

<b>BLenheim GILBOA LANDSLIDE INVESTIGATION SCHOHARIE, NEW YORK</b>		YEAR COMPLETED
		PROFESSIONAL SERVICES <b>1999 - 2010</b>
PROJECT OWNER'S INFORMATION		
a. PROJECT OWNER <b>New York Power Authority</b>	b. POINT OF CONTACT NAME <b>Robert Knowlton, P.E.</b>	c. POINT OF CONTACT TELEPHONE NUMBER <b>(914) 681-6424</b>

**Rizzo Associates (RIZZO)** was the Engineer of Record for the safety evaluation and remediation of the Blenheim-Gilboa Pumped Storage Project, located Gilboa, New York. The Project has an installed capacity of 1000 MW and includes both a lower and upper reservoir. RIZZO determined that the lower reservoir of the Project was affected by an ancient landslide that poses a threat to the integrity of the generation facilities, including the lower reservoir banks, the substation, and the transmission lines. The slide was detected by the increased tension in the power lines and increased stresses at the transmission tower supports. The slide was later confirmed by infrared imagery.



The Scope of Work undertaken by RIZZO included the geological/geotechnical investigation, slope stability analyses, design of improved slope drainage, instrumentation, remediation concept and design, and the development of bidding documents. RIZZO developed state of the art investigations and instrumentation procedures to fully define the problem and to develop an appropriate, cost-effective remediation approach. All investigations and remediations were completed without affecting plant operations and the resulting "fix" fully corrected an issue that had been on-going for more than 20 years.

During the geotechnical and analytical investigation, RIZZO determined that the ancient landslide was in part triggered by the operation of the pumped-storage project. The variation of the lower lake elevation (40-feet on a weekly cycle) was related to what is known as a rapid drawdown. With this condition, the hydrostatic pressure providing partial support to the embankment slopes is removed while increased pore pressures remain in the soil, reducing its capacity to resist shear stress. Other unfavorable conditions detected were poor drainage and increased pore pressures due to rain and snow melting events.

The development of the cross sections was a challenging exercise. Limited access was available on the heavily wooded, steep hillside. Additionally, barge drilling was required to assess the geotechnical properties of the soils located at the toe of the slide. Such drilling operations were performed during drawdown periods to avoid interruptions in the operation of the power project.

Finally, once the instrumentation program was completed, RIZZO designed the remediation concept, which consisted of improved slope drainage, seepage control and a rock-fill stabilization berm. The slope drainage improved stability of the overall slope with the goal of reducing long-term creep while the berm targeted smaller failure surfaces that could fail catastrophically. This two-part remediation approach increased overall safety and stability at a reasonable cost. Additional services provided by RIZZO included evaluation and bids and recommendation of award; engineering support during construction; and final documentation and preparation of as-built drawings. NYPA has been extremely happy with the overall performance of the remediated slope.

The Blenheim-Gilboa project highlights RIZZO experience with the following deliverables:

- Structural and Dynamic Stability Analysis
- Earth Embankment Soil Stability Analysis
- Hydrologic and Hydraulic Analysis
- Seepage Analysis
- Comprehensive Geological and Geotechnical Investigations
- Design Plans and Specifications for modifications
- Instrumentation
- Formal, Intermediate, Emergency, and Special Dam Safety Inspections
- Construction Oversight and Modification Design

