5-2 Akmola Area

5-2-1 Survey area and scope of work

The Akmola Area is situated in the northern-most part of the Terektinsky Uprift and occupies an area of approximately 9 km^2 bounded by the latitudes of 48° 48′ 10″ and 48° 49′ 00″ N and by the longitudes of 68° 25′ 50″ and 68° 28′ 00″ E. Surface indications of the mineralization are found on a number of small hills surrounded by alluvial plains in the centre of the area. An extensive zone of white alteration, including a number of quartz veins, is outlined in association with the mineralization. A number of old trenches which were excavated apparently for mineral exploration purposes are also located in the alteration zones.

The first year's (1997) campaign of the current project indicated the alteration zone to be very extensive and zoned into quartz sericite and propylite sub zones from its center outwards, and also located a number of associated breccia pipes and dikes. According to this result, it was assumed that a porphyry copper system would be concealed in this area. In the second year's (1998) campaign, detailed geological and geochemical prospecting and by shallow drill holes (71drillholes, average depth:14m) covering the entire zone of alteration-mineralization were carried out. As the results of these survey.

Detailed geological mapping and geochemical survey using 70 short drillholes were carried out in phase II survey. As the results of these surveys, a sizeable area of relatively high molybdenum values in rocks was outlined in the central and northeastern part of the area, partly overprinting the zone of the anomalous area of copper values. Geological mapping also made clear that quartz porphyry stocks intruded into medium grained granite are located in the center of quartz-sericite alteration zone and the stockwork quartz with disseminated pyrite>calcopyrite widely distributed within the quartz porphyry stocks.

These features indicate that porphyry type mineralization may be concealed at a certain depth below surface.

Four diamond core drill holes, MJTA-6, -7, -8 and -9, with the total aggregated length of 1,038m, were placed in Akmola Area during the 3rd Year's Field Campaign.

5-5-2 Geology and alteration

(1) Geology

Terrestrial pyroclastic rocks of early Devonian are extensively developed in Akmola and intruded by granitoids and porphyritic intrusions(Fig. 5-31). The pyroclastic rocks comprise mainly fine grained rhyolite tuff and welded tuff accompanying minor andesite lava, sandstone and shale. Of the intrusions, medium grained granite occupies a large area, more than 10 km long in the east-west and about 2.5 km wide in the north-south, and is intruded by fine grained porphyritic granite stocks, quartz porphyry/porphyritic dacite stocks and dikes and andesite dikes. Most stocks have dimensions in the order of 500m by 200m. These intrusions are collectively grouped into the Karamendin Complex and are believed to range from Devonian to Carboniferous for their intrusion ages.

Lower Devonian System

Distribution of the fine grained rhyolite tuff is most extensive of all the pyroclastic rocks in Akmola. The rhyolite tuff can be distinguished into two varieties, aphanitic and porphyritic. The former variety is creamy colored felsic rocks, often containing very minor plagioclase fragments., and is characterized by development of distinct platy joints. The latter, dark brown to brown in color, varies from rhyolite to dacite in its composition and contains quartz and plagioclase fragments within vitreous matrices.

The andesite lava occurs as lenses interbedded within the rhyolite tuff and is limited in its distribution in the southeastern and southwestern corners of the Akmola exploration area. The shale and sandstone occur as lenses interbedded within the pyroclastic rocks and is limited in their distribution in the southeastern corner of the exploration area. The shale is dark gray to purplish brown in color, hard and flinty, and often tuffaceous. The sandstone is dark gray to dark brown in color, mainly fine to medium grained, and occasionally argillaceous or tuffaceous.

Karamendin Complex

The medium grained biotite-hornblende granite extensively distributes in the center of the Akmola exploration area with a dimension more than 10 km long in the east-west and about 2.5 km wide in the north-south. It intrudes the terrestrial pyroclastic rocks of the lower Devonian system as above explained. The granite, showing pinkish gray color in fresh specimens, comprises such major rock-forming minerals as K-feldspar, plagioclase, quartz, hornblende and biotite in descending order of the amount. Under microscope, most samples of the granite indicate adamellitic compositions containing nearly equal amounts of K-feldspar and plagioclase. However, the number of the samples submitted for the microscopic examination is still insufficient to specify

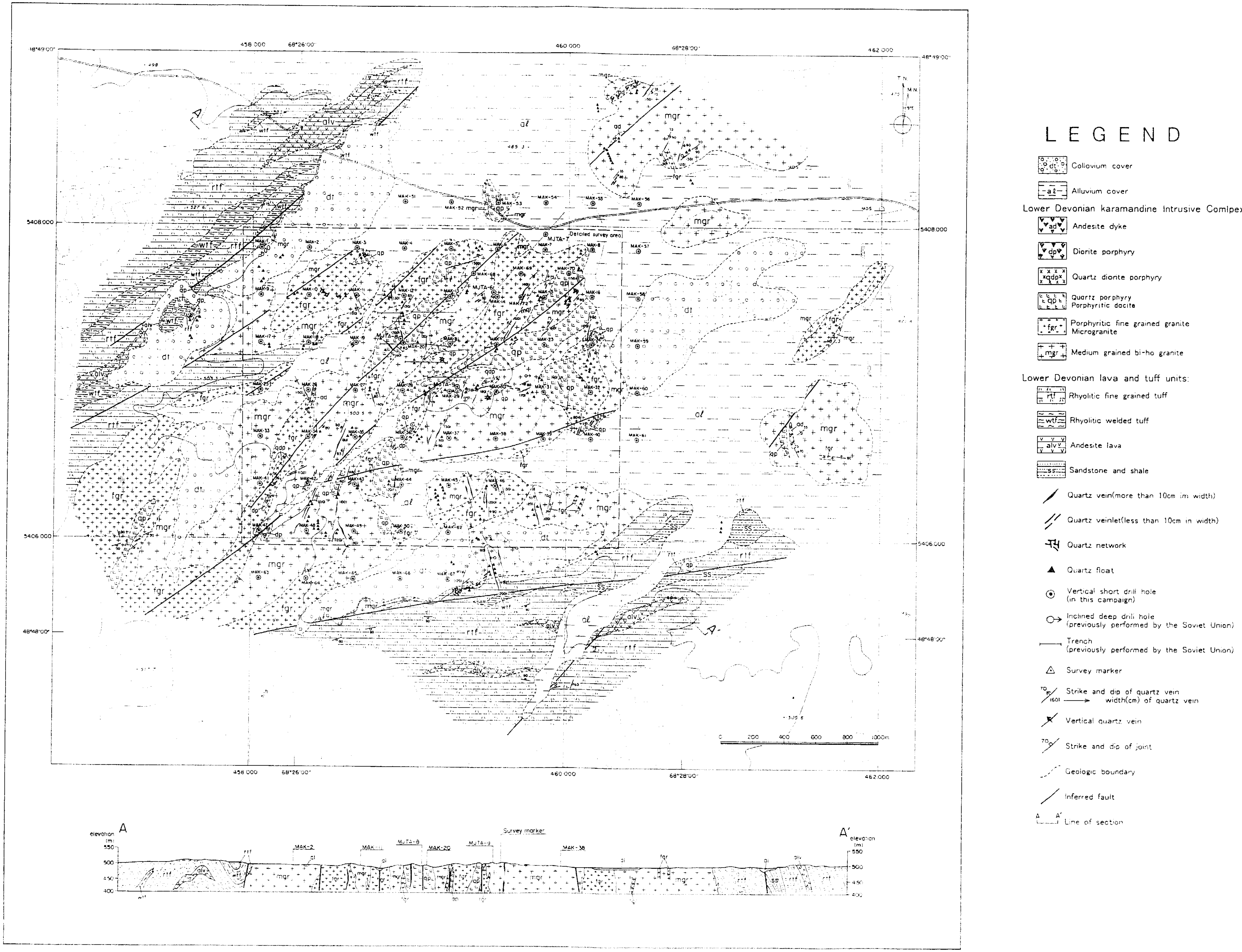


Figure 5-31 Geological Map of the Akmola Area

the composition of the granite as a whole. Therefore, this intrusion is simply called 'granite' or 'medium grained granite' at this stage.

The fine grained porphyritic granite forms several stocks some 700 m long and 200 m wide, elongating in the NE-SW direction. These stocks distribute in the center of the Akmola exploration area, intruding the medium grained granite. Its dikes, several meters in width, are also located in the eastern part. The porphyritic granite, showing pink color, comprises such rock-forming minerals as K-feldspar, plagioclase, quartz, hornblende and biotite, and contains euhedral plagioclase phenocrysts with sizes of about 4 mm within holocrystalline matrices with crystal sizes of 1 to 2 mm.

The quartz porphyry/porphyritic dacite occurs in the center of the Akmola area as stocks and dikes trending in the NE-SW direction. The long axes of the stocks range from 200 to 500 m in length. These stocks intrude the medium grained granite. Their intrusive relation with the porphyritic granite is unclear, although they occur geographically in its close proximity.

The quartz porphyry/porphyritic dacite contains quartz and plagioclase phenocrysts with sizes of 4 to 8 mm within matrices comprising quartz, feldspar and biotite. Hornblende phenocrysts are rarely identified. The amount of phenocrysts varies considerably even within a single intrusive body. Hereunder, the term 'quartz porphyry' is assigned to the porphyry containing a larger amount(30 to 60 volume %) of phenocrysts within relatively coarse grained matrices, and the term 'porphyritic dacite', to that containing less phenocrysts in relatively fine grained matrices. Most stocks and dikes of the quartz/ dacite porphyry are subjected to intense alteration. A unaltered sample, which is collected from a quartz porphyry dike(striking N 20° E, 18 m wide) ,indicates a K-Ar age of 310±6 Ma, which is correlated to early Carboniferous.

The andesite occurs as dikes with widths of 1.5 to 5 m and contains hornblende and pyroxene as major mafic minerals. It is subjected to chloritization and shows dark green color on outcrops. Chloritization is the most prevailing alteration associated with the andesite dikes intersected by the drill holes during the 3rd Year's campaign, although quartz-sericite alteration and pyrite dissemination are also observed in part.

(2) Alteration

According to the field observation, a combined zone of quartz-sericite and argillic alteration is outlined for an area of some 2300 m long north-south and 1600 m wide east-west, enclosing a number of stocks of the porphyritc granite and the quartz porphyry/porphyritic dacite in the center of the Akmola exploration area. Chlorite-epidote alteration is developed in the fine grained rhyolitic tuff and the medium grained granite surrounding the alteration zone. It is interpreted on the basis of the core observation of the 4 holes drilled in the 3rd Year's campaign that the alteration sequence is 1) chlorite-epidote, 2) argillic and 3) quartz-sericite alteration in their advancing order. Alteration zoning of the Akmola area differentiates 4 alteration zones, namely, unaltered, propyritic, argillic and quartz-sericite. The argillic and quartz-sericite alteration zones distribute in an extremely complicated fashion controlled by fracture systems. Minor clay and calcite veins, post-dating the quartz-sericite alteration, are locally developed. Characteristics of each alteration zone are described below.

1) Unaltered –weak altered Zone

Rhyolitic pyroclastics in the southern and northwestern parts are unaltered. Very minor sericite-smectite mixed layer minerals and calcite are occasionally identified by the X-ray diffraction analysis and the microscopic observation of thin sections.

2) Propylitic Alteration Zone

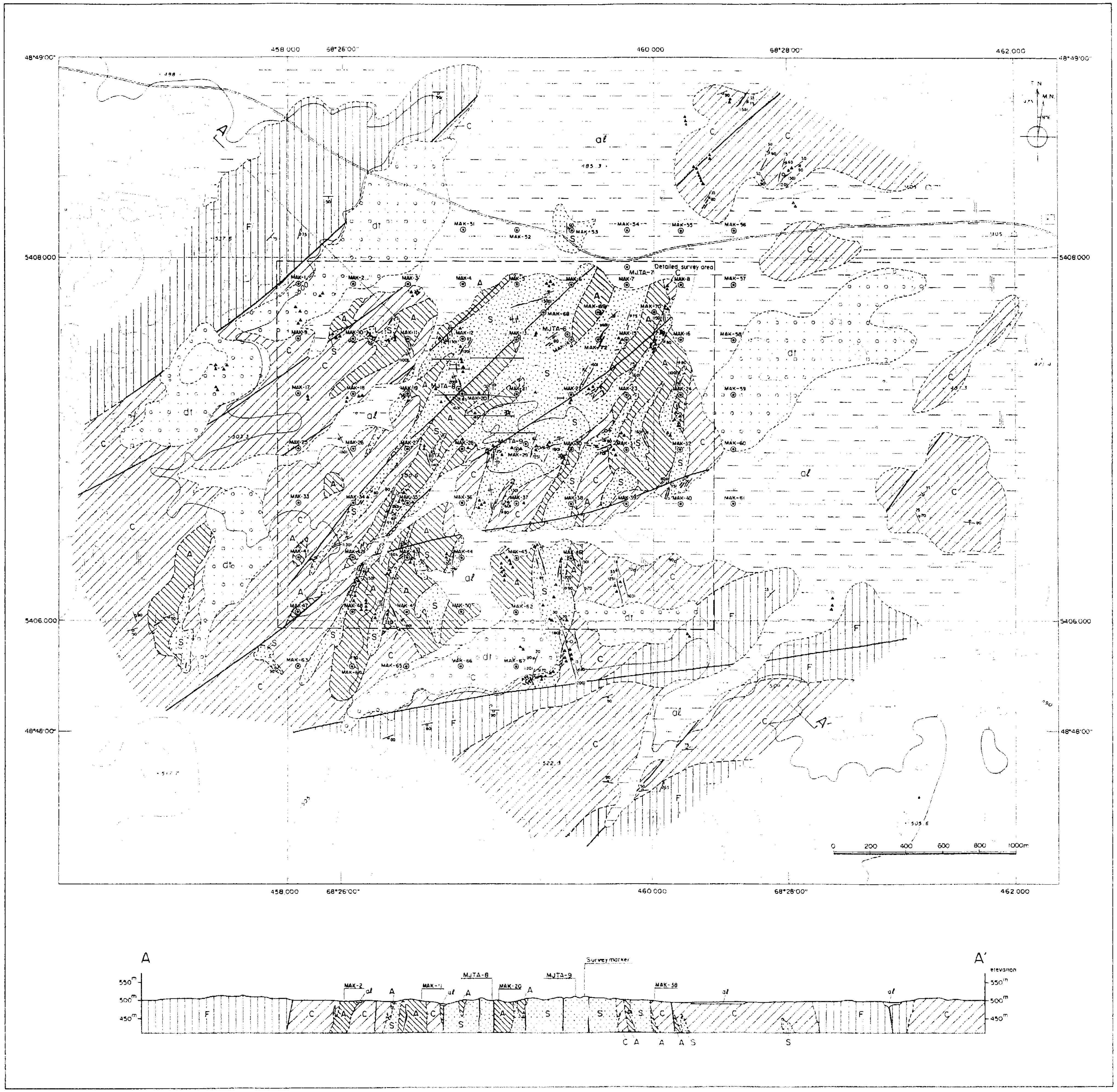
In this alteration zone, biotite, hornblende and occasionally a part of plagioclase are altered to chlorite and/or epidote causing dark green appearance of rocks. According to the result of X-ray diffraction analysis, a large amount of chlorite is commonly contained, accompanied by minor chlorite-smectite mixed layer minerals, sericite-smectite mixed layer minerals, pyrite and calcite. Under microscope, mafic minerals are largely altered to chlorite and partly to epidote, while a part of plagioclase is often altered to sericite.

3) Argillic Alteration Zone

The argillic alteration zone distributes in an area of some 2300 m long north-south and 1600 m wide east-west in the center, inter-fingering with the quartz-sericite alteration zone controlled mostly by the NE-SW fracture system. Alteration minerals identified by the X-ray diffraction analysis are sericite-smectite mixed layer minerals, smectite, kaolinite, chlorite, chlorite-smectite mixed layer minerals, pyrite and calcite. Where the alteration is weak, e.g. in the drill hole, MJTA-7, only chloritization of mafic minerals and argillization of plagioclase are observed, with the original texture of rocks being well preserved. Where the alteration is intense, the original texture is completely obliterated, with development of minor quartz veinlets and sericite.

4) Quartz-Sericite Alteration Zone

This alteration zone overprints the above two alteration zones and distributes in the same extent as of the argillic alteration zone, controlled by the NE-SW fracture system. Rocks subjected to this alteration present white, fine grained appearance, with the orignal rock texture being completely obliterated. The alteration is often accompanied by numerous quartz veinlets and networks as well as abundant pyrite dissemination. It is interpreted, based on the field and drill core observation, that the alteration postdates the propylitic and the argillic alterations and that the NE-SW fracture system has played an important role for its emplacement. Quartz, sericite and pyrite are



LEGEND

- dt — Colluvium cover
- al — Alluvium cover
- S — Phyllic alteration zone with strong silicification
- A — Argillic alteration zone
- C — Propylitic alteration zone
- F — Flesh rocks
- Quartz vein(more than 10cm im width)
- Quartz veinlet(less than 10cm in width)
- Quartz network
- Quartz float
- Vertical short drill hole (in this campaign)
- Inclined deep drill hole (previously performed by the Soviet Union)
- Trench (previously performed by the Soviet Union)
- Survey marker
- 70 (60) Strike and dip of quartz vein → width(cm) of quartz vein
- Vertical quartz vein
- 70 Strike and dip of joint
- Geologic boundary
- Inferred fault
- A A' Line of section

Figure 5-32 Alteration Zoning Map of the Akmola Area characteristically abundant in altered rocks according to the results of X-ray diffraction analysis and microscopic observation of thin sections. It is distinguished from the argillic alteration by its by far intense silicification and lack of sericite-smectite mixed layer minerals. Where the alteration is weak, minor relicts of chlorite and feldspar are occasionally observed.

5-2-3 Rock Geochemical exploration

(1) Method of the survey and analysis

300 meter interval grid were set covering quarz-sericite alteration zone. Rock chip and drill core samples collected on the surface and by shallow drilling was made for 32 elements in order to prepare geochemical maps for selection of exploration targets.

(2) Geochemical Distribution

The analytical results for surface and drill core samples are attached in Appendix.11. Ranges of contents of selected elements are as follows;

Table 5-6 Basic statistics

element	Max.(ppm)	Min.(ppm)	mean(ppm)	standard deviation(ppm)
Au	0.88	<0.01	0.022	0.047
As	143	<3	3.76	7.34
Cu	2,570	1.4	26.2	45.5
Mo	77	<1	4.72	7.08
Pb	1,770	<2	7.2	24.4
Zn	192	<2	16.2	55.9
Ag	2.8	<0.2	0.315	0.299

The characteristics of geochemical distribution for each element are described below.

(i) Au (Figure 5-33)

High gold values ranging from 0.1 to 0.9 g/t are returned from 6 surface and 15 drill core samples, all of which are intensely altered to a degree that their original textures have been completely obliterated. Dissemination of abundant pyrite (non-oxidized) is also one of their common characteristics. High gold values including those for the above samples have been commonly obtained in association with the zones of silicification-sericitization and white argillization that extend from the geochemically mapped area southwestwards.

(ii) As (Figure5-33)

Two clusters of relatively high arsenic values are located in the southern part of the mapped area. A distinct trend of arsenic low, crosscuts the middle of the area in the NW-SE direction and may reflect a certain structural feature.

(iii) Cu (Figure 5-34)

A sizeable area of relatively high copper values is outlined in the northeastern part of the area, overprinting the zones of silicification-sericitization and white argillization. The highest value of 2570 ppm Cu is returned from one of the core samples of MAK-7 at the northeastern corner.

(iv) Mo (Figure 5-34)

A sizeable zone of relatively high molybdenum values is formed by incorporating a distinct high molybdenum cluster in the central north end of the area and a number of smaller clusters distributing southwards. The eastern margin of this zone superimposes over the western margin of the high copper zone. Association of the zones of silicification-sericitization and white argillization with this zone is obvious as the case for the high copper zone. This zone of high molybdenum values appears to be surrounded by the high gold zone.

(v) Pb (Figure 5-35)

Two zones of relatively high lead values are outlined in the northeastern and southeastern parts of the area. The northeastern zone appears to overprint the northern most parts of the high copper and molybdenum zones.

(vi) Zn (Figure 5-35)

A zone of low zinc values, located near the centre of the area, appears to indicate a fair agreement with the zone of relatively high molybdenum values. A couple of clusters of high zinc values are located in the eastern margin of the area, in association with high copper values. None of zinc or lead minerals has been identified in high zinc or lead samples either in handspecimen or under microscope.

(vii) Ba (Figure 5-36)

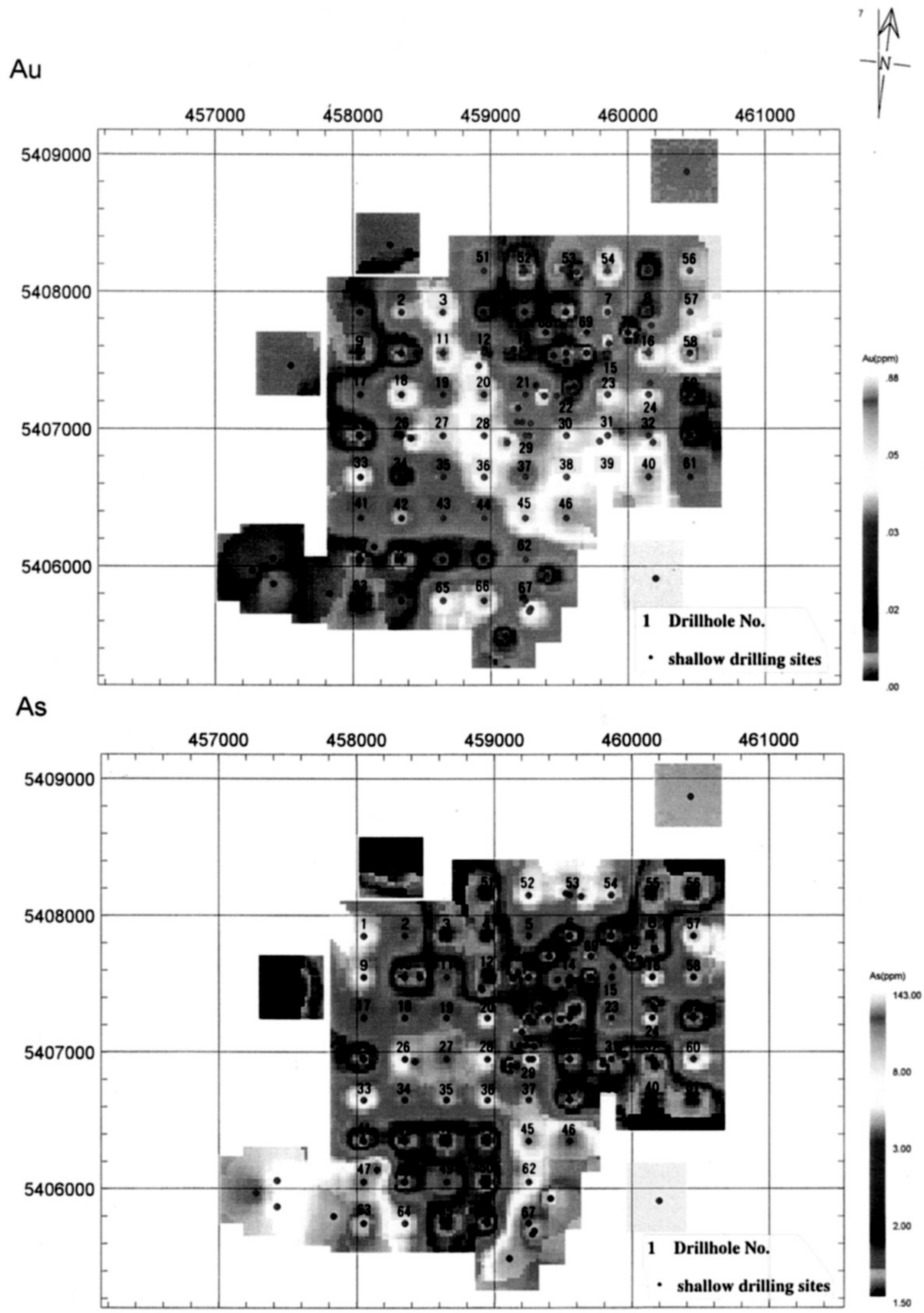
High barium values distribute in a more or less similar fashion as the high zinc values.

(viii) Ag (Figure 5-36)

A zone of high silver values is located in the southeastern corner of the area, partially superimposing over one of the high copper zones.

(ix) Major Elements (K, Na, Ca and Mg, Figure5-37)

These four elements distribute in similar fashions to each other, with their low value cores in the center superimposing over the high molybdenum zone that is



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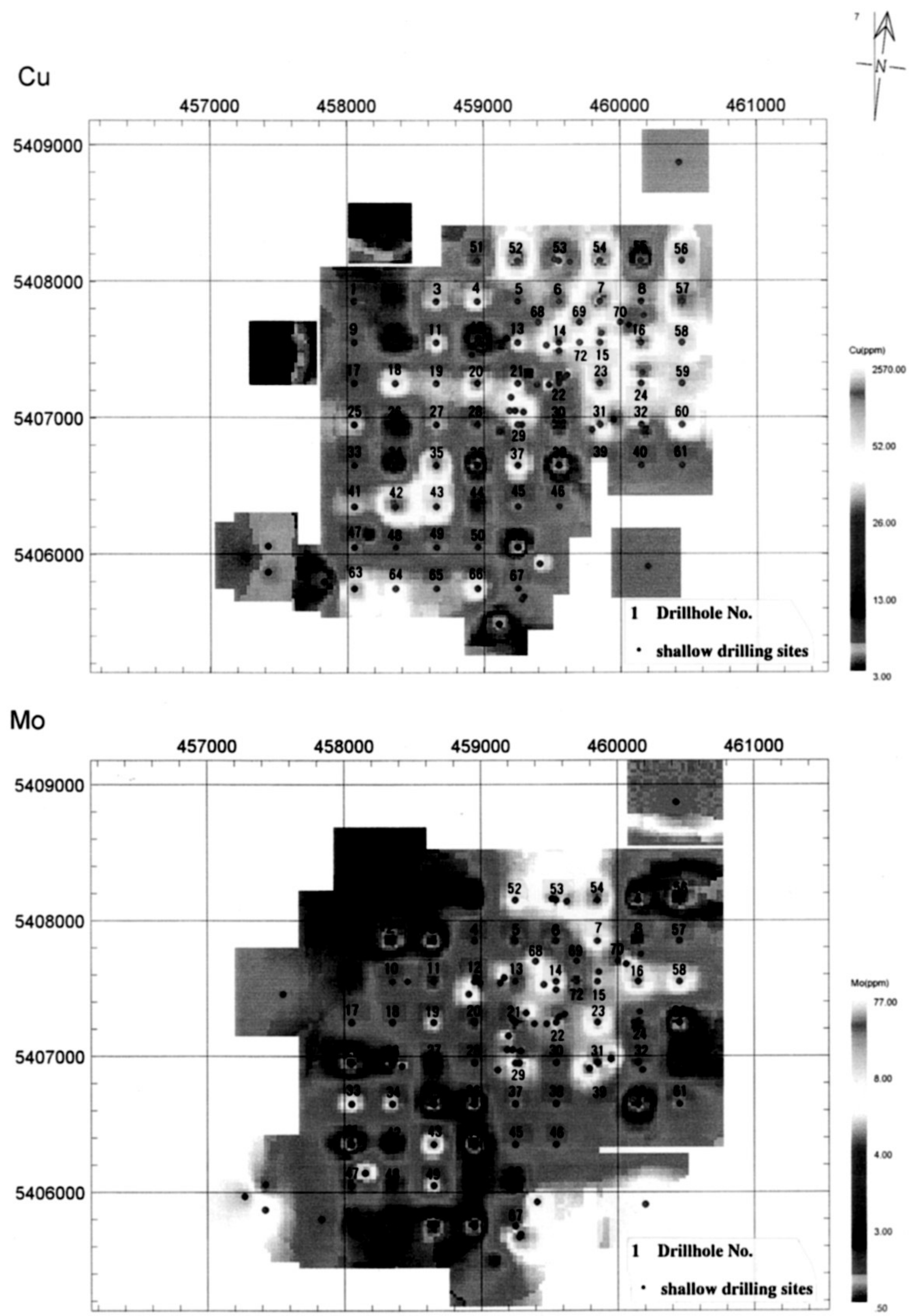
INTERDEX

Akmola Prospect

Rock Chip and Drillcore Assay Results
Gold (upper image) PPM
Arsenic (lower image) PPM

Figure 5-33



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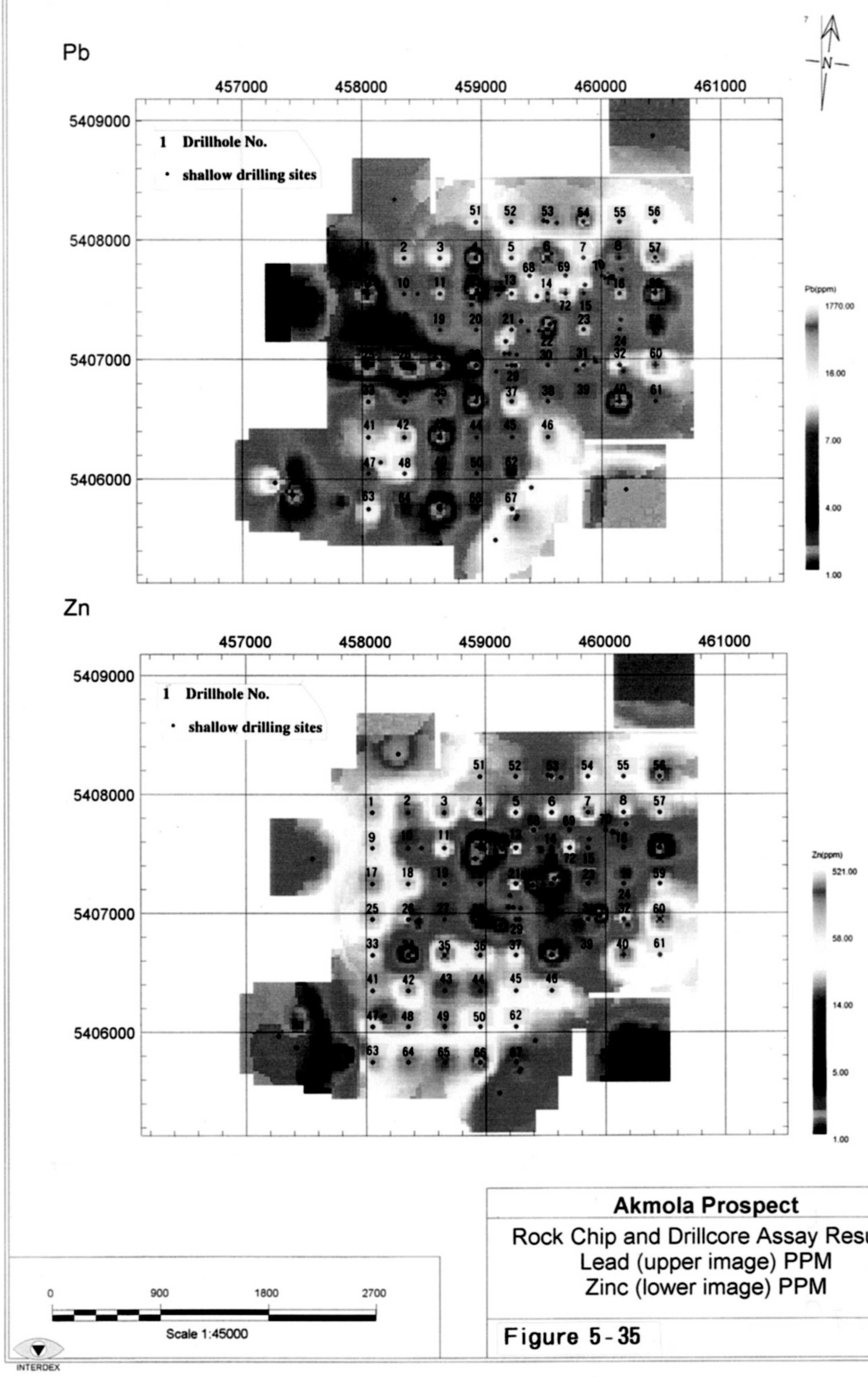
INTERDEX

Akmola Prospect

Rock Chip and Drillcore Assay Results
Copper (upper image) PPM
Molybdenum (lower image) PPM

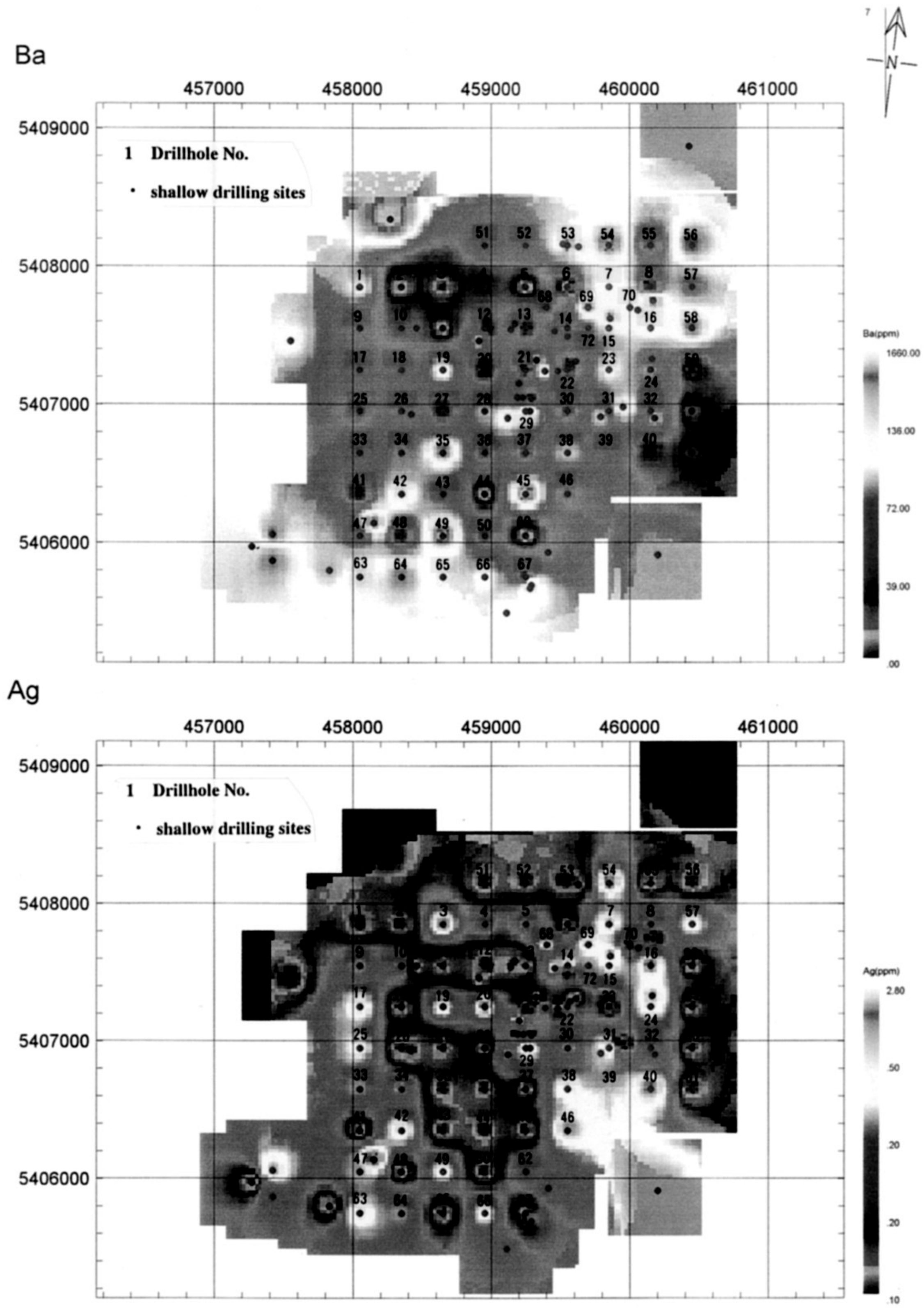
Figure 5-34



Akmola Prospect

Rock Chip and Drillcore Assay Results
Lead (upper image) PPM
Zinc (lower image) PPM

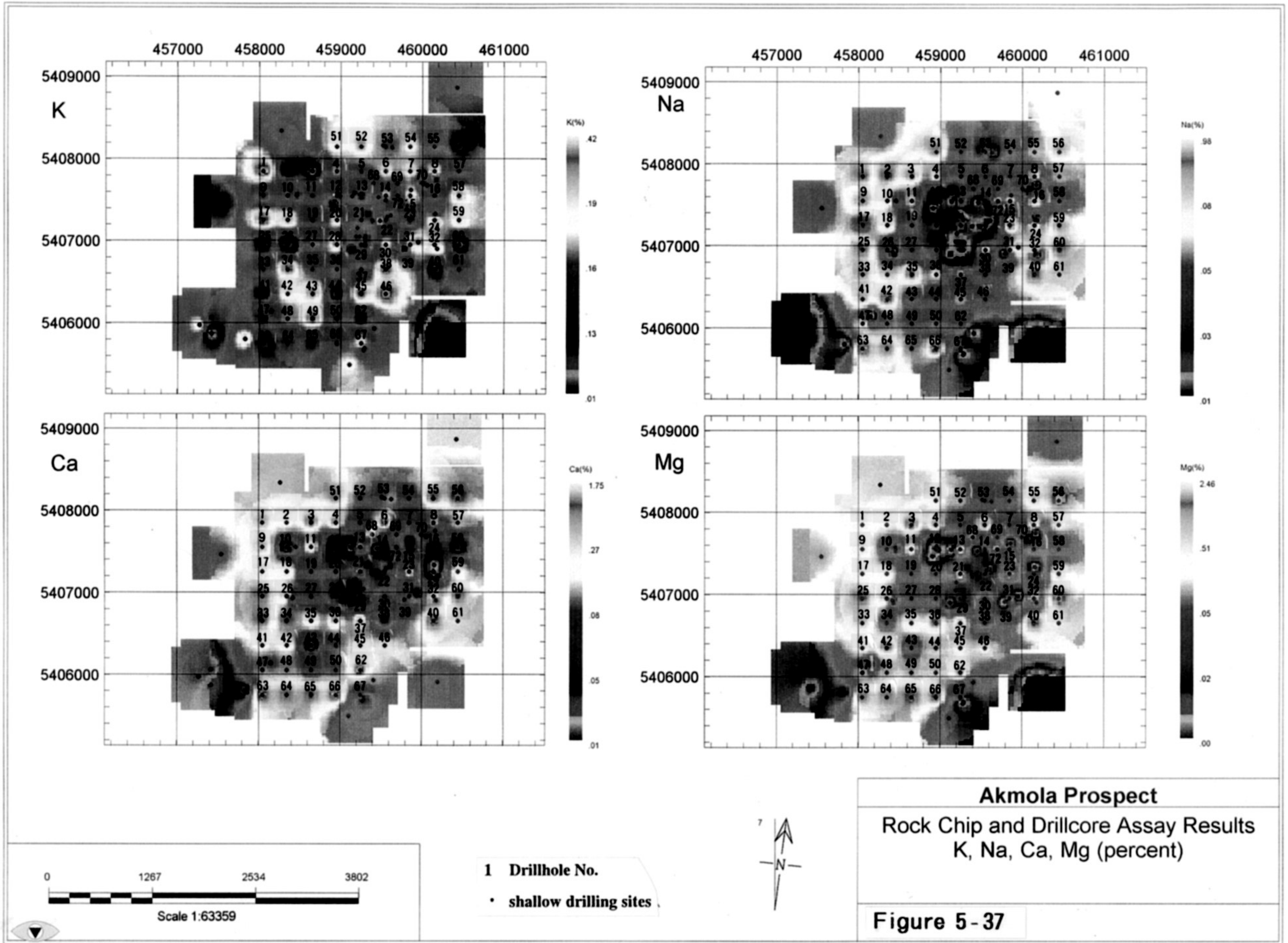
Figure 5-35



Akmola Prospect

Rock Chip and Drillcore Assay Results
Barium (upper image) PPM
Silver (lower image) PPM

Figure 5-36



Akmola Prospect

Rock Chip and Drillcore Assay Results
K, Na, Ca, Mg (percent)

Figure 5-37

spatially related to the zones of silicification-sericitization and white argillization.

5-2-4 Drilling survey

(1) Outline of the survey

Four diamond core drill holes, MJTA-6, -7, -8 and –9,with the total aggregated length of 1,0381 were placed in Akmola Area during the 3rd Year's Field Campaign. The specification of each drillhole is shown in below Table. The locations of each drillhole and the content of laboratory tests are in Figure 5-30 and Table 1-2 respectively. The detailed descriptions of the drill cores are presented in the drill hole columns, Appendix5～9. Geology, alteration, mineralization and the chemical analysis results for each hole are summarized graphically in Figure 5-38～5-41

Table 5-6 Drillholes in Akmola area

Hole No.	Direction	Inclination	Elevation	Hole Length
MJTA-6	-	90°	494m	250m
MJTA-7	-	90°	483m	250m
MJTA-8	-	90°	496m	250m
MJTA-9	-	90°	506m	288m

(2) Results

Mineralization with an average grade of 0.045 % Mo is intersected for the 38.0 m section between 210 and 248 m of MJTA-9. From the modes of occurrence this mineralization seems to be of a porphyry style associated with quartz networks and sulfide dissemination. Superimposed on this mineralization is Au mineralization in quartz veins with widths ranging from 0.2 to 5.0 m. However gold content of those veins is low and further exploration work targeting those veins is not needed.
This section will describe the characteristics of the Mo mineralization below.

1) Mode of Occurrence

The Mo mineralization, as observed in drill cores, is confined within the quartz-sericite alteration zone and invariably associated with quartz networks. Sulfides, which can be visually recognized, are mostly pyrite, minor chalcopyrite and rarely molybdenite. Pyrite and chalcopyrite occur as dissemination of 0.5 to 1 mm grains, 1 to 5 mm thick veinlets or speckies about 1 cm across. Molybdenite is extremely fine grained in general for visual identification. Where identifiable, it forms thin films along fractures or walls of quartz veinlets. Extremely fine grains of these sulfides are also disseminated in quartz veins and veinlets. The total amount of sulfides reaches 1 to 5 volume %, where concentrated. Sulfide dissemination is best developed in MJTA-9, followed by MJTA-8 and then MJTA-6. The alteration which is observed in MJTA-7, is the argillic one but without any notable concentration of sulfides.

2) Ore Minerals

The ore minerals commonly observed under microscope are pyrite, goethite, chalcopyrite, pyrrhotite, molybdenite, galena and electrum. Also rarely identified are magnetite, covellite, bornite, sphalerite, bismuthinite, arsenopyrite, chalcocite, native silver and aikinite($PbCuBiS_3$). Of these, chalcocite and native silver occur only near surface.

3) Mineralization

Mineralization with an average grade of 0.045 % Mo is intersected for the 38.0 m section between 210 and 248 m of MJTA-9. The host rocks, comprising medium grained granite, are subjected to extremely intense silicification with dense development of quartz networks. Such alteration minerals as quartz, sericite and chlorie are identified by the X-ray diffraction analysis. The total amount of sulfides is visually estimated at 3 to 4 volume %. The sulfides consist of mainly pyrite, subordinate molybdenite and very minor chalcopyrite. Molybdenite occurs as fine euhedral crystals with the maximum size of 50 microns and is concentrated upto 2 to 3 volume % as observed under micro- scope. It forms independent constellations from other sulfides but occasionally occurs as inclusions within pyrite.

Mo values above and below the mineralized section are significantly elevated to several tens ppm for appreciable intervals. Increases of Mo values to this order for substatial intervals are also indicated in MJTA-6 and-8 as well, although no such high concentration as in the mineralized section in MJTA-9 is intersected by these drill holes. It may be expected that economically noteworthy mineralization occurs in the vicinity of these holes.

Fluid inclusions of 3 core samples collected from quartz networks in MJTA-8 indicate homogenization temperatures ranging from150 to 220° C, while those of fluid inclusions of surface samples range between 250 and 360° C. Salinity of the fluid inclusions of the same core samples shows a bimodal distribution, with one population ranging from 8 to 10 % and the other, from 20 to 28 %.

(3) Follow-up Exploration

The Mo mineralization, intersected for an appreciable interval by MJTA-9, is associated with quartz networks and intense pyritization within the quartz sericite alteration zone and is formed in close proximity to the contact between the intruded medium grained granite and the intruding quartz porphyry. Breccia pipes also are recognized near mineralization zone. These modes of occurrence imply that the mineralization is of a porphyry style.

Although the degree of Mo concentration is considered sub-economic at this stage, the drill holes to date are too scarce in number and too widely spaced to verify its economic significance. Some additional drill holes with appropriate intervals will be required for an adequate economic assessment of the mineralization.

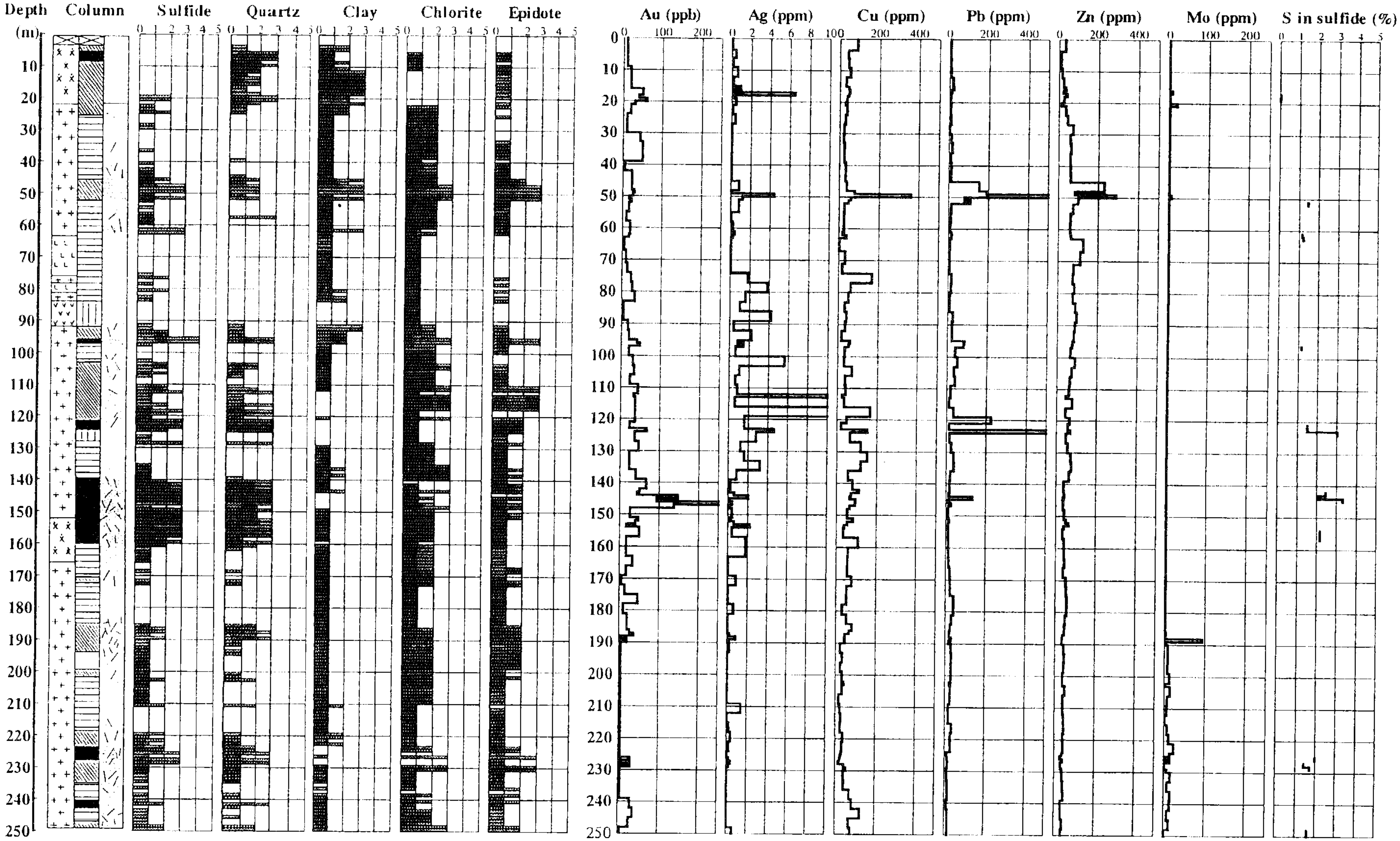


Figure 5-38 Alteration mineral assemblage and assay results of the drill core samples from MJTA-6

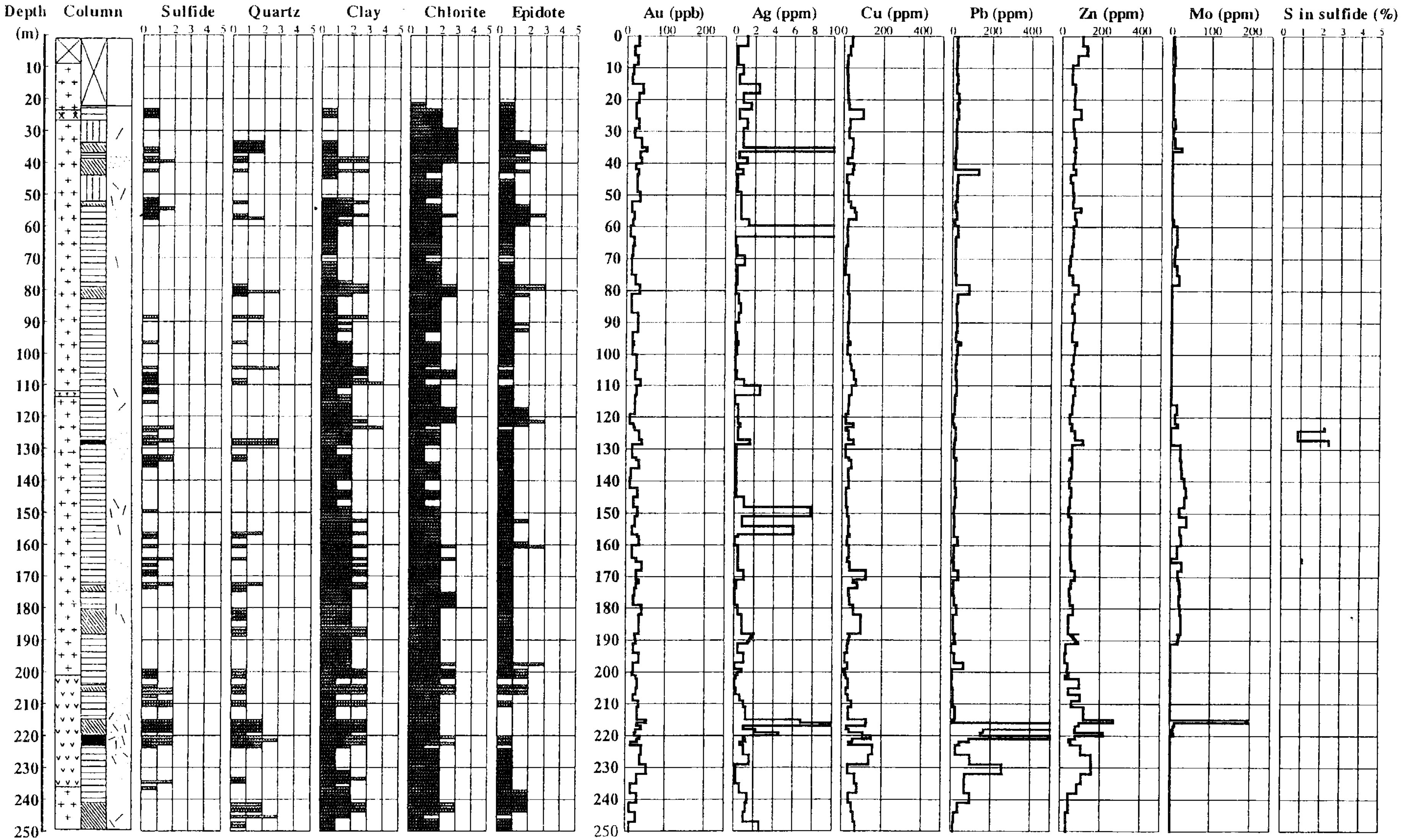


Figure 5-39 Alteration mineral assemblage and assay results of the drill core samples from MJTA-7

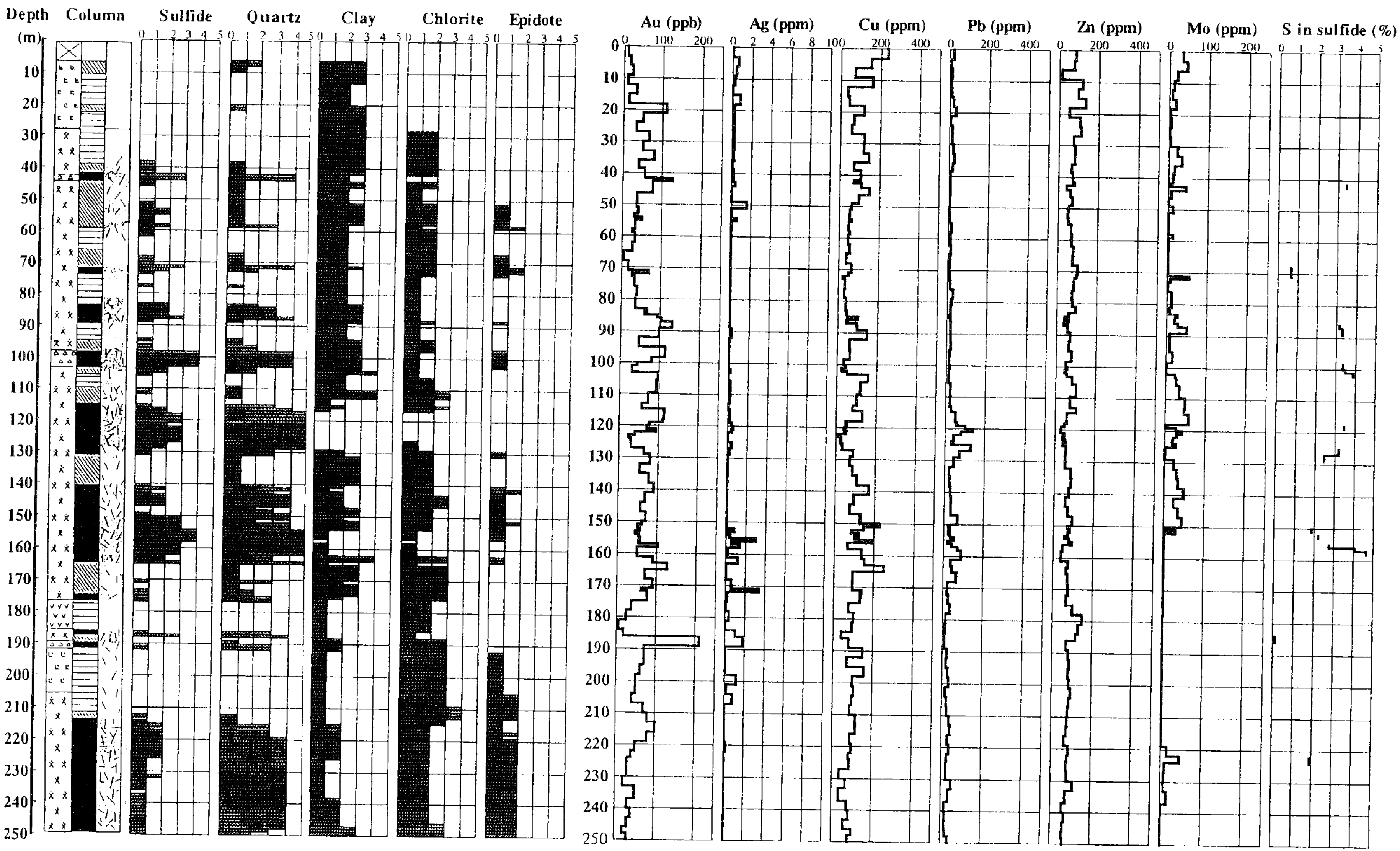


Figure 5-40 Alteration mineral assemblage and assay results of the drill core samples from MJTA-8

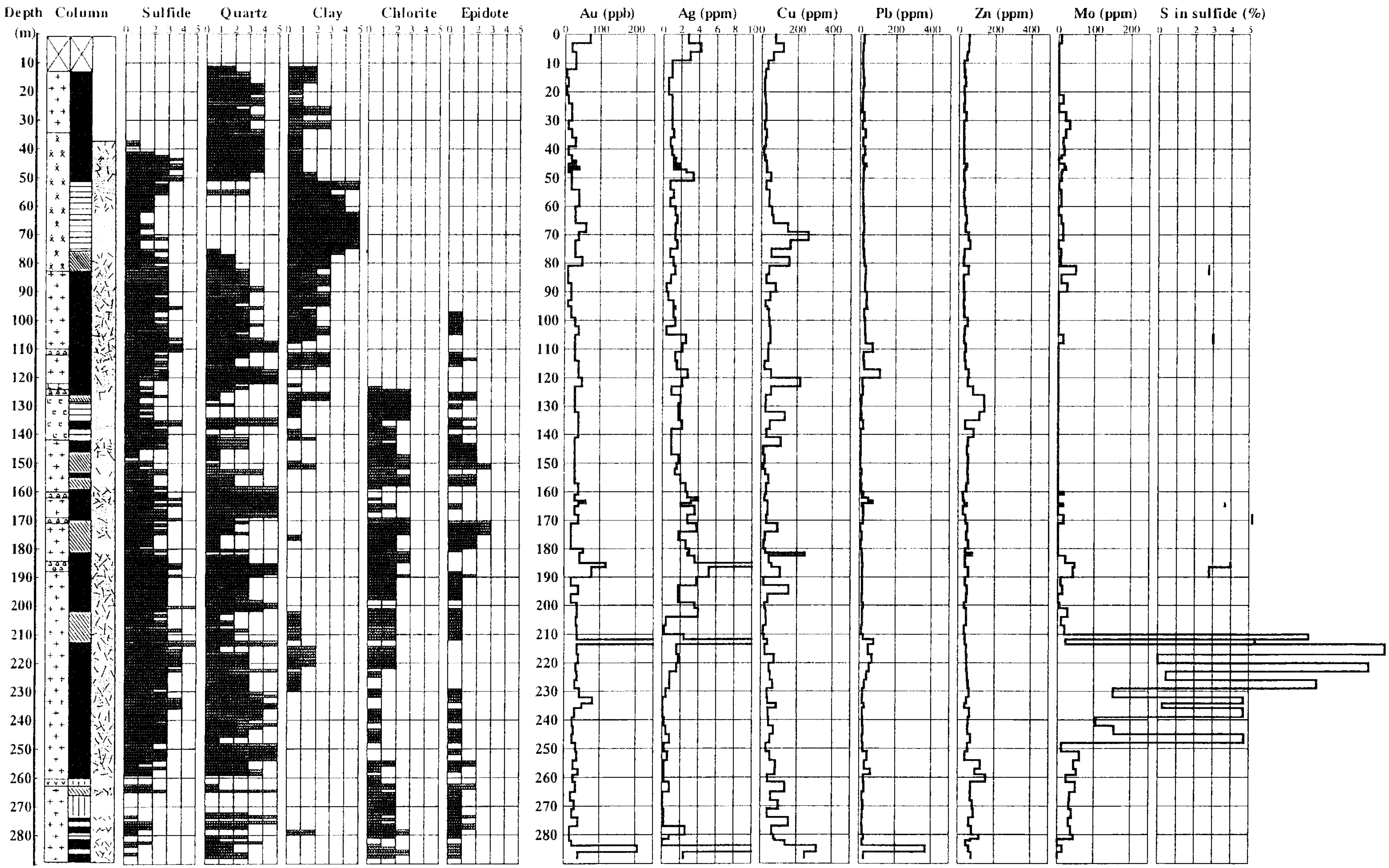


Figure 5-41 Alteration mineral assemblage and assay results of the drill core samples from MJTA-9

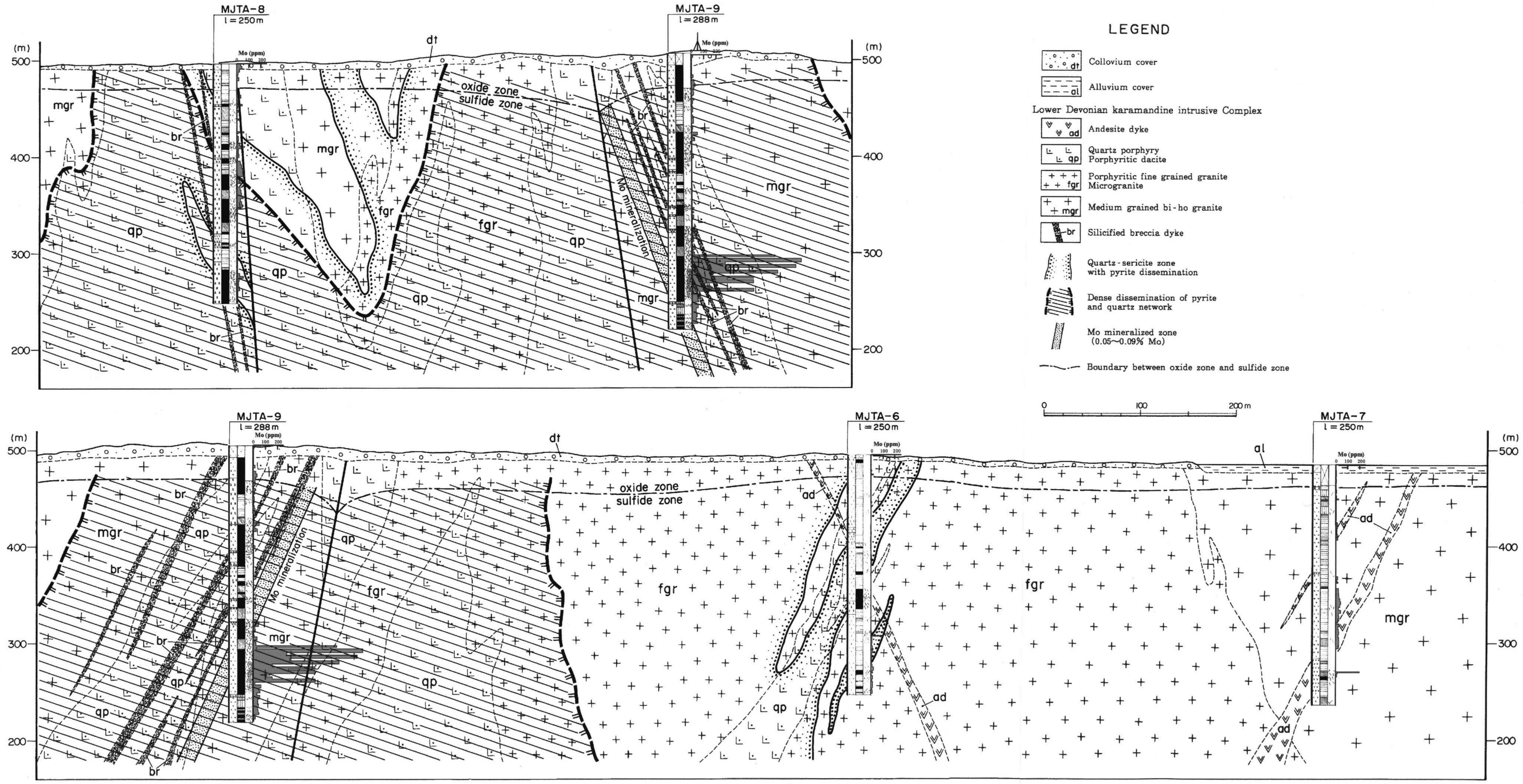


Figure 5-42 Cross Section though drilling sites

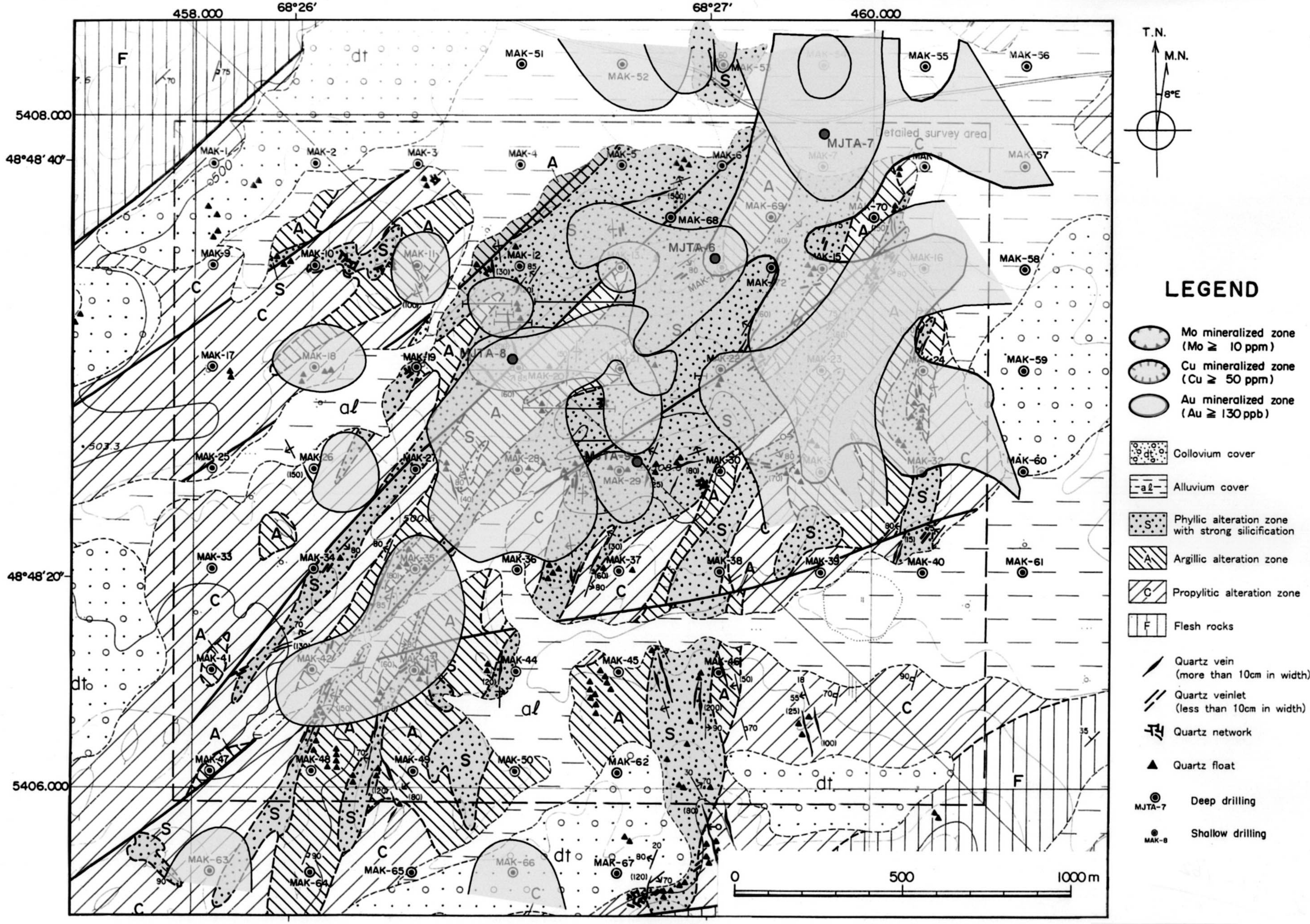


Figure 5-43 Interpretation Map of Geology. Alteration and Geochemistry of Akmola Area