



Why use GSSI technology for Dam Safety?

In the never-ending struggle to maintain the world's critical infrastructure, many professionals are seeking out non-destructive testing (NDT) methods that can assist in accurately determining the soundness of structures and assessing their remaining functional lifetime.

Ground Penetrating Radar (GPR) is one of the many effective geophysical tools for investigating voids, fissures, and fractures in dam infrastructure. GPR offers non-destructive testing and investigation of defects in concrete or earthen dam structures like spillways, rip rap, buttresses, etc. These defects or deformations can occur because of water saturation, erosion, water load, or any number of engineering faults which can put human life in danger.

A technological pioneer for over 50 years, GSSI is the world leader of GPR systems that are trusted daily by professionals around the world. Each system sold is backed by a two-year warranty and includes complimentary training from our dedicated professional trainers during the warranty period. With every purchase, users enjoy unmatched technical support for the lifetime of their system.

GPR uses RADAR (Radio Detection and Ranging) to transmit and receive high frequency electromagnetic waves to image the subsurface. A tiny pulse of radio-frequency energy is sent into a material using an antenna. This wave reaches a target and is reflected to the receiver antenna showing anomalies that can affect the structure of the dam. GPR features extremely low power emission rates – less than 1 percent of the radio waves used by a cell phone – so there is no need for extra safety equipment or safety training to use these antennas.

Ground Penetrating Radar (GPR)

- *Non-destructive imaging of the subsurface and manmade materials*
- *Characterizing Internal Structures*
- *Detection of cavities*
- *Concrete inspection and geotechnical investigation of dams, earthen levees and embankments*
- *Reservoir and stilling basin examination*





GSSI customers have been using GPR systems for decades to conduct nondestructive dam investigations that provide information on sediment buildup and leak or void detection. Low frequency GPR systems can offer a number of non-destructive testing options for dam monitoring. High frequency antennas are ideal concrete condition assessment and repair, detecting voids in realtime, and accurately locating rebar position and depth.

GSSI Technologies and Assessing Dam Health

GSSI's systems aid in identifying and correcting potential structural problems throughout the lifecycle of a dam. Our systems can collect a large amount of very deep data quickly, allowing for easy monitoring of large structures.

Feasibility: GPR works best in resistive conditions like sand, concrete, and fresh water. Where you have highly conductive environments, GPR signals tend to attenuate. Depending on the frequency of the antenna used, you can get 12 inches of data with very high resolution or up to 70 feet with lower resolution. Choosing the correct antenna frequency depends on the scope of your project and site assessment needs.

Design: Before construction on a dam may begin, it is essential to understand the surrounding environment to ensure long-term structural stability. Using low frequency antennas can quickly collect large amounts of very deep data. Users can perform water bed and bathymetric mapping, identify sub-bottom structures, visualize lithological discontinuities and identify remediation and repair locations. High frequency systems can help determine where any drilling or core may need to take place in a safe environment.

Hazard Assessment: Engineers require specific information about ground conditions before making foundation and structural design decisions. High frequency antennas provide sharp vertical resolution for imaging rebar, small voids and fissures as well as enabling useful slab analysis. This information will be useful to pinpoint questionable locations within the concrete slab or other shallow areas to prevent catastrophic failures. Low frequency antennas can help to identify stratigraphic changes, lithological discontinuities, and sub bottom structures in the dam and reservoir.

Working Life: Safe operation requires that dams are regularly monitored for structural stability. GPR systems are ideal for locating problem areas which may develop over the lifetime of a dam. GSSI's low frequency antennas can show the interior of large and/or very deep structures to locate large voids, fractures, or leaks. The ability to collect large amounts of data that can be difficult to obtain using invasive methods makes low frequency GPR the go-to for a quick geophysical analysis. Identifying these remediation and repair locations early on means issues can be addressed before they develop into serious problems which could jeopardize the entire structure.

Upgrade/Replacement: GPR is one of the most cost effective and quickest geophysical surveying that can be done on a site. Significant upgrades or even complete replacement of an existing dam may be required as the dam ages and requirements change. GPR can provide a wealth of information to inform the decision-making process in real time.