Chapter 2
An Introduction to Soviet Military City Plans

The previous chapter concluded that state control, censorship and a desire for ever-increasing accuracy are three trends which have characterised Russia's cartographic history. Of the map series which have emerged from the Soviet era since the fall of the Iron Curtain, the extensive global series of topographic city plans perhaps exhibits these qualities most clearly. Not only does the city plan series exemplify Soviet consistency with the values of pre-revolutionary Russian cartography, its rigour, unprecedentedly extensive coverage and use of the most up-to-date technologies available also display a desire to firmly place the Soviet Union at the forefront of cartographic progress during the twentieth century. As the maps were produced and stored in total secrecy, the aim of this impressive cartographic project was not to provide a celebrated showpiece of Soviet innovation and achievement. Nevertheless, the amount of resources that would have been required to undertake the project (rather than, for example, simply relying on satellite imagery) suggests more than a passing importance to Soviet strategy. Initiated by a decree from Stalin in the mid-1940s and continuing throughout the existence of the Soviet Union, the city plan series represents the largest scale mapping undertaken by the Soviet Union which incorporated areas outside its own territory.

Compiling lists and catalogues from current public collections of Soviet city plans produces a list of 2445 maps of settlements around the world, although only 1899 of these can currently be verified—295 of which are plans of cities within the former Soviet Union. Verified plans are those which are listed by more than one source or those which have been seen during the undertaking of this study. Military city plans were produced by the Military Topographic Directorate (VTU) of the General Staff and many carry the label 'General Staff' above the plan title. A parallel civil series of city plans was produced for cities within the USSR only. These were compiled by the Main Administration of Geodesy and Cartography (GUGK) and do not carry the 'General Staff' label. The differences between the military and civil series are outlined later, in Sect. 2.6, although the military plans are the main focus of this chapter. However, given the similarity of the series and the fact that many records and catalogues do not distinguish them, both are included in the enumerations below.

M. Davis, *A Cartographic Analysis of Soviet Military City Plans*, Springer Theses,
https://doi.org/10.1007/978-3-030-84017-4_2

Table 2.1 Summary of verified Soviet military city plans by scale and number of sheets

	1:5,000	1:10,000	1:15,000	1:20,000	1:25,000	Unknown scale	Total
1 sheet	1	961	24	–	199	–	1185
2 sheets	–	390	2	–	87	–	479
3 sheets	–	12	–	–	1	–	13
4 sheets	–	137	–	1	30	–	168
6 sheets	–	34	1	–	2	–	37
7 sheets	–	–	–	–	1	–	1
8 sheets	–	–	–	–	2	–	2
9 sheets	–	3	–	–	–	–	3
12 sheets	–	–	–	–	1	–	1
Unknown number of sheets	–	8	–	–	1	1	10
Total	1	1545	27	1	324	1	**1899**

Given the tactical scale of city plans, both General Staff and GUGK plans were classified 'secret' and carry the label *sekretno* in the top-right corner.

Whereas Soviet topographic sheets adhere to IMW sheet lines and use a Ginzburg projection, city plans are centred on towns or cities, regardless of their location on the IMW grid, and use a Gauss-Krüger projection. The earliest known city plans are of a trio of Iranian cities from 1944—Sari, Semnan and Shahrud. During 1991, the year in which the USSR was dissolved, 32 verified plans were produced. The most common scale used in the series is 1:10,000 (1545 plans), followed by 1:25,000 (324 plans). A few other scales are used rarely, including 27 plans at 1:15,000, a 1:20,000 plan of Tokyo (Japan) produced in 1966, and a 1:5,000 plan of Milford Haven (UK) produced in 1950. The practice of using of scales other than 1:10,000 and 1:25,000 stopped in the late 1960s and the exclusive production of plans at these two scales became mandatory during the 1970s ([6]: article 3). Although over 1000 city plans comprise a single sheet, many span multiple sheets, the largest being a 12-sheet, 1:25,000 plan of Los Angeles, USA (1976). Table 2.1 shows a summary of verified plans by scale and number of sheets (see also Figs. 2.1 and 2.2).

2.1 Coverage, Rationale and Basic Characteristics

City plans were produced of cities and towns around the world with the aim of facilitating orientation, accurate measurement and detailed studies of urban areas and their surroundings ([6]: article 1). A more recent manual ([12]: 49) adds 'calculations in the organization and conduct of combat' to the purpose of city plans. The underlying *raison d'etre* of the series has been the subject of speculation, although the 1978 production manual for the plans states that these purposes are pertinent to both 'the

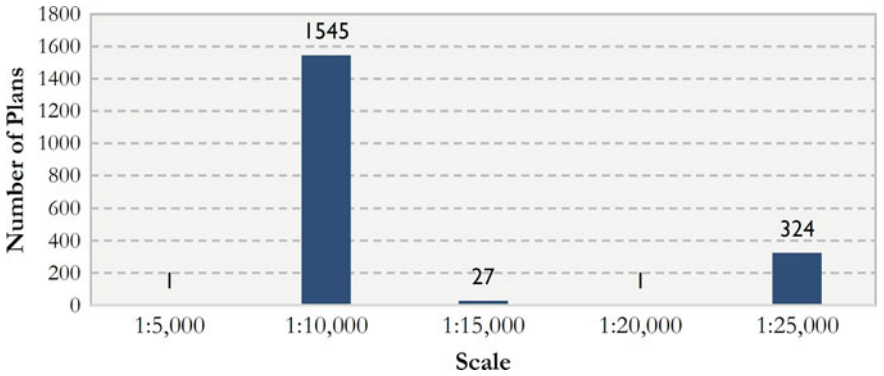

Fig. 2.1 Numbers of verified Soviet military city plans by scale

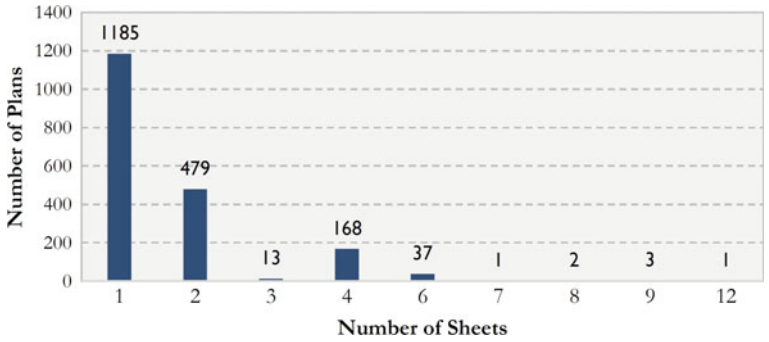

Fig. 2.2 Numbers of verified Soviet military city plans by number of sheets

people's economy and defence' ([6]: article 1). Kent and Davies [8] highlight the perceived threat of mutually-assured destruction (MAD) from nuclear weapons that existed throughout long periods of the Cold War but note that detailed topographic data of a city would be of little use after such an attack. Kent and Davies also highlight the possibility of a Soviet '*blitzkrieg*-style' invasion of Western Europe with the intention of overpowering NATO defences in order to dissuade the USA from using nuclear weapons. It is clear from the plans, however, that strategic sites are not the main focus of this detailed series, which instead focusses on settlements, rather than airfields, barracks and other sensitive sites located outside of urban areas. In light of this, Kent and Davies [8] suggest that perhaps the most feasible motive for the production of this comprehensive series was possible civil administration after successful coups or socialist revolutions in different parts of the world [4].

This notion certainly ties in with the breadth of coverage of the city plan series, as well as the concentration of mapped cities in more developed countries—a prerequisite for a socialist revolution as identified by Karl Marx and Friedrich Engels in *The*

Communist Manifesto [10]. *The Communist Manifesto* makes clear that socialist revolutions should take place in advanced economies where the proletariat would be able to participate in its entirety. Once this economic premise is satisfied, the foremost goal of Marxist communism is the abolition of private property and land ownership. As the product of collective labour and production, Marx believed that capital itself should be collectively owned. Naturally, this collectivisation of property and other capital together with the ensuing centralisation of administration would require some form of geographic data, to which the city plan series may have contributed. This possible rationale may also explain the reference to the 'national' or 'people's' economy in the plans' production manual. Nevertheless, the use of a conformal Gauss-Krüger projection (allowing accurate artillery targeting) and the common practice of highlighting strategically important sites within cities suggests that military applications of the plans were not entirely overlooked.

On the basis of current political boundaries, the city plan series incorporates settlements in 136 countries, with notable concentrations in Europe, North America and the Far East (Fig. 2.3). While many of the world's largest cities are included, such as Shanghai (China), Tokyo (Japan), London (UK), New York (USA), Paris (France), Istanbul (Turkey) and Cairo (Egypt), there are several large cities of which no Soviet plan is currently known to exist, such as Rio de Janeiro (Brazil), Bogotá (Colombia), Melbourne (Australia) and Lagos (Nigeria). Concurrently, some remarkably small settlements have not been overlooked, presumably because of their local administrative importance, military utility, function as a transport hub or proximity to international borders. Examples of such towns are Hamilton (Bermuda), Demblin (Poland) and Vardø (Norway), which together have a population of approximately

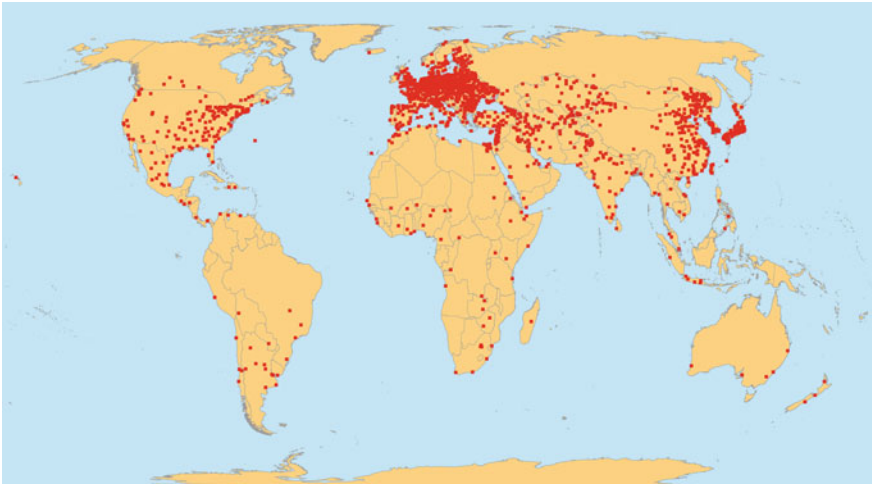

Fig. 2.3 Modern political map of the world showing cities known to be mapped under the Soviet city plan series outside Russia

6,000. Although some cities were mapped more than once, duplication of cities is relatively rare across the series.

The cartographers tasked with producing this vast map series were given several basic requirements which each plan needed to fulfil. Firstly, the plans should 'reliably and accurately' portray the location, condition, outline and character of structures in and around cities, while facilitating the 'rapid detection' of important or prominent landmarks and major roads ([6]: article 2). Potential military applications are alluded in the requirement of the plans to be 'clear and legible' in the interests of 'dependable orientation' and the provision of 'accurate targeting information' (ibid.). Unlike the distorted maps made available to the Soviet public [11], geodetic precision was of prime importance in the city plan series providing 'the possibility of rapid determination of rectangular and geographic coordinates and the absolute and relative heights of points' ([6]: article 2). Both qualitative and quantitative characteristics of objects were also to be included (ibid.). Although the series is a standalone entity from other Soviet map series, city plans were required to be consistent in terms of content with both topographic maps and marine charts 'of the next smallest scale' (ibid.). Flexibility of use was also a priority, with the plans expected to be produced with enough empty space to allow the addition of extra information at a later stage (ibid.).

2.1.1 Production Trends

Although the earliest known Soviet military city plans date from 1944, production remained fairly limited for the 25 years that followed. By 1969—more than half way through the duration of the project—fewer than 200 plans are known to have been produced; a mere eight per cent of the total. Figure 2.4 shows a clear surge in production from 1970 onwards, with the number of known plans issued growing significantly during almost every year of the 1970s. The number of known plans from 1970–1973 alone exceeds that of the previous three decades. By the end of the 1970s, 150–170 known plans were being issued annually; representing the zenith of the programme. Throughout the 1980s, production remained well above pre-1970 levels but began to wane—a trend that would not be reversed. By 1988, production receded to its lowest level since 1971. Of course, these figures only represent the city plans which have emerged since the dissolution of the Soviet Union in 1991; and the existence of many of these have yet to be verified beyond tenuous records. It therefore remains unknown to what extent these trends are representative of total production within the series.

Nevertheless, it seems more than coincidence that such a difference is visible before and after 1970; a trend almost certainly instigated by the launch of Zenit-4MT, the USSR's first photogrammetric imaging satellite, on 27th December 1971 [3]. The growth of the project at this time is also reflected in the geographical spread of its coverage. Although Europe and Asia were mapped from the inception of the project, consistent with the early coverage of the Soviet topographic series, city

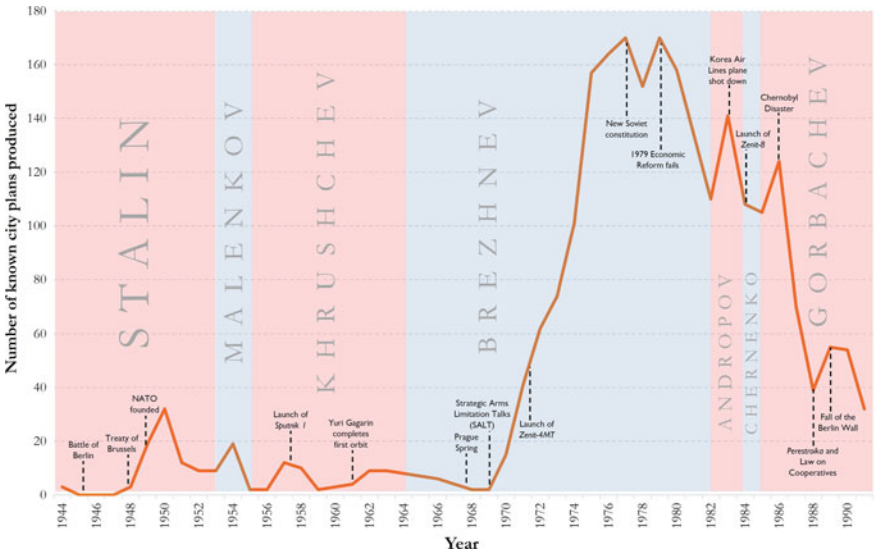

Fig. 2.4 Timeline of the production of known Soviet city plans (verified and unverified)

plans of only two North American cities and two African cities are known which date from before 1970—and no such plans are known to exist of South American or Australasian cities. The mapping of the Soviet Union's own territory at 1:100,000 was completed in 1954, perhaps freeing some capacity in military topographic factories across the country. Notwithstanding these points, without the availability of definitive production inventories such matters remain in the realms of speculation. Zenit-4MT flew over 20 missions before it was decommissioned in 1982 to be replaced by Zenit-8 (1984–1994) (ibid.).

2.2 Plan Content, Components and Layout

Given that the vast majority of Soviet city plans were produced after 1972, and the only available compilation manual for city plans is the edition of 1978, the main focus of this section is plans of the 1970s and later. However, reference is made to earlier practices where these deviate significantly. Soviet military city plans were required to include eight major elements of content, namely mathematical elements (including grids and margins), geodetic points, streets, structures, hydrography, relief, vegetation and boundaries ([6]: article 7). In addition, all city plans were required to include geographic names and annotations providing both qualitative and quantitative characteristics of objects ([6]: article 8). The content of a particular city plan depends partly on the number of colours used to print it. Although some early plans are printed in six colours, from the early 1970s, plans were required to be printed in either eight

or ten colours. Plans printed in ten colours were required to distinguish important buildings and structures by colour coding them ([6]: article 7) (see Fig. 2.6). The scope of the content and symbology used in the city plan series is very similar to that of Soviet topographic series at the same scales. Consequently, the conventional signs of city plans are drawn from a threefold combination of those for 1:25,000 topographic maps, 1:10,000 topographic maps and a small supplement, appended to the city plan compilation manual ([6]: article 11). Nevertheless, the regulations did permit the creation of additional conventional signs if no existing symbols were suitable, on the condition that these were explained in the margins of the plan in the form of a legend. However, in most cases, the legend is used to describe between three and six of the most common symbols on the plan (Fig. 2.5).

As well as the entire urban area, city plans include a buffer zone of at least 1.5–2 km around the city. This band is larger if important landmarks, commanding heights, communication nodes or industrial facilities are located outside of the area immediately adjacent to the city ([6]: article 3). In order to accommodate this need for flexibility, city plans have no standard sheet size. Instead, city plans have a maximum sheet size of 88 × 125 cm, including marginalia (ibid.). If a plan of a particular city at the chosen scale would exceed these dimensions, a multi-sheet plan was produced. Plans are presented in either portrait or landscape orientation, depending on the morphology of the city.

Sheets in a multi-sheet plan do not overlap but are instead arranged in a grid layout and assigned sheet numbers. This can lead to some unfortunate placement of sheet boundaries, which sometimes divide city centres across two or even four sheets [4]. The sheet arrangement and the location of a particular sheet within this framework is indicated by a diagram in the margins of each sheet (see Fig. 2.7).

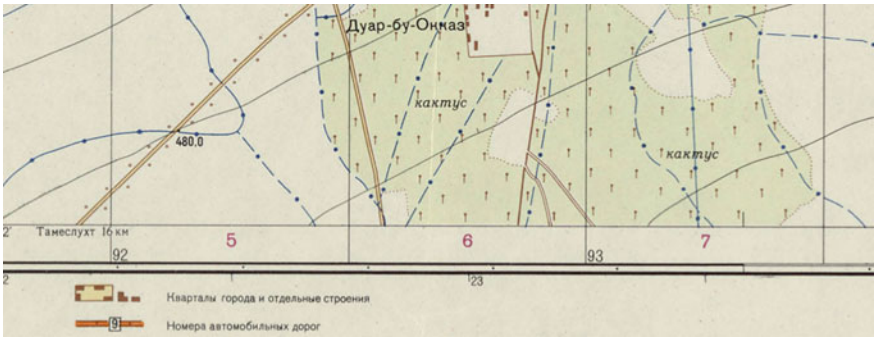

Fig. 2.5 Part of the legend on the Soviet plan of Marrakesh, Morocco (1973, 1:10,000) showing urban blocks and individual buildings (top) and a highway number symbol (bottom) (ICGC, RM.165430)

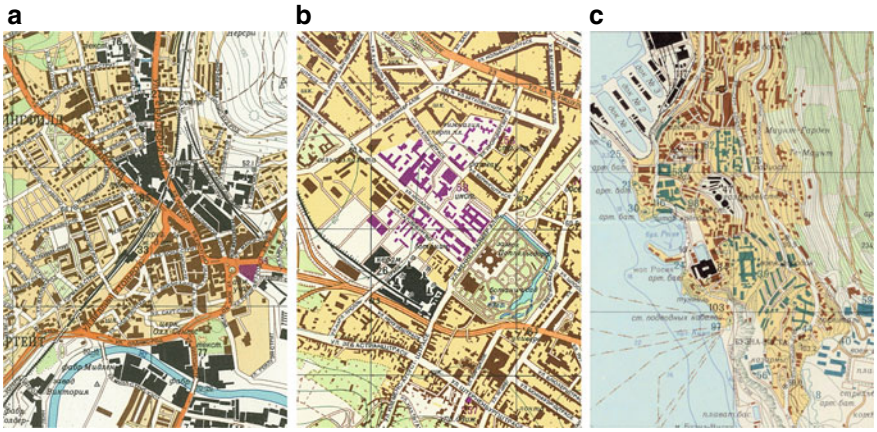

Fig. 2.6 **a** Military-Industrial buildings (black) in the centre of Dewsbury, UK (1983, 1:10,000) (private collection). **b** Administrative/Government buildings (purple) in the centre of Bonn, West Germany (1987, 1:10,000) (private collection). **c** Military/Communications installations (green) in Gibraltar (1974, 1:10,000) (ICGC, RM.165479)

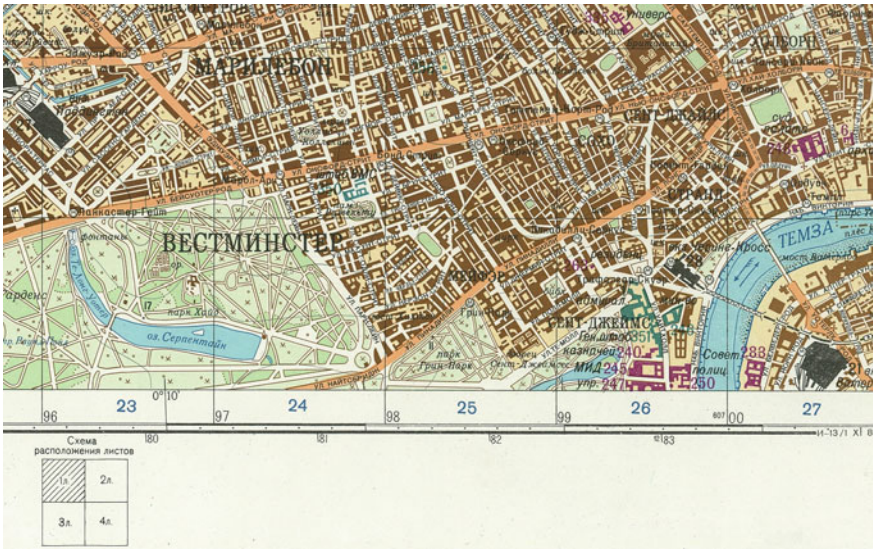

Fig. 2.7 An extract from sheet 1 of the Soviet plan of London, UK (1985, 1:25,000) showing the sheet arrangement diagram in the margin. To the right, the edge of the sheet runs through government buildings in Westminster (private collection)

2.2.1 Title Blocks

The most noticeable element of marginalia is the title of the city plan, which is stated in a bold, serif typeface at the top of the plan. Consistent with all toponyms on the plans themselves, plan titles are phonetically transliterated into the Cyrillic alphabet. Generally, this is a straightforward process, although some names lend themselves to the Cyrillic alphabet better than others (see Table 2.2 for examples). On each plan, the title is located in such a place that it would be at the top-centre of a plan if all of the sheets were to be laid out in their correct relative positions, as indicated by the sheet layout diagram. This is straightforward on single-sheet plans, on which the title appears at the top-centre of the sheet (see Fig. 2.8). On plans with two laterally-arranged sheets (or with two sheets in the top row of the sheet layout diagram), the

Table 2.2 Examples of transliterated toponyms used as titles for Soviet city plans

Cyrillic title	Approximate pronunciation	English toponym, Country
Хаддерсфилд	Khaddersfild	Huddersfield, UK
Гаага	Gaaga	The Hague, the Netherlands
Тегеран	Tegeran	Tehran, Iran
Глостер	Gloster	Gloucester, UK
Суэц	Sooets	Suez, Egypt
Лакхнау	Lakkhnaoo	Lucknow, India
Бадахос	Badakhos	Badajoz, Spain
Танжер	Tanzher	Tangiers, Morocco
Кале	Kalye	Calais, France

Accurate phonetics are prioritised over accurate spellings, although the Cyrillic alphabet does not always facilitate this

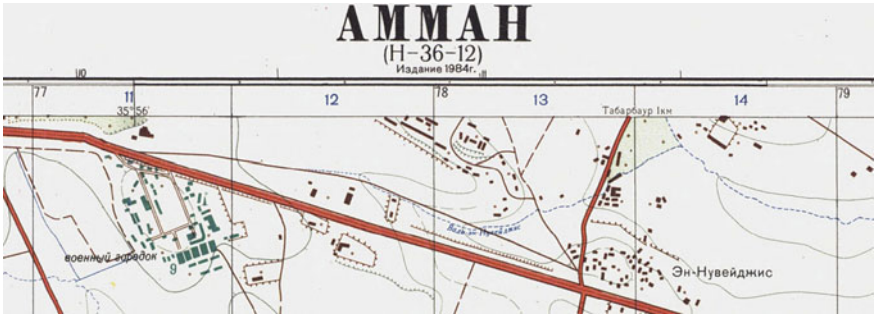

Fig. 2.8 Title block from the single-sheet Soviet plan of Amman, Jordan (1984, 1:10,000). The entire title is given in a bold typeface at the top-centre of the sheet (National Library of Australia, nla.obj-234528465)

first (left) sheet shows the title in the top-right corner of the plan, with the first part of the city name in bold, and the remainder in a much finer typeface at two-thirds of the height of the former.

The second sheet of a plan does the reverse, with the title appearing in the top-left corner of the plan; the first part in a fine typeface and the second in a bold typeface. Any subsequent sheets have a centralised title, sometimes with the sheet number (e.g. Лист 3 to denote sheet 3), using the finer typeface for all lettering (see Fig. 2.9). Sometimes, the title on subsequent sheets instead appears in one of the side or bottom margins. On plans with three laterally-arranged sheets (or with three sheets in the top row of the sheet layout diagram), the main title block will appear in the centre of sheet 2 (the central sheet at the top of the plan). Many military city plans include a widely-spaced label reading 'General Staff' above the title (see Figs. 2.10 and 2.11). This label, however, does not appear on all plans, notably civil plans produced by GUGK. Until the early 1970s, city plan titles were preceded by the term План г. (an abbreviation of *Plan gorod* or city plan) (see Fig. 2.11). Under each title, the nomenclature of the Soviet 1:100,000 topographic sheet(s) which cover the area of the plan is stated ([6]: Appendix 4). Soviet topographic maps use the IMW nomenclature system (retaining the Roman lettering), which covers the whole world. This means that such a reference can be given on all plans, even in areas where a Soviet 1:100,000 sheet had not been produced at the time the plan was issued. The exception to this is early plans from the 1940s and 1950s, before the global 1:100,000 programme had become established.

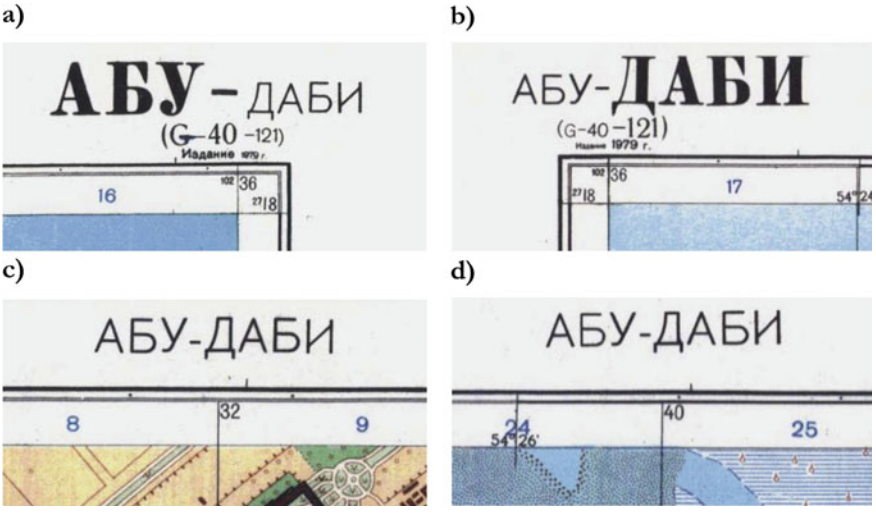

Fig. 2.9 Title blocks from the 4-sheet Soviet plan of Abu Dhabi, UAE (1979, 1:10,000) in the correct relative layout. **a** Top-right corner of sheet 1. **b** Top-left corner of sheet 2. **c** Top-centre of sheet 3. **d** Top-centre of sheet 4 (National Library of Australia, nla.obj-234555319)

Fig. 2.10 Title block from the Soviet plan of Lucknow, India (1986, 1:25,000), including the General Staff label (National Library of Australia, nla.obj-234559035)

Fig. 2.11 Title at the top-centre of sheet 2 of the 6-sheet Soviet plan of Budapest, Hungary (1962, 1:15,000), reading *Plan g. Budapesht* [plan of the city of Budapest] (ICGC, RM.165448)

2.2.2 The Spravka

For each city plan, a 1000–2000-word *spravka*, or reference text, is compiled with the purpose of '[complementing] the plan with information not receiving graphical representation' ([6]: article 49). The *spravka* gives a descriptive overview of the terrain in and around the city as well as an outline of notable features in the area covered by the plan, including but not limited to the major industrial sites, railway stations, sea and river ports, airports, power stations and dams. Important sites outside the area of the sheet can also be described, as long as the direction and distance of the feature from the centre of the city is stated (ibid.). The *spravka* is most frequently included outside of the plan margins or on the plan itself inside a white box, typically on the final sheet across an area of little importance (see Fig. 2.12). Occasionally, the *spravka* appears on a separate sheet and, in exceptional cases, in a separate booklet ([6]: article 9).

The content and format of *spravka* texts follows a predefined framework, ensuring that the *spravka* on each plan gives similar information with comparable levels of

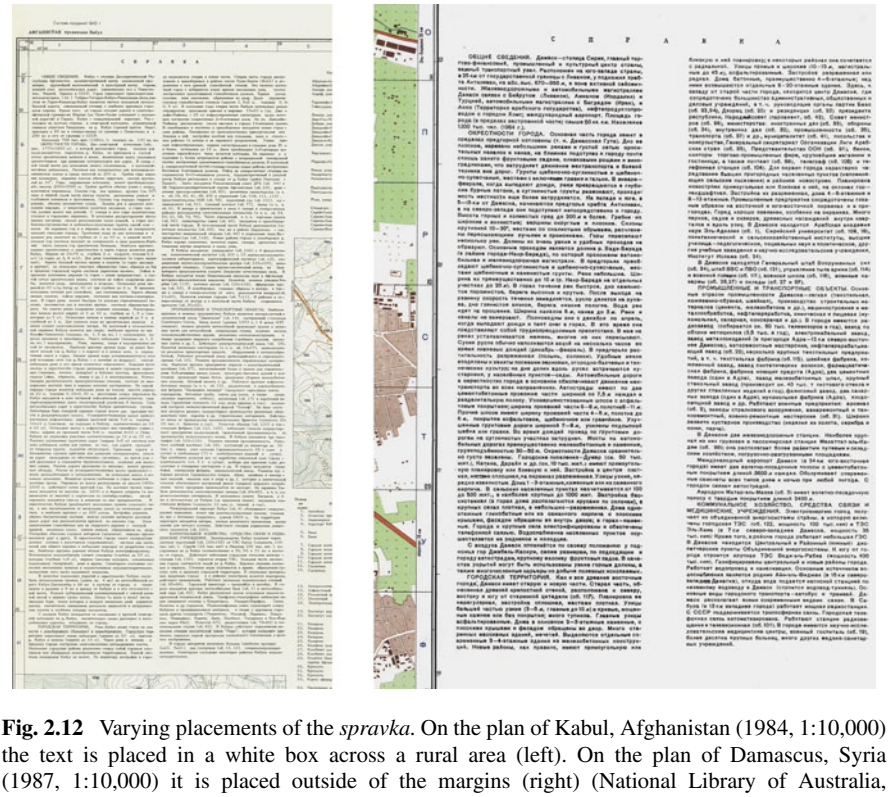

Fig. 2.12 Varying placements of the *spravka*. On the plan of Kabul, Afghanistan (1984, 1:10,000) the text is placed in a white box across a rural area (left). On the plan of Damascus, Syria (1987, 1:10,000) it is placed outside of the margins (right) (National Library of Australia, nla.obj-234130751 and nla.obj-234529475)

detail ([6]: Appendix 1). This framework is set out in Table 2.3. When a specific site or object is first mentioned in the *spravka*, the number of this object in the list of important objects (see Sect. 2.2.3) is placed in brackets after its name.

A variety of sources were used to compile the *spravka* on each plan, including existing large-scale topographic maps of the area, physical, economic and military descriptions of the city, any texts regarding local hydrography, climate or transport, local newspapers, atlases or any other specialist maps and aerial photographs (showing a plan or oblique view) ([6]: article 49). Information from all of these source materials was assessed for its accuracy and current relevance before being included in a *spravka* (ibid.). In order that the whole of the relevant area can be referred to in the *spravka*, the writing of the text took place after master copy of the plan itself had been completed.

Table 2.3 The typical organisation of content in a *spravka* reference text, which accompanies each city plan (translated and adapted from the compilation manual for city plans [6])

	Organisation of content
Paragraph 1 Overview	• Political, economic and cultural importance of the city • Number of railways, major roads and pipelines which enter the city (most important examples are named) • Presence of sea or river ports and access to navigable waterways • Presence of airports • Geographical location relative to boundaries, notable physical features, large administrative/economic centres and sources of raw materials • Population (separate figures for the suburbs and city proper, if available, and the year in which these data were collected) • Area of the metropolitan area
Paragraph 2 The Surroundings of the City	• General summary of topography, soils, hydrology and water bodies (including crossings), vegetation, climatic conditions, seismic activity and the duration of the polar day and night (for cities within the arctic circle) • Influence of terrain and climate on the movement of transport and the range of visibility in different parts of the city • Characteristics of roads (classifications, surfaces etc.) • Characteristics of surrounding settlements (towns, villages etc.) • Characteristics of beaches, coastal zones and tides (for coastal cities) • Guidance on approaching and recognising the city from the air • Presence and characteristics of underground shelters (mines, caves, tunnels etc.)
Paragraph 3 The Urban Area	• The nature of the terrain within the city • The nature of planning and construction within the city, with a particular focus on administrative, industrial and business districts • Characteristics of streets • Typical construction materials and number of storeys in buildings (including reference to basements which can be used as shelters) • Characteristics of green spaces in the city • Important educational and research institutions

(continued)

Table 2.3 (continued)

	Organisation of content
Paragraph 4 Industry and Transport	• Main industries in the city and the types of products produced there • Summary of secondary industries • The most important companies • Presence of warehouses and storage facilities • Major railway stations (passenger, freight, postal etc.) and the nature of the station buildings • Number of railway tracks and the presence of loading areas, workshops, depots and warehouses • Sea or river ports—their purpose, turnover of goods, traffic and water area. Types and numbers of mooring facilities and the length of the mooring line, depths of docks, loading facilities, and the presence of warehouses, cold storage, oil storage, access railways, pipelines and ship repair facilities • Airports—the number of runways and their surfaces, navigation and lighting facilities and the presence of hangars, workshops, warehouses and weather stations • Pipelines—types, numbers, performance characteristics and the presence of pumping stations
Paragraph 5 Utilities, Communications and Medical Facilities	• Sources of the city's electricity • Sources of the city's gas supplies • Water systems and sources, including the sewerage network • Main types of urban transport (e.g. metro systems—lengths of lines and typical depth of stations) • Information about telephone lines and radio and television broadcasting stations • Medical facilities—clinics, hospitals, sanatoriums and rest homes

2.2.3 Lists of Important Objects

Many city plans assign a number to important buildings or structures within the territory of the city. This number refers to a numbered list of important objects which can be placed inside or outside of the margins of the plan or on a separate sheet or booklet, alongside the *spravka*. Lists are compiled in alphabetical order by type of feature (e.g. aerodrome, factory, power station and so on) with this category repeated at the start of each relevant entry. Within each category, entries are listed by alphabetical order of the name of the relevant company or organisation. Next to each item in the list, the relevant grid reference is included (Fig. 2.13). This grid reference can refer to an inset, if the object is outside of the main area of the plan

([6]: article 50). Groups of similar buildings which form part of the same site (e.g. multiple buildings which make up a factory) can be grouped under one number on the list. This rule is not adhered to if a particular part of a site is of more importance than the rest, in which case it is listed separately (ibid.). If large numbers of objects make up each category (typically in larger cities), these categories are listed as subtitles and the individual objects are then listed in alphabetical order by company name under each subtitle (ibid.). Names are never abbreviated or given in quotation marks (ibid.).

After the practice of colour-coding buildings was introduced in the early 1970s (facilitated by printing plans in ten colours), the numbering and listing of important buildings became reserved for plans which made this distinction ([6]: article 9). Building numbers and lists of important objects are not provided on GUGK plans of cities within the Soviet Union, which continued to be printed in eight colours. It could be speculated that this level of detail in domestic cities was reserved for a higher level of classification (*sovershenno sekretno*, or top secret). No maps with this classification have emerged since the dissolution of the Soviet Union, although its existence has been noted by some authors [7].

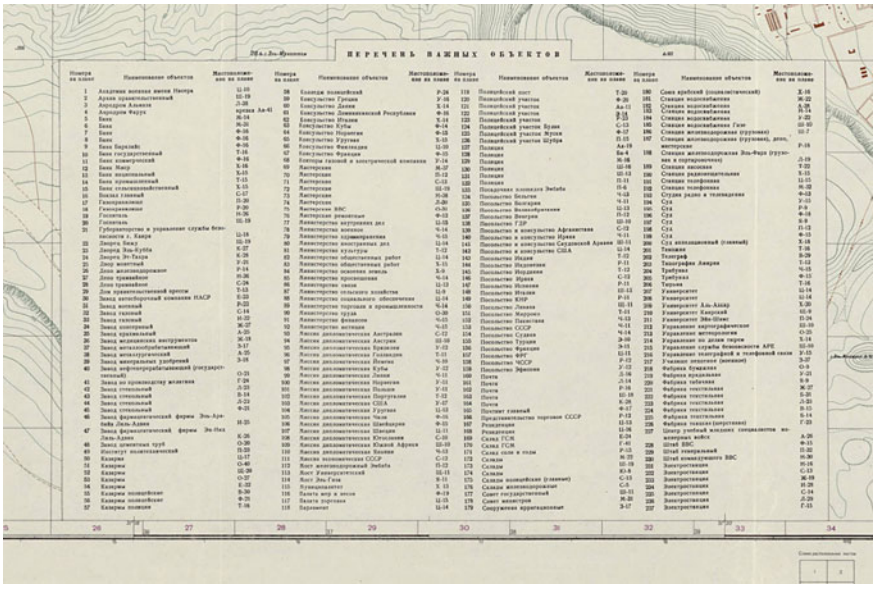

Fig. 2.13 Example of a list of important objects from the Soviet plan of Cairo, Egypt (1972, 1:10,000) (ICGC, RM.165391)

2.2.4 Lists of Street Names

On each plan, a list of street names is provided, including all streets which are labelled on the plan, regardless of their size. A general list is compiled for the whole plan, regardless of the number of sheets that it has ([6]: article 52). As on the list of important objects, a grid reference is provided for each street. If a street straddles two grid squares, the square in which the majority of the street name label is located is listed. For long streets which transcend several grid squares, two grid references are given—one for each end of the street (ibid.). The inclusion of grid references in the list allows for the differentiation of streets with the same name in different parts of a city. The list is compiled in alphabetical order and, unlike the list of important objects, no categorisations or subheadings are used. A small gap is included between the streets belonging to each letter of the alphabet and the first letter of the first street name for each letter is shown in a bold typeface (ibid.). In cities where Cyrillic is not the native alphabet, the transliterated street names are listed in Cyrillic alphabetical order, not the order in which the streets would be listed in the native alphabet (Fig. 2.14).

Street names which start with an ordinal number are listed separately after the alphabetical list. It was common practice in the Soviet Union to name streets after dates of significant historical events and, elsewhere, some cities with grid layouts (e.g. New York) use numbered street systems rather than proper nouns. If street names consist of an ordinal number followed by a name (e.g. 20th October Street), these streets are listed in alphabetical order according to the name. If, however, street names consist of an ordinal number followed by a common street designation (e.g. 51st Avenue), these are listed in numerical order (ibid.).

2.2.5 Schematic Metro Diagrams

A schematic diagram of metro lines around the city is included on some plans (Fig. 2.15). These diagrams show both current and proposed lines, stations (marked by a circle), transfer stations (marked by a larger circle) and railway depots. For context, main roads are also included and labelled, along with water courses and other major landmarks in the city. There is no fixed scale for metro diagrams. Instead, a scale is selected based on the extent of the metro system and the amount of available space on the plan ([6]: article 50). Metro lines and related labels are marked in black, distinguishable from roads and their labels which are marked with a brown outline. Proposed metro lines are indicated by a dashed, black line ([6]: Appendix 9). Hydrographic labels and outlines of water bodies are marked in dark blue, with a paler blue fill used for areas of water. The extent of the built up area is shown in pale yellow or brown ([6]: article 50). A basic legend is included with the diagram. Plans only include a single metro diagram, not one per sheet. If there is not sufficient space for the metro diagram on a sheet of the plan, it can be included in a separate booklet. In these cases, the diagram is printed entirely in black (ibid.).

ПЕРЕЧЕНЬ НАЗВАНИЙ УЛИЦ

Наименование улицы	Местоположение на плане
Аньдинмыньвайдацзе, улица	И, К–23
Аньдинмыньдундацзе, улица	К–24
Аньдинмыньэйдацзе, улица	Л–23
Аньдинмыньсидацзе, улица	К–22, 23
Аньдэлибэйцзе, улица	К–22
Аньдэлу, улица	К–21, 23
Аньлэлиньлу, улица	Ф–23, 24
Аньмынсидацзе, улица	М–21
Аньмыняньхутун, улица	О–24, 25
Аньюаньхутун, улица	П–19
Бадажэньхутун, улица	О–25
Байваньчжуандацзе, улица	Т–19
Байваньчжуансилу, улица	Н–16, 17
Байгуанлу, улица	Т–19
Байтасыдунцзе, улица	М, Н–20
Байцзываньлу, улица	Р–31
Байцзячжуанлу, улица	Н–27, 28
Байчжифандунцзе, улица	Т–20
Байчжифансицзе, улица	Т–19
Байшицяолу, улица	И; Л–16
Байюньлу, улица	П, Р–18
Баличжуанлу, улица	Н–13
Баофанхутун, улица	О–24
Баоцзыхутун, улица	Н–20
Баоцзяцзе, улица	П–20
Батяохутун, улица	М–24
Бэйвэйлу, улица	Т–22
Бэйгуйцуньлу, улица	М, Н–14
Бэйлишилу, улица	Л–18; Н–19
Бэйлогусян, улица	Л–23
Бэйсиньхуацзе, улица	П, Р–21
Бэйсиньцзан, улица	М–25
Бэйфыньволу, улица	Р–16
Бэйхуандунлу, улица	З–21, 24
Бэйхуаньсилу, улица	З–16, 19
Бэйчанцзе, улица	О–22
Бэйчицзыдацзе, улица	О–23
Бэйюаньлу, улица	Б–24
Вайцзяобуцзе, улица	О–24, 25
Вандажэньхутун, улица	Л–24, 25
Ванфудацзе, улица	Н–23
Ванфуцзиндацзе, улица	О–23
Ваньшоулу, улица	О, Р–14
Вэйгунцуньлу, улица	К–15
Вэньцзаньцзе, улица	Н–21, 22
Ганьюйхутун, улица	О–24
Гаолянцяолу, улица	К –17, Л–18
Гуанхуалу, улица	О–26, 27, 28, 29
Гуанцюйлу, улица	С–29, 32
Гуанцюймыньвайдацзе, улица,	С–26, 27
Гуанцюймыньэйдацзе, улица	С–25
Гуанъаньбэйбиньхэлу, улица	Р, С–18
Гуанъаньлу, улица	С–16, Т–15
Гуанъаньмыньвайдацзе, улица	С–17
Гуанъаньмыньнаньбиньхэлу, улица	С, Т–18
Гуанъаньмыньэйдацзе, улица	С–19, 20
Гулоудундацзе, улица	Л–23
Гулоусидацзе, улица	Л–21
Гунжэньтиюйчанбэйлу, улица	М–27
Гунжэньтиюйчандунлу, улица	Н–27
Гунжэньтиюйчанлу, улица	Н–26
Гэсиньлу, улица	Ф–22
Дамочан, улица	Р–23, 24
Дасытяо, улица	Л–20
Дафосысидацзе, улица	М, Н–23
Дахуммыньлу, улица	Х, Ц–23
Дацитяохутун, улица	Л–20
Дашицяо, улица	Л–22
Даянфанлу, дорога	Ф–28
Дианьмыньвайдацзе, улица	М–22

Наименование улицы	Местоположение на плане
Сисыбэйдацзе, улица	Н–20
Сисыпаньдацзе, улица	О–20
Ситяоэрхутун, улица	Л–21, 22
Сихуанчэнгэньбэйцзе, улица	Н–21
Сихуанчэнгэньнаньцзе, улица	О–21
Сицзунбухутун, улица	П–24, 25
Сицуйлу, улица	П, Р–13
Сичанъаньцзе, улица	П–21
Сичжаосыцзе, улица	С–26
Сичжимыньвайдацзе, улица	М–17
Сичжимыньэйдацзе, улица	Л–19, 20
Сишикудацзе, улица	Н–21
Сунцзячжуанлу, улица	Х–25
Сюаньумыньвайдацзе, улица	Р, С–20
Сюаньумыньэйдацзе, улица	П, Р–20
Сюаньумыньсидацзе, улица	С–19, 20
Сюбоутинхутун, улица	Н–19
Сюэюаньлу, улица	Д, З–19
Сюэюаньнаньлу, улица	И–17, 19
Сюэюаньхутун, улица	П–19
Сянмыньхутун, улица	М–23, 24
Сяншаньлу, улица	Г–10
Сяншикоулу, улица	Л–10, 11
Сяньюйкоу, улица	Р –23
Сяотуньлу, дорога	Т–10
Сяошидацзе, улица	С–23, 24
Сяоябаохутун, улица	О–25
Тайисыцзе, улица	П–21
Тайпинлу, улица	Р–11, 13
Тайпинцзе, улица	Т–21
Тайпинцяодацзе, улица	Н, О, П–19
Тайцзичандацзе, улица	П, Р–23
Таожаньтинлу, улица	Т–21
Тешусецзе, улица	С–21, 22
Тиюйгуаньлу, улица	Т–25
Тоутяохутун, улица	Л–23, 24
Тухуаньюйлу, улица	Ф–24
Тяньаньлу, улица	С–23
Тяньаньмынь, площадь	П–22
Тяньтаньдунлу, улица	Т, У–24
Тяньтаньлу, улица	Т–23, 24
Тяньцуньлу, улица	Н–9, 10, 11
Уваитяохутун, улица	Н–20
Удаоин, улица	Л–24
Удинхоухутун, улица	О–19, 20
Укэсунлу, улица	М, Н, О, П–12
Уляндажэньхутун, улица	О–24
Усыдацзе, улица	Н–23
Утяохутун, улица	Н–24
Уцзяцуньлу, улица	С–9
Уцуньлу, улица	Е, Ж–10
Уэрхутун, улица	Л–22
Фандисилу, улица,	Р–21, 22, 23
Фанцзяхутун, улица	Л–23, 24
Фанчжуанлу, улица	У, Ф–26
Фаньдилу, улица	Р–24
Фаньсюлу, улица	Л–25
Фувайдацзе, улица	Н–18
Фусинвайдацзе, улица	П–18
Фусинлу, улица	П–13,16
Фусиммыньнэйдацзе, улица	П–19, 20
Фусюэхутун, улица	М–24
Фучэнлу, улица	Н–12, 15
Фучэнмыньбэйдацзе, улица	М, Н–19
Фучэнмыньнаньдацзе, улица	О, П–19
Фучэнмыньнэйдацзе, улица	Н–19, 20
Фуюцзе, улица	О–21
Фынтайлу, улица	Р, С–12
Фыншухутун, улица	И–21
Фынцзэнхутун, улица	О–20
Хайгуаньхутун, улица	П, Р–24

Fig. 2.14 Extract of a list of streets from the Soviet plan of Peking (Beijing), China (1983, 1:25,000) (National Library of Australia, nla.obj-234057212)

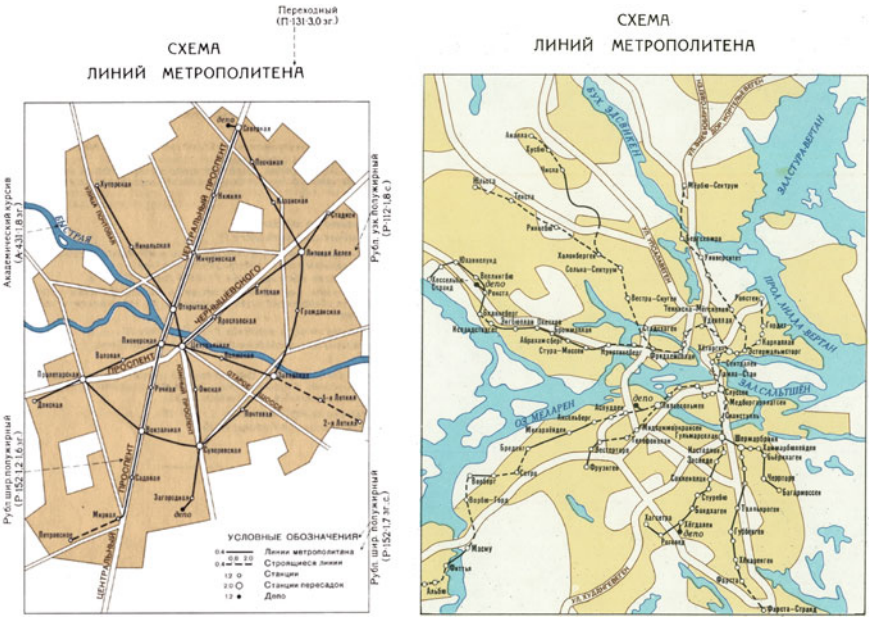

Fig. 2.15 Annotated example of a schematic metro diagram from the compilation manual for city plans (left) [6] and a schematic metro diagram from sheet 6 of the Soviet plan of Stockholm, Sweden (1986, 1:10,000) (right) (private collection)

2.2.6 Separate Booklets for the Spravka, Lists and Diagrams

For plans of larger cities, the *spravka*, the list of important objects and the list of street names can be presented in a separate booklet if including this information on the map sheets would 'enlarge the dimensions of the plan excessively' ([6]: article 9). Such booklets were required to have dimensions of 14.5 × 22.2 cm and feature a small-scale, schematic diagram of the city on the cover, showing the location of nearby settlements, roads, rivers, boundaries and water bodies ([6]: article 53). On plans for which a booklet has been issued, a note is placed in the right-hand margin stating that 'the *spravka*, list of street names and list of important objects is given in a separate booklet' (ibid.) (Fig. 2.16).

2.2.7 Topographic Insets

Despite being a separate series, it is clear that city plans were intended to be used in conjunction with Soviet topographic maps of the wider area. This is apparent from the inclusion of the relevant 1:100,000 IMW sheet reference under the title of each plan (Fig. 2.8). However, in instances where a plan was being produced of a city in

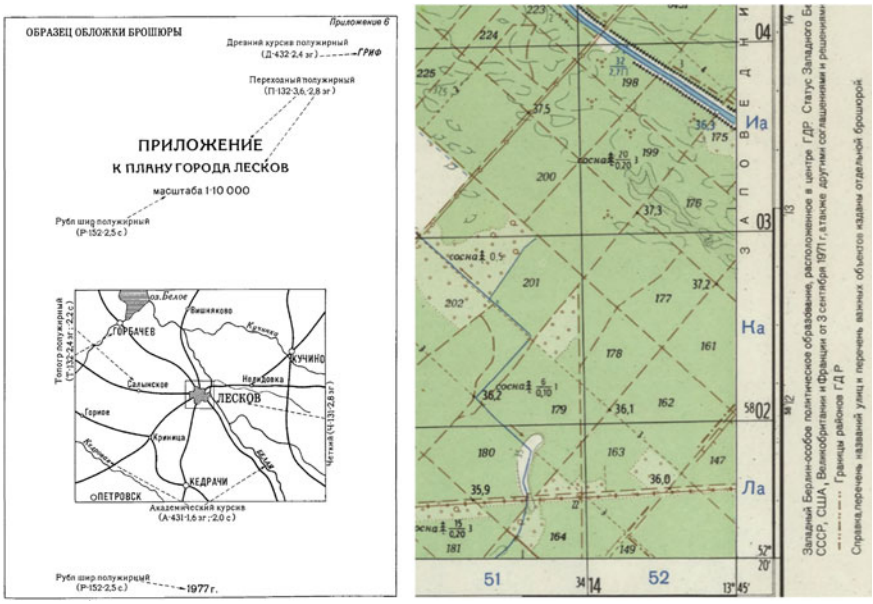

Fig. 2.16 Annotated example of a booklet cover for the fictional city of 'Leskov' from the compilation manual for city plans (left) [6] and a note in the margin of the Soviet plan of Berlin, East Germany (1983, 1:25,000) referring to the separate booklet (right) (National Library of Australia, nla.obj-234558452)

an area which was not covered by a Soviet topographic sheet at 1:200,000 or larger, a topographic extract was compiled at either 1:100,000 or 1:200,000 and placed on the plan as an inset ([6]: article 4). Such insets (see Fig. 2.17) were required to show an area at least 5–10 km in width around the edge of the city (ibid.). At least ten city plans have such a topographic inset.

2.2.8 Marginalia

Several pieces of information are included in the margins of all Soviet city plans. Although conventions regarding the layout of such information have developed slowly over time, the diagram published in the 1978 city plan compilation manual (Fig. 2.18) not only displays the conventions at this particular time, but also indicates the type of information included on Soviet city plans of all eras and the precision with which the format of each plan was stipulated. The marginalia of each sheet, based on its sheet number and the total number of sheets in the plan, was required to follow this layout framework, ensuring consistency between plans.

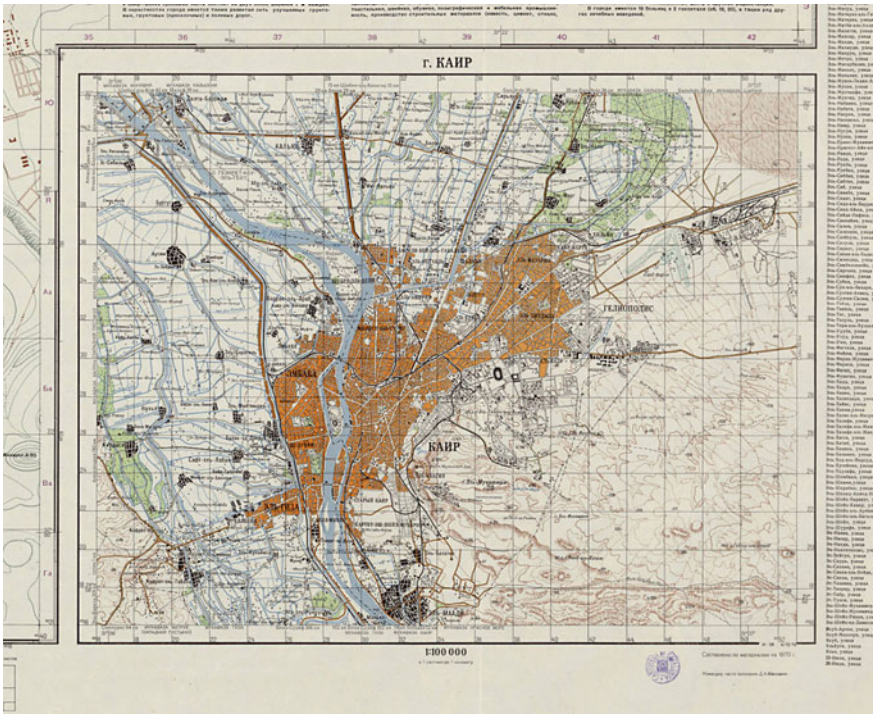

Fig. 2.17 A 1:100,000 topographic inset on the Soviet plan of Cairo, Egypt (1972, 1:10,000) (ICGC, RM.165391)

2.2.8.1 Country and Regional Information

Under the coordinate system label, in the top-left corner of the first sheet of each plan, a short label is given which indicates the political or administrative jurisdiction in which the city is located. Typically, this includes the name of the relevant country, in capitals, followed by the appropriate region or province in sentence case. Unlike other toponyms on the plans, Russian names are given where these exist, not transliterations of local names. Where the territory of a plan straddles an international border, both sets of relevant countries and regions are stated. In these cases, the country which covers the greater area of the plan is listed first (see Fig. 2.19). The label is omitted altogether on very early plans.

2.2.8.2 Edition Dates

The edition dates on city plans produced prior to 1967–69 are stated in a cut out in the frame of the plan, in the top-left corner of the first sheet. This label also includes a Russian ordinal number, indicating how many editions of a plan have been produced

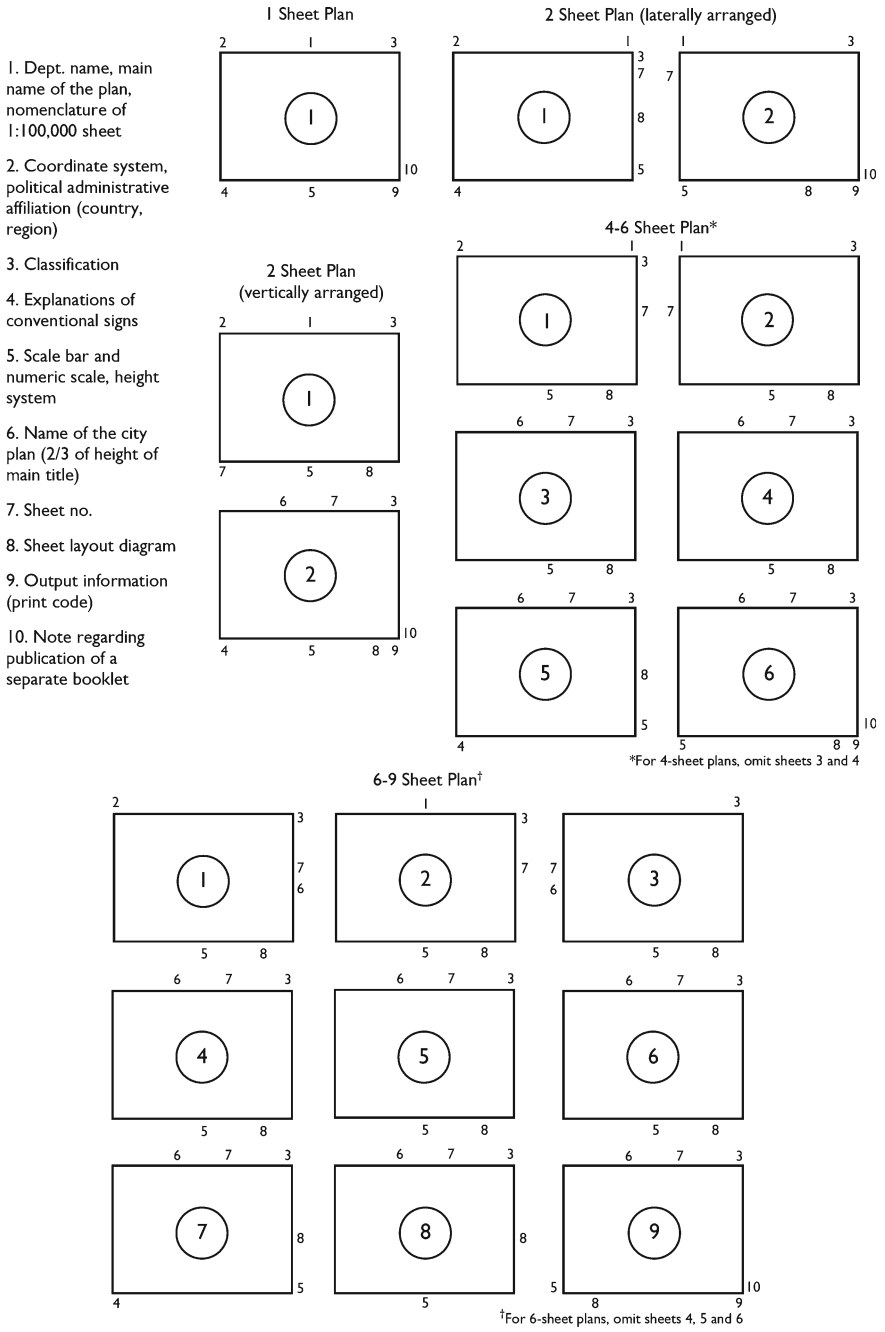

Fig. 2.18 A diagram translated and adapted from that presented in the compilation manual for city plans [6], indicating the content and positions of elements of marginalia on each sheet of a plan

Fig. 2.19 Country and regional information on the Soviet plan of Frankfurt an der Oder, East Germany (1983, 1:10,000). As part of the plan covers Polish territory, 'POLAND Zelenogorsk Voivodeship' is included (private collection)

in the past. After this time, the edition date is stated below the 1:100,000 sheet nomenclature on the first sheet of each plan (see Figs. 2.8, 2.9 and 2.10) and an ordinal number is not given.

2.2.8.3 Output Information (Print Codes)

Within the frame in the bottom-right corner of each sheet, 'output information' ([6]: article A4) is given regarding the printing and issue of the plan. The earliest plans began this information with the word Выпуск (*Vypusk*), meaning issue or output, but this practice was short-lived. The print code on city plans takes the same format as several other Soviet map series, and has five components.

The first is a Cyrillic letter denoting the series to which the map belongs (see Table 2.4). Generally, *И* denotes a city plan, although some early (1949–1962) plans use the code A. The meaning of the number which follows this is not fully clear, though could conceivably be a job number or similar reference, followed by the sheet number in multi-sheet plans. The following Roman numerals represent the month in which the plan was printed, followed by the last two digits of the relevant year. This year almost always corresponds to the year of the edition, as stated under the title. There are some early exceptions to this (pre-1965), which usually contain a note in the margin stating that the plan has been reprinted. The final Cyrillic letter in the print code refers to the factory in which a particular plan was produced (see Table 2.5) (Fig. 2.20).

Table 2.4 Map series codes found in the print codes of Soviet military maps. А and И are those found on city plans [4]

А	1:10,000 topographic maps, some 1:10,000 and 1:15,000 city plans (1949–1962)
И	City plans (all scales, 1944–1991)
Б	1:25,000 topographic maps
В	1:50,000 topographic maps
Г	1:100,000 topographic maps
Д	1:200,000 topographic maps
Е	1:500,000 topographic maps
Ж	1:1,000,000 topographic maps
З	1:2,000,000 and 1:4,000,000 aeronavigation maps

Table 2.5 Factory codes used on Soviet military city plans

Д	439th Military Cartographic Factory, Dunayev (Moscow) (1918–2009)
И	475th Military Cartographic Factory, Irkutsk (1936–2009)
Л	2nd and 444th Military Cartographic Factories, Leningrad (St Petersburg) (1944–2009)
Ср	108th Military Cartographic Factory (1941–1948), 33rd Military Cartographic Factory (1943–1993), Sverdlovsk (Ekaterinburg)
Срт	107th Military Cartographic Factory, Saratov (1941–2009)
Т	456th Military Cartographic Factory, Tashkent (1937–1992)
К	450th Military Cartographic Factory, Kiev (1946–1992)
Тб	453rd Military Cartographic Factory, Tbilisi (1936–1992)
Хб	488th Military Cartographic Factory, Khabarovsk (1933–2009)

Other military cartographic factories existed within the Soviet Union, but seemingly did not contribute to the production of the city plan series [4]

2.3 Mathematical and Geodetic Basis

Soviet city plans use the conformal Gauss-Krüger projection, divided into 6° wide zones within the Krasovskiy 1940 ellipsoid ([6]: article 3). As a transverse Mercator projection, Gauss-Krüger preserves scale along the central meridian of each zone. The Gauss-Krüger projection is markedly similar to Universal Transverse Mercator (UTM), with the exception of the fact that it uses a scale factor of 1 to reduce scale error, whereas UTM uses a factor of 0.9996 (Bugayevskiy and Snyder, 1995). Since the Pulkovo 1942 datum was adopted by domestic Soviet cartography on 7th April 1946 [14], city plans, regardless of the location of the city, also adopted this datum and sheets typically include the label ‘Coordinate System 1942’ in the top-left corner. In areas outside the USSR, source materials frequently provided height data in the local system. Such data were used on Soviet city plans, but only after corrections had been made to convert the data to the Soviet system ([6]: article 6).

Fig. 2.20 Print code from the single-sheet Soviet plan of San Fernando, Spain (1975, 1:10,000). The code reads: *И* (city plan)—85 (job 85) VI (June) 75 (1975) *Д* (Dunayev factory) (ICGC, RM.165391)

The bottom-left corner of the map area of each plan shows information about the position of this point within its Gauss-Krüger zone. This information can be used to establish which 6° Gauss-Krüger zone has been used on a particular sheet. In the example in Fig. 2.21, the distance from this point to the equator is 5786 km (the value on the *x* axis) (a). The last three digits of the value on the *y* axis indicate the false easting; the distance to the false meridian of the relevant Gauss-Krüger zone, in this case 300 km (b). The remainder of the value on the *y* axis, in this case 1, should be added to 30 to find the zone number used on the sheet, in this case zone 31. If the remainder of the value on the *y* axis is 60, this should be treated as zero when adding it to 30 to find the zone number (or 1 for 61, 2 for 62 and so on) [9].

The frames of city plans show not only Gauss-Krüger coordinates, but small ticks indicating latitude and longitude. Many plans include small dots around the frame, which represent 10″ (second) segments, and alternate black and white shading around the frame, representing minute segments ([6]: article 33, e.g. Fig. 2.7). This is consistent with Soviet topographic maps at 1:25,000, 1:50,000 and 1:100,000 (General Staff, 1966).

The scale of individual plans was decided centrally, according to the political, administrative and economic importance of the city in question, in addition to its population and area ([6]: article 3). A rectangular grid is included on all city plans. At 1:10,000, grid squares are 5 × 5 cm (500 × 500 m on the ground) and at 1:25,000 grid squares are 4 × 4 cm (1 × 1 km on the ground) ([6]: article 5). With the exception

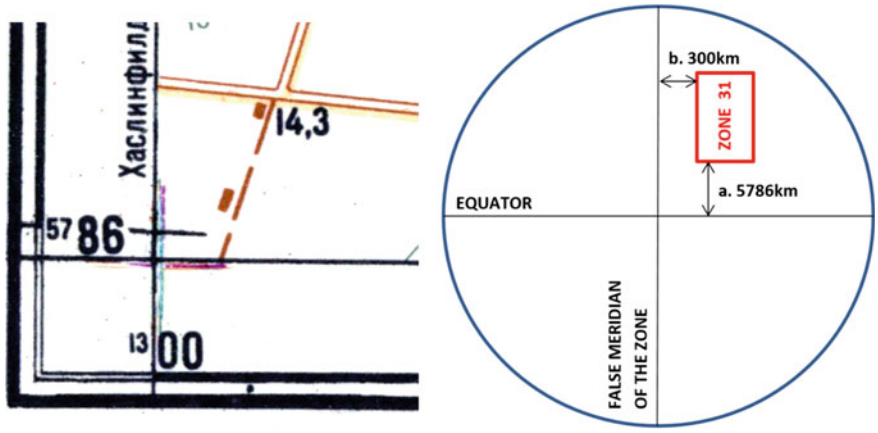

Fig. 2.21 The bottom-left corner of the map area of the plan of Cambridge, UK (1989, 1:10,000) showing information about the position of this point within its Gauss-Krüger zone (left) (private collection) and an illustrative diagram of zone calculation using the information from the Cambridge sheet (right)

of some very early plans, the edges of grid squares form the margins of each plan,grid squares are not partially shown ([6]: article 5).

2.4 Stylistic Development of the Series

The style of Soviet city plans developed somewhat throughout the duration of the series. Naturally, such changes will have been dictated by new editions of the compilation manual for city plans, as well as the later requirement of plans to be consistent with the conventional signs for topographic maps at 1:10,000 and 1:25,000—specifications which also changed on a fairly regular basis. Such changes, however, are difficult to define with precision as some plans possess some characteristics of one style and others of another. In addition, without closely examining every city plan that was produced, any outline of stylistic development can only be an indication of general trends, rather than an exhaustive tracing of minute changes and adaptions of style. It is, however, possible to gain a more thorough understanding of practices in the final years of the 1970s using the compilation manual for city plans [6]. Although this manual refers to earlier editions, only the 1978 edition has become available to date, meaning that observation of the plans themselves provides the only currently available source of information about plans produced at other times.

Nevertheless, it is possible to broadly group the known city plans into five phases, based on their style. The first four of these are relatively limited, both in terms of the number of plans which belong to them and the apparent duration of their utilisation. The fifth phase, which began in 1972 and continued until the dissolution of the USSR,

incorporates the vast majority of Soviet city plans as its adoption corresponds with the aforementioned surge in production in the early 1970s. The fact that the 1978 compilation manual [6] makes brief reference to the previous edition of 1972 confirms that new regulations were indeed introduced in that year. Given that the post-1972 phase was significantly more lasting than its predecessors, the design specifications of the 1972 compilation manual possibly represent the most significant document for the subsequent standardisation of the series. However, none of the series' stylistic phases are, by any means, fully homogenous. Substantial variations in the available source materials and the methods used to compile the plan are likely explanations for smaller variations in the appearances of plans within the jurisdictions of single editions of regulations.

2.4.1 Phase 1

The earliest known city plan, of Sari, Iran (1944, 1:10,000) is fairly basic in its appearance, relative to later plans, largely because it is printed in only five colours. Trees, railways and edges of roads are shown in black, with rivers and lakes in blue. Green is used for vegetation and two shades of brown are used for the urban areas itself. The paler brown is also used to denote sand/gravel and contours. A significant area of the sheet is left white, which may perhaps give the impression of a desert despite much of the area being forested. The city itself is generalised into blocks, with only a small number of buildings being depicted individually (Fig. 2.22).

2.4.2 Phase 2

In the early 1950s, a small number of plans used a very distinctive six-colour scheme, with a striking shade of red used to depict buildings. Individual building footprints are shown; urban areas are not generalised into blocks. The majority of roads are white, although red is occasionally used for major roads. Red is also used to mark tramlines, while a pale green is used for vegetated areas. Blue denotes water, either finely hachured or as a solid fill. One class of notable building is distinguished, either by using a darker shade of red, or by using black hachuring over the standard shade. These buildings are numbered and correspond to an index of important objects. Also characteristic of this phase is the very wide spacing used for street name labels. On the plans in Figs. 2.23 and 2.24, red digits are used to number important objects, while black digits are used to number every block in the town or city. As no such numbering system exists in British, Austrian or Swiss mapping, this system was evidently devised by the Soviet cartographers.

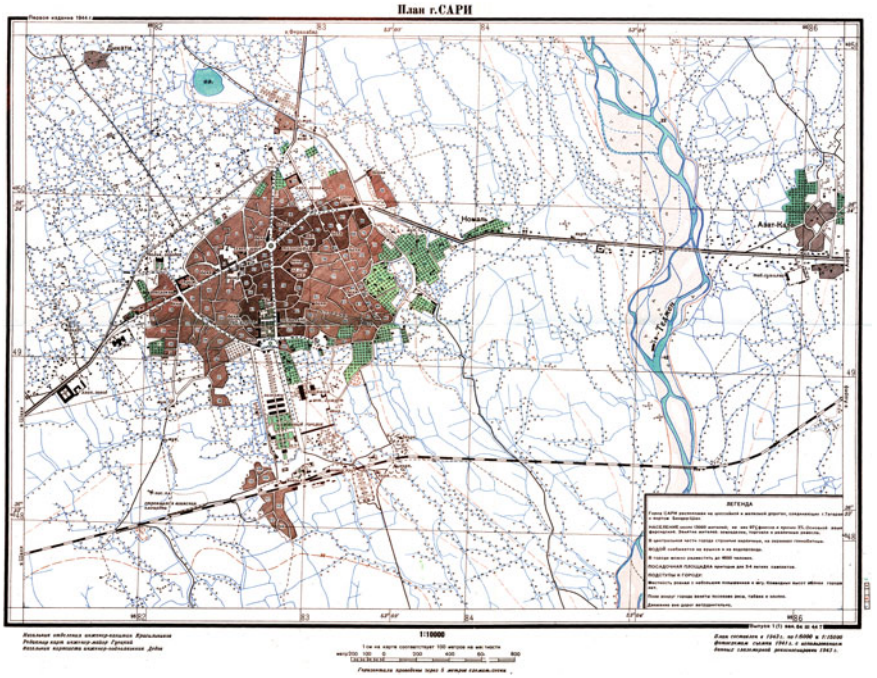

Fig. 2.22 The Soviet plan of Sari, Iran (1944, 1:10,000)—the earliest known Soviet military city plan separate from any topographic series (private collection)

Fig. 2.23 Extract from the Soviet plans of Baden, Austria (1950, 1:10,000) (left) and Zürich, Switzerland (1952, 1:15,000) (right). Given the use of hachuring rather than graduated shades and lack of black building outlines on the plan of Zürich, it has a cruder appearance than the plan of Baden (private collection)

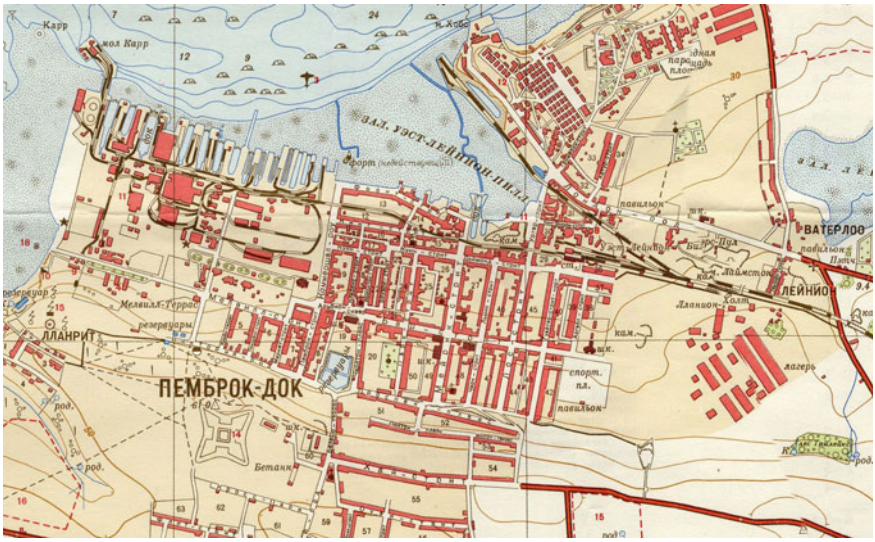

Fig. 2.24 Extract from the Soviet plan of Pembroke, UK (1950, 1:10,000) (private collection)

2.4.3 Phase 3

By the late 1950s, a style had been adopted that fused both of the previous styles and was more extensively used than both of them combined. Building footprints were either depicted individually or generalised into blocks, although the principal colour in either case was brown. The majority of roads remained in white regardless of classification and street names were spaced widely along the length of the street. Where a long street and short street name coincide, legibility can become more difficult. Pale orange was very occasionally used for some streets (see bottom-right corner of Fig. 2.25). Important buildings were once again numbered and highlighted on the map in a single class—either black or dark brown—and blue and green were once again used for water and vegetation respectively. Each block is numbered, although in a smaller font than the important object numbering (Fig. 2.26).

Phase 3 plans are reminiscent in appearance of plans used by Soviet forces during combat in the Battles of Berlin and Breslau at the end of the Second World War (see Fig. 2.27). Such plans are annotated with strategic information, including the numbering of important objects. The numbering of all blocks, the colours used and the spacing of street names are all elements that were revived by the city plan series some 15 years later. Unlike other Soviet city plans before or since, areas outside of the urban extent are printed in black and white. A variation for some Soviet cities in the late 1960s sees urban blocks shaded either orange or pale yellow; the former denoting areas with a predominance of fire-resistant buildings (see Fig. 2.28).

Fig. 2.25 Extract from the Soviet plan of Crewe, UK (1957, 1:10,000) (private collection)

Fig. 2.26 Extract from the Soviet plan of Budapest, Hungary (1962, 1:15,000) (ICGC, RM.165448)

2.4.4 Phase 4

One to two years prior to the publication of the 1972 compilation manual, a small number of plans were produced which were the first to be printed in ten colours. For the first time, this allowed important objects to be colour-coded, rather than simply grouped as a single class. All of the known plans which use this style were produced

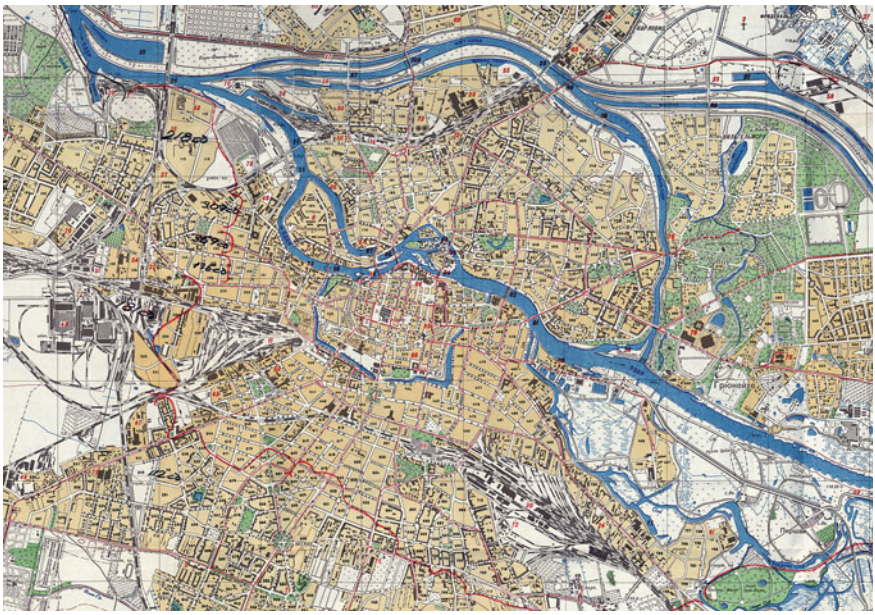

Fig. 2.27 Extract from an annotated Soviet combat plan of Breslau, Germany (now Wrocław, Poland) (1944, 1:15,000) (available at: http://igrek.amzp.pl)

Fig. 2.28 Extract from the Soviet plan of Almaty, Kazakhstan (1967, 1:25,000), distinguishing 'fire-resistant' blocks in orange (National Library of Australia, nla.obj-234565273)

Fig. 2.29 Extract from the Soviet plan of Rawalpindi, Pakistan (1972, 1:10,000); one of the first known plans printed in ten colours (National Library of Australia, nla.obj-234131211)

in 1971 or 1972 at the Tashkent military topographic factory. Besides the use of green and purple for important objects and black for annotations, the plans exclusively use pastel colours. Built up areas are displayed in either a pale beige or peach colour and streets are white, with the exception of orange major roads outside of the city. For the first time, expanded spacing is not used for street names; labels are instead repeated on longer streets, addressing earlier legibility issues (Fig. 2.29).

2.4.5 Phase 5

Phase 5 refers to city plans produced in 1972 or later and incorporates the vast majority of Soviet city plans (Fig. 2.30). Plans in this phase are printed in either eight or ten colours; those in the latter distinguishing important objects in three different classes. Plans of cities in the Soviet Union are printed in eight colours and do not highlight important objects. Civil city plans produced by GUGK also use this style of mapping, though these plans have some minor differences (see Sect. 2.6.1). The use of orange to denote major roads now extends into city centres and a pale yellow replaces the pastel brown in denoting the urban extent. A more comprehensive outline of the content of plans of this phase was given earlier in this chapter (Sect. 2.2).

Fig. 2.30 Extract from the Soviet plan of Addis Ababa, Ethiopia (1978, 1:10,000) (National Library of Australia, nla.obj-234551863)

2.4.6 Prague, Czechoslovakia (1980)

Plans produced after 1972 do exhibit some variation in style, though most broadly conform to the main conventions of the time. One plan which deviates significantly from these conventions is the plan of Prague, Czechoslovakia (1980, 1:10,000) which marks ordinary buildings in peach, reserving the usual brown for architecturally prominent buildings. The other building classifications are the same, although a much paler orange is used for the main roads. This colour combination ensures that classified buildings are even more prominent in the visual hierarchy of the map, although given that an original hard copy of the plan has not been seen during the course of this study, the extent to which scanning methods and digital manipulation have influenced this appearance is unknown. The plan of Prague is the only known plan in this style (Fig. 2.31).

It is clear that the later stylistic phases of the Soviet city military plan series, and their corresponding editions of *Conventional Signs*, accommodate much larger amounts of data than those produced between the 1940s and 1960s. The stylistic development of the series from the early 1970s may reflect the cartographic challenge of mapping the increasing amount of source data available, derived from satellite imagery after the launch of Zenit-4MT in 1971. It seems plausible that as the nature and scope of the available source data changed substantially, the structuring of this data into a broader and much more comprehensive symbology provided a practical cartographic solution. Concurrently, this explanation of the plans' stylistic development is congruent with the Soviet academic cartographic discourse of the 1970s and 1980s which placed increasing emphasis on map use and users (e.g. [13]). Soviet cartographic communication theories of this era may have necessitated a more

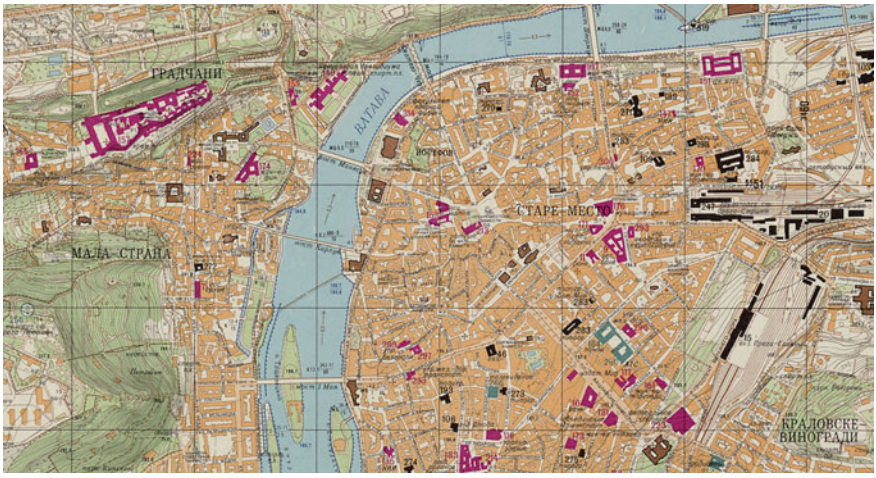

Fig. 2.31 Extract from the Soviet plan of Prague, Czechoslovakia (1980, 1:10,000) (ICGC, RM.165463)

capacious map design, rather than support placing more data on the map within the confines of existing symbologies.

2.5 Production Processes

2.5.1 Selection and Preparation of Source Materials

The source materials used to produce city plans varied by city, depending on what materials were available in a given area. The most important of these sources was a large-scale topographic base map or plan, known as the 'basic cartographic material'. If no such material was available for a particular city, stereographic aerial photographs were used as the base material instead ([6]: article 27). Occasionally, a combination of these methods was used (ibid.). In addition to large-scale topographic maps, the following were used to provide the rich data which would appear on the city plans ([6]: article 28):

- Catalogues and lists of coordinates and geodetic points
- Sea navigation charts (to provide hydrographic information)
- Photo-plans, photo-diagrams and individual aerial photographs
- City plans (e.g. tourist maps or general plans)
- Literary/reference sources (economic or geographic descriptions of the city, directories, guide books, lists of street names and buildings, oblique images of the city or individual buildings and other diagrams)

Before using any of these sources, each one was assessed for accuracy and how up-to-date they were. The extent to which they should be used in the city plan was then recommended by the editor (ibid.). The marginalia of early plans includes a list of the major source materials used in the production of each plan. Although this practice became rare after the early 1960s, these early examples highlight that source materials often predated city plans by several decades, leading to some significantly outdated information appearing on some plans. Later plans also exhibit data which are seemingly in excess of 30 years old in some cases [5]. Naturally, these issues do not apply to cities within Warsaw Pact states where access to up-to-date source materials is likely to have been considerably easier (see Fig. 2.32).

Although satellite and aerial images could be used to update positional data elsewhere, especially after the launch of Zenit-4MT in 1971, non-spatial data, such as text and attributes, could not always be collected by such means and continued to rely on, sometimes outdated, cartographic sources (ibid.). However, where imagery was relied upon for up-to-date positional data, there was a risk of misinterpretation—[4] highlight numerous errors which seemingly result from such misreading.

Fig. 2.32 Source materials listed on the final sheet of the Soviet plan of Budapest, Hungary (1962, 1:15,000). The text reads: 'Compiled in 1960 from 1:25,000 map, surveyed in 1959, corrected with aerial photographs, collected 1960. Prepared for issue in 1962. Re-printed in 1966'. This is followed by the names of various individuals involved in the production of the plan. (ICGC, RM.165452)

2.5.2 Compilation Methods

According to the compilation manual for city plans [6], the exact process by which a plan was compiled could be altered depending on the nature of a plan's content and its source materials. Depending on the type of base material being used (i.e. topographic or photographic base), the editor chose one of three methods of compiling the plan. Compilation on what was known as 'blue copy' took place if a plan was to have particularly rich content, or if its source materials were especially complex and would require generalisation. A 'brown copy', or sometimes 'black copy', was used if the plan would rely heavily on the basic cartographic material, and the additional sources would not add a significant amount of information ([6]: article 30). If the plan was to rely heavily on aerial images, its compilation could alternatively take place on a photo-plan of the city, supplemented by literary/reference sources which provided the descriptive data ([6]: articles 29–30). In this case, contours were plotted using a stereo-pair, as the plan could not rely on contours from an existing topographic map ([6]: article 30). Regardless of the method selected by the editor, compilation always took place at the final scale of the city plan ([6]: article 29). The basic cartographic materials therefore needed to be photo-mechanically enlarged or reduced to the correct scale, if necessary, at the beginning of the process ([6]: article 33).

When using a topographic base, rather than a photo-plan, compilation could either take place on a single transparent or opaque base, or on several matted transparencies (each one for a different element of the plan content). These transparencies could then be overlaid on a lightbox in order to bring the different elements together ([6]: article 31). Furthermore, compiling on multiple transparencies 'increases the productivity of labour' (ibid.), as several aspects of the content of the plan can be compiled simultaneously. Control points were selected on each of these layers so that they could be accurately aligned on completion ([6]: article 32). No transparent layer was permitted to contain more than one colour ([6]: article 40).

Although the order in which the compilation master copy was compiled could vary, as a rule, the following order was used ([6]: article 38):

1. The internal neat line/frame and the control points for alignment
2. The important (colour-coded) objects and their annotations
3. Hydrography
4. Railways and related structures
5. Main streets
6. Minor streets, blocks and other buildings
7. Structures along streets (e.g. tramlines, flyovers etc.)
8. Industrial, socio-cultural and agricultural objects
9. Cobbled/dirt roads
10. Relief
11. Boundaries and fences
12. Vegetation and soils
13. Sheet layout diagram
14. Other marginalia.

Labels could either be added after each individual element, or altogether at the end of the compilation ([6]: article 39). If there were a large number of labels to be added (including street name labels), these could be compiled on their own transparency. Only if labels were scarce could they be written directly on the master copy (ibid.). Other components of city plan sheets, including the *spravka* and lists of streets and important objects were compiled separately and added later (ibid.).

Compilation of city plans never took place directly on printing plates. Instead, the selection of content and the placement of labels took place on the basic cartographic material, in pencil, and this information was then engraved on the plate for printing after the whole plan had been compiled ([6]: article 31). Before this transfer took place, a rigorous checking process took place for each plan. The geodetic points shown on the basic cartographic materials were checked against any lists of coordinates that were available, in order to validate their positions on the map. The coordinates and the grid on the basic cartographic materials were then adjusted to conform to the Pulkovo 1942 coordinate system ([6]: article 32). For cities within the USSR, it is unlikely that this process would be required as it is likely that the basic cartographic materials already used the Pulkovo 1942 coordinate system. Any areas on the basic cartographic material which needed verification were marked on the copy and checked against photographs (ibid.). The layers could then be combined on a 'rigid base' and were required be accurately aligned to within 0.2 mm to be accepted for engraving ([6]: article 33). The combined transparencies for a plan were known as the 'compilation master copy', onto which the frame and marginalia could be added ([6]: article 37).

The final compilation master copy was required to adhere to several rules. Firstly, labels added to it must be full and clear in order that source materials which have already been consulted need not be revisited. Secondly, once all of the transparencies had been aligned, the compilation master copy was required to contain no two symbols closer than 0.2 mm (unless this was required by other regulations). Thirdly, the design quality of the compilation master copy was assessed to ensure that it was a suitable basis for the final copy of the plan.

2.5.3 Revision of City Plans

Revised city plans were produced either to reflect geographical changes in a city, to convert an old plan into a more recent coordinate system or to remake the plan using the latest conventional signs ([6]: article 54). Over 200 cities are known to have been mapped more than once as part of the city plan series.

Master copies were retained after the plan had been issued and were often the basis for future revised plans. Where only 20–25% of the plan content needed to be revised, corrections were made directly on the master copy ([6]: article 65). Where 25–40% of the plan required revision, copies of the original master copy were the basis for the revision ([6]: article 66). If over 40% of the plan content required revision, the option of compiling a completely new master copy was made available, if editing

the existing master copy would be 'more laborious than compilation afresh' ([6]: article 67). If the mean planimetric discrepancy between the original plan and the latest cartographic materials was more than 0.7 mm, a new plan was produced from scratch ([6]: article 59).

Revised master copies used a colour coding system which made clear the changes to be made to the plan. Content to be removed was marked in red, content to remain was marked in dark brown and new content was marked in the colour that would be used for those features on original master copies ([6]: article 68).

2.5.4 Record Files

Alongside the compilation of each city plan, a record file was created and stored with the transparencies. Information regarding the source materials, layout and content of the plan were all accumulated in the record file for the appropriate plan ([6]: article 26). The most notable item in the record file was the 'editorial-technical instructions' for the plan, in which the editor outlined its requirements and characteristics, including guidance on the selection of important objects and the content of the *spravka*. Deviations from these instructions were also required to be recorded and explained (ibid.).

The mandatory contents of the record file for each plan included (ibid.):

- The editorial-technical instructions
- Sheet layout diagrams
- Source material information (and notes on the extents of its usage)
- Coordinates and diagrams of sheet extents
- A list of geodetic points
- Compilation and preparation information
- Lists of discrepancies in geographical names between source materials
- A quality assessment of the master copy.

After a city plan was issued, its record file was retained alongside its master copy for reference in the production of any future revisions. Unfortunately, no record files have emerged since the dissolution of the USSR and it remains unknown when the practice of compiling them began.

2.6 Related Series

2.6.1 Civil (GUGK) City Plans

In many ways, the city plans produced by GUGK for civil administration within the Soviet Union look markedly similar to the military plans produced by the General

Staff. The plans themselves share the stylistic appearance of phase 5 military plans but omit the *spravka* and lists of street names and important objects. They also use a slightly altered coordinate system (i.e. not Pulkovo 1942) and a locally-applied grid without Gauss-Krüger coordinates.

Perhaps the most notable difference between the civil and military plans is that the former are printed in eight, rather than ten, colours and therefore important structures are not marked and colour-coded as on the military plans, although locations of fire-resistant blocks are shown (Figs. 2.33, 2.34 and 2.28). GUGK never produced large-scale maps of territory outside the Soviet Union.

2.6.2 GUGK 1:2,000 and 1:5,000 Plans

Some towns and cities in the Soviet Union were covered by a highly-detailed series of plans produced by GUGK at 1:2,000 and 1:5,000. These very large-scale plans are printed on small single-colour (brown) sheets covering the city and its immediate environs, though often stopping abruptly regardless of the location of the sheet lines (Fig. 2.35). The large scale and small sheet size means that even modest-sized towns can require 10–20 sheets. The detail on these maps exceeds that on other Soviet map series, incorporating utilities networks, individual trees and outbuildings as well as dense contours. The maps use a locally-applied grid but were classified secret.

2.6.3 Plan Schema

A *plan schema* is a simplified map of a town or city within the Soviet Union, produced at scales ranging from 1:5,000 to 1:25,000. They are highly generalised and omit the detailed information and annotations of the aforementioned series. The classification of the series is lower than that of other Soviet city plans and are marked 'for official use' in the top-right corner. Although a typical *plan schema* does include a small legend and a street index, it does not have a *spravka* and uses a locally-applied grid without coordinates. The only known maps in the *plan schema* series are of towns and cities in Latvia and Estonia. Unlike the military city plans, these plans have not appeared in collections around the world since the dissolution of the USSR and remain accessible to the public only via collections within these countries.

2.6.4 Sister Series in Other Warsaw Pact States

The close military cooperation between Warsaw Pact member states did not exclude military-cartographic endeavours. The Polish military adopted the Gauss-Krüger

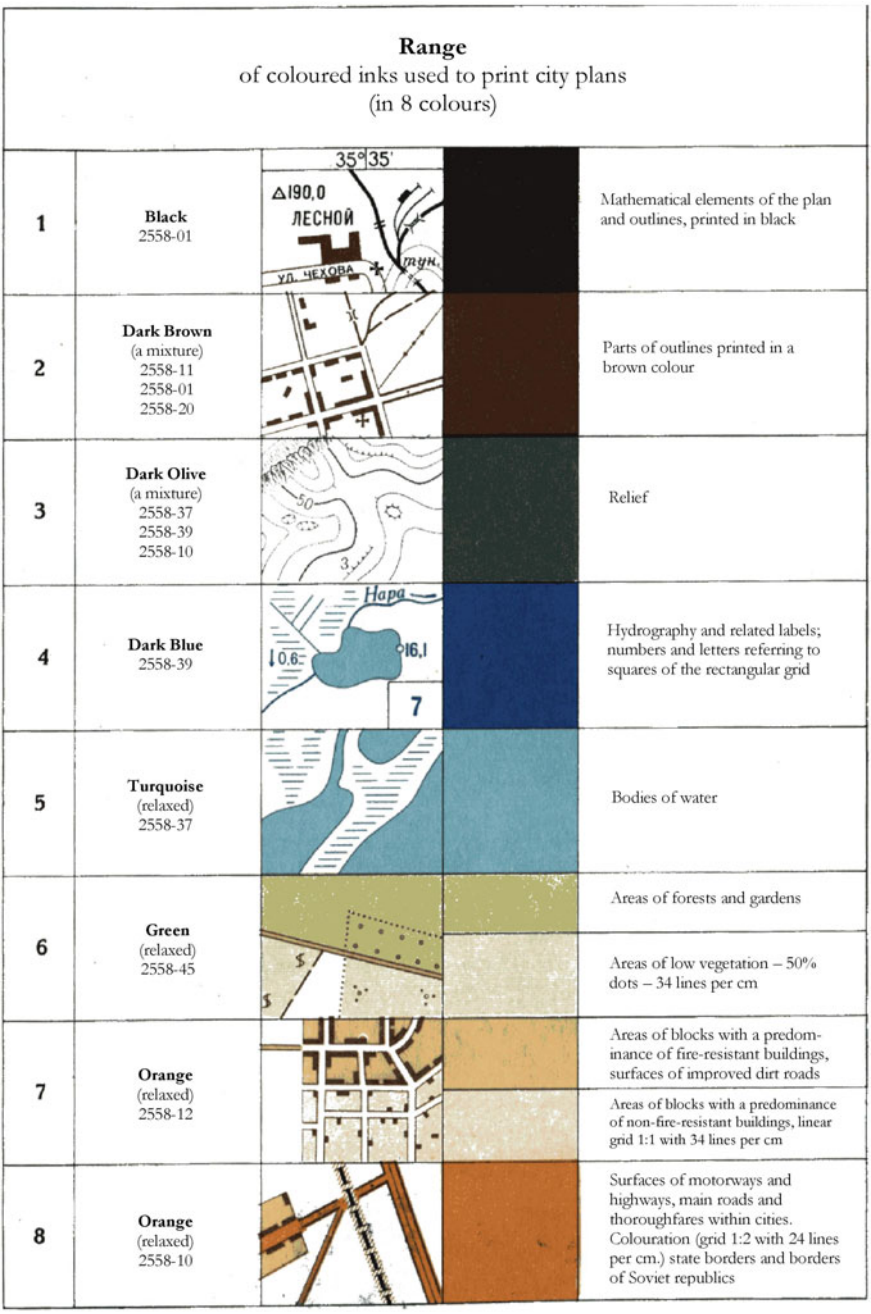

Fig. 2.33 Range of colours used on Soviet city plans printed in eight colours with ink specifications and details of the relevant elements on the plan for each colour. Translated and adapted from the compilation manual for city plans [6]

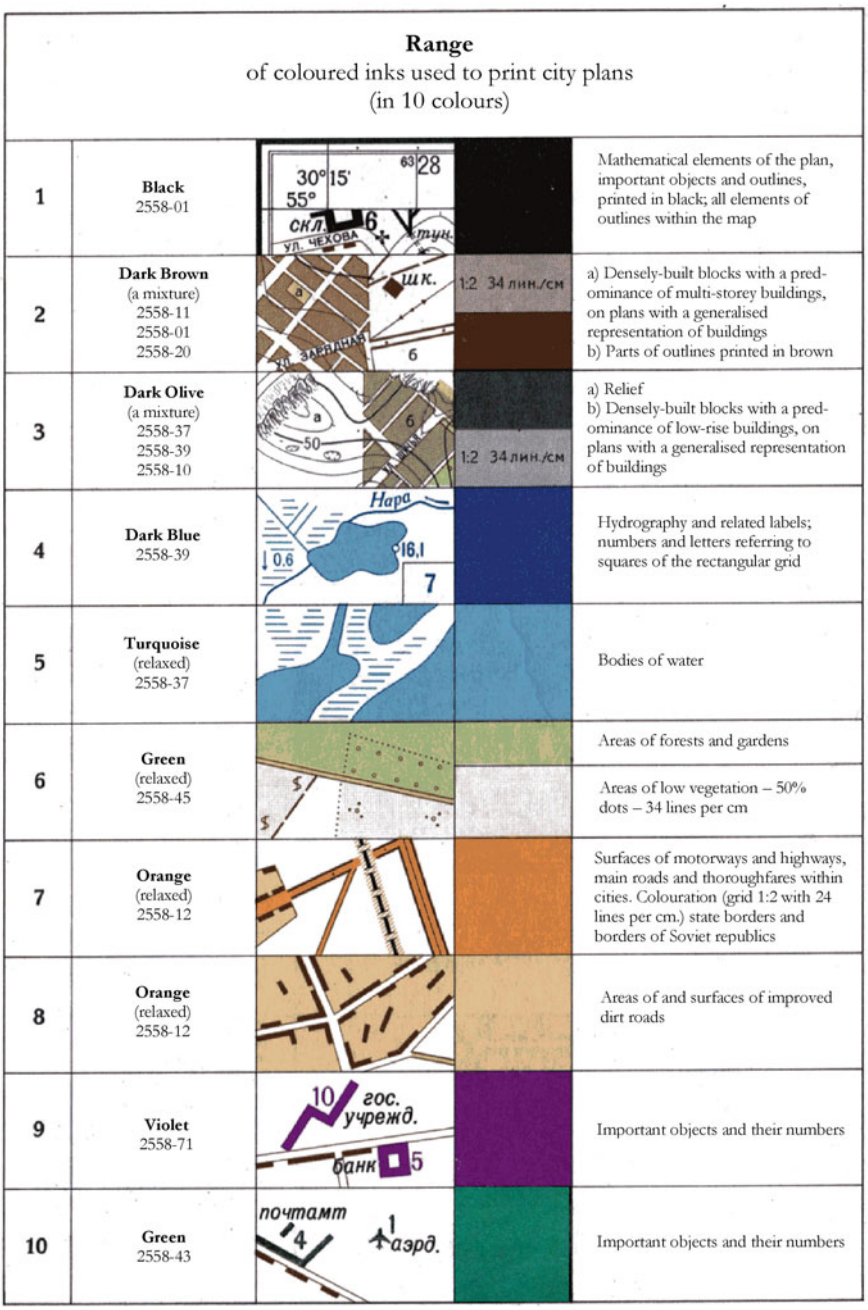

Fig. 2.34 Range of colours used on Soviet city plans printed in ten colours with ink specifications and details of the relevant elements on the plan for each colour. Translated and adapted from the compilation manual for city plans [6]

Fig. 2.35 Extract from a GUGK plan of Tartu, Estonia (1984, 1:5,000) (National Archives of Estonia, EAA.2072.9.866)

projection and the Soviet Pulkovo 1942 datum for its topographic output from 1953 [1]. Moreover, from 1950 until 1990, Hungarian military maps used Soviet nomenclature, a variant on the Gauss- Krüger projection and Soviet topographic symbology [15]. During this period, the Hungarian military produced topographic maps of Northern Yugoslavia, Austria and contiguous parts of neighbouring countries (notably Switzerland, Southern Germany and Northern Italy) at 1:50,000, 1:100,000 and 1:200,000. Mirroring the Soviet system, Hungary also produced 63 plans of foreign cities between 1956 and 1988, covering a similar geographical area to its topographic output. This city plan series differed from its larger Soviet counterpart in three notable respects. Firstly, the maps use the Hungarian language in Roman script, rather than Russian (this also applies to Hungarian topographic maps). Secondly, many Hungarian city plans are at 1:10,000 and 1:15,000, the latter being a relatively rare scale in Soviet cartography. Only one Hungarian city plan, Leoben, Austria (1966), is known to use the common Soviet scale of 1:25,000. As a result, the Soviet symbology was not applied rigidly. Thirdly, some of the Hungarian city plans feature photographs of notable landmarks and buildings (Fig. 2.36), alongside the familiar street index and reference text (or *tájékoztató*) [15].

By outlining details of the scope and nature of Soviet military mapping of cities, it is envisaged that its future uses will not be confined to historical studies of Cold War history or historical cartography, but that Soviet city plans might be used in new contexts and applied to previously unimagined tasks. In order to conceptualise these

Fig. 2.36 A photograph of the Town Hall and the church of St Peter am Perlach accompanies a Hungarian plan of Augsburg, Germany (1966, 1:10,000) (Photograph: Alexander J. Kent)

future applications, it is necessary to take a much broader look at Soviet mapping; considering its ontology and an epistemological framework within cartography in which these maps may be handled. Using the work of Brian Harley as a starting point for this consideration, Chapter Three discusses these issues in order to construct a new paradigm that helps to bridge the conceptual gap between past and future applications of Soviet military city plans.

References

1. Balcerzak J, Stankiewicz M, Pedzich P (2007) The evolution of mathematical bases of Polish topographic maps during the recent 80 years. In: Proceedings of the 23rd international cartographic conference, Moscow, Russia, 4–10 August. Available at: http://icaci.org/files/documents/ICC_proceedings/ICC2007/html/Proceedings.htm. Accessed 14th Apr 2016
2. Bugayevsky LM, Snyder JP (1995) Map projections: a reference manual. Taylor and Francis, London
3. Christy R (2016) Zenit-4MT missions. Available at: http://www.zarya.info/Diaries/Zenit/Zenit-4MT.php. Accessed: 6th Aug 2018
4. Davies JM, Kent AJ (2017) The Red Atlas: How the Soviet Union secretly mapped the world. University of Chicago Press, Chicago
5. Davis M (2014) Soviet Military mapping of the UK and contemporary ordnance survey mapping: a comparative analysis. Unpublished BSc Dissertation. Canterbury Christ Church University
6. General Staff (1978) Руководство по картографическим и картоиздательским работам: часть 4 – составление и подготовка к изданию планов городов [Manual for cartography and cartographic reproduction works: Part 4—compilation and preparation for printing of city plans]. Military Topographic Service, Moscow
7. Jagomägi J, Mardiste H (1994) Maps and mapping in Estonia. GeoJournal 33(1):81–90
8. Kent AJ, Davies JM (2013) Hot geospatial intelligence from a Cold War: the Soviet military mapping of towns and cities. Cartogr Geogr Inf Sci 40(3):248–253
9. Kit O (2008) Soviet city plans grid coordinate calculations. Cartographic Unit, University of Southampton, Southampton
10. Marx K, Engels F (1848) The Communist Manifesto. Reprint, Penguin Classics, 2015, London
11. Postnikov AV (2002) Maps for ordinary consumers versus maps for the military: double standards of map accuracy in Soviet Cartography, 1917–1991. Cartogr Geogr Inf Sci 29(3):243–260
12. Psarev AA (2005) Russian military mapping: a guide to using the most comprehensive source of global geospatial intelligence. Translated by Paul Gallagher. East View Cartographic, Minneapolis
13. Salishchev KA (1970) The subject and method of cartography: contemporary views. Can Geogr 7(2):77–87
14. Stalin J, Chadayev Y (1946) The introduction of a unified system of geodetic coordinates and heights on the territory of the USSR. Council of Ministers of the USSR, Moscow (in Russian)
15. Zentai L, Buga L, Gercsák G (2018) Hungarian military mapping abroad 1919–1990. Cartogr J 55(2):150–158