



Magor and Undy Walkway Station

GRIP Stage 1 - Output Definition

March 2016

Magor Action Group On Rail (MAGOR)

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1 Introduction

1.1 Background to Study

In October 2005 a Sewta Rail Strategy Study was produced which covered:

- A review of the former TIGER Strategy recommendations for a new station to serve the communities of Magor and Undy suggested that there were 5 possible locations for a new station:
 1. Llandeenny – accessed from the road leading from M4 Junction 23a to Green Moor.
 2. Magor Old Station Site – accessed from Redwick Road.
 3. Magor with Undy – at the footbridge linking Chapel Terrace with Whitewall and with highway access from the B4245 Main Road through the open land to the north.
 4. Undy – site recommended in the TIGER Strategy at the point where the B4245 Main Road parallels the railway.
 5. East Undy – access from Church Road East which leads from the B4245 at the eastern edge of the built-up area.
- A review of the demand and revenue implications,
- A review of operations and engineering issues; and,
- A review of the economics and scheme justification

The conclusion of this report was that due to the journey time savings and the freeing up of the main lines, the best outcome was given by a complete transfer of services from Severn Tunnel Junction to a new station on the relief lines at Magor and Undy.

In June 2015 the Magor Action Group On Rail (MAGOR) contacted Mott MacDonald for advice in relation to a Governance for Railway Investment Projects (GRIP) 1 and 2 study for the station site at Magor and Undy. The requirement was to consider only a walkway station at their preferred site; therefore the options would be focussed on one location. This study was formally instructed via Monmouthshire County Council in February 2016.

For further details of the history and work undertaken to date refer to the MAGOR website: <http://magorstation.co.uk/>

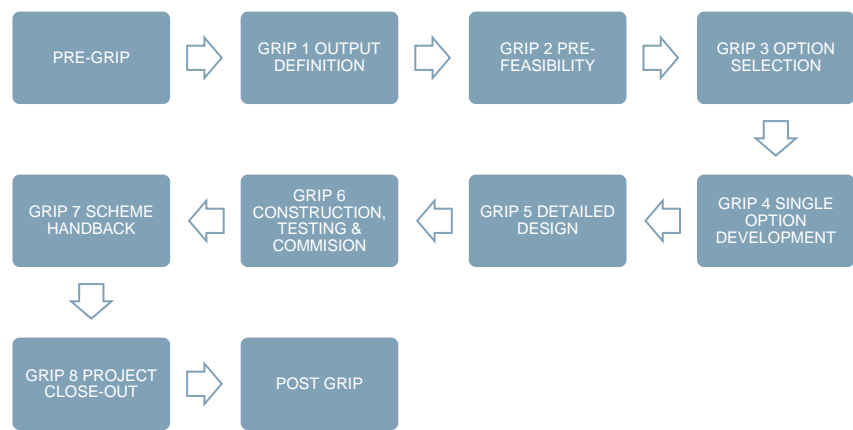
A possible station at Magor is referenced in the draft Wales Route Study and is in the current Metro Phase 2 list of potential schemes.

1.2 GRIP Study

The GRIP process is Network Rail's management and control process for delivering projects that enhance or renew the national rail network.

The GRIP process is an eight-stage process as illustrated in Figure 1.1 below.

Figure 1.1: The GRIP Process



Source: Network Rail

This GRIP 1 report states the aims of the project and defines the output for the GRIP 2 Stage. In considering the needs, requirements and opportunities for the new station site this report contains the following sections:

- Station requirements and aims.
- Information on the proposed location of the walkway station.
- Details of services currently operating through the areas and the options to be considered at GRIP 2.
- Design assumptions to be relied on at GRIP 2.
- GRIP 2 Next Steps.

2 Station Requirements and Aims

The key purpose of GRIP Stage 1 is to 'establish the scope of the investment in terms of the incremental network capability required by the investment's "client"'.

In order to successfully meet the requirements of GRIP Stage 1, discussions have been held with Network Rail Wales Route Lead Strategic Planner. In addition the guidance document Investment in Stations, published by Network Rail, has been consulted, in which the key issues for consideration are as identified in Section 5: Planning a New Station and which have been used as a basis for meeting the objectives of GRIP Stage 1 and 2.

2.1 Positive Impacts

The benefits associated with the opening of a new walkway station at Magor and Undy are:

- Increased revenue to Train Operating Company (TOC) through higher passenger numbers.
- Improved facilities for the communities of Magor and Undy.
- Reduction in number of car journeys required by commuters.
- Reduction in traffic volumes through Magor.
- A draft for consultation issue of the Wales Route Study was published in March 2015. This identifies Magor as a station which will be assessed as part of the process to develop a prioritised list of new stations that could be considered for funding from the rail industry.

2.2 Negative Impacts

The negative impacts that might be associated with a new walkway station at Magor and Undy are:

- Potential for increased journey times for existing rail passengers travelling to/from South Wales and South West of England.
- Potential impact (obstruction) on journey connections at interchanges to other mainline destinations.
- Potential abstraction of passengers from Severn Tunnel Junction.
- Disruption to existing freight services.

2.3 Affordability

The capital cost of the station will need to be considered for each layout option along with the impacts on the track, signalling, and surrounding infrastructure.

2.4 Impacts on Stakeholders

The following TOCs currently operate services that pass through the proposed location of Magor and Undy Walkway Station:

- Great Western Railway (GWR), rebranded from First Great Western, currently operates an express service between London Paddington and Swansea / Cardiff Central and a commuter service between Cardiff Central and Taunton / Portsmouth Harbour.
- Arriva Trains Wales (ATW) currently operates a commuter services between Maesteg and Cheltenham Spa.
- CrossCountry currently operates a commuter service between Cardiff Central and Nottingham.

The current proposal is based upon the station facilities being co-located with a community plaza and park being proposed by the '3 Fields community Trust'. ATW can facilitate third party retailing but ticket vending machines may still be the preferred option.

Discussions have been held with Network Rail Wales Route Lead Strategic Planner and aims of the study agreed and information useful to the production of the GRIP report requested.

3 Proposed Location

3.1 General Location

The Magor & Undy Walkway Station is aimed to cater for the local population of both towns, therefore requiring a centralised location.

Figure 3.1: General location



Source: Mott MacDonald

3.2 Route Description

The site of the proposed Magor & Undy Walkway Station is to be located on the South Wales Main Line corridor. The line has four tracks between Severn Tunnel and Newport of which higher speed passenger

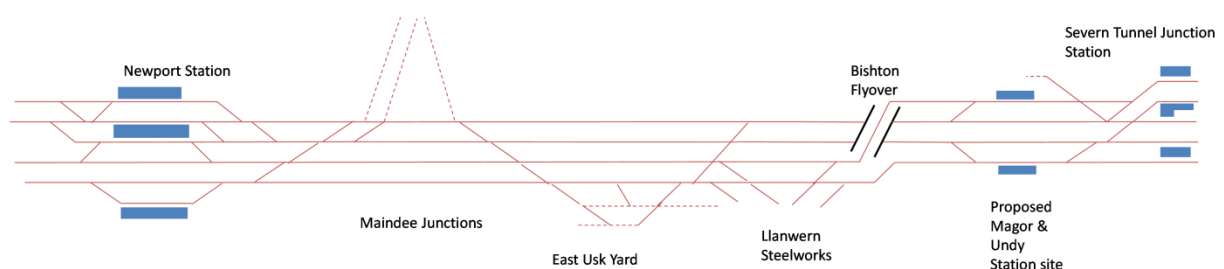
trains normally use the main lines, and lower-speed freight trains predominantly use the relief lines.

The completion of the Newport Area re-signalling in 2011 and the reconstruction of Newport station have raised the levels of performance, as well as greater handling of train capacity on the route.

3.3 Existing Track Arrangement

The line between Severn Tunnel Junction station and Newport consists of four tracks, Down and Up Main lines and Down and Up Relief lines with the opportunity to cross between the lines at Severn Tunnel Junction, Magor, Bishton Flyover, Llanwern and Maindee Junctions.

Figure 3.2: Existing Track Arrangement



Source: Mott MacDonald

3.4 Future Rail Infrastructure Development

3.4.1 Electrification

In the future, the route is to be improved with the South Wales Main Line electrification, in which all four lines are to be electrified. The route is currently undergoing preparatory works such as the reconstruction of The Ramp/Huggets Road bridge and parapets modifications with possible track lowering to gain sufficient clearance to accommodate the overhead lines at the Magor/Redwick Road bridge.

3.4.2 Rolling Stock

The Intercity Express Programme (IEP) will be introduced between Swansea, Cardiff and London, using 9-car electric trains and 5-car

electro-diesel trains. Journey times from Swansea and Cardiff to London is expected to be 15 minutes quicker, and IEP will also provide additional seating capacity for passengers.

3.5 Line Speeds

Line speeds for the Main Lines are 75 miles per hour (mph) with a higher differential speed of 90 mph for HST reducing to 40 mph in the Maindee Junction and Newport areas. The Relief Main Lines are predominately 40 mph with some stretches of 70 mph in the Severn Tunnel Junction area.

3.6 Choice of Site

The proposed location of Magor & Undy station is approximately at 150 miles 60 chains from London, with a platform on the Down Relief line and another platform on the Up Relief Line of the South Wales Main Line (NESA : GW900 seq. 002). This is 1 mile 46 chains west of Severn Tunnel Junction, and 50 chains east of the Bishton Flyover.

4 Potential Rail Services

4.1 Train Services

This study will be based upon train services that operate in the December 2015 to May 2016 Timetable. A typical hour comprises of the following services:

- 1 train from Taunton/Exeter St. Davids/Weston-super-Mare to Cardiff and return via Bristol Temple Meads (Main Line) calling at Severn Tunnel Junction; (GWR)
- 1 train from London Paddington to Cardiff and return via Bristol Parkway (Main Line); (GWR)
- 1 train from London Paddington to Swansea and return via Bristol Parkway (Main Line); (GWR)
- 1 train from Portsmouth to Cardiff and return via Bristol Temple Meads (Main Line); (GWR)
- 1 train from Nottingham to Cardiff and return via Chepstow (Main Line); Cross Country
- 1 train every two hours from Cheltenham Spa to Maesteg and return via Chepstow (Main Line) calling at Severn Tunnel Junction; (ATW) and
- Two Freight paths per hour and return on the (Relief lines).

Discussions will be held with GWR, ATW and Network Rail about any planned changes to the above services in the future.

4.2 Train Service Calls

The location of the station on the Relief lines requires down trains that are to call at Magor & Undy station to cross from the Down Main line at Severn Tunnel Junction to the Down Relief Line, call at the proposed station before crossing back to the Main Line. Up trains will run on the Main line from Newport, crossing to the Up Relief Line before the proposed station at Magor & Undy, trains then make the station call and continue Relief line to Seven Tunnel Junction before crossing back to the Main Lines.

Train services in the December 2015 timetable that call at Severn Tunnel Junction station were selected as the most appropriate to call at the new station.

- 1 train per hour from Weston-super-Mare to Cardiff and return via Bristol Temple Meads (Main Line) and
- 1 train every two hours from Cheltenham Spa to Maesteg and return via Chepstow (Main Line).

For GRIP 1 a typical hour has been considered. A full day services will be considered at GRIP 2.

4.3 Journey Time

The increased journey time for Magor & Undy station call was calculated by using a desktop time & distance analysis with gradients and rolling stock acceleration and braking rates in Excel. The results show for Class 150 stock type, an increase in journey time in the down direction of 2 minutes 26 seconds on trains towards Newport is envisaged with an increase of 2 minutes 23 seconds for journeys to Severn Tunnel Junction station. This increased journey time includes a station dwell time of 30 seconds at Magor & Undy. The Timetable Planning Rules for planning train services suggests that a 30 second dwell time for services calling at similar stations is appropriate for this station.

4.4 Initial Timetable Review

The retiming of the trains to include the station call at Magor & Undy in Newport direction shows that when compared against other trains in the timetable, the increase in journey time calculated above in the service from Taunton/Exeter St. Davids/Weston-super-Mare will affect the train following behind.

A planning headway of four minutes between trains is required by the Timetable Planning Rules. The train affected is a London Paddington to Cardiff service which will require two minutes added to each path approaching Newport to maintain this headway. The Paddington service has one minute pathing time in its schedule on the approach to Cardiff; this can be commuted to show a minute later arrival at Cardiff. The service from Cheltenham has no issues affecting trains following behind.

The trains from Newport have no impact on trains following behind however the potential late arrival at destination and reduction in turnaround has not been undertaken at this stage.

5 GRIP 1 Design Assumptions

There are a number of assumptions which have been made in progressing to the GRIP Stage 2 study, they are as follows:

5.1 Track

5.1.1 Horizontal Alignment

Based on the 5 mile diagram data, the average track radius transitions from 1391m to 4021m, in the direction of increasing track mileage (from east to west) through the location of the proposed station platforms. The associated cant is shown as 93mm, changing to 37mm at the station.

There are no apparent issues and would be compliant to Network Rail and Railway Safety and Standards.

5.1.2 Vertical Alignment

Vertically there is a 1:300 gradient, falling to high mileage. The standard maximum gradient used to be 1:500, and is currently 1:400 (Technical Specification for Interoperability), however the wording has been relaxed in group standard guidance note, and this new station is not planned to be used for terminating services and modern stock likely to be used. A constant gradient would appear to present, which is a requirement of the Railway Group Standards. A derogation may be required, but is not expected to not be an issue.

5.1.3 Other Considerations

The existing track materials will need reviewing for compliance, and a review of the condition of the track will be outlined in GRIP 2.

The proposed platforms are adjacent to an existing signal structure and signal sighting may be an issue.

The track lowering for Magor/Redwick Road bridge could impact on the cover over Westend Subway.

5.2 Signalling

5.2.1 Existing Signalling System

The area is controlled from Cardiff Signalling Control Centre (SCC) which employs Video Display Unit (VDU) technology for controls and indications. The area has been signalled using Solid State Interlocking (SSI). Any alteration to the signalling arrangements will drive VDU updates: this is a significant cost risk and will have a substantial impact on the business case for the station.

It should be noted that an update to the VDU screens will be required to show the station, however it *may* be possible to incorporate this change into another, larger update driven by a different project.

5.2.2 Signalling Infrastructure

The major piece of signalling infrastructure in the proposed station footprint is a signal gantry which supports signals NT1235 (Down Relief), NT1039 (Down Main), NT1038 (Up Main) and NT1232 (Up Relief). Taking each in turn:

- NT1235 is a controlled signal plus junction indicator that controls movements over the Relief-Main crossover just beyond the 151 milepost.
- NT1039 is a controlled signal that protects movements across the Relief-Main crossover.
- NT1038 and NT1232 are automatic signals provided for the separation of trains.

5.2.3 Platform Arrangement

It is not best practice to place a signal just before a station, especially one that has route information such as NT1235, as station duties can be a sufficient distraction to cause the driver to forget what the signal was displaying. With automatic signals the issue is less acute, but should still be avoided if possible.

Because of this, either the stations Down platform should be placed on the approach to the gantry, or signals NT1235 and NT1039 will require moving closer to the crossover. Moving the signals is not recommended: cost aside, moving the signals closer to the crossover increases the potential risk of a signal overrun and therefore makes the railway less safe.

For the Up platform, placing it beyond the signal gantry (i.e. parallel with the Down platform) may be possible, but the project should be aware that it may be resisted by TOC's.

5.3 Civil / Infrastructure

Positioning platforms adjacent to the existing highways allows easier provisions of drop off areas and facilities. Similarly the positioning of the down relief platform will need to consider emergency access and egress.

As a walkway station, parking provisions will not be a major design consideration and as such it should not have a significant effect on the local traffic. Provision will be made for the inclusion of disabled parking, cycle storage, and drop off areas. It should be noted that the proposed diversion of the M4 does not impact on the operation of a walkway station

There are plans for the development of a community centre in the Three Fields site. Depending on the final location of the platforms, a strong link could be made between the developments.

6 Station Options

From the above information there are two main options for positioning of the platforms for a walkway station at the Magor and Undy site. These options are presented below along with a short commentary on the access arrangements for each option. A more detailed review of the civil and structural engineering implications of these station sites will be presented at GRIP 2

6.1 Option A – Parallel Platforms

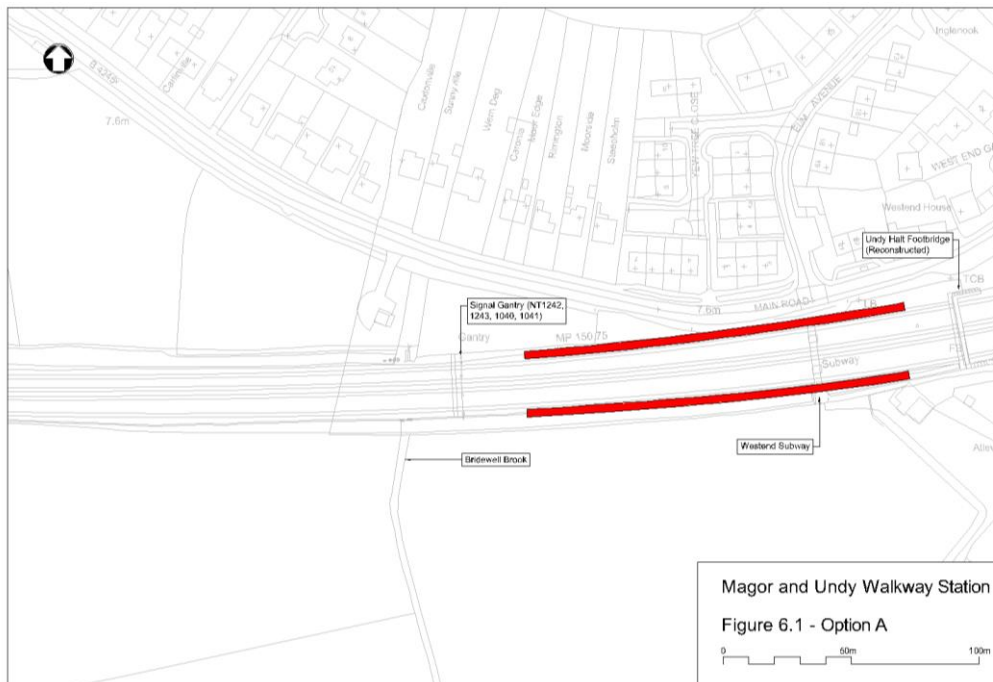
The advantages for this option are:

- Westend (Main Rd) subway could be integrated into the station infrastructure
- New Undy Halt footbridge could be integrated into the station infrastructure
- Quicker and simpler transfer between platforms

The disadvantages for this option are:

- Might require additional infrastructure
- Placing the Up Relief platform past the signalling might be opposed by the TOC's

Figure 6.1: Parallel Platforms Layout



Source: Mott MacDonald

6.2 Option B – Staggered platforms

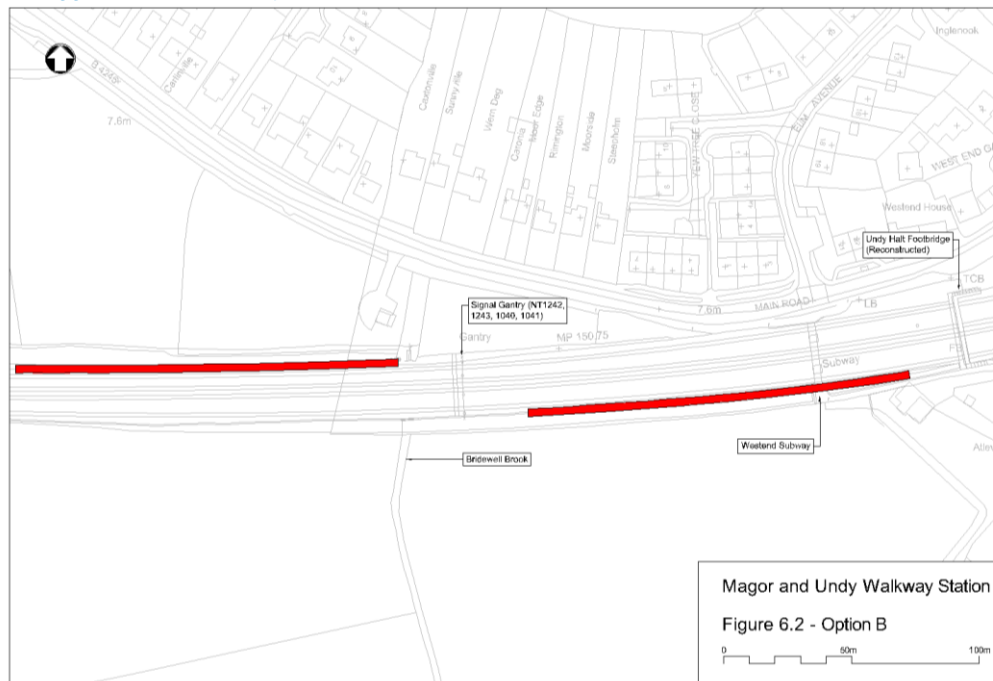
The advantages of this option are:

- No major modifications to the signalling system are required.
- Westend (Main Rd) subway can be integrated into the station infrastructure.
- New Undy Halt footbridge can be integrated into the station infrastructure.
- Better connection to the proposed location of the community centre.

The disadvantages for this option are:

- Distance between platforms is increased significantly.
- The presence of the drainage on the fields north of the Up Relief platform could complicate the platform construction.
- There is a Saxon Orchard located just North of where the Up Relief platform would be located.

Figure 6.2: Staggered Platforms Layout



Source: Mott MacDonald

7 GRIP 2 - Next Steps

As detailed in the original proposal, the following tasks are planned at GRIP Stage 2.

7.1 Detailed Timetable Study

- A Sectional Running Time review will be undertaken.
- Discussions will be held with ATW and GWR about possible planned changes to the existing timetable.
- A detailed timetable analysis will be undertaken.
- We will produce an indicative timetable for Magor and Undy station based on an agreed stopping service.

7.2 Review Rail System Implications of Preferred Site:

- We will receive the requested data from Network Rail and review all relevant data and identify potential issue and solution for the new station.
- Review the track condition and any other related issues.
- Undertake more detailed signalling review and produce a signalling scheme sketch as necessary.
- We will review the Electrical and Power requirements of new station and its implications.

7.3 Civil Infrastructure Study

- A geotechnical review of the conditions will be undertaken along with site visits from the ecology and geotechnical teams.
- An assessment into the accessibility of the proposed site will be carried out.
- The options for the preferred site station layout will be developed into an outline concept design for each station layout.

7.4 Cost Estimation

- A GRIP 2 level capital expenditure assessment will be undertaken.

7.5 Reporting

- A feasibility report with the all the previous stages will be collated. This will include a high level appraisal following Weltag 'Stage 1' guidelines and will be undertaken on the following criteria:
 - Economy, Environment and Society
 - Feasibility and Deliverability Appraisal