address	City/Town
4-4	5
Assessors Map/Plat Number	Parcel/Lot Number

4. The final Order of Conditions was recorded at the Registry of Deeds for:

Property Owner (if different)

Middlesex	77926	65
County	Book	Page

Certificate (if registered land)

5. This request is for certification that (check one):

☒ the work regulated by the above-referenced Order of Conditions has been satisfactorily completed.

☐ the following portions of the work regulated by the above-referenced Order of Conditions have been satisfactorily completed (use additional paper if necessary).

☐ the above-referenced Order of Conditions has lapsed and is therefore no longer valid, and the work regulated by it was never started.

A. Project Information (cont.)

6. Did the Order of Conditions for this project, or the portion of the project subject to this request, contain an approval of any plans stamped by a registered professional engineer, architect, landscape architect, or land surveyor?

☒ Yes — If yes, attach a written statement by such a professional certifying substantial compliance with the plans and describing what deviation, if any, exists from the plans approved in the Order.

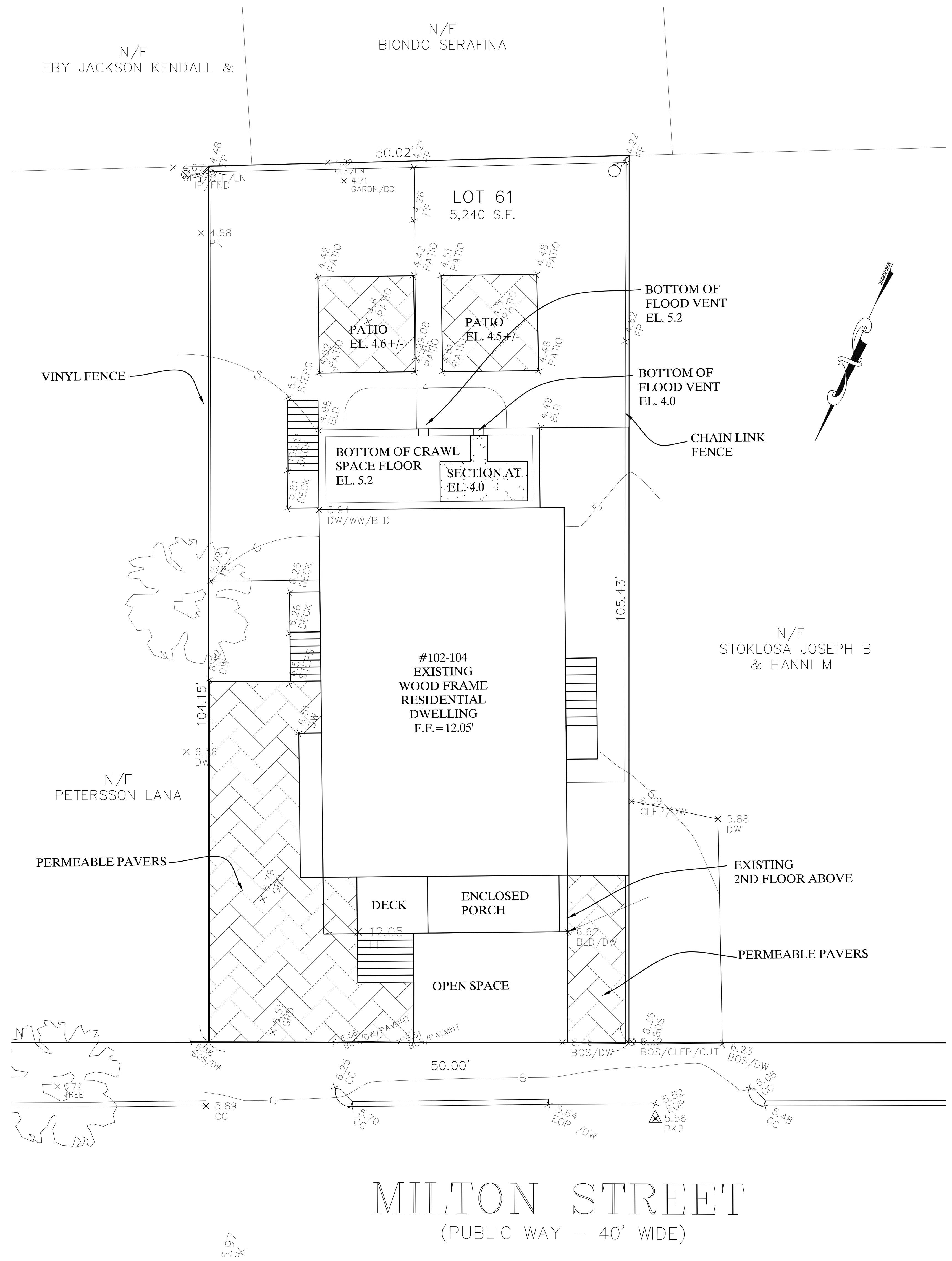
☐ No

B. Submittal Requirements

Requests for Certificates of Compliance should be directed to the issuing authority that issued the final Order of Conditions (OOC). If the project received an OOC from the Conservation Commission, submit this request to that Commission. If the project was issued a Superseding Order of Conditions or was the subject of an Adjudicatory Hearing Final Decision, submit this request to the appropriate DEP Regional Office (see http://www.mass.gov/dep/about/region/findyour.htm).

LEGEND

TP	SOIL TEST PIT
R	RIM
I	INVERT
98	PROP. CONTOUR
+99.7	PROP. SPOT EL.
C.O.	PROP. CLEAN OUT



GRAPHIC SCALE

0 10 20ft

SITE IS FEMA DESIGNATED AE
EL. 7.00 NAVD1988

EXISTING SITE PLAN

SCALE: 1" = 10'

AS BUILT NOTES:

1. AS BUILT COMPILED BY FIELD INFORMATION COLLECTED BY SPRUHAN ENGINEERING AND GALA SIMON ASSOCIATES, INC.
2. ALL ELEVATIONS ARE REFERENCED TO N.A.V.D. 1988 DATUM BASE.
3. INSPECTIONS BY GSA PERFORMED ON 2/14/2022 AND 2/23/2022.
4. FINAL INSPECTION PERFORMED ON 4/11/2022

IMPERVIOUS AREAS TABLE

	EXISTING (SF)	PROPOSED (SF)	AS BUILT (SF)
DWELLING	1,466	1,466*	1,466
DRIVEWAY	1,158	459	–
STORAGE	183	–	–
PORCH	144	–	–
WALKWAY	98	59	–
PATIO	89	–	–
SHED	68	–	–
LANDING/STEPS	64	81	–
ADDITION	–	247	250
TOTAL	3,270	2,222	1716

* ORIGINAL PLAN DID NOT ACCOUNT FOR COVERAGE OVER ENTRANCE. NO INCREASE IN DWELLING IMPERVIOUS FOOTPRINT

Existing Flood Storage

El.	Area (s.f.)	Volume (c.f.)
4.0	18	
		859
5.0	1700	
		1929
6.0	2157	
		2825
7.0	3493	

Proposed Flood Storage

El.	Area (s.f.)	Volume (c.f.)
4.0	480	
		1152
5.0	1825	
		2060
6.0	2296	
		3048
7.0	3799	

As Built Flood Storage

El.	Area (s.f.)	Volume (c.f.)
4.0	138	
		904
5.0	1669	
		1987
6.0	2304	
		3115
7.0	3926	

FLOOD STORAGE CALCULATIONS WITHIN PROPERTY

NOTE: CALCULATIONS FOR FLOOD STORAGE UNDER PROPOSED CONDITIONS WERE PERFORMED INCLUDING THE TOTAL VOLUME ENTERING THE FOUNDATION THROUGH THE VENTS.

Filled Flood Storage

El.	Area (s.f.)	Volume (c.f.)
4.0	0	
		18
5.0	36	
		36
6.0	36	
		36
7.0	36	

Compensatory Flood Storage

El.	Area (s.f.)	Volume (c.f.)
4.0	107	
		113
5.0	119	
		153
6.0	187	
		187
7.0	187	

As Built Compensatory Flood Storage

El.	Area (s.f.)	Volume (c.f.)
4.0	48	
		54
5.0	60	
		147
6.0	235	
		235
7.0	235	

FLOOD FILL/COMP. CALCULATIONS

NOTE: COMPENSATORY VOLUMES CALCULATED IN AREAS NOT PREVIOUSLY CONSIDERED FLOODPLAIN. A 2:1 COMPENSATORY RATIO IS PROVIDED AS REQUIRED BY THE ARLINGTON CONSERVATION COMMISSION.

Gala Simon Associates Inc.
394 LOWELL STREET, SUITE 18
LEXINGTON, MA 02420
Tel: (781) 676-2962
Gala Simon Associates
GSA
Civil Engineers

AS BUILT SITE PLAN

102-104 MILTON STREET
ARLINGTON, MASSACHUSETTS

Job No. 2109	Date: 4/13/2022	
Drawn By: TG	Scale: AS SHOWN	
Rev#	Date:	Description:

C-0

MITIGATION PLANTINGS MEMORANDUM

DATE:	**June 26, 2025**
TO:	**David Morgan, Arlington Conservation Agent**
FROM:	**Richard Kirby, Senior Wetland Scientist**
RE:	**Native Mitigation Plantings** **102-104 Milton Street** **Arlington, Massachusetts**
LEC PROJECT #:	**MSHLLC\21-084.02**
DEP File #:	**091-0328**

LEC has prepared this *Native Mitigation Plantings Memorandum* (*Memorandum*) to document the status of the mitigation plantings and conduct monitoring efforts at 102-104 Milton Street in Arlington. This Memorandum is being submitted in support of a final Request for Certificate of Compliance sought by the property owner, Juffin Francis.

The planting effort was conducted in the Spring of 2022 in accordance with an Order of Conditions issued by the Arlington Conservation Commission on May 24, 2021 (OOC), and the specifications included on the *Proposed Landscape Plan* dated March 8, 2021 prepared by Sasha Pilyavskiy of Design2 (Attachment A). Attachment B contains site photographs from our June 14, 2024 site inspection.

LEC conducted a site inspection on June 14, 2024 (year 3) to inspect the mitigation planting effort and observed that the mitigation plantings were in good health. We observed one dead shrub; however, the remaining plants were observed to be thriving.

Overall, the Mitigation Planting areas are well vegetated and functioning as intended. Should you have any questions or require additional information, please do not hesitate to contact me via email at rkirby@lecenvironmental.com.

Attachment A

Proposed Landscape Design

dated March 8, 2021

prepared by Sasha Pilyavskiy of Design2

Cf - Cornus florida (2) 2-2.5" Cal.

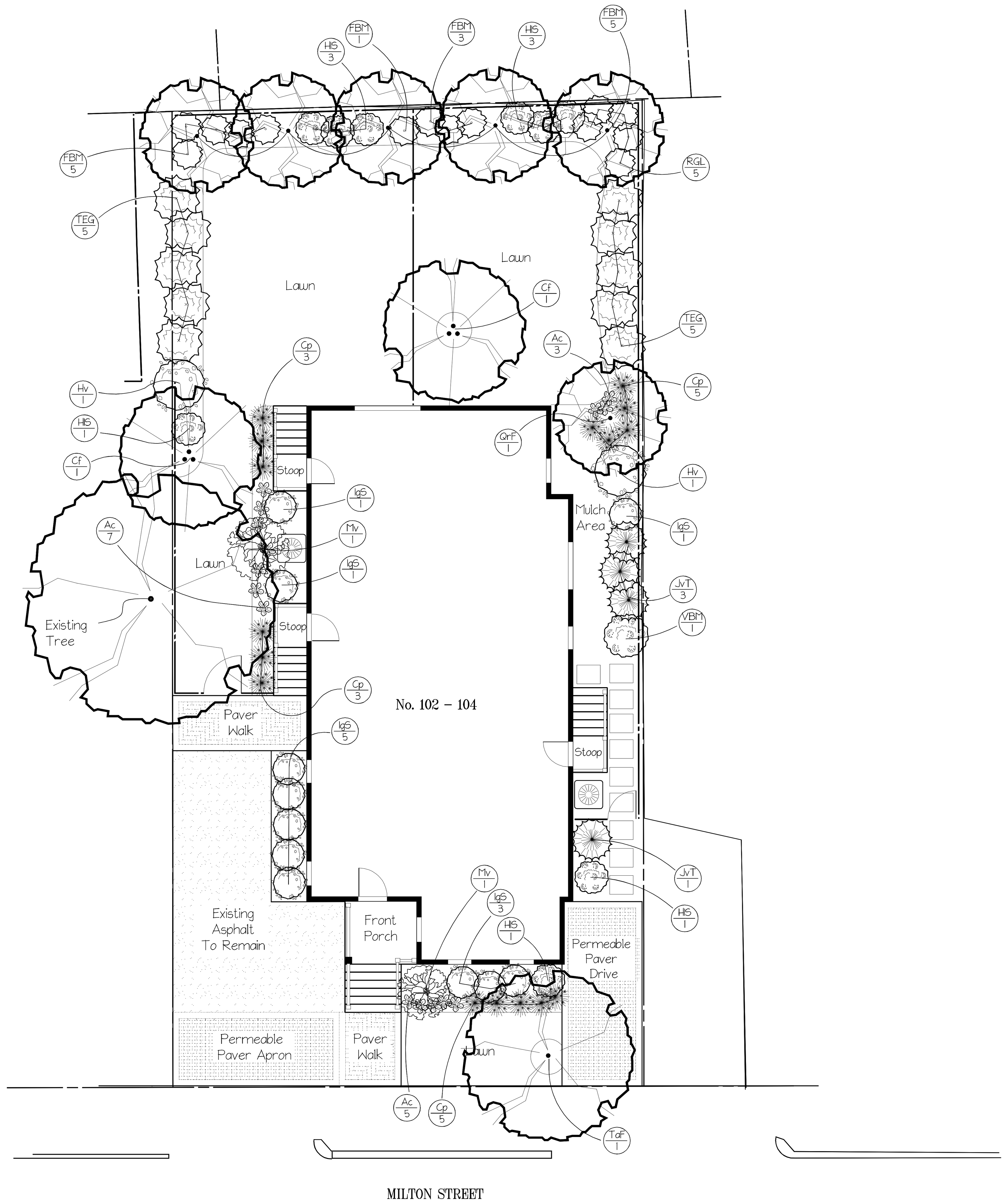
Mv - Magnolia virginiana (2) 7-8'

QrF - Quercus rubra 'Fastigiata' (6) 2.5-3" cal.

TaF - Tilia americana 'Fastigiata' (1) 2.5-3" Cal.

IgS - Ilex glabra 'Shamrock' (11) 5 gal.

JvT - Juniperus virginiana 'Taylor' (4) 7-8'



HIS - Hydrangea 'Invincibelle Spirit' (9)

VBM - Viburnum 'Blue Muffin' 5-6'

FBM - Fothergilla 'Blue Mist' (14) 3 gal.

Hv - Hamamelis virginiana (2) 6-7'

0 5 10 20
SCALE IN FEET

CP - Carex pensylvanica (16) 1 gal.

Ac - Asarum canadence (15) 1 gal.

Thuja o. 'Emerald Green' (10) 7-8'

ZONING LEGEND

ZONING DISTRICT: R2 TWO-FAMILY

	REQUIRED	EXISTING	PROPOSED
MIN. AREA	6,000 S.F	5,240 S.F.± (MEASURED)	5,240 S.F.± (MEASURED)
MIN. FRONTAGE	60'	50.00'	50.00'
MIN. YARD FRONT	–	12.9'	12.9'
SIDE	–	7.3'	8.3'
REAR	20'	35.9'	31.7'
MAX. LOT COV.	35%	34.8%	32.7%
MIN. LANDSCAPED OPEN SPACE	10%	28.1%	23.2%
MIN. USABLE OPEN SPACE	30%	13.7'±	30.4'±
MAX. BLDG. HEIGHT	35'	35.6'±	35.6'±

Prepared By:
Sasha Pilyavskiy MALD
De-sign2
617-913-4395
sashap.design2@gmail.com

For:
Brench Out Residential

NORTH

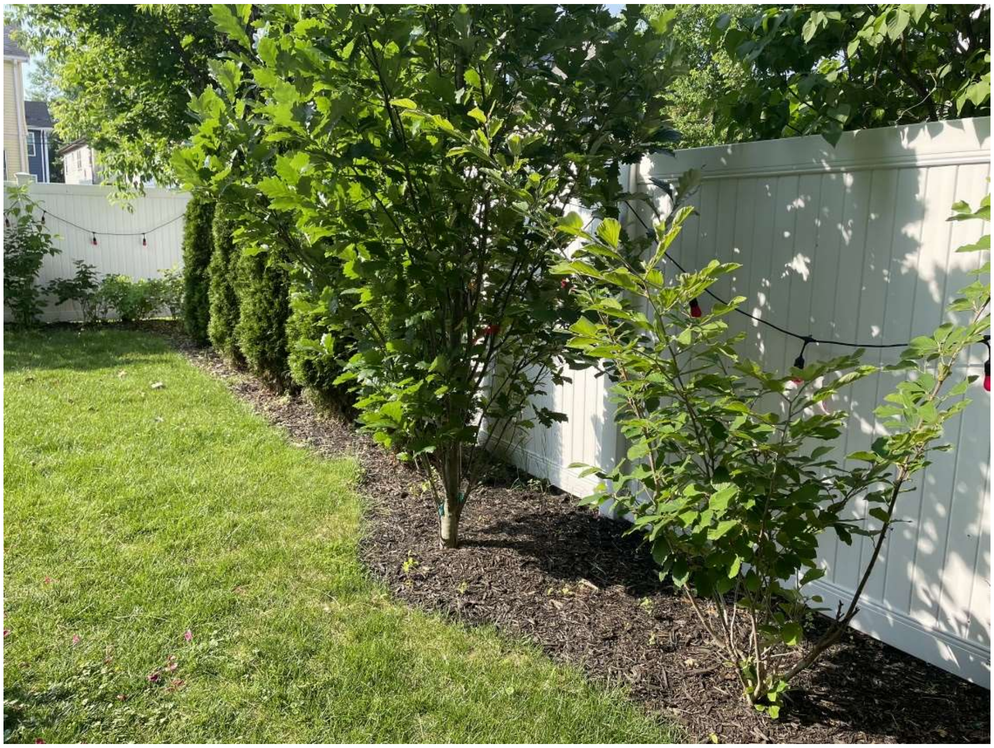
Proposed Landscspe Plan

102–104 Milton Street, Arlington, MA

SCALE 1" = 10'-0"
DATE 03/08/2021
DRAWING # LP - 1.0

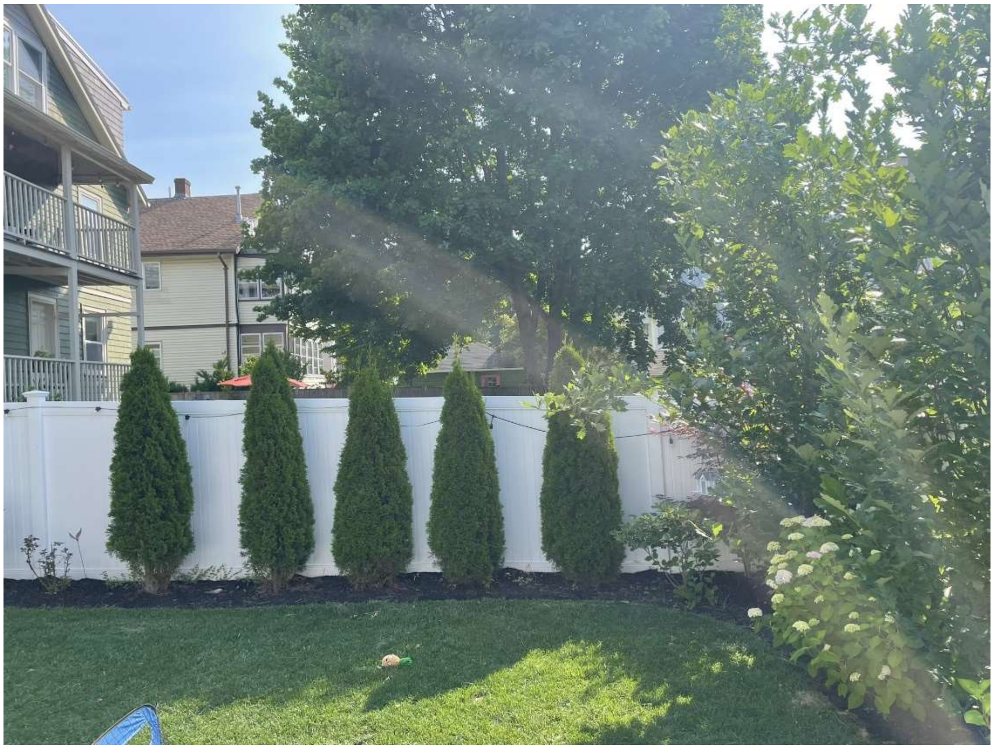
Attachment B

Site Photographs: June 14, 2024

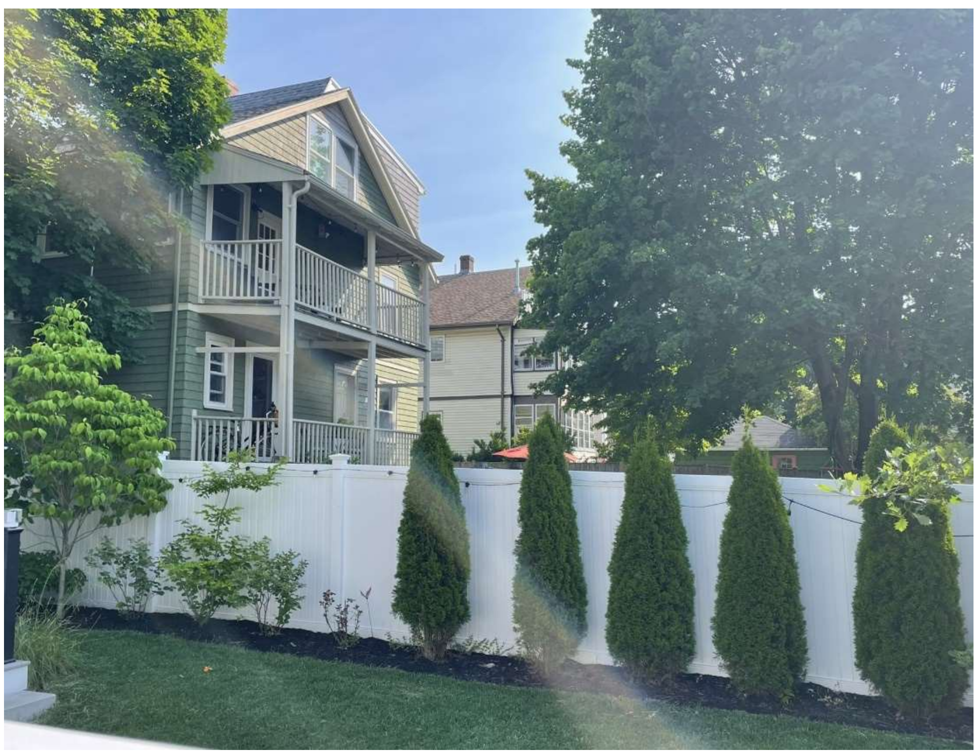


Northerly view of mitigation plantings (eastern unit).

Northeasterly view of mitigation plantings (eastern unit).



Easterly view of mitigation plantings (western unit).



Easterly view of mitigation plantings (western unit).

Town of Arlington, Massachusetts

Symmes Woods Forest Management Plan Outline.

Summary:
Symmes Woods Forest Management Plan Outline.

Town of Arlington, Massachusetts

Enforcement Order: 66-66R Dudley Street/993 Massachusetts Avenue.

Summary:
Enforcement Order: 66-66R Dudley Street/993 Massachusetts Avenue.

Town of Arlington, Massachusetts

CPA Committee Liaison.

Summary:
CPA Committee Liaison.

Town of Arlington, Massachusetts

Notice of Intent: 16-38 Drake Road (Drake Village) (DEP #091-0371) (Continuation).

Summary:
Notice of Intent: 16-38 Drake Road (Drake Village) (DEP #091-0371) (Continuation).
The Arlington Conservation Commission will hold a public hearing to consider a Notice of Intent under the Wetlands Protection Act and Arlington Bylaw for Wetlands Protection for sewer line replacement and repaving of the drive aisle and parking area at the Drake Village Complex at 16-38 Drake Road.

ATTACHMENTS:

	Type	File Name	Description
🗋	Reference Material	Supplmental_Materials_-_Drake_Village.pdf	Supplemental Materials - Drake Village

Wetland WPA – Form 3 – Notice of Intent
Parking Lot Improvement Project – (Supplemental Narrative)
Hauser Building (667-4), 37 Drake Road – (Map 62 - Lot 1-4A), Arlington Housing Authority, Arlington, Massachusetts

Date: July 9, 2025

Project Supplemental Summary:

The Drake Village Complex consists of two elderly/disabled developments and is located on the Arlington/Lexington line in Arlington Heights. Drake Village the oldest AHA senior/disabled development built in 1961, consists of nine (9) two-story eight-unit buildings. The Hauser Building, built in 1975, also located in the complex, is a 144-unit high-rise building. The Hauser Building includes seven (7) specially designed wheelchair accessible units. Both developments abut the Arlington Reservoir and Mill Brook are subject to the Massachusetts Wetland Protection Act 310 CMR 10 and the Arlington Regulations for Wetlands Protection (ARWP) regulations. This supplemental document is to address Section 32 – Climate Change Resilience of the ARWP impacted by this project.

Proposed measures to mitigate climate changes impacts and adapt to changed climate conditions:

Section 32.E. (1) - The NOI proposed works consist of reclaiming and re-paving the parking areas and driveway within its existing footprint; The proposed Parking Lot Improvement Project site plan called out the flood plan elevation at 155' along the Mill Brook at the northeastern portion of the property. Based on the FEMA (federal Emergency Management Agency), FIS (Flood Insurance Study), Volume 6 of 8, date revised July 6, 2016, Number 25017CV006C, Exhibit 1 - Mill Brook 3, Panel 340P, Flood Profiles map. The 0.2% annual chance (500-year) flood elevation at cross section AB was scaled at elevation 155.1 feet. Furthermore, GCG has reviewed the latest FIS 25017CV006D, updated July 08, 2025. Which does not provide any update for the 0.2% annual chance flood elevation. But Table 23, which shows the Floodway Data for Mill Brook 3 at cross section AB with an increase of 0.1 feet during the 1% annual chance flood water surface elevation at 154.6. This project's proposed the lowest elevation within the limit of works is at elevation 156.6 feet, (at the Arlington Reservoir path entrance). Therefore, GCG determined that the work limit is 1.5 feet above the 500-year (0.2% annual chance flood) flood elevation and the proposed work should not have any adverse impacts on the flood area.

Section 32.E. (2) – GCG has prepared a pre-development stormwater surface runoff calculations for this project based on the NOAA 14 Plus Plus, 24-hr duration rainfall precipitation data at the site location, (2-yr = 4.03 in., 10-yr = 6.42 in., 50-yr = 7.19 in., and 100-yr = 11.4 in.) The Hydrology calculations were based on the Natural Resources Conservation Service (NRCS), formerly SCS (Soil Conservation Service), TR-20 (Technical Release 20) hydrologic modeling method and TR-55 (Technical Release 55) calculation procedures with the assistant of HydroCAD hydrology computer software. The computation results the peak flow rates at 7.46 cfs (cubic feet per second), 16.09 cfs, 28.45 cfs, and 35.08 cfs for the four study storm events, respectively. Since the proposed reclaiming is deemed temperately with re-paving within its existing footprint, there should not be any measurable changes of the peak flow rate, duration, volume, and characteristic of the drainage pattern with this pavement replacement project. All disturbed areas during construction will be restored with loam and seed finish. (See attached HydroCAD report). Since there are no changes on the post-development land coverage, a post-development hydrology calculation is not required.

This project will replace approximately 140± l.f. (linear feet) of sewer main and 170± l.f. of drainpipes with the associated concrete structures to eliminate cross contamination due to deterioration of the utility pipes. Which would improve the stormwater outflow substantially.

Section 32.E. (3) – The Arlington Housing Authority developed these two sites in year 1961 and 1975 with minimal setback to the wetland resource area and restrictions with the Massachusetts Wetlands Protection Act, enacted in 1972. Approximately 55% of the property is in the 200-feet Riverfront Area, it is occupied by 9 two-story multi-family dwelling structures, a 7-story high-rise building, and a maintenance garage scattered across the site, with existing utilities (water, sewer and natural gas) service underneath the main drive. The two main parking lots are partially within the 100-foot wetland (BVW) buffer and the 200-foot Riverfront Area with existing grades within three to four feet above the adjacent wetland flags' ground elevation, an indication of the estimated seasonal high groundwater (ESHGW). Therefore, it would be impractical and economically infeasible to retrofit the site to meet the current Wetland Protection regulations and local bylaws, due to the building foundation and utility setback, and separation to the ESHGW.

Section 32.E. (4) – This is a parking lot improvement (repair/maintenance) project for an existing elderly/disabled public housing development. There are eighty-two (82) parking spaces for the 216 dwelling units. A ratio of 2.63 units per parking space. Therefore, reducing additional impervious surface is infeasible.

Section 32.E. (5) – This is an existing high-density elderly public housing development at 50 units per acre site area. Improvement options to address the Climate Change Resilience are limited, there are insufficient building and utility setbacks for surface infiltration BMPs between buildings. The existing parking lots are with shallow separation to the ESHGW (based on the adjacent BVW elevation) and not suitable for subsurface infiltration BMPs. Due to the site limitations, GCG has provided an Operation and Maintenance plan to ensure the drainage system will be maintained and inspected according to schedule.

Section 25 – Vegetationn Removal and Replacement.

This project calls for removal of three Oak trees in front (southeastern side) of the high-rise building along the proposed sewer main and drainpipe replacement. The trees are 16", 19", and 23" diameter, and located in the upland, outside of the 200-foot riverfront area. Three in kind replacement trees have been proposed.

Proposed Additional Improvements.

The Arlington Housing Authority was unable to remove the existing pavement from the northerly corner of the parking lot, where is within the 25' BVW wetland buffer, due to the shortage of the existing parking spaces (See attached letter from Mr. Mitchell, President of the Drake Village Tenant Association, dated July 8, 2025). As mentioned above, Drake Village complex has a parking spaces ratio of 2.63 dwelling units per parking space. Removing the pavement within the 25' wetland buffer will lose 2 parking spaces which is substantial for 216 dwelling units' development.

GCG reviewed the existing drainage system at the northeastern parking lot and proposed adding a water quality treatment unit (Stormceptor STC 450i) in line with the drainpipe prior to the outfall. Which will treat the parking lot's surface runoff to proposed at a minimum pf 50% TSS removal credit and meeting the maximum extent practicable intent for a redevelopment project.

In addition, GCG proposed to remove two bituminous concrete patios from the 50' wetland buffer. One at the back (northern end) of building #31 Drake Road and the patio at the eastern end of #27 Drake Road. Which will reduce the impervious area within the 50' buffer zone.

July 8, 2025

Arlington Conservation Commission
730 Massachusetts Ave. Annex
Arlington, MA 02476

Dear Chair Tirone:

It has been brought to the attention of the Drake Village Tenants Association that the Arlington Conservation Commission would like the Arlington Housing Authority to consider eliminating parking spots as part of the parking lot repavement project that is taking place at this development.

I am deeply concerned about the loss of parking spaces at Drake Village. The AHA has reported that there are currently over 15 residents on the waitlist for parking at Drake Village. Residents have reported being on the waitlist for over two years before being offered a parking space. The loss of additional parking spaces will only increase this wait, which is a burden on the residents that live here. Many residents of Drake Village need a vehicle to get to and from work as well as to access medical and other important appointments. Having a vehicle is a necessity.

I'd like to add that we are in desperate need of a new parking lot. The current condition of the parking lot, walkways and drive pose safety concerns. The repaving project is crucial in addressing these health and safety issues promptly while also improving building accessibility and encouraging residents to move about the property.

The Executive Director, Jack Nagle, has indicated that they will be proposing the removal of other paved surfaces where a clothesline is currently located and one where one was located. I am hopeful that this will sufficiently meet your expectations for this project so that parking spaces are not eliminated.

Thank you for your consideration.

Sincerely,

Stephen Mitchell
President of the Drake Village Tenant Association

PARKING LOT IMPROVEMENT PROJECT

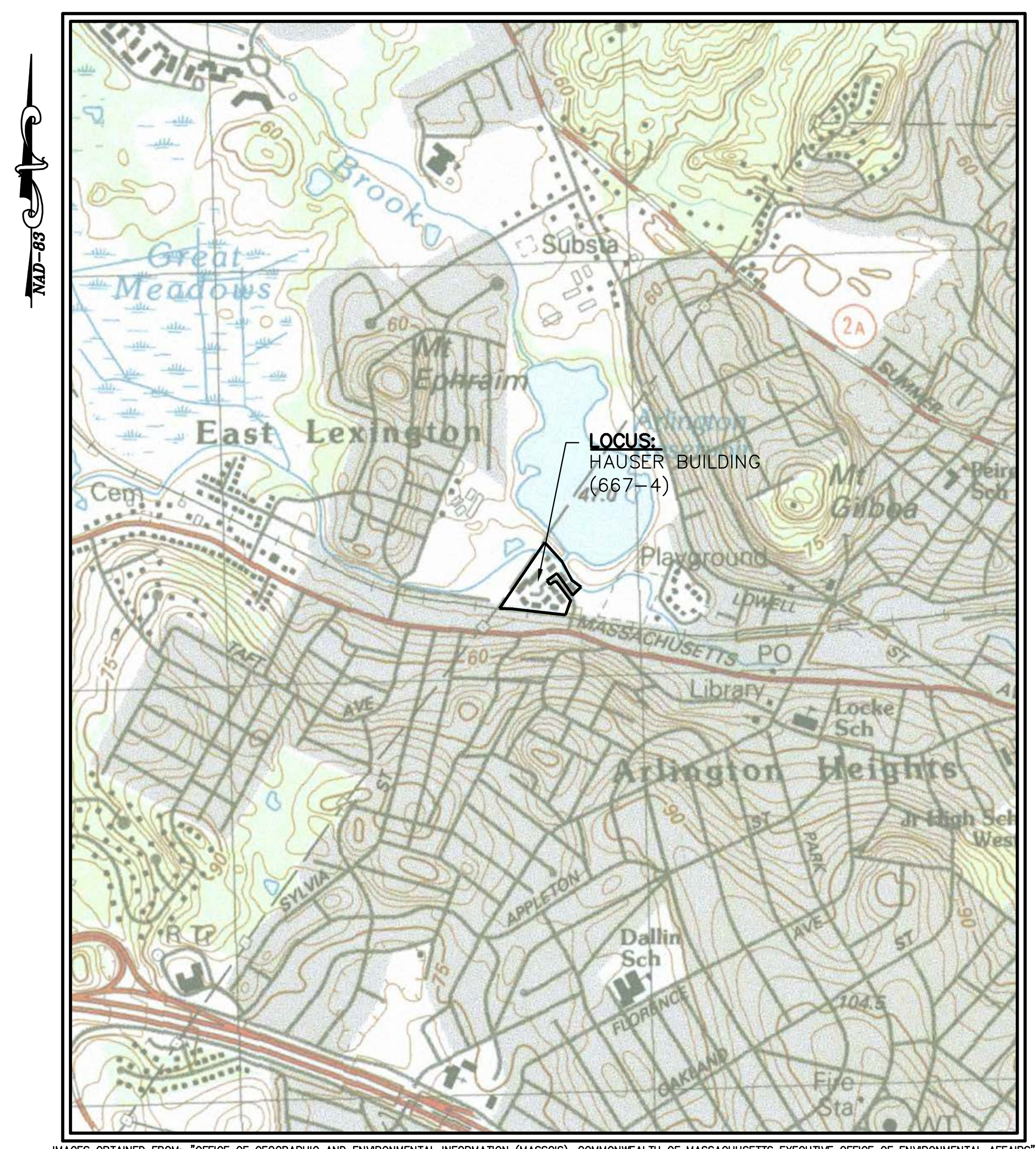
HAUSER BUILDING (667-4)
37 DRAKE ROAD
ARLINGTON HOUSING AUTHORITY
ARLINGTON, MASSACHUSETTS
EOHLC PROJECT #010130

OWNER/APPLICANT:

ARLINGTON HOUSING AUTHORITY
4 WINSLOW STREET
ARLINGTON MA, 02474
PHONE: (781) 646-3400

PROJECT ADDRESS:

HAUSER BUILDING
37 DRAKE ROAD
ARLINGTON, MA ZIP 02476

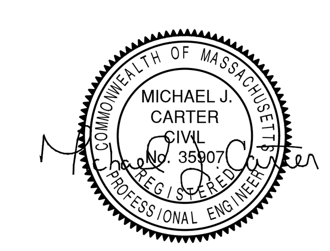


IMAGES OBTAINED FROM: "OFFICE OF GEOGRAPHIC AND ENVIRONMENTAL INFORMATION (MASSGIS), COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS"

LOCUS PLAN
SCALE : 1"=1000'±

INDEX TO DRAWINGS

SHEET NO.	DESCRIPTION
1	COVER SHEET
2	NOTES AND LEGEND
3	PROPOSED UTILITY IMPROVEMENTS
4	PROPOSED SITE IMPROVEMENTS
5	DETAILS I
6	DETAILS II



07/09/2025

NOTICE OF INTENT

GCG ASSOCIATES INC. CONSULTING ENGINEERS WILMINGTON, MASSACHUSETTS

MAY 30, 2025, REVISED JULY 9, 2025

Tab: COVER Plot Style: GCG-2018.ctb Plotted By: Rosey Howe

24108-DESIGN 100.dwg Saved: 7/9/2025 5:03 PM Plotted: Jul 10, 2025 11:57:am

GENERAL NOTES

1. PLANS AND TOPOGRAPHIC INFORMATION ARE PREPARED FROM A GROUND SURVEY PERFORMED BY GCG ASSOCIATES, INC. ON SEPTEMBER 20, 2021.
2. ALL LOCATIONS AND ELEVATIONS SHOWN REFER TO MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD 83/ NAVD 88.
3. EXISTING UTILITIES ARE SHOWN ON THE PLAN FOR INFORMATION PURPOSES ONLY AND THE SIZE, TYPE AND LOCATION OF UTILITIES MAY NOT BE SHOWN AT EXACT LOCATIONS. ALL LOCATIONS OF SUBSURFACE UTILITIES AND STRUCTURES WERE OBTAINED FROM AVAILABLE TOWN AND UTILITY RECORDS. THE CONTRACTOR SHALL PROPERLY LOCATE THE UTILITIES PRIOR TO THE BEGINNING OF CONSTRUCTION. THE CONTRACTOR SHALL OBTAIN UTILITY INFORMATION BY CONTACTING DIGSAFE (811). THE CONTRACTOR SHALL EXCAVATE TEST PITS TO VERIFY UTILITY LINE LOCATIONS AS NECESSARY OR AS DIRECTED BY THE ENGINEER.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR HIRING A PRIVATE MARKING COMPANY TO LOCATE EXISTING UNDERGROUND UTILITIES ON SITE THAT SHALL BE INCLUDED IN THE CONTRACT PRICE.
5. THE CONTRACTOR SHALL PROVIDE THE OWNER WITH A CONSTRUCTION SCHEDULE DELINEATING THE SEQUENCE OF WORK AND ESTIMATED TIME OF COMPLETION OF EACH SEGMENT OF WORK PRIOR TO COMMENCEMENT OF WORK.
6. THE CONTRACTOR SHALL MAINTAIN CONTINUOUS TRAFFIC FLOW DURING CONSTRUCTION SATISFACTORY TO THE ENGINEER. NO EQUIPMENT SHALL BE ALLOWED TO BE PARKED ON THE ROAD WHEN NOT IN USE. MATERIALS SHALL NOT BE STOCKPILED ON THE ROAD UNLESS APPROVED BY THE ARLINGTON HOUSING AUTHORITY.
7. ALL CONSTRUCTION SIGNAGE SHALL CONFORM TO THE REQUIREMENTS OF THE STATE OF MASSACHUSETTS DEPARTMENT OF TRANSPORTATION AND THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD).
8. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES AND PROCEDURES, AND FOR SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH ALL WORK INCLUDED UNDER THIS CONTRACT. THE DRAWINGS DO NOT INCLUDE NECESSARY COMPONENTS FOR CONSTRUCTION SAFETY. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR PROVIDING AND MAINTAINING ALL SAFETY BARRIERS AND WARNING FLASHERS, AS REQUIRED BY THE CONDUCT OF THE WORK FOR THE PROTECTION OF WORKERS AND NON-WORKERS ALIKE. THE CONTRACTOR'S ATTENTION IS DIRECTED TO OSHA REQUIREMENTS.
9. DAMAGE TO ANY UTILITY WILL BE REPAIRED BY THE CONTRACTOR, AT THE CONTRACTOR'S EXPENSE, IN A TIMELY MANNER SO THAT DISRUPTION OF SERVICE TO ANY UTILITY WILL NOT BE LONGER THAN PRACTICALLY NECESSARY TO REPAIR THE DAMAGE.
10. THE CONTRACTOR SHALL OBTAIN SEWER, WATER, DRAIN, TRENCH, ELECTRICAL, AND ANY OTHER PERMITS FROM THE TOWN. THE ARLINGTON HOUSING AUTHORITY (WHA) WILL REIMBURSE THE CONTRACTOR FOR THE COST OF THE PERMITS.
11. WATER MAINS ARE ASSUMED TO BE 5 FEET BELOW THE EXISTING GROUND SURFACE. GAS LINES ARE ASSUMED TO BE 3 FEET BELOW THE EXISTING GROUND SURFACE. TELEPHONE LINES AND TRAFFIC SIGNAL CONTROLS ARE ASSUMED TO BE 2 FEET BELOW THE EXISTING GROUND SURFACE.
12. ALL EXISTING CATCH BASINS, DRAIN MANHOLES, ETC. SHALL REMAIN PROTECTED AND IN PLACE DURING CONSTRUCTION, UNLESS NOTED DIFFERENTLY ON THE PLAN. THE CONTRACTOR SHALL NOT DAMAGE EXISTING STRUCTURES OR COVERS/HATCH DURING THE CONSTRUCTION OPERATION.
13. CONTRACTOR SHALL BE RESPONSIBLE FOR PREVENTING ANY DEBRIS, SEDIMENT OR SILTY WATER FROM ENTERING ANY DRAINAGE SYSTEM, ETC. DURING ALL PHASES OF CONSTRUCTION.
14. DURING CONSTRUCTION THE CONTRACTOR SHALL PROTECT ALL TREES AND ROOTS OF TREES TO REMAIN.
15. THE CONTRACTOR SHALL MAINTAIN ACCESS TO ALL RESIDENCES FOR DURATION OF PROJECT.
16. SIDEWALKS, WALKWAYS AND DRIVEWAYS THAT ARE DAMAGED OR REMOVED DURING CONSTRUCTION SHALL BE REPLACED WITH THE SAME TYPE OF MATERIAL ONCE WORK IS COMPLETED.
17. ANY POLICE DETAILS REQUIRED SHALL BE INCLUDED IN THE LUMP SUM PRICE AT NO ADDITIONAL COST TO THE OWNER.
18. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SITE RESTORATION AND CLEAN UP UPON COMPLETION OF THE PROJECT. ALL DISTURBED AREAS ARE TO BE RESTORED WITH LOAM (6" MINIMUM) AND SEED, AND INCLUDED IN THE CONTRACT PRICE.

CATCH BASIN CLEANING NOTES

1. ALL ACCUMULATED SEDIMENT, DEBRIS, ORGANIC MATTER, ETC. SHOULD BE REMOVED FROM CATCH BASINS AND DRAINAGE SYSTEMS AS NOTED ON THE PLANS.
2. ALL SEDIMENT AND DEBRIS REMOVED FROM THE CATCH BASIN OR PIPE LINE SHALL BE PROPERLY HANDLED AND DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL GUIDELINES AND REGULATIONS.
3. ANY REQUIRED MAINTENANCE OR REPAIRS NOTED DURING THE CLEANING AND INSPECTION SHOULD BE ADDRESSED IMMEDIATELY. DRAINAGE INLET FRAMES AND GRATES SHALL BE REPLACED IN KIND AS NOTED ON THE PLANS.
4. ALL CATCH BASINS SHALL BE CLEANED UPON COMPLETION OF WORK.

FINE GRADING AND COMPACTING

1. THE CONTRACTOR SHALL FINE GRADE AND COMPACT ALL AREAS IN PREPARATION FOR PAVEMENT, INCLUDING, BUT NOT LIMITED TO THE DRIVEWAY AREAS AND TRANSITION DRIVEWAY AREAS. THE CONTRACTOR SHALL ALSO STRAIGHT CUT ALL EXISTING JOINTS AND EDGES IN PREPARATION FOR FINAL PAVEMENT.
2. PAYMENT FOR FINE GRADING AND COMPACTING THE RECONSTRUCTED BITUMINOUS DRIVEWAY AND PARKING AREAS SHALL BE INCLUDED IN THE CONTRACT PRICE.

PARKING AREA NOTES

1. THE CONTRACTOR SHALL REMOVE THE ENTIRE WIDTH OF EXISTING PAVEMENT AND LANDSCAPED AREA AS SHOWN. THE LIMITS ARE SHOWN IN THE PLAN VIEW OF THESE CONSTRUCTION DRAWINGS.
2. AFTER REMOVING THE PARKING AREA ASPHALT PAVEMENT AND UNDERLYING MATERIALS, THE CONTRACTOR SHALL THEN EXCAVATE AND REMOVE THE NECESSARY SUBGRADE MATERIAL IN ORDER TO MEET THE FINAL GRADES OF THE PARKING AREA. THE CONTRACTOR SHALL THEN PLACE, GRADE AND COMPACT THE NEW GRAVEL BASE COURSE TO A 12" DEPTH AS SHOWN ON THE TYPICAL DRIVEWAY AND PARKING AREA DETAIL. THE SUBBASE SHALL THEN BE FINE GRADED AND COMPACTED TO ALLOW FOR THE PLACEMENT OF A 2" BINDER COURSE AND 1 1/2" SURFACE COURSE.
3. THE CONTRACTOR SHALL GRADE THE PROCESSED GRAVEL BORROW MATERIAL TO ALLOW THE FINAL PAVEMENT SURFACE TO MATCH THE EXISTING EDGE OF PAVEMENT GRADES UNLESS OTHERWISE NOTED. ANY GRADING MODIFICATIONS SHALL DIRECT DRAINAGE TOWARDS THE APPROPRIATE AREAS.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COMPACTION TESTING. TESTING SHALL BE PERFORMED AT INTERVALS OF 100 FEET ALONG PARKING AREAS.
5. PRIOR TO COMPLETING FINAL GRADING OF THE GRAVEL THE ENGINEER SHALL REVIEW GRADES TO DETERMINE THAT SUFFICIENT CROSS SLOPES AND POSITIVE DRAINAGE FLOWS HAVE BEEN MAINTAINED. IF GRADES NEED TO BE ADJUSTED, THE CONTRACTOR SHALL REGRADE AS DIRECTED.
6. CROSS SLOPES AT CATCH BASIN SHALL BE ADJUSTED AS NECESSARY TO ASSURE PROPER DRAINAGE.
7. CONTRACTOR SHALL CONTROL DUST DURING CONSTRUCTION USING CALCIUM CHLORIDE.
8. DRAIN STRUCTURES SHALL BE ADJUSTED OR REMODELED AS REQUIRED TO MEET GRADE.
9. ALL PROPOSED CUTS AND FILLS REQUIRED TO GRADE THE SUBSURFACE MATERIAL OR GRAVEL BORROW TO A 12" DEPTH SHALL BE INCLUDED FOR PAYMENT UNDER THE CONTRACT PRICE.
10. THE CONTRACTOR SHALL FINE GRADE THE EXISTING GRAVEL BASE COURSE MATERIAL NO MORE THAN 24 HOURS PRIOR TO THE PLACEMENT OF THE 2" BASE COURSE PAVEMENT. ALL GRADING, COMPACTION AND DUST CONTROL ASSOCIATED WITH THE GRAVEL BASE COURSE SHALL BE INCLUDED IN THE CONTRACT PRICE.
11. THE COSTS ASSOCIATED WITH THE EXCAVATION, PLACEMENT AND DISPOSAL OF SURPLUS SUBBASE MATERIAL SHALL BE INCLUDED IN THE CONTRACT PRICE.

GENERAL PAVING NOTES

1. THE CONTRACTOR SHALL SAW CUT ALL JOINTS IN THE EXISTING PAVEMENT AREAS WHERE THE PROPOSED PAVEMENT WILL MEET EXISTING PAVEMENT TO REMAIN. ALL JOINTS SHALL PROVIDE A SMOOTH TRANSITION BETWEEN NEW AND OLD PAVEMENTS. IMMEDIATELY AFTER BITUMINOUS CONCRETE PAVING, ALL NEW JOINTS SHALL BE SANDED AND SEALED. THE COST FOR THIS WORK SHALL BE INCLUDED IN THE CONTRACT PRICE.
2. THE CONTRACTOR SHALL RESET ALL WATER, SEWER, GAS, ELECTRIC, TELEPHONE AND DRAINAGE FRAMES AND GRATES AND ANY OTHER STRUCTURES, SIGNS, ETC. NECESSARY TO INSTALL THE PROPOSED PAVEMENT TO THE PROPOSED FINISH GRADE ELEVATION. THIS WORK SHALL BE INCLUDED IN THE CONTRACT PRICE.
3. ALL WORK REQUIRED TO LOWER, RAISE, AND EXTEND THE EXISTING CASTINGS AND VALVE BOXES TO THE PROPOSED FINISH GRADE SHALL BE INCLUDED IN THE CONTRACT PRICE.
4. THE CONTRACTOR SHALL BE PAID FOR WORK REQUIRED TO SUPPORT OR REMOVE AND REPLACE EXISTING STRUCTURES AND UTILITY LINES ADJACENT TO OR WITHIN THE LIMITS OF WORK UNDER THE CONTRACT PRICE.
5. ALL CASTINGS, GATE BOXES, ETC. DAMAGED DURING RECONSTRUCTION SHALL BE SUPPLIED AND REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE CONTRACT. THE CONTRACTOR SHALL INCLUDE THE COST IN THE CONTRACT PRICE.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARY RELOCATION OF TRASH BARRELS AS NECESSARY TO COMPLETE THE PROPOSED WORK.
7. THE CONTRACTOR SHALL MAINTAIN CONTINUOUS TRAFFIC FLOW DURING CONSTRUCTION AND SHALL MAINTAIN ACCESS TO ALL RESIDENTIAL DRIVEWAYS AND ACCESS WAYS SATISFACTORY TO THE ENGINEER, THE TOWN OF ARLINGTON, AND THE ARLINGTON HOUSING AUTHORITY. NO EQUIPMENT SHALL BE ALLOWED TO BE PARKED ON THE DRIVEWAY WHEN NOT IN USE. MATERIALS SHALL NOT BE STOCKPILED ON THE DRIVEWAY.
8. ALL NEW PAVEMENT PARKING STRIPING SHALL BE 4" WIDE PAINTED LINES TO MATCH EXISTING COLOR ON SITE.
9. THE CONTRACTOR SHALL APPLY CALCIUM CHLORIDE FOR DUST CONTROL.

TREE REMOVAL AND TRIMMING NOTES

1. THE CONTRACTOR SHALL REMOVE TREES AND STUMPS AS IDENTIFIED ON PLANS AND SHALL NOT REMOVE ANY TREES UNTIL APPROVED BY THE ENGINEER.
2. ROOTS ON TREES WHICH ARE IMPACTING THE SAFETY OF THE SITE OR AFFECTING WALKWAYS SHALL BE REMOVED BY THE CONTRACTOR. WHEN THE ARBORIST DETERMINES THAT THE NUMBER OF ROOTS REMOVED MAY IMPACT THE LIFE OF THE TREE, THE TREE AND STUMP SHALL BE REMOVED.
3. THE CONTRACTOR SHALL REMOVE OVERGROWN VEGETATION ALONG WALKWAYS AND FENCES AS NEEDED. SEE SPECIFICATION SECTION 31.11.00. THIS WORK SHALL BE INCLUDED IN THE CONTRACT PRICE.
4. CLEARING AND GRUBBING WITHIN AREAS IDENTIFIED SHALL INCLUDE TRIMMING OF TREES SO THAT LIMBS SHALL NOT EXTEND OVER ANY BUILDING ROOF AND WITHIN 10 FEET OF ANY UTILITY WIRE. TREE LIMBS SHALL ALSO BE TRIMMED WHEN EXTENDING BELOW A HEIGHT OF 10 FEET FROM GROUND LEVEL.
5. ALL DISTURBED AREAS SHALL BE LOAMED AND SEEDED.

ABBREVIATIONS

APPROX	APPROXIMATE
BB	BITUMINOUS BERM CURB
BC	BOTTOM OF CURB
BLDG	BUILDING
BIT	BITUMINOUS CONCRETE
CB	CATCH BASIN
CC	CONCRETE CURB
CCB	CAPE COD BERM
CIP	CAST-IN-PLACE
CLF	CHAIN LINK FENCE
CONC	CONCRETE
D	DRAIN
DI	DUCTILE IRON
DRV	DRIVEWAY
DMH	DRAIN MANHOLE
E	ELECTRIC
EMH	ELECTRIC MANHOLE
EOC	EDGE OF CONCRETE
EOP	EDGE OF PAVEMENT
EX	EXISTING
HCR	HANDICAPPED RAMP
HYD	HYDRANT
INV	INVERT
LF	LINEAR FEET
LP	LIGHT POLE
MH	MANHOLE
N/F	NOW OR FORMERLY
NO	NUMBER
PROP	PROPOSED
R	RIM
SMH	SEWER MANHOLE
SPEC	SPECIFICATION
SW	SIDEWALK
TC	TOP OF CURB
TH	THRESHOLD
TYP	TYPICAL
UP	UTILITY POLE
VGC	VERTICAL GRANITE CURB

EXISTING LEGEND

- EXIST. MAG NAIL BENCHMARK
- EXIST. CATCH BASIN
- EXIST. ROUND CATCH BASIN
- EXIST. DRAIN MANHOLE
- EXIST. SEWER MANHOLE
- EXIST. MANHOLE
- EXIST. ELECTRIC MANHOLE
- EXIST. PULL BOX
- EXIST. HYDRANT
- EXIST. WATER GATE VALVE
- EXIST. GAS GATE VALVE
- EXIST. BOLLARD
- EXIST. LIGHT POST
- EXIST. SIGN
- EXIST. FLAG POLE
- EXIST. SITE BENCH
- EXIST. BLDG. (APPROX.)
- D — EXIST. DRAIN LINE
- S — EXIST. SEWER LINE
- W — EXIST. WATER LINE
- E — EXIST. ELECTRIC LINE
- G — EXIST. GAS LINE
- T — EXIST. TELEPHONE LINE
- P — EXIST. PLUMBING
- EXIST. CURB
- EXIST. CHAIN LINK FENCE
- EXIST. VINYL FENCE
- EXIST. WALL
- 140 — EXIST. 5' CONTOURS
- 138 — EXIST. 1' CONTOURS
- ×41.29 EXIST. SPOT GRADE
- 36" EXIST. TREE W/ DIAMETER
- EXIST. TREE/VEGETATION LINE
- APPROX. ABUTTER LOT LINE

NOTICE OF INTENT
EOHLC #010130

NOTES AND LEGEND

PARKING LOT IMPROVEMENT PROJECT
HAUSER BUILDING (667-4)
ARLINGTON HOUSING AUTHORITY

GCG ASSOCIATES, INC.
WILMINGTON MASSACHUSETTS

COMMONWEALTH OF MASSACHUSETTS MICHAEL J. CARTER CIVIL No. 35907 REGISTERED PROFESSIONAL ENGINEER

07/09/2025

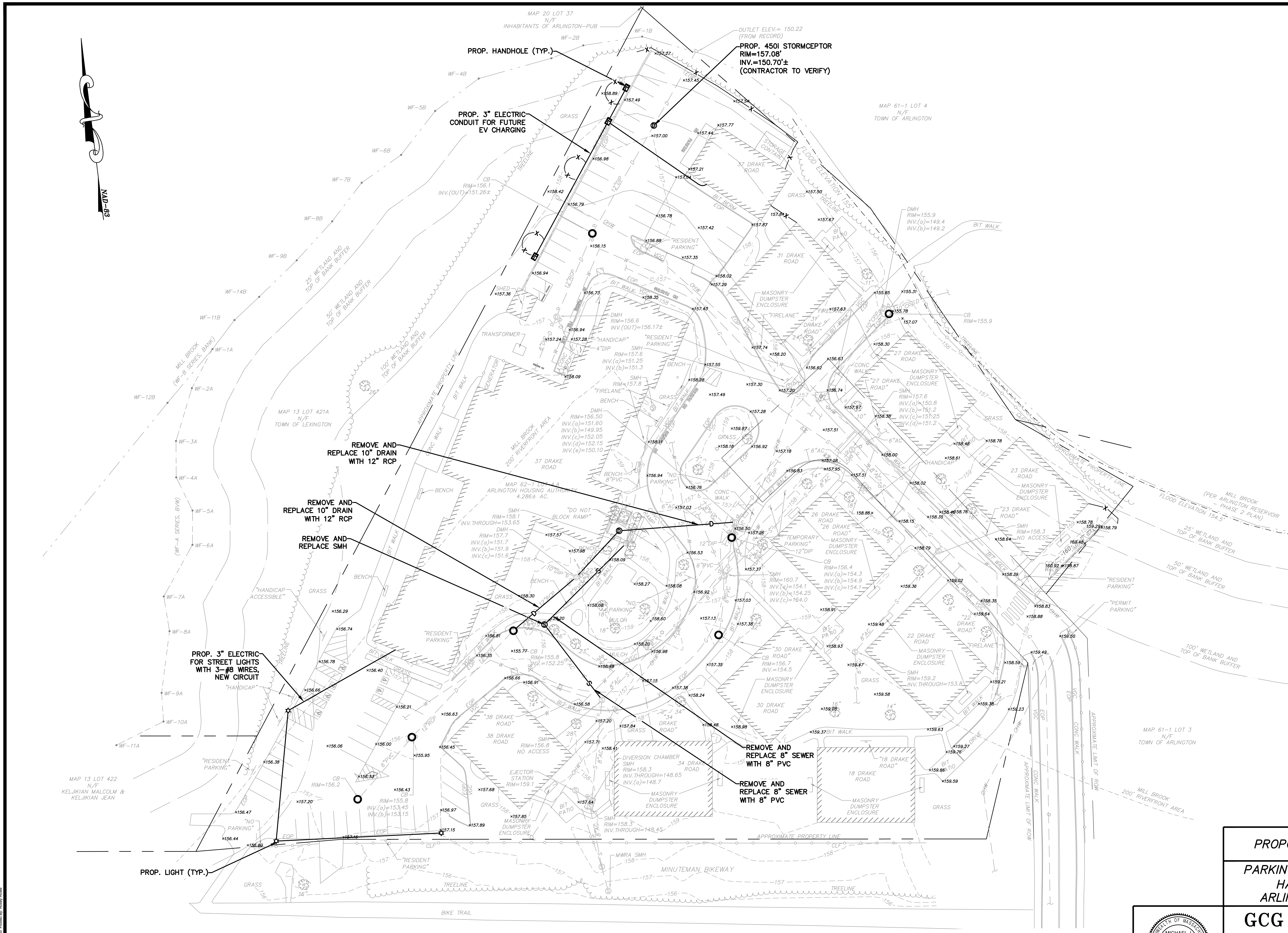
NO.	DATE	DESCRIPTION	BY
1	7/9/2025	CONSERVATION COMMENTS REVISION	RTH

SCALE: 1" = 30' DATE: MAY 30, 2025

JOB NO.\FILE NAME:	DESIGNED BY: R.T.H.	PLAN NO.
24108-DESIGN 100	DRAWN BY: S.R.D. CHECKED BY: M.J.C.	2 OF 6

24108-DESIGN 100.dwg Saved: 7/9/2025 5:03 PM Plotted: Jul 10, 2025 11:57:am

Tab: NOTES AND LEGEND Plot Style: GCG-2018.ctb Plotted By: Rosey Howe



GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

PLAN
SCALE: 1" = 30'

NOTICE OF INTENT
EOHLC #010130

PROPOSED UTILITY IMPROVEMENTS

PARKING LOT IMPROVEMENT PROJECT
HAUSER BUILDING (667-4)
ARLINGTON HOUSING AUTHORITY

GCG ASSOCIATES, INC.
WILMINGTON MASSACHUSETTS

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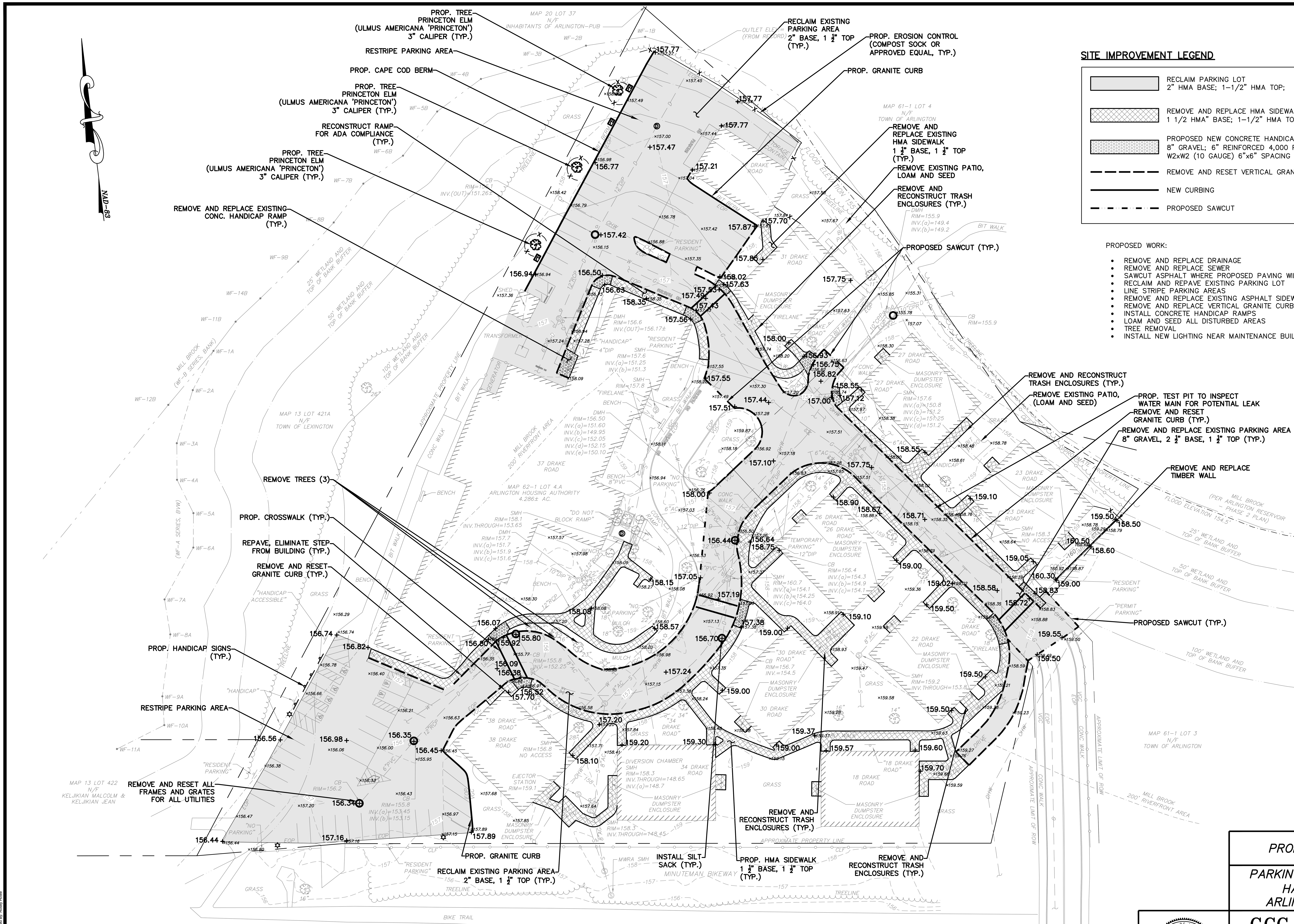
1	7/9/2025	CONSERVATION COMMENTS REVISION	RTH

COMMONWEALTH OF MASSACHUSETTS
MICHAEL J. CARTER
CIVIL
No. 35907
REGISTERED PROFESSIONAL ENGINEER
07/09/2025

SCALE: 1" = 30'	DATE: MAY 30, 2025	
JOB NO.\FILE NAME: 24108-DESIGN 100	DESIGNED BY: R.T.H. DRAWN BY: S.R.D. CHECKED BY: M.J.C.	PLAN NO. 3 OF 6



DRAKE ROAD

SITE IMPROVEMENT LEGEND

(shaded)	RECLAIM PARKING LOT 2" HMA BASE; 1-1/2" HMA TOP;
(cross-hatched)	REMOVE AND REPLACE HMA SIDEWALK (6 FEET WIDE) 1 1/2 HMA" BASE; 1-1/2" HMA TOP; 8" GRAVEL
(stippled)	PROPOSED NEW CONCRETE HANDICAP RAMP (5 FEET WIDE) 8" GRAVEL; 6" REINFORCED 4,000 PSI CONCRETE W/ WWF W2xW2 (10 GAUGE) 6"x6" SPACING
(heavy dashed line)	REMOVE AND RESET VERTICAL GRANITE CURB
(solid line)	NEW CURBING
(dash-dot line)	PROPOSED SAWCUT

PROPOSED WORK:

- REMOVE AND REPLACE DRAINAGE
- REMOVE AND REPLACE SEWER
- SAWCUT ASPHALT WHERE PROPOSED PAVING WILL MEET EXISTING
- RECLAIM AND REPAVE EXISTING PARKING LOT
- LINE STRIPE PARKING AREAS
- REMOVE AND REPLACE EXISTING ASPHALT SIDEWALKS
- REMOVE AND REPLACE VERTICAL GRANITE CURBING
- INSTALL CONCRETE HANDICAP RAMPS
- LOAM AND SEED ALL DISTURBED AREAS
- TREE REMOVAL
- INSTALL NEW LIGHTING NEAR MAINTENANCE BUILDING AND PARKING LOT

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

PLAN
SCALE: 1" = 30'

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1	7/9/2025	CONSERVATION COMMENTS REVISION	RTH

COMMONWEALTH OF MASSACHUSETTS — MICHAEL J. CARTER — CIVIL — No. 35907 — REGISTERED PROFESSIONAL ENGINEER
07/09/2025

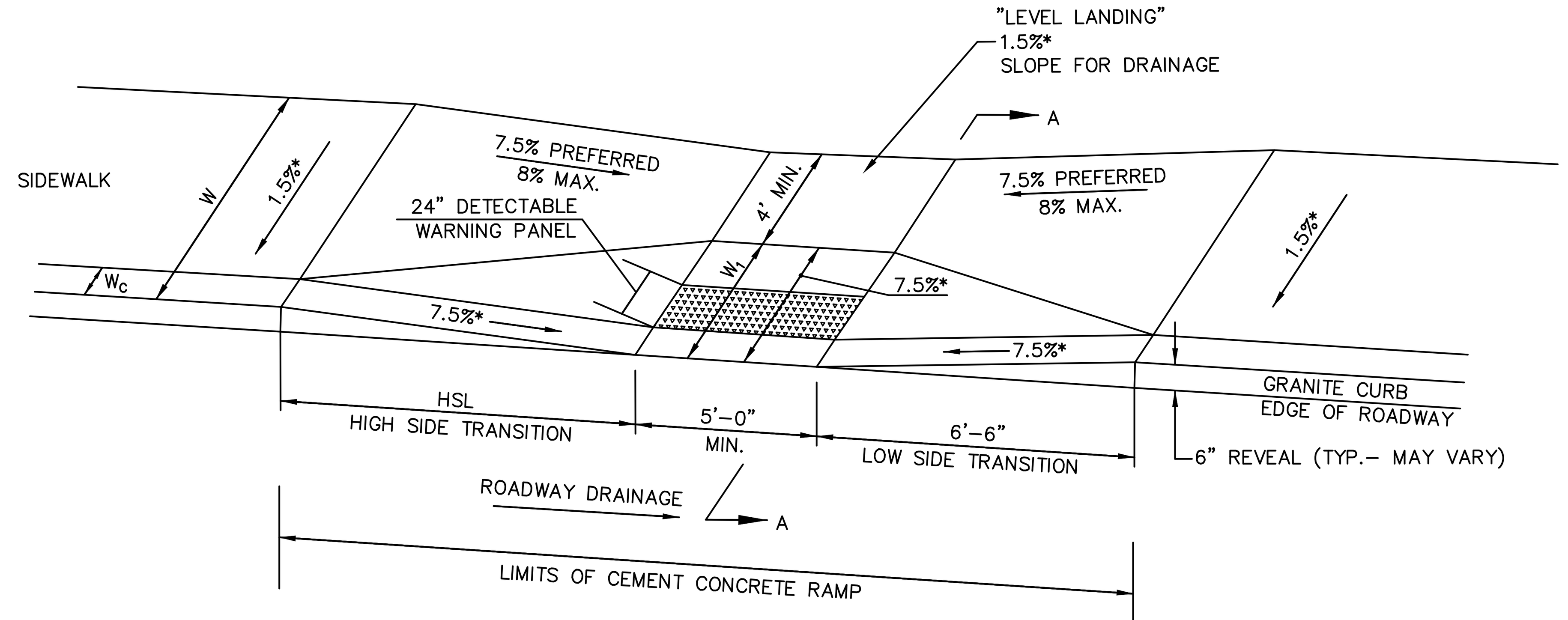
NOTICE OF INTENT
EOHLC #010130

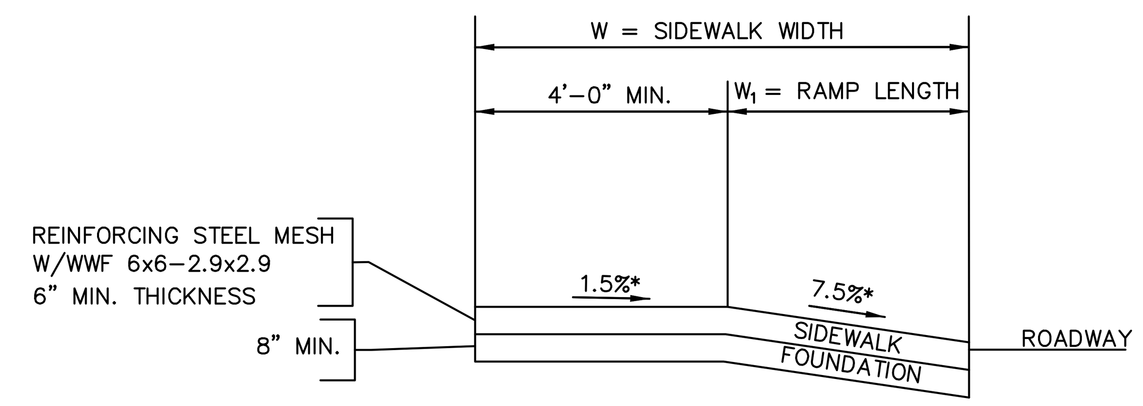
PROPOSED SITE IMPROVEMENTS

PARKING LOT IMPROVEMENT PROJECT
HAUSER BUILDING (667-4)
ARLINGTON HOUSING AUTHORITY

GCG ASSOCIATES, INC.
WILMINGTON MASSACHUSETTS

SCALE: 1" = 30'	DATE: MAY 30, 2025	
JOB NO.\FILE NAME: 24108-DESIGN 100	DESIGNED BY: R.T.H. DRAWN BY: S.R.D. CHECKED BY: M.J.C.	PLAN NO. 4 of 6





* = TOLERANCE FOR CONSTRUCTION ±0.5%
USEABLE SIDEWALK WIDTH PER AAB = $W-W_C$
RAMP LENGTH, $W_1 = W - (4'\text{-}0")$ MIN.

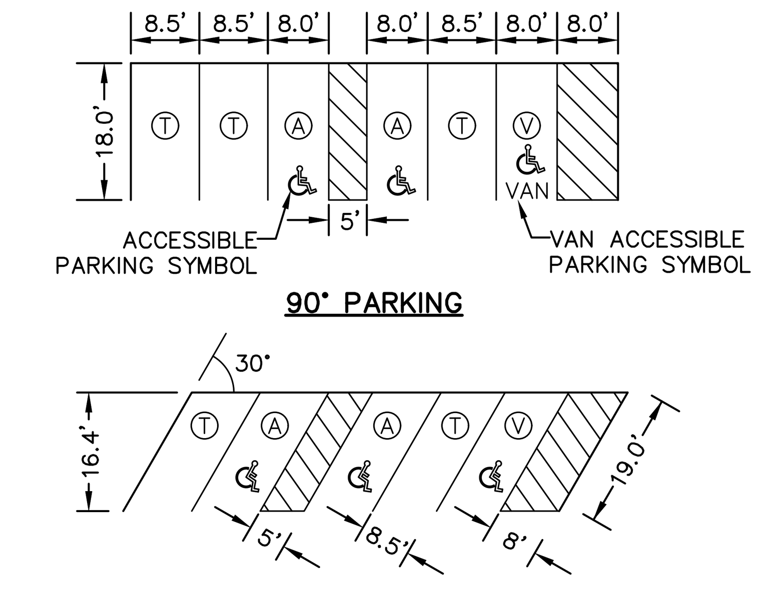
ROAD PROFILE GRADE	*HIGH SIDE TRANSITION LENGTH
0	6'-6"
>0 - 1	7'-8"
>1 - 2	9'-0"
>2 - 3	11'-0"
>3 - 4	14'-0"
>4	15'-0" MAX.

* BASED ON DESIGN SLOPE OF 7.5% AND CURB REVEAL OF 6".

NOTES:
1. THE DIMENSIONS SHOWN AT ROADWAY EDGE ARE FIXED DISTANCES.
2. RAMP CROSS SECTION TO BE SAME AS ADJACENT SIDEWALK; e.g DEPTH OF SURFACES.
3. PORTLAND CEMENT CONCRETE RAMPS ARE TO BE TEXTURED BY BROOMING IN A DIRECTION PARALLEL TO THE LENGTH OF THE RAMP.
4. IN NO CASE ARE THE RAMPS TO BE PLACED BEHIND THE STOP LINE.
5. SIDEWALKS THAT CROSS DRIVEWAYS SHALL BE RAMPED TO MEET THE GRADE OF THE DRIVEWAY.

* THESE DIMENSIONS ARE SUBJECT TO CHANGE IN THE FIELD IF EXISTING APPURTENANCES OR CONDITIONS WILL MAKE THE RAMP LOCATIONS IMPRACTICAL OR UNSAFE.

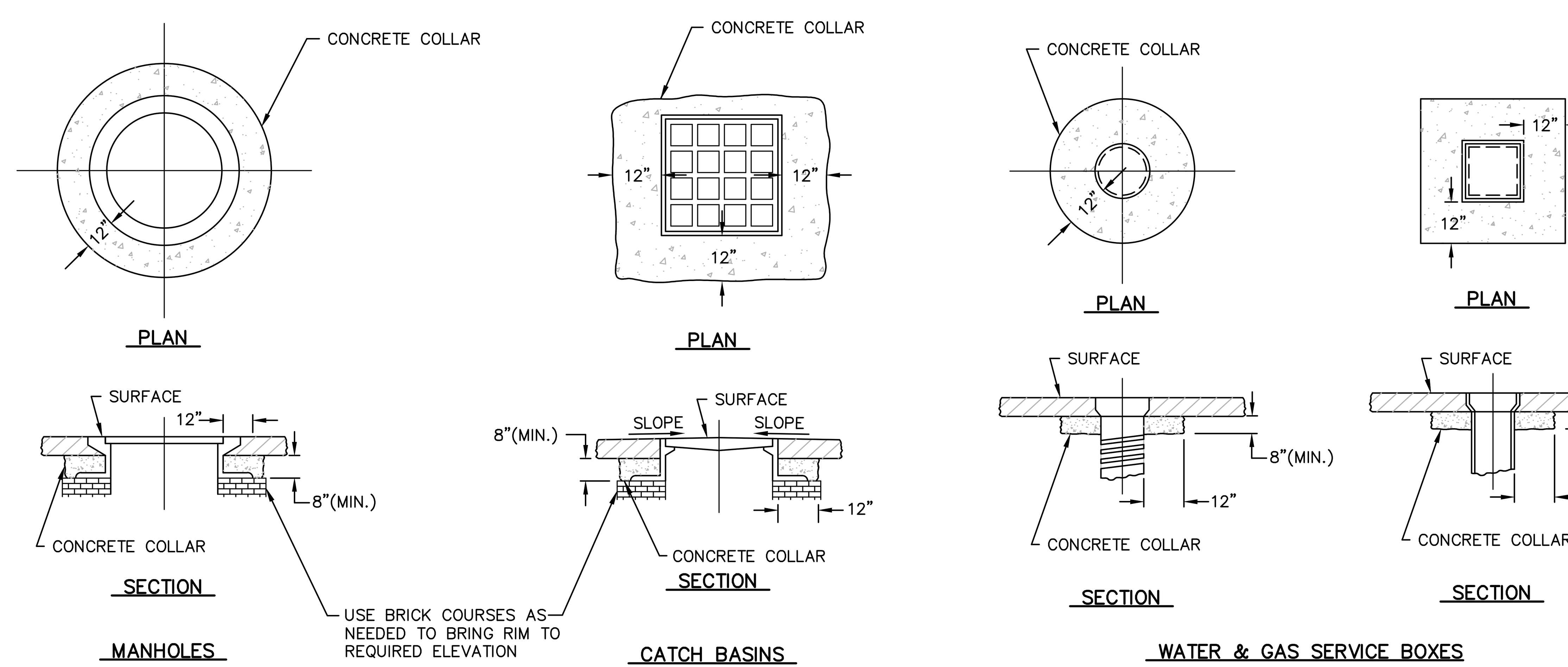
WHEELCHAIR RAMP CONDITION
N.T.S.



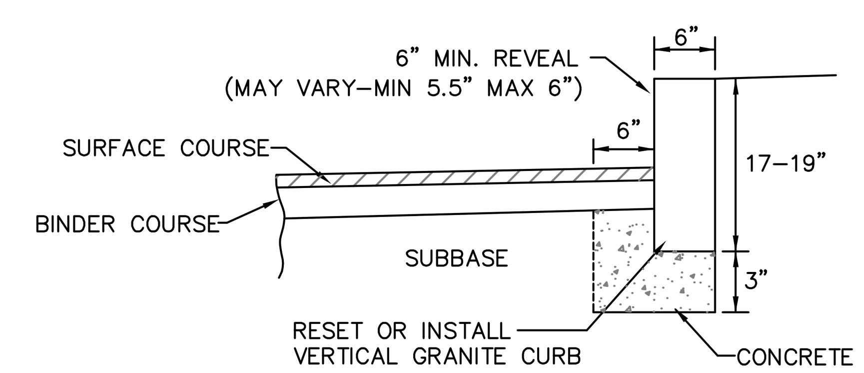
A – ACCESSIBLE PARKING SPACE
T – TYPICAL PARKING SPACE
V – VAN ACCESSIBLE PARKING SPACE

NOTES:
1. VAN ACCESSIBLE SPACES MUST HAVE AN 8' WIDE ACCESS AISLE.
2. ALL OTHER ACCESS AISLES SHALL BE 5' WIDE, MINIMUM.
3. TYPICAL PARKING STALLS SHALL BE 9' WIDE UNLESS NOTED ON THE PLANS.
4. ACCESSIBLE SPACES AND AISLES 2% MAX SLOPE IN ANY DIRECTION.
5. SPACES TO BE RE-STRIPED AND RE-NUMBERED AS SHOWN ON THE PLANS.

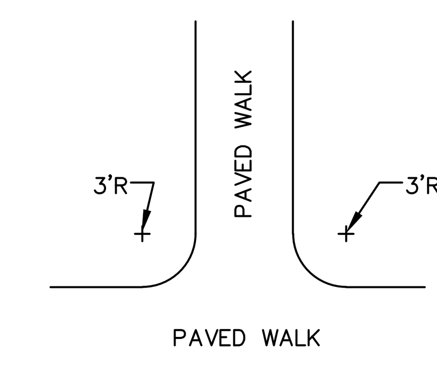
TYPICAL LINE STRIPING DETAIL
N.T.S.



DETAILS FOR ADJUSTING ROADWAY CASTINGS
N.T.S.

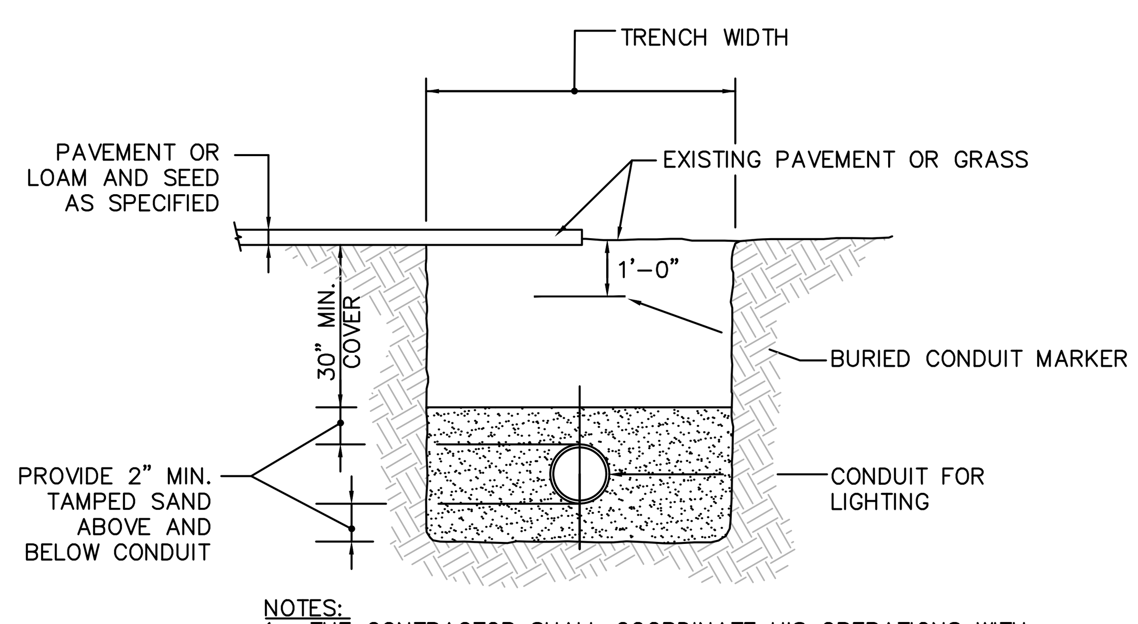


6" VERTICAL GRANITE CURB
N.T.S.



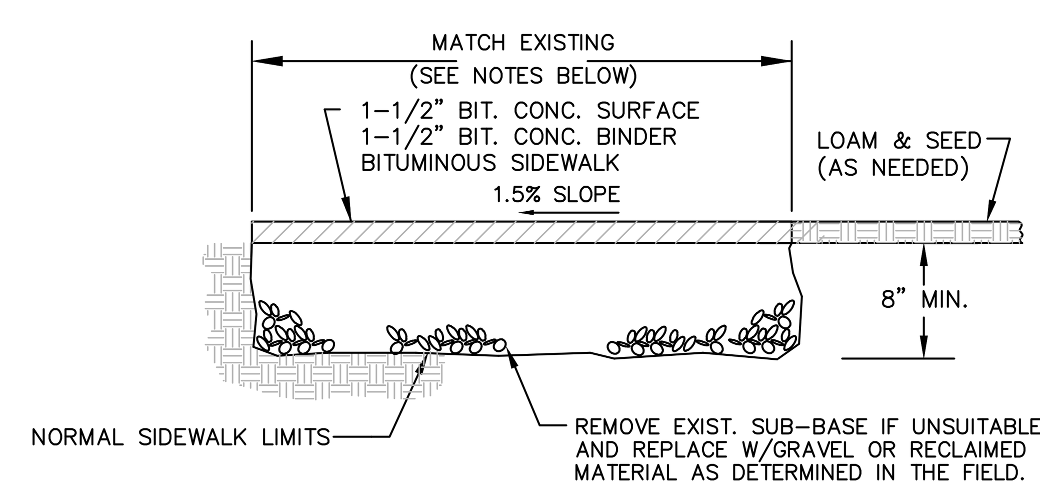
NOTES:
1. ALL WALKWAYS SHALL HAVE A 3' RADIUS AT INTERSECTIONS.

TYPICAL PAVED WALKWAY INTERSECTION DETAIL
N.T.S.



NOTES:
1. THE CONTRACTOR SHALL COORDINATE HIS OPERATIONS WITH THE HOUSING AUTHORITY.

TYPICAL TRENCH DETAIL FOR TELEPHONE AND ELECTRICAL CONDUIT
N.T.S.



BITUMINOUS CONCRETE

NOTES:
1. GRAVEL IN AREAS OF EXISTING SIDEWALKS WHICH ARE BEING REMOVED OR REPLACED IN THE SAME LOCATION SHALL BE REGRADED AND SUPPLEMENTAL GRAVEL ADDED. ADDITIONAL GRAVEL REQUIRED SHALL BE INCLUDED IN THE CONTRACT PRICE.
2. EXCAVATION AND PLACEMENT OF GRAVEL REQUIRED FOR NEW SIDEWALKS, WIDENING SIDEWALKS AND PAVED AREA SHALL BE INCLUDED IN THE CONTRACT PRICE. DISPOSAL OF THE EXCAVATED MATERIAL SHALL ALSO BE INCLUDED IN THE CONTRACT PRICE.
3. REMOVAL OF STUMPS AND CUTTING AND DISPOSAL OF ROOTS SHALL BE INCLUDED IN THE CONTRACT COST TO CONSTRUCT WALKWAYS.

SIDEWALK DETAIL
N.T.S.

NOTICE OF INTENT
EOHLC #010130

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COMMONWEALTH OF MASSACHUSETTS — MICHAEL J. CARTER — CIVIL — No. 35907 — REGISTERED PROFESSIONAL ENGINEER
07/09/2025

DETAILS I

PARKING LOT IMPROVEMENT PROJECT
HAUSER BUILDING (667-4)
ARLINGTON HOUSING AUTHORITY

GCG ASSOCIATES, INC.
WILMINGTON MASSACHUSETTS

SCALE: 1" = 30' DATE: MAY 30, 2025
JOB NO.\FILE NAME: 24108-DESIGN 100
DESIGNED BY: R.T.H.
DRAWN BY: S.R.D.
CHECKED BY: M.J.C.
PLAN NO. 5 OF 6

EROSION AND SEDIMENT CONTROL MAINTENANCE

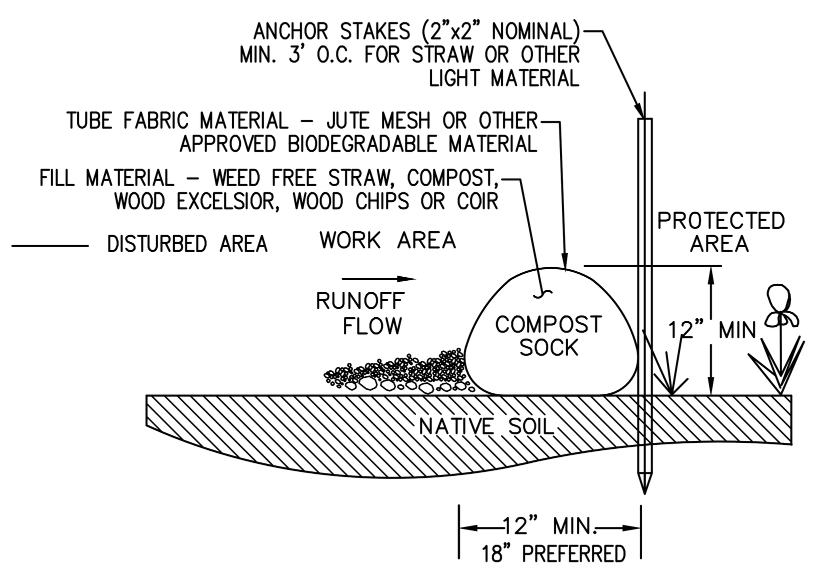
DURING CONSTRUCTION, AS SMALL AN AREA OF SOIL AS POSSIBLE SHOULD BE EXPOSED FOR AS SHORT A TIME AS POSSIBLE. AFTER CONSTRUCTION, GRADE, RESPREAD TOPSOIL, AND STABILIZE SOIL BY SEEDING AND MULCHING AS TO PREVENT EROSION.

ALL SEDIMENTATION AND EROSION CONTROL DEVICES SHALL BE INSPECTED DURING CONSTRUCTION ON A DAILY BASIS AND FOLLOWING ALL STORMS BY THE RESIDENT ENGINEER. THE CONTRACTOR SHALL MAINTAIN AND MAKE REPAIRS AND REMOVE SEDIMENT AS REQUESTED BY THE RESIDENT ENGINEER. THIS WORK SHALL BE PERFORMED WITHIN 24 HOURS OF REQUEST.

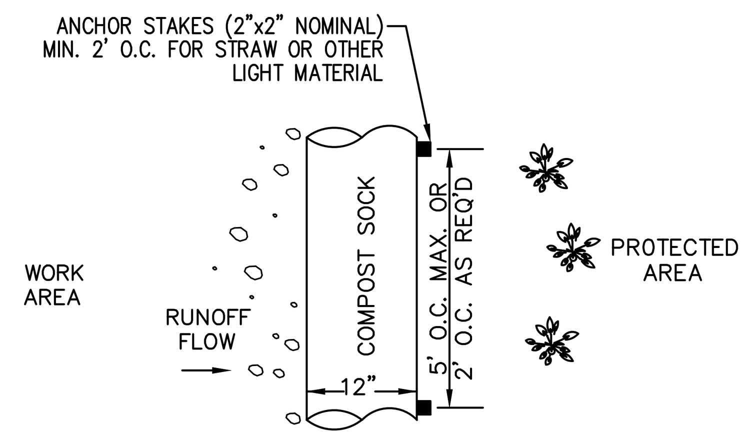
THE CONTRACTOR SHALL CLEAN SEDIMENT AND DEBRIS FORM ALL DRAINAGE STRUCTURES, AND PIPES AT THE COMPLETION ON CONSTRUCTION, THE CONTRACTOR SHALL REPAIR ALL ERODED AREAS AND ENSURE A GOOD STAND OF TURF IS ESTABLISHED THROUGHOUT. THE CONTRACTOR SHALL REPAIR ALL ERODED OR DISPLACED RIPRAP, AND CLEAN SEDIMENT COVERED STONES.

TRENCHES WITHIN PAVED ROADWAY TO BE CLOSED WITH 3" TEMPORARY PAVEMENT AT THE END OF EACH WORK DAY.

CONTRACTOR TO PERFORM STREET SWEEPING AT THE END OF EACH WORK DAY.



END VIEW



TOP VIEW

NOTES:

1. TUBES MAY BE FILLED ON SITE OR SHIPPED.
2. ENSURE PROPER LOCATION AT SITE FOR EFFECTIVENESS.
3. TUBES SHALL BE PLACED AND STAKED IN PLACE AS REQUIRED TO ENSURE STABILITY AGAINST WATER FLOWS.
4. TUBES FILLED WITH LIGHT MATERIAL SHALL BE STAKED AT A MAXIMUM OF 3 FEET ON CENTER. FOR HEAVIER MATERIAL, 5 FEET ON CENTER.
5. TUBES SHALL BE TAMPED TO ENSURE GOOD CONTACT WITH SOIL.
6. INSPECT AFTER EACH RAINFALL OR DAILY DURING RAINFALL EVENTS. CORRECT ALL DEFICIENCIES IMMEDIATELY.
7. FAILURE INCLUDES BUT IS NOT LIMITED TO WASHOUT, OVERTOPPING, CLOGGING, AND EROSION. IF OVERTOPPING OR WASHOUT OCCURS, NEW FILTER TUBES WITH ADDITIONAL STAKING OR MULCH MATERIAL SHALL BE INSTALLED AS DIRECTED BY THE ENGINEER.
8. FILTER TUBES SHALL BE REMOVED ONCE SITE WORK IS COMPLETE, SITE IS STABLE, ADEQUATE GROWTH HAS BEEN ESTABLISHED AND AS DIRECTED BY THE ENGINEER. TUBE FABRIC SHALL BE CUT, REMOVED AND DISPOSED OF OFF-SITE BY THE CONTRACTOR AT NO ADDITIONAL COST. AS DIRECTED BY ENGINEER, REMAINING MULCH MATERIAL MAY BE RAKED OUT SO NO MATERIAL IS GREATER THAN 2" IN DEPTH.
9. REFER TO EROSION CONTROL NOTES FOR ADDITIONAL INSTRUCTION.

COMPOST SOCK DETAIL

NOT TO SCALE

GENERAL

THIS PLAN PROPOSES EROSION CONTROL MEASURES TO ADEQUATELY CONTROL ACCELERATED SEDIMENTATION AND REDUCE THE DANGER FROM STORM WATER RUNOFF AT THE SITE. THE RUNOFF SHALL BE CONTROLLED BY THE INTERCEPTION, DIVERSION, AND SAFE DISPOSAL OF PRECIPITATION. RUNOFF SHALL ALSO BE CONTROLLED BY STAGING CONSTRUCTION ACTIVITY AND PRESERVING NATURAL VEGETATION WHEREVER POSSIBLE.

EXISTING VEGETATION SHALL BE PROTECTED AND ONLY THAT CLEARING AND GRUBBING ABSOLUTELY NECESSARY TO THE PROPOSED CONSTRUCTION SHALL BE PERFORMED. ALL DISTURBED AREAS SHALL BE RESTORED TO THEIR ORIGINAL CONDITION AND CONTOUR, UNLESS OTHERWISE INDICATED ON THE PLANS. THE CONTRACTOR SHALL TAKE SPECIAL CARE WITH HIS CONSTRUCTION METHODS AND SHALL COMPLY WITH THE FOLLOWING GUIDELINES.

SEDIMENTATION CONTROL

ALL AREAS SHALL BE PROTECTED FORM SEDIMENTATION DURING AND AFTER CONSTRUCTION, PARTICULARLY THE STORAGE OF EXCAVATED OR STOCKPILED MATERIAL. THE CONTRACTOR SHALL CAREFULLY STRIP ALL TOPSOIL, LOAM, OR ORGANIC MATTER PRIOR TO THE TRENCHING OR OTHER OPERATIONS AND SHALL STORE THEM SEPARATELY FROM ALL OTHER MATERIALS DURING EXCAVATION. EACH STOCKPILE MUST BE ADEQUATELY RINGED WITH SEDIMENT CONTROL MATERIAL (i.e., COMPOST SOCK AND/OR FILTER FABRIC FENCE).

DEBRIS AND OTHER WASTE RESULTING FROM EQUIPMENT MAINTENANCE AND CONSTRUCTION WILL NOT BE DISCARDED ON SITE.

EROSION & SEDIMENTATION CONTROL PLAN

SEDIMENTATION CONTROL SYSTEM – THE SEDIMENTATION CONTROL SYSTEM SHALL CONSIST OF COMPOST SOCK. THE SEDIMENTATION CONTROL SYSTEM SHALL BE INSTALLED IMMEDIATELY AFTER A CUT SLOPE HAS BEEN GRADED, BEFORE A FILL SLOPE HAS BEEN CREATED, AND AS INDICATED ON THE PLANS. DESIGN THE SYSTEM TO INTERCEPT SILT AND SEDIMENT BEFORE IT REACHES THE WETLANDS OR WATERCOURSES. DEPOSITS OF SEDIMENT AND SILT ARE TO BE PERIODICALLY REMOVED FROM THE UPSTREAM SIDE OF THE TUBE. THIS MATERIAL IS TO BE SPREAD AND STABILIZED IN AREAS NOT SUBJECT TO EROSION, OR IN AREAS WHICH ARE NOT TO BE PAVED OR BUILT ON. THE SEDIMENTATION CONTROL SYSTEM IS TO BE REPLACED AS NECESSARY TO PROVIDE PROPER FILTERING ACTION. THE SYSTEM IS TO REMAIN IN PLACE AND BE MAINTAINED TO INSURE EFFICIENT SILTATION CONTROL UNTIL ALL AREAS ABOVE THE FENCE ARE STABILIZED AND VEGETATION HAS BEEN ESTABLISHED.

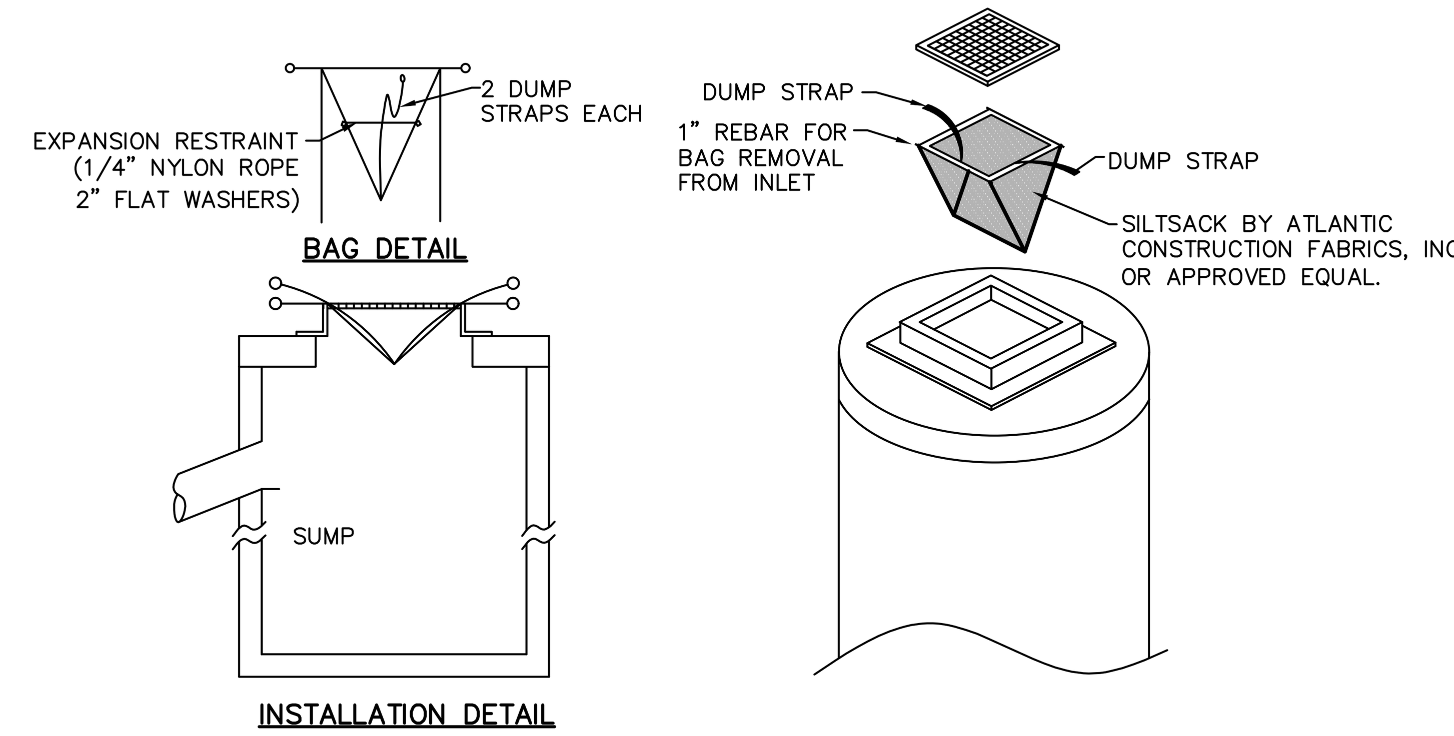
IN ALL AREAS, REMOVAL OF TREES, BUSHES, AND OTHER VEGETATION, AND DISTURBANCE TO THE SOIL, IS TO BE KEPT TO AN ABSOLUTE MINIMUM WHILE ALLOWING PROPER DEVELOPMENT OF THE SITE.

EROSION & SEDIMENT CONTROL MAINTENANCE

DURING CONSTRUCTION, AS SMALL AN AREA OF SOIL AS POSSIBLE SHOULD BE EXPOSED FOR AS SHORT A TIME AS POSSIBLE. AFTER CONSTRUCTION, GRADE, RESPREAD TOPSOIL, AND STABILIZE SOIL BY SEEDING AND MULCHING TO PREVENT EROSION.

ALL SEDIMENTATION AND EROSION CONTROL DEVICES SHALL BE INSPECTED DURING CONSTRUCTION ON A DAILY BASIS AND FOLLOWING ALL STORMS. THE CONTRACTOR SHALL MAINTAIN AND MAKE REPAIRS AND REMOVE SEDIMENT. THIS WORK SHALL BE PERFORMED WITHIN 24 HOURS OF REQUEST.

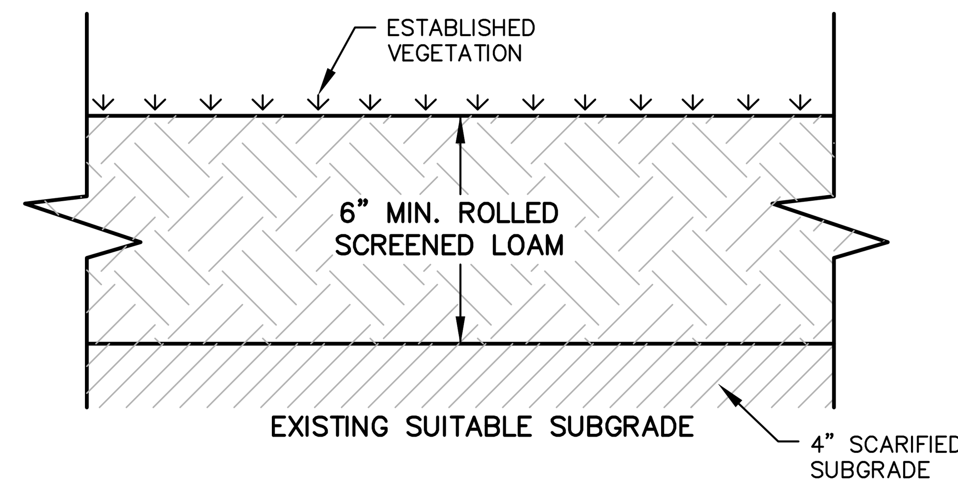
THE CONTRACTOR SHALL CLEAN SEDIMENT AND DEBRIS FROM ALL DRAINAGE STRUCTURES AND PIPES. AT THE COMPLETION OF CONSTRUCTION, THE CONTRACTOR SHALL REPAIR ALL ERODED AREAS AND ENSURE A GOOD STAND OF TURF IS ESTABLISHED THROUGHOUT. THE CONTRACTOR SHALL REPAIR ALL ERODED OR DISPLACED RIP RAP, AND CLEAN SEDIMENT COVERED STONES.



1. SILT SACKS SHALL BE INSTALLED IN ALL CATCH BASINS DURING CONSTRUCTION PERIOD.
2. INSPECTION SHALL BE WEEKLY AND REPAIR/REPLACEMENT MADE PROMPTLY AS NEEDED.
3. SILT SACKS SHALL BE KEPT CLEAN AND FREE OF DEBRIS.

SILTSACK DETAIL

N.T.S.

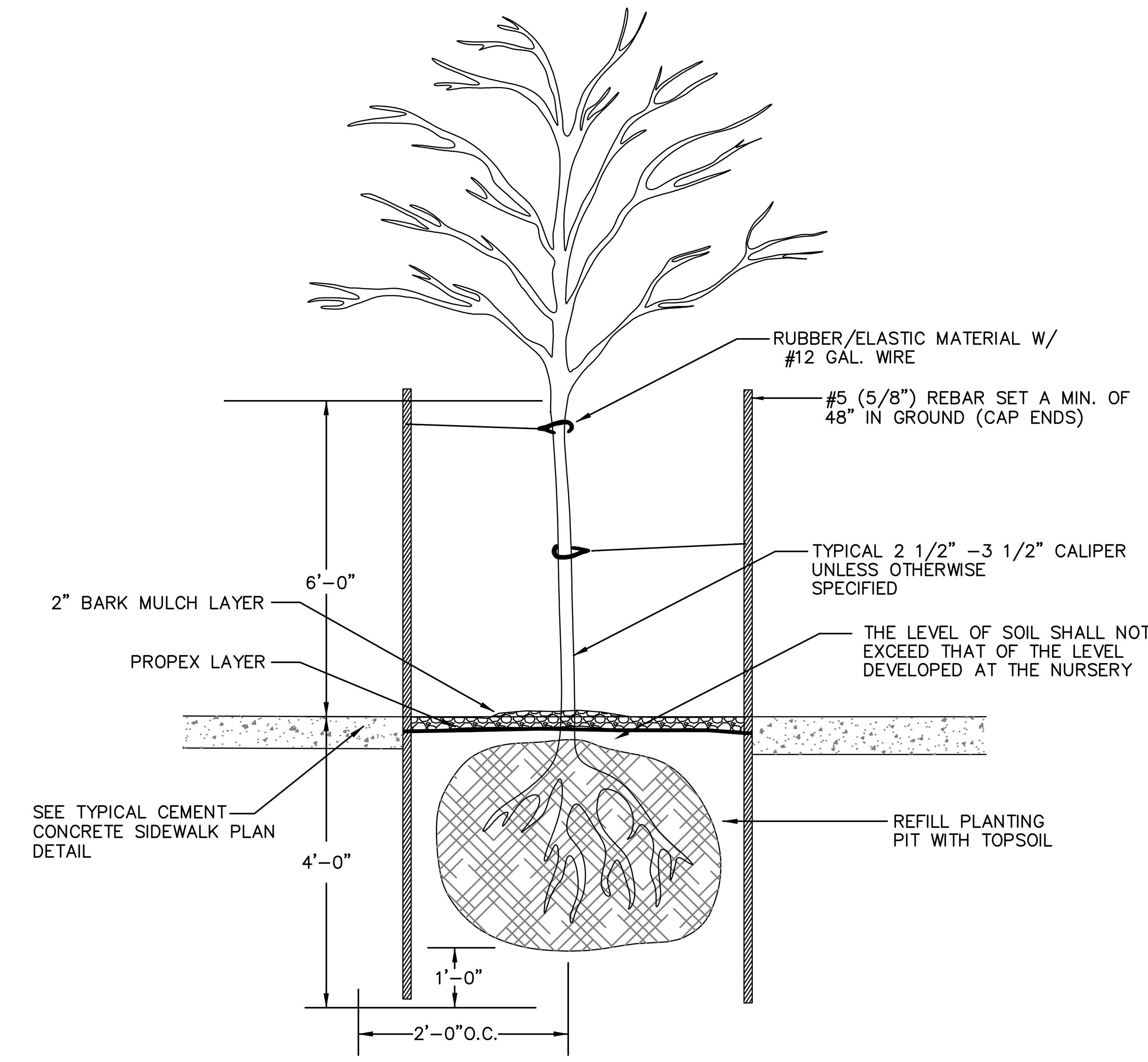


NOTES:

1. ALL DISTURBED AREAS TO BE LOAMED WITH A MINIMUM OF 6-INCHES OF SCREENED LOAM IN ACCORDANCE WITH MASSACHUSETTS HIGHWAY DEPARTMENT (MHD) STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES SECTION 751. LOAM MATERIAL SHALL MEET MHD M1.05.0 MATERIAL SOURCE AND IN-PLACE LABORATORY ANALYTICAL TESTING OF LOAM FOR COMPLIANCE WITH M1.05.0 MAY BE REQUIRED BY THE OWNER PRIOR TO PLACEMENT AND FINAL ACCEPTANCE.
2. AFTER PLACEMENT, ROLLING AND RAKING OF THE SCREENED TOPSOIL, SEEDING AND FERTILIZING OF THE TOP SOIL SHALL BE IN ACCORDANCE WITH MHD STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES SECTION 765. IF NECESSARY, REFERTILIZATION SHALL OCCUR IN ACCORDANCE WITH MHD SECTION 766.
3. MULCHING SHALL BE IN ACCORDANCE WITH MHD SECTION 767, FOR AREAS SPECIFICALLY INDICATED ON THE DRAWINGS, OR AS FIELD CONDITIONS MAY WARRANT.
4. SEED MIX, FERTILIZER AND MULCHING MATERIALS SHALL COMPLY WITH SECTION M6 OF MHD STANDARD SPECIFICATIONS FOR ROADSIDE DEVELOPMENT MATERIALS. SUBMITTAL REQUIREMENTS MAY INCLUDE PRODUCT LABELS OR LABORATORY ANALYTICAL TESTING, AS MAY BE REQUESTED BY THE OWNER OR THEIR AGENTS.

LOAM & SEED

NOT TO SCALE



NOTES:

1. EXCEPT WHERE UTILITY LOCATION DOES NOT ALLOW, THERE SHALL BE AT LEAST ONE TREE TO BE LOCATED IN FRONT OF EACH HOUSE.
2. MAINTAIN A MINIMUM SEPARATION OF 10 FEET BETWEEN PROPOSED TREES AND UNDERGROUND UTILITY SERVICES.
3. NEW TREES THAT WILL BE LOCATED ON THE SAME SIDE OF THE ROAD AS EXISTING OVERHEAD WIRES SHALL BE EITHER JAPANESE TREE LILAC OR CALLERANA PEAR. NEW TREES THAT WILL BE LOCATE ON THE OPPOSITE SIDE OF THE ROAD FROM EXISTING OVERHEAD WIRES SHALL BE EITHER GREEN SPIRAL LINDEN OR THORNLESS HONEY LOCUST.
4. THE EXACT LOCATION OF EACH NEW TREE WILL BE DETERMINED AT THE TIME OF CONSTRUCTION BY THE CITY OF MEDFORD.
5. EXISTING TREE ROOTS, STUMPS, ETC. SHALL BE REMOVED IN LOCATIONS WHERE A NEW TREE WILL REPLACE AN EXISTING TREE.
6. NO TREES SHALL BE REMOVED UNTIL AFTER A TREE HEARING.

TREE PLANTING DETAIL

N.T.S.

NOTICE OF INTENT
EOHLC #010130

DETAILS II

PARKING LOT IMPROVEMENT PROJECT
HAUSER BUILDING (667-4)
ARLINGTON HOUSING AUTHORITY

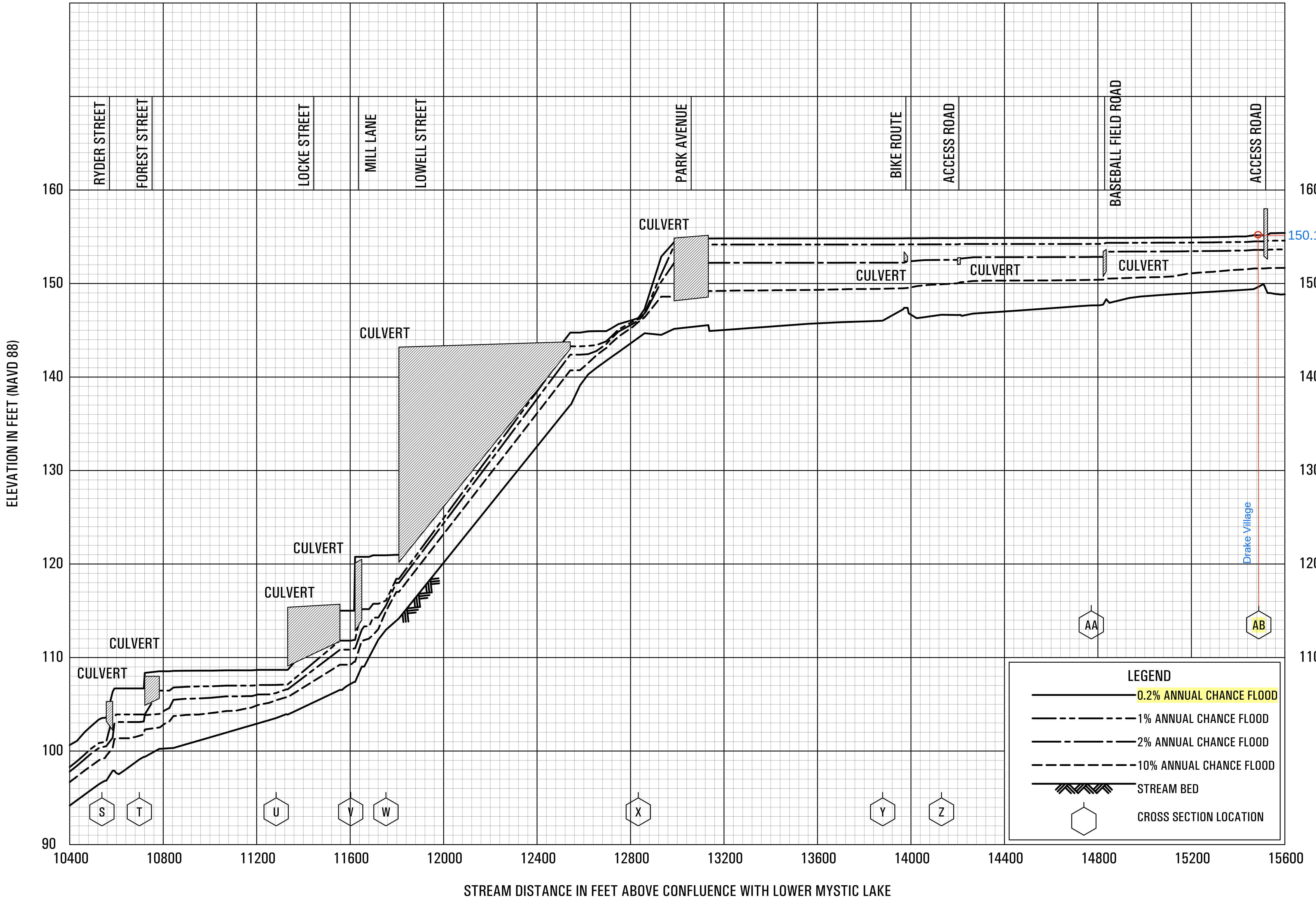
NO.	DATE	DESCRIPTION	BY
1	7/9/2025	CONSERVATION COMMENTS REVISION	RTH

COMMONWEALTH OF MASSACHUSETTS — MICHAEL J. CARTER — CIVIL — No. 35907 — REGISTERED PROFESSIONAL ENGINEER
07/09/2025

GCG ASSOCIATES, INC.
WILMINGTON MASSACHUSETTS

SCALE: 1" = 30' DATE: MAY 30, 2025

JOB NO.\FILE NAME:	DESIGNED BY: R.T.H.	PLAN NO.
24108-DESIGN 100	DRAWN BY: S.R.D.	6 OF 6
	CHECKED BY: M.J.C.	



FLOOD PROFILES

MILL BROOK 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIDDLESEX COUNTY, MA

(ALL JURISDICTIONS)

340P

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
V	11,600	19	63	5.4	111.8	111.8	111.7	0.0
W	11,750	17[2]	33	6.5	116.1	116.1	115.9	0.1
X	12,830	19	35	6.0	146.2	146.2	147.2	1.0
Y	13,880	120	420	0.6	154.2	154.2	154.3	0.1
Z	14,130	348[2]	577	0.4	154.2	154.2	154.3	0.1
AA	14,770	181[2]	360	0.6	154.2	154.2	154.4	0.2
AB	15,490	36[2]	128	0.7	154.5	154.5	154.6	0.1
AC	16,970	32[2]	82	1.0	154.7	154.7	154.7	0.0
AD	18,010	24[2]	39	2.2	162.8	162.8	162.8	0.0
AE	19,540	50[2]	716	1.7	164.7	164.7	164.6	0.0

[1]Feet above confluence with Lower Mystic Lake

[2]The measured top width on the FIRM may differ due to the effects of ineffective flow, the exclusion of small pocket areas due to map scale limitations, or is estimated due to HEC-RAS modeling limitations

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIDDLESEX COUNTY, MA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: MILL BROOK 3

National Flood Hazard Layer FIRMette

FEMA

71°11'45"W 42°25'49"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

71°11'8"W 42°25'23"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- B 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/28/2025 at 2:17 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

NOAA Atlas 14, Volume 10, Version 3
Location name: Arlington, Massachusetts, USA*
Latitude: 42.4255°, Longitude: -71.1896°
Elevation: 169 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.306** (0.237-0.389)	**0.374** (0.290-0.477)	**0.486** (0.375-0.622)	**0.579** (0.444-0.746)	**0.707** (0.527-0.956)	**0.802** (0.587-1.11)	**0.904** (0.645-1.30)	**1.02** (0.688-1.50)	**1.20** (0.778-1.82)	**1.35** (0.856-2.09)
10-min	**0.433** (0.335-0.552)	**0.530** (0.410-0.676)	**0.689** (0.531-0.882)	**0.821** (0.630-1.06)	**1.00** (0.746-1.35)	**1.14** (0.832-1.57)	**1.28** (0.914-1.84)	**1.45** (0.975-2.12)	**1.70** (1.10-2.58)	**1.92** (1.21-2.96)
15-min	**0.509** (0.395-0.649)	**0.623** (0.483-0.795)	**0.810** (0.625-1.04)	**0.965** (0.741-1.24)	**1.18** (0.878-1.59)	**1.34** (0.978-1.85)	**1.51** (1.08-2.17)	**1.71** (1.15-2.50)	**2.00** (1.30-3.04)	**2.25** (1.43-3.49)
30-min	**0.696** (0.539-0.887)	**0.854** (0.661-1.09)	**1.11** (0.858-1.42)	**1.33** (1.02-1.71)	**1.62** (1.21-2.19)	**1.84** (1.35-2.55)	**2.08** (1.48-3.00)	**2.36** (1.58-3.45)	**2.78** (1.80-4.22)	**3.15** (1.99-4.87)
60-min	**0.882** (0.684-1.12)	**1.08** (0.839-1.38)	**1.41** (1.09-1.81)	**1.69** (1.29-2.17)	**2.06** (1.54-2.79)	**2.34** (1.72-3.25)	**2.64** (1.89-3.83)	**3.01** (2.02-4.41)	**3.57** (2.31-5.41)	**4.04** (2.56-6.26)
2-hr	**1.15** (0.898-1.46)	**1.41** (1.10-1.79)	**1.84** (1.43-2.34)	**2.19** (1.69-2.80)	**2.68** (2.02-3.61)	**3.04** (2.25-4.20)	**3.43** (2.48-4.95)	**3.92** (2.64-5.70)	**4.69** (3.04-7.05)	**5.36** (3.40-8.21)
3-hr	**1.34** (1.05-1.69)	**1.64** (1.29-2.07)	**2.14** (1.67-2.71)	**2.55** (1.98-3.24)	**3.11** (2.35-4.18)	**3.53** (2.62-4.85)	**3.98** (2.89-5.73)	**4.56** (3.08-6.59)	**5.46** (3.55-8.17)	**6.25** (3.97-9.53)
6-hr	**1.73** (1.37-2.17)	**2.12** (1.67-2.66)	**2.75** (2.16-3.46)	**3.28** (2.56-4.14)	**4.00** (3.04-5.32)	**4.53** (3.38-6.18)	**5.11** (3.73-7.29)	**5.84** (3.97-8.38)	**6.99** (4.56-10.4)	**8.00** (5.10-12.1)
12-hr	**2.20** (1.75-2.73)	**2.69** (2.14-3.35)	**3.50** (2.77-4.37)	**4.16** (3.28-5.23)	**5.08** (3.88-6.71)	**5.76** (4.32-7.79)	**6.50** (4.76-9.18)	**7.42** (5.06-10.5)	**8.85** (5.79-13.0)	**10.1** (6.45-15.1)
24-hr	**2.63** (2.11-3.25)	**3.26** (2.61-4.03)	**4.29** (3.42-5.32)	**5.15** (4.08-6.42)	**6.33** (4.87-8.30)	**7.19** (5.43-9.67)	**8.14** (6.00-11.4)	**9.34** (6.39-13.2)	**11.2** (7.37-16.3)	**12.9** (8.25-19.1)
2-day	**2.99** (2.41-3.66)	**3.78** (3.04-4.64)	**5.07** (4.07-6.24)	**6.14** (4.89-7.60)	**7.61** (5.90-9.94)	**8.68** (6.61-11.6)	**9.88** (7.36-13.9)	**11.4** (7.85-16.0)	**13.9** (9.18-20.1)	**16.2** (10.4-23.8)
3-day	**3.28** (2.65-4.00)	**4.12** (3.34-5.04)	**5.51** (4.44-6.76)	**6.67** (5.34-8.22)	**8.25** (6.42-10.7)	**9.41** (7.19-12.6)	**10.7** (8.00-15.0)	**12.4** (8.52-17.2)	**15.1** (9.99-21.8)	**17.6** (11.3-25.7)
4-day	**3.55** (2.88-4.32)	**4.42** (3.59-5.39)	**5.86** (4.74-7.16)	**7.05** (5.66-8.66)	**8.69** (6.78-11.3)	**9.88** (7.57-13.1)	**11.2** (8.41-15.6)	**13.0** (8.94-18.0)	**15.8** (10.5-22.6)	**18.3** (11.8-26.7)
7-day	**4.30** (3.52-5.21)	**5.22** (4.26-6.32)	**6.71** (5.45-8.15)	**7.95** (6.42-9.71)	**9.65** (7.57-12.4)	**10.9** (8.38-14.4)	**12.3** (9.22-16.9)	**14.1** (9.74-19.4)	**17.0** (11.3-24.1)	**19.6** (12.7-28.3)
10-day	**5.00** (4.10-6.02)	**5.93** (4.86-7.16)	**7.47** (6.09-9.04)	**8.74** (7.09-10.6)	**10.5** (8.24-13.4)	**11.8** (9.06-15.4)	**13.2** (9.89-18.0)	**15.0** (10.4-20.5)	**17.8** (11.9-25.2)	**20.3** (13.2-29.3)
20-day	**6.99** (5.77-8.36)	**8.01** (6.61-9.60)	**9.68** (7.95-11.6)	**11.1** (9.03-13.4)	**13.0** (10.2-16.3)	**14.4** (11.1-18.5)	**15.9** (11.8-21.1)	**17.6** (12.3-23.9)	**20.2** (13.5-28.2)	**22.3** (14.5-31.8)
30-day	**8.64** (7.17-10.3)	**9.72** (8.06-11.6)	**11.5** (9.49-13.8)	**13.0** (10.6-15.6)	**15.0** (11.8-18.7)	**16.5** (12.7-21.0)	**18.1** (13.4-23.7)	**19.8** (13.9-26.6)	**22.1** (14.8-30.7)	**23.9** (15.6-33.9)
45-day	**10.7** (8.93-12.7)	**11.9** (9.88-14.1)	**13.8** (11.4-16.4)	**15.3** (12.6-18.4)	**17.5** (13.8-21.6)	**19.2** (14.8-24.1)	**20.8** (15.4-26.9)	**22.5** (15.8-30.0)	**24.5** (16.5-33.9)	**26.1** (17.0-36.7)
60-day	**12.5** (10.4-14.8)	**13.7** (11.4-16.2)	**15.7** (13.0-18.6)	**17.3** (14.3-20.7)	**19.6** (15.5-24.1)	**21.3** (16.5-26.7)	**23.1** (17.0-29.6)	**24.7** (17.4-32.8)	**26.6** (18.0-36.6)	**28.0** (18.3-39.3)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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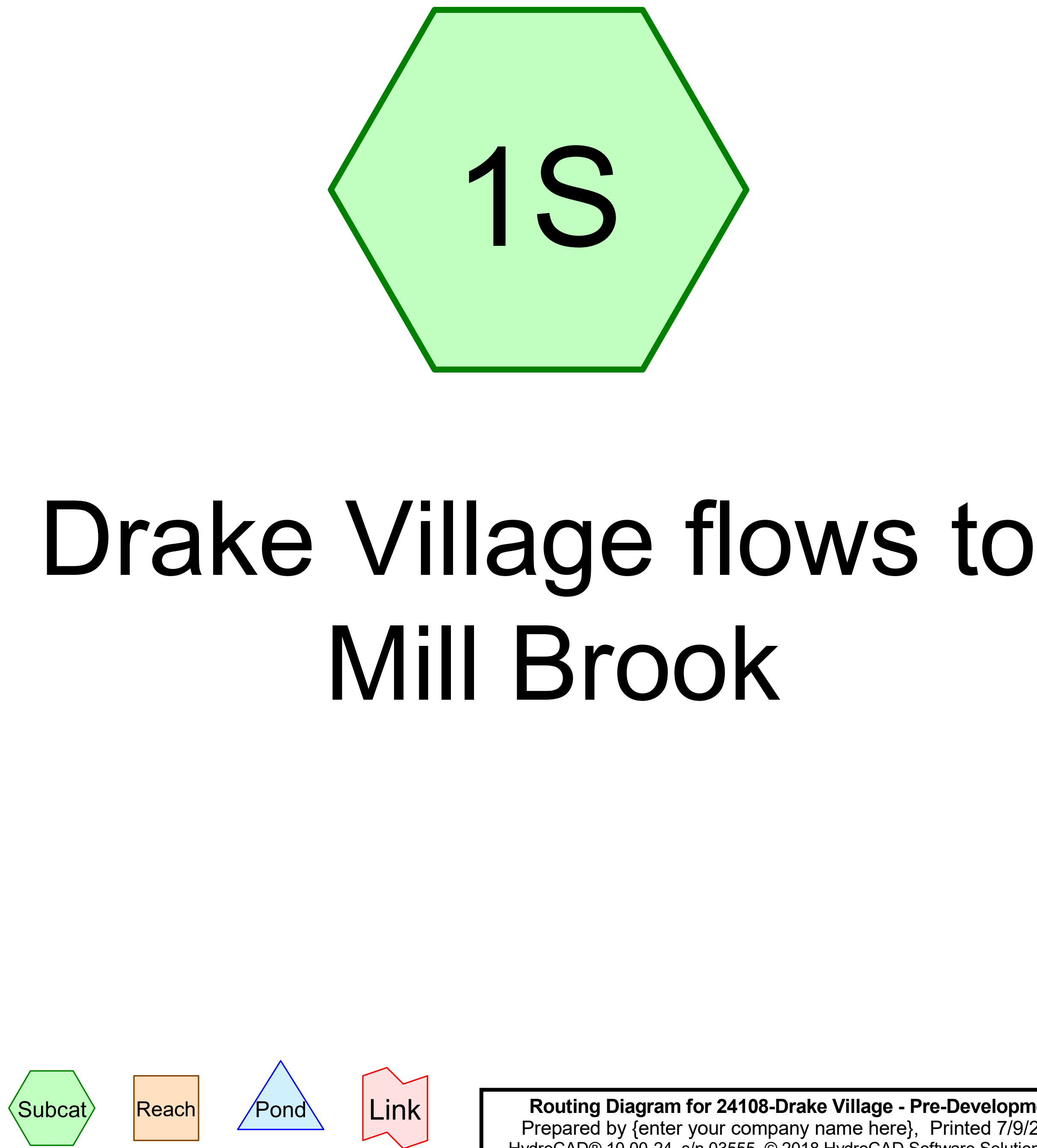
PF graphical



Routing Diagram for 24108-Drake Village - Pre-Development
Prepared by {enter your company name here}, Printed 7/9/2025
HydroCAD® 10.00-24 s/n 03555 © 2018 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.635	39	>75% Grass cover, Good, HSG A (1S)
1.322	98	Paved parking, HSG A (1S)
1.167	98	Roofs, HSG A (1S)
0.337	98	Walkways, HSG A (1S)
4.461	**76**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
4.461	HSG A	1S
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
4.461		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
1.635	0.000	0.000	0.000	0.000	1.635	>75% Grass cover, Good	1S
1.322	0.000	0.000	0.000	0.000	1.322	Paved parking	1S
1.167	0.000	0.000	0.000	0.000	1.167	Roofs	1S
0.337	0.000	0.000	0.000	0.000	0.337	Walkways	1S
4.461	**0.000**	**0.000**	**0.000**	**0.000**	**4.461**	**TOTAL AREA**	

Summary for Subcatchment 1S: Drake Village flows to Mill Brook

Runoff = 7.46 cfs @ 12.17 hrs, Volume= 0.655 af, Depth= 1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Yr Rainfall=4.03"

	Area (sf)	CN	Description
	57,582	98	Paved parking, HSG A
	50,845	98	Roofs, HSG A
*	14,659	98	Walkways, HSG A
	71,223	39	>75% Grass cover, Good, HSG A
	194,309	76	Weighted Average
	71,223		36.65% Pervious Area
	123,086		63.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0080	0.08		**Sheet Flow, Lawn Sheet Flow** Grass: Dense n= 0.240 P2= 4.03"
1.0	45	0.0120	0.77		**Shallow Concentrated Flow, Lawn SCF** Short Grass Pasture Kv= 7.0 fps
0.3	53	0.0210	2.94		**Shallow Concentrated Flow, Paved SCF** Paved Kv= 20.3 fps
11.8	148	Total			

Summary for Subcatchment 1S: Drake Village flows to Mill Brook

Runoff = 16.09 cfs @ 12.16 hrs, Volume= 1.392 af, Depth= 3.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=6.42"

	Area (sf)	CN	Description
	57,582	98	Paved parking, HSG A
	50,845	98	Roofs, HSG A
*	14,659	98	Walkways, HSG A
	71,223	39	>75% Grass cover, Good, HSG A
	194,309	76	Weighted Average
	71,223		36.65% Pervious Area
	123,086		63.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0080	0.08		**Sheet Flow, Lawn Sheet Flow** Grass: Dense n= 0.240 P2= 4.03"
1.0	45	0.0120	0.77		**Shallow Concentrated Flow, Lawn SCF** Short Grass Pasture Kv= 7.0 fps
0.3	53	0.0210	2.94		**Shallow Concentrated Flow, Paved SCF** Paved Kv= 20.3 fps
11.8	148	Total			

Summary for Subcatchment 1S: Drake Village flows to Mill Brook

Runoff = 28.45 cfs @ 12.16 hrs, Volume= 2.490 af, Depth= 6.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Yr Rainfall=9.67"

	Area (sf)	CN	Description
	57,582	98	Paved parking, HSG A
	50,845	98	Roofs, HSG A
*	14,659	98	Walkways, HSG A
	71,223	39	>75% Grass cover, Good, HSG A
	194,309	76	Weighted Average
	71,223		36.65% Pervious Area
	123,086		63.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0080	0.08		**Sheet Flow, Lawn Sheet Flow** Grass: Dense n= 0.240 P2= 4.03"
1.0	45	0.0120	0.77		**Shallow Concentrated Flow, Lawn SCF** Short Grass Pasture Kv= 7.0 fps
0.3	53	0.0210	2.94		**Shallow Concentrated Flow, Paved SCF** Paved Kv= 20.3 fps
11.8	148	Total			

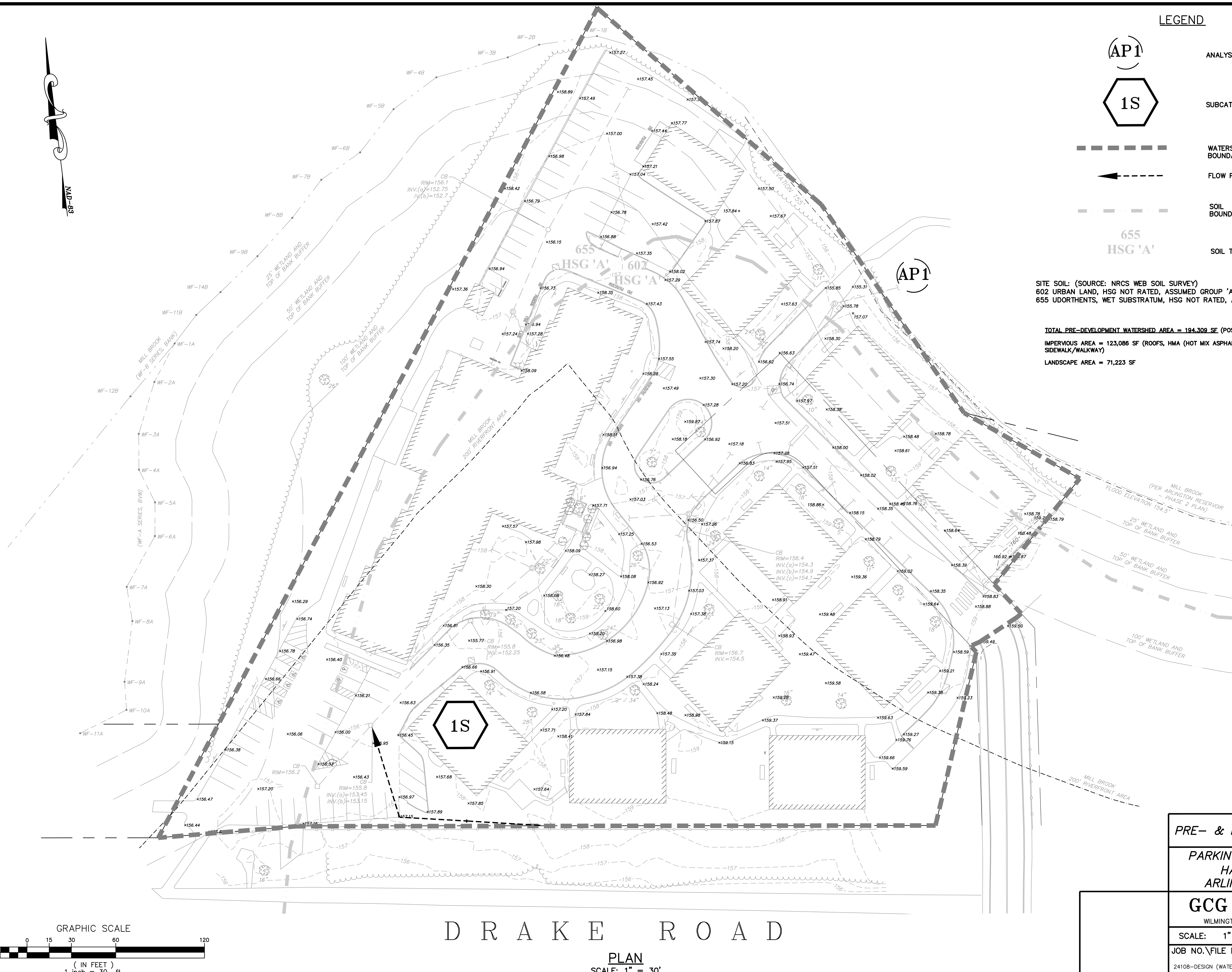
Summary for Subcatchment 1S: Drake Village flows to Mill Brook

Runoff = 35.08 cfs @ 12.16 hrs, Volume= 3.095 af, Depth= 8.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Yr Rainfall=11.40"

	Area (sf)	CN	Description
	57,582	98	Paved parking, HSG A
	50,845	98	Roofs, HSG A
*	14,659	98	Walkways, HSG A
	71,223	39	>75% Grass cover, Good, HSG A
	194,309	76	Weighted Average
	71,223		36.65% Pervious Area
	123,086		63.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0080	0.08		**Sheet Flow, Lawn Sheet Flow** Grass: Dense n= 0.240 P2= 4.03"
1.0	45	0.0120	0.77		**Shallow Concentrated Flow, Lawn SCF** Short Grass Pasture Kv= 7.0 fps
0.3	53	0.0210	2.94		**Shallow Concentrated Flow, Paved SCF** Paved Kv= 20.3 fps
11.8	148	Total			



PLAN
SCALE: 1" = 30'

LEGEND

AP1	ANALYSIS POINT
1S	SUBCATCHMENT
	WATERSHED BOUNDARY
	FLOW PATH
	SOIL BOUNDARY
655 HSG 'A'	SOIL TYPE

SITE SOIL: (SOURCE: NRCS WEB SOIL SURVEY)
602 URBAN LAND, HSG NOT RATED, ASSUMED GROUP 'A'.
655 UDORTHENTS, WET SUBSTRATUM, HSG NOT RATED, ASSUMED GROUP 'A'.

TOTAL PRE-DEVELOPMENT WATERSHED AREA = 194,309 SF (POST-DEVELOPMENT = PRE-DEVELOPMENT)

IMPERVIOUS AREA = 123,086 SF (ROOFS, HMA (HOT MIX ASPHALT) DRIVE AND PARKING LOTS, AND HMA SIDEWALK/WALKWAY)

LANDSCAPE AREA = 71,223 SF

EOHLC #010130

PRE– & POST–DEVELOPMENT WATERSHED

PARKING LOT IMPROVEMENT PROJECT
HAUSER BUILDING (667–4)
ARLINGTON HOUSING AUTHORITY

GCG ASSOCIATES, INC.
WILMINGTON MASSACHUSETTS

SCALE: 1" = 30' DATE: JULY 9, 2025

JOB NO.\FILE NAME:		PLAN NO.
24108–DESIGN (WATERSHED)	DESIGNED BY: R.T.H. DRAWN BY: S.R.D. CHECKED BY: M.J.C.	1 OF 1

24108-DESIGN (Watershed).dwg Saved: 7/8/2025 6:13 PM Plotted: Jul 09, 2025 12:37:pm