

# Technical Standard - Highway and Access Drainage

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## List of acronyms

|       |  |
|-------|--|
| AADT  | Annual Average Daily Traffic                       |
| DMRB  | Design Manual for Roads and Bridges                |
| Defra | Department for Environment, Food and Rural Affairs |
| EA    | Environment Agency                                 |
| EIA   | Environmental Impact Assessment                    |
| EIR   | Environmental Information Request                  |
| ES    | Environmental Statement                            |
| FOI   | Freedom of Information                             |
| HE    | Highways England                                   |
| IAN   | Interim Advice Note                                |
| IDB   | Internal Drainage Board                            |
| LLAU  | Limit of Land to be Acquired or Used               |
| LLFA  | Lead Local Flood Authority                         |
| LOD   | Limit of Deviation                                 |
| PSC   | Professional Services Consultant                   |
| PRoW  | Public Right of Way                                |
| DCLG  | National Planning Policy Framework                 |

# References

| Title   | Reference                            |
|---|--------------------------------------|
| <b><i>HS2 Technical Standards</i></b>   |                                      |
| Technical Standard – Earthworks   | HS2-HS2-GT-STD-000-000001            |
| Technical Standard – Flood Risk   | HS2-HS2-EV-STD-000-000011            |
| Technical Standard – WFD Compliance Strategy  | HS2-HS2-EV-STD-000-000012            |
| Technical Standard – Watercourse Diversions   | HS2-HS2-EV-STD-000-000014            |
| Technical Standard – Groundwater Protection   | HS2-HS2-EV-STD-000-000010            |
| Technical Standard – Ecology  | HS2-HS2-EV-STD-000-000017            |
| Technical Standard – Public rights of way   | HS2-HS2-HW-STD-000-000002            |
| Technical Standard – HS2 Accesses   | HS2-HS2-HW-STD-000-000003            |
| Technical Standard – Accommodation Accesses   | HS2-HS2-HW-STD-000-000004            |
| Technical Standard – Roads  | HS2-HS2-HW-STD-000-000001            |
| <b><i>HS2 Standard Detail drawings</i></b>  |                                      |
| Drainage standard detail drawings   | HS2-ARP-DR-STD-000-XXXXXX-FD, series |
| <b><i>Other HS2 documents</i></b>   |                                      |
| Project dictionary  | HS2-HS2-PM-GDE-000-000002            |
| Consents and Approval Strategy - Water Resources and Flood Risk                     | HS2-HS2-EV-STD-000-000015            |
| HS2 London to West Midlands EIA Scope and Methodology Report                        | LWM-ARP-EV-REP-000-000010            |
| <b><i>Legislation</i></b>   |                                      |
| Highways Act 1980   | Highways Act                         |
| Flood and Water Management Act 2010   | Flood and Water Management Act       |
| <b><i>Design Manual for Roads and Bridges (DMRB) Standards and Advice Notes</i></b> |                                      |
| BD 30 'Backfilled Retaining Walls and Bridge Abutments'                             | DMRB standard BD 30                  |
| HA 103 'Vegetative Treatment Systems for Highway Runoff'                            | DMRB advice note HA 103              |
| HA 106 'Drainage of Runoff from Natural Catchments'                                 | DMRB advice note HA 106              |
| HA 107 'Design of Outfall and Culvert Details'                                      | DMRB advice note HA 107              |
| HA 118 'Design of Soakaways'  | DMRB advice note HA 118              |

| Title   | Reference   |
|---|---|
| HD 33 'Surface and Subsurface Drainage Systems for Highways'          | DMRB standard HD 33   |
| HD 45 'Road Drainage and the Water Environment'                       | DMRB standard HD 45   |
| <b>CIRIA Documents</b>  |   |
| 'Culvert Operation and Design Guide' (CIRIA C689)                     | CIRIA C689  |
| 'The SUDS Manual' (CIRIA C697)  | CIRIA C697  |
| <b>Other documents</b>  |   |
| 'Interim Code of Practice for Sustainable Drainage Systems' (NSWG)    | ICoP for Sustainable Drainage Systems                                 |
| 'National Standards for sustainable drainage systems' (Defra) (draft) | Defra's 'National Standards for sustainable drainage systems'         |
| 'Technical Guidance to the National Planning Policy Framework' (DCLG) | DCLG's 'Technical Guidance to the National Planning Policy Framework' |

# Project terminology

The project terminology used within this document can be found in the HS2 project dictionary (HS2-HS2-PM-GDE-000-000002).

## Conventions

### Mandatory clauses

The following convention is used to indicate mandatory clauses.

Mandatory clauses are differentiated from the main text of this document by use of a 'black box'. They contain the word 'shall' to indicate their status as a requirement.

### Departures

Any intention to not comply with a mandatory clause is considered to be a departure from this Technical Standard.

It is recommended that the designer discusses any proposed departures with HS2's Technical Directorate at an early stage.

### Guidance

The following convention is used to indicate guidance.

*NOTE – Guidance is differentiated from the paragraph to which it relates by use of italic type and use of the words 'should' or 'may'.*

# 1 Executive summary

- 1.1.1 This technical standard provides the technical requirements and associated guidance for the design of highway and access drainage by the HS2 project.
- 1.1.2 Adoption of this technical standard will help ensure a consistent approach to highway and access drainage across the whole project.
- 1.1.3 This technical standard is intended for use during all phases of design, from hybrid Bill design to detailed design.

## 2 Introduction

### 2.1 Highway and access drainage: function

- 2.1.1 The primary objective of highway and access drainage systems is managing surface and groundwater to the level of service required to ensure the continual and safe operation of the network. Highway and access drainage systems must also collect, transport and dispose of surface and groundwater in a safe and controlled manner that is acceptable to the consenting bodies and stakeholders.
- 2.1.2 The function of highway and access drainage system is to:
- Remove surface water from the carriageway surface
  - Control rising groundwater to be below the pavement construction
  - Remove moisture from the unbound pavement construction
  - Control surface water discharge rates
  - Prevent the surface runoff from adjacent land entering the highway drainage system
  - Ensure the risk of a polluting spillage is not increased

## 2.2 Ownership and separation from adjacent drainage systems

2.2.1 HS2 railway drainage shall have its own dedicated system and shall not receive drainage connections from highway and access drainage.

### Highway drainage systems

2.2.2 The highway drainage will be a dedicated system intercepting surface and groundwater within the highway boundary.

2.2.3 The highway drainage system will not, except in exceptional circumstances, receive positive connections from adjacent drainage systems (railway drainage systems, public surface water sewers, private drainage systems and land drainage).

*NOTE – A licence from the highway authority is normally required in such circumstances.*

2.2.4 Under Section 100 of the Highways Act 1980, highway authorities have statutory powers to discharge surface water run-off into adjacent watercourses, subject to land drainage consent.

2.2.5 Perimeter drainage systems will often be required to collect surface water run-off from adjacent land and intercept existing land drainage systems to isolate them from the highway drainage.

2.2.6 These will normally be separate from the highway drainage system, and the highway drainage system will generally be served by independent outfalls to receiving waterbodies.

*NOTE – However, where ever appropriate highway drainage may discharge into a perimeter drainage system (but not visa versa).*

### Access drainage systems

2.2.7 Similar considerations apply to access drainage systems, except that their owners cannot usually rely on the same statutory powers.

2.2.8 Importantly, there is no right to discharge access run-off into a highway drainage system and a separate outfall will be required (unless the hybrid Bill provides otherwise).

## 2.3 Stakeholders and regulatory bodies

2.3.1 There are a number of stakeholders with statutory duties or roles in drainage, surface water management and flooding. The principal interests are:



- Highways England - The Highways England is responsible for the management and maintenance, through maintaining agent contractors (MAC or similar dependent on the contract), for motorway and all-purpose trunk roads.
- Highway authorities - Local highway authorities (such as county councils, unitary authorities, London boroughs and metropolitan boroughs in the West Midlands) are responsible for the maintenance of non-trunk roads.
- Environment Agency (EA) - The Environment Agency is responsible for 'main rivers' and for the issue of land drainage consents for works associated with watercourses. The EA is also responsible for a range of other matters including groundwater protection.
- Lead Local Flood Authorities (LLFAs) - Lead local flood authorities (such as county councils, unitary authorities, London boroughs and metropolitan boroughs) are responsible for flood prevention away from main rivers. They may also improve ordinary watercourses in their areas and make byelaws.
- Internal Drainage Boards (IDBs) - Where these exist, they have the powers to maintain and improve 'ordinary watercourses' (i.e. non-main rivers) and make byelaws.
- Sewerage undertakers – Sewerage undertakers are responsible for treating sewage.

2.3.2 Refer to 'Consents and Approval Strategy - Water Resources and Flood Risk', HS2-HS2-EV-STD-000-000015, for further information on the above stakeholders.

*NOTE - In addition the design should take account of local residents, landowners and non-governmental bodies (e.g. local flood forums) that have interests in or are affected by flooding and surface water management issues.*

## 3 Environmental considerations

### 3.1 Environmental Impact Assessment (EIA)

3.1.1 Refer to the 'HS2 London to West Midlands EIA Scope and Methodology Report' (C250-ARP-EV-REP-000-000010) for Phase One, which includes various Environmental Impact Assessment sections relevant to highway and access drainage issues.

### 3.2 Environmental Statement (ES)

3.2.1 Environmental impacts are assessed prior to and during the hybrid Bill stage and are reported by means of an Environmental Statement.

- 3.2.2 Following Royal Assent, the project is obliged to comply with the Environmental Minimum Requirements (EMRs), which amongst other things state that the project cannot introduce any significant effects<sup>1</sup> beyond those already addressed in the Environmental Statement. Design development for all aspects, including highways and access drainage, need to ensure that no new significant effects are introduced.
- 3.2.3 The ES included a route wide Flood Risk Assessment (FRA) and specific ones by Community Forum Area (CFA), these identified flood risk impacts of the Proposed Scheme.
- 3.2.4 Any works for HS2 shall not exceed the Flood Risk Impacts identified within the ES and accompanying FRA.

### 3.3 Effects on waterbodies

- 3.3.1 All works affecting water bodies shall be carried out in conjunction with 'Technical Standard - WFD Compliance Strategy', HS2-HS2-EV-STD-000-000012 and 'Technical Standard – Ecology', HS2-HS2-EV-STD-000-000017.

## 4 Highway and access drainage: design approach

### 4.1 Design approach

- 4.1.1 Refer to 'Technical Standard – Roads', HS2-HS2-HW-STD-000-000001, for full explanation of 'design basis' for new, realigned or diverted roads.
- Roads design basis is DMRB**
- 4.1.2 Unless otherwise agreed with the highway authority, drainage systems should be designed in accordance with the appropriate Design Manual for Roads and Bridges (DMRB) standards and advice notes.
- 4.1.3 Refer to Section 5 for the approach to be taken for the discharge of drainage runoff.

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<sup>1</sup> Refer to the 'HS2 London to West Midlands – EIA Scope and Methodology Report' (C250-ARP-EV-REP-000-000010) for the definition of a significant effect. An equivalent definition is likely to be adopted for Phase Two in due course.

### **Roads designed to other design bases**

- 4.1.4 Other design basis includes, 'As existing', 'HS2 urban street design criteria' and 'HS2 rural road design criteria' which is explained in full in 'Technical Standard – Roads'.
- 4.1.1 Unless otherwise agreed with the highway authority, drainage systems should be designed in accordance with the appropriate Design Manual for Roads and Bridges (DMRB) standards and advice notes.
- 4.1.2 The design will utilise as much of the existing highway drainage systems as is reasonably practicable. Where this cannot be achieved, refer to Section 5 for the approach to be taken for the discharge of drainage runoff.

### **HS2 accesses**

- 4.1.3 Where appropriate, an HS2 access drainage system may connect to the general railway drainage system.
- 4.1.4 Elsewhere, refer to Section 5 for the approach to be taken for the discharge of drainage runoff.

### **Accommodation accesses**

- 4.1.5 Where feasible, drainage of private accesses will utilise any existing surface drainage system within the property curtilage.
- 4.1.6 There will usually be no connection to a third party drainage system unless there is an existing consented surface water or combined sewer connection.
- 4.1.7 For new outfalls, refer to Section 5 for the approach to be taken for the discharge of drainage runoff.

### **Public rights of way (PRoW)**

- 4.1.8 Unless otherwise agreed with the highway authority, drainage systems should be designed in accordance with the appropriate Design Manual for Roads and Bridges (DMRB) standards and advice notes.
- 4.1.9 Suitable outfalls should be identified for any drainage works, with possible options including:
- Existing public right of way drainage system – preferred option
  - Soakaways – where ground conditions permit refer to drainage standard detail drawing HS2-ARP-DR-DDE-000-000002-FD for further information.
  - Nearby highway drainage system – subject to local highway authority agreement. Refer to drainage standard detail drawing, HS2-ARP-DR-DDE-000-000017-FD, which illustrates the different types of highway drainage system.

## Highway and access drainage components

### Surface drainage

- 4.1.10 The surface drainage will be designed to use a range of surface drainage systems, such as kerbs and gullies, 'over the edge' dispersal, channels and ditches, and will complement the systems already in situ where roads and private accesses are diverted.
- 4.1.11 On embankments, it will often be possible to adopt an 'over the edge' approach to dissipate carriageway runoff unless surface contours or any footway kerbing result in large areas draining to a single point.
- 4.1.12 Similarly, if the highway or access is nominally at grade then an 'over the edge' approach can still be adopted provided that verge levels are kept slightly (typically 25 mm) below the edge of carriageway.
- 4.1.13 In cuttings, it may also be possible to adopt an 'over the edge' approach to collect carriageway and slope runoff by means of filter drains or linear soakaways (where ground conditions permit).
- 4.1.14 A positive drainage system shall be provided at the end(s) of overbridges (including green bridges) as necessary to collect runoff from the structure surface in a controlled manner in order to prevent erosion.
- 4.1.15 A positive drainage system shall be provided from any low points located within underbridges and their immediate approaches as necessary to collect runoff from the carriageway, footway and paved verge surfaces.
- 4.1.16 Wherever feasible, underbridge drainage systems should be designed to operate by gravity in order to avoid the need for pumping systems requiring maintenance.
- 4.1.17 Where a positive drainage system requiring kerbing is used, it may be preferable to use kerbed offset gullies rather than installing long lengths of kerbing on rural roads. This arrangement also benefits any non-motorised users who may be walking or riding along the carriageway edge (where no separate path is provided).
- 4.1.18 Trapped gullies may be used to minimise the risk of pollution from highway surface water drainage systems. Similarly, catchpits may be used rather than conventional manholes on highway drainage carrier drain systems to act as silt traps.
- 4.1.19 Refer to standard detail drawing HS2-ARP-DR-DDE-000-000017-FD for typical highway drainage details to capture surface runoff and highway standard detail drawing HS2-CSI-HW-DDE-000-000721-FD for permeable pavement.

### Sub-surface drainage

4.1.20 Sub-surface drainage in cuttings must not only provide for the necessary drainage of the pavement layers but also the removal, to an adequate depth, of any groundwater that may be present in the cutting.

4.1.21 Sub-surface drainage will generally only be required for main roads, in particular motorways and trunk roads managed by Highways England.

### Perimeter drainage

4.1.22 Toe ditches or filter drains shall be provided along embankments where necessary to intercept significant flows onto adjacent land from the side slopes and/or 'over the edge' surface drainage systems, where used. They shall also be provided in other areas where there is the potential for water to collect and pond.

4.1.23 It is essential that existing land drainage and runoff from external catchments shall be taken into account in the design of highway drainage. See DMRB advice note HA 106 for specific advice.

4.1.24 It is essential that all runoff from existing land drainage systems must be kept separate from the carriageway piped drainage systems (except where the highway authority is known to be willing to grant a licence).

4.1.25 Where a cut-off ditch or filter drain is provided to intercept runoff from adjacent land, the design must ensure that no surface water from the external catchment is connected to the attenuated highway surface drainage system.

4.1.26 Refer to drainage standard detail drawing HS2-ARP-DR-DDE-000-000001-FD for ditches and drainage standard detail drawing HS2-ARP-DR-DDE-000-000003-FD for swales that may be used as perimeter drainage.

### Highway balancing ponds

4.1.27 Highway balancing ponds may be provided as a means to control discharge rates to receiving watercourses. This is usually achieved by maintaining 'greenfield' run-off flow rates (or other agreed maximum allowable outflow rates) via a suitable outlet control structure.

4.1.28 Ponds can be dry or wet outside storm events. A dry (infiltration only) only pond does provide some treatment value. Wet (attenuation only) ponds permanently retain some water, and act as a sump to collect silt and other suspended material over time. Wet ponds can be planted with reeds and similar which provide more vegetative treatment. A hybrid pond provides both infiltration and attenuation attributes.

- 4.1.29 Both dry and wet ponds will need to be cleaned out periodically, so access tracks will need appropriate radii and turning heads for articulated tanker vehicles.
- 4.1.30 Refer to drainage standard detail drawing HS2-ARP-DR-DDE-000-000013-FD for details of balancing ponds.

- 4.1.31 Ponds shall have an overflow, usually a weir or spillway, so that in event of normal controls being blocked or a very high return period rainfall event, water can escape from the pond in a controlled manner.
- 4.1.32 A highway access with a turning head and appropriate vehicle parking shall be provided at each highway pond to ensure ease of maintenance

### **Soakaways**

- 4.1.33 Where ground conditions and groundwater source protection zones considerations permit, linear or deep soakaways may be used to discharge surface water from highways and accesses.
- 4.1.34 Refer to drainage standard detail drawing HS2-ARP-DR-DDE-000-00002-FD for details on a linear soakaway.

## **4.2 Design for climate change allowance**

- 4.2.1 The Climate Change factor shall be 30% and this must be applied to the design of all non-Highways England owned roads and accesses.

*NOTE – This figure is based on DCLG's 'Technical Guidance to the National Planning Policy Framework'.*

## **4.3 Design criteria**

### **Road design basis – 'DMRB'**

- 4.3.1 The applicable DMRB standards and advice notes shall be used.

### Roads designed to other design basis

4.3.2 Except where otherwise agreed with the highway authority, the following design criteria shall be adopted.

- 4.3.3 The drainage system shall be designed on the basis of no surcharge of the piped drainage system during a 1 in 1 year rainfall event (including climate change allowance) and no flooding of the running carriageway during a 1 in 5 year event (including climate change allowance).
- 4.3.4 Drainage pipes shall be designed to ensure self-cleansing.
- 4.3.5 Combined surface and sub-surface water drains (filter drains) shall be designed for no surcharge during a 1 in 1 year rainfall event (including climate change allowance) and must not surcharge into the pavement construction during a 1 in 5 year event (including climate change allowance).
- 4.3.6 Surface water flows in excess of those arising from the existing unpaved surface, usually referred to as the 'greenfield' runoff rate, shall be attenuated to the 1 in 100 year rainfall event (including climate change allowance).
- 4.3.7 Perimeter drainage shall be designed to a 1 in 75 year rainfall event (including climate change allowance) in accordance with DMRB advice note HA 106 using a method appropriate for the catchment size.
- 4.3.8 Ditches shall be lined within Inner Source Protection Zones (SPZ1) to prevent infiltration as set out in the Environment Agency's policy on Groundwater Protection where infiltration prevention is necessary for other environmental or geotechnical reasons or where required to control erosion. Refer to 'Technical Standard – Groundwater Protection', HS2-HS2-EV-STD-000-000010 for further information.

*NOTE – Ditches may also need to be lined in other circumstances, e.g. to control erosion or to prevent infiltration along the top of a cutting.*

- 4.3.9 Any culverts shall be designed in accordance with DMRB advice note HA 107 and CIRIA C689 'Culvert design and operation guide'.
- 4.3.10 Attenuation ponds shall be designed in accordance with CIRIA C697 'The SUDS Manual' to attenuate flows for rainfall events of a 100 year return period plus the climate change allowance. The storm duration to be used in the design of attenuation pond storage volumes is the 'critical storm duration' and is defined as the duration of a rainfall event, with a return period of 100 years, which generates the maximum storage volume within the pond in consideration of the maximum allowable outflow discharge rate.
- 4.3.11 The pond shall be benched to incorporate shallow areas towards the margins and the maximum depth of water in attenuation ponds shall be 3.0m. A gentle slope shall be

provided from inlet to outlet, with a maximum gradient of 1 in 100. The length/width ratio, dependent on specific site constraints, shall be within the range minimum 2:1 to maximum 5:1. The pond side slopes shall be no steeper than 1 in 3 and preferably shallower. Inlets and outlets shall be provided with erosion protection within the pond and receiving watercourse and shall be located to ensure maximum flow path through the pond, which may require provision of baffle arrangements. Erosion protection, using riprap (or similar), shall be provided at the outlet from all attenuation ponds to receiving watercourses, where flow velocities dictate.

- 4.3.12 Soakaways shall be designed on an individual basis using DMRB advice note HA 118.
- 4.3.13 Infiltration shall only be considered where there is at least 1 metre of unsaturated zone between the base of any soakaway system and the groundwater. Where there is a risk of groundwater contamination, treatment systems should be installed upstream of the soakaway.
- 4.3.14 Wetlands shall be designed in accordance with CIRIA C697 and DMRB advice note HA 103.
- 4.3.15 Retaining structure drainage shall be designed in accordance with DMRB standard BD 30.
- 4.3.16 Spillage risk and control of pollution shall be assessed in accordance with HD 45 for roads with an annual average daily traffic (AADT) flow of 10,000 vehicles or more.

### **HS2 and accommodation accesses**

- 4.3.17 The above considerations shall apply to any paved HS2 and accommodation accesses with positive drainage systems.
- 4.3.18 The need for specific drainage measures on paved HS2 and accommodation accesses using 'over the edge' dispersal, and also unpaved HS2 and accommodation accesses, shall be considered on a case-by-case basis.
- 4.3.19 Where accommodation accesses slope towards a public highway, surface water shall be intercepted at the boundary to prevent runoff into the highway.

### **PRoW**

- 4.3.20 The drainage system should normally be provided on a 'like for like' basis unless there is an engineering reason requires something different (e.g. to drain a new low point).
- 4.3.21 Where piped drainage is required, gravity drainage systems should be adopted and the use of equipment (e.g. pumps) avoided.



## Groundwater inflows

- 4.3.22 Drainage system design shall consider potential inflows of groundwater into pipes and ditches and shall ensure that sufficient capacity is allowed for this within the design flow and sensitivity testing.
- 4.3.23 Attenuation facilities shall also allow for groundwater contributions, while noted that in many situations any intercepted groundwater may have formed baseflow to the receiving watercourse in any case.

4.3.24 Refer to 'Technical Standard – Groundwater Protection' for guidance on groundwater.

## 4.4 Flood risk

### General

- 4.4.1 The design of highway and access drainage must ensure that there is no increase in the risk of flooding and the flood routing of excess surface flows shall be checked to ensure that there is no risk to property.
- 4.4.2 DMRB standard HD 45 shall be followed for motorways and trunk roads and, unless otherwise agreed, local highway authority roads.

### Potential impact on HS2

- 4.4.3 A sensitivity test shall be undertaken for any highway and access drainage systems located near the HS2 Line of Route which could potentially flood the railway in a 1 in 1000 year return period event.

*NOTE - Particular attention should be paid to any nearby receiving watercourses, perimeter drainage ditches, perimeter filter drains, soakaways or attenuation ponds located above sub-ballast level where the railway is in cutting.*

- 4.4.4 Refer to 'Technical Standard – Flood Risk', HS2-HS2-EV-STD-000-000011 for further information.

## 5 Disposal of surface water

### 5.1 General

5.1.1 The design will be in line with the approach required by the Flood Water and Management Act 2010 and Defra's forthcoming 'National Standards for Sustainable Drainage' that requires the priority of discharge to be:

- i. Into the ground
- ii. To a surface water body
- iii. To a surface water sewer
- iv. To a combined sewer

### 5.2 Discharge into the ground

5.2.1 Infiltration systems are the preferred means for the disposal of surface water runoff. This is implemented by the Flood and Water Management Act and is set out in Defra's forthcoming 'National Standards for Sustainable Drainage'. There is a stipulation that the quality of the water discharged to ground will have no detrimental impact.

5.2.1 Refer to 'Technical Standard – Groundwater Protection', HS2-HS2-EV-STD-000-0000010, and 'Technical Standard – Earthworks', HS2-HS2-GT-STD-000-000001, for other requirements and guidance about discharge to groundwater.

### 5.3 Discharge to a surface water body

5.3.1 Discharge to a watercourse by gravity should be used where discharge to ground is impractical primarily due to geological conditions. Discharges to a watercourse are to be attenuated to the equivalent 'greenfield' rate (or other maximum allowable discharge rate) and are not to increase flood risk.

5.3.2 Unless agreed with the owner, and in consultation with ecologists, there should be no discharge to other water bodies i.e. lakes, ponds or canals.

## 5.4 Discharge to a sewer

- 5.4.1 Discharge to a surface water or combined sewer is only to be considered as a 'last resort' where discharge to ground or connection to a water course is impracticable, such as in some urban areas.
- 5.4.2 Agreement with the appropriate sewerage undertaker will be required and the discharge rate needs to be agreed with the relevant sewage undertaker in accordance with the protective provisions of the hybrid Bill.

## 5.5 Pumped discharge

- 5.5.1 Pumped discharges should only be considered where the highway or access alignment precludes a gravity connection to a suitable outfall and the geology prevents a discharge to ground. This solution is likely to be confined to drainage of tunnels or underpasses but flows will ultimately discharge to one of the surface water disposal methods above.

## 5.6 Consents and Approvals

- 5.6.1 Refer to 'Consents and Approval Strategy - Water Resources and Flood Risk' for further information on consent and approvals.

# 6 Other Considerations

## 6.1 Highway and access technical standards

- 6.1.1 The following highway and access technical standards should be read in conjunction with 'Technical Standard – Highway and Access Drainage';

### **Roads**

- 6.1.2 Refer to 'Technical Standard – Roads', HS2-HS2-HW-STD-000-000001, for requirements and guidance relating to roads.

### **PRoW**

- 6.1.3 Refer to 'Technical Standard – Public rights of way', HS2-HS2-HW-STD-000-000002, for requirements and guidance relating to public rights of way.

### **HS2 accesses**

- 6.1.4 Refer to 'Technical Standard – HS2 Accesses', HS2-HS2-HW-STD-000-000003, for requirements and guidance relating to HS2 accesses.

### **Accommodation accesses**

- 6.1.5 Refer to 'Technical Standard – Accommodation Accesses', HS2-HS2-HW-STD-000-000004, for requirements and guidance relating to accommodation accesses.

## **7 Further sources of information**

### **7.1 Online**

- 7.1.1 United Kingdom legislation website:

[www.legislation.gov.uk](http://www.legislation.gov.uk)