Introduction to GIS&T – Final Report

On-Screen Digitizing with ArcGIS

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Working Steps

The main objective of this project was to have a better understanding and knowledge of how to digitize with ArcGIS. In order to accomplish this objective, with an aerial image of St Magdalen we had to georeference the image and digitize the entire image creating a geodatabase, feature data sets and classes and assigning the attributes in accordance with what the image provides and what we could extract or need from this image.

In order to begin our digitizing first, we had to georeference the aerial image, which means that to this satellite image, spatial reference needs to be assigned. For now, ArcGIS doesn't know the exact geographical location of this image. To correct this, we use any program that already has as assigned coordinate system for example Google Earth, Google maps, Openstreet maps or the geographic institute that provides the basic maps and cartography of the territory in this case KAGIS. For this project, 5 distributed control points were selected on Google Earth to correctly georeference the satellite image.

Figure 1 Control Points from Google Earth

Table 1 Control Point Coordinates

X	Y
13.882861	46.613509
13.894536	46.612556
13.893918	46.610797
13.884770	46.610102
13.889988	46.611801

For each of the control points the coordinates were taken and input in the georeferencing tool, where a reference system was specified in the ArcMap project as: WGS84. As the different coordinates were introduced to the satellite image, it automatically was updated and, in the table, where all the x and y coordinates can be seen, a final residual number is also shown, indicating how consistent or accurate the control points were. At first 6 control points were added but when analyzing the following table, it increased the RMS value, so it was removed to have smaller RMS value. Having in mind that this step can be repeated many times until the RMS number is as small as it can be, so it takes practice to input good control points.

Figure 2 RMS Value

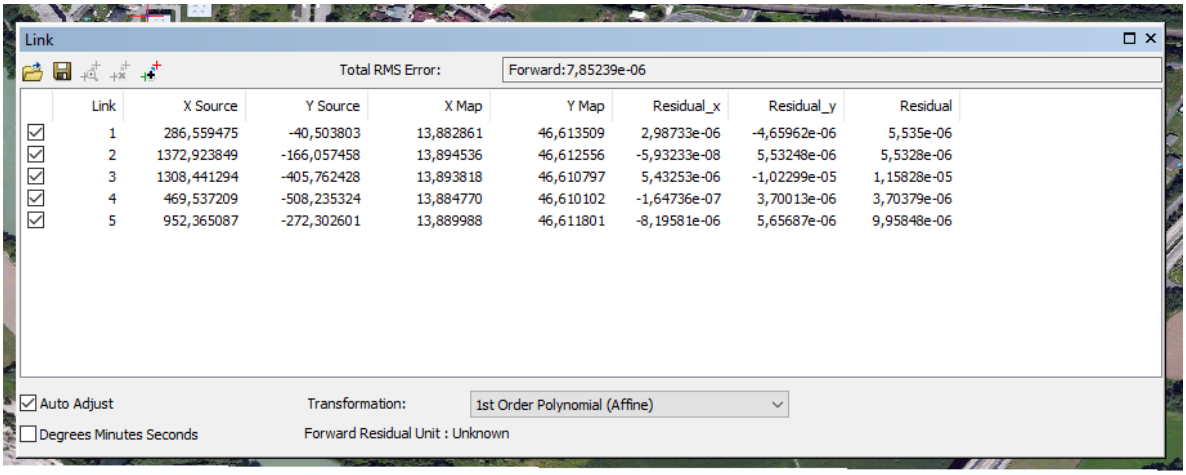
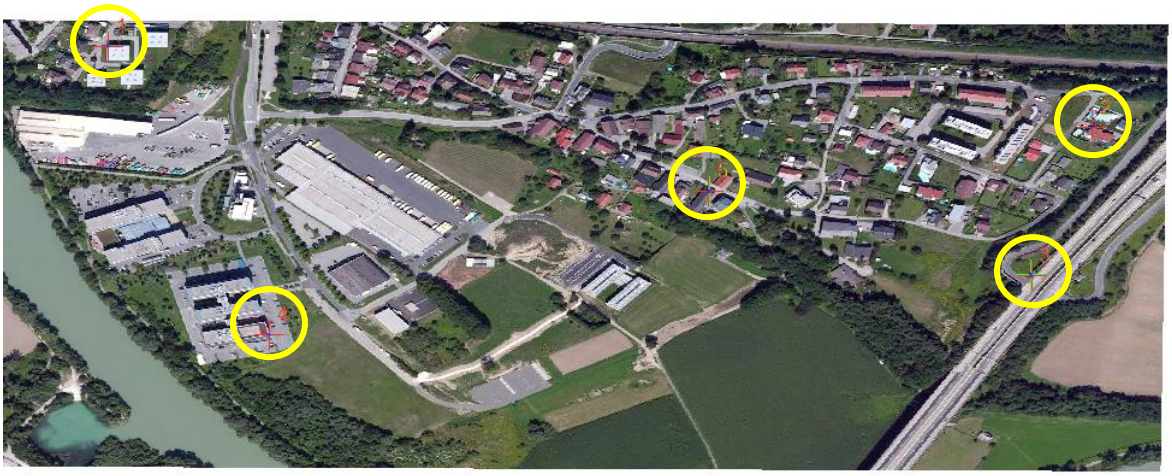


Figure 3 Georeferenced Points ArcMap



Once the georeference points are updated, the image finally has a proper spatial reference, the digitizing step can be started.

For this next part of the project, a new geodatabase was created, where all the feature data sets and classes would be stored. In an excel file, an object model was created, where the feature classes were defined according to what was observed in the image, and to each feature class different attributes were also assigned. This excel can be found in the file doc under the name Table of features_attributes_values.

Once the feature classes and attributes were assigned, in ArcMap in the previously created geodatabase and set as the default “digitizing_mag.gdb”, a new feature dataset was created under the name “St_Magdalen”. In this dataset 7 new feature classes were created, according to the excel file made in the previous step. In each feature class the attributes were input, and the correct data type was assigned. Have in mind, since the project is assigned a WGS84 spatial reference, the feature class should also have the same assigned spatial reference.

Figure 4 Spatial Reference Feature Dataset

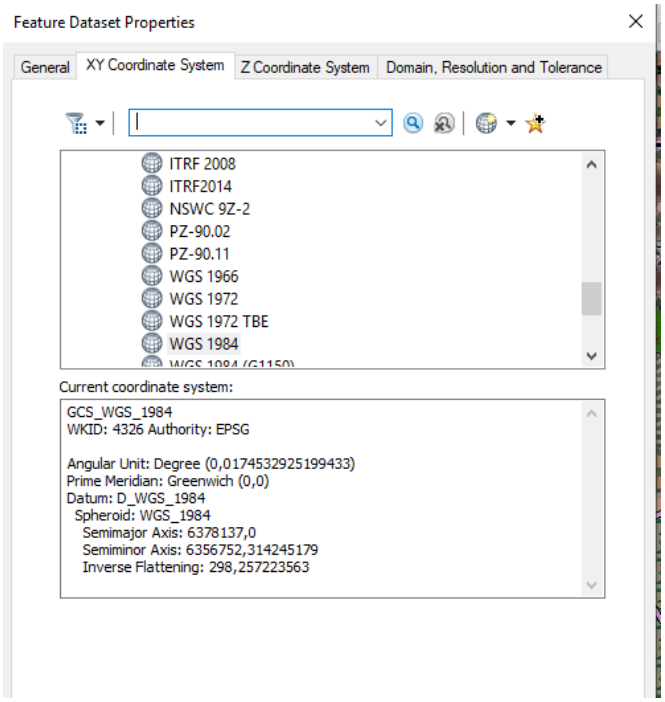
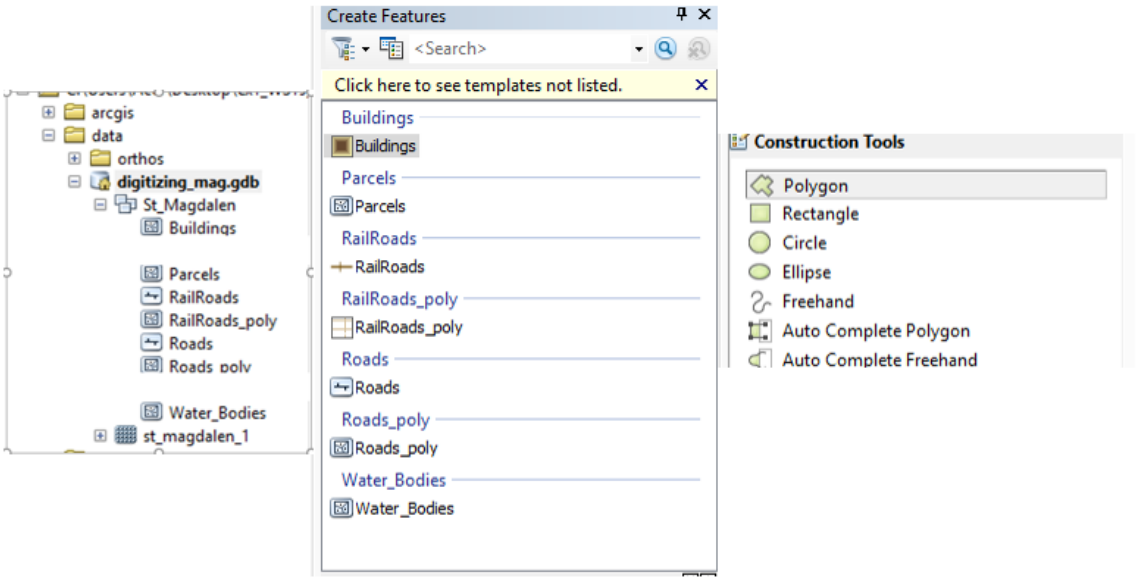
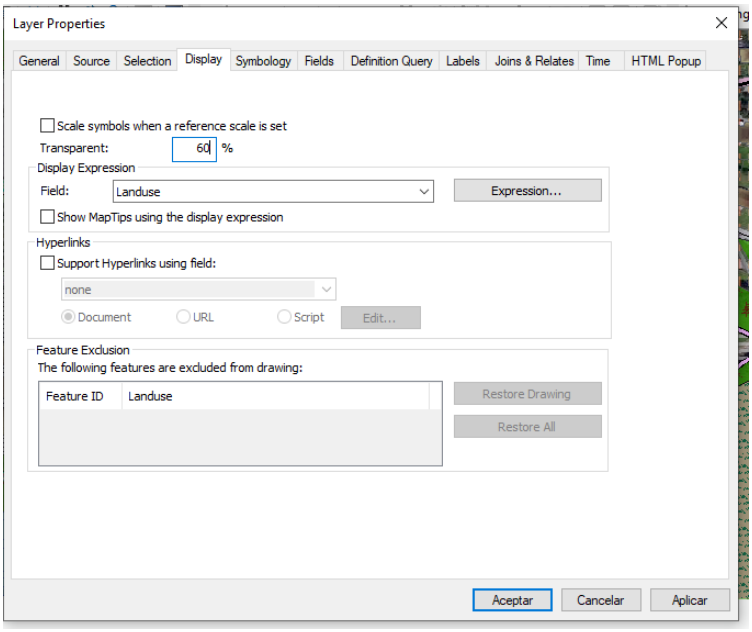


Figure 5 Feature Classes

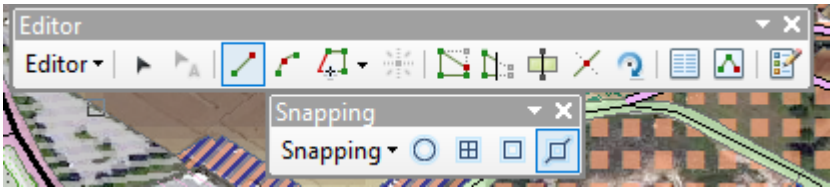


Before the actual digitizing, for each of the layers, the transparency level was adjusted to 60%, in order to have a better visualization of the base map when digitizing.

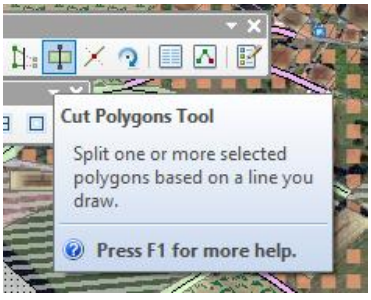
Figure 6 Transparency Level



Before digitizing, the editor tool bar must be activated and, the snapping tool, which allows you to correctly digitize, connecting vertices and edges; in order to avoid slivers or overlays.

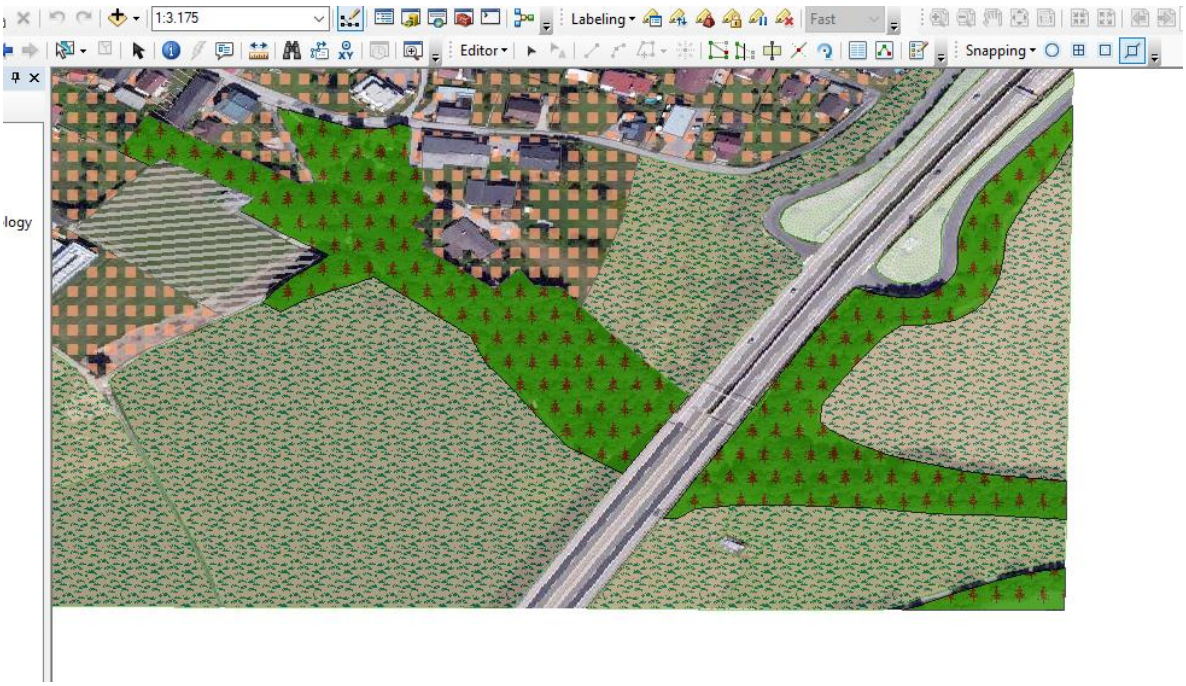


After digitizing the parcel feature first and after many attempts, it was better to digitize a big area of parcel and then with the Cut Polygon tool, smaller parcel areas were created, thus avoiding any kind of topological mistakes.



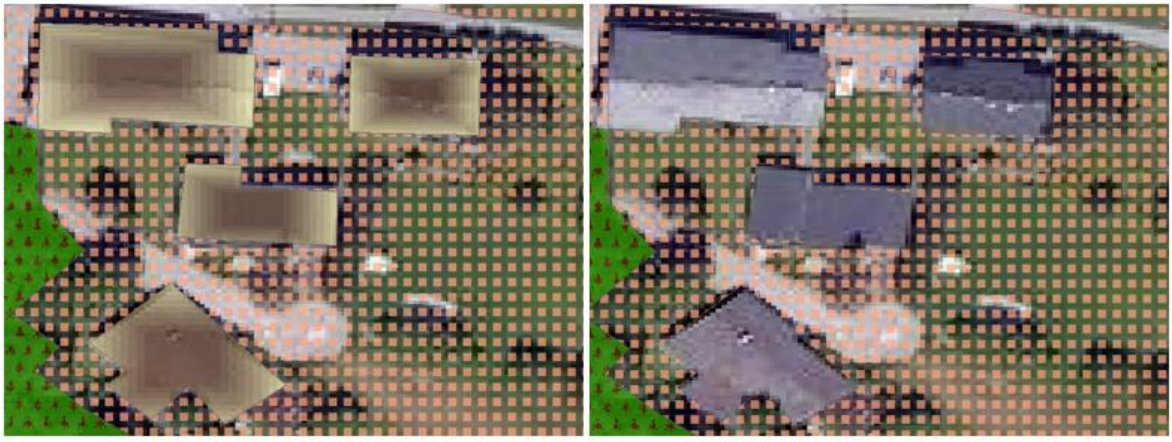
After creating all the parcels in the map, each attribute was added in the fields, and the topology was checked, in order to avoid a longer check at the end of the digitizing.

Figure 7 Parcel Digitized



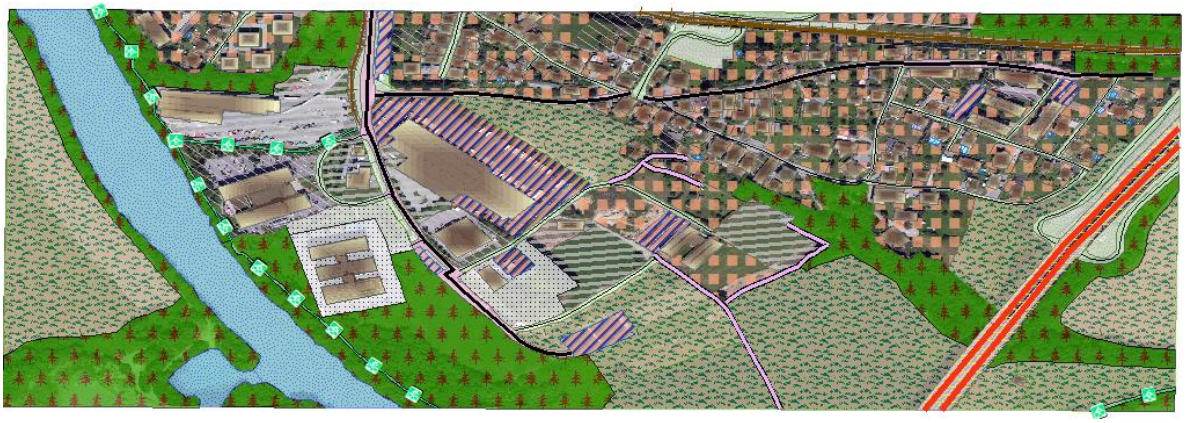
Inside of the digitized parcels, buildings and waterbodies are inside these parcels but must be removed because they do not make part of a parcel area. I created the building with the polygon tool as well as the water bodies. In order to extract this area from the parcel area, the Clip tool was implemented to do so.

Figure 8 Clipped Buildings



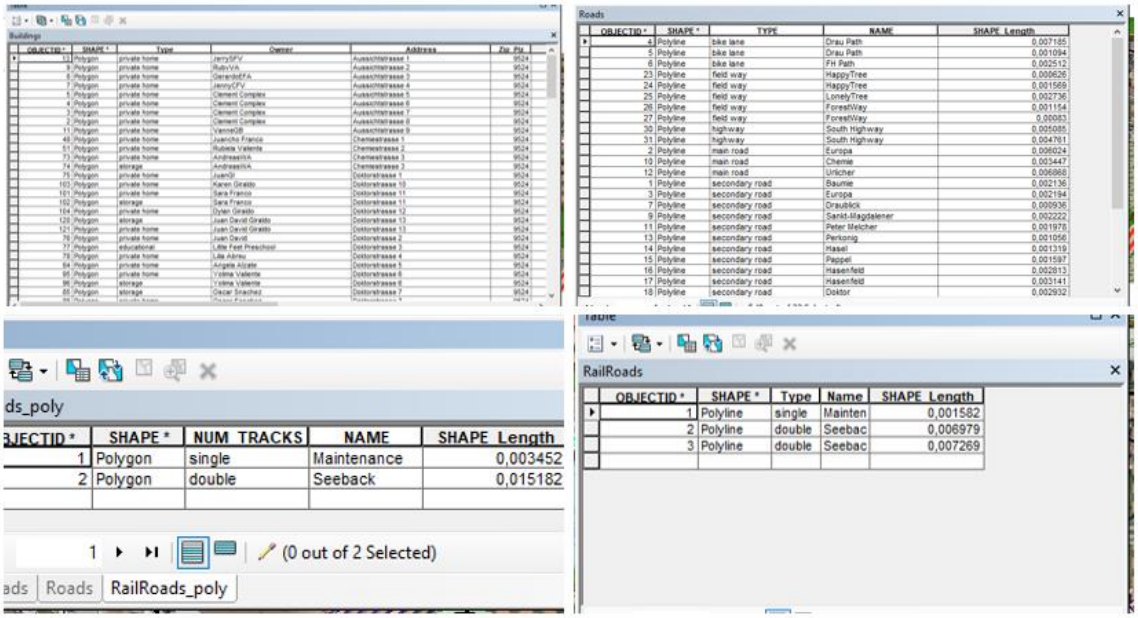
After digitizing each of the feature classes, we have a map as follows:

Figure 9 Digitized Map



Also, to each of the attribute tables, each value was added.

Table 2 Table of Attributes 1



ds_poly

OBJECTID *	SHAPE *	NUM_TRACKS	NAME	SHAPE_Length
1	Polygon	single	Maintenance	0,003452
2	Polygon	double	Seeback	0,015182

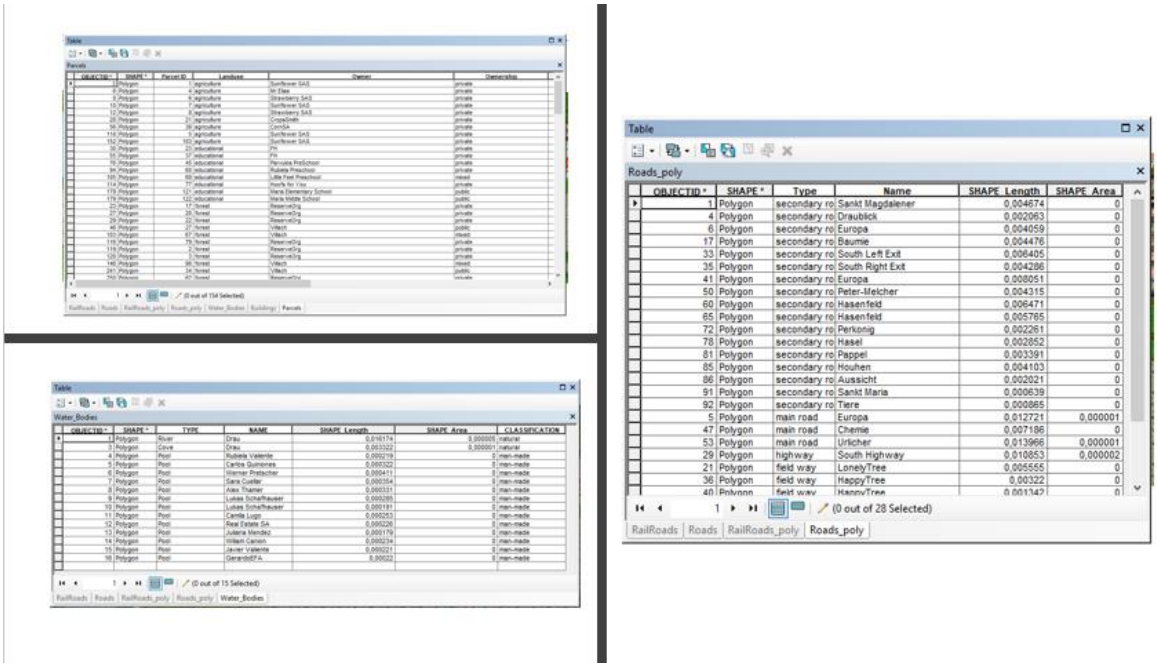
1 (0 out of 2 Selected)

ads | Roads | RailRoads_poly

RailRoads

OBJECTID *	SHAPE *	Type	Name	SHAPE_Length
1	Polyline	single	Mainten	0,001582
2	Polyline	double	Seebac	0,006979
3	Polyline	double	Seebac	0,007269

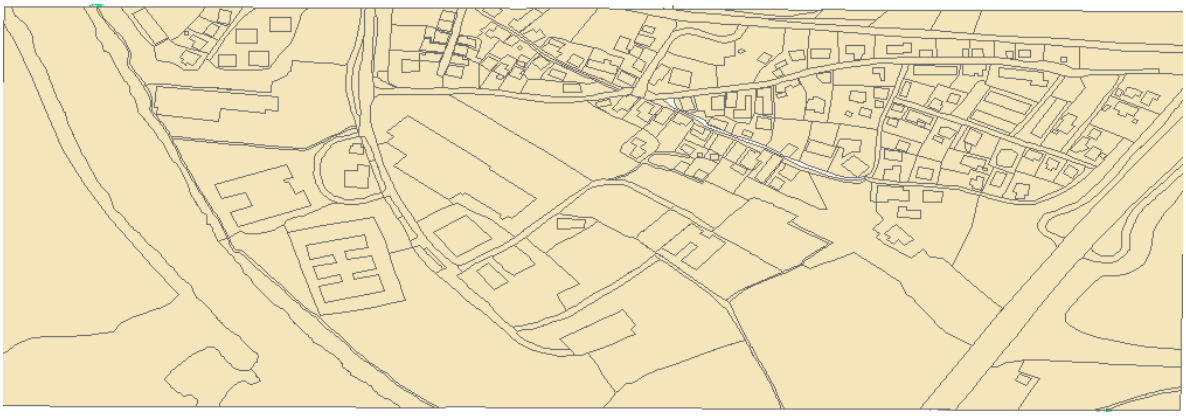
Table 3 Table of Attributes 2



Finally, the last step was to check the topological correctness. Applying certain rules to this wizard. It must indicate that no lines should have under or overshoots (dangles). The polygons must have gaps or overlaps, and no polygon feature class should over lay with another polygon feature class.

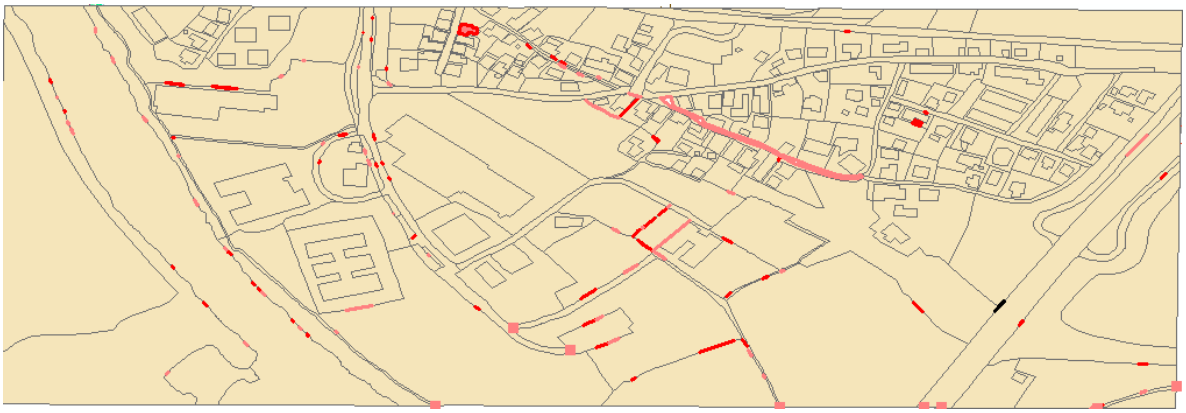
First the merge tool was used to create a big polygon of the entire study area:

Figure 10 Merged Layers



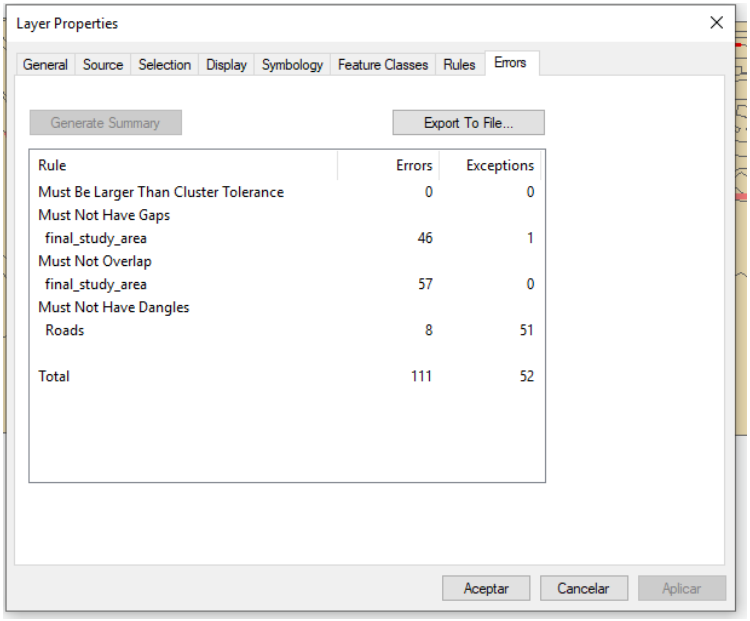
After creating the new topology layer was created, it generated a summary of all the errors in the map.

Figure 11 Topological Errors



Many types of error were shown, specifically in the roads feature class but there was no real error they were exceptions such as the end point of some roads and the frame of the whole map. These errors were selected as exceptions in the Error Inspector.

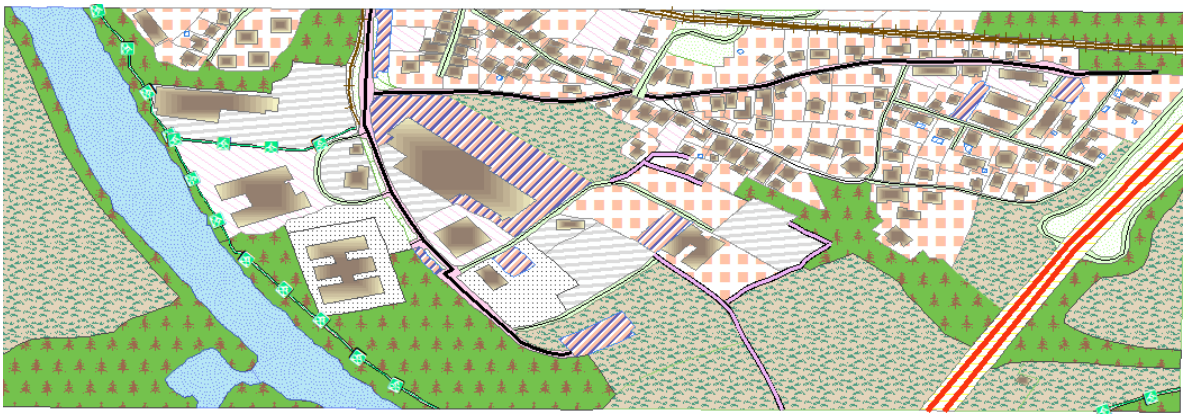
Figure 12 Number of Topological Errors



Some overlaps and gaps were difficult to correct, maybe because we were working on a very small scale or the lack of knowledge to correctly use the topology tools. Very few I was able to correct.

After several attempts to correct the topological mistakes, I proceeded to create the final map, by editing first the symbology to some layers.

Figure 13 Final Digitized map



Conclusions and Lessons learned

In order to conclude this project, having the ability to digitize allows us to create a dynamic map from any satellite image or even from a printed hard copy. It makes visualizing a specific problem from a territory much easier. In this case if anyone has a problem to solve regarding Sankt Magdalen, for instance a new industrial infrastructure, new residential buildings, a new park for the residential area, with the help of this map we can locate a new green area that is accessible to the residents in Sankt Magdalen. We can analyze the noise pollution that can be caused by the highway near the residential area. If there was ever pollution to the river, we could understand the surround possible firsthand actors. Many questions and solutions can come out of this map.

Personally, digitizing has been a great interest for my professional growth, after this digitizing project, I learned more tools and understand the complexity and the number of tools that are still to be learned. The time and dedication to have a better handle in this program. For example, the topological corrections were definitely not my strong suit, something that I will continue to work on. Being clean and careful is a must require skill for this type of work, it is a time-consuming task, but I enjoyed carrying out this project. I am looking forward to learning more tools in ArcMap.