

Revealing Underground Infrastructure and Supporting Heritage Compliance with Advanced Geospatial Technologies

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SUMMARY

Legacy office sites present significant risks during operations, particularly during maintenance and infrastructure upgrades, due to unknown or undocumented underground utilities. Accidental damage to critical assets or heritage structures can result in costly repairs, environmental hazards, and non-compliance with key legislation such as the National Heritage Resources Act, the Occupational Health and Safety Act, and the National Water Act. Conventional subsurface investigation methods are often inadequate, lacking precision and the ability to provide tamper-proof records.

This study presents the investigation of NTCSA's diesel storage and stormwater pipelines, showcasing the transformative role of advanced geospatial technologies in uncovering unknown underground infrastructure, especially within heritage and legacy sites. By integrating Geographic Information System (GIS) technology, laser scanning, and Ground Penetrating Radar Systems (GPRS), the project mapped and documented critical subsurface assets, including the diesel tanks, pipeline systems, and stormwater channels across the NTCSA Simmerpan Office Park, where numerous buildings are designated heritage structures.

These technologies provide essential capabilities such as precise location mapping, depth and dimension measurement, and connectivity tracing of underground utilities, ensuring that interventions respect the integrity of existing infrastructure and protect sensitive structures, particularly heritage buildings.

GPRS, particularly the LMX100 series scanner, proved invaluable for high-frequency, shallow subsurface investigations, enabling the detection of both metallic and non-metallic utilities within a complex site featuring multiple structures and a dense, crisscrossing network of service

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infrastructure. Complementary systems such as Trimble M3 Total Station and Trimble R2 RTK GPS ensured centimetre-level positional accuracy, while electromagnetic locators like CAT GEN4 and Genny 4 enhanced tracing of conductive utilities. The combination of these systems allowed for comprehensive mapping, overcoming challenges posed by varied surface types and ground conditions, including hard roads and pavements, compacted soil, waterlogged areas, and high building density.

Mapping and verifying water pipeline connections ensures that potable, stormwater and hazardous water systems are not wrongly interconnected, preventing contamination and supporting compliance with legislation, water use licenses, and heritage preservation requirements. Moreover, advanced geospatial technologies complete mapping far more efficiently than conventional methods, significantly reducing project timelines and often lowering costs through decreased labour, minimised errors, and improved long-term asset management.

In summary, advanced geospatial technologies are revolutionising the management of underground infrastructure. By providing precise, reliable, and comprehensive subsurface data, they enhance operational safety, support regulatory and heritage compliance, reduce project timelines, and improve cost-effectiveness. These capabilities enable informed decision-making, minimise risks to critical assets and heritage structures, and ensure that infrastructure interventions are both efficient and responsible, marking a significant advancement over traditional mapping methods.

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