Municipal Breakout - Energy Data

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

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

DISCLAIMER: The information contained herein represents estimated conditions based on current available data. It is intended to be a representation of possible conditions and should be used for planning purposes only. More in-depth analysis or evaluation should be done to verify or confirm actual conditions for each scenario represented as errors or omissions may exist within the data.

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 on way to achieve energy goals. There may 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."

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)	1,193
Average Miles per Vehicle (Vtrans)	12,500
Total Miles Traveled	14,912,500
Average Gallons Used per Vehicle per Year (VTrans)	576
Total Gallons Use per Year	801,747
Transportation BTUs (Billion)	97
Average Cost per Gallon of Gasoline (RPC)	2.31
Gasoline Cost per Year	$1,852,036.00

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	7	1.1%	12,741	0.76
Propane	74	11.7%	149,730	8.98
Electricity	0	0.0%	0	0.00
Fuel Oil	262	41.3%	519,570	31.17
Coal	1	0.2%	2,184	0.13
Wood	278	43.8%	552,816	33.17
Other (Includes Solar)	12	1.9%	26,208	1.57
No Fuel	0	0.0%	0	0.00
Total	**557**	**100%**	**1,263,249**	**75.79**

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

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	28	755	21,140

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)	4,593,595
Commercial and Industrial (kWh)	2,718,522
Total (kWh)	7,312,117

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.

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

	2025	2035	2050
New Efficient Wood Heat Systems (in units)	1	0	16

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)	65	166	315

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	51.6%	66.2%	92.8%

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.

Table 1L. Use of Renewables - Electricity

	2025	2035	2050
Renewable Energy Use – Electricity (MWh)	2,555	4,088	10,220

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	103	708	1,414

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	179	331	537

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	0.39	478.30
Wind	0.00	0.00
Hydro	0.00	0.00
Biomass	0.00	0.00
Other	0.00	0.00
Total Existing Generation	**0.39**	**478.30**

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

Table 1P. Renewable Generation Potential

Renewable Type	MW	MWh
Rooftop Solar	0.77	949
Ground-mounted Solar	1,101.71	1,351,142
Wind	929.90	2,851,073
Hydro	0.00	0
Biomass and Methane	0.00	0
Other	0.00	0
Total Renewable Generation Potential	**2,032.39**	**4,203,165**

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

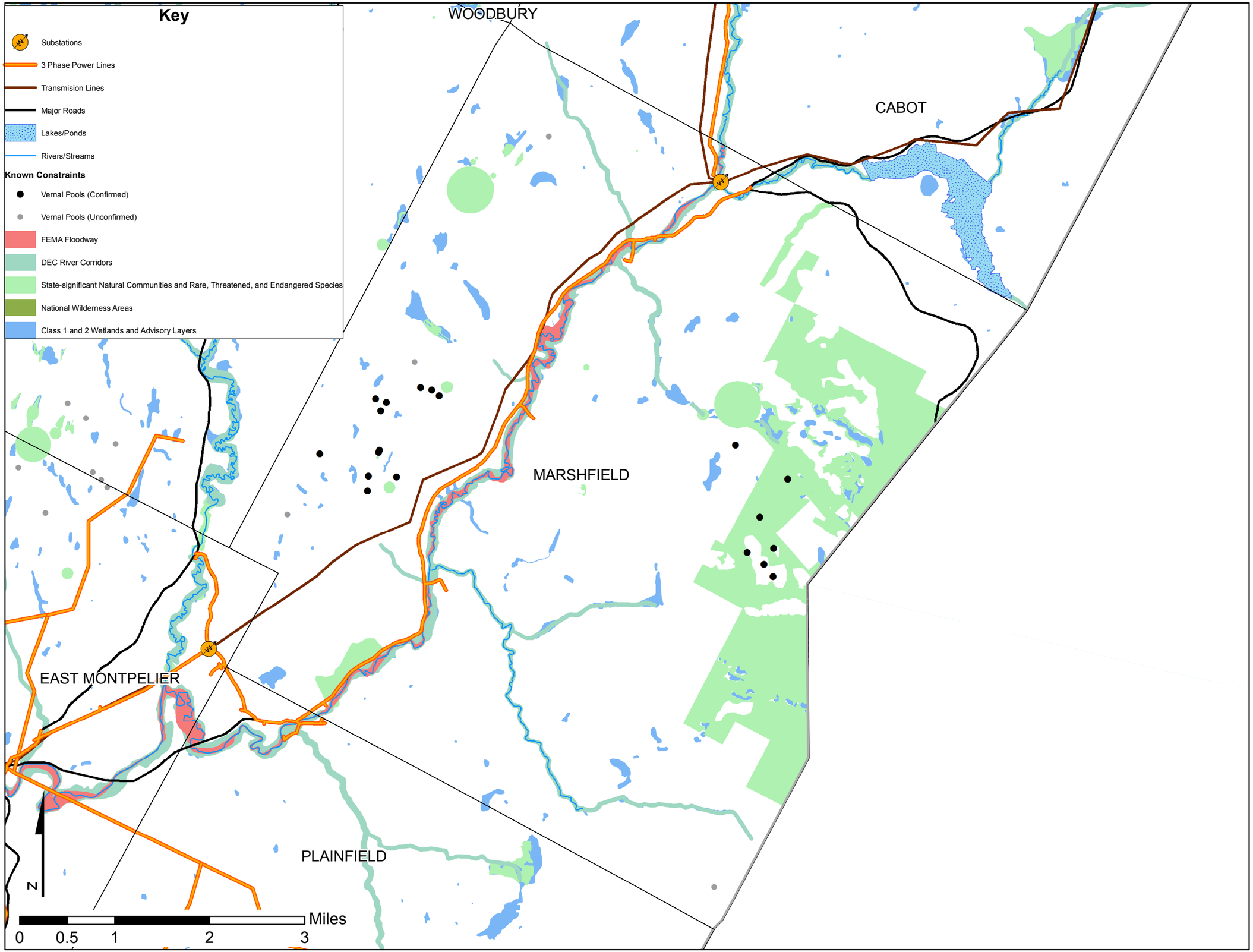
	2025	2035	2050
Total Renewable Generation Target (in MWh)	2,555	4,088	10,220

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

Table 1R. Sufficient Land

	Y/N
Solar	Y
Wind	Y

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.



MARSHFIELD
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 incuding 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.

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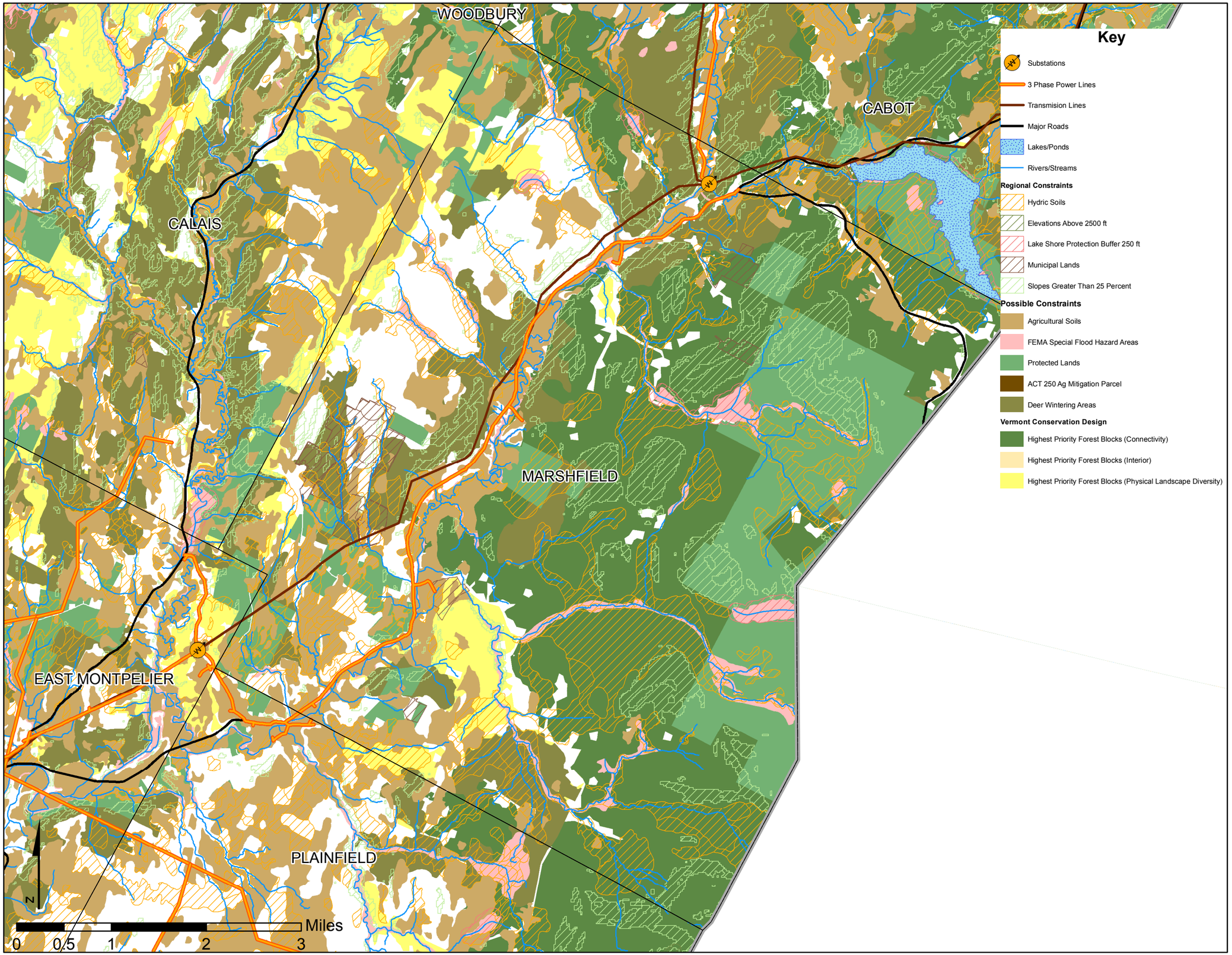
MARSHFIELD
Possible Constraints Map



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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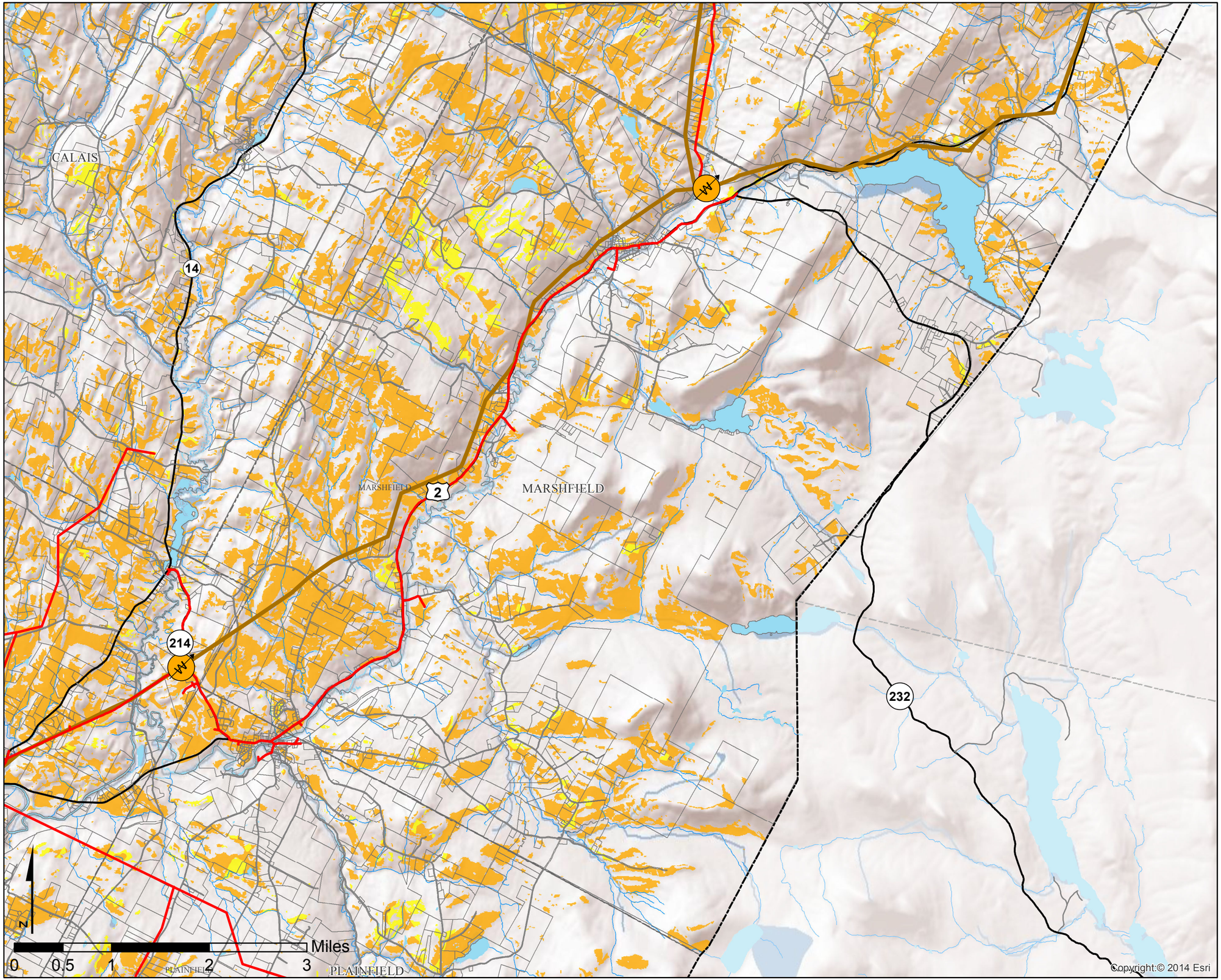
MARSHFIELD

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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This map is for planning purposes.
This map may contain errors and omissions

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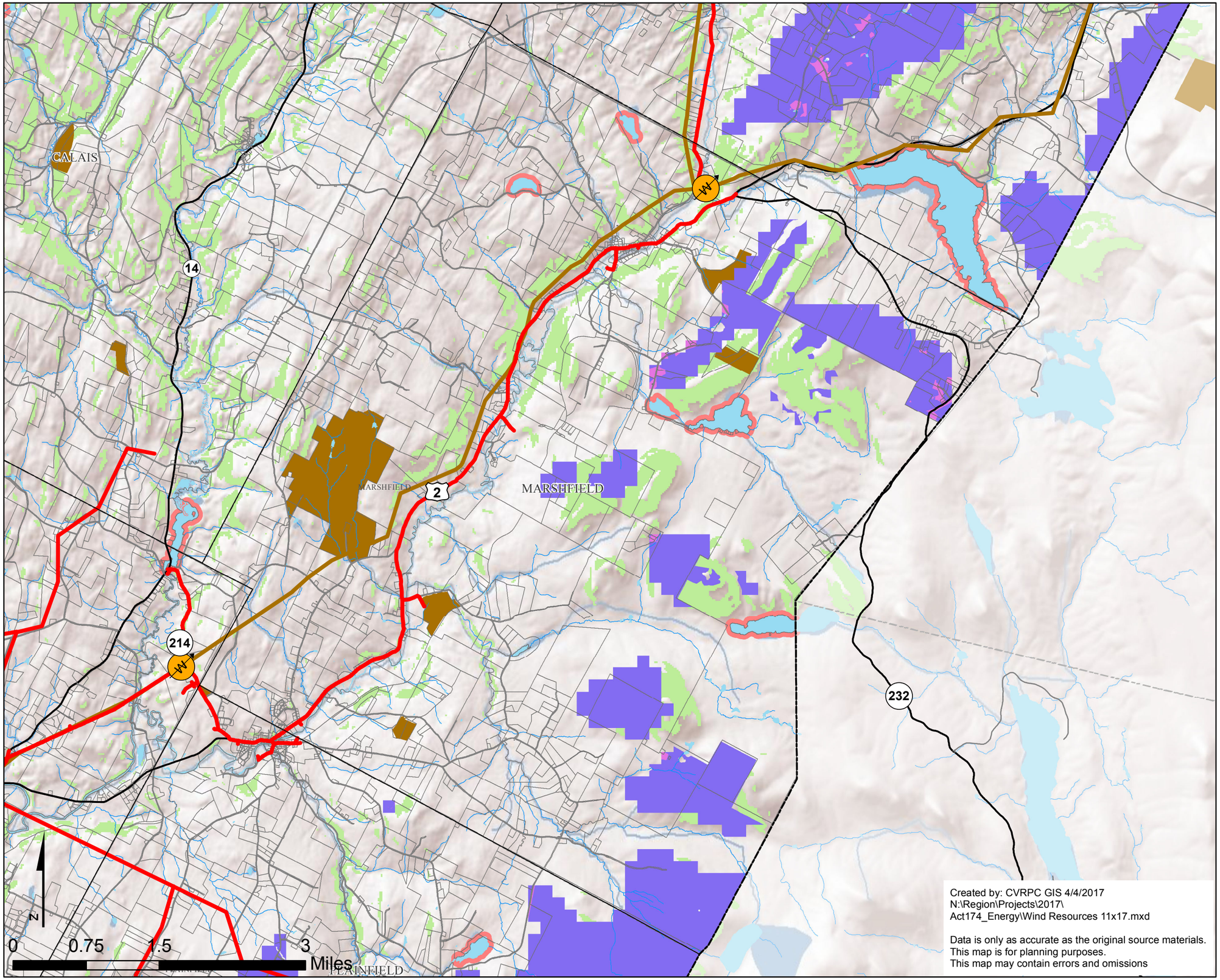
MARSHFIELD
Wind Resources Map



Legend

- Substations
- 3 Phase Power Lines
- Transmission Lines

Wind Potential

Prime Wind (No Constraint)
Hub Height (m)

50 70

Secondary Wind (Possible Constraint)
Hub Height (m)

50 70

- 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

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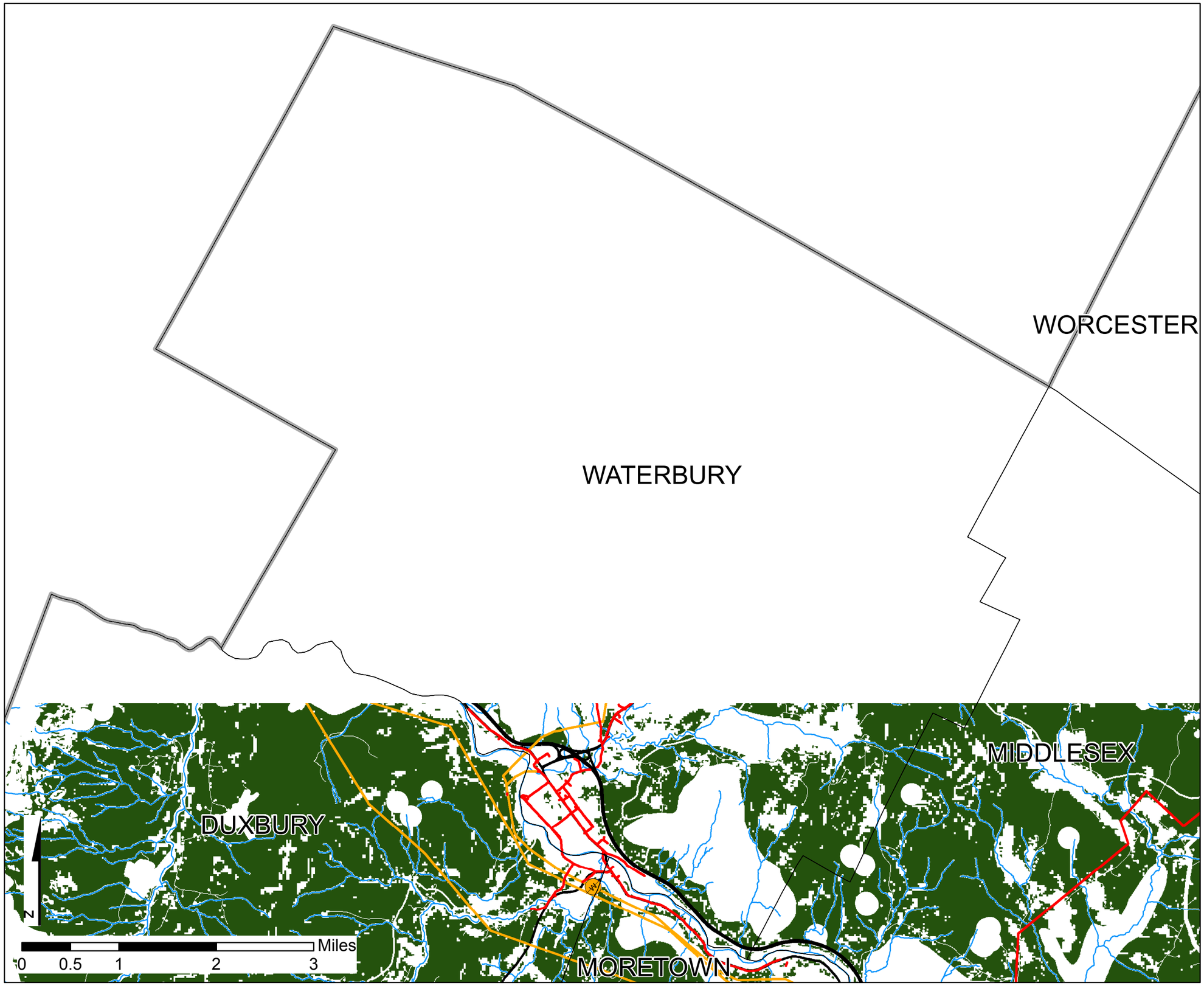
Woody Biomass Resources Map



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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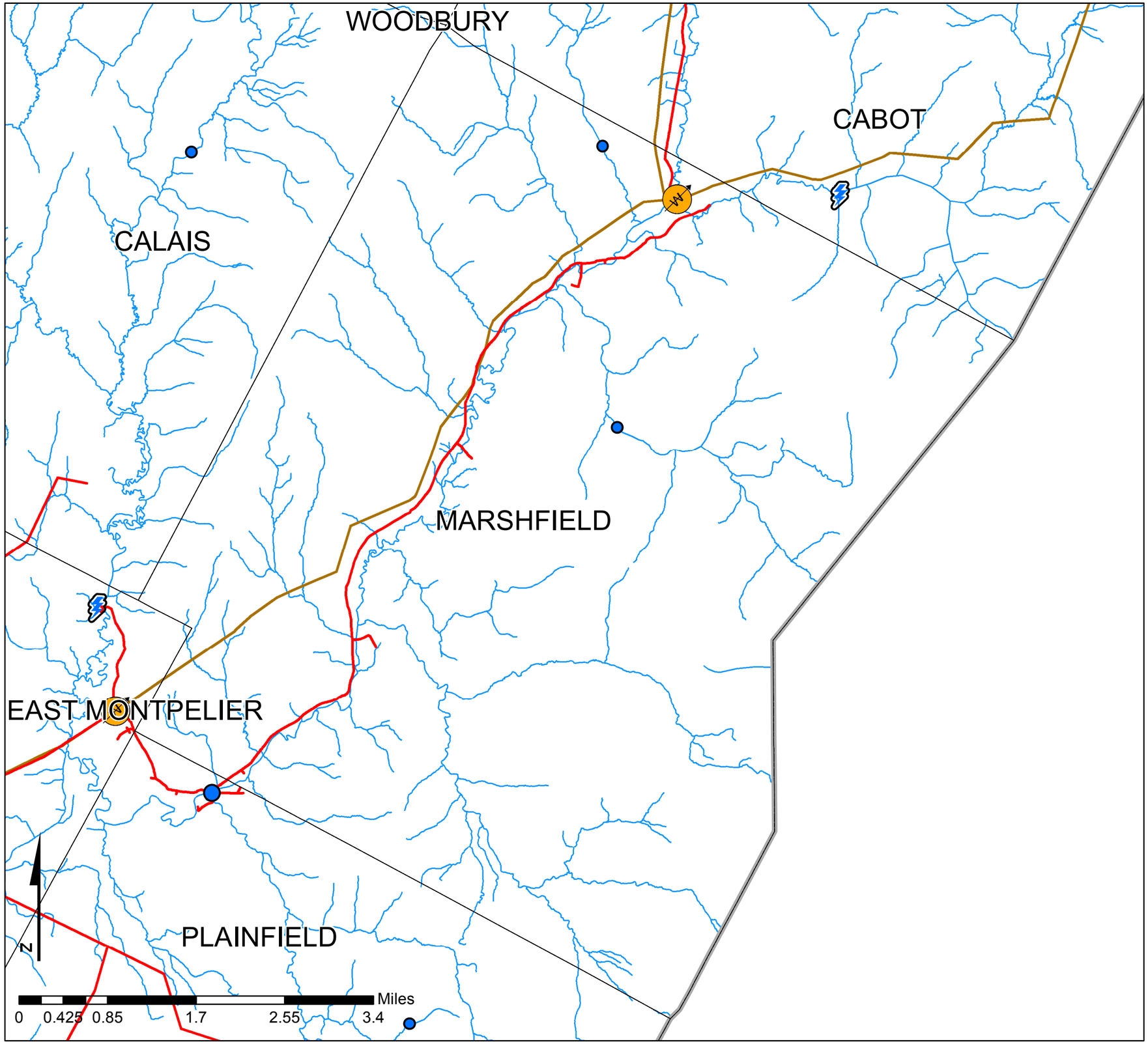
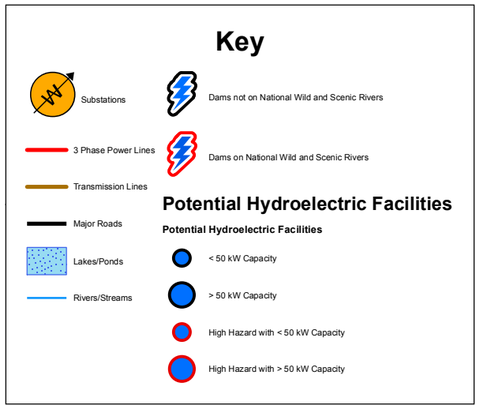
MARSHFIELD
Hydroelectric Resources Map





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 withpopulation and significant infrastructure.

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