The Great Grid Upgrade

Eastern Green Link 5 (EGL 5)

# Preliminary Environmental Information Report

**Volume 2**
**Part 2**
**Appendix 9.B Preliminary Water Environment Design Principles**

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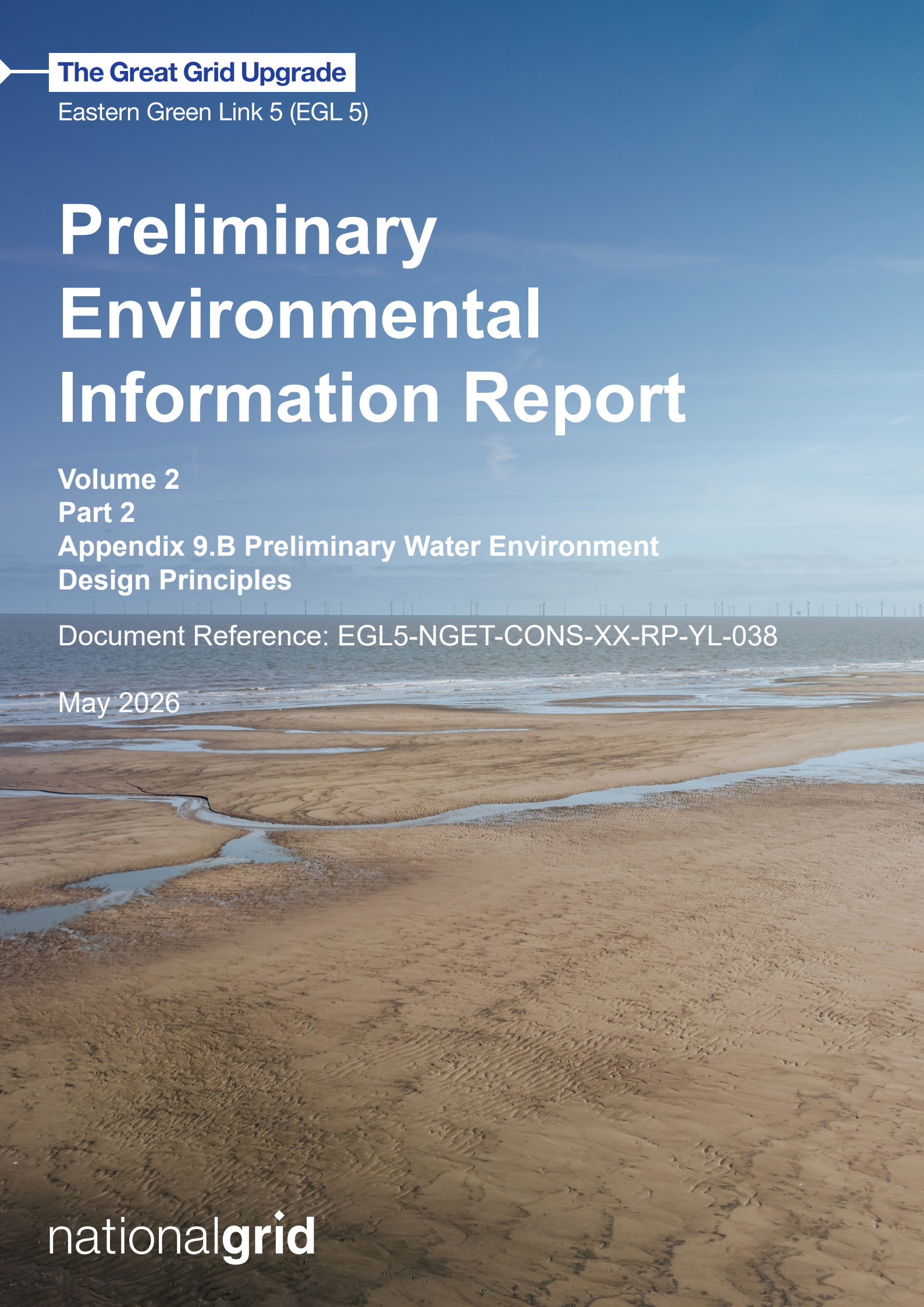

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# 9.B. Preliminary Water Environment Design Principles

## 9.B.1 Introduction

9.B.1.1 This Appendix accompanies **Volume 1, Part 4, Chapter 9: Water Environment** of the Preliminary Environmental Information Report (PEIR) for the onshore components (English Onshore Scheme) within England of Eastern Green Link 5 (EGL 5) ('the Project'). It provides information on the key design and construction principles proposed to be adopted for the English Onshore Scheme, as well as measures proposed to manage:

- Works in, over and under watercourses and in proximity to watercourses and flood defences;
- Surface water drainage and land drainage design; and
- Flood Risk Resilience.

9.B.1.2 Agreement to these principles, which will be secured through suitable requirements and/or commitments within the Development Consent Order (DCO), is sought from the Environment Agency, Lead Local Flood Authorities and Internal Drainage Board (IDB).

9.B.1.3 The principles will then be integrated into the evolving design and construction of the English Onshore Scheme and inform the Flood Risk Assessment and Environmental Impact Assessment (EIA) that will be undertaken in support of the DCO application.

Table 9.B-1 Design and Construction Principles - works in, over and under watercourses and in proximity to watercourses and flood defences

| Ref ID | Principle Name | Principle |
|---|---|---|
| **Construction** | | |
| W01 | Watercourses, surface waterbodies, associated protected areas, existing water interests | Good practice measures during construction. For example, fuels, oils, and chemicals will be stored responsibly, away from sensitive water receptors. All refuelling, oiling, and greasing of construction plant and equipment will take place above drip trays (or similar) and also away from drains as far as is reasonably practicable. Appropriate spill kits will be made easily accessible for these activities.<br>Wastewater generated from construction compound welfare facilities will be discharged to sewer, subject to the agreements with the utility providers, or in locations where a sewer connection is not reasonably practicable, collected and tankered off site for disposal at a licensed treatment facility. |
| W02 | Existing water interests | Measures to encourage water use efficiency during construction, for example, aerated taps and waterless urinals in site offices; rainwater harvesting for use in dust suppression, would be implemented in order to reduce consumptive water use. |
| W03 | All water environment receptors | The Contractor would comply with all relevant consent conditions or DCO requirements regarding de-watering and other discharge activities. This will particularly be with regard to volumes and discharge rates and will include discharges to land, waterbodies, or third-party drains / sewers. All water discharges to be undertaken under the correct Environment Agency permits, with appropriate pre-treatment (e.g., de-silting) where required. |
| W04 | Existing land drainage | Any field (land) drainage assets affected during the construction period would be diverted to maintain continuity of the land drainage system. Existing land drainage systems impacted by the Project during its construction would be re-provided to maintain the land drainage regime. |

| Ref ID | Principle Name | Principle |
|---|---|---|
| W06 | Impeded channel and floodplain flows | All works within main rivers or ordinary watercourses will be in accordance with a method approved under environmental permits issued under the Environmental Permitting Regulations and the Land Drainage Act (1991) (Ref 9.20), or the protective provisions of the DCO for the benefit of the LLFA and IDB. |
| W08 | Construction activities with the potential to impede in channel and floodplain | For open cut watercourse crossings and installation of vehicle crossing points, good practice measures will be included to control pollution risks and to manage and ensure continuation of downstream flows. At crossing sites, the riparian corridor and watercourse channels would be suitably reinstated on completion of the construction works.<br>Reducing working width may not be practical as temporary damming and over-pumping works will require a substantial footprint. |
| W09 | Risk of damage to construction plant and materials | The Contractor(s) will subscribe to the Environment Agency's Floodline service, which provides advance warning of potential local flooding events, and subscribe to the Met Office's Weather Warnings email alerts system and any other relevant flood warning information. The Contractor(s) will implement a suitable flood risk action plan, which will include appropriate evacuation procedures should a flood occur or be forecast. |
| W10 | Waterlogging or flooding of working areas and detriment to surrounding land drainage | Where appropriate, pre-construction field drainage will be installed within the working area to help prevent possible waterlogging of the working area and therefore the need for temporary dewatering during construction. This will also enable current drainage systems to continue working throughout the period of construction. Landowners will be consulted on the design of the land drainage proposals. The design would pay particular attention to the need to reduce the risk that the drains do not act as pathways for contamination or cause flooding off-site, consulting with the LLFA where necessary. |
| W11 | Risk of residual damage to riparian vegetation and watercourses post construction. | Riparian vegetation and the natural bed materials of the watercourses would be reinstated, using the material removed when appropriate on completion of the works. If additional material is required, appropriately sized material of similar composition would be used. |

| Ref ID | Principle Name | Principle |
|---|---|---|
| W12 | Changes to the land drainage from land used during construction | A specialised drainage contractor will review the designs and provide technical advice to NGET and its Contractor during relevant construction and reinstatement activities.<br>Upon completion of the Project, the working areas will be removed, and the sites will be reinstated to their pre-construction condition. Stripped topsoil will be reinstated, and sites would be restored to their original function, subject to any planting constraints or agreements established with landowners. Where required, replacement land drainage systems will be installed. |
| W13 | Risk of hydromorphological change due to watercourse diversion | Upon completion of construction activities, the working areas will be removed, and the sites will be reinstated to their pre-construction condition. Temporary construction haul roads, including associated temporary structures such as bridges and culverts, would typically be decommissioned and removed unless identified during the design process as providing long-term environmental or land-use benefits, subject to agreement with the landowner. |
| W14 | Removal of temporary crossings | Temporary crossings for access would be in-situ for up to 6 years, unless agreed. Once the construction of the Project is completed, temporary construction haul roads including temporary bridges and culverts, would only be retained by exception, for example, if replacing an existing structure in a poor state if repair. Such crossings would be designed in accordance with appropriate standards and these would be maintained, in accordance with a legal agreement with the maintaining body. At all temporary crossing locations watercourses are to be reinstated to no worse than baseline condition and planting re-established. |
| W15 | Riparian habitat retention | Riverbank, ponds and in-channel vegetation would be retained where not directly affected by installation works. |
| MT06 | Risk of disturbance of sensitive locations along watercourses due to access requirement. | Where watercourses are to be crossed by construction traffic, measures to be applied include the use of temporary culverts or temporary spanned bridges.<br>Temporary culverts will be sized appropriately to ensure the watercourse's capacity is maintained and to maintain existing flows, and maintain natural riverine connectivity throughout the year, at both high and low flows and kept free from debris. The inlets and outlets of culverts will be designed such that there is no ledge or disruption to flow into or out of the culvert. They will also be designed to maintain natural slope / water velocities and have buried inlet / outlets. |

| Ref ID | Principle Name | Principle |
|---|---|---|
| | | For crossings of smaller ditches, these culvert design criteria may be varied, in agreement with the relevant authority (IDB / LLFA).<br>Once the temporary culvert is installed, the area above the temporary culvert will be backfilled and a temporary haul road constructed over the backfilled area to permit the passage of plant, equipment, materials, and people.<br>Temporary bridges, which are expected to be used to cross Environment Agency main rivers, larger drains (where required due to engineering complexity) and designated WFD waterbodies, will be designed specifically to consider the span length and the weight and size of plant and equipment that will cross the bridge, and to reduce impediment to flows and increase in flood risk. |
| MT07 | Trenched crossings | Where pre-construction surveys have identified a likely fish presence and opencut crossings or similar severance of channel are proposed, over pumping would be used. The pump would be screened to prevent entrainment or impingement of fish or fish friendly pumps would be used to facilitate the downstream passage of fish through the pumps. The use of pumps to move water would require 2 mm screening to avoid the impingement of fish and juvenile eels. In addition, a fish rescue exercise would be completed under the supervision of a suitably experienced ecologist, to rescue and relocate fish from the dewatered area. Where a watercourse is to be diverted, the new channel would be constructed first prior to *"stopping up*" of the existing channel. |
| MT09 | Timing of works | Compliant with the Salmon and Freshwater Fisheries Act (1975), the timing of construction works would be considerate of the following restriction periods to avoid potentially adverse effects upon the fish present in watercourses impacted by the Project:<br>• 15 March to 15 June (coarse fish), and<br>• 1 October to 31 May (salmonids).<br>Deviation from the above restriction periods need to be agreed with the statutory authority (Environment Agency). |

| Ref ID | Principle Name | Principle |
|---|---|---|
| **Design** | | |
| W01 | Risk of adverse effects relating to surface water runoff at Above Ground Infrastructure (AGI) sites | Suitable flood resilience and surface water drainage provisions would be embedded within the design for any operational above ground infrastructure, in line with national and local policy, and guidance requirements of the relevant LLFA. |
| W02 | Disruption or impediment of floodplain flows and loss of storage for floodwaters | In discussion with the Environment Agency, where placement of above ground Project infrastructure cannot avoid floodplains, measures to suitably mitigate flood risk effects would be provided to ensure receptors themselves are safe and do not adversely increase flood risk to the wider environment. |
| W03 | Disruption or impediment to flows and effects on hydromorphology | Where watercourses are crossed the cable burial depth will be minimised as far as is practicable to reduce the impact on soils during construction whilst preventing potential future exposure due to hydromorphological change. |
| W04 | Increase in rates and volumes of rainfall runoff and subsequent increase in flood risk. | New permanent areas of impermeable land cover are created, the drainage design will be in accordance with the requirements of the relevant Internal Drainage Board, in addition to the Lincolnshire County Council (2025) Guidance for developers: Carbon Management Plan (CMP) and SuDS method statement (Ref 9.8) and will include allowances for climate change in accordance with current (May 2022) Environment Agency requirements. The drainage infrastructure will provide the storage necessary to achieve discharges at greenfield rates and will not significantly alter groundwater recharge patterns by transferring a significant recharge quantity from one catchment to another. A specialised drainage contractor will review the designs and will provide advice to NGET and its contractor during relevant construction and reinstatement activities.<br>The drainage systems will be designed to accommodate runoff from the 1 in 100-year storm, inclusive of the recommended 40% allowance for climate change. |

| Ref ID | Principle Name | Principle |
|---|---|---|
| W05 | Risk of reduction in effectiveness of existing flood defences | Where works are proposed to cross beneath flood defences, appropriate construction methodologies would be adopted. The Contractor would agree with the relevant party any relevant monitoring requirements to ensure no effects on their integrity. |
| W05 | Culvert size and inlet/outlet design | Temporary culverts would be sized appropriately to maintain existing flows, and natural riverine connectivity throughout the year, at both high and low flows and kept free from debris. The inlets and outlets of culverts will be designed such that there is no edge or disruption to flow into or out of the culvert. They will also be designed to maintain natural slope/water velocities and have buried inlet/outlets. For crossings of smaller ditches, these culvert design criteria may be varied, in agreement with the relevant authority (Internal Drainage Board/Lead Local Flood Authority). |
| W06 | Main river crossings | Temporary bridges on Environment Agency main rivers will be designed with soffits that are raised 0.6 m above the flood level in accordance with Environment Agency requirements and appropriate design specifications and will be set back from the river's edge. Appropriate flood levels would be agreed with the Environment Agency and specified in the Flood Risk Activity Permit applications for these structures. On navigable waterways, bridges would be of sufficient size and designed these requirements agreed with the navigation authority. |
| W07 | IDB watercourse clearances for trenchless crossings | Where the underground cables cross IDB watercourses 3 m clearance below the hard bed of the watercourse would be maintained and a 10 m clearance from top of bank and any construction activity where feasible. |
| MT02 | Watercourse diversions | Watercourse diversions are proposed to be avoided wherever possible, unless absolutely necessary and agreed with the key stakeholders. Watercourse diversions, where they are unavoidable namely at the converter station site, would be designed to mimic natural fluvial form and function and maintain passage/connectivity for aquatic species, where applicable. |
| MT03 | Sensitive crossing locations | The Project would be designed to comply with appropriate design specifications. Specifically, at sensitive crossing locations (e.g., main rivers/WFD watercourses), temporary bridges would be used in preference to culverts for construction access and any permanent crossings would be bridges. Where temporary culverting of sensitive watercourses is required, these would either be arch culverts, leaving the natural bed undisturbed, or they would be box culverts, installed with |

| Ref ID | Principle Name | Principle |
|---|---|---|
| | | the invert set below the natural bed level for a seminatural bed to establish within the culvert, where practicable. Culverts would be orientated to reduce culvert lengths to a practicable minimum. Roughened beds, baffles, and refuge areas (such as masonry with cavities) would be installed where practicable, to encourage fish movement through long culverts, or over steep gradients. Where required, culvert design should seek to meet the criteria specified in the IFM Fish Pass Manual (Ref 2.9.D.1). This is to ensure the culvert could, in theory, be passed by fish known to be present. Culvert design on other watercourses would be subject to the watercourse characteristics and would be agreed with the relevant authority. |
| MT04 | Cable burial depth | Where appropriate, trenchless crossing methods (such as HDD) would be used at sensitive locations (for example the landfall and main rivers) to avoid or reduce impacts during construction.<br><br>Where a main river is crossed by a trenchless crossing, the cables would be laid at least 1 m below the hard bed level of the river and would remain at or below this level for a distance of not less than 3 m from the brink of the riverbank before rising at a slope no greater than 1 vertical to 1.5 horizontal. Marker posts shall also be positioned on each bank of the river to indicate the location of the under-crossing and the nature of the works. |

Table 9.B-2 Surface Water Drainage and Land Drainage Design and Construction Principles

| Ref ID | Principle Name | Principle |
|---|---|---|
| **Construction** | | |
| MT10 | Land drainage | Consultation with affected landowners will be carried out to investigate the current extent of land drainage. Existing land drainage systems impacted by the Project during their construction would be re-provided to maintain the land drainage regime. Severance of existing land drainage routes, including agricultural field drainage systems, would be managed during construction through the provision of temporary alternative drainage routes, and these drainage systems would be permanently reinstated or rerouted, ensuring their existing function is maintained. The Project may include a system of 'cut-off' drains which feed into a new header drain, and the Project would also take into account surface water runoff measures. |
| MT01 | Construction drainage and Site runoff and buffer zones | Runoff from working areas would be managed appropriately during construction with respect to both quantity and quality via an appropriate management plan, such as a Drainage Management Plan developed in detail by the Contractor prior to construction.<br><br>Runoff across the site would be controlled through a variety of methods, including header drains, buffer zones around watercourses, on-site ditches, silt traps and bunding. There would be no intentional discharge of site runoff to ditches, watercourses, drains or sewers without appropriate treatment and agreement of the appropriate authority (except in the case of an emergency). The following buffer zones would be implemented: 9 m for IDB watercourses (works within 9 m would be subject to consent), 8 m for main rivers, 16 m for tidal main rivers.<br><br>Watercourses near work sites would be inspected frequently where work activity is being carried out. Inspections would look for signs of siltation or other forms of pollution for the duration of the period of ground disturbance and work site drainage would be inspected and maintained as required, so that they continue to operate to their design standard, safeguarding surface and groundwater quality.<br><br>In the case of soil storage to be located within floodplain, a buffer of 15 m away from rivers would be maintained. |

| Ref ID | Principle Name | Principle |
|---|---|---|
| | | All surface water runoff from the working width, inclusive of haul roads and stone pads for heavy equipment, would be managed through Sustainable Drainage Systems that could include swales, attenuation ponds, infiltration ponds and trenches. These would provide capacity to attenuate a 1:10 year storm in accordance with CIRIA C648 - Control of water pollution from linear construction projects technical guidance (Ref 2.9.D.2). |
| **Design** | | |
| W08 | Operational drainage | Surface water runoff from operational above ground infrastructure would be managed in accordance with the requirements and standards of the relevant Lead Local Flood Authorities and adopt suitable sustainable drainage techniques. |
| W09 | Operational drainage design standard | Permanent drainage systems shall be designed to accommodate runoff from the 1 in 100-year storm, inclusive of the recommended 40% allowance for climate change (in accordance with Environment Agency guidelines). |
| W11 | | Where new or additional surfacing may be required on any access tracks and compound areas, permeable surfaces and materials would be used where practicable and where ground conditions allow. The Project would incorporate appropriate surface water drainage measures into its final design for the haul roads and access tracks so that they do not lead to a significant increase in flood risk. |

Table 9.B-3 Flood Risk Resilience and Design and Construction Principles

| Ref ID | Principle Name | Principle |
|---|---|---|
| **Construction** | | |
| W06 | Haul roads in floodplains | Where construction haul roads would pass through floodplains, the haul road design will include for flood mitigation/drainage to reduce any impediment to floodplain flow paths. |
| | Soil storage and construction compounds | Spoil storage/stockpiling would be avoided in Flood Zone 3 where practicable. Where this cannot be avoided, stockpiles would be aligned to avoid creating continuous barriers to floodplain flows. Construction compounds would be located in Flood Zone 1. Where this is not practicable, additional flood risk management measures would be identified within a flood risk action plan. |
| | Temporary haul routes | Temporary haul routes within Flood Zone 3 and areas of high and medium risk of flooding from surface water would be removed at the end of the construction phase and the ground surface would be reinstated to pre-Project levels. |
| W17 | Working in high-risk surface water flooding zones | Where construction activities take place within surface water flood zones, prior to works commencing appropriate site drainage would be put in place to reduce the risk of standing water and avoid substantial delays to the construction programme. |
| **Design** | | |
| W12 | Finished Floor Levels | The converter station would be constructed with finished floor levels above the 1 in 1,000-year flood level, with an allowance for climate change and an additional freeboard allowance to be confirmed as part of the pre-construction assessment. |
| W13 | Floodplain compensation | Where there are temporary or permanent works within the defended floodplain of tidally dominated watercourses, provision of floodplain compensation storage is not required. |

## Bibliography

Ref 2.9.D.1: Institute of Fisheries Management (2020). Fish Pass Manual: Guidance Notes On The Legislation, Selection and Approval Of Fish Passes In England And Wales [Online]. Available at: https://ifm.org.uk/wp-content/uploads/2020/09/Fish-Pass-Manual.-GoodVersion-pdf.pdf [Accessed 22 December 2025]

Ref 2.9.D.2: CIRIA. (2001). Publication C532: Control of water pollution from construction sites: guidance for consultants and contractors.

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