sciendo

Reports on Geodesy and Geoinformatics, 2025, Vol. 120, pp. 14–24

DOI: 10.2478/rgg-2025-0012
Received: 2 June 2025 / Accepted: 15 July 2025
Published online: 25 July 2025

ORIGINAL ARTICLE

Survey maps for design purposes in Poland – Technical and legal aspects with particular emphasis on the role of cadastral parcel boundaries

Marcin Karabin [1*]

[1]Department of Cadastre and Land Management, Faculty of Geodesy and Cartography, Warsaw University of Technology, Pl. Politechniki 1, 00-661 Warsaw, Poland

*marcin.karabin@pw.edu.pl

Abstract

The survey map for design purposes is one of the most important cartographic products prepared by licensed surveyors, used to prepare land development projects, which are the basis for obtaining a building permit for a building and other construction objects. One of the most important elements of a map for design purposes are the boundaries of cadastral parcels. They are a determinant for designing the location of objects, because technical regulations specify the minimum distances of various designed objects in relation to the boundaries of cadastral parcels. The stability of geometric data regarding parcels boundaries is therefore crucial in the entire design process, but also in the later stages after the object (building) has been accepted for use by the construction supervision authorities. This stability should be ensured by appropriate geodetic and legal regulations that guarantee the immutability of boundaries (real-time GNSS satellite measurements do not constitute a barrier). This article will present the principles of creating maps for design purposes in Poland but also in another country – in Austria. Reason to take up the subject of comparing Polish solutions with Austrian ones is the existence of the so-called Legal Boundary Cadastre in Austria, which ensures the "stability and immutability" of cadastral parcels boundaries. In the end result, a comparison of the rules of making maps for design purposes will provide guidance as to the recommendation of changes in this area in Poland.

Key words: maps for design purposes, cadastre, boundaries, determination and delimitation of parcels boundaries

1 Introduction

A survey map for design purposes is a basic geodetic and cartographic product, used in the process of a permit for construction of a building or engineering structure etc. Based on the map for design purposes a plan is created of development of a parcel for building purposes, as well as a plan (project) of an underground utility network. Regulation of the Minister of Infrastructure of 12 April 2002 on the technical requirements to be met by buildings and their location (Regulation, 2002) establishes the technical conditions that buildings and related facilities must meet, their location on a cadastral parcel. This regulation provides specific distances that must be maintained in the location of building objects in relation to the boundaries of parcels, other development elements, as well as, for example, mutual distances between existing and designed buildings.

It is therefore important to ensure that the content of such a map is up to date, as well as that the data on cadastral parcels boundaries are of appropriate quality. It is crucial that the data on parcels boundaries do not change during or after the construction process – they are fixed and unchangeable.

Until 2020, the method of preparing maps for design purposes in Poland was basically regulated by two legal acts, i.e., the Regulation of the Minister for Spatial Development and Building Industry of February 21, 1995 on types and scope of surveying and cartographic works and surveying works, binding in the building industry (Regulation, 1995) and the Regulation of the Minister of the Interior and Administration of November 9, 2011 on technical standards of geodetic surveys and on processing and transfer of results of those surveys to the state geodetic and cartographic resources (Regula-

tion, 2011). From August 2020, the main legal act containing the rules for the preparation of maps for design purposes is the Regulation of the Minister of Development of 18 August 2020 on technical standards of geodetic surveys and on processing and transfer of results of those surveys to the state geodetic and cartographic resources (Regulation, 2020).

The procedure for creating a map for design purposes according to the previously applicable regulations (Regulation, 1995) is described, among others, in Karlikowski (2011), the procedure according to Regulation (2011) is described in Kampczyk (2015). Mika et al. (2015) presents an economic, technical and user's aspect of the use of software applications for developing maps for design purposes. The current procedure for creating a map for design purposes is described, among others, in Puzia and Pietrzak (2021); Felcenloben (2022, 2023).

Both previous regulations and the current regulation should ensure the uniformity of such geodetic and cartographic works at the national level. In Poland there is one unified set of regulations concerning maps for design purposes; the same map is prepared for design buildings, underground infrastructure and other objects. Many aspects related to the production of maps for design purposes are not clearly explained in the regulations. Also Karabin and Karabin (2013) studied key aspects concerning this kind of maps, i.e. map content, map extent, form of map. Detailed studies were done on the usefulness of maps for design purposes (maps for designing detached houses).

This article will present the principles of creating maps for design purposes in Poland but also in another country – in Austria. The choice of Austria for comparison is not accidental. In the 19th century, Poland came under the rule of three invaders: Prussia, Russia and Austria. Each of them introduced their own laws and administrative systems, which also concerned both the cadastre and broadly understood geodesy. As Mika (2010) said "during the partition period, many Western countries began to reform land tax, abolished serfdom and enfranchised peasants. It also had legal effect on legal ownership relations in Poland, which took various forms and came into force at different times in each partition". The first legal act aimed at initiating the process of unifying the principles of maintaining a cadastre in Poland (in place of the existing cadastres of the partitioners) was the Decree of 1947 on the land and building cadastre. These historical connections encourage comparisons regarding the current functioning of both the cadastre and solutions to other geodetic issues in Poland and Austria.

Another reason to take up the subject of comparing Polish solutions with Austrian ones is the existence of the so-called Legal Boundary Cadastre in Austria, which ensures the "stability and immutability" of cadastral parcels boundaries. This article also focuses on aspects related to parcels boundaries on maps for design purposes and their significance.

In the end result, a comparison of the rules of making maps for design purposes in our country with foreign, i.e., Austrian solutions, will provide guidance as to the recommendation of changes in this area in Poland.

2 Rules of production of maps for design purposes resulting from binding legal regulations in Poland

A map for design purposes is used in the process of securing a permit for construction of a building, engineering structure etc. A plan of development of a parcel for building purposes and also a plan (project) of an underground utility network is based on such map.

As said in Karabin and Karabin (2013), despite the possible utilisation of the map for design purposes to develop designs of various objects, unified regulations are necessary in the course of production of such a map, which do not differentiate the ways of producing such maps depending on the planned investments.

The current regulations also set one unified method of preparing maps for design purposes for various uses. In the current legal status there are no separate rules for preparing such maps depending on the purpose for which they are made. The key aspects related to creating maps for design purposes in Poland will be described below.

2.1 The range of the map for design purposes

A map for design purposes should ensure the appropriate design of objects, and thus enable the designer to take into account the impact of neighbouring objects on the designed objects. In a sense, this provides a complement to the design principles resulting from the provisions of the regulation (Regulation, 2002), which specifies the mutual distances of located objects in relation to the boundaries as well as objects on neighbouring parcels in relation to the cadastral parcel that is the subject of the investment.

In order for these dependencies to be guaranteed, such a map must cover an appropriate area in which the map content should be up to date. Otherwise, the lack of objects on the map caused by the narrowing of the map scope will make it impossible to refer to these objects when designing.

Previous regulations, i.e., Regulation (1995) and Regulation (2011), stated that a map for design purposes should cover the investment site, as well as the area surrounding the investment site, within a buffer of at least 30 metres and if required, an establishment of a protection zone and the area of that zone. Currently, following the Regulation (2020): A map for design purposes is made for the area indicated in the application for surveying works, including the area necessary for the preparation of project documentation.

In practice, for the sake of simplification, many surveyors assume the area range of the map for design purposes with a 30 m buffer. Otherwise, this scope should be agreed with the designer; however, not always at the stage of commissioning such work is this specialist selected. This range indirectly determines the amount of work to be done for the surveyor.

This is due to the fact that such a map contains the content of the so called base map in its basic extent. Now the catalogue of objects presented on the base map is regulated by Regulation (2021a) and includes 169 various elements of the map content. In order to ensure that the content of the basic map is up-to-date, supplementary measurements are required in the area indicated in the application for surveying works, i.e., in the entire area including a possible buffer. This aspect will be illustrated with the example of a case study for the object no. 1 in Section 3.

2.2 The content of the map for design purposes - elements of the spatial development plan and "additional objects"

The content of the map for design purposes is the terrain details constituting the content of the base map, location of high greenery with an indication of natural monuments, as well as other details specified by the designer or investor, other field elements and information, including linear measurements (Regulation, 2020). The content and scale of the map for design purposes is adjusted to the type and size of the construction project (Regulation, 2020).

According the Regulation (2020), to prepare a map for design purposes, the surveyor uses: materials provided by the district geodetic and cartographic resource, the results of field surveying, planning documentation, other documents or information concerning the area of the planned construction project or neighbouring areas, if they are relevant to the construction project.

Previous regulation (not binding anymore), i.e., Regulation (1995), was more precise in terms of specification of the content of the map for design purposes.

The Regulation (1995) constituted that the content of the map

for design purposes, apart from elements of the base map content together with the boundaries of parcels, should include:

- surveyed and calculated, or calculated lines which delimit areas of various designations, lines of land development, axes of streets, roads etc, if they have been set in the local physical management plan or in the decision concerning building conditions and land management,
- location of high greenery components together with the protected natural features,
- location of other objects and details pointed by the designer, according to the objectives of performed works.

A problem connected with the above regulation, stressed in Karabin and Karabin (2013) was the lack of integration of the base map and the local physical management plans and the lack of lines (surveyed and calculated, or calculated), which delimit areas of various designations of land in local development plans. Those aspects will be illustrated with the example of a case study for objects no. 5 and 6 in Section 3.

The previous regulation (Regulation, 2011) also stipulated that on a map for design purposes, within the boundaries of the planned construction investment, land encumbered with land easements disclosed in the land register is distinguished with a brown dashed line and a brief description of the content or method of exercising these easements is provided. At the same time, the regulation (Regulation, 2011) allowed such a map to be made without determining encumbrances (easements), but obliged the licensed surveyor to include relevant information on this matter on the map. The current regulations (Regulation, 2020) do not provide guidelines for the inclusion of such information, but the existence of easements must undoubtedly be taken into account in the design process.

2.3 The content of the map for design purposes – boundaries of cadastral parcels

According to Regulation (2020), if the construction plan provides for the location of buildings at a distance of less than or equal to 4 m or other engineering structures at a distance of less than or equal to 3 m from the property boundary, and there is no data in the resources specifying the location of the boundary points of this boundary with the accuracy appropriate for field details of group I (objects), the contractor determines the location of these points by way of measurement preceded by the procedure of setting the boundary. Geodetic measurement in the case of field details of group I is performed in a way that ensures the determination of the position of field elements (objects) in relation to points in the horizontal state geodetic reference network or control point network set by licensed surveyor, with an accuracy of no less than 0.10 m.

The key problem that emerges here is the fact that designers and also architectural and construction authorities do not respect the fact that the boundaries shown on maps for design purposes do not meet strict accuracy criteria (often data from the vectorization of old cadastral maps) and so there are related frequent situations in which such a map was used in a manner inconsistent with the regulations, and when objects are designed close to the boundaries at a distance of 3 m (construction objects, including land utilities) or 4 m (construction objects constituting buildings).

In the publication, Kowalczyk (2020) raised the issue of licensed surveyors placing appropriate clauses on maps for design purposes and pointed to the need for a licensed surveyor to document the fact of informing the investor and designer about the quality of data concerning boundaries and the possible scope of use of a given map. All this is intended to protect the surveyor from liability for improper use of such a map.

According to Regulation (2021b), determining the boundaries of a parcel takes place in accordance with the following criteria (the following sequence of criteria must be followed):

i. The boundaries of the parcels along with the data on boundary's points are determined by a licensed surveyor on the basis of consistent indications of entities, confirmed their consistent statement submitted to the protocol for determining the course of the boundaries of the parcels if the indicated course is not inconsistent with the information contained in the available documents on the course of the established boundaries.
ii. In the case that the competent entities do not submit to the protocol of the boundaries determination of the registration parcels a compatible statement, referred to above, the boundaries of parcels along with the data on boundary points are determined by the licensed surveyor according to the last peaceful state of possession if this state of possession is not inconsistent with the information contained in the available documents specifying the legal status of the land within the boundaries of these parcels.
iii. In the case that the peaceful state of ownership, referred to above, cannot be ascertained or is inconsistent with the information contained in the available documents defining the legal status of the parcel, the course of the boundaries of the parcels including the boundary points is determined by the licensed surveyor after examining the location of the marks and border traces and analysis of all available documents containing relevant information, including statements of the interested parties.

In reality, only the determination of boundaries based on the first criterion constitutes a peaceful state of possession on the day the boundaries are established. However, it does not guarantee that the boundary will remain unchanged. As this is not an administrative procedure, it is possible to initiate a demarcation procedure conducted by a municipal authority or to establish the boundaries in court which is regulated in Act (1989).

The key problem for this issue is the method of notifying the parties about the activities of determining the boundaries and the related low turnout on the ground, which practically prevents the application of both the first criterion for determining the boundaries (agreed indication of the parties) and the second criterion (peaceful state of possession – the surveyor will not determine such a state without the presence of the parties in the field) (see also Karabin and Łuczyński 2024). The problems of the parties' presence on the ground during border activities were pointed out by Karabin and Łuczyński (2024). After the authors examined 50 border procedures in which the parties were notified about the activities on the land (owners or occupants of neighbouring properties), Karabin and Łuczyński (2024) presented the following statistics:

- in 1 out of 50 cases (2%), all notified persons appeared on the ground,
- in 2 out of 50 cases (4%) no notified person appeared on the ground,
- in 14 out of 50 cases (28%), more than 50% of the notified people appeared on the ground,
- in 28 out of 50 cases (56%), no more than 33% of the notified persons appeared on the land,
- out of a total of 466 notifications, 158 people appeared on the ground, which is 34%.

This "boundary" aspect will be illustrated with the example of a case study for objects no. 2, 3 and 4 in Section 3.

3 Maps for design purposes – case studies

3.1 Research object no. 1

In this case, the licensed surveyor prepared a map for design purposes for a parcel intended for the construction of a residential building (see Figure 1). An important element of this work is to determine the map range so that it also includes buildings and other

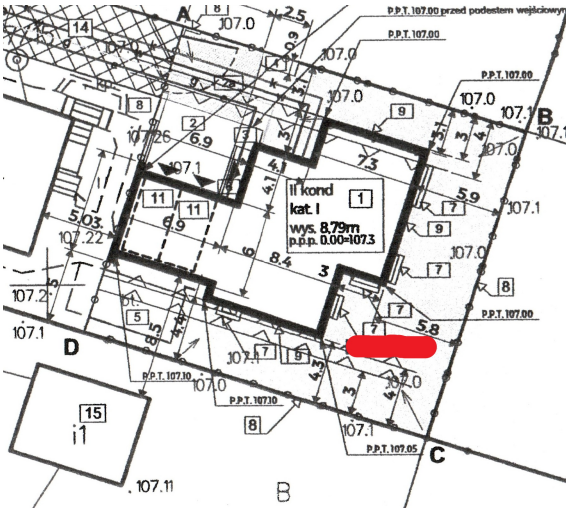


Figure 1. Research object no. 1: Land development plan prepared on the basis of a map for design purposes (Source: author's own research)

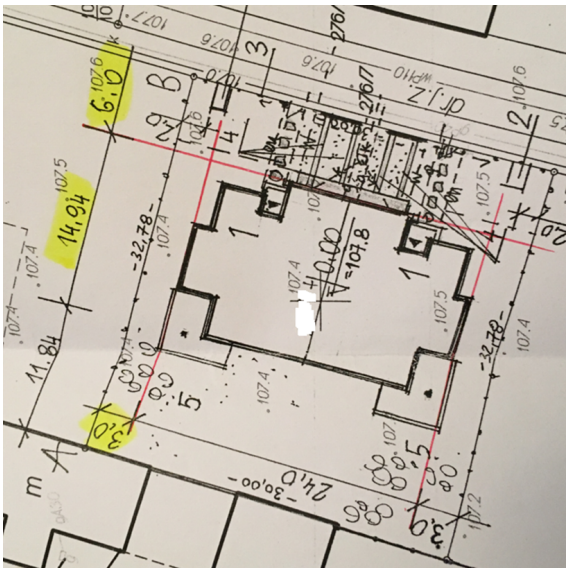


Figure 2. Research object no. 2: Land development plan prepared on the basis of a map for design purposes (Source: author's own research)

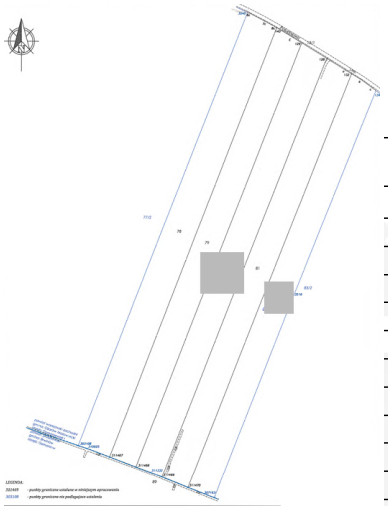
elements important for the design on the neighbouring parcel, because legal regulations impose not only specific distances of the designed buildings in relation to the parcel boundaries, but also in relation to buildings and other objects on neighbouring parcels. If a surveyor determined the scope of the map for design purposes to not include such objects, such buildings/objects would not be included on the map for design purposes either, and therefore the designer would be at risk of making a design error - he would assume that the neighbouring parcel is undeveloped. In this case, in addition to maintaining the standard distance of the designed building from the parcel of 4 m for a wall with windows, it was also necessary, due to fire regulations to maintain a minimum distance of 8 m from the building on the neighbouring parcel (marked on map with "nr 15" and "i1").

3.2 Research object no. 2

In this case, the surveyor prepared a map for design purposes for the construction of a two-unit residential building (see Figure 2). In the case of this investment, data regarding the parcel boundaries were important because the investor intended to use the parcel's potential to the maximum. This use was to design the building (individual project) in such a way as to use the entire width of the parcel for construction. The investor wanted the designed building to be at the maximum permissible distance allowed by law, i.e. for the location of a building with a wall without door openings and windows, it is a distance of at least 3 m from the boundary of the neighbouring parcel (see Regulation 2002).

3.3 Research object no. 3

In this case, the licensed surveyor prepared a map for design purposes for cadastral parcels with numbers: 78, 79, 80, 81, 82, 85/1 (see Figure 3). Due to the lack of documentation allowing for unambiguous reconstruction of the course of the parcels' boundaries and location of boundary points with the appropriate accuracy of measurement, the surveyor decided, in accordance with the legal regulations, to take action to determine the boundaries. That accuracy is set by paragraph 16 of Regulation (2020), which specifies that the geodetic situational survey is performed in a way that ensures the determination of the location of the terrain detail in relation to the points of the horizontal geodetic or control point network, with an accuracy of no less than 0.10 m – in the case of



Boundary point identifier	deviation	
	dx	dy
129	1,74	-0,19
128	0,49	-2,82
311467	0,11	-0,30
140	2,21	0,11
311468	0,24	-0,64
3371	0,00	0,00
311470	-0,14	0,35
132	-0,82	-2,76
309650	0,85	-1,76
311469	-0,27	0,69

Figure 3. Research object no. 3 (Source: author's own research)

field details included in group I. Boundary points and marks are included in this group.

These cadastral parcels were to be used for the implementation of construction projects (construction of buildings). The figure below shows the result of comparing the coordinates of boundary points previously disclosed in the cadastral database and the coordinates established as part of the work. Deviations occurred even at a level exceeding 2.5 meters, so this example shows what differences in the geometric position of boundaries we can deal with in the case of drawing up maps for design purposes.

3.4 Research object no. 4

For test object no. 4, the subject of the surveying work was to create a map for design purposes in order to design the expansion of existing buildings on the parcel (see Figure 4). The boundaries revealed in the cadastre were undetermined and did not meet the accuracy criteria (they came from the digitization of old cadastral maps). The boundary lines intersected the buildings existing on the subject parcel since the 1960s.

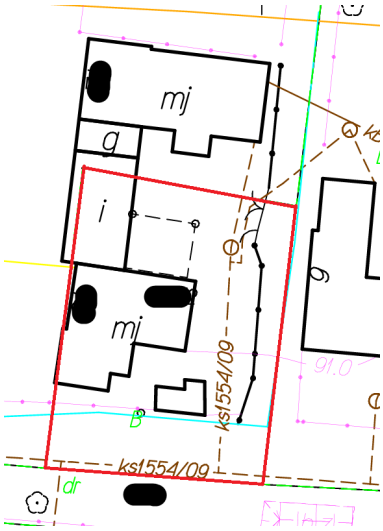


Figure 4. Research object no. 4: Base map before boundary fixing procedure (marked in red) (Source: author's own research)

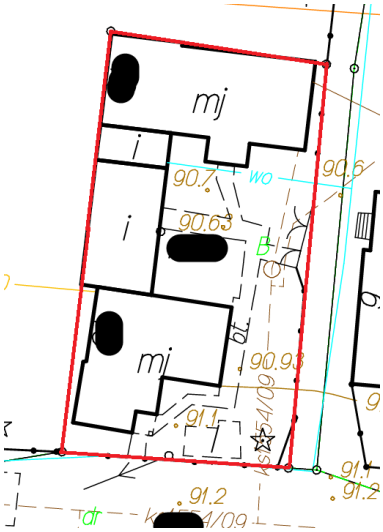


Figure 5. Research object no. 4: Base map after boundary fixing procedure (marked in red) (Source: author's own research)

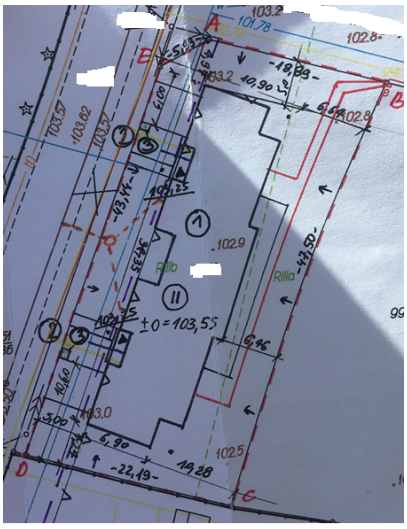


Figure 6. Research object no. 5: Land development plan prepared on the basis of a map for design purposes with incorrect impassable building setback line (Source: author's own research)

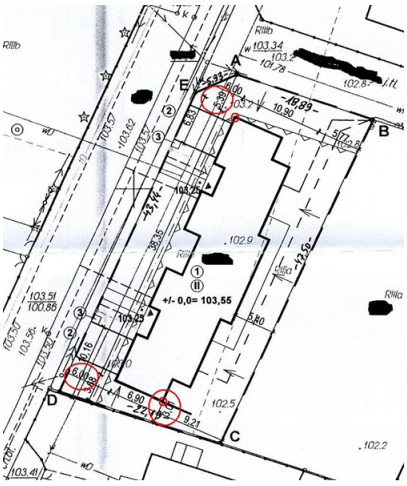


Figure 7. Research object no. 5: Land development plan prepared on the basis of a map for design purposes with correct impassable building setback lines (Source: author's own research)

After analysing the available documentation, including maps constituting an annex to the court's ruling on the acquisition of ownership of the parcel through adverse possession, the boundaries shown in this documentation were reconstructed and the parcel's boundary points were designated. The effect of the activities related to carrying out appropriate border activities is visible on the map in Figure 5. The buildings could colloquially be said to have "returned to the area of the original parcel" and the new owner of the parcel (the client), who had no knowledge of the legal scope of the ownership right to the parcel, gained certainty of future investment activities through their reconstruction in the field and reporting in the cadastre.

3.5 Research object no. 5

In relation to research object no. 5, a licensed surveyor made a map for design purposes (see Figure 6). At the stage of making the map, information on the impassable building setback lines, which were designated by the local spatial development plan, was not supplemented. These lines were incorrectly transferred from the local plan to the map for design purposes by the designer. During the geodetic calculation of the land development project, which was created on the basis of this map, it turned out that the designer did not take this line into account in the scope of the boundary sections marked with letters E-A, A-B (see Figure 6). As a result of the calculations necessary to perform before marking out the building in the field, it turned out that the north-west corner of the building exceeded this line.

In order for the building to be correctly located on the parcel, it was necessary to correctly reproduce the impassable building setback line established in the local development plan, which is located 5 meters from all sections of the parcel boundary adjacent to existing streets (see Figure 7) – the boundary sections marked with the letters D-E, E-A, A-B.

Such a necessary "correction" resulted in the necessity to change the location of the designed building and "move" it into the parcel by 1 meter (see the designed distance of 5 meters in Figure 6 versus the designed distance of 6 meters in Figure 7).

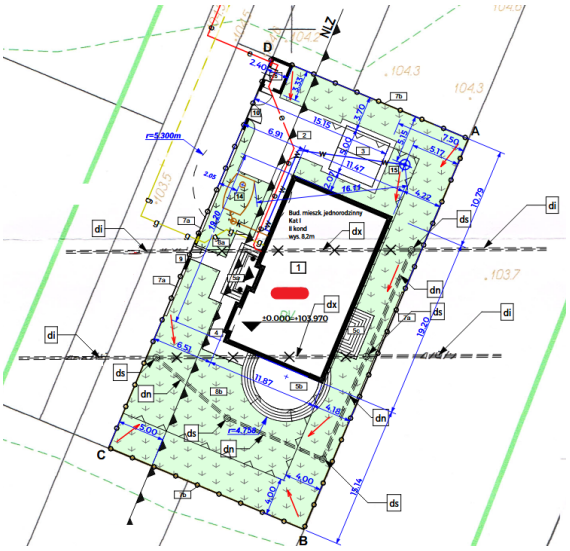


Figure 8. Research object no. 6: Land development plan prepared on the basis of a map for design purposes with drainage network lines (Source: author's own research)

3.6 Research object no. 6

The last research object presents the issue of drainage networks, which were implemented in the 1960s and 1970s. The course of these networks was not inventoried and is not included in the databases of the state geodetic and cartographic resources. The resources of the State Enterprise "Wody Polskie" contain "executive" designs of these networks and they should be taken into account when designing construction objects.

Figure 8 showing the development plan for the parcel, including the construction of a building, which is prepared on the basis of a map for design purposes, shows the existing drainage network (dashed parallel lines marked with the symbol "di"). The same symbol (dashed parallel lines) with the symbols "dh", "dn", "ds" – marks the designed connection of the drainage network after it has been interrupted in the section where it collides with the designed building.

Failure to include this information on the map for design purposes could result in the destruction of the drainage network and irreversible consequences for the parcel where the break would occur – its flooding. It should be noted that such drainage networks often collect excess water from very large complexes of agricultural fields.

4 Rules of production of maps for design purposes resulting from binding legal regulations in Austria

In the 19th century, Poland came under the rule of three invaders: Prussia, Russia and Austria. Each of them introduced their own laws and administrative systems, which also concerned both the cadastre and broadly understood geodesy. As Mika (2010) said "during the partition period, many Western countries began to reform land tax, abolish serfdom and enfranchised peasants. It also had legal effect on ownership legal relations in Poland, which took various forms and came into force at different times in each partition". The first legal act aimed at initiating the process of unifying the principles of maintaining a cadastre in Poland (in place of the existing cadastres of the partitioners) was the Decree of 1947 on the land and building cadastre. These historical connections encourage comparisons regarding the current functioning of both the cadastre and solutions to other geodetic issues in Poland and Austria.

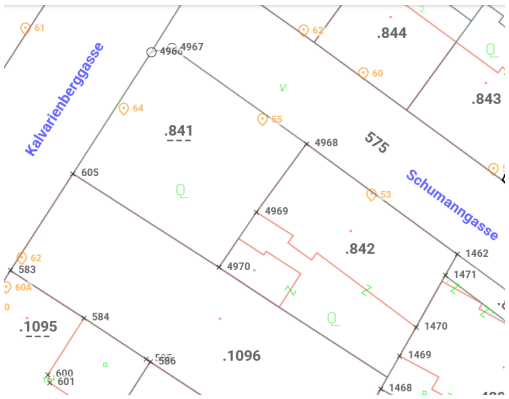


Figure 9. Austrian Cadastral Map (Source: https://portal.bev.gv.at)

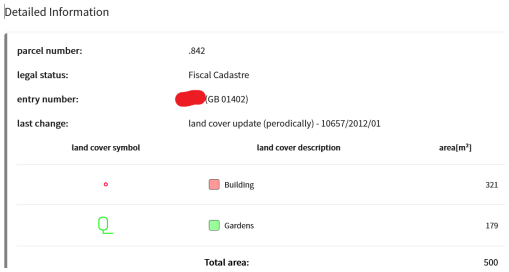


Figure 10. Information about parcel no. 842 (Source: https://portal.bev.gv.at)

4.1 Maps for design purposes in Austria – general information

Maps for design purposes in Austria are prepared by Land Surveyors. No professional license is required for this type of surveying work. However, there are situations in which the authorities issuing building permits, i.e., municipalities, in accordance with their local regulations, require the parcels being the subject of the project to be entered into the so-called legal boundary cadastre, and this activity requires the surveyor to have a professional license. This is due to the fact that work related to the boundaries of the cadastral parcels (determination of boundaries, designation of boundaries, division of real estate) in Austria is carried out only by licensed surveyors. For example, outside Vienna, such requirements are imposed on investors by neighbouring municipalities.

The content of the map for design purposes is not precisely defined on a national scale (national regulation). Therefore, the architect who is to prepare a construction project, which includes the land development project decides which elements of this project constitute the content of the documentation ordered from the surveyor. In addition to that, individual communes determine the scope, not so much of the content of the map for design purposes as the detailed content of the construction plan, the so-called "Bauplane".

Surveyors draw up so-called "Aktuelle Lage- und Höhenplänen" an individual study. In Austria, there is no equivalent of the Polish basic map, kept by state or local administration bodies. Only government administration bodies operating on the basis of special administration keep the real estate cadastre register. The central authority is BEV and it has 41 cadastral offices evenly distributed throughout Austria.

In principle, land surveyors can download the cadastral map from the BEV (Bundesamt für Eich- und Vermessungswesen) portal (https://portal.bev.gv.at) (see Figure 9) and supplement it with the elements necessary for the project (see Figures 10 and 11).

A map for design purposes is usually a compilation of Karabin

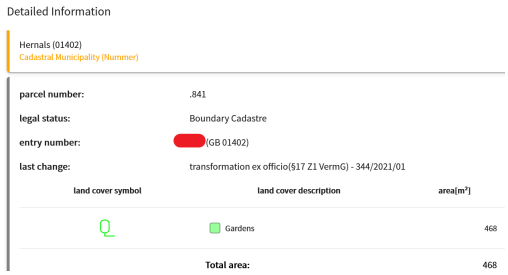


Figure 11. Information about parcel no. 841 (Source: https://portal.bev.gv.at)

(2019):

- cadastral data obtained from the cadastral office (the content of the cadastral map along with the boundaries of parcels, numbers of parcels, marking of boundary points, boundaries of different types of land use),
- layers with data on underground and above-ground infrastructure devices obtained from enterprises, the so-called industry or if a given city runs map portals in this area – from these portals (an example is the map of sewage systems in Vienna – portal https://kanis.at),
- topographic elements to the extent agreed with the designer, standard buildings, fences, high points, trees with their perimeters calculated at a height of 1 m,
- ownership data for neighbouring parcels in a strip of 20 m from the boundaries of the parcel on which the investment will be implemented (name, surname of the owner, address of residence, parcel number and designation of parcel in land register).

For example, according to the building regulations for Vienna i.e., BO für Wien (2021), construction plans must include: a site plan showing the parcels for development, their numbers, numbers of parcels in land register, names and addresses of all their owners, dimensions of the parcel, heights of the land on which the development is to be implemented and adjacent communication areas, in addition, adjacent parcels, including their numbers, designation of parcels in land register, names and addresses of all their owners, adjacent communication areas, trees, sidewalks, hydrants, poles.

A fragment of a map for design purposes in Austria is presented in Figure 12.

Personal data of parcels' owners and land register numbers have been removed from the attached map. The map is limited in terms of area to the parcel where the investment will be planned, the road strip to which the parcel is adjacent, and in this area, in addition to the parcel boundaries, the map is supplemented with topographic elements. These topographic elements are: buildings, fences, heights of the terrain and upper parts of fence foundations, above-ground elements of the land utilities network (water gates, sewage covers).

It is important that the surveyor is not responsible for the data collected from industry institutions in terms of the location of infrastructure devices, height data of cables, and such a clause is included in the map, along with information about the need to verify this data or make opencasts.

With regard to trees - the principles of their measurement are adapted to the requirements of the provisions on the protection of trees, for example in Vienna it is Wiener Baumschutzgesetz (2021), in order to obtain appropriate permits for their felling on the basis of this cartographic material.

4.2 Maps for design purposes in Austria – cadastral parcels boundaries

General information about the Austrian cadastre can be found among others in Schennach (2014) and detailed information about issues of the Legal Boundary Cadastre are described in detail in Lisec and Navratil (2014); Ernst et al. (2019).

Mansberger et al. (2024) emphasize that the legal cadastre is not a separate register, but it is a part of the Austrian cadastral system. The legal boundary cadastre is characterized by the documented agreements of parcel boundaries by neighbours. To date, approximately 18% of all Austrian parcels – predominantly in built-up areas – meet the quality features of the legal cadastre.

Also Karabin and Łuczyński (2024), said that in Austria, the so-called "Legal Boundary Cadastre" is characterized by the fact that after appropriate boundary activities have been carried out on the parcel, in relation to which the owner and the owners of neighbouring parcels have approved the course of the boundaries indicated by the surveyor, they are covered by a specific warranty regarding the boundaries. From the moment the parcel is entered in the Legal Boundary Cadastre, it is not possible to correct/change its boundaries, even if it turns out that some additional documentation has been found, etc.

Entering a parcel into the Legal Boundary Cadastre ensures that those boundaries remain unchanged under any other future procedure. It is a unique solution on the European scale.

In their study, Ernst et al. (2019), quoted the legal regulations in force in Austria: According to §49 of the Surveying Act (Vermessungsgesetz , Surveying Act), a claim based on the boundaries visible in reality cannot be opposed to the party who has acquired a right by relying on the boundaries contained in the Legal Boundary Cadastre. §50 of the Surveying Act (Vermessungsgesetz , Surveying Act) excludes the adverse possession of parts of a property contained in the Legal Boundary Cadastre. This prevents "creeping migration of ownership" and links the Land Register law directly to the boundaries defined in survey documents.

In their study, Ernst et al. (2019) also provided a full list of benefits of entering a parcel into the Legal Boundary Cadastre:

- Boundaries are legally binding and secured.
- The area of the parcel is determined more precisely using the coordinates of boundary points. Nevertheless – as in the Fiscal Cadastre – the area is not legally binding due to technical aspects.
- Adverse possession is not possible for parts of a parcel.
- Confidence in the documentation of boundaries is protected. Natural boundaries deviating from the documented status are irrelevant due to the principle "Paper boundaries are overruling natural boundaries" (e.g. fences, boundary marks).
- The surveying authority carries out the restoration of disputed boundaries by staking out the boundary points based on their coordinates. This technical task replaces the court process.

Mansberger et al. (2024) write that, indeed in case of boundary disputes, the cadastre authority can stake out the boundary of a parcel in the legal boundary cadastre using known coordinates, and the owners do not have to go to court, but in regions with ground movements (landslides), where the boundaries cannot be fixed through coordinates, parcels cannot be transformed to the legal boundary cadastre. As Mansberger et al. (2024) said, in some publications (Fink, 2022; Weber et al., 2022) solutions for such situations are discussed.

Weber et al. (2022) draw attention to the problems associated with directly determining boundary points from coordinates and the dangers associated with it. The reasons for this are due to the development over the centuries and changes in measurement technologies. In connection with this, as they write, there may be inhomogeneities in the local network of control points, which affect the coordinates of boundary points derived from the cadastre system.

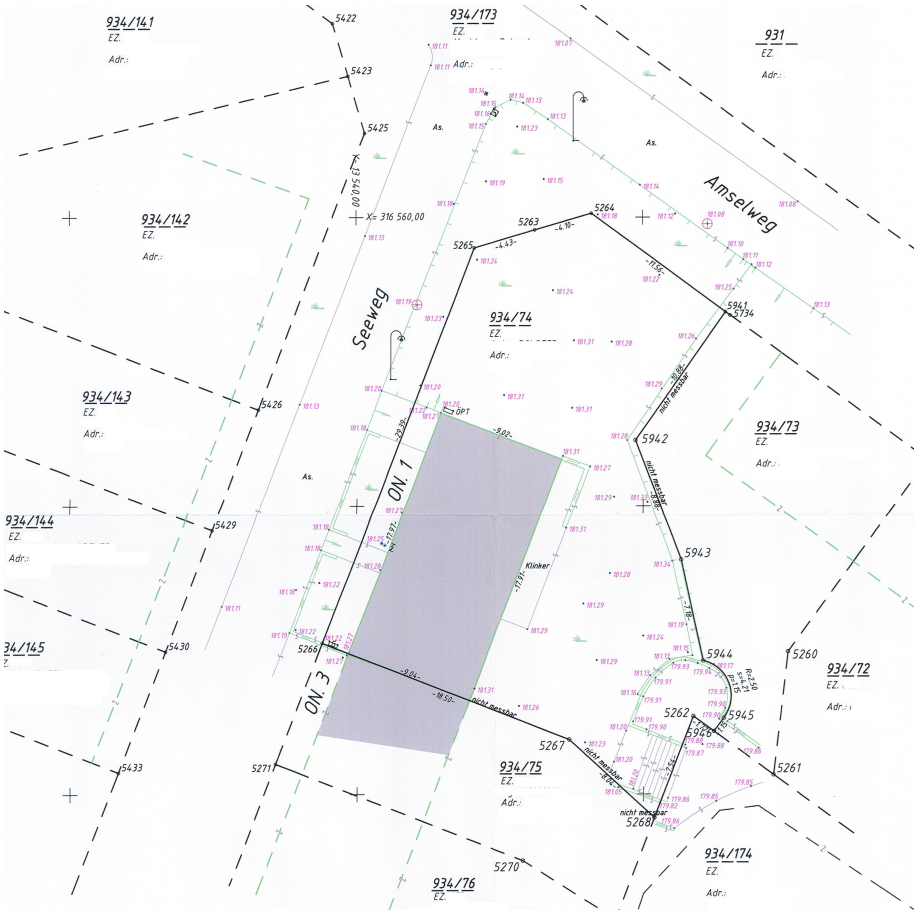


Figure 12. Austrian map for design purposes (Source: prepared by Zivilgeometer Dipl. Ing. Jerzy Szmidt Ingenieurkonsulent fur Vermessungswesen, Perchtoldsdorf, Austria (Karabin, 2019))

Table 1. Maps for design purposes in Poland and Austria – principles of their preparation (Source: author)

Principle	Poland	Austria
Principles of making maps for design purposes regulated at the country level	Yes	No Depends on constructor demands and Commune Building Authority.
Basis for the mapping	Base map includes: cadastral data, utility network data, topographic elements. Maintained at district level. Additionally local land management plans, maintained by communes.	Cadastral data maintained by cadastral offices. Utility networks data - maintained by utility companies. Topographical elements – from individual surveys. Ownership and address data – from cadastre and land register.
Whether parcel boundaries need to be established (fixed)	Yes. In case of buildings designed at a distance of less than or equal to 4 m to the parcel boundary or other construction objects at a distance of less than or equal to 3 m to the parcel boundary.	Yes. In cases when it is required by authorities issuing building permits.
Legal guarantee regarding parcel boundaries	Generally no, except for the conduct of a judicial or administrative property delimitation procedure.	For parcels entered into Legal Boundary Cadastre – full warranty.
Area/range of the map	Agreed with the designer.	Depends on the commune, it usually includes a parcel on which a construction investment will be carried out and an adjacent street lane.
Personal data on maps	No	Yes – for a parcel on which a construction investment will be carried out and for neighbouring parcels.
The map is made under official control for example by state authority	Yes, technical documentation is verified by district authority (District Geodetic and Cartographic Centre)	No control except for the situation in which the cadastral parcel must be entered into the Legal Boundary Cadastre. The inspection covers only the documentation related to the entry of the parcel into the Legal Boundary Cadastre.

Weber et al. (2022) indicate appropriate action scenarios, including transformations, which should prevent errors in determining the correct position of boundary points.

To sum up the benefits as said in Karabin and Łuczyński (2024), in Austria the land owners agree on a boundary and thus all old documentation refers to a boundary that does not exist anymore. This gives the owner certainty as to the location of the boundaries in further processes, in particular investment processes related to the construction of facilities on the parcel (fences, buildings).

The success of this solution lies, on the one hand, in the guaranteed coverage of parcel boundaries, but also in the philosophy of notifying the parties about boundary activities. In Austria, the procedure is aimed at obtaining signatures on the border protocol and is not as formalized as in Poland. The surveyor has the opportunity to verbally inform the parties about the planned activities on the land. These aspects are described in detail in Karabin and Łuczyński (2024).

5 Author's proposal for changes in "rules of preparing maps for design purposes" in Poland

Table 1 summarizes the most important features of maps for design purposes and the principles of their preparation in Poland and Austria.

The author has several proposals regarding the principles of creating maps for design purposes. The first and most important change for Poland is the full State's guarantee of the boundaries of parcels, which were subject to the determination procedure, as is the case with the Austrian Legal Boundary Cadastre. In Poland, the main elements of the development of a parcel are designed in relation to the boundaries of the parcel on which they are to be built. This applies primarily to buildings, as well as other construction objects, such as underground utilities, water wells, tanks for liquid waste (septic tanks) and others. Only covering the boundaries of the parcel with a guarantee of the unchanging nature of its location – guarantees the security of the investment. Issues related to boundaries should be verified by the authority responsible for the building permit. In Austria, by using separate designations for parcels registered in the legal boundary cadastre, this is not necessary, because the authority responsible for the building permit decision knows what parcel they are dealing with.

The second group of proposals is to enable the selection of both the area scope and the map for design purposes content, making them dependent on the specific needs of the project. In the example provided (Austrian map), the surveyor, in accordance with the arrangements with the designer, did not obtain data on underground elements of the site's utilities, and, characteristically, did not include in the measurement the buildings on the parcels on the other side of the street adjacent to the subject parcel. This was not necessary because these buildings would not constitute a reference to the designed facilities on the subject parcel. In return, the map contains data on the owners of neighbouring properties, who, if they were to become parties to the proceedings for obtaining a building permit, would be identified by name and surname, and their residential address and land register number for the given parcel are also provided.

It is true that in Poland, at present, legal regulations allow for the definition of the area scope of a map for design purposes, but they do not allow for the simultaneous selection of the content of such a map. It is proposed to enable such action, for example, by including the full cadastral content in the scope of boundaries, but not necessarily in the entire scope the full content of topographic databases or land development. Not all elements have an impact on design solutions and this should be an element of the arrangements with the designer. This involves taking full responsibility for the material used by the architect. The surveyor's responsibility rests on the geometric correctness of the map content and its completeness within the scope agreed with the designer. This is how it is done in Austria. The cadastral office is responsible for boundaries' issues, and the surveyor is tasked with determining

the boundaries if the parcel is not entered in the legal boundary cadastre. If the surveyor obtains data on the underground utilities (technical infrastructure) from a professional institution (branch office), the institution is responsible for the correctness of this data. The surveyor is responsible for the correctness of the data obtained as a result of the measurement on topographic objects - they are not collected in any official database and the surveyor obtains them, so to speak, from scratch.

The author does not propose adopting the remaining Austrian solutions, because they interfere with the functioning of the geodetic and cartographic administration in Poland – i.e., competences related to maintaining specific sets of spatial data (database of topographic objects, database of geodetic records of land utilities networks).

6 Summary and final conclusions

As can be seen from the comparison of the principles of making maps for design purposes in both analysed countries, the approaches to their preparation show some similarities.

In Poland, after the change in the regulations, the rules for making these maps came closer to the Austrian solutions in terms of the area (range) of map, which is currently agreed with the designer, which should be considered appropriate.

With regard to the fixing of the boundaries of parcels, the big difference is the effect of the Austrian boundaries procedure. With regard to parcels entered in the Austrian Legal Boundary Cadastre, the boundaries of such parcels cannot be changed in the next procedure – they become fixed and unchanging. This is the most important difference and key issue (stability and immutability of boundaries) when it comes to ensuring the safety of construction investments. It is proposed to adopt similar rules also in Poland.

Technically, the preparation of a map for design purposes will also differ in that there are no centres for geodetic and cartographic documentation in Austria for topographical and infrastructure (utilities) objects, only authorities for cadastral data are set. In Austria, a map for design purposes is a kind of individual study, created by combining the cadastral data with other data sets. Such a study is performed by a surveyor who does not need to have a license, except when the parcel must be entered into the Legal Boundary Cadastre. The results of this work are not subject to any official control and constitute the company's internal documentation. However, such a change (switching to Austrian solutions in Poland) will be difficult to implement in Poland due to the need for significant changes, including organizational ones, and a change in the approach to collecting topographic data and data related to land utilities networks.

Acknowledgements

This paper was co-financed under the research grant of the Warsaw University of Technology supporting the scientific activity in the discipline of Civil Engineering, Geodesy and Transport.

References

Act (1989). Act of May 17, 1989 Geodetic and Cartographic Law. Act. Journal of Laws, 2020, item 2052, Poland.

BO für Wien (2021). Gesamte Rechtsvorschrift für Bauordnung für Wien, Fassung vom 27.09.2021 Langtitel Wiener Stadtentwicklungs-, Stadtplanungs- und Baugesetzbuch. StF.: LGBl. Nr. 11/1930, https://www.ris.bka.gv.at.

Ernst, J., Mansberger, R., Muggenhuber, G., Navratil, G., Ozlberger, S., and Twaroch, C. (2019). The legal boundary cadastre in Austria: A success story? *Geodetski vestnik*, 63(02):234–249, doi:10.15292/geodetski-vestnik.2019.02.234-249.

Felcenloben, D. (2022). Wykładnia normatywnego pojęcia mapy do celów projektowych (Interpretation of the normative concept of a map for design purposes). *Przegląd Geodezyjny*, 1(3):16–22, doi:10.15199/50.2022.3.2.

Felcenloben, D. (2023). *Prace geodezyjne realizowane na potrzeby budownictwa (Surveying works carried out for construction purposes)*. Wolters Kluwer.

Fink, G. (2022). Erstellung eines Leitfadens für Vermessungen in Gebieten mit Bodenbewegungen. Master's thesis, TU Wien.

Kampczyk, A. (2015). Opracowanie map do celów projektowych w aspekcie realizacji inwestycji (The preparation of maps to project aims in aspect of realization of investment). *TTS Technika Transportu Szynowego*, 22(3):40–47.

Karabin, M. (2019). *Marcin Karabin's internship materials at the Zivilgeometer Dipl Ing. Jerzy Szmidt Ingenieurkonsulent fur Vermessungswesen, Perchtoldsdorf, Austria, 09.2019*.

Karabin, M. and Karabin, M. (2013). Maps for design purposes – geodetic and legal aspects. In *Croatian Information Technology Society-GIS Forum*.

Karabin, M. and Łuczyński, R. (2024). The issue of parties' participation in technical activities related to the boundaries of parcels. *Reports on Geodesy and Geoinformatics*, 117(1):21–29, doi:10.2478/rgg-2024-0003.

Karlikowski, K. (2011). Podstawowe zasady i procedury opracowania mapy do celów projektowych (Basic principles and procedures for developing a map for design purposes). *Acta Scientifica Academiae Ostroviensis*, (35–36):131–144.

Kowalczyk, P. (2020). Granica na mapie do celów projektowych (Boundary on the map for design purposes). *Przegląd Geodezyjny*, 92(12):27–30.

Lisec, A. and Navratil, G. (2014). The Austrian land cadastre: from the earliest beginnings to the modern land information system. *Geodetski vestnik*, 58(3):482–516, doi:10.15292/geodetski-vestnik.2014.03.482-516.

Mansberger, R., Ernst, J., Muggenhuber, G., Navratil, G., Twaroch, C., and Unger, E. (2024). The Characteristics of the Austrian Cadastre. *Kart og Plan 2024/2, Årgang 117*, pages 182–190.

Mika, M. (2010). Cadastre history in Poland. *Infrastructure And Ecology Of Rural Areas*, (6):75–85.

Mika, M., Przewięźlikowska, A., and Siejka, M. (2015). Monitoring of the surveying software market with focus on applications used to develop maps for design purposes in the district of Krakow. *Journal of Civil Engineering, Environment and Architecture*, XXXII(62):301–313, doi:10.7862/rb.2015.156.

Puzia, M. and Pietrzak, L. (2021). Krótka opowieść o mapie do celów projektowych (A Brief History of the Design Map). *Przegląd Geodezyjny*, (12):19–22.

Regulation (1995). Regulation of the Minister of Physical Management and Construction of February 21, 1995 on the types and scope of geodetic-and-cartographic works and geodetic operations which are obligatory in construction industry. Act. Journal of Laws, 1995 No. 25, item 133, Poland.

Regulation (2002). Regulation of the Minister of Infrastructure of 12 April 2002 on the technical requirements to be met by buildings and their location. Act. Journal of Laws, 2002 No. 75, item 690, Poland.

Regulation (2011). Regulation of the Ministry for Internal Affairs and Administration of November 9,2011 on technical standards of topographic surveys and on elaboration and transfer of results of such surveys to the state geodetic and cartographic resources. Act. Journal of Laws, 2011 No. 263, item 1572, Poland.

Regulation (2020). Regulation of the Minister of Development of August 18, 2020 on technical standards for performing geodetic surveyings, as well as developing and submitting the results of these surveyings to the state geodetic and cartographic resource. Act. Journal of Laws, 2020, item 1429, Poland.

Regulation (2021a). Regulation of the Minister of Development, Labor and Technology of 23 July 2021 on the database of topographic objects and the base map. Act. Journal of Laws, 2021,

item 1385, Poland.

Regulation (2021b). Regulation of the Minister of Development, Labor and Technology of July 27, 2021 on the cadastre. Act. Journal of Laws, 2021, item 1390 (as amended), Poland.

Schennach, G. (2014). Cadastral template – a country report for Austria. Technical report, International Federation of Surveyors (FIG).

Vermessungsgesetz (Surveying Act) (1968). Bundesgesetz über die Landesvermessung und den Grenzkataster (VermG). BGBl. I No. 306/1968.

Weber, V., Navratil, G., and Blauensteiner, F. (2022). Managing Inhomogeneity in the Control Point Network during Staking Out Cadastral Boundaries in Austria. *ISPRS International Journal of Geo-Information*, 11(5):274, doi:10.3390/ijgi11050274.