The Lake Lothing (Lowestoft) Third Crossing Order 201[*]

Document SCC/LLTC/EX/45: Updated Vessel Survey Report - Track changes

Revision 1

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

PINS Reference Number: TR010023

Author: Suffolk County Council

Document Reference: SCC/LLTC/EX/45

Date: December 2018

This page is intentionally left blank

Suffolk County Council

LAKE LOTHING THIRD CROSSING

Vessel Survey Report

Suffolk County Council

LAKE LOTHING THIRD CROSSING

Vessel Survey Report

TYPE OF DOCUMENT: FINAL

PROJECT NO. 62240712

OUR REF. NO. 1069948-WSP-MAR-LL-RP-MA-0007

DATE: ~~MAY 2018~~DECEMBER 2018

Suffolk County Council

LAKE LOTHING THIRD CROSSING

Vessel Survey Report

WSP

1st Floor Station House
Tithebarn Street, Exchange Station
Liverpool
L2 2QP

Phone: +44 151 600 5500

WSP.com

QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3	Revision 4
Remarks	Draft	Draft	Final	Final	Final
Date	November 2017	December 2017	January 2018	May 2018	December 2018
Prepared by	Stephen Horne	Stephen Horne	Stephen Horne	Stephen Horne	Stephen Horne
Signature				[redacted]	
Checked by	Bernard Jones	Bernard Jones	Bernard Jones	Bernard Jones	Bernard Jones
Signature				[redacted]	
Authorised by	Joanna Lyon	Joanna Lyon	Joanna Lyon	Joanna Lyon	
Signature				[redacted]	
Project number	62240712	62240712	62240712	62240712	62240712
Report number	1069948-WSP-MAR-LL-RP-MA-0007	1069948-WSP-MAR-LL-RP-MA-0007	1069948-WSP-MAR-LL-RP-MA-0007	1069948-WSP-MAR-LL-RP-MA-0007	1069948-WSP-MAR-LL-RP-MA-0007
File reference					

CONTENTS

FIGURES

TABLES

1 INTRODUCTION

1.1 GENERAL

WSP Limited have been commissioned to progress approvals, designs and agreements for a third crossing at Lake Lothing, Lowestoft.

1.2 SCOPE OF REPORT

This report details the commissioning, progression and outcome of a vessel survey within the Port of Lowestoft conducted to confirm the number and timings of openings of the existing bascule bridge and to assess the likely opening frequency of the third crossing. The report has been updated to include the results of a further period of vessel survey undertaken during summer/autumn 2018.

1.3 OBJECTIVES

The objectives of the vessel survey were to establish;

- The typical opening frequency of the existing bascule bridge
- The range of numbers of openings over a 24 hour period
- The size and distribution of vessels navigating within the Port
- The ratio of commercial to recreational vessels
- From this information, derive an estimated frequency of openings for the Scheme bridge

Following analysis, the outputs of the survey were to be used to inform a potential operating regime that would integrate with the existing bridge's regime and provide the best operational balance between water and road traffic.

The outputs were also used to inform the Preliminary Navigation Risk Assessment in terms of the number and frequency of vessel movements and therefore the likelihood of incidents.

2 PROJECT DESCRIPTION

2.1 OVERVIEW

Lowestoft is a port town on the east coast of England, in the county of Suffolk. The town is divided in two by a sea inlet, Lake Lothing, which forms Lowestoft Harbour and provides access via Oulton Broad and Oulton Dyke to the River Waveney and the Broads.

Lake Lothing is currently crossed by two road bridges, one carrying the A47 across the passage between the inner and outer harbours and a second carrying the A1117 at the Mutford Bridge, Oulton Broad. These bridges open to allow shipping to access the port, causing significant traffic disruption.

The Scheme is a new road crossing over Lake Lothing, improving access to the lake area as well as relieving congestion in, and around, the town centre.

2.2 LOCATION OF SCHEME

The proposed location for the new bridge is shown on Figure 1~~Figure 1~~Figure 1~~Figure 1~~, below.

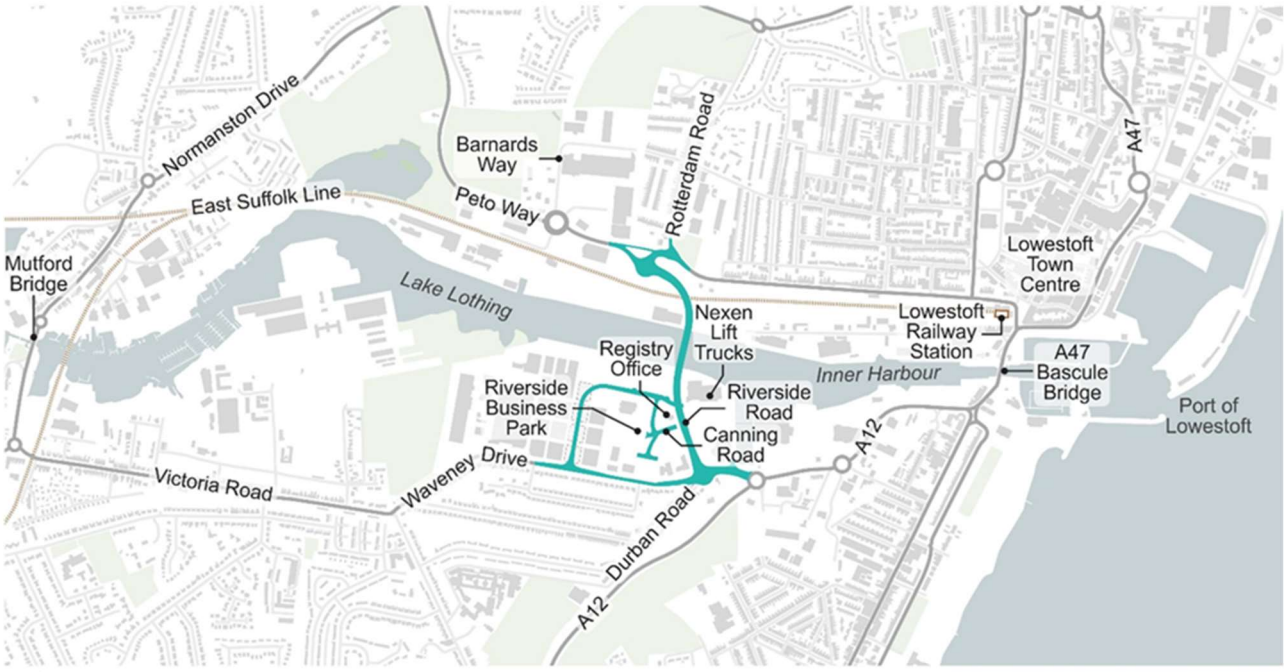

Figure 1 – New bridge location

2.3 BRIDGE DESIGN

The bridge will comprise a single counterweighted, rolling-lift bascule leaf, actuated via below deck hydraulic cylinders, supported on 2 reinforced concrete piers. The bridge will be constructed to provide a clear navigational channel, central in the lake, of 32m between fenders and 35m between the pier faces. The bridge deck will have a clear height over water of at least 12m above highest astronomical tide when lowered and raise to provide infinite clearance across the whole of the navigation channel. The fixed over water sections of the bridge will be protected from navigation impacts by passage and approach fendering. The opening bridge will be connected to the existing

road network by a series of fixed approach spans. An indicative section showing the bridge outline in both the “raised” and “lowered” position is shown in Figure 2, overleaf.

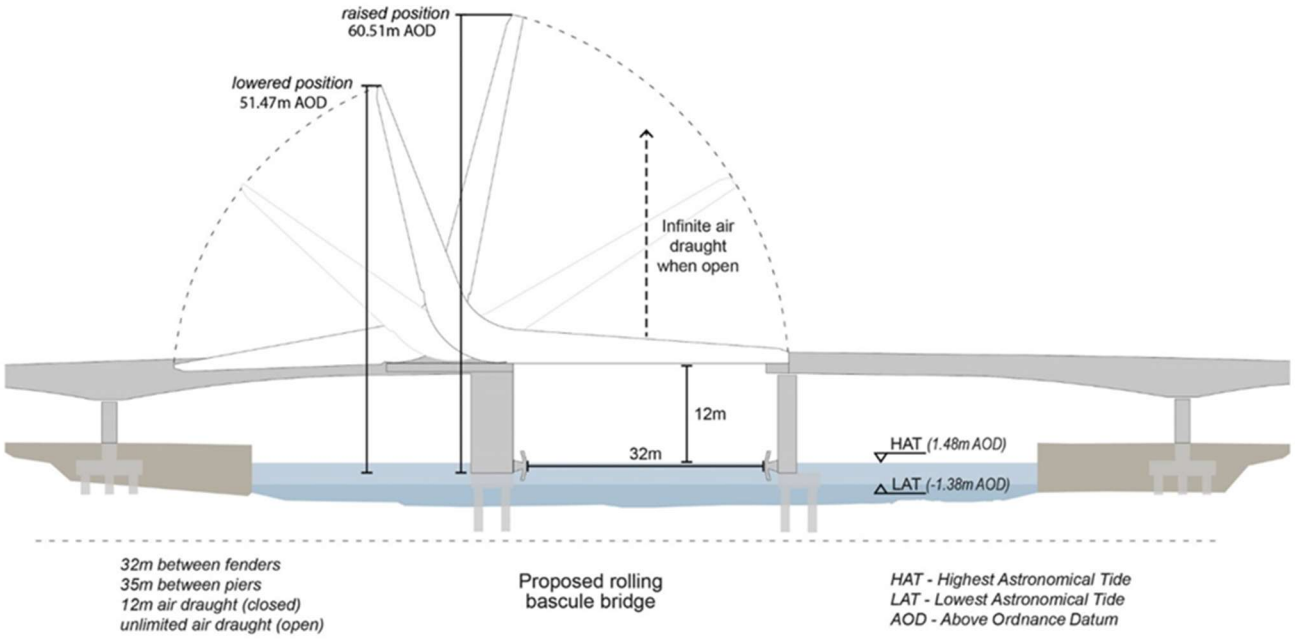

Figure 2 – Bridge outline (looking west)

2.4 PORT OPERATIONS

The location of the Scheme crosses the navigation waterway within Lake Lothing. The Inner Harbour at the Port of Lowestoft has commercial quays both east and west of the Scheme bascule bridge location, along with a number of marina facilities located west of the bridge. Access to these berths will require an opening of the Scheme bascule bridge should the air draft of the vessel exceed the available headroom, including a suitable safety clearance, with the bridge in the lowered position.

3 SURVEY METHODOLOGY

3.1 SURVEY SET-UP

In order to capture details of all vessel movements within the Port, high definition wide angle time lapse cameras were installed at two locations, one capturing images of vessels passing through the existing bridge passage, the second observing those that proceeded past the location of the new bridge. The cameras were of sufficient resolution to allow positive identification of 95% of commercial vessels passing and determination of air draft for all vessels either by identification of the vessel by name or by use of fixed reference points on the captured images.

Figure 3 – Camera locations

The cameras were combined with a local hard drive for data recording, a Wi-Fi router for network connectivity, a 4G M2M aerial for remote connections and a power supply for each unit, all housed in an externally rated box. These boxes were mounted on street lighting columns at suitable locations to ensure sufficient coverage of the areas under inspection.

The cameras were set up to capture an image every 10 seconds. This timeframe was established considering field of vision of the cameras and the anticipated transit time for a vessel travelling at the Port maximum speed of 4 knots through that field. This 10 second frame rate ensured that at least 3 images of every vessel transiting the passage would be recorded.

Initially the method of data recovery was to be via local Wi-Fi network connectivity between the cameras and a laptop taken to site, however after an initial attempt it was found that this method would take too long to complete due to poor signal quality and low transfer rates. Following this it was decided to leave the cameras in position for approximately 3 months, periodically checking that they were continuing to record, and then remove the whole assemblies and recover all of the data via direct connection to the hard drives.

The cameras were initially erected on 13th July 2017 and taken down on 3rd October 2017, this initial recorded data was then collected and analysed. The cameras were then refurbished and re-erected on 2nd January 2018 to continue collecting data for a second period being removed on 13th April 2018 with the second data set subsequently analysed. The cameras were erected for a third period beginning on 24th August 2018 and finishing on 29th October 2018.

3.2 DATA PROCESSING

Following recovery of the captured images, a manual review of the photos was undertaken to identify bridge openings. This information was recorded within a spreadsheet, noting the start and finish of each bridge operation, the numbers and, where possible, names of vessels, whether the vessels were of a size that would require an opening of the new bridge and whether the vessel would progress past the location of the new bridge. A note on openings required solely for recreational vessels was also made.

No allowance for potential berth reassignments within the port post construction of the new bridge has been made within the analysis.

The survey data was compared with a small sample data set obtained from ABP, comprising bridge operation records for 3 weeks from 27th May 2017.

4 INITIAL SURVEY DATA ANALYSIS

4.1 EXISTING A47 BASCULE BRIDGE

A total of 1242 openings of the bridge were recorded during the initial 80 days surveyed; this equates to an average of 15.5 openings per day. The numbers of openings per day ranged from 1 to 23, with the most frequent number of openings being 16 and 17.

In total 2443 vessel movements were recorded during the initial survey period. The highest number of vessel movements during a single day was 62, the lowest being 1. The largest vessel entering the port during this period was the Arklow Raven at 89.99m in length.

The maximum number of vessel movements during a single bridge lift was 14 although over 55% of all lifts were for a single vessel and, on one occasion, the road was closed with no associated vessel movement.

The average durations, from road traffic stop to restart, for recorded bridge operations by number of vessels is shown in Figure 4~~Figure 4~~~~Figure 4~~ below, the overall average duration being just under 5 minutes.

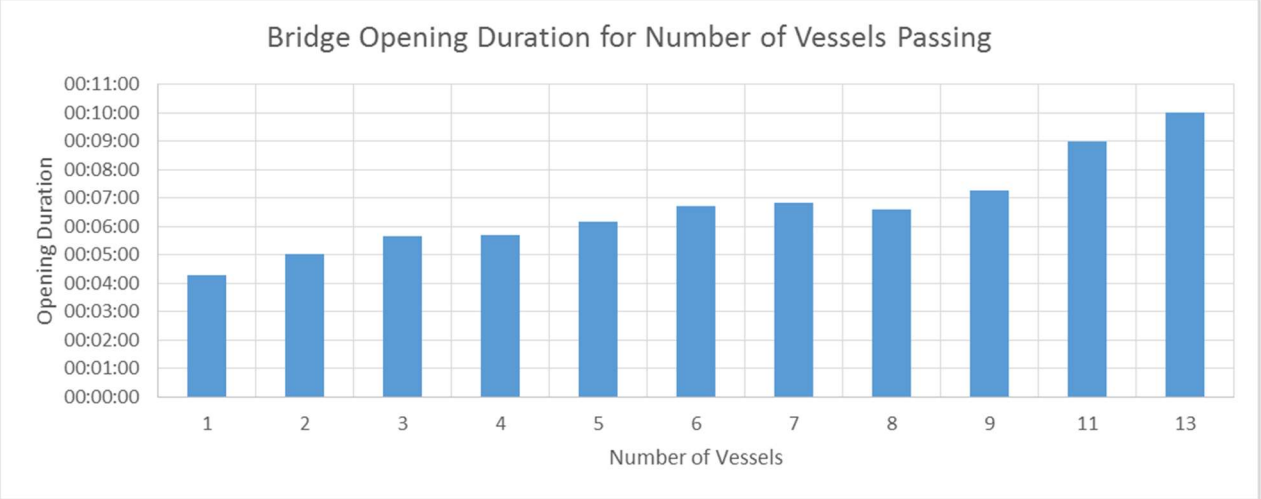

Figure 4 – Bridge opening durations

4.2 NEW BRIDGE

Any vessel with an apparent air draft over 11.5m travelling to or from west of the new bridge location within the survey has been identified as requiring a lift of the new bridge, the figure of 11.5m was chosen to provide a working safety margin below the structure of the new bridge for vessels transiting without a bridge lift. A total of 450 movements including such vessels were observed during the initial 80 days recorded; this equates to an average of 5.6 openings per day. The range of numbers of projected openings per day was 0 to 17, although the figure of 17 occurred on a single day only with the next highest figure being 11. The most common count for projected openings per day was 7.

These figures are likely to be an over estimation as the assessment of whether a vessel would require a lift of the new bridge has not taken account of tide level but has been based on the lowest

available clearance, which is at highest astronomical tide, therefore some vessels with air drafts between 11.5 and 13.5m may be able to transit without an opening at lower tidal levels.

Assessing the potential opening durations associated with movements past the Scheme bridge from the vessel survey data is not straightforward as currently the vessels are uninhibited in their passage through this location and therefore likely travel at a higher speed than they would through the new bridge passage once constructed. They also do not have to make allowances for the potential for having to wait for the bridge to open thus potentially maintain a higher speed for longer, these factors will affect the approach time to the Scheme bridge. While the presence of the bridge would act to slow vessels on approach the fact that the Scheme bridge is significantly wider than the existing A47 bridge passage suggests that vessels will transit the Scheme bridge faster than they do the existing bridge, this will affect the transit time. The principal factor affecting opening durations is the time taken to raise and lower the Scheme bridge which is greater than that of the existing, combined with the time taken to clear the bridge of traffic (both vehicular and pedestrian). Making allowances for each of these factors we believe an equivalent duration ratio of 125% for a single vessel transit reducing to 105% for 4 vessels or more would be applicable. Table 1, below, shows the basic build-up of the comparative durations for typical vessel transit configurations for the A47 bridge and the Scheme.

Table 1 – Typical bridge transit comparisons (durations in seconds)

Number of Vessels	1		2		3		>4	
Operation	A47	Scheme	A47	Scheme	A47	Scheme	A47	Scheme
Wig-Wags	20	20	20	20	20	20	20	20
Barriers	10	10	10	10	10	10	10	10
Clear Bridge	35	35	35	35	35	35	35	35
Raise	60	106	60	106	60	106	60	106
Transit	80	60	125	90	170	120	220	150
Lower	60	106	60	106	60	106	60	106
Barriers	10	10	10	10	10	10	10	10
Total (Mins)	4:35	5:47	5:20	6:17	6:04	6:47	6:55	7:17
Ratio	126.2%		117.8%		111.8%		105.3%	

Applying these ratios to the movements identified within the survey would give an overall average opening duration of around 6 minutes and a longest observed opening of 11.5 minutes.

4.3 OVERALL OPENING FREQUENCY

Comparing the frequency of openings required for the Scheme and A47 Bascule Bridge we can see a significant reduction in the number of openings likely to be required. Figure 5~~Figure 5~~~~Figure 5~~, below, shows the number of days out of the 80 day survey period on which a given number of openings occurred, for example the A47 (existing) Bridge opened 15 times on 8 days.

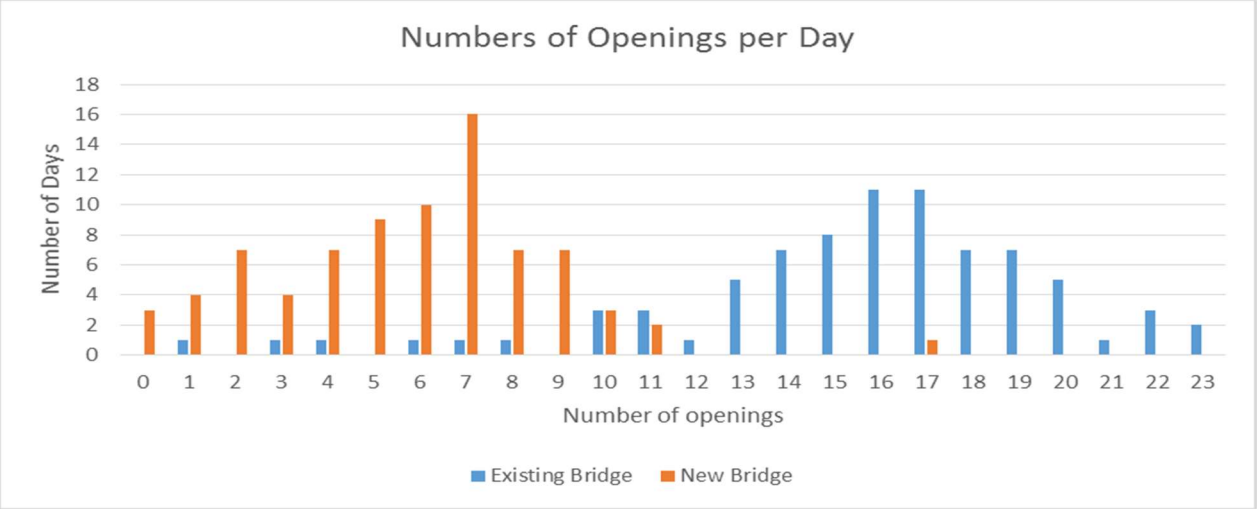

Figure 5 – Distribution of number of openings

These results are consistent with the small sample data set supplied by ABP from their operational records and indicates that the survey accurately reflects the current navigational frequency within the Port, a comparison between the frequency of openings of the A47 Bascule Bridge during the initial survey period and ABP's sample data is shown in Figure 6, below.

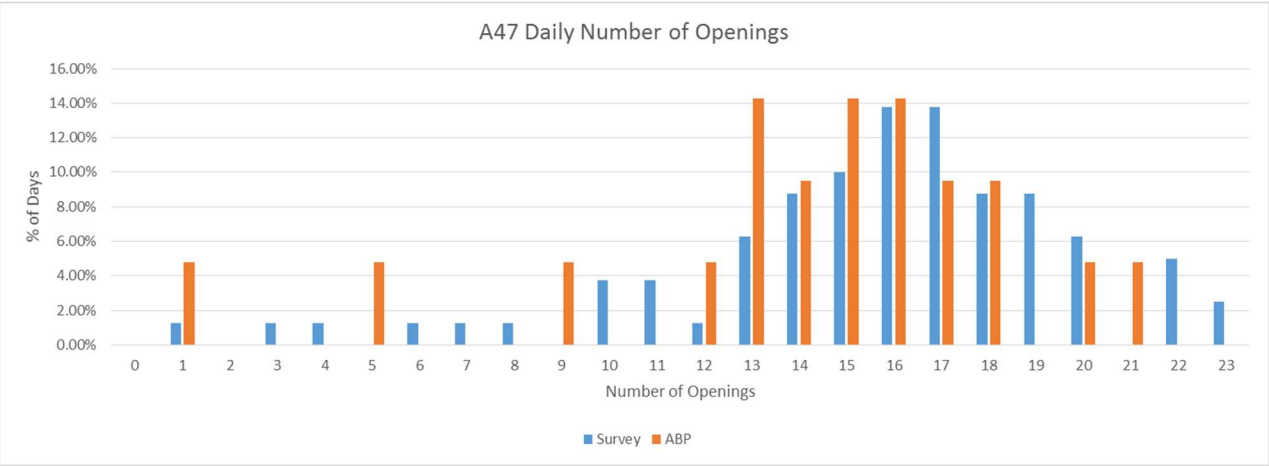

Figure 6 – Distribution of A47 openings during survey and sample set

4.4 AIR DRAFT VARIANCE

A comparison of opening frequencies for different vertical clearances for the Scheme bridge, including the safety margin outlined in Section 4.2 in all cases taken as 0.5m, and vessel air drafts was undertaken, as shown in Figure 7~~Figure 7~~~~Figure 7~~ below.

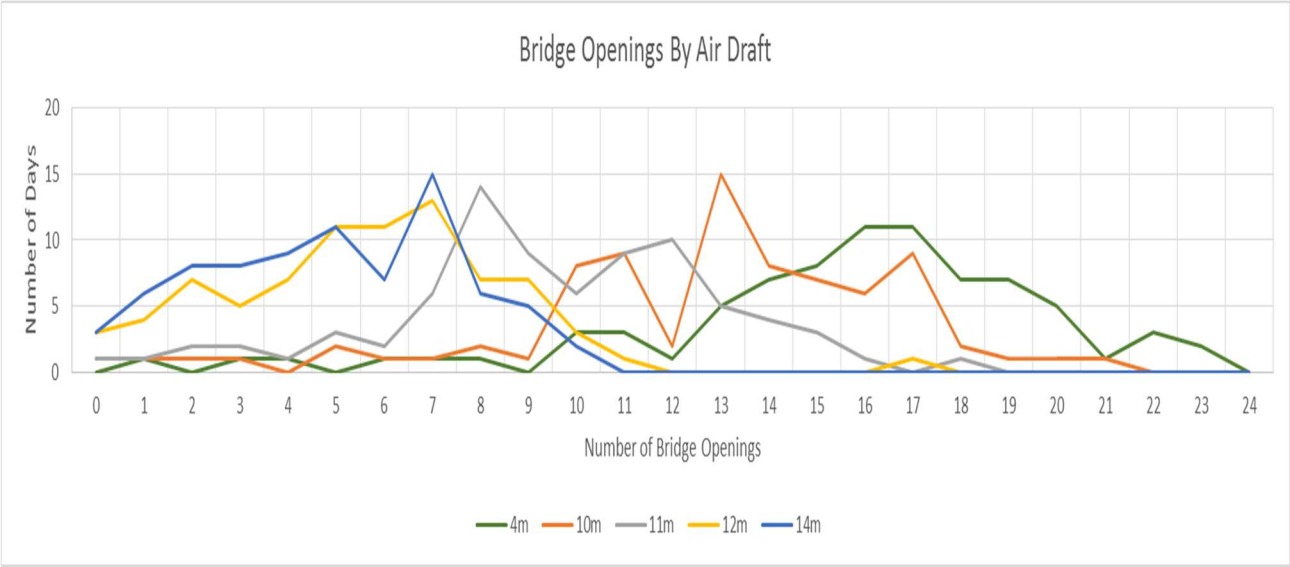

Figure 7 – Bridge openings for different clearances

This comparison shows that a small increase in bridge clearance would produce only minimal improvement on number of openings while a small decrease would result in a substantial increase in opening requirements. This indicates that the Scheme bridge design is set at the optimal height considering road and vessel traffic constraints.

4.5 HOURLY DISTRIBUTION

An analysis of bridge openings per hour was performed to assess the profile of anticipated demand for openings during the day. The results of this are shown on Figure 8.

For the existing bridge pronounced dips occur for the hours 8:00-9:00, coinciding with the am peak road traffic period and also 12:00-13:00. A lesser reduction in operations is observed in the pm peak period of 17:00-18:00. These result from ABP's policy of restricting openings unless requested during these periods to assist with traffic flow.

For the new bridge the pm peak period reduction is more evident with a similar reduction present during the am peak.

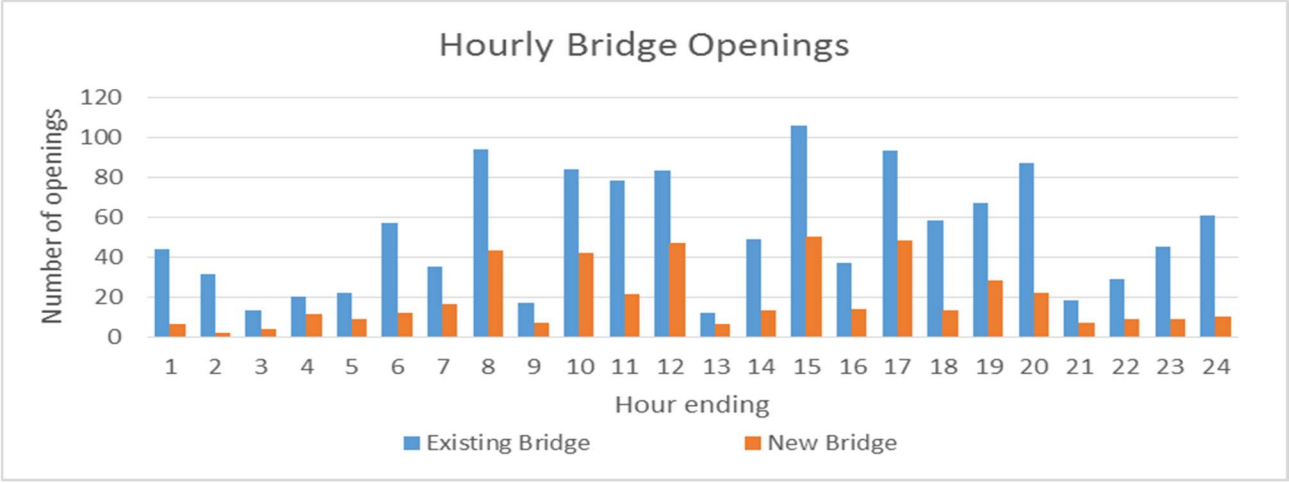

Figure 8 – Hourly openings

4.6 COMMERCIAL AND RECREATIONAL TRAFFIC

An assessment of the number of openings of the new bridge that would have been required by commercial and recreational traffic shows that, of the 450 anticipated openings, 217 would be attributable to commercial vessels, while 233 would have been solely from movements of recreational craft.

Of the recreational movements, approximately 75% occurred during the scheduled A47 bridge operation periods, with the remaining 25% occurring simultaneously with a commercial vessel bridge opening.

4.7 TWO WAY MOVEMENTS

An analysis of the number of operations involving simultaneous two way vessel movements has shown this occurred in 196 of the 1242 operations recorded; however only 13 of these involved vessels of sufficient air draft to require an opening of the new bridge travelling in both directions. Vessels will not be permitted to transit the Scheme bridge while it is in motion, this is similar to the directions for the A47 bridge. For movements involving vessels above and below the clearance limit, it has been assumed that the vessels able to transit the bridge without a lift would proceed with the bridge closed the bridge would then lift to allow the larger vessel to pass (or vice versa depending on the Harbour Masters instruction).

5 ~~SECOND~~ SUBSEQUENT SURVEY DATA ANALYSIS

5.1 SECOND SURVEY RESULTS

The data obtained from the second survey period was evaluated in a similar manner to the initial data.

During this period the total number of recorded movements was considerably lower than during the initial survey, predominantly due to a large reduction in recreational vessels (as may be expected by the seasonal difference).

The following table details the principal differences in the two survey data sets;

Table 2 – Comparison between initial survey and second survey results

	Initial Data (80 Days)	Second Data (89 Days)	% Difference
Total Vessel Movements	2443	1114	-54%
Commercial Vessels	1509	1075	-28%
Recreational Vessels	934	39	-95%
A47 Bridge Openings	1242	841	-32%
Scheme Bridge Openings	450	170	-62%
A47 Recreational Openings	416	33	-92%
Scheme Recreational Openings	233	9	-96%
A47 Commercial Openings	1208	808	-33%
Scheme Commercial Openings	214	161	-25%
Maximum A47 Daily Openings	23	18	-21%
Maximum Scheme Daily Openings	17	6	-64%
Average A47 Daily Openings	15.5	9.5	-38%
Average Scheme Daily Openings	5.6	1.9	-66%

There are a number of potential contributory factors to differences in the data sets namely seasonal variation and maintenance operations undertaken on the A47 Bridge during the second period.

Considering the differences observed it is reasonably conservative to use the results from the initial survey in the Scheme assessments to replicate a worst-case scenario as that data represents more vessel movements in a shorter duration.

5.2 THIRD SURVEY RESULTS

The data obtained from the third survey period was analysed in the same manner as the previous surveys.

The following table details the principal differences between the initial and the third survey data sets; the third survey period was notably shorter than the initial survey.

Table ~~5-~~3 ~~– Type Caption Here~~Comparison between initial survey and third survey results

	Initial Data (80 Days)	Third Survey Data (55 Days)	% Difference
Total Vessel Movements	2443	795	-67%
Commercial Vessels	1509	405	-73%
Recreational Vessels	934	390	-58%
A47 Bridge Openings	1242	504	-59%
Scheme Bridge Openings	450	166	-63%
A47 Recreational Openings	416	149	-64%
Scheme Recreational Openings	233	92	-60%
A47 Commercial Openings	1208	351	-70%
Scheme Commercial Openings	214	74	-65%
Maximum A47 Daily Openings	23	14	-39%
Maximum Scheme Daily Openings	17	9	-47%
Average A47 Daily Openings	15.5	9.2	-40%
Average Scheme Daily Openings	5.6	3.0	-46%

~~5.1~~ As all figure show a negative difference it is clear that the initial survey data still represents the highest activity level observed within the survey periods.

1st Floor Station House
Tithebarn Street, Exchange Station
Liverpool
L2 2QP

wsp.com