

# Town Plan

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Charleston, Vermont

2018

**DRAFT for PUBLIC HEARING: 12/13/18**

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*Town of our fathers, dear old town  
Through which the Clyde River flows swift and clear  
The land our fathers cleared and tilled  
And built the homes we've loved so dear  
We cherish thee, town of our birth  
Most sacred place to us on earth*

*—Charleston Town Song  
Mae Blanche Marvin Buck*

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### **Acknowledgements**

5 Act. 174 places unreasonable demands on small rural towns with its requirements to prepare a  
6 Town Plan. Special thanks to Alison Low and Irene Nagel of the Northeastern Vermont  
7 Development Association (NVDA) for their considerable help.

8

9 We also wish to acknowledge the special role played by Vermont's small rural towns in  
10 preserving the values and way of life so necessary to our nation's unique identity.

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**I. Town History and Demographics**

The site of the Town of Navy in northeastern Vermont, on the lands of the Abenaki people, was granted to Commodore Abraham Whipple in 1780 to honor his heroic defense of the city of Charleston, South Carolina in the Revolutionary War. Navy was first settled by Abner Allyn in 1806 and was renamed Charleston in 1825. The earliest settlers were hearty pioneers who cleared dense forests to make their farms and homes. This same reliance on the land, love of its natural beauty, and spirit of independence and self-reliance still characterizes the people of Charleston today.

The Town of Charleston covers 24,662 contiguous acres. The 2010 U.S. Census reports a total population of 1023 residents, 51% male and 49% female, indicating a population density of about 1 person per 26 acres. The Town's population has shown slow to moderate growth over the past 50 years—a rate that has increased somewhat over the past decade. About 22% of the population is younger than 20 years, about 20% is between 20 and 40 years of age, about 32% is between 40 and 60 years, and 27% is aged 60 or older. The median age is 49 years.

The entire population of Charleston is housed, with two-thirds living in traditional nuclear families, and one-third living in non-family households. About three-quarters of the non-family households are individuals who live alone. The average family size is 2.7 and the average household size is 2.2. About 63% of Town residents are in the civilian labor force and 37% are not, with an unemployment rate of 4.8%, that is higher than the state and national unemployment rates. About 36% of households have annual incomes below \$25,000, about 18% between \$25,000 and \$50,000, 27% between \$50,000 and \$75,000, and 19% above \$75,000. The average annual household income is about \$51,700.

Just under 30% of our Town's housing stock was built before 1950. About 40% was built between 1960 and 1990. About 15% has been built since 2000. About 39% of the housing is valued between \$50,000 and \$150,000, and 38% is valued between \$150,000 and \$300,000. About 64% of the housing is owner-occupied (half of those with a mortgage), and about 34% rented. Rental costs range from \$500 to \$1500 per month.

Many people in Charleston make their living close to the land, with small businesses in Town connected to farming and agriculture, forestry and logging, nurseries, tourism, retail of farm and maple sugar products, home and building construction, and real estate. Other professions and businesses provide services to residents and visitors, and some are connected to education and municipal or public services. All enterprises, commercial or non-profit, are on a smaller scale appropriate to our Town. One non-profit education organization connects children and adults to the wonders of the natural world while providing them with outdoor learning and recreational opportunities.

## **II. Town Plan Objectives and Interpretation**

Charleston is one of the few remaining natural gems protected from the development of the 21st Century by our remote location in Vermont's Northeast Kingdom. This unique character is widely recognized—the NEK was named one of the top ten places to visit in the world by National Geographic's geo-tourism initiative—but sustaining it requires an ongoing commitment to measured development. This precious natural, rural quality—along with the strong character of our people—is among the Town's chief economic and cultural assets.

Charleston can benefit greatly from new business that brings jobs and economic opportunity to our Town. New businesses in areas such as farming, agriculture, forestry, logging, manufacturing, technology, health care, tourism, and services are welcome in Charleston, and find broad support across the community both for the jobs they bring and their vital contribution to our Town's tax base. Any new business must be well integrated with our Town's rural setting, protect our natural resource areas, and preserve our scenic beauty.

The term "proper scale" as used in this Town Plan is intended to be a legally enforceable community standard for determining whether a proposed development is compatible with the rural character and natural scenic beauty of the Town. It is the Town's policy that all proposed development is considered to be not of "proper scale" if it fails to conform to any of the following standards:

- a) Development will not disturb more than five contiguous acres in its construction or operation;
- b) Development will not require construction of new Town roads;
- c) Development related structures will not exceed 125 feet in height; small-scale wind turbines will not exceed 100 feet in height; mid-scale wind turbines will not exceed 125 feet in height.
- d) Development will not exceed noise limitations of 55dBA (exterior)(Leq)(1 hour) at property boundary and 40dBa (exterior)(Leq)(night) at residences;
- e) Development will not cause unreasonable congestion or unsafe conditions with respect to use of local roads and public highways;
- f) Development will not cause an unreasonable burden on the local school district to accommodate additional students;
- g) Development will not cause an unreasonable burden on the ability of the Town to provide municipal or governmental services;
- h) Development will not have an adverse impact on scenic or nature beauty of the area, aesthetics, historic sites, or rare or irreplaceable areas;
- i) Development will not have an adverse impact on a natural resource area;
- j) Development will not interfere with the orderly development of the Town;
- k) Development will not place an unreasonable burden on the ability of the Town to accommodate growth attributed to the project; and

- 1        l) Development will conform to this Town Plan, except as specifically mandated to keep  
2        this Plan in compliance with state law.  
3

4        We intend by this Town Plan to promote the economic well-being of our residents and provide  
5        for the orderly development of our Town and region by encouraging smaller scale new business  
6        and development that is compatible with the rural character of our Town, and protects the  
7        scenic beauty of our natural landscape. We also intend by this Town Plan to preserve and  
8        protect to the greatest extent possible the natural condition of our mountain ridgelines and  
9        high elevation habitats, headwater areas, rivers, streams and surface waters, wetlands and  
10       vernal pools, wildlife habitats, groundwater recharge areas, forestry resources, agricultural  
11       resources, and our aesthetics and natural scenic beauty.  
12

13       The clearly stated policies, provisions, directives and prohibitions set forth in this Town Plan are  
14       land conservation measures intended to be interpreted as legally enforceable standards which  
15       shall be construed by local and state regulatory bodies to achieve their full intended purpose.  
16       No mitigation measures or legal interpretations shall be accepted by any regulatory body to  
17       overcome the policies, provisions, directives and prohibitions stated herein, except as  
18       specifically mandated to keep this Plan in compliance with state law. We urge regulators,  
19       potential developers, state and regional officials, and our neighboring towns to take full,  
20       respectful account of how critical our undisturbed natural setting is to the future of our Town.  
21

22       Charleston is a community of moderate means, but we are rich in our people and our natural  
23       assets. By attracting new business and economic opportunity to our Town on a proper scale  
24       that protects our land, rivers, lakes, hills and mountain ridgelines, we are establishing land use  
25       policy and conservation measures that will protect our Town as an outpost of natural beauty  
26       that will continue to attract visitors, new economic opportunities, and new residents from  
27       across the state and the nation for decades to come. These core objectives permeate every  
28       statement, policy and program in this Plan, and are the touchstones for our economic growth  
29       and quality of life.  
30

### III. Town Plan Elements

This section offers data and information about the required elements of a Town Plan and other elements of importance to our Town.

#### A. Land Use

The Town of Charleston covers 24,662 acres (38.5 square miles). Population density is 26.6 people per square mile, ranking 176<sup>th</sup> among the Vermont's 255 municipalities. Residences are concentrated primarily within the East and West Charleston Village areas, around the larger lakes, and along the larger state and Town roads, leaving much of the Town's acreage in an undeveloped condition. Residents value this character highly for the mix of residential, recreational, silvicultural, and natural scenic beauty it provides.

Natural resources in Vermont's Northeast Kingdom fall into three broad categories: fertile agricultural soils enriched by bedrock type or periodic flooding, less fertile or shallow soils best suited to forest growth, and water or open wetlands. Charleston contains significant elements of all three groups, in part because it lies in a transition zone from the milder climate agricultural lowlands of the Lake Memphremagog environs to the cooler forested granite mountains found to the east and south. The Town straddles two of Vermont's eight biophysical regions, with the Northeastern Highlands encompassing the higher elevation east half of the Town, while the Northern Vermont Piedmont region takes in the west half.

Within these categories of natural resources are environmentally sensitive natural resource areas which include, but are not limited to, mountain ridgelines and high elevation habitats, headwater areas, rivers, streams, and surface waters, wetlands and vernal pools, wildlife habitats and ground water recharge areas. Because the preservation and protection of these resource areas is essential to the wellbeing of the residents of Charleston and surrounding communities, it is the policy of Charleston to prohibit all development within these natural resource areas and any development that will cause degradation of a natural resource area.

The Clyde River enters the Town from the east (Brighton) at an elevation of 1,160 feet above sea level, loses only twenty feet of elevation as it crosses the eight miles of wetlands to the top of the Great Falls, and then drops another 170 feet over only two miles through West Charleston village. The lowest elevation of the Town is at 970 feet in the northwest corner where the Clyde enters Derby, while the highest point is found in the opposite southeast corner at the summit of Pierce Hill (2,047 feet).

Charleston also encompasses several larger water bodies, including Charleston Pond, Pensioner Pond, and Toad Pond—all within the Clyde River floodplain. In a higher basin in the east part of Town is Echo Lake, a 544-acre water body that reaches a depth of 130 feet and is one of only two cool deep water oligotrophic lakes in the Clyde River system (supporting a diverse fishery that includes native lake trout). Many miles of Clyde River tributary streams cross the Town and

1 the falls at lower Mad Brook and the Echo Lake outlet stream (as well as along the Clyde River  
2 in West Charleston), provided water power to mills throughout the early history of the Town.  
3 Dams remain today at the outlet of Echo Lake, below Pensioner Pond, and at Charleston Pond.  
4 While most of the Town's surface waters drain into the Clyde River, Moody Brook and other  
5 streams in the west corner drain west through Brownington to the Willoughby River.

6  
7 Water and open wetlands make up 7.5% of Charleston's total acreage, while forests comprise  
8 nearly 73% of the Town (Table 1). Forest types are predominantly a mix of floodplain and  
9 upland hardwoods, northern white cedar swamp, old field softwoods, and lowland spruce-fir  
10 forest. A number of sugarbushes are also maintained, ranging from small hobby scale to  
11 commercial operations with thousands of sugaring taps.

12  
13 Given the Town's diversity of forest types and relatively large land ownerships, ongoing  
14 sustainable production of a variety of timber types and grades is possible from the Town's  
15 forests, including veneer-grade hardwood, various lower grades of hardwood and softwood  
16 sawlogs, cedar posts and rails, hard and softwood pulp, firewood, chips for electrical  
17 generation, and other products for small specialty markets like ash canoe thwarts and  
18 gunwales, cherry burls for turning, etc. No commercial sawmills currently operate in Charleston,  
19 and most of the volume removed through timber harvests is trucked to mills in Maine, New  
20 Hampshire, Quebec, and more distant towns in Vermont. Several portable sawmills are owned  
21 and operated by landowners in the Town for their own use. Non-timber products supplied by  
22 the Town's forests include edible and medicinal plants, maple syrup, and softwood brush for  
23 wreaths and garlands.

24  
25 Many forest landowners cite improvement of forest health and wildlife habitat as primary goals  
26 in managing their lands, and active management on a number of parcels is focused at least  
27 partly on these goals. Examples include protecting sensitive habitats (wetlands, streams, raptor  
28 nest sites, etc.), using targeted release and thinning operations to promote beech and other  
29 wildlife mast-producing species, re-establishing a diversity of tree age classes, and retaining  
30 cavity trees. Cost-share programs administered by the Natural Resources Conservation Service  
31 (NRCS), with an office in Newport, have in recent years helped to offset the costs of these  
32 forest improvement practices as well as new forest management plans.

Table 1: Charleston Land Cover Types  
(Source VCGI- 2011)

<b>Broad type</b>	<b>Detail</b>	<b>% of Town</b>
Forested	Mixed forest	24.1%
	Evergreen forest	23.3%
	Deciduous forest	16.3%
	Forested wetland	9.2%
	<i>Total forested</i>	<i>72.9%</i>
Agricultural	Hay/pasture	7.8%
	Row crop	6.8%
	<i>Total agricultural</i>	<i>14.6%</i>
Other non-forested	Water	5.7%
	Transportation/utilities	4.0%
	Non-forested wetland	1.8%
	Residential	0.6%
	Brush/transitional	0.3%
	Commercial/industrial	0.0%
	<i>Total other non-forested</i>	<i>12.4%</i>
<b>Grand Total</b>		<b>100.0%</b>

#### *Farming and Agriculture*

Farming is a significant and highly valued land use in the Town, with farmland making up nearly 15% of the total area. As in surrounding towns, this percentage has declined since peaking near the beginning of the 20<sup>th</sup> century at roughly 50% of the Town in farmland. Several dairy farms currently operate in Charleston, with herds ranging from approximately 100 to 400 cows.

#### *Forestry and Logging*

Most of the Town's forests have been logged a number of times since Euro-American settlement in the early 1800s, and a significant portion of the current forest is at an early to mid-successional stage of development following logging within the past 30 years. This work has been carried out with varying levels of care and planning, and examples of both well-managed and degraded forests can be found in our Town.



*Recreation*

Recreation is the land use activity that engages the widest cross section of people in Charleston, and is important both for full-time and seasonal residents as well as for visitors. Common types of recreation include hunting and fishing, snowmobiling, boating, cross-country skiing, bicycling, and the use of off-road vehicles. Development for recreation is found mainly in trails maintained by NorthWoods Stewardship Center (for non-motorized use) and by the Vermont Association of Snow Travelers (VAST) for snowmobile use. The NorthWoods Stewardship Center has developed a Recreation Management Plan for the acreage it owns and manages in the area surrounding Tripp Hill (1,731 ft.), with a primary goal to provide recreational opportunities that maximize public benefits, promote education and exploration, are consistent with its forest management plan, and protect natural resources. Copies of the Trip Hill Plan are available from NorthWoods.

Fishing access areas are located on Echo Lake, the Clyde River at VT Route 105, and on Pensioner Pond. A kayak and canoe rental business along the Clyde River near Pensioner Pond has grown markedly in recent years, coinciding with the establishment of a 740-mile long Northern Forest Canoe Trail from New York to Maine that follows the Clyde River. This trail has seen a steady increase in day and through-paddlers over the past five years.

The 3,315 ft. summit of Bald Mountain in neighboring Westmore with its summit property, Fire Lookout Cabin, and tower owned by the State of Vermont, is the third highest peak in the Northeast Kingdom and provides one of the most spectacular views in the region. Bald Mountain is a popular year-round hiking and mountaineering destination, and two of the three access trails--the Mad Brook Trail and Telegraph Trail--are accessed via Charleston Town highways, linking Charleston to Westmore as a gateway to Bald Mountain and the 7000-acre Westmore Town Forest that includes it.

Playground, ball fields and courts at Charleston Elementary School are available to the general population outside of regular school hours. Nearby Burke Mountain and Jay Peak offer skiing and mountain bike riding. Other recreational opportunities, including bowling, sailing, golf, and tennis, are available in the towns of Derby, Newport, Brighton, and Westmore. A variety of public and private campgrounds in the area offer accommodations from tent sites to RV sites. Charleston residents use public beaches at Seymour Lake in Morgan, Brighton State Park in Island Pond, Lake Memphremagog in Newport, Lake Willoughby in Westmore and Crystal Lake in Barton.

*Land Ownership and Conservation*

Nearly all of the land in Charleston is privately owned with exception of a few small state-owned fishing access areas, Town-owned office and road maintenance facilities, Town-owned gravel pit on Ten Mile Square Road that is also the site for the Charleston Community Solar Project, and a municipal Town Forest. The Town Forest is located along the Class 4 Town Farm Road on the Charleston-Westmore town line, and includes 184 acres within the Town of Charleston, as well as a contiguous 50 acres in Westmore. To date, the Town Forest has been

used mainly by hunters, though several timber harvests have also been completed. In recent years the Town has worked in partnership with the NorthWoods Stewardship Center to further define goals and implement forest management on these parcels. A forest management plan was completed in 2008 for the Westmore acreage and a timber harvest combining salvage of softwood blow-down and improvement thinning was completed in the winter of 2011-2012. Though access to the site can depend on road conditions, the Town Forest is an excellent and underutilized resource, with great potential for further enhancement, and educational/recreational use. The acreage includes a mix of pine plantation, old field softwood, cedar swamp, and northern hardwood forest as well as some old field habitat and an overgrown apple orchard. Historic sites, including remains of a cellar hole, document early homestead activity and the former Charleston Town Farm, once the Town's means of providing for poor residents. A limited trail system exists from past logging and farm use, though some repairs are needed due to off-road vehicle use.

Parcel sizes in Charleston range widely, from less than one acre to over 1,100 acres, with 68% of town acreage comprised of land parcels at least 50 acres in size (VNRC 2016). Increasing land values and development have resulted in steady subdivision of large parcels, inhibited somewhat by Vermont's Use Value Appraisal (UVA) program or conservation easements through various organizations—most notably the Vermont Land Trust (VLT). Actively farmed acreage, and forested parcels of at least 25 qualifying acres, can be enrolled in UVA, which provides significant property tax savings in exchange for a lien that limits development and ensures continued use of the land for forestry, farming, or certain wildlife values. Lands with conservation easements are generally prohibited even more rigidly from development or subdivision. Importantly, forest lands enrolled in either program are required to maintain a current forest management plan and to practice accepted silvicultural practices with oversight by county licensed or VLT foresters. Enrolled landowners are allowed to prevent public access by posting their land, though many choose not to do so.

In Charleston in 2018, more than 10,000 acres (43%) are currently enrolled in UVA, including 56% of all parcels greater than 50 acres. This represents an increase of 3,250 acres since 2003. Lands conserved by the Vermont Land Trust total 3,221 acres (13%). One of the largest blocks of UVA and conserved acreage is found in the east corner of Town, made up of a dairy farm, the NorthWoods Stewardship Center, and multiple smaller private ownerships (see Map 2).

#### *Town Districts*

West Charleston Village is described by the area on both sides of Vermont Route 105 from the junction of Routes 105 and 5A on the east to the Derby-Charleston border on the west. The Clyde River forms the northern boundary. The southern boundary is 1,000 feet in distance on a line perpendicular to the center line of Vermont Route 105. The eastern boundary is the Clyde River, north of Vermont 105 and Vermont 5A, south to a point 1,000 feet from the centerline of Vermont 105.

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East Charleston Village is described by an area on both sides of Vermont Route 105 from Route 105/Ten Mile Square Road to a point approximately .9 miles west of the centerline of Church Hill Road. The northern boundary is 1,000 feet in distance measured on a line perpendicular to the center line of Vermont Route 105. The southern boundary is the Clyde River.

Pensioner Pond is described by the area lying within Route 105 to the north, Route 5A to the south, and to the south and east along Stumpf Brook to where it meets the Clyde River, and from that point to the intersection of Parlin Meadow Road and Vermont Route 5A.

Echo Lake is described by the area circumscribed by East and West Echo Lake Roads.

Rural: All other land within the Town is part of a Town-wide Rural District, which contains approximately 22,050 acres.

*Commercial*

Small scale enterprises flourish in Charleston, employing many Town residents (see below). Many of these are directly tied to the Town's land and natural resources, and depend on the preservation and stewardship of these features to thrive.

Table 2: Active Commercial Enterprises

Contractors
Day Care
Dog Breeding
Farming
Forestry/Logging
General Store/Deli
Landscaping and Floral
Legal/Business Services
Maple Sugaring
Nursery/Farm Stand
Outdoor Power Equipment
Real Estate Appraisal
Rubbish Hauling
Sports & Recreation
Tanning
Truck/Auto Sales & Service
Trucking
Vacation Rental
Welding & Fabrication
Winery

*Public and Semi-Public Uses*

The Vermont Department of Fish and Wildlife maintains a public access area to the Clyde River at Ten Mile Square Road on Route 105, and public access areas to Pensioner Pond and Echo Lake. The Charleston Town Forest, accessible by a Class 4 Road, is used for hunting by Town residents. Charleston Elementary School makes its facilities available to groups and residents, and the NorthWoods Stewardship Center lodge is often used by civic group and organizations.

**B. Transportation**

*Roads and Highways*

Charleston depends on the 54.42 miles of local and state roads within our borders and road maintenance is a top priority. Charleston has 10.15 miles of Class 2 roads, 30.36 miles of Class 3 roads, 8.51 miles of Class 4 roads, and 6.33 miles of legal trails. The state highways account for another 13.91 miles of road (see Map 5). Vermont Route 105 runs through the Town, roughly parallel to the Clyde River, connecting the Town to Island Pond and Derby. Route 5A runs perpendicular to Route 105 in West Charleston, connecting to Brownington. Various classes of roads connect residents to Island Pond, Morgan, Derby, Brownington, and Westmore, and to each other. Nearly 90% of the Town's workforce travels to work by car, truck or van—with almost half on the road before 7:00 am. Roughly 44% is at work in 20 minutes or less; another 43% reach work within 35 minutes; and the rest travel up to an hour or more. Twenty-three percent of households have one vehicle; 41% have two; and 33% have three or more. Only 2% have none.

The three Selectboard members serve as the Town's Road Commissioners and take an active role in road maintenance. The Town maintains its own Town Garage to house road maintenance equipment that consists of one grader, two loaders, two primary ten-wheel dump trucks, one six-wheel dump truck, and a half-ton diesel pickup with snowplow. The Town provides maintenance on this equipment to the degree possible within the skill and tools of the road crew, with major repairs done by equipment dealer or area heavy equipment mechanics. The Town requires three trucks in working order to be efficient. The Town Garage is well maintained, and a new roof and exterior paint were completed in 2012. Needs are assessed yearly. The Town adheres to State of Vermont town road and bridge standards required for the Town to receive state aid for highways, which is necessary to meet the annual costs of maintaining our roads. At this time, our road crew of three, plus an additional part-time driver in summer, is able to perform basic maintenance of roads and equipment, plow and sand winter roads and undertake some smaller projects and road resurfacing. The Town hires spare drivers or other equipment as needed.

Town residents must buy and install their own driveway culverts, which must be sized and placed with approval from the Road Foreman. The Town maintains a culvert survey that assesses over 800 culverts, with data on length, overall condition, size and location of each culvert. This guides the Town's culvert maintenance and replacement plan. All culverts removed from the Town roads become the Town's property. Usable culverts will be reused on

Class 4 roads. Less useful culverts are sold on a first come first served basis and others are sold as scrap metal. Guardrails are placed on an as needed basis or as required by the state. A supply of beam rail and posts are stored at the Town Pit on Ten Mile Square Road.

#### *Parking, Carpooling, and Bus Service*

Two pull-over areas—one in the East Village and the other in the West Village—are available for short term parking. A few informal parking areas are provided as a courtesy by private landowners. Conversations in the Town are ongoing about the feasibility of providing a small parking area to support carpooling by residents who commute to work or want to carpool for other purposes. Greyhound bus service is available at White River Junction and Rural Community Transportation (RCT) in Newport operates local bus service Monday through Saturday within Newport, Derby, and Derby Line. On the first and third Thursday of each month, the free RCT “Island Pond Shopper” transports passengers from the (currently closed) East Charleston Country Store in East Charleston Village to Waterfront Plaza in Newport by reservation.

#### *Airports*

The Newport State Airport in Coventry has two 5,000 ft paved runways designed for aircraft weighing less than 12,500 pounds and with wingspans of less than 79 feet. Visual and navigational aids are available to allow for non-precision approaches for aircraft equipped with electronic navigational instruments. Recent improvements include a 1,000 ft extension to the runway, improved water and sewer services, and additional services from Customs and Border Protection and the Transportation Security Agency. The John H. Boylan State Airport in Island Pond is a public, state-owned facility that maintains two turf surface runways. A private airport with a small, privately owned airstrip is in Norton, and a seaplane base is located on Lake Memphremagog. Commercial air service is available in Burlington, VT; Manchester, NH; Boston, MA; Portland ME; and Montreal, Quebec.

#### *Railroads*

Freight points for rail service are in Newport and Island Pond. Passenger train access points are in White River Junction and Montpelier.

#### *Rivers, Trails and Recreational Routes*

The Clyde River follows a meandering path from the southeast to the northwest end of the Town. The river, its tributaries, riparian areas, and associated wetlands provide wildlife habitat, scenic amenities and recreational opportunities—particularly via boat/fishing access points at Pensioner Pond and the downstream end of Buck Flats. Vermont Route 105 parallels the Clyde and is used both by pedestrians and cyclists. Some Class 4 roads are used seasonally by snowmobilers. Charleston is a gateway to numerous hiking trails in the area’s irreplaceable hills and mountains. The 740-mile long Northern Forest Canoe Trail from New York to Maine follows the Clyde River through Town, and VAST snowmobile trails connect Charleston to this network. The NorthWoods Stewardship Center maintains 10-12 km of hiking/ski trails on its own and neighboring private lands. A number of trails traverse private land by owner permission.

Charleston is along the route of many professional bike touring companies and the Charleston section of the Clyde is mentioned in Northeast Kingdom paddling guides.

#### *Scenic Roads*

Due to Charleston's rural setting, most of our roads are dramatically scenic and contribute greatly to the beauty and economic development of our Town. Routes 105 and 5A in Charleston follow the route of the Northeast Kingdom Scenic Byway, a 51-mile corridor offering recreational opportunities, dining and lodging, quintessential Vermont villages, enduring farmland, and a rich diversity of art, unique shops, entertainment, and events all year long. East and West Echo Lake Roads provide important scenic vistas and Hinton Hill Road—well traveled as a short-cut between Island Pond and Westmore—is named as a scenic drive in travel guides, including *Vermont: An Explorer's Guide (1999)*, and has appeared in Vermont Life Magazine and others.

### C. Utilities and Facilities

#### *Educational*

Major educational institutions based in Charleston are the Charleston Elementary School and NorthWoods Stewardship Center. These are described in the Education section of this Plan.

#### *Libraries and Museums*

The Charleston Elementary School houses a school library. The Town is also served by the Dailey Memorial Library in Derby, the Island Pond Public Library in Brighton, and the Haskell Library in Derby Line, which provide access to the Vermont and the Quebec library systems. The Big Read Book Wagon based in Derby brings books to a variety of locations throughout the area. West Charleston is also home to the museum of the Charleston Historical Society, which is open to the public during the summer. The NorthWoods Stewardship Center maintains a natural history library that is available to the public.

#### *Recreational*

As noted above in this Plan, recreational opportunities abound in Charleston. Already described are the NorthWoods Stewardship Center, Clyde River Recreation, Charleston Elementary School, the numerous hiking trails and snowmobile trails, and our lakes and rivers and woodlands that offer year-around opportunities for residents and visitors to immerse themselves in a wide range of healthful recreation in rare, beautiful, and irreplaceable natural settings.

#### *Fire and Rescue*

Fire and rescue services are provided by the Charleston Volunteer Fire Department, Inc.—an independent, non-profit, 501(c)(3) corporation managed by its Board of Directors. The department was founded in 1954 and was originally housed under the East Charleston Store. The fire station was re-sited in 1966 to where it stands today in the center of East Charleston Village on Route 105. Additions and renovations to the fire station were added in 1976, 2001,

2017, and 2018 to bring the building to its current configuration with five vehicle bays and a meeting room. The department operates five apparatus and is part of the Northeast International Mutual Aid System.

With 22 active members, the fire department provides emergency services to neighboring towns and can receive aid from several other communities. The department responds to a wide variety of emergencies, with fire calls and motor vehicle accidents accounting for the bulk of the runs. The department has added snow machine and water rescue capacities in recent years and continues to focus on upgrading apparatus as well as fire fighter equipment and tools by maintaining an active equipment budget. The department's annual budget is about \$70,000, with a portion of this cost provided for in the Town's annual budget. The Vermont State Police handle dispatch of emergency services, and emergency medical services are available from Newport. Technical rescue services (high angle, confined space, etc.) are available through Northeast Kingdom Mountain Rescue.

#### *Hospitals*

Charleston is served by North Country Hospital in Newport, a 25-bed acute care facility with adjacent physician practices; and Northeastern Vermont Regional Hospital in St. Johnsbury, an acute care facility with 24-hour physician staffed emergency services. Ambulance service is provided by Newport Ambulance Service. Rural Community Transportation (RCT) also provides medical rides by appointment to eligible residents.

#### *Power Plants*

Charleston hosts Great Bay Hydro's West Charleston Hydroelectric Plant, a renewable energy facility, and the smaller Barton Village hydro power plant. Both are described in greater detail in this Plan.

#### *Solar Facilities*

The Town now operates a solar facility (Charleston Community Solar Project) consisting of 296 330-watt panels designed to produce 97.68 kW, 79.8 kW AC of solar generated electricity for net metering to Vermont Electric Cooperative (VEC). This facility is designed to provide sufficient renewable energy to VEC to fully offset electrical energy needs required by the Town Office and Garage, the Town Elementary School, the Town Volunteer Fire Department, and the Town's 30 streetlights for an estimated period of 25 years or longer. Because the solar facility is sited to reclaim a section of the Town's gravel pit, it is out of public view and does not disrupt the Town's rustic nature or natural beauty. The facility went online in mid-2018.

#### *Water and Sewer*

Water and sewer systems are the sole responsibility of the property owner, and are required to meet state and federal regulatory standards.



*Refuse Disposal*

Residential and commercial solid waste and recycling is handled in accordance with Act 148 via independent haulers that contract with individual households and business. The Town subsidizes a recycling program for residents who do not have other arrangements, with the recycled material delivered to the Northeast Kingdom Waste Management District (NEKWMD) recycling center in Lyndonville. A redemption center for refundable containers is located in West Charleston.

*Storm Drainage*

The Town's road crew maintains storm drainage. Ditching is performed along all Town roads. Culverts are maintained and replaced as needed.

*Telecommunications and Internet*

Telecommunications services are available throughout the Town via landlines serviced by Consolidated Communications. Cellular phone service is available from AT&T and other carriers. High speed Internet services are provided by Consolidated Communications via landline, and by major satellite companies (such as DISH and Direct TV). Comcast provides broadband telephone, Internet, and television service along main roads via fiber-optic cable. Television programming is provided by Consolidated Communications (cable) and major satellite companies. Limited antenna reception is possible in some areas.

*Municipal*

The Town Clerk's Office is located on a three-acre parcel between East and West Charleston on Route 105. The Town Garage also occupies this property. The Town Office building provides office and record storage space for the Town clerk, assistant clerk and a work area for the Town listers and auditors. A conference room and space on the first floor are used for meetings of the Selectboard and others. The first-floor space also serves as the polling place for state and national elections. The annual Town Meeting is held in the Town's Elementary School.

*Religious*

East Charleston has two churches: Plymouth Congregational, Church of the Nazarene, and Zion Pentecostal Church. West Charleston has two: St. Benedict Labre and the Free Will Baptist Church. Each of these churches holds services year-round.

*Other*

Post offices are located in East Charleston Village and West Charleston Village.

The Town maintains six public cemeteries:

- Hillside
- Bly
- West Village
- Buck
- Crawford



- Morrill

#### D. Natural Resource Areas

Charleston’s natural environment is a uniquely valuable and important resource of unspoiled natural beauty within the Northeast Kingdom. The purity of the air and water, the abundance of wildlife, and the integrity of our natural resources are critical contributors to Charleston’s strength and character as well as to the health and welfare of all our citizens. The natural resource areas identified in this Plan are to be preserved in their natural condition and protected from development, except as specifically mandated to keep this Plan in compliance with state law.

##### *Mountain Ridgelines and High Elevation Habitats*

Charleston’s mountain ridgelines and high elevation habitats contribute to the scenic landscape of the Town and are some of the most highly visible and important landscape features. The mountain ridgelines provide important high elevation, unfragmented wildlife habitat. The mountain ridgelines and their steep slopes are uniquely sensitive to soil disturbance, clear cutting, and development activity which alter the sensitive ecosystems.

##### *Headwater Areas*

Headwaters are an environmentally critical resource that serves as a source for the highest quality and purest surface waters in the Town. Headwaters are generally characterized by steep slopes and shallow soils and contain streams, and intermittent and ephemeral surface waters highly vulnerable to erosion and man-made disturbance. Headwater seeps, located at higher elevations on the landscape, serve as the source for downslope streams and are protected as Class II wetlands.

##### *Rivers, Streams, and Surface Waters*

Rivers, streams and surface waters comprise unique, sensitive, and irreplaceable natural features found in the Town. Charleston’s rivers, streams, lakes and ponds are important assets to our community providing recreational and aesthetic functions as well as supporting plentiful and diverse fisheries and aquatic species. The surface waters host unique aquatic natural communities supporting diverse species ranging from fresh water mussels to brook trout to common loon to river otter. Echo Lake has been a site of successful loon nesting with resulting chicks (Echo Lake Protective Association).

A 2006 study conducted by the Eastern Brook Trout Joint Venture identified the upper Clyde River subwatershed as among only 14% of watersheds in Vermont with intact brook trout populations (>90% of possible habitats occupied). Water quality surveys and stream geomorphic assessments completed over the past decade have identified the Clyde River (particularly the upper watershed) as in the best condition of the four tributaries of Lake Memphremagog—an international lake that is the public water supply for large populations in Sherbrooke and Magog, Quebec. Charleston’s lakes and streams are also highly valued for their

scenic and recreational qualities, and parcels with frontage on Pensioner Pond and Echo Lake have the highest per acre values in the Town. Development along the lakes and rivers has led to some concerns, including pollution and sedimentation due to a lack of riparian forest buffers, reduced public and wildlife access to lakeshores, and the introduction of invasive exotic flora or fauna. The Echo Lake Protective Association and other conservation-minded individuals and groups are active in various ways to mitigate these threats and educate landowners about ways to limit the impacts of development.

#### *Wetlands and Vernal Pools*

Wetlands are important natural resource areas that provide erosion protection and shoreline stabilization, recharge underground aquifers, provide natural purification of water, mitigate flooding, and provide necessary habitats for many species of fish, wildlife, migratory birds and plants. Wetlands provide scenic areas for hunting, fishing, canoeing, kayaking and other forms of recreation and are important locations for environmental education and research. The Vermont Wetland Rules provide wetland classifications and outline protective measures for Class I and Class II wetlands. The Town of Charleston contains critical areas of state designated significant wetlands.

The Town's wetlands, particularly the extensive wetlands complex extending along most of the Clyde River, include a mix of forested, shrub, and herbaceous plant communities. Surveys conducted by the Vermont Nongame and Natural Heritage Program in 1998 documented a number of rare or uncommon natural community types in these wetlands as well as several endangered plant species and one species not previously known to occur in Vermont (Engstrom et al. 1999). The large (50-acre) Intermediate Fen found between Route 105 and the Brighton town line—rare in the state and uncommon globally—was identified in this survey as one of the highest quality examples in Vermont.

More detailed mapping conducted in this area by the NorthWoods Stewardship Center in 2010-2012 found 84% of the 310 acres mapped to harbor rare or uncommon wetland natural communities, and a diverse assemblage of uncommon plant species such as mare's tail (*Hippuris vulgaris*), marsh mermaidweed (*Proserpinaca palustris*), swamp fly honeysuckle (*Lonicera oblongifolia*), mountain fly-honeysuckle (*Lonicera caerulea* var. *villosa*), bog willow (*Salix pedicellaris*), shining rose (*Rosa nitida*), bog sedge (*Carex exilis*), long sedge (*Carex folliculate*), bog rush (*Cladium mariscoides*), rose pogonia (*Pogonia ophioglossoides*), small bedstraw (*Galium trifidum*), and Loesel's twayblade (*Liparis loeselii*), among others (Benoit, 2012).

Over 130 species of birds are also known to utilize these wetlands, including (stars indicate confirmed nesting) wood duck\*, hooded merganser\*, Canada goose\*, black tern, northern harrier, sora, osprey\*, rusty blackbird\*, merlin\*, pied-billed grebe, bald eagle, and black-backed woodpecker, attracting both waterfowl hunters and birders (NorthWoods, unpublished).

The Vermont State Wetland Inventory (VSWI) delineates the approximate boundaries of wetlands deemed to be of significant public value and sensitivity. VSWI has delineated and mapped 2703 acres within Charleston as Class II significant wetlands. This designation conveys certain protections from development within the wetlands and 50-foot buffer, and places limitations on allowed activities such as logging. Class I wetlands are protected by a 100-foot buffer and a special petition process is required to elevate wetlands to this designation. Portions of the Clyde River wetland complex would likely qualify for Class I wetland designation. Vernal pools are small wetland areas—generally located within upland forests—that are critical seasonal habitats for amphibians such as spotted salamander and wood frog. These unique and sensitive areas were added to the state’s Class II wetland designation in 2010, and a statewide inventory of vernal pools using color infrared aerial photography and field surveys was completed about the same time. Seven vernal pools are currently documented within Charleston, all of these occurring on privately-owned lands. At least three of these are currently being protected through special forest management practices.

#### *Special Wildlife Habitats*

Charleston has a large and diverse wild animal population that depends for its survival upon undeveloped natural resource areas. A forested area in the south part of Charleston, totaling 334 acres, is mapped by the Vermont Department of Fish and Wildlife as a critical deer wintering area. White-tailed deer are near the northern limit of their range in Vermont and require the protective mature softwood cover provided in deer wintering areas as a relative refuge from deep snow, cold temperatures, and wind. In years with deep snow and/or extreme cold, deer sometimes migrate many miles to congregate in these areas.

Several threatened and endangered species and significant natural communities have been identified within the Town of Charleston and are protected by the Vermont Endangered Species Act and applicable federal laws. Data about these areas is maintained by the Vermont Non-game and Natural Heritage Program monitored by the Vermont Agency of Natural Resources.

#### *Groundwater Recharge Areas*

Groundwater is one of our Town’s most valuable resources. Headwater areas, surface waters and wetlands all contribute to productive aquifers found within our Town. Groundwater provides the primary supply of potable water for Charleston’s citizens.

#### *Habitat Blocks and Connectivity*

An inventory of the region’s wildlife habitat connections demonstrates interdependence with neighboring towns, the Northeast Kingdom, and beyond. Coordinated conservation efforts in New York, Vermont, New Hampshire, and Maine are working to identify important areas within the larger northern forest region that provide a wildlife corridor from the Adirondacks in New York through the northern forest of Maine and beyond. A “wildlife corridor” at this larger, regional scale is composed of blocks of forest and connecting lands that many animals need for sufficient food, cover, and access to mates. The forest blocks provide prime wildlife habitat while the connecting lands—often small forest and woodland patches, wetlands and river

corridors—allow wildlife movement across the landscape between larger forested blocks. A key component of this work involved the identification and mapping of large unfragmented forest blocks by the Department of Fish & Wildlife and the Vermont Land Trust, which can be viewed on the Agency of Natural Resource’s “Biofinder” mapping tool.

(<http://anr.vermont.gov/maps/biofinder>) Forest blocks larger than 20 acres are mapped statewide, but are identified generally as “habitat blocks.” Although smaller areas may support some biological diversity and connectivity, such areas provide little interior forest habitat.

An assessment of Biofinder data subsets helps to identify priority Planning areas for Charleston:

- *Highest priority interior forest blocks:* Areas with high-quality interior, unfragmented core forest cover (i.e. land that is more than 100 meters from the non-forest boundary).
- *Highest quality connectivity blocks:* Land or water that function as “stepping stones” between core forest, as well as riparian habitat, or strips of forest cover between developed areas.

When viewed together, this documents how Charleston’s forested resources support critical wildlife movement to the east toward Essex County, as well as north-south movement to Westmore and Morgan through the eastern portion of the Town.

#### E. Aesthetics and Scenic Beauty

Charleston’s natural environment is uniquely valuable and important as an area of unspoiled beauty in the Northeast Kingdom. Charleston’s mix of rolling topography, roadside farm fields, lakes, river, and small villages result in a number of highly scenic vistas that add to the quality of life for residents and to the experience had by visitors. Many of the best views are found along the two paved roads (Routes 5A and 105), and East and West Echo Lake Roads, and portions of the Class II and III Town roads, and collectively take in much of the Clyde River wetlands, the lakes, and the forested side slopes and highlands. Residents value both these views and the working landscape that they encompass.

Charleston’s scenic features includes significant scenic views of Bald Mountain and Mt. Elan, the Clyde River Falls, the rapids that flow through West Charleston, the Clyde River at Buck’s Flat with views of Dolloff Mountain and ridgelines around Island Pond, as well as our rolling countryside with numerous farms and scenic hillsides.

#### F. Historical Sites and Features

The Vermont State Register of Historic Places lists 63 sites within the Town of Charleston, including a mix of barns, private residences, power plants, and unoccupied structures. These are distributed throughout the Town. Many other historical artifacts are found throughout the Town in the form of foundations, barn high drives, stone walls, and other features, including the largely intact Lang Round Barn foundation located along the Ten Mile Square Road and dating back to 1908.

G. Educational Facilities

*Pre-School and Elementary School*

The Charleston Elementary School, located on Center School Road, serves pre-school students through 8th grade. Pre-school is available to all three- and four-year-old children. With a staff of 17 professionals and 13 support staff, the school serves 112 students in nine regular classrooms. The Town provides two buses to transport students to and from the elementary school and on field trips. The school building is used extensively beyond the regular school day. The cafeteria/ gymnasium and classrooms are used for after-school programs, and the gym is used steadily for numerous basketball teams. Semi-annual school concerts are held in the cafeteria/gymnasium, which is also the site of the annual Town Meeting, and monthly third-Friday Jam Sessions highlight local musicians and raise funds for school music programs. Other organizations use the school as a meeting place. The school population fluctuates from year to year but consistently averages just over 110 students each year.

*Secondary Schools*

Charleston students are served by North Country Union High School (grades 9 through 12) in Newport; Lake Region Union High School (grades 9 through 12) in Barton; United Christian Academy, a private school in Newport that serves grades K through 12; and Turning Points, also in Newport. Some parents home-school their children, both part-time and full-time.

*Libraries*

The Charleston Elementary School houses a school library. The Town is also served by the Dailey Memorial Library in Derby, the Island Pond Public Library in Brighton, and the Haskell Library in Derby Line, which provide access to the Vermont and the Quebec library systems. The Big Read Book Wagon based in Derby brings books to a variety of locations throughout the area. West Charleston is also home to the museum of the Charleston Historical Society, which is open to the public during the summer. The NorthWoods Stewardship Center maintains a natural history library that is available for reference to the public.

*NorthWoods Stewardship Center*

The nonprofit NorthWoods Stewardship Center is located in East Charleston within a 1,500 acre forested tract owned and managed by the Center for public recreation, scientific research, education, and sustainable forestry. Through its Forest Stewardship Institute, the land serves as demonstration forest for educational programs for students, landowners, the public, and forestry professionals. NorthWoods is a destination for natural history information, youth and adult education, sustainable land-management and conservation services, and outdoor recreation. Groomed and backcountry hiking and skiing trails, interpretive nature and history trails, a challenge course, and a small pond are some of the features found here. NorthWoods' facilities include a large conference building with kitchen, dining and meeting areas, a log cabin classroom and woodworking shop, high and low ropes courses and initiative events, wilderness campsites, hiking and cross-country ski trails and access to nearly woods, fields, ponds and streams, and a new 16-bed bunkhouse with shower facilities that is available for rent to

individuals, groups and the public. The Charleston Volunteer Fire Department maintains a dry hydrant allowing access to water in NorthWoods' pond for fighting fires. Each year, NorthWoods provides:

- Summer Conservation Corps employment for young people who complete service hours on projects in Vermont and New England.
- K-to-adult experiential learning programs focused on environmental science, outdoor skills, and team-building; and summer camp experiences for children and teens.
- Public programs that engage individuals in land management, natural history, conservation, and outdoor skills.
- Assistance to private landowners with forest management plans, including management for the Charleston Town Forest.

## H. Energy

### H.1 Definitions

In 2016, Act 174 established municipal energy planning standards, which if met, will allow a municipal Plan to receive "substantial deference" in the Section 248 review process. This Plan has been prepared in accordance with the standards required to receive Substantial Deference status.

The definition of "proper scale" as used in this Town Plan is clearly stated in Section I on pages 8 and 9 of this Plan.

For purposes of this Plan, solar facilities are grouped into three categories of scale:

- Small-Scale: Facilities with a capacity of up to 15 kW capacity. (This would include residential roof-mounted panels, which are typically about 4 kW.)
- Mid-Scale: Facilities greater than a 15 kW capacity and less than or equal to 150 kW capacity, or two acres of developed area, including fencing, whichever is greater; and
- Large-Scale (aka "utility scale"): Facilities with a capacity of more than 150 kW or more than two acres of developed site area, whichever is greater.

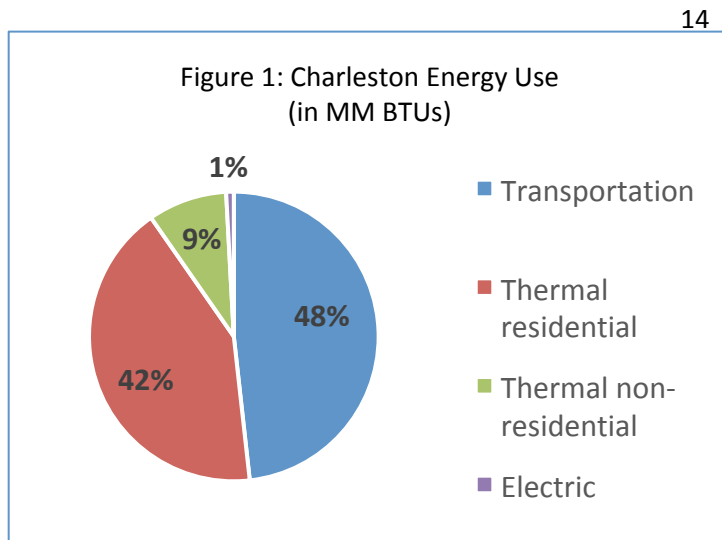
For purposes of this Plan, wind facilities are grouped into three categories of scale:

- Small-Scale: Facilities with a hub height no greater than 100 feet or less (including the blade, measured vertically from the ground to the rotor blade tip at its highest point) and a capacity of up to 10 kw.
- Mid-Scale: Facilities greater than a hub height no greater than 125 feet (including the blade, measured vertically from the ground to the rotor blade tip at its highest point), and capacity of up to 100 kW.
- Large-Scale (also "utility scale"): Facilities with a hub height of more than 125 feet and a capacity of more than 100 kW.

## H.2 Energy Use by Sector

Energy resources are available to Charleston in sufficient supply. Vermont Electric Cooperative and Barton Electric supply electricity to dwellings and buildings connected to the grid. Wood, heating oil, and propane gas are all available through local distribution. Gasoline and diesel fuel are available in adjacent towns and through local fuel suppliers.

According to energy use estimates prepared by the Northeastern Vermont Development Association (NVDA) for Charleston, thermal use (i.e. heating space and water for both residential and commercial uses) is the largest energy use in Charleston, very closely followed by transportation. Electricity usage accounts for the smallest share. (Figure 1, Sources: NVDA and Efficiency Vermont)



### *Thermal Residential*

NVDA developed its residential thermal estimates using American Community Survey (ACS) 5-Year Estimates for primary heating sources. Average household square footages were developed from ACS estimates, as well as American Housing Survey estimates. Included in this estimate are 460 occupied housing units, 348 of which are owner-occupied, and 112 renter-occupied. Owner occupied units have an average of 2.23 persons per unit, with a median of 772 square feet per person. Rented units have an average of 2.29 persons per unit with a median of 496 square feet per person. Collectively, total energy use for heating all occupied units in Charleston accounts for about 57,497 MM BTUs annually at an annual cost of close to \$614,000. Table 1 shows a breakout of heating sources by tenure.



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<b>Table 1: Residential Thermal Estimates for Charleston</b>							
<b>Fuel Type: Space Heating</b>	<b>House- holds (HHs)</b>	<b>Total avg. Use (Annual)</b>		<b>% Use: (All HHs)</b>	<b>% of Use: Owner</b>	<b>% of Use: Renter</b>	<b>% of Cost (All HHs)</b>
<b>Tank/LP/et c. Gas</b>	52	51,169	gals	11%	14%	4%	21%
<b>Electricity</b>	11	200,238	KwH	2%	0.0%	10%	5%
<b>Fuel Oil</b>	186	109,510	gals	40%	35%	57%	40%
<b>Wood</b>	211	923	cords	46%	51%	29%	34%
<b>Coal/Coke</b>	-	-	tons	0%	0%	0%	0%
<b>Other</b>	-	-		<b>0%</b>	<b>0%</b>	<b>0%</b>	-

Although this calculation uses best available data, it has limitations. First, like most Northeast Kingdom residents, Charleston residents are likely to use multiple heating sources. Second, this estimate does not account for the large share of seasonal housing units in Charleston for which no published heating datasets are available. Department of Public Service guidelines suggest it is reasonable to assume that seasonal units account for a fraction of the average owner-occupied housing unit, about 5%. There are 184 seasonal units in Charleston. Assuming 5% of the average owner-occupied housing unit (139 MM BTUs), they could collectively account another 1,282 MM BTUs annually. Long-range housing trends in Charleston indicate a conversion of seasonal units to year around units, particularly around Echo Lake and Pensioner Pond. A continuation of this trend could affect future energy projections.

Age of housing stock also affects thermal energy use. According to ACS 5-year estimates, about one-quarter of Charleston's owner-occupied housing and about one-fifth of renter-occupied housing were built prior to 1940. This is significant because pre-1940 structures are likely to be poorly insulated which, according to the state's Department of Public Service, can nearly double the average thermal use to 80,000 BTUs per square foot. NVDA therefore assumed 80,000 BTUs per square foot for pre-1940 housing stock and 45,000 BTUs for all others. Mobile homes, which are an important part of Charleston's housing stock, also may be older and less energy efficient.

Given the Town's extensive supply of woody biomass, wood is used by a majority of households as a primary or secondary home heating source. While wood is readily available in our Town and affordable for most households, many older homes are energy inefficient and this can drive up costs for all types of home heating. Two heating technologies that may be particularly useful in our region are wood pellet devices and heat pumps. Pellets are cleaner burning, more efficient than cord wood, and relatively easy to use. Stoves and furnaces can be controlled by a thermostat. Pellet prices have remained relatively stable, although there have been some



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shortages in recent heating seasons. In recent years manufacturers have developed air-sourced heat pumps that operate more consistently over Vermont's vast temperature ranges. These units can be two to three times more efficient than propane and fuel oils. Unlike geothermal units, they do not require excavation or duct work and can be much less expensive to install. Cold climate heat pumps have the capacity to heat about 50% to 70% of a building, depending on the size and layout of the structure. Older homes with multiple ells or wings may be difficult to heat with heat pumps alone, but the pumps may be effective for boosting colder underserved zones. Heat pumps may also be useful in outdoor workspaces. Despite recent improvements in effectiveness on cold days, a backup heating source is usually required for sub-zero temperatures.

*Thermal Non-Residential*

Non-residential thermal estimates were developed using data from the Department of Public Service (DPS) and the Vermont Department of Labor's economic and Labor Market Information (Table 2). The Census does not have estimates on heating sources, but DPS is able to estimate average heating loads on types of business. This method does not work for industrial uses, which tend to be highly specific to the function and type of operation. Additionally, this estimate excludes commercial operations likely to be home-based, such as daycares, in order to avoid double-counting.

**Table 2: Non-residential heating use in Charleston**

<b>NAICS Code</b>	<b>Estimated Avg. Consumption (MMBtu)</b>	<b># of Structures in p</b>	<b>Total MM BTUs</b>
<b>42. Wholesale trade</b>	357	1	357
<b>44-45. Retail trade</b>	295	1	295
<b>48-49. Transportation and warehousing</b>	1,666	2	3,332
<b>51. Information</b>	1,568	1	1,568
<b>52. Finance and insurance</b>	761	0	0
<b>53. Real estate and rental and leasing</b>	432	2	864
<b>54. Professional and technical services</b>	109	0	0
<b>55. Management of companies and enterprises</b>	13,763	0	0
<b>56. Administrative and waste services</b>	302	2	604
<b>61. Educational services</b>	4,534	1	4,534
<b>62. Health care and social assistance</b>	1,084	0	0

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<b>71. Arts, entertainment, and recreation</b>	1,778	0	0
<b>72. Accommodation and food services</b>	812	0	0
<b>81. Other services, except public administration</b>	174	3	522
<b>TOTAL</b>		<b>13</b>	<b>12,076</b>

The Town Office is not included in this estimate. The office is housed in a two-story 1981 structure that primarily relies on resistance-type electric space heating. A 2011 energy audit identified potential annual savings of about 36 MM BTUs per year. The bulk of savings were attributed to insulation in the basement and attic, thermal sealing, and programmable controls. The energy audit findings are available through the Town Office.

#### *Transportation Energy Use*

Long commutes and incidental trips require NEK residents to drive an average of 14,000 miles per year. Collectively, Charleston residents drive nearly 12.3 million miles annually, accounting for more than \$1.2 million in fuel costs. As Table 3 indicates, nearly all of this energy is non-renewable. Ethanol currently accounts for nearly all renewable transportation energy usage—about 6% of total BTUs—while electricity accounts for just .01%.

**Table 3: Transportation Energy Use in Charleston**

<b>Total Light Duty Vehicles</b>	879
<b>Total Internal Combustion Engine (ICE) Vehicles</b>	878
<b>Average Miles per gallon for ICE</b>	22
<b>Average annual Vehicle miles travelled ICE</b>	14,000
<b>Total annual VMTs ICE</b>	12,292,000
<b>Total Gallons ICE</b>	558,727
<b>MM BTUs, Fossil fuel</b>	61,653
<b>MM BTUs, Ethanol</b>	4,260
<b>MM BTUs Total ICE</b>	65,913
<b>Total Electric vehicles (EVs) (as of Jan. 2017)</b>	1
<b>Average annual VMT for EVs</b>	7,000
<b>Total annual VMTs for EVs</b>	28,000
<b>Average fuel economy per kWh</b>	3
<b>Total kWh for EVs</b>	9,333
<b>MMBTUs for EVs</b>	8
Sources: American Community Survey, Department of Public Service, NVDA estimates.	

As of January 2017, there was only one all-electric vehicle registered in Charleston. A number of public charging stations have been established around the NEK and several exist outside of the

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region in Morristown, Stowe, and Montpelier. More public charging infrastructure will be needed to support expanded EV use in Charleston. The nearest public park and ride facility is located in Glover (off Bean Hill). Black Bear Biodiesel, located just outside of the region in Plainfield, is a B100 fueling station. North Hardwick Dairy produces oilseed crops for use as fuel and food.

*Electrical Use*

Charleston's electric utility customers are primarily residential, and the number has been fairly steady (about 525) over the most recent three-year period. Residential customers have reduced their average use in recent years—from 20.1 MMBTUs per customer, to 18.5. Similar data for commercial and industrial users is not available, but this sector has seen a 3.6% increase in overall use over the same period.

Table 4: Electricity Use in Charleston						
	2014		2015		2016	
	kWh	MM BTUs	kWh	MM BTUs	kWh	MM BTUs
<b>Commercial &amp; Industrial (kWh)</b>	1,079,333	3,683	1,076,838	3,674	1,118,247	3,815
<b>Residential (kWh)</b>	3,099,650	10,576	3,033,607	10,351	2,849,098	9,721
<b>Total</b>	4,178,983	14,259	4,110,445	14,025	3,967,345	13,537
<b>Average Residential Usage</b>	5,904	20.1	5,767	20	5,427	18.5

The data in Table 4 are collected by zip code, and not by town of service, so are subject to errors in some very rural communities such as Charleston. Inconsistencies in reporting among the utility companies, paired with disparate billing cycles, may also produce some errors. Efficiency measures tracked by Efficiency Vermont and VEIC indicate that Charleston utility customers have achieved an overall reduction in 143,263 kilowatt hours and a thermal savings of 18 MM BTUs (Table 5).

Table 5: Savings Achieved in Charleston, 2014-2016				
	2014	2015	2016	Total
<b>Electric Savings (KWh)</b>	43,686	32,869	66,708	143,263
<b>Residential</b>	23,758	22,346	41,972	88,075
<b>Commercial &amp; Industrial</b>	19,929	10,523	24,737	55,189
<b>Thermal Savings (MMBTU)</b>	(1)	51	(32)	18
<b>Residential</b>	0	52	(25)	27
<b>Commercial &amp; Industrial</b>	(1)	(2)	(6)	(9)

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<b>Total Customer Cost Savings</b>	<b>\$6,866</b>	<b>\$6,402</b>	<b>\$10,245</b>	<b>\$23,513</b>
<b>Residential</b>	<b>\$4,085</b>	<b>\$4,938</b>	<b>\$6,665</b>	<b>\$15,688</b>
<b>Commercial &amp; Industrial</b>	<b>\$2,781</b>	<b>\$1,464</b>	<b>\$3,580</b>	<b>\$7,825</b>

Table 6 shows the types of efficiency measures carried out by Charleston residential, commercial and industrial customers over the most recent three-year period.

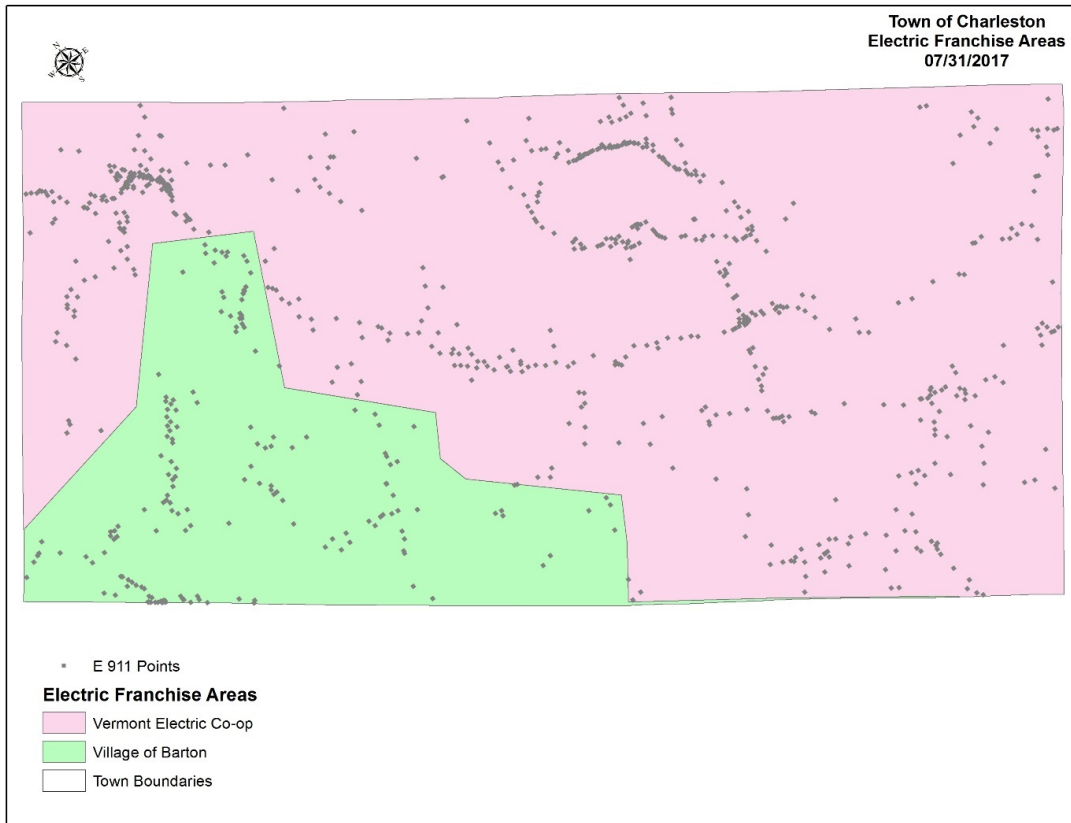
**Table 6: Efficiency Measures by Residential and Commercial & Industrial Customers in Charleston**

	2014		2015		2016		Total	
	R	C&I	R	C&I	R	C&I	R	C&I
<b>Air Conditioning Efficiency</b>	0	0	1	0	1	0	2	0
<b>Cooking and Laundry</b>	2	0	1	0	4	0	7	0
<b>Hot Water Efficiency</b>	8	0	3	0	15	0	26	0
<b>Light Bulb/Lamp</b>	618	79	457	169	417	86	1,492	334
<b>Lighting Hardwired Fixture</b>	30	10	46	25	38	64	114	99
<b>Motor Controls</b>	0	2	0	0	0	0	0	2
<b>Motors</b>	0	0	5	0	4	0	9	0
<b>Office Equipment, Electronics</b>	22	0	8	0	10	0	40	0
<b>Refrigeration</b>	7	0	3	0	4	1	14	1
<b>Space Heat Replacement</b>	0	0	1	0	1	0	2	0
<b>Thermal Shell</b>	0	0	4	0	0	0	4	0
<b>Ventilation</b>	0	0	0	0	0	3	0	3

### H.3 Generation and Distribution

Charleston is served by two electric utilities, Barton Village Electric and the Vermont Electric Coop (VEC), both of which have become increasingly involved with the issues and policies associated with renewable energy production, particularly distributed, small-scale power generation (See Figure 2).

1 Figure 2: Electric Franchise Areas in Charleston



2  
3 Source: NVDA

4  
5 Barton Village Electric owns and runs the two-turbine Barton Village Hydropower Project (FERC  
6 No. 7725) on the Clyde River in West Charleston (See Table 8) which serves more than 2,000  
7 customers in Barton, Westmore, West Charleston, Brownington, Evansville, and Sutton. The  
8 plant operates in “run-of-river” mode. Originally constructed in the 1890s, the current facility is  
9 between 60 and 70 years old. The FERC License for Barton Hydro expires on October 1, 2043.  
10 Barton is currently developing a rigorous maintenance Plan which involves regular and periodic  
11 maintenance of critical mechanical and electrical components.

12  
13 Downstream from the Barton Village Hydropower Project is the West Charleston Hydroelectric  
14 Plant, federally licensed as the Clyde River Hydroelectric Project (FERC Project No. 2306), which  
15 reclaimed the West Charleston Dam, originally constructed in the early 1900s. Great Bay Hydro,  
16 a private energy company based in Portsmouth, NH, acquired the facility from Citizens Utilities  
17 in 2004 and moved power generation upstream to the dam to provide environmental  
18 enhancements. The new configuration, which began operation in April 2011, allows the facility  
19 to use all of the river flow and operate in a “run-of-river” mode with little impact on the river’s  
20 water levels. West Charleston Hydro is a “standard offer” facility with a 20-year power sales  
21 contract to Vermont utilities.  
22

H.3.1 Renewable Energy Generation in Charleston

Charleston currently generates about 7,786 MWh of renewable energy annually (Table 7).

Table 7							
Category	Sub Category	Address	CPG Number	Electricity Type	Utility/ Operator	Capacity kW	Annual Production MWh
Hydro				Grid	Barton Village Electric	1,400.0	4,897.0
Hydro				Standard Offer	Great Bay Hydro Corp.	800.0	2,655.0
				<b>Total Hydro</b>		2,200	7,552.0
Wind	Small Wind	114 Route 105	527	Net Metered	Vermont Electric Coop	9.5	16.6
Solar	Rack-Mounted PV	154 Leadership Drive	444	Net Metered	Vermont Electric Coop	1.7	2.1
Solar	Roof-Mounted PV	2378 Dane Hill Road	1175	Net Metered	Barton Village Electric	5.1	6.3
Solar	Roof-Mounted PV	181 Corkins Rd	1397	Net Metered	Vermont Electric Coop	2.6	3.2
Solar	Roof-Mounted PV	304 Dane Hill Rd	3942	Net Metered	Vermont Electric Coop	8.6	10.6
Solar	Roof-Mounted PV	2223 E Echo Lake Road	4033	Net Metered	Vermont Electric Coop	10.0	12.3
Solar	Roof-Mounted PV	55 Whitcomb Lane	17-2618	Net Metered	Vermont Electric Coop	3.8	4.6
Solar	Roof-Mounted PV	658 Mad Brook Rd	17-2882	Net Metered	Vermont Electric Coop	5.0	6.1

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<b>Solar</b>	Roof-Mounted PV	2371 East Echo Lake Rd	18-0207	Net Metered	Vermont Electric Coop	7.6	9.3
<b>Solar</b>	Roof-Mounted PV	1343 Gratton Hill Rd	18-0909	Net Metered	Vermont Electric Coop	10.0	12.3
<b>Solar</b>	Ground-mounted PV	149 Echo Lake Rd	5712	Net Metered	Vermont Electric Coop	8.0	9.8
<b>Solar</b>	Ground-mounted PV	1166 E Echo Lake Rd	17-0070	Net Metered	Vermont Electric Coop	5.0	6.1
<b>Solar</b>	Ground-mounted PV	1688 VT-105	17-0016	Net Metered	Vermont Electric Coop	5.0	6.1
<b>Solar</b>	Ground-mounted PV	1716 10 Mile Square Rd	17-2799	Community Solar	Vermont Electric Coop	97.7	119.8
<b>Solar</b>	Ground-mounted PV	114 VT-5A	18-1093	Net Metered	Barton Village Electric	7.6	9.3
<b>Total Solar</b>						<b>177.7</b>	<b>217.9</b>
<b>Total Generation</b>						<b>2,387.2</b>	<b>7,786.6</b>

Source: Vermont Renewable Energy Atlas

Charleston hosts three renewable energy facilities that contribute directly to the State of Vermont's renewable energy goal of developing in-state renewable generating resources:

- The **West Charleston Hydroelectric Plant**, federally licensed as the Clyde River Hydroelectric Project (FERC Project No. 2306), reclaimed the West Charleston Dam, originally constructed in the early 1900's. The facility ceased operation in 1998 due to poor condition but Great Bay Hydro, a private energy company based in Portsmouth, NH, acquired the facility from Citizens Utilities in 2004. Great Bay moved power generation upstream to the dam to provide environmental enhancements by eliminating a 1,600 ft. bypass section of the river and improve water quality in the Clyde River. This configuration, which began operation in April 2011, allows the facility to use all of the river flow and operate in a "run-of-river" mode with little impact on the river's water levels.
- Upstream from Great Bay Hydro's operation is the two-turbine **Barton Village Hydropower Project** (FERC No. 7725), operated by Barton Village Electric, which serves more than 2,000 customers in Barton, Westmore, West Charleston, Brownington, Evansville, and Sutton. The Plant operates in "run-of-river" mode. Originally constructed in the 1890s, the current facility is between 60 and 70 years old.

- The **Charleston Community Solar Project** is designed to produce 97.68 kW, 79.8 kW AC of solar generated electricity for net metering to Vermont Electric Cooperative (VEC) to fully offset electrical energy needs required by the Town Office and Garage, the Town Elementary School, Town Streetlights, and the Town Volunteer Fire Department for an estimated period of 25 years or longer. Because the solar facility is sited to reclaim a section of the Town's gravel pit, it is out of public view and does not disrupt the Town's rustic nature or natural beauty.

Additional power currently generated in Charleston is on a proper scale for our Town and primarily consists of roof- and ground-mounted solar, as well as one small-scale wind turbine.

### H.3.2 Preferred Renewable Energy Facility Sites

#### *Solar Facilities*

Under the state's new net-metering regulations of 2017, a net-metered facility with a capacity greater than 150 kW is to be built on a "preferred site." The Town of Charleston has identified the following areas as preferred sites for solar generation, as long as they conform with the requirements stated in this Plan:

- A new or existing structure whose primary use is not the generation of electricity (rooftops).
- Tracts of land that are already disturbed or developed (i.e. previously developed for a use other than siting a plant on which a structure or impervious surface was lawfully in existence prior to July 1 of the year preceding the year in which an application for a Certificate of Public Good was filed).
- A brownfield.
- A sanitary landfill.
- The disturbed portion of a gravel pit, quarry, or similar site for extraction of a mineral resource.
- A site listed on the National Priorities List (a.k.a. Superfund Sites) as confirmed by the EPA, provided development will not compromise or interfere with remedial action on the site and the site is suitable for development of the facility.
- The same parcel as, or directly adjacent to, a customer that has been allocated more than 50% of the system's electrical output (e.g. on-farm generation where more than 50% of the power generated is used by the farm).
- Specific sites as mapped on the attached Charleston solar resources map.

#### *Wind Facilities*

Charleston has limited potential for wind energy development, and lacks areas with elevations sufficient to support utility-scale wind development. Because no locations in Charleston have suitable wind resource, infrastructure availability, or areas free from significant environmental constraints, therefore no utility-scale wind energy facilities can be located in our Town. Small- and mid-scale wind projects may be appropriate as long as noise from such facilities does not



adversely affect neighboring properties, and such facilities meet all other requirements stated in this Plan. Possible sites are indicated on the attached Charleston wind resources map.

#### *Prohibited Sites*

The Town supports the regional policy of the NVDA's Plan. Furthermore, it is the clearly stated policy of this Plan that upland areas of higher than 1700 feet, headwaters, forest coverage of site class 1, 2, or 3, priority forest habitat blocks, and state natural areas and fragile areas are prohibited for utility-scale energy development.

In addition to all sites that do not meet the requirements stated in this Plan, solar and wind generating facilities are excluded from:

- Floodways shown on Flood Insurance Rate Maps (FIRMs).
- Fluvial erosion hazard areas (river corridors).
- Class I or II wetlands.
- A location that would significantly diminish the economic viability or potential economic viability of the Town's working landscape, including productive forest land and primary agricultural soils (as defined in Act 250 and as mapped by the U.S. Natural Resource Conservation Service).

#### *Decommissioning*

As of the adoption date of this Plan, all new solar and wind facility certificates shall specify conditions for system decommissioning, including required sureties (bonds) for facility removal and site restoration to a safe, useful, and environmentally stable condition. All materials and structures, including foundations, pads, and accessory structures, must be removed from the site and safely disposed of in accordance with regulations and best practices current at the time of decommissioning.

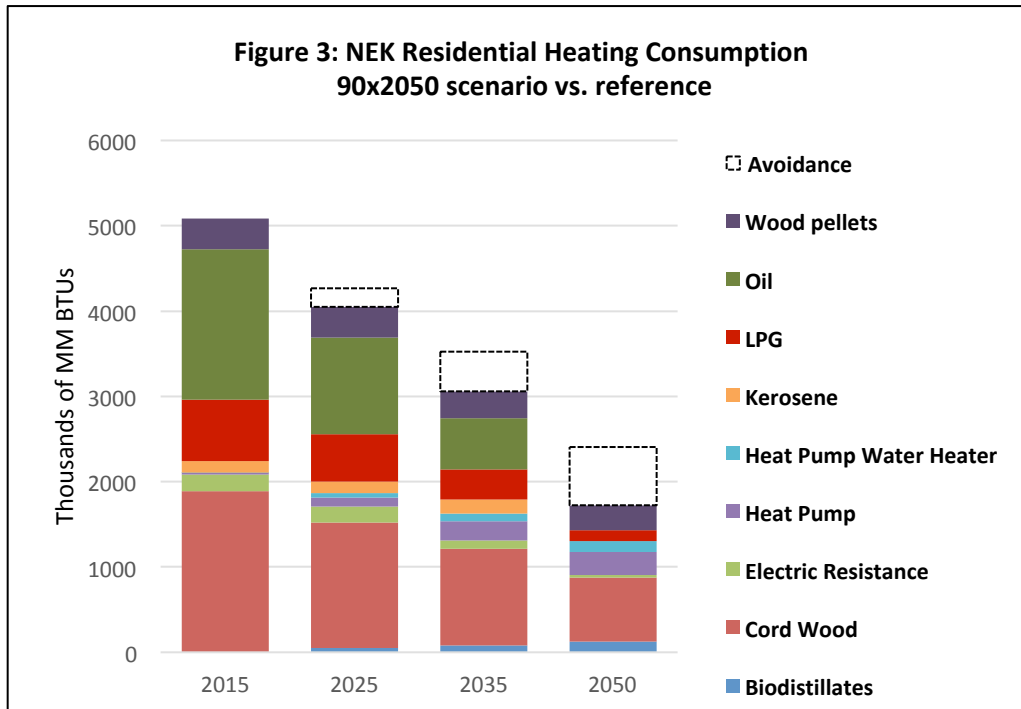
### H.4 Addressing 2050 Statewide Energy Goals

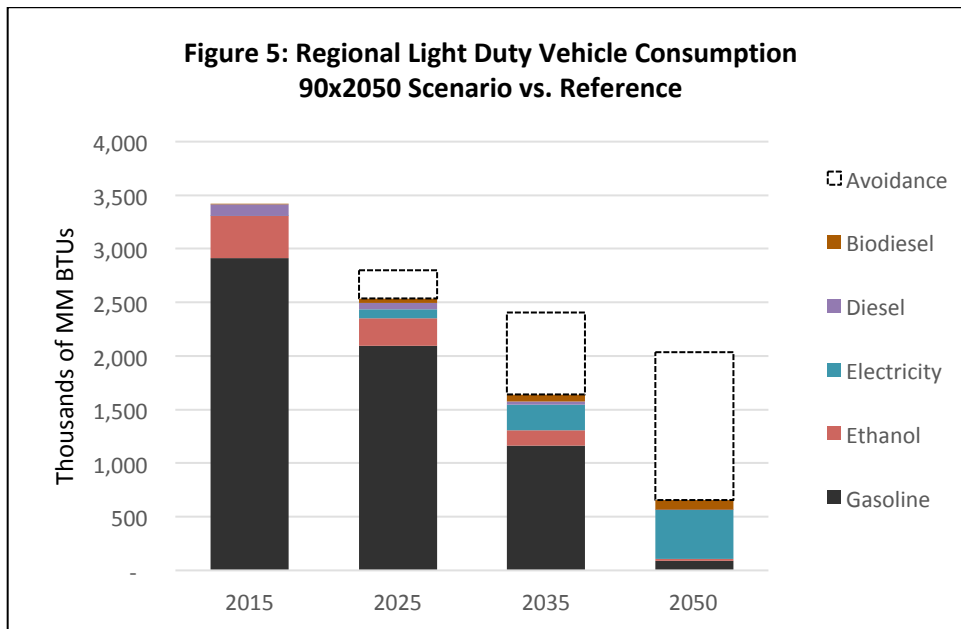
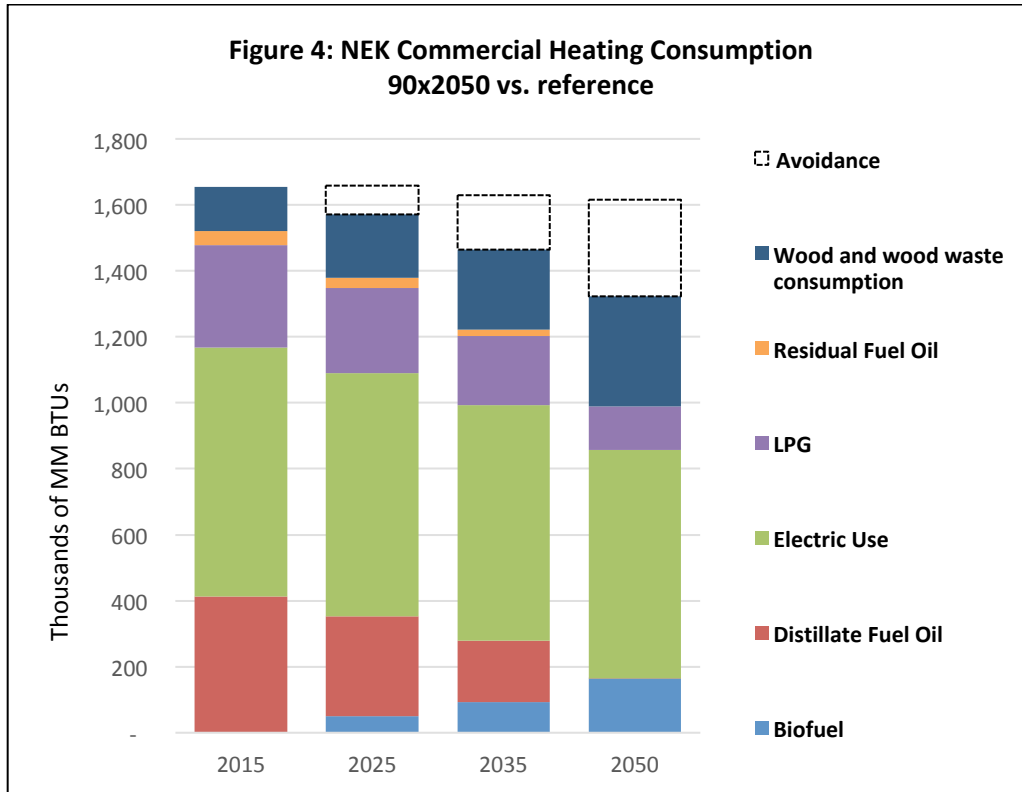
Charleston's Energy Plan supports [Vermont's 2016 Comprehensive Energy Plan](#) (CEP), which contains the following goals:

- 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 renewable end-use sector goals for 2025: 10% transportation, 30% buildings, and 67% electric power.

Figures 3 through 5 show what the Northeast Kingdom's total end use of all fuels might look like if the "90x2050" goals of the CEP were met. This scenario is based on Long-Range Energy Alternatives Planning (LEAP), an integrated modeling that can estimate and track consumption across all sectors, based on a set of assumptions, such as population growth. This LEAP scenario reduces demand enough to make 90% renewable supply possible. This scenario makes use of

wood energy, but there is more growth in electric heating and transportation to lower total energy demand. Where the graphs show “Avoided vs. Reference,” that is the portion of energy that is no longer needed because of the efficiency improvements through weatherization, equipment upgrades, and fuel switching. Despite a modest growth rate of population and economy, energy use declines because of efficiency and electrification. Electrification of heating and transportation has a large effect on the total demand because the electric end uses are three to four times more efficient than the combustion versions they replace.





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Tables 8 through 10 below identify one strategy for Charleston to meet the statewide energy goals of 2050. The targets are predicated on two concepts: *efficiency and fuel switching*.

#### H.4.1 Efficiency and Weatherization

The 2016 Vermont Comprehensive Energy Plan states that efficiency will ensure an affordable and stable cost of doing business, increase entrepreneurship opportunities, improve labor market conditions, drive production, and drive improvements in demand-side thermal and electric efficiency and conservation. Although increased fuel switching from non-renewables to renewables will not compensate for lower weatherization targets, more aggressive weatherization strategies can reduce fuel switching targets in Table 9.

Table 8: Charleston Weatherization and Efficiency Targets			
	2025	2035	2050
<b>Estimated number of households</b>	488	517	<b>548</b>
<b>% of households to be weatherized</b>	18%	29%	<b>30%</b>
<b># of households to be weatherized</b>	87	152	<b>162</b>
<b>Estimated number of commercial establishments</b>	14	15	<b>15</b>
<b>% of commercial establishments to be weatherized</b>	4%	7%	<b>13%</b>
<b># of commercial establishments to be</b>	1	1	<b>2</b>
<b>Estimated number of residential customers</b>	731	775	<b>822</b>
<b>% of residential customers to upgrade</b>	21%	32%	<b>44%</b>
<b># of residential customers to upgrade</b>	<b>157</b>	<b>246</b>	<b>361</b>

These projections estimate a 6% increase in the number of housing units/commercial establishments over each period. Weatherization projects are assumed to achieve an average of 25% reduction in MMBTUs for residential units and 20% for commercial establishments, although some weatherization projects can achieve deeper savings. *Increasing the average savings will decrease the weatherization targets.*

## H.4.2 Fuel Switching Targets

**Table 9: Thermal Fuel Switching Targets for Residential and Commercial**

	<b>2025</b>	<b>2035</b>	<b>2050</b>
<b>New Efficient Wood Heat Systems in Residences</b>	222	182	<b>132</b>
<b>% of households with Wood Heat Systems</b>	46%	35%	<b>24%</b>
<b>New Efficient Wood Heat Systems in Commercial Establishments</b>	2	2	<b>3</b>
<b>% commercial establishments with wood heat systems</b>	14%	16%	<b>21%</b>
<b>New Heat Pumps in Residential Units</b>	66	139	<b>176</b>
<b>% of households with Heat Pumps</b>	14%	27%	<b>32%</b>
<b>Estimated commercial establishments with Heat Pumps</b>	1	1	<b>2</b>
<b>% of commercial establishments with Heat Pumps</b>	<b>5%</b>	<b>9%</b>	<b>13%</b>

Despite the lack of infrastructure and rough terrain, the majority of light-duty vehicles may well be powered by electricity by the year 2040. The projected numbers of vehicles in the area is estimated to be roughly commensurate with projections of population and households. Estimates assume a gradual increase in EV fuel economy from 3 kwh per mile to 4 kwh per mile by 2050.

**Table 10: Transportation Fuel Switch Targets for Charleston**

	<b>2025</b>	<b>2035</b>	<b>2050</b>
<b>Projected number of light-duty vehicles in the area, by year</b>	989	1,112	<b>1,252</b>
<b>Number of vehicles powered by electricity</b>	92	292	<b>629</b>
<b>% of vehicles powered by electricity</b>	<b>9%</b>	<b>26%</b>	<b>50%</b>

Electricity use is expected to increase dramatically by 2050, so demand-side management and upgrades such as hardwiring, lighting fixtures, and appliances is an important part of this scenario, especially since electricity is replacing other fuel-burning thermal applications. Table

11 establishes targets for electrical equipment upgrades. Table 6 (above), which identifies many of the efficiency measures taken by Charleston utility customers over the past three years, provides some insights into the kinds of upgrades likely to take place in the future.

<b>Table 11: Electrical Equipment Upgrade Targets for Charleston</b>			
	2025	2035	2050
Estimated number of customers	725	769	815
# of customers to upgrade equipment	157	246	361
% of customers to upgrade equipment	22%	32%	44%

This estimate assumes an average savings of 400 kWh per project and assumes a projected number of customers by multiplying the number of housing units by 1.5 (to account for multi-units and non-residential customers).

#### H.5 Charleston's Renewable Energy Portfolio

Charleston's new net generation in support of 2050 goals is 291 MWh, based on the Town's share of the regional population. Generation in Charleston established prior to 2017 does not count toward this target, but the region already has a low net generation target, mainly because of the industrial wind production in Sheffield and Lowell. The region's net generation target for new solar facilities ranges from 246 MW to 377 MW. New solar development since the beginning of 2017—including the new Town-owned site on Ten Mile Square Road—have already added a total capacity of 141 kW generating nearly 174 MWh annually.

Charleston has sufficient land for the orderly development of solar, according to NVDA's mapping analysis. These maps, which are to be used to gauge overall siting potential rather than a definitive siting tool, identify known constraints as well as potential constraints:

- **Known constraints:** These include areas not likely to be developed for renewable energy because they contain one or more of the following: vernal pools; river corridors; FEMA floodways; significant natural communities; rare, threatened and endangered species; national wilderness areas; wetlands (Class 1 and Class 2).
- **Potential constraints** are areas that would likely require mitigation because they contain one or more of the following: agricultural soils; special flood hazard areas (outside of the floodway); protected (conserved) lands; deer wintering areas; Act 250 mitigated agricultural soils; hydric soils; and highest priority forest blocks.

Other constraints include:

- **Regional constraint:** NVDA’s regional Plan has long held that rural areas should receive very little commercial or industrial development unless it occurs in an established industrial park, or in an area specifically designated in the local bylaw or Plan as being well suited to such uses. Lands with an elevation of 2,000 feet or more merit consideration as a special class of rural lands that should be protected from any large-scale commercial or industrial development characterized by a constructed height of 100’ or more, and an acre or more of permanent site disturbance, such as clear-cutting. These lands, as indicated on attached siting potential maps, contain one or a combination of factors that make them unsuitable to such development—contiguous forest cover; sensitive wildlife and plant habitat; conservation lands and recreational assets; managed forestland; and headwaters and ephemeral surface waters, which are highly vulnerable to erosion and man-made disturbance. This high-elevation forest cover must be kept unfragmented for the attenuation of flood flows, the benefit of wildlife habitat and linkage, and public enjoyment through passive recreation. It should be noted that there is limited acreage of the proposed regional constraint in Charleston and is not likely to incorporate all of the sensitive habitats and headwaters identified in the land use Plan.
- **Local constraints:** There is no regional or local net generation target for wind. In keeping with the policies in this Plan, the wind resource maps do not show many wind generation areas with high generation potential. This is due to the existence of known constraints, including the clearly stated policy of this Plan, that prohibits utility-scale energy development in upland areas of higher than 1,700 feet, headwaters, forest coverage of site class 1, 2, or 3, priority forest habitat blocks, and state natural areas and fragile ecosystems.

#### H.5.1 Solar, Wind and Hydro

Using conservative estimates of prime solar acreage alone (i.e. no constraints), Charleston has 978 acres with potential for renewable power generation. About eight acres are required to produce 1 MW of solar power. Obviously, not every prime acre is actually available. Property owners may not be interested in leasing their land, interconnection costs may be too high in some areas, and certain sites may still be unsuitable due to neighbor objections or other factors. Regional estimates therefore assume a more conservative estimate of 1 MW for every 60 acres. The potential of rooftop solar—now a preferred site under Act 99—presents important opportunities for progress, although such investments are not economically feasible for many residents. A conservative estimate of one out of every ten residential structures could produce considerable output by 2050. There is also limited opportunity for rooftop commercial, which might include barns and other outdoor structures.

Wind potential is calculated assuming an average output of 9.5 kW (residential), based on average capacity of existing installations in the region.

**Table 12: Charleston Generation Potential**

	Total MW	Total MWh Output
<b>Residential Rooftop</b>	.28	347
<b>Commercial Rooftop</b>	.026	31.9
<b>Ground Mounted</b>	16.3	19,994.0
<b>Total Solar</b>	16.606	20,372.9
<b>Wind</b>	0.58	1,017.9
<b>Hydro</b>	.06	210.2

#### H.5.2 Renewable Energy Policy

It is the Town's policy to support the generation of renewable energy as part of an overall energy policy that promotes energy conservation first and foremost, and uses technologies on a proper scale (as clearly defined in this Plan) to preserve the rural nature and pristine natural setting that is the foundation for economic development in our Town.

#### H.5.3 Challenges to Meeting 2050 Goals

##### *Land Use and Development*

An analysis of long-term development trends in the Northeast region has shown that market demand favors scattered and dispersed development. While Charleston does not have land use regulations to drive development back to its Village centers, it is possible that Village Center Designation may provide incentives for reinvestment in traditional areas of development.

The Vermont Residential Energy Code—Residential Building Energy Standards (RBES)—was passed by the Vermont State Legislature to establish standards to promote energy conservation in all new residential construction. Short of zoning, the Town continually encourages residential development to align with these standards.

##### *Transmission Constraints and Electricity Demand*

The central-west and northwestern area of the Northeast Kingdom, which includes Charleston, is served by a severely constrained transmission line, which already carries the significant outputs from Kingdom Community Wind and the Sheffield Wind projects. Both wind generations sites have faced transmission challenges and shut downs. Because the area generates far more power than it consumes, utilities are opposing numerous renewable projects in the area. Our area's high efficiency in reducing electric demand further hampers the financially viable development of new renewable generation. This Town Plan incorporates NVDA's policy on this matter (see below).



*While NVDA encourages appropriately scaled renewable energy development, NVDA has a commitment to ensure that such development is sustainable and feasible and does not merely substitute one renewable resource with another. NVDA supports energy development that will not exacerbate curtailment at issue within the SHEI. It is unlikely that any single solution will solve congestion within the SHEI and, as such, it is anticipated that incremental progress will be achieved as partial solutions are implemented. In the meantime, NVDA will support projects that are consistent with the land use and conservation measures in this Plan and in duly adopted Plans of impacted municipalities.*

## J. Housing

### *Housing Stock*

Housing stock in the East and West Villages tends to be older and is generally occupied by long-term residents. These villages are characterized by mixed land use (residential and commercial). Homes around Echo Lake and Pensioner Pond tend to be newer. Historically, housing around Echo Lake has tended to be vacation or recreation homes owned by nonresidents, but in recent years many residences around Echo Lake have been upgraded to allow for year-round use. Properties around Pensioner Pond tend to be year-around residences owned by full-time residents. Many former vacation homes in various parts of Charleston have become full-time or primary residences over the past two decades, and new homes are being built in many areas of Town. Mobile homes occupied by full-time and part time residents continue to be a significant part of the housing mix (16% of overall housing units).

According to American Community Survey 5-Year Estimates, about one-third of the Town's housing stock was built before 1950 (25% before 1940), and about 40% was built between 1960 and 1990. About 15% has been built since 2000:

- About 39% of housing is valued between \$50,000 and \$150,000.
- 21% between \$150,000 and \$200,000.
- 17% between \$200,000 and \$300,000.
- 18% above \$300,000.
- 95% of rental units cost between \$500 and \$1,000 per month.
- 5% cost between \$1000 and \$1500 per month.

### *Housing Affordability*

Most people in Charleston reside in their own homes. Nearly 80% of housing is owner-occupied, with more than 20% rented. Half of owner-occupied houses have mortgages and half do not. About two-thirds of housing units are occupied year-around; about one-third are vacant, primarily for seasonal use. The homeowner vacancy rate is 2.5% and the rental vacancy rate is about 0%.

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According to ACS Estimates, about 90% of homeowners in Charleston who earn more than \$50,000 per year in household income pay less than 30% of their household income for their housing costs, indicating that housing is affordable for them. However, less than half of homeowners in Charleston who make less than \$50,000 pay less than 30% of their household income for their housing costs, indicating that housing is less affordable for them. About half of renters pay less than 20% of their household income for their housing. This indicated that housing is generally affordable for these residents.

Some homeowners in Charleston pay more than 30% of their household income for household costs: about one-third of those earning \$35,000 to \$50,000; about half of those earning \$20,000 to \$35,000; and most of those who earn less than \$20,000. About half of renters pay 30% or more of their household income for their household costs. These data suggest that housing affordability may be a challenge for some residents. While the Town would benefit from an increased supply of affordable rental units to address the tight affordable housing supply, the source of such new units is not apparent at present.

**K. Economic Development and Employment**

Charleston has a diverse economic base in which many residents are employed in pursuits closely tied to the Town's abundant local natural resources, including farming, logging, forestry, nurseries, sugaring, hunting and fishing, and outdoor recreation. Service business also abound: auto and machine repair, small retail, food services, construction, manufacturing, transportation, waste management, and real estate. Other residents provide public and professional services: road maintenance, education, health care, and civic administration. Our Town's current businesses are on a smaller scale, with most employing fewer than five people (see Table 2). Some residents are employed by businesses located in neighboring cities and towns, and out-of-state, and they commute to work either physically or electronically. About 15% of the Town is self-employed. In 2010, the Town's unemployment rate among workers in the civilian workforce was 5%.

Charleston can benefit from attracting new business. Although unemployment in our Town is lower than in the State and the nation, there is strong support among Town residents for new job opportunities and the contribution that new business can make to our Town's tax base. New business areas appropriate for our Town include farming, agriculture, manufacturing, technology, health care, service businesses, tourism, and other enterprises that can be well integrated with our rural setting in ways that protect our Town's natural resources and scenic beauty.

**L. Flood Resilience**

FEMA's current Flood Hazard Boundary Map of Charleston, published in 1974, delineates areas of concern along the Clyde River, Mad Brook, Pensioner Pond, Toad Pond, and Echo Lake. There is very limited development in flood hazard areas of the Town, including a few residences and

hay barns. There are no repetitive loss structures in the Town. Portions of the Mad Brook have some fluvial erosion potential, but the Town has not seen any major increase in erosion since 2011 when repeated flooding inundated much of the state. With very little floodplain development in Charleston, the greatest danger during flood events is to Town highway infrastructure. All culverts on Hudson Road and Twin Bridge Road are located within mapped floodplains.

During 2017-2018, the Town completed two FEMA 404 Hazard Mitigation Program projects on highways that saw repeated washout and closure during Tropical Storm Irene and other recent storms. The first was replacement of double culverts with a precast box culvert with natural stream bed over Mad Brook on Cole Road, a town-to-town connector. The second was to build the road surface and upgrade the ditch and culvert network on Hudson Rd, a Class 2 highway and major state highway connector adjacent to the Clyde River flood plain. Both projects will prevent or reduce damages caused by future disasters, reduce future highway repair costs, and mitigate the discharge of stormwater and pollutants into the watershed. Both projects were made possible because the Town adopted a Local Hazard Mitigation Plan in 2016. As well, the Better Roads Program provides grants and technical assistance to help the Town avoid erosion and flash floods resulting from road design and construction.

#### M. Hazard Mitigation

The Town of Charleston has a Local Hazards Mitigation Plan in place that was shaped by community members and adopted by the Town in January 2016. The Town also maintains a current Local Emergency Operations Plan (LEOP) that is updated and adopted annually. In June 2017, members of the Selectboard, Fire Department, and local residents received Basic Shelter Training through American Red Cross.

#### N. Development Trends and Plans of Adjacent Municipalities

Charleston is adjacent to five municipalities: Brighton to the east; Morgan to the east and north; Derby to the north and west; Brownington to the west and south; and Westmore to the south. These towns vary in land use but are similar to Charleston in their rural character, except Derby and Brighton each have centralized business districts that serve the towns around them.

##### *Brighton*

As a result of the connectivity between the towns provided by Route 105 and the Clyde River, there may be areas of mutual benefit and concern between Brighton and Charleston. Water quality issues and watershed development on the Clyde River may be impacted by Brighton's land use. The use of industrial wind turbines on Brighton's elevated regions would severely impact Charleston due to the massive scale of construction and operation of these facilities. The construction of any commercial industrial scale facility for the generation, transmission or distribution of wind energy upon Brighton's mountain ridgelines and high elevation habitats would significantly interfere with the orderly development of Charleston and the local region

1 and would directly conflict with the objectives and land conservation measures set forth in the  
2 Charleston Town Plan.

3  
4 *Morgan*

5 Due to the rural nature of land use along the boundary between Charleston and Morgan, we do  
6 not anticipate any major issues between the two towns. With the outlet of Seymour Lake in  
7 Morgan as the main inlet for Echo Lake, which is in turn a major tributary of the Clyde River, the  
8 maintenance of high water quality in Seymour Lake is important to our Town. The construction  
9 of any commercial industrial scale facility for the generation, transmission or distribution of  
10 wind energy upon Morgan's mountain ridgelines and high elevation habitats would significantly  
11 interfere with the orderly development of Charleston and the local region and would directly  
12 conflict with the objectives and land conservation measures set forth in the Charleston Town  
13 Plan.

14  
15 *Derby*

16 The Clyde River continues from Charleston through Derby and is an area of mutual interest in  
17 terms of water quality, maintenance of natural habitat, and tourism. Derby is a vibrant  
18 commercial area that is growing in scale. For the present, this growth is not negatively  
19 impacting Charleston.

20  
21 *Brownington*

22 Due to the rural nature of land use along the boundary between Charleston and Brownington,  
23 and Brownington's commitment to retain its current natural character, Charleston does not  
24 anticipate any major impact on our Town as a result of Brownington's Town Plan. The  
25 construction of any commercial industrial scale facility for the generation, transmission or  
26 distribution of wind energy upon Brownington's mountain ridgelines and high elevation  
27 habitats would significantly interfere with the orderly development of Charleston and the local  
28 region and would directly conflict with the objectives and land conservation measures set forth  
29 in the Charleston Town Plan.

30  
31 *Westmore*

32 Due to the rural nature of land use along the boundary between Charleston and Westmore, we  
33 do not see any major issues between these two towns at present. The construction of any  
34 commercial industrial scale facility for the generation, transmission or distribution of wind  
35 energy upon Westmore's mountain ridgelines and high elevation habitats would significantly  
36 interfere with the orderly development of Charleston and the local region and would directly  
37 conflict with the objectives and land conservation measures set forth in the Charleston Town  
38 Plan.

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1 *NVDA Regional Plan*

2 The Charleston Town Plan is generally aligned with the rural town goals in the Regional Plan  
3 prepared by the Northeastern Vermont Development Association, and the goals expressed in  
4 the NVDA Regional Plan's section on natural resources. Many of the goals in the NVDA  
5 Regional Plan are not applicable or appropriate for our small, rural Town; these are self-evident.

6

7

#### **IV. Implementation of Town Plan Objectives**

Charleston provides an undisturbed natural setting which attracts visitors from across the state and nation, and is the lynch pin of many of our local businesses. Charleston's economic future is dependent on our ability to attract new business and economic development on a proper scale that preserves and protects the integrity of our Town's natural setting and resources. The Town's scenic beauty and natural environment contributes to our quality of life, and allows residents and visitors to experience an unspoiled natural environment which inspires and refreshes the human spirit. As pristine natural environments become rare in the United States, people travel to the remaining few to have unforgettable experiences of natural beauty in all seasons of the year. Such places also attract new business and new residents to support the local tax base.

It is the Town's policy that all policies and programs affecting our Town be developed and assessed in light of their impacts on our undisturbed natural environment. The implementation of all parts of this Town Plan is subject to the definition of "proper scale" clearly stated in Section I of this Plan on pages 8 and 9.

##### Land Use

It is the Town's policy to encourage land development that attracts new enterprises while preserving the land in its undeveloped rural setting to the maximum degree possible because our scenic, natural environment is essential to our Town's economic development. As such, it is the Town's policy to prohibit large development for any purpose that is not in proper scale with our Town's rural setting, except as specifically mandated to keep this Plan in compliance with state law.

##### *Commercial*

It is the Town's policy to encourage small and medium sized new business and commercial enterprises that are appropriate to our Town's rural way of life. The Town prohibits any large-scale commercial enterprises that are not in proper scale with our Town's rural setting.

##### *Farming*

The Town values and supports the critical role that active farms play in maintaining our desired rural character and their sustainable use of the natural resources of our Town when employing best management practices such as stream buffers and manure management. It is the Town's policy that farms in Charleston be protected by the "right to farm," free from ordinances that limit noise, odor, or other restrictions that unreasonably impede their responsible operation. It is the Town's policy that industrial farming, defined as any "factory" farming of livestock or produce, is prohibited in the Town because it displaces family farms, and creates environmental and health issues.

*Logging*

It is the Town's policy to encourage the use of sustainable management practices so our forests can continue to provide irreplaceable benefits for residents and visitors as well as support the livelihoods of several logging professionals. At minimum, this management should follow VT AMPS and accepted silvicultural guidelines described by USDA guides. It is the Town's policy that the Town Forest will be managed using these and other standards to ensure protection of soil, water, and other long term resources.

*Recreation*

It is the Town's policy to encourage sharing access to private lands for uses such as hunting, fishing, boating, walking, and winter recreation, but to also respect that some residents may wish to post their land. Residents and visitors are requested to check with landowners for permission prior to entering their land for recreational purposes as a courtesy. It is the Town's policy to encourage new recreational enterprises in Charleston as long as these enterprises protect and preserve our natural resources, and are in proper scale with our Town's rural setting.

A. Transportation

*Town Roads*

It is the Town's policy to build our roads with good base material and good top crush, by removing shoulders to allow water to run off, and by maintaining ditches according to Vermont Highway Codes & Standards and Better Roads guidelines. These steps allow our roads to last longer and require less maintenance. Roads on Dane Hill and Echo Lake, Hudson Road, and Gratton Hill Road were upgraded under this Plan. The Town intends to bring one road, or at least a large portion of one road, up to these standards each year.

With assistance from a Better Roads *Road Inventory and Capital Budget Planning Grant*, the Town is working in 2018-2019 with Transportation Planners at NVDA to complete a Town-wide inventory of road related erosion and stormwater issues, prioritize future repairs, and develop a capital budget Plan to bring the Town into compliance with Act 64. The Town filed the required MRGP Notice of Intent in 2018, has received "Authorization to Discharge Stormwater" under the permit, and will submit all required fees before the June 2019 deadline.

The Town has purchased two gravel pits to provide for future needs: the former Erma Worth pit on Ten Mile Square Road was secured for winter sand and rough fill; and the former Ned Fauser pit was acquired in 2012 to secure product to make crushed gravel for many years to come. This pit produces a better-packing crushed product, and should result in future roads being better able to withstand rains, traffic, and every day wear and tear.

*Trails*

It is the Town's policy that there be no use of motorized vehicles on Town trails with the following exceptions:

- Snowmobiles can use designated rights-of-way with the written permission of the Selectboard during the season.
- Adjoining landowners may use motorized equipment on the trail right-of-way to access their land and do not need written permission.

All other motorized traffic is prohibited (e.g., dirt bikes, ATVs, four-wheelers, and any other wheeled recreational vehicles).

*Parking, Public Transportation*

Except as required by the Town's private commercial enterprises such as inns, retail stores, service business, and the like, it is the Town's policy to oppose development of large paved public parking areas that are not in proper scale with our Town's rural setting.

It is the Town's policy to support development of one or more public parking areas for use by Town residents to encourage carpooling and ride sharing as a strategy to reduce transportation energy demand and single occupancy vehicle use.

It is the Town's policy to oppose an airport in the Town as this is not in proper scale with our Town's rural setting. It is the Town's policy that any public transportation facilities are in proper scale with our Town's rural setting.

*EV Charging Station*

The Town is seeking to site and maintain an EV charging station in a centrally located area to allow EV owners in the Town to sufficiently charge their vehicles to be able to travel fully charged to charging stations in nearby regions. The Town will apply to the state Agency of Commerce and Community Development to seek financial support for this venture.

*Trails*

The Town encourages development of hunting and hiking trails, and snowmobile trails through private investment and maintenance as these will serve our residents and bring visitors and new business to our Town.

B. Utilities and Facilities

*Water and Sewer*

It is the Town's policy that centralized water and sewer services are not appropriate or necessary for Charleston. State regulation of septic systems is sufficient to guard our natural resources. Private associations of residents who live adjacent to our lakes, ponds, and wetlands are encouraged to set standards for residences in their immediate area as long as these meet existing state and federal regulatory standards.



*Fire and Rescue*

It is the Town's policy to encourage and support efforts by the Town's fire department to build a new fire station over time. The fire department's Board of Directors—believing that the present station has reached its full potential and that the current needs of the community might be better served by a newer, multipurpose building—continue with their discussions on such a proposal.

C. Natural Resources Areas

The preservation and protection of Charleston's natural resource areas is a core objective of our Town Plan. Charleston intends by this Town Plan to preserve and protect to the greatest extent possible in their natural condition the Town's natural resource areas. It is the Town's policy to prohibit any development within a natural resource area in the Town and any development that will cause degradation of a natural resource area in the Town, except as specifically mandated to keep this Plan in compliance with state law.

*Special Wildlife Habitats*

Removal of the mature softwood cover in deer wintering areas through logging render these areas ineffective as deer wintering habitat. The Town encourages input from hunters, landowners, and biologists to help determine the current status of these areas, and shape Town policy around maintaining them. Wetlands and surface waters in the Town can be protected by adhering to VT AMPS, preventing sediment pollution (manure) from entering into streams, preventing and/or controlling invasive plant populations, and maintaining riparian buffers. The Town encourages protection of other rare or sensitive natural features or species as these are identified (including vernal pools).

D. Aesthetics and Scenic Beauty/Orderly Development of Town and Region

Charleston's aesthetics and scenic beauty are unparalleled in the Northeast Kingdom. Charleston's mountain ridgelines and high elevation areas contribute substantially to the scenic beauty of our area. It is the Town's policy that any development is prohibited in Charleston's mountain ridgelines and high elevation habitats as these are included within Charleston's natural areas that are to be preserved in their natural condition, except as specifically mandated to keep this Plan in compliance with state law.

It is the Town's policy that construction of any commercial facility for the generation, transmission or distribution of electrical energy, including construction of meteorological towers that collect wind data, is prohibited upon ridgelines and mountain areas within the Town of Charleston, except as specifically mandated to keep this Plan in compliance with state law.

Northeast Kingdom ridgelines and high elevation areas are particularly vulnerable to development for wind generation projects. Modern commercial wind turbines are massive industrial machines that are out of character with Charleston's unspoiled natural environment. Development of Charleston's mountain ridgelines and high elevation habitats would result in an undue adverse impact on the aesthetics and scenic beauty of our Town. The construction and siting of an electrical generation facility on Charleston's unspoiled ridgelines and mountain areas would be so out of character with our surroundings as to offend the sensibilities of the average person.

Charleston's economic future is tied inextricably to our ability to preserve our natural environment. Industrial scale facilities for the generation, transmission or distribution of energy located on Charleston's ridgelines or mountain areas would unduly interfere with the orderly development of Charleston and the surrounding region. The societal benefits attained by preserving the aesthetics and scenic beauty of our area, protection of our natural resources and maintenance of our rural character outweigh any potential economic gain or amount of energy that may be produced by commercial development of Charleston's ridgelines and mountain areas.

Charleston's prohibition against construction of any commercial electric generation facilities upon the Town's ridgelines or mountain areas, except as specifically mandated to keep this Plan in compliance with state law, is a clearly written community standard intended to preserve the aesthetics and scenic beauty of Charleston, and is a land conservation measure intended to protect and regulate the orderly development of Charleston and the region. This prohibition shall be construed by local and state regulatory bodies to achieve its full intended purpose.

#### E. Educational Facilities

##### *Charleston Elementary School*

The student population at the Charleston Elementary School has fluctuated from year to year but consistently averages just over 110 students. While the Town might benefit from some expansion of the current facility, particularly in light of the school's commitment to provide pre-school services to all three- and four-year-old children, initial focus is on making the human and financial investments needed to support academic opportunities and outcomes for our children.

It is the Town's policy to encourage student academic achievement by supporting the elementary school's efforts to develop a culture of high expectations for all students and staff, and ensure that Common Core Standards can be achieved in all classrooms to allow students to progress smoothly through grade levels, and be ready to achieve at the high school level when they graduate from our school. To support this, the Town's top priorities are to:

- Have sophisticated technology in the classrooms, including laptops for all students in grades 5 through 8 and an upgrade of the school's wireless capacity.

- Improve content in the school library to ensure students have learning materials to meet literacy goals of Common Core Standards, including access to non-fiction periodicals online.
- Continually assess the number of teachers to appropriately accommodate the student population of the school.

It is the Town's policy to provide all students with opportunities to develop a positive sense of self, respect for others, and responsible behaviors, and to provide a learning environment appropriate to each child's needs, where all students experience the excitement of learning, can become independent learners, and strive to do their best. The Town intends our students to be at the forefront of the 21<sup>st</sup> Century.

It is the Town's policy to oppose all efforts to combine our Town's elementary school with any school or schools outside of the Town's geographic area. The state Board of Education has been unable to articulate any benefits of such an action for our children or the Town. The harm to our Town of this unnecessary action includes loss of local control over our school, substantially longer bus rides for young children, higher barriers to parental involvement in school activities, higher student-to-teacher ratios, and the potential loss of a vital community building with multiple purposes, including the site for our Town Meeting, a polling site for elections, and the only feasible gathering place for numerous annual all-Town events.

#### F. Energy

The energy policies and targets clearly stated in this Plan, in addition to the Town's already robust generation of renewable energy, demonstrate Charleston's commitment to achieving the state's 2016 Comprehensive Energy Plan. As a small rural town in an economically depressed region, we do not have the same range of options available in more resourced areas. Nevertheless, we will make progress wherever possible within the policies set by this Plan. This section offers feasible pathways toward achieving the goals of Vermont's 2016 Comprehensive Energy Plan.

##### *Energy Efficiency Education for Residents*

It is the Town's policy to inform residents about technologies and programs available to them to improve the energy efficiency of their homes and business. While the pursuit of these resources will be left to the discretion of individual homeowners, landlords, and business owners, education efforts will include information about:

- Efficiency Vermont: [www.efficiencyvermont.com/](http://www.efficiencyvermont.com/), 888-921-5990: Locate certified energy auditors; contractors who do energy efficient buildings; retailers of energy efficient goods and services; and rebates and cash incentives and for energy efficient appliances. home energy audits, etc.
- VECAN (Vermont Energy and Climate Action Network): Help with solar: [www.vecan.net/going-solar-in-vermont/](http://www.vecan.net/going-solar-in-vermont/), 802-223-2328

**DRAFT for PUBLIC HEARING**

- VECAN for Energy Efficiency and Conservation: Links on lighting, weatherization, efficient windows, building efficient homes, etc. [www.vecan.net/resources/efficiency-and-conservation/](http://www.vecan.net/resources/efficiency-and-conservation/), 802-223-2328
- Low-income Weatherization help: <http://www.vtneto.org/>, 802-334-7378, 800-639-3212.
- Vermont Natural Resources Council: <http://vnrc.org>, 802-223-2328. Energy and climate action, sustainable communities, energy planning, help for energy committees, etc.
- USDA Rural Development Rural Energy for America Program Renewable Energy Systems & Energy Efficiency Improvement Loans & Grants: Guaranteed loan financing and grant funding to agricultural producers and rural small businesses to purchase or install renewable energy systems or make energy efficiency improvements.
- <http://www.rd.usda.gov/programs-services/rural-energy-america-program-renewable-energy-systems-energy-efficiency>.

*Promotion of Renewable Energy*

It is the Town's policy to support the generation of renewable energy as part of an overall energy policy that promotes energy conservation first and foremost, and uses technologies on a proper scale for our small rural Town. Charleston will continue to help meet the state's renewable energy generation goals by hosting the:

- West Charleston Hydroelectric Plant (see page 30 for details).
- Barton Village Hydropower Project (see page 30 for details).
- Charleston Community Solar Project (see page 31 for details).

It is the Town's policy to encourage the use of residentially-based solar, wind and other technologies sited at individual homes or those that jointly serve a small number of contiguous homes primarily for personal consumption. To implement this policy, the Town prohibits any utility-scale energy generation facility upon Charleston's ridgelines or mountain areas and prohibits any other energy facility for the generation, transmission or distribution of electric energy by water, solar, wind or other technologies that are not in proper scale with the rural, natural setting of our Town, and is not in compliance with the standards and restrictions clearly stated in this Plan, except as specifically mandated by state law.

*Residential Net Metering*

It is the Town's policy to support residential net metering to allow homeowners to utilize wind or solar as a renewable energy resource while operating an individual generation system. The siting of residential wind and solar generation net metering facilities shall be limited to areas where the turbines or solar arrays are not visible from offsite locations so that such facilities do not adversely affect the natural unspoiled beauty of the Town, except as specifically mandated to keep this Plan in compliance with state law. The Town will support renewable energy generation from manure lagoons or pits at the Town's several dairy farms to partially meet the energy needs of those farms.

*Energy Efficiency and Fuel Switching*

It is the Town's policy to promote and advance energy efficiency and fuel switching in residential and commercial energy use, and upgrade electrical equipment to the greatest degree possible given the significant economic limitations facing individual households and commercial enterprises in our Town. Strategies to encourage fuel switching will include educational and outreach efforts by the Town on the use of alternative fuels such as biofuels for vehicles, wood pellets for heating, heat pumps, etc. Targets for these efforts are stated in Part III of this Plan.

*Methane Generation*

It is the Town's policy to support the generation of methane through anaerobic digestion of manure, agricultural wastes, and other organic wastes. The procedure destroys harmful pathogens, reduces water quality impacts, reduces manure odors, and provides a source of income to local farmers. Currently there are no methane digesters in Charleston because systems are costly and not feasible for the farms in our Town, which already struggle to meet rising costs of operation. The Town will seek opportunities to site a methane generation facility in Charleston.

G. Housing

*Housing Affordability*

It is the Town's policy to address housing affordability by focusing on strategies to help residents remain in their current housing, including:

- Town efforts to share information with residents and business owners to promote resources available to them to make their homes more heat and energy efficient, and thus more affordable.
- Welcoming development of affordable rental housing to attract young people, and to provide housing for lower and middle income households, provided that this housing is developed on a proper scale with the rural character of our Town.
- Urging state lawmakers to moderate state-mandated taxation to allow homeowners and other residents to direct their financial resources to help meet the costs of remaining stably housed.

*Elderly and Disabled*

It is the Town's policy to let family, friends, and community look after their own. Nuclear and extended families remain an important part of Charleston's social fabric. Our Town's culture places family at the center of our rural life. Residents who might be viewed as elderly or disabled in other cities and towns are valued first and foremost as family members in Charleston, and are nurtured and cared for by their families and neighbors. All Town residents are housed at this time.

1 H. Economic Development/Employment

2  
3 The overall picture in Charleston is a community with a mix of occupations, operating at a scale  
4 that makes sense for our Town's natural resource base, and small town atmosphere and quality  
5 of life. Residents feel strongly that this is how our Town should remain. There is strong interest  
6 in attracting new business and new employment to the Town if these commercial interests and  
7 economic development opportunities are on a proper scale with our Town's rural setting.

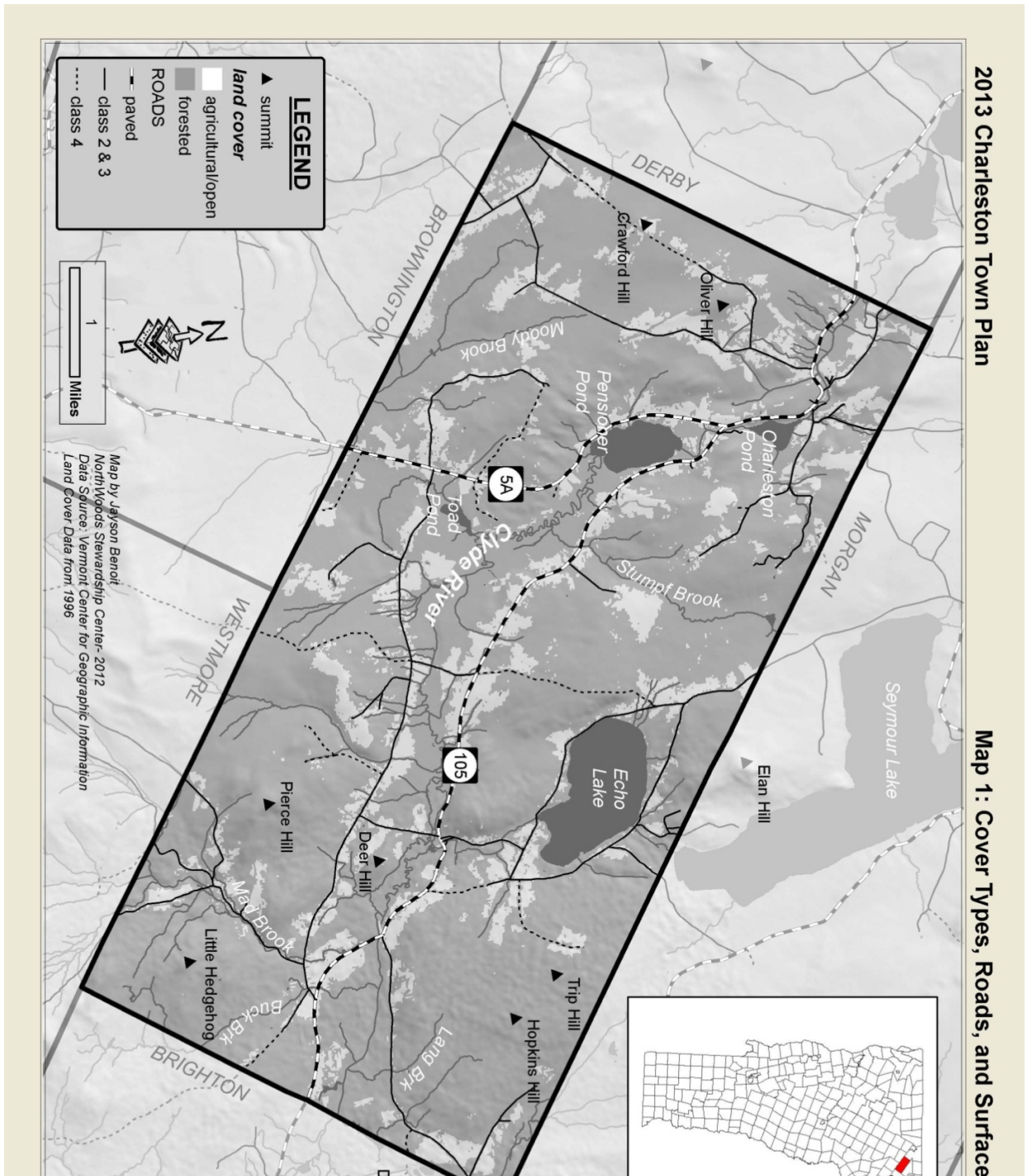
8  
9 Many of Charleston's businesses and enterprises are contingent on the Town's ability to protect  
10 our land, rivers, lakes, hills and mountains. Charleston will be able to continue to attract new  
11 business, new employment, new residents, and visitors from other parts of the state and nation  
12 to the degree to which we can maintain our Town's natural beauty and rural setting. As one of  
13 the few remaining undisturbed areas in Vermont, our natural, rural quality is one of the Town's  
14 chief economic assets and a central driver of economic opportunity for our community. The  
15 Town will continue to seek and support commercial and economic development limited to  
16 smaller and medium scale businesses, and commercial enterprises that are in proper scale with  
17 our Town's rural character and scenic beauty, and preserve our natural landscape.

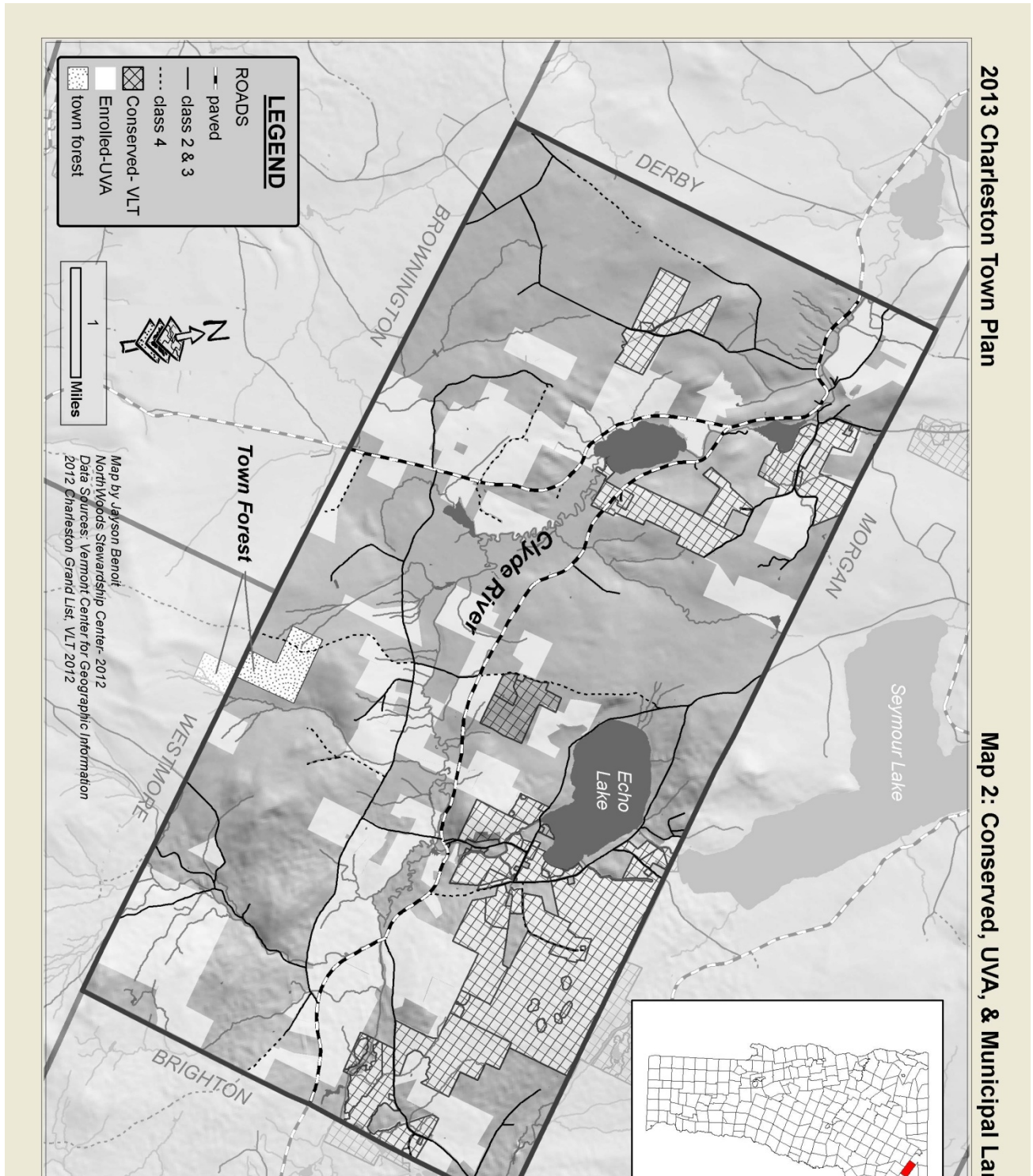
18  
19 To support revitalization of our Town centers in East and West Charleston, the Town will apply  
20 to the Agency of Commerce and Community Development's *Designated Village Centers*  
21 program that provides tax credits, access to state grants, technical assistance to help local  
22 revitalization efforts.

23  
24 J. Flood Resilience

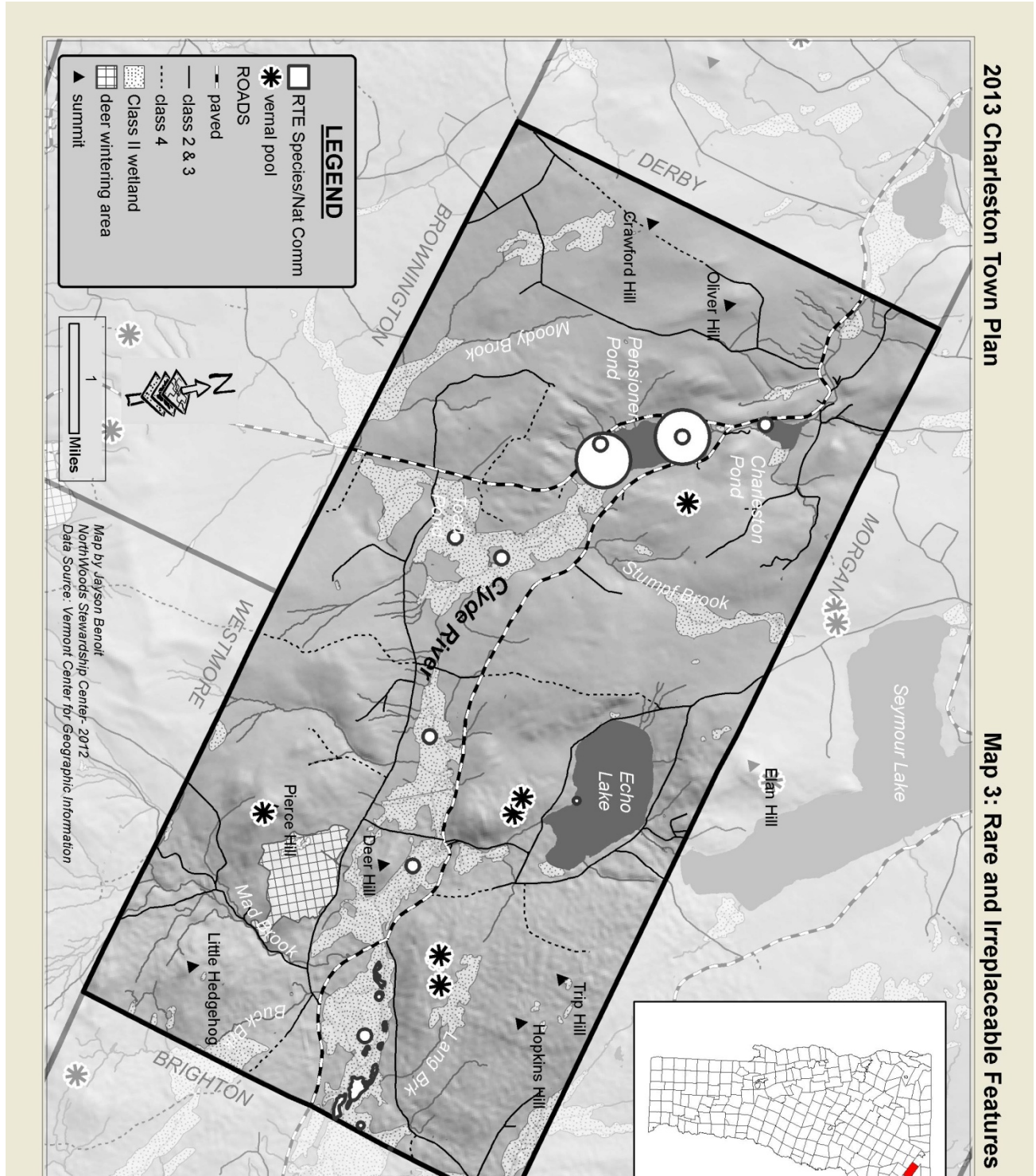
25  
26 It is the Town's policy to continually update its Local Hazard Mitigation Plan and to take part in  
27 the Better Roads Program that provides grants and technical assistance to help the Town avoid  
28 erosion and flash floods resulting from road design and construction. In light of the potential for  
29 severe weather events, it is the Town's policy to align with applicable and logistically feasible  
30 recommendations and considerations resulting from the coordinated flood resilience efforts of  
31 state and federal agencies.

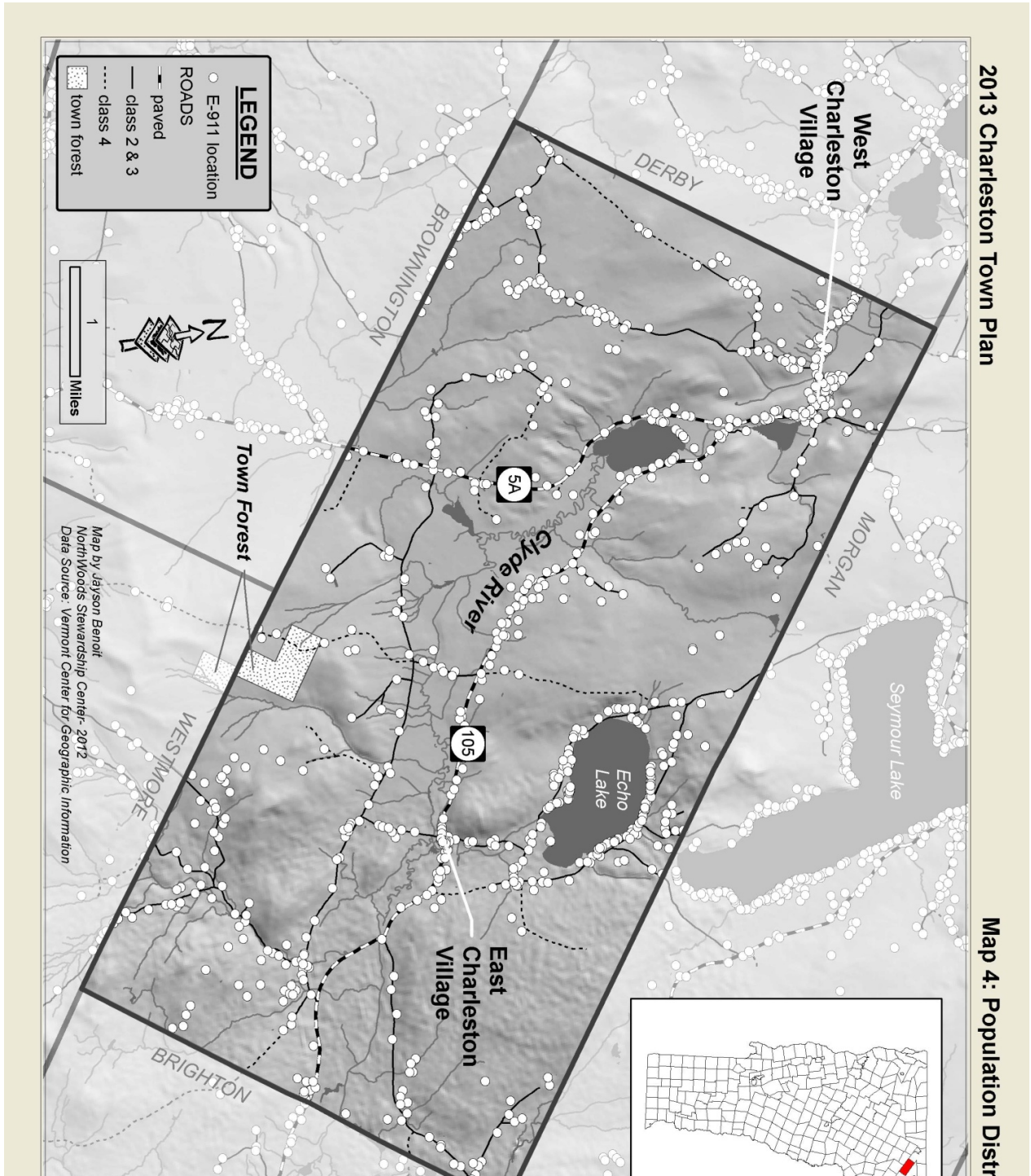


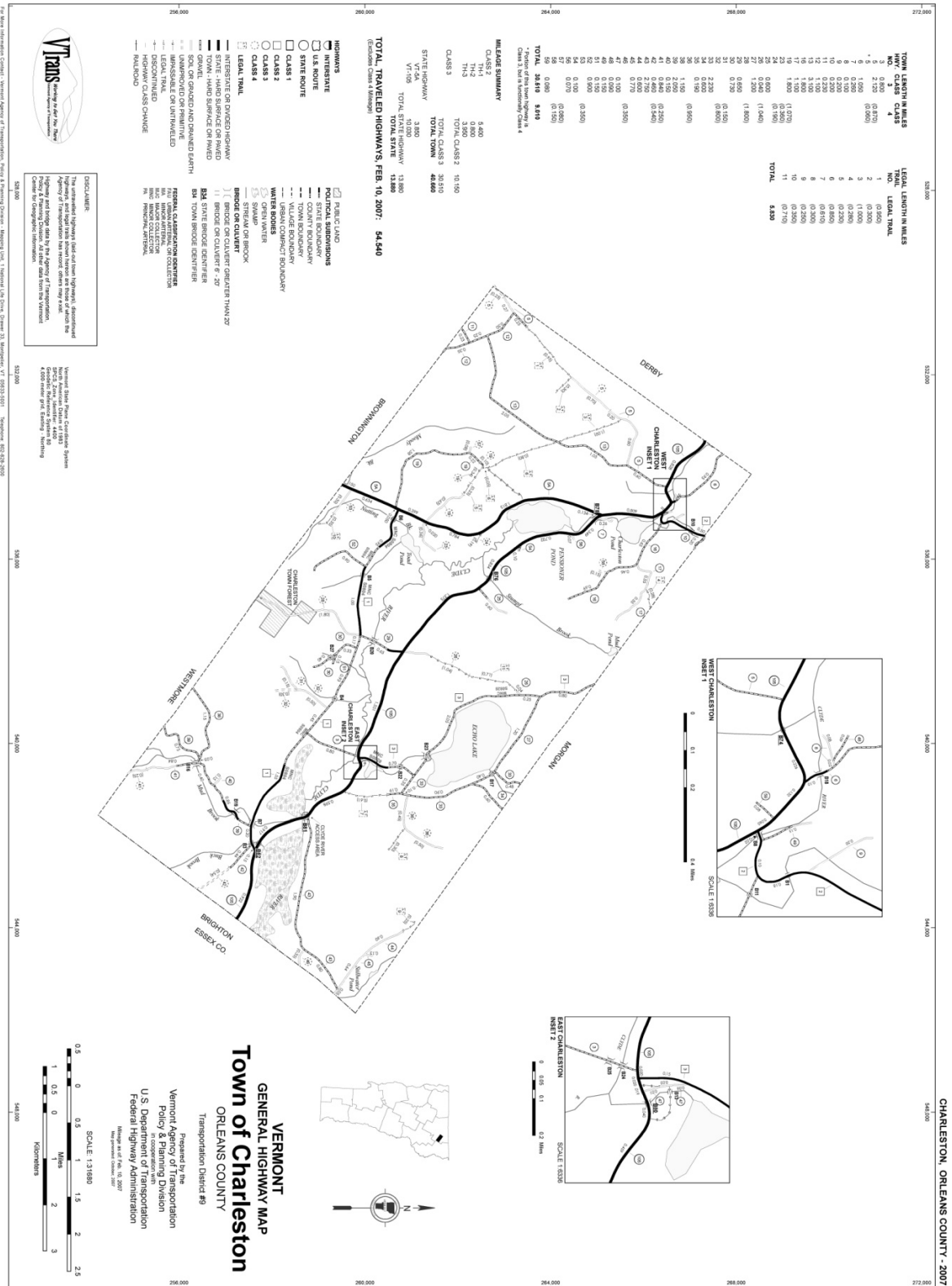








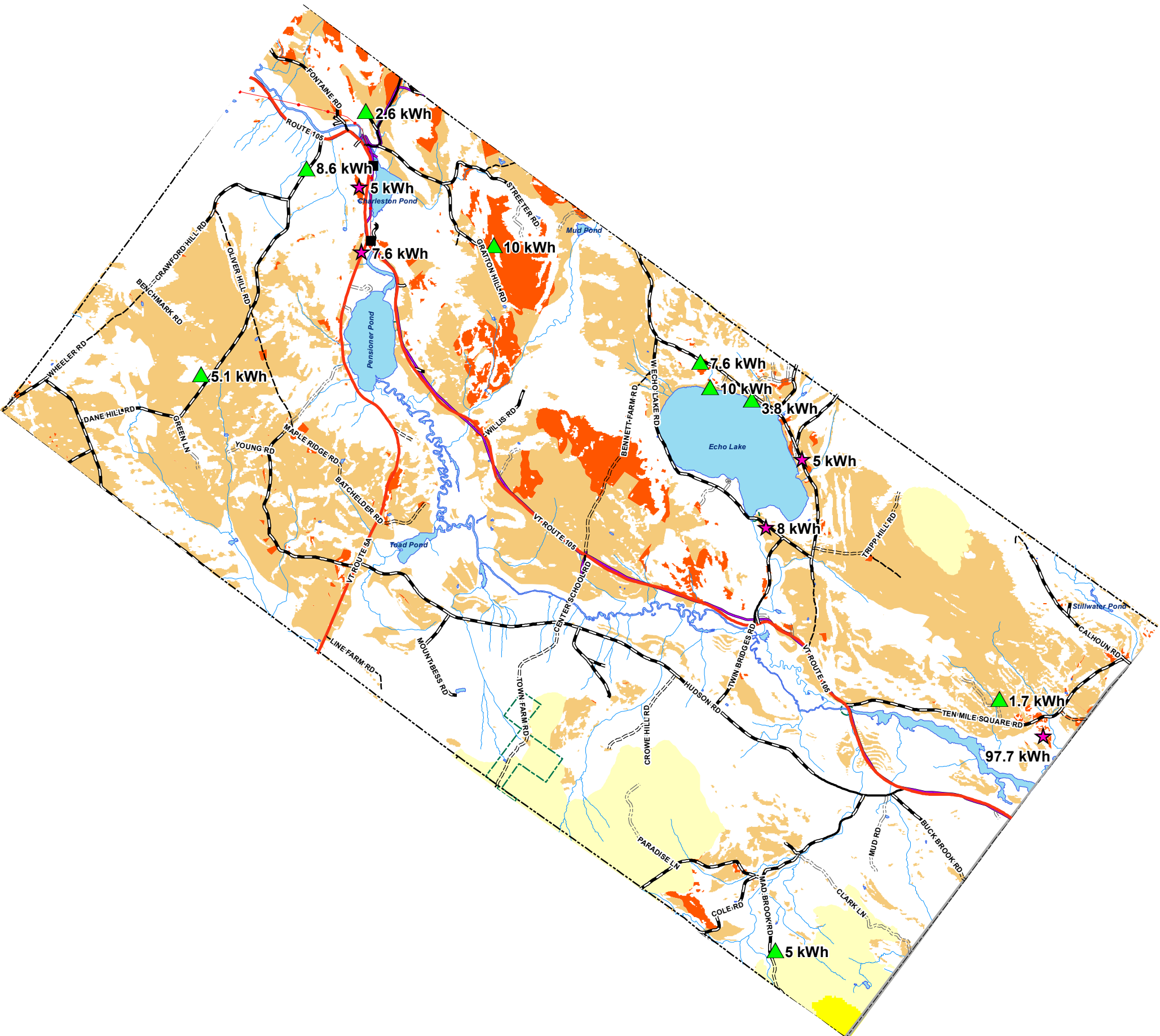






Town of Charleston, VT  
Solar Energy Potential Map

09/10/2018

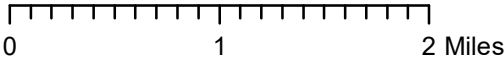


Existing Soalar Sites

- Ground-mounted PV Trackers
- Roof-mounted PV Panels
- Sub Station
- US & State Highways
- Paved Town Road
- Unpaved Town Road
- Class 4 Town Road
- Legal Trail
- Private Road
- Major electric transmission line
- 3 Phase Power Lines (Data is not available for all areas)
- County Boundary
- Town Boundary
- Streams
- Lakes, Ponds & Rivers
- Public Lands Boundary
- Areas Over 2000' Elevation (Proposed Regional Constraint)
- Areas Over 1700' in Elevation (Town Constraint)

Prime Solar

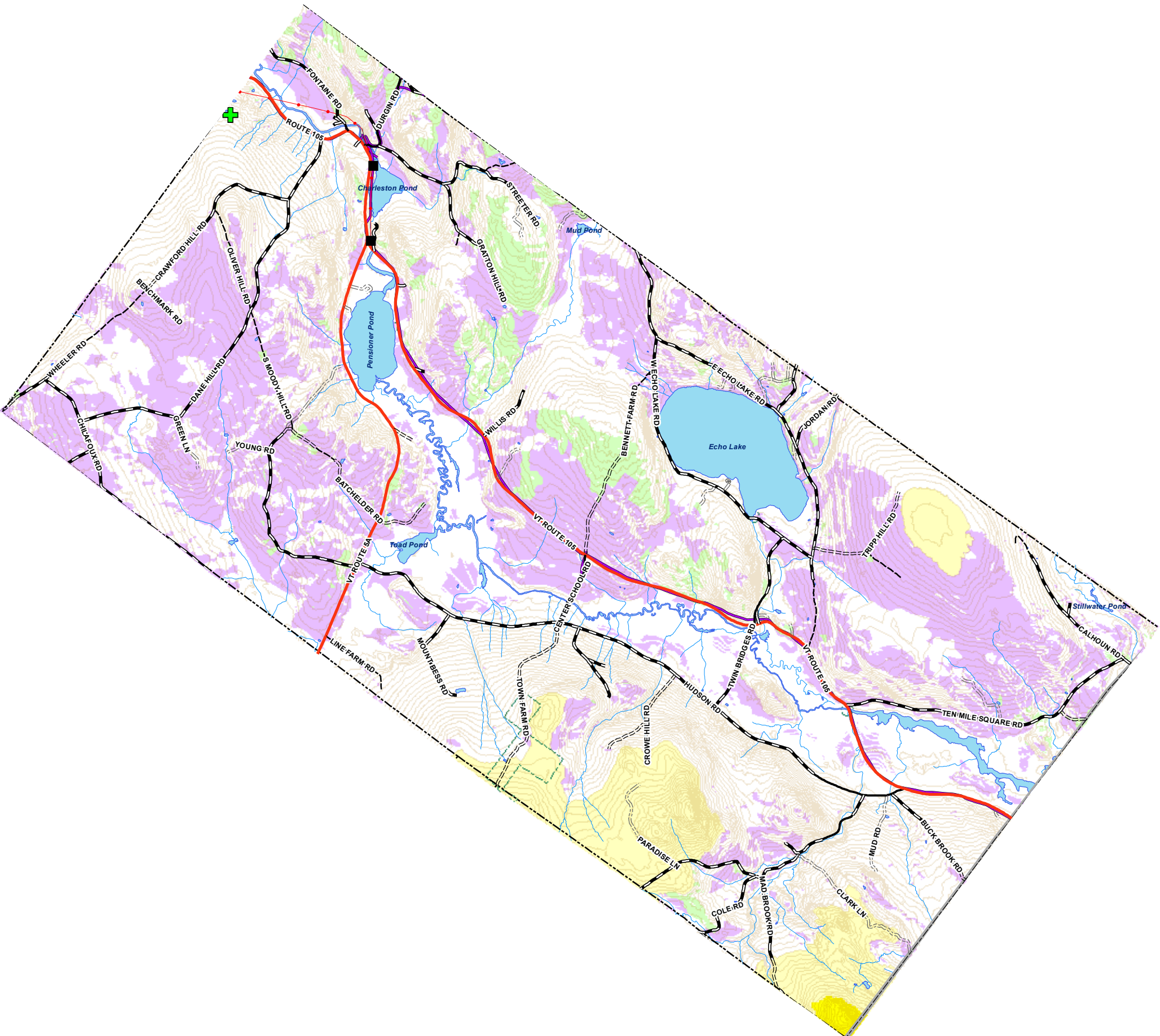
- No State Constraint
- Possible State Constraint



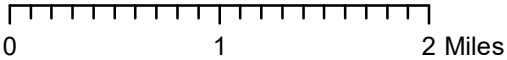
Warning- This Data is for planning purposes only and does not replace a survey and/or engineering study. Because this map is developed from various scale sources, there may be some discrepancies between data layers.

Town of Charleston, VT  
Wind Energy Potential Map

09/10/2018

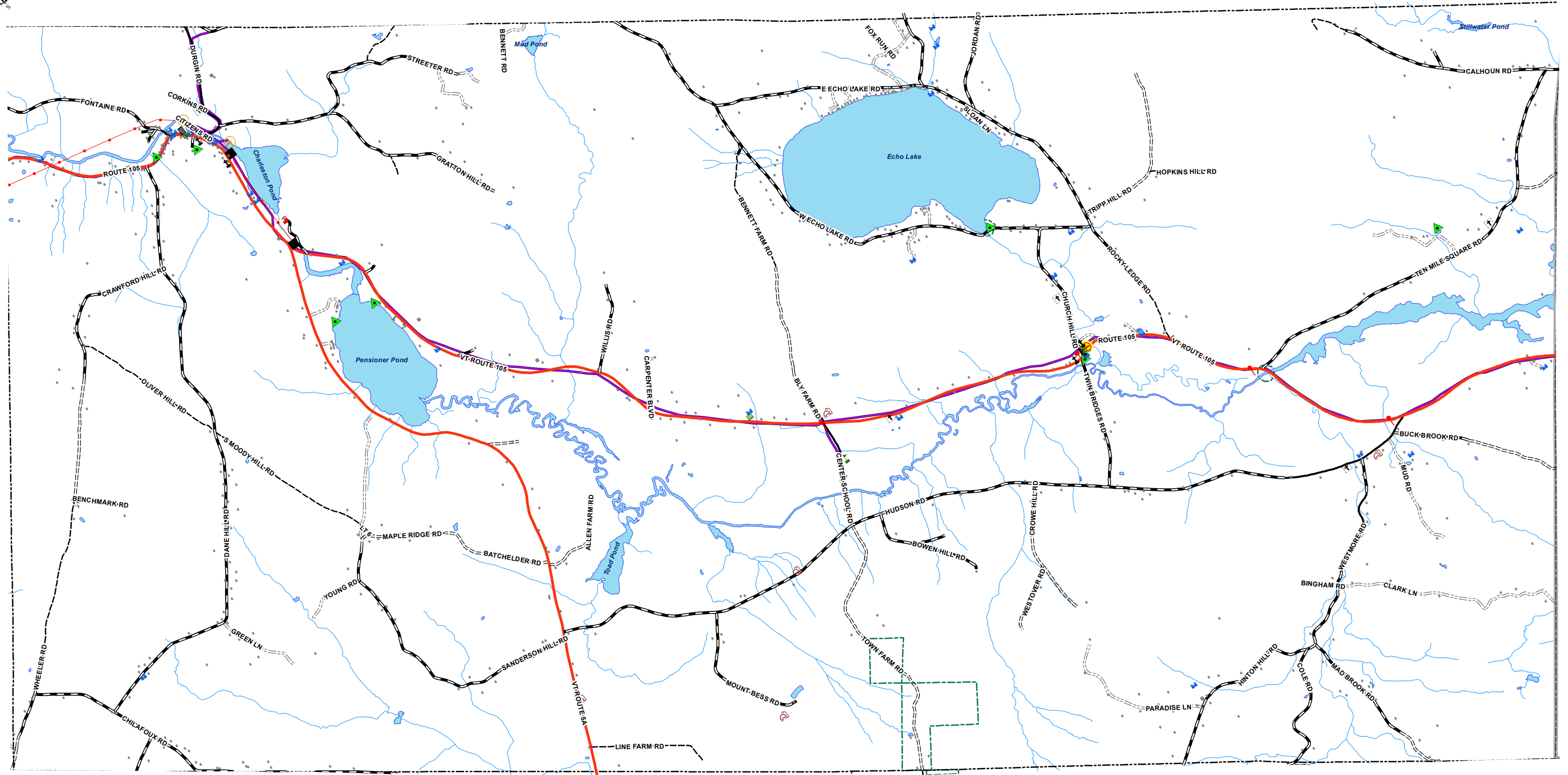


- Charleston\_Wind\_Sites
- Sub Station
- US & State Highways
- Paved Town Road
- Unpaved Town Road
- Class 4 Town Road
- Legal Trail
- Private Road
- Major electric transmission line
- 3 Phase Power Lines (Data is not available for all areas)
- County Boundary
- Town Boundary
- Streams
- Lakes, Ponds & Rivers
- 20' Interval Elevation Contours
- Public Lands Boundary
- Areas Over 2000' Elevation (Regional Constraint)
- Areas Over 1700' in Elevation (Town Constraint)
- Prime Wind Areas**
  - No Constraint
  - Possible Constraint

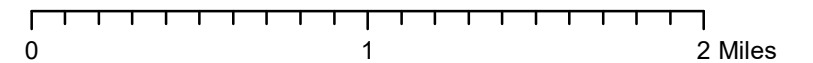


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- |                           |                                  |   |                       |
|---------------------------|----------------------------------|---|-----------------------|
| Multi-Family Dwelling     | School; SCHOOL K / 12            | US & State Highways                                       | County Boundary       |
| Single Family Home        | Government Building; POST OFFICE | Paved Town Road   | Town Boundary         |
| Commercial with Residence | House of Worship                 | Unpaved Town Road   | Streams               |
| Communication Tower       | Cemetery                         | Class 4 Town Road   | Lakes, Ponds & Rivers |
| Commercial Building       | Hydroelectric Facility           | Legal Trail   | Public Lands Boundary |
| Industrial Building       | Community/Recreational/Cutural   | Private Road  |                       |
| Farm                      | Other Building                   | Major electric transmission line                          |                       |
| Fire Station              | Sub Station                      | 3 Phase Power Lines (Data is not available for all areas) |                       |



**Warning- This Data is for planning purposes only and does not replace a survey and/or engineering study. Because this map is developed from various scale sources, there may be some discrepancies between data layers.**

**Town of Charleston, VT**  
**Base Map**  
09/10/2018