Smet Group

Project microtunnelling Helsinge (DK) Underground buffer

Client: Gribvand Spildevand as
Engineer: COWI as
Main contractor: Smet-Tunnelling nv
TBM: AVN Hydroshield
Jacking pipes: reinforced concrete pipes
ID-OD: 2.500 - 3.000 mm
Length: 1.100 m
Pipe-jacking time schedule: July 2012—October 2012

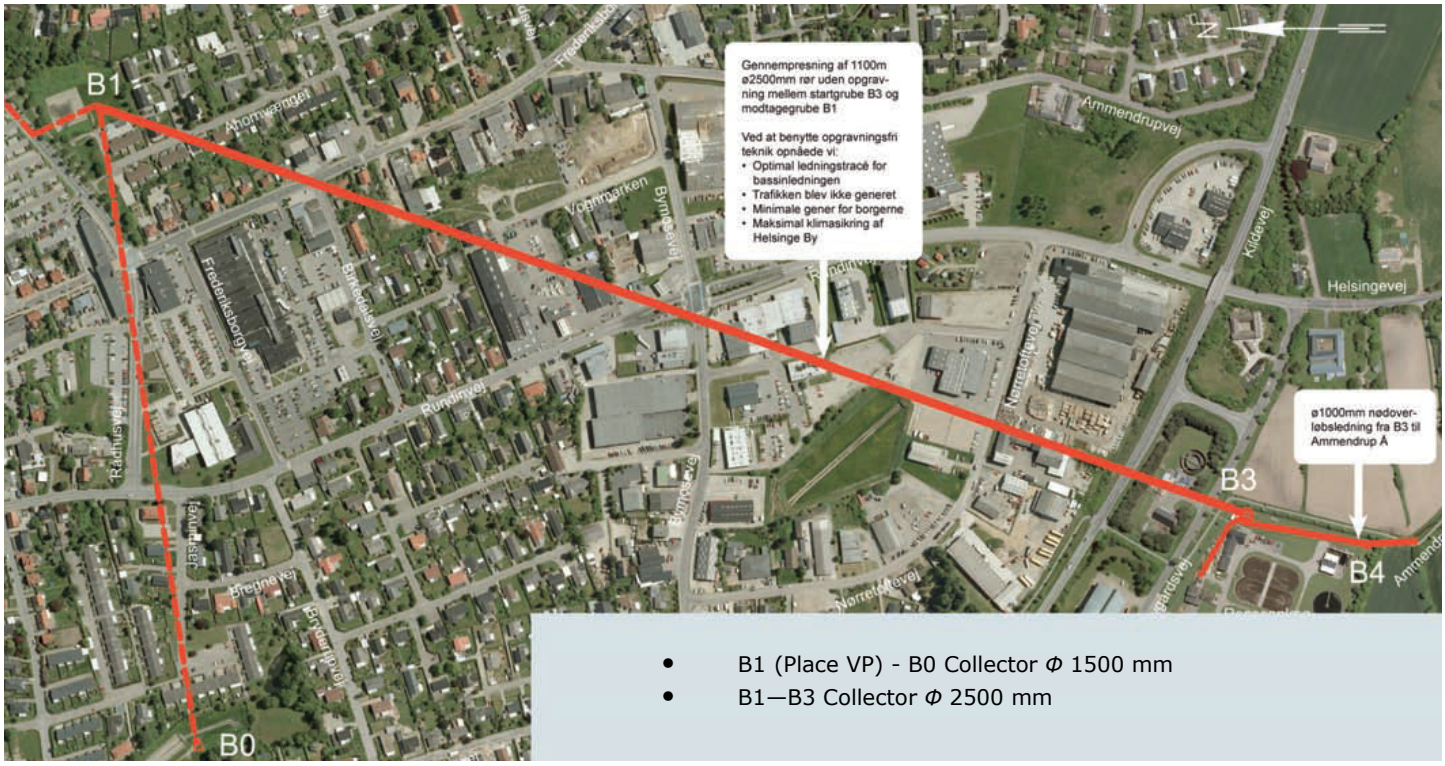
In the summer of 2009 the wastewater company 'Gribvand Spildevand A/S' and Engineering department 'COWI' signed an agreement for a climate security approach of the city of Helsinge. This city is situated in the northern part of Sealand in Denmark. The reason for this agreement were problems with flooding encountered in large parts of the city during heavy rainfall. After a testing and evaluation program, a solution was chosen which was based on the construction of a "water-highway" starting from the city center to the existing wastewater treatment plant (WWTP). All of this was to be combined with creating a 6.000m³ buffer volume underneath the city, in this way reducing the necessity for a new buffer at WWTP itself.

The solution's 'back bone' is characterized by a tunnel with an internal diameter of 2,5m and a length of 1.100m going underneath the city of Helsinge. This solution includes the crossing of 15 existing houses, 8 roads and 2 parking areas. The cost of the tunnel solution was equal to the cost of a similar traditional buffer volume to be established in Helsinge. Therefore, it was the first drain tunneling project in Denmark for a city the size of Helsinge with an average of 10.000 inhabitants.

The project appears to be highly ambitious, but contains so many advantages and possibilities, both technical and economic, that it certainly will serve as a model for climate security in a number of other cities in Denmark and even all over Europe.

Microtunnelling

The microtunnelling works started on the 7th of July 2012, departing at the WWTP-site and arriving at the arrival shaft the 23th of September 2012. After 1100m the TBM (Tunnel Boring Machine) passed underneath 15 houses, 8 roads, 2 parking areas and a lot of other private properties. All through the works the buildings were carefully monitored by means of vibration meas-



- B1 (Place VP) - B0 Collector Φ 1500 mm
- B1—B3 Collector Φ 2500 mm

Smet-Tunnelling nv
Kastelsedijk 64
B-2480 Dessel

Phone: 0032 14 38 96 96
E-mail: infost@smetgroup.be
Website: www.smetgroup.be

urements. The present state of the infrastructures were determined before the start of the execution. No damages were noted after the execution of the microtunnelling.

The departure sealing at the departure shaft consisted of a low-strength cement-bentonite mixture (max. 8MPa) put in place by the VHP jet grouting method and was constructed by a sister company of Smet-Tunnelling, named Smet-F&C.

The microtunnelling drive was executed by means of a TBM type AVND2500 Hydroshield manufactured by Herrenknecht (Germany), which was carefully overhauled and assembled in Smet's home base workshop to meet with the specific requirements of the project. The main challenge for the cutting wheel was the large variety of soil conditions in the Morene deposits. The cutting wheel had to be able to cope with full face clay to sand conditions and everything lying in between, with the constant presence of boulders with estimated diameters up to 2m and characterized by extreme hardness. This meant that a difficult balance had to be found with the contradictions in terms of cutting wheel design. This proved its value during tunneling activities.

After finishing this first tunnel, the client ordered a second tunnel drive to be made to connect another open basin in the city center to the WWTP. This pipe jacking drive had to be 580m long with inner diameter of 1500mm containing a horizontal trajectory in S-curve.

Civil works

For this job, Smet-Tunnelling was not only contractor for the pipe jacking works, but also main contractor for the complete project. Smet-Tunnelling had to quaranteer the complete project from A to Z, starting from the temporary shafts by means of sheetpiles, to in-situ concrete chambers, electromechanical installations, open-trench pipelines and connections, ground works, construction of roads and finishing with a technical command post.

Most of the non-tunnelling works were executed by Danish subcontractors. The departure shaft consisted of a circular shaft by means of sheet piles with an inner diameter of 11m and a depth of 14m below surface. The complete shaft was constructed with 35cm thick concrete wall to be used for the installation of pumping equipment. The technical house on top contains remote control monorail cranes in order to maintain the pumps in an efficient way.

The open trench works included pipelines DN1000 up to DN1600 to connect the newly built system to the existing sewer system in the surrounding and to be able to cope with possible future expansions.

Finally

At the inauguration of the tunnel, November 11, 2012, more than 2.000 people 'strolled' through the 1100 meter long tunnel from the central part of Helsinge to Helsinge WWTP. The professional branch acknowledged the fact that Gribvand used new methods to climate-secure Helsinge City with the construction of Denmark's longest drainage tunnel. The SSTT (Skandinavian Society for Trenchless Technology) awarded the Scandinavian No-Dig Award 2012 for best Environmental project of the year to Gribvand Spildevand A/S.

The project in Helsinge contributes to inspire Denmark (and the rest of Europe) to think wider when it comes to implement solutions for flood protection. Even in smaller cities, that must sometimes withstand the most extreme developments in climate changes, this can be an economical solution.

Once again the microtunnelling technique has pushed its limits in terms of accuracy and reliability: in most challenging conditions 15 houses were crossed successfully without the use of any counter measures!

Smet-Tunnelling nv
Kastelsedijk 64
B-2480 Dessel

Phone: 0032 14 38 96 96
E-mail: infost@smetgroup.be
Website: www.smetgroup.be