

CASE STUDY

Costain | Automated highways asset inspections – December 2022

M60 Simister Island Junction Improvement Scheme

Introduction

This case study describes the use of new and emerging technology on the M60 Simister Island scheme to survey highways assets which would usually present considerable challenges and safety risks using conventional methods. The project team have eliminated confined space entry within the site investigation phase, reduced traffic management requirements and saved considerable time by using automated scanning equipment and unmanned aerial vehicles specialised for internal inspections.



Overview

The M60 Simister Island scheme has been undertaking extensive surveys of the existing highway drainage network. This requires mapping out the drainage assets and recording their geometric data and condition. To do this, remote-controlled crawler cameras are often used. However, they have limits on manoeuvrability and capturing high-definition, accurate data. This means confined space entry is often required to access deep chambers and culvert systems to obtain the necessary data. This can be time consuming, resource intensive and presents considerable safety challenges.



Challenges

- A strategic deep culvert beneath the M60 inaccessible to vehicles and plant and unable to locate upstream chamber/entry point. No historical records or as-builts.
- Difficult access for confined space entry to the culvert. A team of specialist operatives would be required plus traffic management closures and specialist access equipment.
- Large number of drainage chambers requiring detailed surveys resulting in long programme durations and increased traffic management requirements.



"The use of a specialised scanner and aerial drone to carry out deep chamber and culvert inspections eliminated the need for a large scale confined space entry operation, removed the requirement for night time traffic management, greatly reduced safety risk exposure and ultimately provided more data than would typically be collected from conventional survey methods."

Sam O'Kane – Costain, Simister Island Construction Lead



The Elios 2 drone used for internal culvert surveys



The Elios 2 at the culvert outfall



A screen shot of the 4k CCTV footage captured by the drone



Example of the CleverScan system scanning a chamber



Action Taken

- To avoid the need for confined space entry teams, specialist access equipment and night-time traffic management when surveying drainage chambers and a deep culvert, the project team sought alternative survey methods using innovative technology, which would also provide highly accurate, robust and scalable data gathering solutions.
- The **Elios 2** drone was used as the solution to enable safe surveying of a deep culvert and an adjacent length of large diameter drainage pipework. The Elios 2 is a specialist drone designed for operation in confined spaces, only recently available in the UK.
- Use of the **CleverScan** automated internal scanning system was identified and adopted for surveying highway drainage manholes, increasing productivity and maximising the capture of detailed, accurate data.



Results

- The Elios 2 drone was able to successfully fly the 165m length of the culvert and a shorter but very steeply included pipe. It delivered a dense point cloud model of the pipe, the culvert and its chambers, plus a 3D textured model and 4k high-definition raw footage, which allowed for a structural assessment to be undertaken.
- The use of the drone eliminated the need for a complex confined space operation and vastly reduced the resource required whilst providing maximum detail in the outputs. For the culvert inspection we estimate around 120 confined space person-hours were saved as well as traffic management savings required for confined space access.
- The CleverScan system is capable of surveying a manhole in less than 30 seconds. The system delivered a full point cloud model of each manhole providing all the necessary geometric data and condition assessment information.
- 80 drainage chambers were surveyed using CleverScan, avoiding confined space entry and saving an estimated 26 hours of hazardous work. Increased productivity reduced the overall survey programme and reduced temporary traffic management requirements. This also reduced the exposure of workers on the motorway network, as the automated system can be operated by a single person.
- ***The use of unmanned aerial vehicles and automated scanning technology will be further considered in future due to the diverse range of applications and the resulting reduced safety risk exposure to operatives on the network.***



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