SURVEY OF HIGHWAY CONSTRUCTION MATERIALS IN THE TOWN OF LEMINGTON, ESSEX COUNTY, VERMONT

prepared by

Engineering Geology Section, Materials Division
Vermont Department of Highways

in cooperation with

United States Department of Transportation
Federal Highway Administration

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Acknowledgements

The work of this Project was greatly implemented by the cooperation and assistance of many groups and individuals. The following were particularly helpful in carrying out the Project's objectives.

1. Various departments and individuals of the Vermont State Department of Highways, notably the Planning and Mapping Division and the Highway Testing Laboratory.

2. Professor D. P. Stewart of Miami University, Oxford, Ohio.

3. Professor C. G. Doll, Vermont State Geologist, University of Vermont, Burlington, Vermont.

4. United States Department of Commerce, Bureau of Public Roads.

History

The Materials Survey Project was formed in 1957 by the Vermont State Department of Highways with the assistance of the United States Bureau of Public Roads. Its prime objective was to compile an inventory of highway construction materials in the State of Vermont. Prior to the efforts of the personnel of the Survey as described in this and other reports, searches for highway construction materials were conducted only as the immediate situation required. Thus only limited areas are surveyed, and no overall picture of material resources was available. Highway contractors or resident engineers are usually required to locate the materials for their respective projects and have samples tested by the Highway Testing Laboratory. The additional cost of exploration for construction materials is passed onto the State in the form of higher construction costs. The Materials Survey Project was established to minimize or elimate this factor by enabling the State and its contractors to proceed with information

on materials sources available beforehand. Prior knowledge of locations of suitable material is an important factor in planning future highways.

The sources of construction materials are located by this Project through ground reconnaissance, study of maps and aerial photographs, and geological and physiographic interpretation. Maps, data sheets, and work sheets for reporting the findings of the Project were designed with their intended use in mind. These maps and data sheets were devised to furnish information of particular use to the contractor or construction man. For maximum benefit, the maps, data sheets, and this report should be studied simultaneously.

Inclosures

Included in this folder are two surface-geology maps, one defining the location of tests conducted on bedrock sources, the other defining the location of tests conducted on granular materials. These maps are derived from 15-minute or 7½-minute quadrangles of the United States Geological Survey enlarged or reduced to 1:31250 or 1" = 2604'. Delineated on the Bedrock Map are the various rock types of the area. This information was obtained from numerous sources: Vermont Geological Survey Bulletins, Vermont State Geologist Reports, United States Geological Survey Bedrock Maps, and the Centennial Geological Map of Vermont, as well as other references.

The granular materials map depicts areas covered by various types of glacial deposits (outwash, moraines, kames, kame terraces, eskers, etc.) by which potential sources of gravel and sand may be recognized. This information was obtained primarily from a survey conducted by Professor D. P. Stewart of Miami University, Oxford, Ohio, who had been mapping the glacial features of Vermont during the summer months since 1956. Further

information was obtained from the Soil Survey (Reconnaissance) of Vermont conducted by the Bureau of Chemistry and Soils of the United States Department of Agricultrue, and from Vermont Geological Survey Bulletins, United States Geological Survey Quadrangles, aerial photographs, the Surficial Geologic Map of Vermont, and other sources. On both maps the areas tested are represented by Identification Numbers. Several tests are usually conducted in each area represented by an Identification Number, the number of such tests being more or less arbitrarily determined either by the character of the material or by the topography.

Also included in this folder are data sheets for both the Bedrock and Granular Materials Survey, which contain detailed information for each test conducted by the Project as well as information obtained from other sources, and including an active card file compiled by the Highway Testing Laboratory. The latter information was gathered over a period of years by many persons and consequently lacks the organized approach and detail required for effective use. The information on the cards varied widely in completeness. Transfer of information from the cards to the data sheets was made without elaboration or verification. When possible, the locations of the deposits listed in the card files have also been plotted on the maps; however, some cards in the file were not used because the information on the location of the deposit was incomplete or unidentifiable. Caution should be exercised wherever this information appears incomplete. This Project does not assume responsibility for the information taken from the card files.

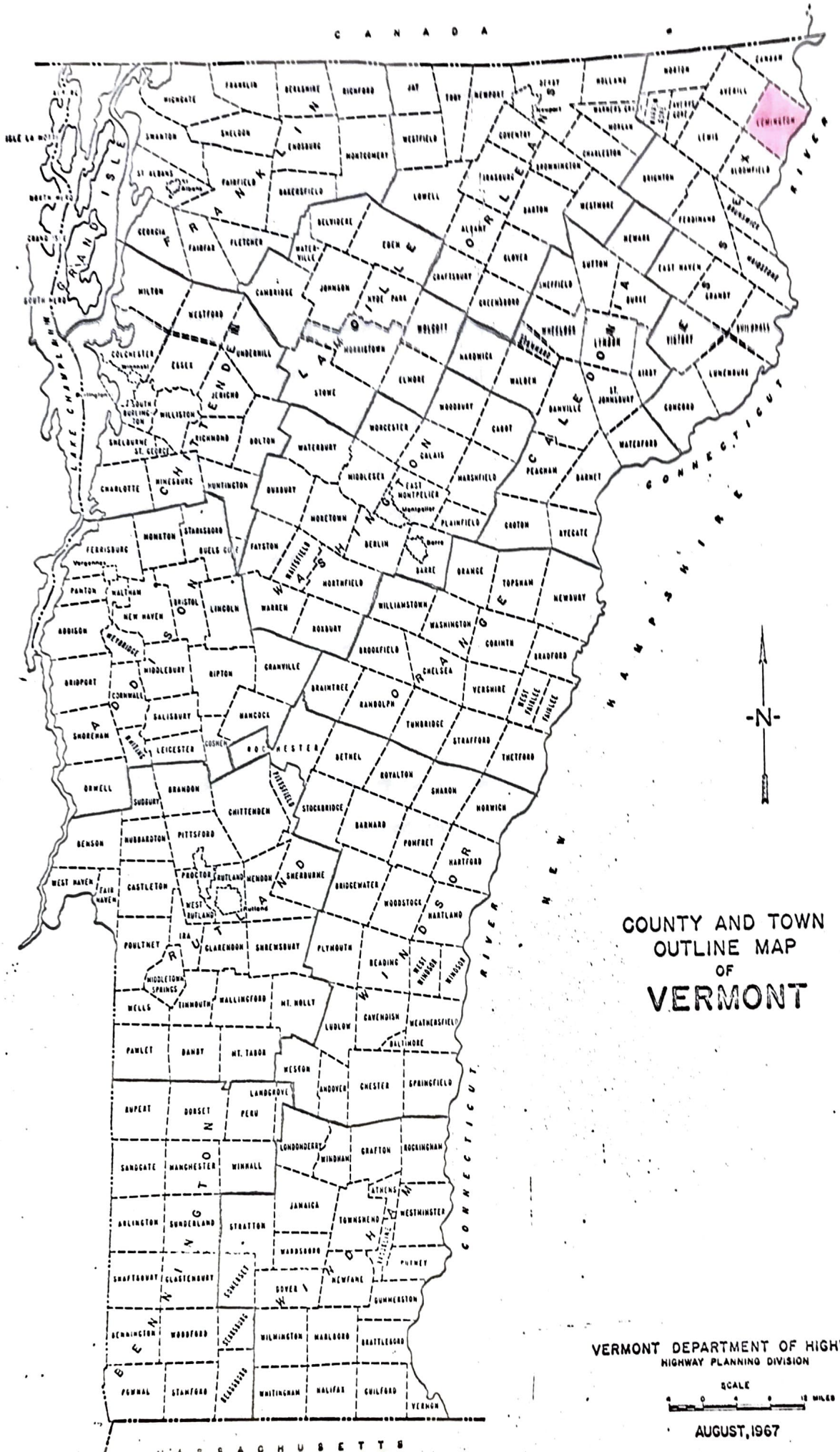
Work sheets contain more detailed information on each test and a detailed sketch of each identification Number Area. The work sheets and laboratory reports are on file in the office headquarters of this Project.

LOCATION

The town of Lemington is located in the northeast part of Essex County in the northeast part of the State. It is bounded on the southeast by the Connecticut River, on the southwest by Bloonfield, on the northwest by Averill and on the northeast by Canaan. (See County and Town Outline Map of Vermont on the following page.)

Lemington lies within the Northeastern Highlands Physiographic Subdivision of the New England Division of the Appalachian Highlands. The topography of Lemington is generally of rounded to steep relief. Monadnock Mountain is the dominant physiographic feature in the town with an elevation of 3, 140 feet at its summit. The lowest point in Lemington is less than 1,000 feet where the west bank of the Connecticut River crosses the Bloomfield Town Line.

Another noteworthy feature, in west-central Lemington, is an extensive post-glacial swampy area known as Meacham Swamp. Principal secondary drainage eastward into the Connecticut River is via Willard Stream and Mill, Blodgett and Clough Brooks. Fisher Brook drains a small portion of the west corner of the town southward into the East Branch of the Mulhegan River.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

VERMONT DEPARTMENT OF HIGHWAYS
HIGHWAY PLANNING DIVISION

SCALE
0 2 4 8 12 MILES

AUGUST, 1967

SURVEY OF ROCK SOURCES

Procedure for Rock Survey

The routine employed by the project in a survey of possible sources of rock for highway construction is divided into two main stages; office and field investigations.

The office investigation is conducted primarilty during the winter months and comprises the mapping and description of rock types as indicated in various reference sources. Many different sources of information are utilized, as indicated in the bibliography. These references differ considerably in dependability due to new developments and studies that have contributed to the obsolescense of a number of reports. In addition, the results of samples taken by other individuals are analyzed, and the location at which these samples were taken is mapped when possible. In other words, as complete a correlation as possible is made of all the information available concerning the geology of the area under consideration.

The field investigation is begun by making a cursory preliminary survey of the entire area. The information obtained in the preliminary survey, together with the information assimilated in the office investigation, is employed to determine the areas where testing and sampling will be concentrated. When a promising source has been determined by rock type, volume of material, accessibility, and adequate exposure and relief, chip samples are taken with a hammer across the strike or trend of the rock. The samples are submitted to the Material Testing Laboratory for abrasion testing both by the Deval Method (AASHO T-3) and the Los Angeles Method (AASHO T-96). It should be kept in mind that the samples taken by the chip method are often within the weathered zone of the outcrop and consequently may give a less satisfactory test result than fresh material deeper in the rock structure. When the material is uniform and acceptable abrasion tests result from the chip samples, the material source is included in this report as being satisfactory.

Discussion of Rock and Rock Sources

It should be noted that information on the Rock Materials Map is somewhat simplified. (For a more detailed description of the respective rock formations see the Summary included in this report.)

Occasionally, rocks belonging to the same formation and exhibiting similar characteristics (i.e. color, texture, etc.) may produce differing abrasion results owing to different physical and chemical properties. Therefore, in no case should a satisfactory test result of an area be construed to mean that the same formation, even in the same area, will not later produce unsatisfactory material. This is especially true of metamorphic rocks.

About 80% of the rocks that underlie Lemington township are metamorphosed sediments of the Gile Mountain formation. Generally speaking, the meta-sedimentary schist, phyllite and interbedded quartzite of this formation usually split into thin and elongate pieces unsuitable for Crushed Stone for Sub-base. The remaining 20% of the rocks underlying Lemington consist of an intrusive quartz syenite stock which was emplaeed in the vicinity of Monadnock Mountain.

Although this materials survey did not find any quarries in the township, freshly exposed quartz syenite was examined at the Norton mine about 500 feet above the east base of the mountain. A granitic segregation that would be a suitable source of Crushed Stone for Sub-base occurs on the mountain slope about one-half mile north of the mine.

SURVEY OF SAND AND GRAVEL SOURCES

Procedure for Sand and Gravel Survey

The method employed by the project in a survey of possible sources of sand and gravel for highway construction is divided into two main stages; office and field investigations.

The office investigation is conducted primarily during the winter months and comprises the mapping of possible potentially productive areas as indicated from various references. Of these references, the survey of glacial deposits mapped by Professor Stewart proves to be valuable, particularly when used in conjunction with other references such as soil-type maps, aerial photographs, and United States Geological Survey quadrangles. The last two are used in the recognition and location of physiographic features indicating glacial deposits and in the study of drainage patterns. In addition, the locations of existing pits are mapped when known. The locations in which samples were taken by other individuals are noted and mapped when possible.

The field investigation is begun by making a cursory preliminary survey of the entire town. All pits and other areas which show physiographic features that give evidence of glacial or fluvial deposition are noted. These locations are later investigated by obtaining samples of pit faces and other exposed materials. Test pits, dug with a backhoe to a depth of approximately 11 feet, are also sampled. The samples are submitted to the Materials Testing Laboratory where they are tested for gradation and stone abrasion, the latter by the Deval Method (AASHO T-4), and the Los Angeles Method (AASHO T-96).

Discussion of Sand and Gravel Deposits

Generally speaking, granular deposition in the town of Lemington can be classified in two categories, glacial till and glacio-fluvial. Probably at least 90 per cent of the town is blanketed with a thick layer of basal till which, according to D.P. Stewart, is thicker in the northeast highlands than in most of the other mountainous areas of Vermont. The Connecticut Valley however was the site of a narrow post-glacial lake. Glacio-fluvial deposition in the form of kame terraces and spillway gravels occur at a number of places in the northern Connecticut River Valley.

This survey determined that both sands and gravels suitable for granular aggregates occur in rather limited quantities adjacent to the Connecticut River Valley in Lemington. Most materials tested either contained too great a silt fraction or were too soft to meet abrasion requirements to be acceptable for Gravel for Sub-base. Probably the best proven source of this material is at Map Identification Nos. 3 and 4. At Map Identification No. 5 a large amount of Granular Borrow occurs that barely fails to meet abrasion requirements and/or has slight excesses that pass the No. 200 Mesh Sieve.

Where Sand Borrow and Cushion is concerned this survey found sources to be even more limited than those for Gravel for Sub-base. Permission to test an extensive pebbly sand deposit in the Connecticut River Valley north of the Columbia Bridge was denied. For the same reason a sand deposit northeast of Vermont Route 102 near the Canaan Town Line could not be sampled. The best proven source of Sand Borrow and Cushion in the town is at Map Identification Nos. 12 and 13. Detailed testing would be necessary to determine extent of the acceptable source at Map Identification No. 15.

SUMMARY OF ROCK FORMATIONS IN THE TOWN OF LEMINGTON

Gile Mountain Formation: gray quartz-muscovite phyllite or schist, interbedded and intergradational with gray micaceous quartzite, calcareous mica schist, and, locally, quartzose and micaceous limestone like that of the Waits River formation. The phyllite and schist commonly contain porphyroblasts of biotite, garnet, staurolite, and , locally, kyanite, andalusite or sillimanite.

Gile Mountain Formation amphibolite: hornblende-quartz-biotite chlorite rock.

White Mountain plutonic series: essexite; granite-biotite and hornblende; syenite-hornblende, biotite, quartz and augite; syenite porphyry-gray with feldspar phenocrysts.

GLOSSARY OF SELECTED GEOLOGIC TERMS

Cross-bedding: A diagonal arrangement of bedding in sedimentary rocks such that the layers are inclined at various angles to the more general planes of stratification or the formation contact. Sand-dune, river channel, and delta deposits commonly show cross-bedding on an extensive scale.

Dip: The angle which a stratum, sheet, vein, fissure or similar geological feature makes with a horizontal plane, as measured in a plane normal to the strike.

Glacio-fluvial: A term used to denote formation by or relation to streams within, upon or emerging from glacial ice.

Ice-contact: Refers to sediments which have accumulated in contact with stagnant or wasting ice. They assume the varied topographic forms expressed by eskers, kames, and kame terraces.

Interbedded: Occuring between beds or lying adjacent and parallel to other beds usually of a different nature.

Intrusive: Igneous rock which has cooled before reaching the earth's surface contains small to large visible grains-opposed to extrusive-solidifying at the surface and containing small unrecognizable grains.

Kame terrace: Stratified sands and gravels deposited by streams between a glacier and an adjacent valley wall.

Kamic: Relating to stratified drift deposited by glacial streams flowing in or on the ice at the sides or terminus of a glacier.

Meta: A prefix used before rock names to indicate that the minerals have been altered chemically and physically.

Phyllite: A fine-grained, foliated metamorphic rock intermediate between the mica schists and slates into which it may grade. The foliation is made possible by the development of a large amount of potash, mica, sericite, which also gives the rock a distinctive silvery appearance.

Quartzite: A compact metamorphic rock composed of quartz grains so firmly cemented that fracture takes place across the grains and the cementing material with equal ease.

Schist: A crystalline rock with a secondary foliation or lamination based on parallelism or platy, or needle-like grains. The name refers to the tendency to split along the foliation

Sediments: All kinds of deposits from the waters of streams, lakes or seas, and in a more general sense the deposits of wind and ice.

Segregation: In the strict sense a "segregation" is a concentration of one or more minerals that have grown together during the crystallization of a molten rock. It is restricted to concentrations of early crystallizing minerals in place and is to be distinguished from an injection, where the differentiate has undergone a change of position before consolidation.

Spillway gravel: Outwash gravel deposited in a valley that acted as a spillway for a melting glacier.

Stock: An irregular body of intrusive rock having a roughly conical or blunt cylindrical shape. Stocks cut across the enclosing rocks and many have steeply dipping contacts, along which characteristic metamorphism or ore deposition has occurred.

Syenite: A wholly crystalline rock, resembling granite in appearance, but containing little or no quartz. Syenites consist mainly of orthoclase, small amounts of acid plagioclase, and usually some dark mineral such as hornblende, biotite mica, magnetite and augite.

Till: An unsorted, unstratified and unconsolidated heterogeneous mixture of clay, silt, sand, gravel and boulders deposited directly by glacial ice.

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PARTIAL SPECIFICATIONS FOR HIGHWAY CONSTRUCTION MATERIALS

Listed below are partial specifications for Highway Construction Materials as they apply to this report at date of publication. For a complete list of specifications see Standard Specifications for Highway and Bridge Construction, approved and adopted by the Vermont Department of Highways in July, 1971.

DIVISION 700 - MATERIALS

Section 703.03, Soils and Borrow Materials

703.03 Sand Borrow and Cushion

Sand Borrow shall consist of material reasonably free from silt, loam, clay, or organic matter. It shall be obtained from approved sources and shall meet the requirements of the following table:

Table 703.03A - Gradation Requirements

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves Total Sample	Sand Portion
2"	100	
1½"	90-100	
½"	70-100	
No. 4	60-100	100
No. 100		0-30
No. 200		0-12

703.05 Granular Borrow

Granular Borrow shall be obtained from approved sources, consisting of satisfactorily graded, free draining, hard, durable stone and coarse sand reasonably free from loam, silt, clay, and organic material.

The Granular Borrow shall meet the requirements of the following table:

Table 703.05A - Gradation Requirements

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves Total Sample	Sand Portion
No. 4	20-100	100
No. 200		0-15

The maximum size stone particles of the Granular Borrow shall not exceed 2/3 of the thickness of the layer being spread.

Section 704, Aggregate

704.05 Gravel for Sub-base

Gravel for Sub-base shall consist of material reasonably free from silt, loam, clay, or organic matter. It shall be obtained from approved sources and shall meet the following requirements.

(a) Grading
The gravel shall meet the requirements of the following table:

Table 704.05A - Gradation Requirements

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves Total Sample	Sand Portion
No. 4	(20-60)	100
No. 100		0-18
No. 200		0- 8

The stone portion of the gravel shall be uniformly graded from coarse to fine, and the maximum size stone particles shall not exceed 2/3 the thickness of the layer being placed.

(b) Percent of Wear
The percent of wear of the gravel shall be not more than 25 when tested in accordance with AASHO T 4, or more than 40 when tested in accordance with AASHO T 96.

704.06 Crushed Stone for Sub-base

Crushed Stone for Sub-base shall consist of clean, hard, crushed stone, uniformly graded, reasonably free from dirt, deleterious material, pieces which are structurally weak and shall meet the following requirements:

(a) Source
This material shall be obtained from approved sources and the area from which this material is obtained shall be stripped and cleaned before blasting.

(b) Grading
This material shall meet the requirements of the following table:

Table 704.06A - Gradation Requirements

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves Total Sample
4½"	100
4"	90-100
1½"	25- 50
No. 4	0- 15

(c) Percent of Wear
The percent of wear of the parent rock shall be not more than 8 when tested in accordance with AASHO T 3, or the crushed stone a percent of wear of not more than 40 when tested in accordance with AASHO T 96.

(d) Thin and Elongated Pieces
Not more than 30 percent, by weight, of thin and elongated peices will be permitted.
Thin and elongated pieces will be determined on the material coarser than the No. 4 sieve.

(e) Filler

The filler shall be obtained from approved sources and shall meet the requirements as set up for Sand Cushion, Subsection 703.03.

(f) Leveling Material

The leveling material shall be obtained from approved sources and may be either crushed gravel or stone screening produced by the crushing process. The material shall consist of hard durable particles, reasonably free from silt, loam, clay or organic matter.

This material shall meet the requirements of the following table:

Table 704.06B - Gradation Requirements

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
	Total Sample
1"	100
3/4"	90-100
1/2"	50- 90
No. 4	30- 70
No. 100	0- 20
No. 200	0- 10

704.07 Grushed Gravel for Sub-base

Crushed Gravel for Sub-base shall consist of material reasonably free from silt, loam, clay or organic matter. It shall be obtained from approved sources and shall meet the following requirements:

(a) Grading

The crushed gravel shall be uniformly graded from coarse to fine and shall meet the requirements of the following table:

Table 704.07A - Gradation Requirements

Grading	Sieve Designation	Percentage by Weight Passing Square Mesh Sieves	
		Total Sample	Sand Portion
	4"	100	
Coarse	No. 4	25- 50	100
	No. 100		0- 20
	No. 200		0- 12
	2"	100	
	1½"	90-100	
Fine	No. 4	30- 60	100
	No. 100		0- 20
	No. 200		0- 12

(b) Percent of Wear

The percent of wear of the parent gravel shall be not more than 20 when tested in accordance with AASHO T 4, or the crushed gravel a percent of wear of not more than 35 when tested in accordance with AASHO T 96.

(c) Fractured Faces

At least 30 percent, by weight, of the stone content shall have at least one fractured face.

Fractured faces will be determined on the material coarser than the No. 4 sieve.

704.09 Dense Graded Crushed Stone for Sub-base

Dense Graded Crushed Stone for Sub-base shall consist of clean, hard, crushed stone, uniformly graded, reasonably free from dirt, deleterious material and pieces which are structurally weak, and shall meet the following requirements:

(a) Source

This material shall be obtained from approved sources and the area from which this material is obtained shall be stripped and cleaned before blasting.

(b) Grading

This material shall meet the requirements of the following table:

Table 704.09A - Gradation Requirements

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
	Total Sample
3½"	100
3"	90-100
2"	75-100
1"	50- 80
½"	30- 60
No. 4	15- 40
No. 200	0- 10

(c) Percent of Wear

The percent of wear of the parent rock shall be not more than 8 when tested in accordance with AASHO T 3, or the crushed stone a percent of wear of not more than 40 when tested in accordance with AASHO T 96.

(d) Thin and Elongated Pieces

Not more than 30 percent, by weight, of thin or elongated pieces will be permitted.

Thin and elongated pieces will be determined on the material coarser than the No. 4 sieve.

704.10 Gravel Backfill for Slope Stabilization

Gravel Backfill for Slope Stabilization shall be obtained from approved sources, consisting of satisfactorily graded, free draining, hard, durable stone and coarse sand reasonably free from loam, silt, clay, and organic material.

The gravel backfill shall meet the requirements of the following table:

Table 704.10A - Gradation Requirements

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves	
	Total Sample	Sand Portion
No. 4	20-50	100
No. 100		0- 20
No. 200		0- 10

The stone portion of the gravel backfill shall be uniformly graded from coarse to fine, and the maximum size stone particles shall not exceed 2/3 the thickness of the layer being placed.

704.11 Granular Backfill for Structures

Granular Backfill for Structures shall be obtained from approved sources, consisting of satisfactorily graded, free draining granular material reasonably free from loam, silt, clay, and organic material.

The granular backfill shall meet the requirements of the following table:

Table 704.11A - Gradation Requirements

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves	
	Total Sample	Sand Portion
3"	100	
2½"	90-100	
No. 4	50-100	100
No. 100		0- 18
No. 200		0- 8

LEMINGTON GRANULAR DATA SHEET NO.1

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						2"	1½"	½"	#4	#100	#200			
1	1	1971	1.5-8	0-1.5	no	64	57	43	32	18	12	26.9%	Gran. Borrow (Grav.)	Owners: G.R. and R.C. Covell Area comprises a long terrace, probably kamic in origin, against Monadnock Mountain roughly N.85°W. of the owner's farm buildings. It is reached via field roads and is about 0.61 mile from Vermont Route 102 at point 0.5 mile north of junction with Vermont Route 26. Test No. 1 was near woods at west side of field at point N.45°W. of Colebrook, N.H. church steeple. Material is: 0-1.5, sod; 1.5'-8', coarse gravel with many sub-angular cobbles; bottom, cobbles and boulders.
2	1	1971	1-8	0-1	no	76	64	51	39	17	10	25.2%	Gran. Borrow (Grav.)	Owners: G.R. and R.C. Covell Area consists of a lobate terrace S.75°W. of the owner's farm buildings. It is reached via field roads and is about 0.42 mile from Vermont Route 102 at point 0.5 mile north of junction with Vermont Route 26. Test No. 1 was near west edge of terrace at point N.45°W. of Colebrook, N.H. church steeple. Material is: 0-1', sod; 1'-8', very cobbly gravel; bottom, compact gravel.
3	1A	1971	2-11	0-2	yes	96	75	60	49	9	6		Gravel	Owners: G.R. And R.C. Covell Area is a long pit west of Vermont Route 102 and extension in terrace to northwest. Pit entrance is 0.12 mile north of Vermont Route 102

LEMINGTON GRANULAR DATA SHEET NO. 2

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						2"	1½"	¼"	#4	#100	#200			
														junction with Vermont Route 26. Material formerly excavated from this pit was seen at the site of a new shopping center in Colebrook south of the east approach to the Vermont Route 26 bridge crossing the Connecticut River. Test No. 1A was in upper northwest face of pit where gently northward dipping beds occur. Material is: 0-2', sod and silt; 2'-11', coarse-to fine-sandy gravel that becomes finer with depth.
	1B	1971	11-40		yes	66	63	52	42	12	4	19.6%	Gravel	Test No. 1B was in middle of northwest face below Test No. 1A. Material is: 11'-40', sand and gravel.
	1C	1971	40-48		yes	87	73	57	47	11	6	27.4%	Gran. Borrow (Grav.)	Test No. 1C was in lower northwest face below Test No. 1B. Material is: 40'-48', sand, gravel and cobbles.
	2	1971	0-10		yes	90	84	71	61	9	6	29.6%	Gran. Borrow (Grav.)	Test No. 2 was in floor at northwest end of pit. Material is: 0-10', eastward dipping sandy cobbly gravel.
	3	1971	1-10	0-1	no	81	70	53	44	12	8	23.4%	Gravel	Test No. 3 was located on crest of ridge at point 160 feet due north of Test No. 1A. It represents northwestward extension of pit. Material is: 0-1', sod; 1-10', coarse to fine sandy gravel.
	4A	1971	1-4	0-1	no			100	97	45	28	----	----	Test No. 4 was dug in center of a field below and 300' due west of Test No.3. Material is: 0-1', sod;

LEMINGTON GRANULAR DATA SHEET NO.3

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1½"	½"	#4	#100	#200	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
	4B	1971	4-7.5		no	83	83	72	63	34	25	17.7%	----	1'-4', brown medium sand. Test No. 4B was in test hole below Test No. 4A. Material is: 4'-7.5', fine gravel; 7.5'-9',sand (not tested.)
4	1A	1971	4-10	0-4	yes	78	70	51	40	12	8	18.9%	Gravel	Owners: G.R. and R.C. Covell Area is a pit west of Vermont Route 102 at point 0.17 mile north of its junction with Vermont Route 26. Owners would allow no tests in ridge northeast of pit as they plan to build houses there. Test No. 1A was in center of northwest face of pit. Material is: 0-0.5', sod; 0.5'-4', stony silt-clay; 4'-10', dusty cobbly gravel.
	1B	1971	10-17		yes	76	66	55	42	12	7	-----	Gravel	Test No. 1B was in lower northwest pit face below Test No. 1A. Material is: slightly cemented, sandy coarse gravel with a boulder from 10'-17' on face.
	2	1971	random		yes		100	93	88	12	6	----	Sand	Test No. 2 was taken in a sand seam at center of left end of northwest pit face. Beds are roughly horizontal.
	3	1971	1-10	0-1	yes	78	71	63	56	16	8	19.2%	Gravel	Test No. 3 was in floor at north end of pit. Material is: 0-1', silt and stones (not in place); 1'-10', gravel and cobbly sand layers.
5	1	1971	2-5.5	0-2	no	91	71	57	42	14	10	------	Gran. Borrow (Grav.)	Owner: Nelson Holbrook Area is a long terrace north of owner's farm buildings. It is

LEMINGTON GRANULAR DATA SHEET. NO. 4

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						2"	1½"	½"	#4	#100	#200			
														reached by field road west of Vermont Route 102 at point 0.9 mile north of junction with Town Highway No. 4. Best place for a pit would be in face of terrace 300 feet west of gate to field. Test No. 1 was at extreme north end of terrace. Material is: 0-1', sod; 1'-2', orange silt; 2'-5.5', sandy gravel; bottom, boulders.
	2	1971	1-10	0-1	no	72	65	48	32	16	12	25.4%	Gran. Borrow (Grav.)	Test No. 2 was on terrace 500' S.65°W. of Test No. 1 and 35' north of tree in rock pile. This is probably material of ice-contact origin. Material is: 0-1', sod; 1'-10', sandy gravel bottoming in same.
	3	1971	1-10	0-1	no	75	71	53	37	14	10	26.2%	Gran. Borrow (Grav.)	Test No. 3 was on terrace 500' S.65°W. of Test No. 2. Material is: 0-1', sod; 1'-10', sandy bouldery gravel.
	4A	1971	1-6	0-1	no	73	66	58	49	7	5	26.1%	Gran. Borrow (Grav.)	Test No. 4A was on terrace 500' S.65°W. of and 45' below Test No. 3. Material is: 0-1', sod; 1'-6', sandy gravel.
	4B	1971	6-9		no			100	95	7	3	----	Sand	Test No. 4B was in test hole below Test No. 4A. Material is: 6'-9', sand; bottom, sand.
6	1A	1971	1.5-17	0-1.5	yes	69	57	38	28	12	9	25.2%	Gran. Borrow (Grav.)	Owner: Nelson Holbrook Area is the north part of a pit west of Vermont Route 102 at point 0.59 mile north of its junction with Town Highway No. 4.

LEMINGTON GRANULAR DATA SHEET NO. 5

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1½"	½"	#4	#100	#200	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
	1B	1971	17-34		yes			100	99	13	5	--------	Sand	Test No. 1A was in upper west face of pit just north of Redmon Gorman property line. Material is: 0-1.5', sod, silt and stones; 1.5-7', cobbly coarse gravel; 7'-17', sandy gravel. Test No. 1B was in lower west face of pit above upper level floor. Material is: 17'-34', clean medium-coarse sand.
	2	1971	0.5-10	0-0.5	yes	100	93	93	92	19	6	--------	Sand	Test No. 2 was in west pit floor, 15 feet N.75°E. of Test No. 1B. Material is: 0.5'-10', sand; bottom, sand.
7	1	1971	2-9	0-2	yes	100	87	80	73	9	4	------	Gran. Borrow (Sand)	Owner: Redmon Gorman Area is the south part of a pit west of Vermont Route 102 at point 0.59 mile north of its junction with Town Highway No. 4. Test No. 1 was in southwest face above lower floor. Material is: 0-2', silt and cobbles; 2'-9', medium sand with layer of cobbles.
	2	1971	0.5-10	0-0.5	yes			100	99	59	23	--------	- --	Test No. 2 was in lowest floor. Material is: 0-0.5', pebbly silt (not in place.); 0.5'-10', fine sand to silt.
	3	1971	29-38		yes	68	63	51	41	14	11	25.2%	Gran. Borrow (Grav.)	Test No. 3 was in lower westernmost face of pit. Material is probably ice-contact in origin. Log of test: 29'-38', dirty fine gravel, finer with depth.

LEMINGTON GRANULAR DATA SHEET NO. 6

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1½"	½"	#4	#100	#200	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
	4	1971	3-10	0-3	no	79	75	60	43	18	14	29.1%	Gran. Borrow (Grav.)	Test No. 4 was in field above and 135 feet due west of westernmost pit face. Material is: 0-1', sod; 1'-3', gray silt; 3'-10', dirty medium gravel.
	3A	1971	1-5	0-1	yes	71	71	47	33	11	7	25.0%	GGravel	Test No. 3A was in upper westernmost face of pit. Material is: 0-1', sod; 1'-5', coarse gravel.
	3B	1971	5-18		yes	100	93	73	59	13	10	28%	Gran. Borrow (Grav.)	Test No. 3B was in westernmost face of pit below Test No. 3A. Material is: 5'-18', interbedded fine gravel to pebbly sand.
8	1A	1971	1.5-5.5	0-1.5	no	75	69	47	33	25	13	27.4%	Gran. Borrow (Grav.)	Owner: Redmon Gorman Area is highest terrace due west of owner's farm buildings. Test No. 1A was 10 feet from fence at point 220 feet N.25°W. of largest pine. Material is: 0-1.5', sod and silt; 1.5-2', gravel; 2-3.5', sand; 3.5'-5.5',gravel; 5.5'-8', silty sand.
	1B	1971	5.5-8		no	100	94	90	85	83	67	----	----	
9	1	1971	2.5-10	0-2.5	no	88	79	63	52	20	15	31.1%	Gran. Borrow (Grav.)	Owner: Redmon Gorman Area is bottom of slope enclosed by corral west-southwest of owner's barn. He suggested it as a possible pit site. Test No. 1 was near southeast corner of field. Material is: 0-1', sod; 1'-2.5', silt and stones; 2.5'-4', silty gravel; 4'-7', sand; 7'-10', cobbly gravel.
10	1	1971	1-10	0-1	No	76	62	50	39	13	7	29%	Gran. Borrow (Grav.)	Owner: Redmon Gorman Area is long field slightly above level of Vermont Route 102. Access

LEMINGTON GRANULAR DATA SHEET NO. 7

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						2"	1½"	½"	#4	#100	#200			
														to field is via gate in wire fence at point 0.43 mile north of Town Highway No. 4. Test No. 1 was on knoll in field at point S.50°W. of barn. Material is: 0-1', sod; 1'-10', cobbly gravel that is coarser with depth.
	2	1971	1-6	0-1	no				100	96	91	-----	----	Test No. 2 was at southwest corner of field 660 feet S.40°W. and 10 feet below Test #1. Material is: 1'-6', silty very fine sand or silt; 6'-8'+, silt-clay.
11	1	1971	1.5-7	0-1.5	no	93	88	60	40	13	8	26.2%	Gran. Borrow (Grav.)	Owner: Ed Daley Area is a large field west of owner's farm buildings and town clerk's residence at junction of Vermont Route 102 with Town Highway No. 4. Owner would only permit limited testing along edge of woods and probably would not make material available in near future. Test No. 1 was at south edge of field. Material is: 0-0.5', sod; 0.5'-1.5', silt and stones; 1.5'-7', very compact medium-coarse gravel, finer with depth. Water occurred at 6.0'.
	2	1971	2-8.5	0-2	no	83	75	65	55	9	6	36.8%	Gran. Borrow (Grav.)	Test No. 2 was at south end of field under utility line about 400 feet northeast of Test No. 1. Material is: 0-0.5', sod; 0.5'-2', sandy silt; 2'-8.5', compact medium coarse gravel.
12	1A	1971	7-10.5	0-7	yes	89	82	60	46	10	8	28%	Gran. Borrow (Grav.)	Owner: Brandon Perron. Area consists of the north of two pits west of Vermont Route 102 and opposite Columbia Bridge across

LEMINGTON GRANULAR DATA SHEET NO. 8

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1½"	½"	#4	#100	#200	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
														the Connecticut River. Pit truncates an extensive kamic feature to the west. Test No. 1A was in upper north face of pit and represents northwest direction of possible extension. Material is: 0-7', cross-bedded sand and silt seams; 7'-10.5', poorly consolidated fine gravel; bottom, sand.
	1B	1971	10.5-27		yes	100	95	91	87	7	5	--------	Sand	Test No. 1B was in lower north face of pit below Test No. 1A. Material is: 10.5-27', moderately westward dipping sand and pebbly sand beds.
	2	1971	0-5		yes			100	98	50	39	----	----	Test No. 2 was in floor of pit 25 feet east of Test No. 1B. Material is: 0-5', interbedded sand and silt seams that dip northwest.
	3	1971	3-8	0-3	no	86	83	55	37	19	13	21.2%	Gran. Borrow (Grav.)	Test No. 3 was on top of feature near utility line about 700 feet west of pit. Material is: 0-1', sod; 1'-3', silt and stones; 3'-8', clean gravel.
	4	1971	2-8.5	0-2	no	85	76	52	39	20	14	27.1%	Gran. Borrow (Grav.)	Test No. 4 was about 750' southwest of Test No. 3 near field roads' intersection. Material is: 0-2', sod and silt; 2'-8.5', coarse sandy gravel.
13	1	1971	0-10	--	yes		100	97	95	10	6	-------	Sand	Owner: Brandon Perron Area consists of the south of two pits west of Vermont Route 102 and opposite Columbia Bridge across the Connecticut River.

LEMINGTON GRANULAR DATA SHEET NO. 9

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1½"	½"	#4	#100	#200	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
	2	1971	1-9	0-1	no	86	80	61	46	15	11	23.8%	Gran. Borrow (Grav.)	Extension is to west. Test No. 1 was in southwest floor of pit. Material is: 0-10', medium-fine sand with a few stones. Test No. 2 was in possible extension 150 feet southwest of pit. Material is: 0-1', sod; 1'-9', sandy cobbly gravel. Test No. 3A was in upper southwest face of pit. Material is: 0-1', sod, silt and stones; 1'-11', medium to fine gravel; 11'+, sand.
	3A	1971	1-11	0-1	yes	97	87	62	48	12	9	22.6%	Gran. Borrow (Grav.)	
14	1	1971	1-10	0-1	no	100	90	89	87	56	33	--------	-----	Owner: Brandon Perron Area is the southwest end of same feature tested at Map Identification No. 12. Test No. 1 was 35 feet north of property line. Material is: 0-1', sod; 1'-8', silt-sand; 8'-10', coarse sand.
15	1	1971	1.5-9.5	0-1.5	no	71	65	52	41	9	6	27%	Gran. Borrow (Grav.)	Owners: Poisson and Robertson. Area is a field south of Map Ident. Nos. 13 and 14 with kame terrace in northwest part. Test No. 1 was on terrace at point 125 feet N.60°W. of utility pole No. 4A/110. Material is: 0-0.5', sod; 0.5'-1.5', silt; 1.5'-9.5', dirty to sandy gravel. Test No. 2 was in field below knoll at point 380 feet S.10°W. of Test No. 1 and 75 feet No.35°W. of utility pole No.4A/111. Material is: 0-1', sod; 1'-3', silty fine sand; 3'-6', fine sand; 6'-9', pebbly coarse sand; 9'-11', fine sand.
	2	1971	3-11	0-3	no			100	97	8	4	------	Sand	

LEMINGTON GRANULAR DATA SHEET NO. 10

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						2"	1½"	½"	#4	#100	#200			
16	1	1971	0-4	----	yes	73	66	50	35	17	12	31.6%	Gran. Borrow (Grav.)	Owner: Mrs. Joseph Daley. Area is a pit east of Town Highway No. 5 at point 0.26 mile north of junction with Town Highway No.4. Test No. 1 was in center of floor. Material is: 0-4', coarse cobbly gravel. Water was encountered at 3'.
	2	1971	6.5	?	yes	68	61	50	40	29	23	31.3%	-----	Test No. 2 was in lower east face of pit. Material tested was lowest 6.5' of face.
17	1	1971	2-9	0-2	yes			100	53	16	6	----	Gran. Borrow	Owner: Redmon Gorman Area is a pit in forested gentle hillside west of Town Highway No. 4 at point 0.22 mile south of junction with Town Highway No. 7. Test No. 1 was in center of northwest face of pit. Material is: 0-2', sod and stony silt; 2'-4', silty cobbly gravel; 4'-8', moist fine sand with silt; 8'-9', dark wet medium sand; bottom, silt-clay.

TABLE I
Supplement

LEMINGTON PROPERTY OWNERS - GRANULAR

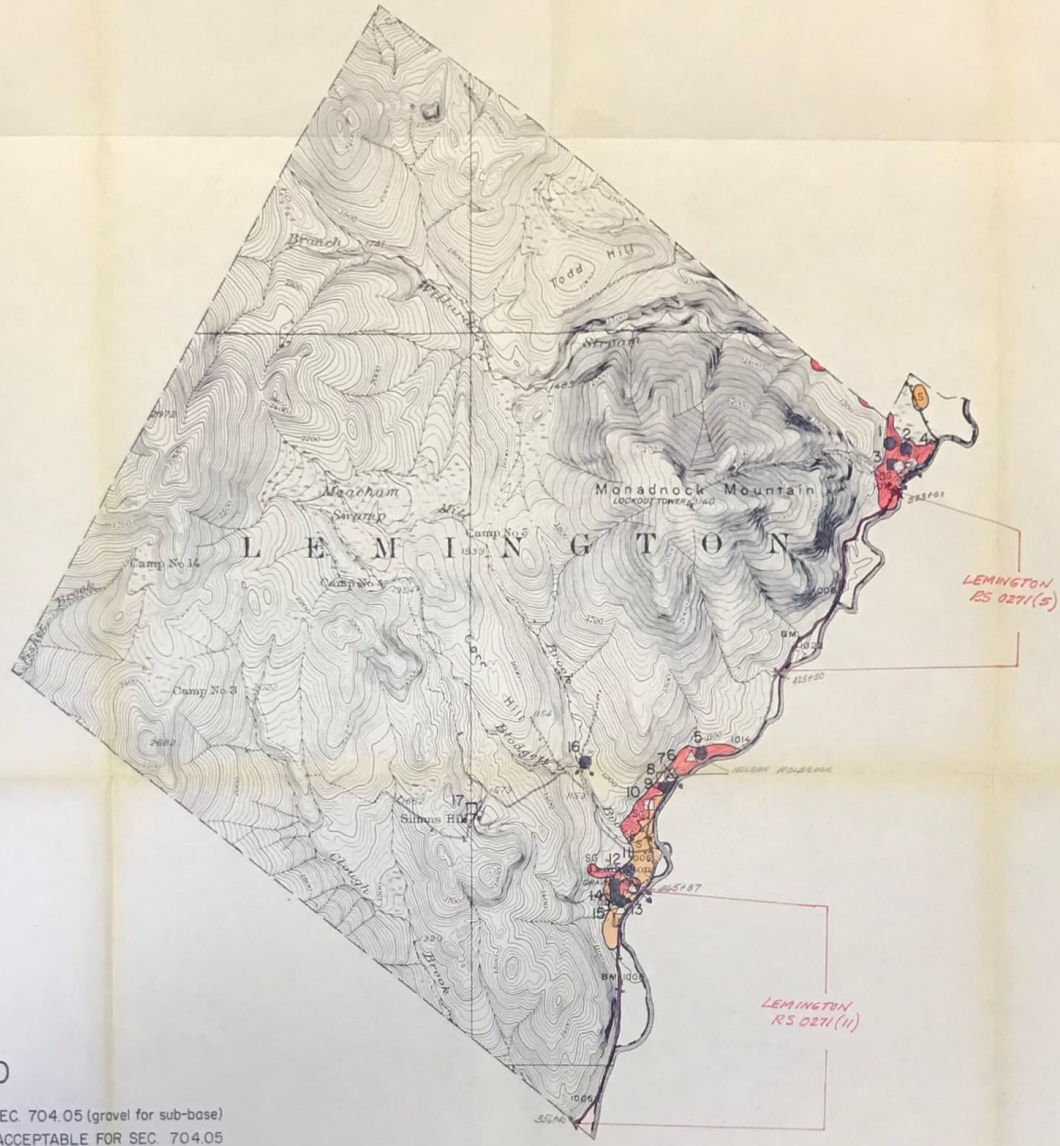
	Map Ident. No.
Covell, G.R.	1,2,3,4
Covell, R.C.	1,2,3,4
Daley, Ed	11
Daley, (Mrs.) Joseph	16
Gorman, Redman	7,8,9,10,17
Holbrook, Nelson	5,6
Perron, Brandon	12,13,14
Poisson, Richard L.	15
Robertson, Donald J.	15

LEMINGTON ROCK DATA SHEET NO. 1

Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHO T-3	Results
1	1	1971	syenite	no	chip	8.6%	Owner: Mrs. Clara Pease. Area consists of an elongate ledge south of the Monadnock Mountain trail at a point about 0.55 mile from Vermont Route No. 102. Approximately 200 feet of bedrock trending N.25°W. is exposed in a thickly wooded area. A short access road from the trail would be necessary for development. Test No. 1 was sampled at random along the base of the ledge from its northwest end for 95 feet in a southeast direction. Material barely fails to meet abrasion requirements of the Deval Test but passes the Los Angeles Test with 39.5 percent of wear.
	2	1971	syenite and granite	no	chip	4.7%	Test No. 2 continued at random along the base of the ledge for an additional 95 feet. A contact between the syenite and granite was encountered. Material meets abrasion requirements of both the Deval Test and the Los Angeles Test with 37.5 per cent of wear.

TABLE II
Supplement

LEMINGTON PROPERTY OWNERS - ROCK	Map Identification No.
Pease, Clara (Mrs.)	1



LEGEND

- ○ GRAVEL, ACCEPTABLE FOR SEC. 704.05 (gravel for sub-base)
- ● GRAVEL, DEPLETED OR NOT ACCEPTABLE FOR SEC. 704.05
- △ SAND, ACCEPTABLE FOR SEC. 703.03 (sand borrow and cushion)
- ▲ SAND, DEPLETED OR NOT ACCEPTABLE FOR SEC. 703.03
- □ GRANULAR BORROW, SEC. 703.05
- ■ MATERIAL NOT ACCEPTABLE FOR SEC. 703.05
- ✕ EXISTING PIT
- SAND & GRAVEL DEPOSIT
- SAND DEPOSIT
- 3 IDENTIFICATION NUMBER (refer to data sheets)

LEMINGTON

SCALE 1:31,250

CONTOUR INTERVAL 20 FEET

1972

GRANULAR MATERIALS MAP

BY

VERMONT DEPARTMENT OF HIGHWAYS

IN COOPERATION WITH

U.S. BUREAU OF PUBLIC ROADS

NOTE: BASED ON U.S.G.S. TOPOGRAPHIC MAPS

PLATE I

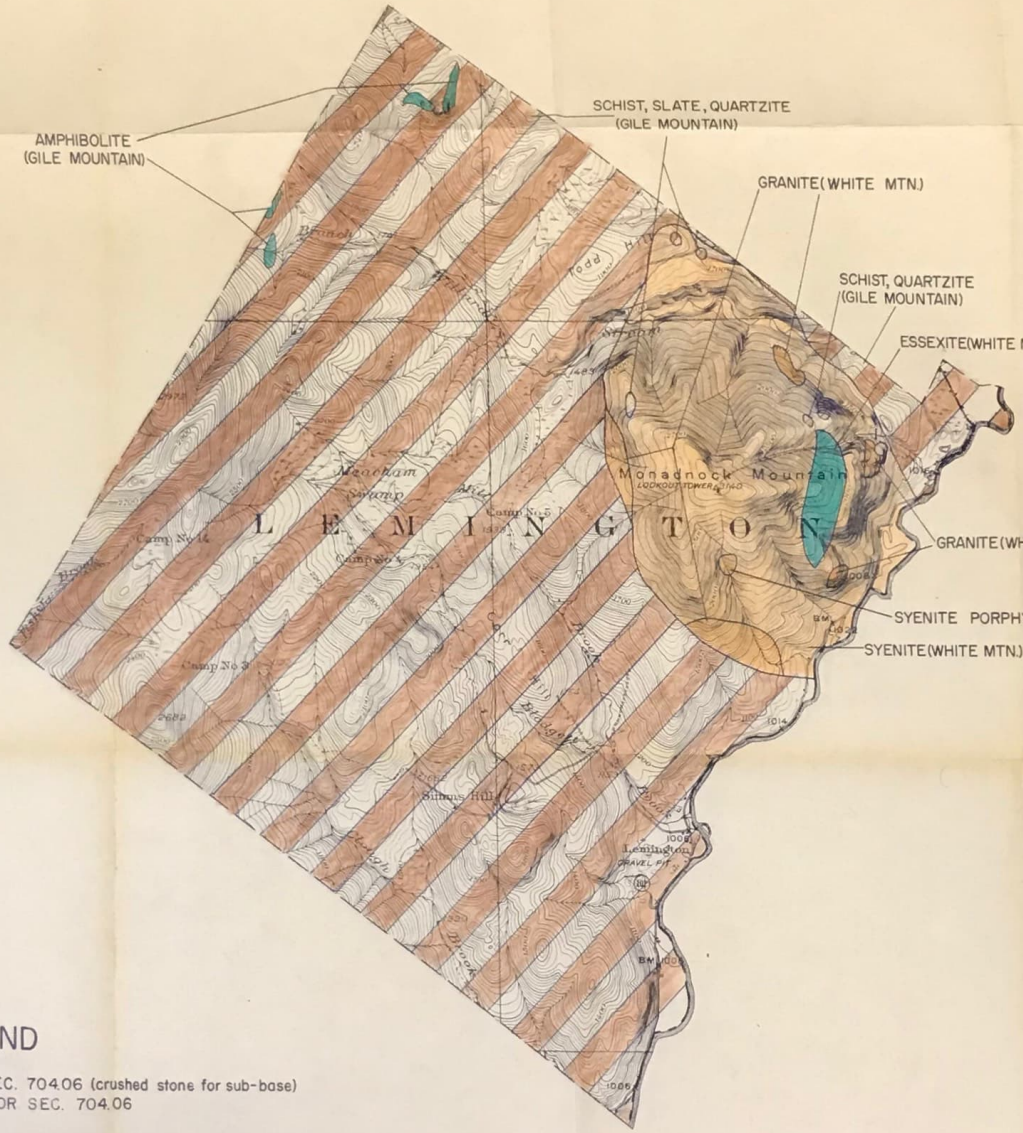
GRANULAR

ESSEX COUNTY

VT. HWY. DISTRICT NO. 9

REVISIONS

DATE						
BY						



N

LEGEND

- ROCK, ACCEPTABLE FOR SEC. 704.06 (crushed stone for sub-base)
- ROCK, NOT ACCEPTABLE FOR SEC. 704.06
- EXISTING QUARRY
- GRANITE TO DIORITE (light to intermediate igneous rocks)
- AMPHIBOLITE, GABBRO, DIABASE, METADIABASE, GREENSTONE, TRAP DIKES (basic or dark igneous rocks)
- PERIDOTITE, PYROXENITE, SERPENTINITE (ultra-basic igneous rocks)
- GNEISS
- QUARTZITE
- DOLOMITE
- MARBLE, LIMESTONE
- SCHISTS, SLATES, PHYLLITES, SHALES, CONGLOMERATES
- 3 IDENTIFICATION NUMBER (refer to data sheets)

LEMINGTON

SCALE 1:31,250

0.5 0 1 MILE

CONTOUR INTERVAL 20 FEET

1972

ROCK MATERIALS MAP

BY

VERMONT DEPARTMENT OF HIGHWAYS

IN COOPERATION WITH

U.S. BUREAU OF PUBLIC ROADS

NOTE: BASED ON U.S.G.S. TOPOGRAPHIC MAPS

ESSEX COUNTY

VT. HWY. DISTRICT NO. 9

REVISIONS

DATE						
BY						