

How GRAHAM Construction slashed its survey times, and costs, by adopting drone technology

COMPANY

Graham is a national construction, asset management and project investment business, which delivers services to a diverse range of clients throughout the UK and Ireland. GRAHAM Construction is the largest subsidiary in the group and delivers building and civil engineering projects for both public and private sector clients.

Half-day data collection vs. 2-3 days terrestrial

5,000 EUR saved on single crossover project

Potential 60,000 GBP saved on aerial photography

Drone breakeven achieved in "matter of months"

Safety of quarry surveys improved

CHALLENGE

- How to optimise efficiencies of new large road contract
- Desire to improve safety of quarry surveys

In 2016, GRAHAM Construction was jointly awarded, with Farrans, the contract to build Northern Ireland's new £130 million A6 dual carriageway. This three-year project will see the two companies construct 14 km of new road.

GRAHAM Construction's previous method of performing its regular cut and fill volume calculations was to employ terrestrial surveying instruments. However, says senior land surveyor, Nick Kelly, these ground-based methods were a costly, and sometimes risky, endeavour.



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"Previously, our weekly or monthly measurements would be carried out by two or three staff using total station and GPS instruments," Kelly says. "Then you would have all the data processing and volume calculation work after that. So it was a time-consuming process. Our surveyors also

work our on-site quarries, where you have sheer rock cliffs and massive boulders, making these areas potentially very dangerous to survey."

Therefore, Kelly turned to the firm's primary supplier of geospatial equipment, [Korec Group](#), to examine the potential of automated mapping drones. His hypothesis being that such aerial mapping solutions could potentially speed up survey times, while simultaneously improving surveyor safety.

SOLUTION

- Adopt eBee Plus mapping drone
- Employ weekly in place of terrestrial measurement

To start, Kelly booked a demonstration of senseFly's eBee Plus with the Korec team. "We've been working with Korec for 15 years. They know our needs and we've always enjoyed good after-sales support. So, we spoke with their team and ran a few eBee demos. We could quickly see that the drone data would pay us back in a matter of months, rather than years," Kelly explains. The firm then purchased a senseFly eBee Plus mapping drone.

Kelly explains how the drone is now employed: "A full topographic survey, with GPS, gives us our starting point. Then, with our drone surveys we can work out the topsoil

volume, plus the volume of all our topsoil stock piles. Once we have the topsoil strip model, we do a weekly measure with the drone, using the eBee Plus' data to analyse the cost of our earthworks and to calculate our weekly cut and fill. We fly our current job site once a week, plus three quarries," Kelly says.



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Each individual flight maps a single 500-metre chainage. This length was specified to ensure that GRAHAM Construction complies with the UK's commercial drone regulations, which specify visual line-of-sight. "Each mission block in our eMotion flight planning software is a 500-metre by 50-metre corridor," Kelly explains. "We just turn on eMotion, upload the mission block, and set our take-off and landing zones. Then, we only process the imagery that's within our chainage boundary, cutting out any extra data and streamlining our processing."



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Kelly's team uses Pix4D photogrammetry software to process the drone's imagery and create digital point cloud and contour model outputs. "Then we use a combination of Trimble Business Centre and NRG Surveys software for our volume calculations," he adds. His team uses a similar workflow to survey several of the company's on-site quarries and, as part of the same contract, has also recently mapped a crossover, part of a related contra-flow system.

RESULTS

- **Large reduction in survey times & costs**
- **Improvement in surveyor safety**
- **Additional benefit of free visual "by-products"**

The efficiency boost the company has received from its drone use has been nothing short of a revelation. "The eBee has revolutionised the laborious task of measuring

our cut and fill each week. Before, our robotic total stations and GPS took us two to three days. Now, we fly the site in half a day," Kelly states.

In addition, Kelly notes that each individual quarry survey is now a 10-minute collection job, versus a half-day on the ground. Plus, his team are no longer put at risk traversing these dangerous sites, where drill and blast occurs twice a week.

The financial benefits of GRAHAM Construction's drone use also apply outside the core job site, such as the crossover mapping that Kelly's team completed. "This took a ten minute flight, plus one-hour of image processing and an hour to produce the CAD model. Compare that to a four-week application for traffic management, a day of management on the ground, with overnight cone placing, plus the survey itself. We're talking about a saving of five thousand euros on that one mission."

Kelly is also speaks to the benefits of the drone's additional RGB outputs. "In the past, we might have spent up to 60,000 pounds over the duration of such a project by using helicopters to capture our aerial photography. Now, this is a free weekly by-product of the drone," he remarks.



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The firm's eBee Plus is, says Kelly, "the best money our survey department has ever spent". Consider, he says, a similar-sized contract the company won a few years prior in Scotland: "That 2010 contract was worth 400 million pounds, so similar in size to today's A6 project. There, our contractor used 18 full-time surveyors, with four guys out there measuring, all day every day. At 40 pounds per hour, each, that's a cost of millions. Now we can do their work in one day."

GRAHAM Construction is looking to add a second senseFly drone to its operation.