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ACHIEVING TOPOGRAPHICAL WORKS FOR STAKINGOUT THE MAIN ELEMENTS OF A TROUT FARM

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Abstract - The present paper revealed an area rehabilitation by accessing European Funds, reason that leads to its aquisition, being also a modality for projecting and execution of a trout farm in Târsa locality, Avram Iancu village, Alba county.
This paper, present the gathering and data procesing phases, the elaboration of topographical plans containing specific field objects.
The paper purpose consist in drafting a documentation in order to obtain the Construction Authorization necessary for the investition.
For the topographical works, and also for topographic stakeout the following devices have been used: GPS, Rover GPS Stonex S9, Leica TCR 1200 containing the data transfer software: Data Exchange Manager, AutoDesk – AutoCad.
Keyword: trout farm, topographic stakeout, situation plan.

1. INTRODUCTION

Topography, relying on the geodetical network, must establish the mutual situations between field objects (topographical details) and to represent them on the plans and maps. Topographical detail is any natural and artificial object, on the field and for defining it several characteristic points, named topographic points are use. Topography, comes from the greek words: „topos" (place) și „grafe" (description). [1] This word expresses exactly this notion. In topographical calculations is use elementary mathematics and plane trigonometry without taking into account the curvature of the earth. This allows calculations to be made easier being the main reason to name it „lower geodesy".

Considering the aim of topography, it came to adopting the methods and tools, specific to each branch that request the topographical works considering the natural conditions. [2]

Hydrographic topography is refering to the hydrotechnical works that in addition to determining the position in plan and heights of topographical points from the land has also the purpose to determine the dephts of bed river points, lakes and seas.

The present economical demands impose knowledge according the terestrial measurements in various fields of activity.

The research and study of the local conditions, for choosing the project solution, applying it to the pitch, is made beginning with the topographical works. These works allows the constructions of cross sections, on the specific areas request by the project, making possible to established flooded areas, the sewage network position for draining the water etc.

2. PRESENTATION OF THE AREA STUDIED.

Avram Iancu locality, known under the old name „Vidra de Sus", is a village situated in the Nord-West side of Alba county, along the Arieşul Mic river course at around 30 km from the Câmpeni village.

Because it is a mountain rural site, is has a lower profile considering the habitants its stretching, comparing with an ordinary city or any other rural seating. It contains 33 villages situated on both sides of Ariesul Mic river and of the county road DJ 762. Its population is around 1865 persons.

First documentary certification of Avram Iancu commune was in 1595, in „Privilege" granted by Cristofor Bathory, prince of Transylvania, which renews the act of donation to its homes and lands from Topánfalva (present Campeni city).

Avram Iancu commune, part of Motilor Country, is situated in its Nordic half part, at 30 km. from Câmpeni, considered as the capital of Motilor Country and the confluence of Arieşul Mic river (Râului Mic) with Arieşul Mare river (Râul Mare).

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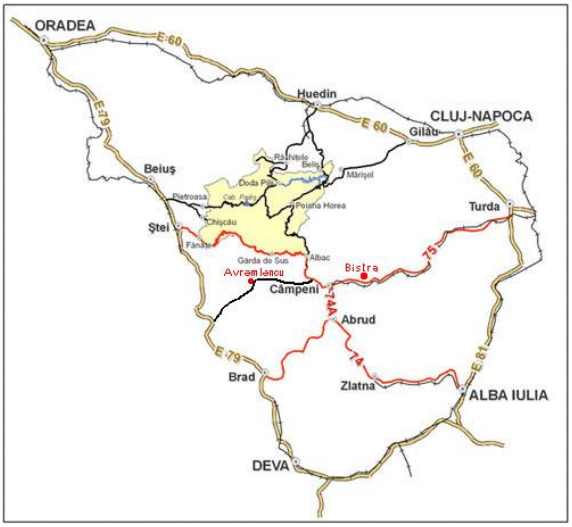

Figure 1. Access of the population towards to main cities

Situated in the North-West part of Alba county, Avram Iancu commune has the South, South-West and West neighborhood as:

- Bulzestii de Sus (Hunedoara County);
- Hălmăgel commune (Arad County);
- Crisciorul de Sus (Bihor County).

The limits with this localities are the boundary of Alba county with the three others counties: Hunedoara, Arad and Bihor.

The sitting of Avram Iancu commune is related to several geographical marks: Aries river and Bihor mountains. Its position in the upper basin of the Arieşului Mic, at 19 km. West of the confluence with Arieşul Mare, in a relatively large intramountain depression, developed at the Arieşului Mic confluence with Vidrişoara and Dobrana valleys, made it to be one of the most important mountain towns, strong related with the Romanian history from Transylvania.

The main area which is take into consideration for the investition is situated in the intravilan area of Târsa, nr. 721, Alba County, is registered in CF 2761 Avram Iancu, on top. nr. 4451/1, 4452/1, 4453/1 in total surface of 4710 mp, having the using category grassland, arable, pastures.

Due to the access to the DJ 721, Târsa locality has a growing urbanistic potential and tends towards sustainable economic development based on natural resources.

The parcel having the surface of 4710 mp has a polygonal shape with trout farm destination by FRDS financing.

Bordering this land is sandwiched between neighborhoods:

- North – with Ariesul Mic;
- West – forestry fund.

At present the terrain is construction less the using category are grassland, arable, pasture.

From the seismic point of view, considering P100/92 normative place the considered site in the „D" area having Tc=1,0 sec. and a seismic coefficient ks=0,16, the equivalent of the intensity degree 7,5MKS.

Considering the climate point of view, the area is characterized by a temperate-continental climate with lower shade of excessive in lower area but moderate and moisturizing in the mountain area.

Considering the position, the studied area is situated in a place where the west, Southwest and North-East wind circulation are overexposed.

Average annual rainfall is between 600-650 mm, predominant winds are the East and North, then North-West and South.

According to the latitude where the studied area is situated, the recorded average solar radiation is 736 cal/m² to 22,12 having a cloud transparency of 0,342.

The average number of days covered by clouds is between 160-180 days.

Considering the topoclimate particularities we have a relatively uniform distribution in the surface of some meteorological elements.

3. MATERIAL AND METHOD

Based on a strong business plan, a trout farm can be easily developed in numerous areas of the country. Considering the terrain configuration, the costs can be lower or higher. Therefore, the investment value is not related only to this aspect, but from the soil structure or the distance from the construction materials supplier point.

There are numerous factors to be considered when a trout farm must be build, but it has to be mentioned that the investment can be reduced when essential steps must be followed just for the efficiency of the construction process in order to reduce the investments costs on the same time.

Considering the extremely low economical situation in the studied area, declared as disadvantaged area, the initiative for some people who worked in the mines around the area to join a company founded to holding a mini trout fructifying land and favorable location.

Such alternative created an income source from production activities.

Following the completion of such economic activities, the appearance of a legal person automatically will bring to the local budget and the state contributions and legal fees necessary.

It is proposed to make an investment that consists of construction of a 7 mini pools having the 15x2,5x1,2m dimensions which will be supplied with fresh water from the Aries river through a continuous circuit, made by a pipeline that takes the water from an water intake settled on the right bank of the Ariesul Mic valley. The intake flow is about 1,9 l/s according to the hydraulic calculus.

The adduction pipeline is having a 300 mm diameter and is discharging into a desander.

Grit is inside a building and serves trout water decantation suspension.

Grit has dimensions of 5.6 x 3.6x 1.0 m and is equipped with two compartments which work interchangeably.

It is equipped with grills for suspension and will be constructed with a slope of 3% for suspension filing.

From settler leaves adduction pipe Dn = 300mm, L = 50m which supply trout ponds.

The settler is equipped with bottom drain, which communicates with the valley bed.

Trout ponds will be executed in stages, seven pools with dimensions 1.5x15.0m and an average depth of 1.0m. The pools will be made of river stone and masonry cement.

The pools are equipped with drain on the bottom and valves to maintain the level in tanks and metal grills to retain fish.

P.O.T. existent =0%

P.O.T. propose = 6.22%

Percentage of Occupation of Land (POT) expressing the ratio of built area on the ground (SC) and land area considered (S), multiplied by 100 (i.e: POT = 25%, means that it can build on a quarter of the land surface respectively).

POT is generating the maximum possible ground built area relative to the ground surface (sample: in cases where by the Urbanism Certificate is mention a 25% POT, than it can be built on a quarter of the land surface.) The POT percentage is established related to the destination where the construction must be settled and according to the land conditions.

The POT percentage is filled with coefficient of land use (CUT), with the street alignment regime and the regime of height, and form a set of mandatory values in construction authorization, which any land owner and every architect should consider.

Existent C.U.T. = 0

Propose C.U.T. = 0.06

Shortcut from the coefficient of land use is the means the ratio between the construction developed area and surface area. The maximum value for the coefficient is the maximum value admitted in the area through the urban regulation.

The level ± 0,00m, is established as follow:

- The upper level of the bottom for the basins;
- The upper level of the perimetral walls in case of desander.

The water discharge from the pipe is made through a 300 mm diameter pipe, the water being lead to the Ariesul Mic valley. Seven basins of independent channel type will be make populated with mountain trout. Two basins for growing, two for exploitation, two more for fattening and one for parking.

Also, the plan for building an administrative Annex which is supplied with potable water from a well will be make in the proximity of this [6].

As we up mention, the necessary water discharge for refreshing the water from basins is 1.9 l/sec and is provided through a intake basin settled on the right bank river of Ariesul Mic valley.

For the proposed Annex, the water from the sanitary group will be taken over from a well situated in the Annex proximity.

Figure 2. The intake basin

Given the reduced activity of this Annex the maximum discharge take by the well is about 0.002 l/sec. According to a consumption of 175 lites/sec during 24 hours.

The sewage.

The used water from the Annex is storage into a concrete septic tank with a 20 m³ capacity which is periodically septet and transported with a special machine at the wastewater treatment plant of Alba Iulia city.

The water from the trout basins is clean and not polluted due to the fact that the trout feeding is made by ecological forage. The supplying discharge is equal with the evacuation discharge, around 1.9 l/sec.

The water discharge from the pipes is made by a 300 mm underground pipe which is connected to the Ariesul Mic valley

Air protection.

The objective proposed will be done by local materials such as river stones and timber and after analyzing the activity will not lead to the air pollution.

The soil and underground protection, waste management.

The septic tank is made by concrete other pollution source being inexistent.

The timber wastes such a result from the Annex construction will be use by the investors such fire materials. After commissioning will not result waste.

The proposed solution.

The Annex settlement is situated in the climatic area „E" the construction category is „C", the level regime having a height of 2.43m is „P".

The infrastructure for the Annex is make by monolithic concrete and continuous foundation, provided with reinforced concrete in the upper side. The board of the ground floor is made by concrete with 10 cm thick.

The infrastructure projected for desanders basins, and rooms is according to the NP 112/04 normative being made by masonry mat of river stone having the thick of 30 cm.

The Upper structure – at the ground floor is made by masonry diaphragms for refrigerant rooms and thermic plant, and whitewood swan timber for the rest of Annex and the complex walls

The floor is made by whitewood swan timber beams.

The roof covering is made by red plate. For basins the superstructure is make by a masonry mat of stone with 30 cm thick. As considering the rooms, the superstructure is make by mansonry mat of stone river with 30 cm thickness. Also, for desander the superstructure is make by masonry mat of stone river having thicknesses of 15, 20 si 30 cm.

Work execution.

Over the whole execution the presence of the planner is required, according to the quality control program.

According to the attribution established by law, the owner or the beneficiary will assure the projects controlled by certified specialists according to established demands, but also to provide a proper execution of construction works [5].

4. RESULTS AND DISCUSSION

The aim of the paper is to achieve o complete documentation in order to obtain the minute for starting the works, minute necessary to obtain the Construction Authorization for the area situated on Avram Iancu village, Târsa locality, Alba County.

As it was mention before, the terrain is having a 4710 mp surface 5% covered by shrubs and trees, being situated at the North of Aries river, on Dj 762, granting by its position economical advantage.

To illustrate how the preparation of paper has been done we split the whole project on main work steps illustrating also the sequence of wording operations of the project.

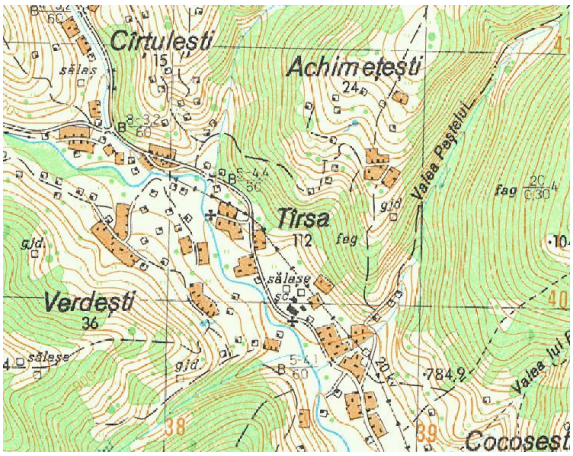

Figure 3. Framing plan 1:25000 scale

Field data acquired by Leica TCR 1200 total station were transferred to specific software named Leica Geo Office. Additional software was necessary such as Notepad, Excel, Word, Autocad 2014.

Maps and topographic plans (scale 1:2500, fig. 3) helped to a better identification of the area and later on lead to the possibility of achieving profiles and cross sections. [4]

After choosing the landmark points the horizontal vertical angles were measure along with the distances by using prisms and the standard measure module [4].

For drawing out the documentation after the measuring process, the data recorded into the electronic tachymeter has been transferred to the computer by using the download menu from the Leica Suvey Office software.

In the planning stage of the project the field data have been processed, the resection and the traverse were compute obtaining the rectangular coordinates of station points and later on the rectangular coordinates for the detail points. The specific software use was Excel, AutoCAD 2014, Topo LT , Golden SURFER 9.

The measurements were made in local system of coordinates and subsequent the results were georeferenced in Stereographic 1970 system of coordinates.

The coordinates of new station points were determined by using the GPS technology.

Positioning with GPS technology was achieved by determining the distances between the points of visible GPS satellites station, mathematical measurements are needed at least 4 satellites.

The number of satellites required to enable us to position precisely as possible only on the basis of distances measured from satellites.

If we had a single satellite measurement and if we know the angle, with one remote distance, our position in space would have be on a sphere centered on the satellite position and having the radius as the distance measured.

Measuring distances from two satellites our position is "improving" in the sense that we are on a circle generated by the intersection of the two spheres that are centered in the two satellites and the distance between them, our circle has a larger radius position or less.

Our position substantially improves when the measurements have a third satellite and that we already locate two points in space in two. These two points are given by the intersection of the last sphere with its center at the third satellite, the circle generated by the first two fields determined.

Finally, we currently relatively easy to determine the point at which we find ourselves, but for the fourth rigorous measurement is required, a fourth satellite to then clearly our point positioning will be unique.

On field after choosing the points and after land marking the horizontal vertical angles were measure along with the distances by using prisms and the standard measure module for a number of almost 90 detail points [3].

INVENTORY OF COORDINATES – **ASCII file**
Județul ALBA
U.A.T. name: Avram Iancu

POINTS OF KNOWING COORDINATES

28 543119.182 331642.584 650.095 (garage corner)
29 543114.927 331638.246 650.032 (garage corner)
30 543112.089 331641.046 650.095 garage corner)

STATION POINTS COORDINATES

100 543112.490 331632.320 650.000
101 543082.510 331584.070 655.319
102 543137.996 331537.386 649.648

Figure 4, Inventory of point coordinates

After downloading the data from the total station by using the Leica Geo Office software a drawing interchange file format compatible with AutoCad is obtained. Further on, processing the points in AutoCad by used toolbars and menus and computing elements needed for the plans, resulting situation plan.

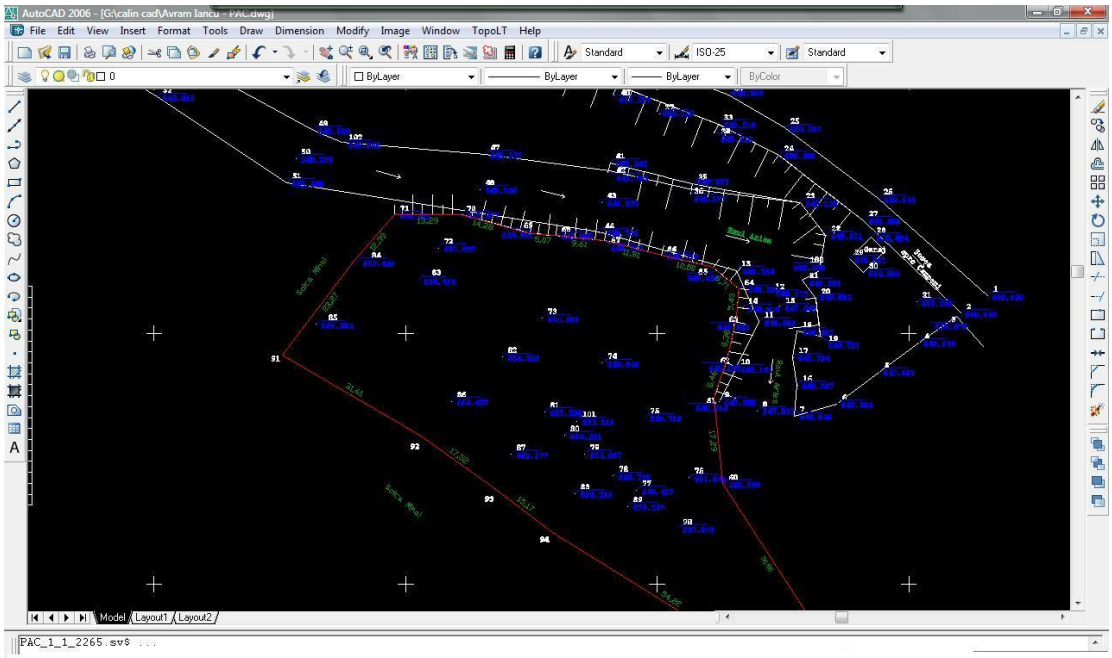

Figure 5. The situation plan obtained after downloading and processing the detail points coordinates.

After obtaining the situation plan, containing the whole elements gathered from the field the ordinary checks by overlapped the plan over the orthophotoplan has been made. (figure 6)

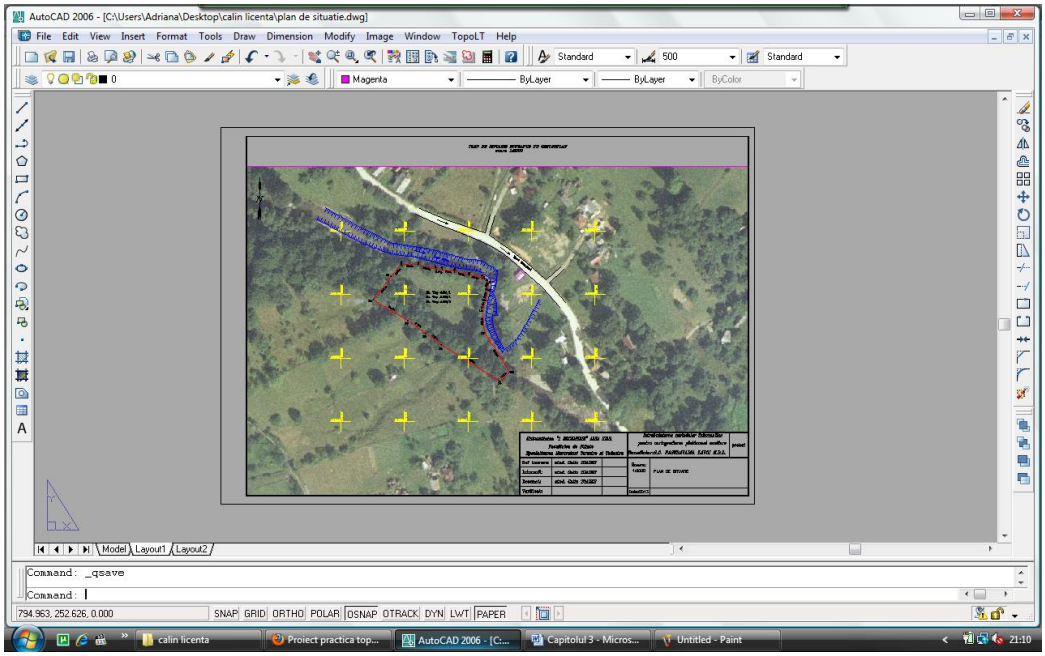

Figure 6. Situation plan overlapped on the orthophotoplan

The situation plan was made in order to obtain the Construction Authorization, the real estate being situated on the UAT of Avram Iancu commune, Alba County, having as neighbors:

- at North – Aries River;
- at South – Soica Mihai;
- at East - Soica Mihai;
- at West - Soica Mihai.
-

The real estate that is the object of the technical documentation is registered into the Land Registry under the nr. 2761 of Avram Iancu locality, made by nr. top. 4451/1 – hayfield; nr. top. 4452/1 – arable; nr. top. 4453/1 – pasture in total surface of 4710 square meters.

For measuring the estate three new station points were used (100, 101, 102 materialization points was done by wooden pickets), the station points were use for topographical measurements to obtain the contour points of the estate.

Another software use was TopoLT. This software works under AutoCAD or IntelliCAD. TopoLT software is a very helpful tool for those who make topographical or cadastral plans in digital format. The main advantages offered by this software are as follows: report directly to the CAD drawing the coordinate file, upload and download points coordinates from the drawing to the total station (in our situation the upload of the points coordinates used for staking operations with Leica TCR 1200 total station);

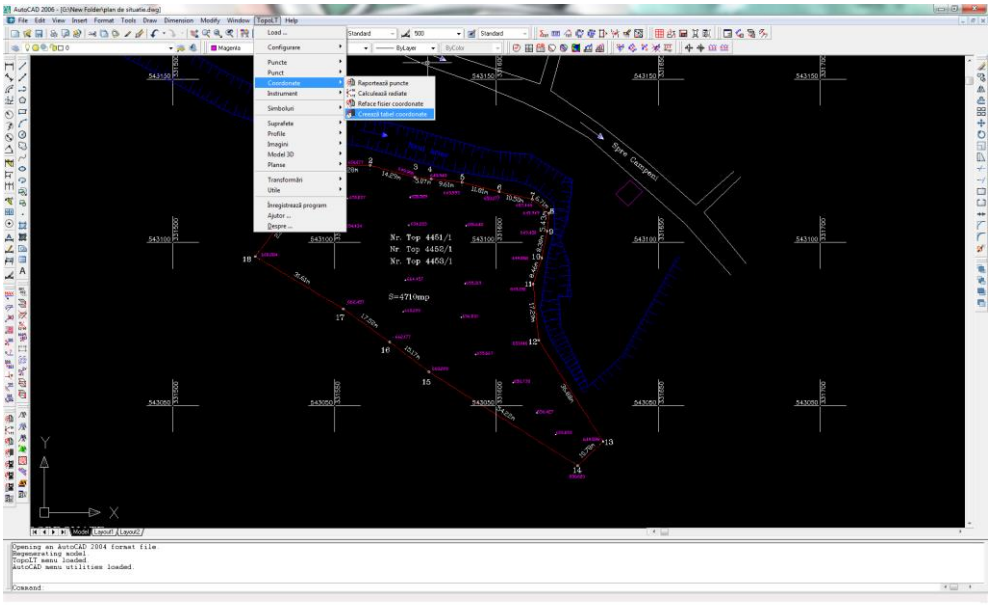

Figure 7. The points coordinate inventory obtained with TopoLT software

The polar coordinates method is use when we have a stacking base or a stacking network.

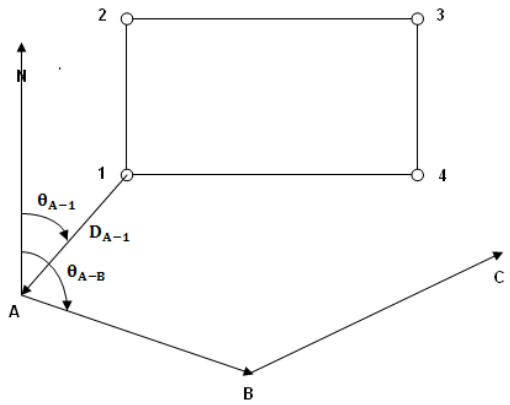

Figure 8. Plane staking using the polar method [1]

Known data:

• Rectangular coordinates of the staking network A(xA,yA), B(xB,yB), C(xC, yC);
• Projected coordinates of the main points of the construction 1(x1, y1), 2(x2, 2), 3(x3,y3), 4(x4, y4).

The coordinates of new station points 100, 101, 102 were determined by using the GPS technology.

From these points was passed to the execution stake as planned elements trout basins resulted from tracing data processing through specialized programs for automated graphics.

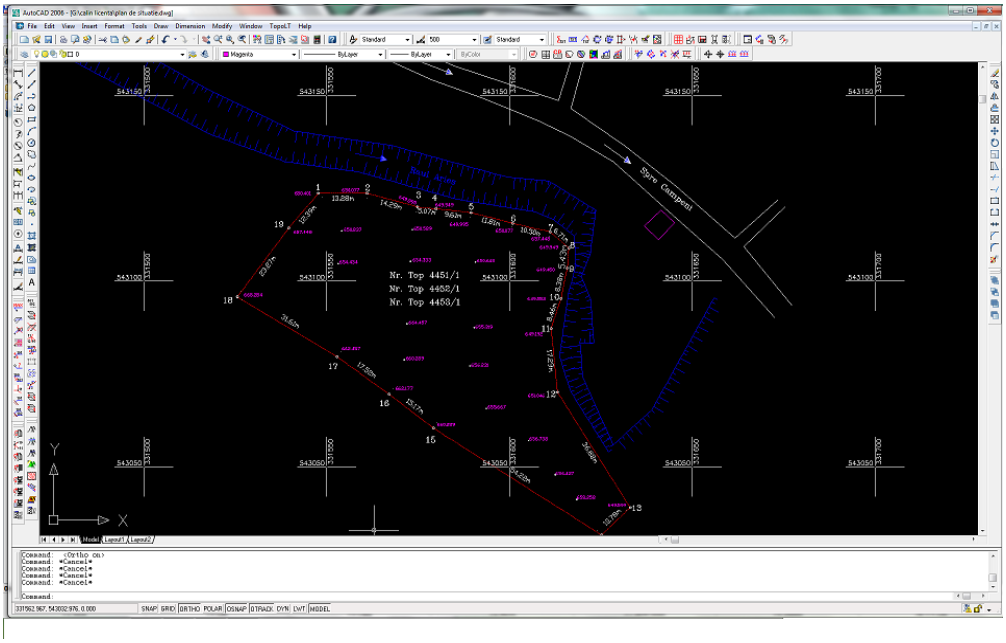

Figure 9, Situation plan with stakeout level curves

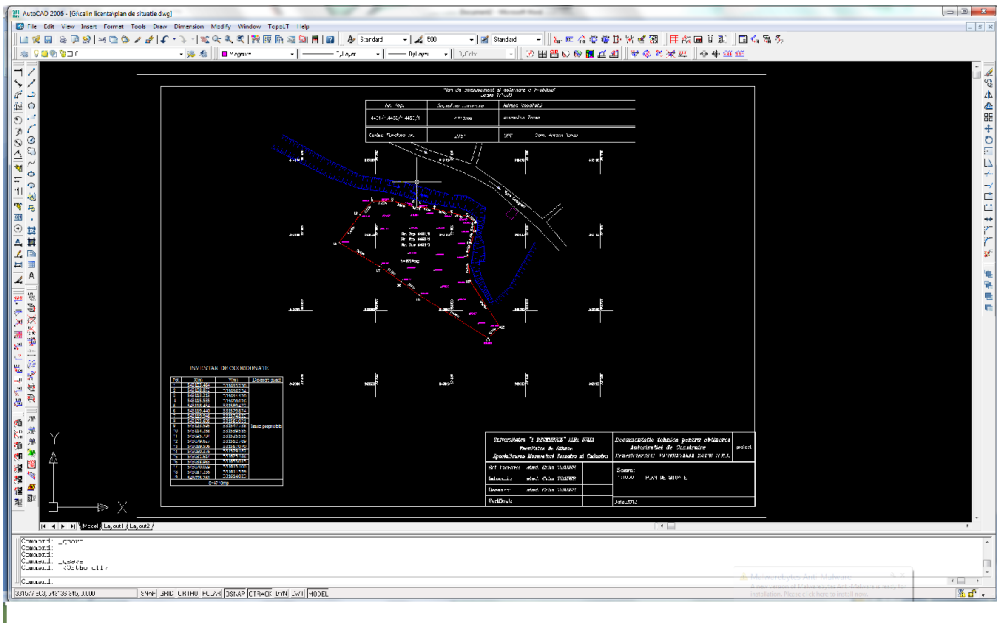

Figure 10. Completion of the situation plan with level curves

After the completion of the situation plan with level curves (figure10) the technical documentation for reception must be achieved.

5. CONCLUSIONS

Acquiring measurement techniques help to achieve good results in order to achieve topographic studies;

Knowledge and operations phase sequence measurement is essential in achieving topographic studies, particularly in the cadastre;

It should be noted that this project was done by accessing European funds based on a well done business plan;

Considerable economic cuts were made to build this trout, given that they follow some basic steps designed specifically to streamline the process of building and reduce capital costs at the same time;

Automation of current cadastral systems by using modern means of calculation, making operation successfully meets the full volume of documents for rural development;

The future performance and outstanding as global positioning systems will evolve towards achieving higher accuracies existing ones, in a short time and with lower costs.

For these developments will primarily benefit geographic information systems (GIS) (the ease of obtaining data on the ground, the main problem of the current systems), the precise location of the APS - areas of permanent sample of the inventory planning works.

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