



The data capture of the Orongo ceremonial village was done using short and long range 3D scanner laser technologies.

## Eastern Island Archaeological Site Preserved by Using Laser Scanning Technology

**Commissioned by Conaf IPA, ReStudio –a TI company- and with the advice of GEOCOM, the latest technology made available for the conservation of an archaeological site listed among the one hundred most vulnerable heritage sites of the world.**

From the one hundred worldwide sites with risk of disappearing recognized by the World Monuments Fund, one is found in the Rapa Nui National Park, Easter Island, Chile. This site is the ceremonial village of Orongo, located at the top of Rano Kau volcano, at the edge of a cliff, 300 meters above sea level.

Due to weather conditions and huge numbers of tourists, the site is deteriorating gradually in addition to risk of falling into the sea. For this reason, CONAF - IPA (National Forestry Corporation - Easter Island) has decided to document digitally the

archaeological and geological structures, as well as the rock art featuring petroglyphs that are unique from anything else in the world.

This project was executed by ReStudio – a TI company specialized in dimensional information analysis of the culture heritage - together with the advice of GEOCOM. Data capture was done by 3D Laser Scanner technology, providing long and short range laser scanning. “The same technology that we have applied in supporting design projects and mining plant maintenance”, says Nicolás Argandoña, manager in Engineering Projects at ReStudio. This technology allows acquisition of the geometry at a millimeter level, and the true color of the current conservation status for the archaeological features (the structure concept refers only to houses, caves or village rooms from the ceremonial place, excluding blocks with rock art and other features of the site).

“All this spatial data is referred to a coordinate frame for its correct analysis and future comparison”, says the GEOCOM Development Manager, David Santos. For the first time it is being generated on an archaeological base with high precision instruments. “This project allows monitoring of the village behavior during the next decades. As such, CONAF-IPA could request reports in medium and long term, of the deterioration speed of its cultural assets”, explains José Tomás Olivares, CEO of ReStudio.

“The capture of the spatial information was done in a specific date, looking to serve in future surveys, with the objective of making comparisons and evaluations of future movements or displacements of the related Orongo places, caused by erosion or any other weather effects” specify Santos.

### **Mining Technology**

Laser scanning technologies are in use in most of the mining sites, with the objective of getting a representation of the production zones in open pit and labors with speed, safety and high precision for later analysis.

According with GEOCOM's explanation, in the case of production zones of an open pit, the laser scanner is located in different strategic positions selected by the user. The spatial 3D data information is acquired through high speed measurements performed by the scanner, allowing the capture of millions of points in a short time. On each position simultaneously the instrument's position is recorded through GNSS technology. This procedure is done in all of the positions where the scanner is installed. Later, in the office, the laser scanner information is processed, getting the representation of the open pit mine surface. This information is useful as a base for various analysis developed by the engineers, such as volume calculation of extracted materials, monitoring of critical zones and evaluation of mining reconciliation. These technologies traded by GEOCOM are used in CODELCO, on its divisions Ministro Hales, Chuquicamata and Radomiro Tomic, also in Escondida, Spence, Sierra Gorda and Los Bronces.

## High precision and long range instruments

In the case of Orongo ceremonial village, ReStudio used different kind of technologies:

- **High precision laser scanner** (precision about 2 mm and measurements up to 150 m). The main objective is to cover with high precision and detail de Orongo village.
- **RIEGL Laser Scanner, model VZ-400** (precision of 3 mm and measurements up to 600 m). High precision and long range equipment used to cover the entire Orongo´s village and generate a base that will be related with the Rano Kau crater, located aside the village.
- **RIEGL Laser Scanner, model VZ-4000** (precision of 10 mm and measurements up to 4000 m). Very high precision and long range equipment used to perform the measurements of crater Rano Kau (approximate diameter of 1500 m), and mainly the sector where landslides are occurring under Orongo´s village. These measurements were done from an islet called Motu Nui in the sea at about 1500 m from the main island.
- **GNSS Trimble global positioning technology**, model R10. It was used to realize the coordinate framework for each position where the laser scanner was located.



The technology applied allows to capture at a millimeter level of both the geometry and color of the current state of conservation of the structures.