SURVEY OF HIGHWAY CONSTRUCTION MATERIALS

IN THE TOWN OF HINESBURG, CHITTENDEN COUNTY, VERMONT

Prepared by

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION

ENGINEERING GEOLOGY SUBDIVISION

Montpelier, Vermont

March, 1982

State of Vermont
Agency of Transportation
Materials & Research Division
April, 1982

TABLE OF CONTENTS

Acknowledgments

This project acknowledges the surficial geological information obtained from Professor D. P. Stewart of Miami University, Oxford, Ohio and the bedrock information from the Centennial Geologic Map of Vermont, C. G. Doll.

History

The Materials Survey Project was initiated in 1957 by the Vermont Department of Highways with the assistance of the Bureau of Public Roads to compile an inventory of highway construction materials in the State of Vermont. Previously, investigations for highway construction materials were conducted only as the immediate situation required and only limited areas were surveyed. Since no overall picture of material resources was available, highway contractors or resident engineers were required to locate the materials for their respective projects and the samples were tested by the Materials & Research Division. The additional expense of exploration for construction materials resulted in higher construction costs being paid by the State. The Materials Survey Project was formed to minimize this factor by enabling the State and the contractors to use available information on material resources and to project cost estimates. Knowledge of locations of suitable materials is an important factor in planning 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 furnish information of particular use to contractors and construction personnel, and should be studied together for maximum benefit.

Enclosures

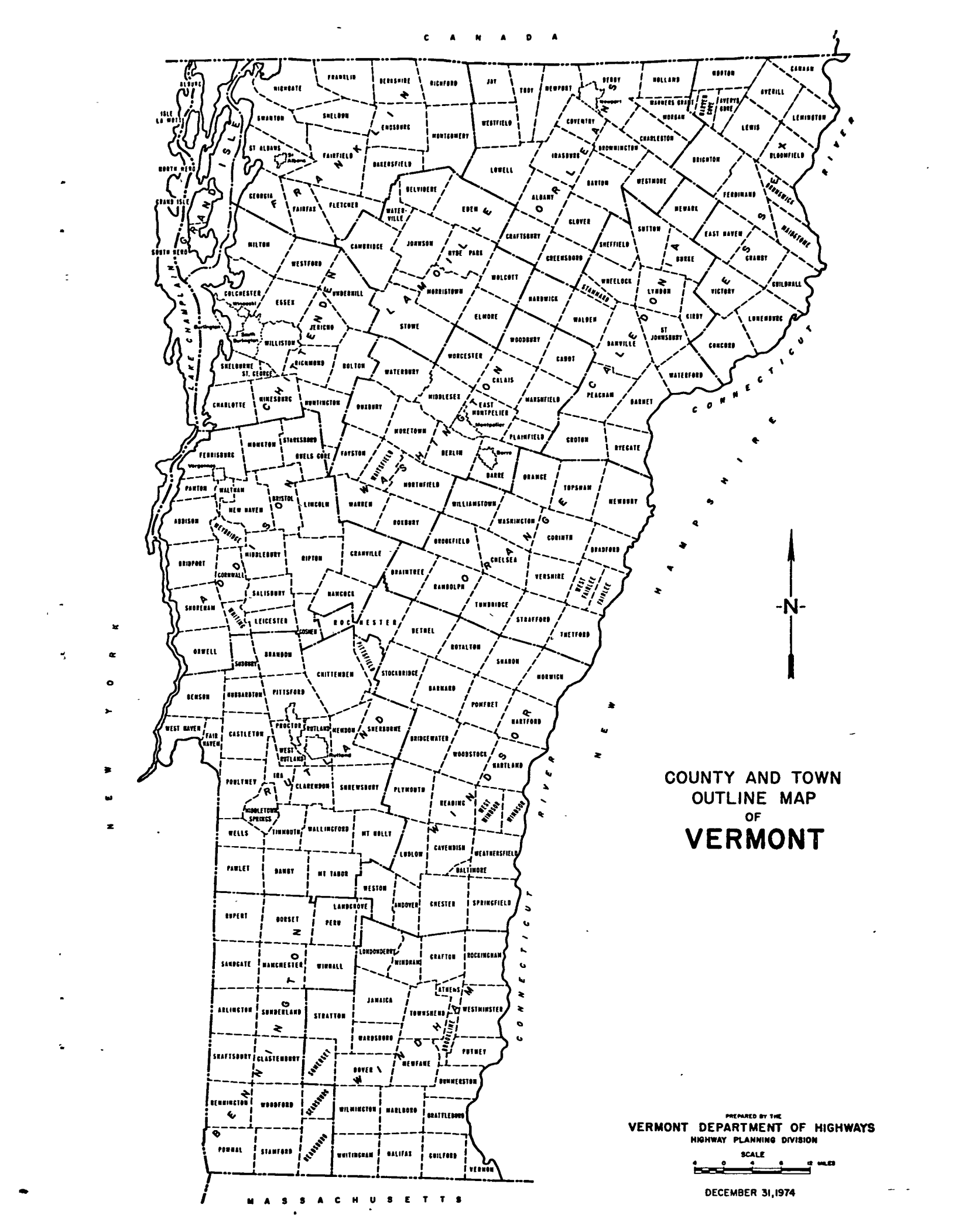
Included in this report are two surface-geology maps, one defining the location of tests on bedrock, the other defining the location of tests on

granular materials. These maps are based on 15-minute or 7-½-minute quadrangles of the United States Geological Survey enlarged or reduced to 1:31250 or 1" = 2604'. The various rock formations and types are delineated on the Bedrock Map of the township. This information is obtained from: Vermont Geological Survey Bulletins, Vermont State Geologist Reports, United States Geological Survey Bedrock Maps, Centennial Geologic Map of Vermont, the Surficial Geologic Map of Vermont and other references.

The granular materials map shows areas of various types of glacial deposits (outwash, moraines, kames, kame terraces, eskers, etc.) which are potential sources of gravel and sand. This information was obtained primarily from a survey conducted by Professor D. P. Stewart of Miami University, Oxford, Ohio, who mapped the glacial features of the State of Vermont during the summer months from 1956 to 1966. Further information is obtained from the Soil Survey (Reconnaissance) of Vermont (conducted by the Bureau of Chemistry and Soils of the United States Department of Agriculture), available Soil Surveys of individual counties (by the Soil Conservation Service of the United States Department of Agriculture), Vermont Geological Survey Bulletins, United States Geological Survey Quadrangles, aerial photographs and other sources. The location of each test area is represented by a Map Identification Number.

This report contains data sheets with detailed information on each test taken in the Granular and Bedrock areas. Data is also used from an active card file compiled by the Materials & Research Division over a period of years. Some cards are not used because they are incomplete or have unusable information on the location of the deposit.

Work sheets containing more detailed information and a field sketch of the area, and laboratory test results are on file in the Materials & Research Division of the Agency of Transportation, State of Vermont.


CANADA
LAKE CHAMPLAIN
GRAND ISLE
FRANKLIN
LAMOILLE
ORLEANS
ESSEX
CHITTENDEN
WASHINGTON
ORANGE
CALEDONIA
WINDSOR
RUTLAND
ADDISON
WINDHAM
BENNINGTON
NEW YORK
CONNECTICUT RIVER
NEW HAMPSHIRE
MASSACHUSETTS
N
COUNTY AND TOWN
OUTLINE MAP
OF
VERMONT
PREPARED BY THE
VERMONT DEPARTMENT OF HIGHWAYS
HIGHWAY PLANNING DIVISION
SCALE
DECEMBER 31, 1974

LOCATION

The town of Hinesburg is in the southern part of Chittenden County, on the west side of Vermont. It is bounded on the north by Shelburne, St. George, Williston and Richmond, on the west by Charlotte, on the east by Huntington, and on the south by Monkton and Starksboro (See County and Town Outline Map of Vermont on the following page.)

The western half of Hinesburg lies within the Champlain Lowlands, and the eastern half lies within the Green Mountain Physiographic Subdivisions of the New England Uplands. The lowlands are basically flat with a few long, low, rolling hills. In contrast, the Green Mountains are characterized by steep-sided hills and mountains. Elevations range from 1650' in the southeast corner to 350' in the southwest corner where Lewis Creek enters Charlotte.

The major drainage in town is to the west. In the northern part of town, the LaPlatte River and its main tributary, Patrick Brook, drain Lake Iroquois and Lower Pond. In the south, drainage is via Lewis Creek and its main tributary, Hollow Brook. All drainage eventually goes to Lake Champlain.

SURVEY OF ROCK SOURCES

Procedure for Rock Survey

The method 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 during the winter months and comprises the mapping and description of rock types perused from many reference sources, as acknowledged in the bibliography. These references differ considerably in dependability due to subsequent developments and studies that have contributed to the obsolescence of a number of reports. The results of samples taken by other individuals are analyzed, and their location is mapped when possible. As complete a correlation as possible is made of the available geological information concerning the area under consideration.

The field investigation is begun by making a cursory survey of the entire town. The information obtained from the preliminary survey, and that from the office investigation, is used to determine where sampling will be concentrated. When a promising source has been determined by rock type, volume of material, accessibility, adequate exposure and relief, chip samples are taken with a hammer across the strike or trend of the rock, and are submitted to the Materials & Research Division for abrasion testing by the Deval Method (AASHTO T-3) and the Los Angeles Method (AASHTO T-96). Samples taken by the chip method are often within the weathered zone of the outcrop and thus may give a less satisfactory test result than fresh material from unweathered rock. When the rock is uniform, and the chip samples yield acceptable abrasion test results, the material source is listed in this report as being satisfactory.

DISCUSSION OF ROCK AND ROCK SOURCES

The information on the Rock Materials Map (Plate II) is simplified. For a more detailed description of the respective rock formations, see the Summary of Rock Formations included in this report.

Occasionally, rocks belonging to the same formation and exhibiting similar characteristics (i.e., color and texture) produce different abrasion test results due to differing physical properties or chemical compositions. Therefore, in no case should satisfactory test results obtained in one area be construed to mean that the same formation, even in the same area, will not later produce unsatisfactory materials; this is particularly true of metamorphic rocks.

The western half of town is underlain by Dolomite, Limestone, Marble, and Quartzite. The main formations involved are Cutting dolomite, Shelburne limestone and marble, Danby quartzite and dolomite, Winooski dolomite, Clarendon Springs dolomite, Monkton quartzite, Dunham dolomite, Cheshire quartzite, and Bascom dolomite limestone, and marble. Because of the large number of formations involved, much of the rock is graded from one to the other giving many impure samples, but all of these generally yield satisfactory results. Therefore, rock quality should remain high. All test areas are in the western half of the town.

The formations in the eastern half of town are Underhill phyllite and schist (Fairfield Pond member), Bascom phyllite (Brownell Mountain member), and Pinnacle graywacke and conglomerate. All these formations are generally of poor quality, although the Pinnacle will occasionally yield a passing sample, None was tested.

Discussion of Rock and Rock Sources (cont.)

There are many suitable quarry sites in town, but only eight (8) were sampled. All of these were chosen on a basis of potential quarry sites as well as rock type. They were spread around the town to give a variety of formations. All areas tested yielded satisfactory results.

SURVEY OF SAND AND GRAVEL SOURCES

Procedure for Sand and Gravel Survey

The method used for conducting the 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 during the winter months and comprises the mapping of potentially productive areas from various references. Of these references, the survey of glacial deposits mapped by Professor Stewart is particularly helpful when used with 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. The locations of existing pits are mapped, as are the locations in which samples were taken by other individuals.

The field investigation is begun by making a cursory survey of the entire town. All pits, and any areas that show evidence of glacial or fluvial deposition are noted, and later investigated by obtaining samples from pit faces and other exposed surfaces. Test holes in pit floors and extensions are later dug with a backhoe to a depth of approximately 11 feet to obtain material which is submitted to the Materials & Research Division for gradation, sieve analysis and AASHTO T-4 Method stone abrasion test.

DISCUSSION OF SAND AND GRAVEL DEPOSTIS

Most of the granular material is located in the south-central part of town, at the base of the mountains (a large terrace feature east of Vt. Rte. 116 and west of the mountains). At the south end of this feature is a large commercial pit (Area #19) owned by Hinesburg Sand & Gravel. Hinesburg Sand and Gravel also owns pits at Areas #7 (sand), #13 (gravel), #16 and #17 (sand and gravel). All have acceptable material. The main pit is the primary source of material in town.

The town of Hinesburg owns a large pit (Area #6) with acceptable material, but due to legal problems, it is not available to the general public.

Other areas in town with acceptable material are (in order of abundance and access) Areas #14, #15, #12, #8, #2, #9, #10, #4, and #1. All are pits except #15 and #12.

Area #11 is a pit with apparent reserves, but testing was not permitted.

SUMMARY OF ROCK FORMATIONS IN THE TOWN OF HINESBURG

Champlain and Vermont Valley Sequence

Bascom Formation: Interbedded dolomite, limestone or marble, clacareous sandstone, quartzite, and limestone breccia; irregular dolomite layers, thin sandy laminae, and slaty or phyllitic partings characterize limestone and marble of lower, middle, and upper parts of the Bascom respectively.

Bascom Formation (Brownell Mt. member): Calcareous phyllite in the upper part of the Bascom Formation of the east limb of the Hinesburg Synclinorium.

Cheshire Quartzite: Very massive, white to faintly pink or buff vitreous quartzite near the top in west-central and south-western Vermont; predominately a less massive appearing, mottled gray, somewhat phyllitic quartzite, dolomitic sandstone, and conglomerate near the base of the formation in west-central Vermont.

Clarendon Springs Formation: Fairly uniform, massive, smooth-weathered gray dolomite characterized by numerous geodes and knots of white quartz; quartz sandstone and irregular masses of chert are near the top.

Cutting Dolomite: Typical Cutting is a massive, gray weathered, nondescript dolomite with a finely laminated calcareous sandstone at the base.

Danby Formation: Comprised of white vitreous quartzite beds, often cross-laminated, interbedded with gray dolomite. White quartzite beds, more than a foot thick, separated by 10 to 12 feet of dolomite in eastern areas, increases westward to continuous sections of white to pink weathered, massively bedded quartzite.

Summary of Rock Formations (cont).

Dunham Dolomite: Buff-weathered siliceous dolomite, pink and cream mottled or buff to gray on fresh surface; lower part is sandy and resembles the Winooski dolomite.

Monkton Quartzite: Distinctively red quartzite interbedded with lesser buff and white quartzite and relatively thick sections of dolomite like that of the Winooski; the quartzites thin to the east, and they become gray and phyllitic to the east and south.

Shelburne Formation: The Shelburne is chiefly a white marble or gray limestone characterized by raised reticular lines of gray dolomite on the weathered surface.

Winooski Formation: Buff-weathered, pink, buff and gray dolomite; beds 4 inches to a foot thick separated by thin, protruding, red, pink. green, and black siliceous partings.

Green Mountain Sequence

Pinnacle Formation: Schistose graywacke, gray to buff, commonly striped, quartz-albite-sericite-biotite-chlorite rock predominates; quartz-cobble and boulder conglomerate is common, chiefly near the base.

Underhill Formation (Fairfield Pond member): Green quartzitic schist (quartz-sericite-albite-chlorite-biotite); sericite-quartz-chlorite phyllite, locally purple or red, common in lower part.

GLOSSARY OF SELECTED GEOLOGIC TERMS

Albite: The light-colored, sodium end-member of the continuous plagioclase feldspar series which is found in alkali rocks. The name is often compounded with the names of rocks containing the mineral.

Alluvial: Pertaining to material carried or laid down by running water.

Bedding: The arrangement of rock or soil in layer, strata, or beds.

Bedrock: The more or less solid, undisturbed rock in place at the surface, or beneath superficial deposits of gravel, sand, or soil.

Biotite: A platy, dark silicate mineral known as black mica.

Calcareous: Containing calcium carbonate. When combined with rock names, it indicates a considerable proportion of $CaCO_3$ together with an equal or predominant amount of the material indicated by the rock name.

Carbonaceous: Containing carbon.

Carbonate Rocks: Rocks composed of the molecule CO_3 combined with calcium, magnesium, etc. Includes limestones, dolomites, and marbles.

Chlorite: A group of green hydrous silicates of aluminum, ferrous iron, and magnesium which occur as plate-like crystals or scales in metamorphic rocks.

Conglomerate: The consolidated equivalent of gravel. There may be considerable range in the size and composition of constituent fragments. The finer material between the larger fragments may be fine particulate matter or a natural cement such as calcium carbonate, clay, iron oxide, or silica.

Cross-bedding: A diagonal arrangement of beds in sedimentary rocks where the layers are inclined at various angles to the more general planes of stratification or the formational contact. Sand dunes, river channels, and delta show extensive cross-bedding.

Delta: A predominantly alluvial deposit built by a stream entering a standing body of water. It usually is formed like the Greek letter <u>delta</u>.

Deltaic: Relating to alluvial deposits built by a stream entering a standing body of water. Deltas are formed like the Greek letter <u>delta</u>.

Dip: The downward slope of a vein or stratum measured from the horizontal.

Dolomite: A rock consisting predominantly of the mineral dolomite, $CaMg(CO_3)_2$.

Drainage: The manner in which the water of an area passes off by surface streams and rivers, or by subsurface channels.

Drainage Basin: A part of the surface of the earth that is occupied by a drainage system, or that contributes surface water to the system.

Fluvial: Pretaining to streams.

Foliation: The banding or lamination of metamorphic rocks as contrasted to the stratification of sediments. Foliation implies the ability to split along nearly parallel surfaces due to the parallel distribution of layers or lines of one or more conspicuous minerals in the rock. The layers may be smooth, flat, undulating, or strongly crumpled.

Garnet: An important group of silicate minerals which contain aluminum, calcium, chromium, ferric and ferrous iron, magnesium, and manganese. Garnets are commonly deep red, brown, or black, but may be any color except possibly blue.

Graywacke: Dark, hard sandstone having angular grains of quartz and feldspar in a matrix of micas, chlorite, and clay minerals.

Greenstone: A field term for metamorphic rocks which have a distinctive color due to chlorite, epidote, or actinolite. It is usually derived from dark igneous rocks and is tough and hard. It is crushed to form good-to-excellent aggregate.

Interbeds: Occur between, or lie adjacent and parallel to, other beds of usually a different nature.

Kame: A conical hill of generally poorly stratified drift deposited against glacial ice by streams flowing in or on the ice.

Kame Moraine: An accumulation of material deposited directly from the frontal portion of glacial ice, and partly sorted by water. The deposits may form as coalescent knolls, hummocks, ridges, etc.

Lamina: A thin layer of stratified rock no more than 1 cm. thick.

Lenticular: Pertains to a mass of rock or earth that thins out in all directions from the center like a double-convex optical lens.

Limestone: A bedded sedimentary deposit containing from 40% to more than 98% calcium carbonate; sand and clay are common impurities. It is the most important, widespread carbonate rock.

Metamorphic Rocks: Rocks formed from pre-existing rocks altered by heat, pressure or the infiltration of gases and liquids below the zones of oxidation and cementation. Metamorphic rocks are formed in place while remaining essentially solid.

Mica: Any tabular, rock-forming minerals having perfect cleavage in one direction which yields thin, tough, elastic flakes.

Phyllite: A fine-grained, metamorphic rock intermediate between the mica schists and slates, into which it may grade. Its cleavage is due to the high content of the potash mica, sericite, which gives the rock a distinctive silvery appearance. Its fracture is intermediate between the rather splintery fissility of schist, and the smooth, even cleavage of slate; however, phyllite is not as tough as slate.

Phyllitic Pertaining to fine-grained, foliated metamorphic rock intermediate between the mica schists and slates, into which it may grade. Cleavage is due to the large amount of potash mica, sericite.

Physiographic: Pertaining to the physical divisions of the earth's surface.

Piedmont: Lying, or formed at the base of mountains.

Quartz: The most common mineral (SiO_2). It is transparent, translucent, opaque, or variously colored due to impurities, and occurs with equal ease across both grains and cement.

Quartzite: The common, siliceous, metamorphic equivalent of sandstone composed of quartz grains so firmly bonded that fractures occur with equal ease across both grains and cement.

Schist: A crystalline, metamorphic rock having secondary foliation or lamination based on the parallelism of platy or needle like grains which causes a tendency to split along the foliation.

Schistose: Pertaining to schist.

Sediments: All materials deposited from the waters of streams, lakes, seas, or more generally, deposited by wind or ice.

Sericite: A metamorphic mineral (very similar to muscovite) which occurs as minute flakes or scales in schists gneisses, and phyllites.

Siliceous: Containing, or pertaining to silica (Silicon Dioxide, SiO_2).

Strike: The direction of a line formed by the intersection of a layer with the horizontal.

Syncline: A fold of rock strata that is concave upward, in which younger formations occur toward the center of curvature.

Synclinorium: A composite fold consisting of connected anticlines and synclines which, grouped together, form an arch. They are relatively large features extending for several miles.

Talus: A heap of rock fragments derived from, and lying at the base of, a cliff or very steep slope. The fragments may be large or small. The aggregate heap usually has its form determined by gravity and the angle of rest of the material.

Till:	An unsorted, unstratified, unconsolidated, heterogeneous mixture of clay, silt, sand, gravel, and boulders deposited directly by glacial ice.
Viterous:	Glassy
Water Table:	The upper limit of the portion of the ground which is wholly saturated with water.
Weathered:	Showing the effects of exposure to the atmosphere.

Bibliography

Flint, Richard F. Glacial Geology and the Pleistocene Epoch. New York: John Wiley and Sons, Inc., 1947

Heinrich, E. W. Microscopic Petrography. New York: McGraw-Hill Co., Inc., 1956

Kemp, James F. A Handbook of Rocks. New York: D.Van Nostrand Co., Inc., 1949

National Academy of Sciences, National Research Council. Highway Research Board. Soil Exploration and Mapping, Highway Research Board Bulletin 28 Washington, D.C.: National Academy of Sciences-National Research Board 1950.

Pirsson, L.V. Rock and Rock Minerals. New York: John Wiley and Sons, Inc., 1949

Stokes, William L. and Varnes, David J. Glossary of Selected Geologic Terms, Colorado Scientific Society Proceedings, Vo. 16. Denver, Colo.: Colorado Scientific Society, 1955

U.S. Department of Agriculture. Bureau of Chemistry and Soils. Soil Survey (Reconnaissance) of Vermont, By D.V. Goodman, W.J. Latimer, F.R. Lesh, S.O.Perkins, and L.R. Smith (1930).

U.S. Department of Interior. Geological Survey Burlington Quadrangle, Vermont, 15 Minute Series (Topographic) (1948)

Vermont Department of Water Resources. Geological Survey. Surficial Geologic Map of Vermont, edited by Charles G. Doll (1970)

Vermont Department of Water Resources. Geological Survey. The Surficial Geology and Pleistocene History of Vermont, Bu David P. Stewart and Paul MacClintock, Bulletin No. 31 (1969)

Vermont Development Department. Geological Survey. Centennial Geologic Map of Vermont, edited by Charles G. Doll (1961)

Vermont Development Department. Geological Survey. The Glacial Geology of Vermont by David P. Stewart, Bulletin No. 19 (1961)

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, March, 1976.

DIVISION 700 - 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 - SAND BORROW AND CUSHION

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, or organic material.

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

TABLE 703.05A - GRANULAR BORROW

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.

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 - GRAVEL FOR SUB-BASE

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 AASHTO T-4, or more than 40 when tested in accordance with AASHTO 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 - CRUSHED STONE FOR SUB-BASE

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 AASHTO T-3, or the crushed stone a percent of wear of not more than 40 when tested in accordance with AASHTO T-96.

(d) Thin and Elongated Pieces. Not more than 30 percent, by weight, of thin and elongated pieces 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 - LEVELING MATERIAL

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

704.07 CRUSHED 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 - CRUSHED GRAVEL FOR SUB-BASE

GRADING	Sieve Designation	Percentage by Weight Passing Square Mesh Sieves TOTAL SAMPLE	SAND PORTION
COARSE	4"	100	
	No. 4	25- 50	100
	No. 100		0- 20
	No. 200		0- 12
FINE	2"	100	
	1½"	90-100	
	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 AASHTO T-4, or the crushed gravel a percent of wear of not more than 35 when tested in accordance with AASHTO 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 - DENSE GRADED CRUSHED STONE FOR SUB-BASE

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 AASHTO T-3, or the crushed stone a percent of wear of not more than 40 when tested in accordance with AASHTO 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 - GRAVEL BACKFILL FOR SLOPE STABILIZATION

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 - GRANULAR BACKFILL FOR STRUCTURES

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

TA404 2C Rev. 2/79

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 1

TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
						2"	1 1/2"	1/2"	#4	#100	#200			
1	1	1981	0.5'-25'	0'-0.5'	Yes	100	100	94	86	50	27	-	-	Owner: Henry & Elan Martin. Area is a small multi-leveled pit in a knoll against a steep hill. The area is 0.04 mile north of TH No. 6. The access is 0.09 mile east of the junction of TH No. 6 and TH. #15. Test No. 1 was taken on the north face of the upper level of the pit. The material is: 0'-0.5' overburden; 0.5'-10', sand; 10'-13', silty sand; 13'-15', pebbly fine gravel; 15'-22', sand; 22'-25', silty sand; bottom, sloughed material.
	2	1981	6'-20'	0'-0.5'	Yes	100	94	85	66	17	13	-	Granular Borrow (Sand)	Test No. 2 was taken on the northeast face of the pit. The material is: 0'-0.5', overburden; 0.5'-3', sand; 3'-6', silt, 6'-20', silty fine gravel; bottom, sloughed material.

TA404 2C Rev. 2/79

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 2

TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing 2"	1 1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
	3	1981	5'-10'	0'-2'	Yes	100	100	90	76	24	17	-	-	Test No. 3 was taken on the northwest face of the middle level of the pit. The material is: 0'-2', overburden; 2'-4' till; 4'-5', silt; 5'-7', pebbly fine gravel; 7'-8', silty sand; 8'-10', silty gravel; bottom, sloughed material.
	4	1981	0'-7'	-	Yes	100	100	95	81	20	9	-	Sand Cushion & Borrow	Test No. 4 was taken on the north face of the lowest level of the pit. The material is: 0'-7', pebbly sand; bottom, sloughed material.
	5	1981	1'-8'	0'-1'	No	84	79	65	52	43	33	-	-	Test No. 5 was taken 180' N 40° E of area entrance. The material is: 0'-1', overburden; 1'-7', till; 7'-8', silt; bottom, silt.
	6	1981	0'-6'	-	Yes	100	100	100	52	45	35	-	-	Test No. 6 was taken 50' east of Test No. 3. The material is: 0'-6', till, bottom, till.

TA404 2C Rev. 2/79

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 3

TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
						2"	1 1/2"	1/2"	#4	#100	#200			
	7	1981	0'-6'	-	Yes	86	76	59	44	46	40	-	-	Test No. 7 was taken 50' S 25° E of Test No. 2. The material is: 0'-6', silt and stones; bottom, silt and stones.
	8	1981	1'-8'	0'-1'	No	100	100	90	76	24	11	-	Sand Cushion & Borrow	Test No. 8 was taken on the south side of the knoll in the field east of the pit. The material is: 0'-1', overburden; 1'-8', sand; bottom, sand.
	9	1981	1'-8'	0'-1'	No	100	100	87	70	42	29	-	-	Test No. 9 was taken atop the knoll in the field west of the pit. The material is: 0'-1', overburden; 1'-8', till; bottom, till.
2	1	1981	1'-15'	0'-1'	Yes	100	100	89	80	19	9	-	Sand Cushion & Borrow	Owner: Hector Aube. Area is 3 small pits and adjoining fields on the south side of TH #6. Access to the area is 0.10 mile north east of the junction of TH #6 and TH #15. Test No. 1 was taken on the east face of the

TA404 2C Rev. 2/79

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 4

TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing 2"	1 1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
														southeast pit. The material is: 0'-1', overburden; 1'-15', interbedded sand and pebbly sand; bottom, sloughed material.
	2	1981	0.5'-12'	0''-0.5	Yes	90	84	73	57	16	11	20.1%	Granular Borrow (Gravel)	Test No. 2 was taken on the northeast face of the northeast pit. The material is: 0'-0.5', overburden; 0.5'-12', sand and sandy gravel; (possibly previously disturbed); bottom, sloughed material.
	3	1981	0.5'-10'	0'-0.5'	Yes	94	78	60	42	9	5	19.4%	Gravel	Test No. 3 was taken on the north face of the southwest pit. The material is: 0'-0.5', overburden; 0.5'-10', silty gravel; bottom, sloughed material.
	4	1981	1'-9'	0'-1'	No	95	92	72	59	12	7	11.3%	Gravel	Test No. 4 was taken 55' N 60° E of Test No. 3. The material is: 0'-1', overburden; 1'-10' silty gravel; bottom, silty gravel and water.

TA404 2C Rev. 2/79

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 5

TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing 2"	1 1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
	5	1981	1'-10'	0'-1'	No	100	94	79	69	15	8	-	Sand Cushion & Borrow	Test No. 5 was taken 50' S 35° W of the southwest end of the southeast pit. The material is: 0'-1', overburden; 1'-10', silty gravel; bottom, silty gravel and water.
	6	1981	1'-9'	0'-1'	No	94	90	69	40	13	10	10.7%	Granular Borrow (Gravel)	Test No. 6 was taken in the southwest corner of the back field. The material is: 0'-1', overburden; 1'-9', gravel; 0'-10', sand; bottom, sand.
3	1	1981	2'-12'	0'-2-	Yes	100	100	78	62	35	26	-	-	Owner: Helen Geprage. Area is a small, overgrown pit along the north side of TH #1, 0.32 mile west of the junction of TH #1 and Vt. Rte. #116. Test No. 1 was taken on the northeast face of the pit. The material is: 0'-2', overburden; 2'-12', silty sand; bottom, sloughed material.

TA404 2c Rev. 2/79

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 6

TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
						2"	1 1/2"	1/2"	#4	#100	#200			
4	1	1981	1'-8'	0'-1'	Yes	100	90	76	58	11	8	19.0%	Gravel	Owner: René Fortin. Area is a small, badly sloughed, waterfilled pit on the west side of TH #9. The pit is located 0.04 mile north of the junction of TH #9 and TH #19. Test No. 1 was taken on the northwest face of the pit. The material is: 0'-1', overburden; 1'-3', silty gravel; 3'-4', silty sand; 4'-8', silty gravel; bottom, sloughed material.
5	1	1981	1'-6'	0'-1'	Yes	100	100	93	76	68	56	-	-	Owner: Ienza Fraser. Area is a small, overgrown pit 100' east of TH #21. The access is 0.34 mile northeast of the junction of TH #21 and Vt. Rte. #116. Test No. 1 was taken on the northface of the pit The material is: 0'-1', overburden; 1'-6', silt and pebbly silt; bottom sloughed material.

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 7

TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1 1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
6	1	1981	-	-	Stock-pile	100	100	92	71	14	8	-	Sand Cushion & Borrow	Owner: Town of Hinesburg. Area is a large multi-level, many lobed pit which the town uses as their source of material but cannot sell commercially with the exception possibly of Town funded projects. The pit is located 0.05 mile north of TH #22. The main access is 0.07 mile west of the junction of TH #9 and TH #22. Test No. 1 was taken from a stockpile of screened material. The material is pebbly, fine gravel.
	2A	1981	3'-22'	0'-3'	Yes	100	90	79	63	6	3	17.3	Sand Cushion & Borrow	Test No. 2A was taken on the west face of the main pit near the shed. The material is: 0'-3', overburden; 3'-8', gravel; 8'-20', pebbly fine gravel; 20'-22', pebbly sand; bottom, pebbly sand (Test No. 2B).

TA404 2C Rev. 2/79

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesbueg GRANULAR DATA SHEET NO. 8

TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
						2"	1 1/2"	1/2"	#4	#100	#200			
	2B	1981	22'-30'	-	Yes	100	100	100	94	6	2	-	Sand Cushion & Borrow	Test No. 2B was taken below Test No. 2A. The material is: 22'-30', interbedded sand and pebbly sand; bottom, gravel (Test No. 2C).
	2C	1981	30'-55'	-	Yes	96	88	74	50	5	2	15.2%	Gravel	Test No. 2C was taken below Test No. 2B. The material is: 30'-55', gravel; bottom, sloughed material.
	3A	1981	2'-25'	0'-2'	Yes	93	93	82	65	19	8	16.1%	Granular Borrow (Gravel)	Test No. 3A was taken on the west face of the northeast lobe of the pit. The material is: 0'-2', overburden; 2'-10', gravel; 10'-16', pebbly sand 16'-25', gravel; bottom, gravel (Test #3B).
	3B	1981	15'-50'	-	Yes	96	89	64	39	7	5	10.8%	Gravel	Test No. 3B was taken below Test No. 3A. The material is: 25'-50', gravel; bottom, sloughed material.
	4	1981	1'-18'	0'- 1'	Yes	95	91	69	49	5	3	15.9%	Gravel	Test No. 4 was taken on the south face of the east end of the uppermost level. The material is: 0'-1', overburden; 1'-18',

TA 404 2C Rev. 1/82

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

GRANULAR DATA SHEET NO. 9

TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1 1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
														interbedded gravel and pebbly fine gravel; bottom, sloughed material.
	5	1981	2'-15'	0'-2'	Yes	100	100	95	85	3	2	-	Sand Cushion & Borrow	Test No. 5 was taken 100' west of Test No. 4. The material is: 0'-2', overburden; 2'-15', pebbly sand; bottom, sloughed material.
	6	1981	2'-12'	0'-2'	Yes	100	100	95	83	8	3	-	Sand Cushion & Borrow	Test No. 6 was taken on the south face at the west end of the upper level. The material is: 0'-2', overburden; 2'-12', interbedded gravel, pebbly fine gravel, and pebbly sand; bottom, sloughed material.
	7	1981	2'-25'	0'-2'	Yes	100	95	88	73	9	4	-	Sand Cushion & Borrow	Test No. 7 was taken on the northwest face of the old section of pit on the south side of the feature. The material is: 0'-2', overburden; 2'-6', pebbly fine gravel; 6'-18', pebbly sand; 18'-22', pebbly fine gravel; 22'-25', pebbly sand; bottom sloughed material.
	8	1981	2'-28'	0'-2'	Yes	100	96	86	66	21	15	-	Granular Borrow (Sand)	Test No. 8 was taken on the north face of the old section of the pit on the south side of the feature. The material is: 0'-2',

TA 404 2C Rev. 1/82

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

GRANULAR DATA SHEET NO. 10

TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1 1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
														overburden; 2'-10', pebbly fine gravel; 10'-16', pebbly sand; 16'-22', pebbly fine gravel; 22'-28', pebbly sand; bottom, sloughed material.
7	1	1981	0.5'-20'	0'-0.5'	Yes	100	100	86	66	15	1	-	Sand Cushion & Borrow	Owner: Paul Casey (Hinesburg Sand & Gravel). Area is a multi-leveled, partially overgrown pit formerly owned by Peters. The pit complex is 250' east of TH #9. The access is 0.50 mile north of the junction of TH #9 and Vt. Rte #116. Test No. 1 was taken on the east face of the upper level of the pit. The material is: 0'-0.5', overburden; 0.5'-20' interbedded sand to pebbly fine gravel; bottom, sloughed material.
	2	1981	3'-25'	0'-3'	Yes	100	100	88	74	15	5	-	Sand Cushion & Borrow	Test No. 2 was taken on the east face of the lower level of the pit. The material is: 0'-3', overburden; 3'-25', beds of sand and pebbly sand; bottom, sloughed material.

TA 404 2C Rev. 1/82

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 11

TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
						2"	1 1/2"	1/2"	#4	#100	#200			
8	1	1981	1'-10'	0'-1'	Yes	100	100	96	88	24	8	-	Sand Cushion & Borrow	Owner: Wayne Bissonette. Area is 2 small pits in a pasture behind the owner's house. The pit is located o.10 mile north of Vt. Rte. #116. The access is 0.45 mile northwest of the junction of Vt. Rte. #116 and TH #9. Test No. 1 was taken on the north face of the southeast pit. The material is: 0'-1', overburden; 1'-10', sand bottom, sand,
	2	1981	1'-8'	0'-1'	Yes	88	81	58	42	7	2	13.7%	Gravel	Test No. 2 was taken on the northwest face of the northeast pit. The material is: 0'-1', overburden; 1'-8', pebbly fine gravel and pebbly sand; bottom, sloughed material.
	3	1981	2'-10'	0'-2'	No	100	100	100	95	46	16	-	-	Test No. 3 was taken 50' S 30^{0} W of Test No. 2. The material is: 0'-2', overburden; 2'-10', sand; bottom, sand.

A404 2C Rev. 2/79

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 12

TABLE I

Map dent. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
						2"	1 1/2"	1/2"	#4	#100	#200			
9	1	1981	1'-10'	0'-1'	Yes	100	100	95	80	9	3	-	Sand Cushion & Borrow	Owner: Everett O'Brian. Area is a large field and the west end of the former town pit (closed). Vt. Rte. #116 now bi-sects the old pit. The area is on the west side of Vt. Rte. #116, at the junction of Vt. Rte. 116 and TH #9. Test No. 1 was taken in the floor of the old pit. The material is: 0'-1', overburden; 1'-10', pebbly sand; bottom, pebbly sand.
	2	1981	1'-10'	0'-1'	No	100	100	100	100	81	36	-	-	Test No. 2 was taken in the southwest corner of the field. The material is: 0'-1', overburden; 1'-9', fine sand; 9'-10', silty sand; bottom, silty sand.
10	1	2981	1'-9'	0'-1'	No	100	100	84	68	11	5	-	Sand Cushion & Borrow	Owner: Everett O'Brian Area is a pasture which is the extension for the former town pit. The pit itself is now an overgrown barnyard and was not sampled.

A404 2C Rev. 2/79

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 12

TABLE I

Map dent. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
						2"	1 1/2"	1/2"	#4	#100	#200			
														The area is 235' E of Vt. Rte. #116. The access is 125' south of the junction of Vt. Rte. 116 and TH #9. Test No.1 was taken 150' N 45° E of the pasture entrance. The material is: 0'-1', overburden; 1'-3', pebbly sand; 3'-9', gravel; bottom, ledge or boulder.
	2	1981	1'-6'	0'-1'	No	100	100	100	73	63	37	-	-	Test No. 2 was taken 150' N 10° E of the pasture entrance. The material is: 0'-1', overburden; 1'-6', silt, bottom, ledge or boulder
	3	1981	1'-10'	0'-1'	No	100	89	84	66	15	12	-	Granular Borrow (Sand)	Test No. 3 was taken 250' E of Test No. 2. The material is: 0'-1', overburden; 1'-10', pebbly sand to pebbly fine gravel; bottom, pebbly fine gravel.
11			No Sample Taken		Yes									Owner: Raymond Ayers. Area is a multi-level, multi-lobed pit complex much of which is over-

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 13

TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1 1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
														grown. Although there are apparent reserves, the owner does not wish to sell and did not allow samples to be taken.
12	1A	1981	20'-35'	0'-1'	No	100	100	66	44	9	5	12.8%	Gravel	Owner: Wayne Bissonette. Area is wooded knoll in a pasture, about 400' W of TH #40, 0.83 mile south of the junction of TH #30 and Vt. Rte. #116. Test No. 1A was taken on the southeast side of the knoll starting about 20' from the crest. The material is: 1'of overburden; 20'-35', gravel; bottom, pebbly sand (Test No. 1B).
	1B	1981	35'-45'	-	No	100	100	91	76	14	9	-	Sand Cushion & Borrow	Test No. 1B was taken below Test No. 1A. The material is: 35'-40', pebbly sand; 40'-45', sand; bottom, silty sand.
	2A	1981	1'-6'	0'-1'	No	100	100	100	97	51	19	-	-	Test 2A was taken atop the knoll 100' northwest of Test No. 1A.

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 14 TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing 2"	1 1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
														The material is: 0'-1', overburden; 1'-6', sand; bottom, gravel (Test No. 2B).
	2B	1981	6'-10'	-	No	85	85	71	55	12	6	11.5%	Gravel	Test No. 2B was taken below Test No. 2A. The material is: 6'- 10', gravel; bottom, gravel.
	3	1981	1'-6'	0'-1'	No	100	100	100	100	92	91	-	-	Test No. 3 was taken 100' N 70° E of the rear entrance gate. The material is: 0'-1', overburden; 1'-6', silt bottom, silt.
13	1A	1981	3'-25'	0'-3'	Yes	94	85	68	51	10	8	10.1%	Gravel	Owner: Paul Casey. (Hinesburg S & G). Area is a large multi-level pit formerly owned by Purington. The pit is 0.03 mile east of Vt. Rte. #116. The access is 0.48 mile south of the junction of Vt.Rte. #116 and TH #9. Test No. 1A was taken on the east face of the main lobe of the pit. The material is: 0'-3', overburden; 3'-18', silty gravel; 18'-25',

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 15

TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1 1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
														gravel; bottom, pebbly sand (Test No. 1B).
	1B	1981	25'-50'	-	Yes	93	93	69	47	7	5	8.5%	Gravel	Test No. 1B was taken below test #1A. The material is: 25'-30', pebbly sand; 30'-50', gravel; bottom, sloughed material.
14	1	1981	1'-15'	0'-1'	Yes	100	92	81	70	15	6	-	Sand Cushion & Borrow	Owner: Juliet Patterson Area is an old overgrown pit formerly owned by Tracy. The pit is on the east side of Vt. Rte 116 in the west side of a large terrace feature. Access to the pit is at the junction of Vt. Rte. 116 and TH #35. Test No. 1 was taken on the east face of the pit The material is: 0'-1', overburden; 1'-6', pebbly sand; 6'-10', sand; 10'-15', pebbly sand; bottom, sloughed material.
	2	1981	1'-12'	0'-1'	Yes	86	86	65	53	12	7	-	Gravel	Test No. 2 was taken on the southeast face of the pit. The material is: 0'-1', over-

A404 2C Rev. 2/79

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 16

TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
						2"	1 1/2"	1/2"	#4	#100	#200			
														burden; 1'-4', gravel; 4'-8', pebbly fine gravel; 8'-10', pebbly sand; 10'-12', pebbly fine gravel; bottom, sloughed material.
15	1	1981	1'-8'	0'-1'	No	100	100	92	79	13	6	-	Sand Cushion & Borrow	Owner: Wayne Bissonette Area is a sloping cornfield on the west side of TH #30 with the highest point being in the southeast corner. Access to the field is 1.30 miles south of the junction of TH #30 and Vt. Rte. 116. Test No. 1 was taken atop the highest point in the field. The material is: 0'-1', overburden; 1'-3', pebbly sand:and pebbly fine gravel; 3'-8', sand; bottom, sand.
	2	1981	0.5'-10'	0'-0.5'	No	90	84	55	30	13	7	9.1%	Gravel	Test No. 2 was taken 250' S 80° W of Test No. 1. The material is: 0'-1', overburden; 0.5'-10', gravel; bottom, gravel.

A404 2C Rev. 2/79

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 17

TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
						2"	1 1/2"	1/2"	#4	#100	#200			
	3	1981	4'-10'	0'-1'	No	100	100	100	90	36	22	-	-	Test No. 3 was taken 100' S 60° W of Test No. 2. The material is: 0'-1', overburden; 1'-4', silt; 4'-10', sand; bottom, pebbly fine gravel.
	4	1981	1'-10'	0'-1'	No	100	100	100	84	15	9	-	-	Test No. 4 was taken 200' S 35° W of Test No. 3. The material is: 0'-1', overburden; 1'-6', sand; 6'-10', pebbly sand; bottom, pebbly fine gravel.
16	1	1981	1'-30'	0'-1'	Yes	94	89	68	44	10	7	14.8%	Gravel	Owner: Paul Casey (Hinesburg S & G). Area is a large, 2 level pit in the south edge of a large terrace. The pit is 0.10 mile north of TH No. 5. The access is 0.39 mile east of the junction of Vt. Rte. 116 and TH #5. Test No. 1 was taken on the north face of the top level of the pit. The material is: 0'-1', overburden; 1'-20', gravel; 20'-23', silty gravel; 23'-30', gravel; bottom, sloughed material.

TA404 2C Rev. 2/79

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 18

TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
						2"	1 1/2"	1/2"	#4	#100	#200			
	2	1981	1'-40'	0'-1'	Yes	93	93	76	60	16	9	18.4%	Granular Borrow (Gravel)	Test No. 2 was taken on the center of the north face of the lower level of the pit. The material is: 0'-1', overburden; 1'-20', gravel; 20'-30', pebbly sand;30'-40', pebbly fine gravel; bottom, sloughed material
17	1	1981	12'-35'	0'-2'	Yes	93	93	75	58	5	4	13.8%	Gravel	Owner: Paul Casey (Hinesburg S & G). Area is a large, overgrown, sloughed pit formerly owned by Driscoll-Cass Warner. The pit is located 0.03 mile south of TH #5. The access is 0.48 mile east of the junction of TH #5 and Vt. Rte. 116. Test No. 1 was taken on the southwest face of the pit. The material is: 0'-2', overburden; 2'-12', inaccessable; 12'-14', gravel; 14'-20', sand; 20'-23', interbedded sand, pebbly sand, pebbly fine gravel, and gravel; bottom, sloughed material.

TA404 2C Rev. 2/79

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 18

TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
						2"	1 1/2"	1/2"	#4	#100	#200			
18	1	1981	0.5'-12'	0'-0.5'	Yes	95	81	48	20	22	19	20.2%	-	Owner: L.H. Abbey. Area is a pasture and heavily overgrown pit on the north side of TH #5, 1.88 miles east of the junction of TH #5 and Vt. Rte. 116. Test No. 1 was taken on the east face of the pit. The material is: 0'-0.5' overburden; 0.5'-12', silt coated cobbles (silty gravel with no sand); bottom, sloughed material.
	2	1981	1'-6'	0'-1'	No	100	100	87	77	37	24	-	-	Test No. 2 was taken 90' S 55° W of the utility pole in the center of the field. The material is: 0'-1', overburden; 1'-6', till; bottom, ledge or boulder.
	3	1981	2'-10'	0'-2'	No	100	100	86	73	36	26	-	-	Test No. 3 was taken 400' S 55° E of Test No 2. The material is: 0'-2', overburden; 2'-10', till; bottom, till.

A404 2C Rev. 2/79

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 19

TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
						2"	1 1/2"	1/2"	#4	#100	#200			
	4	1981	2'-8'	0'-2'	No	100	100	100	67	39	33	-	-	Test No. 4 was taken 400' S 45° E of Test No. 3. The material is: 0'-2', overburden; 2'-8', till; bottom, till.
	5	1981	1'-10'	0'-1'	No	100	92	62	34	38	34	19.6%	-	Test No. 5 was taken in the southwest corner of the pasture northeast of the pit. The material is: 0'-1', overburden; 1'-10', silty gravel; bottom, silty gravel.
19	1	1981	85'-95'	0'-2'	Yes	84	81	51	29	13	10	9.2%	-	Owner: Paul Casey (Hinesburg S & G) Area is a huge commercial pit and the major supplier of granular material to the Greater Burlington area. The area is 0.55 mile east of Vt. Rte. 116. The access is 0.25 mile south of the junction of Vt. Rte. 116 and TH #5. Test No. 1 was taken on the north face of the main section of the pit. The material is: 0'-2', overburden; 2'-85', inaccessable; 85'-95',

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

Hinesburg GRANULAR DATA SHEET NO. 20 TABLE I

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing 2"	1 1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
														interbedded sands and gravels; bottom, sloughed material..
	2	1981	Stockpile	-	Yes	100	100	95	83	8	3	-	Sand Cushion & Borrow	Test No. 2 was taken from a sand stockpile. The material is sand.

Table I

Supplement I

Hinesburg Property Owners - Granular	Map Identification No.
Abbey, L. H.	18
Aube, Hector	2
Ayers, Raymond	11
Bissonette, Wayne	8, 12, 15
Fortin, René	4
Fraser, Ienza	5
Geprags, Helen	3
Hinesburg Sand & Gravel	7, 13, 16, 17, 19
Hinesburg, Town Of	6
Martin, Henry and Elan	1
O'Brian, Everett	9, 10
Patterson, Juliet	14

404A 2C Rev. 2/79

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION
ENGINEERING GEOLOGY SUB-DIVISION

Hinesburg ROCK DATA SHEET NO. 1

TABLE II

Map Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHTO T-3	Abrasion AASHTO T-96	Remarks
1	1A	1981	Lime-stone	No	Chip	4.2%	18.4%	Owner: Larry Ketcham. Area is a 50' high rock knoll in a pasture on the north side of TH #1. The knoll is 200' north of TH #1 and 1.44 miles west of the junction of TH #1 and Vt. Rte. 116. Test No. 1A was taken on the steep outcrop on the northeast side of the knoll.
	1B	1981	Lime-stone	No	Chip	4.0%	18.1%	Test No. 1B was taken 40' north of Test No. 1A.
2	1A	1981	Lime-stone	No	Chip	4.0%	24.6%	Owner: Henry Carse. Area is a low step-like outcrop in an open pasture. The area is 0.21 mile north of TH #3 with access across two hayfields. The access is 0.68 mile west of the junction of TH #3 and TH # 23. Test No. 1A was taken on the center of the first ridge from the hayfield.
	1B	1981	Lime-stone	No	Chip	3.7%	22.9%	Test No. 1B was taken 50' northwest of Test No. 1A.
3	1A	1981	Dolo-mite	No	Chip	2.6%	21.7%	Owner: Wayne Bissonette. Area is a 100' high ledge which runs along the east side of TH #36 between the junction of TH #36 and Vt. Rte. 116 and the junction of TH #36 and TH #22. The rock is interbedded quartzite and dolomite. There is a large talus slope at the base of the ledge. Test No. 1A was taken from random dolomite blocks on the talus slope.
	1B	1981	Quart-zite	No	Chip	2.2%	25.7%	Test No. 1B was taken from random quartzite blocks on the talus slope.

404A 2C Rev. 2/79

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION
ENGINEERING GEOLOGY SUB-DIVISION

Hinesburg ROCK DATA SHEET NO. 2 TABLE II

Map Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHTO T-3	Abrasion AASHTO T-96	Remarks
4	1A	1981	Quartzite - Dolomite	No	Chip	6.2%	21.5%	Owner: Don & Lyle Baldwin. Area is a ridge with a north-south orientation running along the west side of TH #26. The test site was about 50' west of TH #26, 0.70 mile north of the junction of TH #26 and TH #23. The test site seems to be on or near the contact of the Winooski Dolomite and the Monkton Quartzite, and the rock seems to be graded between the two types. Test No. 1A was taken 75' northwest of TH #26 at the corner of the fenceline.
	1B	1981	Quartzite - Dolomite	No	Chip	3.3%	26.3%	Test No. 1B was taken 30' south of Test No. 1A.
5	1A	1981	Quartzite - Dolomite	No	Chip	2.9%	19.1%	Owner: Rod Isham. Area is a 60' high, north-south ridge with numerous exposures on the southwest corner. The area is about 500' north of TH #27 across the cornfield. Access is 0.38 mile west of the junction of TH #27 and TH #4. Test No. 1A was taken on the west side of the southwest corner of the ridge.
	1B	1981	Quartzite - Dolomite	No	Chip	3.3%	26.3%	Test No. 1B was taken on the south side of the southwest corner of the ridge.
6	1A	1981	Dolomite	No	Chip	4.7%	20.6%	Owner: Rod Isham. Area is a rock knoll on a low ridge 150' north of TH #27, 0.20 mile west of the junction of TH #27 and TH #4. The rock knoll has 40' of relief on the south side. Test No. 1A was taken on the top half of the knoll

404A 2C Rev. 2/79

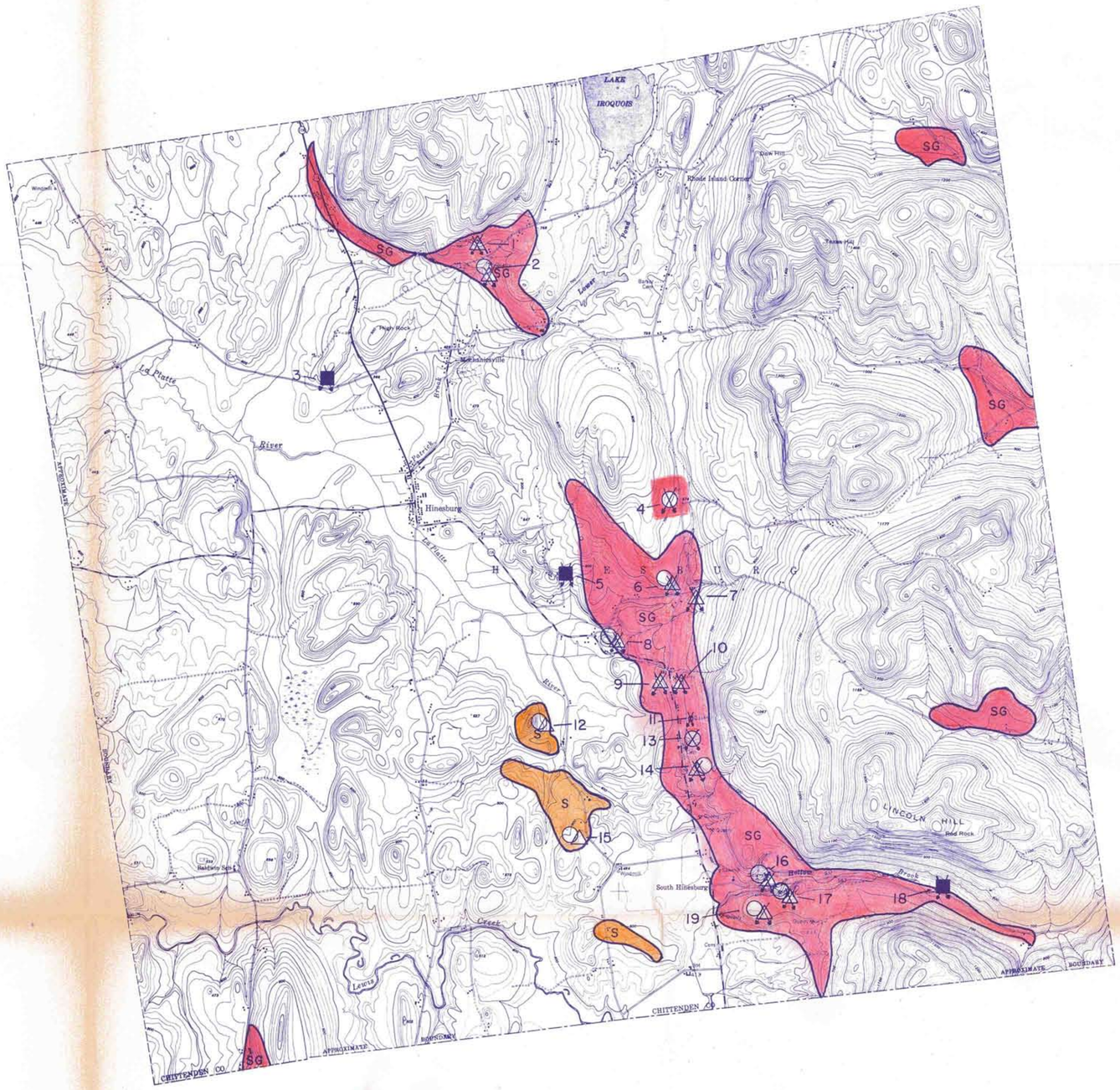
STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION
ENGINEERING GEOLOGY SUB-DIVISION

Hinesburg ROCK DATA SHEET NO. 3 TABLE II

Map Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHTO T-3	Abrasion AASHTO T-96	Remarks
	1B	1981	Dolomite	No	Chip	5.4%	26.3%	Test No. 1B was taken below Test No. 1A.
7	1A	1981	Dolomite	No	Chip	4.2%	25.0%	Owner: Kali Yuga Farm. Area is an 80' high along a woods road 0.35 mile west of TH #30. Access would require a right-of-way across adjoining property. The access is 1.33 miles south of the junction of TH #30 and Vt. Rte. 116. Test #1A was taken at the base of the north end of the ridge.
	1B	1981	Dolomite	No	Chip	4.0%	25.6%	Test No. 1B was taken above Test No. 1A.
8	1A	1981	Dolomite	No	Chip	6.1%	24.7%	Owner: Kali Yuga Farm. Area is a 60' ledge face along the north side of TH #28. The area is located 0.14 mile west of the junction of TH #28 and TH #30. Test No. 1A was taken on the West face of the ledge.
	1B	1981	Dolomite	No	Chip	5.6%	29.4%	Test No. 1B was taken on the southwest face of the ledge.

Table II
Supplement II

Hinesburg Property Owners - Rock	Map Identification No.
Baldwin, Don & Lyle	4
Bissonette, Wayne	3
Carse, Henry	2
Isham, Rod	5, 6
Kali Yuga Farm	7, 8
Ketcham, Larry	1



N

LEGEND

- ○ GRAVEL, ACCEPTABLE FOR ITEM 704.05 (gravel for sub-base)
- ◎ GRAVEL, DEPLETED OR NOT ACCEPTABLE FOR ITEM 704.05
- △ SAND, ACCEPTABLE FOR ITEM 703.03 (sand borrow and cushion)
- △ SAND, DEPLETED OR NOT ACCEPTABLE FOR ITEM 703.03
- □ GRANULAR BORROW, ITEM 703.05
- ▨ MATERIAL NOT ACCEPTABLE FOR ITEM 703.05
- ⚔ EXISTING PIT
- (SG) SAND & GRAVEL DEPOSIT
- (S) SAND DEPOSIT
- 3 IDENTIFICATION NUMBER (refer to data sheets)

HINESBURG

SCALE 1:31,250

1 .5 0 1 MILE

CONTOUR INTERVAL 20 FEET

1982

GRANULAR MATERIALS MAP

BY

VERMONT AGENCY OF TRANSPORTATION

MATERIALS AND RESEARCH DIVISION

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

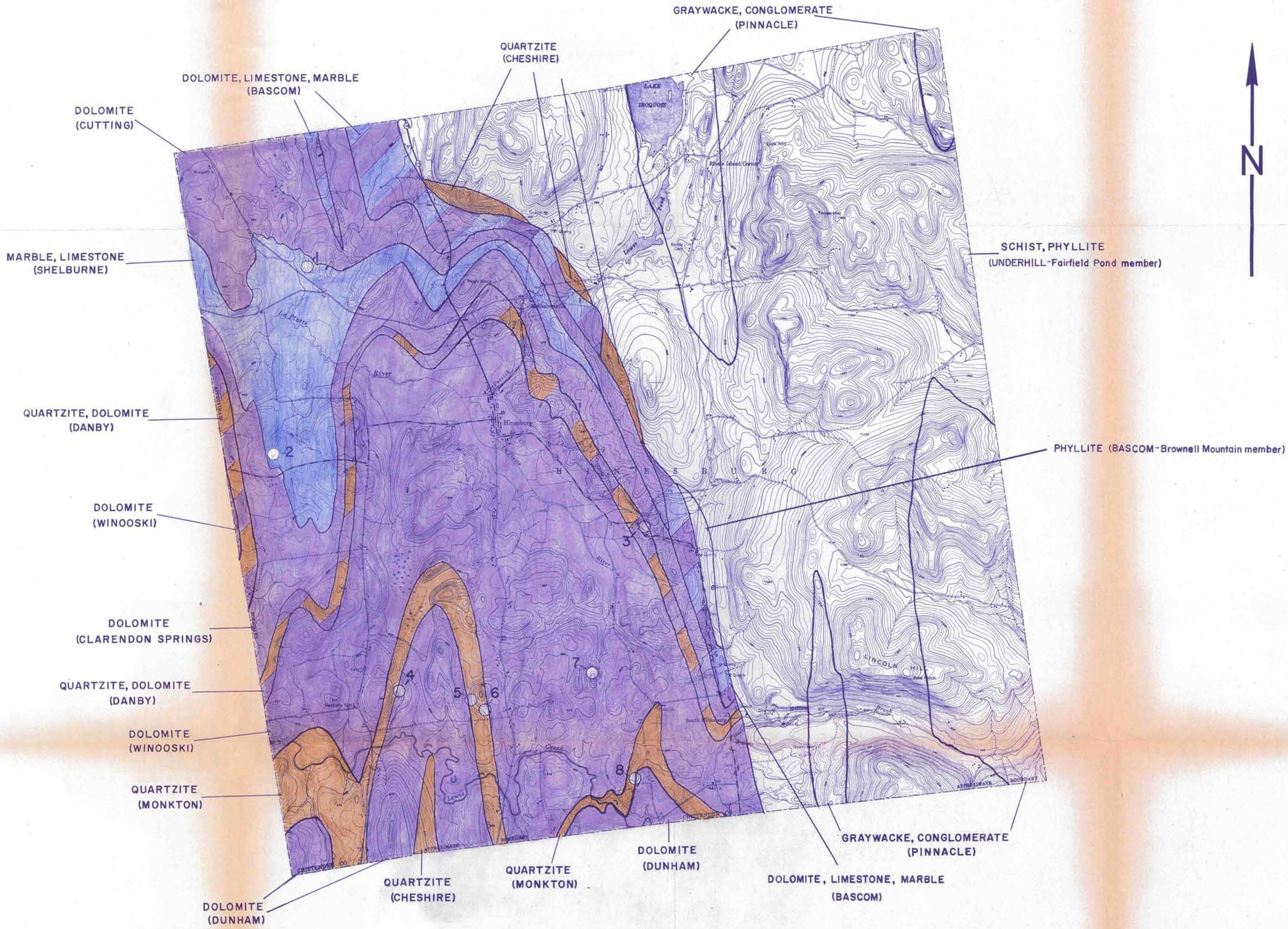
PLATE I

GRANULAR

CHITTENDEN COUNTY VT. HWY. DISTRICT NO. 5

REVISIONS

DATE						
BY						



LEGEND

- ROCK, ACCEPTABLE FOR ITEM 704.06 (crushed stone for sub-base)
- ROCK, NOT ACCEPTABLE FOR ITEM 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)

HINESBURG

SCALE 1:31,250

0.5 0 1 MILE

CONTOUR INTERVAL 20 FEET

1982

ROCK MATERIALS MAP

BY

VERMONT AGENCY OF TRANSPORTATION

MATERIALS AND RESEARCH DIVISION

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

PLATE II

ROCK

CHITTENDEN COUNTY VT. HWY. DISTRICT NO. 5

REVISIONS

DATE							
BY							