



# Improve Construction Site Reporting With Drone Surveying







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Effectively reporting on your construction site requires useable, shareable data and readable report formats. Drone-captured survey data, processed correctly, can boost your accountability, communication, and collaboration.

On today's construction sites alone, lack of project data [costs businesses more than \\$177B annually](#). Having site data that's as up-to-date as possible means spotting problems before they become expensive and preventing rework. It means tighter planning and budgeting. It means better contractor management.

This huge deficit can be rectified in part with better, more frequent data capture, and simpler reporting outputs. With drones becoming affordable worksite tools, doing so is easier than ever.

Drones put the power of data directly into your hands. They don't require the same extensive special training and education that traditional surveyor equipment requires. You don't need to outsource surveying any longer; you can get updated site data as often as you want to fly—monthly, weekly, daily.

In this ebook, we'll cover how drone data visualized in a cloud-based processing platform can provide deeper insight into a site itself; how work is progressing; and what problems have arisen.

Further, we'll discuss report formats for any measurement or analysis you want to do in the platform, and how easy sharing and collaboration can improve efficiency and accountability.

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# Why reporting and collaboration matters on construction sites

It's straightforward, but when you have an open stream of communication between teams on site and back at the head office, everyone is more aware of what's going on in a particular project.

The simple checks and balances enabled through frequent, accurate reporting saves time and money in any project. The more people who are paying attention, the more likely spotting an issue becomes, the more likely getting things to go right the first time becomes.

This preventative mindset only happens easily with good reporting, with reports everyone can understand.

While some people have no issue visualizing a finished structure in their minds from a spreadsheet, not everyone is so lucky. [Cloud-based drone data visualization software like Propeller](#) aims to make reporting and visualizing your site as straightforward as possible with 3D models rendered as close to the real world as possible. The same goes for making measurements or comparison in that model or to automate repeated tasks and highlight the most relevant information.







# Progress reporting the traditional way

Historically, collaboration on worksites has centered on two methods: drawings and physical inspections. While both methods are “tried and true,” the obvious pitfalls are as old as the methods themselves.

One of the major problems with using drawings is the difficulty of communicating the context between your actual, real-world site and a set of drawings.

As one of Propeller’s customers, Robert Usher, a project manager at Boral, recently put it, “Most people on site don’t understand drawings. . . . Using Propeller I can show new contractors around key areas.”

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Management and version control usually lies with a small design or engineering team. Usually most of the site-based workforce doesn't have access to the expensive software necessary to stay in the know about changing designs.

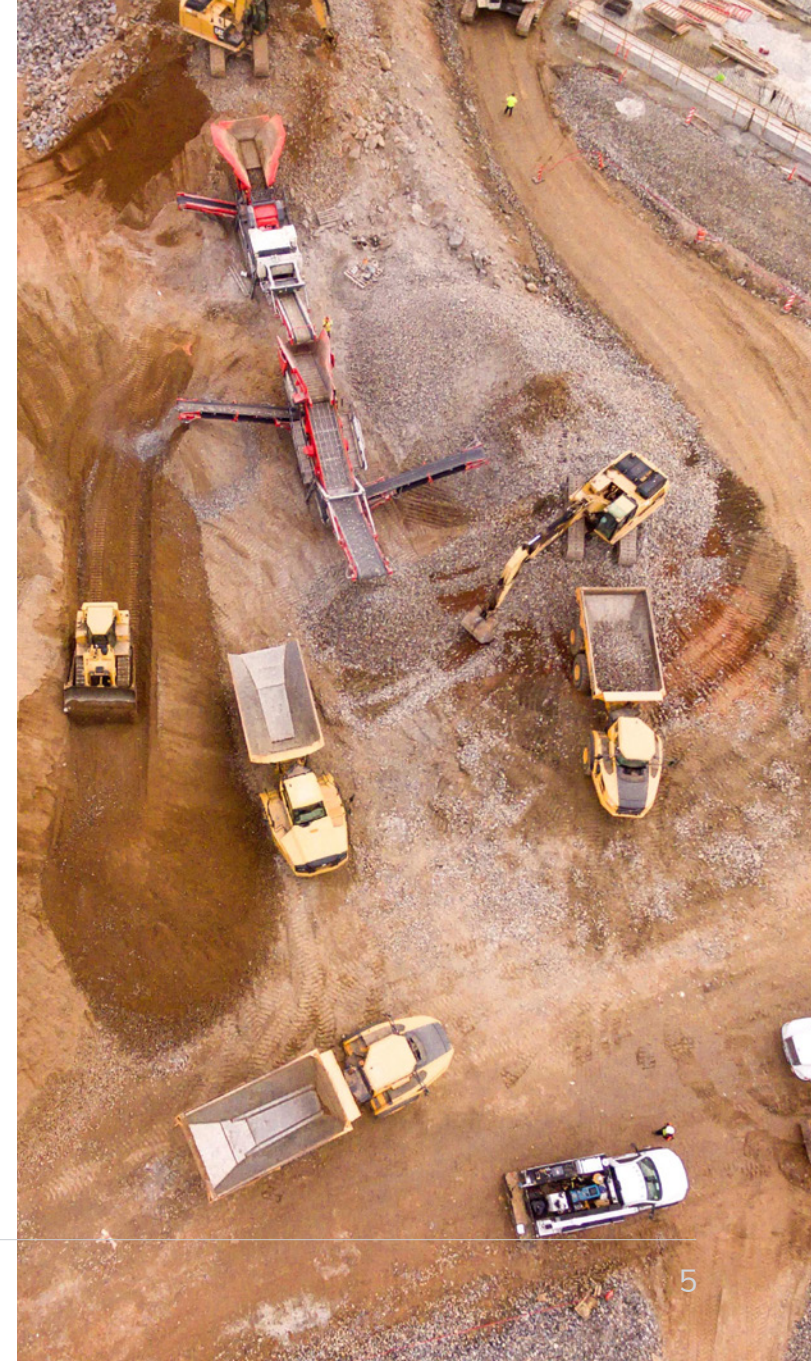
Typically, you'd also be visually inspecting work. Whether it's during mobilization, daily briefings, or as part of QA checks, observing work (or areas of planned work) is the foundation of site-based communication. The reason is simple—it works. Nothing beats the directness of insitu viewing.

This is expensive, however. Having personnel on site to inspect before, during, and after site work requires resources. It can also sometimes bear an unacceptable safety risk depending on the nature of the job, as with deep excavations around blasting or nearby hazardous materials.

For your nonsite-based workforce, including outside stakeholders, getting to site is often not possible. The photos and drawings they have to work with are a poor substitute for in-person visits and they lose a lot of context in translation.

Collaboration challenges span the entire life of any project, from liaising with consultants and mobilizing contractors to monitoring progress and production and QA. At each stage, ensuring the right parties have the information to understand a project's needs and complete their work on time, on budget, and to specification is critical to good decision making and success.

We'll get into how you can do so using drone data and a processing platform further down, but first let's briefly go over the data capture process.







# How drone surveying works

When it comes to actually walking out on site to launch your drone and capture data, the flight itself is mostly automated. Free apps like [GS Pro](#) take the complexity out of flying: set up a flight path on a touchscreen, then hit Go. There's no manual control involved.

We recommend automated flying because steady, consistent flight is crucial to image quality. If you have poor-quality images, you'll get poor-quality surveys.

The average drone surveying workflow looks something like:

- Preplanning
- Ground control placement
- Launching your drone
- Landing and wrap-up

For more information on drone operations, read our free ebook [How to Start a Drone Program on Your Site](#).



# The importance of ground control

Ground control is vital to survey accuracy when you're using a standard drone, such as the Phantom 4 Pro or Mavic Pro, which isn't equipped with an advanced onboard GPS unit.

Without ground control points (GCPs), combined errors of 10-plus degrees in a drone's pitch or roll can introduce errors of tens of centimeters in the final survey.

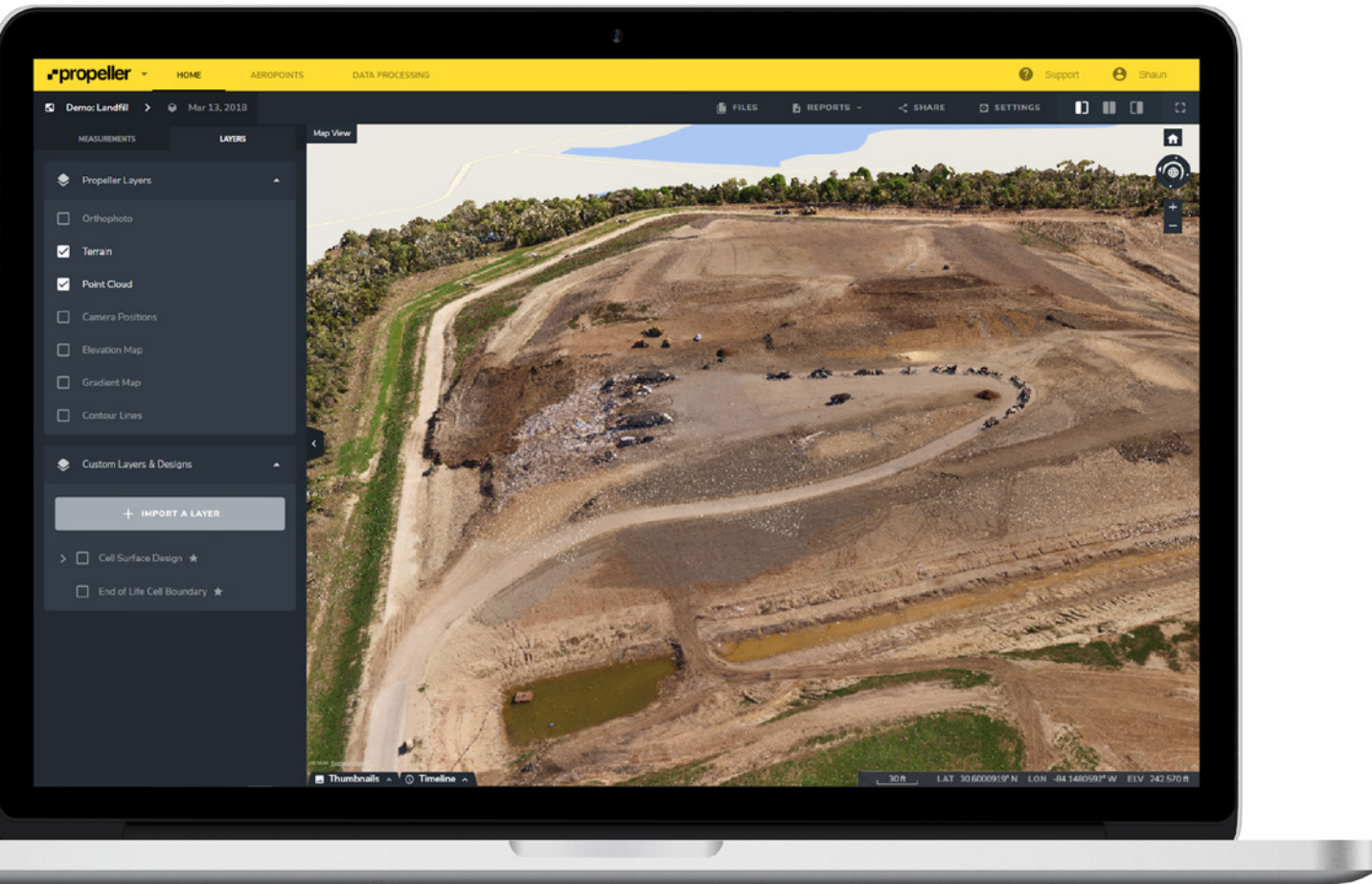
Establishing ground control with [AeroPoints](#) is simple and straightforward. These smart GCPs have a rugged exterior and inbuilt GPS, and are capable of capturing incredibly accurate positional data.



But if you're using a different workflow, like [Propeller PPK](#), the need for traditional ground control is significantly reduced. The Propeller PPK solution uses a Phantom 4 RTK drone and a single AeroPoint as a passive base station.

With a PPK workflow, the drone geotags X,Y,Z coordinates to each image thanks to its onboard GPS

unit. While this is happening, the base station is also recording the positional information, but with much more accurate triangulation. Because of this onboard GPS, you don't need the same ground control as in traditional drone surveying.



# Drone photogrammetry: how drone images become a 3D survey

Drone imagery is the foundation of a 3D survey, which is where all your report data comes from. These photos and their corresponding positional information are stitched together using the [science of photogrammetry](#).

At its most basic, “photogrammetry” is measuring via photos. When you fly a drone, it takes pictures of your site with ~75% overlap. This is so the computer can stitch images together to make the orthophoto and to capture enough angles of each feature to model it in 3D.

If you took an average image from your survey, you’d easily be able to pick out many “features” between different photos. The more features you match, the better you can relate images to one another and reconstruct objects pictured in them.

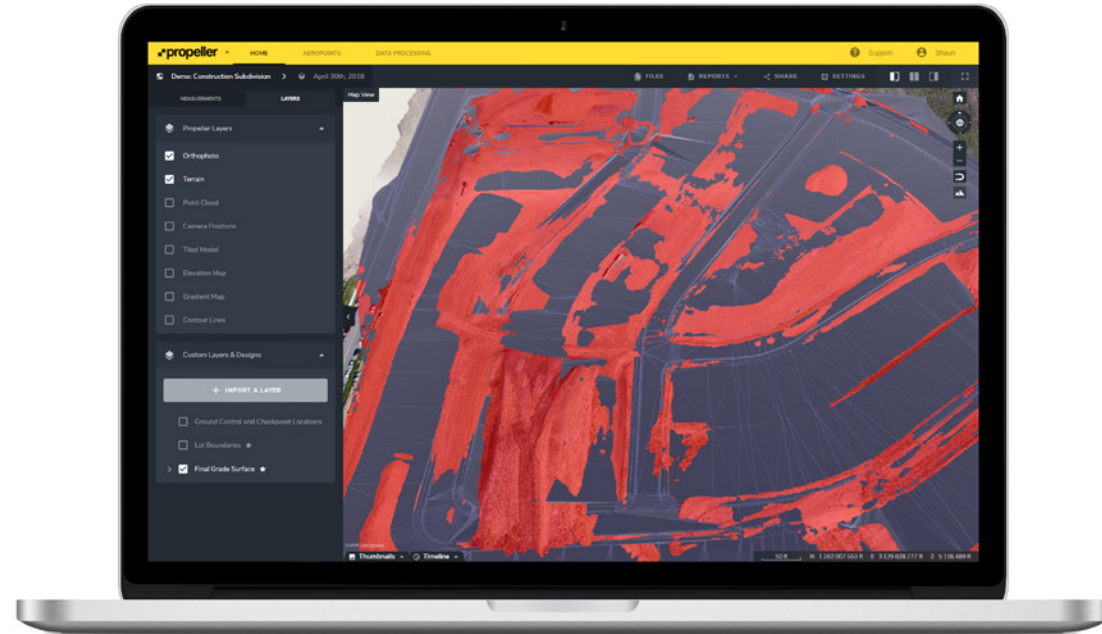
With a lot of these features—think millions—you can create a “cloud” of points. Each point has a matched feature describing your surveyed area in that location. You can then turn your point cloud into any regular outputs used in geospatial software, like a 3D mesh or digital elevation model (DEM).



# Drone data makes reporting and collaborating on your construction site easy

Things change rapidly on construction sites, and making decisions on data weeks or months old can be an exercise in frustration. Because drone surveying takes significantly less time—both in collecting data and processing it—you can have updated information on your site much more frequently. This alone improves reporting and collaboration because you're seeing things much closer to real time.

Using 3D data captured by drone, anyone can produce a model that's visually recognizable and can therefore be used for easy communication by anyone on- or off-site. You can have a visual conversation with your team with relevant data and reports.



In Propeller, adding designs—whether as linework or design surfaces—allows you to visually monitor and track progress towards that final design. Because the model is 3D and uses up-to-date photographs, it's easy to recognize how the design relates to the current state of your site.

For off-site users, like contractors, designers, or head office personnel, using a 3D site model provides

a realistic alternative to costly in-person visits. An accurate and up-to-date model, rich with context provided by notes and shared files, enables off-site users to move around freely, getting a whole-of-site perspective on how things work.

To learn more about how drone data helps you work smarter, check out our free ebook on [drone data analytics for construction](#).



# Construction site report examples and how to use them

Every site has its unique reporting needs, but here we're going to cover some common reports that you can use on your construction site.

## Track progress and volumes easily

You can check site volumes in seconds and track changes over time with printable reports and a timeline slider.

Volume measurements are quick and simple to make. Cut/fill maps are rendered in 3D and color coded for easy viewing.

With on-screen calculators, you can take the guesswork out of tonnage measurements and inventory value calculations. Each individual measurement you make is rendered separately on our downloadable PDF or CSV reports. With these, you can easily see and measure how much dirt has been moved, so you can quickly understand how much has been completed and what's left to do.

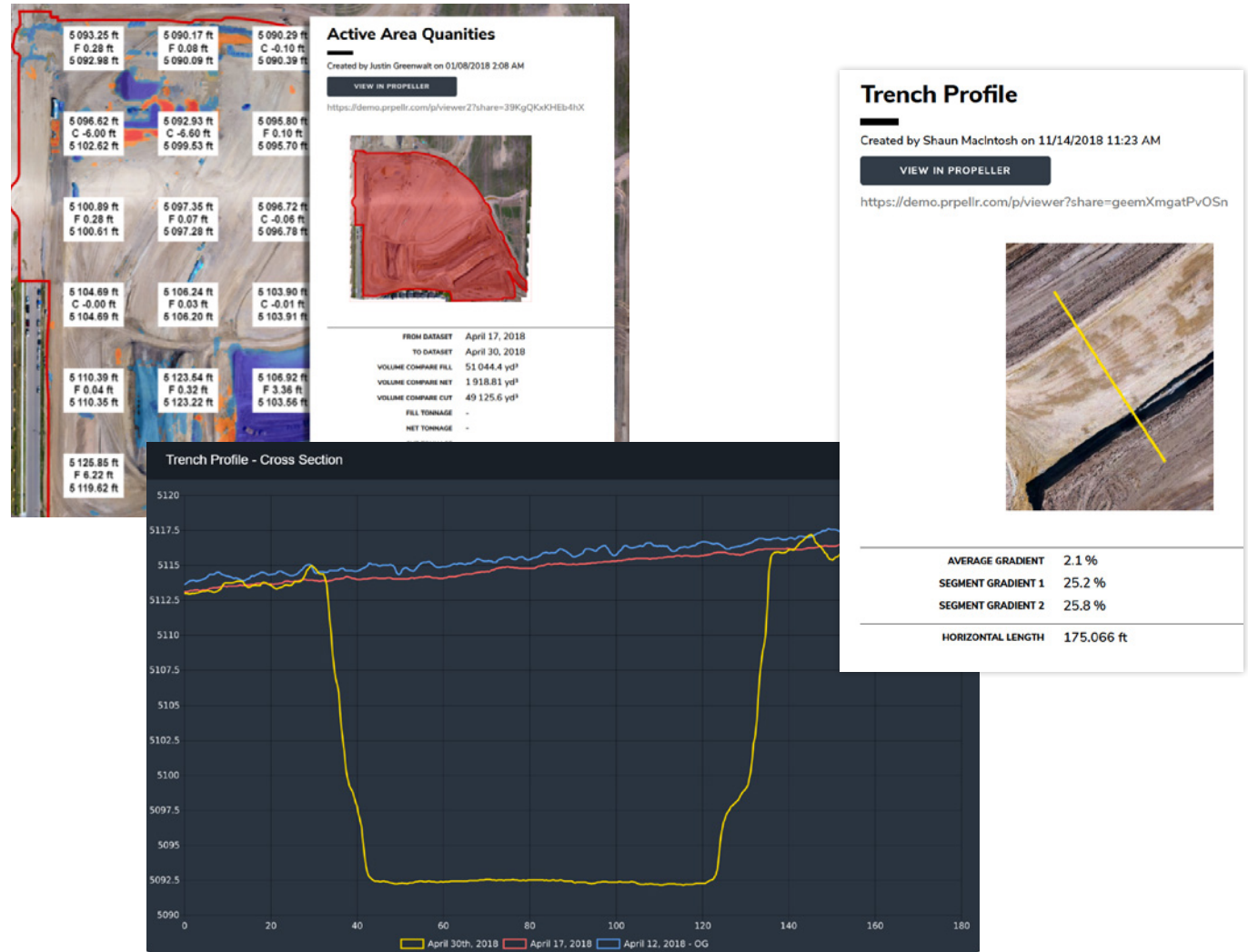




When it comes to comparing your site against design, Propeller allows for uploads of design surfaces and linework.

This gives you an overlay on the 3D site survey, which instantly highlights how you're progressing and if your work is to specification. The cross-section feature allows you to see how you're faring against a design surface or other surveys at specific points and lines.

If you're interested in stockpile reporting specifically, check out our [Stockpile Measurement and Reporting with Drone Surveying](#) ebook.





# Collaboration and sharing with teams and your whole organization



That brings us to another point often overlooked in construction site reporting: the ability to share and collaborate using reports. It should be painless, but it's often not. At each stage, getting the right parties the information is a big effort, but one vital to understand a project's needs and complete work on time, on budget, and to specification.

Because the Propeller Platform is a browser-based tool, instead of traditional desktop software, it means that anyone with an internet browser can use it without installing complicated programs. You can work from a single source of truth and share reports and measurements via email, PDF, CSV, or portal access.

Everything is housed in the same place: your present and past surveys; your designs and any iterations; your notes; your reports; and, of course, all your files in the formats you require. This makes access and collaboration, whether with the head office or your on-site team, painless and version-controlled.

However, not every person on your construction site needs to, or should, know what's happening everywhere. Propeller has no limits on the number of view-only users you can have, making it simple and cost effective to give everyone the best collaboration solution available.

Once your team has access, they can collaborate and share individual measurements or features. They can also upload additional data to surveys, closing the loop between a site-level overview and specific documentation for each stage of completion.





# Case Study: Haskell prevents rework and spots contractor issue before it becomes a problem

Let's take a look at how one Propeller user uses up-to-date reporting and data to solve problems in the real world.

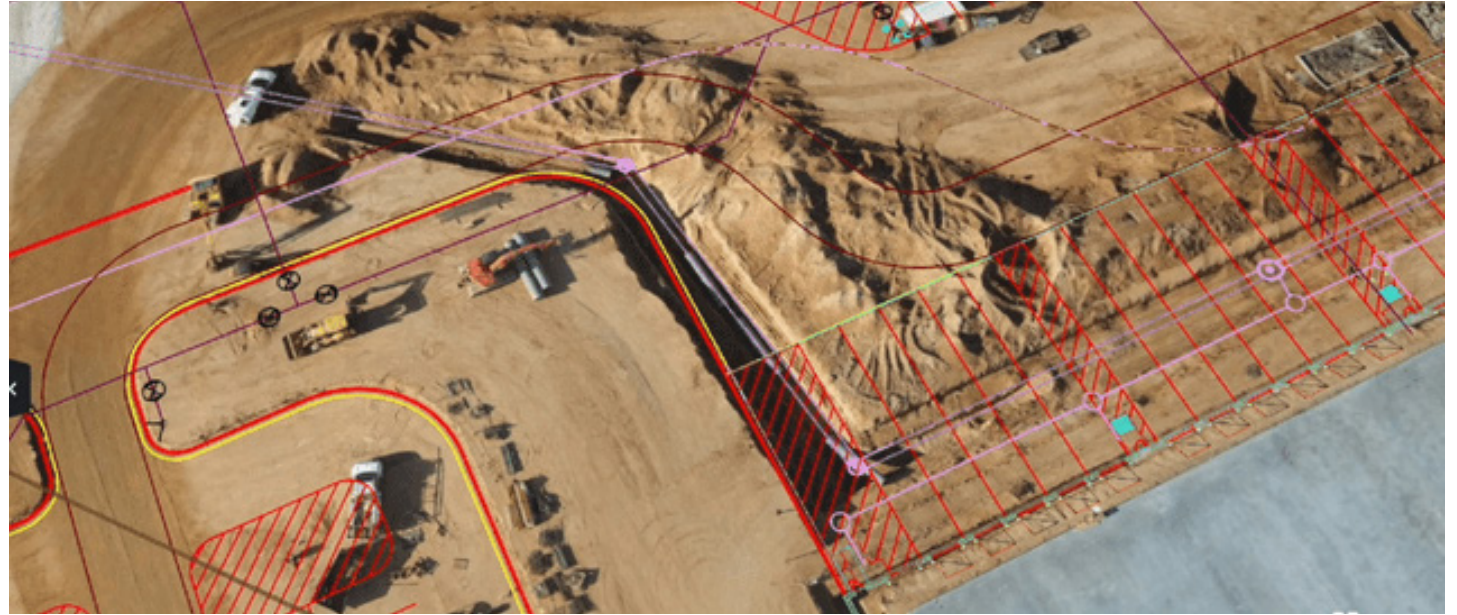
Haskell provides engineering, design, and building solutions for industrial, commercial, government, and civil infrastructure sectors. They use a variety of subcontractors to help with their projects. Managing the quality and progress of individual subcontractors' work, and verifying it meets design specification, is critical to staying on schedule and avoiding conflicts.

[The Haskell team was working on a massive construction project](#) that had them coordinating the work of dozens of subcontractors. Base-and-rover surveying wasn't feasible here due to the speed of construction. The whole site needed to be surveyed once or twice a week, every week.

But using drone-captured data and Propeller, Haskell could visualize twice-weekly surveys—and track subcontractors' progress and productivity quickly and easily.

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Haskell could view and compare 3D site imagery to design files showing various stages, including those prepared by subcontractors. By overlaying the 3D surface with the design file, they could see whether or not work was going to plan and quickly manage issues. “Propeller helped us recognize issues with the work our subcontractors were doing and correct them before they became expensive,” said Hamzah Shanbari, technology and innovation manager at Haskell.



Such information became vital when checking the work of the underground services contractor—who was running conduit below ground—in the Propeller. Comparing the design to the survey of the subcontractor’s work area, the team realized the conduits were placed at a different location and depth than modeled, which would interfere with an eight-inch pipe being installed later.

Armed with this information, the team showed how the subcontractors were off in their conduit placement, proving they needed to correct the work or update the model to reflect as-built conditions.

The subcontractor ended up modifying the model to avoid rework, but more importantly, the coordination team identified the issue before the plumbing subcontractor started laying pipe that would conflict with the conduits. The plumbing model was also

adjusted to account for the new location and depth of the conduits.

“Propeller makes it easy for us to monitor the work happening on the worksite and make sure everything is being done as designed and modeled. The level of visibility drone surveys provide allow us to identify issues quickly and before they become expensive problems. If I was to describe Propeller in one word, it’d be ‘fantastic,’” said Shanbari.





# Drone surveying makes construction site reporting easier, faster, and more understandable

Measuring and managing your construction site with drone data analytics saves on time, money, and mistakes.



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As we've seen, the Propeller Platform gives you the power to see the status of your construction site in minutes, measure volumes with a few clicks, troubleshoot frequently, and, with rock solid data and a timeline for the life of your site, resolve disputes should they arise. Never move someone else's dirt again.

With Propeller's downloadable reports you can keep your whole team on the same page and working from a single source of truth. Ensure that you're effectively reporting both within your immediate team and up and down the ladder with people back at the head office with site viewing permissions, URL links to specific measurements, and data in the form you need it, from PDFs to CSVs.

Want to learn more about how to use a drone on your construction site? Check out a demo of the Propeller Platform in action on a construction site.

**Check it out**

