

# STEPS OF FITTING THE WINTER SHELTER OF HUNGARIAN GREY CATTLE INTO THE ENVIRONMENT IN IPOLYVECE

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## ABSTRACT

Besides creating a living place satisfying the unique demands of Hungarian grey cattle the planning of a winter shelter constructed in Ipolyvece (Ipolyvece Farm) has raised exceptionally diverse tasks as regards of fitting the shelter into the environment. This article introduces the different versions of related demands and answers as well as the finally approved solutions which have been created by using – due to necessity – the „research by planning” methodology.

The facility has been constructed for the winter housing of those cattle and their offsprings that live in and around the municipal area of Ipolyvece, i.e. in the alluvial pastures of the Ipoly river during the growing season (from April until the end of October).

The area involved in the planning process includes some plots and buildings of an animal husbandry facility built in the early 1960s. These real estates have been detached from the other parts of the farm and given to the current operator as a result of the privatisation process of the early 1990s.

The installations are situated in the mild North-western slope of Börzsöny mountains. This slope is bounded by a railroad embankment running around the built-up area of the settlement. The embankment is perpendicular to the slope thus creating a valley where the runoff of water is not ensured. A particularly sensitive groundwater supply can be found below the area; this fact makes special protective measures necessary in order to restrain the utilisation and environmental impact of the surface area.

Keywords: animal keeping facility reconstruction, protection of groundwater supply, loose housing for Hungarian grey cattle, settlement planning

## 1. INTRODUCTION

During the facility development planning process regarding the Ipolyvece Farm [1] the main objective has been to satisfy the keeping demands of the 150 cows and their offsprings to be housed in the facility while taking into consideration the provisions regarding the utilisation of investment resources approved by a tendering process and used in a public procurement procedure. The tasks of „fitting into the environment” were the following:

- satisfying the demands related to the conflict free adjustment to natural attributes (terrain and soils, protection requirements of surface and underground water supplies)
- „selective adjustment” to the systems of the existing artificial environment (land division, access roads, existing public utilities and buildings)

The interactive research and planning process introduced in this article is an example of how budget appropriations, legislative provisions, functional needs, environmental attributes and the decisions of planners and researchers connect to each other, how they propose questions and provide fundamentals for decisions.

## 2. EXAMINATIONS AND METHODS, PLANNING CONSIDERATIONS

### 2.1. The conflict to be solved

During the planning process the result of the first professional/administrative negotiation has brought up the need of a complex adjustment to the naturally existing features. The Middle-Danube-Valley Inspectorate for Environmental Protection, Nature Conservation and Water Management has included the following stipulation in the minute [2] of the meeting held in connection with the first draft plans completed in the subject: „Based on KVVM decree 27/2004 (XII.25.) the area of Ipolyvece falls under the particularly sensitive category as regards of groundwater protection. (According to the 1:100,000 scale map of the Environmental Protection And Water Management Research Institute displaying the groundwater protection areas this site falls under category 2a: area with a recharge of more than 20 mm.) Based on the provisions of Governmental decree 219/2004 (VII.21.) on the protection of groundwaters animal keeping activities shall only be pursued alongside with *engineered protection*.”

This remark has meant that the enclosures of the animals (approximately 1.5 hectare with an average gradient of 5 to 10%) shall be made of concrete so that no manure-contaminated water could drain into the soil.

On the one hand, this solution would have significantly raised the expenditures compared to the planned budget. On the other hand, it would have created a completely inadequate and useless environment for the animals.

## 2.2. The first proposed solution for eliminating the conflict

The farm development plan of the property developer Danube-Ipoly National Park Directorate is subjected to a preliminary examination due to the fact that the area involved in the planning falls under the particularly sensitive area from the aspect of water protection. [3]

In order to complete the preliminary environmental examination an environmental geology examination was carried out. This examination provides the basis for those planning decisions that are covered by the preliminary environmental examination. [4]

According to the agreement made between the planners and the investor based on the results of the environmental geology examination [4] it shall be assess how and in which extent can the partial cover created on the surface of the enclosures (concrete manure collecting surface, closed manure storage facility) decrease the manure load regarding the uncovered parts of the enclosures. The elements of the planned version are the following:

- The animals are feed in a covered (by concrete) feeding surface and the connected and covered manure path. In this case the manure (based on animal keeping experience and planners' estimation approx. 50% of the total amount of manure) can be collected daily. An adequate capacity (150 days) closed manure storage facility shall be built together with the connected monitoring system to store the collected manure. The calculated amount of manure is 1,300 m<sup>3</sup> which could be stored in a 600 m<sup>2</sup> closed storage facility with retaining walls.
- The other 50% of the animal manure is created either in the clay floor, deep litter resting stables or in the litter-covered resting mounds established within the pens. This amount is to be transported directly to the arable land at the end of the overwintering (150 days) as either littered farmyard manure or pen soil.
- The leachate that is created and run off occasionally (in case of exceptionally heavy rains) in the area of the pens shall be collected in a covered surface reservoir established in the Northern side of the pens (facing the railroad).

The results of the environmental geology examination were sufficient to determine the amount of leachate created and run off occasionally (in case of exceptionally heavy rains) in the area of the pens, as follows:

- The 10 minutes standard rainwater for 4 years frequency is 273.61 l/s/ha
- Infiltration conditions: the infiltration coefficient of the surface fine sand layers is in the order of magnitude of 10<sup>-4</sup> m/s, thus they are considered as relatively good water draining media. As a consequence, significant amount of the precipitation infiltrates into the soil. The estimated runoff coefficient is 0.15; since the animals are kept in this area in the winter season, a minimal, 5% evaporation is calculated. Therefore approximately 80% of the precipitation infiltrates into the soil.

Calculating the actual amount of leachate:

The final dimensions of the involved enclosures are the following:

- Enclosure for cows: 1.26 ha
- Enclosure for young animals: 0.25 ha

The corrected value of the calculated maximal precipitation:

$$1.51\text{ha} \times 600\text{sec} \times 273.61\text{l/sec/ha} = 247,881.60 \text{ liter} = 247.9 \text{ m}^3 / 10 \text{ minutes} \quad (1)$$

The estimated runoff coefficient: 0.15

The actual amount of leachate:

$$247.9 \times 0.15 = 37.18 \text{ m}^3 / 10 \text{ minutes} \quad (2)$$

The closed rainwater basin established at the lower end of the enclosures shall be able to contain at least this amount of water.

### 2.3. Expected impacts on the groundwater

Calculations of the environmental geology examination [5] related to the impacts on the groundwater [6] have yielded a surprising result:

- *no significant impacts on the body of the underground water can be expected following the modernisation.*

The calculations and factors taken into consideration are the following:

- During operation the load of the underground body of water is derived from those components of manure created in the pens – primarily different forms of N, such as nitrite, nitrate and ammonium – that are soluble by the precipitation.
- Approximately 2,100 t litter manure is generated by the planned size of livestock (based on the planners' data provision; in the calculations this amount is distributed on the uncovered surface of the enclosures); its average N content is 0.5%. According to the literature around 25% of the organic manure nutrients is exposed in the first year; thus, regarding the 1.5 ha total area of the enclosures the maximal annual N load in this area is 3,000 kg (since the 25% exposure is related to a whole year). This amount corresponds to approx. 8,100 kg nitrate.
- Provided that the total amount of released N content reaches the groundwater its nitrate concentration increases by an average of 2.6 mg/l. Based on the results of the baseline survey this load does not impose significant changes in the attributes of the groundwater. [7]

Several of those circumstances were not considered during the calculations that mitigate the impact:

- Certain proportion of the precipitation and slurry is absorbed by the litter.
- Part of the N-based nutrients are utilised (thus absorbed) by the fertile soil organisms and vegetation.
- The fine-grained fraction of surface layers absorbs some of the contamination content of the infiltrating water.
- The extent of infiltration can decrease due to the soil compaction caused by colmatation.
- 25% was calculated for the exposition of organic manure that is a value determined for an entire year while the manure stays in the area no longer than half a year.

### 2.4. The programme of the concluded plan elaborated in accordance with the results of the environmental geology examination

The fact that no significant contamination of the groundwater can be expected based on the calculations assuming that the whole amount of manure is created on the uncovered surface of the enclosures provided the basis of the following planner-investor decision: in the version described in 2.2 both the concrete-floored manure collection surface and the closed manure storage facility are unnecessary, cost-increasing items.

Moreover, the provision of Governmental decree 219/2004 (VII.21.) on the protection of groundwaters – i.e. animal keeping activities shall only be pursued alongside with *engineered protection* – cannot be maintained; the planned livestock can be kept in uncovered enclosures.

Measures to be taken during the operation of the facility in order to mitigate the impact on the surface and underground water:

- Litter manure shall be removed from the enclosures following the spring driving out so that the leaching of the nutrients would be stopped as soon as possible.
- During winter the rainwater slightly contaminated by manure shall be collected in a covered ditch or basin established in the deepest point of the area. This water can be placed into arable land. In summer when there are neither animals nor litter manure in the area the collected water can be used for the irrigation of the pens.
- In the summer period such plants shall be cultivated in the area of the pens that grows intensively, thus utilising lots of the nutrients leached and accumulated in the upper soil layers. The load of groundwater is decreased this way. These plants can also be utilised as fodder.
- The establishment of an observation well is justified in order to monitor the groundwater quality. By its regular – annual – assessment the changes in the underground body of water can be tracked.

Suggested sampling period: once a year. Components to be examined: general water chemistry. The sampling and the laboratory examination is completed by the involvement of accredited organisations. The suggested location of the observation well is indicated in the detailed site layout.

### 3. EVALUATION OF RESULTS, CONCLUSIONS

The spatial plan of Ipolyvece and – as a part of it – the local building regulations have been approved in 2009, i.e. 4 or 5 years later than the Governmental decrees ordaining the increased level protection of the area had entered into force. Nevertheless, there is no clue in the local building regulations about the particularly sensitive classification of the area involved by the planning, although this fact determines the utilisation possibilities of the area. Neither the local government nor the users of the land knew that the area falls under the particularly sensitive category as regards of water protection. This is an obvious planning fault. Act XXVI of 2003 on the National Spatial Plan and its Annex 3/7 map indicate clearly the area around Ipolyvece, but the map titled „zones of particularly sensitive groundwaters regarding water protection” in Annex 3/2 of the Nógrád County Spatial Plan elaborated by VÁTI in 2005 does not include this site, although it is included in the table of KVVVM decree 7/2005 (III.1.) referenced as the source. This can be (one of) the reason why the obligation of protecting the groundwaters is excluded from among the relevant aspects in the local spatial plan.

Nevertheless, the contradictory final conclusion regarding (1) the delineation and classification made by the 1:100000 scale area database and (2) the results of the on-site examinations calls the attention to the clearly expressed need for conducting environmental geology and environmental protection preliminary examinations during the preparation phase of actual investments. Based on our anticipatory estimations the concrete cover of the 1.5 ha enclosure area would have cost approximately 80 million HUF (as a net amount), besides it would have caused serious damage by hindering and deteriorating the nature-like circumstances of keeping Hungarian grey cattle. The costs of preliminary examinations and that of elaborating the different plan versions related to the establishment of enclosures have consumed only around 1% of the above-mentioned amount.

### REFERENCES

- [1] Építési engedélyezési tervdokumentáció, Ipolyvecei Major, telepfejlesztés, 2012. Megbízó: Duna-Ipoly Nemzeti Park Igazgatóság, Generáltervező: BL2 Mérnöki Tervező KFT, Budapest, Építész tervezők: Ónodi Gábor, Váradi István
- [2] Ipolyvece szürkemarha telep fejlesztéssel kapcsolatos egyeztető tárgyalás jegyzőkönyv, Közép-Dunavölgyi KTVF, 2011.08.31.
- [3] 314/2005(XII.25) Korm. rendelet a környezeti hatásvizsgálati és egységes környezethasználati eljárásról 3. melléklet 127.
- [4] A szükséges környezetföldtani vizsgálat tartalmi követelményeivel kapcsolatos egyeztető tárgyalás, jegyzőkönyv, Közép-Dunavölgyi KTVF, 2011.11.25.
- [5] Kis A., Angelus B., Eperjesi Gy.: Ipolyvece, szürkemarha telepkorszerűsítés, Előzetes környezetvédelmi vizsgálati dokumentáció, 2011. Megbízó: DINPI
- [6] 4.5. Hydrogeology attributes, in Kis A., Angelus B., Eperjesi Gy.: Ipolyvece, szürkemarha telepkorszerűsítés, Előzetes környezetvédelmi vizsgálati dokumentáció, 2011. Megbízó: DINPI
- [7] 4.6 Condition of the ground water, in Kis A., Angelus B., Eperjesi Gy.: Ipolyvece, szürkemarha telepkorszerűsítés, Előzetes környezetvédelmi vizsgálati dokumentáció, 2011. Megbízó: DINPI