

GEOLOGIC HAZARD MAP: USE OF THE LITHOLOGIC UNITS MAP AS BASE FOR THEIR REALIZATION

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Abstract

The map of Lithological Units is one of the thematic maps, of various types and scales, produced in the Environmental and Applied Geology Area (DGAA – IGRM) of the Geological Survey of Argentina (SEGEMAR). It is used as a base for the realization of Geological Hazard Map at 1:250.000 scale.

The Lithological Units Map is independent of the Geological Map because the ages or formational names of the involved lithologies are not considered. The units are identified by the composition and characteristics of the materials and their relationship with ground water. This classification aims to a uniform, comprehensive and flexible approach for mapping lithological units.

The first subdivision of lithological units is based on the genesis of rocks (sedimentary – metamorphic – igneous), and the occurrence of surficial unconsolidated deposits. They are divided fundamentally according to their mechanical characteristics: mineralogical composition, lithology, porosity, permeability and level of ground water.

For consolidated rocks engineering characteristics are considered such as resistance of the rock substance, fracturing, weathering rate, discontinuity characteristics (spacing, continuity, aperture, ruggedness, filler, joint condition) and effect of water.

As an example we present the Lithological Units Map developed for the Geological Hazard Map of Mendoza (3369-II), located in the center west of the República Argentina within 32° and 33° Lat. S and 69° to 67° 30' Long. W. This area is characterized by high natural risks many of them cataclysmic as shown by the earthquake record for the last centuries. In addition large populations occur in the region.

The Lithological Units Map of Mendoza is divided into 12 units, as synthesized in attached table.

In conclusion, for the Geological Hazard map of Mendoza, areas with large concentrations and repetition of geological processes show a coincidence with units Ia1; Ib; Ic; IIc. The units consist of sandstones, conglomerate sandstones, sands, clays, silts and organic sediments and its geomorphology is characterized by recent and old, alluvial cones, alluvial plains and piedmont low hills

Superficial deposits	I.a.	Silts and organic materials: 1. Phreatic minimum depth: 0-1m; 2. Phreatic depth 0-600 m above sea level; 3. Phreatic minimum depth 600 m above sea level; 4. Silts and tuff.
	I.b.	Sands and clays: medium permeability, loam soils, clay loam soils with coarse lithic fragments.
	I.c.	Sands and silts: medium – low permeability, loam soils, silt-clay soils with sandy levels.
	I.d.	Sands: high permeability. Sandy and loam soils.
Sedimentary rocks	II.a	Calcareous rocks: slightly fractured outcrop with competent rock substance: Fresh rock substance, only slightly meteorized by sectors. Coarse fragments (1-4 m ³), strong rock (100-250 Mpa), secondary permeability due to fracturing, 2.5-10 mm wide discontinuities without fill, smooth and planar, 3-10 m continuity. Near the fractures the continuity is low (1-3 m) and the separation is closer (200-600 mm).
	II.b	Sandstones: fractured outcrop with competent rock substance interbedded with incompetent levels: 50-200 Mpa moderately - strong rock, with meter to centimeter beds. Discontinuities filled with fragile gypsum or without filling. Aperture 0.5 cm wide joints, low to very low continuity (less than 1 m), plain roughness, basically orthogonal shape, without presence of water.
	II.c	Sandstones and tuff: Rock mass with medium resistant rock substance, very fragile. Low resistance matrix, secondary permeability due to fracturing and gypsum dissolution. Spacing discontinuities closer to medium (60 – 600 mm) with low continuity (1-3 m), partially open (0.25 - 0.5 m), plain roughness, without filling.
Igneous rocks	III	Andesites, dacites, gabbros, diorites and pyroxenites. Hypabyssal rocks that appear in small isolated bodies and associated dikes.
Metamor rocks	IV	Sandstone, calcareous sandstone, marble, metawacke and quartzite. Metamorphic rocks: folded and faulted rock mass with competent rock substance. Zones with alteration and fragile levels: moderately strong rock (50-100 Mpa), interbedded with very weak rock (5-25 Mpa). Closed discontinuities, oblique to the stratification, straight, smaller continuity to 20 cm, four joints sets.