

## MEMORANDUM

TO: Kendall Barbery, Save the Sound

FROM: Erik Mas, P.E.

DATE: February 16, 2015

RE: Green Infrastructure Retrofit Screening  
West River Watershed based Plan

---

Fuss & O'Neill performed a desktop screening-level review of green infrastructure retrofit opportunities in the West River watershed. The purpose of this review is to initially identify potential areas of the watershed with the greatest feasibility for and potential benefits from green infrastructure retrofits. This memorandum summarizes the methods and findings of the retrofit screening. With input from the West River Watershed Plan Steering Committee, the retrofit screening will serve as the basis for selection of sites for subsequent field inventories and concept designs.

### 1. Approach

A GIS-based screening analysis was conducted to identify specific parcel-based locations within the watershed where green infrastructure retrofits can be implemented that would provide water quality (i.e., pollutant reduction) and quantity (i.e., runoff reduction) benefits in the watershed. The types of green infrastructure retrofits with potential applicability in the West River watershed include:

- Pervious pavement
- Bioretention/bioswales
- Infiltration/filtration
- Green/blue roofs
- Tree planting
- Water harvesting/reuse

Target subwatersheds were initially identified as those subwatersheds with impaired water bodies since green infrastructure retrofits in these areas would have the greatest water quality benefits. The following subwatersheds were identified as target areas for further consideration:

- Lower West River
- Wintergreen Brook
- Beaver Brook
- Belden Brook
- Wilmot Brook

Memo: Kendall Barbery  
February 16, 2015  
Page 2 of 3

These subwatersheds also encompass those areas of the West River watershed with combined sewers, thereby providing additional benefits related to Combined Sewer Overflow (CSO) discharges by reducing the amount of runoff entering the combined sewer system.

The target subwatersheds were further screened to provide a list of sites potentially suitable for green infrastructure implementation. While green infrastructure retrofit opportunities exist within street rights-of-way, as evidenced by the ongoing "green streets" retrofits by the City of New Haven and the Greater New Haven Water Pollution Control Authority, the screening process for our analysis focused on parcel-based green infrastructure opportunities on publicly-owned land and privately-owned institutional properties.

The following screening criteria and data sources were used to initially identify the most feasible sites for green infrastructure retrofits in the target subwatersheds:

- Land Ownership – Publicly-owned (e.g., municipal) parcels are most favorable because they avoid the cost of land acquisition and provide direct control over green infrastructure construction, maintenance, and monitoring by the municipality. Other publicly-owned parcels such as schools, universities, state facilities, and federal facilities are also potential green infrastructure candidates. Certain types of private parcels (e.g., private universities, churches) may be suitable and were also included in the analysis.
- Subsurface Conditions – Subsurface conditions are key considerations for green infrastructure retrofits that rely on infiltration of stormwater runoff and where runoff reduction is desired. Soil infiltration capacity, depth to groundwater, depth to restrictive layers (bedrock, dense till), soil bulk density, and inundation of soils due to flooding are important soil-based characteristics that can affect the feasibility of infiltration-based green infrastructure retrofits.<sup>1</sup> For the purposes of this desktop screening evaluation, the following factors related to subsurface conditions were used to identify candidate sites for green infrastructure retrofits. These factors were selected based on their importance to infiltration capacity and related subsurface characteristics. In addition, these GIS data are widely available in GIS format, including for the entire West River watershed.
  - Hydrologic Soil Group – Hydrologic soil groups (HSGs) mapped by the Natural Resources Conservation Services (NRCS) provide an initial estimate of infiltration rate and storage capacity of soils on a site. Sites where mapped HSGs have high infiltration rates (A and B soils) are most suitable for infiltration stormwater practices. Soil maps

---

<sup>1</sup> Other site-specific factors such as land area, impervious area, drainage area, subsurface utilities, subsurface contamination, and storm drainage system capacity are also important considerations for green infrastructure retrofits.

Memo: Kendall Barbery  
February 16, 2015  
Page 3 of 3

are initial estimates of infiltration potential; field investigations are necessary to verify soil conditions for final feasibility determinations and design purposes.

- o NRCS Soil Based Stormwater Suitability Ratings – The NRCS developed state-wide soil-based suitability ratings in 2005 for several types of stormwater management practices including infiltration systems and retention/detention systems (i.e., rain gardens or bioretention basins that do not rely on infiltration). The suitability ratings are based on state soil survey data, integrate a variety of soil survey characteristics (HSG, depth to groundwater and restrictive layers, bulk density, permeability, flooding, etc.), and are intended for planning purposes, such as this screening evaluation.

## 2. Results

Considering the above screening criteria, the most feasible sites for green infrastructure retrofits in the target subwatersheds were initially identified through GIS analysis of publicly-owned land and NRCS soil units having desirable soil characteristics. Specifically, candidate sites for green infrastructure retrofits were identified as publicly-owned land or higher-priority private institutional land (e.g., churches and private schools) having soils that also meet the following criteria:

- HSG A or B soils, and
- High or moderate suitability for infiltration, retention, or detention stormwater BMPs based on the NRCS soil-based recommendations for stormwater management practices.

Open space areas that are essentially wooded conservation land with no existing buildings, roads, or parking areas (e.g., municipal open space near the intersection of Benham and Main Street in Hamden and the West River open space area near Route 63 in New Haven), were excluded from the list.

The table in *Attachment A* lists the resulting potential retrofit sites, including some basic characteristics of each site. The maps in *Attachment B* show the locations of the selected sites within the upper and lower portions of the West River watershed. The sites were further prioritized into three categories – (1) higher priority given to municipally-owned sites, (2) medium priority assigned to state and federal facilities, and (3) lower priority for privately-owned institutional sites. Aerial photographs of the higher-priority sites are included in *Attachment C*.

This initial list of potential green infrastructure retrofit sites is intended for review by the West River Watershed Plan Steering Committee. This list will be refined with input from the steering committee members based on local knowledge of site-specific conditions and other factors. The final list of sites will guide subsequent field inventories and concept designs.

## Appendix A

### List of Potential Sites for Green Infrastructure Retrofits

List of Potential Sites for Green Infrastructure Retrofits  
West River Watershed

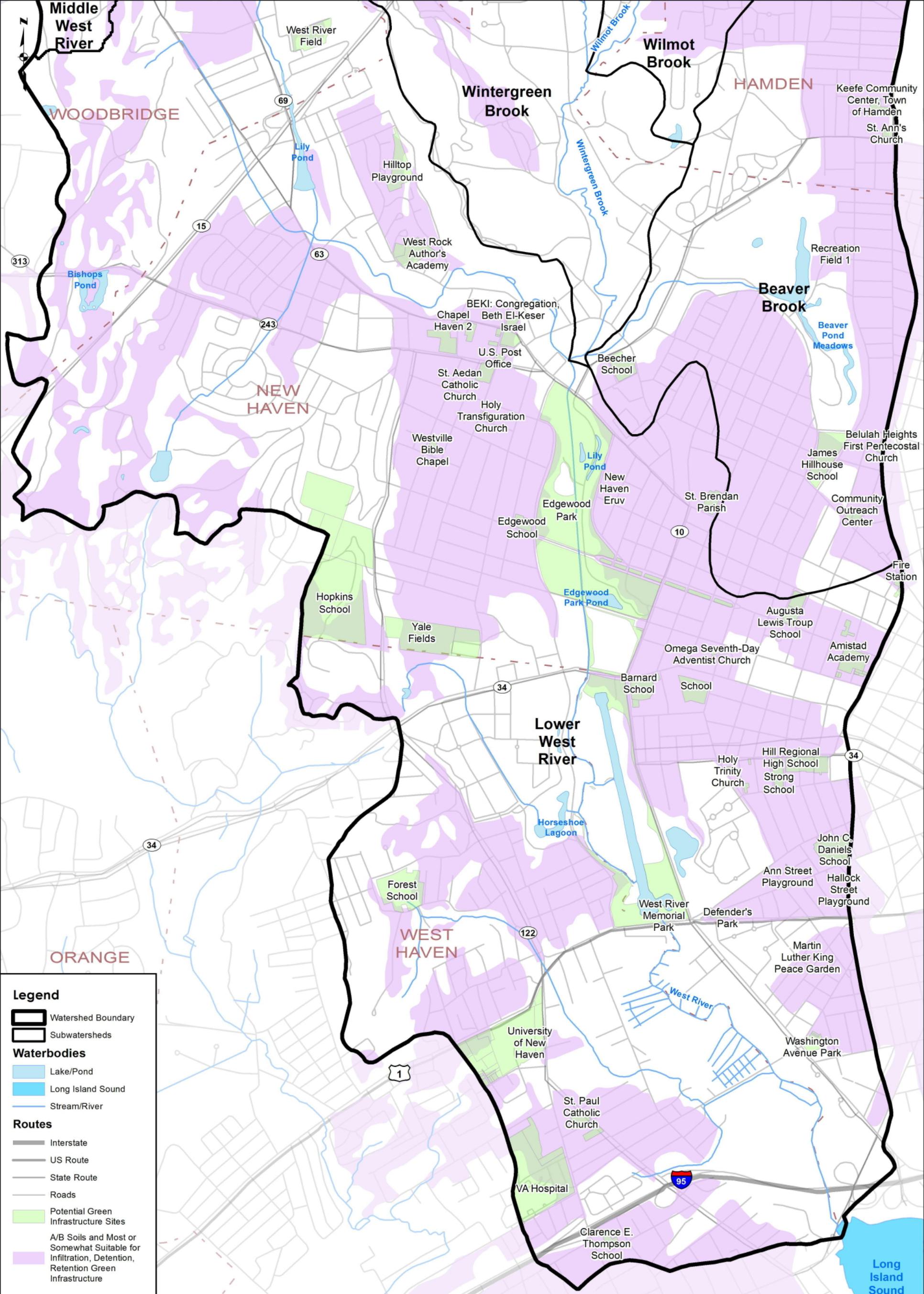
Site Name	Municipality	Address	Type of Parcel	Priority Ranking	Sewer Type	Hydrologic Soil Group	Infiltration Suitability	Detention Suitability	Retention Suitability	Number of Parcels	Area (Acres)
Amistad Academy	New Haven	Gill Street	Charter	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	5	4.92
Ann Street Playground	New Haven	39 Ann Street	Recreational	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	2	0.05
Augusta Lewis Troup School	New Haven	259 Edgewood Ave	Magnet	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	3	3.68
Barnard School	New Haven	170 Derby Avenue	Magnet	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	3	4.74
Beecher School	New Haven	250 Blake Street	Magnet	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	4.05
Chapel-Day Sitting Plaza	New Haven	1323 Chapel Street	Recreational	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.21
Church Street Elementary School	Hamden	93 Church Street	Municipal	1	Separated	A, B	Somewhat Suitable	Least Suitable	Somewhat Suitable	1	3.28
Clarence E. Thompson School	West Haven	165 Richard Street	Municipal	1	Separated	A	Somewhat Suitable	Least Suitable	Least Suitable	1	1.35
Defender's Park	New Haven	Congress Avenue	Recreational	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.66
Edgewood Park	New Haven	540 Edgewood Ave	Recreational	1	Combined	A,D	Somewhat Suitable	Least Suitable	Least Suitable	13	111.52
Edgewood School	New Haven	737 Edgewood Ave	Magnet	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	2	1.82
Fire Station	New Haven	125 Goffe Street	Municipal	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.15
Forest School	West Haven	95 Burwell Road	Municipal	1	Separated	B	Least Suitable	Somewhat Suitable	Least Suitable	1	11.80
Garden Street Playground	New Haven	14 Garden Street	Recreational	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.79
Hallock Street Playground	New Haven	49 Arch Street	Recreational	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.10
Hamden Plains Recreation Field	Hamden	54 Grandview Ave	Recreational	1	Separated	B	Least Suitable	Somewhat Suitable	Somewhat Suitable	2	7.66
Helen Street School	Hamden	285 Helen Street	Municipal	1	Separated	A	Somewhat Suitable	Least Suitable	Least Suitable	2	2.13
Hill Regional High School	New Haven	140 Legion Avenue	Magnet	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	2	5.34
Hilltop Playground	New Haven	Park Drive	Recreational	1	Combined	B	Somewhat Suitable	Somewhat Suitable	Least Suitable	1	6.43
James Hillhouse School	New Haven	460 Sherman Parkway	Magnet	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	9.29
John C. Daniels School	New Haven	587 Congress Avenue	Magnet	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	6.63
Keefe Community Center, Town of Hamden	Hamden	970 Dixwell Avenue	Municipal	1	Separated	A	Somewhat Suitable	Least Suitable	Least Suitable	1	1.59
Laurel View Country Club	Hamden	310 West Shepard Avenue	Recreational	1	Separated	B, D (minimal)	Somewhat Suitable	Somewhat Suitable	Least Suitable	6	169.69
Martin Luther King Peace Garden	New Haven	52 Adeline Street	Recreational	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.24
Mauro-Sheridan Interdistrict Magnet School	New Haven	191 Fountain Street	Magnet	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	3.41
West Rock Author's Academy	New Haven	311 Valley Street	Magnet	1	Combined	B	Least Suitable	Somewhat Suitable	Somewhat Suitable	2	5.44
Mitchell Branch Library/ Beecher Park	New Haven	37 Harrison Street	Municipal	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	2	2.03
Monitor Square	New Haven	Winthrop Avenue	Recreational	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.31
Pine Rock Recreation Field	Hamden	125 Brook Street	Recreational	1	Separated	A, B	Most Suitable	Somewhat Suitable	Least Suitable	1	11.01
Recreation Field 1	New Haven	Willis Street	Recreational	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.47
Strong School	New Haven	130 Orchard Street	Magnet	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	2.61
Washington Avenue Park	New Haven	740 Washington Avenue	Recreational	1	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	3	2.21
West River Field	Woodbridge	25 S Bradley Road	Recreational	1	Separated	B	Most Suitable	Least Suitable	Least Suitable	1	6.75
West River Memorial Park	West Haven/ New Haven	200 Derby Avenue	Recreational	1	Combined/ Unsewered	A	Somewhat Suitable	Least Suitable	Least Suitable	2	35.30
West Rock Nature Center	Hamden	1090 Wintergreen Avenue	Recreational	1	Unsewered	B, C	Somewhat Suitable	Most Suitable	Most Suitable	1	32.72
U.S. Post Office	New Haven	95 Fountain Street	Federal	2	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.43
VA Hospital	West Haven	950 Campbell Avenue	Federal	2	Separated	B	Somewhat Suitable	Somewhat Suitable	Least Suitable	3	32.21
Agape Christian Center	New Haven	100 Goffe Street	Church	3	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	2	0.49
BEKI: Congregation, Beth El-Keser Israel	New Haven	967 Whalley Avenue	Church	3	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	1.21
Belulah Heights First Pentecostal Church	New Haven	782 Orchard Street	Church	3	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.57

List of Potential Sites for Green Infrastructure Retrofits  
West River Watershed

Site Name	Municipality	Address	Type of Parcel	Priority Ranking	Sewer Type	Hydrologic Soil Group	Infiltration Suitability	Detention Suitability	Retention Suitability	Number of Parcels	Area (Acres)
Bethel Ame Church	New Haven	255 Goffe Street	Church	3	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.76
Chapel Haven	New Haven	1040 Whalley Avenue	Private	3	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	1.37
Chapel Haven 2	New Haven	64 Emerson Street	Private	3	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.09
Christian Faith Church	New Haven	141 Sylvan Avenue	Church	3	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.30
Church of the Ascension	New Haven	1055 Main Street	Church	3	Unsewered	B,C	Somewhat Suitable	Somewhat Suitable	Least Suitable	2	27.62
Church of the Blessed Sacrament	Hamden	322 Circular Avenue	Church	3	Separated	A, B	Somewhat Suitable	Least Suitable	Somewhat Suitable	1	6.54
Community Outreach Center	New Haven	654 Orchard Street	Church	3	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.77
Holy Transfiguration Church	New Haven	285 Alden Avenue	Church	3	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.92
Holy Trinity Church	New Haven	135 Winthrop Avenue	Church	3	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	2	0.23
Hopkins School	New Haven	986 Forest Road	Private	3	Combined	B, C	Least Suitable	Most Suitable	Most Suitable	6	70.57
Mt. Calvary Holy Church	New Haven	392 Legion Avenue	Church	3	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.09
Mt. Carmel Associates	New Haven	980 Whalley Avenue	Church	3	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	2	0.30
New Haven Eruv	New Haven	86 Hubinger Street	Church	3	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.18
New Haven Korean Methodist Church	New Haven	24 Harrison Street	Church	3	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.30
Omega Seventh-Day Adventist Church	New Haven	278 Winthrop Avenue	Church	3	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.47
Prince Hall Masonic Temple	New Haven	106 Goffe Street	Church	3	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.30
Simchat Yisrael	West Haven	870 First Avenue	Church	3	Separated	A	Somewhat Suitable	Least Suitable	Least Suitable	1	1.08
St. Aedan Catholic Church	New Haven	112 Fountain Street	Church	3	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	2.30
St. Ann's Church	Hamden	930 Dixwell Avenue	Church	3	Separated	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.42
St. Brendan Parish	New Haven	435 Whalley Avenue	Church	3	Combined	A, B	Somewhat Suitable	Somewhat Suitable	Least Suitable	1	2.34
St. Paul Catholic Church	West Haven	41 Alling Street	Church	3	Separated	A	Somewhat Suitable	Least Suitable	Least Suitable	1	1.85
University of New Haven	West Haven	Ruden Street	Private	3	Separated	B, C, NR	Least Suitable	Somewhat Suitable	Least Suitable	19	32.43
Westville Bible Chapel	New Haven	201 Alston Avenue	Church	3	Combined	A	Somewhat Suitable	Least Suitable	Least Suitable	1	0.86
Yale Fields	New Haven	40 Central Avenue	Recreational	3	Combined	A, B, NR	Most Suitable	Somewhat Suitable	Least Suitable	3	22.03

## Appendix B

### Maps of Potential Green Infrastructure Retrofit Sites



**Legend**

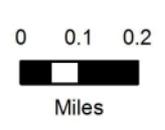
- Watershed Boundary
- Subwatersheds

**Waterbodies**

- Lake/Pond
- Long Island Sound
- Stream/River

**Routes**

- Interstate
- US Route
- State Route
- Roads
- Potential Green Infrastructure Sites
- A/B Soils and Most or Somewhat Suitable for Infiltration, Detention, Retention Green Infrastructure



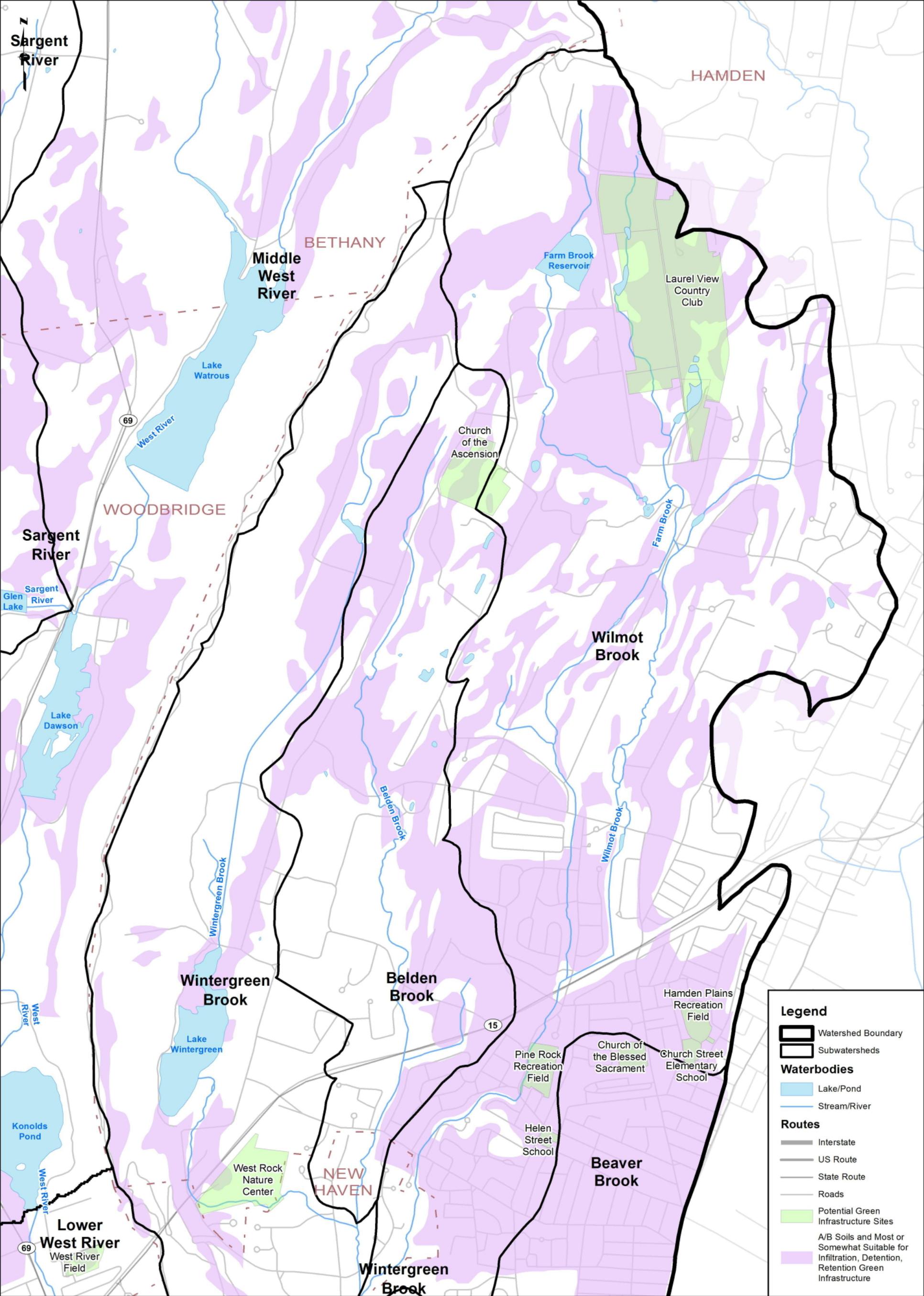
www.FandO.com

**FUSS & O'NEILL**

78 Interstate Drive  
West Springfield, MA 01089

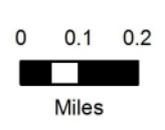
Map References: Connecticut Department of Energy & Environmental Protection (CTDEEP), Watershed Boundaries 1:24,000 scale; Hydrography by NHD. Zoning data provided by SCRCOG.

**POTENTIAL GREEN INFRASTRUCTURE LOCATIONS**



**Legend**

- Watershed Boundary
- Subwatersheds
- Waterbodies**
- Lake/Pond
- Stream/River
- Routes**
- Interstate
- US Route
- State Route
- Roads
- Potential Green Infrastructure Sites
- A/B Soils and Most or Somewhat Suitable for Infiltration, Detention, Retention Green Infrastructure



**FUSS & O'NEILL**

78 Interstate Drive  
West Springfield, MA 01089

www.FandO.com

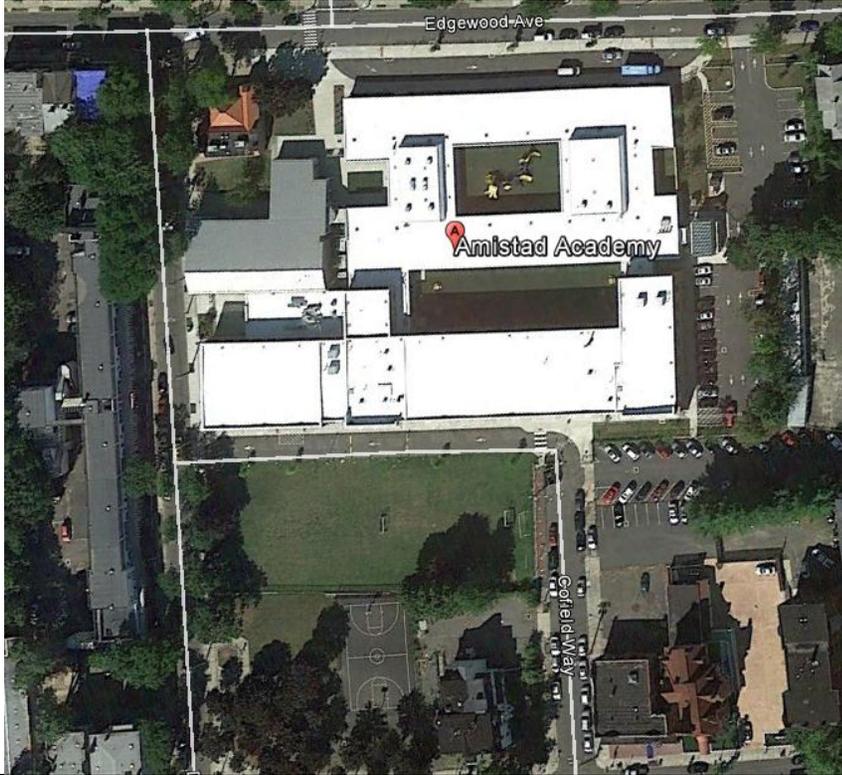
Map References: Connecticut Department of Energy & Environmental Protection (CTDEEP). Watershed Boundaries 1:24,000 scale; Hydrography by NHD. Zoning data provided by SCRCOG.

**POTENTIAL GREEN INFRASTRUCTURE LOCATIONS**

## Appendix C

### Aerial Photographs Higher Priority Green Infrastructure Retrofit Sites

Amistad Academy



Mauro-Sheridan Interdistrict Magnet School



Ann Street Playground



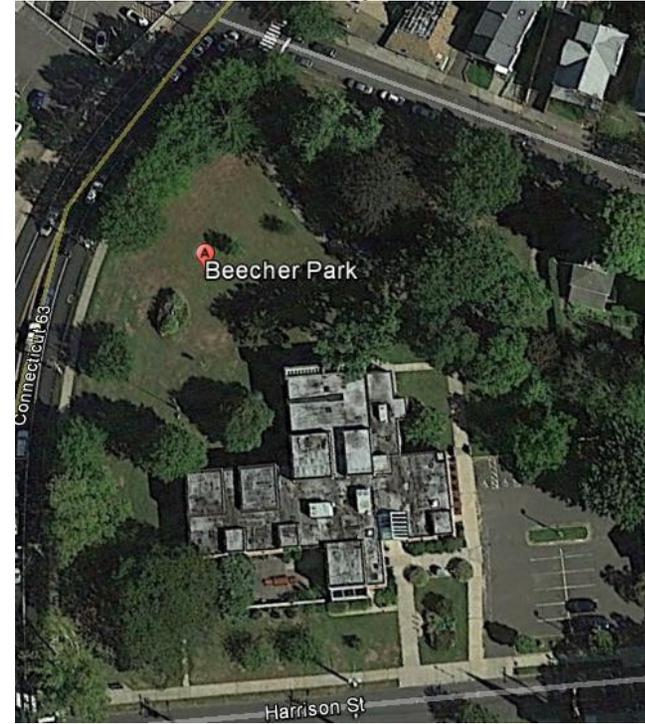
West Rock Author's Academy



Augusta Lewis Troup School



Mitchell Branch Library/ Beecher Park



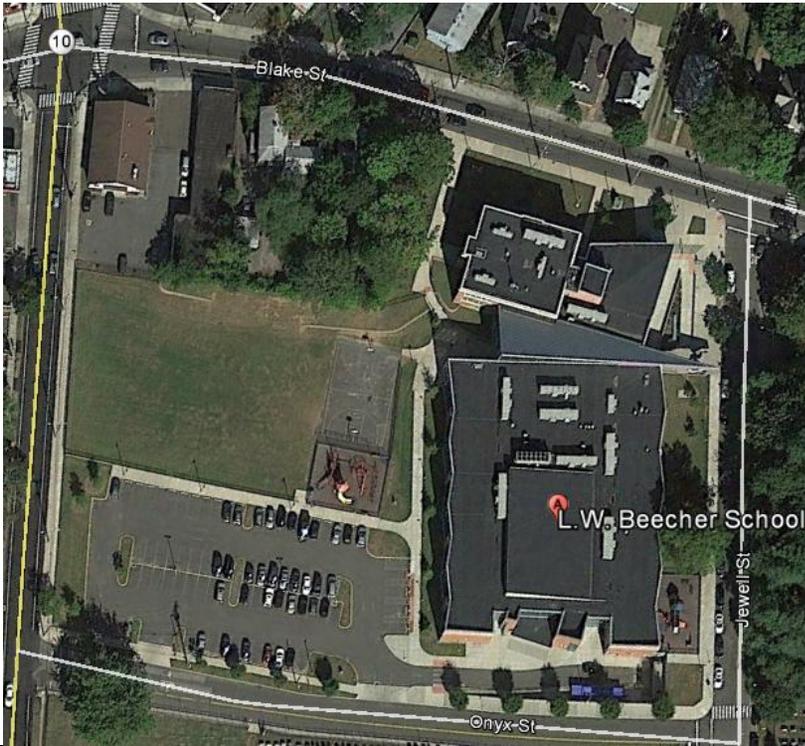
Barnard School



Monitor Square



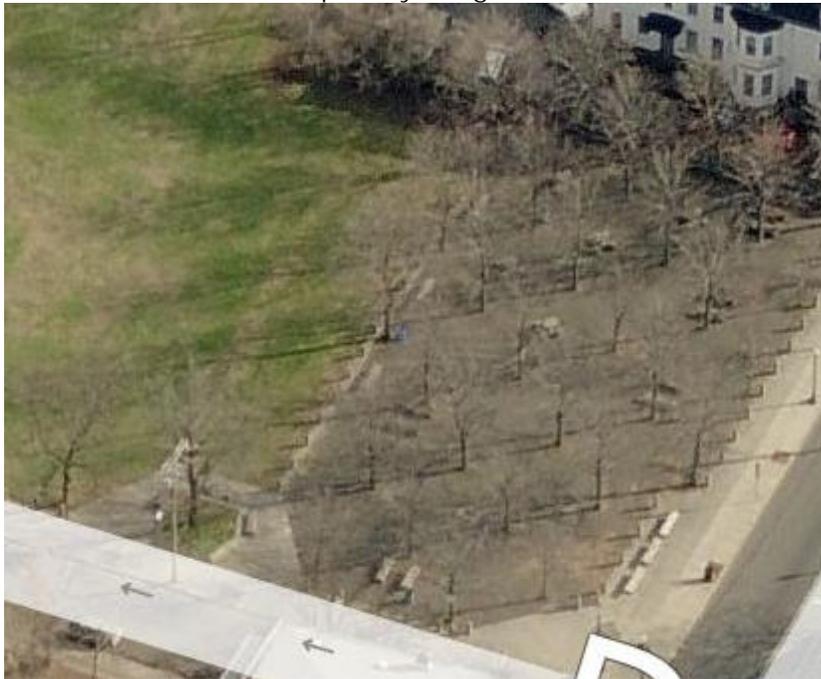
Beecher School



Laurel View Country Club



Chapel-Day Sitting Plaza



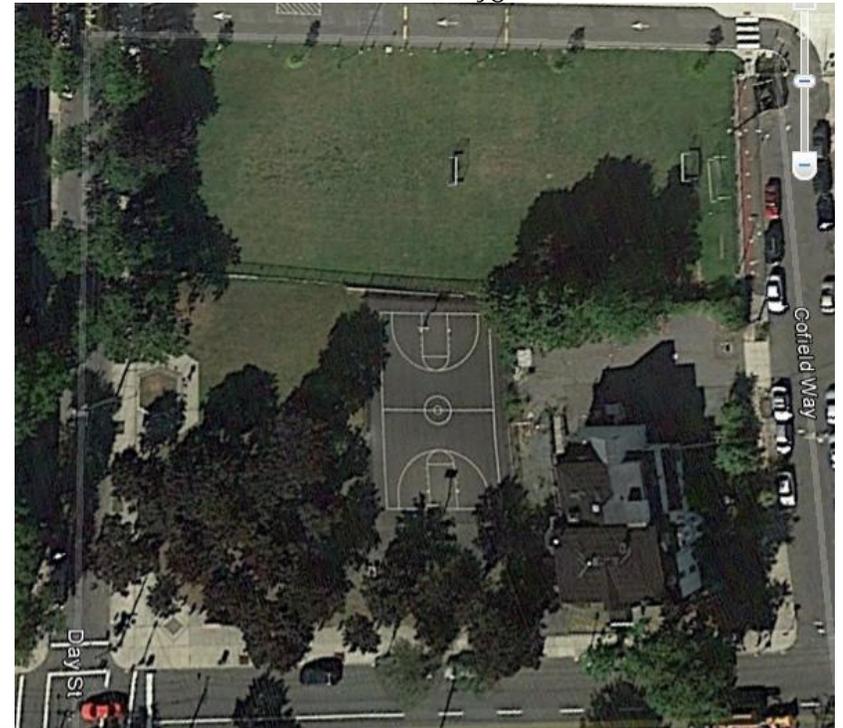
Martin Luther King Peace Garden



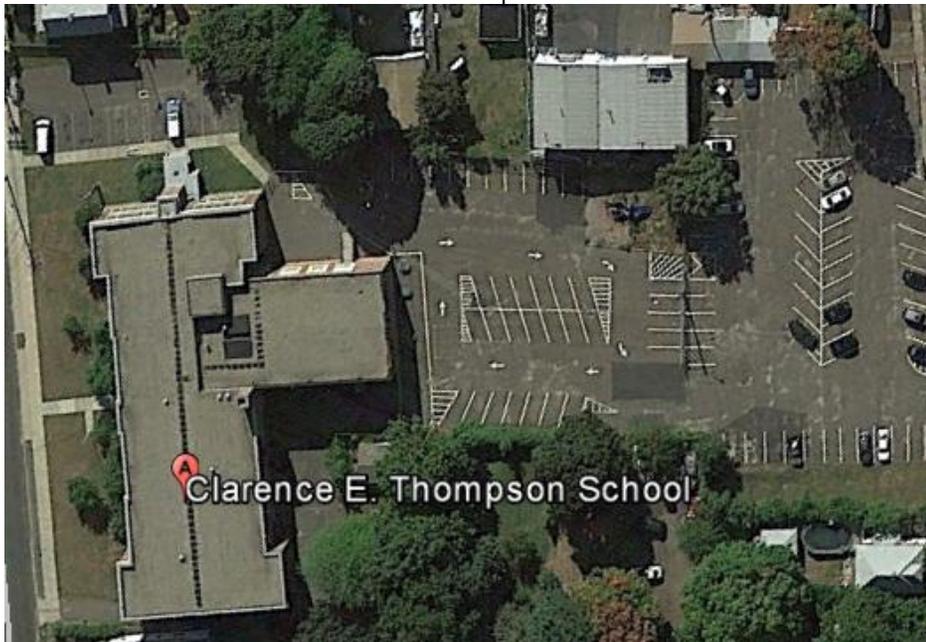
Church Street Elementary School



Garden Street Playground



Clarence E. Thompson School



Hallock Street Playground



Defender's Park



Pine Rock Recreation Field



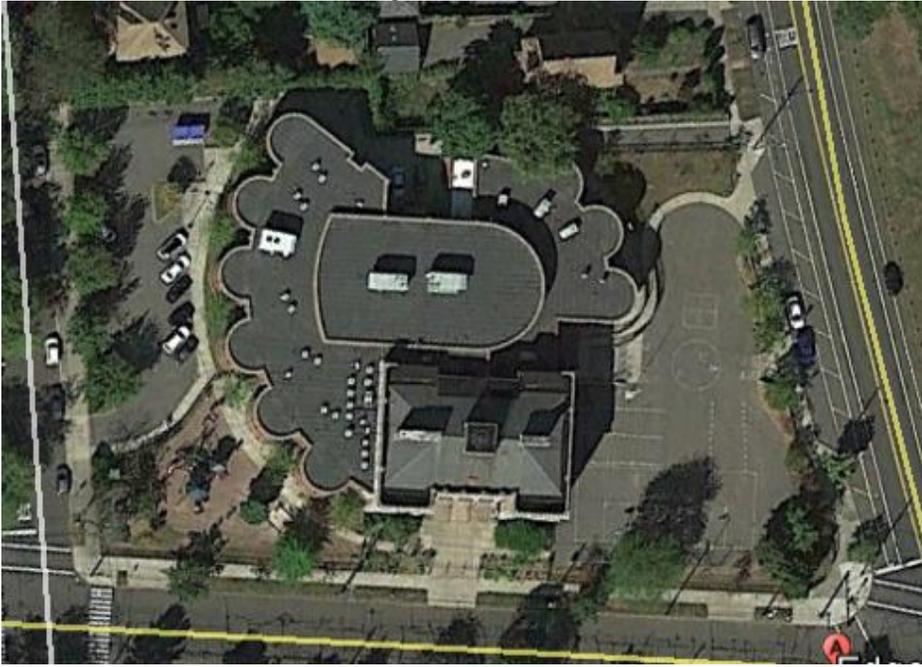
Edgewood Park



U.S. Post Office



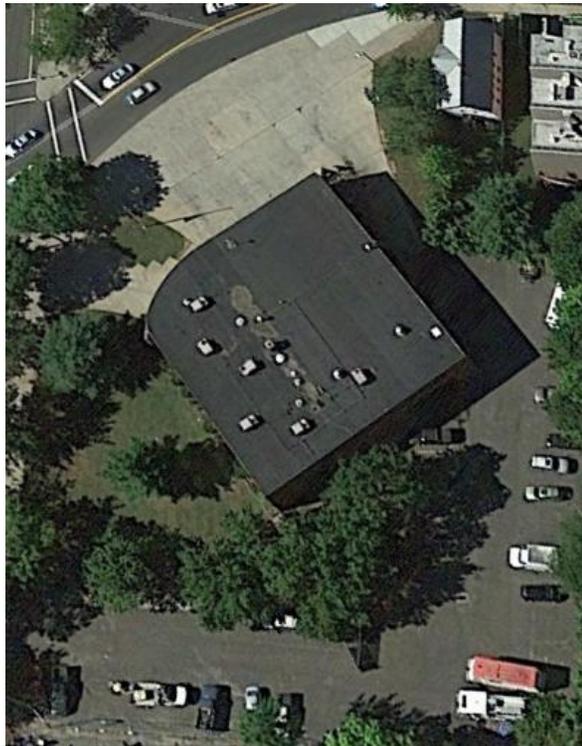
Edgewood School



Recreation Field



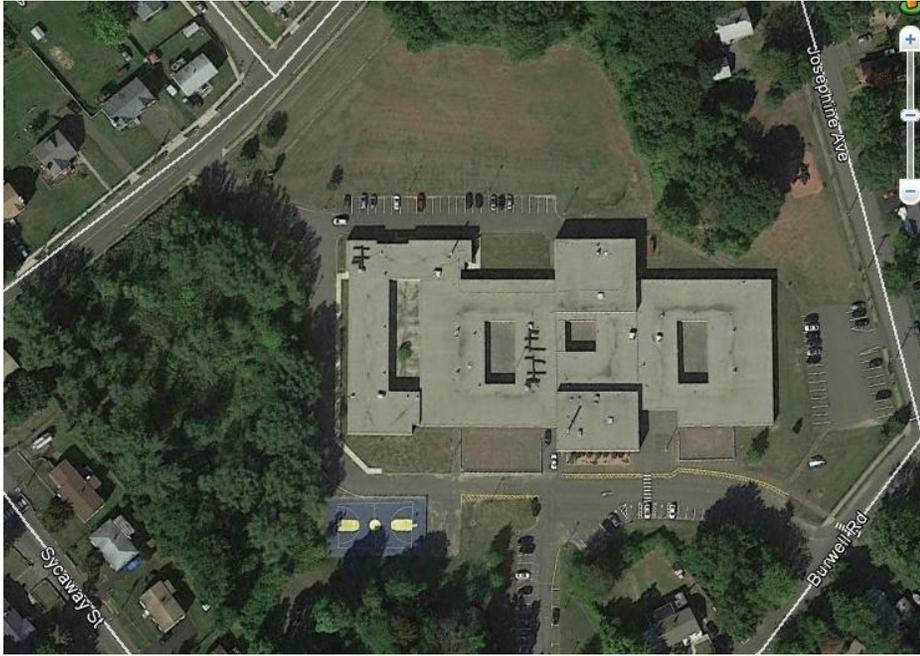
Fire Station



Strong School



Forest School



Washington Avenue Park



Hilltop Playground



West River Field



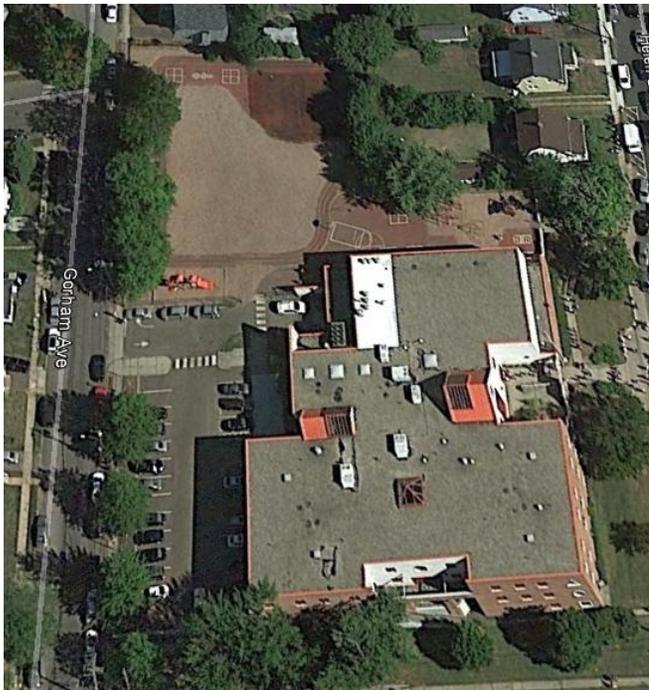
Hamden Plains Recreation Field



West River Memorial Park



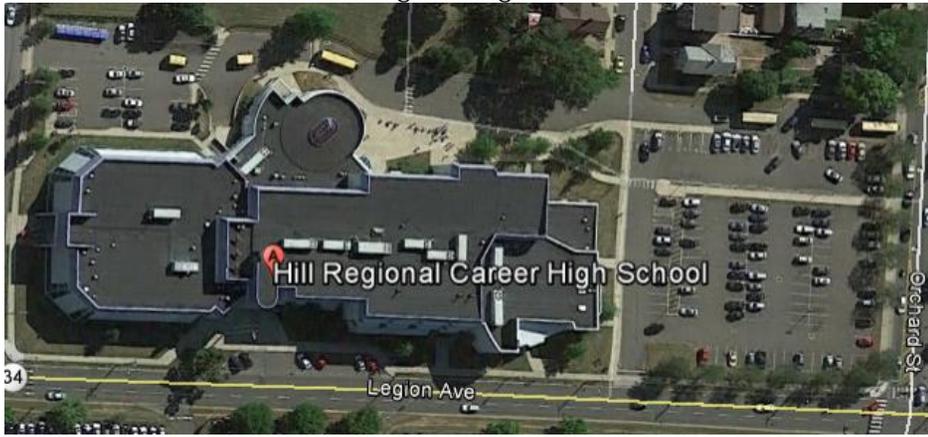
Helen Street School



West Rock Nature Center



Hill Regional High School



Keefe Community Center, Town of Hamden



John C. Daniels School

