

GIS-BASED DATABASES FOR MUNICIPALITIES

CZE, Town of Sušice

11 2017

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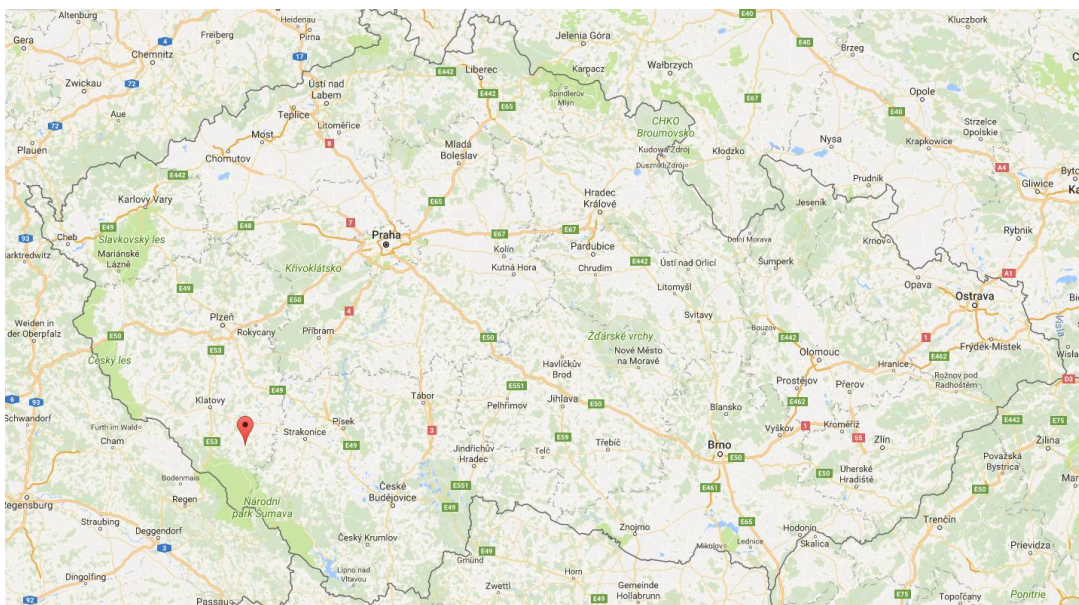
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Background

Sušice lies in the Plzeň Region and since 2003 it has been a municipality having an extended competence for 30 villages and towns. The Town of Sušice, often called the Gate to the Šumava Mountains, lies 465 m above sea level in the Svatobor Highlands. This former royal town spreads on both the banks of the once gold-bearing Otava River on the area of 16.6 square kilometers, and has about 11,500 inhabitants.



Sušice is one of the starting points to the Central Šumava. It lies on the foothills of the Šumava on the crossroads of tourist routes and on the edge of the Šumava National Park. Thanks to its position in densely populated Central Europe, to relatively good conditions of the countryside as well as to rich water sources the Šumava is often called the „Green Roof of Europe” offering a great deal of possibilities to both active and passive relaxation.

GEOGRAPHIC DATA

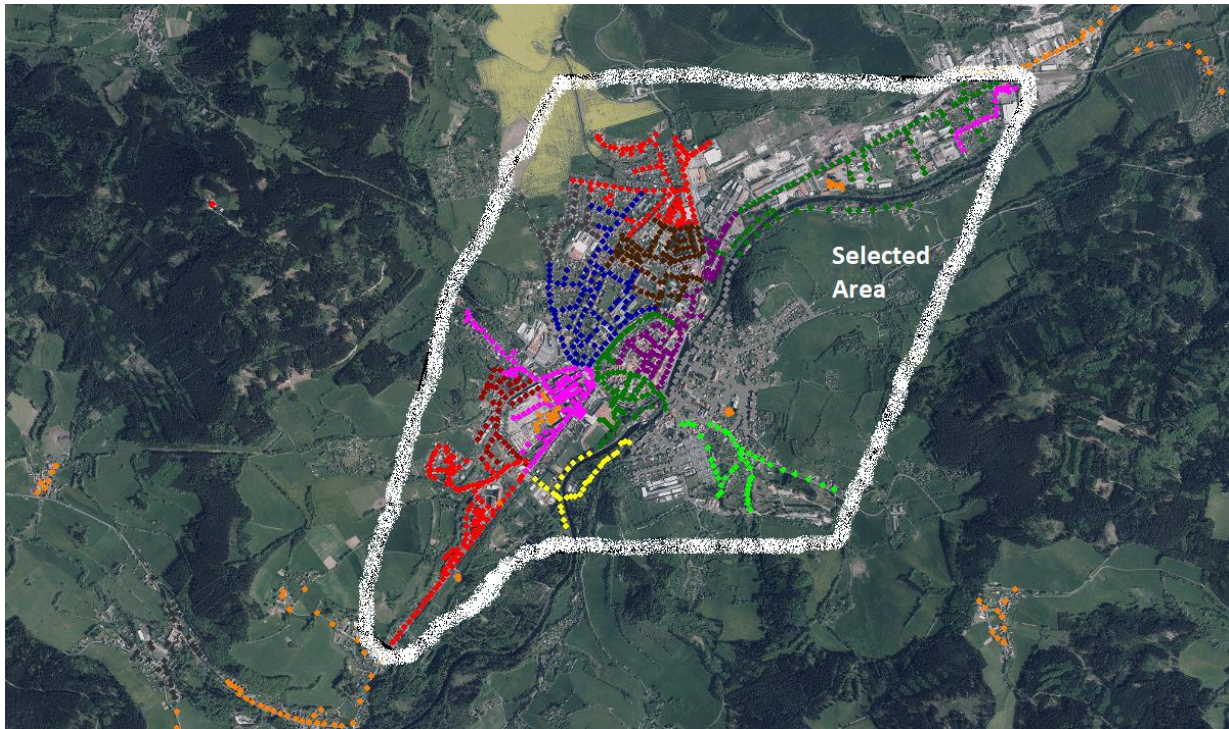
- Latitude 49.2310608N
- Longitude 13.5201833E

Selected area

The selected area covers almost all part of Town of Sušice; only affiliated villages has been excluded (Albrechtice, Červené Dvorce, Divišov, Dolní Staňkov, Malá Chmelná, Nuzerov, Rok, Staré Volšovy, Velká Chmelná, Vrabčov, Zaluží). Center of the Town is included and placed in the hearth of Town which was also the main reason for selection of the area (pilot location). Public lighting is divided into 27 sampling sites in different parts of the town and outlying villages (see figure below). Totally, selected area covers 1 284 lighting points in Town of Sušice. Individual sampling points are divided and marked with different colors in GIS.



Figure 1, Selected Area



For the selected area, the further key strategic documents will be conducted such as Strategy of public lighting and Action plan.



1. Data acquisition/survey and collection of data

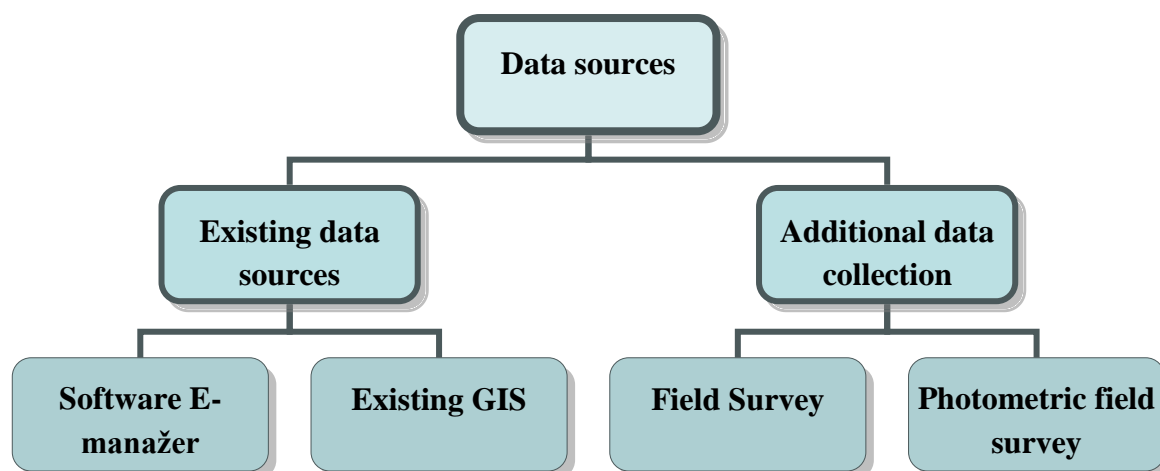
The Town of Sušice is the owner of the street lighting and responsible for the illumination of the municipality. The maintenance and operation of the system is ensured by the town company Sušické lesy a služby, s.r.o. who is responsible for the build-up and timeliness of the database, as well as the maintenance service for street lighting.

The electricity consumption of public lighting is measured for 27 sampling sites in different parts of the town and outlying villages. Totally, 1440 lighting points stand in the municipality and nearby villages administered by Town of Sušice (1284 in Town of Sušice, 155 in villages). Annual electricity consumption of the street lighting infrastructure is about 540 MWh per year. Individual elements of the public lighting system are largely obsolete. Poles and street light luminaries are, unfortunately, often renewed only if their state of disrepair.

1.1. Data sources and methodology used

Three different sources of data used in GIS have been used.

- Data from software E-manažer.
- Data from existing GIS.
- Data from additional data collection.



1.1.1. Data from software E-manažer

With the aim of creating a complex database, the Town of Sušice began the digitalization of data and the development of an energy management solution, called “E-manažer” in 2015. In this software tool, the relevant information related to municipal buildings, public lighting and energy consumption of town are recorded. At the end of 2016 it was decided that the remote data transmission system were implemented at public lighting’s supply points. This represents 17 switchboards (see table below). Another 10 supply points will be included later, after verification of the pilot project.

Table 1, Supply points

No.	Address
1	5. května
2	Hájkova
3	Kaštanová (kotelna)



4	Luh (u koupaliště)
5	Na Vojtěšce
6	Nádražní (CD)
7	Nádražní (Mikloška)
8	Pod Nemocnicí
9	Pod Viničkami
10	Pravdova
11	Příkopy 11
12	Příkopy 157
13	Stupkova
14	Volšovská 859
15	Volšovy (staré)
16	Volšovy (u traťa)
17	Volšovy / Cer.Dvorce

1.1.2. Data from existing GIS

The existing GIS tool of the Town of Sušice (ESRI software) provided part of the relevant GIS data about the lighting infrastructure in the city, geographical data, and organizational information (see below). Furthermore, the system provides technical information about cabling under the surface as listed below:

- Pole ID
- GPS_lon, GPS_lat (lighting poles positions and switchboards - coordinates of each pilot light pole and switchboards)
- Street_Name
- Pole data (Type, Material, Height, Arm length)
- Luminaire Data (Light_Type, Lum_effic, Lum_flux, Power, Number of luminaire)

The data about public lighting have been collected in 2012 and were outdated partly. Therefore additional field survey to identify gaps and to update data have been conducted during the project (see chapter 1.1.3.).

1.1.3. Field survey

Based on data from 2012, field survey (spring 2017) of current state of public lighting was made in order to check the accuracy of data, information and to add missing data as listed below:

- Existence of remote metering
- Luminaire criteria (Light_Type, Lum_effic, Lum_flux, Power, Number of luminaire)
- Pole (Type, Material, Height, Distance)
- Arm lamp base (Type, Height, Arm length)

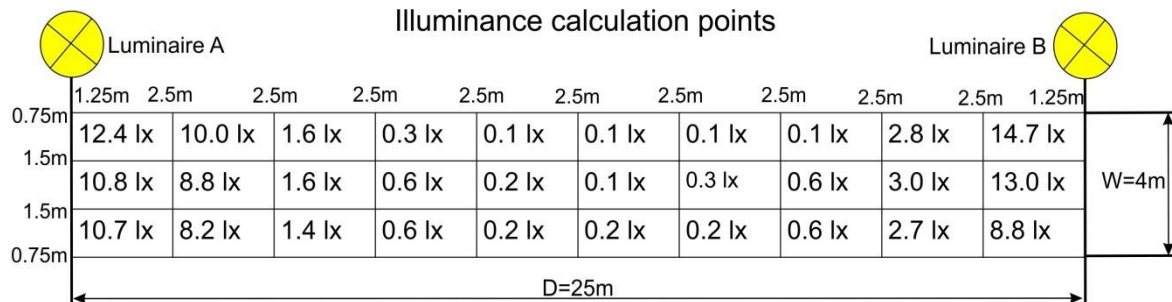
1.1.4. Photometric field survey

Photometric measurements was performed at 48 streets in the area representing all specific lighting situations for selected area (9 mostly used luminaires and 16 typologically similar streets). Totally, 168



measurements were done. Results of photometric measurement were linked (in Excel table) to coordinates of pillars for the area where photometric measurement was performed. For the rest of luminaires the specific calculation scheme has been formulated to calculate photometric data for them.

Figure 2, Example of Illuminance calculation



1.2. Structure and naming of the data

The data included in GIS database is divided into 3 section. Each section has own excel table (sheet) where the data are collected.

Luminaire data

The collected data are assigned to the appropriated luminaire listed as follow: Luminaire/pole ID, GPS, switchboard ID, street name, owner of public lighting, company which is maintaining public lighting, Luminaire data (Light_Type, Lum_effic, Lum_flux, Power, Number of luminaire), Pole data (Type, Material, Height, Distance) and arm lamp base data (Type, Height, Arm length).

Pole_ID	Labeling	Luminaire localization				OWNED_BY	MAINT_BY	Remote metering	Luminaire criteria					Pole				Arm lamp base				
		GPS_LAT	GPS_LON	Street_Name	Swit_ID				Light_Type	Lum_effic	Lum_flux	WAT	No.	TOT_WAT	Type	Material	Height	Distance	Type	Height (from the ground)	Arm length	
[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
1.1.1	49°14'0.284N	13°31'41.513E	Aišova	6	Sušice	Sušice	NO	ST 50/70W	90	6300	70	1	70	Ocelový bezpat. sloup	Ocel	4	72.7	prodloužený atyp	1.8 m			
2.1.2	49°14'2.118N	13°31'39.194E	Aišova - schody	6	Sušice	Sušice	NO	Lucerna 70W SHC	90	6300	70	1	70	Historický litinový sloup	Litina	3	36.4	ne	ne			
3.1.3	49°14'2.867N	13°31'37.824E	Aišova - schody	6	Sušice	Sušice	NO	Lucerna 70W SHC	90	6300	70	1	70	Historický litinový sloup	Litina	3	23.3	ne	ne			
4.1.4	49°14'3.413N	13°31'37.049E	Aišova - schody	6	Sušice	Sušice	NO	Lucerna 70W SHC	90	6300	70	1	70	Historický litinový sloup	Litina	3	45.9	ne	ne			
5.1.5	49°14'4.838N	13°31'37.223E	Aišova - schody	6	Sušice	Sušice	NO	Lucerna 70W SHC	90	6300	70	1	70	Historický litinový sloup	Litina	3	24.8	ne	ne			
6.1.6	49°14'5.55N	13°31'37.81E	Aišova - schody	6	Sušice	Sušice	NO	Lucerna 70W SHC	90	6300	70	1	70	Historický litinový sloup	Litina	3	24.1	ne	ne			
7.1.7	49°14'5.339N	13°31'36.659E	Aišova - schody	6	Sušice	Sušice	NO	Sod. Halogen	N/A	N/A	250	1	250	Ocelový bezpat. sloup	Ocel	6	50.4	ne	ne			
8.1.8	49°14'6.92N	13°31'36.195E	Aišova - schody	6	Sušice	Sušice	NO	Sod. Halogen	N/A	N/A	250	1	250	Betónový sloup	Beton	6	21.5	ne	ne			
9.1.9	49°14'6.485N	13°31'36.996E	Aišova - umítlé káple	6	Sušice	Sušice	NO	Sod. Halogen	N/A	N/A	250	1	250	NE		5	64.2	ne	ne			
10.2.1	49°13'49.857N	13°31'8.963E	Americké Armády	5	Sušice	Sušice	NO	ZVON Cu Pechlát	90	6300	70	1	70	Litínový sloup Pechlát	Litina	6	27.6	Součást sloupu Ø 60	1	0.5		
11.2.2	49°13'49.951N	13°31'7.591E	Americké Armády	5	Sušice	Sušice	NO	ZVON Cu Pechlát	90	6300	70	1	70	Litínový sloup Pechlát	Litina	6	32.4	Součást sloupu Ø 60	1	0.5		
12.2.3	49°13'50.022N	13°31'5.976E	Americké Armády	5	Sušice	Sušice	NO	ZVON Cu Pechlát	90	6300	70	1	70	Litínový sloup Pechlát	Litina	6	30.7	Součást sloupu Ø 60	1	0.5		
13.2.4	49°13'49.974N	13°31'4.488E	Americké Armády	5	Sušice	Sušice	NO	ZVON Cu Pechlát	90	6300	70	1	70	Litínový sloup Pechlát	Litina	6	26.5	Součást sloupu Ø 60	1	0.5		
14.2.5	49°13'49.753N	13°31'3.239E	Americké Armády	5	Sušice	Sušice	NO	ZVON Cu Pechlát	90	6300	70	1	70	Litínový sloup Pechlát	Litina	6	29.5	Součást sloupu Ø 60	1	0.5		

Luminaire data photometric data

The photometric data are assigned to the appropriated luminaire listed as follow: Luminaire/pole ID, GPS, distance to source and photometric data (Lum_flux, Lum_inten, Lum_effic, Illum, Date and Time).

Pole_ID	Pole_ID_meas	Localization - light intensity measurement point		Dist_to_source	Photometric data					
		GPS_LAT	GPS_LON		Lum_flux	Lum_inten	Lum_effic	Illum	Date_meas	Time_meas
[]	[]	[]	[]	[m]	[lm]	[cd]	[lm/W]	[lx]	[]	[]
1	1.1	49°14'0.284N	13°31'41.513E	5,8	6300	231,11	90	6,87	09.05.2017	22:00
2	1.2	49°14'2.118N	13°31'39.194E	3,1	6300	43,15	90	4,49	09.05.2017	22:00
3	1.3	49°14'2.867N	13°31'37.824E	3,1	6300	42,38	90	4,41	09.05.2017	22:00
4	1.4	49°14'3.413N	13°31'37.049E	3,1	6300	42,57	90	4,43	09.05.2017	22:00
5	1.5	49°14'4.838N	13°31'37.223E	3,1	6300	43,25	90	4,50	09.05.2017	22:00
6	1.6	49°14'5.55N	13°31'37.81E	3,1	6300	46,32	90	4,82	09.05.2017	22:00
7	1.7	49°14'5.339N	13°31'36.659E	6	N/A	n	N/A	N/A		
8	1.8	49°14'6.93N	13°31'36.195E	6	N/A	n	N/A	N/A		
9	1.9	49°14'6.485N	13°31'36.996E	5	N/A	n	N/A	N/A		
10	2.1	49°13'49.857N	13°31'8.963E	7	6300	368,48	90	7,52	09.05.2017	22:20
11	2.2	49°13'49.951N	13°31'7.591E	7	6300	316,54	90	6,46	09.05.2017	22:20



Dynamic Light

Switchboard data

The data are assigned to the appropriated switchboard and includes street name, GPS, Number of luminaires, Total power and consumption.

Swit_ID	Street	Switchboard		Luminaires		Grid
		GPS_LAT	GPS_LON	No.	Total Wattage	Consumption
[-]		[-]	[-]	[pc]	[W]	[kWh/year]
1	Kříčkova	49°13'32.826N	13°30'44.524E	120	8 400	70 219
2	Na Vojtěšce	49°13'32.351N	13°30'44.683E	49	3 430	17 870
3	U koupaliště	49°13'27.869N	13°30'53.705E	33	2 310	11 333
4	Na Tržišti	49°13'46.82N	13°30'54.364E	120	9 050	38 638
5	Na Fufermách	49°13'44.936N	13°31'14.187E	95	7 070	33 707
6	Nemocnice	49°13'44.265N	13°31'29.033E	239	15950	89012
7	Nábřeží K. Houry	49°13'48.323N	13°31'15.011E	141	9873	57907
8	5. května	49°13'56.938N	13°30'52.747E	90	6360	37745
9	Pravdova	49°14'11.447N	13°31'20.516E	112	8200	41224
10	Pod Viničkami	49°14'13.826N	13°30'50.73E	32	2 240	11 247

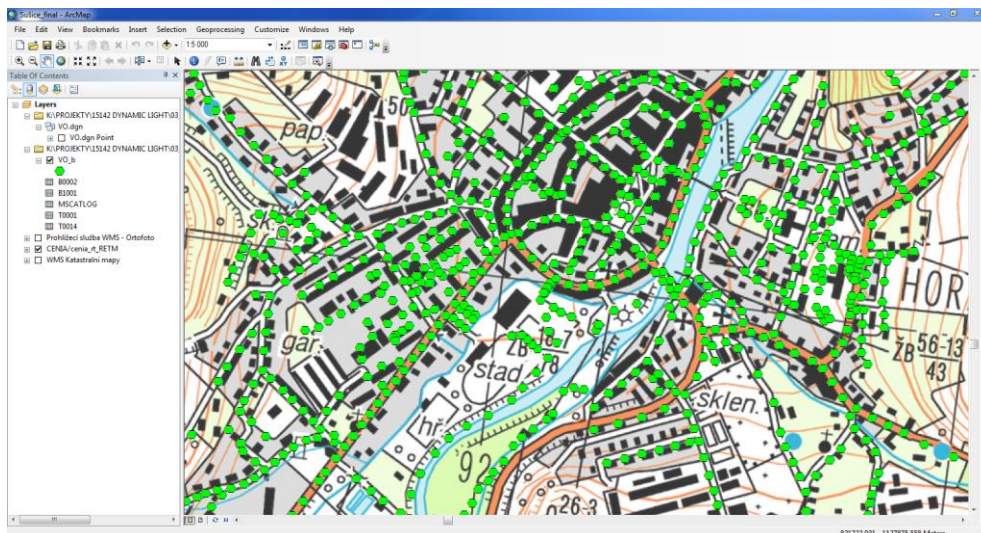
As mentioned above, all collected data are linked to coordinates of each pole and substations in Excel table provided by WPT2 leader. Those tables are loaded in Esri software in order to create operational spatial GIS database.

1.3. SOFTWARES

The Town of Sušice has a long-term maintenance contract with the municipal utility company Sušické lesy a služby, s.r.o.. Therein the Sušické lesy a služby, s.r.o. is responsible for the maintenance of all lighting installations as well as for the data acquisition. The Town of Sušice has user license for the GIS-database “ESRI software”. “ESRI software” is the geographical information system used for the internal documentation of technical infrastructure. The collection and maintenance of the data is in the responsibility of the municipal utility company.

Unfortunately, the data were recorded and entered 5 years ago and have not been updated. Current updated data of renewal or repair actions will be checked and updated by the municipal representatives to ensure topicality and supervision as well.

Figure 3, GIS – ESRI Software

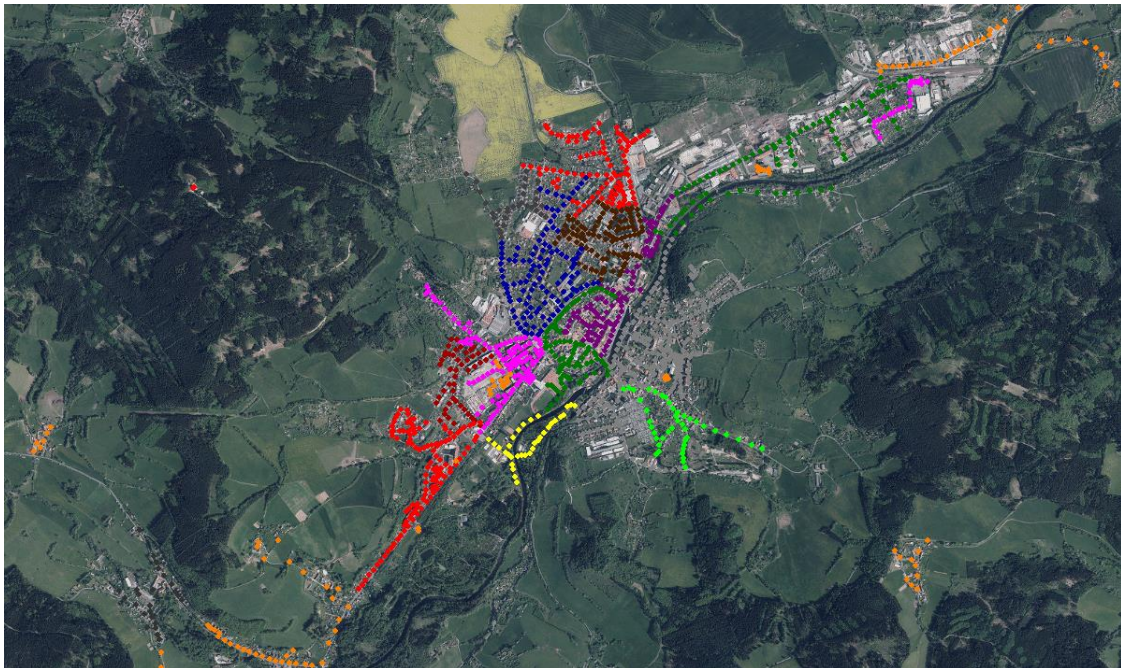




2. VISUALIZATION OF THE COLLECTED DATA

The following figure shows the poles locations. Individual sampling points are divided and marked with different colours in GIS.

Figure 4, Pole visualization



The collected data (luminaire, photometric and switchboard data) are summarized in a table automatically opened after click on particular point in map.

Figure 5, Table of attributes

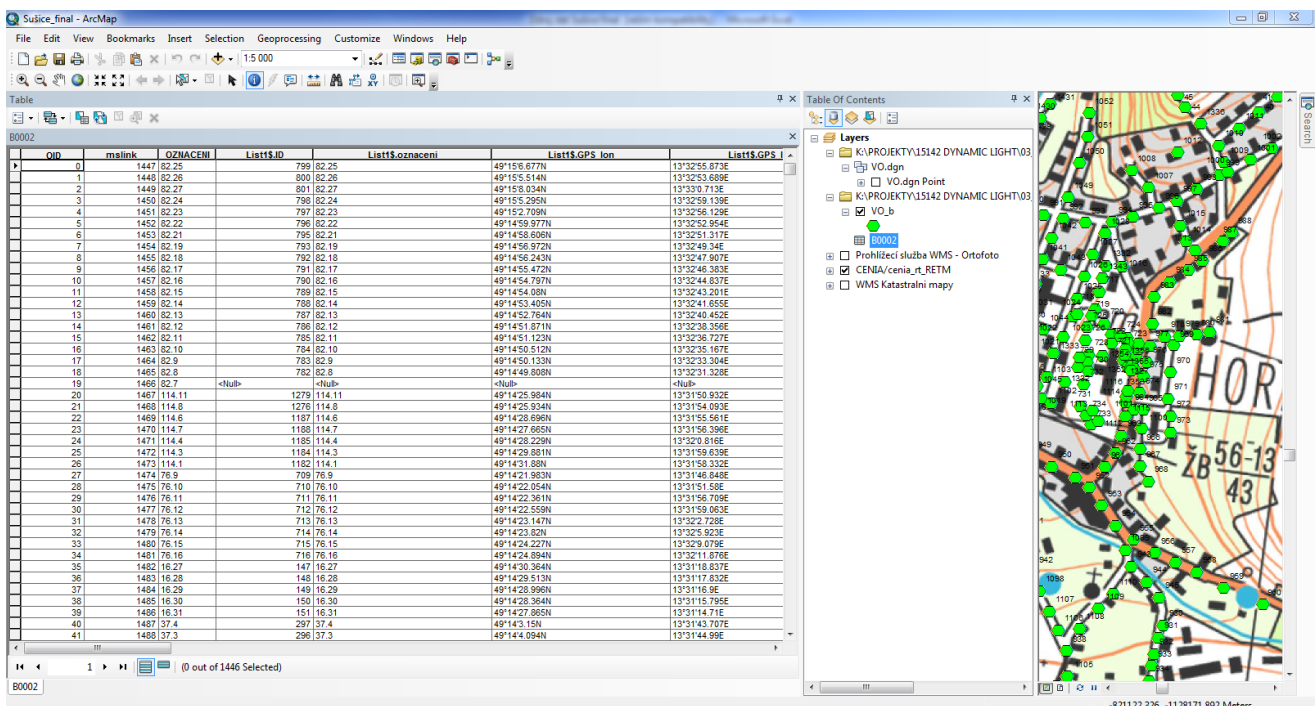
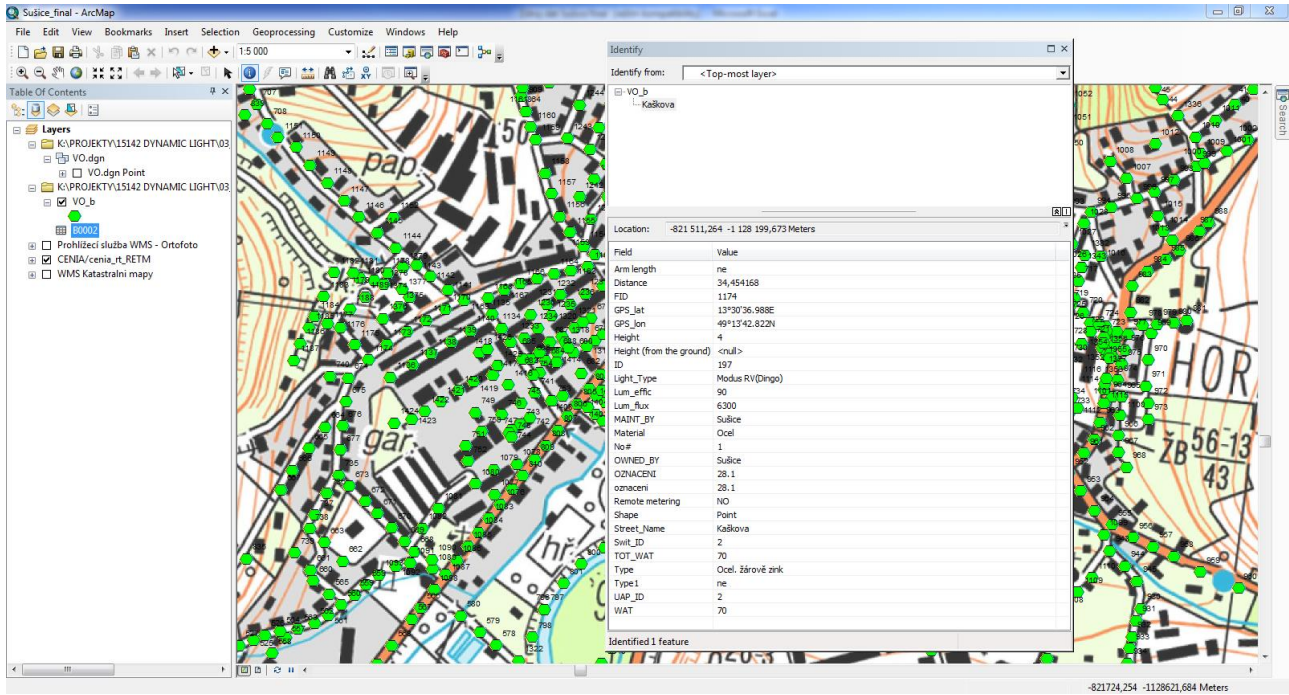




Figure 6, Table of content and data





3. Future use of the GIS database

The aim is to use the collected data to a complex management system which will be used for day-to-day management and as source of information for strategic planning. At the moment, the GIS map is used for public lighting mainly. The data about buildings, energy consumption and other operational data are collected in different softwares and databases. The city representatives tend to merge all existing data to a software which will be able to cooperate with existing E-manažer software, GIS databases and other software in use.

Within the project, the GIS database will be used for creation of other deliverables in WP2 (D.T2.2.1 Analysis of lighting situations) and WP3 (D.T3.1.1 Analysis of the global lighting situation at pilot municipality, D.T3.1.2 Selection of pilot locations & form of lighting application, D.T3.1.3 Analysis of the specific lighting situation).

3.1. Impact and benefits of the tool for the concerned territories and target groups

The main target groups are the employees of the administration and the employees of the company who are responsible for maintenance and service of the luminaires. The GIS database improve the day-to-day management and will ensure the existence of actual information about public lighting in the town of Sušice. In addition, the system facilitates the collaboration between the city and its service provider. So it is possible to match the work on individual luminaires and to ensure the control of municipal company. Finally, the GIS database will provide actual information for municipal planners and will improve the strategic planning. It provides an overview about the existing lighting standard and will be used to recognize places with insufficient lighting at first glance.

3.2. Sustainability of the tool and its transferability to other territories and stakeholders

Municipal representatives and municipal company that is responsible for public lighting will manage GIS databases in the future.

The GIS database will be used as pilot example for other municipalities in CZE and will be used as best example within the project workshops and conferences.