

Navigation Committee

10 June 2021

Agenda item number 11

Mutford Lock - operation and risk assessment

Report by Rivers Engineer

Purpose

This report highlights the completed Harbour Revision Order, a review of the structural integrity of Mutford Lock and the operational risk assessment for vessel passage through the lock. The Committee's view is sought on the proposals by the Rivers Engineer to restrict the beam width of vessels using Mutford Lock to 6.050 m; and to suspend the procedure of 'free flow' through the lock until further notice.

Broads Plan context

Objective 4.3 is to implement, promote and monitor safety measures for the navigation and boats.

1. Introduction

- 1.1. Mutford Lock is the Broads' second principal gateway to the North Sea, connecting Oulton Broad with Lake Lothing. A tripartite operational agreement has been in place from 1992 until autumn 2020 between Associated British Ports, Suffolk County Council and the Broads Authority. The new Harbour Revision Order (HRO) completed on 19 February 2021 covers the formal transfer of land and matters such as easements, rights of way and indemnities from Associated British Ports to the Broads Authority.
<https://www.gov.uk/government/publications/broads-authority-transfer-of-mutford-lock-habour-revision-order>
- 1.2. A new Service Level Agreement between Suffolk County Council, the Broads Authority and East Suffolk Council for the operation of the Lock and Bridge systems was agreed and signed in October 2020.

2. Overview – free flow

- 2.1. Due to different tides in Lake Lothing and Oulton Broad, the lock structure has an unusual bi-directional design. It has two pairs of opposing gates at each end to allow for different water levels on either side of the lock.
- 2.2. Free flow can occur when the outside sea level is equal to Oulton Broad level and both sets of lock gates are opened to allow free transit to and from Lake Lothing. This potentially allows passage of craft larger than the lock chamber. The procedure

requires matching fresh and saltwater tide levels and the window for passage on suitable tides is very limited (typically no more than 6 minutes). Free flow times can vary from those published due to a number of factors including barometric pressure, weather conditions, and Suffolk County Council road bridge opening requirements.

3. Lock condition and risk assessment

- 3.1. In August 2020, 'Durrant Diving Ltd' undertook maintenance work to clear accumulated debris from around the lock gates, and reported: "The concrete bulge from a historical repair is behind the South West Lower Gate on the salt water side, approximately 1.5m from the heel post and 500mm up from the lock bottom. The size of bulge is approximately 600mm high x 400mm wide x 400mm deep."
- 3.2. With the new operational and service level agreements in place, the Broads Authority has revisited the locks operational procedures and risk assessments governing the lock itself and its surroundings.
- 3.3. The revised Mutford Lock Risk Assessment (Appendix 1) has raised the question of lock structural safety and protection, particularly with reference to the vulnerability of the lock walls where historical repairs have been undertaken (item 3.1).
- 3.4. In order to mitigate further risks to the lock structure, and to create a safety zone from the concrete bulge (item 3.1), the recommendation is to reduce the maximum beam width of vessels using the lock system from 6.450m to 6.050m and to temporarily suspend 'free flow'. These measures decrease the risk factor of damage to the lock structures (walls, sills, pintles and lock gates).
- 3.5. Large vessels (over 21.945m in length & 6.050m beam width) wanting to enter the Broads system are best suited to enter via Gt Yarmouth, where there are fewer vessel dimension restrictions and the Port can assist if needed.

4. Financial implications

- 4.1. Mutford Lock is approximately 200 years old. Almost every part of the lock has been repaired or replaced over this time. To give some perspective on likely costs of capital works, a summary of current best estimates is in Table 1 with an indication of timescales. Members should note that these estimates, particularly with regard to lock wall repairs, need some further engineering consideration.
- 4.2. A report to the Navigation Committee in 2017 ([Mutford Lock Navigation Committee report 19 October 2017](#)) estimated that capital costs to repair the lock, under the worst-case scenarios, could amount to £1.67 million over 40 years.

Table 1

Mutford Lock - estimate of capital cost works

Element	Estimated cost	Timescale
River Tours Quay (35m)	£52,500	High priority and to be assessed this summer
Penstocks	£64,000	30 years (if 4 year maintenance plan is implemented)
Steel sheet piling (25m)	£150,000	20 years
De-watering	£500,000	Unknown
Masonry walls incl. gate quoins - repair or rebuild	£100,000 - £500,000	Unknown
Hydraulics	£70,000	30 years
Paving	£10,000	20 years
Lock gates	£320,000	40 years

- 4.3. The Authority has an earmarked reserve fund for maintenance of Mutford Lock, which forms part of the Property Reserve. The potential requirement for significant structural repairs to the lock has always been known, and the Authority has made annual contributions to build up the reserve fund.
- 4.4. The 2017 report outlines the estimated annual and capital costs associated with owning and managing the asset. The report also provides a summary of the current usage and value of the lock as an asset to the Authority and local area.
- 4.5. In terms of managing the lock over the long term, the Authority can expect to face the cost of some significant capital works. The most significant costs are likely to be associated with any major repair or reconstruction of the lock walls. The central part of the lock chamber was rebuilt in 1964 following a collapse. This part of the lock chamber is in good condition; however, the older masonry walls local to the lock gates are in poor condition in some areas and the stability of the masonry walls has not been fully determined. The proposal to reduce maximum beam width and temporarily suspend free-flow reduces the risk of damage, associated requirement for remedial repair and any delays in normal operation while damage is rectified.
- 4.6. The recently completed HRO includes an indemnity by the Authority to Associated British Ports to keep the lock in good and substantial repair.

5. Risk implications

- 5.1. The Mutford Lock Site Risk Assessment (Appendix 1) was reviewed and updated in May 2021.
- 5.2. In addition to providing a physical access point to and from the Broads, Mutford Lock is also a physical controllable barrier between the North Sea and the fresh water of Oulton Broad and the River Waveney. The lock gates are a major control for the water level and flows on Oulton Broad and the separation of saline and fresh water. The Broads Authority manages the lock for the purpose of providing navigational access, not as a tidal barrier. However, it does provide this added value to the area and may be considered by the Environment Agency as a third-party flood risk management asset.

6. Conclusion

- 6.1. Based on the information provided above, the Committee's view is sought on the following proposals:
 - A reduction in maximum vessel beam width to 6.05 when making passage through the lock system; and
 - Free-flow unavailable until further notice.

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Background papers: [Report to Navigation Committee on Mutford Lock condition 19 October 2017](#)

Appendix 1 – Mutford Lock Risk Assessment

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Hazard	Persons at risk	Existing control measures	Initial risk L	Initial risk S	Initial risk IR	Revised/Additional control measures Recommendation	Revised/Additional control measures Owner & Deadline	Residual risk L	Residual risk S	Residual risk RR
Escaping lock in event of a fall into the enclosed water	Boat users Lock operatives	2 No. ladders within the lock. Lock Personel in attendance. Safety lines & Rings 1 No. ladder on inside face of each gate pair	2	2	4	Low risk	Broads Authority			
Unauthorised access into operational area with exposed quay edge - potential for fall into water and drowning	Public	Operational area fenced and gated with 'No access' signs. Exception is gate into northwest operational area which has no signage	2	2	4	Low risk	Suffolk County Council / Broads Authority			
No means of escape from water on Oulton Broad side of lock - potential for drowning in event of fall into water	Boat users Lock operatives Public	None	2	2	4	Low Risk: A ladder should be installed. This should be located so as not to cause a hazard to boats, or be protected by timber fendering.	Broads Authority	1	1	2
Uneven surfacing on quay edge forming trip hazard - possible injury and fall into water.	Lock operatives	None	2	2	4	Remove and replace degraded concrete with suitable repair mortar and ramp stepped slab edges.	Broads Authority	1	2	2
Lock gate retraction arms are painted black and may form a trip hazard in poor light	Lock operatives	White box painted around rollers. None around retraction arms	2	2	4	Paint white lines either side of arms or alternatively re-paint arms a brighter colour	Broads Authority	1	2	2
Exposed access to gate top walkway with steel tread-plate - potential for slip and fall into water	Lock operatives	Handrailing either side of walkway, but the inner railing stops short of walkway end - Only use in emergency	2	2	4	Low Risk: Provide inner handrailing or barrier to close the gap and replace steel tread plate with non-slip material	Broads Authority	2	1	3
Catwalk access over fendering toward bascule road bridge. Handrailing extends beyond walkway encouraging operatives to walk onto timber fendering (high over water) which is slippery with marine growth.	Lock operatives Bridge inspectors	Keep Out' signs in place, but handrailing present - Guard Rails present	1	3	3	Low Risk: Fixed arrest points/forward fencing	Suffolk County Council	1	1	1
Unmarked and exposed quay edge at seaward end of north lock quay.	Lock operatives	None: Also no means of escape from adjacent water	1	3	3	Low Risk: within exclusion Zone - Paint white line at quay edge and install quay edge ladder	Broads Authority	1	2	2

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Cyclists using Pedestrian overbridge	General public	Signage in place	2	2	4	Install Bike barrier making cyclist dismount	Suffolk County Council / Broads Authority	1	1	2
General Lock System Condition Integrity of structure Closure of Lock	General public Lock Operators	<p>Site Survey's- The concrete bulge from a historical repair is behind the South West Lower Gate on the salt water side approximately 1.5m from the heel post and 500mm up from the lock bottom. The size of bulge is approximately 600mm high x 400mm wide x 400mm deep.</p> <p>A minor safety fault or when the asset itself is likely to be compromised if action is not taken.</p>	3	5	15	<p>Defect that can be addressed when resources allow Programmed delivery</p> <p>Limit beam of vessels making passage through the Lock too 6.050m</p> <p>Free Flow - Unavailable until further notice</p>	Broads Authority	1	1	2
Lock Gates Potential lock gate being unable to close Temporary Lock Closure	Boat users	South east lock gate not returning back into sill Monitoring of gate mechanism	2	2	4	Routine maintenance cleaning	Broads Authority	1	1	2
Unpropelled Passage through Lock Vessel blockage of Lock	Boat users Lock operatives Public	Maximum length 21m Passage Plan required	1	1	2					