2. Surveying and Mapping:

The surveying and mapping of mines and quarries are not only expensive and time consuming tasks but also very difficult and often dangerous. Traditionally, creating Digital Terrain Models and Base Maps has been expensive and time consuming but with our UAV mining surveys and aerial data technology, we can provide extremely fast, accurate and cost effective mapping results.

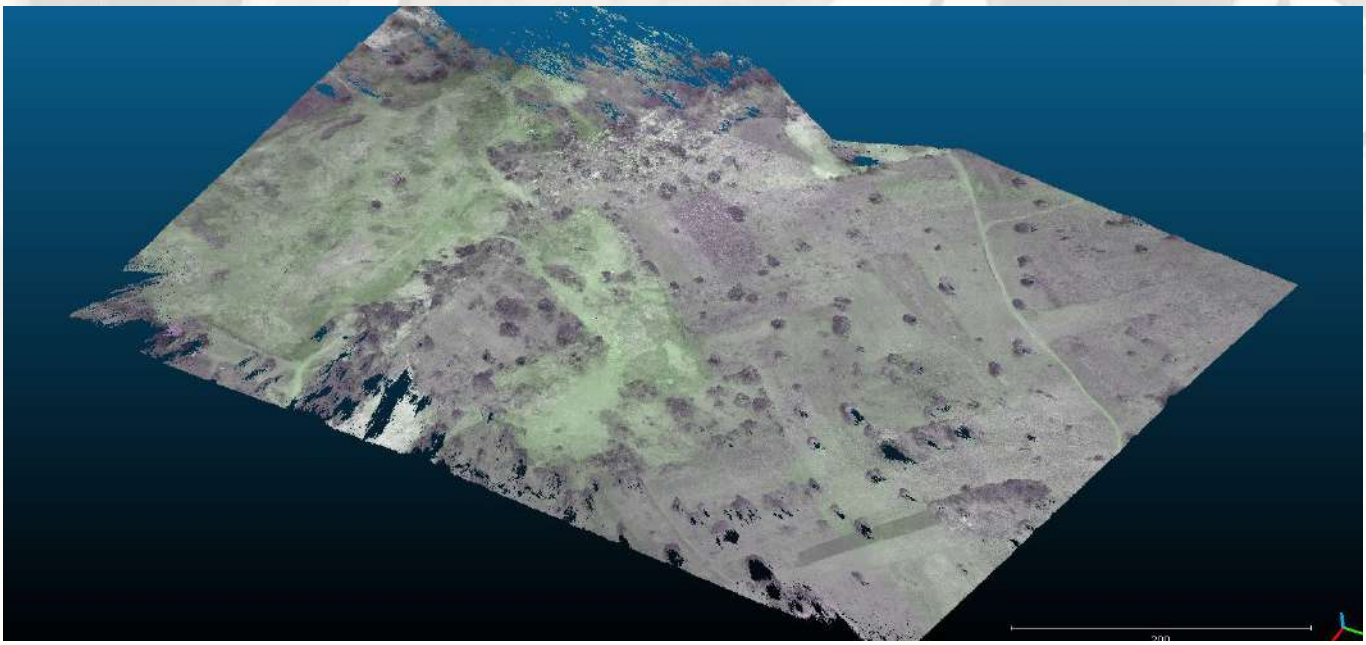
Drone technology makes it possible for SoKo Aerial to collect and analyze aerial data to produce invaluable insights for informed decision making, risk management and planning by creating high quality Digital Terrain Models (DTMs) and Digital Elevation Models (DEMs) with integrated high resolution images that give mines and quarries operators a substantial data set for calculations of heights and elevations of their open pit mines and quarries as well as heights and depths of their entire sites.

We are also able to provide mines and quarries operators with high quality terrain models that show accurate aerial data of ground surface elevations which will allow important features to be seen that are otherwise not easily visible from the ground. These features include slopes, curvature, roughness, deformations and alteration zones of these sites. This will enhance the accurate exploration planning of mining and quarrying activities whiles saving time and reducing cost.

3. 2D and 3D Modeling:

SoKo Aerial uses high end quality drone technology to produce high quality accurate 2D scaled maps for mines and quarries operators to know the exact layout of their sites. These 2D scaled maps help operators of mines and quarries to effectively navigate their sites knowing exactly where to go to for whichever activities they wish to undertake.

We are also able to create 3D conceptual models of tailing dams, haul roads, stockpiles as well as the entire mine and quarry sites from collected aerial data, showing a true vivid representation of these sites.



4. Close-up Inspections:

Inspections, whether routine or impromptu, can be a time-consuming, labor-intensive and costly process. As well as being highly dangerous, often proving ineffective, particularly for larger, more complex sites, the process requires machinery to be shut down, often resulting in significant financial implications.

However, SoKo Aerial offers a safer, cheaper and more efficient option for site inspections with the use of drones. Drone solutions provide site inspectors with powerful tools for equipments dilapidation inspections. With drones, inspectors are able to check on the state of dilapidation of site machinery such as conveyors, crushers, cranes, rockers etc. as well as checking on the integrity of mine high walls.

The use of drones and aerial data in the mining and quarry industries help eliminate the stress associated with tedious and dangerous physical inspections whiles providing simplified inspection processes and enabling work to be carried out as required.

5. High Resolution Imagery:

Aerial photography has proven to be an important tool in support of mineral exploration projects since foot traffic has long been forbidden or ill-advised in many places in a mine, such as near the crests and toes of highwalls, under operating machinery, on stockpiles and muck piles, or near blasts. Under such circumstances, obtaining measurements with a surveying rod, total station or GNSS has proven problematic.

SoKo Aerial uses UAVs to provide high-resolution aerial photography and remote sensing which allows us to capture all that information without putting someone in harm's way. We capture detailed, high-resolution aerial images and develop a range of geospatial products that meet the needs of the mining and quarrying industries. Aerial imagery provides geologists and field crews with the locations of tracks, roads, fences and inhabited areas. This is important for mapping out potential access corridors for exploration areas and considering the environmental impact of large projects.

Aerial imagery also provides mining and quarry companies with geo-referenced and real-time up-to-date images which are used create maps of their entire sites. Maps created from these images make it easy for site inspectors to maneuver around their sites knowing exactly where to go when conducting routine inspections as well as emergency inspections.

6. Blast Sites Monitoring:

In the mining and quarrying industries, blasting of rocks has become a regular routine employed for breaking massive rocks in quarries, open pits, surface and underground mining works. SoKo Aerial identified that the inclusion of UAVs in blasting processes will provide the mining and quarry industries with powerful insights.

As explosive tacticians of all types can attest, including mining engineers, some of the most important aspects of blasting come well before a single explosive is ever detonated. The immense amount of data that can be collected by a drone before the blasting process at a mine site is essential from both a safety and profitability standpoint.

In pre-blast procedures, images and videos collected by drones before blasting allow for a thorough and efficient visual assessment of the blast site. This helps ensure that all equipment and, more importantly, all personnel are at a safe distance from the site. Drones also aid with drill hole alignment by comparing a georeferenced image of drill hole positions with the positions laid out in the blast plan. The precise drilling produced thanks to the data from a drone helps to achieve the sought-after rock fragmentation size and can save on loading and crushing costs while reducing equipment wear and tear, as well as minimizing productivity losses. A Digital Elevation Model (DEM) of the blast site is also efficiently and precisely developed before blasting to determine blast performance.

During blasting, live video feeds are taken to ensure that the process goes as planned. These videos can be played back in slow motion by engineers after the blasting to assess whether the process went as planned and if otherwise, they have the essential data to know exactly what went wrong where and when, which will help them to diagnose the problem. This video also helps them capture and locate rock fragments that have travelled out of the marked safe zones of blasting sites.

In post blast analysis, another DEM, which can be created almost immediately following the blast, much faster than human surveyors could ever even access the site, is used in comparison with the DEM created during the pre-blast procedure to determine the success or failure of the blasting process. Also, drone data can be used to measure post blast rock fragmentations which is an important metric system in the optimization of a mining operation. It is suggested that real- time fragmentation measurement should be implemented to improve blast design over time with the goal of producing an optimal rock size distribution for downstream processes.

7. Haul Road Optimization:

SoKo Aerial provides aerial data that are essential in the optimization of haul roads. Haul road optimization efforts are necessary for improved operational efficiency at mine and quarry sites. Road quality, a big concern associated with haul roads, requires constant watchfulness due the daily wear and tear from heavy machinery and rough weather conditions, leaving roads prone to defects. Insufficient or inadequate vigilance over the design and maintenance of haul roads may have detrimental consequences, negatively impacting productivity, costs and safety.

Critical decisions, which influence operational processes, are traditionally achieved by relying heavily on inefficient and outdated ground-based data collection methods. SoKo Aerial uses drones to assist in haul road design through high quality imagery and videos to be processed into digital 3D models, which assist and guide mining professionals with the planning and construction of roads. Drones can also assist with slope inspection by calculating vertical and horizontal slopes of haul roads, thus preventing temporary stoppage of haulage trucks leading to enhanced productivity.

Additionally, using drones to conduct haul road inspections serve as a safer alternative to physical inspection of dangerous and damaged areas, reducing risks of accidents and injury to personnel as well as daily routine inspections. Drone data can then be analyzed, shared and logged onto our digital web platform for real-time and future reference by mining and quarry professionals. Mining professionals can rely on drone data, to monitor road width at multiple locations, by digitally measuring the ground distance between opposite road edges.

8. Tailings Dams Management:

Tailings dams represent the most significant environmental liability associated with a mine. Monitoring of tailings dams' structural stability is however very critical to establish a safe and stable dam.

SoKo Aerial has identified that UAVs are a valuable worksite tool for engineers responsible for building and monitoring the complex structural integrity of tailings dams. The use of drones for inspections on tailings dams enables routine data collection to assist in evaluations, which can assist in early detection and prevention. By leveraging aerial data collected by a drone, engineers can actively monitor the strength of dams by combining historical and real-time data, hence greatly improving engineering, management and safety control of tailings dams.

Drones enable data collection to assist in identifying surface cracking and locating erosion and delivers data to engineers, surveying and maintenance teams for informed decision making and actions. This process will improve the dams' planning and maintenance.

Aerial data however provides mining professionals with access to frequent, high-quality data of site tailings dams' boundaries to inspect unsafe, hard-to-reach areas without exposing personnel to hazards whiles ensuring operational efficiency.

9. Digital Web Platform:

SoKo Aerial provides its clients with a digital web platform where final processed and analyzed data is made available for easy viewing without them having to physically visit their mining and quarry sites. Our digital web platform has a user-friendly centralized interface with interactive tools which makes it easy for our clients to check their sites without any stress. The final data is uploaded directly to the clients' accounts where they, upon login with their credentials, would be able to view and download the final orthophotos and videos from their sites in the format(s) (i.e. either in jpg, kml or png formats) of their choice. This digital web platform helps SoKo Aerial to provide the clients with a means through which they can remotely track activities as well as check the progress of ongoing projects on their sites from wherever they are without having to travel distances to conduct these checks physically.

SoKo Aerial's web platform gives clients to opportunity to remotely track the progress of routine inspections online without having to physically visit the sites. Our digital web platform has a user-friendly centralized interface with interactive tools which makes it easy for our clients to check their land sites without any stress. because sites can be evaluated faster and work can be started on time.

Benefits

Our aerial data solutions application for mines and quarries is designed to increase efficiency in data collection while minimizing the risks and costly expenses of traditional inspections and monitoring. Benefits our clients stand to gain from using SoKo Aerial's aerial data solutions include:

- Improved safety on sites

Safety is paramount in any mining and quarry site and traditional inspection efforts have often put human lives at risk. With their ability to generate an accurate view of an area from all angles, UAVs effectively take this risk out of the equation. Drones can be deployed to quickly assess a mine and identify any existing or potential hazards, such as areas that could cave in. The use of UAVs will eliminate the need to have people walking around within the site on foot, having to get close enough to a particular area to conduct inspections.

With the use of drones, which can access these hard to reach, and often dangerous areas, mining and quarry companies are able to achieve increased accuracy in their inspections with much less chance of injury. As UAVs, by definition, are unmanned by a human pilot, it also eliminates the need for personnel to be operating aircraft and putting their safety at risk.

- Boost in productivity

In addition to saving lives, UAVs can also save substantial time for mining and quarry firms whiles boosting their operational efficiency. UAVs have the ability to scan an area and produce a 3D map much more quickly than traditional mapping methods, at a fraction of the cost. With a limited number of staff required to operate and oversee these UAVs, human resources can be directed to more pressing needs of the sites.

Dealing with downtime when surveying and assessing mining sites has also been a costly problem, but drones' ability to efficiently inspect a site's infrastructure, without having to shut down the plant, means vital hours can be saved.

- Cost effectiveness

SoKo Aerial presents a cost effective means by which mines and quarries can perform data collection activities through the use of drones. Drones provide a more cost effective method of data collection in mining and quarry industries than traditional approaches because they are cheaper to operate than manned aircrafts, which come with a number of running and maintenance costs. The use of drones in data collection on mining and quarry sites saves the company lots of money.

- High quality data

SoKo Aerial uses drone technology and aerial data to provide mining and quarry companies with high quality data sets which will help speed up decision making processes. Data can be collected, analyzed and shared in real-time. This means that there is no delay in results and that those workers who would have been in the field can spend their time interpreting the data and preparing reports instead. For the mining and quarry industries, this is very important because sites can be evaluated faster and work can be started on time.

- Digital web platform

SoKo Aerial provides a web platform where clients' final analyzed data, after collection and processing, is uploaded for online viewings and download. This final data is uploaded directly to the clients' account where they, upon login with their credentials, will be able to view and download the data in various formats. The final data include orthophotos, real time 2D and 3D maps, DEMs and videos of the sites.