2. The Town should work with landowners to protect lands adjacent to streams and water bodies which serve a recreational.
3. Any community or economic development strategies should incorporate the need for future recreational use opportunities and facilities (see Section 3.0).
4. New recreational facilities should be located conveniently to all members of the community.
5. Pownal should seek funding (e.g., a state transportation grant) to plan and complete a hiking/biking trail on the abandoned railroad bed in North Pownal.
6. The Town should provide parking areas and signage for recreational trails, river access and other recreational amenities.

8.0 Energy

Most of the world is highly dependent on fossil fuels, including oil, coal and gas to supply heat, electricity and fuel for transportation. These types of fuels are labeled "non-renewable" as the supply is finite and depends on how much of these materials can be extracted from the ground or beneath the sea. Other forms of energy from the sun (solar), wind, hydroelectric, and geothermal or labeled as "renewable" as the supplies come from the sun, winds, water power and subsurface heat that are not limited by what can be extracted. Fossil fuels produce greenhouse gasses such as carbon dioxide and methane. Since fossil fuel supplies are dependent on extraction, prices may fluctuate, and that fluctuation can be exacerbated by regional and global conflicts over resources.

Both types of energy require infrastructure such as power lines, substations and other distribution systems. Wind and solar generate power as those resources are available, so storage is needed to provide constant power sources.

Renewable energy can help both to maintain a clean environment and to provide local sources of energy to the community. Potential renewable resources in Pownal include:

- Hydroelectric energy from the Hoosic River;
- Residential, commercial and utility scale wind turbines to provide electricity for residential and commercial uses;
- Solar energy to heat water and generate electricity from photovoltaic cells; and,
- Wood for other biomass powered boilers for public buildings and local geothermal energy to supplement heating and cooling systems in residential and public buildings.

The Town recognizes that renewable energy sources should have a role in Pownal's energy future, but the development and use of those resources may have negative impacts on the town's natural, cultural, and scenic resources, which must be protected.

8.1 Vermont Energy Policy

The energy policy of the State of Vermont, as codified in 30 V.S.A. § 202a (1), states:

"It is the general policy of the State of Vermont:

(1) To assure, to the greatest extent practicable, that Vermont can meet its energy service needs in a manner that is adequate, reliable, secure, and sustainable; that assures affordability and encourages the State's economic vitality, the efficient use of energy resources, and cost-effective demand-side management; and that is environmentally sound.

(2) To identify and evaluate, on an ongoing basis, resources that will meet Vermont's energy service needs in accordance with the principles of least-cost integrated planning; including efficiency, conservation and load management alternatives, wise use of renewable resources, and environmentally sound energy supply."

Providing energy that is reliable and resilient in terms of both supply and cost is essential to the Vermont economy. At the same time, the sources of energy use can be realigned from fossil fuels to solar, wind, hydropower, geothermal, biomass and other sources not derived from fossil fuels to mitigate changes in the climate resulting from greenhouse gas emissions. The Vermont Comprehensive Energy Plan (2016) established the following set of goals:

- Reduce total energy consumption per capita by 15% by 2025, and by more than one third by 2050.
- Meet 25% of the remaining energy need from renewable sources by 2025, 40% by 2035, and 90% by 2050.
- Achieve three end-use sector goals for 2025: 10% renewable sources for transportation, 30% renewable sources for buildings, and 67% renewable sources of electric power (Vermont Department of Public Service, 2016).

In 2016, the Vermont State Legislature passed Act 174, the Energy Development Improvement Act, which amended several parts of Chapters 24 and 30 of the Vermont Statutes Annotated or V.S.A. Among the changes relevant to regional and municipal plans were:

1. Amendments to 24 V.S.A. § 4302(c) (7) to state a that the goal is to make efficient use of energy, provide for renewable energy and reduce emissions of greenhouse gasses;
2. Amendments to 24 V.S.A. § 4345a to provide for a required duty of regional planning commissions to undertake studies and make recommendations on the conservation of energy and development of energy resources;
3. Amendments to 24 V.S.A § 4348 to add requirements for regional energy plans to include conservation and efficient use of energy, development and identification of areas for renewable energy resources and areas unsuitable for such resources.

4. Requirements for both regional and municipal plans that optionally decide to seek a determination of energy compliance by meeting standards developed by the Department of Public Services (DPS).

As stated in 30 V.S.A. § 248, the Public Utility Commission reviews proposals for new natural gas and electric generating facilities and must issue a "certificate of public good" prior to any development of such facilities. Municipal governments may not regulate electric generation or transmission facilities except for those operated solely for on-site energy consumption.[32] A municipal government may appear as a party during public hearings the consideration of applications for these facilities.

Regions and municipalities that receive a "Determination of Energy Compliance" receive "substantial deference" under Section 248 of Title 30, by which the Public Service Board reviews and approves or denies applications for a Certificate of Public Good for the construction of electric transmission lines, electric generation facilities and certain gas pipelines in Vermont. The following sections of this plan were developed using the Guidance for Municipal Enhanced Energy Standards developed by the Vermont Department of Public Service (VT DPS 2017) which advises that plans should include:

- An analysis of current energy use and targets of future targets of energy use across sectors aligned with the state energy goals.
- Pathways or implementation actions to reach those targets.
- Maps to guide renewable energy development.

The Pownal Town Plan largely depends on information provided within the Bennington County Regional Energy Plan (BCRC, 2017) and supplemental information provided by the Bennington County Regional Commission.

8.2 Types of Energy Use

Energy is consumed by transportation, commercial enterprises, residences and industry. Transportation consumes more energy resources than each of the others (BCRC 2017). The following tables summarize targets for energy demand from different sources from 2010 projected to 2050 for the Bennington Region and for the Town of Pownal. Estimates were originally completed for the region using the Long-range Energy Alternatives Planning or LEAP system to estimate future energy supply and demand (BCRC, 2017). The estimates for each town, including Pownal, were calculated based on the proportion of the town population within the region. These assume the goals in the Vermont Comprehensive Energy Plan are achieved, so the time frames in the following tables track the years 2025, 2035 and 2050. These numbers represent targets for energy sources from 2025 to 2050 and not necessarily projections for

[32] Towns may adopt ordinances requiring screening of solar installations provided those requirements are the same as would apply to other commercial uses.

energy demand from those sources. The 2010 numbers represent estimations of current energy use.

Data for the following tables was developed by Jim Sullivan, Director of the Bennington County Regional Commission (Sullivan, 2017). Tables 18 and 19 show the total energy demand for the Bennington Region and for Pownal from 2010 to 2050 for various fuel types. Assuming an increase in electricity as more electric vehicles replace gas and diesel driven vehicles and as residential, commercial and industrial energy is provided by electricity and biomass for heating along with a reduction in energy use through extensive conservation efforts, there should be a decrease in the use of gas and oil.

Table 18. Total energy demand by fuel type in standard fuel measurement units from 2020 projected to 2050 for the Bennington Region

Fuels	2010	2025	2035	2050
Electricity (KWH)[33]	308,909,730 (15%)	371,922,626 (23%)	411,781,946 (30%)	463,657,679 (45%)
Gasoline (gallons)	15,838,344 (28%)	9,667,453 (21%)	5,913,425 (15%)	232,550 (1%)
Kerosene (gallons)	540,741 (1%)	370,370 (1%)	222,222 (1%)	- (0%)
Diesel (gallons)	4,339,577 (9%)	2,667,713 (7%)	1,620,981 (5%)	50,883 (0%)
Residual Fuel Oil (gallons)	2,912,686 (6%)	2,131,071 (6%)	1,596,633 (5%)	788,296 (3%)
LPG (gallons)	5,723,524 (7%)	4,484,411 (7%)	3,386,910 (6%)	1,899,974 (5%)
Oil (gallons)	7,734,188 (15%)	5,175,509 (13%)	3,082,045 (9%)	188,993 (1%)
Wood (tons)	5,750 (13%)	5,506 (16%)	5,306 (18%)	5,144 (24%)
Ethanol (gallons)	3,057,346 (4%)	2,608,778 (4%)	2,396,298 (4%)	2,065,774 (5%)
Solar Thermal (Th MMBtu)[34]	- (0%)	3 (<1%)	5 (<1%)	8 (<1%)
Coal (short tons)	3,592 (1%)	2,258 (1%)	1,334 (1%)	- (0%)
CNG (pounds)	644,841 (<1%)	694,444 (<1%)	694,444 (<1%)	744,048 (<1%)
Biodiesel (gallons)	47,024 <1%)	1,598,809 (4%)	2,641,169 (7%)	4,239,978 (16%)

[33] KWH stands for kilowatt hours

[34] MMBtu stands for one million BTUs or British Thermal Units, a standard unit of heat

Table 19. Total energy demand by fuel units from 2020 projected to 2050 for the town of Pownal in standard fuel measurement units				
Fuels	2010	2025	2035	2050
Electricity (KWH)	30,582,063	36,820,340	40,766,413	45,902,110
Gasoline (gallons)	1,567,996	957,078	585,429	23,022
Kerosene (gallons)	53,533	36,667	22,000	-
Diesel (gallons)	429,618	264,104	160,477	5,037
Residual Fuel Oil (gallons)	288,356	210,976	158,067	78,041
LPG (gallons)	566,629	443,957	335,304	188,097
Oil (gallons)	765,685	512,375	305,122	18,710
Wood (tons)	569	545	525	509
Ethanol (gallons)	302,677	258,269	237,234	204,512
Solar Thermal (Th MMBtu)	-	0	0	1
Coal (short tons)	356	223	132	-
CNG (pounds)	63,839	68,750	68,750	73,661
Biodiesel (gallons)	4,655	158,282	261,476	419,758

Two of the largest sectors for energy use are residences and transportation. Tables 20 and 21 summarize projected energy uses for the region and for Pownal respectively for transportation.[35] Most employees (84%) commuted alone and the average commute time was 23 minutes (BCRC 2017). As discussed above, a dramatic increase in the use of electric vehicles will result in an equally dramatic increase in electricity demand and decrease in the use of oil and gas.

The next tables (22 and 23) show residential energy use targets for the region and for Pownal. The targets are based on significant decreases in oil and gas with significant increases in biomass, biodiesel and heat pumps. Cold climate heat pumps draw air from the outside and by compressing that air, create heat. A somewhat similar system can use the ground or groundwater as a heat source (Efficiency Vermont 2016, Available via: https://www.efficiencyvermont.com/products-technologies/heating-cooling-ventilation/heat-pumps Accessed April 17, 2017). These systems can be very efficient.

Table 24 showing residential energy demand for Pownal is based on low to high ranges for heat pumps from 2015 through 2050. These ranges then affect the use of biodiesel, wood and propane with lower demand for those fuels with higher demand met from heat pumps. Space heating for housing units consumed primarily gas (liquid propane or other delivered; 18% of all use) and fuel oil (59% of all use), though wood (19% of all use) was also used.

Tables 25, 26 and 27 address commercial and industrial energy demand for the region and for Pownal. Space heating fuel types for businesses were not calculated, but for the entire

[35] The regional energy plan determined that there were 2,803 vehicles in Pownal using an estimated 1.9 million gallons of gasoline in 2014. The source of that information is the American Community Survey, which differs from the sources for the LEAP data.

county, 34% of space heating is from electricity, 30.5% from propane, 28.5% from heating oil and 7% from biomass (BCRC 2017). The target for electricity demand drops slightly by 2015 while it increases for industrial uses. Conservation strategies are key to achieving all of these targets.

Table 20. Bennington Region transportation fuel demand for 2015 projected to 2050 for light duty vehicles																
Fuel	2015 Btu	2015 Fuel Quantity	2015 Miles Driven	2015 # Vehicles	2025 Btu	2025 Fuel Quantity	2025 Miles Driven	2025 # Vehicles	2035 Btu	2035 Fuel Quantity	2035 Miles Driven	2035 # Vehicles	2050 Btu	2050 Fuel Quantity	2050 Miles Driven	2050 # Vehicles
Gasoline (gallons)	1115	9,260,490	231,512,242	19,293	888	7,375,170	221,255,108	18,438	447	3,712,501	126,225,042	10,519	35	290,688	10,755,457	896
Ethanol (gallons)	149	1,758,859	31,659,466	2,638	99	1,168,638	24,541,398	2,045	54	637,439	14,661,095	1,222	6	413,155	9,915,716	826
Electricity (KWH)	1	293,083	1,172,333	98	14	4,103,165	18,464,244	1,539	91	26,670,574	126,685,229	10,557	178	52,168,816	260,844,080	21,737
Diesel (gallons)	38	276,221	9,667,735	806	23	167,186	6,687,456	557	13	94,497	4,157,853	346	-	-	-	
Biodiesel (gallons)	3	23,512	752,381	63	15	117,559	4,114,581	343	23	180,258	6,849,798	571	33	258,631	10,345,233	862
	1306		274,764,157	22,897	1039		275,062,787	22,922	628		278,579,017	23,215	252		291,860,486	24,322

Table 21. Pownal transportation fuel demand for 2015 projected to 2050 for light duty vehicles																
Fuel	2015 Btu	2015 Fuel Quantity	2015 Miles Driven	2015 # Vehicles	2025 Btu	2025 Fuel Quantity	2025 Miles Driven	2025 # Vehicles	2035 Btu	2035 Fuel Quantity	2035 Miles Driven	2035 # Vehicles	2050 Btu	2050 Fuel Quantity	2050 Miles Driven	2050 # Vehicles
Gasoline (gallons)	123.8	1,027,914	25,697,859	2,141	98.6	818,644	24,559,317	2,047	50	412,088	14,010,980	1,168	3.9	32,266	1,193,856	99
Ethanol (gallons)	16.5	195,233	3,514,201	293	11.0	129,719	2,724,095	227	6	70,756	1,627,382	136	0.7	45,860	1,100,645	92
Electricity (KWH)	0.1	32,532	130,129	11	1.6	455,451	2,049,531	171	10	2,960,434	14,062,060	1,172	19.8	5,790,739	28,953,693	2,413
Diesel (gallons)	4.2	30,661	1,073,119	89	2.6	18,558	742,308	62	1	10,489	461,522	38	-	-	-	
Biodiesel (gallons)	0.3	2,610	83,514	7	1.7	13,049	456,719	38	3	20,009	760,328	63	3.7	28,708	1,148,321	96

Table 21. Pownal transportation fuel demand for 2015 projected to 2050 for light duty vehicles																
Fuel	2015 Btu	2015 Fuel Quantity	2015 Miles Driven	2015 # Vehicles	2025 Btu	2025 Fuel Quantity	2025 Miles Driven	2025 # Vehicles	2035 Btu	2035 Fuel Quantity	2035 Miles Driven	2035 # Vehicles	2050 Btu	2050 Fuel Quantity	2050 Miles Driven	2050 # Vehicles
Totals	145.0		30,498,821	2,542	115.3		30,531,969	2,544	70		30,922,271	2,577	28.0		32,396,514	2,700

Table 22. Total residential energy demand by standard fuel measurement units and number of households using fuel types from 2010 projected to 2050 for the Bennington Region. Percentages are fuel use based on BTUs										
Fuel	2015	2025	2035	2050		Fuel	2015	2025	2035	2050
Biodiesel (gallons)	86,210 (0.6%)	462,401 (3.6%)	838,591 (8.3%)	1,426,388 (23.5%)		Biodiesel	85	534	1,227	3,453
Cord Wood (cords)	23,550 (24.6%)	20,100 (24.7%)	16,400 (25.5%)	11,550 (29.8%)		Cord Wood	3,627	3,640	3,761	4,382
Wood pellets (tons)	2,848 (2.5%)	4,000 (4.1%)	4,606 (5.9%)	5,212 (11.1%)		Wood pellets	362	598	871	1,632
Electric Resistance (KWH)	21,688,159 (3.9%)	18,757,327 (3.9%)	10,550,996 (2.8%)	2,930,832 (1.3%)		Electric Resistance	570	579	413	190
Heat Pump (KWH)	4,689,332 (0.8%)	24,912,075 (5.2%)	46,893,318 (12.5%)	63,012,896 (27.7%)		Heat Pump	123	770	1,835	4,079
Kerosene (gallons)	474,074 (3.3%)	333,333 (2.8%)	200,000 (2.1%)	- (0.0%)		Kerosene	493	407	310	-
LPG (gallons)	3,823,550 (16.9%)	3,056,480 (15.9%)	2,041,587 (13.5%)	613,656 (6.7%)		LPG	2,495	2,345	1,984	987
Oil (gallons)	6,578,421 (47.3%)	4,695,757 (39.7%)	2,740,403 (29.4%)	- (0.0%)		Oil	6,968	5,849	4,323	-
						Total	14,722	14,722	14,722	14,722

Table 23. Total residential energy demand by standard fuel measurement units and number of households using fuel types from 2010 to 2050 for Pownal, based on 9.0% of the region's households.
Ranges for households vary with the number of heat pumps.

Fuel	2015	2025	2035	2050		Fuel	2015	2025	2035	2050
Biodiesel (gallons)	8,276	44,390	80,505	136,933		Biodiesel	8	51-46	118-100	331-265
Cord Wood (cords)	2,261	1,930	1,574	1,109		Cord Wood	348	349-314	361-307	421-337
Wood pellets (tons)	273	384	442	500		Wood pellets	35	57-52	84-71	157-125
Electric Resistance (KWH)	2,082,063	1,800,703	1,012,896	281,360		Electric Resistance	55	56-50	84-71	157-125
Heat Pump (KWH)	450,176	2,391,559	4,501,758	6,049,238		Heat Pump	12	74-208	176-361	392-596
Kerosene (gallons)	45,511	32,000	19,200	-		Kerosene	47	39-35	30-25	0
LPG (gallons)	367,061	293,422	195,992	58,911		LPG	239	225-203	190-162	95-76
Oil (gallons)	631,528	450,793	263,079	-		Oil	669	562-505	415-353	0
						Total	1,413	1,413	1,413	1,413

Table 24. Commercial energy demand for the Bennington Region from 2010 projected to 2050 in standard fuel measurement units. Proportions are for BTUs				
Fuels	2010	2025	2035	2050
Electricity (KWH)	101,113,716 (45%)	104,923,798 (48%)	101,699,883 (50%)	98,769,050 (54%)
Residual Fuel Oil (gallons)	133,609 (3%)	93,527 (2%)	60,124 (1%)	- (0%)
LPG (gallons)	1,652,151 (18%)	1,439,732 (16%)	1,191,909 (15%)	814,275 (11%)
Oil (gallons)	1,417,450 (26%)	995,849 (18%)	617,863 (12%)	14,538 (<1%)
Wood (tons)	375 (8%)	631 (14%)	794 (18%)	1,075 (28%)
Biodiesel (gallons)	- (0%)	117,559 (2%)	195,932 (4%)	337,004 (7%)

Table 25. Commercial energy demand for the Town of Pownal from 2010 projected to 2050 in standard energy units based on 2.0% of region's commercial establishments				
Fuels	2010	2025	2035	2050
Electricity (KWH)	2,022,274	2,098,476	2,033,998	1,975,381
Residual Fuel Oil (gallons)	2,672	1,871	1,202	-
LPG (gallons)	33,043	28,795	23,838	16,285
Oil (gallons)	28,349	19,917	12,357	291
Wood (tons)	8	13	16	22
Biodiesel (gallons)	-	2,351	3,919	6,740

Table 26. Industrial energy demand for the Bennington Region from 2010 projected to 2050 in standard fuel measurement units. Proportions are for BTUs				
Fuels	2010	2025	2035	2050
Electricity (KWH)	84,407,972 (31.9%)	99,062,134 (39.6%)	108,733,880 (45.4%)	123,094,959 (55.0%)
Fuel Oil (gallons)	3,012,893 (49.9%)	2,184,515 (38.3%)	1,623,355 (29.7%)	788,296 (15.4%)
LPG (gallons)	672,662 (6.3%)	519,248 (5.2%)	413,038 (4.3%)	259,624 (2.9%)
Wood (tons)	6,750 (11.9%)	9,000 (16.9%)	10,500 (20.6%)	12,750 (26.7%)

Table 27. Industrial energy demand for the Town of Pownal from 2010 projected to 2050 in standard energy units based on 4.2% of regions industrial establishments				
Fuels	2010	2025	2035	2050
Electricity (KWH)	3,545,135	4,160,610	4,566,823	5,169,988
Fuel Oil (gallons)	126,542	91,750	68,181	33,108
LPG (gallons)	28,252	21,808	17,348	10,904
Wood (tons)	284	378	441	536

8.3 Existing Programs in Pownal

New residential construction built after July 1, 1998, is required to adhere to the Vermont Residential Building Energy Standards (VRBES), and all relevant updates. These include such measures as efficient insulation, heating systems, and weatherproofing windows and doors. At such time as Pownal has a building inspector, the building inspection required for issuance of a certificate of occupancy should include documentation that the new construction meets these standards.

Green building and LEED Construction (Leadership in Energy and Environmental Design) standards also promote the use of natural, recycled and durable building materials, as well as energy efficiency. To receive LEED certification, building projects must satisfy prerequisites and earn points to achieve different levels of certification. Some towns in Vermont provide building incentives, like density bonuses, for projects that are LEED certified.

Manufactured housing must also meet the same energy standards as traditionally constructed homes, and energy-efficient modular and manufactured home designs could help residents to reduce their fuel bills. Traditional manufactured homes have an inherently inefficient design because of their high service area to volume ratio and low insulation values. (BREP, page 21). Pownal should incorporate energy efficiency guidelines into a town building code.

Pownal has the largest commercial solar array in Bennington County with the 2.2 MW array at the former race track. In addition, there are solar arrays at former gravel pits generating 2.7 MW, making Pownal the largest generator of electricity from solar in the county (BCRC, 2017). The hydroelectric dam on the Hoosic, which is owned by the town, was revived and became operational in 2017 and can generate 400 kW of electricity (BCRC 2017). Green Mountain Power has a high grid capacity for new generating capacity though upgrades are needed in Pownal (BCRC, 2017).

8.4 Energy Siting

For regional and town plans to receive a determination of energy compliance, the plans must identify potential areas for developing renewable energy sources as well as areas unsuitable for those resources. This must also include categories of the sizes of those resources,

and the potential energy generated. The Bennington County Regional Energy Plan (BCRC 2017) went through a review process, including public hearings held by the Department of Public Services and received that designation. Towns may use the maps developed by their regional commission and may add additional constraints. The mapping standards listed by the Vermont Department of Public Service (2017) are:

Mapping Standard 10: Does the plan identify existing electric generation sources? Maps should show generation facilities greater than 15 kW using sources provided by the Department or others as available (See Map 15).

Mapping Standard 11: Does the plan identify potential areas for the development and siting of renewable energy resources and the potential generation from such generators in identified areas? These maps should include:

11A. Raw renewable potential analysis of wind and solar. These are available from both the Bennington County Regional Commission and the Vermont Geoportal.

Wind resources are evaluated based on the potential size of a turbine, measured as the height of the hub or center of the blades from ground level and the lower wind speed below which a given size of turbine would not be viable. Table 28 shows the classes used by the Vermont Department of Public Services.

Table 28. Wind turbine size classes
(Source: VT DPS 2017)

Scale	Residential	Commercial/Community	Utility
Hub Height	30 m (98.4 ft.)	50 m (164 ft.)	70 m (229.6 ft.)
Lower wind speed cutoff	4.5 m/s (10 mph)	5.5 m/s 12.3 mph)	6.5 m/s (14.5 mph)

Similarly, solar resources are based on the amount of electricity that can be generated (Table 29).

Table 29. Solar energy size classes
(Source VT DPS 2017)

Category	Type	Generation Capacity
Net Metered[36]	Residential	<=15 kW
	Small Commercial	<=50 kW
	Commercial/Large	<=150 kW
	Residential Group	<=500 kW
Standard Offer[37]		2.2 MW

[36] Net metering requires utilities to allow individuals or groups to generate their own power and sell the excess back to the grid.
[37] The Vermont Standard Offer program provides incentives to rapidly develop larger scale renewable energy projects.

Table 29. Solar energy size classes (Source VT DPS 2017)		
Category	Type	Generation Capacity
Utility		Can be less than, equal to or greater than 5 MW

11B. Known constraints representing high priority natural resources including (maps in this plan are listed where applicable):

Vernal Pools (none mapped within Pownal)
NYSDEC River Corridors (Map 8)
FEMA Floodways (Map 8)
State-significant Natural Communities and Rare, Threatened and Endangered Species (Map 9)
National Wilderness Areas (none mapped within Pownal)
Class 1 and Class 2 Wetlands and Advisory Layers (Map 8)
Regionally or Locally Identified Critical Resources (see Pownal Energy Goal #4 below)

11C. Possible constraints are lower priority resources. Plans need to articulate policies on these constraints:

Agricultural Soils (Map 9)
FEMA Special Flood Hazard Areas (Map 8)
Protected Lands (Map 14)
Deer Wintering Areas (Map 9)
ANR's Vermont Conservation Design Highest Priority Forest Blocks (Maps 7 and 9)
Hydric Soils (Maps 5 and 7)
Regionally or Locally Identified Resources (see Pownal Energy Goal #4 below)

The above resources (constraints) are described in Section 4.0 of this plan. Maps are at the end of this plan.

11D. Transmission and distribution resources and constraints showing potential for connection to distribution-level power lines.

To meet mapping standards 11 and 12 A-D, Map 15 shows the areas where both solar and wind resources potentially exist, both with and with none of the constraints listed above. Areas where utility scale wind are highlighted and are found within large, contiguous forest blocks in the Green Mountains and Taconics. Other wind resources are suitable for 30 and 50 m hub height turbines. The map also shows three phase transmission lines shown in the regional energy plan (BCRC 2017) and those identified by the Planning Commission along with a one-mile buffer from those lines indicating areas within which generating facilities could be connected to such lines. Map 15 also shows existing energy sources, listed in Table 28 below.

Table 30. Existing energy sites in Pownal. Source:		
Type	Location	Capacity[38]
Hydroelectric	Hydroelectric dam at Dean Rd.	400 kW
Solar array at racetrack	Former Pownal racetrack	2200 kW
Solar array at Barlow Pit	Barlow Pit at Dean Rd.	
Solar array at Northwest Hill Rd.	Northwest Hill Rd.	2200 kW

Table 31 shows the number of acres of wind and solar, with and without constraints, by size classes. For example, the number of acres of wind falling in contiguous areas of greater than 100 acres is 861 with no constraints and 8,811 with constraints.

Table 31. Area in acres of potential solar and wind resources in Pownal			
Type of Resource	No Constraints	With Constraints[39]	Total
Wind >100 acres	861	8811	9672
Wind 10 to 100 acres	699	545	1244
Wind 1 to 10 acres	158	88	246
Wind < 1 acre	11	8	19
	1729	9453	11183
Solar > 5 acres	367	3249	3615
Solar 1 to 5 acres	338	616	954
Solar < 1 acre	161	271	432

The following mapping standards are addressed under Pownal Energy Goal #4 below.

11 E. Preferred locations (specific areas or parcels) for siting a generator with any specific siting criteria for the locations. A "preferred site" as defined by the Public Utilities Commission (2017) can include:

1. A new or existing structure whose primary use is not the generation of electricity or providing support for the placement of equipment that generates electricity;
2. A parking lot canopy over a paved parking lot, provided that the location remains in use as a parking lot;
3. A tract previously developed for a use other than siting a plant on which a structure or impervious surface was lawfully in existence and use prior to July 1 of the year preceding the year in which an application for a certificate of public good under this Rule is filed but not including any headwaters, streams, shorelines, floodways, rare and irreplaceable natural areas, necessary wildlife habitat, wetlands, endangered species, productive forestlands, or primary agricultural soils
4. Land certified by the Secretary of Natural Resources to be a brownfield site

[38] The Bennington County Regional Commission 2017 plan lists the two gravel pits as having a total of 2,700 kw.
[39] Possible constraints are those listed in 11.C above as well as Riparian Wildlife Corridors and High Priority Surface Water and Riparian Areas described in Section 4.0 (see Pownal Energy Goal #4 below).

5. A sanitary landfill provided that the Secretary of Natural Resources certifies that the land constitutes such a landfill and is suitable for the development of the plant;
6. The disturbed portion of a lawful gravel pit, quarry, or similar site for the extraction of a mineral resource provided that all activities pertaining to site reclamation required by applicable law or permit condition are completed prior to the installation of the plant
7. A specific location designated in a duly adopted municipal plan under 24 V.S.A. chapter 117 for the siting of a renewable energy plant or specific type or size of renewable energy plant, provided that the plant meets the siting criteria recommended in the plan for the location;
8. A specific location that is identified in a joint letter of support from the municipal legislative body and municipal and regional planning commissions in the community where the net-metering system will be located.
9. A site listed on the National Priorities List (NPL) established under the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. chapter 103 and the development will not compromise or interfere with any site remediation.
10. On the same parcel as, or directly adjacent to, a customer that has been allocated more than 50 percent of the net-metering system's electrical output.

Mapping Standard 12: Does the plan identify areas that are unsuitable for siting renewable energy resources or particular categories or sizes of those resources? These might be areas that have known or potential constraints or other reasons that make them inappropriate for energy development.

12A. Are areas identified as unsuitable for particular categories or sizes of generators consistent with resource availability and/or land use policies in regional or municipal plans applicable to other types of development? Areas that do not have the potential for wind or solar are unsuitable, but other areas that do have such potential may be unsuitable due to identified constraints. In those cases, plans should consider similar potential impacts from other types of uses and treat them similarly to energy resources.

12B. Does the plan ensure that any regional or local constraints (11B-11C above) identified are supported through data or studies are consistent with the remainder of the plan and do not include an arbitrary prohibition or interference with the intended function of any particular renewable resource or size? First, has a field study been completed identifying resources such as vernal pools? Have viewshed or other studies been completed to support aesthetic constraints? Then, do the policies also limit other types of development?

Mapping Standard 13 applies only to regional plans. Mapping Standard 14 for municipalities asks, for municipalities seeking a determination of energy compliance from the Department and not using their region's maps only: Does the plan ensure that its approach, if applied regionally, would not have the effect of prohibiting any type of renewable generation technology in all locations?

Unless discussed above, the application of the mapping standards is discussed in 8.5 below.

8.5 Energy Goals, Objectives and Actions

State Planning Goal #7 ***(24 V.S.A. § 4302):*** *To encourage the efficient use of energy and the development of renewable energy resources.*

In addition, the Vermont Comprehensive Energy Plan (2016, expanded upon the statutory goal of 25% renewable by 2025 (10 V.S.A. § 580(a)), by establishing the following set of goals:

- Reduce total energy consumption per capita by 15% by 2025, and by more than one third by 2050.
- Meet 25% of the remaining energy need from renewable sources by 2025, 40% by 2035, and 90% by 2050.
- Three end-use sector goals for 2025: 10% renewable transportation, 30% renewable buildings, and 67% renewable electric power.

The following goals, objectives and actions represent a program to achieve the targets in the tables above as required by the Department of Public Service (DPS 2017). In some cases, the reader will need to refer to other sections of this plan that address similar issues.

Pownal Energy Goal 1: Encourage residents, businesses and institutions in Pownal to conserve energy by implementing a long-term education and outreach programs to conserve energy and reduce fossil fuel use.

Objective 1: Identify and disseminate information on resources for residents, businesses and institutions on ways to conserve energy.

Actions:

1. Hire a local energy coordinator (which could be a position shared with another town) to implement conservation programs
2. Develop a Town Energy Committee headed by the Energy Coordinator to assure these actions are implemented.
3. Develop and implement a program of community education and outreach on reducing energy use through conservation, retrofitting, and lifestyle changes.
4. Identify potential funding sources such as grants, tax credits or other means to assist residents and businesses in energy conservation.
5. Encourage residents to hire Efficiency Excellence Network (EEN) contractors when completing energy efficiency projects by including links to the EEN on municipal websites.
6. Work with partner organizations and Efficiency Vermont, an Energy Efficient Utility (EEU) to offer workshops and educational opportunities to businesses, including rental housing owners on efficiency in new construction, retrofits, and conservation practices.

7. Sponsor workshops for home owners in weatherization and other methods of conserving energy
8. Coordinate with and promote Energy Efficiency Utility (EEU) programs and the state Weatherization Assistance Program for low-income households and encourage residents to participate.
9. Provide contact information for energy efficiency resources to people buying property or applying for building or remodeling permits.
10. Support public education and awareness programs aimed at reducing energy consumption and using energy more efficiently.

Objective 2: Promote energy efficiency in buildings

Actions:

1. Promote the use of the residential and commercial building energy standards by distributing code information to permit applicants and ensuring code compliance.
2. Provide energy code and energy efficiency program information when residents apply for municipal land use permits that include alterations or construction of a building.
3. Require that energy code certificates be submitted to the town for all new building construction as well as for additions, alterations, renovations and repairs in existing buildings.
4. Promote the use of landscaping for energy conservation and efficiency

Objective 3: Provide leadership in energy efficiency

Actions:

1. Conduct a building energy audits of how much energy municipal buildings (including schools) use.
2. Establish a timeline for needed improvements or replacements as identified by energy audits of the municipal owned buildings, vehicles, and equipment.
3. Consider energy efficiency and energy conservation in new municipal construction projects, equipment purchases and operations.
4. Use life cycle costing of potential energy improvements during design and construction planning.
5. Incorporate weatherization/energy efficiency projects into the municipal Capital Budget Program and implement weatherization/energy efficiency projects in municipal buildings.
6. Enroll municipal buildings into energy certification programs.
7. Develop policies for evaluating investments in infrastructure that consider energy efficiency, for example making purchasing decisions with life cycle analysis and building operation guidelines in mind.
8. Replace fossil fuel heating with cold-climate heat pumps, geothermal heat or advanced wood heating systems.

9. If a new town hall is constructed or purchased, make sure the location is within one of the village areas to reduce the need for residents to drive to the building.
10. See also Section 5.0 Land Use on encouraging development within villages and limiting sprawl.

Pownal Energy Goal 2: Reduce the use of fossil fuels for both heating and transportation

Objective 1: Encourage options for heating and cooling of homes, businesses and institutions.

Actions:

1. Promote the use of cold climate heat pumps with education/presentations in coordination with the EEUs/electric utilities.
2. Support the use of ground-source (also known as geothermal) heat pump heating and cooling systems for new construction.
3. Promote wood stove change-out programs that take older non-EPA certified stoves out of service and replace them with more efficient and lower emitting cord wood and pellet stoves.
4. Provide information on the installation of advanced wood heating equipment for new construction projects.
5. Provide information to assist residents, businesses and institutions to investigate and acquire advanced wood heating systems.
6. See also Section 4.0 Natural Resources on forest management.
7. Identify potential locations for wood-fired district heating within the village areas. Potential district heating site include areas of Pownal Center including the town hall, fire station, and possibly Pownal Elementary and Pownal Village including the library, church, American Legion and commercial establishments (BCRC 2017).
8. Investigate the use of an anaerobic digester to capture methane at the wastewater treatment plant.
9. Investigate the use of food and other organic waste for use in an anaerobic digester.

Objective 2: Encourage options for reducing the number of vehicle trips by residents, both within the town and for commuting to work.
Actions:

1. Promote development within villages including mixed residential and commercial uses so residents can drive less frequently and far and to reduce sprawl.
2. Build pathways and sidewalks within villages to make bicycle and pedestrian use easier, safer and more attractive. This could include requiring that new development include pedestrian and bike-friendly infrastructure and connect to the existing and planned pedestrian and bike networks.
3. Amend the zoning bylaws to reduce or eliminate potential commercial strip development along Route 7 and 346 except in village and commercial zones (see Section 5.0 Land Use).

4. Seek to reintroduce passenger rail service to Pownal.
5. Provide information for residents and businesses on the Green Mountain Express that serves Pownal and travels to both Bennington and Williamstown
6. Identify and develop one or more park and ride locations to serve commuters traveling to Bennington and Williamstown.
7. Provide for recharge stations for electric vehicles at the park and ride locations.
8. Contact local vehicle dealers to suggest that they offer EV and fuel-efficient vehicles for both sale and lease.
9. Investigate the use of biodiesel for town vehicles.
10. Encourage major employers, such as TAM, to investigate the use of biodiesel for their trucks.
11. Encourage Pownal Elementary and other major employers to install charging stations for electric vehicles.
12. Encourage Pownal Elementary and the Southwestern Vermont Supervisory Union to use biodiesel for school buses when issuing bids for fuels.
13. Promote a working landscape outside of designated growth and residential areas, e.g. by working with land trusts and landowners of farm and forest tracts to conserve key parcels of land.

Pownal Energy Goal 3: Promote compact development in the three villages, with low-density uses and conservation emphasized in outlying areas so as to promote conservation of energy (see Land Use Goal #2).

Objective 1: Pownal should encourage or require lot dimensions and building siting, design and construction techniques to maximize access to on-site renewable energy resources and incorporation of emerging technology.

Actions:

1. Encourage efficient residential and commercial site planning and building construction. Require all major development proposals to quantify and evaluate the energy impact of their proposal.
2. Advocate infill and redevelopment of existing buildings or developed properties, particularly in Pownal's three villages.
3. Promote low-impact development and green infrastructure practices to reduce local temperatures and shade building surfaces. These siting requirements should be developed for use by the Development Review Board and the Zoning Administrator.
4. Implement energy efficient building and site design guidelines, standards, or incentives in zoning that help reduce energy requirements for power, lighting, heating, cooling and transportation.
5. Builders of new homes shall comply with Vermont energy standards and should complete and file with the Town a Vermont Residential Building Energy Standards Certificate.

Pownal Energy Goal #4: Identify suitable areas for wind, solar, biomass and hydroelectric generation while protecting natural resources as described in Section 4.0 and avoiding inappropriate locations including but are not limited to:

- Both known and potential constraints listed in Section 8.4
- Riparian Wildlife Corridors and High Priority Surface Water and Riparian Areas described in Section 4.0
- Areas within 1,000 meters of residences, identified by the Bennington County Regional Commission as unsuitable for commercial wind facilities.

Objective 1: Using mapping standards 12 A-E from Section 8.4, identify potential sites for solar projects to provide an additional 1,600 kW of capacity by 2050 as outlined in the regional energy plan (BCRC 2017).

Actions:

1. Identify potential areas for solar development consistent with Goal #4 above.

The Planning Commission evaluated potential areas for solar along with known and potential constraints. They determined that only sites without any constraints should be considered so as to assure the protection of agricultural lands, wetlands, floodplains, and surface and groundwater resources, rare species and natural communities, high priority forest blocks, physical landscapes, unique natural features, wildlife habitat and other natural resources to achieve the goals and objectives of Section 4.0. They added the additional constraints listed in Goal #4 above. Map 16 shows known, potential and the above additional constraints highlighting contiguous areas of five acres and greater. Map 17 and Table 32 provide information on preferred potential solar sites based on expansion of existing and creation of new sites.

2. Identify preferred sites for new or expanded solar facilities.

The Planning Commission then identified preferred sites for either new development or expansion of existing solar generation capacity. These are also shown on Map 17 and listed in the table below. The Commission determined that new solar energy development of 150 kW or greater be limited to locations that have already been impacted such as the former racetrack, the town landfill, the tannery and gravel pits. Such sites are already considered preferred sites by the Department of Public Services. Solar energy development on rooftops of major buildings such as the elementary school would be appropriate (Table 32). Other sites that are, by definition, preferred sites (see Mapping Standard 11E above), while not all mapped, would continue to be preferred sites.

Table 32. Identified preferred sites in the Town of Pownal		
Name	Owner	Description
American Legion	American Legion	Potential for solar in open space adjacent to buildings
Cleeland Corporation	Cleeland Corporation	Potential on approximately 35 acres of open field
Dean Rd.	Maxum/	Existing with potential for some expansion
Green Mountain Racetrack		Existing with potential for some expansion
Mack Molding	Mack Molding	Large building with extensive rooftops that could potentially support solar panels
Northwest Hill Rd.	Palmer Trust	Existing with potential for some expansion
Oak Hill School	Oak Hill School	Potential for rooftop solar panels
Pownal Elementary	Pownal Elementary	Potential for rooftop solar panels
Pownal Fire Protection Association	Pownal Fire Protection Association	Potential for rooftop solar panels
Pownal Highway Department	Town of Pownal	Some potential on unused open areas
Pownal Landfill/Transfer Station	Town of Pownal	Designated preferred site with proposal from Green Lantern for 150 kW array on the lined landfill[40]
Pownal Town Barn	Town of Pownal	Possible rooftop solar
Pownal Wastewater Treatment Plant	Town of Pownal	Designated preferred site with proposal from Green Lantern for 150 kW array
TAM	TAM, Inc.	TAM is currently in the design phase for solar

Map 17 shows parcels for some of these, and specific building locations for others. Solar development on these sites should be limited to those areas that are free from constraints to achieve Pownal Energy Goal #4, to the maximum extent practicable.

3. Pownal should develop an ordinance requiring screening of solar projects greater than 100 KW.

Objective 2: Using the mapping standards from Section 8.4 identify potential sites for wind projects

Actions:

1. Identify potential areas for wind development consistent with Goal #4 above.

[40] The unlined landfill is likely to need more extensive monitoring and possibly further remediation.

The Planning Commission evaluated known and potential constraints and the additional constraints used in evaluating potential for solar energy development. Section 4.0 of this plan describes the importance of and actions to protect agricultural lands, wetlands, floodplains, and surface and groundwater resources, high priority forest blocks, physical landscapes, rare species and natural communities, unique natural features, wildlife habitat and other natural resources. Map 18 shows areas where wind energy resources exist absent any constraints. The inset map shows an added constraint from the Bennington County Regional Energy Plan. Based on public comment, the Commission added a 1,000 m buffer from residences, shown in the inset map in Map 18. This effectively eliminates any suitable areas for wind power in the Town of Pownal.

Based on the above analyses, areas unsuitable for either wind or solar development include those areas where the resources do not exist (Map 15) or areas of known or potential constraints (Maps 16 and 18).

Based on these analyses, there are no suitable areas for wind development within the town except for a small area in the northwestern part of the town.

Objective 3: Identify potential sites for biomass energy production

Biomass from wood and other sources is already used for home heating in wood and pellet stoves. Biomass to generate electricity is very inefficient. The Planning Commission has determined that biomass for electricity should not be permitted within Pownal. Biomass for commercial or institutional facilities could be permitted to serve Pownal Elementary, the Town Hall, the American Legion, the fire departments and other large buildings. District heating may also be possible, particularly in the villages, though the cost of creating such systems may be prohibitive.

Objective 4: Support the appropriate development of a small-scale hydroelectric where feasible and practical on the Hoosic.

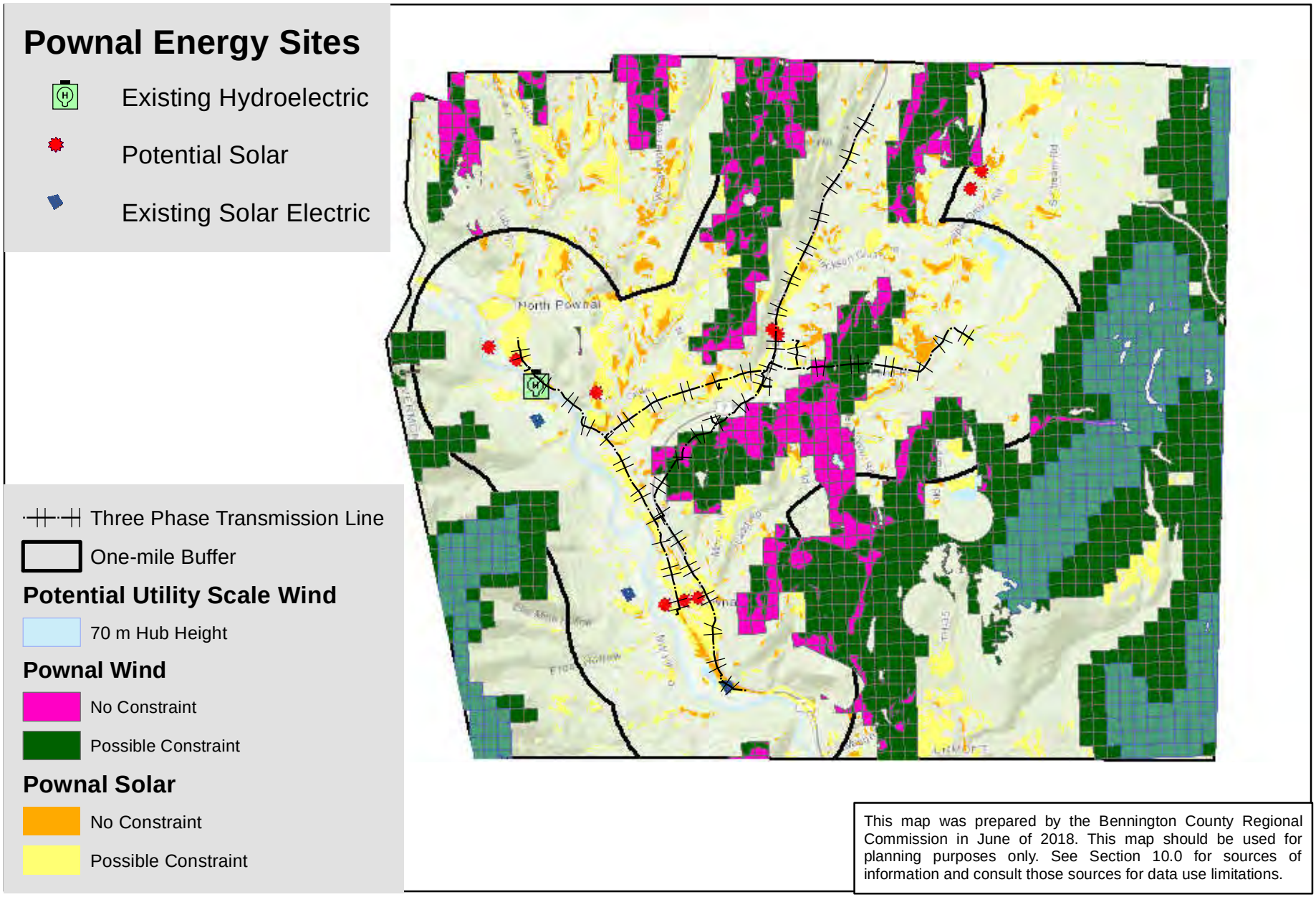
Actions:

1. The town should support the proposed facility in North Pownal at the former Tannery site provided agreement with the Town and hydro developers and affected property owners can be achieved.
2. The town should support the exploration of other environmentally sound hydroelectric potential on the Hoosic River subject to state and federal permitting.
3. The town should support small scale hydroelectric where feasible and subject to state and federal permitting.

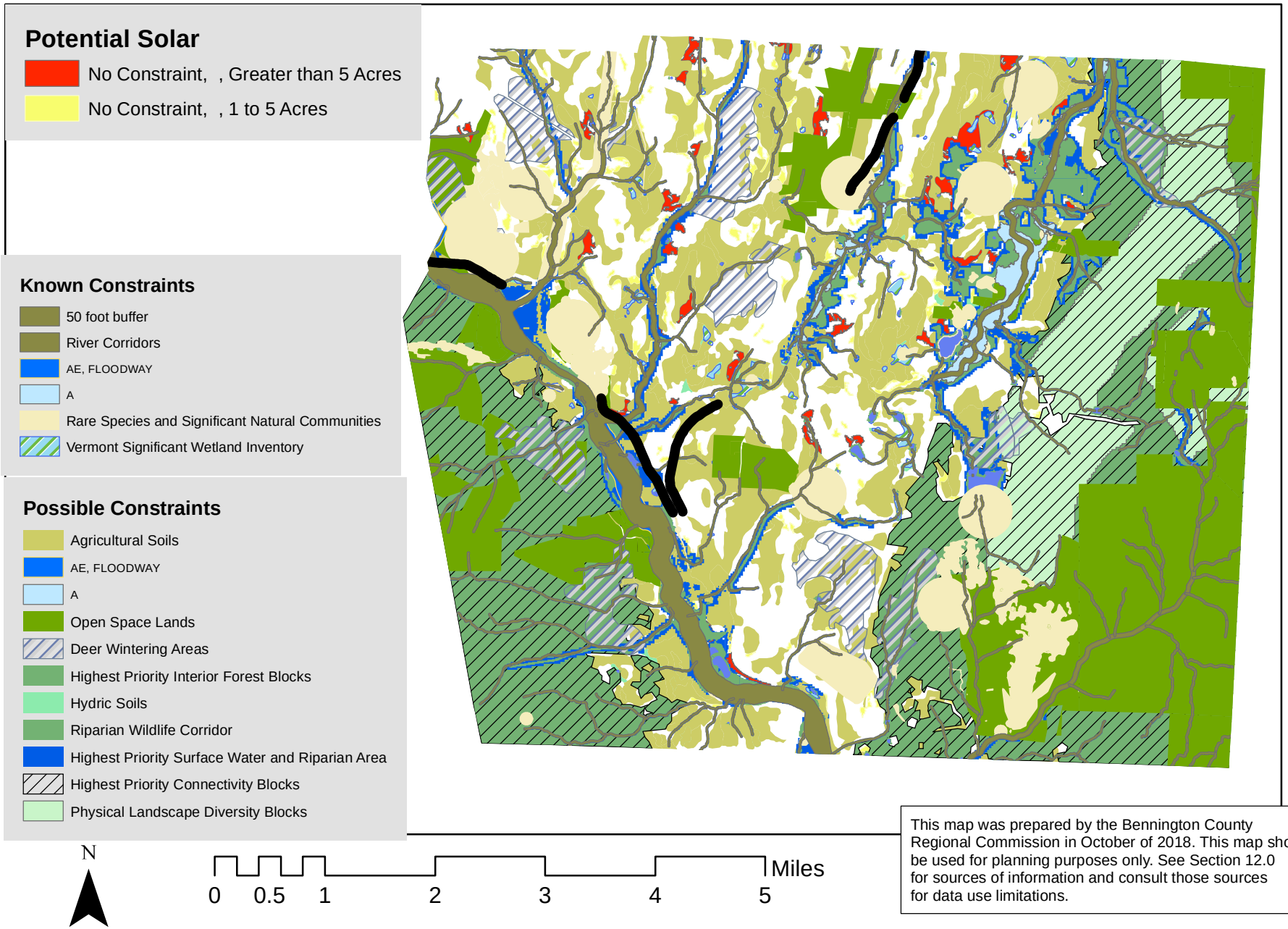
9.0 Implementation

See Exhibit A.

Map 15. Existing and Potential Energy Sources

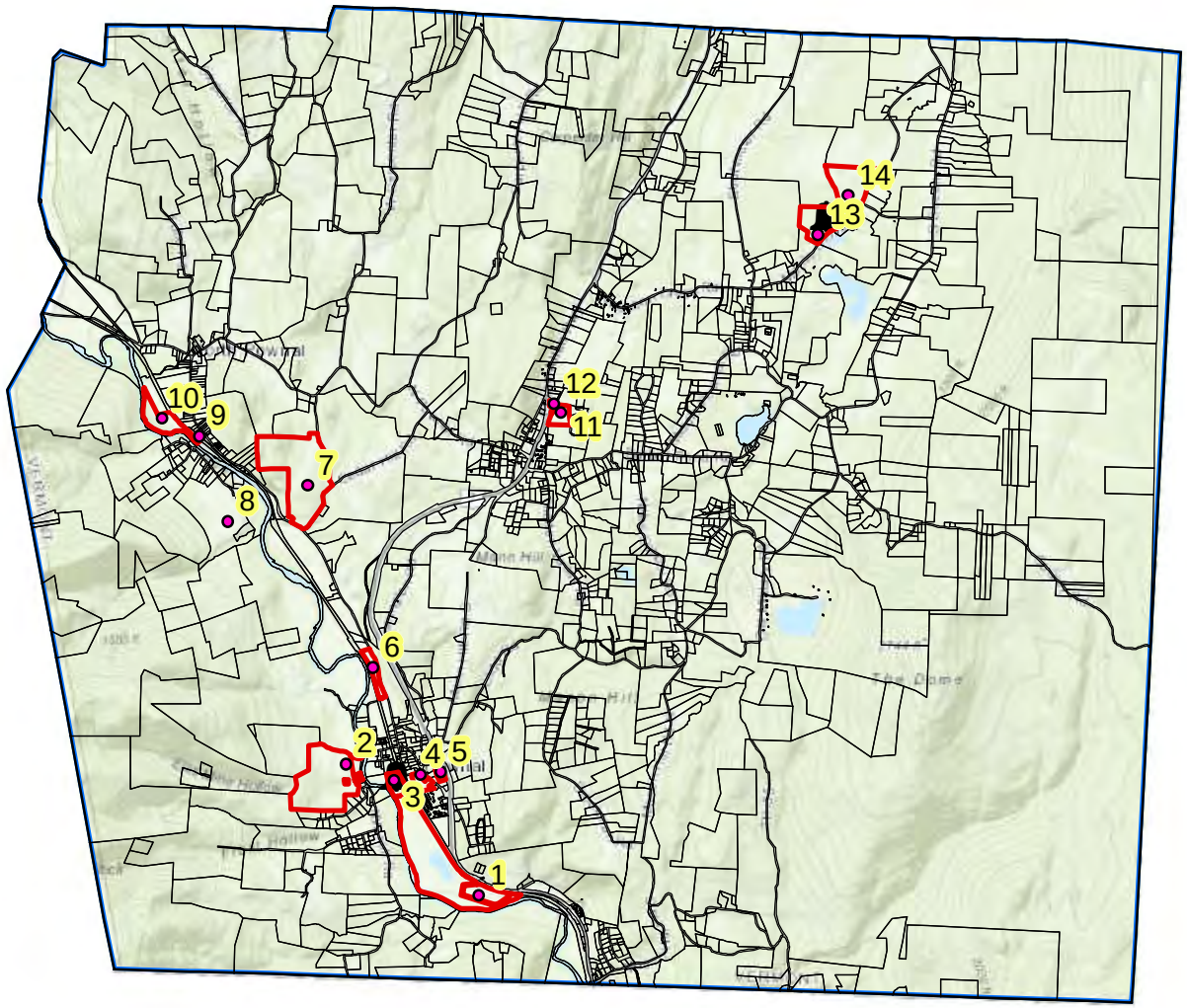


Map 16. Potential Solar Energy
Given Known and Potential Constraints



This map was prepared by the Bennington County Regional Commission in October of 2018. This map should be used for planning purposes only. See Section 12.0 for sources of information and consult those sources for data use limitations.

Map 17. Preferred Solar Sites



Label	Site	Type
1	Racetrack	Existing Solar/Potential Expansion
2	Nothwest Hill Rd.	Existing Solar/Potential Expansion
3	Pownal Wastewater Treatment Plant	Potential Solar
3	TAM	Rooftop Solar
4	Pownal Protective Fire Association	Potential Solar
5	American Legion	Potential Solar
6	Mack Molding	Rooftop Solar/Brownfield
7	Cleeland	Potential Solar
8	Dean Road Barlow Pit	Existing Solar/Potential Expansion
9	Pownal Town Barn	Rooftop Solar
10	Town Treatment Plant/Former Tannery	Potential Solar/Superfund Site
11	Pownal Elementary	Rooftop Solar
12	Oak Hill School	Rooftop Solar
13	Town Landfills (capped and uncapped)	Potential Solar
14	Town Highway Department	Potential Solar

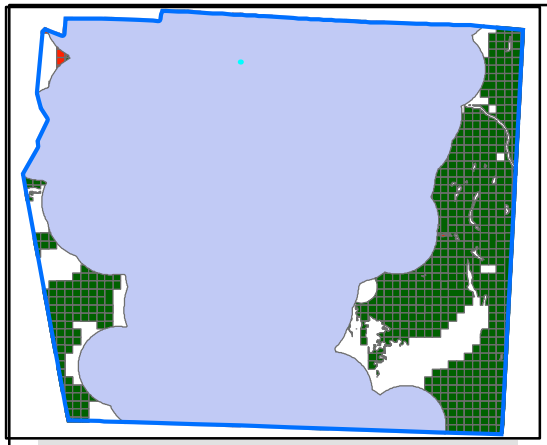
This map was prepared by the Bennington County Regional Commission in October of 2018. This map should be used for planning purposes only. See Section 12.0 for sources of information and consult those sources for data use limitations.

Preferred sites include building where rooftop solar would be possible as well as parcels where existing solar arrays could be expanded or new ones created.

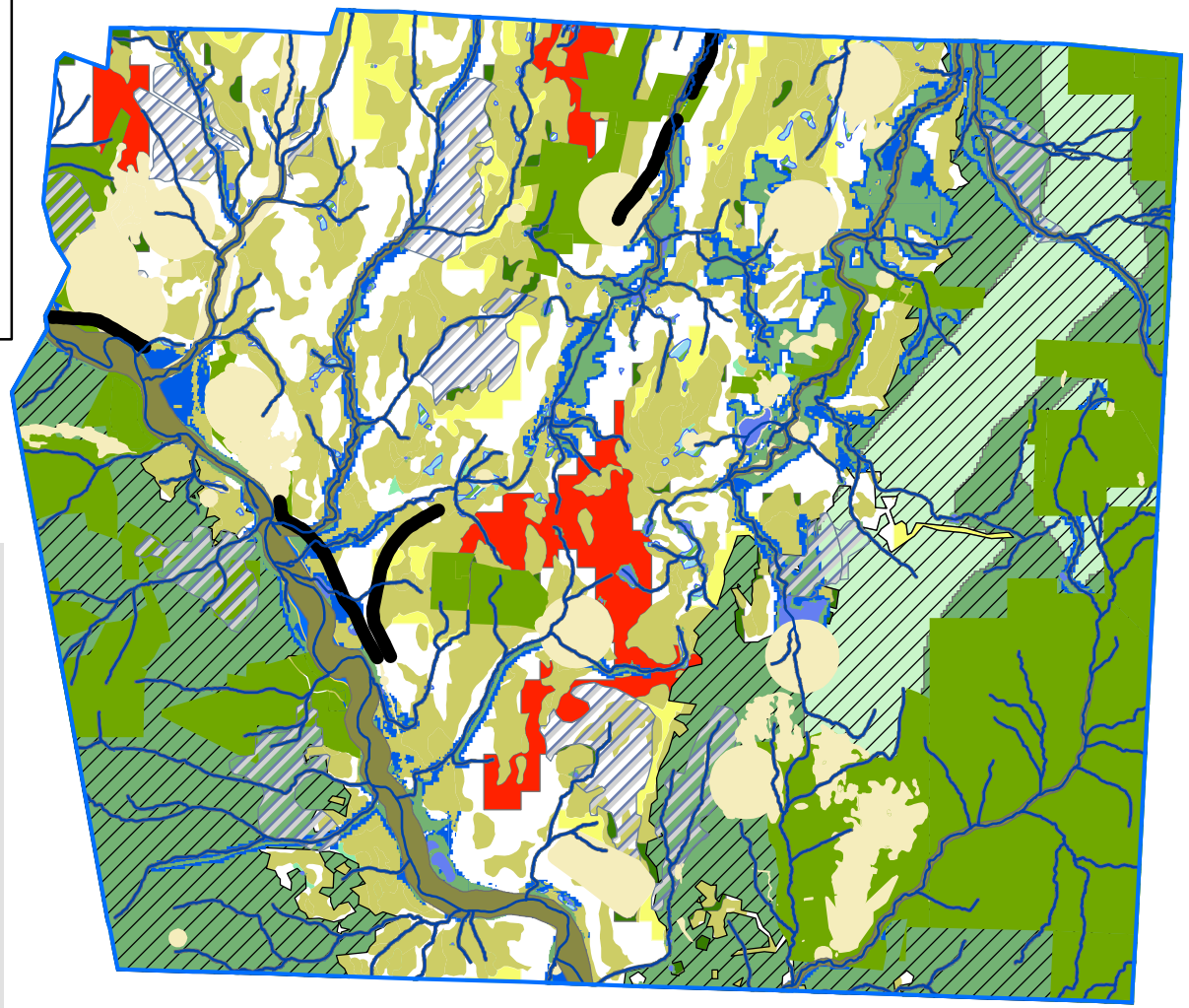
N

0 0.5 1 2 3 4 5 Miles

Map 18. Potential Wind Resources and Constraints



1000-m buffer from residences



Pownal Wind

- No Constraint, , >100 Acres
- No Constraint, , 10 to 100 Acres
- No Constraint, , 1 to 10 Acres
- VT-Wildlife Crossing Value
- 50 foot buffer
- River Corridors
- AE, FLOODWAY
- Rare Species and Significant Natural Communities
- Deer Wintering Areas
- Open Space Lands
- Riparian Wildlife Corridor
- Highest Priority Surface Water and Riparian Area
- Highest Priority Connectivity Blocks
- Physical Landscape Diversity Blocks
- Highest Priority Interior Forest Blocks
- Vermont Significant Wetland Inventory
- Agricultural Soils
- Hydric Soils

N

0 0.5 1 2 3 4 5 Miles

This map was prepared by the Bennington County Regional Commission in April of 2018. This map should be used for planning purposes only. See Section 12.0 for sources of information and consult those sources for data use limitations.