



GROUND & GEOTECHNICS DEPARTMENT

Brochure

The Department

Soil-structure interaction is a cross-cutting theme in most civil engineering works, from the initial excavation phases to the final operational behavior of the completed structure. ITS Geotechnics was established from the need to provide assistance to all ITS internal departments in various project areas, and then to address external entities both nationally and internationally in support of geotechnical design, which today is increasingly important in civil engineering interventions. The technicians at ITS Geotechnics are capable of developing advanced 2D/3D models for studying soil-structure interactions and the subsequent design of structures even in very heterogeneous contexts: provisional and definitive support works for optimizing excavation volumes, foundation works for buildings and infrastructure, consolidation and defense works for hydrogeological instability, interventions for the improvement of existing soils, and environmental monitoring.



Services

ITS Ground&Geotechnics develops services starting from the drafting and possible direct execution of an investigation campaign, followed by the interpretation of the obtained results, preparatory to the definition of a geotechnical-geological model that accurately represents the current state.

This logical process is of fundamental importance for the correct design of the intervention, which takes into account the functionality of the work, economic sustainability, management and maintenance costs, and environmental and landscape compatibility.

01 Planning and design

The Department is capable of following all the design phases: from planning and technical-economic feasibility studies to the project verification for validation, through all the design phases up to the construction and detailed design.

03 Geological surveys, inspections, and site visits

ITS Geotechnics is complemented by the presence of trained geologists in conducting the necessary geognostic and geophysical surveys, thus being able to directly and suitably evaluate all site criticalities. When necessary, the team uses the most advanced mountaineering techniques (technicians certified in rope access work) to reach and inspect less accessible locations.

02 Numerical modeling

The technicians at ITS Geotechnics are trained in the use of the most advanced tools available for 2D and 3D numerical modeling of foundations and special works, underground works, study of natural phenomena such as landslides, and the analysis of earthworks.

04 Monitoring

The Department is capable of providing support with the most modern monitoring techniques in structures, infrastructures, and underground works, thanks to the close collaboration with the ITS Inspection department. Support is also provided in the field of hydrogeological instability, where such techniques are very useful in studying landslides and gravitational movements in general.

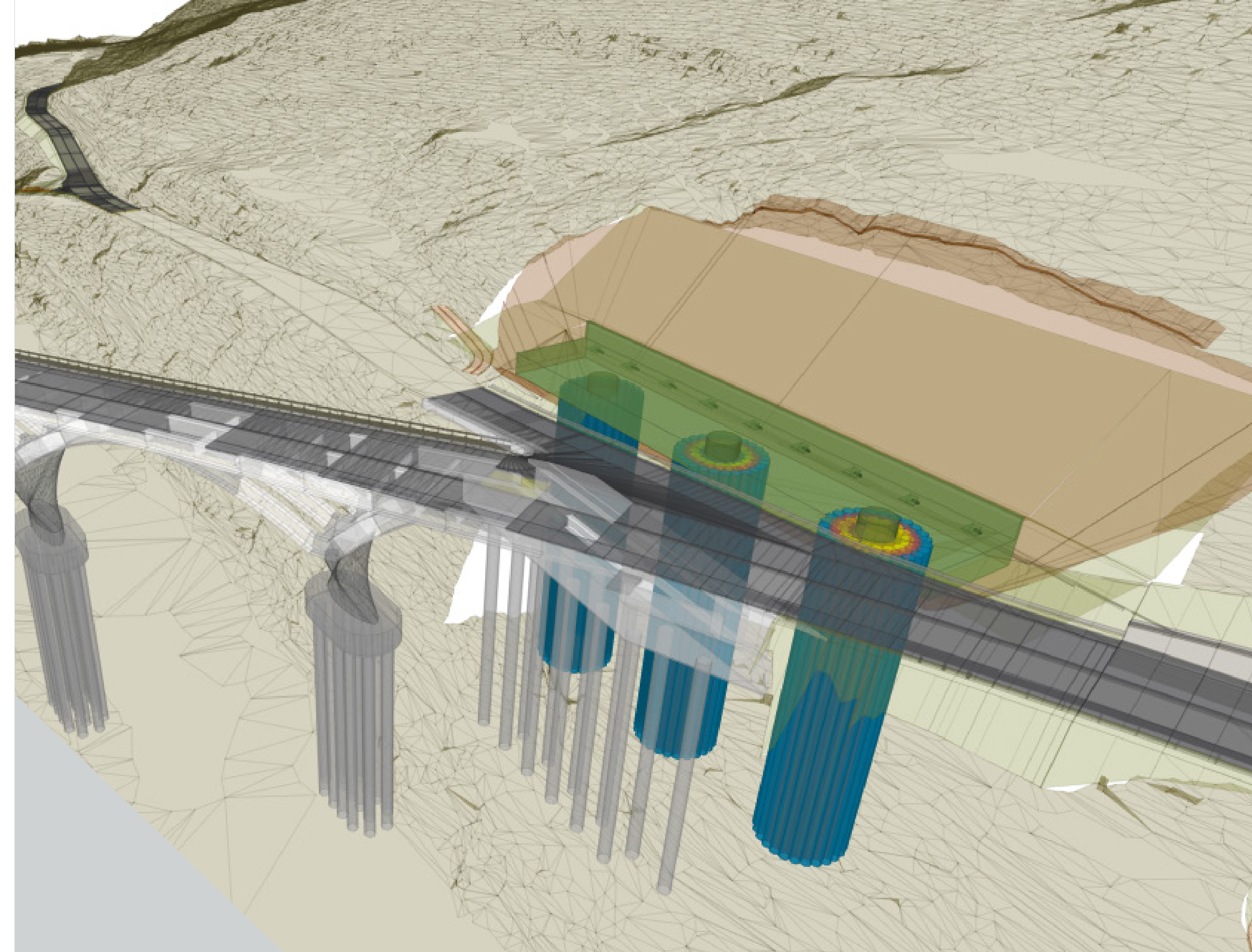


Our projects

Lenzino bridge

Construction works of the definitive bridge over the Trebbia River

Following the collapse of the Lenzino bridge on October 3, 2020, caused by the collapse of the central pier in conjunction with the exceptional flood of the Trebbia river, geotechnical-geological modeling has played a key role in the design of the new bridge on the SS45. The foundations of the new bridge are made of large diameter piles arranged to form a foundation element that is anchored directly into the deep layer of argillite. The presence of a landslide affecting the Genoaside of the bridge has led to the choice of constructing a protective work for the bridge, also anchored in the argillite substrate, and sized to fully absorb the landslide's thrust around the new works in the project. This work consists of three structural wells made up of three circular crowns of tangent and secant piles $\text{\O}1000$ 35m in length. The three wells are connected by a 54m long reinforced concrete top beam, equipped with definitive type pre-stressed tendons, with a total length of 55m and an inclination of 30° . These results were made possible by conducting in-depth geognostic and geophysical surveys (drillings, MASW, refraction seismics, inclinometric and piezometric monitoring, synthetic aperture radar from satellite (SAR)) and consultancy by the University of Bologna on behalf of ANAS and the University of Perugia on behalf of ITS. The measurements made by an inclinometer, in particular during the period May-December 2022, clearly show that the landslide movements are concentrated in a sliding surface about 2m thick, located between 26 and 28m deep from the ground level.



Location: Emilia-Romagna, Italy
Client: ANAS Spa
Year: 2020-2023
Works amount: 25 million €
Categories: D.02, S.05, S.04, V.02
Services provided: Final and Executive Design

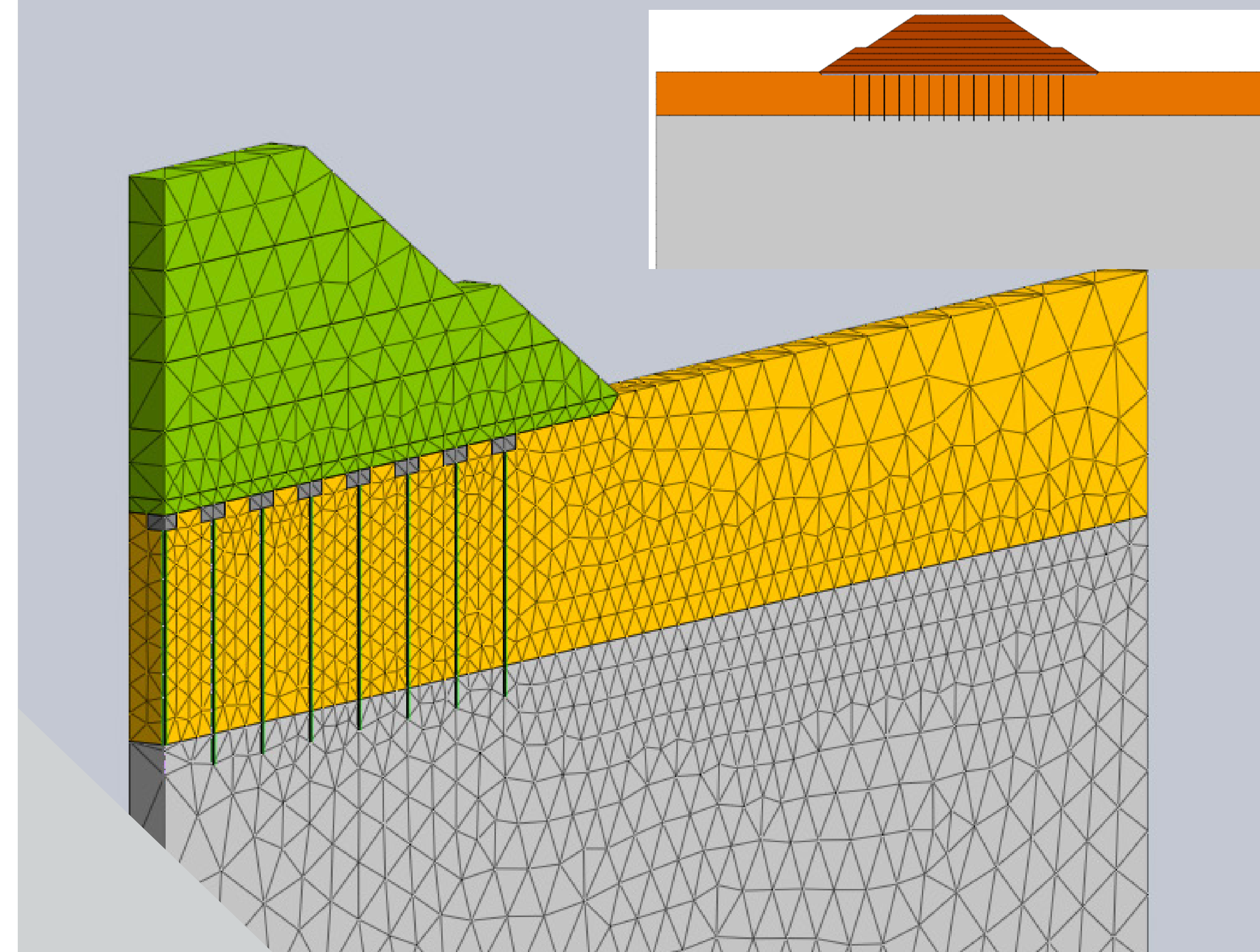
Access ramp to the new railway overpass

Construction works for the connection to road 34 called "Altavilla"

The design of the North access ramp to the new railway overpass, which will connect the roundabout of the "ex Faeda" area (along road 11) to road 34 "Altavilla", has been executed. The project involved the construction of embankments using recycled granular mixed material, with a maximum height of about 10.6 meters at the north shoulder of the railway overpass, and a slope of the side embankments of 2/3. The planimetric dimensions of the structure, combined with the presence of a cohesive and highly compressible surface layer with a maximum thickness of 8 m, necessitated the execution of ground improvement works to ensure the safety of the structure. Specifically, three types of intervention were chosen:

- for the section with heights between 7-10.6 m, a solution with geosynthetics coupled with CFA piles arranged in a 3x3 m grid was chosen. The purpose of this solution is to transfer loads to the underlying incoherent soils;
- for the section with heights between 4-7 m, a consolidation intervention with prefabricated drains arranged in a 2x2 m grid was planned. The purpose of this solution is to reduce the drainage path of the cohesive layer and thus the consolidation time;
- for the section with heights less than 4 m, a traditional embankment was planned.

For the sizing of the structures, 2D modeling was initially performed, followed by simplified 3D analysis using Midas FEA NX software.

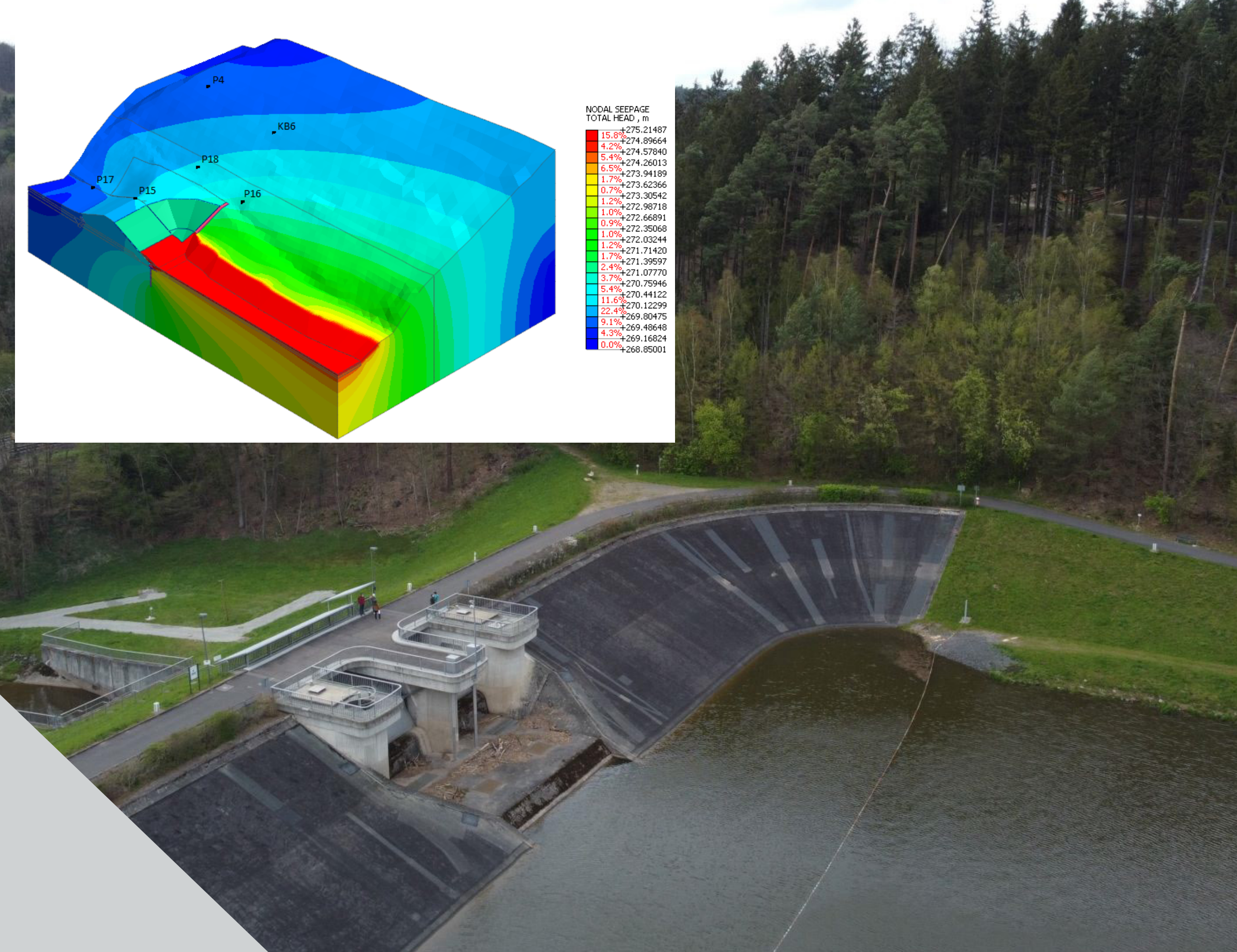


Location:	Veneto, Italy
Client:	Municipality of Montecchio Maggiore
Year:	2022
Works amount:	2.6 million €
Categories:	IA.03, S.05, V.03
Services provided:	Technical and economic feasibility, Final and Executive Design, Safety Coordination in the Design Phase

Haune Dam

Assignment for hydraulic and geotechnical evaluations on the overall stability of the Haune Dam - Germany

The purpose of the project is to thoroughly examine an existing earth dam, in order to provide a clear representation of the structure's condition in terms of safety and consequently offer a general overview useful for planning future maintenance interventions. Based on the existing piezometric data and available photogrammetric surveys, in addition to all the historical documentation, 2D sections were analyzed using finite element software to conduct the main required checks: stability of the dam faces, filtration, siphoning, and erosion checks. Particular attention was paid to the area where the dam body joins the nearby slope: the configuration of the junction is unclear, there are no detailed geotechnical investigations, and the measuring instruments present there show a more marked response to changes in the internal basin level compared to instruments placed at greater distances. For this reason, it was necessary to create a 3D model of the entire slope and the terminal section of the dam, with the aim of studying the hydraulic behavior in the area of interest under normal conditions and during a flood event. The data obtained showed excellent correspondence between the model and reality, thus allowing the identification of an area with anomalous behavior that requires further geotechnical investigations to define a more precise geological model of the subsoil.

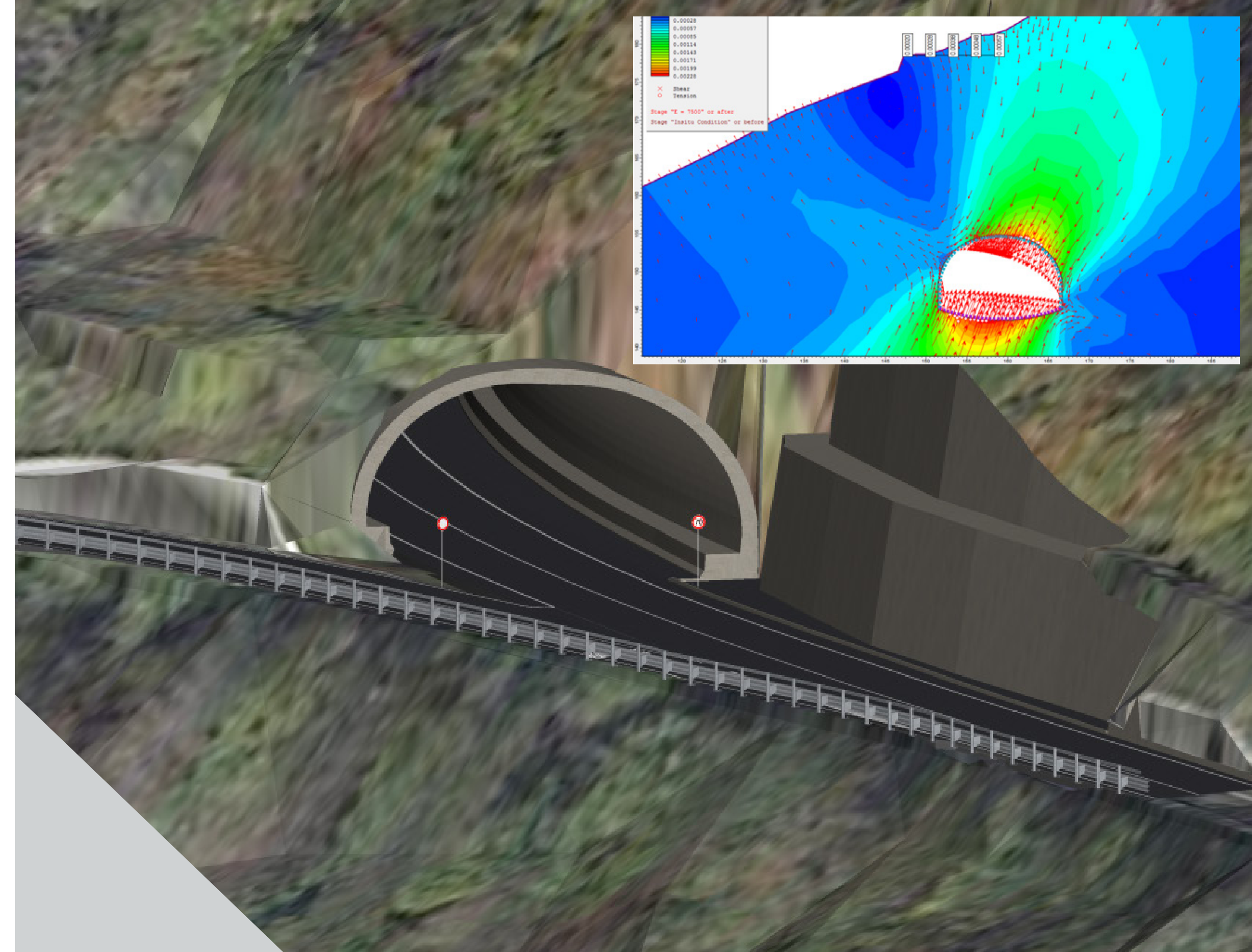


- Location:** Germany
- Client:** Ingenieurburo Professor Kuhlmann
- Year:** 2021 - 2022
- Works amount:** 35.000,00 €
- Categories:** S.05
- Services provided:** Framework and geological-geotechnical modeling, safety checks according to German regulations.

Soffranco Tunnel

New tunnel in Soffranco along road 251 of "Val di Zoldo and Val Cellina"

The project aims to address the critical issues on the section of road 251, characterized by high tortuosity of the route, poor visibility, narrow roadway, lack of stopping places, and exposure to hydrogeological and avalanche risks. To this end, the construction of a tunnel consisting of a single two-way lane with a total length of about 755 m (of which 30 m artificial and 725 m natural) is planned. The geological-geomechanical study made use of detailed field surveys, the execution of two seismic profiles (MASW, HVSR, and refraction seismics), and four drillings with laboratory tests on the extracted samples to define the geomechanical parameters. Based on the conducted investigations, it was then possible to perform a 2D finite element modeling in a plane strain state, through a continuous model of the rock mass. In the development of the project, particular attention was given to the mountainous context in which the structure is located, finding solutions that were compatible from a landscape and environmental perspective: the two entrances are indeed characterized by significant reshaping of the rock walls, followed by covering and concealing of the walls through the construction of reinforced earth structures up to about 20 m high. For the stability analyses of the excavation fronts at the entrances, it was also possible to take advantage of consultancy from the University of Perugia.



Location:	Veneto, Italy
Client:	Veneto Strade Spa
Year:	2020
Works amount:	26 million €
Categories:	S.05, V.03
Services provided:	Structural engineering, specialist reports, and final design services. Executive design and Safety coordination in the design phase.

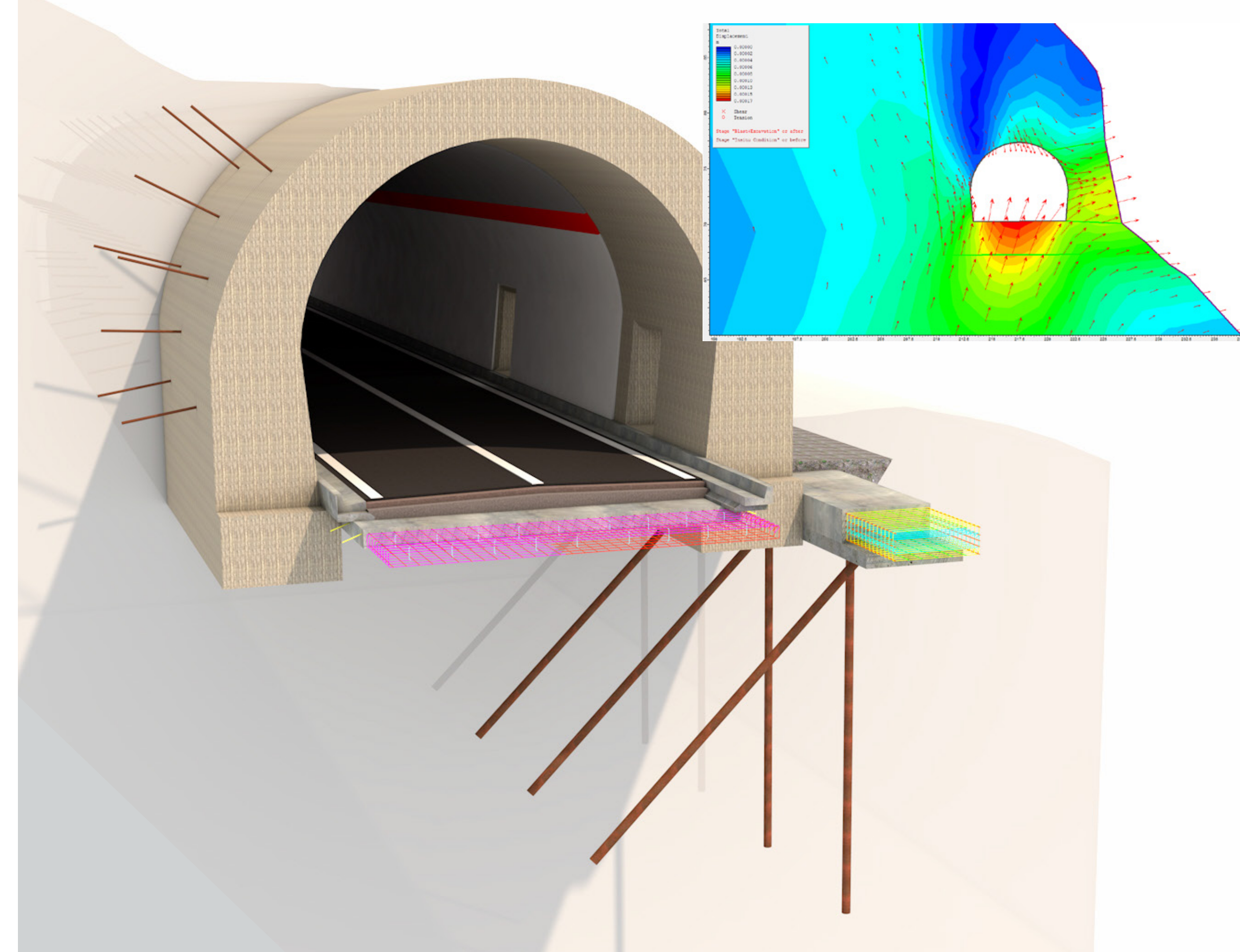
Predil Tunnel

Extraordinary maintenance works for the arrangement of the natural tunnel “Passo Predil”

Following evident settlements with the opening of joints in the rock mass, widespread problems of instability of rock portions as well as a structural insufficiency of the external upright, some extraordinary maintenance interventions of the natural tunnel “Passo Predil” were necessary.

The interventions in the project aimed to secure the tunnel, stabilizing the wall rock mass and the walls above the entrances. Interventions for the reinforcement/restoration of the support and lining structures inside the tunnel were also implemented. Among the main interventions, it is highlighted:

- Nailing of the section with n. 9 nails (in B450C steel and fiberglass) for the stabilization of the mass at the natural tunnel
- Waterproofing of the external surface of the artificial tunnel, as well as the creation of a curb with a micropile trestle for the stabilization of the section.
- Cleaning and scaling of the walls, with stitching in passive B450C steel bars, double twist metal nets, and subhorizontal drainages.
- Sealing of cracks with polyurethane resins or shotcrete



Location: Friuli-Venezia Giulia, Italy
Client: ANAS Spa
Year: 2019- 2020
Works amount: 4.9 million €
Categories: V.02, S.03, S.05, D.04
Services provided: Final and Executive Design, Safety Coordination in the Design Phase

Catajo Tunnel

Static, geostatic, and hydraulic arrangement within the Catajo tunnel on the Bologna-Padova railway line

In the renovation works of the Catajo tunnel, a historic artifact on the Padova-Bologna railway axis where the line interferes with the eastern offshoot of the Euganean Hills, advanced structural analyses were conducted on a numerical model related to the study of the stress and deformation field of the rock mass and the tunnel structures. This was followed by the control of structural and design geometries up to the overall verification of congruence as a whole, as well as the technical-economic analyses of the solution according to R.F.I. editorial methods. The objective of the intervention is to increase safety and technological modernization of the visibly aged artifact. The main purpose is to withstand the traffic of high-speed trains without the need for the previous local attenuation of their operating regime. To achieve this, it was urgent to eliminate the static and geostatic uncertainties that the work, due to its antiquity, implied, also in terms of increasing risk levels. Multiple operations were carried out aimed at the general stabilization of the underground profile, the elimination of structural pathologies in the masonry, and the removal of the macroscopic vacuolization of the lithotype behind the lining, especially at the interface between the back of the latter and the surrounding lithotype.

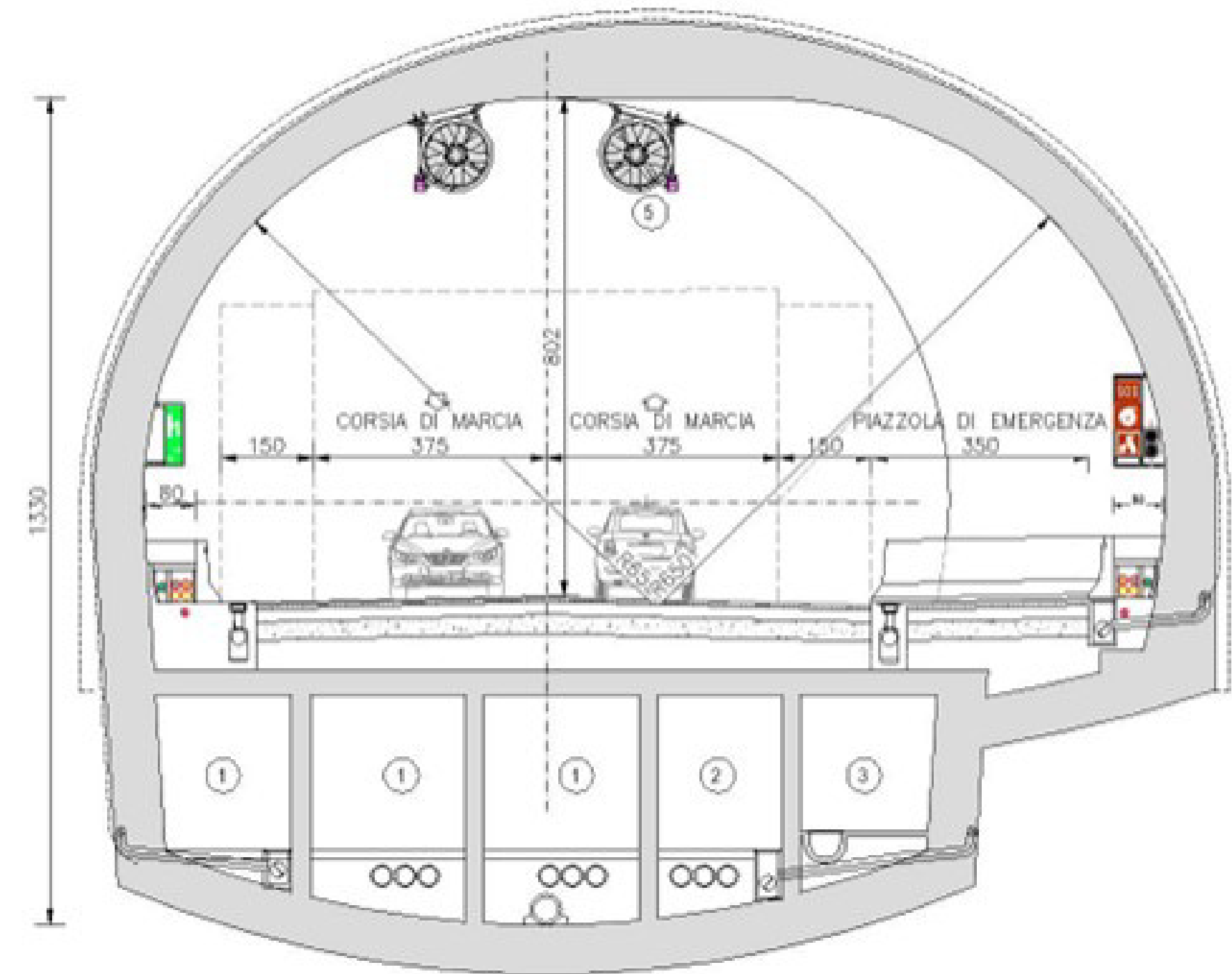


Location:	Veneto, Italy
Client:	Company Silvio Pierobon s.r.l. on behalf of R.F.I. S.p.A
Year:	Phase 1 June-July 2017 ; Phase 2 July-August 2018
Works amount:	5.1 million €
Categories:	-
Services provided:	Final and Executive Design

Four new tunnels

Caudina Valley Connection through the Monte Partenio promontory with the A16 motorway axis

This report is an integral part of the preliminary design for the construction of a road connection between the Caudina Valley, commissioned by the Provincial Administration of Avellino. This document specifically concerns the preliminary definition of the cross-sections in advancement of both the artificial and natural tunnels. A significant part of the route is developed in a tunnel with the dual purpose of minimizing the impact of the new infrastructure on the territory and minimizing the gradients necessary to cross the Monte Partenio promontory. Four different types of tunnels are planned, differing in geometry and total development. All tunnels foresee, near the entrances, the construction of approaches with an "artificial" methodology, that is, with open-cut excavation, to be circumscribed in their extension based on the presence or absence of pre-existing elements to be preserved or not.



Location:	Campania, Italy
Client:	Avellino Province
Year:	2020-2022
Works amount:	291 million €
Categories:	-
Services provided:	Specialist support for project elaborations in the tunnel sector of the Technical and Economic Feasibility project

Perarolo Tunnel

Structural restoration and adjustment of the profile of the Perarolo tunnel along the Treviso - Calalzo di Cadore railway line

The tunnel was excavated partly in a trench, for short sections at the entrances, then backfilled, and partly in a blind bore, within a very deep and extensive paleo-landslide mound. The tunnel is, relative to the slope, generally parallel to the wall, given the great steepness of the overlying slope, as well as of low coverage. The tunnel was afflicted by significant deformative and fissuring phenomena that strongly conditioned the transit of trains. The proposed intervention consists essentially of reshaping the tunnel, following advanced consolidation of the surrounding ground according to the following phases:

- creation, through injections of specially designed chemical mixtures, of a self-contained, cylindrical shell-shaped, waterproof screen, external and coaxial to the lining;
- sealing of the cracks on the intrados of the current lining to prevent internal leakage of the aforementioned cement injections, as well as preventing external leaks with the aforementioned closed shell;
- creation of a thick resistant shell through cement injections within the aforementioned cylindrical crown between the current lining and the remote barrier;
- milling of the old lining to achieve the desired shape for the cavity; this last dimensioning implicitly includes the goal of obtaining, for the entire development of the work, a sufficiently large regular section to allow for the planimetric and altimetric adjustments that will be necessary in the coming decades;
- formation of a new thin, resistant, elastic inner lining, composed of shotcrete and electro-welded mesh, to make up the finished surface of the new lining.



Location:	Veneto, Italy
Client:	RFI Spa
Year:	2014-2015
Works amount:	3 million €
Categories:	-
Services provided:	Final and executive design and Works Management

Catajo Tunnel

Consolidation of the side wall in the odd tunnel of the Catajo Tunnel of the Bologna-Padova railway line

It is a tunnel consisting of two adjacent barrels of 662 meters in length, separated by a masonry partition of varying thickness up to 1.5 meters. The activities planned in the project to secure the work are the following:

- Reinforcement of the section of the side wall located on the odd track by eliminating part of the existing lining (about up to a height of 4 meters starting from the base of the side wall) and by replacing the aforementioned at-risk structure with an HEB 200 centring fixed at the ends with hollow selfdrilling bar tie rods and embedded in a 20 cm thick shotcrete cast. In a second phase, the centring is completely embedded in a reinforced concrete wall;
- Design of a system of works for the containment and regulation of water, including water capture and waterproofing interventions for the water inputs coming from the filter field located in the rock mass, interventions for the arrangement of the channels at the entrances and inside the tunnel, waterproofing interventions of the hole of the ancient ventilation chimney, extraordinary maintenance of the existing water capture system, enhancement of the existing water capture system by constructing new collectors for the disposal of water to the north canal.



Location: Veneto, Italy
Client: RFI Spa
Year: 2013
Works amount: 1 million €
Categories: -
Services provided: Final and executive design

To' Benae Tunnel

Project for the construction of the To' Benae Tunnel with diversion embankments for avalanches on road 215 of Pampeago

Following the indications of the snow report, a tunnel was designed that penetrates the slope sufficiently to ensure the continuity of the inclined plane for avalanche sliding, thereby attenuating the dynamic stresses produced on the structure of the tunnel itself during the peak phase. To optimize the cost/benefit ratio, it was chosen to straighten the road axis itself up to the right-hand curve about 300 meters downstream of the avalanche channel constituting the primary reason for the construction of the work in question. This choice has led to the following advantages:

- reduction of the length of the tunnel and therefore of the costs to build it;
- reduction of the excavation to be carried out for the construction, particularly burdensome considering the steep slope of the hillside, with significant advantages both in terms of costs and environmental impact;
- elimination of the right-hand curve downstream of the tunnel, dangerous because it is located at the exit of an underground passage of a road with a steep gradient (13%) and often snow-covered during the period of maximum use;
- increase in safety resulting from the wide visibility in the sections immediately before and after the tunnel, as well as in the journey through the tunnel itself, conceived as perfectly straight along its entire longitudinal axis.
- To increase the protection of the road from avalanches, two earth and rock embankments were chosen to be built on the sides of the last section of the avalanche channel, in order to guide snowflows and potential rocks unambiguously and reliably within the area of the road track protected by the tunnel.



Location:	Trentino-Alto Adige, Italy
Client:	Trento Autonomous Province
Year:	2000-2004
Works amount:	2.3 million €
Categories:	-
Services provided:	Final and Executive Design and construction management

Rucorvo Tunnel

Entrances of the Rucorvo tunnel at Macchietto area

The project consultancy studied the structure of the initial lining for the South entrance of the Rucorvo to Macchietto tunnel. The structures under examination were constructed in seven phases, briefly summarized below.

PHASE 1: Creation of the embankment behind the current route of road 51;

PHASE 2: Creation of a micropile screen;

PHASE 3: Creation of the foundation micropiles for the reinforced concrete slab on the valley side, and subsequent construction of the same slab;

PHASE 4: Creation of the foundation micropiles for the reinforced concrete slab on the mountain side, and subsequent construction of the same slab;

PHASE 5: Execution of soil consolidation in the excavation face position with fiberglass injections; creation of the arch structure in jet-grouting and the tie rods placed as a constraint of the soldier pile wall;

PHASE 6: Creation of the foundation micropiles for the curb to support the centering; construction of the same curb in reinforced concrete; setting up the pre-ring with centering;

PHASE 7: Cutting of the frontal micropiles and start of the excavation of the 1st field; construction of the pre-ring with centering;

PHASE 8: Excavation of half a section;

PHASE 9: Lowering excavation and casting of the inverted arch.

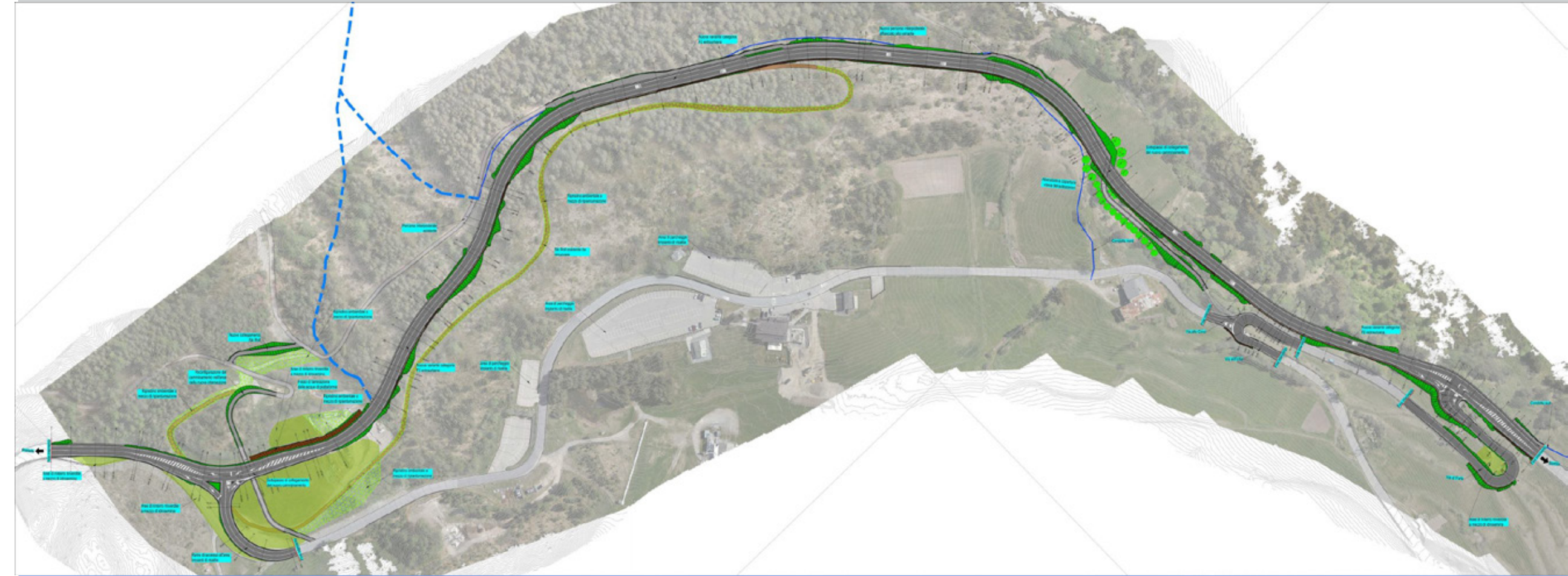


Location:	Veneto, Italy
Client:	Design services of S.I.G.E.S. s.a.s.
Year:	2005-2006
Works amount:	-
Categories:	-
Services provided:	Construction design and design variations

Alternative route to road 28 – Motte di Oga

Summit section in the Municipalities of Valdisotto and Valdidentro

The intervention aims to create an alternative route to reach Livigno, avoiding the crossing of Bormio and the hamlet of Premadio in Valdidentro, a situation that, especially during periods of high tourist influx, has always caused significant traffic congestion. The alternative to the provincial road is about 1200m long, with the road platform being of the "secondary extra-urban road F2" type. The mountainous context in which the work is located has necessarily conditioned the design choices and the need to create significant support structures, either gravity-based or with anchored bulkheads: indeed, the road develops almost entirely on a mid-slope on a very steep side, especially in the southernmost part. Special attention was given to the planimetric and altimetric definition of the route, in order to minimize excavation and earth movements. The design was carried out using BIM methodology, starting from LIDAR survey of the terrain and determination of the terrain's DTM.



Location:	Lombardia, Italy
Client:	Province of Sondrio
Year:	2022-on going
Works amount:	8.8 million €
Categories:	V.02, S.03, S.05, D.04
Services provided:	Final Design, Executive Design, Safety Coordination in the Design Phase, VIA Screening

Piave River

Diaphragm wall construction in the left bank body of the Piave River

The designed intervention envisaged the construction of a bank diaphragm in the section of the left embankment from the access roundabout to the road bridge in the municipality of Ponte di Piave southward, up to approximately the municipal boundary with Salgareda. The intervention aims to eliminate the possibility of siphoning or infiltration phenomena in the event of a flood of the Piave River. Based on the conducted investigations, the possible hydraulic filtration movements that can occur in the embankment and sub-embankment during flood events were modeled. Stability verification was carried out using the Jambu method, considering circular-shaped surfaces, while for the siphoning phenomenon, the most critical area to this phenomenon, located at the base of the embankment on the countryside side, was analyzed, whether or not the waterproof diaphragm in the project is present. Subsequently, infiltration verification was conducted. The diaphragm was created using the jet-grouting technique, a commonly applied design solution in similar cases. Among the peculiarities of the intervention, the interference of the construction site with local traffic, and more precisely with the provincial road road 34 "Sinistra Piave", is of significant importance as it is a vital artery for road connection to the maritime area of Jesolo.



Location:	Veneto, Italy
Client:	Veneto Region
Year:	2019-2021
Works amount:	1.8 million €
Categories:	D.02, S.05
Services provided:	Final and executive design, coordination during design and execution phase

F.A.I.T Underground Parking Garage

Project for the recovery and building redevelopment of the "former Esso station" and "former Pocol Cable Car departure station" area in Cortina d'Ampezzo

The project involved the construction of a multi-story underground parking garage (7 levels) using the top-down technique in the center of Cortina d'Ampezzo. The project was particularly complex both from a structural and geotechnical perspective, due to the nature of the soils (plastic clays related to ancient landslides), the complex multi-aquifer hydrogeological system, and the proximity to existing buildings. ITS specifically oversaw the operational management and part of the geotechnical monitoring. In particular, data related to remote monitoring and spot monitoring with various techniques were correlated. Additionally, the renovation project of the former Pocol Cable Car departure station was carried out, which involved the stabilization of the slope at the base of the building using self-drilling bars.



Location: Veneto, Italy
Client: F.A.I.T srl
Year: 2015-2017
Works amount: 14 million €
Categories: S.06
Services provided: Construction management

Rumerlo Ski Area access road

New access roads to the Rumerlo and Piè Tofana ski areas - Plan for interventions for the CORTINA 2021 Ski World Championships

The intervention mainly involves the construction of a road bypass at the Rumerlo finish area, to allow for its modification according to the requirements of the FIS (International Ski Federation). The BYPASS consists of the construction of a road section with a total length of about 640m and a platform width of 6.0m. The infrastructure design involved numerous complexities, due to the typically mountainous topographic conditions with steeply sloping and partly unstable terrains. To ensure the stability of the slopes in the excavated sections, given the poor bearing capacities of the encountered soils, the design of significant support structures such as reinforced concrete retaining walls, pile foundations, and an anchored micropile berlin wall was necessary. Upstream of the berlin wall, an additional support for the slope located between the bypass and the “Muro de Ra Cioure” ski slope was also designed, made with a green-faced nailed wall.



Location:	Veneto, Italy
Client:	Fondazione Cortina 2021 - Ministry of Infrastructure and Transport
Year:	2019
Works amount:	4.8 million €
Categories:	V.03, S.03, S.04, S.05, D.04, P.02, IA.01
Services provided:	Technical and economic feasibility design, Final and executive design, and Safety coordination in the design phase

Avalanche risk at Passo Falzarego

Avalanche risk mitigation intervention with the extension of the avalanche protection tunnel at Passo Falzarego

The planned intervention involves the construction of two sections of avalanche protection tunnel: one downstream of the two existing ones, and one connecting them. The slope has an incline of around 40°-45° and is particularly complex both in terms of morphological development, consisting of narrow steep ravines, and due to the presence of disarticulated rocky material which, because of freeze-thaw cycles on more than one occasion, even in the warmer seasons, affects the roadway.

The tunnel structure consists of a series of reinforced concrete frames placed side by side with a spacing of 2.50 meters, made with valley pillars of increasing variable cross-section upwards, rectangular mountain pillars, and a beam that connects their tops. Given the location of the work, particular attention was dedicated to the construction site setup. The construction site was divided into four work sections to operate with limited sites at least for the most delicate phases of excavation of the foundations at the rear and the casting of the same, in addition to a section of a wall 3m high that allows for partial filling that secures the slope before proceeding to the same operations in the subsequent sections. Moreover, it is not possible to foresee complete traffic closure, except for short periods and in any case for specific time slots; for this reason, a construction site setup was planned that allows for the possibility of operating on external tracks, both downstream and upstream, in order to limit interference with traffic as much as possible and to allow for the easy movement of excavation material that must then be relocated behind the avalanche protection structure.



Location:	Veneto, Italy
Client:	Veneto Strade Spa
Year:	2014 - 2015
Works amount:	850.000,00 €
Categories:	S.05
Services provided:	Operational management and site inspector

Rockfall risk in Val d'Adige area

Works for the protection against rockfall on road 11 "of Val d'Adige"

The intervention area and all the surrounding area, characterized by vertical walls, is subject to landslides that affect, within a few meters in a straight line, the provincial road SP11 of Val d'Adige and the bike path that runs parallel between it and the Adige river. Due to the stepped morphology of the slope under study, the fall trajectories evaluated following the rockfall model have shown significant heights (even over 20 m vertically from the ground level). A rockfall protection tunnel of about 150 m was therefore constructed to protect the most critical section of SP11, while the remaining project section involved the installation of about 550 m of rockfall barriers on the slope. The tunnel consists of a main portal to protect the provincial road and a cantilevered ledge for the protection of the bike path running alongside. The barriers have a nominal height of 7m with an energy capacity of 5000kJ. A key aspect in this design was the interference with several elements, including a high-voltage power line, the passage through the tunnel (below the slope) of the Biffis canal, and the presence of the medieval Corvara Castle. The construction, particularly for the creation of the tunnel, was constrained by the client's need to ensure vehicle traffic flow. For this purpose, a temporary one-way alternate traffic system was planned.



Location:	Veneto, Italy
Client:	Province of Verona
Year:	2022 - on going
Works amount:	7 million €
Categories:	S.05, S.04
Services provided:	Final and executive design, coordination during design and execution phase, construction

“Saviane” and “Teno-Ribego” Landslides

Possible obstruction of Valturcana stream with risk to the city of Cornei

The intervention area is located along the bed of the Valturcana stream, in the municipality of Alpage. The design was carried out in two phases, each focused on a landslide affecting the stream and threatening its obstruction: the Saviane landslide, approximately 3.5ha, and the TenoRibego landslide, about 14 ha. The works, for both phases, aimed to both restore the hydraulic functionality of the Valturcana stream bed and clean and reshape the landslide slopes to ensure a preferential path for the runoff of meteoric water towards the planned surface drains, which will allow its removal and discharge into the Valturcana stream. The interventions in the stream bed were partly dedicated to the restoration of existing structures, mostly closed weirs from the fascist era with historical significance, requiring specific design precautions to restore the original stone claddings. These interventions were then integrated with new works, such as cliffs and mass concrete slabs for erosion protection, as well as the insertion of two new weirs made by installing "umbrella" mono-anchorage structures. The two rows of umbrellas were located at the foot of the Teno-Ribego landslide to stabilize the stream bed but also as a garrison at the foot of the landslide and to weigh it down. The choice of mono-anchorage technology arose from construction needs, as due to the difficult accessibility of the sites, the creation of a classic concrete weir was not technically and economically advantageous.



Location:	Veneto, Italy
Client:	Regione Veneto
Year:	2022-2023 (1° part), 2023 - on going (2° part)
Works amount:	6.5 million €
Categories:	V.02, S.04
Services provided:	Final and executive project, safety coordination during the design phase. Geognostic and seismic



Legal Headquarters

Corte delle Caneve 11
31053 Pieve di Soligo (TV)
+39 0438 82082

C.F. & P.IVA 02146140260
REA 351225 CAP. SOC. 100.000,00€

Operational Offices

Pieve di Soligo (TV)
Padova (PD)
Cortina d'Ampezzo (BL)
Bolzano (BZ)
Catania (CT)
San Donà di Piave (VE)

