

**Twenty-third Session
Vienna, 28 March – 4 April 2006**

**Item 8 of the Provisional Agenda:
Activities relating to the Working Group on Toponymic
Data Files and Gazetteers**

„Mehrzweckkarte“ („Multipurpose Map“) – The Digital City Map of Vienna

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„Mehrzweckkarte“ („Multipurpose Map“) – The Digital City Map of Vienna

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Modern urban planning processes are inconceivable without the use of digital data. On account of this the Municipal Department 41 – Urban Survey produces the "Mehrzweckkarte" ("multipurpose map") – the digital city map of Vienna. Covering the entire area of the city, the Mehrzweckkarte maps all objects on the terrain-surface like buildings, sidewalks, roadways etc. by way of 3d-data. It is updated regularly in a triennial cycle.

1. History

In the year 1956 the production of the analog city map – the predecessor of the Mehrzweckkarte – was started. It was based on aerial photogrammetry and subsequent cartographic editing. The working scale and standard output scale was 1 : 2 000. Other standard output scales were 1 : 5 000 and 1 : 10 000. These scales resulted from a reprographic reduction and additional cartographic editing of the text layer, which was kept separately from the situation content.

In the year 1972 the initial data acquisition of the of the analog city map was completed, and in 1973 the updating was started. Since 1979 the department was in a position to update the analog map in a triennial cycle.

Following some first tests, the data collection for the Mehrzweckkarte was started in the year 1984. The initial data acquisition of the public street areas by means of terrestrial survey was finished in 1995, while the aerial photogrammetry was completed one year later in 1996. The cartographic editing of the combined data of the Mehrzweckkarte was finished in 1997. From the beginning parallel updating works of the map took place.

Since 1997 the Mehrzweckkarte is updated in a triennial cycle.

2. Production

For the data collection for the production of the Mehrzweckkarte two methods are in use: The objects in the public street areas are surveyed with electronic tachymeters; Inside the blocks data are gained by way of digital aerial photogrammetry.

2.1. Terrestrial Survey

The contents of the public street areas of the Mehrzweckkarte derive from terrestrial surveying with electronic tachymeters. Basically the delimitations of the public street areas (fences, walls, borders of green areas, building contours) and the “street furniture” (such as pavements, hydrants, masts, trees, tracks, covers of service openings, manholes) are acquired digitally by position and elevation. The survey includes certain generalisations: For example only those protrusions are measured, which are longer than five centimeters. Generally all those public street areas are surveyed which are accessible year-round 24 hours a day. Exempt are only expressways and their exits as well as highways.

The updating of the surveyed contents is realized by two measures: Firstly the current Mehrzweckkarte is compared with nature on location, and changes are marked in a plot. These notes afterwards serve as an assignment to newly survey the changed areas.

The operations for the survey of the Mehrzweckkarte are carried out partly by the staff of the Urban Survey and partly by way of outsourcing. Comparison with nature as well as control of assignments is completely in the hands of the Urban Survey, while up to two thirds of the surveying-assignments are given to private civil engineers.

2.2. Aerial Photogrammetry

For the inside of blocks aerial photogrammetry supplies data like building contours, trees and groups of trees or shrubs, footpaths, enclosures, physical boundaries of sealed surfaces and much more. The scale of the aerial photographs in use is about 1 : 7 000, the working scale is 1 : 1 000.

The contents of the aerial survey are updated in a triennial cycle, just like the surveyed data of the Mehrzweckkarte. After completing the updating works of the surveyed street area content, it is blended into an up-to-date aerial photography combined with the existing aerial photography content of the Mehrzweckkarte. So the content of the inside of the blocks is controlled and the changes are detected.

The data acquisition of the Mehrzweckkarte by way of aerial photogrammetry is completely carried out by the staff of the Urban Survey.

2.3. Cartographic Editing

After updating the content of the Mehrzweckkarte by terrestrial survey and aerial photogrammetry follows the cartographic editing of the Mehrzweckkarte. It involves interactive text positioning, the preparation of standard scales and sheet formats and the closing of contours.

The text on the Mehrzweckkarte relates to street names, house numbers, staircase numbers, specific designations (such as "hospital" or "school") and topographic comments. The Mehrzweckkarte shows both house numbers that actually exist in the real world and those that do not yet exist but have already been administratively assigned. Figure 1 shows a plot of the Mehrzweckkarte in the inner city area.



Figure 1: Part of the Mehrzweckkarte, scale 1: 2 500

The cartographic editing of the Mehrzweckkarte is carried out entirely by the staff of the Urban Survey.

3. Data and Contents

Digital, threedimensional, homogeneous, all over Vienna, and up-to-date – these are the outstanding characteristics of the Mehrzweckkarte. They are evidence of the quality of the digital city map of Vienna.

3.1. Data Quality

The accuracy of the contents of the Mehrzweckkarte varies according to whether the data comes from the terrestrial survey or the aerial photogrammetry.

The position and elevation accuracy of terrestrially surveyed points is a few centimeters, with the exception of certain points which are designated as "imprecise" by a special label. The position and elevation accuracy of data acquired by aerial photogrammetry is about 20 centimeters for precisely recognizable and identifiable objects.

3.2. Content

The data of the Mehrzweckkarte are acquired in different layers according to their meaning. More than 200 different kinds of objects are distinguished and mapped with corresponding codes.

Because of the two data sources for the Mehrzweckkarte – terrestrial survey and aerial photogrammetry – for many contents there exist double codes (for example house contour from terrestrial survey and house contour from aerial photogrammetry respectively). This is necessary because the origin of the data is very important for accuracy statements.

Concerning geometry the Mehrzweckkarte contains points, lines and texts. In contrary to the product "Flächen- Mehrzweckkarte" the regular Mehrzweckkarte does not contain polygons.

3.3. Updating cycle

The entire city area of Vienna is mapped in the Mehrzweckkarte. To some extent small areas protruding over the border into Lower Austria are also mapped. Especially near the Lobau the Mehrzweckkarte extends some kilometers downstream along the Danube. The strict definition of the Mehrzweckkarte-area however goes by the updating cycle: The data of the Mehrzweckkarte within the Mehrzweckkarte-area is regularly updated in a triennial cycle. The areas Wiener Wald, Lainzer Tiergarten and Lobau are outside of the Mehrzweckkarte-area. Changes in these regions are incorporated in a five to ten year cycle.

Beside the usual updating of the Mehrzweckkarte, it is attempted to incorporate significant changes in urban development, which are of big public interest, immediately after their completion into the Mehrzweckkarte.

3.4. Coordinate Reference System

The coordinates are given in the Gauss-Krueger coordinate system. The coordinate units follow the metric system (meters). The elevation statements in the Mehrzweckkarte refer to Vienna zero (156,680 meters above Adria zero).

4. Modes of output

Like all geodata of the Urban Survey the data of the Mehrzweckkarte can be bought from the Urban Survey after signing a license-agreement. The data of the Mehrzweckkarte is passed on in vector as well as raster data format. On demand plots on paper are available as well.

The vector data of the Mehrzweckkarte are supplied in DXF-format. They include points, lines and texts, with positional and elevation information.

The raster data of the Mehrzweckkarte are supplied in TIF-format with the corresponding georeferencing file. The pixel-size is 20 centimeters, and there are several raster-versions available.

5. Applications

The Mehrzweckkarte is one of the most important planning tools for the Vienna city area. For example it serves as the base for the zoning and land use plan and for the city map address finder at wien.at (<http://www.wien.gv.at/>). Furthermore the Mehrzweckkarte is the base for the "Flächen-Mehrzweckkarte", the 3d building model, the terrain model and the threedimensional city model of Vienna, as well as for the Vienna-GIS and many other projects.

5.1. Zoning and Land Use Plan

The zoning and land use plan for Vienna is produced on the basis of the Mehrzweckkarte. Via the web service "Flächenwidmungs- und Bebauungsplan" of the city of Vienna (<http://service.wien.gv.at/flaechenwidmung/>) it is possible to inform oneself about the current land use and building regulations, current developing processes and those planning documents soon to be decreed.

5.2. City map address finder in wien.at

An important and very useful field of application for the Mehrzweckkarte is the digital city map with adress finder at the web service of the city of Vienna. For this purpose the Mehrzweckkarte in its highest level of resolution is provided as an orientation guide.

5.3. Digital central pipe cadaster

In the digital central pipe cadaster (<http://www.wien.gv.at/verkehr/strasse/zkl/index.htm>) all underground pipes, cable pipes and sewers are stored in a database. In this way the these objects can be displayed graphically and administered digitally all at the same time. It is possible to find and locate all underground pipes. The Mehrzweckkarte is functioning as the base for the digital central pipe cadaster. With the terrestrially surveyed contents of the public street areas it offers the required high accuracy.

5.4. Basis for other products

Furthermore the Mehrzweckkarte is the basis for many derived products like:

- "Flächen-Mehrzweckkarte" (<http://www.wien.gv.at/ma41/geodaten/fmzk/index.htm>)
- Threedimensional Building Model (<http://www.wien.gv.at/ma41/geodaten/bkm/index.htm>)

- Digital Terrain Model (<http://www.wien.gv.at/ma41/geodaten/dgm/index.htm>)
- Threedimensional City Model
(<http://www.wien.gv.at/ma41/geodaten/stadtmodell/index.htm>)

6. Summary

Today digital base data is an essential tool in all planning processes. The Mehrzweckkarte is an ideal tool for the Vienna City Administration, especially for urban planning tasks. For the entire area of Vienna it delivers threedimensional data of all significant objects on the terrain surface, and it is updated regularly. Besides the use as a basis for the zoning and land use plan and the city map address finder at wien.at, also the threedimensional city model of Vienna has its origin in the Mehrzweckkarte.