IMPLEMENTATION OF GROUND PENETRATING RADAR (GPR) IN WESTERN AUSTRALIA

Investigating GPR as a non-destructive test method to determine depth and condition of pavements.

WARRIP was tasked with assessing the capability and effectiveness of GPR and providing Main Roads WA with confidence in the cost saving technology.

Background

Traditional methods of investigating pavements often involve destructive methods causing traffic disruptions and necessitating repairs. Moreover, destructive testing (e.g. coring) provides spotty information. Modern alternatives are proving to be effective in providing the continuous information and without the hassle of reinstating test sites. A good example of non-destructive methods is the use of deflection testing that gives us insight into pavement strength. This cannot replicate the insight into pavement profile (layers beneath the surface, distress and moisture) though. GPR testing could solve that gap by providing continuous high-resolution subsurface image of the pavement with the equipment operating at traffic speed.

Approach

What is GPR?

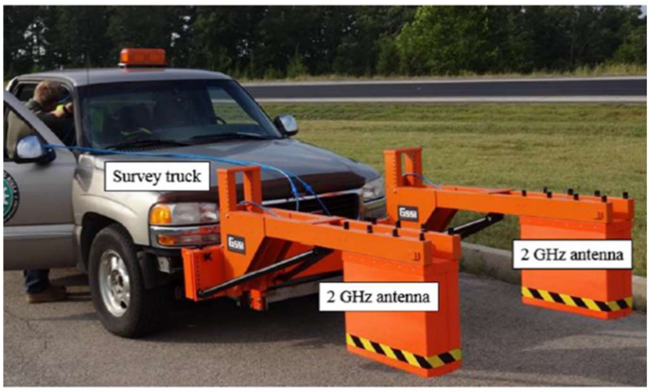
GPR is a non-destructive tool used in many applications such as geological mapping, environmental monitoring, archaeological and mining prospections, concrete scanning and pavement investigations. Vehicle mounted GPR (air-coupled) can operate at traffic speeds of up to 110km/h continuously collecting information about the pavement. A second type of GPR (ground-coupled) maintain contact with the ground and operates at lower speeds. They both use electromagnetic pulses that travel through the ground reflecting from material interfaces and other subsurface and hidden features and detected at the surface by the receiver. These measurements allow experts to analyse and interpret the physical and geometric properties of the pavement.

Will GPR work for WA?

Most providers are not based in Western Australia, however, they travel to Western Australia as required. For best results the GPR must be calibrated with destructive testing (e.g. cores) and the project objectives must be clear from the beginning in order to select the most appropriate equipment as GPR capability is based on frequency of the antenna used for investigation. More investigation is required to compare GPR survey costs with traditional destructive testing as well as costing savings related to network-level surveys. As with all new technology, increased supply options might ensure this technology becomes a viable option

for project- and network-level surveys. GPR capability reported in various researches shows a 98% accuracy but more investigation is required to corroborate these initial findings.

SURVEY TRUCK WITH TWO MOUNTED HIGH FREQUENCY ANTENNAE



Source: Khamzin et al. 2017

What is needed to implement GPR?

WARRIP suggests that a checklist be included in GPR data collection contracts that provides necessary information related the project objectives and intended deliverables to determine the best equipment for the survey.

Technical specifications of the equipment might also help to ensure fit for purpose data is obtained.

It is also advisable that training is provided to those collecting, analysing and using the GPR data.

Last WARRIP also recommends a user-friendly software to convert GPR data into meaningful information to pavement engineers.

This is promising technology used overseas successfully to capture detailed information on road networks.

Next steps could be to undertake further reviews of GPR data to validate initial findings.

FUTURE CONSIDERATIONS

Technical Specification

Training

User-friendly software

References

Khamzin, A, Varnavina, A, Torgashov, E, Anderson, N & Sneed, L, 2017, Utilization of air-launched ground-penetrating radar (GPR) for pavement condition assessment, Construction and Building Materials, vol. 141, p. 130-39.