**TECHNICAL SPECIFICATIONS
FOR THE HARDWARE AND
SOFTWARE NEEDED FOR THE
DIGITAL MAP DATA
INPUT/STRUCTURING
REQUIREMENTS**

**MUNICIPALITY OF
BLAGOEVGRAD, BULGARIA**

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INTRODUCTION

The purpose of this document is to specify in detail the hardware and software requirements required to implement the digital data map input/structuring for the city of Blagoevgrad.

HARDWARE CONFIGURATION

In order to efficiently produce digital Cadaster maps and regulation plans of settlements, it is necessary to create several work stations.

For the purposes of this report, a work station is defined as a set of equipment including a computer of sufficient capacity, input and output peripherals, survey instruments, software, and well trained staff.

Digital map production, editing and updating map material, and information retrieval will be performed at three types of work stations.

Digital Map Production

This work station's tasks are to produce map material and to input text for the data base. Consequently, a computer, a 15" high resolution screen, a mouse, and a printer/plotter are required.

Proper operation of the work station assumes the use of one or more of the following peripheral devices:

! Survey instruments (total stations, electric distance meters and other conventional survey instruments for direct field observations). Data from these instruments can be entered directly into the computer by means of an electronic field log.

! Digitizers, scanners, pointing devices (mouse, pen, etc.), and other graphical input devices for entering geometry data.

Geographical data can also be entered through a text input from a keyboard or data exchange files set up in other applications.

Editing and Updating Map Material

Unlike the work station designed for the initial production of the digital map, this work station does not require a digitizer or a scanner.

Information Retrieval

This work station is more limited in its functions. It enables the production of various types of documents, both graphical and textual, such as map extracts, building permits, drawings, information, etc.

The main issue in selecting hardware is to strike a balance between computer capacity and cost. Presently, the Bulgarian market offers two options:

— Computers (work stations) based on RISC technologies
— PC (Pentium) technology

RISC software costs are ten to fifteen times higher than PC (Pentium) software. Analysis shows that along with the higher price, productivity doubles by using RISC technology. (Details of the analysis are not included in this report.)

SOFTWARE

The functions of the system can be grouped in the following way:

— Initial inputting of code tables and classifiers
— Initial inputting of digital data received from other computer systems in CAD format, including semantic and graphical control as well as elimination of errors
— Modifying data in the system
— Applications on request involving servicing of external users
— Applications involving creation of a resulting CAD file
— Archiving
— Recovery

Below the specific features of each function will be reviewed.

Initial Loading of Tables and Classifiers

Because they codify the major part of the information, tables and classifiers should be loaded into the system from the beginning. It should be checked if each subsequently introduced code is described in the corresponding table. (Here and further on the term "table" will be used as the general name both for tables, classifiers, and nomenclatures.)

All tables approved by a normative document should be used by the primary source in order to provide the option of future communications with external users. This will include the exchange of codified information (information with ID, and not with descriptions/ names). It should be determined for which tables the Municipality and Government are responsible. All tables whose contents are received externally should be inaccessible for writing. No data can be added without complying with whichever institution is responsible for updating them. This task should be completed by the administrator himself. Tables which are locally created and describe data about the area which the system covers, such as "Street and "Complex/Location", will be filled in by the operations crew.

Initial Input of Data from Digital Models in CAD Format, Including Semantic, Graphical Control and Error Elimination

CAD format is the Bulgarian standard for geographical information exchange. Resolution of this task is achieved through the following steps:

- **!** Data mutation from CAD files into command files in the software environment of the graphical database and of DBMS (database management system) by settlements

- **!** Data input from the graphics

- **!** After the elimination of the discrepancies:

  — Checking of the graphics—contour lines without identifiers, contour lines with more than one identifier (idle nodes, contour lines, etc.);
  — Procedure for elimination of the discrepancies, if there are open contour lines and missing identifiers;
  — Checking of the availability of data from the tables and input of the missing data for the tables for the corresponding cadastral object;
  — Formal checking and input of data about the subjects—names and addresses, and for the objects—land estates, buildings, parts of land estates and linear objects, which are not boundaries;
  — Formal checking and input of additional graphical layers for acquisition of attributes in the tables, if there are such existing (for instance boundaries of zones), creating of topology and acquisition of attributes; and
  — Creation of a layer with boundaries, set by acts, defining of the sections, defined by each act, for each section of boundary.

Modifying Data in the System

Sporadic modifications are changes, amendments and deletion of data made after the elaboration of the systems regarding a given property. Modifications of the system can be periodic and can concern a number of properties. The following cases are possible:

- ! A change of data regarding ownership, rights and limitations with no change in the graphics.

- ! Changing the graphics without a change of the owner, rights and limitations.

- ! Changing the graphics as well as data on ownership, rights and limitations.

- ! Modification can refer to a number of properties, as seen in the applied development project. In this case it is likely that the changes will concern both graphics and the attribute information. Described below are the requirements of the system in such a typical case, when the modification of the graphics and the attribute data for ownership, rights and limitations are necessary. The input information for the changes will usually be accepted as a file in CAD format, but it is also essential to create an option to input the data by keyboard.

- ! Modification of data which are not connected to the graphics is done in the attribute tables after the successful editing of the graphics and the compliance of the data between the Municipality System (MS) and Low Registration System (LRS). Obviously, compliance refers only to those properties registered in LRS. The procedure is quite complicated, as for example in the instance of land consolidation. In this case, n properties, registered in LRS, are planned and traced as m properties at the new circumstances ($n<=>m$). All properties which are objects of an organizational activity must be preliminarily described, data about the properties must be transferred to the historical layers, and the data must be inputted. This has been the accepted method of announcing and approving planning.

- ! The procedure becomes complicated due to the fact that based on current legislation some of the properties cannot be registered. No law yet exists to protect the procedure of initial registration. According to the existing law, if there are discrepancies in the number of properties of a given owner registered in LRS, the MS registers the actual and attribute information, and in the field for comments in LRS the identified properties are noted as invalid.

- ! The procedure described above should be accomplished in a simpler and more effective manner. The important thing is that all relevant information be

registered in the graphics and attribute tables. When changes are necessary only in the graphics or in the tables, only those activities should be performed.

Applications on Request Involving Servicing of External Users

Occasionally references to the graphical and attribute database for separate properties are requested. The data are not changed. All inquiries to the system are registered as services, and some users are permitted to access the system without limits. For these purposes there must be defined fields and layers in the system which can be accessed by external users. Information about the system and a price list must be made easily accessible in order to educate users.

Applications Involving Creation of a Resulting CAD File

Through this function users will be able to derive preliminarily defined information from several parts of the system. Users must be informed about available applications, including cost, by the system. Apart from traditional forms of presenting information as printed text and graphics, in the near future the system should be able to generate output files in more widely used graphical and textual formats.

As the program is initiated, an output of sections from the graphical and attribute information in CAD format should be created, including information which was received as a result of primary processing (lists created under conditions, graphical layers generated on the ground of the data from the attribute tables, etc.).

Archiving

This activity is the responsibility of the system administrator. As the program is designed it should include plans and funding for archiving.

Recovery

Recovery of the contents of the attribute and graphical data in the system is a process which can take place in two instances:

— Accidental or deliberate destruction of the system
— Recovery of past data in case of a law suit

The functional relationship between archiving and the recovery of data in the system is obvious. In the first situation, recovery is done on the base of data from the mirror disk. If no such possibility exists, the recovery of the system is possible to the state of the last saved record. In certain cases the recovery of data and graphics will be

necessary not for the entire base, but only for a certain group of properties or group of owners. This need should be addressed by the software program.

APPENDIX

RECOMMENDED SPECIFICATIONS FOR HARDWARE

PRODUCT: GIS NETWORK SERVER

Specifications by Component

Component	*Specification*
Processor	• Intel Pentium CPU equivalent, minimum of 166 MHZ speed • Automatic memory error checking and correction • ISA/PCI SCSI Bus Architecture
Memory	• 32 MB of RAM installed with expansion up to 128 MB • 512 KB Cache Memory • 2 GB SCSI Hard Disk Drive • 1.44 MB 3.5 inch Floppy Disk Drive • 8X speed internal CD-ROM Drive
Screen and Graphics	• SVGA 17 inch color monitor .28 dpi as minimum • 2 MB VRAM PCI SVGA
Keyboard and Mouse	• 101-104 keys Latin/Cyrillic Keyboard • 3 buttons Microsoft compatible Mouse
Backups and Restore	• 400/800 MB Quarter Inch Cartridge (QIC) Tape Drive
Networking & Communications	• 16 bit 3COM Ethernet Combo Card Controller • V34 protocol at 28.8 Kbps speed modem
Backup Power	• 600 VA Uninterruptible Power Supply (UPS) • UPS with 1 hour minimum period of power supply • UPS software driven and monitored (desirable) • UPS scheduled shutdowns and startups (desirable)

PRODUCT: GIS WORK-STATIONS

Specifications by Component

Component	*Specification*
Processor	• Intel Pentium CPU equivalent, minimum of 120 MHZ speed • ISA/PCI SCSI Bus Architecture
Memory	• 16 MB of RAM installed with expansion up to 32 MB • 256 KB Cache Memory • 840 MB SCSI Hard Disk Drive • 1.44 MB 3.5 inch Floppy Disk Drive
Screen and Graphics	• SVGA 14 inch color monitor .28 dpi as minimum • 1 MB Video RAM • Super VGA video adapter
Keyboard and Mouse	• 101-104 keys Latin/Cyrillic Keyboard • 3 buttons Microsoft compatible Mouse
Networking	• 16 bit 3COM Ethernet Combo Card Controller
Operating System	• DOS Operating System • Windows 95

PRODUCT: INK-JET PRINTER / PLOTTER A3 COLOR

Specifications by Component

Component	Specification
Black Resolution	• Best: 600x600 dpi • Normal: 600x600 dpi • Fast: 300x300 dpi
Black Print Speed	• Best: 1 page per minute • Normal: 2.5 pages per minute • Fast: 4 pages per minute
Color Resolution	• Plain/Premium paper: 300x300 dpi • Glossy paper/Transparency film: 600x300 dpi • DOS graphics: Full-page 75, 150, 300 dpi
Color Print Speed	• Best: 1 page per minute • Normal: 2 pages per minute • Fast: 4 pages per minute
Media Size	• A3 (297 x 420 millimeters) • A4 (210 x 297 millimeters)
Memory Buffer	• 512 KB built-in RAM • 32 KB receiver buffer
input/output Interface	• Centronics parallel • IEEE-1284 compliant
Operating Environment	• Temperature: 5C (41F) to 40C (104F) • Relative Humidity: 10 to 80 percent non-condensing
Software Compatibility	• DOS for 80286 and 80386 CPU • Windows 3.1 for 80386, 80486 and Pentium CPUs

PRODUCT: LASER PRINTER (EQUIVALENT TO HP LASERJET 6MP)

Quantity: One (1) unit

Specifications by Component

Component	Specification
Resolution	• 600x600 dpi • 120 levels of gray at 106 lines per inch
Typeface Capabilities	• 35 scalable fonts (Adobe type 1) built-in • Additional 75 scalable fonts (True type) for Windows
Paper Handling	• 250-sheet universal cassette • 100-sheet (or 10-envelope) multipurpose tray • 100-sheet face-down top output tray • 100-sheet face-up rear output tray
Media Type	• Plain paper and Envelopes • Transparencies • Card stock • Postcards and labels
Media Size	• A4 (210 x 297 millimeters) • Letter (8.5 x 11 inches) • Legal (8.5 x 14 inches) • Executive (7.25 x 10.5 inches) • DL (220 x 110 millimeters) • C5 (229 x 162 millimeters) • B5 (250 x 176 millimeters)
Print Speed / Throughput	• 6 pages per minute • 26-second first page out
Memory	• 3 MB standard, 3 unused SIMM slots • 50 MB maximum
input/output Interface	• Bi-directional, IEEE-1284 compliant parallel ports • IrDA-compliant wireless infrared port
Operating Environment	• Temperature: 5C (41F) to 40C (104F) • Relative Humidity: 10 to 80 percent non-condensing
Software Compatibility	• DOS for 80286 and 80386 CPU • Windows 3.1 for 80386, 80486 and Pentium CPUs

PRODUCT: SCANNER (EQUIVALENT TO HP SCANJET 4C)

Specifications by Component

Component	*Specification*
Scanner Type	• Flatbed, color and gray scale
Scanning Mechanism	• 1 pass
Resolution	• Enhanced: 2400 dpi • Optical: 600 dpi
Gray-scale	• 10-bit (1,024 gray-scale levels)
Color Recognition	• 30-bit (more then 1 billion colors)
Scanning Speed (scan time only; data transfer not included)	• Preview: 4 seconds • 300 dpi B/W, letter: 7.5 seconds • 300 dpi color, letter: 7.5 seconds
Scaling	• 3 - 400 percent in 1 percent increments at 600 dpi (scaling range depending on resolution)
File Formats (Windows)	• PCX, TIFF, TIFF compressed, EPSF, Windows 3.0 BMP, OS/2 BMP, EPS with screen
Maximum Document Sizes	• A4 (210 x 297 millimeters)
Interfaces	• PC: dedicated SCSI adapter

OTHER HARDWARE REQUIRED

!   Digitizer A0-A1

!   Geodesic Instruments - Total Station