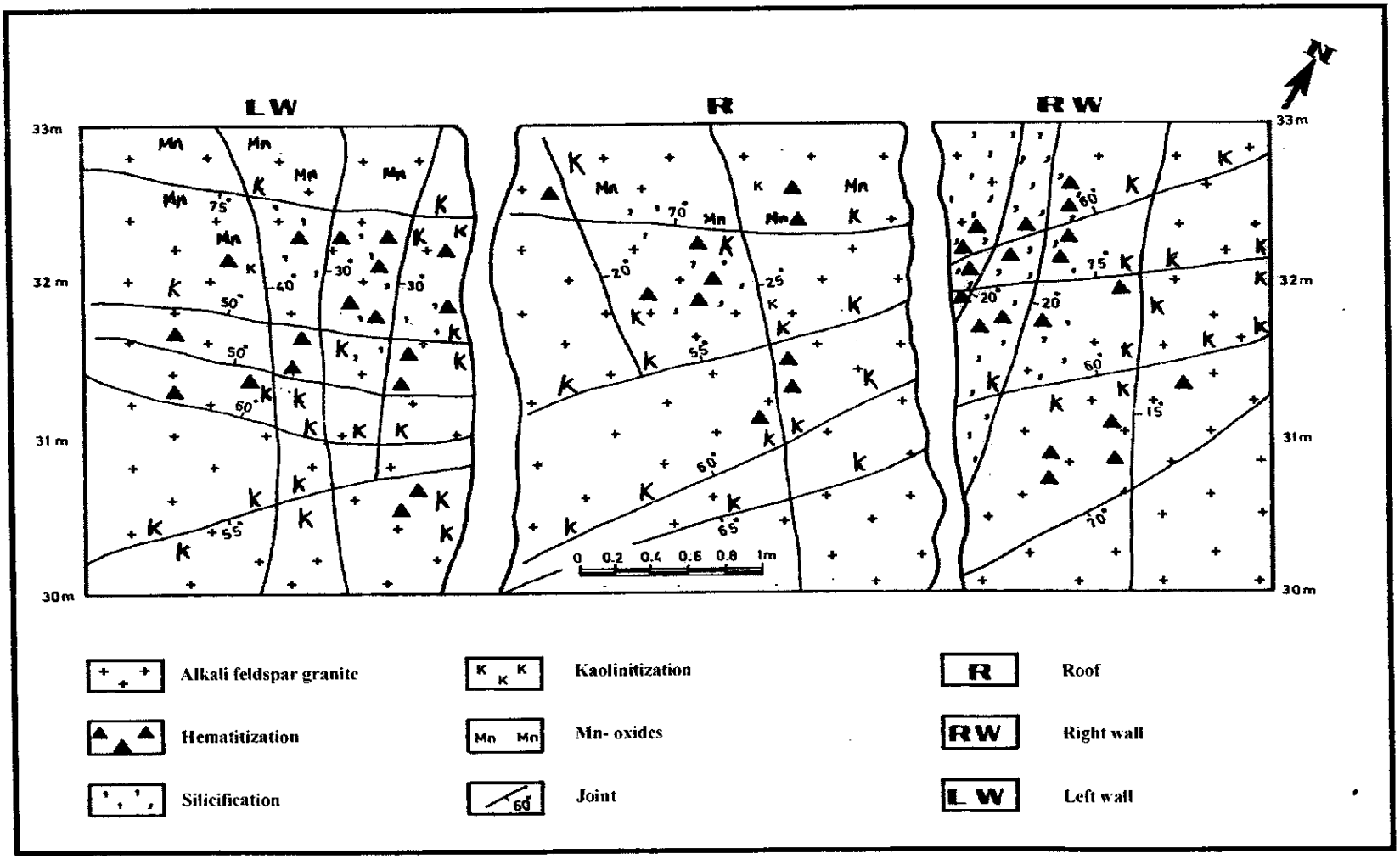


**Fig.5.19 : Geological and structural map of the radioactive anomaly No.4, G-II western tunnel.**

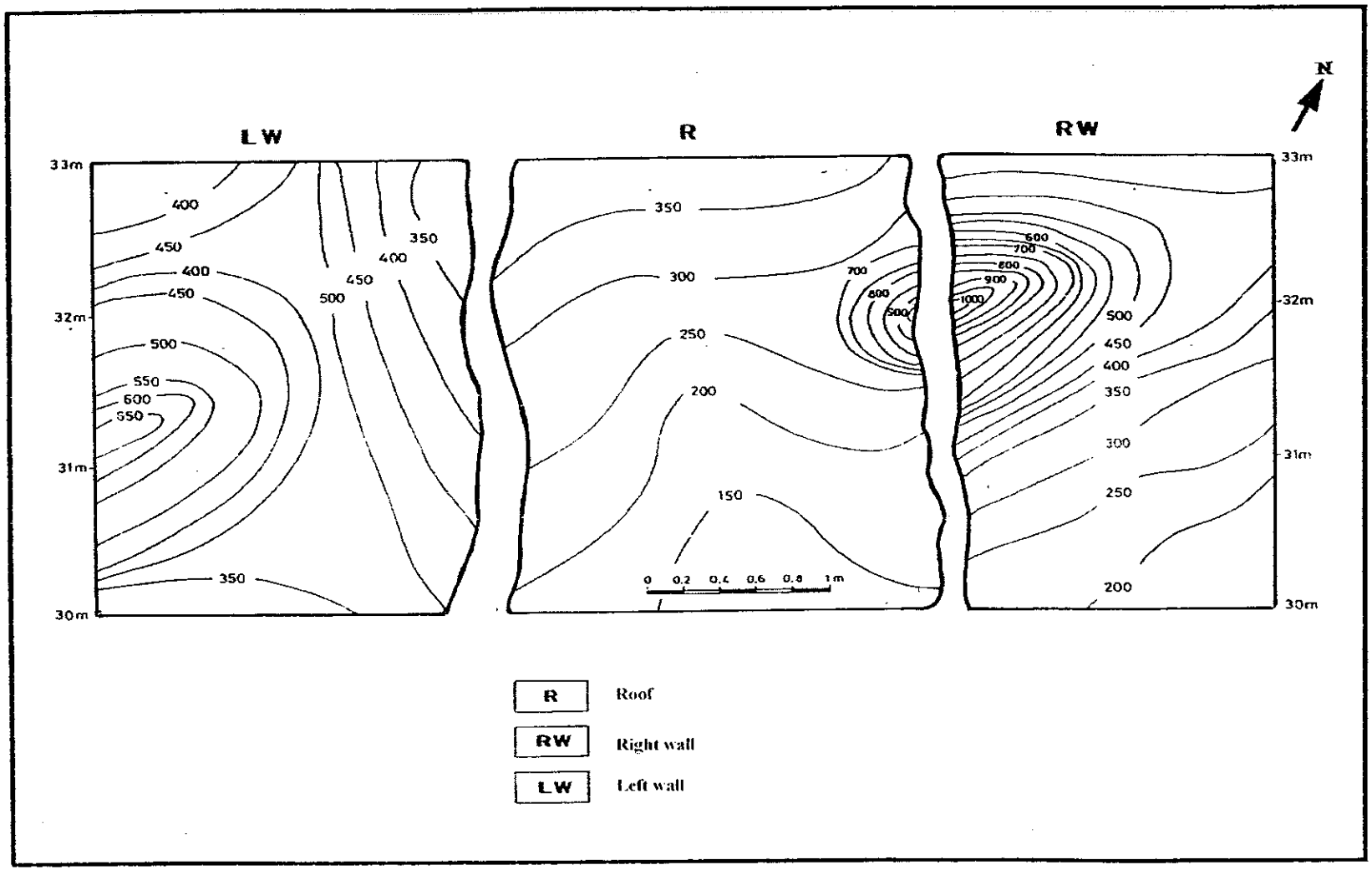


**Fig.5.20 : Isorad map of the radioactive anomaly No.4, G-II western tunnel; isorad interval 50ppm.**

At this uranium mineralized zone, the radiometric field measurements of gamma radioactivity is relatively high and range between 600 and 7000 ppm, with an average value of 4500 ppm in total count. The radioactivity of this mineralized zone increases along highly altered zones rich with iron oxides. The analyzed sample collected from this mineralized zone gives 13132 ppm U, 1080 ppm Th and Th/U ratio is 0.08 (Table 5.5). Detailed geological, structural and radiometric features for this mineralized zone are shown in Figures 5.21 & 5.22.

The primary uranium minerals, principally pitchblende, are commonly concentrated in a zone of closely spaced joint systems mainly directed N-S and WNW-ESE. The pitchblende is of dark black to brownish black colors, possessing a metallic luster and occurs as thin smears along minor fractures or as fine disseminations in the host granite adjacent to the controlling fractures, mostly associated with grayish to black silica. Intense hematitization of brownish red color is present forming thin films and encrustations along fracture surfaces. Pitchblende mineralization partially altered to secondary uranium minerals (Fig.3.30). This site of primary uranium mineralization could be considered as the deep extension of the surface uranium mineralized zone No.1 (1.W).

### V. 6.1. 6. Uranium mineralized zone No.2

It occurs within the distance between the meter 13 and meter 17 from the entrance of the first cross cut $Cc_1$ W (Fig. 3.11 ). Its length is 4 m and 2.00 m in width and striking N60° W. The uranium mineralization is essentially concentrated at the intersection zone between N10°E trending fracture, dipping 30° to the SE and N65°W trending fracture, dipping 50° to the SW direction.

The visible yellow secondary uranium minerals occur as disseminated small discrete grains as well as thin veinlets. These mineralizations are

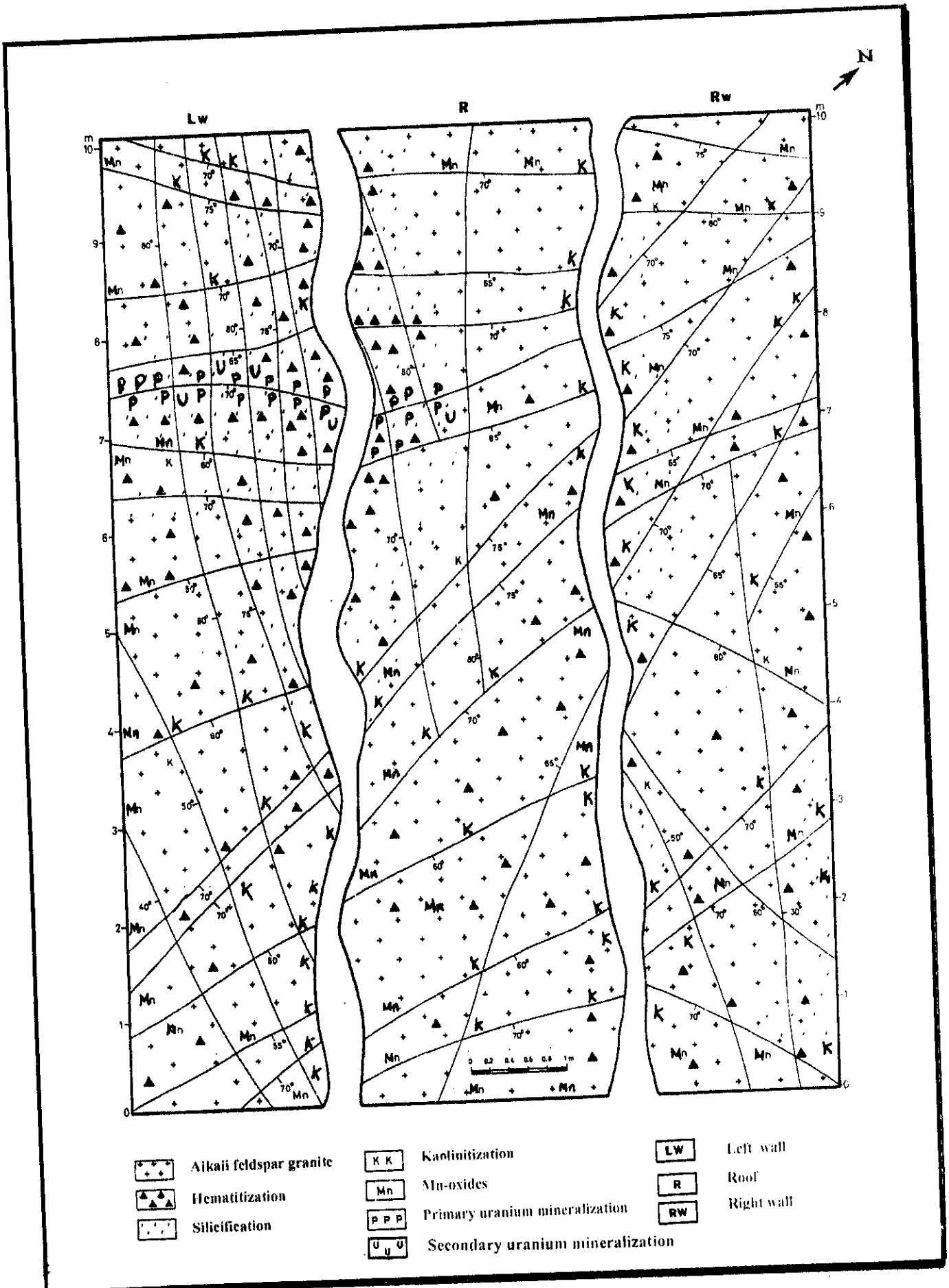


**Fig.5.21 : Geological and structural map of uranium mineralized zone No.1, G-II western tunnel.**

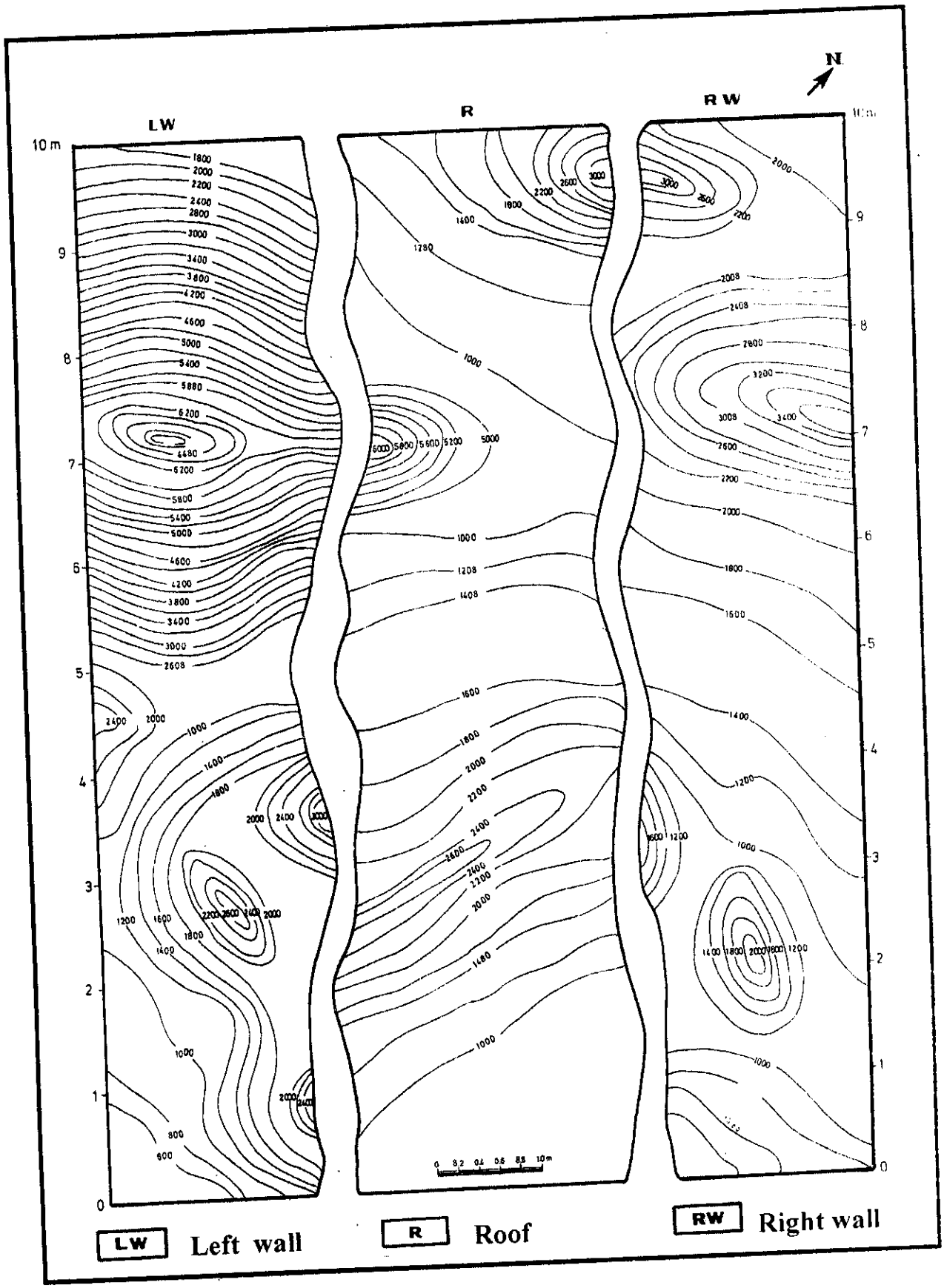


Fig.5.22 : Isorad map of uranium mineralized zone No.1, G-II western tunnel; isorad interval 200ppm.

associated with alteration features, especially deep violet to purple fluoritization, brownish red hematitization as well as the secondary silicification.

Field measurements of gamma radioactivity show wide range, from 200 to 1650 ppm in total count, with 1130.20 ppm as an average value. The analyzed sample collected from this mineralized zone gives 3600 ppm U , 100 ppm Th and Th/U ratio is 0.02(Table 5.5). This mineralized zone could be linked to the surface mineralized zone No.2 (2. W).

### V.6.1.7. Uranium mineralized zone No.3

This uranium mineralized zone extends within the distance 57 to 62 meters from the portal of the drift $D_1$ and of 2 m width and striking N $30^0$ E (Fig.3.11). Detailed geological, structural and radiometric maps for this mineralized zone are shown in Figures 5.23 & 5.24.

The uranium mineralization is mainly controlled by N25°E trending fracture, dipping 45° to the SE direction, N30°W trending fracture, dipping 30° to NE. Abundant uranium mineralization increases when the trend N30°E, dipping 70°SE intersect with N35°E trending fracture, dipping 60° to the NW direction (Fig.5.25).

Field measurements of gamma radioactivity display wide range between 200 and 2200 ppm in total count, with average value of 1150.15 ppm. The uranium content of the analyzed sample collected from this mineralized zone is 3875 ppm, thorium content is 335 ppm and Th/U ratio is 0.08 (Table 5.5). The associated alteration features are represented by silicification, strong hematitization, fluoritization and kaolinitization.

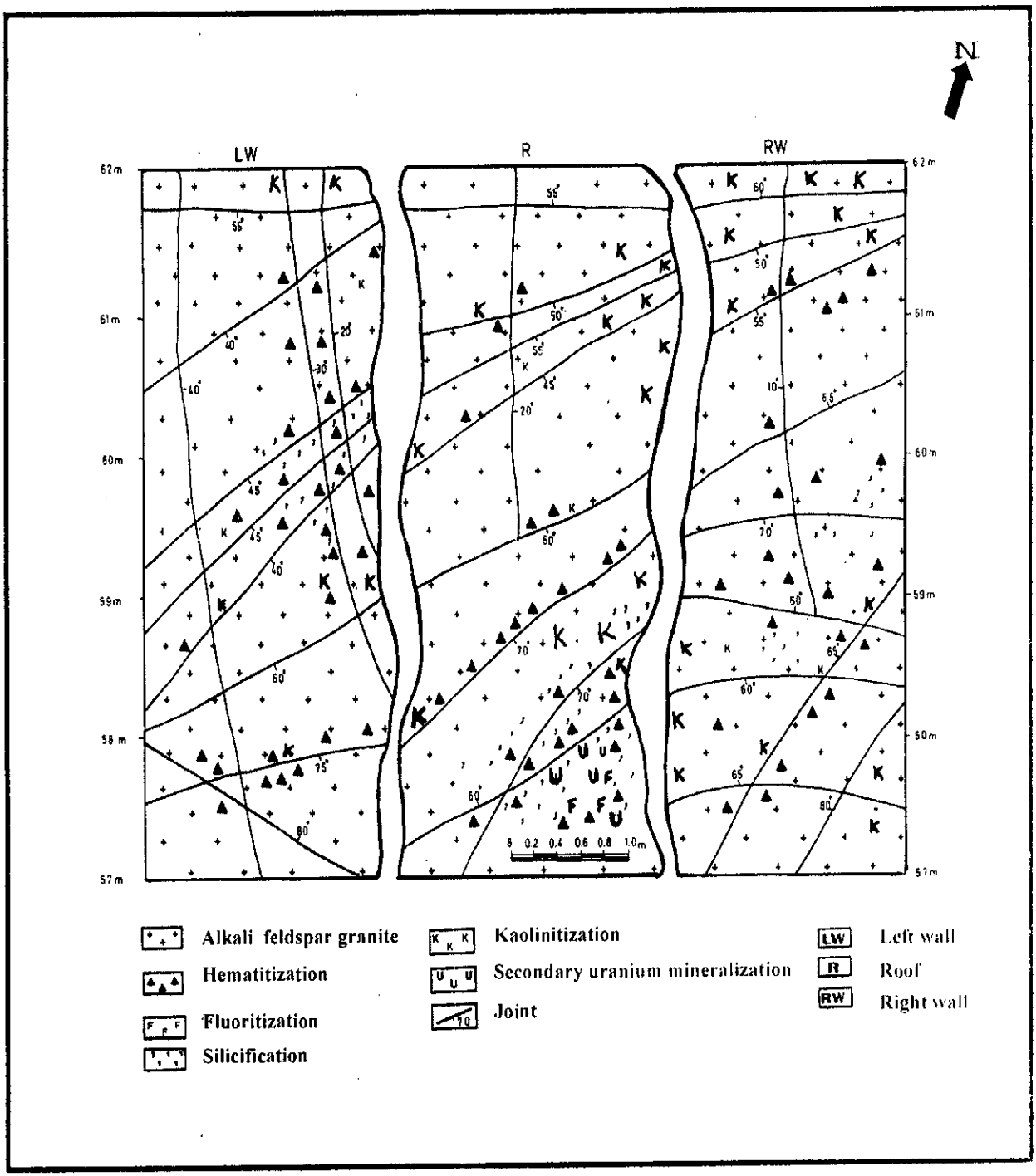


**Fig.5.23 : Geological and structural map of uranium mineralized zone No.3, G-II western tunnel.**

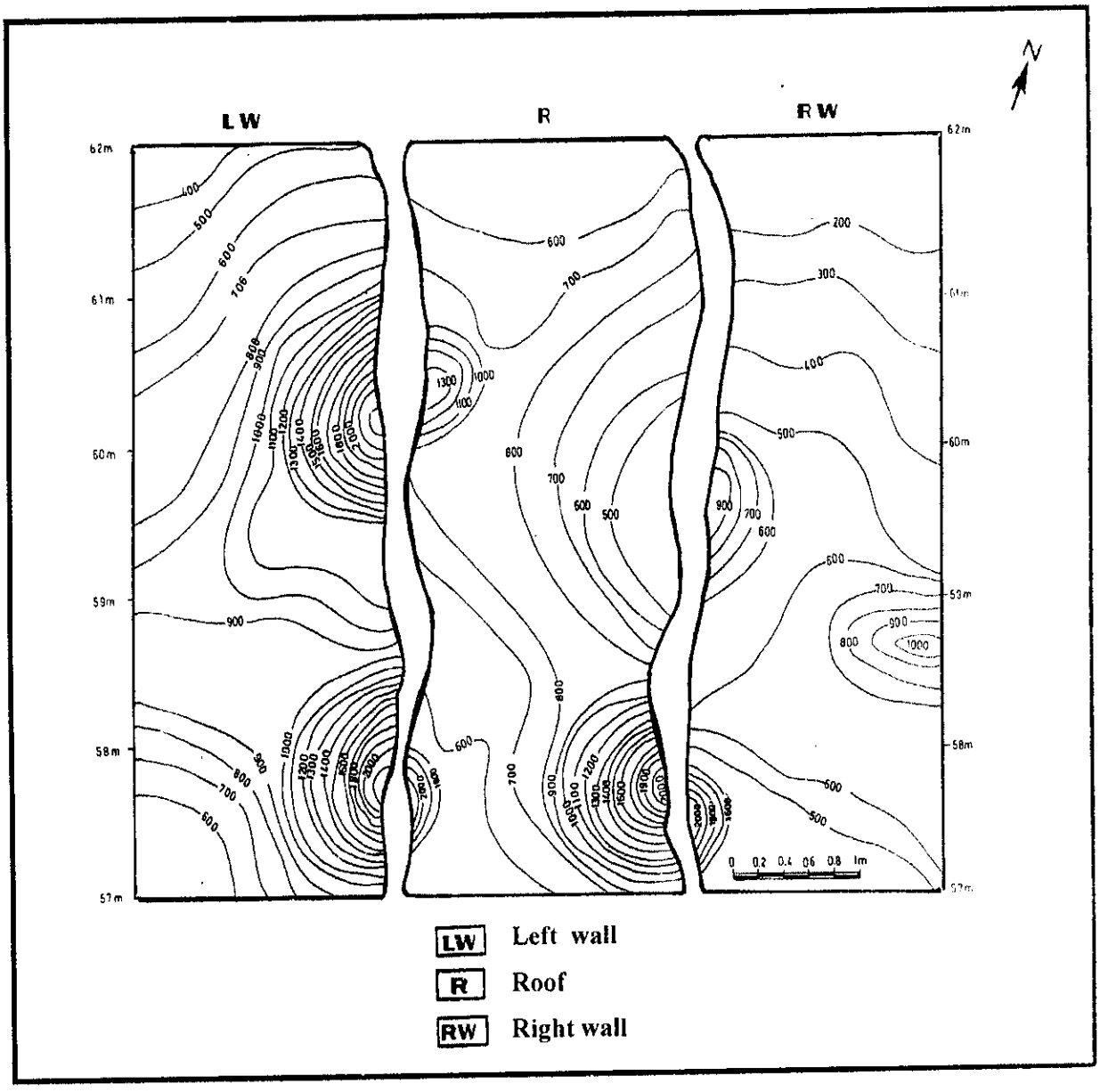


Fig.5.24 : **Isorad map of uranium mineralized zone No.3, G-II western tunnel; isorad interval 100ppm.**

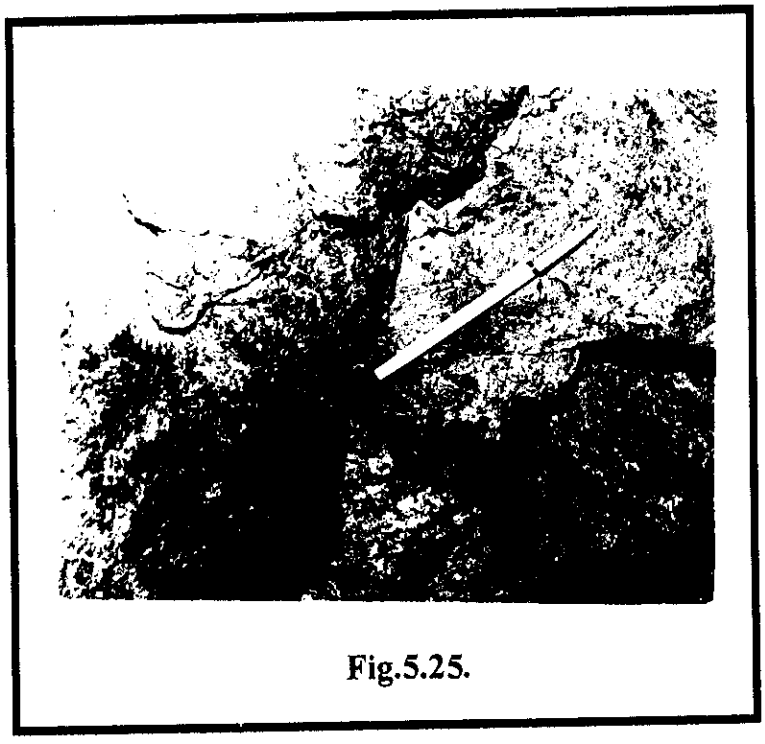

Fig.5.25.

**Fig.5.25:** Secondary uranium mineralization in intimate association with fluoritization, hematitization, manganese oxides as well as kaolinitization, the western tunnel, G-II uranium occurrence; looking SE .

## V. 6.2. Radioactive anomaly and uranium mineralized zones in the eastern tunnel

Two uranium mineralized zones and one radioactive anomaly were recorded in the eastern tunnel ( Fig. 3.12 ).These uranium mineralized zones are of great importance mineralized ones due to their high uranium content and considerable dimensions.

### V.6.2.1. Uranium mineralized zone No. 4

This secondary uranium mineralized zone is encountered within the distance between 0 and 11m from the portal of the main adit ($T_1$) (Fig. 3.12). It extends for about 11.00 m in length, striking $N30^0$ E with width of about 2.00m. Detailed geological, structural and radiometric features are shown in Figures 5.26 & 5.27.

The uranium mineralization mainly follows the fractures trending E-W, dipping 40° to the south direction, N80° W, dipping 60° to SW and N-S, dipping 10° to the east direction. Uranium mineralization increases when these trends intersect NW-SE and NE-SW trending fractures. The visible secondary uranium mineralization of bright yellow color, occurs as veinlets or coating microfractures and filling cavities as disseminated acicular aggregates (Fig.5.28).

Alteration features associated with this mineralized zone are represented by hematitization staining the granite rock (Fig. 5.29). In addition to secondary silicification, fluoritization (Fig. 5.30) and kaolinitization.

Field measurements of gamma radioactivity range from 600 to 7000 ppm with an average value of 4838.20 ppm in total count. The analyzed sample collected from this mineralized zone gives 11900 ppm U, 980 ppm Th and Th/U ratio is 0.08 (Table 5.6).

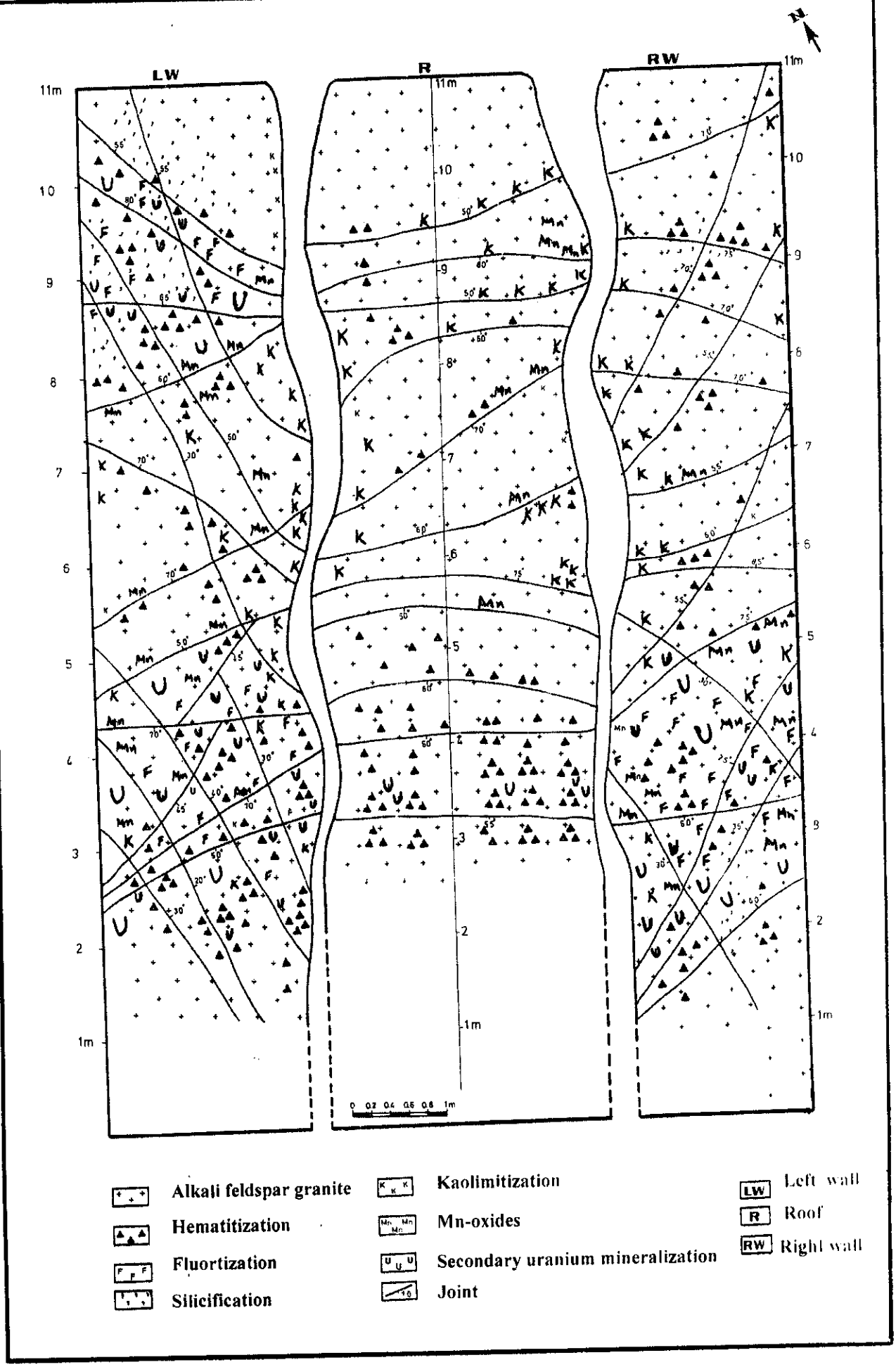


**Fig.5.26 : Geological and structural map of uranium mineralized zone No.4, G-II eastern tunnel.**

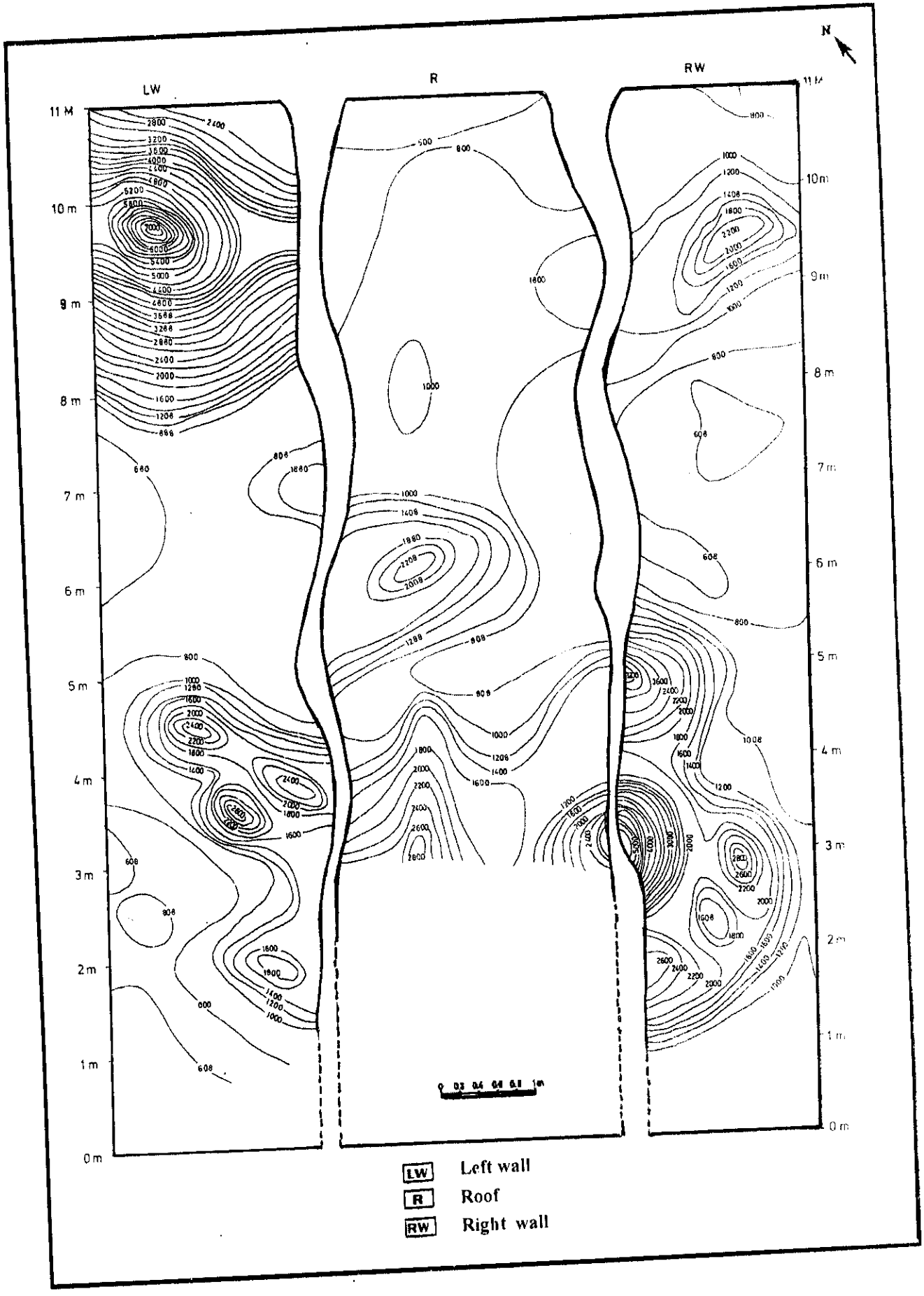


**Fig.5.27 : Isorad map of uranium mineralized zone No.4, G-II eastern tunnel; isorad interval 200ppm.**

Fig.5.28.

Fig.5.29.

Fig.5.30.

**Fig.5.28:** High uranium concentrations and encrustations along fracture surface associated with fluoritization, the eastern tunnel, G-II uranium occurrence ;looking South.

**Fig.5.29:** Intense hematitization associated with uranium mineralization, the eastern tunnel, G-II uranium occurrence; looking North .

**Fig. 5.30:** Purplish black fluorite and silicification coating fracture surface, the eastern tunnel, G-II uranium occurrence ; looking South .

**Table 5.6 : Subsurface radioactive anomalies and uranium mineralized zones in the eastern tunnel, G-II uranium occurrence mining works.**

| No | Mining work | Distance from portal in meter | Structures controlling the uranium mineralization | Field measurements (ppm) | | | Radiometric Analyses of representative samples (ppm) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | min | max | Aver | U | Th | Th/ U |
| 1 | Main adit $T_1$ | 0 | E-W, $40^0$ S; N$80^0$ W, 60 $^0$SW; N-S, $10^0$ E; N$50^0$ W, $15^0$ SW; N$30^0$ E, $80^0$ NW; N$40^0$E , $20^0$ SE; | 600 | 7000 | 4838.20 | 11900 | 980 | 0.08 |
| 2 | First Drift $D_1W$ | 8 | N$45^0$ W, $60^0$ SW; N$45^0$ E, $70^0$ SE | 200 | 1200 | 857.14 | 1756 | 166 | 0.09 |
| 3 | Second Drift $D_2W$ | 9 | N$45^0$ E, $85^0$ SE; N$35^0$ W, $75^0$ SW | 200 | 1100 | 705.30 | 1388 | 152 | 0.10 |

**Min. =Minimum, Max. = Maximum , Aver. = Aver**