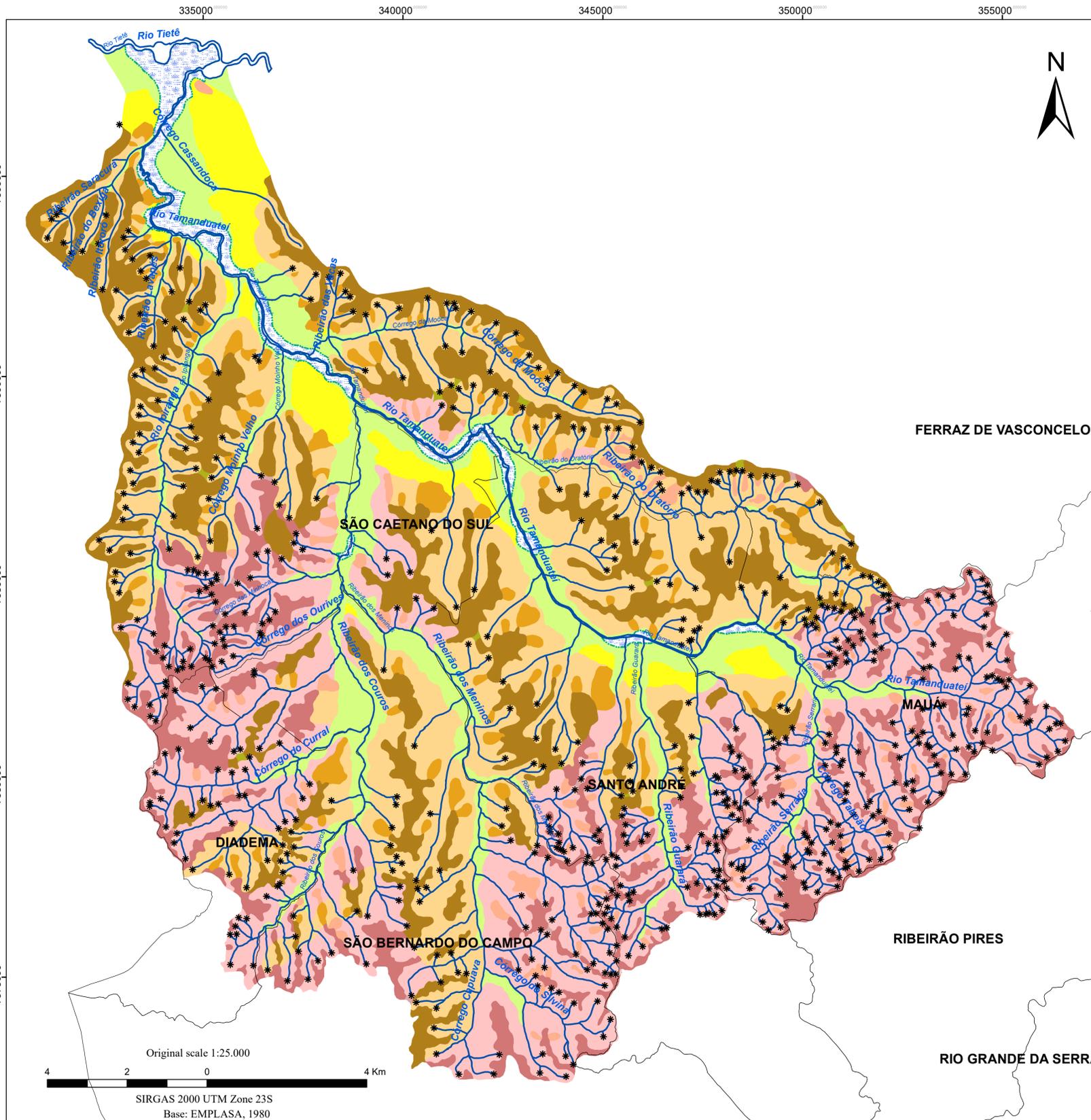


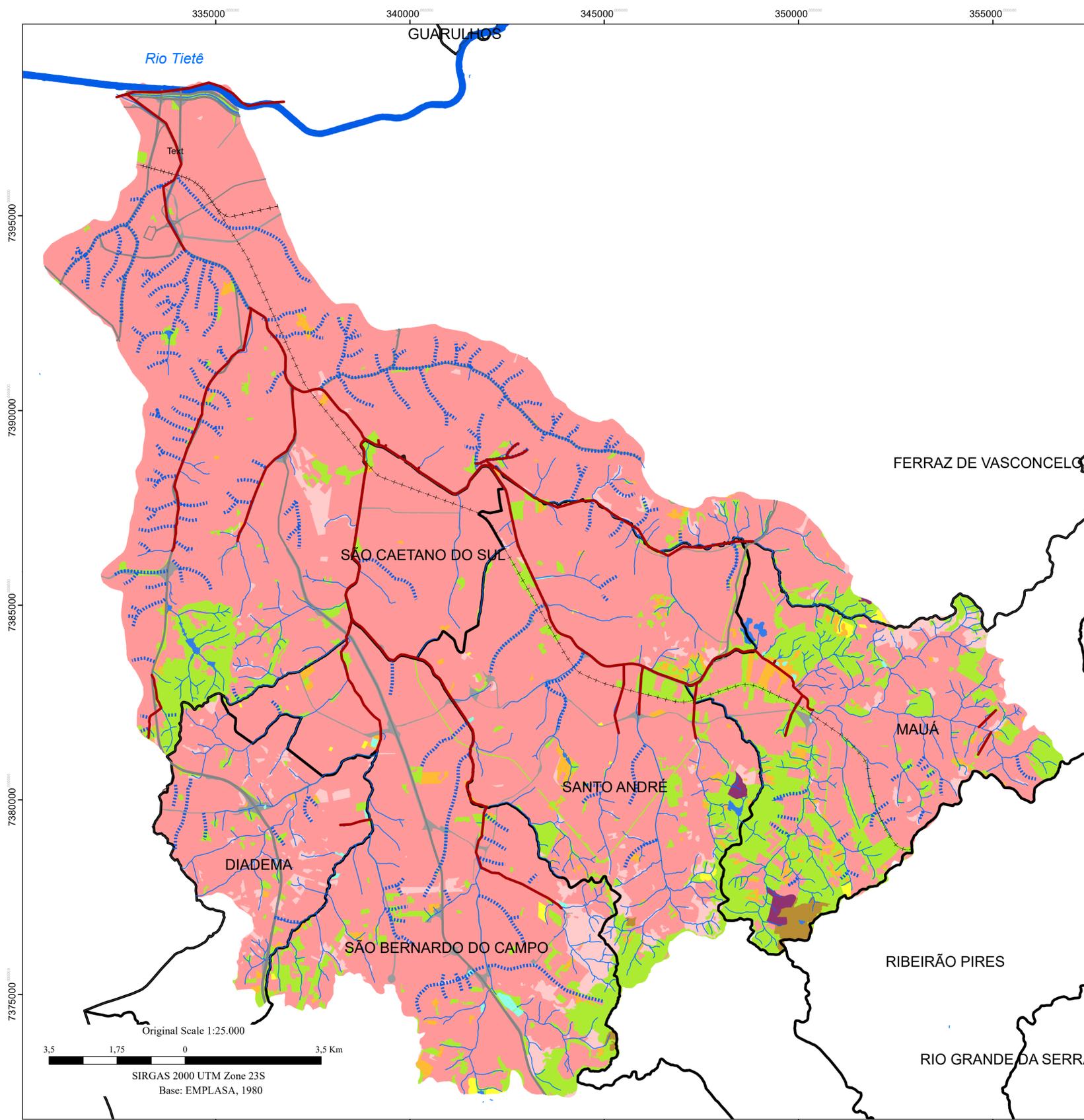
APPENDIX - MAP 1: Pre-urban Geomorphology of the BHRT



1st TAXON	2nd TAXON	3rd TAXON	4th TAXON	5th TAXON	6th TAXON
ATLANTIC OROGENIC BELT	SÃO PAULO PLATEAU (TERTIARY)	PLANALTO PAULISTANO (CRETACEOUS - TERTIARY) CRYSTALLINE MOUNTAINS AND HILLS MORPHOGENESIS: PREDOMINANCE OF DENUDATION PROCESSES	HILLS WITH CONVEX TOPS DESCRIPTION: Low to medium hills with convex, narrow and elongated tops predominate. Forms of medium to high dissection, with notched valleys and medium to high drainage density. Drainage has a dendritic pattern and almost always follows regional structural directions. LITHOLOGY: Consisting basically of migmatites, gneisses, granites, mica schists and meta-sandstones.	<p>Convex and plan-convex elements of the Upper hillslope MORPHOMETRY: Altitudes vary from 850 to 980 m; Predominant slopes < 20%. HYDROMORPHODYNAMICS: Greater tendency for infiltration and subsurface flow. Weathering of rocks and consequent thickening of the alteration mantle. Tendency to reptation.</p> <p>Saddles MORPHOMETRY: Altitudes vary from 850 to 950 m; Predominant slopes < 10%. HYDROMORPHODYNAMICS: Tendency towards the concentration of water and fine sediments by diffuse surface and subsurface flow. C horizon quite thick. Areas subject to intensification of regressive headwater erosion.</p> <p>Convex and plan-convex elements of the Lower hillslope MORPHOMETRY: Altitudes vary from 800 to 900 m; Predominant slopes between 20% and 30%, and may have sections with slopes > 60%. HYDROMORPHODYNAMICS: Tendency to disperse water by diffuse surface flow. Thicker alteration mantle. Tendency to laminar erosion.</p> <p>Concave and plan-concave elements + rectilinear segments of the High and Low hillslope MORPHOMETRY: Altitudes vary from 800 to 980 m.; Predominant slopes between 20% and 30%, and may have sections with slopes > 60%. HYDROMORPHODYNAMICS: Concave and plano-concave elements tend to converge water flows on the surface and subsurface, which can generate concentrated surface runoff, especially in the lower parts of the slope. Shallow soils. In straight segments, diffuse flow prevails on the high and medium slopes. However, on low slopes flows can become concentrated. Shallow soils on the high slopes and thicker on the lower portions. Tendency to linear erosion.</p>	* Springs Niches
CENOZOIC SEDIMENTARY BASINS	SÃO PAULO SEDIMENTARY BASIN (TERTIARY)	RIVER PLAIN OF THE TAMANDUATEÍ RIVER AND AFFLUENTS (QUATERNARY) MORPHOGENESIS: PREDOMINANCE OF AGGRADATIONAL PROCESSES	RIVER PLAINS AND FLOOD PLAINS DESCRIPTION: Flat relief, of river and colluvial origin. Along the Tamanduateí River it is more expressive (in width and length) while in its tributaries it is more restricted and discontinuous. LITHOLOGY: Unconsolidated sandy and clayey sediments. SOILS: Gleisols	<p>Flood Plains MORPHOMETRY: Altitudes vary from 720 to 800 m; Predominant slopes < 5%. PLAIN HYDRODYNAMICS: Floods with a recurrence period of approximately 1.5 years, with filling and drying phases. Shallow hydrostatic level. CHANNEL HYDRODYNAMICS: Continuous flow, with a tendency to lateral migration with a deposition margin and an undermining margin.</p> <p>River Terraces MORPHOMETRY: Altitudes vary from 725 to 750 m; Predominant slopes < 5%. DESCRIPTION: Alluvial platforms that appear discontinuously from 3 to 7 m above the floodplains, in the river plains of higher order watercourses. These are deposits basically made up of sandy or sandy clay alluvial materials, which have horizons of quartz and quartzite pebbles, small and medium-sized, rolled or fragmented. River terraces may have edges ending in gentle ramps or small steps. HYDROMORPHODYNAMICS: The presence of Holocene peat deposits, observed by Ab'Saber (1957), covering terraces (and also stretches of the floodplain and foothills), highlights the problems of poor drainage organization and soil saturation.</p>	Meandric Belt
				<p>HILLS AND LACKS WITH PLANO-CONVEX TOPS DESCRIPTION: Hills and plateaus with plano-convex tops predominate. On the hills, valleys with highly carved headwaters stand out, while on the plateaus the carving is less expressive. LITHOLOGY: Clays, sands and conglomerate lenses predominate. SOILS: Variegated soils associated with the São Paulo Formation</p>	

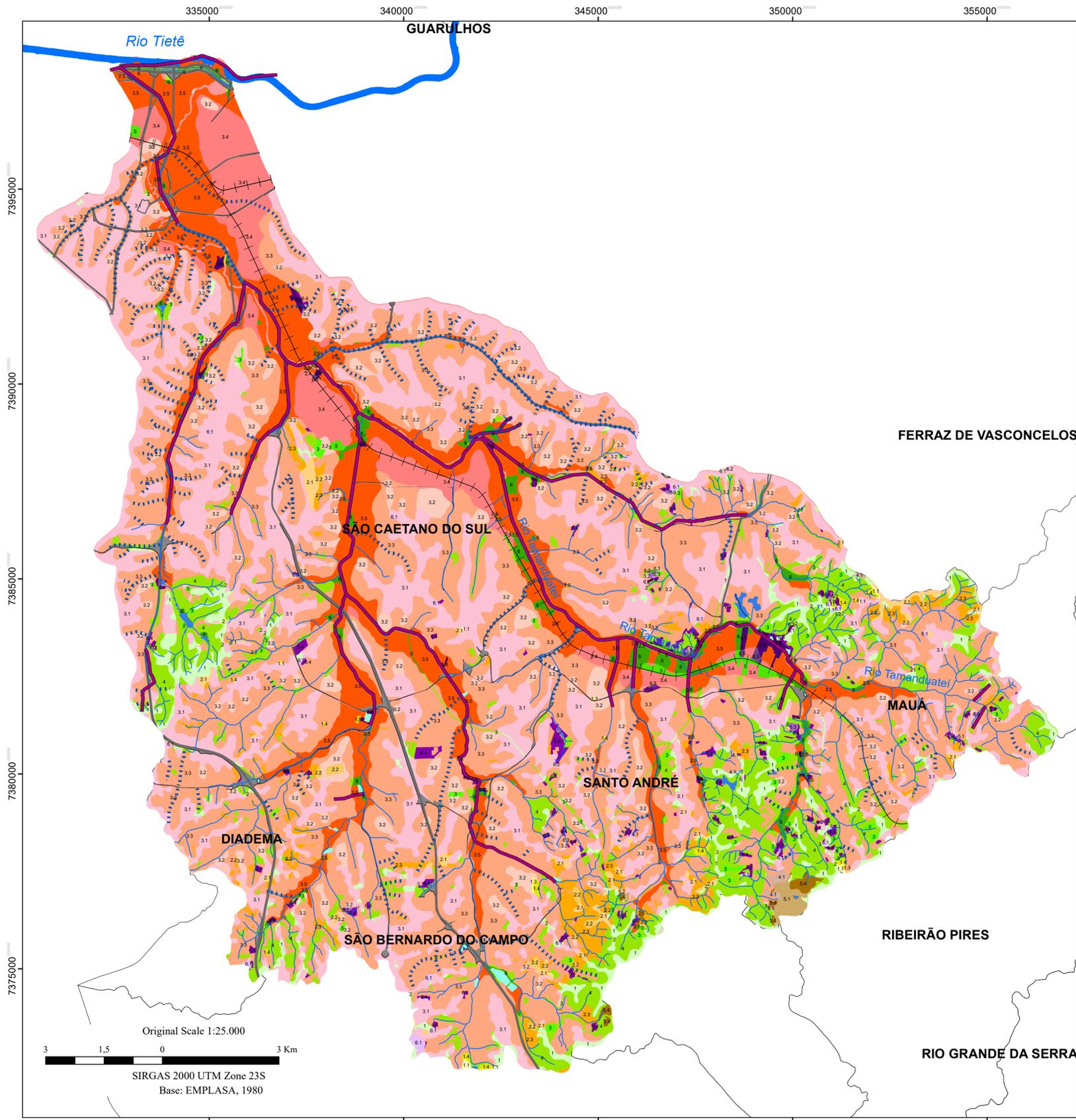
Original hydrography
Municipal Boundaries

APPENDIX - MAP 2: Anthropogenic Morphologies of the BHRT



MORPHOLOGIES		UNITS OR ELEMENTS	PREDOMINANT USES	
ORIGINAL OR SEMI-PRESERVED MORPHOLOGY		Areas with low levels of anthropogenic intervention and urbanization, predominantly covered by vegetation. (forests, shrubland, fields, floodplain vegetation or even reforestation).	- Parks and green areas - Unoccupied areas - Farms (leisure or horticultural activities) Although they may have been the target of anthropogenic interventions, they do not present anthropogenic morphologies resulting from urbanization.	
		Semi-preserved hydrography		
ANTHROPOGENIC MORPHOLOGY	URBANIZATION	 INITIAL STAGE Unoccupied or partially occupied subdivisions. Areas with low levels of urbanization and impermeability, undergoing initial stages of construction and street layout.	Areas with up to 10% consolidated urban occupation, which may be located within the urbanized zone, on its periphery, or in isolated locations. These areas are characterized by a network of streets, which may follow geometric or irregular patterns, and may include earthworks such as cuts and fills.	
		 INTERMEDIATE STAGE Areas with medium to high levels of urbanization and surface impermeability, undergoing intermediate stages of construction and street network development.	Up to 70% urbanized areas in varying stages of development: consolidated urban zones, bare soil, and housing units with incomplete urban infrastructure. Adapted from EMLASA (2005).	
		 FINAL STAGE Consolidated urban areas, highly impervious, and generally equipped with urban infrastructure	Approximately 100% of urban areas effectively occupied by buildings, potentially featuring varying degrees of vertical development, industrialization, and underground works, with urban infrastructure in place (EMLASA, 2005).	
	OTHERS	 TECHNOGENIC OR ANTHROPOGENIC DEPOSITS	- Landfills: Areas of "final disposal of urban solid waste on the ground, through confinement in layers covered with inert material, generally soil" (ABNT, 1989 in EMLASA, 2005). - Dumps: Areas of open solid waste deposits, without any treatment (EMLASA, 2005).	
		 EXPOSED SOIL / SOIL MOVEMENT	- Exposed Soil: Soil without vegetation cover, prepared for cultivation or other uses, and exposed to the action of erosive processes. - Soil Movement: Areas that have undergone earthworks, showing exposed soil due to the removal of vegetation cover (EMLASA, 2005).	
		 MINING	Areas of mineral extraction and their surroundings (earth movement, pits, buildings), which were affected by this activity. At São Paulo Metropolitan Region, it is carried out in the open pit for practically all ores. They are characterized by the removal of vegetation cover and relief cutting. Deactivated mining areas that still have mining characteristics were included in the mapping (EMLASA, 2005).	
		 DETENTION RESERVOIR	Flood control reservoir with non-adjustable outlets (ANEEL & OMM, 1999 in EMLASA, 2005).	
			Railroad	
			Road system	
			Lake/pond or dam/dam	
		Straightened watercourses		
		Buffered watercourses		

APPENDIX - MAP 3: Complex Morphologies of the BHRT



COMPLEX UNITS		AREA (km²)	ORIGINAL MORPHOLOGY	ANTHROPOGENIC MORPHOLOGY	HYDROMORPHODYNAMIC BEHAVIOR
ORIGINAL OR SEMI-PRESERVED MORPHOLOGY	MO 1	7,684	Convex and plan-convex elements of the Upper hillside	Vegetation cover (forests, shrubland, fields, floodplain vegetation or even reforestation).	Infiltration, diffuse surface runoff and subsurface runoff. Weathering of rocks and consequent thickening of the alteration mantle
	MO 2	0,168	Saddles	- Parks and green areas	Concentrated surface and subsurface runoff. Strong concentration of water and fine sediments. Areas subject to intensification of regressive headwater erosion
	MO 3	1,147	Convex and plan-convex elements of the Lower hillside	- Unoccupied areas	Diffuse surface runoff. Tendency to laminar erosion. Alteration mantle not very thick.
	MO 4	25,306	Concave and plan-concave elements/rectilinear segments of the High and Low hillside	- Farms (leisure or horticultural activities)	Concentrated surface and subsurface flow in the concave and plano-concave elements and diffuse flow in the high and medium slopes of the straight segments and concentrated surface flow in the low slopes. Tendency to linear erosion
	MO 5	0,680	River Terraces	Although they may have been the target of anthropogenic interventions, they do not present anthropogenic morphologies resulting from urbanization.	Problems of poor drainage organization and soil saturation
	MO 6	3,808	Flood Plains		Shallow hydrostatic level. Floods with a recurrence period of approximately 1.5 years
INITIAL STAGE URBAN OCCUPATION	MA 1.1	0,118	Convex and plan-convex elements of the Upper hillside	Unoccupied lots or in the process of being occupied. Ruined areas with up to 10% occupancy, which may be located within the urbanized area, on the outskirts or isolated. They are necessarily characterized by a set of streets, which can be geometric or irregular, on soil with or without vegetation cover. EEMPLASA (2002).	Diffuse surface runoff, with concentration of flows in streets. Laminar and linear erosion processes, with large sediment mobilization.
	MA 1.2	0,004	Saddles		Concentrated surface runoff and intensification of regressive headwater erosion
	MA 1.3	0,041	Convex and plan-convex elements of the Lower hillside		Diffuse surface runoff. Tendency to laminar erosion. In streets, tendency to concentrated surface runoff, with linear erosion processes.
	MA 1.4	0,457	Concave and plan-concave elements/rectilinear segments of the High and Low hillside		Concentrated surface and subsurface runoff. Tendency to linear erosion.
	MA 1.5	0,023	Flood Plains		Internal drainage problems, need for compaction and installation of a drainage system. Occurrence of floods and deposition of sediments and garbage
URBAN OCCUPATION INTERMEDIATE STAGE	MA 2.1	2,244	Convex and plan-convex elements of the Upper hillside and Saddles	Highly urban areas waterproofed, generally without infrastructure. Set of housing units (shacks, wooden or masonry houses) arranged, in general, in a disorderly and dense manner. The road system is made up of narrow circulation roads with irregular alignment (EEMPLASA, 2002), with or without paving, but, in general, without rainwater drainage systems, sanitary sewage and systematic garbage collection.	Concentrated surface runoff. Problems related to surface and subsurface flows due to deficiency or absence of sanitation and urban micro drainage systems.
	MA 2.2	0,608	Convex and plan-convex elements of the Lower hillside		Diffuse surface runoff. Tendency to laminar erosion. In streets, tendency to concentrated surface runoff, with linear erosion processes.
	MA 2.3	7,961	Concave and plan-concave elements/rectilinear segments of the High and Low hillside		Concentrated surface runoff, with the occurrence of flash floods. Linear erosion processes and mobilization of materials (sediments and garbage)
	MA 2.4	0,003	River Terraces		Water concentration (formation of water sheets during rainy events) and flooding, due to landfills built in adjacent floodplains.
	MA 2.5	0,413	Flood Plains		Internal drainage problems, need for compaction and installation of a drainage system. Occurrence of floods and deposition of sediments and garbage.
URBAN OCCUPATION FINAL STAGE	MA 3.1	66,202	Convex and plan-convex elements of the Upper hillside and Saddles	Consolidated urban areas, highly waterproofed, generally equipped with infrastructure. Ruined areas effectively occupied by buildings intended for residential, commercial, service, or industrial use.	Concentrated surface runoff. Areas equipped with underground systems (supply, sanitation, communication and transport) may present instability problems related to the rupture of pipelines, lowering of the water table or due to concentrated underground drainage.
	MA 3.2	14,666	Convex and plan-convex elements of the Lower hillside		Diffuse surface runoff. Tendency to laminar erosion. In streets, tendency to concentrated surface runoff, with linear erosion processes.
	MA 3.3	135,756	Concave and plan-concave elements/rectilinear segments of the High and Low hillside	Areas of urban equipment (establishments, spaces or installations intended for education, health, leisure, culture, social assistance, religious worship or public administration, which have direct, functional or spatial links with residential use) EEMPLASA (2002)	Concentrated surface runoff, with the occurrence of flash floods if urban micro drainage systems are inefficient or obstructed.
	MA 3.4	11,670	River Terraces		Water concentration (formation of water sheets during rainy events) and flooding, due to landfills built in adjacent floodplains.
	MA 3.5	35,420	Flood Plains	- They present verticalization and use of the underground	Internal drainage problems, need for compaction and installation of a drainage system. Occurrence of floods and deposition of sediments and garbage.
TECHNOGENIC DEPOSITS	MA 4.1	0,266	Convex and plan-convex elements of the Upper hillside	Landfills: Areas of "final disposal of urban solid waste on the ground, through confinement in layers covered with inert material, generally soil" (ABNT, 1989 in EEMPLASA, 2002).	Contamination of soil and surface and groundwater. Decomposing organic matter produces gases that can cause fires and explosions. Due to the heterogeneity of materials and discontinuities, these surfaces do not present compaction, and material mobilization and transport may occur.
	MA 4.2	0,620	Convex and plan-convex elements of the Upper hillside		The stripping of areas, opening of access roads, the execution of "boasters", dikes, dams and earthmoving works trigger erosive processes and, as a consequence, can cause the silting of water courses. The formation of sub-vertical slopes can result in instability and landslides may occur.
MINING	MA 5.1	0,001	Saddles	Areas of mineral extraction and their surroundings (earth movement, pits, buildings), which were affected by this activity. At RMSP, it is carried out in the open pit for practically all ores. They are characterized by the removal of vegetation cover and relief cutting. Deactivated mining areas that still have mining characteristics were included in the mapping. (EEMPLASA, 2002).	Interception of the water table, lowering its level and modifying the dynamics of underground recharge. The stripping of areas, opening of access roads, the execution of "boasters", dikes, dams and earthmoving works trigger erosive processes and, as a consequence, can cause the silting of water courses. The formation of sub-vertical slopes can result in instability and landslides may occur.
	MA 5.2	0,010	Convex and plan-convex elements of the Lower hillside		Formation of lakes in mining pits and slopes, which means new slope ruptures ation of lagoons in mining pits and slopes, which mean new slope ruptures.
	MA 5.3	0,406	Concave and plan-concave elements/rectilinear segments of the High and Low hillside		Interception of the water table, lowering its level and modifying the dynamics of underground recharge. Formation of lakes in mining pits.
	MA 5.4	0,003	Flood Plains		
	MA 5.5	0,003	Flood Plains		
EXPOSED SOIL	MA 6.1	0,550	Convex and plan-convex elements of the Upper hillside		Diffuse surface runoff and large sediment mobilization by laminar erosion
	MA 6.2	0,013	Saddles	- Exposed Soil: Soil without vegetation cover, prepared for cultivation or other uses, and exposed to the action of erosive processes.	Tendency towards concentrated surface runoff, intensification of regressive headwater erosion and large sediment mobilization. The execution of landfills can result in instability problems. Discontinuities between the layers of landfill and the original debris deposits can trigger earth movements.
	MA 6.3	0,159	Convex and plan-convex elements of the Lower hillside		Diffuse surface flow, with great mobilization of materials by laminar erosion.
	MA 6.4	2,592	Concave and plan-concave elements/rectilinear segments of the High and Low hillside	- Soil Movement: Areas that have undergone earthworks, showing exposed soil due to the removal of vegetation cover. EEMPLASA (2002).	Concentrated surface and sub-surface runoff. In straight segments, surface runoff prevails, with a tendency to linear erosion. Landfills in concave segments can result in instability problems. Discontinuities between the layers of landfill and the original debris deposits, associated with infiltration and sub-surface circulation of water, can trigger earth movements.
	MA 6.5	0,111	River Terraces		Water concentration (formation of water sheets during rainy events) and flooding, due to landfills built in adjacent floodplains.
	MA 6.6	0,904	Flood Plains		Surfaces filled with various allochthonous materials (anthropogenic terrace). Internal drainage problems, need for compaction and installation of a drainage system. Occurrence of floods and deposition of sediments and garbage.

- Road system
- Railroad
- Semi-preserved hydrography
- Rectified hydrography
- Buffered hydrography
- Lake/pond or dam/reservoir