

SURVEY OF HIGHWAY CONSTRUCTION MATERIALS
IN THE TOWN OF IRA, RUTLAND COUNTY, VERMONT

prepared by

Engineering Geology Section, Materials Division
Vermont Department of Highways

in cooperation with

United States Department of Commerce
Bureau of Public Roads

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1. Various departments and individuals of the Vermont State Department of Highways, notably the Planning and Mapping Division and the Highway Testing Laboratory,
2. Professor D.P. Stewart of Miami University, Oxford, Ohio,
3. Professor C.G. Doll, Vermont State Geologist, University of Vermont, Burlington, Vermont,
4. United States Department of Commerce, Bureau of Public Roads.

History

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

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

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

Inclosures

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

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

1956. Further information was obtained from the Soil Survey (Reconnaissance) of Vermont conducted by the Bureau of Chemistry and Soils of the United States Department of Agriculture, and from 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. Several tests are usually conducted in each area represented by an Identification Number, the number of such tests being more or less arbitrarily determined either by the character of the material or by the topography.

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

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

LOCATION

The town of Ira is located in central Rutland County in the southwest part of the state. It is bounded on the west by the towns of Castleton and Poultney; on the southwest by Middletown Springs; on the south by Timmouth; on the east by Clarendon; and on the northeast by the town of West Rutland. (See County and Town Outline Map of Vermont on the following page.)

Ira is in the Taconic Range Physiographic Region of Vermont and is a very mountainous town characterized by steep, rugged terrain with ridges and spurs extending in all directions. The valley of Ira Brook, running from the south to the northeast through the township, is narrow and steep-walled at its south and northeast ends, and becomes broader with somewhat less steep valley slopes in its central portion. This valley is the deposition site of gravel and sand which is found west of Ira Brook between Town Highways No. 6 and No. 7.

The valley of the Castleton River, which has been cut through the Taconic Range in the north part of Ira, is broad with moderately steep lower slopes. The upper valley wall on the north side is high and precipitous. Tributaries to both major valleys are steep-walled, narrow, and have steep gradients.

Drainage in the south and central part of Ira is north via Ira Brook which is fed by numerous tributaries. Drainage in the north part of town is eastward via mountain streams toward the Clarendon River and from the north and south into the west-flowing Castleton River.

Herrick Mountain, which is the dominating feature in the township, is

located in the west-central part, and rises to an elevation of 2,726 feet. Many tributaries of Ira Brook and Castleton River originate on its sides. Another prominent peak is Bird Mountain with an elevation of 2,216 feet located on the Castleton-Ira Town Line. There are numerous peaks with elevations that exceed 1,900 feet. The lowest elevation in Ira is about 480 feet and occurs on the Castleton River at the Ira-Castleton Town Line.

SURVEY OF ROCK SOURCES

Procedure for Rock Survey

The routine employed by the project in the survey of possible sources of rock for highway construction is divided into two main stages: office investigation and field investigation. The first is conducted primarily during the winter months and comprises the mapping of rock types as indicated in various reference sources. Many different sources of information were utilized, as indicated in the bibliography. These references differ considerably in dependability due to new developments and studies contributing to the obsolescence of a number of reports. In addition, the results of samples taken by other individuals are analyzed, and the location in which these samples were taken is mapped when possible. In other words, as complete a correlation as possible is made of all the information available concerning the geology of the area under consideration.

The second stage of the investigation is begun in the field by making a cursory preliminary survey over the entire area. The information obtained in this survey, together with the information assimilated in the first stage of the investigation, is employed to determine the areas in which the testing and sampling will be concentrated. When a promising source is encountered as determined not only by rock type but also by volume, accessibility, and the existence of a good working face, chip samples are taken with a hammer and submitted to the Highway Testing Laboratory for testing by the Deval Method (AASHO T-3). It is kept in mind that the samples taken by the chip method are often in the weathered zone of the outcrop and consequently may show a less satisfactory test result than the fresh material deeper in the body of the rock structure. When deemed necessary, further samples are taken by drilling to a depth of approximately 3 feet and blasting across the strike or trend of the outcrop. When the material is uniform and satisfactory tests result from the chip samples, no further drilling, blasting, or sampling is done, and the material source is included as being satisfactory.

Discussion of Rock and Rock Sources

The rocks in the town of Ira consist predominantly of slates and phyllites of the Taconic and Limestone Valley sequences. Also outcropping in small areas are quartzites, graywacke, marble, and limestones. The upper slopes and summit of Bird Mountain consist of horizontally stratified quartzite and graywacke of the Zion Hill Member of the St. Catherine Formation. A rock fall of these rock types, occurring west of Town Highway No.5 on the east side of the mountain, was sampled as a possible source of Sub-base of Crushed Rock, Item 204. (See Plate II and Table II.) Although the sample met abrasion requirements for this item, the location probably could not be developed as a source because of difficult access, rough terrain, and thick tree cover, and the vertical exposure of quartzite and graywacke above the rock fall is inaccessible. Other exposures of the Zion Hill Member are shown on Plate II (the Rock Materials Map), but are either inaccessible or too small to consider as sources of Item 204.

Limestones of the Orwell and Glens Falls-Orwell formations are also exposed in Ira, but only in small areas. The Orwell limestone, also mapped as the Whipple Marble Member of the Ira Formation, by E-An-Zen in Vermont Geological Survey Bulletin No. 25; 1964, is exposed in a small quarry on the A. W. Day property beyond the end of Town Highway No. 11, and was quarried at one time for its lime content. This area was also sampled as a possible source of Item 204. The rock met abrasion requirements for this item, but is of limited extent.

The Brezee Formation of phyllite, marble, and locally massive quartzite beds was not found to contain a section of marble or quartzite of sufficient extent or thickness to warrant sampling as a source of Item 204.

SURVEY OF SAND AND GRAVEL SOURCES

Procedure for Sand and Gravel Survey

The method employed by the project in the survey of possible sources of sand and gravel for highway construction is divided into two main stages: office investigation and field investigation. The office investigation is conducted primarily during the winter months and comprises the mapping of possible potentially productive areas as indicated from various references. Of these references, the survey of glacial deposits mapped by Professor Stewart proves to be valuable, particularly when used in conjunction with other references such as soil-type maps, aerial photographs, and United States Geological Survey quadrangles. The last two are used in recognizing and locating physiographic features indicating glacial deposits and in studying drainage patterns. In addition, the location of existing pits are mapped when known. The locations in which samples were taken by other individuals are noted and mapped when possible.

The second stage of the investigation is begun in the field by making a cursory preliminary survey over the entire area noting areas which show physiographic features giving evidence of glacial or fluvial deposits. These locations are later examined by digging test pits with a backhoe to a depth of approximately 11 feet and then sampling the material. The samples are submitted to the Highway Testing Laboratory where they are tested for gradation and stone wear, the latter by the Deval Method (AASHTO T-4-35).

Discussion of Sand and Gravel Sources

Sands and gravels in Ira occur in small, scattered ice-contact features along the Castleton River, and on the sides of mountain stream valleys, north and northwest of Ira Village. Also, coarse, poorly-sorted gravels with some tabular stones occur in the valley on the west side of Ira Brook between Town Highways No. 6 and No. 7. Their origin is not known, but they may be alluvial gravels deposited by streams flowing in from the west. The observations that these gravels begin just south of where a tributary enters the valley, and that they extend westward up two tributary valleys, add credibility to this supposition.

The valley between Town Highways No. 6 and No. 7 is extensively farmed, and at the time Ira was sampled, only a very limited amount of testing could be done because of standing hay. However, gravels acceptable for Item 201 were found, and further testing to delineate their extent is clearly indicated. The vicinities of Map Identification Numbers 17, 20, and 21 are recommended for additional tests at some time when the hay crop does not interfere. Gravels which failed to meet abrasion requirements for Item 201 were sampled in Map Identification No. 18, and further testing is recommended here as well.

Ice-contact gravels and sands acceptable for Vermont Highway Department usage were sampled in Map Identification Numbers 7, 8, 12, 13, and 16. Map Identification Number 15 is a fairly large granular feature with a pit in which gravels or gravelly sands are exposed. Samples ought to be taken here if the owners' permission can ever be obtained.

Gravel deposited in kame terraces were sampled in the valley of the Castleton River in Map Identification Numbers 2, 4, 5, and 6. In No. 2

only a minor failure of the abrasion test caused rejection of the sample for Item 201. Gravels from Map Identification Number 3 have been used as Vermont Highway Department Specification gravels on the current Arterial Project, and mainly poorly-sorted gravels from Map Identification Numbers 5 and 6 have been used as Granular Borrow, Item 105. These last three areas were about depleted by the end of the 1967 construction season. Finally, only small quantities of material occur in Map Identification Numbers 2 and 4.

SUMMARY OF ROCK FORMATIONS IN THE TOWN OF IRA

Vermont Valley Sequence

Hortonville Formation - Black, carbonaceous, and pyritic slate and phyllite, locally sandy; brown-weathered limy beds are common near base.

Glens Falls-Orwell Formation (undifferentiated) - Combined where deformation has made the two lithologies indistinguishable. Thick-bedded sublithographic to lithographic dove-gray weathered limestone cut by white calcite veins (Orwell), is generally succeeded by thin-bedded, dark blue-gray, coarsely granular limestone. Both lithologies are fossiliferous.

Orwell Formation - Smooth-ledged, sublithographic and lithographic, dove-gray weathered limestone commonly cut by veins of white calcite; beds filled with fossil shell fragments are characteristic.

Taconic Sequence

Hatch Hill-West Castleton Formation (undifferentiated) - The Hatch Hill, a relatively thin formation that succeeds the West Castleton, is characterized by rusty and spongy weathered gray calcareous quartzite traversed by numerous white-quartz veins. The West Castleton is a gray to black, siliceous, carbonaceous, and pyriticiferous slate containing paper-thin white sandy laminae. Black slates are common to both formations. A blue-gray weathered black limestone is near the base of the West Castleton in a few places.

St. Catherine Formation - Purple, gray-green, and variegated slate and phyllite containing minor interbeds of white to green quartzite; locally albitic. Purple and green chloritoid-bearing slate and phyllite is in northern Taconic Range, but not separated farther south.

Zion Hill Member (of the St. Catherine Formation) - white weathered green, vitreous chloritic quartzite and graywacke spotted with limonite.

Brezee Formation - Dark gray to black phyllite with beds of blue-gray marble, dark gray dolomite, sandy dolomite, and dolomitic sandstone, in upper part; beds of massive quartzite as much as 20 feet thick occur locally and in places contain pebbles of blue quartz. Phyllites are locally highly albitic.

GLOSSARY OF SELECTED GEOLOGIC TERMS

Alluvial - Pertaining to material carried or deposited by running water.

Calcareous - Pertaining to or containing calcium carbonate.

Carbonaceous - Containing carbon.

Crevasse Filling - A ridge of water-sorted material originally deposited in a large glacial crevasse or fissure and left standing after the ice melts.

Delta - A predominantly alluvial deposit built by a stream entering the sea or other body of water. Usually it has the form of the Greek letter delta.

Dolomite - A rock consisting predominantly of the mineral calcium magnesium carbonate (Dolomite), containing carbon dioxide 47.7%, lime 30.4%, and magnesia 21.9%.

Esker - A long, narrow winding ridge of mixed sand and gravel deposited by a stream of meltwater flowing in a tunnel or crevasse in stagnant glacial ice.

Fluvial - Pertaining to streams.

Graywacke - An old rock name loosely applied. Most writers now apply it to a dark-colored, hard sandstone consisting of angular grains of quartz, feldspar, and rock fragments embedded in a fine, compact matrix composed of micas, clay minerals, and chlorite.

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

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

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

Limestone - A bedded sedimentary rock consisting chiefly of calcium carbonate. The most important and widely distributed of the carbonate rocks.

Lithographic Stone - Fine grained, compact and homogeneous limestone formerly used for engraving.

Marble - A soft, white rock being the metamorphic form of limestone in which the calcium carbonate (calcite) is recrystallized and the calcite crystals are overgrown and interlocked with additional calcite. Commercially it is a trade name applied to any carbonate rock of good color and texture and hard enough to take a polish.

Metamorphic Rocks - Rocks that owe their distinctive characteristics to the transformation of preexisting rocks through intense heat or pressure or both.

Outwash - Stratified sands and gravels that are stream-built beyond the glacier; deposited by meltwater streams issuing from the face of the glacial ice.

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

Physiographic - Pertaining to the physical divisions of the earth.

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

Slate - A very fine-grained homogeneous metamorphic rock which splits smoothly along parallel cleavage planes and yields roughly similar slabs.

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

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PARTIAL SPECIFICATIONS FOR HIGHWAY CONSTRUCTION MATERIALS

Listed below are partial specifications for Highway Construction Materials as they apply to this report at date of publication. For a complete list of specifications see Standard Specifications for Highway and Bridge Construction, approved and adopted by the Vermont Department of Highways in April, 1964.

Item 105, Granular Borrow

"Article 105.02 - Materials. The granular borrow shall be obtained from approved sources and shall consist of satisfactorily graded, free-draining, hard durable stone and coarse sand practically free from loam, silt, clay, and organic matter.

"The sand portion (material passing the No. 4 screen) shall have not more than ten percent (10%) passing the No. 270 mesh sieve and shall show a color of not more than three and one-half ($3\frac{1}{2}$) as determined by the colorimetric test described in AASHTO Method of Test, Designation T-21.

"When used in connection with fine grading or in fills where piling is to be driven, the granular material shall all pass the nine-inch (9") square-opening screen."

Item 201, Sub-base of Gravel

"Article 201.02 - Materials. The gravel shall consist of material reasonably free from silt, loam, clay, or organic matter. It shall be obtained from approved sources and meet the following requirements:

"Not less than forty percent (40%) stone shall be retained on No. 4 sieve.

"The percent of wear shall be not more than twenty-five (25) when tested by laboratory methods using Method T-4 or more than forty (40) when tested by AASHTO Method T-96.

"The stone portion of the gravel shall be uniformly graded from coarse to fine, and the maximum-size particles shall not exceed two-thirds ($\frac{2}{3}$) of the layer being spread.

"The sand portion, when tested by laboratory methods using Method AASHO T-27, shall meet the grading requirements set up in the following table:

Minimum Percent of Stone	Percent Passing Square Openings No. 100	Percent Passing Square Openings No. 270
40	0-15	0-3
50	0-15	0-4
60	0-15	0-5
70	0-15	0-6

"The sand shall show a color of not more than three and one-half ($3\frac{1}{2}$) as determined by the colorimetric test described in the AASHO Method of Test, Designation T-21."

Item 202, Sub-base of Sand

"Article 202.02 - Materials. The sand shall consist of material reasonably free from silt, loam, clay, or organic matter. It shall be obtained from approved sources and meet the following requirements:

"The sand, when tested by laboratory methods using Method AASHO T-27, shall meet the grading requirements set up in the following table:

Square Openings	Percent Passing
$1\frac{1}{2}$ "	95-100
$\frac{5}{8}$ "	80-100
No. 4	70-100
No. 100	0-18
No. 270	0-5

"The sand shall show a color of not more than three and one-half ($3\frac{1}{2}$) as determined by the colorimetric test described in the AASHO Method of Test, Designation T-21."

Item 204, Sub-base of Crushed Rock

"Article 204.02 - Materials. The materials for sub-base, filler, and

sand cushion shall be obtained from approved sources and meet the following requirements:

A - Crushed Rock. "The crushed rock shall be uniformly graded, crusher-run material and shall be free from dirt. The ledge from which this material is obtained shall be stripped and cleaned before blasting. Conical stockpiling, or any other method of stockpiling which causes segregation of aggregates, will not be permitted.

"The crushed rock, when tested by laboratory methods using Method AASHO T-27, shall meet the grading requirements set up in the following table:

Square Openings	Percent Passing
4"	95-100
1½"	25-50
No. 4	0-15

"The percent of wear shall not be more than eight (8) when tested by laboratory methods using Method AASHO T-3 or more than forty (40) when tested by AASHO Method T-96."

Item 205, Sub-base of Crushed Gravel

"Article 205.02 - Materials.

A - Crushed Gravel. "The crushed gravel shall consist of material reasonably free from silt, loam, clay, or organic matter. It shall be obtained from approved sources and produced by a crusher adjusted to deliver a product uniformly graded from coarse to fine.

"When tested by laboratory methods using Method AASHO T-27, it shall meet the grading requirements as set forth below:

		Square Openings	Percent Passing
Sub-base of Crushed Gravel	Coarse-Graded Item 205-A	4"	100
		No. 4	25-50
	Fine-Graded Item 205-B	1½"	95-100
		No. 4	30-60

"At least thirty percent (30%) by weight of the stone content of the crushed gravel, that is, the material retained on the No. 4 screen, shall have a minimum of one (1) fractured face as determined by

actual count from the sample submitted to the laboratory.

"The percent of wear shall not be more than twenty (20) when tested by laboratory methods using Method AASHO T-4 or more than thirty-five when tested by AASHO Method T-96.

B - Sand. "The sand content of the crushed gravel, that is, the material passing the No. 4 screen, when tested by laboratory methods using Method AASHO T-27, shall meet the grading requirements set up in the following table:

Square Openings	Percent Passing
No. 100	0-18
No. 270	0-8

"The sand shall show a color of not more than three and one-half ($3\frac{1}{2}$) as determined by the colorimetric test described in the AASHO Method of Test, Designation T-21."

TABLE I

IRA GRANULAR DATA SHEET NO. 1

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						1 1/2"	5/8"	#4	#100	#270				
1	1	1967	1-8	0-1	N	O T S A M P L E D							Owner: North Meadows Inc. This is hilltop on north side of U. S. Route 4 on the Ira - Castleton Town Line. Dr. D. P. Stewart mapped rolling meadows to west and hill as kame moraine. One test hole dug 80' east of stone wall marking the town line encountered unsorted silty clay and stones, many of which are angular to sub-angular. Material was not sampled.	
2	1	1967	1.5-9.5	0-1.5	No	71.4	58.8	33.1	5	3.0	1	25.2%	Gran. Borrow (Grav.)	Owner: F. M. Pawlusiak. Area is a large hilly field on the south side of U. S. Route 4 just west of Town Highway No. 5. A small portion of the field is on a level with feature on north side of highway which contains Grabowski's gravel pit, and may be part of a kame terrace. Test #1 dug in this part of field about 100' south of the highway. Material is a poorly consolidated, cobbly, and sandy gravel that appears to get quite clean below 3'. Hole bottoms in fine gravel. Extent of this material probably limited to a one- or two-acre portion in the northeast part of the field. Test #2 dug at extreme south end of field on top of hill. Material is unsorted and con-
	2	1967	N O T S A M P L E D											

*Percentage of Total Sample

TABLE I

IRA GRANULAR DATA SHEET NO. 2

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks		
						1 1/2"	5/8"	#4	#100	#270						
														sists of stones in a silt-clay matrix. This hole was not sampled. The north slope of the hill was cut through by construction of U. S. Route 4, and owner alledges that gravel stabilization of a clay slope was necessary. Probably hill is composed of glacial till with any gravels confined to the flat area near the high-way.		
3	---	1967	---	---	Yes	N	O	T	S	A	M	P	L	E	D	Onwer: Frank Grabowski. This is a large pit on the north side of U. S. Route 4 across from Town Highway No. 5. At the time the pit was visited it appeared to be about depleted. A very limited extension is to be had to the west and southwest. The south face shows poorly sorted material, mainly silt-clay and large stones. An eastward extension around the north flank of the hill, lying south-southeast of the pit, appears to be the only possibility. Much material from this pit was being used during the 1967 construction season, and a few samples taken met grading requirements for Item 201, Sub-base of Gravel. All samples met requirements for Item 105, Granular

*Percentage of Total Sample

TABLE I

IRA GRANULAR DATA SHEET NO. 3

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks	
						1 1/2"	5/8"	#4	#100	#270					
4	1	1967	1.5-6	0-1.5	No	89.2	75.0	33.0	7	4.0	1	19.0%	Gravel	Borrow. Owner: Gerald Angier. Area is north flank of hill east of Grabowski's pit. Relatively flat area on the north side is probably a kame terrace. Test #1 was sampled on the "terrace" near the property line fence about 250' east of the pit. Material is a fine gravel with many tabular stones and many pebbles. Goes to clay at 6'. Test #2 dug 125' north 85° east of and about 12' below elevation of Test #1. Silt-clay with a few stones was encountered and was not sampled. There is probably very little gravel on this property. Test #1 represents extension of Grabowski pit. Owner alleges that hilltop south of Test #1 had been previously tested and only clayey material had been found. A small farm pit east of Test #1 and northeast of barn was also investigated. It is now used for a dump and shows only a few stones and much silt-clay on badly-sloughed faces.	
	2	1967	1.5-4	N O T S A M P L E D											
5	1	1964	0.5-9	0-0.5	No	81.8	78.2	60.7	30	10.8	2	---	---	Owner: John and Emily Dydo. Area is hillside west of Caccchio property on the north side	

*Percentage of Total Sample

TABLE I

IRA GRANULAR DATA SHEET NO. 4

Map Ident. No.	Field Test No.	Year Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
														of the Arterial Highway between stations 582+0 and 585+0. Tests were taken for right-of-way proceedings. An auger hole drilled 161' north of station 582+0 hit a material denoted as till. Test #1 dug in meadow 471' north of station 582+0, 50' east of top of slope down to stream and trail. Material was a silty pebbly sand with excess silt for Item 105.
	2	1964	1-8	0-1	No	80.4	74.6	61.9	26	7.8	1	---	Gran. Borrow (Grav.)	Test #2 dug 450' north of centerline station 584+0. Soft, angular stones in a wet silty matrix. Material is unstratified and met requirements only for Item 105, Granular Borrow.
	3	1964	1-8	0-1	No	100	100	100	49	11.8	1	---	---	Test #3 dug 650' north of centerline station 585+0, 100' west of pasture fence. Material was described as till - a wet silty sand with clay and some small pebbles. Water runs from sides of hole. A hard-packed till encountered in bottom.
	4	1964	0.5-8.5	0-0.5	No	81.0	65.0	42.6	5	2.5	3	22.5%	Gravel	Test #4 dug 240' north of Test #2 and is near fence at change in slope. Pasture beyond fence is bouldery and looks like till. Material in hole is a sandy gravel with a few cobbles over 6" not included in sample.

*Percentage of Total Sample

TABLE I

IRA GRANULAR DATA SHEET NO. 5

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
	5	1964	1-8.5	0-1	No	82.7	66.9	37.7	11	4.3	1	18.0%	Gravel	Test #5 dug 225' north of Test #1 near change of slope at fence separating bouldery pasture from meadow. Material in hole is a sandy, fine gravel with many angular stones and is unsorted and unstratified. A large pit was opened in this meadow when construction of the Arterial Highway was taking place. Fill for muck excavation and Granular Borrow, Item 105 was taken from this pit. During the 1967 construction season some material was still being removed.
6	1	1964	1-8	0-1	No	58.8	46.3	32.4	10	5.0	2½	18.2%	Gravel	Owner: Robert and Barbara Cacchio. Area includes three tests taken in Ira as part of right-of-way proceedings. Test #1 dug near edge of woods road in wooded area 80' left of station 614+60. Material is a gravel with rounded stones in a yellow-brown matrix. Many large stones with boulders up to 2'. Test #2 dug 250' left of station 612+0, still in wooded area. Material is till with angular stones and water at 6'. Test #3 dug in small clearing 530' left of station 613+0. Material is a silty till with some clay and small stones.
	2	1964	1-6	0-1	No	100	91.2	66.7	35	14.5	1½	---	---	
	3	1964	1.5-9	0-1.5	No	100	86.1	73.1	65	17.0	3	---	---	

*Percentage of Total Sample

TABLE I

IRA GRANULAR DATA SHEET NO. 6

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
7	1A	1967	2-15	0-2	Yes	59.0	44.8	30.2	9	4.3	1	18.4%	Gravel	Owner: E. H. Parkman. This is pit and pasture area on west side of Town Highway No. 2 just south of the Ira-West Rutland Town Line. Access into pit is 0.20 mile via pit road leading across owner's pasture. Area is mapped as kame terrace. Test #1 sampled from mid-way along west face of pit that is about 275' long. Material is a gray, moist, and somewhat sandy-looking gravel with a few +6" cobbles not put in sample. Test #1A - from 2'-15'; Test #1B from 15'-30' on 33-foot high face. Face bottoms in a stony clay with water and apparently pit was dug no deeper due to presence of the clay. Test #2 dug 75' west of north end of pit on flat pasture near edge of woods. This test represents an extension on north end of terrace. Top 3' is reddish silt and stones going to a gray gravel with some +6" cobbles not included in sample. Hole bottoms in same material. Bedding dips to east. Test #3 dug 200' due west of pit and about 175' southwest of Test #2. Test is near edge of low swale beyond which the pasture appears stony and rough.
	1E	1967	15-30	0-2	Yes	58.2	48.5	32.4	7	3.0	1	17.9%	Gravel	
	2	1967	1.5-11	0-1.5	No	71.8	57.6	38.6	8	3.0	1	22.0%	Gravel	
	3	1967	1.5-11.5	0-1.5	No	77.5	62.0	40.8	8	4.0	1	16.6%	Gravel	

*Percentage of Total Sample

TABLE I

IRA GRANULAR DATA SHEET NO. 7

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
	4	1967	1.5-5.5	0-1.5	No	58.1	43.2	28.6	8	4.0	1	20.1%	Gravel	Very likely this test is near edge of deposit. Material is a fairly coarse gravel with an estimated 10%-15% coarser than 6" and is not well consolidated. It is overall a somewhat "dirty"(sandy)-looking gravel. Test #4 dug southwest of south end of pit 35' from Mulo-Parkman fence. This test is about 8' below elevation of Test #3. Material is a coarse sandy gravel going to clay at 5.5'.
	5	1967	1.5-12.0	0-1.5	No	81.6	73.0	60.9	23	3.0	1	23.6%	Gran. Borrow (Grav.)	Test #5 dug on knoll in meadow 155' east of north end of pit. Fine gravel grades into sand. Some silty sand bands also seen. Sample taken had barely too few stones and excess material passing the #100 and #270 mesh sieves for Item 201. Terrace behind pit would be source of 35,000 to 40,000 cubic yards of gravel. It is expected that clay seen at 30' on pit face rises toward the surface westward, and that bouldery surface beyond Test #3 is at limit of deposit.
8	1	1967	1.5-12	0-1.5	No	97.9	97.9	72.6	15.2	2.9*	1	---	Sand	Owner: E. H. Parkman. Area is on west side of Town Highway No. 2 and includes knolls, ridges, and pit south of Map Identification No. 7.

*Percentage of Total Sample

TABLE I

IRA GRANULAR DATA SHEET NO. 8

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
	2	1967	2-11.5	0-2	No	82.5	63.2	41.1	7	2.5	1	16.4%	Gravel	Dr. D. P. Stewart has area mapped as kame terrace. Test #1 sampled in rolling meadow 165' south of Test #5. Material is a pebbly sand acceptable for Item 202, and hole bottoms in the same material.
	3	1967	2-10	0-2	No	77.5	55.4	41.6	13	6.0	1	27.7%	Gran. Borrow (Grav.)	Test #2 dug atop knoll 200' south-southwest of and about 12'-14' above elevation of Test #1. Log of test hole: 0-2' overburden; 2'-6' gravel; 6'-8' silty seam; 8'-10' coarse gravel; 10'-11.5' clean gravel. Hole bottoms in clean-looking gravel. Tests #3 through #9 were taken in the south part of the rolling meadow in or near the pit. Test #3 was dug 110' north of the east part of the pit on the north side of an east-west ridge on which surface gravels appear. Test hole is about 11' below top of ridge. Material down to 7' is a fine gravel separated by a thin sand layer from an underlying coarser gravel. Hole goes to sand at 10'. Sample had excess silt and excessive wear for Item 201, Sub-base of Gravel.
	4	1967	0-3	---	Yes	N O T S A M P L E D								Test #4 dug on short north

*Percentage of Total Sample

TABLE I

IRA GRANULAR DATA SHEET NO. 9

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks		
						% Passing										
						1 1/2"	5/8"	#4	#100	#270						
	5	1967	1-13	0-1	Yes	65.1	50.6	37.5	14	4.5	1	17.6%	Gravel	face in east part of pit. Only 3' of fine gravel overlies a silt-clay- did not sample. Test #5 dug on short west face in east part of pit. Beds of fine gravel dip to southwest and at 13' go to same silt-clay as Test #4.		
	6	1967	0-6	---	Yes	N	O	T	S	A	M	P	L	E	D	Tests #6 through #8 were dug in 70-foot x 95-foot "island" of material between the low east lobe of the pit, and the larger, higher lobe in the west part of the pit. (Extension of this lobe is west about 75' to Mulo property, north up flank of knoll on which Test #2 was dug and east along ridge where Test #3 was dug.) Material encountered in Tests #6 through #8 was silty and much looked like strippings. No samples taken.
	7	1967	2-6	0-2	Yes	N	O	T	S	A	M	P	L	E	D	
	8	1967	1-7	0-1	Yes	N	O	T	S	A	M	P	L	E	D	
	9	1967	0.5-10	0-0.5	No	87.7	85.9	76.7	41	12.0	1	---	---	---	Test #9 dug at top of knoll 200' north 50° west from intersection of Town Highway No. 2 and pit road. This test is east of Test #3. Material is sandy, fine gravel down to 2.5' then goes to silty sand to below depth. Best potential for granular material in this area seems to be from vicinities of Tests #2 and #3 for gravel, and in the northwest part of the field for sand.	

*Percentage of Total Sample

TABLE I

IRA GRANULAR DATA SHEET NO. 10

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks		
						1½"	5/8"	#4	#100	#270						
9	--	1967	---	---	Yes	N	O	T	S	A	M	P	L	E	D	Owner: Unknown. This area is small pit in watershed of West Rutland's municipal water supply, and also includes field across brook to north which may be of different ownership. Pit extensions are set out to trees on each side of town road. Area is located on Ira Town Highway No. 4 just south of the West Rutland Town Line. Probably deposit is kame terrace.
10	1	1967	0.5-7.5	0-0.5	Yes	78.5	69.6	59.6	36.0	15.5	1½	---	---	---	---	Owner: Bob Sanford. Material in this deposit has not been well sorted, but it is probably of ice-contact origin. Area includes an indistinct north-south ridge extending down the hillside east of abandoned Town Highway No. 4. The lower(south) end has been exposed by a 60-foot wide pit located next to barn. Test #1 dug atop face of pit. Material is thinly interbedded fine gravel, gravelly sand, and silt seams. Goes at 7.5' to a stony silt-clay. Sample had excess material passing the #270 mesh sieve for Item 105.
	2	1967	1-8	0-1	No	81.6	69.6	47.6	17	10.0	1	18.4%	Gran. Borrow (Grav.)			Test #2 dug on indistinct trace of ridge in pasture about 400' north of pit. (Could not dig in intervening field because of hay crop.) Material

*Percentage of Total Sample

TABLE I

IRA GRANULAR DATA SHEET NO. 11

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
													has some large, angular cobbles and a boulder or two. Generally, a sandy gravel with angular stones. Goes to a less sorted silt and stone layer at 7.5'. Ridge may be crevasse filling and may be source of material suitable for crushing for town roads. Area is located 0.20 mile north of intersection of Town Highways No. 2 and No. 4, and is reached via owner's driveway.	
11	1	1967	N O T	S	A M P L E D								Owner: Bob Sanford(leased to Stanley Farrell). Area is west-to southwest-sloping field on east side of valley east of Bob Sanford's house and is on northwest side of Town Highway No. 2. Probably feature tested in this area and in Map Identification No. 12, on southeast side of Town Highway No. 2, is a kame terrace. Test #1 dug at northeast end of field at edge of trees next to the road. An unsorted stony silt-clay was encountered and not sampled. Slope between this test and Test #2 is very gentle and shows a few stones on the surface.	
	2	1967	0.5-7.5	0-0.5	No	79.0	67.1	39.4	13	5.8	1	18.6%	Gran. Borrow (Grav.) Test #2 dug near edge of road at top of steep slope down to	

*Percentage of Total Sample

TABLE I

IRA GRANULAR DATA SHEET NO. 12

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1 1/2"	5/8"	#4	#100	#270				
														west. Many stones show at surface and hay does not grow well in vicinity of test hole. Material is a sandy gravel with some +4" stones, and gets coarser below 3.5'. Goes to silt-clay at 7.5'. Beds dip to west. Deposit probably extends to north along slope, but could not test further because of hay.
12	1	1967	0.5-5	0-0.5	No	90.5	75.8	42.7	3	2.0	1	17.6%	Gravel	Owner: Bob Sanford(leased to Stanley Farrell). Two tests were taken in field on the southeast side of Town Highway No. 2 across from Map Identification No. 11. Area set out to corn and tests were dug at lower(west) end of corn field at top of steep slope down to west. Area is continuation south of feature tested on northwest side of road. Test #1 dug 95' from road. Material is a fairly clean, generally fine gravel with a few +4" stones. Goes to silt-clay at 5'.
	2	1967	0.5-8	0-0.5	No	76.0	68.2	51.6	23	8.5	1	18.8%	Gran. Borrow (Grav.)	Test #2 dug 170' south 40° east of Test #1 above steep south slope of field. Material is poorly sorted and has many sub-rounded to sub-angular stones with a few over 4". Fines appear to be a silty sand. Becomes less stony below

*Percentage of Total Sample

TABLE I

IRA 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					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
														6', and goes to silt-clay at 8'. The hillsides tested in the last two areas appear promising as a source of gravels. Probably they are not thick and may be silty. Possibly could be used on town roads if the more silty beds were loaded with the gravels.
13	1	1967	2-11	0-2	Yes	78.5	72.1	48.1	5	2.3	1	14.6%	Gravel	Owner: A. W. Day. This is pit with narrow extension to south, and with an extension along the wooded ridge to the southwest. Pit is pretty well depleted in northeast end and in central part, with some bedrock exposed. Probably there are a few hundred yards of gravel still left in the old workings, but much time would be spent in moving from place to place. Dr. D. P. Stewart has mapped feature as kame terrace. Tests were taken along south faces and on ridge to southwest. Test #1 taken on 11-foot high south face at northeast end of pit. Gravel is fine and fairly clean. Goes to ledge at 11'.
	2	1967	3-9	0-3	Yes	66.0	57.0	52.6	23	8.0	1	---	Gran. Borrow (Grav.)	Test #2 dug 100' southwest of Test #1 in trace of old woods road atop south face of pit. Material below 3' of silt and stones is a hard-packed grav-

*Percentage of Total Sample

TABLE I

IRA GRANULAR DATA SHEET NO. 14

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						1 1/2"	5/8"	#4	#100	#270				
	3	1967	2.5-10	0-2.5	Yes	64.8	56.7	46.7	18	5.0	1	---	Gran. Borrow (Grav.)	elly sand with some silt. Is not as clean and well sorted as Test #1. Goes to silt-clay at 9'. This test indicates the type of material to be expected in a southward extension of the northeast end of the pit.
	4	1967	N	O	T	S	A	M	P	L	E	D		Similar material, but better stratified and a little less silty, was sampled from Test #3. Dug 70' west-southwest of Test #2 and a few feet back from south face of central part of pit. This test is 150' south across pit from Town Highway No. 2. Test hole #3 goes to a pebbly gravel at 10'.
	5	1967	0.5-5	Stripped	Yes	87.1	69.9	39.0	4	2.0	1	15.4%	Gravel	Test #4 dug 170' southwest of Test #3 and 60' south of ledge exposure on south face of pit. Dug for 3.5' in silt-clay with stones and did not sample.

*Percentage of Total Sample

Test #5 dug atop pit face 120' west of Test #4. This part of pit is grown up to trees, and it appears as though little material was removed from here. Beginning of ridge, which extends down to southwest is vaguely apparent between Tests #4 and #5. Test #5 dug off trace of ridge. Material is a fine, clean gravel going to silt-clay at 5.5' and to bed-

TABLE I

IRA GRANULAR DATA SHEET NO. 15

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1 1/2"	5/8"	#4	#100	#270				
	6	1967	0-9	Stripped	Yes	85.7	70.0	37.2	5	4.0	1	21.4%	Gravel	rock at 7'. Test #6 dug 120' west of Test #5 on ridge above gravelly slope beyond west end of pit, and is only about 60' south of town highway. Gravel is coarse in top 2' - gets fine like Test #5 from 2'-9'. Hole bottoms in silt-clay.
	7	1967	1-10.5	0-1	No	91.9	82.9	59.8	26	13.0	1	---	---	Test #7 dug on ridge 125' west of Test #6. Material is a fine gravel down to 7'; then becomes a silty sand and returns to a fine gravel at 10'. Bedding dips to south. Sample had excess silt for Item 105, Granular Borrow. Ridge is only about 100' wide, but extends for some distance to west running along the edge of the road. Feature is mapped as kame terrace by Dr. D. P. Stewart. Most material would come from west end of old pit with an extension to west.
14	1	1967	1-11	0-1	No	100	95.8	83.2	12.5	1.7	1	---	Sand	Owner: Callo M. and Llewella Day. Feature is ridge extending south-southwest out of knolly field which owner has under tillage and in which was a small pit. Many stones now show on side of knoll where pit was located. Test #1 dug atop old farm pit behind barn

*Percentage of Total Sample

TABLE I

IRA GRANULAR DATA SHEET NO. 16

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO	Abrasion AASHO	Passes VHD Spec.	Remarks
						1 1/2"	5/8"	#4	#100	#270				
	2	1967	1-6	0-1		N O T S A M P L E D					T-21	T-4-35		foundation 115' south of field fence. A pocket of very fine pebble gravel occurs between 1'-5' and 1'-2.5' (east and west ends of test hole). Hole continues in fine sand. Test #2 dug on ridge near top of steep south slope 110' south of Test #1. From 0-2' is organic and pebbly; from 2'-6' is silt or silty sand. Did not dig further and did not sample.
15	---	1967	---	---	Yes	N O T S A M P L E D								Owner: George and Bruce Wragg. Permission to sample not obtained. Area is pit in kame terrace or remnant thereof as mapped by Dr. D. P. Stewart. Material looks fine on faces - a gravelly sand.
16	1A	1967	4-34	0-4	Yes	53.8	38.8	22.8	10	5.0	1	18.2%	Gravel	Owner: Ralph Perry. Area is steep gravelly bank on the northeast side of Town Highway No. 2, northwest of the C. Fish Horse Farm. Bank is located about 160' from edge of road. Feature may be of ice-contact origin, but was not mapped by Dr. D. P. Stewart. The face shows many sub-angular to tabular stones, many over 6", some silt-clay. Material is hard-packed because of silty clay coating of constituents. Test #1A was

*Percentage of Total Sample

TABLE I

IRA GRANULAR DATA SHEET NO. 17

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
	1B	1967	36-50	0-4	Yes	59.0	46.8	29.2	6	3.0	1	20.4%	Gravel	sampled by hand on upper face. Sand is a minor constituent as there are many stones with some clay. Test #1B was a backhoe sample on lower face. A two-foot thick lens or bed of sand occurs in predominantly cobbly gravel strata. Many 3"-6" cobbles and some silt-clay binder. Both samples met requirements for Item 201, Sub-base of Gravel. Perhaps material could be crushed for use on town roads or removed as bank run for Vermont Highway Department projects. Quite a bit of overburden is to be expected - from 4'-10' - all along top of bank. Extension, both to north and south along bank has tree and brush cover.
17	1	1967	N O T S	A H P L E D										Owner: Clarence Fish. This is small pit at south edge of meadow, south of Town Highway No. 2 and west of Vermont Route 133. Test #1 was dug on steep lower slope of valley wall behind pit. Material is a stony till and was not sampled.
	2	1967	1.5-10	0-1.5	Yes	61.3	51.2	33.6	5	3.0	1	22.7%	Gravel	Test #2 dug in 10-foot north face of pit which represents valley fill material extending northwest, north, and northeast. Material is a vaguely

*Percentage of Total Sample

TABLE I

IRA GRANULAR DATA SHEET NO. 18

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						1 1/2"	5/8"	#4	#100	#270				
														bedded fine gravel going to clay at 10'. Top 5' is somewhat coarser, more densely packed and has more silt-clay binder than bottom 5'. Pit is in valley fill which is brought up against valley wall consisting of till. Meadow would be source of probably shallow gravel. Owner alleges that water well drilled by son who lives between his place and Vermont Route 133 encountered 10' of clay overlying gravel. That location is about 700' east-northeast of pit.
18	1	1967	2-11	0-2	No	74.3	58.3	31.5	6	2.8	2	26.8%	Gran. Borrow (Grav.)	Owner: Floyd Goodrich. Area is corn field on the east side of Vermont Route 133 just north of Town Highway No. 6. Only one test could be taken, although further testing should be done. Test hole was dug behind barn about 60' from highway. Material is a cobbly gravel with 1 or 2 small boulders. Many stones are sub-angular to tabular. Sand portion is coarse. Silt-clay coats all sizes. Cornfield slopes gently to east toward Ira Brook. Probably quite a good sized cobbly gravel deposit. Test hole was moist at at 10' so eastward extension

*Percent of Total Sample

TABLE I

IRA GRANULAR DATA SHEET NO. 19

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						1½"	5/8"	#4	#100	#270				
														and depth probably limited by water table. Failure of sample on abrasion test probably due to tabular stones.
19	1	1967	1.5-5	0-1.5	No	59.4	44.2	26.8	4	1.5	3½	29.9%	Gran. Borrow (Grav.)	Owner: Robert Johnston Jr. Area is cornfield near east side of valley east of Ira Brook. Access is 0.20 mile via Town Highway No. 6 and tests were dug on south side of road. Test #1 dug near edge of road less than 75' from out-crop of slate. Material in test hole is a "dirty"-looking rubble (angular, flat stones). Ledge hit at 5'. Only sorted portion is from 2.5'-4', and that is poorly sorted.
	2	1967	1-4.5	0-1	No	88.9	68.4	40.2	12	6.3	3½	26.4%	Gran. Borrow (Grav.)	Test #2 dug 175' west-north-west of Test #1. From 1'-2' is a fairly clean gravel; 2'-4.5' is a silty gravel. Material has less stones and is finer than Test #1. Water comes in at 4.5'. Area is not recommended as a source of granular materials. These two tests are 12'-15' below elevation of Test No. 18-1, and are indication of materials to be expected along Ira Brook and next to edge of valley fill. These tests show close association with bedrock.

*Percentage of Total Sample

TABLE I

IRA GRANULAR DATA SHEET NO. 20

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1 1/2"	5/8"	#4	#100	#270				
20	1	1967	1.5-11.5	0-1.5	No	34.5	29.5	18.1	2	1.5	2	25.0%	Gravel	Owner: Robert Johnston Jr. Test was dug 55' south of tributary brook on east side of Vermont Route 133. Extension would be south in field across road from yellow house and Ira Town Hall. However, could not test on east side because of hay crop. Material is a very cobbly and bouldery gravel with 41% coarser than 4" and an estimated 20% coarser than 6". It is expected that boulders and cobbles, that are profuse along course of stream, would diminish in number and size away from the stream. No stratification noted.
21	1	1967	1.5-12	0-1.5	No	66.8	53.2	34.0	6	3.0	1	22.2%	Gravel	Owner: Robert Johnston Jr. This is field on west side of Vermont Route 133 extending to west between Ruth Cramton's yellow house and Ira Town Hall. Only one test could be dug because of standing hay, and it was dug next to highway 170' north of Town Hall. Material is quite stony and coarse with a few small boulders and many 4"-8" stones. Becomes moist at 11'. No particular stratification noted — only a vague segregation of particles.
22	1	1967	1.5-4	0-1.5	No	65.7	56.3	38.3	5	3.0	1	23.4%	Gravel	Owner: Ralph Perry. Area is pasture hillside north of a small brook on the west

*Percentage of Total Sample

TABLE I

IRA 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					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1 1/2"	5/8"	#4	#100	#270				
														side of Vermont Route 133. Access is via a narrow private road leading across Ralph Perry's fields under which gravel is expected to occur. Test taken on hillside is only a thin fine gravel underlying a bouldery surface. Clay hit at 4'. Probably only a thin deposit extending up the side of the shallow valley.

Table I
Supplement

IRA PROPERTY OWNERS - GRANULAR

Map Ident. No.

Angier, Gerald	4
Cacchio, Robert & Barbara	6
Day, A. W.	13
Day, Callo M. & Llewella	14
Dydo, John & Emily	5
Fish, Clarence	17
Goodrich, Floyd	18
Grabowski, Frank	3
Johnston, Robert (Jr.)	19, 20, 21
North Meadows Inc.	1
Parkman, E. H.	7, 8
Pawlusiak, F. M.	2
Perry, Ralph	16, 22
Sanford, Bob	10, 11, 12
Unknown	9
Wragg, George & Bruce	15

TABLE II

IRA ROCK DATA SHEET NO. 1

Map Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHO T-3	Remarks
1	1	1964	Quartzite	No	Chip	4.6%	Owner: Birdseye Development Commission. A rockfall area west of Town Highway No. 5 at a point 0.70 mile south of U. S. Route 4. Access is through a field and into a wooded area. A few scattered exposures and a large pile of rocks, fallen from 150-foot high east face of Bird Mountain, were sampled. The rock is a tight-grained, gray-weathered quartzite with a few noticeable grains of quartz. This same rock type, belonging to the Zion Hill Member of the St. Catherine Formation, is also exposed on the Castleton side of Bird Mountain. The rock appears satisfactory for Item 204, Sub-base of Crushed Rock. However, it is not certain if the rock-fall area can be used as a source because of tree cover and unknown extent of the material.
2	1	1967	Limestone	Yes	Chip	4.6%	Owner: A. W. Day. This is an old quarry where limestone was quarried for its lime content. Access is via old roading leading northwest for about 0.25 mile beyond end of Town Highway No. 11. The limestone is mapped as the Orwell on the Centennial Geologic Map and as the Whipple Member of the Ira Formation by E-An-Zen. Slates and phyllites of the Ira Formation (the Hortonville, after Doll's Centennial Geologic Map) were observed short distances in all directions from the quarry. The limestone does, however, extend along the strike (northeast) for an unknown distance, but becomes only a narrow band exposed in scattered outcrops between slates and phyllites. Its mapped extent is about 1,000' along strike, and a maximum of 450' across the strike. The rock is white-to gray-weathered and is thinly bedded where observed to be gradational with the slates. The rock is fairly hard, breaks mainly blocky to angular, but occasionally breaks hackly. Color on fresh surface is mainly dark gray. The rock is quite soft where calcite is abundant. Area is not extensive enough to be developed as a source of Item 204.

Table II
Supplement

IRA PROPERTY OWNERS - ROCK

Map Ident. No.

Birdseye Development Commission

1

Day, A. W.

2



LEGEND

- GRAVEL, ACCEPTABLE FOR ITEM 201 (sub-base of gravel)
- GRAVEL, DEPLETED OR NOT ACCEPTABLE FOR ITEM 201
- △ SAND, ACCEPTABLE FOR ITEM 202 (sub-base of sand)
- ▲ SAND, DEPLETED OR NOT ACCEPTABLE FOR ITEM 202
- GRANULAR BORROW, ITEM 105
- MATERIAL NOT ACCEPTABLE FOR ITEM 105
- ✕ EXISTING PIT
- SG SAND & GRAVEL DEPOSIT
- S SAND DEPOSIT
- 3 IDENTIFICATION NUMBER (refer to data sheets)

IRA

SCALE 1:31,250



CONTOUR INTERVAL 20 FEET

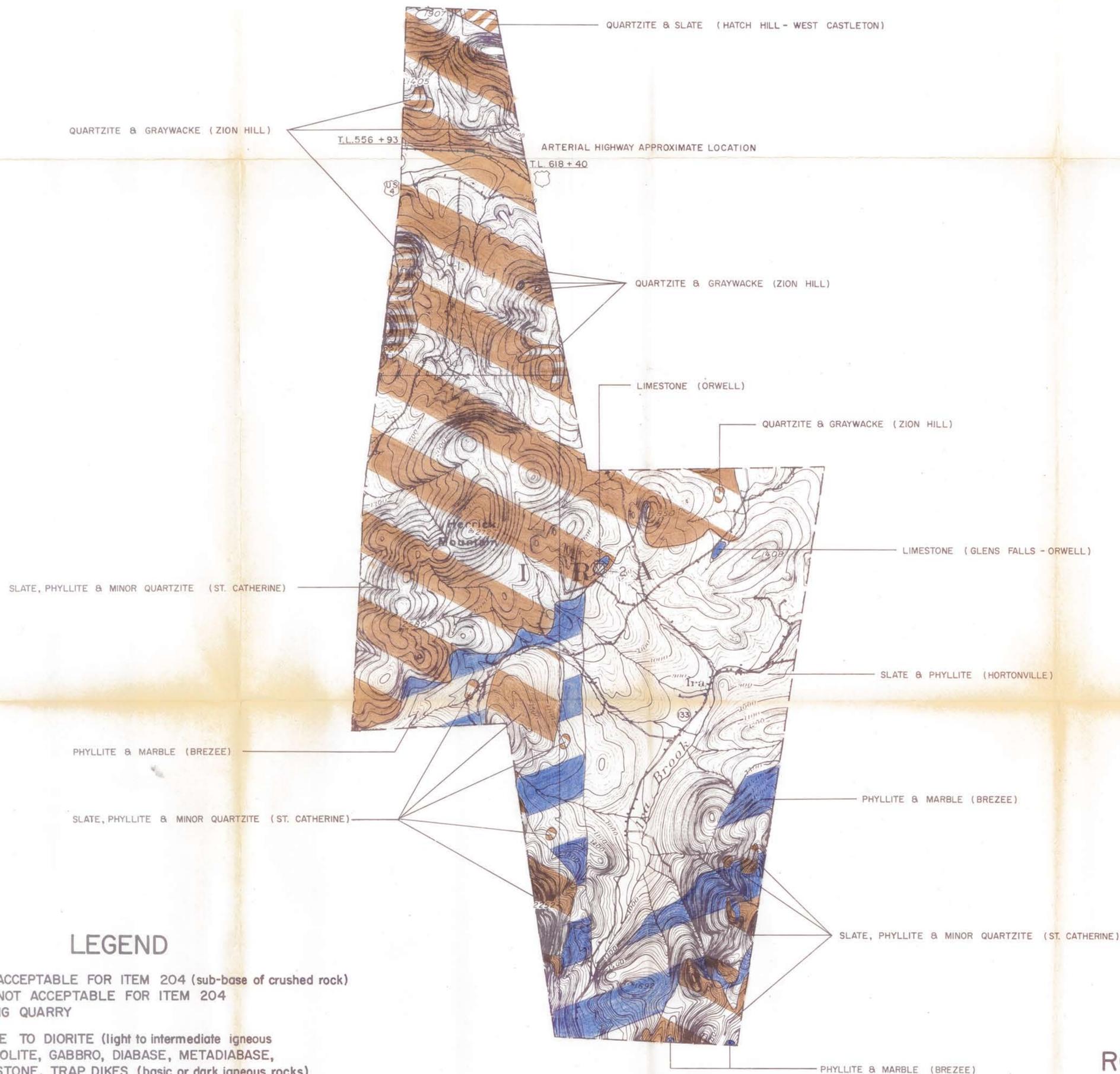
1968

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

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

PLATE 1 GRANULAR

DATE					
BY					



LEGEND

- ROCK, ACCEPTABLE FOR ITEM 204 (sub-base of crushed rock)
 - ROCK, NOT ACCEPTABLE FOR ITEM 204
 - ⊗ EXISTING QUARRY
 - Orange box GRANITE TO DIORITE (light to intermediate igneous)
 - Green box AMPHIBOLITE, GABBRO, DIABASE, METADIABASE, GREENSTONE, TRAP DIKES (basic or dark igneous rocks)
 - Red box PERIDOTITE, PYROXENITE, SERPENTINITE (ultra-basic igneous rocks)
 - Purple box GNEISS
 - Light brown box QUARTZITE
 - Dark blue box DOLOMITE
 - Blue box MARBLE, LIMESTONE
 - White box SCHISTS, SLATES, PHYLLITES, SHALES, CONGLOMERATES, AND GRAYWACKES
- 3 IDENTIFICATION NUMBER (refer to data sheets)

IRA

SCALE 1:31,250



CONTOUR INTERVAL 20 FEET

1968

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

PLATE II

ROCK

REVISIONS

DATE					
BY					