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Preliminary report, geology of Kegashka area, Duplessis county

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GOUVERNEMENT DU QUÉBEC
DEPARTMENT OF NATURAL RESOURCES
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GEOLOGICAL EXPLORATION SERVICE

GEOLOGY

of

KEGASHKA AREA

DUPLESSIS COUNTY

PRELIMINARY REPORT

by

Jean-Pierre Bassaget

QUÉBEC
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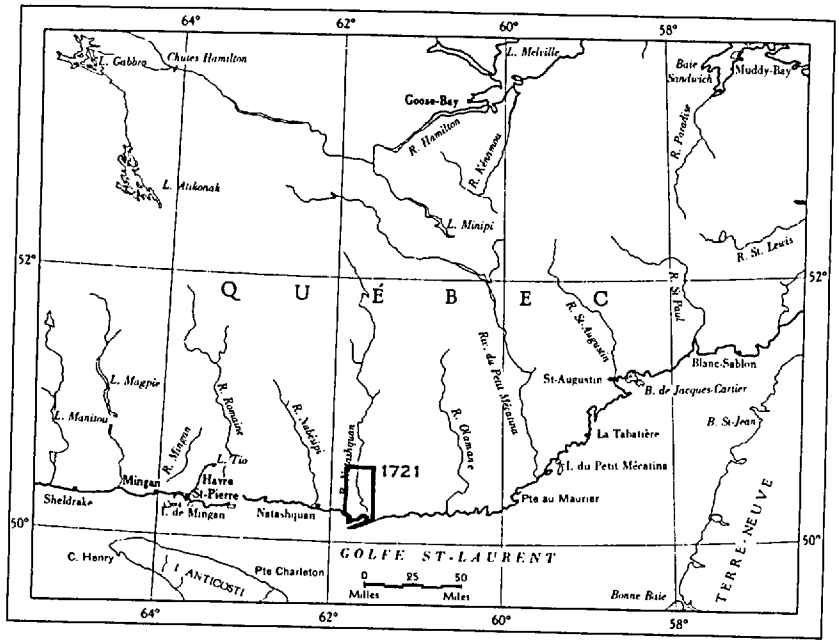

QUÉBEC 1970

P.R.-597

INTRODUCTION

The Kégashka area, mapped during the summer of 1969, lies between longitudes 61°30' and 61°55' and between latitude 50°30' and the north shore of the St. Lawrence. It includes the small North Shore port of Kégashka, as well as the virtially abandoned hamlet of Musquaro.

The area is on the east side of the Natashquan area, mappid by the writer in 1968. About 400 square miles in extent, it is in Duplessis county, and includes all or part of the following townships: Kégashka, Musquaro, Bissot, 881, 981, 982, 983, 1081, 1082 and 1083.

The entire area was accessible by canoe and hydroplane from two base camps established successively at Kégashka and Grand Priant lakes. The hydroplane base is at Havre-Saint-Pierre, about 105 miles from the center of the area.

Topography

The area is relatively flat, with a maximum difference in elevation of only 600 feet. The swampy terrain

in the southwest covers a sandy terrace which forms the eastern edge of the former delta of Natashquan river. To the north, the topography varies with the underlying bedrock.

The region consists mainly of a plateau of gneissic or massive granitic rocks, 400 to 500 feet in elevation, which has been cleared of loose material and altered rock by recent glaciation and on which fresh rock surfaces have been exposed. This plateau has been cut into deeply by the drainage system, which has been rejuvenated by regional postglacial uplift. The numerous valleys and ravines follow joints, faults or, where present, the gneissosity and thus emphasize the structural pattern. Some of the ravines apparently follow the trend of metagabbroic dikes. Except in the low-lying areas, this granitic plateau is barren of any vegetation, thus facilitating its study by aerial photographs.

Long, narrow zones of metasediments (quartzite, arkosic rocks, biotite schist, etc.), relatively more eroded than the other rocks, form sinuous depressions marked by a denser cover of vegetation.

The gabbros form topographic features which can be easily traced on aerial photographs. They occur as elongated and relatively prominent hills, bordered by cliffs. These hills are generally well forested, particularly with spruce.

Hydrography

Three major rivers flow from north to south through the area, emptying into the St. Lawrence. They are, from west to east, the Kégashka, Musquaro and Musquanus. The Kégashka drains Kégashka lake, and Musquaro river, the largest of the three, drains Musquaro lake, the southern end of which extends into the area. Musquanus river, winding and strewn with several small lakes, drains the waters of Musquanus lake.

GENERAL GEOLOGY

The rocks of the area are all Precambrian in age, covered in places by unconsolidated Pleistocene deposits.

Granitic rocks are predominant, with some gray gneiss. The granitic rocks include massive or submassive granite, granitic gneiss, augen granitic gneiss and banded gneiss. On a

large scale, they form the basement complex for the metasedimentary rocks of the Wakeham Group, but they may have been rejuvenated locally by remobilization, which explains the presence of migmatites and granitic rocks intercalated within the Wakeham metasediments. This later remobilization of the granitic rocks must also have played a part in the formation of the hybrid granitic rocks which underlie a large area to the west and northwest of Kégashka lake and which seem to have formed from the widespread granitization of the metasedimentary rocks.

The gray gneisses, the oldest of the metasedimentary rocks, are made up of various facies, ranging from light to dark gray, and even pink, and characterized mainly by a high content of ferromagnesian minerals (averaging about 10%). These gray gneisses are strongly migmatized in places, with intercalated bands of amphibolite and later granite.

Overlying the gray gneiss, in large synclinal zones, is an assemblage of younger metasedimentary rocks. They are not as severely migmatized, and some of the sedimentary characteristics have been preserved. This assemblage corresponds to the Wakeham Group, as described farther to the west, north of Baie-Johan-Beetz. It is made up mainly of detrital rocks, ranging from a virtually pure metaquartzite to meta-arkose and meta-arkose to biotite or hornblende paragneiss. Apparently associated with these rocks are occurrences of muscovite-sillimanite gneiss and some biotite or garnet gneiss. The different facies of this group locally contain nodules of quartz and sillimanite.

The area includes metagabbros and a porphyritic gneissic granite, all clearly intrusive in the area. The porphyritic granite cuts the granitic basement rocks and the gray gneiss. It has been affected by metamorphism and secondary folding. The gabbros have been essentially metamorphosed to amphibolite; in many places, the contact with the enclosing rocks is marked by white muscovite-bearing pegmatite. The mode of intrusion of the metagabbros varies with the host rocks; they form sills in the Wakeham Group and dikes in the granitic basement rocks. There appear to have been several periods of intrusion of these gabbroic rocks.

Table of Formations

CENOZOIC	Erratic boulders Delta sand Alluvial deposits	
PRECAMBRIAN	Intrusive Rocks	Porphyritic gneissic granite Metagabbros; amphibolites; white pegmatite
	Wakeham Group	Metaquartzite Feldspathic metaquartzite Meta-arkose Biotite or hornblende paragneiss Biotite-garnet paragneiss Muscovite-sillimanite mica schist
	Gray Gneiss Group	Medium-grained gray gneiss Coarse-grained gray gneiss Banded gray gneiss
	Granitic Basement Rocks	Hybrid granitic gneiss Pink pegmatites Banded granitic gneiss Augen granitic gneiss Granitic gneiss Massive granites

Precambrian

Granitic Basement Rocks

The granitic basement rocks cover three quarters of the area. The most common rock types, the granitic gneiss and massive or submassive granite, are similar in composition and are described together. Associated with these rocks is an augen granitic gneiss in bands, of limited extent, which vaguely follow the structure. Minor banded granitic gneiss of migmatitic origin also makes up part of the basement complex. All these rocks are impregnated with pink feldspathic pegmatite. Exposures to the west and northwest of Kégashka lake, over a wide area extending beyond the western boundary of the map-area, are made up of hybrid rocks of granitic composition which appear to grade into the basement rocks and are described with them.

Granitic gneiss and massive granite -- These rocks are described together, as they are very difficult to differentiate in the field. Both are pink and medium to coarse grained; a very coarse grained facies has been noted in places, with the grain size measured in centimeters. The rocks are made up of quartz, plagioclase, potash feldspar, 1-2% biotite and rare hornblende. An orientation of the ferromagnesian minerals, and in places the quartz, is commonly their only distinguishing feature.

The contact between the massive granite and the granitic gneiss is well exposed locally. A few massifs or bands, parallel to the regional structure, can be traced through intermittent exposures. The texture and the more leucocratic composition of these rocks set them apart from the enclosing massive or gneissic granitic rocks.

Although, on a large scale, the granitic gneiss and massive granites lie beneath the metasedimentary rocks, a few granitic intrusives, intercalated within the metasedimentaries and following the regional structure, have been observed locally. These intrusives are in apparent continuity with the granitic basement rocks and cannot be differentiated from them. They are probably due to remobilization of the basement rocks during periods of metamorphism.

Augen granitic gneiss -- As seen in the field, the augen granitic gneiss grades progressively into the other granitic rocks and it is, at times, difficult to differentiate the two.

The rock is pink on both the fresh and weathered surface. It is made up of quartz, potash feldspar, plagioclase, biotite (about 5-10%) and rare hornblende, with opaque and accessory minerals. The "augen" consist mainly of potash feldspar, in many places in the form of a single crystal, and small grains of quartz. They are outlined by thin undulating bands of ferromagnesian minerals, mainly biotite.

Certain facies of intrusive porphyritic granite, to be described later, are similar to these augen granitic gneisses and may have a common origin. The gneisses are older, however, as they are much more severely deformed.

Banded granitic gneiss -- Exposures of banded granitic gneiss are confined to the south part of the area. Of the two principal facies, the least abundant is made up entirely of alternating granitic bands distinguished only by variations in mineral percentages. The more typical and abundant facies is made up of regular bands of granitic material, from ½ inch to several feet thick, alternating with bands of gray gneiss. The latter are similar in appearance to the gray gneiss which outcrops elsewhere in the area. The banded gneiss grades progressively into granitic gneiss or into the granitic basement rocks and apparently represents a highly migmatized facies of the gray gneiss.

Pegmatite -- Pink feldspathic pegmatite cuts all the granitic basement rocks. These pegmatite intrusions are, in places, parallel to the regional foliation, but usually occur as irregular injections and may even grade into the enclosing rocks.

Hybrid granitic rocks -- This term was used to describe the rocks of several granitic facies, but of similar appearance, which outcrop mainly over a large area to the west and northwest of Kégashka lake. They were also noted locally between the basement rocks and the metasediments.

These gneissic or massive rocks are characteristically white-weathering, with a whitish, yellowish or pale pink fresh surface. Two generations of crystal growth can be seen in the most typical facies. One forms a fine-grained matrix of feldspar, quartz, biotite and muscovite. The other is

represented by relatively large laths of quartz, made up of numerous crystals, and by large phenocrysts, measured in centimeters, of pink potash feldspar. These phenocrysts are usually crushed and deformed, but, in places, appear to be more or less automorphic. The finely crystalline portion of the rock, owing to its color and mineral composition, particularly the presence of muscovite, is similar in appearance to some of the detrital metasedimentary rocks of the area.

Other facies can also be distinguished from the more common basement rocks. Locally, some resemble a pink quartz-rich granite. Elsewhere, they have a bedded appearance and contain pure quartzite and some arkosic beds.

These hybrid granitic rocks, therefore, seem to bear a close relationship to the metasedimentary rocks of the Wakeham Group.

Gray Gneiss

Gray gneiss covers about one fifth of the area. It is exposed mainly in the same synclinal zones as the rocks of the Wakeham Group, but is more widespread.

This gneiss is characterized by a relatively high percentage of biotite, and, in places, hornblende, averaging about 10%. Its color is not everywhere typical, since the presence of potash feldspar may give the rock a pinkish tinge. It also contains quartz, abundant plagioclase and rare garnet. These gray gneisses commonly include intercalations of amphibolite of undetermined origin, as well as masses of granitic rock from a few to several feet thick.

The gray gneiss is heterogeneous at any scale of mapping. It appears to consist of three principal facies, although they could not be delineated on the map because of their extremely irregular distribution. The three facies are described below.

1 -- Medium-grained gray gneiss -- This facies is quite widespread, covering a large area between Kégashka river and the village of Kégashka. It is a medium-grained gneiss, in places almost fine grained, and regularly contains about 10% disseminated biotite with a prominent orientation. It locally contains potash feldspar, which gives the rock an ambiguous pink color.

2 -- Coarse-grained gray gneiss -- The grain size of this facies ranges from 2 to 5 mm. and the percentage of ferromagnesian minerals, from 10 to 20%. In addition to biotite, hornblende is common and may impart a lineation to the rock. Some varieties of this facies are almost massive in texture.

3 -- Banded gray gneiss -- The regularly alternating bands of this rock, measured in centimeters, are clear, almost white and dark gray, depending on the content of ferromagnesian minerals. This facies is not too well represented in the area and has a limited lateral extent.

Wakeham Group

The metasedimentary rocks of the Wakeham Group are essentially of detrital origin. The different facies are quite variable from outcrop to outcrop, even over a small surface area. Mineral percentages vary considerably, which fact suggests rapid lateral variation in the original conditions of sedimentation.

Nevertheless, three facies can be distinguished and mapped in the field, -namely,

pure or very slightly feldspathic metaquartzite;

meta-arkose and feldspathic metaquartzite;

biotite or hornblende paragneiss containing more than 20% ferromagnesian minerals.

Associated with these rocks are numerous occurrences of muscovite-sillimanite mica schist. In addition, a nodular appearance, occurring locally, is characteristic of all the rocks of the Wakeham Group.

Metaquartzite -- These rocks are white, clear gray or translucent. They contain thin interbeds of muscovite and, in places, biotite. Exposures are confined mainly to the area immediately to the west of Kégashka lake, where they occupy a narrow synclinorium which, pinching and swelling, traces a sinuous path from north to south-east of the lake.

Meta-arkose and feldspathic metaquartzite -- These gray or pink rocks are made up of abundant plagioclase and potash feldspar. They also contain a small amount of biotite and muscovite and,

in places, epidote. They are either bedded, with thin beds of slightly differing composition, or massive. These rocks are the most common representatives of the Wakeham Group in the area.

Biotite or hornblende paragneiss -- These rocks are not too common within the area, and it is difficult to define their relationship with the other rocks of the Wakeham Group.

Most of these paragneisses contain only biotite; other minerals, in varying proportions, include quartz and feldspar. Alternating light and dark centimeter-thick beds, of differing mineralogy, give the rocks a banded appearance. The biotite-rich gneisses are schistose; some beds are quartzitic. Locally, intercalations of similarly bedded hornblende paragneiss, with or without biotite, have been noted. Rare occurrences of large garnet crystals were observed in the biotite paragneiss.

Muscovite-sillimanite mica schist -- These rocks outcrop mainly to the north of Kégashka lake. They form black rounded hills, which can be seen for a considerable distance. The black- and rusty-weathered surface is typical. On a fresh surface, the rock has a variegated appearance, with rusty, yellow or white coloration. These mica schists have a fine-grained quartzofeldspathic groundmass, with abundant large flakes of muscovite, as well as biotite and sillimanite. The sillimanite cannot be seen in all of the hand specimens.

Nodular gneiss -- The metasedimentary rocks of the Wakeham Group, especially those which are rich in biotite, in places contain variable concentrations of flat nodules, usually distributed heterogeneously through the rock. These nodules are made up of quartz and fibrous sillimanite and are surrounded by muscovite.

Intrusive Rocks

Porphyritic gneissic granite -- This granite forms a large and well-outlined ovoid-shaped massif to the north of Grand Priant lake and a small massif to the southwest of Kégashka lake. On a large scale, it intersects the granitic gneiss and massive granites. It would appear to cut the gray gneiss as well, for inclusions of gray gneiss in the porphyritic granite have been noted to the southwest of Kégashka lake. The actual contact

between the porphyritic gneissic granite and the enclosing rocks is not clearly visible in the field.

The matrix of the rock is coarse grained and made up of quartz, plagioclase, potash feldspar and 1-2% biotite. The ferromagnesian minerals show a preferred orientation. The porphyroblasts of feldspar are in places automorphic, show Carlsbad twinning and are arrayed in every direction. More commonly, however, they are deformed and recrystallized and roughly follow the orientation of the ferromagnesian minerals. The porphyroblasts locally have a distinctive "augen" form, similar to that seen in the augen granitic gneiss. Recognizable feldspar porphyroblasts can be seen in most of the outcrops.

Metagabbro -- The metagabbros are generally represented by dark green to black amphibolites. They contain at least 80% hornblende, with some biotite and plagioclase. The original ophitic structure and a few primary minerals were observed in places.

1 -- large massive dike -- An extremely large metagabbro dike, more than a mile wide and about 10 miles long, is exposed in the center of the area. It is rectilinear, with a northwest trend. This metagabbro is the least deformed of any mapped within the area. In some specimens, pyroxene and olivine were noted and the ophitic structure has been preserved.

2 -- sills -- The metagabbro sills intercalated within the rocks of the Wakeham Group are in the form of amphibolites, commonly with a gneissic structure. They occur as sinuous, discontinuous bands, in places interconnecting, deformed by tectonic movements. The bands range from a few hundred feet to $\frac{1}{4}$ mile in thickness.

3 -- small dikes -- Amphibolites, probably of gabbroic origin, also form a few narrow dikes (a few tens of feet wide) of limited extent throughout the basement rocks and the gray gneiss.

Pleistocene

The surface sand in the southwest corner of the area represents the eastern extremity of the former delta of Natashquan river. Remnants of alluvial terraces, rejuvenated

and cut into by the present river system, have been noted throughout the area. Glacial erratics are numerous, and glacial striations, generally trending N.-S., can commonly be noted on the outcrops.

STRUCTURE

Aerial photographs can be used to study the large-scale structure of the area, as outlined by the foliation of the rocks. Two superimposed ages of folding have thus been revealed.

The major fold pattern is represented by prominent folds trending N.-S. to NW.-SE. These folds were in turn deformed by the secondary folding, with folds trending roughly NE.-SW. The superposition of these folds is particularly well displayed in the southeast part of the area, where a characteristic succession of anticlinal domes has been noted. In the field, other structural features (fold axes, lineation of ferromagnesian minerals) have been observed in the rocks of the Wakeham Group and in the gray gneiss. Some of these local features correspond to the regional structural pattern; i.e., it is not unusual to observe two foliations intersecting each other on an outcrop or to see superimposed folds. Other structural features appear to belong to a supplementary tectonic phase or a combinaticn of several phases.

Faults and Joints

Two major NE.-trending faults, and one trending ENE., cut through the north part of the area. All are vertical faults, and there is no appreciable displacement.

Small faults are common, particularly in the rocks of the Wakeham Group. They generally trend close to NE. The principal joints are vertical and trend NE., NW., E., and N.

ECONOMIC GEOLOGY

Mineral Exploration

Considerable prospecting work was done in the area prior to our field season. Claims, now reverted to

the public domain, are worthy of mention (see accompanying map).

On the shore of the St. Lawrence, from the western boundary of the area to a point slightly pas the Kégashka river, the claims are covered with sand in which are found local ferruginous lenses. The claims are located on the eastern extremity of the Natashquan ferruginous sand deposits, which have not as yet been developed (see P.R. 582). It would appear that the sands of Kégashka township are less iron-rich than those of Duval or Natashquan townships.

Other claims are located northeast and east of Kégashka lake. They were staked on radioactive anomalies detected from the air. Exploration work did not lead to encouraging results.

Claims are also found a few miles west of the outlet of Musquaro river. They were also staked on radioactive anomalies. Exploration work did not lead to any tangible results.

Radiometric Surveys

The field party carried out its own radioactivity measurements with the aid of a scintillometer during its traverses. No significant anomalies were noted over any of the rock units.

Mineralization

No important mineralization was observed in the field. The only indications of mineralization were as follows:

Chalcopyrite -- Very local occurrences of chalcopyrite, making up less than 2% of the rock, have been observed in some of the gray gneiss, in the biotite or hornblende paragneiss and in the intrusive metagabbros in the Wakeham Group. A few specks of chalcopyrite were also noted in some calc-silicate beds, of limited extent, intercalated within the biotite paragneiss to the north of Kégashka lake.

Magnetite -- Magnetite is disseminated locally in the biotite paragneiss, in some of the granitic gneisses and granites, and in the pegmatites. It never makes up more than 2-3% of the rock.

Iron -- The Pleistocene sands which cover the southwest corner of the area contain variable amounts of ilmenite, hematite and magnetite in lenses of irregular extent. These sands have been subjected to numerous studies (Bassaget, P.R. 582)

GEOCHEMISTRY

Stream-sediment samples were taken during the field work. The analytical results are shown on the accompanying map and in the table at the end of this report. Analyses for Cu, Zn, Pb, Mo, Ni, U, Co, W, Mn, Sn, Au, Ag and As were made at the laboratories of the Québec Department of Natural Resources.

High values have been obtained for tin. About 10% of the values are scattered between 21 and 100 ppm. It is the first time that such high values for tin are encountered since the onset of routine stream sediments sampling by the Department's geological parties. Note should be taken that relative by high values have also been obtained for antimony.

Sample No. on the map	Code No. of sample in files of Dept.	RESULTS OF ANALYSES IN P.P.M.												
		Cu	Zn	Pb	Mo *	Ni	U	Co	W*	Mn	Sn	Au *	Ag	Sb
1	133	0	25	16		3	1	15		61	2		0	0
2	346	2	15	10		5	1	15		18	2		0	0
3	344	2	10	20		5	1	15		17	0		0	0
4	347	4	15	16		8	–	8		–	–		–	–
5	331	4	25	10		3	1	13		30	2		0	0
6	337	2	15	10		3	3	23		40	0		0	0
7	338	2	10	16		3	4	13		32	2		0	0
8	332	0	15	10		3	0.5	15		23	2		0	0
9	336	4	10	10		5	3	8		48	2		0	0
10	335	2	5	6		8	4	8		20	2		0	0
11	339	4	10	10		3	0.5	13		32	2		0	0
12	340	6	15	20		–	–	–		–	–		–	–
13	334	4	10	10		5	2	10		22	0		0	0
14	333	0	15	6		5	1	25		28	0		0	0
15	341	2	10	16		3	0.5	8		18	0		0	0
16	228	0	15	20		3	0.5	0		28	0		0	0
17	229	0	10	20		7	2	0		38	8		0.4	0
18	230	0	10	16		3	1	0		40	16		0	0
19	231	0	15	16		5	2	0		–	12		–	–
20	237	0	0	–		–	–	–		–	–		–	–
21	232	0	25	16		2	–	0		–	20		–	–
22	233	0	15	16		3	–	0		–	8		–	–
23	150	6	15	30		5	1	0		–	0		–	–
24	345	6	25	70		6	–	26		–	–		–	–
25	343	4	10	10		13	–	13		–	–		–	–
26	371	0	25	16		3	1	0		38	0		0	0
27	342	4	15	16		3	0.5	8		25	0		0	0
28	226	0	15	16		5	–	3		–	20		–	–
29	225	0	25	20		5	–	3		–	12		–	–
30	234	0	0	20		3	–	0		–	24		–	–
31	235	0	0	20		3	2	0		–	8		–	–
32	151	0	15	20		–	–	–		–	0		–	–
33	132	0	25	10		3	2	8		33	0		0	0
34	324	0	10	16		8	1	15		35	2		0	0
35	322	0	15	20		5	2	8		28	2		0	0
36	323	0	5	16		5	0.5	13		28	2		0	6
37	134	0	60	16		3	1	40		81	2		0	4
38	135	0	40	10		3	2	48		85	6		0	0
39	131	0	60	20		3	2	8		36	0		0	0
40	130	0	40	10		3	2	8		66	0		0	0
41	210	0	25	10		0	1	25		37	2		0	0
42	211	0	25	6		0	0.5	23		30	2		0	0
43	157	0	0	16		5	0	0		12	0		0	0
44	156	0	0	20		3	1	0		17	0		0	0
45	155	0	0	16		3	0.5	0		13	0		0	0
46	158	0	0	10		3	0	0	2	17	0		0	0
47	159	0	0	10		3	1	0		13	0		0	0
48	167	0	15	16		3	2	0		22	0		0	12
49	166	0	15	40		3	–	0		–	0		–	–
50	169	0	10	10		10	–	–		–	–		–	–
51	163	6	50	10		14	3	15		316	0		–	–
52	149	6	15	50		–	–	–		–	–		–	–
53	148	0	10	24		3	1	0		27	0		0	0
54	280	0	0	20		3	1	0		18	16		0	0
55	236	0	0	70		–	–	–		–	–		–	–

Sample No. on the map	Code No. of sample in files of Dept.	RESULTS OF ANALYSES IN P.P.M.												
		Cu	Zn	Pb	Mo*	U	Co	W *	Mn	Sn	Au *	Ag	Sb	
56	116	4	75	40		2	10		220	2		–	9	
57	117	6	25	16		2	15		–	–		–	–	
58	115	4	50	40		3	15		100	2		0	12	
59	325	10	50	10		1	38		150	8		0	0	
60	321	0	15	20		1	8		28	5		0	0	
61	320	0	10	10		1	8		35	0		0	4	
62	318	0	10	20		1	25		76	2		0	4	
63	129	0	75	20		2	18		160	0		0	4	
64	136	0	75	10		2	45		170	0		0	6	
65	212	0	15	6		0.5	25		32	2		0	0	
66	214	0	50	10		2	40		125	8		0	0	
67	213	0	15	10		0.5	8		28	2		0	0	
68	209	10	60	10		–	–		–	–		–	–	
69	208	0	60	20		2	33		–	2		–	–	
70	201	0	40	16		1	48		–	–		–	–	
71	202	0	90	10		–	–		–	–		–	–	
72	168	0	15	16		–	–		–	–		–	–	
73	153	0	10	20		–	3		–	0		–	7	
74	152	0	10	24		1	3		75	0		0	0	
75	160	0	25	20		2	3		95	0		0	0	
76	161	6	50	20		2	8	7	200	0		0	5	
77	165	30	125	16		4	27		656	0		0.6	–	
78	162	0	25	16		–	–		–	–		–	–	
79	164	6	60	20		–	–		–	0		–	–	
80	277	0	0	20		1	3		125	32		0	0	
81	276	0	0	36		0	0		–	0		–	–	
82	279	0	0	20		2	0		29	12		0	0	
83	252	0	0	20		0	0		53	8		0	0	
84	241	0	0	60		–	0		–	20		–	–	
85	316	0	15	16		1	30		40	0		0	4	
86	315	0	25	10		0.5	18		30	0		0	0	
87	114	2	15	10		1	13		32	0		0	0	
88	314	0	15	20		0.5	38		45	2		0	0	
89	113	2	25	10		2	43		120	0		0	8	
90	317	0	15	16		1	28		46	0		0	5	
91	110	2	10	4		1	13		28	2		0	4	
92	111	4	15	10		2	8		32	0		0	0	
93	128	0	40	10		0.5	18		42	0		0	0	
94	127	0	50	16		1	25		100	2		0	5	
95	125	0	50	10		–	15		–	–		–	–	
96	124	0	15	16		1	25		33	2		0	0	
97	203	0	25	6		1	43		50	0		0	0	
98	217	6	50	16		2	13		175	4		0	0	
99	215	0	25	20		1	8		115	0		0	0	
100	216	4	15	20		1	10		63	0		0	0	
101	204	0	15	6		0.5	45		37	0		0	0	
102	207	0	25	20		2	50		45	0		–	–	
103	206	0	25	24		2	25		–	0		–	–	
104	205	0	50	20		–	–		–	–		0	0	
105	147	0	10	20		2	0		18	0		0	0	
106	154	0	0	60		2	3		15	0		–	–	
107	221	0	10	10		1	0		–	0		0	0	
108	222	0	10	6		0.5	0		5	0		0	0	
109	223	0	15	10		1	0		12	0		–	–	
110	218	0	15	16		–	0		–	0				

Sample No. on the map	Code No. of sample in files of Dept.	RESULTS OF ANALYSES IN P.P.M.												
		Cu	Zn	Pb	Mo*	Ni	U	Co	W*	Mn	Sn	Au*	Ag	Sb
111	219	6	15	16		5	–	0		–	0		–	–
112	259	0	0	20		5	0	0		–	20		–	–
113	278	0	50	30		12	2	7		224	28		0.4	5
114	275	0	0	20		3	1	2		–	48		–	–
115	251	0	0	30		5	–	0		–	–		–	–
116	303	0	15	10		3	–	8		–	0		–	–
117	304	0	10	10		3	1	5		28	0		0	5
118	311	10	60	50	140	8	20	20		570	0		0.8	19
119	312	0	40	16		3	–	8		–	0		–	–
120	313	0	15	20		0	1	13		38	2		0	0
121	112	4	50	16		3	2	45		160	2		0	5
122	305	6	40	30		8	1	18		–	–		–	–
123	309	0	40	20		8	1	28		100	0		0	4
124	310	0	25	16		3	1	33		28	4		0	0
125	319	0	25	6		5	1	40		86	2		0	4
126	308	6	50	16		8	1	28		105	8		0	4
127	306	4	40	16		3	1	13		70	2		0	4
128	107	2	15	10		8	1	5		83	0		0	6
129	307	6	50	30		–	–	–		–	–		–	–
130	104	2	40	10		5	2	8		130	2		0	6
131	105	4	15	4		5	1	8		51	2		0	0
132	126	0	40	10		0	1	23		105	0		0	0
133	146	0	15	30		10	–	0		–	0		–	–
134	145	0	15	40		6	–	0		–	0		–	–
135	144	0	10	16		3	0.5	0		15	0		0.4	4
136	220	0	15	10		5	1	0		42	0		0	0
137	224	0	60	20		15	4	13		–	0		–	–
138	140	0	40	20		10	1	8		167	00		0.5	7
139	141	0	50	16		10	4	7		178	0		0.4	5
140	264	0	0	20		5	–	0		–	12		–	–
141	263	0	0	10		3	0	0		30	0		0	0
142	262	0	0	10		5	0	0		81	20		0	0
143	261	0	0	16		5	0	3		86	16		0	0
144	260	0	0	16		3	0	0		18	28		0	6
145	255	0	25	140		–	–	–		–	–		–	–
146	250	0	0	20		7	–	3		–	–		–	–
147	242	0	0	20		5	0.5	0		63	20		0	0
148	101	6	50	10		3	2	8		61	0		0	4
149	102	4	50	6		5	1	3		48	0		0	0
150	103	4	15	10		5	2	0		43	0		0	4
151	302	0	15	6		3	1	3		28	2		0	4
152	301	0	25	6		5	1	8		45	0		0	4
153	106	2	10	6		3	2	8		28	0		0	4
154	348	2	10	16		5	1	13		25	0		0	0
155	349	4	15	16		–	–	–		–	–		–	–
156	109	4	10	6		3	1	13		66	0		0	6
157	108	10	15	10		8	7	10		37	2		0	4
158	171	0	25	30		8	–	0		–	21		–	–
159	173	0	15	16		5	1	0		37	20		0	0
160	172	0	25	20		3	1	0		–	20		–	–
161	142	0	10	20		–	–	–		–	–		–	–
162	143	0	15	10		7	2	3	1	143	0		0.4	6
163	265	0	0	40		3	–	0		–	–		–	–
164	254	0	0	20		5	0.5	3		46	20		0	0
165	253	0	0	40		3	0.5	0		51	12		0	0

Sample No. on the map	Code No. of sample in files of Dept.	RESULTS OF ANALYSES IN P.P.M.												
		Cu	Zn	Pb	Mo*	Ni	U	Co	W*	Mn	Sn	Au *	Ag	Sb
166	258	0	0	30		3	0.5	0		37	20		0	0
167	256	0	0	50		3	0	3		-	12		-	-
168	257	0	0	40		3	2	0		-	40		-	-
169	245	0	0	20		3	1	0		-	28		-	-
170	244	0	0	80		-	-	-		-	-		-	-
171	248	0	0	60		3	0.5	3		-	24		-	-
172	243	0	0	20		10	-	0		-	-		-	-
173	247	0	0	20		3	1	0		30	16		0	0
174	246	0	50	30		10	2	3		151	20		0	0
175	328	0	15	16		3	1	15		40	0		0	0
176	329	0	25	30		3	2	28		56	2		0	0
177	327	0	25	20		3	2	45		-	2		-	-
178	326	0	15	70		5	1	35		-	2		-	-
179	330	0	25	16		5	0.5	13		48	0		0	4
180	118	4	15	16		3	0.5	13		225	0		0	6
181	119	6	25	10		10	1	8		17	6		0	6
182	120	10	60	10		10	2	15		22	0		0	7
183	170	0	40	20		20	2	0		-	32		-	-
184	380	0	0	20		20	1	3		83	28		0	4
185	381	0	40	30		30	-	3		-	28		-	-
186	175	0	25	20		20	1	3		42	16		0	0
187	176	0	40	16		16	1	0		172	40		0	5
188	281	0	0	16		16	1	2		90	24		0	5
189	249	0	0	20		20	0	0		45	8		0	0
190	274	0	0	24		24	-	0		-	0		-	-
191	273	0	0	20		20	1	2		45	40		0	0
192	272	0	0	120		120	1	2		40	20		0	0
193	268	0	50	36		36	1	5	32	184	0		0	4
194	266	0	0	30		30	-	0		-	0		-	-
195	267	0	0	30		30	-	0		-	-		-	-
196	382	0	0	20		20	1	0		27	0		0	0
197	227	0	25	16		16	0.5	0		-	20		-	-
198	238	0	0	30		30	1	0		-	0		-	-
199	239	0	0	100		100	-	0		-	-		-	-
200	240	0	0	60		60	-	0		-	12		-	-
201	178	0	25	20		20	-	0		-	12		-	-
202	353	2	15	16		16	2	25		51	0		0	24
203	354	4	10	10		10	-	25		-	0		-	-
204	355	4	50	10		10	1	33		170	2		0.3	0
205	352	4	10	40		40	2	28		-	0		-	-
206	122	0	50	10		10	1	38		71	0		0	0
207	121	0	15	10		10	1	15		45	0		0	0
208	283	0	0	6		6	1	0		35	8		0	0
209	282	0	0	10		10	0.5	3		25	0		0	0
210	285	0	0	50		50	-	0		-	20		-	-
211	376	0	0	20		20	1	0		50	8		0	0
212	286	0	500	6		6	2	0		30	-		0	0
213	377	0	0	30		30	1	0		-	100		-	-
214	375	0	0	30		30	1	3		136	12		0	4
215	351	4	10	20		20	0.5	5		35	0		0	4
216	350	2	5	24		24	-	-		-	-		-	-
217	290	0	60	40		40	1	5		138	20		0	0
218	284	0	0	10		10	1	0		-	24		-	-
219	287	0	15	6		6	2	3		32	12		0	0
220	358	2	10	16		16	0.5	8		66	0		0	0

Sample No. on the map	Code No. of sample in files of Dept	RESULTS OF ANALYSES IN P.P.M.												
		Cu	Zn	Pb	Mo *	Ni	U	Co	W *	Mn	Sn	Au *	Ag	Sb
221	359	4	10	16		8	1	38		35	4		0	0
222	370	0	15	20		7	1	3		23	0		0	0
223	289	0	60	10		17	0.5	10		244	0		0.4	5
224	288	0	15	16		8	1	3		-	16		-	-
225	356	2	10	20		5	1	18		-	0		-	-
226	357	4	50	20		13	1	35		175	0		0	0
227	367	0	15	20		4	-	0		-	0		-	-
228	369	0	25	20		-	-	-		-	0		-	-
229	368	6	15	16		7	-	0		-	0		-	-
230	384	0	0	30		4	0.5	0		-	24		-	-
231	383	0	0	16		6	1	2		73	20		-	6
232	379	0	50	24		10	2	5		148	48		0	4
233	391	0	0	16		3	1	0		27	12		0	0
234	366	-	-	-		-	-	-		-	-		-	-
235	360	0	25	70		-	-	-		-	0		-	-
236	361	0	10	20		3	0.5	0		17	0		0	0
237	362	0	10	16		5	0	3		22	0		0	0
238	363	0	15	20		5	0	2	5	122	0		0	0
239	365	0	10	10		3	0.5	0		72	0		0	0
240	390	0	50	16		18	0.5	8		193	28		0	6
241	385	0	0	16		8	0.5	3		121	12		0	5
242	387	0	0	10		3	0.5	0		38	4		0	0
243	386	0	0	10		5	-	0		-	16		-	-
244	389	0	0	20		4	-	0		-	20		-	-
245	388	0	0	40		-	-	-		-	12		-	-
246	364	0	15	20		2	0	0		7	0		0	0

0 Indicates that the element was not detected

\- Indicates absence of determination for the element.

* Mo, W, and Au were detected only in samples 46, 76, 118, 193, and 238.