Anglian to Affinity Transfer (A2AT)

Gate two report

November 2022

Contents

Acronyms

Acronyms	Definition
A2AT	Anglian to Affinity Transfer
AA	Appropriate Assessment
AACE	Association for the Advancement of Cost Engineering
ACWG	All Company Working Group
AIC	Average Incremental Costs
AMP8	Asset Management Plan
AQMA	Air Quality Management Area
BNG	Biodiversity Net Gain
BPTs	Break Pressure Tanks
BSA	Bulk Supply Agreement
CAP	Competitively Appointed Provider
CAPA	Competently Appointed Provider Agreement
CAPEX	Capital Expenditure
CCW	Consumer Council for Water
CDO	Concept Design Option
CEMP	Construction Environmental Management Plan
DBFOM	Design, Build, Finance, Operate and Maintain
DCO	Development Consent Order
DO	Deployable Output
DPC	Direct Procurement for Customers
DWI	Drinking Water Inspectorate
DWSP	Drinking Water Safety Plan
EA	Environment Agency
EAR	Environmental Assessment Report
ECP	Early Competition Plan
EIA	Environmental Impact Assessment
FSA	Flood Storage Area
GAC	Granular Activated Carbon
GUC	Grand Union Canal
HARP	Haweswater Aqueduct Resilience Project

Acronyms	Definition
HOF	Hands-off-Flow
HRA	Habitats Regulations Assessment
ICMS	International Cost Management Standard
IDB	Internal Drainage Board
INNS	Invasive Non-Native Species
IP	Infrastructure Provider
LA	Local Authority
LWS	Local Wildlife Sites
MCDA	Multiple-Criteria Decision Analysis
MCM	Million Cubic Metres
Ml/d	Million (mega) litres per day
MO-RDM	Multi-Objective Robust Decision Making
MRS	Market Research Society
NC	Natural Capital
NEUBS	Non-essential Use Bans
NFU	National Farmers Union
NPV	Net Present Value
NSIP	Nationally Significant Infrastructure Project
OB	Optimism Bias
OFTO	Offshore Electricity Transmission
OPEX	Operational Expenditure
PEI	Preliminary Environmental Information
PFI	Private Finance Initiative(s)
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PMC	Programme Management Consultant
PMG	Programme Management Group
PPA	Power Purchase Agreement
PWS	Public Water Supply
QCRA	Quantitative Costed Risk Assessment
rCCG	regional Customer Challenge Group

Acronyms	Definition
RSS	Regional System Simulator
SAC	Special Area of Conservation
SCP	Systematic Conservation Planning
SEA	Strategic Environmental Assessment
SFFD	South Forty Foot Drain
SIPR	Specified Infrastructure Project Regulations
SLR	South Lincolnshire Reservoir
SOC	Strategic Outline Case
SOCC	Statement of Community Consultation
SPA	Special Protection Area
SRO	Strategic Resource Option
SSSI	Site of Special Scientific Interest
T2AT	Thames to Affinity Transfer
TTT	Thames Tideway Tunnel
TUBS	Temporary Use Bans
TCPA	Town and Country Planning Act 1990
UCR	Utilities Contract Regulations 2016
UKCP18	(Met Office) UK Climate Projections
VFM	Value For Money
VSD	Variable Speed Drive
WFD	Water Framework Directive
WFRG	Water Farming Reservoir Group
WQRA	Water Quality Risk Assessment
WRE	Water Resources East
WRMP	Water Resources Management Plan* **[1]**
WRSE	Water Resources Southeast
WRZ	Water Resources Zone
WTW	Water Treatment Works

[1] Numbers after WRMP indicate the version of the plan that is being referred to

1. Executive summary

Anglian Water and Affinity Water have been working in partnership to develop the Anglian to Affinity Transfer (A2AT) solution to this gate two milestone. The solution consists of a transfer of treated water from the proposed South Lincolnshire Reservoir (SLR) in Anglian Water's supply area to Affinity Water's Central region. This transfer was developed to help Affinity Water address their forecast long-term deficits driven by population growth and increased environmental protection requirements.

The solution has been assessed and developed for the full length of the transfer, from the proposed SLR delivery point north of Peterborough to the Affinity Water supply area. However, the Affinity Water dWRMP process has latterly concluded that a transfer from the Anglian region to Affinity Water does not represent best value for customers. This position has been confirmed by the strategies outlined in the draft Water Resources East (WRE) and draft Water Resources South East (WRSE) regional plans. Anglian Water's dWRMP and WRE's regional plan, and supporting modelling correspondingly confirm that the full output of SLR is now required within the WRE region, to meet future drought resilience requirements and the need to leave more water in sensitive environments. SLR water will be used locally in south Lincolnshire, as well as across the Anglian Water Ruthamford system. As such, Anglian Water needs to continue developing the Peterborough to Grafham section of the A2AT. It is therefore proposed to increase the onward scope and allowance of the SLR SRO to accommodate the additional pipeline from Peterbrough to Grafham, totalling approximately 50 km. The next phase of work will also consider the need to take SLR water to other strategic hubs. It is proposed that Anglian Water's A2AT PR19 allocation will be retained by Anglian Water to enable this development to be progressed.

The companies are thus recommending that the solution, comprising the northern section of the A2AT, is now progressed by Anglian Water as a single company solution for the remainder of the gates, by merging it into the SLR SRO scope. Affinity Water will likewise cease to be a solution partner in the SLR. Within this context, Anglian Water looks forward to continuing to develop the project together with RAPID, stakeholders and communities, towards the next key milestone, gate three.

This report summarises the extensive work undertaken to date to meet the gate two milestone. A summary of this work is presented in the table below.

Background

- The Anglian to Affinity Transfer (A2AT) scheme is a feasible solution for the transfer of treated water from the proposed South Lincolnshire Reservoir (SLR) in Anglian Water's supply area to Affinity Water's Central region.
- The transfer would help Affinity Water address forecast long-term deficits driven by population growth and increased environmental protection requirements.
- The solution presented is one of several options that were considered by Affinity Water to meet its future water needs. Its suitability was considered in the Water Resources Management Plan (WRMP) and wider context of regional modelling and water resources planning by Water Resources South East (WRSE) and Water Resources East (WRE).

Programme and planning

- The A2AT appears to be broadly suitable for delivery via Direct Procurement for Customers (DPC), based on the criteria adopted in the assessment, i.e., size, discreteness and value for money.
- The main outcome of this stage is the recommendation that the Peterborough to Grafham Water Treatment Works (WTW) transfer route, which would allow Anglian Water to meet water resources needs in the south of their area (Ruthamford South and Central Water Resource Zones), is the only element of the overall scheme that should go forward to gate three.
- Anglian Water and Affinity Water propose that the Peterborough to Grafham transfer should be merged with the SLR SRO from gate three onwards.
- The procurement of the Peterborough to Grafham transfer will therefore be carried out as part of the SLR SRO.
- The proposed consenting approach for the transfer route is as "associated development" to the SLR Development Consent Order (DCO) and should be taken account of in the SLR programme at gate three.

Solution design

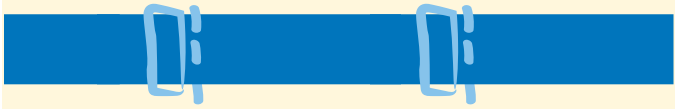
- The proposed solution comprises a treated water piped transfer from Anglian Water's network north of Peterborough to Affinity Water's network in the Stort Water Resource Zone (WRZ5). Two equally viable routes (Eastern and Western routes) have been selected for gate two concept design
- The transfer would start at the proposed destination for treated water transfers from the proposed SLR SRO, which to date has been developed jointly by Anglian Water and Affinity Water. The proposed Affinity Water terminating service reservoir is located in WRZ5 which includes an area of the M11 corridor that is anticipated to experience significant growth in future.
- The scheme's concept design comprises pumping stations, break pressure tanks and a conditioning treatment facility.
- The proposed Peterborough to Grafham transfer comprised the northern part of Western route, and the concept design for this section will be take forward to gate three.

Key risks

- Affinity Water and Anglian Water have considered both qualitative and quantitative risks.
- For gate two, the partner companies developed a detailed, quantified and costed risk register, which was used to derive estimates of construction phase financial risk.
- **Key risks are:**
  - i) future process for obtaining planning consent (with a focus on the Peterborough to Grafham transfer)
  - ii) risk of potential unfavourable ground conditions
  - iii) risk of programme delays should a Public Inquiry be required
  - iv) inflation impacts the cost of delivering the work needed and the budget is no longer sufficient

Drinking water quality considerations

- The gate one Water Quality Risk Assessment (WQRA) has been developed further for gate two. It is based on the results of the water quality monitoring programme, Drinking Water Safety Plans (DWSPs), additional input from water quality experts and design information.
- Limiting hazards have been identified and risk assessed according to the All Company Working Group (ACWG) guidance. Key consideration has been given to emerging contaminants and customer perception.



Cost

- Post Gate 2, the project is now planned to be re-scoped to become a transfer from Peterborough to Grafham only, of up to 150 Ml/d with a Capex (Capital Expenditure) estimate of £276 million and AISC of 39.6 p/m^3. This differs from the previous gate one estimates for the full original scope (4 options), which was estimated at £317 to £532 million with an Average Incremental Cost (AIC) range of 161 to 223 p/m^3, depending on the option, route and capacity (50 or 100 Ml/d).
- The total spend for gate two works is £832,000, representing a £1.43 million underspend against allowance. All the required gate two activities have been carried out and the A2AT has been adequately resourced to provide the expected outputs.
- The forecast for gate three is £3.5 million and gate four is £3.2 million (in PR19 2017/18 Prices).

Water resource assessment

- Utilisation of the A2AT scheme was assessed using the WRSE Regional System Simulator (RSS) model. The same model was used to assess the demand profiles generated when the A2AT scheme is introduced into the water resources system, primarily to replace groundwater sources in the Affinity Central supply area that would be lost through the Environmental Destination scenarios.
- The utilisation analysis shows that typical utilisation is in the order of 80% in summer, only increasing with significant droughts beyond 1 in 50 years. Utilisation outside of the summer period is lower and would typically reduce to a 25% (or less) turnover rate. Expressed as an annual average, 'dry year' utilisation is expected to be just over 40%.
- The infrastructure capacity of the two A2AT variants that are required to deliver 50 and 100 Ml/d average deployable output (DO) have been set at 56 and 112 Ml/d respectively to accommodate higher demand in more severe droughts.
- Anglian Water's WRMP indicates that a transfer of up 150 Ml/d from Peterborough to Grafham would address demand and resilience concerns. The utilisation associated with this transfer will be assessed in detail at gate 3.

Stakeholder engagement

- Affinity Water and Anglian Water developed the approach to engagement in line with RAPID's guidance for gate two. This built on the foundation of stakeholder and customer feedback received before gate one, the activities completed during gate one, the representations made to RAPID on the gate one submission and direct feedback from RAPID and other regulators.
- The partner companies have worked openly and transparently with statutory stakeholders by:
  - Sharing information and providing regular updates to regulators on the programme of work and studies.
  - Jointly defining the scopes of work and technical methods with regulators.
  - Sending a letter to all potentially affected Local Planning Authorities to present the solution and invite feedback on the proposal.
  - Listening to and incorporating feedback.

Environmental assessment

- A desk-based appraisal of key environmental impacts was carried out for the SRO. In addition to the overall environmental appraisal, four regulatory assessments were compiled:
  - A Water Framework Directive Assessment (WFD)
  - An informal Habitats Regulations Assessment (HRA)
  - A Biodiversity Net Gain Assessment (BNG)
  - A Natural Capital Assessment (NCA)
- The environmental impacts of the construction of each pipeline route would be similar, with some negative impacts that are largely temporary once mitigated.
- No compliance issues are anticipated under either WFD or HRA legislation, and no insurmountable environmental impacts have been identified during the gate two studies.

Conclusions and recommendations

- Affinity Water and Anglian Water recommend that:
  - The A2AT scheme in its current form (i.e., water delivered to Affinity Water) is indefinitely deferred and no further work undertaken beyond gate two. The scheme potentially represents a back-up option in the future, but it is currently not being selected as an alternative option in Affinity Water's WRMP or regional plans.
  - The Peterborough to Grafham transfer element of the scheme offers options for Anglian Water to serve customers in Ruthamford from SLR and increase resilience. A 150 Ml/d transfer was assessed. It is recommended that a transfer from Peterborough to Grafham is taken forward for further investigation, with further work required at gate three in line with Anglian Water's WRMP to determine the required capacity.

2. Background and objectives

2.1. Background

The Anglian to Affinity Transfer (A2AT) is a feasible solution for the transfer of treated water originating from the proposed South Lincolnshire Reservoir (SLR) in Anglian Water's supply area to Affinity Water's Central region. This transfer would help Affinity Water address their forecast long-term deficits driven by population growth and increased environmental protection requirements.

The solution presented in this report is one of a wide range of options that were considered by Affinity Water, and by the Water Resources South East (WRSE) and Water Resources East (WRE) regional plans to meet their future water needs. As such, its suitability should be considered within the wider context of company and regional level water resources planning. Public consultation on the draft regional plans and draft water company, Water Resources Management Plan (WRMPs) is expected to commence in Autumn 2022. Modelling work by WRE and WRSE showed that the A2AT scheme was not likely to be selected as a preferred or alternative option for Affinity Water's draft WRMP24 or in the regional plans and therefore will not be taken forward. Affinity Water and Anglian Water propose that this Strategic Resource Option (SRO), in its current form, is stopped and no further work is undertaken after the gate two submission. Anglian Water proposes instead to further develop and progress the up to 150 Million (mega) litres per day (Ml/d) treated water transfer from Anglian Water's service reservoir north of Peterborough to a treatment works in the vicinity of Grafham Water (see Section 3.2) as part of the SLR. This transfer would enable Anglian Water to supply water from the SLR to the south of their supply area, in addition to supporting demand in Lincolnshire, and enhance both resource capability and resilience.

The four feasible A2AT options presented at gate one were further assessed by the partner companies, and a preferred option selected for which the gate two activities could be undertaken. The preferred option, the SLR to Stort Water Resource Zone (WRZ5) transfer, has subsequently been developed by selecting two equally feasible routes that achieve the objective of transferring water to WRZ5 in Affinity Water's Central region. The routes are:

- The Western route: from Anglian Water's service reservoir near Peterborough, this route runs close to the existing Grafham Water and delivers the water to a service reservoir in Affinity Water's supply area

- The Eastern route: from Anglian Water's service reservoir near Peterborough, this option takes a more direct route to deliver the water to a service reservoir in Affinity Water's supply area

In July 2021, Affinity Water and Anglian Water submitted their gate one report to RAPID. The gate one assessment published in December 2021 included the following actions and recommendations which are fully addressed by this gate two submission.

Table 1: Gate one actions and recommendations

RAPID assessment at gate one	A2AT response at gate two
Actions	
Ensure utilisation is refined as part of gate two, including uncertainty and sensitivity	A detailed utilisation analysis has been undertaken and a utilisation profile that describes the likely utilisation of the SRO is presented in Section 4.1
Assess how any new transfer infrastructure will connect with existing infrastructure, particularly how the operations at Rutland/Grafham may have to change to connect the transfer	The interaction with Grafham has been explored as part of the Western route and is detailed in Sections 3 and 4.3. The gate one option that involved the use of Rutland Water was not taken forward for detailed design, therefore no further analysis was undertaken regarding how the operations at this reservoir may have to change to connect the transfer
In-combination assessment must include all relevant interactions between options. We expect robust assessment for any options that are screened out as part of in-combination assessment	In-combination effects, sometimes called synergistic effects result from multiple impacts arising from the same scheme. These impacts might not be significant individually but in-combination the amenity effect could be considered significant. No in-combination factors arose in the selection of the preferred A2AT option detailed in Section 3.1. It is possible that in-combination effects from multiple schemes may rise during the construction phase of A2AT. This was not assessed for the A2AT scheme due to it not being developed beyond gate two. If the Peterborough to Grafham route is absorbed into the SLR SRO as proposed, any effects would be managed under a single programme.

RAPID assessment at gate one	A2AT response at gate two
Actions	
You should consider the potential competing resources from the energy sector	As the water resource source for the A2AT transfer is the SLR, this has been considered under the SLR SRO. The energy requirements for the A2AT transfers are assessed in 3.2.2 and operational carbon in Section 6.5.
You should consider the impact on Rutland Water	One of the proposed options at gate one involved a new, direct river abstraction on the River Trent with onward transfer to Rutland Water. This option was ruled out early at gate two because it had a disproportionate number of key items flagged for further consideration (i.e. , carbon impact, scheme complexity, environmental performance) compared with the other options considered. The Habitats Regulations Assessment was a particular concern as it concluded that there was a likely significant effect on designated sites. As this option has not been taken forward for detailed concept design, analysing the impact of this SRO on Rutland Water was no longer considered necessary.
Recommendations	
You should explain how the chalk streams will benefit as part of the 'need' case for gate two when the route and deployable output (DO) is known	Chalk streams would benefit from this scheme by decreasing Affinity Water's reliance on local groundwater sources. However, the 'need' case, as elaborated by the WRMP and regional planning process, does not support the promotion of this SRO and other alternatives are shown to provide better value for the environment.
You should explain which option is considered best value (rather than just least cost) for customers and the environment and the criteria and method used for best value ahead of gate two	This recommendation has been implemented on two levels. Firstly, an initial option selection identified the preferred A2AT option among the four shortlisted options presented at gate one. This process adopted a multi-criteria approach, whereby a set of criteria, detailed in section 8.2, were applied to the shortlist to identify which option could offer best value. Secondly, the inter-regional alignment process between WRE and WRSE provided the best value framework within which the A2AT scheme could be evaluated and compared with other schemes. Thus, best value comparison between regions confirmed that the full gate two scheme does not represent best value for Affinity Water customers or wider societal metrics.

2.2. Objectives

The primary objective of the A2AT scheme is to provide additional water supplies to Affinity Water. The additional water resources are needed to deal with increased demand due to projected future population growth, impacts of climate change, improved drought resilience requirements (1 in 200-year drought initially, rising to 1 in 500-year drought from 2040) and increased environmental protection requirements which would result in some of Affinity Water's existing abstractions being stopped or reduced.

The requirement for additional water supplies was considered only after the implementation of demand-side interventions, such as leakage and water consumption reductions, in accordance with the Environment Agency's National Framework for Water Resources **[2]** and Water Resources Planning guidance.

The national framework calls for a 50% reduction in leakage by 2050 and planning for a domestic water consumption of, on average, 110 litres per person per day by 2050, while also reducing non-household demand. All of these demand management requirements were adopted by WRSE and the partner companies and are accounted for within the requirement for further future water supplies.

[2] https://www.gov.uk/government/publications/meeting-our-future-water-needs-a-national-framework-for-water-resources?msclkid=245c3d5bc08211ec8b961853f7da9bae

3. Solution design, options and sub-options

3.1. Option selection

The A2AT gate one submission concluded that there were four potential options under the scheme for further assessment at gate two. The four options are:

- South Lincolnshire Reservoir (SLR) to Affinity Water's Lee Water Resource Zone (WRZ3)
- SLR to Affinity Water's Stort Water Resource Zone (WRZ5), now further defined at gate two as a specific service reservoir in the zone
- Fens Reservoir to WRZ5
- River Trent abstraction and transfer to Rutland Water, and then to WRZ3

At the outset of the gate two development, these options were assessed further to determine the preferred option which would form the basis of the rest of the gate two concept design. A multi-criteria approach consistent with WRMP optioneering was selected which assessed the four options against the following criteria:

- Habitats Regulations Assessment (HRA)
- Invasive Non-Native Species (INNS) potential
- Flood risk
- Scheme complexity
- Cost
- Strategic value
- Carbon

The option selection assessment exercise concluded that the gate two concept design should be prioritised as follows:

- SLR to WRZ5
- SLR to Preston (WRZ3)
- Fens Reservoir to WRZ5
- River Trent abstraction to WRZ3

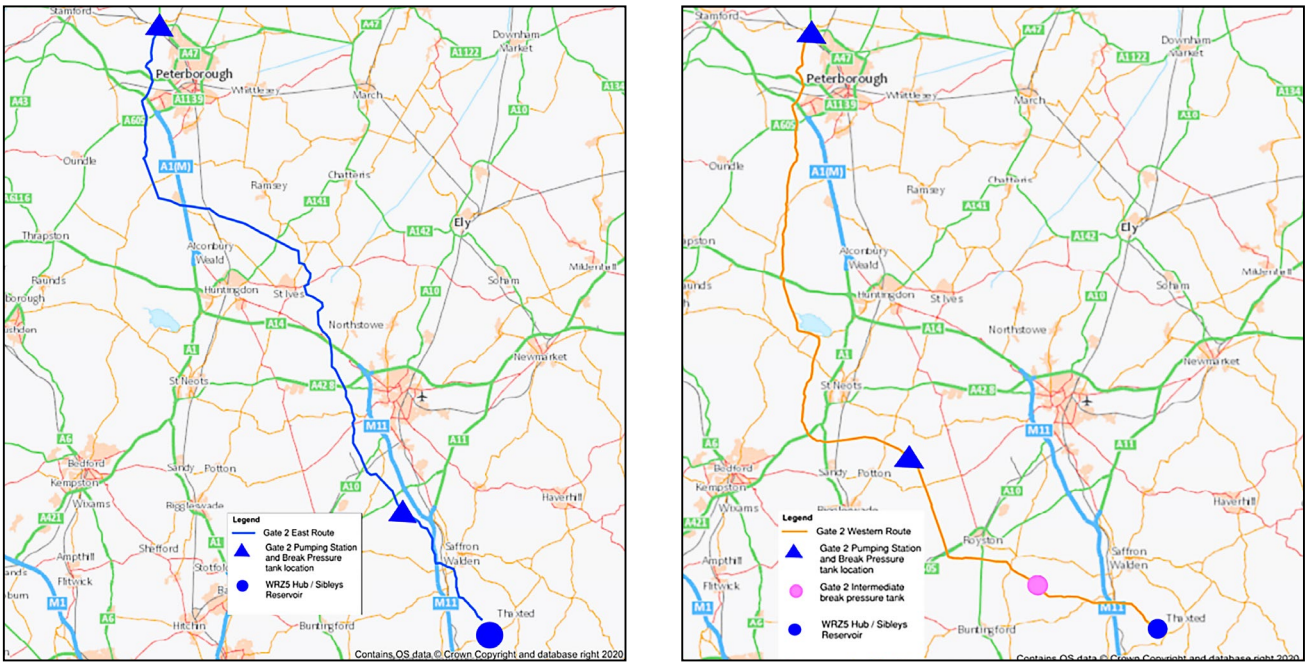
The River Trent Abstraction option was the worst overall performing option against the assessment criteria and was discounted first from further development. The Fens Reservoir option performed poorly when compared with the SLR options due to the additional complexity and cost and was also discounted.

The two SLR options were comparable across the assessment criteria with the only distinguishing factor being the strategic value. It was determined that delivery to the WRZ5 Hub would provide additional benefits to Affinity Water, when compared to delivery to WRZ3. This is described within the Affinity Water draft WRMP, where the network analysis (referred to as 'Connect 2050') indicates that the route to WRZ5 is strategically better placed, given the timing of the SLR development and hence was selected. This option would be able to provide water directly to WRZ5, meaning some of the additional supporting pipelines that otherwise would be needed from WRZ3 to WRZ5 would not be required in the connection was made directly to WRZ5. This would reduce Affinity Water's network costs in the order of £25m and improve resilience in comparison to the WRZ3 option.

Although the option to deliver water to WRZ5 following the same route proposed at gate one provided additional strategic value to Affinity Water, it was also identified that an alternative pipeline route in proximity to the existing Grafham Water reservoir would have the potential to increase resilience within Anglian Water's network. Therefore, to fully realise the additional strategic benefits that this scheme would provide to both Affinity Water and Anglian Water, it was decided to explore two separate pipeline routes as part of the SLR to WRZ5 option. This decision resulted in two indicative SLR to WRZ5 routes being considered in the detailed concept design development:

- Eastern route from Anglian Water's service reservoir to WRZ5
- Western route from Anglian Water's service reservoir to WRZ5 via Grafham Water

Figure 1: Proposed Pipeline Routes - Eastern Route (left) and Western Route via Grafham Water (right)



Both routes were developed further ensuring they met the requirements and constraints agreed between the partner companies:

- The transfer start point for both routes is Anglian Water's service reservoir near Peterborough
- The transfer final delivery point for both routes is a service reservoir in Affinity Water's WRZ5
- A capacity of both 50 Ml/d and 100 Ml/d to be assessed for each route. In addition, a 150 Ml/d capacity sub-option for the Peterborough to Grafham Water route was also developed for further flexibility (see section 3.2.1).
- A conditioning treatment plant to be provided in WRZ5 to ensure the treated water transfers from the Anglian Water network are suitable for delivery into Affinity Water's network (see section 3.2.5)

3.2. Solution description

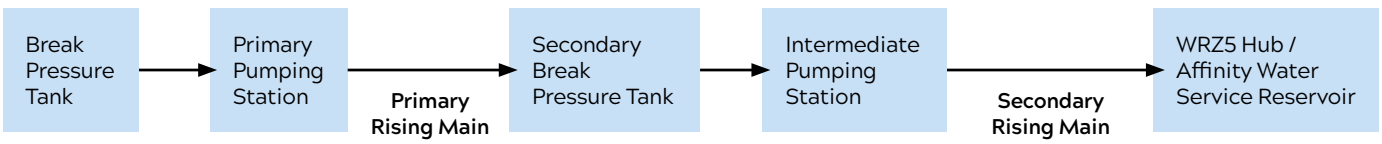
The proposed solution for the A2AT SRO comprises a potable water transfer pipeline between Anglian Water's service reservoir, located north of Peterborough and an Affinity Water service reservoir. Anglian Water's service reservoir near Peterborough is the proposed destination for treated water transfers from the SLR SRO, which is concurrently being developed jointly by Affinity Water and Anglian Water under the RAPID programme. The transfer between the SLR and Peterborough is part of the SLR SRO and not considered here. The destination service reservoir is located in Affinity Water's WRZ5, which is an area of the M11 corridor anticipated to experience significant future population growth.

The proposed solution would comprise the following elements common to both the Eastern and Western routes:

- At Anglian Water's service reservoir north of Peterborough, on land to the east of the existing service reservoir, a new compound housing a pumping station, break pressure tank and surge vessels, together with a chloramine dosing facility to ensure stable chlorine residual for the treated water transfer.
- At Affinity Water's service reservoir, a new control and mess room, together with the conditioning treatment capability, consisting of sodium hydroxide (for alkalinity), carbon dioxide (for pH) and sodium hypochlorite (for disinfection).
- A ductile iron or steel transfer pipeline, ranging from 900 to 1,400 mm in diameter, between Anglian Water's and Affinity Water's service reservoirs. The majority of the pipeline would be constructed using open cut methods, with major crossings, such as railways, major roads and significant watercourses, potentially being undertaken utilising trenchless techniques.

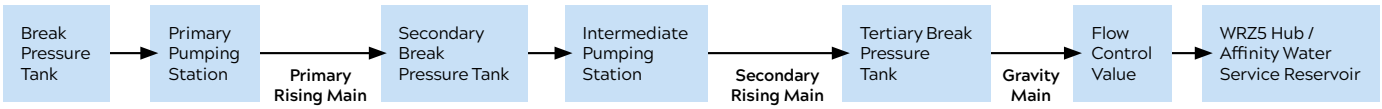
Additionally, for the Eastern route option, an intermediate pumping station, surge vessels and break pressure tank are included in the design as shown in Figure 2 below.

Figure 2: Flow schematic of the eastern route pumped transfer system (50 Ml/d and 100 Ml/d options).



For the Western route, as well as an intermediate pumping station, surge vessels and break pressure tank, a tertiary break pressure tank and flow control valve are included. This would allow the transfer of water flows by gravity to the conditioning plant at Affinity Water's destination service reservoir (Figure 3).

Figure 3: Flow schematic of the western route pumped transfer system (50 Ml/d and 100 Ml/d options)



3.2.1. Pipeline routing and infrastructure site selection

The design of the pipeline route and the selection of sites for supporting infrastructure, such as pumping stations and break pressure tanks, took into consideration constraints such as topography, the environment (Nene washes) and ease of construction or constructability. In addition, health and safety during the construction, operation and maintenance stages of the site was accounted for access and proximity to overhead services such as power lines. The above criteria represent the most appropriate considerations at this stage of the project development, taking into account the concurrent development of regional plans. The partner companies acknowledge that other equally important factors, such as planning policy, land referencing and stakeholder views, should play a role in determining the final pipeline route and the selection of sites for key infrastructure. It is envisaged that a more comprehensive assessment, including appropriate consultation and engagement, would take place before any planning application is submitted, should the full A2AT scheme be promoted in the future, and would be carried out for the Peterborough to Grafham section if brought into the SLR SRO.

Environmental constraint maps and flood risk maps were produced in GIS to identify environmental and infrastructure constraints along the potential pipeline route corridors. The most favourable pipeline routes were then identified, which avoided the most significant constraints. Anglian Water's Strategic Pipeline Alliance 'Avoidance Criteria - Route Selection' methodology was adopted for this purpose due to similarities in both the scope of the project and the geographical location. The criteria provide a consistent approach to route planning to reduce risk. LiDAR ground level data was also used to derive proposed pipeline route profiles which are important for route selection and hydraulic design of the pumping systems.

3.2.2. Pumping stations

For consistency a single operating philosophy is proposed for all the pumping stations associated with both the Eastern and Western routes. The philosophy can be summarised as follows:

- Pumps operating under Variable Speed Drive (VSD) control in order to accommodate the wide range of operational duty flows and corresponding pressures in the pipe network
- Two or three duty pumps (depending on flow) providing the most efficient operation across the required flow range, with an additional pump providing standby capacity
- Drywell type installation of axially split case pumps are expected to offer optimum performance
- Due to the large power supply requirement for the pumps, it is assumed that it would not be cost effective to install a permanent, 100% secondary power supply for pump operation. Therefore, only a smaller generator has been included at each site to provide power to key services during power outages.

3.2.3. Break Pressure Tanks (BPTs)

BPTs have been included to provide buffer storage upstream of each transfer pumping station, based on surge analysis. An additional BPT (Tertiary BPT) has been in included on the Western route, forming the discharge point for the intermediate pumping station.

3.2.4. Pressure sustaining or control valves

On the Western route, downstream of the intermediate pumping station there is a high point which is at a greater elevation than the WRZ5 Hub site location. To simplify operation of the pumping station, a third BPT (Tertiary BPT) has been located at this high point to serve as a discharge point for the pumping station.

The onward pipeline section running from the Tertiary BPT to the WRZ5 Hub site would then be operated as a gravity-fed flow control system, using a pressure sustaining/control valve located at the WRZ5 service reservoir site. This arrangement would prevent the risk of the pipeline draining down or operating under sub-atmospheric pressures, which can lead to risk of contamination.

3.2.5. Conditioning plant

The typical levels of alkalinity and hardness of water in Anglian Water's service reservoir do not pose a corrosion risk to the iron pipework in Affinity Water's network. This means that the potential for any issues with taste and odour is reduced. However, to provide operational flexibility and allow other water sources to be imported to Anglian Water's Peterborough service reservoir in the future, a conditioning plant was designed based on a 'water quality envelope' for treated water. The envelope was in turn based on existing water imports at another of Affinity Water's service reservoirs. Inclusion of a conditioning plant results in a more robust design for the A2AT scheme. The water quality assumptions made at gate two form the basis for future assessments if the A2AT scheme is restarted, as well as for the Peterborough to Grafham transfer.

4. Water resource assessment

4.1. Utilisation

Utilisation of the A2AT SRO was generated using WRSE's regional system simulator (RSS) model, as outlined at gate one. The model uses long timeseries of possible hydrological conditions generated using stochastics to test the resilience of the supply system and provides a utilisation profile for new large-scale water infrastructure developments. The model was used to assess the demand profiles that are generated when the A2AT option is introduced into the system, primarily to replace groundwater sources that would be lost through the Environmental Destination scenarios.

Raw utilisation profiles were obtained by incorporating the new resource into the model supplying the appropriate WRZ. The profiles were then adjusted to reflect operational reality and guiding principles that would be typically applied to proactively manage any new source of water. For instance, it is assumed that the A2AT would not be operated on a complete on/off basis during the year and that a 'minimum turnover' of 25% would apply in order to maintain a reasonable level of operational throughput and enable timely 'ramp up' of treatment and pumping capacity during a drought event.

The modifications were applied to the timeseries of monthly utilisation profiles generated for the full stochastic data series. An example of the resulting stochastic replicate timeseries is shown in Figure 4.

Figure 4: Sample Stochastics Replicate Timeseries from WRSE Modelling

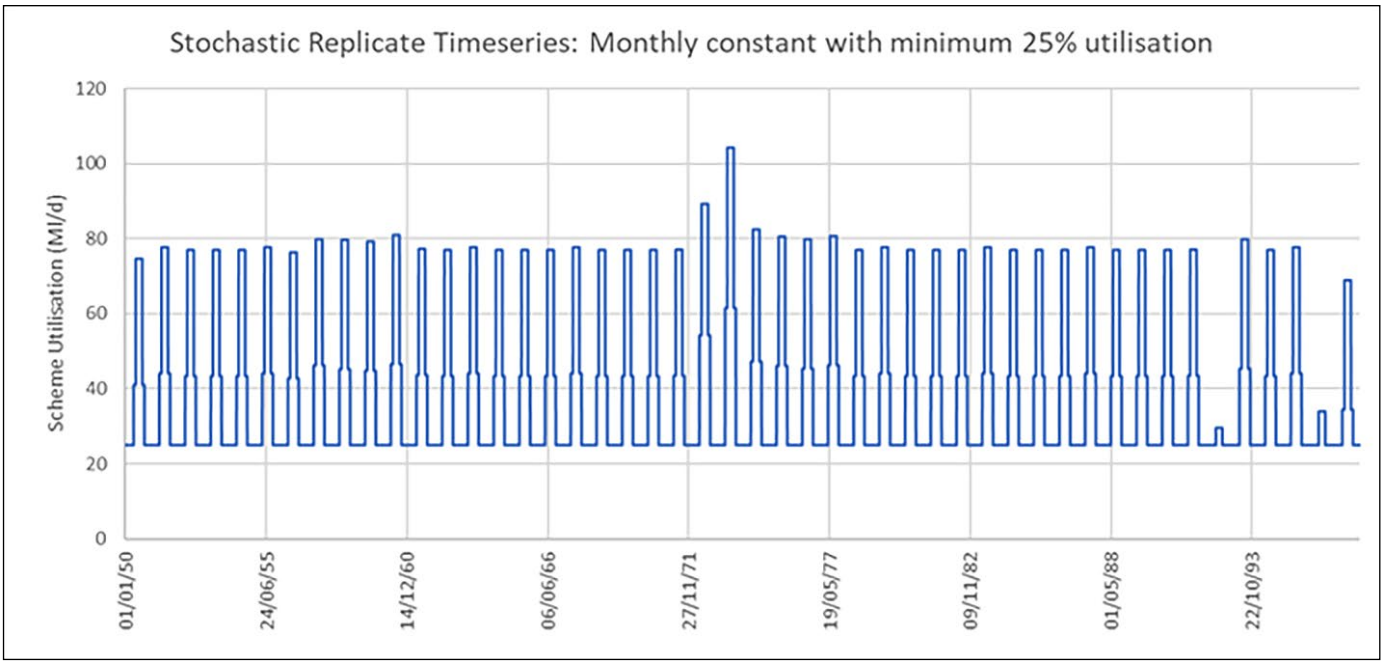
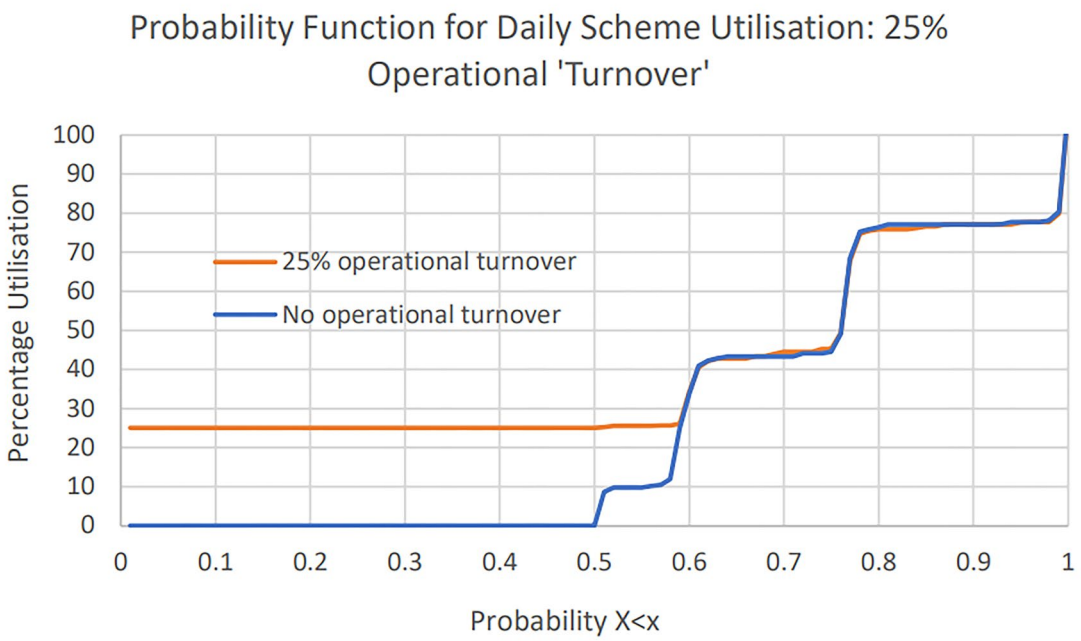


Figure 4 shows that most years can be classed as 'normal', with utilisation dictated by the level of demand. Five years show a deviation in utilisation, with three significantly below the 'normal' requirement and two significantly higher.
The probability of daily usage of this SRO was analysed and is presented in Figure 5.

The utilisation assessment will be further refined in gate three to include updated scenarios, as well as the use of more detailed system modelling and simulation techniques including the WRE Pywr model.

Figure 5: A2AT Scheme Usage - Probability of Daily Usage



Outside of the May to September period, expected use would be driven by the operational turnover requirement (25% minimum turnover). Between May and September, the usage is dictated by the balance of available groundwater levels versus the impacts of demand restrictions, i.e., Temporary Use Bans (TUBs) and Non-Essential Use Bans (NEUBs). The utilisation analysis shows that typical utilisation is in the order of 80% in summer, only increasing with significant droughts beyond 1 in 50 years, whilst average annual utilisation in a 'dry year' is just over 40% as an average across the year.

The three years with reduced requirements (Figure 4) represent droughts that have a return period worse than 1 in 10 years, so restrictions on water use would be applied during the summer. However, the droughts are not severe, and therefore the benefits of restrictions outweigh any negative drought impacts on groundwater resources. The two remaining events are more severe, and the impact of drought outweighs the benefits of demand restrictions.

4.2. Water resource benefit

The DO for this SRO was calculated using WRSE's RSS. The same approach and methodology adopted by WRSE for calculating DO was used **[3]** , but with specific configurations and assumptions relevant to Affinity Water.

The DO identifies the amount of water that could be delivered by both transfer capacities considered for this scheme (50 and 100 Ml/d) during a 1 in 500-year return period drought, with demand restrictions applied to meet agreed levels of service. The stated minimum levels of service applied for Affinity Water DO analysis are:

- Level 1 restrictions: Not more often than once every 5 years
- Level 2 restrictions: Not more often than once every 10 years
- Level 3 restrictions: Not more often than once every 40 years
- Level 4 restrictions: Not more often than once every 200 years after 2024

Table 2 shows the increase in DO associated with the A2AT transfer capacities.

Table 2: DO analysis for A2AT transfer capacities

Transfer capacity (Ml/d)	Increase in DO (Ml/d)	Efficiency
50	43	87%
100	85	85%

Further analysis showed that with TUBs and NEUBs in place, the 30-day rolling average demand during a 'dry year' summer (similar to conditions experienced in 2018) is around 10% - 14% higher than the annual average. The interpretation is that the modelling shows an effective DO that is 9% to 15% lower than the capacity of the transfer. Based on the above, it has been assumed that the transfer alternatives should be sized at around 112% of their intended DO. The infrastructure capacity of the two A2AT variants that are required to deliver 50 and 100 Ml/d have therefore been set at 56 and 112 Ml/d, respectively.

[3] https://www.wrse.org.uk/media/sbblilys/method-statement-depolyable-output-aug-21.pdf

4.3. Long term opportunities and scalability

Preliminary consideration of scalability has been undertaken by developing a 50 Ml/d and 100 Ml/d option for both the Eastern and Western routes. These capacities are considered as stand-alone options, but would have been explored at gate three to assess the potential for phasing of the works. For example, pipelines could be constructed for the full long-term capacity (100 Ml/d) with pumping stations and chemical dosing constructed in modules, initially for 50 Ml/d capacity but with available land and infrastructure to allow easy expansion in future.

Resilience has also been considered both in terms of the assets being provided, and the overall benefits of the scheme. An example is the power supply which has been considered in the short-term to be provided using dual supply feeds from local prime sub-stations for all pumping and dosing assets. Long-term resilience has been considered through a preliminary review of the potential for embedding renewable energy within the proposed concept design. This is explored further in Section 6.5.3.

Wider resilience benefits and long-term opportunities have also been considered by introducing and costing a 150 Ml/d capacity version of the Western route, from Peterborough to Grafham Water, which would enable Anglian Water to support its southern water resource zones with water from the SLR and enhance the connectivity and resilience of its overall supply network.

4.4. Infrastructure resilience to the risk of flooding and coastal erosion

The assets to be constructed mainly comprise a buried pipeline, which would not generally be susceptible to fluvial flooding or surface water flooding. Associated assets such as pumping stations and chemical dosing buildings, together with access tracks and construction phase assets such as site compounds and haulage roads, would be at ground level along the route and have components that may be susceptible to flood damage and potential risk of outage. A preliminary assessment indicates that the proposed pumping station at Anglian Water's service reservoir, which is common to both Eastern and Western routes, would be located in Flood Zone 3 and require flood risk mitigation; compensatory flood storage would need to be provided. The initial assessment has not indicated any significant flood risk at the other proposed above-ground asset locations, but these would require further consideration if the design is taken forward.

For the pipeline routes, a particular concern was the northern section of the Eastern route. At gate one, this was proposed to be routed to the north and east of Peterborough. However, the gate two assessment identified that this choice would result in approximately 35 km of the route being subject to fluvial flooding from the Nene Washes which are in Flood Zone 3, putting at risk associated above-ground assets. This risk has been significantly mitigated by re-routing the northern section of the Eastern route to the west and south of Peterborough, which has reduced the route length exposed to fluvial flood risk to 8 km.

4.5. Summary of Affinity Water and Anglian Water's positions

Regional modelling concluded that there would be no need for exports from the WRE region to the WRSE region, and instead other strategic water resource options would be pursued to support Affinity Water. Affinity Water will, therefore, cease their involvement in and support of the SLR SRO at gate two, and as a consequence it is proposed to stop development of the A2AT SRO as a joint scheme.

This decision, however, does not impact the size or design of SLR; WRE modelling has confirmed that the full output is required within the WRE region, and specifically Anglian Water's supply area. Anglian Water, therefore, needs to continue to develop the Peterborough to Grafham Water portion of the A2AT (Western route) to meet the needs in the Ruthamford South and Central WRZs.

Anglian Water therefore proposes to continue to develop the approximately 50 km of new pipeline along the Western route and merge this scope and the relevant gate three allowance within the scope of the SLR SRO post gate two.

5. Drinking water quality considerations

5.1. Introduction

The Water Quality Risk Assessment (WQRA) process is a semi-quantitative water quality risk assessment developed by the All Company Working Group (ACWG) to determine the impact that new SROs would have on drinking water quality. This section provides an update on drinking water quality considerations at gate one and ensures that the SRO WQRA development is aligned with the water company stakeholders and regulators' policies.

For the A2AT scheme, the WQRA carried out identified the main risk as the impact of transferring water with different water quality characteristics from the Anglian Water network into Affinity Water's network in the recipient supply zone. The risk assessment, therefore, helped develop the design of the proposed treatment, and the development of the SRO to ensure no deterioration in the water quality of the supply zone.

5.2. Methodology

The WQRA process can be summarised as follows:

- Identification of a limiting hazard
- Assigning a pre-mitigation risk score (likelihood and consequence)
- Identifying the recommended mitigations
- Assigning a post-mitigation risk score (likelihood and consequence), and
- Detailing any residual risk considerations.

The WQRA assessed hazards across the catchment, abstraction, raw water transfer, treatment, storage, distribution and consumer stages. The stages are analogous to those used within Drinking Water Safety Plans (DWSPs).

The hazards were ranked across each WQRA stage using a matrix developed for the ACWG, which comprises consequence and likelihood ratings. For consistency, the gate one consequence ratings for parameters were retained, and for a given parameter are consistent across all stages of the WQRA. The likelihood ratings were determined based on new water quality data from the SRO water quality monitoring programme, information from existing Water DWSPs for the relevant receiving zone, and input from water quality experts and process engineers. The likelihood score was then combined with the fixed consequence rating to produce an overall risk score at each WQRA stage. Two strategic WQRA workshops were held to review and further develop the risk assessment.

5.3. Key potential risks to drinking water quality

Drinking water quality considerations were assessed following the WQRA process as described above, building on the WQRA developed at gate one. The gate two WQRA used water quality monitoring data from the SLR SRO water quality monitoring programme and information from existing DWSPs to further develop the understanding of water quality risk. At gate one the WQRA included limiting hazards from the following groups, which align with the ACWG Water Quality Risk Framework Report:

- Pathogens
- Pesticides
- Nitrate/nitrite
- Change in metal types and form
- Disinfection by-product formation potential

Customer acceptability due to change in chemistry or due to taste and odour were also considered at gate one.
During gate two, further limiting hazards were identified through the WQRA process as posing potential risk to drinking water quality. These are shown in Table 3.

Table 3: Additional Limiting Hazards identified during the WQRA gate two workshop process

Limiting Hazard	Reasoning
Aluminium	Choice of coagulant during the concept design is an aluminium-based coagulant.
Temperature	Affinity Water consumers are in a predominantly ground water zone. Utilising surface water can cause temperature fluctuation, affecting customer acceptability of the new transfer water.
Perfluorooctane sulfonate (PFOS)	An emerging hazard of concern. Present in the SLR catchment area at the River Witham and River Trent.
Perfluorooctanoic acid (PFOA)	An emerging hazard of concern. Present in the SLR catchment area at the River Witham and River Trent

5.4. Proposed mitigations for limiting hazards

Once identified, the limiting hazards were assessed across all stages of the WQRA, including risk ranking and identification of proposed mitigations. Mitigations were identified based on existing controls for the hazards included in the design. Taking coliform bacteria (a limiting hazard) as an example, the main proposed mitigation for this is ultraviolet (UV) disinfection followed by the addition of a free chlorine residual at SLR Water Treatment Works (WTW), which is included in the current SLR SRO treatment design.

By contrast for nitrate (another limiting hazard), it is unclear at this stage whether nitrate treatment is required at SLR WTW, so nitrate treatment is not currently included in the A2AT design and is not listed as a mitigation. The key recommendation, therefore, is for modelling and further study to be carried out at gate three to determine whether nitrate treatment is required.

For Affinity Water to receive water from outside of the Affinity Water supply, network process conditioning would be required due to the risk of acceptability due to change in chemistry and taste or odour, as well as changes in pipework or water source. For these reasons, it was identified that a conditioning plant would be required, which took into account Anglian Water and Affinity Water treatment process science and requirements to deal with a range of possible water quality scenarios.

Further information is provided in Annex H.

5.5. Key emerging contaminants

Two key emerging contaminants were identified: PFOS and PFOA, which belong to the group known as per- and poly-fluoroalkyl substances (PFAS). Initial results indicate that PFOS/PFOA risk is low; however, sampling is ongoing and due to the current uncertainty, the risk of PFOS/PFOA in the WQRA is shown as a medium (amber) risk up until the treatment stage. Granular activated carbon (GAC) is included in the process design for SLR WTW, which would mitigate PFOS/PFOA risk. If it is found through the water quality monitoring programme that greater PFOS/PFOA mitigation is required, this would be included in the process design at future stages of development.

5.6. Stakeholder engagement

Stakeholder engagement at gate two led to identification of some water quality concerns by the Drinking Water Inspectorate (DWI) and customers. Discussions were also held with Drinking Water Quality (DWQ) teams. Reflecting the proposal to progress only the northern section of the A2AT Western route as far as Grafham, these concerns are likely to be alleviated.

Had the SRO been further progressed at gate three, then a greater understanding of the WQ risks would become available and stakeholder engagement would continue throughout the development process to ensure the WQRA was developed based on expert knowledge, and included the latest updates to designs and to water company policies.

5.7. Consumer perception and engagement

Consumer acceptability of the transferred water to a key risk of the A2AT SRO that must be considered carefully. There is a risk to consumers associated with the change in source type from a predominantly groundwater supply to surface water. This risk applies to taste, odour and other aesthetic limiting hazards, for which an amber risk rating was maintained in the WQRA through to the consumer stage. It is recognised there will be an ongoing need to manage customer acceptability, through customer engagement at future stages and through the implementation of the SRO. The issue was identified by customers during the stakeholder engagement (Annex G) and the risk will be reviewed and updated at future gates based on further customer engagement.

5.8. Plan for future work to develop drinking water safety plans

The resulting risk assessment is a live document which would progress through RAPID gates, until it is overtaken by the development of a drinking water safety plan (DWSP) in line with the DWI regulation. The outputs of the risk assessment will be addressed by the SLR SRO.

6. Environmental assessment

Following the outcome of the A2AT SRO gate two option selection process, a desk-based appraisal of key environmental impacts was carried out on the selected option (50 Ml/d and 100 Ml/d Eastern and Western routes).

6.1. Environmental appraisal

The environmental appraisal considered the likely environmental effects of the Eastern and Western routes and was undertaken with reference to the environmental factors set out in the European Union's Environmental Impact Assessment (EIA) Directive (2014/52/EU) and transposed into English law through a variety of regulations. Environmental factors listed in the EIA Directive are:

- Population and human health
- Biodiversity
- Land and soils
- Water
- Air
- Climate
- Material assets
- Cultural heritage, and
- Landscape

There are limits to what such a desk-based assessment can achieve at the concept design stage. Whilst the assessments are proportionate for this stage, they should be refined if the scheme progresses through the next phase of investigations.

The broad conclusions of the environmental appraisal are reported in Table 4 for the Western route and Table 5 for the Eastern route. Further details can be found in Annexes A to E.

Table 4: Appraisal Findings for the Western Route

Environmental Factor	Appraisal Findings
Population and Human Health	· Potential socio-economic and health effects associated with A2AT were found to be broadly consistent between the Eastern and Western routes. · Western route passes through more local authority areas which exhibit poor resident health (increasing vulnerability to any adverse health outcomes from the scheme) and higher incidences of deprivation (increasing the potential for social value benefits). · Not possible to further assess these potential impacts owing to the relatively limited information available at the concept design stage.
Biodiversity	· No physical impact on nationally and internationally designated sites, Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). · One SSSI near the Western route could be indirectly impacted via two unnamed waterbodies that cross the route and appear to flow into the SSSI. · Further work to confirm the nature and extent of impacts on SSSIs and other important biodiversity resources would be required if A2AT is taken forward.
Land and Soils	· Temporary loss of 'Best and Most Versatile' (BMV) agricultural land · Mitigation to restore this land to agricultural use is expected to be feasible.
Water	· Crosses five Water Framework Directive (WFD) groundwater bodies, and 28 WFD surface water bodies including three of very high importance: - Ouse (Roxton to Earith) - Nene - Islip to tidal - Debden Water · Main risk of fluvial flooding (Flood Zones 2 and 3) for the Western route arises from the River Nene, the River Great Ouse, River Rhee (near Tadlow) and the River Granta. · Recommend that all works are carried out in accordance with mitigation measures set out in a Construction Environmental Management Plan (CEMP).
Air	· Nearest sensitive receptors were identified for both routes: - Dust sensitive receptors in proximity to the routes, including residential properties, commercial premises, schools and medical facilities - Nature conservation sites including Local Wildlife Sites (LWS), ancient woodlands, SSSIs, and Natura 2000 sites · Review was undertaken of the nearest Air Quality Management Areas (AQMAs) and designated nature conservation sites and the potential for construction phase traffic emissions to impact on receptors within them.

Environmental Factor	Appraisal Findings
Climate	· A whole life carbon assessment was carried out for both selected design routes · 97% of the embodied carbon emissions are associated with the pipework, and the most efficient means of reducing the embodied carbon of the scheme would be in reducing the mass of pipework involved.
Material Assets	· The Western route crosses a total of 67 roads · The route crosses five railway lines.
Cultural Heritage	· Impacts on archaeological and built heritage assets were found to be comparable to the Eastern route. 21 key heritage sites were identified whose nature and form would suggest the presence of significant and extensive archaeological sub-surface remains; possible impacts were also identified. · A small number of designated archaeological and built heritage assets would also be directly impacted by the construction of the scheme. · Broad categories of mitigation measure were identified to address the potential impacts identified.
Landscape	· If A2AT is taken forward in future and consideration is given to the key features which contribute to the landscape - including wetlands, woodland, hedgerows and ridgelines - it is considered that a design route could be developed without substantially altering the landscape character in the long term.

Table 5: Appraisal Findings for the Eastern Route

Environmental Factor	Appraisal Findings
Population and Human Health	· Potential socio-economic and health effects associated with A2AT were found to be broadly consistent between the Eastern and Western routes. · Not possible to assess these potential impacts owing to the relatively limited information available at the concept design stage.
Biodiversity	· No physical impact on nationally and internationally designated sites, SSSIs, SACs and SPAs. · Further work to confirm the nature and extent of impacts on SSSIs and other important biodiversity resources would be required if A2AT is taken forward.
Land and Soils	· Temporary loss of 'Best and Most Versatile' (BMV) agricultural land · Mitigation to restore this land to agricultural use is expected to be feasible.
Water	· Crosses five WFD groundwater bodies, and 21 WFD surface water bodies, including three of very high importance: - Ouse (Roxton to Earith) - Nene - Islip to tidal - Debden Water · River Nene and the River Great Ouse pose the greatest risk for fluvial flooding. · Recommend that all works are carried out in accordance with mitigation measures set out in a CEMP.
Air	· Nearest sensitive receptors were identified for both routes: - Dust sensitive receptors in proximity to the routes, including residential properties, commercial premises, schools and medical facilities - Nature conservation sites including LWS, ancient woodlands, SSSIs, and Natura 2000 sites · Review was undertaken of the nearest AQMAs and designated nature conservation sites and the potential for construction phase traffic emissions to impact on receptors within them.
Climate	· A whole life carbon assessment was carried out for both selected design routes · 97% of the embodied carbon emissions are associated with the pipework and the most efficient means of reducing the embodied carbon of the scheme would be in reducing the mass of pipework involved.
Material Assets	· The Eastern Route crosses a total of 70 roads · The route crosses five railway lines.
Cultural Heritage	· Impacts on archaeological and built heritage assets were found to be comparable to the Western route. 21 key heritage sites were identified on both routes where possible impacts were identified, and avoidance was recommended as a mitigation measure. · These comprise mostly non-designated archaeological sites of prehistoric and medieval date, whose nature and form would suggest the presence of significant and extensive archaeological sub-surface remains. · A small number of designated archaeological and built heritage assets would also be directly impacted by the construction of the scheme.
Landscape	· If A2AT is taken forward in future and consideration is given to the key features which contribute to the landscape - including wetlands, woodland, hedgerows and ridgelines - it is considered that a design route could be developed without substantially altering the landscape character in the long term.

In addition to the overall environmental appraisal, four regulatory assessments were compiled:

- A Water Framework Directive Assessment (WFD)
- An Informal Habitats Regulations Assessment (HRA)
- A Biodiversity Net Gain assessment (BNG)
- A Natural Capital Assessment (NCA)

These assessments are summarised in the sections that follow. The full assessments are provided as Annexes B to E.

6.2. Water Framework Directive (WFD) assessment

A Water Framework Directive (WFD) assessment was undertaken for the preferred option (Eastern and Western routes). The assessment comprised a desk study using freely available online resources, which identified water bodies that have the potential to be impacted by A2AT. The WFD assessment considered both the Eastern and the Western routes for the preferred option.

The assessment tool used for a Level 1 screening includes a list of pre-defined activities which are reviewed against the activities which would be undertaken to construct and operate the preferred option. Each activity has an associated score from, ranging from -2 to 3, which is assigned to a water body if the activity is expected to occur, depending on whether the activity is considered beneficial or adverse in achieving the aims of the WFD and River Basin Management Plans (RBMPs). Any water body with a maximum score above 1 (i.e., at least one of the scheme activities has a medium or high impact) would be carried through to a Level 2 assessment.

However, the Level 1 WFD assessment indicated that neither of the routes was likely to have a significant risk of being non-compliant with WFD objectives and none of the waterbodies needed to be taken to the Level 2 assessment stage.

6.3. Informal Habitats Regulations Assessment (HRA)

An informal Habitats Regulations Assessment was undertaken to identify any likely significant effects arising from A2AT on internationally designated sites - SACs, SPAs and Ramsar sites - either in isolation or in combination with other plans and projects. If relevant, an Appropriate Assessment was then undertaken to advise on appropriate policy mechanisms for delivering mitigation.

6.3.1. Likely significant effects test

The following European Sites were subject to a Likely Significant Effects test:

- Nene Washes SAC/SPA/Ramsar site, for hydrology and water quality
- Ouse Washes SAC/SPA/Ramsar site, for hydrology, water quality and loss of functionally linked land
- Portholme SAC, for hydrology and water quality
- Woodwalton Fen Ramsar/Fenland SAC, for loss of functionally linked land
- Eversden and Wimpole Woods SAC, for loss of functionally linked land
- Orton Pit SAC, for loss of functionally linked land

6.3.2. Appropriate assessment

For those sites where Likely Significant Effects could not be ruled out, an Appropriate Assessment was undertaken. The preliminary conclusion is that it is likely that in each case it should be feasible to devise mitigation measures to avoid an adverse effect on the integrity of these sites.

6.3.3. In-Combination assessment

For all European sites, the mitigation measures identified in the assessment of the scheme alone would be sufficient (subject to further detail and design at a later stage of SRO development) to ensure that no effect arose on any designated sites 'in combination' with other projects and plans. Therefore, it is reasonable to reach a conclusion of no adverse effects on the integrity of European sites in combination with other projects and plans.

6.4. Other environmental considerations

6.4.1. Biodiversity Net Gain (BNG)

If constructed the A2AT SRO would need to achieve 10% Biodiversity Net Gain (BNG), as required by the Environment Act 2021. Opportunities to enhance biodiversity have been identified, however specific habitat mitigation proposals would need to be set out as the design of the project progressed.

For the purposes of the gate two assessment, a BNG score was calculated for both the Western and Eastern routes, using the methodology agreed with the ACWG.

At this early stage in the SRO process, open data sources were utilised to identify the habitat types present in the study area and a series of assumptions made when assigning habitat condition and strategic significance values.

Based on current calculations, both routes are likely to result in a biodiversity net loss due to the temporary and permanent loss of habitats during construction (-30.4% for the Eastern route and -24.9% for the Western route).

When identifying potential mitigation and enhancement opportunities, the gate two assessment used Natural England's Habitat Network Map to determine interventions that would either enhance existing habitats near to the proposed development or create new habitats with the aim of increasing habitat connectivity. If A2AT is taken forward, mitigation would aim to take account of priorities along the route corridor as set out in:

- Local Nature Recovery Strategies
- Local Plans and Strategies/Action Plans

6.4.2. Natural Capital Assessment

A natural capital assessment was conducted for the Eastern and Western routes for the A2AT scheme.

Following the Water Resources East (WRE) Integrated Environmental Assessment Methodology **[4]**, a materiality assessment was undertaken to determine the impacts and/or dependencies across the following natural capital metrics: climate regulation, biodiversity, natural hazard regulation, water purification, recreation and amenity value, food production and air quality regulation.

The materiality assessment showed that, for both options, most of the impacts across the different metrics are due to habitat clearance. As such, except for climate regulation for which carbon emissions were factored alongside carbon sequestration, the materiality of change for the other metrics was assumed to be moderate or low. This is because lost habitats are assumed to be reinstated, resulting in no change in the future value of the ecosystem services provided.

6.5. Carbon

An assessment of the carbon impact of the selected pipeline options and opportunities to minimise embodied and operational carbon within the selected scheme was undertaken. The assessment is summarised here.

6.5.1. Methodology

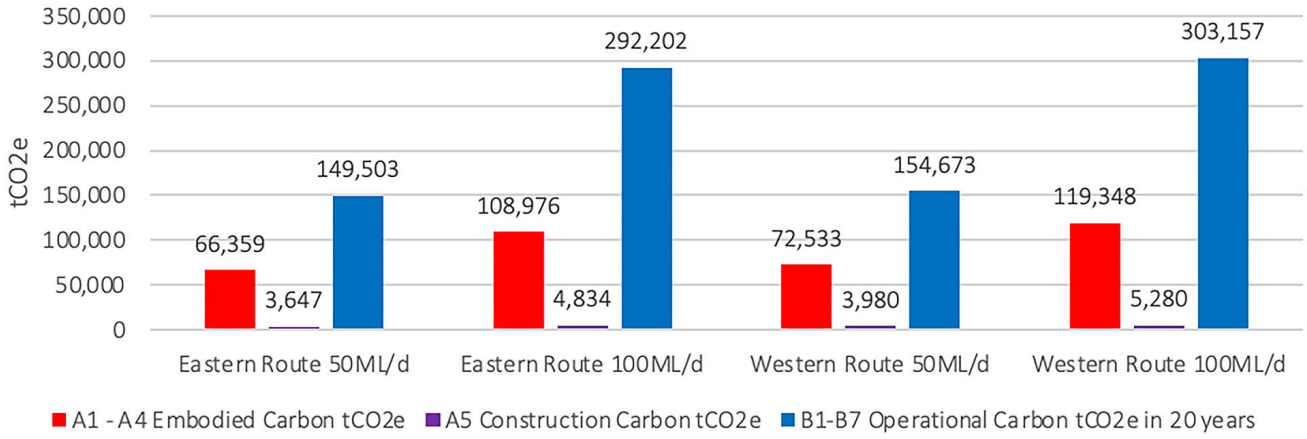
For the selected design routes, a whole life carbon assessment was carried out. The scope of the assessment was based on BS EN 15978:2011 (Sustainability of construction works. Assessment of environmental performance of buildings. Calculation method) stages:

- Before use stage: A1-A5 (A1-A4 Embodied and A5 Construction)
- Use stage: B1-B7 (Operational)
- End of life stage: C1-C4

6.5.2. Results of gate 2 carbon assessment

The results of the gate two carbon assessment are shown in Figure 6 below. The breakdown of capital carbon, construction carbon and operational carbon is provided for both the Eastern and the Western routes. Operational carbon is shown for 20 years, as this is the assumed asset life for pumps. However, it is recognised that the design life for the pipeline is much longer.

Figure 6: Whole life CO2e estimates for Eastern and Western Routes (50 ML/d and 100 ML/d)



[4] Mott MacDonald, 2021. WRE Integrated Environmental Assessment Methodology. Available at: https://wre.org.uk/wp-content/uploads/2021/01/WRE_IEA_Methodology_MottMacDonald_2020.pdf

Embodied carbon

The majority of embodied carbon for all options is associated with the pipework. This means that the largest reductions with respect to embodied carbon would be from reducing the mass of pipe work, i.e., shortening the pipeline route or reducing pipe thickness and/or diameter. Comparing the Eastern route (100 Ml/d) with the equivalent gate one option, the gate two embodied carbon is 30% lower, despite the Eastern route being longer. This is due to differences in material density and carbon factors used.

Construction carbon

Design assumptions have been made at gate two for the construction method, construction timeline, volume of spoil, backfill quantity and vehicle movements. It is recommended that this exercise is repeated as the scheme develops.

Operational carbon

The largest proportion of operational carbon per annum is associated with pumping and chemical dosing. Comparing the Eastern route (100 Ml/d) with the equivalent gate one option, the gate two operational carbon per year is 11% higher. This is due to increased development of pumping and chemical dosing designs. It is assumed that the UK grid is used as a power source for pumping but given Affinity Water and Anglian Water's aspirations to utilise green electricity from the grid, and use of renewable energy, this could be lowered significantly.

End of Life carbon

For the end-of-life stage of this scheme (C1-C4), it is assumed that the pipeline would remain in-situ. Therefore, no CO2 emissions have been associated with the deconstruction phase of the project.

6.5.3. Opportunities for carbon reduction

Consideration has been given to other potential carbon reduction strategies. In descending order of preference these would comprise:

- Build Nothing
- Build Less
- Build Clever
- Build Efficiently

Table 6 below summarises how these opportunities apply to the A2AT scheme.

Table 6: Summary of carbon reduction opportunities

Carbon Reduction Strategy	Typical Carbon Reduction Potential	Aims	Applicability to A2AT
Build Nothing	100%	· Challenge the root cause of the need · Explore alternative ways to achieve desired outcome	Discounted as at least some elements of the SRO scheme are required to secure water for the future.
Build Less	80%	· Maximise use of existing assets · Optimise asset operation and management to reduce need for new construction	· No existing pipe routes between Anglian Water's service reservoir and WRZ5 Hub that can be reused have been identified. · Reusing the pump stations and BPTs at Grafham for the 'Western Route' would not be appropriate as the infrastructure at Grafham would need to be upgraded for the flows associated with the A2AT scheme. New infrastructure (pipes, pump stations and tanks) is necessary. · Reducing the length of pipeline would reduce the embodied carbon of the project; however, other factors such as flood zones, protected areas, rivers, habitats, access, and ease of construction must also be equally considered. The Eastern and Western routes selected have undergone a constraints assessment to optimise the route as far as possible at this stage.

Carbon Reduction Strategy	Typical Carbon Reduction Potential	Aims	Applicability to A2AT
Build Clever	50%	· Use of low carbon materials in design · Streamline delivery processes · Minimise resource consumption	· Pipe material and diameter have been selected to deliver optimum hydraulic conditions (ductile iron has a lower embodied carbon factor compared to steel and high-density polyethylene (HDPE) using the Inventory of Carbon and Energy (ICE) database. It is recommended that at detailed design and procurement stage, the pipeline material is reviewed again, and the most carbon efficient option selected. · Reducing the pipe diameter was considered, however there was an acknowledgement that this decision would increase head losses and increase pumping requirements. · For the Western route, a section of the pipeline, between the BPT and WRZ5 hub, does not require energy for pumping as the elevations allow for gravity flow.
Build Efficiently	20%	· Embrace new technologies · Eliminate waste	· During construction stage, the use of electric plant should be maximised, and local manufacturers should be selected to minimise transport to site. · No-dig construction techniques should be considered to eliminate open cut trenching and backfilling.

Operational carbon

Considerations for reducing operational carbon include the following:

- Variable frequency pumps have been selected for optimum operation, given the varied utilisation of the scheme throughout the year.
- Assuming Affinity Water and Anglian Water succeed in becoming net-zero by 2030, the operational carbon emissions should decrease annually as the partner companies reduce their reliance on the UK grid and increase the update of renewable energy and electric vehicles.
- Solar PV panels and other renewable energy systems have been considered as part of the design of this scheme.

One or more of the above options would be considered if the Peterborough to Grafham transfer continues at gate three.

Offsetting residual carbon

Residual carbon offsetting has also been considered but should only be used as a last resort to tackle residual carbon emissions after the mitigation strategies highlighted above have been implemented.

7. Programme and planning

7.1. Project plan

As outlined in Section 4, the regional modelling by WRE and WRSE did not select the A2AT scheme as a preferred or alternative option in the respective regional plans, and therefore it has not been taken forward in Affinity Water's draft WRMP24. For this reason, Affinity Water and Anglian Water propose that no further work is undertaken on this SRO in its current form after gate two as this would not be efficient use of customers' money in Asset Management Plan (AMP) 7.

Anglian Water proposes instead that a transfer of up to 150 Ml/d from Peterborough to the vicinity of Grafham Water (see Section 2.1) is investigated in future gates as part of the SLR SRO, which is the source of water for the current A2AT scheme. Affinity Water supports this proposal which would allow Anglian Water to transfer water from the proposed SLR to the south of its supply area and enhance water resource capacity in this location.

An indicative project plan has been developed for the delivery of the activities that are planned from gate two through to commissioning. The SLR Development Consent Order (DCO) programme is shown in Figure 7, and reflects the activities required on the transfers. Figure 8 shows the proposed construction schedule for the transfer from Peterborough to Grafham within the broader SLR construction schedule.

In incorporating the Peterborough to Grafham transfer in the SLR SRO programme, Anglian Water would ensure compliance with Section 42 of the Planning Act 2008, which requires all persons within one or more of the land interest categories set out in Section 44 of the Act to be consulted about the proposed application. The proposed statutory consultation in the SLR programme following the identification of temporary land use requirements would mitigate this risk.

Figure 7: Indicative SLR DCO programme (including transfer from Peterborough to Grafham)

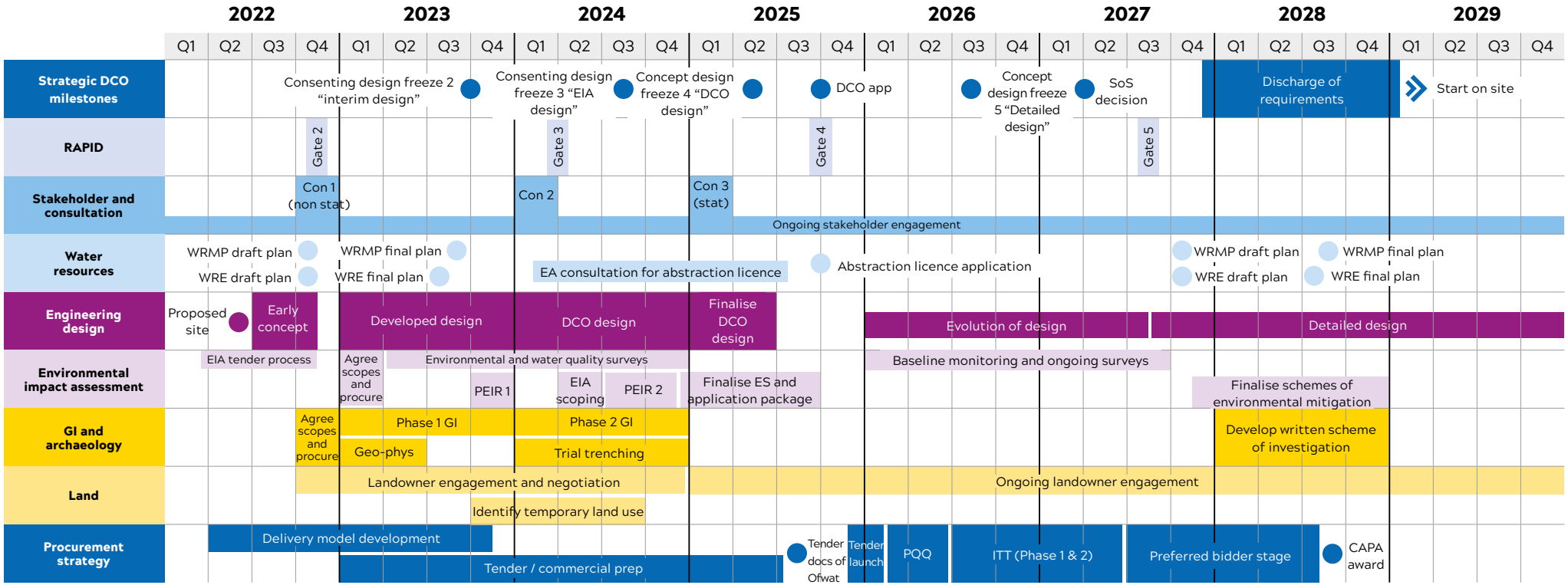
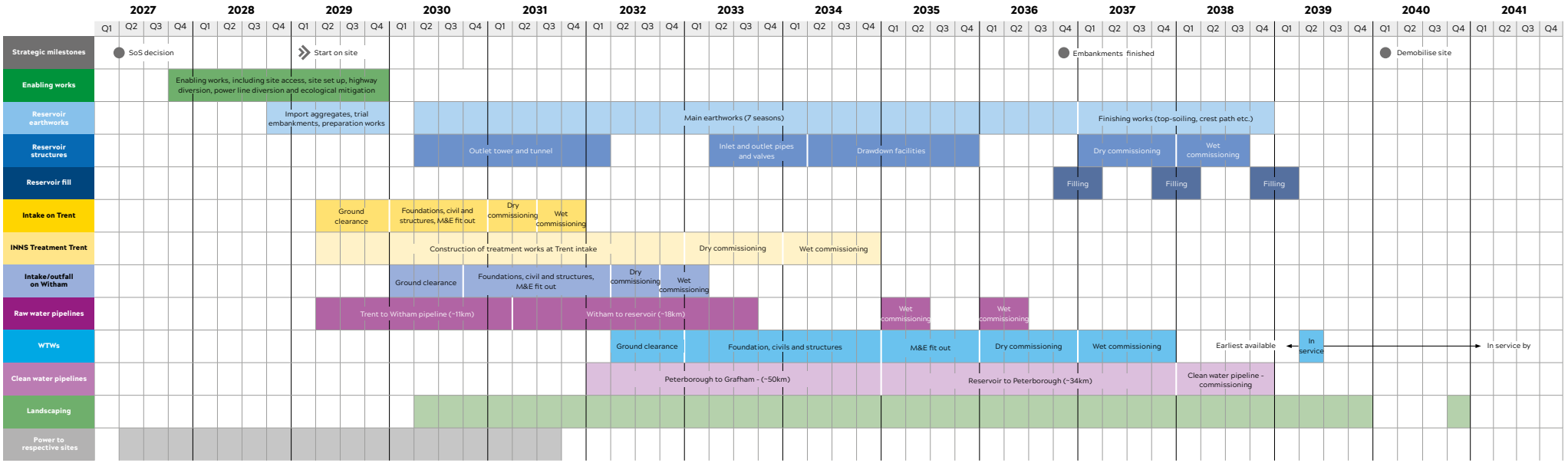


Figure 8: Indicative SLR construction programme (including transfer from Peterborough to Grafham)



7.2. Planning and consenting route strategy

This section presents an outline of the preferred consenting process for the proposed Peterborough to Grafham transfer pipeline (150 Ml/d Western route of the A2AT scheme) only. The consenting strategy has evolved as the project has progressed through the concept design stages. At gate one, it was envisaged that the full A2AT scheme could be consented in one of three ways:

- As an integral part of the SLR DCO application under the Planning Act 2008
- As a separate, standalone DCO application, or
- As a non-DCO project under the Town and Country Planning Act 1990 (TCPA).

The gate two work refined the initial strategy and highlighted areas where further work was needed. Initial consenting work for the A2AT scheme identified that, while the full A2AT scheme would transfer water treated as part of the SLR project, it would not automatically fall within the Nationally Significant Infrastructure Project (NSIP) regime under which DCOs are granted. This is because the NSIP regime does not apply to "drinking water" (potable) transfers, which this transfer would be.

However, if the 150 Ml/d Peterborough to Grafham transfer pipeline continues to be developed at gate three as part of the SLR SRO, Anglian Water intends to bring it into the NSIP regime as "associated development" by virtue of it being an important part of the SLR project from gate three onwards. The decision will be confirmed after gate two, when funding has been confirmed.

Consenting Route Options

In order to identify a suitable consenting route for the Peterborough to Grafham transfer, the consenting options at gate one and identified in the A2AT initial outline consenting strategy were reconsidered.

- Under Section 28 'Transfer of water resources' **[5]** of the Planning Act 2008, the qualifying threshold set out does not apply to the transfer of drinking water. This restriction was identified by the A2AT initial outline consenting strategy and applies to the Peterborough to Grafham transfer, preventing it being consented under DCO. Furthermore, the transfer would automatically not qualify as an NSIP because it would not enable the transfer of water resources between river basins or water undertakers' areas, since it would sit wholly within both the Anglian River Basin District and Anglian Water's supply area. This option is unavailable.
- The above notwithstanding, under Section 35 'Directions in relation to projects of national significance' **[6]** of the Planning Act 2008, Anglian Water could make a request for the Peterborough to Grafham transfer to be treated as "development for which development consent is required in its own right", thereby enabling consent to subsequently be sought via a DCO if successful. However, Anglian Water understands that it would be difficult to make a compelling case that the transfer as a standalone scheme is of national significance. Therefore, this option has little chance of succeeding and was not considered further.
- Water companies have extensive permitted development rights, including for most works that fall below ground. However, the above ground components would mean that the transfer as a whole would be unlikely to qualify as permitted development. In addition, as identified by the A2AT initial outline consenting work, permitted development rights are not available if a project falls within the scope of Schedule 1 or 2 of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (thereby comprising 'EIA development'). For these reasons, use of Anglian Water's permitted development rights would not be a suitable consenting route for the Peterborough to Grafham transfer, and the option was not considered further.

Two consenting routes remained available for the Peterborough to Grafham transfer:

1. Consent for the transfer as a standalone scheme, via a conventional planning application under the Town and Country Planning Act 1990 ('Option 1 - Standalone TCPA Application'); or
2. Consent for the transfer as 'Associated Development' to the SLR SRO scheme, via an application for development consent under the Planning Act 2008 ('Option 2 - Associated Development via the SLR DCO').

Irrespective of the chosen consenting route, an EIA will be required. The more comprehensive consultation process under the DCO regime, which also requires the production of Preliminary Environmental Information ("PEI") would likely make the DCO a more labour intensive and onerous route to consent. Well-resourced and focussed route selection and concept design development will be required regardless of the consenting route, to ensure that risks around environmental impact assessment and compulsory acquisition would be appropriately managed, particularly in respect of the consideration of alternative routes, to help ensure consent is successfully granted for the Peterborough to Grafham pipeline route.

[5] https://www.legislation.gov.uk/ukpga/2008/29/section/28
[6] https://www.legislation.gov.uk/ukpga/2008/29/section/35

Recommended Consenting Route

The key benefits and disbenefits of the two available consenting routes were assessed and compared. Option 2 (Associated Development via the SLR DCO) presents the most appropriate route for the following reasons:

- It represents a more streamlined and efficient approach to presenting and assessing the proposals, which is likely to be more readily understood by stakeholders and local communities and requires consent from a single decision-maker (the Secretary of State) as opposed to several different local authorities (which is the case for Option 1 - Standalone TCPA Application).
- It is likely to be more cost effective given that the SLR DCO is proceeding and would enable simpler and more efficient project team organisation and ways of working.
- Assuming the draft National Policy Statement for Water Resources Infrastructure is designated in advance of the DCO application, the National Policy Statement will provide a clear framework for decision-making, increasing certainty and reducing the risk of the SLR (including the Peterborough to Grafham transfer) being refused on the basis of local impacts without consideration of the wider national benefits.
- A DCO can tie together several different permissions/consents/licences and can include powers of compulsory land acquisition, which is likely to result in efficiencies during the construction stage.

7.3. Key risks and mitigation measures

For the A2AT scheme the partner companies have considered risks across the project at two levels. First, Affinity Water and Anglian Water developed a qualitative risk register, which is used to record, track and manage pre-construction phase risks. This risk register has informed the quarterly reporting to RAPID.

For gate two, the Affinity Water also developed a detailed, costed risk register, which has been used to help derive estimates of construction phase financial risks. This section includes the qualitative risk register only, which is presented in Table 7.

Table 7: Risk register - key risks and mitigation

Risk Theme	Details	Risk Pre-Mitigation			Proposed Mitigation	Risk Post-Mitigation		
		Probability	Impact	Risk		Probability	Impact	Risk
Procurement and Commercial	Economic inflation means G1-G5 budget is insufficient. Economic inflation post G5 means market pricing exceeds current forecasts resulting in project funding being outside of governance	5	4	Very High	Ongoing engagement with RAPID to ensure budget is sufficient. Budget to include contingency for additional cost due to price increases, informed by expert market intelligence. Consideration will be given to establishing longer term relationships with contractors/delivery entities, possibly through careful design of the early contractor involvement mechanism	4	4	High
Planning	A public enquiry on WRMP24 submissions may result in delays in publishing Final WRMP24 and potential delays in consenting application	5	4	Very High	Consenting programme and approach to consultation to be developed to accommodate this risk.	4	4	High
Programme	Unfavourable ground conditions during construction causing programme delays and increased costs.	4	4	High	Appropriate level of ground investigation work to be undertaken as part of gate three design. Experts to take account of local knowledge when developing designs. Contingency allowed for additional cost due to delay and redesign	3	4	High
Programme	Archaeological finds during construction lead to construction delays and increased costs	4	4	High	Design to avoid known archaeologically rich zones. Ensure robust written scheme of investigation is compiled and agreed with all stakeholders and diligently followed. Allow contingency for additional cost due to delay and redesign	3	4	High
Planning	Failure of the SLR to secure consent through DCO application. The case for the A2AT is highly dependent upon the delivery of a new source by Anglian Water.	4	4	High	Ongoing monitoring of progress with supporting SROs and with WRMP24. Progress feasibility investigations for preferred options, but plan for adjustment of scope should source of water need to change during scheme promotion	4	3	Medium
Design	Existing network may not be capable of receiving additional import, making transfer unviable.	4	3	Medium	Connect 2050 project was initiated to look at how the network should evolve to accommodate the SROs. Outputs fed into the gate two analysis	2	3	Medium
Design	Risk that assumptions around water quality of source of the transfer may prove incorrect. The degree to which SLR water will be blended with water coming from other parts of Anglian Water's network at Etton Service Reservoir refer to Peterborough	3	3	Medium	The conditioning plant at Sibley has been designed as a 'worst case' scenario. The exact treatment process at the delivery point will be reviewed and, if needed, revisited as the scheme progresses through future gates	2	3	Medium

Risk Theme	Details	Risk Pre-Mitigation			Proposed Mitigation	Risk Post-Mitigation		
		Probability	Impact	Risk		Probability	Impact	Risk
Programme	Best value assessment for the scheme is not adequate given the cross-regional nature of the proposed transfer. This risks undermining both the regional plans and the SRO submissions	4	3	Medium	A bespoke iterative assessment has been undertaken to evaluate the A2AT within both WRSE and WRE, the results of which have been adopted by the inter-regional reconciliation process	2	3	Medium
Programme	Regional plans from WRE and WRSE are not aligned with regard to selection of SROs across the regional plans	4	3	Medium	Ongoing monitoring of progress with the inter-regional alignment process	3	3	Medium
Programme	Modelling for final regional plan shows different option selection and shows that A2AT is more cost effective or more beneficial than alternative SROs. This may result in our approach to gate two and gate three not being adequate.	2	4	Medium	This risk is being managed by close liaison with the WRSE and WRE regional teams, as well as each company's WRMP24 process	1	4	Low
Programme	Proposed approach to gate three is not agreed with RAPID	2	4	Medium	Early engagement with RAPID before gate two submission lands	1	4	Low
Planning	Risk that proposed consenting, consultation, environmental impact assessment and procurement activities become misaligned with the RAPID gates, giving rise to the risk of ineligible expenditure or programme delay.	4	2	Medium	Carefully scoping gate activities so that they align with the delivery schedule, rather than the gated process driving delivery milestones, and reaching prior agreement of the gate activities with RAPID.	4	1	Low

Probability	**Impact**				
	1	2	3	4	5
5	Medium	Medium	High	Very High	Very High
4	Low	Medium	Medium	High	Very High
3	Low	Low	Medium	High	High
2	Low	Low	Medium	Medium	Medium
1	Low	Low	Low	Low	Medium

7.4. Proposed gate three activities and timelines

The original A2AT scheme is not proposed to continue beyond gate two. However, Anglian Water is proposing that the 150 Ml/d Peterborough to Graham transfer proceeds in gate three and is absorbed into the SLR SRO. The proposed timeline for the transfer is shown in Figure 8.

The proposed gate three activities are summarised below:

- Project management
- Planning
- Stakeholder engagement
- Environmental assessments
- Scheme design, including ground investigations and refinement of gate two designs to a sufficient level for DCO pre-application.
- Land referencing
- Legal input

7.5. Procurement, ownership and operation

This section sets out the eligibility for competitive delivery of the full A2AT SRO, the commercial strategy and the procurement strategy. It provides a summary of the option development and analysis undertaken as part of gate two. This work has focused on the ownership, commercial, regulatory, procurement and legal arrangements and activities for the delivery of A2AT.

7.5.1. Eligibility for competitive delivery

This sub-section sets out an assessment of the suitability of the A2AT for delivery under Direct Procurement for Customers (DPC) and Specified Infrastructure Project Regulations (SIPR). **[7]**

DPC eligibility framework and assessment

At PR19, Ofwat set out three tests - size, discreteness, and Value for Money (VFM) - for eligibility for DPC; the initial methodology for PR24 proposed updates to those tests.

Overall A2AT appears to be suitable for delivery via DPC. A2AT as an entire scheme meets the size threshold, is broadly discrete (different components are varying degrees of discrete) and offers benefits for customers when Ofwat's standard assumptions are used. Three factors require further consideration:

- Limitations of DWI enforcement powers as noted by Ofwat in relation to water conditioning; **[8]**
- Potential financial implications (including the credit rating impact) of the A2AT for the project promoter (Affinity Water and Anglian Water) if delivered via DPC;
- The potential credit counterparty risk due to the scale of the project promoter (Affinity Water and Anglian Water) relative to the A2AT.

SIPR conditions and assessment

SIPR was introduced in 2013 to deliver Thames Tideway Tunnel (TTT). Projects which meet the two SIPR conditions (size and complexity, and VFM) are eligible for competitive delivery. There is no formal threshold or further guidance regarding the size or complexity of a project which would threaten an undertaker's ability to provide services for its customers. **[9]**

TTT is the only designated project under SIPR **[10]** and was used as a benchmark to establish an indicative threshold as to whether the A2AT is suitable. A summary of the detailed assessment of the project characteristics is presented below:

1. Size and complexity

- Scale risk - A2AT relative to the project promoter's size represents a significant concentration of risk and is comparable with TTT. This is exacerbated when considered alongside SLR.
- Construction risk - construction of a treated water transfer is a normal business activity for an appointee.
- Management risk - A2AT would be a very large project for the project promoter and the key challenge would be driven by scale rather than complexity.
- Regulatory risk - project could likely be delivered within an AMP using standard regulatory mechanisms.

2. VfM - potential savings to customers, based on TTT decision analysis, is likely to apply in the context of SLR.

Overall, the A2AT scheme seems reasonably suitable to be delivered under SIPR in terms of scale and VFM but it may not be sufficiently complex. Further consideration of packaging and sequencing of A2AT alongside SLR is required given that the SLR is the water source for the A2AT.

---

[7] It is worth noting that A2AT was considered entirely separately from SLR as part of this analysis and the assessment considers both the western and eastern routes.
[8] https://www.ofwat.gov.uk/publication/competition-in-strategic-investment-a-high-level-stocktake/
[9] Note that Ofwat recently recommended the size and complexity condition is removed under SIPR.
https://www.ofwat.gov.uk/publication/competition-in-strategic-investment-a-high-level-stocktake/
[10] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/317558/TTTP-reason-notice-ldmsig.pdf

7.5.2. Commercial strategy

This section summarises the detailed work done to date on the emerging commercial strategy covering the assumed operating arrangements, commercial considerations and stakeholders, delivery model options and evaluation, tender model and contractual risk identification and allocation.

Operating arrangements

The operating arrangements used to develop the emerging commercial strategy are set out in Section 7.5.1 above.

Commercial considerations and stakeholders

The emerging commercial strategy takes account of:

1. Regulatory expectations of competitive delivery;
2. The potential for system opportunities;
3. The various stakeholders involved in agreeing the arrangements.

Given this complexity a bespoke commercial strategy and delivery model is required.

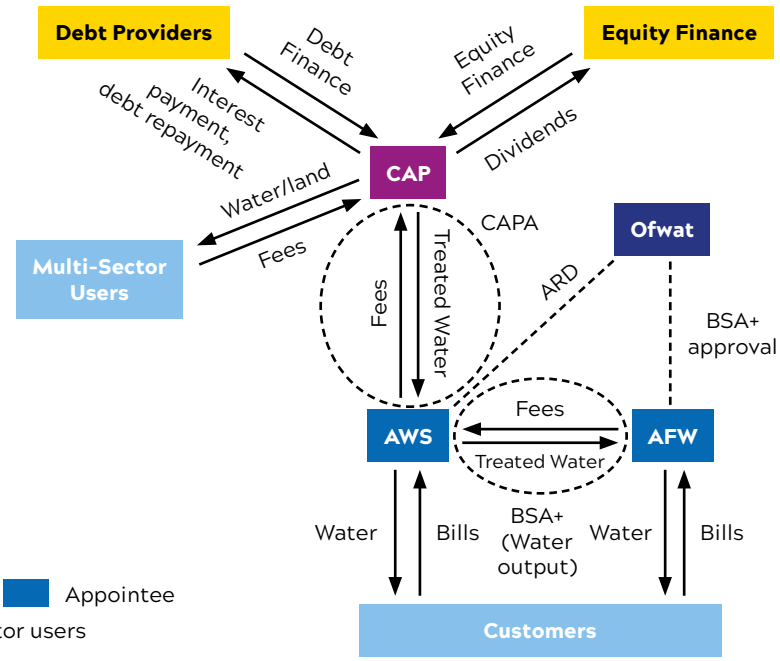
Delivery model

As part of the detailed work to develop the delivery model for A2AT, nine key commercial dimensions, and options within each dimension, were identified based on regulatory and procurement precedents. For the purpose of gate two analysis, six potential delivery model options were developed for A2AT.

Two examples of delivery model options, 3 and 6, are presented in Figure 9 and Figure 10 for illustrative purposes.

Figure 9: Delivery model option 3

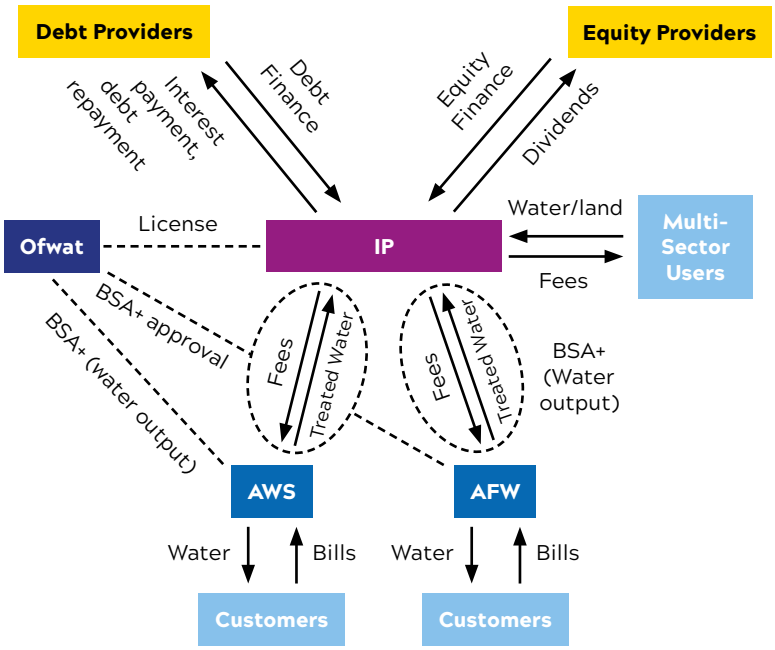
Model dimension	Selected option
Packaging	Single project
Applicable regulations	DPC
Contracting arrangements	· CAPA between AWS and CAP for treated water outtake from CAP to AWS · BSA+ between AWS and AFW for treated water export from AWS to AFW
Finance raising party	CAP
Financing recovery model	Tender Revenue Stream
Regulatory allowance	ARD to AWS BSA+ approval to AFW



Under delivery model 3, the treated water transfer, the conditioning works and all other infrastructure would be delivered by a competitively appointed provider (CAP). The project promoters will agree a bulk supply agreement (BSA) to facilitate the trade of water as the funding for the infrastructure and the commodity will be set out in different arrangements. All delivery risk would be passed to CAP.

Figure 10: Delivery model option 6

Model dimension	Selected option
Packaging	Entire solution packaged as a single project (bundled reservoir and Water Treatment Works)
Applicable regulations	Specified Infrastructure Project Regulations (SIPR)
Contracting arrangements	· Project License from Ofwat to Infrastructure Provider (IP) · BSA+ between IP AWS/AFW for treated water outtake from IP to AWS/AFW
Finance raising party	IP
Financing recovery model	Bid RCV and bid WACC
Regulatory allowance	Regulatory allowance awarded to IP via license; Pass-through allowance awarded to AWS/AFW



Finance providers | Project owner | Appointee | Regulator | Customers/multi-sector users

Delivery model 6 is comparable to option 3, with the exception that the CAP would be awarded a Project Licence instead of a DPC contract. The infrastructure provider (IP) may be able to use powers under the licence to carry out construction and maintenance in terms of land access.

Risk identification and allocation

A detailed bottom-up assessment has been undertaken of all relevant risks for A2AT which will require allocation under the contractual arrangements. Eighty-eight risks were identified and tested with internal experts across five stages: feasibility and design, procurement, construction, operations and termination and quantified (impact and likelihood). Initial views of risk mitigation strategies were then developed based on construction and operational experience and these were then allocated between stakeholders.

This analysis will support the development of the commercial model such as pain/gain sharing, which costs can be fixed, efficient risk allocation and incentivisation. Annex F sets out an example of the output from the analysis for the construction stage.

7.5.3. Procurement strategy

This section summarises the work to date on the procurement strategy for A2AT assuming delivery under either SIPR or DPC. It covers the tender model, pre-tender activities, the tender process stages (including procurement route) and market engagement. At this stage Affinity Water and Anglian Water have not considered in detail the potential differences between a SIPR or DPC tender.

Tender model

The tender model refers to the handover point in the competitive process from the Appointee to the CAP. The very early and early models were discounted as they do not align with the funding and activity timeline for RAPID. Implementing either could create scope for design innovation but would add significant delays to the overall programme. The very late model was discounted on the basis that it would still result in significant financing, regulatory and managerial issues associated with construction. The late model is the current preferred tender model for the A2AT.

A split model (a variation of the late model), where the construction and finance contracts are tendered separately, could be employed to manage risk or maintain competitive pressure and has not been discounted.

Pre-tender

Pre-tender activities for A2AT sit across four key workstreams:

- **Regulatory submissions** - RAPID gates and Ofwat control points;
- **Commercial** - the full development of the contracting arrangements, contractual mechanisms, trading arrangements, negotiation with stakeholders and development of a shadow bid financial model;
- **Tender** - the development of bid evaluation criteria, governance and process design, scenario testing and bidder guidance; and
- **Stakeholder** - engagement with regulators, key public bodies, internal stakeholder engagement (e.g., water resource and regulatory teams) and the market to test and shape the commercial and tender arrangements.

Annex F presents the initial detailed assessment of activities required to prepare for a DPC or SIPR tender of A2AT.

Tender process

The initial tender process for A2AT was developed in alignment to the RAPID programme. This assumes either a late DPC or SIPR tender and does not draw out the differences between those two delivery models. It builds on comparable tenders including Middlegate DPC, Haweswater Aqueduct Resilience Project (HARP) DPC, PFI, the Early Competition Plan (ECP) in electricity onshore transmission, Offshore Electricity Transmission (OFTO) and Thames Tideway Tunnel (TTT) as precedents. It also assumes that a similar gated process to the DPC control point process would be in place for SIPR. The key interdependency in the process with the RAPID programme is the DCO award, discharge of conditions and the preferred bidder stage.

Assessment of the different procurement procedures available under the Utilities Contract Regulations (UCR) 2016 has also been assessed. All options have benefits and limitations and are suitable to different commercial and tender approaches. These will be explored in more detail and a preferred option selection as part of gate three.

Annex F presents the initial detailed assessment of activities required to run a DPC or SIPR tender for A2AT.

Market engagement

As part of the early market engagement, fourteen Tier 1 constructors who operate in the UK market, or are considering entering, were engaged. The aim was to discuss the capacity and competition in the market, how recent macro-events such as Covid19, Brexit and inflationary pressures have impacted their attitude to risk and the application of cost plus, lump sum and target cost contracts. Further formal and informal market engagement is planned to continue if the A2AT project progresses.

8. Solution costs and benefits

This section summarises the methodology and results of the costing assessment for A2AT. The assessment has been undertaken in compliance with the ACWG methodology on cost consistency. The methodology provides guidance on the use of a Quantitative Costed Risk Assessment (QCRA) and the application of Optimism Bias (OB). Costs are presented for both the Western and the Eastern routes, for the 50 Ml/d and 100 Ml/d capacities associated with the original A2AT SRO, as well as the 150 Ml/d proposed Peterborough to Grafham transfer.

8.1. Solution cost estimates

The International Cost Management Standard (ICMS) structure has been adopted to provide a single structure for reporting, grouping, and classifying construction costs. This enables the cost data to be easily benchmarked against other projects which also use the ICMS structure. The Association for the Advancement of Cost Engineering (AACE) International cost estimate classification system has been adopted. The gate two cost estimate is a Class 4 estimate under this system, meaning it is suitable for project screening and determination of feasibility options. It also enables reliable risk estimation using the accuracy ranges provided.

Cost estimates for Capex, costed risk, OB and Opex are presented in Table 8 and Table 9. The Capex and Opex costs use 2021/2022 cost base data and are based on Affinity Water's cost models.

The costs range from £276 m to £467m depending on the chosen route, inclusive of costed risk and optimism bias. The costs for the 150 Ml/d route are not directly comparable to the other routes, as it is much shorter (Peterborough to Grafham).

Table 8: Capex Cost Estimates (2020/2021 base date)

	Eastern Route		Western Route		Peterborough to Grafham section only
	50 Ml/d	**100 Ml/d**	**50 Ml/d**	**100 Ml/d**	**150 Ml/d**
Base Capex	£242.8m	£320.4m	£261.1m	£345.5m	£198.6m
Development and Design Costs	£21.6m	£28.2m	£23.4m	£30.5m	£18.1m
Costed Risk	£14.1m	£14.1m	£16.5m	£16.5m	£16.5m
Optimism Bias	£52.1m	£68.6m	£56.0m	£74.0m	£42.7m
Total G2 Capex	**£330.6m**	**£431.3m**	**£357.0m**	**£466.5m**	**£275.9m**

OPEX cost is broken down by the same routes, assuming 100% or 25% utilisation of the transfer capacity.

Table 9: Opex Cost per Route (2020/2021 base date)

	Eastern Route		Western Route		Peterborough to Grafham section only
	50 Ml/d	**100 Ml/d**	**50 Ml/d**	**100 Ml/d**	**150 Ml/d**
100% Utilisation per annum	£2.4m	£4.3m	£2.5m	£4.5m	£4.9m
25% Utilisation per annum	£1.4m	£2.4m	£1.4m	£2.5m	£3.3m

Detail of capital expenditure

The costs summarised in Table 8 can be broken down by activity and referenced to the proposed programme. 15 months was assumed for procurement and further design prior to the construction period commencing. The estimates are based on the level of design available at this stage of the route development. It is recommended that the profiles are revisited if the designs are altered at any stage in the future, as well as prior to engaging with the market should the scheme be selected for construction.

Detail of operating expenditure

Opex for the pumping stations as well as the chemical plants was calculated using consumption estimates obtained from the engineering team. Affinity Water rates for energy, people and chemicals supplied were applied as part of the overall cost models.

Net Present Cost for all routes

Net Present Value (NPV) and Average Incremental Cost (AIC) have been estimated for both the Eastern and Western routes using the ACWG standard methodology, which is based on HM Treasury Green Book guidance, with a declining schedule of discount rates and an 80-year assessment period. Estimates for the NPV and AIC are given in Table 10.

Table 10: NPV and AIC values per route.

Description	Units	Eastern Route		Western Route		Peterborough to Grafham section only
		50 Ml/d	100 Ml/d	50 Ml/d	100 Ml/d	150 Ml/d
CAPEX	£m	264.39	348.60	284.52	376.00	216.66
OPEX	£m/y	2.40	4.31	2.48	4.48	4.90
Costed Risk	£m	14.14	14.14	16.50	16.50	16.50
OB	£m	52.06	68.63	56.02	74.03	42.66
NPV (Capex)	£m	424.65	557.65	458.57	599.35	295.88
NPV (Opex)	£m	59.05	106.26	61.00	110.39	120.62
AIC	p/m^3	120.4	82.6	129.3	88.3	39.6

*Western Route 150 Ml/d capex and AIC values are lower as this route ends at Grafham and does not continue to Affinity Water, meaning it is much shorter than the other four route options and therefore cannot be compared directly with the other routes.

Optimism bias

Optimism Bias has been calculated in accordance with the UK Treasury Green Book Guidance and is applied in conjunction with costed risk. It is essential to ensure that OB is used to calculate the overall level of confidence that exists at this stage of scheme design once base Capex and known threats have been addressed to ensure that double counting does not take place. The partner companies have followed the ACWG template and methodology for calculating OB. Opex risk has not been included at this stage.

Assumptions

The key assumptions used to produce the current estimate are summarised below. Most of the assumptions are to be expected due to the current design maturity stage and the level of information available.

- Actual cost for pumping stations is taken from Affinity Water's cost models which only contain data for pumping stations up to 2,000 kW. Where models have been used for pumping stations exceeding this value, the results have been benchmarked to ensure that the resulting estimates are acceptable for this stage.
- Pumping station rates include the building works but excludes tanks and vessels.
- The rate used for surge vessels assumes that 30% of supply cost will be necessary for installation
- Standard 7% added to the rate for open cut mains replacement to allow for traffic management and road replacement at road crossings.
- A standard width of 5 m assumed for all road construction, and a standard crossing length of 100 m.
- All excavation is assumed to be in acceptable material of Class 5A standard using back actors and tractor loaders. Disposal of material is assumed to be no more than 5 km from site
- The rate used for chemical compound construction includes the construction of the buildings as well as the plant and equipment that they contain. Detailed measurement will be possible when the design is more mature.
- Cost estimates do not include any allowance for financing cost based on the WRMP24 guidance; however, life spans for all relevant assets were included.

8.2. Best value and solution benefits

The WRSE and WRE Best Value Plans have been derived using the published methodology and metrics **[11]**. The outcomes of the respective best value planning assessments, as well as the inter-regional reconciliation process, have been translated into Anglian Water's and Affinity Water's latest WRMP24 which are due for publication in 2024.

The Affinity WRMP confirms that the A2AT solution is not included in either the preferred plan or any of the viable alternative plans. Other SROs, namely Thames to Affinity transfer (T2AT) and Grand Union Canal (GUC) transfer, are selected in preference to the A2AT. This outcome is the result of the iterative process illustrated in the following paragraphs.

Firstly, A2AT was modelled in the WRSE investment model to assess the option selection within the WRSE Best Value Plan context. None of the model runs carried out by WRSE selected the A2AT in any of the situations that have been explored. This included sensitivity analysis in which more favourable assumptions around the SLR were tested.

[11] https://www.wrse.org.uk/media/sy1bu4to/method-statement-best-value-planning.pdf

Secondly, the process of inter-regional reconciliation involved specific assessments to understand the impact on WRE if the region transferred additional water to Affinity Water via the A2AT. This assessment was carried out using the WRE system simulator and its Best Value Planning framework. Through this assessment, it was determined that the A2AT would have a detrimental impact on WRE's Best Value Plan, particularly in regard to cost-effectiveness and environmental performance. The marginal effect of an export to Affinity Water would result in WRE needing to construct more desalination options to offset the loss of water from an export. This would significantly increase the economic and environmental cost of the export to WRSE, which would in turn make the A2AT less competitive.

As none of the WRSE model runs selected the A2AT, and the additional WRE analysis showed the impact on the WRE's plan, and in turn that there would be an additional effect on WRSE's plan, there is a strong case against further development of the A2AT as a preferred or alternative solution to meet forecast future deficits in Affinity Water's supply area.

However, Anglian Water's draft WRMP confirms that water from the SLR is required to be transferred further south than Peterborough, within the Anglian Water region.

Currently the scope of the SLR SRO includes a transfer to Peterborough in the Anglian Water region. Peterborough was likewise the source or starting point of the A2AT SRO. As Anglian Water has identified the need for the water to be transferred further south into the Ruthamford region and specifically to Grafham, it is proposed that the scope of the SLR SRO is extended to include a transfer, or transfers, further into the Ruthamford region, including to Grafham. This scope extension, would include further investigation of the Peterborough to Grafham section (or "northern section") of the A2AT solution that has been progressed to gate two.

Anglian Water has assessed the options for extending the scope of the SLR SRO, to include progressing the northern section of the A2AT. The company has taken financial, planning and legal advice on the relative merits of each of the options. While there is still a degree of uncertainty over the exact required capacity, the A2AT gate two development work assessed a capacity of 150 Ml/d. However, it is unlikely that a transfer of this capacity, all the way south to Grafham, would be needed. As the Anglian Water WRMP is finalised, and the solution is developed to gate three, the scope will be refined.

9. Stakeholder and customer engagement

9.1. Approach to engagement

The partner companies developed the approach to engagement in line with RAPID's guidance for gate two. Affinity Water and Anglian Water have built on the foundation of stakeholder and customer feedback received prior to gate one, activities completed through gate one, the representations made to RAPID on gate one and direct feedback from RAPID and other regulators.

It is important for clarity, consistency, and efficiency that the engagement activity to inform the development of the SROs is coordinated with dialogue on the regional plans, company WRMPs and company PR24 Business Plan submissions. The customer and stakeholder engagement activities have been undertaken on that basis, to ensure there is a flow of insight through the process as illustrated in Figure 11.

Figure 11: Insight flow from customer and stakeholder engagement

Affinity Water and Anglian Water committed to working openly and transparently, and have achieved this by:

- Sharing information and providing regular updates to regulators, on the programme of work and the studies underway and giving them opportunity to comment.
- Working with regulators as part of the technical working groups to jointly define the scopes of work and technical methods, and to provide the outputs for technical assessments for review and challenge at an early stage of work.
- Sending a letter to all potentially affected Local Planning Authorities to present the solution and invite feedback on the proposal
- Raising awareness of the challenge for water resources management, the planning process and opportunities to contribute to and shape long-term plans at a formative stage.

9.2. Engaging stakeholders

The engagement of stakeholders at gate two has taken two main forms:

- Activity to inform the development of the WRSE and WRE regional plans, to ensure stakeholders understand how the A2AT fits within the strategic planning framework
- Engagement with regulators on the scheme itself, to inform the feasibility assessments and conceptual design of the scheme.

9.3. Regional engagement

WRSE consulted extensively on its regional plan in which the A2AT was considered. Over 1,150 written responses to the consultation were received, and a response document **[12]** was published in May 2022. The response document summarised the consultation responses, highlighted the main themes and issues raised and provided WRSE's consideration of the points and resulting actions.

The main concerns raised in the consultation on the emerging plan in relation to A2AT were:

- **Water Quality** - the DWI highlighted water quality risks and issues associated with raw water and potable water transfer options. For raw transfers, the scheme had to consider the upstream risks and whether mitigation is required at the receiving location. For both raw and potable transfers, the risk of associated changes to taste or perceived taste, existing and emerging contaminants, and potential network impacts from corrosivity were highlighted.
- **Wider environment -** Natural England advised caution around relying on transfers or imports from other regions, especially as other regions have their own environmental constraints. It advocated every effort being taken to minimise reliance on water from other regions and more efficient use of the water resources within the region.
- **Resilience** - queries were raised about the long-term resilience of transfer options in general. Some concerns were expressed that environmentally damaging options might be required in a source area to enable supplies to continue to another area, and how acceptable this is. The financial and environmental costs of pumping water long distances were also highlighted, with some respondents considering that long distance pipelines and transfers should be avoided.
- **Carbon costs** - lack of detailed information about the carbon impacts of proposed transfers and details on how this would be offset and mitigated, including the cost of doing so. Respondents requested the publication of information to enable the whole life cycle, embodied and operational carbon emissions of individual options to be understood.

9.4. SRO-focused engagement

Affinity Water and Anglian Water's engagement on the SRO process has been consistent throughout gate two. This has built on the gate one engagement with regulators and strategic stakeholders, and comprised meetings with regulators, as well as activity to support WRSE and company engagement. The outputs and review comments received from as part of this process have been used to shape the scope, the assessment and initial mitigation measures developed for the preferred A2AT working solution at gate two.

Monthly update meetings have been held with RAPID to discuss the programme, outputs, risks and issues. Technical workshops with the NAU were set up when needed, the purpose of which was to enable collaborative working with regulators and stakeholders who had specialist knowledge or a defined stake in the respective topic areas.

The partner companies also wrote to all the local authorities along the proposed routes in February 2022 to update them on their plans and investigations going forward. The letter adopted a proportionate approach to stakeholder engagement, balancing the need to inform potentially affected local authorities with ensuring that cost for this SRO remained efficient and that the routes were indicative. For this reason, and in light of the fact that this scheme is not selected in any WRMP, the partner companies decided against holding additional stakeholder workshops or events dedicated to the A2AT.

9.5. Wider company engagement

Affinity Water continues to host (jointly with Thames Water) a regular Water Resources Forum which is open to all interested stakeholder organisations. The purpose of the Forum is to update stakeholders on progress in developing the WRSE regional plan, and in turn company WRMP24s, and to share information at a formative stage to enable stakeholders to participate in the process. Three Forums were held during gate two: in November 2021, February 2022 and June 2022.

9.6. Engaging customers

Affinity Water and Anglian Water have worked collaboratively with other water companies to ensure a consistent and efficient programme of customer engagement to support the development of all the SROs. Where practicable, the partner companies have utilised regionally-led work and assessments while for other areas 'club' projects with other SRO teams have been formed, maximising the expertise across the companies.

A high-level summary of the gate two customer work is shown in Table 11 (full details are provided in Annex G.

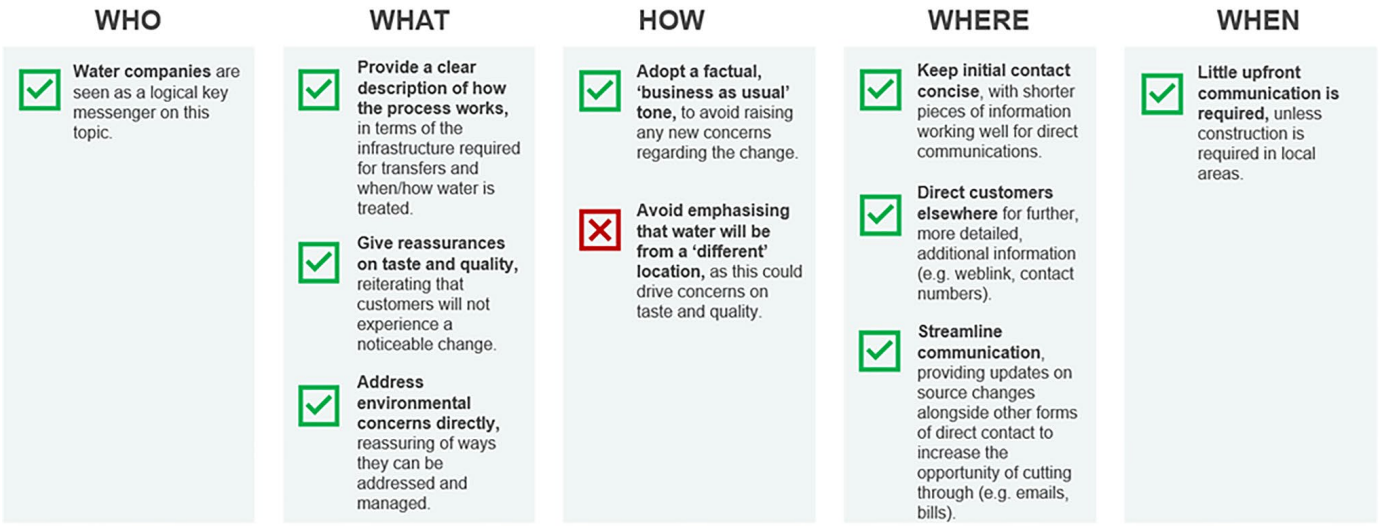
[12] WRSE Emerging Regional Plan: Consultation Response Document, May 2022. Available at: https://www.wrse.org.uk/media/wbdj0jdd/wrse-emerging-regional-plan-consultation-response-document-may-2022.pdf

Table 11: Gate two Customer engagement summary

	WRSE Best Value	Club Project: Public Value	Club Project: Changing Water Sources
What did it test?	Over 300 household customers were engaged to explore their preferences regarding the best value criteria.	Over 5,900 household customers, and more than 550 non-household customers, were engaged to understand the added value our customers perceive is important as part of infrastructure development, their preference for that benefit, and how much they are prepared to pay for it.	96 customers (qualitatively, including product testing), 1,400 customers and 200 non-household customers (quantitatively) were engaged to understand views on changing their water source. This included the co-design and testing of a communications framework.
Main conclusions	Customers place more weight on the delivery of a secure supply of water, followed by the cost of environmental improvements, with resilience placed on the lower end of the scale.	In both the qualitative and quantitative work, environmental project additions were valued highly. There was high emotional resonance with the narrative of supporting wildlife/ new wetlands/habitats, consistent across all participating customers. The top three most highly valued project additions by households near a transfer were: · "Space provided for sustainable agriculture" (average £2.36 annually). · "Wildlife viewing platform/ bird watching facilities" (average £2.32 annually). · "A quarter of employees are local" (average £2.30 annually).	The "human" frame was deemed the best for overall communication. As this is a low-salience topic, a breadth of materials needs to be available to help inform customers.

The outputs of the customer work were fed directly back to the technical teams to help them prioritise and develop the design of the scheme for the subsequent phases of investigations. The key communication implications for the scheme moving forward are summarised in Figure 12 below.

Figure 12: Key Communication Implications



9.7. Challenging our approach

The process of collaboratively delivering Affinity Water's customer engagement activity has been driven through the WRSE Engagement and Communications Board (for regional work) and steering groups formed by the SRO companies for each project. Affinity Water has benefited from a wide range of expertise within the company's insight, regulation, and water resources teams to help the design and development of the engagement activities, ensuring both best practice and alignment to wider activities which inform the PR24 business planning activities. The work was delivered by independent market research agencies compliant with the Market Research Society (MRS) code of conduct.

In addition, WRSE facilitated a regional Customer Challenge Group (rCCG), bringing together representatives from the Consumer Council for Water (CCW) and the company independent challenge groups to share and input to the approaches and materials used to engage customers. Affinity Water also shared briefs and materials for the research with CCW and the DWI for comment and presented findings through a number of webinars.

Further information on the customer engagement is provided in Annex G.

10. Board statement and assurance

WSP UK Ltd undertook assurance of the development of SLR for the gate one submission based on a comprehensive assurance plan and has continued to provide assurance of the project development between gate one and gate two. Assurance has been focussed on studies and findings which present high risk to the safe development of the project or are otherwise critical to decision making in respect of project development.

In addition to this, further assurance has been undertaken of key activities and findings, including legal assurance and detailed cost assurance exercises for different stages of the process. Separate assurance has also been undertaken for both the draft WRMP and the draft WRE regional plan.

Both Anglian Water and Affinity Water Boards support this submission and have signed off the Board statement in accordance with the RAPID guidance, based on the above controls and assurance.

11. Efficiency of expenditure for gate two and forecast

This section provides supporting information to confirm the efficiency of gate two spend for the A2AT SRO.

Gate two costs are presented in Table 13. Due to the timing of the assurance for this report and the rest of the gate two submission, total costs are reported as value of work completed to end of August 2022, plus estimated costs for remaining work to gate two.

The cost breakdown presented in Table 13 is compared to the RAPID gate two allowance. To allow this comparison to take place, actual costs incurred between gate one and gate two have been deflated to a 2017/18 price base, using the deflationary factors in Table 12.

Table 12: Gate two Customer engagement summary

Year	Deflationary factors
2021	0.9279
2022	0.8612

Affinity Water and Anglian Water anticipate that the gate two out-turn costs for this SRO will be £962,191, which equates to £842,383 when the deflationary factors in Table 11 are applied.

The cost allowance to produce the A2AT gate two submission were provided by Ofwat in its PR19 Final Determination documentation **[13]**. The total RAPID gate two allowance for this SRO was £1,725,000 with costs to be split between Affinity Water and Anglian Water in the proportions shown in Table 13.

However, in its gate one final decisions, RAPID approved the use of the SROs gate one underspend at gate two, which for the A2AT resulted in an additional £544,303 available at gate two. Therefore, the total available budget at the beginning of gate two was £2,269,303.

Table 13: Gate two allowances for Affinity Water and Anglian Water

Partner Company	RAPID gate two allowance (£m)	Gate one underspend (£m)	Gate two total allowance (£m)
Affinity Water	£0.900	£0.272	£1.172
Anglian Water	£0.825	£0.272	£1.097

[13] https://www.ofwat.gov.uk/wp-content/uploads/2019/12/PR19-final-determinations-Strategic-regional-water-resource-solutions-appendix.pdf

11.1. The breakdown of costs for gate two

Table 14 shows the breakdown of costs for the activities that have been undertaken to meet the gate two requirements.

Table 14: Gate two breakdown of costs for Affinity Water and Anglian Water

SRO:	Anglian to Affinity Transfer

Category	Activity	Expenditure (£, 2017-2018 prices)	% of Total Expenditure	Description of Activity
Programme and Project Management	External Project Management Team	£52,621.34	6.32%	External Project Management and support
	Assurance	£5,779.99	0.69%	Third line assurance
	AFW and AWS Project Management	£57,506.99	6.91%	AFW and AWS SRO Project Management and support
Feasibility Assessment and Concept Design	Concept Design	£163,040.80	19.59%	Engineering concept design
	Option Selection	£60,527.52	7.27%	Analysis and review to determine preferred option
	Contribution to Connect 2050	£17,225.43	2.07%	
Option benefits development and appraisal	Utilisation profile	£3,305.56	0.40%	Generation of A2AT utilisation profile using WRSE system simulator
	Best value assessment (through WRE)	£143,057.23	17.18%	Assessment of SRO best value through WRE system simulator
Environmental Assessment	Environmental Assessments	£86,881.50	10.44%	Environmental assessments, including WFD, HRA, BNG, NCA
	EA and Natural England	£28,594.22	3.43%	Costs and contributions to EA and NE
Data Collection, Sampling, and Pilot Trials	Water Quality - WQRA	£25,233.50	3.03%	Drinking Water Quality Risk Assessment
	WQ data interpretation	£10,871.95	1.31%	In-house supporting team
Procurement Strategy	Procurement team	£54,182.61	6.51%	Developing procurement, ownership and operation strategy
Planning Strategy	Planning and Consenting strategy	£10,786.93	1.30%	Planning and consenting external advice
	Land Referencing	£7,320.81	0.88%	Team costs to support land referencing
Stakeholder Engagement	Stakeholder Engagement	£22,849.56	2.74%	Develop key stakeholder strategy and presentation material
	Customer research	£18,905.85	2.27%	
Legal	Legal Support	£29,435.16	3.54%	Team costs associated to legal protection of the project
Other	Legal review of documents	£13,889.36	1.67%	Legal assurance of Gate 2 submission
	Design Principles	£20,456.88	2.46%	Design principles framework and route map
Total		**£832,473.21**	**100.00%**	
Gate 2 Allowance		£2,269,303.43		
Gate Under/ Overspend		£1,436,830.22		

Programme management costs have been broken down into internal and external costs. Internal costs are those directly related to water companies' employees who have been supporting the project during gate two. As well as a project manager who has been directly responsible for day-to-day project activities, other company subject matter experts have been involved in meetings or workshops and in reviewing documents. External costs have been incurred through the employment of a Programme Management Consultant (PMC), jointly procured with the SLR, and additional consultancy support in running and managing specific technical workstreams, such as the environmental appraisal.

Costs incurred for the best value assessment refer to a contribution from the A2AT to WRE for a bespoke set of modelling runs to determine the impact on the WRE regional plan if the region transferred additional water to Affinity Water via the A2AT. The best value assessment is detailed in section 8.2. These costs have been derived by calculating the proportion of the DO benefit that the solution would generate compared with the total DO generated by all WRE options and applying the resulting proportion to the WRE modelling costs.

11.2. Efficiency of gate two costs

Affinity Water and Anglian Water have identified an efficiency saving when comparing the deflated total cost of £832,473 against the total gate two budget of £2,269,303.

Whilst all the required gate two activities have been carried out and the A2AT has been adequately resourced to provide the expected outputs, the two partner companies have delivered against the gate two budget with an efficiency of 63%, creating an SRO saving of £1,436,830 (in 2017/18 prices). A small part of this is due to some activities not being fully progressed due to the decision to restrict the scheme.

Whilst its accepted that activities such has the stakeholder engagement have been intentionally limited (in recognition of the unlikely impact to stakeholders) significant efficiencies have been realised through the coordinated delivery of workstreams with the SLR SRO. These include synergies across planning, legal, procurement, project management and assurance. It is anticipated that these synergies will increase into gate three and gate four through the proposed alignment of the P2G section with the SLR reservoir

The efficiency of the spend to gate two has been assured through a series of control mechanisms on the procurement, delivery and reporting of the required technical services.

- **The approach taken to procurement**
- **Cross-SRO working and integration with WRE regional modelling**
- **Effective governance and cost control processes**

11.2. Approach taken to procurement

The approach taken to procuring external services has remained the same from gate one. The approach centred on a prioritised hierarchy of procurement options, the use of which has helped to drive competition and efficiency into the selection of the most appropriate project suppliers. The following options were available, in decreasing order of priority:

- Mini-competition of existing framework suppliers;
- Direct allocation to valid framework suppliers when there is a need for consistency or a particular skillset;
- Direct award outside of existing framework when resource requirements or specialist needs dictated.

Where possible, mini-competitions or direct allocation of work packages to suppliers on existing company frameworks have been utilised. By doing this, the partner companies had access to a pool of suppliers that had previously been selected through tender processes that established competitive pre-agreed rates. Where direct award was used, e.g., highly specialised technical work or advice, qualitative benchmarking and challenge using professional judgement against similar previous work packages ensured efficiency. The formal use of a standard proforma helped to document this qualitative benchmarking process.

11.2.2. Cross-SRO working and integration with WRE regional modelling

Where appropriate, work packages were procured jointly with the SLR SRO or on behalf of multiple SROs to ensure efficiency in both procurement and delivery. Examples of these work packages are legal support, external assurance and programme management. In addition, the WRE system simulator has been used to assess whether the A2AT was included in the WRE best value regional plan and the implications of selecting this transfer to WRSE for the wider WRE region. The use of the WRE system simulator and WRE data prevented the need for additional models to be built and resulted in a more efficient delivery of the best value assessment for this SRO.

11.2.3. Governance and cost control processes

Effective governance and rigorous cost control processes were in place to prevent scope creep and avoid cost escalation. These processes were implemented by the SRO project manager and overseen by the Programme Management Group (PMG), made up of representatives from both partner organisations. The adoption of a standard pro-forma to capture scopes, risks and costs for each work package subject to external procurement helped to provide a framework within which decisions could be made in an effective and controlled manner.

11.3. Forecast of expenditure for following gates

Affinity Water and Anglian Water have proposed that the A2AT scheme as it stands should not proceed beyond gate two. Anglian Water proposes that future expenditure on developing the Peterborough to Grafham route (Western route) is absorbed within the SLR SRO.

Forecast future spend (gate three and gate four) associated with the Peterborough to Grafham pipeline is summarised in Table 15. This assumes that the transfer is absorbed into the SLR SRO from gate three onwards. The current forecast includes efficiencies as a result of shared costs such as project management and are reflected in the expenditure forecast below.

Table 15: Indicative costs associated with DCO pre-application for the Peterborough to Grafham transfer section in 2017/18 prices

	Gate 3		Gate 4		
A2AT RAPID Forecast- to GW 4 - (Indicative costs only)	**A2AT Forecast (£m)**	**% of Total Project Cost**	**A2AT Forecast (£m)**	**% of Total Project Cost**	**A2AT FOC TOTAL**
Design - Engineering	0.71	21%	0.66	20%	**1.38**
EIA, Water Quality, Hydrological Assessments and Environmental Assessment	0.83	24%	0.79	24%	**1.62**
Ground investigation and archaeology	0.51	15%	0.73	22%	**1.23**
DCO works inclusive of Statutory Consultation, Legal, Land and Planning obligations	0.74	21%	0.53	16%	**1.27**
Project Management	0.19	6%	0.17	5%	**0.36**
Procurement (DPC including Legal)	0.22	6%	0.12	4%	**0.34**
Risk	0.27	8%	0.25	8%	**0.52**
Total forecast cost to complete	**3.47**		**3.25**		**6.72**
A2AT Rapid Allowance Assume 48% of Gated Allowance	1.93		2.20		**4.13**
Underspend G2 - Assume 48% of declared efficiencies	0.69				**0.69**
Total RAPID	**2.61**		**2.20**		**4.81**
VARIANCE	**0.86**		**1.05**		**1.90**

12. Conclusions and recommendations

12.1. Conclusions

Design and costs

Further options appraisal has identified SLR to WRZ5 (Stort Water Resource Zone) as the preferred A2AT option to be investigated at gate two. To fully realise the strategic benefits that this scheme can provide to both Affinity Water and Anglian Water, it was decided to explore two separate routes as part of the SLR to WRZ5 option. This decision resulted in the following SLR to WRZ5 routes being retained for detailed concept design development:

- Eastern route
- Western route (via Grafham)

The A2AT SRO has not been selected by the WRSE or WRE regional plans to address forecast deficits in Affinity Water's supply area, and therefore will not be included in Affinity Water's draft WRMP24. However, the concept design was completed and costs for the scheme were developed for future reference and are given in Table 8.

Deployable output and utilisation

DO identifies the amount of water that could be delivered by both transfer capacities considered for A2AT (50 and 100 Ml/d) during a 1 in 500-year return period drought, with demand restrictions applied to meet agreed Levels of Service. The infrastructure capacity of the two A2AT variants that are required to deliver 50 and 100 Ml/d have been set at 56 and 112 Ml/d respectively (112% of expected DO).

The utilisation analysis shows that typical utilisation is in the order of 80% in summer, only increasing with significant droughts beyond 1 in 50 years, whilst normal 'dry year' utilisation is just over 40%. The analysis assumes a minimum 25% operational turnover.

Environmental assessment

The environmental impacts of the construction of each route would be similar, with some negative impacts expected but, once mitigated, largely temporary. There are no compliance issues expected under either WFD or HRA legislation and no 'show-stopping' environmental impacts have been identified during the gate two studies. More detailed assessments backed up by targeted surveys will be carried out during future stages of the project development.

Scheme delivery and consenting strategy

For the original A2AT SRO, both the Eastern and Western routes are estimated to have a 21-month planning and development timeline, with an estimated 34 months required for construction and commissioning, providing an earliest available delivery date of 2026. However, given the dependence with the SLR as the water source, it would not be feasible to meet the earliest delivery date as the SLR SRO is due to be commissioned by 2039-2041. If the Peterborough to Grafham transfer goes ahead as part of the SLR SRO, it would be commissioned to a similar timescale to avoid the risk of it being a stranded asset.

The A2AT appears to be broadly suitable for delivery via DPC based on the criteria adopted in the assessment (size, discreteness and value for money). The conditioning works may be less suitable on the basis of the concerns regarding DWI enforcement powers. The scheme may also potentially be delivered under SIPR, however there may be challenges in passing the 'complexity' test. Further work is required to determine the preferred delivery model and to work through some of the major challenges including DWI enforcement and financing impact on appointees of arrangements.

The A2AT scheme would transfer water treated as part of the SLR project and therefore, potentially could be brought into the NSIP regime under which DCOs are delivered. However, as the SRO is not continuing beyond gate two, the outline consenting strategy was refined for the Peterborough to Grafham transfer route. Anglian Water intendeds to bring this portion of the Western route into the SLR DCO as Associated Development to minimise planning risk.

Efficiency of costs

Affinity Water and Anglian Water have achieved an efficiency saving when comparing the deflated total cost of £832,473 against the total gate two budget of £2,269,303.

Whilst all the required gate two activities have been carried out and the A2AT has been adequately resourced to provide the expected outputs, the partner companies have delivered against the gate two budget with an efficiency of 63%, creating an SRO saving of £1,436,830. A small part of this is due to some activities not being fully progressed due to teh decision to restrict the scheme.

12.2. Recommendations

Affinity Water and Anglian Water recommend that:

- The scheme, in its current form (i.e., water delivered to Affinity Water), is indefinitely deferred and no further work should be undertaken post gate two. The scheme can potentially represent a back-up option in the future but it is currently not being selected as an alternative option in the regional plans
- The Peterborough to Grafham transfer (up to 150 Ml/d option) is taken forward by Anglian Water for further investigations into gate three. The scheme will be integrated into the SLR SRO as it relies on the SLR as a source and provides strategic resources into Anglian Water's southern supply area.

13. Supporting documentation

Annex A: Environmental Assessment Report
Annex B: Biodiversity Net Gain Assessment Report
Annex C: Habitats Regulations Assessment Report
Annex D: Water Framework Directive Assessment
Annex E: Natural Capital Assessment Report
Annex F: Procurement figures
Annex G: Stakeholder and Customer Engagement
Annex H: Drinking Water Quality Risk Assessment