SURVEY OF HIGHWAY CONSTRUCTION MATERIALS

IN THE TOWN OF GOSHEN, ADDISON COUNTY, VERMONT

Prepared by

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION

ENGINEERING GEOLOGY SUBDIVISION

Montpelier, Vermont

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State of Vermont
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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.

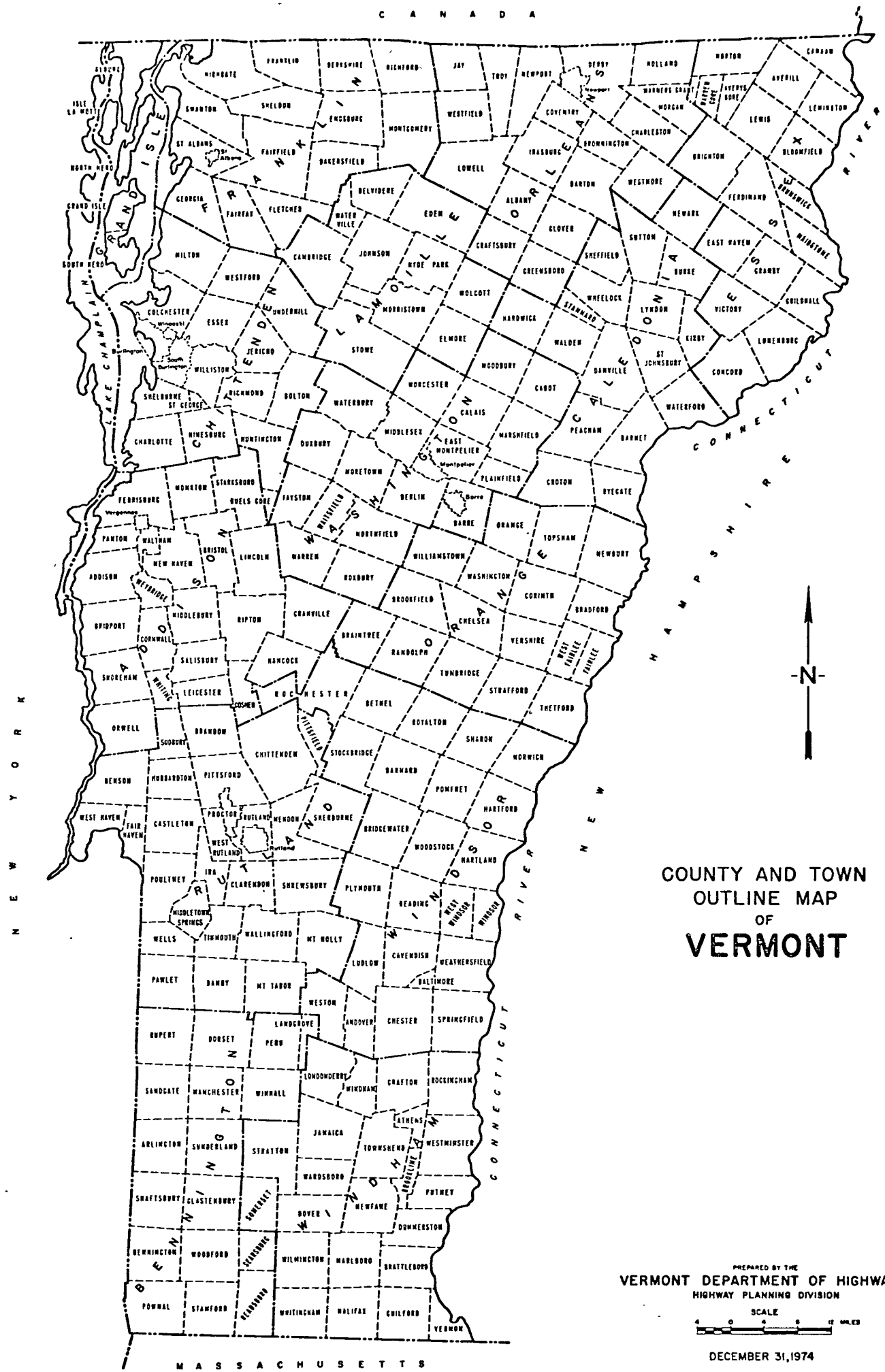
Work sheets containing more detailed information and a field sketch of the area, and laboratory test results are on file in the Materials & Research Division of the Agency of Transportation, State of Vermont.

LOCATION

The town of Goshen is in southeast Addison County in west-central Vermont. It is bounded on the north by Ripton, the east by Hancock and Rochester, the south by Chittenden, and the west by Brandon, Leicester, and Salisbury. (See County and Town Outline Map of Vermont on the following page.)

Goshen is entirely within the Green Mountains Physiographic Subdivision of the New England Upland. Its topography is characterized by steep-sided hills and mountains. Elevations vary from 3,350 feet at the summit of Cape Lookoff Mountain, to 930 feet where the Neshobe River crosses the Brandon town line.

Goshen is in the Otter Creek drainage basin. Principal streams are the Neshobe River and its North Branch. Minor streams are Basin, Dutton, and Sucker Brooks, which drain westward. Sugar Hill Lake, a small reservoir, is located in the northeast corner of the town.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

PREPARED BY THE
VERMONT DEPARTMENT OF HIGHWAYS
HIGHWAY PLANNING DIVISION

SCALE

4 0 4 8 12 MILES

DECEMBER 31, 1974

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 a cartographic simplification. A more detailed description of the respective rock formations is included in the Summary of Rock Formations 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 materials; this is particularly true with metamorphic rocks.

Complex metamorphic rocks comprise almost all of the formations within Goshen. Most of town is underlain by phyllite, schist, and schistose graywacke that are unsuitable for crushed stone because they break into thin plates when crushed. The Mount Holly gneiss is a durable and a proven source of material elsewhere in the state. This rock type is well-exposed along Vermont Route 73 and was sampled in the Green Mountain National Forest at Map Identification No. I. No other locality was well-exposed, due to the mantle of glacial drift and vegetation which limits bedrock exposures.

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 Deposits

Granular materials in Goshen are mostly of glaciofluvial origin. They consist of kame terraces at two separate locations and outwash at the third.

One kame terrace is located on the southwest slope of Hogback Mountain (locally called Blueberry Hill), between 1,900-foot elevation and Town Highway No. 5. This feature was sampled at Map Identification Nos. 2 and 3.

The other kame terrace encompasses Goshen Four Corners on the east and south and lies below the 1,600-foot contour. It was sampled at Map Identification Nos. 6, 7 and 8.

According to the Surficial Geologic Map of Vermont, material at Map Identification No. 4 might be in a spillway outwash or valley train feature.

Elsewhere pits have been opened in pockets of localized material that suggest glaciolacustrine origin (Map Identification Numbers 1, 5 and 9).

The town of Goshen recently enacted zoning laws which stringently regulate the development of sand and gravel pits.

SUMMARY OF ROCK FORMATIONS IN THE TOWN OF GOSHEN

Vermont Valley Sequence

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.

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

Green Mountain Sequence

Camels Hump Group

Underhill Formation (Forestdale member): Buff - to rusty-weathered white, buff, and pink - and white-mottled dolomite containing local interbeds of dolomitic sandstone, gray-green phyllitic quartzite, and cross-bedded sandy dolomite.

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

Hoosac Formation: Quartz-sericite-albite-biotite-chlorite schist characterized by albite porphyroblasts--biotite and garnet porphyroblasts common southward; locally carbonaceous.

Mount Holly Complex: Mainly fine - to medium - grained biotite 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.

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.

Amphibolite: A green-to-black schistose, metamorphic rock consisting mostly of amphibole (i.e., tremolite, actinolite, hornblende, or arfvedsonite).

Bedding: The arrangement of rock in layers, 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 dark platy silicate mineral commonly known as black mica.

Carbonaceous: Containing carbon.

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

Chloritoid: A brittle member of the mica mineral group.

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 natural cement such as calcium carbonate, clay, iron oxide, or silica.

Contour line: A line on a map representing a line connecting points on the surface of the earth having the same elevation.

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

Dolomite: A rock consisting predominantly of the mineral dolomite, containing 47.7% carbon dioxide, 30.4% lime, and 21.9% magnesia.

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

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

Glacial drift: The term embraces all rock material in transport by glacial ice, all deposits made by glacial ice, and all deposits predominantly of glacial origin made in the sea or in bodies of glacial meltwater. It includes till and scattered rock fragments, as well as stratified deposits.

Glossary Continued

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

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

Gneiss: A metamorphic rock having alternating bands of light and dark minerals; the light bands are rich in feldspar and quartz, and the dark bands are rich in hornblende and mica.

Granitic: Characteristic of, composed of, pertaining to, or like granite.

Granitoid: 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 in, or lacking mica, and with a single visible plane of schistosity that is caused by parallel orientation of coarse-grained quartz lenses set in a quartzose matrix.

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

Hornblende: A mineral approximately $Ca_2Na\ (Mg,Fe)_4\ (Al,Fe,Ti)_3\ Si_6O_{22}\ (O,OH)_2$ that is the common dark variety of amphibole.

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

Limonite: A general term for natural hydrous iron oxides whose precise identity is unknown. Limonite is the common secondary material formed by the oxidation of iron or iron-bearing minerals at ordinary temperatures and pressures. It occurs as coatings, loose or dense masses, or a variety of other forms.

Mantle: The loose material at or near the surface; above bedrock.

Metamorphic rocks: Formed from pre-existing rocks that are altered by pressure, heat, or the infiltration of gases and liquids below the weathered zone and zone of cementation. Metamorphic rocks are reconstructed in place while remaining essentially solid.

Mica: Any of a group of rock-making minerals characterized by perfect cleavage in one direction which produces thin, tough, elastic plates or laminae.

Muscovite: An important member of the mica group of minerals, known also as white mica, potash mica, and isinglass.

Pegmatite: A variety of crystalline igneous rock characterized by large grain size, interlocking texture and particularly great range in grain size. Pegmatites are commonly associated with large bodies of igneous rock of similar composition.

Glossary Continued

Phyllite: A fine-grained, foliated metamorphic rock with a distinctive silvery appearance that is caused by the mineral sericite. Practically all phyllites are derived from fine-grained sedimentary rocks by deformation and recrystallization.

Physiographic: Pertaining to the physical divisions of the earth.

Porphyroblasts: Large crystals which have formed in place within the fine-grained matrix of a metamorphic rock, by heat, pressure and infiltrating solutions. They occur later than the rocks in which they form.

Quartz: A mineral (SiO_2) that occurs in hexagonal crystals or amorphous masses. It may be transparent, translucent, opaque, or may be colored depending on impurities. It is the most common mineral.

Quartzite: A common siliceous rock composed of quartz grains so firmly cemented that fracture occurs with equal ease across both grains and cement. The metamorphic equivalent of sandstone.

Sandstone: A consolidated rock composed of sand grains cemented together. Sandstone fractures around the grains rather than through them as in quartzites; the broken surface of a sandstone has a gritty feel and loose grains are usually present.

Schist: A crystalline rock with a secondary foliation or lamination based on the parallelism of platy or needlelike grains. The name refers to its tendency to split along the foliation.

Sericite: A mineral very similar to muscovite that occurs in minute flakes or scales in rocks such as schist and gneiss.

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

Topography: The configuration of a surface, including its relief, the position of its streams, lakes, roads, cities, etc.; hence, loosely, natural or physical features collectively.

Valley train: Sand and gravel deposited by drainage from a valley glacier.

Weathered: Showing the effects of exposure to the atmosphere.

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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, 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

TA 404 2C Rev. 2/79

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

GOSHEN GRANULAR DATA SHEET NO. 1

TABLE I

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 AOT Spec.	Remarks
						2 "	1-1/2"	1/2"	#4	#100	#200			
1	1A	1979	0.5-3.5	0-0.5	Yes	83	70	54	42	12	9	11.3%	Gran. Borrow (Grav.)	Owner: Garfield Fay. Area is a pit complex east of Town Highway No. 2 which is crossed by a private road to a trailer home, 0.86 mile north of the junction of Town Highway No. 3. The pit is 200' X 150' with a 22-foot high face and a northward extension. Area was inactive and overgrown with brush and deciduous trees. Test No. 1A was in lower 10-foot face near south end of complex. Material is: 0-0.5', overburden; 0.5'-3.5', sandy, fine-to-coarse, loosely consolidated gravel, bottom, Test No. 1B.
	1B	1979	3.5-12	-	Yes	100	100	100	100	62	21	-	-	Test No. 1B was below test 1A, and 2 feet into floor. Material is: 3.5'-12', sandy silt-clay; bottom, silt.
	2A	1979	1.5-5.5	0-1.5	Yes	75	61	45	32	8	6	13.9%	Gravel	Test No. 2A was in upper bank north of private road, 115' east of Town Highway No. 2. Material is: 0-1.5', overburden; 1.5'-5.5', loosely consolidated silty, coarse gravel.
	2B	1979	5.5-9	-	Yes	94	79	55	41	8	6	12.8%	Gravel	Test No. 2B was below Test No. 2A. Material is: 5.5'-9', loosely consolidated, sandy, medium-to-fine gravel; bottom, silty sand or sandy silt.

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GOSHEN GRANULAR DATA SHEET NO. 2

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	1979	2-9	0-2	Yes	87	87	79	76	73	55	-	-	Test No. 3 was in northwest face of north lobe of pit. Material is: 0-2', overburden; 2'-5', sandy silt; 5'-9', silt and stones; bottom, stony silt-clay.
2	1A	1979	2-15	0-2	Yes	100	92	82	69	16	12	22.6%	Sand	Owner: U. S. Forest Service. Area is a large (350' X 175') pit north of Town Highway No. 5 and 0.32 mile east of the junction with Town Highway No. 2. There was standing water on the floor of the pit. The 36-foot high southwest face is being worked. A 240-foot ridge connects a higher inactive pit to the west. (See Map Identification Number 3). National Forest Service is making material available to town of Goshen, but not to private contractors. Test No. 1A was in upper SSE face of pit. Material is: 0-2', overburden; 2'-15', thick beds of coarse-to-fine gravel and silty sand.

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

GOSHEN 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			
	1B	1979	19-28	0-2	Yes	87	87	75	60	11	7	23.7%	Gravel	Test No. 1B was in face below, and 15 feet west of Test No. 1A. Material is: 19'-28' loosely consolidated, coarse-to-fine gravel and silty sand; bottom, same.
	1C	1979	28-36	-	Yes	100	89	62	41	8	5	23.9%	Gravel	Test No. 1C was below Test No. 1B. Material is: 28'-36', loosely consolidated, sandy, fine-to-medium gravel; bottom, gravel.
	2	1979	2-5	0-2	Yes	83	76	54	39	11	4	24.5%	Gravel	Test No. 2 was in floor, 20-feet northeast of test No. 1C, Material is: 0-2', overburden; 2'-5', hard-packed coarse gravel.
3	1	1979	2-5	0-2	Yes	100	100	100	55	21		-	-	Owner: U. S. Forest Service. Area is a 72-foot high, (120 X 115') pit north of Town Highway No. 5, and 0.17 mile east of Town Highway No. 2 junction. West side of floor is overgrown and has a stockpile of cobbles and boulders. Extension is east-northeast into an uncut

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

GOSHEN 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						Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
						2 "	1-1/2"	1/2"	#4	#100	#200			
														blueberry bush-covered meadow that connects with the pit at Map Identification No. 2, 240' to the east.
	2	1979	2-7	0-2	Yes	100	91	84	70	14	8	-	Sand	Test No. 1 was in upper northwest face. Material is: 0-2', overburden; 2'-5', silty fine sand; bottom, same. Test No. 2 was in southeast floor. Material is: 0-2', overburden; 2'-7', clean sand and gravel; bottom, cobbles and silt.
4	1	1979	0-5	-	No		(NOT SAMPLED)							Owner: Raymond Brown. Area is a hay field with low, undulatory relief, northwest of end of private road (formerly Town Highway No. 9). North of field is overgrown excavated area. Test No. 1 was at southeast end of field west of access road. Material is: 0-0.5', overburden; 0.5'-5', cobbles and boulders with orange (limonite-stained) sand and silt. More than 25% of the stones are larger than 4 inches. No sample was taken.

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MATERIALS & RESEARCH DIVISION - GEOLOGY SUB-DIVISION

GOSHEN 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						Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
						2 "	1-1/2"	1/2"	#4	#100	#200			
5	1A	1979	2-5	0-2	Yes	100	100	100	95	9	5	-	Sand	Owner: Camp Thorpe. Area is two pits in terrace north of State Aid Highway No. 1, 0.25 mile west of Town Highway No. 5 junction. West pit has 43-foot high north face, and scattered boulders on the 140' X 55' floor. Test No. 1A was in face at southeast corner of west pit. Material is: 0-2', overburden; 2'-3', orange, silty sand with stones; 3'-5', gray fine sand.
	1B	1979	5-9	-	Yes	100	100	100	99	8	3	-	Sand	Test No. 1B was below Test No. 1A. Material is: 5'-9', gray fine sand with a silt seam; bottom, sand. East pit is overgrown with large pines and has been inactive for many years. It is 200' north-east of west pit. Partial access for backhoe allowed less than a 3-foot deep test hole (test #2).
	2	1979	1-3	0-1	Yes	(NOT SAMPLED)								Test No. 2 was in floor of east pit. Material is: 0-1', overburden; 1'-2', hard-packed, sandy, medium gravel; 2'-3', gray sand. No sample taken.

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

GOSHEN GRANULAR DATA SHEET NO. 6

TABLE I

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 AOT Spec.	Remarks
						2 "	1-1/2"	1/2"	#4	#100	#200			
6	1	1979	1.5-4.5	0-1.5	Yes	100	100	100	98	94	87	-	-	Owner: Ralph Hathaway. Area is a 130' X 110', inactive pit in the woods 0.33 mile east of State Aid Highway No.1, with access 0.19 mile north of Vermont Route 73 intersection (Goshen Four Corners). Faces are heavily sloughed with fallen trees and large boulders. Floor is overgrown and had stockpiles and brush. Owner would not permit test of southwest extension. Test No. 1 was in upper southeast face. Material is: 0-1.5', overburden; 1.5'-4.5', yellow silt; bottom, same
7	1	1979	1-4	0-1	Yes	100	100	100	100	13	4	-	Sand	Owner: Charles Golden. Former owner: Baker. Area is a 205' X 15' pit in heavy birch and spruce woods, 0.14 mile from Vermont Route 73 with access via north field road 0.03 mile east of State Aid Highway No. 1 junction (Goshen Four Corners). 50-foot high north face has much loosely consolidated sand and sloughed moss and silt. The north-northwest extension drops steeply to an un-named brook.

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

GOSHEN 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						Abrasion AASHTO T-4-35	Passes AOT Spec.	Remarks
						2 "	1-1/2"	1/2"	#4	#100	#200			
	2	1979	1-9	0-1	Yes	100	100	100	99	26	9	-	Sand	Test No. 1A was near south-west end of upper north face. Material is: 0-1', overburden; 1'-4', slightly silty fine gray sand; bottom, same. Test No. 2 was in floor at foot of face. Material is: 0-1', overburden; 1'-9', medium-to-fine tan sand; bottom, gray sand. Note: The tan sand may not be in place.
8	1	1979	1-4	0-1	Yes	100	90	66	52	34	28	-	-	Owner: John Sherry. Area is a tiny pit near end of Town Highway No. 14. 6-foot high northwest face of pit truncates extensive grassy mound with flag-pole on crest north-northeast of owner's house. Floor is covered with sloughed material. Test No. 1 was in face of pit. Material is: 0-1', overburden; 1'-1.5', stony silt; 1.5'-4'; silty medium gravel with some 4"-plus stones; bottom, same.

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

GOSHEN 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			
9	1	1979	7-16	6-7	Yes	100	100	100	97	37	13	-	Gran. Borrow (Sand)	Owner: Herbert M. Kingsland. Area is an overgrown, 90'X 35' pit on the south side of an elongate, 100' X 35' knoll in a hilly field. Access to field was via bridge across the Neshobe River south of parking area on Vermont Route 73, one mile east of the west end of State Aid Highway No. 1. Test No. 1 was in north face of pit below upper floor. Material is: 0'-1', overburden; 7'-16', tan silty sand; bottom same.

TABLE I
SUPPLEMENT

GOSHEN PROPERTY OWNERS - GRANULAR	Map Identification No.
Brown, Raymond	4
Camp Thorpe	5
Fay, Garfield	1
Golden, Charles	7
Hathaway, Ralph	6
Kingsland, Herbert	9
Sherry, Jack	8
U. S. Forest Service	2, 3

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

GOSHEN ROCK DATA SHEET NO.1

TABLE II

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	1	1979	Gneiss	No	Chip	-	44.8%	Owner: U. S. Forest Service. Area is north of Vermont Route 73, 0.75 mile east of Town Highway No. 14 junction. Area is a steep hillside across Route 73 from a 250-foot long, semicircular parking lot. Next to highway is a 45-foot high rock cut consisting mainly of Mount Holly gneiss with a minor quartzite bed at the west end and a vertical pegmatite dike at the east end. 60-foot wide brush-covered extension is crossed by a Central Vermont Public Service power line that parallels Vermont Route 73. Test No. 1 was a random sample of blocks of gneiss along foot of the cut. Bedding dips 25° SE and a major joint set dips 82° N, 10° W.

TABLE II
SUPPLEMENT

GOSHEN PROPERTY OWNER - ROCK	Map Identification No.
U. S. Forest Service	1

N

LEGEND

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

GOSHEN

SCALE 1:31,250

0.5 0 1 MILE

CONTOUR INTERVAL 20 FEET

1979

GRANULAR MATERIALS MAP

BY

VERMONT AGENCY OF TRANSPORTATION

MATERIALS AND RESEARCH DIVISION

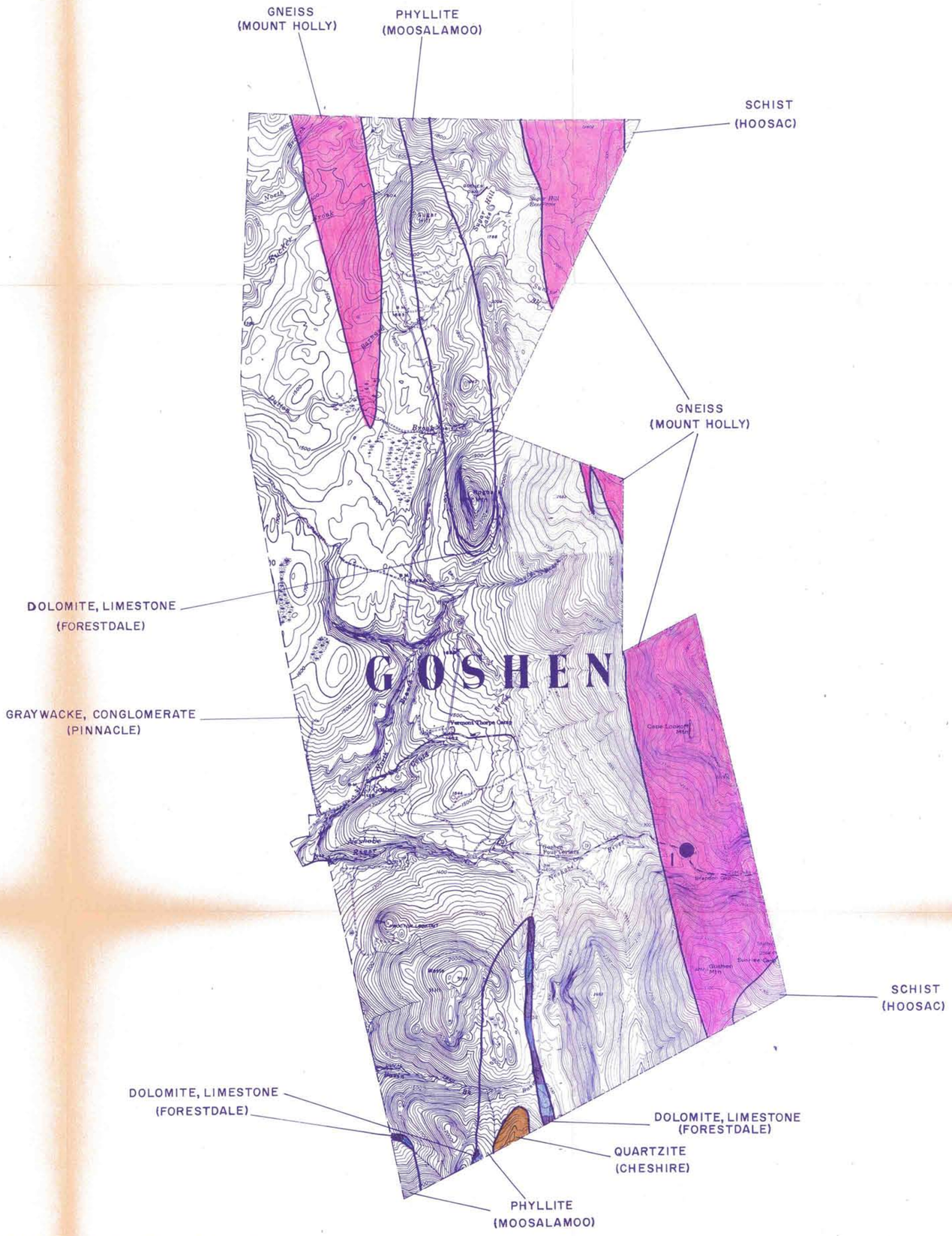
NOTE: BASED ON U.S.G.S. TOPOGRAPHIC MAPS

PLATE I GRANULAR

ADDISON COUNTY VT. HWY. DISTRICT NO. 3

REVISIONS

DATE						
BY						



N

LEGEND

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

GOSHEN

SCALE 1:31,250

0.5 0 1 MILE

CONTOUR INTERVAL 20 FEET

1979

ROCK MATERIALS MAP

BY

VERMONT AGENCY OF TRANSPORTATION

MATERIALS AND RESEARCH DIVISION

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

PLATE II

ROCK

ADDISON COUNTY VT. HWY. DISTRICT NO. 3

REVISIONS

DATE						
BY						