

APPENDIX C

Soil Analysis Sections from 1985 Master Plan

A. Soil Conditions

Soil is a natural, three-dimensional body at the earth's surface which has distinct properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time (Pilgrim and Peterson, 1979). For the purposes of this report, soils in the Town of Hebron have been divided into seven categories based upon the similarity of characteristics, such as parent material, particle size, depth to bedrock and drainage. The classification of soils provides input as to the capability of an area to support development, including building foundations and filtering effluent from septic systems.

Soils data for Hebron was obtained from the Grafton County Soil Survey produced in 1939, with additional assistance from the U.S. Soil Conservation Service. It should be noted that the Grafton County Soil Survey was done primarily for agricultural purposes with special emphasis being given to those features influencing the adaptation of the land for growing crops, grasses and trees. A current soil survey utilizing modern soil survey techniques is not available for Hebron or for any of the Newfound area communities. Although the existing survey does not provide specific detail for planning purposes, it does provide valuable general information for land use planning.

The categories shown on the soils map are:

1. Wetlands Soils: Included in this group are the organic soils; Muck, Peat and Marsh; non-stony and very stony, poorly and very poorly drained mineral soils. The water table ranges typically at or near the ground surface from 5 to 9 months of the year. Some of these soils have standing water on them most of the year.
2. Seasonally Wet Soils: This group includes all moderately well drained soils. The water table rises within 1 - 25 feet from the ground surface in wet seasons.
3. Alluvial Soils on the Floodplains: This group includes all drainage classes that are of stream deposited materials subject to flooding. Some of these Flood Plain soils are also wetland soils. These few soils will appear in both categories, which are indicated on the map legend by cross-hatching.
4. Sand and Gravel Soils: These soils are excessively and well-drained soils on Glacial outwash and Stream Terraces consisting of stratified layers of sand and gravel. Outwash refers to deposition of material by melt water as it flowed from glacial ice.

5. Non-Hardpan Glacial Till Soils: This group includes the well-drained soils formed in material called glacial till. The till consists of varying amounts of different size fragments ranging in size from clay to boulders which were deposited directly from the glacier with little or no water transport.
6. Hard an Glacial Till Soils: This group includes the moderately well drained an well-drained soils formed in glacial till having a distinct compact hardpan layer which retards the downward movement of water.
7. Shallow to Bedrock Soils: This group includes somewhat excessively drained soils formed in glacial till. They are predominately shallow to bedrock soils intermingled with deeper soils. Outcrops are few to many.

For planning purposes, the above soil categories can be classed into three general groups according to their capacity to support development. The first group, which has the highest capability to support development, includes both sand and gravel soils and non-hardpan glacial till soils. These soils, due to high to medium permeability, can generally provide adequate treatment to septic tank effluent and can support construction activities.

The second group has moderate capability and consists of the soils formed on hardpan glacial till. The compact hardpan layer within these soils can prevent the proper movement and treatment of sewage effluent in the soil. It can also be an obstacle in construction. The last group includes wetland soils, soils which have a seasonably high water table and those with a shallow depth to bedrock. All have poor development potential. high water table and proximity of ledge to the surface present serious problems in the proper operation of leach fields and in construction operations.

The general soil groupings discussed above can be summarized as follows:

GROUP 1 SOILS: Slight Limitations

Sand and gravel soils
Non-hardpan glacial till soils

GROUP 2 SOILS: Moderate Limitations

Hardpan glacial till sails

GROUP 3 SOILS: Severe Limitations

Wetland soils
Seasonally wet soils
Shallow to bedrock soils

III. HEBRON SOIL INTERPRETATION AND LIMITATION FOR VARIOUS LAND USES

This section provides information relative to the degree of soil limitations for various land uses. The soil interpretations provide a prediction of the soils behavior under certain conditions. It provides a guide not a recommendation.

Three degrees of soil limitation are used for town planning purposes defined as follows:

GOOD -- rating given soils that have properties favorable for the (Slight) intended use. The degree of limitation is minor and can be overcome easily. Considered to have the best potential.

FAIR -- rating given soils that have properties moderately favorable (Moderate) for the intended use. Limitations can be overcome or modified by special planning, design, or maintenance. Considered to have intermediate potential.

POOR -- rating given soils that have one or more properties unfavorable (Severe) for the intended use. Generally requires major soil reclamation, special design, or intensive maintenance. Considered to have the poorest potential.

A rating of poor does not mean that a soil cannot be used for the intended use. However, it does mean that severe limitations exist that must be overcome with proper design or operation. It commonly is more expensive to develop soils with a severe limitation than those with good or fair limitations.

The following soil limitation information was prepared for specific land uses. On-site investigation of soil type and characteristics is essential for all development purposes as the existing soil classification is primarily for agricultural purposes. Also, some very desirable soil areas are too small in size or too irregular in shape, or their occurrence with less desirable soils forms a pattern too complex to be utilized for the intended use. Although not considered in the interpretations, these items should influence the final selection of sites.

A. Degree of Soil Limitation and Major Soil Features Affecting Town Planning

Septic Tank Absorption Field -- A septic tank absorption field is a soil absorption system for sewage disposal. It consists of a subsurface tile system laid in such a way that effluent from the septic tank is distributed

with reasonable uniformity into the natural soil. The successful operation of a septic tank system depends on the absorptive quality of the soil and the level of the water table during wet seasons. However, design, construction, and maintenance are just as critical as is the kind of soil being used for disposal. A rating of slight will not insure successful operation if improperly designed, installed, or continually used without maintenance. The major soil features affecting use for septic tank absorption fields are permeability of the soil, depth to water table, depth to bedrock or hardpan, steepness of slope, stoniness, rockiness, and hazard of flooding.

Sewage Lagoon -- A sewage lagoon is a shallow pond used to hold sewage for the time required for bacterial decomposition, the process of which is mainly biochemical. Sewage lagoons require consideration of the soil as a vessel for the impounded area and as soil material for the enclosing embankment. Major soil features affecting use for sewage lagoons are permeability of the soil, depth to bedrock, steepness of slope, stoniness, hazard of flooding and organic matter content.

Dwellings -(with basement) -- Ratings are for undisturbed soils on which single-family dwellings or other structures with similar foundation requirements can be built. Buildings are three stories or less and have basements that extend to a depth of at least 5 feet below ground level. Septic tank sewage disposal is not included in the ratings. The emphasis in rating soils for dwellings with basements is on the properties that affect foundations, such as density, plasticity, texture, and shrink-swell potential. Also considered beyond the effects related exclusively to foundations are slope, hazard of flooding, seasonal wetness, stoniness, rockiness, and depth to bedrock.

Dwellings (without basements) -- Dwellings without basements include cottages, summer homes, lodges, and service buildings. It is assumed that construction will be on a slab or on concrete, wood, or steel columns. Ratings are for undisturbed soils on which single-family dwellings (three stories or less) or other structures with similar foundation requirements are built. The same items affecting use for dwellings with basements apply to dwellings without basements. Potential frost action is an additional consideration for dwellings without basements. Interpretations for septic tank sewage disposal is not included in the ratings.

Lawns and Landscaping -- Ratings for lawns and landscaping are based on soil properties that affect the establishment and maintenance of lawns and shrubs. It is assumed that the lawns will be subject to moderate foot traffic and that fill or topsoil is not brought in. The major soil features affecting use for lawns and landscaping are texture of the surface soil and subsoil, depth

to water table, depth to bedrock, steepness of slope, stoniness, rockiness, and hazard of flooding.

Local Roads, Streets and Parking Lots -- Ratings apply to the use of soils for construction and maintenance of improved local roads, streets and parking lots that have all-weather surfacing--commonly of asphalt or concrete--and that are expected to carry automobile traffic all year. The major soil features affecting this use are depth to water table, steepness of slope, depth to bedrock, stoniness, rockiness, shrink-swell potential, potential frost action, and hazard of flooding.

Shallow Excavations (6 feet or less) -- These excavations require excavation or trenching to a depth of 5 or 6 feet. Limitation ratings for shallow excavations alone are insufficient for such uses as dwellings with basements, sanitary landfills, cemeteries, and underground utility lines. Additional soil features must be considered in evaluating soils for those uses. Major soil features affecting shallow excavations are depth to seasonal water table, steepness of slope, texture of soil to depth to be excavated, depth to bedrock, stoniness, rockiness, and hazard of flooding.

B. Degree of Soil Limitation and Major Soil Features Affecting Recreation Development

Camp Areas (Tent and Camp Trailers) -- Ratings apply to soils to be used for tent and camp trailers and the accompanying activities of outdoor living. It is assumed that little site preparation will be done other than shaping and leveling for tent and parking areas. Desirable areas should be suitable for heavy foot traffic and for limited vehicular traffic. Septic tank sewage disposal, street and access roads, and growing and maintaining vegetation was not considered in the ratings. Major soil features affecting this use are wetness, hazard of flooding, permeability, steepness of slope, surface soil texture, coarse fragments (2 mm to 3 inches) on the surface, stoniness and rockiness.

Picnic Areas (Park Type) -- Ratings apply to soils considered for use as park-type picnic areas. It is assumed that most vehicular traffic will be confined to access roads. Major soil features affecting this use are wetness, hazard of flooding, steepness of slope, surface soil texture, coarse fragments, stoniness and rockiness.

Playgrounds (Athletic Fields) -- Ratings apply to soils to be used intensively as playing fields or courts for baseball, football, volleyball, soccer, or other similar organized games in which soils are subject to heavy foot traffic. Soil suitability for growing and maintaining vegetation is not part of the ratings. Major soil features affecting this use are wetness, hazard of

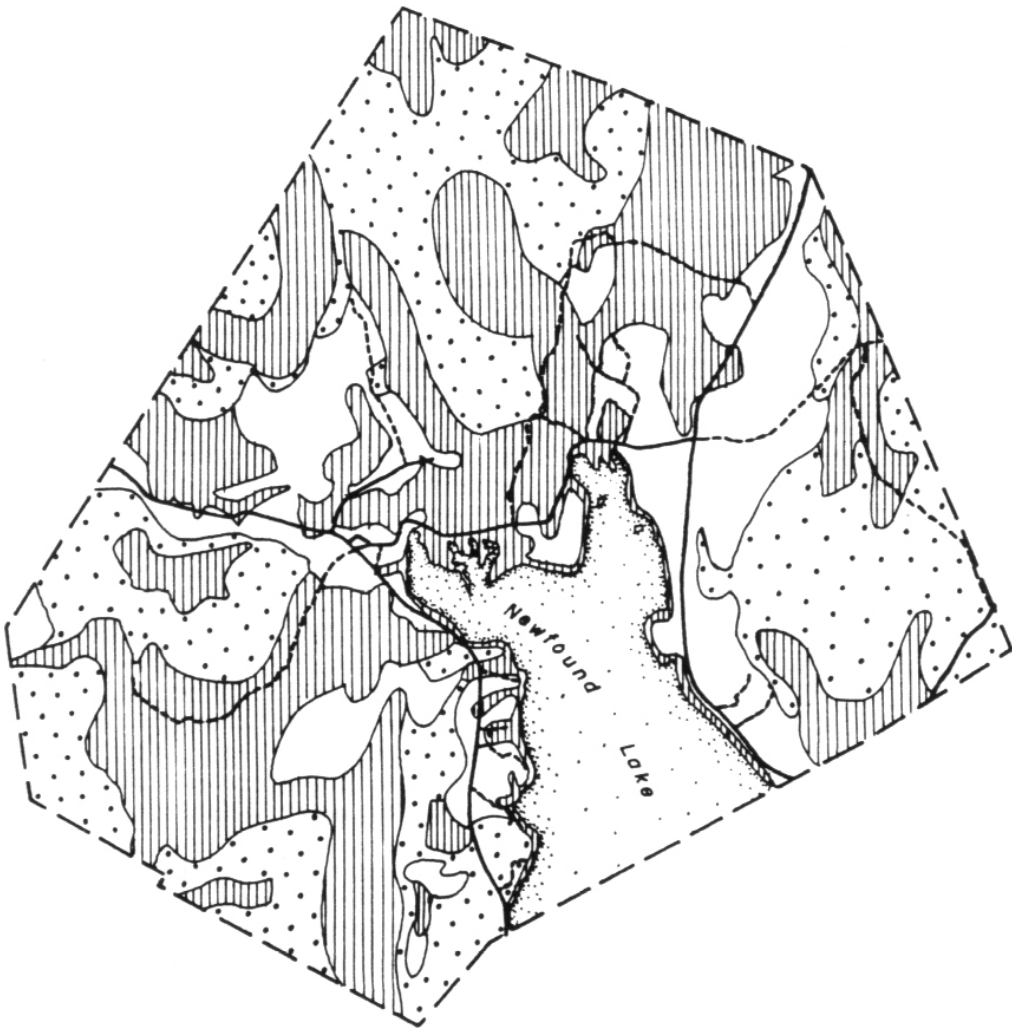
flooding, permeability, steepness of slope, surface soil texture, depth to bedrock, coarse fragments, stoniness and rockiness.

Paths and Trails (Hiking and Bridle) -- Ratings apply to soils to be used for local and cross-country footpaths and trails and for bridle paths. It is assumed that these areas will be affecting this use are wetness, hazard of flooding, steepness of slope, texture of surface soil, and stoniness or rockiness.

C. Septic Tank Absorption Field

The limitation for septic tank absorption fields are based on disposal of effluent from a septic system by means of a filter field. Ratings are based on year-round use. These interpretations will not eliminate the need for on-site investigations and study of specific sites for future design and construction.

Soil Suitability for Septic Tank Absorption Fields



LEGEND:

- GOOD
- FAIR
- ▨ POOR



TOWN OF HEBRON

PREPARED BY
LAKES REGION PLANNING COMMISSION
MEREDITH, NEW HAMPSHIRE

TABLE II - 3 SOIL LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELDS

| Items Effecting Use | Degree of Limitation | | |
|---|-------------------------|--------------------|--------------------------------|
| | Good (Slight) | FAIR (Moderate) | Poor (Severe) |
| Permeability (rate of volume movement of water) | Rapid-Mod. | Low end of Mod. | Slow |
| Percolation Rate | Faster than 45 min./in. | 45-60 min./in. | Slower 60 min./in. |
| Drainage Class | Well Drained | ---- | Mod. Well, Poorly, Very Poorly |
| Flood Hazard | ---- | ---- | Flood Hazard |
| Slope | 0-8% | 8%-15% | 15%+ |
| Depth to Bedrock (or Hardpan) | More than 72" | 48" - 72" | Less than 48" |

Rating the soils for septic systems were as follows: Permeability should be rapid to moderate; percolation rate not slower than 60 minutes per inch; well-drained; groundwater level at least 4 feet below during wet seasons; rock formations or other impervious layers, including hardpans, should be more than 4 feet below ground surfaces; slopes should be under 15%; no flood hazard; system not within 75 feet of a stream or any other water body.

The soils suitable for septic tank absorption fields are those with slight limitations. They are Agawam, Adams, Hinckley, Merrimacs, Gloucester, Colton, Danby and Hermon stony sandy loam. The Grafton County Soils description of Colton and Danby mention a bedded layer 36' from the surface. This bedded layer refers to alternating layers of sand and gravel, which have rapid permeability and pose no problem providing the slope is all right.

Rough stony Hermon was rated moderate because of its greater stone content along with rough stony Gloucester. Also, all soils suitable for septic systems but on an 8-15% slope were included in the moderate rating.

The problem soils and why rated severe:

Becket loam; Becket stony loam: permeability slow; percolation slow; also a hardpan layer about two feet below ground surface.

Rough Stony Becket: Same as Becket with a greater degree of slope and greater stone content.

Suffield silt loam: Permeability slow, seasonal water table 2 1/2-3 feet from ground surface.

Canaan loam: Depth 20", shallow over bedrock.

Canaan stony sandy loam: Same with rock outcrops.

Peru loam, stony loam: Hardpan 2' down, stones and boulders throughout soil, high water table (1-1 1/2' down).

Podunk fine sandy loam, silt loam: Soils on the flood plains, subject to flooding, seasonal high water table (1-1 1/2' down).

Ondawa fine sandy loam, sand loam, loamy fine sand: Subject to flooding.

Whitman stony loam, loam: Very poorly drained, a distinct hardpan present 2 feet down, half-bog soils in swale-like depressions in the uplands.

Muck: severe wetness, organic matter, ponded.

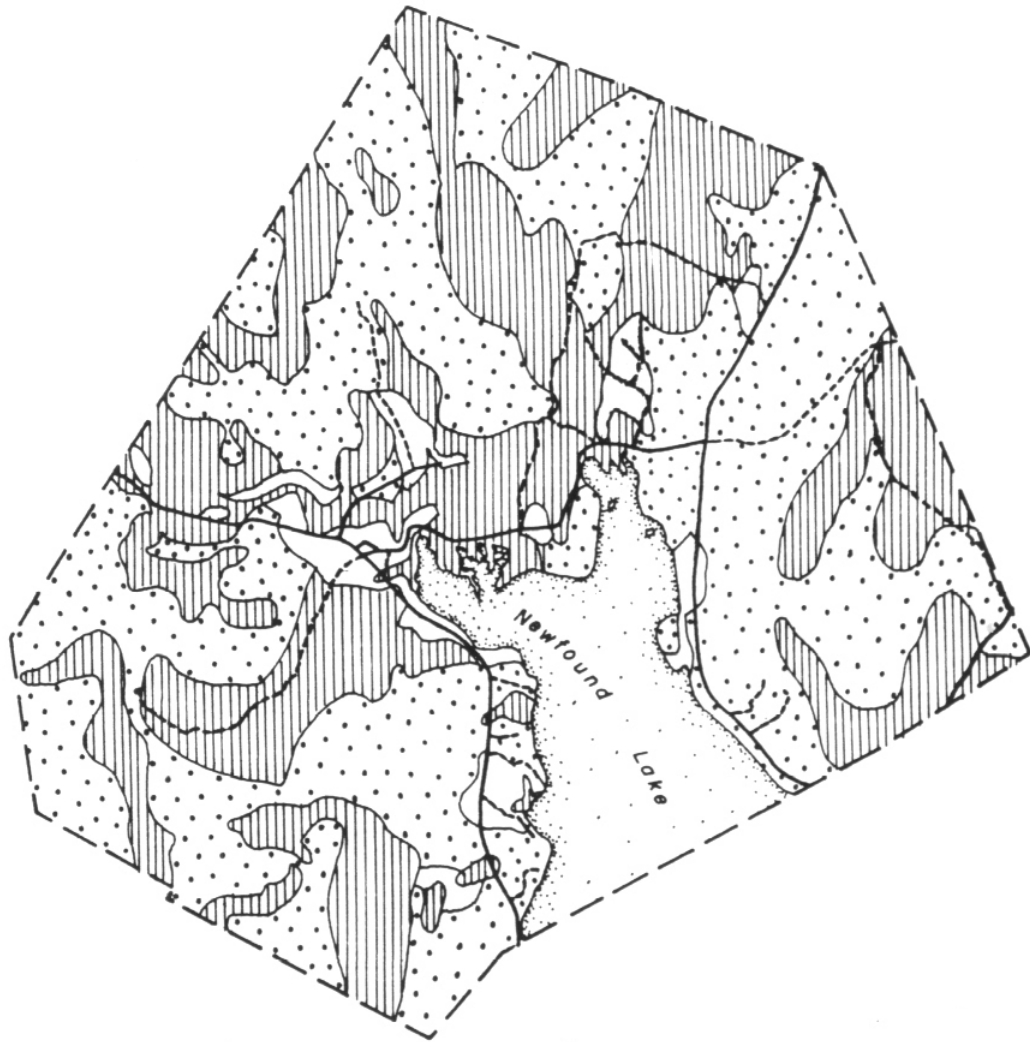
D. Dwellings with Basements

Ratings for dwellings with basements are based on the construction of buildings that are for year-round use and that have three stories or less with a basement at least 5 feet below the normal ground level. Specific locations of buildings require on-site investigations.

TABLE II – 4 SOIL LIMITATIONS FOR DWELLINGS WITH BASEMENTS

| Item | GOOD (Slight) | FAIR (Moderate) | POOR (Severe) |
|-------------------------------|--------------------------|----------------------------|--------------------------|
| Potential Frost Action | Low | Moderate | High |
| Drainage Class | Well Drained | Mod. Well | Poorly, Very Poor |
| Flood Hazard | --- | --- | Flood Hazard |
| Slope | 0 - 8% | 8 - 15% | 15%+ |
| Depth to Bedrock (or hardpan) | More than 60" | 40" - 60" | Less than 40" |

Soil Suitability for Dwellings with Basements



LEGEND:

- GOOD
- FAIR
- ▨ POOR



TOWN OF HEBRON

PREPARED BY
LAKES REGION PLANNING COMMISSION
MEREDITH, NEW HAMPSHIRE

The soil must be at least five feet to bedrock to rate slight for this use. Depth to bedrock or hardpan under 40 inches is severe. A high water table will increase the severity of potential frost action.

Soils suitable with slight ratings are Agawam, Adams, Coltons, Danby, Hinckleys, Merrimacs, Hermons and Gloucesters.

Becket soils are rated moderate because of its compact till layer at two feet below the surface which causes seepage problems. Also, soils where slopes are 8-15% are rated as moderate.

Suffield silt loam is rated moderate because of its moderate drainage and slow permeability due to the character of the compact clayey area 24-36 inches from the ground surface. Suffield has a three-foot water table, which causes the soil to have a moderate potential frost action.

Soils rated severe are:

Canaan: shallow to bedrock.

Peru: hardpan, high water table.

Podunk: flood hazard and seasonal high water table - potential frost action and shrink-swell problems with basements

Ondawa: flood hazard

Whitman: high water table; hardpan 2 feet below ground surface.

Muck: high water table, ponded area - severe potential frost action.

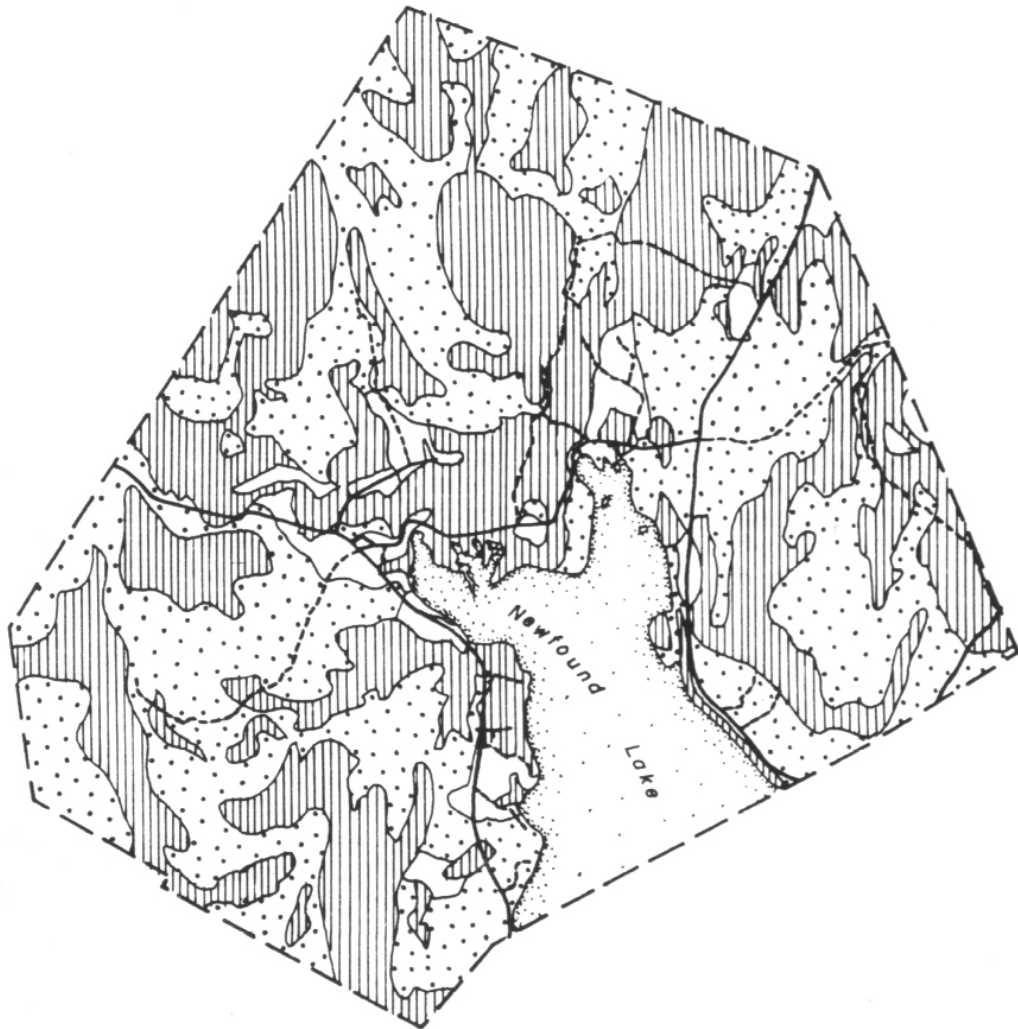
E. Streets and Roads

Ratings for roads, streets and parking lots take into account soil properties that limit locations and construction of roads in future subdivisions. Hard-surfaced pavements are assumed. Major highways are not considered. Specific road and street layout requires on-site investigation.

TABLE II - 5 SOIL LIMITATIONS FOR STREETS AND ROADS

| GOOD | FAIR | POOR | |
|------------------------|-----------------|-------------------|----------------------------|
| Item | (Slight) | (Moderate) | (Severe) |
| Potential Frost Action | Low | Moderate | High |
| Drainage Class | Well Drained | Mod. Drained | Poorly Drained & Very Poor |
| Flood Hazard | No Flood Hazard | Once in 5 yrs. | More than 1 in 5 Years |
| Slope | 0 – 3% | 3 - 8% | More than 8% |
| Depth to Bedrock | More than 40" | 20" - 40" | Less than 20" |

Soil Suitability for Streets & Roads



LEGEND:

- GOOD
- FAIR
- ▨ POOR



TOWN OF HEBRON

PREPARED BY
LAKES REGION PLANNING COMMISSION
MEREDITH, NEW HAMPSHIRE

Listed below are soils found in Hebron and their limitations for road construction. The most critical soils in this group are those with potential frost action, flood hazard soils and steep slope.

The soils with slight limitations are: Merrimacs, Coltons, Danbys, Hinckleys, Agawams, Gloucesters and Hermons.

Soils with moderate limitations besides a 3-8% slope rate are:

Peru: moderate depth and potential frost action.

Becket: because of depth to hardpan 2 feet down.

Suffield: moderate potential frost action and depth to water table.

The severe soils are:

Podunk: flood hazard; Whitman: high water table, half-bog soils;

Muck: severe wetness; Ondawa: flood hazard and Canaan: shallow over bedrock.

F. Description of Soils and Land Types

The following information provides a brief description of soil, basic land forms and major soil properties found within southern Grafton County. Their distribution is shown on the accompanying Town of Hebron soil map. The soils are listed alphabetically. The mapping symbol is listed along with the name of each soil type. Soils are subdivided into mapping units on the basis of stoniness and other factors which affect their use.

Adams Soils

| <u>Map Symbol</u> | <u>Soil Type</u> |
|-------------------|-----------------------|
| Ad | Adams loamy fine sand |

Deep, sandy, droughty soils of the outwash terraces. Generally more than 2% organic matter in the upper subsoil. The water table is generally more than 5 feet below the ground surface. Permeability is rapid.

Agawam Soils

| <u>Map Symbol</u> | <u>Soil Type</u> |
|-------------------|------------------------|
| Af | Agawam fine sandy loam |

Deep, well-drained soils of the stream terraces. The water table is generally more than 5 feet below ground surface. Water moves freely through the soil.

Becket Soils

| <u>Map Symbol</u> | <u>Soil Type</u> |
|-------------------|--------------------|
| Bt | Becket stony loam |
| Bl | Becket loam |
| RsBe | Rough stony Becket |

Deep, well-drained sandy soils of the uplands. Generally more than 2% organic matter in upper subsoil. A distinct hardpan is present at about 2 feet below ground surface. Water moves slowly through soil.

Canaan Soils

| <u>Map Symbol</u> | <u>Soil Type</u> |
|-------------------|---------------------------------|
| Ca | Canaan loam |
| Cd | Canaan stony sandy loam |
| Co loam | Canaan stony fine sandy loam |

Shallow, somewhat droughty sandy soils of the uplands. This soil is developed from shallow glacial till over bedrock in almost flat areas in the plateau tops. Generally have more than 2% organic matter in upper subsoil. Bedrock occurs at about 20 inches below ground surface. Downward water movement is restricted by bedrock.

Colton Soils

| <u>Map Symbol</u> | <u>Soil Type</u> |
|-------------------|----------------------------|
| Ct | Colton sandy loam |
| Cy | Colton loamy sand |
| Cg | Colton gravelly sandy loam |

Deep, droughty soils formed in layered sand and gravel. Colton series have more than 2% organic matter in the upper subsoil and they generally contain gravel near the ground surface. Water moves rapidly through the soil. The water table is usually more than 5 feet below the surface.

Danby Soils

| <u>Map Symbol</u> | <u>Soil Type</u> |
|-------------------|---------------------------|
| Dg | Danby gravelly sandy loam |

Danby gravelly, sandy loam, like the Hinckley soils, is developed on kames having a hummocky topography, but it occurs more commonly in valleys in

the northern part of the county where the climatic conditions are similar to those giving rise to the Colton soils on the associated terraces. Below a depth of 3 feet, in most places, this material becomes bedded and, in some places, it is composed of roughly assorted sand and water worn or rounded gravel. The sand grains are mostly quartz, whereas, the larger fragments are mainly schist or granite.

Gloucester Soils

| <u>Map Symbol</u> | <u>Soil Type</u> |
|-------------------|----------------------------|
| Gf | Gloucester fine sandy loam |
| G1 sandy loam | Gloucester stony fine |
| RsG | Rough stony Gloucester |

Deep, well-drained sandy soils of the uplands. The water table generally is more than 3 feet below the ground surface. Water moves freely through soil. These soils are commonly loose and, although stony, are easy to dig. They are rapidly permeable and somewhat droughty. Except for slope and stoniness, these soils have no serious limitations for most non-farm uses.

Hermon Soils

| <u>Map Symbol</u> | <u>Soil Type</u> |
|-------------------|-------------------------|
| Hr | Hermon stony sandy loam |
| RsH | Rough stony Hermon |

Deep, well-drained sandy soils of the uplands. Hermon soils usually have 2% organic matter in the upper subsoil. The water table is generally more than 3 feet below the ground surface. Water moves freely through soil.

Hinckley Soils

| <u>Map Symbol</u> | <u>Soil Type</u> |
|-------------------|------------------------|
| Hy | Hinckley loamy sand |
| Hg sandy loam | Hinckley gravelly fine |

Deep, droughty nearly level to very steep soils formed in deep layered sand and gravel. Gravel layers generally occur near the ground surface. The water table is generally more than 5 feet below the ground surface. Soils are droughty and very rapidly permeable. Entire subsoil is loose and porous enough for free movement of air, water and roots.

They have few limitations for most non-farm uses. Droughtness limits establishing and maintaining lawns and slope limits some non-farm uses.

Many areas of Hinckley soils are sources of sand and gravel for construction.

Merrimac Soils

| <u>Map Symbol</u> | <u>Soil Type</u> |
|-------------------|-------------------------|
| Ms | Merrimac sandy loam |
| Me | Merrimac loamy sand |
| MI loam | Merrimac gravelly sandy |

Deep, well-drained sandy soils formed in layered sand and gravel. Gravel layers generally occur at about 24 inches from ground surface. The water table is generally more than 5 feet below the ground surface. Water moves rapidly through the soil.

Muck

| <u>Map Symbol</u> | <u>Soil Type</u> |
|-------------------|------------------|
| Mu | Muck |

Muck consists of dark brown or almost black partly decomposed organic matter ranging in thickness from 2 to 5 or more feet. It contains some mineral material. In most places the muck is woody, but, in some places, it is developed from reeds and sedges. The reaction is highly acid. In stream bottoms the underlying material is gray sand, but in the uplands it is bluish-gray till. In some places this land is covered with coarse wild grasses, but in most places, it supports a growth of soft maple, willow and alder trees.

Ondawa Soils

| <u>Map Symbol</u> | <u>Soil Type</u> |
|-------------------|------------------------|
| On | Ondawa sandy loam |
| Os | Ondawa fine sandy loam |
| 01 | Ondawa loamy fine sand |

Nearly level, well-drained soils that formed in deep sand and are subject to occasional flooding. Soils are mostly on high bottoms along the Pemigewasset and Gunstock Rivers. Ondawa soils are rapidly permeable and usually supply adequate moisture for plants.

Ondawa soils commonly adjoin steep gravelly Hinckley soils and other soils along the rivers. They are members of a drainage sequence with moderately well-drained Podunk and the poorly drained Rumney soils. The water table is generally more than 3 feet below the ground surface.

Peru Soils

| <u>Map Symbol</u> | <u>Soil Type</u> |
|-------------------|------------------|
| P0 | Perunloam |
| Ph | Peru stony loam |

Deep, moderately well-drained loamy soils of the uplands. They generally have more than 2% organic matter in the upper subsoil. A distinct hardpan is present about 2 feet below ground surface. During wet season, the water table rises to within 1 1/2 to 2 feet of the ground surface. Water moves slowly through soil.

Podunk Soils

| <u>Map Symbol</u> | <u>Soil Type</u> |
|-------------------|------------------------|
| P1 | Podunk silt loam |
| Pf | Podunk fine sandy loam |

Deep, moderately well-drained soils of the flood plains. During wet seasons the water table rises to within 1 1/2 to 2 feet of the ground surface and water moves freely through the soil. These soils formed in deep, water-sorted sand. They are near large and small streams and are flooded annually. Present woody vegetation consists mostly of alder, willow and red maple. Permeability is rapid, available water capacity is moderate.

Suffield Soils

| <u>Map Symbol</u> | <u>Soil Type</u> |
|-------------------|--------------------|
| S1 | Suffield silt loam |

Deep, well-drained soils formed in silt and clay deposits. The water table is generally more than 3 feet below ground surface. Water moves slowly through soil. This soil occupies smooth or level terraces. Drainage is fairly good but is slightly retarded by the heavy character of the subsoil.

Whitman Soils

| <u>Map Symbol</u> | <u>Soil Type</u> |
|-------------------|--------------------|
| Wh | Whitman loam |
| Wo | Whitman stony loam |

Very poorly-drained loamy soils of the uplands. A distinct hardpan is present at about 2 feet below the ground surface. Whitman soils are completely saturated with water for most of the year. Water stands on the surface for most of the winter and spring. Water moves through the soil slowly. The mineral soils of the swamps are members of Whitman series.

