

Ecuador



Name: ITA-Aites Capitulo Ecuador

Type of structure: Open association

Number of members: 25 members

ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

In 2017 the Ecuadorian Tunnelling Association continued working to show society the benefits of the underground environment, both through the implementation of technical events, and the dissemination of materials via technical media.

Several activities, like Presentations at engineering events, Technical Visits to the Projects under execution, were developed through 2017.



CURRENT TUNNELLING ACTIVITIES

In the last year tunnelling activities in Ecuador mainly concern the following projects, all under construction:

- Hydroelectric Projects
- Metro Line
- Mines
- Improvement of Water Supply and Sewage systems

Hydro Power Projects:

Several hydro plants are under execution in Ecuador, most of them including complex underground structures, such as headrace tunnels, caverns for powerhouse, tailrace and access tunnels. The most relevant are:

The Minas San Francisco HPP, 275MW, which has been recently finalized: a 14km headrace tunnel was completed in 2017 by mechanized excavation (DS-TBM, about 10km) and D&B methods (4km), internal diameter of 4.9m lined with honeycomb segments.

The Delsitanisagua HPP, 180MW, is under execution (95% advance): all the underground structures have been successfully completed last year - an 8km long headrace tunnel of 4.1m internal diameter - a pressurized vertical shaft and horizontal tunnel, steel lined, excavated by conventional methods.

Some private HP Projects are also under execution, like Rio Verde Chico (10MW), Sigchos (18.5MW) and Due (49.7MW), with the construction of underground facilities, such as free-flow headrace tunnels.

Metro Line

Quito Metro Line 1 is under execution; A 20km long, single tube, 8.43m internal diameter running tunnel with 15 underground stations. 3 EPB-TBMs are working at the moment: "La Carolina", "La Guaragua" y "Luz de America". The total estimated progress of the Project is: 53% (February 2018). Excavation of the mechanized tunnels begun in February 2017, and in the last year about 9km was bored, with peaks of advance rate higher than 1,000m per month. The civil works of 10 underground stations were completed, most of them by the Cut & Cover Method. The Project presents some sensitive points, such as the construction of the underground station in the San Francisco square, of UNESCO heritage, using conventional method.



Mines

"Fruta del Norte" is a gold exploitation Project in the Zamora-Chinchipe province, South of Ecuador, the concessionary is Lundingold. Last year the main access tunnels to the underground complex were completed. The tunnels are 3km long, horseshoe shaped with an internal diameter of 4.5m, excavated by conventional method.

Improvement of Water Supply and Sewage networks

Important cities like Quito, need to improve their existing water supply system: due to the typical morphology of the city, this has led to the adoption of tunnelling and microtunnelling technology.

About 3km of tunnels have been executed over the last few years for water or sewage pipe installation, mainly by conventional methods, with small diameters between 2.2 and 2.4m, depending on the pipe diameter to be installed.

FUTURE TUNNELLING ACTIVITIES

Future activities in the underground will continue in the same areas, hydro projects (new projects and projects to be completed), refurbishment of existing hydro tunnels, water supply and drainage-sewage

systems and mining facilities.

Concerning hydro power projects, the Ecuadorian government is analysing the possibility of building 2 new mega projects, Santiago and Cardenillo. Both of them feature underground structures.

On-going hydro projects such as Quijos (1.5km of tunnel driven in very difficult geotechnical conditions, such as old-river deposits) currently on stand-by, and Mazar-Dudas (0.5km long headrace tunnel) should be finalized during 2018.

Quito Metro Line 1 is expected to be completed in the first quarter of 2019.

Mining activities will continue to grow over the coming months; several priority projects have been identified and are under investigation.

Regarding water supply and sewerage, several projects will be assigned this year:

- The Vindobona Water-Treatment System, owner EPMAP (Water Public company of Quito), with more than US\$200M of investment, is a challenging project which includes the execution of 30km of tunnels, mechanized excavation by EPB-TBMs, 3.7m internal diameter.
- A water transmission pipeline, Paluguillo-Bellavista, owner EPMAP (Water Public company of Quito), with more than US\$130M of investment, and 40km of extension; this project is vital for the future water supply of Quito. The final layout includes several underground facilities, for a total of about 2.5km of horizontal and inclined tunnels, including cross-passages below existing roads. Tunnels have been designed to be excavated by conventional methods.

STATISTICS

1. Length or volume excavated - % mechanized/% conventional during 2017: About 25km of tunnelling, 45% mechanized - 55% conventional
2. Amount (USD or EUR) of tunnelling/ underground space facilities awarded in 2017: About US\$50.000.0000.
3. List of tunnels completed:
 - Minas San Francisco HPP, Headrace tunnel 14km.
 - Delsitanisagua HPP, Headrace tunnel, 8km.
 - Access tunnels to Fruta del Norte mine, 2x3km.
4. List of tunnels under construction:
 - Quito Metro Line 1, about 10km of tunnel by EPB-TBMs.
 - Improvement of the sewage network of Quito, various projects.
 - Rio Verde Chico and Sigchos HPP headrace tunnels.