UNITED STATES GEOLOGICAL SURVEY

TEI-70

RECONNAISSANCE OF RADIOACTIVE ROCK OF THE HUDSON VALLEY AND ADIRONDACK MOUNTAINS, NEW YORK

By
Perry F. Narten
Francis A. McKeown

This preliminary report is released without editorial and technical review for conformity with official standards and nomenclature, to make the information available to interested organizations and to stimulate the search for uranium deposits.

May 1952

Prepared by the Geological Survey for the
UNITED STATES ATOMIC ENERGY COMMISSION
Technical Information Service, Oak Ridge, Tennessee

GEOLOGY AND MINERALOGY

In the interest of economy, this report has been reproduced direct from copy submitted to the Technical Information Service.

AEC, Oak Ridge, Tenn.-W25022

CONTENTS

TABLES

ILLUSTRATIONS

RECONNAISSANCE OF RADIOACTIVE ROCK OF THE HUDSON VALLEY AND ADIRONDACK MOUNTAINS, NEW YORK

By Perry F. Narten and Francis A. McKeown

ABSTRACT

In August 1949 a carborne reconnaissance for radioactivity was made along 3,750 miles of road in the Paleozoic rocks of the Hudson Valley and the pre-Cambrian rocks of the Adirondack Mountains in eastern and central New York state.

In the Paleozoic rocks the average radioactivity of the most strongly radioactive rocks is 0.003 percent equivalent uranium.

The area underlain by pre-Cambrian rocks in the northwestern and southeastern parts of the Adirondacks contain the greatest concentration of abnormally radioactive rocks and glacial materials. This radioactivity is most apparent near the contacts of the igneous and metamorphic rocks where the average range of equivalent uranium content is estimated to be 0.003-0.004 percent. Pegmatites contain as much as 0.043 percent uranium and 0.62 percent thorium. Iron slag containing 0.030 percent equivalent uranium was found near Moriah Center, and uranium and thorium in iron minerals have contributed to the radioactivity at several other abnormally radioactive localities.

INTRODUCTION

During August 1949, Perry F. Narten and Francis A. McKeown of the U. S. Geological Survey made a carborne radiometric reconnaissance of the lower Paleozoic shale-slate belt of the Hudson Valley and pre-Cambrian rocks of the Adirondack Mountains using car-mounted Geiger-counter equipment. The objective of this examination was roughly to delimit, for possible future examination, those areas where the radioactivity was generally higher than surrounding areas. Approximately 3,750 miles of state and federal highways and other roads was traversed. The amount of road coverage per unit area was based on the variety of mapped rock types present, the number of mapped roads, and the radioactivity of local traverses. All major

mapped rock units referred to in small-scale maps of New York and most of the minor rock units were traversed at one or more points. Quadrangle geologic maps were used as guides to traversing when available. The traversed roads and estimated equivalent uranium content of the roadside materials are shown in figure 1.

The Paleozoic sediments of the Hudson and Champlain Valleys, and the pre-Cambrian igneous and metamorphic rocks of the Adirondack Mountains are described separately in the text and tables. Both areas have many abnormally radioactive localities where no outcrops are visible. Some of these localities are in glacial deposits; in others, the identity of the cover was not determined, but all such deposits are referred to by the general term "glacial". A detailed log of all the abnormally radioactive localities and the observed and mapped rock types is given in table 1. Laboratory analyses of all samples are listed in table 2.

PROSPECTING METHODS

The car-mounted equipment used in this reconnaissance was of the same general type as that designed by John M. Nelson _/ and consisted of a modified Victoreen counting ratemeter, an alarm circuit, and four

_/ Nelson, J. M., Prospecting for uranium with car-mounted equipment: U. S. Geol. Survey Trace Elements Investigations Rept. 65, July 1949.

42-inch Geiger tubes, each tube having a normal response of 1,500 pulses per minute. The four tubes were mounted on the roof of a truck in a vertical plane parallel to the length of the truck.

The use and performance of similar equipment using two tubes instead of four, is described in Trace Elements Investigations Reports 67, 68, and 69. The net effect of the four tubes was to decrease the time constant approximately by half, the statistical accuracy remaining practically unchanged.

The roads were traversed at about 30 miles per hour and ratemeter readings were recorded as outcrops were passed. Anomalous activities in soil or glacial cover were also recorded. If the radioactivity was estimated to be greater than 0.003 percent equivalent uranium, as indicated by the car-mounted equipment, the investigation was continued on foot using the counting ratemeter and one 42-inch Geiger tube. A small Geiger tube was used for locating radioactive minerals.

All samples were first analyzed in the field for equivalent uranium by comparing the radioactivity of the crushed sample to that of a standard. The sample and standard were placed in a brass container and their

radioactivities measured by means of a neon-light scaling modification on a Victoreen survey meter, model 263B. The standard, assaying 0.015 percent equivalent uranium, the sample holder, the scaling device, and the technique have been briefly described. _/ Such field analyses compare favorably with

_/ Nelson, J. M., and Narten, P. F., Radioactive rocks of Maine: U. S. Geol. Survey Trace Elements Investigations Rept. 68, pp. 7, 8, 13, 1951.

laboratory radiometric analyses, particularly for those samples containing 0.0X percent equivalent uranium or less. On higher-grade samples better results probably could be obtained with standards of higher activity. The value in these field analyses is three-fold in that they serve as an immediate check on grade of the deposit, while the investigator is in the area; as a check on later laboratory analyses; and as a check on materials that tend to lose some of their activity through loss of radon, when they are in a crushed or otherwise disturbed state for several months.

All outcrops or other material that are estimated to contain 0.003 percent equivalent uranium or more are called "abnormally" radioactive in this report. Although many black shales and granitic rocks may contain between 0.003 and 0.004 percent equivalent uranium, they still may be considered as "abnormal" when compared to the bulk of shales and granites and certainly so when compared to other rock types. Estimates of equivalent uranium content shown in table 1, and elsewhere in the report, are derived from the correlations of the ratemeter readings obtained from direct outcrop measurement with the car-mounted and portable instruments and the measured equivalent uranium content of samples taken from the outcrop.

Road metal was found to be abnormally radioactive at several localities, particularly on some of the old granite cobble streets of Albany. A concrete railway underpass 1.3 miles northwest of Willsboro on U. S. Highway 22 is estimated to contain approximately 0.006 percent equivalent uranium. The source of the materials in the concrete is not known. The surrounding area is composed of Paleozoic limestones and anorthosite, both of which are estimated to contain less than 0.001 percent equivalent uranium.

Although the density of the network of roads in the Adirondack Mountains is low, the authors believe that sufficient information has been obtained through the use of the car-traverse technique to outline those parts of the area that are most favorable for further work.

PALEOZOIC ROCKS OF THE HUDSON AND CHAMPLAIN VALLEYS

Cambro-Ordovician rocks

Traverses across belts of north-northeasterly striking Cambro-Ordovician argillaceous rocks from Newburgh north to Ticonderoga have shown that no formation is at all places abnormally radioactive and that at the few "abnormally" radioactive outcrops the estimated equivalent uranium content is not unusual for dark fine-grained detital materials. These belts of rock, most of which are shales and their metamorphic equivalents, are generally referred to collectively as the Hudson River formation, _/ although many sub-

_/ Merrill, F. D. H., Geologic map of New York, New York State University, 1901.

divisions have been mapped. The extent of these Cambro-Ordovician rocks is roughly outlined in figure 1 by the road coverage south and east of the Adirondacks. The western extent is limited by the pre-Cambrian rocks of the Adirondack Mountains and the Devonian rocks forming the Helderberg escarpment, except for the lowlands of the Mohawk Valley. The Cambro-Ordovician rocks belong to two depositional troughs, designated as the Western (Chazy) and the Eastern (Levis) troughs, _/ which were supposedly separated by a

_/ Newland, D. H., et al., The Paleozoic stratigraphy of New York: 16th International Geol. Congress, Guidebook 4, p. 26, 1933.

land barrier. The rocks of the eastern trough have been folded and overthrust westward and are now in contact with the rocks of the western trough.

A sample of black shale was taken from each trough. Descriptions of these two sampled localities are presented below.

Ballston Spa locality

In the Western trough the Middle Ordovician Canajoharie black shale was examined and sampled in a fresh road cut just east of the railroad crossing on the east end of an unnumbered east-west road through Ballston Spa (fig. 1).

The average radioactivity of the shale is estimated at about 0.002 percent equivalent uranium. A grab sample, number @304, contained 0.001 percent equivalent uranium and 0.001 percent uranium by

laboratory analysis. The Canajoharie shale is estimated to be 1,100 feet thick in this area, but as it is easily weathered, outcrops are rare. _/

_/ Cushing, H. P., and Ruedemann, R., Geology of Saratoga Springs and vicinity: New York State Mus. Bull., no. 169, p. 49, 1914.

Stuyvesant locality

In the Eastern trough the Lower Ordovician Deepkill black shale _/ was examined in a railroad cut

_/ Goldring, Winifred, Geology of the Coxsackie quadrangle: New York State Mus. Bull. 332, pp. 94-98, 1945.

south of the railroad station at Stuyvesant (fig. 1). About 200 stratigraphic feet of outcrop was scanned with the 42-inch gamma tube and nowhere was the estimated radioactivity above 0.002 percent equivalent uranium.

A sample of the black shale, number @203, contained 0.002 percent equivalent uranium and 0.001 percent uranium by laboratory analysis.

Other localities

Grab samples were also taken for use in instrument calibration, of a Cambrian slate, _/ (Fair Haven

_/ Dale, T. N., The slate belt of eastern New York and western Vermont: U. S. Geol. Survey 19th Ann. Rept., pt. 3, map opp. p. 176, 1899.

locality, fig. 1, sample number @205) and an Ordovician slate, _/ (Chatham locality, fig. 1, sample

_/ Dale, T. N., Geology of the Hudson Valley between the Hoosic and the Kinderhook: U. S. Geol. Survey Bull. 242, map opp. p. 12, 1904.

number @202). Both slate samples contained 0.002 percent equivalent uranium and 0.001 percent uranium by laboratory analysis.

The Cambro-Ordovician rocks that flank the Adirondack pre-Cambrian rocks on the north, west, and south are relatively flat lying, covered with glacial debris and generally contain less than 0.003 percent equivalent uranium. At a few localities the glacial material was estimated to contain up to 0.003 percent equivalent uranium.

Devonian rocks

Traverses across the Rensselaer grit Plateau have shown it to be an area of radioactivity slightly higher than that of the surrounding sedimentary rocks. Few outcrops were identified but most of the bouldery debris, which was called glacial, may be Rensselaer grit. Ruedemann _/ states that, "The

_/ Ruedemann, Rudolf, Geology of the Capital district, New York State Mus. Bull. 285, p. 125, 1930.

Rensselaer grit . . . appears almost everywhere in the plateau either along the roads, or as low rounded rocks in the fields and woods". As the Rensselaer grit has been called both Cambrian and Devonian in age, the apparent property of radioactivity, which may be assumed to be a measure of the heavy mineral content, might be of some use in tracing the source of materials and thus establishing a more definite geologic age.

Token traverses were also made across the Helderberg escarpment, up to and including parts of the Middle Devonian Hamilton beds. Most of these Devonian rocks are limestones and are estimated to contain a maximum of 0.001 percent equivalent uranium. Two samples of black shales (@200 and @201) were taken and are described below.

Medway locality

The Middle Devonian Bakeoven black shale was examined and sampled about 3 miles southeast of Medway (fig. 1). This locality, described by Goldring, _/ is in a ravine on the north side of an old road

_/ Goldring, Winifred, op. cit., p. 245, 1945.

to Medway 1 mile south-southwest of Roberts Hill. The formation here consists of alternating fissile black and gray shales. Goldring estimates the stratigraphic thickness at about 62 feet. The entire section was traversed with the 42-inch gamma tube and contained an estimated equivalent uranium content of 0.002-0.003 percent. A grab sample of the shale, @200, contained 0.002 percent equivalent uranium and 0.001 percent uranium by laboratory analysis.

Ravena locality

The Middle Devonian Esopus black and gray shale was examined and sampled about 1 3/4 miles northwest of Ravena (fig. 1). This locality has been described by Goldring. _/ A grab sample, number

_/ Goldring, Winifred, op. cit., p. 205, 1945.

@201, of the shale contained 0.002 percent equivalent uranium and 0.001 percent uranium by laboratory analysis.

Conclusions

The estimated average equivalent uranium content of the most radioactive Paleozoic sedimentary rocks traversed is about 0.003 percent. To the extent that the traversing covered a representative part of the Paleozoic rocks of the Hudson Valley, it is concluded that probably no uranium deposits of economic importance exist in this area. With the possible exception of the Rensselaer grit, no formation was everywhere identified with a particular intensity of radioactivity. Locally, however, abnormally radioactive beds may be of considerable help to the stratigrapher acquainted with the area.

PRE-CAMBRIAN ROCKS OF THE ADIRONDACKS

The pre-Cambrian rocks of the Adirondack Mountains consist of metasedimentary rocks, referred to as the Grenville series, _/ that have been intruded by anorthosites, gabbros, syenites, and granites. The

_/ Balk, Robert, The Adirondack Mountains: 16th Intern. Geol. Congr., Guidebook I, Excursion A-1, p. 22, 1933.

areas with the greatest number of radioactive outcrops are the northwestern and southeastern parts of the Adirondacks. This division of areas on the basis of radioactivity may be more apparent than real, however, as few roads were traversed in the northeast and southwest parts of the Adirondacks. The northeast section, moreover, contains the mass of the anorthosite core which is essentially nonradioactive, and the southwest section is topographically lower and covered with more extensive glacial deposits than the rest of the Adirondacks. With the exception of one locality in glacial debris, which contained an estimated 0.003 percent equivalent uranium, none of the anorthosite area contained abnormally radioactive rocks. Many of the other igneous rocks and the Grenville metasedimentary rocks are abnormally radioactive. Abnormally

radioactive syenite and granite were found at many places but because of the compexity of the various facies no attempt is made here to correlate the facies with respect to radioactivity--such being beyond the immediate scope of this report. In general, similar facies of a formation cannot be correlated over large areas solely on the basis of their radioactivity. There is no evidence to indicate whether the radioactive elements in rocks of the Grenville series were part of the original sedimentary constituents or were injected into the series with the intrusive rocks. Many of the abnormally radioactive rocks, however, are at or near the contacts of the Grenville series and the intrusive rocks.

Pegmatites, usually less than 50 feet long, contained the greatest concentrations of radioactive elements. Uraninite-bearing basic pegmatites in a very similar geologic setting have been described in Haliburton County, Ont. _/

_/ Wolfe, S. E., and Hogg, Nelson, Report on some radioactive mineral occurrences in Cardiff and Monmouth Townships, Haliburton County, Ontario: Ontario Dept. of Mines, P. R. 1948-8, pp. 2-4, 1948.

For the purpose of clarity in reading figure 1, the log of abnormally radioactive roadside localities in the Adirondacks (table 1) is roughly divided into four quadrants around the coordinate axes formed by the 44th parallel and the 74° 30' meridian. These localities are described in counterclock-wise order beginning with the northwest quadrant.

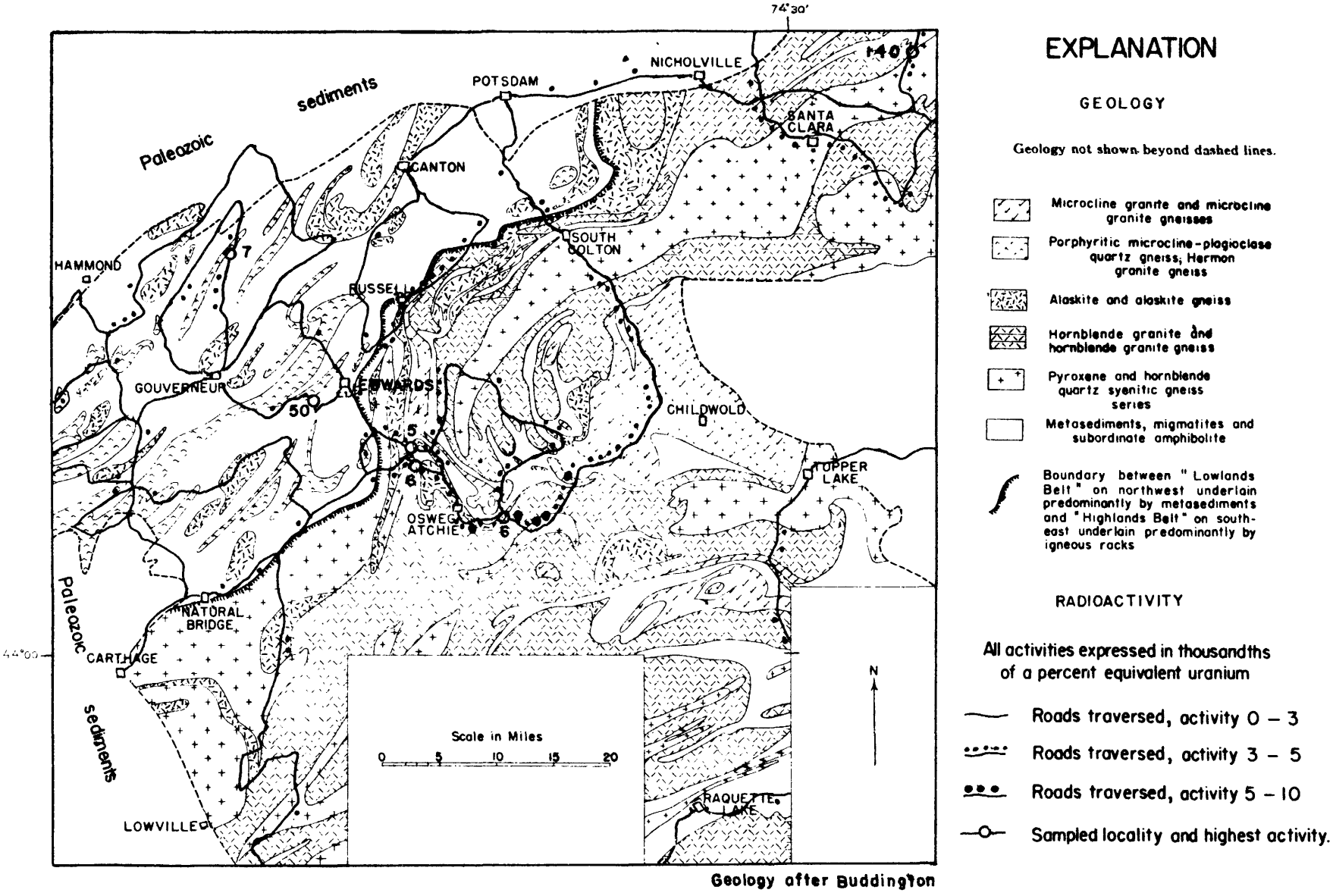
Northwestern Adirondacks

Traverses indicate that the northwestern part of the Adirondack Mountains is the most radioactive area described in this report. Distribution of the abnormally radioactive roadside localities with relation to the geology _/ is shown in figure 2. The abnormally radioactive localities plotted on figure 2 include

_/ Buddington, A. F., Granitic rocks of northwest Adirondacks, Origin of Granite: Geol. Soc. America Mem. 23, pl. 1, 1948.

both glacial debris and outcrops so that the radioactivity may not be directly compared to the geology. The radioactivity and mapped and observed geology of each locality is given in table 1, pages 25 to 49. Abnormal radioactivity is most apparent in an area predominantly underlain by igneous rocks, the "Highlands Belt" of Buddington, between latitude 44° and 44°30' and longitude 74°45' and 75°15' (fig. 1). Within these coordinates rocks of many types average 0.003 percent equivalent uranium.

Sampled outcrops within the northwest quadrant of the Adirondacks are described below.



Geology after Buddington

FIG. 2—RELATIONSHIP BETWEEN GEOLOGY AND RADIOACTIVITY IN THE NORTHWEST ADIRONDACKS.

Benson Mines locality

A red gneissic granite was examined along New York State Highway 3 at 1.5 miles east of Benson Mines (fig. 1). A grab sample, number @213, contained 0.006 percent equivalent uranium and 0.003 percent uranium. The minor constituents are muscovite, chlorite, biotite, and weakly radioactive hematite. Measurements at the outcrop indicate that the maximum radioactivity may be a few thousandths of a percent more. This locality has been mapped as "granite, medium even grained, commonly gneissoid to gneissic structure." _/

_/ Buddington, A. F., and Leonard, B. F., Preliminary report on the eastern part of the northwestern Adirondack magnetite district, New York: U. S. Geol. Survey Strategic Mineral Investigations, Preliminary map, 1944.

Fine locality A

A red granite was sampled at the junction of New York State Highways 58 and 3 just east of Fine (fig. 1). Here the granite is in contact with a gray gneiss near the southeastern end of a 50-foot outcrop. Field estimates at the outcrop show that the maximum radioactivity of the granite is about 0.008 percent equivalent uranium, and that of the gneiss about 0.004 percent equivalent uranium. A grab sample, number @214, of the granite contained 0.005 percent equivalent uranium and 0.002 percent uranium. The major constituents are quartz and microcline perthite; and chlorite is a minor constituent. No radioactive minerals were identified. The rock at this locality has been mapped as pyroxene gneiss, granitized in part. _/

_/ Dale, N. C., Geology of the Oswegatchie Quadrangle: New York State Mus. Bull. 302, map, 1935.

Fine locality B

A massive red granite, which crops out along an unnumbered road about 0.7 mile south of the junction with New York State Highway 3, 0.2 mile west of Fine (fig. 1), is abnormally radioactive over its outcrop extent of about 0.2 mile along the road. The average estimated radioactivity of the granite over a 300- by 500-foot area, was about 0.006-0.007 percent equivalent uranium. Numerous local spots contained up to 0.018 percent equivalent uranium. Quartz pegmatite veins in the granite are essentially

nonradioactive. A grab sample, number @217, of the granite contained 0.006 percent equivalent uranium, 0.002 percent uranium, and 0.004 percent thoria. The major constituents are quartz and microcline-perthite; the minor constituents are chlorite, fluorite, and calcite, and trace amounts of beryl, weakly radioactive sphene, and hematite. Dale _/ mapped this granite as "pink granite", the youngest in the

_/ Dale, N. C., op. cit., pp. 50-51.

area, and reports it to contain "quartz, albite, microcline perthite, rarely hornblende, sometimes fluorite, and pyrite enveloped in magnetite."

Talcville locality

The dump materials from an active talc mine were estimated to average 0.007-0.010 percent equivalent uranium for about 1,000 feet beginning 0.2 mile northwest of the Talcville bridge on an unnumbered dirt road to Emeryville (fig. 1). The most radioactive material on the dump is coarsely crystalline pegmatite consisting largely of greenish-gray feldspar with pyrite and molybdenite. The highest radioactivity is associated with black, blocky to amorphous material scattered through the feldspar. A selected grab sample, number @216, of the more radioactive fragments contained 0.050 percent equivalent uranium, 0.043 percent uranium, and 0.02 percent thoria. The major constituents are albite, microcline, and quartz; the minor constituents are chlorite, sericite, and beryl; trace amounts of weakly radioactive allanite and very radioactive uraninite are also present. Field examination of the crushed sample by fluorescent light showed a scattering of minute fluorescent yellow-green particles. Some of these particles appeared to be feldspar or calcite fragments with a coating of the fluorescent material on one edge or disseminated throughout. The fluorescent particles may be the decomposition products of uraninite because the highly fluorescent parts of the sample were the most radioactive. The rock in this area has been mapped as impure siliceous Grenville limestone which carries talc and zinc blende in the Edwards belt. _/

_/ Cushing, H. P., and Newland, D. H., Geology of the Gouverneur Quadrangle: New York State Mus. Bull. 259, map, 1925, pp. 112-113.

Cushing and Newland described this mine, No. 2 1/2, in 1925 as follows: "It is located on a seam of talc which lies on the north side of the limestone belt not far from the granite contact. . . . on the hanging wall the talc is bordered by hard tremolite schist. . . . and this is in turn succeeded by limestone". None

of the abnormally radioactive pegmatite was found in place.

Uraninite has also been reported in a "replacement" albite-microcline-quartz pegmatite in the Grenville limestone northwest of Bigelow, about 10 miles north of Talcville. _/

_/ Shaub, B. M., Age of the uraninite from the McLear pegmatite near Richville Station, New York: Am. Min., vol. 25 no. 7, pp. 480-487, July 1940.

The dump of an abandoned talc mine 0.1 mile east of the No. 2 1/2 mine was examined and found to be essentially nonradioactive. No pegmatite was found at this dump. Investigations of the mines at Edwards and Balmat have shown that they are similarly low in radioactivity. _/

_/ Wright, R. S., Visit to Gouverneur zinc district, New York: AEC Memorandum Rept. (unpublished) Nov. 22, 1949.

Although these occurrences represent the only two known uraninite-bearing pegmatites in the northwestern Adirondacks, it is conceivable that more of this type exist and may be of richer grade. Buddington _/

_/ Buddington, A. F., Adirondack igneous rocks and their metamorphism: Geol. Soc. America Mem. 7, p. 161, 1939.

described the granite pegmatites of the northwestern Adirondacks as "...widely variable in quantity but are omnipresent throughout all the different kinds of rocks in the Grenville belt ....They are common simple pegmatites....molybdenite, apatite, and allanite are found occasionally".

DePeyster locality

Abnormally radioactive biotite granite-gneiss lenses were found in fine-grained mafic rock along an unnumbered road to Gouveneur, 6.8 miles south of DePeyster (fig. 1). The granite gneiss-mafic rock complex at this locality forms a prominent ridge about 100 feet high above the flat fields floored by Grenville limestones to the south. Traversing on the ridge with the 42-inch gamma tube showed that the abnormally radioactive lenses are at least 6 feet wide and 100 feet long and seemed to be confined to "stratigraphic" units. The maximum equivalent uranium content of the lenses is estimated to be 0.015 percent. The average radioactivity of the granite gneiss is estimated to be between 0.006 and 0.008 percent equivalent uranium. The mafic rocks are estimated to contain up to 0.002 percent equivalent uranium. A grab sample, number @215, of one of the most radioactive granite gneiss lenses contained 0.007 percent equivalent uranium and 0.002 percent uranium. The major constituents are albite and microcline; the minor constituents

are biotite and quartz, and trace amounts of zircon and monazite, both of which are weakly radioactive. As both zircon and monazite may contain appreciable thorium, most of the radioactivity of the rock probably is caused by this element. The average calculated thorium content _/ of the granite gneiss would be

_/ McKeown, F. A. op. cit., pp. 8 and 9.

0.016 percent. The rocks have been mapped as "ambhibolites, much cut and soaked by porphyritic granites". _/

_/ Cushing, H. P., and Newland, D. H., op. cit., map.

Southeastern Adirondacks

Lake George locality

Along U. S. Highway 9, beginning 2 miles north of the junction with New York State Highway 9N in the town of Lake George and continuing northward for about 1 mile (fig. 1), a long outcrop of crystalline rocks is estimated to contain between 0.002 and 0.004 percent equivalent uranium. At 3.2 miles from the junction of Highways 9 and 9N a high cliff of these rocks is estimated to contain a mimimum of 0.006 percent equivalent uranium. The outcrop at this point consists of gabbro, cut by pegmatite, intrusive into syenite. _/ Examination with the 42-inch Geiger tube showed that a dark gray pegmatitic zone in the

_/ Newland, D. H., and Vaughan Henry, Guide to the geology of the Lake George region: New York State Mus. Handbook 19, p. 175, 1942.

gabbro is the most radioactive. This pegmatite is 2 to 3 feet thick where exposed; other dimensions were not determined. A grab sample, number @ 208, of the pegmatite contained 0.024 percent equivalent uranium, 0.013 percent uranium, and 0.03 percent thoria. The major constituents are perthite, quartz, and calcite; the minor constituents are chlorite, and traces of rutile, weakly radioactive zircon, and very radioactive ilmenite. A grab sample, @209, of the syenite at this locality contained 0.004 percent equivalent uranium, 0.002 percent uranium, and 0.002 percent thoria. Major constituents of the syenite are reported as quartz and microcline-perthite, minor constituents as biotite and penninite, and traces of weakly radioactive zircon and beryl. The gabbro is estimated to contain 0.002 percent equivalent uranium or less.

Graphite locality

An abnormally radioactive outcrop of gneiss and pegmatite was found along the south side of New York State Highway 8, 6.2 miles southwest of Graphite near the northern end of Bear Lake. The outcrop of gneiss is about 300 feet in length and contains pegmatite dikes and stringers in the westernmost 100 feet. One of these pegmatites, about 6 feet wide, contained a 3-inch zone of minerals and was the most radioactive part of the outcrop. A sample, number @206, of the rock of this zone, contained 0.016 percent equivalent uranium, 0.002 percent uranium, and 0.05 percent thoria. The major constituents were determined as albite, orthoclase, and quartz; the minor constituent as biotite; and trace amounts of pyrite, weakly radioactive apatite, weakly radioactive zircon, and beryl. Weathered pegmatite immediately above this zone was also sampled, number @207, and contained 0.039 percent equivalent uranium, 0.003 percent uranium, and 0.18 percent thoria. The major constituents of the weathered pegmatite are albite, quartz, and muscovite; the minor constituents are penninite, antigorite, biotite, calcite, and sericite, and beryl in trace amounts. The area surrounding the described outcrop is heavily wooded and other outcrops are scarce although there is scattered float of graphic granite, gneiss, and porphyritic granite south of the highway. The zone of pegmatites, roughly 40 feet wide, was traceable through the woods S.80° W. for about 250 feet by following the strongly radioactive soil and float derived from it with the 42-inch gamma tube. The zone was not traced farther because of piles of slash timber from recent logging operations. A sketch map of the general plan of the locality is shown in figure 3. North of Highway 8 the woodlands drop very steeply to Mill Brook and no abnormal radioactivity was noted along the one accessible route to the brook.

Assuming an aggregate thickness at 10 feet, a length of 250 feet, a depth of 50 feet, and a tonnage factor of 12 cubic feet per ton, the pegmatite contains about 10,000 tons of rock averaging 0.008-0.010 percent equivalent uranium. From the sample analysis of the most radioactive parts of the pegmatite it may be inferred that this average grade approximates 0.001 percent uranium and 0.020-0.030 percent thoria.

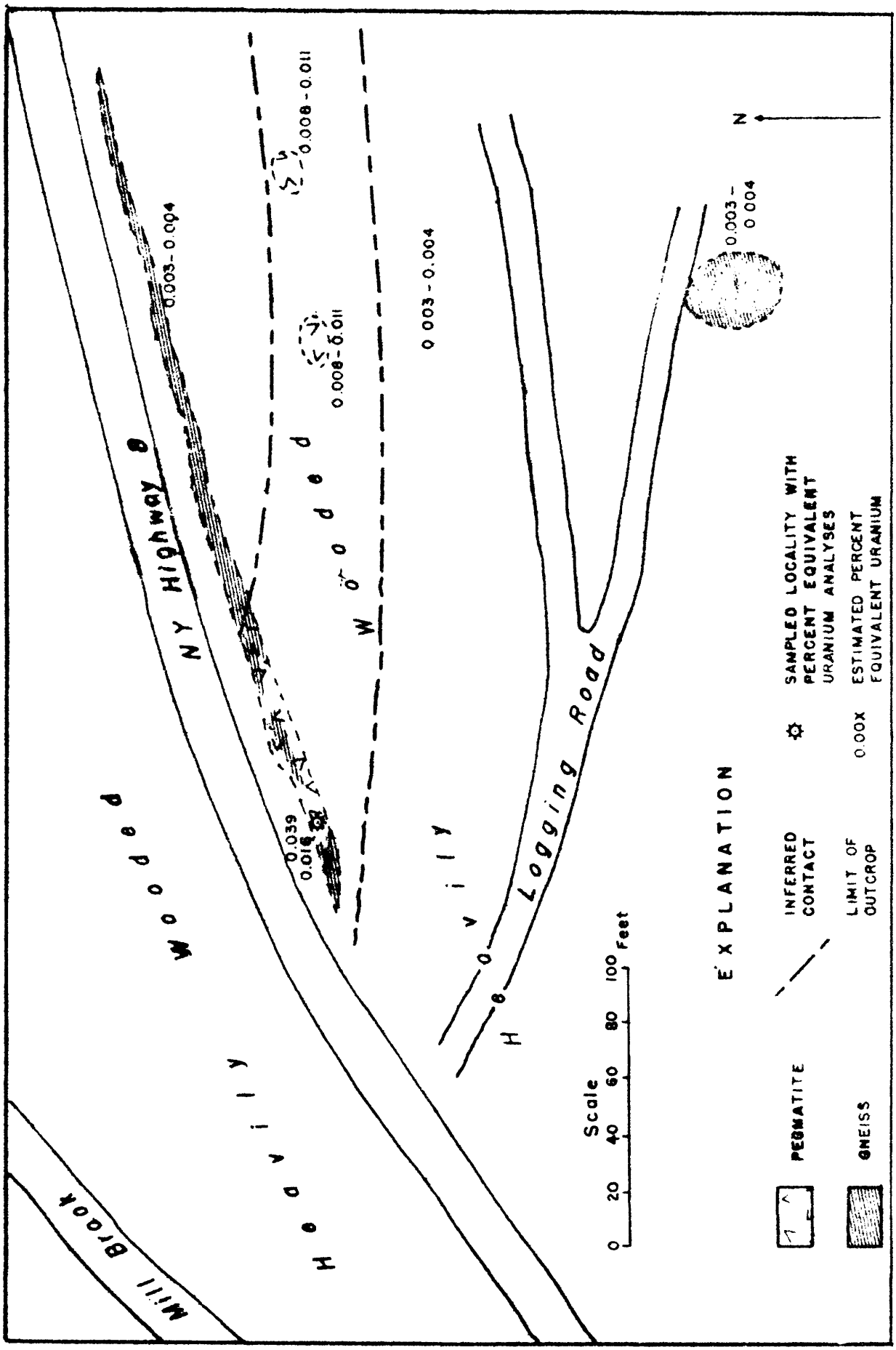


FIG. 3—SKETCH MAP OF THE GEOLOGY AND RADIOACTIVITY AT THE GRAPHITE LOCALITY.

Northeastern Adirondacks

Moriah Center locality, Mineville district

Abnormally radioactive slag underlies a field adjacent to the old Colburn furnace about 1 mile west of Moriah Center on an unnumbered road. This furnace is reported to have been built in 1848. _/ The

---

_/ Kemp, J. F., and Ruedemann, Rudolf, Geology of the Elizabethtown and Port Henry quadrangle: New York State Mus. Bull. 138, p. 99, 1910.

---

slag is not now exposed but is buried under at least 3 inches of sod. The extent of the slag, as indicated by foot traverse with the large gamma tube, is roughly 180 by 400 feet. The thickness of the slag is not known but as boulders of syenite are seen throughout the abnormally radioactive area it is presumed to be about 1 foot thick or less. Assuming 15 cubic feet per ton, approximately 4,800 tons of slag are present at this locality. A sample of the slag, number @210, contained 0.030 percent equivalent uranium, 0.007 percent uranium, and 0.11 percent thoria. By semiquantitative spectrographic analysis the major constituents of the slag are calcium, magnesium, aluminum, titanium, and iron; the minor constituents are sodium, vanadium, manganese, boron; and there are trace amounts of zirconium and cadmium. Lanthanum, cerium, and yttrium are present in amounts of 1-10 percent. From 0.1 to 1.0 percent thorium is also present. The sources of the ores and flux materials used in this old furnace are not known; however, it was reported in 1849 _/ that "the ores are to come principally from the Sanford ore bed."

_/ Anon., Port Henry mines and furnaces: American Railroad Journal, 2nd Quarto ser., vol. 5, no. 39, p. 607, Sept. 1849.

The oldest mine in the area, near the Cheever school, and the mine just west of Mineville were in operation about the time this furnace was built. Other furnaces of the sand type were located at Fletcherville (not shown on map) 1 1/2 miles north of Mineville, and at Cedar Point in Port Henry; neither locality was examined. The flux materials could have been the source of the radioactive elements and rare-earths, as the Grenville limestone, containing lenses of pegmatite, was once quarried

for this purpose. _/

_/ Kemp, J. F., and Ruedemann, Rudolf, op. cit., p. 149, 1910.

Impure magnetite ore, however, is a more probable source. Kemp _/ reports "The ore bodies are

_/ Kemp, J. F., and Ruedemann, Rudolf, op. cit., p. 125, 1910.

occasionally cut by pegmatite dikes of a very coarse character and of interesting mineralogy". Unusually large allanite crystals, abundant zircon, arsenopyrite, and "a black coaly mineral, obviously one of those containing the rare earths" have been found in the pegmatites in the "21 pit" of the mine just west of Mineville. Large allanite crystals have also been found in the pegmatites in the old "Cook shaft", the mine just west of Bartlett Pond. Hurley, _/ furthermore, has shown that in samples of over 90 percent

_/ Hurley, P. M., and Goodman, Clark, Helium age measurement, I. Preliminary magnetite index: Geol. Soc. America Bull., vol. 54, no. 3, p. 313, March 1943.

pure massive magnetite from the Cheever mine the microscopic gangue minerals contained 12 x 10^{-12} gm/Ra/gm and 120 x 10^{-6} gm/Th/gm. By calculation, using Russell's equilibrium factors _/ these figures

_/ Russell, W. L., The total gamma ray activity of sedimentary rocks as indicated by Geiger counter determinations: Geophysics, vol. 9, no. 2, p. 185, April 1944.

are about equal to 0.003 percent uranium and 0.012 percent thorium or a total activity of 0.006 percent equivalent uranium.

At Moriah Center, and from Mineville west to Witherbee, roadside materials contain from 0.002 to 0.003 percent equivalent uranium. No outcrops are visible, and it is presumed that the radioactivity is due to mine tailings or slag used as road fill. At and near recent mine dumps the estimated percent equivalent uranium content is between 0.004 and 0.006. The mine dump near the portal of the old inactive "North Pit" and a larger dump adjacent to it were scanned with beta-gamma and gamma tubes and no abnormally radioactive rocks or minerals were found. The mine dump at the Republic Steel mine at Fischers Hill, just north of Barton Hill, contained an estimated 0.004 percent equivalent uranium.

Along New York State Highway 22, 0.7 mile north of the traffic circle in Port Henry, is a long outcrop of hornblende schist and limestone estimated to contain between 0.001 and 0.003 percent equivalent uranium. This area has been mapped as Grenville schists and gneisses _/ and is near one of the old quarries

_/ Kemp, J. F., and Ruedemann, Rudolf, op. cit., map, 1910.

from which limestone, which was used as flux, was mined. At 2.1 miles north of the traffic circle abnormal radioactivities of 0.003 to 0.004 percent equivalent uranium are indicated but no outcrops were seen. Kemp _/

_/ Kemp, J. F., and Ruedemann, Rudolf, op. cit., p. 104, 1910.

mentions an outcrop of magnetite ore along the road near the Cheever mine, but because the roads have been rerouted since his writing, it is not known if these abnormal radioactivities are related to the ore outcrop or to other Grenville rocks. The location has been mapped as Grenville schist, gneisses, and limestone. Outcrops of the Grenville limestone at 0.3 and 3.2 miles north of the traffic circle in Port Henry are estimated to contain a maximum of 0.003 and 0.005 percent equivalent uranium respectively.

Duane locality

Along New York State Highway 10, 8 miles north of the junction with New York State Highway 99 in Duane, a roadcut in crystalline rocks contains a mimimum of 0.006 percent equivalent uranium. The rocks at this locality have been mapped as metagabbro and amphibolite by Buddington _/ who states, "The meta-

_/ Buddington, A. F., Geology of the Santa Clara Quadrangle, New York: New York State Mus. Bull. 309, pp. 28, 46, map, 1937.

gabbro.....is in part much injected by coarse pink granite, pegmatite veins or locally shredded by granite, and in part is quite uniform amphibolite with only a sparse, coarse granitic pegmatite vein". The St. Regis hornblende granite with lenses and shreds of amphibolite is exposed about 0.2 mile west of the outcrop.

A sketch of the outcrop at this locality showing the approximate radioactivity as estimated by examination with a 6-inch Geiger tube is shown in figure 4. Diabase dikes are the youngest intrusives of the region and form part of a wide system of Keweenawan dikes. They strike N. 60° - 80° E. _/ The pegmatite body

_/ Buddington, A. F., op. cit., p. 28, 1937.

is the most radioactive, and within it most of the radioactive elements are concentrated near the lower contact with the hornblende gneiss in a zone characterized by black quartz, magnetite, and pyrite. Two samples were taken. Sample number @211 is from a weathered part of the pegmatite near the contact with the gneiss. The crushed sample was separated into two fractions with a hand magnet. The magnetic fraction was approximately twice as radioactive as the nonmagnetic fraction. The composite sample contained 0.14 percent equivalent uranium, 0.005 percent uranium, and 0.62 percent thoria. The major constituents

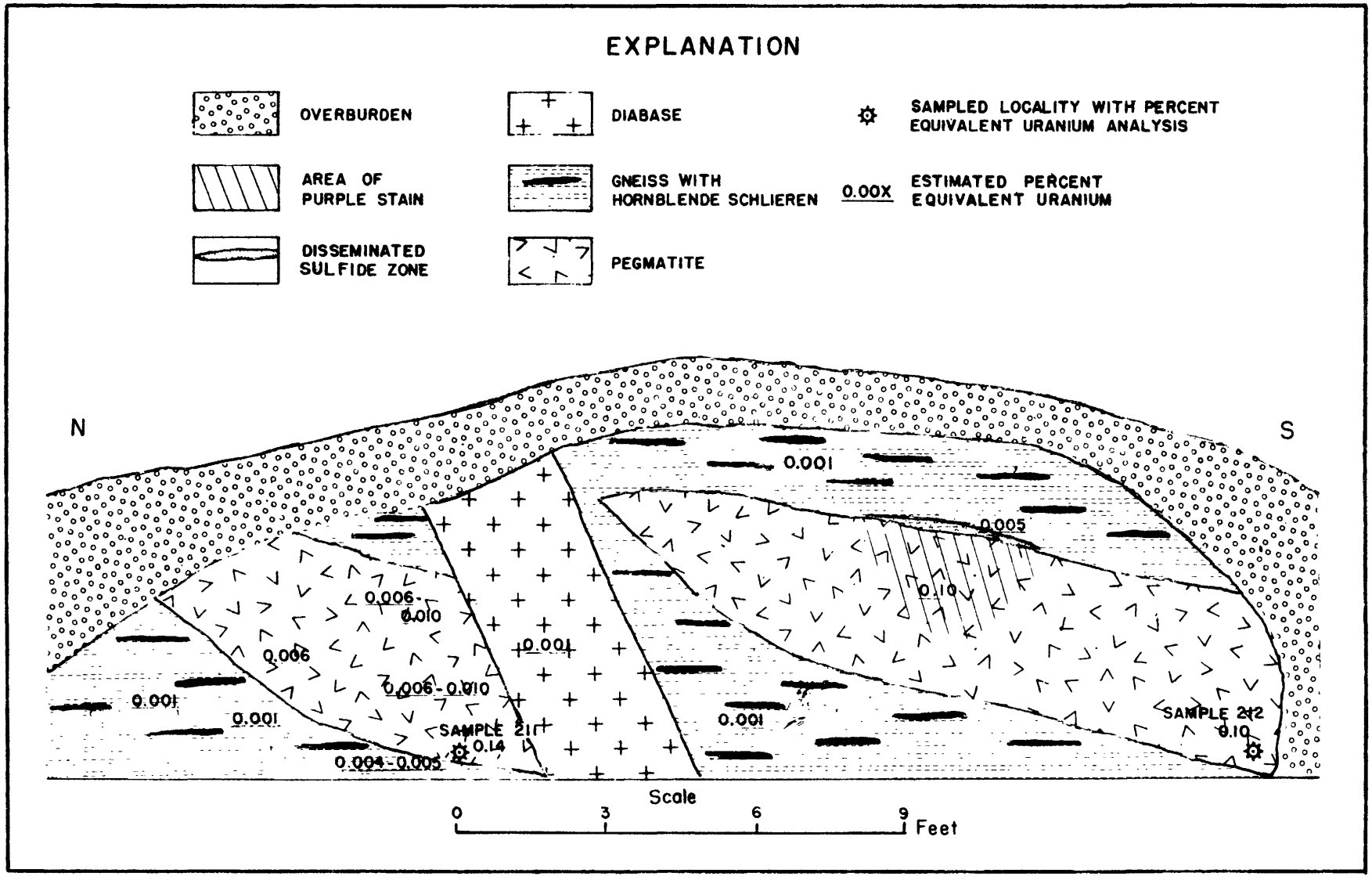


FIG. 4—SKETCH OF SAMPLED OUTCROP AT THE DUANE LOCALITY ON HIGHWAY 10 SHOWING THE RELATIONSHIP BETWEEN GEOLOGY AND RADIOACTIVITY.

are quartz and antiperthite; the minor constituents are biotite, chlorite, [illegible]rite, and clinozoisite; and trace amounts of xenotime, zircon, and pyrite are present, all three of which are weakly radioactive. The magnetic fraction apparently owes its radioactivity to the adherence of pyrite on the magnetite. Sample number @212 is from a relatively fresh portion of the pegmatite and represents about a 1 foot thickness of the pegmatite at its lower contact with the gneiss. This sample contained 0.10 percent equivalent uranium, 0.004 percent uranium, and 0.52 percent thoria. The major constituents are albite and quartz; the minor constituents are biotite, chlorite, and hematite, and trace amounts of magnetite, and weakly radioactive pyrite. Pyrite is in a small lenticular zone between the gneiss and the upper surface of the pegmatite. This zone contains an estimated 0.005 percent equivalent uranium. Beneath, and apparently originating from it, is a very radioactive purple film on the surface of the pegmatite. This film was not sampled but field measurements indicate it may contain up to 0.1 percent equivalent uranium.

Heavy overburden prevented tracing the pegmatite in the immediately surrounding area but glacial materials along the road for several miles south and at 2.6 miles north of this locality are estimated to contain up to 0.004 percent equivalent uranium. A few scattered outcrops within this glacial material contained up to an estimated 0.002 percent equivalent uranium.

Conclusions

Although road traversing in the Adirondacks has shown that there are many abnormally radioactive rocks and glacial materials, particularly near the contacts of the igneous and metamorphic rocks, pegmatites are the only known sources of concentrations of radioactive elements. Moreover, they may owe their radioactivity both to thorium (as at the Duane and Graphite localities) and to uranium (as at the Lake George and Talcville localities). If it can be assumed, however, that these pegmatites are representative of a certain percentage of the total number of pegmatites in the Adirondacks, then there may well exist a very large number of pegmatites, each too small to be of economic significance by itself but close enough together to be mined and concentrated by a mobile plant. Pyrite, ilmenite, and hematite have all been reported to be radioactive (table 2) and there is some association of radioactivity with magnetite as at the Moriah Center locality. This direct association of radioactivity with these particular iron minerals has not

been reported previously. _/ There is also an apparent affinity of pitchblende to iron minerals or iron-rich

_/ Frondel, J. W., and Fleischer, M., A glossary of uranium and thorium bearing minerals: U. S. Geol. Survey Cir. 74, 1950.

rocks in many of the known pitchblende deposits of the Canadian Shield. _/

_/ Christie, A. M., and Kesten, S. N., Pitchblende occurrences of the Goldfields area, Saskatchewan: Canadian Min. and Met. Bull., vol. 42, no. 452, pp. 643-665, December 1949.

_/ Murphy, Richard, Geology and mineralogy at Eldorado Mines, Part II, The Eldorado Enterprise: Canadian Inst. Min. and Met. Trans. vol. 49, pp. 426-434, 1946.

The greater number of abnormally radioactive outcrops in the areas containing iron mineralization and contact zones of igneous rocks with the Grenville series in the northwestern and southeastern parts of the Adirondacks suggests that these may be the better areas to prospect for uranium deposits.

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and all sampled localities in Paleozoic rocks of the Hudson Champlain Valley

Observed rock type	Mapped rock type and reference ?	Range and average estimated equivalent uranium (percent)	Location	Remarks
Dark slate	Hudson River formation 1/	0.001-0.003	Highway 94, 4.0 to 5.0 miles southwest of Washingtonville	
Black shale	Onondaga Marcellous shale 2/	do	Highway 209, 4.4 miles southwest of Wurtzboro	
Dark shales and sandstone	do	.002-.003	Highway 209, 1.3 miles north of the junction with Highway 52 in Ellenville	
Glacial	Ordovician Snake Hill shale 3/	.003	Highway 52 at Pine Bush	
Red sandstone and shale	do	.002-.004	Highway 52, 3.2 miles southeast of Pine Bush	
Shaley slates	Hudson River Snake Hill formation 3/	.002-.003	Highway 32, 2.7 miles northwest of the junction with Highway 9W in Newburgh	
Dark shales	do	do	Highway 55, 0.7 of a mile north of the Wallkill River bridge, north of Gardiner	Long outcrop
Slatey shale	Ordovician Hudson River group 4/	do	Highway 9W, 3.3 and 3.9 miles north of Highland	do
Slate	Ordovician Hudson River group 4/	.002-.004	Highway 55, 2.8, 4.6, and 8.2 miles east of the junction with Highway 44 in Poughkeepsie	
Do	Ordovician-Cambrian Hudson River pelite 5/	do	Highway 82, 3.0, 3.6, 5.2, 7.6, and 7.7 miles north of Billings	
Do	do	.002-.003	Highway 343, 2.9 and 5.5 miles west of Dover Plains	
Siliceous marble	Dolomitic part of Stockbridge limestone 6/ Wappinger crystalline marble 5/	.003-.004 .001-.002	Highway 22, 1.5 miles south of Dover Plains	50 foot road cut

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and all sampled localities--Continued

Paleozoic rocks of the Hudson Champlain Valley --Continued

Observed rock type	Mapped rock type and reference ?	Range and average estimated equivalent uranium (percent)	Location	Remarks
Gneiss and schist	Ordovician Berkshire schist 6/	0.002-0.004	Unnumbered road, 3 miles west of Wingdale	
Phyllitic slates	Hudson River pelite 5/	do	Unnumbered road, 3.9 to 4.1, 5.4, and 6.1 to 6.5 miles west of Wingdale	
Gray fissile slaty shale	do	.002-.003	Highway 199, 1.1 miles west of Pine Plains	
Slate	Hudson River formation, metamorphosed 1/	.000-.003	Highway 217, about 3 miles west of North Hillsdale	Many outcrops; most are negligibly radioactive
Do	Ordovician Hudson River schist 7/	.002	Highway 203, 0.9 mile east of the railroad crossing in Chatham	Chatham locality, Sample @202, contained 0.002% eU and 0.001% U
Dark gray shale	Deepkill shale 8/	.001-.002	Railroad cut south of the Station at Stuyvesant	Stuyvesant locality, Sample @203, contained 0.002% eU and 0.001% U
Black shale	Bakeoven shale 8/	.002-.003	Unnumbered road about 3 miles southeast of Medway	Medway locality, Sample @ 200, contained 0.002% eU and 0.001% U
Gray and Black shale	Esopus shale, Oriskany 8/	.002	Unnumbered road 1.75 miles northwest of Ravena	Ravena locality, Sample @201, contained 0.002% eU and 0.001% U
Glacial ?	Rensselaer grit 9/	.003	Unnumbered road about 0.5 mile east of East Nassau	No outcrop may have been road metal. Traverse from here to Stephentown and then northwest to the Alps is generally in more active materials than surrounding areas. All in Rensselaer grit 9/
Glacial? and large boulders	do	.001-.003	Highway 154, 3.8 miles east of Poestenkill	

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and all sampled localities--Continued

Paleozoic rocks of the Hudson Champlain Valley--Continued

Observed rock type	Mapped rock type and reference ?	Range and average estimated equivalent uranium (percent)	Location	Remarks
Glacial	Rensselaer grit [9]	0.003-0.004	Highway 154, 4.9 miles east of Poestenkill	
Glacial? and large boulders	do	do	Highway 154, 8.2 miles east of Poestenkill	
Slates and phyllites	Berkshire schist [9]	do	Highway 154, 1.8 to 2.1 miles west of Berlin	
Red quartzite and shale	Rensselaer grit [10]	.002-.003	Highway 2, 4.0 miles west of Grafton	
Glacial	do	.001-.003	Highway 423, about 2 miles west of Bemis Heights	
Black carboniferous graptolitic shale	Canajoharie shale [11]	.002	Unnumbered road at the railroad crossing at eastern edge of Ballston Spa	Ballston Spa locality, Sample @204, contained 0.001% eU and 0.001% U
Shale	Ordovician Snake Hill shale [11]	.002-.004	Unnumbered road east of, and parallel to Highway 40 about 4.0 miles north of Middle Falls	Two outcrops traverse for 6.6 miles along this road averaged 0.000-0.003% eU
Slate	Lower Silurian-Ordovician slate [12]	.001-.004	Highway 22, 4.7 miles south of Granville	
Do	Lower Silurian and lower Cambrian slate [12]	.002-.004	Highway 149, from Hartford to 2.6 miles to the east	Many outcrops
Do	Lower Cambrian slates, quartzites, grit, and some limestone and sandstone [12]	.004-.006	Highway 40, 0.6 and 0.9 mile east of North Granville	Large outcrops
Do	Silurian-Ordovician slates [12]	.002-.003	Highway 286, 1.8 miles north of Middle Granville	Long outcrop

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and all sampled localities--Continued

Paleozoic rocks of the Hudson Champlain Valley--Continued

Observed rock type	Mapped rock type and reference ?	Range and average estimated equivalent uranium (percent)	Location	Remarks
Slate	Ordovician Normanskill grits [13]	0.002-.003	Highway 286 (22A), 1.3 miles south of Hampton and at Hampton	
Slate	Lower Cambrian Bomoseen grit [13]	do	Highway 286, 1.7 miles south of Fairhaven, Vermont	High cliff
Iron-stained slates	Lower Cambrian slates [12]	.002-.005 .002	Highway 4, 3.3 miles west of Fairhaven, Vermont	Long outcrop, Fairhaven locality, sample @205, contained 0.002% eU, and 0.001% U

Adirondacks - Northwest Quadrant, 44° and North, 74° 30' and West

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Gneiss	Mixed rocks, probably calcic pyroxene-pyrite biotite-amphibolite gneisses [14]	0.004	Highway 56, 3.6 miles south of the bridge in Hannawa Falls	
Glacial	do	.002-.004	Highway 56, 3.8 miles south of the bridge in Colton	No outcrops; activity extends for about 0.2 mile
Gneiss	Medium-grained granite gneiss [14]	do	Highway 56, 1.5 miles north of the bridge in South Colton	Long outcrop
Glacial	Phacoidal granite gneiss [15]	.003-.004 .002	Highway 56, 4.5-4.8 miles south of the bridge in South Colton	Activity extends for about 0.3 mile
Glacial	Granite [15]	.003-.004	Highway 56, 7.9 miles south of the bridge in South Colton	

Table 1.--Log of localities estimated to contain ≥.003 percent equivalent uranium or more and all sampled localities--Continued

Adirondacks - Northwest Quadrant, 44° and North, 74° 30' and West--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Dark gray granite	Granite and amphibolite [15]	0.002-0.003 .002	Highway 56, 8.9 miles south of the bridge in South Colton	
Glacial	do	.003-.004	Highway 56, 10-10.3 miles south of the bridge in South Colton	
Glacial	Granite [15]	do	Highway 56, 3-3.3 miles north of the junction with Highway 3 at Sevey	
Do	do	do	Highway 56, 1.6-1.9 miles north of the junction with Highway 3 in Sevey	
Do	do	do	Junction of Highways 3 and 56 in Sevey	
Granite	do	do	Highway 3, 2.3 miles west of the junction with Highway 56 in Sevey	
Crystalline	do	do	Highway 3, 3 miles west of the junction with Highway 56 in Sevey	
Glacial	Granite [15]	.004-.005 ±.001	Highway 3, 3.0-3.1 miles east of the railroad crossing in Cranberry Lake	
Granite gneiss	do	.002-.005	Highway 3, 2.0 miles east of the railroad crossing in Cranberry Lake	Long outcrop
Gneiss	Grenville metasediments and migmatites [15]	.004-.005	Highway 3, 1.4 miles east of the railroad crossing in Cranberry Lake	
Unidentified	do	.002-.003	Highway 3, 0.7 mile east of the railroad crossing in Cranberry Lake	
Glacial	do	.004	Highway 3 at Cranberry Lake railroad crossing	

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and all sampled localities--Continued

Adirondacks - Northwest Quadrant, 44° and North, 74° 30' and West--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Glacial	Grenville metasediments and migmatites [15]	0.004	Highway 3, 1.1-1.4 miles west of the railroad cross-in Cranberry Lake	
Do	Granite [15]	.006	Highway 3, 1.9 miles west of railroad crossing in Cranberry Lake	
Granite	do	.003-.004	Highway 3, 4.2 miles west of railraod crossing in Cranberry Lake	
Glacial	Grenville metasediments and migmatites [15]	.003-.004 ±.001	Highway 3, 5.2-5.5 miles west of the railroad crossing in Cranberry Lake	
Do	Quartz syenite gneiss [15]	.001-.006 ±.001	Highway 3, 1.0 miles east of the junction with a road going south to Wanakena	
Do	do	do	Highway 3, 0.8 mile east of the junction with the road to Wanakena	
Do	do	.001-.007 ±.001	Highway 3, 0.3-0.6 mile east of the junction of road to Wanakena	
Gneiss	do	.003-.007 .004	Highway 3 at the junction with the road to Wanakena	
Gneiss	do	.006-.007 .003-.004	Highway 3, 0.5 mile west of the road to Wanakena	
Gneiss	Quartz syenite gneiss or granite [15]	.001-.004 .004	Highway 3, 2.8 miles east of Benson Mines	
Glacial and small outcrops of granite	Granite [15]	.006-.009	Highway 3, 1.8-2.1 miles east of Benson Mines	

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium of more and all sampled localities--Continued

Adirondacks -- Northwest Quadrant, 44° and North, 74° 30' and West--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Red gneiss granite	Granite [15]	0.006-0.009	Highway 3, 1.4 miles east of Benson Mines	Benson Mines locality, Sample @ 213, contained 0.006% eU and 0.003 % U
Granite	do	.004-.005	Highway 3, 0.9 mile east of Benson Mines	
Glacial	Grenville metasediments [15]	.003-.004	Highway 3 at Benson Mines	
Gneiss	Pyroxene gneiss [16]	.002-.004	Highway 3, 0.1 mile west of the post office in Star Lake	
Glacial	Hornblende granite gneiss [16]	.002-.009 .002-.004	Highway 3, 1.7 miles west of the post office in Star Lake	
Gneiss	do	.005	Highway 3, 2.3 miles west of the post office in Star Lake	
Do	do	.002-.003	Highway 3, 0.3 mile south of the railroad crossing in Oswegatchie	
Do	do	do	Highway 3, 0.1 to 0.3 mile south of the railroad crossing in Oswegatchie	
Granite	Hornblende granite gneiss [16]	.002-.005	Highway 3, 1.2 miles north of the railroad crossing in Oswegatchie	
Glacial	Pyroxene gneiss, granitized in part with amphibolite, quartzite and calcareous inclusions [16]	.002-.004	Highway 3, 3.6 miles north of the railroad crossing in Oswegatchie	
Gneiss	do	do	Highway 3, 4.9 miles north of the railroad crossing in Oswegatchie	

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and all sampled localities--Continued

Adirondacks - Northwest Quadrant, 44° and North, 74° 30' and West--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Gneiss	Pyrozene gneiss or pink granite 16/	0.003-0.005	Highway 3, 1.0 miles west of road junction of the road north to Degrasse	Long outcrop
Granite and gneiss	Pyroxene gneiss granitized in part 16/	.004-.008	Junction of Highways 3 and 58 west of Fine	Fine locality A, long outcrop, Sample @214, contained 0.005% eU and 0.002% U
Red and green gneiss	Garnet mica gneiss and schist injected by granite 17/	.002-.003	Unnumbered road to Degrasse, 0.9 of a mile north of its junction with Highway 3 east of Fine	
Granite	do	.004	Unnumbered road to Degrasse, 1.5 miles north of the above junction	
Granite and amphibolite	Rusty gneiss, quartz-pyrite and some limestone beds 17/	.002-.003	Unnumbered road to Degrasse, 1.8 miles north of the above junction	
Granite and amphibolite	Granite gneiss and granosyenite gneiss 17/	.002-.003	Unnumbered road to Degrasse, 2.0 miles north of the above junction	Adjacent glacial materials contained up to 0.004% eU
Glacial	do	.003-.004	Unnumbered road, 4.0 miles south of Degrasse	
Granite	do	.004	Unnumbered road, 2.4 miles south of Degrasse	
Crystalline	do	.002-.004	Unnumbered road, 2.0 miles south of Degrasse	Long outcrop
Glacial	do	do	Unnumbered road, 0.5 of a mile south of Degrasse	

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and all sampled localities--Continued

Adirondacks - Northwest Quadrant, 44° and North, 74° 30' and West--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent urnaium (percent)	Location	Remarks
Glacial	Granite [15]	0.003	Unnumbered dirt road, 4.2 miles southeast of Degrasse	
Do	Grenville metasediments and migmatite [15]	.003-.004	Unnumbered dirt road, 4.1 miles southeast of a bridge over the Grass River southeast of Degrasse	
Granite	Granite with amphibolite [15]	.002-.003	Unnumbered dirt road, 5.2 miles southeast of the above bridge	Outcrop in roadbed, glacial averages 0.002% eU
Granite	Granite [15]	.003	Unnumbered road, 6.2 miles west of Newton Falls	
Gneiss	Grenville metasediments and migmatite [15]	.003-.004	Unnumbered road, 0.9 of a mile west of Newton Falls	Low outcrop, glacial materials contained up to 0.004% eU
Glacial	do	.003-.004 .003	At Newton Falls	
Gneiss	do	.004	Unnumbered road to Benson Mines, 2.4 miles south of Newton Falls	
Glacial	Hornblende granite gneiss [16]	.003-.004 .001	Unnumbered road, 0.1 mile west of its junction with Highway 3, 2.4 miles north of the railroad crossing in Oswegatchie	
Do	do	.001-.005 ±.001	Unnumbered road, 1.7 miles west of the junction with Highway 3 as above	
Granite gneiss	Pyroxene granite gneiss [16]	.003	Unnumbered road, 1.1 miles south of its junction with Highway 3, 0.2 mile west of the junction with Highway 58 near Fine	

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and all sampled localities--Continued

Adirondacks - Northwest Quadrant, 44° and North, 74° 30' and West--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Granite	Pink granite[16]	0.006-0.013	Unnumbered road, 0.7 mile south of its junction with Highway 3 near Fine	Long low outcrop, extends for about 0.3 mile. Fine locality B; sample @217 contained 0.006% eU, 0.002% U and 0.004% ThO_2
Glacial	Pyroxene granitized gneiss[16]	.003	Unnumbered road, 0.1 mile south of the junction with Highway 3 near Fine	
Red-gray granite gneiss	do	do	Junction of the above unnumbered road and Highway 3, 0.2 mile west of the junction with Highway 58	
Red and gray gneiss	Rusty gneiss, usually quartzose and pyritic[17]	.002-.003	Highway 58, 1.6 miles northwest of the junction with Highway 3 west of Fine	
Red granite	do	.004	Highway 58, 2.8 - 2.9 miles northwest of the junction with Highway 3 west of Fine	Long outcrop
Gneiss and red granite	Granite gneiss and grano-syenite gneiss[17]	.002-.003	Highway 58, 4.1 miles northwest of junction with Highway 3 west of Fine	
Red granite	Gneissic[17] syenite	do	Highway 58, 0.8 of a mile south of the junction with Highway 87 in Edwards	
Glacial	do	.003-.004 ±.001	Unnumbered road to East Pitcairn about 1-1.1 miles south of its junction with Highway 58, 5 miles south of Edwards	
Glacial	Glacial[17]	.003	Unnumbered road, about 2.4 miles south of its junction with Highway 58, 5 miles south of Edwards	

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and all sampled localities--Continued

Adirondacks - Northwest Quadrant, 44° and North, 74° 30' and West--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Granite and amphibolite	Hornblende syenite granite [16]	0.002-0.005	Highway 3, 4.6 miles west of its junction with Highway 58 east of Fine	200 feet of outcrop
Granite	do	.002-.003	Highway 3, 3.5 miles west of its junction with Highway 58 east of Fine	
Glacial cobble bank	do	.003	Highway 3, 2.7 miles west of its junction with Highway 58 east of Fine	
Red granite	Pyroxene gneiss [16]	do	Highway 3, 2.2 miles west of its junction with Highway 58 east of Fine	
Red granite and glacial	do ?	.003-.004 .003-.004	Highway 3, 2.0 miles west of its junction with Highway 58 east of Fine	
Red granite	do	.004	Highway 3, 0.5 mile west of its junction with Highway 58 east of Fine	
Glacial	Gabbro and derived amphibolite [18]	.002-.003 .001	Unnumbered road from Pyrites, 5.1-5.2 miles northeast of Hermon	
Red and gray gneiss	Garnet-mica gneiss and banded sericite injected by granite [17]	.001-.003	Unnumbered road, 6.3 miles south of Hermon	
Granite ?	Syenite, usually gneissic [17]	.002-.003	Highway 87, 5.5 miles southwest of the Plum Creek bridge in Russell	
Granite	do	.001-.003	Highway 87, 4.9 miles southwest of the above bridge	
Pink granite gneiss	Rusty gneiss, usually quartzose and pyritic; and syenite gneiss ? [17]	do	Highway 87, 3.9 miles southwest of the above bridge	

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and all sampled localities--Continued

Adirondacks - Northwest Quadrant, 44° and North, 74° 30' and West--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Red gneiss and carbonate rock	Granite gneiss, granosyenite gneiss, and rusty gneiss with occasional limestone bands [17]	0.003	Highway 87, 2.9 miles southwest of the Plum Creek bridge in Russell	Long outcrop
Gray gneiss	Rusty gneiss, usually quartzose with pyrite and limestone bands [17]	.002-.003	Highway 87, 0.7 mile southwest of the above bridge	
Red and green gneiss with calcite banding	do	.002-.004	Highway 87, 0.6 mile southwest of the above bridge	
Gray gneiss	do	do	Unnumbered road, 0.9 mile northeast of the Plum Creek Bridge in Russell	
Greenish gray gneiss	Rusty gneiss, usually quartzose with pyrite and limestone bands [17]	.002-.003	Unnumbered road, 1.4 miles northeast of the Plum Creek Bridge in Russell	
Red gneiss	Granite gneiss and granosyenite gneiss [17]	do	Unnumbered road, 2.8 miles northeast of the above bridge	
Red granite gneiss	do	.002-.004	Unnumbered road, 4.3 miles northeast of the above bridge	
Do	do	do	Unnumbered road, 5.1 miles northeast of the above bridge	
Gray gneiss	Garnet-mica gneiss and banded schists injected by granite [17]	.002-.003	Unnumbered road, 4.2 miles southwest of Pierremont	
Do	Garnet gneiss injected by amphibolite and granite [18]	do	Unnumbered road, 1.9 miles southwest of Pierremont	
Do	Gabbro diorite, mostly amphibolite injected by granite [18]	do	Unnumbered road, 0.9 mile southeast of Pierremont	

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and all sampled localities--Continued

Adirondacks - Northwest Quadrant, 44° and North, 74° 30' and West--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Gneiss	Porphyritic, gneissic, biotite granite, and mixed with amphibolites 19/	0.001-0.003	Unnumbered road, 6.0 miles northwest of its junction with Highway 87 at Edwards	
Crystalline	Amphibolites cut and soaked by porphrytic granite 19/	.002-.003	Unnumbered dirt road, 2.8-3.0 miles north of intersection with Highway 58 near Fowler	
Dump from Talc mine	Grenville siliceous limestones 19/	.006-.010	Unnumbered dirt road, 0.5-0.8 mile west of the bridge in Talcville	Talcville locality, sample @216 contained 0.050% eU, 0.043% U, and 0.02% ThO_2
Glacial	Amphibolites, injected by porphyritic granites 19/	.001-.004 .001	Unnumbered road, 1.4 miles north of the Oswegatchie River bridge north of Gouverneur	
Limestone	Massive pure crystalline limestone 19/	.003	Unnumbered road, 3.1 miles north of the above bridge	
Do	do	.002-.004	Unnumbered road, 3.8 miles north of the above bridge	
Biotite granite gneiss and amphibolite	Amphibolite injected by porphyritic granite 19/	.002-.008	Unnumbered road, 4.8 miles north of the above bridge	DePeyster locality, sample @215 contained 0.007% eU, and 0.002% U
Gneissoid granite	do	.003-.004	Unnumbered road, 6.0 miles south of DePeyster	
Schists	Various schists usually mica or pyroxene 19/	.002-.004	Unnumbered road, 4.5 miles south of DePeyster	
Limestone	Crystalline limestone with pegmatites quartz stringers, and silicates 20/	.001-.003	Unnumbered road, 6.8 miles southwest of DePeyster near Macomb	Macomb not shown on figure 1
Limestone	Quartzite, with thin layers of limestone 20/	do	Unnumbered road, 8.5 miles southwest of DePeyster	Locality is 1.0 miles northeast of Macomb

Table 1. -- Log of localities estimated to contain 0.003 percent equivalent uranium or more and all sampled localities--Continued

Adirondacks - Northwest Quadrant, 44° and North, 74° 30' and West--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Pegmatitic veinlets in quartzitic limestone	Biotite gneisses, white quartzite, and interbedded limestone and quartzite, local lenses of granite and pegmatite 20/	0.003	Highway 58, 4.2 miles south of Pope Mills	Glacial materials average 0.002% with local high of 0.003% eU. Pegmatite veinlets contain up to 0.015% eU, as estimated with beta-gamma tube
Gneiss	do	.002-.003	Highway 185, 1.3 miles southwest of Brassie Corners	
Do	Thin-banded rock with limestone laminae, quartz, and pyroxene granulite 20/	.004 .002-.003	Highway 185, 2.2 to 2.4 miles southeast of Brassie Corners	
Do	Diorite and quartz diorite with local intrusive sheets of granite and aplite 20/	.003	Highway 185, 0.2 mile northeast of Rossie	
Gneiss	Hermon-type granite 20/	.002-.003	Unnumbered road 8.5 miles northeast of its junction with Highway 26 west of Theresa	Near Chapel Corners, (not shown on figure 1)
Granite	Hermon-type porphyritic granite 20/	.003-.004	Unnumbered road, 0.2 mile south of the Indian River bridge near Rossie	
Glacial	Potsdam sandstone of Cambrian age 20/	.004 < .001	Unnumbered road, 2.6 miles south of its junction with the Oxbow-Wegatchie road	Local high, most of the glacial runs less than 0.001% eU
Granite	Probably the contact of Hermon granite and crystalline limestone with pegmatite 20/	do	Highway 26, 1.6 miles west of the junction with Highway 11 in Antwerp	
Gneissoid granite	Hermon-type prophyritic granite 20/	.000-.003	Unnumbered road to Balmat, 1.4 miles east of its junction with Highway 26 south of Antwerp	
Gneiss	Biotite garnet gneiss 20/	.001-.003 ± .001	Highway 11, 2.4-2.5 miles southwest of its junction with Highway 26 in Antwerp	Long outcrop

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and of sampled localities--Continued

Adirondacks - Northwest Quadrant, 44° and North, 74° 30' and West--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Glacial	Granite [20]	0.002-0.003 ± 0.001	Unnumbered road, 1.1-1.3 miles southwest of its junction with Highway 11 south of Philadelphia	
Gneiss and schist	Augite syenite gneiss	.001-.003	Highway 3, 0.6 mile east of the Bridge in Harrisville	
Glacial	Pyroxene syenite [21]	.001-.003 .001	Highway 3, 4.4-4.6 miles southwest of Harrisville	
Gneiss	Grenville gneiss [21]	.002-.003	Highway 3, about 3 miles east of Natural Bridge	
Gray granite	Grano-syenite gneiss [21]	.003	Unnumbered road, 4.2 miles north of Indian River	
Glacial	Grano-syenite gneiss [21]	.002-.003 .002	Unnumbered road, 3.3 miles north of Indian River	

Adirondacks, Southwest Quadrant, 44° and South, 74° 30' and West

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Dark gneissic granite	Equal-granular augite syenite [20]	0.002-0.003	5.2 miles south of Kinchinerville on an unnumbered road near Crystal Dale	
Glacial	Gneissoid rocks of various types, mostly Grenville metasediments much cut by syenite [22]	.002-.004	Unnumbered road east of Moose River 0.7 mile north of Lyons Falls	
Medium-course-grained red granite	do	.006	Unnumbered road east of Moose River, 1.4 miles north of Lyons Falls	Accessory minerals are hornblende, biotite, magnetite and fluorite; many quartz-feldspar pegmatitic veins; highest radioactivity measured with beta-gamma tube is about 0.010% eU and is associated with the finer-grained zones

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and all sampled localities--Continued

Adirondacks - Southwest Quadrant, 44° and South, 74° 30' and West--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Glacial	Adirondack gneiss 1/	0.002-0.003	Unnumbered dirt road to McKeever 6.9 miles east of Port Leyden	
Glacial	Adirondack gneiss 1/	.002-.004	Unnumbered dirt road to McKeever 12.2 to 12.3 miles east of Port Leyden	
Pink and gray gneiss	do	.002-.003	Highway 28, 2.5 miles south of McKeever	
Glacial	Trenton limestone 1/	.002-.003 ±.001	Highway 12 south of Boonville, at the junction with an unnumbered road to Hawkinsville	No outcrops, local high in crystalline glacial boulders
Gneiss	Adirondack gneiss 1/	.002-003 ±.001	Highway 28, 0.5, 1.7, 2.0, and 2.2 miles east of Old Forge	
Glacial	do	.003	Highway 28, 3.4 miles east of Old Forge	
Gneiss	do	do	Highway 28, 1.7 and 5.0 miles west of Inlet	
Glacial	Trenton limestone 23/	.002-.004 ±.001	Unnumbered road north of Hinckley Reservoir, 11.4 miles south of the bridge on Highway 28 near Forest Port	Local highs in glacial material
Do	Syenite in Grenville gneiss 23/	.003-.004	Unnumbered dirt road north of Hinckley Resevoir about 8 miles west of Wilmurt	Local highs
Glacial and Sand dunes	Adirondack gneiss 1/	.003	Highway 8, 2.9 miles west of Wilmurt	
Glacial	do	do	Highway 8, 1.8 miles east of Wilmurt	
Do	do	do	Unnumbered road about 2 miles south of Wilmurt	

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and all sampled localities--Continued

Adirondacks - Southwest Quadrant, 44° and South, 74° 30' and West-- Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Banded gray gneiss	Adirondacks gneiss [1]	0.003	Highway 29A, 5.9 miles east of Stratford	
Poorly banded, sheared and crushed gneiss	do	do	Highway 10, 2.1 miles north of the junction with Highway 29A from Stratford	
Granite	Granite [24]	.001-.004 ±.001	Highway 10, 1.4 miles south of the junction with Highway 8 near Pisceo	Fresh road cut, most of outcrop contained about 0.001% eU
Glacial	do	.001-.003	Junction of Highways 10 and 8 near Pisceo	
Red granite gneiss	do	.002-.004	Highway 8, 0.4 mile west of the junction with Highway 10 near Pisceo	
Glacial	do	do	Highway 8, 1.3 to 1.4 miles west of the junction with Highway 10 near Pisceo	

Adirondacks - Southeast Quadrant, 44° and South, 74° 30' and East

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Gneiss	Adirondack gneiss [1]	0.003	Highway 8, 3.5 miles east of Speculator	
Glacial	Grenville Series [25]	.001-.004 ±.002	Highway 8, 2.3 miles southeast of the Church in Bakers Mills	
Granite	Granite, a facies of the syenite granite series [25]	.002-.003	Highway 8, 0.8 mile southwest of Bakers Mills	Long outcrop
Glacial	Granite [26]	.003	Highway 8, 0.9 mile east of Johnsburg	

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and all sampled localities--Continued

Adirondacks - Southeast Quadrant, 44° and South, 74° 30' and East--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Gneiss	Granite [26]	0.002-0.003	Highway 8, 1.6 miles east of Johnsburg	
Gray gneiss	Grenville, syenite and granite, mixed gneisses [26]	.002-.003	Highway 28, 1.0 miles south of The Glen	Long outcrop and quarry
Glacial	do	.001-.003 .002	Highway 28, 2.0 miles north of The Glen	
Dark micaceous gneiss	do [27]	.002-.003	Highway 10, 2.1 miles south of Indian Lake	
Glacial	Glacial, gabbro, and Grenville limestone [28]	.001-.003 ±.001	Highway 28, 4.2 to 6.7 miles east of Indian Lake	
Dark gneissic rock	Syenite, granite, and garnetiferous gabbro [28]	.002-.003 ±.001	Highway 28, 2.3 to 4.2 miles east of Indian Lake	Scattered outcrops
Glacial	Grenville and syenite granite mixed gneisses [27]	.001-.004 .001	Highway 28, 0.4 mile east of Blue Mountain Lake	
Do	Grenville and glacial [27]	.001-.004 .002	Highway 28 in Blue Mountain Lake	
Do	Quartz syenite [27]	.003	Highway 28, 5.3 miles west of Blue Mountain Lake	
Do	Adirondack, gneiss [1]	.004 ±.001	Unnumbered road, 3 miles north of Bleecker	
Gneiss	do	.002-.003	Unnumbered road, 4.2 miles north of Bleecker	
Glacial	do	.002-.003 .001	Unnumbered road to Bleecker 3.7 miles northwest of the bridge at Northville	

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and all sampled localities--Continued

Adirondacks - Southeast Quadrant, 44° and South, 74° 30' and East--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Glacial	Adirondack, gneiss [1]	0.002-0.003 0.001	Unnumbered road to Bleecker, 10.1 miles northwest of the bridge at Northville	
Gneiss	do	.002-.004	Highway 30, 5.0 and 9.8 miles north of Northville	
Glacial	Cambrian Potsdam sandstone [29]	.002-.003 .001	Unnumbered road to Lake Luzerne, 5.1 miles south of the junction with Highway 30 in Northville (At Edinburg)	
Do	Adirondack, gneiss [1]	.004	Unnumbered road, 11.1 miles east of the above junction	
Gneiss	do	.002-.003	Unnumbered road, 11.3 to 11.5 miles east of the above junction in Northville	Long outcrop
Do	do	.003	Unnumbered road, 6.3 miles west of the Conklingville dam	
Schist and gneiss	Grenville and granite, intimately mixed [30]	.002-.003	Unnumbered road to Lake Luzerne, 0.5 of a mile east of Conklingville dam	Long outcrop
Glacial	do	.003-.004 .002	Unnumbered road to Lake Luzerne, 3.1 to 3.2 miles east of Conklingville dam	Frequent anomolies
Do	Grenville, metagabbro and granite, mixed [30]	.002-.003	Near the junction of Highway 418 and 9K at Lake Luzerne	
Gneiss	Granite and glacial [30]	.002-.003	Highway 9K, 4.8 and 5.0 miles east of Lake Luzerne	
Glacial	Granite? [30]	.003-.004	Highway 9K, 7.4 to 7.5 miles east of Lake Luzerne	Glacial boulder
Granite gneiss	Granite and glacial [30]	.002-.003	Highway 418, 4.1 to 4.2 miles south of Warrensburg	Glacial bank at this locality contained about 0.004% eU

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and all sampled localities--Continued

Adirondacks - Southeast Quadrant, 44° and South, 74° 30' and East--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Granite	Medium-grained granite and quartz syenite [30]	0.001-0.003 .001	Highway 418, 5.1 to 6.1 miles south of Warrensburg	
Glacial and granite	Granite, quartz syenite and glacial [30]	.002-.003 .001	Highway 418, 7.1 to 8.1 miles south of Warrensburg	
Glacial	Medium-grained granite [30]	.001-.004 .001	Highway 418, 2.8 - 2.9 miles east of Stony Creek	
Granite gneiss	do	do	Highway 418, 2.5 miles east of Stony Creek	Long outcrop
Glacial	do	.001-.003 .001-.002	Highway 418, 3.9 miles south of Stony Creek	
Granite	Syenite [31]	.002-.003	Highway 9, 1.4 miles north of the junction with 9N in Lake George	Adjacent to gabbro dike [31]
Granite and basic rocks	do	.002-.004	Highway 9, 2.0 to 3.0 north of the junction with Highway 9N in Lake George	Long outcrop of crystalline rocks
Basic intrusions in gray granite	Syenite and gabbro [31]	.006	Highway 9, 3.2 miles from the above junction in Lake George	Lake George locality High cliff, samples @208 and 209, basic pegmatite. Sample @208 contained 0.024% eU, 0.013% U, and 0.03% ThO_2 %
Dark gneiss	Syenite and granite mixed [31]	.003-.004	Highway 9L, 4.4 and 5.0 miles east of the junction with Highway 9N in Lake George	
Gneiss	Gneiss [32]	.003	Highway 4, 1.8 to 1.9 miles northeast of Fort Ann	

Table 1.--Log of localities estimated to contain 0.00[illegible] percent equivalent uranium or more and of sampled localities--Continued

Adirondacks - Southeast Quadrant, 44° and South, 74° 30' and East--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Glacial	Gneiss [33]	0.002-0.003	Highway 4, 0.3 to 0.4 mile south of the junction with Highway 40 in Comstock	
Glacial	Gneiss [33]	.002-.004	Unnumbered dirt road, 10 miles northwest from Bolton Landing	1 mile south of Schroon River bridge near River Bank (not shown on map)
Gneiss	Grenville gneisses [26]	.003	Unnumbered road (9M?) to Pottersville, 1.9 miles northwest of its junction with Highway 8	
Gneiss and pegmatite	Gneiss [33]	.006-.009	Highway 8, 6.2 miles southwest of Graphite	Graphite locality, pegmatite sample numbers @206 and 207, contained up to 0.039% eU, 0.003% U and 0.18% ThO_2
Gneissic rocks	Grenville limestone, quartzite and schist [31]	.003	Highway 9N, 0.6 of a mile north of the junction with Highway 8 in Hague	
Light-colored granite gneiss	Syenite [31]	.002-.004	Highway 22, 1.5 miles south of the junction with Highway 347 in Ticonderoga	
Light gray granite gneiss	Grenville garnet gneiss and other gneisses [31]	.003	Highway 22, 5.6 miles south of the junction with Highway 347 in Ticonderoga	
Gray and pink gneiss	do	.002-.004	Highway 22, 8.2 miles south of the junction with Highway 347 in Ticonderoga	
Limestone	Grenville Limestone [31]	.002-.003 ±.001	Highway 73, 5.6 miles east of the junction with Highway 9 near Severance	

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and all sampled localities--Continued

Adirondacks - Southeast Quadrant, 44° and South, 74° 30' and East--Continued

Observed rock type	Mapped roack type and reference	Range and ~~average~~ estimated equivalent uranium (percent)	Location	Remarks
Limestone	Grenville Limestone 34/	0.002-0.004	Highway 73, 6.0 and 6.8 miles east of the junction with Highway 9 near Severance	
Gneissic rocks	Granite 34/	$\overline{.004}$	Highway 73, 4.8 miles west of Chilson	Long outcrop
Dark gneissic rocks	do	.002-.003	Highway 73, 4.3 miles west of Chilson	
Gneissic rocks	do	.002-.004	Highway 73, 3.5 miles west of Chilson	
Marble and glacial	Grenville limestone	.003-.004	Highway 73, 1.3 miles west of Chilson	Glacial material averages 0.001-0.002% contains maximum of 0.005% eU
Gneiss, glacial	Hornblende gneiss 34/	$\overline{.003}$	Highway 73 at Chilson	
Gray gneiss	Garnet gneiss and banded gneiss 31/	.002-.004	Highway 73, 1.3 miles west of the junction with Highway 8 near Ticonderoga	Long outcrop

Adirondacks - Northeast Quadrant, 44° and North, 74° 30' and East

Observed rock type	Mapped rock type and reference	Range and ~~average~~ estimated equivalent uranium (percent)	Location	Remarks
Tailings dump	Syenite 35/	$\overline{0.004}$	Mine dump at Republic Steel Mine north of Barton Hill	

Table 1.--Lo[illegible] o[illegible] loca[illegible] e[illegible] stimated [illegible] contain 0.[illegible] [illegible]ercent [illegible]quivalent uranium or more and [illegible] [illegible] rock [illegible]--Continued

Adirondacks - northeast Quadrant, 44° [illegible] north, 74° 30' and east--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Glacial	Augite syenite [1]	0.001	Highways 10 and 365, 6.4 miles south of the junction with Highway 3 in Tupper Lake	
Granite	do	.004	Highways 10 and 365, 8.7 miles south of junction with Highway 3 in Tupper Lake	Locality is 0.3 of a mile north of junction with Highway 421 at south end of Tupper Lake
Gray granite gneiss with small pegmatite bodies	Adirondack gneiss [1]	.002-.005	Highways 10 and 365, 8.8 miles north of the junction with Highway 28 in Long Lake	Long outcrop
Gneiss	do	.004	Highways 10 and 365, 5.9 miles north of the Highway 28 junction in Long Lake	
Gneiss and glacial	Granite, a gneissoid, very quartzose phase of the syenite [27]	.003-.004 .002	Highway 28N, about 2.1 miles east of the junction of Highway 10/365 in Long Lake	
Gneiss	do	.003	Highway 28N, 4.0 miles east of Long Lake	
Glacial	Syenite [36]	.001-.003	Highway 86A, 7.8 miles west of Keene	
Gneiss	Granite and related types [35]	.003	Highway 8, 2.4 miles south of the traffic circle in Port Henry. See fig. 5	
Limestone and hornblende schist	Grenville schists and gneisses [35]	.001-.003	Highway 22, 0.7 of a mile north of the traffic circle in Port Henry	Long outcrop
Glacial	Grenville schists, gneiss, and limestone [35]	.003-.004	Highway 22, 2.1 miles north of the traffic circle in Port Henry	

Table 1.--Log of localities estimated to contain 0.003 percent equivalent uranium or more and a sampled localities--Continued

Adirondacks - Northeast Quadrant, 44° and North, 74° 30' and East--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Gneiss	Grenville limestone 35/	0.002-0.003	Highway 22, 2.4 miles north of the traffic circle in Port Henry	
Dark limestone	do	.003-.004	Highway 22, 3.2 miles north of the traffic circle in Port Henry	
Slag	Syenite 35/		Unnumbered road 1 mile west of Moriah Center at Colburn Furnace	Moriah Center locality, Sample of iron slag, @210 contained 0.030% eU, 0.007% U, 0.11% ThO_2
Glacial	do	.002-.003	Moriah Center road intersection	Probably fill material from mine dumps
Glacial or tailings	do	.002-.006	Unnumbered road between Mineville and Witherbee	Probably all mine dump materials used in road fills
Glacial	Glacial 37/	.001-.003	Highway 86A, continuous for a few miles south of its junction with Highway 86A in Lake Placid	Bedrock to the immediate north and east is mainly syenite and Grenville gneiss which form a pocket in the anorthosite
Gneiss	Granite, a very quartzose phase of the syenite 37/	.004	Highway 86, 6.8 miles north of its junction with Highway 86A in Lake Placid	Large outcrop
Glacial	About contact of Marcy and White Face anorthosites 37/	.003	Highway 9N, 1.0 mile north of the bridge over the East Branch of the Ausable River in Upper Jay	No outcrop
Glacial and fill	Cambrian Potsdam sandstone 38/	.003-.004	Highway 9, 0.5 of a mile northeast of the bridge in Ausable Chasm	
Glacial	Lower Ordovician Beekmantown sediments 38/	.001-.004 ±.001	Highway 3/365, about 2 miles west of the junction with Highway 22 in Plattsburg	

Table 1.--Log of localities estimated to contain 0.01 percent equivalent uranium or more and of localities sampled for analyses--Continued

Adirondacks - Northeast Quadrant, 44° and North, 74° 30' and East--Continued

Observed rock type	Mapped rock type and reference	Range and average estimated equivalent uranium (percent)	Location	Remarks
Gneiss	Inferred as Lyon Mountain granite 39/	0.004-0.005 0.002	Highway 374, 0.7 and 1.6 miles west of Dannemora	Long outcrop
Glacial	Hornblende granite 40/	.003	Unnumbered highway, about 4.8 miles south of Clayburg	
Glacial	Metagabbro and pyroxene-hornblende quartz syenite and glacial 41/	.004	Highway 10, about 3.7 to 8.0 miles north of the junction with Highway 99 in Duane	
Amphibolite, gneiss, and pegmatite	Metagabbro and amphibolite 41/	.006-.008	Highway 10, 8 miles north of Duane	Duane locality Pegmatite samples @211 and 212 contained up to 0.14% eU, 0.005% U, and 0.62% ThO_2
Glacial	do	.004	Highway 10, 10.9 miles north of Duane	
Do	Mostly glacial, some St. Regis granite and various quartz syenites 41/	.003-.004	Highway 10, from a point 5.6 miles south of Duane and thence northeastward on Highway 72 to about 1.0 miles west of St. Regis Falls	Outcrops along this traverse contained about 0.002% eU
Do	Gneiss 42/	.003	Unnumbered road to Dickinson Center, 2.0 miles north of St. Regis Falls	
Do	Heavy ground moraine 14/	.002-.003 .001-	Highway 11B between Hopkintown and Potsdam	Bedrock is probably Potsdam sandstone

REFERENCES CITED IN TABLE 1

1/ Merrill, F. J. H., Geologic map of New York: New York State University, 1901.

2/ Ingham, A. I., The zinc and lead deposits of Shawangunk Mountain, New York: Econ. Geol. vol. 35, no. 6, p. 752, 1940.

3/ Holzwasser, Florrie, Geology of Newburgh and vicinity: New York State Mus. Bull. 270, map, 1926.

4/ Gorden, C. E., Geology of the Poughkeepsie Quadrangle: New York State Mus. Bull. 148, map, 1911.

5/ Balk, Robert, Structural and petrologic studies in Dutchess County, New York, Pt. I: Geol. Soc. America Bull., vol. 47, p. 47, pl. 20, 1936.

6/ Dale, T. N., The limebelt of Massachusetts and parts of eastern New York and western Connecticut: U. S. Geol. Survey Bull. 744, Pl. IV, Pl. IX, 1923.

7/ _____, Geology of the Hudson Valley between the Hoosic and the Kinderhook: U. S. Geol. Survey Bull. 242, map opp. p. 12 1904.

8/ Goldring, Winifred, Geology of the Coxsackie Quadrangle: New York State Mus. Bull. 332, map, 1943.

9/ Dale, T. N., The Rensselaer grit Plateau in New York: U. S. Geol. Survey Ann. Rept. no. 13, pt. 2, map opp. p. 297, 1893.

10/ Ruedemann, Rudolf, Geology of the Capital District: New York State Mus. Bull. 285, p. 125, map, 1930.

11/ Cushing, H. P., and Ruedemann, Rudolf, Geology of Saratoga Springs and vicinity: New York State Mus. Bull. no. 169, map, p. 49, 1914.

12/ Dale, T. N., The slate belt of eastern New York and western Vermont: U. S. Geol. Survey 19th Ann. Rept., pt. 3, map opp. p. 176, 1899.

13/ Larrabee, D. M., The Colored slates of Vermont and New York: Eng. and Mining Jour., vol. 140, p. 49, 1939.

14/ Reed, J. C., Geology of the Potsdam Quadrangle: New York State Mus. Bull. 297, map, 1934.

15/ Buddington, A. F., and Leonard, B. F., Preliminary report on the eastern part of the northwestern Adirondack Magnetite district, New York: U. S. Geol. Survey Strategic Minerals Invest. Fig. 1, Preliminary map, 1944.

16/ Dale, N. C., Geology of the Oswegatchie Quadrangle: New York State Mus. Bull. 302, map, 1935.

17/ _____, Preliminary Report on the geology of the Russell Quadrangle: New York State Mus. Cir. 15, map, 1934.

18/ Martin, J. C., The pre-Cambrian rocks of the Canton Quadrangle: New York State Mus. Bull. 185, map, 1916.

19/ Cushing, H. P., and Newland, D. H., Geology of the Gouverneur Quadrangle: New York State Mus. Bull. 259, map, 1925.

20/ Buddington, A. F., Geology and mineral resources of the Hammond Antwerp, and Lowville Quadrangles: New York State Mus. Bull. 296, map, 1934.

21/ Smyth, C. H., Jr., and Buddington, A. F., Geology of the Lake Bonaparte Quadrangle: New York State Mus. Bull. 269, map, 1926.

22/ Miller, W. J., Geology of the Port Leyden Quadrangle, Lewis County, New York: New York State Mus. Bull. 135, map, 1910.

23/ _____, Geology of the Remson Quadrangle: New York State Mus. Bull. 126, map, 1909.

24/ Cannon, R. S., Geology of the Piseco Lake Quadrangle: New York State Mus. Bull. 312, map, 1937.

25/ Krieger, M. H., Geology of the Thirteenth Lake Quadrangle, New York: New York State Mus. Bull. 308, map, 1937.

26/ Miller, W. J., Geology of North Creek Quadrangle, Warren County: New York State Mus. Bull. 170, map, 1914.

27/ _____, Geology of the Blue Mountain, New York Quadrangle: New York State Mus. Bull. 192, map, 1917.

28/ Balk, Robert, Geology of the New Comb Quadrangle: New York State Mus. Bull. 290, map, 1932.

29/ Miller, W. J., Geology of the Broadalbin Quadrangle, Fulton and Saratoga Counties, New York: New York State Mus. Bull. 153, map, 1911.

30/ Miller, W. J., Geology of the Luzerne Quadrangle: New York State Mus. Bull. 245, 246, map, 1921.

31/ Newland, D. H., and Vaughan, Henry, Guide to the Geology of the Lake George Region: New York State Mus. Handbook 19, map, 1942.

32/ Kemp, J. F., et al., Preliminary Report on the geology of Hamilton, Warren, and Washington Counties: New York State Mus. Rept. 52, 2, pl. 4, p. 163, 1898.

33/ Kemp, J. F., and Newland, D. H., Preliminary report on the geology of Washington, Warren, and parts of Essex and Hamilton Counties: New York State Mus. 41st Ann. Rept., vol. 2, 541-542, pl. 6, pl. 11, 1897.

34/ Ogilvie, I. H., The geology of the Paradox Lake Quadrangle, New York: New York State Mus. Bull. 96, map, 1905.

35/ Kemp, J. F., and Ruedemann, Rudolf, Geology of the Elizabethtown and Port Henry Quadrangles: New York State Mus. Bull. 138, map, 1910.

36/ Kemp, J. F., Geology of the Mount Marcy Quadrangle, Essex County, New York: New York State Mus. Bull. 229-330, map, 1921.

37/ Miller, W. J., Geology of the Lake Placid Quadrangle: New York State Mus. Bull. 211, 212, map, 1918.

38/ Hudson, G. H., The fault systems of the northern Champlain Valley, New York: New York State Mus. Bull. 286, fig. 1, 1931.

39/ Miller, W. J., Geology of the Lyon Mountain Quadrangle: New York State Mus. Bull. 271, map, 1926.

40/ Buddington, A. F., Adirondack Igneous Rocks and their metamorphism: Geol. Soc. America, Mem. 7, pl. 21, 1939.

41/ Buddington, A. F., Geology of the Santa Clara Quadrangle, New York: New York State Mus. Bull. 309, map, 1937.

42/ Cushing, H. P., Preliminary Report on the geology of Franklin County: New York State Mus. 52nd Ann. Rept. vol. 2, map, 1900.

Table 2.--Analyses of samples from the Hudson Valley and the Adirondack Mountains

Locality and sample number Lot 16	Sampled Material	eU 1/ (percent)	U 2/ (percent)	ThO_2 2/ (percent)	Mineralogy 4/ Major	Minor	Trace
MEDWAY @200	Bakeoven	0.002	0.001				
RAVENA @201	Esopus shale	0.002	0.001				
CHATHAM @202	Slate	0.002	0.001				
STUYVESANT @203	Deepkill shale	0.002	0.001				
BALLSTON SPA @204	Canajoharie shale	0.001	0.001				
FAIRHAVEN @205	Slate	0.002	0.001				
GRAPHITE @206	Pegmatite	0.016	0.002	0.05	Albite Orthoclase	Biotite	Pyrite, beryl, weakly radioactive apatite and zircon
GRAPHITE @207	Chloritized pegmatite	0.039	0.003	0.15	Albite Quartz Muscovite	Penninite Antigorite Biotite Calcite Sericite	Beryl
LAKE GEORGE @208	Pegmatite	0.024	0.013	0.03	Perthite Quartz Calcite	Chlorite	Rutile Zircon (weakly radioactive), Ilmenite (very radioactive)
LAKE GEORGE @209	Granite	0.004	0.002	0.001 0.002 3/	Quartz Microcline-perthite	Biotite Penninite	Zircon (weakly radioactive) Beryl
MORIAH CENTER @210	Iron slag	0.030	0.007	0.11	Calcium 5/ Magnesium Aluminum Titanium Iron Lanthanum (1-10%)	Sodium 5/ Vanadium Manganese Boron Cesium (1-10%) Yttrium (1-10%)	Zirconium 5/ Cadmium Thorium (0.1-1%)

Table 2.--Analyses of samples from the Hudson Valley and the Adirondack Mountains

Locality and sample number Lot 16	Sampled Material	eU 1/ (percent)	U. 2/ (percent)	ThO_2 2/ (percent)	Mineralogy 4/ Major	Minor	Trace
DUANE @211	Pegmatite	0.140	0.005	0.62	Quartz Anti-perthite	Biotite Chlorite Hematite Clinozoisite Magnetite	Zenotime (weakly radioactive) Zircon (do) Pyrite (do)
DUANE @212	Pegmatite	0.100	0.004	0.52	Albite Quartz	Biotite Chlorite Hematite	Magnetite Pyrite (weakly radioactive)
BENSON MINES @213	Granite	0.006	0.003		Quartz Microcline-perthite	Muscovite Chlorite Biotite	Hematite (weakly radioactive)
FINE A @214	Granite	0.005	0.002		Quartz Microcline-perthite	Chlorite	
DEPEYSTER @215	Granite-gneiss	0.007	0.002		Albite Microcline	Biotite Quartz	Zircon (weakly radioactive)
TALCVILLE @216	Pegmatite	0.050	0.043	0.02	Albite Microcline Quartz	Chlorite Sericite Beryl	Allanite (weakly radioactive) Uraninite (very radioactive)
FINE B @217	Granite	0.006	0.002	0.004	Quartz Microcline-perthite	Chlorite Flourite Calcite	Beryl Sphene (weakly radioactive) Hematite

1/ Percent equivalent uranium by J. J. Warr, Jr.
2/ Percent uranium and thoria by H. Levine except where noted
3/ Percent thoria by H. Mela
4/ Mineral identifications by C. E. Boudreau
5/ Spectrographic analysis of Sample @210 by J. N. Stich