

安房トンネルは、中部縦貫自動車道の一部である長野県と岐阜県を東西に結ぶ安房峠道路に位置する延長4,370mの山岳トンネルである。乗鞍火山帯に属する火山が連なる条件下にあり、建設段階では高い地熱や大量湧水など、幾多の困難を克服し1997年12月に供用された。現在、供用開始後26年を経過し、劣化に伴う変状の顕在化により対策を実施してきている。将来的に適切な維持管理計画の策定を目的として、有識者による検討会を組織し検討した。本稿は、これまでの補修・補強の実態と施工記録を分析して作成した「安房トンネル維持管理マニュアル」について報告するものである。

### Maintenance Manual for the Abo Tunnel, in Service for 26 Years

By Takeharu Tajiri, Central Nippon Expressway Company Limited

The Abo Tunnel is a 4,370-m-long mountain tunnel located on the Abo Toge Road, a part of the Chubu Jukan Expressway, connecting Nagano Prefecture and Gifu Prefecture from east to west. The tunnel is located in a chain of volcanoes belonging to the Norikura volcanic belt. The tunnel was put into service in December 1997 after overcoming many difficulties during the construction phase, including high geothermal heat and large water inflow. Now, 26 years after the operation, measures have been implemented as deterioration has become evident. A study group of experts was organized to discuss the issue to develop a proper maintenance and management plan for the future. In this paper, the authors report on the “Abo Tunnel Maintenance Manual” which was created by analyzing the actual repair and reinforcement works to date and construction records.

姫路市汐入川才西川放水路幹線建設工事は、姫路市広畑区小坂地区および才地区の浸水被害軽減を目的として、既存水路から雨水を取り込み汐入川に排水する全長約2,400mの放水路幹線を、シールド工法および推進工法にて構築する工事である。シールドはJR山陽本線との近接施工や、新設される県道工事直下での掘進などが課題であった。一方、推進工事は砂礫地盤における長距離推進が課題であった。本稿では上記の課題への取組みとともに、生産性の向上を目的として取り組んだAIによるシールドの自動運転についても報告する。

### Shield Tunneling beneath the JR Sanyo Main Line and Long-Distance Pipe Jacking through Gravel Ground

—Himeji City, the Shioiri River, the Sai-nishi River Main Flood Bypass—

By Seiichiro Kawabata, Himeji City

The goal of the construction of the main flood bypass between the Shioiri River and Sai-nishi River in Himeji City is to reduce inundation damage in the Kosaka area and the Sai area of the Hirohata-ku in Himeji City. The project involves the construction of a main flood bypass with a total length of approximately 2,400 m using the shield tunneling method and the pipe jacking method to capture rainwater from an existing waterway and discharge it into the Shioiri River. The shield tunneling had to be conducted close to the JR Sanyo Main Line, and boring had to be done directly under the new prefectural road. On the other hand, the pipe jacking works were a challenge as it required long-distance pipe jacking in gravel ground. In this paper, the authors report on efforts to address the above issues and to develop an AI-based automated shield tunneling operation system to improve productivity.

**宮水を守りつつ市街地で鉄道近接の立坑をニューマチックケーソンで築造**

—二級河川東川水系津門川地下貯留管他整備工事—

大豊・ソネック・田村特別共同企業体 三野 章生

兵庫県西宮市中央部を南北に縦断する津門川流域は、豪雨による浸水被害がたびたび発生しており、内径4.9m、延長3.8kmの地下河川計画のうち、上流側1.7kmを地下貯留管として先行整備する。この1.7kmの先行整備区間では、最上流部に流入施設、最下流部に放流立坑を設ける。地下貯留管はシールド工法で構築する。一方、放流立坑は、深度約40mで、下流側のシールドの発進立坑を兼ね、ニューマチックケーソン工法で築造する。この立坑には、JR神戸線および集合住宅が近接しており、また、津門川下流には日本を代表する酒どころのひとつである灘五郷があり、ここでは「宮水」と呼ばれる酒造用地下水が利用されている。本稿では、市街地での鉄道に近接した立坑の施工とそこで採用した「宮水」の汚染対策について報告する。

**Building a Shaft near Railway Line in an Urban Area Using Pneumatic Caissons While Protecting Miyamizu Spring.**

—Second-Class River Higashi River System Tsuto River Underground Reservoir Tunnel and Other Construction Works—

**By Fumio Mino, Daiho Sonec Tamura Special Joint Venture**

The Tsuto River basin, which runs north to south through the center of Nishinomiya City, Hyogo Prefecture, is subject to frequent inundation damage caused by heavy rains. A 3.8-km-long underground river of 4.9 m diameter is planned, with the upstream 1.7 km to be constructed as an underground reservoir tunnel. In this 1.7 km section, an inflow facility is located at the upstream end and a discharge shaft is located at the downstream end. The underground reservoir tunnel will be constructed using the shield tunneling method. The discharge shaft will be about 40 m deep and will also serve as the starting shaft for the downstream shield TBM. It will be constructed using the pneumatic caisson method. The shaft is located near the JR Kobe Line and housing complexes, and downstream of the Tsuto River is Nada Gogo, one of the most famous sake brewing areas in Japan, which uses spring water called Miyamizu for sake brewing. In this paper, the authors report on the construction of the shaft close to a railway line in an urban area and the pollution control measures taken for the Miyamizu water.

施工

## 大規模ターミナル線路直下で大口径推進により土砂搬出トンネルを施工

—東京駅南部東西自由通路—

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東日本旅客鉄道(株) 池本 宏文

東京駅では、駅東西地区の回遊性の高い歩行者ネットワークの強化に向けて有楽町方の地下1階レベルにおいて丸の内と八重洲エリアを結ぶ南部東西自由通路を整備する。工事では、駅構内の盛土および既存構造物を撤去し、高架橋の新設および既存高架橋の改築を行う計画である。東京駅の内外にはさまざまな構造物が存在するため、約19,200m<sup>3</sup>の掘削土砂を搬出するルート確保が最大の課題となった。課題解決のため、新たに土砂搬出用のトンネルを泥濃式推進工法により構築することとしたが東京駅という制約の多い施工環境、かつ鉄道営業線直下を掘進することから、さまざまな課題に直面した。本稿では、自由通路整備計画の概要を述べるとともに、土砂搬出トンネルの施工において、鉄道運行の安全を確保するための検討内容について報告する。

**Boring a Tunnel for Muck Removal by Large-Diameter Pipe Jacking Directly under Tracks in a Large Terminal Station**

—Southern East-West Free Passage of Tokyo Station—

By Hirofumi Ikemoto, East Japan Railway Company

The Southern East-West Free Passage connecting the Marunouchi area and the Yaesu area will be constructed at Tokyo Station on the first basement floor of the Yurakucho side to improve accessibility between the east and west areas of the station. The construction work will involve removing the muck and existing structures within the station, constructing a new viaduct, and renovating the existing viaduct. Because there are various structures inside and outside Tokyo Station, the biggest challenge was to secure a route to remove the approximately 19,200 m<sup>3</sup> of muck. To solve this problem, it was decided to construct a new tunnel for transporting the muck using high-density slurry type pipe jacking method. However, due to the restrictive construction environment of Tokyo Station and the fact that the tunnel would have to be excavated directly underneath a railway line in service, various challenges arose. In this paper, the authors present an overview of the free passage construction plan and report on the studies conducted to ensure the safety of railway operations during the construction of the soil removal tunnel.