



GPRsurvey as a part of land-use planning in Levi, Finnish Lapland

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The need for detailed information regarding overlying soil layers in townplanning areas has become an important issue, especially in certain areas of Finnish Lapland where the lack of usable soil materials is obvious. Use of ground penetrating radar (GPR) is a fast and cost-effective method of determining the structure of subsurface layers and quantity of soil material above the bedrock surface.

This environmental project was carried out by the Geological Survey of Finland together with local enterprises, environmental authorities and an EU structural fund. One of the goals of the project was to use GPR to determine the thickness of soil layers and the differences in material above the bedrock level in certain target areas of the project. The study area is located in the municipality of Kittilä, in the center of the Levi ski resort. The study area (total size of 28 hectares) and surroundings are under fast townplanning and there are, for example, plans for a hotel, apartments and underground garages and service routes, thus it is very important to determine the volume of quarrying. As well, the quality and quantity of existing soil is valid data for the reuse of materials and upcoming construction.

One drilling program has already been executed in the area (11 boreholes), so GPR profiles were planned based on this drilling data, soil mapping data and data collected from the townplanning map of the area. According to these earlier drillings and soil mapping, most of the soil in the study area was morainic, so the antenna for the GPR-survey was set at 100 MHz. The positioning method used in this project was VRS-GPS (Virtual Reference Station Global Positioning System), which is a very accurate positioning system to use. Accuracy can be as good as a few centimeters.

After the GPR-survey, secondary drilling program was carried out according to the GPR-profiles, thus the total amount of collected data from the planning area was 23 boreholes and 3500 meters of GPR-profiles. In the second phase of the project, all the collected data was used as a reference to build a 3D-model of the planning area. Interpreted GPR-profiles, surface soil map and borehole data formed a database from which an exact model of the study area subsurface was created using GISsoftware. Acquired results show the feasibility of this method to help local actors and authorities in planning and constructing of the area, in present and upcoming projects.