

# THE BLATNÁ WATER DITCH – AN EXAMPLE OF CONNECTING MULTIPLE INTERESTS WHILE PRESERVING A FUNCTIONAL MONUMENT OF TECHNICAL HERITAGE

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## Abstract

The Blatná water ditch, also named “Blatenský” water channel, belongs to a specific group of monuments of so-called technical and industrial heritage, which have managed to preserve their work even in the face of a change in function and repeated degradation of the structure and partial structures. It was necessary during the previous two reconstruction phases to balance the often-conflicting interests of historic preservation, nature protection, provision of water management functions and interests connected with tourism in the Ore Mountains. This was due to the nature of the water ditch representing an artificial water channel itself with many accompanying structures, e.g. the aqueduct and water distribution facilities. This paper aims to demonstrate the possibilities of solving the reconstruction of similar waterworks taking into account the aforementioned interests and at the same time preserving the maximum possible authenticity of the work, including the structural design and the techniques used for carrying out the work.

**Keywords:** Water channel, industrial heritage, authenticity, tourism, waterworks reconstruction

## Introduction

In the last decade, cultural heritage protection has become significantly focused, both in the Czech Republic and in other countries, on the description, documentation, preservation and presentation of industrial heritage (Douet, 2015). An integral part of cultural heritage protection is the typology of structures of individual fields, their identification, assessment of their current state and protection (Ryšková and Dzuráková et al., 2022). Preservation and reconstruction activities are complemented by popularising this type of heritage in various ways. Popularisation through visualisations of structures and their functional units is one of the suitable tools for making the preservation of this heritage and awareness of it possible. As far as the water management field is concerned, these procedures of visualisation of structures will enable the retention of information about their state in a certain period because continuous reconstruction, additions to structures, replacement of technological equipment and often also changes of usage are typical for this field. This is typical for structures both on regulated water courses (especially reservoirs, regulating and distribution structures) and on artificial channels, the representative of which is the Blatná water ditch.

The Blatná water ditch has been heritage-protected since 1981, and in 2017 it was declared a national cultural monument. It is also part of the Erzgebirge/Krušnohoří (Ore Mountains) Mining Cultural Landscape which was, together with waterworks for ore mining and processing, inscribed on the World Heritage List in 2019 (UNESCO, 2019), which makes the channel itself a popular tourist destination.

## Materials and methods

The field working methods include, apart from walking and taking photos and geodetic positioning of structures and sections of watercourses (here the ditch trough), the following approaches: (i) modern methods of providing source materials in the field were used to identify and document structures and their functional units (electronic versions of forms, acquisition of images using UAV equipment); (ii) GNSS receiver Trimble R2 was used to determine the spatial position of Ground Control Points (GCP); (iii) the source materials were further processed using special SW tools, e.g. GIS; (iv) the processing of the aerial images acquired was carried out using the Agisoft PhotoScan Professional software. This software uses digital photogrammetry and Structure from Motion (SfM) methods and the output is a textured 3D model of the captured scene.

Archive research is an essential part of the study of historical waterworks and their functional units (Sviták et al., 2022). In the case of the Blatná water ditch, it consisted of the following steps: (i)

detailed research, analysis and interpretation of available archive fonds, ii) research of map works, plans and schemes, iii) digitalisation of selected archive (map, project and other) materials and their interpretation using SW tools (GIS).

## Results

### *History of the water ditch operation*

According to written sources, the Blatná water ditch was built at the turn of the 1540s by a person called Stephan Lenk, not long after the discovery of tin deposits in the vicinity of Blatenský hill and the subsequent foundation of the town of Horní Blatná (1532). An almost 12 km-long water ditch with an average slope of 3 ‰ was started to the west of Boží Dar, where it took water from Černá Brook, from where it led through Myslivny, Ryžovna, Bludná, along the northern slope of Blatenský Hill to Horní Blatná (Fig. 1), where its water provided the propulsion power for the equipment and machinery in mining and processing operations (the crushing and smelting plant of extracted tin ore) situated to the west of the core of the town buildings. To the south of the town the ditch led into the Blatenský Brook. From the early 1870s, the Blatná water ditch operated under the name of a newly formed water cooperative based in Horní Blatná. The water ditch served its function and was maintained till the displacement of the local German population after the Second World War. Then it lay decaying for half a century (Cais, 2018).



Fig. 1: The Blatná water ditch route

### *Results of the field research*

The water ditch is about 2 metres wide and over 1 metre deep (Fig. 2). Its trough was reinforced with wooden battens or lined with stone cladding and in the past it was covered year round. The whole works was equipped with necessary technical elements which ensured the desired function. It involved: (i) a system of sluice gates; (ii) supply and drainage branch channels; (iii) traps for gravel and sand deposits drifted by the current of tributaries which supplied water to the ditch; (iv) overflows which, on the contrary, served to drain an excessive amount of water from it into the Černá River; (v) culverts under roads; (vi) bridges over the ditch or water transfer (via aqueduct) allowing crossing the brook. They could be used to carry out regular walking inspections of the ditch (nowadays they are often used by tourists), check its flow rate and remove any obstacles or repair damage to the structure.



Fig. 2: Channel of the ditch in a forest area (left) and in an open landscape (right)

Between 1995 and 2001, this technical-heritage monument was repaired according to a reconstruction project from the 1920s (final inspection documentation is from 1929) with partial modifications. A number of stakeholders participated in the project proposal – the municipality of Boží Dar, Karlovy Vary District Council, State Bureau for Amelioration, Ohře River Basin, state enterprise, and Forests of the CR, state enterprise. The project was approved and supervised by the National Heritage Institute. The reason for its preservation was not only to preserve the historical waterworks but also to comply with the current water management requirements in the area. Until today, the task of the water ditch has been to drain acidic water from the Boží Dar peat bog out of the water surface of the Myslivna reservoir, which serves as a source of drinking water; and in the event of an accident or technological problems with the quality of the drainage water at the Boží Dar town WWTP, to divert these waters out of the water reservoir. Furthermore, the repair of the trough was to prevent the degradation of forest cover around the ditch, into which the water seeped due to the leaking structure. Forest ameliorations were also to be led into the ditch.

### **Problems identified**

Due to the effects of climatic conditions, about ten years after the end of the restoration from the turn of the 21st century, new major repairs were made. Damaged spruce round logs were replaced and masonry elements were reinforced. The trough was cleaned from the turf which grew in places without natural inflow. Ensuring a sufficient flow through the waterworks is a problem. In 2011, a regular staff service of the ditch was launched to check its state. Both the channel body and many other structures were gradually falling into serious disrepair. The filling structure did not work, the relief structures were apparently intentionally damaged and oak planks were stolen. Water escaped from the ditch due to the damaged wooden reinforcement and the trough became overgrown with vegetation. Weather conditions also affected its state. The last reconstruction, focused on the overall repair of reinforcement and structures (along the entire length of the water channel) lasted two years and was completed at the end of 2023. The reconstruction was carried out with respect to the preservation of the heritage value of the waterworks, with an emphasis on the authenticity of the material but also the procedures used, i.e. a large proportion of manual work, in a relatively difficult to reach area.

### **Discussion**

The use of UAV equipment for the documentation of historical structures has been one of the established techniques in recent years (Lo Brutto et al., 2014). The imaging results, together with suitable SW tools, are used to prepare visualisations and map outputs (Nex and Remondino, 2014), as was the case of the Blatná water ditch. The heritage value of the Blatná water ditch is based above all on its operational continuity with a clearly documented beginning in the 16th century. On the other hand, this operational continuity has resulted in repeated reconstructions. Nevertheless, during the present reconstruction, it turns out that a lot of structures or substructures have been preserved presumably from the 18th century.

The Blatná water ditch belongs to a specific group of technical and industrial-heritage monuments in the case of which the waterworks itself has been preserved even with changes in function and a repeated degradation of its structure and sub-structures. The change in function in the course of history and the approach to repairs and reconstructions, as well as the selection of technological methods of repair and technology used, correspond to the requirements and possibilities of the time for this type of water management structure and does not always reflect the requirement to maintain authenticity (Ryšková and Dzuráková et al., 2022). In spite of that, in the case of this ditch, both during the major reconstruction in the 1920s and during the recent ones, the requirements for authenticity have been taken into account. All this happened thanks to the efforts of a number of enthusiasts and experts and the helpfulness of the organisations that were responsible for the management and operation of the ditch. Its regular, frequently repeated inspection is essential to the maintenance of the channel, on the basis of which its cleaning and any necessary repairs are done without undue delay.

### **Conclusion**

The uniqueness of the Blatná water ditch resides also in its size and its operational link to two Renaissance mining towns of Horní Blatná and Boží Dar. With its long in operation length of 13 km, it is an excellent example of technological ingenuity, but also of foresight in the context of the area use, which has survived even the decline of mining. It is also one of the most significant examples of the colonisation landscape of the early 16th century, showing the interconnection of anthropogenic activity (mining), mining towns with a strong commercial and economic component, as well as architectural and artistic works. During the last two reconstructions (in the 1990s and current), it was necessary due

to the nature of the works, which comprises the trough of an artificial water channel with many accompanying structures (aqueduct, relief structures, etc.), to balance the often contradictory interests of heritage protection, nature conservation, water management functions and the interests associated with growing tourism in the Ore Mountains. More information, photo documentation and plans of the ditch body and related structures can be found on the project website:

(<https://heis.vuv.cz/data/webmap/datovesady/projekty/kanaly/default.asp>)

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## Souhrn

Blatenský vodní kanál patří do specifické skupiny památek tzv. technického a industriálního dědictví, u nichž se podařilo zachovat vlastní dílo i při změně funkce a opakované degradaci konstrukce a dílčích objektů. Vzhledem k charakteru díla, které představuje koryto umělého vodního kanálu s mnoha doprovodnými objekty (akvadukt, odlehčovací objekty aj.), bylo nutné během posledních rekonstrukcí vyvážit často protichůdné zájmy památkové ochrany, ochrany přírody, zajištění vodohospodářských funkcí a zájmy spojené s rostoucím turistickým ruchem v oblasti Krušných hor. Cílem příspěvku je představit možnosti řešení rekonstrukce podobných vodních děl se zohledněním těchto zájmů a současně zachováním maximálně možné autenticity díla, včetně konstrukčního provedení a použitých technik provádění prací.

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