

Japan

Tokyo to Expand as Deep Subterranean City

With 27 million residents, Tokyo is both the world's most populous metropolis and, in many places, one of its most densely packed. That leaves little room for further expansion. The average commute time is already 56 minutes, with some commuters travelling like sardines on local trains for as long as two hours. Japanese engineers have been studying the possibilities of deep underground space for nearly 20 years.

During the 1980s, firms began drafting schemes to create underground cityscapes replete with office buildings, sports clubs, roadways and rail links, even gardens. Most of those plans were stalled by the economic doldrums of the 1990s. Yet neither recession nor slumping land prices has entirely squashed the idea. In 2001, a new legislation has legalised deep underground development beneath the country's major cities. The zone, more than 37 m below ground or 9 m beneath existing buildings, is now open to public works projects free of charge and without prior permission from landowners on the surface.

The focus today is on burying infrastructure in order to free up space on the surface. Tokyo's topography will remain one of clustered towers. But many surface roads will turn to green belts, railway lines will disappear into tunnels and major urban systems, everything from dumps to gas storage tanks, will move deep underground. All this by the middle of this century.

Economics will dictate the form Tokyo's deep underground takes. Japan's maglev, a proposed 480 km/hour bullet train linking Tokyo, Nagoya and Osaka, is a test case. This is the biggest project that could involve the new law. There is nowhere else for it to go but deep underground.

Another project is a proposed underground system that, instead of street-level garbage collection, carries rubbish to the edge of the city to be burned in power plants and produce energy. The scheme might also clear the city of diesel-polluting garbage trucks.

Tokyo is already pioneering deep underground construction. In 2000, the city christened a new metro line that runs 46 m below the surface at its lowest point. But riders soon discovered a predictable problem. Those exiting from downtown stations spent nearly three minutes on escalators moving from the platforms to the street, an eternity for commuters obsessed with shaving seconds off their trip to and from work. To remedy the problem, Mitsubishi Electric has a two-speed escalator in development that could shorten the trip by a minute.

World Digest of Tunnels under Planning

Spain. Palencia is a city which, like many other Spanish cities, grew and developed alongside the railway. However, the railway is now a barrier which hampers movements and communication. This is why the city, like many others in Spain, plans to put underground the line. The Ministry of public works proposed a 960 m tunnel but the city council negotiated and got it to be 500 m longer. The 1,460 m length is the maximum that the city can finance. However, many Palencians think this is still too short. So, the city requested wider financial contribution from the ministry. The ministry refused and another solution emerged, calling for a railway bypass and a new railway station out of the city in Magaz de Pisuega, for high speed and conventional trains.

Spain. The design of the south sewer in Ronda (Andalusia) has been completed. The project plans a 2 km tunnel to

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E-News Weekly 46/2003
No. 98 – 6th November 2003

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Published on Thursdays. 48 issues per year.

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replace an existing sewer on the Tagus riverbed. The tunnel will link the existing sewage treatment plant in Padre Jesus with La Indiana, where the new plant is under construction. The tunnel will cross the Tagus ledge. At the beginning of the year, AEPO carried out core drills on behalf of the Confederación Hidrográfica del Sur (CHS) to determine the best alignment in the city. Tenders are to be invited soon, for a budget of €4.8 million. Read E-News Weekly 6/2003. Visit www.chse.es

Switzerland. The Rapperswil/Jona tunnel has been in discussion for many years to connect those two municipalities of the St. Gallen canton. Exhaust gases, noise, creeping traffic have been worsening to such an extent that the situation has become critical. The lake road is the most congested road in the St. Gallen canton. A daily average of 23,000 vehicles cross the centre of Rapperswil. The tunnel would go from the lake to Hüllistein. The first stage is from the lake to Teuchelweiher and the second stage from Teuchelweiher to Hüllistein. A full tunnel route is considered as the best variant instead of an aboveground option for Teuchelweiher-Hüllistein. The overall project should be approved by the end of the year.

The tunnel is 4 km in length and is estimated to cost CHF500-600 million. Construction would take seven years starting in 2008. Consulting engineers are Ernst Basler + Partner. Visit www.dertunnel.ch and www.ebp.ch

World Digest of Bids

France. Open call for bids, deadline 5th January, 2004 for supply and installation of electro and mechanical equipment (ventilation, low and high power supply, lighting, telemonitoring, radiotransmission, etc.) in the 840 m Saint-Charles tunnel in Marseille. Visit <http://ted.publications.eu.int/udl?request=Seek-Deliver&language=en&docid=192628-2003>, OJ S 214, or contact Communauté urbaine Marseille Provence Métropole, Marseille, tel. +33 491999900.

South Africa. Objections to the route of the proposed Gautrain rapid rail link, or Shilowa Express, in Pretoria received a boost on 3rd November when the Tshwane metro council passed a proposal recommending that the route be by tunnel from Pretoria station to Hatfield station. The Muckleneuk and Lukasrand Property Owners and Residents Association has been the only opponent of the proposed route and the council's proposal adds impetus to the association's cause. The council decided that the tunnel option, with increased pedestrian accessibility in the central business district, was preferred. The construction of the rail link between Johannesburg and Pretoria and between Johannesburg International Airport and Sandton was given the go-ahead when Gauteng's environment and land affairs department gave a conditional go-ahead for the project at the end of September.

From Park Station (Johannesburg), it will mainly be in tunnels for the 6 km to Rosebank, then 5 km underground to Sandton. It will surface 4 km beyond Sandton on its way to Marlboro where a branch will go off to the airport.

The two prequalified contractors bidding to build the Gautrain high speed rail link submitted their proposals to the Department of Transport and Public Works. The consortiums, Bombela and Gauliwe, will be informed of the outcome in January 2004. Bombela includes Bombardier Transportation, Bouygues TP, three South African civil engineering construction companies (Basil Read, Concor Holdings and Murray & Roberts) and RATP International. Gauliwe gathers Alstom, Dragados, Grinaker-LTA, one of the largest civil construction companies in South Africa, and Siemens. Read E-News Weekly 18/2003. Visit www.gautrain.co.za and www.tunnelbuilder.com, za/11.

World Digest of Contract Awards

Portugal. A JV of Teixeira Duarte, Empresa Portuguesa de Obras Subterrâneas (EPOS) and Avelino Farinha & Agrela (AFA) has won a €1.45 million contract to build two rescue tunnels (70 m and 120 m)

on the Vila da Ponta do Sol bypass. Read E-News Weekly 21/2003. Visit www.tunnelbuilder.com, pt/11.

Spain. The 4 km Vallès metro line extension in Terrassa, west of Barcelona will be built by Agrupación Guinovart Obras y Servicios Hispania and Copisa for €51.6 million. The work supervision contract has been secured by Cicsa and Norcontrol for €1.3 million. Read E-News Weekly 44/2003. Visit www.copisa.es, www.cicsa.es and www.tunnelbuilder.com, es/29.

Spain. Faiveley Española and Copisa have secured a €89.5 million contract to design and install the platform edge door system for metro line 9 in Barcelona. Read E-News Weekly 20/2003. Visit www.copisa.es

Spain. The Ministry of public works awarded a €19.3 million to Tecsa and Dragados for the modernisation of the 10.6 km Benalmádena-Fuengirola section on the Malaga-Fuengirola railway. The works will consist in dualling the line on a 4.7 km section, increasing its capacity and improving access to the Malaga airport. A 150 m tunnel will be built. The works will last 25 months. Visit www.tecsa.es and www.dragados.es

World Digest of Ongoing Tunnelling

Spain. Construction of the controversial 4 km Bracons tunnel on road C-37 in Catalonia, between Vic and Olot, is starting. The contractors, FCC and Agrupación Guinovart, Obras y Servicios Hispania have already built the portals and 24 m of tunnel on the Sant Andreu de la Bola side. Opposition to the project is less strong than on the other side in Vall d'en Bas. Generalitat de Catalunya will invest €156 million in the 20 km road project. Visit www.tunnelbuilder.com, es/90.

Spain. The Gibralmora tunnel on section 17 of the Corboba-Malaga high speed rail link broke through on 4th November. The tunnel is 3.2 km in length and 12.5 m in width. The contractors, Obras Subterráneas and Salvador Rus López Construcciones, used the drill/blast method with Goma-2 explosives supplied by UEE (Unión Española de Explosivos) to dig through gneiss. The builders used 360 tons of these explosives. This is the fourth tunnel breakthrough on the line, after the 961 m Tevilla tunnel (read E-News Weekly 22/2003), the 1.8 km Gobantes tunnel and the 2.5 km Cártama tunnel. All these tunnels have been blasted. The 7 km Abdalajís tunnels, the longest on the line, are driven using two MHI-Robbins TBMs. A first section (100 km) of the line, from Cordoba to Bobadilla, will open in 2005. The full line will be opened in 2007. Visit www.obrassubterraneas.es and www.tunnelbuilder.com, es/41.



Picture 1: Breakthrough of the Gibralmora tunnel.



Switzerland. The new garbage incineration plant in Lausanne is a sustainable development project developed by Tridel (TRaitement et Incinération des Déchets Lausannois). The purpose is to build a single-track rail line to transport from 2006 rubbish by train instead of by road, thus taking 6,000 trucks off the roads every year. The line will connect the Sébeillon garbage collection station and two other stations, possibly in Aclens and Chavornay, to La Sallaz. The S-shaped route climbs the upper part of the city with a gradient which does not exceed 5%. Its depth will range from 20 to 40 m. The line will be operated by CFF, the Swiss railways. Some 3,000 rail cars carrying 90,000 tons of garbage will use the line.

Picture 2: Sébeillon start box for the tunnel drive towards the Tridel plant in La Sallaz.

The line includes a 3.8 km 44 m² tunnel awarded to a JV of

Frutiger, Atra and Wayss & Freytag. The contractors will use roadheaders on three drives, whereof one uphill towards the plant and one downhill towards Sébeillon, both starting from the La Borde shaft located at about two thirds along the route. The first drive starts at the Sébeillon start box. The geology is molasse and swelling marls (15%).

Not only the tunnel will accommodate a railtrack but also utilities (drinkable water, heating to 120 households, waste water and medium voltage cable). In the future, it is also planned to adapt the tunnel for passenger trains to serve the Blécherette plateau and Chailly. The new infrastructure will cost CHF75 million, whereof CHF42 million for the tunnel. The federal office for transport will finance 44% of it (CHF33 million). Visit www.tridel.ch

United States. The City of Atlanta is making progress toward fixing its aging sewage system, called the Clean Water Atlanta initiative. One key structure included in the programme is the Nancy Creek sewer tunnel. The tunnel, which will cost around \$131 million, will be 13.7 km-long when completed. Construction has so far been completed on 4 km. The contractor is a JV between Obayashi and CJB Contracting.

The first of two Robbins TBMs to be used on the project commenced its job in July. It is a refurbished 5.6 m-diameter TBM which previously bored the 16.3 km-long Chattahoochee tunnel. The second refurbished Robbins TBM started a few weeks later. The geology is composed of hard metamorphic gneiss, schist and quartzite, with some granite. The tunnel is being constructed in two separate drives. The first drive is between Clayton shaft and the Roswell Road shaft and is 7,985 m in length. As at 1st November, 2003 progress reached 1,773 m. At the second drive (5,023 m), occurring at approximately the same time as the first drive, 669 m had been mined at the same date. Breakthrough is expected in August 2004 for both drives. Tunnellers are working 24 hours/day, 7 days/week.

The Nancy Creek drainage basin includes the northern part of the City of Atlanta, parts of northeast Fulton County and a portion of DeKalb County. The tunnel will be connected to another tunnel in south Atlanta. Work on that tunnel is scheduled to begin next year. Nancy Creek has been paid for, but the south Atlanta tunnel is not. The city called federal, state and county authorities to help the city fund the tunnel. Read E-News Weekly 42/2002. Visit www.cleanwateratlanta.org/NancyCreek, www.robbinstbm.com and www.tunnelbuilder.com, us/60.

World Digest of Inaugurations

Austria. The second (and west) tube of the Gräbern tunnel (2,148 m) was officially opened on 30th October. The west tube is connected to the east tube by three cross galleries. One of them, just in the middle of the length, may be used to detour traffic from one tube to the other while the others, each situated at every quarter of the total length, may be used in case of emergency by small vehicles (ambulances, police) and pedestrians. Renovation of the 20-year-old east tube will now commence. Both tubes will be operational in June 2004. The project will cost €45.7 million altogether, whereof €34.5 million for construction of the west tube and €6.5 million for renovation of the east bore, fully financed by Asfinag. Read E-News Weekly 43/2003. Visit www.asfinag.at

United States. The MetroWest water supply tunnel went officially into service on 3rd November. It spans 28.3 km and serves 2.2 million people. The \$665 million tunnel, which came in \$63 million under budget and on time, essentially replaces the leaky Hultman Aqueduct. The aqueduct has been metropolitan Boston's water lifeline, connecting the region to its water sources in Western and Central Massachusetts, the Quabbin and Wachusett reservoirs. The 4.3 m-diameter tunnel, carved 61 to 150 m below the surface, is the first of three massive water improvements in the Massachusetts Water Resources Authority's \$1.7 billion upgrade, with a new water treatment plant and large covered storage tanks scheduled to be completed next year. The MWRA broke ground on the tunnel in late 1996. Since then, digging at a rate of 17.4 m per day, workers have excavated more than 764,600 m³ of rock. Hole through took place in October 2000. Read E-News Weekly 45/2002. Visit www.mwra.state.ma.us/04water/html/metrow.htm and www.tunnelbuilder.com, us/15.