New Construction Section

Vienna – St. Pölten

APRIL 2009
The Western Line – Main Transport Axis of Austria

The quality and efficiency of the transport infrastructure are strongly linked to a country’s economic development. The Western Line is not only one of Austria’s most important main transport axes, but because of its position in the “Danube corridor” also takes high priority in the European Union’s agenda. The extension of the Western Line is of utmost importance due to the EU expansion towards the East as well as the enhanced mobility and increased demand for passenger and freight transport.

Railways must ensure efficiency for decades, sometimes even for centuries. All planning and realisation in the area of railway infrastructure made today must also meet the requirements of future generations – “railways for many generations”.

The extension of the Western Line into a four-track route from Vienna to Wels creates the prerequisites for the urgently required capacity increase and efficiency in passenger and freight transport. The new high-performance route will allow a marked reduction of the travel time mainly in long-distance transport. The aim is to cover the distance between Vienna and Salzburg in about two hours.

The extension to the four-track the Western Line between Vienna and Wels will about double the capacity in the freight transport sector, allowing to meet the industry’s increasing demands regarding operating quality and punctuality.
The Trans-European Networks (TEN)

Trans-European networks are high priority infrastructures in the areas of transport, energy, and telecommunication with the aim to enhance European cohesion and to strengthen the economy. The objective is to ensure passenger and freight transport within the European Union on a long-term basis, to enhance competitiveness, and to open up new economic regions with the development and extension of these networks.

To achieve this, priority axes are defined throughout the Community’s territory, which are to be realised with priority (Priority Projects). Planning and construction of these projects are co-financed by the European Union.

**Priority Project No. 17**

The Priority Project 17 is the railway axis Paris-Strasbourg-Stuttgart-München-Vienna-Bratislava. The Austrian section of the TEN 17 is the Danube axis. It runs from the German border at Salzburg via Linz, St. Pölten, and Vienna up to the Slovakian border at Bratislava. Therefore, the new construction section Vienna – St. Pölten is an essential part of the Priority Project 17. With the extension of the Danube axis, ÖBB-Infrastruktur Bau AG makes a considerable contribution to mobility.

*The trans-European railway network*
Multiple Customer Benefits

The new construction section Vienna – St. Pölten will considerably contribute to the safeguarding of the business location Austria. The enormous capacity increase will allow meeting the requirements of the national industry for market-oriented just-in-time deliveries in freight transport and facilitating the environmentally friendly shift of traffic from road to rail.

The new section will also ensure more quality in passenger transport:
- The capacity increase will create more possibilities for extended suburban services on the existing Western Line between Vienna and St. Pölten.
- The regional connection of the Tullnerfeld and Northern Lower Austria will be improved with the linkage of the railway lines Tulln-Herzogenburg and the Franz-Josefs Line in the new overtaking and regional railway station Tullnerfeld.
- The new regional railway station Tullnerfeld will motivate people to use the railway instead of the car. It has more than 500 park&ride parking spaces and is connected with the local bus lines. Passengers can reach St. Pölten or Vienna by train in approximately 15 to 20 minutes.
- The travel time on the new railway route between Vienna and St. Pölten will be less than 25 minutes (without stop at the regional station Tullnerfeld).
- The travel times between Vienna and Salzburg will be considerably reduced.

New Construction Section Vienna – St. Pölten

In 1989, the railway route Vienna – Salzburg was declared a high-performance route by the Austrian Federal Government. On the basis of this ordinance, the Western Line between Vienna and Wels will be extended into a four-track operation.

Between Vienna and St. Pölten, a new two-track section with a completely new alignment was projected in addition to the existing tracks of the Western Line.

The new construction section Vienna – St. Pölten is one of Austria’s first transport projects to be subjected to an environmental impact assessment pursuant to the Austrian EIA Act. It was designed according to the criteria for high-performance routes and for velocities of up to 250 km/h.

In the East, the line is connected with the Lainzer Tunnel (connection Western, Southern, and Donaulände Line). Then it crosses the Wienerwald.

<table>
<thead>
<tr>
<th>FIGURES, DATA, FACTS</th>
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<tbody>
<tr>
<td>Route length</td>
</tr>
<tr>
<td>4 tunnels</td>
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<tr>
<td>3 tunnels</td>
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<tr>
<td>27 bridges</td>
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<tr>
<td>and as game passages</td>
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<tr>
<td>1 new overtaking and regional railway station in the Tullnerfeld</td>
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</tbody>
</table>
hills in a tunnel and runs through the Tullnerfeld and the Perschling Valley. To the West it is connected again with the existing Western Line at the traffic junction Wagram near St. Pölten.

The project has a total length of approximately 44 km and is divided into three sections:
- Wienerwald
- Tullnerfeld
- Western section

### Wienerwald Section

The Wienerwald section has a total length of 14.4 km. To the East in the area of Hadersdorf (Vienna), the route connects to the Lainzer Tunnel project, underpasses the Wienerwald in a tunnel and ends in the section Tullnerfeld in the West near Chorherrn and Klein Staasdorf.

The central structure of this section is the 13.3 km long Wienerwald Tunnel. The Eastern part is a 2.2 km double-track single-tube tunnel. The remaining 11.1 km of the tunnel are constructed as two parallel single-track tunnels.

A customised tunnel safety concept was developed for the Wienerwald Tunnel. Three emergency exits are projected in the single-tube section and one emergency ventilation duct in the widening area. In the twin-tube area in Lower Austria, there are cross connections between the two tunnel tubes at intervals of 500 m.

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**PROJECT TIME SCHEDULE**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 1989</td>
<td>High-performance route ordinance</td>
</tr>
<tr>
<td>1990 – 1994</td>
<td>Route selection procedure</td>
</tr>
<tr>
<td>November 1998</td>
<td>Completion of environmental impact assessment procedure (EIA)</td>
</tr>
<tr>
<td>1999 – 2003</td>
<td>Several administrative procedures (e.g. pursuant to railway, nature conservation, water and road laws …)</td>
</tr>
<tr>
<td>February 2003</td>
<td>Ground breaking and start of construction works in the Tullnerfeld</td>
</tr>
<tr>
<td>November 2004</td>
<td>Start of driving works Wienerwald Tunnel (WWT)</td>
</tr>
<tr>
<td>December 2005</td>
<td>Start of driving works tunnel chain Perschling</td>
</tr>
<tr>
<td>End of 2012</td>
<td>Scheduled start of operation</td>
</tr>
</tbody>
</table>
They serve as escape routes to the safe neighbouring tube in case of emergency.

**Tunnel driving**

Due to its length, the Wienerwald Tunnel was driven from two sides.

Driving from the East from Vienna in the Western direction was started in November 2004 using the "New Austrian Tunneling Method" (NATM) with drill and blast technique. Driving of the twin-tube section from the Western Portal was done with two tunnel boring machines.

The machines were designed according to the specific ground conditions of the Wienerwald and pre-fabricated in Germany. The individual components were brought to the construction site with a special transport and assembled on site.

The first machine started its driving operation in September 2005, while the second machine was put into operation in March 2006. Breakthrough to the Eastern heading was made on September 3, 2007. Construction of the inner tunnel lining as well as the sidewalks will be completed in spring 2010. After that, the technical equipment will be installed. This includes the fixing of the tracks and the installation of the fire fighting facilities, ventilation, contact lines, signal and safety systems, electro-technical equipment etc.

A special tubbing factory with a workshop, two gantry cranes and an open-air storage area was set up at the Western portal for the construction of the tubbing segments (precast concrete units for the tunnel shell).

<table>
<thead>
<tr>
<th>TECHNICAL DATA BORING MACHINE (TBM)</th>
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<tbody>
<tr>
<td>Total weight:</td>
</tr>
<tr>
<td>Length incl. trailer:</td>
</tr>
<tr>
<td>Drill head diameter:</td>
</tr>
<tr>
<td>Weight of drill head:</td>
</tr>
<tr>
<td>Drive power:</td>
</tr>
<tr>
<td>Propelling force:</td>
</tr>
<tr>
<td>Mining tools:</td>
</tr>
</tbody>
</table>
The central area of the new construction section Vienna – St. Pölten is the Tullnerfeld section with a total length of approximately 17 km.

To the East in the area of Chorherrn, the route connects to the Wienerwald section. It runs approximately 10 km along the southern edge of the Tullnerfeld as open construction. The new overtaking and regional railway station Tullnerfeld is located in this area.

The existing railway line Tulln – Herzogenburg will run parallel to the high-performance line. After that, the route turns into the Perschling Valley, runs along its southern edge in a sequence of open route and underground sections and ends into the Western section in the area of Diendorf.

This section includes three tunnels, 23 bridges for crossing roads, tracks, rivers and game passages. Furthermore, it includes the new overtaking and regional railway station Tullnerfeld and two new substations for the traction power supply.

**Tunnel in open construction method**

Due to the thin cover, the three tunnels in Atzenbrugg, Hankenfeld and Saladorf are made in open construction. First, the excavation pit is made and its walls secured. Following the construction of the bottom plate, the tunnel vault is concreted using formwork carriages and then again backfilled. The original terrain is recreated according to the landscape design and recultivated.

The Atzenbrugg Tunnel has a length of 2,460 m, the Hankenfeld Tunnel of 663 m and the Saladorf Tunnel of 730 m. A particular challenge was the slope stabilisation for the Hankenfeld Tunnel, which in some areas was more than 20 m deep and scarped almost vertically.

**Regional railway station Tullnerfeld**

The new overtaking and regional railway station Tullnerfeld will be constructed in a central position. Here, the new construction section Vienna – St. Pölten is linked with the existing railway line Tulln – Herzogenburg and also connected to the Franz-Josefs Line by reactivating the Western Loop Line near Tulln. This will contribute to an attractive public transport system at the end of 2012. The travel time from the new railway station to Vienna or St. Pölten will be approximately 15 to 20 minutes.

**Reactivation Western Loop Line near Tulln**

The reactivation of the Western Loop Line near Tulln with a length of approximately 1.8 km is a part of the Tullnerfeld section. The reconstruction of this loop line will create a direct connection of the Franz-Josefs Line with the new construction section Vienna – St. Pölten and, thus, considerably improve the transport links of Northern Lower Austria.

For the reactivation of the Western Loop Line near Tulln, existing structures and tracks must be adapted to the new requirements or even newly built.

The crucial point of the Western Loop Line near Tulln is the overall renovation of the Danube bridge of Tulln.
Western section

In the East after the village Diendorf, begins the 12.6 km long Western section of the new construction section Vienna – St. Pölten. The route runs to the South of the Perschling river and – with intermittent open air stretches – through the 1,370 m long Reiserberg Tunnel and the 3,293 m long Stierschweiffeld Tunnel up to Rassing. Then it crosses the river Perschling and after the 2,775 m long Raingruben Tunnel near Pottenbrunn it ends at the traffic junction Wagram, where it is again connected with the existing Western Line.

The key element of this section is the tunnel chain Perschling consisting of the three above mentioned tunnels with a total length of approximately 7.5 km. A total of five bridges such as e.g. the railway bridge across the river Perschling are constructed.

Perschling bridge

In the open air section between the Stierschweiffeld and the Raingruben Tunnel, the route crosses the river Perschling with a 117 m long and 13.1 m wide prestressed concrete bridge.

The construction was made in three sections, whereas the two side spans were constructed first. Then, the centre span was levitatingly concreted using a service girder.

With the gradual construction, the riverbed was not restricted to make provisions for a potential flood.

Tunnel chain Perschling

The tunnel chain Perschling consists of a sequence of three two-track tunnels with emergency exits at intervals of approx. 500 m.

Different construction methods are used for the construction. Some sections are constructed by using Cut&Cover methods. The majority is done as closed construction using a tunnel boring machine (TBM). Because of the two-track construction of the tunnels, the drill head has a diameter of approximately 13 m. Thus, it is worldwide one of the largest tunnel boring machines.

The tunnel driving works started in December 2005 at the Western portal of the Stierschweiffeld Tunnel.

**TECHNICAL DATA TBM**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total weight</td>
<td>2,000 t</td>
</tr>
<tr>
<td>Length incl. trailer</td>
<td>240 m</td>
</tr>
<tr>
<td>Drill head diameter</td>
<td>13.03 m</td>
</tr>
<tr>
<td>Weight of drill head</td>
<td>270 t</td>
</tr>
<tr>
<td>Drive power</td>
<td>5,200 kW</td>
</tr>
<tr>
<td>Propelling force</td>
<td>49,270 kN</td>
</tr>
<tr>
<td>Mining tools</td>
<td>76 cutting rollers</td>
</tr>
</tbody>
</table>
Building with Responsibility

Every major construction project entails interventions in nature and impacts on the environment. ÖBB-Infrastruktur Bau AG is aware of the responsibility for the habitats of people and animals. Therefore, environmental aspects were taken into account from the start of planning on a par with the topics of transport, engineering and cost effectiveness.

The new construction section Vienna - St. Pölten is one of the first infrastructure projects in Austria to be submitted to an environmental impact assessment pursuant to the Austrian EIA Act.

Citizen participation model Ephesos

The quality of planning determines to a large extent the benefit and the citizens’ acceptance of a project. Following the example of the ancient Greek town of Ephesos, a communication model was developed for the new construction section Vienna – St. Pölten with the aim to integrate all concerned interest groups into the planning process as early as possible.

The prerequisite for this is the active information of the public with broadcasts, media reports and information events as well as an open communication in regular working groups with representatives of the municipalities, citizens’ initiatives and political representatives. This allowed including the interests, concerns, and proposals from the regions into the planning process. The result is an optimal project developed in cooperation with all concerned parties.

Protecting nature and the environment

Already in the planning phase, many preventative and compensatory ecological measures were defined for the realisation of the new construction section Vienna – St. Pölten.

Long before the first construction measure took place, extensive surveys on the existing animals and plants, the quality and quantity of the flowing and surface water bodies, the air quality and soil conditions were conducted in order to be able to compensate any adverse effects.

In the construction phase, natural monuments will receive special protection to avoid any damages. Flowering, spawning and breeding seasons were taken into account in the construction schedule. Generous game guidance facilities and passages for amphibians ensure the preservation of the diversity of species.

The river Große Tulln, which up to now has been regulated, had to be relocated and was renaturalised accord-
ing to the latest hydro-engineering guidelines. New habitats are created with the flood retention basins along the route.

Following completion of the construction works, local trees and shrubs will be planted on all utilised areas according to a special landscaping concept.

The ecological construction supervision monitors the compliance and implementation of all these measures during the entire construction period.

**Archaeological excavations**

Special attention was also paid to the preservation of cultural assets during the realisation of the new construction section Vienna – St. Pölten. A schedule was developed in cooperation with the Federal Office for Historical Monuments to allow archaeological excavations to take place on a total area of approximately 700,000 m² before start of construction works. 20 find spots at the Southern edge of the Tullnerfeld, in the Perschling and Traisen Valley provided rich findings from 20,000 years and sensational scientific results.

**Construction site logistics**

To be able to manage the required construction site transports as independent from the existing road network as possible. Furthermore settlement areas had to be relieved as much as possible from noise and dust. Therefore a service road was constructed along the new railway line. After completion of major construction works the road is now part of the local road network.

In the Western section, certain project units were anticipated and separate access roads to the sites constructed in order to manage mass transports on the future railway route. The gravel
pits in the environs were filled with the excavation material from the tunnel chain Perschling.

A mass balance was prepared for the realisation of the new construction section Vienna – St. Pölten taking into account the material properties in order to reuse the excavation material from the tunnel areas as fill material for the tracks and for noise protection embankments in places as close as possible to the construction sites.

Up to 6,000 m³ of excavation material from the driving of the Wienerwald Tunnel were transported daily to an interim storage site via conveyor belts. From there, some of the material was transported via the service road to the neighbouring section Tullnerfeld and used for the noise protection embankments and the railway tracks. The remaining material was deposited in an approximately 8 ha site at the close-by Wienerwald. After completion of the tunnel driving works, the terrain will be modelled, planted and reforested in the hilly shape typical for the Wienerwald.

Almost all of the material accumulated from the Eastern driving of the Wienerwald Tunnel was removed by railway. A special loading siding was constructed for this purpose.

**Noise and vibration protection**

Many measures are taken for the new construction section Vienna – St. Pölten in order to reduce the noise and vibration values caused by the railway operation to a minimum. Noise protection walls or noise protection embankments with plants are constructed everywhere where there are settlement areas close by.

Tunnels in built up areas and shallow cover are equipped with mass spring systems. This will mitigate vibrations emitted by train operation.

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*Loading of railway wagons at the Eastern driving of the Wienerwald Tunnel*

*Area matting for light and medium mass-spring system*
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