

Town of Jamaica, Vermont



Town Plan

Adopted, with amendments,
January 10, 2022

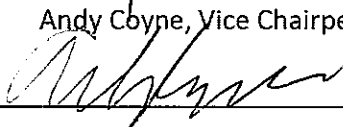
Jamaica Town Plan
2017 Update
as amended January 10, 2022

Adopted, with amendments, by the Jamaica Selectboard
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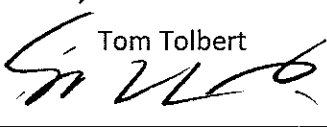
Greg Meulemans, Chairperson



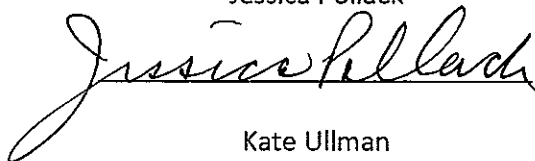
Andy Coyne, Vice Chairperson



Tom Tolbert



Jessica Pollack



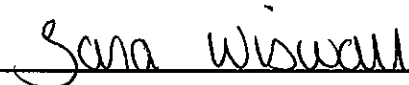
Kate Ullman



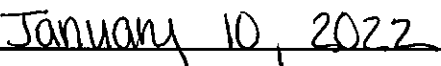
Clerk's certificate:

I, Sara Wiswall, Clerk of the Town of Jamaica, Vermont, do hereby certify pursuant to 24 VSA, §4447 that the actions required by 24 VSA, §§ 4384, 4385 and 4444 were taken by the designated parties with respect to the adoption, with amendments, of the proposed municipal plan for the Town of Jamaica, of which the attached is a true copy.

Signed:



Date:



Jamaica has had a Town Plan since 1974. The plan was updated in 1991, 1995, 2001, 2006, 2012 and 2017, and was amended in 2022. The plan may be reviewed by the Planning Commission and updated or amended, after public hearings, in light of new developments and changed conditions affecting the Town. Without further action, this plan will expire, as provided by State Law, on November 13, 2025.

Jamaica Town Plan
Adopted by the Jamaica Selectboard November 13, 2017
Adopted, with amendments, by the Jamaica Selectboard
January 10, 2022

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I. INTRODUCTION

OVERVIEW

This plan, like all plans, is a work in progress. It represents hours of careful discussion, thoughtful deliberation, and interaction between citizens, Selectboard members, and Planning Commissions past and present. Municipal planning commissions are required to review, update as necessary, and adopt their Town Plans every eight years. The Jamaica Planning Commission obtained a municipal planning grant to undergo thorough study and community involvement to assist in the rewriting of this version.

Building upon the knowledge gained from a Community Survey completed in 2006 that made extensive study of three issues: water and waste water, affordable housing and conservation, in the fall of 2014, the Jamaica Planning Commission (JPC) working with the Windham Region Commission invited the public to participate in a Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis. This reaffirmed that the townspeople valued Jamaica retaining its rural character, but also wanted to ensure that the town had adequate infrastructure and services to make for a livable community, including a strong school, cultural activities, and a viable small business community.

In the spring of 2017, the JPC applied for and received a Municipal Planning Grant from the state to facilitate the complete review and updating of the Town Plan. The JPC then hosted community discussions on the above stated three main areas of concentration, which were followed with subsequent meetings to discuss the language in the Town Plan. Interviews were completed with local organizations such as the Fire Department, Library Board, school officials from Leland & Gray, and Jamaica Village and other local business owners.

We are grateful to the community for their participation, vision, and guidance and have used the information collected throughout the development of this Town Plan.

PURPOSE OF THE TOWN PLAN

The Jamaica Town Plan provides a comprehensive statement about where we are as a community, our goals and our needs for the future. Official adoption of the Plan represents a community decision about the future character of the Town, priorities for land use and conservation of natural resources. It is the purpose of the Plan to help the Town achieve its shared vision and values through the development of goals, policies and priorities that establish a standard of review for Act 250 proceedings and other state regulatory processes. The Plan directs state agencies to take only those actions in Jamaica that are compatible with the goals, policies and priorities of the Town Plan. With approval by the Regional Commission, the Town may also request that the Regional Plan be reviewed for compatibility with the Town Plan.

The Plan also serves to increase the amount of local control exercised over future development in Jamaica by:

1. Allowing the citizens of Jamaica to have the opportunity to put into writing how a variety of issues may be resolved or acted upon before they arise through the Town Planning process. The Plan therefore is an obligation and a commitment by appointed and elected officials at all levels of government to resolve issues according to the direction that has been established in the Town Plan by the people of Jamaica.
2. Providing a basis for the development and interpretation of Town bylaws, regulations and ordinances. The Town Plan can be thought of as the Town's constitution in that future

decisions and local laws should be consistent with the direction set forth in the Town Plan. That is, the Plan establishes standards and the direction for future local bylaws, regulations and ordinances or future amendments to existing local laws.

3. Establishing policies that will be considered in regional and state planning efforts, and for **the issuance of permits under Vermont's Land Use and Development Act (Act 250) and** Certificates of Public Good (Section 248) from the Public Service Board.
4. Directing the Planning Commission to develop work programs that address the issues, tasks and studies suggested in the Town Plan.
5. Serving as a source of information for the Planning Commission, Board of Selectmen, Zoning Board of Adjustment, citizens and businesses.

PLANNING PROCESS GOALS

1. To establish a coordinated, comprehensive planning process and policy framework to guide local decisions.
2. To encourage citizen participation at all levels of the planning process, and to assure that decisions shall be made at the most local level possible commensurate with their impact.
3. To consider the use of resources and the consequences of growth and development for the region and the state, as well as the community in which it takes place.
4. To assist adjoining municipalities to develop and implement compatible Town Plans.

The planning process is a continuous process that requires ongoing contributions from Town citizens and community leaders. The planning process goals will guide the Planning Commission in obtaining local input and participation when evaluating important planning issues.

2010 CENSUS

The census data is an important aspect to the Town Plan as it shows trends regarding the history of Jamaica. Data elements provided by the census, such as population, employment, income, housing and demographics, are compiled and analyzed to be used in the planning process. Town Plan elements such as Housing and Economic Development are dependent on this census data.

Census Data and the American Community Survey

There are different sources for data used to inform the Plan. The numbers do not always match precisely, in part because they are generated using differing methodologies and timeframes. The **decennial census, conducted once every ten years, collects "point-in-time" data. The American Community Survey (ACS) is conducted year-round to gather "period" data that are five-year** rolling average estimates which have a relatively large margin of error; they do not reflect actual counts like population, age, or sex. These estimates can be useful when analyzing trends in small populations, but should be used cautiously when making direct comparisons. While the data inform the discussion of the Town Plan, ACS figures have margins of error and should not be interpreted as literal or precise.

II. COMMUNITY PROFILE

HISTORY

Sculpted by the last ice age, the topography of Vermont was forever altered. Glaciers gouged out valleys and carved mountains that were much steeper and higher than they are today. Erosion led to fertile valleys in the lowlands and to the rocky terrain that characterizes much of the area now

known as Jamaica. In Jamaica one can find gneiss rock formations such as Ball Mountain and Attridge Mountain. High terraces above the West River reveal banks of ancient glacial streams. These are a testament to the extraordinary forces that shaped the environment we enjoy today.

This area of Vermont was largely uninhabited in early history and used by native peoples primarily for hunting and fishing. Early travel routes passed through the Jamaica area, beginning at the Connecticut River and **following the West River. Called “Wantastiquit” (in the Algonkian language “top place of the river”) is a reference to the fact that the West River makes a major contribution to the Connecticut.** These routes followed the rivers across the mountains eventually to Otter Creek and north to Lake Champlain.

In the colonial period, what is now Vermont was disputed territory, with land claims arising from both New York and New Hampshire. The original grants for this area were issued by the Royal Governor of New York in 1767 and 1772 and were for two towns. In 1777 the Independent Republic of Vermont was established and in 1780, ignoring the previous grants, gave charter for **“a tract of vacant land within this state which has not heretofore been granted “. The Charter goes on to say “that the same be and is hereby Incorporated into a Township by the name of Jamaica”.** The grant encompassed forty-two square miles. The land lies at an altitude ranging from 688 above sea level along the West River to 2,542 feet on The Pinnacle. There were sixty-seven **grantees listed on the Charter, and many of those names can be found among Jamaica’s residents today.** Jamaica is one of only two civic entities in Vermont whose modern name is derived from a Native place name, in this case the Natick word for “beaver”.

The earliest settlement of the town was along the West River near the Wardsboro Bridge, now called East Jamaica. It was here that the first school was established in 1791. The step-by-step building of roads and bridges pointing towards Manchester to the northwest moved settlement westward so that by 1800 it appeared that the town center was moving. Within the forty-two square-mile township of Jamaica there developed as many as ten separate hamlets surrounded by outlying farms, all linked to Jamaica Village by a network of roads. Eventually there were as many as 14 one-room schools which served the families in the outlying areas.

In the first quarter of the 19th century Jamaica Village assumed increasing importance as a center, largely for topographical reasons. Located near the confluence of the West River and Ball Mountain Brook, the area offered a strategic location for bridges, dams and mills. Along Ball Mountain Brook alone there were numerous dams, each providing power for at least one mill. **The first store “Noon House” was built in 1803. The popularity of “Noon House” led to the building in 1814 of Jamaica House, which provided a convenient overnight spot for travelers at the mid-point between Manchester and Brattleboro.**

The economy of Jamaica, like that of so many Vermont communities, prospered with the introduction of Merino sheep in the early 19th century. The Spanish sheep flourished on the rocky hillsides, and as their numbers increased, open land and bare hillsides replaced the forests which had characterized the earlier landscape.

Prosperity did not last. The depression that followed the Civil War and the decline in the wool market took their toll on the local economy. Population decreased. The rivers that had propelled **the economy also ravaged its infrastructure. In 1869 a great flood carried away “a mile of bridges” and damaged every dam on Ball Mountain Brook. During this period Jamaica and other towns in the West River Valley bonded together in a venture that was seen as the salvation of the**

area's economic woes, the West River Railroad. Originally chartered in 1867, the proposed railroad was to run from Brattleboro to Whitehall, NY. In 1877, financing provided by the valley towns moved the languishing project forward with the first segment from Brattleboro to Londonderry. Although it was never extended further, the railroad provided valuable public transportation for the lower West River Valley until the 1930's, by which time automobile ownership had become almost universal.

The high fields once grazed by sheep have returned to forestland. The mills and dams that once fueled the local economy are gone. Gone, too, are most of the hamlets. East Jamaica, Rawsonville, and Jamaica Village remain as the population and business centers of the Town. The basis of our economy has shifted dramatically, but our land and streams and our historic village remain. In 2006, the Town of Jamaica applied for and received Village Center designation status for Jamaica Village from the Vermont Department of Housing and Community Affairs. The Village Center designation status recognizes and encourages local efforts to revitalize Vermont traditional village centers. Jamaica Village is host to several town festivals, civic and recreational facilities, as well as several local businesses. In addition, the Town of Jamaica was designated as a Historic Village in 1974.

Adapted from Hometown Jamaica by Mark Worthen, a longtime resident of Jamaica.

RURAL CHARACTER

Jamaica currently reflects more than two centuries of growth and development guided by a wide variety of social, physical, and economic factors. The rural character of Jamaica is a quality of life based upon traditional rural landscapes, activities, lifestyles, and aesthetic values. For the purposes of this plan, Jamaica's rural character is defined by the following:

- Landscape: The rural landscape of wooded hillsides, open fields, uncluttered hilltops and ridges, unimpeded views of the night sky, and ample opportunities for outdoor recreation. It is a landscape where the natural appearance of the landscape dominates and natural processes are largely unaffected by human activity and infrastructure. The visual appeal of these varied elements of Jamaica is one of the reasons people are strongly attracted to the Town.
- Settlement: Jamaica's built environment is characterized by a densely settled, traditional New England village center that contains a collection of historic buildings and public institutions serving as the center for the community. The majority of residences in Jamaica are in a rural setting where inhabitants feel a strong connection to the natural environment. Although the transportation system has increased accessibility, it does not diminish the connection to the land.

POPULATION

Town Population for the Period 1791 to 2010

Jamaica's resident population has continued to increase since 1960 (Table 2 -1). Between 1990 and 2000, Jamaica experienced its largest increase since the 1800's.

Table 2-1: Jamaica Population, 1791-2010

Year	Population	# Change	% Change*	% Average Annual Rate
1791	263	N/A	N/A	N/A

Year	Population	# Change	% Change*	% Average Annual Rate
1800	582	319	121.3	13.5
1840	1,586	1,004	172.5	4.3
1860	1,606	20	1.3	.1
1880	1,252	(354)	(22.0)	(1.1)
1940	567	(685)	(54.7)	(0.9)
1950	597	30	5.3	0.53
1960	496	(101)	(16.9)	(1.69)
1970	590	94	18.9	1.89
1980	681	91	15.4	1.54
1990	754	73	10.7	1.07
2000	946	192	25.5	2.55
2010	1,035	89	9.4	0.94

Source: US Census and W. E. Booker

Population Growth in Jamaica and Surrounding Towns

Table 2-2: Population Growth, 2000-2010

Town	2000	2010	# Change	% Change
Jamaica	946	1,035	89	9.4
Townshend	1,149	1,232	83	7.2
Windham	328	419	91	27.7
Winhall	702	769	67	9.5
Wardsboro	854	900	46	5.4
Stratton	136	216	80	58.8
Londonderry	1,709	1,769	60	3.5
Windham County	46,449	44,513	-1,936	-4.2

Source: 2010 US Census

In the recent past, the rate of growth in Jamaica has been higher than the region as a whole and fairly average compared to many of the neighboring towns (Table 2-2). Jamaica, and its neighbors, experienced some of the largest population increases in the county.

Population Projections

Population projections prepared by the VT Department of Aging and Independent Living for Jamaica estimate that the town will continue to grow, but at a slower rate than the community experienced in the late twentieth century (Table 2-3).

Table 2-3: Population Projections for Jamaica

Year	Projected Population	# Change	% Change
2000	946 (US Census)		N/A
2005	1,006	60	6.3
2010	1,049	43	4.6
2015	1,084	35	3.4
2020	1,119	35	3.2

Source: VT Department of Aging and Independent Living

Age Distribution in Jamaica

In 2010, about 21.7% of Jamaica's population was under the age of 18 (Table 2-4). The working age population, those aged 18 to 64, accounted for 62.4% of the population while an additional 15.8% were aged 65 years and older.

Table 2-4: Age Distribution in Jamaica

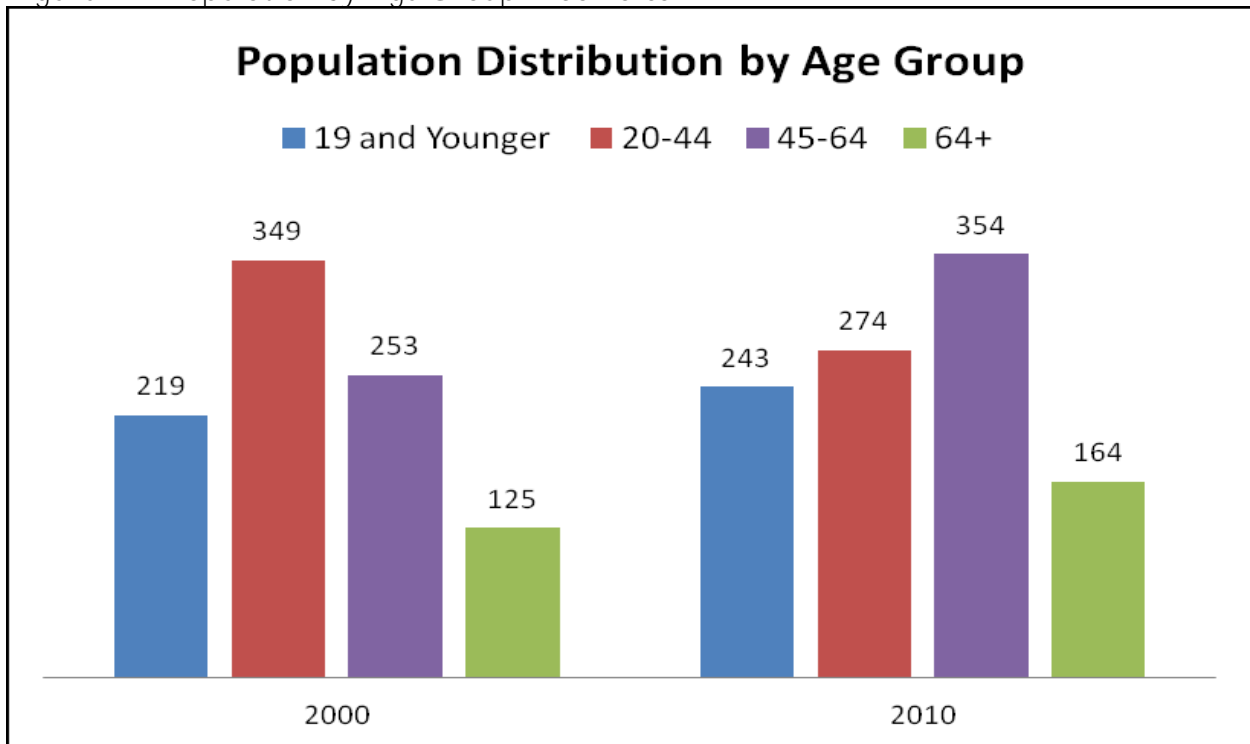
Age	2000	% of total*	2010	% of total*
Under 18	211	22.3	225	21.7
18 – 64	610	64.4	646	62.4
65 and older	125	13.2	164	15.8
Total	946	100	1,035	100
Median age	38	N/A	45	N/A

Source: US Census

* Note that percentages may not total to 100% due to rounding.

Figure 2-1 shows the age distribution in Jamaica in both 2000 and 2010. The fastest growing age group since 2000 is 45 to 64, The aging of the resident population and in-migration are contributing to the changes in this age group. By contrast, there was a decrease in those aged 20 to 44.

Figure 2-1: Population by Age Group in Jamaica



Source: U.S. Census Bureau, 2010 Census, 2000 Census

III. LAND USE

Current Land Use in Jamaica

The Town of Jamaica is situated in the eastern foothills of the Green Mountains. It is an area of steep forested hills and narrow river valleys. The Town consists of approximately 31,000 acres, approximately 90 percent of which is forestland. An estimated 70 percent of the forestland is hardwood (such as sugar and red maple, beech, yellow birch, and red oak) and 30 percent is softwood (mainly white pine and hemlock, and at higher elevations red spruce and balsam fir). Most stands represent a mixture of the two. Elevations on Turkey Mountain, College Hill, Mundal Hill, Sage Hill rise to just over 2000 feet while the Pinnacle reaches 2,500 feet. The little remaining open field land in Town is located along the West River in East Jamaica and Jamaica Village, along the Winhall River in Rawsonville and at three locations where land is still actively managed for agriculture. These areas and an area near the old hamlet of West Jamaica contain the only sizable areas of relatively flat land in Town.

Much of the development that has occurred in Jamaica is located along or near Vermont Routes 30 and 100. Other developed areas are found along Pikes Falls, West Jamaica Road, Turkey Mountain Road and in the Cole Pond and West Hill areas. Of the developed land in Jamaica, the principal land use is residential. Most of the commercial development is concentrated in Jamaica Village and Rawsonville. Other commercial development is scattered along Route 30. Cellular tower development will likely be an increasingly common land use as the Town, State and Country strive to broaden the cellular network. There is a recently constructed cell tower in East Jamaica.

Jamaica Village is the Town's cultural, civic, religious and educational center. Most of the Town-owned facilities are located here as are the church, post office, Masonic Hall, and commercial businesses including restaurants, shops, inns and bed and breakfasts. The land in Jamaica Village is already heavily subdivided. Most of these existing lots are already developed with one or more residential units, and some contain commercial-residential or multi-unit residential buildings. Of the 156 parcels within the Village, 4.5% are one-tenth acre or less, 45.5% are one-half acre or less, 62.2% are 1 acre or less, and 35.2% are between one and ten acres.

Rawsonville continues to experience commercial improvements including restaurants, specialty shops and car service stations that are associated with major regional attractions in the area. Rawsonville presently contains 69 parcels. Of these, 36.2% are one acre or less, 49.3% are one to five acres and the remainder range from five to thirty acres.

East Jamaica hamlet is an area of Town which can support a variety of land uses, including commercial and residential development.

Several platted subdivisions exist in Town which are not yet built-out. The larger subdivisions within this category include Wheeler Woods, Wild Turkey, Gleason Farms, Mountain Acres, Stonehedge, Cole Pond and Strattongate. These subdivisions collectively contain approximately 160 lots, a large number of which contain no houses. Most of these subdivisions are in the western part of Town.

Much of the total area of Jamaica is not served by maintained roads or public utilities; this has contributed significantly towards keeping these areas undeveloped. These remote areas are primarily used for timber production and recreation. Jamaica State Park and the federal flood control reservation areas are the most significant undeveloped outdoor recreation areas in the Town. The State Park consists of two parcels totaling 656 acres along the West River and Shatterack Mountain.

The Hamilton Falls Natural Area (owned and managed by the Vermont Department of Forests, Parks and Recreation) comprises approximately 52 acres. The Vermont Department of Forests, Parks and Recreation also owns the conservation area on Turkey Mountain Road which comprises approximately 312 acres.

The Ball Mountain flood control reservoir on the West River and land adjacent to the reservoir and the River are owned by the US Army Corps of Engineers and are available for recreation. With permission of the landowner, privately owned land in Jamaica is also used for recreation. Many of the streams and trails which cross private lands have traditionally been used for informal recreational activities such as hunting, hiking, swimming, skiing, snowmobiling and horseback riding.

Architectural Heritage

Jamaica has a large and rich collection of architecturally significant buildings representing styles from various periods. These structures serve as a link to our past and help strengthen our local economy by increasing property values, promoting investment, and contributing to the scenic character of Jamaica. It is important that the Town should preserve its historic buildings as important principle in guiding growth. Considerable care should be taken to preserve this heritage.

Night Sky

In most populated areas, being able to enjoy the night sky is becoming a rarity. Residents and visitors to Jamaica are fortunate in that they can enjoy the night sky. The overuse of lighting can **be harmful to Jamaica's rural character. It can also be detrimental to road safety (through distraction and glare), energy conservation, and wildlife interests.** Appropriate lighting can prevent private and public nuisances and protect property value.

Land Use Plan

The Land Use Plan descriptions and policies represent a vision for the use and development of the lands in Jamaica, and the means to realize this vision. The Land Use Plan Map (included in Appendix C) **depicts the areas that are described below. Jamaica's Land Use Plan is greatly** influenced by the existing land use, natural and cultural resources, and transportation patterns.

Within all Land Use Districts, specified maximum development densities shall be calculated using the Gross Land Area method. That is, the total number of units that can be developed on a parcel shall be calculated using the total area of the parcel, including land with site limitations as indicated in this Plan.

Conservation Areas

Conservation Areas are those areas that have unique or outstanding natural resource value, or are characterized by significant site limitations to development, such as critical wildlife habitat, wetlands, high elevation and steep slope lands, remote stream corridors and ponds, and scenic areas such as prominent ridge lines which are currently essentially undeveloped or without public road access.

These areas should be withheld from intensive development and restricted to development densities low enough to maintain resource values and clustered to maintain maximum open and undeveloped land and to promote contiguous, unbroken habitat. Overall development density in

these areas should not exceed one unit per 27 acres, equivalent to an overall density of 3.7 units per 100 acres, except in situations where it is clearly demonstrated that development to that density would seriously jeopardize a resource of special value.

Developers should consider using the “cluster design” principle. Cluster development is a type of subdivision design that locates the same number of houses on smaller lots to allow the remainder of the site to be used for agriculture, forestry, private open space, natural resource protection or similar open, undeveloped uses. Location of the developed and open areas should be based on the characteristics of the specific site.

Because of their cultural and natural significance, some areas within the Conservation Areas are more sensitive to development than others. Two types of overlay areas have been identified superimposed on the Conservation Areas and are shown on the Proposed Land Use Map. Below is a description of the overlay areas:

Conserved Lands

Conserved lands are defined as lands in Jamaica that are either publicly or privately conserved. Publicly-owned lands are land primarily used for recreation, forestry, or open space with the majority of land being in an undeveloped state. In Jamaica, these lands include lands administered by the US Forest Service, US Army Corps of Engineers as well as State Parks and Town owned forestland. Also included in the conserved land overlay is privately-owned land with a conservation easement. Most conservation easements are held by the Vermont Land Trust. Lands with conservation easements are not necessarily open to the public. However, they are grouped with the publicly-owned lands because they indicate a high level of commitment to preserving the ecological values of the land. Residential, commercial, and industrial uses other than agricultural and forestry are not encouraged in this overlay area.

Areas of Special Interest

Areas of Special Interest are areas with special natural and cultural resources that contribute to **Jamaica’s rural character and are specifically designated on maps including** the Proposed Land Use, Special Sites and Areas, Water Resources, and Wildlife and Plant Resources maps in this plan. They include, but are not limited to, scenic hillsides and ridgelines, scenic waterfalls or gorges, and important wildlife plant habitats. **In order to sustain Jamaica’s rural and scenic** character, these landscapes must be preserved. Residential, commercial, and industrial uses are not encouraged in this overlay area and development is prohibited on prominent ridgelines and peaks. Any development that occurs in these areas should avoid fragmentation of large tracts of land and be designed to have no impact on the special resource value of the area.

Rural Resource Areas

Rural Resource Areas are those areas with high resource value such as accessible buildable land, agricultural land, productive forestland, wildlife habitat and similar resource land. These areas should be developed for residential, commercial, recreational or open space uses only at densities low enough to protect their resource values and to minimize demands on Town and other public services.

As in Conservation Areas, developers in Rural Resource Areas are encouraged to utilize low impact development practices in order to maintain the rural character of the area. One example of low impact development is cluster units in locations more favorable for development and to balance this with larger conservation lots elsewhere.

In Rural Resource Areas, the average density within each parcel proposed for development should not exceed one unit per 5 acres, equivalent to an overall density of 20 units per 100 acres. Uses other than residential should be situated on lots of sufficient size to prevent adverse impacts such as noise, light, vibration and odor from affecting adjacent properties.

Within both the Conservation and Rural Resource Areas, development of each parcel, up to the average density specified for the district, should be situated so as to minimize extension of town infrastructure and the provision of services and maximize the protection of the resource values of the parcel proposed for development.

Residential Areas

Residential Areas are lands that are already committed to primarily residential development. They are located within close proximity to Routes 30 and 100 and near existing villages and services. These lands do not contain significant amounts of high value natural resource lands and have been able to accommodate moderate density development, generally in the form of residential subdivisions. These areas should be developed for residential, commercial, recreational or open space uses as long as they relate to the primarily residential character of the area. Average development density of parcels within these areas should not exceed one unit per two acres of land.

To prevent the undesirable effects of “strip” development, new construction within these districts should be clustered and carefully planned and designed so as to minimize the number of new access points to the highways. In order to minimize adverse impact on the scenic qualities of the highway corridors and to integrate with the residential and commercial uses, new development should provide for landscaping and screening.

Commercial-Residential Areas

Commercial-Residential Areas are lands bordering or situated in relatively close proximity to State Routes 30 and 100 and having site characteristics generally suitable to relatively high-density development. They are located close to existing transportation, electric and telecommunication infrastructure needed for new commercial development.

To maximize density of development in these areas, buildings are encouraged to have shared septic systems and/or wells. Average development density of parcels within these districts should not exceed one unit per two acres of land.

To prevent the undesirable effects of “strip” development, new construction within these districts should be clustered and carefully planned and designed so as to minimize the number of new access points to the highways. In order to minimize adverse impact on the scenic qualities of the highway corridors and to integrate with the residential and commercial uses, new development must provide for landscaping and screening and should be designed to connect to existing sidewalks and share driveways, parking, and water and/or septic systems.

Village Areas

Jamaica Village

Jamaica Village is and should continue to be the Town’s cultural, civic, social, commercial and residential center. Because the Village is the most densely settled area in Town, new public facilities and services should first be provided here to maintain Jamaica Village as the Town’s

center. The character of the Village and its sense of Town center is to a great extent created by the cooperative co-existence of commercial and residential land use within a unique setting which is greatly influenced by the predominating architectural styles. The Jamaica Village District also includes an area just east of the existing Village along Route 100 that is an area that would serve as a natural outgrowth of the traditional center.

Residential uses including, but not limited to, single family dwelling and multi-family dwellings as well as small, low-impact commercial operations with appropriate buffering in keeping with the village character shall be encouraged. Development should be compact and should provide certain amenities, such as public spaces and lighting, to keep Jamaica Village an attractive and comfortable place in which to live.

New development within Jamaica Village must provide for landscaping and screening and maximize possibilities for pedestrian and bicycle travel. The intent of this is to encourage a mixture of residential and commercial development in a pedestrian friendly setting. This will contribute to the economic vitality of Jamaica while preserving a sense of proportion in the Village center. New development should also be designed to include shared green space, driveways, parking, and shared water and septic systems.

Whenever possible, public investments and state and federal funding/grants shall be utilized to make improvements to, create new or expand existing infrastructure within Jamaica Village. These investments shall be made to support the existing character of the Village, as well as planned growth.

Average development density in Jamaica Village should not exceed one unit per acre, although it may not be possible to achieve this density in some areas of the Village because of the number of pre-existing small lots and the need to provide for safe isolation distances between leach fields and water supplies. Generally, villages are developed at a much higher density (one unit per 1/8 acre or 1/4 acre). However, due to the water and wastewater limitations previously mentioned, the ability to achieve this higher density is restricted. In addition, Jamaica Village is a designated Historic District with many attributes that are historically and culturally important. The removal or renovation of these attributes would be inconsistent with the nature of this plan.

Rawsonville

Rawsonville has become a significant commercial district in the Town. Businesses within Rawsonville primarily serve the needs of visitors who are drawn by regional attractions. Continued commercial development is expected to occur here as these regional attractions expand. Average development density within Rawsonville should not exceed one unit per acre. The guidelines for and limitations to development in Jamaica Village should also be applied to development in Rawsonville.

Land Use Policies:

1. Jamaica Village shall continue as the center of the Town. Future expansion of publicly owned community facilities buildings shall be in the Village.
2. Further development within and adjacent to the Village districts must be carefully planned to minimize adverse impacts on the character of the village, existing water supply and wastewater disposal, and traffic within the villages.
3. The character of Jamaica Village is an important asset to the community. The character of the Village shall be maintained by limiting uses within the Village to those that are

compatible with the existing commercial and residential uses.

4. Encourage the restoration and preservation of buildings that contribute to the architectural and historical character of the Town. When such buildings become obsolete, new uses shall be found for them that will preserve the architectural and historic character of the buildings.
5. Lands adjacent to or including areas of historical, educational, cultural, scientific or architectural value shall be used in a manner that will not reduce or destroy the value of the site or area.
6. Lands adjacent to existing public land and existing or planned public facilities shall be used in a manner that will not diminish the value of such investments or interfere with their intended uses.
7. Require appropriate site planning and landscape design by siting structures to fit into the natural characteristics of the land and maintaining vegetative buffers along roads and parcel boundaries.
8. Require the use of low impact development strategies (e.g., cluster development, conservation easements) that minimize the fragmentation and loss of agricultural land, forest land, unique or ecologically sensitive areas and special sites and areas.
9. Encourage the town to purchase or accept donations of rights to properties that have high public value.
10. Scenic hills and ridgelines shall be left in their natural condition, free from all development, including, roads, building structures, utilities, and wireless broadcast and telecommunications facilities.
11. Require developers to incorporate the following in the site planning of commercial facilities: shared access, landscaping, and provisions for pedestrians.
12. Reduce light pollution by using fixtures that direct light below the horizontal plane, utilizing energy efficient lamps, and using light levels appropriate for the use of the property.
13. Light shall not trespass onto adjacent properties or create dangerous conditions due to glare on adjacent roadways.
14. Lighting design shall include the installation of timers, photo sensors, and other energy saving devices to reduce the overall energy required and to eliminate unnecessary lighting.
15. Require that housing developments not have undue adverse impact on natural resources, open space, and important agricultural and forest lands.

Priorities for Action:

1. **Evaluate options for the Town's acquisition of public open space land for recreation, conservation, or a Town Forest.** (Planning Commission, Selectboard)
2. Identify and appropriately designate historically significant structures. (Planning Commission, Historical Foundation)
3. Assess opportunities to establish green spaces in the village areas. (Planning Commission)
4. Review and monitor municipal street lighting fixtures to evaluate their effectiveness in directing light towards the street and sidewalk and away from neighboring properties and the night sky. (Planning Commission, Selectboard)
5. Investigate acquisition of water rights in anticipation of possible development of a municipal water supply and/or wastewater disposal system. (Planning Commission, Selectboard)

IV. NATURAL RESOURCES

Jamaica is a rural community with exceptional natural resources. Significant water resources, **wetlands, agricultural and forest lands, and unfragmented blocks of land support the community's** wildlife species, recreation activities, and quality of life.

The primary focus of this section is to identify the natural resources of Jamaica, recognize the role that they play in giving the Town its character, and decide which strategies would best maintain that character while contributing to the long term sustainability of the community. All of the **community's resources are interconnected, and any change to one can have a significant impact** on the others. The goal of this section is to help develop a balance between development and resource protection within Jamaica that will guide further sustainable development of the community. It is also hoped that this section will alert residents of Jamaica to the importance of the integrity of natural systems for the entire region.

Agriculture

Over the last 225 years, the role of agriculture in the Town of Jamaica has changed dramatically. In 1900 nearly 80 percent of the land area of Jamaica was cleared and used for agriculture. Today, agriculture is not extensive in Jamaica but the remaining agricultural areas are still an important resource that provide local farm product, open space, and contribute to the rural character of the Town.

The largest remaining commercial agricultural operation in Jamaica is located northwest of Rawsonville. Lands in the northeast corner of Jamaica, West Jamaica, and Pikes Falls are still used for hay production. A number of homeowners throughout the town keep horses and/or a few beef cattle, and these utilize small areas of pastureland that remain from what were once larger farms. Small scale agriculture includes gardens and fowl. Some open, level land along the West River in East Jamaica, within the flood easements of Townshend Dam, is used for hay production. Additional open land upstream of this area is restricted from further development, and could be used for agricultural production if the owner desired.

The US Department of Agriculture has identified soil types that are best suited to crop production based on soil quality, growing season and moisture supply. These areas, called prime agricultural soils, are likely to produce the highest crop yields using the least amount of economic resources **and causing the least environmental impact. Jamaica's prime agricultural soils are located along** the West and Winhall Rivers and Wardsboro Brook.

Agriculture Policies:

1. Engage landowners in protecting natural resources and encourage the management of open lands for farming, forestry and recreation.
2. Encourage agricultural production, including small-scale production and innovative and non- traditional farming operations.

Biological Diversity

Rare, Threatened, and Endangered Species

The Vermont Non-game and Natural Heritage Program has drawn up a preliminary inventory of the plant and animal species that have been listed by either the state or the federal government as being rare, threatened or endangered. These species and communities are considered so rare because they have particular habitat requirements, are at the edge of their ranges, or are

vulnerable to disturbance or collection. Each rare community that Jamaica harbors contributes in an important way to the overall diversity of the state and larger region. Although some of the listed species are protected to some extent under either Vermont or Federal law, the presence and distribution of these species in the Town are generally not well known. Therefore, protecting these resources represents a very difficult conservation challenge. Nonetheless, Jamaica recognizes the significant contribution that rare, threatened, and endangered species make to our **natural heritage and the health of greater Vermont's environment.**

There have been 25 documented occurrences of rare plant and animal communities in and around Jamaica, the majority of which are rare **plant communities (see Table "Rare Plant and Animal Occurrences in Jamaica" in the Appendix)**. Using a ranking, the Vermont Non-game and Natural Heritage Program assesses the rarity of species on a global and statewide ranking. There are seven communities which have been ranked as threatened at the state level. The rare plant and animal communities that have been documented within the last 20 years are primarily found along the West River upstream of Ball Mountain Dam, Cole Pond, and on either state or US Army Corps of Engineers lands. A portion of Mill Brook and segments of the West River that flow into Townshend also host rare plant and animal communities that were documented within the last 20 years.

Invasive Species

Invasive plant species have become common in many forests, wetland, and riparian areas. They can out-**compete native plants for space, nutrients, and light**. An **"invasive species"** is defined as a species that is 1) non-native to the ecosystem under consideration and 2) whose introduction causes or is likely to cause economic or environmental harm (Executive Order 13112). Human actions are the primary means of invasive species introductions.

The sale, purchase, and or planting of plants considered to be invasive have been banned at both the state and federal level. In 2002, the Vermont Department of Agriculture, Food, and Markets adopted a plant quarantine rule to regulate the importation, transportation, sale, possession, cultivation and/or distribution of certain invasive plants. This Quarantine Rule includes both species that are not yet known to occur in Vermont but are on the Federal Noxious Plant List and species which do occur in Vermont and pose a serious threat to the state. The state has also created a Watch List which includes plants that have the potential to become invasive in Vermont. **A list of invasive plant species is included in the Table "Invasive Plant Species and Invasive Species Watch List for Vermont", found in the Appendix. (This list does not include all of the plant species listed on the Federal Noxious Plant List.)**

There are increasing populations of invasive plant species in Jamaica. Japanese Knotweed presents water quality concerns due to the fact that it out-competes other vegetation and dies back in the winter, leaving shorelines susceptible to erosion because there is no other vegetation stabilizing the stream bank. Purple loosestrife is commonly seen in many riparian and wetland habitats in the region.

Species such as Japanese Knotweed, European Buckthorn, Japanese Barberry, Oriental Bittersweet, and Asiatic Honeysuckle have all become well established in many locations in the West River Valley, and their range has been expanding up the Valley in the past decade. These species are primarily spread by birds ingesting seeds at one location and depositing them elsewhere. Community action is necessary to combat invasive species.

Elevations generally below 1,500 feet are most susceptible to invasive species, though any land with some sort of major disturbance (from wind, water, logging, or land clearing and development) could potentially host them. It may be possible to slow down or even halt the spread of these species by identifying and removing plants as soon as they appear. Early detection is the key. This detection can be aided by educating residents about the identification of and problems caused by invasive species.

Natural Communities

The Vermont Department of Fish and Wildlife has identified the following significant natural communities in Jamaica: Hemlock Forest; Mesic Red Oak-Northern Hardwood Forest; Temperate Acidic Outcrop; Hemlock Swamp; River Cobble Shore; and Rivershore Grassland. According to **Vermont Department of Fish and Wildlife, natural communities are “an assemblage of plants and animals that are found recurring across a specific landscape under similar environmental conditions where natural processes, rather than human disturbances, prevail”**. These areas, identified by dominant plants, vegetation structure, and major features of the physical environment **represent intact examples of Vermont’s native flora, fauna, and vegetation**. There may be additional natural communities in Jamaica that have not yet been identified.

Significant Wildlife Species

The Town’s natural environment supports white tail deer. Some areas within Jamaica have been identified as deer wintering areas. These areas were mapped by the Vermont Department of Fish and Wildlife using aerial photography, infrared aerial photos, and ground confirmation. **The mapping of these wintering areas or “deer yards” needs updating as much of the mapping was done in the 1960's and 1970's.** Areas identified during the original mapping may have undergone forest cover or land use changes and may not be current deer wintering areas. It is also likely that current deer wintering areas have not been included in the State's data.

Wintering areas can be utilized by generations of deer over many decades if appropriate habitat conditions are maintained. Conserving deer wintering areas is essential to the species survival and is critical to maintaining the resource for recreational activity.

The black bear is native to Vermont and primarily found in remote, forested habitat. In Jamaica, the National Forest Service has conserved 720 acres of land on Sage Hill for its critical bear habitat. Jamaica is also home to a regionally significant black bear travel corridor that has been identified by the Vermont Agency of Natural Resources. This bear travel corridor links Sage Hill to important habitat in neighboring Stratton. Black bear travel corridors are forested habitats that are regionally important and are used by a large number of bears to access critical seasonal foods or to link bear ranges with sub-populations. Travel corridors are comprised of bear travel routes and may include one or more road crossing areas. The Town places a high priority on protecting the resources value of land identified by the Agency of Natural Resources in order to protect this important wildlife travel corridor.

Unfragmented land provides some of the most valuable wildlife habitat, especially when it provides a range of contiguous habitat of many different types (mature forests, wetlands, open fields, etc.) in close proximity. A primary characteristic of unfragmented habitat is the absence of roads. Roads can be a source of mortality and a barrier to wildlife movement. The impact of a road varies depending on its use. Narrow dirt roads that maintain a tree canopy retain a greater degree of forest cover and habitat for many species of wildlife, including birds.

Biological Diversity Policies:

1. Protect all viable occurrences of known rare, threatened, and endangered species. Sites or areas of rare, threatened, or endangered species of plants and animals shall not be developed and shall not be used in a manner that will destroy those species.
2. Ensure the conservation, protection and proper stewardship of significant natural communities. Carefully assess potential impacts of proposed development on significant wildlife habitats in order to preserve such habitats.
3. Prohibit fragmentation of large blocks of significant wildlife habitat and maintain connectivity between habitat blocks as corridors for wildlife migration.
4. Configure and design roads so as to prevent the fragmentation of significant blocks of wildlife habitat.
5. Prevent the spread of and support efforts to remove invasive species.
6. Prohibit the distribution of any plant on the Federal Noxious Plant list.

Earth and Mineral Resources

Earth and mineral resources in Jamaica consist principally of sand, gravel and uranium deposits. Compared with other parts of the state, sand and gravel resources are limited. There are outwash deposits of stratified sand and gravel, formed when glacial melt waters sorted material and deposited like sizes together along glacial streams or in glacial ponds or lakes.

Locally significant deposits of sand and gravel can be found along the terraces of the West and Winhall Rivers. To a lesser extent, deposits also occur along Ball Mountain and North Branch Ball Mountain Brooks. Though sand and gravel deposits are present along the West River, there are several areas that contain rare and threatened species. Therefore, mining for sand and gravel along the West River with high concentrations of rare or threatened species is strongly discouraged.

Sand and gravel resources are particularly important materials for road construction (see Soil Resources map); however, Jamaica has few excavation sites. Extraction and processing are limited by existing development on or near deposits, the suitability of Town roads and bridges to withstand heavily loaded trucks, and State restrictions on the removal of gravel from streambeds.

The impacts from sand and gravel operations are often cited as concerns. Increased truck traffic, noise, erosion, and airborne particles can create problems for abutters. The use of outwash deposits in commercial sand and gravel operations could alter the performance of these areas as groundwater recharge areas. As material is moved and the geology is altered, water will not be filtered and stored in the same manner.

There is a significant uranium deposit in the vicinity of The Pinnacle. Previous attempts to extract uranium from this area resulted in State legislation requiring legislative approval for future uranium mining in the state. It should also be noted that land uses in this area might result in public health hazards resulting from the possibility of exposure to high concentrations of radon.

Earth and Mineral Resources Policies:

1. Require that earth and mineral extraction is carried out in a manner and in locations that result in minimal adverse impact to the environment and character of the surrounding area.
2. Limit the extraction of earth and mineral resources to areas that are not heavily developed.
3. Extraction of earth and mineral resources shall not interfere with or have negative impacts

on groundwater, wildlife habitat, air quality (dust and noise), community resources including recreation and special sites and areas, or neighboring property owners. Extraction sites must handle truck traffic without creating unsafe travel conditions on Town roads and bridges.

4. Use local sources of sand and gravel for Town construction projects when it is cost effective and consistent with the Town Plan.
5. Require those responsible for extracting earth and mineral resources to prepare a site rehabilitation plan that provides for the restoration of the natural and aesthetic character of the land and that ensures a safe, attractive and useful condition of the land.

Forestland

According to **Conserving Vermont's Natural Heritage** (VT Department of Fish and Wildlife, 2004), nearly 75% of Vermont's forests were cleared for sheep farming and the production of timber resources in the mid-1800's. As the economy changed and people moved west, the landscape began to return to forest. Like the greater setting of the state, Jamaica's landscape has also changed over time. Today, approximately 28,000 acres (90%) of the Town's 31,000 acres is forested.

The forest cover is quite diverse, consisting of about 70 percent hardwoods and 30 percent softwoods. A major component of our landscape, forests provide timber for wood products, maple sugar, clean water, recreational opportunities and wildlife habitat. Their economic value extends from their resource value. Jamaica's forests values and uses depend on many factors, including the soil type, the quality of forest management, commitment to long term management, forest type, size and accessibility of privately owned parcels, and existing land uses.

Contiguous Forests

While it is important to track the resources (or potential resources) in each forest parcel, it is also critical to look beyond parcel lines and understand the entire forest landscape without divisions. Contiguous forest habitat serves many uses and functions including recreation, timber harvesting, wildlife habitat and migration paths, water quality protection, open space, and scenic enhancement. These are all important uses for the residents of Jamaica, both from a quality of life and economic standpoint. Contiguous forest refers to an area of forested land either without roads or with low densities of Class 3 and 4 roads, and little or no human development (buildings, parking areas, lawns, gravel pits).

Contiguous forest blocks larger than 500 acres have a greater capacity of supporting a wider range of resource protection values such as economic forest management, wildlife habitat, outdoor recreation, and water supply protection than smaller forest tracts. It is for this reason that 500 acres is used as a threshold indicator of forest health and forest fragmentation. Many animal species, including the black bear, require large areas of extensive forest or mixed habitat in order to maintain a stable population. Smaller forest tracts can be difficult to manage economically for sustainable timber harvesting and less desirable for hunting and other forms of outdoor recreation. Jamaica has several large contiguous forest blocks which are shown on the Existing Land Use Map.

The subdividing of large **woodland parcels into smaller lots is a threat to Jamaica's forestland**. This is a process known as parcelization. In addition to fragmenting plant and animal habitat, parcelization affects people and communities by making it difficult to having a working forest that produces an economic benefit. Recreational use of the forest can also be jeopardized when

more than one landowner is involved in land use decisions.

Forest Management

Forest management is important to the environmental and economic well-being of Jamaica's forests. Responsible harvesting of forest resources will support the local economy and provide access to local forest products. Considerable care should be taken during both commercial timber cuts and cuts to create open space for development to ensure the conservation of soils by mitigating erosion. Because large forested tracts are another aspect of the rural character of the community, visible clear cuts, either for commercial harvests or for development, should be carefully avoided or buffered. "Viewsheds," the views available to residents and tourists while driving, hiking, etc., and the impact of large clearcut areas on a viewshed are important **considerations to maintaining Jamaica's rural character. The maintenance of forested and agricultural views is important and can be accomplished by selective cuts or smaller clear cuts with active replanting.**

There are several large parcels currently managed as forest industry lands. For the various functions that these large unfragmented forests have, the Town supports the maintenance of these large blocks of land.

The Use Value Appraisal (UVA) Program (commonly referred to as Current Use) was passed by the State legislature in 1977 to provide greater tax equity for forest and agriculture landowners as well as to encourage long-term productive use of Vermont's agricultural and forest land. This program allows farm and forest lands to be taxed on their resource production rather than their value for development purposes. The program includes a Land Use Change Tax as a disincentive to develop land.

Use Value Appraisal is currently the strongest incentive for maintaining large blocks of private forest land. Forest parcels enrolled in the program must have a minimum of 25 contiguous acres to enroll in the program (not counting the two acres surrounding any dwelling). The forest land is required to be managed according to the provisions of a 10-year forest management plan that is approved by the County Forester. Agricultural land has a different set of eligibility requirements that are similar to the forest requirements.

According to tax year 2016 Vermont Department of Taxes data, Jamaica had 53 parcels totaling 10,116 acres enrolled in the Use Value Appraisal Program. While Use Value Appraisal reduces the burden for landowners, land can be taken out of the program with payment of a penalty. Therefore, it does not provide absolute assurance of continued open space.

Conserved Lands

Conservation areas are those lands protected for the foreseeable future through either outright preservation by governmental or conservation organizations, preservation by land owners, or through conservation easements. Jamaica has approximately 3,357 acres of land that has been set aside as conservation land. Table 3-1 shows the acreage amounts for those lands which are owned outright. There is an additional 640 acres on 5 parcels of private land that have conservation easements held by the Vermont Land Trust.

Table 3-1: Significant Conservation Lands in Jamaica

Name	Acres	Owner	Comment
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Sage Hill & Blake	1173	US Forest Service	
US Army Corps of Engineers	732	US Army Corps of Engineers	Several individual parcels of land mostly contiguous
Jamaica State Park, West River/Campground tract	323	State of Vermont	Includes campground and undeveloped portions of the park
Jamaica State Park, Shatterack Mountain Tract	333	State of Vermont	
Conserved Land on Turkey Mountain Road	312	State of Vermont	Part of Jamaica State Park
Hamilton Falls Natural Area	52	State of Vermont	
Winhall Town Forest	509	Town of Winhall	
Pikes Falls	16	Town of Jamaica	
Sage Hill	28	Town of Jamaica	

Source: 2016 Jamaica Grand List, and Windham Regional Commission GIS Data

Despite the support for land acquisition that was indicated in the 2006 Community Survey, the challenge of financing land acquisition will remain. While 59% of respondents stated that the Town should set aside funds on an annual basis to be used exclusively to purchase land, the majority of respondents were not willing to increase property taxes in order to preserve farm, forest, and open space land.

Forestland Policies:

1. Encourage stewardship for existing relatively large areas of contiguous forest habitat and prohibit parcelization of land. Assure continuity between parcels of contiguous forest **within Jamaica's boundaries and those that lie within the surrounding towns.**
2. Ensure that the extraction of forest products is carried out in a manner and in locations that result in minimal adverse impact to the environment and character of the surrounding area.
3. Encourage the continued practice of forestry in those areas of Town that are well suited **for growing and harvesting timber. Encourage the use of the Windham County Forester's** Office to advise timberland owners on tree selection and access routes that will maximize long- term timber value and to minimize erosion and the introduction of invasive exotic species.
4. Maintain wildlife habitat, scenic vistas, clean water, and recreational opportunities provided by forestlands.
5. Encourage public, industrial, and private landowners to maintain and enhance forest resources on their lands and to follow sustainable forest management practices that **provide habitat for diverse natural species and follow Vermont's current Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont.**
6. Provide opportunities for citizen and landowner comments during the process of **reviewing proposals for public acquisitions of land under Jamaica's written land**

acquisition policy.

7. Encourage private landowners to consider protective easements.

Natural Areas

Natural areas in Jamaica are those areas that make a unique contribution to the scenic, recreational and biological resources of the Town. These areas provide such public benefits as scenic views of mountain ridges, popular areas for fishing, hunting, trapping, hiking and important wildlife habitat.

There are many prominent forested peaks or ridgelines in Jamaica of which the principal ones are shown on the Special Sites and Areas map. The main forested peaks of interest include Ball Mountain, Turkey Mountain Ridge, College Hill, Mundal Hill, Sage Hill, Shatterack Mountain, and The Pinnacle. These peaks and ridgelines provide many important values and uses. They provide a scenic background from various vantage points that greatly contribute to the Town's character. They also provide important wildlife habitat, and serve as the headwaters to many streams. Because the steep slopes of these peaks and ridgelines are primarily undeveloped and heavily forested, the fragile soils of these areas are able to deliver clean water to Jamaica's rivers, brooks and ponds. These areas, however, are very susceptible to erosion.

It is highly desirable that prominent peaks and ridgelines shown on the Special Sites and Areas map be maintained in a natural state and be avoided as sites for buildings, utilities, or other **structures. It is also highly desirable that Jamaica's important wildlife corridors be protected or** conserved from encroaching development and incompatible activities, such as road expansion or development of new Class 1, 2, or 3 roads. Development should be restrained in and around corridors and these resources should be given high priority in considering lands for acquisition or other long-term conservation efforts. As noted previously, Jamaica is home to a regionally significant black bear travel corridor linking Sage Hill to their habitat in the Town of Stratton. The Town places a high priority on protecting the resource value of land within the area identified by the Agency of Natural Resources in order to protect this important wildlife travel corridor.

Jamaica contains a wide trail network throughout many parts of the Town. All of these trails currently provide important recreational opportunities to the Town's residents and visitors. As land is subdivided or developed it will become increasingly difficult to assemble a trail system of connected footpaths in Jamaica. Also, as public lands or public rights-of-way along the West River are transferred to individual ownership, opportunities for public use will decline.

There are segments of the West River, Mill Brook, Cobb Brook and Turkey Mountain Brook in Jamaica which have no roads within 1,000 feet of the stream for a length of at least one-mile. These stream segments provide remoteness important for wildlife and make an important contribution to the recreational uses of these areas.

There are several unique geologic formations that provide important opportunities for recreation and natural history observation. These include the Hamilton Falls Natural Area, Pikes Falls Natural Area, and the South Windham Gorge.

Natural Areas Policies:

1. Maintain the scenic qualities provided by mountaintops and ridgelines.
2. Protect the natural character of roadless stream segments.
3. Protect important wetlands, including the areas surrounding them, from land uses that

would diminish the benefits and functions they provide.

4. Protect areas shown on the Special Sites and Areas Map and the areas surrounding them from incompatible adjacent land uses which would diminish the benefits and functions they provide.
5. Minimize areas of earth disturbance, grading, or vegetation clearing on slopes between 15% and 25%, bedrock outcroppings, shallow soils, or probable areas of shallow and wet soils.
6. Prohibit construction of roads and structures in areas predominated by slopes exceeding 25%.

Priorities for Action:

1. Continue to maintain a Special Sites and Areas map and update it as additional areas are identified. (Planning Commission)

Water Resources

Rivers and Brooks

There are approximately 104 miles of waterways in Jamaica. The West River is the only major river in Jamaica. Its course through the Town extends for nine miles. Small rivers include the Winhall River, Ball Mountain Brook (below the North Branch), and Wardsboro Brook. There are 16 miles of major brooks. These include Mill Brook, Cobb Brook, North Branch of Ball Mountain Brook, Ball Mountain Brook (above the North Branch) and Turkey Mountain Brook. Additionally, there are numerous small brooks, only a few of which are shown on our Town Plan maps.

The quality of surface water in Jamaica is generally very good. Except for short periods after rainstorms, most brooks and small rivers appear to meet Vermont Department of Environmental Conservation's (DEC) turbidity standards. **The North Branch of Ball Mountain Brook has been** identified by the DEC as impaired by manganese from reservoir sediment. Wardsboro Brook requires further assessment of possible impairment by sediment and temperature.

All surface waters in Vermont are classified according to a system established by the legislature. The system provides for two classes of water, A and B, with appropriate standards for their maintenance. Class A waters are all those above 2,500 feet in elevation plus certain waters which are a source of community drinking water or are of very high quality and ecological value. All other waters are Class B, suitable for drinking with filtration and disinfection; irrigation and other agricultural uses; swimming and recreation. There is also a special category known as Outstanding Resource Waters (ORW) that recognizes waters having exceptional natural, recreational, cultural or scenic values.

In Jamaica, Kidder Brook and Cobb Brook are classified as Class A waters, and all others are Class B. The town also has the distinction of possessing an ORW, namely the Pikes Falls segment of the North Branch of Ball Mountain Brook.

The land within Jamaica drains into the West River Watershed. A watershed is a land area which collects precipitation and contributes runoff to a receiving body of water or point along the **watercourse. The drainage areas of Jamaica's rivers and brooks extend beyond the Town's** borders so inter-municipal coordination of land uses is essential to ensure effective management and protection of the water resource.

Ball Mountain Dam

The Ball Mountain Dam is one of about 18 federal dams on tributaries of the Connecticut River in Connecticut, Massachusetts, New Hampshire, and Vermont. Together they form a system of flood control dams operated by the US Army Corps of Engineers (Army Corps) and designed to minimize flood damage on the Connecticut River and its tributaries. The Army Corps maintains fish passage facilities at Ball Mountain and Townshend Dams to allow for upstream and downstream migration of Atlantic salmon.

The Ball Mountain Dam has a height of 265 feet above the river bed. It is capable of holding back almost 55,000 acre-feet of water before overflowing its spillway. This volume of water is equivalent to six inches of water over the entire 172 square miles of drainage area upstream from the dam. The drainage area controlled by the dam represents about 40 percent of the total drainage area of the West River.

The level of flow in the West River as it passes through Jamaica varies tremendously due to the fact that the river passes between two federally controlled flood control dams, the Ball Mountain Dam in Jamaica and the Townshend Dam in neighboring Townshend. The average flow over the years has been about 400 cubic feet per second (cfs). Currently, there are controlled releases from Ball Mountain Dam in which the river flow is about 1,500 cfs.

Sediment accumulation in the pool behind Ball Mountain Dam poses a continuing serious risk to water quality and aquatic and riparian habitat in the West River both upstream and downstream of the dam. Ball Mountain Dam was not designed to impound a permanent pool, but a pool has been maintained behind the dam since shortly after it was constructed in 1960. Several hundred thousand cubic yards of sediment have accumulated in and near the historic river channel **underneath the surface of the pool. In the mid 1990's two successive accidental sediment releases** from the dam caused severe damage to aquatic and riparian habitat along the West River. Major fish kills resulted from both of these releases, and ecological and economic losses were significant.

The Ball Mountain Dam is currently being used for generation of hydroelectric power. Refer to the Energy section for more details.

Ponds

Although Jamaica has streams in abundance, there are only three significant natural ponds. Of these, Cole Pond, comprising 41 acres, is the largest. With approximately 57 houses on 4 1/2 miles of road and 10 lots on the market in the Cole Pond area, special measures may eventually be required, such as a community sewage disposal system, to maintain adequate water quality. The two other Jamaica ponds, Adams Pond and Forrester Pond, seven and nine acres in size respectively, are relatively undeveloped. Both have been documented as containing significant rare plant communities.

Forrester Pond is included on Vermont's 2016 List of Priority Surface Waters Part D. Impaired Surface Waters with Completed and Approved TMDLs as impaired; it is noted as being critically acidified by atmospheric deposition, which impacts aquatic life support. DEC and the US Environmental Protection Agency completed and approved a total maximum daily load (TMDL) for the pond September 30, 2003. A TMDL is a calculation of the maximum amount of a pollutant that a surface water can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. DEC performs ongoing monitoring to track this impairment.

The Cole Pond Association voluntarily monitors water quality in the pond. The entire shoreline of Cole Pond is privately owned and there is no public access. Based on years of sampling data, Cole Pond is in mesotrophic state meaning that it contains moderate nutrient concentrations. Generally, mesotrophic water bodies have moderate algae growth and relatively clear water. Often these water bodies support plant growth around much of their shoreline and may have some shallow areas with abundant plant growth.

Wetlands

Wetlands are areas that are frequently inundated by surface or ground water to support vegetation or aquatic life that depend on saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands take such diverse forms as marshes, swamps, sloughs, potholes, fens, river and lake overflows, mud flats, bogs, and ponds. It is well recognized that wetlands provide important habitat for certain species of wildlife, filter pollutants from runoff that flows through wetlands on its course downstream and stabilize stream flow during periods of heavy precipitation and drought.

The Vermont Wetlands Inventory (VWI) Maps show in the neighborhood of 100 different wetlands in Jamaica comprising 231 acres. To date, a comprehensive field study of wetlands in **Jamaica has not been performed.** DEC's **Vermont Wetland** Rules categorizes wetlands as Class I, II, or III. Class I wetland areas are those that are exceptional or irreplaceable in contribution so they merit the highest level of protection. Class II wetland areas are those wetland areas which are found to be significant enough to merit some protection (50-foot buffer zones). Class III wetland areas are those wetlands that have not been determined to be sufficiently significant to merit any protection. However, these wetlands may be protected by other federal, state, or local regulations. Class I and II wetlands (referred to as significant wetlands) are protected by the Vermont Wetland Rules and require permit approval by the Vermont Department of Environment Conservation, Watershed Management Division, Wetlands Program prior to development.

The Vermont Wetland Rules (2017) provide the following “Functional Criteria for Evaluating a Wetland's Significance:”

1. Water Storage for Flood Water and Storm Runoff
2. Surface and Ground Water Protection
3. Fish Habitat
4. Wildlife Habitat
 - a. Birds
 - b. Mammals
 - c. Amphibians
 - d. Reptiles
 - e. Landscape Considerations indicative of wildlife habitat diversity
5. Exemplary Wetland Natural Community
6. Rare, Threatened, and Endangered Species Habitat
7. Education and Research in Natural Sciences
8. Recreational Value and Economic Benefits
9. Open Space and Aesthetics
10. Erosion Control through Binding and Stabilizing the Soil

Floodplains and Floodways

Floodplains are relatively flat areas adjacent to a stream or river that experience occasional or

periodic flooding. Federal Emergency Management Agency (FEMA) has mapped the Special Flood Hazard Areas (SFHAs), which are the floodplain areas with a one percent chance of flooding in any given year. In Jamaica, these areas include lands along Wardsboro Brook, Ball Mountain Brook, the Winhall River, and segments of North Branch Ball Mountain Brook, Turkey Mountain Brook, and the West River. Current FEMA maps are available for review in the Town Office.

Within the SFHAs are floodways, which carry the strongest of flood currents. FEMA has mapped **these which are defined as “the channel of a watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without increasing the water surface elevation by more than one (1) foot at any point.” There are mapped floodways on the West River, Ball Mountain Brook, and Wardsboro Brook.**

The Town participates in the National Flood Insurance Program (NFIP) and has adopted and enforces a Flood Hazard Bylaw. By doing so, property owners in Jamaica are able to obtain flood insurance and mortgages at affordable rates and flood disaster assistance. The Flood Hazard Bylaw regulates development within the FEMA defined flood hazard areas by imposing design standards that are intended to minimize property damage during flood events.

Fluvial Erosion Hazard Areas

In addition to the flood hazards described above, there are areas that can be affected by erosion hazards, the scouring of the channel and banks of streams and rivers, often caused by high flows. These areas have been identified by ANR and are mapped as River Corridors on the ANR Natural Resources Atlas and the State’s Floodready Atlas.

(For more information about floodplains, floodways, fluvial erosion hazard areas, and River Corridors, please refer to the Flood Resilience Plan element of this Plan.)

Ground Water

As in most of rural Vermont, Jamaica relies on ground water as the principal source of water for domestic use. Different types of wells penetrating to different depths produce a wide range of yields. There are pockets of sand and gravel that can yield abundant supplies of ground water if they are of sufficient depth and especially if they are in close proximity to a stream or pond. Areas that contain such pockets of sand and gravel are found along Ball Mountain Brook, North Branch Brook, Winhall River and the West River. These areas are the most likely to provide a yield of ground water sufficient to provide a central community water supply for the villages.

Threats to groundwater and wells include agricultural runoff, road salting, contaminated runoff from paved areas, underground storage tanks, and failing septic systems. Another threat is when **water is pumped at rates exceeding the aquifer’s capacity, resulting in yields that do not adequately meet the needs of users.**

All private and public water supplies are groundwater wells. There is one public water system in Jamaica that serves the Bear Creek Condominiums. A public water system is any source that provides water to 15 permanent connections or serves an average of 25 individuals daily for at least 60 days a year. Public water supplies are regulated by VT DEC, as required by the US EPA. The West River Trailer Park was reclassified from a public water system to Transient Non-Community water system in 1997. A Transient Non-Community water system serves non-residential users who do not change over time.

Each public water system has an accompanying source protection area. The current Vermont Water Supply Rule defines a source protection area as the surface and subsurface area through which contaminants are likely to move toward and reach a collection point that supplies a public water system. Within the 200-foot radius of this primary collection area, contamination impacts are likely to be immediate and certain. Beyond that radius, source protection areas are tested and mapped to determine further sources of probable and possible contamination. Both the Bear Creek Condominiums and the Jamaica Village School have delineated source protection areas.

It is well documented that there are deposits of uranium in Jamaica. Over billions of years, uranium decays into radium, and eventually radon. Radon is a naturally occurring radioactive gas that has no color, odor, or taste. Well water that contains radon may increase the level of radon gas in a home. The Vermont Department of Health provides free long-term radon test kits to Vermont residents that measure the amount of radon in the air.

Water Resources Policies:

1. Protect waters by restricting development to low densities and low impact uses in the following areas:
 - a. Drainage and headwaters characterized by steep slopes and shallow soils.
 - b. Watersheds of public water supplies, when and if developed.
 - c. Drainage areas of streams classified as Class A by the State of Vermont. Within such areas, special attention shall be given to prevent soil erosion, silting of streams and wetlands, pollution of ground or surface waters, or other forms of water quality degradation.
2. Prohibit the obstruction of streams in order to maintain flows at levels that support current in-stream uses including but not limited to swimming, boating, and fishing.
3. Reduce the potential for flood damage.
4. Significant wetlands as defined in the current Vermont Wetland Rules shall be managed so as to protect their natural ecological and physical functions.
5. Wetlands within or adjacent to proposed development sites shall be identified by a Wetland/Environmental Consultant that performs wetlands delineations in Vermont and development plans shall include design and siting requirements necessary to maintain the ecological and physical functions which the wetlands provide.
6. Support surface water classification and management strategies that will maintain or enhance existing water quality.
7. Structural stream channel alterations shall be permitted only for public safety, restoration of stream ecosystems, or when it can be demonstrated that no other nonstructural methods of accomplishing the same objectives are possible.
8. All stream corridors and pond shorelands shall be maintained in their natural condition with an adequate undisturbed vegetative buffer strip along shorelines.
9. Development proposals along shorelines of public waters which are commonly used by the public shall make provision for continued public access along existing public rights-of-way to such waters.

Priorities for Action:

1. Identify for future planning the wetlands that perform a significant function in providing wildlife habitat, as defined in the Vermont Wetland Rules, and the existing or possible new artificial wetlands (vegetated drainage ways and stormwater detention basins), which are important for non-point pollution control. (Planning Commission, preferably a

- Conservation Commission)
- 2. Continue to administer the provisions of the Flood Hazard Bylaw. Update as needed to maintain eligibility in the National Flood Insurance Program and to address fluvial erosion hazard areas. (Selectboard, Planning Commission)
- 3. Use road maintenance methods and materials that will maintain or improve water quality, such as those described in the Vermont Better Roads Manual. (Selectboard, Road Commissioner, Highway Department)

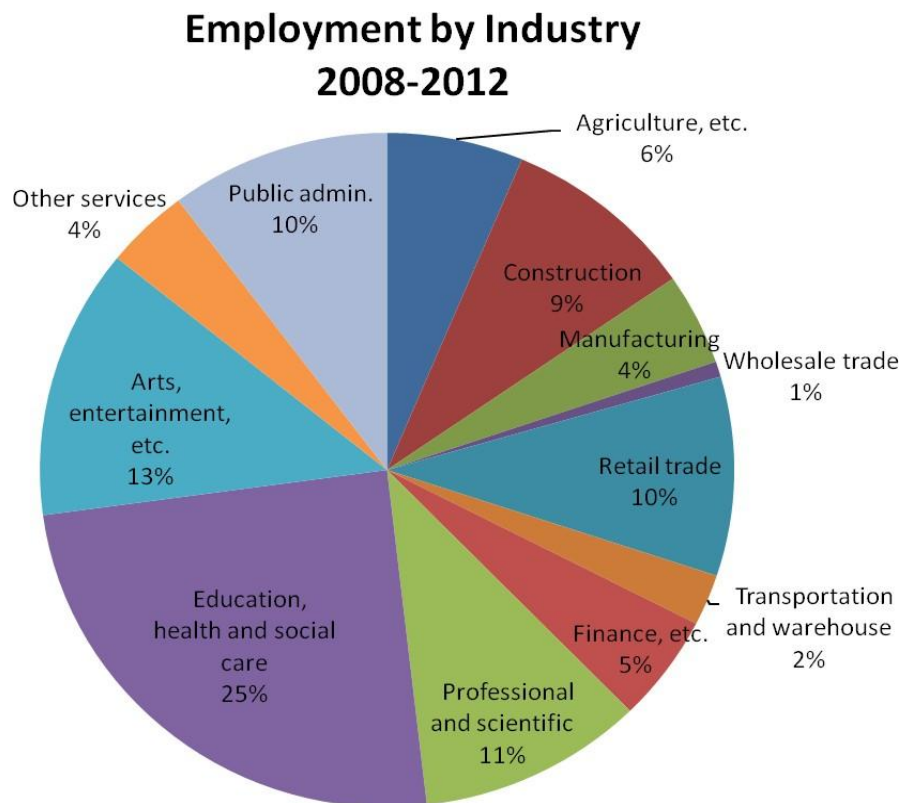
V. ECONOMIC DEVELOPMENT

Workforce

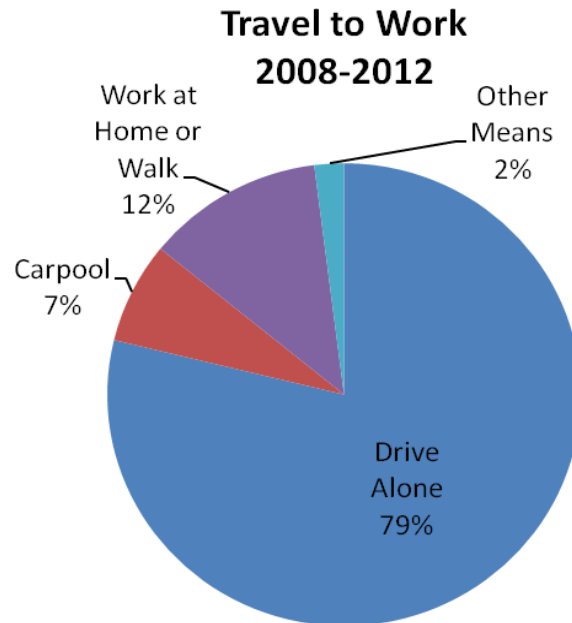
According to the 2006-2010 American Community Survey 5-Year Estimates, there were approximately 529 people 16 years and older from Jamaica in the labor force in 2010 and the annual average unemployment rate was 5.1%.

During the period 2008-2012, American Community Survey Estimates indicate that 24.0% of Jamaica residents worked in Jamaica, including the 8.1% of residents that worked at home.

Jamaica's civilian population was employed in the following industries:



According to 2006-2010 American Community Survey 5-Year Estimates, the average travel time to work was 18.7 minutes.



Current Economic Characteristics

As a rural community, Jamaica has a local economy based primarily on local services, small businesses, and tourist related or hospitality businesses. Businesses are primarily located along Route 30, with the greatest concentrations in Jamaica Village and Rawsonville. Local businesses include a country market, retail stores, art galleries, a general store, eating and lodging establishments, and professional services. In 2005, the only bank closed. Residents must travel outside of Jamaica for most of their major goods and services, including groceries and medical, dental and pharmacy needs, as well as other professional services.

Home occupations and resource industries (agriculture, forestry, and sand and gravel operations) are located throughout the Town. Home occupations continue to serve an important role in Jamaica by allowing for local economic development, encouraging the creation of new businesses, and providing flexible or accessible working conditions for residents.

While the number of businesses in Rawsonville has increased during the period covered by the previous town plan, the number in Jamaica Village has declined. The inability of Jamaica Village's current wastewater and drinking water systems to meet the requirements of state regulations governing isolation distances of drinking water sources and septic systems has forced the closure of two restaurants and a coffee shop, and is limiting the remaining food service business to takeout service only. Further, this condition is increasing the transfer of currently inactive businesses to new ownership and inhibiting new businesses from locating in Jamaica Village. While Jamaica Village's location on Route 30 and adjacent to a very popular Vermont State Park would seem to make it an ideal location for economic expansion, the inability to comply with critical state environmental requirements precludes any significant economic growth. This situation is discussed in greater detail in the Water and Wastewater section of the plan.

There are two conflicting visions for the economic future of Jamaica Village. The first is for vigorous economic growth and the second is to retain the status quo, i.e., to remain a quiet, rural residential community for families earning their livelihood elsewhere. While both have merit,

neither is really sustainable in the long term without significant upgrades to the drinking and wastewater infrastructure. This element of the town plan addresses the first vision, identifying policies and actions needed to encourage economic growth of the larger town of Jamaica and revitalize the economic sector of Jamaica Village. Infrastructure improvements necessary to sustain Jamaica Village as a desirable residential community, again addressed in the Water and Wastewater section, will have the added economic benefit of allowing reopening of those businesses that have been forced to close.

The state publishes an annual report on covered employment and wages on a town by town basis. Covered employment is a phrase that is used to describe wage positions that are covered by unemployment insurance. Employment for these purposes is synonymous with jobs. In 2015, there were a reported 169 jobs at 34 reporting establishments in Jamaica, down from 175 reported jobs from 40 reporting establishments in 2010. These include 56 in construction, 80 in services, 9 federal employees, and 24 local government employees including education employees. The employment figures in the state reports are an average of the monthly employment figures for the calendar year. In some industries where there are significant seasonal changes in the number jobs during the year, the annual average employment will differ significantly from the level of employment for any part of the year.

Recreational tourism plays a large role in Jamaica's economy. Ski resorts, summer and fall tourism, and second homes are three major components of the tourism and recreation industry. Businesses in Jamaica continue to benefit from growth related to tourism and recreation. While data is not available at the town level, a 2013 Vermont Department of Tourism and Marketing survey revealed that lodging expenditures were the largest spending category for visitors (23.6 percent), followed by food and beverage (22 percent) amusement and recreation (16.5 percent), shopping (12.1 percent) gasoline (8.1percent) and groceries (8.1 percent). The loss of two restaurants and a coffee shop in Jamaica Village represents a significant loss in a major component of the state's tourist economy. Preserving the natural environment and quality of life is important to support the Town's remaining tourists and vacation home based economy.

Respondents to the 2006 Community Survey seemed to favor commercial/retail development and land based economic activities (farming and forestry) over industrial development. **A new community survey which will include the town's views on economic development is planned for the future.**

COMMUNITY SURVEY			
Question: What kind of development would you like to see more of/less of in Jamaica?			
Answer:	More of	Less of	No Change
Commercial/Retail development	41%	17%	29%
Industrial Development	13%	40%	33%
Farming activities	53%	4%	30%
Forestry activities	49%	11%	28%

The Jamaica Village Business Council was formed in 1998 and in 2004 it was reformed as the Jamaica Community Council. The purpose of this group was to work on initiatives for the betterment of the Town as a place to work, live, and visit. The Community Council has since ceased operating. Reestablishing a village business council will be helpful to promoting economic development in Jamaica Village. The business council should consider the type of economic

development that the community would like to attract to Jamaica, to include telecommuting and business incubation, value added product manufacturing, e.g., custom cabinetry, AirB&B, tourist oriented businesses, etc. Where appropriate, the council should consider the best location for new businesses, i.e., Jamaica Village, Rawsonville, or greater town of Jamaica. The community survey **should include the business council's recommendations for the appropriate locations for economic development in Jamaica, Jamaica Village, and Rawsonville.**

In 2016, Jamaica Village received renewal of its Village Center designation from the State. Created by the legislature in 2002, Village Center designation recognizes and encourages local efforts to revitalize traditional village centers. Communities that receive the designation become eligible for a number of benefits which include tax credits for building rehabilitation and improvements as well as priority consideration for certain state grants.

A number of factors will influence economic development within Jamaica:

- Due to large second home market in Jamaica and surrounding towns, home maintenance and service, as well as construction, continue to provide opportunities for business ownership and employment for town residents.
- The continued build-out of the Stratton resort will continue to have a subsidiary impact on Jamaica, e.g., increased tourism traffic along the Route 30 corridor and increasing demand for employees in the retail and services industries.
- With grant funding from the Federal Communications Commission Connect America Funds (CAF) and substantial investment of company funds, Fairpoint Communications **has made a substantial upgrade to Jamaica's communication infrastructure. The goal of the CAF program is to bring broadband internet service of at least 15Mbps (million bits per second) to rural areas.** Fiber optic cabling has been installed on route 30, route 100, Windham Hill Road, South Hill Road and Pikes Falls Road to make broadband service available in Jamaica Village, Rawsonville, and many other locations in the town. Service to individual locations is provided by copper wire connection to the fiber optic cables. Basic broadband service utilizing ADSL (Advanced DSL) asymmetric technology is available at distances one mile the nearest point on the fiber optic cabling. Speeds of 15 Mbps download/1 Mbps upload or 7 Mbps download/1Mbps upload are available. Higher speed service is newly available in some locations using newer ADSL-2 + Bonded technology at rates of either 25Mbps download / 1 Mbps upload or 20 Mbps download / 1.5 Mbps upload speeds. There remain areas in Jamaica without broadband connectivity. While sparsely settled, they remain areas that are eligible for CAF phase II grants to establish broadband internet connectivity.

Additionally, upgrades to Jamaica's communication infrastructure supports two classes of business service. Business Broadband Elite (BBE) utilizing multiple pairs of copper wire connections to the fiber optic cabling provides symmetric service of 20 Mbps download and upload speeds. For businesses requiring higher rates of data transfer, Carrier Ethernet Service (CES) can be provided to the business via a dedicated fiber optic connection to the main fiber optic cabling. Scalable speeds up to 10 Gbs (billion bits per second) can be made available. Depending on the distance of the dedicated fiber optic run and the complexity of the connections, the cost of a CES connection may be amortized over a period of years and included in the cost of service. Startup ventures requiring high bandwidth service need not make a large capital outlay to obtain necessary broadband service.

In addition to Fairpoint Communications some areas of Jamaica have broadband service from other providers. Jamaica has one other DSL service provider, SOVERNET Communications, providing 1 Mbs service; a cable provider, Southern Vermont Cable company providing up to 50 Mbs service; three mobile broad band providers; and three satellite providers. There is significant overlap in the areas covered by the different providers.

In the period since the last town plan update, a major broadband digital communications infrastructure upgrade has taken place. Currently this capability, with its primary use of home entertainment, is significantly underutilized. Available high-speed service can now make telecommuting feasible for Jamaica residents. Its availability will support business use of the internet such as video conferencing, on-line collaborative software development, businesses with major data communications requirements, remote on-line cloud computing, and readily support telecommuting non-traditional work from home occupations. Employees of virtual companies, i.e., companies whose employees are connected by the internet, can now locate in Jamaica.

- Adequate infrastructure is essential to support economic activities. Not improving the infrastructure will limit the scale and type of businesses that can locate throughout the Town. Water and wastewater infrastructure requirements key to economic growth are addressed in the Water and Wastewater section of this plan.

Economic Development Policies:

1. Support revitalization efforts within Jamaica Village and Rawsonville.
2. Promote existing businesses and encourage new businesses to locate in the town of Jamaica, including Jamaica Village and Rawsonville, following the guidance of the updated economic development survey.
3. Support job creation and retention efforts.
4. Ensure adequate infrastructure (cellular, high-speed internet), road maintenance, fire/safety services, water supply and wastewater, and snow removal) to promote and support the increase of economic activities.
5. Develop a solution to Jamaica Village compliance with wastewater and potable water isolation standards that at a minimum will allow businesses forced to close to reopen and support Jamaica Village as a viable residential community and enable further economic growth within the Village. This topic is addressed further in the Water and Waste Water section of the town plan.
6. Exploit the availability of high speed internet service in the town of Jamaica to attract millennial non-traditional workers with internet based occupations to settle in Jamaica.
7. Advertise the availability of broadband internet service to existing business concerns, potential new ventures, and potential new residents wanting to telework from home.

Priorities for Action:

1. Establish a Jamaica Business Council. (Planning Commission)
2. Conduct a community survey on types of economic development desired for Jamaica **based on the business council's determination of appropriate for Jamaica.** (Planning Commission)
3. Explore the extension of public transit into Jamaica with stops in East Jamaica, Jamaica Village, and Rawsonville. (Selectboard)
4. Explore solutions for upgrading existing infrastructure to support economic development.

- Upgrades to water and wastewater infrastructure (including funding) are addressed in the Water and Wastewater section of this plan. (Planning Commission, Selectboard)
5. Update the town website to advertise the availability of broadband internet service in most locations. (Town Clerk)
 6. Ensure realtors serving the Jamaica area provide prospective buyers with location specific broadband service options. (Planning Commission)
 7. **Explore other venues to advertise Jamaica's high speed internet capability to potential new businesses and residents.** (Planning Commission)

VI. POTABLE WATER SUPPLY AND WASTEWATER

Wastewater treatment in Jamaica is handled by individual septic systems. Soil and topographic conditions play a major factor in designing on-site systems. In 2007, the State adopted the revised Wastewater System and Potable Water Supply Rules that regulate on-site wastewater systems.

Since July 1, 2007, every parcel of land has come under the jurisdiction of the state's on-site wastewater and potable water supply permitting system program. As a result, a state permit is needed for most repairs, upgrades, and new construction of on-site wastewater treatment and disposal facilities, as well as on-site potable water supplies. Important changes include the elimination of the 10+ acre lot exemption from the permitting process and the requirement that area for a replacement system be identified, and new technical standards for isolation of wastewater from potable water supplies, see [Vermont Department of the Environment, Environmental Protection Rules, Subchapter 5; Technical Standards for Wastewater Disposal and Potable Water Supplies.](#)

Proper design, construction, and maintenance of on-site wastewater systems, including compliance with standards for isolation from potable water supplies, are important to keeping them operating effectively thereby preventing ground and surface water contamination. Existing septic systems and drinking water supplies are grandfathered, but new or replacement systems must comply with the new state regulations including isolation distances. Failing or substandard systems can release pathogens, nutrients and chemicals to groundwater and surface water. Areas of dense development such as Jamaica Village are vulnerable to system failure due to the cumulative effects of building on small lots with septic systems and drinking water wells in close proximity to one another, many of which were designed and operated prior to the establishment of State-level standards. Another area that can be susceptible to septic system failure is developed shore land areas, such as Cole Pond. In these areas soil and water conditions near the shore may make the septic system less efficient in treating wastewater.

Several buildings in Jamaica Village have been underutilized and are strictly limited by wastewater and potable water supply capacity. Septic system failures are not easily remediated due to the density of development with on-site septic and water systems in the Village. Septic systems have a limited life. Typically, they are designed for a 20-year life span, but do last longer if well maintained. Therefore, it is anticipated that increasingly systems will need to be replaced over time. This is especially true for older systems due to their outdated design standards. Many of the disposal systems in the Village are older leach fields and drywells without special filtering sand beneath them as would be required today in highly permeable soils. In many cases, because of the size of **individual homeowner's lots, state mandated isolation distances for replacement systems cannot be met.** Additionally, soil conditions within the Village are described as coarse

and gravelly with severe limitation with regard to filtering septic system effluent before it reaches the groundwater table. Based on the above, it may be concluded that there is an increased risk of contamination to the Jamaica Village drinking water supplies from on-site sewage disposal systems.

If and when homeowner septic systems fail, engagement of a septic engineer licensed by the state and a state permit(s) are required for replacement systems. On its face, in a number sites the technical standards for isolation will not be able to be met or met with difficulty. However, it is **the state's policy to work with homeowners to find a solution that does comply with state standards** or, failing that, a best possible solution. Homeowners who will not make a good faith effort may face legal action including in extreme cases condemnation of their property. However, the state does not want to displace homeowners who are making good faith efforts to comply with regulations and will accept replacement systems that are the best possible solution for particular circumstances. State forbearance notwithstanding, replacing failing septic systems under new state drinking water and wastewater isolation standards can be anticipated to be a more complex and expensive process than would be the case in a less densely settled area.

The stricter standards for buildings utilized by the public, occupied by 25 or more persons for 60 days or more, has forced the closing of several businesses in Jamaica Village. Further, there is no state forbearance for public establishments. (See Economic Development section.) There are two **conflicting visions for Jamaica Village's future; one of encouraging economic development** and the other of maintaining a quiet residential rural village. The operating constraints on commercial building operations imposed by the state wastewater and potable water standards preclude any significant economic development in Jamaica village. They also make maintaining the status quo indefinitely possible only with considerable difficulty and expense to village homeowners. For these reasons, the Planning Commission believes that if at all feasible, a village-wide solution to complying with state wastewater and potable water standards should be pursued.

During 1999-2000, the Planning Commission conducted a study of existing wastewater disposal and water supply conditions in Jamaica Village. The purpose of the testing was to determine whether or not on-site septic systems within the Village are having an effect on the water quality of the wells that serve the Village population.

E-coli counts in Ball Mountain Brook in the Village center were found to be typically higher than counts at a control point upstream of the Village. The final reports and recommendations of this study are available from the Town Clerk, and are incorporated into this plan by reference.

The 2006 Community Survey indicated that there was uncertainty as to whether there are problems in Jamaica with the poor treatment of wastewater. However, 73% of respondents indicated that they would support a Town effort to identify and address issues regarding wastewater and drinking water issues.

COMMUNITY SURVEY
Question: Would you support a Town effort to identify and address issues regarding wastewater and drinking water issues?
Yes – 73%
No – 15%
<u>No Response – 13%</u>

The most effective and least cost solution the wastewater and potable water supply isolation problem is the development of a municipal water system for Jamaica Village. Such a system would consist of a municipal well, or wells, and water pipelines to village homes. Existing homeowner wells would be capped or re-plumbed for non-domestic use rendering the septic system isolation issue moot. Additionally, although potable water wells have longer life spans than septic systems, they do fail. A municipal water supply would alleviate the need to maintain individual wells. Municipal water systems typically cost on the order of \$1M, a significant burden for the village. However, state and federal funding may be available for the purpose of building such a system.

Not having town water causes the businesses in town to suffer which decreases our tax base. The lack of a village decreases property values both in and out of the village. Also, residents tend statistically not to have their water tested on a regular basis. And even if they did have their water tested, the basic test will show only bacteria content, and not the presence of heavy metals and radioactive substances. There are areas that could have levels of lead, arsenic, and uranium and many residents may be unaware of the current quality of their water. A town water system would address these concerns. Regular comprehensive (full spectrum) water testing is recommended.

Potable Water Supply and Wastewater Policies:

1. Encourage on-site sewage disposal system owners and operators to properly maintain their systems.
2. Support collaborative potable water supply and wastewater planning efforts that build on the Jamaica Village Water Quality and Septic Study and investigate alternatives for water supply and/or wastewater treatment.
3. Encourage the use of technical assistance to help address the potable water supply and wastewater issues in Jamaica and to allow existing buildings to be used at full capacity.
4. Building on existing Water Quality and Septic Study and require the development and review of options for municipal water and/or wastewater systems.
5. Explore potential funding options for development of a Jamaica Village solution to comply with state wastewater and potable water technical standards.

Priorities for Action:

1. Evaluate the feasibility of a water supply and distribution system and/or a wastewater collection and treatment system in Jamaica Village. Recommended steps for the evaluation are as follows:
 - a. Engage local citizens throughout the process by information dissemination and public meetings;
 - b. Identify, collect, and analyze all relevant reports, findings, and data that may have a bearing on water quality issues in the community;
 - c. Evaluate economic impact of existing conditions;
 - d. Investigate different solutions to the water and wastewater issue in Jamaica Village based on their cost, reliability, management and maintenance requirements, regulatory restrictions, soils requirements, and possibility for future expansion;
 - e. Explore state and federal funding sources. If identified, establish a budget pursue development of a municipal solution for a water supply and distribution system or a waste water collection and treatment system for Jamaica Village. (Planning Commission, Selectboard)
 - f. Establish a budget and funding sources. (Planning Commission, Selectboard)
2. Explore the possibility of creating a public restroom within Jamaica Village. For example,

research what existing public building (such as the Library, Bank/Historical Society building, Town Hall, Church) could provide for allowing off hours secure public access. (Planning Commission, Selectboard)

3. Follow up on the Jamaica Village Water Quality and Septic Study, 2000, including mapping potential water supply sources. Specific possibilities discussed in the Study include creating a Decentralized Wastewater Management System (Study page 27) or creating a Centralized Community Treatment and Disposal System (Study page 29). (Planning Commission, Selectboard)
4. Educate citizens about septic system maintenance. (Planning Commission)

VII. ENERGY

Energy Element – Executive Summary

A summary of the Energy Element of the Jamaica Town Plan is presented in this section. The full Energy Element is attached as an Appendix to this plan. **Jamaica's Energy Element addresses the need to reduce carbon-based pollution (CO₂) of the atmosphere with a realistically executable energy plan that preserves the nature of our town, prized by both our residents and many vacation homeowners. It is also intended to provide our residents the significant cost savings in energy costs that advances in energy technology will offer. Our goal is to meet the requirements of Act 174 which embodies the energy saving and sourcing goals of Vermont's 2016 Comprehensive Energy Plan in a manner that is consistent with Jamaica's long-standing Natural Resources, Land Use, and Economic Development policies. This Energy Element will be used as a tool to advance the economic and environmental well-being of Jamaica, thereby improving the quality of life for its residents. Furthermore, these energy goals will reduce Jamaica's vulnerability to energy-related economic pressures and, in the long- term, climate change-related natural disasters, and promote long-term community resiliency in a variety of contexts.**

The cost of energy in Jamaica, including residential, commercial and governmental use (for heating, electricity, transportation, etc.) is estimated to be \$3,897,193 per year. Because a large majority of this energy is imported from outside of Jamaica and Windham Region, most of the money spent on energy does not directly benefit the local economy. Efforts to reduce the use of energy sources from outside the Town, or shift reliance to locally produced energy, can improve household financial security and strengthen the local economy.

The Energy Element has three major components, improving the efficiency of thermal and electrical energy usage, switching fuels for more efficient heating and transportation, and conversion to renewable energy sources for transportation, heating and electricity generation. The plan implements these components through a program of community outreach to bring energy saving measures to the community's attention and thereby promote the opportunity to reduce energy costs. **The plan will meet the Windham Regional Commission's (WRC) allocation of transportation and home heating energy savings and renewable energy sourcing targets necessary to be Act 174 compliant in a manner consistent with preserving our town's rural nature and consistent with the pace at which enabling technology and low cost financing become available. Jamaica fully embraces the regional targets for renewable energy generation to be met by solar installations and residential wind generators, as well as the goals for energy conservation in home heating and transportation. These targets are summarized in table E1 below. Additionally, we will explore adding micro hydroelectric generation to our generation mix.**

Preserving the Town's natural environment is essential to Jamaica's economy and tax base. Many visitors to our state and virtually all of the Town's residents value the area's natural beauty, including the state's most popular state park. For these reasons, commercial wind energy sources, which by their nature must be located on ridgelines on which the long established land use policies of our town plan prohibit development, are not considered appropriate for Jamaica and are therefore excluded under the provisions of this plan. While the Windham Regional Plan does not presently assign a target for wind-generated renewable energy, it is Jamaica's policy to meet regional community renewable energy targets with solar, residential wind, as defined in the full energy element, and possibly micro-hydroelectric generation and to exclude commercial wind development, also defined in the full energy element, as both unnecessary and inconsistent with long-standing Town land use policies. Residential wind development will be encouraged in areas specified by the Wind Potential and Resource map (maps 4 and 5 of Appendix A) of the Mapping Appendix of the Energy Element that are not constrained by Act 250 considerations or provisions of our town plan. It is further considered that the regional targets based on current commercially available technology may prove to be very conservative by 2050. Excluding commercial wind development does not interfere with the town's ability to reach its renewable energy targets.

The plan is realistically attainable. By design, some Act 174 targets for key dates are aspirational. Several enabling technologies are necessary to achieve large-scale penetration of renewable energy generation into the power grid. These include energy storage, power electronics, and smart grid architecture and technology, including grid control. Vermont's current limit on net metering, 15% of base load, is a reflection of the difficulty in accommodating the variable levels of renewable energy source output in the current power grid. Technologies that deal with the variable nature of renewable energy sources and exploit their geographical distribution are necessary to relaxing net-metering limits in order to achieve broad utilization of renewable energy sources. Similarly, conversion to electric, hybrid, or alternate fueled vehicles is dependent on market availability of alternative vehicles suitable for rural use, e.g. trucks, all-wheel drive vehicles, and heavy utility vehicles. Improved energy storage is key to developing markets for these vehicles. These technologies are in various stages of research and commercial development with unknown maturity dates. Community outreach efforts will include maintaining awareness of maturation of these technologies so that opportunities based on their use are introduced to the community as soon as available.

The major benefit to our citizens' is reduced energy expenses. The cost of renewable energy continues to fall and is predicted ultimately to be much less expensive than fossil fuel-based sources. The combination of low-cost energy and the technology to deliver it to all domestic and industrial energy users will in turn spawn economic models with minimal capital expense and much reduced unit costs. The future difference between fossil fuel and renewable sources will be sufficient to finance the upfront capital costs of installations within unit costs and still offer users considerably less expensive energy unit costs than are currently possible. Both these developments, low unit costs and amortization of capital conversion costs within the lower unit costs, will provide our residents' major cost saving opportunities while reducing CO2 emissions. Our plan includes efforts to keep abreast of these much-anticipated technology and economic trends so that we may be able to take advantage of them as early as possible.

While Jamaica can do little to shift the broader state or federal policies, we can influence energy use and production on a local level. In this energy plan, we hope to address Jamaica's local actions for increasing our energy efficiency and promoting renewable energy generation, and

overall pathways to become more resilient. We will adopt policies to meet our specific goals as technology and economic developments permit.

The Windham region has been assigned goals for efficiency improvements, use of alternative fuels, and generation of renewable energy for the benchmark years 2025, 2035, and 2050. The Windham Regional Commission (WRC) has in turn apportioned these goals to each town. Meeting these specific goals will make our town's energy use compliant with Act 174 and Vermont's 2016 Consolidated Energy Plan. This plan commits Jamaica to meeting the goals assigned to it within the constraints imposed by the pace of introduction of enabling technologies and cost effectiveness. They are summarized in Table E1 below.

Table E1: Summary of Jamaica's Commitment to meeting allocated energy goals

Category	2025	2035	2050
Efficiency Targets at Benchmark Years			
<u>Residential Thermal</u> : Estimated number/percent of houses to be weatherized to meet efficiency goals	94 / 9%	184 / 17%	377 / 36%
<u>Commercial Thermal</u> : Estimated number/percent of commercial establishments to be weatherized	3 / 9%	6 / 16%	10 / 30%
<u>Electricity</u> : Estimated number/percent of kilowatt hours to be conserved annually and percentage of building upgrades	561,700 / 42%	917,900 / 68%	1,342,600 / 100%
Fuel Switching Targets			
<u>Residential and Commercial Fuel</u> : Estimated number of new wood pellet stoves and high efficiency wood boilers	280	266	266
<u>Residential and Commercial Fuel</u> : Estimated number of new heat pumps	87	172	24
<u>Transportation Fuel</u> : Estimated number of new electric vehicles	60	424	896
<u>Transportation Fuel</u> : Estimated number of new bio-diesel vehicles in town	92	176	304
Use of Renewable Energy			
<u>Transportation</u> : Percentage of total BTUs consumed	13%	31%	90%
<u>Heating</u> : Percentage of total BTUs consumed	56%	67%	93%
<u>Electricity</u> : Estimated number of MWh to be produced from residential and commercial solar, residential wind, and small hydroelectric generators	308	492	1,231

VIII. COMMUNITY FACILITIES AND SERVICES

The quality of and capability of community facilities and services are important components of a town and are often used as a measure of the quality of life within the community. Therefore, the

planning for community facilities and services is important in providing for the needs of the community.

This chapter examines the existing conditions, levels of services, and future needs of the municipal facilities and services provided in Jamaica. As a rural community, Jamaica must often rely on services provided by agencies from the outside. Therefore, a variety of services that are provided to Jamaica residents from outside the Town are also considered.

Town Services

Administration

It is through the combined efforts of elected officials, appointed officials and hired employees that the services of the Town are provided. Town government is overseen by a five-member Selectboard. Other elected officials that are involved in Town government include the three Listers and the Library Trustees. Elected officials such as Moderator, Grand Juror, Town Agent, First and Second Constable, and others serve their respective roles as may be required. There are many officials who are appointed by the Selectboard, including the Town Clerk, Town Treasurer, Delinquent Tax Collector, Fire Warden, 911 Address Coordinator, Planning Commission, Zoning Board of Adjustment, Health Officer, and various other appointees who actively participate in Town government.

Jamaica holds a traditional Town Meeting to elect local officials, approve a budget for the following year, and conduct other local business. At the Town Meeting, eligible citizens of the town may vote on specific issues that are announced through a warning.

Ambulance Service

Formerly, Rescue, Inc. (stationed at West Townshend), Londonderry Ambulance, and Stratton Mountain Rescue all provided ambulance service to different parts of Jamaica. However, at the [June 26, 2017 Selectboard meeting](#), the Selectboard voted to revise the Rescue, Inc. contract for the Town so that Rescue, Inc. will be responsible for covering the complete Town, not just a portion. The Town will continue providing Londonderry Ambulance with financial support.

Emergency Management

The Town has an appointed Emergency Management Director; whose duties include the coordination of municipal resources in the event an emergency is declared by the Selectboard. The Fire Department is typically the first to respond to most local emergencies, and has a number of written procedures for specific emergency situations.

In the event of an emergency, the Town Clerk's Office has been designated as the Emergency Management Post Command Center. It is here that the Emergency Management Director coordinates all involved service providers during an emergency. In addition, the Masonic Hall is the Evacuation Center during Town emergencies. It has been certified by the American Red Cross as the Town shelter.

The Town of Jamaica has a FEMA-approved Final Approved Local Hazard Mitigation Plan, dated February 19, 2015. This plan, in conjunction with the Town Plan, will aid the Town in resource management and coordination of Town Services. The Hazard Mitigation Plan will be available at the Town Clerk's office.

The Town has adopted the National Incident Management System (NIMS). The Town continues to work on efforts to support the safety of the Town.

A statewide Enhanced 911 system has been implemented locally. All structures now have unique road addresses in accordance with 24 V.S.A. Sections 229(16), and 4421, and the Town of Jamaica Ordinance Regarding Street Names and Addressing. These addresses correlate to the **site's distance from the** beginning of the road in increments of 5.28 feet (based upon fraction of a mile) so that they may be easily located in the case of emergency. Each address falls within one of the four mapped Emergency Service Zones in Jamaica and 911 calls are automatically routed to the closest rescue service based on these zones. The primary responders for these zones are from towns of Winhall, Jamaica, Wardsboro, Stratton, and Windham. The Jamaica Address Coordinator, a Town appointed official, is responsible for the update and maintenance of the **municipal 911 database. Applications for a new 911 address are available in the Town Clerk's** office.

Jamaica Volunteer Fire and Rescue Association

The Jamaica Volunteer Fire and Rescue (JVF&R) provides fire suppression operations, advanced emergency medical treatment, and various forms of technical rescue operations. The department has approximately 30 members to its roster.

The department operates out of a six bay garage facility. Attached to the garage are a command center, supply room, and meeting room. This facility has capabilities to be an evacuation center or serve in some other civic function. Built in 1994, the fire house replaced a much older building in the center of the Village. Jamaica has 3 engines and one rescue truck.

JVF&R is funded through tax appropriation, donations, and fundraising efforts. Since September 11, 2001, state and federal funding has been available and awarded to JVF&R. These funds have been used to purchase equipment and pay for training to improve the protection and ensure the safety of the community.

There are five cisterns throughout the Town. The two municipally owned cisterns are located in the Village center along with a hydrant, guaranteeing a consistent source of water to assist in the event of a major structure fire in the Village. There are three privately owned cisterns located on Sugar Lot Lane, Dalewood Road, and Trager Road, which provide fire protection. New developments may be required to install cisterns for fire protection if the JVF&R cannot provide adequate fire protection.

JVF&R is a member of Tri-Mountain Mutual Aid Association, which includes the towns of Londonderry, Peru, Weston, Winhall, Stratton, and Windham. Tri-Mountain Mutual Aid is also a member of the Southwest New Hampshire Fire Mutual Aid. Mutual aid systems are associations of fire companies that allow local fire companies to receive fire-fighting assistance or back-up service from other member fire companies.

Police Protection

The Town contracts annually with **the Windham County Sheriff's Department for motor vehicle** enforcement. The Vermont State Police handle criminal complaints and cases. Jamaica also elects a First Constable and a Second Constable. Constables are responsible for animal control and keeping the peace.

Solid Waste Management

The Jamaica Transfer Station, located on Castle Hill Road, processes waste materials for the

residents of the town. It is open five days a week at specified times. Residents are required to show the Attendant an identification card each time they enter the facility. These cards are available at the Town Office and are renewed yearly on October 1st. The Transfer Station accepts **trash in the “Pay as you Throw” bags. Recyclables of paper, cardboard, glass, plastics, and** organic garbage are accepted at no charge. Other items such as electronics, refrigeration, demolition/construction materials, and metals are also collected. Some of these materials are chargeable items. Brush, leaves, and clean lumber are debris accepted at no charge. The Swap Shop provides residents the opportunity to bring in reusable items or take items free of charge. It is open at the same hours as the Transfer Station.

Jamaica is a member of the Windham Solid Waste Management District (WSWMD). The purpose of the District is to provide effective and efficient waste management for the 18 member towns. It provides educational workshops for community members and employees of town waste facilities. The WSWMD staff also provides educational classes for school students focusing on recycling in the classrooms. The District also accept hazardous waste disposal.

Town Services Policies:

1. **The Town's rate of growth should not exceed the Town's ability to provide the community** facilities and services needed.
2. If the capacity of community facilities or services (e.g. sewer, water, fire, police protection, schools) cannot be expanded without incurring significant capital expenditures, then the expansion of such facilities or services shall be limited to that which the Town can finance or a fair share of the burden for required services or facilities shall be borne by the beneficiary of such services.
3. Support the efforts of the JVF&R to provide effective fire and emergency services.
4. Require that all new development provide adequate water availability and additional equipment or infrastructure needed for effective fire protection. Developers must consult with JVF&R to ascertain if additional provisions will be necessary.
5. Support surrounding towns by providing Mutual Aid assistance when needed.
6. **Continue to contract the services of the Windham County Sheriff's Department, or other** appropriate law enforcement organization, for police protection in the Town.
7. Maintain a certified solid waste transfer and recycling facility.
8. Participate in the Windham Solid Waste Management District (WSWMD) as long as it remains advantageous to do so.
9. Require recycling and composting efforts and support efforts to provide additional recycling programs.
10. Support the assessments of waste disposal fees that accurately and fairly charge disposal costs to the generators of unique or large amounts of solid waste.

Priorities for Action:

1. Continue providing an annual Town appropriation to the JVF&R. (Selectboard)
2. Establish a procedure for JVF&R to review subdivision proposals so that they can work with developers to minimize the risks of fires and maximize their ability to combat fires. (Planning Commission, Selectboard, JVF&R)
3. Participate in local emergency planning efforts. (Planning Commission, Selectboard, JVF&R, Emergency Management Director)
4. Stock the emergency shelter at Jamaica Village School with emergency supplies. (Selectboard, JVF&R, Emergency Management Director)
5. Continue to monitor benefits of continuing to participate in the WSWMD. (Selectboard)

Town Facilities

Cemeteries

There are six cemeteries in Jamaica that receive appropriations from the Town: Rawsonville, East Jamaica, South Hill, South Windham, West Jamaica, and Pikes Falls. A five-person Cemetery Commission is responsible for the administrative duties and maintenance of all six cemeteries. The cemeteries are shown on the Transportation and Community Resources map.

Jamaica Memorial Library

The Jamaica Memorial Library occupies the former District #2 School. This library was established under state law in 1923, but it wasn't until 1969 that the book collection was moved into the present building on Depot Street just off Main Street (VT Route 30). There are currently **5,532 books for adults and over 3,000 children's' books. There are 267 audio books, 495 DVDs and 10 periodical subscriptions.** The library has a large adult mystery section as well as large print books.

Library services continue to be funded through tax monies, fundraisers, and grants, as the State of Vermont does not subsidize libraries. Maintenance and operation of the library is overseen by the Library Trustees, which are elected positions.

The library has been expanding its public outreach. In 2016, the hours were expanded to be open 19 hours per week over 4 days. The library offers **many programs including Children's Summer Reading Program, "Open Book" Adult Book Group, Film Series and Programming for All Ages,** Vermont State Parks Pass & Vermont Historic Sites Pass, BMAC Free Pass, Echo Lake Aquarium Discount Pass, the ongoing Book Sale, and offers free audiobooks and ebooks through One Click Digital.

The library is one of twenty-five in the State of Vermont chosen to participate in the **"Vermont Early Literacy Initiative in Science, Technology, Engineering, and Math" (VELI-STEM),** an IMLS National Leadership Grant promoting early learning in the library. This grant provides training, some equipment and books for libraries but no funding. In 2016, eleven events were **presented to 119 children including "Little Ones Story Time," JVS Classroom visits, homeschooling groups and WCSU Explorer's Camp programs. One Camp Program was created** for 50 campers who explored Force and Motion and gave children the opportunity to create marble runs with inclined planes.

Internet access has allowed the library to join the Vermont Online Library, which provides community residents access to online electronic information databases. The library participates in the Inter-Library Loan program which allows for book exchanges with other Vermont libraries. The library has a website at www.jamaicavtlibrary.org and a Facebook page. The library is in the process of automating its collection with barcoding and scanning capabilities, providing patrons with online catalog access. Unfortunately, the State of Vermont has recently cut back on personnel and services that support small town libraries such as ours. In these circumstances, it is desirable that the Town consider increasing its support for the library in order to maintain and support essential programming, collections, personnel and services.

There are currently two public computers as well as Wi-Fi access. Other resources available for use are the Universal Class & Other Online Resources, and a photocopier/fax machine. The **library also has one volunteer who helps on a regular basis, but no "Friends of the Library"**

organization.

The building has two main rooms currently in use--an adult reading room that includes a Young **Adult section, and a Children's room. The full basement is under renovation and will be converted to a community meeting and activity room, as well as a permanent book sale room, when funding becomes available. The building was also approved to have an onsite bathroom installed and these renovations are taking place will begin in the summer of 2017. Other space in the building could be put to use for library services and collections, but they are uninsulated and unfinished. Finding funding for these additional improvements would greatly increase the comfort and availability of the library collections and services and lead to increased use and enjoyment by Town residents.**

Rawsonville Schoolhouse

The Town also owns the historic Rawsonville Schoolhouse. The Schoolhouse is a one-room building that has the potential to be connected to a wastewater system and has the ability to connect to a potable water supply.

Town Hall

Town Hall is currently used for Town Meetings and both public and private community gatherings. This historic building was built in 1853 as the Universalist Church of Jamaica. In the late 1870s, with two churches in Town, attendance dropped and the building was sold to the Jamaica Dramatic Club in 1880. After some renovations; stage and dressing rooms, vestibule and **ticket window, the "Jamaica Opera House" opened in 1888. The Opera House became the social gathering place for the area, hosting many events. As the population and economy in Jamaica declined so too did the use of the Opera House. In 1921, the Dramatic Club closed its door (called its curtains) and donated the building to the Town to use as the Town Hall.**

The Town Hall is now operated and maintained by the Jamaica Town Hall Programming Committee and the Jamaica Town Hall Building Committee. The building is currently used for public meetings, theater and music events, and private functions.

Town Offices

The Town Office houses Town records, land deeds, Town Treasurer and Town Clerk's office and Selectboard activities. The Town Listers and Planning Commission also use the building. The second floor meeting room is used primarily for office work. The most recent additions include the vault and first floor meeting rooms used mostly by the Selectboard and Planning Commission.

West River National Bank Building

The West River Bank was chartered as a State institution in 1853. The first bills were issued on July 20, 1854 and continued until 1865 when it reorganized as the West River National Bank with charter number 1564. The brick building is located at the south end of Main Street in Jamaica Village and is listed on the state historical register. The building served continuously as a bank until February 2006, when it was closed.

In 2006, after the bank was closed, the building was put up for sale. At a special Town Meeting the residents of Jamaica voted to purchase the building. The Jamaica Historical Foundation currently uses this building for meetings and exhibits. However, the Town is still working on a plan for future use of this building.

Town Facilities Policies:

1. Construct or expand community facilities in Jamaica Village first in order to maintain the **Village as the Town's center.**
2. Encourage community-based partnerships working for the revitalization and expanded public use of Town owned historic buildings.
3. Maintain and encourage activities that support or enhance the provision of library and information services.
4. Ensure that Town property, including all town-owned municipal buildings (Town Hall, Town Office, Library, bank building, Rawsonville School, Town garage, and Fire Station) is adequately maintained and serviced in order to provide a safe and efficient work environment for Town employees and to maintain the safety and aesthetic quality of Town property.

Priorities for Action:

1. Investigate using sole source vendor contracting to provide certain goods and services such as insurance, fuel, and maintenance for Town facilities. (Selectboard, Planning Commission)

Recreational Resources and Events

Jamaica has a wealth of recreational resources, especially in regards to public forests and natural areas. There are facilities owned and operated by the State of Vermont, the Town and the Army Corps of Engineers. An extensive network of trails and back roads provide impromptu opportunities for hiking, biking, cross-country skiing, snowshoeing, and horseback riding through the Town and the many miles of streams and rivers provide opportunities for fishing and swimming. Private recreation facilities, including golf courses, camp grounds, and major ski resorts, are located in surrounding towns and are easily accessible from Jamaica.

Jamaica's recreational and cultural resources include:

Recreation Areas

- Ballantine Ball Field: Through a cooperative agreement, the US Army Corps of Engineers and the Town maintain a ball field in East Jamaica at the intersection of Routes 30 and 100 that supports a wide range of recreational use and is home to the Jamaica Jets baseball team.
- Jamaica State Park: Owned and maintained by the Vermont Department of Forest, Parks, and Recreation, Jamaica State Park is popular for hiking, picnicking, swimming, fishing, camping, canoeing, kayaking, and hunting. The State Park includes two parcels of land, the West River block and the Shatterack block, that together comprise 656 acres. Salmon Hole, in Jamaica State Park, is used as a swimming area.
- Hamilton Falls Natural Area: This natural area, comprised of 52 acres surrounding Hamilton Falls is owned and managed by the Vermont Department of Forests, Parks, and Recreation. It is a popular hiking and swimming destination.
- Ball Mountain Dam and Lake: Owned and operated by the US Army Corps of Engineers, use of the land in this area includes hiking, picnicking, fishing, and hunting.
- Winhall Town Forest: Public recreational use of this land includes hiking, hunting, trapping, and fishing.
- West River: The river provides an excellent habitat for native fish species and was included in the federally sponsored Atlantic Salmon Restoration Program.

- Whitewater Runs: The two-mile section from Ball Mountain Dam to the Salmon Hole at Jamaica State Park is famous as a challenging whitewater run. Downstream from the State Park the river continues to be navigable with moderate whitewater features for 7 miles to the Townshend Dam. In early fall, conditions permitting, the Army Corps of Engineers provides one weekend when the flow is augmented by releases from Ball Mountain Dam.
- West River Trail: The West River Trail is open from Jamaica State Park to South Londonderry and from Townshend Dam to West Townshend. Public Lands Highway funding (funding that is available for projects that are on, adjacent to, or provide access to federal public lands or Army Corps of Engineers property) have been used for improvements along the West River trail. In Jamaica, improvements have included supporting the Cobb Brook Bridge and the Ball Mountain Dam switchbacks in 2003 construction projects.
- Pikes Falls: Located on the North Branch of Ball Mountain Brook, Pikes Falls drops over two ledges before entering into a large pool which serves as one of many swimming holes in Jamaica. Several acres of land between Pikes Falls Road and the brook are owned by the town and provide public access.

Events

- Old Home Day: **A celebration, dating back to the 1800's, where new and old residents come home to Jamaica to celebrate the Town's history. Old Home Day is held on the last weekend in July.**
- Jamaica Masonic Hall: Bingo is held weekly on Friday nights.
- Jamaica Community Arts Council: a local volunteer group organizes the Craft Show and an ongoing concert series in the Town Hall.

Support for Events/Community Revitalization:

- Traffic calming (see Transportation chapter)
- Parking issue (see Transportation chapter)
- Public bathroom
- Revitalize Business Council
- Revitalize Town Hall like what Winhall has done with their old Town Hall to create a community center

Recreational Resources and Events Policies:

1. Support public access to and maintenance and improvement of recreational areas.
2. Support cultural and arts events and programs.

Priorities for Action:

1. Encourage the development and construction of alternative recreational facilities for children and young adults on underutilized town land. (Selectboard, Planning Commission)
2. Revitalize Business Council. (Planning Commission, Selectboard)
3. Revitalize Town Hall like what Winhall did with their old Town Hall to create a community center. (Selectboard, Planning Commission)

Senior Services

As a small town, Jamaica depends on regional services to offer opportunities for its seniors. To support such service, the Town makes annual contributions to several organizations. The Senior

Solutions (formerly known as The Council on Aging provides support services to seniors aged 60 years and older living independently in Windham County. This organization can assist seniors in obtaining information on caregiver support, nutrition, legal services, transportation, housing, visiting nursing and hospice. Below are some of the services that Jamaica residents either are using or can take advantage of:

- Nutrition Services: For a small donation, seniors can take advantage of community meals that offer nutritious meals and are often accompanied by interesting programs such as guest speakers or educational programs and information about other senior activities. Residents can take advantage of meals in Jamaica, as well as other towns including Londonderry and Townshend. Senior Solutions also coordinates home delivery of meals (known as Meals on Wheels) by using volunteer networks that bring the meal to the individuals. Other nutrition services provided by Senior Solutions include food benefit and supplemental food programs for age and income-eligible Vermonters.
- Transportation: Seniors can take advantage of transportation services that are provided by Southeastern Vermont Transit, Inc. (SEVT). Residents with Medicaid, over the age of 60, or that have an ADA-defined disability can schedule point-to-point transportation for **medical appointments by calling CRT's Dial-A-Ride** service two days in advance. In addition, the Betty Boop bus runs twice a month from Wardsboro to Brattleboro. Grace Cottage Hospital also coordinates rides to and from medical appointments using volunteer drivers vetted by RSVP.
- Caregiver Support: Adult Day Services (ADS) provides supervised activities for the frail and/or cognitively impaired, and respite for family and caregivers. The closest Adult Day Service to Jamaica is The Gathering Place in Brattleboro. Senior Solutions can also arrange for senior companions, who provide friendship and support to homebound elderly. In addition, the Grace Cottage Health Care Center provides educational and care programs for seniors.

Despite the existence of these programs, Jamaica and surrounding rural towns are underserved by **social services. The programs closest to home for Jamaica's seniors to access are the Senior Solutions senior advocate** that works part-time at the Grace Cottage Hospital and the Community Food Pantry that serves families in need in both Jamaica and Wardsboro. The Community Food Pantry provides supplemental food to families in need without any questions. Though not just available to seniors, the Community Food Pantry does deliver food and can cater to special dietary needs.

Senior Services Policies:

1. Support the well-being and quality of life for seniors.
2. Continue to improve accessibility to public buildings and sidewalks.

Communications

Wireless phone services and broadband internet access are now available in many parts of Jamaica, although with wide variations in options, reliability, and speed. Cable TV and broadband internet access is available, mostly in the more densely populated areas along the Route 30 and Route 100 corridors. In addition to this, DSL and satellite access are available. Wireless phone service is available in many parts of Jamaica. Due to

Jamaica's rural landscape and the cost associated with providing some services to all areas of Jamaica, some people still do not have access to the latest technologies.

Communications Policies:

1. Encourage expansion of wireless broadcast and telecommunications facilities at existing sites.
2. Require that the location of and design of communication facilities and services provide quality transmission and minimize the negative impacts on natural resources and special sites and areas (including access roads).
3. Require that provisions are made for the removal of communications facilities when they are no longer in use.
4. The development or alteration of wireless broadcast and telecommunications facilities that would require lighting or marking by the Federal Aviation Administration (FAA) shall not be permitted.
5. Encourage underground utilities in new subdivision proposals of more than 10 lots.
6. Ensure that public safety and the public works department have the best communication system possible.

Priorities for Action:

1. Coordinate with providers of communication services in the siting, construction, alteration, development, decommissioning, and dismantling of new lines, towers, poles, and equipment. (Selectboard, Planning Commission)

Child Care

In June 2003, Public Act 67 amended Chapter 117 of 24 VSA (Municipal and Regional Planning **and Development**) to add **planning goal number 13, “To ensure the availability of safe and affordable child care and to integrate child care issues into the planning process, including child care financing, infrastructure, business assistance for child care providers, and child care work force development.” Child care, in this context, encompasses children ages birth to twelve, in congruence with the Vermont Child Care Services Division definition of child care.**

The accessibility, affordability, and quality of child care affects parents’ ability to enter the workforce, be productive while at work, and remain employed. The 2010 US Census reported that there were 46 children under the age of five. This indicates a potential need for child care.

According to the Bright Futures Information System, a service of the Vermont Department for Children and Families, there are two registered family child care home currently operating in Jamaica. In addition, the Jamaica Pre-K Program is a licensed child care provider. There are other registered child care homes in Londonderry and Townshend and other licensed child care providers in Wardsboro, Townshend, Londonderry (2), Winhall, Stratton (2), and Athens.

There may be other child care operations in Jamaica that are not registered. The Vermont Agency of Human Services, Department for Children and Families requires any person who provides child care for children from more than two families, other than their own, to be registered or licensed. Family child care home registration is for a care giver seeking to operate out of his or her home. A registered care giver may provide care for up to six children, including up to two children under the age of two, at any one time. In addition, he or she may care for up to four school-age children for not more than four hours daily per child. A care giver wishing to care for children in a building other than his or her home requires a state license.

Child Care Policies:

1. Support town and regional efforts to increase the availability and affordability of child

- care.
2. **Consider Jamaica's capacity to provide quality child care for its youngest population when the Town responds to new development in the town and region.**
 3. Encourage home-based registered child care facilities in the community.

IX. EDUCATION

Early Education

Early Educational Services of Brattleboro (EES) is an organization that provides several programs for families with children from birth to five years of age. The programs include Head Start classrooms in Brattleboro and Westminster, Family Support Specialist services including nutrition, dental, medical, and behavioral support, home visiting for support and education of community resources, the Welcome Baby program that gives out bags and collaborates with schools to provide Teddy Bear Teas, playgroups (the closest currently is in Townshend), the Dedicated Dads Program that meets weekly, the Dental Clinic, information and referral services, and Parent Education Classes and Support Groups. Jamaica residents are eligible to participate in all of the EES programs.

Windham Central Supervisory Union Preschool Support

Windham Central Supervisory Union is starting a new program for families with preschoolers in the West River Valley towns of Jamaica, Wardsboro, and Townshend. The Preschool Support Program is funded by a state/federal Preschool Expansion Grant. Through this program, families with preschoolers can get help with a variety of needs. The preschool support worker can help families; receive beneficial screenings for their child (hearing, vision, dental, health and developmental), connect to community resources for help with things like housing, food, etc., and coordinate/pay for transportation to and from appointments or preschool.

Pre-Kindergarten

Another opportunity for early education is the Jamaica's pre-kindergarten program that began in the 2006-2007 school year. The program now runs for the full day with the option of five morning half days for Pre-Kindergartners. In order to be eligible for the Preschool Support Program, a child must be 4 years old by September 1st and as mentioned above, be living in Jamaica, Wardsboro, or Townshend. This Preschool Support Program also sponsors family and parent events that are open to all families with preschool-aged children in the three towns. Look for information on these events under the family events subpage on this site.

Primary and Secondary Education

Jamaica Village School and Community Center

The Jamaica Village School serves the town's children from pre-kindergarten through sixth grade. A full time kindergarten program was initiated in the 2000-2001 school year. The school building has six classrooms, a small meeting/work room, library, principal's office, administrative office, multi-purpose room and kitchen. There are currently four mixed-age classrooms, which are a Pre-K/K, 1st/2nd grade, 3rd/4th grade, and a 5th/6th grade. The current wastewater system has a capacity of 102 occupants. Enrollment in the 2016-2017 school year was 56 students (pre-kindergarten through sixth grade). The Jamaica Village School Board has five members.

The LAFTER Program (Learning After School), runs Monday through Thursday from 3:00- 5:00

PM and offers a variety of enrichment activities from community members and beyond. The LAFTER program stresses: (1) learning by doing in activities such as building, drawing, constructing, and sewing, (2) practicing new skills in literacy, math, science, and studies, and social skills emphasizing healthy recreation and cooperation. The program is supported with a late bus schedule so all students may participate.

The Jamaica Village School building is also a community center and designated emergency shelter. It has a non-transient public water system and a back-up generator. It can be, and has been, used for yoga classes, fundraisers, and birthday parties.

Leland and Gray Union High School and Middle School

Jamaica is a member of the Leland and Gray Union High School & Middle School District in Townshend (LGUHS). As a District member, Jamaica has two seats on the Leland and Gray Union Board. In the 2016-2017 school year, there were 42 students from Jamaica enrolled at Leland and Gray; 30 students at the high school and 12 students at the middle school. LGUHS participates in a limited school choice program that was authorized under Act 150. This program allows a limited number of public high school students in grades 9-12 to transfer from their district into another school in the choice region. No funding for transportation is provided and, unless otherwise agreed upon, no tuition is exchanged. LGUHS is in a choice region with Hartford High School, Rivendell Academy (Orford, NH), Black River High School (Ludlow), Springfield High School, Bellow Falls Union High School, Brattleboro Union High School, Twin Valley High School (Wilmington), Woodstock Union High School, Windsor High School, and Green Mountain Union High School (Chester).

West River Modified Union School District

In compliance with ACT 46 upon completion of the school year in 2019, the Leland and Gray High School Union will become the West River Modified Union Education District (WRMUED) governing primary, middle and high schools of the member towns. Jamaica has joined the modified union along with the towns of Townshend, Newfane, and Brookline. Jamaica has two members on the new board overseeing the Townshend, NewBrook, and Jamaica primary schools, as well as the Leland and Gray middle and high schools. While overseeing all schools in the unified union, Jamaica members of the unified school board must ensure the unique interests of the Jamaica primary school are met. Prior to activation, the WRMUED is meeting to establish organization and governing policy. When the WRMUED is activated, the Jamaica School Board will be dissolved. It is anticipated that the Jamaica School Advisory Board will then be formed to provide continuing community input to the Jamaica primary school, but this board will not have a governing role.

Education Costs

Educational costs in Jamaica have been increasing. The reasons for this are similar to those that affect other school districts all over Vermont. These include increases in under-funded government mandates regarding the type and quality of education, salaries and accompanying benefits, tuition at Leland and Gray Union High School, costs of special educational programs, transportation, and operation and maintenance costs. The current Education Funding System under Act 60 establishes education tax rates meeting school operating costs on a per normalized student basis. Normalized student numbers are determined by the number of actual students weighted by certain factors such as age and family income. Decreasing student enrollment numbers has been the primary reason for significant education tax rates. With the formation of the West River Modified Union School District, education tax rates will be set on a district wide

basis. The impact on Jamaica is dependent on operating costs of all schools in the modified union and are not yet clear.

In spite of these factors, the Jamaica School has made a number of improvements. The water quality at the school through its potable water system is now in compliance with State regulations. The wastewater capacity was increased not only to meet State regulations, but also to allow for future growth. Water fountains, bathroom facilities and a backup power system were added. Playground facilities were also upgraded providing better safety for the students.

Adult Education

Adult education opportunities for Jamaica residents are available regionally. The Community College of Vermont has learning centers in Brattleboro, Bennington, Rutland and Springfield that offer associate degrees, career-related certificates, and credit and non-credit training programs. Adult education and literacy programs are offered through Learning Works, a program of the Vermont Department of Education, with offices in Brattleboro, Bennington, and Manchester Center. Career and technical education is available at the Windham Regional Career Center in Brattleboro, Stafford Technical Center in Rutland, or Southwest Vermont Career Development Center in Bennington. These centers offer adult technical education and career skills both on-line and in the classroom or shop.

Windham Regional Career Center

The Windham Regional Career Center provides all learners, adults and high school aged students, with skills and competencies leading to post-secondary success. The Career Center supports a system of communication promoting an organizational climate that maximizes learning opportunities. The Career Center utilizes advanced technology to deliver valid curriculum aligned with recognized educational and industry standards and competencies to all learners in Windham County and the surrounding region. Participants in the STEM (Science, Technology, Engineering, and Math) and FVPA (Fine, Visual, and Performing Arts) Academies require a combination of required and elective coursework, a student portfolio, professional interaction within the chosen field and a capstone course. Successful completion of a STEM or FVPA program will result in a **notation on a student's transcript and high school diploma. These academies are open to students** graduating in 2017 and later. An application and interview are required for acceptance to both academies. On Campus and On-line courses in areas of health careers, career training and development, computer courses, and personal development are available to adult learners.

Continuing Education at Marlboro College

Marlboro's continuing education courses give students the opportunity to increase their knowledge in a specific subject or to "test drive" a degree or certificate program. For those who've been out of the classroom for a long period of time, continuing education courses also offer a way to ease back into the student routine. Courses may be taken for credit or audited for no credit. Most courses are 3 credits; a maximum of 9 credits may be earned without matriculating as a degree student. Until that threshold is met, there are no admissions requirements for continuing education courses, which are offered on a space-available basis. If pursuing a degree program after taking one or more continuing education courses, course credits can be applied toward your final degree in most cases.

Windham County Adult Learning Center

The Windham County Vermont Adult Learning Center helps high school and adult learners to reach their goals with classes and programs designed for success. Our experienced staff design

educational plans that fitting individual needs. Courses are offered in basic skills education, high school completion programs, GED preparation and testing, English Language Learner (ELL), Workkeys Certification (job critical real world skills), work readiness, and college transition. Programs are free except for some incidental fees such as GED testing and textbooks.

The Southwest Vermont Career Development Center

The Southwest Vermont Career Development Center (SVCDC) is committed to career and lifelong learning to prepare secondary and post-secondary students for career and lifelong learning in a rapidly changing world. The SVCDCs are located in Bennington, Manchester, and Danby, Vermont. They serve high school and adult students from the southwestern region of Vermont and adjacent New York and Massachusetts. The SVCDC Adult and Continuing Education (ACE) program provides classes and workshops that support varied professional and personal learning goals and interests that are aligned to industry, educational, occupational, and recreational trends. On line and Classroom Courses are offered in a variety of career oriented fields.

Education Policies:

1. Require and support the provision of early education and K-12. Encourage and support post-secondary, vocational and adult education programs.
2. Provide energy efficient and appropriate space to meet current and projected educational, health, and safety needs.
3. Promote the utilization of community based facilities and organizations that will support the educational, recreational, and cultural needs of residents.
4. Disseminate information on adult learning including the resources available at the Jamaica Memorial Library.

Priorities for Action:

1. Continue, through membership in the LGUHS District or by other appropriate means, to provide comprehensive educational and vocational training opportunities for young adults. (School Board)
2. Explore creating a wilderness education program using the resources of the Jamaica State Park, the Jamaica Village School, and the Jamaica Memorial Library
3. Identify needs and initiate stocking of emergency shelter with supplies, equipping the school with emergency supplies including blankets, food, and water. (Planning Commission, volunteers)
4. Encourage the use of all facilities including the State Park and Library with its VELI-STEM (Vermont Early Literacy Initiative-Science, Technology, Engineering, and Math) program. (school Board, Library)
5. Encourage opportunity to serve the individualized needs of all students drawing on the regional resources available. (School Board)
6. Disseminate information on adult education resources available. Reach out to those residents that may benefit from adult learning. (volunteers, local charitable organizations)

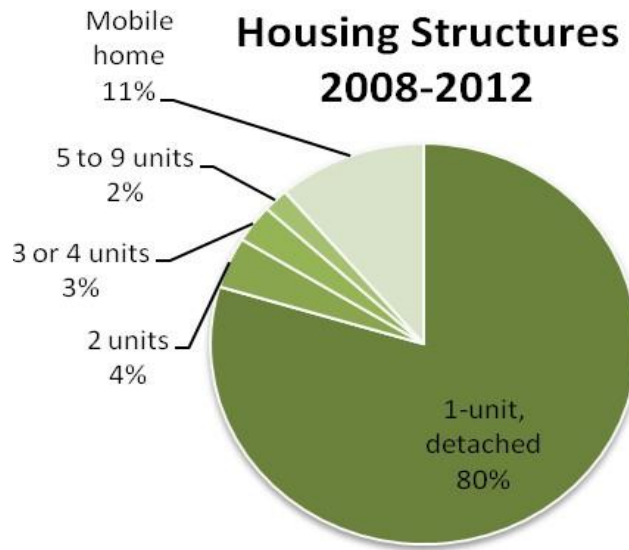
X. HOUSING

Housing Units by Type

During the 1990's the number of single family, multi-family, and mobile home housing units

grew in Jamaica. While there is a variety of housing types available in Jamaica, the predominant housing unit type is the single-family detached dwelling.

Over 80% of Jamaica's housing units are single-family units. Mobile homes account for 10% of the housing units. With the exception of densely settled Jamaica Village and some large subdivisions, residential development has occurred in a dispersed pattern, with a small number of lots being subdivided at a time. Housing density is 21 units per square mile.



Housing Tenure

Of the 1,055 housing units in Jamaica, 460 units were occupied in 2010 and 595 units were considered vacant (vacant units include seasonal housing units). Of the occupied units, 377 were owner-occupied and 83 were renter-occupied. Of the vacant units, only 24 were for sale or rent while 556 units were seasonal units. Table 2-8 uses VT Housing data which represents important trends, including the conversion of some seasonal housing to year-round units.

Table 2-8: Housing Units by Tenure and Vacancy in Jamaica

	2000	Percentage	2010	Percentage	Change
Total Units	967		1,055		9%
Occupied Units	416	43% of total	460	44% of total	11%
Owner Occupied	311	75% of occupied	377	82% of occupied	21%
Renter Occupied	105	25% of occupied	83	18% of occupied	-21%
Vacant Units	551	57% of total	595	56% of total	8%
Vacant For Sale	10	2% of vacant	7	1% of vacant	-30%
Vacant for Rent	11	2% of vacant	17	3% of vacant	55%
Vacant Seasonal	507	92% of vacant	556	93% of vacant	10%

Source: 2010 VT Housing Data

Beginning in the 1960's, Jamaica began to experience tremendous housing growth. In the early 1980's, Jamaica housing units exceeded the population. This coincides with a time when the nearby ski resorts were expanding their facilities.

Jamaica's proximity to three major ski areas is both a blessing and a curse. On the one hand, these resorts create economic opportunity for Jamaica residents, from jobs at the resorts to private businesses, such as care-taking, landscaping, hospitality and retail establishments. On the other hand, the vacation-home real estate market has driven the cost of single-family homes in Jamaica to the point where it is increasingly difficult for the average wage earner to own a home. Housing costs reached an all-time high in 2006. Over half the respondents to the 2006 Community Survey indicated that housing for fixed income seniors, moderate income people, and the local workforce were moderate or top priority housing needs. The real challenge for the future will be to create **and maintain balance and diversity in Jamaica's housing stock, providing for the needs of the entire community.**

While it is difficult to predict the future, it is likely that Jamaica's proximity to ski resorts will continue to affect the housing values. Jamaica offers a different experience than the resort's real estate opportunities, and one that many people enjoy. Second home ownership will continue to exert speculative pressure on both the Town's dwellings and open land.

COMMUNITY SURVEY					
Question: Prioritize the housing needs in Jamaica over the next five years.					
Answer:	Top	Moderate	Low	Not	No Change
Housing for fixed income seniors	23%	31%	9%	13%	13%
Housing for low-income people	19%	24%	15%	19%	13%
Housing for moderate income people	17%	35%	11%	15%	12%
Housing for the local workforce	23%	31%	8%	13%	12%
Single family housing	25%	33%	10%	8%	11%
Multi-family housing	5%	16%	19%	33%	13%
Second homes	11%	19%	15%	32%	11%
Increased rental opportunities	11%	25%	15%	23%	14%
Provide housing assistance	14%	23%	11%	25%	15%

Housing Affordability

Affordability is defined as dwelling units for those households whose annual income is less than 80% of their county median income and whose housing cost are no more than 30% of gross income including rent or mortgage payments, utilities, property taxes, and insurance. Annual income is the adjusted gross income as reported for annual federal income tax purposes. **Affordable housing takes into account "workforce housing" units because they are often housing the very people employed by businesses in the community and town employees.**

According to the Vermont Housing Data, the median sales price for a primary residence in Jamaica as of 2010 was \$157,000. To purchase a home at that price, an annual income of approximately \$55,000 would be needed. However, the median household income in Jamaica is only \$50,375 a year (median income divides the total household income distribution for the Town into two equal groups). Simply stated, the cost of housing has outpaced any increase in income for many residents of Jamaica.

Median price of primary residences sold

2000	\$118,750
2005	\$142,000
2010	\$157,000
2015	\$77,700

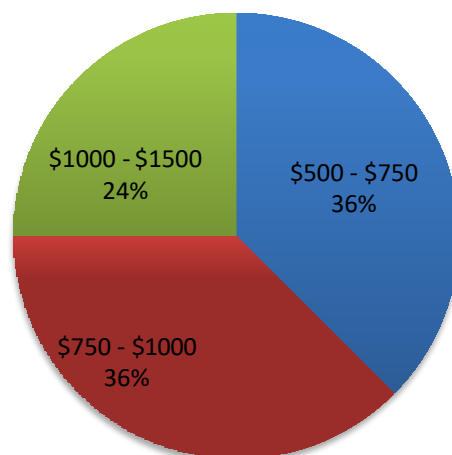
Median price of vacation residences sold

2000	\$125,000
2005	\$250,000
2010	\$197,500
2015	\$167,000

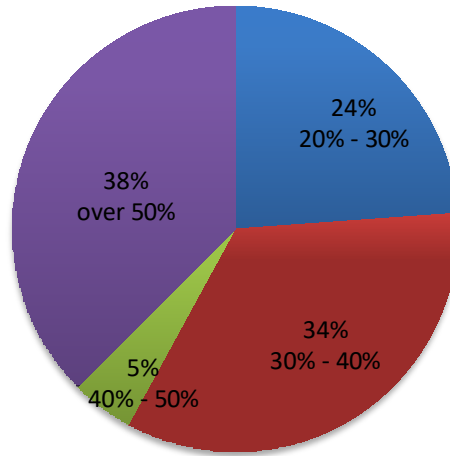
Vermont housing data profiles; Vermont Housing Data V2

There continue to be more second homes in Jamaica than primary homes. Often second homes are purchased or constructed at prices out of scale to the local economy and can put upward price pressure on local housing. This is evident in Jamaica when comparing the 2010 median sales prices of \$197,500 for a second home to the median sales price of \$157,000 for a primary residence.

Planning for Affordable Housing

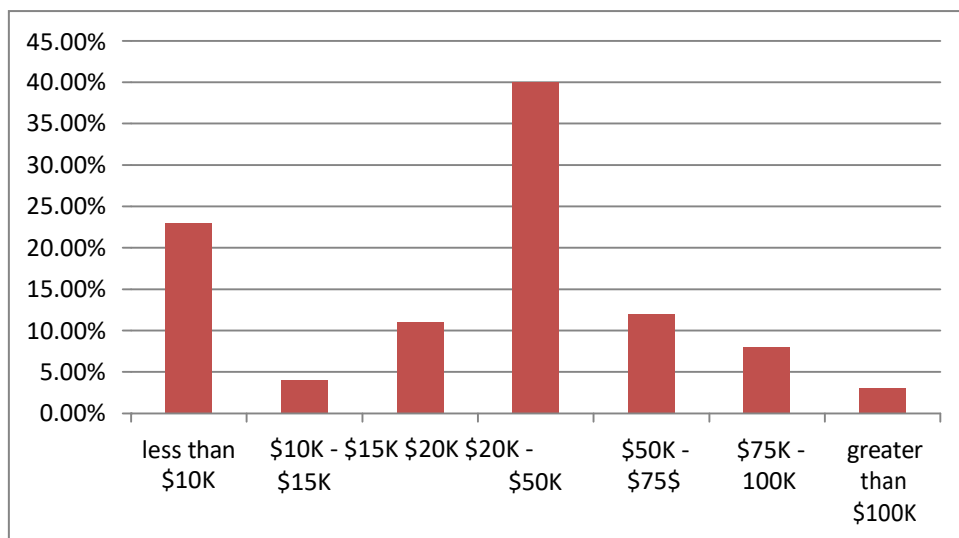


Distribution of Rent Payments



Distribution of Rent as a percentage of Income

As of 2016 per the Towncharts.com – United States Demographics Data estimates the distribution of rent payments and rent as a percentage of income as shown above. An estimate of the mean rent payment of Jamaica renters is \$847 of which would require a hourly wage of \$17.65 or an annual income of \$33,878 to fall within the 30% affordability guideline. The distribution of income as a percentage of wage earners is shown below. The median household income is \$55,921 and the median worker income is \$38,436. From the distribution of worker income as a percentage of population it can be seen that between 38% and 50% of individual worker incomes fall below the 30% affordability guideline. The statistics do not address the percentage of individual workers who live in two worker households. However, for the significant number that do not, this is a significant problem. For the 13% living at or below the poverty level, this is a major concern.



Distribution of Worker Income as a percentage of population over 18

The realities of the real estate market and development costs preclude private sector production of housing that is affordable to typical working families. Therefore, housing affordability is largely addressed through the activities of non-profit agencies in the area. Windham/Windsor Housing Trust (WWHT) provides affordable rental housing to low and moderate income households, including families and individuals, persons with disabilities or special needs, and the elderly. WHT can also provide income-eligible home buyers with a subsidy towards the purchase of a qualifying home. In addition, home buyers under this program have access to below market rate mortgages as well as financial assistance with closing costs. Southeastern Vermont Community Action Agency (SEVCA) provides referrals to area shelters, landlord lists, and assists in completing applications for affordable housing possibilities. SEVCA also operates weatherization and fuel assistance programs for income- eligible homeowners and renters. In 2006, there were five fuel/utility assists in Jamaica.

Accessory apartments (second units that are self-contained living units either attached or detached from the primary residential unit) are an excellent way to create affordable housing units in the community. Density, the measure of the number of housing units per acre, is a key factor in the creation of an affordable range of units within the community. With land and construction costs increasing drastically in recent years, building low-density housing increases per unit costs thereby making it difficult to keep the housing affordable. Locating housing near the village centers provides residents with access to services and can help to keep individual housing costs reasonable as well.

As part of the Stratton Mountain Master Plan, Stratton Mountain is required to contribute money on a per unit basis for every housing unit constructed. That amount is currently \$400 per unit and is used to help bridge the affordability gap rather than construct affordable housing units. The money is given to the Vermont Housing and Conservation Board who has primarily distributed it to the Rutland Area Housing Coalition for use on housing projects in Manchester.

Senior and Handicapped Housing

The supply of affordable housing units is important to residents at many stages of their lives. In **1990 Jamaica's population of citizens aged 65 years and older numbered 112**, representing 14.8% of the Town's total residents. **According to census figures, there were 125 citizens aged 65 and older in 2000, representing 13.3% of Jamaica's total resident population** – an 11.6% net increase in the senior population, but a 1.5% decrease relative to the proportion of Jamaica's total population. **2016 estimates of Jamaica's population over 60 years of age is 18.6% or 155.** Of those, 145 or 16% receive retirement income. This is an increase of 5.3% from 2000. While **Jamaica's senior population** is not unusually high, it is increasing and special considerations may **be needed to meet this group's housing needs. In Townshend, several units of senior housing** currently exist and more are under construction. Valley Cares, a non-profit organization, provides 24 units of independent housing with supportive services and 28 units of assisted living. The Smith Haven Home in South Londonderry offers 24 subsidized housing units for the elderly. In Manchester there are several units of affordable rental housing for the elderly and disabled at Manchester Knoll, Meadows I and II, and Manchester Fields. There are other senior housing developments in Windham County, primarily in Rockingham and Brattleboro. Neighborhood Connections, a volunteer organization, provides emergency housing assistance.

Housing Policies:

1. Recognize, encourage, and support private non-profit and for-profit organizations in the

- development, rehabilitation and conservation of affordable housing within Jamaica.
2. Encourage the rehabilitation of existing housing stock to ensure safety and an adequate standard of living.
 3. Keep publicly funded affordable housing projects from reverting to market driven housing.
 4. Work cooperatively with neighboring towns and the Windham Regional Commission to ensure an appropriate dispersal of affordable housing stock throughout the region.
 5. Encourage accessory apartments.
 6. Encourage developers and builders to minimize the costs of living through quality housing design and energy efficient construction.
 7. Require that housing development is coordinated with the adequate provision of public utilities, facilities, and services.
 8. Encourage the installation and maintenance of code-conforming fire protection sprinkler systems and alarms in commercial buildings and multi-family housing units.
 9. Support new housing locations that are in close proximity to more densely populated areas that have easy access to services and potential for public transportation.

Priorities for Action:

1. Work with the Windham Regional Commission and neighboring towns to address the impact of high end development on housing prices for typical working families and area or local employers. (volunteers)
2. Develop a vision statement for affordable housing. (Planning Commission)
3. Investigate possible new construction or rehabilitation housing projects in Jamaica which may be eligible for grants under the Housing Revenue Bond Initiative (<http://www.vhcb.org/housing-for-all-bond-funds.html>) enacted in Spring 2017 by the Vermont legislature. Since "At least 25% of the housing will be targeted to households with incomes below \$35,000 and another 25% will be targeted to moderate-income Vermonters earning \$55,000-\$83,000 annually (for 4-person households)", it may be a way to create much-needed affordable housing in the Town. (Planning Commission)

XI. TRANSPORTATION

Road Network

The transportation of people, goods, and materials in Jamaica occurs almost entirely on State and Town highways. Pedestrian travel is a significant means of transportation in the village of Jamaica and hiking and bicycling occur along all the country lanes and byways of the entire town. Town highways are divided into four classes according to use and condition. The total of road miles in Jamaica, by classification, is as follows:

Table 3-1: Town Highway Mileage

Class	1	2	3	4	Total Mileage
Town Roadways	0	6.44	43.02	2.95	52.380
State Highways					14.675
Legal Town Trails					19.610
Total					86.625

Source: 2017 VT Agency of Transportation Town Highway Map

Vermont Routes 30 and 100 are identified as major collector routes in the regional transportation plan and serve most of the traffic bound for and passing through Jamaica. These routes connect **Jamaica's village centers and have** scenic qualities valuable to the recreation/tourism industry as well as local residents. Increasing traffic volume on Vermont Routes 30 and 100 present a challenge to the town and careful attention must be given to planning development along these routes.

Speed on Route 30 in the village areas is a serious problem and threat to the safety of Town residents. Traffic calming techniques designed to reduce speeds or redirect traffic flow have the potential to mitigate this problem. In 1999, the Vermont Route 30 Corridor Management Study was completed. The study called for a systematic and thematic approach to traffic calming along this road. In 2004, three traffic calming techniques were selected to be implemented: lowering speed limits, installation of Town welcome signs, and experimental installation of dynamic stripes. All of these calming techniques have been implemented. Jamaica continues to participate in a regional planning process addressing issues related to traffic calming along the Route 30 corridor.

A large percentage of Jamaica's roads are Town-owned back roads. Speed is a major concern on these back roads, as well as on the major collector routes. Since the Town of Jamaica does not have a local police department, it is difficult to enforce speed limits on the many miles of back roads. Consideration must be given to motorist and pedestrian safety on these roads during future development planning.

The three principal Town maintained highways which link Jamaica with other destinations in the Upper West River Valley include: South Hill Road (Town Highway #35), Pikes Falls Road (Town Highway #1), and West Jamaica Road (Town Highway # 30). South Hill Road is a steep rugged road which used to be used primarily by local residents, but now is more widely used as a shortcut from southerly towns, such as Wardsboro, Dover, and Wilmington, through Jamaica village and northward, taking the place of Route 100. There is continued concern regarding the volume and speed of traffic on South Hill Road, Pikes Falls Road and, to a lesser extent, West Jamaica Road, associated with development at the Stratton Mountain Resort and vacation housing associated with Resort expansion. Stratton Corporation has taken steps through the installation of signage to direct traffic away from Pikes Falls Road and onto the main Stratton access road and Route 30. Resort traffic should continue to be directed away from local roads.

The scenic qualities of Pikes Falls Road and West Jamaica Road are unique in the Town. Both roads wind through ravines and along scenic segments of North Branch Brook and Ball Mountain Brook. Travel on these roads is part of the recreational experience of the area. Because of their scenic value, physical constraints, and the rural character of the area they serve, major upgrades, beyond regular maintenance, to these roads are not considered feasible or desirable.

Many local roads in Jamaica are unpaved. Gravel roads and driveways are a potential source of sediment and phosphorus to surface waters. State programs, such as Better Roads, educate communities on proper road construction, access policies, and road and bridge standards. They focus on inventory and maintenance of local roads and advocate practices and techniques to preserve the integrity and vitality of roads as well as bridges, culverts, drainage, and ditching.

Jamaica currently has an infrastructure inventory that includes the condition of bridges and

culverts. The Town maintains an electronic list of all bridges and culverts that includes information on condition, material, and dimension. By maintaining an up-to-date bridge and culvert inventory (updated every three years), Jamaica can potentially reduce the required local funding match on road projects by up to one half.

The town of Jamaica highway system depends on 28 bridges, 17 of these bridges are owned by the State of Vermont and 11 are owned by the Town of Jamaica. Two of the town bridges are a high priority for repair or reconstruction in the near future. The town will continue to work with the WRC and the VTrans District staff to seek advice about if repair or replacement is appropriate for each bridge and about other possible approaches to managing these infrastructure concerns.

Jamaica Bridge number 32 also called the State Park Bridge carries Depot St. over the West River **leading to the Jamaica State Park Entrance. The State Park Bridge is a Candidate in VTrans's** Town Bridge Capital Program with a rank of 27 out of 46 in for FY 2018. The State Park Bridge has been on the Candidate list since at least FY 2015. The Windham Regional Transportation Committee ranked the State Park Bridge as their second highest regional priority within the town bridge category. This ranking will be incorporated into the final rankings for FY 2019. The bridge currently has a posted weight limit of only eight tons which limits activities including logging, large recreational vehicles, emergency access, firewood deliveries, and dam repairs. It is not yet known if the bridge can be repaired or will need to be replaced. At this time, it is also not known how long the town should expect to wait for a solution for this bridge from VTrans town bridge program.

Jamaica Bridge number 24 carries Depot St. over Ball Mountain Brook leading to the Elementary school and the Jamaica **State Park Entrance. Bridge 24 is in VTrans' Town Bridge Pre-Candidate** Program with a rank of 101 out of more than 1,500 for FY 2018. The Windham Regional Transportation Committee ranked the State Park Bridge as their second highest regional priority within the town bridge pre-candidate program. This ranking will be incorporated into and updated ranking for FY 2019. The bridge survived four houses and multiple cars traveling under it during Hurricane Irene. Because of the removal of a center pier on an upstream bridge, this bridge presents a more significant hazard mitigation concern for future extreme weather. It is not yet known if the bridge can be repaired or will need to be replaced. At this time, it is also not known how long the town should expect to wait for a solution for this bridge from VTrans Town Bridge program.

The town of Jamaica has taken a proactive approach to compliance with the upcoming Municipal Roads General Permit (MRGP). The town applied for and was awarded a Category A Better Roads grant in 2017 for a road erosion inventory that will be performed by the Windham Regional Commission (WRC) in the 2018 field season. The town of Jamaica was also awarded \$14,200 through the pilot **Grants-in-Aid program to bring at least one "hydrologically connected"** road segment into compliance with the MRGP in either the 2017 or 2018 field season. The town of Jamaica will continue to participate in educational opportunities and work with the WRC and the VTrans Maintenance district to facilitate road maintenance practices and capital improvement projects that proactively move Jamaica town roads toward compliance with the MRGP.

Because so many Jamaica residents depend on automobile travel to get to their jobs, snow **removal is a critical element of the town's** road management responsibility. The state is responsible for snow removal on state highways, Routes 30 and 100. The town is responsible for the remaining 49 miles of class 1, 2, and 3 town roads. With the exception of a small amount of

roadway mileage in the Northeast corner of Jamaica, Town owned and maintained snow plows are used for snow removal. Snow removal for the roadways along the Windham/Jamaica border is done under contract. Snow removal is accomplished according to a priority system. Class 2 roads are cleared first with South Hill and Pikes Falls roads at the beginning of their routes. The remaining roads are cleared in order of population density often with snow plow operators working well in excess of eight-hour work days to ensure town roads are cleared as expeditiously as possible. Adjustments can be made in response to special needs. Because snowfall can vary significantly from year to year, snow removal budgets are based on worst case snow fall with any unused funds held in reserve of other unanticipated needs.

Local Road Policies

The Selectboard is responsible for the maintenance and repair of public roads in Jamaica. In order for private roads or driveways to access town roads an access permit is required. Applicants must adhere to Vermont **Agency of Transportation's driveway design standards**. Jamaica also has adopted road design specifications. The regulations are available from the Jamaica Town Clerk.

The Selectboard adopted a Class 4 Road Policy Statement in 1996. The policy states that existing rights-of-way of Class 4 highways and trails as of the date of the adoption of the policy shall be retained by the Town for the following purposes: recreational and multi-use activities, access to private property, and agricultural and forest management. Amongst other items, the policy **statement reserves the Selectboard's right to exercise weight limits, establish speed limits**, prohibit or restrict wheeled vehicle use during mud and snow season, and require temporary permits for heavy equipment access.

Alternative Forms of Transportation

At present, public transit in Jamaica is limited to specialized services to targeted populations. Southeastern Vermont Transit (SEVT) provides paratransit and elderly/disabled service to Windham County towns. Fixed route bus service is currently not available in Jamaica. However, SEVT has applied for a grant to run bus service up Route 30 from Brattleboro to Townshend, and possibly extending into Jamaica. This would provide many more opportunities for Jamaica residents. The extension of fixed route service with stops along Route 30 in Jamaica and continuing to Stratton Mountain Resort, a major employer in the region, would also be desirable.

Relatively low usage/population densities, weather conditions, automobile oriented development patterns, and lifestyle preferences keep biking and walking from serving as a significant mode of transportation in Jamaica. In Jamaica Village, where usage/population density is relatively high, walking can be a viable alternative to automobile use especially for short trips or recreation. Jamaica Village does have a limited sidewalk network which was upgraded in 2016, with plans for ongoing maintenance. As growth occurs in the compact areas of Jamaica Village and Rawsonville, sidewalks and other paths for non-motorized transportation should be considered. Adequate pedestrian and bicycle access to village districts enhances marketability, reduces vehicular traffic, and ensures greater safety.

Since 1996 the Friends of the West River Trail (FWRT) has been working with the towns of Jamaica, Londonderry, and Townshend along with the Windham Regional Commission and State and Federal government agencies to plan and maintain a trail roughly following the rail bed of the former West River Railroad. The steering committee overseeing this project has the objective of connecting a bicycle and pedestrian pathway along the West River corridor from South Londonderry through Jamaica and continuing to the Townshend Dam. Comprehensive planning

and some portions of the project have already been constructed. Most notably in the town of Jamaica, a pedestrian bridge crossing Cobb Brook in Jamaica State Park was completed in 2000 **and in 2003, Pratt's Bridge Trail, 1.7 miles of hard packed, handicapped accessible** trail, was completed. This portion of the trail extends from Winhall Brook Campground in Londonderry to **Pratt's Bridge in Jamaica. This portion of the trail was completed in partnership with the** Paralyzed Veterans of America.

The FWRT have worked to redefine the route, taking into account the needs and desires of property owners and the safety of bicyclists and pedestrians along the Route 30/100 corridor. Comprehensive planning has been conducted and some portions of the project have already been constructed. Notably, a pedestrian bridge crossing Cobb Brook in Jamaica State Park was **completed in 2000. In 2003, Pratt's Bridge Trail, 1.7 miles of hard packed, handicapped** accessible trail, was completed. The trail extends from Winhall Brook Campground in **Londonderry to Pratt's Bridge in Jamaica. This portion of the trail was completed in partnership** with the Paralyzed Veterans of America.

Transportation Policies:

1. Require that any project or regulatory change for existing State highways be consistent with the Land Use policies of this Town Plan.
2. Encourage development to incorporate pedestrian links to existing sidewalk networks.
3. Minimize the number of new access points to State highways in order to promote the safe integration of local traffic along these through routes.
4. Require that any project for increasing the capacity of any existing local road is consistent with the general character of the Town and will perpetuate the rural character.
5. Restrict construction of new roads or improvements to existing Class 4 roads and legal town trails in Rural Resource Areas. If constructed for specific one time/one use purpose (e.g. logging), they shall be restricted from becoming roads for further development.
6. Prohibit new permanent roads from being constructed close to any roadless stream segment identified in the Town Plan as having significant ecological or recreational value. When stream crossings cannot be avoided, or when access to an area cannot avoid a stream corridor, the road shall be designed with an adequate buffer to minimize disruption in order to preserve the ecological and/or recreational value.
7. Require that all road construction activities, public and private, preserve the rural character of the landscape and limit adverse impact upon important natural areas. Properly grade and seed all road cuts and embankments to minimize erosion and to maintain their rural character. When creating new roads, provide an adequate buffer distance and plant cover from the edge of road to surface waters.
8. Maintain and improve bridges on Town roads in a manner that ensures public safety and is consistent in terms of scale and capacity with the use and classification of the road.
9. Establish speed limits on Town roads that respect safety, the rural character and multiple uses of these byways.
10. Encourage and support the continued planning and development of the West River Trail continuously from Townshend Dam to South Londonderry.
11. Promote the use of Class 4 roads, legal trails, trails on public land, and trail easements on private land as part of a trail network throughout the Town.
12. Encourage and support opportunities for public transportation in and through Jamaica, including special accommodations for the elderly and handicapped.
13. Encourage and support the continued development of traffic calming strategies for the Route 30 corridor.

14. Repair and maintain sidewalks in Jamaica Village, including a plan for snow removal, in order to promote a safe pedestrian environment.
15. Encourage future roadway improvements to include non-motorized, multi-use trails.
16. Promote the development of adequate and safe parking facilities in Jamaica Village.
17. Encourage strategies and techniques to increase safety on the Town's back roads.

Priorities for Action:

1. Continue to work with state and regional officials toward implementation of traffic calming on Route 30. (Planning Commission, Selectboard)
2. Maintain a road inventory that lists each road, its mileage, and its current condition. Maintain a bridge inventory that lists each bridge and its current condition. Use these inventories to prioritize and plan for needed improvements. (Selectboard, Road Commissioner, Highway Department)
3. Make recommendations for long and short-term improvements and implement projects on a consistent basis. (Selectboard, Road Commissioner, Highway Department)
4. Review options for adequate and safe parking facilities in Jamaica Village and make recommendations for improvements. (Planning Commission)
5. Encourage resort traffic to be directed away from South Hill Road and Pikes Falls Road. (Planning Commission, Selectboard)
6. Encourage biking and walking traffic and development of paths. (Planning Commission, Selectboard)
7. Add speed limit signs on roads such as South Hill Road, Goodaleville Road, and Water Street. (Selectboard, Road Commissioner, Highway Department)
8. Implement a maintenance plan, including snow removal, for sidewalks. (Road Commissioner)

XII. FLOOD RESILIENCE PLAN

Historic Flooding

- A. Jamaica has seen several great flooding events since the beginning of its recorded history.
- B. The flooding Ball Mountain Stream of November 1869 destroyed a covered bridge spanning Depot Street, sweeping William Carr with his horse and carriage downstream to Turkey Mountain Brook.
- C. Flooding from 4.12 inches of rain in 24 hours in 1927 carried several mill dams downstream while covering several roadways with mudslides. Twelve bridges in Jamaica were severely damaged in that flood.
- D. In March 1936, 3 inches of overnight rain, along with melting mountain snow, threw Jamaica back into a state of emergency. It took roughly 11 months to clean up the mess from that storm.
- E. Five days of rain thoroughly saturated the ground in September of 1938. A hurricane rapidly dropped three more inches of rain on Jamaica, ripping out 12 bridges, the telephone and
- F. electrical lines, and covering Water Street with 3-5 feet of water.

- G. Another flood in 1948 gutted Water Street and left 14 without homes.
- H. The latest flooding even was in late August 2011. After a week of rain, Tropical Storm Irene devastated southern Vermont and totaled the town of Jamaica, as had happened in **the major floods of days past. Most of the town's bridges and roads were compromised or destroyed completely. Jamaica, as well as most of the southern Vermont, was in a "can't get there from here" state of affairs. It has taken five years to get the town back to a "Pre-Irene" condition.**

Background

In 2013 Vermont enacted Act 16, “An act relating to municipal and regional planning and flood resilience, which requires that all town plans effective after July 1, 2014 include a “flood resilience element” pursuant to the purpose and goals of 24 V.S.A. § 4302(c)(14):

- (14) To encourage flood resilient communities.
 - (A) New development in identified flood hazard, fluvial erosion, and river corridor protection areas should be avoided. If new development is to be built in such areas, it should not exacerbate flooding and fluvial erosion.
 - (B) The protection and restoration of floodplains and upland forested areas that attenuate and moderate flooding and fluvial erosion should be encouraged.
 - (C) Flood emergency preparedness and response planning should be encouraged.

Act 16 also amended 24 V.S.A. § 4382 to add a twelfth element to the required contents of a municipal plan, specifically adding a flood resilience plan:

- (a) A plan for a municipality . . . shall include the following:
 - (12)
 - (A) A flood resilience plan that:
 - (i) identifies flood hazard and fluvial erosion hazard areas, based on river corridor maps provided by the Secretary of Natural Resources pursuant to 10 V.S.A. § 1428(a) or maps recommended by the Secretary, and designates those areas to be protected, including floodplains, river corridors, land adjacent to streams, wetlands, and upland forests, to reduce the risk of flood damage to infrastructure and improved property; and
 - (ii) recommends policies and strategies to protect the areas identified and designated under subdivision (12)(A)(i) of this subsection and to mitigate risks to public safety, critical infrastructure, historic structures, and municipal investments. (emphasis added)
 - (B) A flood resilience plan may reference an existing local hazard mitigation plan approved under 44 C.F.R. § 201.6.

Fluvial Erosion

By statutory definition, “fluvial erosion” means the erosion or scouring of riverbeds and banks during high flow conditions of a river. Most of the flooding damage experienced in Vermont is from the power of moving water causing the sudden destruction of under-sized culverts and erosion of stream banks supporting roads and buildings. Providing a river, the room it needs to slow the flow, over time can allow it to function as a responsive system and avoid repeated losses to public infrastructure and investments.

Erosion (and deposition) along a stream or river is natural. Sometimes, efforts to stop this process

in one place can make it worse in others. Rivers, streams, and their channels are changing constantly in response to the inputs of water, energy, sediment and debris that pass along them. Every few years a stream fills to bankfull and the shape of the channel responds to this force by cutting deeper into some streambanks and also by depositing sediments in the quiet inside bends. **This process is visible as an “S” shaped form that slowly changes position.**

If the stream cannot spill out of its banks, the power of the trapped water increases and the channel either digs down or cuts out further to the sides. Where there are roads and buildings **nearby these adjustments to the channel’s shape can become dramatic and costly.**

A river is in geomorphic equilibrium when its water, energy, sediment, and debris are in balance. In this condition a river is neither building up sediment in the channel nor losing sediment from its bed. Importantly, a river in equilibrium has not become overly deep and can continue to overflow onto its floodplains. The water that spills onto the floodplain slows down, and the velocity of the water still in the channel does not become excessively powerful.

In order to protect roads and buildings it is important to be sure that the river is able to function as well as possible upstream and downstream. We need functional streams and rivers with room to adjust (River Corridors) and intact floodplains to moderate the impact of high water events.

River Corridors and floodplains

River Corridors and floodplains are different but related. The River Corridor is the area that provides the physical space that the river needs to express its energy and meander without it having to dig out to the side or down into its bed. The state-designated River Corridor includes a 50-foot buffer on either side of the fluvial erosion hazard area to prevent disturbance in this area and allow for bank stabilization. In statute the area is defined as: "River corridor" means the land area adjacent to a river that is required to accommodate the dimensions, slope, planform, and buffer of the naturally stable channel and that is necessary for the natural maintenance or natural restoration of a dynamic equilibrium condition and for minimization of fluvial erosion hazards, as delineated by the Agency of Natural Resources in accordance with river corridor protection procedures.

A floodplain is the area where water flowing out over a river bank can spread out and slow down. The floodplain as defined by FEMA is the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or, most commonly, as the 100-year flood.

River Corridors and floodplains overlap a great deal. One on top of the other there might be 60 – 90% overlap. However, there are areas in the River Corridor that will be eventually shaped by the channel - although they may be currently high and dry - and other areas in the floodplain that will be under water during a large flood, but which the river channel may not need to access to maintain its geomorphic equilibrium.

The extent of a River Corridor is based on calculations including such things as the meander belt of the stream, soils, watershed size and gradient, and channel width. The extent of floodplains is based on calculations such as stream peak flow history and frequency.

Regulatory Flood Hazard Designations

There are two types of regulatory flood hazard designations and two sets of official maps that

identify those flood hazards in Vermont: inundation hazard areas are identified by the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs); fluvial erosion hazard areas are identified by the VT Agency of Natural Resources (ANR) on River Corridor maps.

Jamaica has land, homes and businesses that are susceptible to the two types of flooding impacts: inundation and fluvial erosion. Inundation flooding occurs during high water events on the West and Winhall Rivers and many brooks. Fluvial erosion occurs in areas both in and out of the flood hazard area (floodplain) as mapped by the Federal Emergency Management Agency (FEMA). Both inundation flooding and fluvial erosion are potential hazards along the West River, Winhall River, and Ball Mountain, Turkey Mountain, and Wardsboro Brooks.

Inundation Hazard

Towns participating in the National Flood Insurance Program (NFIP) must regulate development in areas designated on the FIRMs that show the floodplain that FEMA has calculated would be covered by water in a 1% **chance annual inundation event, also referred to as the “100-year flood”** or base flood. This area of inundation is called the Special Flood Hazard Area (SFHA).

FIRMs may also show expected base flood elevations (BFEs) and floodways (areas within the SFHA that carry more current). FIRMs have been prepared for only larger streams and rivers. The Town of Jamaica has areas of inundation hazard flood risk mapped by FEMA.

Fluvial Erosion Hazard

A significant portion of flood damage in Vermont occurs outside of the FEMA-mapped SFHAs and along smaller upland streams, as well as along road drainage systems that fail to convey the **amount of water they are receiving**. ANR’s River Corridor maps show the area needed to address fluvial erosion hazards, which may be inside of FEMA-mapped areas, but which often extends outside of those areas. River Corridor maps delineate areas where the lateral movement of the river and the associated erosion may be more of the threat than inundation by floodwaters. Elevation or floodproofing alone may not be protective of structures in these areas, as erosion can undermine structures. ANR released statewide River Corridor maps in January 2015. The Town of Jamaica has areas of River Corridor mapped by ANR.

Flood Hazard Regulation

Inundation

For federal flood insurance to be available to property owners through the National Flood Insurance Program (NFIP), a municipality must adopt and administer flood hazard area **regulations. A community’s flood hazard regulations must apply to at least the** Special Flood Hazard Areas identified by FEMA. They regulate new structures and place restrictions on other types of activities, such as fill within the floodplain. They specify land, area and structural requirements to be adhered to within the SFHA.

Erosion

To qualify for maximum Emergency Relief and Assistance Fund state match in the event of a disaster, a town must adopt and administer River Corridor protection standards as part of its flood hazard area regulations.

Emergency Relief and Assistance Fund

The Emergency Relief and Assistance Fund (ERAF) provides State funding to match [Federal Public Assistance](#) after [federally-declared disasters](#). Eligible public costs are reimbursed by

federal taxpayers at 75%. For disasters after October 23, 2014, the State of Vermont will contribute an additional 7.5% toward the costs. For communities that take specific steps to reduce flood damage the State will contribute 12.5% or 17.5% of the total cost. Towns that participate in the NFIP and regulate SFHAs, and meet several other state requirements, can achieve a 12.5% state share of the required 25% state/local match for federal disaster relief funds. As of 2017, Jamaica qualifies for the 12.5% match. Towns that regulate River Corridors can obtain an **additional 5% ERAF match, reducing the town's required local match to 7.5%.**

Addressing flood resilience

This plan identifies inundation flood hazards as the Special Flood Hazard Areas shown on the NFIP FIRMs and identifies fluvial erosion hazard areas as those shown on the ANR River Corridor maps. This Plan designates both those identified areas as areas to be protected, including floodplains, River Corridors, and land adjacent to streams, wetlands, and upland forests, to reduce the risk of flood damage to infrastructure and improved property. This plan also incorporates by **reference the town's Local Hazard Mitigation Plan approved under 44 C.F.R. § 201.6.** Finally, this plan recommends the following policies and strategies to protect the designated areas to mitigate risks to public safety, critical infrastructure, historic structures, and municipal investments.

Flood Resilience Policies:

1. It is the policy of the Town to foster the protection and restoration of River Corridors, floodplains, wetlands, and upland forested areas that attenuate and moderate flooding and fluvial erosion, in order to reduce the risk of flood damage to infrastructure, improved property, people, and the environment.
2. Development activities in identified flood hazard, fluvial erosion, and River Corridor Protection Areas should be avoided. If new development is to be built in such areas, it should not exacerbate flooding and fluvial erosion.
3. The protection and restoration of floodplains and upland forested areas that attenuate and moderate flooding and fluvial erosion should be encouraged.
4. The Town of Jamaica shall engage in flood emergency preparedness and response planning.

Priorities for Action

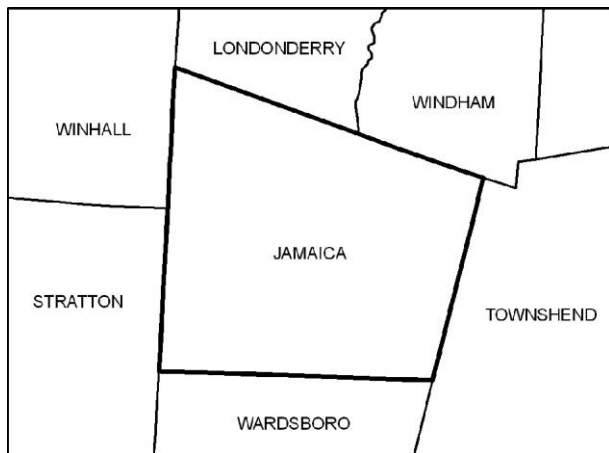
- 1.1 The Town will be familiar with up-to-date ANR River Corridor maps that delineate the land area adjacent to streams and rivers that are required to accommodate a stable channel. (Planning Commission, Selectboard, Zoning Board of Adjustment, Floodplain Administrator)
- 1.2 The Town will be familiar with Flood Insurance Rate Maps (FIRMs) that delineate areas that could be covered or inundated by water during flooding. (Planning Commission, Selectboard, Zoning Board of Adjustment, Floodplain Administrator)
- 2.1 The Town will regulate development in FEMA mapped flood hazard areas to ensure that development does not exacerbate flooding and is in compliance with the requirements for participation in the National Flood Insurance Program. (Selectboard, Zoning Board of Adjustment, Floodplain Administrator)

3.1 The Town will update the Flood Hazard Area Regulations, which will include provisions for advance notification of and specific limits on development activities in FEMA designated Special Flood Hazard Areas. (Planning Commission, Selectboard, Zoning Board of Adjustment, Floodplain Administrator)

4.1 The Town will pursue a flood resilience management approach whose essential components are to identify and map flood hazard areas, fluvial erosion hazard areas, and River Corridor Protection Areas based on stream geomorphic assessment studies and maps provided by the Vermont ANR Rivers Program, and designate those areas for protection to reduce the risk of flood damage to infrastructure and private property. (Planning Commission, Selectboard, Zoning Board of Adjustment, Floodplain Administrator)

Additional information is available at <http://floodready.vermont.gov/>.

XIII. TOWN PLAN COMPATIBILITY



Compatibility of Plans with Neighboring Towns and the Region

Jamaica is located in the northwest quadrant of Windham County in Southern Vermont. It shares borders with the towns of Londonderry, Windham, Wardsboro, Townshend, Stratton, and Winhall, (the latter is in Bennington County). The six surrounding towns and Jamaica participate in the Windham Regional Commission, which provides a forum for addressing regional issues.

Implementation of this Plan will require cooperation and coordination across Jamaica's borders. Roadways, watersheds, schools, and natural resources are shared with our neighboring communities. Throughout the planning process, Jamaica Planning Commission reviewed neighboring plans. The results of these reviews are as follows:

Londonderry

Border: Northwest

Town Plan: Expired 4/2/17; Update at Selectboard hearing stage

Londonderry borders Jamaica along the northwest part of Town. Route 100 is the main traffic

corridor and serves as the biggest asset as well as the main area of concern. The easy access to a well-maintained VT Highway can lead to development. Londonderry's border with Jamaica is listed as Rural Residential (R-L), which appears to allow for low-density residential development, agriculture, forestry, and other compatible land uses that maintain the rural character, scenic landscape, and natural resources. Jamaica has designated this area as rural resource lands. While both towns discouraged strip development there is a potential for this area to be over developed due to Route 100. It is in Jamaica's interest that it remains involved with any land use changes and development in this area. Jamaica recognizes that there are several large contiguous areas of forest that extend from Londonderry into Jamaica, many of which are already conserved.

Windham

Border: Northeast

Town Plan: Adopted 1/5/15

The border between Jamaica and Windham is primarily steep and forested terrain with little access. Almost half of the border is publicly owned land (Jamaica State Park) or privately owned land with a conservation easement. The hamlet of South Windham is accessed via Windham Hill Road in the northeast corner of Jamaica. The Town of Windham's Zoning Regulations and Town Plan policies are compatible with this Plan.

Wardsboro

Border: South

Town Plan: Adopted 6/17/14

Most of Wardsboro's common border with Jamaica consists of farms, fields and forestlands. It is classified mostly as Resource Residential with low density factor; the topographical constraints make development difficult in this area, which should help the compatibility with Jamaica's Rural Resource Areas. There is however, a small area of this border in Wardsboro that is proposed as Rural Residential. In addition, there is a very small area of the border proposed as Village Residential, which is centered on Main Street. These areas should be monitored and the Towns should work together to maintain their respective classifications minimizing the effect to the perspective areas.

Townshend

Border: East

Town Plan: Expired 3/21/16; Update at Selectboard hearing stage

Both Jamaica and Townshend share the vision on their common border. Townshend Town Plan designates the border as Resource Lands – low impact and low density. Jamaica's border is designated as conservation area or rural resource area. Both towns are working cooperatively to mitigate the impacts of traffic on Route 30.

Winhall

Border: West/Northwest

Town Plan: Adopted 11/2/16

Route 100 between Jamaica and Winhall is a main travel corridor for the Stratton Mountain ski resort. The main access road to the ski resort is in the Bondville Village, which borders Jamaica. Winhall owns the Winhall Municipal Forest in Jamaica. The majority of Winhall's border with Jamaica is zoned residential for moderate density; on the Jamaica side, a lower density of development is encouraged. This area should be closely observed for traffic and environmental concerns.

Stratton

Border: West/Northwest

Town Plan: Adopted 10/27/14

At this time, there is not a lot of development along the border between Stratton and Jamaica, which is proposed as Residential. However, Stratton has designated the area that is accessed by Pikes Falls Road as Commercial/Residential and as the designated growth area. As this Commercial/Residential area grows, Jamaica will see increased traffic on Pikes Falls Road as this is the quickest route to that part of Stratton. As noted in this Plan, because of the scenic value, physical constraints, and the rural character of the area Pikes Falls Road serves, upgrading this road is not considered feasible or desirable. Furthermore, there is regionally important black bear travel corridor that has been identified by the Vermont Agency of Natural Resources connecting an important bear habitat on Sage Hill to Stratton. The intensity of uses that Stratton proposes in the Commercial-Residential Districts could impact that ability of the bears to travel between the important bear habitat in each town. The towns of Stratton and Jamaica should work cooperatively to protect the lands with important conservation value.

Windham Regional Commission

Regional Plan: Adopted 2014

The Windham Regional Plan is intended to provide guidelines for the planning and coordination of change and development which will, in accordance with present and future needs and resources, best promote the health, safety, and welfare of the citizens of the region. The proposed land use plans in both the Jamaica Town Plan and the Regional Plan are similar with one difference being that Jamaica recognizes Rawsonville as a Village District while the Regional Plan proposes Rawsonville as an area of High Intensity Mixed Use. Residents around Rawsonville strongly identify with this as a Village. Despite the different name, the Jamaica Town Plan policies and the Windham Regional Plan policies are compatible in that they both encourage a development pattern of compact mixed uses that are designed and scaled to be pedestrian oriented. As proposed, Jamaica does not intend or expect that this Plan will prevent any current or future efforts to implement that Windham Regional Plan.

XIV. IMPLEMENTING THE TOWN PLAN

OVERVIEW

The Jamaica Town Plan is a statement of vision; it is a dynamic document that resets the place in the ongoing process of planning for the future of the Town. Used properly, the Town Plan provides guidance for elected officials and citizens charged with decision making for Jamaica. By making a commitment to the principles and goals laid out in the Town Plan, local government secures an effective and well-defined framework for meeting challenges and achieving long-term goals.

The ongoing work of the Jamaica Planning Commission is another important element in the implementation of the Town Plan. The Plan provides the foundation for the annual work program of the Commission. By recognizing the Town Plan as a living document, the Planning Commission is constantly refining its vision for the future, bringing the goals of the Town Plan into ever clearer focus. The Town of Jamaica supports decision making at the most local level possible commensurate with the impacts of the decision. Therefore, we encourage implementation of this Plan first by individuals and then, as needed, by successive levels of

government.

IMPLEMENTATION STEPS

The following are some, but not necessarily all, of the techniques, strategies and actions available to implement this plan.

- **Planning Commission Work Program**
It is the responsibility of the Planning Commission to establish a schedule of planning priorities and project development that will further the goals and policies established in this Town Plan.
- **Land Use Regulations**
Act 250 requires that any development permitted under its jurisdiction be found to be in conformance with the provisions of the applicable Town Plan. Individuals proposing development subject to Act 250 jurisdiction are encouraged to consult with the Jamaica Planning Commission prior to submitting an Act 250 application.
- **Capital Budgeting**
A capital budget is a program the Town of Jamaica utilizes for ensuring that the Town's expected capital expenditure needs (e.g., major road improvements, school expansions or renovations, vehicle acquisitions, solid waste disposal facility needs, etc.) will be met. By prioritizing a schedule of anticipated capital expenditures and sources of financing, the Town is better prepared to meet facility and service needs as they arise. The Jamaica Planning Commission places a high priority on maintaining the Capital Budget program.
- **Land Acquisition**
The most certain, and potentially expensive, method for realizing some of the goals of the Town Plan is to purchase or otherwise acquire property, or certain rights to property. For example, by purchasing fee simple interest in land, or by acquiring easements or development rights to land, certain outstanding natural areas in Town can be protected from incompatible development. This technique could be used by the Town or by the Town in association with a land trust, which has the interest and expertise to work with the Town.

The Town has developed a written policy on land acquisition by the Green Mountain National Forest. This policy provides that lands which are designated in the Town Plan for future, relatively intensive, development should not be acquired and that other lands should only be acquired if they are found by the Town to have "unique or highly significant resource value" or if the owner is willing to make a lump-sum payment to the Town to be invested to offset any reductions in property tax revenues received by the Town. (Copies of this policy are available from the Town Clerk.)

- **Voluntary Actions**
Donations of land or conservation easements, restrictive covenants placed on land by the landowner, participation in Act 250 reviews by abutting landowners and participation by individuals or groups in the continuing planning process, are all voluntary methods available to citizens to further the goals and objectives of the Town Plan. The Planning Commission encourages the use of these techniques whenever they are consistent with the development objectives set forth in the Plan.

- **Coordination with Neighboring Towns**
The effects of growth and change do not respect town boundaries and the consequences of actions that originate in one town are often shared with its neighbor. The Town of Jamaica shall take the initiative to work with its neighbors to address issues which cross town borders. The Jamaica Planning Commission shall endeavor to consult with its neighbors on issues of mutual concern, review and comment on the plans of neighboring towns and solicit comment from neighboring towns and affected parties when making decisions concerning development and implementation of the Town Plan.
- **Participate in the Regional Planning Process**
The Jamaica Planning Commission, through its Town Representatives to the Windham Regional Commission, shall actively participate in the Regional Planning process and in regional projects of importance to the Town.
- **Public Information**
The Planning Commission shall seek out and provide information, as it comes available, and provide opportunities for public discussion of new issues and concerns as they arise.

IMPLEMENTATION RESPONSIBILITIES

This section summarizes the "Priorities for Action" elements of the Town Plan and suggests who has the responsibility for implementation. (Note: page #s have to be updated.)

ACTION	RESPONSIBILITY	PAGE #
Land Use		
• Evaluate options for the Town's acquisition of public open space land for recreation, conservation, or a Town Forest.	Selectboard and Planning Commission	14
• Identify and appropriately designate historically significant structures.	Jamaica Historical Society	14
• Assess opportunities to establish green spaces in the village areas.	Selectboard and Planning Commission	14
• Review municipal street lighting fixtures to evaluate their effectiveness in directing light towards the street and sidewalk and away from neighboring properties and the night sky.	Selectboard	14
Natural Resources - Natural Areas		
• Continue to maintain a Special Sites and Areas Map and update it as additional areas are identified.	Planning Commission and WRC	22

Natural Resources - Water Resources

- Identify for future planning the wetlands that perform a significant function in providing wildlife habitat, as defined in the Vermont Wetland Rules, and the existing or possible new artificial wetlands, which are important for non-point pollution control.

Planning Commission &
Consultants 28

- Continue to administer the provisions of the Flood Hazard Bylaw. Update Jamaica Flood Hazard Regulations as needed to support Windham Regional Commission Flood Hazard Model to maintain eligibility in the National Flood Insurance Program.

Planning Commission 28

- Use road maintenance methods and materials that will maintain or improve water quality, such as those described in the Vermont Better Roads Manual.

Road Crew 28

Economic Development

- Establish a Jamaica Business Council.

Planning Commission 33

- Explore the extension of public transit into Jamaica with stops in East Jamaica, Jamaica Village, and Rawsonville.

Selectboard and
Planning Commission 33

- Develop means of outreach to potential non-traditional internet-based enterprises and work at home based workers to locate in town areas served by high bandwidth communications.

Selectboard and
Planning Commission 34

- Encourage development of specialty agricultural enterprises serving niche markets in town areas supporting agriculture.

Selectboard and
Planning Commission 30

Potable Water Supply and Wastewater

- Evaluate the feasibility of a water supply and distribution system and/or a wastewater collection and treatment system in Jamaica Village. Explore sources of grant and other public funding for building a water distribution or wastewater collection system.

Selectboard and Planning
Commission 37

- Explore the possibility of creating a public

Selectboard and Planning

restroom within Jamaica Village.	Commission	37
Energy		
• Monitor municipal energy use and, where feasible, implement energy conservation measures and the use of renewable energy sources	Selectboard	40
• Increase awareness among residents and businesses about incentives for energy conservation through programs such as Efficiency Vermont, which promote energy audits, weatherization, and upgrades to energy efficient appliances to reduce consumption.	Planning Commission	40
• Continue to work with the school district to coordinate school busing schedules to reduce fuel Board consumption and costs.	JVS School Board and ULGSU School Representatives	40
• Develop a "No Idling" ordinance	Selectboard and Planning Commission	40
• Update the Town Plan to plan support the Windham Regional Commission Municipal Energy Data & Technical Assistance Package for ACT 174 Compliance.	Planning Commission	40
• Investigate initial feasibility of a pumped energy system utilizing the Ball Mountain and Townshend Dams.	Planning Commission	40
Community Facilities & Services - Town Services		
• Continue providing an annual Town appropriation to the JVF&R.	Selectboard	43
• Investigate procedures for JVF&R to review subdivision proposals so that they can work with developers to minimize the risks of fires and maximize their ability to combat fires	Planning Commission and JVF&R	43
• Participate in local emergency planning efforts	Planning Commission and JVF&R	44
Community Facilities & Services - Town Facilities		
• Investigate using sole source vendor contracting to provide certain goods and services such as insurance,	Selectboard	46

fuel, and maintenance for
Town facilities.

Community Facilities & Services - Recreational and Cultural Activities

- | | | |
|--|-------------------------------------|----|
| • Encourage the development and construction of alternative recreational facilities for children and young adults such as a skateboard park. | Selectboard and Planning Commission | 48 |
|--|-------------------------------------|----|

Community Facilities & Services - Communications

- | | | |
|--|-------------------------------------|----|
| • Coordinate with providers of communication services in the siting, construction, alteration, development, decommissioning, and dismantling of new lines, towers, poles, and equipment. | Selectboard and Planning Commission | 49 |
|--|-------------------------------------|----|

Education

- | | | |
|---|--|----|
| • As members of the newly created Unified Leland and Gray Union School Board, seek to provide comprehensive education and vocational training opportunities for the unified districts children and young adults. Ensure preservation of the special interests and needs of Jamaica's students. | Jamaica's ULGSU
members and
Selectboard | 54 |
|---|--|----|

Housing

- | | | |
|---|---------------------|----|
| • Work with the Windham Regional Commission and neighboring towns to address the impact of high end development on housing prices for typical working families and area or local employers. | Planning Commission | 60 |
|---|---------------------|----|

Transportation

- | | | |
|--|-------------------------------------|----|
| • Continue to work with state and regional officials toward implementation of traffic calming on Route 30. | Selectboard and Planning Commission | 65 |
|--|-------------------------------------|----|

- | | | |
|---|---|----|
| • Maintain a bridge inventory that lists each bridge and its current condition. Use these inventories to prioritize and plan for needed improvements. Make recommendations for long and short-term improvements and implement projects on a consistent basis. | Planning Commission,
Road Commissioner and
Highway Department | 65 |
|---|---|----|

- | | | |
|---|-------------------------------------|----|
| • Review options for adequate and safe parking facilities in Jamaica Village and make recommendations for improvements. | Selectboard and Planning Commission | 65 |
|---|-------------------------------------|----|

XV. TOWN RESPONSE TO VERMONT'S PLANNING GOALS

Goal 1. To plan development so as to maintain the historic settlement pattern of compact village and urban centers separated by rural countryside.

The Town Plan recognizes that Jamaica's existing moderate and higher density areas should continue to be where future higher density settlement should occur while areas outside of these districts should be maintained as rural countryside. The moderate and higher density areas are delineated on the Land Use Plan map as Commercial-Residential Areas, Jamaica Village and Rawsonville. Areas outside of these districts may contain a variety of uses, but should be used in a manner that will protect existing natural resource values of the land and their attractiveness to tourists and vacation homeowners valuing remote homesites. **Protecting Jamaica's scenic** ridgelines is seen as critically important. This goal is backed up by reference throughout the Plan.

Goal 2. To provide a strong and diverse economy that provides satisfying and rewarding job opportunities and that maintains high environmental standards, and to expand economic opportunities in areas with high unemployment or low per capita incomes.

The Plan encourages small business to locate in Jamaica, especially home occupation, home industry and other businesses that could be expected to employ local residents. To further this goal, the Plan has not restricted the location of any particular type of business in any specific area of Town. High bandwidth internet service sufficient to support even the most demanding enterprises is now available in areas corresponding with those designated for moderate had high density development. With this critical infrastructure now in place, the town should exploit its availability to support location of non-traditional millennia workers and enterprises in the town.

Goal 3. To broaden access to educational and vocational training opportunities sufficient to ensure the full realization of the abilities of all Vermonters.

Jamaica has an excellent town elementary school and encourages the development of private and public early education initiatives for the Town's children. With the completion of the 2019 school year in compliance with ACT 46, the Leland and Gray Union School District will become the Unified Leland and Gray School District governing both the Leland and Gray High School and Jamaica, Townshend, and NewBrook primary schools. The Jamaica school board be dissolved. Jamaica will have two members on the unified school board. This has not changed the above **goal, but now Jamaica's members on the unified school board are jointly responsible for both** seeing that they are met for all children in the unified district and protecting any interests particular to Jamaica. Reference: Education. A Jamaica School Advisory Board will be established to continue community input to the Jamaica Village School.

Goal 4. To provide for safe, convenient, economic and energy efficient transportation systems that respect the integrity of the natural environment, including public transit options and paths for pedestrians and bicyclers.

The Jamaica Town Plan promotes a safe and well maintained road network, including efficient winter snow removal. It encourages alternative forms of transportation, such as pedestrian and bicycle travel, in all areas of the Town. All road building and maintenance shall respect the scenic and resource value of the area served and be consistent with the Land Use policies of this Plan. The Plan recognizes the challenge faced by rural villages located along State highways and seeks

to ensure that its' village districts are protected from the adverse impacts of through traffic. Reference: Transportation.

Goal 5. To identify, protect and preserve important natural and historic features of the Vermont landscape, including significant natural and fragile areas; outstanding water resources, including lakes, rivers, aquifers, shorelands and wetlands; significant scenic roads, waterways and views; important historic structures, sites or districts, archaeological sites and archaeologically sensitive areas.

Jamaica has done an extensive review of its natural areas, resources and features, and recognizes the importance of protecting these sites. The Land Use element of this Plan identifies and discusses the protection of these resources and sites. Specific features are identified on the various Resource and Special Sites Maps included as part of this Plan. Historic structures and sites will require additional study and mapping to continue the work of this Town Plan. Reference: Land Use, Communication Facilities and Services, Water Resources, Forestland, Agriculture, and Natural Areas.

Goal 6. To maintain and improve the quality of air, water, wildlife, forests, and other land resources.

To a great extent, this goal has been addressed under the response to State Goal 5.

Goal 7. To make efficient use of energy, provide for the development of renewable energy resources, and reduce emissions of greenhouse gases.

The Town has reflected this goal in its Town Plan policies and priorities for action in its Energy Section. The town plan will be updated in the near term to support the goals of the Windham Regional Commission Municipal Energy Data & Technical Assistance Package for Act 174 Compliance. To investigate the feasibility of innovative renewable energy initiatives to meet ACT 174 goals. Reference: Energy.

Goal 8. To maintain and enhance recreational opportunities for Vermont residents and visitors.

Jamaica residents, second-home owners and visitors place a high value on recreational opportunities. This goal is addressed in depth in several sections of the Town Plan, including Transportation, Community Services and Facilities and Land Use. The Plan seeks to protect the quality of the natural environment for recreation and encourages informal recreational activities throughout the Town. Jamaica is home to a Class A State Park and is in close proximity to major recreational resorts. Reference: Land Use, Forestland, Natural Areas, Community Facilities and Services, and Transportation.

Goal 9. To encourage and strengthen agricultural and forest industries.

Although these industries are not as important to the local economy as they once were, they are still important to the Town. The Forestland section of the Plan encourages forest industry in areas well suited for growing and harvesting timber and encourages the cooperative management of small forest parcels. Although not rich in farmland, the Agriculture section of the Plan encourages small-scale production and innovative and non-traditional farming operations that develop

specialty products for niche markets. Reference: Natural Resources.

Goal 10. To provide for the wise and efficient use of Vermont's natural resources and to facilitate the appropriate extraction of earth resources and the proper restoration and preservation of the aesthetic qualities of the area.

This goal has been addressed under the discussion of Goal 5. Specific policies have been developed to address concerns. Reference: Earth and Mineral Resources.

Goal 11. To ensure the availability of safe and affordable housing for all Vermonters.

Information has been collected to address this problem in Jamaica. The Housing element discusses a variety of approaches to address the availability of safe and affordable housing. A diversity of housing types, costs and locations is encouraged to promote a diverse population. Reference: Housing.

Goal 12. To plan for, finance and provide an efficient system of public facilities and services to meet future needs.

The Town recognizes that the community facilities and services it provides are the heart of Town government. As such, a significant portion of the Town Plan addresses community facilities and services issues. Reference: Community Facilities and Services.

Goal 13. To ensure the availability of safe and affordable child care and to integrate child care issues into the planning process, including child care financing, infrastructure, business assistance for child care providers and child care work force development.

The Town acknowledges that there is a need for child care within easy reach of the Town's working population. Currently there is one registered home childcare facility and one licensed child care facility in the Town of Jamaica. Reference: Community Facilities and Services.

Goal 14. To encourage flood resilient communities.
The Plan addresses this goal in the Flood Resilience chapter.

APPENDIX A - Energy Element Amendment with Energy Maps

Importance of Enhanced Energy Planning

Introduction

Energy planning is important to Jamaica because, as concerned and responsible citizens, we recognize the need to reduce carbon based pollution (CO₂) of the atmosphere through a realistically executable energy plan, one that preserves the nature of our town prized by both our residents and many vacation home owners. We further recognize that advances in energy technology will offer significant cost savings to our citizens. The objective of Jamaica's Town Plan revised Energy section is to meet the requirements of Act 174 which embodies the energy saving and sourcing goals of Vermont's 2016 Comprehensive Energy Plan in a manner that is consistent with Jamaica's long-standing Natural Resources, Land Use, and Economic Development policies.

Though Vermont's energy transformation may take years to implement, it will enhance the vitality of the state and local economy by reducing money spent on fuels pumped, mined or generated elsewhere, improve our health through reduced emissions and increased bicycle and pedestrian mobility options, and improve the quality of our local and global environment through reduced greenhouse gas emissions. This robust Energy Plan is used as a tool to advance the economic and environmental well-being of Jamaica, thereby improving the quality of life for its residents. Furthermore, these energy goals will reduce Jamaica's vulnerability to energy-related economic pressures and, in the long-term, climate change-related natural disasters, and promote long-term community resiliency in a variety of contexts.

The cost of energy in Jamaica, including residential, commercial and governmental use (for heating, electricity, transportation, etc.) is estimated to be \$3,897,193 per year (see Energy Costs & Expenditures section below). Because a large majority of this energy is imported from outside of Jamaica and Windham Region, most of the money spent on energy does not directly benefit the local economy. Efforts to reduce the use of energy sources from outside the Town, or shift reliance to locally-produced energy, can improve household financial security and strengthen the local economy.

From an environmental perspective, petroleum and other hydrocarbon-dependent energy is a significant cause of localized environmental damage where those fuels are produced and refined, and the emissions from their use is responsible for human-induced climate change, related climate-change disasters, and ecological degradation. Moderate summer weather and snowy winters are major attractions to the tourists and vacation homeowners that are both essential to our economy and a major factor in our permanent residents' decisions to live here. Any efforts to reduce the use of non-renewable energy and shift to more environmentally-sound energy sources will benefit the Town's environment by contributing, however modestly, to the moderation of greenhouse gas-based climate change's effects on our local climate.

The primary objective of the Energy element of our Plan is to meet the Windham Regional Commission's (WRC) allocation of transportation and home heating energy savings and

renewable energy sourcing targets in a manner consistent with preserving our town's rural nature, but consistent with the pace at which enabling technology and low-cost financing are available. Jamaica fully embraces the regional targets for renewable energy generation to be met by solar installations and residential wind generators, as well as the goals for energy conservation in home heating and transportation. Additionally, we will explore adding micro hydroelectric generation to our generation mix.

Preserving the Town's natural environment is essential to Jamaica's economy and tax base. Many visitors to our state and virtually all of the Town's residents value the area's natural beauty, including the state's most popular state park. For these reasons, large and small commercial wind energy sources, which by their nature must be located on ridge lines, are not considered appropriate for Jamaica and are therefore excluded under the provisions of this plan. While Windham Regional's plan does not presently assign a target for wind-generated renewable energy, it is Jamaica's policy to meet regional community renewable energy targets with solar, residential wind, and possibly micro-hydroelectric generation and to prohibit commercial wind development as inconsistent with long-standing Town policies. It is further considered that the regional targets based on current commercially-available technology may prove to be very conservative by 2050. Prohibiting commercial wind development does not interfere with the town's ability to reach its renewable energy targets.

A second objective is to develop a realistically attainable plan. By design, Act 174 targets for key dates are aspirational. Several enabling technologies are necessary to achieve large-scale penetration of renewable energy generation into the power grid. These include energy storage, power electronics, and smart grid architecture and technology, including grid control. Vermont's current limit on net metering, 15% of base load, is a reflection of the difficulty in accommodating the variable levels of renewable energy source output in the current power grid. Technologies which deal with the variable nature of renewable energy sources and exploit their geographical distribution are necessary to achieve broad utilization of renewable energy sources. These technologies are in various stages of research and commercial development with unknown maturity dates. The cost of renewable energy continues to fall and is predicted ultimately to be much less expensive than fossil fuel-based sources. The combination of low-cost energy and the technology to deliver it to all domestic and industrial energy users will in turn spawn economic models with minimal capital expense and significantly reduced unit costs, enabling us to meet our goals. Our plan will include efforts to keep abreast of these much-anticipated technology and economic trends so that we may be able to take advantage of them as early as possible.

Our third objective is to reduce our citizens' energy expenses. As mentioned above, prices for renewable energy, wind, and solar have continued to decline and are expected to bottom out well below those of fossil fuels. This will allow our town to make significant savings of the \$3,897,193 annual energy bill mentioned above. The future cost spread between fossil fuel and renewable sources will be sufficient to finance the upfront capital costs of installations without increasing unit cost and still offer users considerably less expensive energy costs than are currently possible. Both these developments, low unit costs and low capital conversion costs, will align our residents' economic self-interest with our citizenship interest of reducing CO2 emissions. We believe that our citizens will be motivated to act in

their economic self-interest, i.e., take advantage of energy cost savings and low capital financing plans. Therefore, we will promote conversion to renewable sources, emphasizing the financial benefits, as soon as technology and economics enable.

While Jamaica can do little to shift the broader state or federal policies, we can influence energy use and production on a local level. In this energy plan, we hope to address Jamaica's local actions for increasing our energy efficiency and promoting renewable energy generation, and overall pathways to become more resilient. We will adopt policies to meet our specific goals as technology and economic developments permit.

Long-Term Vision & Petroleum Dependence

There is a trend toward factoring the "societal costs" into the price of energy; society pays for health costs associated with pollution, environmental clean-up, military protection of petroleum sources, and the continued failure of the Federal government to address the disposal of radioactive wastes. In the long-term, communities who depend on fossil fuels are vulnerable to risks associated with their price and production volatility.

These challenges may significantly increase the cost of conventional energy sources within the next ten to twenty years. As a result, Jamaica will seek to establish reliable energy resources for townspeople and municipal operations in order to hedge against the increasing volatility of hydrocarbon prices, and to reduce the environmental impact of our energy use. Should societal costs be added to energy from conventional sources, the spread between fossil fuel and renewable energy will increase, providing increased market pull for the technologies enabling large-scale renewable energy grid penetration, i.e. 100% net-metering, and business models making it more affordable. The role of clean, alternative energy sources will be expanded and supported.

The Windham region has been assigned goals for efficiency improvements, use of alternative fuels, and generation of renewable energy for the benchmark years 2025, 2035, and 2050. The Windham Regional Commission (WRC) has in turn apportioned these goals to each town. This plan commits Jamaica to meeting the goals assigned to it within the constraints imposed by the pace of introduction of enabling technologies and anticipated competitively lower unit cos. They are summarized in Table E1 below.

Category	2025	2035	2050
Efficiency Targets at Benchmark Years			
<u>Residential Thermal</u> : Estimated number/percent of houses to be weatherized to meet efficiency goals	94 / 9%	184 / 17%	377 / 36%
<u>Commercial Thermal</u> : estimated number/percent of commercial establishments to be weatherized	3 / 9%	6 / 16%	10 / 30%
<u>Electricity</u> : Estimated number/percent of kilowatt hours to be conserved annually and percentage of building upgrades	561,700 / 42%	917,900 / 68%	1,342,600 / 100%
Fuel Switching Targets			
<u>Residential and Commercial Fuel</u> : Estimated number of new wood pellet stoves and high efficiency wood boilers	280	266	266
<u>Residential and Commercial Fuel</u> : Estimated number of new heat pumps	87	172	24
<u>Transportation Fuel</u> : Estimated number of new electric vehicles	60	424	896
<u>Transportation Fuel</u> : Estimated number of new bio-diesel vehicles in town	92	176	304
Use of Renewable Energy			
<u>Transportation</u> : Percentage of total BTUs consumed	13%	31%	90%
<u>Heating</u> : Percentage of total BTUs consumed	56%	67%	93%
<u>Electricity</u> : Estimated number of MWh to be produced from residential and commercial solar, residential wind, and small hydroelectric generators	308	492	1,231

Table E1

Summary of Jamaica's commitment to meeting allocated energy goals

Jamaica's Current Energy Use

The following paragraphs describe Jamaica's current estimated energy demand in detail. These current use estimations provide a starting point from which the town can develop informed energy policies that directly address its current context and opportunities going forward.

In order to provide a more accurate picture of the energy planning requirements in Jamaica, energy consumption, generation targets, and efficiency targets need to be broken down into three distinct energy sectors. Those sectors are electricity, transportation, and heating.

Current Electricity Demand

Jamaica's current electric energy supply comes from Green Mountain Power. Electricity consumption data from Efficiency Vermont was produced for each town in the state, and is the primary source of this information. This data set combines the energy supplied from all potential electricity providers to that town. It also separates the usage for both the residential and commercial or industrial sectors. (See Figure E2 below)

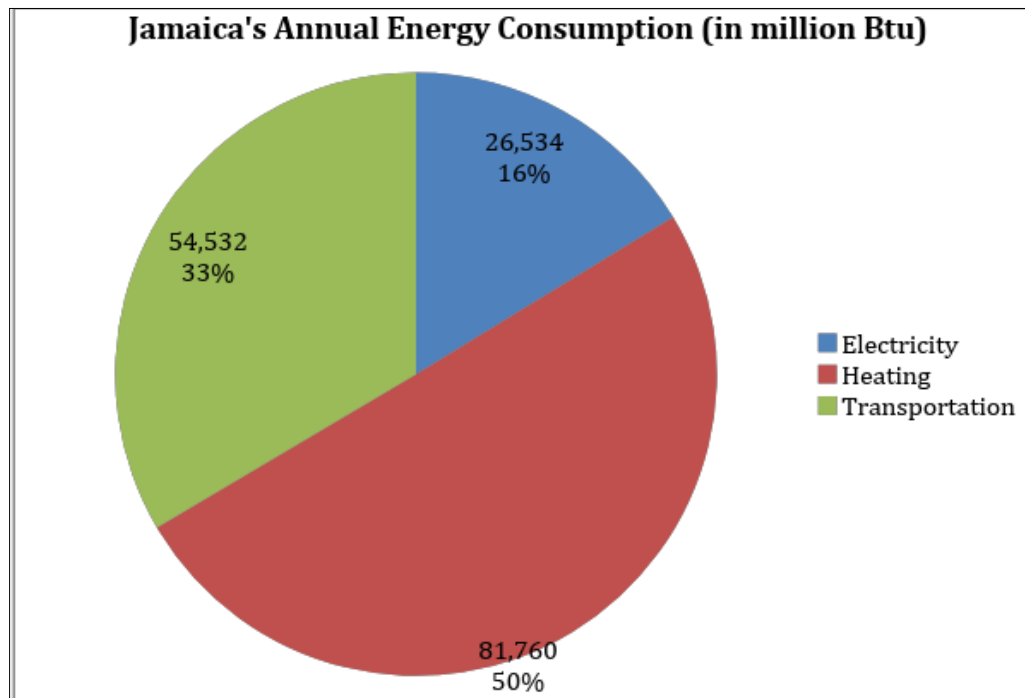


Figure E1

Figure E1 shows how energy consumed in the town is divided between these sectors. The sections below break down the calculations and describe the assumptions made to arrive at these final demand figures.

Since the rural nature of Jamaica is characterized by Jamaica Village residences and geographically-dispersed full-time and vacation residences, residential electricity needs far exceed commercial and industrial use. Because of this, current residential use is the greater factor in our planning. To translate this energy demand into dollar amounts, we can estimate a cost of \$0.1435 per kilowatt-hour (Vermont state average for electricity costs across all sectors in 2015). Based on the above data, residences in Jamaica paid over \$955,500 in 2016 for 6,656.277 kWh. Commercial and industrial facilities paid just over \$160,000 for their 1,120,056 kWh of electricity.

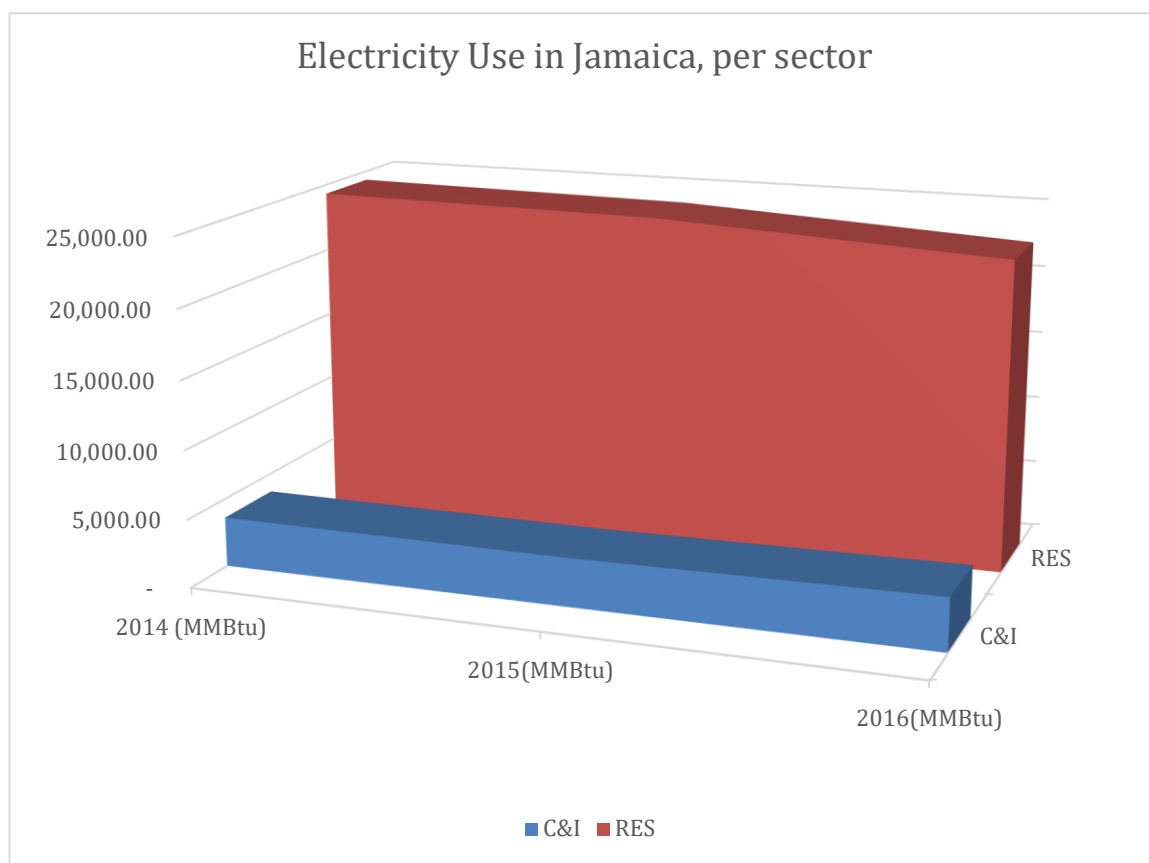


Figure E2

Figure E2 shows the electricity consumption by Jamaica Residential and Commercial / Industrial sectors.

Current Transportation Use

According to 2010 U.S. Census Bureau data, Jamaica has 790 primary housing units (not vacant or used for seasonal / recreational purposes). Based on that number of households, it can be estimated that there are 1,356 light-duty vehicles on Jamaica's roads, which consume 927,504 gallons of fossil fuel each year. Below is a table summarizing the averages and estimates used to arrive at those figures.

790	Number of primary housing units.
1356	Number of fossil-fuel burning light-duty vehicles (LDV).
11,356	Estimate of the average annual number of miles travelled by an LDV in the area (For Vermont as a whole, total vehicle miles traveled per registered vehicle was around 12,500. The vast majority of LDV in Vermont can safely be assumed to drive between 9,000 and 15,000 miles annually).
22	Estimate of the average fuel economy of fossil-fuel burning LDV fleet in the area, in miles per gallon (statewide average fuel economy).
408,373	Estimated number of gallons of fossil fuel consumed annually, calculated from the values above.
121,259	Number of BTUs in a gallon of fossil fuel, computed as a weighted average of the individual heat contents of gasoline (95%) and diesel (5%).
62,591	This is the estimated total annual energy consumption of internal combustion vehicles in the area, in millions of BTU.

Table E2
Summary of Jamaica's Transportation Energy Use

To estimate the cost of this consumed energy, we assumed a cost of \$2.34 per gallon (Vermont state average in 2015). In Jamaica, consumers spent over \$955,692 on transportation related fuel costs alone.

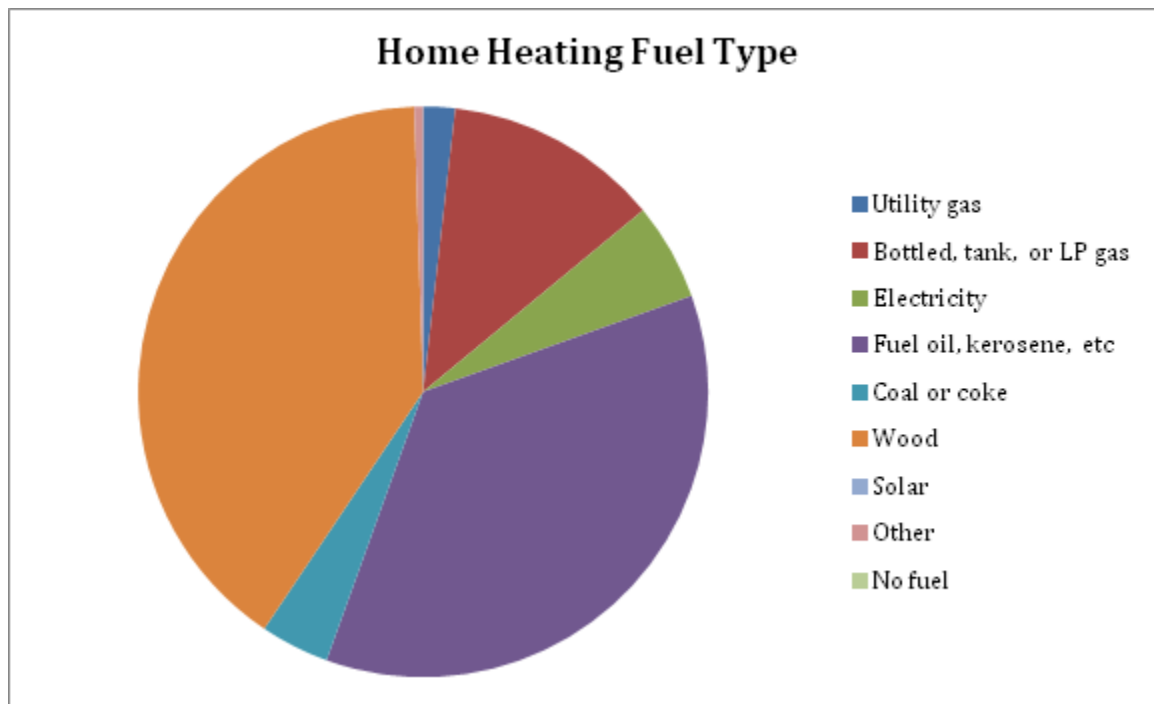


Figure E3
Use of home heating fuel in Jamaica by type

Current Heating Demand

To account for the different building types and their respective uses, the following estimates divide thermal energy demand by either residential or commercial use (industrial building thermal demand is not included).

For residential buildings, it was assumed that average annual heating load of area residences is 110MM BTU, for both space and water heating (Vermont state average). With 460 residential housing units, 23 commercial buildings, and 585 vacation homes in Jamaica, the state average usage yields an estimated 81,760 MMBTU annual total heat consumption.

Furthermore, census data also provides information on the home heating fuels used for both owner-occupied and renter-occupied housing units (both are considered “occupied”). Figure E3 above shows the percentage of fuel use by fuel type.

For residential and commercial buildings, an estimated total of just over \$1.8 million was spent in home heating (roughly \$1.67 million from home owners and \$330,000 from renters). In Jamaica, 44% of housing units are primary/“occupied” homes, while 56% are seasonal/“vacant” homes. Based on the energy model projections from the state (created by the LEAP, or Long-Range Energy Alternatives Planning model), it can be assumed that seasonal homes only use about 15% of the energy of a primary home, due to more occasional use and a presumed higher energy efficiency. As such, seasonal homes in town are estimated to consume about 7,590 MMBTU annually (compared to the 50,600 MMBTU for primary residences).

For commercial establishments, it is estimated that the total heating load is 650 MMBTU each year. For the state, the average is in the range of 700 MMBTU to 750 MMBTU per year, but the average for any given area is very likely to be significantly higher or lower, as the mix of businesses from region to region is highly variable. Based on the types of commercial buildings in Jamaica, the heating load was calculated to be less than state average. With 23 commercial establishments, there is an estimated thermal energy demand of 21,500 MMBTU. These businesses pay about \$770,000 each year in heating expenses.

Total Energy Costs

In sum, Jamaica pays a staggering amount in energy across the three use sectors. The total estimated cost to the town's residents for electricity, heating, and transportation is roughly \$3.9 million dollars each year. There are real financial incentives for the Town to move toward energy efficiency, on behalf of both residents and business owners (see section 4 "Jamaica's Energy Targets and Conservation Challenges" of this plan for more detail about energy efficiency and conversion targets).

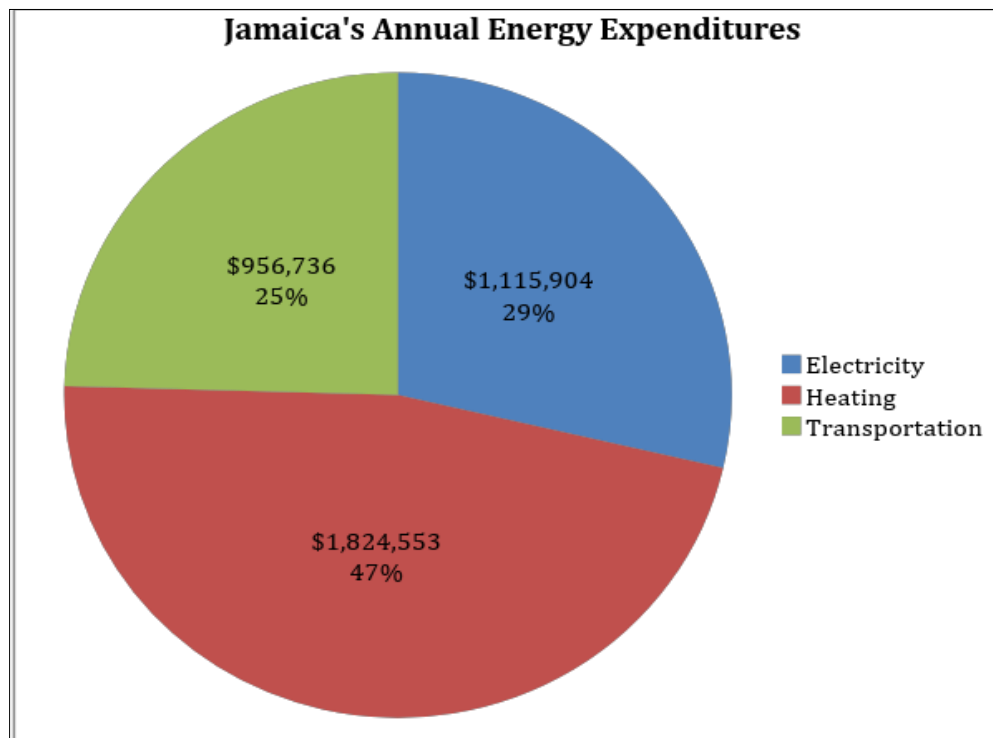


Figure E4
Jamaica's energy costs by energy category

Jamaica's Constraints & Potential for Energy Generation Resources

Jamaica is adopting an "all of the above" (all available and cost competitive renewable energy sources except large and small commercial wind generation) strategy in order to meet renewable energy generation targets. Energy resources within Jamaica are all renewable resources: wood, solar, micro-hydro, and residential wind. In order to reduce dependence on conventional energy sources, of which the costs and availability are outside residents' control (see the section above), the use and generation of appropriately-sited

alternative energy sources is encouraged. A mix of PV solar, residential wind, and micro-hydro installations will provide a more robust renewable energy generation capability and expand the opportunity for property owners to participate in the new energy economy. Solar and Wind potential for Jamaica is shown in maps 1 and 2 of Appendix A. Additionally, Jamaica may share a unique resource with neighboring Townshend in the Ball Mountain and Townshend Dams that may someday be suitable for a hydroelectric pumped energy storage system if and when current structural deficiencies and serious sediment accumulation problems in the existing reservoirs of these federally-owned facilities are addressed and corrected.

Photovoltaic (PV) Solar Potential

PV Solar renewable energy trends support high potential for PV solar generation contributing substantially to meeting Jamaica's renewable energy generation goals. While State and regional plans are aspirational, it is considered that conversion to renewable energy sources will be driven by economic considerations. Jamaica residents most likely will act in what they perceive to be their economic self-interest, i.e. the opportunity to enjoy substantially lower energy costs for electricity, heating, and transportation needs. We anticipate that the falling price of renewable energy, including PV Solar, will align our residents' economic interests with meeting our renewable energy generation targets with substantial conversion to PV solar generation. Figure E5 below shows the declining prices of PV solar and wind renewable energy in comparison to that from coal and natural gas. Cross-over of renewable sources costs with those of fossil fuel sources is anticipated to occur in 2022 according to this Bloomberg data.

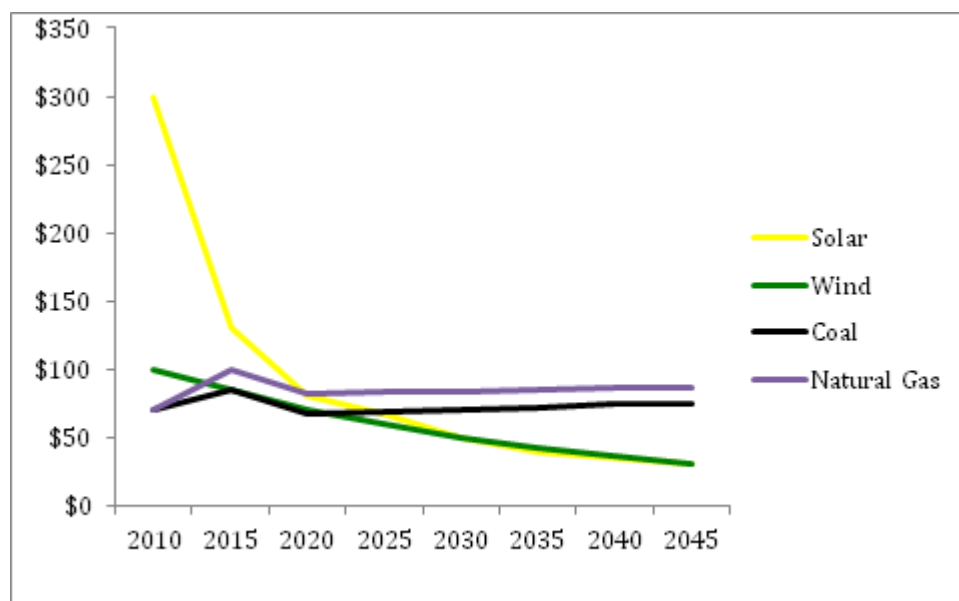


Figure E5

Cost per MWh by fuel type

Source: Bloomberg New Energy Finance as reprinted in April 2017 National Geographic

Large PV Solar generator projects scheduled for completion beyond this date are anticipating unit cost" well below the \$0.14 current average. The spread between current and anticipated future unit cost" from renewable sources will finance innovative business

models. Homeowners will be offered a variety of energy loans or lease-based financial products with little or no capital requirements for installation of PV solar systems that will include unit cost well below current averages. Venture capital most likely will be readily available for financing consortium-based community PV solar generators.

Solar Panel efficiencies currently available are in the 17% to 18% range, somewhat better than the 15% assumed in the 2016 CEP. However, there are a number of research efforts to improve solar cell efficiency. As of 2016, various solar cell efficiencies ranging from 20% to 46% have been demonstrated in laboratories.¹ The time and effort required to transition laboratory results to production solar panels cannot be predicted with certainty and expectation of near term availability is not reasonable. Nevertheless, in the 32 years until 2050, it is entirely reasonable to expect that these research efforts will result in major improvements in PV solar source efficiency. Efficiency improvements will increase power outputs, make marginal sites viable, and reduce required footprints for given output levels -- all of which will lower costs. It is likely that in retrospect, targets assigned in 2018 will seem very conservative by 2050.

Enabling Technologies

Large scale penetration of the power grid by renewable energy sources is dependent on commercial availability of several enabling technologies.² The fluctuating nature of renewable energy sources makes maintaining grid power quality while accommodating large amounts of power generated by renewable sources very difficult. Vermont's current limitations on net-metering are a reflection of this difficulty. Large scale conversion to renewable energy generation, in the absence of devices and controls that support efficient utilization of energy from renewable sources, leaves homeowners converting to renewable energy generation being forced to operate in a virtual off-the-grid mode in which power in excess of that needed onsite will be wasted, i.e. shunt to ground (in the same way current from a lightning rod is channeled into the ground) rather than sold.

¹ M. Malinowski, J. I. Leon and H. Abu-Rub, "Solar Photovoltaic and Thermal Energy Systems: Current Technology and Future Trends," in *Proceedings of the IEEE*, vol. 105, no. 11, pp. 2132-2146, Nov. 2017.

Occasionally, when energy stored in home batteries is exhausted, the home may draw power from the grid if not physically disconnected. Larger community generators may be forced to sell power to the wholesale market on a 'catch as catch can' opportunity basis. Returns from capital investment will be reduced below the level that full utilization of the generators could produce. While ideal for some remote locations, large scale realization of off-grid operation of renewable energy sources will be inefficient and create major difficulties for those homeowners that have not converted to renewable energy sources.³ Those remaining customers will have to bear the cost of GMP's distribution system resulting in much higher rates.

For these reasons, technologies necessary to effectively integrate renewable energy generation on a scale envisioned by this plan must be broadly available. These technologies are energy storage, solid-state power electronics, smart grid architecture, and smart grid control, including control algorithms and their distributed high performance computing based implementation. They are in various stages of research and development with uncertain maturity dates. Their commercial availability will pace the achievable rate of conversion to renewable energy. As these technologies mature, the most salient measure of their adoption and integration into the power grid will be the relaxation of the net-metering limitations from its current 15% to 100%, i.e., every watt of renewable energy generated will be used.

The falling cost of renewable energy (see figure E5) and the expansion of the market for renewable energy products that relaxation of current net-metering will lead to the development of business models that make conversion to renewable energy affordable for the average homeowner. The cost spread between fossil-based and renewable energy will stimulate financing plans that allow incorporation of up-front capital costs into prevailing unit cost that still offer cost savings to energy consumers. Early adopters with capital to invest in future energy savings will realize excellent return on their investment in the form of low energy costs. All of this will be paced by the availability of the enabling technology required to support full utilization of renewable energy.

Energy Storage

Energy storage is considered fundamental to integrating PV solar and residential wind energy generation into the power grid. Indeed, expert opinion considers that a self-sufficient

² Molina, Marcelo G. "Energy Storage and Power Electronics Technologies: A Strong Combination to Empower the Transformation to the Smart Grid." *Proceedings of the IEEE* 105, no. 11 (2017): 2191-2219.

³ Vermont Department of Public Service, 2016 Comprehensive Energy Plan (2016 CEP), Ch. 7, p. 112

system cannot be achieved without suitable energy storage.⁴ There are a number of technologies that provide energy storage; mechanical, electrical, electrochemical, chemical and thermal.⁵ Energy storage technology will provide a number of essential services to future smart grid components. Those of relevance to a possible West River Valley-based micro-grid element of a regional or state smart grid are: (1) electrical storage devices for maintaining power levels and quality over short periods of time (seconds to minutes) and (2) electrochemical (battery) storage systems that provide peak shaving and longer term (hours to days) load leveling. Additionally, battery storage at the micro-grid level will allow separation of the times of energy generation and delivery to users. The ability of battery-based energy storage to absorb peaks of fluctuating power from renewable generators and deliver needed additional power during valleys of generation to maintain a constant power output is absolutely essential to lifting the stringent limits on net-metering. Renewable energy generators with adequate energy storage and the right controls may emulate conventional synchronous generators, producing grid-quality power for a predictable amount

⁴ Gómez-Expósito, Antonio, Angel Arcos-Vargas, José M. Maza-Ortega, José A. Rosendo-Macías, Gabriel Alvarez-Cordero, Susana Carillo-Aparicio, Juan González-Lara, Daniel Morales-Wagner, and Tomás González-García. "City-Friendly Smart Network Technologies and Infrastructures: The Spanish Experience." *Proceedings of the IEEE* 106, no. 4 (2018): 626-660.

⁵ Molina, Marcelo G. "Energy Storage and Power Electronics Technologies: A Strong Combination to Empower the Transformation to the Smart Grid." *Proceedings of the IEEE* 105, no. 11 (2017): 2191-2219.

of time.⁶ In its absence, PV solar generators would have to operate in a virtual off-the-grid mode as described above.

Energy storage research includes both efforts to increase the charge-carrying capacity of chemical batteries and efforts to produce low-cost batteries for applications where size and weight are not constraints. The former is important for meeting energy storage needs where constrained by size, weight or available space. Historically, large scale deployment of batteries as energy storage systems has been too expensive. However, prices are declining and expected to fall by 60% by 2020.⁷ The latter research effort addresses this need.

Although not envisioned by the 2016 CEP or the targets assigned by the WRC, a batteries-only conversion to the renewable energy grid may prove beneficial to those property owners for whom none of the renewable energy generation systems are appropriate. With sufficient battery capacity, homeowners may separate time of delivery of electricity from time of its generation. This will maximize the efficiency of local distribution of renewable energy within a micro-grid. It will also minimize the need for supplemental electricity from outside local micro-grids. Arrays of batteries, either closely coupled with community solar arrays or as stand-alone arrays, will play a similar role for an entire micro-grid. Power excess from distributed generators may be saved and redistributed locally as needed. Local excess reserves may be made available more predictably to the larger grid and deficits more predictably provided for.

Pumped hydroelectric storage systems are responsible for the bulk of the world's energy storage.⁸ These normally are massive systems consisting of two reservoirs separated in elevation and a pump/generator at the lower reservoir. Water is pumped up to the upper reservoir with electrical energy to be saved as kinetic energy and released to flow to the generator at the lower reservoir to be recovered as electrical energy. Costing hundreds of millions of dollars to build, they are used to store GWh of energy for large energy providers. While not feasible now because of dam limitations, serious sediment accumulation problems within the existing reservoirs, and shoreline erosion concerns, Jamaica is investigating the possibility of a more modest pumped hydro energy storage system utilizing the Ball Mountain and Townshend dams if dam and environment concerns are addressed. If these problems are mitigated, such a system could provide bulk energy storage for a potential future West River Valley-based micro grid.

⁶ Gómez-Expósito, Antonio, Angel Arcos-Vargas, José M. Maza-Ortega, José A. Rosendo-Macías, Gabriel Alvarez-Cordero, Susana Carillo-Aparicio, Juan González-Lara, Daniel Morales-Wagner, and Tomás González-García. "City-Friendly Smart Network Technologies and Infrastructures: The Spanish Experience." *Proceedings of the IEEE* 106, no. 4 (2018): 626-660.

⁷ 2016 Vermont Comprehensive Energy Plan, Chapter 10, pp 641

⁸ Molina, Marcelo G. "Energy Storage and Power Electronics Technologies: A Strong Combination to Empower the Transformation to the Smart Grid." *Proceedings of the IEEE* 105, no. 11 (2017): 2191-2219.

Smart Grid

By 2050, the 2016 CEP envisions a radical reorganization of the power grid into what has become known as the smart grid. In concept, the smart grid is an inter-connected network of micro-grids. Micro-grids are smaller connections of power generators, energy storage, and power users. Generators may be both residential and community-based PV solar and residential wind generators and energy storage may be both “behind the meter” and at the community generator level. Micro grids will be controlled as a single entity, a single unified producer and consumer of electrical power, and capable of operating as an externally controlled element of the larger smart grid or in a stand-alone, “island” mode.

The smart grid will network micro grids, providing exchange of power among them and providing power to them on those occasions when local sources are inadequate, e.g. during prolonged periods of overcast skies and calm winds when renewable energy generation is inadequate. A certain amount of conventional power generation will be at the smart grid's disposal for this purpose, but its use will be limited and — more importantly — predictable, well in advance of need. Consuming power locally where generated and better controlled transfer of power directly from centralized generators to micro-grids will avoid transmission losses the grid currently experiences, saving 5% of current electrical energy generated.⁹

Power Electronics

Power electronics are those solid-state devices found in inverters and transformers needed to transform the output of renewable energy generators to 60 cycle AC power that homeowners and business users consume. Other power electronics are used in the grid to transform power between AC and DC currents and between different voltage levels for long haul transmission. An emerging form of power electronics is the Flexible AC Transmission System (FACTS). The components in FACTS are to be used in the smart grid to support active control of power transfer, both within and among the smart grid's micro-grids. Local consumption of power flowing in and out of micro-grids will require external control of these devices by the larger smart grid control system.

Smart Grid Control

The fundamental building block of the smart grid will be smart meters that report in real time the state of all connected micro-grid elements to the micro-grid controller. Intra micro-grid control is exercised based on the aggregate of smart meter reports. Micro-grid states, computed from smart meter reports, are reported to the smart grid controller to exercise control of the overall grid. Control of the smart grid is envisioned to be implemented on a distributed computing network of high performance computers, e.g., distributed cloud computing. Control algorithms for implementing the above hierarchical control of the smart

⁹ "How Much Electricity Is Lost in Transmission and Distribution in the United States January 29, 2018. Accessed June 06, 2018. <https://www.eia.gov/>.

grid, the supporting hardware, and software computing architecture are currently in the conceptual stage of research and development efforts.¹⁰

Solar Constraints

The above discussion of enabling PV Solar technology is to make the point that the pace at which the technology necessary to integrate renewable energy generation into the power grid will constrain the rate at which Jamaica, and the rest of the state, can adopt it. Jamaica fully accepts the WRC targets for PV solar energy generation and their scheduled implementation as the best estimate of what can be achieved based on the 2016 CEP. However, we expect that near-term targets will be subject to change as the pace of enabling technology reaching market availability becomes clearer. We expect that as the enabling technology is realized as products, business models that make it attractive to consumers will quickly follow. As Jamaica residents and vacation home owners become aware of PV solar systems available to them at energy cost savings, we expect them to act to take advantage of energy costs savings and expeditious conversion to renewable generation including PV solar energy will follow. Accordingly, it follows that a major part of Jamaica's path forward will be to maintain awareness of the state of PV solar enabling technologies and supporting business models so that our residents and vacation homeowners may be made aware of their availability at the earliest opportunity.

Wind Potential

Map 4, Jamaica Wind Potential and Map 5 Jamaica Wind Resource show wind energy areas with known and possible constraints and areas suitable for large and small commercial wind and residential wind generation respectively¹¹. Jamaica will encourage a mix of renewable energy generation sources, including residential wind in areas specified by the Wind Potential and Resource map (maps 4 and 5 of Appendix A) of the Mapping Appendix of this plan that are not constrained by Act 250 considerations or provisions of our town plan. Maps 6,7, and 8 show those constraints overlaid on the different areas of the wind Resource Map. The WRC targets identify 1060 acres available for residential wind energy generation. Therefore, there is substantial potential for effective utilization of residential wind for renewable energy generation. It is considered that residential wind installations would be beneficial supplements to PV solar generation, and particularly useful in areas where PV solar may be impractical. The cost of wind-based renewable energy closely tracks that of PV solar and will offer the same cost savings opportunities as PV solar. Since wind velocities fluctuate independently from sunlight, the overlap of wind and PV solar

¹⁰ Gómez-Expósito, Antonio, Angel Arcos-Vargas, José M. Maza-Ortega, José A. Rosendo-Macías, Gabriel Alvarez-Cordero, Susana Carillo-Aparicio, Juan González-Lara, Daniel Morales-Wagner, and Tomás González-García. "City-Friendly Smart Network Technologies and Infrastructures: The Spanish Experience." *Proceedings of the IEEE* 106, no. 4 (2018): 636.

¹¹ As used in this plan, "residential wind generator" is defined as any on-site wind driven electric generator for local use that is of no more than 500 kW capacity, operates either off-grid or, through net metering, in parallel with facilities of the electric distribution system, is intended primarily to offset the owner's own electricity requirements, is located on the owners premises, or, for group net-metered systems, on the premises of a member of the group, and is mounted on a mast or tower structure of no more than 120 feet in total height (height of mounting structure plus radius of airfoil arc).

energy offers a more robust renewable energy generation capability than either can provide alone. The above discussion of enabling technologies applies equally to residential wind renewable energy utilization as well.

Wind Constraints

To be effective from a wind resource perspective, commercial wind generators must be located on ridgelines (see map 5).¹² Jamaica's town plan prohibits ridgeline development. Therefore, Jamaica does not consider commercial wind to be an acceptable source of renewable energy as its introduction in potential wind energy regions of the town is inconsistent with other elements of our Town Plan and detrimental to the town's economic interests, which depend on maintaining its rural and scenic qualities, as described below under "Environmental Concerns" and "Economic Concerns". While the regional plan does not assign any large or small commercial wind target to Jamaica, this plan explicitly prohibits commercial wind development in Jamaica. This prohibition does not interfere with the town's ability to meet its renewable energy targets

Ridge Line Protection

It is a long-standing policy of Jamaica to protect the ridge lines of surrounding mountains from commercial and residential development.¹³ The Town's natural beauty, particularly its forested ridge lines, is the main attraction for our full-time residents, vacation home owners, and the many visitors we enjoy. Jamaica is home to the State's most popular State Park. The views of surrounding ridge lines are one of the major attractions enjoyed by visitors to this park.

Jamaica's town plan prohibits ridge line development. Specific ridge lines upon which development is prohibited include, but are not limited to the Pinnacle, Sage Hill, and Mundal Hill. Ridge lines associated with these mountains are viewsheds shared both by Jamaica and the neighboring Stratton resort area. Ridge lines of Cottage Hill, Ball Mountain, South Hill, and Attridge Mountain surrounding Jamaica State Park are viewsheds included in Jamaica's ridge lines as viewsheds enjoyed by visitors to Jamaica State Park. The Vermont Land Trust holds a conservation easement on most of the privately owned Shatterack Mountain ridge line which might be negatively impacted by ridgeline commercial wind development. The Nature Conservancy owns most of the Turkey Mountain ridge line in Jamaica with commercial wind potential. Any commercial wind development on this portion of the Turkey Mountain ridge line might affect this conserved land. Turkey Mountain and South Hill ridge lines are important viewsheds for travelers along Route 30 during fall foliage season. Map 6, 7, and 8 of Appendix A shows the juxtaposition of ridgeline areas with

¹² As used in this plan, "commercial wind generator" is defined as any wind driven electric generator that does not fall within this plan's definition of "residential wind generator". Commercial wind generators are explicitly prohibited in all locations within Jamaica under provisions of this plan.

¹³ "Vermont Highest Priority Interior Forest Blocks," Geodata.vermont.gov., accessed June 05, 2018, http://geodata.vermont.gov/datasets/b05737376a3f4553a025967aba4cac6a_183

wind resources suitable for commercial wind development with public lands and other constraints specified by our town plan. For these and other reasons, commercial wind is excluded from our plan to meet renewable energy conversion goals.

Environmental Concerns

Areas identified as secondary wind energy resources either lie within or adjacent to conservation areas.¹⁴ Per the State's Town of Jamaica Wind Resource Map, all the named peaks and associated ridge lines, except South Hill, lie in Vermont Conservation Design¹⁵ Highest Priority Forest Blocks. Deer wintering areas are located on the sides of Turkey Mountain and South Hill ridgelines. Location of large and small commercial wind towers in these areas has a potential to cause severe environmental damage to these areas, interrupt wildlife habits, and in some cases, cause runoff damage to local brooks and streams and the West River. Maps 7 and 8 of Appendix A show the juxtaposition of conserved and proposed conservation and scenic hills or ridgeline areas with areas shown on the state potential wind resource maps as suitable for large and small commercial wind development.

The entire town of Jamaica lies within the West River Watershed and is included in the Vermont Department of Environmental Conservation (VDEC) Basin 11 Strategic Plan. Due to the challenges of balancing recreational, commercial and industrial uses of the West River and its tributaries, the Basin 11 Strategic Plan was developed to identify priority actions to improve water quality, and protect natural communities and the rare, threatened and endangered species concentrated along the surface water areas. The plan specifically identifies the need to work with the Town of Jamaica to address sediment and temperature impairments to the local waterways.

The focus of the Plan included an attention to building with flood resiliency in mind. For the Town of Jamaica, actions include the implementation of sediment and storm water restoration and storm water control actions to reduce flow, sedimentation, and promote the regrowth of riparian vegetation.

The ridge lines listed above are a direct source of runoff to tributaries or smaller brooks that empty into the West River and are governed by the VDEC Basin 11 Strategic Plan. Many of these areas include steeply graded and severe terrain that increases the amount and velocity of storm water runoff to lower elevations. The earthwork process of tree clearing and grading to construct access roads and the wind turbine sites are actions that may add to the amount of storm water runoff, increase soil exposure areas, erosion, and direct sunlight, in conflict with the goals of the Basin 11 Plan. Runoff from commercial wind turbine sites, if located on Jamaica's ridge lines, has the potential to cause contamination in the West River, ponds, and wetlands included in the Jamaica Watershed.

¹⁴ Town Plan, Town of Jamaica, Vermont, November 13, 2017, Town Plan Maps, Proposed Land Use Map

¹⁵ Town Plan, Town of Jamaica, Vermont, November 13, 2017, Appendix

Economic Concerns

A large part of Jamaica's economy is centered on tourism or providing goods and services to vacation homeowners. The natural beauty of the Town's forests and mountains are a major draw for both. Vacation homeowners are both summer residents and winter residents who take advantage of the nearby ski resorts. Vacation homes constitute the major portion of the town's grand list. Any commercial wind installations degrading the natural beauty of the area has a high potential to adversely affect property values, increase the tax burden of full time residents, and reduce the considerable contribution of Jamaica tax revenue to the State's Education Fund. The western ridge lines of the Pinnacles, Sage Hill, or Mundal Hill are in the primary foreground of Stratton's easterly view. Commercial wind development on any of Jamaica's ridgelines described in the above text would negatively affect the town of Stratton's easterly viewshed. Jamaica is undertaking economic development efforts, infrastructure improvements, and outreach efforts to attract new businesses and residents. The area's natural beauty is the primary advantage we offer to potential new residents.

Necessity

Commercial wind energy generation is not necessary to meet the Jamaica targets for renewable energy generation. The mix of PV solar, residential wind, and micro-hydro will be sufficient. If, as expected, the next 32 years see substantial improvement in PV solar efficiency and battery storage capacity, the goals established by the WRC plan will prove to be conservative and easily exceeded with PV solar energy alone.

Hydro Potential

The presence of two perennial fast-flowing waterways, the West River and Ball Mountain Brook, presents a significant opportunity for harnessing renewable energy. Based on Efficiency Vermont 2014 figures for residential electricity use in the Town of Jamaica, 1,164 residences utilize 6,102.37 kWh per residence/year. Assuming 85% efficiency, a single 100kW micro-hydro turbine could generate electricity for 120 homes. The Federal Energy Regulatory Commission (FERC), has licensed run-of-the-river hydro generators on the West River just upstream of Jamaica at the Ball Mountain and downstream at Townsend Dam.

Micro-hydro (<100kW and >10kW) is an option for hydro power on the West River, Ball Mountain Brook, and potentially in perennial waterways on individual parcels. Well-designed low impact hydropower technology is the most aesthetically and environmentally-conforming of the renewable energy types to the Town Plan's "low impact development strategy. While water-flow dependent, it can provide continuous power output, independent of time of day or wind conditions, and can be connected to the power grid for net metering. Adequate flow for new low impact river-run turbines will be determined during development of small and micro hydroelectric projects." In 2015, the State of Vermont Department of Public Service (DPS) Agency of Natural Resources and Agency of Commerce and Community Development established the Vermont Small Hydropower Assistance Program (VSHAP) in order to facilitate permitting of hydroelectric power and incentivize hydropower installations. To identify and assist low-impact projects they jointly conduct a desktop review of project proposal characteristics; if that screening is successful, they then conduct a project proposal review based on a site visit, as appropriate. The agencies will then provide enhanced assistance to projects that screen as low impact (for instance, waiving scoping periods in the FERC process and/or representing to FERC that agency concerns have been satisfied).

Upfront costs for micro-hydropower are considerably lower than for solar or wind, given the

smaller scale, and levelized costs are the lowest of the three renewable technologies. Current technological advances meet the demand for low impact 'run-of-the-river' turbines that are 'fish friendly' and report up to 90% efficiency. Companies such as Voith Hydro and General Electric have innovative technology that has proven to meet stringent environmental regulations. Another consideration which would help alleviate or avoid otherwise applicable environmental concerns would be the placement of hydro technology in existing infrastructure such as a storm sewer outlet or in connection to existing bridge footings.

Hydro Constraints

Permitting and rate-of-return on investment for micro-hydropower presents the greatest challenge to installation. As of January 2018, there have been no permits issued through the VSHAP program. The State of Vermont has tried to facilitate permitting; however, there is no financial incentive offered at the present time as of spring 2018. While technology allows for hydropower to be installed in the "river run", greater energy returns are achieved where hydropower is installed at a dam or weir with, "head height," or waterfall. However, new dams or weirs that obstruct or alter stream flow regimes are effectively prohibited under existing state water quality laws. Run-of-the-river hydro generators can potentially be permitted. The West River and Ball Mountain Brook do not have dams or weirs below the Ball Mountain Dam. Levelized costs, i.e., lifetime costs including initial startup costs, of the infrastructure and maintenance of hydropower technology are lower than solar or wind.

Potential Heating Energy Conservation and Constraints

Wood Heating

The fact that Jamaica's forests are able to supply significant quantities of cordwood for local cordwood businesses plus the ready availability of wood pellets heightens the potential for increasing the number of homeowners who heat with wood. The lower cost of heating BTUs from wood relative to fuel oil is an added incentive for wood heating. To the extent that Jamaica residents cut their own firewood, the cost of wood heating is further reduced. Further, Jamaica's extensive forest lands act as an important CO₂ sink.

However, there is an important caveat to encouraging a further increase in the use of wood for home heating. Burning wood is half of a CO₂ cycle. To be a recyclable source of energy, growing new trees must reabsorb the CO₂ released from burning wood. Burning wood releases nearly as much CO₂ per BTU as heating oil. Growing a tree to replace a tree consumed will reabsorb the CO₂ released, but it will take the tree's lifetime. The CO₂ load in the atmosphere will build up until a sufficient number of replacement trees establish equilibrium. Figure E6 illustrates the effect for three scenarios.

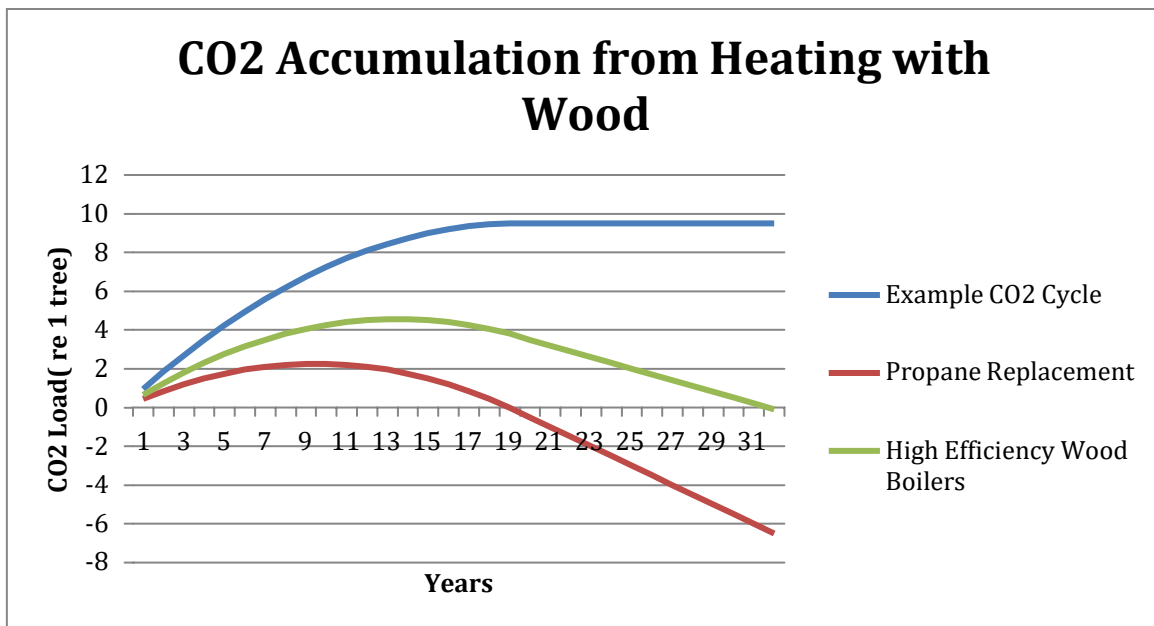


Figure E6
CO2 atmospheric load buildup and
dissipation for three wood heating conversion
scenarios

The blue curve illustrates a representative CO2 cycle for a wood burning stove. Heating with a conventional wood stove (blue curve) and tree-for-tree replacement of trees burned will cause a buildup of CO2 until sufficient replacement trees have been planted to absorb the CO2 released by each tree consumed. In this example, a 20-year life cycle is assumed; i.e., each replacement tree absorbs 5% of the CO2 released per year. Accumulated replacement trees therefore absorb the CO2 released by burning a single tree. Equilibrium, i.e., the condition in which the CO2 released by each tree burned is absorbed by 20 growing trees, is reached after 20 years. Twenty trees, each absorbing 5% of the CO2 released by burning a single tree have been accumulated and thereafter harvested at the rate consumed.

The CO2 cycle in Jamaica's mature forest is more complex. CO2 release varies by tree species and absorption rates vary by species and tree age. Further, a tree must reach a certain size before significant absorption can occur. Therefore, the CO2 cycle in Jamaica's mature forest does not occur in isolation as illustrated above but rather in the context of a forest that is already absorbing CO2 at its maximum capacity. Adding a new fossil fuel (including wood) heating system will only generate CO2 beyond its capacity to absorb unless new trees are introduced to the forest to absorb the new CO2 generated. If the fuel is wood harvested from the Jamaica forest, then two trees must replace each tree burned; one to maintain the existing equilibrium and one to offset the CO2 released by the new system. If the fuel is oil, new trees must be introduced at the rate of the blue curve example to offset the new source of CO2. In both cases, CO2 will increase to a new equilibrium point as shown in the blue curve.

The red curve illustrates the effect on contribution to the CO₂ level of replacing propane or natural gas heating with conventional wood heating accompanied with tree replacement. Replacing each tree harvested plus a second tree for the number of BTUs burning a tree releases, i.e., the replacement rate for a conventional wood heating system, will cause an initial buildup of CO₂ followed by a decrease in CO₂ as illustrated by the red curve. In Jamaica forest's saturated CO₂ sink, any reduction in local CO₂ load from a conversion in Jamaica will quickly be filled from excess CO₂ in the atmosphere. But Jamaica's contribution will be reduced.

Replacing conventional wood heating systems with high-efficiency wood boilers or pellet stoves has the effect of reducing the CO₂ load by approximately one third, 60% / 90% efficiency ratio in heat use. If tree-for-tree replacement were already in effect for the replaced conventional system, the replacement will cause more CO₂ to be absorbed than generated as shown by the green curve. As with the propane example, any unused capacity of Jamaica's forest to absorb CO₂ will quickly be used by excess in the atmosphere, but Jamaica's contribution will be reduced. If the pellet or high-efficiency wood boiler system is new, then trees harvested from Jamaica's forest must be replaced at the rate consumed and new trees must be added, but at a rate that is two thirds of that required by a conventional wood heating system.

The foregoing discussion is to illustrate that to be effective in addressing the fundamental objective of the State's 2016 CEP, i.e., reducing the greenhouse gas loads from energy generation, use of wood for heating energy must be accompanied by responsible forest management.¹⁶ Firewood must be harvested at a sustainable rate and in a manner that assures replacement trees grow at a rate not less than one-for-one replacement for existing systems and greater for new systems. Jamaica is largely covered in forest and Jamaica has a long-standing policy of encouraging responsible forest management practices.¹⁷ While this policy has been motivated by esthetic and economic reasons in the past, promoting increases in the use of wood for heating energy must be accompanied by re-emphasis of good forest management to ensure Jamaica remains a CO₂ sink for itself and perhaps other less-wooded towns.

A major constraint to conversion of current residential heating systems to high-efficiency wood heating is cost. High-efficiency wood stoves and wood gasification wood boilers are expensive. Initial costs may be offset through the Department of Public Services Micro Renewable Energy Incentive program (SSREI) rebate offers for advanced wood pellet, chip boilers, and solar heating systems. The department also offers low-interest loans through the Heat Saver Loan program to offset up-front costs for energy upgrades that may be used to finance conversion to wood heating. Cost savings of wood pellets and cordwood relative to fuel oil, propane, and electricity heat will allow homeowners to recover conversion costs. Jamaica will ensure that citizens are informed of available financial assistance for conversion to high efficiency wood heating.

¹⁶ 2016 Comprehensive Energy Plan, Chapter 9, pp 194

¹⁷ Town Plan, Town of Jamaica, Vermont, November 13, 2017, Natural Resources, p14

Heat Pumps

Heat pumps offer an efficient alternative to electric, propane and oil heating. This is because heat pumps move heat (calories) rather than create them through burning or passing electric current through electrical resistance. In a manner analogous to electrical transformers, heat pumps extract calories from a large volume of outdoor air at low temperatures and release them to a lower volume of air at a higher temperature indoors. Given their efficiency relative to fossil fuel heating, they offer homeowners significant cost savings. They lose their effectiveness at sub-zero temperatures, so on Vermont's coldest days they must be supplemented with a second heating source. Ground-based heat pumps that extract calories from the ground to heat indoor air can deliver 100% of a building heat even on the coldest days. Because of excavation costs, they are costlier than air source heat pumps.

Depending on the source of electricity to operate them, the CO₂ load on the atmosphere varies. Because of their improved efficiency, CO₂ loads are reduced even if powered by electricity distributed from fossil-fueled generators. With the conversion to renewable power, their use will create no CO₂ impact.

Financing conversion to heat pumps may be eased through rebates and income-based low-interest loans available through Efficiency Vermont. Businesses may finance conversion to heat pumps through business energy loans also available through Efficiency Vermont.

Other Alternative Heating

Geothermal heating and solar hot water heating systems are alternative heating sources to replace or augment non-renewable heating. They may require augmentation from a second source. While the energy element of the Windham Regional Plan does not assign a target for savings from these alternative heating systems, they may offer an attractive alternative renewable heating option. The SSREI and Heat Saver Loan programs may help finance conversion to these alternative heating options.

Potential Transportation Energy Saving and Constraints

Based on 2016 five-year estimates of commuting times from 2010 census data, the average daily round trip commute for Jamaica residents is 43 miles. Energy use for all transportation from regional data is 3075 MBTUs. Meeting these needs with electric vehicles, provided they are charged with electricity from renewable sources, or with reusable fuel, has the potential of significantly reducing greenhouse gas loads of the atmosphere. While Jamaica adopts the WRC targets as Jamaica's goals for transportation energy saving, the pace at which these goals can be met is dependent on factors beyond the Town's control. These include the pace at which enabling technology is brought to market, the availability of suitable vehicles at affordable prices, and the development of infrastructure needed to support vehicles using alternative fuel or power.

Because of the multi-use automotive needs of Jamaica residents, winter driving conditions, and the preponderance of Class 2 and Class 3 dirt roads with difficult driving conditions in

mud season, residents require all-wheel drive or four-wheel drive vehicles or light trucks. Additionally, many local businesses require vans and trucks. It is not known when electric or alternative fuel versions of these vehicles will be available for purchase. An additional lag will occur until they are available as more affordable used vehicles.

Battery Technology

The current state of battery technology limits the range of electric vehicles to approximately 200 miles, the mean weekly commuting distance of Jamaica workers. This range is for a relatively light car. A much lower range would be possible for the larger all-wheel or four-wheel drive cars and light duty trucks appropriate for Jamaica's roads. A number of research and development efforts are underway to increase the charge-carrying capacity of batteries that will increase electric car range and make their use in heavier car models practical.

Current battery charging times are lengthy and battery charging infrastructure is limited for the most part to home recharging. Limited public electric vehicle recharging is available in regionally, but for the most part, electric vehicles will have to be recharged at home. This is satisfactory for commuting purposes, but not for longer trips. A "chicken and egg" relationship between infrastructure development and electric car use is anticipated. More electric cars will stimulate more infrastructure development which will support more electric car buying.

Renewable Energy

Electric vehicles, because of their energy recovery systems, are slightly more efficient than internal combustion vehicles. Their real impact on reducing CO₂ will come when they are recharged from renewable energy sources. Drawing transportation energy from significantly cheaper renewable energy will offer a major reduction in operating costs and provide an incentive to buy electric vehicles. The rate at which the grid converts to renewable sources will therefore pace transition to electric vehicles.

Alternative Automotive Technologies

Although electric vehicles are the most advanced of renewable or recyclable energy automotive technologies now, other approaches are in various stages of research and development. The automotive technologies of 2050 are far from settled. These include alternative fuels such as biodiesel, hydrogen, and even ammonia, hydrogen fuel cells, and hybrid electric / alternative fuel cell vehicles. The latter would address the long haul problem of all electric vehicles. These technologies are not mature and their commercial availability is uncertain.

Resource Mapping Process and Policy Tool

Jamaica will utilize the Town of Jamaica Solar Energy Potential and Town of Jamaica Wind Energy maps generated by the Windham Regional Commission as baseline maps supporting the town's energy policies (maps 1 and 2 of Appendix A). We have augmented these maps by superimposing the Jamaica parcel maps on them so that solar and wind energy potentials may be identified by parcel and owner. Both the Town and individual parcel owners will then be better able to use these maps in future renewable energy conversion determinations.

Solar Resource Maps

Jamaica's solar map includes raw resource potential, known and possible constraints, grid infrastructure, transmission and distribution resources and constraints. Solar Resource Maps show 818 acres of prime solar generation land available without constraints and 4503 acres available with some constraints. There are a few solar projects in existence and one larger net-metered project in the permitting process. 54.7 KW are currently generated from ground and rooftop PV solar generators. Parcel boundaries have been superimposed over the solar energy map. Comparison of the parcel boundaries with the indexed parcel map in the Town Office will allow identification of parcel owners and facilitate promoting solar energy conversion to and by individual parcel owners. It will also support forming consortiums or other business partnerships for community solar generation.

Wind Resource Maps

Jamaica's wind map includes raw resource potential, known and possible constraints, grid infrastructure, transmission and distribution resources and constraints. There are no existing wind installations. There are 1687 acres potentially suitable, from a wind resource availability perspective, for large scale commercial wind generation, 1683 with possible, potential constraints and only 4 without constraints. There are a total of 6175 acres in Jamaica potentially suitable, from a wind resource availability perspective for small-scale commercial wind generation, 136 without constraints and 6038 available with possible, potential constraints. This estimate does not include the recent purchase of land on Turkey Mountain by the Nature Conservancy. Development of either large or small commercial wind generation on Jamaica's mountain ridge lines is deemed unacceptable for reasons enumerated elsewhere. There are 12572 acres with potential residential wind development in Jamaica, 1060 without possible, potential constraints and 11513 acres available with possible, potential constraints. Jamaica will encourage residential wind generation development where feasible. As with the solar map, parcel boundaries have been superimposed to facilitate location of possible residential wind installations. Comparison with the Town's indexed parcel map will facilitate both planners and parcel owners to determine the residential wind energy potential of their property.

Jamaica's Preferred Locations

Jamaica will determine specific areas suitable for community solar generators by comparison of solar potential maps, map 3 included in this Energy Plan, with our town plan's Existing Land Use and Proposed Land Use District maps and on-site evaluation. In this determination, ridge lines, conservation areas, and special interest areas will be excluded from consideration (see maps 6,7 and 8 of Appendix A). State-defined preferred locations, such as previously developed sites, brownfields, and gravel pits will be identified, as well as existing open fields where solar fields may be unobtrusively located. Community generators, co-ops, or other ventures will be encouraged to develop these sites. Residential sites for rooftop solar panels or small stand-alone solar arrays must be handled individually in that house orientation and available direct sunlight vary from property to property.

Similarly, Jamaica will encourage homeowners to participate in determining the suitability of their property for residential solar or wind generation by using the solar and wind potential

maps with parcel overlays. Our energy committee will request suitability information from our residents. A planned town survey may be used for this purpose. This data will be used to keep homeowners informed as anticipated technology and business developments enable economic conversion to renewable energy generation.

Areas Unsuitable for Energy Siting

Jamaica has overlaid the conservation and special siting areas from our 2017 Town Plan Proposed Land Use District map and the public land and conservation easement areas from our Existing Land Use map with the wind and solar potential maps from the WRC (see map 6, 7, and 8 of Appendix A). The high degree of correlation between ridge lines with commercial wind potential and the existing and proposed and current conservation areas and special sites leaves no areas with commercial wind potential that would not be in conflict with the Town's land-use policies. Existing and proposed conservation areas generally correspond with ridge lines identified in our 2017 Town Plan. Jamaica seeks to protect these areas for economic as well as environmental reasons. This is further reason to exclude commercial wind from our approach to meeting regional targets. Excluding commercial wind development does not interfere with the town's ability to meet renewable energy targets.

Jamaica's Energy Targets and Conservation Challenges

The Windham region was given an overall renewable energy generation target, as determined by the Department of Public Service, based on its percentage of the State's population (which directly affects its share of statewide consumption). The Windham Regional Commission (WRC) then determined energy generation targets for each of their member-towns, based on both the resource availability in town and its population. The resulting Jamaica generation targets are an average between those two characteristics.

Energy Generation Targets

In Jamaica, it is estimated that 1,231 MWh of renewable energy should be generated each year by 2050. This figure is an average of 1,167 MWh (based on the town's share of the regional population), and 1,294 MWh (based on the percent of regional resource availability). This estimated generation target serves as a starting point from which the town can develop policy to address its energy needs. We have applied the 25% and 40% ratios to determine interim targets for the benchmark years.

To translate this figure into what kinds of installations would be required, 1231 megawatt hours of renewable energy each year would require a total of 946.57 kilowatts of solar photovoltaic installations (using the assumption that only solar energy would contribute to the overall energy generation target, not any other generation source). On the landscape, this could mean that the town identifies 57 acres of solar-capable land. This is a very conservative figure; assuming that each megawatt of energy requires 60 acres (on average, solar installations produce a single megawatt over 8 acres). Using the 60 acres/megawatt energy production rate is for contingency; it reserves space for landowner, grid, or spatial constraints that may limit development. This ensures enough space would be delineated. Acres needed for the actual footprint of the development to accommodate for the target is 8

based on 8 acres/megawatt.

While not included in the target, residential wind and micro-hydro generation that may be installed will supplement renewable energy generation contributing to meeting or exceeding Jamaica's target. It should be noted that a 2.2 megawatt hydro generator recently commenced operation at the Ball Mountain Dam, and is accounted for in determining existing power generation.

Although renewable energy generation can occur in the Town and supply its residents with reliable, affordable, and clean power, the Town is challenged by the current amount of energy being consumed. In order to minimize the amount of energy generation required, the town must first develop strategies to reduce the amount of energy consumed.

Projected Energy Use: LEAP Model Results

To help inform Jamaica's policies on energy conservation measures, Jamaica used guidance from the LEAP (Long-Range Energy Alternatives Planning system) model, conducted by the Vermont Energy Investment Corporation as part of the state's comprehensive energy planning initiative.

The LEAP model is used to guide Vermont's regions towards reducing the amount of greenhouse gas emissions and consuming 90% renewable energy by 2050 (referred to as the "90x50" goal). To accomplish the state's energy goals, there are several interim benchmarks built into the LEAP model which ensure a progressive pace in attaining that "90 x 50" goal. Vermont's energy goals are:

- Greenhouse gas reduction goals of 50% from 1990 levels by 2028 and 75% by 2050.
- 25% of energy supplied by renewable resources by 2025 (25 x 25).
- Building efficiency of 25% of homes (80,000 units) by 2020.

Incorporating those goals into the model produced energy generation, conservation, and fuel conversion targets at benchmark dates for all regions in the state, and is informed by the region's current energy profile. The WRC received the results from this model and was tasked with making those results relevant to its member towns. The WRC therefore divided its region-wide benchmark targets among its towns based on their population (which is assumed to most directly impact the amount of energy the towns consume).

The following paragraphs and figures show Jamaica's LEAP model results, and how much energy could be conserved in order to reduce the burden of energy generation facilities in the region.

Residential Heating Conservation & Fuel Conversion

In order to determine how much energy would have to be conserved or how much fuel conversion to renewable energy achieved, the LEAP model produced both "Reference" and "90x50" scenarios. The Reference scenario is meant to depict energy use over decades if no major changes were made in our energy profile. It is the "business as usual" scenario. The "90x50" scenario shows one pathway that communities can adopt in order to reduce greenhouse gas emissions, conserve energy, and generate renewable energy so as to meet

the state's goals. This pathway is translated to Jamaica's use, and is shown below. It is another data estimate that serves to help inform the Town to develop its own policies for energy conservation and fuel conversion.

Figure E7 below show the LEAP results for Jamaica's residential heating sector. In both the Reference and 90x50 scenarios, energy consumption is modeled to decrease (on account of technological improvements, building innovation, and home efficiency improvements).

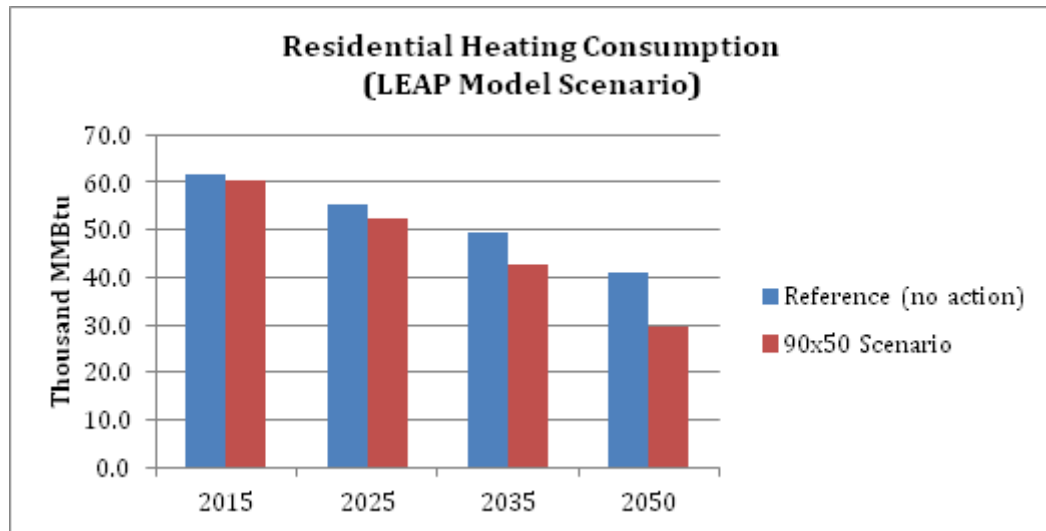


Figure E7
Jamaica Residential Heating Sector LEAP Results

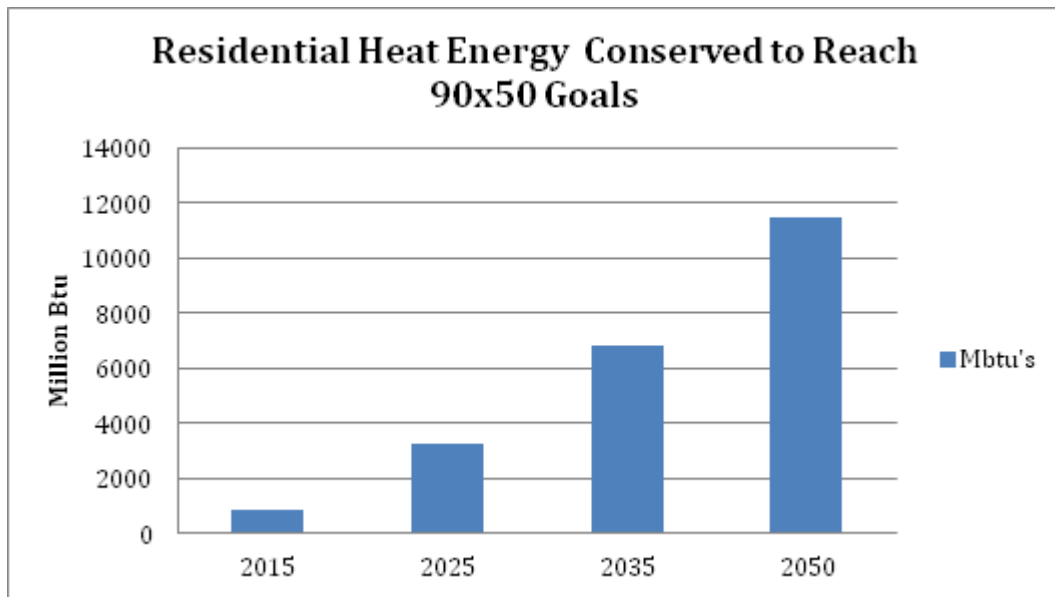


Figure E8
Jamaica Residential Heat Energy Conserved to Reach 90x50 Goals

However, the 90x50 scenario shows a sharper increase in the amount of energy conserved in residential heating. Figure E8 shows how much energy should be conserved through 2025, 2035, and 2050, to help the Town arrive at these energy goals. Not only would energy need to be conserved solely by building efficiency measures, but fuel conversion to more efficient energy sources would be promoted.

In order to attain the renewable energy goals, the following cumulative targets have been established for Jamaica for years 2025, 2035, and 2050.

Thermal (Heat) Efficiency Targets at Benchmark Years

Use/Sector	2025	2035	2050
Residential thermal (increased efficiency and conservation): Percent of municipal households to be weatherized over benchmark years to meet efficiency targets.	9%	17%	36%
Residential thermal (increased efficiency and conservation): Estimated number of municipal households to be weatherized.	94	184	377
Commercial thermal (increased efficiency and conservation): Percent of commercial establishments to be weatherized over benchmark years to meet efficiency targets.	9%	16%	30%
Commercial thermal (increased efficiency and conservation): Estimated number of commercial establishments to be weatherized.	3	6	10

Table E3
Jamaica Thermal (Heat) Efficiency Targets at Benchmark Years

Additionally, the following fuel conversion targets are set for heating fuel types used, with an emphasis towards shifting to more renewable heat sources and using more efficient sources (such as heat pumps).

Heating Fuel Switching Targets				
Use/Sector	2025	2035	2050	
Residential and Commercial Thermal Fuel: Estimated new efficient wood heat systems overall (in units) in the LEAP 90x50 scenario (this includes both wood stoves and wood pellet burners for homes and businesses). This number may decline over the target years, which indicates an overall trend toward energy conservation and building weatherizing, which reduces the demand on heating systems.	280	266	266	
Residential and Commercial Thermal Fuel: Estimated new wood pellet systems only (in units) in the LEAP 90x50 scenario.	49	54	67	
Residential and Thermal Fuel: Estimated new heat pumps (in units).	87	172	243	

Table E4
Jamaica Heating Fuel Switching Targets

Transportation System Changes

The LEAP model created benchmark targets for both light and heavy duty vehicles, assuming a difference in residential and industrial energy needs and changes over time. Below are the two interpretations of these sector's efficiencies over time.

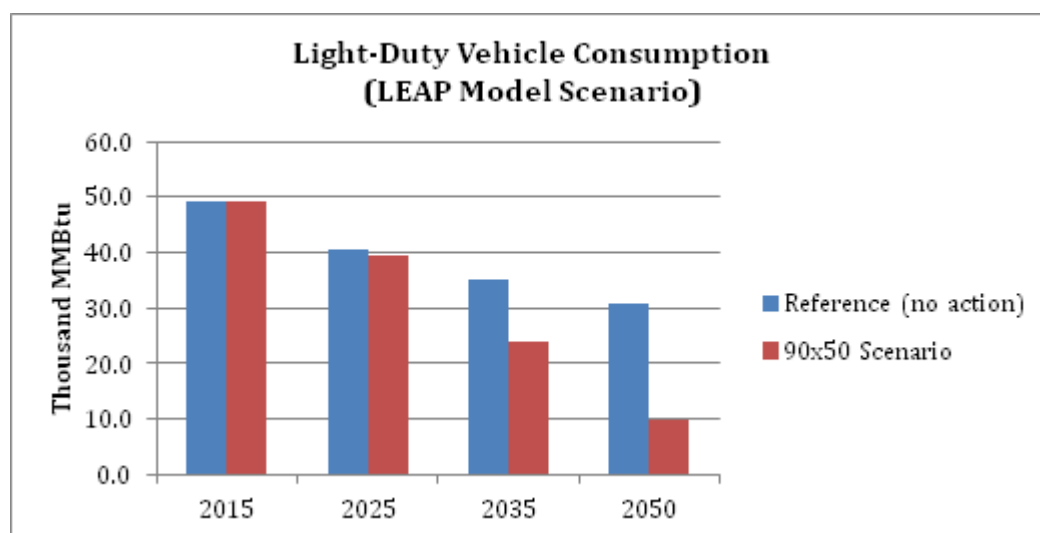


Figure E9
Jamaica Light-Duty Vehicle Consumption (LEAP Model Scenario)

Light-duty vehicle consumption represents a larger portion of the total amount of energy consumed by the transportation sector, and there is a large amount of energy conservation required. The LEAP model projects much of this conservation of energy comes from the electrification of the vehicle fleet, especially as market demand changes and technology improves. This reduction in gasoline consumption and electrification of the car motor comes in addition to increased cluster developments and other land use changes that improve the efficiency of our community's transportation network. Jamaica's economic development policies encourage business development in Jamaica Village and Rawsonville. Improved local availability of goods and services will decrease vehicle use. The following targets for the years 2025, 2035, 2050 are set for the town's transportation fuel conversion:

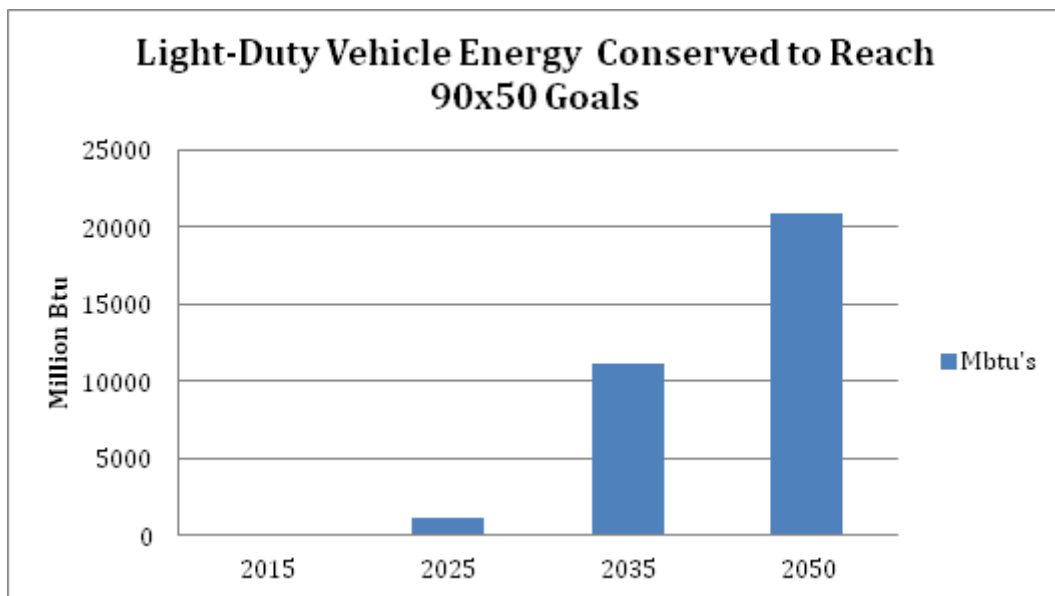


Figure E10

Jamaica Light-Duty Vehicle Energy Conserved to Reach 90x50 Goals

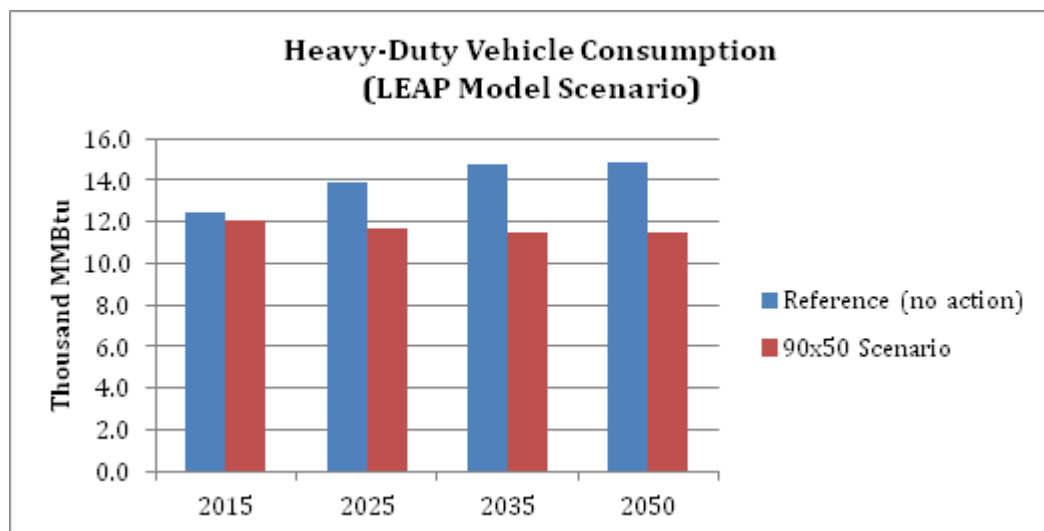


Figure E11

Jamaica Heavy-Duty Vehicle Consumption (LEAP Model Scenario)

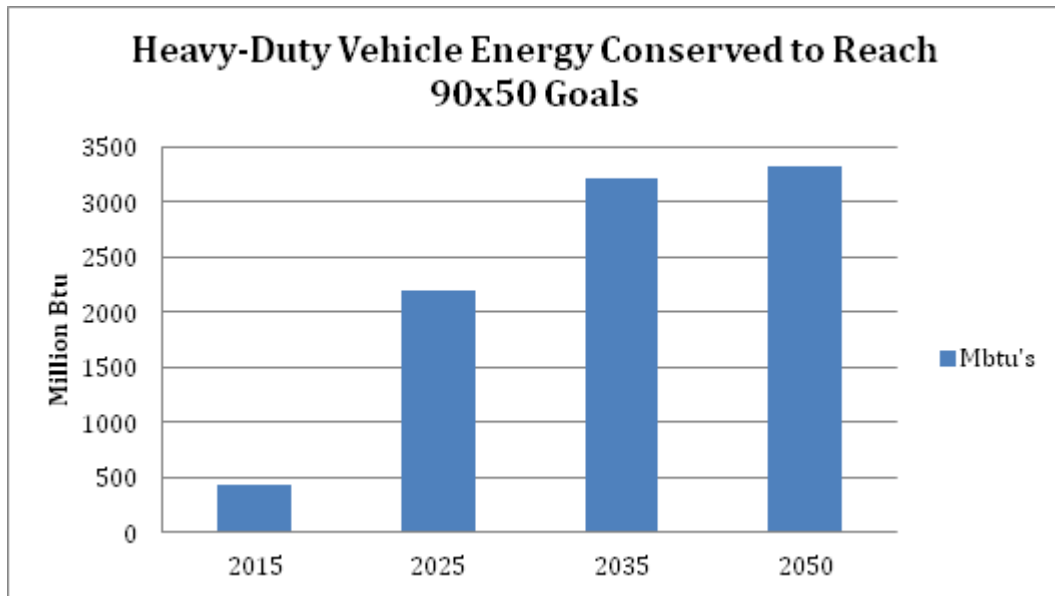


Figure E12
Jamaica Heavy-Duty Vehicle Energy Conserved to Reach 90x50 Goals

Transportation Fuel Switching Targets			
Use/Sector	2025	2035	2050
Transportation Fuel: Estimated number of new electric vehicles, in town.	60	424	896
Transportation Fuel: Estimated number of biodiesel-powered vehicles, in town.	92	176	304

Table E5:
Fuel switching targets for the transportation sector, across the benchmark years.

Heavy-duty vehicle consumption doesn't show the same curves as per light-duty vehicles, since commercial and industrial applications for this vehicle fleet isn't anticipated to change as much. However, efficiency in this sector is achieved by changing the fuel type for these vehicles from diesel to bio-diesel.

Electricity Conservation

Over the benchmark years, electricity rates are anticipated to increase in the Reference scenario, due to a combination of more amenities, appliances, and motors being supplied by electric power, and an increase in the number of people using those products. The 90x50

scenario promotes electricity conservation in the form of energy-efficient appliances, lighting, and heating/cooling.

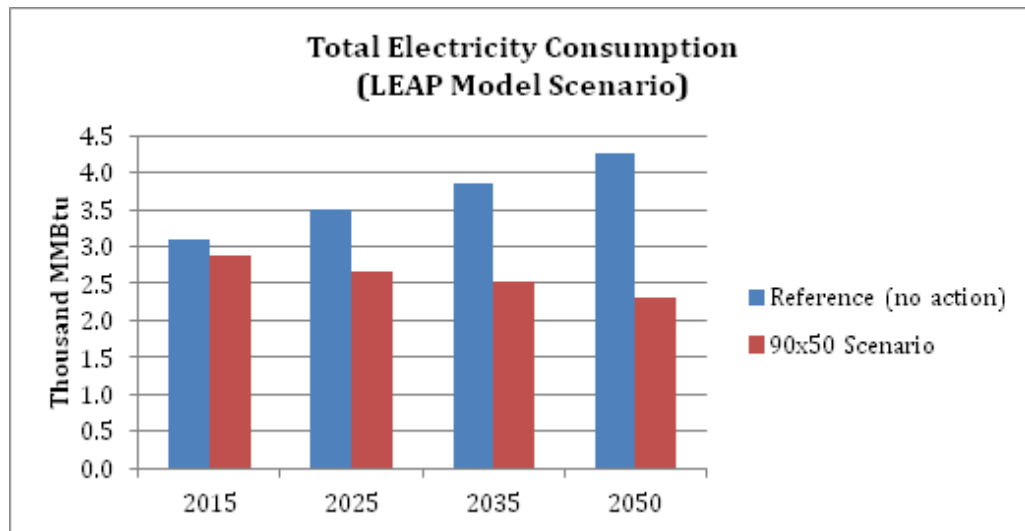


Figure E13
Jamaica Total Energy Consumption (LEAP Model Scenario)

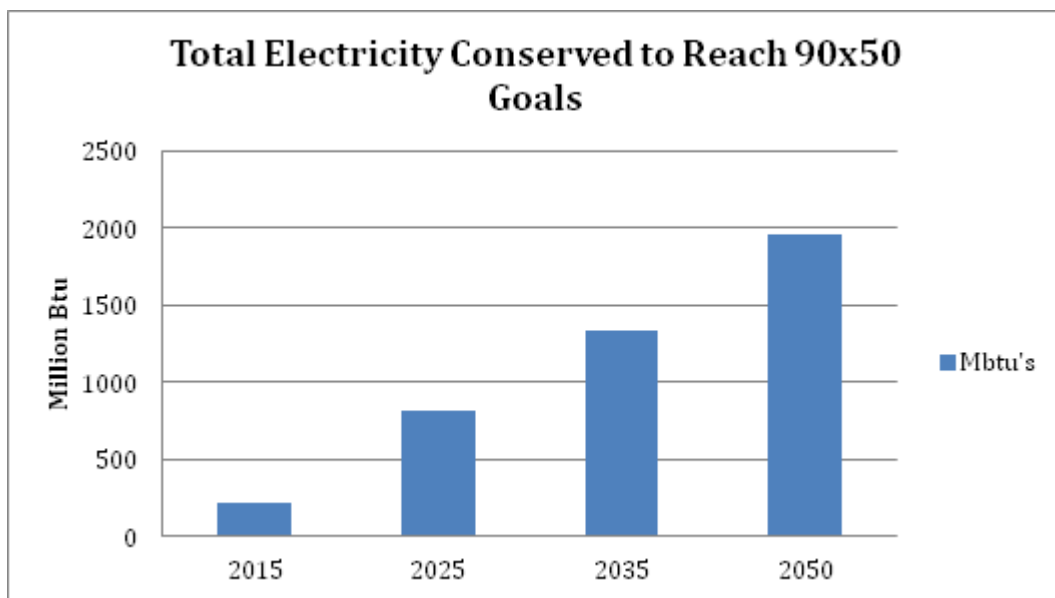


Figure E14
Jamaica Total Electricity Conserved to Reach 90x50 Goals

Pursuing these upgrades, the town is targeted to save the following in electrical conservation measures for target years 2025, 2035, 2050:

Efficiency Targets at Benchmark Years			
Use/Sector	2025	2035	2050
Electricity: Number of kilowatt hours to be conserved, annually, over the target years.	561,700	917,900	1,342,600
Electricity: Percentage of number of homes and buildings that will have been upgraded with electric efficiency improvements.	42%	68%	100%

Table E6:
Electric-sector efficiency targets across the benchmark years.

Conservation and Efficiency Strategies

With total energy expenditures in the Town in excess of 164,862 MBTUs, there is considerable opportunity for savings from various energy conservation and improved efficiency measures. Because most of the energy use in Jamaica is for private uses (home heating, commuting, etc.), savings would accrue primarily to residents. Public education is one of the most effective strategies to bring about savings through energy conservation and improved efficiency, though there are some specific policies that can also move the community in that direction.

Most new construction in Jamaica is required by the State to meet or exceed the Vermont Building Energy Standards (for both residential and commercial buildings) through the use of insulation, heating systems, and weatherproof windows and doors. Current state building codes provide basic energy efficiency requirements for buildings; however, technology advancements have generated higher standards such as net-zero energy construction standards in which buildings generate as much energy as they consume. Green construction and LEED Construction (Leadership in Energy and Environmental Design) standards promote the use of natural, recycled and durable building materials, as well as energy efficiency. These efficiency standards are also applied to landscaping, advocating for native plantings that are low-maintenance.

The siting, design, and construction of buildings strongly influences the amount of energy needed for heating as well as the amount of electricity needed for lighting. Proper subdivision design, building orientation, construction, and landscaping provide opportunities

for energy conservation such as less vehicular travel, and by designs incorporating passive solar space, domestic hot water heating, natural lighting and photovoltaic electricity production.

Energy savings can be realized by retrofitting existing buildings with insulation, installing high-performance windows and doors to reduce heat loss, weather-stripping, replacing incandescent lights with LED bulbs, and using energy efficient appliances. The following programs are available to residents of Jamaica:

- **Southeastern Vermont Community Action (SEVCA):** SEVCA is the service provider in Windham County that runs the Weatherization Assistance Program. Weatherization services, which include an energy audit, diagnostic tests, analysis and installation measures, are available at no cost to income-eligible homeowners and renters. SEVCA is also available to help in the event of a heating emergency. They can help purchase oil, kerosene, propane or wood. In addition, they also work with electric companies in order to prevent disconnection and help negotiate payment plans.
- **Efficiency Vermont:** Efficiency Vermont is the State's provider of energy efficiency services. They provide technical and financial assistance to electrical consumers for the purpose of improving the efficiency of existing and new facilities.
- **ENERGY STAR Home Rebates:** Energy Star Homes meet strict energy efficiency guidelines set by the U.S. Environmental Protection Agency and U.S. Department of Energy. Efficiency Vermont provides free financial, design, and technical to help build an ENERGY STAR qualified home. Benefits of being an ENERGY STAR home include financial incentives such as product rebates; utility savings; higher resale value; increased comfort and air quality; and other environmental benefits.
- **Vermont Housing Finance Authority's Energy Saver Loan Program:** Administered by Windham & Windsor Housing Trust, this program offers low interest loan funding for homeowners for an energy audit and improvements specified in the audit.

Transportation-related efficiency strategies are a very significant part of Jamaica's efforts, since it represents a significant portion of the energy demand. Simple changes, such as ride-sharing, combining trips and using alternative transportation, will conserve fuel and reduce wear and tear and maintenance costs on individual vehicles. Fuel-efficient and electric cars will use less gasoline and emit less pollution.

Effective land use planning can promote energy conservation. Targeting new development toward areas located close to the community's major roads and existing settlements will minimize the energy consumed by residents commuting, and will reduce the energy required to deliver essential services to residents and businesses.

Energy Goals, Policies, and Action Steps

Goal 1: Jamaica will reduce the total energy use by our Town through education and promotion of economic opportunities to implement energy conservation and

efficiency measures and convert to renewable and recyclable energy sources.

Jamaica is starting from a minimal base of renewable energy sources. Current rooftop capacity is 57 KW. A 500 KW commercial array exists, but it provides power to a different community. There are no residential wind towers. A 2.2 MW hydro source does exist at Ball Mountain Dam, but its operation is not well publicized. Because of this, informing Jamaica's citizenry is the essential first step of implementing this plan.

Jamaica will use the communications tools available to inform our citizenry and promote energy savings and conversion opportunities. We will enable residents to exploit the nexus of advances in energy savings technology and the innovative financing methods that will follow with economic self-interest. We will combine the interests of good citizenship in reducing the CO₂ burden on the atmosphere with energy cost savings products and practices. Most importantly, we will bring low up-front cost financing programs to our citizens' attention to make it financially feasible for everyone to participate in energy saving efforts.

Heating costs are a major element of all Jamaica residents' budgets and a significant municipal operating cost. Conversion to advanced heating technology can save sufficient energy costs to more than pay for conversion. Financing programs that reduce initial capital outlay can make energy savings possible for everyone. Jamaica will encourage conversion to efficient heating systems. We will identify local businesses selling wood heating products including cord, pellet and wood chip fuel and high efficiency wood heating systems.

Responsible forest management is required to make wood heating effective in reducing CO₂ from wood heating systems. With its preponderance of forest lands, Jamaica is in an excellent position to do this and will continue to emphasize responsible forestry for CO₂ reduction as well as environmental and economic concerns. Harvesting wood for heating purposes as well as timber sales in a manner that promotes forest re-growth will be encouraged.

Jamaica will lead by example by identifying and promoting opportunities for cost savings through energy conservation. Opportunities may include improvements in conservation such as improved insulation and weatherization as well as heating source conversion. For demonstration projects involving town owned buildings, initial costs and lifecycle cost reduction will be assessed to determine cost effectiveness of improvements considered. The number of years required for heating cost reduction to offset capital outlay will be determined and used as the major decision criteria. Energy certifications will be sought. Capital costs of projects to be undertaken will be included in proposed Town budgets.

As recognized in the 2016 CEP, compliance with all the energy savings goals is dependent on voluntary actions of an informed citizenry. Informing Jamaica's residents of available opportunities is therefore key to meeting all policy objectives. The Planning Commission's approach to meeting all goals will be by facilitating the alignment of our residents' economic interests with available energy-saving programs, products and — most importantly — low-cost, low up-front capital financing opportunities. A number of opportunities currently exist while others will emerge as the enabling energy savings and conversion technologies

mature. For example, the lifecycle cost of cold weather heating systems will decrease as conversion to PV solar electricity generation proceeds. The spread in operating costs will, in turn, enable attractive financing options for conversion. A primary responsibility of the Planning Commission's Energy Committee will be to maintain awareness of the state of energy conservation technology and financing opportunities in order to inform our citizens and encourage adoption of the various conservation measures.

Policy 1.1: Jamaica will promote individual energy conservation through use of the town website and informational town energy presentations and workshops.

Action Steps:

1. Maintain an energy committee responsible for overseeing implementation of this plan (see policy 1.5).
2. Promote state Energy Efficiency Utility (EEU) and the Weatherization programs by using the town website to inform our citizens. Encourage and investigate ways to fund training and education for Town staff to develop the Town website to its fullest potential in order to use it effectively for disseminating such information. Develop social media policies in conjunction with other Town agencies to establish the most appropriate ways to use social media to promote energy information. We will provide links to available electric, natural gas, and deliverable fuel EEU program resources and Efficiency Excellence Network (EEN) contractors.
3. Co-sponsor weatherization information presentation to town meetings, recording them for later viewing on our website for those unable to attend the original presentation.
4. Promote energy-efficiency opportunities in new construction and remodeling to businesses we hope to attract to Jamaica (see economic development). Jamaica will focus energy conservation measures on the buildings that are municipally owned with particular emphasis on measures to reduce operating costs.
5. Encourage energy audits in any affordable housing units Jamaica develops.

Policy 1.2: Jamaica will promote the efficient use of heating energy in commercial and residential buildings by encouraging citizens to follow energy saving standards and building codes emphasizing lifecycle costs savings of heating energy conservation.

Action Steps:

1. Promote the use of Vermont's residential building energy score/label through use of the town's website. We will encourage local realtors to feature energy labels in real estate offers.

2. Make commercial building energy standards available to all commercial and residential land use registration applicants.

3. Encourage the use of the EPA's Portfolio Manager tool with EEU assistance for commercial building construction and renovation. The residential stretch energy codes will be promoted for all residential Act 250 projects and required for all commercial Act 250 projects.

4. Review and evaluate making the stretch energy code the standard recommended for all building additions, alterations, and repairs.

5. Join the Vermont Climate Action Coalition and its popular tool, the Vermont Energy Dashboard, to encourage citizens to take energy-actions, no matter how small. The Planning Commission will take the lead on publicizing and implementing. See <https://www.vtenergydashboard.org/stories/vermont-climate-action-communities>

Policy 1.3: Jamaica will promote the decreased use of fossil fuel for heating by encouraging the use of efficient heat technology to reduce heating costs.

Action Steps:

1. Encourage conversion to cold climate heat pumps and use of ground-source heat pumps as primary heat sources for new construction and major remodeling projects.

2. Assess the cost-effectiveness of converting municipal building heating systems to cold weather heat pumps. Promote conversion based on potential costs savings.

3. Encourage the use of efficient wood heating systems in both commercial and residential buildings including the upgrade of the significant number of wood heating units already in use to EPA approved cord and pellet stoves by making heating cost reduction information available through the town website and town energy information meetings.

4. Encourage the installation of district heating systems in Jamaica Village and Rawsonville.

5. Identify local businesses selling wood heating products including cord, pellet and wood chip fuel and high efficiency wood heating systems.

Policy 1.4: Jamaica will lead by example by assessing and, where cost effective, upgrading the heating of municipally owned buildings.

Action Steps:

1. Jamaica will conduct a baseline energy study including energy audits to determine energy use and identify opportunities for energy cost savings.
2. Identify energy conservation cost saving opportunities. Evaluate capital investment requirements to implement identified actions and return on investment through operating costs reductions.
3. Prepare Town Budget proposal for implementation to be approved in annual Town meetings.

Policy 1.5: The Jamaica Planning Commission's Energy Committee will educate itself on the current state of energy conservation technology and energy conservation financial assistance programs. This policy is considered key to meeting all of our Energy Plan goals.

Action Steps:

1. The Energy Committee will maintain awareness of the current state of renewable energy technology and related financing options.
2. Review available material on energy conservation technology and financial assistance programs from both State and commercial sources on an ongoing basis to maintain a current awareness of available conservation measures suitable for Jamaica's residents.
3. Participation in the Vermont Energy Dashboard and related future programs will facilitate this.

Goal 2: Jamaica will address reduction of transportation energy with steps to immediately facilitate ride sharing. We will encourage use of electric vehicles and or alternative fuel vehicles as alternative automotive technology and renewable or recyclable fuel becomes available and economically feasible.

As noted above, the dispersed commuting and shopping needs of our rural community are unmet by public transportation or alternative vehicles and fuels. In the near term, Jamaica will implement measures to facilitate ride-sharing to common destinations. Anticipated advancement in automotive technology that will increase the range of electric vehicles and the variety of models appropriate to rural community needs will make it practical to promote their purchase for family and municipal use. As conversion to renewable electricity proceeds, savings in fuel costs will provide economic incentives for their use. As they become available, Jamaica will implement measures to promote the use of alternative vehicles and fuels and the economic benefits they offer.

Policy 2.1: Jamaica will encourage the increased use of public transit.

Action Steps:

1. Identify public transit options available to Jamaica residents, including those offered by local service organizations, such as Neighborhood Connections, Senior Solutions, Southeast Vermont Transit (operates The Current, the MOOver, and Dial-A-Ride).
2. Develop an information-dissemination strategy, including print, online, and in-person methods in order to keep Jamaica residents aware of options and choices.
3. Examine strategies to increase effective communications and exchange of knowledge.

Policy 2.2: Jamaica will promote a shift away from single-occupancy vehicle trips through strategies appropriate to Jamaica.

Action Steps:

1. Identify established local ride-sharing and public transit options (as outlined above).
2. Develop a local database or clearinghouse to identify Jamaica residents who make regular trips to popular destinations (Brattleboro, Grace Cottage, etc.).
3. Investigate liability and insurance impacts for those taking part in ride-sharing opportunities, either as drivers or riders.
4. Examine strategies for publicizing the above -- utilizing varied online and offline messaging formats.
5. Investigate the possibility of locating CSA share drops in local establishments to save driving transport time.

Policy 2.3: Jamaica will promote a shift away from gas/diesel vehicles to electric or other non-fossil fuel transportation options through strategies appropriate to Jamaica.

Action Steps:

1. Identify costs and funding opportunities for installing EV charging stations in the Village Center.
2. Develop marketing and publicity for the above (if installed) to alert visitors to Jamaica State Park of the availability of EV charging opportunities. In the meantime, alert potential visitors to Jamaica of other charging stations in the area.
3. Examine strategies for funding and maintenance for EV charging stations. Investigate technology for solar charging of EV stations.

Policy 2.4: Jamaica will facilitate the development of walking and biking infrastructure through strategies appropriate to Jamaica.

Action Steps:

1. Identify locations in Jamaica Village and elsewhere in town where bicycle racks would be most used.
2. Develop marketing and publicity to inform residents and visitors of safe places to keep their bikes in town.
3. Examine strategies to secure funding for the above.

Goal 3: Jamaica will continue its standing policy of encouraging compact, relatively high density development in Jamaica and Rawsonville Villages and designated Commercial/Residential (CR) and Residential Area (RA) land use districts. Recent and planned infrastructure improvements in Jamaica village and along Route 30 will be promoted to encourage development in our villages and in designated areas (CR and RA districts) along this corridor. Policies promoting low-density land use and preservation of forests and other important natural resources in Conservation (CN) and Rural Resource Area (RRA) Districts, which are central to the Town's economic development goals, will continue to be followed. Responsible forest management practices that are essential to absorb the increase in CO2 that increased use of wood heating will produce will continue to be emphasized.

Policy 3.1: Jamaica's land use policies and descriptions of current and future land use will continue to encourage compact, relatively high density development in designated Village Centers and CR and RA land use districts. Jamaica's land use policies and land use district maps will continue to discourage sprawl and inappropriate scattered development outside of designated Village Centers, CR, and RA Districts.

Land Use Policies:

1. Jamaica Village shall continue as the center of the Town. Future expansion of publicly owned community facilities and buildings shall be in the Village.
2. Further development within and adjacent to the village districts will be carefully planned to minimize adverse impacts on the character of the village, existing water supply and wastewater disposal, and traffic within the villages.
3. The character of Jamaica Village is an important asset to the community. The character of the Village shall be maintained by limiting uses within the Village to those that are compatible with the existing commercial and residential uses.
4. Encourage the restoration and preservation of buildings that contribute to the architectural and historical character of the Town. When such buildings become obsolete, new uses shall be found for them that will preserve the architectural and historic character of the buildings.
5. Lands adjacent to or including areas of historical, educational, cultural, scientific or

architectural value shall be used in a manner that will not reduce or destroy the value of the site or area.

6. Lands adjacent to existing public land and existing or planned public facilities shall be used in a manner that will not diminish the value of such investments or interfere with their intended uses.
7. Require appropriate site planning and landscape design by siting structures to fit into the natural characteristics of the land and maintaining vegetative buffers along roads and parcel boundaries.
8. Require the use of low impact development strategies (e.g., cluster development, conservation easements) that minimize the fragmentation and loss of agricultural land, forest land, unique or ecologically sensitive areas and special sites and areas.
9. Encourage the Town to purchase or accept donations of rights to properties that have high public value.
10. Scenic hills and ridge lines shall be left in their natural condition, free from all development, including roads, building structures, utilities, and wireless broadcast and telecommunications facilities.
11. Require developers to incorporate the following in the site planning of commercial facilities: shared access, landscaping, and provisions for pedestrians.
13. Reduce light pollution by using fixtures that direct light below the horizontal plane, utilizing energy efficient lamps, and using light levels appropriate for the use of the property.
14. Light shall not trespass onto adjacent properties or create dangerous conditions due to glare on adjacent roadways.
15. Lighting design shall include the installation of timers, photo sensors, and other energy saving devices to reduce the overall energy required and to eliminate unnecessary lighting.
16. Require that housing developments not have undue adverse impact on natural resources, open space, and important agricultural and forest lands.

Action Steps:

1. Identify practical ways to identify potential threats to the policies outlined in the 2017 Town Plan.
2. Develop an amendment to the Land Use section of the 2017 Town Plan to ensure land use policies referenced in this energy plan amendment are properly supported with appropriate regulatory language.
3. Examine strategies to achieve broad support for the goals outlined in the 2017 Town Plan.

Policy 3.2: Jamaica will prioritize development in compact, mixed-use centers when physically feasible and appropriate to the use of the development, or identify steps to make such compact development more feasible.

Action Steps:

1. Identify barriers to development in compact, mixed-use centers (septic, water issues etc.)
2. Develop consensus of citizens to address the above.
3. Examine and promote strategies to remove barriers, including exploring funding opportunities.

Goal 4: Jamaica will locate areas suitable for renewable energy generator siting, PV solar, residential wind and micro-hydro.

Because of Jamaica's rural nature and the emphasis we place on conservation, the types of preferred sites for PV solar arrays, as specified by the Public Utility Commission rule 5.100, are limited to rooftops, possible future municipally-designated preferred sites, and potentially, part of an active gravel pit. Jamaica will identify those land parcels that are suitable for either rooftop or residential ground mounted PV solar installations. Jamaica will identify areas comprised of one or more contiguous parcels that are suitable for a commercial PV solar array. Jamaica will identify parcels suitable for residential wind towers. Jamaica will investigate the suitability of siting small hydroelectric generators in the West River to include the potential to meet the stringent licensing requirements. Initial identification of appropriate sites will occur when this plan is adopted and will be repeated as advances in renewable energy technology increase the potential of currently marginal sites. Additionally, Jamaica will investigate the feasibility of developing a hydroelectric pumped energy storage system at the Ball Mountain and Townshend dams. This investigation will address environmental concerns including silting, potential river bank damage, and required

structural improvements to the Ball Mountain dam as well as the cost effectiveness of building a pumped energy system utilizing the two dams.

Jamaica will utilize the April 2017 WRC Solar Resource and Wind Resource maps with Town Parcel Map and Conservation Area overlays (maps 3 and 4 of Appendix A) to identify individual parcels with either PV solar or residential wind potential and areas comprised of contiguous parcels for community PV solar arrays to contribute to meeting 2050 targets. See appendix A. The following decision criteria will be utilized:

- PV solar or residential wind potential of parcel
- Consistency with 2017 Jamaica Town Plan land use policies
- Minimal viewshed impact
- Minimal impact on agricultural use of high quality soils
- No impact on conservation areas, wildlife travel corridors, or living habitat
- Location on agricultural soils only with facility design compatible with continued agricultural use
- Compliance with Jamaica's Flood Regulation
- South facing slopes of out of agricultural production river bottomlands which allow higher density PV solar arrays.
- For commercial PV solar arrays, proximity to 3-phase power lines to minimize Infrastructure expansion until such time as "smart grid" architecture supports both 3-phase and single phase connections
- Existing road structure suitable for installation and maintenance

Jamaica's 2050 target for commercial PV solar generation is 230 MWh (2050 target of 1231 MWh minus rooftop target of 1001 MWh). This equates to 176 KW of generation capacity, which in turn will require 1.4 acres of actual footprint.¹⁸ Using the criteria that 60 candidate acres are necessary to locate an 8-acre footprint for each MW generator, Jamaica's target is to locate 10.6 candidate acres containing sufficient contiguous acreage for one or more large solar arrays (150KW – 1MW) or two or more medium size arrays (15KW – 150KW) sufficient to meet our 2050 target.

Jamaica's total 2050 target of 1231 MWh of renewable energy generation can be met with: (1) 130 residential building rooftops, 6.25 small commercial building rooftops and 1.25 large commercial buildings rooftop using PV solar arrays and (2) 10.6 acres of PV solar capable land needed to locate 1.42 acres of actual footprint .¹⁹ Residential wind installations and micro-hydro, if proven feasible, will augment solar contribution to meeting 2050 targets. Given the solar (818 acres of solar potential land with no presently known constraints), residential wind (1060 acres of land with potential for residential wind generation without

¹⁸ ACRES OF RESOURCE LAND NEEDED TO MEET RENEWABLE GENERATION TARGETS FOR A MUNICIPALITY; untitled Windham Regional Commission excel workbook, Workspace – Generation Calcs., April 9, 2018

¹⁹ EXISTING ROOFTOP SOLAR GENERATION POTENTIAL; Targets_Generation_Jamaica_UPDATED excelworkbook, workspace-solar rooftop, April 18, 2018

constraints), and micro-hydro potential identified in maps 3 and 4 of appendix A, 2050 targets seem conservative and readily attainable.

Other than town plan prohibition on ridge line development and flood plain regulations that may impose conditional use permits for solar arrays located in Jamaica's special hazard flood zones, Jamaica has no constraints on individual property owners' land use, but rather policies encouraging land use consistent with the Town's goals for natural resource protection, cultural heritage, and economic development objectives. The Town's policies will encourage individual landowners of parcels identified as high potential solar or residential wind sites to develop renewable energy projects in a manner consistent with these goals.

Commercial solar development will be encouraged in areas determined suitable from map 3 in Appendix A. Jamaica will not impose any constraints nor discourage renewable energy generation systems which could limit the town's ability to meet 2050 targets, other than those constraints created by the town plan land use policies (see page 44) and the provisions of the Jamaica Floodplain Regulation. Jamaica will not impose any constraints nor discourage renewable energy generation systems, other than those contained in our town plan land use section or conditions required by Act 250 permits and Jamaica Flood Regulation permits, which could limit the town's ability to meet 2050 targets. Jamaica will review the parcels with PV solar or residential wind generation potential to determine those unsuitable for development because of conflict with designated conservation areas, special interest areas, and ridgelines. Maps 5, 6, and 7 of Appendix A identify these areas.

A major theme to this Energy Plan is that innovative financing plans that will accompany renewable energy technology development will motivate conversion to renewable energy on the basis of cost reduction. Jamaica will take the lead in demonstrating that conversion to renewable energy for town-owned buildings and surrounding property will reduce annual town operating costs. Budget savings will be translated to tax savings and publicized in town meetings or other energy information presentations.

Jamaica will monitor commercial offerings of renewable energy conversion projects to determine the availability of renewable energy technology that offers either low or no capital investment and reduced energy costs. Falling renewable energy costs, coupled with renewable energy technology advancements, should support this by mid-2020. As it becomes economically advantageous, Jamaica will initiate projects to save taxpayer money and demonstrate financial advantages to town residents.

Policy 4.1 Jamaica will identify sufficient parcels and or areas to meet 2050 targets for renewable energy generation.

Action Steps:

1. Upon approval of this Energy Plan, conduct an initial assessment of parcels with suitable potential for meeting 2050 renewable energy targets utilizing renewable energy potential maps with parcel overlays, Maps 3 and 4 from appendix A.
2. Identify Jamaica municipal parcels or multi-parcel zones with adequate PV solar

generation potential.

3. Identify Jamaica municipal parcels with adequate wind potential for residential wind generation.
4. Apply above criteria to identified PV Solar and residential wind parcels to eliminate unsatisfactory sites.
5. Make identified parcel PV solar and residential wind potential available to parcel owners.
6. Male identified parcel PV solar potential map available to PV solar contractors.
7. Review site potential assessment as enabling renewable energy technology advances increase the potential of previously marginal areas.

Policy 4.2: Jamaica will ensure that a sufficient amount of land, with sufficient PV solar, residential wind potential, or micro-hydro to meet 2050 renewable energy generation goals is identified.

Action Steps:

1. Jamaica will review the suitable parcels identified in goal 4.1 as having potential for PV solar or residential wind generation potential to identify those that are homesteads.
2. Jamaica will use the energy section of the planned town survey update to assess the homesteads' suitability for rooftop or ground-mounted PV solar and residential wind with questions of building orientation, available space for ground mounted arrays, space for a residential wind tower and interest in reducing energy costs with renewable energy technology to identify the number of buildings likely to contribute to meeting 2050 targets.
3. Jamaica will review the parcels identified in Goal 4.1 as having solar potential to determine the total acreage suitable for community PV solar arrays.
4. Jamaica will use the energy section of the planned town survey update to determine suitable acreage owner's interest in leasing acreage for community solar array development to identify the acreage likely to contribute to meeting 2050 targets.

Policy 4.3: In the absence of local land use regulations other than a NFIP compliant floodplain zoning regulation, Jamaica has no constraints on or prohibitions of individual landowner's development of residential solar or wind installations beyond prohibition of development in designated ridge line areas that are subject to Act 250 or section 248 jurisdictions. While Town Plan land use prohibition of ridge line development precludes commercial wind development, Jamaica will impose no constraints, other than those required by the NFIP zoning regulation and conformance with the land use policies of the Jamaica Town Plan (see page 44), on meeting 2050 targets with residential PV solar, micro-hydro, residential wind, and community solar arrays.

Action Steps:

1. Jamaica will ensure that any changes to the Town Plan Land Use section will be

assessed for their impact on changing the number of parcels likely to install either rooftop PV solar or residential wind renewable energy generators. If any impact is identified, Jamaica will ensure that the benefit of the change, e.g. enhancing environmental preservation, outweigh the impact on meeting renewable energy development.

2. If action step 1 identifies any reduction in available parcels for renewable energy generation, Jamaica will ensure that the remaining land resources are adequate to meet 2050 targets.

Policy 4.4 Jamaica will identify preferred, potential, and unsuitable areas for renewable energy generation.

Action Steps:

1. Jamaica will review the parcels with PV solar or residential wind potential developed with the action steps of policy 4.1 and 4.2 to identify any meeting the criteria of Public Utility Commission Rule 5.100.

2. Utilizing the Solar and Wind Generation Potential Maps with parcel conservation and special interest areas from Jamaica's Town Plan Planned Land Use Maps overlaid, identify those parcels in which commercial wind development is prohibited or in which solar or residential wind development is unsuitable because of low potential. Identification of areas deemed unsuitable for PV solar or residential wind generation will not interfere with the town's ability to reach its target.

Policy 4.5: Jamaica will review parcels identified in the action steps of policy 4.1 to identify areas comprised of one or more contiguous parcels as preferred areas for commercial PV solar generator siting.

Action Steps:

1. From the set of parcels identified in the action steps of policy 4.1 with potential for PV solar generation, Jamaica will identify areas, comprised of one or more parcels with sufficient area for either a large or medium sized PV solar generator. Jamaica will identify at least 10.6 acres meeting these criteria.

2. Jamaica will prioritize areas identified according to the distance to 3 phase power lines, and access from existing roads criteria of policy 4.1.

3. Jamaica will advise owners of parcels that include areas suitable for commercial generator siting of their identification as such.

4. With parcel owner's consent, Jamaica will advise commercial PV solar generator developers of site availability.

Policy 4.6: Jamaica will demonstrate leadership by example with respect to the deployment of renewable energy

Action Steps:

1. Jamaica will maintain awareness of the state of renewable energy technology and financing option available from solar enterprises.
2. As anticipated advances occur, Jamaica will conduct a feasibility study of conversion of town-owned buildings, town office, town garage, and firehouse, to renewable energy utilizing rooftops and surrounding land for solar arrays.
3. When feasibility studies show a combination of both electrical rate reductions and financing costs are less than existing energy costs, Town approval will be sought for executing a conversion project as both a demonstration and budget reduction effort.
4. Jamaica will conduct an economic feasibility assessment of converting town building heating systems to heat pumps. A conversion project will be initiated when capital and operational costs are lower than current heating costs.

Jamaica Energy Plan

Appendix A – Energy Maps

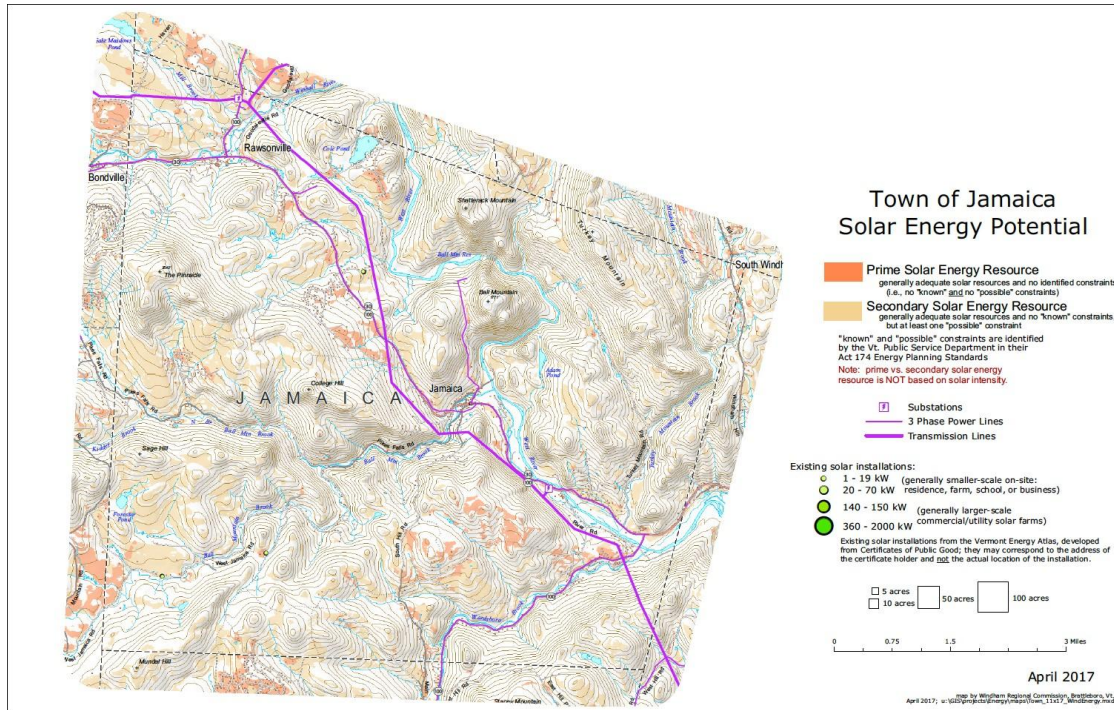
List of Maps

1. Town of Jamaica Solar Energy Potential. Windham Regional Commission map overlays areas of Prime and Secondary Solar Potential on Town Map of Jamaica.
2. Town of Jamaica Wind Energy Potential. Windham Regional Commission map overlays areas of Prime and Secondary Wind Resources on Town Map of Jamaica.
3. Solar Energy Potential in Town of Jamaica Land Parcels. Town Map of Jamaica Land Parcels is overlaid on Windham Regional Commission Town of Jamaica Solar Energy Potential maps to identify solar potential in individual Jamaica land parcels.
4. Wind Energy Potential in Town of Jamaica Land Parcels. Town Map of Jamaica Land Parcels is overlaid on Windham Regional Commission Town of Jamaica Wind Energy Potential map to identify wind potential in individual Jamaica land parcels.
5. Jamaica Wind Resources with Existing Land Use. The Jamaica Wind Resources with Existing Land Use map overlays public land parcel and large continuous forest block layers from the Town of Jamaica Existing Land Use map on the Windham Regional Commission

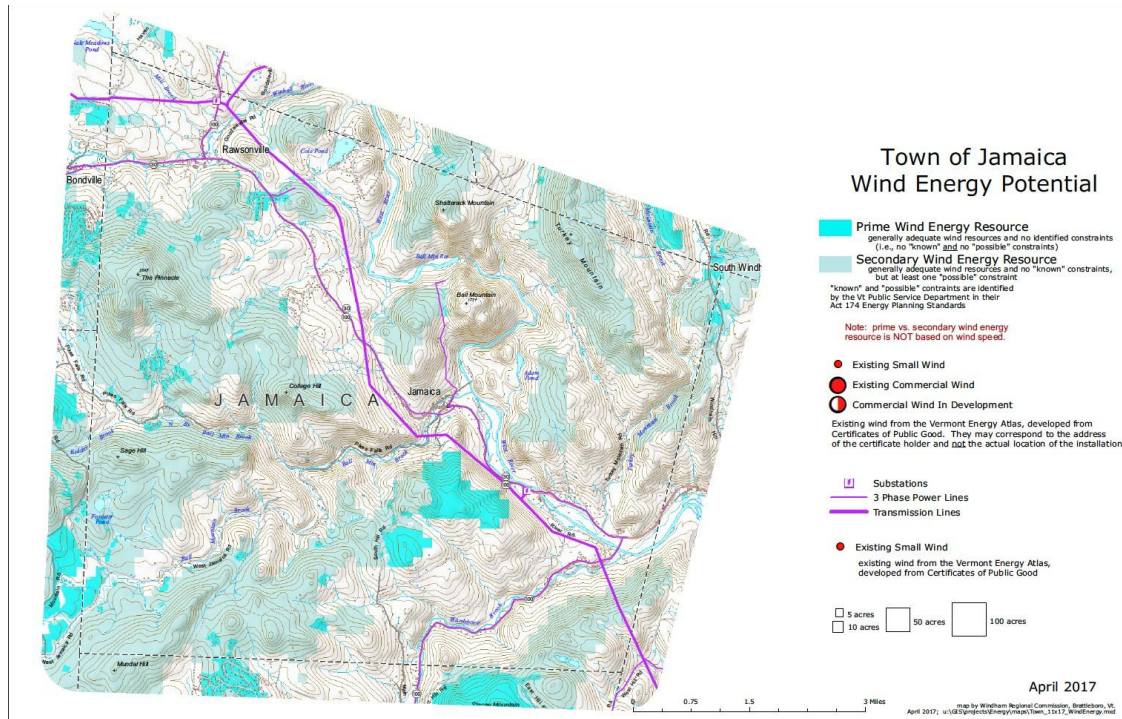
Wind Resource map. This map shows the juxtaposition of areas identified as suitable for large and small commercial and residential wind generator development with public lands and large forest blocks.

6. Jamaica Wind Resource with Proposed Land Use. The Jamaica Wind Resource with Proposed Land Use map overlays the Scenic Hill or Ridge Line, proposed conservation area, proposed rural resource area, and conserved land area layers from the Jamaica Existing Land Use map on the Windham Regional Wind Resource Map. This map shows the juxtaposition of scenic areas and ridgelines, proposed conservation areas, rural resource areas, and conserved areas with areas identified as suitable for large and small commercial and residential wind development.

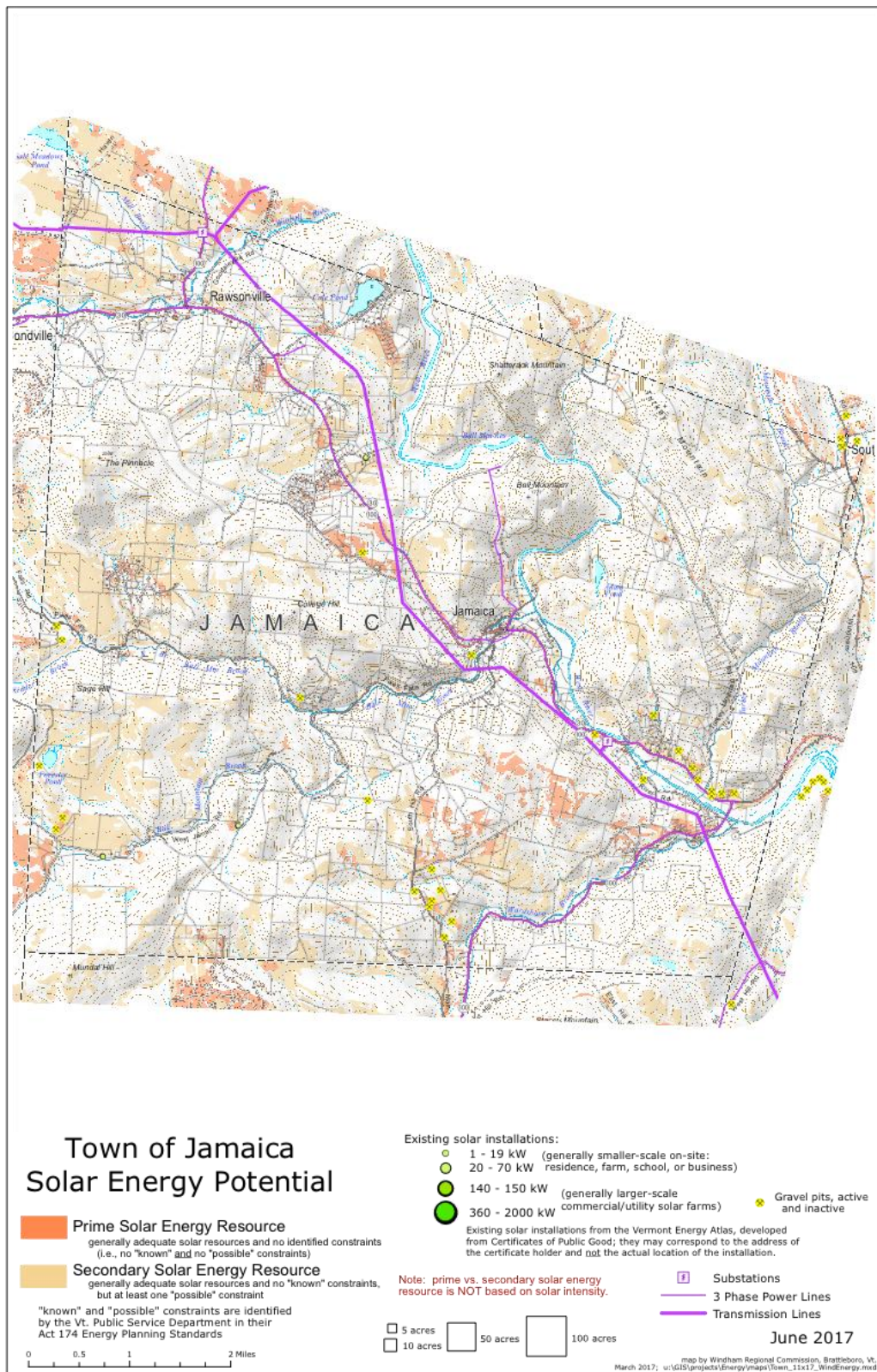
7. Jamaica Wind Resource with Special Sites. The Jamaica Wind Resource with Special Sites map overlays the scenic waterfall or gorge, federal, state, and town land, and undeveloped stream segment layers from the Jamaica Special Sites town map on the Windham Regional Commission Wind Resource Map. This map shows the juxtaposition of the scenic water fall or gorge, federal, state, and town land, and undeveloped stream segments with areas identified as suitable for large and small commercial and residential wind development.



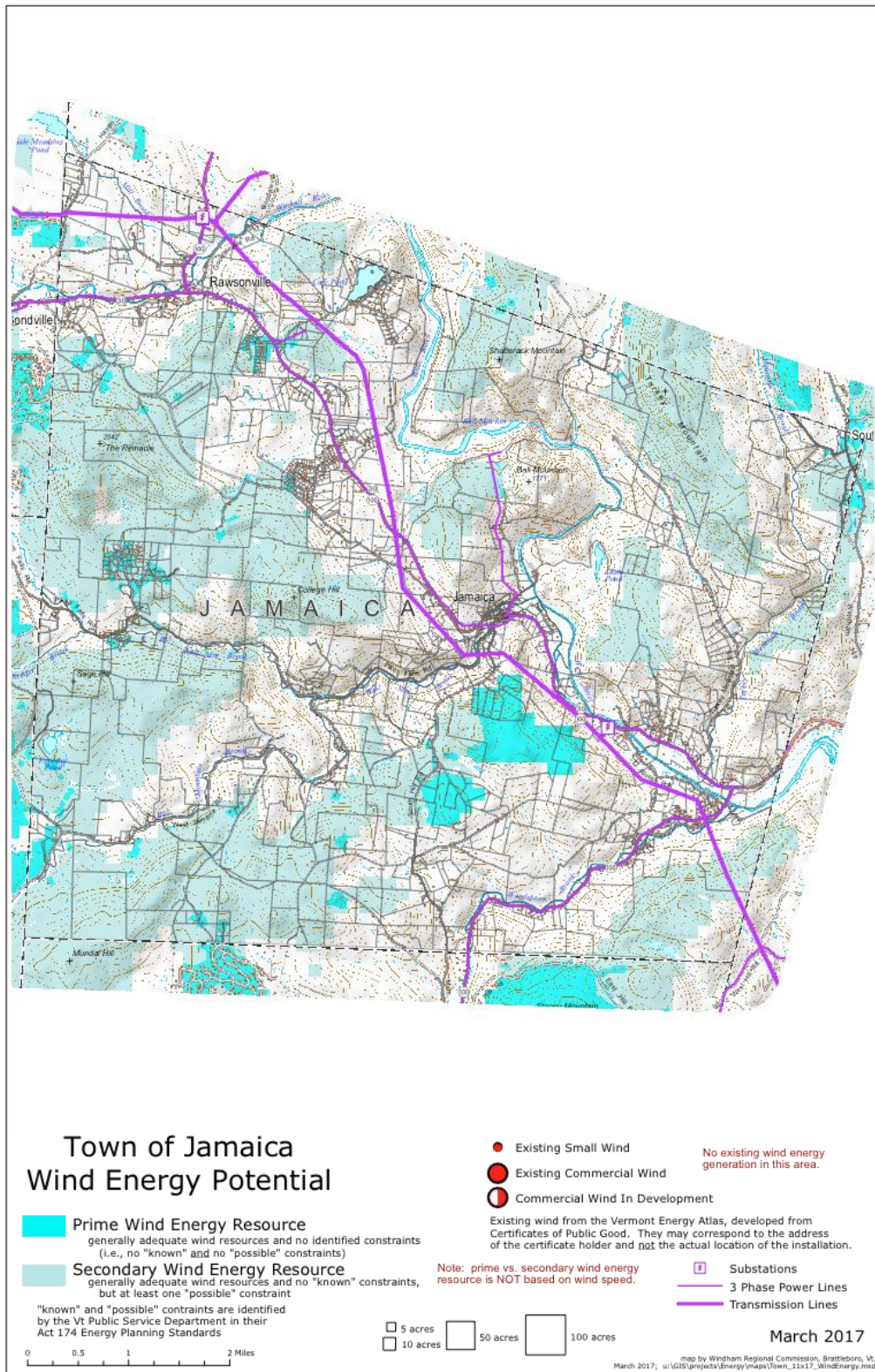
Map 1 – Town of Jamaica Solar Energy Potential



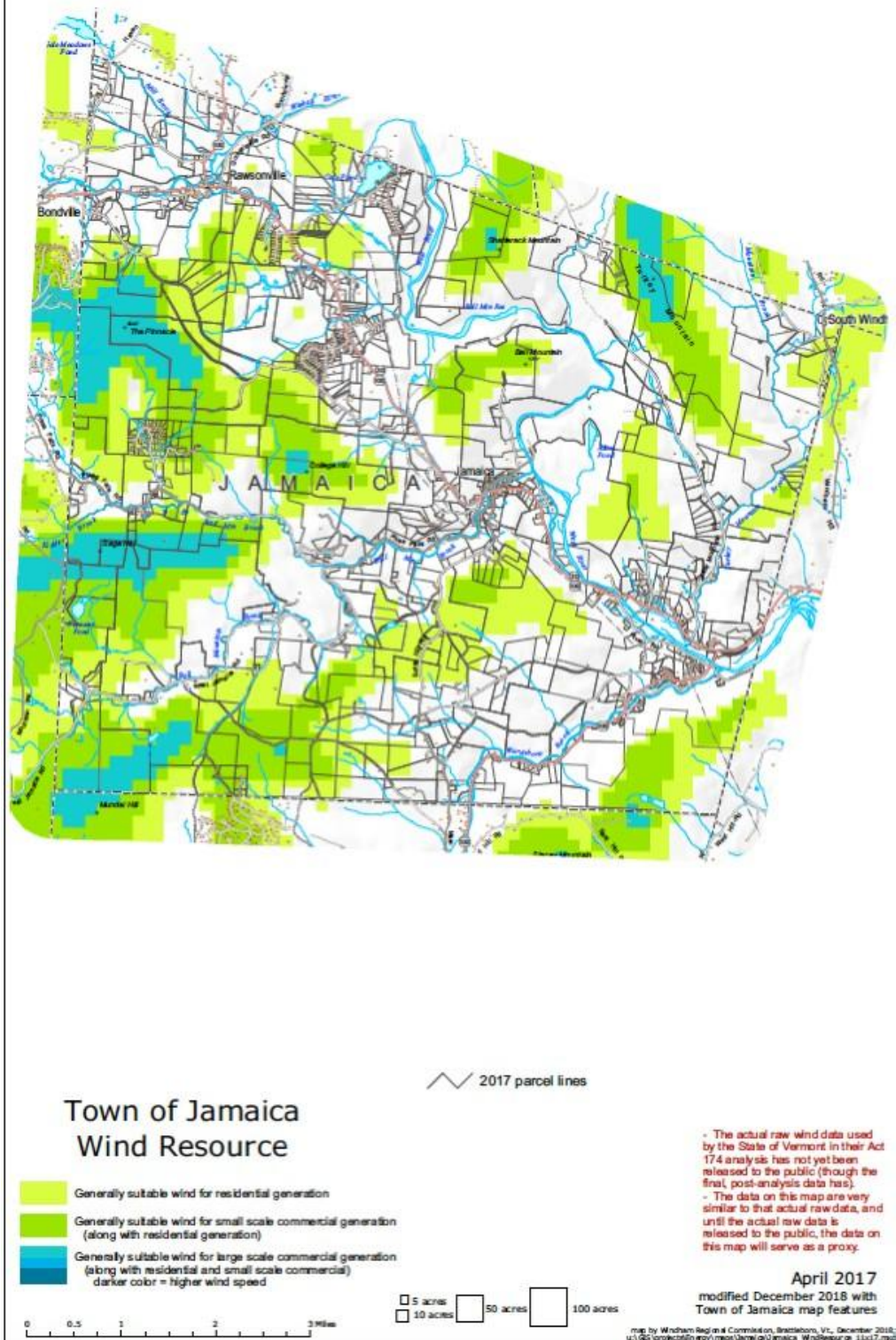
Map 2 – Town of Jamaica Wind Energy Potential



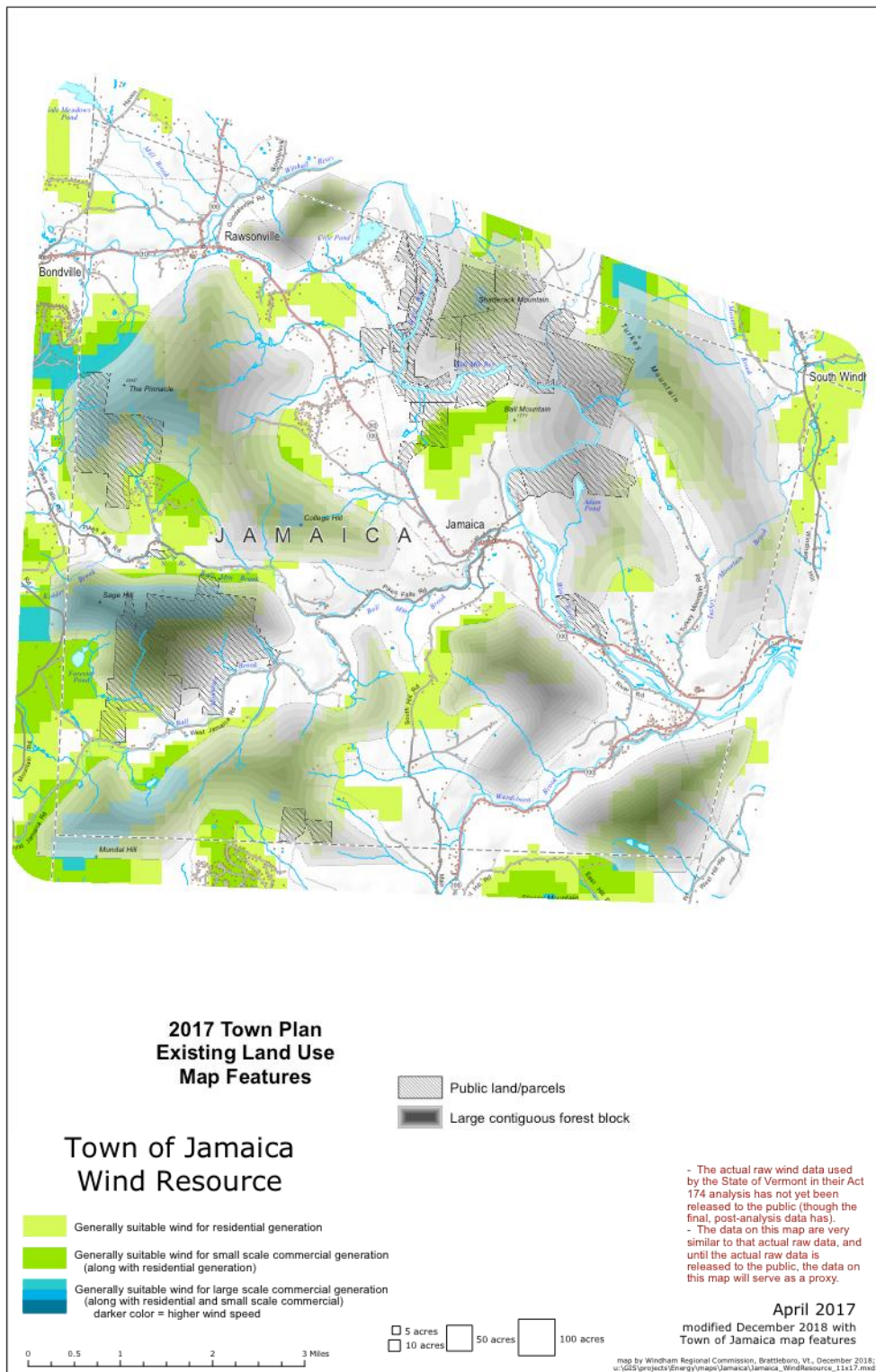
Map 3 - Solar Energy Potential in Town of Jamaica Land Parcels



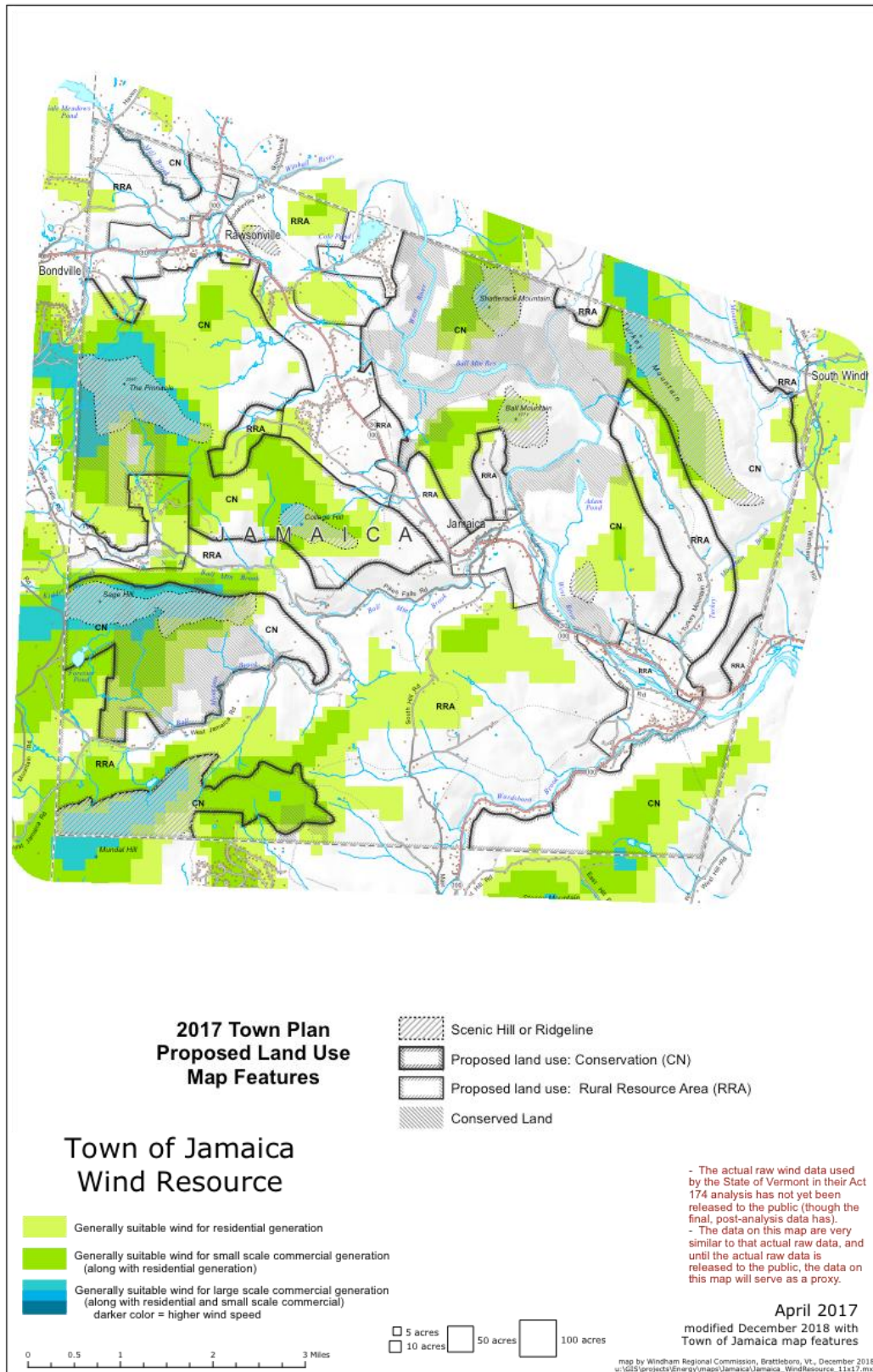
Map 4 - Wind Energy Potential in Town of Jamaica Land Parcels



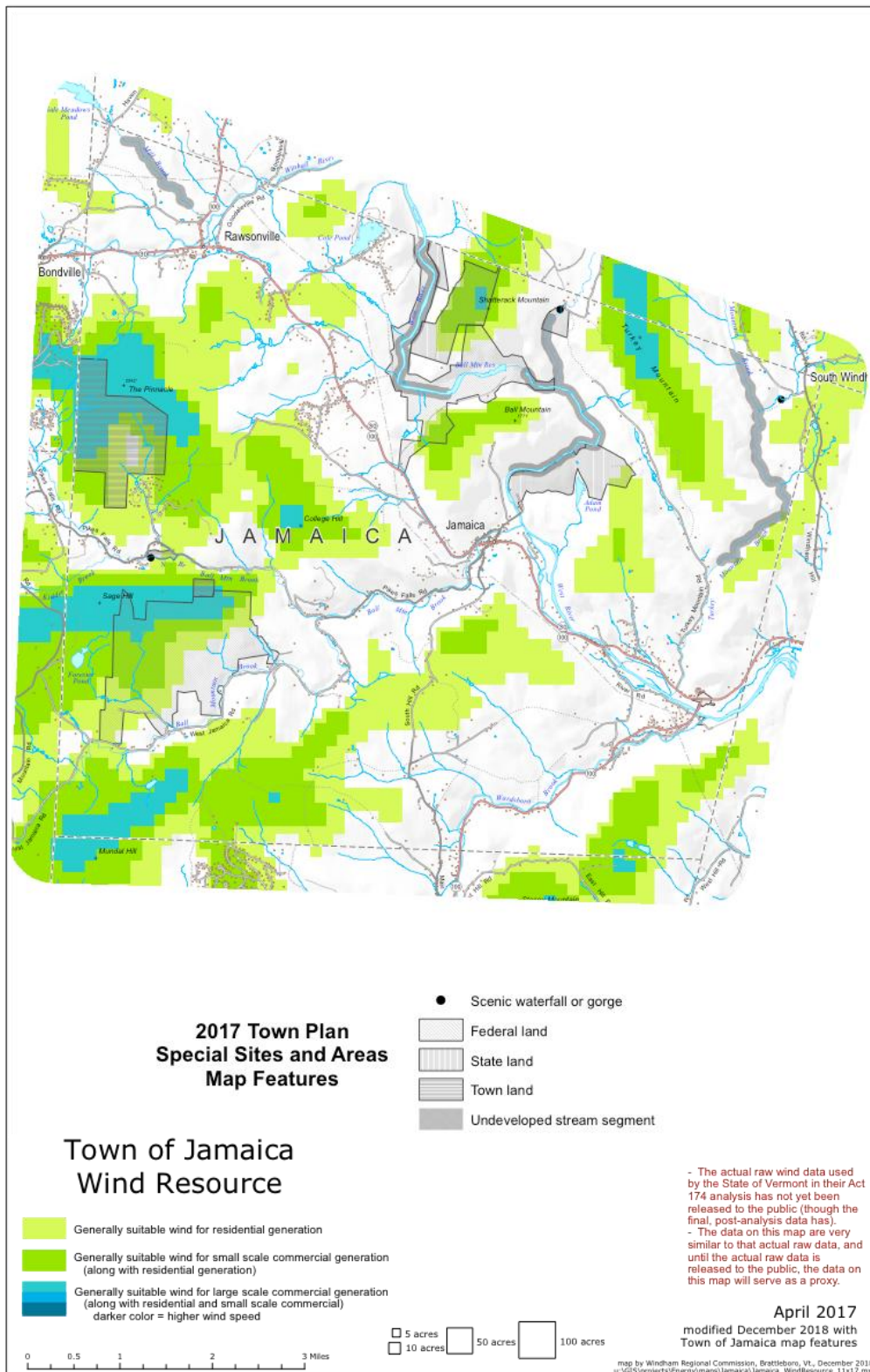
Map 5 – Wind Resources in the Town of Jamaica



Map 6 - Jamaica Wind Resources with Existing Land Use



Map 7 - Jamaica Wind Resource with Proposed Land Use



Map 8 - Jamaica Wind Resource with Special Sites

Appendix B

Pumped Energy Storage in the West River Valley

C.B Robbins

The Jamaica Town Plan calls for encouraging the use of clean energy sources while also protecting the regions natural beauty. The wide scale use of **small solar panels on homeowner's rooftops or fields can** meet the goal of expanding the use of clean energy with little or no visual or environmental impact to meet both objectives. However, integrating a large number of relatively small solar systems into the power grid remains a vexing problem for the power company because of the variability and **unpredictability of energy they can supply the power grid. Ideally, power in excess of the owners' needs** is fed back into the grid to be used instead of power generated with fossil fuel. In practice, to provide reliable power 24/7 power companies must keep both base load generators and peaking generators that handle load variations on line constantly. All too often, excess electricity from variable solar sources goes **unused. Further selling excess energy when you can't predict its availability isn't practical. What is** needed to make efficient use of excess energy generated from a large number of solar sources is grid-scale energy storage. In effect, a very big battery system that can store the excess energy fed back onto the grid from many small solar sources for later use. But, battery technology with this capability really does not yet exist.

However, where geography exists, there is one system that can provide grid level energy storage; namely pumped energy storage. A pumped energy storage system consists of high and low reservoirs vertically separated by several hundred feet, a pipe connecting the two reservoirs, and a Frazer generator or two-way generator/pump at the lower reservoir pipe end. Excess energy, whenever available during the day, is used to pump water from the lower reservoir to the higher one. And, water is drawn from the upper reservoir through the same pipe to drive the generator at night or when otherwise advantageous to do so. Frazer generators are capable of responding in real time to variations in excess power availability and power demand. Efficiencies of 80% or more are reported in the literature¹ for pumped energy storage systems; that is 80% of the power used to drive the system pump can be returned to the grid at a later time. The only drawback to wide scale adoption of this technology is that they can only be realized in mountainous regions where high and low reservoirs exist in close proximity. (Note: there are other potential drawbacks, e.g., impacts on fisheries, etc.) It is possible that the Ball Mountain Lake and Townshend Dam might meet these criteria and be used in a pumped energy system, in effect becoming a battery for the West River Valley.

The Eagle Creek Renewable Energy Company² already operates hydroelectric generators at the Ball Mountain and Townshend Dams. To add a pumped energy storage capability at Ball Mountain Lake would require a pipeline from the Townshend Dam to the Ball Mountain Dam, the addition of a second, Frazer, generator at the Townshend Dam location, and smart meters on solar arrays to allow real time determination of the energy available for storage. Adding pumped energy storage to the existing hydroelectric facilities has additional advantages. It could provide additional water to drive the Ball Mountain hydroelectric generator, building reserves during the summer when solar energy is most abundant, to be drawn in the late summer and fall when river flow decreases. Also, before sufficient solar systems are on line to use it for pumped energy storage, it can be put to good use as a load leveler. Load leveling involves pumping water uphill to the Ball Mountain Dam at night with cheap purchased electricity and drawing the water from Ball Mountain for hydroelectric power during the day when electricity is expensive.

An impediment to wide scale adoption of solar arrays is their high initial cost. While they may ultimately pay for themselves, many homeowners just **can't afford the initial capital outlay. The ability to save and reuse excess energy from many small solar arrays may enable innovative business models that can make solar arrays affordable to the average homeowner.** The capability to efficiently use all energy generated by a homeowner's solar array can make business models based on leasing solar systems to a homeowner practical. Under such plans, the business installs and leases the solar arrays to homeowners for \$0. In return, the leasing company gains control of all electricity generated. It agrees to **sell power up to 100% of the solar array's output to the homeowner at a reduced price. The excess is sold to the power company for either immediate use or storage with pumped energy storage.** The capability to store excess solar generated power creates the power market for the leasing company.

A second business model is based on a solar array farm sourcing a community micro grid. Homeowners would purchase individual panels of the farms array. Economies of scale in installation costs would significantly reduce the cost to individual homeowners. The power grid itself is changing and is expected to evolve into a network of micro grids over the next decade. As the cost of solar electricity falls and the improvement in grid control improves, economics and technology will drive the power grid architecture toward a distributed renewable sourced network of micro grids. One can imagine an energy independent West River Valley micro grid sourced by a combination of distributed solar sources and Ball Mountain and Townshend Dam hydroelectric sources. A pumped energy storage system would significantly enhance its independence, perhaps enabling it to provide its excess power to neighboring regional micro grids³.

There are downsides to pumped energy storage systems, the most prevalent of which is the pipeline **itself. Where visible it's bound to be considered an eyesore. The obvious route between dams is the river valley and some or all of the pipeline may lie along the West River trail.** Since parts of the trail is state land, the process of obtaining easements for the pipeline could be greatly simplified. Gaining easements across private land can be difficult. The cost and impact to private landowners if the pipeline route lies along private land must be considered. A possible solution to the eyesore problem is to bury it wherever possible. Except for keeping the pipeline route clear of trees that have roots that could damage the pipe, once buried, it will be out of sight and out of mind. If routed along the West River trail, during construction the trail will be impacted. Pipe laying can be staged so the only a relatively small section of trail is closed at any given time. And, the trail can be restored to original condition or even improved if wanted once the pipe is laid. When construction is complete, it is not clear what, if any, environmental concerns would remain.

Preliminary consideration of the feasibility of a pumped energy storage system is necessary to uncover any **"show stoppers," conditions that will make pumped energy storage impractical. There may be reasons why, despite the vertical separation of two neighboring dams, accommodating a pumped energy system isn't feasible. Those might include:**

- (1) Ball Mountain Lake may be too small to store enough water to make its use for energy storage practical.
- (2) **Fundamental incompatibility of the Dam's primary mission of flood control with pumped energy storage.** One requires maintaining low levels to accommodate storm surges and the other high levels to provide power reserves.
- (3) Too great a lateral separation between Ball Mountain and Townshend dams. Energy expended pumping water vertically can be recovered with high efficiency. Energy expended to pump water horizontally is lost. Too great a ratio of lateral to vertical separation will reduce the systems efficiency to the point that it is no longer useful as an energy storage system.
- (4) The construction cost is too great to make adding pumped energy storage a viable business

venture. The amount of energy that can be stored cannot be sold at prices that justify the system cost.

- (5) The impact of construction on the West River trail and or the difficulty of obtaining easements for the pipeline route that may cross private land may be unacceptable to the community.

If this idea is of interest to the Planning Commission, the first step to proceeding further is to determine the presence or absence of considerations that would make the addition of a pumped energy storage capability to Ball Mountain and Townshend Dams **unrealistic, i.e., to find any “show stoppers” up front.** This will require seeking expert technical advice from the Army Corps of Engineers on the technical feasibility of such a system and concurrently business advice from Eagle Creek Renewable Energy Company and/or Green Mountain Power Company as to its business potential. Other helpful sources of **expertise may include the Energy Storage Association⁴ and the state’s Department of Public Service Clean Energy Board.** The Friends of the West River Trail, the Division of Vermont State Parks and others with environment concerns will need to be consulted to determine acceptability of pipeline routes and any conditions on route, restoration and improvements that might be required.

If initial feasibility considerations indicate that adding pumped energy storage to the Ball Mountain and Townshend Dam hydroelectric facilities may be practical, it is recommended that the Planning Commission develop a strategy to initiate a project to do so. Such a strategy should include:

- 1) Seeking a consensus from the community, including the Townshend citizens that may be affected by it, to support the project. The last thing we want to do is touch off another Windham style “windmill war.” **The conflict between concerns for the environment and the Stiles, Willie, and Howe Brooks ridgeline’s natural beauty and economic concerns has divided the Windham community in a way we don’t want to repeat. It is considered that environmental impacts of installing a pumped energy system will be temporary and once installed the system will pose little danger the environment. But this assumption must be firmly established and the community persuaded before proceeding.**
- 2) **Seeking political and technical support from the state’s Clean Energy Board,** the Army Corps of Engineers, and other interested parties such as the Energy Storage Association. If state political support can be gained, further support from our congressional representative and senators should be sought. Detailed feasibility studies well beyond our initial feasibility assessment will be necessary to seriously plan and fund a pumped energy storage system. This study will be funded by the Army Corps of Engineers and either performed by the Corps or under contract to them. The support of our representative and Senators will be necessary to get federal budget support for a detailed study.
- 3) Obtaining commercial support. Ultimately a commercial concern such as Eagle Creek Renewable Energy, Green Mountain Power, or some third party that can work with both the hydroelectric generation and power distribution companies must be convinced to adopt the project as their own. The firm taking on the project must be convinced that they will realize both a return of their capital investment and long term profitability for building a pumped energy storage system. The firm undertaking this project must also be convinced they have the **community’s support. After Iberdrola’s experience in Windham, it’s hard to imagine a company wanting to commit resources without the wholehearted support of the host communities.** Success will be realized when an energy company becomes the driving force for the project for commercial reasons.
- 4) Gaining community support. Before seeking state and national support for a pumped energy storage system beyond our initial assessment of its feasibility, the community should be informed and their support obtained. This will have to include support from Townshend as well

as half of any pipeline route will lie in Townshend. Issues concerning the environment and construction disruption should be thoroughly understood and accepted before proceeding.

- 5) The formation of a group of citizens willing to pursue this idea. Such a group should include members from Townshend. Perhaps a joint committee under the auspices of the Jamaica and Townshend Selectboards would be appropriate. It is anticipated that bringing a project of this magnitude to fruition will take years and require the sustained effort of a citizen group dedicated to it.

It is requested that the Planning Commission and its plan update energy committee consider whether we might explore getting a pumped energy storage capability added to the existing Ball Mountain and Townshend Dam hydroelectric facilities. If interested, we should consider how to proceed with an initial feasibility assessment and how to approach other community leadership with the idea.

Finally, we should include some language in the energy segment of the town plan update that, without being overly specific, addresses exploring pumped energy storage for the Ball Mountain and Townshend Dam facilities.

1. Wikipedia, Pumped-storage hydroelectricity, https://en.wikipedia.org/wiki/Pumped-storage_hydroelectricity
2. Eagle Creek Renewable Energy, <http://www.eaglecreekre.com>
3. Robert Hebner, The Power Grid in 1030, IEEE Spectrum, April 2017
4. Energy Storage Association, Pumped Energy Storage, <http://energystorage.org/energy-storage/technologies/pumped-hydroelectric-storage>

APPENDIX C - TOWN PLAN MAPS

Existing Land Use

Proposed Land Use

Transportation and Community Resources

Soil Resources

Special Sites & Areas

Water Resources

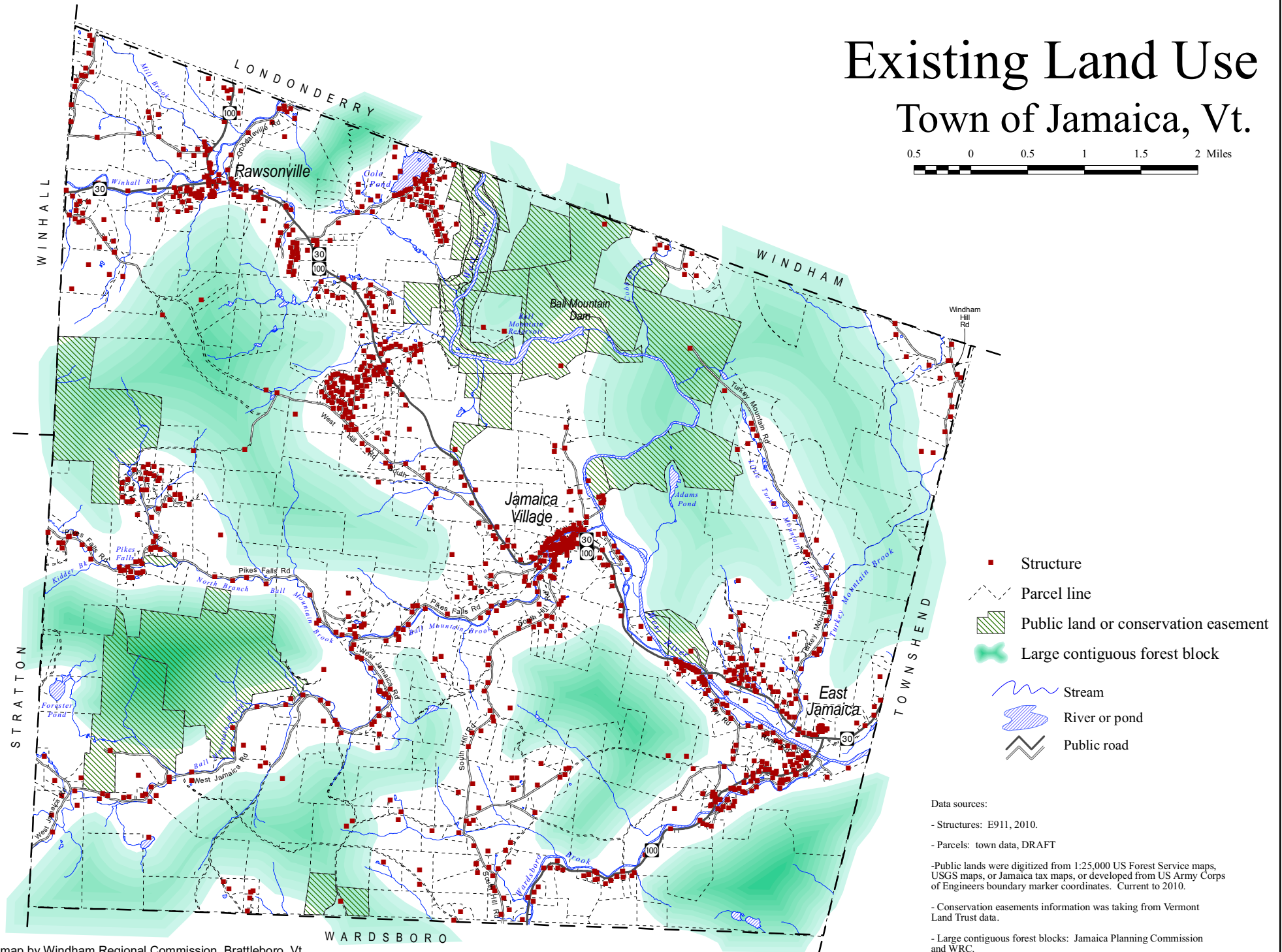
Wildlife and Plant Resources

Designated Village Center

Existing Land Use

Town of Jamaica, Vt.

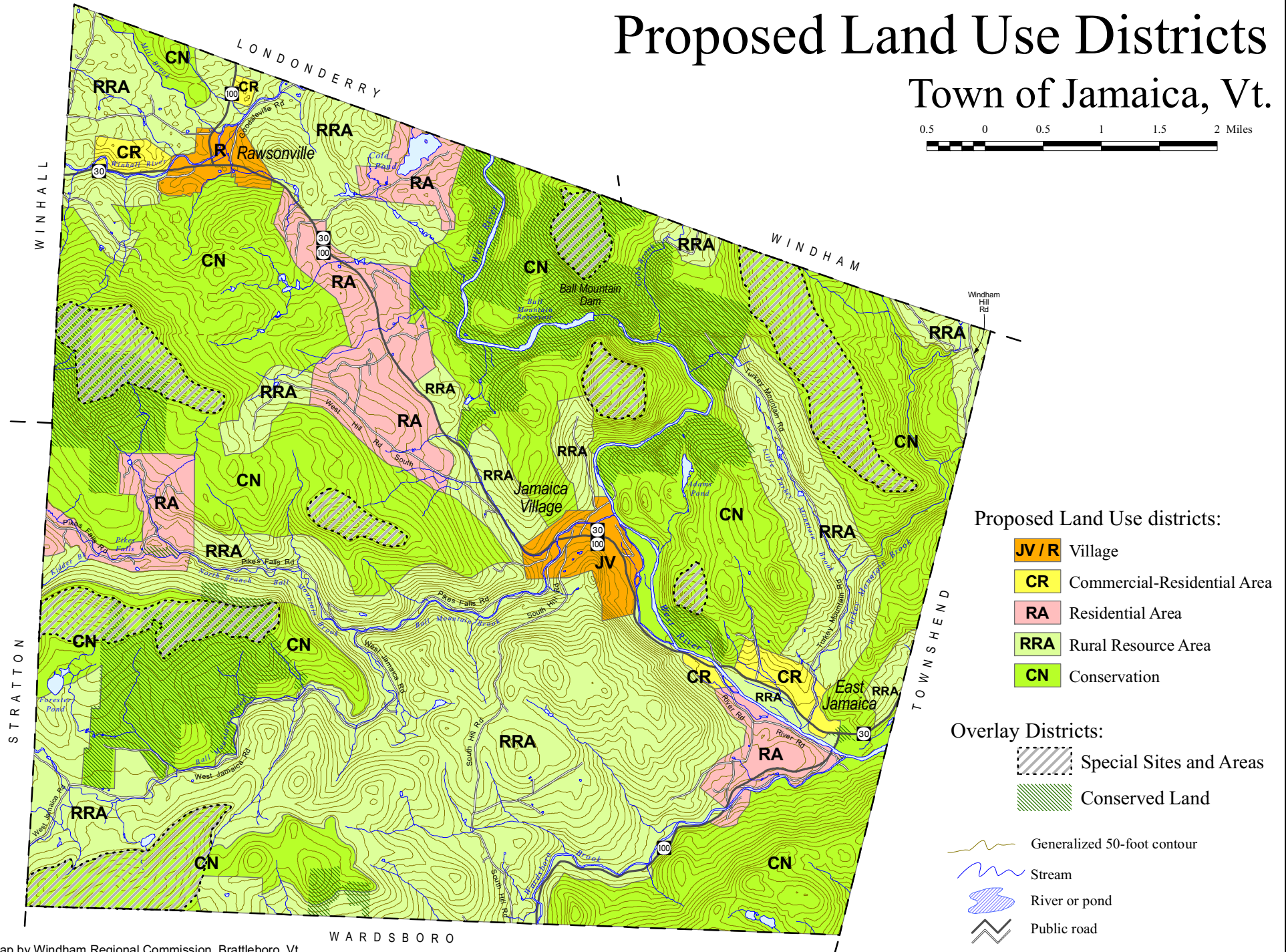
0.5 0 0.5 1 1.5 2 Miles



Proposed Land Use Districts

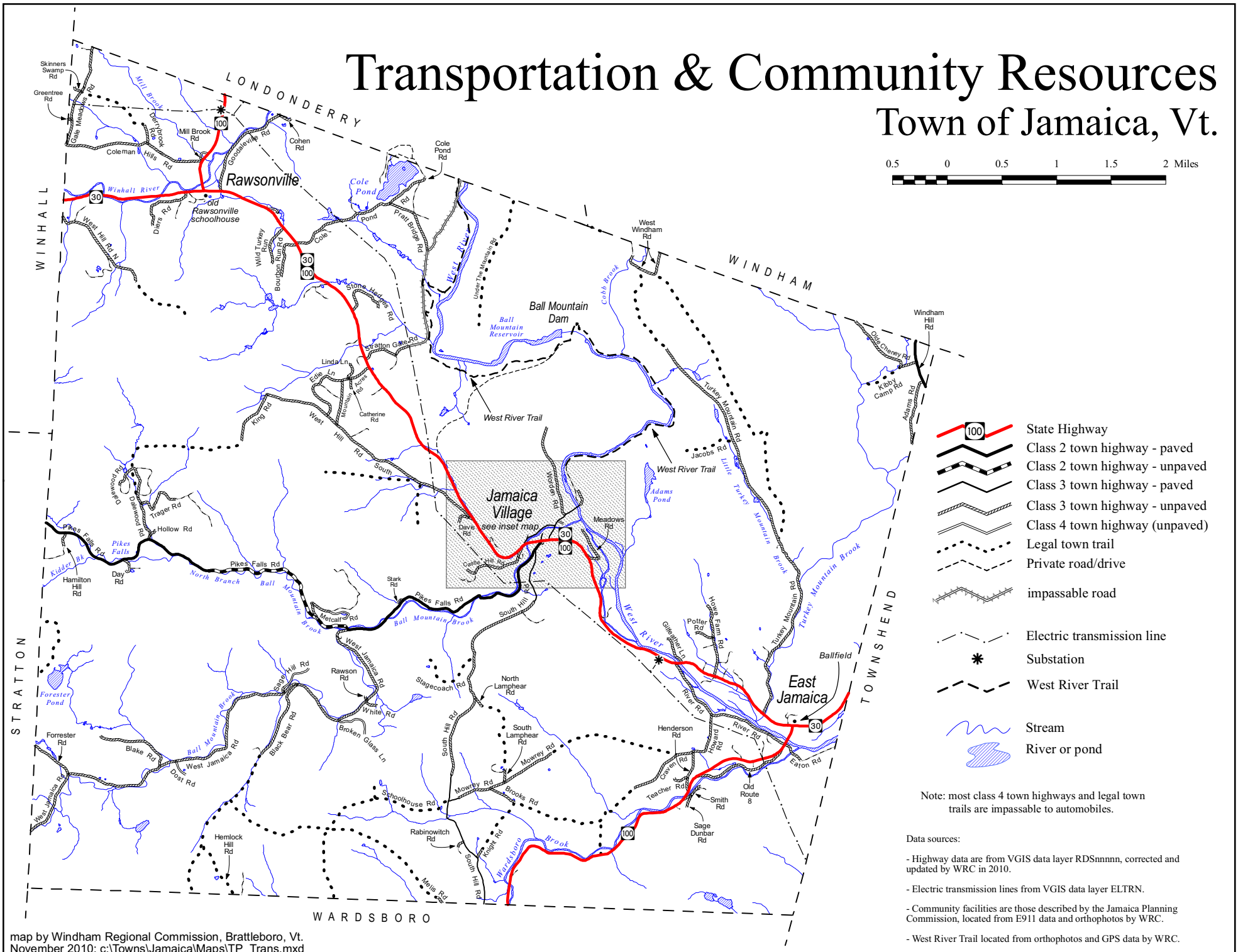
Town of Jamaica, Vt.

0.5 0 0.5 1 1.5 2 Miles



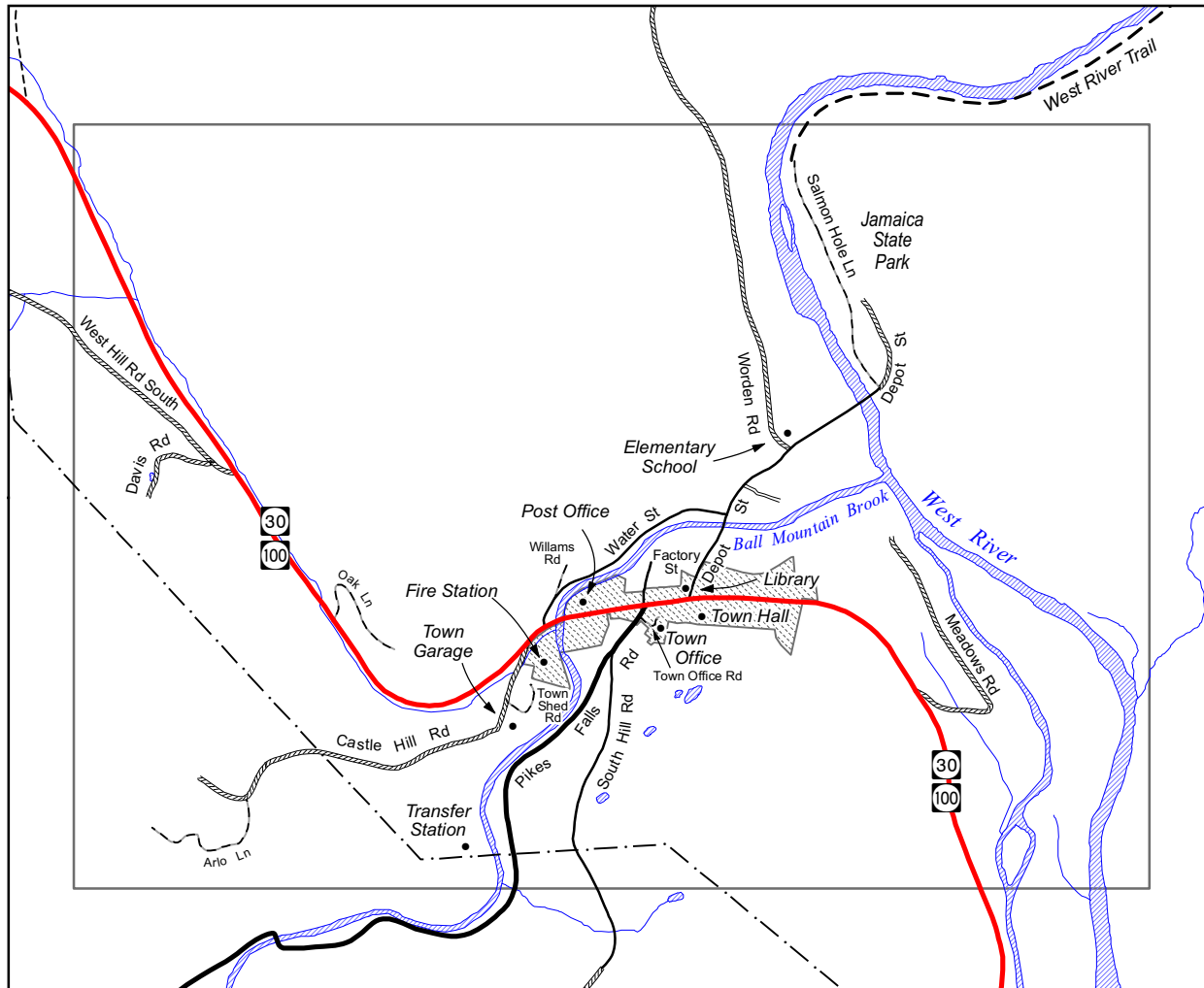
Transportation & Community Resources

Town of Jamaica, Vt.



Transportation & Community Resources

Inset Map - Jamaica Village



- State Highway
- Class 2 town highway - paved
- Class 2 town highway - unpaved
- Class 3 town highway - paved
- Class 3 town highway - unpaved
- Class 4 town highway (unpaved)
- Legal town trail
- Private road/drive
- impassable road
- Electric transmission line
- West River Trail
- Designated Village Center
- Stream
- River or pond

Note: most class 4 town highways and legal town trails are impassable to automobiles.

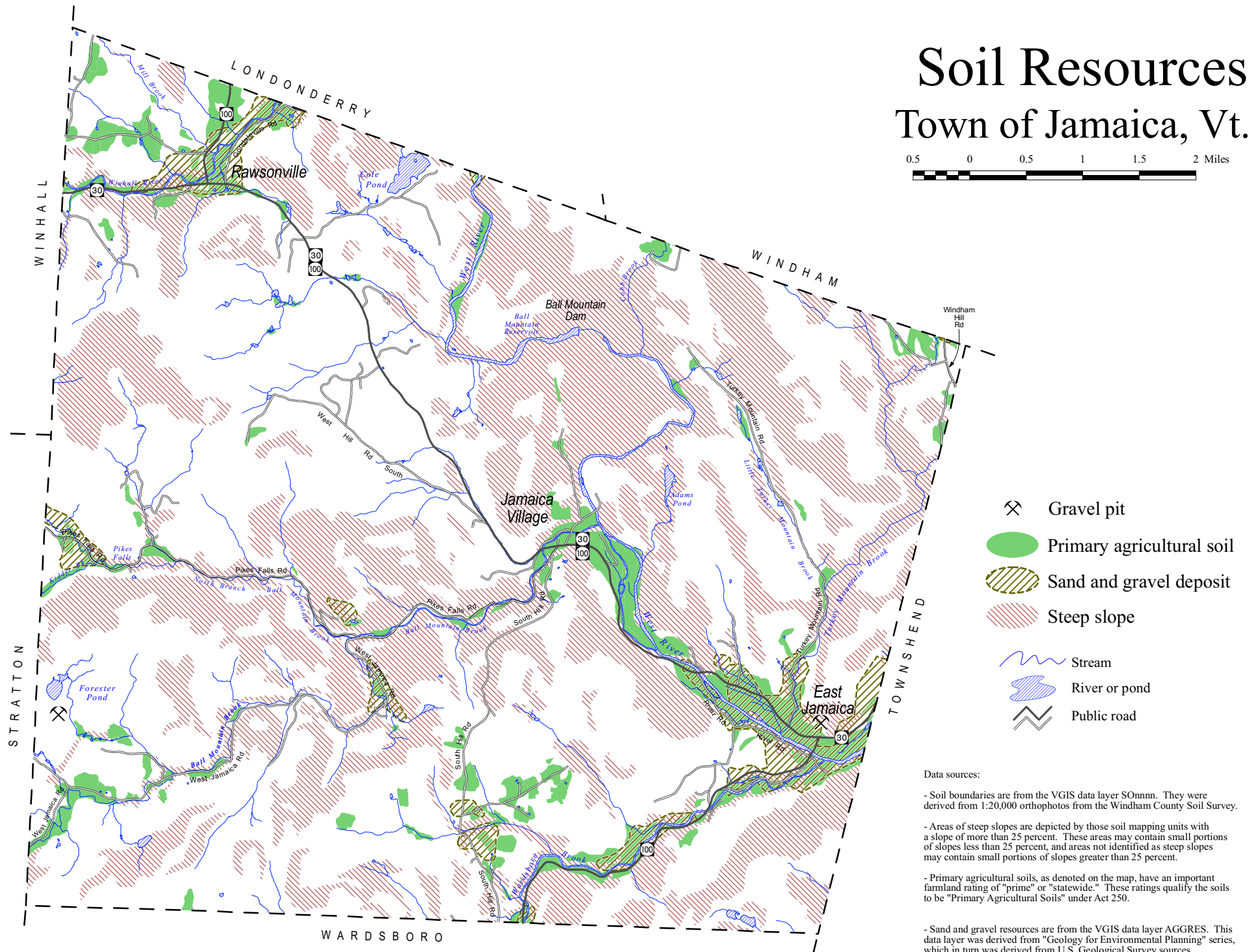
Data sources:

- Highway data are from VGIS data layer RDSnnnnn, corrected and updated by WRC in 2010.
- Electric transmission lines from VGIS data layer ELTRN.
- Community facilities are those described by the Jamaica Planning Commission, located from E911 data and orthophotos by WRC.
- West River Trail located from orthophotos and GPS data by WRC.
- The Jamaica village center is a Designated Village Center under the State of Vermont Downtown Program. The district boundary coincides with parcel boundaries; data were developed by WRC in 2005 using tax map data provided by Dauchy Associates.

Soil Resources

Town of Jamaica, Vt.

0.5 0 0.5 1 1.5 2 Miles



Data sources:

- Soil boundaries are from the VGIS data layer SONnnn. They were derived from 1:20,000 orthophotos from the Windham County Soil Survey.

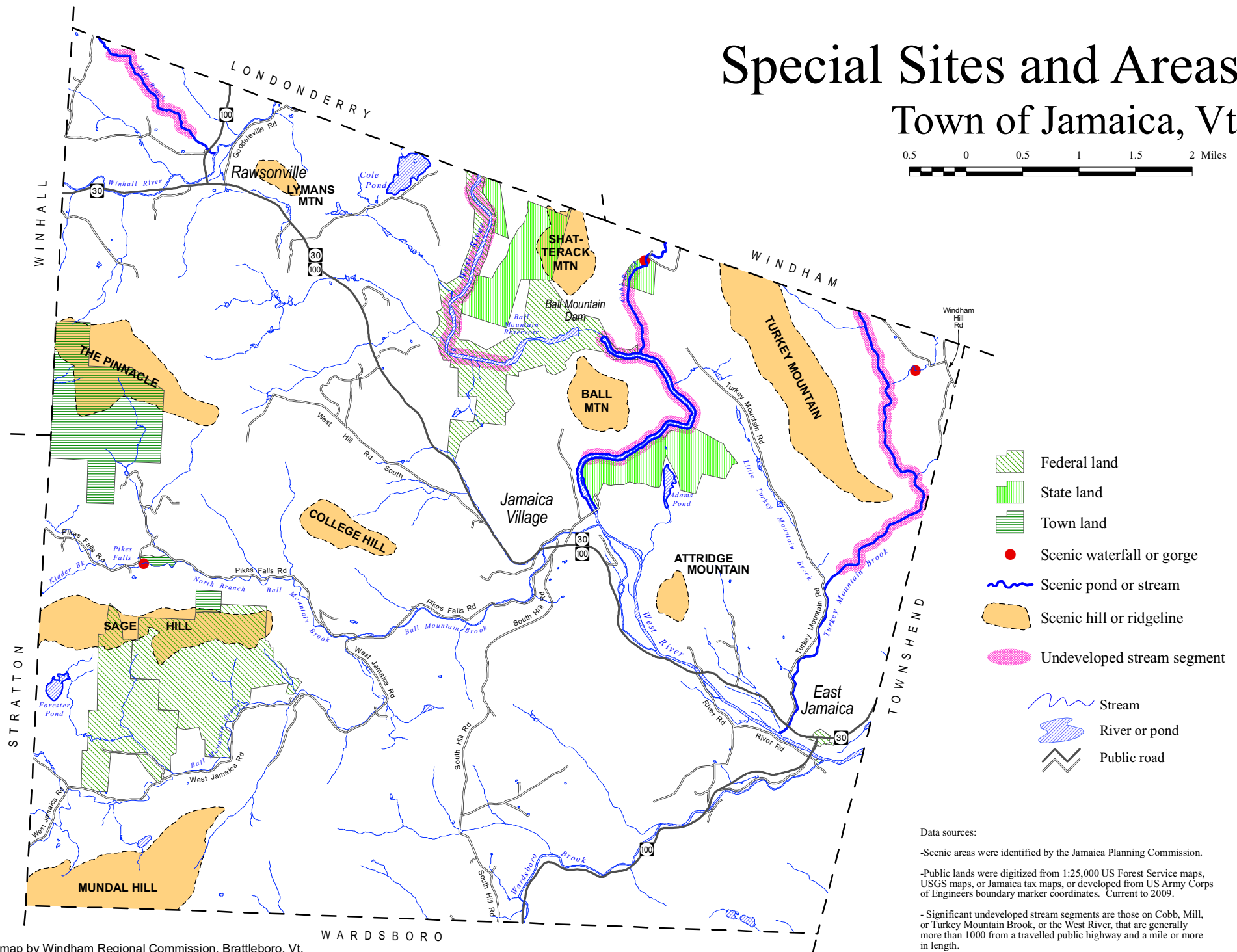
- Areas of steep slopes are depicted by those soil mapping units with a slope of more than 25 percent. These areas may contain small portions of slopes less than 25 percent, and areas not identified as steep slopes may contain small portions of slopes greater than 25 percent.

- Primary agricultural soils, as denoted on the map, have an important farmland rating of "prime" or "statewide." These ratings qualify the soils to be "Primary Agricultural Soils" under Act 250.

- Sand and gravel resources are from the VGIS data layer AGGRES. This data layer was derived from "Geology for Environmental Planning" series, which in turn was derived from U.S. Geological Survey sources.

Special Sites and Areas Town of Jamaica, Vt.

0.5 0 0.5 1 1.5 2 Miles



Data sources:

-Scenic areas were identified by the Jamaica Planning Commission.

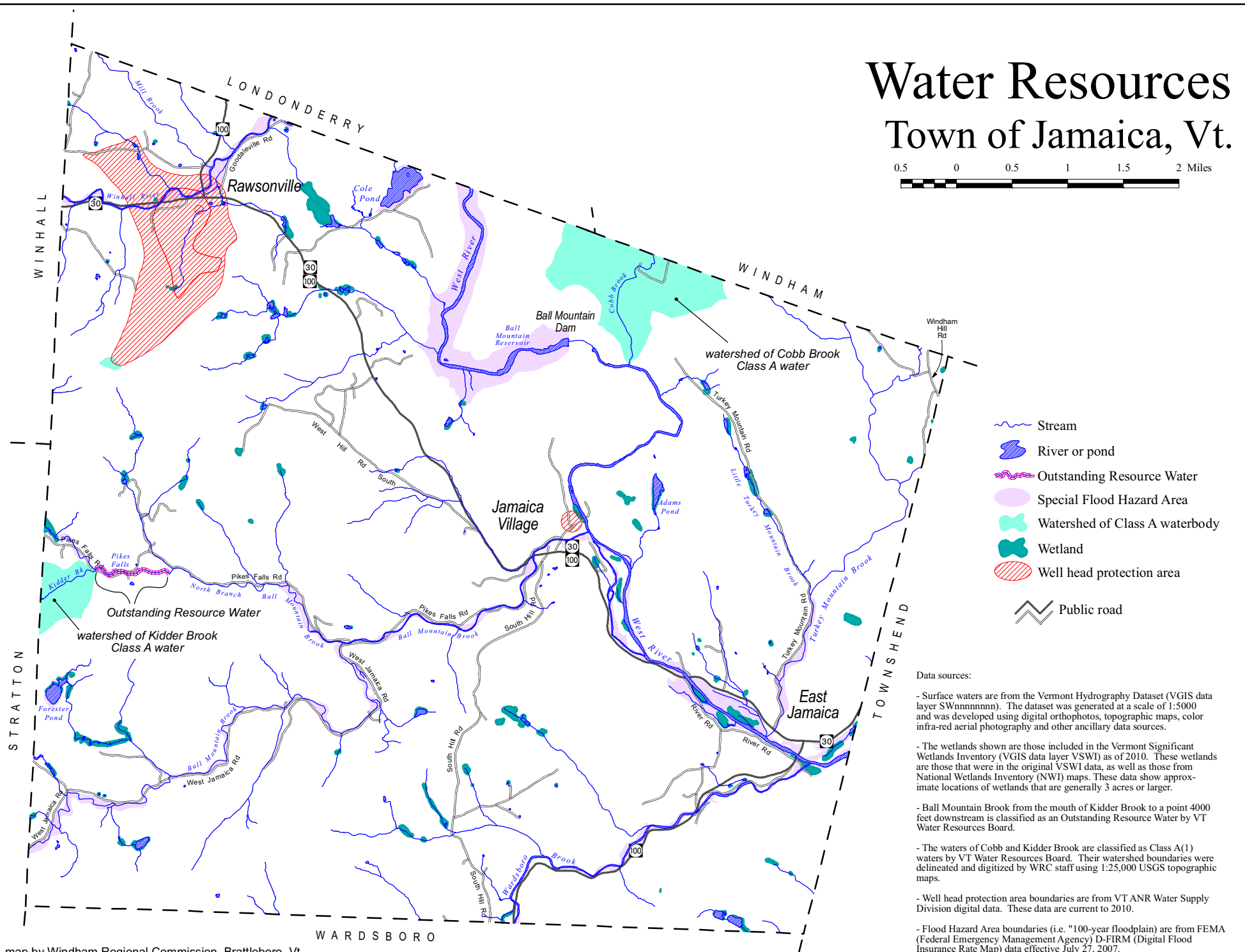
-Public lands were digitized from 1:25,000 US Forest Service maps, USGS maps, or Jamaica tax maps, or developed from US Army Corps of Engineers boundary marker coordinates. Current to 2009.

- Significant undeveloped stream segments are those on Cobb, Mill, or Turkey Mountain Brook, or the West River, that are generally more than 1000 from a travelled public highway and a mile or more in length.

Water Resources

Town of Jamaica, Vt.

0.5 0 0.5 1 1.5 2 Miles



- Stream
- River or pond
- Outstanding Resource Water
- Special Flood Hazard Area
- Watershed of Class A waterbody
- Wetland
- Well head protection area
- Public road

Data sources:

- Surface waters are from the Vermont Hydrography Dataset (VGIS data layer SWnnnnnnn). The dataset was generated at a scale of 1:5000 and was developed using digital orthophotos, topographic maps, color infra-red aerial photography and other ancillary data sources.

- The wetlands shown are those included in the Vermont Significant Wetlands Inventory (VGIS data layer VSWI) as of 2010. These wetlands are those that were in the original VSWI data, as well as those from National Wetlands Inventory (NWI) maps. These data show approximate locations of wetlands that are generally 3 acres or larger.

- Ball Mountain Brook from the mouth of Kidder Brook to a point 4000 feet downstream is classified as an Outstanding Resource Water by VT Water Resources Board.

- The waters of Cobb and Kidder Brook are classified as Class A(1) waters by VT Water Resources Board. Their watershed boundaries were delineated and digitized by WRC staff using 1:25,000 USGS topographic maps.

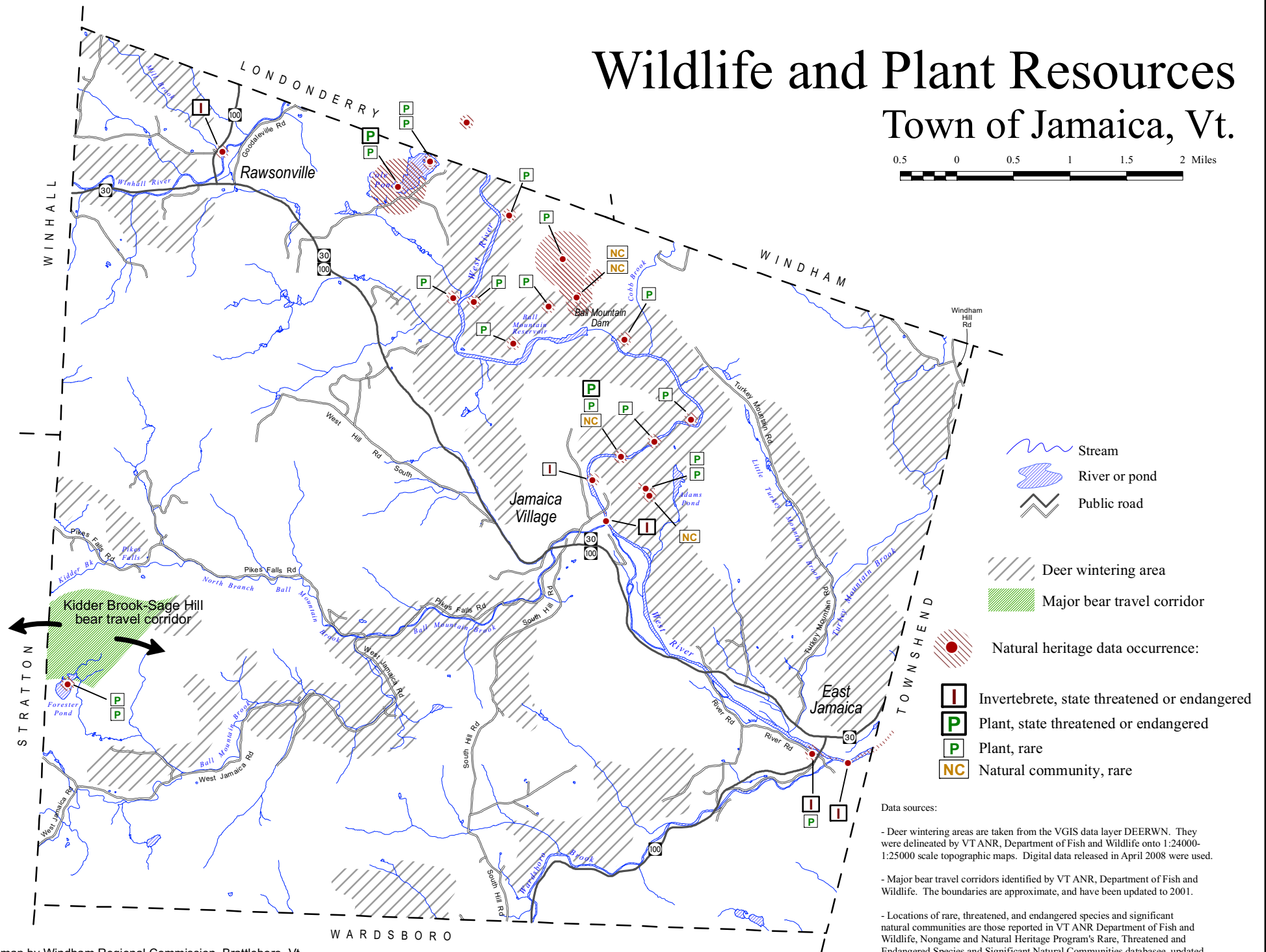
- Well head protection area boundaries are from VT ANR Water Supply Division digital data. These data are current to 2010.

- Flood Hazard Area boundaries (i.e. "100-year floodplain) are from FEMA (Federal Emergency Management Agency) D-FIRM (Digital Flood Insurance Rate Map) data effective July 27, 2007.

Wildlife and Plant Resources

Town of Jamaica, Vt.

0.5 0 0.5 1 1.5 2 Miles



Data sources:

- Deer wintering areas are taken from the VGIS data layer DEERWN. They were delineated by VT ANR, Department of Fish and Wildlife onto 1:24000-1:25000 scale topographic maps. Digital data released in April 2008 were used.

- Major bear travel corridors identified by VT ANR, Department of Fish and Wildlife. The boundaries are approximate, and have been updated to 2001.

- Locations of rare, threatened, and endangered species and significant natural communities are those reported in VT ANR Department of Fish and Wildlife, Nongame and Natural Heritage Program's Rare, Threatened and Endangered Species and Significant Natural Communities database, updated in 2010.

Jamaica Village Center

Town of Jamaica, Vermont

--- Designated Village Center

- Parcel boundary
- Public/Institutional building
Commercial building
Residential building
Vacant/Other building
- Public/Institutional parcel
Commercial parcel
Residential parcel
Vacant/other parcel

0 100 200 300 400 500 Feet



map prepared by Windham Regional Commission
December 2015; c:\Towns\Jamaica\Maps\Villctr_2015.mxd

Building key

- 1 fire station
- 2 post office
- 3 general store
- 4 town office
- 5 church
- 6 library
- 7 town hall
- 8 inn
- 9 historical society
- 10 Masonic lodge

