



Geographic Information System

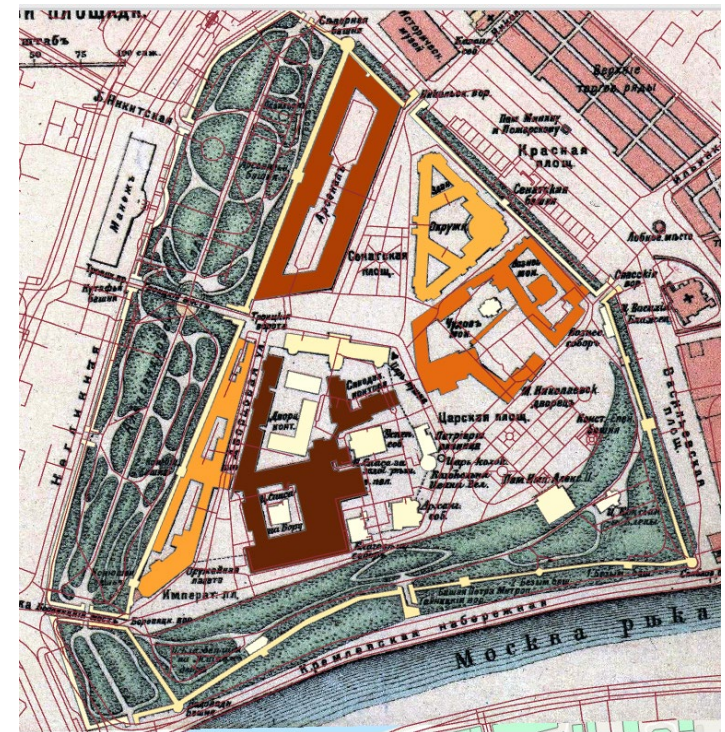
Digitalization

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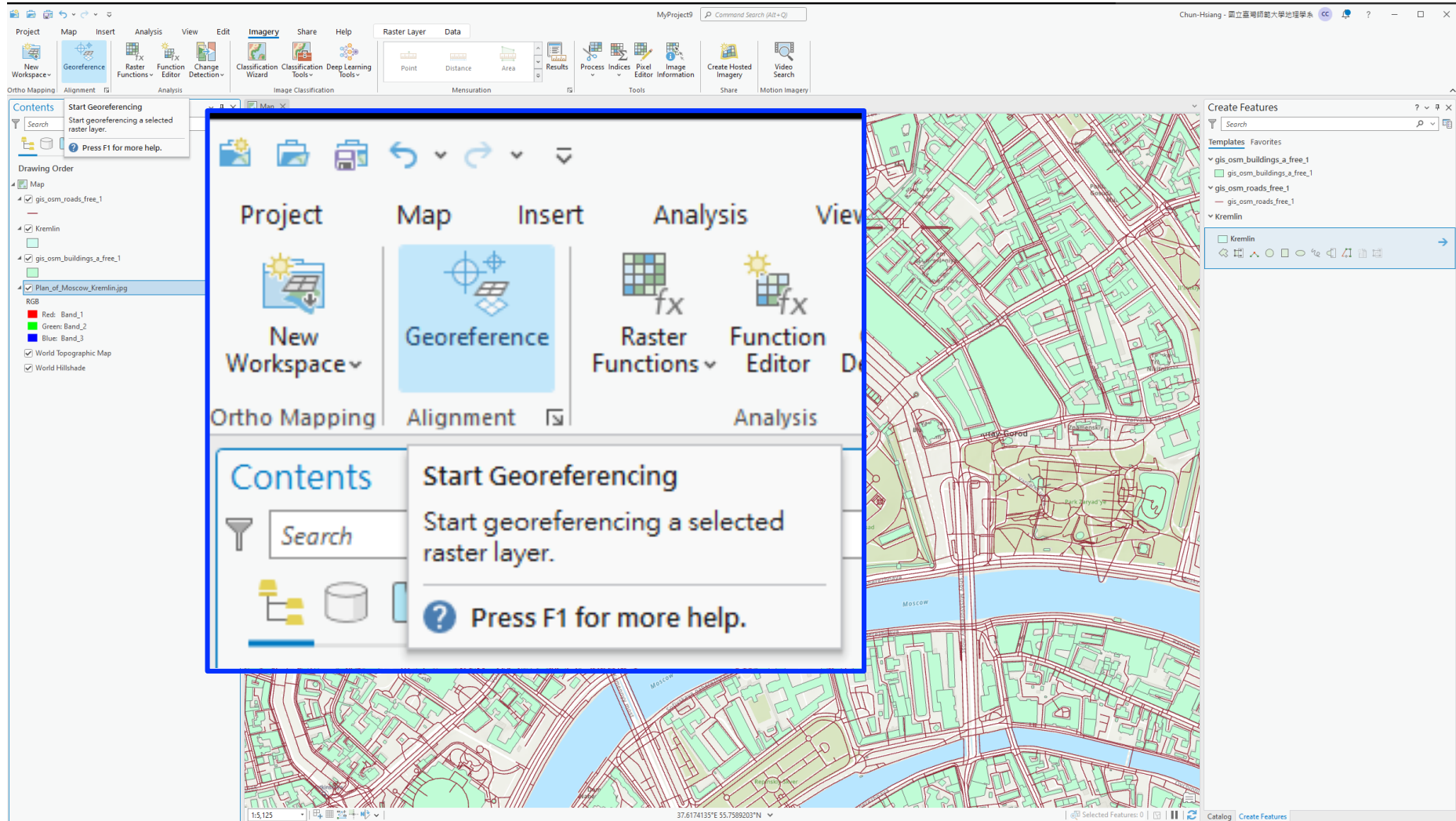


Digitalization Lab

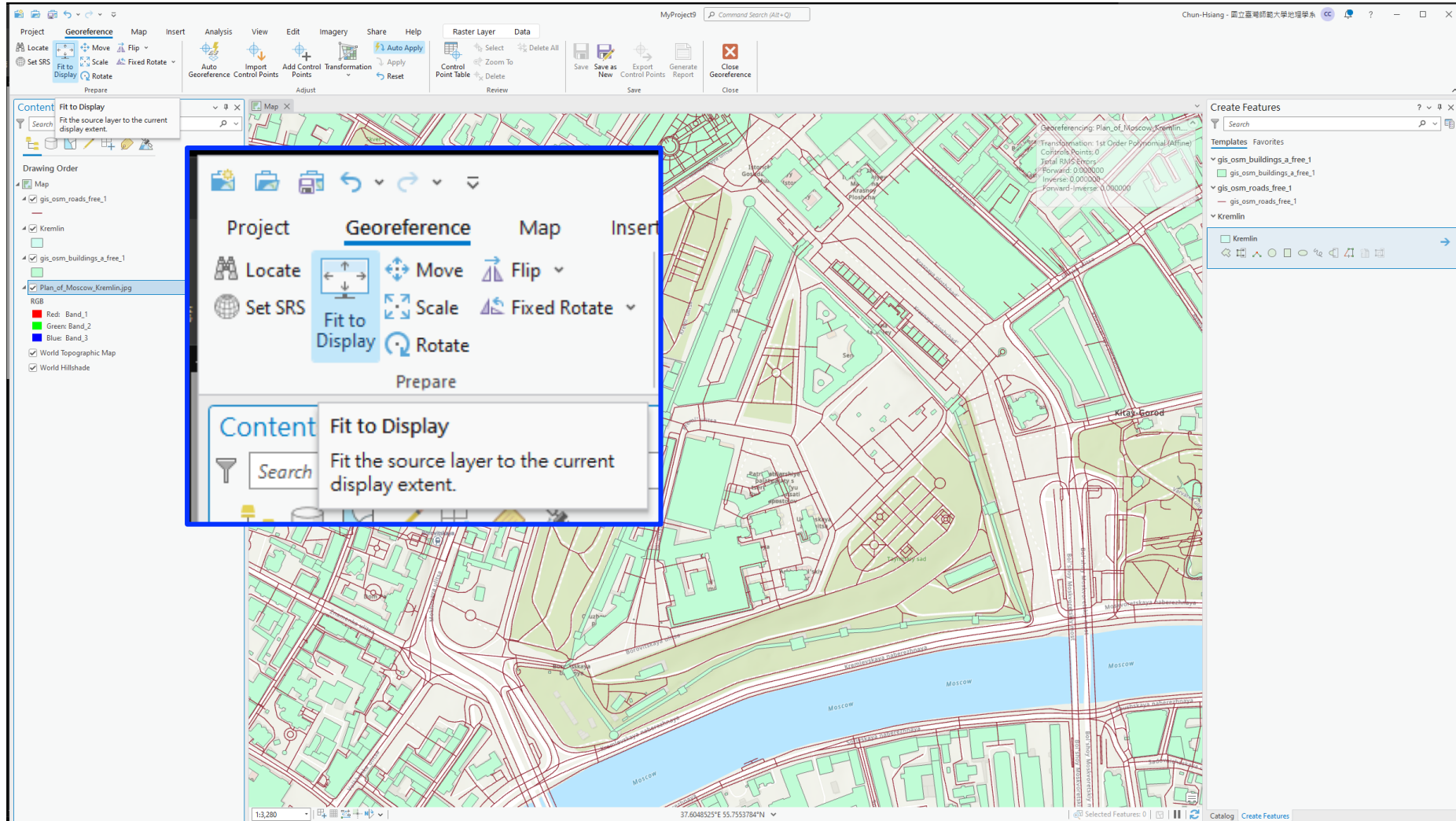
- 1) Set **PCS** for targeting area
- 2) Create a **Feature Class** (Shapefile)
- 3) **Georeferencing**
- 4) **Fit to Display**
- 5) **Add Control Points**
- 6) Show **Control Point Table** and **Save** it
- 7) **Edit :: Create** → start to digitalizing all Kremlin buildings
- 8) **Create a Feature Class** (Shapefile) for Erasing the overlapped areas
- 9) **Erase** the overlapped areas
- 10) **Create a Feature Class**(Shapefile) for adding the overlapped areas
- 11) **Union** the added areas
- 12) **Calculate Geometry** :: Perimeter and Area
- 13) **Symbology** with Area values



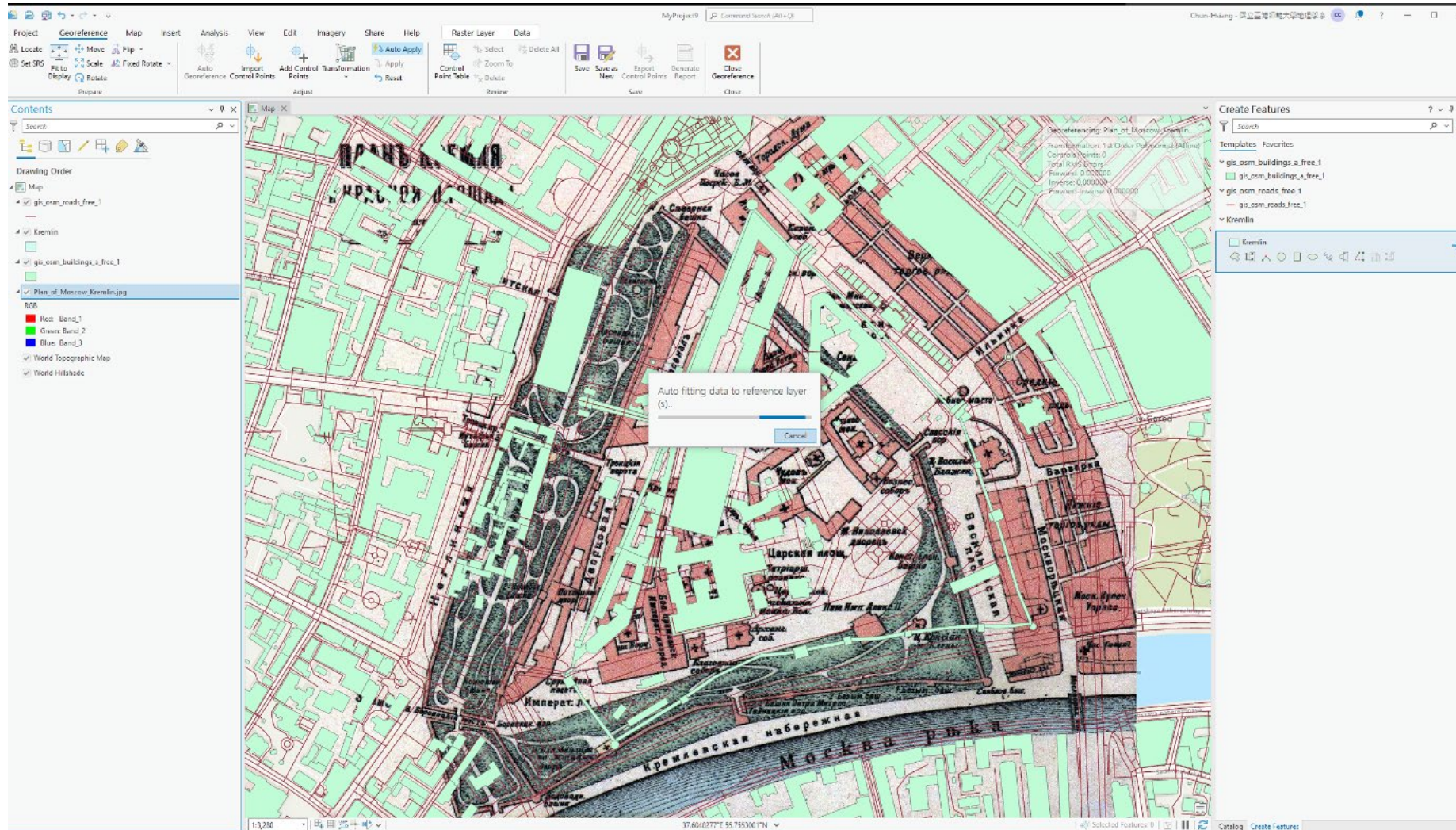
Georeferencing



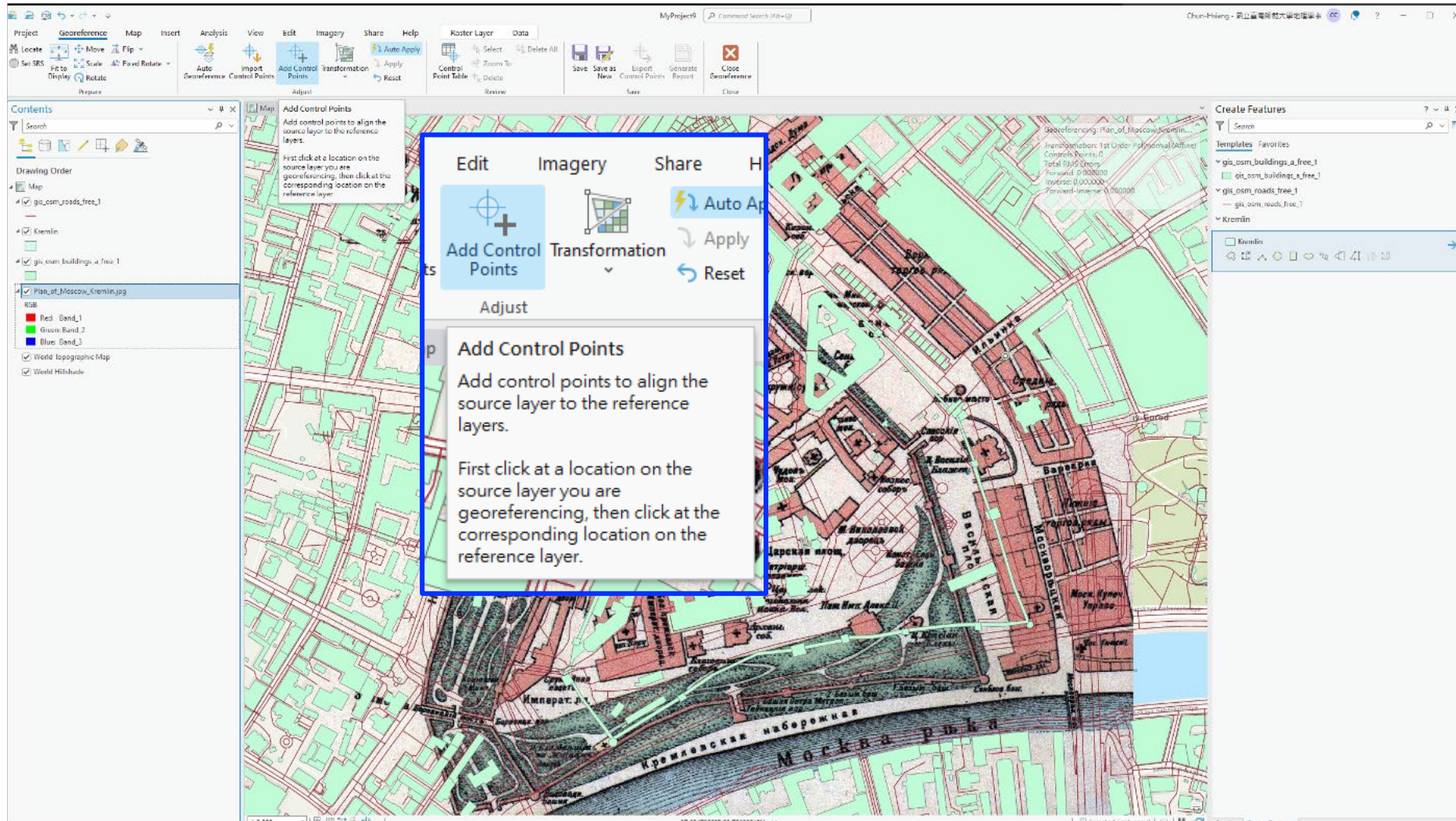
Georeferencing



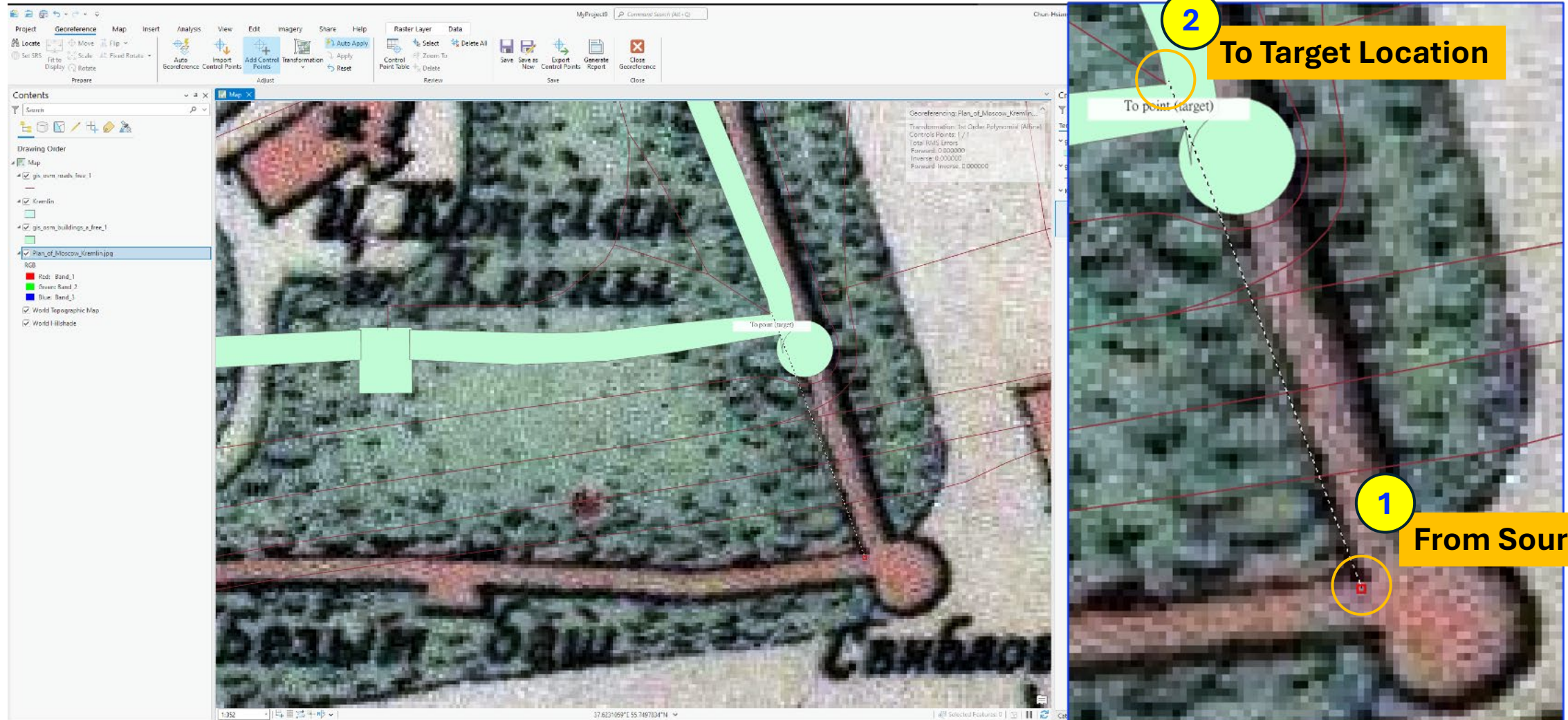
Georeferencing



Georeferencing



Georeferencing



Georeferencing

The screenshot shows the ArcGIS software interface with the 'Georeference' tab active. The 'Control Point Table' window is open, displaying a table of control points used for georeferencing. The table has columns for Link, Source X, Source Y, Map X, Map Y, Residual X, Residual Y, and Residual. The map view shows a satellite image of the Moscow Kremlin area with a grid overlaid. The 'Control Point Table' window is highlighted with a blue box, and a blue arrow points to the 'Control Point Table' icon in the 'Raster Layer Data' menu. Another blue arrow points to the map view.

Link	Source X	Source Y	Map X	Map Y	Residual X	Residual Y	Residual
1	886.163389	-287.996193	413.175.981294	6.179.604.833480	-0.613242	3.602504	3.654326
2	1.563.147293	-1.327.387345	413.575.176137	6.179.090.170617	2.155401	3.105348	3.780072
3	514.201262	-1.596.210459	412.975.362807	6.178.920.862356	-0.039387	-0.116936	0.123391
4	881.918864	-249.739301	413.173.535105	6.179.702.789677	-0.293232	-0.520415	0.597341
5	1.586.249453	-1.321.368849	413.584.080654	6.179.087.665719	-2.093265	-3.114039	3.752199
6	875.299241	-246.271011	413.170.894972	6.179.702.282049	0.883725	-2.956462	3.085715

Georeferencing

Save
Update the georeferencing transformation of the source raster dataset.

Link	Source X	Source Y	Map X	Map Y	Residual X	Residual Y	Residual
1	886.163389	-287.996193	413,175.981294	6,179,684.833480	-0.613242	3.602504	3.654326
2	1,563.147293	-1,327.387345	413,575.176137	6,179,090.170617	2.155401	3.105348	3.780072
3	514.201262	-1,596.210459	412,975.362807	6,178,920.863356	-0.029387	-0.116936	0.123391
4	881.918864	-249.739301	413,173.535105	6,179,702.789677	-0.293232	-0.520415	0.597341
5	1,586.249453	-1,321.368849	413,584.088654	6,179,087.665719	-2.093265	-3.114039	3.752199
6	875.299241	-246.271011	413,170.894972	6,179,702.292049	0.883725	-2.956462	3.085715

Editing :: Digitalization

The screenshot displays the ArcGIS software interface with several key components highlighted:

- 1**: A callout box highlights the **Edit** tab in the top ribbon, which contains the **Snapping** and **Features** toolbars.
- 2**: A callout box highlights the **Kremlin** layer in the **Contents** pane on the right, showing its specific editing tools.

The main map area shows a topographic map of the Kremlin in Moscow, with various features like roads, buildings, and water bodies. A table at the bottom of the interface provides georeferencing data:

Link	Source X	Source Y	Map X	Map Y	Residual X	Residual Y	Residual
1	886.163389	-287.996193	413,175.981294	6,179,684.833480	-0.613242	3.602504	3.654326
2	1,563.147293	-1,327.387345	413,575.176137	6,179,090.170617	2.155401	3.105348	3.780072
3	514.201262	-1,596.210459	412,975.362807	6,178,920.863356	-0.039387	-0.116936	0.123391
4	881.918864	-249.739301	413,173.535105	6,179,702.789677	-0.293232	-0.520415	0.597341
5	1,586.249453	-1,321.368849	413,584.088654	6,179,087.665719	-2.093265	-3.114039	3.752199
6	875.299241	-246.271011	413,170.894972	6,179,702.292049	0.883725	-2.956462	3.085715

Editing :: Digitalization

The screenshot displays the QGIS interface with a map of the Moscow Kremlin. The 'Create Features' panel on the right is active, showing the 'Autocomplete Polygon' tool selected. A blue arrow points from this tool to the map. A yellow circle with the number '3' is located to the right of the map. The 'Contents' panel on the left shows the map layers, including 'gis_osm_roads_free_1', 'Kremlin', 'gis_osm_buildings_a_free_1', and 'Plan_of_Moscow_Kremlin.jpg'. The 'Map' layer is selected, and the 'Kremlin' layer is highlighted in the 'Create Features' panel. The 'Autocomplete Polygon' tool is described as: 'Create an adjoining polygon using an existing polygon in the same layer to complete the coincident edges.'

Link	Source X	Source Y	Map X	Map Y	Residual X	Residual Y	Residual
1	886.163389	-287.996193	413,175.981294	6,179,684.833480	-0.613242	3.602504	3.654326
2	1,563.147293	-1,327.387345	413,575.176137	6,179,090.170617	2.155401	3.105348	3.780072
3	514.201262	-1,596.210459	412,975.362807	6,178,920.863356	-0.039387	-0.116936	0.123391
4	881.918864	-249.739301	413,173.535105	6,179,702.789677	-0.293232	-0.520415	0.597341
5	1,586.249453	-1,321.368849	413,584.088654	6,179,087.665719	-2.093265	-3.114039	3.752199
6	875.299241	-246.271011	413,170.894972	6,179,702.292049	0.883725	-2.956462	3.085715

Editing :: Digitalization

Georeferencing: Plan_of_Moscow_Kremlin...

Transformation: 1st Order Polynomial (Affine)
Controls Points: 6 / 6
Total RMS Errors:
Forward: 2.933022
Inverse: 5.080805
Forward-inverse: 0.000000

Link	Source X	Source Y	Map X	Map Y	Residual X	Residual Y	Residual
1	886.163389	-387.996193	413.175.981294	6.179.684.833480	-0.610242	3.602504	3.654326
2	1.563.147293	-1.327.387345	413.875.176137	6.179.090.170617	2.155401	3.105348	3.786072
3	514.201262	-1.596.210459	412.975.362807	6.178.920.863356	-0.093387	-0.116936	0.123391
4	881.918864	-249.739301	413.173.535105	6.179.702.789677	-0.293232	-0.520415	0.597341
5	1.586.249453	-1.321.368849	413.584.088654	6.179.087.665719	-2.093265	-3.114039	3.752199
6	875.299241	-246.271011	413.170.894972	6.179.702.292049	0.883725	-2.956462	3.085715

Editing :: Digitalization

Georeferencing: Plan_of_Moscow_Kremlin...

Transformation: 1st Order Polynomial (Affine)
Controls Points: 6 / 6
Total RMS Errors
Forward: 2.933022
Inverse: 5.080805
Forward-Inverse: 0.000003

AutoComplete Polygons Tool

There are uncommitted geometry sketch operations.
Do you want to apply or discard the sketch operations?

Remember choice and don't show this message aga

> More Info Apply Discard

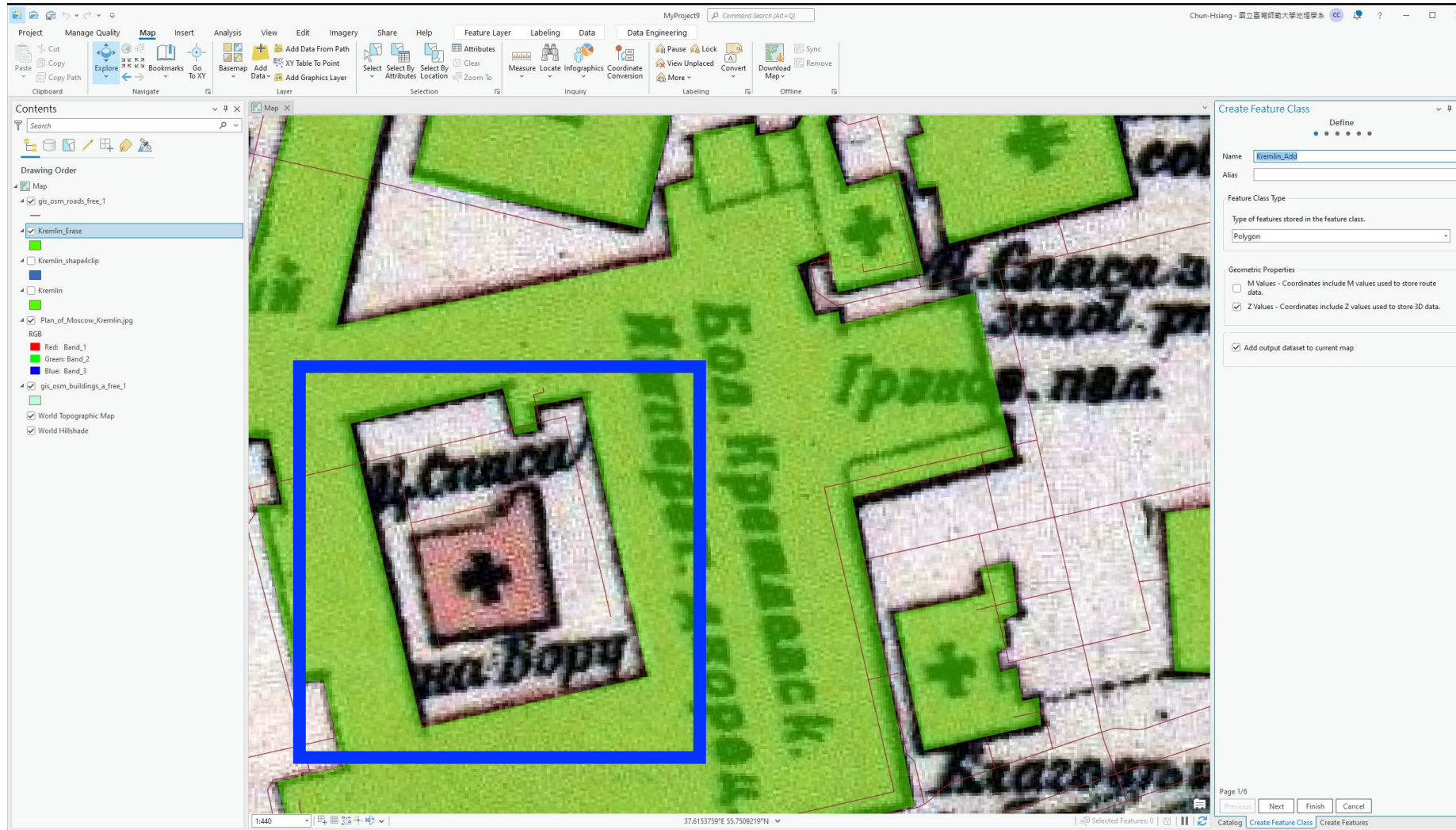
Link	Source X	Source Y	Map X	Map Y	Residual X	Residual Y	Residual	
<input checked="" type="checkbox"/>	1	986.163389	-287.996193	413.175.951294	6.179.694.823480	-0.612242	3.602504	3.654326
<input checked="" type="checkbox"/>	2	1.563.147293	-1.327.387345	413.575.176197	6.179.090.170617	2.155401	3.165340	3.780072
<input checked="" type="checkbox"/>	3	514.201262	-1.596.210459	412.975.362807	6.178.920.863356	-0.039387	-0.116936	0.123391
<input checked="" type="checkbox"/>	4	881.918864	-249.739301	413.173.535105	6.179.702.789677	-0.293232	-0.520415	0.597341
<input checked="" type="checkbox"/>	5	1.586.249453	-1.321.368849	413.584.086654	6.179.087.665719	-2.093265	-3.114039	3.752199
<input checked="" type="checkbox"/>	6	875.299241	-246.271011	413.170.894972	6.179.702.292049	0.883725	-2.956462	3.085715

Editing :: Digitalization

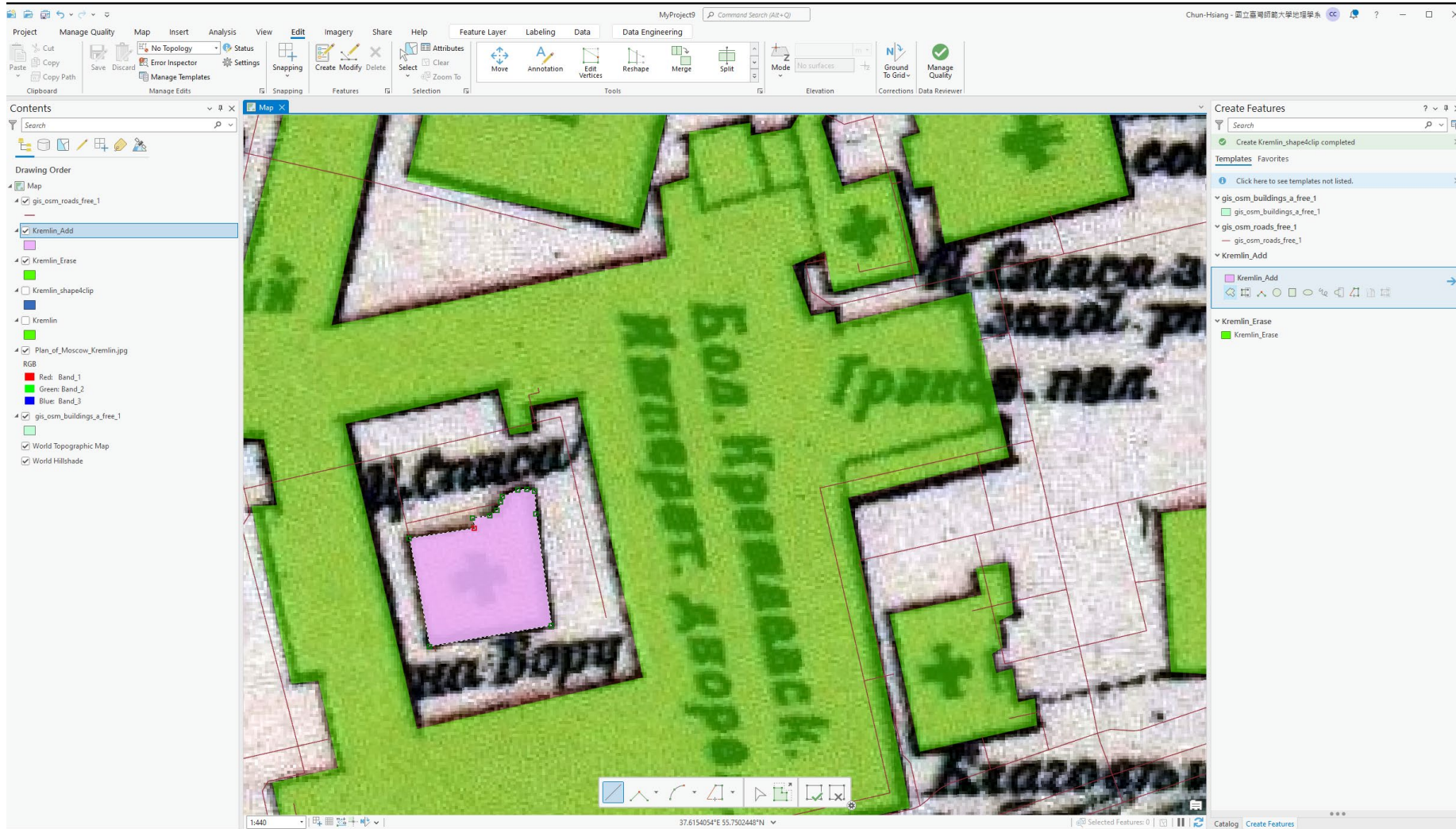
The screenshot displays the QGIS desktop environment. The main map window shows a topographic map of the Kremlin in Moscow, with a blue polygon highlighting a specific area. The interface includes a toolbar at the top, a Contents panel on the left, and a Properties panel on the right. The Properties panel shows the 'Kremlin' layer selected, with a table of attributes for the selected feature.

OBJECTID *	SHAPE *	Shape_Length	Shape_Area	Area	Length
1	Polygon Z	1102.3117	9377.190438	<Null>	<Null>

Create a Feature Class for Adding Polygon



Create a Feature Class for Adding Polygon



Union Two Shapefiles Together

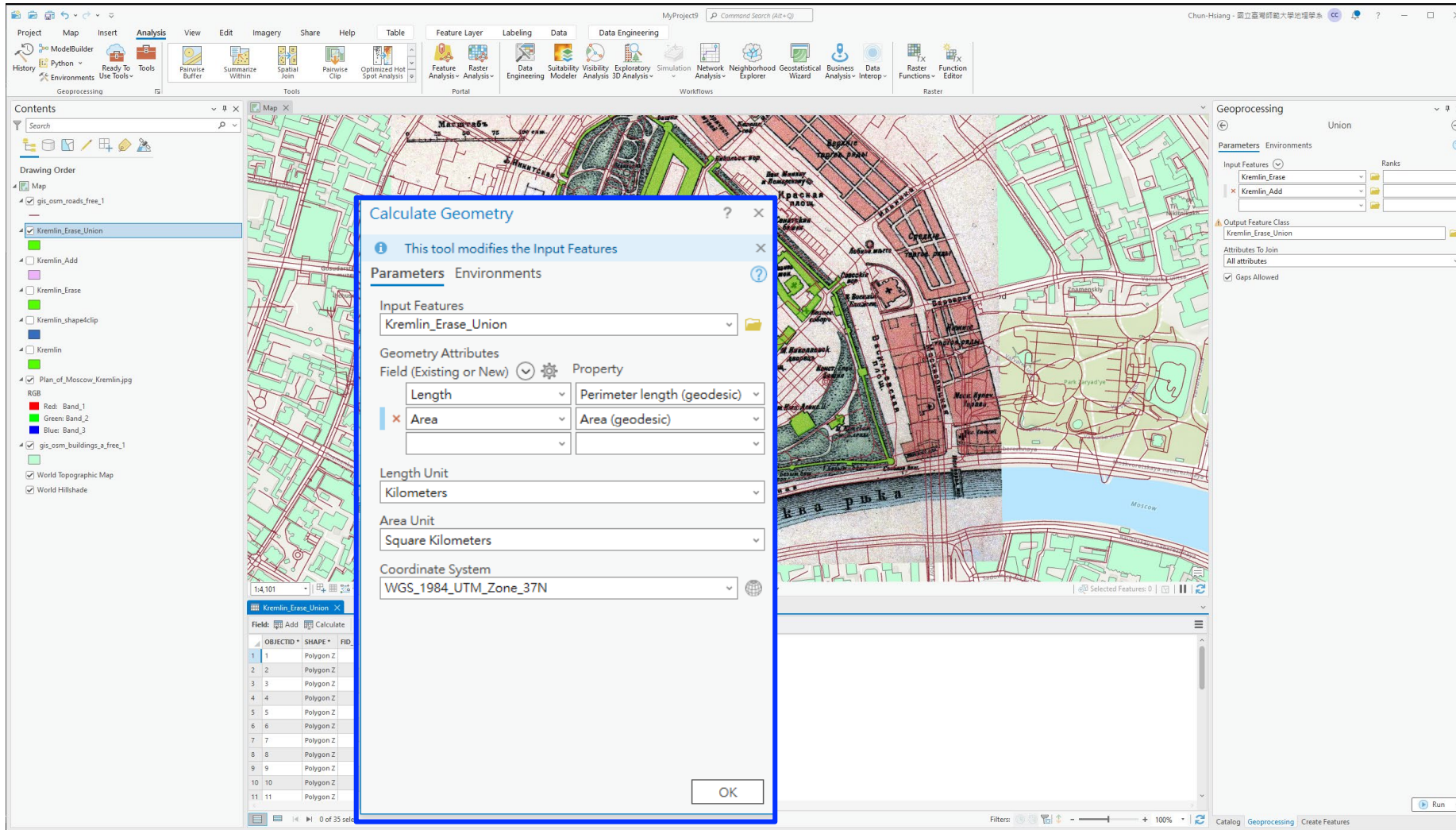
The screenshot shows the ArcGIS Pro interface with the Geoprocessing pane open. The main map displays a historical map of the Kremlin in Moscow, with various layers overlaid. The Geoprocessing pane on the right is titled "Union" and shows the following parameters:

- Input Features:** Kremlin_Erase, Kremlin_Add
- Output Feature Class:** Kremlin_Erase_Union
- Attributes To Join:** All attributes
- Gaps Allowed:**

The map shows the Kremlin area in Moscow, with various layers overlaid. The layers in the Contents pane include:

- gis_osm_roads_free_1
- Kremlin_Add
- Kremlin_Erase
- Kremlin_shapeclip
- Kremlin
- Plan_of_Moscow_Kremlin.jpg
- gis_osm_buildings_a_free_1
- World Topographic Map
- World Hillshade

Calculate Geometry



Symbology with Building Areas

The screenshot displays the ArcGIS Desktop interface. The main map shows a vector-style map of the Kremlin in Moscow, with building footprints colored according to their area. The symbology legend on the right is titled "Symbology - Kremlin_Erase_Union" and shows a graduated color legend for the "Area" field. The legend is set to "Defined Interval" with an interval size of 0.001. Below the legend is a table of 18 classes, each with a symbol, an upper value, and a label representing the area range.

Symbology - Kremlin_Erase_Union

Primary symbology

Graduated Colors

Field: Area

Normalization: <None>

Method: Defined Interval

Interval size: 0.001

Classes: 18

Color scheme: [Color gradient]

Classes Histogram Scales

Symbol	Upper value	Label
[Symbol]	≤ 0.001	0.000000 - 0.001000
[Symbol]	≤ 0.002	0.001001 - 0.002000
[Symbol]	≤ 0.003	0.002001 - 0.003000
[Symbol]	≤ 0.004	0.003001 - 0.004000
[Symbol]	≤ 0.005	0.004001 - 0.005000
[Symbol]	≤ 0.006	0.005001 - 0.006000
[Symbol]	≤ 0.007	0.006001 - 0.007000
[Symbol]	≤ 0.008	0.007001 - 0.008000
[Symbol]	≤ 0.009	0.008001 - 0.009000
[Symbol]	≤ 0.01	0.009001 - 0.010000
[Symbol]	≤ 0.011	0.010001 - 0.011000
[Symbol]	≤ 0.012	0.011001 - 0.012000
[Symbol]	≤ 0.013	0.012001 - 0.013000
[Symbol]	≤ 0.014	0.013001 - 0.014000
[Symbol]	≤ 0.015	0.014001 - 0.015000
[Symbol]	≤ 0.016	0.015001 - 0.016000
[Symbol]	≤ 0.017	0.016001 - 0.017000
[Symbol]	≤ 0.018	0.017001 - 0.018000

Table of Contents

- gis_osm_roads_free_1
- Kremlin_Erase_Union
 - Area
- Kremlin_Add
- Kremlin_Erase
- Kremlin_shape4clip
- Kremlin
- Plan_of_Moscow_Kremlin.jpg
- World Topographic Map
- World Hillshade

Table of Contents - Area Legend

- 0.000000 - 0.001000
- 0.001001 - 0.002000
- 0.002001 - 0.003000
- 0.003001 - 0.004000
- 0.004001 - 0.005000
- 0.005001 - 0.006000
- 0.006001 - 0.007000
- 0.007001 - 0.008000
- 0.008001 - 0.009000
- 0.009001 - 0.010000
- 0.010001 - 0.011000
- 0.011001 - 0.012000
- 0.012001 - 0.013000
- 0.013001 - 0.014000
- 0.014001 - 0.015000
- 0.015001 - 0.016000
- 0.016001 - 0.017000
- 0.017001 - 0.018000

Table of Contents - RGB Legend

- Red: Band_1
- Green: Band_2
- Blue: Band_3

Table of Contents - Data Table

OBJECTID	SHAPE	FID_Kremlin_Erase	Area	Length	FID_Kremlin_Add	Shape_Length	Shape_Area
29	Polygon Z	-1	0.000576	0.101528	1	101.496864	575.589657
2	Polygon Z	1	0.008673	1.240704	-1	1240.322296	8667.791685
30	Polygon Z	1	0	0.034517	-1	34.506173	0.300777
4	Polygon Z	2	0.001681	0.222281	-1	222.212375	1679.704175
3	Polygon Z	3	0.000768	0.118881	-1	118.844688	767.314401
6	Polygon Z	4	0.017856	1.54712	-1	1546.6447	17945.002588
7	Polygon Z	5	0.002776	0.338605	-1	338.501324	2773.848601
8	Polygon Z	6	0.001173	0.1435	-1	143.456032	1172.76821
9	Polygon Z	7	0.000831	0.165887	-1	165.836324	830.072263
10	Polygon Z	8	0.011852	1.684844	-1	1684.325292	11845.113265
11	Polygon Z	9	0.001295	0.148691	-1	148.645577	1294.41383



The End

Thank you for your attention!

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