

# NWT-G02-003

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United Utilities

# **North West Transfer Strategic Resource Option**

Gate 2 Water Framework Directive Compliance Assessment

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## Report for

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## Document revisions

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# 1. Introduction

## 1.1 Purpose of this report

This report presents the Water Framework Directive (WFD) compliance assessment for United Utilities' North West Transfer Strategic Resource Option to inform the Gate 2 submission to RAPID. This assessment for Gate 2 represents the best available information at the time, and includes recommendations for further evidence collection and assessment for Gate 3.

## 1.2 The North West Transfer SRO

The United Utilities (UU's) North West Transfer (NWT) Strategic Resource Option (SRO) is one of 17 schemes promoted by Ofwat in the PR19 Final Determination to identify new strategic water resources to meet projected supply deficits as a consequence of population growth and climate change. The NWT SRO is a combination of the United Utilities Sources (UUS) and Vyrnwy Aqueduct (UUVA) SROs. Both the UUS and UUVA SROs have progressed through Gate 1 (July 2021) of the Regulators' Alliance for Progressing Infrastructure Development's (RAPID) gated process, and UU is now preparing its Gate 2 submission for a combined NWT SRO.

The NWT SRO solution promotes cost efficient source options, selected to facilitate transfer volumes by the release of raw water directly from Lake Vyrnwy into River Vyrnwy or transferred through a new River Vyrnwy bypass pipeline into the River Severn as part of the Severn Thames Transfer (STT) SRO. The NWT SRO provides new sources to be brought online if water were to be transferred out of region, maintaining resilience for customers in the North West. The NWT SRO comprises two principal components:

- new sources to offset water transferred out of region from Lake Vyrnwy as part of the STT SRO; and
- enabling works on the Vyrnwy Aqueduct to allow treated water from regional UU sources to be transferred by pumping into the Vyrnwy Aqueduct to maintain customer supplies (for transfer volumes greater than 50 Ml/d).

The purpose of Gate 2 is to enable detailed feasibility, concept design and multi-solution decision making, building on the work undertaken during Gate 1 to further develop the NWT SRO programme and option design. To inform concept solution designs and reduce uncertainty in costs and benefits, the potential environmental effects of the NWT SRO identified in Gate 1 have been considered further in a series of updated overarching assessments, including this Water Framework Directive compliance assessment. The assessment has built on Gate 1 by taking account of:

- The preferred options being taken forward at Gate 2 including updated design information;
- Regulator feedback (during Gate 1 including RAPID's Gate 1 decision and during the preparation of the Gate 2 submission); and
- Further, topic-specific evidence collection and assessment work.

A total of 14 options are proposed for the NWT SRO (13 supply options and one enabling works option). The source options are geographically spread across UU's supply area (as shown in **Figure 1.1**), and include groundwater and river abstractions. Of the 13 source options, nine are included in the NWT Full Solution, with the remaining four held in reserve. The options are summarised in **Table 1.1**.

Table 1.1 Options included in the NWT scheme

Option ID	Option name	Description	Capacity (MI/d)	Part of NWT Full Solution?
WR015	[REDACTED]	[REDACTED]	40	Yes
WR049d	[REDACTED]	[REDACTED]	40	Yes
WR076	[REDACTED]	[REDACTED]	25	Yes
WR102b	[REDACTED]	[REDACTED]	17	Yes
WR105a1	[REDACTED]	[REDACTED]	4.5	No
WR106b	[REDACTED]	[REDACTED]	8.5	No
WR107a2	[REDACTED]	[REDACTED]	10	Yes
WR107b	[REDACTED]	[REDACTED]	12	Yes
WR111	[REDACTED]	[REDACTED]	9	Yes
WR113	[REDACTED]	[REDACTED]	3	Yes
WR144	[REDACTED]	[REDACTED]	5	No
WR149	[REDACTED]	[REDACTED]	13	Yes
STT041b	[REDACTED]	[REDACTED]	58	No
STTA4	[REDACTED]	[REDACTED]	n/a	Yes

### 1.3 The Water Framework Directive

The Water Framework Directive (WFD) (2000/60/EC) introduced a comprehensive river basin management planning system to the European Union, to help protect and improve the ecological health of our rivers, lakes, estuaries and coastal and groundwaters. The *Water Environment (Water Framework Directive) (England and Wales) Regulations 2017* transposed into domestic law, for England and Wales, the WFD as well as aspects of the Groundwater Directive and Environmental Quality Standards Directive. The WFD Regulations require the preparation and publication of river basin management plans; the setting of environmental objectives for groundwater and surface waters (including estuaries and coastal waters) and the devising and implementing of programmes of measures to meet those objectives.

The All Company Working Group (ACWG) guidance (October 2020<sup>1</sup>) sets out a requirement for an environmental assessment to be undertaken for each SRO, "which will include the need for WFD no deterioration assessments". The guidance states that *"As part of the SRO assessment process, it must be demonstrated that an option will not cause the deterioration in status of any waterbodies, as measured and defined in the Water Framework Directive (WFD). This assessment should include and consider any mitigation methods that would be put in place to protect a waterbody status."*

RAPID's Gate 2 guidance (February 2022<sup>2</sup>) states that at Gate 2, all options must be assessed "to ensure they comply with and support the achievement of Water Framework Directive Regulation requirements and objectives set out in the River Basin Management Plans". This includes a recognition that not all evidence will be available at Gate 2, and requires a plan to be set out for *"Addressing uncertainties: Provide a plan to gather further evidence for gate three. Report initial evidence at Gate 2."*

This report provides that assessment, using the best available information at the time of the Gate 2 submission, and highlighting key areas for further evidence collection and assessment for Gate 3. The information within this report has, in turn, been used to inform the Integrated Environmental Assessment (IEA) Report for Gate 2.

## 1.4 Format of this report

The remainder of this report sets out:

- In **Section 2**, the methodology applied to the assessment;
- In **Section 3**, the results of the individual option assessments;
- In **Section 4**, the results of the cumulative assessment for the NWT Full Solution;
- In **Section 5**, conclusions of the assessment at Gate 2, and recommendations for evidence collection and assessment during Gate 3.

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<sup>1</sup> All Company Working Group (October 2020). Water Framework Directive: Consistent framework for undertaking no deterioration assessments

<sup>2</sup> Regulators' Alliance for Progressing Infrastructure Development (February 2022). Strategic regional water resource solutions guidance for gate 2.

## 2. WFD Compliance Assessment methodology

### 2.1 Supporting Assessments

This WFD assessment draws on other technical assessments that have been undertaken to inform the Gate 2 submission. Those assessments have focussed on the potential impacts of the operation of the 13 supply options, i.e. of the abstractions from rivers and groundwater. The relevant assessments are set out in **Table 2.1**.

Table 2.1 Other assessments that inform the WFD Compliance Assessment

Assessment report	Relevance to WFD compliance assessment
<b>NWT SRO Gate 2: Assessment of options involving groundwater abstractions (Wood, 2022a)</b>	<p>Primary source of information to for the assessments of groundwater options, giving consideration to each of the quantitative groundwater tests.</p> <p>The assessments are qualitative, drawing on best available information. Quantitative information will become available once the regional groundwater models (the Lower Mersey &amp; North Merseyside model and the East Cheshire model) have been updated (at Gate 3)</p>
<b>NWT SRO Gate 3: Assessment of options involving surface water abstractions (Wood, 2022b)</b>	<p>The main report, with more detail in technical appendices, gives consideration to each of the classification elements for rivers, including:</p> <p>Appendix B, Flow Impact Assessment. Provides a quantified assessment of impacts on river flows, using gauged flow records and predicted option utilisation profiles.</p> <p>Appendix D, Water quality assessment. Provides an initial quantified assessment of potential for deterioration of physico-chemical elements, using simple dilution calculations. Uses predicted flow impacts and observed water quality data. More detailed modelling is proposed leading in to Gate 3, to allow a range of scenarios to be considered, including any impacts on planned water quality improvements in the catchments.</p> <p>Appendix E, Macroinvertebrate Assessment. Provides an assessment of likely sensitivity of macroinvertebrates to flow changes, through review of historic data. The robustness of the assessment varies between options, depending on data availability: further data collection is proposed leading in to Gate 3.</p> <p>Appendix F, Macrophyte Assessment. Provides an assessment of likely sensitivity of macrophytes to flow changes, through review of historic data. The robustness of the assessment varies between options, depending on data availability: further data collection is proposed leading in to Gate 3.</p> <p>Appendix G, Fisheries Assessment. Provides a review of fisheries data with recommendations for further evidence collection leading in to Gate 3. The current assessments are precautionary, subject to further evidence collection relating to physical habitat, fish surveys and barriers.</p>

## 2.2 Relevant guidance

Guidance for WFD compliance assessments for SROs was set out by the ACWG in October 2020<sup>3</sup>, in *Water Framework Directive: Consistent framework for undertaking no deterioration assessments*. The guidance sets out the objectives of a WFD assessment, and a proposed framework for undertaking the assessments.

Water company guidance for Water Resource Management Plans (WRMPs) is set out in UKWIR (2021<sup>4</sup>) and Environment Agency (2021<sup>5</sup>). The ACWG guidance is aligned with the WRMP guidance in terms of the objectives that the assessment must achieve, although they provide alternative templates for presenting the assessment.

All options that are considered part of the NWT SRO are also included in UU's draft Water Resources Management Plan 2024 (dWRMP24). As a result, all of the supply options in the NWT have already been assessed as feasible options in the WRMP, using the approach set out in the Water Resource Planning Guidance (WRPG, 2021). In order to provide continuity and consistency with the WRMP, the WRPG approach has been applied to the NWT assessment, rather than the ACWG framework approach. Both approaches are identical in their objectives, and the presentational difference does not affect the conclusions of the assessment.

The methodology applied here was provided to regulators for consultation in the form of a Method Statement in May 2022<sup>6</sup>.

## 2.3 Objectives of the WFD Compliance Assessment

Principally, the WFD assessment acts as an indicator of constraint, and determines where the SRO or options within the SRO do not meet WFD Objectives set out in Regulation 13 of the WFD Regulations. In line with both the ACWG (2021) and WRPG (2021) guidance, the principal WFD Assessment Objectives that the NWT SRO options will be tested against are as follows<sup>7</sup>:

1. To prevent deterioration of any WFD element of any water body - in line with WFD Article 4.1(a) (Regulation 13(2)(a) and 13(5)(a)).
2. To prevent the introduction of impediments to the attainment of 'Good' WFD status or potential for any water body in line with Article 4.1 (a)ii and iii (Regulation 13(2)(b) and 13(5)(c)).
3. To ensure that the planned programme of water body measures in RBMP2, to help attain the WFD objectives for the waterbody, are not compromised.

The WRPG (2021) also sets out if there is the possibility that an option could influence priority hazardous substance or priority substances in a water body, additional WFD Assessment Objectives may be agreed with the regulator in line with Regulation 13(3) and 13(5)(d).

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<sup>3</sup> All Company Working Group (October 2020). *Water Framework Directive: Consistent framework for undertaking no deterioration assessments*

<sup>4</sup> UKWIR (2021) *Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans*.

<sup>5</sup> Environment Agency (2021) *Water Resources Planning Guideline*.

<sup>6</sup> Wood (2022) *North West Transfer Strategic Resource Option Gate 2: Overarching Environmental Assessments Method Statement*

<sup>7</sup> The ACWG guidance refers to articles of the Water Framework Directive itself, while the WRPG refers to the WFD Regulations. Both have been listed, providing the context of the articles of the WFD for familiarity

If an option is assessed to:

- Definitively not comply with the WFD Assessment Objectives set out above then the option is reported as WFD non-compliant and removed from further consideration. This will only apply to options for which a clear and obvious conclusion around non-compliance can be reached, and for which no mitigation to provide compliance is possible.
- Potentially not comply with the WFD Assessment Objectives set out above then the option is reported as potentially WFD non-compliant. If an option is reported as potentially WFD non-compliant it may be appropriate to consider the option further where it is considered that additional evidence to improve confidence in the assessment and/or enhanced design could mitigate the potentially WFD non-compliant issues.

As will be shown in Sections 3 and 4, the latter is largely the case for the NWT SRO at Gate 2. The assessments undertaken at Gate 2 have used the best available information, and have identified requirements for further work that will allow improved confidence in conclusions at Gate 3 and beyond. Some options have been given precautionary conclusions of being potentially non-compliant, that have the potential to revert to compliant once more evidence is available as option design (including embedding suitable mitigation) develops.

## 2.4 Assessment approach

Each option that is included in the NWT SRO (as set out in **Table 1.1**) has been assessed individually. In addition, a scheme-level assessment has been undertaken, which incorporates the options included within the NWT Full Solution. The sub-sections below set out the proposed approach for each assessment.

### Option-level assessments

All assessments have been undertaken at the reporting unit of a WFD water body. The appropriate baseline information for water bodies status and targets is the most recent interim classification data (2019), which is expected to be used in the draft third cycle of RBMPs (RBMP3).

In line with the UKWIR guidance, a stepped process has been applied to each NWT SRO option, to determine if it is compliant with the three principal WFD Assessment Objectives. Each of the four steps involved increasingly detailed assessments, but where there is sufficient confidence in an assessment's conclusions the option will not progress onto the next step. The four steps are:

- Step 1 Screening based on activities;
- Step 2 Screening based on magnitude of hydrogeological/hydrological impact and water body context;
- Step 3 Impact assessment;
- Step 4 Detailed impact assessment.

In the WRMP (for which the guidance was derived), Steps 2 and 3 are designed to be relatively high level, considering the large number of options that may require assessment. Individual options

requiring detailed assessment would then be passed through to Step 4. Inclusion of abstraction-related options in the NWT has, by the nature of the SRO scope and programme, involved more detailed assessment at the individual option level, which can therefore be considered to constitute the first stages of a Step 4 assessment (with further Step 4 evidence collection and assessment continuing into Gate 3), as presented in Wood (2022a and 2022b). Within this WFD compliance assessment report, the findings of those assessments are presented within the Step 2 and 3 framework, for simplicity of reporting.

Further detail on how these steps have been applied to the NWT at Gate 2 is set out below.

### *Step 1: Screening based on activities*

This step has been used to either exclude options from further assessment where it could be reasonably expected that the option would not have an influence on any WFD status elements or supporting elements, or identify which activities required progressing to Step 2 assessment and in which water bodies. All NWT options have been subject to this step. Any option screened as WFD compliant at this stage has been accompanied by a robust explanation as to why this assessment can be made without the need to progress the option to Step 2.

### *Step 2: Screening based on magnitude of hydrogeological/hydrological impact and waterbody context*

This step has been used to either exclude options from assessment where they are negligible or low impact, or identify which activities required progressing to Step 3 assessment and in which water bodies.

The assessment has identified the water body name, ID and type of any water bodies that could potentially be impacted. Additional constraints were also considered, such as any protected areas, and any planned water body measures in RBMP2. Relevant water bodies have been identified, and likely hydrological and/or hydrogeological impact assessed:

- For options involving groundwater abstraction, the hydrogeological setting has been reviewed in Wood (2022a). Both the groundwater body from which the abstraction would be taken, and surface water bodies that may receive baseflow from the groundwater body have been identified. Much of the permo-triassic sandstone from which the options would abstract is confined, but there may be connectivity with rivers where there are gaps in the confining layers and groundwater levels reach the surface. A relatively precautionary approach has been taken to identifying surface water bodies at Gate 2. This will be improved through development of the updated groundwater models over the upcoming year, which will allow quantification of impacts on both groundwater and surface waters.
- For options involving surface water abstraction, the water body within which the abstraction is located has been assessed. Downstream water bodies have also been considered, depending on the magnitude of impact on flows and the rate of accretion downstream (e.g. passing confluences of other tributaries). Impacts on flow have been calculated in Wood (2022b) using historic gauged flows and predicted utilisation rates for each option.

In addition to the assessments presented above, the most recent water availability information provided by the Environment Agency (March, 2022<sup>8</sup>) has been used to inform the assessments.

### *Step 3: Impact assessment*

As for Step 2, Wood (2022a) and Wood (2022b) should be referred to for detail of the Step 3 assessments for options involving groundwater and surface water abstractions respectively. Those assessments were used to establish the likelihood of compliance with the agreed WFD Assessment Objectives in all relevant water bodies, with a confidence rating to reflect the amount of uncertainty in the design, environmental baseline and magnitude of impact.

For each option, a source-pathway-receptor approach to identifying effects on WFD Assessment Objectives has been undertaken. In this approach, the source of change is the construction or operational activity, the pathway is any physical environment changes such as in water levels, flow velocities, morphology or water quality, and the receptor is the WFD status element or the WFD protected area. All relevant WFD status elements have been considered, according to the water body type:

- Groundwater bodies: Quantitative tests including dependent surface water body status, groundwater dependent terrestrial ecosystems (GWDTE), saline intrusion and water balance. Chemical tests including dependent surface water body status, GWDTEs, drinking water protected areas, saline intrusion and general quality.
- River water bodies: fish, invertebrates, macrophytes, physico-chemical water quality, chemicals;
- Transitional water bodies: phytoplankton, angiosperms, macroalgae, invertebrates, fish, physico-chemical water quality, chemicals.

Each element is assessed individually, and the worst-case compliance conclusion is taken as the overall conclusion for the water body (i.e. if one element is non-compliant, then the water body will be identified as being non-compliant), in line with Environment Agency (2011)<sup>9</sup>.

As no quantitative assessment is yet available for the groundwater options, and the understanding of groundwater-surface water connectivity was relatively limited at Gate 2, the focus has been on hydrogeological conceptualisation. A detailed assessment of impacts on surface water bodies will be developed leading in to Gate 3, through a combination of ecological evidence collection and updated groundwater modelling.

### *Step 4: Detailed impact assessment*

As noted above, all options involving abstraction from rivers or groundwater (i.e. all options besides STTA4, as presented in Section 3) are subject to detailed assessment in Wood (2022a and 2022b), which may be referred to for more detail. In this WFD Compliance Assessment report, the findings of those detailed assessments have been reported in the template of the Step 3 assessments (i.e. **Appendix A**), for simplicity of presentation.

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<sup>8</sup> Provided by email from Environment Agency to UU

<sup>9</sup> Environment Agency (2011) Method statement for the classification of surface water bodies

## NWT Full Solution WFD Assessment

The WFD Assessment Objectives have also been tested at the NWT Full Solution level. The same principles regarding conclusions of compliance or non-compliance were applied as at the option level, i.e:

- If the Full Solution is reported as potentially WFD non-compliant it may be appropriate to consider it further, where it is considered that additional evidence to improve confidence in assessment and enhanced design could mitigate the potentially WFD non-compliant issues.
- If the Full Solution is assessed as definitively WFD non-compliant then it should be adapted, for example by removing non-compliant options, to enable compliance to be achieved, unless a Regulation 19 exemption applies<sup>10</sup>.

For the cumulative assessment of the NWT Full Solution, the water bodies assessed for each option individually were added to a matrix showing option vs water body. Downstream linkages were considered, even where downstream water bodies had not been identified as being necessary for individual option assessments, to ensure a comprehensive catchment-wide review.

For water bodies identified as having the potential to be impacted by more than one option, a cumulative assessment has been undertaken, against the agreed set of WFD Assessment Objectives using the methodologies for the option level assessment. This included revision of the hydrological and hydrogeological assessments which underpin the testing of the WFD Assessment Objectives.

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<sup>10</sup> Extracts from the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017:

19(1) A failure to achieve good groundwater status, good ecological status or (where relevant) good ecological potential, or to prevent deterioration in the status of a body of surface water or groundwater, is not a breach of the environmental objectives set for it under regulation 12 if—

(a) the failure is the result of new modifications to the physical characteristics of the body of surface water or alterations to the level of the body of groundwater, and

(b) all the conditions in paragraphs (3) to (5) are or will be met.

(2) A failure to prevent deterioration from high status to good status of a body of surface water is not a breach of the environmental objectives set for it under regulation 12 if—

(a) the failure is the result of new sustainable development activities, and

(b) all the conditions in paragraphs (3) to (5) are or will be met.

(3) The condition is that all practicable steps are taken to mitigate the adverse impact on the status of the body of water.

(4) The condition is that one or both of the following is the case—

(a) the reasons for the modifications or alterations, or for the sustainable development activities, are of overriding public interest;

(b) the benefits to the environment and to society of achieving the environmental objectives are outweighed by the benefits of the new modifications or alterations, or of the sustainable development activities, to human health, to the maintenance of human safety, or (in the case of modifications or alterations) to sustainable development.

(5) The condition is that the beneficial objectives served by the modifications or alterations, or by the sustainable development activities, cannot, for reasons of technical feasibility or disproportionate cost, be achieved by other means which are a significantly better option.

### 3. Option-level WFD Assessment Outcomes

This section presents a summary of the option level WFD Compliance Assessment for all 14 options included in the NWT scheme. These assessments have focussed on key operational effects as relevant to Gate 2, and will be revisited and completed at later stages, prior to implementation.

**Figure 3.1** shows the surface water WFD water bodies that have been identified as having potential to be impacted by the options, while **Figure 3.2** shows the groundwater bodies. A summary of the findings per option is presented in **Table 3.1**, with the full Step 3 assessment sheets available in **Appendix A**.

**Table 3.1** shows one option assessed as compliant, seven as potentially non-compliant (low confidence) and six as potentially non-compliant (medium confidence). An explanation of the conclusions at Gate 2 is presented below:

- The enabling works option STTA4 is assessed as compliant. This is because the option does not involve any new or additional abstraction of water from the environment, and relates only to the redistribution of water around UU's network;
- The five options involving abstractions from surface water (WR015, WR049d, WR076, WR144, STT041b) have all been assessed as potentially non-compliant (low confidence). These are viewed as having the potential to be compliant, but further evidence and assessment is required. The Environment Agency has provided updated water availability assessments to UU (March 2022) indicating that water is available for the abstractions, but it is possible that Hands-Off Flows (HOFs) may need to be agreed. Initial assessments of water quality impacts relating to reduced dilution have indicated that resulting changes to water quality are likely to be small, and not result in a change of WFD status. However, risks of impeding future improvements to water quality require further assessment (to inform Gate 3 assessments). In addition, further evidence is needed in relation to the biological elements (to inform Gate 3 assessments), in particular:
  - ▶ Improving the understanding of the impacts of changes to flow on physical habitat parameters, and resulting impacts for species;
  - ▶ Improving the understanding of impacts of changes to flow on ability of fish to pass barriers.
- There are two options involving abstractions from groundwater that have been assessed as potentially non-compliant (low confidence) (WR107b, WR113). These are viewed as having the potential to be compliant, but further evidence and assessment is required. The Environment Agency has stated that water is available for the abstractions, although this is in the absence of an up-to-date groundwater model that is reflective of the current baseline. For these options, there is the potential for impacts on rivers and/or wetlands, although it is likely that there is generally low surface water-groundwater connectivity. Additional evidence and assessment is required to inform

the Gate 3 assessments, in the form of updated groundwater models (including the Lower Mersey and North Merseyside groundwater model and the East Cheshire groundwater model);

- There are six options involving abstraction from groundwater that have been assessed as potentially non-compliant (medium confidence). For these, there is greater potential for them to remain non-compliant after further evidence collection and assessment. For these options, either the Environment Agency has stated that there is insufficient water available for the total abstraction quantity required (WR102b, WR105a1, WR106b, WR149), or they have stated that there is sufficient water available within current licences, but the option involves a new licence or licence alteration (WR107a2, WR111). Some of these options also have a risk of causing further deterioration of the salinity tests (WR102b, WR105a1, WR106b, WR149). Additional evidence and assessment is required to inform the Gate 3 assessments, in the form of updated groundwater models (including the Lower Mersey and North Merseyside groundwater model and the East Cheshire groundwater model).

Table 3.1 Option-level WFD Compliance Assessment Summary

Option ID	Water bodies	Risk of WFD non-compliance	Reason, if not confirmed as compliant
<b>WR015</b>	GB112069061451 Irwell (Croal to Irk) GB112069061452 Irwell/Manchester Ship Canal (Irk to confluence with Upper Mersey)	Potentially non-compliant (low conf.)	<p>The anticipated flow impact of the proposed abstraction would be a 7% reduction from gauged flows at Q95 for the 'all years' utilisation scenario, and 11% reduction for the 1 in 500 year utilisation scenario. The catchment is discharge-rich, with discharges supporting flows above natural at low flows. The EA's water availability assessment (March 2022) states that there is unconstrained water available for abstraction of this size.</p> <p>The option is potentially non-compliant for fish and water quality in the Irwell (Croak to Irk). The former relates to uncertainty about the impact of reduced flows over downstream barriers (objective 1): a barrier assessment survey will be carried out to further assess this (for Gate 3). The latter relates to potential impediments to improvement (objective 2): water quality modelling will be carried out to further assess this (for Gate 3).</p> <p>The option is potentially non-compliant in the Irwell/Manchester Ship Canal for water quality (objective 2, as above).</p>
<b>WR049d</b>	GB112071065500 Ribble (conf Calder to tidal) GB531207112400 Ribble transitional water	Potentially non-compliant (low conf.)	<p>The anticipated flow impact of the proposed abstraction would be less than 5% at Q95 for the 'all years' utilisation scenario, and 9.2% for the 1 in 500 utilisation scenario. The EA have confirmed that water is available following the most recent CAMS ledger update (May 2022).</p> <p>The option is potentially non-compliant for fish and water quality in the Ribble (conf Calder to tidal). The former relates to uncertainty about the impact of reduced flows on salmonid migration from the estuary (objective 1): further desk study will be carried out to understand this (for Gate 3), recognising that the impacts on flow are modest. The latter relates to potential impediments to improvement (objective 2): water quality modelling will be carried out to further assess this (for Gate 3).</p> <p>The option is assessed as compliant in the Ribble transitional water.</p>

Option ID	Water bodies	Risk of WFD non-compliance	Reason, if not confirmed as compliant
<b>WR076</b>	GB112069061382 Bollin (Ashley Mill to Manchester Ship Canal) GB112069061012 Mersey (Bollin confluence to Howley Weir) GB71210004 Manchester Ship Canal.	Potentially non-compliant (low conf.)	<p>The anticipated flow impact of the proposed abstraction would be 14% reduction from gauged Q95 in the 'all years' utilisation scenario, and a 22% reduction in the 1 in 500 year scenario. The catchment is discharge-rich, and the draft Upper Mersey ALS (Environment Agency, 2021) indicates that there is water available for abstraction at the proposed rate.</p> <p>The option is potentially non-compliant for fish and water quality in the Bollin (Ashley Mill to Manchester Ship Canal). The former relates to uncertainty about the impact of reduced flows over downstream barriers (objective 1): a barrier assessment survey will be carried out to further assess this (for Gate 3). The latter relates to potential impediments to improvement (objective 2): water quality modelling will be carried out to further assess this (for Gate 3).</p> <p>The option is potentially non-compliant for water quality in the Mersey (Bollin Confluence to Howley Weir) (objective 2, as above).</p> <p>The Manchester Ship Canal is not classified for biological or physico-chemical elements, but potential impacts on water quality in the canal will be included within the scope of the water quality modelling discussed above.</p>
<b>WR102b</b>	GB41201G101700 Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone Aquifers GB112069060680 Netherley Brook GB112069061390 Ditton Brook GB112069060690 Dog Clog Brook GB112069060710 Prescott Brook GB531206908100 Mersey transitional water	Potentially non-compliant (med. conf.)	<p>The option is potentially non-compliant for dependent surface water body status, saline intrusion, water balance and chemical status, in the Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone groundwater body. Of these, saline intrusion and water balance have been assigned medium confidence of non-compliance (objectives 1 and 2), based on classification information at the GWMU level. The Environment Agency has indicated that there is insufficient water available for the proposed option capacity. These assessments will be quantified and revisited once the Lower Mersey &amp; North Merseyside groundwater model has been updated (for Gate 3).</p>

Option ID	Water bodies	Risk of WFD non-compliance	Reason, if not confirmed as compliant
			<p>The option has been assessed as potentially non-compliant for biological and physico-chemical elements (objectives 1 and 2) for the listed river water bodies. This is a precautionary conclusion in the absence of a quantified understanding of the impacts on flow in these water bodies. Further ecological evidence collection will be undertaken in these water bodies, to support impact assessment should they be required, once flow impacts are available from the Lower Mersey &amp; North Merseyside groundwater model.</p> <p>The option is assessed as compliant in the Mersey transitional water.</p>
<b>WR105a1</b>	GB41201G101700 Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone Aquifers	Potentially non-compliant (med. conf.)	<p>The option is potentially non-compliant for GWDTes, saline intrusion, water balance and chemical status (objectives 1 and 2) in the Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone groundwater body. Of these, saline intrusion and water balance have been assigned medium confidence of non-compliance, based on classification information at the GWMU level. The Environment Agency has indicated that there is insufficient water available for the proposed capacity. These assessments will be quantified and revisited once the Lower Mersey &amp; North Merseyside groundwater model has been updated (for Gate 3).</p> <p>There is no linked WFD river water body for this option.</p>
<b>WR106b</b>	GB41201G101700 Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone Aquifers GB112069061010 Keckwick Brook	Potentially non-compliant (med. conf.)	<p>The option is potentially non-compliant for dependent surface water body status, GWDTes, saline intrusion, water balance and chemical status (objectives 1 and 2) in the Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone groundwater body. Of these, saline intrusion and water balance have been assigned medium confidence of non-compliance, based on classification information at the GWMU level. The Environment Agency has indicated that there is insufficient water available for the proposed capacity. These assessments will be quantified and revisited once the Lower Mersey &amp; North Merseyside groundwater model has been updated (for Gate 3).</p>

Option ID	Water bodies	Risk of WFD non-compliance	Reason, if not confirmed as compliant
			The option is potentially non-compliant for biological and physico-chemical elements (objectives 1 and 2) in Keckwick Brook. This is a precautionary conclusion in the absence of a quantified understanding of the impacts on flow. Further ecological evidence collection will be undertaken in the catchment, to support impact assessment should it be required, once flow impacts are available from the Lower Mersey & North Merseyside groundwater model.
<b>WR107a2</b>	GB41201G101700 Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone Aquifers GB112069060640 Downholland (Lydiate/ Cheshire Lines) Brook	Potentially non-compliant (med. conf.)	<p>The option is potentially non-compliant for dependent surface water body status, GWDTes, water balance and chemical status (objectives 1 and 2) in the Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone groundwater body. Of these, water balance has been assigned medium confidence of non-compliance. Although the Environment Agency has indicated that there is sufficient water available for the proposed capacity within the licensed surplus, this option would require a new licence. The assessments will be quantified and revisited once the Lower Mersey &amp; North Merseyside groundwater model has been updated (for Gate 3).</p> <p>The option is potentially non-compliant for biological and physico-chemical elements (objectives 1 and 2) in Downholland (Lydiate/ Cheshire Lines) Brook. This is a precautionary conclusion in the absence of a quantified understanding of the impacts on flow. Further ecological evidence collection will be undertaken in the catchment, to support impact assessment should it be required, once flow impacts are available from the Lower Mersey &amp; North Merseyside groundwater model.</p>
<b>WR107b</b>	GB41201G101700 Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone Aquifers GB112069060610 Croxteth/Knowsley Brook GB112069061441 Alt US Bull Bridge GB112069060580 Alt GB112070064830 Three Pool's Waterway	Potentially non-compliant (low conf.)	The option is potentially non-compliant for dependent surface water body status, GWDTes and chemical status (objectives 1 and 2) in the Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone groundwater. These are all low-confidence, and may be considered a precautionary conclusion until a spatially distributed assessment of connectivity to rivers and wetlands is possible using the Lower Mersey & North Merseyside groundwater model (for Gate 3).

Option ID	Water bodies	Risk of WFD non-compliance	Reason, if not confirmed as compliant
<b>WR111</b>	GB41201G101100 Manchester and East Cheshire Permo-Triassic Sandstone Aquifers GB112069061360 Dean (Bollington to Bollin) GB112069061320 Bollin (source to Dean) GB112069061030 Mersey (upstream of Manchester Ship Canal)	Potentially non-compliant (med. conf.)	<p>The option is potentially non-compliant for biological and physico-chemical elements (objectives 1 and 2) in the Alt U/S of Bull Bridge and the Alt. This is a precautionary conclusion in the absence of a quantified understanding of the impacts on flow. Further ecological evidence collection will be undertaken in the catchment, to support impact assessment should it be required, once flow impacts are available from the Lower Mersey &amp; North Merseyside groundwater model.</p> <p>The option is assessed as compliant in the Croxteth/Knowsley Brook and Three Pool's Waterway, on the basis of lack of connectivity to the regional sandstone.</p> <p>The option is potentially non-compliant for dependent surface water body status, GWDTes, water balance and chemical status (objective 1) in the Manchester and East Cheshire Permo-Triassic Sandstone groundwater body. Of these, water balance has been assigned medium confidence of non-compliance. Although the Environment Agency has indicated that there is sufficient water available for the proposed capacity within the licensed surplus, this option would require a licence variation. The assessments will be quantified and revisited once the Manchester &amp; East Cheshire groundwater model has been updated (for Gate 3).</p> <p>The option is potentially non-compliant for biological and physico-chemical elements (objectives 1 and 2) in the Dean and Bollin water bodies. This is a precautionary conclusion in the absence of a quantified understanding of the impacts on flow. Further ecological evidence collection will be undertaken in the catchments, to support impact assessment should it be required, once flow impacts are available from the Manchester &amp; East Cheshire groundwater model.</p> <p>The option is assessed as compliant in the Mersey (upstream of Manchester Ship Canal). While the hydrogeological understanding suggests that the majority of impact of the option would be felt on the</p>

Option ID	Water bodies	Risk of WFD non-compliance	Reason, if not confirmed as compliant
			Mersey, this would constitute a very small proportional impact, that is unlikely to have an impact in a managed system.
<b>WR113</b>	GB41201G101100 Manchester and East Cheshire Permo-Triassic Sandstone Aquifers GB112069061320 Bollin (source to Dean) GB112069061360 Dean (Bollington to Bollin) GB112069061030 Mersey (upstream of Manchester Ship Canal)	Potentially non-compliant (low conf.)	<p>The option is potentially non-compliant for dependent surface water body status, GWDTes, water balance and chemical status (objective 1) in the Manchester and East Cheshire Permo-Triassic Sandstone groundwater body. These are all low-confidence, and may be considered a precautionary conclusion until a spatially distributed assessment of connectivity to rivers and wetlands is possible using the Manchester &amp; East Cheshire groundwater model (for Gate 3).</p> <p>The option is potentially non-compliant for biological and physico-chemical elements (objectives 1 and 2) in the Dean and Bollin water bodies. This is a precautionary conclusion in the absence of a quantified understanding of the impacts on flow. Further ecological evidence collection will be undertaken in the catchments, to support impact assessment should it be required, once flow impacts are available from the Manchester &amp; East Cheshire groundwater model.</p> <p>The option is assessed as compliant in the Mersey (upstream of Manchester Ship Canal), while the hydrogeological understanding suggests that the majority of impact of the option would be felt on the Mersey, this would constitute a very small proportional impact, that is unlikely to have an impact in a managed system.</p>
<b>WR144</b>	GB112069061111 Tame (Chew Brook to Swineshaw Brook)	Potentially non-compliant (low conf.)	<p>NWT Gate 2 flow impact assessment shows that impacts on flow in the River Tame would be consistently below 10% immediately downstream of the abstraction. The impacts would be further reduced by the downstream CAMS Assessment Points. The ALS indicates that there is water available across the flow regime.</p> <p>The option is potentially non-compliant for biological elements including fish, macroinvertebrates, macrophytes (objective 1) and water quality (objective 2 in the Tame (Chew Brook to Swineshaw Brook)). However, the</p>

Option ID	Water bodies	Risk of WFD non-compliance	Reason, if not confirmed as compliant
			flow impacts are modest and so this is a relatively precautionary assessment, until further evidence collection and assessment have been undertaken leading in to Gate 3.
<b>WR149</b>	GB41201G101700 Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone Aquifers GB112069061020 Spittle Brook GB112069061420 Glaze GB112069060760 Pennington Brook (Glaze) GB112069064520 Hey/Bordsane Brook	Potentially non-compliant (med. conf.)	<p>The option is potentially non-compliant for dependent surface water body status, GWDEs, saline intrusion, water balance and chemical status (objectives 1 and 2) in the Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone groundwater body. Of these, saline intrusion and water balance have been assigned medium confidence of non-compliance, based on classification information at the GWMU level. The Environment Agency has indicated that there is insufficient water available for the proposed capacity, and there are known salinity issues. These assessments will be quantified and revisited once the Lower Mersey &amp; North Merseyside groundwater model has been updated (for Gate 3).</p> <p>The option is potentially non-compliant for biological and physico-chemical elements (objectives 1 and 2) in the listed river water bodies. This is a precautionary conclusion in the absence of a quantified understanding of the impacts on flow in these water bodies. Further ecological evidence collection will be undertaken in these water bodies, to support impact assessment should they be required, once flow impacts are available from the Lower Mersey &amp; North Merseyside groundwater model.</p>
<b>STT041b</b>	GB112069064600 Roch (Spodden to Irwell) GB112069060840 Irwell (Roch to Croal) GB112069061451 Irwell (Croal to Irk) GB112069061452 Irwell/Manchester Ship Canal (Irk to confluence with Upper Mersey) GB112069061011 Mersey/ Manchester Ship Canal (Irwell/Manchester Ship Canal to Bollin)	Potentially non-compliant (low conf.)	<p>On the Roch, the new abstraction is anticipated to reduce Q95 flows by up to 10.3% compared to gauged in the 'all years' utilisation scenario, and 15.3% in the 1 in 500 year utilisation. Below the Irwell abstraction, the Q95 impact could reach up to 10% in the 'all years' scenario, and 17% in the 1 in 500 year scenario. The catchment is discharge-rich, with discharges supporting flows above natural at low flows. The Environment Agency's water availability summary from March 2022 stated that water would be available for the Roch and Irwell abstractions individually.</p> <p>The option is potentially non-compliant for fish, macroinvertebrates, macrophytes (objective 1) and water quality (objective 2) in the Roch</p>

Option ID	Water bodies	Risk of WFD non-compliance	Reason, if not confirmed as compliant
			<p>(Spodden to Irwell) and Irwell (Croal to Irk). These are the water bodies in which the options are located, and hence would experience the greatest impact on flow.</p> <p>The option is potentially non-compliant for fish (objective 1) and water quality (objective 2) in the Irwell (Roch to Croal) and Irwell/Manchester Ship Canal. The former relates to uncertainty about the impact of reduced flows over downstream barriers: a barrier assessment survey will be carried out to further assess this (for Gate 3). The latter relates to potential impediments to improvement: water quality modelling will be carried out to further assess this (for Gate 3).</p> <p>The option is assessed as compliant in the Mersey/Manchester Ship Canal to Bollin.</p>
<b>STTA4</b>	n/a	Compliant (high confidence) (Step 1)	This is a network option involving redistribution of water across the network by reversing flow in the Vyrnwy aqueduct. No additional abstraction from the water environment is involved, or changes to existing abstractions.

## 4. SRO-level WFD Assessment

In order to understand the WFD compliance of the NWT SRO as a whole, a cumulative assessment has been undertaken. This includes the nine supply options that are part of the NWT Full Solution, which were identified in **Table 1.1**, along with the enabling works option.

**Figure 4.1** shows the surface water WFD water bodies that have been identified as having potential to be impacted by the NWT Full Solution, while **Figure 3.2** can be referred to for the groundwater bodies. **Figures 4.2** and **4.3** show schematics of the options that make up the NWT Full Solution and the water bodies that they could have a cumulative impact on (i.e. those that would be impacted by more than one option), for the Mersey and the Alt & Ribble respectively.

**Table 4.1** shows the options that make up the NWT Full Solution. It identifies all water bodies that could be impacted by the NWT Full Solution, and highlights those that could be impacted by more than one option. The water bodies listed are as informed through the option-level assessment, but have also looked further downstream, where the individual option assessments did not extend to the coast (in some cases this has resulted in additional water bodies being added, compared to the individual option assessments). Note that the enabling works option has not been included in this assessment, since (as concluded in **Section 3**) it is not expected to impact on any water bodies individually.

The water bodies identified for cumulative assessment can be grouped as follows:

- River Bollin- options WR076, WR111 and WR113 are in the Bollin catchment;
- River Mersey, Manchester Ship Canal and Mersey Estuary- options WR015, WR076, WR111, WR113 and WR149 are in the catchment of the River Mersey. Option WR120b flows separately into the Mersey Estuary;
- Alt Estuary- options WR107a2 and WR107b are in the catchment of the Alt Estuary;
- Ribble Estuary- option WR049 and the Primrose Hill abstraction of WR107b are in the catchment of the Ribble Estuary, each discharging to different parts of the estuary;
- Lower Mersey and North Merseyside Permo-Triassic Sandstone Aquifers- options WR102b, WR107a2, WR107b and WR149 abstract from this water body;
- Manchester and East Cheshire Permo-Triassic Sandstone Aquifers- options WR111 and WR113 abstract from this water body.

Each of the cumulative impacts identified above has undergone a hydrological assessment and associated WFD compliance assessment. The cumulative hydrological impacts include both the surface water abstractions (for which quantitative flow impacts have been calculated using modelled utilisation profiles), and groundwater abstractions (for which modelled utilisation profiles are available, but there is not yet a mechanism for quantifying the resulting impacts on surface waters). In order to accommodate the differing levels of quantification, a simple worst-case scenario has been assessed, which assumes that all sources are used at full capacity, and that the full capacity will directly impact on the surface water body in question.

The assessment is summarised in **Table 4.2**, with the detail presented in **Appendix B**.

Table 4.1 NWT Full Solution WFD Compliance Assessment Summary

Type	Waterbody ID	WR015	WR049d	WR076	WR102b	WR107a2	WR107b	WR111	WR113	WR149
River	GB112069061451 - Irwell (Croal to Irk)	√								
	GB112069061452 - Irwell / Manchester Ship Canal (Irk to confluence with Upper Mersey)	√								
	GB112069061011 - Mersey/ Manchester Ship Canal (Irwell/Manchester Ship Canal to Bollin)	√								√
	GB112069061012 - Mersey (Bollin confluence to Howley Weir) including Padgate Brook	√		√				√	√	√
	GB112071065500 - Ribble - conf Calder to tidal		√							
	GB112069061360 - Dean (Bollington to Bollin)							√	√	
	GB112069061320 - Bollin (Source to Dean)							√	√	
	GB112069061382 - Bollin (Ashley Mill to Manchester Ship Canal)			√				√	√	
	GB112069060680 - Netherley Brook				√					
	GB112069061390 - Ditton Brook (Halewood to Mersey Estuary)				√					
	GB112069060690 - Dog Clog Brook (including Mill Brook)				√					
	GB112069060710 - Prescott Brook (Logwood Mill Brook)				√					
	GB112069060640 - Downholland (Lydiate/Cheshire Lines) Brook					√				
	GB112069064500 - Downholland Brook)					√				
	GB112069060610 - Croxteth/Knowsley Brook						√			

Type	Waterbody ID	WR015	WR049d	WR076	WR102b	WR107a2	WR107b	WR111	WR113	WR149
	GB112069060580 - Alt						√			
	GB112069061441 - Alt US Bull Bridge						√			
	GB112069061442 - Alt DS Bull Bridge					√	√			
	GB112070064830 - Three Pool's Waterway						√			
	GB112069061020 - Spittle Brook									√
	GB112069061420 - Glaze									√
	GB112069060760 - Pennington Brook (Glaze)									√
	GB112069064520 - Hey/Borsdane Brook									√
<b>Canal</b>	GB71210004 - Manchester Ship Canal	√		√				√	√	√
<b>Transitional</b>	GB531206908100 - MERSEY	√		√	√			√	√	√
	GB531207112400 - RIBBLE		√				√			
	GB531206908300 - ALT					√	√			
<b>Groundwater</b>	GB41201G101700 - Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone Aquifers				√	√	√			√
	GB41201G101100 - Manchester and East Cheshire Permo-Triassic Sandstone Aquifers							√	√	

Water bodies with the potential to be impacted by more than one option are shown in blue.

Table 4.2 NWT Full Solution WFD Compliance Assessment Summary

Type	Water body	Options contributing to cumulative effect	Risk of WFD non-compliance	Comments
Groundwater	GB41201G101700 Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone Aquifers	WR102b, WR107a2, WR107b, WR149	Potentially non-compliant (medium confidence)	<p>Potentially non-compliant for dependent surface water body status, GWDTEs, saline intrusion, water balance and chemical status. The elements with medium confidence of non-compliance include:</p> <ul style="list-style-type: none"> <li>- Saline intrusion (quantitative and chemical tests), relating to historic saline intrusion in the GWMUs in which WR102b and WR149 are located.</li> <li>- Water balance tests relating to options WR102b and WR149 (Environment Agency has indicated that there is insufficient water available for the proposed option capacity), and WR107a2 (where the Environment Agency has indicated that there is sufficient water available for the proposed capacity within the licensed surplus, but the option would require a new licence).</li> </ul> <p>The dependent surface water body status and GWDTEs are precautionary conclusions with low confidence of non-compliance, in the absence of a quantified understanding of the impacts on flow and/or groundwater levels.</p>

Type	Water body	Options contributing to cumulative effect	Risk of WFD non-compliance	Comments
Groundwater	GB41201G101100 Manchester and East Cheshire Permo-Triassic Sandstone Aquifers	WR111, WR113	Potentially non-compliant (medium confidence)	<p>Potentially non-compliant for dependent surface water body status, GWDTes and water balance. The element with medium confidence of non-compliance is the water balance test relating to option WR111. Although the Environment Agency has indicated that there is sufficient water available for the proposed option capacity within the licensed surplus, option WR111 would require a licence variation.</p> <p>The dependent surface water body status and GWDTes are precautionary conclusions with low confidence of non-compliance, in the absence of a quantified understanding of the impacts on flow and/or groundwater levels.</p>
	GB112069061451 - Irwell (Croal to Irk)	WR015	Potentially non-compliant (low confidence)	The Irwell (Croak to Irk) is impacted by WR015 only. Potential non-compliance is associated with a reduction in flow having the potential to affect fish habitat and fish passage. It is also possible that a reduction in dilution could prevent future improvements to physico-chemical status.
	GB112069061452 - Irwell / Manchester Ship Canal (Irk to confluence with Upper Mersey)	WR015	Potentially non-compliant (low confidence)	The Irwell / Manchester Ship Canal (Irk to confluence with Upper Mersey) is impacted by WR015 only. Potential non-compliance is associated with the possibility that a reduction in dilution could prevent future improvements to physico-chemical status.
	GB112069061020 - Spittle Brook	WR149	Potentially non-compliant (low confidence)	Spittle Brook, Glaze, Pennington Brook (Glaze) and Hey/Borsdane Brook water bodies are impacted by WR149 only.
	GB112069061420 - Glaze	WR149	Potentially non-compliant (low confidence)	Potential non-compliance is associated with the potential for increased abstraction leading to reduced river baseflow, which could potentially impact on biological elements, or result in reduced dilution of physico-chemical elements. This is a precautionary conclusion in the absence of a quantified understanding of the impacts on flow from the

Type	Water body	Options contributing to cumulative effect	Risk of WFD non-compliance	Comments
	GB112069060760 - Pennington Brook (Glaze)	WR149	Potentially non-compliant (low confidence)	groundwater abstraction, which will be addressed by groundwater modelling.
	GB112069064520 - Hey/Borsdane Brook	WR149	Potentially non-compliant (low confidence)	
	GB112069061011 - Mersey/Manchester Ship Canal (Irwell/Manchester Ship Canal to Bollin)	WR015, WR149	Potentially non-compliant (low confidence)	Cumulative impacts on flow have been calculated at the confluence of the Bollin with the Mersey/Manchester Ship Canal. A worst-case scenario, assuming all abstractions are used permanently at their maximum capacity, results in an impact of up to 8.5% at Q95. In reality, the impacts will be less than this, as the actual utilisation would be lower, and impacts on groundwater are likely to be more dispersed and may not entirely be felt on the Mersey.
	GB112069061012 - Mersey (Bollin confluence to Howley Weir) including Padgate Brook	WR015, WR076, WR149, WR111, WR113	Potentially non-compliant (low confidence)	
	GB71210004 - Manchester Ship Canal	WR015, WR076, WR149, WR111, WR113	Potentially non-compliant (low confidence)	Potential non-compliance is associated with the possibility that a reduction in dilution could prevent future improvements to physico-chemical status (while noting that the Manchester Ship Canal is not classified for physico-chemical status in Cycle 2, the canal is considered integral to the drivers for improving water quality in its upstream catchment). The low confidence reflects the managed nature of the lower Mersey and the Manchester Ship Canal. Uncertainty about the extent to which reduced dilution from the abstractions will impede future improvements to physico-chemical status will be addressed by water quality modelling.
	GB112069060680 - Netherley Brook	WR102b	Potentially non-compliant (low confidence)	Netherley Brook, Ditton Brook (Halewood to Mersey Estuary), Dog Clog Brook (including Mill Brook) and Prescott Brook (Logwood Mill Brook) water bodies are impacted by WR102b only.
	GB112069061390 - Ditton Brook (Halewood to Mersey Estuary)	WR102b	Potentially non-compliant (low confidence)	Potential non-compliance is associated with the potential for increased abstraction leading to reduced river baseflow, which could potentially

Type	Water body	Options contributing to cumulative effect	Risk of WFD non-compliance	Comments
	GB112069060690 - Dog Clog Brook (including Mill Brook)	WR102b	Potentially non-compliant (low confidence)	impact on biological elements, or result in reduced dilution of physico-chemical elements. This is a precautionary conclusion in the absence of a quantified understanding of the impacts on flow from the groundwater abstraction, which will be addressed by groundwater modelling.
	GB112069060710 - Prescott Brook (Logwood Mill Brook)	WR102b	Potentially non-compliant (low confidence)	
	GB531206908100 – Mersey estuary	WR015, WR076, WR149, WR111, WR113, WR102b	Compliant (low confidence)	<p>At the Mersey estuary, impacts may be felt from:</p> <ul style="list-style-type: none"> <li>- Cumulative impacts on flow in the River Mersey (as discussed for the upstream water bodies).</li> <li>- Impact from WR102b on the Ditton Brook and/or direct groundwater discharge to the estuary (not yet quantified).</li> </ul> <p>Considering the small proportional impacts on the individual inflows, contributions from other notable un-impacted inflows to the estuary including the Rivers Dane and Gow, and the impacts of tidal mixing, these impacts are unlikely to result in non-compliance of biological, physico-chemical or chemical elements.</p>
<b>Bollin</b>	GB112069061360 - Dean (Bollington to Bollin)	WR111, WR113	Potentially non-compliant (low confidence)	Potentially non-compliant for biological and physico-chemical elements in both the Dean and Bollin water bodies. This is a precautionary conclusion in the absence of a quantified understanding of the impacts on flow from these two groundwater abstractions.
	GB112069061320 - Bollin (Source to Dean)	WR111, WR113	Potentially non-compliant (low confidence)	

Type	Water body	Options contributing to cumulative effect	Risk of WFD non-compliance	Comments
	GB112069061382 - Bollin (Ashley Mill to Manchester Ship Canal)	WR076, WR111, WR113	Potentially non-compliant (low confidence)	Potentially non-compliant for fish associated with WR076. There are also uncertainties regarding water availability, which require further clarification from the Environment Agency. Any impacts felt from the groundwater abstractions upstream would add to the cumulative impact on flows in the lower reaches of the Bollin.
Alt	GB112069060640 - Downholland (Lydiate/Cheshires Lines) Brook	WR107a2	Potentially non-compliant (low confidence)	Downholland (Lydiate/Cheshires Lines) Brook is impacted by WR107a2 only. Potential non-compliance is due to increased borehole abstraction leading to reduced river baseflow impacting fish, invertebrate and macrophyte/phytobenthos populations, and reduced dilution of physico-chemical elements with the introduction of impediments to physico-chemical status. This is a precautionary conclusion in the absence of a quantified understanding of the impacts on flow from the groundwater abstraction.
	GB112069064500 - Downholland Brook	WR107a2	Potentially non-compliant (low confidence)	
				Downholland Brook water body has not been assessed individually but has been included to reflect the connectivity from the upper catchment to the Alt estuary. The same precautionary conclusion has therefore been assumed as for the upstream water body.
	GB112069060610 - Croxteth/Knowsley Brook	WR107b	Compliant (low confidence)	Croxteth/Knowsley Brook is impacted by WR107b only.  A quantified understanding of the impacts on flow is not yet available (these will be calculated from the from the Lower Mersey & North Merseyside groundwater model once updated). A review of the hydrogeological setting indicates that the watercourse is perched above the regional water table in the sandstone aquifer and therefore hydraulically disconnected, therefore increased groundwater abstraction is unlikely to cause a deterioration in ecological status. Low confidence is assigned due to lack of quantified assessment.

Type	Water body	Options contributing to cumulative effect	Risk of WFD non-compliance	Comments
	GB112069060580 - Alt	WR107b	Potentially non-compliant (low confidence)	The Alt and Alt US Bull Bridge are impacted by WR107b only.  A quantified understanding of the impacts on flow is not yet available (these will be calculated from the from the Lower Mersey & North Merseyside groundwater model once updated). A review of the hydrogeological setting indicates that the watercourse may have good hydraulic connection with the sandstone aquifer. Non-compliance is a precautionary conclusion in the absence of a quantified understanding of the impacts on flow.
	GB112069061441 - Alt US Bull Bridge	WR107b	Potentially non-compliant (low confidence)	
	GB112069061442 - Alt DS Bull Bridge	WR107a, WR107b	Potentially non-compliant (low confidence)	Potentially non-compliant for biological and physico-chemical elements. This is a precautionary conclusion in the absence of a quantified understanding of the impacts on flow.
	GB531206908300- Alt estuary	WR107a, WR107b	Compliant (low confidence)	A quantified understanding of the impacts on flow is not yet available (these will be calculated from the from the Lower Mersey & North Merseyside groundwater model once updated). Given the size of the estuary catchment relative to the cumulative rate of abstraction (which represents the worse-case scenario), it is unlikely to cause a deterioration in ecological status. Low confidence is assigned due to lack of quantified assessment of flow impacts.
<b>Ribble</b>	GB112071065500 - Ribble - conf Calder to tidal	WR049d	Potentially non-compliant (low confidence)	The Ribble (conf. Calder to tidal) is impacted by WR049d only. Potential non-compliance is associated with a modest reduction in flow, having the potential to affect fish habitat and fish passage.  Further investigations are planned, including assessments of fish migration through the estuary. Following those investigations, which could be used to support definition of a HOF, there is a low likelihood of WFD non-compliance for the final WRMP24.

Type	Water body	Options contributing to cumulative effect	Risk of WFD non-compliance	Comments
	GB112070064830 - Three Pool's Waterway	WR107b	Compliant (low confidence)	<p>Three Pool's Waterway is impacted by WR107b only.</p> <p>A quantified understanding of the impacts on flow is not yet available (these will be calculated from the from the Lower Mersey &amp; North Merseyside groundwater model once updated). A review of the hydrogeological setting indicates that the watercourse is perched above the regional water table in the sandstone aquifer and therefore hydraulically disconnected, therefore increased groundwater abstraction is unlikely to cause a deterioration in ecological status. Low confidence is assigned due to lack of quantified assessment.</p>
	GB531207112400- Ribble estuary	WR049d, WR107b	Compliant (low confidence)	<p>In the estuary, impacts on flow may be felt from:</p> <ul style="list-style-type: none"> <li>- Reduced flows in the River Ribble from WR049d;</li> <li>- Impact from the Primrose Hill abstraction (part of WR107b) could be felt on the Three Pool's Waterway, which discharges to the outer reaches of the estuary.</li> </ul> <p>Impacts on flows in the Ribble upstream of the estuary are less than 5%, which will be further reduced in the estuary by contributions from other un-impacted inflows to the lower Ribble, including the rivers Darwen and Douglas. As a result of this and the impacts of tidal mixing, these impacts are unlikely to result in non-compliance of biological, physico-chemical or chemical elements. Medium confidence of compliance has been concluded for all elements except fish, where a low confidence has been applied: further work is planned to consider potential impacts on salmonid migration into the River Ribble.</p>

## 5. Summary and recommendations

### 5.1 Summary

This report has presented the WFD compliance assessment for UU's NWT, to inform the Gate 2 submission to RAPID. 14 options have been assessed, including 13 supply options and one enabling works option. The assessment has drawn on the option-specific assessments that have been undertaken for the options involving groundwater abstractions (Wood, 2022a) and those involving surface water abstractions (Wood, 2022b).

The individual option assessments have found one option to be WFD compliant, seven potentially non-compliant (low confidence) and six potentially non-compliant (medium confidence). Those that have low confidence of non-compliance are considered relatively precautionary assessments, whereas for those with medium confidence of non-compliance, there is a greater chance of a conclusion of non-compliant being retained at later gates. A cumulative assessment has also been undertaken of the NWT Full Solution, involving nine of the individual options, which has shown the full solution to be potentially non-compliant. However, in all cases, further evidence and assessment is required before Gate 3, alongside further evolution of the solution design. The further evidence collection and assessment has been planned by UU and is presented in the Integrated Environmental Assessment (IEA) Report (WSP, 2022), with a summary of key aspects for the WFD assessment below.

### 5.2 Recommendations

This section summarises recommendations from the Gate 2 WFD Compliance Assessment, and other supporting assessments, for work that should be undertaken in advance of Gate 3.

#### Evidence collection

For the options involving abstraction from groundwater, updating the relevant groundwater models is a key step towards enabling a quantitative assessment of impacts. This includes the Lower Mersey Basin & North Merseyside groundwater model and the East Cheshire groundwater model, both of which UU has now commenced work on.

For all river water bodies that could be impacted by abstraction (either from surface water or groundwater), further ecological evidence is required including:

- Improving the understanding of the impacts of changes to flow on physical habitat parameters, and resulting impacts for species;
- Improving the understanding of impacts of changes to flow on ability of fish to pass barriers;
- Undertaking further ecology surveys including macroinvertebrate, macrophyte and fish (while some data is available in all water body catchments, there is variability in the extent of data and the most recent sample dates).

For GWDEs identified as potentially being impacted by abstraction, further review of existing information is required to understand potential hydrological connectivity, as the current conclusions are relatively precautionary.

Other recommendations have also been made in the individual option assessment reports (Wood, 2022a and 2022b), which will further develop the evidence base.

## Assessment

A NWT scheme-wide WFD assessment will not be prepared specifically for Gate 3, rather WFD assessments will be prepared for individual sub-options in line with their individual implementation requirements. Where abstraction licence and/or planning permission applications are required, they will be accompanied by formal WFD assessments. However several of the NWT groundwater sub-options do not require a new or varied abstraction licence, as they will continue to operate under their current licence conditions. For these sub-options a formal WFD assessment of the impacts of operational abstraction will not be required for permitting purposes. However, because these sub-options will involve increasing abstraction rates compared to recent abstraction, an informal WFD assessment will be undertaken during Gate 3 to ensure that the sub-options will not cause deterioration of WFD status or introduce impediments to improvements in status.

The WFD Assessments will meet the requirements set out by RAPID in its draft Gate 3 Guidance:

- *“Evidence (including monitoring evidence) that the solution will meet WFD objectives;*
- *If necessary, evidence that Regulation 19 test criteria will be met;*
- *If uncertainties remain in your assessment, you must provide a plan to gather further evidence in a timely manner” (RAPID, 2022<sup>11</sup>).*

The assessments will be prepared for each sub-option individually (rather than for the NWT SRO as a whole), but each WFD Assessment will consider the other sub-options as part of the in-combination assessment. The WFD assessments will build on those undertaken during Gate 2, take account of the additional evidence collection described above, and include data from the third cycle RBMPs, which should have been published by Gate 3.

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<sup>11</sup> RAPID (2022) Draft Gate 3 Guidance, June 2022.



# Appendix A

## Option-level Assessments

# **Appendix B**

## **Assessment of NWT Full Solution**

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