single indicative element.

Consequently, it was decided to apply the principal component analysis method for the analytical research and to adopt the method of picking up anomaly areas resembling the Matsitama copper mineralization area which is adjacent to the survey area on the southwest.

4-2 Results of Surveys

The results of the aforementioned surveys are summarized as follows:

4-2-1 Analysis of LANDSAT Data

Such geological units as intrusive granite, ultrabasic rocks and basic rocks in the survey area of 5,300 km^2 were distinguished by the differences of tones of color, and from lineations indicated in the directions of intrusive rock and drainage system patterns, three systems of NW–SW, NNW–SSE, and NE–SW as principal structural directions were picked up.

Also, as a regional structure including the surrounding areas of Maitengwe, Matsitama, and Francistown, a semicircular structure opening to the east as if to encircle Vumba schist relict was distinguished.

4-2-2 Geological Survey

A geological survey was made along survey lines for geochemical sampling and in parallel with the geochemical survey. However, as a detailed trace of strata was not made, only an outline of geology was found. Accordingly, basically the views of Litherland (1975) and Bennett (1970) were followed for geology and geological strucutre, only partly revising the lithfacies in the generally surveyed area of Vumba. According to our synthetic study of the results of the age determination by the K-Ar method of granitic rocks, rock analysis, analysis of LANDSAT data, interpretation of aerial photographs, it was found that the results of our study does not always agree with the views so far expressed in such points as stratigraphical correlation and the ages of intrusion of intrusive rocks in various areas; these issues, in particular correlation between the Vumba area and the Matsitama area, have come to remain as unsolved problems.

4-2-3 Mineral Deposits

As the result of the geological survey, the three mineralization zones of Vumba, Timbale and Matsitama were recognized in the survey area. Among these, in the northern Matsitama area, the Matsitama Schist and Metasedimentary Group which bears metasedimentary copper deposits was found to offer the possibility of extending into the survey area, justifying further exploration.

4-2-4 Geochemical Survey

As the result of studying the relations between the properties of the samples as well as the environment of the sampling points and the indicative elements, the color tones of soil which are considered to reflect considerably the chemical composition of the country rock were found to roughly correspond to the geological units and vegetation.

Also found was the fact that the contents of the elements vary according to the difference of the geological units and the color tones of soil. However, the variance was not so much as to enable discrimination of geology by the differences of color tones of soil and of the contents of the elements. Furthermore, geochemical anomalies picked up from the distribution of the content of each element that derive from rock overlap with those that derive from mineralization, and it was considered difficult to distinguish between these. Among the indicative elements, molybdenum showed values less than 3 ppm, for almost all, as the result of chemical analysis, and was found unsuitable as an indicative element.

Since it was judged difficult to pick up mineralization anomaly areas by means of analytical research for each element, first the characteristics of principal components in Matsitama deposits, which are copper mineralization anomaly areas, were turned out. Then analytical research by the principal component analysis method for all the survey area was made, to seek similar characteristics in the survey area.

As a result 10 anomaly areas were picked out, and among then an anomaly area at the southwest corner of the survey area was found to show the highest degree of anomaly and cover a large area and to require a more detailed prospecting.

The above-mentioned result having been synthesized, the northern Matsitama area of about 800 km^2 was selected as the survey area for the second year.

4-2-5 Conclusion and Recommendation

Among the three areas offering the hope of mineralization — Vumba, Timbale and northern Matsitama which were revealed by the first year surveys the promising one as the area that was proposed for semi-detailed and detailed surveys for the next year and on is the northern Matsitama area.

According to the result of the surveys, the east wing of the folds of the Matsitama Schist and Metasedimentary Group which bear copper deposits was found to expand further north than had been thought in the past and came to make one expect its distribution in the survey area too. As promising anomalies found by the geochemical survey by the principal component analysis method lie also in this northern Matsitama area, this area was chosen as the survey area for the next year and onward.

The survey area covers 800 km^2. It was desired that this be explored by airborne geophysical prospecting with a total length of survey lines of 3,000 km, a geological survey on the surface, geochemical survey and other methods, to narrow down this area into about 100 km^2 as a more promising area.

In the Vumba area unrecorded sulphide-disseminated outcrops and old pits were found scattered around Somerset Mine. However, since systematic exploratory work had been done to some-extent over this area, and the mineral indications were within the explored area, there was no need to repeat similar work.

As for the Timbale area, the geological survey and geochemical survey did not result in discovery of promising mineral indications. Although the extent of the surveys in this year was greatly restricted and the extent of unexplored areas remained quite large, the possibility of existence of porphyry-type copper-molybdenum deposits was considered little.

Chapter V. SURVEYS IN THE SECOND YEAR

5-1 Methods of Surveys

Over the northern Matsitama area covering about 800 km^2 which was selected as the result of the first year surveys, an airborne geophysical prospecting over the whole area and a sub-regional geological survey were conducted. And over a part of this area, an area of about 230 km^2, ground geophysical prospecting, geochemical survey and a geological survey were carried out in this order.

5-1-1 Airborne Geophysical Prospecting

The field work of the airborne geophysical prospecting was made at the beginning of the second year in advance of the geological survey. The work covered the area of about 800 km^2. The measurement was made at an altitude of 120 m with 300 m spacing of survey lines, the total of which came up to 2,800 km.

For the survey methods, the Input Electromagnetic method with Barringer Mark V Input System, which was considered most effective in the prospecting of Matsitama-type meta-sedimentary ore deposits, was mainly employed, with combined use of magnetic prospecting with a Geometries G-803 proton magnetometer and radioactive prospecting with a four channel γ-ray spectrometer.

The field work was entrusted to Geoterrex Limited because of the patent license, and synthetic analysis was made by the survey team. The results of the work were taken over by the ground geophysical prospecting work to follow up them.

5-2-2 Geological Survey

The geological survey comprised a sub-regional survey along the water system of the whole area, and for some part geological survey was also conducted along the survey lines for geochemical survey in parallel with sampling work for this prospecting.

The survey area lies in the northeastern part of the geological map of the Mosetse – Matsitama area by Bennett (1970). The geology is composed of the Mosetse River Gneiss Group formed of a basement complex, the Matsitama Schist and Metasedimentary Group overlying the said gneiss group, igneous rocks intruding into these and superficial sediment.

In this survey the team basically followed the view of Bennett, but made further detailed classification of lithofacies and traced calcrete – amphibole schist – limestone strata, to analysize the geological structure.

The survey area is situated at the middle of the east edge of a mineralization zone connecting the Matsitama deposit group and Bushman mine; in particular, in the southwest of the survey area copper indications were found in the Matsitama Schist and Metasedimentary Group, and a survey of outcrops and sampling were carried out there.

On geophysical prospecting anomalies at the top of folds on the horizon of folded calcrete – amphibole schist – limestone strata in the Mosetse River Gneiss group, the study of the possibility of occurrence of deposits was made.

In addition, chromite in ultrabasic rock was explored in an area on the north of th Lepashe river.

5-1-3 Geochemical Survey

Geochemical survey was conducted on soil for the three elements of copper, lead and zinc over an 230 km^2 area in the survey area that had been judged promising as a result of on-the-site analysis in the airborne geophysical prospecting. The sampling intervals were 500 m on survey lines that were spaced 500 m apart, as a rule. The sampling intervals were made 250 m on the anomaly areas indicated by the result of the airborne geophysical prospecting. In the south of Mmapatse area where the geological survey found mineral indications, samples were taken at the intervals of 50 to 100 m. The total number of samples was 1,363. The method of treatment and analysis of the collected samples was the same as in the first year. In analyzing the chemical analysis result, monovariant analysis and multivariant analysis by the principal component analysis method were jointly used.

5-1-4 Ground Geophysical Prospecting

Ground geophysical prospecting was carried out over 26 anomaly areas out of the anomaly areas that had been picked up by the airborne geophysical prospecting. The field work was entrusted to Geoterrex for the same reason as the case of the airborne geophysical prospecting. The prospecting methods were as follows: Aiming at the effect of the overlap of various geophysical prospecting methods, Pulse Electromagnetic prospecting and magnetic prospecting were made on three survey lines at the internals of 500 m, and seeing the results of these, induced polarization prospecting was made on one of the above-mentioned three survey lines. The synthetic analysis of their results was conducted by the survey team.

5-2 Results of Surveys

The surveys carried out in the second year as described in the foregoing sections produced the following results.

5-2-1 Geological Survey

Geology of this area is formed of the Mosetse River Gneiss group comprising a basement complex, the Matsitama Schist and Metasedimentary Group, igneous rocks intruding into these and superficial sediment. Also unrecorded ultrabasic rocks and basic rock dike group were presumed to exist in the northwest of the survey area. The existence of graphite, which was found to be one of the causes of anomaly in the geophysical prospecting, was unable to be confirmed on the surface. Development of shear zones running in parallel with the Bushman lineament was not recognized on the surface.

Four copper indications discovered in the Matsitama Schist and Metasedimentary Group in the southwest of the survey area were found to be arranged along a certain horizon that is characterized by amphibole schist and calcareous rocks in the group, as the result of a survey of outcrops and a detailed survey of old trenches. In addition, a chromite boulder zone which was found to justify further exploration was confirmed in ultrabasic rock that has intruded into the upper part of the Mosetse River Gneiss Group on the north of the Lepashe river.

5-2-2 Geochemical Survey

In the geochemical survey on soil, as the result of conducting monovariant analysis and multivariant analysis by the principal component analysis method for the three elements of copper, lead and zinc, a large number of geochemical anomalies were found. The anomaly areas, which are largely grouped into four zones, are all distributed practically in hamony with the distribution of the strata where copper indications were found in the geological survey, except for those in the north. And almost all the anomaly areas by the above-mentioned geophysical prospecting concentrated on these zones.

5-2-3 Airborne Geophysical Prospecting

A survey by the Input Electromagnetic method resulted in finding 47 clear anomaly areas in the survey area. Among them anomaly areas that are considered attributable to the bed rock (The conductors are a massive sulphide or graphite.) are in harmonic arrangement with the arrangement direction of the strata; they were grouped into the following seven zones from north to south.

A	M−1′ (checked immediately above the Matsitama ore horizon)
B	M−2, M−3, M−4
C	M−9, M−8, M−7D, M−7C, M−7B, M−10, M−11, M−7A, M−6
D	M−32, M−31, M−33, M−26, M−30, M−29, M−27, M−28
E	M−17, M−16, M−15, M−14, M−18, M−19, M−20, M−21, M−22, M−23, M−23A, M−24A, M−24, M−25
F	M−35
G	M−36, M−37, M−38

According to the result of the magnetic survey, D. F and G of the above-listed bedrock anomaly areas are comparatively in conformity with magnetic anomaly axes, and their relations with some magnetic bodies are inferred. However, the relations between the two are not generally recognized, and it is presumed that the magnetic anomalies derive from basic rock dikes.

Radioactive anomalies were rendered into a contour map about uranium. The distribution of the anomalies seems to concentrate in the west of this area, but no evident concentration or arrangement is recognized. Correlation between the redioactive anomalies and the arrangement of the input EM anomalies and airborne magnetic anomalies, and their relations with geological structure are not clear.

5-2-4 Ground Geophysical Prospecting

From the 47 anomaly areas obtained as the result of the airborne geophysical prospecting, 26 areas were selected paying attention to geological conditions and the arrangement and distribution of the anomalies. Over them pulse EM, IP and magnetic prospecting were conducted. As the result the following anomaly areas which are considered attributable to graphite or a sulphide were confirmed. (M−1 was excluded because it was checked above the Matsitama and Takadu known deposits.)

M–2, M–3, M–4, M–7A, M–7B, M–7C, M–7D, M–9, M–10, M–14, M–16, M–18, M–19/20, M–21, M–23, M–23A, M–24, M–25, M–28/29, M–35, M–36

Among the above, anomaly areas that were considered to be related with a sulphide mineral even to some extent were M–3, M–4, M–7B, M–7C, M-10, and M–35, and the others were judged ones due to graphite.

5-2-5 Synthesis of Result of Surveys

The anomaly areas obtained by the various surveys present belt-shape distribution and seem to coincide with the zones of distribution of the horizon of calcrete – amphibole schist -- limestone, the strikes of strata and their folds. The distribution of anomaly areas found by the various surveys were put together and grouped into Zone I to Zone V as shown in Fig. 20.

In Zone I the geology is composed of metasedimentary rock, and there is a copper indication on the southeast extension of the anomaly areas.

In Zone II the geology is composed of metasedimentary rock with interposing thin layers of limestone; there is no copper indications on the surface.

Zone III is a block that was dislocated from Zone II by faulting, and like Zone II metasedimentary rock is distributed. The result of the geochemical survey showed generally high content of copper, but no copper indication was found on the surface. At the northwestern extremity of this zone a small float (S–127) of biotite schist which seemed likely to contain graphite was found, but existence of graphite has not been confirmed yet. Two old drilling sites were found in this zone.

Zone IV almost coincides with the distribution of the horizon of calcrete – amphibole – limestone, and a geophysical anomaly was found at the top of its fold. However, no copper indication was able to be recognized in the results of the geological survey on the surface and geochemical survey.

Zone V is an area where floats of basic rock and ultrabasic rock are dominant, and it is presumed from the result of the magnetic prospecting that basic rock dikes are densely concentrated. The result of the geochemical survey showed higher lead content than the other zones, but no lead indication was recognized; nor copper indication was found in this zone. In this zone chromite indications were confirmed.

In the geophysical prospecting, graphite was considered as one of the causes of the anomalies, but as the result of the geological survey only a little of rock likely to contain graphite was found on the surface at the northwest end of Zone III. In the survey area, the firstly expected type of deposit is the Matsitama-type metasedimentary deposit which is unrelated with graphite or graphite schist, but in addition there still remains the possibility of the Bushman-type mineralization with dense concentration of copper – graphite along shear zones.

5-2-6 Conclusion and Recommendation

Table 10 represents the summary of the synthesis of the anomaly areas obtained as the result of the above-mentioned surveys. They were found to be concentrated in the areas where geochemical survey was carried out in the survey area. They were divided into five zones broadly; all of them had a nearly NW–SE strike except for Zone V, the northernmost one, and are distributed almost in conformity with the distribution of the strata. It was the relation of graphite with mineralization that was taken up as the most important problem in assessing the anomaly areas.

Analytical study was made on the assumption that in the survey area the possibility of occurrence of deposits was higher in the type of the Matsitama deposit group than in the Bushman-type.

As the result, as far as ore deposits with copper principally were concerned, Zone I, located at the southwest extremity, was judged most promising, followed by Zones II, III and IV in this order in terms of the value of further exploration.

Zone V, the northernmost, had some anomaly detected as the result of analysis of the geochemical survey finding by the principal component analysis method, in addition to the chromite indications mentioned later. (The anomaly is due to lead content in a large measure.) However, they do not coincide with geological or geophysical anomaly, and since they were along farm roads and farms, which make one suspect some secondary contamination, they were excluded from areas for copper prospecting thereafter.

For the third year surveys, it was recommended that, out of the anomaly areas picked up as the result of the ground and airborne geophysical prospecting, drilling exploration be made on the following anomaly areas which were included in the geochemical survey anomaly areas: M–4, M–3, the vicinity of M–13, M–7B, M–7C, M–7A, M–23A, M–10, M–35, M–32 and M–16 in the priority order.

For the drilling exploration, judging from the facts that the strata generally dip to south and that the extent of detecting anomalies by the Pulse EM method and the IP method in the ground geophysical prospecting was about 30 m below the surface, it was decided appropriate to make the drill holes vertical, to make the intended depth of reaching ore the range between 30 and 60 m approximately, and to make the depth of a hole about 100 m.

In addition to the above-mentioned copper indications mainly in the southwest of the survey area, a detailed geological survey including shallow drilling was recommended over the massive chromite ore indications that had been found in the second year in Zone V in the northwest of the survey area. At the same time the necessity for a geological survey was additionally recognized of the chromite indication area, the existence of which had been reported in the Lepashe area about 10 km southwest of the said indications.

Table 10 List of various anomalies with interpretation

Selected conductors by airborne geophisical survey		Geological survey (G.S.)			Geochemical Survey (G.C.)			Ground follow-up geophysical survey (G.G.)				Recommendation			
Anomaly	Location	Geology	Mineralization	Position	Soil	Max. value in ppm (Cu)	P.C.M. result	Conductor	Polarizable	Magnetic association	Probable primary source	G.S.	G.C.	G.G.	Priority
M-2	X6–7 Y0–1		out of survey area		out of survey area			Multiple bed rock	Yes	No	Graphite	–	–	×	
M-3	X4–6 Y3–4	A (U)	Cu showing	4	1.2	521	◎	Bed rock	Yes	No	Sulphide	◎	◎	◎	2
M-4	X3–4 Y3–5	A (U)	Cu showing	4	1.2	565	◎	Bed rock	Yes	No	Sulphide	◎	◎	◎	1
M-7A	X2–3 Y11–12	A (L)	–	4	2.3	90	◎	Multiple bed rock	Yes	Yes	Graphite	○	○	○	6
M-7B	X3–6 Y9–11	A (L)	–	4	2.3	87	◎	Bed rock	Yes	No	S + G	○	○	◎	4
M-7C	X6–8 Y7–9	A (L)	–	4	1.2.3	272	◎	Bed rock	Yes	No	S + G	◎	◎	◎	5
M-7D	X8–10 Y5–8	A (L)	–	4	1.2	175	◎	Bed rock	Yes	No	Graphite	◎	◎	×	
M-9	X9–13 Y0–5	A (L)	–	4	1.2.3	77	○	Bed rock	Yes	No	Graphite	○	○	×	
M-10	X4–6 Y10–11	A (L)	–	4	1.2.3	69	○	Multiple bed rock	Yes	No	S + G	○	○	○	8
near M-13	X5–6 Y13–14	A (L)	Cu showing	4	1.2	187	○	?	–	?	?	○	◎	○	3
M-14	X10–13 Y7–12	B (U)	–	4	1.2.3	62	○	Bed rock	Yes	No	Graphite	○	×	×	
M-16	X12–14 Y7–8	B (U)	–	4	1.2	50	◎	Multiple bed rock	Yes, ?	No	Graphite	◎	○	○	11
M-18	X10–11 Y12–14	B (U)	–	4	1.2	51	×	Bed rock	Yes	No	Graphite	×	○	×	
M-19/20	X9–11 Y14–15	B (U)	–	4	1.2	48	○	Bed rock	Yes	No, ?	Graphite	○	○	×	
M-21	X9–10 Y15–16	B (U.L)	–	4	1	53	○	Bed rock	Yes	Yes, ?	Graphite	×	○	×	
M-22	X8–9 Y15–16	B (U)	–	–	1.2	42	×	Surficial?	No	No	–	×	×	×	
M-23	X9–11 Y17–18	B (U)	–	4	1.2	53	○	Multiple bed rock	Yes	Yes	Graphite	○	○	○	
M-23A	X9–11 Y17–18	B (U.L)	–	4	1.2	52	○	Bed rock	Yes	Yes	Graphite	○	○	○	7
M-24	X11–12 Y18–19	B (U.L)	–	4	1.2	47	○	Bed rock	Yes	No	Graphite	○	○	×	
M-25	X8–9 Y18–19	B (U.L)	–	4	1.2	47	○	Bed rock	Yes	Yes, ?	Graphite	○	○	○	
M-28	X1–4 Y18–20	A (L)	–	4	2.3	62	◎	Bed rock	Yes	Yes, ?	Graphite	○	○	×	
M-29	X1–2 Y18–19	A (L)	–	4	1.2	31	○	Bed rock	Yes	Yes, ?	Graphite	○	×	×	
M-35	X1–3 Y23–24	B (U.L)	–	4	1.2	56	○	Multiple bed rock	Yes	No	S + G	○	○	○	9
M-36	X1–2 Y28–29	A (L)	–	4	1.2	–	–	Bed rock	Yes	No	Graphite	○	×	×	
M-5	X3–4 Y7–8	A (U)	–	4	3	–	–	–	–	–	–	–	–	–	
M-6	X1–2 Y12–13	A (L)	–	4	2	65	○	–	–	–	–	○	○	–	
M-8	X9–10 Y5–6	A (L)	–	4	2	87	◎	–	–	–	–	×	◎	–	
M-11	X2–4 Y11–13	A (L)	–	4	1.2.3	103	○	–	–	–	–	○	○	–	
M-12	X3–4 Y13–14	A (L)	–	4	1.2	130	◎	–	–	–	–	◎	◎	–	
M-15	X11–13 Y8–10	B (U)	–	4	1.2.3	56	○	–	–	–	–	○	○	–	
M-17	X16–17 Y7–8	B (U)	–	4	?	–	–	–	–	–	–	○	–	–	
M-27	X3–4 Y18–19	A (L)	–	4	2	37	○	–	–	–	–	○	×	–	
M-30	X1–3 Y17–19	A (L)	–	4	1.2	62	◎	–	–	–	–	◎	○	–	
M-31	X2–4 Y16–18	A (L)	–	4	1.2	144	○	–	–	–	–	○	○	–	
M-32	X3–6 Y14–16	A (L)	–	4	1.2	156	◎	–	–	–	–	◎	○	○	10
M-33	X1–3 Y15–17	A (L)	–	4	1.2	115	○	–	–	–	–	○	○	–	
M-34	X2–3 Y14	A (L)	–	–	2	54	×	–	–	–	–	○	◎	–	

Note;

1. M-1, M-1' Out of the survey area. Checking known Matsitama deposits. Data are not listed on the table.
2. M-37, M-38, M-39, M-40, M-41 are minor conductors and have no priority. Data are not listed on the table.
3. Abbreviation

A: Matsitama schist and metasedimentary group (upper, lower)
B: Mosetse river gneiss group (upper, lower)
U: Upper, L: Lower
Soil 1; brwon soil, 2; brown grey soil, 3; dark brown soil
Position 4; in and close to calcrete

S: Sulphide
G: Graphite

Chapter VI. SURVEYS IN THE THIRD YEAR

6-1 Methods of Surveys

On the basis of the results of the first and second year surveys, the following works were carried out.

I hopes of finding copper deposits, drilling prospecting and a geological survey were conducted on four areas, Area I to Area IV, totalling a 53 km^2 area, in the northern Matsitama area, and general geochemical survey was made on an area of 12 km^2 within the above.

On an area of 4 km^2 of chromite indication too, drilling geological survey, and handy magnet prospecting were carried out.

6-1-1 Geological Survey

In the areas offering hopes of finding copper deposits, routes totalling 127 km were set along survey lines for geochemical survey in the vicinities of the drilling positions, and a semi-detailed geological survey was made for the purposes of inquiring into the cause of the indications yielded by the second year geophysical prospecting, finding the positions of mineral indications as geologically borne and their scale, and synthesizing these findings with the result of drilling.

Since there were scarcely any outcrops in the chromite indication area, lines on a grid pattern with 100 m spacing were set in the boulder-distributed area, and a detailed geological survey and handy magnetic prospecting were made along the survey lines totalling 40 km. On the basis of their results, a trenching survey was made excavating 16 trenches, the total length of which was 144.4 m.

6-1-2 Geochemical Survey

Among the anomaly areas discovered by the soil geochemical survey in the second year, an anomaly area in the southwest of the survey area included Class A anomaly with the maximum value of Cu 560 ppm, and floats containing a copper mineral were found at several places of the surface. These facts led to the judgement that this was the most promising area.

Since this anomaly area was presumed to extend further west, soil geochemical survey was made along with geophysical prospecting over an 2 by 6 km area adjacent to this area on its southwest side as a continuation of the second year geochemical survey. In addition, complementary soil geochemical survey was made along Survey Line M--5 in the area prospected in the preceding year, because a copper indication had been found there.

Sampling was made at each point of the 500 m x 250 m units of the grid pattern, the total number of the samples coming up to 183. The indicative elements were Cu, Pb and Zn. Such matters as sampling, analysis and analytical study of the result were made all by following the methods taken in the second year (PL. 2).

6-1-3 Drilling Exploration

On the basis of the results of the surveys in the first and second years, in the third year, drilling exploration was carried out by drilling 14 holes with a depth of 100 m each, totalling 1,405.45 m, aiming at firstly geophysical anomalies and secondly geochemical anomalies, for the purpose of exploring copper indications. The geology of the places where drilling was made, the results of the geophysical and geochemical prospecting, and the result of the drilling are shown in Table 11, and the drilling positions in Table 12, Fig. 21.

The object of drilling in each area is explained as follows:

Area I The holes of GSJ–4 and 5 were drilled at a fold in a NE direction of the Mosetse River Gneiss group, where amphibole schist, quartz schist, quartzite, limestone and large quantity of calcrete are distributed. In this area, as a result of geophysical prospecting in the second year, an indication by ground geophysical prospecting suggesting existence of graphite was found in Anomaly Area M–23A, and also in the neighborhood a geochemical anomaly about Zn was found. Situated at a fold axis of strata, it is equipped with geologic conditions likely to become a place to bear mineral deposits.

Area II GSJ–6 was drilled aiming at a strong geochemical anomaly in a stratum of amphibole schist with secondary calcrete, which belong in the Matsitama Schist and Metasedimentary Group.

To the north of GSJ–6 there is the airborne geophysical anomaly of M–32, and to its south is th some kind of anomaly, M–12. About 800 m north of this hole there is an old site of drilling by the ACC group, and at a point about 1,000 m north-northeast of the hole there is a small outcrop of quartzite accompanied by green copper. Also about 1,250 m southwest of the hole, an amphibole schist boulder with green copper was found.

Area III The holes of GSJ–7, 8, 9 and 10 were drilled at places where the airborne geophysical prospecting anomalies of M–7A, M–7B, M–7C and M–10 and a geochemical prospecting anomaly of Class B were found in a strata of the Matsitama Schist and Metasedimentary Group, mainly aiming at the geophysical anomalies. The results of the airborne and ground geophysical prospecting made one presume existence of graphite or a sulphide. The existence of graphite forms an important indication of Bushman copper deposits located about 50 km northwest of the survey area for the third year.

On the surface characteristic black soil is widely distributed, and this area forms a savanna with low trees and plants.

Area IV The drilling points are divided into (1) an area where geochemical and geophysical anomaly areas are concentrated, in the middle part of the area, and (2) vicinities of old trench sites in the east.

Area IV-(1) The holes of GSJ–11, 12, 13, 14 and 15 were drilled aiming at the airborne geophysical anomalies of M–3 and M–4 and geochemical anomalies in the Matsitama Schist and Metasedimentary Group. The holes of GSJ–11, 13 and 14 were aimed at geophysical anomalies suggesting existence of a sulphide, and the holes of GSJ–12 and 15 at geochemical anomalies of Class A.

Area IV-(2) The holes of GSJ–16 and 17 were drilled to confirm the lower extension of a green copper indication found in a trench. The strata here belong in the Matsitama Schist and Metasedimentary Group.

Four drill holes, each 100 m in depth, were made for chromite in the chromite deposit area on the basis of the results of the prospecting in the first and second years. The geological conditions found by the four holes totalling 401.5 m.

The conditions of exposure in this area were extremely poor, there was not a single outcrop where the strike and dip of the stratum could be measured. As the result of trenching, however, the strikes and dips of chromite deposits were found, though very unclear, to be N50°E/N50° with the deposits of B, C, E and F and N60°W/N60° with the deposit of D.

Accordingly, to explore below the deposits of B, C, D, E and F, the drill holes of GSJ–1, 2, 3 and 18 were all sunk vertically from points that were judged to be on the hanging wall side and 10 to 20 m apart from the ore bodies.

6-2 Results of Surveys

The copper indication areas surveyed in the third year project had been selected as areas offering the highest possibility of occurrence of deposits from the results of the second year prospecting work, particularly those of the geophysical and geochemical prospecting.

The chromite deposit area is an area where outcrops had been found, though to a limited extent, by the surveys until the second year. All of these are borne on a certain horizon.

6-2-1 Result of Surveys of Copper Indication Areas

For copper indications, areas with similar geological conditions to those of the Matsitama deposit group about 10 km south of the survey area, as its extension, and with some indications were selected and explored mainly depending on drilling.

The result of the exploratory work for each area is described as follows, and is summarized in Table 11, Fig. 20.

Area I — No mineral indication was confirmed as the result of the geological survey and drilling. The indication by the geophysical prospecting is presumed attributable to graphite schist.

Area II — The rock in which dissemination of chalcopyrite and pyrite was confirmed extensively by the result of drilling for a geochemical anomaly area of Class A was found to be amphibole schist in the Matsitama Schist and Metasedimentary Group and belong in the same group as the country rock of the Matsitama deposit group and identical with this rock. The area is considered to be the most promising one in view of the fact that copper indications are found in the neighborhood.

Area III — As the result of drilling made for a geophysical indication, weak mineralization of pyrite and chalcopyrite and graphite schist was recognized, and it was confirmed that this area has a geological condition close to geological environment that bears deposits of the Bushman type accompanied by graphite.

Area IV — As the result of drilling made for a geophysical anomaly area and a nearby geochemical anomaly, comparatively extensive dissemination of pyrite and a copper indication, though slight, were found. As floats containing copper minerals are scattered in an area on the west side of this drilling area and also anomalies by geochemical survey made additionally this year tend to extend westward, occurrence of Matsitama-type deposits can be hoped.

In drill cores from drilling at the side of an old trench revealing an outcrop of copper mineral which is found in a limited number in the east of this area, a mineral indication similar to a copper indication seen in the trench was found. However, in geology as found in the trench and drill core, the origin of the rock is unknown as there has been a complication of intrusion of basalt occuring several times, alteration as its result, and the effects of weathering. So that, though this cannot be said definitely, the copper indication seems to be of a small size because this copper mineralization derives from basalt.

6-2-2 Result of Survey of Chromite Indications

The chromite deposits are found in ultrabasic rock. The distribution of ultrabasic rock is not found on a sizable scale except for the indication area of A to D and the surrounding of the indications of E and F. In view of the condition of the boulders, concealed rock bodies are considered small in size.

All the chromite bodies are small and their shape is lenticular or pod-like; they do not show clear strike, which could be accounted for by their having been controlled by minor structure of the country rock.

The drilling aiming at the lower extension of the ore bodies in the third year work failed to seize it but reached other ore bodies.

From the result of drilling and trenching, the size of the ore bodies is considered to be, as one unit, 0.5 to 1 m in thickness, 5 to 10 m in length, and several meters in the dip direction. Such ore bodies of small size are scattered in ultrabasic rock. Therefore, although prospecting in this year was made aiming at mainly the north side of them, it is possible that ore bodies may occur on the south side too.

However, as the ore bodies are small and do not show any structural control, it would be a proper way of exploration to expand the prospecting extent while confirming the ore body through driving a drift from the outcrop. As for the indication area of A to D, if this is regarded as a gathering of small ore bodies, an ore reserve of somewhat sizable size would be expected.

6-2-3 Conclusion and Recommendation

The surveys for this year were conducted on the area that had been selected as an area with high potentialities of occurrence of copper ore deposits and the area where outcrops of chromite had been confirmed and an increase in its reserves was expected.

The surveys consisted of primarily drilling, and in addition geological survey, handy magnet prospecting and geochemical survey over the surroundings of the drilling points.

The purpose of this year's surveys over copper mineral indication areas consisted in confirmation of the indications and finding their size, ore grade and other properties by conducting geophysical prospecting and geochemical survey, drilling and other activities to make comprehensive evaluation of this area and to find the principle for the future prospecting work.

On the other hand, the purpose over the chromite deposits lied in finding the conditions of the mineral occurrence and confirming the indications in the surroundings of outcrops by making a geological survey, trenching, drilling, handy magnetic prospecting and other activities centering on the outcrops.

The conclusion from the results of the surveys in this year is as follows:

1. As for the geology in the survey area, new facts which would lead to a change in the past views were not found because the survey area for this year was limited and also there are few outcrops.

2. The copper mineral indication areas were divided into four, Area I to IV. In Area I, which is located on a fold of the strata of the Mosetse River Gneiss Group, drilling (GSJ–4 and 5) was made for geophysical indications. No copper mineralization was found, with thin layers of pyrite being found in GSJ–5.

In Area II, drilling (GSJ–6) was made to probe a geochemical anomaly. At a result, mineralization of pyrite, chalcopyrite and hematite was found in amphibole schist in the Matsitama Schist and Metasedimentary Group. The mineralization was weak but extensive, and on the surface copper indications were observed near a drilling point.

In Area III, drilling (GSJ–7 to 10) was made for mainly geophysical indications. As a result, only a little chalcopyrite and pyrite were found in GSJ–9. Graphite schist was recognized in GSJ–7 and 10, which indicates a geological condition close to a geological environment bearing Bushman-type deposits accompanied by graphite.

The work in Area IV included drilling (GSJ–11 to 15) made aiming at geochemical and geophysical anomalies in an ara extending from the middle to the west of the area and the drilling (GSJ–16 and 17) made by the side of an old trench on the east side. In the former (in GSJ–14) relatively wide dissemination of pyrite was revealed, and native copper also was found, though in a very small quantity (in GSJ–11).

Geochemical survey was carried out as a continuation of the second year survey over an area of 12 km^2 at the southwest end of the survey area, resulting in the finding that anomalies of Class B, together with anomalies of Class A, extend westward. On the surface too copper indications were confirmed at several places.

On the other hand, as the result of drilling (GSJ–16 and 17) to follow up a mineral indication in a trench made by the A.A.C. group in the southwest of the survey area, the indication was confirmed but the rock was found to be a complication of wearthered rock, intrusive rock and altered rock, not allowing determination of the geology.

The original rock of the altered rock where a mineral indication was observed was considered basalt, and if the mineralization derives from basalt it should be of a small scale.

3. In this year's surveys, the greater part of drilling was intended for the indications detected by the ground geophysical prospecting which was conducted overlapping with anomaly areas picked up by airborne geophysical prospecting, to confirm the real conditions.

As the result, graphite was found in GSJ–4, 7, 10 and 13, which is judged to be the cause of the said indications by the geophysical prospecting. The other anomalies are presumed to be the reflection of the geology such as dikes or the likes or a difference in lithofacies but this cannot be definitely said. No mineral indication was in any of these drill holes, and the geophysical indications are inferred to be attributable to geological units such as strata and faults.

Drilling aiming at geochemical anomalies resulted in finding mineral indications in all the holes, though they were weak.

4. Chromite is considered to be borne in ultrabasic rock in a lenticular or pod-like form. The scale of the ore bodies is 0.5 to 1.0 m in width and 5 to 10 m in length. The ore grade is: 32 to 36% of Cr_2O_3, 17 to 19% of T. Fe, 11 to 13% of Al_2O_3, 11 to 15% of MgO, and 7 to 11% of SiO_2. These small ore bodies are scattered in the ultrabasic rock. The individual ore bodies have no certain strike, making one assume that they have been controlled by the local structure of the country rock, ultrabasic rock.

5. From the above-mentioned results of the surveys, in the copper mineralization area, Area II and the western part of Area IV were considered promising.

As for Area II, the facts that the drilling revealed copper mineralization ranging widely, that there are geochemical anomalies, that copper indications are seen on the surface, and that these are found within the Matsitama Schist and Metasedimentary Group on whose horizon the Matsitama deposits are borne, suggested the following surveys: Geochemical survey on a fine grid pattern centering on GSJ–6 should be made to narrow down the prospecting area, and a horizontal and vertical extent of the mineralization areas should be confirmed by drilling holes about 100 m in depth.

About Area IV, the facts that some anomaly areas were picked up by the geochemical survey, that copper mineral indications were found on the surface too, and that the Matsitama Schist and Metasedimentary Group is distributed there, suggest: Prospecting should be made on these indications by means of drilling holes about 100 m in depth for the purpose of confirming mineral occurrence.

6. As for the chromite deposit area, since the strikes of ore bodies vary and their extension is difficult to presume, the prospecting range should be expanded by making trenching to confirm the size, shape and ore grade of ore bodies, which is to be advanced together with short drilling combined for the purpose.

Table 11 Result of prospecting, Phase III

Area		No. of drill hole	Phase I, II (1979, 1980): Geology	Mineralization	Geochemical anomaly Z_1 score (A, B class)	Air-borne anomaly	Ground follow-up geophysical survey: Conductor	Polarizable	Magnetic association	Probable primary source	Phase III (1981): Geology	Geochem. anomaly Z_1 scores	Magnetic anomaly	Drilling: Rock	Mineralization (m): Copper	Pyrite	Chromite	Gra
Copper area	I	4 5	B B			M-23A M-23A	Bed rock Bed rock	Yes Yes	Yes Yes	Graphite Graphite	amp sch, calcrete, gn mica sch,	Survey not done	Survey not done	mica sch, gn, ls, graph sch, Iuartzite, amp sch		52.60-70.25 (17.65) 38.83-30.85 (0.02)		45.80-49.4 53.70-54.1 14.60-14.7
	II	6	A	Copper showing	A						amp sch, mica sch, qartzite	Survey	Survey not done	Amp sch not done	20.00-101.50 (81.50)			
	III	7 8 9 10	A A A A		B (B) (B)	M-7A M-10, (M-7B) M-7B M-7C	Multiple bed rock Multiple bed rock Bed rock Bed rock	Yes Yes Yes Yes	Yes Yes No No	Graphite Sulf + Graph Sulf + Graph Sulf + Graph	amp sch, mica sch, calcrete, black turf soil covers widely	Survey not done	Survey not done	mica sch, graph sch, dolerite, green sch aplitized basic rock, aplite talc-carb rock, dolerite amp sch, basalt, quartzite, talc-carb rock dolerite, graph sch, mica sch, q sch, green sch.	69.60-75.00 (5.40)	69.60-82.00 (12.40) 70.60-79.00 (8.40)		9.05-25.30 28.90-31.6 40.20-51.5 58.15-81.9 49.35-70.0
	IV-(1)	11 12 13 14 15	A A A A A		 A B	M-4 M-3 M-3	Bed rock Bed rock Bed rock	Yes Yes Yes	No No No	Sulfide Sulfide Sulfide	quartzite, mica sch amp sch, ls, dolerite, floats of green copper in quartzite	At the western part of Area IV-(1) A, B class of anomalies were detected	Survey not done	mica sch, q sch, amp sch, quartzite mica sch, q sch, green sch, q uartzite mica sch, q sch bb sch. q sch, mica sch, q uartzite mica sch	79.35-81.20 (1.85)	79.70-83.40 (3.70) 55.45-87.70 (32.25) 95.10-100.30 (5.20) 54.35-100.00 (45.15)		
	IV-(2)	16 17	A A	Copper occurrence Copper occurrence							quartzite, mica sch, dolerite,	Survey not done	dolerite NW direction	Dolerite, talc-carb, rock, mica sch, apl. sore skarn minerals	41.75-47.50 (5.75) 30.50-34.80 (4.30) 64.00-66.00 (2.00)			
Chrome area		1 2 3 18	B B B B	Chromite occurrence Chromite occurrence Chromite occurrence Chromite occurrence							serp, gn, amp sch 5 deposits, many showings and floats of chromite were found. Each serp body is	Survey not done	Most of serp bodies are less than 30 m, in width. Dolente dykes were catched clearly	Serp, gn serp, chromite, gn serp, gn gn, serp			12.97-13.39 (0.42) 20.45-21.75 (1.30) 23.38-24.10 (0.72) 38.10-38.45 (0.35) 40.10-40.33 (0.23)	

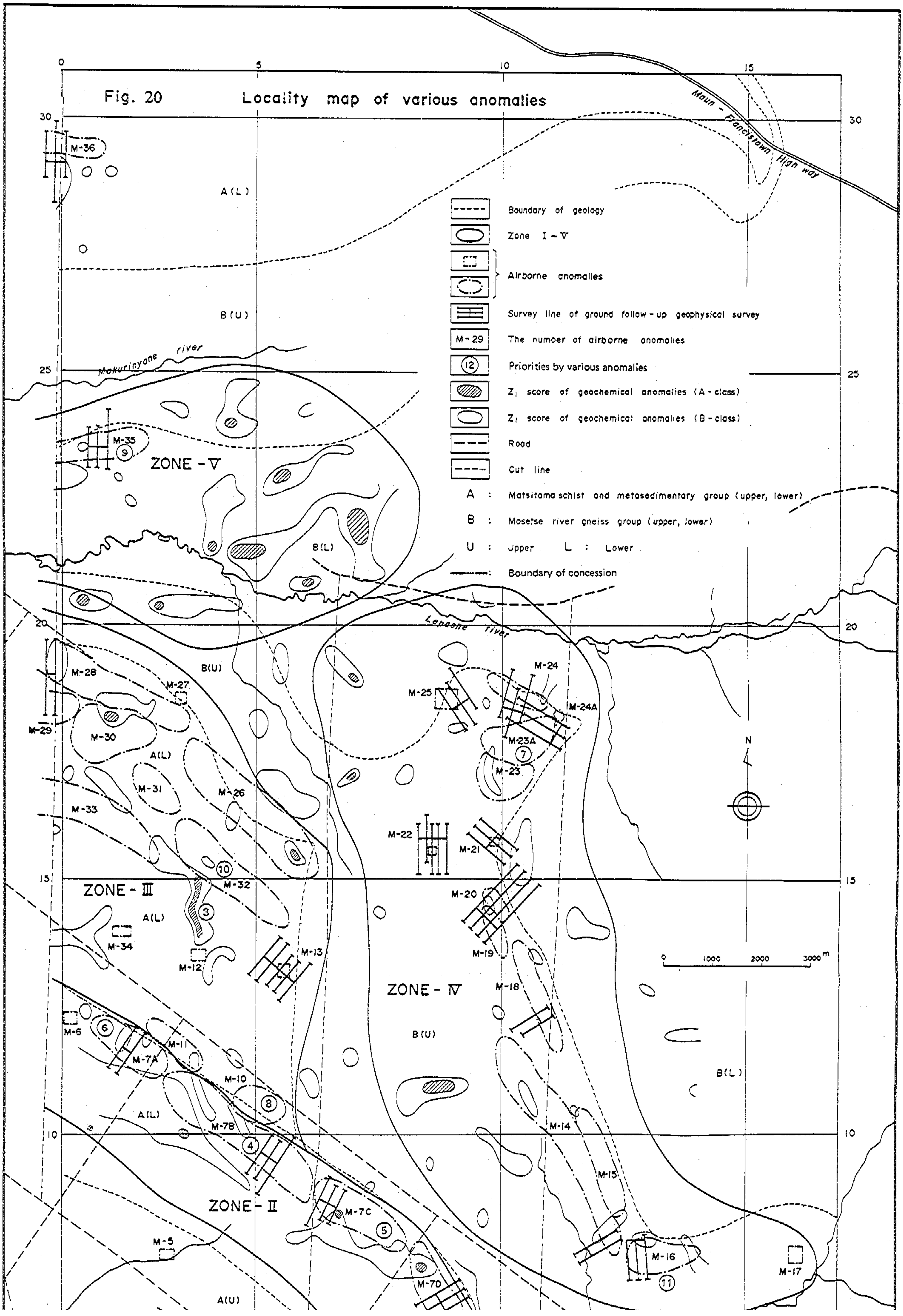
Geology A: Matsitama schist and metasedimentary group

B: Mosetse river gneiss group

Table 11 Result of prospecting, Phase III

	Phase III (1981)												
			Drilling										
				Mineralization (m)					Assay max. %				
	Geochem. anomaly Z, scores	Magnetic anomaly	Rock	Copper	Pyrite	Chromite	Graphite	Note	Cu	Cr_2O_3		Conclusion	Priority for future exploration
	Survey not done	Survey not done	mica sch, gn, ls, groph sch, 1uartzite, amp sch		52.60-70.25 (17.65) 38.83-30.85 (0.02)		45.80-49.45 (3.65) 53.70-54.10 (0.40) 14.60-14.70 (0.10)	Graphite: only a little Graphite: only a little			sulfide (?) graphite (?) ?	No copper mineralization	
	Survey	Survey not done	Amp sch not done	20.00-101.50 (81.50)				Py, Cp, hem: imp. or in q vein	0.228		sulfide	Copper mineralization is weak, but wide. Biggest potentiality for copper deposit.	1
	Survey not done	Survey not done	mica sch, graph sch, dolerite, green sch aplitized basic rock, aplite talc-carb rock, dolerite amp sch. basalt, quartzite, talc-carb rock dolerite, graph sch. mica sch, q sch, green sch.	69.60-75.00 (5.40)	69.60-82.00 (12.40) 70.60-79.00 (8.40)		9.05-25.30 (6.25) 28.90-31.65 (2.75) 40.20-51.50 (11.30) 58.15-81.90 (23.75) 49.35-70.05 (20.70)	Strong aplitization Py.Cp imp. and in q vein py: weak imp.	0.113		graphite ? sulfide (?) graphite	Existence of graphite, though not rich is preferable surroundings for Bushman type copper deposit	3
r	At the western part of Arca IV-(1) A, B class of anomalies were detected	Survey not done	mica sch, q sch, amp sch, quartzite mica sch, q sch, green sch, q uartzite mica sch. q sch bb sch. q sch, mica sch, q uartzite mica sch	79.35-81.20 (1.85)	79.70-83.40 (3.70) 55.45-87.70 (32.25) 95.10-100.30 (5.20) 54.35-100.00 (45.15)			native copper Py: weak imp. Py: weak imp. Py: imp > in q vein	0.022		? ? ? sulfide ?	No copper mineralization except native copper were found, but wide pyritization are observed. Results of geol, geochem, geophy, surveys show suitable environments for copper mineralization. Further explorations ions were preferable for this area	2
	Survey not done	dolerite NW direction	Dolerite, talc-carb, rock, mica sch, apl. sore skarn minerals	41.75-47.50 (5.75) 30.50-34.80 (4.30) 64.00-66.00 (2.00)				Bo, Cc, Cp, malachite	0.172 0.620		sulfide sulfide	Copper mineralization seems to be related with leaching products of basalt and small scale.	
xings e were ly is	Survey not done	Most of serp bodies are less than 30 m, in width. Dolente dykes were catched clearly	Serp, gn serp, chromite, gn serp, gn gn, serp			12.97-13.39 (0.42) 20.45-21.75 (1.30) 23.38-24.10 (0.72) 38.10-38.45 (0.35) 40.10-40.33 (0.23)		massive chromite, with some magnetite		27.30 31.70		Surface scale of unit deposit 20 m x 2 m (max.) Chromite layers by drilling seem to be accessory ones, but not the main ore bodies.	4

Fig. 20 Locality map of various anomalies



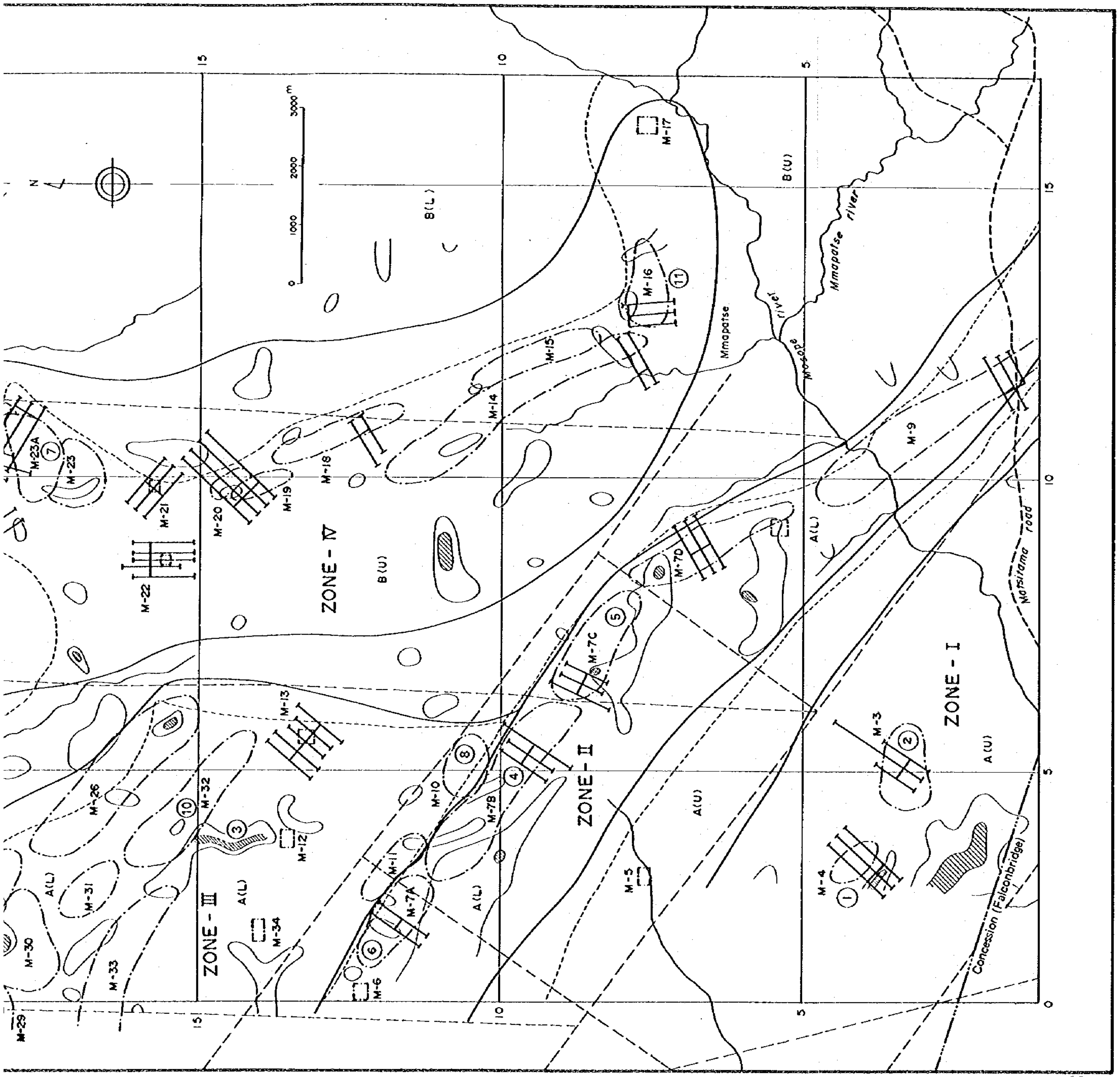
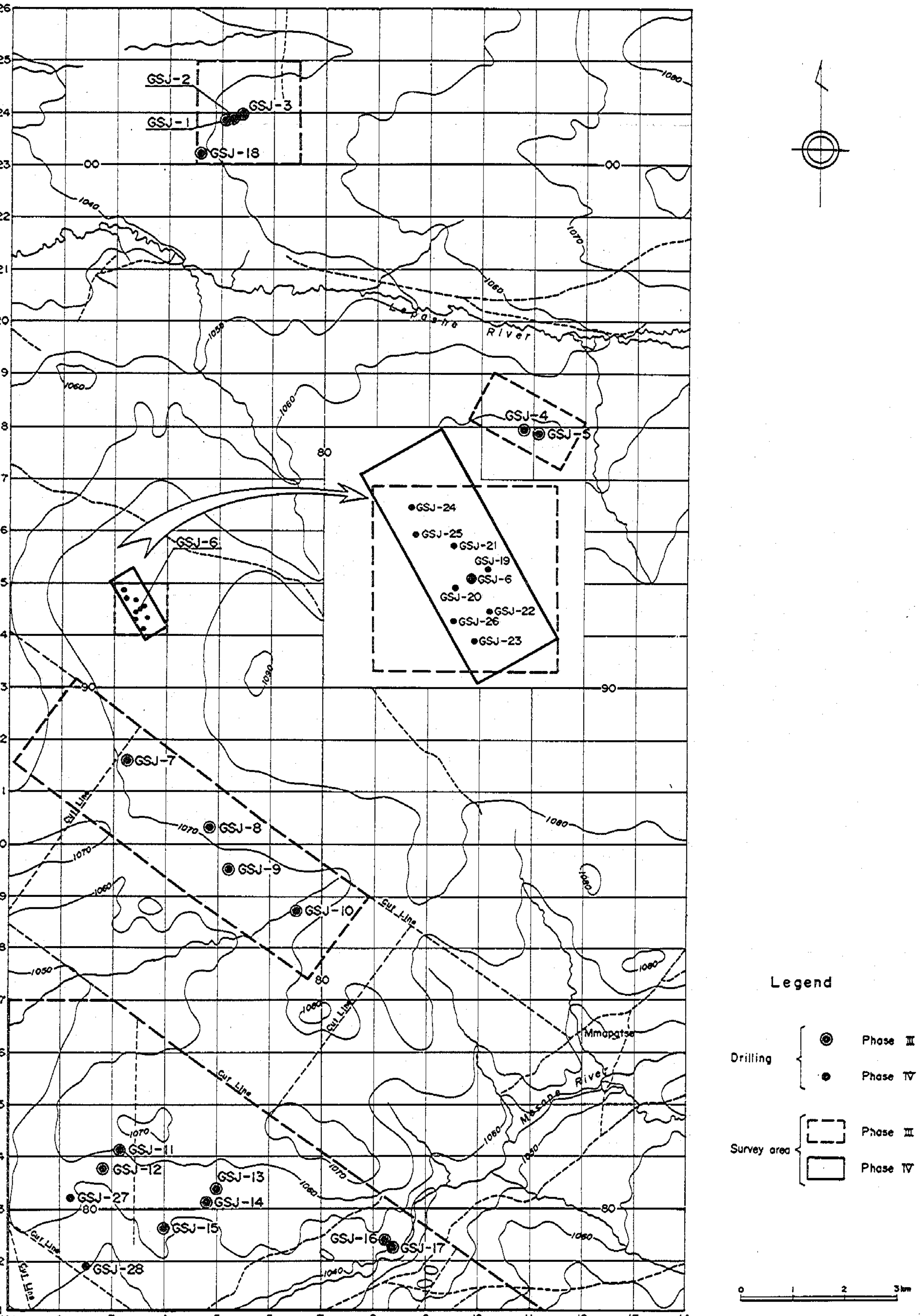

N
0
1000
2000
3000m
ZONE - I
ZONE - II
ZONE - III
ZONE - IV
B(L)
B(U)
A(L)
A(U)
Mmapatse river
Mmapatse
Mosope river
Matsitama road
Concession (Falconbridge)
M-3
M-4
M-5
M-6
M-7A
M-7B
M-7C
M-7D
M-9
M-10
M-11
M-12
M-13
M-14
M-15
M-16
M-17
M-18
M-19
M-20
M-21
M-22
M-23
M-23A
M-26
M-29
M-30
M-31
M-32
M-33
M-34

Table 12 Coordinate of drill hole

Phase III					Phase IV				
Hole No.	Length (m)	Coordinate X	Coordinate Y	Remarks	Hole No.	Length (m)	Coordinate X	Coordinate Y	Remarks
GSJ– 1	100.20	4.87	22.56	cromite	GSJ–19	150.50	3.58	14.55	
GSJ– 2	100.60	5.06	24.06	area	GSJ–20	150.50	3.44	14.45	
GSJ– 3	100.50	5.83	26.26		GSJ–21	100.40	3.42	14.66	
GSJ– 4	100.20	10.94	17.97		GSJ–22	100.20	3.63	14.33	
GSJ– 5	100.40	11.05	17.90		GSJ–23	150.50	3.56	14.14	
GSJ– 6	101.50	3.56	14.49		GSJ–24	150.50	3.17	14.86	
GSJ– 7	100.20	2.23	11.62		GSJ–25	100.30	3.25	14.70	
GSJ– 8	100.30	4.84	10.33		GSJ–26	100.40	3.42	14.30	
GSJ– 9	100.20	5.24	9.50		GSJ–27	100.05	2.21	3.22	
GSJ–10	101.00	6.50	8.73		GSJ–28	100.05	2.53	1.88	
GSJ–11	100.05	3.34	4.16						
GSJ–12	100.10	2.92	3.75						
GSJ–13	100.30	4.99	3.33						
GSJ–14	100.00	4.80	3.05						
GSJ–15	100.20	4.00	2.70						
GSJ–16	100.20	8.31	2.38						
GSJ–17	100.80	8.40	2.31						
GSJ–18	100.20	4.58	23.21	cromite area					
Total	1,806.95	–	–			1,203.40	–	–	
	3,010.35 m								

Fig. 21 Location map of drilling



Chapter VII. SURVEYS IN THE FOURTH YEAR

7-1 Methods of Surveys

Prospecting was made, mainly relying on drilling, of the copper indication areas of A and B, which had been selected on the basis of the results of surveys in the first to third years.

7-1-1 Geochemical Survey

The area covered by geochemical survey was an area of 1.3 km by 0.5 km centering on GSJ–6 where a copper indication was found in the third year survey. This survey was made to know the extent of the mineral indication prior to drilling and also to use the result as material for deciding the drilling positions.

The sampling was made on a grid pattern with 50 m spacing collecting a total of 297 samples. The indicative elements were Cu and Zn, and an analytical research by the mono-variant analysis was carried out (Fig. 22).

7-1-2 Drilling

Area A: This is an area of 1.3 km by 0.5 km centering on GSJ–6; in this area amphibole schist belonging in the Matsitama Schist and Metasedimentary Group and partly quartz schist are distributed. Out of outcrops that can be seen in a very small number, a small outcrop of amphibole schist lying in the northwest corner of this area has a strike of N45°W and a dip of 45°S, and is accompanied by a very small quantity of green copper.

The result of geochemical survey showed copper anomaly distributed in a clear belt shape, out of which an anomaly of Class A extends in the northern half. GSJ–6 was drilled aiming at a strong geochemical anomaly in the third year program, and resulted in confirmation of a copper indication extending to its depth, through low in content.

In the fourth year program, eight holes, four with a 100 m length and remaining four with a 150 m length, were drilled centering on this copper indication to confirm its size and grade.

Area B: The Matsitama Schist and Metasedimentary Group is distributed here. Since on the surface floats of copper-containing rock had been found at several places, the highest values of geochemical anomaly in the area had been found here, and this as not for from the Matsitama deposit group, there was the hope of occurrence of deposits.

In the fourth year one drill hole with a 100 m length was made for each of the two anomalies that had been picked up by the third year geochemical survey.

7-2 Results of Surveys

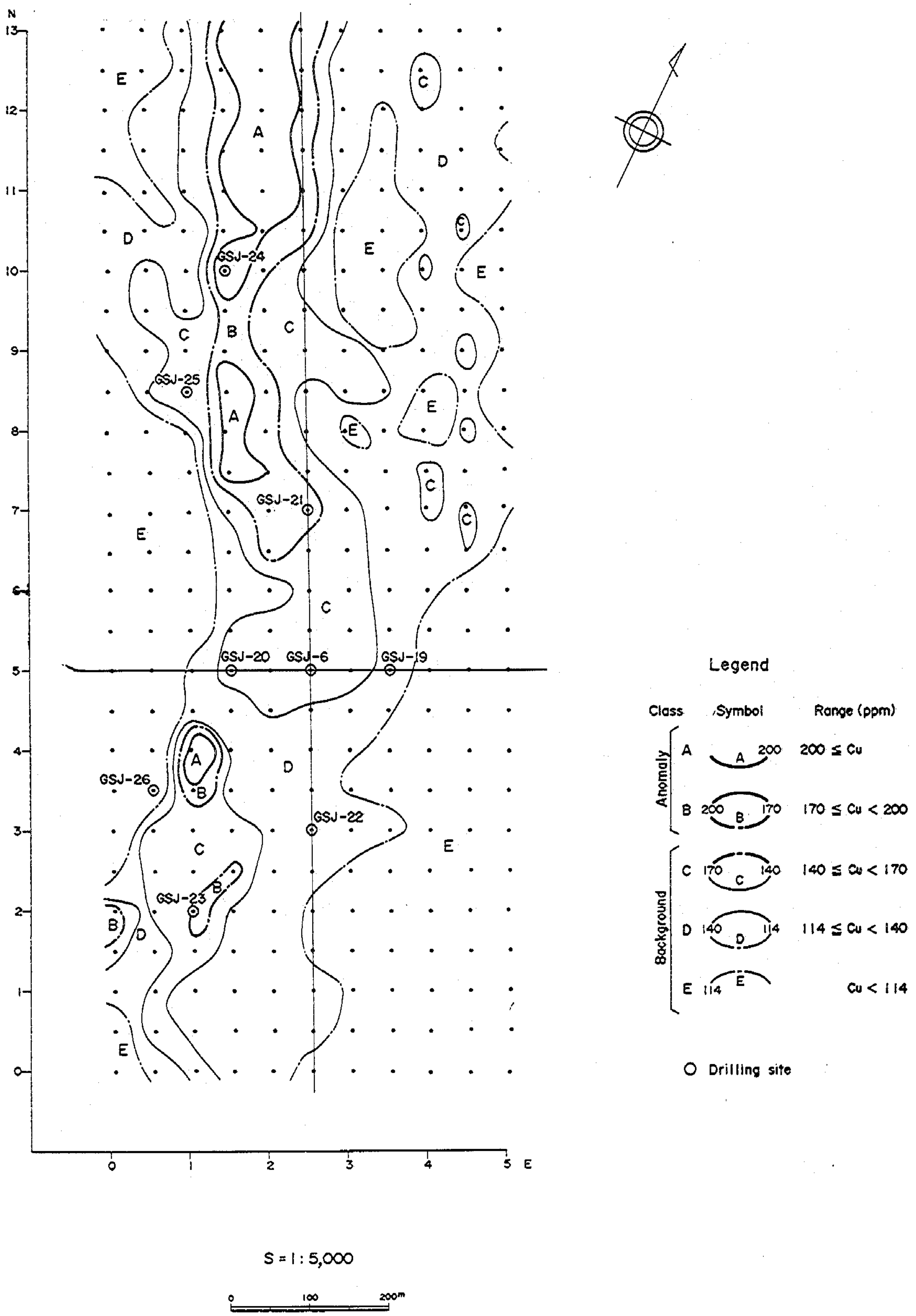
7-2-1 Results of Surveys

Area A: As the result of the geochemical survey a clearly belt-shaped copper anomaly was picked up. Geological structure of this area is in the direction of NW–SE, and the same direction is taken by the geochemical anomalies. All the holes drilled for these anomalies indicated mineral indication. The fact that, though the content of copper was low as a whole with the content of copper 0.1% or over being seen sporodically and almost all the contents of lead and zinc were 0.01%, areas with geochemical anomaly showed mineral indications to some extent indicates that this area of A practically coincides with the deposit-bearing horizon.

With regard to the mutual relations between the drill holes, however, almost all of them showed the same rock and mineral indication. Accordingly, correlation of lithofacies or parts of mineral indication was made impossible, so that the survey team was unable to learn detailed geological structure and the characteristics of deposits.

Area B: Out of two drill holes, one encountered a dolerite dike; almost all the strata were missed, and no mineral indication was found. In the other one, two this layers of limestone in mica schist were confirmed, and in one of them dissemination of chalcopyrite, though slight, was recognized. Since the geochemical anomaly of this area is a little weaker than that of Area A, the anomaly area was unable to be narrowed down enough because it was a semi-detailed prospecting, and only two holes were drilled, it was unable to concentrate a promising area.

Fig. 22 Cu content distribution map



7-2-2 Conclusion and Recommendation

In the fourth year, on the basis of the result of the surveys in the first to third years, surveys were conducted, primarily depending on drilling, on the vicinity of GSJ–6 that had been selected as a highly promising area for occurrence of copper deposits (Area A) and on an anomaly area that had been picked up by geochemical survey (Area B).

As for Area A, mineral indications confirmed by drilling was weak in all the drill holes, and no indication that could justify mining operation was unable to be found. However, the fact that the geochemical anomaly area presents distribution concordant with the strata indicates that this coincides with a deposit bearing horizon. Also this anomaly area shows higher anomaly values on the northwest side, and also tends to extend further northwest ward.

This area falls in a part of anomaly areas that were picked up in the second year survey program. So that for the future it is desired that the scope of exploration be extended so that this anomaly area is covered, and that for anomaly areas that are picked up by a detailed geochemical prospecting, mineral indications be confirmed through drilling holes about 100 m in depth.

In Area B, since the number of drilled holes was too few and on top of that one drill hole encountered dolerite, the geology and the conditions of mineral indication were not able to be adequately known, and no clear promising area was concentrated. However, it suggests the possibility of this area bearing a Matsitama-type deposit that this area is equipped with geological conditions similar to those of Matsitama deposits and also copper indication was found, though slightly, in the findings from dirlling.

Since the geochemical anomaly of this area tends to extend further westward, for the future it is desired that the extent of exploration be expanded westward and anomalies be picked up by a detailed geochemical survey, confirming mineral indications through short drilling.

Chapter VIII. CONCLUSION AND RECOMMENDATION

This technical cooperation project undertaken by the Japanese Government has come to an end in the 1982 fiscal year. In the event of the Botswanan Government continuing exploratory work, the undermentioned steps are recommended for the mineral indication areas that have been brought to light by the past four years' surveys.

8-1 Methods of Surveys and the Results

(1) Since the survey area was as large as 5,300 km^2 and is covered with the Kalahari sediment of the Cenozolic, showing very few outcrops, the survey work depended on the method that geochemical survey was principally used, with geophysical prospecting and geological survey combinedly used, and that the scope of exploration was narrowed down by stages, mineral indications being finally confirmed by drilling.

(2) In the first year the geology, geological structure and geological history of the survey area were revealed through geological survey and geochemical survey on the whole area, and all mineral indication areas were studied; as the result an 800 km^2 area in the northern Matsitama area was picked up.

(3) In the second year geological survey and airborne geophysical prospecting were made over this area, thereby picking up an area of 230 km^2. As a result of conducting ground geophysical prospecting and geochemical survey to find more detailed conditions of mineralization of this 230 km^2 area, four copper anomaly areas (53 km^2) and one area (4 km^2) of chromite were picked up.

(4) In the third year, over these picked-up areas geological survey and drilling survey of 18 holes with the total length of 1,806.95 m to reveal underground conditions, were conducted. These surveys produced the result of picking up, as the survey areas for the next year, two areas (Area A and Area B) where copper indication were found through the geological survey and drilling survey.

(5) The fourth year program comprised geochemical survey and drilling survey of 10 holes totaling 1,203.40 m, for the purpose of confirming the conditions and scale

of the mineralization. As the result, in Area A copper indication was confirmed in all the drill holes, though the copper content was low (0.442% at maximum but not more than 0.01% in almost all the holes).

8-2 Conclusion and Evaluation

(1) Geochemical survey and airborne geophysical prospecting proved effective in picking up promising areas in this survey area.

(2) Starting with an area of 5,300 km^2 which shows scarcely any outcrops and is a semi-desert, various kinds of surveys were carried out, and the area was narrowed down to an area of 1.3 km x 0.5 km in the northern Matsitama area as a zone where copper indication is expected.

(3) In the anomaly areas found by a detailed geochemical survey in the promising zones, copper indication was confirmed, though copper content was low, by the drilling survey; It is considered a sedimentary copper deposit along a specific horizon from the conditions of its occurrence; so the possibility is supported that a Matsitama-type metasedimentary copper indication occurs in a zone including these areas.

Also the said areas form a part of the anomaly areas that were picked up by a semi-detailed geochemical survey and the anomaly areas found by a detailed geochemical survey over these areas tend to extend further in the northwest direction. Accordingly, the plan considered for the future would be to follow up the mineral indication by means of detailed geochemical survey and drilling in the above-mentioned anomaly areas found by the semi-detailed geochemical survey.

(4) Exploration of the chromite indication by trenching and drilling resulted in confirming that small lenticular ore bodies, each 5 to 10 m in length and 0.5 to 1 m in thickness, are scattered in ultrabasic rock, and in obtaining general characteristics of them. However, there still remain some leeway for exploration, and the steps considered for the future would be to expand the scope of prospecting while confirming ore bodies by drilling along them or making short drilling because the scale of the ore bodies is small.

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Apex.-1 CORE LOG S = 1 / 200

Legend

- quartzite
- quartz schist
- black schist, muscovite schist, biotite schist
- biotite schist (porphyroblastic)
- graphite schist
- limestone
- amphibole schist
- green schist
- gneiss
- gneiss (porphyroblastic)
- quartz vein
- aplite, pegmatite, granite
- basalt
- dolerite
- altered basic rock
- serpentinite
- talc-carbonate rock
- aplitized basic rock with skarn
- chromite
- <40° dip of schistosity and gneissosity

Abbreviation

q:	quartz	tour:	tourmaline
fs:	feldspar	ta:	talc
mus:	muscovite	carb:	carbonate
bi:	biotite	amp:	amphibole
hb:	hornblende	apl:	aplite
act:	actinolite	kaol:	kaolinite
cpx:	clinopyroxene	cr:	chromite
ep:	epidote	Cp:	chalcopyrite
chl:	chlorite	Py:	pyrite
gt:	garnet	Hm:	hematite

GSJ-1 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Pt g/t) Cr_2O_3 T.Fe Al_2O_3 MgO SiO_2 Pt	Rock name	Alteration	Mineralization	Remarks
		1.20				overburden			brown soil, floats of serpentinite.
10		12.97				serpentinite	serpentinization		same as 13.97-66.00 m
		13.39	S-47	0.42	27.3 22.9 8.7 14.5 11.6 /	chromite		cr	massive chromite
20 30 40 50		50° 44.50 45.20				serpentinite	serpentinization act.bi		serpentinite greyish green - dark green massive - foliated generally rich in magnetite generally strongly serpentinized, talcosed, some carbonated, weakly epidotized. secondary actinolite or/and biotite formation at places 44.50-45.20m, 50.60-51.75m 54.50-55.80m, 56.70-58.60m 59.00-66.00m, 78.95-81.05m 82.65-84.90m bi-mus Granite 58.60-59.00m replacing serpentinite aplite 64.60-64.80m replacing serpentinite

GSJ-1 50–100.20 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Pt g/t) Cr_2O_3 T.Fe Al_2O_3 MgO SiO_2 Pt	Rock name	Alteration	Mineralization	Remarks
60		50.60 51.75 54.50 55.80 56.70 58.60 59.00 64.60 64.80 66.00					serpentinization act.bi ep bi tour bi act. bi		
70		45° 60° 71.45				hb gneiss			porphyroblastic gneiss granitic composition porphyroblast: fs
80 90 100		73.85 74.25 50° 78.95 81.05 82.65 84.90 86.00 100.20				serpentinite	ep serpentinization ep act.bi ep bi		same as 13.97-66.00 m

GSJ–2 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp No	Width (m)	Assay % (Pt g/t) Cr_2O_3 T.Fe Al_2O_3 MgO SO_2 Pt	Rock name	Alteration	Mineralization	Remarks
		1.20				overburden			light brownish grey soil, calcretized, floats of chr
10, 20		20.45				serpentinite	serpentinization		serpentinite brownish grey - greenish grey, massive - foliated generally rich in magnetite generally strongly surpentinized, talcosed, subordinately carbonated secondary actinolite or/and biotite formation at places. 43.45-44.50m 86.80-89.50m 96.45-98.20m 100.00-100.60m
		21.75	S-48	1.30	31.7 19.7 11.4 14.1 10.4 0.0	chromite		cr	massive chromite. 2cm at the upper contact, magnetism is strong, while 5cm at the lower contact, it is weak. Middle part has no magnetism.
		23.38				serpentinite	serp		
		24.10	S-49	0.72	30.2 20.0 9.7 13.9 15 0.0	chromite		cr	massive chromite 2cm at upper and lower contact, magnetism is strong, but the rest is non-magnetic
30		38.10				serpentinite	serpentinization		
		38.45	S-50	0.35	26.7 21.9 8.2 14.7 12.3/	chromite		cr	massive chromite magnetism is strong at upper and lower contact, the rest is non-magnetic.
40		40.10			serpentinite	serpentinite	serp		
		40.33	S-51	0.23	17.0 20.0 10.8 19.3 18.0/	chromite		cr	massive chromite
		43.45				serpentinite	serp		
		44.50					bi		
50									

GSJ–2 50–100.60 m

Depth (m)	Core log	Boundary (m) Dip	Samp No	Width (m)	Assay % (Pt g/t) Cr_2O_3 T.Fe Al_2O_3 MgO SO_2 Pt	Rock name	Alteration	Mineralization	Remarks
60, 70, 80		80°, 80°, 55°, 65°, 86.80				hb-bi gneiss			porphyroblastic gneiss granitic composition mafic hb>bi 44.50 - 55.20m 63.20 - 86.80m bi>hb 55.20 - 63.20m 77.45 - 86.80m porphyroblast: fs gneissosity: very clear
		89.50				serpentinite	serp act.bi		
90		65°, 70°, 96.45				bi-hb gneiss			same as 44.50-86.80m bi>hb 89.50-95.10m hb>bi 95.10-96.45m
		98.20				serpentinite	serp act.bi		
100		100.60					bi		

GSJ-3 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Pt g/t) Cr_2O_3 T.Fe Al_2O_3 MgO SiO_2 Pt	Rock name	Alteration	Mineralization	Remarks
		1.20				overburden			brown soil floats of Q, chr
		4.90				serpentinite			brown soil
		5.45				aplite			
10 20		< 35° 20.85				gt-bi-hb gneiss			granitic composition mafic mafic hb > bi > gt fine-coarse grained color index: 10-15% gt: transparent pale brown 0.3-0.5 mm
		23.00 25.00				serpentinite	serpentinization - tion act		
30 40		47.40				serpentinite	serpentinization		peridotite origin serpentinite
50							act		

GSJ-3 50–100.50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Pt g/t) Cr_2O_3 T.Fe Al_2O_3 MgO SiO_2 Pt	Rock name	Alteration	Mineralization	Remarks
		53.80				serpentinite	serpenti-nization		
		54.75 55.20 56.00 56.40 < 40° 57.50				hb gneiss			porphyroblast: feldspar 54.75-55.02m aplite 56.00-56.40m serpentinite
60 70 80		64.75 69.50 79.50 81.45				serpentinite	bi serpentinization act.bi		peridotite origin serpentinite
90		< 55° 92.50				hb-bi gneiss			porphyroblastic gneiss granitic composition bi > hb porphyroblast: fs generally 3-5 mm max. 10 mm gneissosity very clear
100		< 65° 100.50				gneiss			light grey, felsitic composition gneissosity is not clear, it looks like aplite, some thin layers of biotite 98.70-99.00m aplite

GSJ-4 — 0–50 m

Depth (m)	Boundary (m) Dip	Samp. No	Width (m)	Cu	Pb	Zn	Au	Ag	Rock name	Alteration	Mineralization	Remarks
	2.20								overburden			brown soil floats of Q.
10	< 25°								bi-mus schist			light grey very rich in mica schistosity: very clear
	17.60											
	19.00								quartzite			18.60-19.60m some wollastonite
20	19.75 19.80											dark grey q > fs > bi > mus schistosity: very clear porphyroblast pale brown-grey less than 1cm garnet, feldspar
	27.25 27.45 28.60 29.10 29.85											
30	29.90 < 30°								mus-bi schist			q veins: barren
	35.60 35.70 37.40 37.45 39.28 39.42 39.85 39.90											
40	40.35 40.40 < 30°											
	45.80											
	49.45								graphite schist			black amount of grahoite is only a little.
50									bi schist			

GSJ-4 — 50–100.20 m

Depth (m)	Boundary (m) Dip	Samp. No	Width (m)	Cu	Pb	Zn	Au	Ag	Rock name	Alteration	Mineralization	Remarks
	50.40											
	51.25								limestpne			crystalline
	52.60								black schist			black schist-phyllite
	53.70 54.10											white-light grey crystalline. some silicification wollastonite: max. 10 mm 61.50-70.25 m rich in wollastonite
60	< 20°								limestone		py	pyrite parallel-subparallel to bedding 20° (biotite thin layer) 65.40-66.90 m many pyrite layers
	65.40											
	< 20° 66.90	1.50	S-52	0.029	0.004	0.002	/	/				53.70-54.10 m graphite schist
70	70.25											gneiss-schist granitic composition mafic: bi hard,
	75.67 75.72											q veins: barren
	79.80											81.30-81.72m aplitic granite
80	80.10 81.30 81.72								bi gneiss			
90												
	92.75 93.30											
100	100.20											

GSJ-5 | 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		1.70 2.30				overburden			pale brown soil and calcrete.
		3.50 6.10				bi schist			bi > mus. upper part: calcretized schistosity: very clear
		7.30				mus schist			
10		9.85				black schist			
		< 20° 12.85				bi-mus schist			
20 30		14.30 14.60 14.70 15.00 15.90 16.50 < 20° 31.50				limestone		Py	white-light grey crystalline, mainly massive some silicification wollastonite. 18.45-19.00m siliceous ls with wollastonite. 28.40-31.50m rich in wollastonite pyrite layers 30.83-30.85m 14.30-14.60m graphite schist (?) 14.70-15.00m quartzite 15.90-16.50m black schist
		< 15° 35.80				bi-amp schist			bi = hb 1-4 mm
40		< 25° 41.55				hb-bi gneiss			gneiss-schist light grey granitic composition fine grained
		44.75				amp schist			minor folding
50		< 15°							

GSJ-5 | 50–100.40 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
60 70 80		51.30 51.50 54.60 55.40 < 20° < 50° 82.95				bi gneiss			gneiss-schist granitic composition gneissosity (schistosity) very clear. fine-coarse grained several veins-dykes. q veins: barren 2.30-3.50m 51.30-51.50m 54.60-55.40m aplite: 82.95-83.35m 89.20-89.30m 91.10-91.20m granite: 89.45-87.95m 91.60-91.75m 96.70-96.90m 98.10-98.40m
		83.35 < 20° 87.45 87.95				hb-bi gneiss			porphysoblastic gneiss granitic composition porphyroblast: fs
90 100		89.20 89.30 91.10 91.20 91.60 91.75 < 30° 96.70 96.90 98.10 98.40 100.40				bi gneiss			same as 44.75-82.95 m aplite 82.90-89.30m 91.10-91.20m granite 87.45-87.95m 91.60-91.75m 96.70-96.90m 98.10-98.40m

GSJ-6 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu	Pb	Zn	Au	Ag	Rock name	Alteration	Mineralization	Remarks
		1.50								overburden			brown soil floats of Q.
		<55°											dark green generally schistosity is very clear. dip of schistosity 0-30m 55°,30-101.5m 40° from horizontal. some epidote 61.70-62.70m,89.90-92.40m 12.10-12.90m amp schist becomes clayey. some carbonate veinlets 69.10-69.15m,72.30-73.90m Py.Cp.hm > malachite Py.Cp. impregnated > within hm-q veinlets hm-q veinlets with or without Py, Cp. width 0.05-3cm about 50 veinlets generally veinlets are accompanied by Py or/and Cp. generally they are parallel-subparallel to schistosity. Cu content 26.00-29.00m Cu 0.178% 94.00-97.00m Cu 0.228%
10													
		<60°											
20		20.00											
		23.00	S-53	3.00	0.039	0.000	0.007	0.0	0				
		26.00	S-54	3.00	0.046	0000	0.007	0.0	0	amp schist			
		<50° 29.00	S-55	3.00	0.178	0000	0.006	0.0	0			Cp	
30		32.00	S-56	3.00	0.043	0000	0.007	0.0	0				
	Q	33.80 34.50 35.00	S-57	3.00	0.029	0000	0.006	/	/				
		38.00	S-58	3.00	0.041	0.000	0.005	/	/				
40		38.80 39.40 <40° 41.00	S-59	3.00	0.066	0000	0.004	/	/		act.chl		
		44.00	S-60	3.00	0.025	0000	0.004	/	/				
		47.00	S-61	3.00	0.043	0.000	0.006	/	/				
50		50.00	S-62	3.00	0.034	0.000	0.004	0.0	0				

GSJ-6 50–101.50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu	Pb	Zn	Au	Ag	Rock name	Alteration	Mineralization	Remarks
		53.00	S-63	3.00	0.054	0.001	0.005	/	/				
		56.00	S-64	3.00	0050	0.001	0.004	/	/				
		59.00	S-65	3.00	0.023	0.001	0.004	/	/				
60		<40° 61.70	S-66	2.70	0.023	0.001	0.006	/	/				
		63.70	S-67	2.00	0.028	0.001	0.005	/	/				
		66.10	S-68	3.30	0.045	0.002	0.005	/	/				
70		70.00	S-69	3.00	0.029	0.003	0.004	/	/				
		73.00	S-70	3.00	0.037	0.002	0.005	/	/				
		76.00	S-71	3.00	0.045	0.002	0.005	/	/	amp schist			
		79.00	S-72	3.00	0.036	0.002	0.007	/	/				
80		<35° 82.00	S-73	3.00	0.083	0.002	0.006	/	/				
		85.00	S-74	3.00	0.041	0.002	0.006	/	/				
	Q	86.15 86.80 88.00	S-75	3.00	0.073	0.002	0.007	/	/				
90		91.00	S-76	3.00	0.062	0.001	0.007	/	/				
		94.00	S-77	3.00	0.036	0.001	0004	0.0	0				
		97.00	S-78	3.00	0.228	0.001	0.006	/	/			Cp	
100		<40° 101.50	S-79	4.50	0.063	0.001	0.007	/	/				

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au, Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		2.00				overburden			black turf soil floats of Q, schist
		< 40° 9.15				bi-mus schist			up to 5.90m slime slime contains some garnet(?)
10		11.40				black schist			pelitic
		19.05				mus schist			pale purplish schist pelitic, phyllitic
20		< 35° 25.30				graphite schist			same as 58.15-81.90 m
		< 35° 28.90				mus schist			pale purplish schist pelitic, phyllitic
		29.55				graphite schist			graphite (?)
30		30.20				basalt			
		31.65				graphite schist			graphite schist - black schist
		40.20				basalt			fs phenocryst max. 3 cm 28.90-29.55m, 31.65-32.90m weathering, clayish 36.05-36.75 m soft, yellowish green, serpentinization
40		< 25° 45.70 46.45				graphite schist			45.70-46.45m aplite same as 58.15-81.90 m
50									

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au, Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		51.50							51.50-52.50m, 57.30-58.15m chilled margin
		58.15				dolerite			dolerite - microgabbro very fresh
		59.00							
60		59.15							59.00-59.15m quartzite
70		< 40° < 40° 81.90				graphite schist			amount of graphite is only a little abrasived by fingers, then they become dark grey it has weak electric conductivity sometimes, not often. pelitic, it looks like slate
80		< 30° 84.50				mus-bi-amp schist			
		87.65				mus schist			
90		87.70 89.90 90.20 91.10 91.60 93.25				green schist			q veins w=2cm parallel to schistosity
		< 40° 95.65				mus schist			
		96.15				green schist			
		98.65				bi-mus schist			
100		100.20				green schist			

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		1.50 1.80 2.25				overburden			
		5.85				quartzite			fs quartzite or aplite 1.80-2.25 m aplite
		8.30				green schist			green basic rock (basalt?) origin
10		10.20				aplite			white, fs > q
		13.75				green schist			same as 5.85-8.30 m
20		20.70				aplite			white fs > q
		22.35				bi-mus-q schist			basic rock origin (?)
		28.70				aplite			white fs > q
30		29.90				altered basic rock			yellowish green
		< 70° 32.90				amp-bi-q schist			
		39.50				q-schist			pale brown-brownish grey weak magnetism basic rock origin (?) aplitization
40		43.30 43.65 46.50 46.80 48.90				talc-carbonate rock	to carb chl		yellowish and purplish green alteration product from basalt 43.30-43.60m, 46.50-46.80m fs megaphenocryst bearing basalt remains
50						aplitized			49.90-50.20 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		51.00				basalt			basalt with megaphenocryst remains
		55.60 56.30 56.85				basalt	chl sil		darkgrey-black-dark green phenocryst: fs max. 3 cm 55.60-56.30 m aplite
60						aplitized basalt			basalt has been aplitized 50%.
		61.10 61.34 62.00				basalt			61.10-61.34 m granite
70 80 90 100		95.00 96.70 100.30				aplitized basic rock | aplite			reddish pink-greenish grey -green strong aplitization relict of basic rock (basalt?) 5-95% i.e. aplite replaces basic rock 95-5% 95.00-96.70 m bi quartzite or aplite

GSJ-9 0–50 m

Boundary (m) / Dip	Samp No	Width (m)	Assay % (Au, Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
2.00				overburden			brown soil, calcrete, floats of Q.
7.50							greenish yellow-greyish green-grey fine-coarse grained schistosity very clear 20°-50° from horizontal.
7.53							
9.40							
9.45							alteration chlorite, talc-carbonate, epidote, tourmaline
< 20°					chl / ta / corb		chl-talc-carb 2.00-37.90 m talc-carb 64.85-66.45 m, 83.60-84.00 m some epidote 72.00-77.00 m tourmaline 55.15-55.30 m tour-q vein; 72.20-72.40 m tour-fs-q-vein with some ep and py.
< 25°				amp schist			carbonate 5.0-9.0 m veinlet-network
26.90							
26.95							
27.70							
27.80							
29.10							
29.20							q veins width 1-30 cm with or without sulfide
33.95							aplite veins 7.50-7.53 m, 87.40-88.15 m
34.00							
36.05							
36.30							
37.90							
< 30°							
41.85							
42.15							
42.85							
43.15							
46.10							36.20-37.90 m some clay 40.90-43.60 m core is taken as slime
46.20							
48.50							

GSJ-9 50–100.20 m

Boundary (m) / Dip	Samp No	Width (m)	Assay % (Au, Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
< 50°				bi-q schist			
52.25							
55.15				amp schist	tour		mineralization 69.50-82.00 m Py > Cp impregnation > within q vein. cu content 69.60-75.00 m cu: 0.113%
55.30							
< 20°							
64.85				talc-carbonate rock	ta-carb		
66.45							same as 2.00-64.85 m
69.60							
72.00	S-80	5.40	0.113 0.000 0.006 / /	amp schist	ep tour	Cp Py	
73.10							
74.80							
75.00							
77.00	S-81	7.00	0.059 / / / /				
82.00							
83.60					ta-carb		
84.00							
84.70				basalt			phenocryst fs max 7 mm
87.40				amp schist			
88.15				aplite			
90.50				basalt			phenocryst: fs max 7 mm
91.80				quartzite			with some fs (aplite?)
< 50°				amp schist			
100.20							

GSJ-10 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		1.85				overburden			black turf
10		12.00				bi schist			core is taken as slime fs. Q >> bi > gt (?)
20 30		12.25 12.70 13.00 20.90 21.50 23.10 23.35 23.60 23.85 24.65 24.80 31.30 31.50 39.95				dolerite	chl | to | carb		yellowish grey medium grained chilled margin 12.20-16.50m, 38.10-39.95m composed of fs. cpx, mt as main primary minerals. without megaphenocryst of fs alteration chl, talc, carb weathering many aplite veins white.
40		<40° 44.65				q schist			core is taken as fragment
50		49.35				black schist			schist or black massive slate (?) with small amount of graphite

GSJ-10 50–101 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		52.55				graphite schist			
		53.60				aplite			
60 70		55.40 64.65 65.00 65.55 66.00 68.00 68.25 70.05 70.60				graphite schist			53.60-53.80 m high grade graphite 53.75-53.80 m fixed carbon 66.8% volatile material 7.3% ash 24.8% 53.60-55.45 m with many q veinlets 55.45-69.75 m core is taken as slime amount of graphite is only a little in slime many aplite veins
80		<60° <40° 79.00 <35° 82.90				green schist	chl | to | carb	Py	pale greenish grey-dark green, generally schistosity is very clear some relict of basic rock remains, i.e., basic rock origin some magnetism, 70.60-79.00 m very weak pyritization
90 100		101.00				dolerite			dark greenish grey dolerite-microgabbro without megaphenocryst of fs. medium-strong magnetism.

GSJ-11 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Cu	Pb	Zn	Au	Ag	Rock name	Alteration	Mineralization	Remarks
		1.50								overburden			
10	q	9.40 10.00 13.80								mus-bi schist			1.50-5.00 m core is taken as slime bi > mus amount of mica changes by places. schistosity: very clear q vein: barren
20 30	q	< 30° 27.10 27.20 35.00								mus-bi-q schist			schistosity: very clear q vein: barren
40		< 25° 47.10								mus-bi schist			
50		< 20° 49.05								quartzite			fs quartzite with some mus >> bi

GSJ-11 50–100.05 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Cu	Pb	Zn	Au	Ag	Rock name	Alteration	Mineralization	Remarks
	q	51.45 51.50 53.65								mus-bi schist			schistosity: very clear q vein: barren
60 70	q q	56.70 56.95 < 25° 69.95 70.05 < 35° 73.80								mus-bi-q schist			55.65-60.95 m coarse grained q veins: barren
	q q	73.95 75.35 75.65 79.35	S-82	5.40	0.006	0.000	0.007	/	/	amp schist			coarse grained some ep a little gt 79.35-81.20 m native copper along crack Cu: 0.022%
80		< 40° 81.20	S-83	1.85	0.022	/	/	0.0	0			native cu	
	q	81.50	S-84	1.05	0.050	/	/	/	/				
90	q	82.25 82.45 87.30 87.65 < 20° 97.35								mus-bi-q schist	kaol		85.90-86.00m sericite rich 87.30-87.65m sericite schist with some kaolinite
100		100.05								quartzite			fs quartzite

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		1.20				overburden			calcretized soil
		6.20				mus-q schist			5.20-5.40m bi schist
10		13.75				aplite			schist is replaced by aplite but schist remains at places. many q veins.
		<45° 18.20				mus-bi schist			greenish grey with brownish tint schistosity: very clear mus, bi very rich
20		23.30				bi-mus schist			geenish grey 1.20-25.80m, 44.50-63.60m black small dot, graphite (?) amount of it is only a little, but distributes
		25.80				mus quartzite			grey. schistosity not clear
30		<40° 27.60 28.20 29.05 29.25 29.65 29.75 31.90				bi-mus schist			greenish grey aplite veins q vein: barren
		33.20 34.00 <30° 38.70				aplite			white aplite with relict of schist. 33.20-34.00m mus-q schist, grey 36.00-37.20m limonitization after Py
40		44.50				mus-q schist			brownish grey
50		<40° 48.30 48.80							greenish grey q veins: barren

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
60		50.25 50.40 <25° 55.00 55.20 63.60				bi-mus-q schist			
70		<20°				bi-mus green schist			greenish grey mica rich bi > mus > chl, talc (?) basic rock origin (?) 79.70-83.40m strong aplitization very weak pyritization
80		79.70 <25° 83.40						Py	
90									
100		<20° 100.10							

GSJ–13 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au, Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		1.20				overburden			
10		< 20°				bi-mus schist			greyish brown-brownish grey
	q	12.20, 12.30, 13.60, 13.70, 14.30, 14.40							q veins: barren
20		23.40							
	q	23.70, < 40°, 27.50				mus-bi schist			brownish grey
30		37.10				bi-mus schist			pale brownish grey
40		< 35°, 43.60				mus-bi schist			pale brownish grey
		46.20				mus-bi-q schist			light grey
		49.30				mus-bi schist			brownish grey
50									

GSJ–13 50–100.30 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au, Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		< 25°, 55.45				bi-mus-q schist			light grey
60	q	56.80, 56.85				mus schist			light grey-dark grey weak pyritization. very small amount of graphite (?) exist. amount of pyrite is only a little.
70		< 20°						Py	
80		< 25°, 87.70							
90		88.65, 89.20, 94.90				bi-hb schist			greenish grey 88.65-89.20m bi schist
100	q	95.10, < 30°, 100.30				mus-bi schist		Py	dark grey weak pyritization.

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		1.50				overburden			q rich
		3.50				aplite			white
		<30°				mus-q schist			brownish grey q >> fs >>> bi schistosity: very clear
10									
		17.30							
20						bi-mus-q schist			brownish grey with greenish tint
		<25°							
30									
		<50°							
		37.15							
40						bi-mus schist			pale greenish grey
		42.40							
		42.50							
	q	42.90							
		43.40							
50		<40°							

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		51.90				bi-mus schist			
	q	52.40							
		54.35							
			S-85	5.35	0.002 0.000 0.002 0.0 0	mus-q schist			light grey 54.35-100.00 m pyrite impregnated >> py bearing q veinlets.
60		60.00							
			S-86	5.00	0.010 / / / /				
		<30°							
		65.00							
			S-87	5.00	0.004 0.000 0.003 / /				
70		70.00							
		70.85				quartzite		Py	light grey q veins: barren 74.70-75.60 m mus-q schist
		72.25							
	q	72.95	S-88	5.00	0.004 / / / /				
		73.50							
	q	73.70							
		75.00							
		75.60							
			S-89	5.00	0.004 0000002 00 0				
		79.25				mus-q schist			greenish grey
80		80.00							
		<25°							
			S-90	5.00	0.002 / / / /				
		84.15				quartzite			light grey
		85.00							
		85.60				bi schist			brownish grey
		87.70	S-91	5.00	0.002 0.000 0.005 / /	quartzite			light grey
90		90.00							
		92.95	S-92	5.00	0.001 / / / /	bi schist			brown very rich in bi
		95.00							
		95.55				mus-q-schist			grey
			S-93	5.00	0.008 0.000 0.003 0.0 0				
		<20°							
100		100.00							

Depth (m)	Core log	Boundary (m) Dip	Samp No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		1.50				overburden			
		<40° 7.00				bi-mus schist			pale greenish grey.
10	q	8.30 8.40 10.30				mus-bi schist			yellowish brown q vein: barren
20 30 40	x x q	<30° 22.15 22.45 23.10 35.70 36.60 <45° 40.80				bi-mus schist			pale greenish grey schistosity: very clear mus >> bi > ep very small black dot are contained widely but its amount is only a little (1.50-100.20m) → graphite (?) q vein: barren 22.15-22.45m aplite 35.70-36.60m mus-bi schist
		42.60				mus-bi schist			
50	x x	43.00 <30°				bi-mus-schist			same as 10.30-40.80m 42.60-43.00m pegmatite

Depth (m)	Core log	Boundary (m) Dip	Samp No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
60	q q	51.60 51.75 56.50 56.60 <35° 61.80				bi-mus schist			q veins: barren
		65.50				mus-bi schist			biotite very rich
70 80 90 100	q q q	65.90 66.00 <25° <40° 93.15 93.65 94.85 95.87 <25° 100.20				bi-mus schist			same as 10.30-40.80m q veins: barren

GSJ–16 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp No	Width (m)	Cu	Pb	Zn	Au	Ag	Rock name	Alteration	Mineralization	Remarks
		1.70								overburden			calcrete
		7.20								calcretized rock			white original rock: unclear. mus. schist (?)
		8.40								pegmatite			
10 20 30 40		41.75								dolerite			dark grey-greenish grey fresh. many steep cracks. composed mainly of fs and transparent cpx by microscopic obserba-tion.
		42.40	S-94	0.65	0.564	0.000	0.004	0.0	/	talc-carbonate rock	talc - carb		dark green, yellowish green, red brown, greasy lustre, chl, talc, carb, ep, diop, some gt, mica Cu mineralization Bo. Cc, Cp, malachite occur as impregnated grains.
		45.00	S-95	2.60	0.162	0.000	0.007	/	/				
		47.50	S-96	2.50	0.103	0.000	0.007	0.0	0				
50		49.70	S-97	2.20	0.172	0.000	0.005	/	/				

Assay % (Au, Ag g/t)

GSJ–16 50–100.20 m

Depth (m)	Core log	Boundary (m) Dip	Samp No	Width (m)	Cu	Pb	Zn	Au	Ag	Rock name	Alteration	Mineralization	Remarks
60 70		55.25 70.50								mus schist	chl ep amp		pale brownish grey q > fs > mus. schistosity: not so clear, rather massive homogenous sandstone origin 49.70-55.25m pale green layers of chl, ep, amp.
80 90		92.20								talc-carbonate rock			this rock is divided into 2 facies. 1) talc-carbonate facies richer in ferromagne-sian minerals than carbonate. same as 41.75-49.70m. 70.50-71.40m 71.75-72.20m 73.25-75.30m 76.50-79.40m 80.50-81.50m 2) carbonate rich facies richer in carbonate than ferromagnesian minerals. red brown, pink, white carbonate: crystalline. 71.40-71.75m 72.20-73.25m 75.30-76.50m 79.40-80,50m 81.50-92.20m minerals in both facies are same, but amount is different.
		99.20								mus schist			same as 49.70-70.50m
		99.05								talc-carb. rock			
		99.65								mus schist			
100		100.20								talc-carb. rock			

Assay % (Au, Ag g/t)

GSJ-17 0-50 m

Boundary (m) Dip	Samp. No	Width (m)	Cu	Pb	Zn	Au	Ag	Rock name	Alteration	Mineralization	Remarks
1.60								overburden			dark brownish grey soil.
23.10								dolerite			dary grey-greenish grey fresh. many steep cracks.
24.35								aplite			basic rock remains (10%)
29.70	S-98	5.35	0.002	0.000	0.007	/	/	aplitized basic rock with skarn	cpx gt		yellowish green altered basic rock some schistosity, along which q, apl veinlets intruded. aplitization
30.50								basalt			phenocryst of fs: 7 mm
32.40	S-99	1.90	0.025	0.000	0.005	/	/	aplitized basic rock with skarn	cpx gt	Cp	pale greenish grey altered basic rock with strong aplitization. skarn mineral: gt, ep. diop. secondary Cu mineral, Cc, Bo, Cp (impregnated) malachite (film) Cu content 32.40-33.40m Cu=0.620% 33.40-34.80m Cu=0.110%
33.40	S-100	1.00	0.620	0.000	0.005	0.0	0				
34.80	S-101	1.40	0.11	0.000	0.003	/	/				
(50)								dolerite			dark grey-greenish grey fresh. many steep cracks.

Depth (m): 10, 20, 30, 40, 50

GSJ-17 50-100.80 m

Boundary (m) Dip	Samp. No	Width (m)	Cu	Pb	Zn	Au	Ag	Rock name	Alteration	Mineralization	Remarks
61.00								dolerite			
64.00								bi-talc-carbonate rock			green-greenish brown greasy. brown banding (biotite) altered products of basic rock (?)
66.00	S-102	2.00	0.021	0.000	0.005	/	/			Py	
74.00								bi schist			greyish brown schistosity: very clear biotite very rich bi-talc-carb alteration is weaker than bi-talc-carbonate rock.
79.20								bi-talc-carbonate rock	bi to carb		same as 61.00-66.00m
84.05								mus-bi schist			brownish grey same as 66.00-74.00m
84.15											q vein: barren
88.00											
92.00								bi-talc-carbonate rock			same as 61.00-66.00m
93.70								mus-bi schist			very pale greenish grey same as 64.00-74.00m
93.90											q veints: barren
97.20											
97.30											
98.50											
98.55											
100.80											

Depth (m): 60, 70, 80, 90, 100

GSJ–18 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp No	Width (m)	Assay % (Au,Ag g/t) Cr_2O_3 T.Fe Al_2O_3 MgO SiO_2 Pt	Rock name	Alteration	Mineralization	Remarks
		1.50				overburden			brown soil, floats of Q, chromite, serpentinite
		3.20				serpentinite			
10, 20, 30		< 30° < 30° < 60° < 70° 34.00				gt-bi-hb gneiss			granitic composition composed of gt, bi, hb, q, fs coarse grained color index: 10-15% gt: transparent pale brown 0.3-0.5 mm
40		< 75° 42.40				gt-bi-hb gneiss			porphyroblastic gneiss granitic composition mafic gt>bi>hb coarse grained porphyroblast: fs
		44.90				aplite			grey
		47.50				gt-bi-hb gneiss			amount of gt is less than above, color index: 30%
50		50.00				serpentinite	Serpentinization		47.50-50.00 m rich in talc 50.00-51.30 m secondary bi, act

GSJ–18 50–100.20 m

Depth (m)	Core log	Boundary (m) Dip	Samp No	Width (m)	Assay % (Au,Ag g/t) Cr_2O_3 T.Fe Al_2O_3 MgO SiO_2 Pt	Rock name	Alteration	Mineralization	Remarks
		< 80° 51.30					ser. act.bi		
60, 70		53.30 53.62 < 50° < 50° 77.80				gt-bi-hb gneiss			same as 3.20-34.00 m 53.30-53.62 m dark green amphibole
80		< 40° 81.25 81.70 89.40 85.30				bi-hb gneiss		Py	dioritic composition color index: 35% 81.25-81.70m, 84.40-85.30m granitic composition 85.30m just contact
90		86.80 92.60 94.75				serpentinite	serpentinization act act		85.30-86.80m, 92.60-94.75m actinolite 86.80-92.60 m talc
100		< 60° 100.20				gt-bi-hb gneiss			same as 3.20-34.00 m

GSJ–19 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
		3.00						overburden			brown soil q small gravel
10		< 40° < 45°									pale yellow ~ pale green weathered dark green, schistosity: clear
20 30		< 40° 35.00						amp schist			27.30 m Hm vein 30.10 m q vein with Cp spots 30.50 m Hm vein
		< 45° 36.70	1	1.70	0.093	0.002	0.004		ep	Cp	35.00 ~ 45.00 m Cu minor spots scattered 37.70 ~ 38.00 m calcareous rock
		39.00	2	2.30	0.077	0.002	0.004		carb		
40 50		< 40°									47.70 m minor Cp veinlet

GSJ–19 50–100 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
60 70		< 30° 73.80						amp schist	ep		53.50m q veinlet with Cp spots 55.00 m Hm vein Cp spot 59.20 m Hm vein Py, Cp spots 65.30 m Hm veinlet 66.20 m Py 67.90 ~ 69.10 m Cp minor spot 73.80 m magnetite spots
		< 10° 77.50						bi - q schist			pale brown
80		80.00									80.00 ~ 95.00 m Py > Cp spots scattered
		< 45° 82.00	3	2.00	0.157	0.002	0.004				
		83.50	4	1.50	0.018	0.003	0.004				
		85.00	5	1.50	0.049	0.002	0.004				
90 100		< 20° < 10°						amp schist		Py Py Cp	88.30 m Cp spot 90.80 ~ 95.70 m q vein with Py, Cp sporadically 98.30 m, 98.80 m, 99.20 m, 99.40 m q vein with Py, Cp spots

Assay % (Au, Ag g/t)

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
		< 30°						amp schist			medium ~ fine grained schistosity: clear
											105.30 m Cp minor spots
											107.80 ~ 109.90 m q vein with Cp spots
110		< 20°									
										Cp	113.70 m Cp minor spots
										Py	119.10, 119.70 m Py scattered
120											
		129.00									
130		132.10						bi - q schist	chl		pale grey schistosity waving
		< 20°									
		136.00								Py	136.00 ~ 138.00 m Py ≫ Cp impregnated
		138.00	6	2.00	0.040	0.001	0.005				
140											140.60 ~ 145.00 m He vein, q vein with Py, Cp sporadically
		< 20°									
150		< 40° 150.50									

GSJ–20 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
		3.00						overburden			grey soil q gravel
											dark green, medium ~ coarse grained
10											
		< 20°						amp schist	ep		13 ~ 20 m epidotization sporadically
20											
30											
		< 10° 34.60									
		34.70						Limestone			crystalline, Cp spots
											38.15, 39.30 m barren q vein
40		40.00							carb		39.90 m Cp small spot
		41.00	7	1.00	0.108	0.001	0.003				40.00 ~ 42.50 m Py, Cp minor spots scattered
		42.00	8	1.00	0.138	0.003	0.003	amp schist		Py Cp	
		< 60° 43.50	9	1.50	0.174	0.004	0.004				
		< 50°									
											48.40 m q vein
50											

GSJ–20 50–100 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
		50.50									
		51.00	10	0.5	0.122	0.004	0.004				
		53.00	11	2.00	0.139	0.004	0.004				50.50 ~ 63.00 m Py, Cu minor spots scattered
		55.00	12	2.00	0.021	0.004	0.004			Py Cp	
		57.00	13	2.00	0.026	0.004	0.004				
		59.50	14	2.50	0.026	0.004	0.004				
60		60.40	15	0.90	0.033	0.004	0.003				
		< 20° 63.00	16	2.60	0.041	0.005	0.003				
								amp schist			
70											
		73.40									73.40 ~ 73.80 m Cp, Py impregnation
		73.90								Cp Py	
		74.10	17	0.90	0.442	0.005	0.006	Limestone			crystalline
		74.30								Cp Py	74.10 ~ 74.20 m Cp, Py impregnation 75.50 ~ 76.00 m minor spots of Cu 76.60 m Cu spots
80											80.50 ~ 87.00 m q veinlet with Py, Cp or small spots of Py, Cp impregnated sporadically
										Cp Py	
90											
								amp schist			92.50 m Hm vein
											95.50 m Cp spots
100											

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
											102.90 ~ 103.10 m Py impregnated 103.30 ~ 105.00 m minor Cp spots
110		110.00									
		111.80	18	1.80	0.092	0.006	0.003		carb	Py Hm	110.10 ~ 111.80 m carbonate rock with Py, Hm ≫ Cp
									carb	Py	113.20 ~ 113.30 m carbonate rock Py impregnated
											116.10 m Hm vein
										Hm Py	119.50 m Hm with Py
120											
								amp schist			
		∠ 30°									
130											
										Cp	131.20 131.70 m q vein with Cp spots
										Cp	134.10 134.90 m q vein with Cp spots
140											
										Cp	143.60 m calcite vein with Cp spots
150		150.50									

GSJ–21 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
								overburden			brown soil
											dark green medium ~ coarse grained
		∠ 45°									
10											
		∠ 35°									
20								amp schist			schistosity: unclear
30										Py	30.20 m q veinlet, Py rich
		∠ 40°									
											35.50 Cp spots
40		40.00									
		43.00	19	3.00	0.061	0.004	0.004		ep		40.00 ~ 71.00 m Py, Cp minor spots scattered q veinlets with Py, Cp
		46.00	20	3.00	0.053	0.004	0.003			Py Cp	
		49.00	21	3.00	0.053	0.002	0.004				
50											

GSJ–21 50–100.40 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
		∠ 45° 52.00	22	3.00	0.050	0.001	0.003				mineralisation: Py, Cp impregnation or within q vein sporadically
		55.00	23	3.00	0.051	0.004	0.004				
		58.00	24	3.00	0.079	0.004	0.004			Py Cp Hm	
60		61.00	25	3.00	0.045	0.004	0.004				
		64.00	26	3.00	0.063	0.002	0.004		ep		
		67.00	27	3.00	0.037	0.001	0.002				
		68.00	28	1.00	0.122	0.001	0.003				
		68.90	29	0.90	0.309	0.001	0.003				S–29: Au: 0.0g/t, Ag: 2g/t
70		71.00	30	2.10	0.034	0.004	0.004	amp schist			
80											
									ep		87.50 ~ 88.20 m epidotization
90		90.60									
		∠ 25° 95.00						q schist			white ~ pinkish grey schistosity: clear
100		100.40						amp schist		Cp Py	97.60 m q veinlet with Cp, Py 99.20 m Cp spots

GSJ-22 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
								overburden			brown soil
		3.80									calcrete
								amp schist			upper part pale green-brown, weathered
10											
20											
30											dark green, coarse grained massive Amphibolite schistosity: unclear
40											39.00 m magnetite scattered
		30°									barren q veinlets scattered
											45.80 m green copper
50									ep		

GSJ-22 50–100.20 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
		53.00						amp schist			
		20° 57.50						bi - q schist			white ~ pale brown schistosity: clear, waving
60								amp schist			dark green massive
70		72.30								Py Cp	70.10 ~ 70.25 m Py, Cp spots
		40° 74.50						bi - q schist	chl		light brown ~ grey schistosity: clear
80								amp schist		Cp Py	78.40 m, 79.60 m q veinlet with Py, Cp spots
										Py	83.50 m, 83.40 m 89.30 m q. veinlet with Py
90		94.10								Py Cp Cp	89.10 m small spots of Cp
		94.50						bi - q schist			pale brown
		96.50						amp schist		He	reddish purple schistosity: waving
		99.40						bi - q schist	chl		pale brown
100		100.20						amp schist		Py	Py magnetite spots

GSJ–23 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
								overburden			brown soil
		3.00									
											upper part brownish grey, weathered
10											
		< 35°									schistosity: clear
		< 50°									
20								amp schist			
		< 35°									
30											
		< 45°									
		< 40°									
40											
		< 35°									
		47.40									47.40 ~ 49.0 Hm vein
		30° < 49.00	31	1.60	0.043	0.004	0.012			Hm Cp	Cp spots scattered Au 0.1g/t, Ag 1g/t
50											

GSJ–23 50–100 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
										Cp Hm Cp	50.20 m q. veinlet with Cp 51.50 m, 51.80 m Hm veinlet 51.90 m Cp spots scattered
		< 40°									
										Py	56.40 m Py spots
60											
		61.00									
		62.00	32	1.00	0.013	0.001	0.003		chl	Py	61.00 ~ 62.00 m q veinlet, Py impregnated
										Cp Cp He	65.10 ~ 65.40 m Cp minor spots impregnated 66.30 m calcite veinlet with Cp spots 68.40 ~ 68.90 m Hm network
70											
								amp schist		Cp	71.90 m Cp spot imp
										Cp	73.60 m q vein with Cp
		< 30°									
										Cp	76.10 ~ 76.50 m Cp minor spots scattered
80		< 80.00									80.00 ~ 99.00 m minor spots of Cp, Py scattered
		82.00	33	2.00	0.068	0.001	0.004				
		85.00	34	3.00	0.048	0.004	0.004				
		88.00	35	3.00	0.039	0.001	0.004			Cp Py	
90		< 45° 91.00	36	3.00	0.035	0.001	0.003				
		94.00	37	3.00	0.041	0.002	0.004				
		97.00	38	3.00	0.034	0.003	0.004				
100											

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
110		110.00									
			39	2.00	0.099	0.001	0.004			Cp ep	110.60 m, 11.40 m, 112.20 m q veinlet with Cp
		112.00									
										ep	
120		< 35°						amp schist			
										Cp	128.70 m q veinlet with Cp spots
130											
										Py	130.30 m Py spots
140											
		143.40								Py Cp	143.40 ~ 144.50 m Py > Cp impregnated
		144.50	40	1.10	0.052	0.001	0.004				
150		150.50									

GSJ-24 　　　0-50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
		3.00						overburden			red soil calcrete
											dark green partly weathered: pale green medium ~ coarse grained
10											
									ep		11.20 m Hm q veinlet 13.50 m ep veinlet
20								amp schist			
		30°									
30											28.70 m Hm vein
		35°									31.40, 31.90 Hm veinlet
											36.50 ~ 37.50 m q veinlets scattered, barren
										Cp	39.50 q veinlet with Cp
40		50°							ep		39.90 ~ 40.00 m Cp spots scattered 40.30 Ep. with Cp
										Cp Py	43.50 ~ 43.60 Py, Cp minor spots
										Cp Py	47.20 ~ 47.30 Py, Cp minor spots
50		35°									

GSJ-24 　　　50-100 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
											dark green, medium ~ coarse grain schistosity: unclear
									ep	Py Cp	52 ~ 54 m small spots of Cp, Py scattered
								amp schist	ep sil	Cp	56.40 ~ 57.50 m 58.30 m qu veinlet with Cp spots
60									ep		59 ~ 63 m epidotization
		65.40									
		45° 67.10						bi - q schist			pale brown q ≫ bi
								amp schist		Cp	67.50 m Cu spots
70		70.00									
		20° 71.00						bi - q schist			pale grey
									ep		72.50 m q vein with Cp
		74.00									74.30 m 74.50 Cp spots
		75.00	41	1.00	0.081	0.001	0.007			Cp	
										Py	76.60 m q vein with Cp, Py
80											
								amp schist		Hm	83.40 m Hm veinlet
										Cp	85.70 m q veinlet with Cp spots
90											
		91.00								Hm Cp	91.60 m Hm vein with Cp spots
		92.50	42	1.50	0.102	0.001	0.004			Py	S-42: Au 0.1g/t Ag 1g/t 93.50 m q veinlet with Cp spots
										Cp	
100										Cp	

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
											106.40 m q. veinlet with Cp spots
											107.90 m Py > Cp spots
110											
											112.90 m Cp spot impregnated
								amp schist			
										Cp	118.20 m, 118.80 m q veinlet with Cp spots
120										Cp	120.30 m q veinlet with Cp
										Cp	122.00 m q veinlet Cp
									ep	Cp	127.30 m Cp spots
130											
140											
										Cp	
									ep		
150		150.50									

GSJ–25 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
		3.00						overburden			red soil, Amp. gravel
											upper part weathered dark green generally coarse, partly fine ~ medium grained schistosity: unclear
10		< 60°									
20		< 40°						amp schist			
		< 45°									
30		< 55°									
40										Cp Hm	40.50 m veinlet with Cp spots 40.80 m calcite veinlet with Hm
									chl		
											47.70 m green Cp 47.90 m q veinlet with Cp spots
50											

GSJ–25 50–100.30 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
										Hm Cp Cp	50.90 m Hm veinlet with Cp 51.60 m q veinlet with Cp
		55.50									
		56.30	43	0.80	0.385	0.001	0.004		carb	Py Cp	55.50 ~ 58.80 m Py, Cp spots scattered S-43: Au 0.2g/t Ag 2g/t
		59.00	44	2.70	0.019	0.001	0.004				
60											
		< 30°									
		66.50									
		68.00	45	1.50	0.021	0.004	0.006			Py Cp	66.50 ~ 69.50 m Py, Cp spots scattered
		69.50	46	1.50	0.018	0.001	0.004	amp schist			
70											
		<									
80											
		< 30°									
90											
		92.00									
		94.00	47	2.00	0.049	0.001	0.004				92.00 ~ 99.50 m small spots of Cp, Py scattered q vein with Cp, Py
		96.00	48	2.00	0.071	0.001	0.004		ep	Hm Py Cp	
		98.00	49	2.00	0.142	0.001	0.004				
		99.30	50	1.30	0.032	0.003	0.003				
100		100.30							ep carb		

GSJ–26 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
		1.70						overburden			red soil
		7.50						amp schist			pale green ~ yellowish grey weathed
10								mus - q schist			grey q ≫ mus generally sericitisation
20		23.50									
		60°						amp schist			pale green ~ yellowish grey, calcite veinlet network schistosity: clear
30											
		35°									
40		40° 40°									lower part: dark green
										ep	45.00 ~ 63.00 m epidotization spots (2~3 mm) scattered
50											

GSJ–26 50–100.40 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
										Cp	dark green fine grained, lower part coarse grained schistosity: unclear, partly clear 56.00 m green Cp
60		45°									
70								amp schist			74.20 m q. veinlet with Py
		45° 45°								Py Cp Hm	76 ~ 80 m Hm q veinlets with small spots of Cu, Py scattered
80		35° 50° 85.80									
		86.00						Limestone		Cp	Chalcopyrite (2 cm X 2 cm)
90		40°						amp schist		Cp Py	90.15 ~ 95.60 m small spots of Cp, Py scattered
100		40° 100.40									98.50 m q vein Py ≫ Cp impregnated 98.90 m Hm thin layer with Cp spots

GSJ–27 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
		3.00						overburden			brown soil
10, 20		40°, 40°, 21.50						bi schist			grey, schistosity: clear, generally weathed; many calcite veinlets appear to be parallel to bedding
30		31.90						dolerite		chl	brownish grey
		40°, 34.50						bi schist			brownish grey
		39.50						dolerite			grey
40		40°, 43.90						bi schist			dark grey pelitic
50								dolerite			grey

GSJ–27 50–100.05 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
		54.00						dolerite	chl		
		40°, 59.00						bi schist			dark grey pelitic
60, 70		76.40						dolerite	chl	Py	drak grey, medium grained; 60 ~ 65 m: hair cracks with minor spots of Py
80, 90, 100		30°, 40°, 40°, 40°, 100.05						bi schist		Py	dark grey; 78.10 m barren q vein (w = 7 cm); schistosity: clear; 88.40 ~ 90.00 m minor spots of Py scattered

GSJ–28 0–50 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Rock name	Alteration	Mineralization	Remarks
								overburden			brown soil q. float
10		15.00						mus · bi · q schist			upper part: dark grey bi schist light grey, massive q ≫ bi ≫ mus
20		60° 24.70						bi schist			dark grey schistosity: clear
		27.50						bi · q schist			light grey schistosity: unclear
30 40 50		40° 45° 40° 30°						bi schist			dark grey ~ grey pelitic, slaty

GSJ–28 50–100.05 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No.	Width (m)	Assay % (Au, Ag g/t) Cu	Zn	Pb	Rock name	Alteration	Mineralization	Remarks
60 70 80		25° 20° 30° 25° 20° 20° 10° 87.90						bi schist			dark grey, slaty schistosity clear partially intercalated with thin bands of q schist
		88.00						Limestone			crystalline, barren
90		30° 97.50						bi schist		Py	weak pyritization
		97.70						Limestone		Cp	crystalline, Cp spots
100		100.05						bi schist			