Appendix 5-2

Map Set (Project)(see Volume III)

Appendix 5-3

Map Set (Noticed Alternative)(see Volume III)

Appendix 5-4

Preliminary Inadvertent Returns Contingency Plan for HDD Crossing

EVERSOURCE

GREATER CAMBRIDGE ENERGY PROGRAM

PRELIMINARY INADVERTENT RETURNS CONTINGENCY PLAN FOR HORIZONTAL DIRECTIONAL DRILL CROSSING OF THE CHARLES RIVER

CAMBRIDGE AND BOSTON, MA

PRELIMINARY

DECEMBER 2021

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PRELIMINARY

PRELIMINARY INADVERTENT RETURNS CONTINGENCY PLAN FOR HORIZONTAL DIRECTIONAL DRILLING

1.0 Introduction

The Greater Cambridge Energy Project (the "Project") involves the construction of approximately 8.3 miles of new underground electric transmission lines located primarily in public roadways in Cambridge, Somerville, and Boston along with related ancillary substation work. One of the transmission lines servicing the Allston/Brighton area of Boston (identified herein as "Preferred Route B2A East") will cross the Charles River using a Horizontal Directional Drill ("HDD") technique.

HDD operations have a potential to release drilling mud to the surface environment through inadvertent returns ("IR"). An IR is the condition where drilling mud is released through fractured soil into the surrounding formation and travels toward the surface. Because drilling muds consist of a bentonite clay-water mixture, they are not classified as toxic or hazardous substances. A drilling mud discharge to surface water, however, can cause potential water quality impacts related to turbidity.[1]

While drilling mud seepage associated with an IR is most likely to occur near the bore entry and exit points where the drill head is shallow, IRs can occur in any location along a directional bore. Drilling mud may also be lost to the fractures within the soil or bedrock formation and never reach the surface. The key to containing and controlling an IR is early detection and quick response by the drilling crew.

The purpose of this PRELIMINARY Inadvertent Returns Contingency Plan ("IRCP") is to provide regulatory and permitting agencies with information on the typical procedures utilized by HDD contractors to prevent a fluid release during HDD construction and to outline steps to manage, control and minimize the impacts if an IR of drilling fluid occurs. The HDD Contractor for this Project has yet to be selected. The plan outlined in this document serves as a preliminary framework for the selected HDD Contractor's submittal presenting a site-and-contractor-specific IRCP that is consistent with the site conditions and constraints, and the HDD Contractor's proposed means, methods, and equipment. This IRCP was prepared as a draft to support and inform the environmental permit applications and will be updated with the HDD Contractor's specific information prior to the start of HDD construction. The HDD Contractor will be responsible for incorporating applicable environmental permit conditions, other regulatory requirements, site

[1] Bentonite is a naturally occurring, nontoxic, colloidal clay. Bentonite swells in water by absorbing the water, thus providing a viscous fluid that facilitates the HDD drilling operation by maintaining the drill path integrity by filling the bore hole void while also transporting the drill cuttings back to the surface through the bore hole. While bentonite is non-toxic, if released to the environment it has the potential to cause water quality impacts related to turbidity.

specific environmental features and geotechnical information into its IRCP submittal. The final plan will be submitted for review and approval by Eversource's Environmental representative prior to the start of HDD construction.

All personnel and sub-contractors responsible for the work will be required to adhere to the FINAL IRCP during the directional drilling process. The objective of this plan is to:

- Identify controls to be implemented during construction to minimize the potential of an IR.
- Provide for the timely detection of IR.
- Protect areas that are considered environmentally sensitive (river, wetlands, other biological resources, recreational areas, cultural resources, etc.).
- Establish site-specific environmental protection measures to utilize prior to, during, and following drilling and cable installation activities to minimize and control erosion and release of sediment or drilling fluid to adjoining wetlands or watercourses.
- Establish a general response program for construction that is understood and can be implemented immediately by field crews in the event of an IR of drilling fluid occurs.
- Establish a chain of command for reporting and notifying, in a timely manner, the construction management team, Eversource, and the proper authorities in the event of an IR of drilling fluid and of the response actions that are to be implemented.

2.0 General Description of HDD Process

Eversource is proposing to install an electric transmission line beneath the Charles River in Cambridge and Boston, Massachusetts (the municipal boundary is approximately in the center of the river). To avoid potential impacts to the Charles River, Eversource proposes to use the HDD method to install the electric transmission line below the bed and banks of the river and adjacent wetland resource areas. HDD is recognized as the least environmentally impactful construction technique available for installing utilities beneath sensitive environmental resources such as rivers and wetlands. For perspective, at its deepest point, the HDD installation for the Project could be up to 30-feet below the bed and shoreline of the river. The HDD process begins by mechanically excavating entry and exit pits at either end of the directional bore alignment. For this Project, the HDD entry/exit pits would be located east of the Charles River on the Massachusetts Department of Conservation and Recreation ("MassDCR") Magazine Beach property in Cambridge and on MassDOT's Allston Multimodal Project Site west of the Charles River in Boston on land owned by Harvard University. The layout of equipment and materials at the entry and exit locations will be carefully prepared to limit the required working area(s). In this way, the amount of site preparation and the resulting environmental disturbance can be minimized.

A small diameter pilot bore is then drilled from the entry pit using directional boring methods. During the pilot bore, a drilling fluid (typically bentonite and water based with selected polymers/additives to improve and modify fluid and drilling properties to address site-specific ground characteristics) is pumped through nozzles in the drill head to support the hole and to hydraulically transport drill cuttings from the drill bit back to the entry pit.

A guidance system is mounted immediately behind the drilling head to allow the driller to track and steer the path of the drill so that it follows the proposed alignment. The drilling fluid holds the cuttings in suspension and carries the drill cuttings back through the annular space between the drill string and the bore hole wall to the entry pit where drilling fluid is collected and processed for re-use by a recycling system. The cuttings are separated from the bentonite using screens, centrifuges, and de-sanding units which prepare the bentonite for re-use. Once the pilot bore reaches the exit pit, a larger diameter back-reaming head is attached to the drill string and pulled back through the pilot hole to enlarge the hole. Depending on the size of the pipe to be installed and the subsurface geologic conditions, several successively larger reaming passes may be needed. Again, a bentonite and water slurry are pumped into the bore hole during reaming to remove cuttings and to stabilize the bore hole. Once the bore hole is sufficiently enlarged, the drill string is pulled back through the bore hole with the new pull-back pipe attached to it typically in one continuous process until the lead end of the pipe reaches the entry pit.

Specific to this plan, it is important to have an awareness of the function and composition of the HDD drilling fluids. The drilling fluid composition and drilling fluid management are integral components of the HDD process with the following purposes:

- Support and stabilize the bore hole.
- Suspend and transport cuttings from the drill bit through the bore hole annulus.
- Control fluid loss through the bore's side walls by forming a filter cake on the bore hole walls.
- Managing and modifying the drilling fluid mix to improve its cutting carrying characteristics, its pumpability, and its hole stabilization and support characteristics.
- Power the downhole cutting tools (e.g., via mud motors if required).
- Serve as a coolant and lubricant to the drill bit during the drilling process, and lubricant during the pull-back pipe insertion process.

During the HDD process and subsequent pipe insertion, the drilling fluid pumped downhole will tend to flow along the path of least resistance. Generally, this will be through the annulus between the drill string and the bore hole side wall. However, the bore alignment may encounter ground conditions where the path of least resistance is an existing fracture, fissure, or hole of either natural or anthropogenic origin, areas with low overburden confinement, or coarse gravel zones in the soil. When this occurs, drill fluid circulation can be lost or reduced. This is a common

occurrence in the HDD process but does not necessarily prevent completion of the bore or result in a release to the environment. However, the environment may be impacted if the fluid inadvertently releases to the surface along a waterway's banks or within a waterway or wetland. Again, environmentally acceptable additives to amend the properties of the drilling fluid will be used as necessary to prevent and limit IRs through such paths of lower flow resistance.

3.0 Organization and Staff Responsibilities

The principal organizations involved in this project include the local, state and Federal Regulatory Agencies, Project Proponent (Eversource), Design Engineer, and HDD Contractor. The roles and responsibilities of the principal organizations are discussed in the following subsections.

3.1 Regulatory Agencies

Eversource is working to obtain necessary permit authorizations and approvals to implement the HDD crossing. Anticipated regulatory agencies reviewing and issuing permits include:

- Massachusetts Department of Environmental Protection ("MassDEP").
- U.S. Army Corps of Engineers ("USACE").
- Massachusetts Department of Conservation and Recreation ("MassDCR").
- Massachusetts Department of Transportation – Highway Division ("MassDOT").
- Massachusetts Water Resources Authority ("MWRA").
- Cambridge Conservation Commission.
- Boston Conservation Commission.

3.2 Project Proponent

The Project Proponent is Eversource. Eversource will provide Construction Manager(s) and Environmental Monitors ("EM") for the Project and will be responsible for correspondence and coordination among the parties including the HDD Contractor and the Design Engineer.

3.3 HDD Contractor

The HDD Contractor is responsible for the work and must adhere to this Plan during the HDD process. More specifically, the HDD Contractor will be responsible to complete the pipe installation by HDD in accordance with the design criteria, contract documents, environmental compliance permits, as well as local, state, and federal regulations. The HDD Contractor will be expected to use the appropriate construction procedures and techniques to complete the installation, including a project specific IRCP prepared by the HDD Contractor in accordance with

the provisions provided within this PRELIMINARY IRCP, contract documents and applicable permit conditions.

The HDD Drill Operator ("Drill Operator") will be responsible for operating the HDD drill rig and observing and managing changes in annular fluid pressure or loss of circulation. The Drill Operator will communicate with other members of the drill crew as needed when issues arise. The HDD Contractor will be responsible for developing the specific lines of communication within their organization and shall dedicate a responsible person for communicating IRs to the Proponent's Construction Management team and Environmental Monitor.

3.4 Lines of Communication and Authority

In the case of a detected or suspected IR of drilling fluids from the boring, the Drill Operator will notify the HDD Contractor's foreman or superintendent and Eversource's Construction Management team and Environmental Monitor immediately. Eversource will be responsible for notifying regulatory agencies, as necessary.

3.5 Training

The HDD Contractor will ensure that all construction personnel have appropriate environmental training and understand applicable permit conditions before beginning work. Eversource will also conduct a project orientation and field training meeting for staff assigned with specific roles during the HDD installation and will review the site-specific environmental concerns and permit conditions. Eversource and the Design Engineer will also attend the orientation meeting to review the procedures that will be used to document IRs in accordance with the HDD specifications.

4.0 Fluid Release Minimization Measures

4.1 Geotechnical Investigation

The first steps taken to minimize the potential risk of an IR will include conducting a geotechnical investigation along the HDD alignment to develop an understanding of the subsurface conditions. The data will be used by the Design Engineers to inform the detailed design of the HDD crossing and transmission line installation.

4.2 HDD Design

The HDD crossing will be designed to reduce the potential risk of an IR during construction. Design considerations will likely include (in part):

- Depth of cover during profile design (based on the results of the geotechnical borings) to limit the potential inadvertent break through to the river bottom or ground surface.
- Generally, for the formation of IRs, the more critical stage of the HDD process tends to be during the initial pilot hole drilling when the annular space between the bore sidewall and the drill string is the smallest.

- Adjusting the drill alignment to avoid existing infrastructure including existing utilities.

- Establishing a drill alignment line that allows for gradual angular changes to minimize pressure build-up.

- Requiring drilling fluid composition and drilling procedures that minimize drilling fluid pressures.

- Requiring drilling fluids that adequately address site-specific drilling concerns while posing the least threat to the environment.

4.3 Contingency Plans

As mentioned above, prior to construction the selected HDD Contractor will be required to submit a final Project-Specific IRCP for review and acceptance by Eversource. At a minimum, the Project specifications will require that the following major elements be addressed in detail in the HDD Contractor's Plan:

- Work plan and detailed description of the drilling program (details for executing pilot hole, reaming, pull-back operations, and schedule); this plan will include necessary procedures for addressing problems that are typically encountered during HDD installations through the anticipated subsurface for each drill location, including the potential use of conductor casings in the softer, weaker soils at the ends of the bore.

- Drilling fluid composition design and on-hand amendments to alter fluid properties to reduce pressures, potential for plugging, and seepage losses.

- Description of the proposed drilling equipment and drill site layout.

- Material Safety Data Sheet ("MSDS") information for all drilling fluid products proposed for use.

- Procedures for drilling fluid pressure control, and fluid and pressure loss monitoring and management to aid in the detection of an IR (i.e., metering of makeup water, recording of drilling fluid product quantities utilized, fluid return volumes, fluid and cuttings disposal quantities, turbidity of surface water, etc.).

- Contingency plans for addressing IRs into the river or adjacent wetlands, or other sensitive areas, which includes the specific procedures used to halt the release and then contain, clean-up, and remove materials from the release site.

- Notification procedures and chain-of-command in the event of a release.

- Criteria for evaluating the need for a drill hole abandonment and the associated plan for sealing the drill hole if abandoned.

- Drilling fluid management and disposal procedures.

The HDD Contractor will also be responsible for implementing the necessary safeguards to minimize the likelihood of a fluid release and management/control should a release occur. This includes having a readily available supply of spill response devices (e.g., containment booms, pumps, straw bales, silt fence, sediment logs, sandbags, vacuum trucks, silt curtains) and other materials or equipment necessary to contain and clean up IRs. To maximize protection to sensitive environmental areas these measures will be pre-positioned at the site, readily available and operational prior to the start of drilling. Such additional spill response will be employed immediately, as secondary measures, in the event of a fluid release.

4.4 Early Fluid Release Detection

The HDD method has the potential for seepage or fluid loss into pervious geologic formations through which the bore path crosses. This may occur because of fractures in the rock, low overburden confinement, or from seepage through porous soils such as coarse gravels. It is important to note that IRs of drilling fluid can occur even if the down-hole pressures are minimal. Subsurface conditions that could be conducive and lead to IRs or drill difficulties include:

- Highly permeable soil such as cobbles and gravel.
- Considerable differences in the elevations of HDD entry and exit points.
- Disturbed soil, such as unconsolidated fill.
- Soft soils with low overburden capacity.

An experienced drill crew is the most effective approach to detecting drilling fluid seepage prior to a surface release and promptly stopping drilling so they can modify the drilling fluid composition, properties, and pressures to address indications of loss of drill fluid. The HDD Contractor will be required to utilize experienced drill crews as the HDD alignment is adjacent to environmentally sensitive areas. The following factors can be used for identifying the potential for drill fluid release:

- The loss of pressure within the drill hole utilizing a downhole pressure monitoring system.
- A substantial reduction in the volume of return fluid (loss of circulation).
- Lack of drill cuttings returning in the drill fluid.

In addition to an experienced drill crew, the HDD Contractor will be required to perform periodic visual inspection and monitoring of the Charles River and adjacent areas in the vicinity of the drill bit or reaming bit for signs of an IR. If visual monitoring indicates a potential release additional measures such as turbidity measurements and bentonite accumulation measurements both upstream and downstream of the current active location of the drill bit may be required.

5.0 Inadvertent Return Monitoring and Notifications

The HDD Contractor is responsible for monitoring of the drilling operation to detect a potential IR by observing and documenting the flow characteristics of drilling fluid returns to the HDD entry/exit pits and by visual inspection along the drill path. If drilling fluid to the HDD entry/exit pits are lost, the HDD Contractor will implement the following steps:

- The Drill Operator will monitor and document pertinent drilling parameters/conditions and observe and monitor the drill path for evidence of an IR. If there is evidence (typically visual) of a release, the HDD Contractor will be required to stop the drilling immediately.
- The HDD Contractor will notify Eversource's Construction Manager and Environmental Monitor of significant loss of drilling fluid returns at the drill rig or if there is evidence (typically visual) of a release.
- The HDD Contractor will take steps to modify the drill fluid properties and pressures to reduce the potential of drill fluid loss or release.
- The Drill Operator will take steps to restore drilling fluid circulation in accordance with the requirements of the HDD technical specifications.

If a fluid release is identified, an immediate response is necessary and the proper corrective actions must be taken to minimize impacts to environmentally sensitive resources, including the Charles River, adjacent wetlands, and Magazine Beach.

5.1 Inadvertent Release Notification

The HDD Contractor will notify Eversource's Construction Manager and Environmental Monitor immediately if an IR is identified regardless of its location. Eversource will be responsible for notifying applicable regulatory agencies, as warranted. The HDD Contractor will not resume HDD activities until the release is controlled and confirmation has been received from the proper authorities. Eversource's Construction Manager will notify the HDD Contractor when HDD drilling operations may resume.

6.0 Inadvertent Returns Response (Uplands)

A common reason for upward movement and release of drill fluid is from pressure exerted by drill pumps. Lowering drill fluid pressure is a first step to limiting a release and can be accomplished by stopping drill rig pumps and allowing pressure to bleed off. With no pumping pressure in the hole, surface seepage will generally stop, then the HDD Contractor can withdraw the drill string back a selected distance and attempt to clear cuttings from the annulus to re-establish circulation.

The contractor will be required to contain/isolate and remove fluid that has emanated from the surface. On land this can be done through use of sediment controls (e.g., wattles, strawbales, filter

tubes, etc.) in conjunction with excavating a small sump pit if needed. Sufficient spill-absorbent material will also be available on-site.

If a release is identified in an upland area, the HDD Contractor will be required to immediately respond as described above to limit the extents of the release. After containment is established, cleanup and removal can be conducted by hand, with vacuum trucks, or other equipment. Eversource's Construction Manager and Environmental Monitor will be present during clean up and removal activities, as they may need to be conducted outside of the pre-authorized temporary workspace areas. The Environmental Monitor, Construction Manager, and the HDD Contractor will work closely to determine the best course of action for IRs occurring within upland areas.

Upon containment of the release, the HDD Contractor will be required to evaluate the cause of the seepage and develop mitigation strategies to limit the likelihood of recurrence. The location of the seepage and the area around the seep will be monitored upon the re-start of the HDD operations for changes in conditions. The segments of borehole nearest the entry and exit points and other areas of low overburden cover tend to be the most susceptible to surface seepage as they have the least amount of soil confinement. These locations may have areas of dry land where seepage detection is easily identified and contained. If areas of high risk for IRs are identified during the HDD design phase, they can be protected from an uncontrolled release through use of strategically placed confinement/filter beds, straw bales, silt fence, or earthen berms place prior to the start of drilling.

7.0 Preliminary IR Response Plan (Charles River and Adjacent Wetlands)

If an IR occurs within the Charles River, the HDD Contractor will be required to cease drilling operations, reduce pressures in the borehole immediately, and notify Eversource's Construction Manager and Environmental Monitor. The Environmental Monitor, with input from the Drill Operator and Design Engineer, will evaluate the potential impact of the release on a site-specific basis and will determine the appropriate course of action in accordance with the Contractor's separate Operations Plan and Emergency Response Plan. The HDD Contractor will be required to develop general response methods for within the resource area(s) and pre-place the necessary materials and equipment required for implementation of the response methods at the site prior to construction. Specific response actions will be determined in consultation with Eversource's Construction Manager, Environmental Monitor, Design Engineer, and Contractor and could potentially include the following one or more of the following measures:

- If the IR occurs close to the entry or exit point, a conductor casing can be installed to contain the IR. Alternatively, if a conductor casing is already installed, the HDD Contractor may advance it beyond the IR location, if practical.
- Shutting down or slowing the drill fluid pumps at the first sign of an IR.

- Modifying the drill fluid properties, adding agents to reduce drilling fluid pressures and/or to attempt to plug/seal release path.

- Withdrawing the drill string back and attempting to clear cuttings from the annulus to re-establish circulation.

- Stopping drilling activities as necessary to allow the bentonite in the subsurface pathways to gel and seal the pathways.

- Evaluate the current drill methods to identify site specific improvements to lower the risk of additional IRs.

- Prior to the start of HDD operation, the HDD Contractor will implement proper sedimentation control measures including, but not limited to gravity cells, silt curtains, turbidity curtains, or if suitable, sandbags and confinement/filter beds and/or other measures prescribed by environmental permits and approvals. Additionally, an emergency stockpile of sedimentation controls will be prepositioned and readily available at or near the site.

8.0 Drill Hole Abandonment Plan

In the unlikely event the HDD Contractor must abandon the drilled hole, a plan to fill the abandoned hole will be implemented as outlined in the Contractor's IRCP and an alternative plan/alignment for crossing the river will be evaluated. If it becomes necessary to abandon a partially completed hole, the abandoned hole will likely be filled with a mixture of high-yield bentonite, water, and drill spoil. A portion of the bore path will likely be compacted and filled with soil, or a cement-bentonite mix to prevent future settlement. The HDD Contractor's site-specific abandonment plan will be accepted by the Design Engineer and Eversource prior to being performed in the field.

After the abandoned hole has been filled, an alternate entry and exit hole and bore path alignment will be evaluated by the HDD Contractor, Eversource, and the Design Engineer. The new alignment will be offset from the abandoned hole by a pre-determined distance to help limit the risk of steering difficulties due to the presence of or hydraulic connection causing drill fluid loss to the abandoned hole.

9.0 Project Completion and Clean-up

The HDD Contractor will identify an approved landfill or off-site facility for disposal of all excess drilling fluids and cuttings. As previously described, during the pilot hole and reaming operations, bentonite drill fluids will carry the solids from the formation back to the entry pit. The fluids and cuttings will be pumped to the recycling system for separation, containment, and ultimate disposal. The solid materials will be contained in a lined roll-off dumpster and prepared for hauling to an approved disposal site. Similarly, the bentonite drilling fluids are continually being cleaned

and recycled back down hole. When the HDD installation is completed, the drilling fluids will be collected in a vacuum truck to be transported to the approved site for disposal.

Alterations at MassDCR's Magazine Beach property are generally limited to the temporary workspace necessary for the HDD drill rig and support equipment/materials staging area. The balance of the HDD installation will be sufficiently deep and will not otherwise affect the surface of the Magazine Beach property. The temporary workspace area will be located outside the existing athletic fields and exercise equipment area and setback from nearby mature trees. The temporary workspace area is presently flat and comprised of regularly maintained lawn/turfgrass cover. Upon completion of the work Eversource will restore the altered area to its preexisting conditions or better with loam and an appropriate turfgrass seed mix as approved by MassDCR. Where the transmission line duct bank transitions from conventional open-cut trenching on Memorial Drive to HDD construction on Magazine Beach, the adjacent Dr. Paul Dudley White Path (bituminous pavement), sidewalk, lighting, and grassed shoulder areas will also be restored to their preexisting condition or better in consultation with MassDCR. The final restoration details will be advanced in consultation with MassDCR as part of the Access Permit review process.

The MassDOT Allston Multimodal Project Site is already heavily disturbed with a gravel base cover and devoid of any vegetation. Eversource will restore the workspace to its preexisting condition or better, including restoration of existing grades and site stabilization measures as appropriate.

In addition to the above, general housekeeping measures will be implemented onsite and all materials and any rubbish or other construction debris will be removed from the construction zone at as necessary to maintain a clean and safe workspace area during construction. All erosion and sediment control measures (e.g., fiber rolls, straw bales, silt fence, etc.) will remain in place until all disturbed areas have achieved adequate vegetative cover or other stabilization measures (as applicable), after which these control measures will be removed from the site and disposed of as construction debris.

Appendix 5-5

Local Noise Ordinances

Chapter 8.16 NOISE CONTROL

Cambridge

Sections:

8.16.010 Short title.

This chapter may be cited as the "Noise Control Ordinance" of the City of Cambridge.

(Ord. 1121 (part), 1991)

8.16.020 Declaration of findings and policy--Scope.

A. Declaration of Findings and Policy. Whereas excessive sound and vibration are a serious hazard to the public health and welfare, safety, and the quality of life; and whereas the people have a right to and should be ensured an environment free from excessive sound and vibration that may jeopardize their health or welfare or safety or degrade the quality of life; now, therefore, it is the policy of the City to prevent excessive sound and vibration which may jeopardize the health and welfare or safety of its citizens or degrade the quality of life.

B. Scope. This chapter shall apply to the control of all sound and vibration originating within the limits of the City, unless otherwise exempted by law.

(Ord. 1121 (part), 1991)

8.16.030 Definitions.

1. "Authorized enforcement personnel" means the City Police Commissioner, the Commissioner of the Inspectional Services Department, the Chairperson of the License Commission and their designees.

2. "Commercial area" means any area defined as an office or business district by the City zoning ordinance, Article 3.000.

3. "Construction" means any site preparation, assembly, erection, substantial repair, alteration, or similar action, but excluding demolition, for or of public or private rights-of-way, structures, utilities or similar property.

4. "Daytime" means the period between the hours of seven a.m. and six p.m. daily except Sunday and holidays according to the time system locally in effect.

5. "dB" means the abbreviation for decibel.

6. "dB(A)" means the A-weighted sound level in decibels, as measured by a general purpose sound level meter complying with the provisions of Specifications for Sound Level Meters (S1. 4 1971), American National Standards Institute (ANSI), properly calibrated, and operated on the "A" weighting network.

7. "Demolition" means any dismantling, intentional destruction or removal of structures, utilities, public or private right-of-way surfaces, or similar property.

8. "Emergency" means any occurrence or set of circumstances involving actual or imminent physical trauma or property damage which demands immediate action.

9. "Emergency work" means any work performed for the purpose of preventing or alleviating the physical trauma or property damage threatened or caused by an emergency.

10. "Hz" means the abbreviation for Hertz, which means cycles per second.

11. "Impact device" means a construction device in which or by which a hammer, meaning a moving mass of hard solid material, is mechanically by means of a working fluid or compressed air caused to repetitively impact upon and transmit kinetic energy to a tool. The tool may be included as a part of the device, as in the case of a moil on a paving breaker or the drill steel of a jackhammer, or it may be a mass to which the impact device is temporarily connected as in the case of a pile and pile driver. Examples of impact devices are pile drivers, paving breakers and power impact hammers, impact wrenches, riveters and stud drivers.

12. "Industrial area" means any area defined as an industrial district by the City zoning ordinance, Article 3.000.

13. "L10 level" means the A-weighted sound level exceeded ten percent of the time.

14. "Motor vehicles" means any vehicle so defined in G.L., c. 90, § 1.

15. "Motorcycle" means any vehicle so defined in G.L., c. 90, § 1.

16. "Noise disturbance" means any sound which (a) causes temporary or permanent hearing loss in persons exposed; or (b) is injurious to the public health; (c) causes a nuisance which is prohibited by law; or (d) is defined as a noise disturbance pursuant to the provisions of this chapter.

17. "Noise sensitive zone" means any area designated by the enforcement authority pursuant to subsection B of Section 8.16.040 of this chapter for the purpose of ensuring exceptional quiet. Noise sensitive zones shall include, but not be limited to, areas where noise sensitive activity occurs, such as the operation of schools, libraries open to the public, churches, hospitals and nursing homes.

18. "Person" means any individual, association, partnership, or corporation, and includes any officer, employee, department, agency or instrumentality of a state or any political subdivision of a state.

19. "Public right-of-way" means any street, avenue, boulevard, highway, sidewalk or alley or similar place which is owned or controlled by a governmental entity.

20. "Public space" means any real property or structures thereon which are owned or controlled by a governmental entity.

21. "Real property boundary" means an imaginary line along the ground surface, and its vertical extension, which separates the real property owned by one person from that owned by another person, but not including intra-building real property divisions.

22. "Residential area" means any area defined as a residence district by the City zoning ordinance, Article 3.000.

23. "Sound pressure level" is numerically equal to twenty times the logarithm (to the base ten) of the sound pressure to the reference sound pressure (the reference sound pressure shall equal twenty micropascals). Unless otherwise stated, the level is understood to be that of a root mean-square pressure.

24. "Weekday" means any day Monday through Friday which is not a legal holiday.

(Ord. 1121 (part), 1991)

8.16.040 Enforcement.

A. Enforcement Officials. The Police Commissioner, the Commissioner of the Inspectional Services Department and the Chairperson of the License Commission shall be the authorized enforcement personnel charged with the enforcement of these provisions.

B. The License Commission may designate any appropriate area as a noise sensitive zone as that term is defined in Section 8.16.030(17) of this chapter.

C. Violations. Authorized enforcement personnel may: order and specify reasonable remedial actions to be taken by a violator of this chapter to achieve compliance; or issue citations, pursuant to G.L., c. 40, § 21D, for violations of these provisions assessing fines of three hundred dollars for each day such violation is committed or permitted to continue. Additionally, any person found in violation of any of the provisions of this chapter may be prosecuted for a misdemeanor and upon conviction thereof shall be fined three hundred dollars.

D. Injunction. As an additional remedy, the operation or maintenance of any device, instrument, vehicle or machinery in violation of any provision of this chapter and which causes a noise disturbance may be subject to abatement summarily by a restraining order or injunction issued by a court of competent jurisdiction.

E. Suspension or Revocation of License or Permit. As an additional remedy for violation of any provision of this chapter, any enforcement official under subsection A of this section may summarily suspend, and after a hearing may revoke, any license or permit, including a building or demolition permit.

(Ord. 1121 (part), 1991)

8.16.050 General prohibition of noise disturbances.

No person or persons owning, leasing or controlling the operation of any source or sources of noise shall wilfully, negligently, or through failure to provide necessary equipment or facilities or to take necessary precautions, permit the establishment or continuation of a condition of noise disturbance.

(Ord. 1121 (part), 1991)

8.16.060 Measured noise disturbance.

A. This section shall apply to the use or occupancy of any lot or structure thereon and to the noise produced thereby, but shall not apply to the following:

1. To the intermittent or occasional use, during the daytime, of light homeowner's residential outdoor equipment or commercial service equipment provided said equipment and its use complies with other provisions of this chapter;

2. To construction activities and the associated use of construction devices nor to the noise produced thereby, provided such activities, and such equipment and its use, comply with provisions of this chapter.

3. To bell towers or clock towers with bels or chimes.

(Ord. 1206, Added, 07/27/1998)

B. Noise in Residential Areas or Affecting Residential Property. No person shall create or cause to be emitted from or by any source subject to the provisions of this chapter, any noise which causes or results in a noise level, measured at any lot line of any lot located in any residential area or in residential use elsewhere in conformance with the zoning ordinance, in excess of any level of subsection E of this section, residential district noise standard, provided, that if said lot is located in any industrial area, the noise level measured at the lot line shall not exceed any level of subsection E of this section, residential-industrial noise standard. Noise emitted from construction sites shall be excepted from this regulation.

C. Noise in Commercial Areas. No person shall create or cause to be emitted from or by any

source subject to the provisions of this chapter, any noise which causes or results in a noise level, measured at any lot line of any lot in any commercial area other than a lot in residential use in conformance with the zoning ordinance, in excess of any level of subsection E of this section, business district noise standard. Noise emitted from construction sites shall be excepted from this regulation.

D. Noise in Industrial Areas. No person shall create or cause to be emitted from or by any source subject to this chapter, any noise which causes or results in a noise level, measured at any lot line of any lot in recreational or business use in any industrial area in conformance with the zoning ordinance, in excess of any level of subsection E of this section, industrial district noise standard. Noise emitted from construction sites shall be excepted from this regulation.

E. Area Noise Standards. Noise standards referred to in this chapter for the several zoning districts of the City, as defined in and established pursuant to the City zoning ordinance are established by Table 8.16.060E following this section.

(Ord. 1121 (part), 1991)

TABLE 8.16.060E

TABLE OF ZONING DISTRICT NOISE STANDARDS

Maximum Allowable Octave Band Sound Pressure Levels

TABLE INSET:

Octave Band Center Frequency Measurement (Hz)	Residential Area		Residential in Industrial		Commercial Area	Industry Area
	Daytime	Other Times	Daytime	Other Times	Anytime	Anytime
31.5	76	68	79	72	79	83
63	75	67	78	71	78	82
125	69	61	73	65	73	77
250	62	52	68	57	68	73
500	56	46	62	51	62	67
1,000	50	40	56	45	56	61
2,000	45	33	51	39	51	57
4,000	40	28	47	34	47	53
8,000	38	26	44	32	44	50
Single Number Equivalent (dB(A))	60	50	65	55	65	70

(Ord. 1206, Added, 07/27/1998)

8.16.070 Restrictions on noise emitted from construction sites.

A. 1. Except as provided for in subsections C and D of this section, it is unlawful for any person to operate any construction device or devices on any construction site if the operation of such device or devices emits noise, measured at the lot line of the affected property, in excess of the values shown below:

TABLE INSET:

Lot Use of Affected	L 10	Maximum Noise

Property	Level	Level
Residential	75 dB(A)	86 dB(A)
Business or Office	80 dB(A)	--
Industrial	85 dB(A)	--

2. The same level shall apply to a public way as applies to an industrial use. Measurements should not be taken closer than fifty feet or approximately fifteen meters from the nearest active construction device on the construction site. The maximum noise level shall be measured on the sound level meter at slow response.

B. The L10 level shall be determined in the following manner:

1. Every ten seconds, on the mark, the A-weighted noise level on the sound level meter with slow response is recorded until one hundred observations have been made. If, during any of these observations, a measurement is substantially affected by any source outside the construction site (such as aircraft overflight), measurements made during these periods will not be considered. However, the observation period shall be extended until one hundred valid measurements are obtained. The L10 level will be that level that is equal to the tenth highest level recorded.

2. If, in the estimation of the person taking the measurements, outside noise sources contribute significantly to the noise level, the above procedure shall be repeated (with the same outside noise source contributions) when construction is inactive, in order to determine the existing background L10 level. The L10 level during construction must exceed the background L10 level by 5 dB(A) to be considered a violation of subsection A of this section.

C. 1. Except as provided for in subsection D of this section, it shall be unlawful to operate a construction device at any street excavation, grading or repair, utility street work installation or repair, which produces a noise level exceeding 86 dB(A) at a distance of fifty feet or approximately fifteen meters from the device.

2. The provisions of subsection A of this section shall not apply to any construction site covered by subdivision C(1). The provisions of this subsection will not be applicable to any construction device used in emergency service work that is necessary to return utility service to an area provided that within twenty-four hours such device is brought into compliance with this section or is not reused within the City until it does comply.

D. The provisions of subsections A and C of this section shall not be applicable to impact devices.

(Ord. 1121 (part), 1991)

8.16.080 Non-measured noise disturbances.

Noise Disturbances Prohibited. The following acts are declared to be loud, disturbing and unnecessary noises in violation of this chapter, but said enumeration shall not be deemed to be exclusive. Non-commercial public speaking and public assembly activities conducted on any public space or public right-of-way shall be exempt from the operation of this section. Bell towers and clock towers with bells or chimes shall be exempt from the operation of this section. (Ord. 1206, Added, 07/27/1998)

A. Horns, Signalling Devices, Etc. The sounding of any horn or signalling device on any automobile, motorcycle, street car or other vehicle on any street or public place of the City, except as a danger warning; the creation by means of any such signalling device of any unreasonably loud or harsh sound; and the sounding of any such device for an unnecessary and unreasonable period of time. The use of any signalling device except the one operated by hand or electricity; the use of any horn, whistle or other device operated by engine exhaust; and the use of any such signalling device when traffic is for any reason held up.

B. Radios, Phonographs, Etc. The using, operating, or permitting to be played, used or operated any radio receiving set, musical instrument, phonograph, loudspeaker or public address systems, unless used by the City of Cambridge, or other machine or device for the producing or reproducing of sound in such a manner as to be plainly audible at a distance of fifty (50) feet from the building, structure, vehicle or dwelling unit in which it is located.

C. Street Sales. Offering for sale or selling anything by shouting or outcry within any residential or commercial area of the City except between the hours of eight a.m. and five p.m. if all necessary permits are obtained.

D. Animals, Birds. Etc. Owning, possessing or harboring any animal or bird which frequently or for continued duration, howls, barks, meows, squawks or makes other sounds which are plainly audible within a noise sensitive zone, or plainly audible at a distance of fifty feet from the lot line of the lot on which it is located.

E. Loading and Unloading. Loading, unloading, opening, closing or other handling of boxes, crates, containers, building materials, garbage cans, or similar objects between the hours of nine p.m. and seven a.m. the following day on weekdays, or between the hours of nine p.m. and nine a.m. the following day when the following day is a Saturday, Sunday or holiday in such a manner as to be plainly audible at a distance of fifty feet from the lot line of the lot on which such activity is located, or to be plainly audible within a noise sensitive zone.

F. Construction. Operating or permitting the operation of any tools or equipment used in construction, drilling, or demolition work:

1. Between the hours of six p.m. and seven a.m. the following day on weekdays, or between the hours of six p.m. and nine a.m. the following day when the following day is a Saturday, Sunday or holiday, such that the sound therefrom is plainly audible at a distance of fifty feet from the lot line of the lot on which said activity is located, or within a noise sensitive zone, except for emergency work of public service utilities or by special variance issued pursuant to subsection B of Section 8.16.090;

2. This section shall not apply to the use of domestic power tools subject to subsection L of Section 8.16.080.

G. Vehicle or Motorboat Repairs and Testing. Repairing, rebuilding, modifying, or testing any motor vehicle, motorcycle, or motorboat in such a manner as to be plainly audible at a distance of fifty feet from the lot line of the lot on which said activity is located, or within a noise sensitive zone.

H. Places of Public Entertainment. Operating, playing or permitting the operation or playing of any radio, television, phonograph, drum, musical instrument, sound amplifier, or similar device which produces, reproduces, or amplifies sound in any place of public entertainment in such a manner as to be plainly audible at a distance of fifty feet from the source or to be plainly audible within a noise sensitive zone.

I. Vibration. Operating or permitting the operation of any device that creates vibration which is above the vibration perception threshold of an individual at or beyond the property boundary of the source if on private property or at fifty feet from the source if on a public space or public right-of-way. For the purposes of this section, "vibration perception threshold" means the minimum ground- or structure-borne vibrational motion necessary to cause a normal person to be aware of the vibration by such direct means as, but not limited to, sensation by touch or visual observation of moving objects.

J. Emergency Signalling Devices.

1. The intentional sounding or permitting the sounding outdoors of any fire, burglar or civil defense alarm, siren, whistle or similar stationary emergency signalling device, except for emergency purposes or for testing, as provided in subdivision (2) following.

2. a. Testing of a stationary emergency signalling device shall occur at the same time of day each time such a test is performed, but not before eight a.m. or after ten p.m. Any such testing shall use only the minimum cycle test time. In no case shall such test time exceed ten minutes.

b. Testing of the complete emergency signalling system, including the functioning of the signalling device and the personnel response to the signalling device, shall not occur more than once in each calendar month. Such testing shall not occur before eight a.m. or after ten p.m. The time limit specified in paragraph (a) above shall not apply to such complete system testing.

3. a. Sounding or permitting the sounding of any exterior burglar (or fire) alarm or any motor vehicle burglar alarm unless such alarm is automatically terminated within ten minutes of activation and does not sound again at all within the hour.

b. In addition to the enforcement provisions of 8.16.040, violators of section (a) above shall be subject to a fine of $l00.00 for each violation. Each ten (l0) minute interval of sounding, or part thereof, after the initial ten (l0) minutes sounding shall constitute a separate violation.

c. Fines for the sounding of burglar or fire alarms in violation of this ordinance may be assessed against the owner or occupant of the building in which the alarm is located.

d. Any motor vehicle, located on either public or private property, whose alarm has been sounding in excess of ten (10) minutes in an hour, is hereby deemed to be a public nuisance subject to immediate abatement. To effect abatement, policy must first observe personally that the sounding has lasted in excess of ten (10) minutes, and then make reasonable efforts to contact the owner of such vehicle to either have the owner shut-off the alarm or to authorize police to arrange for the shut-off of the alarm. If such efforts are unsuccessful, police are hereby authorized to abate the nuisance by arranging for tow company employees to shut off the alarm and/or to tow the motor vehicle to a storage area or other place of safety. In addition to any fines for violating this Chapter, the registered owner of the motor vehicle shall be responsible for all reasonable expenses, costs and charges incurred by the deactivation of the alarm, and by the removal and storage of such vehicle.

K. Noise Sensitive Zones.

1. Creating or causing the creation of any sound within any noise sensitive zone as defined by this chapter, so as to disrupt the activities normally conducted within the zone, provided that conspicuous signs are displayed indicating the presence of the zone; or

2. Creating or causing the creation of any sound within any noise sensitive zone, as defined by this chapter, containing a hospital, nursing home, or similar activity, so as to interfere with the functions of such activity or disturb or annoy the patients in the activity, provided that conspicuous signs are displayed indicating the presence of the zone.

L. Domestic Power Tools. Operating or permitting the operation of any mechanically powered saw, drill, sander, grinder, lawn or garden tool, snow blower, or similar device used outdoors in residential areas between the hours of ten p.m. and seven a.m. so as to be plainly audible at a distance of fifty feet from the lot line of the lot on which said activity is located, or in a noise sensitive zone.

M. Electronic Bug Killing Devices. The use of an electric bug killing device between the hours of eleven p.m. and eight a.m. if a written objection to such use by an abutter has

been received by the City Clerk within one year.

(Ord. 1121 (part), 1991)
(Ord. No. 1167, Amended, 09/11/95; Ord. No. 1167, Amended, 09/11/95)
(1206, Added, 07/27/1998; 1200, Amended, 04/27/1998, additions to 8.16.080 (J) (3))

8.16.081 Leaf Blowers

Statement of purpose. The City Council hereby finds that the reduction of noise and emissions of particulate matter resulting from the use of leaf blowers is a public purpose that protects the public health, welfare and environment of the City of Cambridge and its citizens. The City Council recognizes that a total ban on the use of such equipment would have a severe adverse impact on the ability of the City to effectively remove leaves, dust, dirt, grass clippings, cuttings and trimmings from trees, shrubs and other types of litter and debris from streets, sidewalks, cemeteries and large recreational facilities and other open spaces and to clean and maintain such facilities without relaxing restrictions on the use of such equipment for maintenance operations of such facilities.

(Ord. 1311, Added, 12/10/2007)

8.16.081.1 Use Regulations. The use of leaf blowers shall be regulated as follows:

1. *Definitions.*

a. *Definition of leaf blower.* Leaf blowers are defined as portable, handheld or back pack style power equipment that is powered by fuel or electricity and used in any landscape maintenance, construction, property repair, or property maintenance for the purpose of blowing, moving, removing, dispersing or redistributing leaves, dust, dirt, grass clippings, cuttings and trimmings from trees and shrubs or any other type of litter or debris.

b. *Definition of commercial leaf blower operator.* Any entity or organization that employs two (2) or more employees that receives income, remuneration or compensation of any kind, whether as a fee, a charge, a salary, wages or otherwise, for operating a leaf blower, except that municipal operators and municipal contractors are excluded from this definition.

(Ord. 1311, Added, 12/10/2007)

8.16.081.2 Limitations on Use.

a. The use of leaf blowers is prohibited except between March 15 and June 15 and between September 15 and December 31 in any year. The provisions of this subsection 8.16.081.2.2(a) do not apply to the use of leaf blowers in accordance with the provisions of this Leaf Blower Ordinance and regulations promulgated hereunder by municipal operators and municipal contractors performing leaf blower operations in Mayor Thomas W. Danehy Park, Fresh Pond Reservation, Thomas P. O'Neil, Jr. Municipal Golf Course at Fresh Pond, Cambridge Municipal Cemetery, Old Burial Ground or performing emergency operations and clean-up associated with storms, hurricanes and the like or by operators performing leaf blower operations on one or more adjoining parcels of land in common ownership that together comprise a total of two (2) acres or more, so long as the owners of such land comply with the provisions of subsection 8.16.081.2.2(c).

b. The use of leaf blowers is further prohibited on Sundays and legal holidays except Columbus Day and Veterans' Day and prohibited on other days except between the hours of 8:00 a.m. and 5:00 p.m. Mondays through Fridays and 9:00 a.m. and 5:00 p.m. Saturdays, Columbus Day and Veterans' Day. Commercial leaf blower operators may operate leaf blowers between the hours of 12:00 noon and 5:00 p.m. only on Columbus Day and between the hours of 1:00 p.m. and 5:00 p.m. only on Veterans' Day, consistent with the provisions of G.L. c. 136, §13 as it may be amended. The provisions of this subsection 8.16.081.2.2(b) do not apply to the use of leaf blowers in accordance with the provisions of this Leaf Blower Ordinance and regulations promulgated hereunder by municipal operators and municipal contractors

performing leaf blower operations in Mayor Thomas W. Danehy Park, Fresh Pond Reservation, Thomas P. O'Neil, Jr. Municipal Golf Course at Fresh Pond, Cambridge Municipal Cemetery, Old Burial Ground or performing emergency operations and clean-up associated with storms, hurricanes and the like or by operators performing leaf blower operations on one or more adjoining parcels of land in common ownership that together comprise a total of two (2) acres or more, so long as the owners of such land comply with the provisions of subsection 8.16.081.2.2 (c).

c. Commercial leaf blower operators and owners of one or more adjoining parcels of land in common ownership that together comprise a total of two (2) acres or more seeking to operate leaf blowers on such land shall not be permitted to operate leaf blowers, but may be exempted from the prohibition of this subsection 8.16.081.2.2(c) if they submit an operations plan to the City Manager or his or her designee for review and approval. At a minimum, the operations plan shall: address the owner's or operator's efforts to mitigate the impacts of noise and emissions upon citizens and the occupants and owners of nearby property, include an inventory of all leaf blowing equipment owned and to be used by the owner or operator in its operations program, which shall comply with the noise and emission restrictions set forth in this Leaf Blower Ordinance and regulations promulgated hereunder, and include the owner's or operator's plan for educating users of its equipment on the proper use of equipment as well as the need to mitigate impacts upon others. The operations plan shall be reviewed by the City Manager or his or her designee, who shall ensure that it complies with the applicable provisions of this Leaf Blower Ordinance and regulations promulgated hereunder, and shall impose any conditions that may be required in order for the owner or operator to comply with the provisions of this Leaf Blower Ordinance and regulations promulgated hereunder. No operations plan submitted by owners of one or more adjoining parcels of land in common ownership that together comprise a total of two (2) acres or more seeking to operate leaf blowers on such land shall be approved by the City Manager unless there has been a showing of significant hardship.

d. Leaf blower operations shall not cause leaves, dirt, dust, debris, grass clippings, cuttings or trimmings from trees or shrubs or any other type of litter or debris to be blown or deposited on any adjacent or other parcel of land, lot, or public right-of-way/property other than the parcel, land, or lot upon which the leaf blower is being operated. Leaves, dirt, dust, debris, grass clippings, cuttings or trimmings from trees or shrubs or any other type of litter or debris shall not be blown, swept or raked onto or into an adjacent street or gutter, except by municipal employees or municipal contractors or leaf blower operators placing leaves, dust, dirt, grass clippings, cuttings and trimmings from trees and shrubs on a municipal street or sidewalk for collection and pick-up, during municipal street and sidewalk sweeping and cleaning operations. In no event shall leaves, dirt, dust, debris, grass clippings, cuttings or trimmings from trees or shrubs or any other type of litter or debris be blown, swept or raked onto or into catch basins or onto vehicles, persons or pets. Deposits of leaves, dirt, dust, debris, grass clippings, cuttings or trimmings from trees or shrubs or any other type of litter or debris shall be removed and disposed of in a sanitary manner which will prevent dispersement by wind, vandalism or similar means.

e. All leaf blowers shall satisfy the emissions standards of the United States Environmental Protection Agency and noise level standards as follows: the sound emitted from any leaf blower shall be rated by the manufacturer to be no greater than 65 decibels.

f. On parcels of 10,000 square feet or less, only one leaf blower at a time may be used, and on parcels larger than 10,000 square feet, only one leaf blower may be used within each 10,000 square foot area.

(Ord. 1311, Added, 12/10/2007)

8.16.081.3 Fees.

A fee for the City to recover all costs connected with emission or sound testing and enforcement may be charged in an amount set by the License Commission and approved by the City Manager.

(Ord. 1311, Added, 12/10/2007)

8.16.081.4 Regulations

The License Commission and the Commissioner of Public Works shall have the authority to promulgate regulations to implement the provisions of this Leaf Blower Ordinance.

(Ord. 1311, Added, 12/10/2007)

8.16.081.6 Severability.

The provisions of this Chapter are severable. If any section, provision or portion of this Chapter is determined to be invalid by a court of competent jurisdiction, the remaining provisions of this Chapter shall continue to be valid.

(Ord. 1311, Added, 12/10/2007)

8.16.081.7 Effective Date.

The provisions of this Leaf Blower Ordinance shall be effective commencing on March 1, 2008 except as to City of Cambridge contracts now in effect, as to which the provisions of this Leaf Blower Ordinance shall be effective commencing on September 15, 2008.

(Ord. 1311, Added, 12/10/2007)

8.16.090 Exceptions and variances.

A. Emergency Exception. The provisions of this chapter shall not apply to (a) the emission of sound for the purpose of alerting persons to the existence of an emergency, or (b) the emission of sound in the performance of emergency work.

B. Special Variances.

1. The License Commission shall have the authority, consistent with this section, to grant special variances which may be requested pursuant to any section of this chapter.

2. Any person seeking a special variance pursuant to this section shall file an application with the License Commission. The application shall contain information which demonstrates that bringing the source of sound or activity for which the special variance is sought into compliance with this chapter would constitute an unreasonable hardship on the applicant, on the community, or on other persons. Notice of an application for a special variance shall be published according to procedure. Any individual who claims to be adversely affected by allowance of the special variance may file a statement with the License Commission containing any information to support his claim. If the License Commission finds that a sufficient controversy exists regarding an application, a public hearing may be held.

3. In determining whether to grant or deny the application, the License Commission shall balance the hardship to the applicant and the community, of not granting the special variance, against the adverse impact on the health, safety, and welfare of persons affected, the adverse impact on property affected, and any other adverse impacts of granting the special variance. The License Commission shall also consider whether the noise disturbance occurs in or across a buffer zone. Buffer zones shall be the imaginary line along the ground surface, its vertical extension, and the area at fifty feet on either side of the line, which separates a residential area from a commercial area or an industrial area. Applicants for special variances and other persons contesting special variances may be required to submit any information the License Commission may reasonably require. In granting or denying an application, the License Commission shall place on public file a copy of the decision and the reasons for denying the special variance.

4. Special variances shall be granted by notice to the applicant containing all necessary conditions, including a time limit on the permitted activity. The special variance shall not become effective until all conditions are agreed to by the applicant. Noncompliance with any condition of the special variance shall terminate it and subject the person holding it to those provisions of this chapter regulating the source of sound or activity for which the

special variance was granted.

5. Application for extension of time limits specified in special variances or for modification of other substantial conditions shall be treated like applications for initial special variances under subdivision (2).

6. The License Commission may issue guidelines defining the procedures to be followed in applying for a special variance and the criteria to be considered in deciding whether to grant a special variance.

C. Variances for Time to Comply.

1. Within sixty days following the effective date of the ordinance codified in this chapter, the owner of any commercial or industrial source of sound may apply to the License Commission for a variance in time to comply with Section 8.16.080I, vibration, or Section 8.16.060, measured noise disturbance.

2. Any person seeking a variance in time to comply shall file an application with the License Commission. The application shall contain information which demonstrates that bringing the source of sound or activity for which the variance is sought into compliance with this chapter prior to the date requested in the application would constitute an unreasonable hardship on the applicant, on the community, or on other persons. Notice of an application for a variance in time to comply shall be published according to procedure. Any individual who claims to be adversely affected by allowance of the variance in time to comply may file a statement with the License Commission containing any information to support his claim. If the License Commission finds that a sufficient controversy exists regarding an application, a public hearing may be held.

3. In determining whether to grant or deny the application, the License Commission shall balance the hardship to the applicant and the community, of not granting the variance in time to comply against the adverse impact on health, safety, and welfare of persons affected, the adverse impact on property affected, and any other adverse impacts of granting the variance. The License Commission shall also consider whether the noise disturbance occurs in or across a buffer zone. Buffer zones shall be the imaginary line along the ground surface, its vertical extension and the area at fifty feet on either side of the line which separates a residential area from a commercial area or an industrial area. Applicants for variances in time to comply and persons contesting variances may be required to submit any information the License Commission may reasonably require. In granting or denying an application, the License Commission shall place on public file a copy of the decision and the reasons for denying or granting the variance in time to comply.

4. Variances in time to comply shall be granted to the applicant containing all necessary conditions, including a schedule for achieving compliance. The variance in time to comply shall not become effective until all conditions are agreed to by the applicant. Noncompliance with any condition of the variance shall terminate the variance and subject the person holding it to those provisions of this chapter for which the variance was granted.

5. Application for extension of time limits specified in variances in time to comply or for modification of other substantial conditions shall be treated like applications for initial variances under subsection B of Section 8.16.090, except that the License Commission must find that the need for the extension or modification clearly outweighs any adverse impacts of granting the extension or modifications.

6. The License Commission may issue guidelines defining the procedures to be followed in applying for a variance in time to comply and the criteria to be considered in deciding whether to grant a variance.

D. Reconsideration. Any person aggrieved by a decision or action of the authorized enforcement officials may, within ten business days of said decision or action, request reconsideration of same by the official.

(Ord. 1121 (part), 1991)

8.16.100 Miscellaneous.

A. Severability. It is the intention of the City Council that each separate provision of this chapter shall be deemed independent of all other provisions herein, and it is further the intention of the City Council that if any provision of this chapter be declared to be invalid, all other provisions thereof shall remain valid and enforceable.

B. All ordinances or parts of ordinances inconsistent herewith are repealed.

C. This chapter shall take effect thirty days after its adoption.

(Ord. 1121 (part), 1991)

Boston

CITY OF BOSTON

AIR POLLUTION CONTROL COMMISSION

BOSTON CITY HALL

BOSTON, MASSACHUSETTS 02201

REGULATIONS FOR THE CONTROL OF NOISE IN THE CITY OF BOSTON

The Air Pollution Control Commission of the City of Boston, acting under the authority granted in Chapter 40, Section 21 of the General Laws of the Commonwealth of Massachusetts, and by the City of Boston Code, Ordinances, Title 7, Section 50, hereby adopts the following Regulations for the Control of Noise in the City of Boston.

DEFINITIONS

1. COMMISSION means the Air Pollution Control Commission of the City of Boston, or its successor as may hereinafter be designated.

2. PERSON means an individual, partnership, association, firm, syndicate, company, trust, corporation, department, bureau or agency, or any other entity recognized by law as the subject of rights and duties.

3. NOISE POLLUTION means the presence of that amount of acoustic energy for that amount of time necessary to:

   a) cause temporary or permanent hearing loss in persons exposed;

   b) otherwise be injurious, or tend to be, on the basis of current information, injurious, to the public health or welfare;

   c) cause a nuisance;

   d) interfere with the comfortable enjoyment of life and property or the conduct of business; or

   e) exceed standards or restrictions established herein or pursuant to the granting of any permit by the Commission.

4. Acoustical terminology used throughout these Regulations is that most recently approved as American Standard Acoustical Terminology by the American National Standards Institute (ANSI); except as may be specified otherwise herein.

5. dB is the abbreviation for decibel.

6. Hz is the abbreviation for Hertz, and is equivalent to cycles per second.

7. SOUND PRESSURE LEVEL (SPL) shall be numerically equal to 20 times the logarithm (to the base 10) of the ratio of the sound pressure to the reference sound pressure (the reference sound pressure shall be equal to 20 micropascals.) Unless otherwise stated, the level is understood to be that of a root-mean-square pressure.

8. dBA shall mean the A-weighted sound level in decibels, as measured by a general-purpose sound level meter complying with the provisions of the American National Standards Institute, "Specifications for Sound Level Meters (ANSI S1.4 1983)", properly calibrated, and operated on the "A" weighting network.

9. L_{10} LEVEL shall mean the A-weighted sound level exceeded ten per cent of the time.

10. DAYTIME shall mean the period between the hours of seven *ante meridian* (7:00 AM) and six *post meridian* (6:00 PM) daily except Sunday according to the time system locally in effect.

11. ZONING DISTRICTS shall mean the zoning districts and land uses therein as established by the Zoning Code of the City of Boston.

12. RESIDENTIAL USE shall include Use Items Numbers 1 through 15 inclusive and Number 53 of Section 8-7 of the Boston Zoning Code.

13. INSTITUTIONAL USE shall include Use Items Numbers 16, 17, 18, 20, 21, 22, 23, 24, 25, 29, and 33 of Section 8-7 of the Boston Zoning Code. It shall also include courthouses.

14. BUSINESS USE shall include Use Items Numbers 19, 26, 32, 34 through 52 inclusive, and 61 of Section 8-7 of the Boston Zoning Code.

15. RECREATIONAL USE shall include Use Items Numbers 27 and 28 of Section 8-7 of the Boston Zoning Code.

16. INDUSTRIAL USE shall include Use Items Numbers 68, 69, and 70 of Section 8-7 of the Boston Zoning Code.

17. MOTOR VEHICLE shall be defined as in the General Laws of the Commonwealth, Chapter 90, Section 1, titled Definitions.

18. LIGHT MOTOR VEHICLE shall be defined as all motor vehicles having a gross vehicle weight of 10,000 pounds or less.

19. HEAVY MOTOR VEHICLE shall be defined as all motor vehicles having a gross vehicle weight in excess of 10,000 pounds.

20. MOTORCYCLE shall be defined as in the General Laws of the Commonwealth, Chapter 90, Section 1, titled Definitions.

21. CONSTRUCTION shall mean any and all physical activity necessary or incidental to the erection, placement, demolition, assembling, altering, cleaning, repairing, installing, or equipping of buildings and other structures, public or private highways, roads, premises, parks, utility lines, or other property, and shall include land clearing, grading, excavating, filling, and paving.

22. CONSTRUCTION SITE shall mean that area within which a contractor confines a construction operation. This includes defined boundary lines of the project itself plus any contractor staging area outside those defined boundary lines used expressly for the construction.

23. CONSTRUCTION DEVICE shall mean any powered device or equipment, designed and intended for use in construction. Examples of "construction devices" are: Air compressors, bulldozers, backhoes, trucks, shovels, derricks, and cranes.

24. IMPACT DEVICE shall mean a construction device in which or by which a hammer, meaning a moving mass of hard solid material, is mechanically, by means of a working fluid, caused to repetitively impact upon and transmit kinetic energy to a tool. The tool may be included as part of the device, as in the case of a moil in a paving breaker or the drill steel of a jackhammer, or it may be a mass to which the impact device is temporarily connected as in the case of a pile and a pile driver. Examples of "impact devices" are: Pile drivers, paving breakers and power impact hammers, impact wrenches, riveters and stud drivers.

    a) PAVING BREAKER shall mean any hydraulically or pneumatically powered impact device intended to cut or trench pavement, sub-base macadam, gravel, concrete or hard ground.

    b) PILE DRIVER shall mean an impact device designed or used for the driving of piles, columns and other supports into soil or other material by means of impact, vibrations, pressure or other means.

25. HOMEOWNER'S LIGHT RESIDENTIAL OUTDOOR EQUIPMENT means all engine- or motor-powered garden or maintenance tools intended for repetitive use in residential areas, typically capable of being used by a homeowner. Examples of Homeowner's Light Residential Outdoor Equipment are: Lawn mowers, garden tools, riding tractors, snow blowers, snow plows, etc.

26. COMMERCIAL SERVICE EQUIPMENT means all engine- or motor-powered equipment intended for infrequent service work in inhabited areas, typically requiring commercial or skilled operators. Examples of Commercial Service Equipment are: Chain saws, log chippers, paving rollers, etc.

REGULATIONS FOR THE CONTROL OF NOISE

IN THE CITY OF BOSTON

REGULATION 1: General Prohibition of Noise Emissions

No person or persons owning, leasing, or controlling the operation of any source or sources of noise shall willfully, negligently, or through failure to provide necessary equipment or facilities or to take necessary precautions, permit the establishment of a condition of noise pollution.

REGULATION 2: Noise Restrictions According to Zoning Districts

2.1 This Regulation shall apply to the use or occupancy of any lot or structure thereon and to the noise produced thereby, but shall not apply to the following:

a) The intermittent or occasional use, during the daytime, of homeowner's light residential outdoor equipment or commercial service equipment, provided said equipment and its use complies with other provisions of these Regulations;

b) Construction activities and the associated use of construction devices nor to the noise produced thereby, provided such activities, and such equipment and its use complies with other provisions of these Regulations;

c) The operation of any motor vehicle on any public way, nor to the noise produced thereby.

2.2 Noise in Residential Zoning Districts or Affecting Residential or Institutional Property

No person shall create or cause to be emitted from or by any source subject to Regulation 2, any noise which causes or results in a maximum noise level, measured at any lot line of any lot located in any Residential Zoning District or in residential or institutional use elsewhere in compliance with the Boston Zoning Code, in excess of any level of the "Residential District Noise Standard", Regulation 2.5; provided that if said lot is located in any Industrial Zoning District, the maximum noise level, measured at the lot line, shall not exceed any level of the "Residential-Industrial Noise Standard", Regulation 2.5.

2.3 Noise in Business Zoning Districts

No person shall create or cause to be emitted from any source subject to Regulation 2, any noise which causes or results in a maximum noise level, measured at any lot line of any lot in any Business Zoning District other than a lot in residential or institutional use in conformance with the Boston Zoning Code, in excess of any level of the "Business District Noise Standard", Regulation 2.5.

2.4 Noise in Industrial Zoning Districts

No person shall create or cause to be emitted from or by any source subject to Regulation 2, any noise which causes or results in a maximum noise level, measured at any lot line of any lot in recreational or business use in any Industrial Zoning District in conformance with the Boston Zoning Code, in excess of any level of the "Industrial District Noise Standard", Regulation 2.5.

2.5 Zoning District Noise Standards

Noise standards referred to in these Regulations for the several zoning districts of the City of Boston, as defined in and established pursuant to the Boston Zoning Code, are as established by the following table:

TABLE OF ZONING DISTRICT NOISE STANDARDS

Maximum Allowable Octave Band Sound Pressure Levels

Octave Band Center Frequency of Measurement	Residential		Residential / Industrial		Business	Industrial
(Hz)	Daytime	All Other Times	Daytime	All Other Times	Anytime	Anytime
31.5	76	68	79	72	79	83
63	75	67	78	71	78	82
125	69	61	73	65	73	77
250	62	52	68	57	68	73
500	56	46	62	51	62	67
1000	50	40	56	45	56	61
2000	45	33	51	39	51	57
4000	40	28	47	34	47	53
8000	38	26	44	32	44	50
Single Number Equivalent	60 dBA	50 dBA	65 dBA	55 dBA	65 dBA	70 dBA

REGULATION 3: Restrictions on Noise Emitted from Construction Sites

3.1 Except as provided for in Regulation 3.3 and 3.4, it shall be unlawful for any person to operate any construction device or devices on any construction site if the operation of such device or devices emits noise, measured at the lot line of the affected property, in excess of the values shown below:

Lot Use of Affected Property	L_{10} level	Maximum Noise Level
Residential or Institutional	75 dBA	86 dBA
Business or Recreational	80 dBA	--
Industrial	85 dBA	--

The same level shall apply to any public way as applies to an industrial use. Measurements should not be taken closer than fifteen (15) meters (50 feet) from the nearest active construction device on the construction site. The maximum noise level shall be measured on the sound level meter on "Slow" response.

3.2 The L_{10} level shall be determined in the following manner:

a) Every ten seconds, on the mark, the A-weighted noise level on the sound level meter on "slow" response is recorded until one hundred (100) observations have been made. If, during any of these observations, a measurement is substantially affected by any source outside the construction site (such as an aircraft overflight), measurements made during these periods will not be considered. However, the observation period shall be extended until 100 valid measurements are obtained. The L_{10} level will be that level that is equal to the tenth highest level recorded.

b) If, in the estimation of the person taking the measurements, outside noise sources contribute significantly to the noise level, the above procedure shall be repeated (with the same outside noise source contributions) when construction is inactive, in order to determine the existing background L_{10} level. The L_{10} level during construction must exceed the background L_{10} level by five (5) dBA to be considered a violation of Regulation 3.1.

3.3 Except as provided for in Regulation 3.4, it shall be unlawful to operate a construction device at any street excavation, grading or repair, utility street work installation or repair, which produces a noise level exceeding 86 dBA at a distance of fifteen meters (50 feet) from the device.

The provisions of Regulation 3.1 shall not apply to any construction site covered by Regulation 3.3. The provisions of Regulation 3.3 will not be applicable to any construction device used in emergency service work that is necessary to return utility service to an area, provided that within 24 hours such device is brought into compliance with Regulation 3.3, or is not reused within the City until it does comply.

3.4 The provisions of Regulations 3.1 and 3.3 shall not be applicable to impact devices.

REGULATION 4: Restrictions on Noise Emitted by New Motor Vehicles

No person shall sell or lease a new motor vehicle that produces a maximum noise level, in dBA, exceeding the following limits (measured at a distance of fifteen (15) meters (50 feet) from the center-line of travel, in accordance with procedures established by the Commission), provided that at such time as the United States Environmental Protection Agency (USEPA) shall promulgate noise emission regulations or standards covering any class of motor vehicles, this regulation shall automatically be amended to prescribe noise emission limits identical to those of the USEPA for the class or classes of vehicles involved, without, however, in any way affecting the limits for vehicles for which the USEPA has not established regulations or standards. The preceding proviso is intended to satisfy the requirements of Section 6 (e) (1) (A) of the Noise Control Act of 1972.

Date of Manufacture of Vehicle	Light Motor Vehicle	Heavy Motor Vehicle	Motorcycle
After January 1, 1970	--	88	88
Before January 1, 1973	86	--	--
After January 1, 1973	84	86	86
After January 1, 1975	80	84	84
After January 1, 1978	--	83	--
After January 1, 1982	--	80	75

REGULATION 5: Restriction on Noise Emitted from New Outdoor Powered Equipment for Sale or Lease – Other than Pile Drivers

No person shall sell or lease any new outdoor powered equipment that produces a maximum noise level, in dBA, exceeding the following limits (measured at a distance of fifteen (15) meters (50 feet), under test procedures established by the Commission); provided that at such time as the United States Environmental Protection Agency (USEPA) shall promulgate noise emission regulations or standards covering any product covered by this Regulation, this Regulation shall automatically be amended to prescribe noise emission limits identical to those of the USEPA for the product or products involved, without, however, in any way affecting the limits for other products for which the USEPA has not established regulations or standards. The preceding proviso is intended to satisfy the requirements of Section 6 (e) (1) (A) of the Noise Control Act of 1972.

Date of Manufacture of Equipment	Homeowner's Light Residential Outdoor Equipment	Commercial Service Equipment and Construction Devices (other than Pile Drivers)
After January 1, 1973	74	88
After January 1, 1975	70	85
After January 1, 1978	65	--
After January 1, 1980	--	80

REGULATION 6: Permits - General

6.1 A permit shall constitute permission to use or to allow the use of a device or to engage in an activity to which reference has been made in these Regulations or in the Ordinances of the City of Boston.

6.2 All applications for permits shall be made to the Air Pollution Control Commission in such form as it shall prescribe. Such application shall not relieve any person from otherwise complying with the provisions of these Regulations or any other law or ordinance.

6.3 Such permit shall include such provisions and conditions as the Commission may deem necessary to protect the public health, welfare and comfort.

6.4 Any permit required by these Regulations shall be displayed to any police officer or employee of the Air Pollution Control Commission upon request.

6.5 Any permit issued by the Air Pollution Control Commission under the provisions of these Regulations may be revoked for violation of any of the terms and conditions of such permit.

REGULATION X: Conflict with other Regulations

The noise regulations shall not relieve any person from complying with other laws, statutes, codes, regulations, or ordinances of the Commonwealth or the City of Boston.

REGULATION Y: Variances

The Commission may grant variances after public hearing or may reject applications on review without a hearing. Variances thus granted may be effective for no longer than one year.

REGULATION Z: Severability

Each of these Regulations shall be construed as separate to the end that if any Regulation or section, sentence, clause or phrase thereof shall be held invalid for any reason, the remainder of these Regulations shall continue in full force.

DIVISION 2. - NOISE CONTROL ORDINANCE

SOMERVILLE

Footnotes:

*--- (**CH009_11**) ---*

***Editor's note—** Ord. No. 2000-11, §§ I—VII, IX, adopted Nov. 22, 2000, did not specify manner of codification, hence; inclusion of these provisions as §§ 9-112—9-119 was at the discretion of the editor. In the event of conflict it is presumed that the more recent provisions will prevail.*

Sec. 9-112. - Noise prohibition.

It shall be unlawful for any person to make, continue or cause to be made or continued any loud, unnecessary or unusual noise or any noise which either annoys, disturbs, injures or endangers the comfort, repose, health, peace, or safety of others within the limits of the city.

(Ord. No. 2000-11, 11-22-2000)

Sec. 9-113. - Noise control ordinance purpose.

(a) *Findings.* Excessive sound and vibration are serious hazards to the public health, welfare, safety, and quality of life. The people have a right to, and should be ensured, an environment free from excessive sound and vibration that may jeopardize their health, welfare, safety, or quality of life.

(b) *Intent and purpose.* It is the intent and purpose of this section to prevent excessive noise and excessive vibration and to limit, control, and eliminate excessive noise and excessive vibration in general from whatever source.

(c) *Construction.* This section is intended to prohibit preventable and unnecessary noise and is not intended, nor shall it be construed, to regulate the usual and customary noise incidental to urban life. Due consideration shall be given to the zone in which the establishment is located and the customary and natural noise incident to the operation of businesses or industries permitted in the area zoned shall be considered so as not to work an undue hardship upon lawful business establishments.

(d) *Scope.* This section shall apply to the control of all sound and vibration originating within the city, unless otherwise exempted by law.

(Ord. No. 2000-11, 11-22-2000)

Sec. 9-114. - Noise control standard.

The standard which may be considered in determining whether a violation of the provisions of this section exists may include, but not be limited to, the following:

(1) The level of noise;

(2) The time of day or night of noise;

(3) Duration of noise;

(4) Whether the noise is recurrent, intermittent, or constant;

(5) Whether the nature of the noise is usual or unusual;

(6) Whether the origin of the noise is natural or unnatural;

(7) The level and intensity of the background noise, if any;

(8) The proximity of noise to residential sleeping facilities;

(9) The density of the inhabitation of the area within which the noise emanates; and

(10) The nature of the zoning area within which the noise emanates.

(Ord. No. 2000-11, 11-22-2000)

Sec. 9-115. - Definitions.

Ambient noise shall be mean the all-encompassing noise associated with a given environment, being either a composite of sounds transmitted by any means from many sources near and far or a single, predominant source.

Authorized emergency vehicle shall mean any of the following vehicles when equipped and identified according to law:

(1) A vehicle of a fire department;

(2) A publicly owned police vehicle or a privately owned vehicle used by a police officer for police work under agreement, express or implied, with the authority to which he or she is responsible;

(3) An ambulance, whether publicly or privately owned;

(4) An emergency vehicle of a city department or a public service corporation.

Commercial area shall mean any area defined as an office or business district by the zoning ordinance.

Construction shall mean any site preparation, assembly, erection, substantial repair, alteration, or similar action, but excluding demolition.

Decibel, db or *db(A)* shall mean the weighted sound level measured by the use of metering characteristics and the prescribed A-weighting frequency response specified in American National Standards SL.4. 1971 as established by the American National Standards Institute, Inc.

Demolition shall mean any dismantling, intentional destruction or removal of structures, utilities, public or private right-of-way surfaces, or similar property.

Emergency shall mean any occurrence or set of circumstances involving actual or imminent physical trauma or property damage, which demands immediate action.

Emergency work shall mean any work performed for the purpose of preventing or alleviating the trauma or property damage threatened or caused by an emergency.

Industrial zone shall mean any area defined as an industrial district by the Somerville Zoning Ordinance.

Motor vehicle shall mean any vehicle so defined in G.L. c. 90, § 1.

Motorboat shall mean any vehicle so defined in G.L. c. 90B, § 1.

Motorcycle shall mean any vehicle so defined in G.L. c. 90, § 1.

Noise disturbance shall mean any sound which (a) causes temporary or permanent hearing loss in persons exposed; or (b) is injurious to the public health; or (c) causes a nuisance; or (d) is defined as a noise disturbance pursuant to the provisions of this chapter; (e) which either annoys, disturbs, injures or endangers the comfort, repose, health, peace, or safety of others within the limits of the city.

Official traffic-control device shall mean any traffic light, stop or yield sign, official or police officer.

Person shall mean any individual, association, partnership, or corporation, and includes any officer, employee, department, agency or instrumentality of a state or any political subdivision of a state.

Public right-of-way shall mean any street, avenue, boulevard, highway, sidewalk, alley, or similar place, which is owned or controlled by a governmental entity.

Public space shall mean any property or structures thereon which are owned or controlled by a governmental entity.

Residential area means any area defined as a residence district by the zoning ordinance.

Sound for the purposes of the "duration of sound" column in the table of section 9-117, includes continuous, continual and intermittent sounds transmitted by any means, the interval of silence between which does not exceed ten seconds.

Vibration perception threshold shall mean the minimum ground, or structure, borne vibration motion necessary to cause a normal person to be aware of the vibration by such direct means as, but not limited to, sensation by touch or visual observation of moving objects.

Violation shall mean a determination by an enforcing agent, officer or employee that a noise disturbance has occurred.

(Ord. No. 2000-11, 11-22-2000)

Sec. 9-116. - Noise disturbances.

Noise disturbances prohibited. The following acts are declared to be loud, disturbing and unnecessary noises in violation of this section, but said enumeration shall not be deemed to be exclusive.

(1) *Air conditioners.* It shall be unlawful for any person to maintain any refrigeration machinery or air conditioning, consisting of air compressors or rotating or reciprocating machinery, in such manner as to create a noise disturbance.

(2) *Animals and birds.* Owning, possessing or harboring any animal or bird which creates a noise disturbance.

(3) *Construction.* Unless otherwise authorized by the enforcing authority, based on consideration of the factors contained in section 9-114 of this chapter, the public convenience and consultation with the ward councilor, it shall be unlawful to operate or permit the operation of any tools, pile drivers, hammers or equipment used in construction, drilling, demolition, or similar work, or otherwise conduct any related activity before 7:00 a.m. and after 7:00 p.m. on weekdays, or before 9:00 a.m. and after 7:00 p.m. on Saturdays, and the day after Thanksgiving and Christmas (unless such day falls on a Sunday), or anytime on Sundays and Massachusetts Legal Holidays (as published by the Secretary of the Commonwealth), such that the sound therefrom creates a noise disturbance.

(4) *Domestic power tools.* Operating or permitting the operation of any mechanically powered saw, sander, drill, grinder, lawn or garden tool, or similar device used outdoors in residential areas between the hours of 9:00 p.m. and 7:00 a.m. on weekdays, or between 9:00 p.m. and 9:00 a.m. on Saturdays, Sundays, and state and federal holidays so as to cause a noise disturbance.

(5) *Alarms.*

a. Sounding or permitting the sounding of any exterior burglar or fire alarm or any motor vehicle burglar alarm unless such alarm is automatically terminated within minutes of activation and does not sound again at all within the hour.

b. Each ten minute interval of sounding, or part thereof, within an hour after the initial ten minute sounding shall constitute a separate violation.

c. Fines for the sounding of burglar or fire alarms in violation of this section may be assessed against the owner or the occupant of the building in which the alarm is located.

d. Any motor vehicle, located on either public or private property, whose alarm has been sounding in excess of ten minutes in an hour, is hereby deemed to be a public nuisance subject to immediate abatement. To effect abatement, police must have reasonable evidence that the sounding has lasted in excess of ten minutes, and then make reasonable efforts to contact the owner of such vehicle to either have the owner shut off the alarm or to authorize police to arrange for the shut-off of the alarm. If such efforts are unsuccessful, police are hereby authorized to abate the nuisance by arranging for tow company employees to shut off the alarm and/or to tow the motor vehicle to a storage area or other place of safety. In addition to any fines for violating this section, the registered owner of the motor vehicle shall be responsible for all reasonable expenses, costs and charges incurred by the deactivation of the alarm, and by the removal and storage of such vehicle.

(6) *Stationary nonemergency signaling devices.*

a. Sounding or permitting the sounding of any single from any bell, chime, siren, whistle, or similar device, intended primarily for nonemergency purposes, from any place, for more than ten minutes in any hourly period.

b. Devices used in conjunction with places of religious worship shall be exempt from the operation of this provision.

(7) *Engine exhausts.* The discharge into the open air within the city of the exhaust of any steam engine, gasoline engine, stationary internal combustion engine, or other kind or type of engine, or motor vehicle, except through a muffler or other device which will effectively prevent loud or explosive noises therefrom, provided that fines for such noise disturbance shall be provided for in G.L. c. 90, § 16.

(8) *Explosives, firearms, and similar devices.* The use or firing of explosives, firearms, firecrackers, or similar devices which create impulsive sound so as to cause a noise disturbance.

(9) *Defect in vehicle or load.* The use within the city of any wagon, cart, motor vehicle, truck, motorcycle, or other vehicle, so out of repair or loaded in such manner or with material of such nature as to create loud and unnecessary grating, grinding, rattling or other noises.

(10) *Horns and other signaling devices.* The sounding of any horn or signaling device on any motor vehicle, motorcycle, or other vehicle on any street or public place of the city, except as a danger warning; the creation by means of any such signaling device of any unreasonably loud or harsh sound; the sounding of any such device for an unnecessary and unreasonable period of time; the use of any signaling device except one operated by hand or electricity; the use of any horn, whistle or other device operated by engine exhaust; and the use of any such signaling device when traffic is for any reason held up. The use of sirens, except by authorized emergency vehicles, is prohibited.

(11) *Loading and unloading.* Loading, unloading, opening, closing or other handling of boxes, crates, containers, building materials, garbage cans, dumpsters or similar objects between the hours of 7:00 p.m. and 7:00 a.m. in such a manner as to cause a noise disturbance.

(12) *Loudspeakers and public address system.* Unless otherwise permitted by a duly authorized agent of the city, using or operating for any purpose any loudspeaker, public address system, or similar device (1) such that the sound therefrom creates a noise disturbance; or (2) between the hours of 10:00 p.m. and 7:00 a.m.

(13) *Radios, television sets, musical instruments, and similar devices.* Operating, playing or permitting the operation or playing of any radio, television, phonograph, drum, musical instrument, sound amplifier, or similar device which produces, reproduces, or amplifies sound between the hours of 11:00 p.m. and 7:00 a.m. in such a manner as to create a noise disturbance.

(14) *Shouting.* Shouting, yelling, hooting, whistling, or singing on the public streets, particularly between the hours of 11:00 p.m. and 7:00 a.m. or at any time or place so as to create a noise disturbance.

(15) *Street sales.* Offering for sale or selling anything by shouting or outcry within any residential or commercial area of the city, except in a stadium or sports arena. Ice cream trucks shall be exempt from this section.

(16) *Vehicle repairs and testing.* Repairing, rebuilding, modifying, or testing any motor vehicle, motorcycle, or motorboat in such a manner as to cause a noise disturbance.

(17) *Vibration.* Operating or permitting the operation of any device that creates vibration which is above the vibration perception threshold of an

individual at or beyond the property boundary of the source if on private property or at 50 feet from the source if on a public space or public right-of-way.

(Ord. No. 2000-11, 11-22-2000; Ord. No. 2016-13 , 8-25-2016; Ord. No. 2018-05 , 4-12-2018)

Sec. 9-117. - Noise levels.

It shall be unlawful to make, continue, or cause to be made or continued, any noise in excess of the noise levels set forth in subsection (1) unless such noise is reasonably necessary to the preservation of life, health, safety or property.

(1) Measurement of noise. Any activity, not expressly exempted by this section, which creates or produces sound, regardless of frequency, exceeding the ambient noise levels at the property line of any property, or if a condominium or apartment house, within any adjoining apartment, above the ambient noise levels as designated in the following table, at the time and place and for the duration then mentioned, shall be deemed to be a violation of this article, but the following enumeration shall not be deemed to be exclusive:

Duration of Sound	I	II	III
	7 AM 6 PM (all districts)	6 PM 10 PM (residential districts) 6PM 7AM (all other districts)	10 PM 7 AM (residential districts)
Less than 10 minutes	75 db	70 db	60 db
Between 10 minutes and 2 hours	70 db	60 db	50 db
In excess of 2 hours	60 db	50 db	40 db

(2) In determining whether a particular sound exceeds the maximum permissible sound level in the table set out in subsection (1):

a. Sounds in excess of the residential district limitations as measured in a residential district are violations of this section whether the sound originates in a residential district or any other district.

b. During all hours of Sundays and state and federal holidays, the maximum allowable decibel levels for residential districts are as set forth in column III of the table.

(3) Noise emanating from the operation of the following are exempt from the application of this section:

a. Motor vehicles on a public highway;

b. Outdoor implements such as power lawn mowers, power hedge clippers and power saws;

c. Pile drivers, jackhammers and other construction equipment.

(4) A guide to noise. The intensity of noise is measured in decibels (db). Its measurement is logarithmic, which means that each decibel increase of ten, is a ten times increase in the level of noise:

130 is 10 times greater than 120

130 is 100 times greater than 110

A guide to the noise intensity:

30 decibels is considered
very quiet

50 decibels is considered
moderately quiet

80 decibels is considered
annoying

100 decibels is considered
intolerable

140 decibels is considered
threshold of pain

180 decibels is considered
lethal

Applying the decibel scale to everyday, we find:

LEVEL	DECIBELS
Lethal Level	180 Rocket engine
	150 Jet plane at takeoff
Pain Threshold	120 Machine gun at close range
	120 Pneumatic chipper
	115 House party, 4 piece rock band
	115 Jet airliner (500 ft. overhead)
	111 Motorcycle
	108 Pneumatic hammer, 6ft. away
	107 Power mower
	104 Walking near a helicopter
Discomfort and Danger Area	102 Outboard motor

	102 Outside, jet taking off at airport
	100 Heavy automobile traffic or jet, aircraft passing overhead
	100 Train stopping in station
	100 150 cubic foot air compressor
	98 Farm tractor
	96 Pushing a power lawn mower
	95 Subway train
	95 At a seat in subway, windows open
	94 Inside a jet airplane on take off
	93 Food blender
	92 Screaming child
Hearing Damage (8 hours)	90 Bus idling, heavy city noises
	90 Niagara Falls at base, garbage disposal
	88 Propeller aircraft flyover at 1,000 ft.
	86 Sports car running in street
	85 Garbage truck, 200 ft. away
	82 Traffic at a residential intersection
Recommended Maximum Noise Level	75 Average traffic
	75 Vacuum cleaner, dishwasher
	70 Automobile, home air conditioner
	60 Conversational speech
	60 Large office
	55 Window air conditioner
	50 Quiet restaurant
	45 Homes
	40 Quiet office
	35 Library
	30-40 Refrigerator
	30 Whispering
	20 Leaves rustling in breeze
	20 Broadcasting studio
	10 Normal breathing
	0 Audibility Threshold (level of weakest sound that can be heard by young person with excellent hearing)

(Ord. No. 2000-11, 11-22-2000)

Sec. 9-118. - Enforcement.

The provisions of this section shall be enforced by the chief of police, the superintendent of inspectional services, and their duly authorized agents, officers and employees, by a noncriminal disposition pursuant to Massachusetts General Laws Chapter 40 Section 21D. Each violation shall be deemed a separate offense. Unless otherwise provided, any person, firm, corporation, association or other entity violating any provision of this section shall be punished by a fine in accordance with the provisions of section 1-11. Nothing in this provision shall be deemed to limit the use of other lawful methods of abating violations of this section, including but not limited to application for equitable relief from a court of law.

(Ord. No. 2000-11, 11-22-2000; Ord. No. 2006-09 , § K, 4-11-2006)

Sec. 9-119. - Additional noise policies.

The chief of police and superintendent of inspectional services are hereby authorized and empowered to make and adopt such policies as they deem proper and necessary for the implementation of this division for the better protection of the health, welfare and safety of the city.

(Ord. No. 2000-11, 11-22-2000)

Appendix 5-6

EMF Report

Electrical Engineering and Computer Science Practice

Exponent®

Greater Cambridge Energy Program

Magnetic-Field Assessment

Greater Cambridge Energy Program

Magnetic-Field Assessment

Prepared for

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December 13, 2021

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Executive Summary

As part of the Greater Cambridge Energy Program NSTAR Electric Company, d/b/a Eversource Energy (Eversource), has proposed to increase power and transmission connectivity to the greater Cambridge area in Massachusetts by connecting 115-kilovolt (kV) underground transmission lines to the proposed below-grade East Cambridge Substation (New Substation), located between Binney Street and Broadway in Cambridge.

Eversource requested that Exponent model the 60-Hertz (Hz) magnetic fields associated with the 115-kV underground transmission lines proposed to connect between the New Substation to existing substations in the greater Cambridge area at expected average and peak loading. Such underground transmission lines do not produce an electric field; it is completely contained within the underground cables.

The underground transmission lines will divert from Broadway as they enter the New Substation. Exponent also measured 60-Hz magnetic fields around the New Substation site and along the routes of the proposed transmission lines proposed to connect the New Substation to existing substations in the greater Cambridge area. The average of magnetic fields from existing sources measured at the site of the proposed New Substation were quite low (0.3 to 1.1 milligauss [mG]). Measured magnetic-field levels along the routes of the proposed transmission lines ranged from 0.01 mG to 32 mG with the average along the routes ranging from 0.8 to 2.0 mG. These background levels along both routes were quite similar and were so low that existing sources were not considered to add to calculated post-project magnetic-field levels. Five proposed transmission line duct bank configurations were modeled to describe the magnetic-field levels along the proposed transmission line routes between the proposed New Substation and the existing Somerville #402, Brighton #329, Kendall #800, East Cambridge #875, and Putnam #831Substations.

Results of this modeling show that for all transmission line duct bank configurations, the highest magnetic field was located above the respective duct bank and decreased rapidly with distance from the duct bank. At average loading and the Eversource standard minimum burial depth of 30 inches, the highest magnetic-field level (in all segments of the proposed routes but one) was 49 mG directly above the duct bank, decreasing to 3.4 mG or less at a distance of 25 feet from

the duct bank centerline. In the remaining segment between the proposed New Substation and the existing Kendall Substation (routes K5A/K11), the magnetic field was higher because the loading on the cable assumed that the Vicinity Energy facility would be operating at its maximum output. Under this uncommon loading condition the maximum calculated average magnetic field was 121 mG, decreasing to 8.4 mG at a distance of 25 feet from the duct bank centerline. Magnetic-field levels at peak loading were approximately 50% higher. At bridge crossings, where the cables will be closer to the road surface, the magnetic-field levels were calculated to be about 50% higher than above the duct bank, but with just a less than 10% change beyond about 10 feet from the duct bank.

Magnetic-field levels were compared to health-based international standards and guidelines developed by the International Commission on Non-Ionizing Radiation Protection and the International Committee for Electromagnetic Safety and were found to be far below these standards, even directly above the underground transmission line at minimum burial depth and peak loading.

Note that this Executive Summary provides only an outline of the material discussed in this report. Exponent's technical evaluations, analyses, conclusions, and recommendations are included in the main body of this report, which at all times is the controlling document.

Introduction

As part of the Greater Cambridge Energy Program NSTAR Electric Company, d/b/a Eversource Energy (Eversource), has proposed to increase power and transmission connectivity to the greater Cambridge area in Massachusetts by connecting 115-kilovolt (kV) underground transmission lines to the proposed below-grade East Cambridge Substation (New Substation), located between Binney Street and Broadway in Cambridge. To accommodate construction of the New Substation, the landowner (Boston Properties, Inc.) will demolish the existing 6-story Kendall Center Blue Garage and replace it with underground parking generally situated between new commercial buildings. The New Substation will be constructed predominantly underground, occupying roughly one-third of the parcel. The balance of the parcel will be re-developed by the landowner with a mix of commercial and residential uses. The landowner's design plans include adequate space within the parcel to install the Eversource electrical substation infrastructure and associated distribution and transmission line duct banks and ensure the ongoing safe operation and maintenance of such equipment. A public open space area will be constructed by the landowner above the New Substation.

Eversource requested that Exponent model the 60-Hertz (Hz) magnetic field associated with the underground transmission lines in the street and underground connections to the New Substation at expected average and peak loading of the transmission lines. Such underground transmission lines do not produce an electric field; it is completely contained within the underground cables. This report summarizes the methods used to measure existing magnetic fields, the methods used to model future magnetic fields and the results.

Five transmission line duct banks containing eight transmission lines enter the proposed New Substation, including two duct banks from the existing Brighton Substation and one each from the existing Somerville and Kendall Substations. The transmission lines in the fifth duct bank exit the south side of the proposed New Substation and travel to Memorial Drive where they

connect to existing transmission line duct banks between the Putnam Substation and East Cambridge #875 Substation (Routes P11/P13).[1]

Two routes for transmission lines to connect the proposed New Substation to existing substations are shown in aerial maps below in Figure 1 (Option 1 route) and Figure 2 (Option 2 route), with the locations of transmission line segments indicated in the figure legends. Exponent calculated the magnetic field from each of these proposed transmission line routes. The calculated magnetic-field levels were the same for both route options.[2]

[1] Three of the five duct banks are double-circuit duct banks with two separate circuits routed together in one duct bank. The two remaining duct banks are single circuits, but are proposed with two conductors per phase. Thus all five duct banks have six phase conductors per duct bank and hereafter may be referred to as "double-circuit" duct banks even when only one circuit (with two conductors per phase) are proposed.

[2] Existing pipe-type transmission lines along some of the proposed routes were not modeled because the steel pipe surrounding the conductors of pipe-type transmission lines reduces the magnetic field to a very low level (e.g., Stoffel et al., 1994; Commonwealth Associates, 1997).

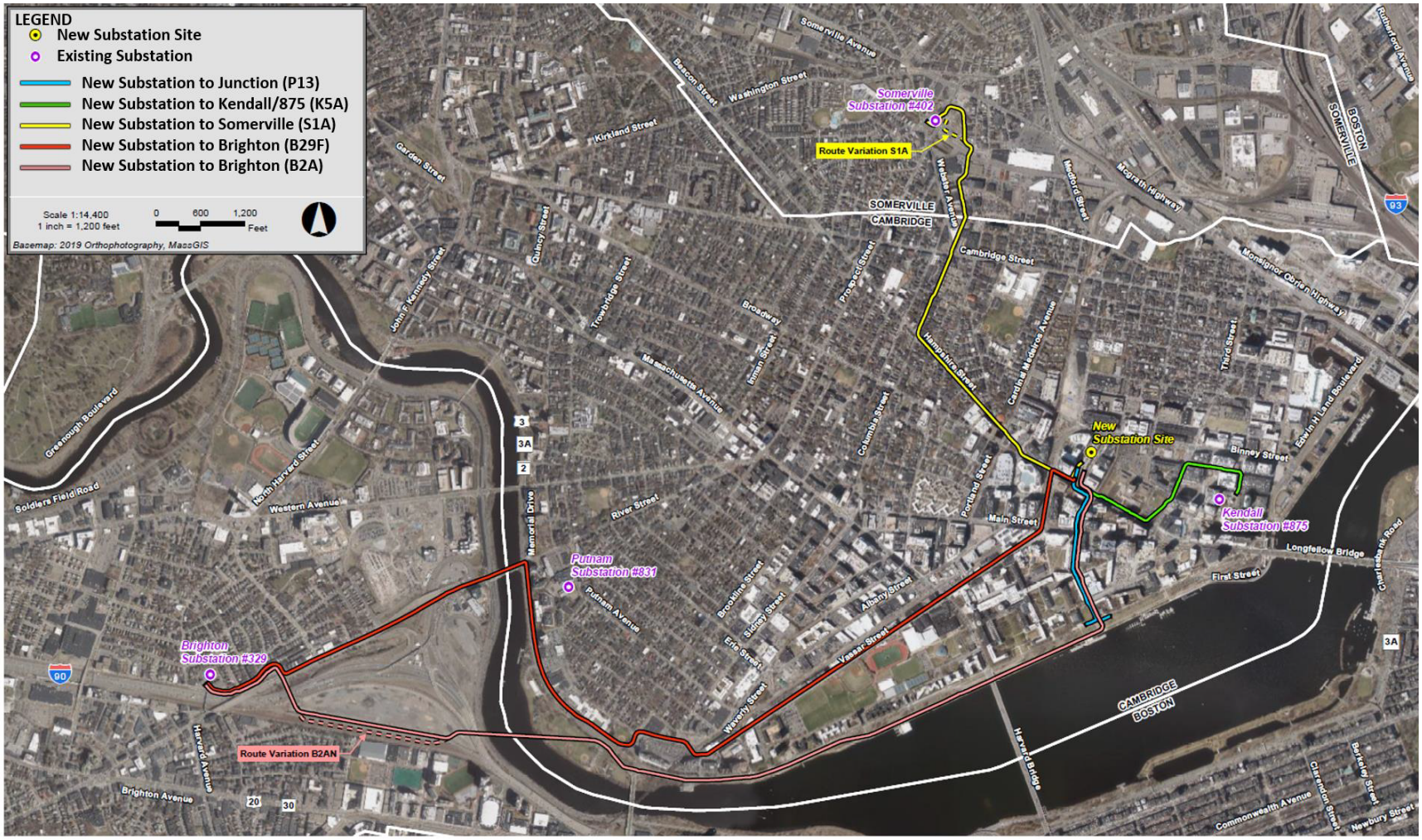

Figure 1. Aerial photograph of the Option 1 routes of transmission lines between the proposed New Substation and existing Eversource substations in the area.

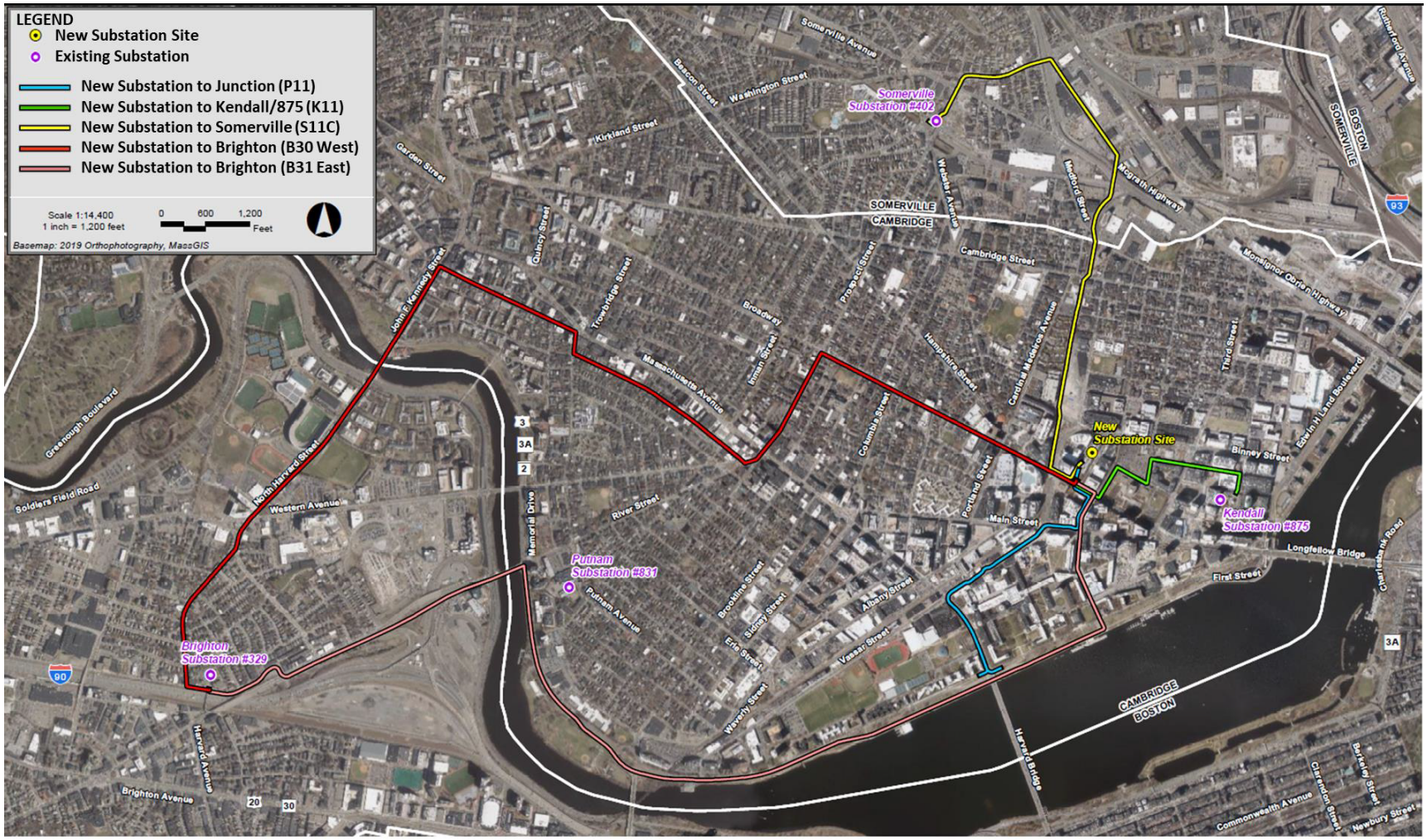

Figure 2. Aerial photograph of the Option 2 routes of transmission lines between the proposed New Substation and existing Eversource substations in the area.

Proposed Configuration

Magnetic-field levels were calculated assuming the proposed transmission lines operate in isolation from all other magnetic-field sources. As a result, the calculated magnetic-field levels depend only on the physical configuration, phasing, and electrical loading of the proposed lines. The standard configuration of the lines in duct banks is shown below in Figure 3. The cross-linked polyethylene (XLPE) cables will have an outer diameter of 4.76 inches and a conductor area of 5,000 kcmil. The loading and circuits in each transmission line duct bank are summarized in Appendix A. The phasing of each duct bank was selected to be the optimal for minimizing magnetic field levels above ground. Where lines carry current in the same direction the optimal phasing is A-B-C (top) and C-B-A (bottom). Where lines carry current in the opposite directions the optimal phasing is A-B-C (top) A-B-C (bottom)

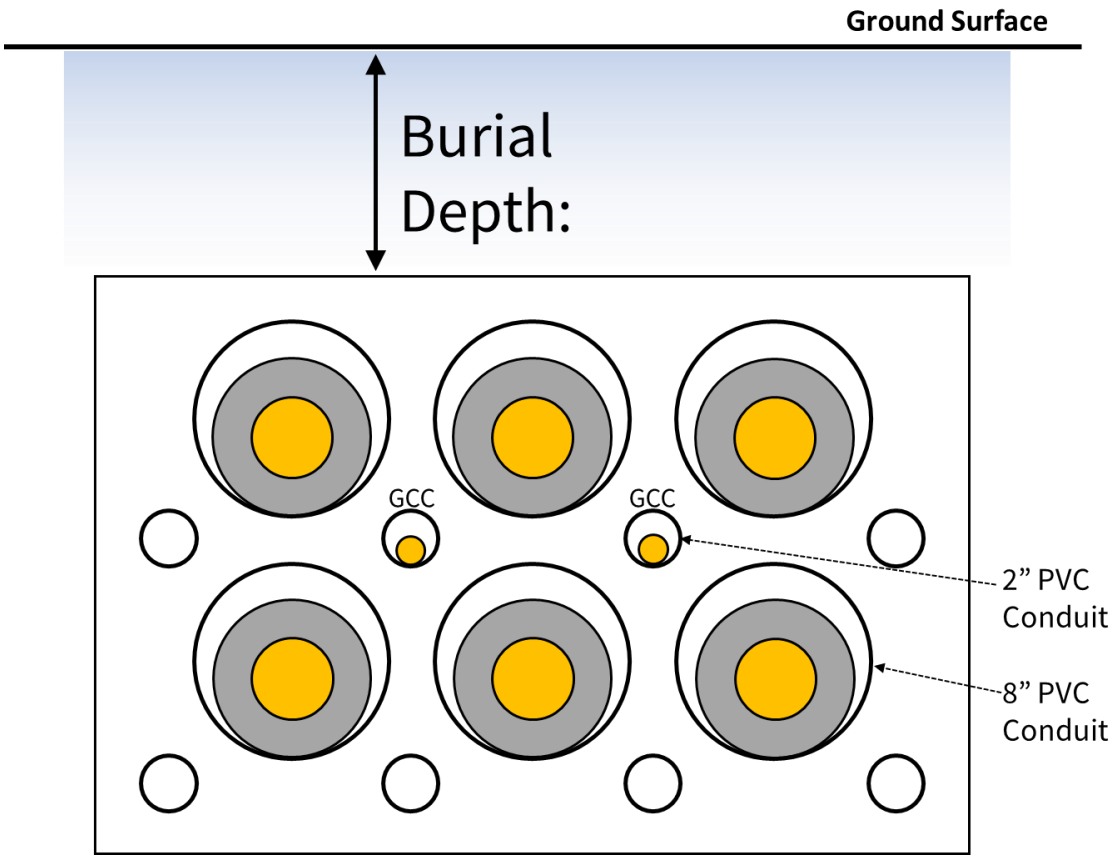

Figure 3. Configuration of the proposed transmission line duct banks used for magnetic-field modeling.

(GCC = ground continuity conductor; PVC = polyvinyl chloride)

Methods

Magnetic Field Calculations

The new transmission lines will be constructed in duct banks in which the conductors of each line are arranged to minimize the magnetic field. The depth of the top of the duct bank was assumed to be 30 inches, consistent with Eversource standard practice. Additional burial depths ranging from 18 inches up to 8.5 feet also were modeled, as summarized in Appendix B.

Magnetic-field levels were calculated at a height of 3.3 feet (1 meter) above ground in COMSOL Multiphysics 5.5 as the root-mean-square value of the field in accordance with IEEE Std. C95.3.1-2021 and IEEE Std. 644-2019 (IEEE, 2021, 2019). The data used to calculate magnetic fields included current flow, phasing, conductor configurations, and depth below grade. Additional details on the configuration of the duct banks and line loading data are provided in Appendix A. Currents induced on the ground continuity conductor were calculated and included in calculations. The conductors were modeled as straight, parallel to one another, and infinite in extent, and carrying balanced currents. No shielding effects of the cable sheath or other surrounding materials were included.

Measurements of magnetic-field levels from existing sources adjacent to the two route options were performed on April 13, 2021, between the hours of 9 AM and 7 PM. A summary of these measurement methods and results is provided in Appendix C.

Assessment Criteria

While the federal government has no regulations regarding magnetic fields, including from transmission lines or substations, the Massachusetts Energy Facilities Siting Board (EFSB) assesses magnetic-field levels on a case-by-case basis with a focus on practical options to reduce magnetic fields along transmission line rights-of-way. This practice is also consistent with the recommendations of the World Health Organization (WHO, 2007).

Magnetic fields also are assessed by comparison to standards and guidelines developed by scientific and health agencies—the International Committee on Electromagnetic Safety (ICES), and the International Commission on Non-Ionizing Radiation Protection (ICNIRP). These agencies published guidelines to ensure that exposure to 60-Hz magnetic fields are below levels that would exceed limits on internal exposure to body tissues. The ICES guideline for exposure of the general public to magnetic fields is 9,040 milligauss (mG) (ICES, 2019), and the ICNIRP guideline level is 2,000 mG (ICNIRP, 2010).

Results and Discussion

Measured magnetic-field levels along the routes of the proposed transmission lines ranged from 0.01 mG to 32 mG with the average along the routes ranging from 0.8 to 2.0 mG. These background levels were so low that existing sources were not considered to add to calculated post-project magnetic-field levels. The calculated magnetic-field levels are highest directly above the transmission line duct bank and decrease rapidly with distance. Figure 4 is an example profile of the calculated magnetic-field levels for a duct bank at a height of 3.3 feet (1 meter) above ground under a typical loading scenario. This figure for the duct bank between the New Substation and the junction with the existing transmission line between the Putnam #831 and East Cambridge #875 Substations (Junction) shows that magnetic-field levels are highest directly over the duct bank and decrease rapidly with distance. At average loading with the duct banks installed at Eversource's standard minimum burial depth of 30 inches, the magnetic-field level (in four segments of the proposed routes) directly above the duct bank was 49 mG or less, decreasing to 3.4 mG or less at 25 feet from the duct bank centerline. In the remaining duct bank segment between the New Substation and the existing East Cambridge Substation (Routes K5A/K11), the loading of the transmission lines is forecast to be greater than for other segments of the route and so the calculated magnetic field above the duct bank at average loading was also greater, 121 mG,[3] decreasing to 8.4 mG at 25 feet from the duct bank centerline. Calculated magnetic-field levels at peak loading for all duct banks were approximately 50% higher.

Table 1 summarizes the calculated magnetic-field levels for each of the transmission line duct bank configurations. A detailed tabular summary of the magnetic-field levels at distances of 10, 25, 50, and 75 feet from the centerline and for average and peak loading scenarios is provided in Appendix B. As noted, the tables in Appendix B also provide the calculated magnetic-field levels at a height of 3.3 feet above ground for burial depths other than the typical Eversource standard depth of 30 inches (18 inches up to 8.5 feet). Field levels at a greater burial depths

[3] The higher calculated magnetic field along this line is driven largely by the consideration that the Vicinity Energy facility could operate at its maximum output, which has been an infrequent occurrence in recent years. In the hours of the year when that generating facility is not operating at full output, the loading of the transmission line in this area would be proportionally lower, resulting in a modeled magnetic-field level more similar to those calculated in other portions of the route.

would be lower, while field levels at a shallower burial depth would be higher, which generally would be limited to relatively short areas where the typical burial depth cannot be achieved.

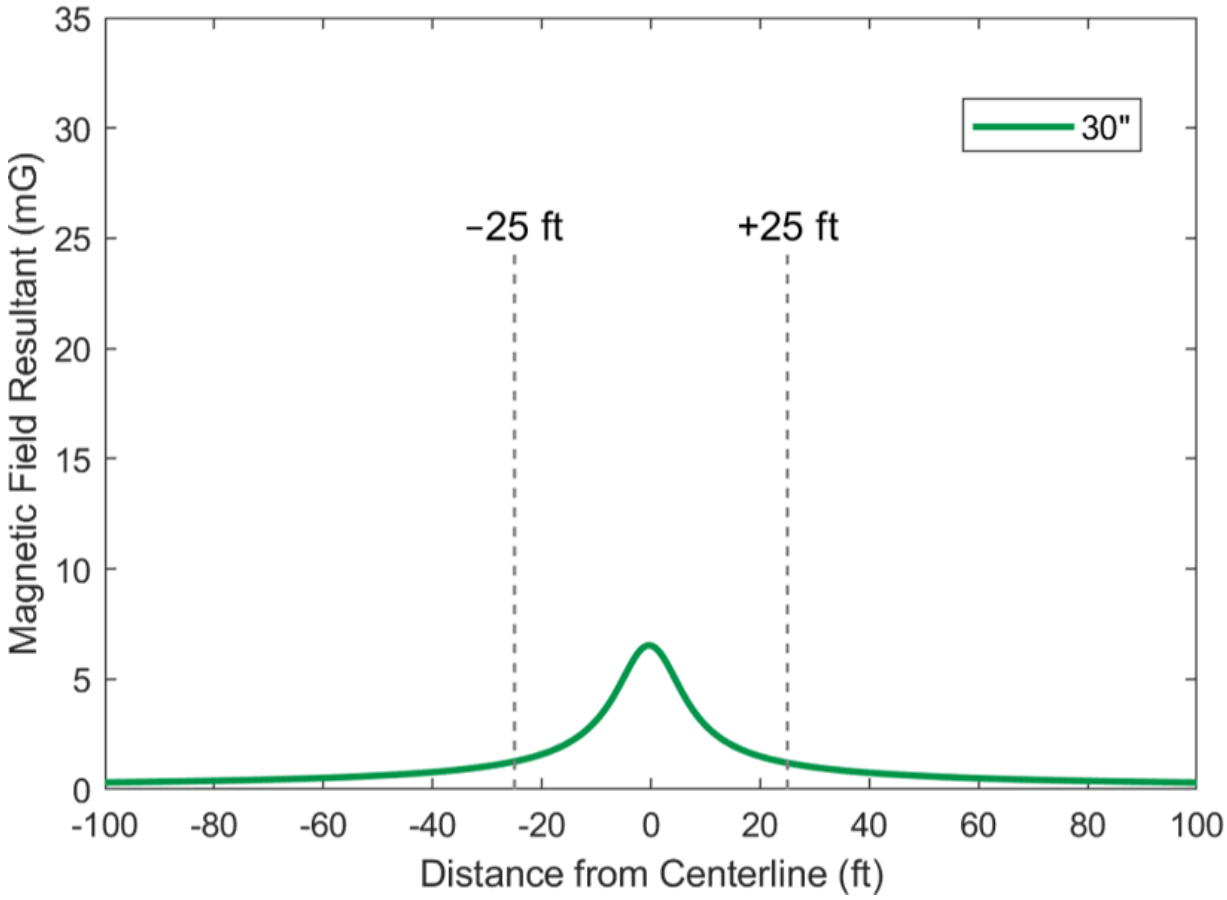

Figure 4. Calculated magnetic-field level above the duct bank for 30-inch burial between the New Substation and the junction with the existing transmission line between the Putnam #831 and East Cambridge #875 Substations.

Table 1. Calculated magnetic-field levels at 3.3 feet (1 meter) above ground for 30-inch duct bank burial from the New Substation to existing substations at average loading

Duct Bank Route	Magnetic Field at Average Loading (mG)	
	Maximum at ±25 feet*	Maximum above duct bank
Junction (P11/P13)	1.3	6.5
Kendall #800 or East Cambridge #875 (K5A/K11)	8.4	121
Somerville #402 (S1A/S11C)	0.4	2.1
Brighton #329 (B29F/B30)	1.5	6.0
Brighton #329 (B2A/B31)	1.5	6.0

*These distances are referenced to the duct bank centerline.

Summary

This report summarizes calculations of magnetic-field levels associated with the underground 115-kV transmission lines proposed to connect to the New Substation. These calculations were performed using methods that are accepted within the scientific, engineering, and regulatory communities.

The project design, including optimal phasing of conductors, responds to recommendations by the EFSB and the World Health Organization to reduce magnetic-field exposure by constructing the transmission lines underground with the conductors installed close together to maximize mutual cancellation of the magnetic-field vectors from each conductor. This feature causes the magnetic fields from the underground transmission lines to decrease rapidly with increasing distance.

The calculated magnetic-field levels for all configurations at both average and peak loading are far below both ICNIRP (2,000 mG) and ICES (9,040 mG) Reference Levels for exposures of the general public. In addition, measurements of existing magnetic-field levels in neighborhoods on proposed routes indicate that the magnetic-field level from the proposed transmission lines would generally fall within the same general level of existing measured average background magnetic-field levels within 25 feet of the duct bank centerlines.

References

Commonwealth Associates. Electric and Magnetic Fields (EMF) RAPID Program Engineering Project 8: Final report, Evaluation of Field Reduction Technologies, 1997.

Institute of Electrical and Electronics Engineers (IEEE). Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines. ANSI/IEEE Std. 644-2019. New York: IEEE, 2019.

IEEE C95.3-2021™ IEEE Recommended Practice for Measurements and Computations of Electric, Magnetic and Electromagnetic Fields with Respect to Human Exposure to Such Fields, 0 Hz-300 GHz (IEEE Std. C95.3-2021). New York: IEEE, 2021.

International Commission on Non-Ionizing Radiation Protection (ICNIRP). ICNIRP statement—guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz to 100 kHz). Health Phys 99:818-836, 2010.

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Stoffel JB, Pentecost ED, Roman RD, Traczyk PA. Electric Power High-Voltage Transmission Lines: Design Options, Cost, and Electric and Magnetic Field Levels (No. ANL/EAD/TM--31). Argonne, IL: Argonne National Lab, 1994.

World Health Organization (WHO). Environmental Health Criteria 238: Extremely Low Frequency (ELF) Fields. Geneva, Switzerland: World Health Organization, 2007.

Notice

At the request of Eversource, Exponent measured magnetic fields around the proposed site of the New Substation and modeled magnetic-field levels associated with the operation of the proposed underground 115-kV transmission lines that will connect to this substation. This report summarizes work performed to date and presents the findings resulting from that work. In the analysis, we have relied on geometry, material data, usage conditions, specifications, and various other types of information provided by Eversource. Eversource has confirmed to Exponent that the data provided to Exponent, and summary contained herein, are not subject to Critical Energy Infrastructure Information restrictions. We cannot verify the correctness of these data and rely on the client for its accuracy. Although Exponent has exercised usual and customary care in the conduct of this analysis, the responsibility for the design and operation of the project remains fully with the client.

The findings presented herein are made to a reasonable degree of engineering and scientific certainty. Exponent reserves the right to supplement this report and to expand or modify opinions based on review of additional material as it becomes available, through any additional work, or review of additional work performed by others.

The scope of services performed during this investigation may not adequately address the needs of other users of this report outside of the licensing and permitting processes, and any re-use of this report or its findings, conclusions, or recommendations presented herein are at the sole risk of the user. The opinions and comments formulated during this assessment are based on observations and information available at the time of the investigation. No guarantee or warranty as to future life or performance of any reviewed condition is expressed or implied.

Appendix A

Transmission Line Configurations and Line Loadings

Transmission Line Configurations

The configurations of transmission lines in the proposed duct banks are the same as shown in Figure 3 in the main report.

Transmission Line Loading

Eversource Transmission Planning provided the loading levels for existing (2021) and proposed (2028) project configurations. The average loading scenario is based upon the 65% shoulder case (i.e., 65% of the 90/10 peak case). Two separate peak loading cases were evaluated—one in which power generation at the Kendall Generation Station is maximum (Max Kendall Generation) and one in which the power generation at Kendall Generation Station is minimum (Min Kendall Generation). The dynamics of the transmission system are such that some of the transmission lines will have a higher peak loading during Max Kendall Generation and others will have a higher peak loading during Min Kendall Generation. The loading used for modeling was the maximum of either case for each transmission line duct bank to conservatively overestimate results.

Table A-1. Current and phase for both circuits* in the duct bank for each route segment at average and peak loading

Line Segment	Average Loading (A)				Peak Loading (A)			
	$I1^{\dagger}$	θ1	$I2^{\dagger}$	θ2	$I2^{\dagger}$	θ1	$I2^{\dagger}$	θ2
Junction (P11/P13)	100.6	-170.3	91.5	-172.4	154.8	-170.3	140.8	-172.4
Kendall #800 or East Cambridge #875 (K5A/K11)	657.7	-2.8	110.2	-164.2	1011.8	-2.8	169.6	-164.2
Somerville #402 (S1A/S11C)	32.6	-90.0	30.0	-90.0	50.2	-90.0	46.2	-90.0
Brighton #329 (B29F/B30)	118.0	6.6	118.0	6.6	181.5	6.6	181.5	6.6
Brighton #329 (B2A/B31)	118.4	6.6	118.4	6.6	182.2	6.6	182.2	6.6

* Reported values are to maximize flow on the transmission lines for system scenarios.

† I1 corresponds to top three cables and I2 corresponds to bottom three cables for each 6-cable duct bank modeled.

Appendix B

Calculated Magnetic-Field Levels

Table B-1. East Cambridge #8025 – Junction (P11/P13, 875-538 / 831-538): Calculated magnetic-field levels (mG) at 3.3 feet (1 meter) above ground for various duct bank burial depths at average loading

Duct Bank Burial Depth	Distance from Center of Duct Bank								
	-75 feet	-50 feet	-25 feet	-10 feet	max	10 feet	25 feet	50 feet	75 feet
18"	0.4	0.6	1.3	3.4	9.8	3.2	1.2	0.6	0.4
30"	0.4	0.6	1.3	3.2	6.5	2.9	1.2	0.6	0.4
42"	0.4	0.6	1.2	2.9	4.8	2.7	1.2	0.6	0.4
54"	0.4	0.6	1.2	2.7	3.8	2.5	1.2	0.6	0.4
66"	0.4	0.6	1.2	2.5	3.2	2.3	1.1	0.6	0.4
78"	0.4	0.6	1.2	2.3	2.8	2.1	1.1	0.6	0.4
90"	0.4	0.6	1.2	2.1	2.5	2.1	1.1	0.6	0.4
102"	0.4	0.6	1.1	2.0	2.3	1.9	1.1	0.6	0.4

Table B-2. East Cambridge #8025 – Junction (P11/P13, 875-538 / 831-538): Calculated magnetic-field levels (mG) at 3.3 feet (1 meter) above ground for various duct bank burial depths at peak loading

Duct Bank Burial Depth	Distance from Center of Duct Bank								
	-75 feet	-50 feet	-25 feet	-10 feet	max	10 feet	25 feet	50 feet	75 feet
18"	0.6	1.0	2.0	5.3	15	4.9	1.9	0.9	0.6
30"	0.6	0.9	1.9	4.9	10	4.5	1.8	0.9	0.6
42"	0.6	0.9	1.9	4.5	7.4	4.1	1.8	0.9	0.6
54"	0.6	0.9	1.9	4.1	5.8	3.8	1.8	0.9	0.6
66"	0.6	0.9	1.9	3.8	4.9	3.5	1.8	0.9	0.6
78"	0.6	0.9	1.8	3.5	4.3	3.3	1.7	0.9	0.6
90"	0.6	0.9	1.8	3.3	3.8	3.1	1.7	0.9	0.6
102"	0.6	0.9	1.8	3	3.5	2.9	1.7	0.9	0.6

Table B-3. East Cambridge #8025 – Kendall #800 or East Cambridge #875 (K5A/K11, 875-539 / 850-539): Calculated magnetic-field levels (mG) at 3.3 feet (1 meter) above ground for various duct bank burial depths at average loading

Duct Bank Burial Depth	Distance from Center of Duct Bank								
	-75 feet	-50 feet	-25 feet	-10 feet	max	10 feet	25 feet	50 feet	75 feet
18"	1.5	2.6	8.2	39	169	40	8.6	2.8	1.6
30"	1.5	2.6	8.1	36	121	37	8.4	2.8	1.6
42"	1.5	2.6	7.9	33	90	33	8.3	2.8	1.6
54"	1.5	2.6	7.8	30	70	30	8.1	2.8	1.6
66"	1.5	2.6	7.6	27	56	28	7.9	2.8	1.6
78"	1.5	2.6	7.4	24	46	25	7.7	2.7	1.6
90"	1.5	2.6	7.2	22	38	23	7.5	2.7	1.6
102"	1.5	2.6	7.3	20	33	21	7.3	2.7	1.6

Table B-4. East Cambridge #8025 – Kendall #800 or East Cambridge #875 (K5A/K11, 875-539 / 850-539): Calculated magnetic-field levels (mG) at 3.3 feet (1 meter) above ground for various duct bank burial depths at peak loading

Duct Bank Burial Depth	Distance from Center of Duct Bank								
	-75 feet	-50 feet	-25 feet	-10 feet	max	10 feet	25 feet	50 feet	75 feet
18"	2.3	4.1	13	61	260	62	13	4.3	2.5
30"	2.3	4.1	12	55	186	57	13	4.3	2.5
42"	2.3	4.0	12	50	139	52	13	4.3	2.5
54"	2.3	4.0	12	46	108	47	12	4.3	2.5
66"	2.3	4.0	12	42	86	42	12	4.2	2.5
78"	2.3	4.0	11	38	71	38	12	4.2	2.4
90"	2.3	4.0	11	34	59	35	12	4.2	2.4
102"	2.3	3.9	11	31	50	32	11	4.2	2.4

Table B-5. East Cambridge #8025 – Somerville #402 (S1A/S11C, 250-510 / 250-511): Calculated magnetic-field levels (mG) at 3.3 feet (1 meter) above ground for various duct bank burial depths at average loading

Duct Bank Burial Depth	Distance from Center of Duct Bank								
	-75 feet	-50 feet	-25 feet	-10 feet	max	10 feet	25 feet	50 feet	75 feet
18"	0.1	0.2	0.4	1.1	3.1	1.1	0.4	0.2	0.1
30"	0.1	0.2	0.4	1.0	2.1	1.0	0.4	0.2	0.1
42"	0.1	0.2	0.4	0.9	1.5	0.9	0.4	0.2	0.1
54"	0.1	0.2	0.4	0.8	1.2	0.8	0.4	0.2	0.1
66"	0.1	0.2	0.4	0.8	1.0	0.8	0.4	0.2	0.1
78"	0.1	0.2	0.4	0.7	0.9	0.7	0.4	0.2	0.1
90"	0.1	0.2	0.4	0.7	0.8	0.7	0.4	0.2	0.1
102"	0.1	0.2	0.4	0.6	0.7	0.6	0.4	0.2	0.1

Table B-6. East Cambridge #8025 – Somerville #402 (S1A/S11C, 250-510 / 250-511): Calculated magnetic-field levels (mG) at 3.3 feet (1 meter) above ground for various duct bank burial depths at peak loading

Duct Bank Burial Depth	Distance from Center of Duct Bank								
	-75 feet	-50 feet	-25 feet	-10 feet	max	10 feet	25 feet	50 feet	75 feet
18"	0.2	0.3	0.6	1.6	4.7	1.7	0.6	0.3	0.2
30"	0.2	0.3	0.6	1.5	3.2	1.5	0.6	0.3	0.2
42"	0.2	0.3	0.6	1.4	2.3	1.4	0.6	0.3	0.2
54"	0.2	0.3	0.6	1.3	1.8	1.3	0.6	0.3	0.2
66"	0.2	0.3	0.6	1.2	1.5	1.2	0.6	0.3	0.2
78"	0.2	0.3	0.6	1.1	1.4	1.1	0.6	0.3	0.2
90"	0.2	0.3	0.6	1.0	1.2	1.0	0.6	0.3	0.2
102"	0.2	0.3	0.6	0.9	1.1	1.0	0.6	0.3	0.2

Table B-7. East Cambridge #8025 – Brighton #329 (B29F/B30, 329-510): Calculated magnetic-field levels (mG) at 3.3 feet (1 meter) above ground for various duct bank burial depths at average loading

Duct Bank Burial Depth	Distance from Center of Duct Bank								
	-75 feet	-50 feet	-25 feet	-10 feet	max	10 feet	25 feet	50 feet	75 feet
18"	0.5	0.7	1.5	3.8	9.1	3.9	1.5	0.7	0.5
30"	0.5	0.7	1.5	3.5	6.0	3.6	1.5	0.7	0.5
42"	0.5	0.7	1.5	3.2	4.6	3.3	1.5	0.7	0.5
54"	0.5	0.7	1.4	3.0	3.8	3.0	1.5	0.7	0.5
66"	0.5	0.7	1.4	2.7	3.3	2.8	1.4	0.7	0.5
78"	0.5	0.7	1.4	2.6	3.0	2.6	1.4	0.7	0.5
90"	0.5	0.7	1.4	2.4	2.7	2.4	1.4	0.7	0.5
102"	0.5	0.7	1.3	2.3	2.5	2.3	1.4	0.7	0.5

Table B-8. East Cambridge #8025 – Brighton #329 (B29F/B30, 329-510): Calculated magnetic-field levels (mG) at 3.3 feet (1 meter) above ground for various duct bank burial depths at peak loading

Duct Bank Burial Depth	Distance from Center of Duct Bank								
	-75 feet	-50 feet	-25 feet	-10 feet	max	10 feet	25 feet	50 feet	75 feet
18"	0.8	1.1	2.3	5.9	14	6.0	2.3	1.1	0.8
30"	0.8	1.1	2.3	5.4	9.3	5.5	2.3	1.1	0.8
42"	0.8	1.1	2.3	5.0	7.0	5.1	2.3	1.1	0.8
54"	0.8	1.1	2.2	4.6	5.8	4.7	2.2	1.1	0.8
66"	0.8	1.1	2.2	4.2	5.1	4.3	2.2	1.1	0.8
78"	0.8	1.1	2.2	3.9	4.6	4.0	2.2	1.1	0.8
90"	0.8	1.1	2.1	3.7	4.2	3.8	2.1	1.1	0.8
102"	0.8	1.1	2.1	3.5	3.9	3.5	2.1	1.1	0.8

Table B-9. East Cambridge #8025 – Brighton #329 (B2A/B31, 329-511): Calculated magnetic-field levels (mG) at 3.3 feet (1 meter) above ground for various duct bank burial depths at average loading

Duct Bank Burial Depth	Distance from Center of Duct Bank								
	-75 feet	-50 feet	-25 feet	-10 feet	max	10 feet	25 feet	50 feet	75 feet
18"	0.5	0.7	1.5	3.8	9.2	3.9	1.5	0.7	0.5
30"	0.5	0.7	1.5	3.5	6.0	3.6	1.5	0.7	0.5
42"	0.5	0.7	1.5	3.2	4.6	3.3	1.5	0.7	0.5
54"	0.5	0.7	1.5	3.0	3.8	3.1	1.5	0.7	0.5
66"	0.5	0.7	1.4	2.8	3.3	2.8	1.4	0.7	0.5
78"	0.5	0.7	1.4	2.6	3.0	2.6	1.4	0.7	0.5
90"	0.5	0.7	1.4	2.4	2.7	2.5	1.4	0.7	0.5
102"	0.5	0.7	1.4	2.3	2.5	2.3	1.4	0.7	0.5

Table B-10. East Cambridge #8025 – Brighton #329 (B2A/B31, 329-511): Calculated magnetic-field levels (mG) at 3.3 feet (1 meter) above ground for various duct bank burial depths at peak loading

Duct Bank Burial Depth	Distance from Center of Duct Bank								
	-75 feet	-50 feet	-25 feet	-10 feet	max	10 feet	25 feet	50 feet	75 feet
18"	0.8	1.1	2.3	5.9	14	6.1	2.4	1.2	0.8
30"	0.8	1.1	2.3	5.4	9.3	5.6	2.3	1.2	0.8
42"	0.8	1.1	2.3	5.1	7.1	5.1	2.3	1.1	0.8
54"	0.8	1.1	2.2	4.6	5.9	4.7	2.3	1.1	0.8
66"	0.8	1.1	2.2	4.2	5.1	4.3	2.2	1.1	0.8
78"	0.8	1.1	2.2	4.0	4.6	4.0	2.2	1.1	0.8
90"	0.8	1.1	2.1	3.7	4.2	3.8	2.1	1.1	0.8
102"	0.8	1.1	2.1	3.5	3.9	3.5	2.1	1.1	0.8

Appendix C

Measurements of Pre-Construction Magnetic Fields

Magnetic-field measurements were performed on April 13, 2021, between 9 AM and 7 PM. Magnetic-field levels were measured in units of magnetic flux density at a height of 3.3 feet (1 meter) above ground using a data-logging EMDEX II meter that meets IEEE Std.1308-1994 (R2010) for obtaining accurate field measurements at power line frequencies. Measurements were taken and reported as the root mean square value of the field in accordance with IEEE Std. C95.3.1-2021 and IEEE Std. 644-2019. Measurements were taken around the perimeter of the existing Kendall Blue Parking Garage, on the sidewalk across the street from the Kendall Blue Parking Garage, and on the sidewalk on both sides of the street around the city block containing the Kendall Blue Parking Garage (see Figure C-1). Measurements along the proposed transmission line routes were performed along both sides of the proposed route, where accessible, using a hand-held magnetic-field sensor and a global positioning satellite (GPS) device for GPS-level time and location accuracy.

Measured Magnetic Fields along the Routes of the Proposed Transmission Lines

Measurements of magnetic-field levels of 60-Hz magnetic-fields along the routes of the proposed transmission line between the proposed New Substation and existing Eversource substations in and around the Project area of Cambridge, Somerville, and the Allston/Brighton section of Boston, Massachusetts, were performed along both sides of the proposed route, where accessible, using the EMDEX II hand-held magnetic field sensor and GPS device for time and location information. Measurement paths, including three different paths to the Brighton Substation are shown in Figure C-2.

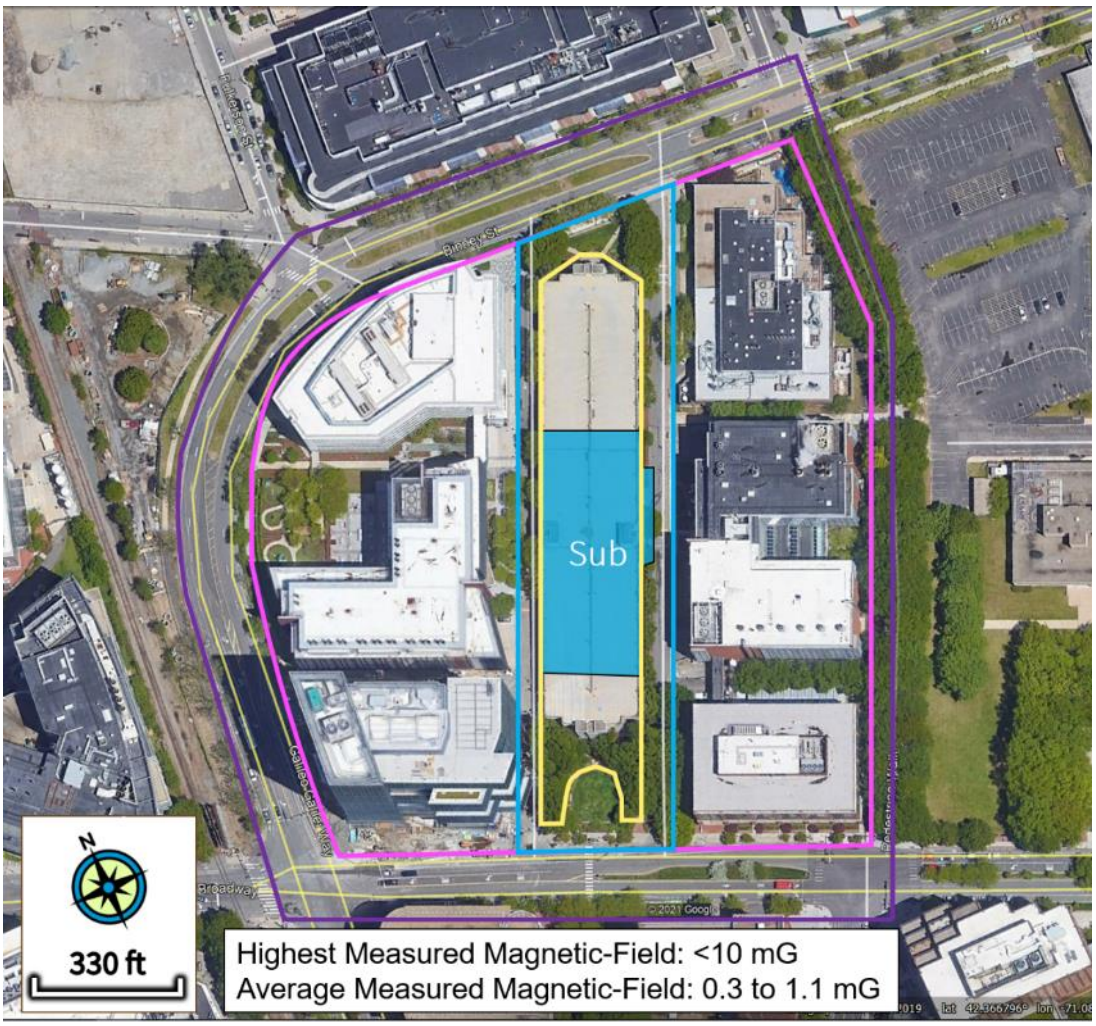

Figure C-1. Four measurement paths around the proposed New Substation site.

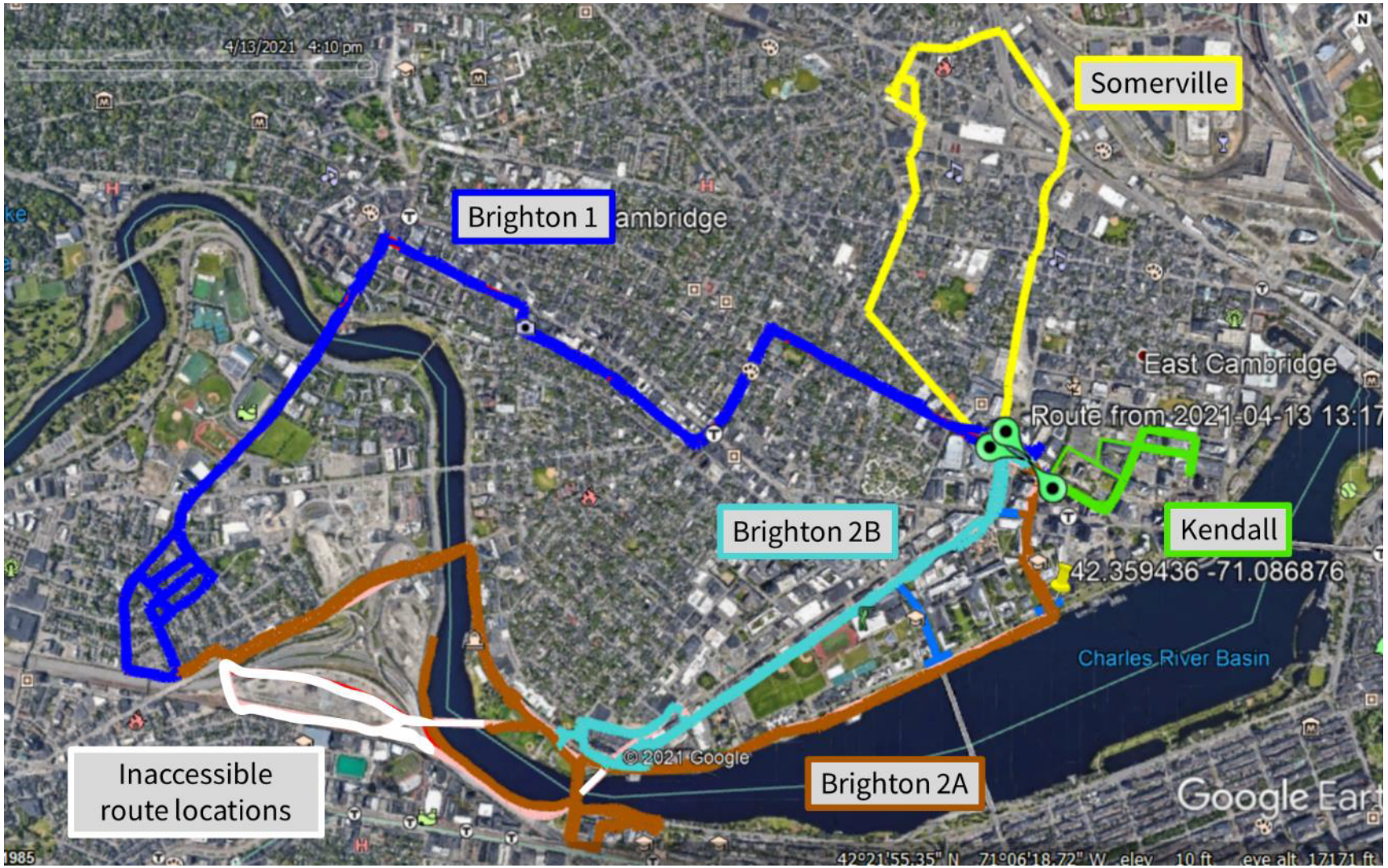

Figure C-2. Locations of magnetic-field measurements along the transmission line routes between the proposed New Substation and nearby substations to which the lines connect.

The measured magnetic field varied along the routes with the average magnetic-field of approximately 2.0 mG or less. Higher magnetic-field levels were measured on most of the routes, with the maximum of 32 mG recorded near the intersection of Second Street and Athenaeum Street between the proposed New Substation and the existing Kendall Substation. This maximum magnetic field is likely near an underground power line. An example of magnetic-field measurements for the proposed route segment between the Putnam and East Cambridge #875 Substations is provided in Figure C-3. Table C-1 shows the minimum, average, and maximum magnetic-field values for all route segments.

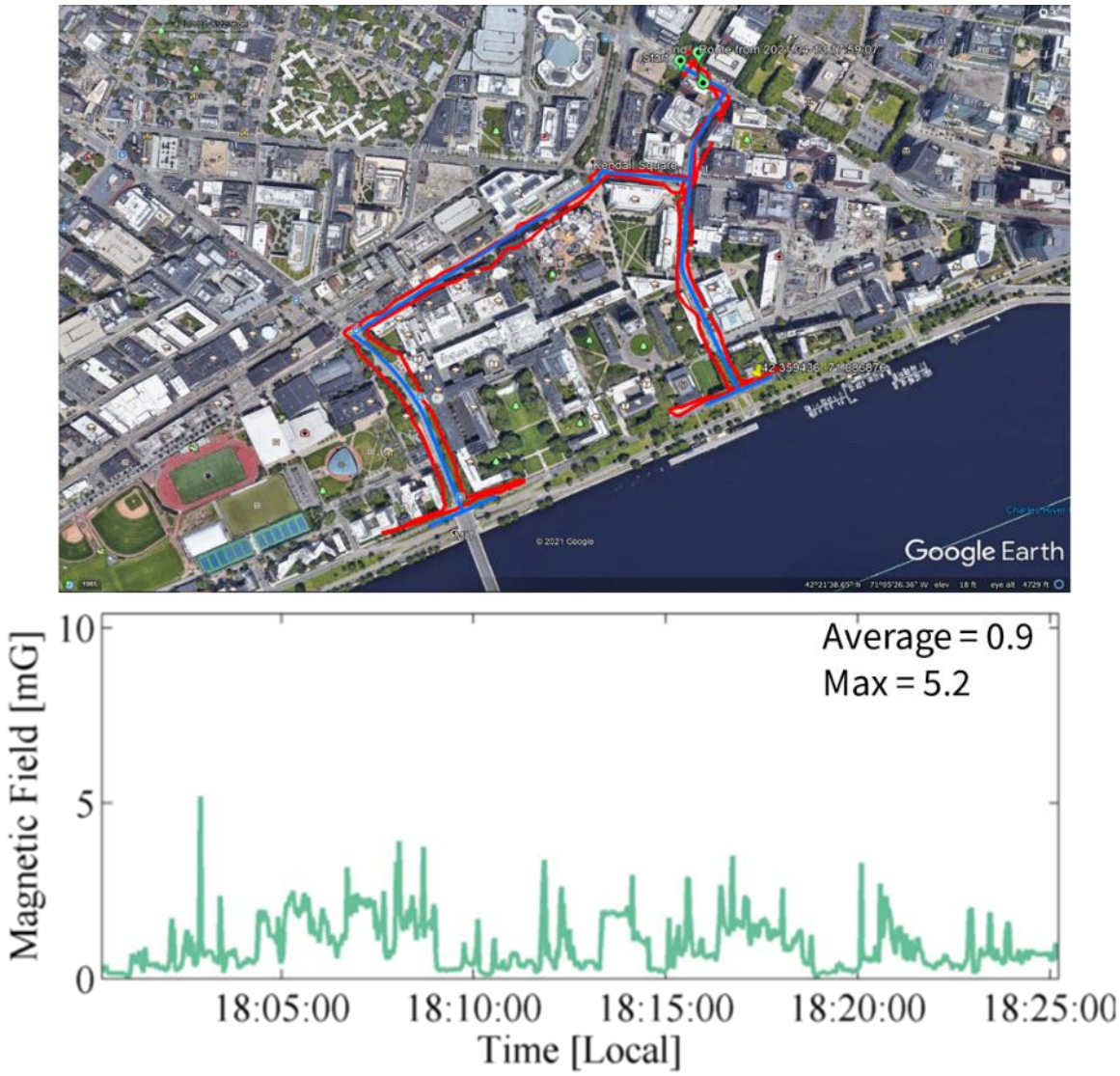

Figure C-3. Measurement route and data for the proposed route options for the lines connecting to the Junction with the Putnam #831 and East Cambridge #875 Substations (Routes P13 and P11).

Table C-1. Existing magnetic-field measurements (mG) along the route of the proposed transmission lines

Measured Route Segment*	Minimum	Average	Maximum
Brighton 1	0.05	2.0	16
Brighton 2a	0.01	0.8	20
Brighton 2b	0.01	1.0	7.6
Putnam	0.01	0.9	5.2
Somerville	0.01	1.5	20
Kendall	0.11	1.0	32

* Refer to Figure C-2 for illustration of each measured Route Segment

A magnetic field results from the flow of electricity on conductors, so magnetic-field levels vary as the demand for electricity changes; when the loading of local power lines increases or decreases, the magnetic-field levels increase or decrease as well. Measured magnetic-field levels present only a snapshot of the magnetic field at the time of measurement and can vary over days, months, and years depending on power demand.

Appendix D

Calibration Certificates for Magnetic-Field Meters

Certificate of Calibration

The calibration of this instrument was controlled by documented procedures as outlined on the Certificate of Testing Operations and Accuracy Report using equipment traceable to N.I.S.T., ISO/IEC 17025:2017(E), and ANIZ540-1 COMPLIANT.

Instrument Model: EMDEX II - Standard

Frequency: 60 Hz

Serial Number: 3074

Date of Calibration: 03/06/2021

Re-calibration suggested at one year from above date.

Calibration Inspector: *H. Christopher Hooper*

EMDEX LLC
1356 Beaver Creek Drive
Patterson, California 95363
(408) 866-7266

Certificate of Calibration

The calibration of this instrument was controlled by documented procedures as outlined on the Certificate of Testing Operations and Accuracy Report using equipment traceable to N.I.S.T., ISO/IEC 17025:2017(E), and ANIZ540-1 COMPLIANT.

Instrument Model: EMDEX II - Standard

Frequency: 60 Hz

Serial Number: 1134

Date of Calibration: 03/19/2021

Re-calibration suggested at one year from above date.

Calibration Inspector: H. Christopher Hooper

EMDEX LLC
1356 Beaver Creek Drive
Patterson, California 95363
(408) 866-7266