

PROJECT:

Star Lake Dams

LOCATION:

Bloomington, NJ

DEVELOPER:

The Salvation Army

SERVICES:

Geotechnical

Site Civil

PROJECT SUMMARY:

The Salvation Army commissioned the rehabilitation of two dams located at their Star Lake campground in Bloomington, NJ to mitigate the risk associated potential failure. SESI was tasked with investigating the condition of both the Upper and Lower Star Lake Dams to determining the best course of action for each. Making any necessary changes was a proactive measure to reduce the potential for downstream catastrophic loss of life and property, while maintaining the recreational lakes used in the Salvation Army's Summer Camp programs. The Upper Star Lake Dam also serves as a valuable stormwater management tool to reduce the downstream environmental effects of uncontrolled stormwater runoff.

SESI conducted many studies including a geotechnical investigation, stability analyses, and watershed analyses to determine the Probable Maximum Flood (PMF) and 100-year event flow rates, and hydrograph for the lake feeding into the Upper and Lower Star Lakes.

The Lower Star Lake Dam needed some improvements, so SESI designed a 14-foot-wide concrete impact pad to provide scour protection caused by overtopping flows. SESI also designed a new 24-inch slide gate and ductile iron pipe to serve as a low-flow channel through the new dam. A final improvement for this Dam involved a SESI-designed concrete low-level outlet protection system at the downstream toe of the dam.

The investigations revealed that Upper Star Lake Dam would need an overhaul. The existing rock/rubble/masonry dam was found to be unstable by the NJDEP. Through teamwork among the design engineers, contractor, and the concrete supplier, many difficult tasks were met with pragmatic design solutions which enabled the construction to progress in a timely, cost-effective, and safe manner.

This project had several challenges were inherent to the dam construction:

- An existing Earth and Dry-Laid Boulder Dam had to remain intact during construction.
- The base of the existing bolder wall had to be shored while constructing the foundation below it.
- Work had to be segmented to limit the amount of exposed existing boulder wall.
- There are lakes on both sides of the proposed structure. The lake's natural flow had to be diverted through the work area.
- Working below the Upper Lake created hydrostatic forces to the subgrade & the earthen dam.
- The lower lake continually refilled, requiring constant pumping to maintain a safe/dry work area.

Keeping all of those restrictions in-mind, the new dam for the Upper Star Lake was designed. Using information from the geotechnical studies and stability analysis SESI designed a 190 foot long, three-level concrete spillway which safely passes the runoff from a 0.35-PMF storm event with appropriate freeboard. The L-shaped dam used stone anchors to offset the water pressure and ensure there was no movement of the dam. To allow for extra storage in times of forecasted rain, a 24-inch slide gate and ductile iron pipe was designed and constructed to serve as a low-flow channel through the new dam. SESI was also responsible for inspecting all construction activities at both dams on behalf of the client. This proactive dam construction provided protection to the area from a flooding disaster and gives the downstream community peace of mind.

