

SURVEY OF HIGHWAY CONSTRUCTION MATERIALS  
IN THE TOWN OF MIDDLEBURY, ADDISON 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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### Acknowledgments

The work of this Project was implemented with 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 Division and Mapping Section and the Materials Division.
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, Federal Highways Administration.

### History

The Materials Survey Project was formed in 1957 by the Vermont Department of Highways with the assistance of the Federal Highway Administration. Its prime objective was to compile an inventory of highway construction materials in the State of Vermont. Originally, investigations for highway construction materials were conducted only as the immediate situation required and only limited areas were surveyed; thus, no over-all picture of material resources was available. Highway contractors or resident engineers were required to locate the materials for their respective projects and samples were tested by the Materials Division. The additional cost of exploration for construction materials was passed on to the State bringing about higher construction costs. The Materials Survey Project was established to eliminate or minimize this factor by enabling the State and the contractors to proceed with information on available material resources and to project cost estimates. 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 are used 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 together.

### Enclosures

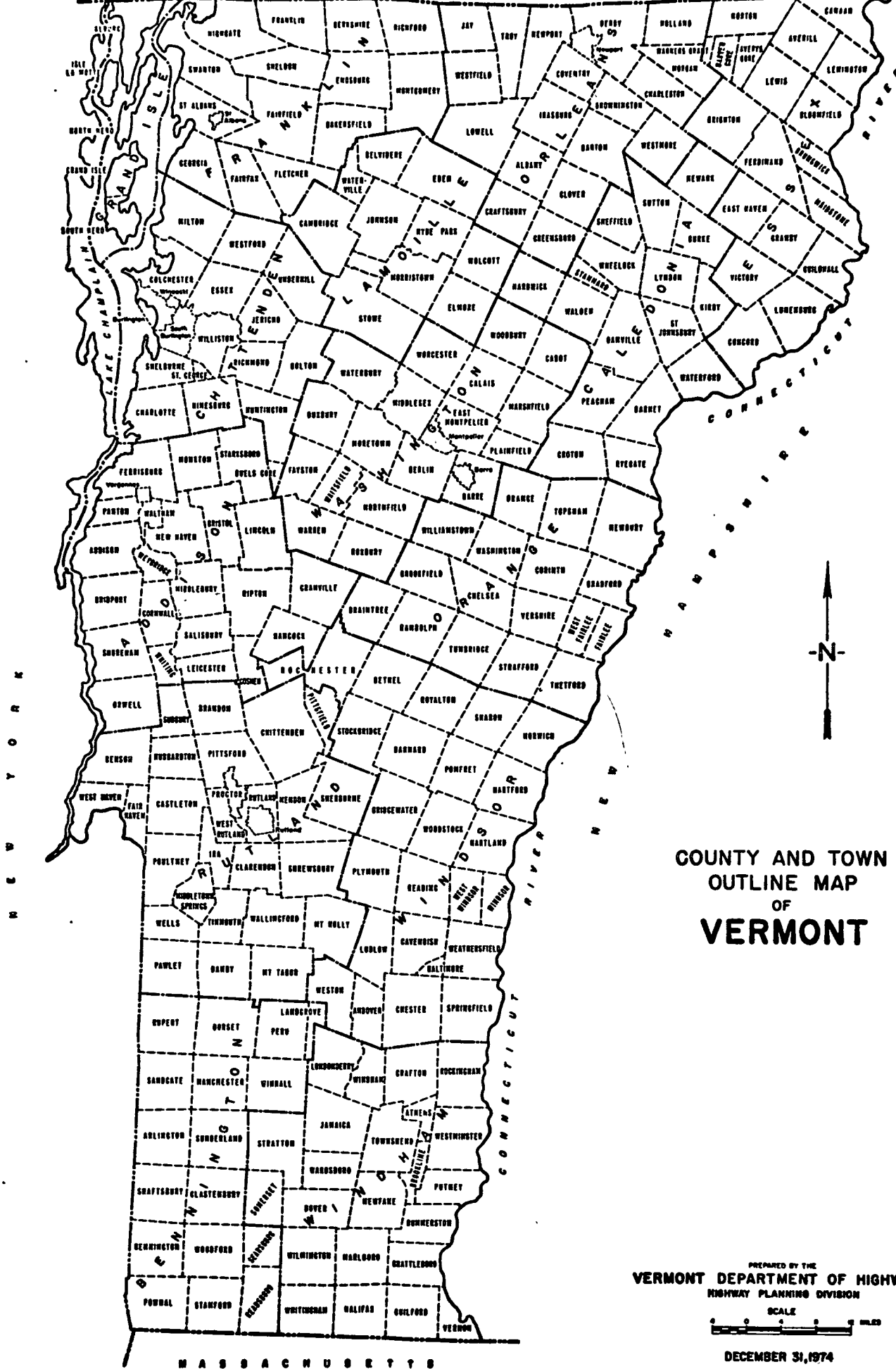
Included in this report are two surface-geology maps, one defining the location of tests on bedrock, the other defining the location of tests on granular materials. These maps are based on 15-minute or 7-1/2-minute quadrangles of the United States Geological Survey enlarged or reduced to 1:31250 or 1" = 2604'. Delineated on the Bedrock Map are the various rock formations and types in the township. This information was obtained from: Vermont Geological Survey Bulletins, Vermont State Geologist Reports, United States Geological Survey Bedrock Maps, Centennial Geological Map of Vermont, the Surficial Geologic Map of Vermont and other references.

The granular materials map shows 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 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), Vermont Geological Survey Bulletins, United States Geological Survey Quadrangles, aerial photographs and other sources. On both maps, the areas tested are represented by Identification Numbers. The number and location of tests taken in each area represented by an Identification

Number is determined by the nature of the material or its topographic feature.

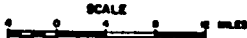
Also included in this report are data sheets for both the Bedrock and Granular Materials Survey, which contain detailed information for each test conducted by the Project as well as information obtained from an active card file compiled and updated by the Engineering Geology Section of the Materials Division over a period of years. Transfer of information from the cards to the data sheets was made and the location of the deposits was plotted on the maps. However, some cards in the file were not used because of incomplete or unidentifiable information on the location of the deposit. Caution should be exercised wherever this information appears incomplete.

Work sheets, containing more detailed information and a field sketch of the area represented by the Identification Number, and laboratory reports are on file in the Materials Division of the Vermont Department of Highways.



COUNTY AND TOWN  
OUTLINE MAP  
OF  
**VERMONT**

PREPARED BY THE  
**VERMONT DEPARTMENT OF HIGHWAYS**  
HIGHWAY PLANNING DIVISION



DECEMBER 31, 1974

## LOCATION

The town of Middlebury is near the center of Addison County in west-central Vermont. It is bounded on the west by Cornwall, the south by Salisbury, the east by Ripton, the northeast by Bristol, the north by New Haven, and the northwest by Weybridge; (see County and Town Outline Map of Vermont on the following page).

Middlebury lies in both the Green Mountain and Champlain Lowland physiographic subdivisions of the New England Upland. The Champlain Lowland is basically flat with a few long, low rolling hills, and comprises the western four-fifths of the town. The Green Mountains are characterized by steep-sided hills and mountains which rise abruptly to the east, and typify the mountain front in the eastern one-fifth of Middlebury. Elevations range from 2,132 feet atop Elephant Mountain in the northeast corner of town, to less than 280 feet where Otter Creek crosses the New Haven town line in the northwest corner.

Major drainage is south and southwestward via Beaver Brook, then westward via the Middlebury River which flows along the southern edge of town to Otter Creek, which flows northward into New Haven. Muddy Branch drains northwestward into New Haven from its source in Dow Pond. Numerous unnamed brooks rise in the east and flow westward down the steep slopes of the Green Mountains.

Dow Pond and several unnamed ponds are the only significant bodies of water in Middlebury.

## 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 primarily during the winter months and comprises the mapping and description of rock types as indicated in the many reference sources, as indicated in the bibliography. These references differ considerably in dependability due to new developments and studies that have contributed to the obsolescence 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. As complete a correlation as possible is made of all the available information concerning the geology of the area under consideration.

The field investigation is begun by making a cursory survey of the entire town. The information obtained from this preliminary survey, as well as that assimilated in the office investigation, is used to determine the areas where 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, and are submitted to the Materials 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 consequently may give a less satisfactory test result than fresh material deeper in the rock structure. When the rock is uniform, and the chip samples yield acceptable abrasion test results, the material source is included 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 owing 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 material; this is particularly true of metamorphic rocks.

Complex metamorphic and some sedimentary rocks comprise the bedrock lithology in the town. The formations mapped as underlying Middlebury from west to east are: the Middlebury Limestone; the Chipman Formation (Beldens Member dolomite, limestone and marble), (Weybridge Member limestone), and (Burchards Member limestone); the Bascom Formation dolomite, limestone and marble; the Cutting dolomite, the Shelburne Formation limestone and marble, the Clarendon Springs dolomite, the Danby Formation quartzite and dolomite, the Winooski dolomite, the Monkton quartzite, the Dunham dolomite, the Cheshire quartzite, the Moosalamoo phyllite, the Forestdale dolomite, the Underhill Formation (Fairfield Pond Member schist and phyllite); the Pinnacle Formation graywacke, the Mt. Holly Complex schist, quartzite and minor gneiss, and the Mt. Holly Complex gneiss.

The Bascom Formation was sampled from a small quarry at Map Identification No. 5. Map Identification No. 4 was mapped as being in the Cutting dolomite, but the survey determined that it lies in the Shelburne Formation, as does No. 3, which was sampled from an old quarry. Map Identification No. 1 was a small, water-filled, vertical-walled quarry which the survey was unable to sample. The Cheshire quartzite was sampled from ledges in the northeast corner of town.

## 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 potentially productive areas from various references. Of these references, the survey of glacial deposits mapped by Professor Stewart proves to be particularly helpful 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. 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 of materials from pit faces and other exposed surfaces. Test holes in pit floors and extensions are dug with a backhoe to a depth of approximately 11 feet to obtain samples which are submitted to the Materials Division where they are tested for stone abrasion by the AASHTO T-4 Method, and sieved for gradation.

Discussion of Sand and Gravel Deposits

Results of this survey showed that Granular materials suitable for highway and related construction purposes were formed by glaciofluvial and glaciolacustrine processes at elevations mostly between 500 and 600 feet.

Two areas at the 450-foot level in the western section of town are shallow and very limited in extent. Most of the materials in town are from a kame terrace between Vermont Route 116 and the steep Green Mountain front, one-half mile to the east. Permission to sample a small fluvial gravel feature crossed by Vermont Route 116 near its junction with Town Highway No. 92 was refused because of new housing and a commercial orchard in the area. Permission to sample lake sediments at a pit and its vicinity on the Middlebury State Airport east of Vermont Route 116 was also refused. A heavily wooded zone on both sides of Town Highway No. 23 in the southeast corner of town is underlain by outwash but not sampled due to a housing development in the vicinity.

The most promising sources of Gravel for Subbase, Item 704.05, are pits at Map Identification Nos. 8, 15, and 17; less favorable sources are pits at Nos. 4, 6, and 11. The most promising sources of Sand Borrow and Cushion, Item 703.03, are pits at Map Identification Nos. 8, 11, 4, and 15.

Summary of Rock Formations in the Town of Middlebury

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

Cheshire Quartzite: Very massive, white to faintly pink or buff vitreous quartzite near the top in west-central and southwestern Vermont; predominantly a less massive-appearing mottled gray, somewhat phyllitic quartzite; dolomitic sandstone and conglomerate near the base of the formation in west-central Vermont apparently grades southward into the Dalton Formation.

Chipman Formation (Beldens Member): Interbedded buff to brown heavily scored dolomite and white to blue-gray marble and limestone, east of Highgate Springs Thrust.

Chipman Formation (Burchards Member): Blue-gray limestone with irregular spots of light buff dolomite that give weathered surface a mottled appearance.

Chipman Formation (Weybridge Member): Gray limestone with thin interbeds of sandy limestone 1/2 to 2 inches thick and 1 to 4 inches apart.

Clarendon Springs Dolomite: 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 base.

Danby Formation: The Danby is comprised of interbedded quartzite and dolomite; white quartzite beds, more than a foot thick, separated by 10 to 12 feet of dolomite in eastern areas, increase westward to continuous sections of white to pink weathered, massively bedded quartzite.

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

Forestdale Dolomite: Buff to rusty-weathered white, buff, and pink- and white-mottled dolomite containing local interbeds of dolomitic sandstone, gray-green phyllitic quartzite, and crossbedded sandy dolomite.

Middlebury Limestone: Dark blue-gray, somewhat nodular and granular limestone with buff dolomite and shaly interbeds a fraction of an inch thick and 2 to 4 inches apart.

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.

Moosalamoo Phyllite: Gray to black sericite-quartz phyllite; sericite-quartz-chlorite phyllite occurs locally.

Mt. Holly Complex: Mainly fine- to medium-grained biotitic gneiss, locally muscovitic, and in western areas chloritic; massive and granitoid in some localities, fine-grained or schistose and compositionally layered in others; also abundant amphibolite and hornblende gneiss, and minor beds of mica schist, quartzite and calc-silicate granulite; includes numerous small bodies of pegmatite and gneissoid granitic rock.

Mt. Holly Complex Quartzite: Locally in massive beds as much as 30 feet thick, micaceous quartzite, and quartz-mica schist that commonly contains garnet or pseudomorphs (largely chlorite) after garnet; schists are locally rusty-weathered and contain conspicuous flakes of graphite; also includes amphibolite and minor hornblende gneiss, biotite gneiss, and pegmatite.

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 base.

Shelburne Formation: The Shelburne is chiefly a white marble or gray limestone characterized by raised reticulate lines of gray dolomite on the weathered surface; includes Sutherland Falls marble, intermediate dolomite, and Columbian marble of the marble quarries. Interbedded massive dolomite increases westward.

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

Winooski Dolomite: Buff-weathered, pink, buff, and gray dolomite; beds 4 inches to 1 foot thick separated by thin, protruding, red, pink, green, and black siliceous partings.

## 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.

Amphibole: An important silicate mineral group. Color varies from white or gray in tremolite, to bright green or grayish green in actinolite, to dark green and black in hornblende, and black in arfvedsonite.

Amphibolite: A dark green to black metamorphic rock containing varying amounts of the silicate amphibole minerals, and having a somewhat schistose structure.

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

Breccia: A rock consisting of consolidated angular rock fragments larger than sand grains. There are fault-, talus-, and volcanic-breccia.

Calcareous: Pertaining to, or containing from 10- to 50- percent of calcium carbonate ( $\text{CaCO}_3$ ).

Chert: A very dense siliceous rock occurring as nodules, concretionary masses, or distinct beds usually found associated with limestone. No grains are visible to the naked eye. Its use as an aggregate has diminished with the discovery that many varieties possess chemical and physical properties injurious to concrete.

Chlorite: A term for a group of green hydrous silicates of magnesium and iron, with or without aluminum, which resemble the micas. Chlorites are widely distributed, and often occur as secondary minerals resulting from the alteration of pyroxene, amphibole, biotite, garnet, or olivine.

Conglomerate: The consolidated equivalent of gravel. There can be considerable range in size and composition of the constituent rock and mineral fragments. The matrix of finer material between the larger fragments may be sand, silt, or any of the common natural cementing materials such as calcium carbonate, silica, clay, or iron oxide.

Cross-Bedded: 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 formational contact. Sand-dune, river channel, and delta deposits commonly show extensive cross-bedding.

Dolomite: A rock and its constituent mineral,  $\text{CaMg}(\text{CO}_3)_2$ . The rock is usually considered a favorable material for highway construction.

Fluvial Gravel: Gravel produced by stream action.

Garnet: An important group of silicate minerals having the general formula  $\text{R}_3\text{R}_2(\text{SiO}_4)_3$ , in which the radical  $\text{R}_3$  is calcium, magnesium, ferrous iron, or manganese; and  $\text{R}_2$  is aluminum, ferric iron, or chromium. Garnets occur as wide-spread accessory minerals in metamorphic rocks.

Geode: A rock cavity lined with crystals that are not separate from the surrounding rock.

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

Glaciolacustrine: A term used to denote formation by, or pertaining to, deposition in the quiet waters of glacial lakes.

Gneiss: A foliated metamorphic rock with no specific composition implied, but having layers that are mineralogically unlike and consisting of particles visible to the eye. Usually gneiss displays an alternation of granular minerals and schistose minerals, with the rock tending to split along the schistose bands.

Granitoid: Igneous rocks having the characteristic texture of granite. The mineral grains may be fine or coarse, but are nearly uniform in size.

Granulite: A quartz-feldspar rock of high metamorphic grade, poor or lacking in mica, and characterized structurally by a single regular plane of schistosity easily visible to the eye. The schistosity is determined mainly by parallel orientation of flat lenses of coarse-grained quartz set in a quartzose matrix of smaller, equidimensional grains.

Graphite: A common, soft, black-to-dark gray carbon mineral occurring in foliated masses; it has a metallic luster and greasy feel.

Graywacke: Dark, hard sandstone consisting of angular grains of quartz, feldspar, and rock fragments in a fine, compact matrix of micas, clay minerals, and chlorite.

Hornblende: A black, dark green, or brown amphibole which commonly occurs in prismatic masses in metamorphic and igneous rocks.

Kame Terrace: Stratified drift deposited by streams flowing between a glacier and an adjacent valley wall.

Kyanite: A blue aluminum silicate mineral occurring in metamorphic rocks as thin-bladed crystals or crystalline aggregates.

Laminae: Thin layers of stratified rock, each, 1 cm. or less in thickness.

Limestone: The most important and widespread carbonate sedimentary rocks. It consists chiefly of calcium carbonate.

Marble: A soft white rock that is the metamorphic equivalent of limestone. The calcite (calcium carbonate) is recrystallized and the calcite crystals are overgrown and interlocked with additional calcite.

Metamorphic: Rocks that owe their distinctive characteristics to the transformation of pre-existing rocks, either through intense heat, pressure, or both.

Nodule: A relatively small roundish or irregular lump of material which may be either solid or hollow. For example, a nodule of ironstone.

Pegmatite: A light-colored, coarse-grained, feldspar-rich granite which is characterized by large average grain size, interlocking texture, and an unusually great range in grain size. It occurs as veins or dikes and usually is associated with large intrusives of similar composition.

Phyllite: A fine-grained, foliated metamorphic rock, intermediate between the mica schists and slates into which it may grade. The foliation is caused by the development of large amounts of potash mica (sericite) which gives the rock its distinctive silvery appearance.

Physiographic: Pertaining to the physical divisions of the earth.

Pseudomorph: A mineral having the outward form of another species (or of some object, as a shell), as a piece of quartz having the cubic form of fluorspar. Pseudomorphs are formed from the original crystals (whose form alone they retain) by a process of substitution, incrustation, infiltration, or alteration.

Quartz: Anhydrous crystalline silica,  $\text{SiO}_2$ . It is the most common of minerals. It has a hardness of 7, specific gravity of 2.65, color from colorless to white, or varicolored depending on impurities, luster greasy or vitreous, fracture conchoidal, crystals hexagonal, or found as amorphous grains. The word quartz is prefixed to the names of many rocks when quartz is not a normal, necessary or essential constituent, as quartz monzonite.

Quartzite: A firm, compact rock composed of quartz grains so firmly bonded that fracture occurs across, instead of around, the grains. It is the metamorphic equivalent of sandstone.

Reticulate: Having a netlike pattern.

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

Schistose: Of, or pertaining to, schist; having a tendency to split along the foliation because of parallelism of platy or needle-like grains.

Sericite: A mineral similar to muscovite mica. It occurs in small flakes and scales in metamorphic rocks such as sericite schists and sericite gneisses.

Siliceous: Containing or pertaining to silica (silicon dioxide,  $\text{SiO}_2$ ) or partaking of its nature.

Talus: An accumulated heap of rock fragments lying at the base of a cliff or very steep slope where there is a projecting mass from which the fragments were obviously derived.

Vitreous: Having the luster of broken glass; also, possessing any of the other properties of glass such as composition and brittleness. Applied to igneous rocks, or the groundmass of such rocks when the material is of a glassy, non-crystalline nature.



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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, January, 1972.

## 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



TABLE I

MIDDLEBURY GRANULAR DATA SHEET NO. 2

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
3	1	1972	1-8	0-1	No	100	95	94	90	29	10	----	Sand	Owner: Jan DeBouter. Area is small sand pit now occupied by a house and trailer. Pit is adjacent to power line from substation and 120' south of State Aid Highway No. 7 (Quarry Road), and 0.4 mile east of its junction with Town Highway No. 7 (Foote Street). Material is not available. Test No. 1 (1972) was on southwest face of pit. Material was: 1'-2', fine silty sand; 2'-2.5', sand; 2.5'-3.5', fine silty sand; 3.5'-8', clean coarse sand.
4	1	1976	----	----	Yes (Stock-pile)	100	100	100	90	12	8	----	Sand	Owner: Pike Industries, Inc. Area is a commercial pit east of Vermont Route 116, 0.3 mile south of the Bristol Town Line. A nearly flat, wooded feature extends 350 feet eastward from the pit to the base of a talus slope. Test No. 1 was taken from west side of sand stockpile near road.
	2-A	1976	1-14	0-1	Yes	85	85	85	71	42	39	----	----	Test No. 2-A was on southeast face of pit. Material was: 1'-8', mixed beds of sand with some fine gravel seams; 8'-13', sand; 13'-14', pebbly fine gravel.



TABLE I

MIDDLEBURY 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						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	2-B	1976	14-25	----	Yes	100	100	88	85	27	22	----	----	Test No. 2-B was below Test No. 2-A. Material was: 14'-17', fine gravel; 17'-20', sand; 20'-21', fine gravel; 21'-25', sand; bottoms in sloughed material.
	3	1976	0-10	----	Yes	94	94	66	42	2	1	7.2%	Gravel	Test No. 3 was in northeast floor of pit. Material was: 0'-1', sand; 1'-10', coarse gravel and boulders.
	4	1976	0-10	----	Yes	89	89	83	49	9	2	----	Granular Borrow	Test No. 4 was in southern floor of pit. Material was: 0'-10', sand with thin beds of pebbles; bottom, fine gravel.
	5	1976	3-10	0-3	No	100	83	61	46	8	4	10.9%	Gravel	Test No. 5 was atop pit, 50 feet N 20° E of face. Material was: 3'-8', pebbly fine gravel; 8'-10', gravel.
	6	1976	2-10	0-3	No	89	71	56	44	28	12	9.5%	Granular Borrow (Gravel)	Test No. 6 was in woods, 130 feet N 70° E of Test No. 5. Material was: 2'-7', dirty gravel; 7'-9', sand; 9'-10', gravel.
	7	1976	0.5-11	0-0.5	No	100	100	97	87	10	3	----	Sand	Test No. 7 was in clearing on woods road 50 feet south of pit. Material was: 0.5'-11', sand and pebbly sand.

TABLE I

MIDDLEBURY GRANULAR DATA SHEET NO. 4

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						2"	1-1/2"	1/2"	#4	#100	#200			
5	1	1976	1-11	0-1	No	100	100	100	91	19	11	----	Sand	Owners: Andrew and Arlene Talley, and Louis Zitney. Area is a field with low knolls east of Vermont Route 116, 0.3 mile south of the Bristol Town Line. The north end of field slopes up to woods and marks the southern-most extent of granular material for Map Identification No. 4. Test No. 1 was in the north-east corner of field. Material was: 1'-11', sand.
	2	1976	1-6	0-1	No	100	100	100	84	28	14	----	Granular Borrow (Sand)	Test No. 2 was in southeast corner of field, 650 feet S 25° E of Test No. 1. Material was: 1'-6', silty fine sand; bottom, moist silt-clay.
6	1-A	1976	0-15	---	Yes	81	69	52	35	11	9	5.0%	Granular Borrow (Gravel)	Owner: Joseph P. Carrara and Sons, Inc. Area is commercial pit which was inactive at time of survey, 0.1 mile east of Vermont Route 116 and 1.26 miles south of the Bristol Town Line. There is easy access with limited visibility entering the roadway. Steep slopes prevented backhoe sampling of the extension in the woods east of pit.

TABLE I

MIDDLEBURY GRANULAR DATA SHEET NO. 5

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks	
						% Passing									
						2"	1-1/2"	1/2"	#4	#100	#200				
															<p>The extension is limited by a stream to the south; pit faces caved very readily making sampling difficult. There were many boulders and strippings piles on the floor. Test No. 1-A was on high south-east face of pit. Material was: 0'-2.5', coarse sand; 2.5'-3', silt; 3'-5', pebbly fine gravel; 5'-9', cobbles and small boulders; 9'-15', silt-clay coated gravel and fine gravel.</p>
	1-B	1976	15-33	---	Yes	88	84	73	59	12	9	9.7%	Granular Borrow (Gravel)	<p>Test No. 1-B was below Test No. 1-A. Material was: 15'-18', pebbly fine gravel; 18'-24', silt-clay coated fine gravel; 24'-33', silt-clay coated gravel and fine gravel.</p>	
	1-C	1976	33-64	---	Yes	96	86	67	52	10	7	16.0%	Gravel	<p>Test No. 1-C was below Test No. 1-B. Material was: 33'-38', silt-clay coated gravel with some sub-angular stones; 38'-41', pebbly fine gravel with a layer of 3" to 4" stones; 41'-53', gravel caved too quickly to sample; 53'-64', interbeds of gravel and gravelly sand; bottom, sand and sloughed material. The material on most of the faces was so loose that the wind caused caving.</p>	

TABLE I

MIDDLEBURY GRANULAR DATA SHEET NO. 6

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	2	1976	0-10	----	Yes	85	74	59	41	9	6	4.6%	Gravel	Test No. 2 was in north floor of pit. Material was: 0'-5', gravel; 5'-7', layer of boulders; 7'-10', fine gravel which kept caving.
	3	1976	0-10	----	Yes	83	83	63	50	25	16	11.4%	----	Test No. 3 was in lowest floor at south end of pit, 300 feet south of, and 5 feet below Test No. 2. Material was: 0'-4', gravel with a few boulders; 4'-7', pebbly sand; 7'-9', silty fine sand; 9'-10', bouldery gravel.
7	1-A	1976	0.5-18	0-0.5	Yes	91	85	63	46	11	6	10.1%	Gravel	Owner: Elbert Forbes. Area is a large, nearly depleted pit south of brook and Map Identification No. 6. Pit is 200 feet east of Vermont Route 116, 1.31 miles south of the Bristol Town Line. Test No. 1-A was on steep, silt-clay covered east face of pit and represents possible extension eastward into woods. Material was: 0.5'-3', fine gravel; 3'-9', pebbly fine gravel; 9'-11', fine sand and silt-clay layer; 11'-18', gap-graded gravel having sand and cobbles with not many intermediate sized particles; bottom, moist silt-clay.

TABLE I

## MIDDLEBURY GRANULAR DATA SHEET NO. 7

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	1-B	1976	22-47	----	Yes	100	97	86	74	7	6	----	Sand	Test No. 1-B was below Test No. 1-A. Material was: 22'-47', interbedded fine gravel, gravelly sand, coarse sand, and some layers of 3" cobbles; bottom, moist silt-clay; (18'-22' was silt-clay and not sampled).
	2	1976	0-8.5	----	No	86	81	65	55	7	5	12.4%	Gravel	Test No. 2 was at edge of woods atop east face of pit. Material was: 0'-4', pebbly fine gravel; 4'-6', pebbly sand; 6'-8.5', fine gravel; bottom, sand. Material caves readily.
	3	1976	1-10	0-1	Yes	80	72	50	32	5	4	10.2%	Gravel	Test No. 3 was in floor at northeast corner of pit. Material was: 1'-4', bouldery (+6') gravel; 4'-10', coarse gravel. Some of the large boulders were angular or tabular.
	4	1976	0.5-10	0-0.5	Yes	93	80	66	52	4	3	7.9%	Gravel	Test No. 4 was in floor at east end of pit, 180' S 45° W of, and 6' above Test No. 3. Material was: 0.5'-8', fine gravel; 8'-10', boulders. The beds dip west or northwest 20°-30°; the north end of hole was fine gravel, and the south end was coarse gravel.

TABLE I

MIDDLEBURY GRANULAR DATA SHEET NO. 8

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						2"	1-1/2"	1/2"	#4	#100	#200			
	5	1976	3-10	0-3	Yes	94	94	85	68	7	5	----	Granular Borrow (Sand)	Test No. 5 was in floor of southwest corner of upper level of pit, 220' S 80° W of Test No. 4. Material was: 3'-8', fine gravel; 8'-10', gravelly sand.
	6	1976	1-10	0-1	Yes	84	79	57	43	11	7	11.0%	Gravel	Test No. 6 was at north end of lowest floor 200' N 15° E of, and 17' below Test No. 5. Material was: 1'-7', coarse gravel with random boulders; 7'-10', bouldery gravel; bottom, same plus water.
8	1-A	1976	2-14	0-2	Yes	72	72	54	35	12	9	10.1%	Granular Borrow (Gravel)	Owner: Elbert Forbes. Area is a large commercial pit with wooded extension to the east, 0.07 mile east of Vermont Route 116 and 0.17 mile north of its junction with Town Highway No. 16. Owner leases to Champlain Construction Co. Test No. 1-A was on northeast face of pit. Material was: 2'-14', gravel, with a few, random + 12" boulders.
	1-B	1976	14-29	---	Yes	100	89	75	50	4	3	11.5%	Gravel	Test No. 1-B was below Test No. 1-A. Material was: 14'-29', gravel with a few +12" boulders.

TABLE I

## MIDDLEBURY GRANULAR DATA SHEET NO. 9

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	1-C	1976	29-51	---	Yes	92	86	71	50	3	2	9.9%	Gravel	Test No. 1-C was below Test No. 1-B. Material was: 29'-51', gravel with a few +12" boulders. Note: Faces cave easily.
	2-A	1976	1-20	0-1	Yes	91	85	64	42	2	1	8.9%	Gravel	Test No. 2-A was on south face of upper level of pit. Material was: 1'-20', gravel with some 6", 12", and 24" boulders.
	2-B	1976	20-31	---	Yes	88	88	74	59	7	4	8.3%	Gravel	Test No. 2-B was below Test No. 2-A. Material was: 20'-31', gravel which caved very readily; bottom, sloughed material.
	3-A	1976	0-13	---	Yes	100	88	69	51	5	4	8.2%	Gravel	Test No. 3-A was on southeast face of northern lobe of pit, 75' S 40° W of Test No. 2. Material was: 0'-13', gravel.
	3-B	1976	13-26	---	Yes	86	71	59	43	5	2	10.7%	Gravel	Test No. 3-B was below Test No. 3-A. Material was: 13'-26', gravel; bottom, sloughed material which caved rapidly and was not sampled.
	4-A	1976	0-17	---	Yes	100	100	100	100	13	4	----	Sand	Test No. 4-A was on east face of south lobe of pit, 330' S 40° W of Test No. 3. Material was: 0'-17', sand with some minor silt seams.

MIDDLEBURY GRANULAR DATA SHEET NO. 10

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	4-B	1976	17-34	---	Yes	100	100	100	99	28	10	----	Sand	Test No. 4-B was below Test No. 4-A. Material was: 17'-34', sand with some minor silt seams.
	5	1976	0-8	---	Yes	91	80	58	35	6	4	7.1%	Gravel	Test No. 5 was in north floor of east lobe of pit. Material was: 0'-8', coarse gravel with some boulders; hole caved a lot. Could not sample face due to excessive sloughed material.
	6	1976	1.5-10	0-1.5	No	93	87	66	45	20	14	13.2%	Granular Borrow (Gravel)	Test No. 6 was in small clearing on wooded terrace, 250' N 65° E of east face of pit. Material was: 1.5'-10', coarse gravel with boulders, bottom, sand layer.
	7	1976	0-11	---	Yes	100	100	100	100	45	18	----	----	Test No. 7 was in floor of southeast corner of pit, 40' north of Test No. 1. Material was: 0'-11', fairly hard-packed silty sand with some silt-clay layers.
	8	1976	0-10	---	Yes	86	69	51	35	5	3	9.2%	Gravel	Test No. 8 was in lower floor near middle of pit. Material was: 0'-10', good-looking coarse gravel; hole caved excessively.
	9	1976	0-10	---	Yes	94	80	57	34	26	24	9.8%	----	Test No. 9 was in floor near northeast corner of pit. Material was: 0'-10', dusty coarse gravel.



TABLE I

MIDDLEBURY GRANULAR DATA SHEET NO. 11

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	10	1976	0-10	----	Yes	83	69	41	18	9	6	7.4%	----	Test No. 10 was in floor near north end of upper pit level. Material was: 0'-10', gravel which failed due to an excess of stone.
	11	1976	0-10	----	Yes	92	82	59	43	4	2	10.1%	Gravel	Test No. 11 was atop pit face, 250' S 65° W of Test No. 6. Material was: 0'-2', gravel; 2'-10', bouldery gravel with sand lenses.
	12	1976	1-5	0-1	Yes	100	100	100	89	52	22	----	----	Test No. 12 was on south face of upper pit level. Material was: 1'-5', silty sand; bottom, silt-clay.
	13	1976	1-10	0-1	Yes	91	87	78	69	11	4	12.4%	Granular Borrow (Sand)	Test No. 13 was in floor, 15' north of Test No. 12. Material was: 1'-5', fine gravel and pebbly sand beds; 5'-7', sand or silty fine sand; 7'-10', gravel. The main body of gravel lies north of Test No. 12 and 13.
9	1	1976	2-11	0-2	No	93	90	61	48	5	1	12.7%	Gravel	Owner: Elbert Forbes. Area is a clearing in woods along Abbey Pond Trail (Town Highway No. 16), 0.11 mile east of Vermont Route 116. Test No. 1 was in small clearing, 100' south of Abbey Pond Trail. Material was: 2'-7', dirty gravel; 7'-11', cleaner, bouldery gravel.

TABLE I

## MIDDLEBURY GRANULAR DATA SHEET NO. 12

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	2	1976	1-9	0-1	No	74	71	55	39	16	11	8.8%	Granular Borrow (Gravel)	Test No. 2 was near snow machine trail, 40 feet south of Abbey Pond Trail. Material was: 1'-6', coarse gravel; 6'-9', cobbly gravel which was finer than 1'-6' interval; bottom, bouldery gravel with moist silt-clay.
	3	1976	1.5-9	0-1.5	No	94	87	62	46	14	9	13.6%	Granular Borrow (Gravel)	Test No. 3 was in small clearing, 175' N 25° E of junction of woods roads. Material was: 1.5'-9', gravel; bottom, boulders. A small bank at the east end of wooded esker-like ridge was scraped down, 125' S 25° W of Test No. 3; a six-foot layer of large boulders was exposed but not sampled.
10	1-A	1976	0-11	---	Yes	100	94	87	83	16	9	----	Sand	Owners: Forbes Bros. Area is a large sprawling pit in woods 0.05 mile southeast of woods road extension to Town Highway No. 16, and 0.3 mile east of the junction of Vermont Route 116 and Town Highway No. 16. Test No. 1-A was on northeast face of pit. Material was: 0'-2', gravel; 2'-11', sand.
	1-B	1976	11-26	---	Yes	67	63	49	36	5	3	6.4%	Gravel	Test No. 1-B was below Test No. 1-A. Material was: 11'-18', gravel and fine gravel; 18'-

TABLE I

MIDDLEBURY GRANULAR DATA SHEET NO. 13

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						2"	1-1/2"	1/2"	#4	#100	#200			
	1-C	1976	26-46	----	Yes	95	81	54	31	18	13	10.2%	Granular Borrow (Gravel)	22', layer of 3"-8" cobbles; 22'-26', gravel and fine gravel.  Test No. 1-C was below Test No. 1-B. Material was: 26'-46', gravel and fine gravel; bottom, sloughed material.
	2-A	1976	1-20	0-1	Yes	100	100	76	59	9	6	13.3%	Gravel	Test No. 2-A was on south face of southeast pit lobe. Material was: 1'-5', sand; 5'-6', layer of silt-clay; 6'-17', gravel; 17'-20', fine gravel or pebbly coarse sand.
	2-B	1976	20-32	----	Yes	94	90	71	58	2	1	12.1%	Gravel	Test No. 2-B was below Test No. 2-A. Material was: interbedded fine gravel and pebbly coarse sand; bottom, sloughed material. Material caved very readily.
	3	1976	0-12	----	Yes	96	89	75	49	24	23	11.0%	---	Test No. 3 was in east face of lowest pit level. Material was: 0'-3', gravel; 3'-7', fine pebbly gravel; 7'-12', gravel with coarse sand layers; bottom, sloughed material.
	4	1976	0-10	----	Yes	100	97	77	51	3	2	9.0%	Gravel	Test No. 4 was in south face of lowest level, 60' S 60° W of Test No. 3. Material was: 0'-5', gravel; 5'-10', pebbly fine gravel.

TABLE I

## MIDDLEBURY GRANULAR DATA SHEET NO. 14

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	5	1976	1-5	0-1	Yes	84	66	47	26	6	4	12.6%	Gravel	Test No. 5 was in floor below Test No. 1. Material was: 1'-5', gravel with a few random boulders; bottom, boulders.
	6	1976	0.5-7	0-0.5	Yes	96	96	72	41	5	3	5.2%	Gravel	Test No. 6 was in floor at east end of lowest level. Material was: 0.5'-2.5', layer of small boulders; 2.5'-7', coarse gravel with some boulders. Material caved very easily.
	7	1976	0.5-7	0-0.5	Yes	85	81	55	39	27	24	11.5%	----	Test No. 7 was in floor near southeast corner of pit. Material was: 0.5'-4', brown silt-clay coated bouldery gravel; 4'-7', coarse gravel (also coated with brown silt-clay); material caved too rapidly to dig any deeper; bottom, moist gravel.
	8	1976	0-9	----	Yes	100	100	100	91	8	3	----	Sand	Test No. 8 was in floor near northwest corner of pit. Material was: 0'-3', sand; 3'-6', pebbly sand or fine gravelly sand; 6'-9', sand.
	9	1976	1.5-9	0-1.5	No	88	72	50	33	24	20	11.8%	----	Test No. 9 was in small clearing on wooded terrace northeast of pit. Material was: 1.5'-9', coarse gravel with some silt-clay.

TABLE I

MIDDLEBURY GRANULAR DATA SHEET NO. 15

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	10	1976	1.5-10	0-1.5	No	92	82	55	32	38	31	6.7%	----	Test No. 10 was in small clearing, 200' S 20° E of Test No. 9, and 115' S 55° W of ledges. Material was: 1.5'-10', gravel with silty sand.
11	1-A	1976	1-20	0-1	Yes	94	75	48	19	6	5	12.9%	Granular Borrow (Gravel)	Owner: Fred Johnson. Former owner was Floyd Hall who opened pit. Area is large pit in woods east of the Lin-Dale Trailer Park, 0.6 mile east of Vermont Route 116. The pit is limited by property lines north and south, and by ledges to the east; there may be some extension in the woods west of pit. Pit is used only for trailer park residents. Test No. 1-A was on north face of pit. Material was: 1'-10', interbedded pebbly fine gravel, gravelly sand, and cobbly gravel with a lot of silt-clay on the stones; 10'-13', clean gravel; 13'-20', gravelly sand, pebbly fine gravel, and silt-clay coated cobbly gravel; bottom, sand.
	1-B	1976	20-35	----	Yes	100	100	97	94	3	1	----	Sand	Test No. 1-B was below Test No. 1-A. Material was: 20'-25', clean sharp sand; 25'-26', silt-clay seam; 26'-30', fine sand; 30'-35', coarse sand; bottom, sloughed material. The

TABLE I

## MIDDLEBURY GRANULAR DATA SHEET NO. 16

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 VHD Spec.	Remarks
						2"	1-1/2"	1/2"	#4	#100	#200			
	2-A	1976	1-14	0-1	Yes	84	76	58	36	5	2	9.6%	Gravel	lower face caved too rapidly to sample, but material was mostly cobbles.  Test No. 2-A was on southeast face of pit. Material was: 1'-5', silty sand; 5'-11', fine gravel; 11'-12', pebbly gravel; 12'-14', gravel.
	2-B	1976	14-20	----	Yes	100	88	67	45	2	1	7.5%	Gravel	Test No. 2-B was below Test No. 2-A. Material was: fine gravel and pebbly gravel; bottom, water and ledge.
	3	1976	1-10	0-1	Yes	89	89	81	64	6	4	-----	Granular Borrow (Sand)	Test No. 3 was in floor at north end of pit. Material was: 1'-7', pebbly fine gravel; 7'-9', pebbly sand; 9'-10', gravel.
	4	1976	1-4	0-1	Yes	92	80	58	41	7	5	15.4%	Gravel	Test No. 4 was in southeast floor of northwest (lowest) pit lobe, 235' S 10° E of, and 6' below Test No. 3. Material was: 1'-4', gravel with angular stones; 4', ledge.
	5	1976	0-5	---	Yes	100	92	76	56	6	3	11.7%	Gravel	Test No. 5 was in floor of northeast corner of upper level, 180' N 70° E of, and 20' above Test No. 4. Material was: 0'-2', lens of gravel; 2'-5', sand; bottom, ledge.

TABLE I

## MIDDLEBURY GRANULAR DATA SHEET NO. 17

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	6	1976	0.5-11	0-0.5	Yes	100	100	100	97	5	2	----	Sand	Test No. 6 was in floor near southwest corner of pit, 210' S 15° W of Test No. 4. Material was: 0.5'-2', sand; 2'-2.5', silt-clay seam; 2.5'-11', sand.
	7	1976	0-10	---	Yes	92	89	67	39	3	2	11.3%	Gravel	Test No. 7 was in floor at southeast corner of pit, 170' S 40° E of Test No. 6. Material was: 0'-7', fine gravel; 7'-9', sand; 9'-10', gravel. There was a layer of 4"-6" cobbles at 5'.
12	1	1976	1-10	0-1	No	89	85	59	41	23	10	11.8%	Granular Borrow (Gravel)	Owner: Elbert Forbes. Area is a clearing in woods south of pit at Map Identification No. 11. Access is via woods road through the west side of Fred Johnson's land. Test No. 1 was in small clearing 250' northeast of the junction of woods roads. Material was: 1'-2', layer of boulders; 2'-10', gravel with some +12" boulders.
	2	1976	2-10	0-2	No	83	74	54	23	15	10	13.4%	Granular Borrow (Gravel)	Test No. 2 was in clearing, 165' N 85° E of, and 15' above Test No. 1. Material was: 2'-4', silty gravel; 4'-10', silt-clay coated pebbly gravel.

## MIDDLEBURY GRANULAR DATA SHEET NO. 18

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
13	1	1976	0.5-17	0-0.5	Yes	87	75	60	48	6	3	11.1%	Gravel	Owner: Percy R. Dow. Area is inactive pit with extension in woods, 0.2 mile east of Vermont Route 116 and 1.0 mile south of its junction with State Aid Highway No. 7 (Quarry Road). There were piles of boulders and trash on the floor, and standing water in places. Test No. 1 was in northeast face of south lobe of pit. Material was: 0.5'-5', poorly graded gravel with some boulders and sand; 5'-12', pebbly gravel; 12'-13', silty pebbly sand; 13'-15', coarse gravel; 15'-17', pebbly sandy fine gravel; bottom, sloughed material and silt-clay.
	2	1976	0.5-4	0-0.5	Yes	100	100	83	73	62	47	----	----	Test No. 2 was in east floor of southern part of pit. Material was: 0.5'-4', silt-clay, and angular rock fragments; 4', ledge. Material was a till.
	3	1976	0.5-4	0-0.5	Yes	100	100	100	56	58	49	----	----	Test No. 3 was in floor of middle pit section. Material was: 0.5'-4', silt-clay and angular rock fragments; bottom, same.
	4	1976	0.5-5	0-0.5	Yes	100	100	100	52	51	38	----	----	Test No. 4 was in east floor of northern part of pit. Material was: 0.5'-5', silt with angular rock fragments; bottom, same.



## MIDDLEBURY GRANULAR DATA SHEET NO. 19

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						2"	1-1/2"	1/2"	#4	#100	#200			
	5	1976	0-11	---	No	78	71	53	41	12	6	9.3%	Gravel	Test No. 5 was in small clearing in woods. Material was: 0'-1', sand; 1'-2', pebbly fine gravel; 2'-2.5', silt seam; 2.5'-7', gravel; 7'-8', a layer of 12"+ boulders; 8'-9', gravel; 9'-10', bouldery gravel; 10'-11', sand.
	6	1976	2-10	0-2	No	91	88	68	41	16	11	11.3%	Granular Borrow (Gravel)	Test No. 6 was in small clearing on curve in woods road. Material was: 2'-5', fine gravel; 5'-7', pebbly gravel; 7'-8', boulders; 8'-10', pebbly gravel with a few boulders.
	7	1976	1.5-10	0-1.5	No	87	67	48	33	13	10	9.4%	Granular Borrow (Gravel)	Test No. 7 was in clearing at junction of logging road, 320' east of junction of woods roads. Material was: 1.5'-4', dirty gravel; 4'-6', bouldery gravel; 6'-10', gravel. Material caved very readily.
	8	1976	1-8	0-1	No	100	100	100	99.3	76.4	48.7	----	----	Test No. 8 was in clearing, 0.2 mile south of junction of logging roads. Material was: 1'-3', silty fine sand; 3'-8', silt-clay. Material had a soil classification: A-4, sandy silt.
	9	1976	2-8	0-2	No	83	75	59	37	38	29	10.7%	----	Test No. 9 was in woods, 500' west and north from Test No. 8. Material was: 2'-8', gravel or fine gravel; 8', ledge or large boulder.

TABLE I

MIDDLEBURY GRANULAR DATA SHEET NO. 20

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	10	1976	0.5-7	0-0.5	No	84	70	61	46	13	9	12.6%	Granular Borrow (Gravel)	Test No. 10 was in clearing west of junction of three logging roads, 0.2 mile north of Test No. 5. Material was: 0.5'-2', gravelly sand; 2'-4', silt-clay coated pebbly, fine gravel; 4'-6', gravel; 6'-7', silt-clay; bottom, ledge or large boulder.
	11	1976	1-7	0-1	No	100	100	100	84	62	47	----	----	Test No. 11 was in clearing, 0.12 mile N 50° E of Test No. 10. Material was: 1'-3', silty sand; 3'-7', silt-clay with random angular rock fragments.
	12	1976	0.5-12	0-0.5	No	100	100	100	100	22	9	----	Sand	Test No. 12 was dug on north side of woods road, 0.06 mile S 70°E of Test No. 10. Material was: 0.5' - 6.5', fine sand; 6.5'-12', moist sand.
14	1-A	1976	0.5-18	0-0.5	Yes	94	85	58	32	19	12	11.8%	Granular Borrow (Gravel)	Owner: Russell Dwire. Joseph P. Carrara & Sons, Inc. leases area for commercial plant. Area is pit 0.05 mile east of Vermont Route 116, 1.07 miles south of its junction with State Aid Highway No. 7 (Quarry Road). The 500' x 600' pit is irregularly shaped and has several

TABLE I

MIDDLEBURY GRANULAR DATA SHEET NO. 21

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 VHD Spec.	Remarks
						2"	1-1/2"	1/2"	#4	#100	#200			
														plant buildings, screens, crushing equipment, stock-piles and many levels and ramps. Faces have many large boulders on them; cobble- and boulder- screenings have been dumped on some faces. It would require considerable work to develop this site as a granular source, and thus might not be economically feasible. The eastern end of pit was sampled to show material in woods east of pit. Test No. 1-A was on face in upper northeast corner of pit. Material was: 0.5'-18', pebbly fine gravel which caved very readily.
	1-B	1976	18-34	----	Yes	100	97	55	32	22	14	11.7%	Granular Borrow (Gravel)	Test No. 1-B was below Test No. 1-A. Material was: 18'-34', gravel and pebbly fine gravel. Some very large (3 cubic yard) boulders were in the face.
	2	1976	1-10	0-1	No	95	75	51	32	25	18	12.2%	----	Test No. 2 was in clearing, 135' N 45° E of the top of northeast pit corner. Material was: 1'-4', coarse gravel; 4'-5', boulders; 5'-8', coarse gravel; 8'-10', bouldery gravel. An estimated 30% of the stones were larger than 4" and were not included in the sample.

MIDDLEBURY GRANULAR DATA SHEET NO. 22

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over- burden (Ft)	Exist- ing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	3	1976	0-8	----	No	74	71	58	42	10	7	18.2%	Gravel	Test No. 3 was in stripped area atop pit, 125' east of face. Material was: 0'-2', gravelly sand; 2'-4', boulders; 4'-8', gravelly sand with some random boulders; material kept caving at 8'.
15	1-A	1976	1-18	0-1	Yes	96	90	58	32	11	8	13.2%	Gravel	Owner: State of Vermont. Area is a series of overgrown pits used as dumps, 0.07 mile east of Vermont Route 116, and 0.82 mile north of its junction with Town Highway No. 40. Test No. 1-A was on northeast face of upper pit level. Material was: 1'-18', coarse-to-medium gravel with some silt-clay coating.
	1-B	1976	18-30	----	Yes	100	93	71	46	8	4	8.3%	Gravel	Test No. 1-B was below Test No. 1-A. Material was: 18'-20', pebbly fine gravel; 20'-30', silty gravel; bottom, sloughed cobbles and boulders.
	2-A	1976	0-8	----	Yes	86	76	59	38	6	5	11.0%	Gravel	Test No. 2-A was on northeast face of middle pit level. Material was: 0'-2', pebbly gravel; 2'-8', silty gravel. Material caved very readily.

## MIDDLEBURY GRANULAR DATA SHEET NO. 23

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	2-B	1976	8-14	----	Yes	88	80	65	45	7	4	10.5%	Gravel	Test No. 2-B was below Test No. 2-A. Material was: 8'-14', silty gravel and finer than material in 2'-8' interval.
	3-A	1976	0-10	----	Yes	89	85	60	34	7	5	9.8%	Gravel	Test No. 3-A was on north-east face of lowest pit level. Material was: 0'-3', pebbly fine gravel; 3'-7', fine gravel; 7'-10', gravel.
	3-B	1976	10-20	----	Yes	94	91	71	41	7	4	11.1%	Gravel	Test No. 3-B was below Test No. 3-A. Material was: 10'-18', gravel; 18'-20', cobbles; bottom, sloughed material and boulders.
	4	1976	0.5-10	0-0.5	Yes	100	100	85	79	15	7	----	Sand	Test No. 4 was in floor at northeast corner of middle pit level. Material was: 0.5'-2.5', gravel; 2.5'-6.5', gravelly sand; 6.5'-8', pebbly sand; 8'-10', sand.
	5	1976	2-10	0-2	Yes	87	85	70	46	3	2	6.9%	Gravel	Test No. 5 was in west side of floor in upper pit level. Material was: 2'-10', gravel with a layer of 6'+ boulders at 5' and another at 7'.
	6	1976	0.5-9	0-0.5	No	----- RESULTS MISSING -----								Test No. 6 was in clearing atop east face of upper pit level. Material was: 0.5'-2', fine gravel; 2'-5', gravel; 5'-9', bouldery gravel; bottom, large boulders.

TABLE I

MIDDLEBURY GRANULAR DATA SHEET NO. 24

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	7	1976	0-9	---	No	100	90	81	69	17	8	----	Sand	Test No. 7 was in clearing, 350' N 75° E of Test No. 6. Material was: 0'-5', sand; 5'-9', bouldery gravel; bottom, large boulder.
	8	1976	1-10	0-1	Yes	----- RESULTS MISSING -----						-----	Test No. 8 was in floor on west side of lowest pit level. Material was: 1'-6', pebbly-to-fine gravel, and a large boulder; 6'-10', gravel. Material looked good. Test results missing.	
16	1-A	1976	1-15	0-1	Yes	87	84	51	23	13	9	9.8%	Granular Borrow (Gravel)	Owner: Foster Bros. Farms, Inc. (Former Owner: Keith Pearson). Area is a 100' x 150' active pit. Leased to Vernon Dwire, 0.2 mile east of Vermont Route 116, and 0.73 mile north of its junction with Town Highway No. 40. Test No. 1-A was on east face of upper pit level. Material was: 1'-15', silt-clay coated, fine-to-medium gravel which caved very readily. There were many large boulders on entire face.
	1-B	1976	15-35	----	Yes	100	93	78	46	9	6	10.3%	Gravel	Test No. 1-B was below Test No. 1-A. Material was: 15'-35', damp, silt-clay coated, fine-to-medium gravel which caved very readily. There was

TABLE I

## MIDDLEBURY GRANULAR DATA SHEET NO. 25

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	1-C	1976	35-50	----	Yes	95	89	73	42	5	3	14.9%	Gravel	sloughed material and roots on face.  Test No. 1-C was below Test No. 1-B. Material was: 35'-50', damp, silt-clay coated, fine pebbly gravel with some cobbles and large boulders; there was much sloughed material.
	2-A	1976	Stockpile	----	Yes	72	62		36	9	5	T-96 27.7%	----	Test No. 2-A was from Town of Middlebury Stockpile. Passing 4" sieve = 100%. Fractured Faces = 30%. Material failed for crushed gravel due to excess large stones.
	2-B	1976	Stockpile	----	Yes	100	100		66	15	8	T-96 28.5%	----	Test No. 2-B was from Town of Middlebury Stockpile. Fractured Faces = 75%. Material failed for crushed gravel due to excess sand.
	3-A	1976	10-16	0-10	Yes	88	72	53	33	8	5	12.9%	Gravel	Test No. 3-A was in southeast face of central pit lobe. Material was: 0'-10', not in place; 10'-12', cobbly gravel; 12'-14', pebbly gravel; 14'-16', cobbly, moist, silt-clay coated gravel.
	3-B	1976	16-24	----	Yes	90	84	72	51	3	2	9.3%	Gravel	Test No. 3-B was below Test No. 3-A. Material was: 16'-18', fine gravel; 18'-20', cobbly

TABLE I

MIDDLEBURY GRANULAR DATA SHEET NO. 26

Map Ident. No.	Field Test No.	Year Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks	
						% Passing									
						2"	1-1/2"	1/2"	#4	#100	#200				
															gravel; 20'-24', pebbly sand or pebbly fine gravel which was moist and silt-clay coated; bottom, sloughed material.
	4	1976	1-7	0-1	Yes	100	100	100	100	38	17	----	----		Test No. 4 was in small excavation near junction of access roads. Material was: 1'-3', sand; 3'-4', layer of silt-clay; 4'-7', sand with a few, thin silt-clay seams; bottom, sloughed material.
	5	1976	0-11	----	Yes	100	100	93	89	13	8	----	Sand		Test No. 5 was in east side of lowest pit floor. Material was: 0'-1', sand; 1'-3', gravel; 3'-6', sand; 6'-8', silty sand; 8'-9', boulders and silty sand; 9'-11', sand.
	6	1976	0-10	----	Yes	85	76	62	42	5	3	9.3%	Gravel		Test No. 6 was in southern end of pit floor, 125' S 13° W of, and 6' above Test No. 5. Material was: 0'-1.5', fine gravel; 1.5'-2', cobbly gravel; 2'-5', fine pebbly gravel; 5'-10', cobbly gravel and a few 12"+ boulders. Material caves very readily.
	7	1976	5-10	0-5	Yes	85	77	58	33	20	14	15.1%	Granular Borrow (Gravel)		Test No. 7 was in floor of small excavation, 10' south of Test No. 4. Material was: 5'-7', gravel; 7'-8', boulders;



MIDDLEBURY GRANULAR DATA SHEET NO. 27

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	8	1976	2.5-10	0-2.5	Yes	90	76	57	38	6	4	10.1%	Gravel	8'-10', gravel.  Test No. 8 was in upper level, 45' S 55° E of lowest eastern face. Material was: 2.5'-3.5', layer of 6" - 12" boulders; 3.5'-10', sandy gravel; bottom, bouldery gravel.
17	1	1976	0-9	---	Yes	93	89	77	65	4	2	9.3%	Sand	Owner: Foster Bros. Farms, Inc (Former Owner: Keith Pearson.) Joseph P. Carrara & Sons, Inc. leases from owner and may have an option to buy. Eventually, the lessee wants to draw out enough gravel to have a level road; instead of the present steep one. The planned road will follow the power-line right-of-way. Area is a large pit with high faces and dangerous, very easily dislodged boulders. Pit is east and southeast of pit at Map Identification No. 16 and 0.15 mile east of Vermont Route 116, 0.73 mile north of its junction with Town Highway No. 40. Test No. 1 was on low south face of pit. Material was: 0'-4', pebbly fine gravel; 4'-6', pebbly sand; 6'-9', sand and cobbles (gap-graded gravel); bottom, sloughed material.

## MIDDLEBURY GRANULAR DATA SHEET NO. 28

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						2"	1-1/2"	1/2"	#4	#100	#200			
	2-A	1976	2-15	0-2	Yes	89	70	47	30	20	12	8.5%	Granular Borrow (Gravel)	Test No. 2-A was on east face of north spur of pit. Material was: 2'-15', moist, silt-clay coated gravel with boulders. Material caves readily.
	2-B	1976	15-45	----	Yes	82	76	48	26	22	16	6.0%	----	Test No. 2-B was below Test No. 2-A. Material was: 15'-45', moist, silt-clay coated gravel which caved very easily. There were many boulders.
	2-C	1976	45-60	----	Yes	88	84	67	46	12	8	10.9%	Gravel	Test No. 2-C was below Test No. 2-B. Material was: 45'-60', silt-clay coated gravel with some boulders. Material caved very readily. There is considerable material remaining in the feature which may be the edge of a kame terrace.
	3	1976	0-10	----	No	86	86	64	44	14	6	10.9%	Gravel	Test No. 3 was in clearing atop pit, 30' east of face and 15' N 15° W of power pole #5/51-5. Material was: 0'-5', fine gravel; 5'-6', lens of sand; 6'-10', gravel; material caved readily. The sand lens tapers from 5' to 8' at the north end of test-hole.
	4	1976	0-10	----	Yes	92	79	57	27	11	7	8.3%	Gravel	Test No. 4 was in floor at south end of pit. Material was: 0'-10', coarse gravel which caved very readily.

MIDDLEBURY GRANULAR DATA SHEET NO. 29

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	5	1976	0-10	----	Yes	95	81	43	22	19	13	8.6%	Granular Borrow (Gravel)	Test No. 5 was in floor at north end of pit, 145' N 10° W of Test No. 4. Material was: 0'-10', silt-clay coated gravel and coarse gravel with some boulders.
	6	1976	0-10	----	Yes	89	86	60	36	12	8	10.1%	Gravel	Test No. 6 was in northeast floor of upper pit level. Material was: 0'-2', silt-clay coated, coarse gravel; 2'-5', silt-clay coated, bouldery gravel; 5'-10', silt-clay coated gravel.
	7	1976	1-10	0-1	Yes	88	72	45	23	23	14	13.6%	Granular Borrow (Gravel)	Test No. 7 was in north face of upper pit level. Material was: 1'-10', silt-clay coated gravel; bottom, sloughed material; face caved too rapidly to sample.
18	1	1976	1-12	0-1	Yes	97	87	55	33	46	43	11.6%	----	Owner: Mrs. Marion Munson. Area consists of two small, inactive, overgrown, boulder- and trash-strewn pits in woods, 300' northwest of Town Highway No. 27, and 0.37 mile north of its junction with Town Highway No. 40. Test No. 1 was on north face of small (30' x 60') northern pit. Material was: 1'-12', silty, well-nested, tabular gravel; bottom, sloughed

TABLE I

MIDDLEBURY GRANULAR DATA SHEET NO. 30

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	2	1976	1-12	0-1	Yes	88	66	44	29	22	16	15.7%	----	cobbles. This pit was not accessible to back-hoe.  Test No. 2 was on north face of small (45' x 60') southern pit. Material was: 1'-12', dirty cobbly gravel with some tabular stones in a mushy sand matrix; bottom, boulders and sloughed material.
	3	1976	0-8	----	Yes	57	39	24	14	24	18	16.9%	----	Test No. 3 was in northwest corner of southern pit floor. Material was: 0'-7', poorly graded, silt-clay coated, coarse bouldery gravel with an estimated 50% of the stones larger than 4" and not included in the sample; 7'-8', silt-clay and boulders.
	4	1976	1-10	0-1	No	100	100	90	84	38	20	----	----	Test No. 4 was in woods just east of line-fence, 480' west of the junction of pit access road and woods road. Material was: 1'-8', fine sand; 8'-10', sand; bottom, water and sand.
19	1-A	1976	1.5-11	0-1.5	Yes	97	86	74	59	7	3	10.3%	Gravel	Owner: Joseph P. Carrara & Sons, Inc. (Former Owner: Harry Goodro.) Area is pit east of Town Highway No. 27, 0.2 mile north of its junction with Vermont Route 125. Pit is a source

TABLE I

## MIDDLEBURY GRANULAR DATA SHEET NO. 31

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
														of material for Carrara's form plant, and has a wooded granular extension to the east. The floor is soft and silty; the faces have vegetation, stone piles and sloughed material. Test No. 1-A was on north face of pit. Material was: 1.5'-5', dusty gravel; 5'-6', silt-clay seam; 6'-11', gravel and fine gravel; bottom, fine gravel. Face caved very readily.
	1-B	1976	11-27	----	Yes	100	100	92	84	21	9	----	Sand	Test No. 1-B was below Test No. 1-A. Material was: 11'-12', dusty, pebbly, fine gravel; 12'-18', sand; 18'-21', pebbly sand; 21'-27', pebbly sand.
	1-C	1976	27-38	----	Yes	100	100	100	96	60	33	----	----	Test No. 1-C was below Test No. 1-B. Material was: 27'-28', pebbly sand; 28'-38', sand and silty sand seams; bottom, sloughed material.
	2	1976	1-14	0-1	Yes	85	85	77	68	25	24	----	----	Test No. 2 was on east face of pit. Material was: 1'-3', pebbly fine gravel; 3'-6', pebbly sand; 6'-14', sand; bottom, sloughed material.
	3	1976	1-12	0-1	Yes	100	88	88	73	8	4	----	Granular Borrow (Sand)	Test No. 3 was on north face of small, lowest pit level. Material was: 1'-5', dusty

## MIDDLEBURY GRANULAR DATA SHEET NO. 32

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	4	1976	0.5-10	0-0.5	Yes	100	100	91	85	10	3	----	Sand	sand; 5'-7', pebbly sand; 7'-12', sand and some silt seams. Test No. 4 was in floor of northeast corner of pit. Material was: 0.5'-2.5', pebbly fine gravel; 2.5'-11', sand with a few scattered layers of pebbles.
	5	1976	0-11	----	Yes	100	100	100	97	35	12	----	Granular Borrow (Sand)	Test No. 5 was in northwest floor of pit, 275' N 66° W of Test No. 4. Material was: 0'-11', fine silty sand.
	6	1976	0-11	----	Yes	100	100	100	98	28	7	----	Sand	Test No. 6 was in floor near Town Highway No. 27, 235' southwest of Test No. 5. Material was: 0'-11', uniform sand.
	7	1976	0.5-8	0-0.5	Yes	100	89	74	66	5	3	----	Granular Borrow (Sand)	Test No. 7 was in floor of lowest pit level, 285' S 60° E of Test No. 6. Material was: 0.5'-5.5', pebbly fine gravel; 5.5'-6.5', gravel; 6.5'-8', sand.
	8	1976	0.5-10	0-0.5	Yes	75	61	53	43	12	5	12.8%	Gravel	Test No. 8 was in clearing atop, and 10' northeast of pit. Material was: 0.5'-2', sand; 2'-4', gravel; 4'-6', fine silty sand; 6'-7', gravel; 7'-10', sand.

TABLE I

MIDDLEBURY GRANULAR DATA SHEET NO. 33

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
20	1	1976	3-10	0-3	No	92	88	72	61	12	5	11.0%	Granular Borrow (Gravel)	Owner: U.S. Forest Service. Area is a low roadside bank north of Town Highway No. 35, with small clearing on possible wooded extension south of road. Area is 0.2 mile east of the junction of Town Highway No. 35 and U.S. Forest Route 234, and 0.4 mile north-east of Vermont Route 125. Test No. 1 was in face near corner of bank north of road. Material was: 3'-5', sand; 5'-8', gravel; 8'-9', sand; 9'-10', gravel; bottom, gravel.
	2	1976	1-10	0-1	No	87	81	68	54	22	14	10.4%	Granular Borrow (Gravel)	Test No. 2 was in clearing, 125' S 20° E of Town Highway No. 35 and 0.3 mile east of Test No. 1. Material was: 1'-10', bouldery gravel.
21	1	1976	1-17	0-1	No	86	86	82	78	11	4	----	Granular Borrow (Sand)	Owner: U.S. Forest Service. Area is a bank on north side of road cut on Town Highway No. 35, 0.8 mile northeast of its junction with Vermont Route 125. Access is fair-to-poor, steep, bumpy, and needs culvert upgrading. Test No. 1 was in face along west end of bank. Material was: 1'-5', gravelly sand;

## MIDDLEBURY GRANULAR DATA SHEET NO 34

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						2"	1-1/2"	1/2"	#4	#100	#200			
	2	1976	1-17	0-1	No	79	70	56	43	6	3	13.8%	Gravel	5'-8', pebbly sand; 8'-17', sand with a few pebbles; bottom, sloughed material.  Test No. 2 was on face of bank, 80' east of Test No. 1. Material was: 1'-8', gravel; 8'-9', gravelly sand; 9'-12', sand; 12'-17', gravel; bottom, sloughed material.
	3-A	1976	1-13	0-1	No	96	85	73	60	22	17	14.3%	----	Test No. 3-A was in face of bank, 110' east of Test No. 2. Material was: 1'-13', gravel; bottom, same.
	3-B	1976	13-24	----	No	96	78	60	37	6	3	14.4%	Gravel	Test No. 3-B was below Test No. 3-A. Material was: 13'-18', gravel; 18'-20', gravelly sand; 20'-24', gravel; bottom, sloughed material.
	4	1976	1-10	0-1	No	87	87	87	78	5	3	----	Granular Borrow (Sand)	Test No. 4 was in clearing at height of road, 635' north and east of Test No. 3. Material was: 1'-5', pebbly sand; 5'-7', gravelly sand; 7'-10', sand. There were several 2-foot boulders.
	5	1976	3-10	0-3	No	100	100	93	87	6	3	----	Sand	Test No. 5 was in pull-off on North Branch Road, 130' S 80° W of Test No. 1. Material was: 3'-7', pebbly sand; 7'-10', sand with a few cobbles and boulders.





TABLE I  
Supplement

MIDDLEBURY PROPERTY OWNERS - GRANULAR

	Map Identification Number
Bushey, Raymond . . . . .	2
Carrara, Joseph P. & Sons, Inc. . . . .	6, 14, 19
DeBouter, Jan . . . . .	3
Dow, Percy R. . . . .	13
Forbes Bros. . . . .	10
Forbes, Elbert . . . . .	7, 8, 9, 12
Foster Bros. Farms, Inc. . . . .	16, 17
Johnson, Fred . . . . .	11
Munson, Mrs. Marion . . . . .	18
Pike Industries, Inc. . . . .	4
Stearns, Roy J. . . . .	1
Talley, Andrew and Arlene; and Zitney, Louis . . . . .	5
United States Forest Service . . . . .	20, 21, 22
Vermont, State of . . . . .	15

TABLE II

## MIDDLEBURY ROCK DATA SHEET NO. 1

Ident. No.	Field Test No.	Year Field Tested	Rock Type	Exist- ing Quarry	Method of Sampling	Abrasion AASHTO		Remarks
						T-3	T-96	
1	-----		NOT SAMPLED Shelburne Yes Limestone					Owner: Mrs. Noreen Halpin (Hubbard R.E.). Area is a small (50' x 80'), water-filled quarry 0.4 mile south of Town Highway No. 10 east end, and a covered bridge (#23) over Muddy Branch Brook. The access road is 0.4 mile east of the junction of Town Highway No. 8 and 10, progresses from a crude woods road to a trail, and is the remnant of the old haul road on east side of brook. The present owner is interested in keeping the land as untouched as possible and is not willing to sell. The quarry hole is steep-sided and water-filled; no sample was taken.
2	1-A	1976	Cheshire Quartzite	No	Chip	2.0%	25.3%	Owner: Pike Industries, Inc. Area is west base of mountains 0.3 mile east of Vermont Route 116 in the northeast corner of town. Access is good via a 0.2-mile long woods road joining Vermont Route 116, 10 feet south of the Bristol Town Line; the remaining distance is thru deciduous woods. The volume of material is major, and development of the site would be quite easy with a well-drained road in a granular feature, and flat topography. Unless owner-ship of the woods road is established, access will have to be via Pike's pit at granular Map Identification No. 4. Rock is hard, brittle, sharp-edged Cheshire Quartzite. Very indistinct bedding seems to strike N 12° E and dip 65° to the east. The quartzite is mostly light gray to buff, compact, fine-grained but not vitreous. The outcrop (mountain base) trends roughly north-south. Test No. 1-A was from random blocks at bottom of talus slope.
	1-B	1976	Cheshire Quartzite	No	Chip	1.0%	24.5%	Test No. 1-B was from blocks along bottom of scarp. Rock does not have the typical appearance of Cheshire Quartzite.

TABLE II

## MIDDLEBURY ROCK DATA SHEET NO. 2

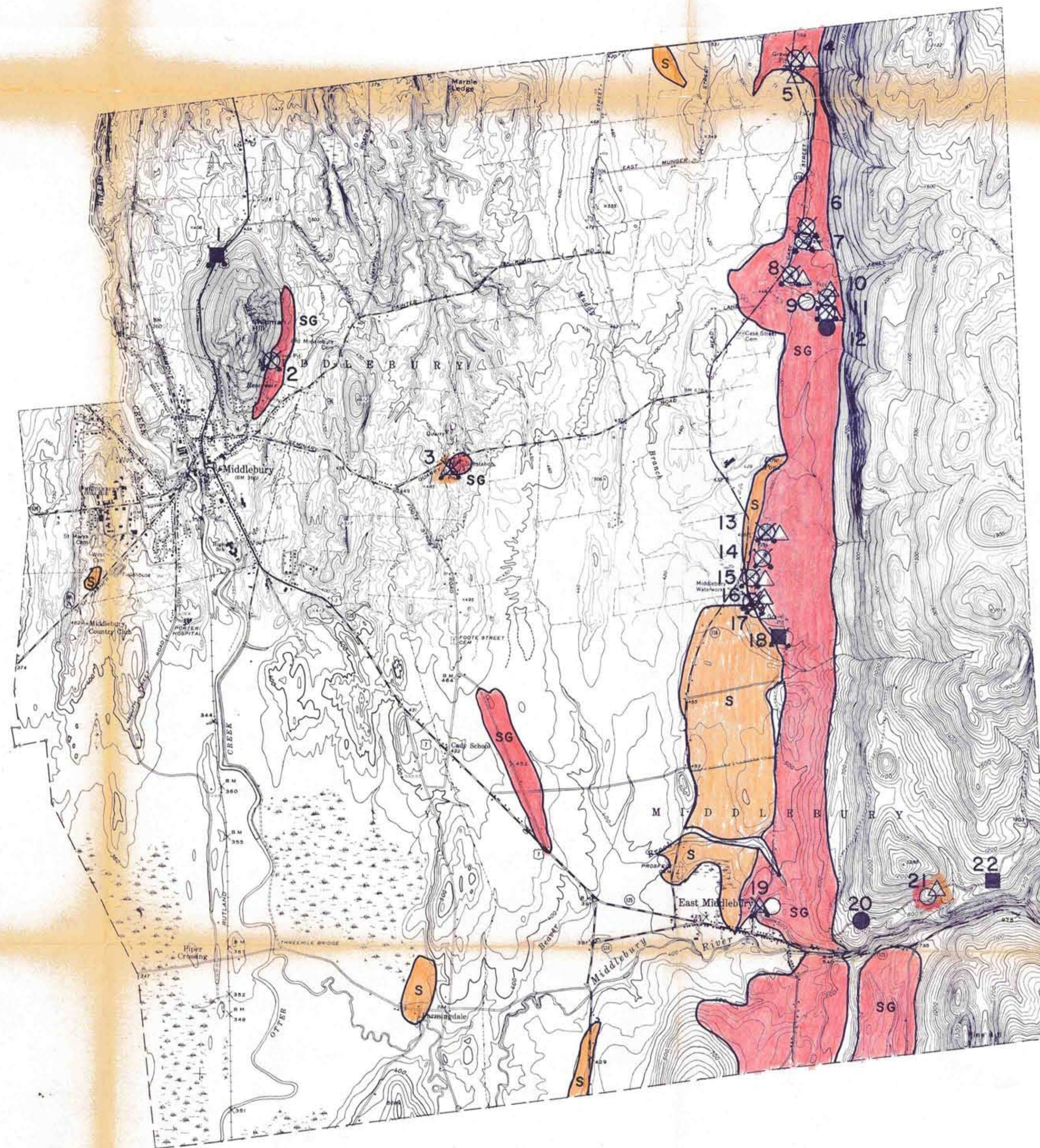
Ident. No.	Field Test No.	Year Field Tested	Rock Type	Exist- ing Quarry	Method of Sampling	Abrasion AASHTO		Remarks
						T-3	T-96	
3	1-A	1976	Shelburne Marble	Yes	Chip	4.6%	30.2%	Owner: Richard Pominville. Area is a series of narrow, deep, water-filled quarries which extend in a line northward 100' west of old crusher buildings and waste piles. Access is southward via a 0.14 mile haul road to State Aid Highway No. 7 (Quarry Road). The rock is white to light buff Shelburne formation marble which weathers from gray to nearly black. No bedding was noted but the foliation is nearly vertical and trends north-south, therefore the tests represent 150' of rock across the foliation and not across the strike of the beds. The rock broke into mostly sub-angular to thin and tabular pieces; minor amounts of blocky fragments were obtained. Test No. 1-A was from random blocks.
	1-B	1976	Shelburne Marble	Yes	Chip	4.5%	27.4%	Test No. 1-B was from random blocks.
4	1-A	1976	Shelburne Limestone and Marble	Yes	Chip	4.2%	33.1%	Owner: Guy LaFramboise. Vermont Marble Company leases property from owner; and every two years blasts and crushes enough stone for its white pigment plant operation. Area is a large, partly water-filled quarry 0.5 mile east of Town Highway No. 7, and 0.35 mile north of its junction with Town Highway No. 24. The area was mapped as the Cutting Dolomite; however, it appears to be the Shelburne limestone and marble. There are zones which indicate that the quarry lies very close to the contact between two rock types. The fragments varied from blocky to sub-angular to angular, to thin and elongated. The more dolomitic zones were harder than the calcareous ones. The height of walls varied from 5' in water-filled sections to over 60' along the northwest edge. There was no bedding; only obscure inclined foliation. Test No. 1-A was from random blocks on quarry floor.



TABLE II  
Supplement

MIDDLEBURY PROPERTY OWNERS - ROCK

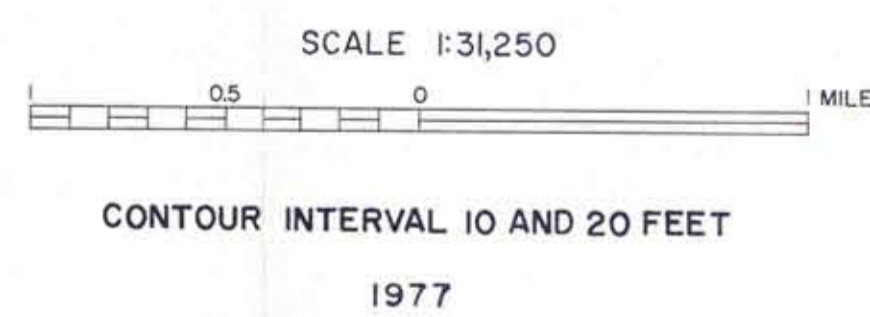
	Map Identification Number
Halpin, Mrs. Norene . . . . .	1
Laframboise, Guy . . . . .	4
Middlebury, Town of . . . . .	5
Pike Industries, Inc. . . . .	2
Pominville, Richard . . . . .	3



**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)

**MIDDLEBURY**

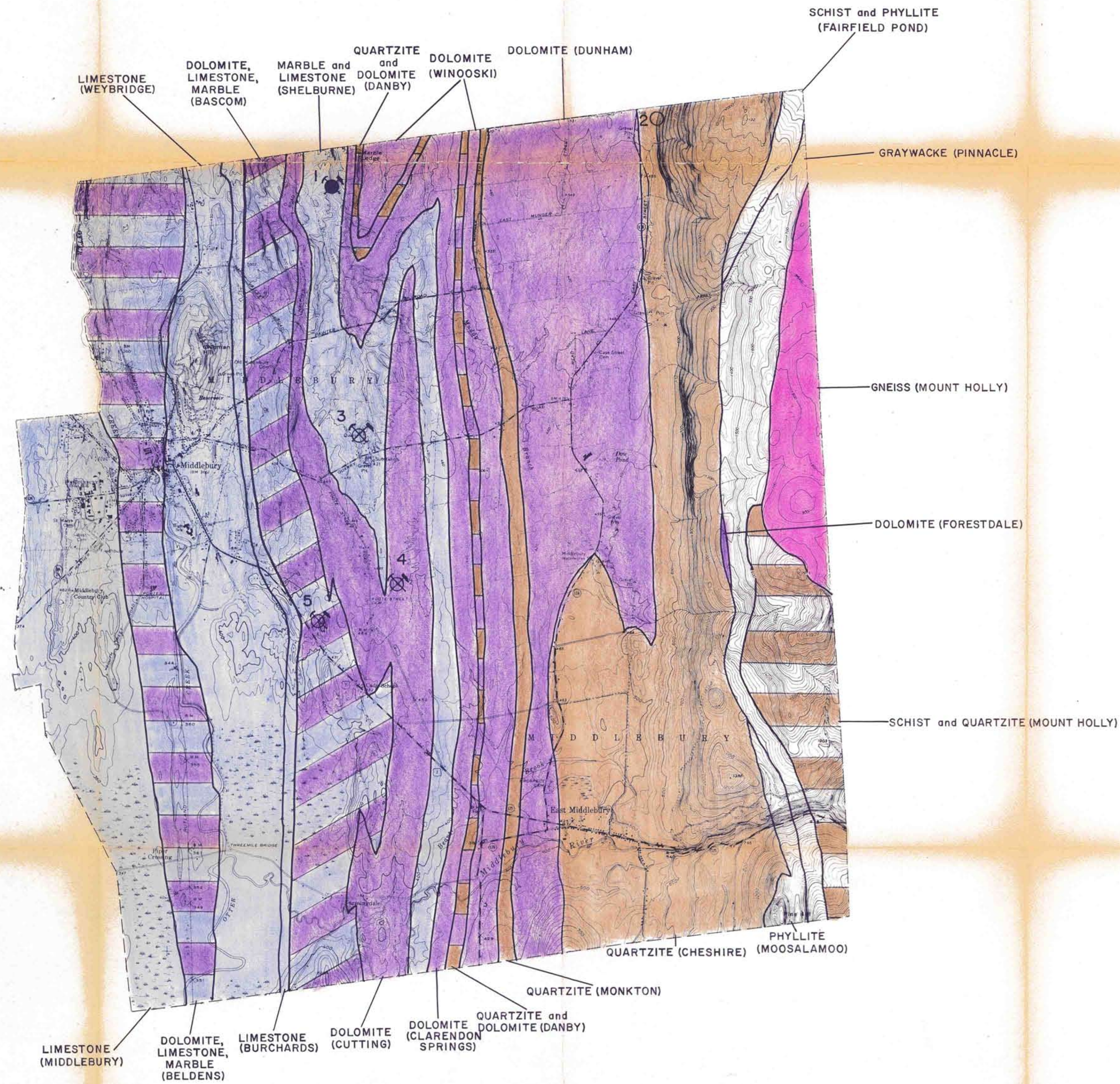


**GRANULAR MATERIALS MAP**  
 BY  
 VERMONT DEPARTMENT OF HIGHWAYS  
 IN COOPERATION WITH  
 U.S. BUREAU OF PUBLIC ROADS

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

REVISIONS

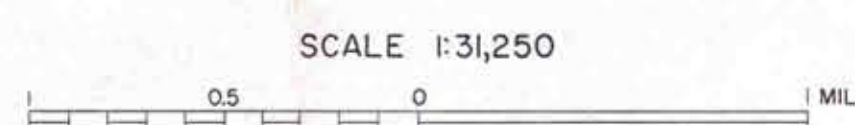
DATE	BY				



**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)

**MIDDLEBURY**



CONTOUR INTERVAL 10 AND 20 FEET

1977

**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

DATE					
BY					