



11th December 2020

Gareth Clancy
Head of Access and Licencing
By email only

Dear Gareth

Grand Union Trains Section 17 Application between London and Carmarthen: Capacity and Performance Assessment

I am writing in response to your letter of 13 November 2020 regarding the Grand Union Trains Section 17 application between London Paddington and Carmarthen.

Since our last substantial representations, submitted to ORR on 30 October 2020, Network Rail has undertaken further assessment of the Grand Union Trains Ltd (GUTL) application. We have taken a methodical and logical progression of the assessments as part of evaluating GUTL's applications.

As set out in our representations of 30 October 2020, the coronavirus (covid-19) pandemic has significantly impacted the railway industry, with a collapse in passenger numbers, which has been sustained for several months. As service levels were reduced, there was an immediate improvement in punctuality and performance on the network. The industry has been challenged to continue to maintain the high levels of performance which have been seen over the last few months. Network Rail is committed to 'building back better' and to embed improved performance. This is in line with the Government's expectations and is in the interests of passengers.

The structure of Network Rail's representations centres on ORR's key queries in your letter of 13 November which concerns performance modelling undertaken on the concept timetable which was developed with GUTL. The main response is shown in Annex 1. However, in summary, we cannot at this time support the proposed services in GUTL's application when considered alongside existing rights, assuming the continuation of the full quantum of services which currently have committed rights.

When we consider all the capacity analyses which Network Rail and GUTL have completed, and when we consider them purely from a capacity point of view, they indicate sufficient capacity exists for six of the seven paths in each direction per day which are being sought. However, when balanced against the performance impacts forecast by the analyses undertaken, Network Rail is not able to support this application. The introduction of a further 12 services per day on this congested route will lead to a further performance reduction which would not be in the best interests of passengers and freight end users. The analysis indicates that, per service, the GUTL trains would have approximately a 36% greater performance impact than the additional Great Western Railway (GWR) services which secured access rights from the December 2019 timetable. Our position is consistent with the direction to "manage performance risks actively" and that we should "seek to retain [performance] benefits going forward" as per the 8th December 2020 ORR letter to Andrew Haines.

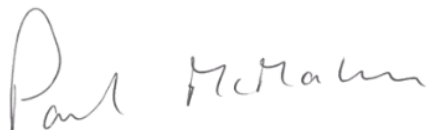
Much of the network has become increasingly busy in recent years as service numbers have increased. Network Rail, and the industry more broadly, have increasingly used performance modelling as part of access rights applications and ahead of making timetable changes. It is an important part of the evaluation process as stakeholders and passengers have an expectation that the network will performance at a high level.

The queries which were raised with Network Rail in separate correspondence from ORR about our work on this access application are covered in a response from Network Rail dated 1st December 2020. For transparency this is appended to this letter in Annex 2.

I trust our response provides you with sufficient information to inform your decision making.

Please do not hesitate to contact me if there's anything further you require.

Yours sincerely

A handwritten signature in black ink that reads "Paul McMahon". The signature is written in a cursive style with a large initial 'P'.

Paul McMahon
Managing Director, System Operator

Annex 1: Responses to ORR's Questions

Below are the more detailed responses to the specific questions set out in ORR's letter of 13 November 2020. The numbering is from ORR's letter:

5. For avoidance of doubt, the information we require Network Rail to provide by 11 December includes:

- (i) *Modelled performance impacts of the proposed services, in PPM terms. Including the overall impact and the impact per path;*
- (ii) *Contextual background of the PPM impacts, including a comparison against the modelled PPM impacts Network Rail has accepted for other additional services on the route in the last three years;*
- (iii) *A full evidence base for Network Rail's conclusions.*

Trenolabs Performance Assessment: Paddington to Bristol Parkway

This access application covers sections of the Great Western Main Line (GWML) which are either near to the limit of capacity or are expected to become close to the limit of capacity due to a planned increase in the number of services operating. For this reason, and in common with changes to the December 2019 timetable change on the GWML and the introduction of Elizabeth Line Stage 5 ("the recent exercises"), performance modelling using microsimulation has been carried out.

Because this timetable performance modelling has been carried out using the same "Trenissimo" software as the recent exercises, it allows selection of the input variables to permit comparisons. By creating separate variants of the model to include firstly the timetable changes necessary to accommodate GUTL but with the services deactivated and then secondly with the GUTL services activated it is possible to isolate the effects of the GUTL services as far as is reasonably practicable from other timetable effects.

Following three rounds of performance modelling and iterative timetable development for the December 2019 change on GWML, the same methodology forecast a reduction in T-10 punctuality for GWR Main Line services of 2.5% from May 2019 to December 2019. An example of the modelling is shown in Annex 3. The first Trenissimo model which covered a part of the GWML for December 2019 began in June 2019. The significant disruption posed by the coronavirus (Covid-19) pandemic has limited the amount of observed performance data to a period which included a significant amount of adverse weather. For this reason and also because the performance modelling methodology more closely resembles operation without cancellations, a 75th percentile performance figure has been calculated for the May 2019 and December 2019 timetables. This figure resembles a repeatable "good day" performance for the timetable and indicated an observed drop of 3.0% in PPM for GWR Main Line service groups EF01, EF02, EF03 and EF04. With not all the limited-stop London – Bristol services having commenced operation by March this year, this comparison demonstrates correlation between forecast and observed performance but with the actual impact greater than forecast.

The full results of performance modelling of the GUTL additional services are included in Annex 4. The delta between Scenarios 1 (where the changes to accommodate GUTL services have been applied to the Base scenario) and 2 (where the GUTL paths are activated) indicates that the performance impacts are experienced most strongly by GWR Main Line and Heathrow Express services, noting that the model geography for this assessment was between Bristol Parkway and London Paddington. The minimal impact to TfL Rail and CrossCountry services correlates with the minimal interaction with the GUTL services in this area.

It is to be expected that the greatest impact on the punctuality of other services is experienced by EF02 (London – South Wales) with a forecast reduction of 0.79% in T-10 punctuality. Heathrow Express services (HM01) experience a 0.83% drop in T-5 punctuality and EF01 (London – Bristol) services see a 0.44% drop in T-10 punctuality.

If converted to a similar basis as the December 2019 performance modelling results these forecasts would represent a drop in T-10 punctuality of 0.46% for GWR service groups EF01, EF02, EF03 and EF04 combined. As requested, these changes have been contrasted with the GWR December 2019 change. Because that change contained a much greater number of additional services, the table below normalises the figures to indicate the impact per additional service. An increase in the impact would be expected because the GUTL increase builds on the GWR increase and as the system approaches capacity the level of reactionary delay with each subsequent service added will increase, tending towards an exponential curve.

Service Change	Forecast Punctuality Change for GWR ML	Change in Number of Services	Average Forecast Impact per Service
GWR Dec '19 Main Line	-2.5 %	+89	-0.028 %
GUTL Introduction	-0.46 %	+12	-0.038 %

Table 1 Comparison of modelling outputs - GUTL introduction to GWR Dec 2019 Main Line services

Heathrow Express services are particularly sensitive to changes in punctuality because of the short journey time and that most passengers are travelling to catch flights. The reduction in performance will be driven by changes to their approach to London Paddington to accommodate GUTL as well as increased interactions joining at Heathrow Airport Junction.

Taken together, the capacity analysis studies which Network Rail completed collaboratively with GUTL indicate sufficient capacity for six of the seven paths in each direction per day being sought. However, when balanced against the performance impacts forecast, Network Rail is not able to support this application. We believe the introduction of a further 12 services per day on this congested route will lead to a further performance reduction which would not be in the best interests of passengers and freight end users. This position is consistent with the direction to “manage performance risks actively” and that we should “seek to retain [performance] benefits going forward” as per the 8th December 2020 ORR letter to Andrew Haines.

Network Rail may be able to reconsider this position if the access rights already granted to other operators on key sections of the Main Lines between London Paddington and Cardiff Central were reduced to maintain the balance between capacity and performance. In line with the cross-industry initiative to sustain the performance benefits realised in 2020, Network Rail will continue to work with all operators to strike a sustainable, high-performance balance between frequency, capacity, journey times and performance. This work will build on the lessons from operating the December 2019 uplift to deliver a more robust timetable.

Network Rail has considered operational mitigations to the performance decrements which have been identified through analysis on this application. Mitigations could include:

- Additional dispatch staff at London Paddington to support right-time departures on 2-minute headways during the evening peak
- Rescue locomotives at key locations to haul Class 91 sets during power or traction failures, especially in the Severn Tunnel
- Planned introduction of Class 802 traction in Phase 2 of the GUTLs service introduction, providing increased robustness against power or traction failure and improved traction performance

Network Rail does not believe that these mitigations would be sufficient to resolve the key performance challenge with these services, which would be increased reactionary delay experienced on the most congested sections of the GWML.

Bristol to Cardiff Central: Path Variance Assessment

To supplement the performance modelling work undertaken, Network Rail has prepared a performance assessment based on Path Variance Analysis using existing train service performance shown against their Working Timetable (WTT) paths. This assessment allows us to demonstrate the risks associated with the proposed paths based on the performance of existing WTT trains on the section beyond that included in the performance modelling. The full analysis is in Annex 5 entitled '20201126_PerformanceAssessmentOfGUTPaths_v1' that is attached to these representations.

The analysis indicates that the performance of the preceding trains would give Network Rail confidence that the capacity proposed to be used for GUTL is consistently available for 3 of the 6 train slots west of Bristol Parkway, which have demonstrable capacity alongside existing access rights. The conclusions of this assessment have been combined with the outcomes of the Bristol to London Paddington performance modelling to draw an overall conclusion. Note: there are some services which do not appear on the graphs in this assessment. This is due to the limitations in the amount of available data for trains operating in the December 2019 prior to the reductions in services due to Covid-19.

If there are insufficient numbers of each train service, then the software will not include the train headcode in the analysis. This does not invalidate the conclusions drawn from the analysis, as the data shows the trains preceding the GUTL service, which allows for the main conclusions to be drawn.

Down Direction – 11:00-16:00

Based upon analysis of the first tranche of diagrams showing train paths from Patchway heading west, from 1100-1600 the first GUTL service to enter the area is the 1B70 (09:58 London Paddington to Cardiff Central), this follows the 08:23 1F10 Portsmouth Harbour to Cardiff service which based upon the analysis is a reasonably well performing service. It is noted that as this service enters the area having missed the morning peak that any delay which may be imported from east of Bristol Parkway would not have a material knock on effect for any subsequent services that it interacts with.

A similar position is considered for 1B72 (11:59 London Paddington to Cardiff Central), again following a Portsmouth Harbour to Cardiff Central Service (1F14) which demonstrates minimal path variance.

Finally, in the analysis for this 11:00 – 16:00 section of the timetable is the third GUTL service, 1B75 (12:58 London Paddington to Cardiff Central) which follows the third Portsmouth Harbour to Cardiff Central and again this service performs well and shows little risk west of Bristol Parkway.

Based upon the analysis provided, of the above three paths, Network Rail notes there is little apparent performance risk west of Bristol Parkway within this time period.

Down Direction – 18:00-22:00

There are performance concerns over the 17:15 GUT London Paddington to Cardiff Central service (1B80) which follows the poor performing 1B25 GWR service (London Paddington to Swansea) – the analysis shows that this service is regularly late by the time it enters the Wales Route and the allowances built into the path have only a marginal impact in Western Route, but once it arrives at Bristol Parkway it begins to lose time and does not recover. Variance to the timetable reaches circa 300 seconds by the time the service reaches Cardiff Central and only increases further en-route to Swansea. The introduction of another service in an already busy section of the timetable only imports further risk into the timetable in Wales based upon the analysis. At this point without any apparent mitigations, Network Rail would not support the introduction of this service.

The 18:15 GUT London Paddington to Cardiff Central service (1B82) is sandwiched between two GWR services (1B28 18:14 London Paddington to Carmarthen and 1B29 18:18 London Paddington to Cardiff Central) leaving London in the evening peak so there is concern over those services affecting each other in what is already a tight schedule, and although compliant only imports further risk into a congested timetable, Network Rail do not support the introduction of this proposed service as the performance risk would be too significant.

Up Direction – 08:00 – 12:00

The GUT 1L73 and 1L75 services (Cardiff Central – London Paddington services) show little risk from path variance. The path variance analysis indicates risk to 1L77 (GUT 10:38 Cardiff Central to London Paddington) based on its apparent position between a GWR Cardiff Central to Portsmouth Harbour (1F13) service and a GWR 10:41 Cardiff Central to London Paddington service (1L15). The concept train plan development work for the GUTL paths has however re-timed 1L15 significantly later (10:55) which means 1L15 is not close to 1L77 and the level of risk associated with this path is low, west of Bristol Parkway.

Up Direction – 12:00 – 19:00

The analysis covering GUT's 1L81, 1L85 and 1L89 does not present any obvious risks to train running west of Bristol Parkway.

Contextual Background of Additional Services

In order to set the basis for answering the "Contextual background of the PPM impacts, including a comparison against the modelled PPM impacts Network Rail has accepted for other additional services on the route in the last three years;" Network Rail has interpreted this as reviewing access rights applications and service introductions, of a similar size or greater, proposed between the Subsidiary Change Date 2018 and now which operate on a significant part of the same route. On that basis, the qualifying service introductions are the GWR service changes for the December 2019 and May 2020 timetable changes, the MTR Elizabeth Line (MTREL) changes for December 2019 timetable, and the ongoing development of the timetable for Phase 5 of the MTREL service introduction (which is due in 2022). For completeness we have provided context for other sales of access rights on the routes GUT plan to use.

'For all sales of access right, the level of evidence presented as part of the sale of access rights application process is based on a judgement in each individual case. Factors such as the current capacity utilisation of a route and the scale of the change will be considered when the level of assessment is considered. The evaluation of the application will then range from an expert view of the implications of changing the service levels at one end of the scale, to detailed performance modelling and timetable iterations at the other.

December 2019 and May 2020 Service increases GWR Services on GWML

The December 2019 timetable change for GWR represented the realisation of outputs from The Greater West programme of electrification, network enhancement and rolling stock replacement. This timetable change involved significant changes to sectional running times to take advantage of the enhanced rolling stock as well as uplifts in frequency and changes to the repeating hourly structure of the timetable to allow for both of these changes and to increased standardisation of the timetable on parts of the Western Route.

Infrastructure enhancements at Reading station, Bristol Parkway and along Filton Bank relieved bottlenecks to permit significant frequency increases. These frequency increases would take other parts of the network to near their capacity limit, especially between Swindon and London. To test the impact of these changes, Network Rail and GWR carried out performance modelling using Trenissimo modelling and also carried out an extensive independent expert review of the changes.

During development of the timetable, to balance the needs of freight and passenger users whilst maintaining performance it became necessary to compromise the desired service specification for GWR services and remove off-peak calls at Didcot Parkway for South Wales services and put them in other service groups. Additionally the performance modelling identified other performance mitigations which were required, including but not limited to increases in planned journey times between London Paddington and Reading and acceleration improvements for the Class 80X rolling stock.

With the initial performance modelling outcomes not proving acceptable, three further iterations of the timetable were made and tested using performance modelling software before the timetable was implemented. This process was also able to inform an extensive operational readiness and communication workstream to make sure staff and passengers were best-placed to deliver a high-performing timetable from day 1.

It was also agreed as a further performance mitigation, amongst other operational reasons, to phase the implementation of the majority of the inter-peak limited-stop Bristol Temple Meads to London Paddington via Bristol Parkway services. These services have rights, but have not yet operated in the timetable. This would reduce the capacity and fleet utilisation during the crucial 'bedding-in' period for the timetable change and also allow monitoring of real performance to confirm that performance was high enough to allow them to start operating. The Coronavirus pandemic has since further postponed the introduction of these services.

The additional rights necessary to support this timetable change were sought in GWR supplemental agreements 38, 40 and 48.

MTR Elizabeth Line Timetable Performance Assessments

The [Crossrail Track Access Option](#) (TAO) was signed in 2008 and was restated in 2014. This TAO identifies in detail the process which determines whether TfL (as the current option-holder) is able to draw down the access rights. A “Railway Systems Model” is defined within the TAO, at the core of which is a performance model built in software known as “TRAIL”. The configuration and assumptions for this model as well as the creation of a 24-hour weekday timetable to input to the model were the result of extensive cross-industry consultation in 2016 and 2017. The TAO defines a “Performance Threshold” (Schedule 12) which at the time of statement of the TAO was set at 92%. Following the serving of a Commitment Notice in 2016, the sixth iteration of a whole-day Crossrail timetable (with interacting services) was input to the Railway Systems Model in 2017. That Model forecast punctuality above the Performance Threshold which then required Network Rail to enter into a Track Access Contract, which subject to industry consultation in line with the normal processes was signed in 2018.

Having completed these tests of capacity and performance, Network Rail has been working with the industry through the Event Steering Group (ESG) process to update the timetable in light of more recent changes to the train plan and in pursuit of a higher performing timetable. This work has involved performance modelling using a different methodology compared with TRAIL, which is carried out by Treno Labs. It allows Network Rail to directly compare outcomes of the analysis for Crossrail with recent performance modelling for the December 2019 timetable change. The findings from this modelling are being used to develop further iterations of the Concept Train Plan which we expect to achieve higher performance than the first 2020 iteration of the Concept Train Plan (which is the 7th iteration overall). This work is overseen by the ESG, of which Grand Union are a part, and is how Network Rail is working with the industry to achieve the benefits and reliable service which our customers expect. Network Rail also notes with respect to Crossrail that the most recent timetabling work being carried out includes an assumption that Grand Union will be running trains that are the subject of its current application for access.

As noted previously, the train service specification for the Elizabeth Line has been tested extensively since 2008 through an iterative process of timetable development and performance modelling. By 2018, six iterations of this process had been carried out when it became clear that the Crossrail Central Operating Section (CCOS) would not be able to open as planned to permit the culminating Stage 5 of the Crossrail project to take place. To respond to this challenge, MTREL developed an interim “5A” timetable which could be implemented on the existing infrastructure and would involve MTREL services terminating at London Paddington.

Due to the high capacity utilisation of the network affected by these changes, it was agreed to use a comprehensive performance analysis approach to determine the most appropriate service specification into three strands. These three strands were:

- Independent expert review of the changes along with operator and Network Rail readiness for them
- Operational simulation of the revised timetable using a signalling simulator at Thames Valley Signalling Centre
- Timetable Performance Modelling using Trenissimo

A concept train plan was developed by Network Rail using collaborative operator input to permit the analysis strands described above to take place. The outputs from the three analysis strands were brought together for review in a workshop chaired by Network Rail and attended by MTREL, GWR and their respective service specifiers, TfL and DfT.

The output of the assessment work led to a number of detailed changes to improve performance in the timetable but the most significant decision was to remove 2tph of Maidenhead to London Paddington services from the off-peak service specification. This was in response to outputs from the modelling which identified performance degradation associated particularly with the high throat utilisation at London Paddington. Reduction of the specification in this way allowed existing connectivity to be maintained for passengers, whilst permitting longer turnround times at London Paddington for some services, along increased recovery from any perturbation experienced through the day.

The rights for the MTREL services included in this change had previously been drawn down on the basis of the extensive testing defined by the TAO process but these rights required extension to cover the network between Portbello Junction and London Paddington. The rights necessary to support the amended and reduced specification for MTREL services in this change were sought in MTR’s 8th supplemental agreement.

Wales Route

On Wales Route, there have been comparatively few service changes in the intervening period of time. There have been four applications for access rights in the defined time period. They were assessed by the Route Performance Manager, and considered to be of minimal impact. The most significant change brought forward was the 98th supplemental agreement, which increased the number of services West of Cardiff Central. The majority of these service changes were made on a Sunday, which had a lower number of trains operating when compared with midweek, so the performance risk of introducing more services, which did not exceed levels of the midweek timetable was judged to be acceptable.

Freight

There have been several applications for rights across Western Route over the last three years, however, it is not straight-forward to draw parallels with track access applications for freight services and passenger services. The usual process for access rights for freight services tends to be different to passenger applications. Most access rights applications for Freight services are made after the services have started operating. Therefore, there is an established view for the performance impact of running the freight service prior to the sale of rights taking place.

A recent example of freight performance evaluations is the Freightliner 9th supplemental agreement. Network Rail was approached with an application to secure access rights for Mendip traffic, which had been transferred between freight operating companies during 2019. Whilst all the services were in the timetable, Network Rail did not support all the rights being sought. We undertook a significant amount of performance assessment to demonstrate which services were operating at a good level of performance from having operated already. 125 services taken to panel were approved on the basis that the services were operating at 92.5 % FDM (which is the regulatory target) or better. 53 services rejected due to their performance not meeting the specified level. For those services, Network Rail is looking to put in place performance improvement plans, which may allow for a supported application in future.

Capacity at Cardiff and Cardiff to Carmarthen

To test the availability of sufficient capacity at Cardiff Central to accommodate the GUTL services the development timetable constructed as part of a project to assess Transport for Wales' (TfW) plans for enhanced service patterns from December 2022 was used as a base for the analysis. This was to ensure that the greatest quantum of services likely to be encountered during the first phase of GUTL's operations was accounted for.

Assumptions were agreed with GUTL relating to ancillary movements associated with the services to and from Cardiff. These included the use of diesel locomotives to drag the Class 91 + Mk 4 sets to and from an assumed stabling location in the Swansea area, the requirement for 10-minute dwell times to allow for attachment and detachment of the assisting locos, the use of Pengam Reception Sidings as a reversing location for locos detaching in the Up direction, and the use of Canton Sidings as a stabling point for the locos between duties.

On the basis of these assumptions it was found possible to construct a platforming plan at Cardiff Central which accommodated all six GUTL services in each direction, together with the necessary ancillary movements. Flexing of operators' services was necessary to achieve a compliant plan, the full details of which are available in the technical note (Annex 6 'GUT at Cardiff Technical Note v1.0 Final'. This includes a subjective assessment of the overall feasibility of the solution, based on the degree of flexing required and the need for assumptions as noted above. A sample hour platforming bar chart is also illustrated in the technical note.

Development of the Concept Train Plan is expected to continue along with associated performance modelling, governed by the cross-industry Event Steering Group for Wales and Borders.

A high-level assessment was also made of the viability of proposed extensions of GUTL's services to and from Carmarthen during the second phase of operations, using bi-mode units of the Class80x family. A key variable here is uncertainty in TfW's plans for stopping services between Cardiff and Swansea, which means the conclusion reached that paths for GUTL's services appeared to be compatible with those services can only be valid for the current assumption, which is expected to change.

The capacity concerns for the extensions west of Cardiff relate to platforming capacity at both Swansea and Carmarthen stations. Some platform sharing of TfW's services would be required, and in the case of Carmarthen the overnight stabling of TfW units may compromise capacity for GUTL's first morning departure and the last two evening arrivals. The stabling plans and associated unit diagrams for TfW's units are still at an early stage in development, however. Significant flexing of freight services would be required, particularly to those operating to and from Margam Yard. The technical note shows details of the flexing required.

Based on the assumptions made, Network Rail believes there is sufficient capacity to accommodate the six pairs of GUTL services per day at Cardiff Central. Whilst incompatibilities with aspired changes for Tfw services were noted for the extensions to the west of Cardiff Central, it is expected these can be resolved through the cross-industry timetable development process.

The introduction of regular coupling and un-coupling incidences to allow the Class 91-hauled services to be brought in from stabling locations to the west of Cardiff increases performance risk at Cardiff Central. The station already has the highest level of reactionary delay in Wales, due mostly to high utilisation of platform capacity and minor perturbation on their approach by multiple service groups. Because three of the stock movements per day will not be able to proceed to their assumed stabling location in the Swansea area without a successful coupling operation to a diesel locomotive, this introduces additional risk over existing coupling activities for DMU services at the station which can at least proceed separately if a coupling attempt fails.

In order to provide the full evidence base for Network Rail's conclusions, the following Annexes are appended to the email issuing this letter:

Annex 2

Separate attachment containing letter from Chris Rowley shared with Gareth Clancy on 1 December 2020.

Annex 3

Example of Treno Labs modelling report, undertaken as part of the development of the December 2019 timetable service increases.

Annex 4

RailAspects / Treno Labs performance modelling report for GUTL services.

Annex 5

Path Variance Analysis performance assessment, covering Patchway to Marshfield (outside Cardiff)

Annex 6

Technical note covering capacity assessment for Cardiff Station (phase 1 of the application) and extensions beyond Cardiff (phase 2 of the application).