Charles River Watershed Association

Guidance Memorandum on Location Screening and Prioritization for Structural Controls

To: Charles River watershed communities

From: Charles River Watershed Association (CRWA) and Kleinfelder

Date: June 30, 2021

Introduction

Charles River Watershed Association (CRWA) and Kleinfelder prepared a template for Charles River communities to plan for, prepare, and implement their written Phosphorus Control Plans (PCPs) in compliance with the General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) in Massachusetts (MS4 Permit). PCP compliance will require Charles River communities to design, permit, construct, and maintain additional stormwater controls to reduce the amount of phosphorus entering the river through stormwater runoff. As detailed in the MS4 permit and the PCP Template, communities will receive phosphorus reductions credits for structural stormwater best management practices (a.k.a. structural controls) based on the system type and the volume of runoff treated. This memorandum provides recommendations for how communities can go about identifying possible sites for installing structural stormwater best management practices. The accompanying maps identify potential opportunity sites across the watershed. A section discussing prioritization is also included at the end of this memorandum. In addition, portions of this memorandum describe how they can implement local decision-making processes for establishing a prioritized list of properties that incorporates community input and consideration of environmental justice communities.

Background

An important element of the PCP is identifying areas that are favorable for implementation of structural controls to support a community's phosphorus reductions:

> *The permittee shall develop a priority ranking of areas and infrastructure within the municipality for potential implementation of structural phosphorus controls during Phase 1. The ranking shall be developed through the use of available screening and monitoring results collected during the permit term either by the permittee or another entity and the mapping required pursuant to part 2.3.4.6 of the Permit. The permittee shall also include in this priority ranking a detailed assessment of site suitability for potential phosphorus control measures based on soil types and other factors. The permittee shall*

coordinate this activity with the requirements of part 2.3.6.d of the Permit. A description and the results of this priority ranking shall be included in Phase 1 of the PCP.

This document and accompanying maps have been developed to support communities in addressing the requirement to prepare a detailed assessment of site suitability for potential phosphorus control measures based on soil types and other factors (and coordinate this activity with the requirements of part 2.3.6.d of the Permit) by providing methods and resources for identifying areas and specific sites favorable for BMP implementation based on a desktop GIS analysis.

Field verification of site suitability is always required before a treatment system can be implemented. No field verifications were conducted in the creation of this guidance.

Complete details of GIS methods are available in Attachment B. Maps are available in high resolution to allow users to zoom in on areas of interest. Many of these maps can also be recreated using online tools such as MassGIS Oliver and Massachusetts Coastal Resilience map view (See Attachment B). All GIS files used to create the maps are available upon request via email to Charles@crwa.org .

Identification of "Opportunity Sites" for Structural Control Implementation

The accompanying maps are designed to help identify early opportunity sites that the municipality may want to take the lead on designing and implementing. This mapping displays priority site opportunities based on general factors. In practice, many community-specific factors will inform stormwater treatment system installation, some of which are discussed in this memorandum. It is important to note that just because the attached maps do not display an area as a priority, it does not mean it is not a feasible site. This memorandum is intended to guide municipalities to potential high priority/near-term implementation sites based on broadly available data.

The combination of factors upon which site suitability and prioritization are determined for an individual community are not specified in the permit. The basis upon which any community prioritizes opportunity sites will be unique, and must be documented in the Phase 1 PCP. In addition to the primary attributes cited above, municipalities may consider additional factors with relevance to their community and program goals. Some of these factors are described below for reference. **Note that a compliant site suitability/prioritization analysis need not include all of the factors listed below** .

See *Section 1.7 Structural Controls* in the PCP template for information about addressing the remaining portions of this permit requirement in your PCP.

Areas Considered a Priority for Upland Restoration

Typical parameters for siting BMPs include land ownership, land use (including impervious area), soil type and hydraulic conductivity, elevation, and location relative to waterbodies. CRWA and The Nature Conservancy developed a tool for the Charles River watershed that helps identify stormwater treatment system opportunity areas based on a desktop GIS analysis of many of these characteristics. Attachment A includes a matrix that summarizes the GIS layers used to prioritize opportunity sites as well as layers used to exclude potential areas of conflict. The results of this GIS desktop analysis are displayed in the attached series of maps with the legend title: Green stormwater infrastructure opportunity sites. The tool is also available online at:
https://maps.coastalresilience.org/massachusetts

Soil Conditions

Structural controls that infiltrate stormwater runoff provide the most phosphorus reduction credit, therefore soil conditions favorable to infiltration have been prioritized in this memo and the attached maps. There are many treatment system opportunities for soil conditions that are not favorable to infiltration, however, that are likely to make good opportunity sites for structural stormwater best management practices that filter water, but do not infiltrate it into underlying soils. It is also important to note that soil conditions can also differ between online data and reality. On the ground soil assessments are a critical element of treatment system design and should be undertaken early in the process. In each of the attached map packages, priority areas include areas with mapped hydrologic soil groups A and B in the NRCS database.

Urbanized Areas (Regulated MS4 areas)

For the small number of communities in the watershed where there are areas *not* currently designated as "Urbanized Area" based on the U.S. Census (areas that are not regulated by the MS4 Permit), the location of opportunity sites with respect to the Urbanized Area will be an important consideration when selecting your PCP Area (See *Section 1.3.1* of the PCP Template). Attachment C includes maps of each watershed region showing the urbanized area overlaid with opportunity sites.

Large Publicly Owned Sites

Large sites with considerable impervious cover can be good opportunity sites because they provide an opportunity to target a large pollutant load working on one site and one property owner. If site conditions (such as drainage patterns, available space and soil conditions) allow, this could potentially be done with one treatment system. Sites that are publicly owned, particularly municipally owned, are likely to be the best place to start as the municipality would not need to acquire any land or partner with other land owners. Attachment D includes maps of each watershed region showing large publicly owned parcels (>2 acres) with more than an acre of impervious cover. The ownership database is available in Attachment G. Municipalities with GIS capabilities may want to further refine this dataset based on just municipally owned properties. Although not highlighted in the attached maps, municipalities should also consider their roadway network as large, impervious publicly-owned opportunity sites.

Environmental Justice/Climate Vulnerable Communities

Communities with environmental justice (EJ) areas or areas with high concentrations of climate vulnerable residents can consider prioritizing green stormwater infrastructure in these areas for the co-benefits they provide, including improving air quality, reducing temperatures, and mitigating stormwater flooding. Environmental gentrification is a potential threat when implementing GSI in some communities, and therefore it is critical that when working in EJ (or otherwise marginalized communities), municipal leaders and planners engage the community from the earliest possible stages of planning. Attachment E includes maps of each watershed region showing opportunities sites overlapped with environmental justice areas.

Greenspace Deserts

Communities may similarly want to prioritize areas currently lacking greenspace as sites for early implementation of GSI. These so called "greenspace deserts" defined here as areas with no open space within a quarter mile, are likely in need of trees and other plants for temperature control, habitat

enhancement, and aesthetic reasons. Attachment E includes maps of each watershed region showing opportunity sites overlapped with existing greenspace deserts.

Habitat Connectivity

In the highly developed Boston area, expansive forests and open space are bifurcated by areas of heavy development and impervious cover. Even small greenspaces can help wildlife navigate across the area and support migration (Kong et al., 2010). Strategic location of GSI may support developing wildlife corridors across the region. Attachment E includes maps of each watershed region showing opportunities sites overlapped with priority areas for habitat connectivity.

Large Privately-Owned Sites

Municipalities with large institutions or commercial developments should consider engaging with these large landowners in their communities. As noted above under public sites, these have the potential to provide considerable stormwater treatment on one site or through one project. Commercial, industrial, and high-density residential properties contribute the highest pollutant loads and therefore it will be difficult to achieve necessary phosphorus reductions without targeting these areas. It should be noted that the EPA is considering targeting these properties with a separate permitting process; communities are encouraged to follow that process (See *Charles River (Massachusetts) Residual Designation Petition* link in references). Communities should follow this process as it may impact their phosphorus reduction requirements. In the interim, a preliminary inventory of suitable privately-owned sites may allow the community to take opportunistic advantage of new or re-development activity initiated by the owner where enhanced structural controls may achieve significant progress toward reduction goals.

Areas with Additional Planning/Permitting Concern s

Institutional, regulatory or administrative barriers clearly exist that can negatively impact long-term strategies for implementing nature-based solutions. Examples include issues such as the fact that many low-quality wetland areas, both from hydrologic and ecological perspective, often have local protections or State protections, such as deed restrictions, Article 97, and/or specific Wetland Protection Act protections. These can be significant roadblocks to permitting or implementation of projects. These are important protections generally, however re-evaluation of such restrictions may be necessary if larger-scale projects are envisioned.

Two common constraints include wetland areas under the jurisdiction of the Wetlands Protection Act and land subject to conservation restrictions. Attachment F includes maps of each watershed region showing opportunities sites overlapped with these areas. These constraints do not necessarily preclude implementation of structural controls and such controls may in fact have considerable benefits in protecting areas with unique or high-quality habitat value. They may require additional administrative, legal or regulatory processes to ultimately implement such projects.

Flood Mitigation Co-Benefits

The Charles River Climate Compact (CRCC) developed the Charles River Flood Model in the spring of 2021. This model developed using the software PCSWMM models stormwater flow in the upper and middle watershed. The model incorporates stormwater infrastructure from the majority of the communities in this region and can be updated to include additional infrastructure as it is mapped or made available. Initial results of this model are available online (see Charles River Flood Model results viewer link in references) and demonstrate key areas of concern for flooding in a variety of different

present day and future scenario storm events. Communities are encouraged to consider flood mitigation co-benefits when selecting and siting structural stormwater best management practices. In certain cases, communities may want to consider implementing larger structural stormwater best management practices to achieve both water quality and flood mitigation goals in light of the expected impacts of climate change to our area.

Medium/Large Scale Development/Redevelopment Opportunities

There may be sites in the community that have been identified as opportunities for development or redevelopment through master planning (or other) processes. Communities may consider assigning these sites a required phosphorus reduction as part of their PCP development. When the time comes to develop or redevelop the property the specific phosphorus reduction will already be established.

Stormwater Drainage Network

Communities may evaluate their stormwater drainage networks to identify potential opportunities to intercept stormwater runoff from pipes for treatment. Key opportunity sites may include:

- Stormwater pipes that run through parks or other open spaces
- "Downstream" end of stormwater drainage areas (areas where considerable stormwater can be accessed in one location)
- Stormwater pipes that run through parking lots (especially oversized lots)
- Cul-de-sacs and other roadways
- Existing retention/detention ponds that could be retrofitted for phosphorus control

If your community provided stormwater drainage information in GIS for incorporation into the Charles River Flood Model, closely review results in your community to determine if green stormwater infrastructure can also help address stormwater flooding challenges (see below).

Other Factors Per the MS4 Permit

Communities should also consider the following in identification of areas (including municipal properties with significant impervious cover (including parking lots, buildings, and maintenance yards) and infrastructure (e.g., drainage systems, roadway projects, etc.) where BMP implementation may be easiest and provide the most pollution reduction benefits (a.k.a. "priority ranking").

- Available screening and monitoring results collected during the permit term either by the municipality (e.g., IDDE dry and/or wet weather outfall screening) or another entity (watershed organization, public health agency, state agency, etc.). The intent of using these data is to help communities identify catchments with higher phosphorus loading and plan to address those areas with phosphorus BMPs through the PCP as soon as possible.
- Access for maintenance purposes;
- Site-specific subsurface geology;
- Site or area-specific depth to water table;
- Proximity to aquifers;
- Proximity to subsurface infrastructure including sanitary sewers and septic systems;
- Capital plans for facilities, utility including sewer and drainage work, roadway programs including paving;
- Current storm sewer level of service;
- Discharges to water quality limited waters, first or second order streams, public swimming beaches, drinking water supply sources, and shellfish growing areas may be appropriate to target first because of the additional public health benefits improved water quality can provide;

- Previously developed watershed management plans or results from watershed planning tool (Opti Tool)
- Development/redevelopment permits, as any site undergoing new or redevelopment poses an opportunity to install structural BMPs.
- Anticipated private projects.

Public Input and Engagement

Planning and siting of green stormwater infrastructure for PCP compliance is similar to any municipal planning process. Public engagement and opportunities for input should be key components of the process and incorporated from the start. The PCP will require a switch from stormwater infrastructure that is completely underground and out of public view to stormwater infrastructure that may take up space on our roads, sidewalks, parking lots, parking lanes, etc. Additionally, achieving compliance with the PCP will require the expenditure of public funds. The public will need to be engaged in the planning process to ultimately support these investments and changes. There are numerous webinars available online regarding engaging communities in GSI planning.

Previously developed watershed management plans or results from watershed planning tool (Opti Tool), MVP Summary of Findings Reports, Open Space and/or Recreation, Local Hazard Mitigation, Master and other local plans.

Many of the elements discussed above are likely already the focus of one or more local plans or initiatives. Other existing plans can be consulted both for opportunity site identification and for prioritization based on attributes not included in this memorandum.

Organizing the Inventory and Initiating the Priority Ranking

We recommend that each community develop a list and then a ranking matrix of opportunity sites based on the factors noted above (or others appropriate to your community) and the accompanying maps and resources. (The Excel provided in Appendix R.6 of the Charles River PCP can serve this purpose.)

Note: It is beneficial to develop a system for naming treatment system opportunity sites and contributing drainage areas at this stage. BATT requires an ID for each system and consistency between planning materials and accounting materials will be important. IDs can be based on location, system type, year constructed, drainage infrastructure ID, or any other factors.

Communities can rank priority areas based on the factors noted above or other community values or community specific feasibility factors. These may include other green infrastructure co-benefits not discussed above, community wants and needs, political climate, and implementation mechanisms.

For each opportunity site we recommend that communities make a reasonable assumption of the phosphorus reduction possible on each site to plan a path toward compliance. See PCP Template *Section 1.7.2 Planned Structural BMPs* for additional details on undertaking this prioritization effort.

As noted in PCP Template and accompanying materials, municipalities are strongly encouraged to use legal, policy, and possibly financial mechanisms to drive structural control implementation on private property, especially highly-impervious properties, and commercial, industrial and high-density residential land uses.

References

Charles River (Massachusetts) Residual Designation Petition: https://www.epa.gov/charlesriver/epa-region-1-petition-review-stakeholder-engagement-process-faqs

CRWA and The Nature Conservancy developed a tool for the Charles River watershed that helps identify stormwater treatment system opportunity areas based on a desktop GIS analysis. The tool is available online at: https://maps.coastalresilience.org/massachusetts

List of Attachments

Attachment A: Location Screening and Prioritization Matrix
Attachment B: GIS Methods
Attachment C: Urbanized Areas Maps
Attachment D: Large Publicly Owned Sites Maps
Attachment E: Environmental Justice/ Greenspace Desert/ Habitat Connectivity Maps
Attachment F: Areas with Additional Planning Concerns Map
Attachment G: List of Large Publicly Owned Sites (Provided as Excel)

Attachment A: Location Screening and Prioritization Matrix

Criteria Subcategory	Degradation			Feasibility	
Criterion Overview	Indicates need for restoration			Indicates high feasibility areas to implementing effective green infrastructure	
Criteria Shorthand	Areas with groundwater depletion	Properties with high impervious cover	Areas with high pollution loading	Areas with well draining soils	Areas with space availability
Layer Details (GIS file)	MassDEP Sustainable Water Management Initiative (SWMI) net groundwater depletion	Building Structures, MassGIS	• Impervious cover, MA Land Use/Land cover 2016 • MA Land Use 2005	NRCS Hydrologic Soil Groups	Existing parks and open spaces, MassGIS 2017
Analysis	Categories 4 or 5	Building Structure Footprints >1 acre	Commercial, Industrial, High-Density Residential land Land cover = impervious	Soil groups A and B, and unknown	Publicly owned parks and open space
Analysis Detail	Basins whose unaffected August median flow is more than 25% depleted after accounting for groundwater and groundwater discharges	Buildings with large footprints often have large parking lots	High pollutant, impervious areas are ideal areas to target large pollutant loads	A and B soils have high infiltration capacity, making them ideal areas to implement green infrastructure. Unknown soils were included to not exclude urban areas with little information.	Upland restoration projects can often be implemented in existing, publicly owned parks and open spaces
Co-benefits (displayed as overlays)	• Environmental Justice Communities (MA_CharlesRiver_EnvJustice) • Greenspace Deserts (MA_CharlesRiver_GreenspaceDeserts)				
Excluded	• Activity/Use Limitation (AUL) sites, 21(e) sites, and underground storage tanks (MassGIS 2016 with 200' buffer) • Forested areas (MA Land Use 2005) • Wellhead Protection Zone I and Zone II areas (MassGIS 2016) • Surface water and buffer zones				
Prioritization	• Priority upland restoration opportunities occur at sites that have at least one degradation indicator and/or at least one feasibility indicator.				

Attachment B: GIS Methods

GIS Methods

All maps have a base layer (upland restoration)

- From the CRWA and TNC conservation tool
    - "Upland areas are areas in the watershed not within surface water buffer zones. Upland restoration opportunities occur at sites that have at least one degradation indicator and/or at least one feasibility indicator. Where these overlap with inland flooding hazards LID projects could have a positive impact on flood storage. We also identify sites that could provide targeted co-benefits to environmental justice communities and areas with gaps in protected green space."

1. *Urbanized Areas*
    1. From the EPA, downloaded urbanized area shapefiles from 2010 (UA2010_watershed.shp) and 2000 (UA2000_watershed.shp)

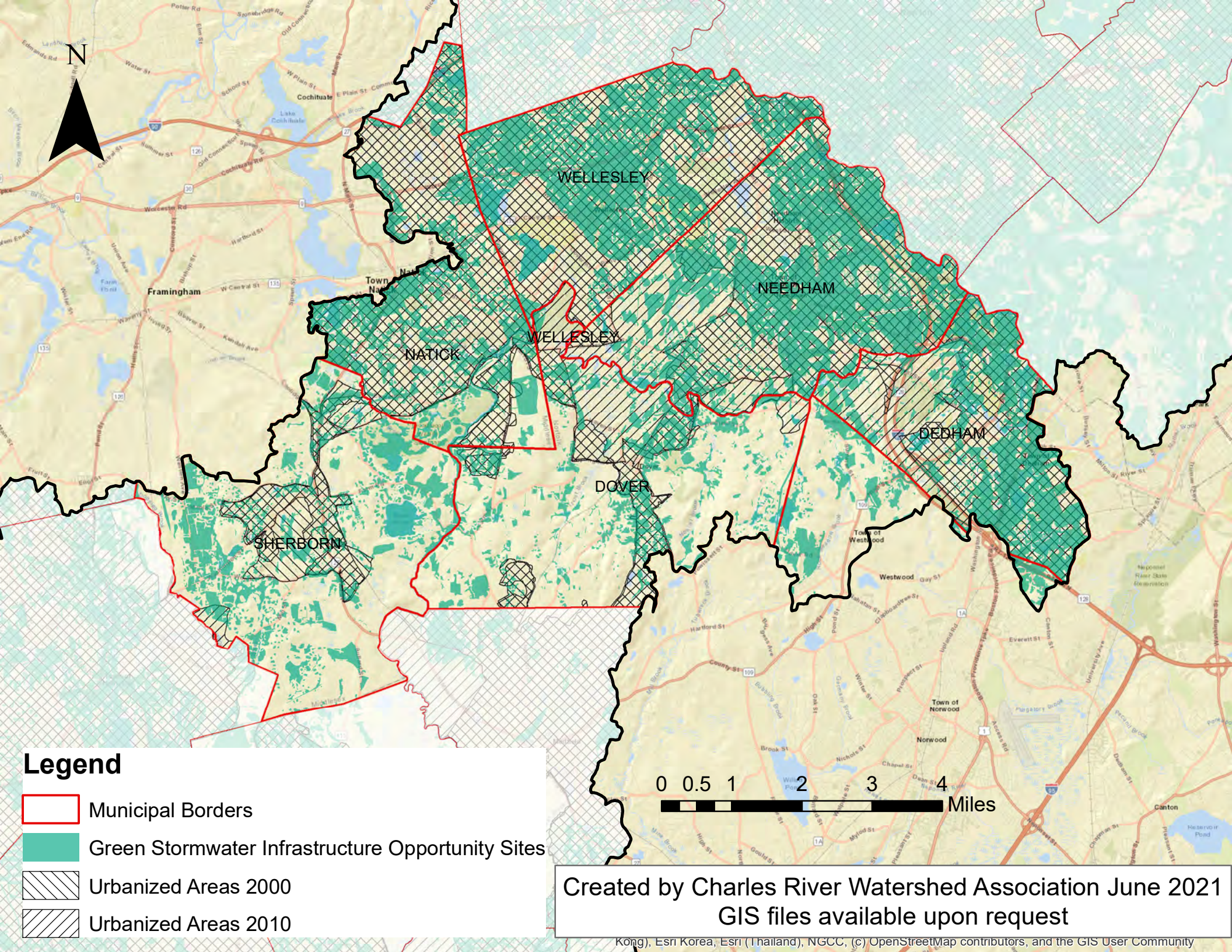
2. *Large Publicly Owned Sites*
    a. For each municipality, selected for "Tax Exempt" from MA Land Use 2016 to pull out public parcels
    b. Merged all tax exempt parcels per town into one single watershed-wide file (TaxExempt_merge.shp)
    c. Dissolved merged tax exempt parcels (TaxExempt_Dissolve.shp)
    d. Pull parcels >= 2 acres from state-wide parcel layer
    e. Intersected TaxExempt_Dissolve.shp with the selected parcels to find public parcels >2 acres (TaxExemptParcels2acres_watershed.shp)
    f. From TaxExempt_merge, select for COVERNAME = "Impervious", to pull out impervious areas within the tax exempt parcels
    g. Dissolve previous selection (TaxExempt_ImperviousDissolve.shp), then intersect with TaxExemptParcels2acres_watershed.shp to get impervious areas within the tax exempt parcels >2 acres → PublicParcel2acre_imperviousintersect.shp
    h. Filter and select impervious areas >1 acre
    i. From TaxExempt_Parcels2acres_watershed.shp, pull out publicly owned parcels (municipal, state, or federally owned) that had >1 acre of impervious area→ Public_TaxExemptParcels2acres.shp
    j. Intersect Public_TaxExemptParcels2acres.shp with TaxExParc5Imperv_1acre.shp to only pull out impervious areas >1 acre within publicly owned parcels (PublicParcel2acre_impervious1.shp)

3. *Environmental Justice Communities, Greenspace Deserts, Habitat Connectivity*
    a. From CRWA's and TNC's Conservation Tool:
        i. Environmental Justice Communities (MA_CharlesRiver_EnvJustice.shp)
        ii. Greenspace Deserts (MA_CharlesRiver_GreenspaceDeserts.shp)
        iii. Habitat Connectivity (MA_CharlesRiver_Category_Habitat.shp)
            1. Select "Tier 2"
    b. This map can be mostly recreated via the online tool by turning on these specific layers:
        1. Restoration → Environmental Justice Communities, Green Space Deserts, and Upland Restoration Opportunities
        2. Conservation → Conservation Categories → Habitat Category

4. *Areas with additional planning/permitting concerns*

a. From DEP, added 100ft buffer to wetlands shapefile (Wetland_buffer.shp)
b. From CRWA's and TNC's Conservation Tool: Protected Open Space (MA_CharlesRiver_ProtectedOpenSpace_June2018.shp)

Attachment C: Urbanized Areas Maps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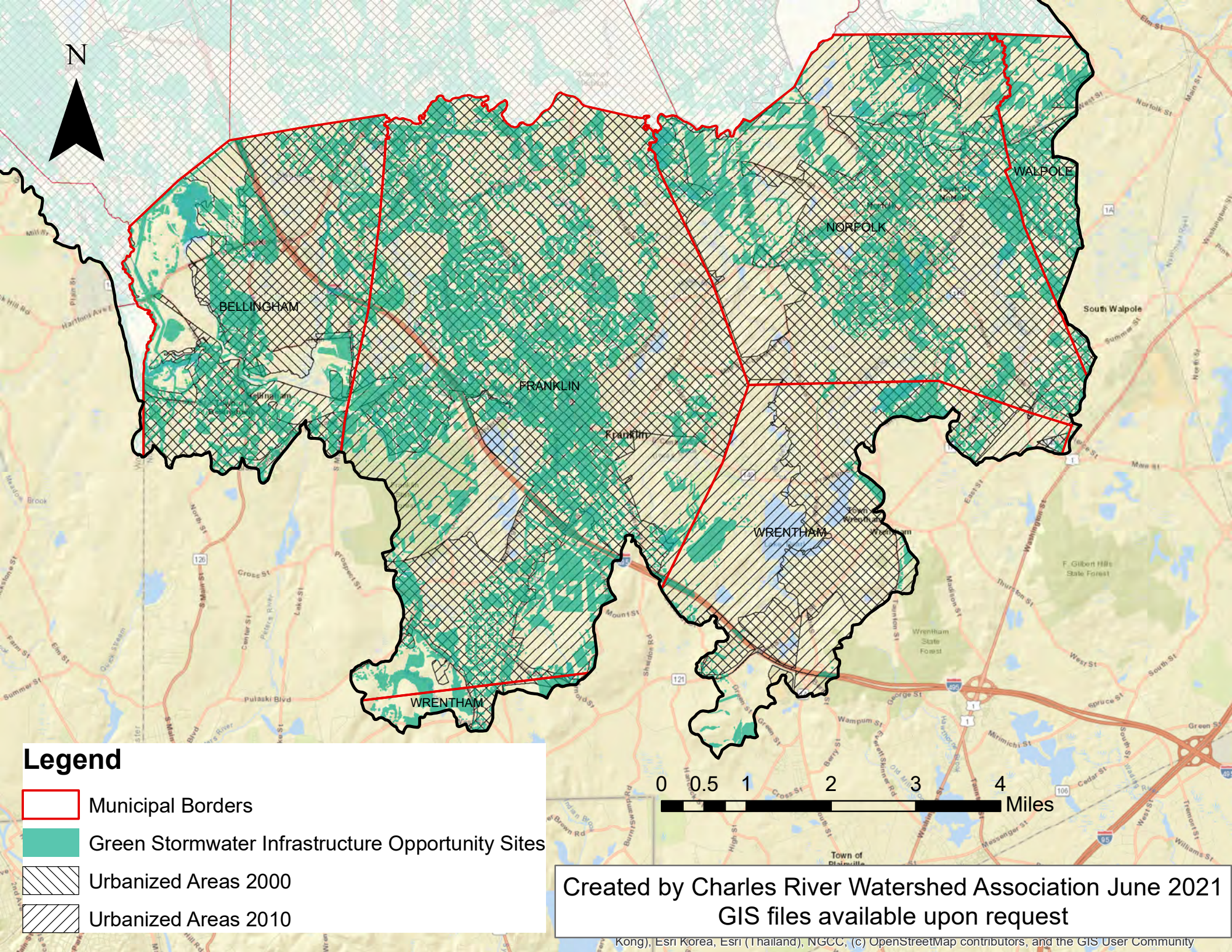
Municipal Borders
Green Stormwater Infrastructure Opportunity Sites
Urbanized Areas 2000
Urbanized Areas 2010
Created by Charles River Watershed Association June 2021
GIS files available upon request
Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community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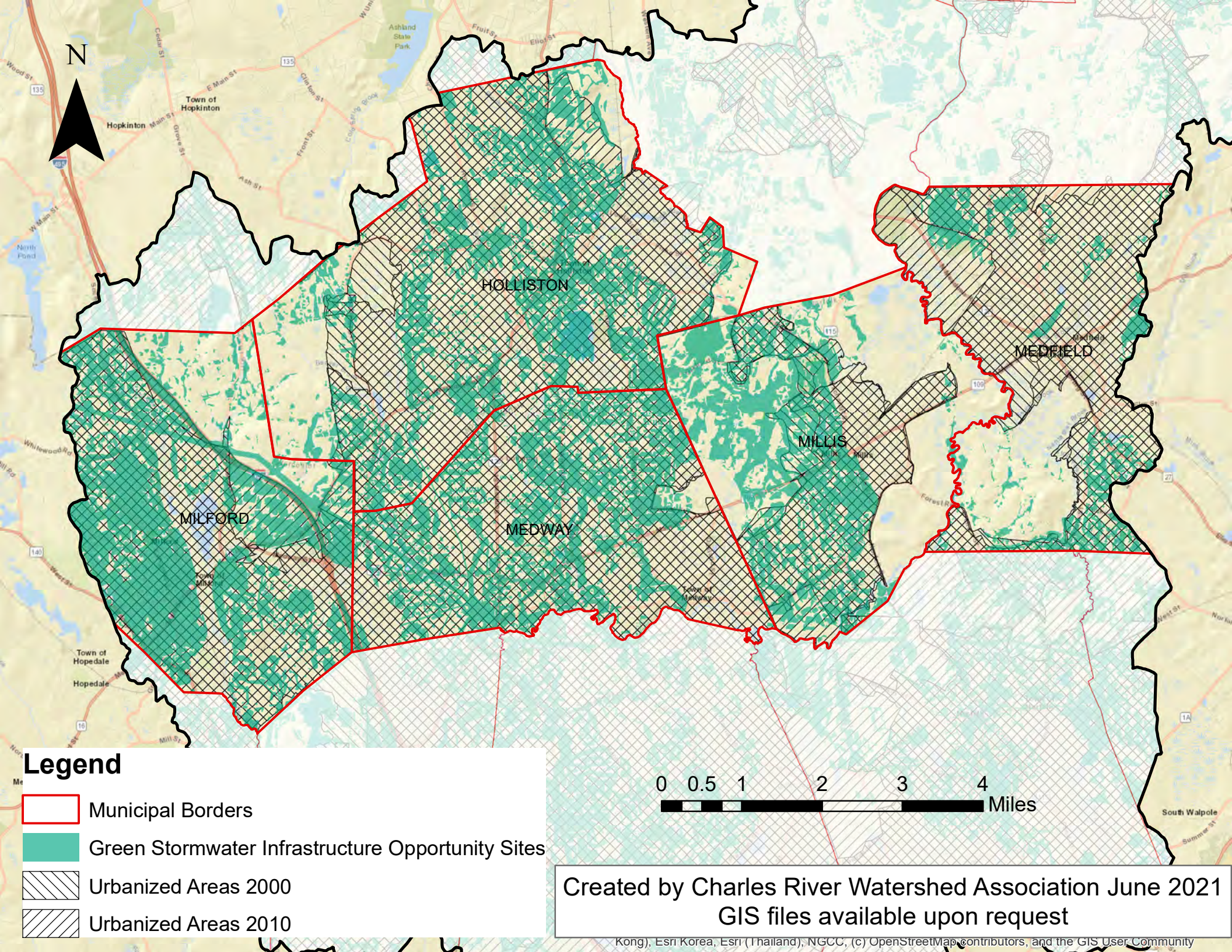
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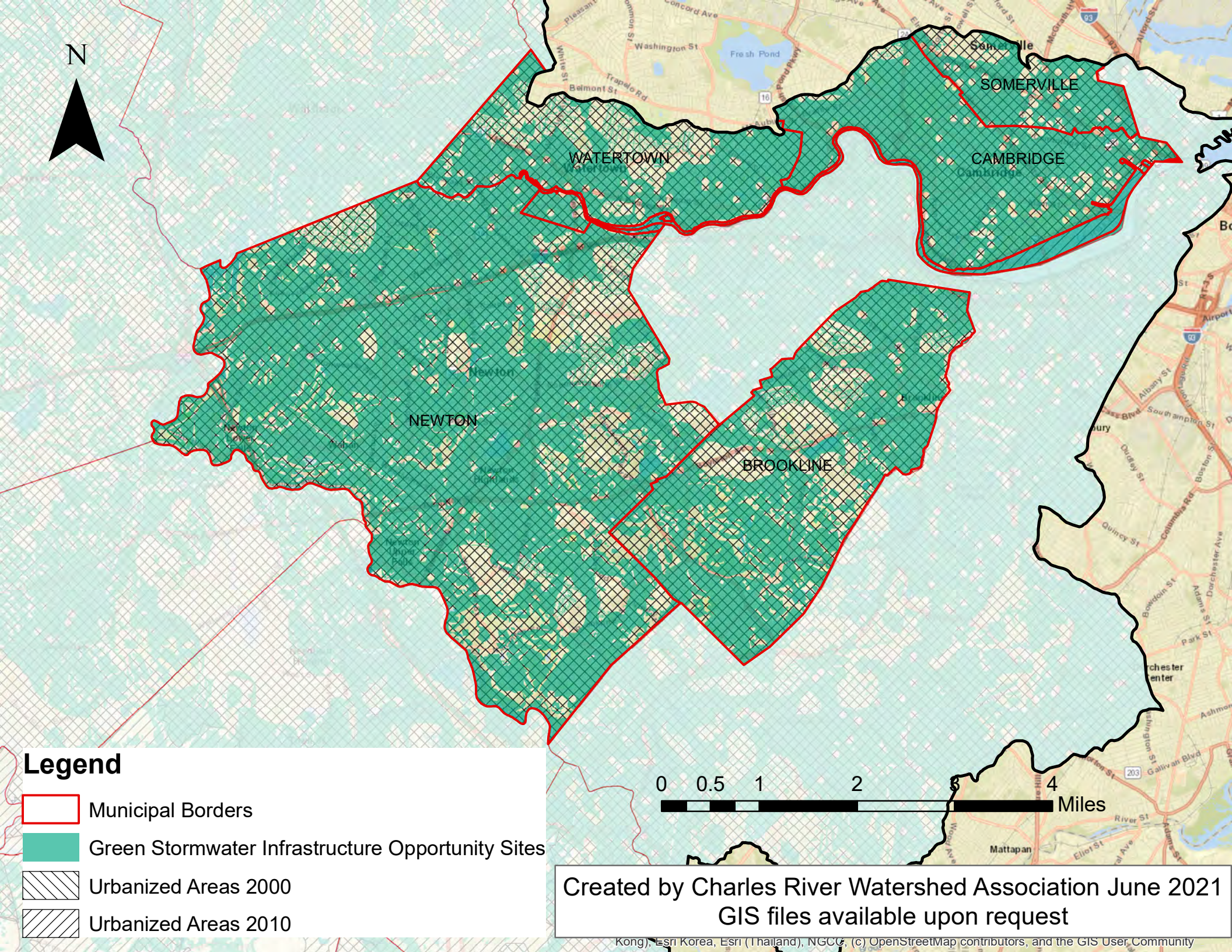
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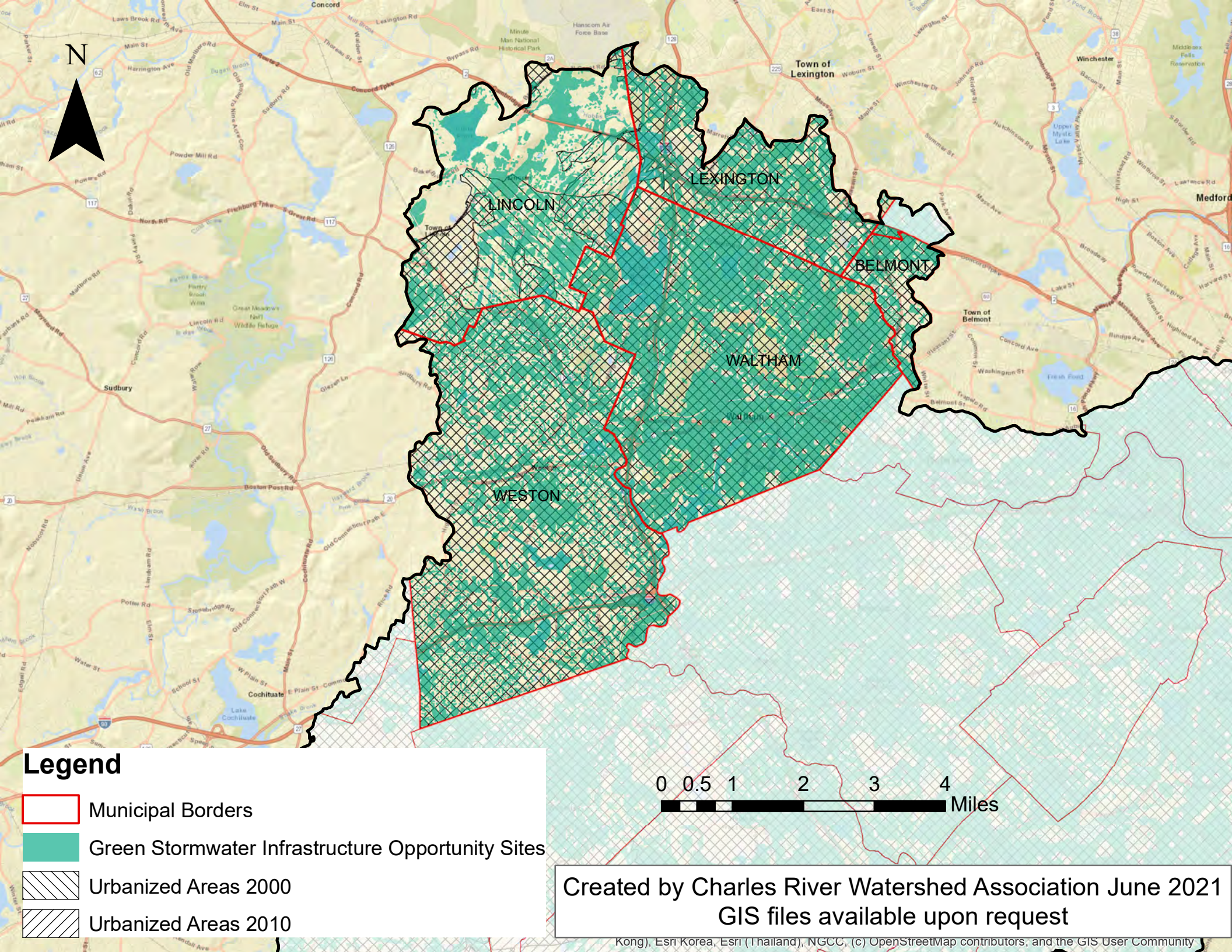
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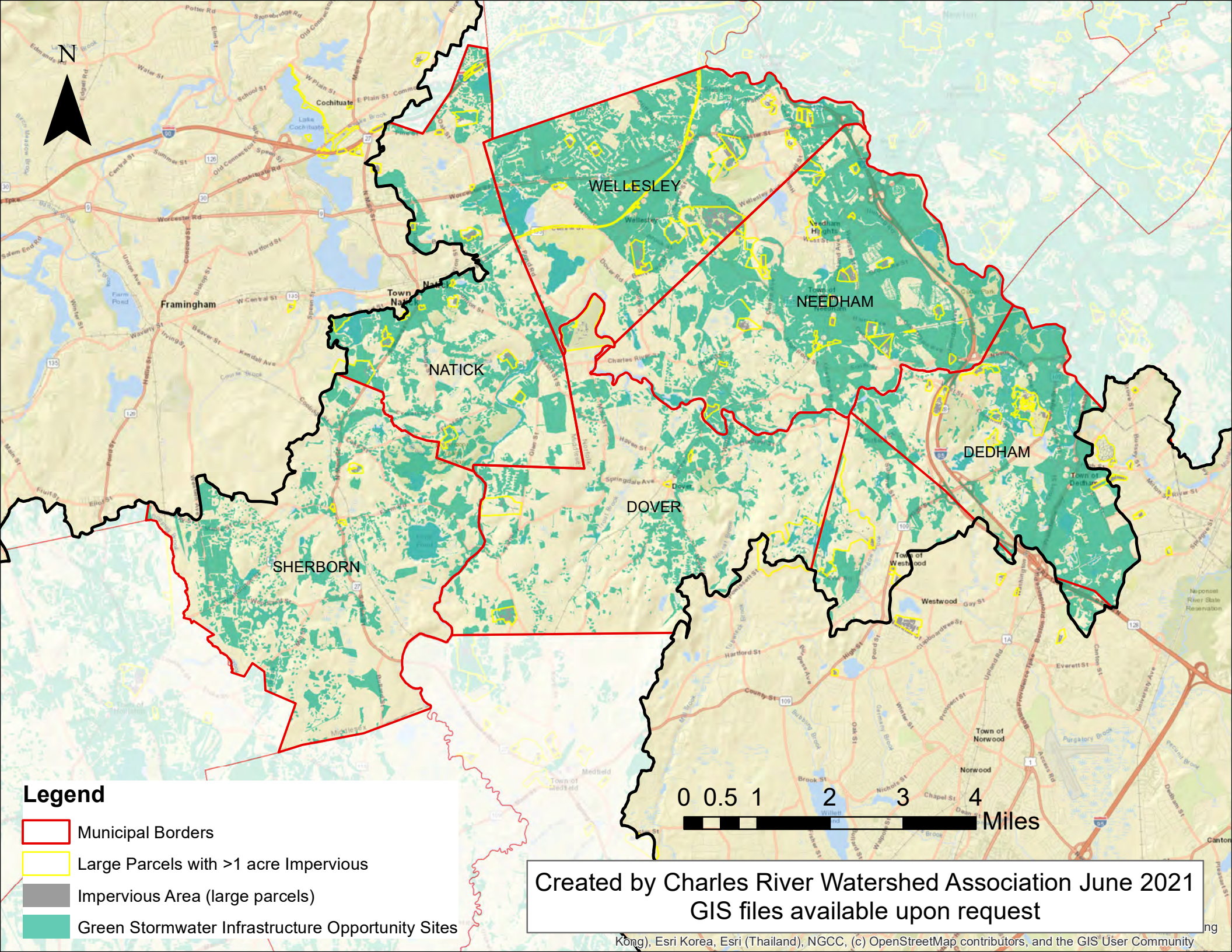
Attachment D: Large Publicly Owned Sites Maps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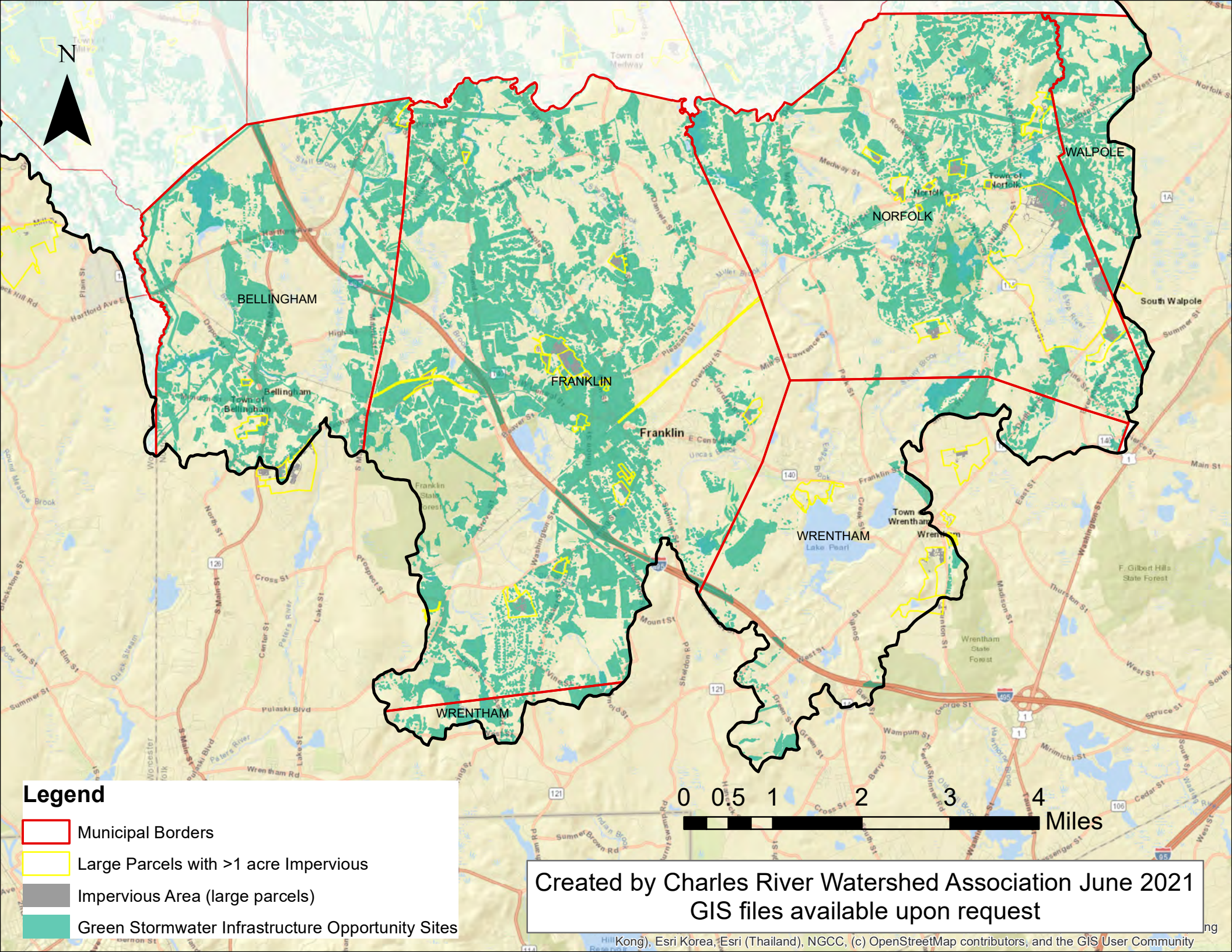
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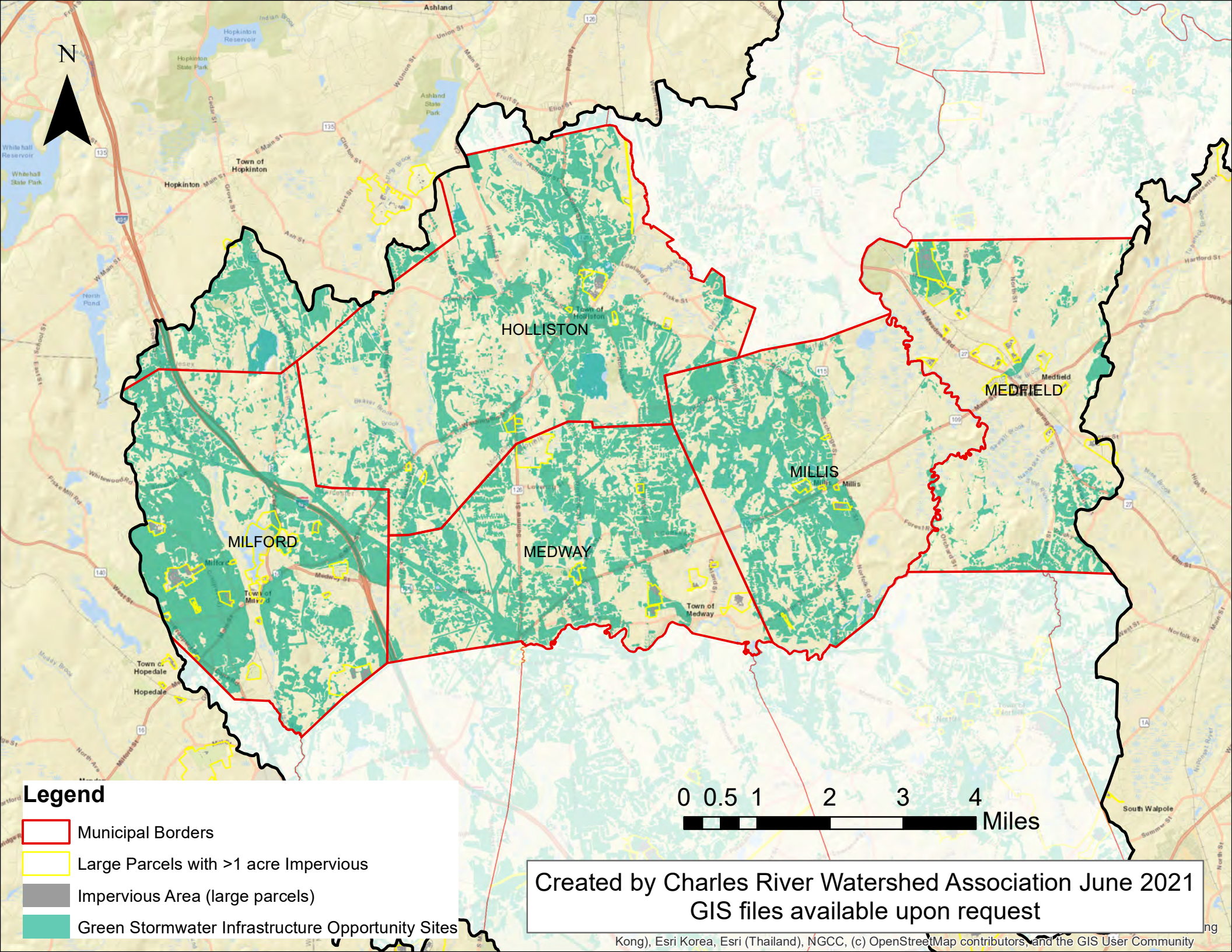
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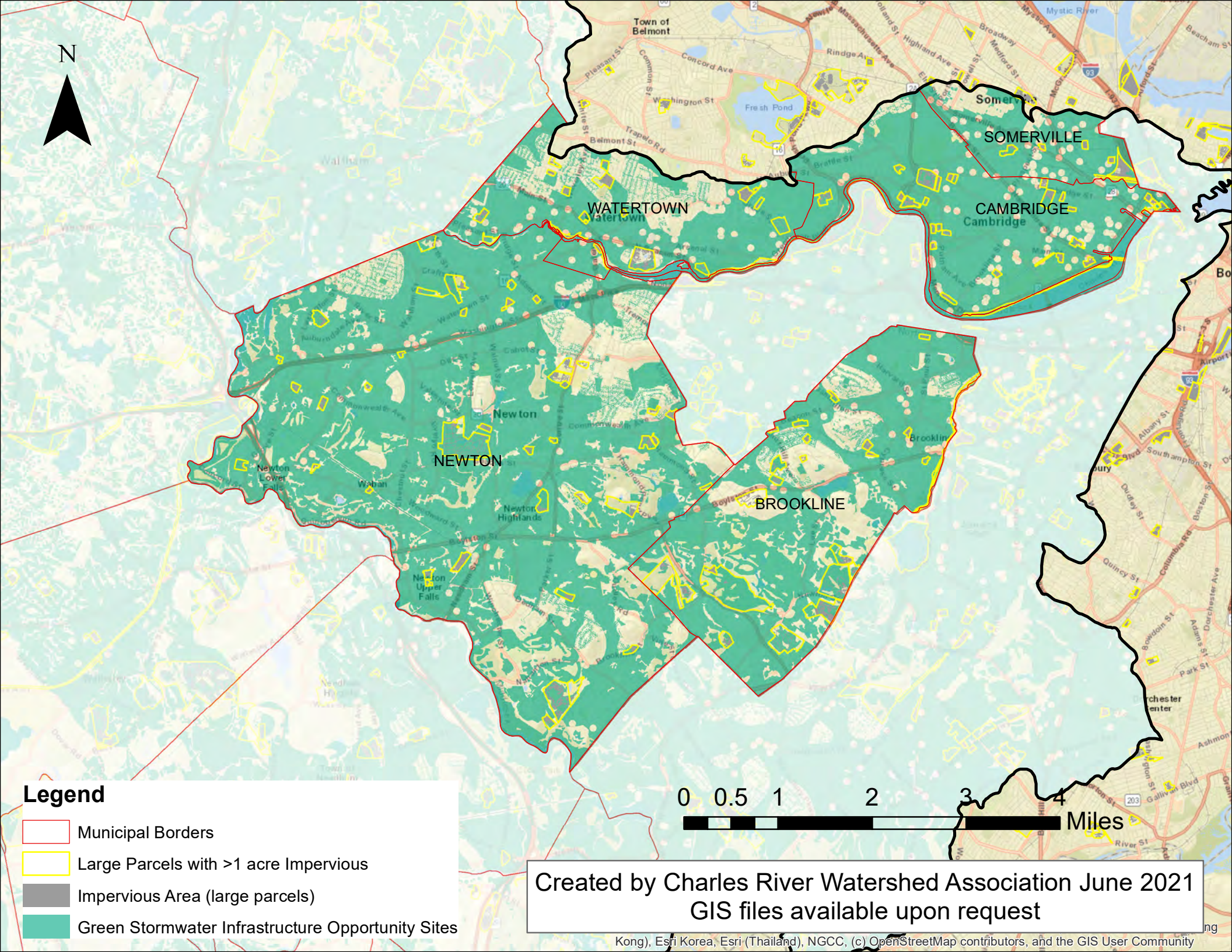
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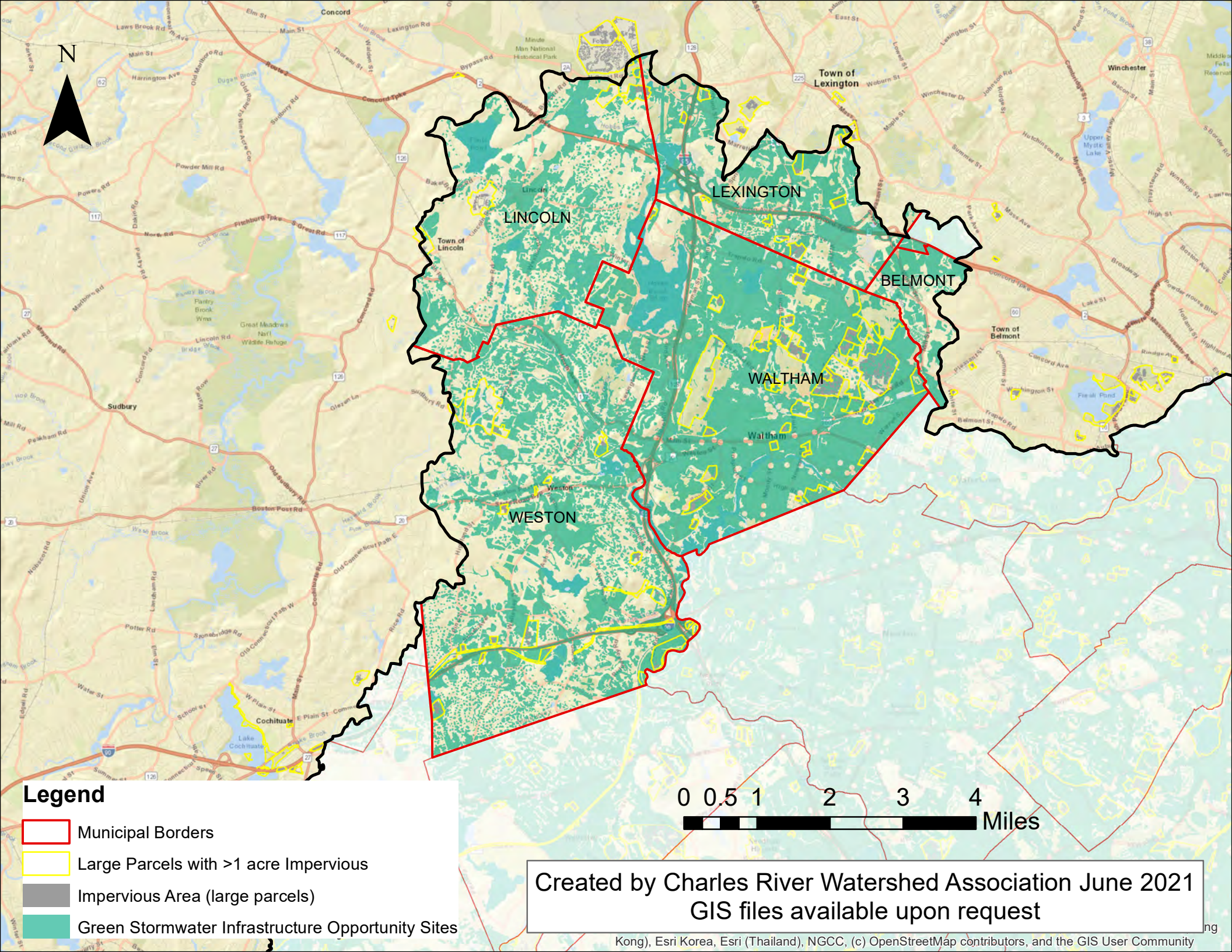
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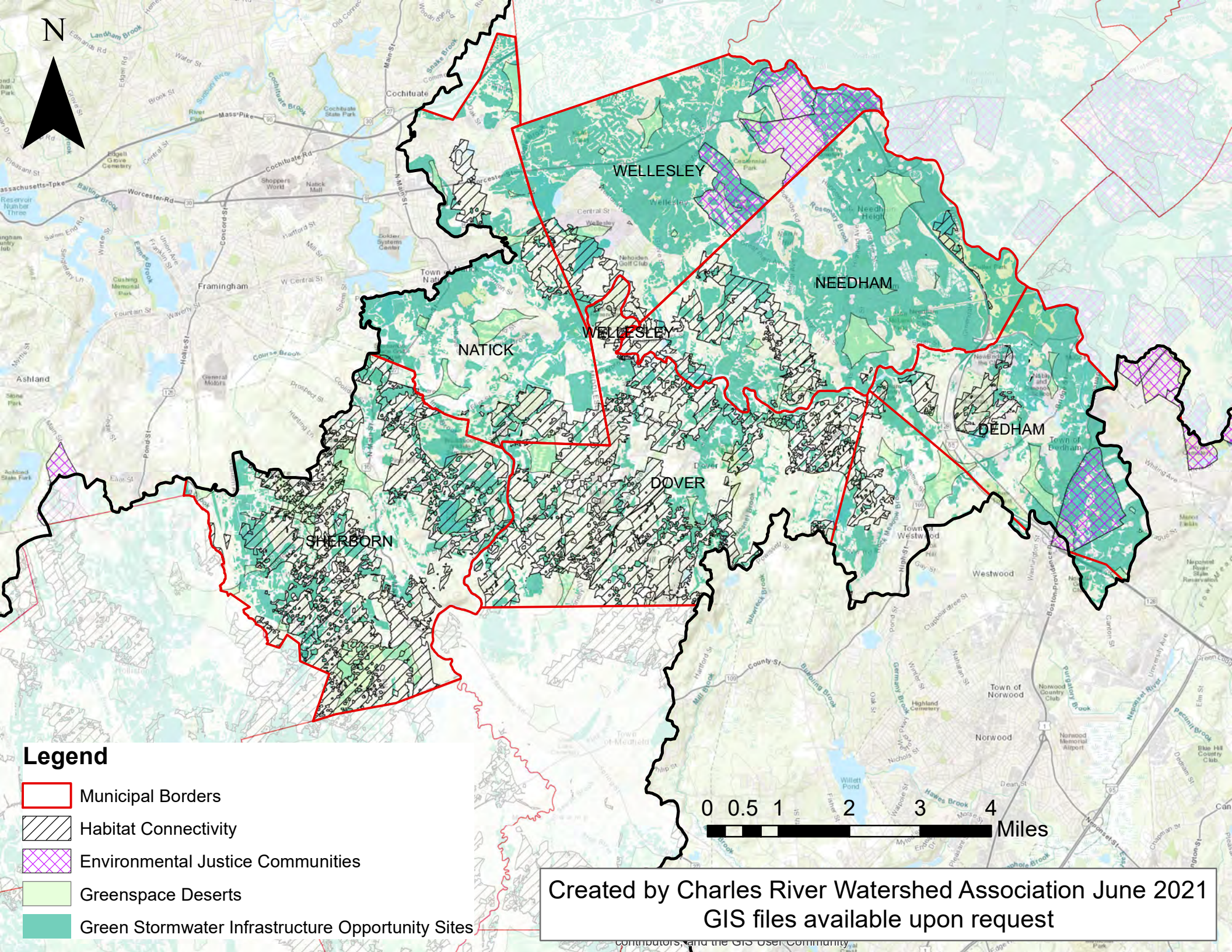
Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Attachment E: Environmental Justice/Greenspace Desert/ Habitat Connectivity Maps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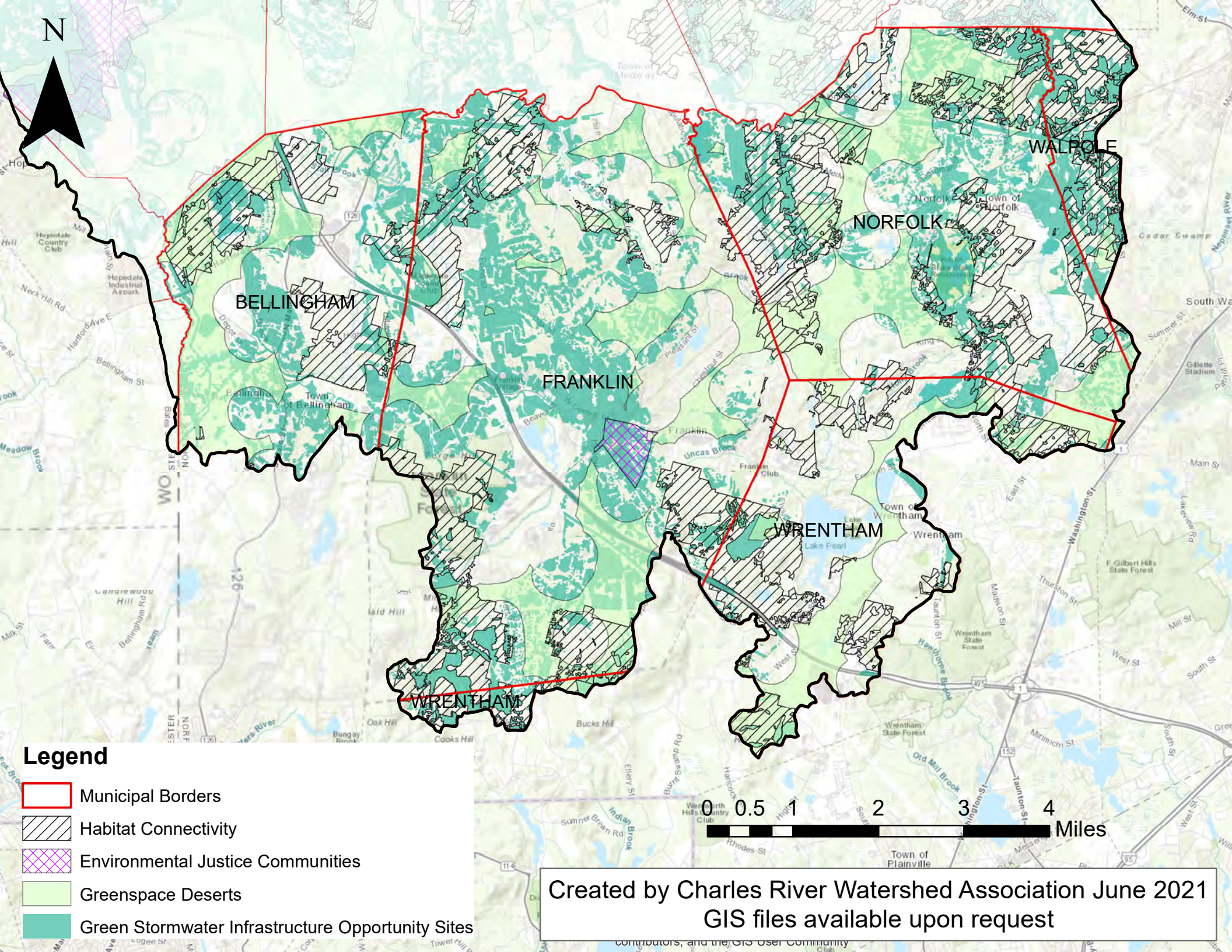
WELLESLEY
NEEDHAM
NATICK
WELLESLEY
DEDHAM
DOVER
SHERBORN
Framingham
Cochituate
Ashland
Westwood
Norwood
Legend
Municipal Borders
Habitat Connectivity
Environmental Justice Communities
Greenspace Deserts
Green Stormwater Infrastructure Opportunity Sites
0 0.5 1 2 3 4
Miles
Created by Charles River Watershed Association June 2021
GIS files available upon request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NORFOLK
BELLINGHAM
FRANKLIN
WRENTHAM
WRENTHAM
Legend
Municipal Borders
Habitat Connectivity
Environmental Justice Communities
Greenspace Deserts
Green Stormwater Infrastructure Opportunity Sites
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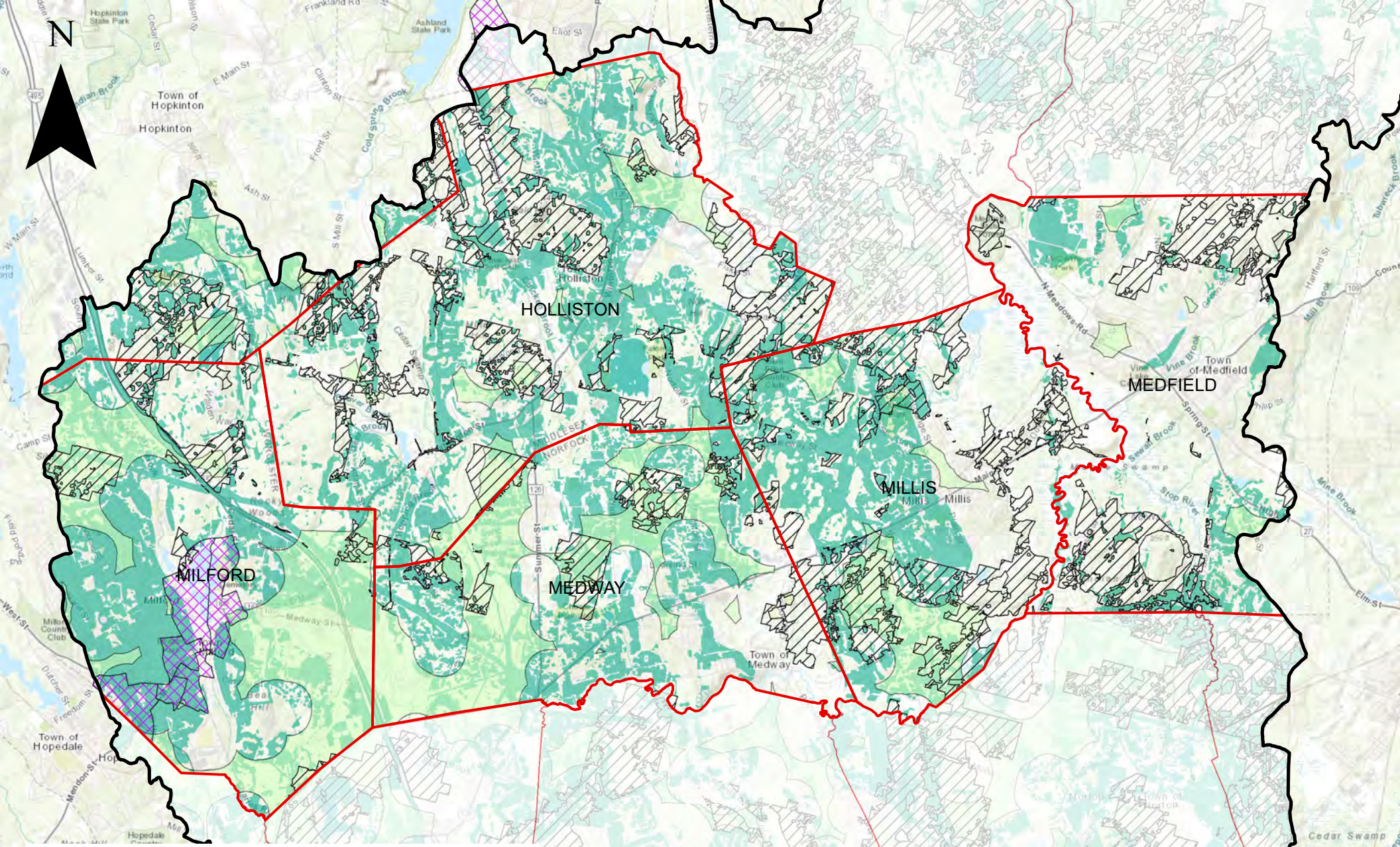
Miles
Created by Charles River Watershed Association June 2021
GIS files available upon request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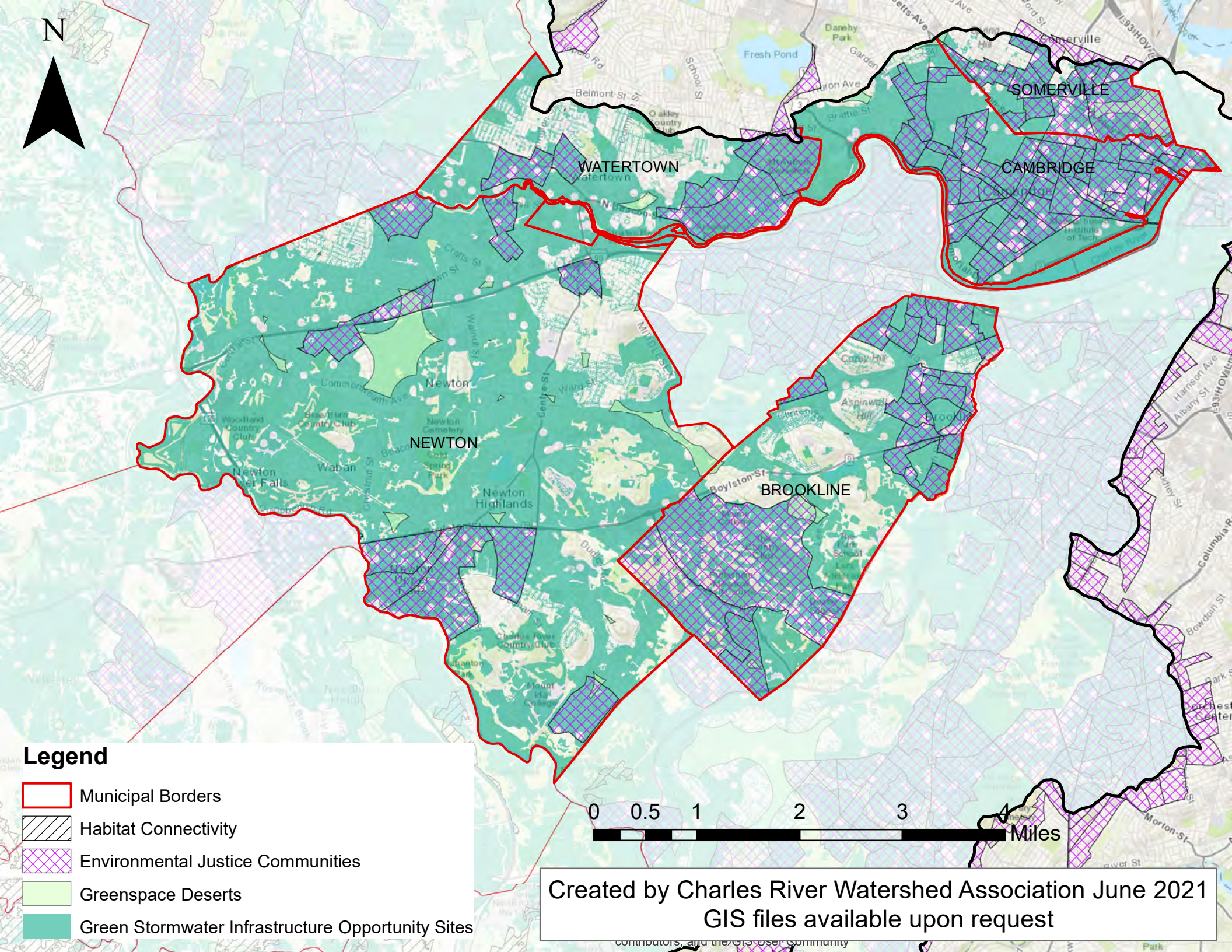
MEDFIELD
MILLIS
MILFORD
MEDWAY
Town of Hopkinton
Hopkinton
Town of Medfield
Town of Medway
Town of Hopedale
Legend
Municipal Borders
Habitat Connectivity
Environmental Justice Communities
Greenspace Deserts
Green Stormwater Infrastructure Opportunity Sites
0 0.5 1 2 3 4
Miles
Created by Charles River Watershed Association June 2021
GIS files available upon request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SOMERVILLE
CAMBRIDGE
NEWTON
BROOKLINE
Newton
Waban
Newton Highlands
Fresh Pond
Belmont St
Boylston St
Legend
Municipal Borders
Habitat Connectivity
Environmental Justice Communities
Greenspace Deserts
Green Stormwater Infrastructure Opportunity Sites
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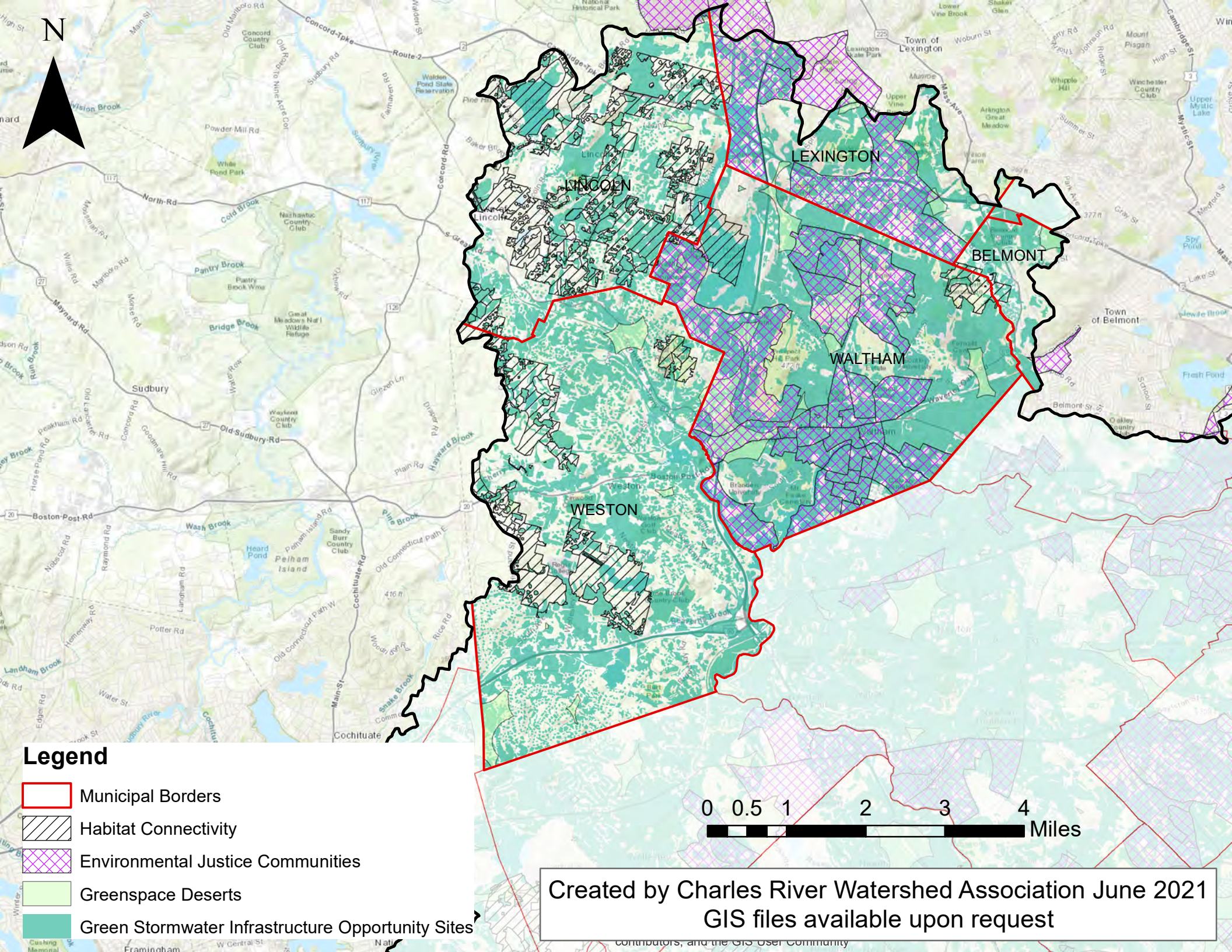
Miles
Created by Charles River Watershed Association June 2021
GIS files available upon request


N
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BELMONT
WALTHAM
WESTON
Legend
Municipal Borders
Habitat Connectivity
Environmental Justice Communities
Greenspace Deserts
Green Stormwater Infrastructure Opportunity Sites
0 0.5 1 2 3 4
Miles
Created by Charles River Watershed Association June 2021
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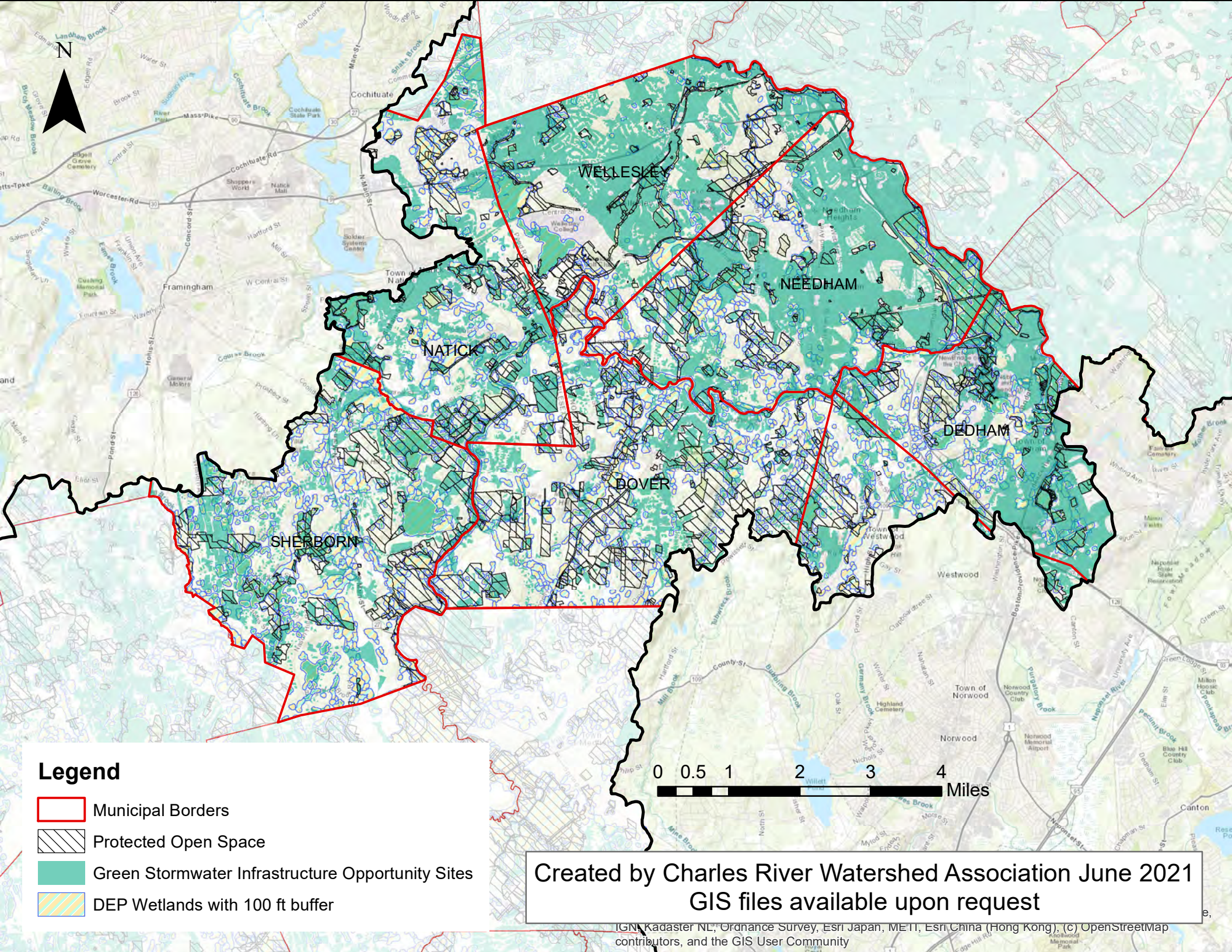
Attachment F: Areas with Additional Planning Concerns Map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NEEDHAM
NATICK
DEDHAM
DOVER
SHERBORN
Framingham
Cochituate
Westwood
Norwood
Town of Norwood
Canton
0 0.5 1 2 3 4
Miles
Legend
Municipal Borders
Protected Open Space
Green Stormwater Infrastructure Opportunity Sites
DEP Wetlands with 100 ft buffer
Created by Charles River Watershed Association June 2021
GIS files available upon request
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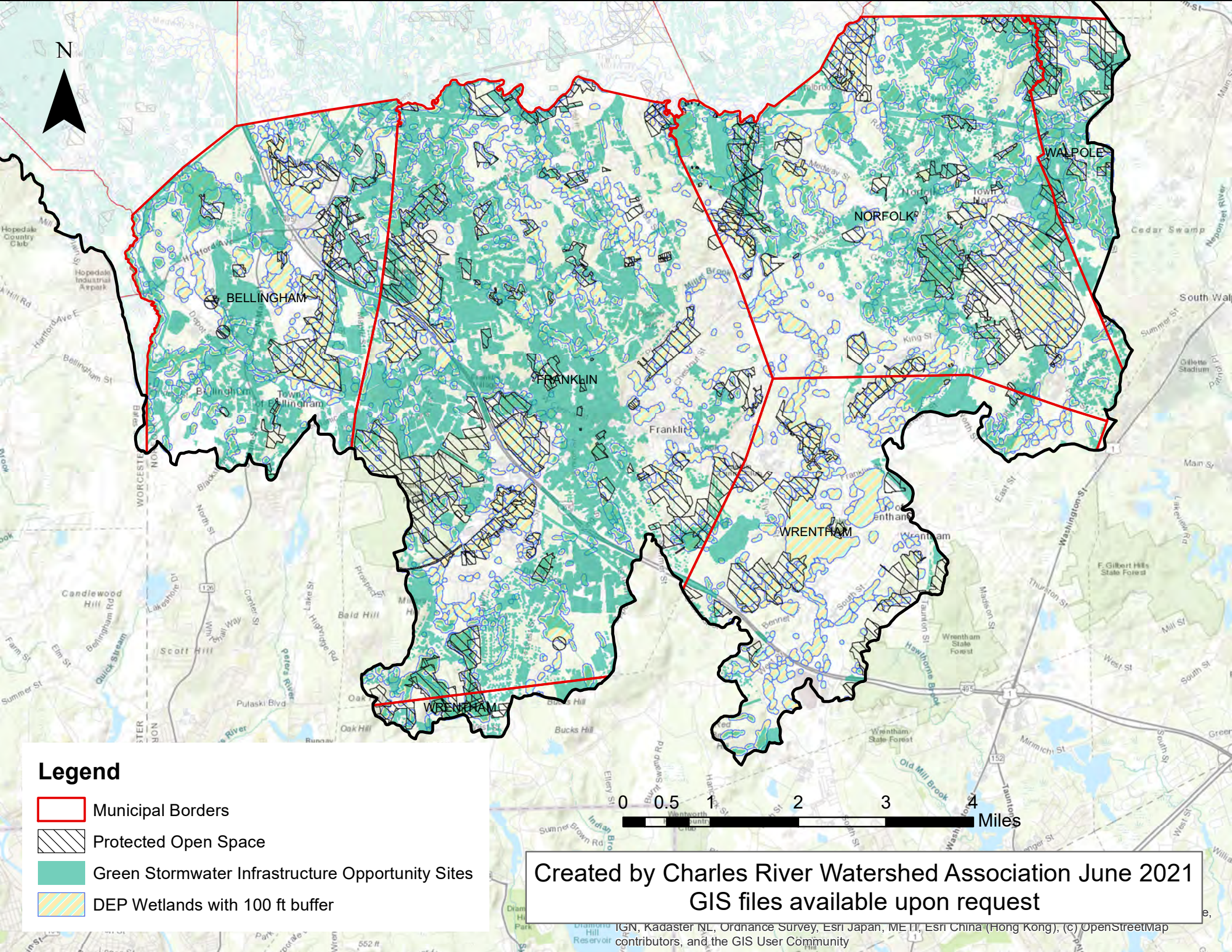
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WALPOLE
NORFOLK
WRENTHAM
WRENTHAM
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Municipal Borders
Protected Open Space
Green Stormwater Infrastructure Opportunity Sites
DEP Wetlands with 100 ft buffer
0 0.5 1 2 3 4
Miles
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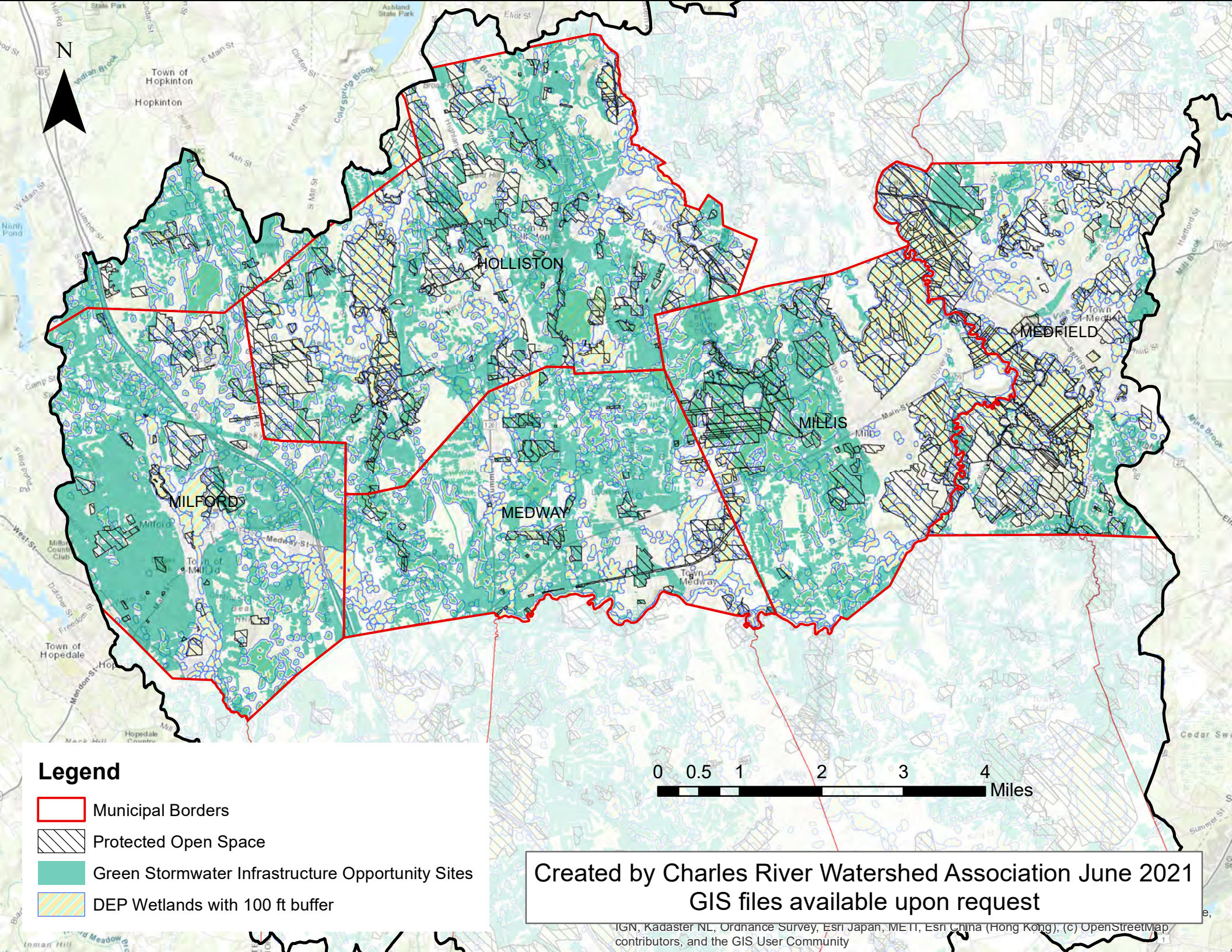
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MEDWAY
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MEDFIELD
Town of Hopkinton
Hopkinton
Town of Hopedale
Legend
Municipal Borders
Protected Open Space
Green Stormwater Infrastructure Opportunity Sites
DEP Wetlands with 100 ft buffer
0 0.5 1 2 3 4
Miles
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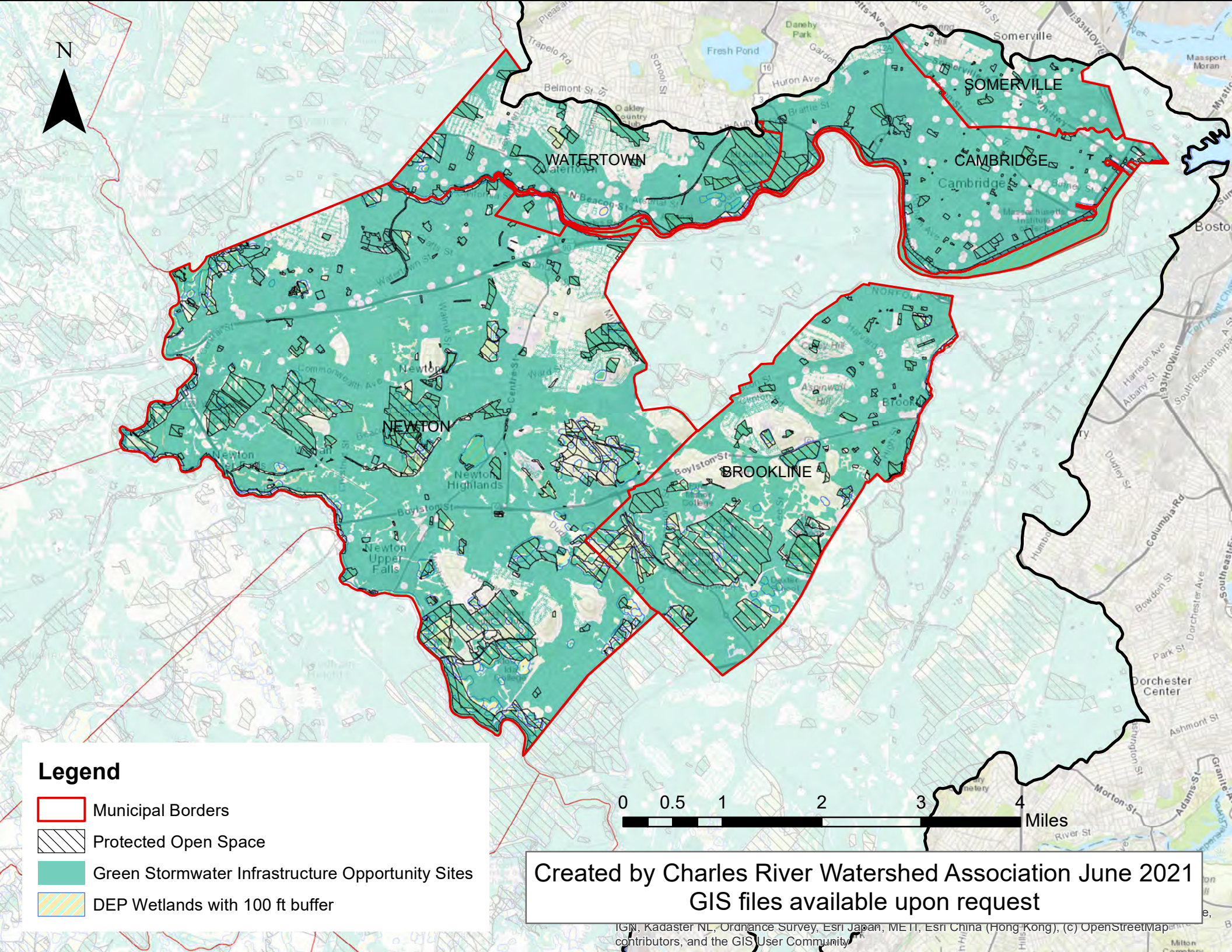
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WATERTOWN
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NEWTON
BROOKLINE
Legend
Municipal Borders
Protected Open Space
Green Stormwater Infrastructure Opportunity Sites
DEP Wetlands with 100 ft buffer
0 0.5 1 2 3 4
Miles
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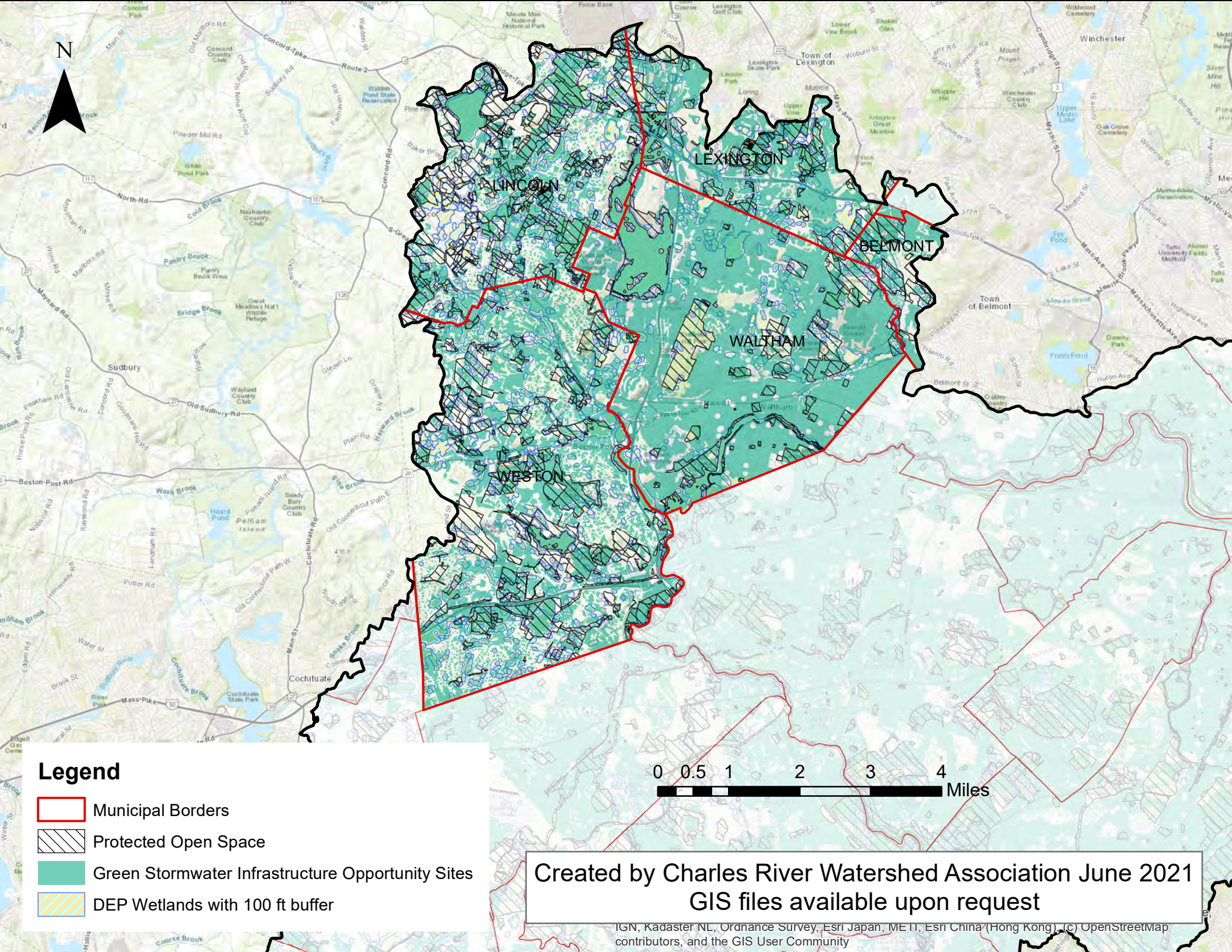
N
LINCOLN
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BELMONT
WALTHAM
WESTON
Sudbury
Cochituate
Town of Belmont
Town of Lexington
Winchester
0 0.5 1 2 3 4
Miles
Legend
Municipal Borders
Protected Open Space
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