KEADBY 3
CARBON CAPTURE
POWER STATION

A collaboration between **SSE Thermal** and **Equinor**

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Planning Inspectorate Ref: EN010114

The Keadby 3 (Carbon Capture Equipped Gas Fired Generating Station) Order

Land at and in the vicinity of the Keadby Power Station site, Trentside, Keadby, North Lincolnshire

Summary of Canal Water Abstraction Assessment

The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure Regulations 2009 - Regulation 5(2)(a) The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

Applicant: Keadby Generation Limited

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GLOSSARY

Abbreviation	Description
DCO	Development Consent Summary
ES	Environmental Statement
HMSO	Her Majesty's Stationary Office
OEP	Office for Environmental Protection
NPS	National Policy Statements
BEIS	Business, Energy and Industrial Strategy
WFD	Water Framework Directive
SCADA	Supervisory Control and Data Acquisition
SSSI	Site of Special Scientific Interest
SAC	Special Area of Conservation
CEMP	Construction Environmental Management Plan
AOD	Above Ordnance Datum
NCA	National Character Area
EIA	Environmental Impact Assessment
HRA	Habitats Regulations Assessment
LWS	Local Wildlife Site

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APPENDICES

1.0 STAINFORTH AND KEADBY CANAL WATER ABSTRACTION ASSESSMENT

1.1 Introduction

1.1.1 This assessment summarises the potential effects of the proposed minor modifications to the lock gates at Keadby Lock Scheduled Monument. The modifications were not identified to be required at the time of preparing the Environmental Statement (ES) submitted with the Development Consent Order (DCO) application. The applicant for the proposed modifications to the Keadby Lock gate is the Canal and River Trust.

1.1.2 The proposal is to raise the lock gate at Keadby Lock by 300mm to prevent that overflowing water from being lost into the River Trent. Currently that water overtops Keadby lock at 230mm over the lock gate; this equates to a flow rate of around 37 Ml/d. By retaining that water, this water efficiency proposal would supply sufficient additional water (27.4 Ml/d) required for abstraction for cooling use in the Proposed Development, in line with the principles of sustainable development.

1.1.3 This assessment is included as an addendum to the DCO Application [**APP-043** to **APP-159**] and provides the assessments relating to the potential water abstraction at the Stainforth and Keadby Canal, updating the following chapters and appendices of the ES:

- **Chapter 11**: Biodiversity and Nature Conservation (ES Volume I – Application Document Ref. 6.2.11) [**APP-054**];
- **Chapter 12:** Water Environment and Flood Risk (ES Volume I – Application Document Ref. 6.2.12) [**APP-055**];
- **Appendix 12A:** Flood Risk Assessment (ES Volume II – Application Document Ref. 6.3.20) [**APP-084**];
- **Appendix 12B:** Water Framework Directive Assessment Report (ES Volume II – Application Document Ref. 6.3.21) [**APP-085**];
- **Chapter 15**: Cultural Heritage of the ES Volume (ES Volume I – Application Document Ref. 6.2.15) [**APP-058**]; and
- **Appendix 15A**: Cultural Heritage Desk Based Assessment (ES Volume II – Application Document Ref. 6.3.29) [**APP-093**].

1.2 Legislation, Planning Policy and Guidance

1.2.1 The Environment Act 2021 ('The Act') (Her Majesty's Stationary Office (HMSO) 2021) was given Royal Assent after the submission of the Application and sets out legislation to provide a post-Brexit environmental framework for the United

Kingdom. In summary, The Act includes new legislation such as: binding targets on / water quality, biodiversity, and resource efficiency.

1.2.2 The majority of The Act is not yet in force. The Office for Environmental Protection (OEP) has been brought into effect but is yet to receive its enforcement powers in England that would apply to the Proposed Development. The Applicant will continue to monitor implementation of The Act throughout the course of Examination and will consider the need for changes where they apply to policy or plans and their implementation, during the course of Examination.

1.2.3 Draft revised National Policy Statements (NPS) for energy infrastructure were published by the Department for Business, Energy and Industrial Strategy (BEIS) on 6 September 2021 following submission of the Application. Consultation closed on 29 November 2021 and BEIS is now considering consultation feedback. The draft revised NPS are capable of being an "important and relevant" consideration in the final decision making balance by the Secretary of State on the Application.

1.3 Methodology

1.3.1 The general assessment methodology and topic-specific methodologies, relevant legislation, policy and guidance, key assumptions and limitations set out in the submitted ES Volume I, Chapters 2-7 submitted with the Application (Application Document Refs. 6.2.2 – 6.2.7) [**APP-045** to **APP-050**] remain unchanged, unless specifically stated in this Addendum.

1.4 Relevant Additional Information

1.4.1 Since submission of the Application, Additional Information that has been prepared on behalf of the Canal and River Trust or that has been submitted into examination that is relevant to this assessment includes:

- Habitats Regulations Assessment Appropriate Assessment Report (Application Document Ref. 5.12) [**REP1-006**]; and
- Scheduled Monument Consent Application Heritage Impact Assessment (prepared on behalf of the Canal and River Trust) and reproduced in Appendix C below.

1.4.2 Other Additional Information has been gathered by the Applicant, and where relevant, this is presented in this chapter including:

- Keadby 3 Cooling Water Abstraction Flood Risk Technical Note (AECOM, 2021a, see Appendix B); a review of flood risk to take into account the potential impact of changes to operation of the canal due to the proposed modification to the Keadby Lock gates.
- Water Framework Directive – Screening Assessment Modification Works to Keadby Lock - Stainforth and Keadby Canal technical note.

1.4.3 A Keadby Lock Gate Modification Options Appraisal report (Arcadis, 2022) has been produced which analyses six proposed options to modify the Keadby Lock Gate. The options are:

- Option 1 - Fit a plank horizontally to the upstream face of the gate, with a height of 300mm.
- Option 2 - Install planks in gaps between existing timbers to a height of 300mm.
- Option 3 - Fit a baulk to the existing bar.
- Option 4 - Fit planks in gaps between existing vertical timbers up to the top bar of the gate.
- Option 5 - Remove planking between intermediate and top bars and install a mechanised tipping weir.
- Option 6 - Install a demountable stop plank system.

1.4.4 Both Option 1 and Option 2 were deemed to be equally viable, to perform in a similar manner, and meet the Canal and River Trust's requirements. The report found that in selecting the options, the main driving factor is the appearance, due to the heritage value of the lock. Option 1 has been presented to Historic England and is assessed in this report.

1.5 Consultation

1.5.1 Engagement is ongoing with statutory consultees in order to inform them of the proposed changes to the Keadby Lock gate.

1.5.2 A Water Abstraction Licence pre-application meeting was conducted between the Applicant, the Canal and River Trust ('the Trust') and the Environment Agency, on 5th November 2021. This discussed the water efficiency measures to enable water from the Stainforth & Keadby Canal to supply Keadby 3. The Trust proposed raising the height of Keadby Lock Gate. Discussions followed regarding the assessment of alternative options, the pattern of operation, how fisheries may be impacted, how abstraction will be controlled, the need for Water Framework Directive (WFD) assessment and separate water abstraction licences, estimations of low flow scenarios and the impact on the Trent's hydrograph.

1.5.3 A pre-application consultation was also undertaken with Historic England on 9th December 2020. This focused on the purpose of the scheme, a discussion of design options, and agreement of the documentation that would be required to accompany an application for Scheduled Monument Consent.

1.5.4 All options considered for the proposed development are presented in the Options Appraisal Report (Arcadis, 2022). Consultation identified Option 1 as Historic England's preferred option for this modification to the existing Keadby

Lock gates, but Option 2 was also identified as the preferred option for the gates if they are to be replaced in their entirety in the future.

1.6 Updated Baseline Conditions

Existing Baseline

Water Environment

1.6.1 The proposed change to the Keadby Lock gate does not alter the existing baseline conditions for the water environment as described in **Chapter 12:** Water Environment and Flood Risk (ES Volume I – Application Document Ref. 6.2.12) [**APP-055**].

1.6.2 Further information on the existing baseline of the Stainforth and Keadby Canal is included within the Keadby 3 Cooling Water Abstraction Flood Risk Technical Note (AECOM, 2021a) (Appendix B).

Cultural Heritage

1.6.3 The proposed change to the Keadby Lock gate does not alter the existing baseline conditions for cultural heritage as described in **Chapter 15**: Cultural Heritage (ES Volume I – Application Document Ref. 6.2.15) [**APP-058**]. Further information on the listing description and historical background of the Keadby Lock gate is included within the Keadby Lock Scheduled Monument Consent Application Heritage Impact Assessment report (Appendix C).

Other Technical Chapters

1.6.4 The existing baseline for all other technical disciplines included within the ES remain as reported within the submitted ES [**APP-051 to APP-062**].

Future Baseline

Water Environment

1.6.5 The Canal & River Trust will control the incoming water flow from River Don, and intake volumes will remain as reported within the submitted ES, therefore the future baseline conditions will not change for water environment.

Cultural Heritage

1.6.6 The future baseline remains as reported within the submitted ES, therefore the future baseline conditions will not change for Cultural Heritage.

Other Technical Chapters

1.6.7 The future baseline for all other technical disciplines included within the ES remain as reported within the submitted ES [**APP-051 to APP-062**].

1.7 Development Design and Impact Avoidance

Construction

Water Environment

1.7.1 The SCADA (Supervisory Control and Data Acquisition) technology used by the Trust is designed to minimise variation from the normal maintained water level and is set with a 50 mm +/- tolerance; therefore any breach of this tolerance will result in the sluices automatically adjusting in order to maintain the required water level. If necessary, the Trust would utilise an existing by-wash weir to act as an overflow in the event that the Proposed Development did not draw as much water from the Canal as was expected and if levels in the Canal temporarily rose as a result, until the SCADA system rebalanced water levels.

1.7.2 Therefore, as there will be no change to the water level in the canal, no further design and impact avoidance measures during construction are proposed as a result of the changes to the Keadby Lock gate, above those stated in **Chapter 12**: Water Environment and Flood Risk (ES Volume I – Application Document Ref. 6.2.12) [**APP-055**].

Cultural Heritage

1.7.3 No further design and impact avoidance measures during construction are proposed as a result of the changes to the Keadby Lock gate, above those stated in **Chapter 15**: Cultural Heritage (ES Volume I – Application Document Ref. 6.2.15) [**APP-058**].

Other Technical Chapters

1.7.4 The construction design and impact avoidance measures for all other technical disciplines included within the ES remain as reported within the submitted ES [**APP-051 to APP-062**].

Operation

Water Abstraction

1.7.5 No further design and impact avoidance measures during the operational phase are proposed as a result of the changes to the Keadby Lock gate.

Cultural Heritage

1.7.6 No further design and impact avoidance measures during the operational phase are proposed as a result of the changes to the Keadby Lock gate.

Other Technical Chapters

1.7.7 The operation design and impact avoidance measures for all other technical disciplines included within the ES remain as reported within the submitted ES [**APP-051 to APP-062**].

1.8 Likely Impacts and Effects

Construction Effects

Air Quality

1.8.1 Typical small construction plant to be used for the proposed works, which will not produce any significant pollutants. There are no changes to the effects described within **Chapter 8**: Air Quality (ES Volume I – Application Document Ref. 6.2.8) [**APP-051**].

Noise and Vibration

1.8.2 The works proposed are minor physical modifications to an existing lock gate. The noise levels arising during these minor modifications will be temporary and are not anticipated to be audible above existing construction noise levels from the Proposed Development. There are no changes to the effects described within **Chapter 9**: Noise and Vibration (ES Volume I – Application Document Ref. 6.2.9) [**APP-052**].

Traffic and Transportation

1.8.3 The Stainforth and Keadby Canal is used for recreational sailing within interests maintained by the Trust who operate Keadby Lock. It is anticipated that as the applicant, the Trust would seek to schedule works to minimise disruption to mariners.

1.8.4 Trentside, Keadby (B1392) provides local access to Keadby village. However, it is not anticipated that this access will be affected by the proposals as no stopping up is proposed.

1.8.5 There are no changes to the effects described within **Chapter 10**: Traffic and Transportation (ES Volume I – Application Document Ref. 6.2.10) [**APP-053**].

Biodiversity and Nature Conservation

1.8.6 Although the boundary of the Keadby Lock intersects the boundary of the River Trent and therefore the Humber Estuary Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC) and Ramsar site, these designated areas would not be affected during implementation of the proposed minor modifications to increase the height of the Lock gate.

1.8.7 The modifications can be achieved without works within the boundary of these designations, so there would be no loss or disturbance of habitats within the

designations. Further, the banks of the River Trent at this location are heavily modified (Plate 2) and would be unchanged by these proposed works, while the channel of the river at the lock gate is already affected by the established use of the lock gate. The proposed modifications would not alter the established use and conditions of the River Trent at this location.

1.8.8 No impacts to the designations are therefore anticipated, so there are no likely significant effects.

Plate 1 – Keadby Lock Scheduled Monument intersection with Humber Estuary Ramsar/SAC/SSSI

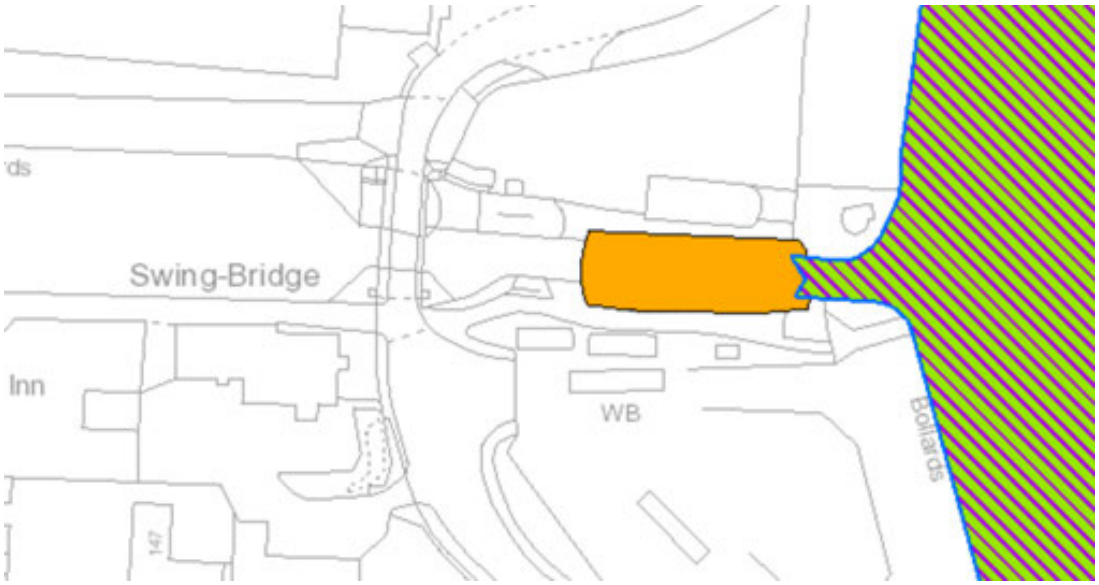

Plate 2 – Vertical reinforced man-made walls at intersection with River Trent

1.8.9 There are no changes to the effects described within **Chapter 11:** Biodiversity and Nature Conservation (ES Volume I – Application Document Ref. 6.2.11) [**APP-054**].

Water Environment and Flood Risk

1.8.10 During the construction phase, modifications will be made to the existing Keadby Lock. Given the small scale and localised nature of the works, and that there is no requirement to physically work within the waterbody, it is anticipated that all residual risk would be adequately mitigated through measures to protect the water environment which will be outlined in the Contractor's Construction Environmental Management Plan (CEMP), based on the Framework CEMP included in the DCO application (Application Document Ref. No. 7.1). As such there are no changes to the significance of effect reported for the Stainforth and Keadby Canal and River Trent in **Chapter 12**: Water Environment and Flood Risk (ES Volume I – Application Document Ref. 6.2.12) **[APP-055]**.

1.8.11 The Keadby 3 Cooling Water Abstraction Flood Risk Technical Note (AECOM, 2021a) (see Appendix A) has been prepared which assesses the impact of the proposed water efficiency measures on all relevant sections of the Stainforth and Keadby Canal, up to Doncaster Lock.

1.8.12 The Trust's SCADA will control the water level in the canal and maintain it at the 'Zero' (base) Level of 4.35m Above Ordnance Datum (AOD). As the canal will still be operating at the Zero Level, no additional alterations are required to contain the volume of water in the canal, and abstraction can take place whilst still allowing sufficient water levels for boats using the canal. The Flood Risk

Technical Note (AECOM, 2021a) (see Appendix B) finds a negligible impact on the flood risk of the canal as a result of the proposed work, with the mechanism remaining unchanged from the baseline flood risk. The SCADA technology is designed to minimise variation from the normal maintained water level and is set with a 50 mm +/- tolerance, therefore any breach of this tolerance will result in the sluices automatically adjusting in order to maintain the required water level. Therefore, should abstraction at Keadby 3 Carbon Capture Power Station temporarily cease, firstly the canal would remain at the Zero Level, but in the unlikely event that an increase of 50 mm above the Zero Level is observed, the SCADA automated system will operate to reduce the volume of water entering the canal and mitigate flood risk.

Geology, Hydrogeology and Land Contamination

1.8.13 The works proposed are minor modifications to an existing lock gate and will not involve releases to land or water that could affect water resources.

1.8.14 There are no changes to the effects described within **Chapter 13:** Geology, Hydrogeology and Land Contamination (ES Volume I – Application Document Ref. 6.2.13) [**APP-056**].

Landscape and Visual Amenity

1.8.15 The proposal is not located within or in the vicinity of any nationally designated landscapes. National Character Area (NCA) Profile 39: Humberhead Levels occurs in the vicinity and includes the Isle of Axholme Area of Special Historic Landscape Interest (designated locally for its extensive strip field system). However, the scale of the works is trivial with no realistic potential to affect the landscape character and perception of the NCA.

1.8.16 The surrounding area in the immediate vicinity is industrial. The only views could be glimpsed views from Trentside. There are no changes to the effects described within **Chapter 14**: Landscape and Visual Amenity of ES Volume I – Application Document Ref. 6.2.14) [**APP-057**].

Cultural Heritage

1.8.17 The proposed works involve the addition of one plank to the mid-rail of the upstream side of the upstream lock gates. The addition is a minimal visual alteration to this set of lock gates. Whilst the lock gates are not historic (the gates form part of the scheduled monument, but were replaced in 2015/16), their function and appearance make a contribution to the heritage significance of the lock. The gates are one pair of four pairs of matching gates present at the lock. Whilst the visual alteration to the gates is minimal, and will be largely imperceptible when weathered, the addition will alter one set of four sets of gates making one set slightly different to the other three. This very minor change will not alter the perception and understanding of the lock's architectural and historic interests. The proposal can therefore be achieved without impacting upon the significance and special interest of the lock.

1.8.18 Further information on heritage effects is included within the Keadby Lock Scheduled Monument Consent Application Heritage Impact Assessment report (AECOM, 2021b).

1.8.19 There are no changes to the effects described within **Chapter 15**: Cultural Heritage (ES Volume I – Application Document Ref. 6.2.15) [**APP-058**].

Socio-economics

1.8.20 There are no changes to the effects described within **Chapter 16**: Socio-economics (ES Volume I – Application Document Ref. 6.2.16) [**APP-059**].

Climate Change and Sustainability

1.8.21 There are no changes to the effects described within **Chapter 17**: Climate Change and Sustainability (ES Volume I – Application Document Ref. 6.2.17) [**APP-060**].

Major Accidents and Disasters

1.8.22 There is not anticipated to be any risk of major accidents or disasters relating to the proposed changes to the Keadby Lock gate. There are no changes to the effects described within **Chapter 18**: Major Accidents and Disasters (ES Volume I – Application Document Ref. 6.2.18) [**APP-061**].

Operation effects

Air Quality

1.8.23 No operational air quality effects are anticipated as a result of the proposed changes to the Keadby Lock gate. There are no changes to the effects described within **Chapter 8**: Air Quality (ES Volume I – Application Document Ref. 6.2.8) [**APP-051**].

Noise and Vibration

1.8.24 No operational noise and vibration effects are anticipated as a result of the proposed changes to the Keadby Lock gate. There are no changes to the effects described within **Chapter 9**: Noise and Vibration (ES Volume I – Application Document Ref. 6.2.9) [**APP-052**].

Traffic and Transportation

1.8.25 No operational traffic and transportation effects are anticipated as a result of the proposed changes to the Keadby Lock gate. There are no changes to the effects described within **Chapter 10**: Traffic and Transportation of (ES Volume I – Application Document Ref. 6.2.10) [**APP-053**].

Biodiversity and Nature Conservation

1.8.26 During the operational phase, although the proposals will involve the conservation of water (for the purposes of the cooling water abstraction) which currently weirs over the horizontal beams of Keadby Lock directly into the River Trent. The designations are not reliant on a specific volume of water supply from the canal, and the established function of the existing lock gate is to retain water within the canal except when the lock is in operation. The water utilised for Keadby 3 will still be discharged into the tidal River Trent on transit from the cooling system (albeit subject to some evaporative losses). The effects of use and discharge of cooling water on habitats within the River Trent have been assessed as part of the Environmental Impact Assessment (EIA) and Habitats Regulations Assessment (HRA) Screening Report submitted to the Planning Inspectorate for that project and this has concluded no likely significant effect.

1.8.27 The Stainforth and Keadby Canal Corridor Local Wildlife Site (LWS) designation applies to the canal at this location, so this also intersects the location of the proposed Keadby Lock modifications (Plate 3).

Plate 3: Keadby Lock intersection with Stainforth and Keadby Canal Corridor LWS

1.8.28 The LWS comprises a 10km long watercourse and habitat corridor designated, and of county nature conservation value, for its aquatic and wetland plant interest, and the associated ancillary bank-top scrub and grassland habitats that supplement the biodiversity value of the LWS. The effects on the LWS during construction would be limited to temporary disturbance of a very limited area of channel at Keadby Lock and would therefore be not significant given the large size of the LWS. The minor nature of the proposed modifications mean that any impact would be comparable to or less than that associated with the existing purpose and operation of the lock gate.

1.8.29 Effects during operation of abstracting water from the LWS have previously been assessed in the EIA for the Keadby 3 Carbon Capture Power Station,

submitted to the Planning Inspectorate and assessed as negligible (not significant).

1.8.30 If it became necessary to reactivate the by-wash weir it would require some removal of vegetation (common wetland species, particularly bulrush) that has accumulated within the weir structure while it has been disused. The Keadby Wetland LWS is located adjacent to the structure but, as access can be achieved via the towpath, no impacts to the LWS or its integrity are considered likely. This is currently considered to be unlikely to be required and is dealt with during the licence application.

1.8.31 While the potential presence of nesting birds cannot be fully discounted, nesting is not likely on the lock gate itself so there is not likely to be a conflict with general legal requirements. Nesting birds could utilise vegetation requiring removal to reactivate the by-wash weir. Standard good practice mitigation and timings would be applied to address this minor potential constraint so significant effects would not be anticipated.

1.8.32 Other protected and notable species would not reasonably be anticipated to be resident at the location of the lock gate given the established use and context of this location (Plate 4). Otter and bats may have an incidental presence in this area, but there are no features likely to be used as places of refuge by these species or that could be affected by the minor daytime works proposed. So, a significant effect is not likely on these or any other protected or notable species.

Plate 4: Habitat context and land use in the vicinity of the lock gate

1.8.33 It cannot be discounted that other protected species may occur in the vicinity of the by-wash weir. However, the very minor vegetation removal needed to reactivate the weir would not reasonably be anticipated to adversely affect the conservation status of any species. Legal compliance is mandatory so relevant inspections by an ecologist would be completed prior to these works, and mitigation would be agreed to ensure legal compliance.

Water Environment and Flood Risk

1.8.34 The proposed works will retain the required 27.4 Ml/d of water, which would otherwise typically discharge into the River Trent beyond Keadby Lock, for water cooling purposes required by the Proposed Development for baseload operations. The retention of water will be achieved by increasing the Keadby Lock gate threshold from 4.12m AOD to 4.35m AOD. The increase aligns with the current normal water level which will also be maintained following the modification works. When Keadby 3 is operational, following cooling duty and subject to evaporative losses, the water will be discharged into the River Trent. It is not anticipated that this would increase the risk of fluvial flooding (see Appendix B) as there would be no increase in water volume discharged to the Trent, following use in the Proposed Development compared to the baseline.

1.8.35 The retention of water is not going to increase the risk of canal flooding within the Keadby Lock and Thorne Lock pound, as the Trust has confirmed that overtopping would occur at levels of 4.6m AOD or greater. This is 250 mm greater than the proposed Keadby Lock threshold, and therefore any excess

water would likely spill over into the River Trent (as currently). Along the canal from Keadby Lock through to Doncaster Lock the water levels are controlled by the SCADA sluice and lock control technology. Therefore, the flows will be constantly monitored and regulated to ensure the Zero Level is maintained.

1.8.36 If water levels were to increase upstream, the Don Aqueduct would likely act as a form of mitigation. The overspill element of the Don Aqueduct, which is at a similar level to the respective pound's (section of a canal between two locks) Zero Level, would ensure that any increases in water level would spill into the River Don.

1.8.37 The fluvial flood risk associated with both the River Trent and River Don are not likely to increase as a result of the proposed change. This is because the current maintained water level is not proposed to change and therefore the volume of any overspill is considered to be similar (or less) to that currently received.

1.8.38 The residual risk of blockage or periods of maintenance could hinder or temporarily pause the abstraction process which would result in the normal water level being exceeded without further controls. However, in this event, the installed SCADA technology would adjust the sluices which could mean water level rises upstream as each pound is likely to reduce the flow received to avoid deviation from the normal water levels. The Don Aqueduct is designed with an overspill which is assumed to have been designed to a level similar to the Zero Level for that pound. Any increase in water level would likely spill over into the River Don.

1.8.39 Overall, the proposed works are considered to have minimal impact on canal flood risk with the mechanisms of flooding remaining similar to that of the baseline, therefore both the risk of canal flooding and residual risk remains Neutral and not significant.

Geology, Hydrogeology and Land Contamination

1.8.40 No operational geology, hydrogeology and land contamination effects are anticipated as a result of the proposed changes to the Keadby Lock gate. There are no changes to the effects described within **Chapter 13**: Geology, Hydrogeology and Land Contamination (ES Volume I – Application Document Ref. 6.2.13) [**APP-056**].

Landscape and Visual Amenity

1.8.41 There are no changes to the effects described within **Chapter 14**: Landscape and Visual Amenity (ES Volume I – Application Document Ref. 6.2.14) [**APP-057**].

Cultural Heritage

1.8.42 No operational cultural heritage effects are anticipated as a result of the proposed changes to the Keadby Lock gate beyond those effects outlined within the construction section above. There are no changes to the effects described within **Chapter 15**: Cultural Heritage (ES Volume I – Application Document Ref. 6.2.15) [**APP-058**].

Socio-economics

1.8.43 There are no changes to the effects described within **Chapter 16**: Socio-economics (ES Volume I – Application Document Ref. 6.2.16) [**APP-059**].

Climate Change and Sustainability

1.8.44 There are no changes to the effects described within **Chapter 17**: Climate Change and Sustainability (ES Volume I – Application Document Ref. 6.2.17) [**APP-060**].

Major Accidents and Disasters

1.8.45 There is not anticipated to be any risk of major accidents or disasters relating to the proposed changes to the Keadby Lock gate. There are no changes to the effects described within **Chapter 18**: Major Accidents and Disasters (ES Volume I – Application Document Ref. 6.2.18) [**APP-061**].

1.9 Additional Mitigation, Monitoring and Enhancement Measures

1.9.1 No additional mitigation, monitoring and enhancement measures above those described in the submitted ES are required as a result of this proposed change.

1.10 Limitation or Difficulties of Additional Assessment

1.10.1 The limitations and/ or difficulties related to this document are consistent with those reported in the submitted ES.

1.11 Summary of Updated Likely Significant Residual Effects

1.11.1 There are no significant changes to the likely residual effects identified in the submitted ES, as a result of the proposed changes to the Keadby Lock gate. The residual effects would remain as reported within the submitted ES.

1.11.2 The proposed changes to the Keadby Lock gate will not lead to any changes to the assessment of cumulative and combined effects included within **Chapter 19**: Cumulative and Combined Effects (ES Volume I – Application Document Ref. 6.2.19) [**APP-062**].

1.12 References

AECOM (2021a) Keadby 3 Cooling Water Abstraction Flood Risk Technical Note.

AECOM (2021b) Keadby Lock Scheduled Monument Consent Application Heritage Impact Assessment report

Arcadis (2022) Keadby Lock Gate Modification Options Appraisal.

APPENDIX A: FLOOD RISK REVIEW

AECOM

To:

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Project name: The Keadby 3 Low Carbon Gas Power Station Project

Project ref: EN010114

From: AECOM

Date:04/22/2021

Technical Note

Subject – Keadby 3 cooling water abstraction flood risk

Introduction

AECOM Limited ('AECOM') has been commissioned by Keadby Generation Limited (KGL) to prepare a Flood Risk Technical Note, which will form part of an abstraction licence application by Canal and River Trust ('the Trust') to supply cooling water for a proposed low carbon gas fired generating station located on land within the Keady Power Station site at Keadby, Scunthorpe DN17 3EF known herein as 'Keadby 3'.

Purpose of this document

To support the operation of Keadby 3, there is a need for a water-cooling process to take place which will require a total volume of 27.4 Ml/d for baseload operation. The preferred option for sourcing cooling water is to abstract from the nearby Stainforth and Keadby Canal (here after referred to as 'the canal'). The abstraction is proposed to be located adjacent to the abstraction for Keadby 2 Power Station (under construction) between Keadby Lock and Thorne Lock on an impounded section of the canal.

The Trust is applying to the Environment Agency for an Abstraction Licence [CRT to confirm whether this is a new licence of variation with EA] to authorise the proposed Keadby 3 abstraction. This Technical Note assesses the potential flood risk impacts associated with the proposed abstraction from the canal. The design of the abstraction structure and associated civils works is at concept stage, and this assessment is based on the information currently available i.e. that the proposed abstraction is likely to be very similar to the recently constructed intake and abstraction for Keadby 2 Power Station. There may be a requirement for further analysis assessment once the detailed design for Keadby 3 is finalised.

In order to facilitate the proposed water abstraction from the canal without impacting the normal operating water level in the canal, upgrade works to the Keadby Lock threshold are required. These

works, although minor in nature, have the potential to impact flood risk associated with the canal. For assessment purposes, the reach of potential impacts (i.e. study area) has been assumed to include the canal from Keadby Lock back to Doncaster Lock (the start of the Keadby Canal and its junction with the River Don). Therefore, this assessment has focussed on the Sheffield and South Yorkshire Navigation – Stainforth and Keadby Canal (Keadby Lock to Doncaster Lock).

Site description

The final proposed water abstraction location has not yet been finalised. However, in accordance with Rochdale Envelope principles, the application for Development Consent Order (DCO) includes an area within which the proposed abstraction would need to be sited (Work 4A).

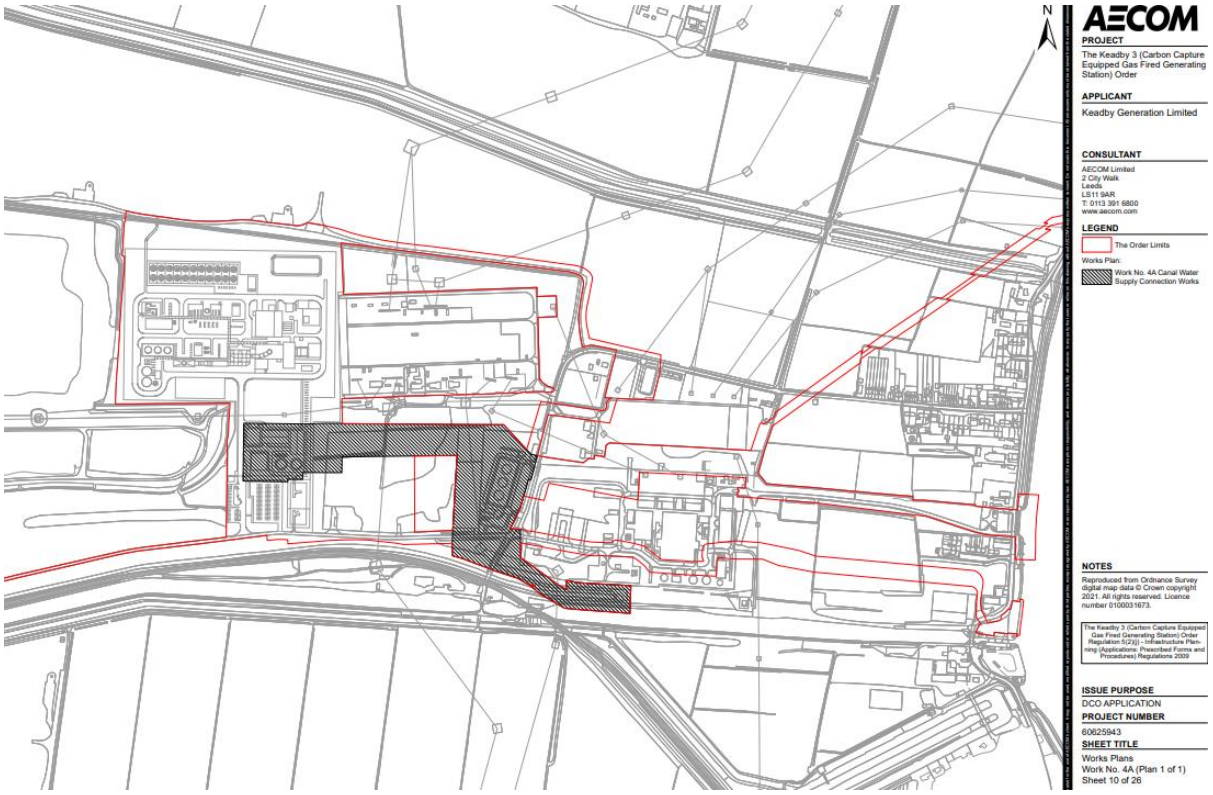

Figure 1: Location of Proposed Canal Water Abstraction (Work 4A)

The proposed abstraction would therefore be positioned on the northern bank of the canal located south of the main power plant within the proposed Keadby 3 site. The highlighted area on Figure 2 indicates the area within which the abstraction is proposed to be located and the position of Keadby Lock.

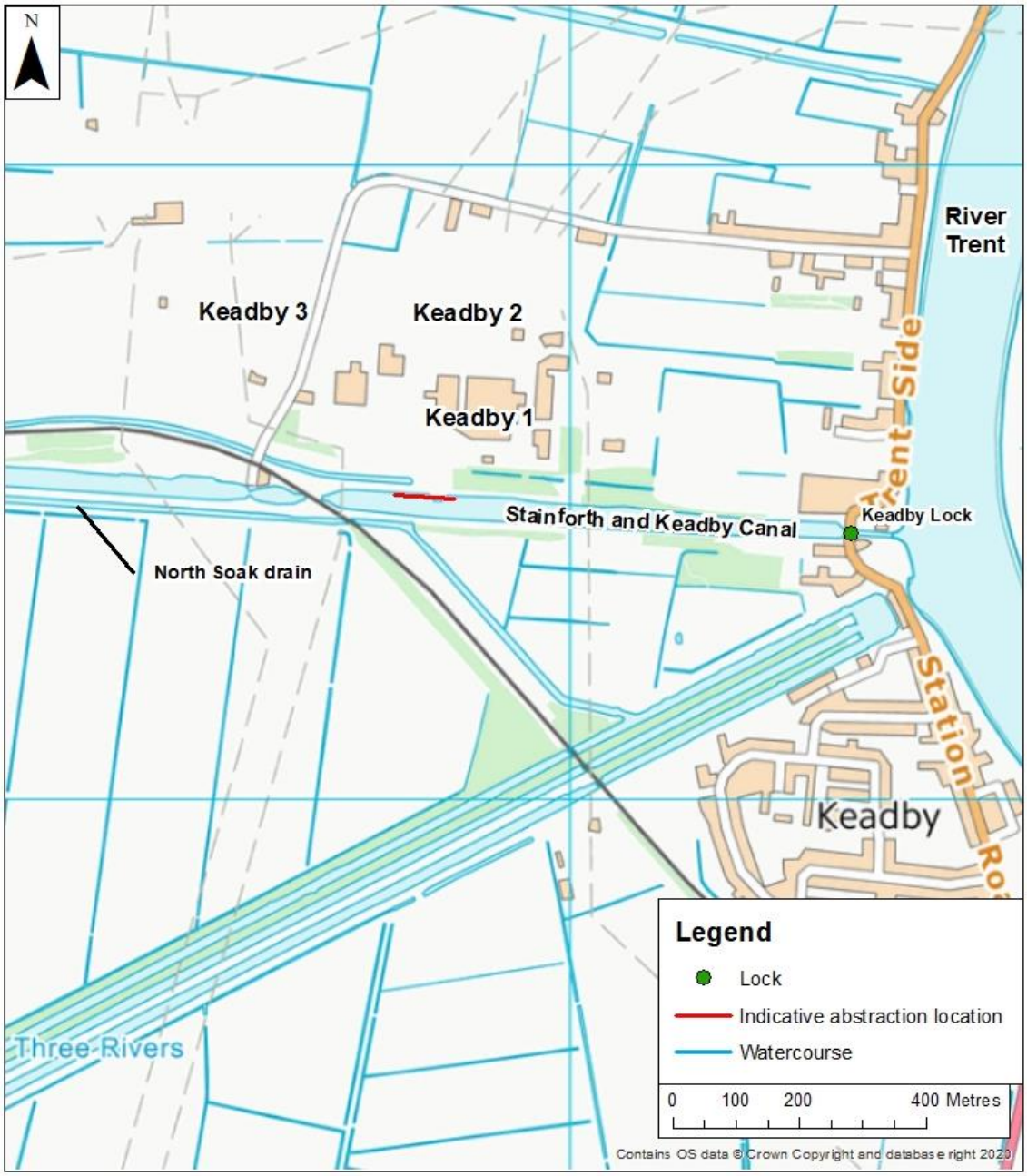

Figure 2: Location of Proposed Abstraction and Keadby Lock

The canal connects the River Don and River Trent and flows around the urbanised residential settlements of Stainforth, Kirk Bramwith, Barnby Dun and Kirk Sandall whilst flowing through Thorne and Doncaster. The canal also traverses the South Humberside Main Line and the M18 motorway.

Local hydrology

The proposed abstraction location lies approximately 750m west of the tidal River Trent which flows in a northerly direction towards the Humber. Approximately 785m to the north of the proposed abstraction location, beyond Keadby Common is Warping Drain, an ordinary watercourse maintained by the Isle of Axholme and North Nottinghamshire Water Level Management Board ('the IDB') that flows east and into the tidal River Trent via sluice gates. Warping Drain includes Paupers Drain; an artificial waterbody influenced by tidal locking with flood embankments on either side.

To the west of the proposed abstraction location is the Keadby Boundary Drain, an ordinary watercourse maintained by the IDB that flows into Warping Drain via a sluice with flood gates. South of the proposed abstraction location there are a number of watercourses running west to east in parallel with each other. These include the North Soak Drain and the South Soak Drain, which flow either side of the Sheffield and South Yorkshire Navigation – Stainforth and Keadby Canal. The North and South Soak Drains flow into the Three Rivers a short distance to the south, and then this connects with the River Trent via sluice gates and Keadby Pumping Station, which is a major pump draining the Isle of Axholme. These three watercourses and the River Trent are all main rivers. The Sheffield and South Yorkshire Navigation – Stainforth and Keadby Canal is linked to the River Trent via Keadby Lock and managed by the Trust.

Existing System

Canal systems are well maintained watercourses; however, there are still instances where they may present a flood risk due to overtopping or failure. The Canal, like all other canals, is monitored and kept at specific levels to ensure safe passage for canal users. In this case, the process is automated and involves technology known as MEICA SCADA (Mechanical, Electrical, Instrumentation, Control and Automation Supervisory Control And Data Acquisition). This system is set up to automatically operate and control a number of sluices along the Canal to ensure the water in the Canal stays at the appropriate depth for boats to use. These systems are present at a number of locks across the canal of which are shown in Figure 3.

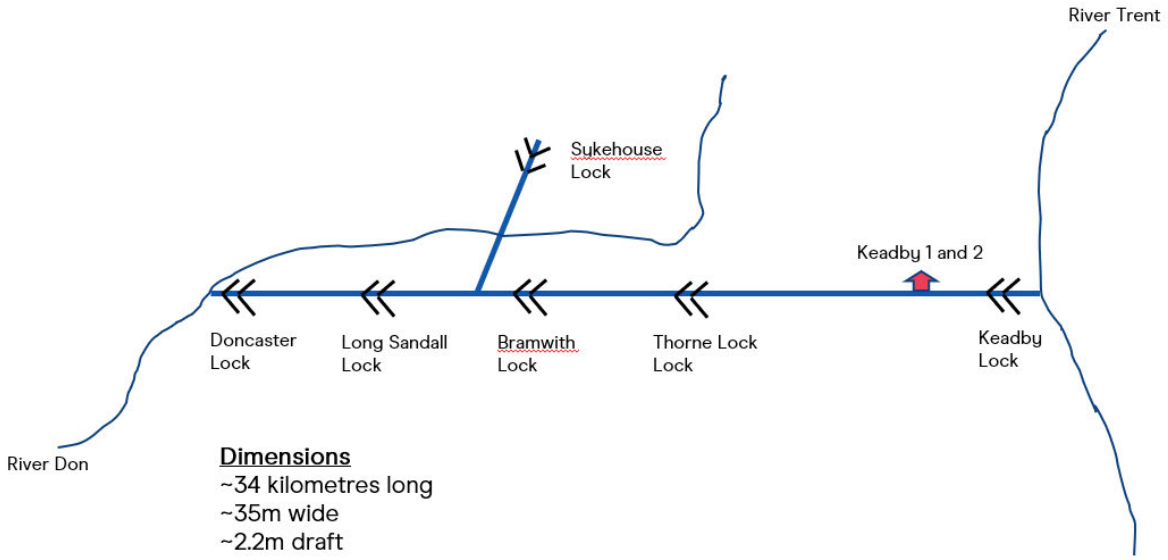

Figure 2 – Canal overview

The normal water level, as confirmed by the Trust, of the Thorne Lock to Keadby Lock pound is set at 4.35 metres Above Ordinance Datum (mAOD) (known as 'Zero Level'). It is within this pound that the abstraction and proposed upgrade works are to take place. The SCADA technology is designed to minimise variation from the normal maintained water level and is set with a 50 mm +/- tolerance, therefore any breach of this tolerance will result in the sluices automatically adjusting in order to maintain the required water level. The existing design level of Keadby Lock is set at 4.12 mAOD which is 230 mm below the maintained water level. As a result of this, in normal operation there is a flow of water out of the Canal of approximately 37 Ml/d through spill over Keadby Lock into the River Trent (see Figure 4).

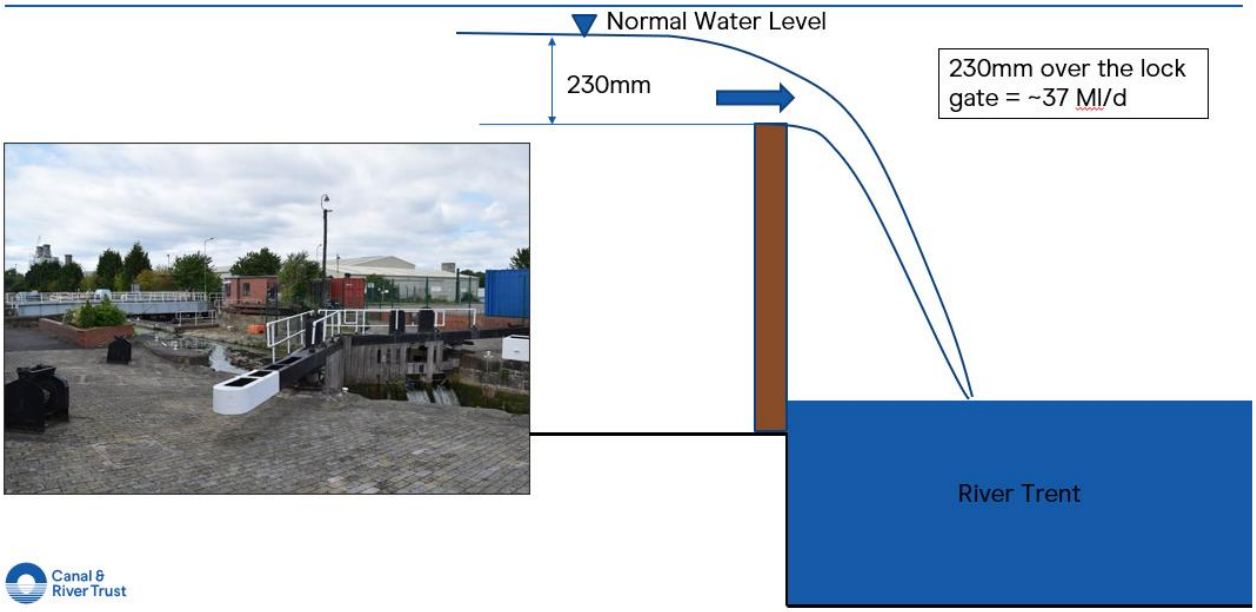

Figure 4: Keadby Lock daily spill volume

Proposed Modification Works at Keadby Lock

In order to make the required volume of water for the Keadby 3 cooling process available for abstraction, efficiency measures are proposed to upgrade Keadby Lock gates. The proposed works are subject to concept design and are understood to involve a modification to the top of the existing Keadby Lock gates to increase the threshold for water spillage. As the final design has not yet been developed, therefore it has been agreed with the Trust to assume a design level similar to the Zero Level for the purpose of this assessment. This would increase the Keady Lock threshold from 4.12 mAOD to 4.35 mAOD and ensure that water which currently is able to discharge into the River Trent is retained in the pound, allowing a sufficient volume of water to be available for abstraction whilst maintaining the Zero Level.

Baseline flood risk

This section discusses potential baseline (as existing) risks in relation to tidal, fluvial, surface water runoff, groundwater and artificial sources (e.g. canals, reservoirs).

Table 1 – Baseline flood risk summary

Source	Baseline flood risk	Risk
Tidal flooding	The proposed abstraction site is located in Flood Zone 3 (>0.5% AEP). The Tidally influenced River Trent is the dominant source of sea flooding, but the area benefits from maintained flood defence embankments and lock gates The Site is at 'low' risk of flooding from tidal sources with the defences in place or flooding resulting from overtopping of the defences during events that exceed 0.5% AEP (1 in 200 chance) of flooding. The Site is at a 'low' residual risk of tidal flooding from the North and South Soak Drains and in the event of a breach in defences.	Low
Fluvial flooding	The proposed abstraction site is located in Flood Zone 3 (>1% AEP). The River Trent is the dominant source of fluvial flooding, particularly as the high embankments allow water levels on the Trent to rise much higher than surrounding watercourses and much of the Isle of Axholme drainage (including the Three Rivers and North and South Soak Drains) is lifted by pumping into the Trent.	Low

	The Site is at 'low' risk of flooding from fluvial sources and ordinary watercourses with the defences in place or resulting from overtopping of the defences during events that exceed 0.5% AEP (1 in 200 chance) of flooding. The Site is at a 'low' residual risk of fluvial flooding in the event of a breach in defences.	
Surface water flooding	The Environment Agency's Risk of Flooding from Surface Water (RoFfSW) online flood map identifies that the majority of land surrounding the abstraction location and along the canal to be at Very Low risk of surface water flooding. The proposed abstraction works are to be situated within and alongside the canal and therefore it is not likely to be impacted by surface water flooding and therefore it is considered to be at 'very low' risk of flooding from surface water.	Very Low
Groundwater flooding	The areas around the proposed abstraction are artificially drained by various land drains and pumping stations, which help to maintain the groundwater level. These are expected to remain operational through the lifetime of the development, contributing to a low risk of groundwater emergence at the proposed abstraction location. The proposed abstraction works are to be situated within the canal and therefore are unlikely to be influenced by groundwater. Based on the information provided, the proposed abstraction is considered to be at low risk of flooding from groundwater sources.	Low
Artificial sources of flooding	The proposed abstraction location is not considered at risk from reservoir flooding. The Sheffield and South Yorkshire Navigation – Stainforth and Keadby Canal has a shallow gradient and drains into the River Trent via a sluice. The pound located in between Thorne Lock and Keadby Lock has a maintained water level of 4.35 mAOD (Zero Level). The Trust has confirmed that the section of the canal overtops 250mm above zero level (4.6 mAOD). Over topping is unlikely as the MEICA SCADA technology which automates the sluice gates / locks, ensures the Zero Level is maintained. If any overtopping of the canal were to occur, this would drain into the North and South Soak drains located at a lower elevation on either side of the canal and drain away. The risk of flooding is considered to be 'low'.	Low

Impact of proposed abstraction on flood risk

As the proposed works directly relate to water levels within the Stainforth and Keadby Canal, only canal flood risk has been assessed within this section. The proposed works are not likely to impact any other source.

Impact of the proposed works on canal flooding

The proposed works at Keadby Lock will be designed to provide the required volume of water (27.4 Ml/d for baseload operation) to allow the abstraction from the Canal for Keadby 3 to take place. By retaining and utilising water for a beneficial purpose which would ordinarily discharge into the River Trent, the Zero Level (4.35 mAOD) will be maintained allowing continued safe use of the canal for navigation. This has been confirmed by the Trust with water levels to be controlled by the locks, sluices and abstraction process. Overtopping within the canal occurs 250mm above Zero Level and therefore overtopping is expected at water levels at and above 4.6 mAOD. Overtopping is unlikely to occur as the Keadby Lock gate height will be designed lower than this, which would allow excess water to spill over into the River Trent. With minimal changes to the Zero Level, the proposed works are considered to have a negligible impact on the flood risk of the canal, with the mechanism remaining unchanged from the baseline flood risk.

There is a risk that during a high tide, the River Trent could experience periods of spate and high river levels could restrict the ability of the River Trent receiving water from the canal. At this point, the MEICA SCADA system would recognise a rise in local water levels within their retrospective pounds, which in turn would signal for the locks and sluices to adjust to maintain the Zero Level. This would likely have a knock-on effect up the reach of the canal system as each pound would also experience water level rises. Eventually, this would reach upstream of Bramwith Lock at the Sheffield & South Yorkshire Canal and Stainforth and Keadby Canal confluence. Located within this pound is the Don Aqueduct (NGR: SE 61492 11293) which is located on New Junction Canal and is used to traverse the

River Don. The aqueduct has an overspill mechanism which allows excess water to spill over into the River Don. This mechanism would mitigate any increase in water level within the respective pound. The amount of overspill into the River Don, if any, would likely be negligible and sporadic.

The Don Aqueduct has two large guillotine gates at either end which become operational when the River Don is in flood. These prevent flood waters from the Don flowing along the canal system and protect large amounts of farmland, farmhouses, and key infrastructure from flooding. However, it is possible for flood waters from the Don to enter the canal from Doncaster Lock. If this occurs, the SCADA system initiates and opens the sluices up to Keadby Lock, passing increased flow along the canal. This allows more flood waters to pass down the system into the Keadby Lock pound and into the River Trent. If heavy flooding is forecast, the sluices can be manually operated (if deemed necessary) to allow as much conveyance as possible. Given that this mechanism already operates, and as the normal water level after the proposed changes to Keadby Lock gates will remain similar (or the same as) the levels currently maintained in the system, the impact of the proposed works on canal flooding is considered Low.

Residual canal flood risk

Although the risk of canal flooding is considered Low, there are residual risks which may impact this including blockage, maintenance or reduced or intermittent use of the abstraction operation over time. The Environmental Permit will require maintenance of all infrastructure, including the abstraction, in accordance with Best Available Techniques (BAT). During any maintenance period when the abstraction is not in use, the lower pound will continually receive water from the upper sections of the canal (either from overspill, as a result of a boat utilising a lock or rainfall events). In such instances therefore, there is a risk that the normal water level will be exceeded in the pound. This situation would likely initiate the SCADA technology (works within a 50 mm +/- tolerance of normal water level) which would adjust the relevant sluices to mitigate any further increase in water level. This may reduce the amount of flow entering the pound which would subsequently work its way back upstream resulting in water level rises in each subsequent pound. Eventually, this rise in water level would be mitigated by the overspill mechanism associated with the Don Aqueduct and spill into the River Don. The upgrade works to Keadby Lock gates are to be designed at Zero Level with a 250mm freeboard, therefore any additional flow which enters the pound during either of these residual events would spill into the River Trent. Asa result, residual canal flood risk is considered Low.

In an extreme scenario, the River Trent and River Don may potentially both be in flood through tidal and fluvial influences respectively, potentially resulting in overtopping of Doncaster Lock and Keadby Lock. In this scenario, it is anticipated that all sluices except Keadby Lock would be opened to allow as much flood water as possible through the system. If overtopping is expected, then Keadby Lock is the most favourable pound to overtop as it is close to the river system and has less vulnerable receptors (e.g. residential properties, essential infrastructure) located within close proximity of the lower pound than any others. The probability of this scenario occurring is very low and, in this instance, the mechanism as a result of the proposed works would not change from the existing works, therefore the impact is considered negligible.

Climate change impact on canal flooding

Keadby 3 will have an expected lifespan of circa 25 years and for the purposes of undertaking a worst-case assessment, for flood risk and extended life of35 years has been assessed as agreed with the Environment Agency. It has been assumed that the Proposed Development will become operational between 2026 and 2033, (depending on financial investment decision and construction

programming). On this basis, and assuming a 35 year operational life, decommissioning could commence between 2061 and 2068. This will fall within the 2050s' (2040 to 2069) epoch, which is predicted to have a 20% increase in rainfall. This increase will be associated with more extreme weather and is likely to increase the risk of canal breaches. In the event of more extreme weather conditions, the extreme scenario highlighted within the residual risk section may become more probable. Considering the above, the proposed works would have a negligible impact on the impact of climate change on canal flood risk.

Conclusion

The proposed works will retain the required 27.4 Ml/d of water, which would otherwise typically discharge into the River Trent beyond Keadby Lock, for water cooling purposes required by the proposed Keadby 3 low carbon gas fired power station for baseload operations. The retention of water will be achieved by increasing the Keadby Lock threshold from 4.12 mAOD to 4.35 mAOD. The increase aligns with the current normal water level which will also be maintained following the modification works. When Keadby 3 is operational, following cooling duty and subject to evaporative losses, the water will be discharged into the River Trent. It is not anticipated that this would increase the risk of fluvial flooding as in the baseline scenario, water discharges into the River Trent.

The retention of water is unlikely to increase the risk of canal flooding within the Keadby Lock and Thorne Lock pound as the Trust has confirmed that overtopping would occur at levels of 4.6 mAOD or greater. This is 250 mm greater than the proposed Keadby Lock threshold therefore any excess water would likely spill over into the River Trent. Along the canal from Keadby Lock through to Doncaster Lock the water levels are controlled by the MEICA SCADA sluice and lock control technology. Therefore, the flows will be constantly monitored and regulated to ensure the Zero Level is maintained.

If water levels were to increase upstream, the Don Aqueduct would likely act as a form of mitigation. The overspill element of the Don Aqueduct, which is at a similar level to the respective pounds Zero Level, would ensure that any increases in water level would spill into the River Don.

The fluvial flood risk associated with both the River Trent and River Don are not likely to increase as a result of receiving any additional flows from the canal. This is because the current maintained water level is not proposed to change and therefore the volume of any overspill is considered to be similar to that currently received.

The residual risk of blockage or during periods of maintenance could hinder or temporarily pause the abstraction process which would result in the normal water level being exceeded without further controls. However, in this event, the installed SCADA technology would adjust the sluices which could mean water level rises upstream as each pound is likely to reduce the flow received to avoid deviation from the normal water levels. The Don Aqueduct is designed with an overspill which assumed to have been designed to a level similar to the Zero Level for that pound. Any increase in water level would likely spill over into the River Don.

Overall, the proposed works are considered to have minimal impact on canal flood risk with the mechanisms of flooding remaining similar to that of the baseline, therefore both the risk of canal flooding and residual risk remains Low.

APPENDIX B: KEADBY 3 COOLING WATER ABSTRACTION LICENCE APPLICATION WATER FRAMEWORK DIRECTIVE – SCREENING ASSESSMENT MODIFICATION WORKS TO KEADBY LOCK - STAINFORTH AND KEADBY CANAL- TECHNICAL NOTE

AECOM Infrastructure & Environment UK Limited
11th Floor Colmore Building
Colmore Circus Queensway
Birmingham.
B4 6AT
United Kingdom

[redacted]

To: SSE

CC:

Project name: The Keadby 3 Low Carbon Gas Power Station Project

Project ref: EN010114

From: Tim Jones, Owen Tucker (AECOM)

Date:
19 November 2021

Technical Note

Keadby 3 Cooling Water Abstraction Licence Application
Water Framework Directive – Screening Assessment
Modification Works to Keadby Lock - Stainforth and Keadby Canal

1. Introduction

AECOM Limited ('AECOM') has been commissioned by Keadby Generation Limited (KGL) to prepare a Water Framework Directive (WFD) Screening Assessment which considers the additional works that are proposed by the Canal and River Trust ('the Trust') to provide cooling water for a proposed low carbon gas fired generating station which will be located on land within the Keady Power Station site at Keadby, Scunthorpe (DN17 3EF) (known herein as 'Keadby 3').

The Trust proposes to secure the necessary water for abstraction by undertaking water efficiency measures which will involve modifying Keadby Lock gate to conserve water which otherwise ordinarily flows from the Stainforth and Keadby Canal directly into the River Trent. The works are being designed with regard to minimising impacts on the normal operating water level of the Stainforth and Keadby Canal, maintained by the Trust for navigation purposes.

For clarity, the scope of this WFD Screening Assessment considers only the additional elements of design that are proposed to be undertaken by the Trust to enable the abstraction to take place without impacting the normal operating water level of the canal. The impacts associated with the proposed water abstraction and its use within the generating station have already been fully assessed within the **Keadby 3 Environmental Statement Volume II Appendix 12B: Water Framework Directive Assessment Report [redacted]),** which can be read alongside this technical note.

This WFD Screening Assessment forms part of an abstraction licence application by the Trust to the Environment Agency.

2. Need for Water Abstraction

To support the operation of Keadby 3, there is a need for water-cooling to take place which will require a maximum flow of 27.4 Ml/d . The preferred option for sourcing cooling water is to abstract from the nearby Stainforth and Keadby Canal. This canal is WFD designated under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. The abstraction is proposed to be located adjacent to the abstraction for Keadby 2 Power Station (under construction) between Keadby Lock and Thorne Lock.

In order to facilitate the proposed water abstraction from the canal without impacting the normal operating water level in the canal, upgrade works to increase the Keadby Lock threshold level are required to increase water retention in the canal. These works are minor in nature. However, given the canal is connected hydrologically to the River Trent (WFD designated as the Humber Upper transitional waterbody), there are also potential impacts to this adjacent water body that require consideration. The potential for impact pathways to the underlying WFD groundwater bodies also requires consideration (i.e. the Lower Trent Erewash - Secondary Combined and Idle Torne - Secondary Mudrocks WFD groundwater bodies).

3. Approach

New developments that have the potential to impact the current or targeted WFD status of a water body are required to assess their compliance against the WFD objectives of the potentially affected water bodies. In accordance with the Planning Inspectorate's Advice Note Eighteen[1] and the Environment Agency guidance for WFD assessments for coastal and transitional waters[2], a three-stage approach may be adopted:

- Stage 1: WFD Screening;
- Stage 2: WFD Scoping; and
- Stage 3: WFD Impact Assessment.

This report presents the findings of Stage 1 (Screening) for the additional design element i.e. modifications to Keadby Lock. Further scoping and WFD Impact Assessment (Stage 2) is not considered necessary at this stage., as outlined below

This assessment is based on the proposed design to raise the height of the bar on the lock gates.

4. Site description

In accordance with Rochdale Envelope principles, the application for Development Consent Order (DCO) includes an area within which the proposed abstraction would need to be sited (Work 4A), see Figure 1.

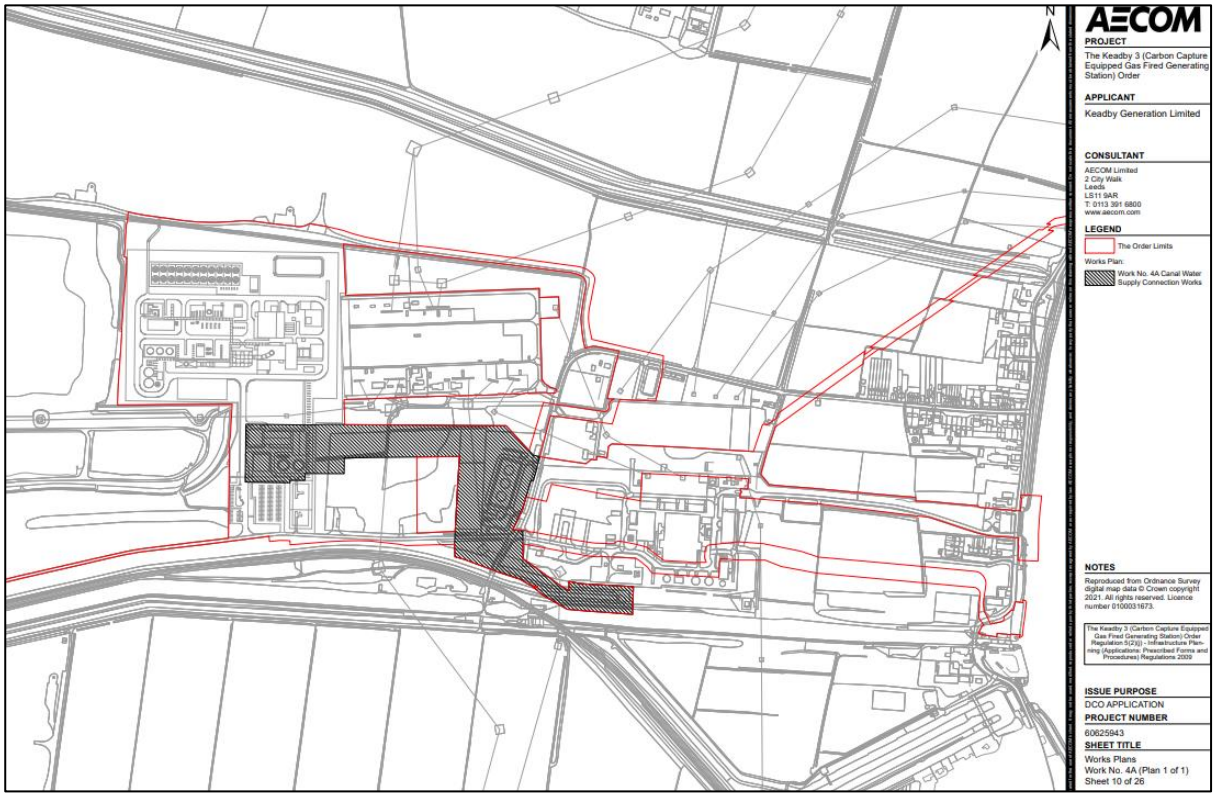

Figure 1: Location of Proposed Canal Water Abstraction (Work 4A, Shaded)

The proposed abstraction would therefore be positioned on the northern bank of the canal located south of the proposed generating station within the proposed Keadby 3 site. The highlighted area on Figure 2 indicates the area within which the abstraction is proposed to be located and the position of Keadby Lock.

[1] PINS (2017) Advice Note 18: The Water Framework Directive
[2] Environment Agency (2016) Water Framework Directive assessment: estuarine and coastal waters (Clearing the Waters for All). Available online: [redacted]

Figure 2: Location of Proposed Abstraction and Keadby Lock

The Stainforth and Keadby Canal is approximately 34 km long and connects the River Don in the west with the River Trent in the east. It flows around the settlements of Stainforth, Kirk Bramwith, Barnby Dun and Kirk Sandall whilst flowing through Thorne and Doncaster. The canal also traverses the South Humberside Main Line and the M18 motorway.

Local hydrology

The locations of local watercourses are shown in **Figure 12-1: Surface Waterbodies and their attributes (ES Volume III)** ([redacted] reproduced in Appendix 1**.**

The proposed abstraction location lies approximately 750m west of the tidal River Trent (Humber Upper WFD waterbody) which flows in a northerly direction towards the Humber. Approximately 785m to the north of the proposed abstraction location, beyond Keadby Common is Warping Drain, an ordinary watercourse maintained by the Isle of Axholme and North Nottinghamshire Water Level Management Board (‘the IDB’) that flows east and into the tidal River Trent via sluice gates. Warping Drain includes Paupers Drain (WFD designated as the Paupers Drain Catchment (trib of Trent)); an artificial waterbody influenced by tidal locking with flood embankments on either side.

To the west of the proposed abstraction location is the Keadby Boundary Drain, an ordinary watercourse maintained by the IDB that flows into Warping Drain via a sluice with flood gates. South of the proposed abstraction location there are a number of watercourses running west to east in parallel with each other. These include the North Soak Drain and the South Soak Drain (WFD designated as North Soak Drain Catchment (trib of Torne/Three Rivers)), which flow either side of the Stainforth and Keadby Canal. The North and South Soak Drains flow into the Three Rivers (WFD designated as

Torne/Three Rivers from Mother Drain to Trent) a short distance to the south, and then this connects with the River Trent via sluice gates and Keadby Pumping Station, which is a major pump draining the Isle of Axholme. These three watercourses and the River Trent are all main rivers. The Sheffield and South Yorkshire Navigation – Stainforth and Keadby Canal is linked to the River Trent via Keadby Lock and managed by the Trust.

Existing Canal System

The Stainforth and Keadby Canal, like all other canals, is monitored and kept at specific levels to ensure safe passage for canal users. In this case, the process is automated and involves technology known as MEICA SCADA (Mechanical, Electrical, Instrumentation, Control and Automation Supervisory Control and Data Acquisition). This system is set up to automatically operate and control a number of sluices along the Canal to ensure the water in the Canal stays at the appropriate depth for boats to use. These systems are present at a number of locks across the canal as shown in Figure 3.

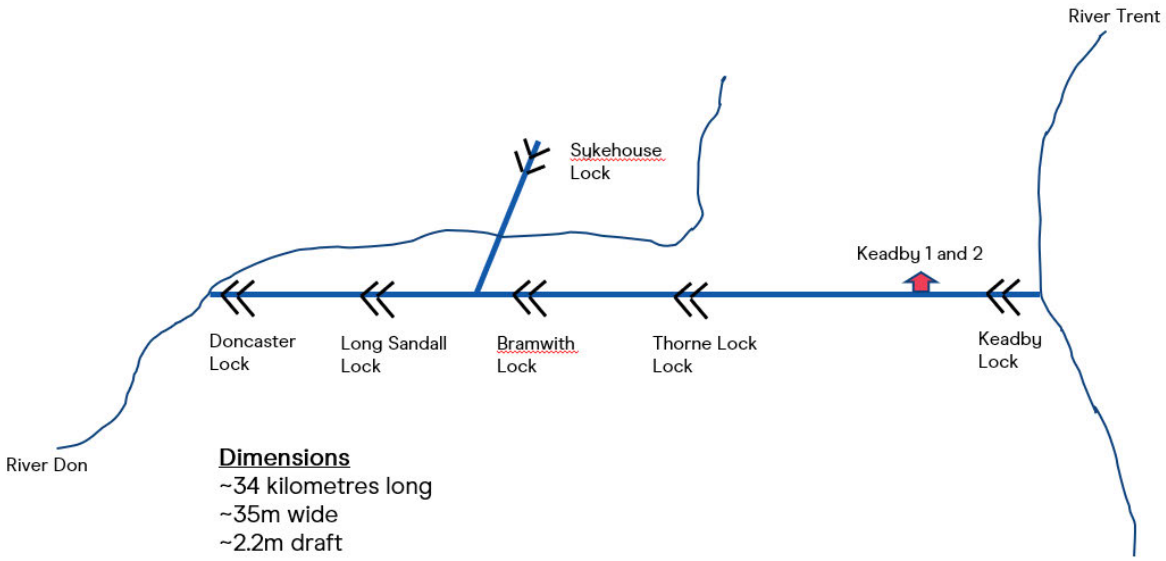

Figure 3 – Canal overview (source: Canal and River Trust)

The normal water level, as confirmed by the Trust, of the Thorne Lock to Keadby Lock pound (i.e. the reach between two sets of locks) is set at 4.35 metres Above Ordinance Datum (mAOD) (and known as 'Zero Level'). It is within this pound that the abstraction and proposed upgrade works are to take place. The SCADA technology is designed to minimise variation from the normal maintained water level and is set with a 50 mm +/- tolerance, therefore any breach of this tolerance will result in the sluices automatically adjusting in order to maintain the required water level. The existing design level of Keadby Lock is set at 4.12 mAOD which is 230 mm below the maintained water level. As a result of this, in normal operation there is a flow of water out of the Canal of approximately 37 Ml/d through spill over Keadby Lock into the River Trent (see Figure 4).

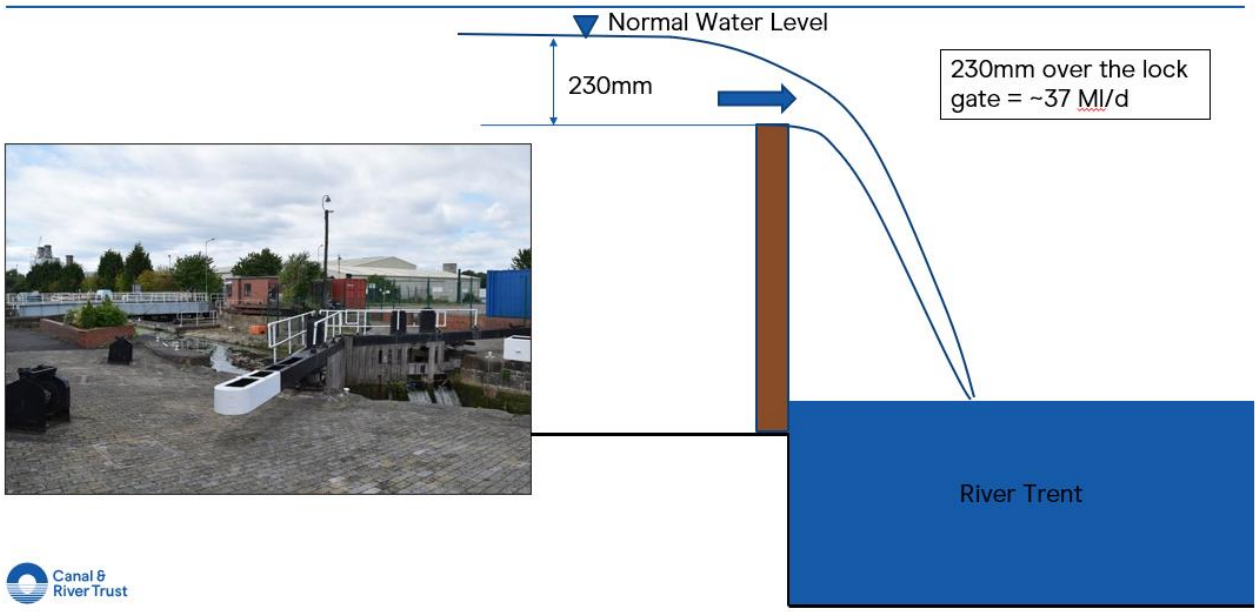

Figure 4: Keadby Lock daily spill volume

Proposed Modification Works at Keadby Lock

In order to make the required volume of water for the Keadby 3 cooling process available for abstraction, changes are required to upgrade Keadby Lock gates. The proposed works are subject to final design but will involve a modification to the top of the existing Keadby Lock gates to increase the threshold level before water overflow into the Trent occurs. As the design has not yet been developed, it has been agreed with the Trust to assume a design level similar to the Zero Level for the purpose of this assessment. This would increase the Keady Lock threshold from 4.12 mAOD to 4.35 mAOD and ensure that water which currently discharges into the River Trent daily is retained in the pound and available for abstraction. This will allow a sufficient volume of water to be available for abstraction whilst maintaining the Zero Level required for navigation. There will be no increased abstraction into the canal system from wider sources, and water that would ultimately drain to the Trent will still do so, but via Keadby 3.

5. Overview of the Water Framework Directive

The WFD, EC Directive 2000/60/EC[3], aims to protect and enhance the quality of the water environment across all European Union (EU) member states. England and Wales have adopted the WFD as national law by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017[4]. Following the departure of the United Kingdom from the European Union these regulations continue to apply until they are revoked or superseded by new legislation.

The WFD takes a holistic approach to the sustainable management of water by considering the interactions between surface water, groundwater and water-dependent ecosystems. Ecosystem quality is evaluated according to interactions between biological, physico-chemical and hydromorphological elements (or 'Quality Elements').

Under the WFD, 'Water bodies' are the basic management units and are defined as all or part of a river system or aquifer. Water bodies form part of larger River Basin Districts (RBD), for which River Basin Management Plans (RBMP) are developed and environmental objectives are set. RBMP are produced every six years, in accordance with the river basin management planning cycle. Cycle 2 plans were published in February 2016, and the most recent RBMP data available on the online Catchment Data Explorer is from 2019, which are due to be updated to Cycle 3 plans in 2021 (no updates have yet been published at the time of writing in November 2021).

The WFD requires water bodies to be classified according to their current condition (i.e. the 'Status' or 'Potential,' depending on whether they are heavily modified or artificial water bodies) and to set a series of objectives for maintaining or improving conditions so that water bodies maintain or reach Good Status or Potential.

[3] European Union (2000) Water Framework Directive 2000/60/EC.
[4] HMSO (2017) Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.

The Environment Agency is under a duty to exercise its relevant functions so as to best secure that the requirements of WFD for the achievement of environmental objectives are co-ordinated. The Planning Inspectorate's Advice Note 18[5] summarises the overall aims and objectives of the WFD as to:

- Enhance the status and prevent further deterioration of surface water bodies, groundwater bodies and their ecosystems;
- Ensure progressive reduction of groundwater pollution;
- Reduce pollution of water, especially by Priority Substances and Certain Other Pollutants;
- Contribute to mitigating the effects of floods and droughts;
- Promote sustainable water use; and
- Achieve at least good surface water status for all surface water bodies and good chemical status in groundwater bodies by 2015 (or good ecological potential in the case of artificial or heavily modified water bodies).

As a result, new developments that have the potential to impact on current or predicted WFD status are required to assess their compliance against the WFD objectives of the potentially affected water bodies.

In determining whether a development is compliant or non-compliant with the WFD objectives for a water body, the Environment Agency and partnering organisations must also consider the conservation objectives of any Protected Areas (i.e. Natura 2000 sites or water dependent Sites of Special Scientific Interest) and adjacent WFD water bodies, where relevant.

Further details regarding the WFD and how waterbody status/ potential is determined is outlined in **Keadby 3 Environmental Statement Volume II Appendix 12B: Water Framework Directive Assessment Report** – Section 2 [redacted]).

Methodology

Guidance on how to undertake WFD assessments can be found in the 'Water Framework Directive risk assessment - How to assess the risk of your activity'[6] and on the You.Gov website. Although the modifications proposed by the Trust are not in their own right a Nationally Significant Infrastructure Project (NSIP), guidance contained in 'The Water Framework Directive - Advice note eighteen: The Water Framework Directive'[5] is also considered relevant best practice. Taken together, these guidance documents have informed the approach taken in this assessment.

A stepwise approach consisting of screening, scoping and impact assessment phases is generally followed in order to: (a) rationalise the levels of WFD assessment and impact mitigation that are required; and (b) verify that proposals meet the requirements of the WFD. The general approach is described by The Planning Inspectorate (2017) and briefly summarised below.

Stage 1 Screening

Screening identifies the zone of influence of a proposed development, and if proposed activities pose a risk to the water environment. It is used to identify if there are activities that do not require further consideration for WFD objectives, for example activities which have been ongoing since before the current RBMP plan cycle and which have thus formed part of the baseline.

Stage 2: Scoping

Scoping is used to identify any potential impacts of the proposed activities to specific WFD receptors and their water quality elements. This involves review of WFD impact pathways, shortlisting which WFD water bodies and quality elements could or could not be affected by proposed activities, and collecting baseline information from the relevant RBMP on the status and objectives for each water body.

Stage 3: Impact Assessment

This involves rationalised assessment of water bodies and quality elements that could be affected by proposed activities, in order to identify any areas of WFD non-compliance. Proposed activities are reviewed in terms of both positive and negative impacts, and the baseline mitigation measures, enhancements, and contributions to the WFD objectives

[5] PINS (2017) Advice Note 18: The Water Framework Directive.
[6] Environment Agency (2016) WFD Risk Assessment: How to Assess the Risk of Your Activity.

described in the RBMP. Any proposed activities with potentially deleterious impacts are reviewed simultaneously with their corresponding mitigation proposals, to determine a net effect on WFD objectives.

Further details regarding the WFD assessment methodology and how waterbody status/ potential is determined can be found in **Keadby 3 Environmental Statement Volume II Appendix 12B: Water Framework Directive Assessment Report** – Section 2. This also includes details on desk study sources and the findings of a site walkover undertaken for the Keadby 3 development on 31 July 2020 which are also considered relevant and applicable in the context of this WFD screening assessment.

The impact assessment is based on a source-pathway-receptor model. For an impact on the water environment to exist the following is required

- an impact source (such as the release of polluting chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or the loss or damage to all or part of a water body);
- a receptor that is sensitive to that impact (i.e. waterbodies and the services they support); and
- a pathway by which the two are linked.

Article 4.7 Derogation

Where the potential for deterioration of water bodies is identified, and it is not possible to mitigate the impacts to a level where deterioration or failure to improve can be avoided, the project would need to be assessed in the context of Article 4.7 of the Directive. For the proposed works considered in this assessment, a derogation under Article 4.7 is not considered necessary.

6. Screening Assessment

The water bodies screened into the assessment have been selected based on the following criteria:

- all surface water and groundwater bodies that may potentially be directly or indirectly impacted by the proposed works; and
- the relevant water bodies have been determined using a Zone of Influence (ZoI) approach, which firstly requires the identification of all potential pathways to an effect on all quality elements, and secondly determination of the extent of the effect (i.e. the ZoI).

Section 2 above provides a brief description of the required works to Keadby Lock to enable the canal water abstraction. All potential pathways to an effect and ZoI have been identified from this understanding of the proposed design. Potential for effects on protected areas associated with the WFD waterbodies has also been considered within the screening assessment.

The proposed works are located within the catchment of the Humber RBMP[7] Table 1 provides a summary of the baseline status/ potential of the WFD waterbodies that have been identified within a 1km ZoI of the proposed works at Keadby Lock. Full WFD status classifications under Cycle 2 (2019) and baseline conditions are presented in **Keadby 3 Environmental Statement Volume II Appendix 12B: Water Framework Directive Assessment Report** – Annex A.

[7] DEFRA (2016) Humber River Basin Management Plan. Available online at: [redacted]

Table 1. WFD Surface Water bodies in the Study Area

Waterbody	Ecological Status / Potential	Chemical Status	Overall Target Objective	Hydromorphological Designation	Designated Reach
Humber Upper (GB530402609203)	Moderate Ecological Potential	Fail	Moderate (2015)	Heavily Modified	This section of the River Trent is designated from Owston Ferry to the south (approximately 13km upstream of Keadby) to its confluence with the River Ouse approximately 14.5km downstream of Keadby.
Site Observations: The Humber Upper waterbody (River Trent) was observed during the site visit from the western bank adjacent to Keadby Power Station, where it flows from the south to the north. Embankments line the river here for flood protection. At this point the waterbody is tidal and has a width of approximately 140m. The river is used for navigation with a wharf at Keadby and the nearest jetty approximately 600m upstream on the east bank near Gunners Wharf. Further details regarding hydrodynamics, tides and sediments are provided in **Keadby 3 Environmental Statement Volume II Appendix 12B: Water Framework Directive Assessment Report**. Adjacent to Keadby village there are two existing discharge points into the River Trent from Keadby power station (SE 83536 11647 and SE 83655 12226), with trash screens and bollards to prevent collision from passing boats. The tide was low enough during the site visit to expose intertidal muddy sediments at the channel. **Protected Areas**: The river adjacent to Keadby is situated in the Humber Estuary Site of Special Scientific Interest (SSSI), Humber Estuary Special Area of Conservation (SAC) and Humber Estuary Ramsar Site. Nitrates Directive areas S653, S298, S281, S352. Habitats and Species Directive UK0030170 (SAC), Conservation of Wild Birds Directive area UK9006111 (SPA) and Urban Wastewater Treatment Directive area UKENRI130.					
Paupers Drain Catchment (trib of Trent) (GB104028064300)	Moderate Ecological Potential	Fail	Moderate (2015)	Artificial	Unusually, this waterbody consists of two separate designated watercourses, Warping Drain and Paupers Drain which both flow west to east between Crowle and the River Trent, totalling approximately 13km length and draining an area of around 32.04km^2.
Site Observations: Warping drain was observed from the B1392 at SE 83592 12125 where it crosses beneath the road. The watercourse is single thread and approximately 7m wide here and perfectly straight. There was no flow observed due to the tidal lock upstream of the River Trent. The watercourse was extremely turbid and so depth could not be ascertained. There was an algal bloom upstream of the tidal lock indicative of nutrient enrichment. The channel is incised with banks rising relatively steeply away from the channel bed. The banks and riparian zone was densely vegetated as would be expected in summer and provides something of a buffer strip to the arable fields beyond. **Protected Areas**: The drain is a designated Local Wildlife Site (LWS) as it supports a population of whorled water-milfoil (*Myriophyllum verticillatum*). The site is also designated for its wet reed beds with a large population of common reed (*Phragmites australis*). Nitrates Directive areas S653, S281, S349, S352 and S350. Habitats and Species Directive area UK0030170 (SAC).					
North Soak Drain Catchment (trib of Torne/Three Rivers) (GB104028064350)	Moderate Ecological Potential	Fail	Moderate (2015)	Artificial	This artificial drain is designated between Thorne and Keadby, where it meets Torne/Three Rivers shortly upstream of the River Trent. It is 26.4km in length and drains a catchment area of 55.641km^2
Site Observations: North and South Soak Drains were observed during the site visit at SE 82505 11545 and SE 82487 11450, respectively. Both were approximately 8 m wide and are straight, artificial drainage channels with steep banks, and are located either side of the Stainforth and Keadby Canal. Both were extremely turbid with phytoplankton such that depth could not be ascertained although is expected to a be several metres. There were clumps of algae on the surface and appear nutrient enriched. Fine sediment accumulations were apparent at channel margins in some locations. South Soak Drain is located approximately 3m lower in elevation than the adjacent canal, and the drain supports rich aquatic, emergent and marginal flora. **Protected Areas**: The site is a designated LWS for its swamp habitat which is dominated by common reed. Nitrates Directive area S351, S298, S281, S349, S342; Habitats and Species Directive area UK0012915 Thorne Moor.					

Waterbody	Ecological Status / Potential	Chemical Status	Overall Target Objective	Hydromorphological Designation	Designated Reach
Torne/Three Rivers from Mother Drain to Trent (GB104028064340)	Moderate Ecological Potential	Fail	Good (2027)	Artificial	This watercourse includes the River Torne, South Engine Drain and Folly Drain. In total, it is designated from the northeast of Rossington and flows generally northwest to meet the River Trent at Keadby. In places the drains move apart and flow parallel to each other. Their combined total length is 50.6km, and they drain a catchment of 85.3km^2.
Site Observations: Torne/Three Rivers from Mother Drain to Trent was not visited during the Water Environment walkover. **Protected Areas**: Three Rivers is a LWS designated for its three parallel canalised watercourses which support a rich aquatic, emergent and marginal flora. Similarly, the River Torne LWS is designated for supporting a rich aquatic, emergent and marginal flora. It is also designated for its surrounding neutral grassland, purple moor grass and rush pasture and marsh. Nitrates Directive areas S335, S653, S351, S352, S337. Urban Wastewater Treatment Directive area UKENRI99 and Habitats and Species Directive area UK30030166 (SAC).					
Sheffield and South Yorkshire Navigation (New Junction and Stainforth and Keadby) (GB70410281)	Good Ecological Potential	Fail	Good (2015)	Artificial	The designated reach is 43.8km in length, extending from an offtake from the River Don in the centre of Doncaster to the southwest, to the River Trent immediately southeast of the Keadby 1 power station.
Site Observations: This watercourse was visited between the road crossing at SE 82494 11484 and the lock gates between the canal and River Trent at SE 83444 11423. The canal by its nature is artificial and so very straight. At this point it is a wide waterbody at approximately 30m width. There are four sets of lock gates separating the canal from the River Trent, managed by the Canal and River Trust. The canal appeared to be around 1.5m deep with the water being very clear at the time of the site visit. There was an abundance of submerged, floating and emergent macrophytes, and numerous fish were seen in the channel. The canal is used for navigation and water sports, and the towpath is popular for recreation. There is an existing abstraction point from the canal for Keadby 1 at SE 82997 11468, and a new abstraction point for Keadby 2 was being constructed behind a coffer dam during the site visit at SE 82769 11499. **Protected Areas**: The Stainforth and Keadby Corridor LWS is designated for a rich aquatic flora throughout its length. The canal is also designated for its mosaic of associated bankside habitats. Nitrates Directive Area S653.					
Lower Trent Erewash - Secondary Combined WFD Groundwater Body (GB40402G990300)	Good Status	Good Chemical Status	Good (2027)	Not applicable	In relation to the Proposed Development, this waterbody spans the study area to the north of Keadby Common. The overall waterbody is large (1,924km^2) and extends from Ashby-de-la-Zouch to the south to the Humber Estuary to the north.
Protected Areas: Nitrate Directive areas Lincolnshire Limestone (G69), Nottinghamshire (G40), Burton (G34); Lower Trent Erewash – Secondary Combined Drinking Water Protected Area (UKGB40402G990300).					
Idle Torne - Secondary Mudrocks WFD Groundwater Body (GB40402G992200)	Good Status	Good Chemical Status	Good (2015)	Not applicable	In relation to the Proposed Development, this waterbody spans the study area to the south of Keadby Common. The overall waterbody is large (320km^2) and extends from Bilsthorpe to the south to the Swinefleet to the north.
Protected Areas: Nitrates Directive area Nottinghamshire (G40); Idle Torn – Secondary Mudrocks Drinking Water Protected Area (UKGB40402G992200)					

WFD water bodies have been screened into this assessment using a ZoI approach and on the basis of whether they are:

- A designated WFD water body within the ZoI (1 km); and
- A designated WFD water body indirectly affected by the ZoI.

WFD Screening of these water bodies in relation to the proposed modification works at Keadby Lock is provided in Table 2. Please note that impacts relating to the proposed water abstraction from Stainforth and Keadby Canal are separately assessed within **Keadby 3 Environmental Statement Volume II Appendix 12B: Water Framework Directive Assessment Report ([redacted]).**

Table 2. Screening of WFD waterbodies potentially impacted by the proposed Keadby Lock modification works

Waterbody ID	Screening Outcome	Justification
Surface Waterbodies:		
Humber Upper (GB530402609203)	In	Given works to the Keadby Lock between Stainforth and Keadby Canal and the River Trent (Humber Upper WFD waterbody) there is potential for direct impacts on the watercourse.
Sheffield and South Yorkshire Navigation (New Junction and Stainforth and Keadby) (GB70410281)	In	Given works to the Keadby Lock between Stainforth and Keadby Canal and the River Trent (Humber Upper WFD waterbody) there is potential for direct impacts on the watercourse.
Paupers Drain Catchment (trib of Trent) (GB104028064300)	Out	There is no identified pathway to impact this waterbody from works to the Keadby Lock
North Soak Drain Catchment (trib of Torne/Three Rivers) (GB104028064350)	Out	There is no identified pathway to impact this waterbody from works to the Keadby Lock
Torne/Three Rivers from Mother Drain to Trent (GB104028064340)	Out	There is no identified pathway to impact this waterbody from works to the Keadby Lock
Groundwater bodies:		
Lower Trent Erewash - Secondary Combined (GB40402G990300)	Out	There is no identified pathway to impact this waterbody from works to the Keadby Lock
Idle Torne - Secondary Mudrocks WFD Groundwater Body (GB40402G992200)	Out	There is no identified pathway to impact this waterbody from works to the Keadby Lock

A screening assessment of the components and activities proposed for the Keadby Lock are considered in Table 3.

Table 3. Screening of the proposed works and activities against WFD quality elements

Activity & Description	Potential Impact	Mitigation	Screening Outcome & Justification
Works to increase the height of Keadby Lock gates - construction workers, vehicles and plant around the Stainforth and Keadby Canal (at Keadby Lock) could be a direct source of fine sediment mobilisation, and this sediment could contain contaminants which are runoff into the canal. Works directly over the watercourse would only consist of modification to the existing lock gate, and no works are proposed within the watercourse itself.	Potential for adverse water quality impacts and subsequent impacts of aquatic ecology from mobilisation of sediments and surface water runoff containing contaminants into Stainforth and Keadby Canal. Could be conveyed downstream to River Trent (Humber Upper WFD waterbody, also a SAC and SSSI). These impacts could impact site designations.	The proposed lock gate modification works are minor in nature and impacts would be very localised and of short duration. They would not require any direct contact with the waterbody, instead being focused on upgrading the existing lock gate above the water level. However, measures to avoid, prevent and reduce adverse effects on the water environment and deal with runoff from surrounding accesses would be included within a Construction and Environmental Management Plan (CEMP) prepared by the Contractor and submitted to the Trust, prior to commencement of construction in line with best practice. The measures included in the Framework CEMP [redacted]) and in **Keadby 3 Environmental Statement Volume II Appendix 12B: Water Framework Directive Assessment Report –** Section 6 which accompany the DCO Application for Keadby 3 would be used as a reference point by the Contractor, in addition to the measures set out in other guidance by the Trust.	**Screen out impacts to**: - Humber Upper (GB530402609203) - Sheffield and South Yorkshire Navigation (New Junction and Stainforth and Keadby) (GB70410281) Given the small scale and localised nature of the works, and that there is no requirement to physically work within the waterbody, it is anticipated that all residual risk would be adequately mitigated through measures to protect the water environment which will be outlined in the Contractor's CEMP to be approved by the Trust. As such this activity can be screened out of further assessment as it would not have an adverse impact on WFD waterbody status for any element or cause a prevention of future improvement in status. The Stainforth and Keadby Canal LWS comprises a 10km long watercourse and habitat corridor designated for its aquatic and wetland plant interest, and the associated ancillary bank-top scrub and grassland habitats that supplement the biodiversity value of the LWS. The effects on the LWS during construction would be limited to temporary disturbance of a very limited area of channel at Keadby Lock and would therefore not be significant given the large size of the LWS. The minor nature of the proposed modifications mean that any impact would be comparable to or less than that associated with the existing purpose and operation of the lock gate. While the boundary of the Keadby Lock intersects the boundary of the River Trent and therefore the Humber Estuary SSSI, SAC and Ramsar site, these designated areas would not be affected during implementation of the proposed minor modifications to increase the height of the Lock gate. The modifications can be achieved without works within the boundary of these designations, so there would be no loss or disturbance of habitats within the designations, particularly given implementation of measures in the CEMP.
During construction works to increase the height of the Keadby Lock Gate, fuel, hydraulic fluids, solvents, grouts, paints and detergents and other potentially polluting substances may be used on Site. Leaks and spillages of these substances could	Potential for adverse water quality impacts and subsequent impacts of aquatic ecology from accidental spillages into Stainforth and Keadby Canal. Pollutants could be conveyed downstream to River Trent (Humber Upper	The required works would be very localised and short in duration. They would not require any direct contact with the waterbody, instead being focused on the existing lock gate above the water level. However, measures to avoid, prevent and reduce adverse effects on the water environment and deal with spillages (including emergency response plans)	**Screen out impacts to**: - Humber Upper (GB530402609203) - Sheffield and South Yorkshire Navigation (New Junction and Stainforth and Keadby) (GB70410281) Given the small scale and localised nature of the works, and that there is no requirement to physically enter the waterbody, it is anticipated that all residual risk would be adequately mitigated through measures to protect the water environment to be outlined in the Contractor's CEMP.

Activity & Description	Potential Impact	Mitigation	Screening Outcome & Justification
pollute the nearby surface watercourses if their use or removal is not carefully controlled, and spillages could enter existing flow pathways or water bodies directly.	WFD waterbody). These impacts could affect site designations.	would be included within the CEMP prepared by the Contractor, prior to commencement of construction in line with best practice.	As such this activity can be screened out of further assessment as it would not have an adverse impact on WFD waterbody status for any element or cause a prevention of future improvement in status. The effects on the Stainforth and Keadby Canal Corridor LWS during construction would be limited to temporary disturbance of a very limited area of channel at Keadby Lock and would therefore not be significant given the large size of the LWS. The minor nature of the proposed modifications mean that any impact would be comparable to or less than that associated with the existing purpose and operation of the lock gate. The modifications can be achieved without works within the boundary of the Humber Estuary designations, so there would be no loss or disturbance of habitats within the designations, particularly given implementation of measures in the CEMP.
During construction works to Keadby Lock, there is the potential for Invasive Non-Native Species (INNS) to spread to other sites (including WFD waterbodies) via plant and machinery.	Potential for spread of INNS to other location via plant and machinery. This might include the River Trent (Humber Upper waterbody) but may also include off site locations where machinery and plant are next used.	During construction, appropriate controls would be in place to limit the potential for INNS which are known to be present within the Stainforth and Keadby Canal from spreading via plant and machinery onto other sites. Measures will be outlined in an Invasive Species Management Plan (ISMP) which will form part of the Contractor's CEMP. The measures included in the Framework CEMP ([redacted]) and in Keadby 3 Environmental Statement Volume II Appendix 11G: Aquatic Ecology Survey Report ([redacted])– which accompany the DCO Application for Keadby 3 would be used as a reference point by the Contractor in addition to the measures set out in other guidance by the Trust.	**Screen out impacts to**: - Humber Upper (GB530402609203) - Sheffield and South Yorkshire Navigation (New Junction and Stainforth and Keadby) (GB70410281) Given mitigation measures outlined in the ISMP to be produced by the Contractor as part of the CEMP, then risk of spreading INNS would be expected to be negligible and would not adversely impact on WFD classifications or future objectives.
During operation the Keady Lock threshold level will increase from 4.12 mAOD to 4.35 mAOD and ensure that water which currently is able to discharge into the River Trent is retained in the canal, allowing a sufficient volume	Increased level of Stainforth and Keadby Canal leading to reduced flow through to River Trent (Humber Upper WFD waterbody). Potential to change physico-chemical properties (e.g. dissolved	There is no designed mitigation required for this potential impact, given that water will continue to leave the canal but via the abstraction route rather than directly over Keadby Lock.	**Screen out impacts to**: - Humber Upper (GB530402609203) - Sheffield and South Yorkshire Navigation (New Junction and Stainforth and Keadby) (GB70410281) No adverse impacts against WFD classifications or future objectives are anticipated given that the required works are minimal (in order to

Activity & Description	Potential Impact	Mitigation	Screening Outcome & Justification
of water to be available for abstraction whilst maintaining the Zero Level.	oxygen levels) or potential to lead to increased build-up of nutrients or pollutants. However, the current water loss to the River Trent should be regarded as leakage. The established function of the existing lock gate is to retain water within the canal except when the lock is in operation. Furthermore, there will be a new abstraction to Keadby 3 of up to 27.4 Ml/d, as well as the Keadby 2 abstraction which has yet to commence as the scheme is under construction. As such, there will continue to be a significant flow of water out of the canal, albeit via the abstractions rather than directly into the River Trent (Humber Upper WFD waterbody).		prevent leakage of water from the lock), and that water will continue to pass through the canal via the abstraction. The minor nature of the proposed modifications means that any impact on the Stainforth and Keadby Canal LWS would be comparable to or less than that associated with the existing purpose and operation of the lock gate. The banks of the River Trent at this location are heavily modified and would be unchanged by these proposed works, while the channel of the river at the lock gate is already affected by the established use of the lock gate. The proposed modifications would not alter the established use and conditions of the River Trent at this location. No impacts to the designations are therefore anticipated. The water utilised for Keadby 3 will still be discharged into the tidal River Trent on transit from the cooling system (albeit subject to some evaporative losses). The effects of use and discharge of cooling water on habitats within the River Trent have been assessed as part of **Keadby 3 Environmental Statement Volume II Appendix 12B: Water Framework Directive Assessment Report**

7. Conclusion

In conclusion, taking into consideration the minor nature of the works proposed by the Trust to Keadby Lock and the mitigation measures that are also being proposed including a Contractor CEMP, it is considered that no significant adverse impacts will occur to all identified WFD waterbodies (principally the Sheffield and South Yorkshire Navigation (New Junction and Stainforth and Keadby) and Humber Upper WFD waterbodies) meaning that non-compliance with the WFD objectives is unlikely, and no further assessment is required (i.e. it can be screened out).

There are no direct works to other watercourses/ waterbodies to construct the changes to Keadby Lock, and best practice mitigation measures outlined in the CEMP and ISMP would prevent an impact on WFD classifications (for ecological, hydromorphological or physico-chemical quality elements) during construction and would not prevent future objectives being achieved.

Similarly, no operational impacts have been identified that would adversely impact WFD classifications or future objectives.

Furthermore, no impact on the designated ecological sites related to the Stainforth and Keadby Canal or River Trent have been identified, given the mitigation measures.

On the basis of this screening assessment, it is not considered necessary to proceed to Stage 2 (Scoping) or Stage 3 (Impact Assessment) as described in the Planning Inspectorate's Advice Note Eighteen[8].

[8] PINS (2017) Advice Note 18: The Water Framework Directive

Appendix 1. Surface Waterbodies and their Attributes Figure

APPENDIX C: SCHEDULED MONUMENT CONSENT APPLICATION HERITAGE IMPACT ASSESSMENT

Keadby Lock

Scheduled Monument Consent Application
Heritage Impact Assessment

Project number: 60665962

14 January 2022

Delivering a better world

Quality information

Prepared by	Checked by	Verified by	Approved by
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Revision History

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1	02-02-22	Amendment following client review	[redacted]	Susan Evans	Associate - EIA

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Figures

1. Introduction

Background

1.1 This Heritage Impact Assessment accompanies a draft application for Scheduled Monument Consent (SMC) concerning proposed modifications to the lock gates at Keadby Lock Scheduled Monument [NHLE: 1005204] and Grade II listed building [NHLE: 1342734] ('the proposed works'). The proposed works form part of a proposed water management scheme for the Stainforth & Keadby Canal. The Canal & River Trust (hereafter 'the Trust') wish to supply additional water into the pound above Keadby Lock to be abstracted by a third party. The proposed abstraction, by Keadby Generation Limited, would be used to supply cooling water to the proposed Keadby 3 Carbon Capture Power Station. A Development Consent Order (DCO) application for Keadby 3 Carbon Capture Power Station has been submitted to the Secretary of State for Business, Energy and Industrial Strategy, under Section 37 of 'The Planning Act 2008 and is going through Examination at the time of writing. The proposal is to raise the lock gates at the top gates of Keadby Lock by 300mm to prevent water being lost into the River Trent when water levels are high in the canal. This water efficiency proposal would supply sufficient additional water required for abstraction in line with the principles of sustainable development[1].

1.2 This report has been prepared in order to assess the impact of the proposed modifications on the heritage significance and special interest of the Keadby Lock Scheduled Monument [NHLE: 1005204] and Grade II listed building [NHLE: 1342734]. This report conforms to the requirements of the National Planning Policy Framework (2021) and has been prepared in accordance with the guidance published in 2019 by Historic England in Statements of Heritage Significance: Analysing Significance in Heritage Assets.

Objectives

This Heritage Impact Assessment identifies heritage constraints associated with the proposed works and provides relevant and proportional mitigation strategies to reduce the impact where required. The objectives of this document are as follows:

- to place the proposed works within their legislative and policy context;
- to provide an assessment of the significance of Keadby Lock;
- to minimise harm to the heritage significance and special interest of Keadby Lock through sensitive design; and
- to assess the impact of the proposed works on the significance and special interest of Keadby Lock.

Site Location

Keadby Lock is located in the Parish of Keadby with Althorpe, approximately 4km west of the town of Scunthorpe, North Lincolnshire at NGR se 83495 11415. The lock forms the connections between the Stainforth and Keadby Canal and the River Trent and consists of a single lock basin with two alternating pairs of gates.

The proposed works relate to the top lock gates, shown in Figures 1-4. These are furthest upstream of four sets of gates at Keadby. The gates are named in order from west to east as follows: top gates; upstream middle gates; downstream middle gates; and flood gates.

[1] In accordance with National Planning Policy Framework (2021) paragraph 8.c) *'Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives) – c) an environment objective – to protect and enhance our natural, built and historic environment;* ***including making effective use of land****, improving biodiversity,* ***using natural resources prudently****, minimising wastes and pollution and mitigating and adapting to climate change, including* ***moving to a low carbon economy***.'

Figure 1 - Site location (image Arcadis 2022 after Google Earth™).

Figure 2- Map showing the designations at Keadby Lock Scheduled Monument [NHLE: 1005204] and Grade II listed building [NHLE: 1342734] (image Arcadis 2022 after Historic England).

Figure 3 - Downstream face of the top lock gates to be modified at Keadby Lock (image Arcadis 2022)

Figure 4 - Upstream face of the top lock gates to be modified at Keadby Lock (image Arcadis 2022)

2. Legislation and Planning Policy

Legislation

Ancient Monuments and Archaeological Areas Act 1979

2.1 The Ancient Monuments and Archaeological Areas Act (1979) ('the Act') is the central piece of legislation for the protection of the archaeological resource. The first section of the Act requires the Secretary of State for National Heritage to maintain a schedule of nationally important sites. For the purpose of the Act, a monument is defined as:

> *"a) any building, structure or work, whether above or below the surface of the land, and any cave or excavation;*
>
> *b) any site comprising the remains of any such building, structure or work or of any cave or excavation;*
>
> *c) any site comprising, or comprising the remains of, any vehicle, vessel, aircraft or other moveable structure or part thereof which neither constitutes nor forms part of any work which is a monument as defined within paragraph a) above; and*
>
> *d) any machinery attached to a monument shall be regarded as part of the monument if it could not be detached without being dismantled' (Section 61 (7))."*

2.2 The Act further defines an ancient monument as: "*any Scheduled Monument; and any other monument which in the opinion of the Secretary of State is of public interest by reason of the historic, architectural, traditional, artistic or archaeological interest attaching to it' (Section 61 (12))*."

2.3 A set of criteria, defined as survival/ condition, period, rarity, fragility/ vulnerability, diversity, documentation, group value and potential, assist in the decision-making process as to whether an asset is deemed of national importance and best managed by scheduling.

Planning (Listed Buildings and Conservation Areas) Act 1990

2.4 The Planning (Listed Buildings and Conservation Areas) Act 1990 (as amended) is the principal statutory instrument which must be considered in the determination of any application affecting listed buildings and conservation areas.

2.5 Under this legislation, local planning authorities and the Secretary of State are required to have special regard to the desirability of preserving a listed building, its setting, or any features of special architectural or historic interest that it possesses. It also places a duty on local planning authorities to publish proposals for their conservation areas and exercise their planning functions in a manner that gives regard to the desirability of preserving and enhancing the character or appearance of these areas.

2.6 Section 61 of the Act outlines that where a building is both listed and scheduled, the Ancient Monuments and Archaeological Areas Act 1979 takes precedence and Scheduled Monument Consent, rather than listed building consent is required for any proposed alterations.

National Planning Policy

National Planning Policy Framework (NPPF)

2.7 The NPPF (Ministry of Housing, Communities and Local Government, 2021) sets out the Government's planning policies for England and how these should be applied to contribute to the achievement of sustainable development. While the Environmental Impact Assessment (EIA) methodology forms part of a separate planning regime, the planning decision still takes account of national guidance. As such, it important to understand where the development fits within this. 2.5 Section 16 of the NPPF deals specifically with the historic environment. Where changes are proposed, the NPPF sets out a clear

framework to ensure that heritage assets are conserved, and where appropriate enhanced, in a manner that is consistent with their significance.

2.8 The NPPF sets out the importance of being able to assess the significance of heritage assets that may be affected by a development. Significance is defined in Annex 2 as being the, “value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic or historic”. Significance is not only derived from an asset's physical presence, but also from its setting. The setting of a heritage asset is defined in Annex 2 as, “the surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve”.

2.9 Paragraph 194 of the NPPF states that in determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the assets’ importance and no more than is sufficient to understand the potential impact of the proposal on their significance. Similarly, paragraph 195 includes a requirement on local planning authorities, having assessed the particular significance of any heritage asset that may be affected by a proposal, to take this into account when considering the impact of a proposal on a heritage asset.

2.10 In determining planning applications, local planning authorities should take account of the following points:

- the desirability of sustaining and enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation;
- the positive contribution that conservation of heritage assets can make to sustainable communities including their economic vitality;
- the desirability of new development making a positive contribution to local character and distinctiveness (paragraph 192); and
- opportunities to draw on the contribution made by the historic environment to the character of a place.

2.11 Paragraphs 199 to 203 of the NPPF introduce the concept that heritage assets can be harmed or lost through alteration, destruction or development within their setting. This harm ranges from less than substantial through to substantial. With regard to designated assets, paragraph 199 states that great weight should be placed on its conservation, irrespective of whether any potential harm is considered to be substantial or less than substantial. The paragraph goes further to say that the more important the asset, the greater the weight should be on its conservation. In paragraph 200, a distinction is made in respect of those assets of the highest significance (e.g. scheduled monuments, Grade I and Grade II* listed buildings) where substantial harm to or loss should be wholly exceptional.

2.12 Paragraph 201 states that in instances where development would cause substantial harm to or total loss of significance of a designated asset, consent should be refused unless it can be demonstrated that it is necessary to achieve substantial public benefits that outweigh that harm or loss. Paragraph 202 says in instances where development would cause less than substantial harm to the significance of a designated asset, the harm should be weighed against the public benefits of the proposal to provide a balanced judgement.

Local Planning Policy

2.13 The Proposed Development Site lies entirely within the administrative area of North Lincolnshire Council. The statutory development plan for the area currently comprises the following documents:

- North Lincolnshire Core Strategy (NLC, 2011a) - adopted June 2011;
- Housing and Employment Land Allocations (NLC, 2017) - adopted March 2016; and
- Saved Policies of the North Lincolnshire Local Plan (North Lincolnshire Council, 2007) - adopted May 2003, saved September 2007.

2.14 North Lincolnshire historic environment planning policies relevant to the current application include the following saved policies from the 2003 Local Plan.

- Policy HE5: Development affecting Listed Buildings. The policy states that ‘proposals which damage the setting of a listed building will be resisted’ (North Lincolnshire Council 2003, 204).

- Policy HE8: Ancient Monuments. The policy states that proposals that would result in an adverse effect on the setting of a 'scheduled ancient monument' will not be permitted (North Lincolnshire Council 2003, 206).

2.15 The North Lincolnshire Core Strategy (adopted June 2011) includes Policy CS6 Historic Environment stating the following [extract]:

> *"The council will promote the effective management of North Lincolnshire's historic assets through…preserving and enhancing the rich archaeological heritage of North Lincolnshire.*
>
> *The council will seek to protect, conserve and enhance North Lincolnshire's historic environment, as well as the character and setting of areas of acknowledged importance including historic buildings, conservation areas, listed buildings (both statutory and locally listed), registered parks and gardens, scheduled ancient monuments and archaeological remains.*
>
> *All new development must respect and enhance the local character and distinctiveness of the area in which it would be situated, particularly in areas with high heritage value".*

2.16 North Lincolnshire Council is currently preparing a new single Local Plan for North Lincolnshire. Once formally adopted, this will replace the existing North Lincolnshire Local Plan and Core Strategy. Policy HE1p will apply to all scheduled monuments in the plan area. Policy HE1p states the following:

> *"Development proposals affecting archaeological remains, whether known or potential, designated or undesignated, should take every practical and reasonable step to protect and, where possible, enhance their significance.*
>
> *Planning applications for such development must be accompanied by an appropriate and proportionate desk based assessment to understand the potential for and significance of remains, and the impact of development upon them.*
>
> *If desk based assessment does not provide sufficient information, developers will be required to undertake field evaluation in advance of determination of the application. This may include a range of techniques for both intrusive and non-intrusive evaluation, as appropriate to the site. All archaeological work should be undertaken by a suitably qualified party in accordance with professional standards and guidance published by Historic England and the Chartered Institute for Archaeology.*
>
> *Wherever possible and appropriate, mitigation strategies should ensure the preservation of archaeological remains in-situ. Where this is either not possible or not desirable, the developer will be required to make adequate provision for preservation by record according to a written scheme of investigation submitted by the developer and approved by the planning authority.*
>
> *Any work undertaken as part of the planning process must be appropriately archived in a way agreed with the local planning authority. The written scheme of investigation should be submitted in advance of determination of the application and its implementation will be secured by condition' (North Lincolnshire Council 2020, Policy HE1p)".*

3. Guidance

Planning Practice Guidance (PPG)

3.1 The PPG (Ministry of Housing, Communities and Local Government, 2019) provides further advice and expands on the guidance and policy outlined in the NPPF.

3.2 Significance of heritage assets and its importance in decision taking is explored in Paragraph 009 of the PPG which states that heritage assets may be affected by direct physical change or by change in their setting. Being able to properly assess the nature, extent and importance of the significance of a heritage asset, and the contribution of its setting, is very important to understanding the potential impact and acceptability of development proposals (ID 18a-009-20140306 Last updated 23 07 2019).

3.3 The PPG discusses how to assess if there is substantial harm. It states that what matters in assessing if a proposal causes substantial harm is the impact on the significance of the heritage asset. Ultimately, whether a proposal causes substantial harm will be a judgement for the decision taker. However, it acknowledges that substantial harm is a high test so may not arise in many cases. A key consideration when assessing whether there is an adverse impact on a listed building is whether the adverse impact seriously affects a key element of its special architectural or historic interest. It is the degree of harm to the asset's significance rather than the scale of the development that is to be assessed (Paragraph: 017 Reference ID: 18a-017-20140306).

Historic England Guidance

3.4 Historic England has published a series of Good Practice Advice (GPA), of which those of most relevance to this appraisal are GPA2 - *Managing Significance in Decision-taking* (March 2015), GPA3 - *The Setting of Heritage Assets* (2nd Edition) (December 2017a) and Advice Note 12 *Statements of Heritage Significance* (2019).

3.5 GPA2 emphasises the importance of having a knowledge and understanding of the significance of heritage assets likely to be affected by the development and that the *"first step for all applicants is to understand the significance of any affected heritage asset and, if relevant the contribution of its setting to its significance"* (paragraph 4). Early knowledge of this information is also useful to a local planning authority in pre-application engagement with an applicant and ultimately in decision making (paragraph 7).

3.6 GPA3 provides advice on the setting of heritage assets. Setting is as defined in the NPPF and comprises the surroundings in which a heritage asset is experienced. Elements of a setting can make positive or negative contributions to the significance of an asset and affect the ways in which it is experienced. Historic England state that setting does not have a boundary and what comprises an asset's setting may change as the asset and its surroundings evolve. Setting can be extensive and, particularly in urban areas or extensive landscapes, can overlap with other assets. The contribution of setting to the significance of an asset is often expressed by reference to views and the GPA in paragraph 11 identifies those views, such as those that were designed, or those that were intended, that contribute to understanding the significance of assets.

3.7 Historic England published Advice Note 12 (HE 2019) which outlines a recommended approach to assessing the significance of heritage assets in line with the requirements of NPPF. It includes a suggested reporting structure for a 'Statement of Heritage Significance,' as well as guidance on creating a statement that is proportionate to the asset's significance (heritage value) and the potential degree of impact of a proposed scheme.

Chartered Institute for Archaeologists

3.8 The baseline study has been undertaken in accordance with guidance published by the Chartered Institute for Archaeologists (CIfA), with specific regard to the Standard and Guidance for Historic Environment Desk-based Assessment (CIfA 2020) and the Code of Conduct (CIfA 2019).

IEMA Principles of Cultural Heritage Impact Assessment in the UK

3.9 Principles of Cultural Heritage Impact Assessment in the UK (IEMA 2021) is a guide to good practice in cultural heritage impact assessment published jointly by the Institute of Environmental Management and Assessment (IEMA), the Institute of Historic Building Conservation (IHBC) and the Chartered Institute for Archaeologists (CIfA). The document provides guidance on understanding cultural heritage assets and evaluating the consequences of change.

3.10 Understanding cultural heritage assets is split into three stages: Description, Significance and Importance. The description arrives at a factual statement that establishes the nature of the asset. The heritage values of the asset are then analysed (the guidance stresses that these include but are not limited to aesthetic, historic, scientific, social or spiritual values) and a statement of cultural significance given. Finally, the importance of the asset is assessed, and a conclusion drawn as to the level of protection that the asset merits in planning policy and cultural heritage legislation. The guidance notes that, unlike cultural significance, importance is scaled and can be described as high, medium or low.

3.11 The process of evaluating the consequences of change is split into three stages: Understanding change, Assessing impact and Weighting the effect. All aspects of a proposal that have the ability to change a cultural heritage asset or its setting are first explained. If these changes affect the cultural significance of the asset the resulting impact, which could be positive or negative, and its magnitude is then assessed. The effect is a combination of the magnitude of the impact and the cultural heritage asset's importance, and the scale of the effect will determine by how much the issue should influence the design of the proposal and whether the proposal is acceptable and will be permitted.

4. Methodology

Defining Significance

4.1 A methodology for the assessment of significance of heritage assets is outlined in Historic England's Advice Note 12 (Historic England 2019) whilst Historic England GPA3 (2017a) provides the basis of a methodology for the assessment of setting and how it contributes to significance. The NPPF defines significance as *"The value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting"*.

4.2 Significance is often established by statutory designations such as listed buildings, scheduled monuments and conservation areas. More particular advice as to what makes up significance is set out in Historic England's Advice Note 12 (Historic England 2019), which provides a methodology for thinking consistently about the heritage values that can be ascribed to a place and defines those heritage interests as follows:

- Archaeological interest: there will be archaeological interest in a heritage asset if it holds, or potentially holds, evidence of past human activity worthy of expert investigation at some point.
- Architectural interest: these are interests in the design and general aesthetics of a place. They can arise from conscious design or fortuitously from the way the heritage asset has evolved. More specifically, architectural interest is an interest in the art or science of the design, construction, craftsmanship and decoration of buildings and structures of all types.
- Artistic interest: this is an interest in other human creative skills, like sculpture.
- Historic Interest: An interest in past lives and events (including pre-historic). Heritage assets can illustrate or be associated with them. Heritage assets with historic interest not only provide a material record of our nation's history but can also provide meaning for communities derived from their collective experience of a place and can symbolise wider values such as faith and cultural identity.

4.3 This impact assessment is focused on Keadby Lock. To define the significance of the asset, research into the history of the canal and lock has been undertaken using historic maps, photographs and primary and secondary documents. A discussion of the lock's historic background is provided in Section 5, together with information on its development over time including historic and recent alterations. This information is used to define the asset's significance using the terminology provided above in Section 6. By defining significance in this way, modifications can be designed sensitively to conserve and enhance the significance of heritage places.

Consultation

4.4 Consultation was undertaken with Historic England via a virtual meeting platform on 9th December 2020. This focused on the purpose of the scheme, a discussion of design options, and agreement of the documentation that would be required to accompany an application for Scheduled Monument Consent.

4.5 All options considered for the proposed development are presented in the Options Appraisal Report (Arcadis 2022). Consultation identified Option 1 as Historic England's preferred option for this modification to the gates, but Option 2 was also identified as the preferred option for the gates if they are to be replaced in their entirety in the future.

4.6 It was agreed that the following documentation would be submitted as part of the Scheduled Monument Consent application:

- Cover letter outlining the need for the scheme;
- Options Appraisal showing the design development and selection, as well as providing information on control measures in place for dealing with overflow, should abstraction cease;
- Heritage Impact Assessment (this document); and
- Completed Application form with signed Certificate 2(1)(a) to comply with Paragraph 2(1) of Schedule 1 of the Ancient Monuments and Archaeological Act 1979.

5. Heritage Baseline

Listing Description

5.1 The Lock is a scheduled monument [NHLE: 1005204] however no formal description of the monument is currently available on Historic England's online NHLE. The lock is also a Grade II listed building [NHLE: 1342734], and the listing description for the asset is as follows:

"Tidal canal lock and abutments for former swing bridge. 1793-1802 for the Stainforth and Keadby Canal; new lock gates and sills fitted 1932; concrete platform, lock-keeper's hut and sheet steel pilings to river front of 1970s- 80s. Ashlar-faced lock basin and bridge abutments. Timber lock gates with iron railings. Aligned east-west, with River Trent to east. Single lock basin with 2 alternating pairs of gates; the outer flood gates nearly 8 metres high. Lock wall has depth gauge in Roman numerals inscribed on north side beside outer flood gates, and inscription to centre of north side recording fitting of new gates and sills in August 1932. To west of lock are abutments for former swing road bridge with curved recessed retaining walls to north and south, and coped stone wall to southern entrance with wooden and iron barred gate. C20 swing road bridge to west, and brick walls around lock are not included in the listing. The Stainforth and Keadby Canal, built to by-pass the lower reaches of the River Don, was purchased by the South Yorkshire Railway Co which opened a line along the north canal bank in 1859. Its terminus beside Keadby Lock was superseded in 1864 when the line was diverted to Keady Bridge a mile to the south."

[redacted]

Historical Background

5.2 Throughout the medieval period, the Keadby area is likely to have been marshland, used as summer pasture and exploited for the rich fishing and hunting resources that such an environment provides. In the post-medieval period however, a systematic drainage programme was initiated, converting areas of marshland and moorland into organised, drained and fertile enclosures to create an entirely new landscape. The work comprised the cutting of new drains, construction of dykes, and re-directing the flow of the island's bounding rivers, and warping systems. The ambitious programme, begun in the 1620s, was designed by Cornelius Vermuyden, who had been commissioned by Charles I to drain the land. Vermuyden redirected the flow of the Rivers Idle, Torne and Don, by channelling them in large straight dykes into the River Trent. A later addition consisted of the creation of the 'New Idle River' or Keadby Drain', running south-west to north-east to a new sluice gate south of Keadby village.

5.3 In 1792 the Stainforth and Keadby Canal Navigation Company obtained an Act of Parliament to cut the non-tidal Stainforth and Keadby Canal. It was engineered by John Thompson (Surveyed 1772, engineer 1792-95) and Daniel Servant (Historic England 2017c) and opened in 1802. It bypassed the lower reaches of the River Don and linking the River Don at Bramwith with the River Trent via Stainforth, Thorne and Ealand. This enabled a waterway navigation for the industries of South Yorkshire and Nottinghamshire (Van de Noort and Ellis 1998). Drains were cut either side of the canal (the North and South Soak Drain) due to its disrupting the existing drainage system, and the runoff was carried to Keadby outfall (ibid). A bridge was constructed over the canal, at the western end of Chapel Lane, and a swing bridge operated at its eastern end, at its confluence with the River Trent (Le Quesne 2015). It had three locks; one at the beginning of the canal at Bramwith; one at Thorne; and the other at Keadby, the eastern terminus of the canal at its junction with the River Trent. Keadby Lock comprised a single, pound-type lock basin, constructed in stone ashlar, with two opposing sets of timber gates meaning that the lock could be used whether the level of the river was higher or lower than in the canal. The lock could take vessels with keels up to 81 by 22.5 feet, although longer vessels could pass through if the river was level with the canal and

both sets of gates could be opened. This was an important facility for the boatbuilding industry on the canal, which was otherwise limited in its vessel size by the limit of the lock. To the immediate west of the lock there was originally a swing bridge, but only the bridge abutments now remain.

5.4 The Don Navigation Company bought the canal in 1836 after a series of aborted attempts to construct new navigations to by-pass it. In 1850 the Don Navigation Company was merged with the Doncaster and Goole Railway company to become the South Yorkshire Railway Company. In 1859 they opened a railway line along its north bank, but the canal was still a busy navigation during this time. Initially the railway terminus was at the lock, but in 1864 it was diverted south across the canal to the original Keadby Swing Bridge (later replaced with the existing Keadby Bridge. As the 19th century progressed, however, there was growing dissatisfaction with the canal and its use began to decline. In an effort to save the canals and make them competitive with the railways, the Sheffield and South Yorkshire Canal Company Ltd. was formed in 1888 with a view to buying back the canals from the railway company and upgrading them. Plans were drawn up to upgrade the Don Navigation and the Stainforth and Keadby Canal to take 300- or 400-ton barges and to build a new port facility at Keadby, where coal could be trans-shipped to seagoing vessels. These plans never came to fruition however due to protracted dealings with the railway companies, whilst ownership of the waterways had been transferred to the Sheffield and South Yorkshire Canal Company, the railway company still nominated five of the ten directors, and thus retained significant control. Instead, a jointly funded project to build a canal from Bramwith to the Aire and Calder was progressed and in 1905 the New Junction Canal was opened. It was completely straight, and was the last canal built in England for commercial purposes (Historic England 2017c, 49). This removed the need to build a new port at Keadby.

5.5 The 20th century history of the canal is a story of slow decline, although the lock gates and sills at Keadby were replaced in 1932 according to an inscription on the lock. The current road swing bridge was also added in the 1930s. Nationalisation of the Stainforth and Keadby Canal took place in 1948 in common with most other canals in Britain. The Transport Acts of 1968 and 1983 divided British canals into commercial waterways, which were still carrying commercial traffic, cruising waterways, which had potential for leisure use, and remainder waterways, for which no economic use could be seen at the time. The Stainforth and Keadby Canal was designated as a commercial waterway, and traffic was restricted to working boats carrying freight. The area around Keadby Lock was developed in the 1970s and 1980s with the addition of a lockkeeper's hut. Steel sheet pilings were added to the river front. As the 20th century progressed this gradually changed with all use of the canal now being predominately leisure boats. In 2012 the Canal & River Trust were created, and they took over all of the assets of British Waterways including the Stainforth and Keadby Canal and Keadby Lock.

5.6 The lock was designated as a listed building in 1987, when the description presented in Section 5.1 of this report was written. The date of its designation as a scheduled monument is not available on Historic England's online record. The Historic England Archive holds one photographic image of the lock dated to 1999 [redacted] This shows the westernmost set of gates that are the focus of this assessment and the gates shown are not the same gates as those now present at the site. A review of main works and maintenance works undertaken at the lock between 1997 and 2021 is provided in Appendix A of this report. This demonstrates a process of continued maintenance and evolution at the lock to ensure it continues to meet the needs of its present uses. An application for scheduled monument consent was made in the 2003 for full mechanisation of the lock and in 2005 for stabilisation and strengthening works. These works included replacement of the lock gates, which was carried out in 2005/6. A building recording of the lock was undertaken by Mercian Archaeology in 2003, as part of the conditions of consent, but it has not been possible to find an archived copy of the resulting report. It therefore appears that the present lock gates are likely to have been installed in the early 2005/6 as part of this work and they are not the surviving gates from 1932 described in the 1987 listing description. This is borne out in examination of the present lock gates (see Figures 3-4). The ironwork may be a survival from 1932, but the timber gates themselves appear much newer, fitting with a date in the early 2000s. The original timber balance beams have also been replaced in steel across the majority of the gates. The only remaining timber balance beam is on the downstream middle gates (cabin side). That timber beam was original until 2017, when it was replaced with a new oak beam in accordance with the Section 12 Scheduled Monument Management Agreement (SMMA).

5.7 There are four sets of matching lock gates at Keadby, all of the same design, except for the downstream middle gates where there is a replacement timber balance beam instead of the steel replacement beams seen on the other gates). They comprise perforated timber gates with steel balance beams and gate

paddles. A timber walkway is fitted with a metal guard rail to the topside. The gates are constructed of timber upright posts that are linked on the rear sides by horizontal timber rails. The rails are jointed to the uprights with a dado joints and heavy-gauge square-section iron nails and straps. Spaces between the upright posts create the perforation. At the top of the gate these are called fenders and they prevent boats from getting stuck between the top bar of the gate and the balance beam. The fenders are a modification to the original gate design. The lower sections of the gates and sill were not visible at the time of inspection, but it is assumed that gate paddles are still present in the lower third of the gates. As can be seen in Figure 3, water currently overtops the mid-rail of the top gates at Keadby and flows through the perforation when the gates are closed. This is not the correct operation of the gates and it will lead to more rapid deterioration of the gates over time and can also create flooding problems for full length boats attempting to use the lock. As well as allowing for a greater capacity of water in the canal behind the gates, the proposed development will also assist with this overtopping issue.

6. Statement of Significance

6.1 The designation of the Lock as a scheduled monument and Grade II listed building demonstrates that it has been previously assessed by the Secretary of State as being of special interest. The specific reasons for this designation are not provided in the online listing description. The Lock draws its significance from its architectural and illustrative historical interests as a well-preserved section of the British canal network, demonstrating late-18th century engineering and technical innovation. The Stainforth and Keadby Canal, whilst quite late in the date range of British canal construction (1745-1835), was built during the peak period of canal construction in the 1790s. By this time the success of the canals, both in supporting trade and industry, and as a financial investment for their creators, had been proven by the earlier canal systems. By the 1790s they were seen as a safe investment, but this tailed off in the 1820s as the threat of the railways became more apparent. Many of the canals built in the 1790s suffered from financial difficulty almost as soon as they were built. The fact that Keadby lock, together with the wider Stainforth and Keadby canal, has remained in continuous use from the early-19th century to the present therefore contributes to its significance. The double lock gates ensured for efficient operation of the lock dependent upon water levels in the Trent and the facility to allow for longer vessels to pass through the lock when the lock and river were at the same level was an important mechanism that supported the boat building industry on the canal until 1984. The canal and lock have adapted to changes in use throughout this time, from industrial traffic, to freight cargo, to leisure and continues to perform the function for which it was originally built.

6.2 The lock also has a degree of archaeological interest in the evidence it contains of previous structures, such as the former swing bridge abutments and the phases of development of the lock over the course of the 19th, 20th and 21st centuries. The lock has remained in continuous use from the early-19th century to the present and it, together with the wider canal network, has adapted to changes in use throughout this time, from industrial traffic, to freight cargo, to leisure.

6.3 The proposed works are focused on modifying the lock gates. The listing description for the lock records that the lock gates were installed in 1932, however this assessment has found that the existing lock gates were installed in 2005/ 6. Historic England's Designation Listing Selection Guide for Transport Infrastructure (2017b) states that most locks predating the 1830s are worthy contenders for designation, and that "*locks, usually of the pound type, are listable if appreciable parts of the original stone pound walls (and associated surfaces) survive"* (Historic England 2017b, 8). This is the case at Keadby, so its designation as a scheduled monument and listed building relates in part to the degree of survival of original fabric. The Listing Selection Guide proceeds to state that *"lock gates will rarely be early as they require regular renewal, and appropriate allowance must be made"* (Historic England 2017b, 8). This statement acknowledges that it is much less common for the original lock gates to survive and that the lack of survival of original fabric of the gates should not be a barrier to designation. It acknowledges that in order for the lock to continue to function for its original purpose, which is usually a structure's optimum viable use, frequent renewal of the gates is a necessity. The lack of survival of the original gates, together with the loss of the replacement gates of the 1930s at Keadby does not therefore diminish the significance of the lock. The presence of two sets of functioning gates at Keadby is a key part of the lock's significance. The design and materials used in the present gates, installed in 2005/ 6, are appropriate to the lock's architectural and illustrative historic values and they therefore contribute to the significance of the lock and assist in maintaining it in active use.

7. Development Description

Options Appraisal

7.1 An Options Appraisal report has been prepared by Arcadis to accompany the draft application of Scheduled Monument Consent (Arcadis 2022). This presents the background to the proposed changes, before discussing six design options that were initially considered for the proposed modification to the lock gates. All options aim to lessen the volume of water that currently overtops the mid-rail of the lock gate and flows through the perforated face of the of the gate. Options considered included:

- Option 1. Fit a plank horizontally to the upstream face of the top gates, with a height of 300mm.
- Option 2. Install planks in gaps between existing timbers to a height of 300mm.
- Option 3. Fit a baulk to the existing bar.
- Option 4. Fit planks in gaps between existing vertical timbers up to the top bar of the gate.
- Option 5. Remove planking between intermediate and top bars and install a mechanised tipping weir.
- Option 6. Install a demountable stop plank system.

7.2 A shortlist of two options, namely Option 1 and Option 2, was presented to Historic England during a formal pre-application consultation on 9th December 2021 and Option 1 was selected as the preferred option for the scheme due to its minimal intervention and sensitive design that retains the character and special interest of the gates and lock. It was noted that the Option 2 design would be the preferred option if the lock gates were to be entirely replaced in the future.

7.3 This application therefore assesses Option 1 as the proposed scheme.

Design and Materials

7.4 The proposed modification is to fit an additional plank, of 300mm width, to the upstream face of the top lock gates, sitting directly above the mid-rail and resting against the existing vertical planks of the gates. Figure 5 shows a proposed elevation and cross section. The plank would be green oak, to match as closely as possible to the existing gates once weathered, and the fixings would be heavy-gauge square-section nails to match the existing fixings. The additional plank would heighten the retained water level in the canal upstream of the lock, allowing the additional capacity required for third-party abstraction as outlined below

- 1,253 cubic metres per hour
- 27,400 cubic metres per day
- 7,250,000 cubic metres per year

7.5 A Flood Risk Technical Note has been prepared for the proposed works (AECOM 2021) which details how the canal's automated MEICA SCADA (Mechanical, Electrical, Instrumentation, Control and Automation Supervisory Control And Data Acquisition) system is set up to automatically operate and control a number of sluices along the canal to ensure the water level stays at the appropriate depth for boats to use. The operating level of the canal (the 'Zero' level) is currently set at 4.35mAOD. The height of the mid-rail on the present gates at Keadby Lock is 4.12mAOD, meaning that the additional head of water currently overtops the mid-rail of the canal and discharges through the lock into the River Trent. The proposed works would increase the threshold height at Keadby Lock from 4.12 mAOD to c.4.35 mAOD and ensure that water which currently is able to discharge into the River Trent is retained upstream, allowing a sufficient volume of water to be available for abstraction whilst maintaining the Zero Level. Because the canal will still be operating at the Zero level, for which it has capacity, no additional alterations are required to contain the additional volume of water in the canal. It also means that abstraction can take place whilst still allowing sufficient water level for boats using the canal. The Flood Risk Technical Note finds only a negligible impact on the flood risk of the canal as a result of the proposed work.

7.6 The canal's MEICA SCADA will control the water level in the canal and maintain it at the Zero level. The SCADA technology is designed to minimise variation from the normal maintained water level and is set with a 50 mm +/- tolerance, therefore any breach of this tolerance will result in the sluices automatically adjusting in order to maintain the required water level. Therefore, should abstraction at Keadby III Power

Station cease, firstly the canal would remain at the Zero level, but in the unlikely event that an increase of 50 mm above the Zero level is observed, the SCADA automated system will operate to reduce the volume of water entering the canal and mitigate flood risk. Only in extreme events would there be the risk of flooding, a stoppage on abstraction would not cause such an event in the day to day operation of the canal.

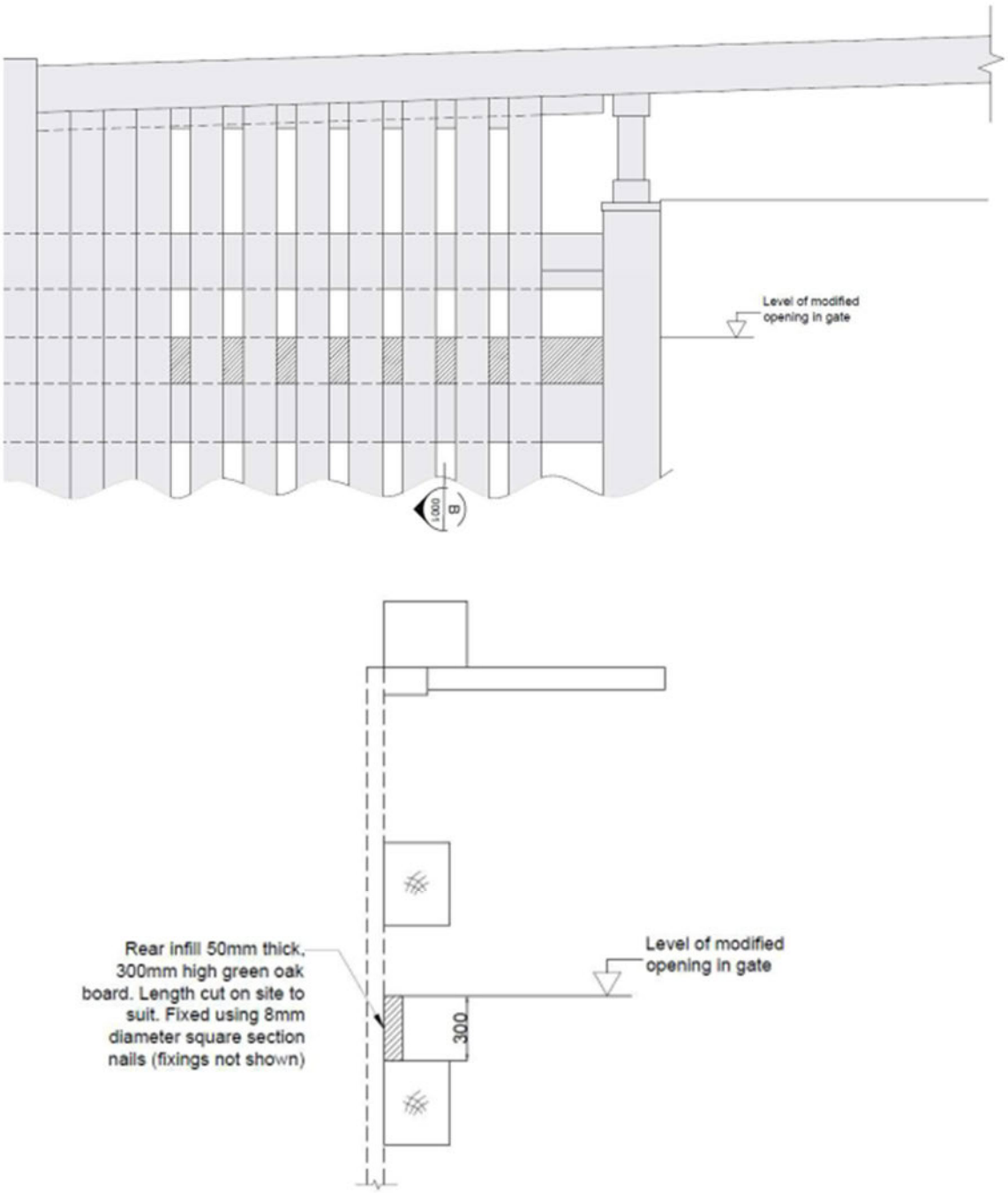

Figure 5 - Elevation and cross section of the proposed modification to the top lock gates (Arcadis 2022).

8. Assessment of Impact

8.1 This assessment has confirmed that the present lock gates at Keadby were installed in 2005/ 6, rather than being a survival of the 1930s as stated in the listed building description. The Listing Selection Guide for Transport Infrastructure acknowledges that lock gates require frequent renewal and that allowances need to be made with regard to the survival of historic fabric when defining the significance of a lock for this reason. The present lock gates, although not historic, therefore make a positive contribution to the

significance of the lock through maintaining it in operation and through their design and materials which are sensitive and appropriate to the age of the lock and its heritage significance.

8.2 The proposed works involve the addition of one plank to the mid-rail of the upstream side of the top lock gates. The addition is a minimal visual alteration to this set of lock gates. Whilst the lock gates are not historic, their function and appearance make a contribution to the heritage significance of the lock and they form part of the designated asset. The gates are one pair of four pairs of matching gates present at the lock. Whilst the visual alteration to the gates is minimal, and will be largely imperceptible when weathered, the addition will alter one set of four sets of gates making one set slightly different to the other three. This very minor change will not alter the perception and understanding of the lock's architectural and historic interests. It is also a reversable detail. The proposal can therefore be achieved without impacting upon the significance and special interest of the lock.

8.3 The proposal will allow for the scheme objective of retaining water in the canal behind the lock for proposed abstraction. It will also improve the current situation at the lock where presently water overtops the mid-rail of the lock gate and flows into the lock when the gates are closed. This is not the correct operation of the gates and it will lead to more rapid deterioration of the gates over time. It can also create problems for full length boats attempting to use the lock. The improvement to this situation will increase the longevity of the present lock gates and therefore delay further necessary changes and larger interventions to the heritage asset.

8.4 The canal's MEICA SCADA will control the water level in the canal and maintain it at the Zero Level of 4.35mAOD. Because the canal will still be operating at the Zero Level, no additional alterations are required to contain the additional volume of water in the canal, and abstraction can take place whilst still allowing sufficient water levels for boats using the canal. The Flood Risk Technical Note (AECOM 2021) finds only a negligible impact on the flood risk of the canal as a result of the proposed work, with the mechanism remaining unchanged from the baseline flood risk. The SCADA technology is designed to minimise variation from the normal maintained water level and is set with a 50 mm +/- tolerance, therefore any breach of this tolerance will result in the sluices automatically adjusting in order to maintain the required water level. Therefore, should abstraction at Keadby 3 Carbon Capture Power Station temporarily cease, firstly the canal would remain at the Zero Level, but in the unlikely event that an increase of 50 mm above the Zero Level is observed, the SCADA automated system will operate to reduce the volume of water entering the canal and mitigate flood risk.

9. Conclusion

9.1 This Heritage Impact Assessment has presented the legislative and policy background pertaining to the proposed works and has provided background information and a statement of significance for Keadby Lock Scheduled Monument and Grade II listed building.

9.2 The assessment of the impact of the scheme, presented in Section 8 found that there will be no impact to the significance or special interest of the lock as a result of the proposed works. The proposal would require a minimal alteration to the lock gates, which are not themselves historic. The proposed works will also assist in improving the longevity of the current gates by reducing a current overtopping problem that will, if left unchecked, accelerate the natural deterioration of the gates. The improvement to this situation will increase the longevity of the present lock gates and therefore delay further necessary changes and larger interventions to the heritage asset.

9.3 The proposed development therefore passes the tests of the Scheduled Monument and Archaeological Areas Act 1979 by ensuring for the 'benefit of the monument' as per Schedule 1 Part 1 (2). It also passes the tests of the Planning (Listed Buildings and Conservation Areas) Act 1990, firstly by seeking scheduled monument consent in advance of the works and by placing great weight on the conservation of designated heritage assets. The development is in accordance with paragraph 199 of the NPPF (2021). It is also in accordance with saved Policies HE5 and HE8 of the North Lincolnshire Local Plan (2003) and Policy CS6 of the North Lincolnshire Core Strategy (2011).

9.4 This heritage impact assessment forms part of the formal pre-application, accompanying a full draft application for scheduled monument consent, on which the advice of Historic England is sought.

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Appendix A Summary of Works to Keadby Lock 1997-2021

A.1 Summary of Main Works

Year	Proposal	Details	Implemented
Pre-1997	Works to lock invert	Sections of the timber floor beyond the main lock chamber removed and replaced in concrete.	
1997		Extensive work including re-pointing, pressure grouting, excavation and reconsolidation of the ground beside the lock walls, re-concreting the surface there, removal of parts of the timber planking from the lock floor near the east gates and its replacement there in concrete. Works recorded that some stone setts had been located beneath the concrete surface and suggested that these be retained as a feature. Not implemented.	
1999	Gate replacement & Minor associated works	Proposal for replacement of two pairs of lock gates in ekke hardwood, fitting steel quoins, removal of timber plank floor to the main lock chamber and its replacement in concrete. The provision of new flood gates and downstream middle lock gates and localised work to the quoins sealing surfaces. At that time a photographic record was made of the lock chamber for the owners British Waterways. Works limited to gate replacement and minor associated works (due to take place in Feb-March 1999). Proposals for steel quoins were dropped and the stonework will instead be repaired with mortar. The timber planking floor or lock 'invert' to be further investigated during de-watering, and the case for its restoration or replacement re-examined. Previous survey in 1998 indicated that the surface of the planking had softened, and that there was localised damage by mechanical	New flood gates and downstream middle lock gates. Lock had previously undergone a series of partial refitting's of winding gear and gates. Programme of archaeological recording undertaken as part of works.

Year	Proposal	Details	Implemented
		dredging; no evidence submitted to show that the floor was still heaving, although there was some suggestion that one of the lock walls was sinking, perhaps due to failure of the timbers beneath. Proposals for mechanisation were also put on hold.	
2002	Intrusive Ground Investigation Works (outside scheduled area)	Initial site investigation works into the ground alongside the lock outside the scheduled area	English Heritage Notified
2003	Mechanisation (P/00556)		SMc granted Programme of archaeological recording was condition of consent.
2005	Stabilisation/ Strengthening (P/00561)		SMc granted
2006	Stone setts & lighting	Material and design details as part of wider lock landscaping post stabilisation project	English Heritage approved
	FAS: Envt Agency Modifications	?	?
2011	FAS: access step Modifications	Alter the existing (modern) steel steps due to safety concerns (late 2011).	SMc granted
2014	Balance beam repairs	?	?
2016	Disposal of land (Estates)	Disposal of various parcels of land SAP Numbers Part 1356,1357,1360 and lease in area to Crown Estate at Keadby to PD Ports Properties Limited. The land is leased to AWS which is a company owned by PD Ports and we are selling subject to the existing leases which are contained within the registered Title.	
2017	Balance beam replacement & missing riser chains replaced	The balance beam of the downstream middle gate (cabin side) rotten and requires replacing. Historic England advise that the beam must be replaced like-for-like in oak, rather than in steel as the other balance beams at this location. Lock chamber riser chain at upstream middle gate (far side) is missing and requires replacing. Bottom fixings are broken	Clearance from Historic England under terms of s.17 management agreement

Year	Proposal	Details	Implemented
		on chains at the downstream and upstream middle gates and the **top gates**. Remove rotten timber balance beam and replace like-for-like. Repair/replace missing/damaged riser chains and fixings.	
2018	Septic tank replacement to control cabin (Estates)	Current metal above ground waste storage tank is beyond repair and requires replacement. Project is to remove the metal tank in situ and replace with an above ground bunded polyurethane tank system	
2019	dredging	Silt build-up in the lock chamber – dredging required	Clearance issued from Historic England under terms of s.17 management agreement
2021	dredging	Silt build-up to lock approach (Trent side) – dredging required	Clearance issued from Historic England under terms of s.17 management agreement

Notifications identified in CRT's database for works 2012-2021

Notification	Functional Location	PG	Description	Created On	Req End	Completion	Description of functional location
12188024	FK-025-006	2	CRT - Sluice sticking at keadby	08.11.2012	28.02.2013	18.02.2013	Keadby Lock
12213724	FK-025-006	3	M&E Replace Pull Starters on Gennies	20.11.2012	30.03.2026	01.04.2016	Keadby Lock
12215790	FK-025-006	2	CRT - Keadby lock fuse needs resetting	21.11.2012	22.11.2012	14.01.2013	Keadby Lock
12315463	FK-025-006	2	R3 BW - Increase tred depth on step	04.02.2013	31.03.2014	31.03.2014	Keadby Lock
12326074	FK-025-006	2	PCS PCH	11.02.2013	10.01.2027		Keadby Lock
12326075	FK-025-006	2	ladder 8 runs broken	11.02.2013	31.03.2015	30.07.2014	Keadby Lock
12326072	FK-025-006	2	balance beam rotten	11.02.2013	11.02.2015	13.02.2013	Keadby Lock
12326073	FK-025-006	2	B22 Insufficient tread depth of 80mm	11.02.2013	23.09.2022		Keadby Lock
12372680	FK-025-006	2	slippery surface around lock	11.03.2013	31.03.2013	19.03.2013	Keadby Lock
12420482	FK-025-006	2	holding chains missing	15.04.2013	31.03.2015	05.08.2014	Keadby Lock
12423901	FK-025-006	2	keadby dredging	17.04.2013	31.03.2015	26.06.2014	Keadby Lock
12429630	FK-025-006	2	Repairs to Lock - Keadby	22.04.2013	31.03.2015	21.05.2015	Keadby Lock
12429625	FK-025-006	2	Repairs to Lock - Keadby	22.04.2013	31.03.2014	17.03.2014	Keadby Lock
12450873	FK-025-006	2	R1 replace rotten walkboard	09.05.2013	31.08.2014	30.07.2014	Keadby Lock
12491633	FK-025-006	2	hydraulic pump leaking at keadby	07.06.2013	31.07.2013	15.07.2013	Keadby Lock
12536940	FK-025-006	2	FK-Sluice switches open	11.07.2013	31.08.2013	09.08.2013	Keadby Lock
12542944	FK-025-006	2	ELECTRICAL FAULT AT KEADBY LOCK	15.07.2013	16.07.2013	09.08.2013	Keadby Lock
12557641	FK-025-006	2	FK-Main control fuse blown	25.07.2013	26.07.2013	09.08.2013	Keadby Lock
12564251	FK-025-006	2	FK-mains power fault	30.07.2013	31.07.2013	09.08.2013	Keadby Lock
12599095	FK-025-006	2	FK-faulty power pack oil filter pump	21.08.2013	22.08.2013	22.08.2013	Keadby Lock
12605051	FK-025-006	2	FK-main power supply Keadby Lock	28.08.2013	31.03.2014	01.04.2014	Keadby Lock
12605052	FK-025-006	2	FK- Keadby Lock Paddle Gear	28.08.2013	31.12.2013	14.01.2014	Keadby Lock
12608732	FK-025-006	2	R3 Repairs to CCTV system	30.08.2013	31.03.2015	27.11.2013	Keadby Lock
12608740	FK-025-006	2	FK - Filtration Pump	30.08.2013	31.12.2013	18.11.2013	Keadby Lock

Notification	Functional Location	PG	Description	Created On	Req End	Completion	Description of functional location
12633514	FK-025-006	2	Paint balance beam	16.09.2013	16.09.2014	14.07.2014	Keadby Lock
12660093	FK-025-006	2	FK-Keadby Lock - 240v socket	01.10.2013	31.12.2013	14.01.2014	Keadby Lock
12704282	FK-025-006	2	mains power failure at keadby	31.10.2013	01.11.2013	13.11.2013	Keadby Lock
12745313	FK-025-006	2	Spindle survey	29.11.2013	31.03.2030	06.11.2014	Keadby Lock
12781640	FK-025-006	2	Metal Stalk bent	06.01.2014	31.03.2015	30.07.2014	Keadby Lock
12781639	FK-025-006	2	B17 - Balance beam rotten	06.01.2014	31.03.2018	30.01.2018	Keadby Lock
12827924	FK-025-006	2	Refixs green fencing	10.02.2014	31.03.2014	31.03.2014	Keadby Lock
12836436	FK-025-006	2	Keadby Lock - Anti-slip	17.02.2014	31.03.2015	17.06.2014	Keadby Lock
12900070	FK-025-006	2	Metal stalk bent	31.03.2014	31.03.2015	30.07.2014	Keadby Lock
12900068	FK-025-006	2	Corrosion on bottom of balance beam.	31.03.2014	31.03.2019	30.06.2016	Keadby Lock
12900069	FK-025-006	2	Boil on gate cill	31.03.2014	30.04.2014	29.04.2014	Keadby Lock
12978759	FK-025-006	2	M&E Repairs to Gate Proximity Switches	29.05.2014	31.03.2015	03.06.2014	Keadby Lock
12986064	FK-025-006	2	Replace back planking on upstream middle gate (far side).	03.06.2014	31.03.2025		Keadby Lock
13002934	FK-025-006	2	FK-Keadby Lock **top gate (far side)** sluice	12.06.2014	19.06.2014	30.07.2014	Keadby Lock
13122822	FK-025-006	2	Holding Chain missing	29.08.2014	31.03.2019	05.07.2016	Keadby Lock
13122824	FK-025-006	2	Bent stalk on paddle gearing downstream middle gate (far side)	29.08.2014	31.03.2016	16.10.2015	Keadby Lock
13144208	FK-025-006	2	Holding Chain missing	11.09.2014	11.09.2015	16.09.2014	Keadby Lock
13144210	FK-025-006	2	Bent stalk on paddle gearing downstream middle gate (far side)	11.09.2014	11.09.2015	16.09.2014	Keadby Lock
13164526	FK-025-006	2	Pointing to Blockwork Required	20.09.2014	31.03.2026		Keadby Lock
13400132	FK-025-006	3	M&E Repairs to HPU Cover	10.03.2015	28.07.2017	12.05.2017	Keadby Lock
13423333	FK-025-006	2	Balance beam corrosion in two places	24.03.2015	31.03.2025		Keadby Lock
13441570	FK-025-006	2	Keadby - lock area needs power washing	08.04.2015	19.06.2015	16.06.2015	Keadby Lock
13674787	FK-025-006	2	Concrete crack next to steps.	02.09.2015	31.03.2025		Keadby Lock

Notification	Functional Location	PG	Description	Created On	Req End	Completion	Description of functional location
13674788	FK-025-006	2	Broken backboard downstream middle gate (cabin side).	02.09.2015	31.03.2025	21.04.2021	Keadby Lock
13685264	FK-025-006	2	Keadby Lock downstream middle gate (far side) manual Sluice defect	08.09.2015	01.11.2016	02.10.2016	Keadby Lock
13719571	FK-025-006	14	Non-slip missing on walkway.	28.09.2015	27.09.2016	18.10.2016	Keadby Lock
13719532	FK-025-006	3	Clean CCTV lens	28.09.2015	05.10.2015	22.04.2016	Keadby Lock
13742338	FK-025-006	2	Manual sluice downstream middle gate (far side) bolt on stalk	09.10.2015	01.11.2016	02.10.2016	Keadby Lock
13742335	FK-025-006	2	B16R Lock riser chains broken	09.10.2015	17.09.2017	30.01.2018	Keadby Lock
13802125	FK-025-006	2	keadby lock storage cabin	13.11.2015	16.12.2015	15.12.2015	Keadby Lock
13810198	FK-025-006	12	Generator door keadby lock	19.11.2015	26.11.2015	20.09.2016	Keadby Lock
13890312	FK-025-006	3	CON - Ram bolts to tighten.	17.01.2016	16.02.2016	21.09.2018	Keadby Lock
13942619	FK-025-006	3	Hydraulic leak from power pack	19.02.2016		11.03.2016	Keadby Lock
14100791	FK-025-006	3	M&E Generator not working	20.05.2016	21.05.2016	06.02.2017	Keadby Lock
14168924	FK-025-006	2	Broken fender **top gate (cabin side)**	29.06.2016	29.08.2016	02.10.2016	Keadby Lock
14202545	FK-025-006	3	hydraulic leak u/s gates keadby lock	14.07.2016		02.10.2016	Keadby Lock
14234228	FK-025-006	2	Keadby Sluice No3 stalk detat from door	01.08.2016	02.09.2016	02.10.2016	Keadby Lock
14245308	FK-025-006	3	M&E - Keadby Lock Sluice Fault	05.08.2016		06.02.2017	Keadby Lock
14272314	FK-025-006	2	**Top gate (cabin side)** Missing back planking	19.08.2016	26.08.2016	06.12.2016	Keadby Lock
14272318	FK-025-006	2	3 x riser chains within lock are missing	19.08.2016	26.08.2016	19.08.2016	Keadby Lock
14310016	FK-025-006	14	CCTV camera obscured	09.09.2016	16.09.2016	08.11.2016	Keadby Lock
14343191	FK-025-006	3	Horse shoe around heel post loose **top gate (cabin side)**	29.09.2016	29.09.2017	26.10.2018	Keadby Lock
14391035	FK-025-006	2	Fender missing on balance beam downstream middle gate (far side)	27.10.2016	31.03.2026		Keadby Lock
14421463	FK-025-006	2	Slider chains within Lock are missing	16.11.2016	15.02.2017	25.11.2016	Keadby Lock
14421470	FK-025-006	14	Re align safety fence to prevent injury	16.11.2016	14.02.2017	29.03.2017	Keadby Lock

Notification	Functional Location	PG	Description	Created On	Req End	Completion	Description of functional location
14469781	FK-025-006	3	M&E - Defective green traffic light.	16.12.2016	23.12.2016	06.02.2017	Keadby Lock
14510374	FK-025-006	3	M&E Keadby Lock: Faulty Navigation Light	19.01.2017	26.01.2017	06.02.2017	Keadby Lock
14517124	FK-025-006	14	replace worn signage	24.01.2017	24.04.2017	30.03.2017	Keadby Lock
14525808	FK-025-006	3	M&E Keadby Lock traffic light ent fault	30.01.2017	06.02.2017	12.05.2017	Keadby Lock
14558677	FK-025-006	3	M&E - Keadby Lock: Change Power Pack AC	16.02.2017		12.05.2017	Keadby Lock
14558675	FK-025-006	3	Keadby Lock: Change Power Pack Oil Filter	16.02.2017		12.05.2017	Keadby Lock
14917719	FK-025-006	3	Hydraulic Leak power pack Keadby Lock	14.09.2017	21.09.2017	14.02.2018	Keadby Lock
14987043	FK-025-006	3	M&E - river light indicator light	24.10.2017	31.10.2017	05.10.2018	Keadby Lock
15061544	FK-025-006	3	Repair to Control Desk Panel Keadby Lk	08.12.2017	15.12.2017	09.04.2019	Keadby Lock
15126080	FK-025-006	14	Lifebuoy box fallen off fence	29.01.2018	28.02.2018	27.02.2018	Keadby Lock
15284497	FK-025-006	3	green traffic light out at keadby	09.05.2018	16.05.2018	05.10.2018	Keadby Lock
15325563	FK-025-006	14	Footpath to Lock entrance	05.06.2018	05.07.2018	01.08.2018	Keadby Lock
15516886	FK-025-006	3	M&E replacing lights	26.09.2018	27.09.2018	05.10.2018	Keadby Lock
15555676	FK-025-006	3	One cross head slider seized	18.10.2018	25.10.2018	26.10.2018	Keadby Lock
15555597	FK-025-006	3	M&E no 8 Sluice actuator loose	18.10.2018	25.10.2018	26.10.2018	Keadby Lock
15555595	FK-025-006	3	M&E no 3 Sluice actuator loose	18.10.2018	25.10.2018	26.10.2018	Keadby Lock
15555599	FK-025-006	3	M&E no 1 Ram Bed Loose	18.10.2018	25.10.2018	26.10.2018	Keadby Lock
15580870	FK-025-006	1	Fenders loose/missing on wingwall	06.11.2018	31.03.2025		Keadby Lock
15650419	FK-025-006	3	M&E Sluice No 4 actuator leaking oil	18.12.2018	25.12.2018	18.09.2020	Keadby Lock
15650401	FK-025-006	3	M&E Low oil levels on power pack	18.12.2018	25.12.2018	10.01.2019	Keadby Lock
15819123	FK-025-006	2	Leak in o/s wall	03.04.2019	31.03.2029		Keadby Lock
16002478	FK-025-006	5	MEICA In Lock Level Transducer Failed	22.07.2019	23.07.2019	03.04.2020	Keadby Lock
16051590	FK-025-006	14	ASSA key snapped in the lock	19.08.2019	18.08.2021	31.12.2019	Keadby Lock
16132027	FK-025-006	3	M&E Tidy & Secure Hydraulic Pipes	08.10.2019	15.10.2019	18.09.2020	Keadby Lock
16132028	FK-025-006	3	M&E Label Isolator Correctly	08.10.2019	15.10.2019	14.12.2020	Keadby Lock
16458129	FK-025-006	3	M&E **top gate (cabin side)** weld strides	29.07.2020	05.08.2020	18.09.2020	Keadby Lock

Notification	Functional Location	PG	Description	Created On	Req End	Completion	Description of functional location
16458127	FK-025-006	3	M&E downstream middle gate (cabin side) pipe re-route	29.07.2020	30.07.2020	18.09.2020	Keadby Lock
16464597	FK-025-006	2	Lock ladders missing runs/steps	04.08.2020	03.09.2020		Keadby Lock
16464596	FK-025-006	2	Lock entrance river side to be dredged	04.08.2020	03.09.2020	26.08.2020	Keadby Lock
16484660	FK-025-006	3	M&E Inv leaks on filter on powerpack	18.08.2020	25.08.2020	18.09.2020	Keadby Lock
16490143	FK-025-006	3	M&E Power pack failure	21.08.2020	28.08.2020	16.11.2020	Keadby Lock
16490155	FK-025-006	14	Keadby lock chains loose	21.08.2020	22.08.2020	24.08.2020	Keadby Lock
16524305	FK-025-006	12	Septic Tank needs emptying urgently	11.09.2020	31.03.2021	30.09.2020	Keadby Lock
16529289	FK-025-006	2	VRA - Ladders not compliant	15.09.2020	31.03.2031		Keadby Lock
16602497	FK-025-006	15	Silt build up River entrance to lock	27.10.2020	27.10.2022		Keadby Lock
16682394	FK-025-006	14	Ladder hoop bent req straightening	12.01.2021	12.01.2023		Keadby Lock
16730482	FK-025-006	3	M&E Desk panel lights blown	10.03.2021	17.03.2021	13.05.2021	Keadby Lock
16739862	FK-025-006	3	M&E Repair & reinstall system on lock	23.03.2021	21.06.2021	20.09.2021	Keadby Lock
16777724	FK-025-006	14	Boat chains 1 missing, 1 not attached	20.04.2021	20.03.2022	28.09.2021	Keadby Lock
16807203	FK-025-006	12	CCTV at Keadby Lock not working	10.05.2021	31.03.2022	22.06.2021	Keadby Lock
16855296	FK-025-006	2	Pot holes to be filled	08.06.2021	08.07.2021	22.06.2021	Keadby Lock
16893015	FK-025-006	3	M&E Number 2 ram bed loose	30.06.2021	07.07.2021	12.07.2021	Keadby Lock
16892968	FK-025-006	3	M&E **top gate (cabin side)** Gate bracket	30.06.2021	07.07.2021	12.07.2021	Keadby Lock
16892970	FK-025-006	3	M&E No 3 ram bed loose	30.06.2021	07.07.2021	12.07.2021	Keadby Lock
16895351	FK-025-006	3	M&E Replace all pressure gauges on HPU2	01.07.2021	08.07.2021	12.07.2021	Keadby Lock
16895350	FK-025-006	3	M&E Replace all pressure gauges on HPU1	01.07.2021	08.07.2021	12.07.2021	Keadby Lock
16895346	FK-025-006	3	M&E Replace 2 Sluice sensors on **top gate (far side)**	01.07.2021	08.07.2021	12.07.2021	Keadby Lock
16895348	FK-025-006	3	M&E Replace 2 sluice sensors on **top gate (cabin side)**	01.07.2021	08.07.2021	12.07.2021	Keadby Lock
16895347	FK-025-006	3	M&E Replace 2 gate sensors on **top gate (far side)**	01.07.2021	08.07.2021	12.07.2021	Keadby Lock

Notification	Functional Location	PG	Description	Created On	Req End	Completion	Description of functional location
16895349	FK-025-006	3	M&E Replace 2 gate sensors on **top gate (cabin side)**	01.07.2021	08.07.2021	12.07.2021	Keadby Lock
16910908	FK-025-006	3	M&E Upgrade upstream middle gate (far side) and sluice 6 sensors	09.07.2021	16.07.2021	16.11.2021	Keadby Lock
16910906	FK-025-006	3	M&E Upgrade upstream middle gate (cabin side) and sluice 5 sensors	09.07.2021	16.07.2021	01.11.2021	Keadby Lock
16910905	FK-025-006	3	M&E Upgrade downstream middle gate (far side)and sluice 4 sensors	09.07.2021	16.07.2021	01.11.2021	Keadby Lock
16910903	FK-025-006	3	M&E Upgrade downstream middle gate (cabin side) and sluice 3 sensors	09.07.2021	16.07.2021	01.11.2021	Keadby Lock
16949123	FK-025-006	2	Masonry joints cracking O/S chamber	04.08.2021	03.08.2026		Keadby Lock
16972287	FK-025-006	3	M&E D/S N/S Sluice fault	18.08.2021	25.08.2021	13.09.2021	Keadby Lock
17067470	FK-025-006	14	Lifebuoy ring Lanyard missing	18.10.2021	31.03.2022	29.11.2021	Keadby Lock
17089873	FK-025-006	3	M&E HPU2 replace oil and filters	03.11.2021	03.12.2021		Keadby Lock
17089872	FK-025-006	3	M&E HPU1 replace oil and filters	03.11.2021	03.12.2021	20.12.2021	Keadby Lock
17123876	FK-025-006	3	M&E Repair floodlights	25.11.2021	02.12.2021	29.11.2021	Keadby Lock
17162610	FK-025-006	3	M&E upstream middle gate (far side) and sluice 6 not working	22.12.2021	29.12.2021		Keadby Lock
15529097	FK-025-006-04	2	Boil on cill on upstream middle gates	03.10.2018	31.03.2025		Keadby Lock D/S Middle Gate
15819124	FK-025-006-04	2	Lobby side plank broken	03.04.2019	01.04.2024		Keadby Lock D/S Middle Gate
16877665	FK-025-006-04	3	Stalk on gate paddle bent both side	21.06.2021	20.06.2026		Keadby Lock D/S Middle Gate
16949124	FK-025-006-04	14	DONE Nonslip boards loose lobby side	04.08.2021	04.08.2022		Keadby Lock D/S Middle Gate
15316043	FK-025-006-02	14	0325m Fenders Missing/Broken DONE	30.05.2018	30.09.2020	28.08.2020	**Keadby Lock Top Gate**
15580869	FK-025-006-02	14	Walkboard starting to rot	06.11.2018	26.08.2022		**Keadby Lock Top Gate**
16148652	FK-025-006-02	14	Loose no-slip boards on walkway	18.10.2019	17.10.2020	31.12.2019	**Keadby Lock Top Gate**
16148653	FK-025-006-02	14	Collar req repacking on heel post DONE	18.10.2019	30.03.2021	28.08.2020	**Keadby Lock Top Gate**
16738731	FK-025-006-02	14	Refixs non-slips walkboards	22.03.2021	22.03.2022	30.07.2021	**Keadby Lock Top Gate**

Notification	Functional Location	PG	Description	Created On	Req End	Completion	Description of functional location
16949125	FK-025-006-02	2	Boil on cill possibly silt on downstream middle gate (cabin side)	04.08.2021	24.08.2026		Keadby Lock
15580871	FK-025-006-03	14	Outside walkway board starting to rot	06.11.2018	26.08.2022		Keadby Lock U/S Middle Gate
15936832	FK-025-006-03	3	Gate paddle motor on working downstream middle gate (far side)	12.06.2019	13.09.2019	26.08.2020	Keadby Lock U/S Middle Gate