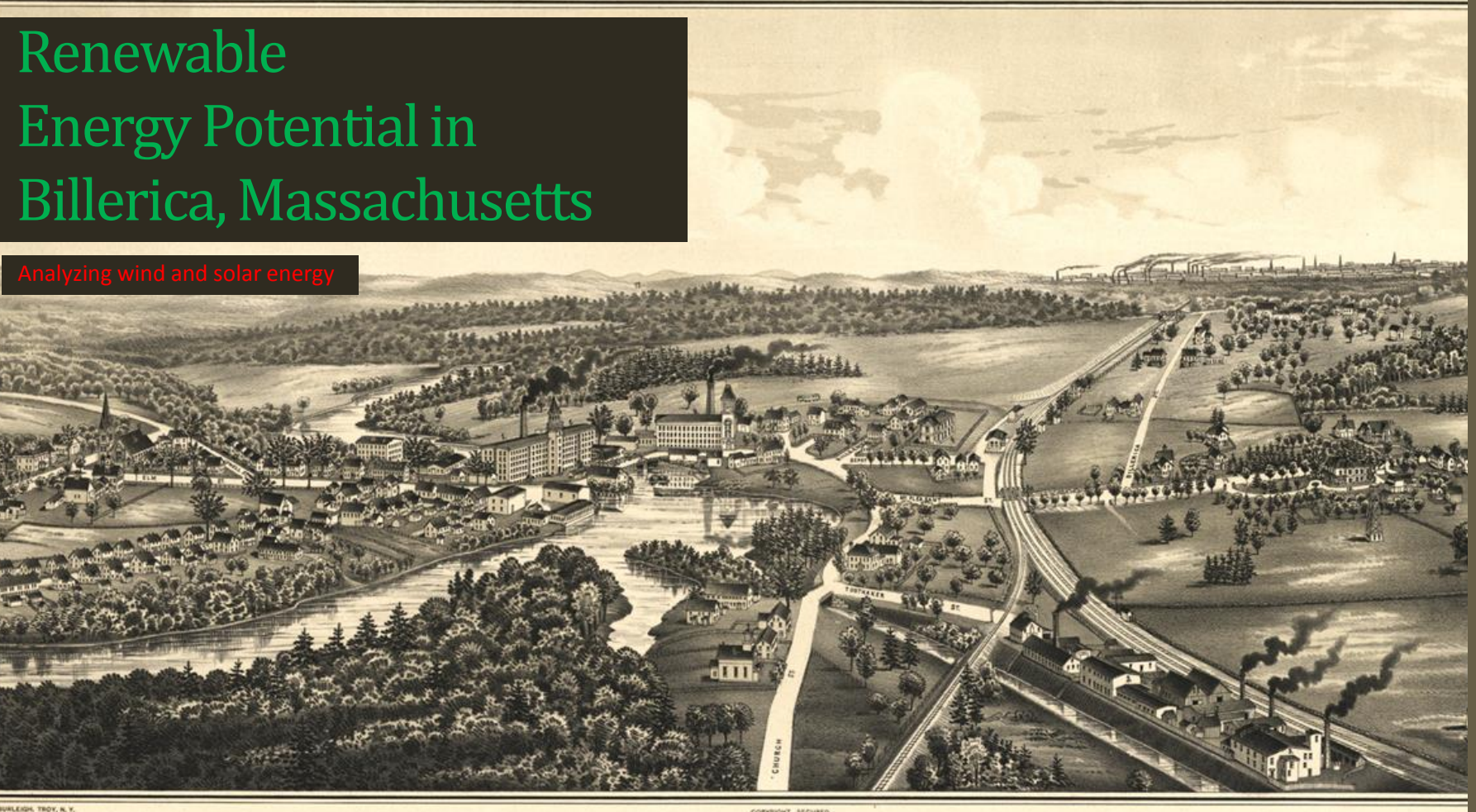
Renewable Energy Potential in Billerica, Massachusetts

Analyzing wind and solar energy



1 Talbot Mills.
2 Faulkner Manufacturing Co.
3 Talbot Dye Wood & Chemical Co.
4 Town Hall.
5 Baptist Church.
6 St. Andrew's Catholic Church.
7 Post Office.
8 Boston & Lowell R. R. Station.
9 School.

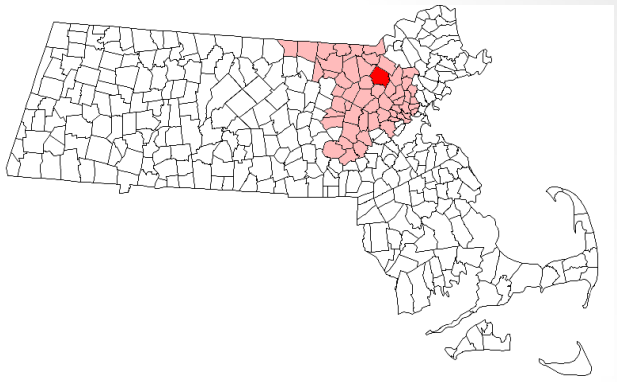
NORTH BILLERICA, MASS.

1887.

10 Ex-Gov. Talbot's Resi
11 F. S. Clark's
12 J. D. Gould's
13 Chas. Kohlrausch Jr's
14 J. R. Stott's
15 W. A. Evans'
16 James Sutcliffe's
17 Unconnonuck Mounta

Massachusetts 1887 L. R. Burleigh Library of Congress Reprint Old Maps West Chesterfield, NH 03466 www.old-maps.com

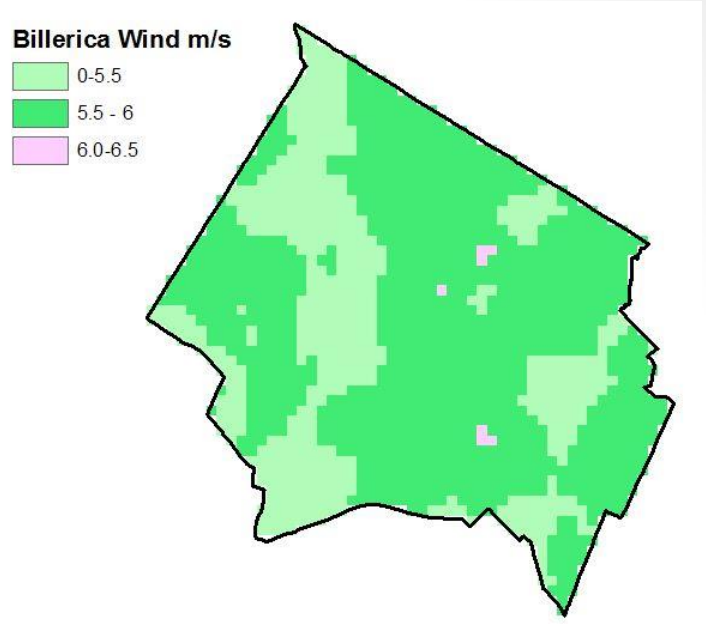
Background

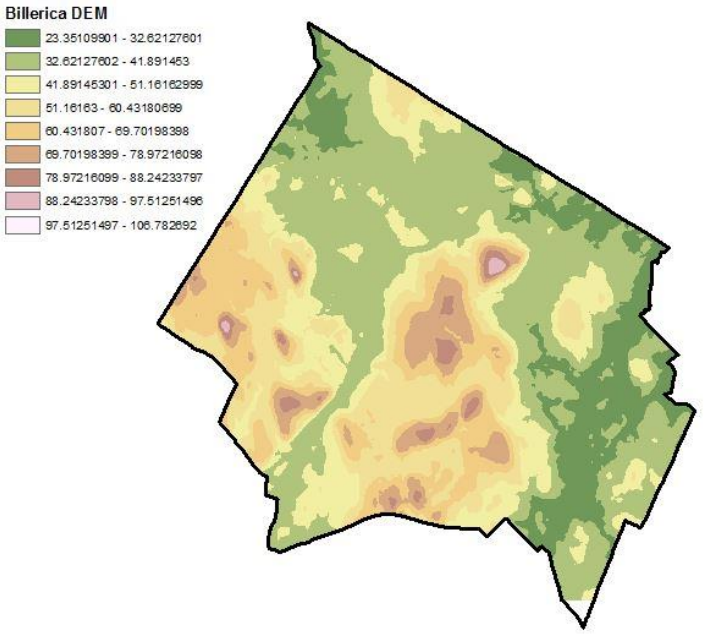


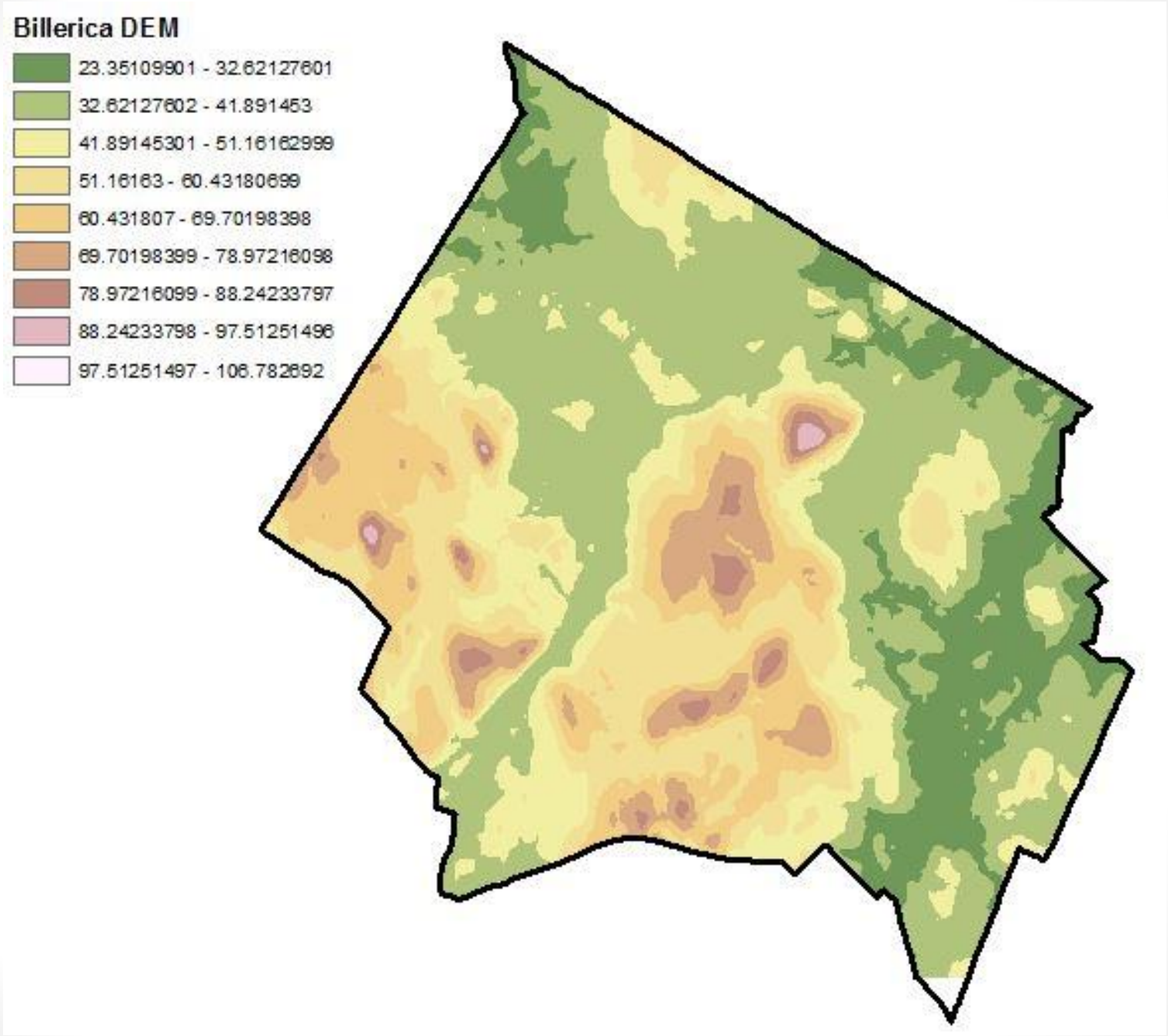
- Founded in 1655
- Middlesex County
- 26.4 square miles
- Population: 40,243
- 36.7% residential, 37.4% commercial
- 91% of buildings are residential
- Estimated kWh used in 2010: *510,882,980.75*

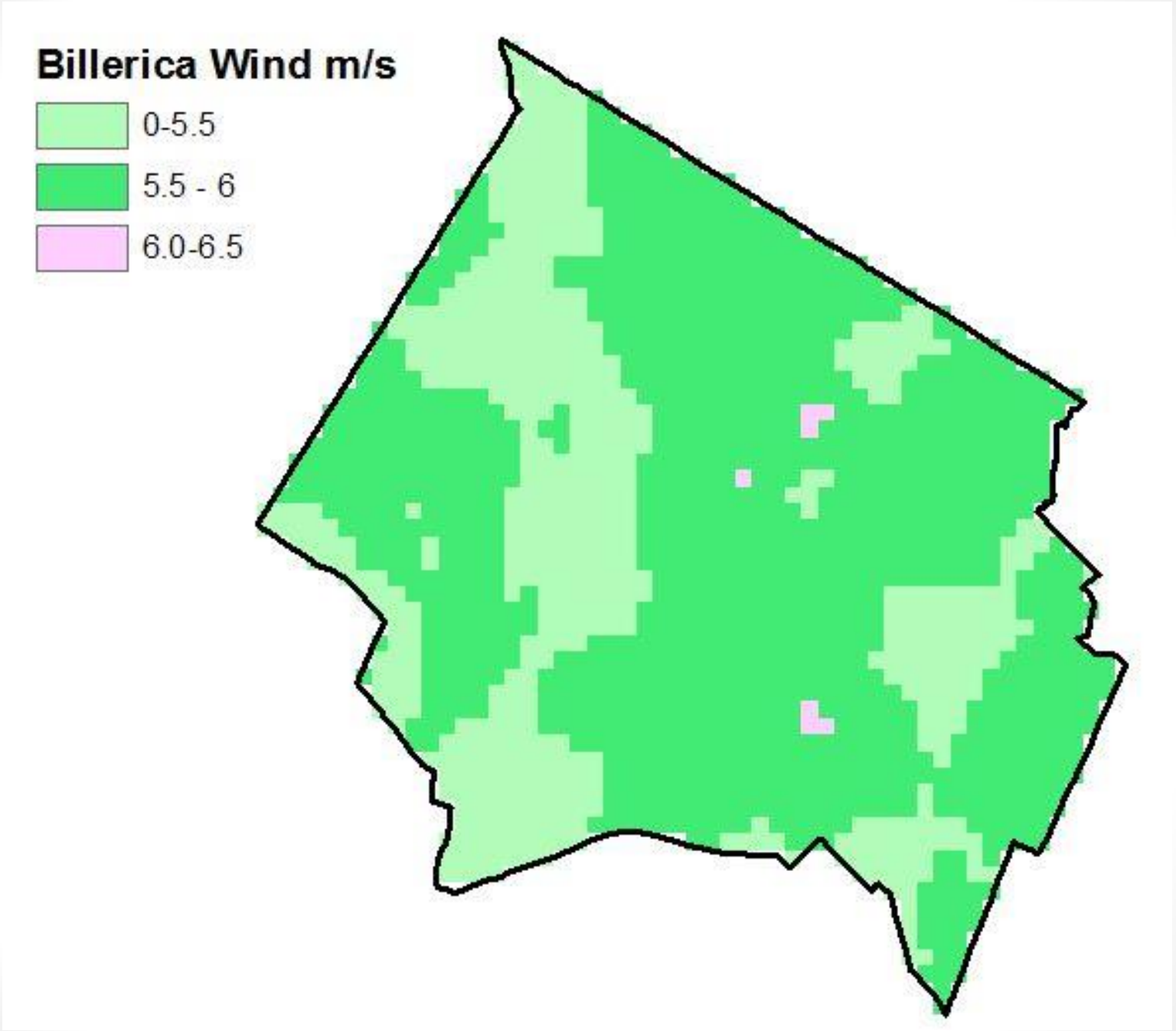
Wind Potential

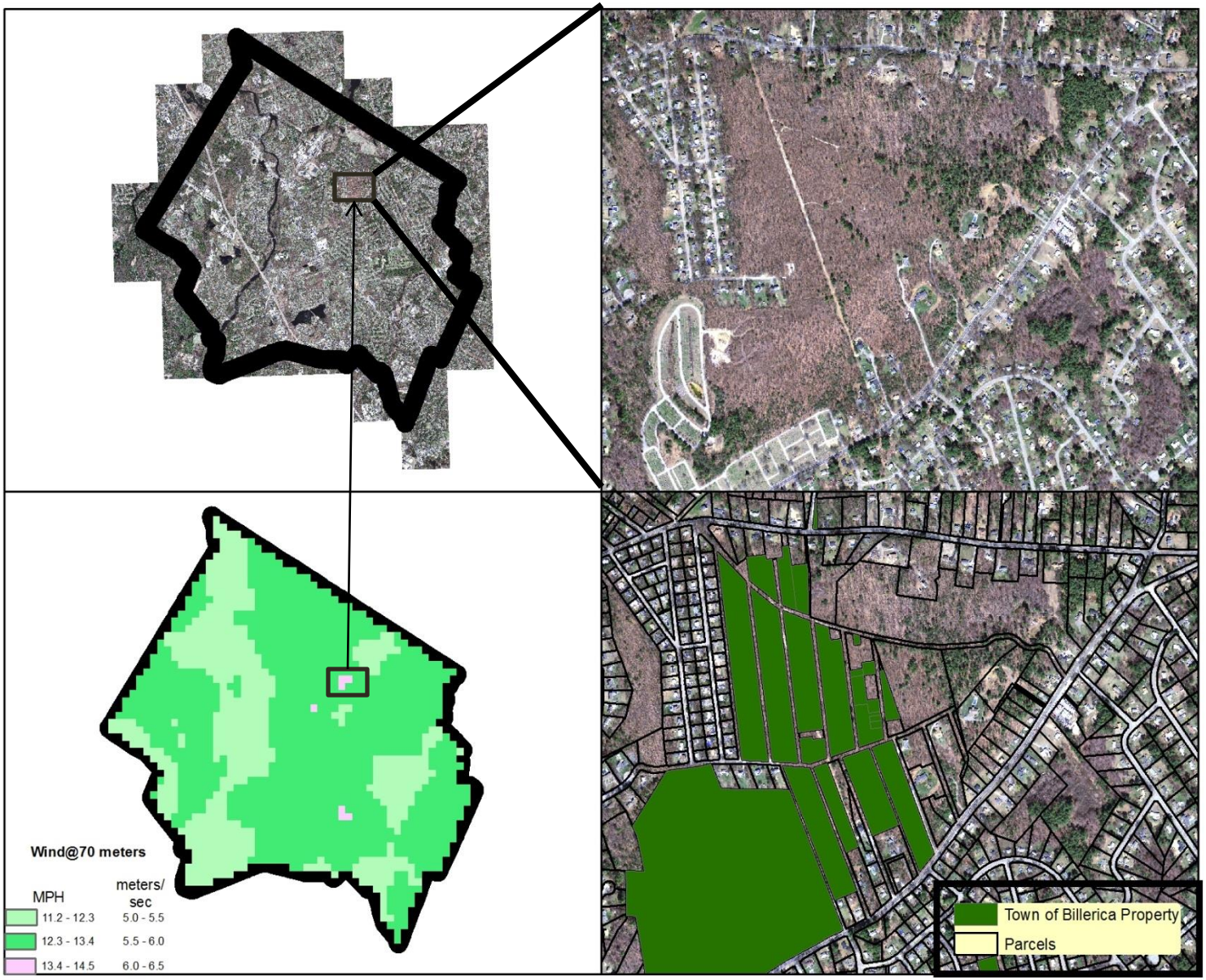
- Highest average wind speed: 6.0-6.5 m/s
- Limited area available, especially area with higher wind speeds
- Billerica owns several properties located on Fox Hill, which is one of the few areas with the moderate wind speeds

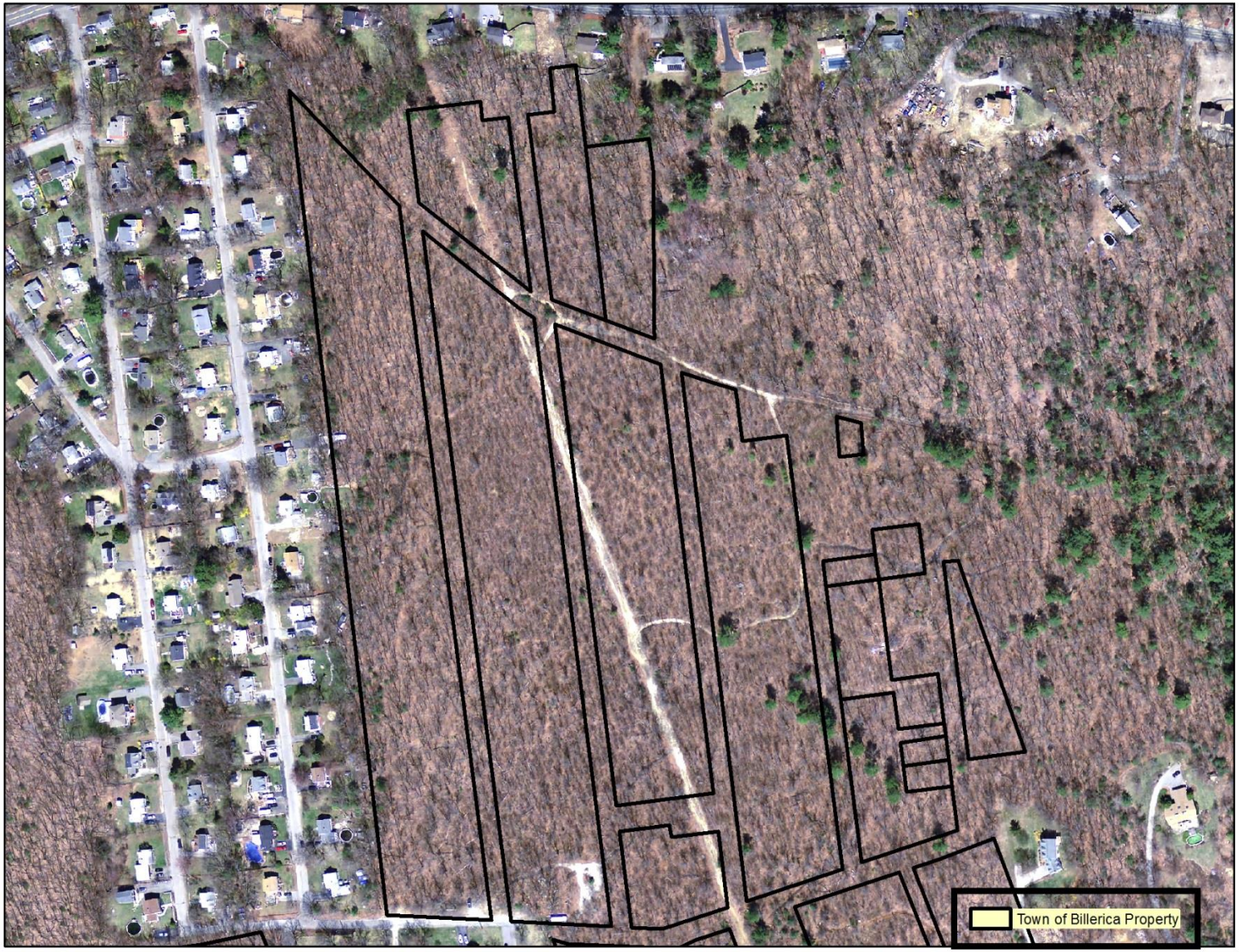


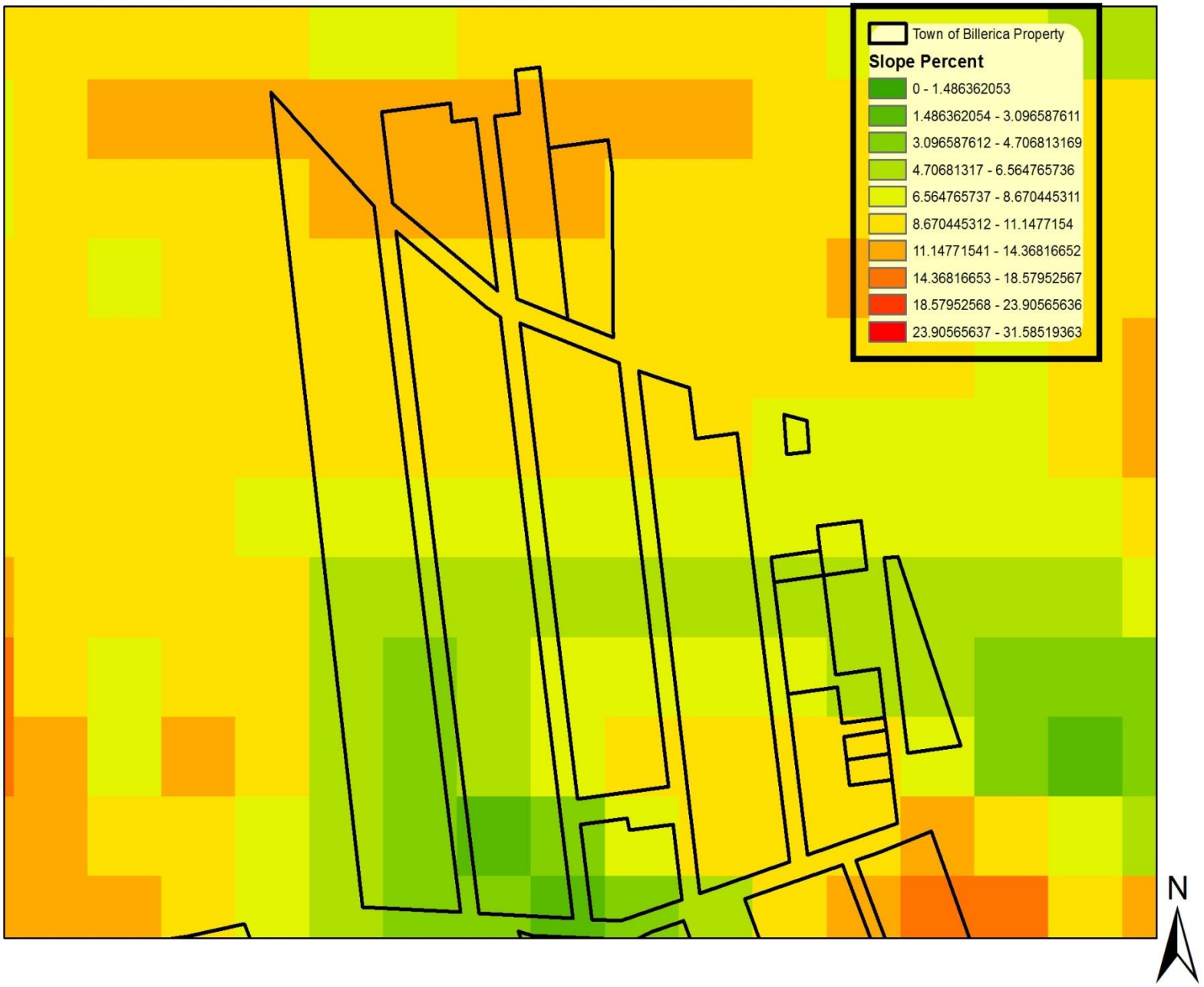



Billerica DEM
23.35109901 - 32.62127601
32.62127602 - 41.891453
41.89145301 - 51.16162999
51.16163 - 60.43180699
60.431807 - 69.70198398
69.70198399 - 78.97216098
78.97216099 - 88.24233797
88.24233798 - 97.51251496
97.51251497 - 106.782692


Billerica Wind m/s
0-5.5
5.5 - 6
6.0-6.5


Wind@70 meters
MPH
meters/ sec
11.2 - 12.3
5.0 - 5.5
12.3 - 13.4
5.5 - 6.0
13.4 - 14.5
6.0 - 6.5
Town of Billerica Property
Parcels
N


Town of Billerica Property
N


Town of Billerica Property
Slope Percent
0 - 1.486362053
1.486362054 - 3.096587611
3.096587612 - 4.706813169
4.70681317 - 6.564765736
6.564765737 - 8.670445311
8.670445312 - 11.1477154
11.14771541 - 14.36816652
14.36816653 - 18.57952567
18.57952568 - 23.90565636
23.90565637 - 31.58519363
N


N

Proposal Positives

- Approximately 14 acres of Billerica property on Fox Hill is <20% slope and has an average wind speed between 6.0-6.5 m/s.

- There is potential to develop a small wind farm consisting of (7) 1-MW turbines.

- Enough output to provide energy to 1,323-2,205 households in Billerica based on various parameters (efficiency, turbine model, actual wind speeds). Roughly 9-15% of homes in Billerica
- Access via utility road and bordering neighborhood.

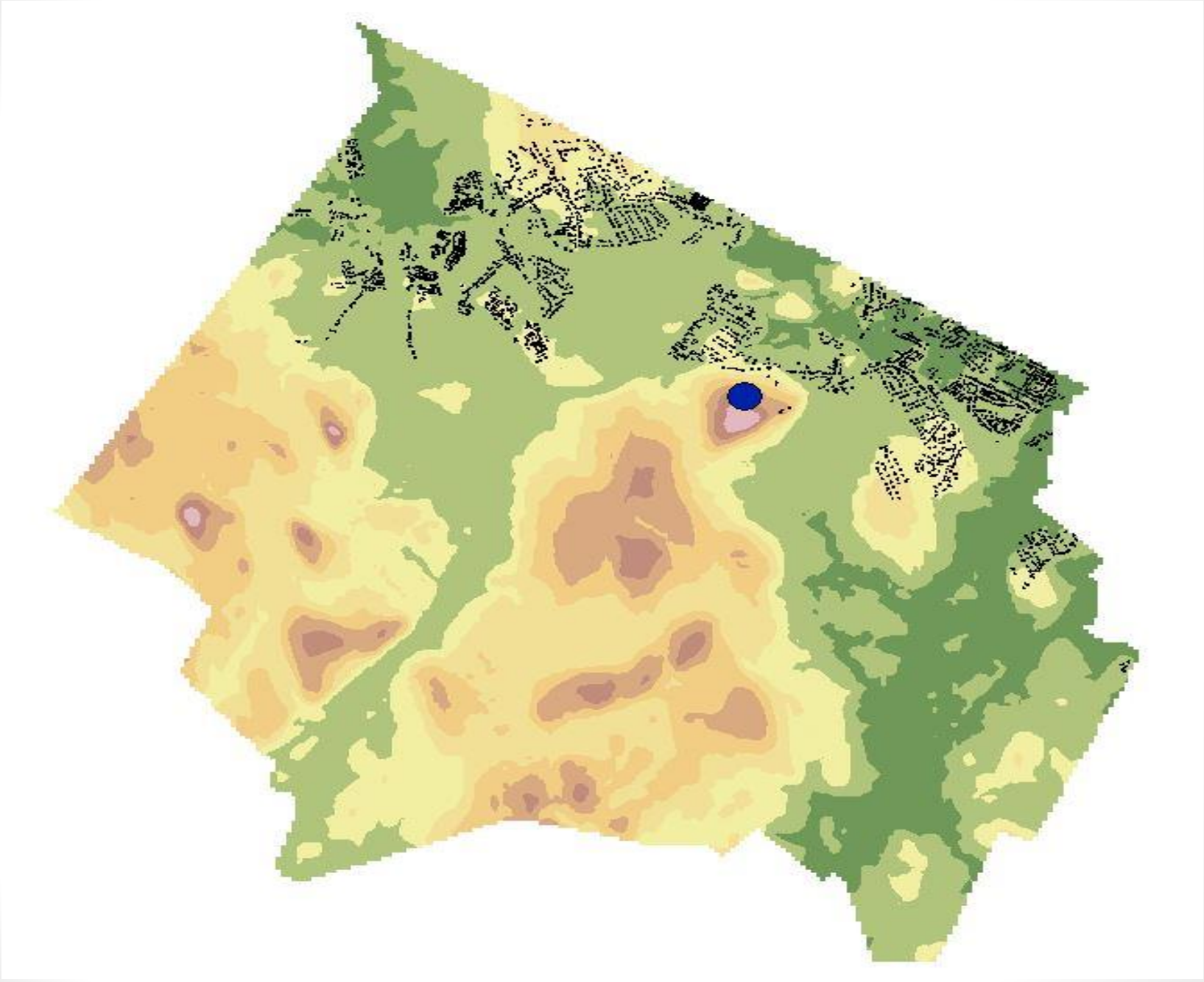
Proposal Negatives

- Site constraints: distance to residents, slope, relatively lower wind speeds than normal, cemetery boundary.

- Overall number of turbines subject to land use restrictions and available space after applicable buffers are applied.

- 3,062 (19%) residential homes in view of potential turbine
- Recent proposals rejected by local residents:

  Home Depot at the Billerica Mall
  Center Improvement Plan
  Cellular tower installation in Pinehurst
  Power Plant in North Billerica



Solar Potential

Current/New Solar Projects

Shaffer Landfill

- 40 Acres
- 19,700 panels

Part of Superfund cleanup

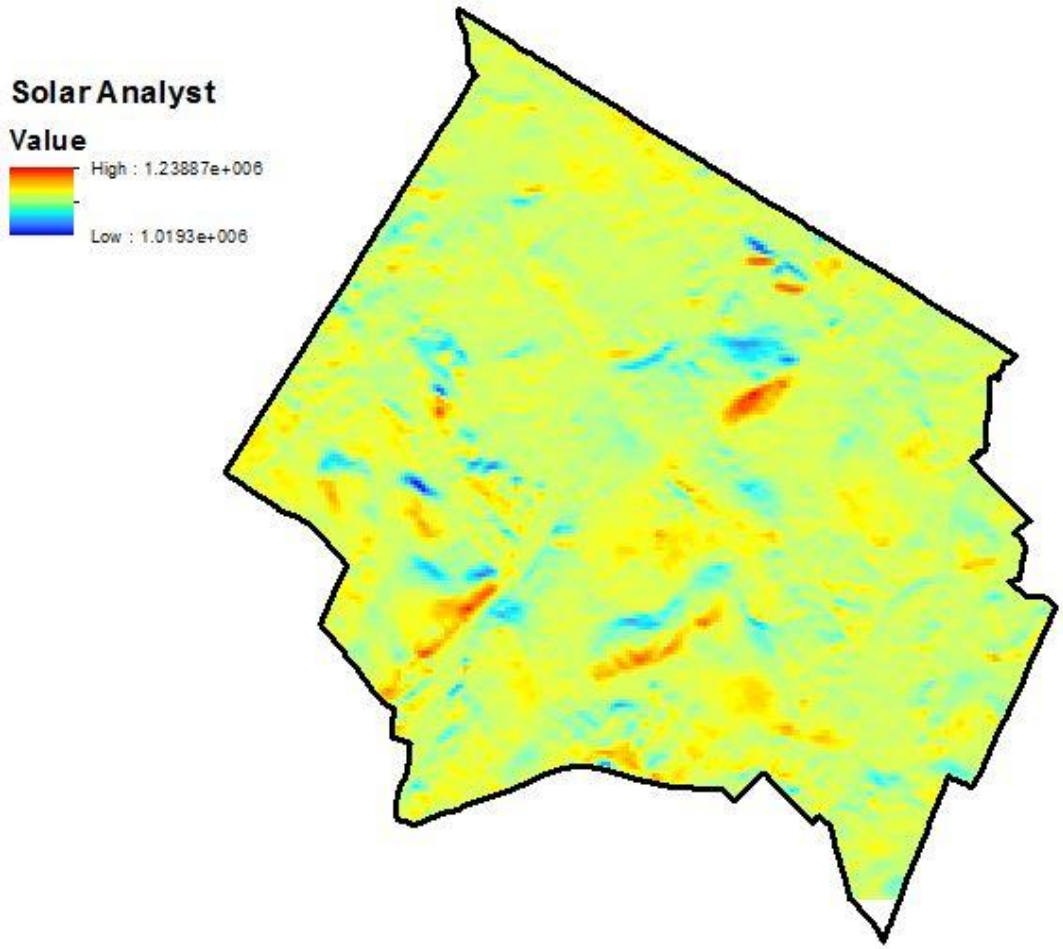
41 Alexander Road (Verizon/MCI)

- 2 Acres
- 3,120 panels
- Massive data farm facility

Shaffer Landfill Project

41 Alexander Road, Verizon

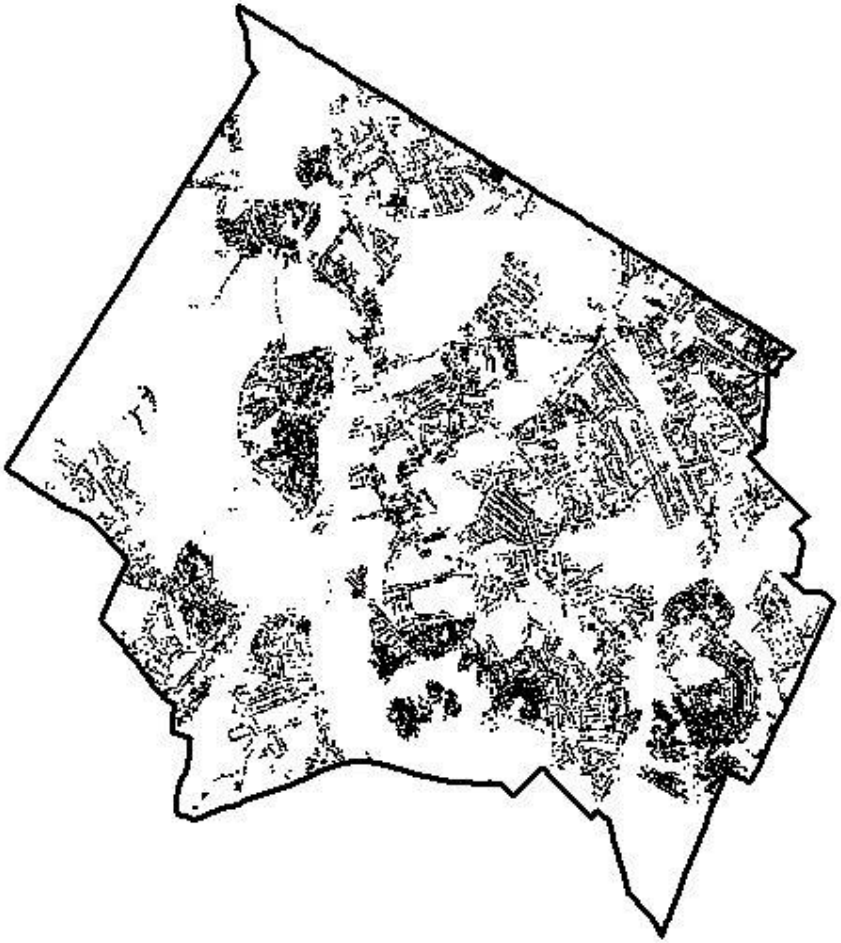
Solar Radiation



Solar Potential For Residential

- Approximately 15,624 residential structures in Billerica
- 769 structures used in Solar Zonal Statistic analysis
- 85,557square meters of total rooftop area
- Using 25% of rooftop area and 13% efficiency, potentially 3,180,448 kWh/year can be generated with resident structures (less than 1% of total energy use)
- More optimal parameters: 50% of rooftop area and 30% efficiency, potential jumps to 2.6% of total energy use

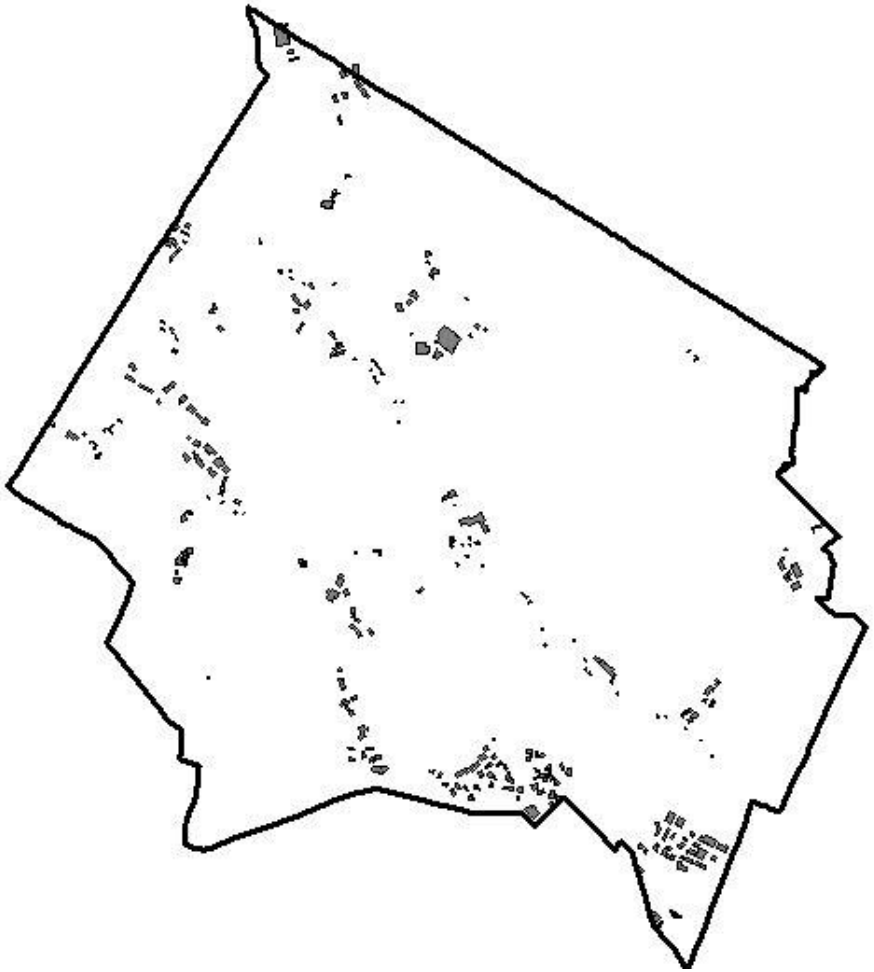
Residential Buildings



Solar Potential For Commercial

- Approximately 720 commercial/industrial structures in Billerica
- 259 structures used in Solar Zonal Statistic analysis
- 971,828 square meters of total rooftop area
- Using 25% of rooftop area and 13% efficiency, potentially 36,136,263 kWh/year can be generated with commercial structures (7% of total energy use)
- More optimal parameters: 50% of rooftop area and 30% efficiency, potential jumps to 32% of total energy use

Commercial Buildings



Potential Sites for Solar Farms

- ***90 Salem Road***
  15,663 square meters
  582,278 kWh per year (25% land cover, 13% efficiency)
  Owner: CH-Billerica LLC
- ***High Street Pits***
  31,261 square meters
  1,171,510 kWh per year (25% land cover, 13% efficiency)
  Owner: General Latex
- ***Locke Middle School Pits***
  49,657 square meters
  1,834,314 kWh per year (25% land cover, 13% efficiency)
  Owner: Cormier Yvon Construction
- ***Iron Horse Park***
  321,972 square meters
  11,947,488 kWh per year (25% land cover, 13% efficiency)
  Owner: Mass Bay Transit Authority

90 Salem Road

High Street Pits

Locke Middle School Pits

Iron Horse Park

References

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- http://science.howstuffworks.com/environmental/green-science/wind-power4.htm