Chapter 4 Drilling Investigation

4-1 General

4-1-1 Objective

The drilling investigation was carried out to verify the geological and mineralogical characteristics of ore body, F3, at depth.

According to the drilling investigation of 16 holes (total 1,480m) in the first phase, we recognize the geology and mineralization settings of middle and southeastern part of F3 ore body. The drilling program in the project of second phase that consists of 7 holes (total 820m) aimed at exploring and characterizing the geology and mineralization of western and northern part of F3 ore body.

4-1-2 Drilling Operation

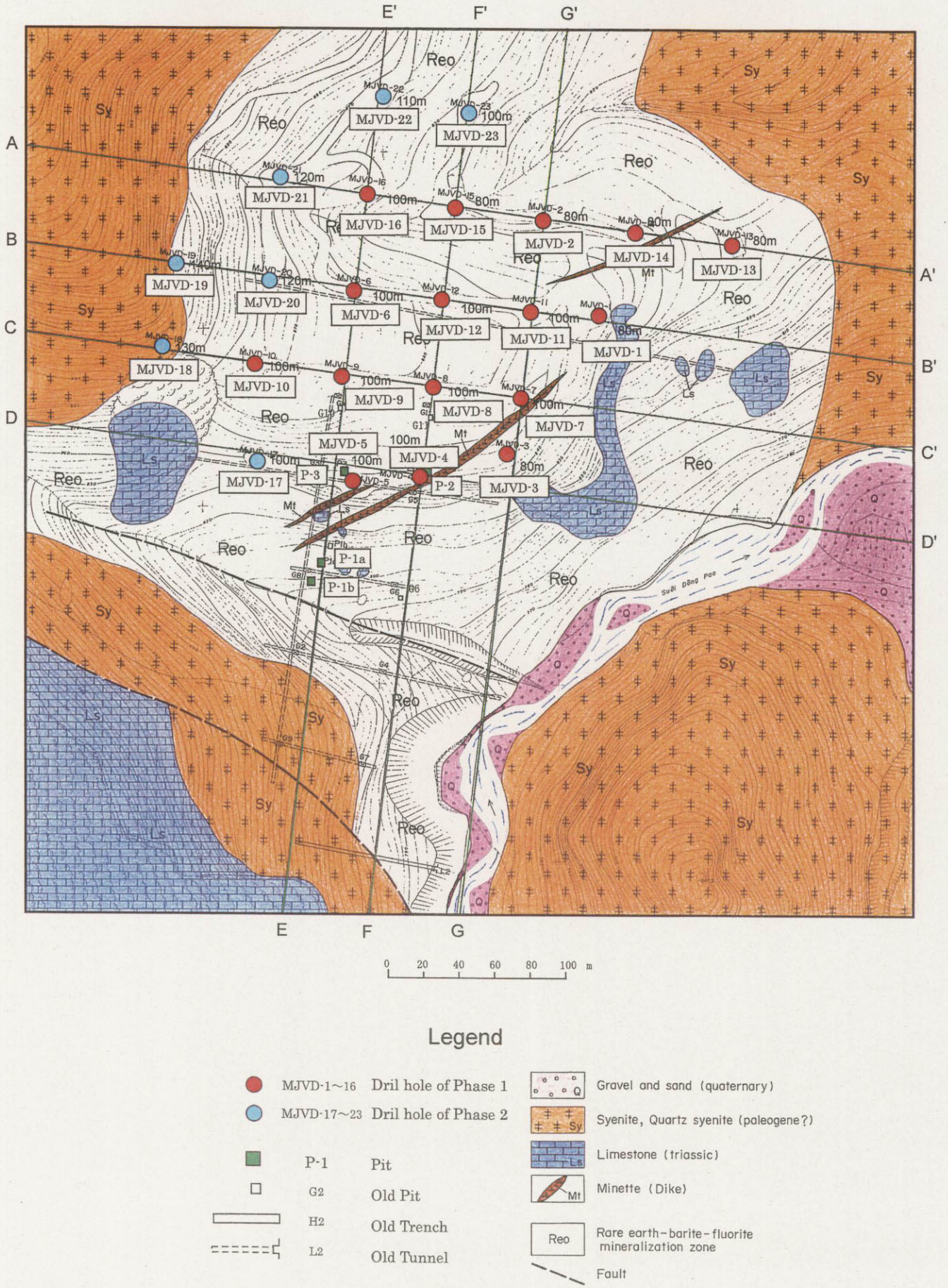
The drilling operation was carried out for F3 ore body to the west of New Dong Pao village as shown in the location map (FigureIII-4-1). For the drilling operation, the trail connecting Ban Hong to F3 ore body was repaired for the distance of 9.1 km. In addition, access roads to drilling sites, with the total length of 0.7 km, were newly constructed.

A total of 7 holes, MJVD-17 through-23, totaling 820 m in length, were drilled during the 2nd Year Campaign. The hole locations are indicated in FigureIII-4-2. The performance of each hole is shown in TableIII-4-1.

TableIII-4-1 Drilling Performance

Hole Name	Depth (m)	Inclination (Deg)
MJVD-17	100	-90
MJVD-18	130	-90
MJVD-19	140	-90
MJVD-20	120	-90
MJVD-21	120	-90
MJVD-22	110	-90
MJVD-23	100	-90
Total	820	-

The drilling operation was performed according to the work progress of each drill machine as shown in TableIII-4-2. The drill crew was mobilized on November 1st, 2001 and remobilized on December 10th, 2001, with the actual operation period from November 3rd, 2001 to December 10th, 2001. Two drill machines were employed for the operation. The usage of drill bits, the consumption of consumables and the work progress



Legend

- MJVD-1~16 Dril hole of Phase 1
- MJVD-17~23 Dril hole of Phase 2
- P-1 Pit
- G2 Old Pit
- H2 Old Trench
- L2 Old Tunnel
- Q Gravel and sand (quaternary)
- Sy Syenite, Quartz syenite (paleogene?)
- Ls Limestone (triassic)
- Mt Minette (Dike)
- Reo Rare earth-barite-fluorite mineralization zone
- Fault

Figure Ⅲ-4-1 Location map of the drilling sites

Table Ⅲ-4-2 Work progress of each drill machine

Hole No. \ Date	Depth	Norvember				December	
		10	20	30			10
MJVD－17	100 m				29	1	
MJVD－18	130 m						
MJVD－19	140 m	3			19		
MJVD－20	120 m				25		
MJVD－21	120 m		11				
MJVD－22	110 m				18		
MJVD－23	100 m	3					
Total depth	820 m						

: ckb-4
: XY2B

are presented in Appendices 8, 9 and 10 respectively.

The holes were drilled principally with the hole diameter of HQ and partly with that of PQ. The core recovery of 83.82 to 94.60% was achieved. The operation was performed satisfactorily as a whole except the holes MJDV-20 and -23 that were occurred jamming.

The recovered drill cores were placed in tin core boxes with the inner length of 1 m (mostly 5 rows in a box, partly 3 rows) labeled with the hole numbers and the respective depth. The drill cores were photographed and observed on site to prepare the columnar sections of holes at a scale of 1 to 200. It is virtually impossible to visually determine ore grades due to difficulty in identifying rare earth minerals by a hand lens. Therefore, one quarter of each 1-m section of drill cores was continuously sampled and submitted for chemical analysis. The collected samples were dried, crushed, pulverized and quartered before shipping to Chemex Labs Ltd. via air for chemical analysis. Core samples were also collected and submitted for microscopic observation of thin sections, and X-ray diffraction analysis. The cores, after the sampling as above mentioned, were stored in the core storage constructed beside the road about 400 m to the southwest of New Dong Pao village.

4-2 Description of Drill Cores

The drill core samples were analyzed by ICP spectrometry for 57 elements.

Table III-4-3 Analytical elements and detection limit

1	F	0.01	%	20	Be	0.5	ppm	39	Ti	10	%
2	Ba	0.5	ppm	21	Bi	2	ppm	40	V	5	ppm
3	Cs	0.1	ppm	22	Ca	0.01	%	41	Zn	5	ppm
4	Co	0.5	ppm	23	Cd	0.5	ppm	42	Sc	1	ppm
5	Hf	1	ppm	24	Cr	1	ppm	43	Y	0.5	ppm
6	Nb	1	ppm	25	Cu	1	ppm	44	La	0.5	ppm
7	Rb	0.2	ppm	26	Fe	0.01	%	45	Ce	0.5	ppm
8	Sr	0.1	ppm	27	Ga	10	ppm	46	Pr	0.1	ppm
9	Ta	0.5	ppm	28	Hg	0.01	ppm	47	Nd	0.5	ppm
10	Tl	0.5	ppm	29	K	0.01	%	48	Sm	0.1	ppm
11	Th	1	ppm	30	Mg	0.01	%	49	Eu	0.1	ppm
12	Sn	1	ppm	31	Mn	5	ppm	50	Gd	0.1	ppm
13	W	1	ppm	32	Mo	1	ppm	51	Tb	0.1	ppm
14	U	0.5	ppm	33	Na	0.01	%	52	Dy	0.1	ppm
15	Zr	0.5	ppm	34	Ni	1	ppm	53	Ho	0.1	ppm
16	Se	0.2	ppm	35	P	10	ppm	54	Er	0.1	ppm
17	Ag	1	ppm	36	Pb	5	ppm	55	Tm	0.1	ppm
18	As	2	ppm	37	S	0.01	%	56	Yb	0.1	ppm
19	B	10	ppm	38	Sb	2	ppm	57	Lu	0.1	ppm

T-RE_2O_3, $BaSO_4$ and CaF_2 contents are calculated based on the analytical results of the relevant elements and are recorded in the hole columnar sections of 1 to 200 scale as per the data file attached in Appendix-4. The T-RE_2O_3, $BaSO_4$ and CaF_2 contents of the

continuous core samples are compared with the analytical results for rare earth elements and are presented in the data-file attached in Appendix-5. The analytical results for all elements are filed in Appendix-6. The hole columnar sections are summarized into those at a scale of 1 to 600 and are presented in Figure III-4-2 (1/7-7/7), together with graphical displays of T-RE_2O_3, grades. Appendix-7 includes the results of microscopic observation for thin sections of ore samples collected from the drill cores. The drill core observation of each hole is described below.

(1) MJVD-17 (Total Depth : 100 m, Vertical, Collar Elevation : 842 m)

· Geology : comprising syenite (mineralized), limestone, minette and calcite dikes.

Syenite ; observed in the section as follows;

0.00-33.00 m :strongly weathered rock, including barite, fluorite and rare earth minerals, pale yellow, dark brown, black, violet to reddish brown.

33.00-48.90 m : barite, fluorite and a lot of calcite, dark brown, white, pink, violet, pale yellow.

51.10-91.30 m : barite, fluorite and rare earth minerals, dark brown.

98.70-100.00 m : weakly weathered barite, fluorite, and a little rare earth minerals.

Limestone ; observed from 93.00 to 98.70m, showed saccharoidal texture, altered to marble.

Minette dike ; observed from 46.60 to 48.90m, strongly weathered, dark green

Calcite dike ; observed from 48.90 to 49.70m, dark brown

Cave ; observed from 42.90 to 44.30m

· Mineralization

The hole is mineralized with rare earths, barite and fluorite as a whole.

The rare earth mineralization is strong with the best assay-run between 27 and 28m indicating 37.20 % T-RE_2O_3. Main mineralization is in the 0 to 8 (8 m) section indicating the average grade of 10.53 % T-RE_2O_3, in the 11 to 38m (27m) section indicating the average grade of 10.09 % T-RE_2O_3. Other is in the 38 to 93m (55m) section indication the average grade of 3.67% T-RE_2O_3. Whole average grade is 5.57% T-RE_2O_3.

The fluorite mineralization is strong except in limestone containing a lot of calcite fragments between 48.90 and 57.80 m and in limestone between 93.00m and 98.70 m. The best assay value is obtained in the assay run between 24 and 25 m indicating 55.68 % CaF_2. Whole average grade is 16.07% CaF_2.

The barite grade is low indicating the average of 4.70 % $BaSO_4$ in the 46 to 49 m section where minette dike and 49 to 58m section where includes a lot of calcite. The best assay value is obtained in the assay-run between 17 and 18m indicating 50.54 % $BaSO_4$. Whole average grade is 18.72%.

MJVD - 17	Max (%)	Average (%)	Depth (m)	Thickness (m)	Content (Average %)
T-RE_2O_3	37.20	5.57	0.00~7.00	7.00	10.53
			7.00~11.00	4.00	3.84
			11.00~38.00	27.00	10.09
CaF_2	55.68	16.07			
$BaSO_4$	50.54	18.72			

(2) MJVD-2 (Total Depth : 100 m, Vertical, Collar Elevation : 900m)

· Geology : mineralized syenite, limestone and limestone sand

Syenite ; observed in the section as follows;

0.00-11.70 m :strongly weathered syenite including barite, light brown, pale brown

11.70-26.80 m : strongly weathered rare earth minerals, including a lot of barite, dark brown, white, black, pale yellow

29.00-36.00 m : strongly weathered rare earth minerals, including a lot of barite, light brown to pinkish brown.

102.20-113.80 m : weathered barite, fluorite and rare earth minerals, white, dark brown, violet, pale yellow.

114.35-130.00 m : rare earth minerals including fluorite and a lot of barite, white, dark brown, violet.

Limestone ; observed mainly from 44.10m to 99.30m section, most of all part are altered to marble and weakly weathered, white, partly disseminated by pyrite.

Cave ; observed from100.50 to 102.20m.

· Mineralization

The hole is mineralized with rare earths, barite and fluorite of the depth from 14.00 to 28.00m. Other section is no significant mineralization observed.

The rare earth mineralization in the section from 14 to 27m (13m) is averaged at 2.11 %, from 103 to 111m (8m) is averaged at 2.33 % and from 115 to 129m (14m) is averaged at 2.16 %. The best assay value is obtained in the assay run between 128 and 129 m with 6.28 % T-RE_2O_3. Whole average grade is 0.74% T-RE_2O_3.

The fluorite mineralization is weakly observed in the section from 102.20 to 111.05 m and 117.10 to 130.00m. The best assay value is obtained in the assay run between 115 and 1169 m with 11.36 % CaF_2. Whole average grade is 1.23% CaF_2.

The barite mineralization is associated with the mineralization of rare earth minerals. The section from 14 to 33 m indicates an average grade of 28.64 % and from 100 to 130 m indicates an average grade of 19.74 % $BaSO_4$. The best assay value is obtained in the assay run between 19 and 20 m with 52.86 % $BaSO_4$. Whole average grade is 10.72% $BaSO_4$.

MJVD - 18	Max (%)	Average (%)	Depth (m)	Thickness (m)	Content (Average %)
T-RE_2O_3	6.28	0.74	14.00~27.00	13.00	2.11
			103.00~111.00	8.00	2.33
			115.00~129.00	14	2.16
CaF_2	11.36	1.23			
$BaSO_4$	52.86	10.72			

(3) MJVD-19 (Total Depth : 140 m, Vertical, Collar Elevation : 900m)

· Geology : comprising syenite, limestone and limestone breccia and limestone sand.

Syenite; observed from 0.00 to 5.00m section, strongly weathered, light brown – pale orange.

Limestone ; observed from 5.30 to 21.20m and from 30.80 to 140.00m section, most of all part are altered to marble and weakly weathered, white, partly disseminated by pyrite.

Limestone breccia ; observed from 21.20 to 30.80 m section, gray – white, partly reddish brown, breccia consists of barite, limestone and a little phlogopite., matrix is calcareous.

Cave ; observed remarkably from 9.45 to 11.00m, 38.70 to 40.00m and 65.00 to 66.80m.

· Mineralization

The hole is not observed significant mineralization without barite mineralization from 53.00 to 71.00m. The best assay-run of the rare earth mineralization is the 53-54m section indicating 1.26 % T-RE_2O_3. Whole average grade is only 0.24% T-RE_2O_3.

The fluorite mineralization is weakly observed in the section from 111.00 to 111.40 m. The best assay value is obtained in the assay run between 137 and 138 m with 3.70 % CaF_2. Whole average grade is 0.57% CaF_2..

The barite mineralization is observed in the section from 53.to 71m where indicates an average grade of 22.11 % $BaSO_4$. The best assay value is obtained in the assay run between 70 and 71 m with 37.35 % $BaSO_4$. Whole average grade is 6.35% $BaSO_4$.

MJVD - 19	Max (%)	Average (%)	Depth (m)	Thickness (m)	Content (Average %)
T-RE_2O_3	1.26	0.24	-	-	-
CaF_2	3.70	0.57			
$BaSO_4$	37.35	6.35			

(4) MJDV-20 (Total Depth : 120 m, Vertical, Collar Elevation :873 m)

· Geology : comprising soil, syenite, limestone and limestone sand.

Surface soil ; observed from 0.00 to 0.50m., dark brown, mud to fine sand

Syenite ; observed in the section as follows;

0.50-12.35 m :strongly weathered syenite with rare earth mineralization, including barite, light brown – dark gray, partly pale yellow patch.

16.85-18.00 m : rare earth minerals, dark brown – brown, partly including pale yellow patch.

58.80-70.30 m : weakly weathered barite, fluorite and rare earth minerals, white.

75.00-111.30 m : weakly weathered barite, fluorite and rare earth minerals, white, violet, partly dark brown.

116.10-117.00 m : barite, fluorite, and rare earth minerals. white, violet, pink, and pale yellow. observed bastnaesite.

Limestone ; observed mainly from 26.30m to 58.80m section, weakly weathered, white - gray, partly disseminated by pyrite.

Cave ; observed from 19.30 to 20.30m.

· Mineralization

The hole is mineralized with rare earths, barite and fluorite in syenite.

The rare earth mineralization in the section from 5 to 14m (9m) is averaged at 2.01 %, from 37 to 43m (6m) is averaged at 2.43 %, from 65 to 69m (4m) is averaged at 2.48 %, from 76 to 90m (14m) is averaged at 2.48 %, from 97 to 105m (8m) is averaged at 20.7 %, and from 115 to 119m (4m) is averaged at 3.54 %. The best assay value is obtained in the assay run between 17 and 18 m with 6.60 % T-RE_2O_3. Whole average grade is 1.25% T-RE_2O_3.

The fluorite mineralization is associated with the mineralization of rare earth minerals except for the section between 5 and 14m. The best assay value is obtained in the assay run between 66 and 67 m with 31.34 % CaF_2. Whole average grade is 5.45% CaF_2..

The barite mineralization is associated with the mineralization of rare earth minerals in the same as fluorite, and besides, the section from 20 to 35 m indicates an average grade of 30.70 % $BaSO_4$. The best assay value is obtained in the assay run between 62 and 63 m with 67.93 % $BaSO_4$. Whole average grade is 20.66% $BaSO_4$.

MJVD - 20	Max (%)	Average (%)	Depth (m)	Thickness (m)	Content (Average %)
T-RE_2O_3	6.60	1.25	5.00~14.00	9.00	2.01
			37.00~43.00	6.00	2.43
			65.00~69.00	4.00	2.48
			76.00~90.00	14.00	2.15
			97.00~105.00	8.00	2.07
			115.00~109.00	4.00	3.54
CaF_2	31.34	1.23			
$BaSO_4$	67.93	20.66			

(5) MJDV-21 (Total Depth : 120 m, Vertical, Collar Elevation : 863m)

· Geology : comprising surface soil, syenite, and limestone.

Surface soil ; observed from 0.00 to 3.80m., dark brown, partly include strongly weathered syenite breccia.

Syenite ; observed in the section as follows;

3.80-34.00 m : strongly weathered syenite with rare earth minerals and barite. light brown, white and partly reddish brown.

81.50-87.20 m : barite ore, white, partly including fluorite.

91.00-120.00 m : weakly weathered barite, fluorite and rare earth minerals, white and partly dark brown.

Limestone ; observed mainly from 34.00m to 82.50m section, weakly weathered, white – dark brown, quite partly observed barite, fluorite, and rare earth and pyrite dissemination.

Cave ; observed from 19.30 to 55.00m.

· Mineralization

The hole is mineralized with rare earths, barite and fluorite in syenite.

The rare earth mineralization in the section from 29 to 34m (5m) is averaged at 2.00 %, from 86 to 107m (21m) is averaged at 2.25 %, and from 111 to 118m (7m) is averaged at 6.87 %. The best assay value is obtained in the assay run between 113 and 114 m with 14.69% T-RE_2O_3. Whole average grade is 1.29% T-RE_2O_3.

The fluorite mineralization is associated with the mineralization of rare earth minerals. The best assay value is obtained in the assay run between 113 and 114 m with 11.18 % CaF_2. Whole average grade is 1.38% CaF_2..

The barite mineralization is associated with the mineralization of rare earth

minerals in the same as fluorite. The best assay value is obtained in the assay run between 82 and 83 m with 62.16 % $BaSO_4$. Whole average grade is 16.73% $BaSO_4$.

MJVD - 21	Max (%)	Average (%)	Depth (m)	Thickness (m)	Content (Average %)
T-RE_2O_3	14.69	1.29	29.00~34.00	5.00	2.00
			86.00~107.00	21.00	2.25
			111.00~118.00	7.00	6.87
CaF_2	11.18	1.38			
$BaSO_4$	62.16	16.73			

(6) MJDV-22 (Total Depth : 110 m, Vertical, Collar Elevation : 869m)

· Geology : comprising soil, syenite, and limestone.

Surface soil ; observed from 0.00 to 2.00m., light brown, origin is strongly weathered syenite.

Syenite ; observed in the section as follows;

2.00-24.30 m : strongly weathered barite and rare earth minerals, dark brown – brown with pale yellow patch.

95.20-98.20 m : barite and rare earth ore, white, violet, and dark gray. cataclastic.

101.00-107.60 m : barite, fluorite, and some rare earth minerals. white, and partly reddish brown.

Limestone ; mainly observed from 28.00m to 95.20m section, observed weak mineralization of barite and fluorite at the depth between 63.30 and 63.60m. partly observed pyrite dissemination.

Cave ; observed from 21.00 to 22.70m, from 26.10 to 28.30m, and from 37.90 to 38.70m.

· Mineralization

The hole is mineralized with rare earths, barite and fluorite in syenite.

The rare earth mineralization in the section from 10 to 24m (14m) is averaged at 2.00 %. The best assay value is obtained in the assay run between 95 and 96 m with 3.90 % T-RE_2O_3. Whole average grade is 1.29% T-RE_2O_3.

The fluorite mineralization is the section between 101.00 and 107.60m. The best assay value is obtained in the assay run between 104 and 105 m with 24.45 % CaF_2. Whole average grade is 2.10% CaF_2..

The barite mineralization is associated with the mineralization of rare earth minerals. The best assay value is obtained in the assay run between 85 and 86 m with 56.67 % $BaSO_4$. Whole average grade is 13.48% $BaSO_4$.

MJVD - 22	Max (%)	Average (%)	Depth (m)	Thickness (m)	Content (Average %)
T-RE_2O_3	3.90	2.00	10.00~24.00	14.00	2.00
CaF_2	24.45	2.10			
$BaSO_4$	56.67	13.48			

(7) MJDV-23 (Total Depth : 100 m, Vertical, Collar Elevation : 840 m)

· Geology : comprising syenite, limestone and minette dikes.

Syenite ; observed in the section as follows;

3.90-21.00 m : rare earth ore, dark brown – black with pale yellow patch. including brecciated limestone and bastnaesite.

29.60-100.00 m : barite, fluorite and rare earth ore, white, violet, and dark gray with pale yellow patch.

Limestone ; mainly observed from 21.60m to 25.80m section, from 47.70m to 50.20m section, and from 62.40m to 68.90m section, white – gray, partly observed pyrite dissemination.

Cave ; observed from 39.80 to 42.00m.

· Mineralization

The hole is mineralized with rare earths, barite and fluorite in syenite.

The rare earth mineralization in the section from 0 to 45m (45m) is averaged at 2.48 %, from 72 to 96m (24m) is averaged at 5.08 % The best assay value is obtained in the assay run between 89 and 90 m with 9.16 % T-RE_2O_3. Whole average grade is 2.74% T-RE_2O_3.

The fluorite mineralization is associated with the mineralization of rare earth minerals, but mineralization observes weak below 30m. The best assay value is obtained in the assay run between 92 and 93 m with 42.33 % CaF_2. Whole average grade is 8.43% CaF_2..

The barite mineralization is associated with the mineralization of rare earth minerals in the same as fluorite. The best assay value is obtained in the assay run between 17 and 18 m with 70.80 % $BaSO_4$. Whole average grade is 26.17% $BaSO_4$.

MJVD - 23	Max (%)	Average (%)	Depth (m)	Thickness (m)	Content (Average %)
T-RE_2O_3	9.16	2.47	0.00~45.00	45.00	2.74
			72.00~96.00	24.00	5.08
CaF_2	42.33	8.43			
$BaSO_4$	70.80	26.17			

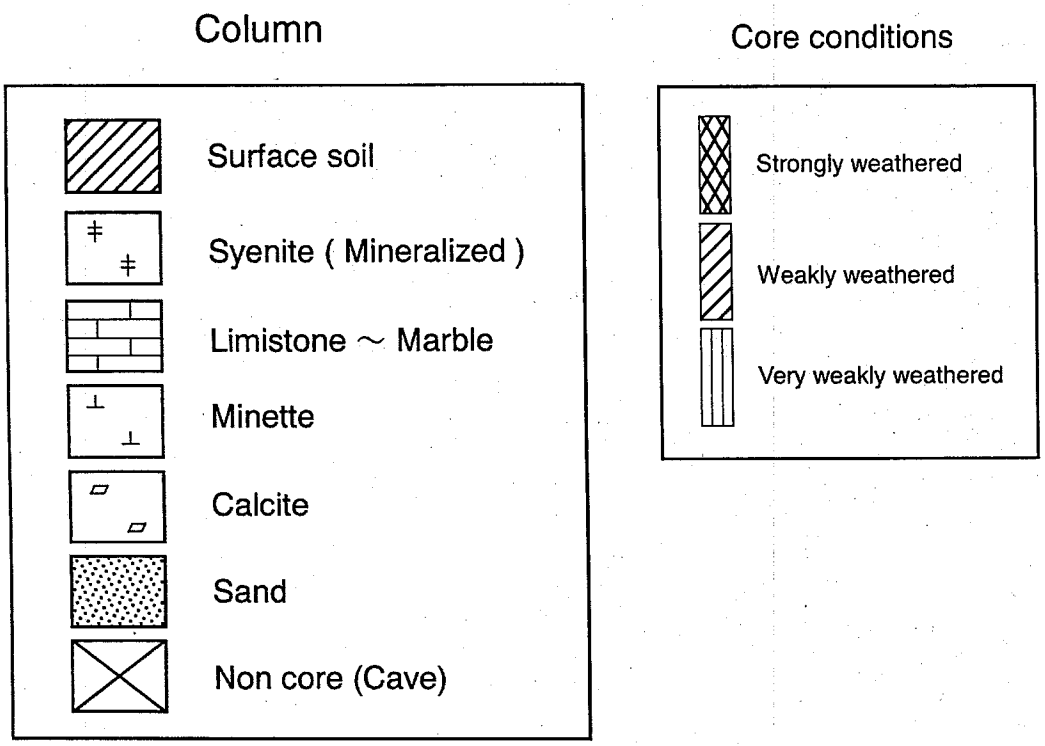
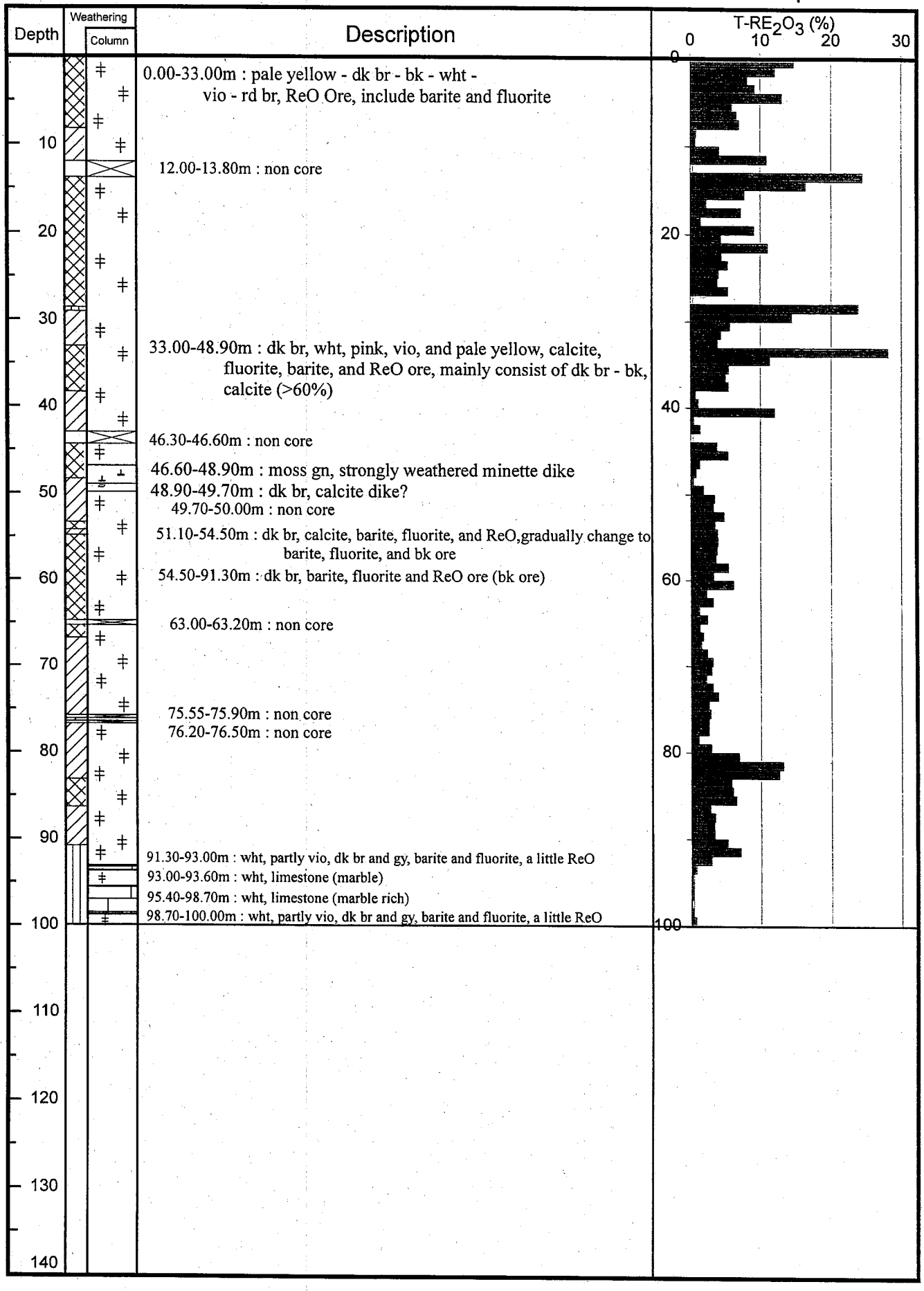


Figure Ⅲ-4-2 Schematic columnar section (MJVD-17～MJVD-23)

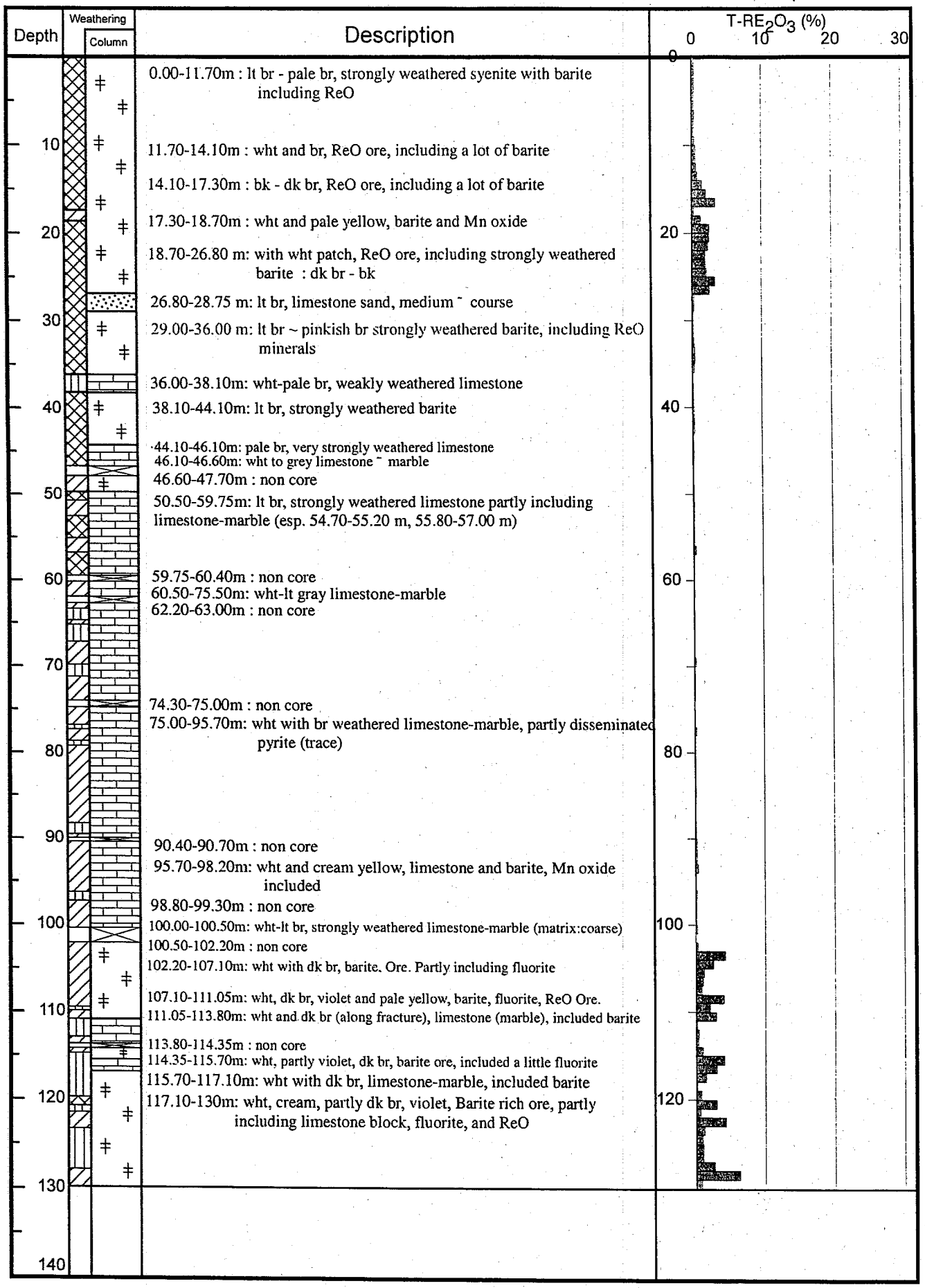
MJVD - 17

Depth : 100 m



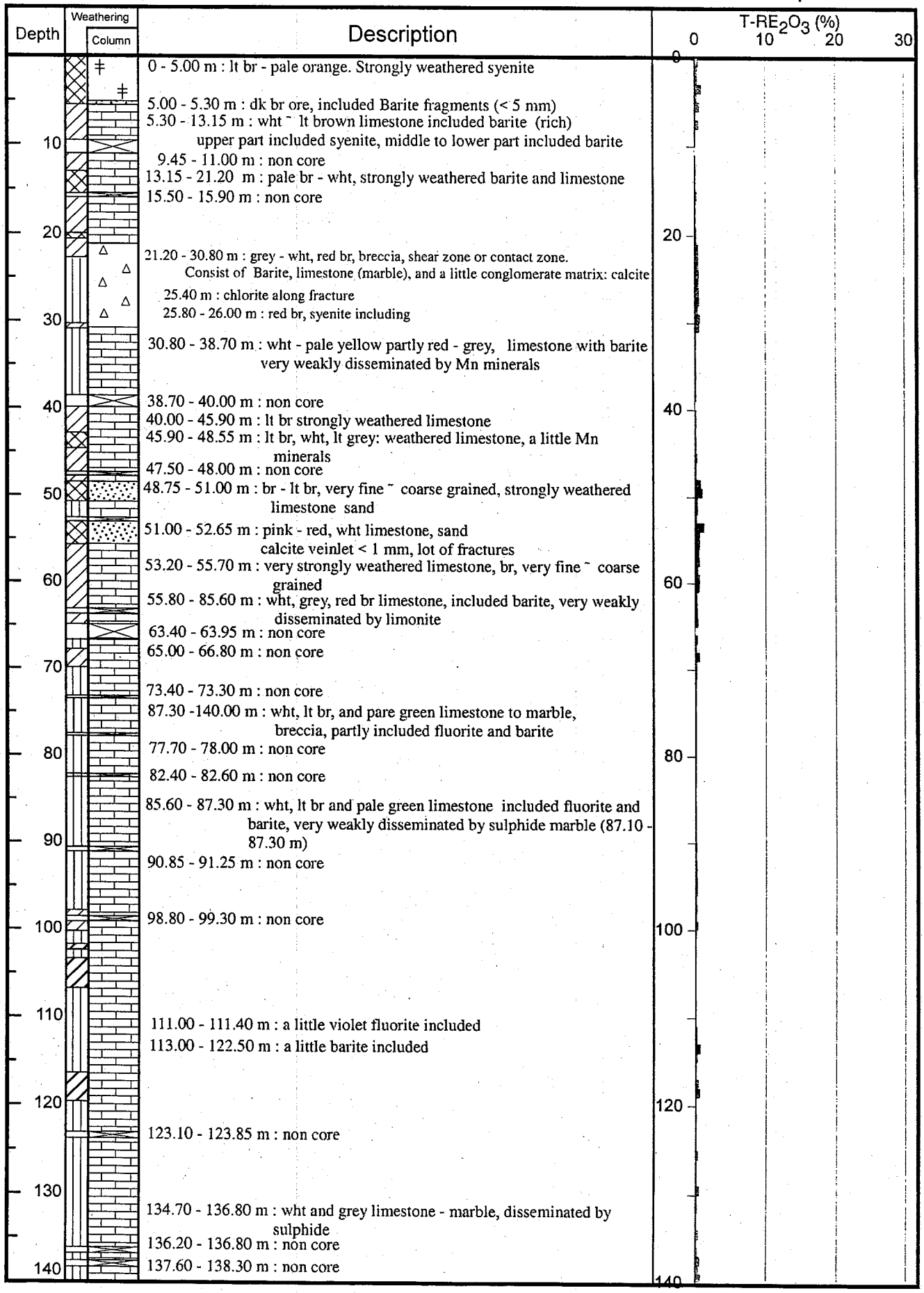
MJVD - 18

Depth : 130 m



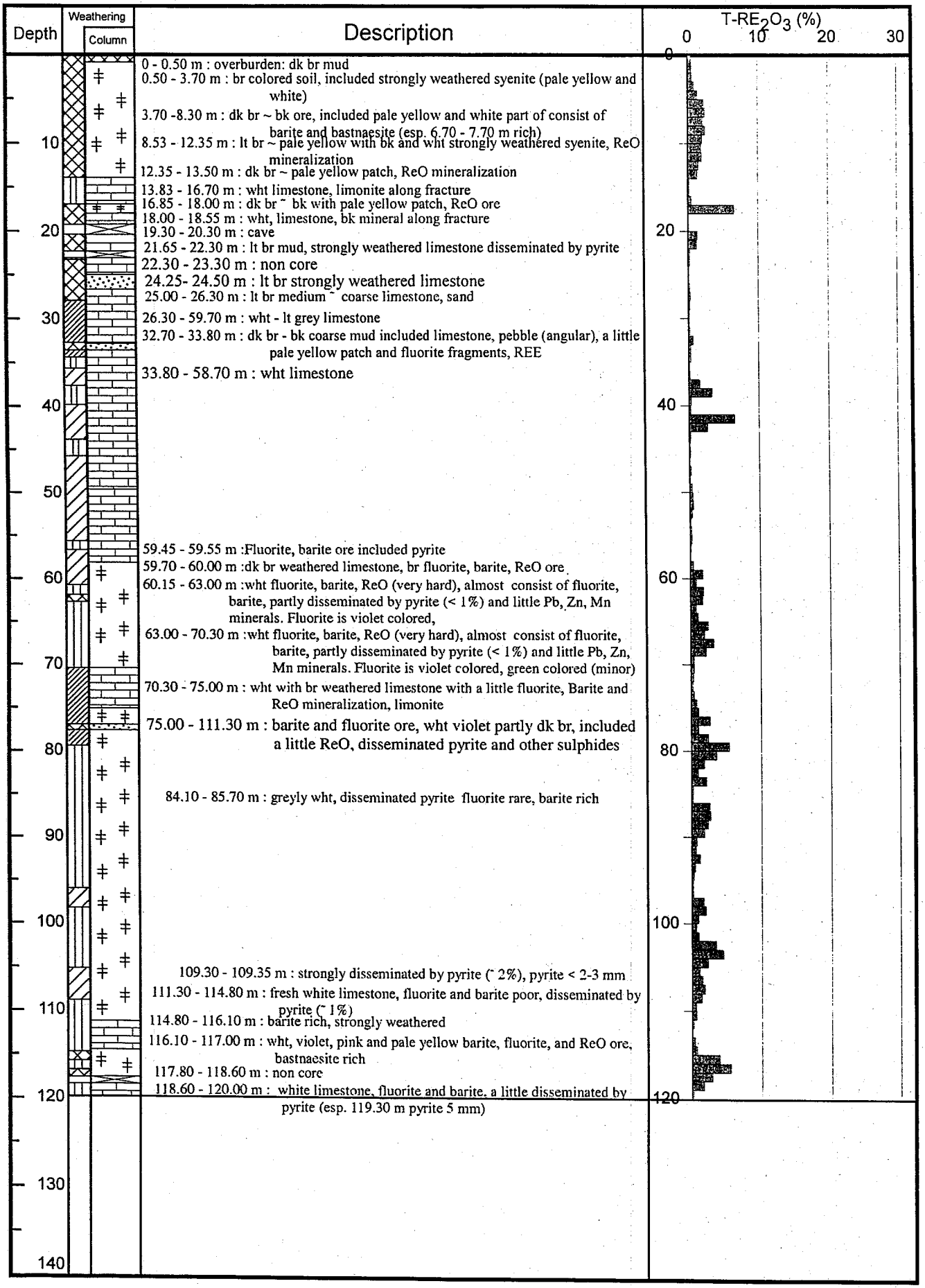
MJVD - 19

Depth : 140 m



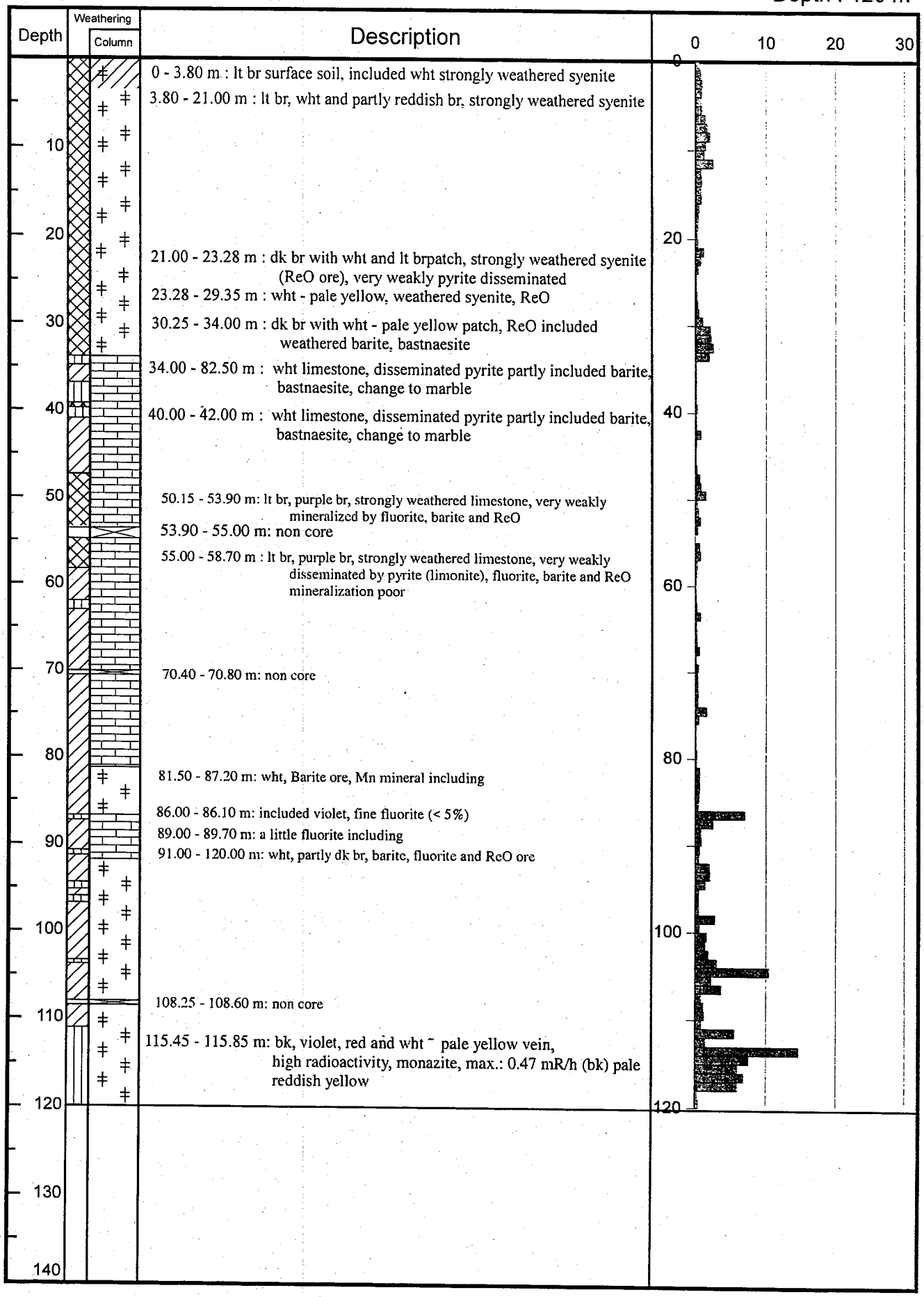
MJVD - 20

Depth :120 m



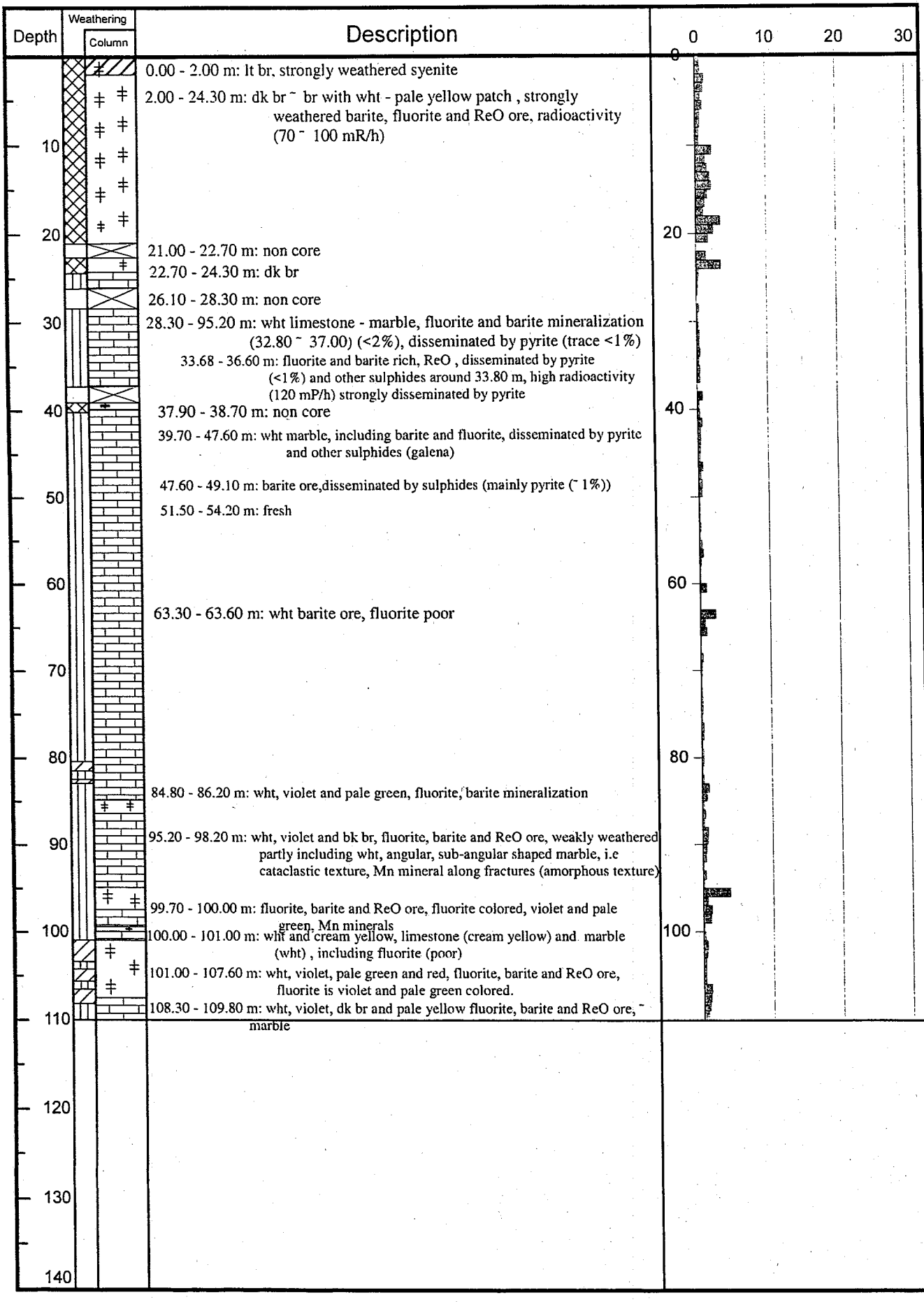
MJVD - 21

Depth : 120 m



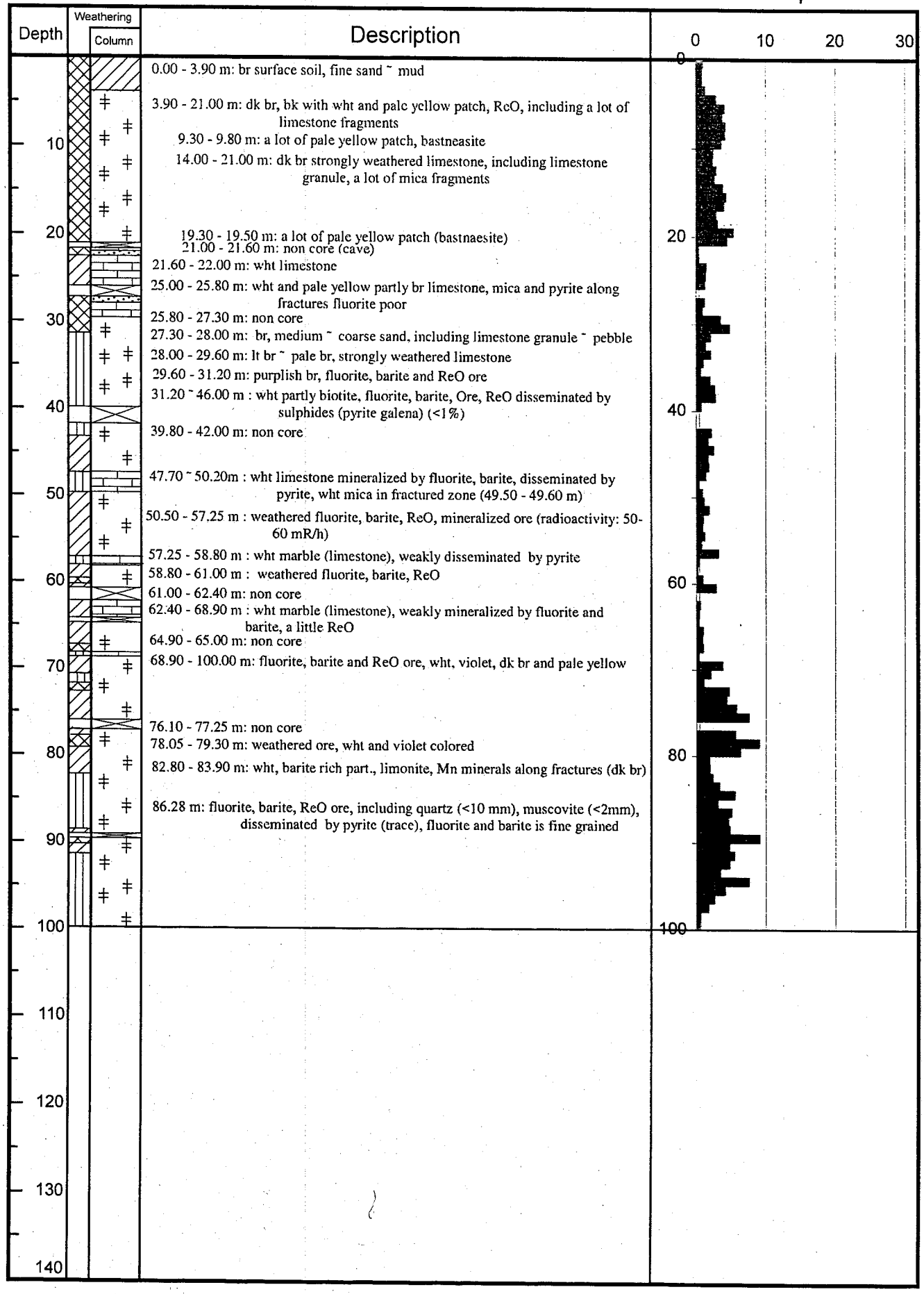
MJVD - 22

Depth : 110 m



MJVD - 23

Depth : 100 m



4-3 Interpretation of the Drilling Result

4-3-1 Geology and Geological Structures

The mineralized zone including the F3 ore Body is shown in plan in Figure III-4-3. The geology of the mineralized zone comprises limestone of the middle Triassic System and Palaeogene syenite intruded by minette dikes. The regional geological structures trend in the NW-SE direction, as typically indicated in the trend of the Song Da Tectonic province to which the Project Area belong. The major fault system crosscuts the limestone and the syenite in the southwestern part of the mineralized zone, striking in the NNW-SSE direction. The minette dikes presumably run in the NE-SW direction as shown in the geological cross-sections interpreted on the basis of the drilling result.

The rocks of the mineralized zone show the following mode of occurrences according to the results of the drilling and of the 1st Year Geological Prospecting.

- The limestone forms steep cliffs in the southwestern part and presents light gray, massive appearances.
- The syenite intrudes the Triassic limestone and extensively developes in the Project Area. It is intensely weathered and loose in the surface in general. The unmineralized syenite shows brown color when weathered, while the mineralized syenite is gray to black-gray in color. Numerous limestone blocks are included in the syenite. Their sizes are relatively large in the western and eastern part. The larger blocks of limestone are light gray to gray in color and fine grained, while the smaller blocks are turned into white to gray microcrystalline marble and are often mineralized. Sulfides are also disseminated in part.
- The minette forms small size dikes intruding the syenite. These dikes are also intensely weathered and loose, showing brown color. It characteristically contains phlogopite with sizes of 2 to 5 mm.
- Alluvium developes along the Dong Pao river, running to the southeast of the F3 Ore Body.

A total of 7 holes with the aggregated length of 820m were drilled to recover drill cores during the 2nd Year Campaign. Of these holes, 5 holes except MJVD-17 and –23 encountered limestone blocks with thickness exceeding 30m. The hole MJVD-19, in particular, intersected limestone for the continuos hole section of approximately 135m. These results indicate that the steep slope to the west of the F3 Ore Body is mainly composed of limestone and bounds the western limit of the Ore Body.

4-3-2 Mineralization

Based on the results of the drilling exploration for the 2-year period, 7 cross-sectios, from A-A' to G-G', are prepared to demonstrate the geology and mineralization of the F3

Ore Body as shown in Figures III-4-4 (1/7) to (7/7) and Figures III-4-5 (1/7) to (7/7).

The extent of the mineralization and alteration zone enclosing the F3 Ore Body is estimated about 300m wide in the east-west and about 600m long in the north-south, based on the results of the past exploration and of the geological and geochemical prospecting in the Current Project. The extent of the mineralization with the grades of 10% RE_2O_3 or better is estimated 150m wide in the east-west and 400m in the north-south based on the drilling results for the last 2 years (Figure III-4-3).

4-3-2-1 Rare Earth Mineralization

Of the 16 holes drilled in the 1st Year Campaign, the 7 holes, MJVD-5, -6, -7, -9, -10, -12 and –15n encountered mineralization containing 10% RE_2O_3 or better, and the 5 holes, MJVD-2, -3, -4, -8 and –16, that containing 5 to 10% RE_2O_3. The remaining 4 holes intersected only low grade rare earth mineralization. Of the 7 holes drilled in the current Year Campaign, the hole MJVD-17 was the only one to have intersected mineralization containing 10% RE_2O_3 or better and the two holes, MJVD-21 and –23, that containing 5 to 10% RE_2O_3. The remaining 4 holes intersected long sections largely comprising limestone only with week rare earth mineralization.

(1) Cross-sections of the Mineralized Zone

The E-W cross-sections of the F3 Ore Body are shown in FigureIII-4-4(the cross-sections A-A' to D-D'). Along the E-W cross-sections, the mineralized zone is bounded by limestone blocks at the east and west ends. Along the N-S longitudinal sections(E-E' to G-G'), the mineralized zone, cropping out on the slope at the southern end, continues to the center in a flat-lying form, and then tends to weaken and narrow northwards. Along the longitudinal sections F-F' and G-G', however, the zone appears to be open to the north of the northern limit of the drilling grid, suggesting possible continuation to the F7 Ore Body. The limestone block at the west end that forms a steep cliff, is intersected by the hole MJVD-22 on the section E-E', indicating its northern continuation, and bounds the northern extension of the mineralized zone on this longitudinal section.

The F3 Ore Body, comprising the high grade center (RE_2O_3 > 10%) and the surrounding moderate grade periphery (10% > RE_2O_3 > 5%), forms a irregularly shaped lens that is enclosed by extensive low grade mineralization with grade less than 5% RE2O3. The high grade intersections are tabulated in Table III-4-4.

TableIII-4-4 High Grade Intersections in the Drill Holes along the Cross-Sections

Section No.	Drill Hole No.	Depth (m)	Thickness (m)	Content T-RE_2O_3 (%)
A-A'	MJVD-15	63.00~77.00	14.00	10.90
B-B'	MJVD-6	63.00~87.00	24.00	14.20
	MJVD-12	46.00~91.00	45.00	10.82
C-C'	MJVD-10	44.00~96.00	52.00	10.44
	MJVD-9	64.00~88.00	24.00	10.59
	MJVD-7	39.00~55.00	16.00	11.72
D-D'	MJVD-5	0.00~25.00	25.00	11.00
	MJVD-17	11.00~38.00	27.00	10.09

(2) Plan of the Mineralized Zone

The lateral distribution of the high grade center and the moderate grade periphery is shown in Figure III-4-3. The distribution to the south of the cross-section D-D' is drawn based on the assay results of the past pit and tunnel samples to the depth of 30m from the surface. The high grade center distributes in an area approximately 150m wide and 400m long in plan.

(3) Statistical Analysis of the RE_2O_3 Contents

The histogram and the cumulative frequency distribution of the RE_2O_3 contents in the drill core samples are prepared and presented in Figure III-4-6.

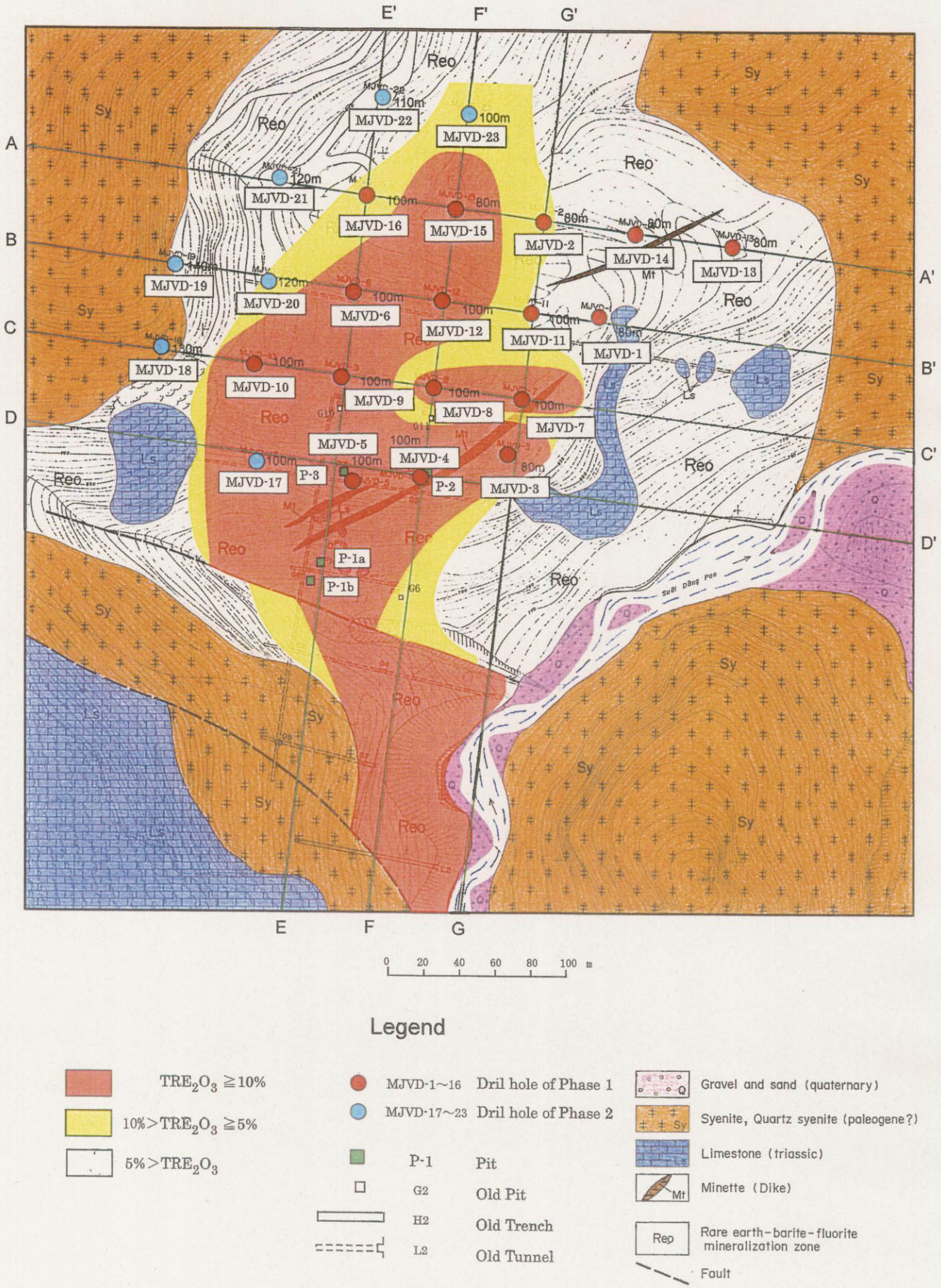


Figure Ⅲ-4-3 The geology-mineralization map of F 3 orebody

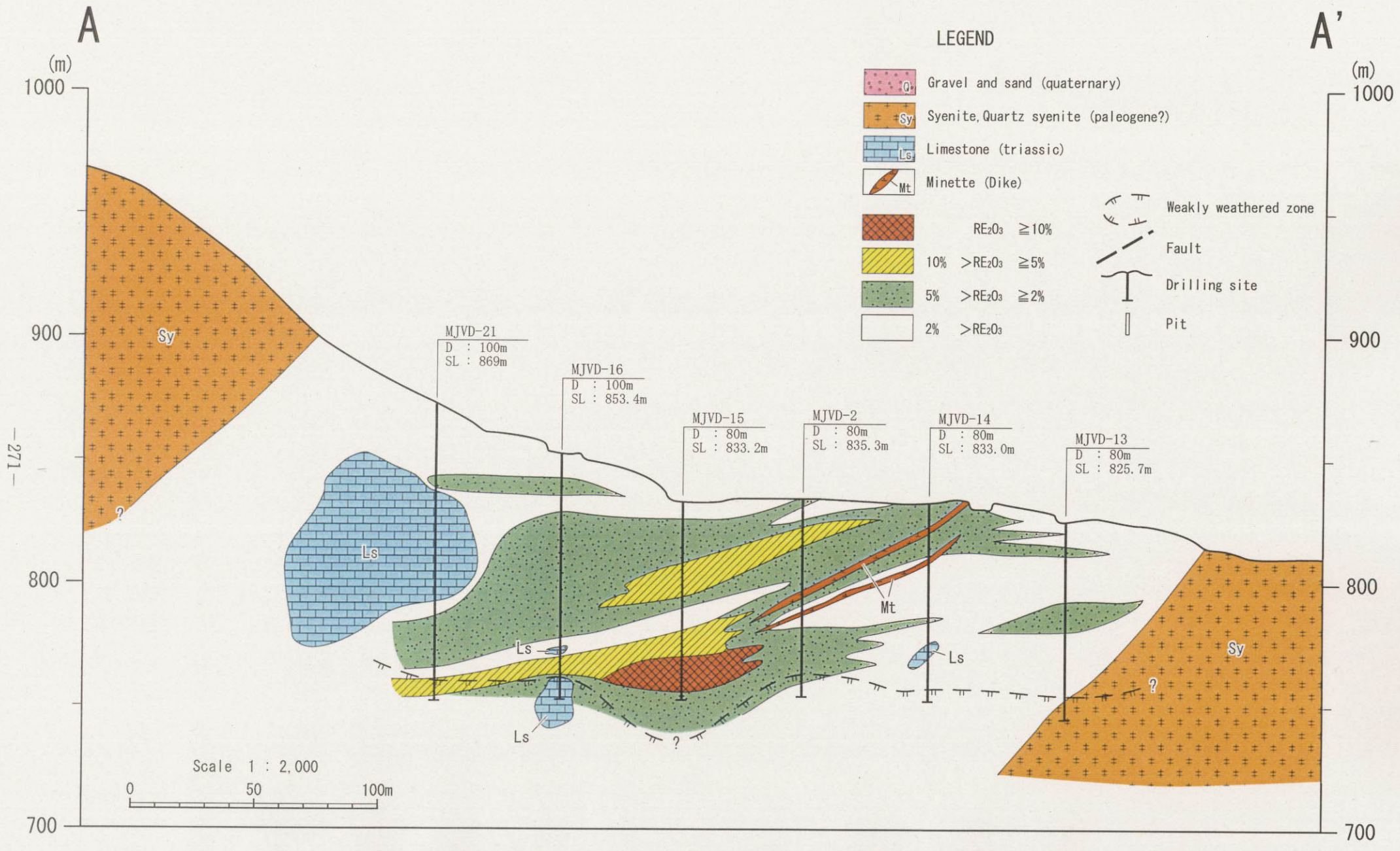


Figure Ⅲ-4-4 (1/7) Geology-mineralization cross-section of F3 orebody (A-A')

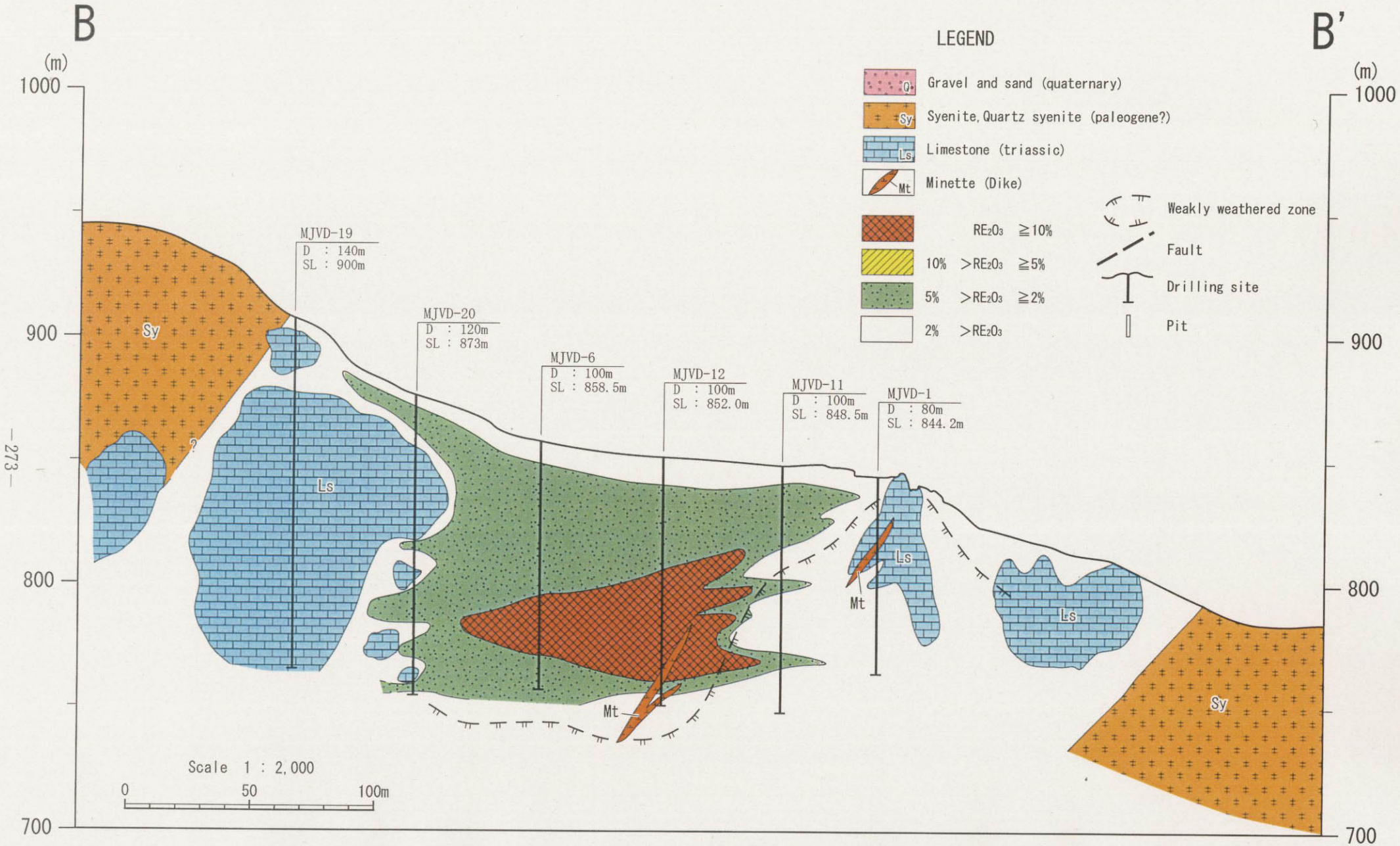


Figure Ⅲ-4-4 (2/7) Geology-mineralization cross-section of F3 orebody (B-B')

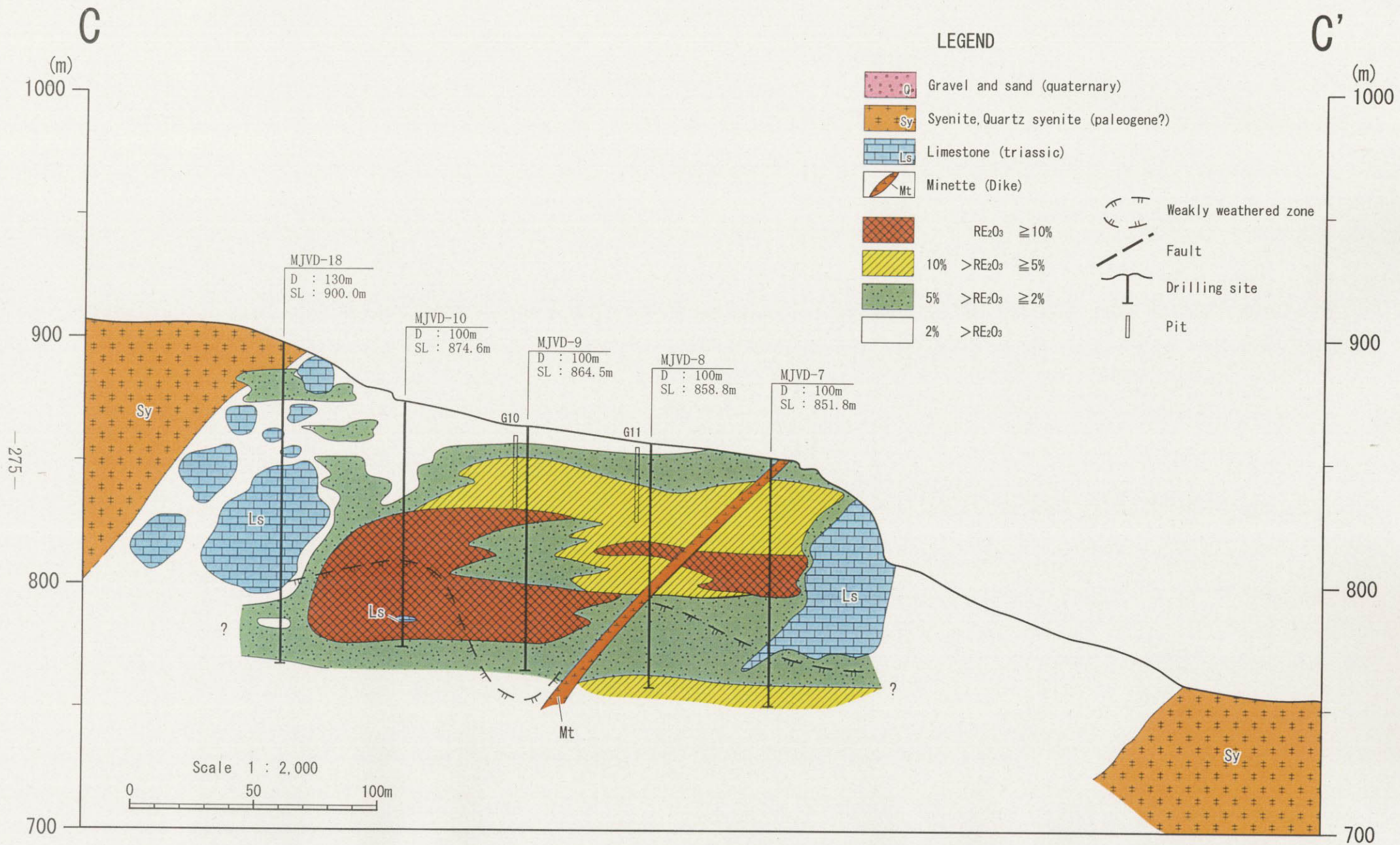


Figure Ⅲ-4-4 (3/7) Geology-mineralization cross-section of F3 orebody (C-C')

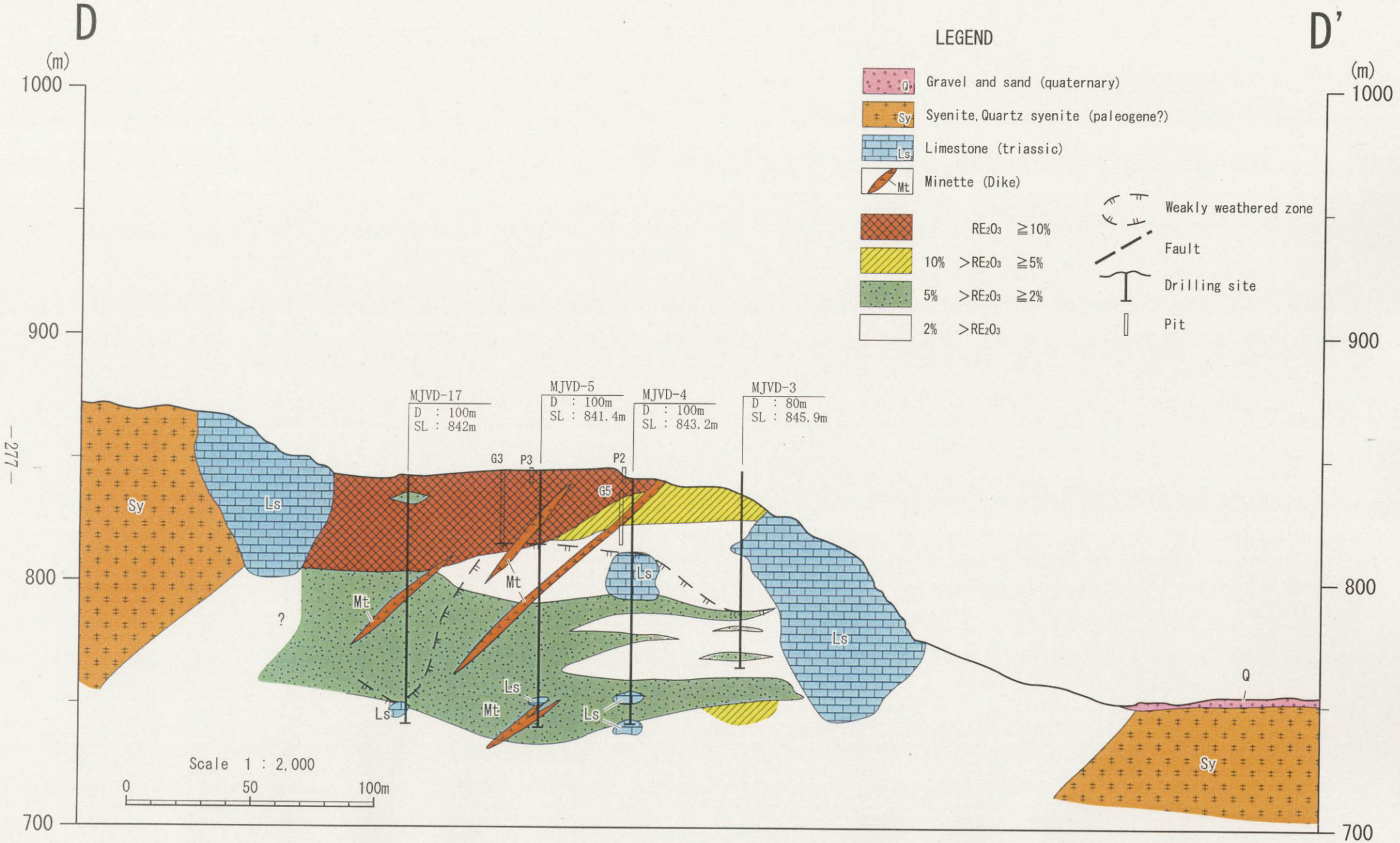


Figure Ⅲ-4-4 (4/7) Geology-mineralization cross-section of F3 orebody (D-D')

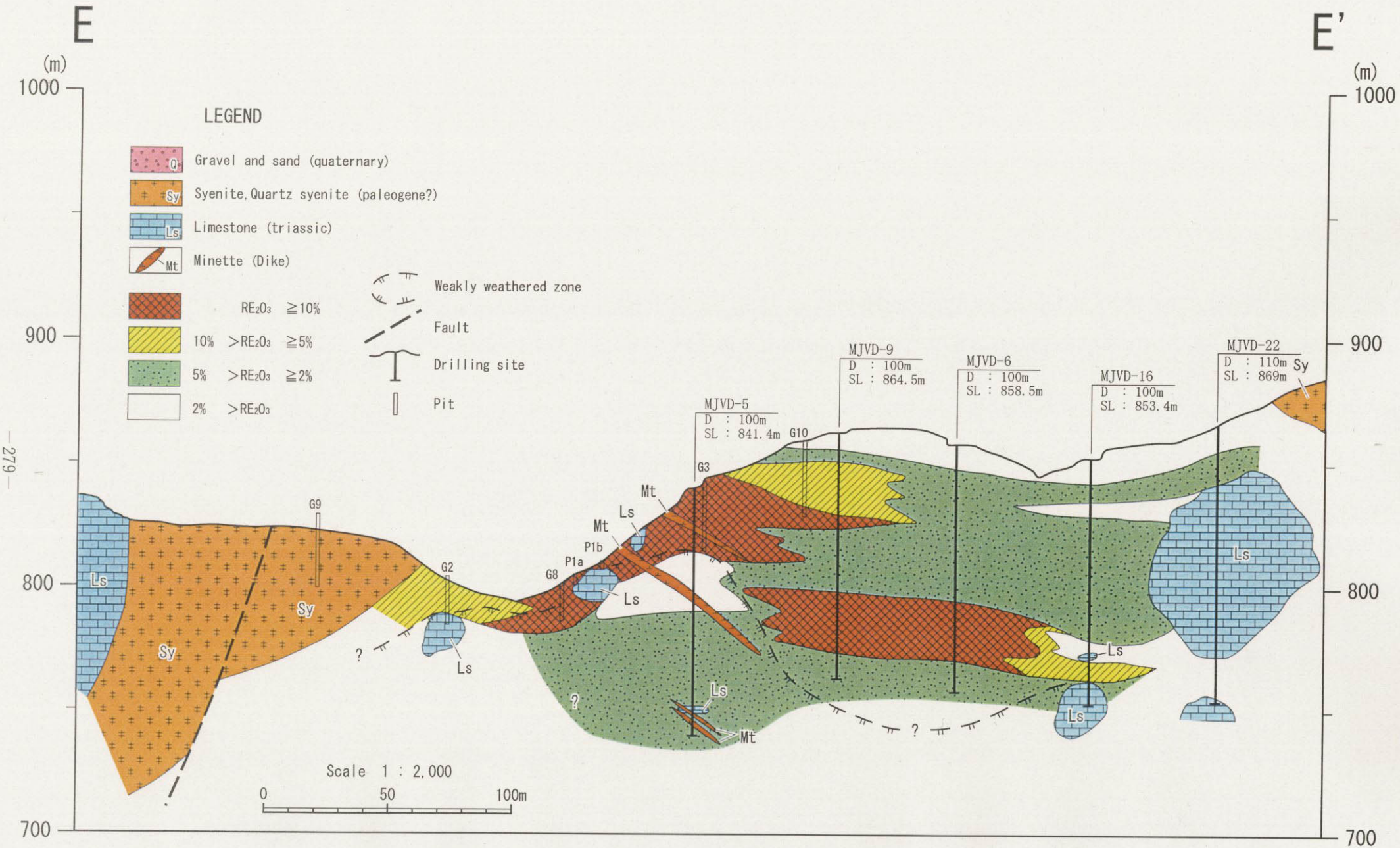


Figure Ⅲ-4-4 (5/7) Geology-mineralization cross-section of F3 orebody (E-E')

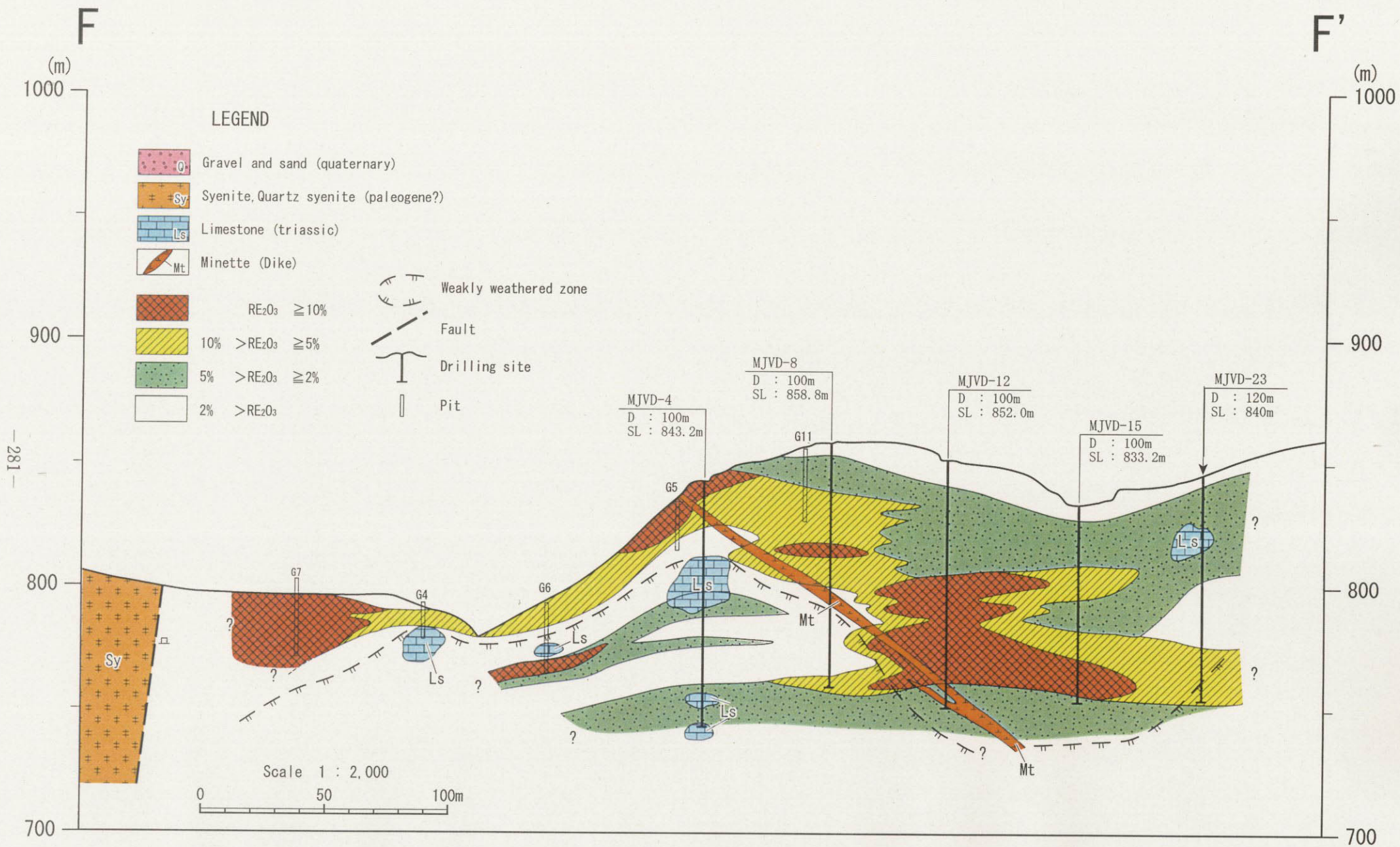


Figure Ⅲ-4-4 (6/7) Geology-mineralization cross-section of F3 orebody (F-F')

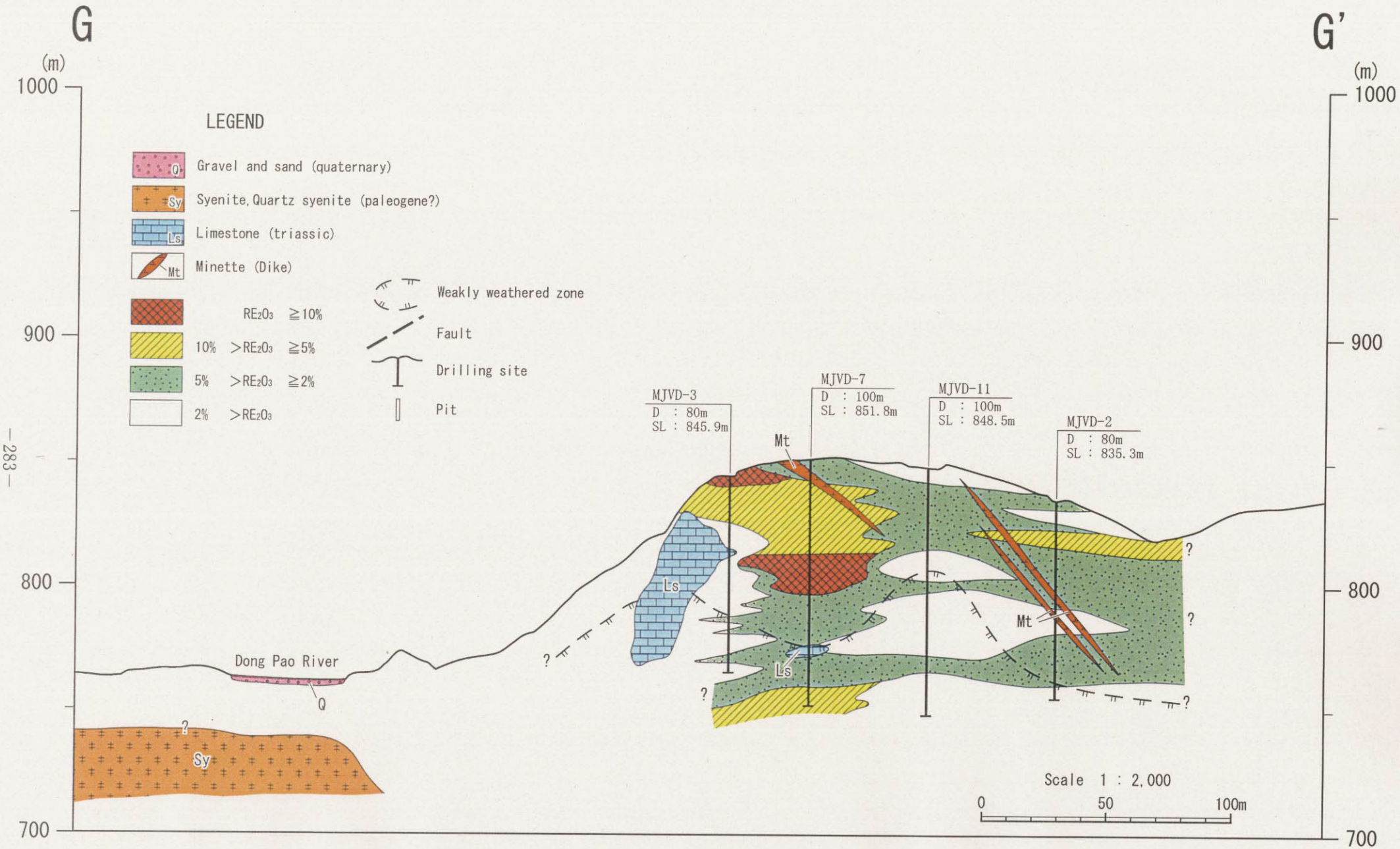


Figure Ⅲ-4-4 (7/7) Geology-mineralization cross-section of F3 orebody (G-G')

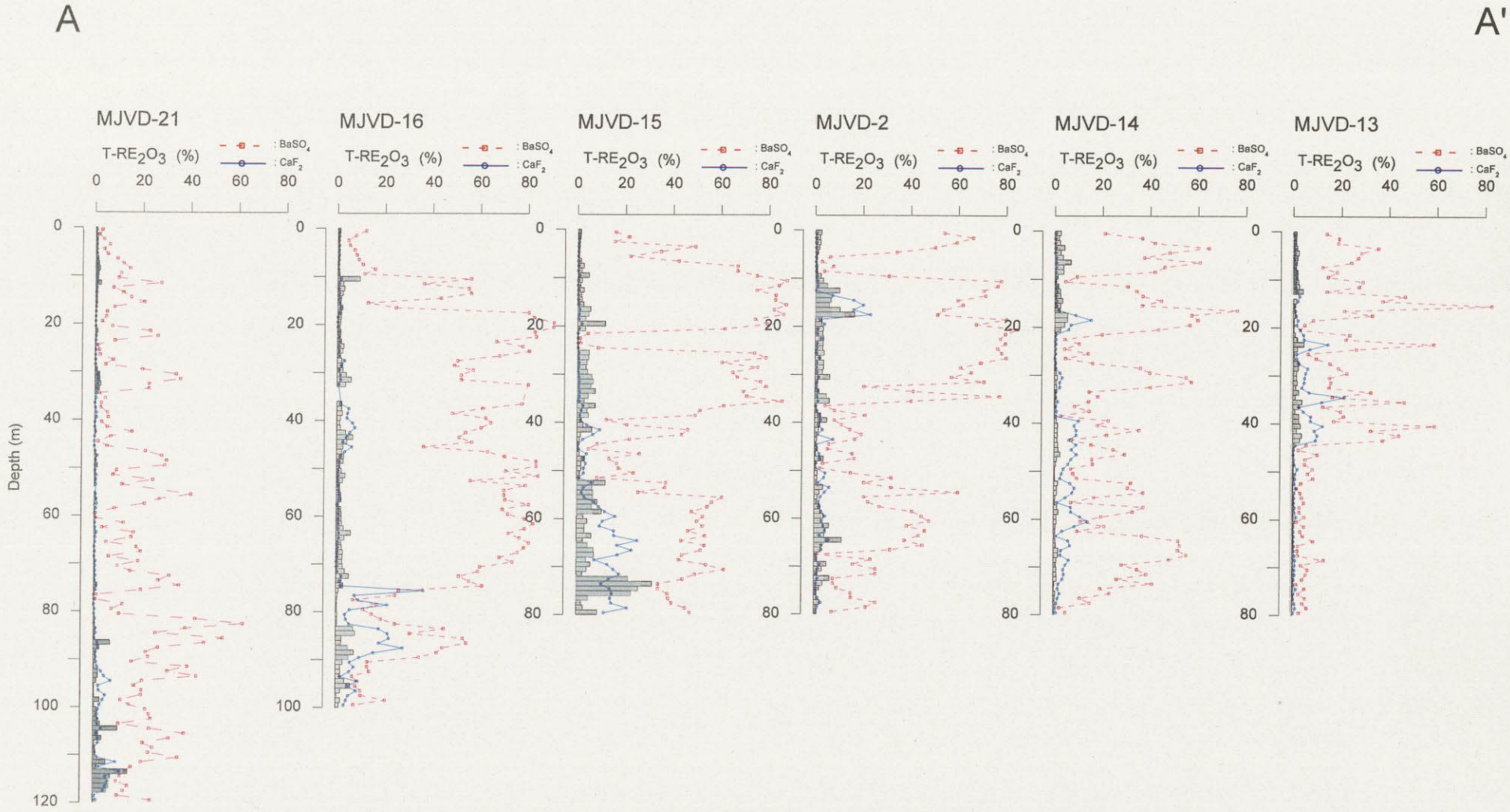


Figure Ⅲ-4-5 (1/7) Bar graphs for $T\text{-}RE_2O_3$, line graphs for CaF_2 and $BaSO_4$ (A-A')

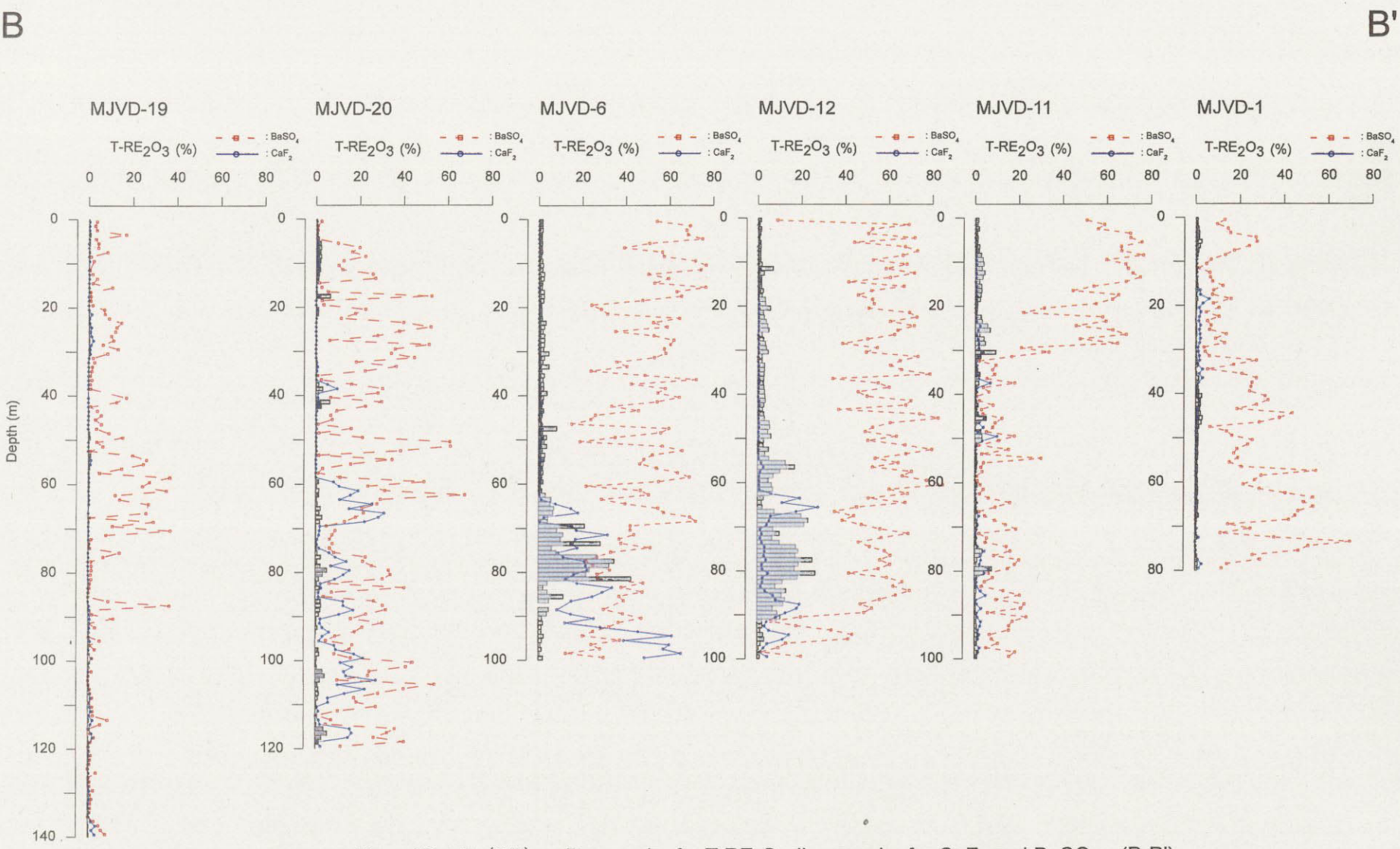


Figure Ⅲ-4-5 (2/7) Bar graphs for $T\text{-}RE_2O_3$, line graphs for CaF_2 and $BaSO_4$ (B-B')

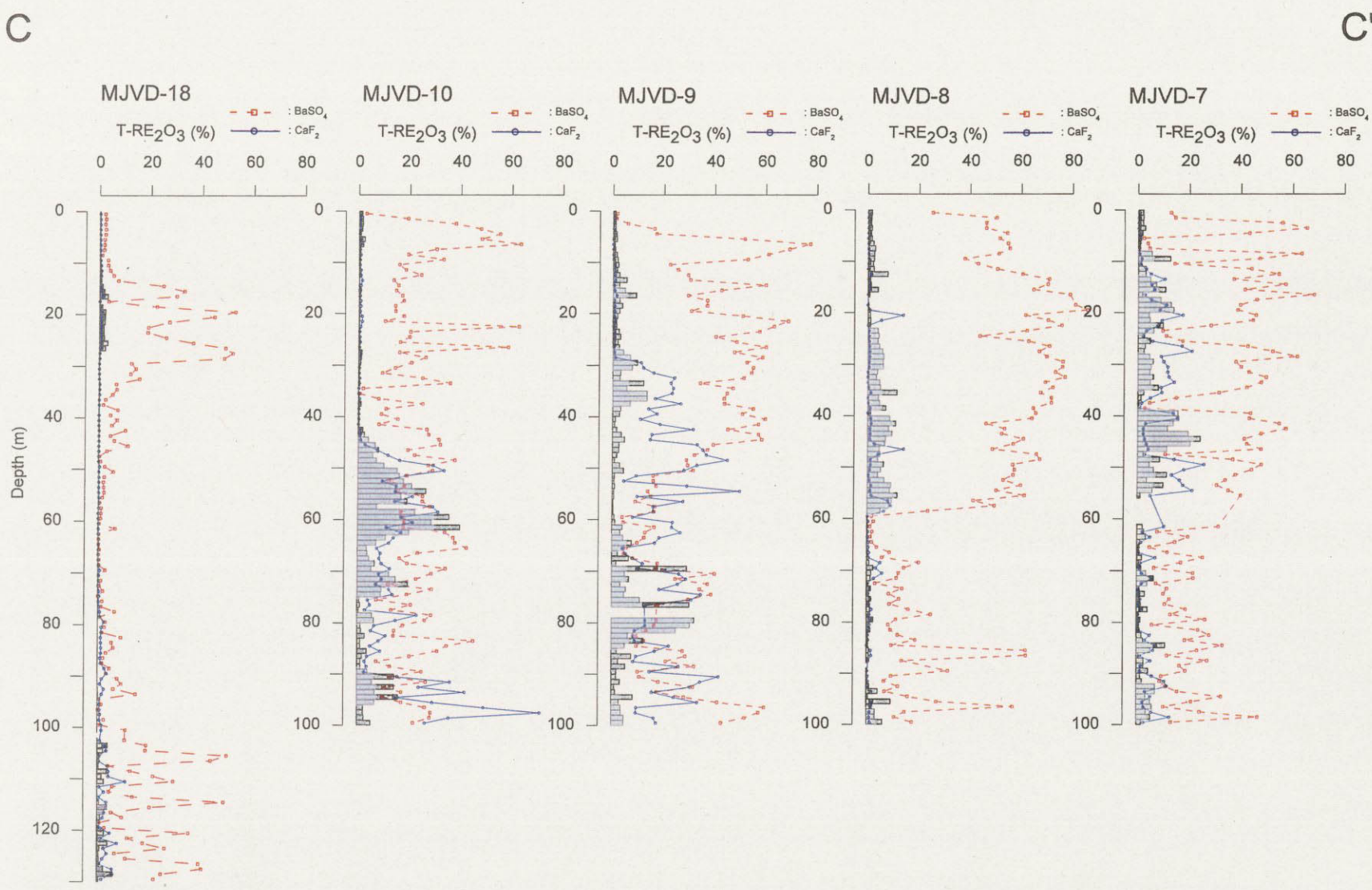


Figure Ⅲ-4-5 (3/7) Bar graphs for T-RE_2O_3, line graphs for CaF_2 and $BaSO_4$ (C-C')

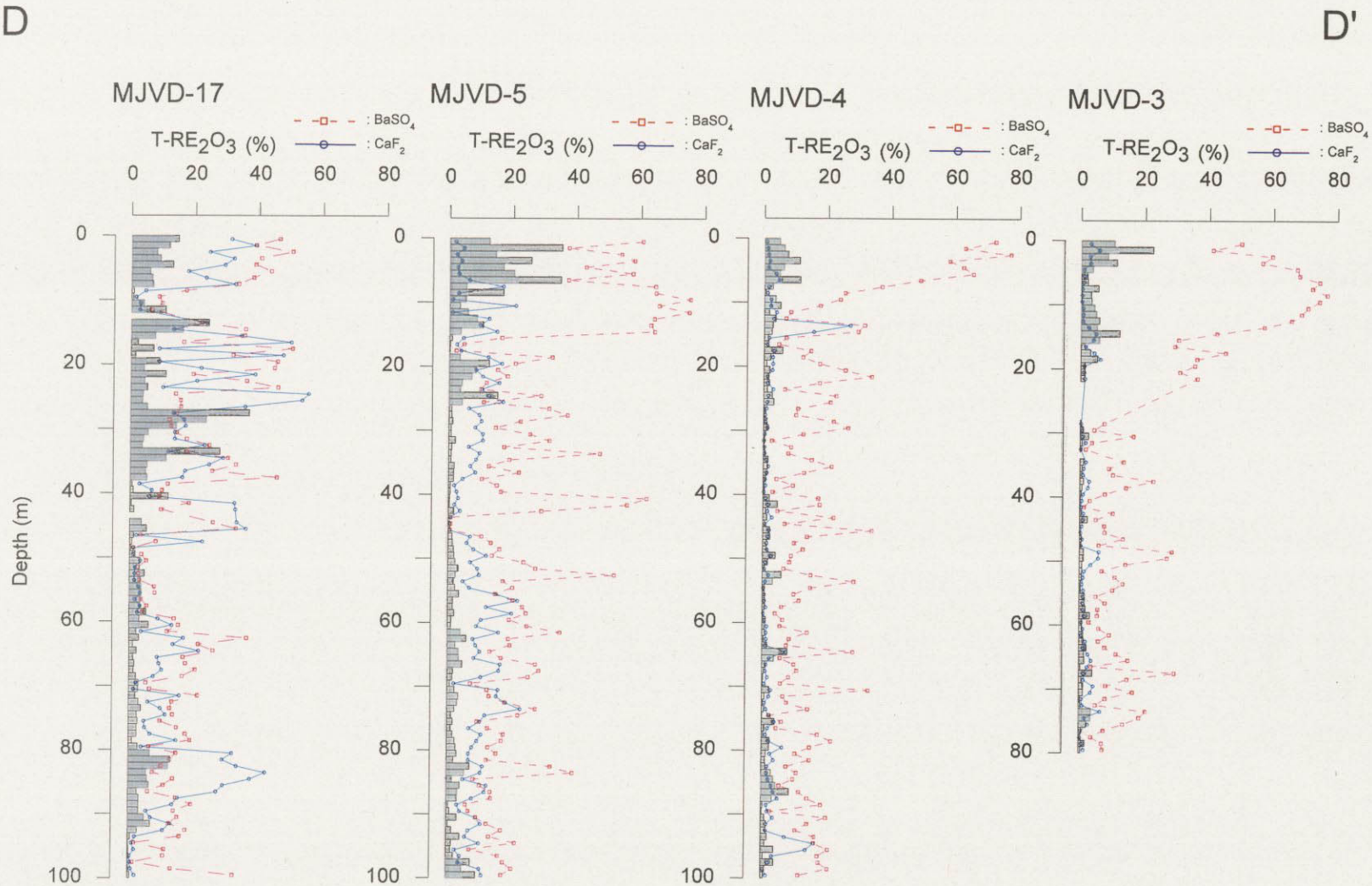


Figure Ⅲ-4-5 (4/7) Bar graphs for T-RE_2O_3, line graphs for CaF_2 and $BaSO_4$ (D-D')

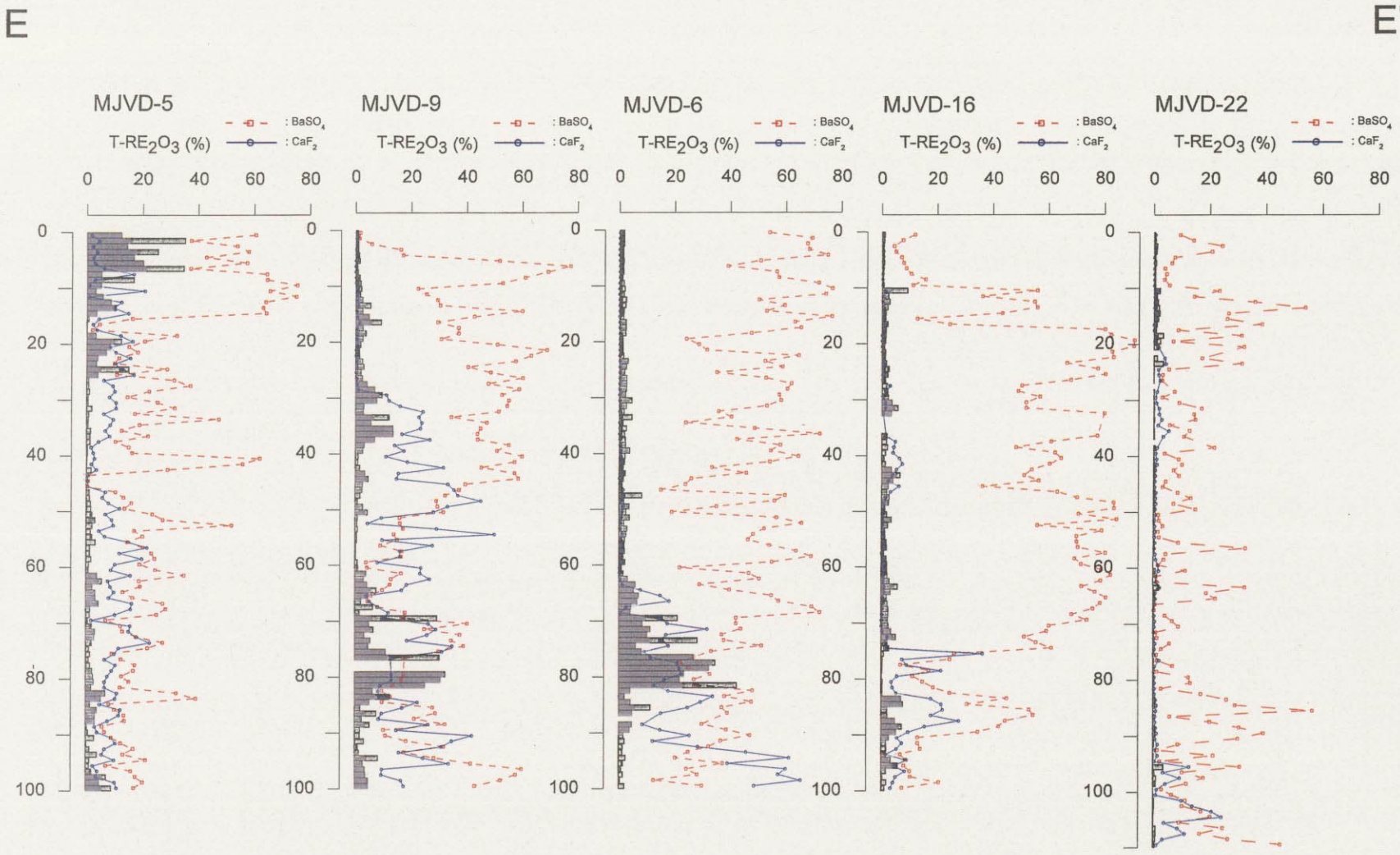


Figure Ⅲ-4-5 (5/7) Bar graphs for T-RE_2O_3, line graphs for CaF_2 and $BaSO_4$ (E-E')

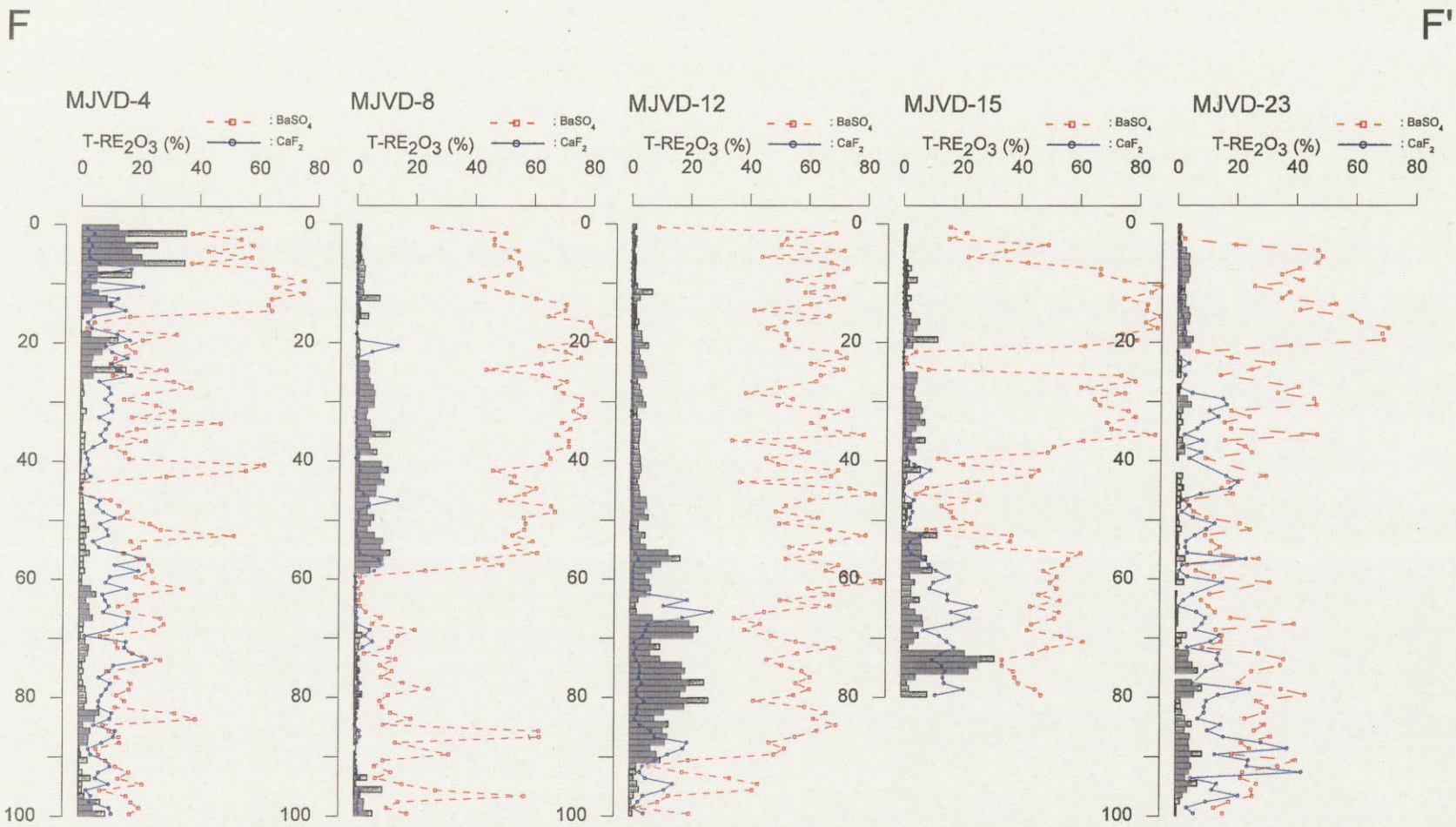


Figure Ⅲ-4-5 (6/7) Bar graphs for T-RE_2O_3, line graphs for CaF_2 and $BaSO_4$ (F-F')

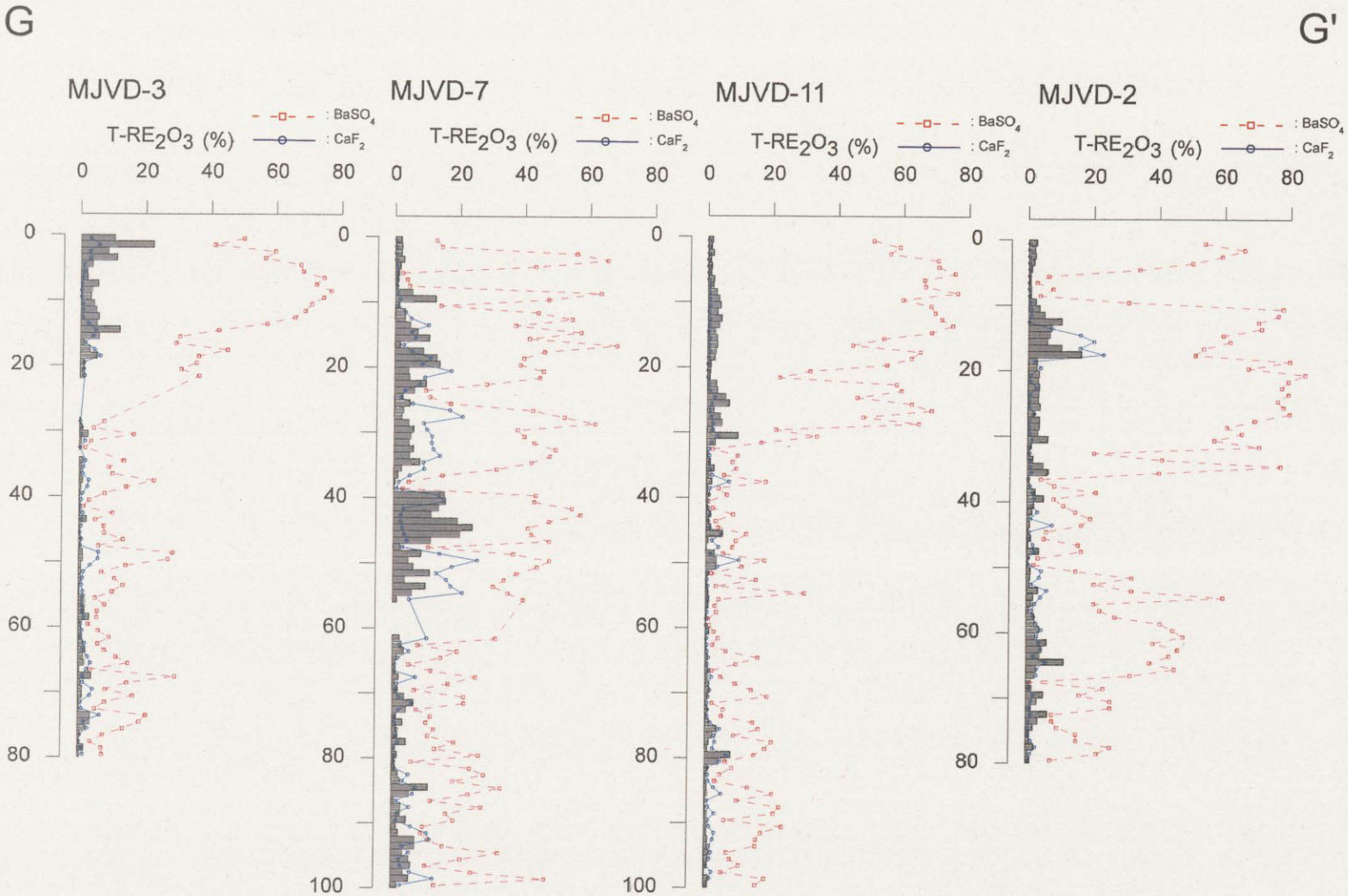


Figure Ⅲ-4-5 (7/7) Bar graphs for T-RE_2O_3, line graphs for CaF_2 and $BaSO_4$ (G-G')

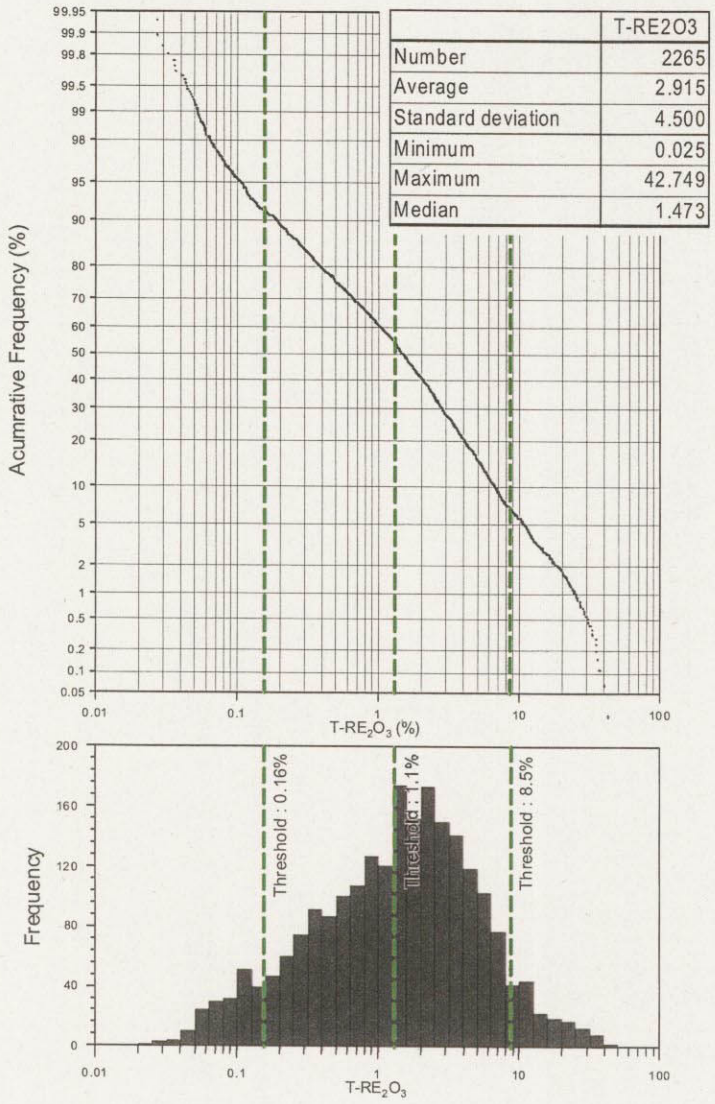


Figure III-4-6 Histogram and Cumulative Frequency Distribution of RE_2O_3 contents

The RE_2O_3 content of the F3 Ore Body indicates a unimodal distribution and accordingly is linear in the cumulative frequency distribution. However, slight inflections are observed at 0.16%, 1.1% and 8.5% RE_2O_3. The intervals between these thresholds are compared for the mineralization characteristics as shown in TableIII-4-5.

TableⅢ-4-5 Classification of mineralization by thresholds of T-RE_2O_3(%) distribution

Threshold Intervals	Classification of Mineralization
$RE_2O_3 < 0.16\%$	Unmineralized limestone
$0.16\% \leq RE_2O_3 < 1.1\%$	Limestone and syenite slightly mineralized
$1.1\% \leq RE_2O_3 < 8.5\%$	Weakly to moderately mineralized ores
$8.5\% \leq RE_2O_3$	Intensely mineralized ores

(4) Correlation between RE_2O_3 Content and Radioactivity

The RE_2O_3 content in the drill cores of the hole MJVD-23 is compared with the radioactivity. If the RE_2O_3 content and the radioactivity are correlative to each other, the measurement of radioactivity will be useful for distinguishing the intensity of the RE_2O_3 mineralization, which is virtually impossible by visual observation.

The radioactivity was measured for 3 equally divided sections of each 1m-long drill core for 2 minutes. The measurements of the divided sections were averaged for the representative radioactivity of the 1m-long drill core. The radioactivity was measured using a portable radioactivity measuring instrument, Inspector, equipped with a Gaiger-Muller counter (manufactured by S.E. International, Inc.). The measurement result is shown in Apx.9. The correlation coefficients between radiation, RE2O3, U and Th are tabulated in Table III-4-6. The number of the samples measured were 95 in total.

Table III-4-6 The Correlation Coefficients between Radioactivity, RE_2O_3, U and Th

	T-RE_2O_3	U	Th	Radiation
T-RE_2O_3	1.0000			
U	0.2727	1.0000		
Th	0.2282	0.3959	1.0000	
Radiation	0.3195	0.5604	0.7653	1.0000

The correlation coefficient between the radioactivity and RE_2O_3 is 0.3195, indicating a positive correlation between the two at the significance level of 1%. However, the higher correlation coefficient is indicated between the radioactivity and U or Th. The correlation coefficient between the radioactivity and Th is particularly high at 0.7653. The correlation diagrams of the radioactivity to RE_2O_3 and to Th are shown in Figures III-4-7 and –8.

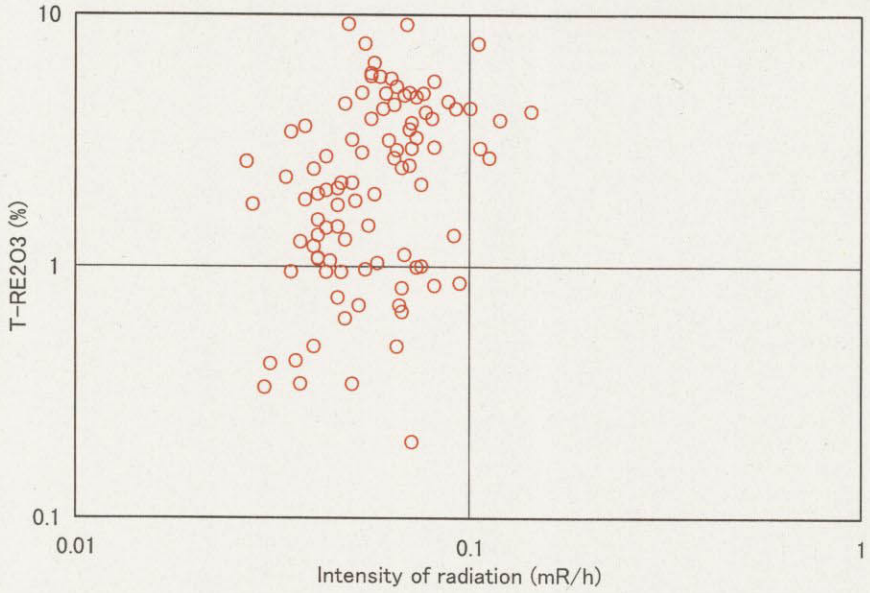


Figure III-4-7 Correlation Diagram between Radioactivity and RE_2O_3

Figure III-4-8 Correlation Diagram between Radioactivity and Th

The rare earth minerals contained in the F3 Ore Body are mostly bastnaesite and a minor amount of synchysite. The contents of U and Th are relatively low in comparison with other rare earth deposits elsewhere in the world. Although the correlation coefficient between the radioactivity and RE_2O_3 is low, they are correlative to each other to some extent. Therefore, the measurement of radioactivity can be utilized with a certain limitation for distinguishing the degree of intensity of rare earth mineralization.

4-3-2-2 Fluorite Mineralization

The holes MJVD-2, -5, -6, -7, -9, -10, -12 and –15, drilled in the 1st Year Campaign, and MJVD-17 and –23, drilled in the 2nd Year Campaign, intersected significant fluorite mineralization. The concentration of fluorite mineralization superimposes that of rare earth mineralization in plan. However, they differ from each other in cross-section and indicate no correlation to each other. Therefore, it is presumed that these two types of mineralization were formed in different stages.

The fluorite mineralization occurs as dissemination in syenite and as veinlets or dissemination in limestone. Fluorite intersections in drill holes are summarized in Table III-4-7.

Table III-4-7 Significant Fluorite Intersections in Drill Holes

Section No.	Drill Hole No.	Depth (m)	Thickness (m)	Content CaF_2 (%)
A-A'	MJVD-15	58.00 ~ 80.00	22.00	14.99
B-B'	MJVD-6	69.00~100.00	31.00	27.42
C-C'	MJVD-10	47.00~ 65.00	18.00	18.85
	Ditto	90.00~100.00	10.00	34.63
	MJVD-9	29.00~100.00	71.00	19.81
D-D'	MJVD-5	18.00~ 32.00	14.00	11.37
	Ditto	55.00~ 78.00	23.00	12.94
	Ditto	0.00~ 46.00	46.00	23.10
F-F"	MJVD-23	69.00~100.00	31.00	15.17

4-2-2-3 Barite Mineralization

The barite mineralization is considerable in the F3 Ore Body. A number of holes drilled in the 1st Year Campaign intersected high grade barite mineralization. However, the 4 holes, MJVD-18, -19, 21 and –22 drilled in the 2nd Year campaign, encountered long limestone sections and were weak in barite mineralization in comparison with other drill holes.

The concentration of barite mineralization extensively distributes beyond that of rare earth mineralization in plan. These types of mineralization indicate no agreement in their distributions in cross-section and no correlation to each other. The barite concentration tends to thicken from south to north and east to west, excluding the limestone portions, with increasing the degree of concentration. No correlation is observed between the barite and the fluorite mineralization. Significant mineralization that was intersected by the 4 holes drilled in the 1st Year Campaign is summarized in Table III-4-8.

Table III-4-8 Significant Barite Intersections in Drill Holes

Section No.	Drill Hole No.	Depth (m)	Thickness (m)	Content $BaSO_4$ (%)
A-A'	MJVD-16	10.00～33.00	23.00	62.03
	Ditto	36.00～75.00	39.00	68.01
B-B'	MJVD-6	0.00～76.00	76.00	50.95
	MJVD-12	1.00～90.00	89.00	58.93
C-C'	MJVD-8	1.00～59.00	58.00	60.20

4-2-2-4 Mode of Mineral Occurrences and Mineralogy

(1) Mode of Mineral Occurrences

The mode of mineral occurrences that was observed in the cores of the 7 holes drilled in the 2nd Year Campaign is similar to that observed in the drill cores of the 1st Year Campaign. The ores of the F3 Ore Body are intensely weathered both in the drill cores and in surface outcrops, which makes it extremely difficult to distinguish minerals by visual observation of hand specimens. It is, however, possible to distinguish them by their colors and color tones. Their visual characteristics are distinguished as follows.

- Brown to dark brown, partly dark gray: mainly observed in surface soil.
- Brown to light brown: mainly observed in intensely weathered syenite.
- Black-gray to gray: relatively high in Mn content, containing less than 10% of RE_2O_3 in general.
- Yellow to light yellow: generally high in bastnaesite content indicating higher grades than 10% RE_2O_3.
- White: barite ores or limestone, often in pebbles or white sands due to weathering.
- Purple: abundant in fluorite that is crystalline in limestone but powdery when intensely weathered, presenting dark purple color when contaminated with Mn.

The proximity photographs of drilling core are shown in Figure III-4-9

(2) Mineralogy

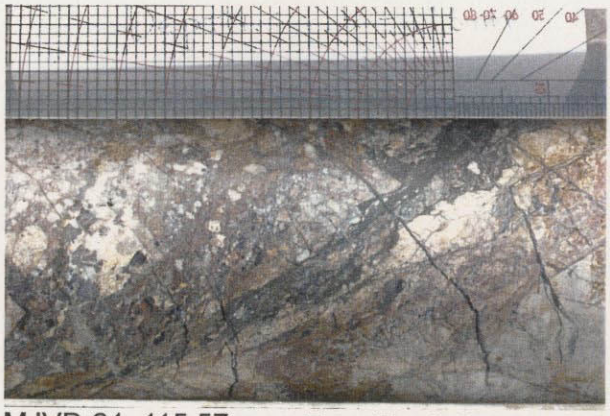
The result of microscopic observation of thin sections of ore samples is attached in Apx. 7 as well as that of X-ray diffraction analysis in Apx. 8.

The ore minerals that were observed in the cores of the holes drilled in the 2nd Year Campaign are bastnaesite, hydroxy-bastnaesite, synchysite, barite, fluorite and minor pyrite. The gangues observed include quartz, calcite, K-feldspar and phlogopite.

Bastnaesite mainly occurs as fine grained crystals interstitially filling spaces between crystals of barite, fluorite, calcite and other minerals. In part, it forms veinlets crosscutting barite, fluorite and calcite crystals.

MJVD-19, 24.68m Brecciated limestone

SAMPLE	TRE_2O_3	CaF_2	$BaSO_4$	U	Th
	%	%	%	ppm	ppm
MJVD-19-24.65	0.54	0.90	6.77	6	16



MJVD-21, 115.57m Rare Earth Oxide ore

SAMPLE	TRE_2O_3	CaF_2	$BaSO_4$	U	Th
	%	%	%	ppm	ppm
MJVD-21-115.60	17.47	8.08	7.32	421	45

MJVD-23, 5.40m
Rare Earth Oxide ore, with barite

SAMPLE	TRE_2O_3	CaF_2	$BaSO_4$	U	Th
	%	%	%	ppm	ppm
MJVD-23-6	4.11	0.64	48.65	72	206

MJVD-23, 13.40m
Rare Earth Oxide ore, with barite

SAMPLE	TRE_2O_3	CaF_2	$BaSO_4$	U	Th
	%	%	%	ppm	ppm
MJVD-23-14	2.69	1.09	53.23	96	113

MJVD-23, 30.14m
Rare Earth Oxide ore, with barite and fluorite

SAMPLE	TRE_2O_3	CaF_2	$BaSO_4$	U	Th
	%	%	%	ppm	ppm
MJVD-23-31	4.87	16.81	46.88	68	50

MJVD-23, 91.56m
Rare Earth Oxide ore, with barite and fluorite

SAMPLE	TRE_2O_3	CaF_2	$BaSO_4$	U	Th
	%	%	%	ppm	ppm
MJVD-23-92	5.55	24.25	34.51	49	36

Figure Ⅲ-4-9 Photograph of the drilling core

Chapter 5 Geological Ore Reserves of the F3 Ore Body

5-1 Basic Data for the Ore Reserve Estimation

(1) Drill Hole Collar Coordination

The data of the holes that were drilled in the 1st and 2nd Year Campaigns of the current Exploration Project, were used for the ore reserve estimation. A total number of 23 holes, totaling 2,300m, were drilled during the 2-year exploration period. All of them were drilled vertically. The hole data, including the hole collar coordination (X, Y, Z), the azimuth, the inclination and the hole length, are shown in Table III-5-1.

Table III-5-1 Drill Hole Data

HOLE-ID	LOCATION_X	LOCATION_Y	LOCATION_Z	AZIMUTH	DIP	LENGTH(m)
MJVD-1	350721.00	2466109.00	849.00	0.0	-90.0	80.00
MJVD-2	350691.00	2466164.00	840.00	0.0	-90.0	80.00
MJVD-3	350670.00	2466030.00	851.00	0.0	-90.0	80.00
MJVD-4	350622.00	2466018.00	848.00	0.0	-90.0	100.00
MJVD-5	350583.00	2466015.00	846.00	0.0	-90.0	100.00
MJVD-6	350584.00	2466123.00	864.00	0.0	-90.0	100.00
MJVD-7	350677.00	2466062.00	857.00	0.0	-90.0	100.00
MJVD-8	350627.00	2466069.00	864.00	0.0	-90.0	100.00
MJVD-9	350577.00	2466075.00	869.00	0.0	-90.0	100.00
MJVD-10	350528.00	2466081.00	880.00	0.0	-90.0	100.00
MJVD-11	350683.00	2466112.00	853.00	0.0	-90.0	100.00
MJVD-12	350633.00	2466118.00	856.00	0.0	-90.0	100.00
MJVD-13	350798.00	2466149.00	831.00	0.0	-90.0	80.00
MJVD-14	350742.00	2466157.00	838.00	0.0	-90.0	80.00
MJVD-15	350641.00	2466171.00	838.00	0.0	-90.0	80.00
MJVD-16	350592.00	2466178.00	858.00	0.0	-90.0	100.00
MJVD-17	350531.00	2466025.00	847.00	0.0	-90.0	100.00
MJVD-18	350478.00	2466090.00	905.00	0.0	-90.0	130.00
MJVD-19	350486.00	2466137.00	905.00	0.0	-90.0	140.00
MJVD-20	350537.00	2466128.00	878.00	0.0	-90.0	120.00
MJVD-21	350543.00	2466185.00	874.00	0.0	-90.0	120.00
MJVD-22	350599.00	2466231.00	874.00	0.0	-90.0	110.00
MJVD-23	350648.00	2466221.00	845.00	0.0	-90.0	100.00
total						2300.00

The result of the on-site were used for the horizontal coordination (X and Y) without any correction. However, the elevation for each hole collar were equally elevated by 5m from that based on the on-site surveying result, because the topographic map prepared based on the aerial photogrammetry indicated elevations uniformly higher than those obtained by the on-site surveying. No hole deviation survey was carried out, because it was assumed that hole deviation would be minimal since all holes were drilled vertically for relatively short length ranging between 80 and 140 m. Therefore, it was

assumed for estimation of coordination of each assay run that all holes were vertically drilled without any curvature.

(2) Assay Result of Drill Core Samples

Drill cores were sampled for a length of 1m at an interval of 1m(1m assay run) over the entire depth of each hole and were submitted for chemical analysis(assay). Prior to carrying out the ore reserve estimation, the contents of Sc_2O_3, Y_2O_3, La_2O_3, CeO_2, Pr_6O_{11}, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3 were estimated on the basis of the assay result and were summed up for the total rare earth content(RE_2O_3). It was also assumed that the elements F and B were entirely contained in CaF_2 and $BaSO_4$ respectively for estimation of CaF_2 and $BaSO_4$ grades based on the F and B contents as the assay results. The grades of the three oxides, RE_2O_3, CaF_2 and $BaSO_4$, were used for the ore reserve estimation. In addition, the ore types were classified into 4 categories, namely black ore, mixed ore, low grade mixed ore and yellow ore coded to B, M, M? and Y based on visual observation of cores.

(3) Lithology

Lithology and lithological boundaries were recorded and digitized for input data according to the description in the geologic log sheets. The Lithology is classified into 8 categories, namely overburden, syenite, minette, limestone, unconsolidated sand, clay, breccia and cave.

(4) Morphologic Data

According to the digitized topographic data for the 1 to 5,000 topographic map based on the aero-photogrammetric survey, it was found that there was a discrepancy for the drill locations between the aero-photographic and the original topographic maps. Accordingly, the hole collar locations were corrected by adding 40m in the X coordination and adding 30m in the Y coordination to the original coordination of each hole collar.

5-2 Procedure of the Ore Reserve Estimation

(1) Data Processing System and Software

The estimation was carried out using the data processing system and the soft ware owned by Sumitomo Metal Mining Co., Ltd. The data processing hardware and software are as follows;

- Hardware : Compaq, Professional Workstation AP550
- OS : Microsoft, NT Workstation 4.0+Service Pack4(English Version)
- Mintec Inc., Mine Sight 2.7

(2) 3-Dimensional Block Model

Blocks having a dimension of 20m in N-S, 20m in E-W and 5m in height were set up for the extent of the ore reserve estimation shown in Table III-5-2. The extent of the

ore reserve estimation was determined based on the topographic map with the plot of drill hole locations.

Table III-5-2 The Extent of the Ore Reserve Estimation

	min	max	block size(m)	number of blocks
X	350000	351260	20	63
Y	2464800	2466000	20	90
Z	600	1150	5	110

(3) Composite Assay Run

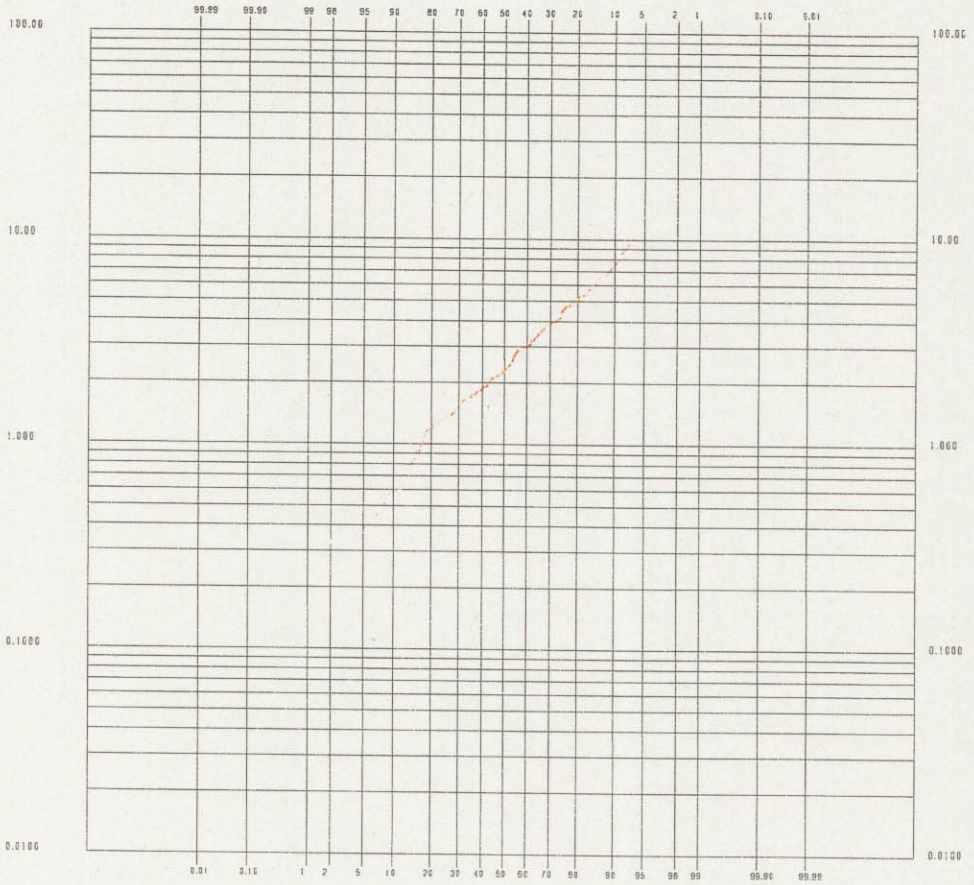
In the geostatistic ore reserve estimation, original assay runs of each drill hole are composed into composite assay runs having an equal length. The grades of each composite assay run are estimated by averaging the assay results of original assay runs with the weight of their core lengths. In this estimation, composite assay runs with a length of 5m that were bounded by block boundaries, were produced. Where a lithological boundary crosscuts a composite assay run, such assay run was divided at the boundary. A cave intersection formed one composite assay run with 0 grade.

(4) Treatment of Extraordinary Assays

Logarithmic histograms and log-normal probability distributions of composite assays for RE_3O_3, CaF_2 and $BaSO_4$ were prepared in order to examine extraordinarily high assays for their suitability for grade estimation. Inflexion points of these three oxides in the log-normal probability distribution curves were adopted for the upper thresholds of extraordinarily high assays. They were 20% for RE_3O_3, 30% for CaF_2 and 80% for $BaSO_4$. Higher assays above these thresholds were regarded as extraordinary assays (Figures III-5-1, -2 and –3). Extraordinary assays exceeding the thresholds were converted to the respective thresholds and then were used for the variogram analysis and for the grade assignment to each block.

(5) 3-D Solid Models of the Ore Body and Lithological Units

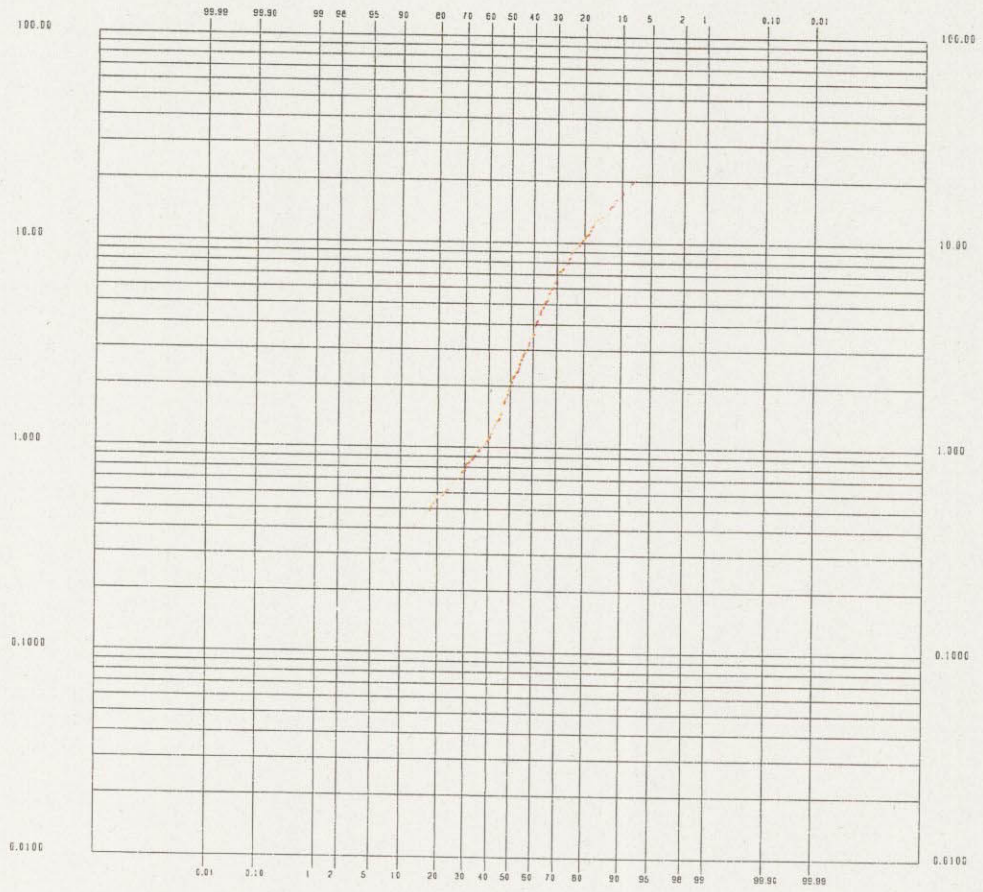
The ore and lithological boundaries that were indicated on the cross-sections with the azimuth of 100° , were digitized and extrapolated to 25m each side of the relevant cross-sections, observing the longitudinal sections with the azimuth of 5° , in order to construct 3-dimensional solid models of the ore body(syenite), minette, limestone and unmineralized syenite. The percentage of ores in each block(block partial) was estimated in accordance with these solid models.



** PROBABILITY DISTRIBUTION PLOT OF RE2O3 **

ITEM	RE2O3	NATURAL LOGS	
NUMBER	295	NUMBER	295
MEAN	3.6500	MEAN	0.8570
MINIMUM	0.2000	MINIMUM	-1.6090
MAXIMUM	22.4800	MAXIMUM	3.1130
VARIANCE	14.8940	VARIANCE	0.9240
ST.DEV.	3.8590	ST.DEV.	0.9610

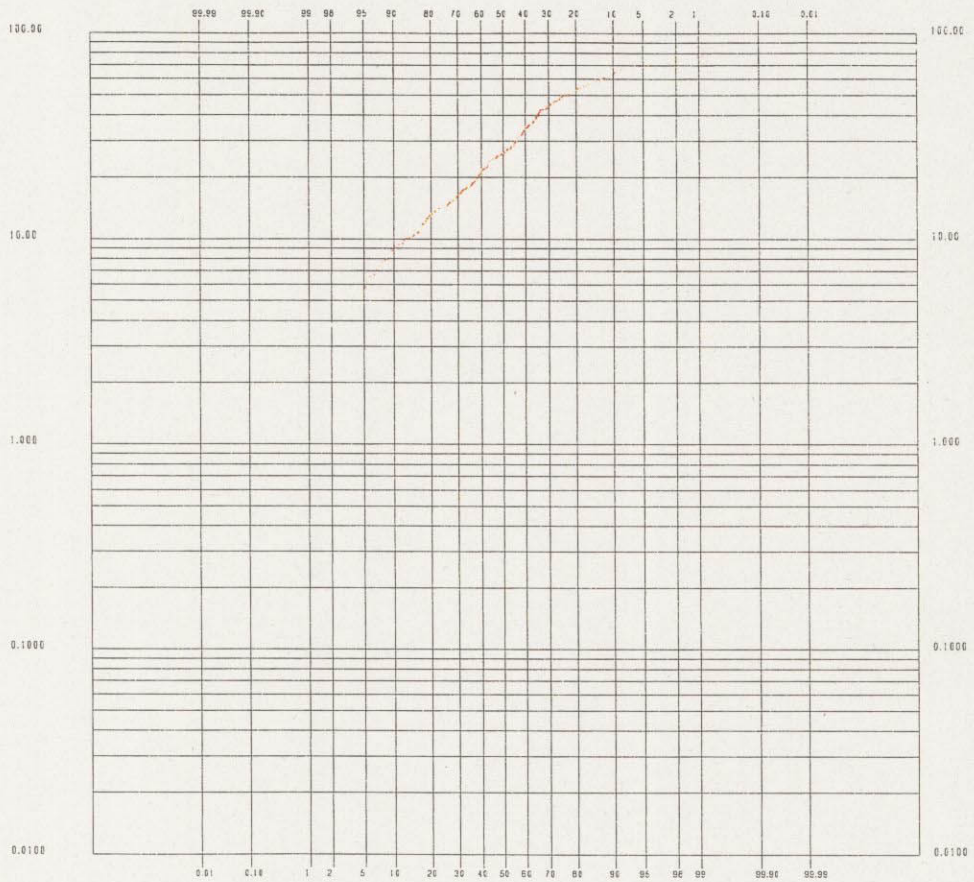
Figure Ⅲ-5-1 Logarithmic histogram and probably distribution of T-RE_2O_3



** PROBABILITY DISTRIBUTION PLOT OF CAF2 **

ITEM	CAF2	NATURAL LOGS	
NUMBER	295	NUMBER	295
MEAN	6.0220	MEAN	0.8250
MINIMUM	0.1100	MINIMUM	-2.2070
MAXIMUM	56.8200	MAXIMUM	4.0400
VARIANCE	72.1110	VARIANCE	2.2130
ST.DEV.	8.4920	ST.DEV.	1.4880

Figure Ⅲ-5-2 Logarithmic histogram and probably distribution of CaF_2



ITEM	BASO4	NATURAL LOGS	
NUMBER	295	NUMBER	295
MEAN	32.2480	MEAN	3.2140
MINIMUM	1.9600	MINIMUM	0.6730
MAXIMUM	85.9600	MAXIMUM	4.4540
VARIANCE	437.9460	VARIANCE	0.6200
ST.DEV.	20.9270	ST.DEV.	0.7870

Figure Ⅲ-5-3 Logarithmic histogram and probably distribution of $BaSO_4$

(6) Variogram

Experimental variograms for the 3 oxides, RE_2O_3, CaF_2 and $BaSO_4$ were estimated using composite assay run pairs only for syenite. Distances between the composite pairs (lag distances) were taken at 5m, 10m, 15m, ・・・・, with an allowance of ± 2.5m. The variogram estimation was made for 6 azimuths, 10, 30, 60, 90, 120 and 150 degrees with 4 inclinations, 0, −30, −60 and −90 degrees for each azimuth, allowing ±15° deviations both for the azimuth and inclination. A total of 19 sets of variograms were produced(6 azimuths x3 inclinations + 1 set only for −90° inclination).

The vertical variograms for all of the 3 oxides showed stereotype patterns, which made it easy to determine parameters for a model function. However, the inclined and horizontal variograms were quite irregular in their distribution patterns and were difficult to be standardized. This may be attributed to the current drilling scheme, in which all holes had been vertically drilled and widely spaced. Therefore, variations in horizontal lag distances were limited. In the current geostatistic analysis, it was assumed that variances of oxide grades would be isotropic in any directions. With this assumption, the parameters based on the vertical were equally adopted to all directions. The adopted parameters are shown in Table III-5-3, and the variograms, in Figures III-5-4, -5 and -6.

Table III-5-3 Variogram Parameters

		RE2O3	CaF2	BaSO4
Model Type		Spherical	Spherical	Spherical
Nugget		2.60	7.12	46.08
Sill		14.35	58.89	447.88
Range	(Azi=10, Dip=0)	36.8	67.9	66.4
	(Azi=100, Dip=0)	36.8	67.9	66.4
	(Azi=0, Dip=−90)	36.8	67.9	66.4

(7) Assignment of Oxide Grades to Blocks

The oxides grades of each block were estimated using the ordinary Kriging method based on the composite assay run data. The ambit enclosing composite assay run data was defined as a sphere with a radius of 40m centering the center of each block. The Kriged oxide grades were assigned to the blocks that contained more than 1% of ores according to the 3-D solid model. The ore type of each block was determined level by level using a polygonal method according to the ore types included in the composite assay run data. The locations of cross and longitudinal sections that were used for the interpretation are shown in Figure III-5-7. The cross-sections and plans that demonstrate RE_2O_3 grades assigned to individual blocks are attached in Apx.10 and Apx. 11 respectively.

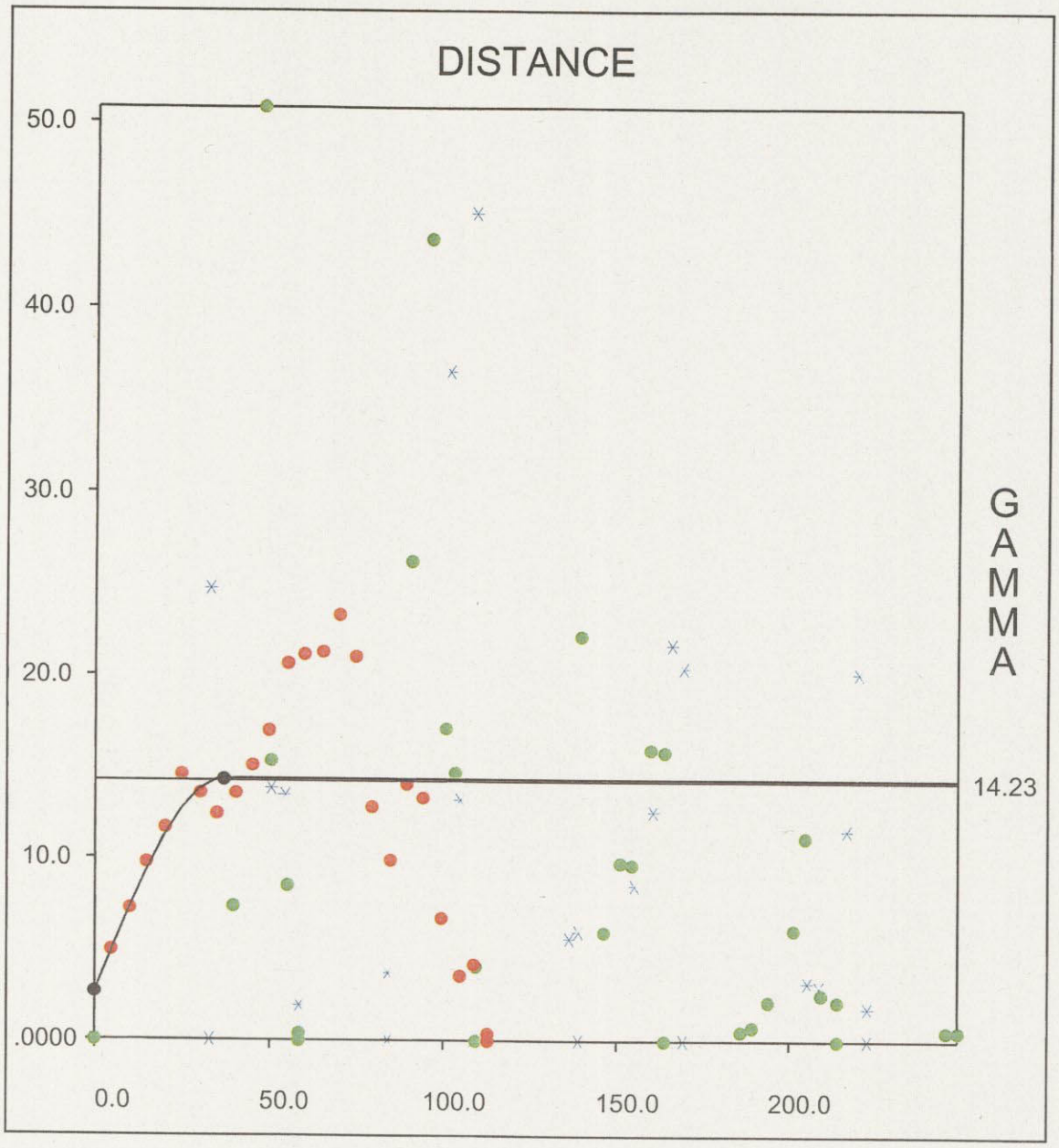


Figure Ⅲ-5-4 Variogram of T-RE_2O_3

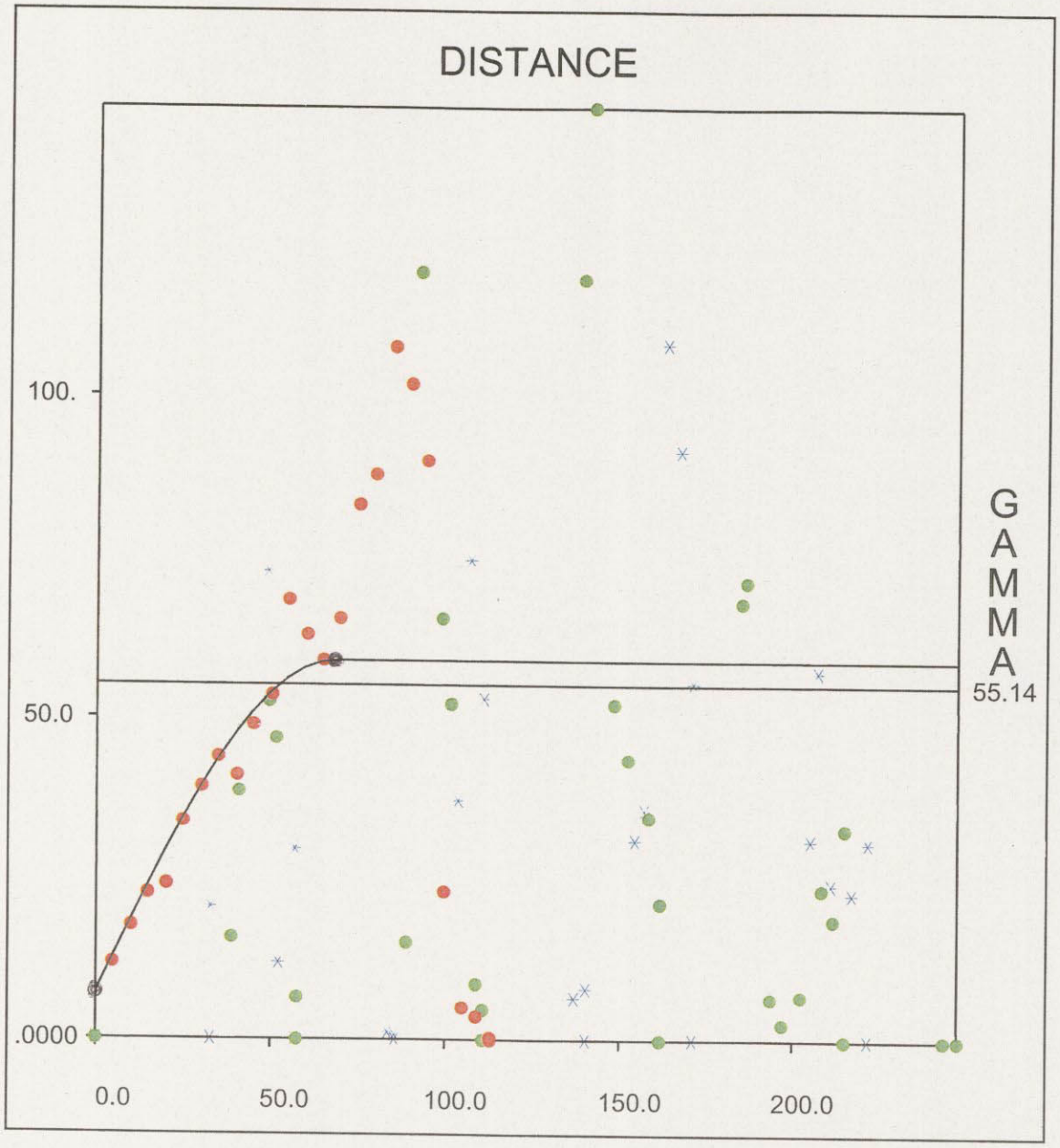


Figure Ⅲ-5-5 Variogram of CaF_2

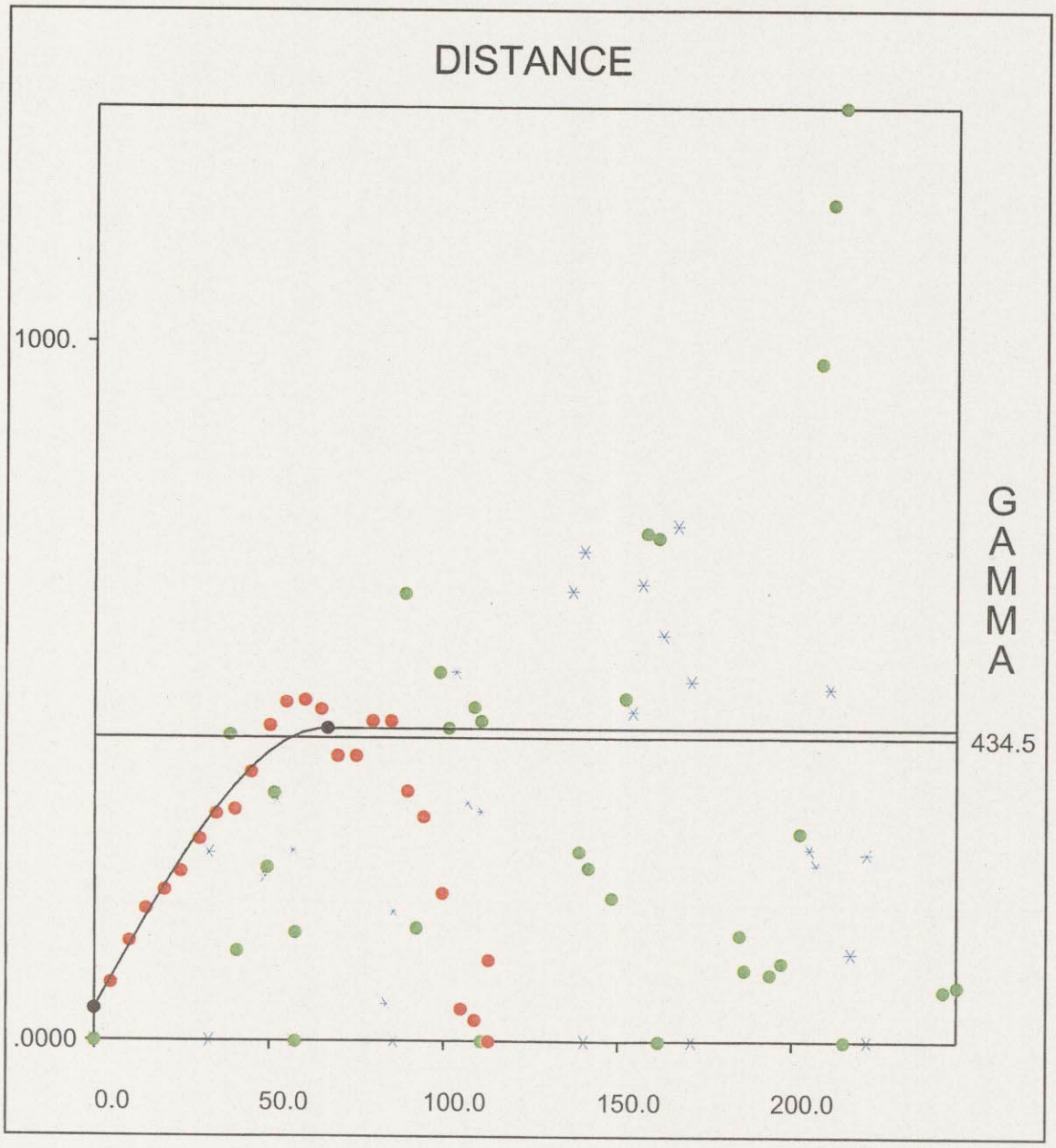


Figure Ⅲ-5-6 Variogram of $BaSO_4$

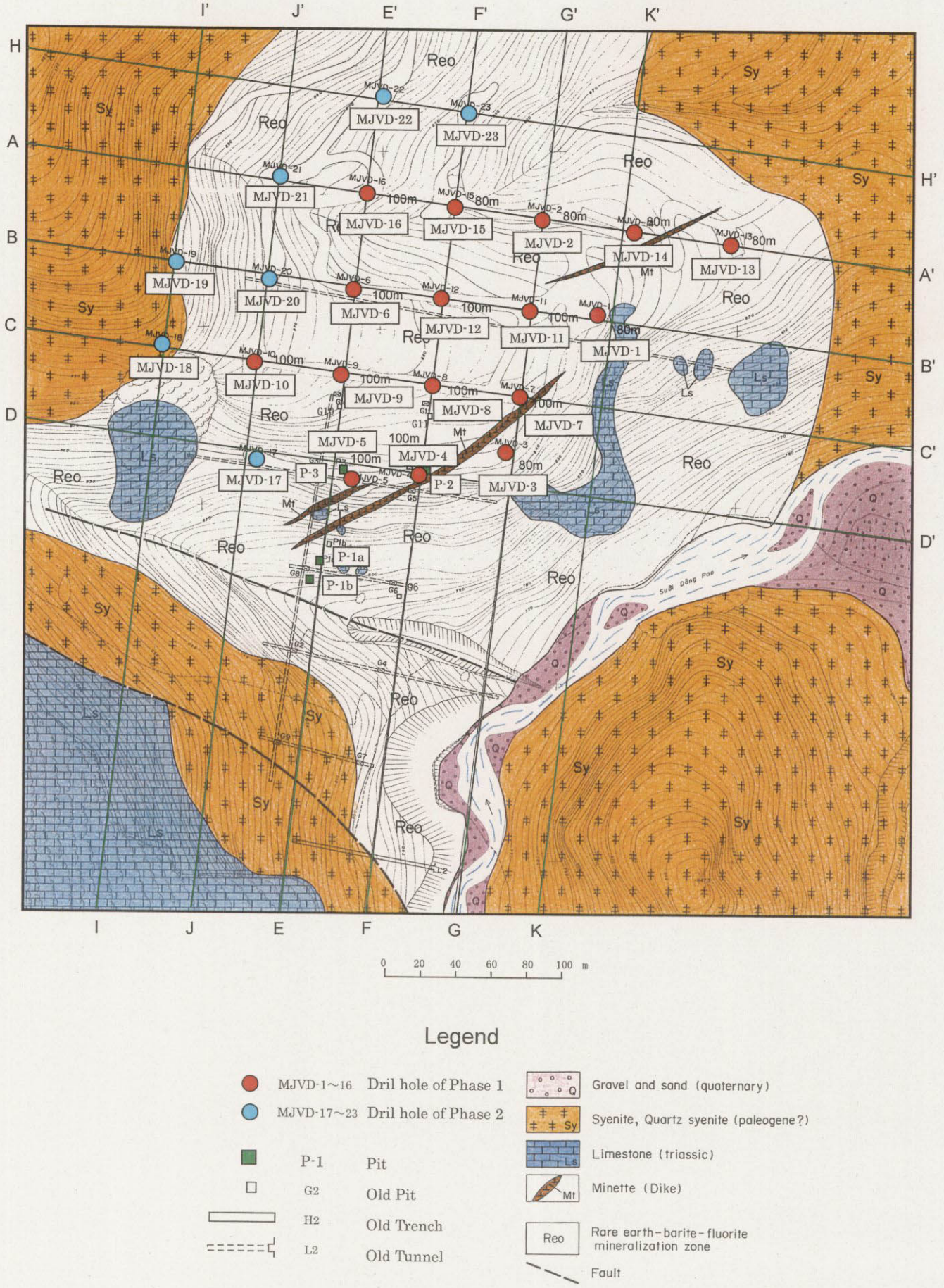


Figure Ⅲ-5-7 Plane map of cross section setting for Ore reserve calculation

(8) Specific Gravity

Data on specific gravity are scarce (Apx. 12). Therefore, it was difficult to specify the specific gravities of the ores and lithological units. The same specific gravity of 2.6 was applied to all ores and lithological units.

5-3 Result of Ore Reserve Estimation

The geological ore reserves, assuming 100% mining extraction and 0% dilution, were estimated and collected by cut-off grades ranging from 0 to 15% as shown in Table III-5-4. The reserve-grade relationship is demonstrated in FigureIII-5-8.

Table III-5-4 Geological Ore Reserves by Cut-Off Grade

		INSITU ORE (BCMS)	INSITU ORE (TONNES)	Average Grade		
				RE2O3 (%)	CaF2 (%)	BaSO4 (%)
CUTOFF=	0	11,517,458	29,945,392	1.84	3.37	16.84
	1	5,696,462	14,810,801	3.60	6.57	31.24
	2	4,229,725	10,997,284	4.32	7.84	34.32
	3	2,836,391	7,374,617	5.23	9.87	34.50
	4	1,833,175	4,766,256	6.19	12.06	34.01
	5	1,221,250	3,175,249	7.06	12.80	34.97
	6	789,018	2,051,446	7.93	13.59	35.40
	7	520,980	1,354,549	8.69	14.24	36.16
	8	294,291	765,156	9.63	12.74	39.72
	9	153,551	399,232	10.67	12.07	42.05
	10	75,671	196,744	11.88	12.20	44.74
	11	51,691	134,396	12.53	11.31	45.97
	12	28,600	74,361	13.29	11.32	45.52
	13	11,340	29,484	14.50	10.74	43.24
	14	6,200	16,120	15.66	9.64	38.85
	15	2,380	6,188	17.56	15.22	16.66

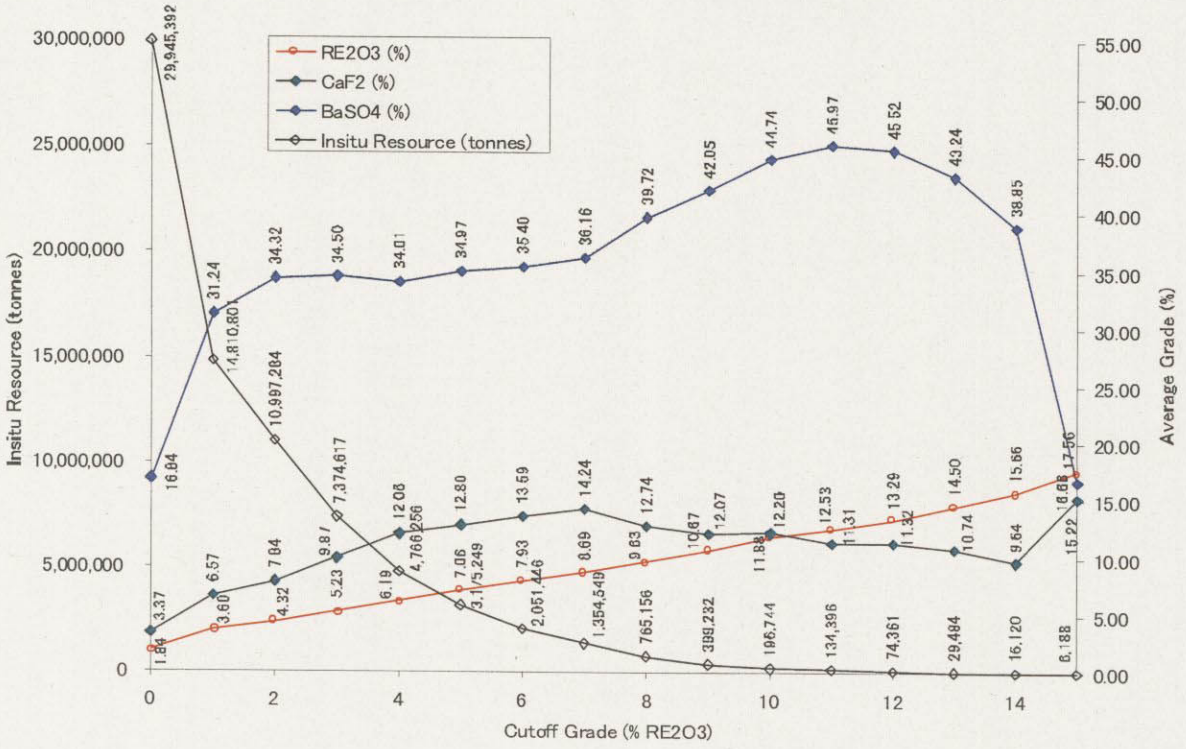


Figure Ⅲ-5-8 Relation between ore reserve and grade

(1) Ore Reserves by Bench

The ore reserves by bench are shown in attached Apx.15

(2) Ore Reserves by Ore Types

The ore reserves were collected by 4 ore types, namely black, mixed, low grade mixed and yellow, in order to estimate flotation recoveries according to the ore types. The cross-sections that demonstrate the ore types are shown in Apx.14, and the ore reserves collected by the ore types, in Part II-Table II-5-2

5-4 The Geological Reserves to the south of the Drilled Extent

The geological reserves estimated as above is limited to the extent where the 23 drill holes were put down. Therefore, the reserves that are expected to the south of the southern limit of the drilled extent are excluded from the above reserves.

In the 1st Year Campaign, A preliminary ore reserve estimation for the 18 ore blocks of the southern part of the F3 Ore Body was made on the basis of the plans and cross-sections prepared according to the data acquire in the 1986 exploration. the

estimation result is shown in Table I-4-2(Chapter 4 of Part 1 in this report). The 6 ore blocks, CI-13 through CI-18 in Table I-4-2, superimpose part of the current drilling grid where the holes, MJVD-3, -4, -5 and -17 were put down. The ore reserves excluding these 6 ore blocks are re-estimated and tabulated in Table III-5-5.

Table III-5-5 Geological Reserves beyond the Southern Limit of the Drilled Extent

	Volume (m^3)	Gravity	Reserve (t)	TRE_2O_3 (%)	TRE_2O_3 (t)	Pit,Tunnel
CI-1	6,305	1.93	12,169	14.80	1,801	L2
CI-2	54,800	1.93	105,764	12.90	13,646	L2, G7
CI-3	19,850	1.93	38,311	12.73	4,876	G2,G4,G7
CI-4	21,735	1.93	41,949	12.73	5,340	G7
CI-5	2,770	1.93	5,346	12.73	681	G7
CI-6	504	1.93	973	12.70	124	G2
CI-7	2,585	1.93	4,989	15.20	758	G2,G8
CI-8	13,360	1.93	25,784	12.29	3,168	G2,G6,G8
CI-9	802	1.93	1,547	9.90	153	G6
CI-10	22,008	1.93	42,476	15.68	6,661	G3,G8
CI-11	35,656	1.93	68,816	14.29	9,832	G3,G5,G6G8
CI-12	23,419	1.93	45,199	12.87	5,816	G5,G6
		Ore reserve	393,322	Total	52,856	
				Ore grade	13.44	
Case of safety factor 10%		Ore reserve	→ 353,990	TRE_2O_3 (t)	→ 47,570	
Case of safety factor 20%		Ore reserve	→ 314,657	TRE_2O_3 (t)	→ 42,285	
				Ore grade	13.44	

The ore reserves of Ore Class I (C1+C2) are estimated at approximately 390,000 tons with 13.44% RE_2O_3. Taking a safety factor into consideration because of the irregular lens form of the F3 ore body, it is reasonable to expect an increase of the geological reserves of 310,000 to 350,000 tons with a high average grade in RE_2O_3. These reserves are located near surface at a relatively low elevation and easily accessible for an open pit mining.