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## PODPOVRCHOVÝ PRIESKUM HISTORICKÉHO PARKU V SANTOVKE UNDERGROUND EXPLORATION OF HISTORICAL PARK IN SANTOVKA

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The paper is a part of the park reconstruction project. Following the historical information of a formal promenade existence in the park composition from the 19th century, there was a need to confirm this assumption. Non-invasive measuring with georadar X3M equipped with 500 MHz shielded antenna from Swedish company MALÅ was selected as a method. As much as 12 measurements were made, crossing the park in different directions – either parallel or perpendicular to the main axis of the park – as the promenade was parallel with the main axis. Afterwards, the measurement results were processed by Rad Explorer 1.41 and GroundVision 2 software. The visual interpretation of radargrams showed root crowns of trees, probable placement of the promenade and, of course, engineering infrastructure (water pipes); however, the exact identification of all elements has to be proven by invasive methods.

**Keywords:** georadar, Santovka, historical park

Historical greenery is an important part of human cultural heritage. Having knowledge about it and maintaining it is a task for today's society; the goal is to preserve it for future generations. The state of historic greenery in the Slovak Republic is rather not satisfactory. It is so due to the official policy of former socialist political regime, attempting to erase all traces of social stratification. Castles, manors and palaces were the most visible signs of higher class of society, although there was a democratic intermezzo after the feudalism which ended by the First World War. Fighting an imperialistic enemy did not make any difference between feudal and democratic regime. Both were representing their wealth by their residences, surrounded by vast greenery which is today considered historical. From an artistic point of view, it is necessary to upkeep also this kind of art called garden or landscape architecture. That is why this is also the main goal of our research.

There are about 1,000 bigger or smaller historical greenery objects in Slovakia; officially, only 400 are on the list of The Monuments Board of the Slovak Republic (MB SR). As it is not possible for one man to know everything about them, and the role of the MB SR is not really adequately supported by sufficient financial funding, there is a need to develop the research of historic greenery also in other institutions. Each partial attempt to know something even about the least important garden or park, whether in the largest city or in the most forgotten village in the middle of nowhere, is going to be a small piece of the mosaic. Bihuňová and Štěpánková (2012) say that localization of a village is also important for the recreational and cultural potential. Flóriš (2010) states that Santovka village belongs to the microregion Tufová kopa – Biely kameň (Tufa Mound – White Stone).

### Material and methods

The historical park with a manor in the municipality of Santovka in Levice District, Nitra County was chosen as

a model object. The state of classicist manor is quite good as it serves as a Social Services Facility (SSF). The building itself was recently reconstructed; it was even enlarged in functionalist style which can be considered as unfortunate, nevertheless, it serves its purposes. The park itself does not belong to the SSF but to the municipality (which is quite a frequent solution in Slovak municipalities). Of course, it had been decaying for a long time, waiting for an enterprising mayor with an idea to rebuild the historical park to a municipality park (also a very frequent solution in Slovak municipalities). Indeed, we can discuss whether it is better to have a more and more decaying historical park or a functional, though uncharming municipal park with minimal care necessity but that is not our goal now. As the second possibility had been chosen by municipal officials, a radical cleaning of the park was carried out; all naturally sown trees were cut out, and just older trees, planted in the original composition, remained on the site. Plenty of ill, dangerous or damaged old trees were removed as well. Finally, the stream basin of the local water element was cleaned up and its banks were adjusted into a geometrical trapeze shape together with fire fighting pool on its side, situated in the middle of the park.

According to historical maps, there was a formal promenade following the main axis of the park. It is still traceable thanks to the tree alley on its sides but it is not visible itself. As it was only one side alley, and there are no visible remains of the path, it was questionable where exactly the promenade is situated. This question was answered by non-invasive research, performed by georadar X3M equipped with 500 MHz shielded antenna from Swedish company MALÅ. Altogether 12 measurements were carried out, always in two directions, either parallel or perpendicular with the main axis of the park or with the main axis of the parterre situated in front of the manor. The resulting radargrams were processed in Rad Explorer 1.41 and GroundVision 2 software, compatible with the mentioned georadar. The measurements were carried out in sunny weather in summer 2012; grass



**Figure 1** Historical cadastral map showing the position of the promenade and formal parterre. The bold lines with arrows represent two main axes of the parterre and park itself

Source: MB SR, original 1888, reproduction by Karpišová 1969

**Obrázok 1** Historická katastrálna mapa zobrazujúca polohu promenády a niekdajšieho parteru. Tučne zvýraznené čiary so šípkami predstavujú dve hlavné osi parteru a samotného parku

Zdroj: Pamiatkový úrad SR, original z 1888, reprodukcia: Karpišová, 1969

had to be cut down to ensure good movability of georadar; soil had to be dry to ensure the best measurement results, and fortunately, there had been no rain for a long period before action. The measurements could start only after morning dew disappeared, because water can influence measurements details.

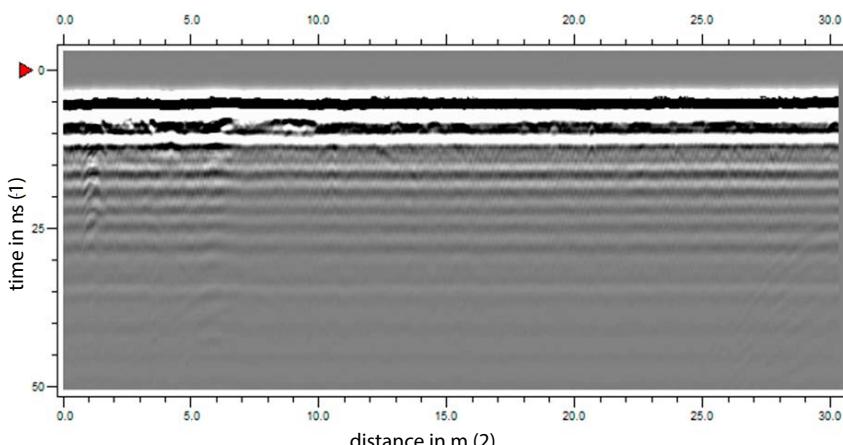
## Results and discussion

Clark (2008) made a similar research in Amache in Granada Relocation Centre, located in south-eastern Colorado, USA. The investigations were designed to further assess the archaeological resources of the site, especially the gardens documented by historical photographs and site survey. These locations were subjected to ground penetrating radar (GPR) survey, which confirmed the presence of features with ornamental and vegetable garden. The GPR results in the vegetable garden were inconclusive.

Watters (2012) made a GPR research in the residence of the poet Henry W. Longfellow in Cambridge, Massachusetts, USA. It was a part of a wider research, using not only GPR, but also other techniques, such as Magnetometry, Resistance and Conductivity/Magnetic Susceptibility. At the front parterre, the author came to a conclusion that resistance data suggest there may be compacted surfaces between these 'garden beds', based upon the higher resistance value along what appears to be a central pathway in the GPR data. The GPR data, however, shows the garden 'beds' as an anomaly stronger than the 'pathways'. If the 'pathways' were a compacted surface, in theory, they should show as

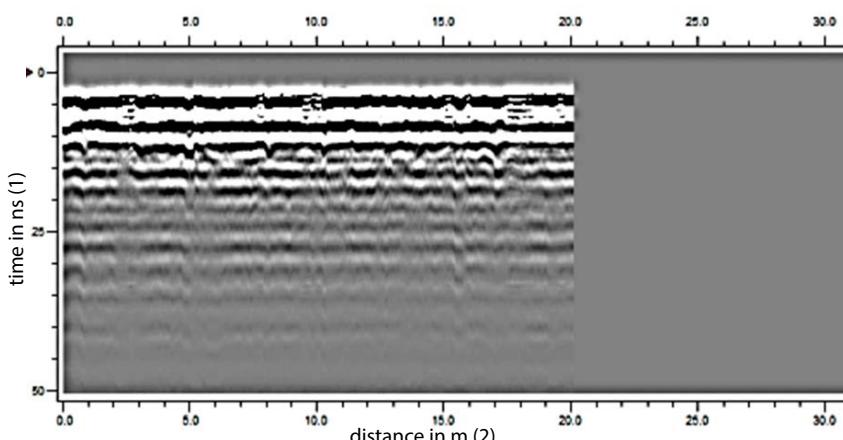
a strong anomaly in the GPR data. Different geophysical survey methods provide detailed information as to what is buried beneath the ground. We are able to integrate this information for a more insightful interpretation of the buried features, but to truly know what remains, archaeologists must ground truth these features through auguring or excavation. These results show that even a flower bed can be easily recognizable in GPR research thanks to the long lasting change of the soil structure compared to neighbouring parts of the plane.

Following presumptions about position of the promenade in the park and about an existence of the formal parterre in front of the manor house, 12 directions of georadar scanning were set. Each was 20–75 m long, always either parallel or perpendicular with the main axis of the park or of the parterre. Afterwards, each measurement was processed in the software and visually evaluated. There were recognizable tree root systems, engineering infrastructure (water pipes), and significant layers with different density compared to surrounding soil structure. These layers were located on assumed position of the promenade; 3–4 m wide and approximately 30–40 cm deep (see the figure with radargram No. 3 and No. 8). The material composition probably includes sand, gravel or maul, as it has different structure and density than the soil. The promenade is completely covered by the soil and other organic materials as the park had not been maintained for 20 or more years. The recent cleaning out in the park offers the possibility to implement archaeological probes on the places indentified by the georadar.



**Figure 2** Radargram No. 3 showing perpendicular measurement with visible position of promenade path between 6<sup>th</sup> and 10<sup>th</sup> m

**Obrázok 2** Radargram č. 3 zobrazujúci kolmé meranie s viditeľnou polohou promenádneho chodníka medzi šiestym a desiatym metrom  
(1) čas, (2) vzdialenosť



**Figure 3** Radargram No. 8 showing perpendicular measurement with visible probable parterre paths

**Obrázok 3** Radargram č. 8 zobrazujúci kolmé meranie s viditeľnými pravdepodobnými chodníkmi na partere  
(1) čas, (2) vzdialenosť

Separate radargrams No. 1–7 (7 together) were made in the park, No. 1–6 were perpendicular to the main axis of the park, so they were crossing the assumed position of the promenade from the beginning next to the manor house to the end at the park border. The radargram No. 7 was made parallel with the axis and unfortunately, it did not cross the promenade. The radargrams 8–12 (5 together) were made at the parterre; the short ones (approximately 20 m) are perpendicular to the main axis (No. 8, 11), and the long ones (approximately 75 m) are parallel to the main axis of the parterre.

According to the visual evaluation of radargrams, the hypothesis of

the promenade existence has been approved. The existence of the formal parterre has been probably approved as well, as there were visible significant changes on the radargrams measured in front of the manor house. All these results have to be approved also by invasive research methods.

## Súhrn

Práca je súčasťou projektu obnovy parku v Santovke. Na základe historickej informácie z 19. storočia o existencii pravidelnej promenády v kompozícii parku bolo potrebné overiť daný predpoklad. Ako metóda bolo zvolené neinvazívne skenovanie s georadarem

X3M vybaveným 500 MHz tienenou anténou švédskej firmy MALÅ. Bolo spracovaných 12 meraní križujúcich park v rôznych smeroch, buď rovnoobežných, alebo kolmých na smer hlavnej kompozičnej osi, keďže promenáda s ňou bola rovnobežná. Následne boli výsledky meraní spracované softvérmami Rad Explorer 1.41 a GroundVision 2. Vizuálna interpretácia radargramov poukázala na koreňové systémy drevína, pravdepodobnú lokalizáciu promenády a existujúce inžinierske siete (vodovodné potrubie), avšak presná lokalizácia všetkých prvkov musí byť overená invazívnymi metódami.

**Kľúčové slová:** georadar, Santovka, historický park

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