

Green and Blue Futures



Our canals, river navigations, docks and reservoirs are nationally important infrastructure, helping to mitigate the effects of climate change and support energy and water security.

Along with supplying enough water for approximately five million people, they keep cities and urban areas cool in the summer and they protect our homes and businesses from flooding. This 'public protection value' is estimated at £42 billion.

The World Economic Forum (2023) ranks natural disasters and extreme weather events, the failure of climate change adaptation and biodiversity and ecosystem collapse in the top five global risks expected within the next 10 years. In the UK, the summer heatwave of July 2022 set new records with temperatures exceeding 40°C for the very first time, resulting in significant consequences for people and nature. (Climate Change Committee 2023)

With the world struggling to meet the carbon dioxide emission reductions required to keep global temperatures below the recommended 1.5°C threshold, climate threats are likely to become more prevalent in the coming years.

Green and Blue Futures

The UK Government is focussed upon enhancing energy and water security, seizing the economic opportunities of the transition, and delivering Net Zero by 2050.

The presence and resilience of our network is important to the UK's energy, telecommunications and water supply networks servicing 13.4 million people and 370k businesses as well as the banking system. There is huge potential to utilise our canals and docks for warming and cooling purposes.

Our canals and docks have a vital role in both mitigating the effects of climate change and in providing innovative passive and active solutions to the climate hazards we are likely to face. As a ready-made blue-green infrastructure network, canals, other waterways and waterspaces contribute to the fight against climate change by:



Balancing the availability of water through water transfers, saving cost and carbon



Generating hydropower for around 6,200 homes, saving around 9,500 tonnes of CO₂



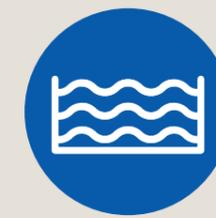
Moving freight off roads onto our larger commercial waterways



Heating and cooling needs of around 350,000 homes, saving over one million tonnes of CO₂ per year



Supplying water to 5 million homes



Providing flooding relief and water storage



Providing vital green corridors for nature



Providing active travel routes for walking and cycling



Mitigating the impact of flooding

Flood protection offered by our embankments and reservoirs

The reservoir dams and canal embankments maintained by the Trust protect many households, properties, a wide range of businesses, telecommunications and utilities as well as other national infrastructure such as electricity sub-stations, transport and schools.

PROTECTING

Embankment	Reservoir	Embankment	Reservoir
840 sub stations protected	387 sub stations protected	370,294 people protected	193,663 people protected
128 schools protected	34 schools protected	31,881 businesses protected	
Railways protected at 570 locations	Railways protected at 55 locations	122,428 properties protected	80,693 properties protected
Motorways protected at 114 locations	Motorways protected at 18 locations		



Tees Barrage, Stockton on Tees

This 70m-wide barrage controls the flow of the river Tees, maintaining water levels and preventing localised flooding around Stockton-on-Tees. Visitors can experience the sheer scale of the operation at our regular open days.

Case study: Canal Feeder preventing flooding during Storm Babet, October 2023

During Storm Babet, we fully opened our feeder sluice to take extra water in to the Chesterfield Canal at Worksop, which supported the Environment Agency in reducing levels in the River Ryton.



In Retford, out of hours staff manned locks to feed water through the system. This allowed the Environment Agency to pump flood water from the River Idle into the Chesterfield Canal as it had overtopped their flood defences. The downstream section of the canal took a significant amount of water away from populated areas. Careful flow management by our colleagues ensured the canal did not overtop and water was eventually released into the River Trent at West Stockwith.

The Environment Agency estimated that had we not taken on the water, at least 50 more families would have been evacuated and homes flooded.

“ Could I extend my thanks to the Canal & River Trust for the part they played in dealing with the recent flood events in Bassetlaw. The role the Trust played within the partnership response to the flooding ensured that the impacts were minimised as much as possible and I would therefore, on behalf of the Council and residents of Bassetlaw, like to thank the whole team for the work you did at this very difficult time.”

David Armiger, the CEO of Bassetlaw District Council

Case study: Rochdale Canal and the Mytholmroyd Flood Alleviation Scheme

The Mytholmroyd Flood Alleviation Scheme was developed by the Environment Agency in partnership with Calderdale Council, Canal & River Trust and the local community.

The scheme utilises the Rochdale Canal which runs through the village of Mytholmroyd, in the Upper Calder Valley in West Yorkshire. The valley is vulnerable to flash flooding and has suffered significant flooding events in 2012, 2015 and 2020 which posed a significant risk to life.

The £41 million Flood Alleviation Scheme was officially opened in October 2021 and provides 4,000 residents, local businesses, infrastructure, schools and other public amenities with greater flood protection.

This flood alleviation scheme is utilising approximately 1.3 km of the Rochdale Canal as an overflow system. Flood

waters are discharged from the canal at the new overflow weir (at the eastern end of Brearley Fields), down an embankment and into a flood plain. Excess flood water is now directed into the canal and transported down to the weir.

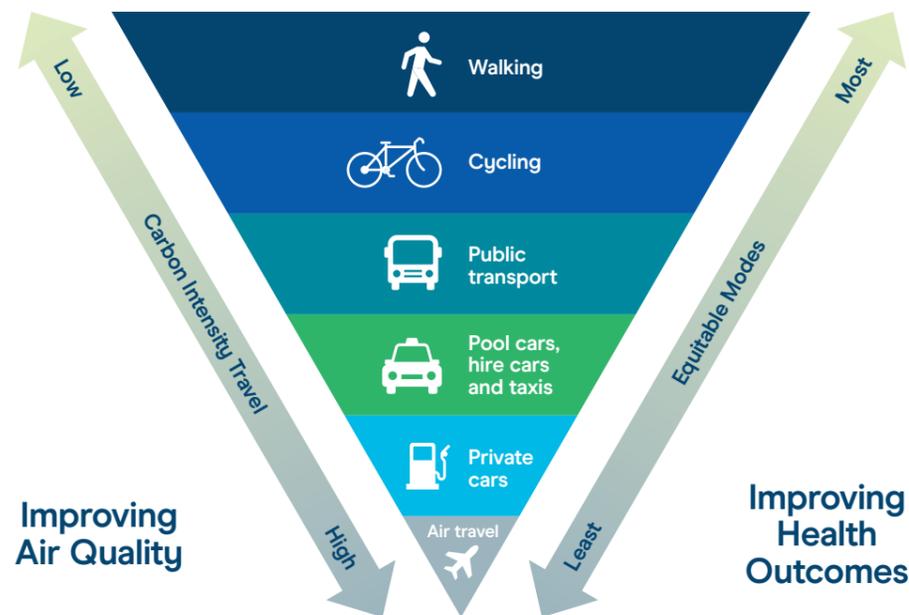


Active travel

Towpaths are an important component of the 'natural health service' and play a key role in providing sustainable transport across England and Wales.

By moving a commuter out of a car and onto the towpath we can save an average of 0.8 tonnes of CO₂ a year per commuter.

Using our network for active travel and recreational usage is saving up to 65,663 quality adjusted life years (QALYs) per annum.



Grand Union Canal Towpath Improvement Scheme, Leighton Buzzard

Working with our partner, Sustrans, and with £500,000 funding from the Department of Transport, in 2022 we upgraded 2.9km of towpath along the Grand Union Canal in Leighton

Buzzard. The scheme involved widening the towpath and improving its surface, new signage, vegetation management and hedge planting to enhance the local biodiversity.



Case study: 'Beat the Street' Initiative on canal towpaths

With a shared goal of connecting local people to blue spaces to increase physical activity and improve wellbeing, our partnership with Intelligent Health has supported the delivery of 'Beat the Street' programmes across the canal towpath network, including in Blaby, Leicester, Sefton, Burnley, Dudley and Birmingham.

'Beat the Street' is a tool designed to connect individuals with their local environment and make physical activity and active travel an enjoyable, integral part of everyday life.

In Bootle, we partnered with Intelligent Health, Natural England, and Sefton School Sports Partnership to deliver our 'Beat the Street' programme, encouraging people to explore their local canals and green spaces, embrace active travel and reduce car reliance.

We placed Beat Boxes along active routes to schools and workplaces, including our towpaths. The boxes, usually placed on lamp posts, have sensors that record journeys. Participants were given a card and map. The aim of the game is to rack up as many visits and miles as possible to score points.



Key achievements of the Bootle programme:

3,800 participants covered 44,000 miles.



10% increase in adults meeting recommended physical activity levels (150 mins per week).



There was a 13% surge in towpath use among children.



A 3% rise in the children achieving 60+ minutes of daily activity.



“Parents said children are getting up earlier and asking to leave earlier so they can walk 'the long way round' to get to more 'Beat Boxes' on the way to school.”

Year 3 teacher

“It got me doing more exercise plus I spent time with my family and friends and it was fun to go together.”

Girl, aged 11 and under

“We have been working with the Canal & River Trust since 2020 when we launched the first canal focused Beat the Street game in Blaby. Since then we have continued to grow our partnership, working in diverse communities across England and Wales and helping people of all ages improve their health and wellbeing through physical activities. The Trust's network of canals and navigable rivers provides the ideal space for Beat the Street games as they are on the doorstep of so many communities and offer open and accessible places for people to walk, cycle and run, helping them to make healthy choices and build healthy habits for life.”

Dr William Bird, CEO and founder of Intelligent Health who developed Beat the Street

Case study: Trent & Mersey Canal Towpath Improvement Scheme, Fradley

Fradley Junction, where the Coventry Canal joins the Trent & Mersey Canal, is a popular destination for visitors exploring the canal and Fradley Pool Nature Reserve.

The towpath from Fradley Junction towards Kings Bromley Wharf and beyond is a widely used routeway to discover the local area.

The towpath has been almost impassable during the wet winter months. In 2023 with funding from the High Speed 2 Road Safety Fund and Staffordshire County Council Road Safety Fund, we installed a new 2.9km surface material to provide an all-year round, accessible path to encourage people visiting the area to travel on foot or on wheels. A grass verge has been retained between the water's edge and the new towpath surface, providing valuable grassland habitat.



Before



After

Case study: Grand Union Canal Towpath Improvement Scheme, Loughborough

The Grand Union Canal towpath links surrounding residential areas with Loughborough's town centre and the train station.

The canal towpath offers a sustainable active travel route for commuters, shoppers, and visitors as well as providing access to nature and sport and recreation opportunities, on and by the water, for local communities.

In Spring 2023 we undertook improvement works to the canal towpath. This £885,000 Town Deal funded project has improved 2km of the waterway through the town centre by upgrading the surfacing to provide a consistent high standard finish. Improved signage, wayfinding and access points were also introduced, 100m of canal bank improved and new moorings for visiting boats installed.



Before



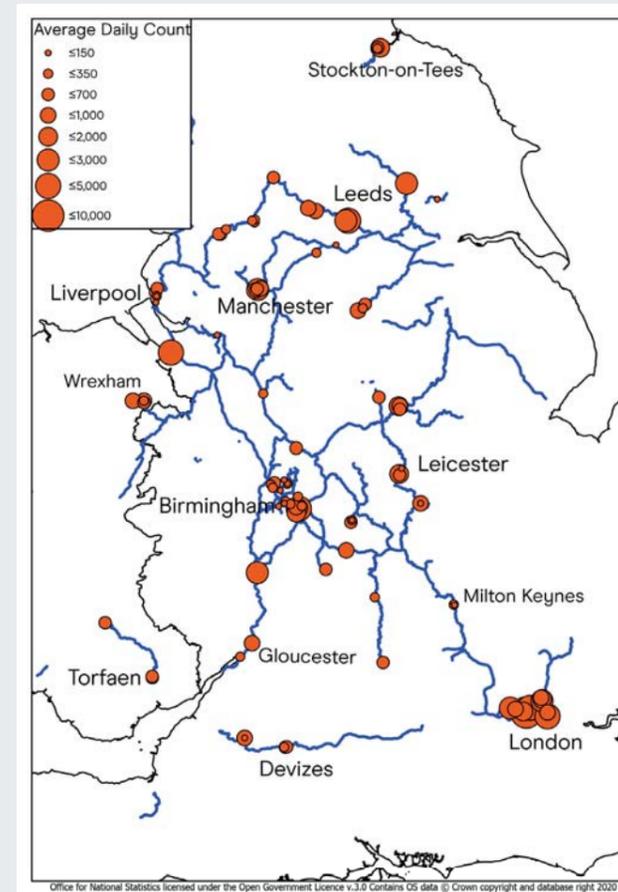
After

Case study: Installation of towpath sensors

With the support of Tracsis Plc we have installed 130 towpath sensors in key locations along our canal towpath network including in high footfall urban areas such as city centres, at our ten outcome focus areas and at our key visitor destination sites.

Our network of towpath sensors provide accurate real-time towpath usage data at key locations. This is proving an invaluable tool in helping us to better understand uplifts in towpath usage following completion of towpath improvement works.

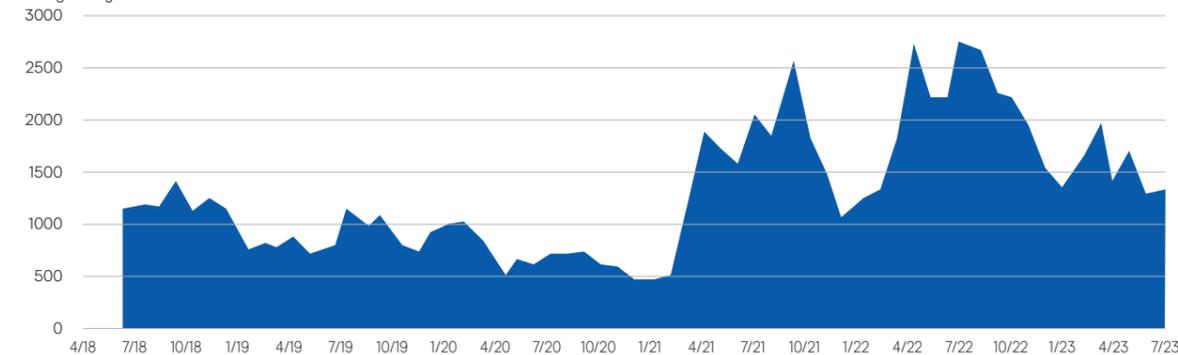
The sensors use machine learning algorithms to count the volume of towpath users and visitors in real-time and the sensor software can differentiate between the range of users by activity as well as demonstrating the seasonality effects of towpath usage and the patterns of use throughout the day.



Sheffield

Sheffield Canal Basin

Average Daily Count



Who uses our towpaths



Sustainable transport – waterborne freight

Moving freight from roads and onto our network of canals, river navigations and docks plays a key role in reducing the number of road

haulage miles and contributes to reduced road congestion, greenhouse gas emissions and noise while helping to improve air quality.

Inland Port of Leeds

500 tonnes of marine dredged aggregate are carried on the canal system from Goole to Knostrop wharf in Leeds. The barge capacity is equivalent to around 18 lorry loads, so this solution means c.1,500 fewer lorry trips each year.



“Moving freight by water makes economic and environmental sense. Our inland waterways connect many large centres of population to each other as well as those conurbations to many major UK ports. Waterborne freight carriage reduces environmental impact of emissions and noise and the economic costs of congestion and accidents. However, the current tonnages carried are just a small amount when you consider the tonnages that could be moved on our inland waterways if they were to realise their freight carrying potential.”

Tim West, Vice Chairman of the Commercial Boat Operators Association

Waterborne Freight on the River Severn



The Severn operation carries 700 tonnes of marine dredged aggregate daily on the canal system from Ryall Quarry to Ripple wharf (concrete manufacturing site). The barge capacity of 350 tonnes is equivalent to around 12.5 lorry loads. Transporting the aggregate this way means we are removing c.10,250 lorries from the roads each year.

Exol Pride lubricant barge operating on the Aire & Calder Navigation & the South Yorkshire Navigations

Twice a week, the Exol Barge carries 400 tonnes of lubricating oil from Hull docks along the canal to the bulk blending facility at Rotherham. The barge capacity is equivalent to approximately 16 lorry loads, taking c.720 lorries off the roads each year.



Supporting decarbonisation

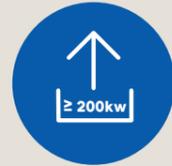
Decarbonisation is a critical aspect of global efforts to address climate change and transition towards a more sustainable and environmentally friendly future.

The UK government has set an ambitious target to reduce carbon emissions by 68% by 2030 compared to 1990 levels.

Our network of canals, river navigations, docks and reservoirs sited in the hearts of our towns and cities is perfectly placed to provide 'net zero' solutions and help to achieve a more resilient and sustainable planet.

Case study: Using our network to generate green electricity

Constructed in 1874, the Grade II listed sluices on the River Weaver at Dutton, Cheshire are helping to power the future via a low-head hydroelectric plant installed by our partner, Nether Dutton Hydro Limited. The energy produced by the scheme is exported to the local electricity grid where it is then distributed to homes and businesses. As part of the project, a bristle eel pass has been installed which in effect acts as another sluice, assisting further with water control.



Output up to 200kw



Estimated generation of 900,000kwh per year of green energy



Equivalent to 150 homes off the grid



190 tonnes of CO₂ saving



Case study: Using our network to heat the historic York Guildhall building

York Guildhall dates back to the 15th century and in 2021 required major structural renovation to develop it as a meeting and events space for businesses in the city.

The £21 million renovation project funded by York City Council included a water source heat pump to deliver a long-term sustainable heating solution for the building.

The water source heat pump takes water from the Ouse Navigation, heat is transferred to the Guildhall, before the water is returned to the river. The heat pump converts the temperature of the water from about 5°C to 45°C.



The carbon savings from using the heat pump are estimated at 40 tonnes per year when compared to the previous gas boiler.

Case study: Reducing energy use at our pumping stations

Pumping water to keep our canals topped up accounts for 25-33% of our annual electricity use and around 20% of our carbon emissions.

As part of the EU funded 'Green WIN Project' we are working with our partners – Waterways Ireland, Voies Navigables de France, the University of Liege, Arcadis and inland waterways experts across north-west Europe to investigate opportunities to reduce energy use. Using a test tank at the University of Liege the consortium has conducted a series of trials on different pumps and control systems. Using this knowledge 'live' test sites were established at 11 locations in France, Ireland and the UK.



We estimate that improvements at our pumping station sites at Cean Hill in Devizes, Tinsley in Sheffield and Calcutt near Southam could reduce energy use by 15-20%, saving over 112 tonnes of CO₂ emissions a year.



Case study: Heating Mersey Heat, a new energy centre

Water from Leeds & Liverpool Canal will be a vital component of Peel NRE's Energy Supply Company which will see a district heating network supplying more than 9,000 homes and 4 million sq ft of commercial space at Liverpool Waters and other nearby buildings.

Water source heat pumps and thermal stores will provide energy for the new district, heating the new network. The water source heat pumps (6MW in total) will take water from the Leeds & Liverpool Canal before returning it to Peel's dock system.

The heat pumps will be one of the UK's largest installations and the energy centre is expected to be operational in autumn 2024.

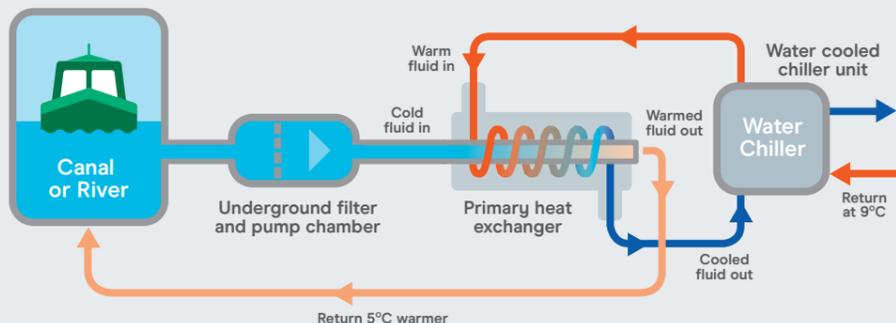


The heat pumps will save 4,200 tonnes of carbon per year



Low carbon heat to 9,000 homes and 4 million sq ft of commercial space

Water-Sourced Heating and Cooling



Keeping cities & urban areas cool as temperatures rise

'Urban heat island effect' plus a warming climate threatens to make summers intolerable in many metropolitan and urban areas in the UK.

Our research

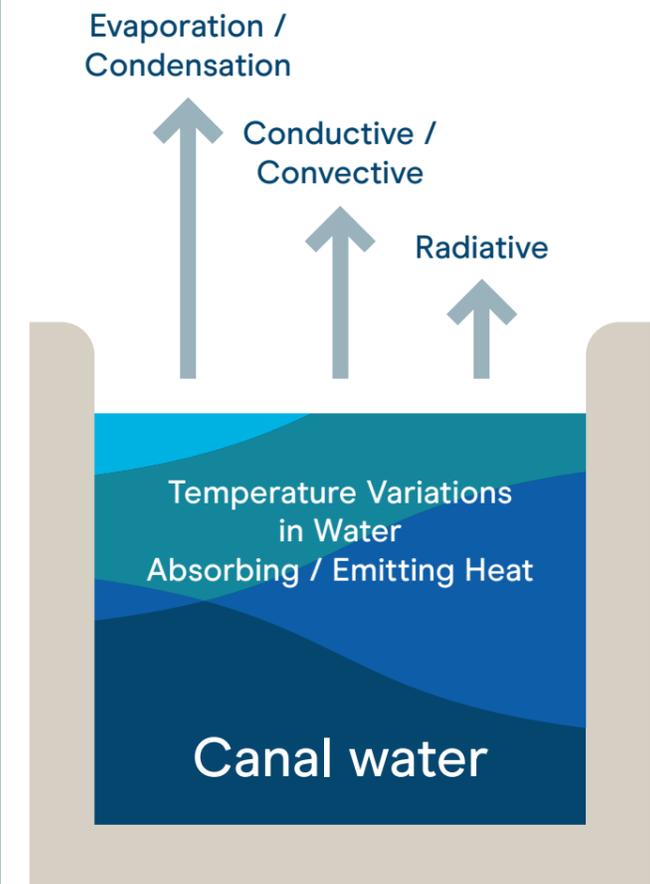
'Urban heat islands' occur in metropolitan and urban areas with dense concentrations of pavement, buildings, and other surfaces that absorb and retain heat. This effect increases energy costs, air pollution levels, and heat-related illness and mortality.

We have worked with the University of Manchester, to understand the extent to which canals contribute to urban cooling and whether canals in urban areas have a positive impact upon lowering local air temperatures.

The modelling work conducted across Birmingham, London and Manchester shows reductions in summer temperatures of up to 1.6°C, without undesirable cooling in winter.



The University of Manchester



Heat energy inputs and outputs from the canal (Adapted from Lu (2008))



The canals in our cities were a product of the Industrial Revolution, a time of great innovation. Adapting to climate change will require new thinking and ways of working, and this research shows the importance of working across disciplines and in partnership. Bringing together our industrial heritage with new technologies and cutting-edge research like this can help us create urban areas where people and nature thrive in a more sustainable future.”

Dr Joanne Tippett, lead project researcher from the University of Manchester

Water transfer & supply

Increased temperatures due to climate change will exacerbate water stress in the coming years. Water shortages in some areas of the UK are a serious risk, with some parts of the country facing significant drought while neighbouring areas have surplus water.

Our network of canals can help mitigate water shortages by transferring water from areas with a

surplus to those with higher levels of water stress.

Case study: Water transfer for drinking water supply

Since 2019 we have worked with Severn Trent Water and Affinity Water to develop plans to use the canal network to transfer surplus raw water from Birmingham to Leighton Buzzard.

Using the network of canals provides a viable and cost-effective route to ensure Affinity Water and Severn Trent Water can combat future risks of climate change by improving their drought resilience.

The scheme will involve transferring 115 million litres of enhanced treated

water per day – enough for over 700,000 residents – from Severn Trent’s Minworth facility on the East of Birmingham along 131km of canals to a site near Leighton Buzzard. Here it will be abstracted and treated before going into Affinity Water’s public water supply distribution system.



Case study: Water transfer for cooling gas-fired power station at Keadby

The Trust is transferring and supplying water from Stainforth & Keadby Canal for use in cooling the most efficient gas-fired power station in Europe.

SSE is a leading generator of renewable electricity and one of the largest electricity network companies in the UK. SSE Thermal’s Keadby2 gas-fired power station (893 MW) project in North Lincolnshire officially entered its commercial operational phase in March 2023.

With the ability to reach full power in just 30 minutes, Keadby2 can provide important flexibility for the electricity system, complementing the increasing amounts of renewable generation on the grid.

SSE Thermal and Equinor are currently developing Keadby 3, which could become the UK’s first power station equipped with carbon capture technology. With an electrical output of up to 910MW, Keadby 3 Carbon Capture Power Station will use natural gas as its fuel and will be fitted with a carbon capture plant to remove the CO₂ from its emissions.



Water that currently enters the River Trent Navigation from the Stainforth & Keadby Canal will be used to supply the power station by modifying Keadby Lock gate to stop the water from spilling over the weir. Keadby 3 is expected to offset at least 1.5MT of CO₂ – 5% of the Government’s target. In December 2022, Keadby 3 became the first power CCS project in the UK to gain planning consent.