

## Municipal Breakout - Energy Data

The following is a breakout of current and future energy use and targets for the Town of Berlin.

The intent of the Municipal Template is to provide the municipality with data that can be used to ensure compliance with the requirements of Act 174 and “Enhanced Energy Planning” (24 V.S.A. 4352). This document contains data that estimates current energy use and provides targets for future energy use across all sectors (transportation, heating, and electricity). It also sets targets for renewable energy generation within the municipality.

This data is meant to be a starting point for the municipality to begin planning its energy future and to talk about the changes that may need to occur within the municipality to ensure that local, regional and state energy goals are met. This includes the goal that 90% of all energy demand be met by renewable sources by 2050.

Estimates of current energy use consist primarily of data available from the American Community Survey (ACS), the Vermont Agency of Transportation (VTrans), the Vermont Department of Labor (DOL), and the Vermont Department of Public Service (DPS). Targets for future energy use are reliant upon the Long-range Energy Alternatives Planning (LEAP) analysis for the region completed by the Vermont Energy Investment Corporation (VEIC). Targets for future energy generation have come from the regional planning commission and DPS. For more information on LEAP, see [CVRPC's website](#). Targets for both future energy use and energy generation have been generally developed using a “top down” method of disaggregating regional data to the municipal level. This should be kept in mind when reviewing the template. It is certainly possible to develop “bottom up” data. For those municipalities interested in that approach, please see the Department of Public Service’s Analysis and Targets Guidance.

### Figure 1 – Data Sources

ACS – AMERICAN COMMUNITY SURVEY  
 DOL – VERMONT DEPARTMENT OF LABOR  
 DPS – VERMONT DEPARTMENT OF PUBLIC SERVICE  
 EIA – ENERGY INFORMATION ADMINISTRATION  
 EVT – EFFICIENCY VERMONT  
 LEAP – LONG-RANGE ENERGY ALTERNATIVES  
 PLANNING  
 VEIC – VERMONT ENERGY INVESTMENT  
 CORPORATION  
 VTRANS – VERMONT AGENCY OF TRANSPORTATION

There are some shortcomings and limitations associated the data used in the Municipal Template. For instance, assumptions used to create the LEAP analysis are

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slightly different than assumptions used to calculate current municipal energy use. Regardless, the targets established here show the direction in which change needs to occur to meet local, regional and state energy goals. It is important to remember that the targets established by LEAP represents only one way to achieve energy goals. There may be several other similar pathways that a municipality may choose to take in order to meet the 90x50 goal.

The Department of Public Service's municipal standards are viewable [here](#). The following is instruction language that is found in the Analysis and Mapping Sections of the standards:

*“For the Analysis & Targets determination standards, municipalities will be provided with analyses and targets derived from regional analyses and targets no later than April 30, 2017. Municipalities may choose to rely on these “municipalized” analyses and targets to meet the standards in this section. Municipalities which elect to use the analysis and targets provided by a region will be presumed to have met the standards in this section. Alternatively, municipalities may develop their own custom analyses and targets or supplement the analyses and targets provided by the regions with specific local data; if this option is chosen, the analysis and targets must include all of the same components and meet the standards required of regions, as described below.*

*....*

*Plans must include maps that address all of the standards, unless N/A is provided as an option, in which case a compelling reason why the standard is not applicable or relevant should be provided in the Notes column. Regions must develop their own maps, and to then break out the maps for their municipalities, who can use their region-provided maps to meet the municipal Mapping standards.*

*Municipalities may choose to rely on the maps provided by the regions to meet the standards in this section. Alternatively, municipalities may choose to undertake their own mapping, according to the same set of standards as regions. Additionally, municipalities are expected to work collaboratively with their regions and with neighboring municipalities to ensure compatibility between the final products.”*

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Below is the municipal data that can be used to ensure compliance with the requirements of Act 174 and “Enhanced Energy Planning” (24 V.S.A. 4352):

### 1. Municipal Summary

The Municipal Summary worksheet summarizes the type of data that is required to be in the Municipal Plan if the plan is to meet the “determination” standards established by the Vermont Department of Public Service.

*Table 1A. Current Municipal Transportation Energy Use*

| Transportation Data                                | Municipal Data |
|----------------------------------------------------|----------------|
| Total # of Vehicles (ACS 2011-2015)                | 1,836          |
| Average Miles per Vehicle (Vtrans)                 | 12,500         |
| Total Miles Traveled                               | 22,950,000     |
| Average Gallons Used per Vehicle per Year (VTrans) | 576            |
| Total Gallons Use per Year                         | 1,233,871      |
| Transportation BTUs (Billion)                      | 149            |
| Average Cost per Gallon of Gasoline (RPC)          | 2.31           |
| Gasoline Cost per Year                             | \$2,850,242.00 |

*This table uses data from the American Community Survey (ACS) and Vermont Agency of Transportation (VTrans) to calculate current transportation energy use and energy costs.*

*Table 1B. Current Municipal Residential Heating Energy Use*

| Fuel Source            | Municipal Households (ACS 2011-2015) | Municipal % of Households | Municipal Square Footage Heated | Municipal BTU (in Billions) |
|------------------------|--------------------------------------|---------------------------|---------------------------------|-----------------------------|
| Natural Gas            | 6                                    | 0.6%                      | 6,810                           | 0.4                         |
| Propane                | 227                                  | 21.5%                     | 439,550                         | 26.4                        |
| Electricity            | 30                                   | 2.8%                      | 47,625                          | 2.9                         |
| Fuel Oil               | 594                                  | 56.2%                     | 1,101,350                       | 66.1                        |
| Coal                   | 0                                    | 0.0%                      | 0                               | 0                           |
| Wood                   | 186                                  | 17.6%                     | 368,580                         | 22.1                        |
| Other (Includes Solar) | 14                                   | 1.3%                      | 20,415                          | 1.2                         |
| No Fuel                | 0                                    | 0.0%                      | 0                               | 0                           |
| <b>Total</b>           | <b>4,066</b>                         | <b>100%</b>               | <b>1,984,330</b>                | <b>119.1</b>                |

*This table displays data from the ACS that estimates current municipal residential heating energy use.*

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Table 1C. Current Municipal Commercial Energy Use

|                                 | Commercial Establishments in Municipality (VT DOL) | Estimated Thermal Energy BTUs per Commercial Establishment (in Millions) (VDPS) | Estimated Thermal Energy BTUs by Commercial Establishments in Municipality (in Millions) |
|---------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Municipal Commercial Energy Use | 215                                                | 707                                                                             | 152,005                                                                                  |

This table uses data available from the Vermont Department of Labor (VT DOL) and the Vermont Department of Public Service (DPS) to estimate current municipal commercial establishment energy use in the municipality.

Table 1D. Current Electricity Use

| Use Sector                             | Current Electricity Use |
|----------------------------------------|-------------------------|
| Residential (Efficiency Vermont) (kWh) | 47,931,428              |
| Commercial and Industrial (kWh)        | 20,874,368              |
| Total (kWh)                            | 68,805,796              |

This table displays current electricity use within the municipality. This data is available from Efficiency Vermont (EVT).

Table 1E. Residential Thermal Efficiency Targets

|                                                                                                   | 2025 | 2035 | 2050 |
|---------------------------------------------------------------------------------------------------|------|------|------|
| Residential – Increased Efficiency and Conservation (% of municipal households to be weatherized) | 20%  | 42%  | 92%  |

This table displays targets for thermal efficiency for residential structures based on a methodology developed by DPS using data available from the regional Long-range Energy Alternatives Planning (LEAP) analysis and ACS. The data in this table represents the percentage of municipal households that will need to be weatherized in the target years.

Table 1F. Commercial Thermal Efficiency Targets

|                                                                                                       | 2025 | 2035 | 2050 |
|-------------------------------------------------------------------------------------------------------|------|------|------|
| Commercial - Increased Efficiency and Conservation (% of commercial establishments to be weatherized) | 22%  | 33%  | 61%  |

This table shows the same information as Table 1E, but sets a target for commercial thermal efficiency. Information from the VT DOL is required to complete this target.

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Table 1G. Thermal Fuel Switching Targets (Residential and Commercial) - Wood Systems

|                                            | 2025 | 2035 | 2050 |
|--------------------------------------------|------|------|------|
| New Efficient Wood Heat Systems (in units) | 9    | 13   | 60   |

This table provides a target for new wood heating systems for residential and commercial structures in the municipality for each target year. This target was calculated using data from LEAP and ACS.

Table 1H. Thermal Fuel Switching Targets (Residential and Commercial) - Heat Pumps

|                           | 2025 | 2035 | 2050 |
|---------------------------|------|------|------|
| New Heat Pumps (in units) | 107  | 279  | 525  |

This table provides a target for new heat pump systems for residential and commercial structures in the municipality for each target year. This target was calculated using data from LEAP and ACS.

Table 1I. Electricity Efficiency Targets

|                                      | 2025 | 2035 | 2050  |
|--------------------------------------|------|------|-------|
| Increase Efficiency and Conservation | 1.5% | 7.3% | 15.2% |

Data in this table displays a target for increased electricity efficiency and conservation during the target years. These targets were developed using regional LEAP analysis.

Table 1J. Use of Renewables - Transportation

|                                       | 2025 | 2035  | 2050  |
|---------------------------------------|------|-------|-------|
| Renewable Energy Use - Transportation | 9.6% | 31.3% | 90.2% |

This data displays targets for the percentage of transportation energy use coming from renewable sources during each target year. This data was developed using the LEAP analysis.

Table 1K. Use of Renewables - Heating

|                                | 2025  | 2035  | 2050  |
|--------------------------------|-------|-------|-------|
| Renewable Energy Use - Heating | 54.6% | 67.6% | 91.6% |

This data displays targets for the percentage of heating energy use coming from renewable sources during each target year. This data was developed using information from the LEAP analysis.

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Table 1L. Use of Renewables - Electricity

|                                          | 2025  | 2035  | 2050   |
|------------------------------------------|-------|-------|--------|
| Renewable Energy Use – Electricity (MWh) | 4,644 | 7,431 | 18,579 |

This data displays targets for MWh generation coming from renewable sources within the municipality during each target year. This data was developed using information from the regional planning commission and DPS. This data is the same as the data in Table 1Q.

Table 1M. Transportation Fuel Switching Target - Electric Vehicles

|                   | 2025 | 2035  | 2050  |
|-------------------|------|-------|-------|
| Electric Vehicles | 158  | 1,090 | 2,176 |

This tables displays a target for switching from fossil fuel based vehicles (gasoline and diesel) to electric vehicles. This target is calculated by using LEAP and ACS data.

Table 1N. Transportation Fuel Switching Target - Biodiesel Vehicles

|                    | 2025 | 2035 | 2050 |
|--------------------|------|------|------|
| Biodiesel Vehicles | 275  | 510  | 826  |

This tables displays a target for switching from fossil fuel based vehicles to biodiesel-powered vehicles. This target is calculated by using LEAP and ACS data.

Table 1O. Existing Renewable Generation

| Renewable Type                   | MW          | MWh            |
|----------------------------------|-------------|----------------|
| Solar                            | 0.87        | 1061.45        |
| Wind                             | 0.00        | 0.00           |
| Hydro                            | 0.00        | 0.00           |
| Biomass                          | 0.00        | 0.00           |
| Other                            | 0.00        | 0.00           |
| <b>Total Existing Generation</b> | <b>0.87</b> | <b>1061.45</b> |

Table 1O shows existing renewable generation in the municipality, in MW and MWh, based on information available from the Vermont Department of Public Service.

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Table 1P. Renewable Generation Potential

| Renewable Type                              | MW           | MWh              |
|---------------------------------------------|--------------|------------------|
| Rooftop Solar                               | 2.13         | 2,615            |
| Ground-mounted Solar                        | 648.6        | 795,471          |
| Wind                                        | 223.5        | 685,374          |
| Hydro                                       | 0.00         | 0                |
| Biomass and Methane                         | 0.00         | 0                |
| Other                                       | 0.00         | 0                |
| <b>Total Renewable Generation Potential</b> | <b>874.3</b> | <b>1,483,459</b> |

Renewable generation potential is based on mapping completed by the regional planning commission that is based on the Municipal Determination Standards and associated guidance documents developed by DPS. The renewable generation potential is expressed in MW and MWh by the type of renewable resource (solar, wind, hydro, etc.).

Table 1Q. Renewable Generation Targets

|                                                   | 2025         | 2035         | 2050          |
|---------------------------------------------------|--------------|--------------|---------------|
| <b>Total Renewable Generation Target (in MWh)</b> | <b>4,645</b> | <b>7,431</b> | <b>18,579</b> |

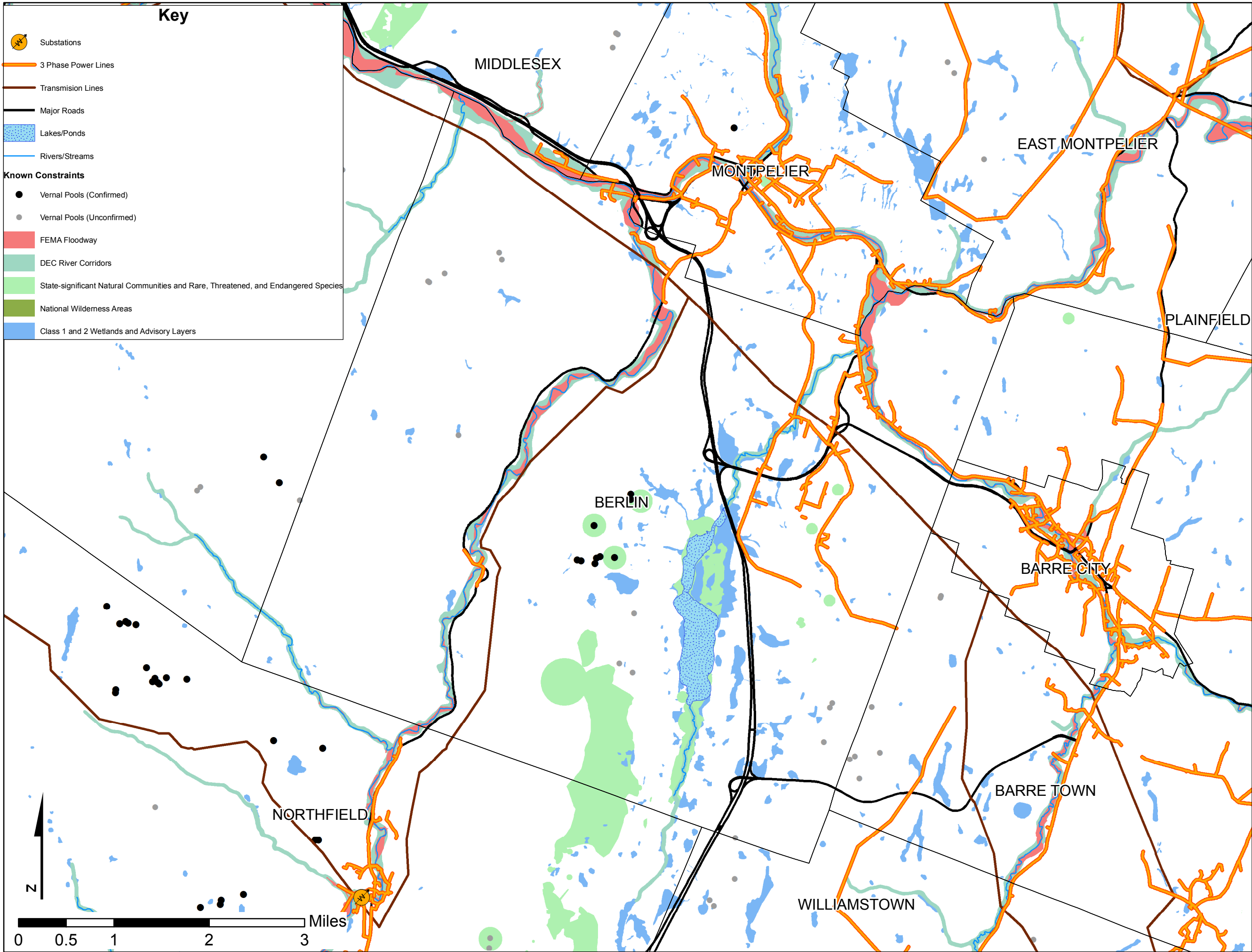
Renewable generation targets for municipalities were developed by the regional planning commission.

Table 1R. Sufficient Land

|       | Y/N |
|-------|-----|
| Solar | Y   |
| Wind  | N   |

This table shows whether or not there is sufficient land in the municipality to meet the renewable generation targets based on the renewable generation potential in the municipality.

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# BERLIN

## Known Constraints Map

**Known Constraints**

These constraints signal likely, though not absolute, unsuitability for development based on statewide or local regulation or designated critical resources.

Link to Data - <http://vcgi.vermont.gov/opendata/act174>

**Known Constraints**

Vernal Pools including confirmed and unconfirmed - Vermont Fish and Wildlife

DEC River Corridors - DEC WSMD Rivers Program 1/2/15

FEMA Floodway included in Zones AE - FEMA Map Service Center

State-significant Natural Communities and Rare, Threatened, and Endangered Species - Vermont Fish and Wildlife, Natural Heritage Inventory

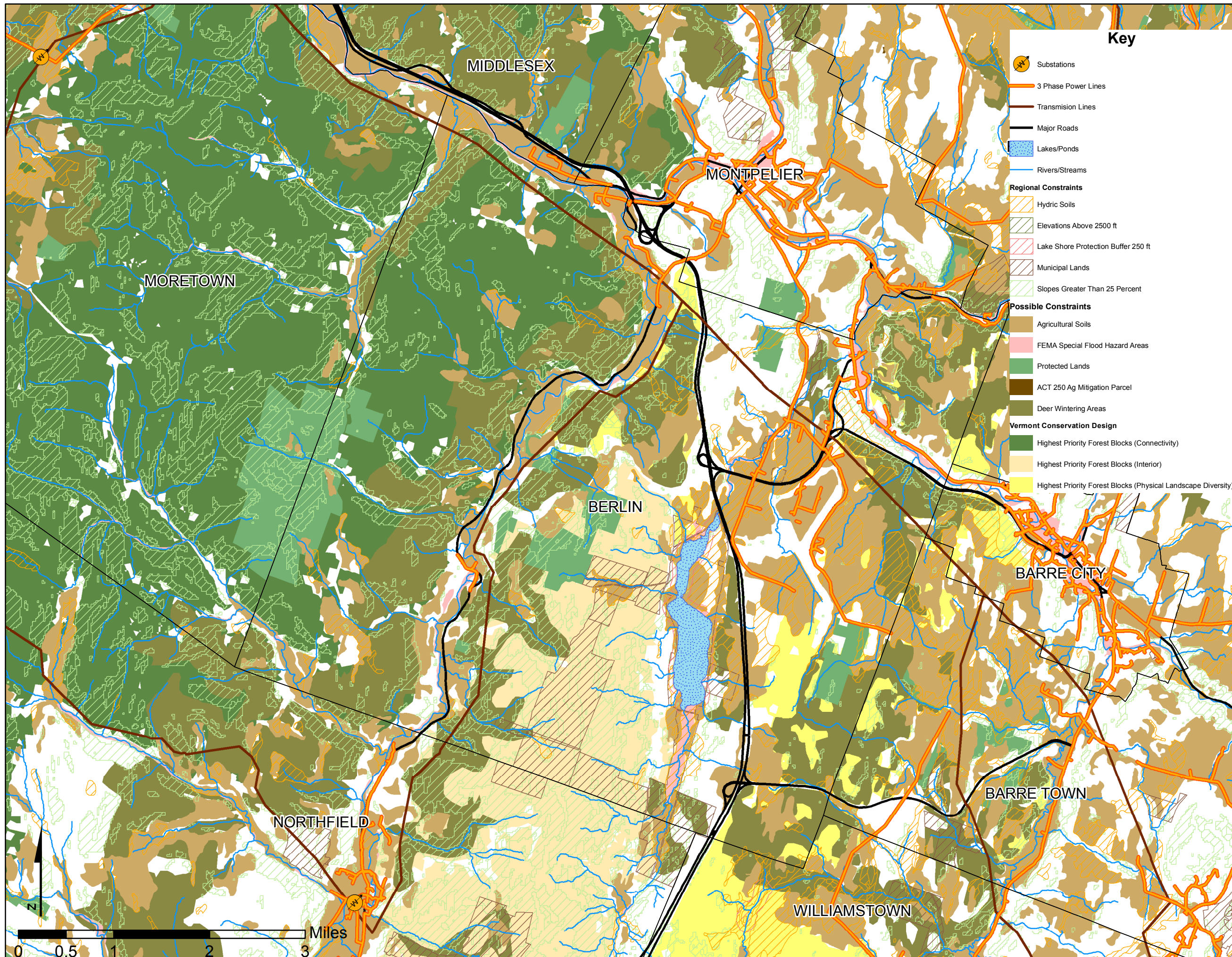
National Wilderness Areas - USDA Forest Service

Class 1 and Class 2 Wetlands (VSWI) and Advisory Layers - VT Watershed Management Division

This map was created as part of a Regional Energy Planning Initiative being conducted by the Bennington County Regional Commission, and the Vermont Public Service Department.

**Created:** December 2016 by CVRPC GIS.





# BERLIN

## Possible Constraints Map

### Possible Constraints

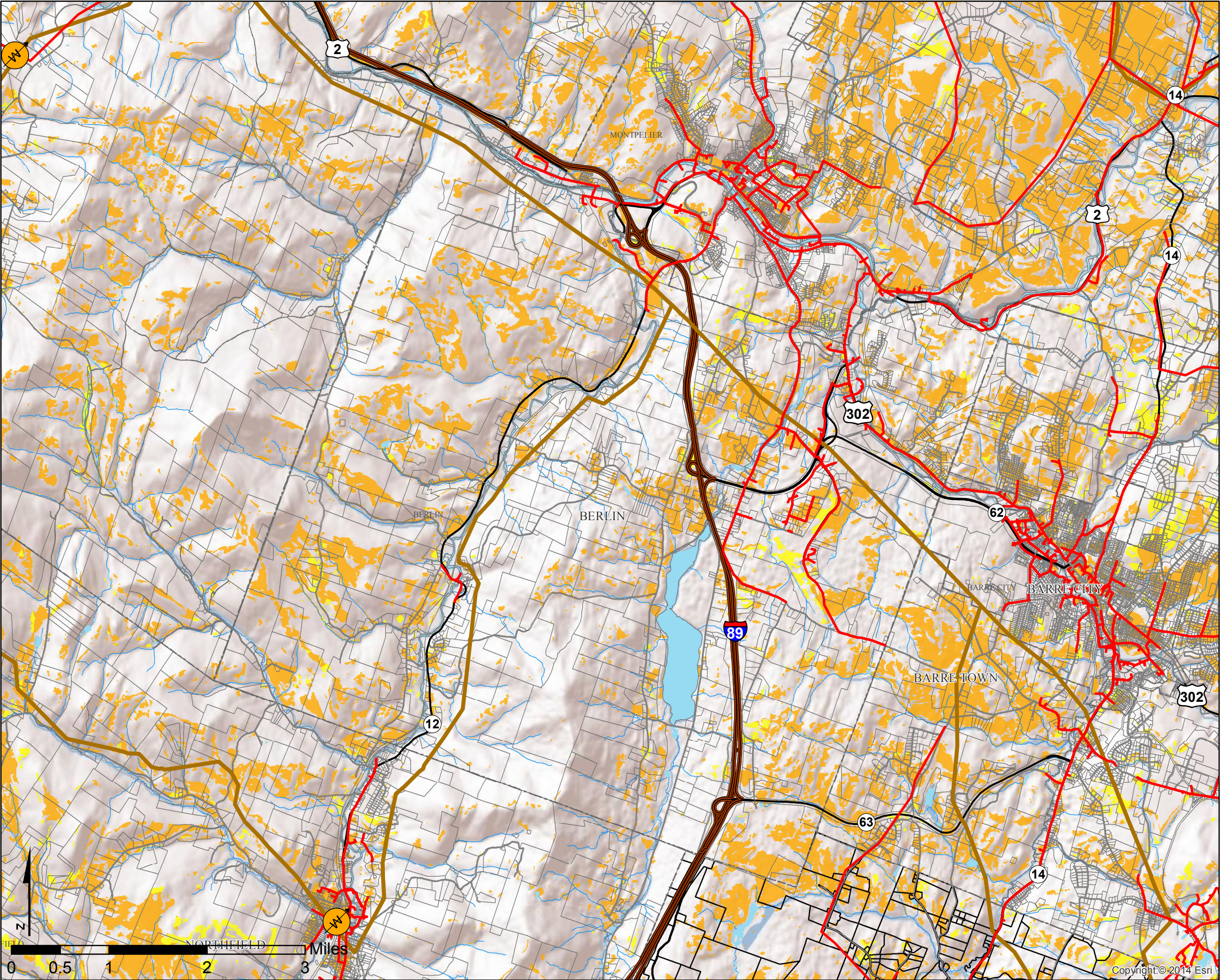
These constraints signals conditions that would likely require mitigation, and which may prove a site unsuitable after site-specific study, based on statewide or regional/ local policies that are currently adopted or in effect.

Link to Data - <http://vcgi.vermont.gov/opendata/act174>

**Possible Constraints Data Sources**  
Agricultural Soils include local, prime and statewide classifications - NRCS  
FEMA Special Flood Hazard Areas include Zones A and AE - FEMA Map Service Center  
Protected Lands - Include State fee lands and private conservation lands - VCGI  
Act 250 Ag Mitigation Parcels include parcel as of 2006 - VT Dept. of Ag  
Deer Wintering Areas - VT Fish and Wildlife  
Vermont Conservation Design include the following Highest Priority Forest Blocks: Connectivity, Interior, and Physical Landscape Diversity) - VT Fish and Wildlife  
Hydric Soils include soils that have hydric named components in the map unit - NRCS

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**Created:** December 2016 by CVRPC GIS.



# BERLIN

## Solar Resources Map

### Legend

- Substations
- 3 Phase Power Lines
- Distribution Lines
- Solar Potential**
  - Prime (No Constraint)
  - Secondary (Possible Constraint)
- Parcels
- Roads**
  - Interstate
  - US Highway
  - Vermont State Highway
  - Town Class 1-3

### Known Constraints

- Areas not shown on map
- Vernal Pools
- River Corridors
- FEMA Floodways
- Natural Communities & Rare, Threatened and Endangered Species
- National Wilderness Areas
- Wetlands Class 1 and 2

### Possible Constraints

- VT Agriculturally Important Soils
- FEMA Special Flood Hazard Areas
- Protected Lands
- Act 250 Agricultural Soil Mitigation Areas
- Deer Wintering Areas
- Highest Priority Forest Blocks
- Hydric Soils
- Elevations Above 2500Ft
- Lake Shore Protection Buffer 250 Ft
- Municipal Lands
- Slopes Greater Than 25 Percent

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Data is only as accurate as the original source materials.  
This map is for planning purposes.  
This map may contain errors and omissions

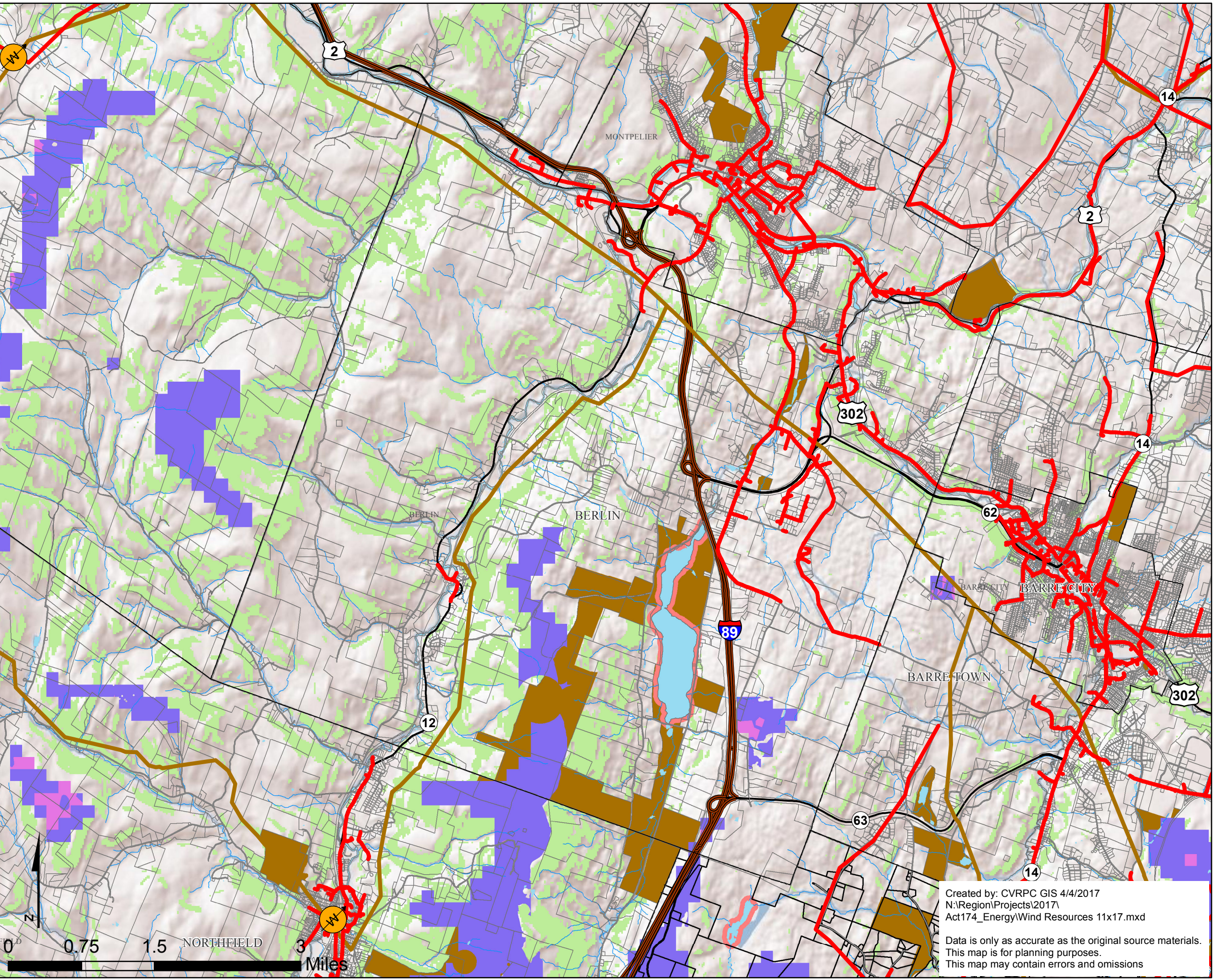


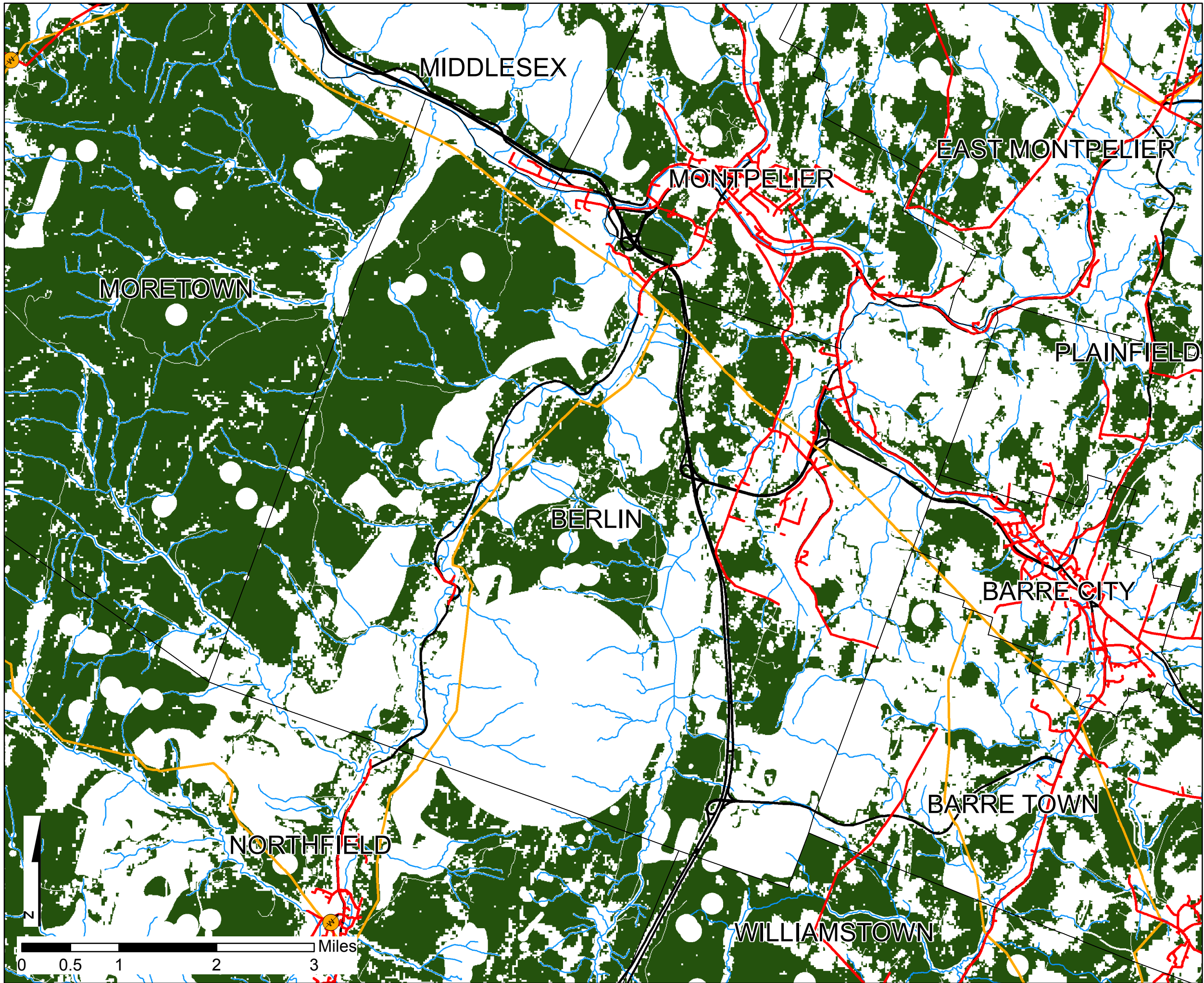
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## Wind Resources Map

### Legend

-  Substations
-  3 Phase Power Lines
-  Transmission Lines
- Wind Potential**
  - Prime Wind (No Constraint)  
Hub Height (m)  
 
  - Secondary Wind (Possible Constraint)  
Hub Height (m)  
 
-  Parcels
- Roads**
  -  Interstate
  -  US Highway
  -  Vermont State Highway
  -  Town Class 1-3
- Regional Constraints**
  -  Elevations Above 2500 ft
  -  Lake Shore Protection Buffer 250 ft
  -  Municipal Lands
  -  Slopes Greater Than 25 Percent
- Known Constraints**
  - Areas not shown on map
  - Vernal Pools
  - River Corridors
  - FEMA Floodways
  - Natural Communities & Rare, Threatened and Endangered Species
  - National Wilderness Areas
  - Wetlands Class 1 and 2
- Possible Constraints**
  - VT Agriculturally Important Soils
  - FEMA Special Flood Hazard Areas
  - Protected Lands
  - Act 250 Agricultural Soil Mitigation Areas
  - Deer Wintering Areas
  - Highest Priority Forest Blocks
  - Hydric Soils





# BERLIN

## Woody Biomass Resources Map

### Key

-  Substations
-  3 Phase Power Lines
-  Transmission Lines
-  Major Roads
-  Lakes/Ponds
-  Rivers/Streams
-  Woody Biomass

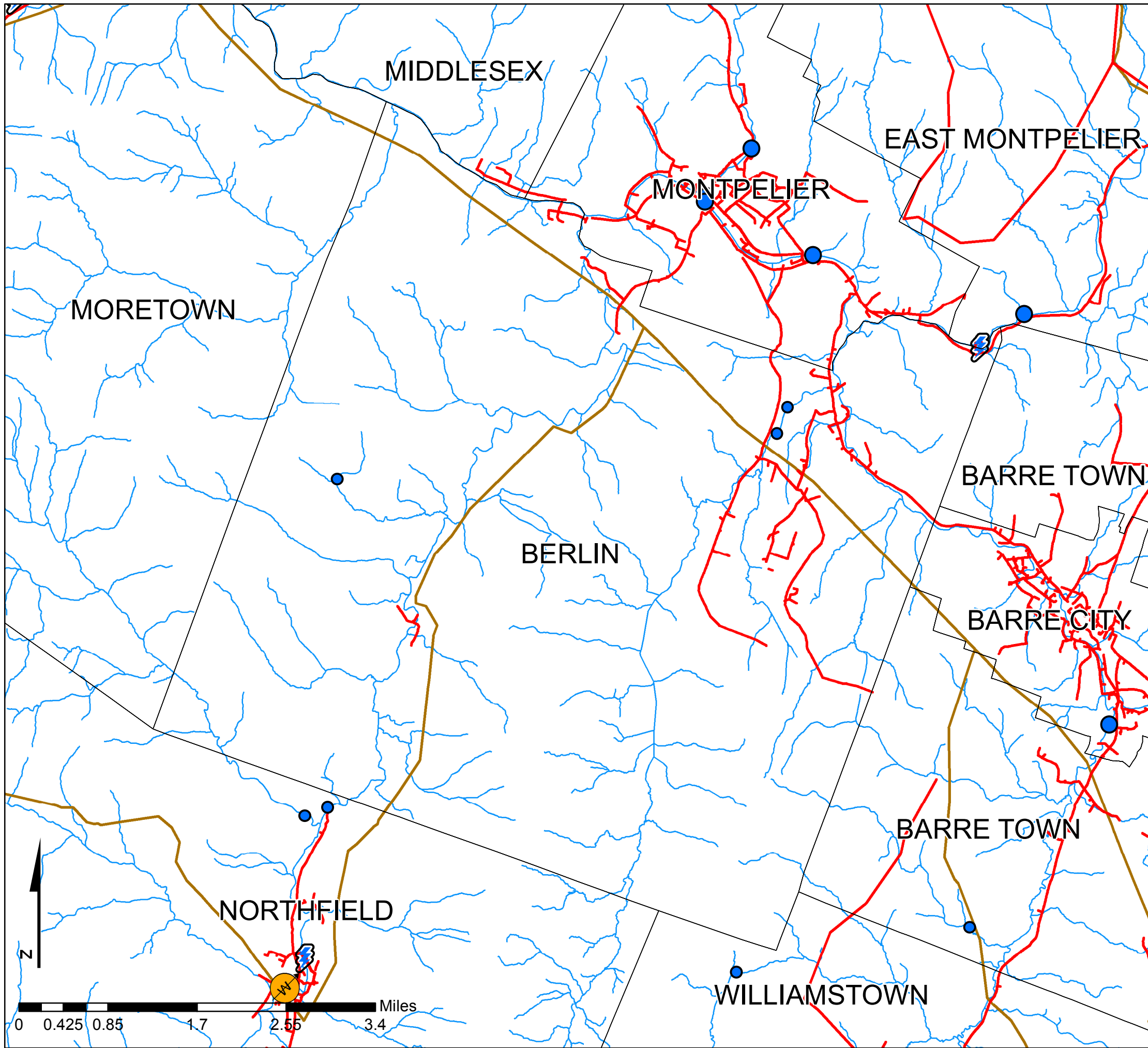
### Methodology

This map shows areas of resource potential for woody biomass, i.e., locations where forested areas are. This map also considers various other conditions, such as ecological zones, that may impact the feasibility of renewable energy/alternative heating source. These conditions are referred to as constraints. This map does not include areas where other types of biomass, such as biomass from agricultural residue, could be grown/harvested.

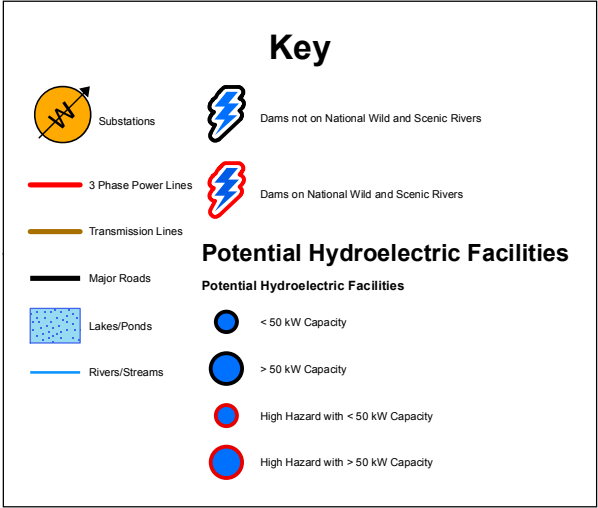
This map was created as part of a Regional Energy Planning Initiative being conducted by the Bennington County Regional Commission, and the Vermont Public Service Department.

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BERLIN  
Hydroelectric Resources Map



**Methodology**

This map shows areas of resource potential for renewable energy generation from hydroelectric , i.e., dams that could be converted in to hydroelectric facilities as well as active hydroelectric sites. Existing hydroelectric dam information was extracted from the Vermont Dam Inventory, while potential hydroelectric sites were derived from a study conducted by Community Hydro in 2007.1 Based on estimates conducted within the report, this map categorizes dams based on their potential hydroelectric generation capacity, and the downstream hazard risk that would be involved in hydroelectric production at each site.

High hazard potential dams are those where failure or mis-operation will probably cause loss of human life. The other rankings were grouped together and their failure or mis-operation results in no probable loss of human life, but could cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns. These dams are often located in predominately rural or agricultural areas, but could be located in areas with population and significant infrastructure.

This map was created as part of a Regional Energy Planning Initiative being conducted by the Bennington County Regional Commission, and the Vermont Public Service Department.

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Hydroelectric Resources 11x17.mxd