# RESEARCHES REGARDING THE WATER QUALITY IN THE WAST LANDING PLATFORM OF ARAD

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***Abstract:*** *The research was carried out on a ground placed under the waste landing platform located in Câmpul Liniştii street from the town of Arad, referring to its physical characteristics and their influence on groundwater pollution level. In this respect there were made four drillings at different depths, in the four cardinal points to groundwater level and the granulometric composition of the soil profile was established. The analysis of soil and water make evident different values concerning the soil texture on depth and the water quality factors*.

***Key words:*** *soil, sand, dust, clay, phreatic water pollution.*

## INTRODUCTION

The waste landing platform located in Câmpul Liniştii street has been operating since 1998 as a temporary use area for depositing waste, situation generated by the filling out of the waste landing platform situated in Poetului street. All along this operating period (1998 – 2003) the specialized documentation in view of obtaining the environment authorisation was not submitted. This waste landing platform served the municipality of Arad until the ecological landfill site of the municipality of Arad was established. The discussions that took place in the respective zone with the citizens living in the neighbouring streets and the reports of the Arad County Environment Protection Agency, starting with those from 1999, revealed that this waste landing platform had and still has a negative impact on the environment as water, air, soil pollution and on inhabitancy's` well-being.

Over the years several specialized studies were performed that aimed to identify the significant potential risk on the environment through an environmental balance II; analyzes were performed on the quality of the environment factors and recommendations were made for closing the location, both by moving it to a new location fitted out properly and by closing the platform on the same location and the ecological reconstruction of the respective area.

The purpose of the research performed is to determine the granulometric composition on different depths to groundwater level and its influence on the groundwater quality.

## MATERIAL AND METHODS

Arad area is located in the central part of the Romanian sector of the Pannonian Depression at a distance of about 25 km west from the Zărand Mountains.The waste landing platform area is of 14 ha, having an average height of 3,3 m.In order to characterize the geology and hydrogeology of the respective area we took into consideration the works performed by S.C. Proiect S.A. and S.C. Geoproiect S.R.L. Arad, presented in environment balance I and II. The soil characteristic in the area is cambic chernozem. For this purpose there were carried out 4 drillings placed in the four cardinal points of the waste landing platform, in order to determine the granulometric composition and the groundwater level. The determination of particle size fractions was made according to Kacinski`s methode, and the texture assessement was performed by using the soil textural triangle (C.D. CHIRIȚĂ, 1974 and

the I.C.P.A. Methodology Bucharest, 1987). These drillings were cased with tubes made of polyvinyl chloride (PVC) having a diameter of 110 mm in order to be able to take samples for determining the water quality. These drillings are also located on the situation plan scale 1:1000. The analyze of quality of water concerning in determining of content as nitrites, nitrogenous, ammonium, iron total and index of permanganate in water in this drillings and compared with admissible values.

## RESULTS AND DISCUSSION

In the drilling nr. 1 West, carried out to a depth of 3,5 m on the first groundwater level, we observe a sandy-clay-loam texture (LN), to a depth of 2 m, and in the deep a sandy loam texture (U), (table1).

At the drilling nr. 2 North, at a depth of about 1,1 m there is a sandy-clay-loam texture (LN), followed by a layer of 0,90 m of sandy loam texture (S), and after that followed by a sandy texture (N). The first groundwater level is situated at a depth of 3,30 – 5,0 m, in this area existing a sandy texture (table 2.).

The drilling nr. 3 East presents on a depth of 1,40 m a medium loamy texture (LL) and a clay-sandy texture (S), following then a sandy texture (N) to the depth of 4,0 m, where the first layer of groundwater is situated. (table 3).

The data obtained at the drilling nr. 4 South, reveal at a depth of 1.80 m a sandy-clay-loam (LN), argillaceous loam (AL), medium loamy (LL) , sandy clay (TN) texture. On the depth interval 1,80 – 4,50 m we find a sandy clay texture (U) and a sandy one (N). At the depth of 3,20 – 4,50 m we find the first groundwater layer (table 4).

*Table 1*

Granulometric analysis to drilling F1 West

| Granulometric fractions / Depth (m) | Coarse sand (%) 2-0,2 mm | Fine sand (%) 0,2-0,02 mm | Dust (%) 0,02-0,002 mm | Clay (%) $\phi$ < 0,002 mm | Texture |
|---|---|---|---|---|---|
| 0,50 | 23,9 | 29,2 | 16,0 | 30,9 | LN |
| 1,00 | 35,0 | 30,1 | 3,0 | 31,9 | LN |
| 1,50 | 40,0 | 30,6 | 5,5 | 23,9 | LN |
| 1,75 | 51,8 | 19,9 | 8,4 | 19,9 | S |
| 2,20 | 61,9 | 13,6 | 6,3 | 18,2 | U |
| 2,75 | 42,6 | 35,3 | 2,2 | 19,9 | LN |
| 3,00 | 68,7 | 20,0 | 1,0 | 10,3 | U |
| 3,50 | 60,7 | 25,4 | 2,0 | 11,9 | U |

*Table 2*

Granulometric analysis to drilling F2 North

| Granulometric fractions / Depth (m) | Coarse sand (%) 2-0,2 mm | Fine sand (%) 0,2-0,02 mm | Dust (%) 0,02-0,002 mm | Clay (%) $\phi$ < 0,002 mm | Texture |
|---|---|---|---|---|---|
| 0,45 | 23,1 | 36,5 | 12,0 | 28,4 | LN |
| 1,10 | 31,6 | 35,5 | 5,5 | 27,4 | LN |
| 1,60 | 23,9 | 44,5 | 17,5 | 14,1 | S |
| 2,00 | 46,4 | 35,5 | 1,5 | 16,6 | S |
| 2,50 | 29,8 | 57,9 | 0,5 | 11,7 | U |
| 2,75 | 88,2 | 7,2 | 0,5 | 4,1 | N |
| 3,30 | 88,2 | 0,4 | 10,0 | 1,4 | N |

*Table 3*

Granulometric analysis to drilling F3 East

| Granulometric fractions<br>Depth (m) | Coarse sand (%)<br>2-0,2 mm | Fine sand (%)<br>0,2-0,02 mm | Dust<br>(%)<br>0,02-0,002 mm | Clay (%)<br>ϕ < 0,002 mm | Texture |
|---|---|---|---|---|---|
| 0,40 | 25,3 | 29,3 | 18,0 | 27,4 | LL |
| 1,40 | 34,8 | 19,6 | 22,6 | 23,0 | LL |
| 1,65 | 56,6 | 21,6 | 8,3 | 13,6 | S |
| 2,00 | 80,4 | 2,0 | 15,8 | 1,8 | N |
| 2,30 | 90,0 | 1,9 | 8,1 | 0,2 | N |
| 3,60 | 90,7 | 0,4 | 8,7 | 0,2 | N |
| 4,00 | 97,1 | 0,5 | 1,0 | 1,4 | N |

*Table 4*

Granulometric analysis to drilling F4 South

| Granulometric fractions<br>Depth (m) | Coarse sand (%)<br>2-0,2 mm | Fine sand (%)<br>0,2-0,02 mm | Dust<br>(%)<br>0,02-0,002 mm | Clay (%)<br>ϕ < 0,002 mm | Texture |
|---|---|---|---|---|---|
| 0,80 | 17,6 | 37,0 | 13,5 | 31,9 | LN |
| 1,10 | 12,4 | 34,7 | 7,5 | 45,4 | AL |
| 1,50 | 11,4 | 37,7 | 23,5 | 27,4 | LL |
| 1,80 | 11,3 | 43,6 | 2,5 | 42,6 | TN |
| 2,15 | 66,3 | 20,8 | 1,5 | 11,4 | U |
| 2,40 | 87,9 | 6,6 | 1,5 | 4,0 | N |
| 3,20 | 86,4 | 0,2 | 12,0 | 1,4 | N |
| 4,50 | 80,5 | 11,0 | 1,0 | 7,6 | U |

Figure 1 shows the content of nitrites and nitrates existing in the water samples collected from four drillings. The values of the nitrites exceed the allowable value (0,50 mg/l), in the water from the eastern drilling. (4,8 mg/l), and in the other samples the values are within the normal limits , below the allowed limit, namely 0,077 mg/l in the water from the western drilling, 0,084 mg/l in the water from the northern drilling and 0,50 mg/l in the southern one. The content of nitrates in the water is within the permissible limits (50 mg/l), namely 6,46 mg/l in the eastern drilling, 25,63 mg/l in the western one, 27,35 mg/l in the northern one and 11,45 in the southern drilling.

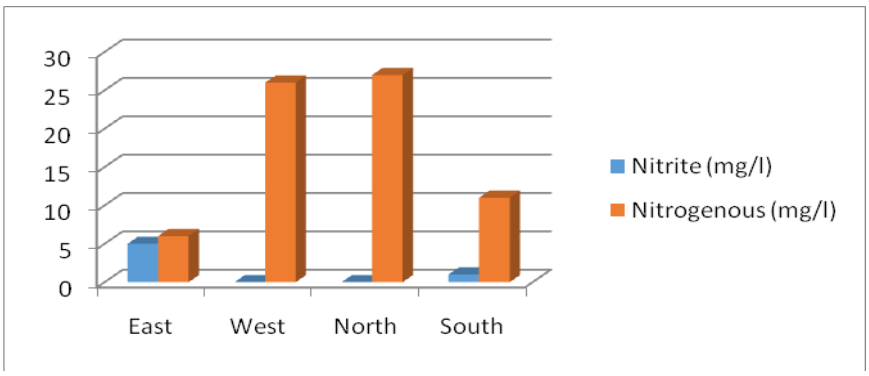


Fig. 1. The content so nitrites and nitrogenous in water

The data presented in Figure 2 indicate an elevated ammonium content, the values exceeding the allowable (permissible) ones (0,50 mg/l). Thus, in the water from the eastern drilling we registered 4,99 mg/l, from the western one 13.03 mg/l, 33,69 from the northern one and 2,86 from the southern drilling.

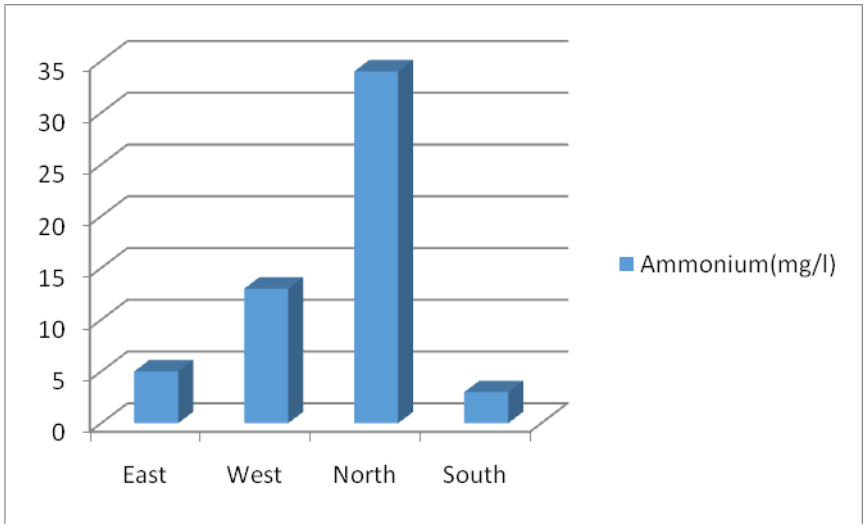


Fig. 2. The content so ammonium in water

The total content of iron (Figure 3.) is of 0,63 mg/l in the eastern drilling, 0,045 mg/l in the western one, 0,055 mg/l in the northern drilling and 0,25 mg/l in the southern drilling. The values from the eastern and southern drillings exceed the allowable (permissible) values (0,20 mg/l)

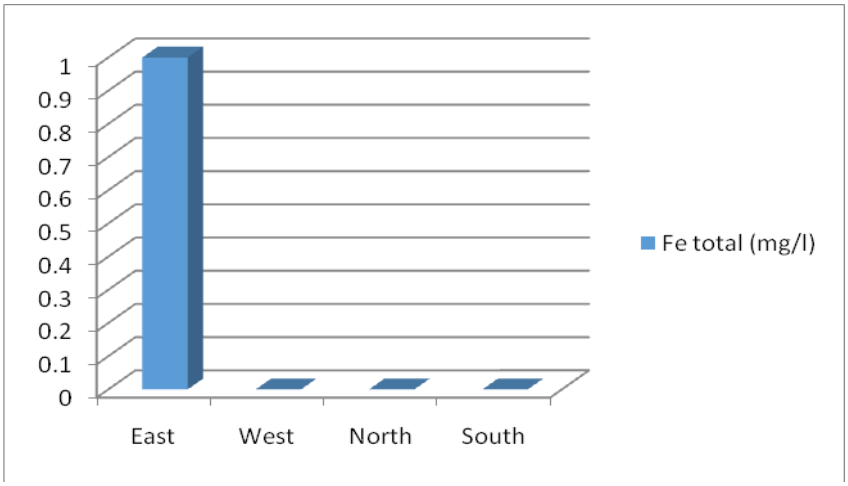


Fig. 3. The content so iron total in water

Figure 4 presents the oxidability value in the water samples collected from those four drillings. The registered values in the water samples collected from those four drillings exceed the minimum required content (5 mg/l). The highest values were registered in the water from the western and northern drillings, 27, 13 mg/l and 42,97 mg/l, and the lowest value was in the water from the eastern drilling, 8,78 mg/l.

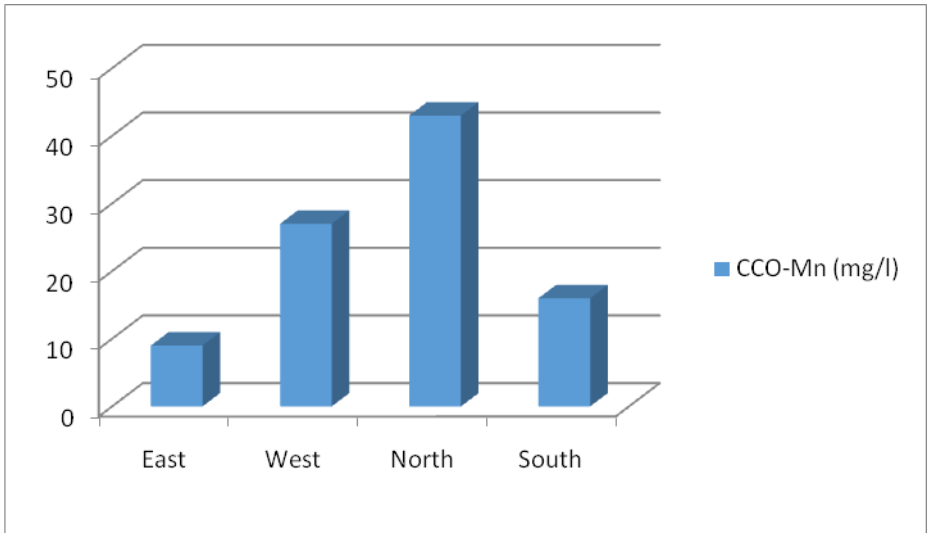


Fig. 4. The permanganate index of water

## CONCLUSIONS

The values resulting from those four drillings carried out highlight the existence of layers with different textures, prevailing the argillaceous and loamy (clay loam) ones. These layers do not provide a waterproofing of the studied soil profile so there is a risk of contamination of the groundwater layers with different pollutants existing in the waste from the area of the waste platform. The content of nitrites exceeds the permissible value in case of the eastern drilling, the values of the ammonium content exceed the permissible limits at all four drillings, the total iron content has higher values in case of the eastern and southern drilling, and the oxidability value is above the minimum value allowed.

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