

## 4. Environmental Inventory and Analysis

Note: Much of the text in this section remains the same as that in the 2001 Open Space and Recreation Plan, having been revised and amended only where needed to reflect more recent concerns or changed conditions.

### ***A. Geology, Soils and Topography***

Lakeville is located within the Narragansett/Bristol Lowland sub-region of the Northeastern Coastal Zone Ecoregion, as defined by the Massachusetts Ecological Regions Project (US EPA, 1994). Our sub-region, roughly encompassing all of Bristol County and most of Plymouth County, is defined along the western and northern boundaries by topography and geology and along the eastern and southeastern boundaries by vegetation and soils. The lowland sub-region is flat to gently rolling, underlain by both sedimentary and igneous bedrock, with soils derived from an extensive cover of glacial deposits.

#### *1. Geology*

##### *a. Geology of Bedrock and Subsurface Unconsolidated Deposits*

The following account of the bedrock geology is taken from Koteff (1964), Williams and Willey (1973), and Foster (personal communication).

Two major bedrock units lie beneath Lakeville's soils and glacial deposits. The sedimentary Rhode Island Formation of Pennsylvanian age (ca. 300 million years), composed of sandstone, siltstone, and conglomerate, occurs in the northern section of town as well as the area underlying Assawompset, Pocksha, and parts of Great Quittacas and Long Ponds. These rocks are part of a regional bedrock system, which extends from Narragansett Bay northeastward to Hanover, Massachusetts. The remainder of the town is underlain by igneous Dedham Granodiorite of probable early Paleozoic age (600 million years), composed of quartz monzonite and granodiorite. This formation extends southward to Buzzard's Bay.

The sole outcrop of sedimentary rock in the portion of Lakeville shown on the USGS Assawompset Pond quadrangle is located on the southern end of Lewis Island in Long Pond. Exposed igneous bedrock occurs throughout the town as small outcrops, and in one large and prominent outcrop of roughly 500 acres in Lakeville and Freetown in the area bounded by County Street, Freetown Street, and East Howland Road. This latter area of exposed bedrock is one of the largest three or four in the entire Taunton River basin.

Two geologic faults are inferred to exist at the boundaries of these two bedrock units just west and east of the Assawompset Pond Complex. The lakes occur atop a graben, or downthrown crustal block bordered by the two faults. This downfaulting may have preserved the sedimentary rock in the area of the Ponds while the surrounding Rhode Island Formation was eroded away to expose the older, igneous bedrock.

The advance of the ice sheet scoured pre-glacial bedrock stream valleys during the Wisconsin Glaciation, roughly 15,000 years ago. The topography of the resulting bedrock surface grossly resembles the current surface contours in many areas, with depressions under the Assawompset Pond Complex, and deep valleys under Assonet/Cedar Swamp Brook, southern Betty's Neck, just south of Rt. 495, and around Loon Pond. The latter site exhibits the lowest bedrock elevation in Lakeville, at 81 feet below sea level.

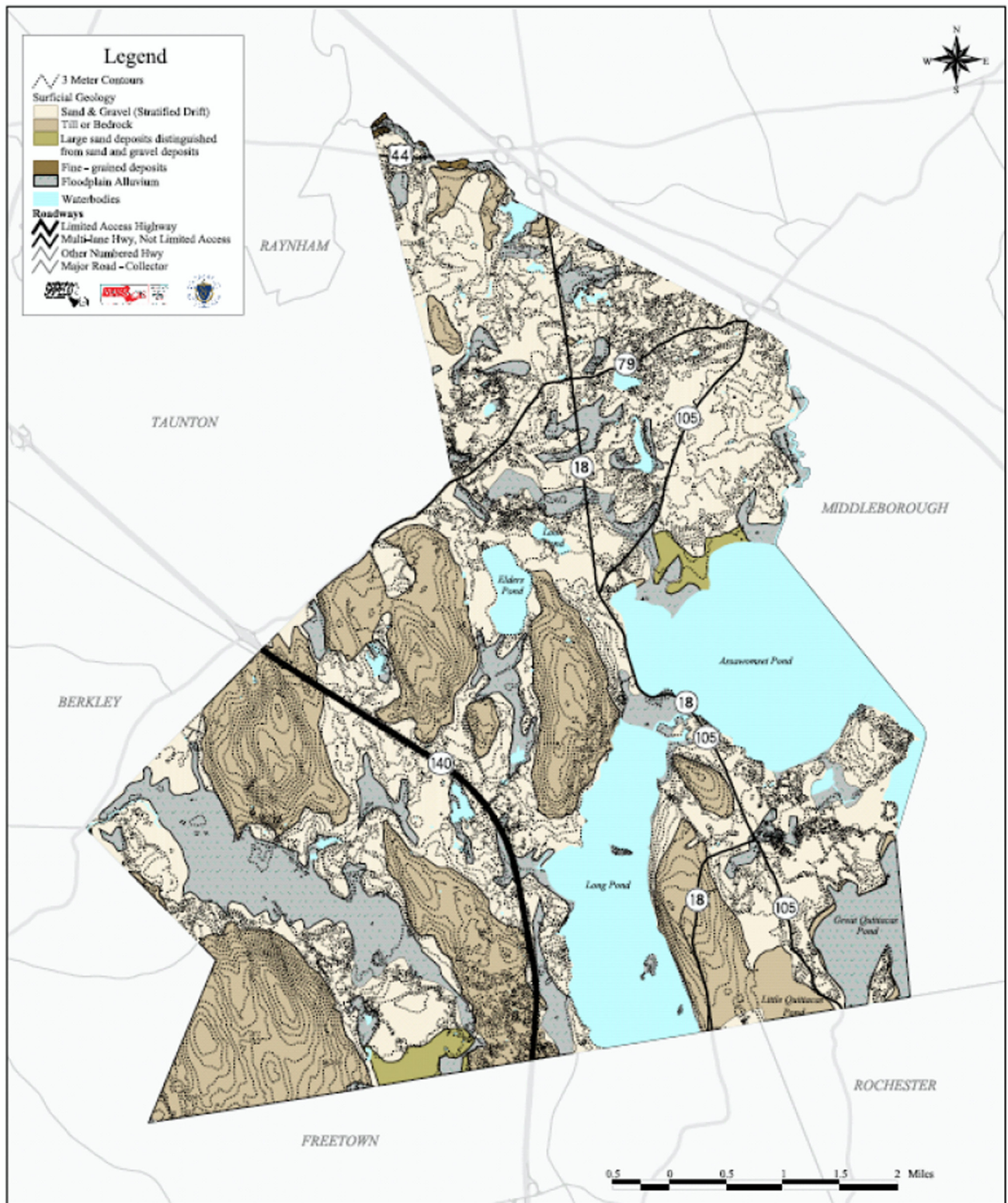
During the last glaciation, the southward advancing ice sheets deposited a thick layer of poorly sorted materials, ranging in particle size from clay to boulders. The average thickness of this till mantle in the Taunton River basin is 15 feet. Above this basal till layer, the retreating glaciers left unconsolidated deposits. The thickest layers of stratified, or sorted, materials were deposited in the deep bedrock valleys. There are some areas in the northern and central sections of the Taunton River basin where the deposits of outwash sand and gravel are consistently coarse with depth. However, in general, the texture of the unconsolidated deposits varies considerably with depth in most areas, with sand and gravel near the surface and silts, clays, and fine sands at depth. The following discussion of surficial geology pertains only to those deposits immediately below the soil layer, and does not necessarily reflect the character of the entire depth of loose material down to the bedrock surface.

#### *b. Surficial Geology*

Soil and subsoil conditions dictate to a large degree potential uses and limitations of the land, as well as the availability of groundwater. Surficial deposits which are poorly sorted, such as till, have little pore space between particles, hindering absorption, slowing water flow, and limiting groundwater storage. In contrast, well-sorted glaciofluvial deposits, particularly those of large particle size such as coarse sands and gravels, have relatively more pore space, increasing drainage capability (percolation) and groundwater storage capacity and flow.

The following account of the surficial geology is taken from Koteff (1964) and the MassGIS Surficial Deposits datalayer, except where noted.

The surficial deposits of about 25% of the town's total area are composed of glacial till, occurring mainly in areas of higher elevation: Tinkham Hill, Shockley Hill and Pickens Hill around Pickens Street; Myricks Hill between County Street and Pierce Avenue; Canedy's Corner; just east of Long Pond; and the unnamed hill south of Howland Road, west of the railroad. The till in these areas is either exposed till mantle (ablation till or ground moraine), or hills of very compact lodgment till (drumlins), formed where the force and weight of advancing ice sheets compressed and streamlined earlier deposits.



October 2010

## Town of Lakeville Open Space and Recreation Plan Surficial Geology Map

Map produced by BPS/DIG for the sole purpose of aiding regional planning decisions and are not intended for any other use. This map is not intended for engineering, legal or survey purposes.

Produced by:  
BPS/DIG  
Old Regional Service Center  
Dana Street  
Second Floor  
Office of Geographic and Environmental Information  
Vermont State Highway Department  
30 Park Drive  
Freetown, VT 05740

Nearly half of Lakeville's total area is immediately underlain by coarse sand and gravel, and less than 0.1% by silts and fine and medium sands. These water-borne, or glaciofluvial, stratified deposits are collections of poorly to well sorted material left by glacial meltwater streams. Sorting occurred as smaller particles were carried farther by the flowing water, forming outwash plains. Landforms in Lakeville such as kames, kame plains, kame terraces, and eskers, collectively termed ice-contact deposits, were built against and over stagnant ice.

The remaining locales in Lakeville, about 27% of the town's total area, are capped with floodplain alluvium, very fine-grained deposits occurring mainly under the Ponds.

Sand and gravel deposits, such as Lakeville's, are often regarded as a resource to mine. Historically, earth removal permits in Lakeville (Board of Selectmen) have been granted for incidental removal during roadway construction, for cranberry bog sanding, and for commercial sale. The last remaining commercial earth removal operation, located north of Precinct Street, ceased activity in late 2000. Two other former sand and gravel removal operations have in recent years become the Nachaomet Estates subdivision, east of Bedford Street at Betty's Neck Road, and the LeBaron Hills Country Club on Rhode Island Road. Lakeville residents continue to mine sand and gravel, but at a reduced extent from the past. Within the past eight years numerous permits have been issued for up to as much as 230,000 cubic yards, most much smaller, most related to housing construction. A gravel removal permit for 100,000 cubic yards is still open on the Town-owned Howland Street property.

## *2. Soils*

### *a. Soil Survey Data*

Based on soil field surveys, the USDA's Natural Resources Conservation Service published the following General Soil Map and accompanying descriptions of soil map units (USDA, 2001).

The six major soil groups occurring in Lakeville are described below. Although there may be inclusions of other minor soil types in each general unit, the map can be used for overall planning purposes.

The relative suitability of these soils for development is based on current septic system design and wastewater regulation.

Birchwood-Poquonock-Mattapoisett soils are well drained to poorly drained soils formed in sandy mantle, underlain by dense glacial till in areas of ground moraines, drumlins, and uplands. These soils are generally poorly suited for residential units with on-site septic tank absorption fields because of the slow permeability of the underlying till and the perched, seasonally high water table. Birchwood-Poquonock-Mattapoisett soils com-

prise about 9.6% of Lakeville's land area, primarily in the southwestern portion of the town, and in the area surrounding Cross St. in the far northern section.

Freetown-Swansea-Scarboro soils are very poorly-drained soils formed in freshwater organic deposits, underlain by glaciofluvial deposits in swamps and depressions. They are very poorly suited for development due to a seasonal high water table and low soil strength. Freetown-Swansea-Scarboro soils comprise about 11.0% of Lakeville's land area, largely in the vicinity of Assonet/Cedar Swamp Brook, but also in the wetlands between Clear Pond and Thompson's Brook, and in a narrow strip adjacent to Rt. 140 south of Highland Road.

Hinckley-Windsor-Deerfield soils are excessively to moderately well drained soils formed in glaciofluvial deposits on outwash plains, deltas, kames, and other ice contact features. Although they are generally well suited for site development from the standpoint of percolation rate, these soils occur in areas of aquifer recharge, and careful planning is needed to minimize damage to the groundwater quality from land conversion. Hinckley-Windsor-Deerfield soils comprise about 45.3% of Lakeville's land area. The association occurs throughout the portion of Lakeville north of Precinct Street and Assawompset Pond, between Assawompset and the Quittacas Ponds, just north of Canedy's Corner, and in the vicinity of Apponequet High School.

Scituate-Montauk-Norwell soils are well drained to poorly drained soils formed in sandy loam overlying dense glacial till on upland drumlins and ground moraines. They are poorly suited for residential development with on-site septic systems because of the inability of the dense substratum to absorb the effluent. The firm substratum usually causes a perched seasonally high water table, impeding subsurface drainage. Scituate-Montauk-Norwell soils comprise about 29.8% of Lakeville's land area, primarily in the west-central portion of town and along the eastern shore of Long Pond.

Plymouth-Carver soils are excessively drained soils formed in thick sand deposits and/or deposits on moraines and other ice-contact features. There are no major limitations on the use of these soils for residential development, although, like the Hinckley-Windsor-Deerfield association, these soils occur in areas of groundwater recharge. Plymouth-Carver soils comprise only 0.8% of the land area of Lakeville, almost entirely along the west shore of Long Pond south of Churchill Shores.

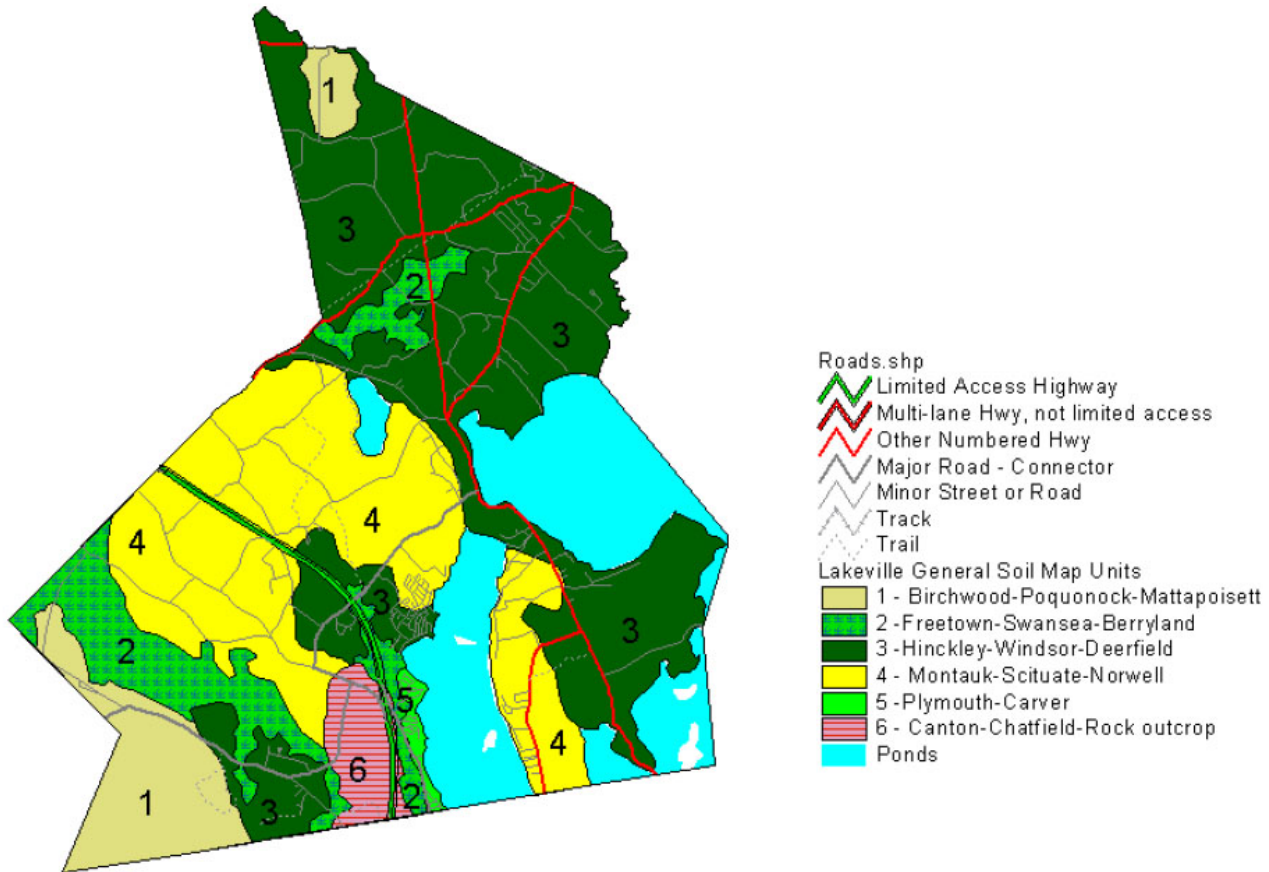
Canton-Chatfield soils are well-drained soils formed in glacial till, occurring along with rock outcrops in areas of bedrock controlled uplands. Although areas of Canton soils are well suited for development, with greater than six feet to bedrock, Chatfield soils are not nearly as deep (20 to 40 inches to bedrock), and are thus poorly suited for development. These soils and associated ledge, comprising about 3.5% of the town's land area, occur in an area roughly bounded by Route 140, County Street, Freetown Street, and Assonet/Cedar Swamp River.

*b. Agricultural Soils*

Prime agricultural soils are defined by the USDA (1979) as having the “soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods.” Prime farmland soils are located throughout Lakeville (USDA, 1979). The largest contiguous block of prime agricultural soils includes the

**Figure 6**

**General Soil Map, Town of Lakeville Massachusetts, April 2000**



present-day Ted Williams Camp, the area southeast of Main Street north to Nelson’s Grove Road, and the area between Main Street and Bedford Street to Crooked Lane/Stetson Street (the latter being the site of the Wilkie/Schobel Agricultural Preservation Restriction). There is little chance that any part of Ted Williams Camp will ever again be used for agriculture, but large portions of the other two areas are farmed. Other areas of prime farmland soils which are currently used for agricultural purposes include bogs on both sides of Reed Farm Road just south of Kingman Street and the pig farm in the area just west of Elders Pond.

The USDA map also shows areas of unique farmland, which, in Lakeville, represent cultivated cranberry bogs. Following a recent temporary decline of the cranberry industry, some of these bogs, ones that had been cre-

ated from upland, were converted back to dry land for housing. However, now an uptick in cranberry sales has led to creation of new bogs in town.

The next category, additional farmland soils of statewide importance, are defined by USDA as “those (soils) that fail to meet one or more of the requirements of prime farmland, but are important for the production of food, feed, fiber or forage crops.” Further, “some may produce as high a yield as prime farmlands if conditions are favorable.” Farmland soils of statewide importance occur over large areas throughout the town. It is strikingly apparent that the soils of Lakeville are very well suited for agriculture, especially in contrast to the eastern half of Plymouth County, where extremely droughty soils have precluded the development of farmland.

The USDA’s Natural Resource Conservation Service in Wareham has expressed its willingness to assist in the determination of the value of the agricultural soils on remaining open land in Lakeville, through detailed soil surveys, for the purposes of farmland conservation.

#### *c. Soil Types of Undeveloped Land*

Undeveloped parcels occur in a thoroughly dispersed pattern throughout Lakeville, and thus are based on all the soil unit types listed above. Freetown-Swansea-Scarboro soils, occurring across roughly 2,000 acres of wetland area, are likely to remain undeveloped. The 1,800 acres of Birchwood-Poquonock-Mattapoisett and Canton-Chatfield-Rock outcrop areas can only handle development in which waste disposal can be limited to a small portion of a large site. Areas of Montauk-Scituate-Norwell and especially Hinckley-Windsor-Deerfield soils are experiencing ongoing residential development. More recent soil maps are being created and should be consulted before the Town makes any decisions as to rezoning areas of undeveloped land or acting relative to lands being removed from Chapter 61.

### *3. Topography*

Elevations in Lakeville range from about 20 feet above sea level at the extreme northern corner of town, on Poquoy Brook close to the confluence with the Taunton River, to about 240 feet on the unnamed hill at the southwestern corner of town south of Howland Road. The terrain through the northern section is flat to gently rolling, while there are several hills in the south - Tinkham Hill, Williams Hill, Shockley Hill, Pickens Hill, and others - that approach 150 feet and greater in elevation. The surface elevation of the Assawompset Pond Complex is about 50 feet. The major drainages in Lakeville, almost entirely within the Taunton River watershed, are the Nemasket River, along the northeastern boundary, draining the Assawompset Ponds; Poquoy Brook, along the northern tip; and the Assonet/Cedar Swamp River in the southwestern sector. A small finger of land along the southerly end of Lakeside Avenue is on the other side of a divide and falls within the Buzzard Bay watershed.

## ***B. Landscape/Skyscape Character***

Lakeville's scenic landscapes and skylines remain among its most important assets. Just as the Great Ponds served as a center of Native American culture in pre-colonial times, they now provide a focus for Lakeville's attention and sense of place. It is particularly important that the shorelines of Assawompset, Pocksha, and Quittacas have remained largely undeveloped in contrast to the intensely developed shoreline of Long Pond. Elsewhere, the gentle terrain and modest hills have been farmed and settled since colonial times with almost uniform density, a density which first increased slowly, but has in the latest half-century rapidly accelerated. Already certain areas have lost completely the rural character they possessed as recently as 1950; others are rapidly losing it today, while some others do retain at least some flavor of the older town. The Town's night sky has also suffered by uncontrolled outdoor lighting. It is apparent that very shortly, unless Lakeville takes strong steps to protect the vestigial remains of the traditional landscape and skyline, all the rural character as we now know it will be lost.

### *a. The Process*

The town divides neatly into three major watersheds, the Great Ponds and Nemasket River, the Assonet River, and the Poquoy Brook drainage basins. While their detailed characteristics are presented in the following sections, the unique overall effect of each area on the complete character of the town is significant. The Great Ponds provide our signature views, while downstream the Nemasket River valley retains considerable expanses of open colonial farmland. The appearance of the Assonet River basin provides much of Lakeville's old-time rural character. At its core lies the 1000-acre wildlife preserve owned by the Massachusetts Audubon Society. Abutting this protected refuge lie a number of extant colonial and 19th-century farmsteads, complete with open fields, stone walls and specimen trees. Although the Poquoy Brook area has been as intensely developed as any of our rural areas along its thoroughfares, its rural heritage remains manifest in two unusually deep vistas containing a working farm, cranberry bogs, and a colonial cemetery, all backed by multiple tree-lines that are visible from nearly one mile away. The wide expanse of water and protected land surrounding the Great Ponds, the impenetrable expanse of the Assonet Cedar Swamp and undeveloped forest land along the Leonard Washburn Brook have helped preserve the Town's night sky.

In recognition of the importance of Lakeville's scenic vistas to the town's identity, two surveys have been done.

### *Scenic Landscapes Survey*

The first survey, updated from the 2001 plan, focuses on scenic landscape vistas visible from the public ways of the town. The landscape vistas were inventoried in accordance with the guidelines, which appear in Table 3. Five major vista classifications were thus established, Grand (G), Large (L), Mid-size (M), Small (S) and (W) Wooded. Class letter and number code may be used to locate scenic view on the Special Landscape and

Unique Features Map. Within these classes each vista was then ranked according to the time, in seconds, that it remained visible from the public way driving at moderate speed. When a scene could be seen from more than one public way, it was attributed to the way to which it presented the more important vista; if, however, the presentations were deemed equivalent, then to the more heavily traveled way. In addition, when a subject viewscape contained a State inventoried historic site, the Massachusetts Historical Commission's "MHCN number" (LAK.----) has been placed in the subject's description. Amongst the 'remarks' "fgrnd. obs." indicates there now exist some foreground obscurations, typically brush or small saplings, which currently threaten the vista's future integrity. Finally, for the older open fields, a best estimate (as obtained from Plymouth County Deeds or Wills) as to when original clearing of the site occurred is included. "Very early colonial" suggests prior to 1690; "early colonial," by 1710; and "colonial," before 1776.

Lakeville has voted at Town Meeting to designate certain ways as Scenic Roads, including roads passing through a mix of woodlands and open fields, esthetically pleasing combinations of the two environments which are becoming increasingly rare in the community. This designation carries with it a certain level of protection for stonewalls and trees in the right-of-way. Scenic roads are indicated in the inventory of vistas.

#### *b. The Inventories*

The surveyed vistas in each watershed are first summarized and then enumerated in the following tables. They are also individually plotted, each according to its classification and approximate extent on the Special Landscape Features Map.

The scenic inventory for the Great Ponds-Nemasket River area is detailed in Table 4a. Overall this area contains the town's most extensive reasonably flat regions, which lie principally in the Nemasket valley and around Long Pond. Overlooks are therefore rare, but the large, impressive expanses of open water more than compensate, presenting several truly spectacular views. It must be noted, however, that every single one of these water views, as well as those of the largely pristine Nemasket River, contains some part of a neighboring town. It will be, therefore, extremely important for Lakeville to develop cooperative regional programs with these neighbors to gain complete shoreline protection. Further, the over water views are so extensive that for truly complete protection vigilance must extend well beyond the Pond's immediate shorelines. The SEMASS smokestack in southeastern Rochester already intrudes upon Assawompset's eastern horizon, so any proposed erection of other distant tower-like structures must be carefully monitored. Lands owned by New Bedford and Taunton for water protection and Lakeville's purchase of Betty's Neck provide protection of the views across Assawompset, especially those from Routes 105 and 18.

The Assonet River watershed contains by far the roughest terrain in Lakeville, including the numerous and extensive granite outcroppings, previously discussed in Section 4A, which are peculiar to this part of town.

Therefore, the vistas inventoried in Table 4b tend to be less extensive on the average than elsewhere but do, in most instances, contain at least one stone wall. In fact, a large majority of the scenes here strongly evoke Currier and Ives prints, since they contain relatively small fields, occasional farm animals, and a variety of colonial and 19th-century structures. It is also significant that many of the inventoried farmsteads also provide critical grassland-by-forest habitat, in the form of hayfields, around the periphery of Audubon's 1000-acre Assonet Cedar Swamp Wildlife Sanctuary. Upstream along Holloway Brook, which enters the swamp at about its mid-point, there are several excellent vistas which contain well-kept cranberry bogs. Preservation of the features in this basin from which Lakeville derives much of its old-fashioned character will require strong encouragement for continued small scale farming activity and cranberry growing. Without continuing the current on-going agricultural practices in the area, the open fields will quickly revert to trees, and the cranberry bogs to mostly forested wetland. As new housing is built on the old farmsteads their identities blur and we lose the views that give us a sense of connection with the past and with the land.

The Poquoy Brook watershed is smaller than Great Ponds and Assonet watersheds, but provides the town's two longest over-land roadside vistas. See Table 4c. This is primarily because its terrain is gently rolling, thereby offering the potential for overlooks. It is particularly significant that the hills here are composed largely of sand and gravel, large quantities of which have been removed over the years in a strip mining-like process, thus altering the land's original contours considerably. Although the other viewscape, equally extensive and more centrally located in the watershed, is perhaps more impressive and varied, it too gives the impression of being manufactured, containing numerous cranberry bogs interspersed with pastures and modern farm buildings. It would appear, however, that the greatest traditional development concern in this area lies with the large forested area in its North, which presently has only two scenic vistas. One of these, however, lies within the "Tack Factory Area," which has been identified by the Massachusetts Historical Commission as a possible site for one of Lakeville's potential historic districts. Historic restorations would likely involve re-clearing other nearby areas in consonance with colonial records.

While the Big Bearhole watershed lies mostly in Taunton, providing the centerpiece of Massasoit State Park, parts of it do lie within Lakeville. Thompson Brook and another unnamed perennial stream rise in Lakeville and flow across Rhode Island Road (Rte 79) into Taunton's Big Bearhole Pond. Each has a scenic vista along it. The first involves Thompson Hill and Precinct Cemeteries with the LeBaron Hills golf course stretching behind them. Prior to the construction of the golf course, this had been the scene of extensive gravel mining activity. The other much smaller viewscape, just south of Precinct Village, although previously attractive, has been recently allowed to revert to shrubby growth of increasing height.

**Table 3. Scenic Classification Guidelines.** At their greatest extent:

G - Grand Vista: View approaches or exceeds 150 deg. viewing angle.

Horizon sky exceeds 90 deg.

Predominant ridges/tree-lines over 1 mi. distant.

L - Large Vista: View exceeds 120 deg. viewing angle.

Horizon sky exceeds 60 deg.

Ridges/tree lines over 0.33 mi. distant.

M - Mid. Vista: View subtends more than 90 deg.

Significant open sky with token horizon sky visible.

Open areas largest dimension exceeds 600 ft.

S - Small Vista: View subtends more than 60 deg.

Open sky is visible.

Open areas largest dimension exceeds 200 ft.

W - Wooded canopy: Only forest visible, no structures.

Numbers used with classification refer to the Special Landscape and Unique Features Map.

**Table 4a. Scenic Inventory, Great Ponds and Nemasket River Watershed**

Way/Subject	Class	Remarks
Bridge St. Open farmland	L.30	Foreground Obscured. early colonial clearing.
River, wetlands	L.3	Vaughan St.
River, wetlands N.	L.3	...
River, wetlands S.	L.4	...
Main St. Wilkie Farm APR	L.45	Early colonial clearing, becoming obscured by vegetation
Open garden, field	M.7	Early colonial clearing
Bedford St. Wilkie farm APR E.	L.18	Early colonial clearing
Bedford St. Wilkie farm APR W.	L.18	Early colonial clearing
Assawompset Pond	G.105	Foreground Obscured, scene partly in Middleboro
Pond Cemetery, LAK.804,	G.105	Scenic view Assawompset, Middleboro's White Banks
Meeting hse. site, LAK.908	...	Obscure - Invasive Plants
Little Quittacas,	G.75	Fgrnd. obs., scene partly in Rochester and Freetown

Indian cemetery, LAK.801	...	
Great Quittacas, E.	G.30	Scene partly in Rochester and Middleboro
Long Point Rd.	...	Scenic Road
Great Quittacas, S.	G.70	Scene partly in Middleboro and Rochester
Pocksha Ponds	G.50	Scene partly in Middleboro
Cranberry bog	L.25	...
Highland Rd. Wetland	L.5	Foreground Obscured.
Hilltop Farm APR overlook	L.12	Colonial clearing
Hilltop Farm APR, LAK.67 & 68 Homestead	M.30	Colonial clearing Foreground Obscured.
Reservoir, Mullein Hill Cemetery LAK 17	M.30	Foreground Obscured
Cranberry bog	L.15	Colonial clearing
Precinct St. Elder's Pond	L.25	Foreground Obscured
Montgomery St. Horse farm	M.12	Colonial clearing
Rural hayfield	S.2	
Pickens St. wetland	S.8	Semi-open
Old homestead area	S.3	Building in needs of repairs
County Rd. Horse field	S.4	Colonial clearing
Cranberry bog, Long Pd.	L.9	
Long Pond	S.2	

**Table 4b. Scenic Inventory, Assonet River Watershed**

Way/Subject	Class	Remarks
Mill St. 19th-Century farm	L.25	Scenic Road, colonial clearing
Pierce Ave.		Scenic Road
19th Century farmyard	S.6	
Hayfields/farmyards	M.40	Colonial clearings
Allen homestead, LAK 12	S.6	Fgrnd. obs., colonial
Pierce homesteads, LAK 20 fields farmyards	M.5 M.25 S.10	Hayfield, colonial pasture, Colonial clearings Fgrnd. obs., colonial
County Rd., Cranberry Bog	L.15	
So. Pickens St., Meadow, wetland	M.5	Colonial clearing
Kingman St.		Scenic Road
Cranberry bog	M.15	Colonial meadow
Hayfield, pasture	L.34	Colonial clearing
Montgomery St., Cranberry bogs	L.17	

**Table 4c. Scenic Inventory, Poquoy Brook Watershed**

Way/Subject	Class	Remarks
Bedford St. (Rte. 18) Rural field, LAK C	M.4	Very early colonial Clearing, becoming obscured
Tack Factory Area LAK.A	M.4	Potential historic district
Cross St., Open rural field	S.4	Foreground Obscured.
Wooded swamp	W.1	Long uninterrupted stretch of pristine swamp with seasonal standing water
Leonard St., Golf Course	M.26	
Southworth St. Golf Course	M.20	On Scenic Road
Farm, cranberry bogs	L.80	
Crooked Lane		Scenic Road
Open field to E.	M.20	Colonial clearing
Open field to W.	M.20	Colonial clearing
Clear Pond S.	M.10	Foreground obscured.
Clear Pond Rd. and Clear Pond N.	M.12	View of Clear Pond Park
Swamp	W2	Small stretch of pristine Atlantic White Cedar

**Table 4d. Scenic Inventory, Big Bear Watershed**

Rhode Island Rd. Open field, meadow	M.15	Colonial clearing Becoming overgrown
Precinct & Thompson Hill Cemetery LAK.800 Golf Course	L38	Oldest cemetery in town Houses in foreground.

Class: Grand (G), Large (L), Mid size (M), Small (S) and (W) Wooded. Numbers refer to the Special Landscape and Unique Features Map.

One of Lakeville's scenic assets is only visible by canoe. The upper Nemasket River is celebrated for its beauty and wildlife. Current commercial construction near the rail station intrudes to within 25 feet of the river marsh and may impact both scenic and wildlife values. The Wildlands Trust owns a strip of land between the development and the river which hopefully will minimize this impact. As of this writing farmlands and state owned fields still protect portions of the river.

Unfortunately, this inventory must note that many of our scenic and potentially scenic vistas are currently spoiled by exotic invasive plant species, especially bittersweet, and by the dumping of household trash and casual littering.

Really appreciating the Town's scenic assets requires leaving one's car and exploring the Town's open spaces on foot.



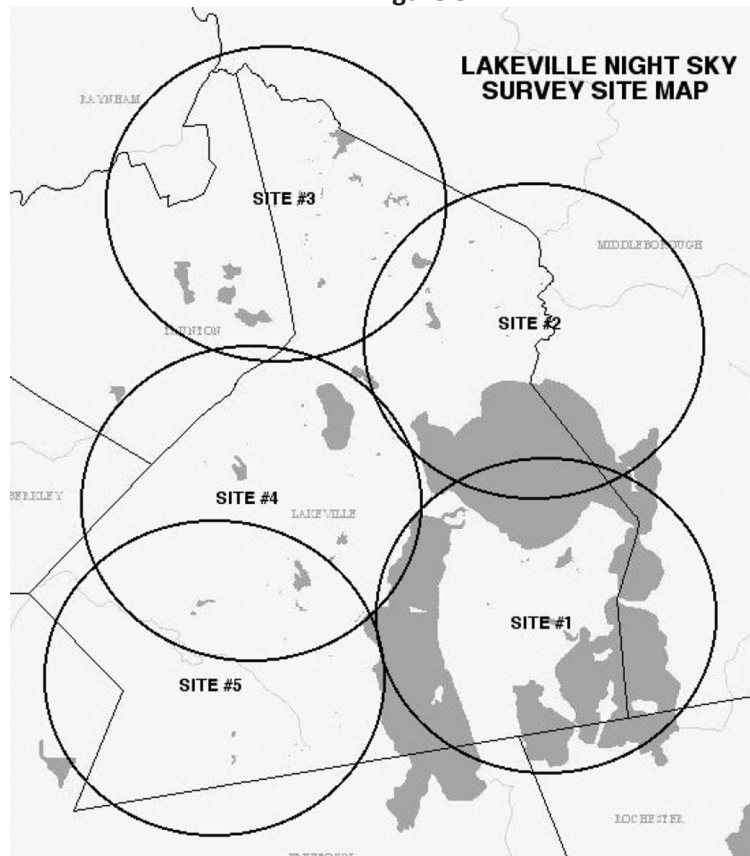
### *Scenic Night Sky Survey*

This survey was conducted on March 10, 2010 between 9-11 PM by M. Renzi and K. Leonard; apparent sky condition: good to excellent. The Limiting Magnitude at the Zenith (LMZ) is an overall measure of the light pollution at a site. The theoretical limit for sea level in New England is about 6.5. This is a measure of the faintest stars visible to the naked eye that are above 60 degrees in elevation. The winter Milky Way, about 1 magnitude fainter than the summer Milky Way, is faintly visible at LMZ=5.0, and clearly so at LMZ=5.5. "Intrusion" is horizon glow and refers to anomalous brightening of the sky up to 30 degrees above the horizon.

Five sites were monitored. These sites, known to be relatively local-light free, were selected at locations evenly spaced around town. It is assumed that each will be most strongly influenced by local lighting within one and one-half miles of it. As shown on the map below, this affords little overlap and covers the entire town rather well. These sites were:

1. Assawompset Neck / Great Ponds  $\geq 5.0$  LMZ
2. Nemasket River / NE Lakeville  $\leq 5.0$  LMZ
3. Poquoy Brook / N Lakeville  $\geq 4.0$  LMZ
4. Central Lakeville / Pickens St. at Hill St.  $\sim 4.5$  LMZ
5. Assonet Swamp / Beechwoods  $\sim 5.5$  LMZ

**Figure 8**



**Detailed observation notes:**

Site 1, Assawompset Neck: LMZ was a good solid 5.0. A moderate intrusion was noted between NW and N that extended to 20 degrees elevation. W horizon was affected by very local lighting glare. Milky Way was faintly visible. This site is significantly advantaged by the Great Ponds that surround it. It is impacted primarily by badly directed local development lighting and that in central Lakeville to the N.

Primary Threat: Placement of any additional badly directed development lighting on Assawompset Neck.

Site 2, Nemasket River: LMZ approached 5.0 at the true zenith. However, there was a significant intrusion in the NW quadrant extending up to 30 degrees elevation, but the Milky Way was still slightly visible high to the SW. This site is significantly advantaged by the Great Ponds to its south and the lack of development in S. Middleboro across the river to the E. It is impacted almost exclusively by commercial development lighting near the commuter rail station and in Middleboro to its N.

Primary Threat: Potential placement of badly directed commercial lighting at the Lakeville Hospital site and in any nearby development.

Site 3, Pogooy Brook: LMZ was noticeably poor, approaching 4.0 only very high in the sky. A significant all-over red sky glow was noticed, particularly to the N. There was a severe intrusion extending between NW and NE, which reached well over 30 degrees in elevation. There were significant intrusions to the SW and E as well. This site is severely impacted by the Route 44 commercial zone to its N, and further impacted by badly directed development and/or commercial lighting to the E and SW.

Primary Threat: Public and/or official apathy to the existing problem.

Site 4, Central Lakeville: LMZ was fair, about 4.5, with significant intrusions to the N and especially to the SW, with modest additional intrusion to the E. This site is significantly affected by the poorly directed development lighting to its immediate SW, and to a lesser extent by the overall lighting in central Lakeville.

Primary Threat: Installation of additional badly directed development lighting, to the W & SW.

Site 5, Assonet Cedar Swamp: LMZ was superior, about 5.5, with the Milky Way clearly visible overhead extending downward to the SSW. There was a modest intrusion visible to the NNW, reaching upwards about 15 degrees. This site is significantly advantaged by the Assonet Cedar Swamp to the S and W, and additionally

by the Howlands wilderness area and Freetown State Forest further to the S. It is favored to a lesser extent by the Great Ponds to the east, being impacted primarily by the commercial development south of Taunton and occasionally by outdoor lighting from the Howland Road schools.

Primary Threat: Additional commercial development spreading southward from its core in East Taunton/Berkley. It should be noted that this site had an estimated LMZ= 6.0 in 2001, per the 2001 Lakeville Open Space Plan.

#### Threat Mitigation

In June 2008, Town Meeting adopted the Outdoor Lighting General By-Law. The Statement of Need and Purpose of this By-law is: "Good outdoor lighting at night benefits everyone. It increases safety, enhances the Town's night time character, and helps provide security. New lighting technologies have produced lights that are extremely powerful, and these types of lights may be improperly installed so that they create problems of excessive glare, light trespass, and higher energy use. Excessive glare can be annoying and may cause safety problems. Light trespass reduces everyone's privacy, and higher energy use results in increased costs for everyone. There is a need for a lighting By-Law that recognizes the benefits of outdoor lighting and provides clear guidelines for its installation so as to help maintain and complement the Town's character. Appropriately regulated and properly installed outdoor lighting will contribute to the safety and welfare of the residents of Lakeville.

This By-Law is intended to reduce the problems created by improperly designed and installed outdoor lighting. It is intended to eliminate problems of glare, minimize light trespass, and help reduce the energy cost of outdoor lighting by establishing regulations which limit the area that certain kinds of outdoor-lighting fixtures can illuminate and by limiting the total allowable illumination of lots located in the Town of Lakeville. All business, residential, and community driveway, sidewalk and property luminaries should be installed with the idea of being a "good neighbor," with attempts to keep unnecessary direct light from shining on abutting properties or streets. This By-Law was "intended to reduce the problems created by improperly designed and installed outdoor lighting." For more insight into the night sky, see Appendix F, Preserving the Night Sky in Lakeville.

## ***C. Water Resources***

### *1. Surface Water*

#### *a. Watersheds*

All surface water in Lakeville is within the Taunton River watershed, except for a very small portion of the town along of Lakeside Avenue, which is in the Buzzard's Bay watershed. Drainage in the Lakeville portion of the Taunton River basin is either into the Assawompset Pond Complex and the Nemasket River, towards the upper reaches of the watershed, or into other, lower tributaries to the Taunton River, including Poquoy Brook and Cedar Swamp River to the Assonet River.

#### *b. Area and Extent*

Surface water within the Lakeville town boundaries covers about 18% of the town's total area, or about 4,141 acres (MA GIS, Land Use data layer). The largest water bodies extend beyond the town boundaries: Assawompset, Pocksha, and Great Quittacas Ponds are shared with Middleborough, Long Pond is partly located in Freetown, and Great and Little Quittacas Ponds are partly located in Rochester. The Nemasket River, which is the outlet for Assawompset Pond, and Poquoy Brook both form part of the border with Middleborough.

Lakeville is crisscrossed by many streams, both perennial and intermittent. The Rivers Act gives perennial streams a measure of protection, through a 200 foot buffer zone, that intermittent streams do not have. Only streams determined to be perennial can be officially named. The Town would do well to go through the process of determining which streams are indeed perennial and naming them.

#### *c. Nemasket River*

Meandering and semi-natural, the Nemasket River is one of the area's premier scenic, ecological, and recreational resources. It was first nominated for designation as a Massachusetts Scenic River in 1977 (Anderson). The Nemasket is a part of the Wampanoag Commemorative Canoe Passage; as Snipatuit Pond in Rochester drains both northward into the Taunton River system via Assawompset Pond and the Nemasket, as well as southward into Buzzard's Bay via the Mattapoiset River, there was a through waterway between the upper Taunton watershed and the South Coast. Native Americans used this route for canoe travel from their inland hunting grounds around Bridgewater to coastal fishing areas (AMC Canoeing Guide, 1971 ed.).

#### *d. Great Ponds*

Lakeville's ten Great Ponds are its most salient physical feature. (MGL Chapter 91, Section 35 defines a Great Pond as a pond, which, in its natural state, exceeds 10 acres. MGL Chapter 131, Section 1 states that for the purposes of fishing regulations, a Great Pond is one which exceeds 20 acres.) Assawompset Pond, at 2,444 acres, is the largest natural lake in the Commonwealth, and Long Pond, at 1,721 acres, is the second largest. Great Quittacas (1,185 acres), Little Quittacas (295 acres), and Pocksha (252 acres) Ponds complete the Assa-

wompset Pond Complex. These headwater lakes, largely groundwater-fed, drain into the Nemasket and flow into the Taunton River at Bridgewater. The outlet structure on Assawompset Pond can be raised or lowered slightly to manipulate the water levels of the Ponds, for the purpose of water delivery to Taunton and New Bedford.

Elders Pond (145 acres) and Loon Pond (23 acres) have minor surface water connections downstream to Long Pond and Assawompset Pond, respectively, while Clear (28 acres) and Dunham (10 acres) Ponds occur as isolated high-elevation kettles.

Cranberry Pond (17 acres) is only slightly higher than Assawompset; a quarter-mile stream at Indian Shore connects the two. This pond was listed as a Great Pond in the Lakeville's 1969 Master Plan and 1981 Open Space and Recreation Plan. Cranberry Pond qualifies as a "great pond", but apparently was inadvertently dropped from the state's list. It is a recommendation of this plan that the necessary regulatory process be put in motion to correct this error.

The land under the water of a Great Pond is considered to be owned by the Commonwealth, and is regulated by state law. For example, MGL Chapter 91, Section 19 restricts the building or extension of structures into great ponds below the natural high water mark.

## *2. Water Quality Classification*

Pursuant to the federal Clean Water Act (33 USC Section 1251) and 314 CMR 4.00, MA DEP has adopted surface water quality standards to classify and protect designated uses. The Assawompset Pond Complex and Elders Pond, and all tributaries thereto, are designated as Class A waters, sources of public water supply. 314 CMR 4.00 states "To the extent compatible with this use they shall be an excellent habitat for fish, other aquatic life and wildlife, and suitable for primary and secondary contact recreation. These waters shall have excellent aesthetic value. These waters are designated for protection as Outstanding Resource Waters..." 314 CMR 4.04(3) further defines Outstanding Resource Waters as "an outstanding resource as determined by their outstanding socio-economic, recreational, ecological, and/or aesthetic values. The quality of these waters shall be protected and maintained." Certified vernal pools and wetlands contiguous with water supply ponds and other tributaries are also classified as Outstanding Water Resources.

The remainder of surface water in Lakeville is designated as Class B, "...habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation. Where designated they shall be suitable and a source of public water supply with appropriate treatment."

### *3. History of Use as Water Supply*

In 1901, the Assawompset Pond Complex and Elders Pond were established as a water supply source for the City of Taunton. Rules and Regulations of the State Board of Health pertaining to the surrounding land use and use of the Ponds were proposed to protect the drinking water supply. At that time, a committee of the Town of Lakeville voiced objections to the proposed restrictions, stating that private recreational, agricultural and residential rights to use would be taken without adequate compensation. Nonetheless, the Rules and Regulations were promulgated in 1902. Later, Chapter 400 of the Acts of 1924 established allocations of water from the Assawompset Pond Complex and Elders Pond to the Cities of New Bedford, Taunton and Fall River.

Pursuant to the Water Management Act (WMA) of 1986 (MGL Chapter 21G), the Massachusetts Department of Environmental Protection (MassDEP) regulates water withdrawals from surface and groundwater supplies in excess of an annual average of 100,000 gallons per day or, for seasonal users, 9 million gallons in any consecutive three-month period (310 CMR 36.00). From 1986 until 1988, large water users had the ability to register existing water withdrawals based on historic water use between 1981 and 1985. “New” withdrawals, meaning withdrawals started following the registration period, require a Permit.

WMA Registrations are renewed every ten years. All WMA Registrations were renewed by December 31, 2007. WMA Permits are issued for a maximum 20-year term, on a basin schedule established by 310 CMR 36.00. Permits authorize an annual average daily withdrawal rate in five-year increments, and reviews of permit conditions and compliance occur every five years. All Taunton River Basin Permits were scheduled to expire February 28, 2010 but that date has been extended until the State establishes the new Safe Yield Methodology to determine the safe yield for water withdrawal. For now all water withdrawal permits will be held to their current allocation.

Table 5 summarizes the authorized surface water withdrawals from the Assawompset Pond Complex and Elders Pond. New Bedford is authorized under WMA Registration #425201.01 and WMA Permit #9P425201.01 to withdraw from Little and Great Quittacas, Long, Assawompset and Pocksha Ponds. All of New Bedford’s withdrawal is through the treatment plant at Little Quittacas. Taunton is authorized under WMA Registration #425239.02 and WMA Permit #9P425239.04 to withdraw from Elders, Long, Assawompset and Pocksha Ponds. Taunton’s water is pumped from Assawompset to Elders Pond, where it is treated. Although Fall River was allocated water rights under Chapter 400 of the Acts of 1924, the City never exercised these rights and Fall River does not have a WMA authorization for water withdrawals from the Assawompset Pond Complex. Fall River withdraws its water from sources in the Buzzards Bay and Narragansett Bay Basins.

The established safe yield for the Assawompset Pond Complex (Long, Assawompset, Pocksha, Great Quittacas and Little Quittacas Ponds) is 27.5 mgd. Of this 27.5 mgd, New Bedford is allocated 20.79 mgd and Taunton is allocated 6.71 mgd. USACOE 1995 estimate of a safe yield for Elders Pond was less than 1.0 mgd.

New water needs forecasts will be developed for New Bedford and Taunton as part of the permit renewal process. It is estimated that Taunton will need a total of 7.8 mgd by 2020. Taunton has considered a hookup to the desalination plant in Dighton, but the cost of desalinated water far exceeds the cost of Lakeville water. (Fay, Spofford and Thorndike, Inc., 2000). New Bedford's water needs will surely increase also.

**Table 5: Summary of Authorized Withdrawals under Water Management Act (WMA) from Lakeville's Great Ponds**

CITY	Allocation from C. 400	WMA Registered Withdrawal	WMA Permitted Withdrawal	Total WMA Authorized Withdrawal	2007 Actual Withdrawals
New Bedford	11.5 mgd	18.27 mdg	2.52 mdg	20.79 mdg	12.63 mdg
Taunton	8.0 mgd	5.87 mdg	1.41 mdg	7.29 mdg	6.78 mdg
Fall River	11.5 mgd	0.0 mdg	0.0 mdg	0.0 mdg	0.0 mdg

(Source: O'Shea, MADEP, 2008) (mdg - Million gallons per day) Note: These figures from the DEP would indicate that though New Bedford's withdrawal was much less than its authorized withdrawal, the combined authorized withdrawal was somewhat greater than the established safe yield.

Lakeville had no guaranteed right to draw water from the Ponds until it was established as part of the Betty's Neck purchase agreement that Lakeville is entitled to one million gallons per day out of New Bedford's allotment. Currently the limit that Taunton can treat for Lakeville is 300,000 gallons per day which serves Le Baron Estates, Council on Aging, Library, Assawompset School, the Great Ponds Industrial Park and new development in the northeast part of town including Walgreen's and Wood's Edge. The availability of sufficient water and water pressure is a critical issue for priority development areas in the northwestern section of town. To solve the pressure problem, a project is underway to construct a water tower near the Transfer Station to be fed initially by the Town's allotment from the Ponds. The target completion date for the tower is February 2011.

The cities' water-withdrawal permits are due for renewal (originally scheduled for February 2010), the basis being a revised calculation of a safe yield from the ponds. Water taken from the Ponds by New Bedford and Taunton leaves the subwatershed and is not available to recharge Lakeville's water resources. The water Lakeville withdraws from private wells or from its allotment from the Ponds through Taunton's facility, or its potential town well at the well site, does not represent an inter-basin transfer. However, some of that water is lost to evaporation and runoff downstream from the Ponds. Septic systems do not necessarily recharge

the aquifers or groundwater in the same consistent manner as rainfall on a natural landscape; for example, there can be more rapid movement through disturbed ground to lakes and streams, and thence water is lost downstream in post-storm surges. Increased water usage facilitated by allotments and a town well may impact the safe yield from the ponds which are groundwater fed. Surface water, shallow wells, and deep wells are all part of an interconnected aquifer system. If water is removed from this system faster than it can be recharged by rainfall, the system is being mined and the levels of our rivers and ponds will be drawn down.

Excessive drawdown of groundwater has been shown to impact negatively the plant communities of coastal plain ponds, such as our Great Ponds. (See Section 4D Wildlife - Plant Communities.) This and the health of the Nemasket River and our groundwater wells should be taken into consideration as potential impacts of mining our water by DEP and the cities as they determine the total volume to be pumped from the ponds.

#### *4. Surface Water Supply Protection Zones*

Pursuant to the federal Safe Drinking Water Act (42 USC Section 300f et seq.), MA DEP regulations (310 CMR 22.00) establish surface water supply protection zones around drinking water supplies, and restrict new and expanded uses in these zones. 310 CMR 22.00 applies to public water systems serving 25 or more people.

Surface water supply protection zones for Lakeville are shown on the Water Resources Map. Zone A consists of all land within 400 feet from the bank of a Class A surface water source, as well as all land 200 feet from the banks of tributaries. New or expanded uses prohibited in these areas include underground storage tanks, and treatment and disposal works with exceptions. Zone B consists of all land within 1/2 mile from the surface water supply. Zone C includes the entire contributing area, or surface watershed, of a public water supply. In Lakeville, the Zone C for the Assawompset Pond Complex and Elders Pond encompasses roughly 1/2 of the town's land area, excepting only that land in the Buzzard's Bay, Assonet River, and Poquoy Brook drainages. In general, 310 CMR 22.00 restricts activities within water supply buffer zones to a greater degree when the drinking water withdrawal is new or expanded. This greater restriction on activities may be triggered if renewed Pond permits withdrawals increase permitted gallons per day.

#### *5. Public Access*

Public boating access to the Great Ponds is available at Long Pond, at a state boat ramp in adjacent Freetown, and at Loon Pond, at a small-boat (non-motorized) launch and fishing area within the town's Ted Williams Camp. A small-boat (non-motorized) launch area at Tamarack Park provides further access to the northern end of Long Pond. Motor boating, with a ten horsepower limit, in Assawompset and Pocksha Ponds is allowed only for shoreline landowners by special permit. Canoeing and kayaking in Assawompset and Pocksha are prohibited. No boating is allowed in Elders, Little Quittacas or Great Quittacas Ponds.



Public canoe launches for the Nemasket are provided at Old Bridge Street and Vaughan Street on town-owned conservation land.

The swimming area at Clear Pond is owned and operated by the Town of Lakeville Park and Recreation Department. Its availability depends on the ability of the Park Department to provide staffing and a life guard. Swimming in the water supply ponds (Assawompset, Pocksha, Little and Great Quittacas, and Elders) is prohibited.

#### 6. Flood hazard Areas

Areas within the 100-year floodplain, shown as Zone A on the Federal Emergency Management Agency's Flood Insurance Rate Maps (1980, 1984), are shown on the Water Resources Map. These floodplains generally surround the Assawompset Pond Complex and the Nemasket River, and are also mapped in areas surrounding Poquoy Brook and its tributaries, the unnamed stream valley between Elders Pond and Long Pond, and the Cedar Swamp River and its tributaries.

One hundred-year floodplains in Lakeville are protected by a Flood Plain Zoning District, which encourages non-intensive uses such as agriculture, forestry, and recreation; by 310 CMR 10.00, regulations for the Massachusetts Wetlands Protection Act; and by 310 CMR 15, Title 5.

#### 7. Wetlands

DEP's Wetlands Conservancy Program developed the most recent delineation of wetlands in Lakeville. Digital orthophotographs taken in 1996 and 1997 were printed with overlying wetlands boundaries delineated from 1993 photography. From these delineations, the following summary figures in Table 6 were generated.

**Table 6 Summary of wetland types and acreage as of 1993**

	Acres	% of Town
<b>Open Water</b>	4303.73	18.63
<b>Vegetated wetland:</b>		
Non-cultivated bog	38.21	
Cultivated cranberry bog	288.11	
Deep Marsh	220.72	
Marsh	73.66	
Shrub swamp	406.44	
Wooded swamp	2423.66	
Total vegetated wetland*	3451.00	14.94
Total open water/wetland	7754.74	33.57
Total upland	15347.48	66.43
Total area	23102.21	
Total land area (total area minus open water)	18798.48	81.36

Source: C. Costello, Wetlands Conservancy Program, MA DEP, 2000, Christine Odiaga, 2010

\* Here, "vegetated wetland" means wetland other than open water bodies.

In short, 33.57% of Lakeville's total area is wetland, 18.63% being open water, and 14.94% being vegetated wetland. 66.43% of Lakeville's is upland.

Wetlands in Lakeville are shown on the Water Resources Map. (These boundaries are for general planning purposes only, and do not take the place of on-site delineations.) The largest wetland, aside from the Ponds, is the forested Assonet Cedar Swamp, discussed in detail in the Vegetation section of this Plan. Other wetland areas occur throughout the town, both in areas surrounding stream courses and in isolated settings.

Cultivated cranberry bogs are an integral part of the landscape, economy, and ecological processes of southeastern Massachusetts. Cultivated cranberry bogs in Lakeville as of 1993 are shown on the Zoning and Land Use Map. The open, scenic value of bogs is referenced earlier, and the open water of the bog reservoirs provides habitat for a variety of fauna. However, these are heavily managed systems, and the historical and ongoing alterations have undoubtedly affected natural habitat in the vicinity of the bogs. Impoundments, for example, may have eliminated longer-distance fish movement in a particular drainage, although species with limited home ranges may still inhabit the reaches between impoundments (Hartel).

Historically, cultivated bogs were established on wetlands, where the peaty-mucky soils serve to trap agricultural chemicals. Newer bogs, however, built on mineral soils, must incorporate a confining layer of fine-grained particles such as silt or clay and an organic confining layer to inhibit leaching of materials beyond the bog environment (University of Massachusetts, 2000).

Several upland bogs in town have been converted back to dry land when house lots held more economic promise than cranberry bogs. However, this trend may be reversing as cranberry prices rebound.

The Lakeville Conservation Commission and the MA Department of Environmental Protection (DEP) have joint responsibility for reviewing development proposals in or near wetlands, including vernal pools officially certified by the NHESP. All of Lakeville's wetlands and certified vernal pools are under the protection of the MA Wetlands Protection Act, Title 5 of the Massachusetts Environmental Code, Section 401 of the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards related to Section 401, and the Massachusetts Forest Cutting Practices Act.

### *8. Groundwater*

Lakeville's groundwater resources provide a reliable water supply for the town's residences, businesses, and industries, through individual and small community wells. Using the average per capita daily consumption figure from 1992 for the Taunton River Basin (US Army Corps of Engineers, 1995), an estimated 1.2 million gallons is withdrawn each day for domestic purposes (119 gallons per day per capita times approximately

10,000 residents). In addition, as the Assawompset Pond Complex is largely groundwater-fed (Dayian), Lakeville's groundwater also, indirectly, supports Taunton's and New Bedford's needs, as well as those additional communities serviced by the cities' water delivery systems, totaling 19.41 million gallons per day in 2007 (O'Shea).

#### *a. Groundwater Availability*

Groundwater availability data are taken from Williams et al., 1973, Water Resources of the Taunton River Basin. Aquifer designations are based on a combination of transmissivity and yield. Transmissivity, measured in gallons per minute per foot of drawdown, is equal to hydraulic conductivity (assumed uniform) times saturated thickness (Studley).

Lakeville's high- and medium-yield aquifers are shown on the Water Resources Map. These aquifers occur in thick, uniform stratified drift (sand and gravel) deposits over deep bedrock valleys. Potentially productive high-yield aquifers, those that may yield greater than 300 gpm (0.43 mgd), occur in about 90 areas throughout the Taunton River basin, occupying a total area of only about 25 square miles, or 4.7% of the basin. In Lakeville, potentially productive high-yield aquifers occur generally at five locations: the upper Assonet/Cedar Swamp River watershed; the far lower reaches of the Assonet/Cedar Swamp River; part of Betty's Neck; a swath from Massasoit State Park to Assawompset Pond; and the area north of the Great Ponds Industrial Park between routes 495, 18, and 79.

Additional areas of potentially productive medium-yield aquifers (capable of yielding between 100 and 300 gpm, or between 0.14 and 0.43 mgd) occur in bands surrounding the high-yield areas. The remainder of Lakeville's groundwater supply is considered of moderate-low (25-100 gpm) or low (below 25 gpm) potential yield. These last sources are located in areas of poorly stratified drift, till, or bedrock.

#### *Groundwater Supply Protection Zones*

In addition to private wells, there are over 30 public groundwater wells (those serving 25 or more people) in Lakeville (MA GIS). Pursuant to the federal Safe Drinking Water Act (42 USC Section 300f et seq.), MA DEP regulations (310 CMR 22.00) establish groundwater supply protection zones around drinking water supplies and restrict new and expanded uses in these zones. Groundwater supply protection zones for Lakeville are shown on the Water Resources Map.

Public groundwater suppliers must own or control the area immediately surrounding the supply well. This area, termed Zone I, is calculated based on the approved yield:

required radius (in feet) =  $[\log (\text{approved yield gallons/day}) \times 150] - 350$ ,  
with a minimum Zone I radius of 250'.

For example, for a well drawing 100,000 gpd, the Zone I is a circle of 400' radius. Regardless of size, the regulations state that nothing but water supply-related activities shall occur within the Zone I.

Zone II is defined as the zone of contribution, or the capture zone, for a well. Delineation of a Zone II is determined through hydrologic modeling, and is required for supplies exceeding 100,000 gpd. There are no delineated Zone IIs in Lakeville.

In the absence of a delineated Zone II, an Interim Wellhead Protection Area (IWPA) is established and used for regulatory protection of community wells. An IWPA is calculated as follows:

required radius (in feet) =  $(32 \times \text{approved yield gallons/minute}) + 400$ ,  
with a maximum IWPA radius of 1/2 mile.

Non-transient non-community (NTNC) wells have a standard IWPA radius of 750', and transient non-community (TNC) wells have a standard IWPA radius of 500'.

Zone III is defined as the surface and ground watershed upgradient or cross gradient of a well. This designation is generally used for wells drawing over 100,000 gpd.

Every 10 years the DEP tests and adjusts the size of the zones.

The Source Water Assessment Program established in 1996 by the USEPA requires states to delineate all public drinking water sources that serve more than 25 people, to inventory the land uses within the protection zone, to assess its susceptibility to contamination and to publicize the results. A review of these results shows that almost all of Lakeville's public water sources are at risk due mostly to pavement or use of fertilizers and lawn chemicals within the protection zones. The 400-foot zone around the wellhead at the Apponequet High School is fenced off for protection, but the Freetown-Lakeville Middle School wellhead is considered highly susceptible to contamination. Protection of its groundwater, both its quality and its quantity, needs to be a high priority in the Town, especially in areas of high yield aquifers.

#### *Overlay District*

In 1982, a Water Resource Protection Overlay District to encompass the entire town was approved by voters at a Town Meeting. This overlay district, created to protect ground and surface water supplies, prohibits outdoor storage of hazardous materials.