



The Influence of Superficial Waters in the Mine of Sibovc and Protection Measures for Removing Them

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Abstract: Systematic researches of the coal basin in Kosovo, as one of the basins with largest amounts of reserves of coal have started since years of 50s of the last century. However basing on new technologies of drilling, and geological-hydro geological map-making, is established a more accurate view of data for thickness verification of coal cover, the extension of coal lay, hydrological conditions of the basin, *etc.* For usage of the coal firstly should be taken these priorities: removal of argil covers, removal of superficial and underground water that present permanent interferences as in the geotechnical as well in that technological aspect. Knowing hydro geological characteristics in entire cover of the coal basin through researching drillings with an advanced technology have made possible solving of many problems that relate direct with the determination of elements that influence in watering of carrier as: Position of alluviums, extension borders, thickness of alluviums, water contain in the carrier and more. According to the operation hydro geological drillings is made possible determination of underground water level, wells pumping to determine the filtration coefficient, these data make us possible to prepare protection measures to be undertaken for protection of superficial and underground water by means of protection channels as well of horizontal and vertical drainage (combined) that play a positive role even in physic-mechanical parameters, that during exploitation of coal to have stability of stable slopes.

Key words: *superficial water, protection measures, removal*

Introduction

The territory of Kosovo is rich with coal resources ,about 14 billion tons that are sufficient for usage for necessities of Electro Energetic Corporation of Kosovo and further, However as a permanent obstacle is tectonics, presence of superficial and underground water that is the purpose of this work. The zone wherein the research is done belongs to the coal basin of Sibovc that is shown on the map of basin of Kosovo in Figure 1 with lit logical composition of the drilling fig 2. Explorative operations are concentrated in the design of lit logical erection of the zone, identification of the water spring lays (fossil zones ,sand zones, oxide zones and with cleavage) that are installed 20 testing wells that are presented – Bresnahan & Dickenson, 2009- software program surfer 8) in Figure 4. In meantime it is done and the prescribing of hydro geological lays by drillings done , Institute Inkos (2007) that are displaced also pies meters for monitoring monthly and yearly water that are presented as a model in fig. 7, whereas the depth of underground level of water is presented with software BuB J (2008) in Figure5. All drillings are done with rotation with Drilling diameter 250mm.

Geological Construction

Basin of Kosovo is mainly tectonically zone completed with tertiary sediments. Zone of basin in the West part is represented by Palaeozoic and in East with sediments of the above Cretaceous. The large area of Sibovc lies in the North part of the coal basin which is in Kastriot in North of Prishtina and Drenica River and the village Lismir in the South, presented in the map of coal basin of Kosovo as in Figure 1. In the series of tertiary sediments are represented with lit logical describes that are shown in fig. 2, the tertiary cover which is represented from the yellow argil with a thickness of 5-15 m and grey argil with a thickness of 5-45m with fossil mixtures here and there a little bit sandy, whereas the

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thickness of coal lay is various that is from 30m in the West part because of cuneiform and the offspring of basin, although in the East part achieves to 70m. Whereas the unreliable part of green argil achieves approximately 250m

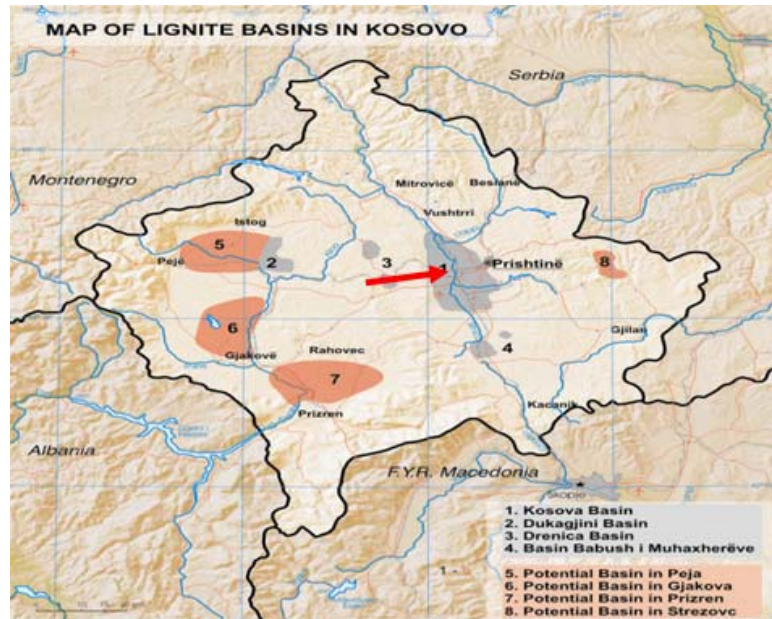


Figure1 . Map of lignite basin in Kosovo

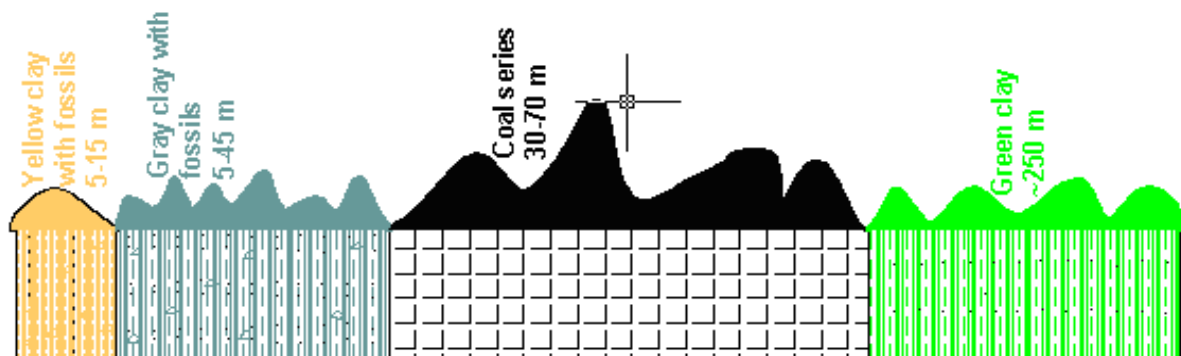


Figure 2. -litological composition of drilling

Hydrological conditions

According to meteorological measures of the *INSTITUTE INKOS* of 2004-2005-2006-2007-2008 years it is computed the quantity of one monthly, yearly precipitation in mm that is shown in Figure 3. In the stationary point in front of Mining Directorate the month which mostly has had precipitations is November of 2007-2004 with 125.6-107.49 mm. The calculations of debit (bearing) are done in dependence of the bearing surface of water (flowing) although the intensity of precipitations is calculated according to formula 1.

Considering all these atmospherically absolute maximal precipitations of 30mm in 60 min. The intensity of the precipitations is calculated according to the formula:

$$i = H/60 * t * 10m^3 = 8.33 m^3 / km^2 / s \text{ -----(1)}$$

H=the height of precipitations 30mm

t= duration of precipitations 60min

30% e of the precipitation which fall vaporize

10% of the atmospherically precipitation are infiltrated and 60% of the atmospherically precipitation fall, flow through surface of hills, then from total of the atmospherically precipitation, 60% of them we should create conditions for removal by means of protection channels and protection pipes that are presented in photos Nr. 1.-2.-3.-4 that during the removal of cover for exploitation of

coal influences positively even in physic-mechanical parameters that is evidenced with the done activities in field.

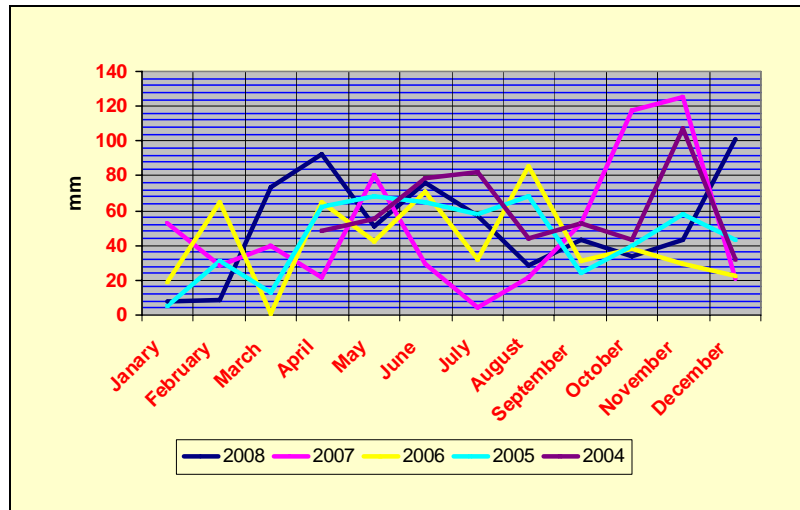


Figure.3 .Diagram of monthly (yearly) precipitations

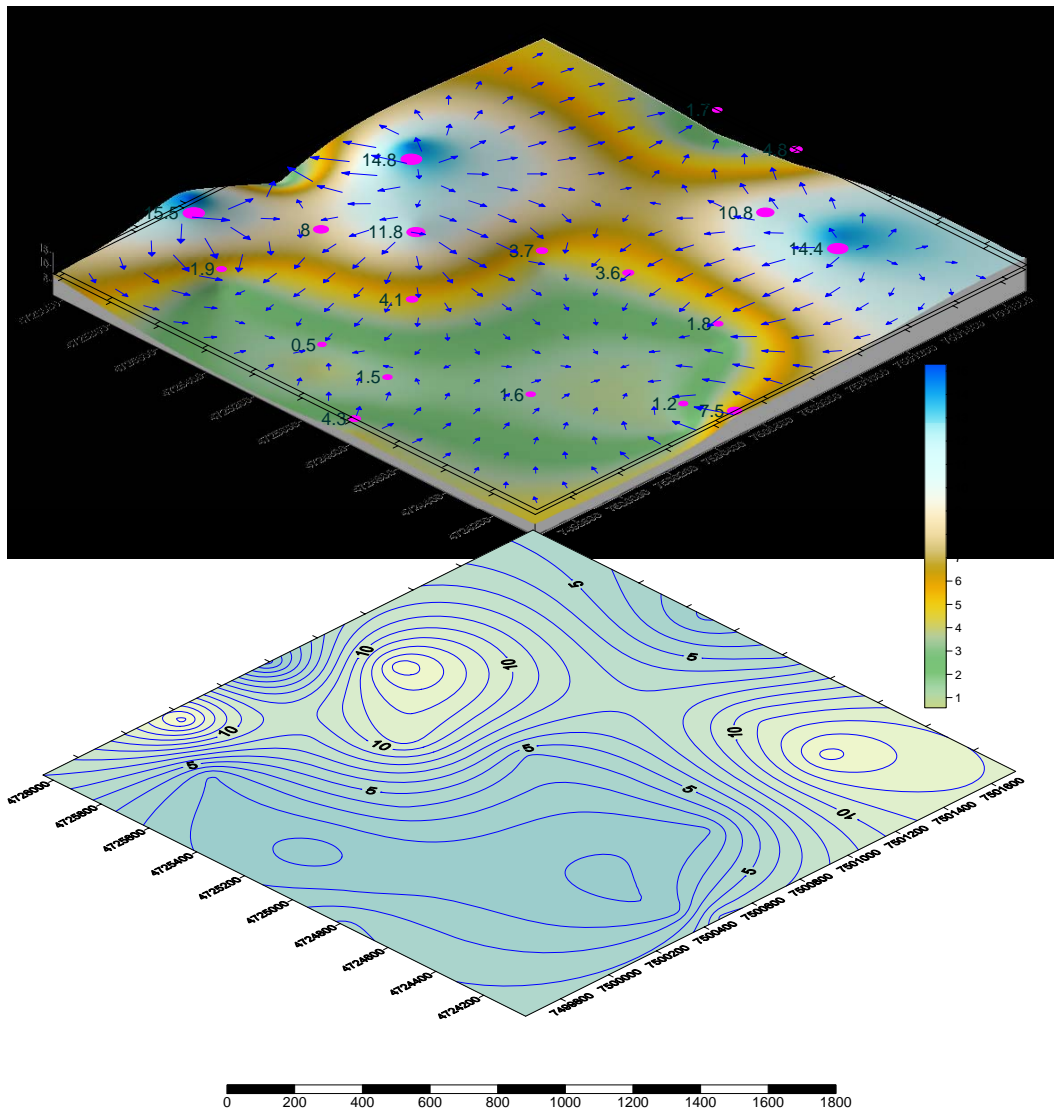


Figure 4. Presentation of 3D with the net of drillings (pz) and the level of the underground water.

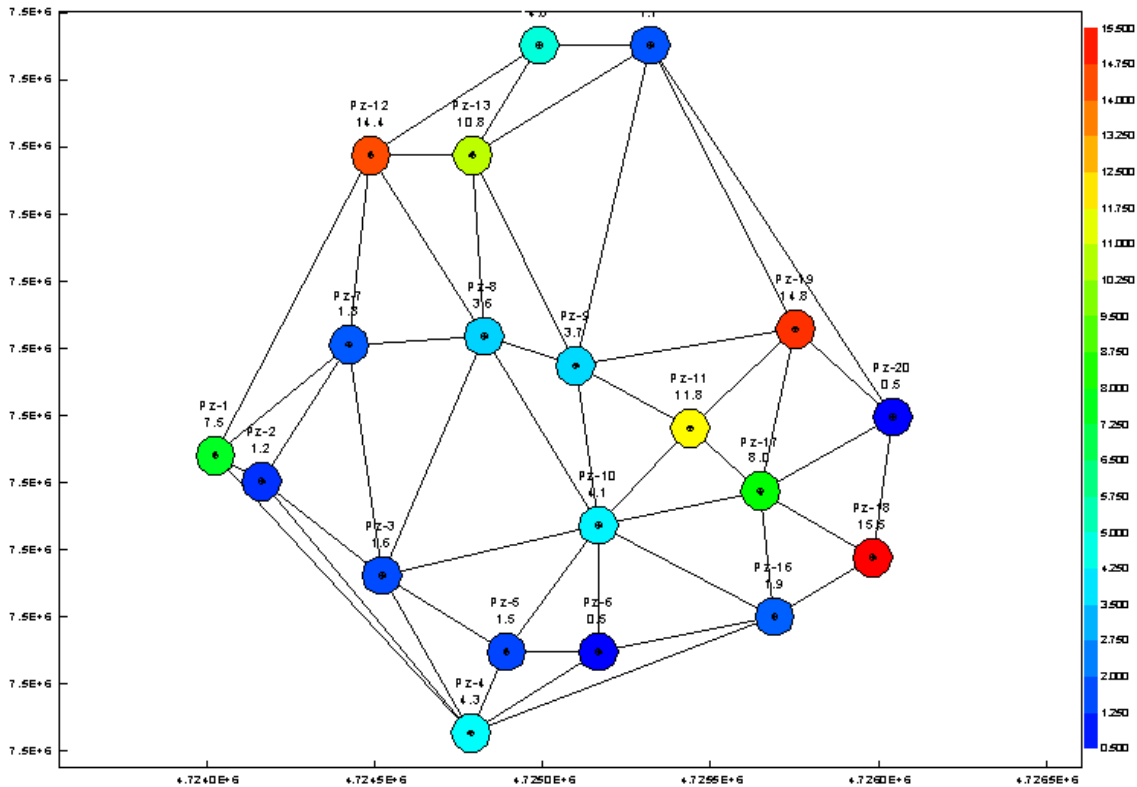


Figure 5. The depth of the underground water level

Pumping methods

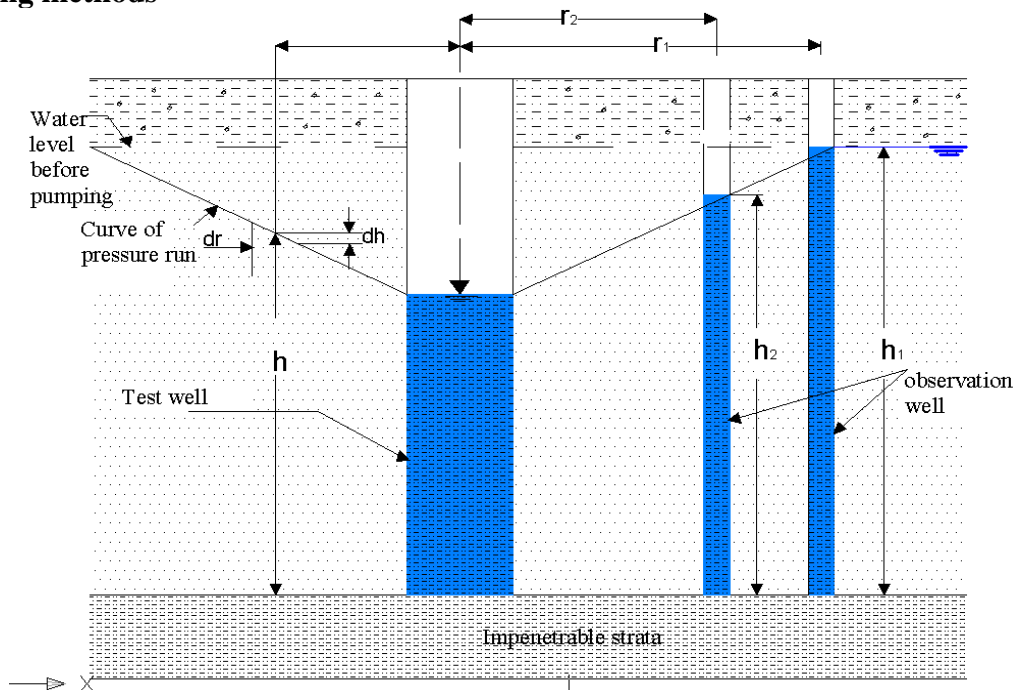


Figure 6. Experimental methods of pumping

The method in field by means of wells to determine the filtration coefficient is one of the most used method and the most accurate for coefficient determination of filtration Bozo L (2002-2007) that are shown on Table 1.

$$Q = \frac{H.R.ne.L}{t} \text{ (m}^3\text{/s)} \quad (2)$$

H=thickness of alluviums

R=influence ray

L=length

ne=effective porosity

t= time in seconds

$$q = k \left(\frac{dh}{dr} \right) 2\pi r h \quad (3)$$

And by integrating the right part of (3) in limits, dr changes from r₁ in r₂ we should have

$$\int_{r_1}^{r_2} \frac{dr}{r} = \frac{2\pi k}{q} \int_{h_1}^{h_2} h dh \quad k = \frac{2.303.q \cdot \log_{10} \left(\frac{r_1}{r_2} \right)}{\pi(h_1^2 - h_2^2)} \quad (4)$$

In observation wells, it is observed continually the level of water after pumping h₁ and h₂ till it is achieved stationary situation, we say that this situation is achieved when the level of water remains constant as in main wells as well in observing wells.

Results

The bearing of water in the main well will be according to the formula 3, whereas filtration coefficient according to formula 4

Table 1. Presentation of results

Number of shafts	Depth of underground level of water(m)	Filter coefficient (m/s)	Bringing -(m ³ / s)
P1	7.50 m	Kf=9x10 ⁻⁶ m/s	q=9x10 ⁻⁶ m ³ /s
P2	1.20 m	Kf=7x10 ⁻⁵ m/s	q=2x10 ⁻⁵ m ³ /s
P3	1.60 m	Kf=9x10 ⁻⁶ m/s	q=9x10 ⁻⁷ m ³ /s
P4	4.30 m	Kf=1x10 ⁻⁵ m/s	q=1x10 ⁻⁶ m ³ /s
P5	1.50 m	Kf=2x10 ⁻⁵ m/s	q=2x10 ⁻⁶ m ³ /s
P6	0.50 m	Kf=1x10 ⁻⁵ m/s	q=2x10 ⁻⁵ m ³ /s
P7	1.80 m	Kf=3x10 ⁻⁷ m/s	q=7x10 ⁻⁷ m ³ /s
P8	3.60 m	Kf=2x10 ⁻⁷ m/s	q=1x10 ⁻⁷ m ³ /s
P9	3.70 m	Kf=9x10 ⁻⁶ m/s	q=1.4x10 ⁻³ m ³ /s
P10	4.10 m	Kf=4x10 ⁻⁵ m/s	q=1x10 ⁻⁴ m ³ /s
P11	11.80 m	Kf=4x10 ⁻⁶ m/s	q=8x10 ⁻⁶ m ³ /s
P12	14.40 m	Kf=9x10 ⁻⁶ m/s	q=9x10 ⁻⁶ m ³ /s
P13	10.80 m	Kf=9x10 ⁻⁶ m/s	q=4x10 ⁻⁷ m ³ /s
P14	1.70 m	Kf=2x10 ⁻⁶ m/s	q=8x10 ⁻⁷ m ³ /s
P15	4.80 m	Kf=2.5x10 ⁻⁶ m/s	q=9x10 ⁻⁶ m ³ /s
P16	1.90 m	Kf=6x10 ⁻⁶ m/s	q=4.9x10 ⁻⁶ m ³ /s
P17	8.0 m	Kf=7x10 ⁻⁶ m/s	q=2.9x10 ⁻⁵ m ³ /s
P18	15.50m	Kf=9x10 ⁻⁶ m/s	q=1x10 ⁻⁷ m ³ /s
P19	14.80 m	Kf=3x10 ⁻⁵ m/s	q=2x10 ⁻⁷ m ³ /s
P20	0.50 m	Kf=1x10 ⁻⁶ m/s	q=5x10 ⁻⁶ m ³ /s

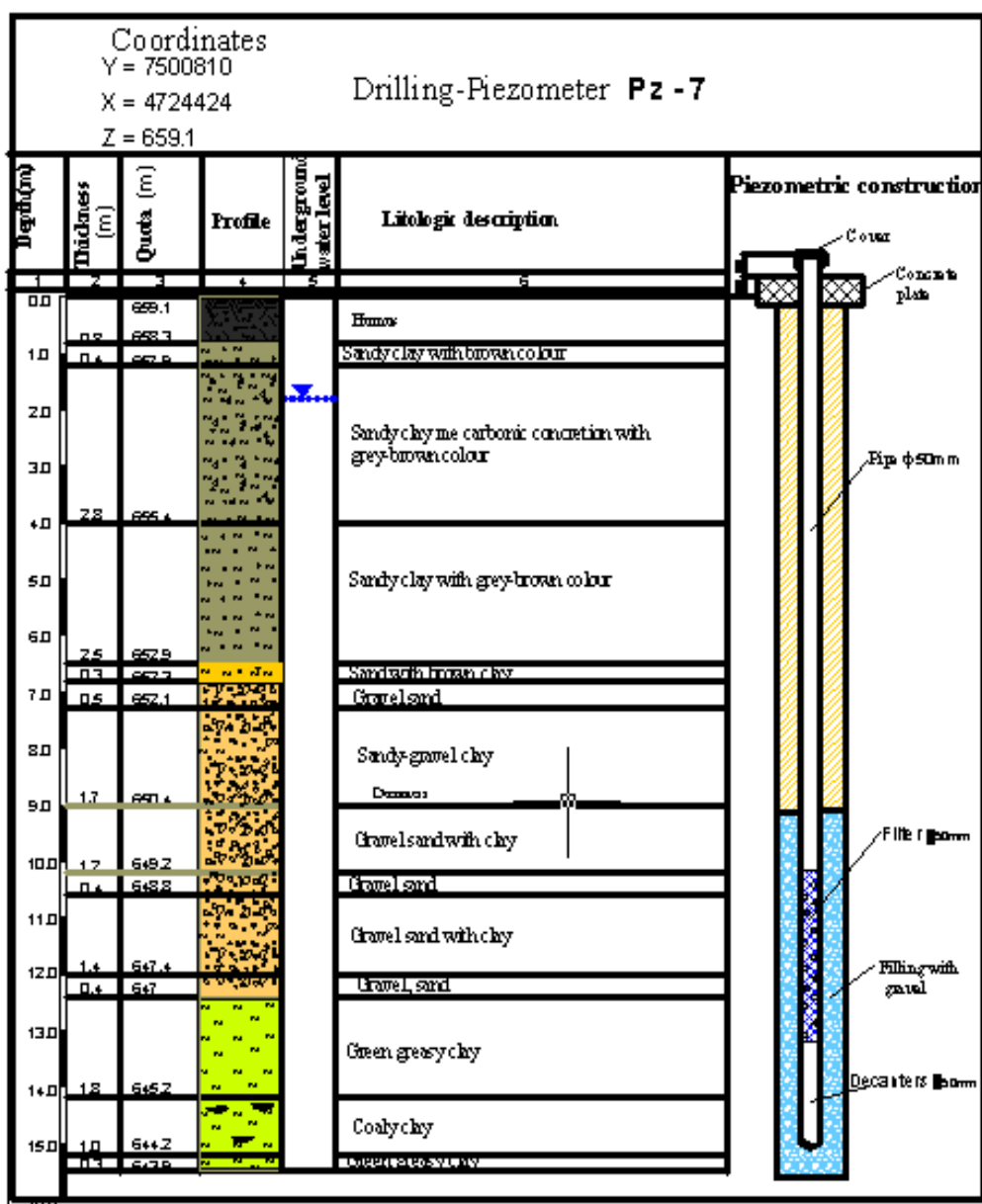


Figure7. Drilling (Placement of piezometric construction)



Photo 1. Superficial water



Photo 2. Protection channels for water removal

**Phot 3.** Protection channels**Photo 4.** Protection tubes for water removal

Conclusion

Hydro geological characteristics in the zone of source in Sibovc treat a big role, underground water of alluvial gravel, as well those superficial from atmospherically precipitation. From geomorphologic aspect the coal basin of Kosovo presents a tableland with an average height of 620-630m that is intersected by a hydrographical density net. The morphology of coal package itself with a thickness over 70m and the thickness of extent favours the usage of place source in an open sky. Coal basin of Kosovo, by geologic- structure side, presents a low surface filled in centre with new formations Neogen (Pliocene), by including peripheral zones around the basin, this low surface is erected by Palaeozoic, Mesozoic, tertiary and Quaternary formations. In the source of coal in Sibovc in transversal cutting are distinguished these water horizons:

- Shallow freatic water that are related to alluviums and de alluviums with various regimes in different seasons with little bearings
- Aquifer of alluvial gravel, with high penetrability that are caught with drilling wells with effective porosity over 25%
- Underground water that are related with coal ceiling with tectonically cleavage with large water reserves those are water of the type sulphate calcium with mineralizing much more increased (09-1.1 gr/l acidic water (PH<7), that are aggressive to the concrete and metallic constructions.

On the base of hydro-geological researches that are done in the zone of Sibovc are undertaken protection measures: as the displace of pies meters for monitoring of underground water, the opening of channels for protection of Mines from superficial water, that influence positively and in physic-mechanical parameters that present a high geotechnical-technological security to remove the cover for coal exploitation, according to the necessity of Electro Energetic Corporation of Kosovo.

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