



ANNEX B3.2.1

Watercourse Connections

This document has been written in line with the requirements of the RAPID gate two guidance and to comply with the regulatory process pursuant to Severn Trent Water's and Affinity Water's statutory duties. The information presented relates to material or data which is still in the course of completion. Should the solution presented in this document be taken forward, Severn Trent Water and Affinity Water will be subject to the statutory duties pursuant to the necessary consenting process, including environmental assessment and consultation as required. This document should be read with those duties in mind.



Grand Union Canal Strategic Resource Option

Watercourse Connections

June 2022

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1 Introduction

1.1 Background

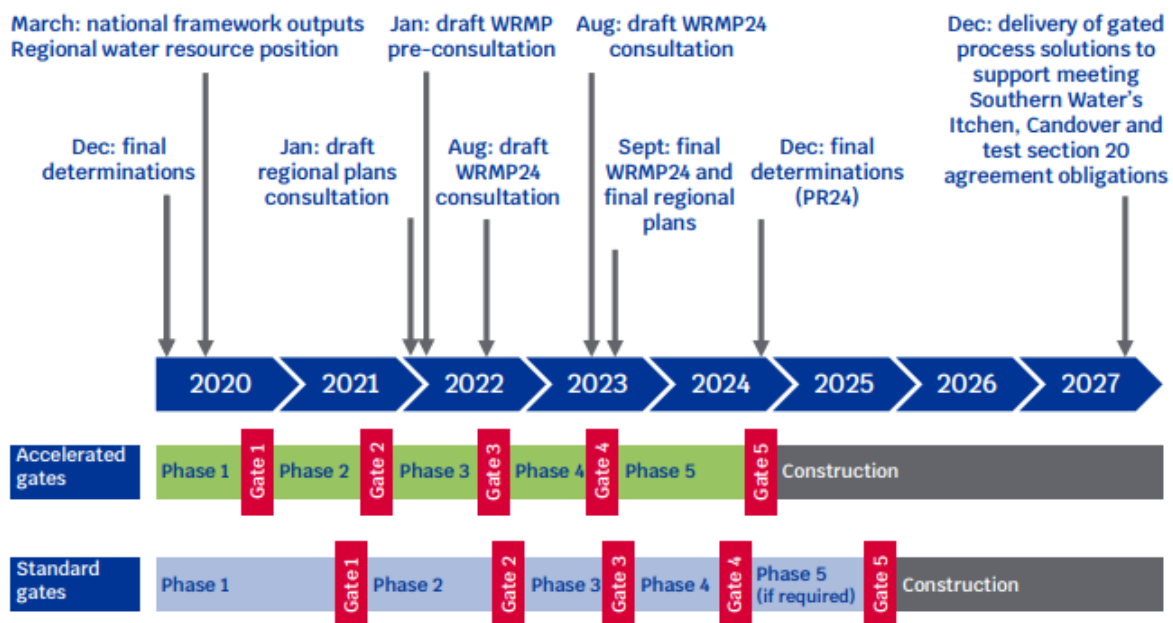
Owat, the economic regulator for the water and sewerage sectors in England and Wales, has identified the potential for water companies to jointly deliver strategic water resource schemes to secure long-term water supply resilience while protecting the environment.

To support the progression of these Strategic Resource Options (SROs), the Regulatory Alliance for Progressing Infrastructure Development (RAPID) has been established, comprised of representatives from Ofwat, the Environment Agency and the Drinking Water Inspectorate. RAPID has produced guidance for progressing each SRO which is aligned to a formal gated process to ensure that at each gate:

- Companies are progressing strategic water resource solutions that have been allocated funding at PR19 or have subsequently joined the programme.
- Costs incurred in doing so are efficient.
- Solutions merit continued investigation and development during the period 2020 to 2025.

The timelines for the assessment gates are shown in Figure 1.1 below; the Grand Union Canal (GUC) SRO is on the standard gate timeline and is currently at Gate 2.

Figure 1.1: Gated process for potential strategic regional water resource solutions¹



¹ Source: Regulators' Alliance for Progressing Infrastructure Development, Forward programme 2021-22, March 2021, available online at https://www.ofwat.gov.uk/wp-content/uploads/2021/03/RAPID-Forward-programme-2021_22.pdf, accessed 07/03/2022.

1.2 Grand Union Canal SRO

The GUC SRO has been jointly developed in partnership between Severn Trent Water (STW), Affinity Water (AW) and the Canal and River Trust (the Trust). At the start of Gate 1 a long-list of sub-option routes were derived for the GUC SRO. The discharge options were then shortlisted to three route options by the start of Gate 2 based on the following criteria: environmental and societal impacts; operational flexibility and resilience; operational and embedded carbon; and cost. Of these, Option Route 3 was selected. Optioneering was also undertaken with regards to abstraction locations. A site at Leighton Buzzard was ultimately selected, further details on the optioneering process can be found in the Gate 2 submission.

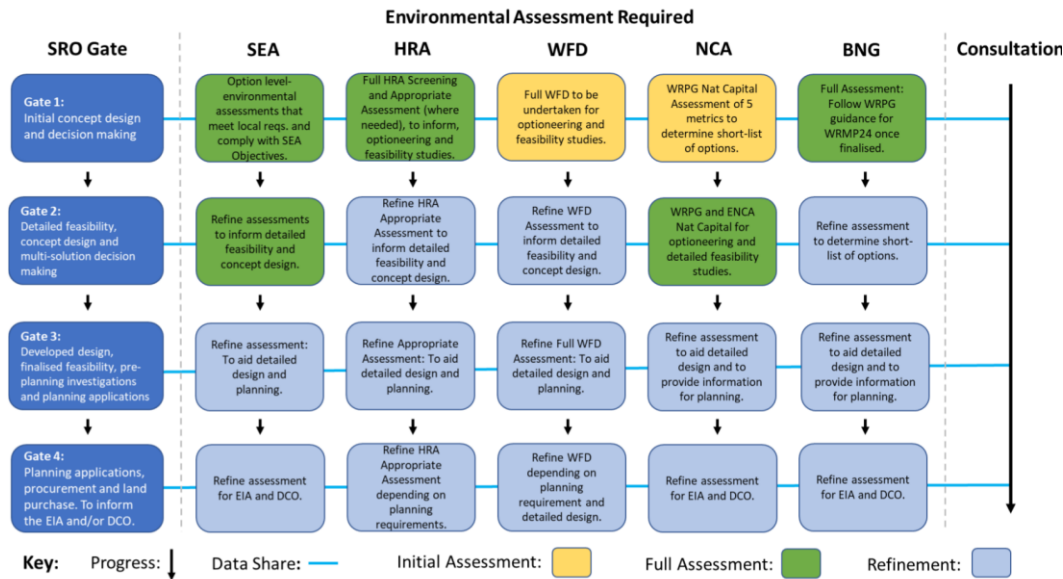
The single solution assessed at Gate 2 includes the pipeline from Minworth to Atherstone (Route 3), the canal transfer to Leighton Buzzard and the abstraction and treatment works at this location (hereafter referred to as 'the scheme') and will be assessed in the following Gate 2 Environmental assessments:

- Natural Capital (NC) and Biodiversity Net Gain (BNG) (Annex B3.3.2)
- Environmental Appraisal Report (EAR) (Annex B3.3.5)
- Fish survey report (Annex B3.2.3)
- Habitats and protected species desk study (Annex B3.2.6)
- Habitats Regulations Assessment (HRA) (Annex B3.3.3)
- Invasive and non-native species (INNS) survey report (Annex B3.2.4)
- Sediment report (Annex B3.2.5)
- Strategic Environmental Assessment (SEA) (Annex B3.3.1)
- Waterbody connections report (Annex B3.2.1)
- Water Framework Directive Assessment (WFD) (Annex B3.3.4)

This report forms the Waterbody connections report. Figure 1.2 below shows the integration of the statutory assessment reports (i.e. SEA, HRA, WFD, NCA/BNG) with the RAPID gated process. This schematic is taken from the All Companies Working Group (ACWG) guidance that was released in Gate 1. While this is still largely relevant and followed, it has been somewhat superseded by the RAPID Gate 2 guidance², which the Gate 2 assessments have followed. In addition to the statutory assessments listed in Figure 1.2, the scheme has also undertaken additional assessments, including this Waterbody connections report.

² Strategic regional water resource solutions guidance for gate two, Regulators' Alliance for Progressing Infrastructure Development, February 2022, available online at https://www.ofwat.gov.uk/wp-content/uploads/2022/02/Strategic-regional-water-resource-solutions-guidance-for-gate-two_Feb_2022.pdf, accessed 09/02/2022.

Figure 1.2: Environmental Assessment Integration with SRO Gates³



1.3 Scheme description

The scheme is shown below in Figure 1.3 and described in detail in the Annex A1, Engineering CDR (WSP, 2022). It will comprise a transfer rising main from Minworth Wastewater Treatment Works (WwTW) to the Coventry Canal at the top of Atherstone lock flight. Once outside the Minworth site, and past the M42 and HS2 corridors, the rising main will pass through agricultural land until reaching the outskirts of Atherstone, a small market town within North Warwickshire. The rising main will discharge to the canal side at Coleshill Road, via a new discharge structure, sized to avoid deleterious flow velocities and shears.

Transferred water will then progress along the Coventry Canal by gravity into the Oxford Canal at Hawkesbury Lock. Flows will need to bypass the Hawkesbury lock via a low lift pumping station.

The Oxford Canal will then convey the water to the Grand Union Canal at Braunston. The majority of the flow along the Oxford Canal will be by gravity, however a pumping station will be required to bypass the locks at Hillmorton.

At Braunston a bypass pumping station will be required to lift flows from near Braunston Marina to the top lock just before Braunston Tunnel. From Braunston to the abstraction and treatment site at Leighton Buzzard, four additional lock bypass pumping stations will be required south of Milton Keynes at Fenny Stratford, Stoke Hammond, Three Locks and Leighton. The Grand Union Canal section will also require eight gravity bypasses around “downflow” locks at the Wilton Marine Lock Flight, Stoke Bruerne Lock Flight and Cosgrove Lock.

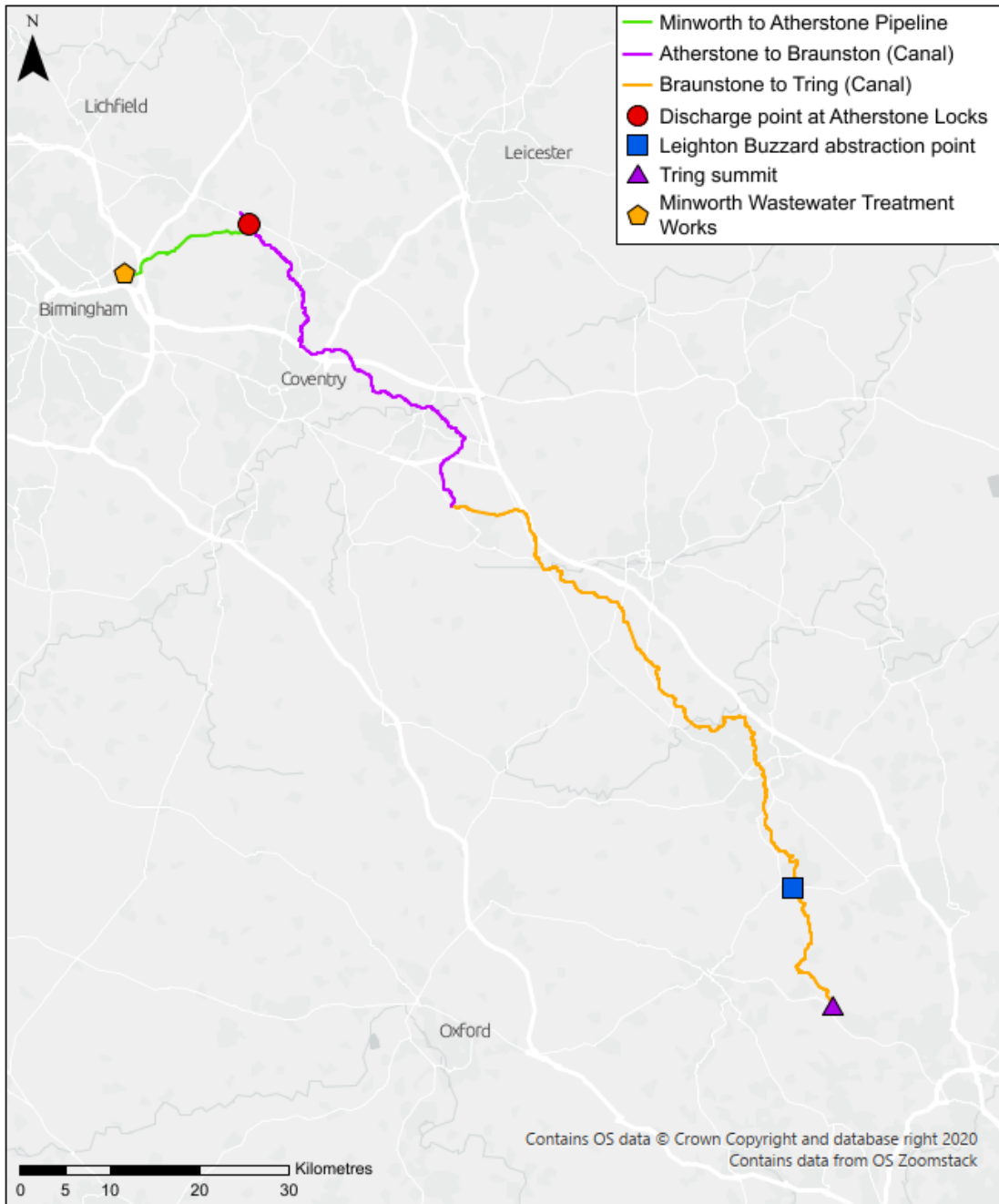
Flow will be abstracted from the Grand Union Canal just south of the A4146 bridge, after the River Ouzel. The site currently proposed at Gate 2 for the treatment works is on relatively flat land slightly raised from the river and canal, although further investigations will be carried out at Gate 2/3 to determine the precise location. Flow will therefore need to cross the River Ouzel within a new, short pipeline and be pumped into an operational raw water storage reservoir before gravitating into the first stage of treatment. Additional interstage pumping in the treatment

³ Source: All Companies Working Group, WRMP environmental assessment guidance and applicability with SROs, Mott MacDonald, October 2020

works will be required with final high lift pumps transferring potable treated water to a new clean water holding tank at the existing Chaul End Water Supply Reservoir (WSR).

During the option selection process, it was determined this option would have the least overall cost, lowest environmental impact and greatest opportunity for net gain and public benefit. The slightly higher operational cost when compared to Route 1, due to longer transfer from Minworth to Atherstone, can be partially offset by energy recovery from the break tank to outfall.

Figure 1.3: The scheme



1.4 Assumptions and Limitations

The following assumptions have been used within the assessment:

- The design assumptions stated in the WSP Gate 2 Position Paper - Route Selection technical note⁴ can be applied to the Gate 2 Environmental Assessments, including assumption that >50mm depth change requires towpath raising is valid.
- The assessment is based on a 'worst-case' 100% utilisation of the SRO.
- Tring represents the SE limit of influence of the SRO.
- The volume of water passing NW (after discharging from pipeline) due to the locks opening at Atherstone is deemed to be of minimal change.
- The risk of fish and INNS travelling NW of Atherstone is not increased due to the scheme.

⁴ Gate 2 Position Paper - Route Selection, WSP Technical Note, 25 January 2022

2 Methodology

2.1 Purpose and scope

The purpose is to provide a consistent definition of water body connectivity for the environmental assessments, drawing together information from previous Gate 1 assessments and ongoing hydrological and water quality modelling workstreams, being undertaken by JBA and ecological and water quality monitoring (led by APEM and Atkins respectively).

The primary output is a map indicating existing points of connection between the canal network and natural watercourses, that provide a pathway for potential environmental effects (primarily changes to water quality and transfer of Invasive Non Native Species) as a result of the transfer operating.

A summary of the types of connections and their likely scale of influence on the environmental assessments is included.

The watercourse connections have been considered for all three potential route options that were under consideration at the outset of Gate 2. The number of relevant connections will reduce based on the selection of the preferred route option (currently option 3, Minworth to Atherstone pipeline) and abstraction location (Leighton Buzzard), as the significant volume of the transfer flow would be concentrated within an area defined by the canal topography between these points. This process was undertaken in parallel with the optioneering process and as such, this map is not specific to the selected option, but rather shows all the connections in the scheme area to give a holistic view.

2.2 Sources of information

The following information sources and reports from previous Gate 1 GUC assessments and ongoing workstreams have been used to define connectivity.

- *Grand Union Canal SRO Water Quality Modelling, Gate 2 Phase 1* (JBA, Draft report, Jan 2022)
- *Grand Union Canal Strategic Resource Option, Water Quality Monitoring Phase 2 Quarterly Report Q2 2021* (Atkins, Dec 2021)
- *Annex B2.1 Grand Union Canal Strategic Transfer – Ecological Monitoring: Phase 2 Report* (Apem, Draft report, Feb 2022)
- *Grand Union Canal, Gate 2 Position Paper – Route Selection* (WSP, Draft technical note, Jan 2022)
- *Annex B3.3.4 Grand Union Canal Strategic Resource Option, Water Framework Directive Assessment: Level 2 Assessment* (Mott MacDonald, May 2021)
- *Grand Union Canal Strategic Resource Option, Phase 2 Water Quality Monitoring 2021-22* (Atkins, Jun 2021)
- *Annex A2.4 Grand Union Canal Gate 1 Model Final Report* (JBA, Mar 2021)
- GIS layers of canal sluices and weirs (provided by Canal and River Trust in Nov 2021).

Topographic and hydrographic surveys, modelling and assessment work is ongoing, and the list of watercourse connections will be subject to refinement at future Gate stages.

3 Watercourse Connections

3.1 Types of canal-watercourse connections

The canal system is already highly connected to adjacent watercourses throughout all of the transfer routes. The following key types of connections exist:

Table 3.1: Types of canal-watercourse connections

Connection type	Description and examples	Likely influence on environment assessment
Direct connections	Canal and river flow into and out of the same channel (e.g. River Bulbourne and River Gade).	High level of potential influence on the environmental assessments. Note that preferred route and abstraction option minimises to a minor/negligible level impacts on directly connected watercourses.
Waste weirs/overspills	Includes side weirs, sluices and flood paddles, where excess water from the canal overtops a control structure, set at a particular level or via manual operation, to discharge into an adjacent watercourse (see Table 3.1).	Varied influence on the environmental assessments depending on changes to structures. Design work is ongoing to confirm how existing structures will need to be amended to maintain canal operation.
Bed valves	Sluices allowing drawdown of a canal pound (presumably manually operated and used very occasionally for maintenance).	Unlikely to have an important influence, as would not be open during transfer operation. May influence mobilisation of canal sediment at a highly localised level.
Feeders/inflows	Includes direct connections and sluices, where water feeds into the canal system	The locations and function of canal feeds are included within ongoing water balance and water resources modelling workstreams. The significance of the environmental impact of Inflow/feeders will depend on possible changes in the use of these feeders. It would be expected not to be significant if the operation of the feeder is not changed.

Photo 3.1: Example waste weir structures during topographic survey:

a) waste weir CC-022-005;



b) waste weir CC-014-004



Source: Storm Geomatics, 2022

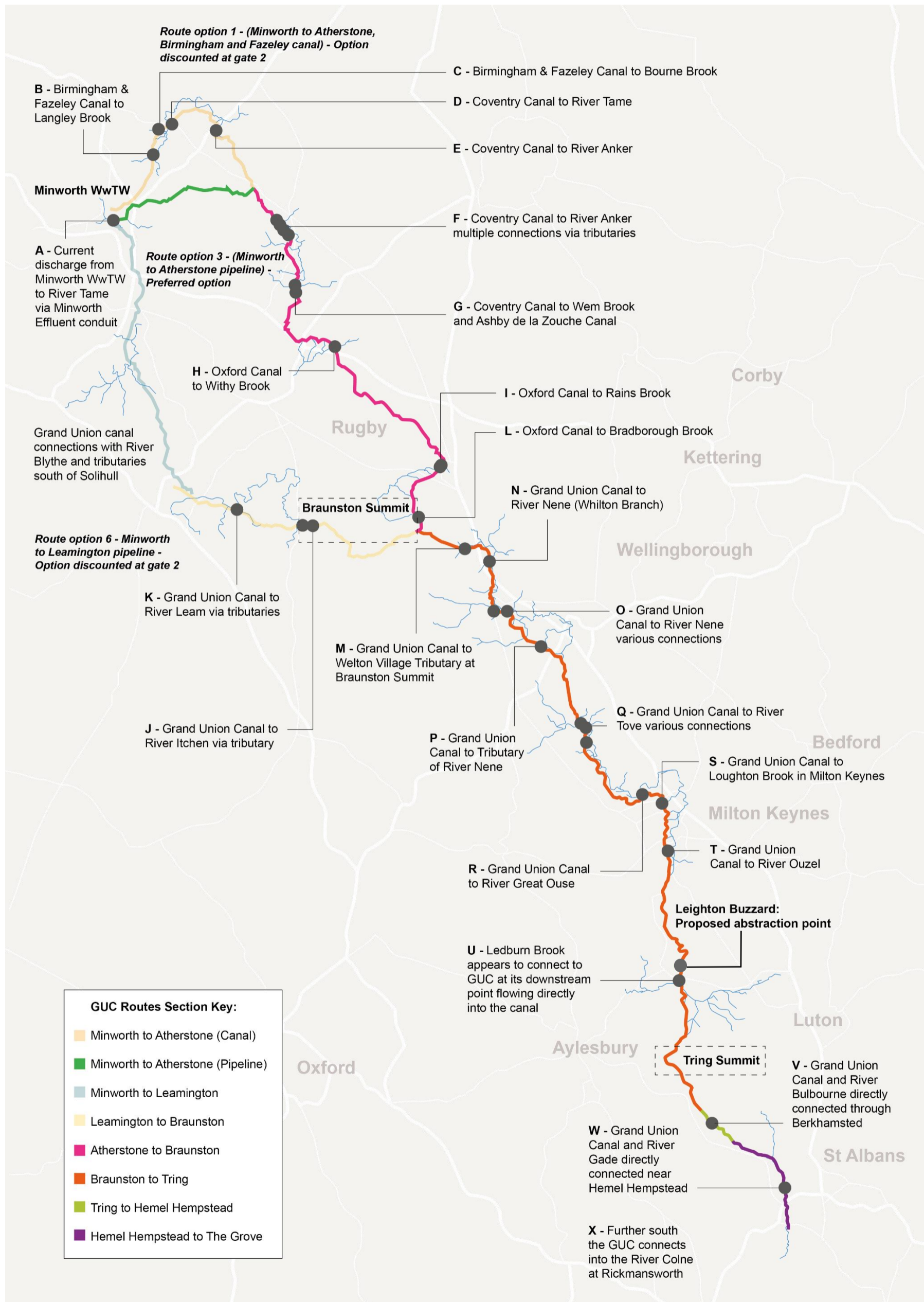
Connections outside of the three potential transfer route options have not been included, as it is anticipated the volume of water back-pumped around canal summits would be limited enough to have a negligible effect. This will be confirmed through further hydrological, hydraulic and water quality modelling workstream tasks, which are continuing during Gate 2.

3.2 Map of watercourse connections

A conceptual map (Map 3.1) indicates the locations of identified watercourse connections throughout the transfer routes (direct, and via waste weirs/sluices to main rivers or tributaries) which can be used to aid understanding of existing connectivity in the system to inform the ongoing environmental assessments⁵. The watercourse connections have been included for all three potential route options that were under consideration at the outset of Gate 2. The preferred route option (currently option 3, Minworth to Atherstone pipeline) and abstraction location (Leighton Buzzard) will reduce the number of relevant connections moving forwards.

⁵ *The map is not intended to show all individual weirs, sluices and feeders, but to concentrate on the areas where there are clear connections between the canal and adjacent rivers (mostly waste weirs) and focused mainly on the preferred route. The map is intended to be a conceptual overview only.*

Map 3.1: Conceptual map of watercourse connections along the three transfer route options under consideration (route option 3 Minworth to Atherstone pipeline and then south to Leighton Buzzard abstraction point is the proposed preferred option at Gate 2)



3.3 Conclusion

The watercourse connections have been considered for all three potential route options that were under consideration at the outset of Gate 2. A conceptual map was produced which indicates the locations of identified watercourse connections throughout the transfer routes (direct, and via waste weirs/slucices to main rivers or tributaries) which can be used to aid understanding of existing connectivity in the system to inform the ongoing environmental assessments. The map is not intended to show detail on every individual weir, sluice and feeder, but to highlight areas where there are clear connections between the canal and adjacent rivers (mostly waste/overspill weirs).

This process was undertaken in parallel with the optioneering process and as such, this map is not specific to the selected option, but rather shows the connections in the scheme area to give a holistic view. The map is intended to be a conceptual overview only, and it may be useful at Gate 3 to integrate it with other workstreams to produce a series of more detailed maps showing all connections and hydrological features along the route.

