



Phase 2b Western Leg Information Paper

E21: Balancing ponds and replacement flood storage areas

This paper outlines the approach and background to balancing ponds and replacement floodplain storage areas, which are used to mitigate the impact on water resources and flood risk of the Proposed Scheme.

It will be of particular interest to those potentially affected by the Government's proposals for high speed rail.

This paper was prepared in relation to the promotion of the High Speed Rail (Crewe - Manchester) Bill. Content will be maintained and updated as considered appropriate during the passage of the Bill.

If you have any queries about this paper or about how it might apply to you, please contact the HS2 Helpdesk in the first instance.

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1 Introduction

- 1.1 High Speed Two (HS2) is the Government's scheme for a new, high speed north-south railway, which is being taken forward in a number of phases. Phase One will connect London with Birmingham and the West Midlands. Phase 2a will extend the route from the West Midlands to Crewe. The Phase 2b Western Leg will connect Crewe to Manchester. As set out in the Integrated Rail Plan, published in November 2021, HS2 East is proposed to deliver a new high speed line from the West Midlands to East Midlands Parkway.
- 1.2 HS2 Ltd is the non-departmental public body responsible for developing and promoting these proposals. The company works under the terms of a Development Agreement entered into with the Secretary of State for Transport.
- 1.3 The construction and operation of Phase One of HS2 is authorised by the High Speed Rail (London – West Midlands) Act 2017 and Phase 2a by the High Speed Rail (West Midlands – Crewe) Act 2021.
- 1.4 In January 2022, the Government introduced a hybrid Bill to Parliament (hereafter referred to as 'the Bill'), to seek powers for the construction and operation of the Phase 2b Western Leg (the Proposed Scheme), which is called the High Speed Rail (Crewe – Manchester) Bill. The Proposed Scheme comprises the Phase 2b Western Leg from Crewe to Manchester and several off-route works. It also facilitates the delivery of Northern Powerhouse Rail by providing the Crewe Northern Connection and junctions and other infrastructure to be used in future schemes.
- 1.5 The work to produce the Bill includes an Equalities Impact Assessment and an Environmental Impact Assessment (EIA), the results of which are reported in an Environmental Statement (ES) submitted alongside the Bill. The Secretary of State has also published draft Environmental Minimum Requirements (EMRs), which set out the environmental and sustainability commitments that will be observed in the construction of the Proposed

Scheme. For more information on the EMRs please see Information Paper E1: Control of environmental impacts.

1.6 The Secretary of State for Transport is the Promoter of the Bill through Parliament. The Promoter will also appoint a body responsible for delivering the Proposed Scheme under the powers granted by the Bill. This body is known as the 'nominated undertaker'. There may be more than one nominated undertaker. However, any and all nominated undertakers will be bound by the obligations contained in the Bill, the policies established in the EMRs and any commitments provided in the information papers.

1.7 These information papers have been produced to explain the commitments made in the Bill and the EMRs and how they will be applied to the design and construction of the Proposed Scheme. They also provide information about the Proposed Scheme itself, the powers contained in the Bill and how particular decisions about the Proposed Scheme have been reached.

2 Overview

2.1 This information paper outlines the approach and background to balancing ponds and replacement floodplain storage areas, which are used to mitigate the impact on water resources and flood risk of the Proposed Scheme. Further information on flood risk is contained in the Information Paper E15: Water resources, flood risk and authorisation of related works, as well as in the ES and the EMRs.

3 Background

3.1 The design of the Proposed Scheme includes various drainage measures to control the rate, volume and quality of water run-off from the rail corridor of the Proposed Scheme and other associated infrastructure, taking into account projected climate change impacts. These systems will help to avoid an increase in flood risk and will help to maintain natural water flow by encouraging storm water to soak into the ground or, where

that is not reasonably practicable, will discharge it into watercourses or surface water/combined sewers at a controlled rate.

- 3.2 This will be undertaken by implementation of sustainable drainage systems (SuDS) which include balancing ponds and various other drainage techniques such as use of swales and linear soakaways. Swales are shallow vegetated channels designed to convey water and which may also allow infiltration to the ground. Soakaways are sub-surface structures (usually filled with stones or rubble) into which surface water is conveyed for infiltration into the ground without a connection to a piped system. Linear soakaways usually take the form of a stone filled trench.
- 3.3 The design of the Proposed Scheme also includes measures to mitigate losses of flood water storage capacity that occur where development is required within the floodplain of watercourses.
- 3.4 Floodplains play a key role in naturally reducing volumes and rate of downstream flood flows. When ground levels are artificially raised within a floodplain area, it can reduce the amount of water storage available and increase flood flows downstream. Where possible, the design of the Proposed Scheme has sought to avoid floodplains, but where this has been unavoidable, loss of storage has been compensated for by creating replacement floodplain storage areas.

4 Balancing ponds

- 4.1 Balancing ponds are required in order to regulate water flows to avoid an increase in flooding from new surface water drainage systems. These systems include the drainage required for all aspects of the Proposed Scheme covering railway drainage, new or altered highway drainage networks and new land drainage arrangements following construction of the railway.
- 4.2 Balancing ponds are of three types:

- Attenuation ponds, which can temporarily store rapid water run-off and then discharge it at an agreed lower rate to a nearby watercourse, thereby reducing the risk of localised flooding;
- Infiltration ponds, which allow water run-off to be absorbed into the ground where conditions are suitable; and
- Hybrid ponds, which combine attenuation and infiltration features.

4.3 Balancing ponds will typically be unlined and have banks with a varying profile (see Figure 1 below). Their size will depend on local drainage requirements taking climate change allowances into account. The majority will not be designed to hold water permanently, but will be dry most of the time, except following intense rainfall events. Balancing ponds required for land drainage purposes only will often resemble depressions in the ground rather than actual ponds. These can be any of the three types listed above.

4.4 Although infiltration to ground is the preferred option for sustainable drainage systems, in certain locations balancing ponds may be designed to be permanently wet where there are site specific environmental requirements to retain water. These would take the form of attenuation ponds.

Figure 1: Example of a hybrid balancing pond during dry weather, with land potentially suitable for grazing



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- 4.5 In many cases, it is not possible to combine balancing ponds for different types of drainage systems (e.g. railway, highway and land), as they need to be kept separate due to varying ownership, management and maintenance requirements.
- 4.6 Systems have been designed to drain by gravity where possible. Pumping will only be adopted where it is unavoidable in order to save on energy and maintenance, and as pumps introduce a risk of failure. Underground attenuation tanks may also be considered in some constrained locations, but these are generally avoided for sustainability reasons and because they are always more difficult to maintain than open ponds.
- 4.7 Sustainability reasons for avoiding the use of underground tanks include:
- they do not provide habitat for wildlife;
 - they do not provide any improvement in the quality of water discharged;
 - they do not allow any water to infiltrate into the ground; and
 - they often require pumping, and hence have on-going energy requirements and CO₂ emissions.

- 4.8 Permanent access routes to balancing ponds for railway drainage will be retained by the Proposed Scheme and suitable means of access to new road drainage ponds will be constructed, which will be handed over to highway authorities (or in cases in Scotland, the roads authorities) on completion. Access and maintenance rights are not expected to be retained for most balancing ponds for land drainage since these will generally be returned to landowners.
- 4.9 Fencing requirements for railway and road drainage ponds will be assessed on a case-by-case basis, depending on a risk assessment. The degree of security required will be proportionate to the level of risk and will take into account the nature of the locality.
- 4.10 Balancing ponds for land drainage will often be located in land suitable for livestock grazing once returned to landowners. Fencing of such ponds may not be required, but a simple agricultural fence for land or livestock management purposes has been assumed in the ES.

5 Replacement floodplain storage areas

- 5.1 Replacement floodplain storage areas are provided to compensate for the loss of floodplain where the Proposed Scheme crosses existing floodplains. They assist in ensuring that the Proposed Scheme does not cause an increased flooding risk as a result of its construction or operation.
- 5.2 Replacement floodplain storage areas, as with land drainage balancing ponds, will be suitable for grazing once the Proposed Scheme is operational. Arable farming may also be possible on replacement floodplain storage areas in some locations. There is no requirement to fence these areas, unless needed for land or livestock management purposes.

6 Detailed design

- 6.1 Final arrangements of balancing ponds and replacement floodplain storage areas, including their size and depth will be finalised during the

detailed design stage. The design of all elements associated with these drainage systems, including built elements, landscape earthworks and planting will be sympathetic to its local context, environment and setting.

- 6.2 The detailed design will be done in conjunction with statutory bodies such as the Environment Agency, Lead Local Flood Authorities (e.g. county councils and metropolitan borough councils), Internal Drainage Boards and sewerage undertakers in England. In Scotland, this would be performed by the Scottish Environment Protection Agency, Local Authorities and Scottish Water.

7 Legislation and policy

- 7.1 The balancing ponds and replacement floodplain storage areas for the Proposed Scheme have been designed to ensure compliance with UK national regulations which derive from European Union legislation such as the Management of Floods Directive and the Water Framework Directive and national legislation such as the Flood and Water Management Act 2010 and Flood Risk Management (Scotland) Act 2009. Large balancing ponds may also be governed by the Reservoirs Act 1975, as amended by the Flood and Water Management Act 2010 and Flood Risk Management (Scotland) Act 2009.
- 7.2 Their design is also based on the requirements of the National Planning Policy Framework and the associated web-based Planning Practice Guidance on flood risk for England, produced by the Department for Levelling Up, Housing and Communities. In Scotland, the Scottish Planning Policy and supporting guidance apply.

8 More information

- 8.1 More detail on the Bill and related documents can be found at www.gov.uk/hs2-phase2b-crewe-manchester.