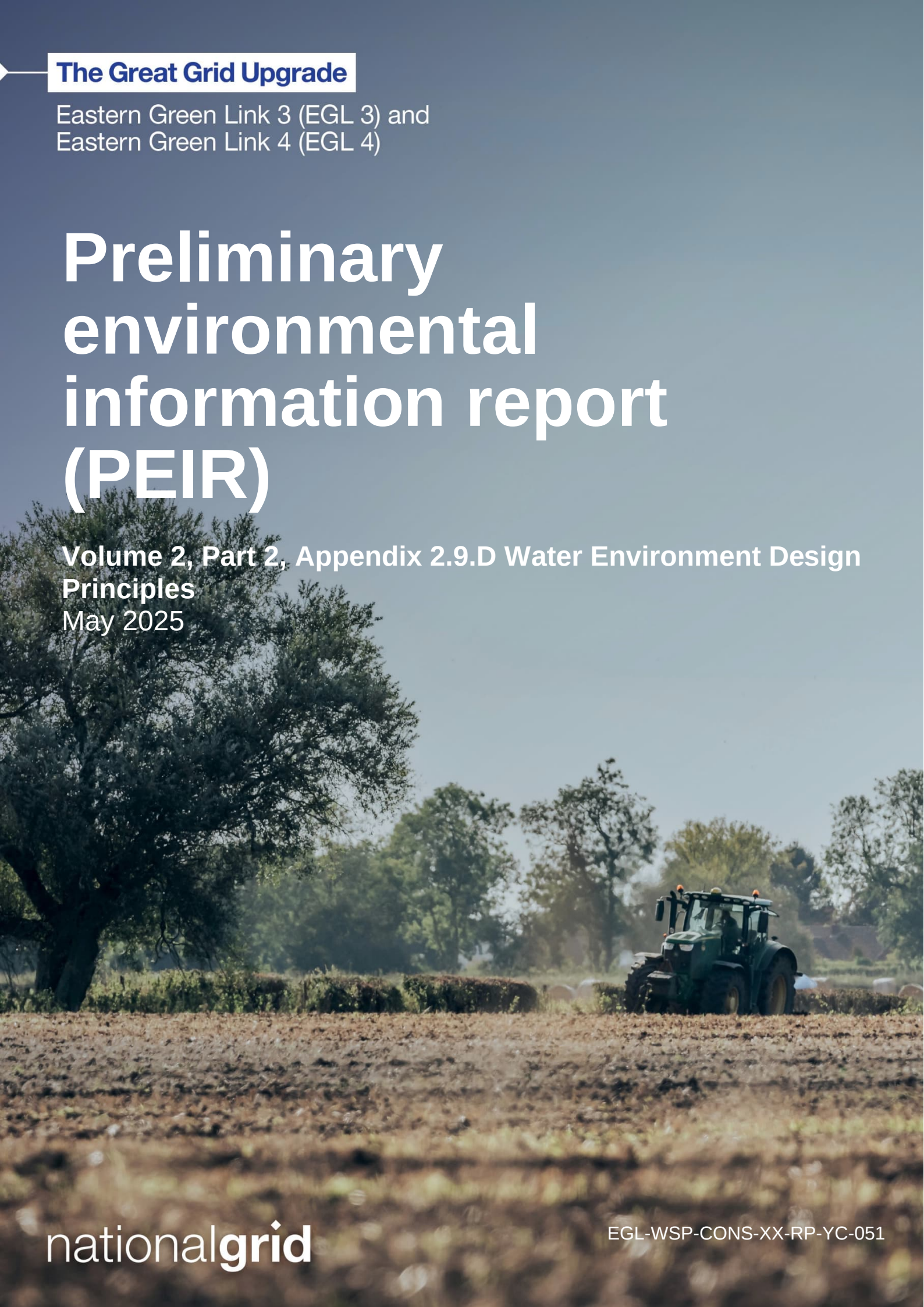
The Great Grid Upgrade

Eastern Green Link 3 (EGL 3) and
Eastern Green Link 4 (EGL 4)

Preliminary environmental information report (PEIR)

Volume 2, Part 2, Appendix 2.9.D Water Environment Design Principles

May 2025



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Contents

2.9.D. Initial Water Environment Design and Construction Principles

2.9.D.1 Introduction

2.9.D.1.1 This appendix has been produced to support **Volume 1, Part 2, Chapter 9: Water Environment** of the Preliminary Environmental Information Report (PEIR) for the onshore components (English Onshore Scheme) within England of Eastern Green Link 3 (EGL 3) and Eastern Green Link 4 (EGL 4) ('the Projects'). 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.

2.9.D.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 Boards (IDBs).

2.9.D.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 2.9D.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		
W14	Removal of temporary crossings	Temporary crossings for access would be in-situ for approximately 6 years, unless agreed. Once the construction of the Projects is completed, temporary construction haul roads including temporary bridges and culverts, would only be retained if designed and constructed 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.

Ref ID	Principle Name	Principle
W15	Reinstatement at watercourse crossings	Riverbank, ponds and in-channel vegetation would be retained where not directly affected by installation works. At all temporary crossing locations watercourses are to be reinstated and planting re-established.
W16	Culvert design	Natural substrate would be provided through temporary watercourse crossings culverts.
W05	Monitoring 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.
MT09	Timings 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 Projects: – 15 March to 15 June (coarse fish), and – 1 October to 31 May (salmonids). Deviation from the above restriction periods need to be agreed with the statutory authority (Environment Agency).
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.
Design		

Ref ID	Principle Name	Principle
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 sites, would be designed to mimic natural fluvial form and function and maintain passage/connectivity for aquatic species, where applicable.
MT03	Sensitive crossing locations	The Projects 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 the invert set below the natural bed level for a semi-natural 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. Where practical, culverts should seek to reduce the impacts on aquatic species by using designs that simulate natural channel conditions, for example, by providing roughened beds, baffles, and refuge areas (such as masonry with cavities) through long culverts, or those with steep (>2) gradients. Culvert design on other watercourses would be subject to the watercourse characteristics and would be agreed with the relevant authority.
W05	Culvert size and inlet/outlet design	Temporary culverts would be sized appropriately to ensure the watercourse's capacity is maintained and to prevent any local constriction of the flow, 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

Ref ID	Principle Name	Principle
		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. 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 600 mm above the flood level in accordance with Environment Agency requirements and appropriate design specifications and will be set back 8 m (or distance otherwise agreed with the Environment Agency) 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.
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. 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.
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.

Table 2.9.D.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 Projects 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 Projects may include a system of 'cut-off' drains which feed into a new header drain, and the Projects 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. 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. Watercourses near work sites would be inspected daily 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.

Ref ID	Principle Name	Principle
		In the case of soil storage to be located within floodplain, a buffer of 15 m away from rivers would be maintained. 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).
W10	Construction drainage design standard	Temporary drainage system shall be designed to accommodate runoff from the 1 in 10 year storm as a minimum with no allowances for climate change uplift.
W11	Surfacing	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 Projects 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 2.9.D.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

Ref ID	Principle Name	Principle
		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 (other measures have been included in **the Volume 2, Part 1, Appendix 1.5.B Outline Code of Construction Practice (CoCP)**). If possible, construction compounds would be located in Flood Zone 1. Where this is not practicable, additional 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	Converter stations and substations 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 24/02/2025]

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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