Accurate Digital Terrain Model derived from aerial LiDAR surveys provides multiple benefits to mining operations life-cycle from exploration through production to decommission.

**AERIAL LIDAR**

**finds gold mineralization, improves mining efficiency, safety and reduces costs**

TriMetals Mining Inc. discovered new areas of outcropping gold mineralization with aerial LiDAR in an area straddling the northern border of Nevada and Utah providing striking results for the gold and silver mining company.

The recently acquired LiDAR data at TriMetals Mining’s Gold Springs property has produced a high resolution, high accuracy “bare earth” digital terrain model by removing all ground based vegetation as part of the post processing deliverables. This has not only allowed for detailed structural interpretations and clear outlines of vein traces, but for the identification of all historic shafts, adits and even small isolated pits. Field investigations aided by the LiDAR survey have identified several new target areas.

Ralph Fitch, President and CEO of TriMetals Mining Inc. stated, “We are making new discoveries with the help of the recently completed LiDAR survey, which can see through the trees to show geology and very small old prospect pits and outcrops which our team has been following up with on-the-ground visits.”

“The LiDAR in conjunction with our ZTEM geophysical survey which shows rocks that are associated with the gold mineralization and our growing database of geochemistry and geology have proven to be powerful tools for identifying and targeting new areas with high exploration potential. These additional target areas present excellent opportunities for new gold-silver discoveries in this emerging gold district,” he said. Field investigations of other areas of historic workings shown on the “bare earth” LiDAR image have found
significant zones of veining, brecciation and stockwork development.

TriMetals Mining Inc contracted LiDAR Services, LLC, Las Vegas, Nevada, the wholly owned US subsidiary of LiDAR Services International, Calgary, Alberta, for the aerial LiDAR survey. Dan Phillips, Chief Business Officer with LiDAR Services, said “We are extremely pleased to work with TriMetals Mining on this project.”

“LiDAR can be an invaluable tool for mining operations. The utilization of a comprehensive, detailed, accurate survey using airborne LiDAR and orthophotos provides an accurate, detailed base-map from which all preconstruction design and engineering can be done, not to mention its value as an exploration tool.”

“A LiDAR/orthophoto survey can eliminate redundant, expensive surveys, improve safety by sending fewer crews onsite to survey treacherous and inaccessible terrain, and improve decision making by utilizing the best, most accurate data for the project area,” added Phillips.

Mining projects have taken LiDAR Services (LSI) to three continents and a wide range of environments, from the boreal forest and plains of Canada to the jungles of Borneo and Madagascar. LSI designs and manufactures their own proprietary LiDAR systems and has produced 6 generations of airborne sensors over the past 25 years. During the evolution of LiDAR systems, LSI has developed a modular approach in both the software and hardware sensor integration.
which easily facilitates the customization of the system into an integrated set of sensors applicable to their clients’ project requirements and budgets.

Traditionally, LSI’s mining surveys have involved typical DTM and volumetric mapping, but recently they have performed time-sequenced topographic modeling to facilitate subsidence monitoring, and precision slope determination for ore slurry pipeline engineering.

**LiDAR Benefits Madagascar Nickel Mine**

The Ambatovy Nickel mine in eastern Madagascar for Dynatec Corporation was a particularly challenging mining project. LSI was contracted by Dynatec Corporation to provide surveying and mapping services to support the route planning and development of a nickel mine in Madagascar. Because much of the project area was located in remote mountainous jungle, the project required the establishment of a GPS control network in order to provide an accurate DEM and 15cm orthophotography for the entire project area.

The rugged terrain, dense vegetation, and weather patterns presented a unique challenge to the LSI survey team. The MATRIX LiDAR system installed in a local helicopter was able to fly below the clouds and collect data when other high altitude fixed wing LiDAR systems would have been waiting for better weather.

LSI delivered a bare earth and full feature DEM, high resolution orthophotography, and contours for the proposed mine site, ore processing plant site, and connecting slurry pipeline route. The area covers approximately 300km² and hundreds of kilometers of pipeline route over difficult terrain varying from mountainous jungle to coastal flood-plain.

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The pipeline route surveying was of key concern as the undulating, densely-forested, upland terrain made traditional surveying techniques nearly impossible from an access and accuracy perspective. The critical nature of this was the pipeline slope gradient.

The slurry mass and velocity characteristics were such that a precise slope gradient needed to be designed and constructed such that the slurry mass and velocity would be predictable and controllable with minimal risk and facility cost. If the survey terrain accuracy was not at the level expected by the pipeline design engineers, then several undesirable situations could arise, such as; runaway slurry masses stressing pipeline integrity, additional lift or pump station facilities may be needed along route in difficult access areas or potential slurry solidification in the pipe resulting in complete facility remediation.

**Conclusion**

The utilization of a comprehensive, detailed, accurate survey using airborne LiDAR and ortho photos provides an accurate, detailed base-map from which all preconstruction design and engineering can be done in the office by computer using CAD and GIS software. As part of a Lifecycle Survey it eliminates redundant, expensive surveys, improves safety by sending fewer crews onsite to survey treacherous and inaccessible terrain, and improve decision making by utilizing the best, most accurate data for the project area.

Roland Mangold is managing editor of LiDAR Magazine and UAV Business and Technology Report. He has more than twenty years experience as a geospatial journalist.