



3D Geological model to support managing urban subsurface environment: Bucharest City case study

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1. Objectives

2. Methodology

- **Data processing**
- **Creation of the 3D detailed geological model**

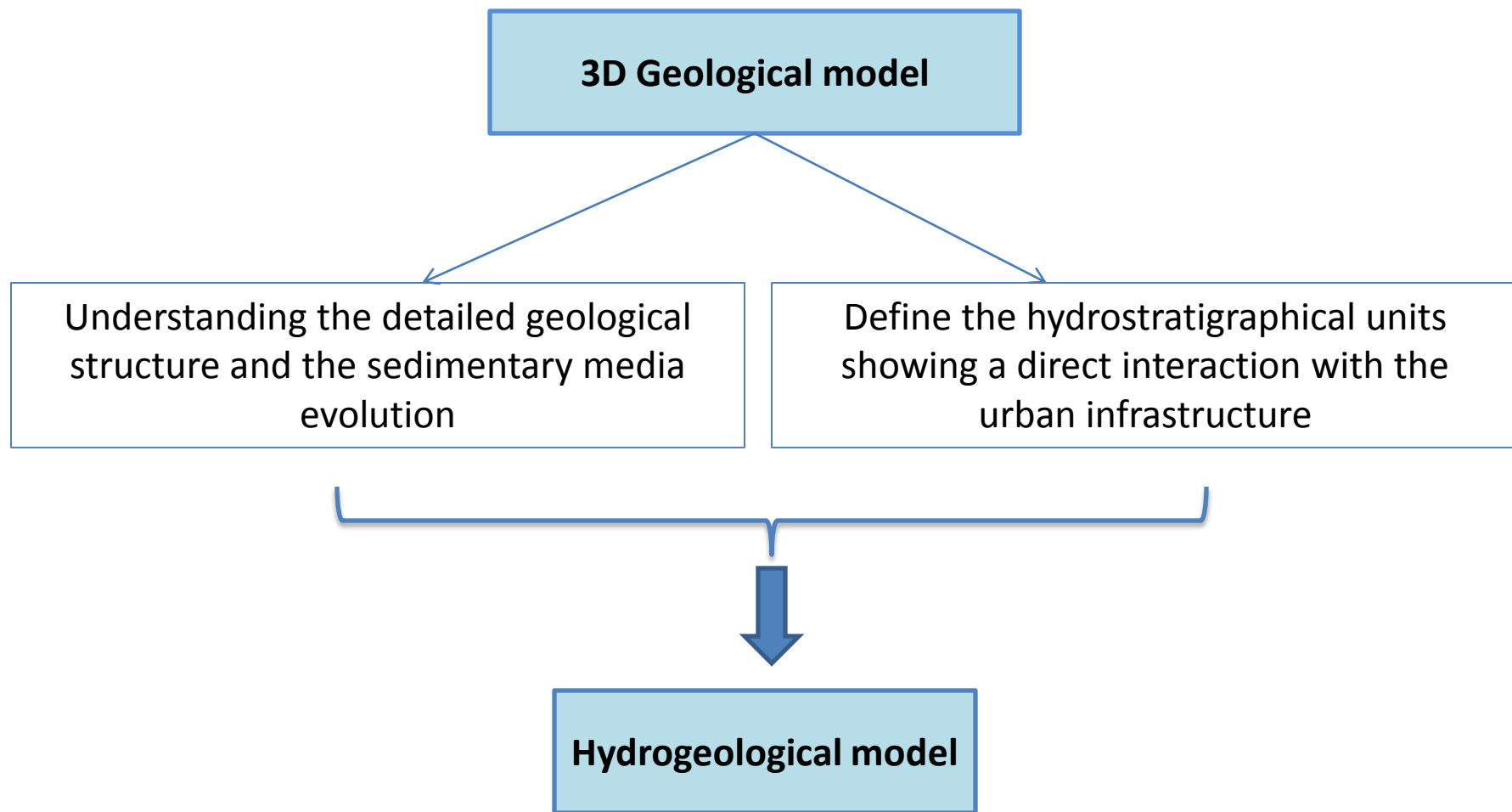
3. Case study – Bucharest City

- **Geology and geomorphology of Bucharest City**
- **3D Geological model of Bucharest City**

4. Geological model as application for hydrogeological studies

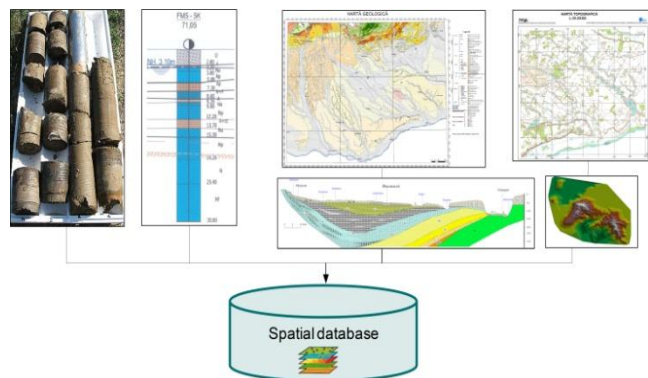
- **Geological model intersection with Bucharest urban infrastructure**

1. Objective:

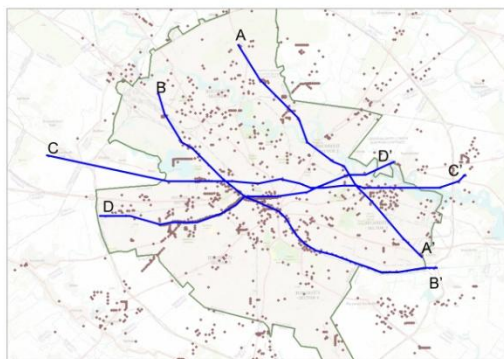


2. Methodology

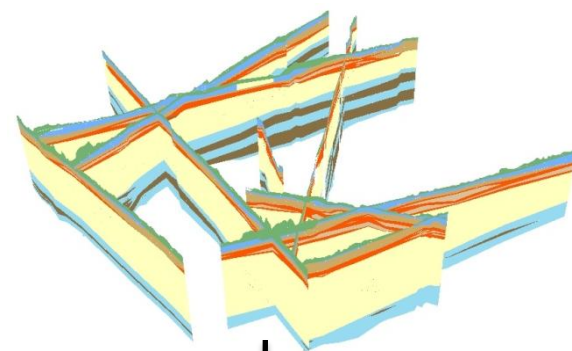
Collect and storage of information



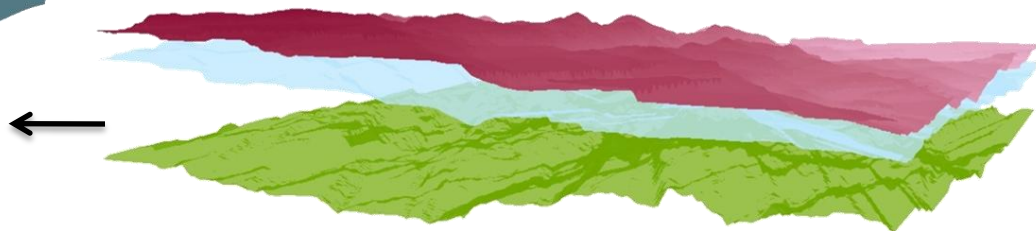
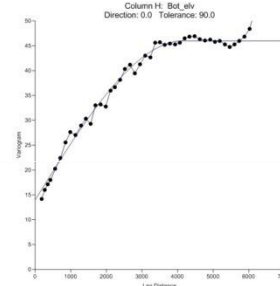
Define geological cross-section



Geological interpretation

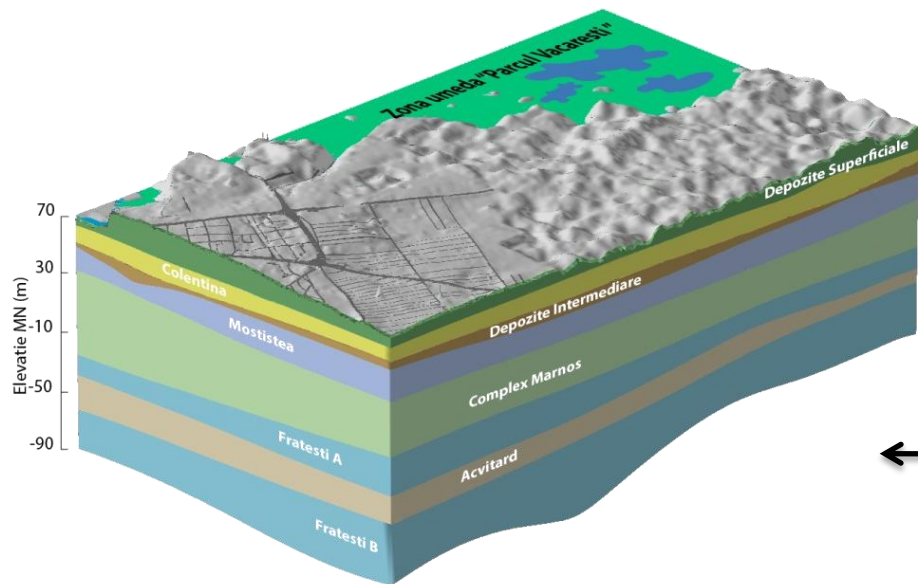


Create surfaces – geostatistical analysis

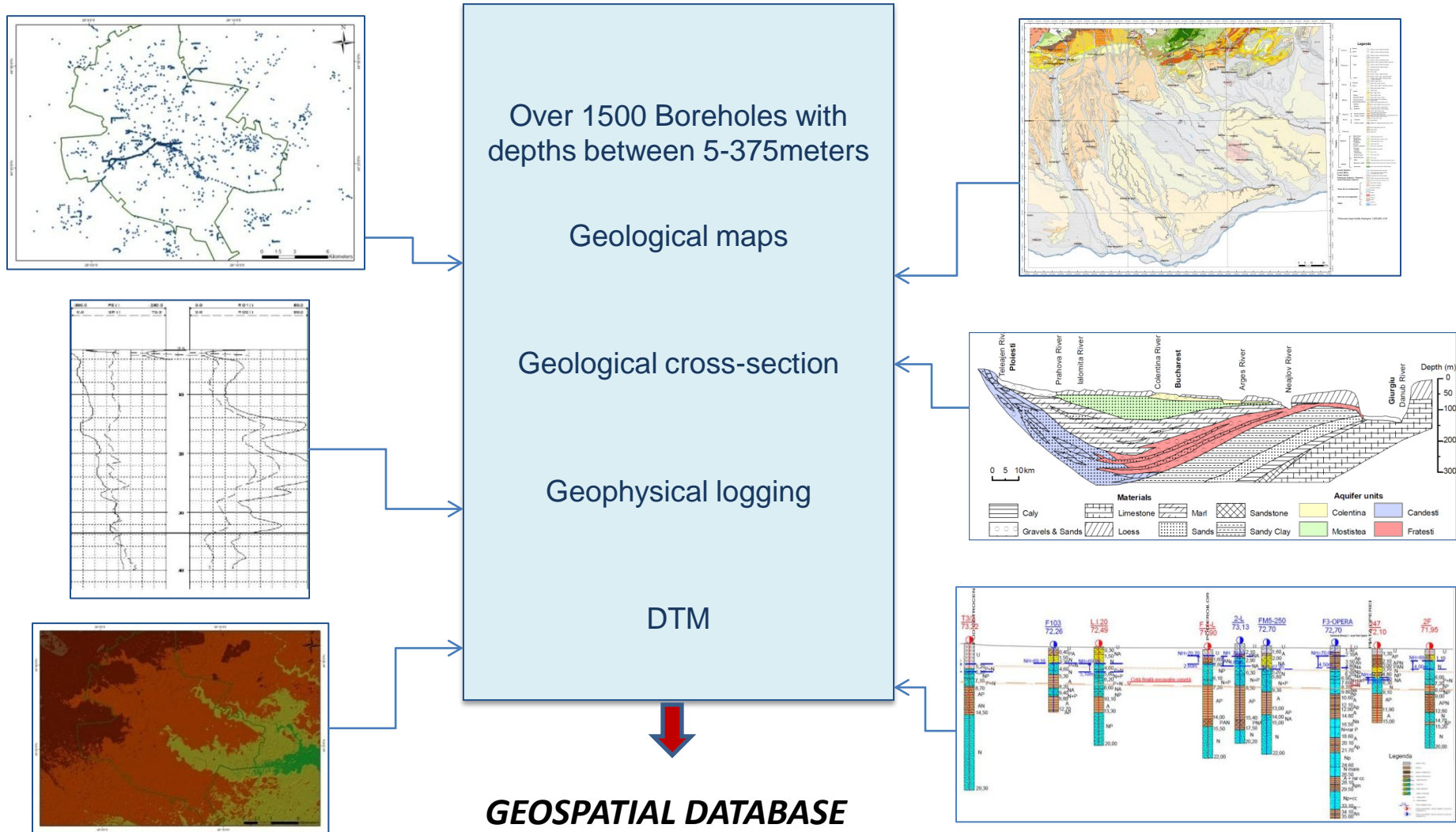


Surfaces defining the extent of hydrogeological units

3D solid model



Collect and storage of information



Collect and storage of information

Collect and storage of boreholes information

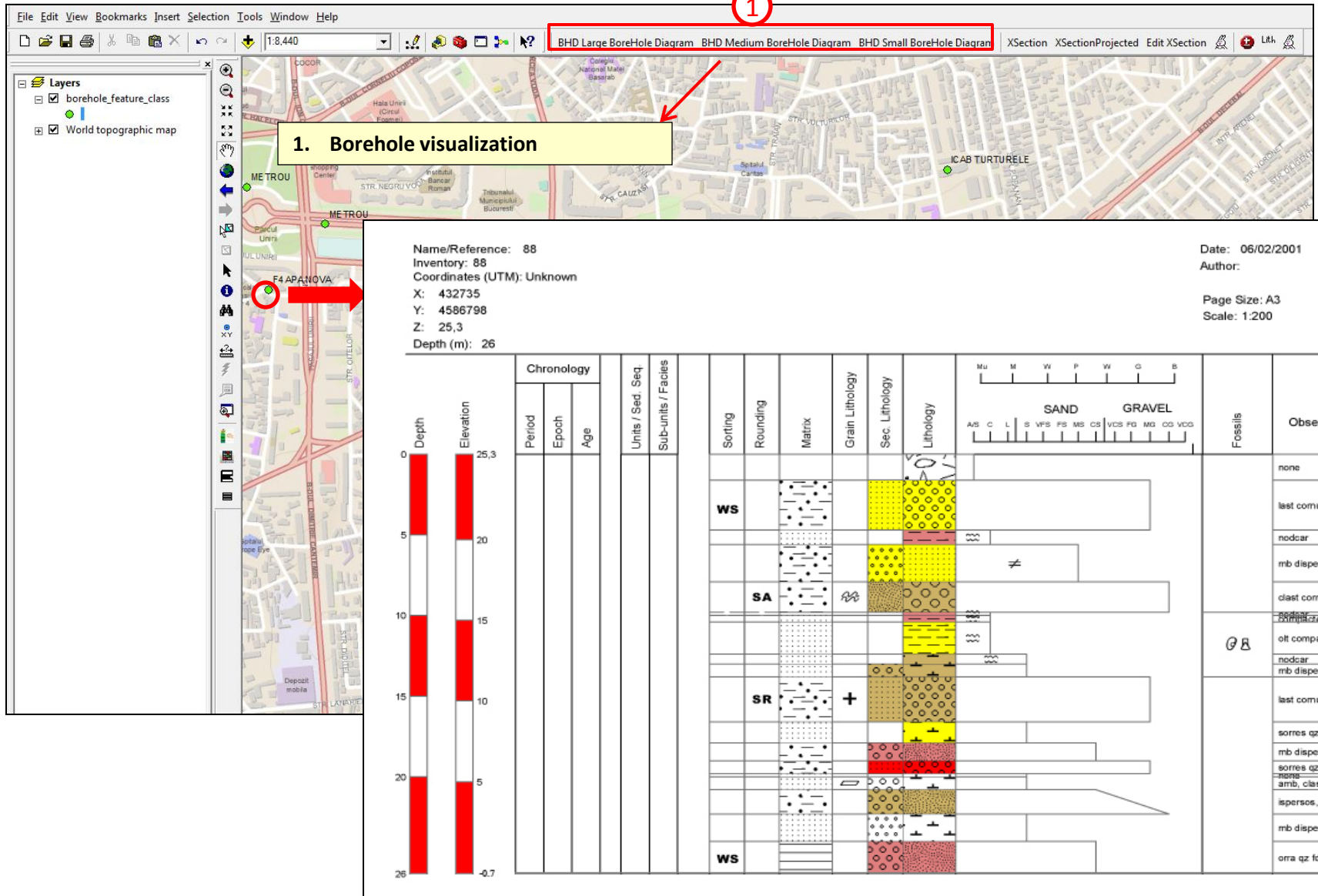
Spatial database



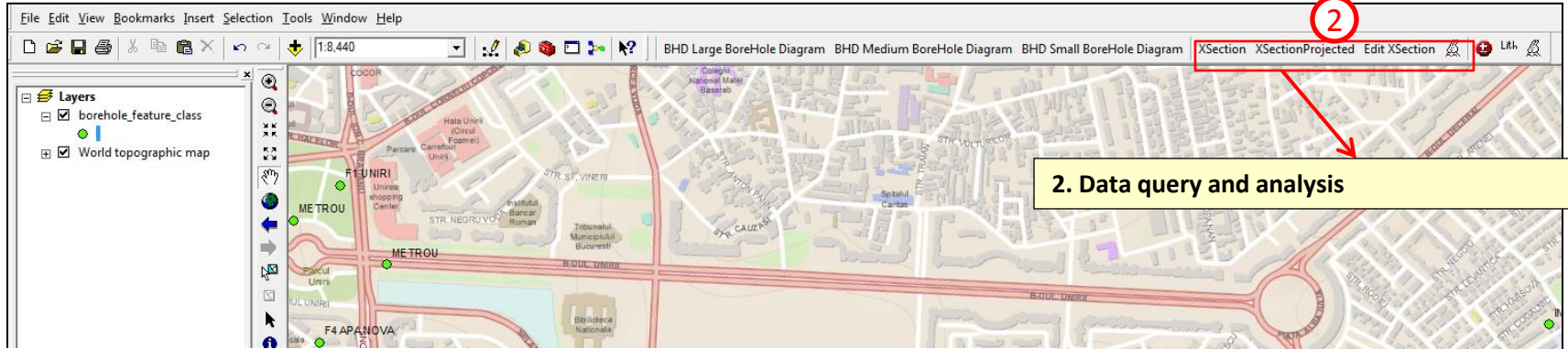
OBJECTID	BOREHOLE_ID	Top_Depth	Bottom_	Lithology	Lithology_Sec_ID	Observations
47303	911154272	0	7.8	sol_argilos_prafos		SOL ARGILOS PRAFOS_...
47304	911154272	7.8	13.6	pietris	nisip_grosier	PIETRIS CU NISIP GROSIER_...
47305	911154272	13.6	23.2	argila_siltica		ARGILA PRAFOASA_...
47306	911154272	23.2	24.4	nisip_fin_catre_mediu		NISIP FIN SI MEDIU_...
47307	911154272	24.4	33.8	argila		ARGILA_...
47308	911154272	33.8	37.8	nisip_fin		NISIP FIN_...
47309	911154272	37.8	62.6	argila		ARGILA_...
47310	911154272	62.6	68.5	nisip_fin_argilos	pietris	NISIP FIN ARGILOS CU PIETRIS_...
47311	911154272	68.5	78.5	nisip		NISIP_...
47312	911154272	78.5	91.5	argila		ARGILA MARNOASA_...
47313	911154272	91.5	98	nisip_fin	nisip_grosier_si_pietris	NISIP FIN SI GROSIER CU PIETRIS_...
47314	911154272	98	105.6	nisip	pietris	NISIP CU PIETRIS_...
47315	911154272	105.6	111	argila		ARGILA_...
47316	911154272	111	113	pietris	nisip	PIETRIS CU NISIP_...
47317	911154272	113	117	argila	nisip_fin	ARGILA CU NISIP FIN_...
47318	911154272	117	130	argila		ARGILA_...
47319	911254289	0	7.8	w		W_...
47320	911254289	7.8	13.6	pietris	nisip_grosier	PIETRIS CU NISIP GROSIER_...
47321	911254289	13.6	23.2	argila_siltica		ARGILA PRAFOASA_...
47322	911254289	23.2	24.4	nisip_fin_catre_mediu		NISIP FIN SI MEDIU_...

BOREHOLE_ID	X	Y	Elevation	Depth	Local_Code	Constructor	Inventory
19438	438234.989146427	388079.77922314	216.84197998	10	GOVORA-BISTRITA		
19439	438334.880646576	388082.240637297	216.43893433	10	BABENI		
19440	438434.780700728	388084.699912953	217.44656372	10	BABENI		
19441	440232.900412434	388128.960459261	226.7167511	13	GOVORA-BISTRITA		
19442	437033.789098969	388150.180800422	230.74726868	130	BABENI		
19443	438132.62981662	388177.220001636	217.74885559	11	GOVORA-BISTRITA		
19444	438232.529870771	388179.679277292	215.83433533	10	BABENI		
19445	440130.549636628	388226.399099256	227.01904297	13	GOVORA-BISTRITA		
19446	438030.279040814	388274.660780131	218.35342407	11	GOVORA-BISTRITA		
19447	438130.170540963	388277.120055787	218.65571594	10	BABENI		
19448	440028.19030682	388323.829185249	234.47549438	12	GOVORA-BISTRITA		
19449	437927.919711007	388372.090866124	219.96563721	12	GOVORA-BISTRITA		
19450	438227.609180958	388379.470831593	216.64045715	10	BABENI		IFB
19451	438327.50923511	388381.930107249	217.24504089	10	BABENI		IFB
19452	438427.400735259	388384.389382905	216.7412262	10	BABENI		IFB
19453	439925.839531015	388421.269963744	257.04641724	19	GOVORA-BISTRITA		
19454	437825.568935202	388469.529506119	219.76411438	13	GOVORA-BISTRITA		
19455	437925.468989353	388471.990920275	219.76411438	10	BABENI		
19456	438025.360489502	388474.450195932	219.56257629	10	BABENI		
19457	439823.480201208	388518.710742239	265.30895996	13	GOVORA-BISTRITA		
19458	437623.320243745	388564.511008958	221.07402039	10	BABENI		
19459	437723.220297896	388566.970284614	220.26792908	10	BABENI		
19460	437823.109659454	388569.42956027	218.95800781	12	GOVORA-BISTRITA		

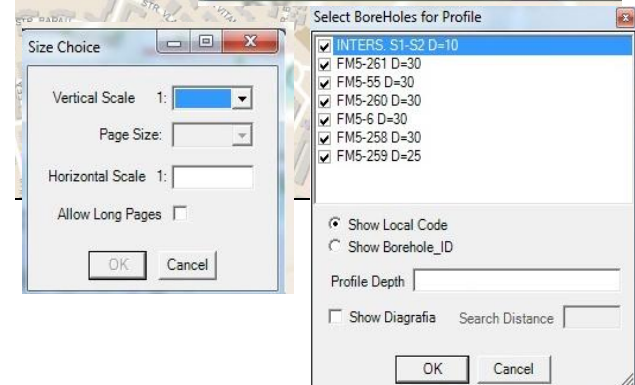
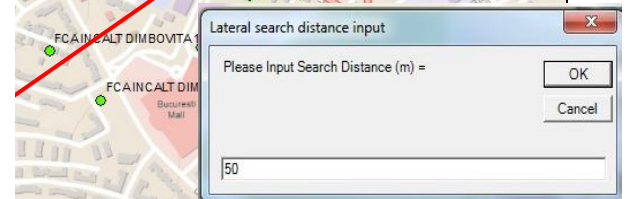
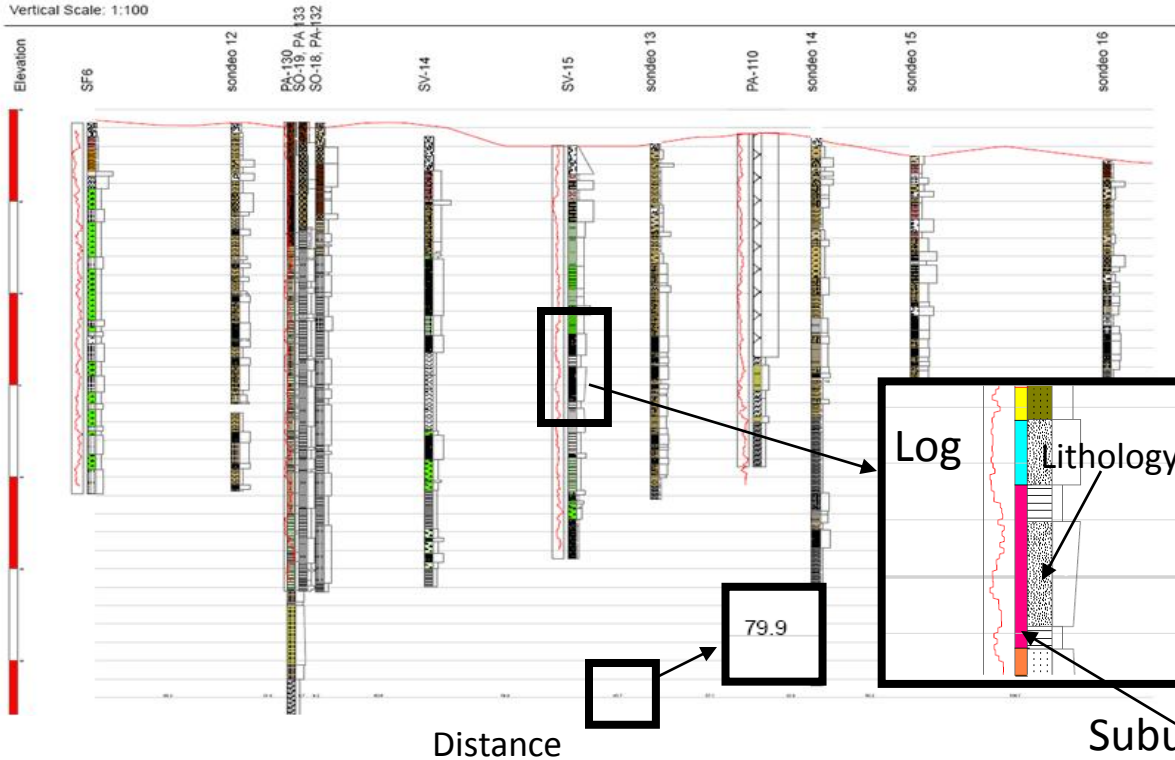
Define geological cross-section



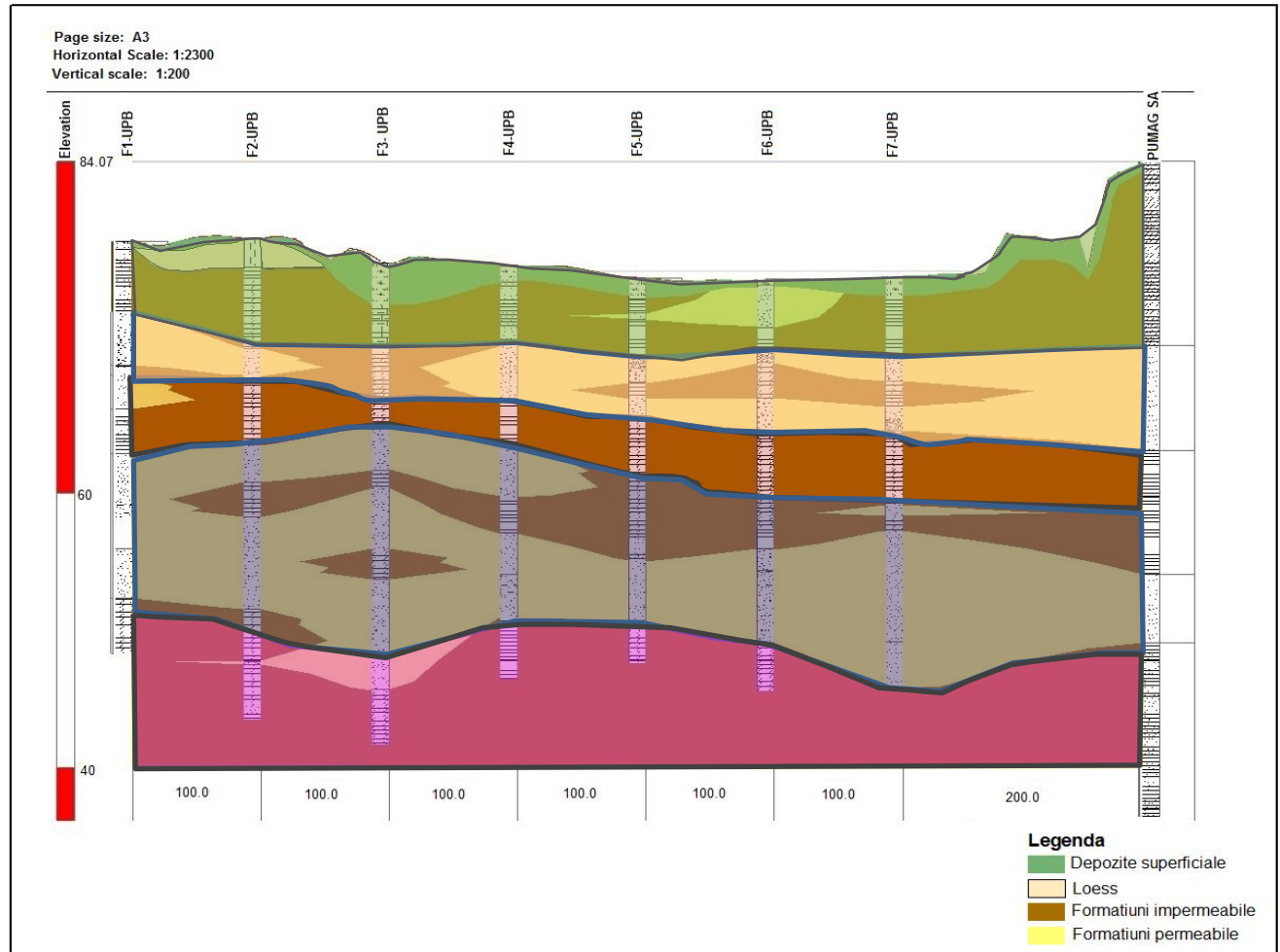
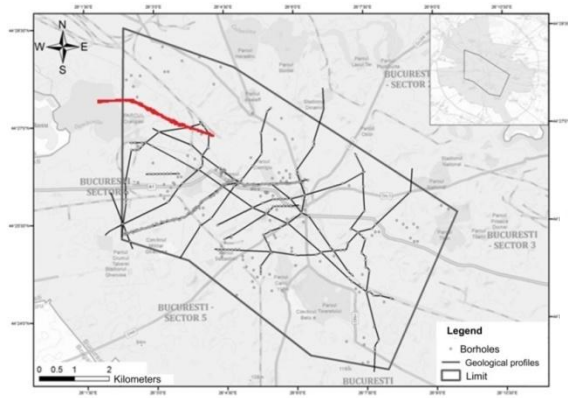
Define geological cross-section



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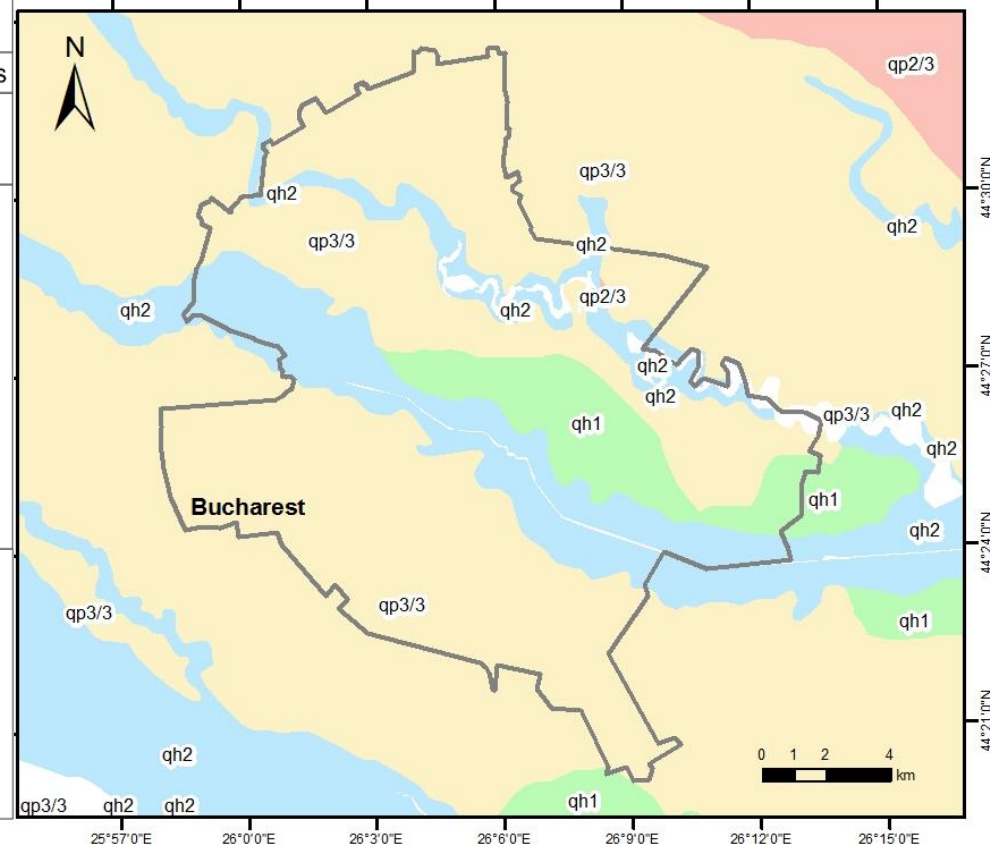
Define geological cross-section



3. Case study: Bucharest City

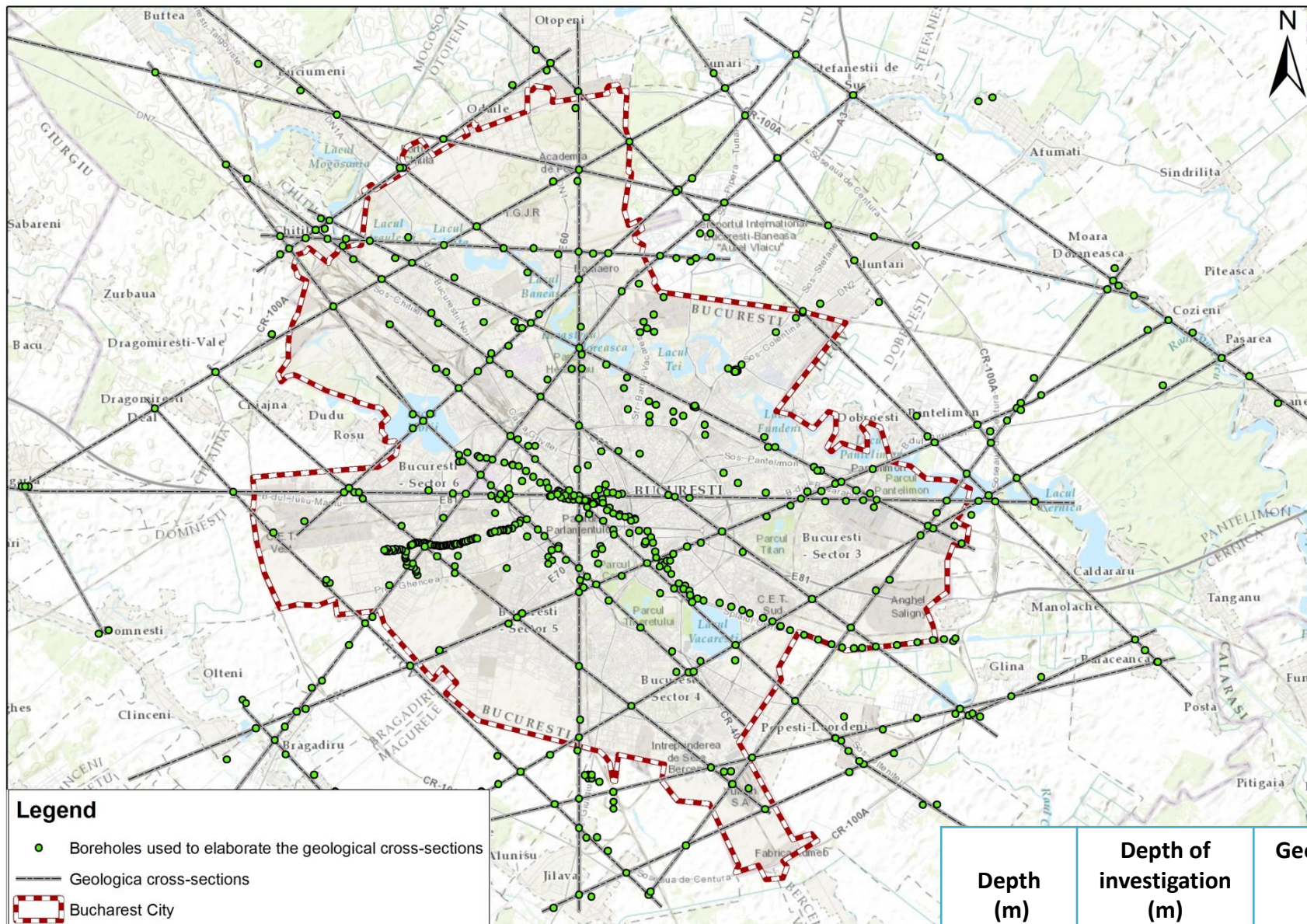
Period	Age		Depth (m)	Thickness (m)	Lithology	Hydrogeological units	
	Epoch						
QUATERNARY	Holocene	qh2	0-15	5-10	Loess, clay		Superficial deposits
		qh1					
	Pleistocene	qp3 ³	4-25	5-25	Gravels & sands		Colentina
		qp3 ²	15-30	5-10	Clay		Intermediary deposits
		qp3 ¹	20-50	10-20	Sand		Mostiștea
		qp2	45-100	20-120	Marl, clay, silt with sand intercalations		Coconi strata
NEOGENE	Pliocene	qp1-ro	70-280	15-115	Gravels & sands with clayey intercalations		Frătești

Geology and geomorphology of Bucharest City



Synthetic stratigraphical column of Bucharest City Quaternary deposits

3. Case study: Bucharest City

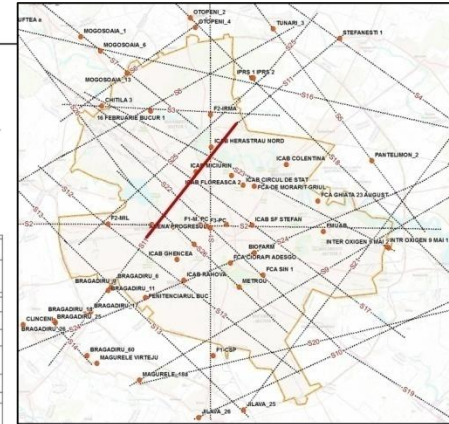
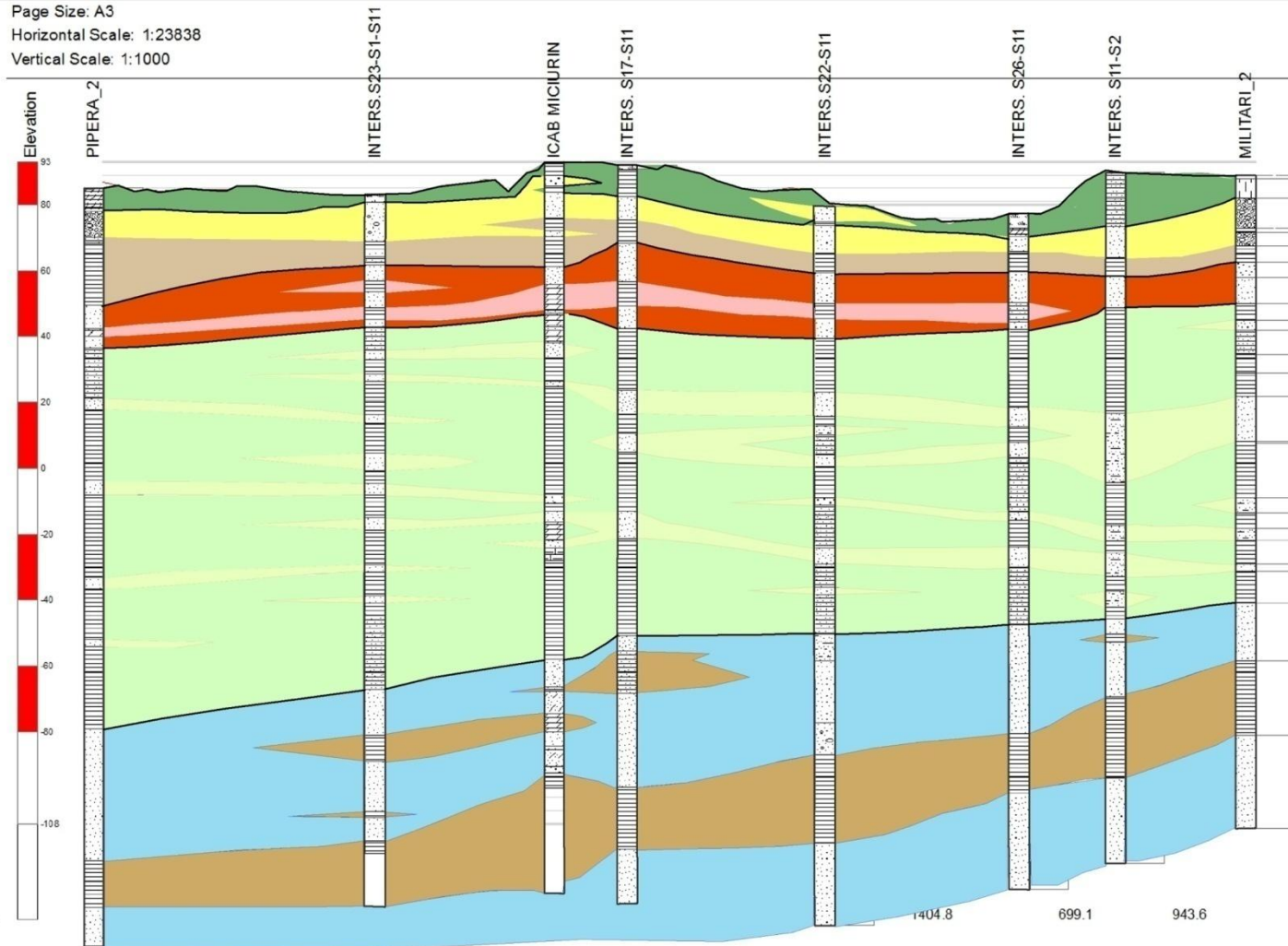


Depth (m)	Depth of investigation (m)	Geological cross-sections
15 - 270	200	33

3. Case study: Bucharest City

3D Geological model

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 Vertical Scale: 1:1000

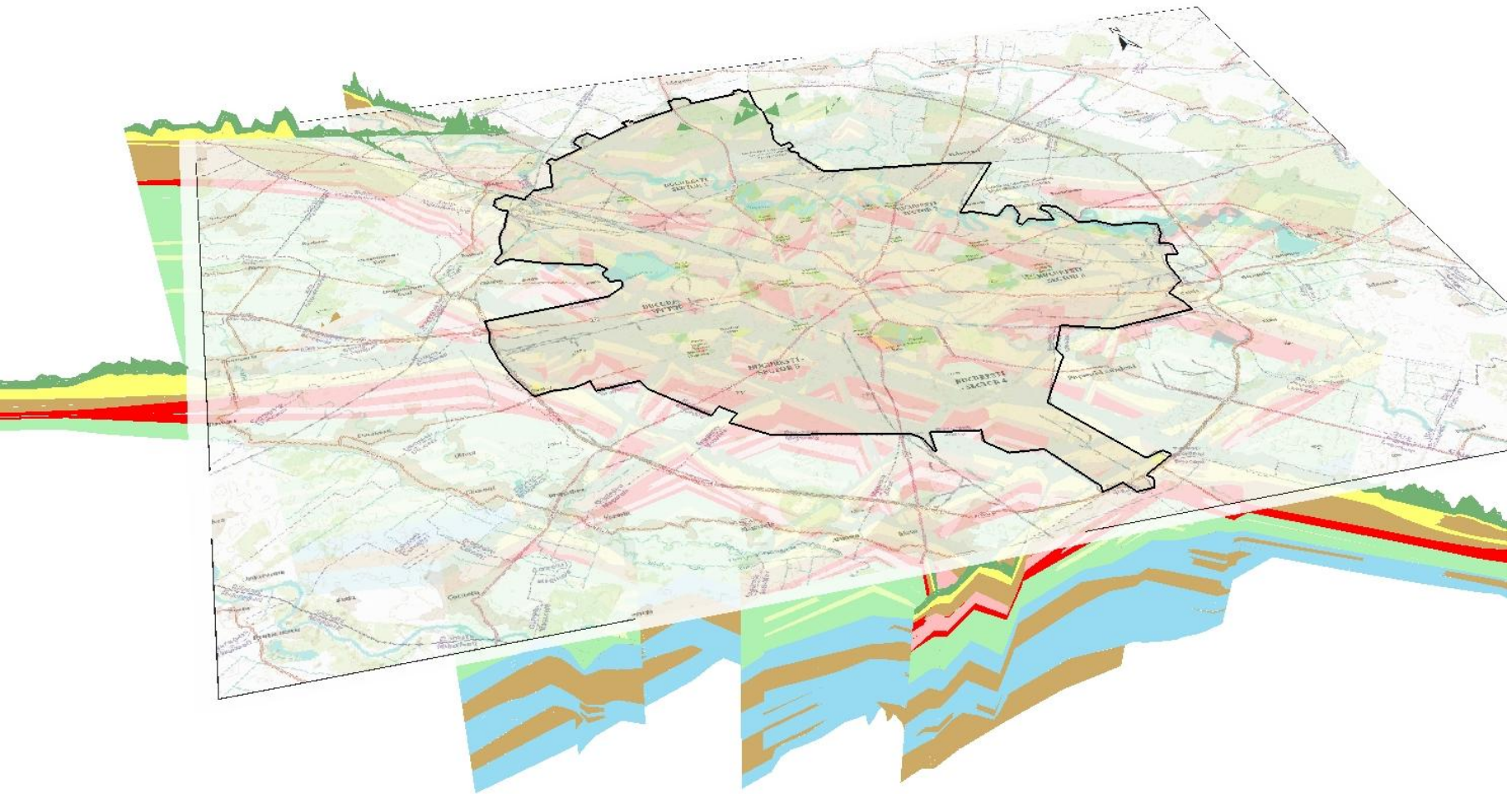


Legend

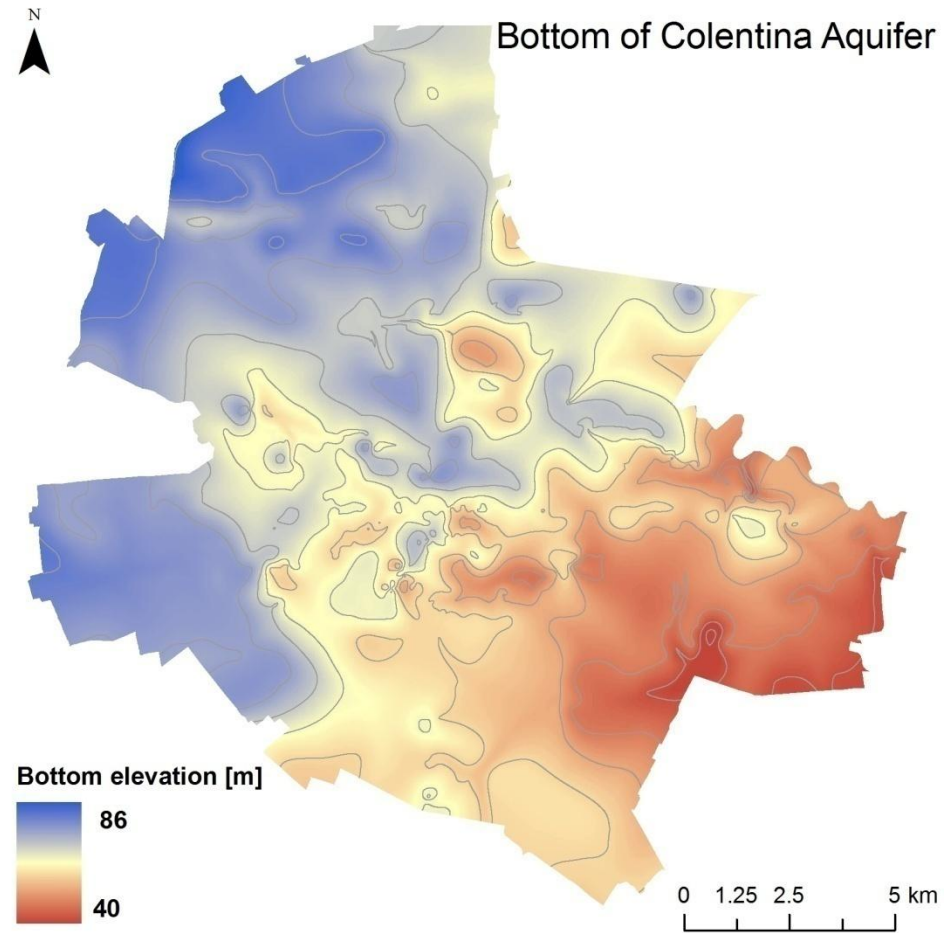
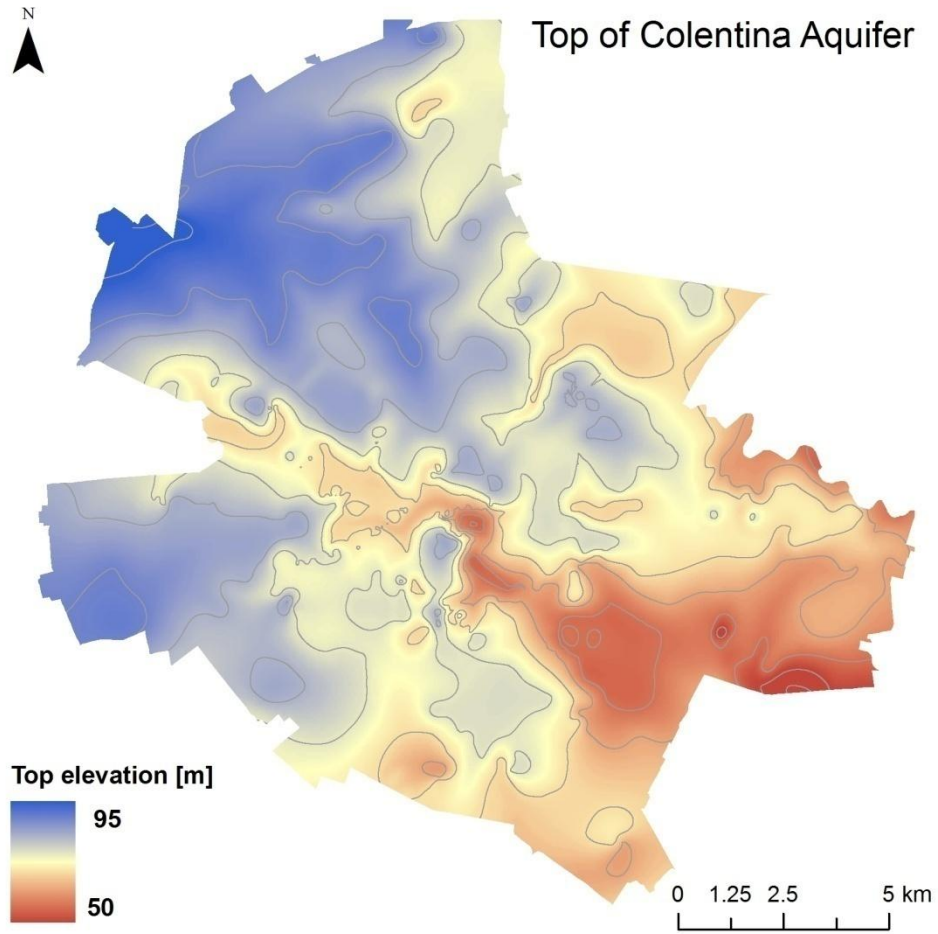
- Superficial deposits
- Colentina formation
- Intermediary deposits
- Mostistea formation
- Coconi strata
- A Fratesti formation
- B Fratesti formation

3. Case study: Bucharest City

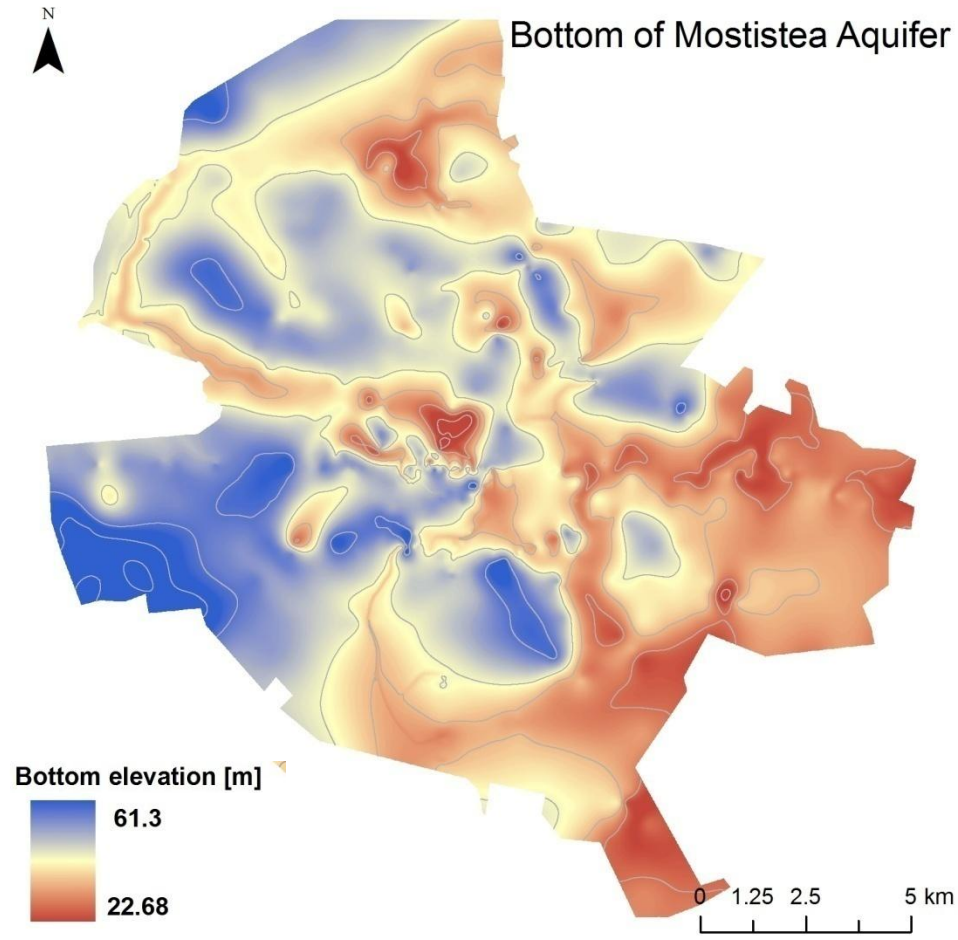
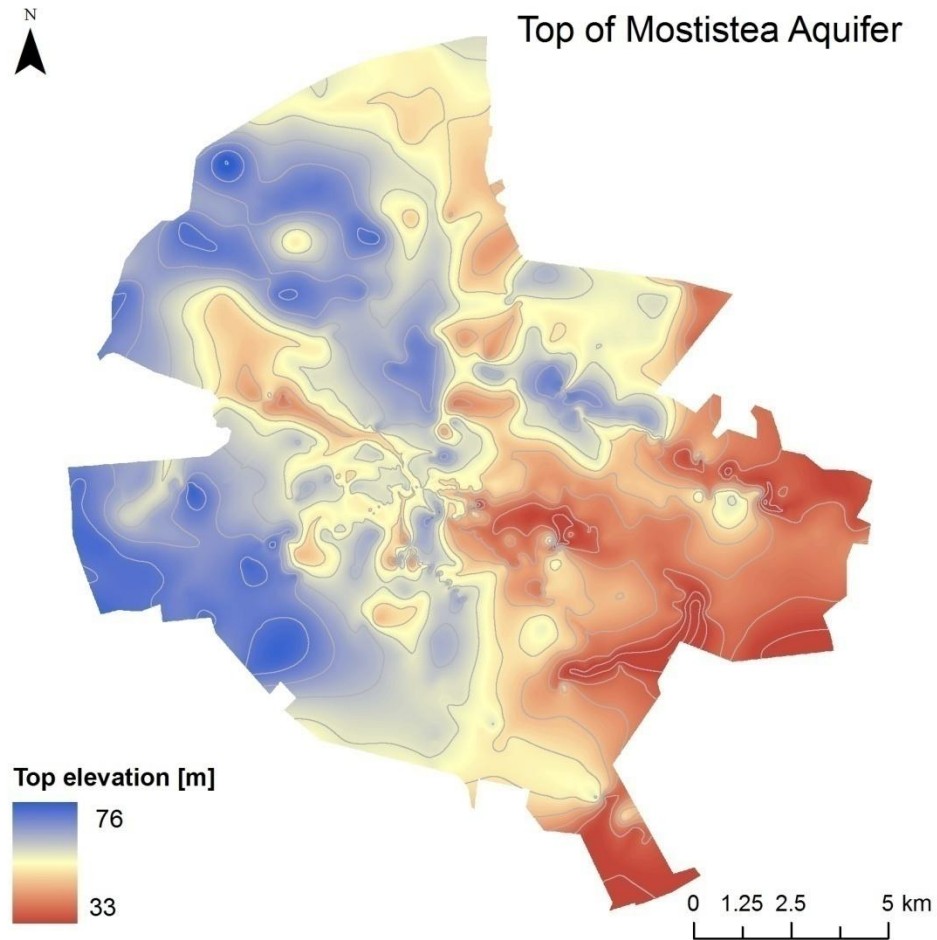
3D fence diagram



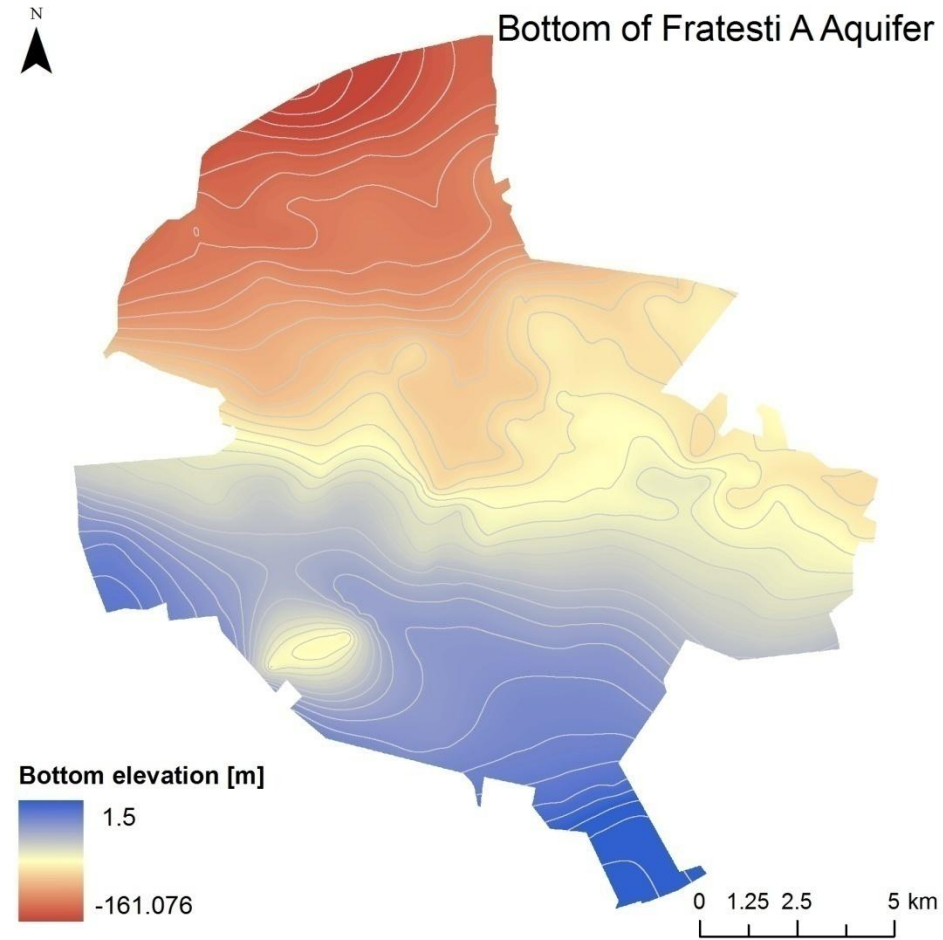
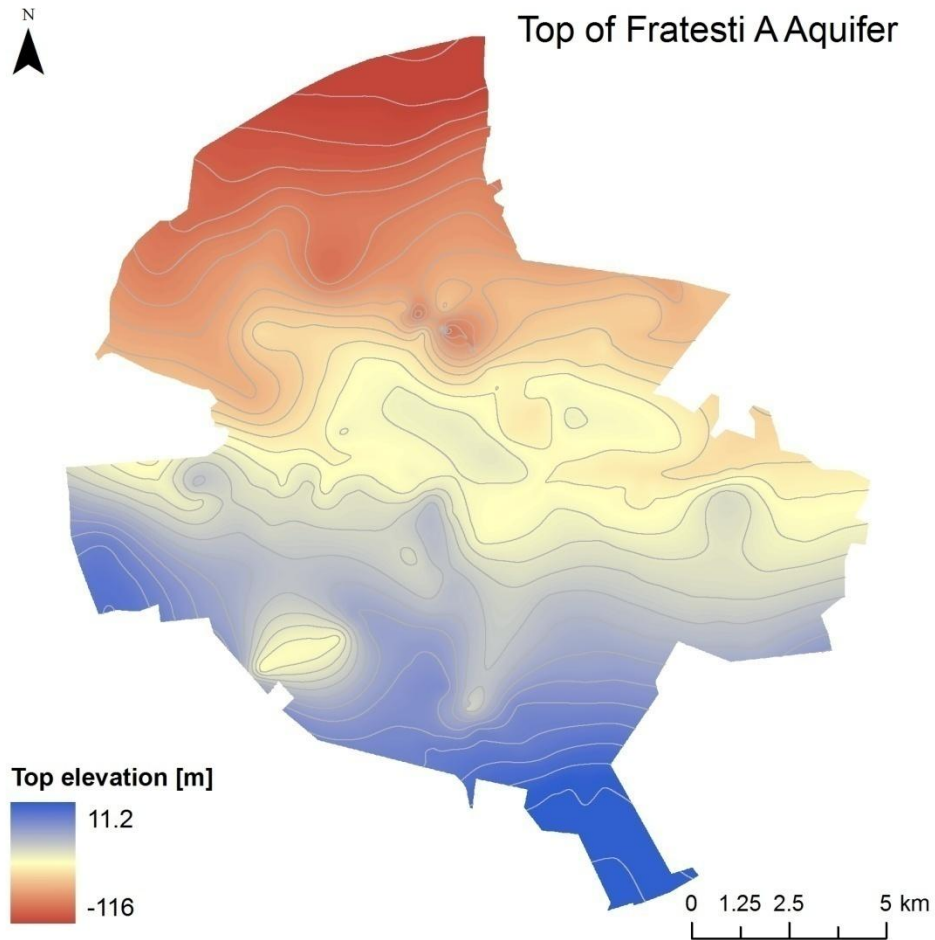
Structural maps



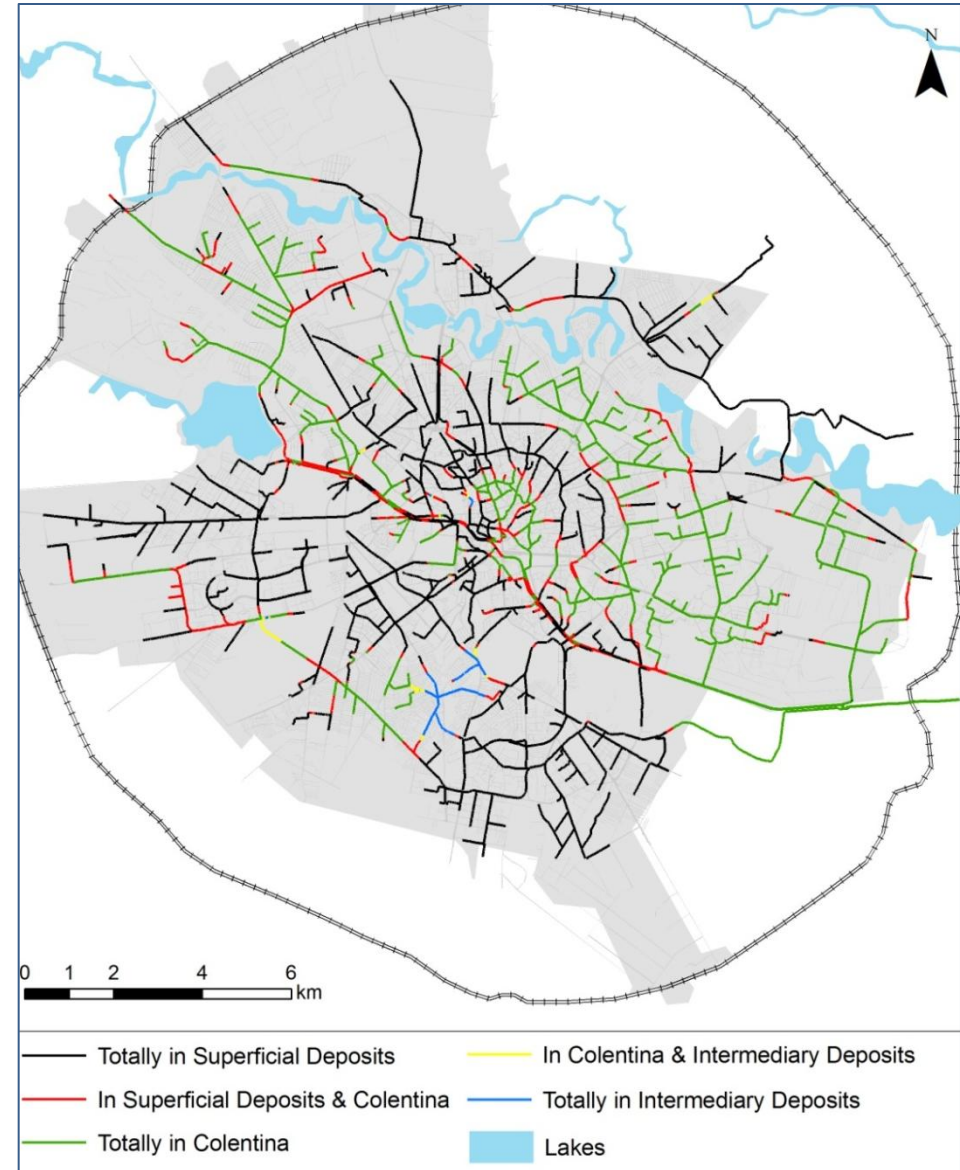
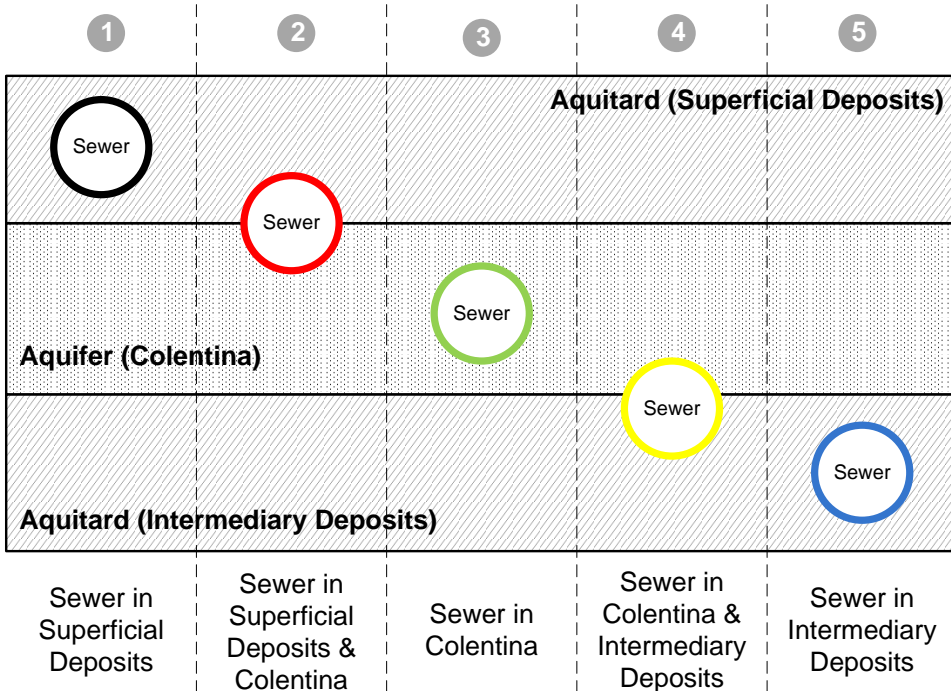
Structural maps

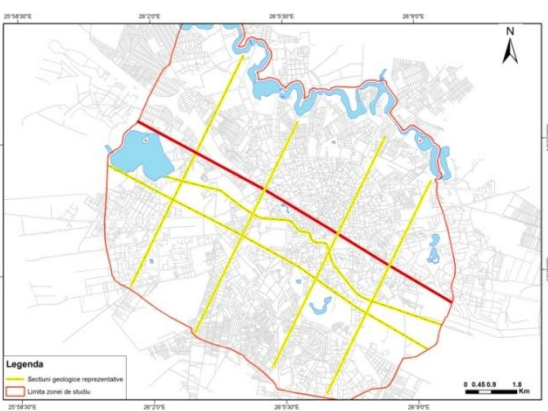
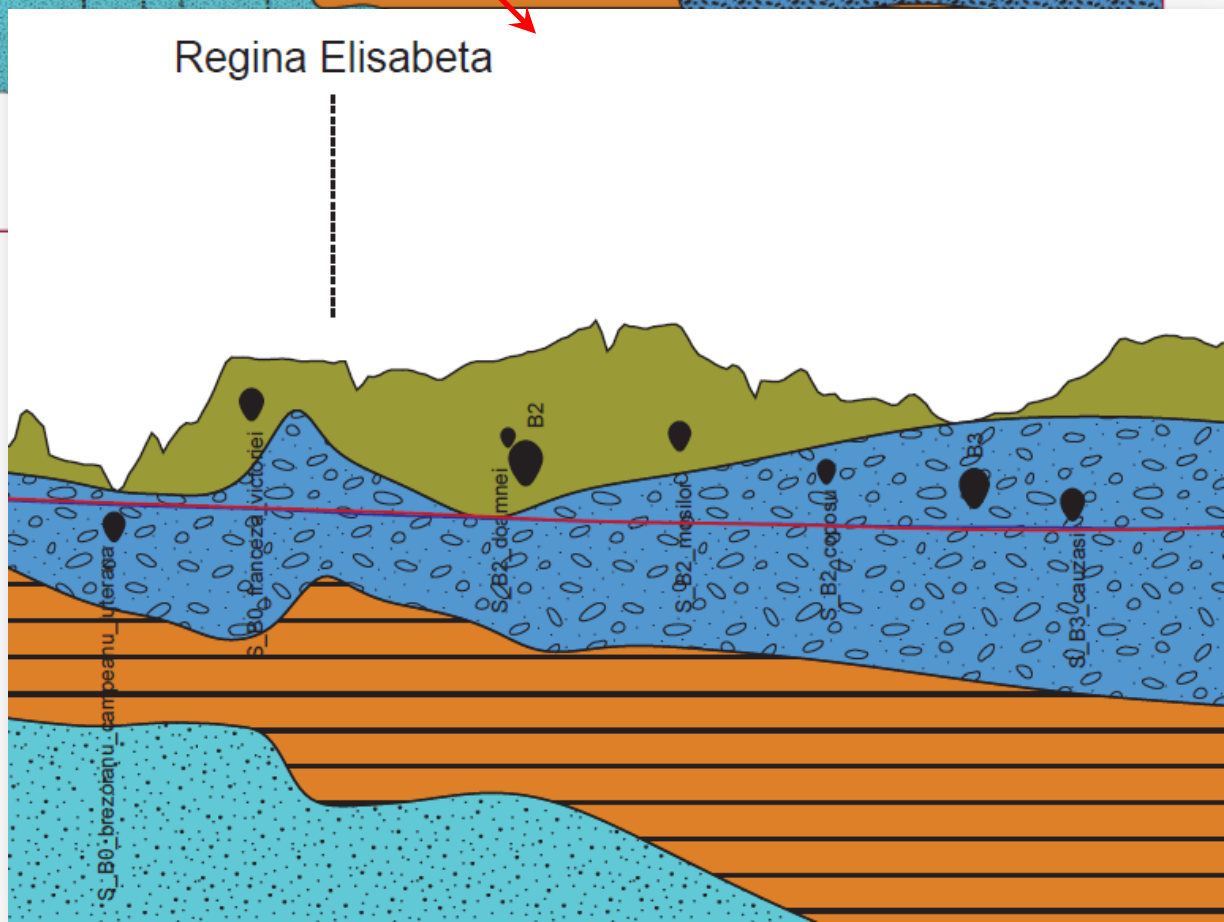
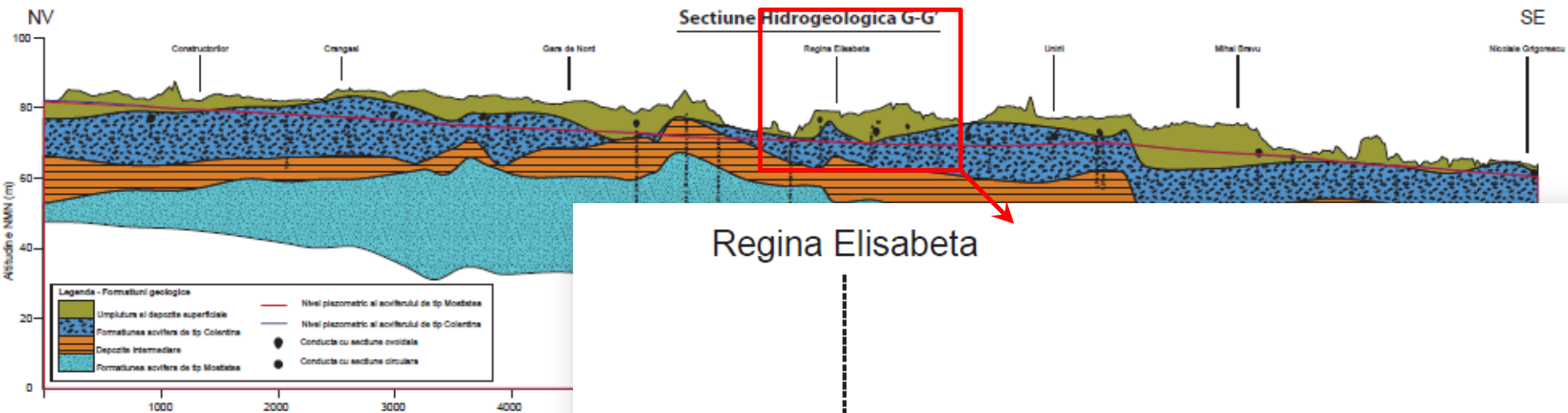


Structural maps



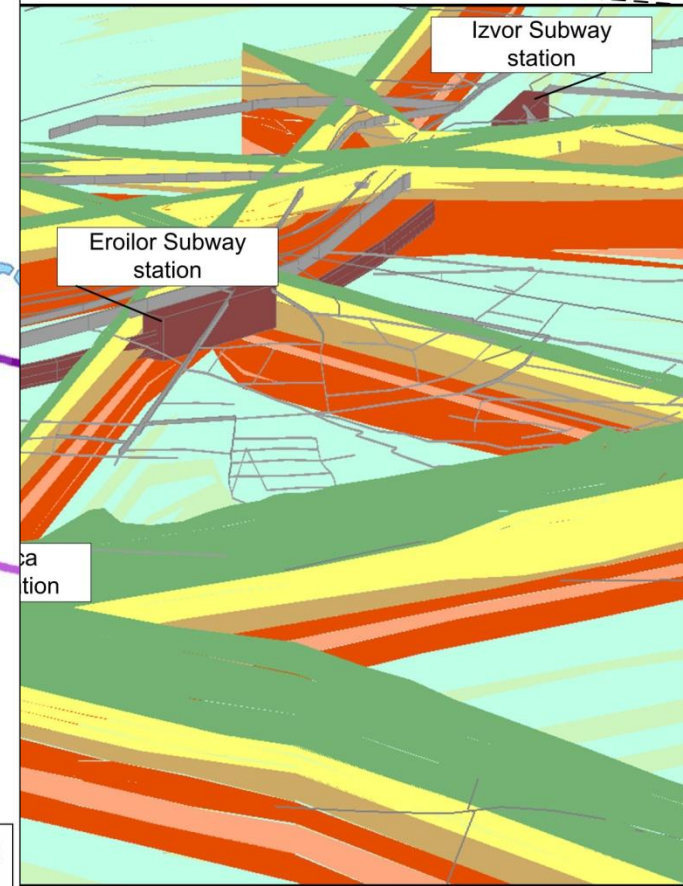
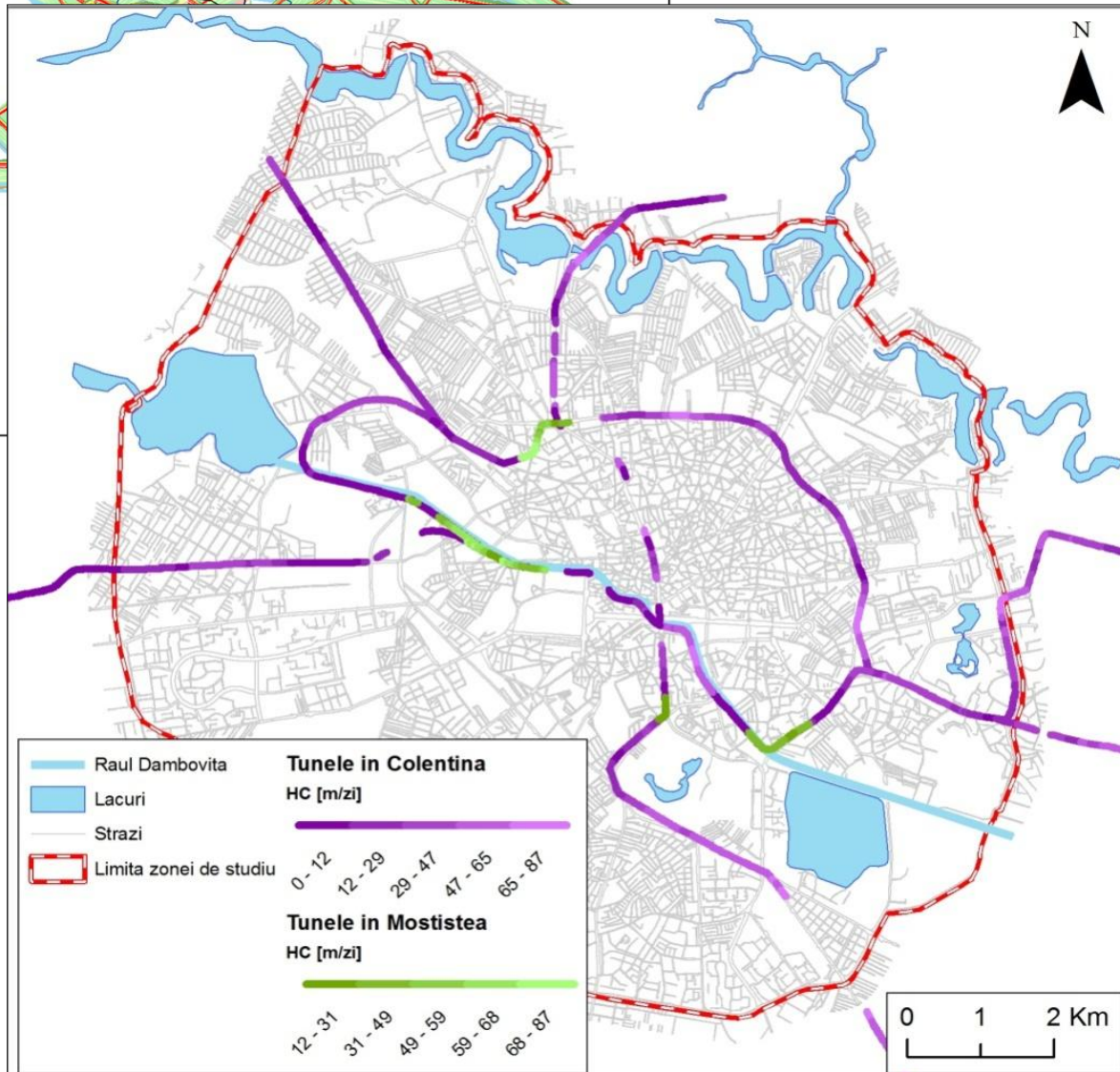
Sewer system location in relationship to the geological formations



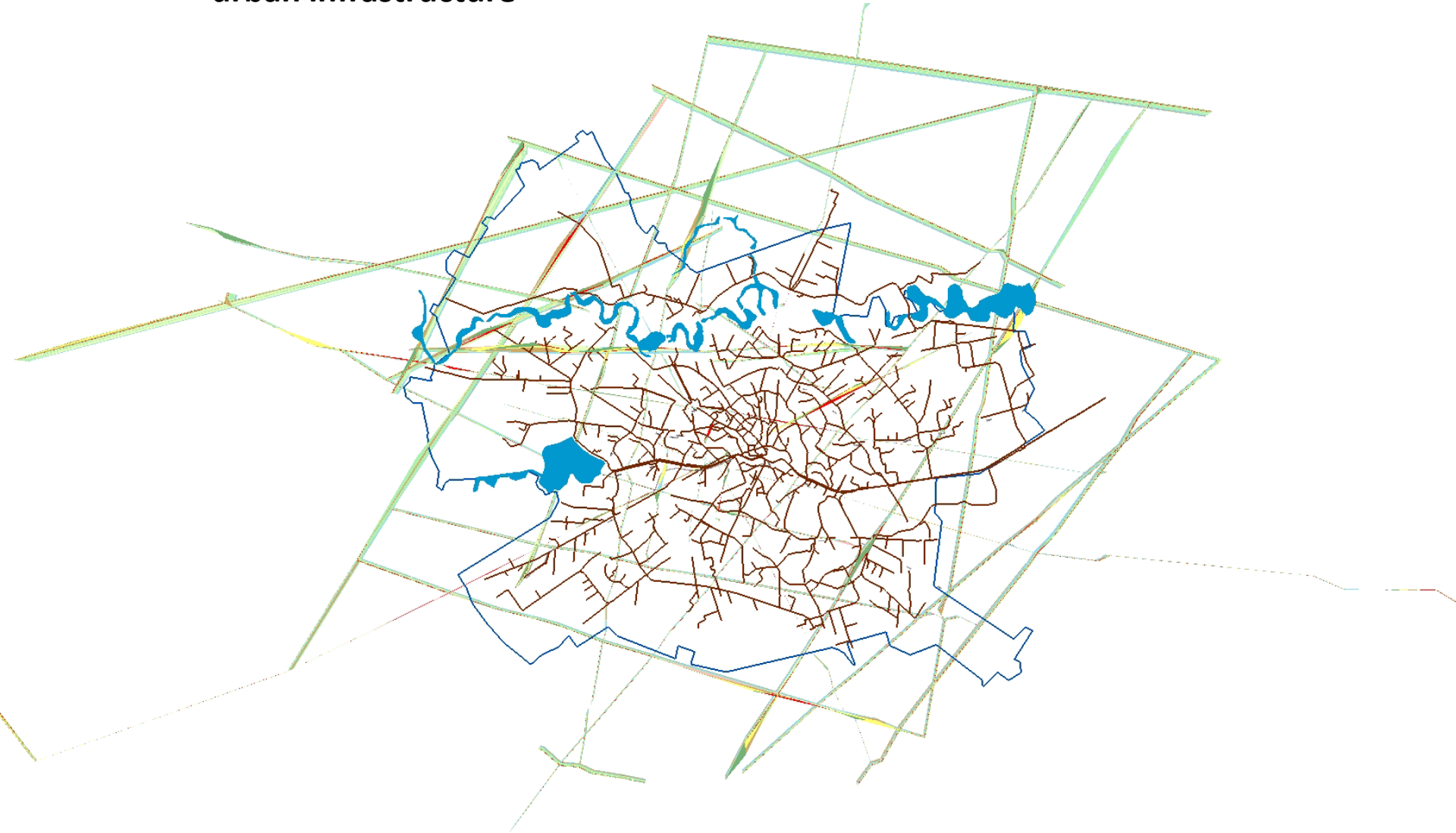


4. Geological model as application for hydrogeological studies

- Zoning the subway tunnels in function of their position into the hydrostratigraphical units



Geological model intersection with Bucharest urban infrastructure





Thank you for your attention!