Geological report at the seismic station
IT.SNZ1 – San Nazzaro (PC)

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Subject: Final report illustrating the geological setting for station IT.SNZ1

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1. INTRODUCTION

The geological description is related to the site of the IT.DSG seismic station. The coordinates are reported in Table 1.

**Table 1**

<table>
<thead>
<tr>
<th>CODE</th>
<th>NAME</th>
<th>LATITUDE</th>
<th>LONGITUDE</th>
<th>QUOTA (a.s.l.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT.SNZ1</td>
<td>San Nazzaro</td>
<td>45,07427</td>
<td>9,89449</td>
<td>42</td>
</tr>
</tbody>
</table>

**ADDRESS**

Via centro San Nazzaro, 27, 29010 San Nazzaro (PC), Italy

2. TOPOGRAPHIC AND GEOLOGICAL INFORMATION

Topographic and morphological information related to the site are reported in Table 2. Table 3 summarizes all available geological maps from literature for geological analyses.

**Table 2**

<table>
<thead>
<tr>
<th>Topography</th>
<th>Description</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Flat surfaces, isolated slope and reliefs with slope $i \leq 15^\circ$</td>
<td>T1</td>
</tr>
</tbody>
</table>

**Morphology**

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plain</td>
<td>P</td>
</tr>
</tbody>
</table>

**Table 3**

<table>
<thead>
<tr>
<th>Geological map</th>
<th>Source</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT.SNZ1</td>
<td>Geological map of Italy sheet 060 (Piacenza)</td>
<td>1:100,000</td>
</tr>
<tr>
<td>IT.SNZ1</td>
<td>Geological map of Emilia Romagna Region</td>
<td>1:10,000</td>
</tr>
<tr>
<td>IT.SNZ1</td>
<td>Geological and technical maps – Seismic Microzonation level 3</td>
<td>1:5,000</td>
</tr>
</tbody>
</table>
In Table 4 Geological, Lithological and Lithotechnical Units (according to Seismic Microzonation classification; Technical Commission MS, 2015) are described and are concerned to maps of following chapters. The term “original” means the result comes from a preexisting cartography (Table 3); the term “deduced” means the result comes from an interpretation of a preexisting cartography according to the nomenclature of corresponding cartography.

Table 4

<table>
<thead>
<tr>
<th>GEOLOGICAL UNITS (10k Regione Emilia Romagna) original</th>
<th>LITHOLOGICAL UNITS (Amanti et al., 2008) deduced</th>
<th>LITHOTECHNICAL UNIT (MZS) original</th>
</tr>
</thead>
<tbody>
<tr>
<td>code</td>
<td>description</td>
<td>code</td>
</tr>
<tr>
<td>AES8a</td>
<td>Gravel, sand, silt</td>
<td>B3</td>
</tr>
</tbody>
</table>
3. GEOLOGICAL MAP

In Figure 1 Geological Map is reported in a 1kmx1Km square around the station.

Figure 1. Geological map of seismic station IT.SNZ1. Scale 1:5,000. Geological units are established according to the nomenclature of geological map of Italy 1:100,000 (Sheet 060-Placenza).

4. LITHOLOGICAL MAP

In Figure 2 Lithological Map is reported in a 1kmx1Km square around the station.

Figure 2: Lithological map of station IT.SNZ1. Scale 1:5.000. The codes of the lithological units are assigned according to the nomenclature of the Lithological map ISPRA 1: 100.000 (Amanti et al. 2008).

5. LITHOTECHNICAL MAP


In Figure 3 Lithotechnical Map is reported in a 1kmx1Km square around the station.

Figure 3: Lithotechnical map of the seismic station IT.SNZ1. Scale 1:5.000. The lithotechnical units are assigned according to the nomenclature of Seismic Microzonation (Technical Commission MS, 2015).
6. **SURVEY MAP**

Figure 4 shows the survey Map reported both previous investigations and geophysics surveys conducted by INGV Working Group.

![Survey Map](image_url)

*Figure 4: Map of the surveys in the surroundings of the station IT.SNZ1. Scala 1: 10.000. Geophysical measurement consisted in 9-stations array conducted by INGV Working Group for the seismic characterization of the site (Agreement DPC-INGV 2019, Allegato B2: Obiettivo 1 - TASK B, Velocity profile report IT.SNZ1)*

**Convenzione DPC-INGV 2019-21, All.B2-WP1, Task 2:** “Caratterizzazione siti accelerometrici” (Coord. G. Cultrera, F. Pacor)

7. GEOLOGICAL MODEL

7.1 General description

The locality of San Nazzaro is located in the Po Plain, specifically in the municipality of Monticelli d’Ongina that is part of the Piacenza province. San Nazzaro is in correspondence to the Po River (southern shore), at an altitude of about 41 m a.s.l., in an area characterized by drainage channels and abandoned channels of the Po River that laterally shifted during the Holocene. The alluvial succession is typical of meandering river plain and it belongs to the Modena Unit of the Emiliano-Romagnolo Synthem. These deposits are characterized by vertical and horizontal heterogeneity, with predominant silt and clay at shallow depth, followed by predominant sand and gravel at greater depth. The deeper sedimentation is associated to regressive-transgressive cycles of Plio-Pleistocene age, related to the deepening and the subsequent continentalization of the sea basin that has involved the area currently occupied by the Po Plain. As a whole, the Plio-Quaternary succession is regressive, with basal turbidites followed by fluvio-deltaic sediments and continental deposits (Regione Emilia Romagna, ENI-AGIP, 1998).

From a structural point of view, the study area is inside the Emilia Folds that are characterized by two different thrust fronts: the first defines the limit of the outcropping Apennines, and the second defines the limit of the buried Apennine thrust fronts. These buried thrusts and folds are North-verging and can be reactivated with associated seismicity. The only tectonic structure with Quaternary activity is the buried Chero-Carpaneto structural high, which represents the prosecution toward SE of the Stradella thrust.

7.2 Geological Section

Data related to the drilling of three wells for water purposes allowed to draw a geological section up to 90 m of depth, beyond which there are no direct investigations available (Figure 5 bottom and right).

According to Sheet 060 “Piacenza” (Geological Map of Italy scale 1: 100.000) these outcropping deposits have an alluvial origin and belong to Modena Unit AES8a (Upper Pleistocene-

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Holocene) consisting of different lithologies depending on the depositional environment if distal or proximal.

### 7.3 Subsoil model

A subsoil model is built up to a depth of 90 m for the area around the IT.SNZ1 station on the basis of geological and stratigraphic information (Figure 5 right). The stratigraphy shows the presence of gravel, coarse sand and sand up to 20 m in depth. From 20 m to 55 m there is an alternation of clay, fine sand and silt with sand and coarse sand. From 55 m to the end of the available data survey (90 m) sand and gravel are already present with lens of silt and clay.
Figure 5: Bottom: Geological section A-A’ crossing seismic station IT.SNZ1. Right: Subsoil model under the IT.SNZ1 seismic station and classification according to ISPRA: B1: clay, fine sand and silt, B2: sand, B3: coarse sand and gravel; according to MZ: MH: sand and silt, SC: mixture of sand and clay, SM: mixture of sand and silt.
8. REFERENCES

Amanti M., Battaglini L., Campo V., Cipolloni C., Congi M.P., Conte G., Delogu D., Ventura R., Zonetti C. (2008). The Lithological map of Italy at 1:100.000 scale: An example of re-use of an existing paper geological map. 33rd International Geological Conference, IEI02310L – 6-14th August, Oslo (Norway).

Commissione tecnica per la microzonazione sismica (2015). Microzonazione sismica. Standard di rappresentazione e archiviazione informatica, Versione 4.0b (Commissione tecnica inter-istituzionale per la MS nominata con DPCM 21 aprile 2011).

ISPRA - Geological Survey of Italy - Lithological map of Italy 1:100.000 - Geological Survey Portal http://sgi.isprambiente.it/geoportal/ Sheet 060 “Piacenza”.


Regione Emilia Romagna – Geoportale - https://geoportale.regione.emilia-romagna.it/it.

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