



HIGH SPEED TWO PHASE ONE INFORMATION PAPER

E27: LAND DRAINAGE

This paper describes the approach taken to land drainage issues during the preliminary design of Phase One of HS2 and the further measures to be taken during detailed design, construction and operation of the new railway.

This paper was prepared in relation to the promotion of the Bill for Phase One of the scheme which is now enacted. Although the contents were maintained and updated as considered appropriate during the passage of the Bill (including shortly prior to the enactment of the Bill in February 2017) the contents are now historic and are no longer maintained.

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 proposal for a new, high speed north-south railway. The proposal is being taken forward in two phases: Phase One will connect London with Birmingham and the West Midlands and Phase Two will extend the route to Manchester, Leeds and beyond.
- 1.2. HS2 Ltd is the non-departmental public body responsible for developing and promoting these proposals. The company works to a Development Agreement made with the Secretary of State for Transport.
- 1.3. In November 2013, HS2 Ltd deposited a hybrid Bill¹ with Parliament to seek powers for the construction and operation of Phase One of HS2 (sometimes referred to as 'the Proposed Scheme'). The Bill is the culmination of nearly six years of work, including an Environmental Impact Assessment (EIA), the results of which were 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.
- 1.4. The Bill is being promoted through Parliament by the Secretary of State for Transport (the 'Promoter'). The Secretary of State will also appoint a body responsible for delivering the Proposed Scheme under the powers granted by the Bill.
- 1.5. This body is known as the 'nominated undertaker'. There may well be more than one nominated undertaker – for example, HS2 Ltd could become the nominated undertaker for the main railway works, while Network Rail could become the nominated undertaker for works to an existing station such as Euston. But whoever they are, all nominated undertakers will be bound by the obligations contained in the Bill and the policies established in the EMRs.
- 1.6. 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 project have been reached.

¹The High Speed Rail (London – West Midlands) Bill, hereafter 'the Bill'.

2. Background

- 2.1. This paper describes the approach taken to land drainage issues during the preliminary design of Phase One of HS2 and the further measures to be taken during detailed design, construction and operation of the new railway.
- 2.2. The 'structural earthworks' (i.e. cuttings and embankments) to be constructed for the Proposed Scheme have been assessed to identify locations where existing drainage arrangements are likely to be affected.
- 2.3. The hybrid Bill also incorporates a wide variety of landscape earthwork areas to help mitigate the visual impacts of the Proposed Scheme that would otherwise arise during and/or after the construction. These are shown on the CT-o6 series drawings in the map books produced for each Community Forum Area (CFA) in Volume 2 of the Environmental Statement.
- 2.4. In some locations, structural and landscape earthworks will affect existing land drainage of agricultural and other land adjacent to the new railway. Elsewhere, they will alter the existing overland flow routes helping to drain surface water run-off from fields and areas of woodland, or change the slope of the land.
- 2.5. Additionally, the excavated material placed in landscape earthwork areas may have different water infiltration characteristics from those of the underlying geology. However, although the planned agricultural restoration measures will, so far as is reasonably practicable, seek to keep any differences to a minimum.
- 2.6. Such water infiltration alterations may increase or decrease the rate of surface-water runoff from the land, so the Proposed Scheme includes a range of measures to manage surface water on agricultural land affected by construction and operation of the new railway and associated mitigation works. In addition to new or altered ditches, 'land drainage areas' (i.e. informal balancing ponds, as described in Information paper E17, Balancing Ponds and Replacement Flood Storage Areas) are included to control the flow of surface water between source and point of discharge, and thus help mitigate the impact of flood risk in the surrounding area.
- 2.7. An extensive programme of ground investigation and testing will be undertaken before the detailed design of the Proposed Scheme is completed. The results from the ground investigations will be used to validate the water infiltration assumptions used in the preliminary design, undertaken before the hybrid Bill was submitted.

3. Preliminary design approach

- 3.1. The rate of surface-water run-off from an area of ground is relative to the water infiltration rate of that ground. In simple terms, the lower the water infiltration rate of the ground, the greater the rate of surface-water run-off during rainfall and snow-melt events.

- 3.2. The approach taken in the preliminary design was based on the principle that the rate of surface water run-off from the deposited material (e.g. embankments, environmental mitigation earthworks or sustainable placement) should be as close as possible to that from the existing ground over which the material has been placed. The surface water run-off rate from the existing ground is referred to as the 'greenfield run-off rate'.
- 3.3. Where necessary, land drainage areas and ditches have been designed to intercept run-off water and control the discharge rate to any receiving watercourse. The controlled discharge rate is usually equivalent to the greenfield run-off rate from the existing land, with the aim of not increasing flood risk (as defined in Information Paper E4, Water Resources and Flood Risk).
- 3.4. In locations where the deposited material may have a lower water infiltration rate than the existing ground, a precautionary approach has been taken to managing post-construction surface water run-off. This approach ensures that the storage volumes for land drainage areas and ditches are sufficient to accommodate surface water run-off and enable it to be discharged at the greenfield run-off rate.
- 3.5. In certain areas, where the shape of the earthworks and the track drainage system effectively remove the operational railway land from the land drainage catchment, specific measures to control surface water run-off are not required since existing overland flows across adjacent land during periods of wet weather will already be reduced by construction of the Proposed Scheme.

4. Potential refinements during detailed design and construction

- 4.1. As the ground investigation results become available, it is possible that the water infiltration rate of the deposited material may actually be greater than the relatively conservative assumptions used in the preliminary design or that it could be increased as part of the construction process in some locations. The effect of increasing the deposited material's water infiltration rate - so that it is close to, or the same as, that of the existing ground - would be to reduce storage volumes or remove land drainage areas and associated drainage ditches completely.
- 4.2. Methods to increase the water infiltration rate could include scarifying the deposited material before topsoil is placed or mixing the excavated material with another material with greater water infiltration rate.
- 4.3. Where the geology is suitable and the limits of land acquired for the railway permit, it may be possible during detailed design to look at substituting certain planned ditches with shallow depressions or 'swales'. This will allow water to infiltrate into the ground whilst enabling agricultural activities to continue in all but the severest weather. Elsewhere, it may be possible for planned ditches to be substituted with a network of conventional sub-surface drains.

- 4.4. Where this is not practicable, ditches will be provided with crossing points by culverts at appropriate locations.
- 4.5. If alternative land drainage arrangements may be feasible, it is planned to discuss such options with landowners if they express an interest in reassessing the arrangements provided for in the hybrid Bill and shown on the Environmental Statement drawings.
- 4.6. This would be done by the nominated undertaker in accordance with the terms of the following assurance set out in letter to the National Farmers' Union dated 20 June 2016).
- The nominated undertaker will identify with the farmer existing drainage arrangements on the holding. This will include the carrying out, where reasonable, of inspections of the site and of any existing plans.
 - The location of any drains cut or disturbed by the construction works will be recorded by the nominated undertaker.
 - The nominated undertaker will utilise appropriate drainage consultants to advise on drainage works and will engage with the farmer in respect of the pre and post drainage schemes that are required. The nominated undertaker will use reasonable endeavours to engage drainage consultants with working knowledge of the local conditions.
 - Prior to the commencement of significant construction works, land drains affected by the Proposed Scheme will, where practicable, be intercepted in a manner which maintains their efficiency. Work will be carried out to an appropriate specification after discussion with the farmer which may include the design (e.g. layout, falls, pipe sizes and types, outfall arrangements) and timing of any land drainage works required.
 - As-built plans of modifications to existing land drainage and of any new land drainage works will be provided to the farmer or landowner as appropriate by the nominated undertaker.
 - Where natural drainage patterns are adversely affected by the Proposed Works, the provision of supplementary drainage or irrigation works will be considered having regard to an assessment of compensation and the commercial justification by the farmer.

5. Operation and maintenance

- 5.1. After construction of the Proposed Scheme is complete, much of the land acquired to construct the landscape earthworks will be offered back to landowners for return to agricultural use as part of the land compensation discussions. Except where the nominated undertaker needs to retain full control of the land drainage arrangements (e.g. to protect the new railway from flooding), these will be transferred to the landowner as part of the package of land.

- 5.2. Once returned, such land drainage arrangements will become the sole responsibility of the landowner. Maintenance requirements will generally be consistent with normal farming practice, with any operations capable of being carried out by hand or using standard agricultural machinery. However, where appropriate, indicative maintenance plans will be provided by the nominated undertaker to landowners for guidance purposes.
- 5.3. Should a landowner decide at some stage in the future to alter the land drainage arrangements constructed by HS2, they will be responsible for any loss of agricultural productivity, any increased risk of flooding to their own land or premises, and any impacts to neighbours or other third parties.

6. More information

- 6.1. More detail on the Bill and related documents can be found at: www.gov.uk/HS2