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ACHIEVING SPECIAL TOPOGRAPHICAL WORKS CONCERNING THE STAKE OUT OF A ZONAL URBAN PLAN IN PETROASA MARE, TIMIŞ COUNTY

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Abstract – The present paper has as purpose the achieving of topographical and cadastre works in order to achieve an Urban Zonal Plan in Petroasa Mare locality. By definition the urban plan establish specific regulation for a area, part of a urban or rural locality made by lots of parcels and covering functions as: habitation, services, productions, circulations, green zones, public institutions etc. The topo-cadastral works are significant important because they provide the documents that ensure the safety of transactions on the real estate market. The topographical works achieved by using GPS technologies and total station, using GPS Hi-Target V30 and Total station Leica TCR 805. The method use to achieve the measurements was the kinematic method, RTK (Real Time Cinematic). The coordinates obtained from the ETRS 89 were transformed in stereographic 1970 coordinate system, using the software TransDatRO 4.04, given by ANCPI. Data processing was made by the dedicated software Leica Geo Office. The points coordinate were compute in ZWCAD 2015 and later on where use in plans activities.

Keywords: ZUP, approvals, GPS, topo-cadastral works, RTK, AutoCAD.

1. INTRODUCTION

The Zonal Urban Plan (ZUP) has a specific regulation character, detailed for a certain area or locality and ensures the correlation of the urban complex development of the zone with the foresight of General Urban Plan of the locality. Through the Zonal Urban Plan the objectives, actions, priorities, urban regulation, - allowances and restrictions – necessary to be applied on land use and construction conformation is established. The lack of technical regulation for the category of documentation of ZUP, the importance and the frequency of elaboration correlated with the problematic variety of these lead to the necessity of elaborate of specific regulation. The present regulation is the procedural base for the complete and unitary elaboration of a Zonal Urban Plan, useful in case of solving the functional problems of functions from the urban and rural localities. The regulations are useful, in the same manner to the initiators, elaborators, and documentary testers for ZUP. The ZUP having a specific character of regulation for the urban development area of the locality, include coordinate provisions to reach its objectives. ZUP is not investment phase, but a preliminary phase to achieve the investments. As such, these provisions are phased in, depending on the funds made available, but registered in the ZUP provisions. The UPZ can cover all the functional areas of a locality. Depending on the predominant function of the UZP area, the documentation may address the following specific problem categories: Complex functions (central zones or great interest, spa areas, climate or balneary areas planted, leisure, sports etc);

- Habitat functions;
- Productions and storage functions;
- Transport functions;
- Modernization and development of traffic;
- General institution of interest, public and private;
- Confine and protecting the natural patrimony;
- Recovering degraded land;
- Revitalization and complex urban reconstruction;
- Competition, expanding and replacement of the existent construction fund;
- Modernization of technical-municipal networks, including related constructions;
- Making of urban furniture, pedestrian areas.

Main ZUP mentioned may include the areas studied restoration of existing, its development and new objectives. The ZUP's for the protected built areas are delineated and elaborated on the basis of specific technical regulations, according to the "Methodology for the elaboration of the urbanism documentation for protected built-up areas provided for by Law 5/2000".

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2. MATERIAL AND METHODS

Due to the fact that the geodetic network from the interest zone is widely compromised physically and useless a new geodetic network was necessary to be creating in order to execute the topographic works. Therefore, using GPS technologies, GPS Hi-Target V30by the measuring method static postprocesing.

The equipment use for field measurements is GPS HI-TARGET V30 and LEICA TCR 805. The measurements were made using RTK (Real Time Kinematic) method. The ETRS 89 coordinates system has been transformed in stereographic 1970 coordinate system, by using TransDatRO 4.04, software developed and offered by ANCPI.

Data processing has been made by Leica Geo Office software. The points coordinated computed were exported in ZWCAD 2015 software and later were use for achieving the digital plans. The Victor Vlad Delamarina commune is located in the East part of Timiș county, at the border with Caraș Severin county, at a 62 km. distance from Timișoara and at 5 km from Lugoj. The dominant relief is the hill plain. Petroasa Mare (Figure 1) (1924: *Vecehaza*, german *Wetschehausen* Hungarian *Vecsehaza*) is a locality in Timiș county, Banat, Romania. Is part of Victor Vlad Delamarina commune.

Petroasa Mare is located in the South-East part of Timiș county, at 6 km South from Lugoj. The locality is cross by a communal road on North-South direction, that link the village at North with Herendești (4 km) and further with Lugoj, and at South with Visag.

3. RESULTS AND DISCUSSIONS

The documentation and field recognition. Considering the documentation regarding the geodetic state network, planimetric and altimetric, the altimetric network of I-IV range, and the triangulation network points of I-IV range from the Geodetic National Found, and also from the coordinates catalogues of geodetic points compute in the Gauss projecting plan for the nomenclature of maps sheets at scale: 1:100.000: L-34-80, L-34-81, L-34-92, L-34-92 of Topographic Military Department result that in the interest area rezultat că în zona de interest, in evidence there are enough geodetic points.

Figure 1. Petroasa Mare site (*www.google.ro/maps*)

Land Recognition was aimed at identifying geodetic sites and the possibilities for their use for topographical measurements as well as establishing the needs, resources needed to perform fieldwork. Following on-the-spot recognition, the geodetic support network in the area of interest has been largely physically compromised and unusable. The use of GPS technology is ensured by the existence of 4 GNSS stations in the permanent national A-class network, namely: TIM1 (Timișoara), at an average distance of 50 km FAGE (Făget), at an average distance of 36 km , RESI (Resita), at a distance of 37 km and DEVA (DEVA) permanent station from the EUREF network. During the realization of the recognitions, the outline of the area (the buildings that are the subject of the Zonal Urban Plan) and the

elements necessary for the execution of the topographic elevation were established. GPS static observation program was carried out in two days on 33, year 2017 (GPS week - 1882) with the time required using technology required by GPS - GPS receivers Hi-Target V30.

Working sessions for observations using GPS technology have been planned using the MISSION PLANNING utility (GNSS Planning http://www.spectraprecision.com/fra/support/gnss-planning.html) The location for which the observations were planned is GPS - 45.5885° N, 22.8952°E, from the Petroasa Mare locality (Figure 2).

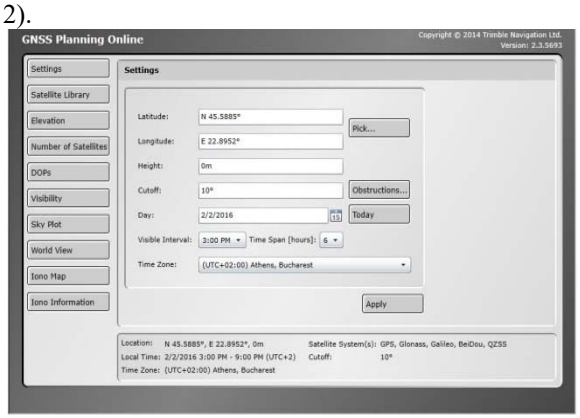


Figure 2. Establishing the location for static observation with GPS

The time of the beginning and ending for the GPS observations was establish so that the following conditions to be accomplished:

- the value of the general accuracy factor GDOP to be less than 3 (and the standard deviation of PDOP position to be less or equal with 2);
- the maximum number of satellites visible from the location up mentioned;
- the limit of the elevation angle: 10°;
- recording gap: 5s

Thus based on the data provided by the utility program GNSS Planning the working session were established:

Day 33, year 2017 (GPS week - 1882) – time slot 16.00-20.20 (Figure 3).

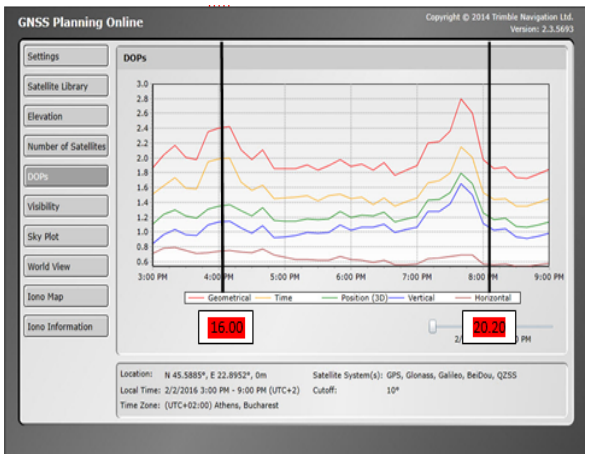


Figure 3. Establishing the the working sesionfor day 33, year 2017

The number of satellites for the chose time slot: day 33, year 2017 (GPS week - 1882) - time slot 16.00-20.20 (Figure 4).

To process GPS observations and to determine the coordinates of new points in the ETRS 89 system, the GNSS SOLUTIONS integrated environment has been used, which has input data for the navigation and observation files corresponding to each stationary point.

For each of the points use for the GPS observations were drawn observations sheets (sample for one point in Figure 5)

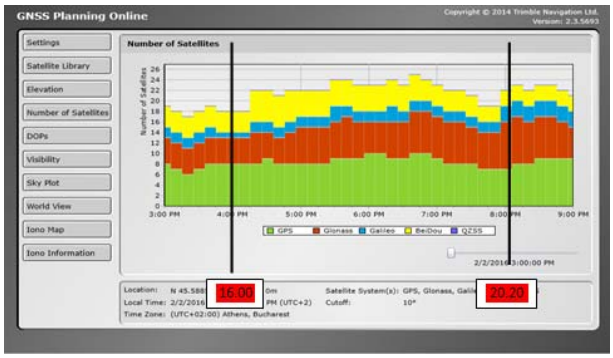


Figure 4. Establishing the working session for the day 33, year 2017

FISA OBSERVATII-PUNCTUL DE STAȚIE : ST100

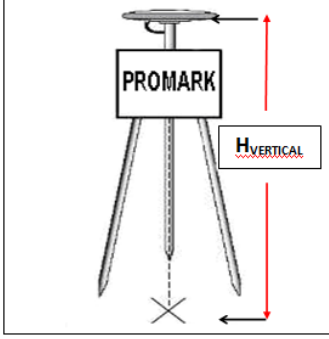
GPS OBSERVATII	Rețea de indesire		OPERATOR(I):	Ing. Barliba Costel	
Instituția:			Echipa:	1	
Nume proiect:	Determinări GPS		Data:	02.02.2017	
Nume stație:	ST100		Zi din an:	33	
Identificator (4 caractere) ID:	ST100		Sesiune de obs.:	1	
Nr. tija (centrare forțata):	TREPIED				
Nume fișier(e) în receptor:	G0100E16.033				
Nume fișier obs. descărcat:	Q0100e16.033		Metoda de arhivare:	Ashtech	
Tip receptor:	GPS Hi-Target V30		Nr. serial receptor:	01204701155748	
Tip Antena:	ASH111661		Nr. serial antena:	200725126	
Sursa alimentare:	interna		Lungime cablu antena:	1.58m	
Unghi elevație:	15°		Interval de înregistrare:	5 s	
Perioada înreg.:	Start time: 17.15 (local) (UTC)		End time:	18:33 (local) (UTC)	
Înălțime verticala: 1.41 m			Obs. Range: lungimea maximă a liniei de bază care poate fi determinată în mod precis prin post-procesare : 55 Km		
Început măsurători:	1.41 m				
Sfârșit măsurători:	1.41m				
Schița instalării receptorului/antenei și descrierea modului de măsurare a înălțimii antenei – GPS Hi-Target V30			Observații:		
			Measure Type No. Epoch: Durata:	L1/L2 GPS/WAAS 950 1h 18 min	

Figure 5 Observation sheet for point ST_{100}

The WGS-84 control (ETRS 89) was achieved by linking GPS points of interest to the GPS stations of the national network of Class A: RESI, TIM1, FAGE. For the day 33, year 2017 the measuring method to determine the points coordinate from the points network was static method.

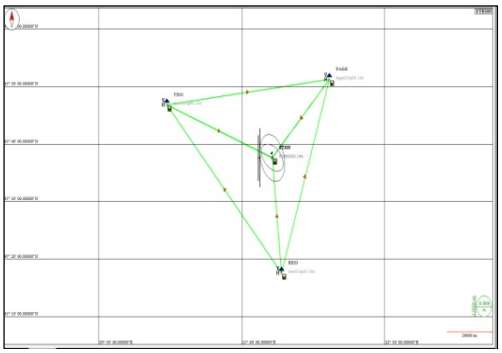


Figure 6. Vectors draft for day 33, year 2017

After processing and adjusting (netting) the network for static GPS observations - using the option of "Import Process and Adjust" environment of processing and offer the following graphic data – vectors draft - by Survey View Map – for the points ST_{100} si ST_{200} (Figure 6)

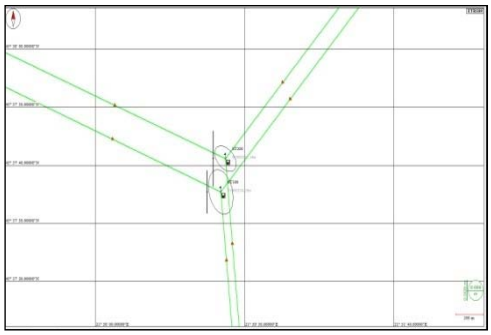


Figure 7. Vectors draft for day 33, year 2017
ST_{100}, ST_{200}

The GPS report processing environment for ST_{100} and ST200 provides information defining the results of procesing the measured vectors (relative coordinates and component precision indicators), compensate coordinates of points and precisions. The coordinate transformations from the ETRS 89 system in the national reference system - 1970 stereographic projection system were performed through the TransDatRO 4.04 transformation program available on the A.N.C.P.I. site (table 1)
For the day 33 year 2017 was obtained:

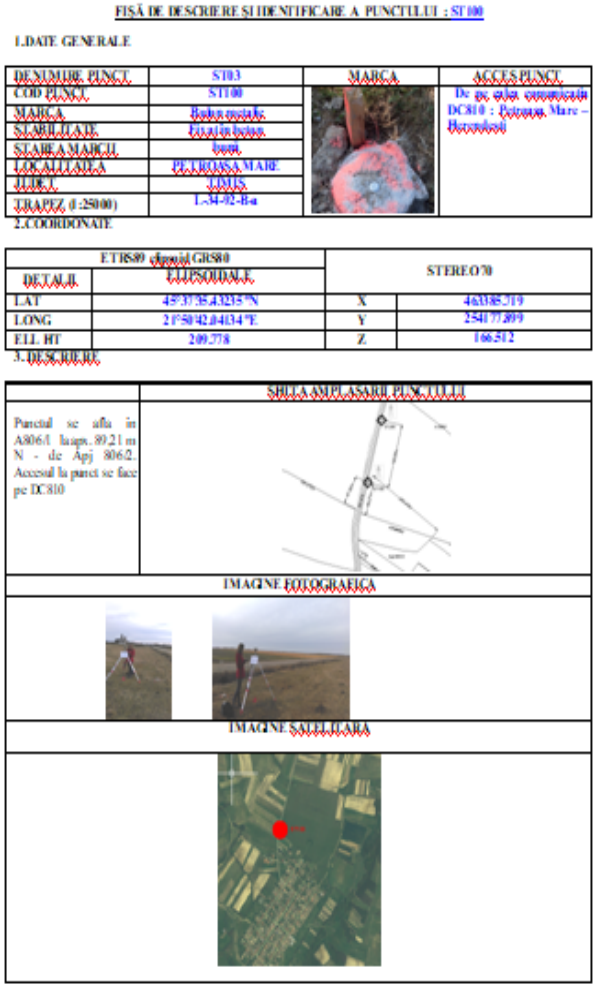
Table 1.Coordinates transformation for the 265 day

Point nr.	ETRS 89 coordinates		
	Latitude	Longitude	Elipsoid height
ST100	45°37'35.43133"N	21°50'42.04033"E	209.997
	Stereo 70 coordinates		
	X(m)	Y(m)	Z(m)
	463385.689	254177.876	166.731
ST200	Coordonate ETRS 89		
	Latitude	Longitude	Elipsoid height
	45°37'41.15998"N	21°50'43.60163"E	209.327
	Coordonate ETRS 89		
	X(m)	Y(m)	Z(m)
	463561.102	254218.658	166.065

At the same time, there were written descriptions and observations for each station (Figure 8.).

The execution of the topographical papers for the elaboration of the topographical support for the elaboration of the Urban Zonal Plan Petroasa Mare, Timis County, was made on the basis of topogeodetic measurements and the documents made available by the Petroasa Mare Town Hall.

The Urban Zonal Plan was achieve in the extravilan of Petroasa Mare locality on the parcels from the Land Registry as follows:
CF 402540 Victor Vlad Delamarina – Cadastral number A8802/1/1 , area 15230 m^2
CF 402059 Victor Vlad Delamarina - Cadastral number A806/3, area 14800 m^2.
CF 402061 Victor Vlad Delamarina - Cadastral number A 806/2, area 9495 m^2.
CF 402560 Victor Vlad Delamarina - Cadastral number 402566, area 132616 m^2.


FIŞĂ DE DESCRIERE ŞI IDENTIFICARE A PUNCTULUI : ST100

1.DATE GENERALE

DENUMIRE PUNCT	ST03	MARCA	ACCES PUNCT
COD PUNCT	ST100		
MARCA			
STAREA TERENULUI			
STAREA MARCII			
LOCALITATEA	PETROŞA MARE		
JUDEŢ	TIMIŞ		
TRAPEZ (1:25000)	L-34-92-B-a		

2.COORDONATE

ETRS89 (Sistem GRS80)		STEREO 70	
DETALII	ELIPSOIDALE		
LAT	45°37'35.43215"N	X	463385.719
LONG	21°50'42.04034"E	Y	254177.899
ELL HT	209.778	Z	166.512

3. DESCRIERE

SCHIŢA AMPLASARII PUNCTULUI

Punctul se afla in A806/1 la aprx. 89.21 m N - de Apj 806/2. Accesul la punct se face pe DC810

IMAGINE FOTOGRAFICA

IMAGINE SATELITARA

Figure 8. The identification and description chart

The work was carried out in the stereographic projection system 1970, using the tumbling method and tachymetry. In the field phase, having station point at ST100 and ST200, the planimetric and altimetric detail elements were measured.
The operations were performed using the Leica TCR 805 total station, which performs computerized data collection and processing, using electronic distance readings with an accuracy of ± 2 mm per 1 km in any season within the range of -20 ... + 50 grade C and with a precision of 5^{cc} reading.

At the office stage we processed the data - according to the field card - using the specific work programs (Toposys). The points computed coordinate were implemented in ZWCAD 2015, then the plan was achieve according to 700 ANCPI Order.

The measurements data processing, was effectuated by using the field chart downloaded from Leica TCR 805.

In order to ensure the consistency of the implementation of the approved Petroasa Zoning Urban Plan, it is necessary to join the parcels registered in CF 402540 V.V.DELAMARINA - Cadastral number A8802/1/1 area 15230 m^2, CF 402059 V.V.DELAMARINA - Cadastral number A806/3 area 14800 m^2, CF 402061 V.V.DELAMARINA – Cadastral number A 806/2 area 9495 m^2 and CF 4025600 V.V.DELAMARINA - Cadastral number 402566 area 132616 m^2.

Joining the parcels is imposed by the foresight of the ZUP. The joining of the parcels is shown in Figure 9

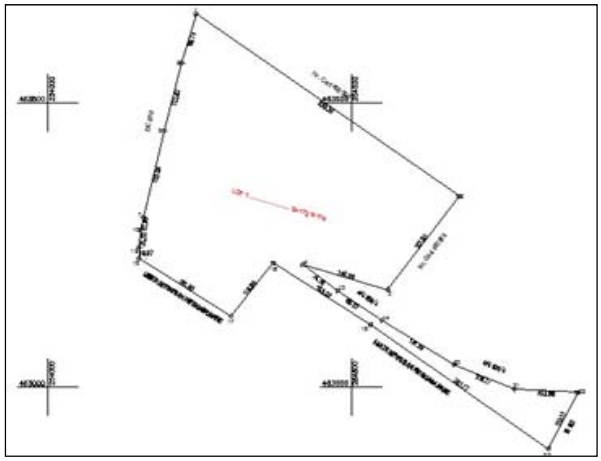


Figure 9. Location and delimitation plan of the estate resulting from the affixing

Implementation of the Petroasa Mare ZUP requires that the cadastral landfill operation be carried out on the estates with the destinations and the categories of use provided in the urban zonal plan.

In the first phase of applying for the ZUP Petroasa Mare in field was materialized the lot nr.3 (figure 10) destinated for the independent economical activities and storage. The field materialization was done by using the total station Leica TCR 805, station that ensure the distance measuring with an accuracy of ±5 mm / 1 km, no matter the season in limits of –20 ...+50 ºC and an angle precision of de 5^{cc}.

Staking out the points that define the estate position with cadastral number 402786 was done by rectangular coordinates method according to the stake out plan. (Figure 11).

Known data:

1. Rectangular coordinates of the station points in the stereographic system 1970. (Table 2):

Table 2. Station points coordinates

STATION	X[m]	Y[m]	Z_{MN}
ST_{100}	463385.689	254177.876	166.731
ST_{200}	463561.102	254218.658	166.065

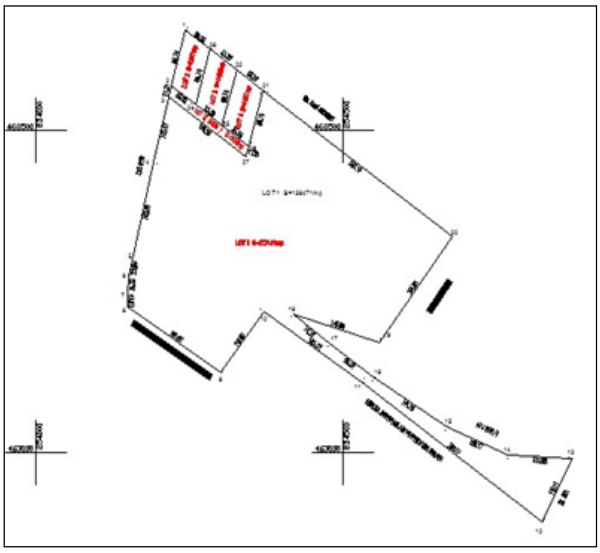


Figure 10. Site and delimitation plan of the estate with a proposal of detachment

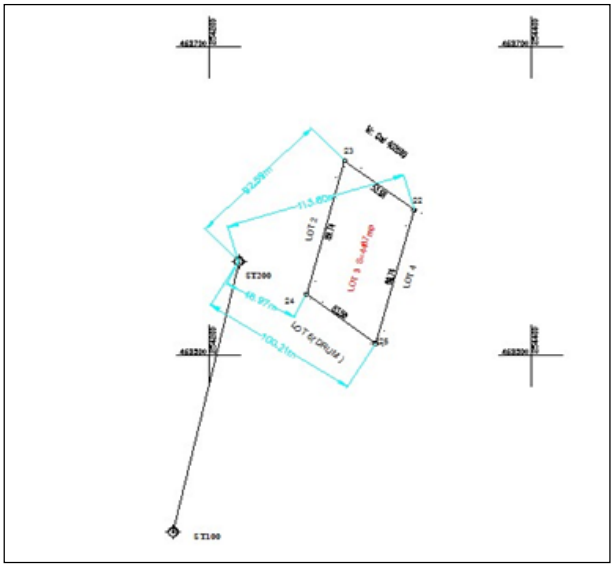


Figure 11. Location and delimitation plan estate lot nr.3 and stake out plan

Rectangular coordinates of the estate with the cadastral number 402786 in the stereographic system 1970. (table 3). The Leica TCR 805 Total Station has a complete measuring program with data logging functions and parameter setting is provided with a memory management program that allows you to record coordinates and measurements.

Table 3.Estate point coordinates cad. Nr. 402786

Point number	X[m]	Y[m]
22	463594.386	254327.499
23	463626.286	254284.444
24	463539.793	254260.524
25	463507.893	254303.579

To stake out the points, the by the instrument's communication cable we transfers the rectangular

coordinates of estate points and stations to the total station memory.

4. CONCLUSIONS

Through the study, the investment in the area was pursued taking into account the existing elements, the imposed ones, as well as the legislation in force. The area on which the measurements were made is 17.21 ha. Having analyzed the area studied, the Victor Vlad Delamarina commune in Timiş county, it was found that there is an accelerated pace of urban development, from which it is concluded that the modern and precise topographical methods, which underlie these urbanization works, have a very important role in avoiding subsequent overlaps in accurately establishing infrastructure areas, green areas, public service areas and other destinations. It has been proposed by the work, the marking and signaling of the landmarks that formed the basis of the topographical surveys, because the building of the buildings within a ZUP is also staged and for further tracing in the territory, it is very important to keep the same landmark.

Law 86/2014, is an impediment to the homogeneous and balanced linear development of urban areas, which complements the OUG 34/2013 (the Law on Pastures), obstructing the continuation of development in areas with pasture land use and proposing a coherent analysis for each in particular, in particular, where there are isolated situations with these categories of use. Another important aspect related to the areas with a pronounced urban development character is the development of the water-canal infrastructure, which, besides the complexity of the topography and cadastre works integrated in projects, also requires a unitary thinking such as a master plan level of administrative territory in order to avoid further malfunctions. Therefore, taking into account the above and the data presented in the project, it is considered that the methods chosen in the project studied by us have been judiciously implemented and can be a fair way of working in other similar projects.

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[12] Ghid privind metodologia de elaborare şi conţinutul-cadru al planului urbanistic zonal;

[13] Legea nr. 7/1996- Cadastru şi publicitatea imobiliară cu modificările şi completările ulterioare;

[14] Legea nr. 350/2001 privind amenajarea teritoriului şi urbanismul.