

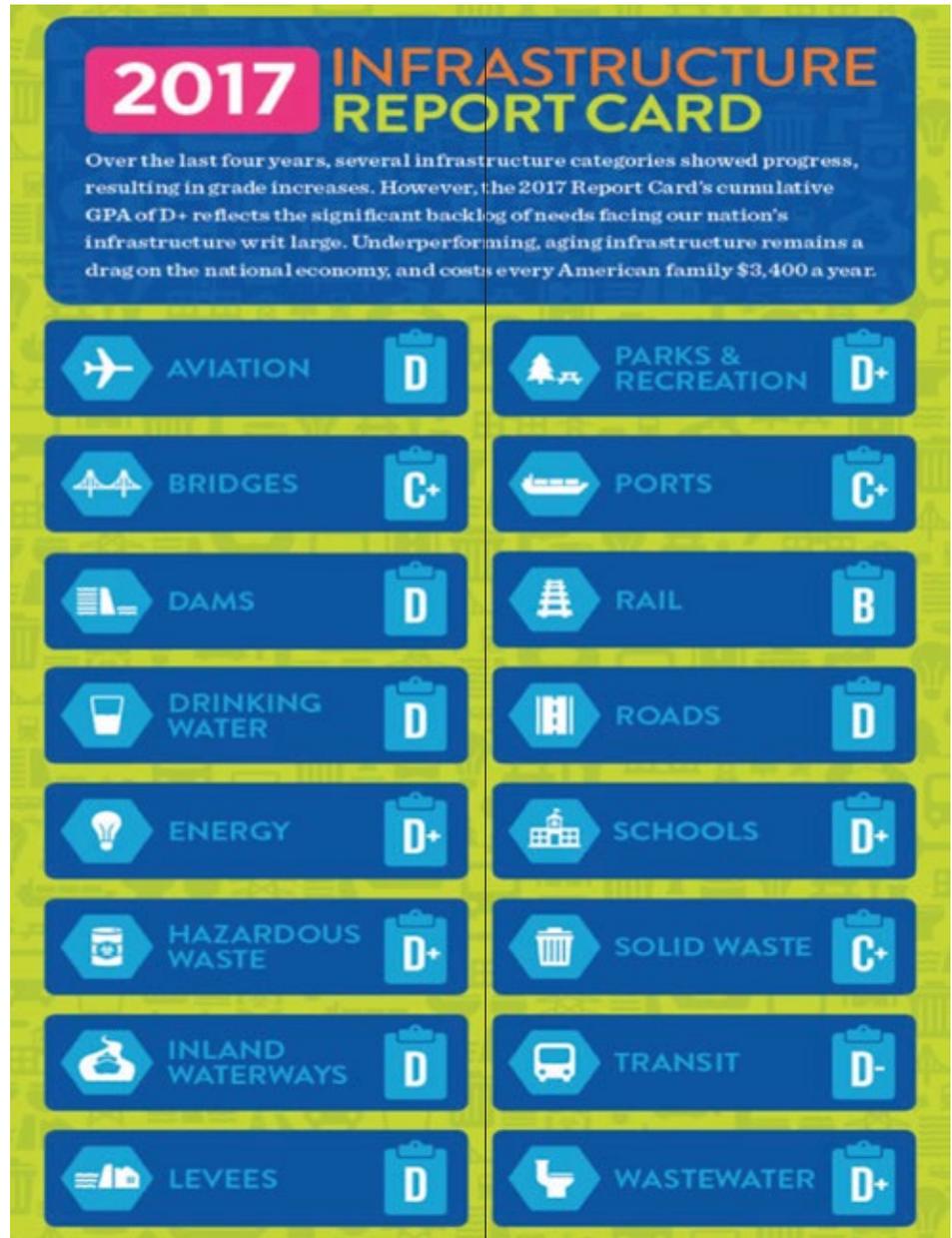
Solutions for Supporting the Aging U.S. Utility Infrastructure

Much has been studied, analyzed, and written about as it relates to the aging U.S. infrastructure over the last several years. While we can't pretend we have the expertise to add high-level studies, data or information to the ongoing conversation regarding infrastructure, we do want to provide a unique perspective from an industry contractor who supports the efforts to maintain, upgrade and replace that infrastructure.

From one vantage point, given the data, the infrastructure needs in the U.S. seem like an insurmountable task. From our vantage point, with the power of American ingenuity, teamwork and grit, we can overcome and ensure the critical infrastructure stability needed for our future.

It's important to first define what we mean when we say 'U.S. infrastructure.' The Department of Homeland Security (DHS) and the Cyber Infrastructure Security Agency (CISA) offer 16 sectors defined as 'critical infrastructure' (DHS source; CISA source). However, these categories are too broad and far reaching for us to attempt to provide perspective.

A definition for 'critical infrastructure' is also provided by Wikipedia (sourced by common and educated resources from around the globe) which offers a more narrow and helpful list of 'critical infrastructure'. Even more helpful, however, is the infrastructure list provided by the American Society of Civil Engineers (ASCE) in their landmark report, 2017 Infrastructure Report Card – A Comprehensive Assessment of America's Infrastructure. Within this report, the ASCE recognizes 16 categories (which



differ from those supplied by DHS and CISA) it deems critical. Of this group, we will review and consider five. Our selection is not meant to imply importance. Simply put, these are infrastructure segments in which GPRS holds a unique expertise and perspective. The categories are:

BRIDGES – Receiving a 'C+' grade on the ASCE Report Card, the U.S. has more than 614,000 bridges. Forty percent of these bridges are more than 50 years old. More, 9.1% of bridges in the U.S. were deemed structurally deficient in 2016. It is calculated that 188 million trips

were conducted across bridges that were structurally deficient. Lastly, it is estimated that it will take more than \$120 billion to rehabilitate the nation's structurally deficient bridges – and this statistic is from 2017!

The Report Card estimates the total infrastructure budget needed to repair our roadways and bridges ('surface transportation') at \$2.042 trillion.

Source: ASCE 2017 Infrastructure Report Card, page 8,14

DRINKING WATER – Receiving a 'D' grade on the ASCE Report Card, there is roughly 1,000,000 miles of potable water piping across the country. It is estimated that over 240,000 water mains break per year and with many of these pipes having been installed in the early to mid-20th century, contamination is a concern. The American Water Works Association estimates \$1 trillion are needed to maintain and expand water service in the near future.

The Report Card estimates the total infrastructure budget needed to repair our drinking water supply system is \$150 billion (combined with our wastewater system).

Source: ASCE 2017 Infrastructure Report Card, page 8,15

ENERGY – Receiving a 'D+', the U.S. energy system also presents some disturbing statistics. As of 2017 it was estimated that there were more than 640,000 miles of high-voltage transmission lines throughout the lower 48 states. All of these lines were running at full capacity and with most having been installed in the 1950s and 1960s, they have surpassed the planned life expectancy of 50 years.

The Report Card estimates the total infrastructure budget needed to repair our energy system is \$934 billion.

Source: ASCE 2017 Infrastructure Report Card, page 16

ROADS – To quote the ASCE 2017 Report Card directly, "America's roads are often crowded, frequently in poor condition, chronically underfunded and are becoming more dangerous." The ASCE offered a 'D' grade to our roads. One out of every five miles of roadway is deemed to be in poor condition and the repair and remediation timelines for our road system is increasing.

As noted above, the Report Card estimates the total infrastructure budget needed to repair our roadways and bridges ('surface transportation') at \$2.042 trillion.

Source: ASCE 2017 Infrastructure Report Card, page 19

WASTEWATER – With roughly 15,000 wastewater treatment plants around the U.S., we have seen significant increases in water quality. That being said, millions of new users will be connected to centralized plants over the next 20 years. New infrastructure is needed to meet this demand not to mention the burden this places on existing facilities. As it relates to our wastewater facilities, the ASCE offered a 'D+' grade.

The Report Card estimates the total infrastructure budget needed to repair and upgrade our wastewater system is \$150 billion (combined with our drinking water supply system as show above).

Source: ASCE 2017 Infrastructure Report Card, page 21

In total, the ASCE estimates needing \$3.2 trillion to complete the necessary repairs and upgrades to the five critical infrastructure categories noted in this article. While the current statistics surrounding the aged U.S. infrastructure are concerning, to say the least, things are not dire just yet. Attention must be given to the remediation, repair and ongoing maintenance procedures for our infrastructure. If little is done to bolster our efforts, the articles written 10 years from now will offer a grim picture as it relates to failing infrastructure and the spending necessary to bring things back to the standards normally accepted in the most prominent and technologically advanced country in the world. What is needed to overcome these statistics is a sound strategy and a commitment to teamwork ranging from local contractors to the national government.

(Note: the statistics above were sourced from the referenced ASCE 2017 Infrastructure Report Card)

The ASCE 2017 Report Card offers an overarching strategy for how to deal with the current critical infrastructure crisis in the U.S. Their strategy is inclusive of the following keys:

- Investment – given the financial statistics quoted above, it is easy to see that a significant financial investment will be necessary. The way that investment is deployed is key, as the Report Card states. The investment approach must be long-term and consistent in its focus.
- Leadership & Planning – The Report Card recommends a collaborative effort from all levels of government, business, labor, and nonprofit organizations. A team (or several teams) oriented effort is the only way to overcome the daunting

infrastructure needs in the U.S.

- Preparing for the Future – Lastly, in considering the Investment and Planning noted above, the strategy must have a future oriented focus. An emphasis on resilient and sustainable technology will be critical to ensure we reverse the infrastructure deterioration curve over the course of time.

As an industry partner working on and around the named U.S. infrastructure on a daily basis, GPRS believes we have a unique vantage point allowing us to offer distinctive recommendations within the categories enumerated in the ASCE 2017 Report Card.

- Investment – the technologies and services deployed by GPRS and similar service providers can offer high quality information on subsurface features critical to determining the location of the infrastructure in question. From concrete scanning analysis and mapping with the ability to provide 3D images of inspection areas to utility locating, designating and mapping, the pre-project spending (investing) conducted with companies specializing in scanning and locating is certain to save financial resources down the road. Additionally, locating and scanning companies like GPRS are able to deploy technologically advanced video pipe inspection equipment that can provide a high quality internal view of piping. All the information and images collected with VPI equipment is compiled and positioned within a formal report (many providers like GPRS provide NASSCO certified reports). All of this subsurface information makes project planning more accurate, provides real-time information on the location of subsurface features of concern, and can illuminate other hazards within the project vicinity that may not be originally known.

Contractors specializing in subsurface investigations offer many unique subsurface studies that are certain to protect and ensure the investments made in our critical infrastructure will be prudent. These services could include any of the following:

Concrete Scanning and Investigations:

- Scanning to determine the positioning (horizontal and vertical) of reinforcing steel
- Locating subsurface voids around critical infrastructure below concrete slabs
- Analysis of reinforcing steel delamination and deterioration

- Concrete voiding and honeycombing investigations
- 3D Imaging of concrete embedments

Utility Locating and Investigations:

- Scanning to determine the positioning (horizontal and vertical) of subsurface utilities
- Locating subsurface boice around critical infrastructure
- Locating of non-metallic objects, structures, and pipes
- Conflict and anomaly investigations related to unknown subsurface features

Video Pipe Inspections and Investigations:

- Structural integrity consultation related to the internal features of large pipes
- Blockage investigation and awareness
- Cross-drill confirmation and locating
- Accurate vertical and horizontal locating of the line being investigated
- Confirmation of sound construction practices post installation of utility infrastructure

Deliverables Provision and Detailed Reporting:

- 3D imaging of concrete and utility subsurface features
- Accurate, GPS collected, data points which can be mapped and provided to a utility contractor in varied data formats (Revit, AutoCAD, KMZ, etc.)
- Aerial drone imaging
- Formal written reports with detailed reviews of the subsurface findings including pictures and data screen shots
- Contour maps for electromagnetic induction data
- Contour maps displaying disparity in reinforcing steel spacing, elevation, and concrete thickness

Again, the construction landscape has many service providers capable of providing expert subsurface investigations, many of those investigations are listed above. GPRS and similar service providers exist for the purpose of revealing unknown subsurface concerns in many and varied ways to, again, support and protect the investment needed when planning and conducting critical utility infrastructure projects.

Leadership & Planning – GPRS and our similarly equipped competitors and industry service providers offer field service

team members who are committed to deploying the right tool with the correct scanning method on any infrastructure project. Further, they are prepared to offer a consultative approach to a project's decision makers that moves them closer to the solutions needed when repairing or updating critical infrastructure. Our industries services and team members work in concert with the architects, civil engineers, and construction professionals ensuring they have the most accurate subsurface information on their job site. It's all but certain that the information provided by GPRS or a similarly capable company will increase the speed of the project, limit cost overruns related to unknown subsurface concerns, and streamline the flow of critical infrastructure information between all leaders on a given job site.

Preparing for the Future – Not only do the services provided by service providers in our industry offer real time Investment and Planning solutions but, they are built to help maintain and support the future needs of the U.S. Infrastructure. For example, as an infrastructure maintenance or repair project is underway, subsurface scanning and locating service providers can offer scanning and mapping services on a set interval to ensure all subsurface utility changes are captured and prepared for future records needs. Mapping whole utility infrastructure systems (wastewater facility, water filtration plant, energy production environment, etc.) and providing ongoing mapping of that system is not beyond the capabilities of the best services providers in our industry. Having accurate and up-to-date records of an entire utility infrastructure facility provides cost saving data which can be utilized in the future. Not only the locating, mapping, and data storage capabilities of GPRS and our similarly equipped competitors add future value but, our technologies will continue to be seen as a viable non-destructive key to maintaining our critical infrastructure.

Overall, the most effective, qualified, and skilled subsurface investigation companies are focused on providing the subsurface information necessary to empower project solutions for even the most complex infrastructure job sites. The added safety and risk mitigating benefits added through the application of these services increase the return on investment, too.

In each of the recommendations presented by the ASCE in their Report Card, it is easy to see that a qualified service provider like GPRS has a key support role to play. Whether in utility locating and mapping, concrete scanning and mapping, NASSCO certified video pipe inspection services, or client mapping and data management support, our industry providers can be your subsurface eyes helping you plan and execute your critical infrastructure maintenance project. When you need subsurface solutions, turn to an expert company providing subsurface locating and assessment.

In closing, the aging infrastructure in the U.S. is certainly problematic. When compared to the various seen and unseen adversities we have faced as a country, this is nothing. We've got this. The key to overcoming and moving forward with excellent support and management of our critical infrastructure is teamwork, a care for the common good of our fellow Americans, and an expert plan of attack. The best solutions won't come from our nation's government alone but from a collaborative effort from all levels of government, business, labor, and nonprofit organizations - the creative individuals powering our engineering, construction, and support service businesses. Will you join GPRS, and our industry, in pushing forward in the fight against our growing infrastructure concerns?

GPRS is a CSDA member contractor

providing GPR scanning, imaging, utility locating and other related services to companies all over the U.S. CSDA offers several other GPR scanning companies, many of whom employ CSDA GPR Certified Operators and are CSDA Certified Companies. These Certifications provide company owners, general contractors, architects, engineers and government officials with a valuable prequalification tool, improves the knowledge and skills of GPR contractors and enhances their public image. Contractors carrying these designations can be found on the CSDA website and GPR contractors can be searched by service type and location at <https://csda.org/find-a-product-service/>.