HS2

High Speed Rail (West Midlands - Crewe)

Supplementary Environmental Statement 2 and Additional Provision 2 Environmental Statement

Volume 5: Technical appendices

Water Framework Directive compliance assessment (WR-001-000)

February 2019

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Department for Transport

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1 Introduction

1.1 Background

1.1.1 This document is an appendix to the water quality assessment which forms part of Volume 5 of the Supplementary Environmental Statement 2 (SES2) and Additional Provision 2 Environmental Statement (AP2 ES). This report is a route-wide report and covers the following community areas (CA):

- CA1: Fradley to Colton;
- CA2: Colwich to Yarlet;
- CA3: Stone and Swynnerton;
- CA4: Whitmore Heath to Madeley; and
- CA5: South Cheshire

1.1.2 This appendix comprises an addendum to the Water Framework Directive (WFD) compliance assessment presented in the High Speed Two (HS2) Phase 2a (West Midlands - Crewe) Environmental Statement (ES)[1] published in July 2017 (the main ES), as well as the Supplementary Environmental Statement (SES1) and Additional Provision Environmental Statement (AP1 ES) published in March 2018[2].

1.1.3 The WFD compliance assessment (referred to hereafter as 'the original WFD assessment') was published in Volume 5, Appendix WR-001-000[3] of the main ES. An addendum to the original WFD assessment, which reported the WFD implications of the AP1 revised scheme, was included in the SES1 and AP1 ES Volume 5, Appendix WR-001-000[4]. This document therefore comprises the second addendum to the original WFD assessment.

1.1.4 In order to differentiate between the proposals originally described in the main ES and subsequent changes, the following terms are used:

- 'the original scheme' – the Bill scheme submitted to Parliament in July 2017, which was assessed in the main ES;
- 'the SES1 scheme' – the original scheme with the changes described in the SES1 that are within the existing powers of the Bill, submitted to Parliament in March 2018;

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[1] HS2 Ltd (2017), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Environmental Statement*. Available online at: https://www.gov.uk/government/collections/hs2-phase-2a-environmental-statement

[2] HS2 Ltd (2018), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Supplementary Environmental Statement and Additional Provision Environmental Statement*. Available online at: https://www.gov.uk/government/collections/hs2-phase-2a-supplementary-environmental-statement-and-additional-provision-environmental-statement

[3] HS2 Ltd (2017), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Environmental Statement, Volume 5, Route-wide Water Framework Directive compliance assessment*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627161/E65A_WR-001-000_Part_1_WEB.pdf and https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627163/E65A_WR-001-000_Part_2_WEB.pdf

[4] HS2 Ltd (2018), *High Speed Rail (West Midlands - Crewe), Supplementary Environmental Statement and Additional Provision Environmental Statement, Volume 5: Technical appendices, Water Framework Directive compliance assessment addendum*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/692655/G30_WFD_framework__WR-001-000__WEB.pdf

- 'the AP1 revised scheme' – the original scheme as amended by the SES1 changes and AP1 submitted to Parliament in March 2018;
- 'the SES2 scheme' – the original scheme with the changes described in the SES2 that are within the existing powers of the Bill; and
- 'the AP2 revised scheme' – the original scheme as amended by the SES2 changes and AP2 amendments.

1.2 Purpose of this addendum

1.2.1 The purpose of this addendum is to report on any changes or updates to environmental information and scheme design or assumptions that have occurred since publication of the main ES and SES1 and AP1 ES, which will result in a change in effects and/or the introduction of new effects on WFD status and status objectives.

1.3 Assessment methodology

1.3.1 The assessment method for deriving effects on WFD status and status objectives is outlined in Section 3 and Annex B of the original WFD assessment in the main ES[3].

2 Part 1: Supplementary Environmental Statement 2

2.1 New environmental baseline information relevant to WFD

2.1.1 No new environmental baseline data that is relevant to the WFD has been derived that were not reported in the main ES.

2.2 Changes to design or construction assumptions which do not require changes to the Bill

2.2.1 Since submission of the Bill, the need to make changes to the design or construction assumptions has been identified. The changes that do not require a change to the Bill are detailed in SES2. Those relevant to the WFD assessment are summarised in the section below.

Borrow pit hydrogeological modelling (CA1)

2.2.2 Since submission of the Bill, additional information relating to the likely ground conditions in the vicinity of all the borrow pits in the Fradley to Colton area has become available. For three of these borrow pits, this indicated that useful aggregates may be present to a maximum depth greater than originally estimated. The new information for the fourth borrow pit (at Blithbury, located to the north of the River Trent viaduct) confirmed that the previous assessment of the maximum depth of aggregates there was as originally estimated.

2.2.3 Since submission of the Bill, more detailed hydrogeological models have been developed of the areas around each borrow pit. These models have been used to inform the scope of a ground investigation. They provide an improved, but very precautionary estimate of the areas where groundwater levels could potentially be affected by the AP2 revised scheme. They assume that the borrow pits are excavated, one at a time, to their maximum depth over their full areas and are fully dewatered.

2.2.4 For the following borrow pits a maximum depth of 18m has been assumed:

- Kings Bromley South, located either side of Crawley Lane and to the south of Ashby Sitch, both sides of the route of the Proposed Scheme;
- Kings Bromley North, located adjacent to the realigned A515 Lichfield Road; and
- Kings Bromley North, located adjacent to the realigned Shaw Lane.

2.2.5 For the borrow pit at Blithbury, located to the north of the River Trent viaduct, a maximum depth of 15m is assumed.

2.2.6 Initial outputs from a preliminary ground investigation indicates that suitable aggregate may not actually be present to these maximum depths. This further reinforces the conservative and precautionary nature of the assessment of temporary dewatering impacts and effects.

2.2.7 The general approach to excavation and the restoration proposals are set out in the Borrow pits restoration strategy[5]. Ground permeability in the areas around the borrow pits is based on the British Geological Survey (BGS) mapping data[6]. Conservatively high permeability values have been selected with the aim of ensuring that the maximum potential extent of the impacts is identified.

2.2.8 This new information has necessitated a review of the potential for adverse effects on local water bodies. Those watercourses that are located within the potential zone of groundwater influence of the borrow pits, for which effects were not reported in the hybrid Bill, are summarised in Table 1. These relate to the three borrow pits at Kings Bromley South and Kings Bromley North, located in the Fradley to Colton area (CA1). The location of these watercourses is shown on map number WR-03-101 in the Volume 5: Water resources and flood risk Map Book in the main ES. Further details of the predicted maximum zone of groundwater influence from these borrow pits are provided in of the SES2 and AP2 ES Appendix Volume 5: Water resources assessment CA1 report (see SES2 and AP2 ES Appendix WR-002-001).

[5] HS2 Ltd (2017), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Borrow pits restoration strategy.* Available online at: https://www.gov.uk/government/publications/hs2-phase-2a-environmental-statement-volume-5-borrow-pits-restoration-strategy

[6] British Geological Survey (2000), *The physical properties of minor aquifers in England and Wales: Hydrogeology Group Technical Report WD/00/04, Environment Agency R&D Publication 68*

Table 1: WFD surface water bodies / watercourses scoped into the WFD assessment potentially affected by dewatering of the borrow pits (not previous reported at hybrid Bill)

WFD water body (ID)	Watercourse	Borrow pit potentially affecting watercourse not previously reported at hybrid Bill (WFD assessment reference ID)
Pyford Brook Catchment (GB104028047250)	Pyford Brook	Kings Bromley South, located either side of Crawley Lane and to the south of Ashby Sitch, both sides of the route of the AP2 revised scheme (WFD-BP01)
Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270)	Bourne Brook	Kings Bromley South, located either side of Crawley Lane and to the south of Ashby Sitch, both sides of the route of the AP2 revised scheme (WFD-BP01)
		Kings Bromley North, located adjacent to the realigned Shaw Lane (WFD-BP03)
Trent and Mersey Canal, summit to Alrewas (GB70410142)	Trent and Mersey Canal	Kings Bromley South, located either side of Crawley Lane on the east and to the south of Ashby Sitch, both sides of the route of the AP2 revised scheme (WFD-BP01)
		Kings Bromley North, located adjacent to the realigned A515 Lichfield Road (WFD-BP02)
		Kings Bromley North, located adjacent to the realigned Shaw Lane (WFD-BP03)
Trent from Moreton Brook to River Tame (GB104028047290)	Unnamed trib of River Trent (MB to RT) 1	Kings Bromley North, located adjacent to the realigned A515 Lichfield Road (WFD-BP02)
		Kings Bromley North, located adjacent to the realigned Shaw Lane (WFD-BP03)
	Unnamed trib of River Trent (MB to RT) 2	Kings Bromley North, located adjacent to the realigned A515 Lichfield Road (WFD-BP02)
		Kings Bromley North, located adjacent to the realigned Shaw Lane (WFD-BP03)

2.3 Assessment of effects on WFD surface water bodies

Baseline conditions of affected watercourses

2.3.1 The baseline conditions of the watercourses affected by the SES2 scheme are described in the original WFD assessment, Volume 5, Appendix WR-001-000 of the main ES.

Embedded mitigation

2.3.2 Mitigation has been embedded within the design, construction methodology and operational phase of the SES2 scheme in order to reduce any adverse impacts on the water environment as far as is reasonably practicable. This mitigation ensures that the scheme is, where possible, inherently compliant with the objectives of the WFD for both surface water and groundwater bodies. This embedded mitigation is described in Section 6.2 of the WFD assessment, Volume 5, Appendix WR-001-000 of the main ES.

2.3.3 Following construction, the areas excavated as borrow pit will be restored to the existing levels and land use (as detailed within the Borrow pits restoration strategy, Volume 5: Appendix CT-009-000 of the main ES). Based on the restoration strategy, it is assumed that the material used to backfill the borrow pits will be of lower permeability than the material extracted. Drainage measures will be designed to control groundwater levels and to sustain baseflow to affected watercourses.

Effects on current status

2.3.4 A detailed impact assessment has been undertaken to identify the magnitude of the effects on the current status of the quality elements of the Pyford Brook Catchment (GB104028047250), Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270), Trent and Mersey Canal, summit to Alrewas (GB70410142), and Trent from Moreton Brook to River Tame (MB to RT) (GB104028047290) surface water bodies. This is in relation to the new SES2 information regarding the potential zone of groundwater influence associated with the dewatering of borrow pits during the construction phase.

2.3.5 A revised detailed impact assessment table for each of these water bodies is provided in Annex A of this addendum. These tables note any difference from the original WFD assessment in red. The SES2 information introduces new adverse (amber) effects, with a risk of deterioration of the current status of a number of the quality elements, within each of these water bodies. This is described below.

2.3.6 The three borrow pits at Kings Bromley South (located either side of Crawley Lane on the east and to the south of Ashby Sitch), Kings Bromley North (located adjacent to the realigned A515 Lichfield Road), and Kings Bromley North (located adjacent to the realigned Shaw Lane) will involve the excavation of floodplain river terrace deposits or glaciofluvial deposits (to a maximum depth of 18mbgl). Depending on the permeability of the underlying strata between the watercourse and the borrow pit, dewatering activities associated with these borrow pit excavations may result in some reductions in the volume of baseflow within Pyford Brook, Bourne Brook, an Unnamed tributary of River Trent (MB to RT) 1 and an Unnamed tributary of River Trent (MB to RT) 2 during the construction phase. This, in turn, may result in associated adverse effects on aquatic biota, physicochemical water quality and hydromorphological regime not previously reported in the original WFD assessment. These effects are considered to have the potential to cause a deterioration in the status of one or more quality elements within these watercourses.

2.3.7 Current evidence suggests that the Trent and Mersey Canal has a puddle clay liner[7]. It should in principle therefore be unaffected. The local geology is such that temporary reductions in groundwater level will not cause subsidence and the risk of structural damage occurring to the canal is negligible. If the canal is unlined, local reductions in groundwater level would have potential to induce greater losses of water though its bed and banks. Until this has been confirmed in consultation with the Canal and River Trust (CRT), adverse effects on aquatic biota, physicochemical water quality and the hydromorphological regime of the canal have been identified. These effects are considered to have the potential to cause a deterioration in the status of one or more quality elements of this water body.

2.3.8 Consequently, additional mitigation measures (beyond those already embedded in the SES2 scheme) will be required to manage groundwater baseflow to the watercourses, and the Trent and Mersey Canal, during the construction phase. These are described in the section below.

[7] Institution of Civil Engineers (2018), *Trent and Mersey canal*. Available online at: https://www.ice.org.uk/what-is-civil-engineering/what-do-civil-engineers-do/trent-and-mersey-canal

Additional mitigation requirements to reduce the risk of deterioration of current status

2.3.9 The ground investigation now in progress will provide detailed information on the permeability of the ground in the areas adjacent to the borrow pits, which will allow the hydrogeological models to be updated. If these continue to identify potential impacts on surrounding watercourses (including those reported in the WFD assessment in the main ES and those summarised in Table 1 of this report), then additional mitigation measures will be incorporated into the design in order to avoid and/or mitigate the adverse impacts of dewatering of the borrow pits. These mitigation measures will be designed in consultation with the Environment Agency. As well as those measures listed in the original WFD assessment, these measures may include excavating the material from (and backfilling) the borrow pits in phases to reduce the groundwater zone of influence, and/or augmenting flow in the watercourses using water abstracted from the borrow pit excavations.

Residual effects on current status

2.3.10 The implementation of the additional mitigation measures described above will ensure that there are no residual adverse (amber) effects with a potential risk of deterioration in status on the Pyford Brook Catchment (GB104028047250), Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270),Trent and Mersey Canal, summit to Alrewas (GB70410142), and Trent from Moreton Brook to River Tame (GB104028047290) surface water bodies from the borrow pits.

Effects on status objectives

2.3.11 The Environment Agency's river basin management plan (RBMP) Cycle 2 'reasons for not achieving good status' (RNAG) and 'programme of measures' (PoM) datasets for the relevant surface water bodies affected by the route are provided in Annex F2.1 (Table 43) and F2.2 (Table 45) of the original WFD assessment, respectively.

2.3.12 The data for the Pyford Brook Catchment (GB104028047250), Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270) and Trent from Moreton Brook to River Tame (GB104028047290) surface water bodies have been screened against the new SES2 information regarding the potential zone of groundwater influence associated with dewatering of the borrow pits during the construction phase. No RNAG or PoM data is provided for the Mersey Canal, summit to Alrewas (GB70410142) water body, as this water body has already achieved its Good Overall Status objective under the WFD.

2.3.13 The new SES2 information is not expected to result in any risks of the route preventing the future achievement of the status objectives of the relevant water bodies. A summary of this screening assessment is provided below.

Reasons for not achieving good status

2.3.14 The existing RNAG for the Pyford Brook Catchment (GB104028047250) water body relate to: point source and diffuse course pollution from waste water treatment works, agricultural land, and urban areas impacting upon ammonia (phys-chem), phosphate, dissolved oxygen and macrophytes and phytobenthos status.

2.3.15 The existing RNAG for the Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270) water body relate to: point source and diffusion course pollution from waste water treatment works, agricultural land, and urban areas impacting upon phosphate and macrophytes and phytobenthos status.

2.3.16 The existing RNAG for Trent from Moreton Brook to River Tame (GB104028047290) water body relate to: point source and diffuse course pollution from waste water treatment works, agricultural land, and urban areas impacting upon phosphate and macrophytes and phytobenthos status; and physical modifications associated with agricultural land and urban/transport development impacting upon fish status.

2.3.17 The proposed borrow pits will not affect point or diffuse sources of pollution, or involve any physical modification of watercourses, within these water body catchments.

Programme of measures

2.3.18 The PoM for the Pyford Brook Catchment (GB104028047250) water body relate to the control/management of point source inputs from waste water treatment works. This involves a requirement for additional treatment to reduce concentrations of phosphate from the Lichfield sewage treatment works. The proposed borrow pits will not impact upon the implementation of these measures.

2.3.19 No PoM have been identified by the Environment Agency for the Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270) and Trent from Moreton Brook to River Tame (GB104028047290) water bodies as part of the RBMP Cycle 2.

2.4 WFD compliance

No deterioration of current status

2.4.1 The assessment has identified new adverse (amber) effects on watercourses within the Pyford Brook Catchment (GB104028047250), Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270), Trent and Mersey Canal, summit to Alrewas (GB70410142), and Trent from Moreton Brook to River Tame (GB104028047290) surface water bodies as a result of the new SES2 information (Table 2). These effects are anticipated to cause a potential risk of deterioration in current status of these water bodies, requiring the implementation of additional mitigation measures beyond those embedded within the current design and construction methodology of the SES2 scheme.

2.4.2 It is anticipated that these impacts can be mitigated to ensure that there is no residual risk of deterioration of the current status of the relevant water bodies.
These measures may include, but will not be limited to, one or more of the following:

- excavating the material from (and backfilling) the borrow pits in phases to reduce the groundwater zone of influence;
- augmenting flow in the watercourses using water abstracted from the borrow pit excavations;
- implementing a wider buffer strip, or shallower batter on the excavations;
- installation of groundwater cut off structures;

- adoption of wet working techniques that avoid the need for dewatering; and/or
- creation of a new, temporary lined channel and/or diversion.

2.4.3 These measures will be developed in detail with the Environment Agency following completion of ongoing ground investigations and subsequent update of hydrogeological modelling.

2.4.4 The implementation of these additional mitigation measures will ensure that there are no residual risks of deterioration of the current status of the relevant surface water bodies as a result of the potential adverse effects of dewatering the borrow pits on nearby watercourses.

2.4.5 The SES2 scheme is therefore considered to remain compliant with no deterioration of current status objective of the WFD.

Table 2: SES2 changes to the risk of deterioration of overall status of relevant WFD surface water bodies

Water body (ID)	Risk of deterioration of overall status of water body				Compliance (original scheme + SES2)
	Original assessment (pre additional mitigation)	Original assessment (post additional mitigation)	SES2 (pre additional mitigation)	SES2 (post additional mitigation)	
Pyford Brook Catchment (GB104028047250)	Yellow	n/a	Amber	Yellow	Remains compliant
Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270)	Amber	Yellow	Amber	Yellow	Remains compliant
Trent and Mersey Canal, summit to Alrewas (GB70410142)	Green	n/a	Amber	Yellow	Remains compliant
Trent from Moreton Brook to River Tame (GB104028047290)	Amber	Yellow	Amber	Yellow	Remains compliant

No prevention of future status objectives

2.4.6 The assessment has screened the new SES2 information against the available RNAG and PoM data for the Pyford Brook Catchment (GB104028047250), Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270) and Trent from Moreton Brook to River Tame (GB104028047290) surface water bodies. The new SES2 information does not result in any new risks of the route preventing the future achievement of the status objectives of the relevant water bodies.

2.4.7 The SES2 scheme is therefore considered to remain compliant with the no prevention of future status objective of the WFD.

3 Part 2: Additional Provision 2 Environmental Statement

3.1 Summary of amendments relevant to WFD

3.1.1 The following types of amendments are proposed in the AP2 revised scheme:

- engineering amendments;
- minor utility amendments; and
- other amendments requiring changes to Bill powers.

3.1.2 A summary of these amendments, together with a detailed description of the engineering amendments, is provided in Part 2 (AP2) of the SES2 and AP2 ES Volume 2, Community area reports 1-5. Those relevant to the WFD assessment are described in the sections below.

Additional Provision 2 changes relevant to WFD

3.1.3 Two AP2 amendments have been scoped in as having the potential to have effects on WFD status and status objectives. Table 3 summarises the amendments that have the potential to impact upon the WFD status and status objectives of the relevant WFD water bodies. These amendments are described below.

Amendments affecting Bourne Brook

3.1.4 An AP2 amendment is located on Bourne Brook, within the 'Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270)' surface water body.

3.1.5 The route within the original scheme intersected Common Lane, with a section of the road to be permanently stopped-up on both sides of the route. Common Lane is an unclassified road that provides access to a number of farm buildings in the vicinity of Bromley Hayes. Accommodation access for farm vehicles will be maintained under the Kings Bromley viaduct reducing the need for farm-related traffic to divert via Crawley Lane and the A515 Lichfield Road. However, the stopping-up will lead to an increase in travel distance of up to 4km for general traffic and result in a minor adverse traffic delay effect, which is significant. The AP2 amendment has therefore been implemented to address the concerns in this area related to vehicle movements in addition to connectivity for non-motorised users (NMUs).

3.1.6 The amendment sees an extension of Common Lane to the A515 Lichfield Road realignment, which will require a new set of 13m long culverts to cross the Bourne Brook. This amendment is shown in map CT-06-202 in the SES2 and AP2 ES Volume 2, CA1 Map Book.

Amendments affecting Unnamed tributary of Meece Brook 3

3.1.7 An AP2 amendment is located on a previous unaffected, unnamed tributary of Meece Brook (referred to hereafter as 'Unnamed tributary of Meece Brook 3'), within the Meece Brook from Source to Chatcull Brook (GB104028053080) surface water body. In the absence of field survey data at this stage, this watercourse is considered on a

precautionary basis to be a moderate value receptor at the location of the access road crossing, and has been scoped into the WFD assessment.

3.1.8 As part of the amendments, Severn Trent Water Ltd's (STWL) Whitmore borehole will be taken out of their distribution network temporarily due to the potential for contamination during construction activities. Three existing STWL sites have been identified to provide alternative supply to Whitmore borehole and new treatment plants at each site are proposed in the AP2 revised scheme.

3.1.9 The amendments include a new treatment plant, access road and parking area for operation and maintenance tasks located adjacent and to the rear of the existing Mill Meece treatment plant. Drainage attenuation and mitigation planting has been included as part of the amendment. The access road will cross the Unnamed tributary of Meece Brook 3 with an approximately 21m long culvert. This amendment is shown in map CT-06-225-L3 in the SES2 and AP2 ES Volume 2, CA3 Map Book.

Table 3: Summary of new scheme components proposed under the AP2 revised scheme, with the potential to effect WFD status and status objectives

WFD water body (ID)	Watercourse	Scheme component type	Scheme component name	Design details	Approximate location (NGR)	AP2 WFD assessment addendum ID
Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270)	Bourne Book	Culvert	-	Approx. culvert length: 13m; Approx. culvert diameter: 1.2m	SK 11944 15554	WFD-AP2-01
Meece Brook from Source to Chatcull Brook (GB104028053080)	Unnamed tributary of Meece Brook 3	Culvert	-	Approx. culvert length: 21m; Approx. culvert diameter: 1.2m	SJ 82999 34008	WFD-AP2-02

3.2 Assessment of effects on WFD surface water bodies

Baseline condition of affected watercourses

3.2.1 The baseline conditions of Bourne Brook is described in the original WFD assessment, Volume 5, Appendix WR-001-000 of the main ES. This includes the area where the new culvert is proposed under the AP2 revised scheme.

3.2.2 The Unnamed tributary of Meece Brook 3 was not assessed in the original WFD assessment and the existing condition is currently unknown. The watercourse has therefore been scoped in for detailed impact assessment in this WFD assessment Addendum on a precautionary basis. The watercourse falls within the Meece Brook from Source to Chatcull Brook (GB104028053080) surface water body catchment. The watercourse flows south-westward from the A519 Newcastle Road north of the village Mill Meece (at approximately SJ 83387 34494) to the existing STWL Mill Meece site. The watercourse then enters a culvert under the WCML and is assumed to continue within a culvert to its confluence with Meece Brook.

Embedded mitigation

3.2.3 Mitigation has been embedded within the design, construction methodology and operational phase of the AP2 revised scheme in order to minimise any effects on the water environment and to ensure that the scheme is, where possible, inherently compliant with the objectives of the WFD for both surface water and groundwater bodies. This is described in Section 6.2 of the original WFD assessment.

3.2.4 Culvert lengths have been reduced as far as reasonably practicable and, where possible, culverts have been designed to be perpendicular to associated track and road crossings to minimise culvert lengths and reduce potential shading effects. The invert level of each culvert is to be buried below the existing bed level of the watercourse. This is to reduce disruption to sediment transfer and to allow build-up of natural substrate, whilst culvert dimensions have been sized to minimise impacts on flow continuity.

3.2.5 The detailed design of all culverts is to be developed in general accordance with CIRIA7 and Environment Agency guidance and will ensure appropriate low-flow water depths and velocities for fish passage. The detailed design will, where reasonably practicable, aim to incorporate hydromorphological improvements on the river channel, which will be undertaken immediately upstream and downstream of the culvert to compensate for footprint loss.

Effects on current status

3.2.6 A detailed impact assessment has been undertaken to identify the magnitude of the effects of the AP2 revised scheme on the current status of the quality elements of the Bourne-Bilson Brook Catchment (trib of Trent) (GB GB104028047270) and Meece Brook from Source to Chatcull Brook (GB104028053080) surface water bodies, in relation to the amendments outlined in Table 3.

3.2.7 A revised detailed impact assessment table for each of these water bodies is provided in Annex A of this addendum. These tables note in red any difference from the original WFD assessment. The AP2 revised scheme is not expected to introduce any new effects that pose a risk of deterioration of the current status of the quality elements of either water body.

3.2.8 The new culvert on Bourne Brook proposed under the AP2 revised scheme will introduce shading and footprint impacts that will cause a new minor, localised adverse (yellow) effect on the biological, physicochemical and hydromorphological quality elements of the watercourse. An overall adverse (amber) effect on a number of the quality elements of the Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270) water body, with a risk of status deterioration, was reported in the original WFD assessment and as a result of the SES2 revised scheme (see Table 2). This is due to the potential impacts of dewatering of the borrow pits at Kings Bromley North on the baseflow of Bourne Brook and Crawley Brook during the construction phase. This overall effect at the water body scale is therefore expected to remain the same under the AP2 revised scheme.

3.2.9 The new culvert on the Unnamed tributary of Meece Brook 3 proposed under the AP2 revised scheme will introduce shading and footprint impacts that will cause a minor, localised adverse (yellow) effect on the biological, physicochemical and

hydromorphological quality elements of this previously unaffected watercourse. An overall minor, localised adverse (yellow) effect on a number of the quality elements of the Meece Brook from Source to Chatcull Brook (GB104028053080) water body, with no change in status when balanced against the embedded mitigation, was reported in the original WFD assessment. This is driven by the impacts of several small culverts and an underbridge proposed on the Unnamed tributary of Meece Brook 2 watercourse. Whilst the AP2 revised scheme will increase the amount of culverting proposed within the water body by 21m (to a total of 51m), this is not expected to increase the overall effect of the scheme to adverse (amber) with a risk of status deterioration at the water body scale. The overall effect at the water body scale is therefore expected to remain the same under the AP2 revised scheme.

Additional mitigation requirements to reduce the risk of deterioration of current status

3.2.10 No additional mitigation is deemed required to reduce the risk of deterioration of current status of the Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270) or Meece Brook from Source to Chatcull Brook (GB104028053080) water bodies as a result of the AP2 revised scheme.

Effects on future achievement of status objectives

3.2.11 The Environment Agency's RBMP Cycle 2 RNAG and PoM data for the Bourne-Bilson Brook Catchment (trib of Trent) (GB GB104028047270) and Meece Brook from Source to Chatcull Brook (GB104028053080) surface water bodies have been screened against the new scheme components proposed under the AP2 revised scheme as outlined in Table 3.

3.2.12 The AP2 revised scheme is not expected to result in any risks of the route preventing the future achievement of the status objectives of the relevant water bodies. A summary of the assessment findings is provided below.

Reasons for not achieving good status

3.2.13 The RNAG for the Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270) water body relate to point source and diffuse source pollution from waste water treatment works, agricultural land, and urban areas impacting upon phosphate and macrophytes and phytobenthos status. The new culvert on Bourne Brook proposed under the AP2 revised scheme will not impact upon point and diffuse sources of pollution within the water body.

3.2.14 The RNAG for the Meece Brook from Source to Chatcull Brook (GB104028053080) water body relate to diffuse source pollution from mixed agricultural land and urban areas impacting upon dissolved oxygen and macrophyte and phytobenthos status. The new culvert on the unnamed tributary of Meece Brook 3 proposed under the AP2 revised scheme will not impact upon point and diffuse sources of pollution within the water body.

Programme of measures

3.2.15 No PoM have been identified by the Environment Agency for the Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270) water body as part of the RBMP Cycle 2.

3.2.16 The PoM for the Meece Brook from Source to Chatcull Brook (GB104028053080) water body relate to the control/management of abstractions for water supply and of point source inputs from waste water treatment works. This involves a requirement for modifications to compensation releases (flow augmentation) and for additional treatment to reduce concentrations of phosphate from the Baldwin's Gate sewage treatment works. The new access road culvert on the unnamed tributary of Meece Brook 3 under the AP2 revised scheme will not impact upon the implementation of these measures.

Additional mitigation requirements to reduce the risk of prevention of status objectives

3.2.17 No additional mitigation is deemed required to reduce the risk of prevention of status objectives of the Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270) or Meece Brook from Source to Chatcull Brook (GB104028053080) water bodies as a result of the AP2 revised scheme.

3.3 WFD compliance

No deterioration of current status

3.3.1 The assessment has identified a new minor, localised adverse (yellow) effect on Bourne Brook and the Unnamed tributary of Meece Brook 3 located within the Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270) and Meece Brook from Source to Chatcull Brook (GB104028053080) surface water bodies, respectively, as a result of the AP2 revised scheme. These effects are not anticipated to cause a deterioration in current status of either water body (see Table 4).

3.3.2 The AP2 revised scheme is therefore considered to be compliant with the no deterioration of current status objective of the WFD.

Table 4: AP2 changes to the risk of deterioration of overall status of relevant WFD surface water bodies

Water body (ID)	**Risk of deterioration of overall status of water body**				**Compliance (original scheme + SES2)**
	Original assessment (pre additional mitigation)	Original assessment (post additional mitigation)	AP2 (pre additional mitigation)	AP2 (post additional mitigation)	
Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270)	Amber	Yellow	Amber	Yellow	Remains compliant
Meece Brook from Source to Chatcull Brook (GB104028053080)	Yellow	n/a	Yellow	n/a	Remains compliant

No prevention of future status objectives

3.3.3 The assessment has screened the AP2 revised scheme against the available RNAG and PoM datasets for the Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270) or Meece Brook from Source to Chatcull Brook (GB104028053080) surface water bodies. The AP2 revised scheme is not anticipated to impact on the pressures identified by the Environment Agency that are currently restricting these

water bodies from achieving their good status objective, or to inhibit the implementation of measures derived to date to address these pressures.

3.3.4 The AP2 revised scheme is therefore considered to be compliant with the no prevention of future status objective of the WFD.

4 Conclusion

4.1.1 This WFD assessment Addendum provides an indication of the likely compliance of the SES2 and AP2 revised scheme at the time the assessment was prepared.

4.1.2 The assessment has concluded that the new SES2 information, regarding the potential zone of groundwater influence associated with dewatering of the borrow pits during the construction phase, will cause a new risk of deterioration in the current status of the Pyford Brook Catchment (GB104028047250), Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270), Trent and Mersey Canal, summit to Alrewas (GB70410142), and Trent from Moreton Brook to River Tame (GB104028047290) surface water bodies. It is currently anticipated that it should be possible to develop the means of mitigating these impacts, to ensure that there is no residual risk of deterioration of the current status of the relevant water bodies. These measures may include excavating the material from (and backfilling) the borrow pits in phases to reduce the groundwater zone of influence, and/or augmenting flow in the watercourses using water abstracted from the borrow pit excavations. These measures will be developed in detail with the Environment Agency following completion of ongoing ground investigations and subsequent update of hydrogeological modelling.

4.1.3 The assessment has concluded that the AP2 revised scheme will not cause a deterioration of the current status of the relevant Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270) or Meece Brook from Source to Chatcull Brook (GB104028053080) surface water bodies, or prevent these water bodies from achieving its status objectives.

4.1.4 The AP2 revised scheme will therefore remain compliant with the objectives of the WFD.

4.1.5 No instances where an Article 4.7 test is required have been identified in this assessment.

5 References

British Geological Survey (2000), *The physical properties of minor aquifers in England and Wales: Hydrogeology Group Technical Report WD/00/04, Environment Agency R&D Publication 68*

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HS2 Ltd (2017), *High Speed Two (HS2) Phase 2a (West Midlands-Crewe) Environmental Statement*. Available online at: https://www.gov.uk/government/collections/hs2-phase-2a-environmental-statement

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HS2 Ltd (2018), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Supplementary Environmental Statement and Additional Provision Environmental Statement*. Available online at: https://www.gov.uk/government/collections/hs2-phase-2a-supplementary-environmental-statement-and-additional-provision-environmental-statement

HS2 Ltd (2018), *High Speed Rail (West Midlands-Crewe) Supplementary Environmental Statement and Additional Provision Environmental Statement, Volume 5: Technical appendices, Water Framework Directive compliance assessment addendum (WR-001-000)*.Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/692655/G30_WFD_framework__WR-001-000__WEB.pdf

Institution of Civil Engineers (2018), *Trent and Mersey canal*. Available online at: https://www.ice.org.uk/what-is-civil-engineering/what-do-civil-engineers-do/trent-and-mersey-canal

Annex A: Revised detailed impact assessment tables

Table 5: Revised Detailed Impact Assessment - Pyford Brook Catchment (trib of Trent) (GB104028047250)

Surface water body: Pyford Brook Catchment (trib of Trent)				**Detailed Impact Assessment**								**Detailed Impact Assessment Results**					
Water body ID:	GB104028047250	**Watercourse (EIA receptor value):**		**Pyford Brook (High)**													
Hydromorphological designation:	Not A/HMWB	**Scheme component:**		**WFD-PYB-W-01-01 Viaduct**	**WFD-PYB-W-01-02 Access road culvert**			**WFD-BP01 Borrow pit - Kings Bromley South, located either side of Crawley Lane and to the south of Ashby Sitch, both sides of the route of the Proposed Scheme**				**Cumulative effects - effects on element from scheme component(s) located in other WFD water bodies**	**Overall effect on element**	**Additional mitigation requirements**		**Residual effect on element**	**WFD compliance outcome - potential for deterioration of current status**
Overall Status:	Bad	**Description of scheme component:**		Pyford Brook Viaduct; Approx. viaduct width: 15m; Approx. viaduct length: 180m; Viaduct height: 10m	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m			Approx. total borrow pit surface area: 0.37km^2; Assumed maximum excavation depth: 18m; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 270m; Approx. total catchment area of watercourse: 28.7km^2						**Construction**	**Operation**		
Status Objective:	Good by 2027	**Summary of embedded mitigation:**		Clear span viaduct. Viaducts designed to cross perpendicular to river channel wherever possible to reduce shading impact.	Culvert length has been reduced as far as reasonably practicable. Invert of culvert to be buried 300mm below the existing bed level to reduce disruption to sediment transfer and maintain natural substrate. Culvert sized to minimise impact on flow continuity. Detailed design to be developed in general accordance with CIRIA and Environment Agency guidance and to ensure appropriate low flow water depths and velocities for fish passage. Hydromorphological improvements to be undertaken to river channel immediately upstream and downstream of the culvert to compensate for footprint loss.			A 50m buffer zone is incorporated between nearby watercourses and borrow pits. Excavation will not take place in this zone. Depending on the permeability of the underlying strata between a watercourse and the borrow pit excavation, there is the potential for dewatering and excavation activities to affect watercourse flow regime. Therefore, site investigation and monitoring before during and after dewatering and excavation activities will be required to protect the integrity of these watercourses. Following construction, the areas excavated as borrow pit will be restored to the existing levels and land use in accordance with the Phase 2a Borrow Pits Agricultural Restoration Strategy. The materials used to backfill the borrow pit as part of the restoration plan are assumed to consist of a lower permeability than the current material. Drainage measures will be designed to control groundwater levels and to sustain baseline to the watercourse.						
WFD Classification Elements		**2015 Status**	**Status Objective**	**Shading**	**Footprint**	**Shading**	**Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream**	**Footprint**	**Changes in flow velocity and volume due to dewatering**	**Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream**							
Biological Quality Elements	**Macrophytes and Phytobenthos - combined**	Moderate	Good by 2027	Some minor, localised and periodic shading of river channel. However negligible effect on macrophytes and phytobenthos anticipated. **No measurable change in quality element**	Localised but permanent loss of open river habitat. Localised adverse effects on macrophytes and phytobenthos anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of section of river channel. Localised adverse effect on macrophytes and phytobenthos anticipated (due to a reduction in photosynthetic activity), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and macrophytes and phytobenthos habitat upstream and downstream of culvert. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx.1.3% of catchment area of watercourse). No direct physical impact on river channel or riparian zone. No likely effects anticipated on macrophyte and phytobenthos habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on macrophytes and phytobenthos habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on river channel leading to changes in river processes and habitat upstream and downstream. No likely effects anticipated on macrophytes and phytobenthos. **No measurable change in quality element.**	None - water body downstream (Trent from Moreton Brook to River Tame) affected by Proposed Scheme but no widespread adverse impacts identified with the potential to propagate upstream and affect water body (e.g. restrictive structures significantly affecting biological continuity). Also Proposed Scheme effects to downstream water body all occur upstream of confluence with this water body.	Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**	Additional mitigation measures for the management of groundwater baseflow to the Pyford Brook during the construction phase will be required to ensure that there is no significant impact on the water environment. Mitigation measures will be designed in detail following ground investigation and monitoring of surface water and groundwater levels and in consultation with the Environment Agency. Mitigation could take the form of: • excavation of material from (and backfilling) the borrow pit in phases to reduce the groundwater zone of influence; • augmentation of flow in the watercourse using water abstracted from the borrow pit excavation; • a wider buffer strip, or shallower batter on the excavations; • installation of a groundwater cut off; • adoption of wet working techniques that avoid the need for dewatering; • creation of a new lined channel and temporary diversion.	None required.	Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	**Compliant - no change in biological status of water body**
	Macroinvertebrates	Bad	Good by 2027	Some minor, localised and periodic shading of river channel. However negligible effect on macroinvertebrates anticipated. **No measurable change in quality element**	Localised but permanent loss of open river habitat. Localised adverse effects on macroinvertebrates anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of section of river channel. Localised adverse effects on macroinvertebrates anticipated (including due to a reduction in/loss of riparian and aquatic vegetation), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and macroinvertebrate habitat upstream and downstream of culvert. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx. 1.3% of catchment area of watercourse). No direct physical impact on river channel or riparian zone. No likely effects anticipated on macroinvertebrate habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on macroinvertebrate habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on river channel or riparian zone leading to changes in river processes and habitat upstream and downstream. No likely effects anticipated on macroinvertebrates. **No measurable change in quality element**		Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**			Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	
	Fish	-	-	Some minor, localised and periodic shading of river channel. However negligible effect on fish anticipated. **No measurable change in quality element**	Localised but permanent loss of open river habitat. Localised adverse effects on fish anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of culverted section of channel. Localised adverse effects on fish anticipated (including due to a reduction in/loss of riparian and aquatic vegetation), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and fish habitat upstream and downstream of culvert. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx. 1.3% of catchment area of watercourse). No direct physical impact on river channel or riparian zone. No likely effects anticipated on fish habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on fish habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on river channel or riparian zone leading to changes in river processes and habitat upstream and downstream. No likely effects anticipated on fish. **No measurable change in quality element**		Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**			Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	
Physicochemical Quality Elements	**Dissolved oxygen**	Bad	Good by 2021	Some minor, localised and periodic shading of river channel (with potential associated reduction in photosynthetic activity by aquatic flora). However negligible effect on dissolved oxygen concentrations anticipated. **No measurable change in quality element.**	Element is insensitive to impact	Localised but permanent shading of culverted section of channel. Potential to lead to minor and localised impact on dissolved oxygen concentrations (due to reduced photosynthetic activity by aquatic flora). Localised adverse effects anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised and temporary loss of area of agricultural land within vicinity of watercourse (approx. 1.3% of catchment area of watercourse). No direct physical impact on river channel or riparian zone. No likely effects on dissolved oxygen. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential localised but temporary adverse effects on dissolved oxygen, but **no change in quality element when balanced against mitigation embedded in the scheme.**	No direct physical impact on river channel or riparian zone leading to changes in river processes upstream and downstream. No likely effect anticipated on dissolved oxygen concentrations. **No measurable change in quality element**	None - water body downstream (Trent from Moreton Brook to River Tame) affected by Proposed Scheme but no widespread adverse impacts identified with the potential to propagate upstream and affect water body. Also Proposed Scheme effects to downstream water body all occur upstream of confluence with this water body.	Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.	None required.	None required.	N/A	**Compliant - no change in physicochemical status of water body**
	pH	High	Good by 2015	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact		Element is insensitive to impact. No measurable change to quality element			N/A	
	Phosphate	Bad	Good by 2021	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx. 1.3% of catchment area of watercourse). Localised and temporary reduction in agricultural activity, with potential associated reductions in application of organic and inorganic fertilizer. However negligible effect anticipated on phosphate concentrations. **No measurable change in quality element**.	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential localised and temporary adverse effects on phosphate concentrations, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/A	
	Ammonia (phys-chem)	Bad	Good by 2021	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx.1.3% of catchment area of watercourse). Localised and temporary reduction in agricultural activity, with potential associated reductions in application of organic and inorganic fertilizer. However negligible effect anticipated on ammonia concentrations. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential localised but temporary adverse effects on ammonia concentrations, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/A	
	Temperature	High	Good by 2015	Some minor, localised and periodic shading of river channel. However negligible effect on water temperature anticipated. **No measurable change in quality element.**	Element is insensitive to impact	Localised but permanent shading of culverted section of channel. Potential to lead to minor and localised impact on water temperature. Localised adverse effects anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact		Localised and temporary adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/A	
Specific Pollutants	**Ammonia, Copper, Triclosan, Zinc**	High	High by 2015	N/A - Specific pollutants effects screened out for scheme component	N/A - Specific pollutants effects screened out for scheme component			Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential localised but temporary adverse effects on specific pollutant concentrations, but **no change in quality element when balanced against mitigation embedded in the scheme.**	No direct physical impact on river channel or riparian zone leading to changes in river processes upstream and downstream. No likely effects anticipated on specific pollutant concentrations. **No measurable change in quality element.**	None - water body downstream (Trent from Moreton Brook to River Tame) affected by Proposed Scheme but no widespread adverse impacts identified with the potential to propagate upstream and affect water body. Also Proposed Scheme effects to downstream water body all occur upstream of confluence with this water body.	Localised and temporary adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.				
Hydromorphological Quality Elements	**Quantity and dynamics of water flow**	Supports Good	Supports Good by 2015	N/A - Hydromorphology effects screened out for scheme component	Localised but permanent changes to hydromorphology regime. Localised adverse effects on flow dynamics (including potential localised increases in flow velocity) anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and quantity and dynamics of water flow upstream and downstream. **No measurable change in quality element**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx.1.3% of catchment area of watercourse). No direct physical impact on river channel. No likely effects anticipated on quantity and dynamics of water flow. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on the quantity and dynamics of water flow. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on river channel or riparian zone leading to changes in river processes upstream and downstream. No likely effects anticipated on quantity and dynamics of flow. **No measurable change in quality element.**	None - water body downstream (Trent from Moreton Brook to River Tame) affected by Proposed Scheme but no widespread adverse impacts identified with the potential to propagate upstream and affect water body. Also Proposed Scheme effects to downstream water body all occur upstream of confluence with this water body.	Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**	Additional mitigation measures for the management of groundwater baseflow to the Pyford Brook during the construction phase will be required to ensure that there is no significant impact on the water environment. Mitigation measures will be designed in detail following ground investigation and monitoring of surface water and groundwater levels and in consultation with the Environment Agency. Mitigation could take the form of: • excavation of material from (and backfilling) the borrow pit in phases to reduce the groundwater zone of influence; • augmentation of flow in the watercourse using water abstracted from the borrow pit excavation; • a wider buffer strip, or shallower batter on the excavations; • installation of a groundwater cut off; • adoption of wet working techniques that avoid the need for dewatering; • creation of a new lined channel and temporary diversion.	None required.	Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	**Compliant - no change in hydromorphological status of water body**
	Connection to groundwater bodies				Localised but permanent loss of connection to surrounding shallow groundwater within superficial deposits. However no likely effect anticipated on connection to groundwater bodies. **No measurable change in quality element.**	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in connection to groundwater bodies as a result of dewatering activities. Potential adverse effects on the connection to groundwater bodies. **There is a risk that a change in status could occur. Requires additional mitigation.**	Element is insensitive to impact		Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**			Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	
	River continuity				Localised but permanent changes to hydromorphology regime. Localised adverse effects on river continuity anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx. 1.3% of catchment area of watercourse). No direct physical impact on river channel or riparian zone. No likely effect anticipated on river continuity. **No measurable change in quality element.**	Element is insensitive to impact	Element is insensitive to impact		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/A	
	River depth and width variation				Localised but permanent changes to hydromorphology regime. Localised adverse effects on river depth and width anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and river depth and variation upstream and downstream. **No measurable change in quality element**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx. 1.3% of catchment area of watercourse). No direct physical impact on river channel. No likely effect on river depth and width variation. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on the river depth and width variation. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on river channel or riparian zone leading to changes in river processes upstream and downstream. No likely effects anticipated on river depth and variation. **No measurable change in quality element**		Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**			Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	
	Structure and substrate of the river bed				Localised but permanent changes to hydromorphology regime. Localised adverse effects on structure of river bed anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and structure and substrate of river bed upstream and downstream. **No measurable change in quality element**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse(approx.1.3% of catchment area of watercourse). No direct physical impact on river channel. No likely effects anticipated on structure and substrate of river bed. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential localised but temporary adverse effects on river substrate (due to a potential increase in siltation), but **no change in quality element when balanced against mitigation embedded in the scheme.**	No direct physical impact on river channel or riparian zone leading to changes in river processes upstream and downstream. No likely effects anticipated on structure and substrate of river bed. **No measurable change in quality element.**		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/A	
	Structure of the riparian zone				Localised but permanent loss of riparian zone. Localised adverse effects on structure of riparian zone anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx. 1.3% of catchment area of watercourse). No direct physical impact on riparian zone. No likely effects anticipated on structure of riparian zone. **No measurable change in quality element.**	Element is insensitive to impact	Element is insensitive to impact		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/A	

Table 6: Revised Detailed Impact Assessment - Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270)

Surface water body: Bourne-Bilson Brook Catchment (trib of Trent)

Water body ID:	GB104028047270
Hydromorphological designation:	Not A/HMWB
Overall Status:	Moderate
Status Objective:	Good by 2027

Detailed Impact Assessment

Watercourse (EIA receptor value)	Scheme component	Description of scheme component	Summary of embedded mitigation
Bourne Brook (High)	WFD-BRN-W-01-01 Viaduct	Kings Bromley Viaduct; Approx. viaduct width: 15m; Approx. viaduct length: 980m; Approx.. viaduct height: 6m	Clear span viaduct. Viaducts designed to cross perpendicular to river channel wherever possible to reduce shading impact.
Bourne Brook (High)	WFD-BP01 Borrow pit - Kings Bromley South, located either side of Crawley Lane and to the south of Ashby Sitch, both sides of the route of the Proposed Scheme	Approx. total borrow pit surface area: 0.37km²; Assumed maximum excavation depth: 18m; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 535m; Approx. total catchment area of watercourse: 37.54km²	A 50m buffer zone is incorporated between nearby watercourses and borrow pits. Excavation will not take place in this zone. Depending on the permeability of the underlying strata between a watercourse and the borrow pit excavation, there is the potential for dewatering and excavation activities to affect watercourse flow regime. Therefore, site investigation and monitoring before during and after dewatering and excavation activities will be required to protect the integrity of these watercourses. Following construction, the areas excavated as borrow pit will be restored to the existing levels and land use in accordance with the Phase 2a Borrow Pits Agricultural Restoration Strategy. The materials used to backfill the borrow pit as part of the restoration plan are assumed to consist of a lower permeability than the current material. Drainage measures will be designed to control groundwater levels and to sustain baseflow to the watercourse.
Bourne Brook (High)	WFD-BP02 Borrow pit - Kings Bromley North, located adjacent to the realigned A515 Lichfield Road	Approx. total borrow pit surface area: 0.16km²; Assumed maximum excavation depth: 18m; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 145m; Total catchment area of watercourse: 37.54km²	A 50m buffer zone is incorporated between nearby watercourses and borrow pits. Excavation will not take place in this zone. Depending on the permeability of the underlying strata between a watercourse and the borrow pit excavation, there is the potential for dewatering and excavation activities to affect watercourse flow regime. Therefore, site investigation and monitoring before during and after dewatering and excavation activities will be required to protect the integrity of these watercourses. Following construction, the areas excavated as borrow pit will be restored to the existing levels and land use in accordance with the Phase 2a Borrow Pits Agricultural Restoration Strategy. The materials used to backfill the borrow pit as part of the restoration plan are assumed to consist of a lower permeability than the current material. Drainage measures will be designed to control groundwater levels and to sustain baseflow to the watercourse.
Bourne Brook (High)	WFD-BP03 Borrow pit - Kings Bromley North, located adjacent to the realigned Shaw Lane	Approx. total borrow pit surface area: 0.24km²; Assumed maximum excavation depth: 18m; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 525m; Approx. total catchment area of watercourse: 37.54km²	A 50m buffer zone is incorporated between nearby watercourses and borrow pits. Excavation will not take place in this zone. Depending on the permeability of the underlying strata between a watercourse and the borrow pit excavation, there is the potential for dewatering and excavation activities to affect watercourse flow regime. Therefore, site investigation and monitoring before during and after dewatering and excavation activities will be required to protect the integrity of these watercourses. Following construction, the areas excavated as borrow pit will be restored to the existing levels and land use in accordance with the Phase 2a Borrow Pits Agricultural Restoration Strategy. The materials used to backfill the borrow pit as part of the restoration plan are assumed to consist of a lower permeability than the current material. Drainage measures will be designed to control groundwater levels and to sustain baseflow to the watercourse.
Bourne Brook (High)	WFD-BRN-W-01-02 Daylighting (of existing highway culvert)	Approx. existing culvert length: 9m; Approx. existing culvert dimensions: approximately 3.5m x 2.5m	Reinstatement of river channel form within daylighting footprint, equivalent to reaches upstream and downstream of existing culvert
Bourne Brook (High)	WFD-BRN-W-01-03 Highway realignment culvert	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	Culvert length has been reduced as far as reasonably practicable. Invert of culvert to be buried 300mm below the existing bed level to reduce disruption to sediment transfer and maintain natural substrate. Culvert sized to minimise impact on flow continuity. Detailed design to be developed in general accordance with CIRIA and Environment Agency guidance and to ensure appropriate low flow water depths and velocities for fish passage. Hydromorphological improvements to be undertaken to river channel immediately upstream and downstream of the culvert to compensate for footprint loss.
Bourne Brook (High)	WFD-AP2-01 Access road culvert	Approx. culvert length: 13m; Approx. culvert diameter: 1.2m	Culvert length has been reduced as far as reasonably practicable. Invert of culvert to be buried 300mm below the existing bed level to reduce disruption to sediment transfer and maintain natural substrate. Culvert sized to minimise impact on flow continuity. Detailed design to be developed in general accordance with CIRIA and Environment Agency guidance and to ensure appropriate low flow water depths and velocities for fish passage. Hydromorphological improvements to be undertaken to river channel immediately upstream and downstream of the culvert to compensate for footprint loss.
Crawley Brook (Moderate)	WFD-BRN-T-02-01 Highway realignment culvert	Approx. culvert length: 10m; Approx. culvert diameter 0.9m	Culvert length has been reduced as far as reasonably practicable. Invert of culvert to be buried 300mm below the existing bed level to reduce disruption to sediment transfer and maintain natural substrate. Culvert sized to minimise impact on flow continuity. Detailed design to be developed in general accordance with CIRIA and Environment Agency guidance and to ensure appropriate low flow water depths and velocities for fish passage. Hydromorphological improvements to be undertaken to river channel immediately upstream and downstream of the culvert to compensate for footprint loss.
Crawley Brook (Moderate)	WFD-BRN-T-02-02 Viaduct	Kings Bromley Viaduct; Approx. viaduct width: 15m; Approx. viaduct length: 980m; Approx. viaduct height: 6m	Clear span viaduct. Viaducts designed to cross perpendicular to river channel wherever possible to reduce shading impact.
Crawley Brook (Moderate)	WFD-BRN-T-02-03 Realignment	Approx. total length of new realigned channel: 60m; Approx. total length of existing channel: 55m; Total net gain: 5m	The length of watercourse realignments has been reduced as far as reasonably practicable. Design of the new channel will also ensure the equivalent hydraulic capacity and incorporation of appropriate features equivalent to those lost along the existing channel footprint. Where natural watercourse, the design will aim to enhance hydromorphological condition over the existing condition where reasonably practicable (provided this is compatible with the watercourses' flood risk and land drainage functions). In addition, the design of the new channel will allow for a 10m wide buffer zone for the implementation of marginal/riparian improvements.
Crawley Brook (Moderate)	WFD-BP02 Borrow pit - Kings Bromley North, located adjacent to the realigned A515 Lichfield Road	Approx. total borrow pit surface area: 0.16km²; Assumed maximum excavation depth: 18m; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 87m; Approx. total catchment area of watercourse: 4.97km²	A 50m buffer zone is incorporated between nearby watercourses and borrow pits. Excavation will not take place in this zone. Depending on the permeability of the underlying strata between a watercourse and the borrow pit excavation, there is the potential for dewatering and excavation activities to affect watercourse flow regime. Therefore, site investigation and monitoring before during and after dewatering and excavation activities will be required to protect the integrity of these watercourses. Following construction, the areas excavated as borrow pit will be restored to the existing levels and land use in accordance with the Phase 2a Borrow Pits Agricultural Restoration Strategy. The materials used to backfill the borrow pit as part of the restoration plan are assumed to consist of a lower permeability than the current material. Drainage measures will be designed to control groundwater levels and to sustain baseflow to the watercourse.
Crawley Brook (Moderate)	WFD-BP03 Borrow pit - Kings Bromley North, located adjacent to the realigned Shaw Lane	Approx. total borrow pit surface area: 0.24km²; Assumed maximum excavation depth: 18m; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 50m; Approx. total catchment area of watercourse: 4.97km²	A 50m buffer zone is incorporated between nearby watercourses and borrow pits. Excavation will not take place in this zone. Depending on the permeability of the underlying strata between a watercourse and the borrow pit excavation, there is the potential for dewatering and excavation activities to affect watercourse flow regime. Therefore, site investigation and monitoring before during and after dewatering and excavation activities will be required to protect the integrity of these watercourses. Following construction, the areas excavated as borrow pit will be restored to the existing levels and land use in accordance with the Phase 2a Borrow Pits Agricultural Restoration Strategy. The materials used to backfill the borrow pit as part of the restoration plan are assumed to consist of a lower permeability than the current material. Drainage measures will be designed to control groundwater levels and to sustain baseflow to the watercourse.
Crawley Brook (Moderate)	WFD-BRN-T-02-04 Highway realignment culvert	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	Culvert length has been reduced as far as reasonably practicable. Invert of culvert to be buried 300mm below the existing bed level to reduce disruption to sediment transfer and maintain natural substrate. Culvert sized to minimise impact on flow continuity. Detailed design to be developed in general accordance with CIRIA and Environment Agency guidance and to ensure appropriate low flow water depths and velocities for fish passage. Hydromorphological improvements to be undertaken to river channel immediately upstream and downstream of the culvert to compensate for footprint loss.

WFD Classification Elements

Element group	WFD Classification Element	2015 Status	Status Objective
Biological Quality Elements	Macrophytes and Phytobenthos - combined	Moderate	Good by 2027
Biological Quality Elements	Macroinvertebrates	High	Good by 2015
Biological Quality Elements	Fish	-	-
Physicochemical Quality Elements	Dissolved oxygen	High	Good by 2015
Physicochemical Quality Elements	pH	High	Good by 2015
Physicochemical Quality Elements	Phosphate	Moderate	Good by 2027
Physicochemical Quality Elements	Ammonia	High	Good by 2015
Physicochemical Quality Elements	Temperature	High	Good by 2015
Specific Pollutants	Copper, Triclosan, Zinc	High	High by 2015
Hydromorphological Quality Elements	Quantity and dynamics of water flow	Supports Good	Supports good by 2015
Hydromorphological Quality Elements	Connection to groundwater bodies	Supports Good	Supports good by 2015
Hydromorphological Quality Elements	River continuity	Supports Good	Supports good by 2015
Hydromorphological Quality Elements	River depth and width variation	Supports Good	Supports good by 2015
Hydromorphological Quality Elements	Structure and substrate of the river bed	Supports Good	Supports good by 2015
Hydromorphological Quality Elements	Structure of the riparian zone	Supports Good	Supports good by 2015

WFD-BRN-W-01-01 Viaduct (Bourne Brook)

WFD Classification Element	Shading
Macrophytes and Phytobenthos - combined	Some minor, localised and periodic shading of river channel. However negligible effect on macrophytes and phytobenthos anticipated. **No measurable change in quality element.**
Macroinvertebrates	Some minor, localised and periodic shading of river channel. However negligible effect on macroinvertebrates anticipated. **No measurable change in quality element.**
Fish	Some minor, localised and periodic shading of river channel. However negligible effect on fish anticipated. **No measurable change in quality element.**
Dissolved oxygen	Some minor, localised and periodic shading of river channel (with potential associated reduction in photosynthetic activity by aquatic flora). However, negligible effect on dissolved oxygen concentrations anticipated. **No measurable change in quality element.**
pH	Element is insensitive to impact
Phosphate	Element is insensitive to impact
Ammonia	Element is insensitive to impact
Temperature	Some minor, localised and periodic shading of river channel. However, negligible effect on water temperature anticipated. **No measurable change in quality element.**
Copper, Triclosan, Zinc	N/A - Specific pollutants effects screened out for scheme design component
Hydromorphological Quality Elements (all)	N/A - Hydromorphology effects screened out for scheme design component

WFD-BP01 / WFD-BP02 / WFD-BP03 Borrow pits (Bourne Brook)

Component	WFD Classification Element	Footprint	Changes in flow velocity and volume due to dewatering	Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream
WFD-BP01	Macrophytes and Phytobenthos - combined	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx.1% of catchment area of watercourse). No direct physical impact on river channel or riparian zone. No likely effects anticipated on macrophyte and phytobenthos habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on macrophytes and phytobenthos habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on river channel leading to changes in river processes and habitat upstream and downstream. No likely effects anticipated on macrophytes and phytobenthos. **No measurable change in quality element.**
WFD-BP01	Macroinvertebrates	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx. 1% of catchment area of watercourse). No direct physical impact on river channel or riparian zone. No likely effects anticipated on macroinvertebrate habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on macroinvertebrate habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on river channel or riparian zone leading to changes in river processes and habitat upstream and downstream. No likely effects anticipated on macroinvertebrates. **No measurable change in quality element**
WFD-BP01	Fish to Structure of the riparian zone	[illegible]	[illegible]	[illegible]
WFD-BP02	Macrophytes and Phytobenthos - combined	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx. 0.4% of catchment area of watercourse). No direct physical impact on river channel or riparian zone. No likely effects anticipated on macrophyte and phytobenthos habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth: 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on macrophytes and phytobenthos habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on river channel leading to changes in river processes and habitat upstream and downstream. No likely effects anticipated on macrophytes and phytobenthos. **No measurable change in quality element.**
WFD-BP02	Macroinvertebrates	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx. 0.4% of catchment area of watercourse). No direct physical impact on river channel or riparian zone. No likely effects anticipated on macroinvertebrate habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of floodplain (assumed maximum excavation depth: 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on macroinvertebrate habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on river channel or riparian zone leading to changes in river processes and habitat upstream and downstream. No likely effects anticipated on macroinvertebrates. **No measurable change in quality element**
WFD-BP02	Fish to Structure of the riparian zone	[illegible]	[illegible]	[illegible]
WFD-BP03	Macrophytes and Phytobenthos - combined	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx. 0.6% of catchment area of watercourse). No direct physical impact on river channel or riparian zone. No likely effects anticipated on macrophyte and phytobenthos habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth: 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on macrophytes and phytobenthos habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on river channel leading to changes in river processes and habitat upstream and downstream. No likely effects anticipated on macrophytes and phytobenthos. **No measurable change in quality element.**
WFD-BP03	Macroinvertebrates	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx. 0.6% of catchment area of watercourse). No direct physical impact on river channel or riparian zone. No likely effects anticipated on macroinvertebrate habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth: 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on macroinvertebrate habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on river channel or riparian zone leading to changes in river processes and habitat upstream and downstream. No likely effects anticipated on macroinvertebrates. **No measurable change in quality element**
WFD-BP03	Fish to Structure of the riparian zone	[illegible]	[illegible]	[illegible]

WFD-BRN-W-01-02 Daylighting (of existing highway culvert)

WFD Classification Element	Footprint / creation of new habitats	Shading	Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream
Macrophytes and Phytobenthos - combined	Removal of existing 10m culvert. Localised but permanent increase in open river habitat. Localised improvement in macrophyte and phytobenthos habitat anticipated, but **no change in quality element.**	Removal of existing 10m culvert. Localised but permanent reduction in shading of section of river channel. Localised improvement in macrophyte and phytobenthos habitat anticipated, but **no change in quality element.**	Localised but permanent improvement to hydromorphology regime. However negligible effect anticipated on river processes and macrophyte and phytobenthos habitat upstream and downstream. **No measurable change in quality element.**
Macroinvertebrates	Removal of existing 10m culvert. Localised but permanent increase in open river habitat. Localised improvement in macroinvertebrate habitat anticipated, but **no change in quality element.**	Removal of existing 10m culvert. Localised but permanent reduction in shading of section of river channel. Localised improvement in macroinvertebrate habitat anticipated (including due to a increase in riparian and aquatic vegetation), but **no change in quality element.**	Localised but permanent improvement to hydromorphology regime. However negligible effect anticipated on river processes and macroinvertebrate habitat upstream and downstream. **No measurable change in quality element.**
Fish to Structure of the riparian zone	[illegible]	[illegible]	[illegible]

Culverts: WFD-BRN-W-01-03 Highway realignment culvert, WFD-AP2-01 Access road culvert (Bourne Brook); WFD-BRN-T-02-01 and WFD-BRN-T-02-04 Highway realignment culverts (Crawley Brook)

WFD Classification Element	Footprint	Shading	Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream
Macrophytes and Phytobenthos - combined	Localised but permanent loss of open river habitat. Localised adverse effects on macrophytes and phytobenthos anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of section of river channel. Localised adverse effect on macrophytes and phytobenthos anticipated (due to a reduction in photosynthetic activity), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and macrophytes and phytobenthos habitat upstream and downstream of culvert. **No measurable change in quality element.**
Macroinvertebrates	Localised but permanent loss of open river habitat. Localised adverse effects on macroinvertebrates anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of section of river channel. Localised adverse effects on macroinvertebrates anticipated (including due to a reduction in/loss of riparian and aquatic vegetation), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and macroinvertebrate habitat upstream and downstream of culvert. **No measurable change in quality element.**
Fish	[illegible]	[illegible]	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and fish habitat upstream and downstream of culvert. **No measurable change in quality element.**
Dissolved oxygen	[illegible]	[illegible]	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and dissolved oxygen upstream and downstream of culvert. **No measurable change in quality element.**
pH	[illegible]	[illegible]	Element is insensitive to impact
Phosphate	[illegible]	[illegible]	Element is insensitive to impact
Ammonia	[illegible]	[illegible]	Element is insensitive to impact
Temperature	[illegible]	[illegible]	Element is insensitive to impact
Copper, Triclosan, Zinc	[illegible]	[illegible]	[illegible]
Quantity and dynamics of water flow	[illegible]	[illegible]	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and quantity and dynamics of flow upstream and downstream. **No measurable change in quality element.**
Connection to groundwater bodies	[illegible]	[illegible]	Element is insensitive to impact
River continuity	[illegible]	[illegible]	Element is insensitive to impact
River depth and width variation	[illegible]	[illegible]	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and river depth and variation upstream and downstream. **No measurable change in quality element.**
Structure and substrate of the river bed	[illegible]	[illegible]	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and structure and substrate of river bed upstream and downstream. **No measurable change in quality element.**
Structure of the riparian zone	[illegible]	[illegible]	Element is insensitive to impact

WFD-BRN-T-02-02 Viaduct (Crawley Brook)

WFD Classification Element	Shading
Macrophytes and Phytobenthos - combined	Some minor, localised and periodic shading of river channel. However negligible effect on macrophytes and phytobenthos anticipated. **No measurable change in quality element.**
Macroinvertebrates	Some minor, localised and periodic shading of river channel. However negligible effect on macroinvertebrates anticipated. **No measurable change in quality element.**
Fish to Structure of the riparian zone	[illegible]

WFD-BRN-T-02-03 Realignment (Crawley Brook)

WFD Classification Element	Footprint	Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream	Creation of new habitats
Macrophytes and Phytobenthos - combined	Creation of 60m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). Localised improvement in macrophytes and phytobenthos habitat, but **no change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and macrophytes and phytobenthos habitat upstream and downstream. **No measurable change in quality element.**	Creation of 60m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). Localised improvement in macrophytes and phytobenthos habitat, but **no change in quality element.**
Macroinvertebrates	Creation of 60m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). Localised improvement in macroinvertebrate habitat, but **no change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and macroinvertebrate habitat upstream and downstream. **No measurable change in quality element.**	Creation of 60m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). Localised improvement in macroinvertebrate habitat, but **no change in quality element.**
Fish to Structure of the riparian zone	[illegible]	[illegible]	[illegible]

WFD-BP02 / WFD-BP03 Borrow pits (Crawley Brook)

Component	WFD Classification Element	Footprint	Changes in flow velocity and volume due to dewatering	Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream
WFD-BP02	Macrophytes and Phytobenthos - combined	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx. 3.2% of catchment area of watercourse). No direct physical impact on river channel or riparian zone. No likely effects anticipated on macrophyte and phytobenthos habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth: 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on macrophytes and phytobenthos habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on river channel leading to changes in river processes and habitat upstream and downstream. No likely effects anticipated on macrophytes and phytobenthos. **No measurable change in quality element.**
WFD-BP02	Macroinvertebrates	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx. 3.2% of catchment area of watercourse). No direct physical impact on river channel or riparian zone. No likely effects anticipated on macroinvertebrate habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth: 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on macroinvertebrate habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on river channel or riparian zone leading to changes in river processes and habitat upstream and downstream. No likely effects anticipated on macroinvertebrates. **No measurable change in quality element**
WFD-BP02	Fish to Structure of the riparian zone	[illegible]	[illegible]	[illegible]
WFD-BP03	Macrophytes and Phytobenthos - combined	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx. 4.8% of catchment area of watercourse). No direct physical impact on river channel or riparian zone. No likely effects anticipated on macrophyte and phytobenthos habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth: 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on macrophytes and phytobenthos habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on river channel leading to changes in river processes and habitat upstream and downstream. No likely effects anticipated on macrophytes and phytobenthos. **No measurable change in quality element.**
WFD-BP03	Macroinvertebrates	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (approx. 4.8% of catchment area of watercourse). No direct physical impact on river channel or riparian zone. No likely effects anticipated on macroinvertebrate habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of watercourse (assumed maximum excavation depth: 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on macroinvertebrate habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on river channel or riparian zone leading to changes in river processes and habitat upstream and downstream. No likely effects anticipated on macroinvertebrates. **No measurable change in quality element**
WFD-BP03	Fish to Structure of the riparian zone	[illegible]	[illegible]	[illegible]

Detailed Impact Assessment Results

WFD Classification Element	Cumulative effects - effects on element from scheme component(s) located in other WFD water bodies	Overall effect on element	Additional mitigation requirements: Construction	Additional mitigation requirements: Operation	Residual effect on element	WFD compliance outcome - potential for deterioration of current status
Macrophytes and Phytobenthos - combined	None - water body downstream (Trent from Moreton Brook to River Tame) affected by Proposed Scheme but no widespread adverse impacts identified with the potential to propagate upstream and affect water body (e.g. restrictive structures significantly affecting biological continuity). Also Proposed Scheme effects to downstream water body all occur upstream of confluence with this water body.	Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**	Additional mitigation measures for the management of groundwater baseflow to the Bourne Brook and Crawley Brook watercourses during the construction phase will be required to ensure that there is no significant impact on the water environment. Mitigation measures will be designed in detail following ground investigation and monitoring of surface water and groundwater levels and in consultation with the Environment Agency. Mitigation could take the form of: • excavation of material from (and backfilling) the borrow pit in phases to reduce the groundwater zone of influence; • augmentation of flow in the watercourse using water abstracted from the borrow pit excavation; • a wider buffer strip, or shallower batter on the excavations; • installation of a groundwater cut off; • adoption of wet working techniques that avoid the need for dewatering; and/or • creation of a new lined channel and temporary diversion.	None required.	Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	**Compliant - no change in biological status of water body**
Macroinvertebrates		Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**			Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	
Fish		Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**			Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	
Dissolved oxygen	None - water body downstream (Trent from Moreton Brook to River Tame) affected by Proposed Scheme but no widespread adverse impacts identified with the potential to propagate upstream and affect water body. Also Proposed Scheme effects to downstream water body all occur upstream of confluence with this water body.	Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.	None required.	None required.	N/a	**Compliant - no change in physicochemical status of water body**
pH		Element is insensitive to impact. No measurable change to quality element			N/a	
Phosphate		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/a	
Ammonia		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/a	
Temperature		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/a	
Copper, Triclosan, Zinc	None - water body downstream (Trent from Moreton Brook to River Tame) affected by Proposed Scheme but no widespread adverse impacts identified with the potential to propagate upstream and affect water body. Also Proposed Scheme effects to downstream water body all occur upstream of confluence with this water body.	Localised and temporary adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.	None required.	None required.	N/a	**Compliant - no change in specific pollutant status of water body**
Quantity and dynamics of water flow	None - water body downstream (Trent from Moreton Brook to River Tame) affected by Proposed Scheme but no widespread adverse impacts identified with the potential to propagate upstream and affect water body. Also Proposed Scheme effects to downstream water body all occur upstream of confluence with this water body.	Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**	Additional mitigation measures for the management of groundwater baseflow to the Bourne Brook and Crawley Brook watercourses during the construction phase will be required to ensure that there is no significant impact on the water environment. Mitigation measures will be designed in detail following ground investigation and monitoring of surface water and groundwater levels and in consultation with the Environment Agency. Mitigation could take the form of: • excavation of material from (and backfilling) the borrow pit in phases to reduce the groundwater zone of influence; • augmentation of flow in the watercourse using water abstracted from the borrow pit excavation; • a wider buffer strip, or shallower batter on the excavations; • installation of a groundwater cut off; • adoption of wet working techniques that avoid the need for dewatering; and/or • creation of a new lined channel and temporary diversion.	None required.	Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	**Compliant - no change in hydromorphological status of water body**
Connection to groundwater bodies		Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**			Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	
River continuity		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/a	
River depth and width variation		Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**			Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	
Structure and substrate of the river bed		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/a	
Structure of the riparian zone		Negligible effect anticipated when scheme component effects considered in combination. No measurable change in quality element.			N/a	

Table 7: Revised Detailed Impact Assessment - Trent and Mersey Canal, summit to Alrewas (GB70410142)

Surface water body: Trent and Mersey Canal, summit to Alrewas				Detailed Impact Assessment										Detailed Impact Assessment Results					
Water body ID:	GB70410142		Watercourse:	Trent and Mersey Canal (High)										Cumulative effects - effects on element from scheme component(s) located in other WFD water bodies	Overall effect on element	Additional mitigation requirements		Residual effects on element	WFD compliance outcome - potential for deterioration of current status
Hydromorphological designation:	Artificial Water Body (AWB)		Scheme component:	WFD-TMC-W-01-01 Viaduct	WFD-BP01 Borrow pit - Kings Bromley South, located either side of Crawley Lane and to the south of Ashby Sitch, both sides of the route of the Proposed Scheme			WFD-BP02 Borrow pit - Kings Bromley North, located adjacent to the realigned A515 Lichfield Road			WFD-BP03 Borrow pit - Kings Bromley North, located adjacent to the realigned Shaw Lane								
Overall Status:	Good		Description of scheme component:	Great Haywood Viaduct; Approx. viaduct width: 15m; Approx. viaduct length: 780m; Approx. viaduct height: 16m	Approx. total borrow pit surface area: 0.37km^2; Assumed maximum excavation depth: 18m; Excavation material: sand and gravel; Approx. distance from borrow pit to canal (at nearest point): 437m			Approx. total borrow pit surface area: 0.16km^2; Assumed maximum excavation depth: 18m; Excavation material: sand and gravel; Approx. distance from borrow pit to canal (at nearest point): 790m			Approx. total borrow pit surface area: 0.24km^2; Assumed maximum excavation depth: 18m; Excavation material: sand and gravel; Approx. distance from borrow pit to canal (at nearest point): 500m								
Status Objective:	Good by 2015		Summary of embedded mitigation:	Clear span viaduct. Viaducts designed to cross perpendicular to river channel wherever possible to reduce shading impact.	A 50m buffer zone is incorporated between nearby watercourses and borrow pits. Excavation will not take place in this zone. Depending on the permeability of the underlying strata between a watercourse and the borrow pit excavation, there is the potential for dewatering and excavation activities to affect watercourse flow regime. Therefore, site investigation and monitoring before during and after dewatering and excavation activities will be required to protect the integrity of these watercourses. Following construction, the areas excavated as borrow pit will be restored to the existing levels and land use in accordance with the Phase 2a Borrow Pits Agricultural Restoration Strategy. The materials used to backfill the borrow pit as part of the restoration plan are assumed to consist of a lower permeability than the current material. Drainage measures will be designed to control groundwater levels and to sustain baseflow to the watercourse.			A 50m buffer zone is incorporated between nearby watercourses and borrow pits. Excavation will not take place in this zone. Depending on the permeability of the underlying strata between a watercourse and the borrow pit excavation, there is the potential for dewatering and excavation activities to affect watercourse flow regime. Therefore, site investigation and monitoring before during and after dewatering and excavation activities will be required to protect the integrity of these watercourses. Following construction, the areas excavated as borrow pit will be restored to the existing levels and land use in accordance with the Phase 2a Borrow Pits Agricultural Restoration Strategy. The materials used to backfill the borrow pit as part of the restoration plan are assumed to consist of a lower permeability than the current material. Drainage measures will be designed to control groundwater levels and to sustain baseflow to the watercourse .			A 50m buffer zone is incorporated between nearby watercourses and borrow pits. Excavation will not take place in this zone. Depending on the permeability of the underlying strata between a watercourse and the borrow pit excavation, there is the potential for dewatering and excavation activities to affect watercourse flow regime. Therefore, site investigation and monitoring before during and after dewatering and excavation activities will be required to protect the integrity of these watercourses. Following construction, the areas excavated as borrow pit will be restored to the existing levels and land use in accordance with the Phase 2a Borrow Pits Agricultural Restoration Strategy. The materials used to backfill the borrow pit as part of the restoration plan are assumed to consist of a lower permeability than the current material. Drainage measures will be designed to control groundwater levels and to sustain baseflow to the watercourse .								
WFD Classification Elements		2015 Status	Status Objective	Shading	Footprint	Changes in flow velocity and volume due to dewatering	Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream	Footprint	Changes in flow velocity and volume due to dewatering	Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream	Footprint	Changes in flow velocity and volume due to dewatering	Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream			Construction	Operation		
Biological Quality Elements	Macrophytes and Phytobenthos - combined	-	Not assessed	Some minor, localised and periodic shading of river channel. However negligible effect on macrophytes and phytobenthos anticipated. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects anticipated on macrophyte and phytobenthos habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on macrophytes and phytobenthos habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on macrophytes and phytobenthos. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects anticipated on macrophyte and phytobenthos habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on macrophytes and phytobenthos habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on macrophytes and phytobenthos. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects anticipated on macrophyte and phytobenthos habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on macrophytes and phytobenthos habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on macrophytes and phytobenthos. **No measurable change in quality element.**	None	Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**	Additional mitigation measures for the management of groundwater baseflow to the canal during the construction phase may be required to ensure that there is no significant impact on the water environment. Mitigation measures will be designed in detail following ground investigation and monitoring of surface water and groundwater levels and in consultation with the Environment Agency. Mitigation could take the form of: • excavation of material from (and backfilling) the borrow pit in phases to reduce the groundwater zone of influence; • augmentation of flow in the canal using water abstracted from the borrow pit excavation; • a wider buffer strip, or shallower batter on the excavations; • installation of a groundwater cut off; and/or • adoption of wet working techniques that avoid the need for dewatering.	None required	Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	**Compliant - no change in biological status of water body**
	Macroinvertebrates	-	Not assessed	Some minor, localised and periodic shading of river channel. However negligible effect on macroinvertebrates anticipated. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects anticipated on macroinvertebrate habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on macroinvertebrate habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on macroinvertebrates. **No measurable change in quality element**	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects anticipated on macroinvertebrate habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on macroinvertebrate habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on macroinvertebrates. **No measurable change in quality element**	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects anticipated on macroinvertebrate habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on macroinvertebrate habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on macroinvertebrates. **No measurable change in quality element**		Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**			Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	
	Fish	-	Not assessed	Some minor, localised and periodic shading of river channel. However negligible effect on fish anticipated. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects anticipated on fish habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on fish habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on fish. **No measurable change in quality element**	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects anticipated on fish habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on fish habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on fish. **No measurable change in quality element**	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects anticipated on fish habitat. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on fish habitat. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on fish. **No measurable change in quality element**		Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**			Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	
Physicochemical Quality Elements	Dissolved oxygen	Good	-	Some minor, localised and periodic shading of river channel (with potential associated reduction in photosynthetic activity by aquatic flora). However, negligible effect on dissolved oxygen concentrations anticipated. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects on dissolved oxygen. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential localised but temporary adverse effects on dissolved oxygen, but **no change in quality element when balanced against mitigation embedded in the scheme.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effect anticipated on dissolved oxygen concentrations. **No measurable change in quality element**	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects on dissolved oxygen. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential localised but temporary adverse effects on dissolved oxygen, but **no change in quality element when balanced against mitigation embedded in the scheme.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effect anticipated on dissolved oxygen concentrations. **No measurable change in quality element**	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects on dissolved oxygen. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential localised but temporary adverse effects on dissolved oxygen, but **no change in quality element when balanced against mitigation embedded in the scheme.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effect anticipated on dissolved oxygen concentrations. **No measurable change in quality element**	None	Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.	None required	None required	N/a	**Compliant - no change in physicochemical status of water body**
	pH	High	Good by 2015	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact		Element is insensitive to impact. No measurable change to quality element			N/a	
	Phosphate	-	-	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. Localised and temporary reduction in agricultural activity, with potential associated reductions in application of organic and inorganic fertilizer. However negligible effect anticipated on phosphate concentrations. **No measurable change in quality element**.	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential localised and temporary adverse effects on phosphate concentrations, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. Localised and temporary reduction in agricultural activity, with potential associated reductions in application of organic and inorganic fertilizer. However negligible effect anticipated on phosphate concentrations. **No measurable change in quality element**.	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential localised and temporary adverse effects on phosphate concentrations, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. Localised and temporary reduction in agricultural activity, with potential associated reductions in application of organic and inorganic fertilizer. However negligible effect anticipated on phosphate concentrations. **No measurable change in quality element**.	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential localised and temporary adverse effects on phosphate concentrations, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/a	
	Ammonia	High	Good by 2015	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. Localised and temporary reduction in agricultural activity, with potential associated reductions in application of organic and inorganic fertilizer. However negligible effect anticipated on ammonia concentrations. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential localised but temporary adverse effects on ammonia concentrations, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. Localised and temporary reduction in agricultural activity, with potential associated reductions in application of organic and inorganic fertilizer. However negligible effect anticipated on ammonia concentrations. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential localised but temporary adverse effects on ammonia concentrations, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. Localised and temporary reduction in agricultural activity, with potential associated reductions in application of organic and inorganic fertilizer. However negligible effect anticipated on ammonia concentrations. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential localised but temporary adverse effects on ammonia concentrations, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/a	
	Temperature	High	Good by 2015	Some minor, localised and periodic shading of river channel. However, negligible effect on water temperature anticipated. **No measurable change in quality element.**	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact		Negligible effect anticipated in when effects considered in combination. No measurable change in quality element			N/a	
Specific Pollutants	Ammonia (Annex 8), Copper, Triclosan, Zinc	-	Not assessed	N/A - Specific pollutants effects screened out for scheme design component	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential localised but temporary adverse effects on specific pollutant concentrations, but **no change in quality element when balanced against mitigation embedded in the scheme.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on specific pollutant concentrations. **No measurable change in quality element.**	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential localised but temporary adverse effects on specific pollutant concentrations, but **no change in quality element when balanced against mitigation embedded in the scheme.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on specific pollutant concentrations. **No measurable change in quality element.**	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential localised but temporary adverse effects on specific pollutant concentrations, but **no change in quality element when balanced against mitigation embedded in the scheme.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on specific pollutant concentrations. **No measurable change in quality element.**	None	Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.	None required	None required	N/a	Compliant - no change in specific pollutants status of water body
Hydromorphological Quality Elements	Quantity and dynamics of water flow	-	Not assessed	N/A - Hydromorphology effects screened out for scheme design component	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects anticipated on quantity and dynamics of water flow. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on the quantity and dynamics of water flow. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on quantity and dynamics of flow. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects anticipated on quantity and dynamics of water flow. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on the quantity and dynamics of water flow. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on quantity and dynamics of flow. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects anticipated on quantity and dynamics of water flow. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on the quantity and dynamics of water flow. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on quantity and dynamics of flow. **No measurable change in quality element.**	None	Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**	Additional mitigation measures for the management of groundwater baseflow to the canal during the construction phase may be required to ensure that there is no significant impact on the water environment. Mitigation measures will be designed in detail following ground investigation and monitoring of surface water and groundwater levels and in consultation with the Environment Agency. Mitigation could take the form of: • excavation of material from (and backfilling) the borrow pit in phases to reduce the groundwater zone of influence; • augmentation of flow in the canal using water abstracted from the borrow pit excavation; • a wider buffer strip, or shallower batter on the excavations; • installation of a groundwater cut off; and/or • adoption of wet working techniques that avoid the need for dewatering.	None required	Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	**Compliant - no change in hydromorphological status of water body**
	Connection to groundwater bodies				Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in connection to groundwater bodies as a result of dewatering activities. Potential adverse effects on the connection to groundwater bodies. **There is a risk that a change in status could occur. Requires additional mitigation.**	Element is insensitive to impact	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in connection to groundwater bodies as a result of dewatering activities. Potential adverse effects on the connection to groundwater bodies. **There is a risk that a change in status could occur. Requires additional mitigation.**	Element is insensitive to impact	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in connection to groundwater bodies as a result of dewatering activities. Potential adverse effects on the connection to groundwater bodies. **There is a risk that a change in status could occur. Requires additional mitigation.**	Element is insensitive to impact		Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**			Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	
	River continuity				Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effect anticipated on river continuity. **No measurable change in quality element.**	Element is insensitive to impact	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effect anticipated on river continuity. **No measurable change in quality element.**	Element is insensitive to impact	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effect anticipated on river continuity. **No measurable change in quality element.**	Element is insensitive to impact	Element is insensitive to impact		No effect anticipated in when effects considered in combination. No measurable change in quality element			N/A	
	River depth and width variation				Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effect on river depth and width variation. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on the river depth and width variation. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on river depth and variation. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effect on river depth and width variation. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on the river depth and width variation. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on river depth and variation. **No measurable change in quality element**	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effect on river depth and width variation. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. Potential adverse effects on the river depth and width variation. **There is a risk that a change in status could occur. Requires additional mitigation.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on river depth and variation. **No measurable change in quality element**		Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**			Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	
	Structure and substrate of the river bed				Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects anticipated on structure and substrate of river bed. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. **However negligible effect anticipated on substrate. No measurable change in quality element.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on structure and substrate of river bed. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects anticipated on structure and substrate of river bed. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. **However negligible effect anticipated on substrate. No measurable change in quality element.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on structure and substrate of river bed. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects anticipated on structure and substrate of river bed. **No measurable change in quality element.**	Localised and temporary excavation of area of agricultural land within vicinity of canal (assumed maximum excavation depth of 18mbgl). Potential for temporary reduction in flow regime downstream as a result of dewatering activities. **However negligible effect anticipated on substrate. No measurable change in quality element.**	No direct physical impact on channel leading to changes in processes and habitat upstream and downstream. No likely effects anticipated on structure and substrate of river bed. **No measurable change in quality element.**		Negligible effect anticipated in when effects considered in combination. No measurable change in quality element			N/A	
	Structure of the riparian zone				Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects anticipated on structure of riparian zone. **No measurable change in quality element.**	Element is insensitive to impact	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects anticipated on structure of riparian zone. **No measurable change in quality element.**	Element is insensitive to impact	Element is insensitive to impact	Localised and temporary excavation of area of agricultural land within vicinity of canal. No direct physical impact on channel or riparian zone. No likely effects anticipated on structure of riparian zone. **No measurable change in quality element.**	Element is insensitive to impact	Element is insensitive to impact		No effect anticipated in when effects considered in combination. No measurable change in quality element			N/A	

Table 8: Revised Detailed Impact Assessment - Trent from Moreton Brook to River Tame (GB104028047290)

Surface water body: Trent from Moreton Brook to River Tame	
Water body ID:	GB104028047290
Hydromorphological designation:	Not A/HMWB
Overall Status:	Poor
Status Objective:	Good by 2027

Detailed Impact Assessment

Watercourse (EIA receptor value)	Scheme component	Description of scheme component	Summary of embedded mitigation	Impacts assessed
Unnamed tributary of River Trent 1 (MB to RT) (Moderate)	WFD-TMT-T-01-01 Viaduct	River Trent Viaduct; Approx. viaduct width: 15m; Approx. viaduct length: 1900m; Approx. viaduct height: 14m	Clear span viaduct. Viaducts designed to cross perpendicular to river channel wherever possible to reduce shading impact.	Shading
Unnamed tributary of River Trent 1 (MB to RT) (Moderate)	WFD-TMT-T-01-02 Diversion	Approx. total length of new diverted channel: 55m; Approx. total length of existing channel lost: 50m; Total net gain: 5m	The length of watercourse diversions has been reduced as far as reasonably practicable. Design of the new channel will also ensure the equivalent hydraulic capacity and incorporation of appropriate features equivalent to those lost along the existing channel footprint. Where natural watercourse, the design will aim to enhance hydromorphological condition over the existing condition where reasonably practicable (provided this is compatible with the watercourses' flood risk and land drainage functions). In addition, the design of the new channel will allow for a 10m wide buffer zone for the implementation of marginal/riparian improvements.	Footprint; Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream; Creation of new habitats
Unnamed tributary of River Trent 1 (MB to RT) (Moderate)	WFD-BP03 Borrow pit - Kings Bromley North, located adjacent to the realigned Shaw Lane	Approx. total borrow pit surface area: 0.24km²; Assumed maximum excavation depth: 18m; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 225m; Approx. total catchment area of watercourse: 2.7km²	A 50m buffer zone is incorporated between nearby watercourses and borrow pits. Excavation will not take place in this zone. Depending on the permeability of the underlying strata between a watercourse and the borrow pit excavation, there is the potential for dewatering and excavation activities to affect watercourse flow regime. Therefore, site investigation and monitoring before during and after dewatering and excavation activities will be required to protect the integrity of these watercourses. Following construction, the areas excavated as borrow pit will be restored to the existing levels and land use in accordance with the Phase 2a Borrow Pits Agricultural Restoration Strategy. The materials used to backfill the borrow pit as part of the restoration plan are assumed to consist of a lower permeability than the current material. Drainage measures will be designed to control groundwater levels and to sustain baseflow to the watercourse.	Footprint; Changes in flow velocity and volume due to dewatering; Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream
Unnamed tributary of River Trent 2 (MB to RT) (Moderate)	WFD-TMT-T-02-01 Viaduct	River Trent Viaduct; Approx. viaduct width: 15m; Approx. viaduct length: 1900m; Approx. viaduct height: 14m	Clear span viaduct. Viaducts designed to cross perpendicular to river channel wherever possible to reduce shading impact.	Shading
Unnamed tributary of River Trent 2 (MB to RT) (Moderate)	WFD-BP03 Borrow pit - Kings Bromley North, located adjacent to the realigned Shaw Lane	Approx. total borrow pit surface area: 0.24km²; Assumed maximum excavation depth: 18m; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 450m; Approx. total catchment area of watercourse: 1.7km²	A 50m buffer zone is incorporated between nearby watercourses and borrow pits. Excavation will not take place in this zone. Depending on the permeability of the underlying strata between a watercourse and the borrow pit excavation, there is the potential for dewatering and excavation activities to affect watercourse flow regime. Therefore, site investigation and monitoring before during and after dewatering and excavation activities will be required to protect the integrity of these watercourses. Following construction, the areas excavated as borrow pit will be restored to the existing levels and land use in accordance with the Phase 2a Borrow Pits Agricultural Restoration Strategy. The materials used to backfill the borrow pit as part of the restoration plan are assumed to consist of a lower permeability than the current material. Drainage measures will be designed to control groundwater levels and to sustain baseflow to the watercourse.	Footprint; Changes in flow velocity and volume due to dewatering; Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream
River Trent (Very high)	WFD-TMT-W-01-01 Viaduct	River Trent Viaduct; Approx. viaduct width: 15m; Approx. viaduct length: 1900m; Approx. viaduct height: 14m	Clear span viaduct. Viaducts designed to cross perpendicular to river channel wherever possible to reduce shading impact.	Shading
River Trent (Very high)	WFD-BP04 Borrow pit - Blithbury, located to the north of the River Trent viaduct	Approx. total borrow pit surface area: 0.25km2; Assumed maximum excavation depth: 15m; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 60m; Approx. total catchment area of watercourse (within water body extent): 36.6km2	A 50m buffer zone is incorporated between nearby watercourses and borrow pits. Excavation will not take place in this zone. Depending on the permeability of the underlying strata between a watercourse and the borrow pit excavation, there is the potential for dewatering and excavation activities to affect watercourse flow regime. Therefore, site investigation and monitoring before during and after dewatering and excavation activities will be required to protect the integrity of these watercourses. Following construction, the areas excavated as borrow pit will be restored to the existing levels and land use. The materials used to backfill the borrow pit as part of the restoration plan are assumed to consist of a lower permeability than the current material. Drainage measures will be designed to control groundwater levels and to sustain baseflow to the watercourse.	Footprint; Changes in flow velocity and volume due to dewatering; Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream
Unnamed tributary of Bentley Brook 2 (Moderate)	WFD-TMT-T-05-01 Highway realignment culvert	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	Culvert length has been reduced as far as reasonably practicable. Invert of culvert to be buried 300mm below the existing bed level to reduce disruption to sediment transfer and maintain natural substrate. Culvert sized to minimise impact on flow continuity. Detailed design to be developed in general accordance with CIRIA and Environment Agency guidance and to ensure appropriate low flow water depths and velocities for fish passage. Hydromorphological improvements to be undertaken to river channel immediately upstream and downstream of the culvert to compensate for footprint loss.	Footprint; Shading; Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream
Unnamed tributary of Bentley Brook 2 (Moderate)	WFD-TMT-T-05-02 Realignment (with associated removal of existing culvert; see WFD-TMT-T-05-03)	Approx. total length of new realigned channel: 150m; Approx. total length of existing channel: 140m (120m open channel; 20m culverted channel); Total net gain of open channel: 30m	The length of watercourse realignments has been reduced as far as reasonably practicable. Design of the new channel will also ensure the equivalent hydraulic capacity and incorporation of appropriate features equivalent to those lost along the existing channel footprint. Where natural watercourse, the design will aim to enhance hydromorphological condition over the existing condition where reasonably practicable (provided this is compatible with the watercourses' flood risk and land drainage functions). In addition, the design of the new channel will allow for a 10m wide buffer zone for the implementation of marginal/riparian improvements.	Footprint; Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream; Creation of new habitats
Unnamed tributary of Bentley Brook 2 (Moderate)	WFD-TMT-T-05-03 Removal of existing highway culvert (with associated realignment; see WFD-TMT-T-05-02)	Approx. existing culvert length: 20m; Approx. existing culvert dimensions: unknown (restricted access)	Reinstatement of river channel form, equivalent to reaches upstream and downstream of existing culvert. Associated with localised realignment of channel (see WFD-TMT-T-05-02)	Footprint; Shading; Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream
Unnamed tributary of Bentley Brook 2 (Moderate)	WFD-TMT-T-05-04 Daylighting (of existing culvert)	Approx. existing culvert length: 250m; Approx. existing culvert dimensions: suspected 1.2m diameter pipe (access restricted to culvert outlet only); Length of new daylighted channel: 180m	Reinstatement of river channel form, equivalent to reaches upstream and downstream of existing culvert	Footprint; Shading; Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream
Unnamed tributary of Bentley Brook 2 (Moderate)	WFD-TMT-T-05-05 Highway realignment culvert (on daylighted channel; see WFD-TMT-T-05-04)	Approx. culvert length: 60m; Approx. culvert dimensions: unknown (tbc at detailed design) (located on existing culverted section of watercourse to be daylighted under Proposed Scheme, see WFD-TMT-T-05-04)	Culvert length has been reduced as far as reasonably practicable. Invert of culvert to be buried 300mm below the existing bed level to reduce disruption to sediment transfer and maintain natural substrate. Culvert sized to minimise impact on flow continuity. Detailed design to be developed in general accordance with CIRIA and Environment Agency guidance and to ensure appropriate low flow water depths and velocities for fish passage. Hydromorphological improvements to be undertaken to river channel immediately upstream and downstream of the culvert to compensate for footprint loss.	Footprint; Shading; Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream
Unnamed tributary of Bentley Brook 2 (Moderate)	WFD-TMT-T-05-06 Access road culvert	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	Culvert length has been reduced as far as reasonably practicable. Invert of culvert to be buried 300mm below the existing bed level to reduce disruption to sediment transfer and maintain natural substrate. Culvert sized to minimise impact on flow continuity. Detailed design to be developed in general accordance with CIRIA and Environment Agency guidance and to ensure appropriate low flow water depths and velocities for fish passage. Hydromorphological improvements to be undertaken to river channel immediately upstream and downstream of the culvert to compensate for footprint loss.	Footprint; Shading; Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream

WFD Classification Elements		2015 Status	Status Objective	WFD-TMT-T-01-01 Viaduct: Shading	WFD-TMT-T-01-02 Diversion: Footprint
Biological Quality Elements	Macrophytes and Phytobenthos - combined	Moderate	Good by 2027	Some minor, localised and periodic shading of river channel. However negligible effect on macrophytes and phytobenthos anticipated. **No measurable change in quality element.**	Creation of 55m of new channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). Localised improvement in macrophytes and phytobenthos habitat, but **no change in quality element.**
Biological Quality Elements	Macroinvertebrates	Good	Good by 2015	Some minor, localised and periodic shading of river channel. However negligible effect on macroinvertebrates anticipated. **No measurable change in quality element.**	Creation of 55m of new channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). Localised improvement in macroinvertebrate habitat, but no change in quality element.
Biological Quality Elements	Fish	Poor	Good by 2027	Some minor, localised and periodic shading of river channel. However negligible effect on fish anticipated. **No measurable change in quality element.**	Creation of 55m of new channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). Localised improvement in fish habitat and fish passage, **but no change in quality element.**
Physicochemical Quality Elements	Dissolved oxygen	High	Good by 2015	Some minor, localised and periodic shading of river channel (with potential associated reduction in photosynthetic activity by aquatic flora). However, negligible effect on dissolved oxygen concentrations anticipated. **No measurable change in quality element.**	Creation of 55m of new channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). However negligible effect anticipated on dissolved oxygen concentrations. No measurable change in quality element.
Physicochemical Quality Elements	pH	High	Good by 2015	Element is insensitive to impact	Element is insensitive to impact
Physicochemical Quality Elements	Phosphate	Poor	Good by 2021	Element is insensitive to impact	Element is insensitive to impact
Physicochemical Quality Elements	Ammonia	Good	Good by 2015	Element is insensitive to impact	Element is insensitive to impact
Physicochemical Quality Elements	Temperature	High	Good by 2015	Some minor, localised and periodic shading of river channel. However, negligible effect on water temperature anticipated. **No measurable change in quality element.**	Element is insensitive to impact
Specific Pollutants	Copper, Triclosan, Zinc	High	High by 2015	N/A - Specific pollutants effects screened out for scheme component	N/A - Specific pollutants effects screened out for scheme component
Hydromorphological Quality Elements	Quantity and dynamics of water flow	Supports good	Supports good by 2015	N/A - Hydromorphology effects screened out for scheme component	Creation of 55m of new channel, with incorporated hydromorphological improvements (resulting in 5m net gain of river channel). Localised improvement in flow dynamics, but **no change in quality element.**
Hydromorphological Quality Elements	Connection to groundwater bodies				Element is insensitive to impact
Hydromorphological Quality Elements	River continuity				Element is insensitive to impact
Hydromorphological Quality Elements	River depth and width variation				Creation of 55m of new channel, with incorporated hydromorphological improvements (resulting in 5m net gain of river channel). However negligible effect anticipated on river depth and width. **No measurable change in quality element.**
Hydromorphological Quality Elements	Structure and substrate of the river bed				Creation of 55m of new channel, with incorporated hydromorphological improvements (resulting in 5m net gain of river channel). However negligible effect anticipated on structure and substrate of river bed. **No measurable change in quality element.**
Hydromorphological Quality Elements	Structure of the riparian zone				Creation of 55m of new channel, with incorporated riparian/marginal habitat improvements (resulting in 5m net gain of river channel). Localised improvement in structure of riparian zone, but **no change in quality element.**

Detailed Impact Assessment Results

WFD Classification Elements	Cumulative effects - effects on element from scheme component(s) located in other WFD water bodies	Overall effect on element	Additional mitigation requirements: Construction	Additional mitigation requirements: Operation	Residual effects on element	WFD compliance outcome - potential for deterioration of current status
Macrophytes and Phytobenthos - combined	None - water bodies upstream affected by Proposed Scheme but no widespread adverse impacts identified with the potential to propagate downstream and affect water body (e.g. restrictive structures significantly affecting flow regime, sediment transfer or biological continuity)	Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**	Additional mitigation measures for the management of groundwater baseflow to the Bourne Brook and Crawley Brook watercourses during the construction phase will be required to ensure that there is no significant impact on the water environment. Mitigation measures will be designed in detail following ground investigation and monitoring of surface water and groundwater levels and in consultation with the Environment Agency. Mitigation could take the form of: • excavation of material from (and backfilling) the borrow pit in phases to reduce the groundwater zone of influence; • augmentation of flow in the watercourse using water abstracted from the borrow pit excavation; • a wider buffer strip, or shallower batter on the excavations; • installation of a groundwater cut off; • adoption of wet working techniques that avoid the need for dewatering; and/or • creation of a new lined channel and temporary diversion.	None required	Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	**Compliant - no change in biological status of water body**
Macroinvertebrates		Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**			Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	
Fish		Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**			Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	
Dissolved oxygen	None - water bodies upstream affected by Proposed Scheme but no widespread adverse impacts identified with the potential to propagate downstream and affect water body (e.g. restrictive structures significantly affecting flow regime or sediment transfer)	Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.	None required	None required	N/a	**Compliant - no change in physicochemical status of water body**
pH		Element is insensitive to impact. No measurable change to quality element			N/a	
Phosphate		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/a	
Ammonia		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/a	
Temperature		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/a	
Copper, Triclosan, Zinc	None	Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.	None required	None required	N/a	**Compliant - no change in specific pollutant status of water body**
Quantity and dynamics of water flow	None - water bodies upstream affected by Proposed Scheme but no widespread adverse impacts identified with the potential to propagate downstream and affect water body (e.g. restrictive structures significantly affecting flow regime or sediment transfer)	Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**	Additional mitigation measures for the management of groundwater baseflow to the Bourne Brook and Crawley Brook watercourses during the construction phase will be required to ensure that there is no significant impact on the water environment. Mitigation measures will be designed in detail following ground investigation and monitoring of surface water and groundwater levels and in consultation with the Environment Agency. Mitigation could take the form of: • excavation of material from (and backfilling) the borrow pit in phases to reduce the groundwater zone of influence; • augmentation of flow in the watercourse using water abstracted from the borrow pit excavation; • a wider buffer strip, or shallower batter on the excavations; • installation of a groundwater cut off; • adoption of wet working techniques that avoid the need for dewatering; and/or • creation of a new lined channel and temporary diversion.	None required	Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	**Compliant - no change in hydromorphological status of water body**
Connection to groundwater bodies		Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**			Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	
River continuity		Localised improvement anticipated when scheme component effects considered in combination, but no change in quality element.			N/a	
River depth and width variation		Adverse effect anticipated when scheme component effects considered in combination. When balanced against mitigation embedded in the scheme, there remains a risk that there could be change in the status of the quality element. **Requires additional mitigation.**			Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme and additional mitigation measures.	
Structure and substrate of the river bed		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/a	
Structure of the riparian zone		Localised improvement anticipated when scheme component effects considered in combination, but no change in quality element.			N/a	

Table 9: Revised Detailed Impact Assessment - Meece Brook from Source to Chatcull Brook (GB104028053080)

Surface water body: Meece Brook from Source to Chatcull Brook	
Water body ID:	GB104028053080
Hydromorphological designation:	Not A/HMWB
Overall Status:	Poor
Status Objective:	Good by 2027

Detailed Impact Assessment – Unnamed tributary of Meece Brook 2 (Moderate)

WFD Classification Elements		2015 Status	Status Objective	Watercourse (EIA receptor value): Unnamed tributary of Meece Brook 2 (Moderate). Scheme component: WFD-MEE-T-02-01 Realignment (with removal of existing highway culvert). Description of scheme component: Approx. total length of new realigned channel: 100m; Approx. total length of existing channel: 95m (85m open channel; 10m culverted); Total net gain: 5m. Summary of embedded mitigation: The length of watercourse realignments has been reduced as far as reasonably practicable. Design of the new channel will also ensure the equivalent hydraulic capacity and incorporation of appropriate features equivalent to those lost along the existing channel footprint. Where natural watercourse, the design will aim to enhance hydromorphological condition over the existing condition where reasonably practicable (provided this is compatible with the watercourses' flood risk and land drainage functions). In addition, the design of the new channel will allow for a 10m wide buffer zone for the implementation of marginal/riparian improvements.			
				Footprint	Shading	Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream	Creation of new habitats
Biological Quality Elements	Macrophytes and Phytobenthos - combined	Moderate	Good by 2027	Creation of 100m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). Localised improvement in macrophytes and phytobenthos habitat, but **no change in quality element.**	Removal of existing 10m culvert. Localised but permanent reduction in shading of section of river channel. Localised improvement in macrophyte and phytobenthos habitat anticipated, but **no change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and macrophytes and phytobenthos habitat upstream and downstream. **No measurable change in quality element.**	Creation of 100m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). Localised improvement in macrophytes and phytobenthos habitat, but **no change in quality element.**
	Macroinvertebrates	Moderate	Good by 2027	Creation of 100m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). Localised improvement in macroinvertebrate habitat, but **no change in quality element.**	Removal of existing 10m culvert. Localised but permanent reduction in shading of section of river channel. Localised improvement in macroinvertebrate habitat anticipated (including due to a increase in riparian and aquatic vegetation), but **no change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and macroinvertebrate habitat upstream and downstream. **No measurable change in quality element.**	Creation of 100m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). Localised improvement in macroinvertebrate habitat, but **no change in quality element.**
	Fish	Poor	Good by 2027	Creation of 100m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). Localised improvement in fish habitat, but **no change in quality element.**	Removal of existing 10m culvert. Localised but permanent reduction in shading of section of river channel. Localised improvement in fish habitat anticipated (including due to a increase in riparian and aquatic vegetation), but **no change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and fish habitat upstream and downstream. **No measurable change in quality element.**	Creation of 100m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). Localised improvement in fish habitat, but **no change in quality element.**
Physicochemical Quality Elements	Dissolved oxygen	Good	Good by 2015	Creation of 100m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). However negligible effect anticipated on dissolved oxygen concentrations. **No measurable change in quality element.**	Removal of existing 10m culvert. Localised but permanent reduction in shading of section of river channel. Potential to lead to localised improvement in dissolved oxygen concentrations (due to increased photosynthetic activity by aquatic flora), but **no change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and dissolved oxygen concentrations upstream and downstream. **No measurable change in quality element.**	Creation of 100m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). However negligible effect anticipated on dissolved oxygen concentrations. **No measurable change in quality element.**
	pH	High	Good by 2015	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact
	Phosphate	Poor	Good by 2027	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Creation of 100m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). Potential localised reductions in fine sediment inputs and nutrient loading. However negligible effect anticipated on phosphate concentrations. **No measurable change in quality element.**
	Ammonia	High	Good by 2015	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Creation of 100m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). Potential localised reductions in fine sediment inputs and nutrient loading. However negligible effect anticipated on ammonia concentrations. **No measurable change in quality element.**
	Temperature	High	Good by 2015	Element is insensitive to impact	Removal of existing 10m culvert. Localised but permanent reduction in shading of section of river channel. Potential to lead to localised improvement in water temperature, but **no change in quality element.**	Element is insensitive to impact	Element is insensitive to impact
Specific Pollutants	Ammonia (Annex 8), Copper, Triclosan, Zinc	-	Not assessed	N/A - Specific pollutants effects screened out for scheme design component			
Hydromorphological Quality Elements	Quantity and dynamics of water flow	Support Good	Supports Good by 2015	Creation of 100m of new realigned channel, with incorporated hydromorphological improvements (resulting in 5m net gain of river channel). Localised improvement in flow dynamics, but **no change in quality element.**	Element is insensitive to impact	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and quantity and dynamics of flow upstream and downstream. **No measurable change in quality element.**	Element is insensitive to impact
	Connection to groundwater bodies			Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact
	River continuity			Creation of 100m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 5m net gain of river channel). Including removal of existing 10m culvert. Localised improvement in river continuity, but **no change in quality element.**	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact
	River depth and width variation			Creation of 100m of new realigned channel, with incorporated hydromorphological improvements (resulting in 5m net gain of river channel). However negligible effect anticipated on river depth and width. **No measurable change in quality element.**	Element is insensitive to impact	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and river depth and width upstream and downstream. **No measurable change in quality element.**	Element is insensitive to impact
	Structure and substrate of the river bed			Creation of 100m of new realigned channel, with incorporated hydromorphological improvements (resulting in 5m net gain of river channel). However negligible effect anticipated on structure and substrate of river bed. **No measurable change in quality element.**	Element is insensitive to impact	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes structure and substrate of river bed upstream and downstream. **No measurable change in quality element.**	Element is insensitive to impact
	Structure of the riparian zone			Creation of 100m of new realigned channel, with incorporated riparian improvements (resulting in 5m net gain of river channel). Localised improvement, but **no change in quality element.**	Removal of existing 10m culvert. Localised but permanent reduction in shading of section of river channel. Localised improvement in riparian zone, but **no change in quality element.**	Element is insensitive to impact	Creation of 100m of new realigned channel, with incorporated riparian improvements (resulting in 5m net gain of river channel). Localised improvement, but **no change in quality element.**

WFD Classification Elements	WFD-MEE-T-02-02 Highway Realignment Culvert (on realigned channel) (replacement of existing highway culvert; see WFD-MEE-T-02-01). Approx. culvert length: 10m; Approx. culvert dimensions: 0.9m. Culvert length has been reduced as far as reasonably practicable. Invert of culvert to be buried 300mm below the existing bed level to reduce disruption to sediment transfer and maintain natural substrate. Culvert sized to minimise impact on flow continuity. Detailed design to be developed in general accordance with CIRIA and Environment Agency guidance and to ensure appropriate low flow water depths and velocities for fish passage. Hydromorphological improvements to be undertaken to river channel immediately upstream and downstream of the culvert to compensate for footprint loss.			WFD-MEE-T-02-03 Access road culvert (on realigned channel). Approx. culvert length: 10m; Approx. culvert dimensions: 0.9m. Culvert length has been reduced as far as reasonably practicable. Invert of culvert to be buried 300mm below the existing bed level to reduce disruption to sediment transfer and maintain natural substrate. Culvert sized to minimise impact on flow continuity. Detailed design to be developed in general accordance with CIRIA and Environment Agency guidance and to ensure appropriate low flow water depths and velocities for fish passage. Hydromorphological improvements to be undertaken to river channel immediately upstream and downstream of the culvert to compensate for footprint loss.		
	Footprint	Shading	Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream	Footprint	Shading	Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream
Macrophytes and Phytobenthos - combined	Localised but permanent loss of open river habitat. Localised adverse effects on macrophytes and phytobenthos anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of section of river channel. Localised adverse effect on macrophytes and phytobenthos anticipated (due to a reduction in photosynthetic activity), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and macrophytes and phytobenthos habitat upstream and downstream of culvert. **No measurable change in quality element.**	Localised but permanent loss of open river habitat. Localised adverse effects on macrophytes and phytobenthos anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of section of river channel. Localised adverse effect on macrophytes and phytobenthos anticipated (due to a reduction in photosynthetic activity), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and macrophytes and phytobenthos habitat upstream and downstream of culvert. **No measurable change in quality element.**
Macroinvertebrates	Localised but permanent loss of open river habitat. Localised adverse effects on macroinvertebrates anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of section of river channel. Localised adverse effects on macroinvertebrates anticipated (including due to a reduction in/loss of riparian and aquatic vegetation), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and macroinvertebrate habitat upstream and downstream of culvert. **No measurable change in quality element.**	Localised but permanent loss of open river habitat. Localised adverse effects on macroinvertebrates anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of section of river channel. Localised adverse effects on macroinvertebrates anticipated (including due to a reduction in/loss of riparian and aquatic vegetation), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and macroinvertebrate habitat upstream and downstream of culvert. **No measurable change in quality element.**
Fish	Localised but permanent loss of open river habitat. Localised adverse effects on fish anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of culverted section of channel. Localised adverse effects on fish anticipated (including due to a reduction in/loss of riparian and aquatic vegetation), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and fish habitat upstream and downstream of culvert. **No measurable change in quality element.**	Localised but permanent loss of open river habitat. Localised adverse effects on fish anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of culverted section of channel. Localised adverse effects on fish anticipated (including due to a reduction in/loss of riparian and aquatic vegetation), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and fish habitat upstream and downstream of culvert. **No measurable change in quality element.**
Dissolved oxygen	Element is insensitive to impact	Localised but permanent shading of culverted section of channel. Potential to lead to minor and localised impact on dissolved oxygen concentrations (due to reduced photosynthetic activity by aquatic flora). Localised adverse effects anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and dissolved oxygen upstream and downstream of culvert. **No measurable change in quality element.**	Element is insensitive to impact	Localised but permanent shading of culverted section of channel. Potential to lead to minor and localised impact on dissolved oxygen concentrations (due to reduced photosynthetic activity by aquatic flora). Localised adverse effects anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and dissolved oxygen upstream and downstream of culvert. **No measurable change in quality element.**
pH	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact
Phosphate	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact
Ammonia	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact
Temperature	Element is insensitive to impact	Localised but permanent shading of culverted section of channel. Potential to lead to minor and localised impact on water temperature. Localised adverse effects anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Element is insensitive to impact	Localised but permanent shading of culverted section of channel. Potential to lead to minor and localised impact on water temperature. Localised adverse effects anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact
Ammonia (Annex 8), Copper, Triclosan, Zinc	N/A - Specific pollutants effects screened out for scheme design component			N/A - Specific pollutants effects screened out for scheme design component		
Quantity and dynamics of water flow	Localised but permanent changes to hydromorphology regime. Localised adverse effects on flow dynamics (including potential localised increases in flow velocity) anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and quantity and dynamics of flow upstream and downstream. **No measurable change in quality element**	Localised but permanent changes to hydromorphology regime. Localised adverse effects on flow dynamics (including potential localised increases in flow velocity) anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and quantity and dynamics of flow upstream and downstream. **No measurable change in quality element**
Connection to groundwater bodies	Localised but permanent loss of connection to surrounding shallow groundwater within superficial deposits. However no likely effect anticipated on connection to groundwater bodies. **No measurable change in quality element.**	Element is insensitive to impact	Element is insensitive to impact	Localised but permanent loss of connection to surrounding shallow groundwater within superficial deposits. However no likely effect anticipated on connection to groundwater bodies. **No measurable change in quality element.**	Element is insensitive to impact	Element is insensitive to impact
River continuity	Localised but permanent changes to hydromorphology regime. Localised adverse effects on river continuity anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. Localised adverse effects on river continuity anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Element is insensitive to impact
River depth and width variation	Localised but permanent changes to hydromorphology regime. Localised adverse effects on river depth and width anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and river depth and variation upstream and downstream. **No measurable change in quality element**	Localised but permanent changes to hydromorphology regime. Localised adverse effects on river depth and width anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and river depth and variation upstream and downstream. **No measurable change in quality element**
Structure and substrate of the river bed	Localised but permanent changes to hydromorphology regime. Localised adverse effects on structure of river bed anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and structure and substrate of river bed upstream and downstream. **No measurable change in quality element**	Localised but permanent changes to hydromorphology regime. Localised adverse effects on structure of river bed anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and structure and substrate of river bed upstream and downstream. **No measurable change in quality element**
Structure of the riparian zone	Localised but permanent loss of riparian zone. Localised adverse effects on structure of riparian zone anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Element is insensitive to impact	Localised but permanent loss of riparian zone. Localised adverse effects on structure of riparian zone anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Element is insensitive to impact

WFD Classification Elements	WFD-MEE-T-02-04 Access road culvert (on realigned channel). Approx. culvert length: 10m; Approx. culvert dimensions: 0.9m. Culvert length has been reduced as far as reasonably practicable. Invert of culvert to be buried 300mm below the existing bed level to reduce disruption to sediment transfer and maintain natural substrate. Culvert sized to minimise impact on flow continuity. Detailed design to be developed in general accordance with CIRIA and Environment Agency guidance and to ensure appropriate low flow water depths and velocities for fish passage. Hydromorphological improvements to be undertaken to river channel immediately upstream and downstream of the culvert to compensate for footprint loss.			WFD-MEE-T-02-05 Underbridge. Swynnerton Footpath 10 Underbridge; Approx. total length of underbridge: 70m: Approx. total width of underbridge: 15m. Clear span bridge. Underbridge length has been reduced as far as reasonably practicable.
	Footprint	Shading	Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream	Shading
Macrophytes and Phytobenthos - combined	Localised but permanent loss of open river habitat. Localised adverse effects on macrophytes and phytobenthos anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of section of river channel. Localised adverse effect on macrophytes and phytobenthos anticipated (due to a reduction in photosynthetic activity), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and macrophytes and phytobenthos habitat upstream and downstream of culvert. **No measurable change in quality element.**	Localised but permanent shading of a section of river channel. Localised adverse effect on macrophytes and phytobenthos anticipated (due to a reduction in photosynthetic activity), but **no change in quality element when balanced against mitigation embedded in the scheme.**
Macroinvertebrates	Localised but permanent loss of open river habitat. Localised adverse effects on macroinvertebrates anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of section of river channel. Localised adverse effects on macroinvertebrates anticipated (including due to a reduction in/loss of riparian and aquatic vegetation), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and macroinvertebrate habitat upstream and downstream of culvert. **No measurable change in quality element.**	Localised but permanent shading of a section of river channel. Localised adverse effects on macroinvertebrates anticipated (including due to a potential reduction in riparian and aquatic vegetation), but **no change in quality element when balanced against mitigation embedded in the scheme.**
Fish	Localised but permanent loss of open river habitat. Localised adverse effects on fish anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of culverted section of channel. Localised adverse effects on fish anticipated (including due to a reduction in/loss of riparian and aquatic vegetation), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and fish habitat upstream and downstream of culvert. **No measurable change in quality element.**	Localised but permanent shading of a section of river channel. Localised adverse effects on fish anticipated (including due to a potential reduction in riparian and aquatic vegetation), but **no change in quality element when balanced against mitigation embedded in the scheme.**
Dissolved oxygen	Element is insensitive to impact	Localised but permanent shading of culverted section of channel. Potential to lead to minor and localised impact on dissolved oxygen concentrations (due to reduced photosynthetic activity by aquatic flora). Localised adverse effects anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and dissolved oxygen upstream and downstream of culvert. **No measurable change in quality element.**	Localised but permanent shading of a section of river channel. Potential to lead to minor and localised impact on dissolved oxygen concentrations (due to reduced photosynthetic activity by aquatic flora). Localised adverse effects anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**
pH	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact
Phosphate	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact
Ammonia	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact
Temperature	Element is insensitive to impact	Localised but permanent shading of culverted section of channel. Potential to lead to minor and localised impact on water temperature. Localised adverse effects anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent shading of a section of river channel. Potential to lead to minor and localised impact on water temperature. Localised adverse effects anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**
Ammonia (Annex 8), Copper, Triclosan, Zinc	N/A - Specific pollutants effects screened out for scheme design component			
Quantity and dynamics of water flow	Localised but permanent changes to hydromorphology regime. Localised adverse effects on flow dynamics (including potential localised increases in flow velocity) anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and quantity and dynamics of flow upstream and downstream. **No measurable change in quality element**	N/A - Hydromorphology effects screened out for scheme design component
Connection to groundwater bodies	Localised but permanent loss of connection to surrounding shallow groundwater within superficial deposits. However no likely effect anticipated on connection to groundwater bodies. **No measurable change in quality element.**	Element is insensitive to impact	Element is insensitive to impact	
River continuity	Localised but permanent changes to hydromorphology regime. Localised adverse effects on river continuity anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Element is insensitive to impact	
River depth and width variation	Localised but permanent changes to hydromorphology regime. Localised adverse effects on river depth and width anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and river depth and variation upstream and downstream. **No measurable change in quality element**	
Structure and substrate of the river bed	Localised but permanent changes to hydromorphology regime. Localised adverse effects on structure of river bed anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and structure and substrate of river bed upstream and downstream. **No measurable change in quality element**	
Structure of the riparian zone	Localised but permanent loss of riparian zone. Localised adverse effects on structure of riparian zone anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Element is insensitive to impact	

WFD Classification Elements	WFD-MEE-T-02-06 Access road culvert (on realigned channel). Approx. culvert length: 10m; Approx. culvert dimensions: 0.9m. Culvert length has been reduced as far as reasonably practicable. Invert of culvert to be buried 300mm below the existing bed level to reduce disruption to sediment transfer and maintain natural substrate. Culvert sized to minimise impact on flow continuity. Detailed design to be developed in general accordance with CIRIA and Environment Agency guidance and to ensure appropriate low flow water depths and velocities for fish passage. Hydromorphological improvements to be undertaken to river channel immediately upstream and downstream of the culvert to compensate for footprint loss.			WFD-MEE-T-02-07 Realignment. Approx. total length of new realigned channel: 45m; Approx. total length of existing channel: 30m; Total net gain: 15m. The length of watercourse realignments has been reduced as far as reasonably practicable. Design of the new channel will also ensure the equivalent hydraulic capacity and incorporation of appropriate features equivalent to those lost along the existing channel footprint. Where natural watercourse, the design will aim to enhance hydromorphological condition over the existing condition where reasonably practicable (provided this is compatible with the watercourses' flood risk and land drainage functions). In addition, the design of the new channel will allow for a 10m wide buffer zone for the implementation of marginal/riparian improvements.		
	Footprint	Shading	Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream	Footprint	Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream	Creation of new habitats
Macrophytes and Phytobenthos - combined	Localised but permanent loss of open river habitat. Localised adverse effects on macrophytes and phytobenthos anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of section of river channel. Localised adverse effect on macrophytes and phytobenthos anticipated (due to a reduction in photosynthetic activity), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and macrophytes and phytobenthos habitat upstream and downstream of culvert. **No measurable change in quality element.**	Creation of 45m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 15m net gain of river channel). Localised improvement in macrophytes and phytobenthos habitat, but **no change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and macrophytes and phytobenthos habitat upstream and downstream. **No measurable change in quality element.**	Creation of 45m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 15m net gain of river channel). Localised improvement in macrophytes and phytobenthos habitat, but **no change in quality element.**
Macroinvertebrates	Localised but permanent loss of open river habitat. Localised adverse effects on macroinvertebrates anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of section of river channel. Localised adverse effects on macroinvertebrates anticipated (including due to a reduction in/loss of riparian and aquatic vegetation), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and macroinvertebrate habitat upstream and downstream of culvert. **No measurable change in quality element.**	Creation of 45m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 15m net gain of river channel). Localised improvement in macroinvertebrate habitat, but **no change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and macroinvertebrate habitat upstream and downstream. **No measurable change in quality element.**	Creation of 45m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 15m net gain of river channel). Localised improvement in macroinvertebrate habitat, but **no change in quality element.**
Fish	Localised but permanent loss of open river habitat. Localised adverse effects on fish anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of culverted section of channel. Localised adverse effects on fish anticipated (including due to a reduction in/loss of riparian and aquatic vegetation), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and fish habitat upstream and downstream of culvert. **No measurable change in quality element.**	Creation of 45m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 15m net gain of river channel). Localised improvement in fish habitat, but **no change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and fish habitat upstream and downstream. **No measurable change in quality element.**	Creation of 45m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 15m net gain of river channel). Localised improvement in fish habitat, but **no change in quality element.**
Dissolved oxygen	Element is insensitive to impact	Localised but permanent shading of culverted section of channel. Potential to lead to minor and localised impact on dissolved oxygen concentrations (due to reduced photosynthetic activity by aquatic flora). Localised adverse effects anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and dissolved oxygen upstream and downstream of culvert. **No measurable change in quality element.**	Creation of 45m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements. However negligible effect anticipated on dissolved oxygen concentrations. **No measurable change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and dissolved oxygen concentrations upstream and downstream. **No measurable change in quality element.**	Creation of 45m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements. However negligible effect anticipated on dissolved oxygen concentrations. **No measurable change in quality element.**
pH	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact
Phosphate	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Creation of 45m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements. Potential localised reductions in fine sediment inputs and nutrient loading. However negligible effect anticipated on phosphate concentrations. **No measurable change in quality element.**
Ammonia	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Creation of 45m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements. Potential localised reductions in fine sediment inputs and nutrient loading. However negligible effect anticipated on ammonia concentrations. **No measurable change in quality element.**
Temperature	Element is insensitive to impact	Localised but permanent shading of culverted section of channel. Potential to lead to minor and localised impact on water temperature. Localised adverse effects anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact
Ammonia (Annex 8), Copper, Triclosan, Zinc	N/A - Specific pollutants effects screened out for scheme design component			N/A - Specific pollutants effects screened out for scheme design component		
Quantity and dynamics of water flow	Localised but permanent changes to hydromorphology regime. Localised adverse effects on flow dynamics (including potential localised increases in flow velocity) anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and quantity and dynamics of flow upstream and downstream. **No measurable change in quality element**	Creation of 45m of new realigned channel, with incorporated hydromorphological improvements (resulting in 15m net gain of river channel). Localised improvement in flow dynamics, but **no change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and quantity and dynamics of flow upstream and downstream. **No measurable change in quality element.**	Element is insensitive to impact
Connection to groundwater bodies	Localised but permanent loss of connection to surrounding shallow groundwater within superficial deposits. However no likely effect anticipated on connection to groundwater bodies. **No measurable change in quality element.**	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact
River continuity	Localised but permanent changes to hydromorphology regime. Localised adverse effects on river continuity anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact
River depth and width variation	Localised but permanent changes to hydromorphology regime. Localised adverse effects on river depth and width anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and river depth and variation upstream and downstream. **No measurable change in quality element**	Creation of 45m of new realigned channel, with incorporated hydromorphological improvements (resulting in 15m net gain of river channel). However negligible effect anticipated on river depth and width. **No measurable change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and river depth and width upstream and downstream. **No measurable change in quality element.**	Element is insensitive to impact
Structure and substrate of the river bed	Localised but permanent changes to hydromorphology regime. Localised adverse effects on structure of river bed anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and structure and substrate of river bed upstream and downstream. **No measurable change in quality element**	Creation of 45m of new realigned channel, with incorporated hydromorphological improvements (resulting in 15m net gain of river channel). However negligible effect anticipated on structure and substrate of river bed. **No measurable change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes structure and substrate of river bed upstream and downstream. **No measurable change in quality element.**	Element is insensitive to impact
Structure of the riparian zone	Localised but permanent loss of riparian zone. Localised adverse effects on structure of riparian zone anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Element is insensitive to impact	Creation of 45m of new realigned channel, with incorporated riparian improvements (resulting in 15m net gain of river channel). Localised improvement, but **no change in quality element.**	Element is insensitive to impact	Creation of 45m of new realigned channel, with incorporated riparian improvements (resulting in 15m net gain of river channel). Localised improvement, but **no change in quality element.**

WFD Classification Elements	Unnamed tributary of Meece Brook 3 (Moderate) – WFD-AP2-02 Access road culvert. Approx. culvert length: 21m; Approx. culvert dimensions: 1.4m. Culvert length has been reduced as far as reasonably practicable. Invert of culvert to be buried 300mm below the existing bed level to reduce disruption to sediment transfer and maintain natural substrate. Culvert sized to minimise impact on flow continuity. Detailed design to be developed in general accordance with CIRIA and Environment Agency guidance and to ensure appropriate low flow water depths and velocities for fish passage. Hydromorphological improvements to be undertaken to river channel immediately upstream and downstream of the culvert to compensate for footprint loss.			Meece Brook (High) – WFD-MEE-W-01-01 Viaduct. Meece Brook Viaduct; Approx. viaduct width: 15m; Approx. viaduct length: 240m; Approx. viaduct height: 12m. Clear span viaduct. Viaducts designed to cross perpendicular to river channel wherever possible to reduce shading impact.
	Footprint	Shading	Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream	Shading
Macrophytes and Phytobenthos - combined	Localised but permanent loss of open river habitat. Localised adverse effects on macrophytes and phytobenthos anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of section of river channel. Localised adverse effect on macrophytes and phytobenthos anticipated (due to a reduction in photosynthetic activity), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and macrophytes and phytobenthos habitat upstream and downstream of culvert. **No measurable change in quality element.**	Some minor, localised and periodic shading of river channel. However negligible effect on macrophytes and phytobenthos anticipated. **No measurable change in quality element**
Macroinvertebrates	Localised but permanent loss of open river habitat. Localised adverse effects on macroinvertebrates anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of section of river channel. Localised adverse effects on macroinvertebrates anticipated (including due to a reduction in/loss of riparian and aquatic vegetation), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and macroinvertebrate habitat upstream and downstream of culvert. **No measurable change in quality element.**	Some minor, localised and periodic shading of river channel. However negligible effect on macroinvertebrates anticipated. **No measurable change in quality element**
Fish	Localised but permanent loss of open river habitat. Localised adverse effects on fish anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent shading of culverted section of channel. Localised adverse effects on fish anticipated (including due to a reduction in/loss of riparian and aquatic vegetation), but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and fish habitat upstream and downstream of culvert. **No measurable change in quality element.**	Some minor, localised and periodic shading of river channel. However negligible effect on fish anticipated. **No measurable change in quality element**
Dissolved oxygen	Element is insensitive to impact	Localised but permanent shading of culverted section of channel. Potential to lead to minor and localised impact on dissolved oxygen concentrations (due to reduced photosynthetic activity by aquatic flora). Localised adverse effects anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and dissolved oxygen upstream and downstream of culvert. **No measurable change in quality element.**	Some minor, localised and periodic shading of river channel (with potential associated reduction in photosynthetic activity by aquatic flora). However, negligible effect on dissolved oxygen concentrations anticipated. **No measurable change in quality element.**
pH	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact
Phosphate	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact
Ammonia	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact
Temperature	Element is insensitive to impact	Localised but permanent shading of culverted section of channel. Potential to lead to minor and localised impact on water temperature. Localised adverse effects anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Some minor, localised and periodic shading of river channel. However, negligible effect on water temperature anticipated. **No measurable change in quality element.**
Ammonia (Annex 8), Copper, Triclosan, Zinc	N/A - Specific pollutants effects screened out for scheme design component			N/A - Specific pollutants effects screened out for scheme design component
Quantity and dynamics of water flow	Localised but permanent changes to hydromorphology regime. Localised adverse effects on flow dynamics (including potential localised increases in flow velocity) anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and quantity and dynamics of flow upstream and downstream. **No measurable change in quality element**	N/A - Hydromorphology effects screened out for scheme design component
Connection to groundwater bodies	Localised but permanent loss of connection to surrounding shallow groundwater within superficial deposits. However no likely effect anticipated on connection to groundwater bodies. **No measurable change in quality element.**	Element is insensitive to impact	Element is insensitive to impact	
River continuity	Localised but permanent changes to hydromorphology regime. Localised adverse effects on river continuity anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Element is insensitive to impact	
River depth and width variation	Localised but permanent changes to hydromorphology regime. Localised adverse effects on river depth and width anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and river depth and variation upstream and downstream. **No measurable change in quality element**	
Structure and substrate of the river bed	Localised but permanent changes to hydromorphology regime. Localised adverse effects on structure of river bed anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Localised but permanent changes to hydromorphology regime. However negligible effect anticipated on river processes and structure and substrate of river bed upstream and downstream. **No measurable change in quality element**	
Structure of the riparian zone	Localised but permanent loss of riparian zone. Localised adverse effects on structure of riparian zone anticipated, but **no change in quality element when balanced against mitigation embedded in the scheme.**	Element is insensitive to impact	Element is insensitive to impact	

WFD Classification Elements	Meece Brook (High) – WFD-MEE-W-01-02 Realignment. Approx. total length of new realigned channel: 65m; Approx. total length of existing channel: 55m; Total net gain: 10m. The length of watercourse realignments has been reduced as far as reasonably practicable. Design of the new channel will also ensure the equivalent hydraulic capacity and incorporation of appropriate features equivalent to those lost along the existing channel footprint. Where natural watercourse, the design will aim to enhance hydromorphological condition over the existing condition where reasonably practicable (provided this is compatible with the watercourses' flood risk and land drainage functions). In addition, the design of the new channel will allow for a 10m wide buffer zone for the implementation of marginal/riparian improvements.			Detailed Impact Assessment Results: Cumulative effects - effects on element from scheme component(s) located in other WFD water bodies	Overall effect on element	Additional mitigation requirements: Construction	Additional mitigation requirements: Operation	Residual effects on element	WFD compliance outcome - potential for deterioration of current status
	Footprint	Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream	Creation of new habitats						
Macrophytes and Phytobenthos - combined	Creation of 65m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 10m net gain of river channel). However negligible effect anticipated on river processes and macrophytes and phytobenthos habitat upstream and downstream. **No measurable change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and macrophytes and phytobenthos habitat upstream and downstream. **No measurable change in quality element.**	Creation of 65m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 10m net gain of river channel). However negligible effect anticipated on river processes and macrophytes and phytobenthos habitat upstream and downstream. **No measurable change in quality element.**	None	Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.	None required	None required	N/a	Compliant - no change in biological status of water body
Macroinvertebrates	Creation of 65m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 10m net gain of river channel). However negligible effect anticipated on river processes and macroinvertebrate habitat upstream and downstream. **No measurable change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and macroinvertebrate habitat upstream and downstream. **No measurable change in quality element.**	Creation of 65m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 10m net gain of river channel). However negligible effect anticipated on river processes and macroinvertebrate habitat upstream and downstream. **No measurable change in quality element.**		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/a	
Fish	Creation of 65m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 10m net gain of river channel). However negligible effect anticipated on river processes and fish habitat upstream and downstream. **No measurable change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and fish habitat upstream and downstream. **No measurable change in quality element.**	Creation of 65m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements (resulting in 10m net gain of river channel). However negligible effect anticipated on river processes and fish habitat upstream and downstream. **No measurable change in quality element.**		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/a	
Dissolved oxygen	Creation of 65m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements. However negligible effect anticipated on dissolved oxygen concentrations. **No measurable change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and dissolved oxygen concentrations upstream and downstream. **No measurable change in quality element.**	Creation of 65m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements. However negligible effect anticipated on dissolved oxygen concentrations. **No measurable change in quality element.**	None	Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.	None required	None required	N/a	Compliant - no change in physicochemical status of water body
pH	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact		Element is insensitive to impact. No measurable change to quality element			N/a	
Phosphate	Element is insensitive to impact	Element is insensitive to impact	Creation of 65m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements. Potential localised reductions in fine sediment inputs and nutrient loading. However negligible effect anticipated on phosphate concentrations. **No measurable change in quality element.**		Negligible effect anticipated in when effects considered in combination. No measurable change in quality element			N/a	
Ammonia	Element is insensitive to impact	Element is insensitive to impact	Creation of 65m of new realigned channel, with incorporated hydromorphological and riparian/marginal habitat improvements. Potential localised reductions in fine sediment inputs and nutrient loading. However negligible effect anticipated on ammonia concentrations. **No measurable change in quality element.**		Negligible effect anticipated in when effects considered in combination. No measurable change in quality element			N/a	
Temperature	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/a	
Ammonia (Annex 8), Copper, Triclosan, Zinc	N/A - Specific pollutants effects screened out for scheme design component								
Quantity and dynamics of water flow	Creation of 65m of new realigned channel, with incorporated hydromorphological improvements (resulting in 10m net gain of river channel). However negligible effect anticipated on river processes and quantity and dynamics of flow upstream and downstream. **No measurable change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and quantity and dynamics of flow upstream and downstream. **No measurable change in quality element.**	Element is insensitive to impact	None	Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.	None required	None required	N/a	Compliant - no change in hydromorphological status of water body
Connection to groundwater bodies	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact		No effect anticipated in when effects considered in combination. No measurable change in quality element			N/a	
River continuity	Element is insensitive to impact	Element is insensitive to impact	Element is insensitive to impact		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/a	
River depth and width variation	Creation of 65m of new realigned channel, with incorporated hydromorphological improvements (resulting in 10m net gain of river channel). However negligible effect anticipated on river depth and width. **No measurable change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes and river depth and width upstream and downstream. **No measurable change in quality element.**	Element is insensitive to impact		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/a	
Structure and substrate of the river bed	Creation of 65m of new realigned channel, with incorporated hydromorphological improvements (resulting in 10m net gain of river channel). However negligible effect anticipated on structure and substrate of river bed. **No measurable change in quality element.**	Localised but permanent change to hydromorphological regime. However negligible effect anticipated on river processes structure and substrate of river bed upstream and downstream. **No measurable change in quality element.**	Element is insensitive to impact		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/a	
Structure of the riparian zone	Creation of 65m of new realigned channel, with incorporated riparian improvements (resulting in 10m net gain of river channel). However negligible effect anticipated on river processes and quantity and structure of riparian zone. **No measurable change in quality element.**	Element is insensitive to impact	Creation of 65m of new realigned channel, with incorporated riparian improvements (resulting in 10m net gain of river channel). However negligible effect anticipated on river processes and quantity and structure of riparian zone. **No measurable change in quality element.**		Localised adverse effect anticipated when scheme component effects considered in combination. No change in quality element when balanced against mitigation embedded in the scheme.			N/a	

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