Scientific Bulletin of Politehnica University of Timişoara

Transactions on HYDROTECHNICS

Volume 63(77), Issue 1, 2018

ENVIRONMENTAL IMPACT STUDY AS A RESULT OF SEWERAGE FROM AN URBAN AREA

Camelia Monica ȘTEFĂNESCU[1]

Abstract: Wastewater is a major source of pollution through which microbes and viruses can be transmitted. The proposed works are of public utility, contributing to the sanitation of the inhabited area and the protection of the environment. They are intended for the collection of household wastewater from the households of the locality, thus providing the inhabitants with optimum hygiene and comfort conditions.

This paper presents the results of the environmental impact assessment of the wastewater treatment plant for city of Anina. This presentation includes assessment methodology, project description and alternatives, baseline data related to water resources, impact assessment on water and proposed mitigation measures,. The assessment of the impacts has been performed for the construction and operational phase of the wastewater treatment plant. The construction phase was subdivided into several phases, while in the operational phase; the impacts are analyzed following the line for treatment of the wastewater and effluent production, the line for sludge production and drying process, sludge disposal and the line for gas utilization.

Keywords: wastewater, water sources, sewerage network, sources of pollution, environmental factors

1. INTRODUCTION

Through this work it is aimed at:

- improving access to quality services for the supply of drinking water by connecting all to the inhabitants of the city by the distribution network;
- the ensuring continuous operation of the water supply system and of the necessary pressures of all consumers;
- reducing water losses by rehabilitating waste pipelines;
- increasing the coverage of sewage service up to 100%;
- the ensuring collection of the entire waste water flow and transporting it to the treatment plant, thus avoiding the risk of pollution of groundwater and surface water;
- reducing seepage through the rehabilitation of degraded sewerage pipelines;
- improving operational safety by replacing mechanical and electrical installations with overheated service life;
- reducing operating costs;
- increasing the quality of life in the community by creating a framework favorable to the health of the population;
- compliance with environmental and regulatory restrictions imposed by national law.

2. THE CURRENT SITUATION OF THE ANINA CANAL IN CARAŞ-SEVERIN COUNTY

The drinking water distribution network is 47 kilometres long, in generally is very old, but there are some areas where the power grid is recently replaced in recent years.

At the same time, there are no suitable filtration and treatment facilities for potable water, it is necessary to re-dimension the network and to modernize it. These aspects have been included in the local development strategy. The sewerage network has a length of 18.5 km, of which 6.7 km of unitary channels and 11.8 km of obsolete municipal channels.

3. LOCATION OF THE LOCALITY IN THE ENVIRONMENT. WATER RESOURCES

The town of Anina is located in Banat Montan, in the central part of Caraş-Severin County, 36 km away from Resita (Figure 1,[1]).

Figure 1. Location of Anina city

[1] Politechnica University of Timişoara, Faculty of Civil Engineering, Department of Hydrotechnical Engineering, George Enescu Street, no.1A, Zip code 300022, Timisoara, Romania, e-mail: achim_camelia@yahoo.co.uk

Underground water

The underground water sources are: Colonovatul Mare, Valea Tereziei, Kraksenthal, Grota Morii. Their capture is done in reservoirs; some sources are treated with sodium hypochlorite and then distributed gravitationally to different neighbourhoods of the city.

Surface water

The surface source is Lake Buhui, with an area of 11.5 ha and a volume of water of 610.000 cubic meters, the water flows gravitationally through a 200 m alluvium and then falls underground through 5 natural beaches located 200m away and at a distance of 1.2 km of the lake reaches the Buhui cave; also in the cave Buhui comes the water from Certej sources, located on the eastern slope of the mountain near the cave, which goes underground this mountain and reaches the surface 100 m from the entrance to the Buhui cave [1]..

After a 2.2 km journey through the Buhui Cave, a ditch is set up at the exit, so a portion of the water is headed through a 1.2 km underground watering gallery at the Buhui Filter Station; maximum capture is 60 l / s but on average it is 28 ÷ 30 l / s, the rest of the water being the Buhui brook, a brench of the Caras River.

From this water source, after a decanting process and after water disinfection, part of the treated water is gravitationally distributed, the other part is pumped into two tanks, the New City reservoir of 2500 cubic meters and the 180 mc Dealul Crucului reservoir, from which distributes all gravitationally.

From the Buhui water source, some of Anina's neighbourhoods feed water; this source is actually the most important source of water (Figure 2).

Figure 2. Buhui water source

4. IMPACT ASSESSMENT ON THE ENVIRONMENT

Potential sources of pollutants during execution

Permanent sources of pollutants for groundwater and surface waters (emissaries) do not exist during the execution period. For surface spills and underground water may cause sources of contamination in case of accidental leakage of oil products from construction machinery and equipment (trucks, dumpers, tractors, compressors, etc.).

Also underground and surface water can be polluted by the leakage of suspensions caused by meteoric waters from the sewers laying sewers. These categories of pollutants have low concentrations, with insignificant effects on water resources.

Air pollutants during sewage works are: dust, noise and exhaust gases from construction equipment (trucks, dumpers, tractors, compressors, compactors, etc.).

Dust is the result of the movement of machinery and construction equipment from digging, land and ballast spraying, compaction and construction work.

During the execution of the works, by the handling of building materials, air pollution can be achieved, mainly with powders in the form of dusts. Therefore, the main pollutant will be the dust that will be released during the excavation, loading and transportation of the earth.

Reducing these sources of pollution can be achieved by spraying work areas, using high-performance machines, or by using screens to protect areas where they work.

During the execution of the construction works, the population and the biodiversity in the area will be affected by the noises specific to these types of activities, by keeping the equipment under normal operating conditions, without technical failures that would accidentally cause some noise or unwanted vibrations due to some operations inappropriate.

Preventive measures to reduce noise pollution in motor vehicles are regulated by periodic technical inspections of motor vehicles and by the technical limitations of noise prescribed for road vehicle type-approval. The work schedule and movement of motor vehicles in the area will be set so as to strictly observe the rest periods of the inhabitants of the area.

The specific working conditions and the construction of the sites on relatively small surfaces make possible the intervention of a small number of small and medium capacity machines. Thus, the impact-generating effects remain relatively limited, and no other protective measures are needed.

During the execution of the works, the following measures have been taken to reduce noise and vibrations in the vicinity of sensitive areas (dwellings, public spaces): Restriction of working hours with earth moving equipment and means of transport for materials over time 7.00- 20:00, in agreement with the community.

The normal limits according to the Order of the Ministry of Health no. 536/1997 [9] for noise are: 50 dBA-day and 40 dBA-night.

Potential sources of soil pollution include leakage of lubricants or other petroleum products both in the built area and in the organization of the site.

To prevent soil contamination during the execution of the works, all protective measures shall be taken in accordance with the technical safety regulations to avoid accidental spills of fuel or lubricants in the soil.

Therefore, during the implementation period, the following measures of prevention or mitigation will be observed.

A selective waste collection system will be implemented. The vegetal layer removed at the beginning of the works will be preserved in the site area and will be used for the restoration of the environment at the end of the activities;

Rapid intervention in case of accidental damages to eliminate causes and reduce damage; Periodic verification and maintenance in a suitable technical state of all used machinery and means of transport.

After the completion of the works, the surface of the sites affected by the sites will be brought to the initial state, measures will be taken for the ecological reconstruction of the affected perimeters, the restoration of the vegetal soil through the erosion, as well as the green areas [1], [2].

Sources of pollution and protection of environmental factors during the exploitation period

Sources of pollutants for groundwater and surface waters are: sewage seepage through the leaks of the sewerage pipe joints or from the sewers to the sewers;

Accidental spills of household wastewater partially or unpurified due to accidental damage or accidental flooding of the treatment plant.

During operation (operation), the household sewerage network on the commune's hearth will not result in emissions into the air, which could have a potential impact on its quality.

To avoid soil pollution, proper collection of wastewater inside the sewerage network will be organized during the period of operation of the sewers. Soil infiltration may be due to possible appropriate leakages/damage to the sealing membranes used to join the pipes).

5. IMPACT ON THE ENVIRONMENT IN THE PERIOD OF EXECUTION

The impact of sewage works on water

Due to the works carried out during the execution of the sewerage works, the surface water and the underground water in the area of Anina was partially affected.

Impregnation of surface and underground water during the construction period could be achieved by accidental spillage of fuels from construction machinery and equipment, but also by the use of lubricants (especially oils) used for various aggregates.

The sewerage works are carried out from downstream to upstream and the commissioning is done after the sewerage network has been executed to the first houses connected to it. For the sewage the emissary is the Buhui brook.

The evacuated waste water flow is:

$$q = Q_{uzimax} = 340.93 \text{ c m/day} = 3.96 \text{ l/s} \quad (1)$$

The main works required for the sewage system were excavations and equipment for the transport of land and building materials.

Thus, the main air pollutants during the construction period were: dust and exhaust gases from construction machinery (NO_X, SO_2, CO).

Throughout the execution of the works, the dust was sprinkled with water, precisely to stop raising the cloud of dust in the am phosphorus.

Thus, due to excavations made to dispose of a volume of soil required for the sewage pipe laying, the soil has undergone the following modifications:

Partial destruction of the humus layer on some terrain

Change of horizons due to the depth of sewage pipe laying at 2,40 m below the road axis.

One important thing, however, was the water spraying of the fillings to be repaired in the ditch that had just been done and shortly the appropriate compaction to give as much as possible the initial texture of the soil.

Everywhere there is work with machines there is noise pollution. Therefore, the main sources of noise were: backhoe loaders, compactors, dropper, tractor, harvester, bucket, front loader, large tonnage equipment and waste resulting from the goal.

Each noise pollution source listed above corresponds to a noise level measured in decibels.

Fauna and vegetation were partially affected by the construction works of the sewage system.

Site vegetation has been temporarily affected on a relatively small surface. At the sewer system execution, the pickled plant layer was deposited separately and then used to restore the area affected by the works.

6. IMPACT ON THE ENVIRONMENT IN THE OPERATING PERIOD

Waste water from scrubbing will be evacuated through open gullies in the nearby watercourses, while respecting the quality requirements imposed by regulation NTPA 001/2005.

The purpose of the normative document is to establish the conditions for the disposal of waste water in the above-mentioned receptors so as to ensure their normal protection and operation and to protect the environment from the adverse effects of waste water discharges.

Surely there is also discomfort in the sewer network during this period. Most often, inconvenience can occur during the summer. The first thing that makes its presence felt is the unpleasant smell generated by the decomposition of organic matter inside the wastewater collection system.

If there is a large volume of gas accumulated inside, they can even cause explosions, which ultimately cause damage to certain portions of pipes or even entire sections.

In order to avoid these gas accumulations in the interior, those vents are provided, precisely to diminish unwanted effects later.

In case of proper exploitation, the objective will not have a significant impact on air quality.

During the operation of the sewerage network there are a lot of things that can adversely affect the soil. The main works that are carried out during the

exploitation period are the ones to remedy the possible damage or accidents as well as the maintenance ones, the proper maintenance of the normal operating parameters.

Because of these interventions, the soil suffers from scratches on some portions. It joins these scrapes and infiltrations inside the collector tube as well as the infiltrations of lubricants from the aggregates and machinery used.

What is important to minimize the negative impact on the soil is to restore as much as possible the areas where the burring's have been done. Only in this way will we have a relatively short negative impact.

Impact studies - is Environmental Impact Assessment (EIA).

EIA - is a process designed to identify, describe and establish, on a case-by-case basis and in accordance with current legislation, the direct and indirect, synergic, cumulative, primary and secondary effects of a project on human health and the environment, such as and the establishment of measures to reduce them.

Environmental impact studies (SI) are required by the environmental legislation in force in Romania and have the structure defined by the Order of the Ministry of Health and Hygiene no. 860/2002 [3]. They are an essential component of the beneficiary's dossier for obtaining the Environmental Agreement.

Environmental impact studies aim at estimating the environmental impact of new investments and the modernization or retrofitting of enterprises. As such, the environmental impact assessment provides a rational approach to sustainable development.

The method of environmental impact analysis (Rojanschi V. method) is one of the most used in the procedural practice of the EIA in Romania (Figure 3, Figure 4)[3]. The method is based on the estimation of the environmental quality indexes according to their creditworthiness scale.

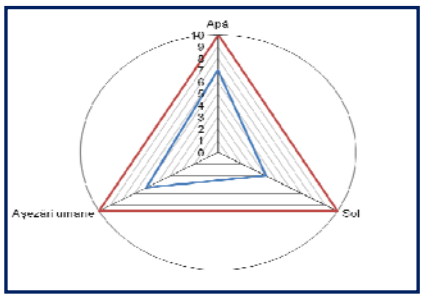

Figure 3. Evaluation of IPG in execution period

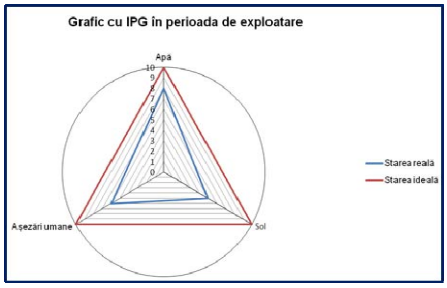

Figure 4. Evaluation of IPG in exploitation period

7. POSSIBILITIES TO DISCHARGE OR ELIMINATE THE ENVIRONMENTAL IMPACT

As a result of the environmental impact assessment due to the work required to achieve the domestic network and the data presented, it follows that the environment is not completely affected but only partially (water and soil-suffering).

The design was based on general requirements, which mainly focused on the protection of workers, operating personnel and the environment.

Thus, during the execution period, the following measures will be considered:

- the yard space must have a fairly large area to allow the planned activities to be carried out but should be limited as far as possible to reduce the period of temporary occupation of the land
- when fixing the position of the yard, it must be considered the possibility of easy connection to the current service network
- the digging is not kept open and the filling operations are carried out on the same day;
- within the limit of the prism of possible breakage there is no circulation, no special construction or other loads which may constitute an overload;
- The site must be designed in such a way as to minimize potential interference with the surrounding areas.

During the exploitation period it will be followed:

- the quality of the waters discharged into the sewerage network of Anina by carrying out periodic measurements and analyses to fit the projected parameters before being discharged into the emissary.
- monitoring emissions from sources and emissions in the protected area

From the analysis carried out in the impact assessment, a number of conclusions can be drawn.

The air environment factor will be influenced locally during the execution of the sewerage network;

The soil environmental factor will be negatively influenced: the negative influence is local and is caused mainly by the transport of materials and the execution of works on the sewerage network

The water environment factor will not be significantly affected, given the organized way in which the sewerage works are being carried out and exploited. Sound pollution is particularly relevant for machine operating areas that are insignificant [4].

REFERENCES

[1].http://www.aquacaras.ro/anina
[2].http://www.anina.ro/https
[3].10. NTPA 001/2005 [10]
[4].O.M 860/2002 Environmental Impact Assessment Procedure.