



## Using the eBee drone to measure extraction volume in an open pit

When Chilean photogrammetry provider WSdata3D needed to calculate volume extraction at one of the world’s largest mines, it used the eBee mapping drone to ensure operator safety and boost operational efficiency



WSdata3D was employed to measure the volume of copper extracted during a specific one-month exploitation phase at a large copper mine in Northern Chile.

This particular open pit is one of the world’s largest, with a radius of over 3 km (1.86 miles) and a total depth of 1,000 m (3,280 ft).

“The mine’s team needed a supplier to come in and collect a large amount of accurate data in a short period of time,” says WSdata3D co-founder Eric Romersa. “They chose us because they trusted that we could deliver accurate data in an efficient manner.”

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There were two reasons why Romersa’s client was willing to try a non-lidar approach:

- Cliff top lidar locations posed a serious security risk
- The topography of the pit, at the extraction stage in question, produced a problematic blind spot



Romersa and his team use the senseFly eBee mapping drone for every job they perform in harsh mining environments. “The eBee provides the best overall performance of any UAS system we’ve tried,” he explains. “It can fly at high altitude, behaves reliably in unstable wind conditions, and it doesn’t require extra additional take-off and landing equipment. Its pre-flight software also makes it easy to create your flight plan and its photogrammetry program generates very precise 3D models.”

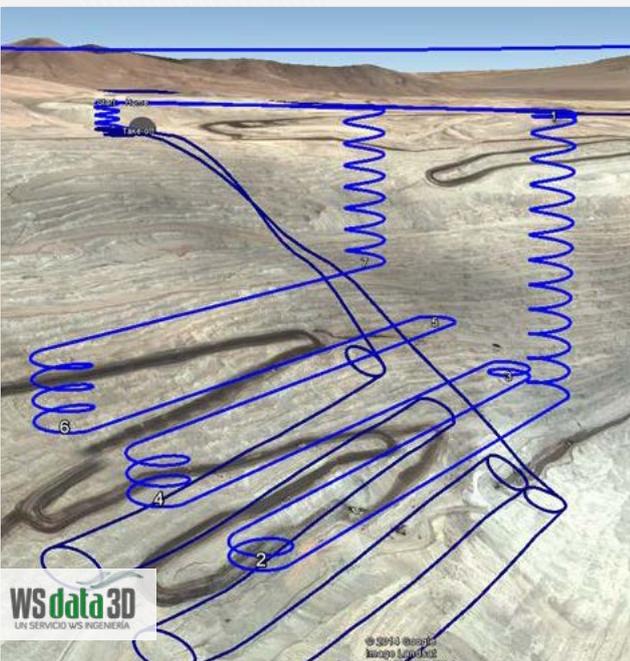
## Flight planning & GCPs

The WSdata3D team first assessed possible take-off and landing locations, choosing a high elevation take-off to reduce the eBee's initial energy consumption and maximise its flight time.

They then highlighted the area to be mapped in eBee's flight planning software (eMotion 2). This program automatically generates a full flight plan, which was then further optimised in 3D using eMotion's integrated Google Earth interface.

Ten GCPs were also set to ensure the resulting digital terrain models (DTMs) were precisely geo-positioned.

This project planning complete, WSdata3D's team flew six 30-minute drone flights over the site.



*Fine-tuning the flight plan in 3D via Google Earth*



*The huge open copper pit has a radius of 3 km (1.86 miles).*

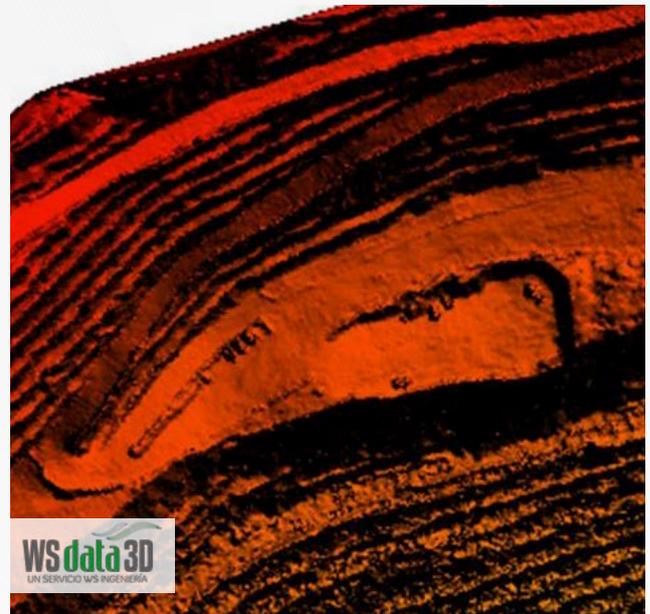
## Processing & modelling

Following each flight, the team imported the 250 images acquired into the eBee's image-processing software, Postflight Terra 3D. This program generated a high-resolution orthomosaic – an aerial snapshot of the pit – with a ground sampling distance (GSD) of 7 cm (2.7") per pixel.

Postflight Terra 3D was then used to generate a 3D DTM of the mine site. This was the model used to calculate the volume of the pit.

Since the project's aim was to measure the pit's extraction volume over one month, WSdata3D's team simply repeated this same mapping and modeling session four weeks later.

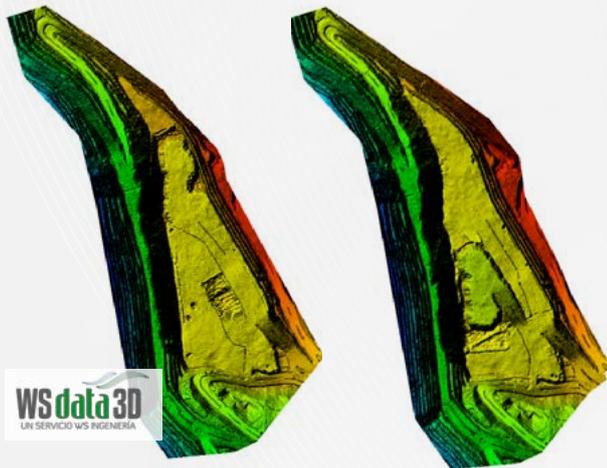
The team then used check points, measured previously via GPS, to cross-check the two models for accuracy using GlobalMapper and civil CADD software, before calculating the volume difference between the two models to determine how much copper had been extracted.



*A close-up of the extraction site (centre) that was assessed.*

## Timely, accurate results

"The client was very happy with the results obtained," Romersa says. "They liked the DSM accuracy of 7 cm that we achieved and they appreciated the aerial view of the all the pit's faces, which they could use to really monitor what was going on."



Before and after DTMs of the centre of the pit (the exact extraction location is shown in the centre).

"In terms of efficiency, our two-man team completed each of its six-flight mapping sessions in a single day, compared to seven using lidar."

The mining company now regularly employs WSdata3D to measure extraction volumes and manage additional surveying projects.

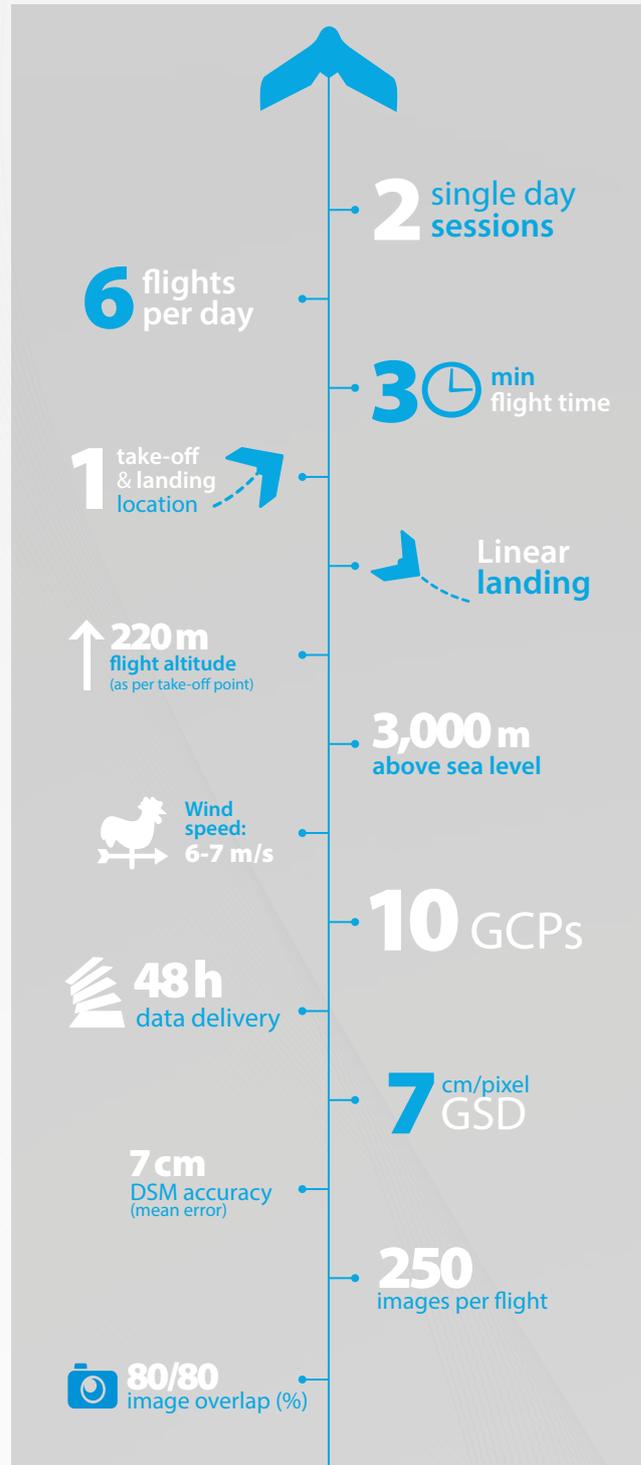
“ Our two-man team completed each of its mapping sessions in a single day, compared to seven using lidar ”

## About WSdata3D

WSdata3D ([www.wsdata3d.cl](http://www.wsdata3d.cl)) is an engineering and consulting firm based in Santiago, Chile, specialising in operational control and integrity asset management for the mining industry. The company was founded in 2013 by Eric Romersa and Marcelo Ramirez P, and currently employs a team of seven. WSdata3D and its processes are fully ISO 9001-2008 certified.

"We use the latest drone and photogrammetry technology to gather accurate data on a mine's extractive and productive processes," says Romersa. "Aerial mapping is still new in the mining industry, so it's our job to prove that this gives you similar accuracy to lidar. Only in less time, with a full aerial view and no blind spots. It's an approach our customers increasingly trust."

## PROJECT STATISTICS



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