

# How Britain's railway infrastructure has gained from the Channel Tunnel

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*TML Channel Tunnel handover to Euro-tunnel at the tunnel portal on the UK side on 10th December, 1993, with Bo-Bo shuttle locomotive No. 9016 in the background. The line-up is (left to right) Peter Costain (Costain), Tony Palmer (Taylor Woodrow), Neville Simms (Tarmac), Sir Alastair Morton (Eurotunnel), Joe Dwyer (Wimpey) and Sir Robert Davidson (Balfour Beatty).*



Photo:  
Brian Morrison  
Courtesy the  
Oakwood Press

**F**or Channel Tunnel trains to run in Britain, major improvements to our domestic rail infrastructure have been undertaken, both before the Tunnel opened in 1994 and since. Some have proved white elephants, but most will have value even if Eurostars confine themselves to Channel Tunnel Rail Link at the end of 2007.

With a high-speed line ruled out when the tunnel was promoted, British Rail had to graft a rapid service of highly sophisticated trains onto a network dependent in places on Victorian technology and overloaded at peak periods. And preparing the routes to the tunnel and providing station, freight and depot facilities for longer, faster, bulkier and heavier trains cost £1.7 billion.

The highest-profile project was the £130 million Waterloo International terminal. The choice of Waterloo stemmed from a belief that none of the alternatives – including Victoria, Bricklayers' Arms, King's Cross (then thought too congested) and White City – could handle the predicted traffic [1]. A central position,

excellent Tube connections and bearable approaches by road gave Waterloo the edge.

Five terminal platforms numbered 20-24 were squeezed into a twisting three-hectare site on the north-west of the station, created by eliminating four platforms (18-21, two of them replaced by converting the taxi road) and several carriage sidings. Into this space were inserted three 400-metre platforms, two of them islands, with a three-level concourse beneath a spectacular one-hectare ribbed glass and steel roof. Waterloo underground station gained a new escalator to the Eurostar concourse from the booking hall, and new tunnels linking the Bakerloo, Northern and Waterloo and City platforms.

Work began in December 1990, and the terminal was opened on 6th May, 1993, the original opening date for the tunnel. For seventeen months before services began, it was hired out for parties and concerts – and may be again once Eurostar moves out: so far the terminal is earmarked only for Reading line trains while Waterloo is reconstructed, and

Thameslink while the line through Blackfriars is upgraded [2].

Eurostars using Waterloo had to coexist with 149 incoming trains between 0700 and 1000, and 132 leaving between 1600 and 1900. To prevent conflicts, the brick viaduct at the station throat was widened with more running lines. On the busy line out through Vauxhall, the northernmost of four pairs of tracks was rededicated to tunnel traffic and equipped for bi-directional running. Domestic services also use these tracks, especially the down line, and outgoing Eurostars use the first of the other tracks. Power supply limitations mean that suburban trains outpace departing (and arriving) Eurostars.

From a new Nine Elms Junction 2.4km. beyond Vauxhall, a 1.15km. double-track concrete viaduct takes international trains up and over the domestic lines between both Waterloo and Victoria and Clapham Junction, then bends 90 degrees south-east to join the South London Line at Linford Street Junction, approaching Clapham High Street station. The Stewarts Lane chord (named after the depot visible below) is long enough to hold a Eurostar train without affecting other services. This facility proved a blessing when, on 7th February 2003, a Eurostar was stranded there for more than five hours in the evening peak [3]. This

stretch of track was the only entirely new line constructed in Britain to serve the tunnel when it opened.

Eurostar stock bound for North Pole depot continues on a single track through a disused platform at Queenstown Road before diverging from the South-Western route onto the Sheepcote chord, the electrified reinstatement of a connection removed in the 1950s. The only revenue-earning services to have used it are the HSTs from Newcastle and Manchester which between 1995 and 1997 offered Eurostar passengers an easy connection at Waterloo, the Great Western sleeper to Penzance, diverted briefly to Waterloo in the mid-1990s, an even shorter-lived daily HST to and from Cardiff, plus rare diverted Eurostars and railtours.

The Factory Junction-Latchmere Junction connection, which carries inter-regional and tunnel freight and a handful of Inter-City services serving Kensington Olympia from the Brighton line, was also electrified. Close to Clapham Junction, both connections join the 11km. West London Line (WLL), which was electrified, resignalled and upgraded to keep down noise. The southern end between Clapham Junction and the elevated A40(M) was electrified at 750vDC, and the next 1100 metres to North Pole Junction on 25KvAC overhead as well, just long enough for a Eurostar to exit the



*There are Eurostars in all five platforms at Waterloo International on 5th December, 2001. To the right class '159' No. 159105 slows as it enters Waterloo*

Photo:  
Brian Morrison  
Courtesy the  
Oakwood Press

*Class '373' units  
Nos. 3003 and  
3004 on the 'classic  
route' between Dun-  
ton Green and Knock-  
holt with the 1219  
Paris Nord-Waterloo  
on 20th February,  
2001*



Photo: Brian  
Morrison  
Courtesy the  
Oakwood Press

depot "under the wires", clear the junction, then reverse northward without lowering its pantographs. Network Rail hopes to extend the overhead south to the projected Shepherds Bush station for voltage changes, freeing up valuable train paths, if conflicts with London Underground signalling can be eliminated [4]. The northern section to Willesden Junction was electrified overhead, ending the blockage at Mitre Bridge Junction when inter-regional passenger and freight trains had to be halted to change locomotives.

WLL electrification enabled electric tunnel freight to operate through to Willesden and Wembley yards, Network South-East to eliminate diesel traction from its Clapham Junction-Olympia service, extending it to Willesden Junction, and later, Connex to run between Gatwick Airport and (initially) Rugby.

North Pole depot, like Waterloo International facing redundancy after less than 14 years use, is equally striking and as remote as its name, (inspired by a nearby pub, not an Arctic waste), suggests. The £80 million facility is 3km long, and its maintenance shed is claimed as Britain's largest railway servicing structure. It has two connections with the WLL at North

Pole Junction, two-thirds of the way between Olympia and Willesden Junction: in, forking west off the WLL into reception sidings, and out along what was formerly a through connection with the GW fast lines. Severing this link forced Brighton-Olympia-Reading-Manchester trains to make a 15-minute snail's pace detour through Old Oak Sidings. Though North Pole Junction is electrified at 25KvAC, the four reception sidings are electrified third-rail at 750vDC. Inside the depot electrification is again overhead a short section can be energised at 3000vDC to test trains for operation in Belgium.

Olympia station would have been important for night services. Diesel-hauled sets from Plymouth and Swansea respectively would have been marshalled there for attachment to Class 92-hauled rakes arriving from Glasgow and Edinburgh, to continue as single trains to Paris and Brussels. Eurostar recruited staff to supervise marshalling, crew changes and border control from special premises there; but they were withdrawn in 1997. The following year Olympia hosted its first in-service Eurostar, when a cable fire closed Waterloo and an incoming train from Brussels was diverted to unload there.

Further south on the WLL, Chelsea Bridge over the Thames was strengthened to accommodate heavier trains and raise the speed limit from 24 to 64 mph; a further improvement to 80 kph has since been carried out and a further upgrade is proposed [5].

To ensure access to North Pole and keep freight moving in the event of the WLL and its approaches being blocked, BR eased clearances on an alternative route: north from the depot to Mitre Bridge Junction, then west to Acton Wells Junction, diverging at Kew East Junction for Clapham Junction via Barnes and Putney. It is occasionally used, with Class 37 diesel haulage, during engineering work or to maintain drivers' route knowledge.

Before the CTRL, Eurostars between London and the tunnel used Southern Region's two traditional boat train routes, BTR (Boat Train Route)1 and BTR2 being redesignated CTR (Channel Tunnel Route)1 and CTR2, with both needed to accommodate Tunnel traffic. CTR1 comprises the "main" line through Herne Hill and Sevenoaks; CTR2 the Catford loop and the Maidstone East line. They diverge at Brixton and rejoin from Shortlands to the grade-separated junctions east of Bickley; Eurostars now continue via Swanley to the CTRL, but until 2003 – and now when the high-speed route is closed – they proceeded via Tonbridge or Maidstone to Ashford and Cheriton. The 5km Otford-Sevenoaks branch was upgraded for trains to switch from CTR1 to CTR2, a facility seldom used.

CTR1 is the hillier route (important given the power needed to drive a Eurostar) and busier, but includes a 42km. 160kph straight between Tonbridge and Ashford. CTR2 is slower and 4km longer, but less severely graded; between 1994 and 2003 it handled on a weekday two out of a maximum thirty one Eurostars each way (two inward in the morning peak, two outward in the evening) plus some ski trains and Disney services, and most tunnel freight. For several days in October 2000 it handled the entire Continental service, plus extra domestic traffic, after floods breached the Tonbridge-Ashford line.

Extra substations were constructed along both routes to upgrade the power supply to meet Eurostars' unprecedented demands. Just before services began, BR was forced to spend an extra £30 million replacing up to 900 lineside

circuits to prevent arcing when Eurostars passed over gaps in the conductor rail.

Clearances were improved to prevent Eurostars fouling platforms, bridges or other trains. Track was upgraded, and long stretches relaid with continuous welded rail, notably 27km. west from Continental Junction, where the line for the tunnel diverged from the route to Folkestone. Some high-speed turnouts were installed, but it would have required a controversial and costly land purchase to iron out the worst bends, notably west of Tonbridge station where the line turns sharply northward. Thus at this point Eurostar's fairly rapid progress from the tunnel ended in a severe speed restriction.

To cater for greater traffic, higher speeds and changed track layout, signalling was upgraded between Chislehurst and Folkestone, with a new Integrated Electronic Control Centre at Ashford. An anomaly that survived until 2001, to the delight of the French, was a manually-operated level crossing at Willesborough, east of Ashford.

BR also redeveloped Ashford station to give passengers from east and central Kent (and, via the still unelectrified Hastings line, East Sussex) direct access to tunnel services instead of having to travel via London. This £100 million development, by a Public-Private Partnership to which Eurostar pays a "user tax" for every passenger – took shape late on in the project, a separate Parliamentary Bill being promoted in 1990. Ashford's international platforms – 3 and 4 in the centre of the station – were lengthened to 400m, and a third island platform added on the north side. Ashford International was designed for 2 million passengers a year; after a very slow start it has yet to reach half this capacity. As at Waterloo passengers are segregated: arrivals leave the platforms by a subway, those beginning their journey use a footbridge from a mezzanine check-in area and departure hall for 800 passengers.

Work began in October 1993, the Duke of Kent opened the new station on 6th September, 1995, but it was 8th January 1996 before Eurostars called, bringing the Kent town within two hours of the Gare du Nord. CTRL trains stopping there diverge from the two elevated high-speed running lines to gain the Eurostar platforms, each of whose tracks (plus two domestic lines as back-up) is electrified

overhead as well as third rail. Beaver Road bridge, raised during construction of Ashford International, had to be lifted further during work on the CTRL for the overhead catenary for international trains making a stop there.

One major improvement came after the Tunnel opened: the £60 million burrowing junction at Shortlands for London-bound Eurostars and freight to take the Catford Loop (CTR2) without impeding down trains on CTR1. A box tunnel just west of Shortlands station under the main lines to a point short of Ravensbourne station was proposed in 1999; trains first used it in May 2003, improving punctuality as intended before CTRL Stage One opened [6].

The Tunnel was expected, wrongly, to bring a boom in rail freight, and BR provided for more, heavier and faster services. International freight trains would line up to join the Eurotunnel system at a new yard at Dollands Moor, beside Continental Junction, and while a few might arrive by other routes, china clay traffic from Cornwall, for instance, the vast majority of these trains would come from Wembley.

Between those points, electrically-hauled trains would travel via the WLL and either CTR2 or the more southerly CTR3, via Clapham Junction and Redhill, joining CTR1 at Tonbridge. To avoid delaying Eurostars, passing loops 1km. long were installed at Hollingbourne on CTR2, and Headcorn where Eurostar's highest speeds on CTR1 would be reached, for freight trains using CTR3. The loop on the up side of Headcorn station obliterated the last traces there of the Kent and East Sussex Railway, whose northern terminus the bay platform had been until 1954; the down loop is 1km. nearer London. There is also an up loop on CTR2 south of Otford, for freight trains and passenger services overtaken by Eurostars.

Use of CTR3 by Eurostars was never intended, despite the speeding potential of the dead straight, lightly used Redhill to Tonbridge section; limited clearances on the line via East Croydon ruled it out. But Class 92 hauled tunnel freight was expected to use this route, requiring third-rail electrification of 34km between Tonbridge and Redhill. This proved an extravagance, as the Class 92s proved incompatible with the signalling; only trains powered by Class 47 diesels, and later Class 66s,

have run on CTR3, and only since completion of CTRL Stage One has much international freight operated via Redhill. How infrequent it had been was demonstrated on 5th October 2002 when the 0307 Trafford Park-Dollands Moor headed by No. 66063 was halted at Latchmere Junction when the driver revealed that he had no route knowledge via Redhill, thus blocking the southbound WLL.

Tonbridge to Redhill electrification however did enable Network South-East to end "heritage" diesel traction and reshape its services. The previous Tonbridge to Reading stopping service was replaced by through trains from Gatwick Airport via Tonbridge to Maidstone West, and Tonbridge via Redhill to Victoria, and (more successfully) an accelerated diesel service between Reading and Gatwick.

Dollands Moor yard was planned as a "stacking area", with Class 92s bringing tunnel trains in "under the wires", then continuing over the third rail. The yard was not designed for diesels. But in the early years, because Class 92s were initially banned by Railtrack for interfering with lineside circuits, it became the point where Class 47s delivered trains for Class 92s to take through the tunnel, and collected incoming freights for Wembley or beyond. As traffic fell short of expectations, passengers on passing Eurostars became used to seeing rows of Class 47s and 92s standing idle. Once Class 92s were passed for operation to Wembley and later up the West Coast Main Line (WCML), through haulage from Fréthun yard, Calais to Wembley or even Mossend became an option.

Dollands Moor is skirted to the north by the CTRL's southbound track and to the south by the Folkestone-Ashford line. Electrified overhead save for its western extremity, its trackwork begins not far from the eastern mouth of Saltwood Tunnel, and rejoins the classic route to the Channel Tunnel. 5km. further east, short of the Cheriton terminal and over 3km. from the portal. Sturdy fences surround the nine-road yard, and between each pair of tracks is an island platform, accessed by a subway, for rail and customs personnel.

The principal terminal commissioned by BR for tunnel freight, and the main customs clearance point, is Willesden. It abuts the WCML beside Willesden Junction station occupying a former Freightliner depot; trains from North Pole Junction fork left into it off the

WLL. 2km. further north, across the WCML, is Wembley yard, planned for tunnel traffic but now a general-user yard for international wagonload and domestic traffic. This was where Tunnel trains originally changed locomotives and intermodal services for the East and West Coast main lines were split. As there have been far fewer block trains and simple splits than expected, and more wagonload traffic, Wembley has had to be used as a flat shunt yard. In 2001 all intermodal shunting was concentrated on Willesden and Daventry. Wembley has plenty of room for locomotive stabling, useful up to 1999 when Class 92 use was severely limited and many switches to and from Class 47 haulage were made there.

Each of BR's dedicated Tunnel freight terminals were given road access, impressive

lifting gear for swap-bodies and containers as well as plenty of storage space. Mossend, Lanarkshire, beside the Motherwell-Cumbernauld line, was concrete proof that the Channel Tunnel would benefit Scotland, but international traffic built slowly and much was lost during the chaos at the French end over asylum-seekers when direct services were temporarily withdrawn. Mossend has, however, thrived as a domestic terminal.

Trafford Park, on the Cheshire Lines route out of Manchester to Warrington and Liverpool, has never handled the forecast 100,000 containers and swapbodies a year, the figure used to justify the eleven million pound investment, and freight to the neighbouring industrial estate has ceased altogether. But the 20-acre terminal with five sidings handles 10



*Activity at the French portal: a Tri-Bo banks in a car/coach shuttle train as a class '92' breaks cover with a freight.*

Photo:  
Bob Sweet  
Courtesy the  
Oakwood Press

intermodal trains a week, and the thrice-weekly service to Bari, in southern Italy, makes the longest journey of any train using the tunnel.

The final dedicated terminal at Wakefield, on the site of Kirkgate locomotive depot, generated a small amount of traffic which soon fizzled out. Container terminals at Birmingham

Landor Street and Liverpool Seaforth, converted for intermodal use, attracted little business, as did a facility at Doncaster.

Most successful is the privately-promoted Daventry International Freight Terminal (DIRFT) on the WCML's Northampton loop. Though DIRFT struggled to retain its Continental traffic during the disruption over asylum-seekers, its growing domestic business saw it through and it came out of the crisis still handling 10 intermodal tunnel trains each week.

A further intermodal terminal now handling tunnel traffic is at Hams Hall, beside the Birmingham-Nuneaton line. Its survival was touch and go until Associated British Ports took it over, but nine trains a week have continued for Milan Rogoredo and Novara. Another recently constructed terminal at Wentloog, east of Cardiff, is generating traffic, but not for the Continent.

Infrastructure improvements were also needed for regional Eurostar and night services. Through trains to and from Scotland, Wales and the English regions had been a *quid pro quo* with MPs for passage of the Channel Tunnel Act, and the revival of proposals for a high-speed link between London and the tunnel once boring had begun heightened their expectations [7].

The Government required BR to invest heavily for even the sparse service envisaged for the Midlands and the North. (Only some formation strengthening and eased clearances were needed for Nightstar trains to serve South Wales and the West, as they would be hauled by Class 37 diesels).

Regional Eurostars were to follow routes CTR1 or CTR2 to Stewarts Lane, then gain the WLL, change crew at Olympia and pass North Pole, returning to overhead traction. More than half would thread their way onto the WCML for Birmingham or Manchester; the rest following the North London Line (NLL) through Willesden Junction (High Level) to the ECML by the Maiden Lane chord, just north of Kings Cross, then head for York, Newcastle,

Edinburgh and (once a day) Glasgow [8]. Plans for Eurostars to Glasgow via the WCML were dropped early on.

There were four main tasks: reconstructing the NLL through Hampstead Heath tunnel where clearances were inadequate, immunisation of signalling and trackside circuits on both main routes, general work on clearances, and providing depots. Most costly was the £148 million upgrade of the NLL, closed for several months between Willesden Junction and Gospel Oak while track in the tunnel was lowered, drainage improved and that section converted to overhead electrification. Electric inter-regional freight could now run between Willesden and Stratford without changing locomotives, and NLL commuters got a smoother and quicker ride. But with the rest of the network starved of investment, the work might not have been undertaken had it been known that regional Eurostars would never operate, Hampstead Heath Tunnel would require further costly work to take new-generation containers, and Class 373s would not be able to access North Pole from St Pancras International without still more improvements - hence the eventual move to Temple Mills.

When testing of Eurostar and Night stock on the East and West Coast Main Lines began, both played havoc with lineside circuits. Despite the repeated postponement of regional services, the tests and improvements continued. The WCML to Manchester (via Birmingham and direct) was almost clear by mid-1997, but on the ECML serious problems remained. When in 2000 GNER hired Eurostar regional sets to cope with booming traffic, they could only shuttle between Leeds and Kings Cross, where only two platforms were long enough - York. Edinburgh were out because Newcastle's curved platforms would require wholesale reconstruction, and only the complete restructuring of Leeds station permitted "White Rose" services, as the Eurostars were rebranded, to operate from 2002.

Sidings and depot accommodation were provided at Manchester International (Longsight) and Glasgow Polmadie to stable one 14-car Eurostar and service one night train, and at Plymouth Laira to service night stock. None ever saw more than a test train. Regional Eurostars on test were routinely serviced at

Longsight – where a banner reading "*L'Eurostar habite ici*" (Eurostar lives here) was prematurely hoisted, staying until 2000 when West Coast Train Care took over the depot. The still-unused Polmadie facilities were leased to Virgin which in 2003 stabled "Pendolino"s there pending acceptance.

**References:**

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8. European Passenger Services publicity brochures. circa 199½



*An historic moment. A new entente cordiale: a historic handshake follows breakthrough on 1st December, 1990*

Photo:  
Bob Sweet  
Courtesy the Oakwood Press

\* *Nicholas Comfort is the author of "The Channel Tunnel and its High-Speed Links" published by Oakwood Press.*



*The entrances beside the Folkestone-Dover railway to the two adits prepared for construction of the 1970s tunnel. This photograph was taken on the day in 1973 when breakthrough was achieved on the adit above and to the right, to take road traffic from Upper Shakespeare Cliff to the construction site behind the camera.*

Photo:  
British Channel Tunnel Co. Ltd  
Courtesy the Oakwood Press