Annex A

BTA'S "Best Practice Guidance – Pre-Towing Tasks Checklist"

BRITISH TUGOWNERS ASSOCIATION

Delivering for Britain

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BEST PRACTICE GUIDANCE - PRE-TOWING TASKS CHECKLIST

Members may wish to note that the agreed checklists and assessment criteria for general towing tasks is now available on our website. These checklists provide an overview on checks that should be carried out prior to commencement of harbour related towing operations.

Individual companies may wish to use their own checklists and use this as a cursory guide to ensure that they are in compliance with the basic safety standards.

The Pre Towing Tasks checklist is in four parts;

1) Prior to undertaking tow and during passage
2) Fitness for Purpose and verification of documentation prior to commencement of Towage
3) Verification of Internal and External communications
4) Review of Emergency procedures

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BTA's Pre Towing Tasks Checklist

1) Safe Towage Operations Checklist

	Task / Duty	Officer's Initials	Date
	When preparing to undertake a towage operation:		
1	Identify the principle risks and method of assessment		
2	Identify and understand the reasons for the towage method to be used		
3	Visual inspection of the towing wire		
4	Identify suitable towage points and the chafing areas		
5	Identify the characteristics of the tow		
6	Ensure rigging and correct deployment of the towing gear		
7	Knowledge of safe handling of the towing gear		
8	Identify safe areas on deck		
9	Ensure adequate lighting of working areas		
10	Identify the stability of the tug and tow		
11	Prepare a passage plan		
12	Identify local byelaws that may affect the operation		
13	Identify where different phases of the tow may require different towing requirements		
14	Identify berthing arrangements on arrival		
	On Passage		
15	Follow correct procedures to connect, let go and change of the towing gear		
16	Monitor the tow to take timely and effective corrective action when required		
17	Aware of the importance of avoiding large dynamic forces on the tow line		

2) Fitness for Purpose Checklist

	Task / Duty	Master's Initials	Date
	For an intended passage:		
1	Check correct documentation for the tug		
2	Check correct documentation required for the tow		
3	Verify tug requirements for the tow		
4	Assess fitness and suitability of navigation equipment for proposed passage		
5	Assess number, experience and qualifications of crew		
6	Assess the suitability of the towing equipment		

3) Internal & External Communications Checklist

	Task / Duty	Master's Initials	Date
	Verify Internal Communications		
	Conduct:		
1	A pre-tow briefing with crew		
2	The use of hand signals and state the importance of non-verbal signals		
3	The use of hand held radios and state the importance of correct radio procedures		
4	The use of on-board CCTV		
5	The use of on board alarms, signage and announcements		
	Verify External Communications		
	Ensure:		
1	Tow set up briefing with external stakeholders		
2	Agreement of terminology with pilot		
3	Check communications with other tugs and vessels		
4	Check traffic reports and communication with VTS / Port Control/vessel		

4) Emergency Procedures Checklist

	Task / Duty	Master's Initials	Date
	Verify Actions to be taken in the event of:		
1	Failure of towing lines and equipment		
2	Failure of gog arrangements		
3	Failure of engines, steering, electrical systems		
4	Failure of steering gear		
5	Failure of electrical systems		
6	Loss of external communication to pilot /port control etc		
7	Mechanical problem on the towed vessel		
8	Rope in propulsion system		
9	Compromise of watertight integrity of tug when towing		
10	Collision		
11	Grounding of tug and/or tow		
12	Man overboard		
13	Fire		
14	Pollution		
	Verify:		
15	Use of the emergency controls		
16	Deployment of the emergency tow line		
17	Emergency release of the tow procedure		
18	Crew preparedness at emergency stations		
	Awareness of:		
19	The statutory requirement to render assistance		
20	The difference between responding to a Mayday and rendering salvage assistance		

Annex B

Section 4 – Testing, Inspection & Maintenance of Towing Equipment - PLA's Code of Practice for Craft Towage Operations on the Thames 2011

SECTION FOUR – TESTING, INSPECTION & MAINTENANCE OF TOWING EQUIPMENT

4.1 Items to be Checked Before and After Towing

Before and after the completion of any tow, it is recommended that all towing equipment is thoroughly checked for defects and general wear. This should include both the towing equipment aboard the tug and also the towing equipment aboard the vessel to be towed. The following general guidance should be adhered to:

Towing Hook

- Monitor the condition of the gear on a regular basis, especially wear and tear at the fulcrum pin and where the hook interacts with the guide track;
- Look out for stress fractures in the key stress areas i.e. the fulcrum pin and supporting structure;
- The smooth and efficient action of the quick release system (if applicable); and
- An axe should be provided and be readily available for use.

Towing Winches

- Check the effective operation of the winch including braking mechanism and 'in gear' operation;
- Ensure the pawls on winches are effective and free to arrest the tension on the towing wire and are able to release with ease (see figure 4); and
- Look for excessive corrosion or fracturing of the winch hold down bolts and/or welds.

Bollards, Fairleads and Sheaves

- Check for excessive corrosion leading to the wasting of the bollard/fairleads and supporting structure;
- Look closely for fractures in both the bollard support structure especially around bollard pins; and
- Proper rotation of sheaves or other pulley devices such as snatch blocks, and secure connection to deck or other tug structure.

Ropes & Wires

Undertake regular visual inspections of all ropes and wires, identifying frayed strands, distortion of wire/rope and condition of splices/mechanical wire splices, knots & shackles.

4.2 Logging of Inspections

The results of the towing gear and equipment inspections should be recorded as part of the vessel's daily log or this may preferably be recorded in a dedicated folder for all towing equipment. Such data should be submitted to the company as required by internal procedures.

4.3 Formal Testing and Maintenance of Towing Equipment

Testing

Towing equipment, such as hooks, winches and ropes should be provided with test certificates when new and should be tested and certified by an approved contractor every 5 years. Test certificates should be kept for future reference and gear should be re-certificated either when the tug is reengined or if a serious defect occurs and subsequent repairs are completed.
(Or as and when required by the licensing authority). Towing ropes should be provided with test certificates, which it is recommended, are filed onboard the tug. Coils of rope, used for making up deck ropes, should also be provided with test certificates, although it is not necessary for individual deck ropes to be tested and certified.

Maintenance

Owners and operators should ensure that they have in place an appropriate towing equipment maintenance system for each vessel. Clear procedures should be in place for recording the required daily, weekly (and other periodic) checks, and those checks required to be undertaken before each towing job; and appropriate record forms and log books provided.

Maintenance of all towing equipment and associated gear should form part of the tug's weekly maintenance checklist. The maintenance carried out should aid in preventing the premature failure or wear of towing equipment which is subject to extensive loads during towing operations. Particular attention should be made to ensuring that towing equipment is free of excessive corrosion, all moving parts are regularly lubricated (this also applies to the core of wire ropes) and serviced.

The PLA, as part of its Vessel Licensing (ship towage tug) regime, requires the following records to be maintained:

Details of checks relating to all Towing Equipment; this should be in the form of weekly, monthly and quarterly check sheets.

Engine Room maintenance log including maintenance schedules for
towing equipment.

4.4 Acceptable Safety Factors for Towing Equipment

As a general rule it is recommended that steel wire and fibre rope towlines and towing springs have a Safe Working Load of at least 2 times the bollard pull of the tug involved in the towing operation. This also applies to towing hooks. A lesser safety factor can have a detrimental effect on the towlines lifespan, which may lead to failure of the towline during towing operations.
The factor of safety may be reduced for deck lines and pusher tug connecting wires as the loads experienced are greatly reduced.

Annex C

Section 25.2.2 – Towing Arrangements - The Small Commercial Vessel and Pilot Boat Code

Towing arrangements

25.2.2.1 The design of towing gear should minimise the overturning moment due to the lead of the towline.

25.2.2.2 The towing hook or towline should have a positive means of release which can be relied upon to function correctly under all operating conditions.

25.2.2.3 The towing hook (or equivalent fitting) and the supporting structure should be strong enough to withstand loads imposed during towing operations.

25.2.2.4 The release mechanism should be controlled from all conning positions and at the hook itself. The local control at the hook should be of the direct mechanical type capable of independent operation.

25.2.2.5 Towing arrangements should be appropriate to the task in hand and maintained to ensure that they are in an efficient working condition.

Annex D

Section 1.2 – Responsibilities - PLA’s Code of Practice for Craft Towage Operations on the Thames 2011

1.2 Responsibilities

1.2.1 Tug master's Responsibilities

The Master of a vessel at all times has responsibility for the safety of his/her vessel, crew and of any vessels being towed. The Master has the authority to make decisions affecting the safety and conduct of his/her ship, crew and any vessels under tow. Due to the hazardous nature of towing Tug masters (and crew) should ensure that:

- All onboard pre-sail checks are completed before getting underway;
- Any risk assessments required are completed and applied before engaging in towage operations;
- All crew are fit, have correct PPE and are correctly trained for the task to be carried out;
- Crew are properly briefed on the work to be carried out;
- Good communication is established and maintained between the Tugmaster and Crew at all times during towage operations;
- Towing gear is in good condition and prepared for use (towing equipment should be inspected both before and after towage operations).
- All watertight hatches and doors are kept closed whilst towing to maintain the watertight integrity of the vessel(s).

Annex E

PLA's generic risk assessments, No 21 (Contact – navigation/mooring buoy (River)) and No 86 (Contact – tug with jetty/other obstruction)

Plasma Hazard Detail Report

Hazard Detail

Hazard Title **Contact - Navigation/Mooring Buoy (River)**

Reference 26

Accident Category Contact

Vessels Involved

Primary All Vessels : - All

Secondary

Review Date 01/09/2011

Areas Affected Sea Reach No 1 to Gravesend, Gravesend to Crayfordness, Crayfordness to London Bridge and London Bridge to Bell Lane Creek and Bell Lane Creek to Teddington

Hazard Description

Hazard Detail Contact with Navigation/mooring buoy.

Possible Causes Misjudgement, Inattention, Failure to follow procedures, especially position monitoring and passage planning. Failure to keep a proper lookout.
Adverse weather, poor visibility,
Mechanical / steering failure,
Vessel characteristics (high freeboard, cpp, manoeuvring characteristics, etc)
Nav aid or mooring buoy out of position.
Nav aid / buoy unlit.
Vessel navigating which is encumbered in some way and is unable to proceed normally or respond to external influences (Vessel not under command).
A Health and Safety accident on board could result in or contribute to causing a navigational incident.
Terrorist action could result in or contribute to this navigational hazard.
A significant proportion of mooring buoys in the river are unlit.

Remarks More likely in river than estuary due to closer intended passing distances and greater buoy density.

Mucking No.1 is vulnerable in respect of inbound vessels on the flood tide. Lower Hope buoy is vulnerable to contact from outbound vessels due to inbound vessels cutting the corner. Mid Blythe is vulnerable on the ebb and is difficult to distinguish against the background
lights. Sea Reach No.3 is vulnerable as vessels move out towards the centre of the channel off SE Leigh to make the turn when inbound. Most of the mooring buoys in Gravesend Reach are well outside the main channel. Most are unlit and are difficult to distinguish against the background light. Vessels may be manoeuvring with difficulty at slow speed, approaching the Gravesend pilot boarding area.

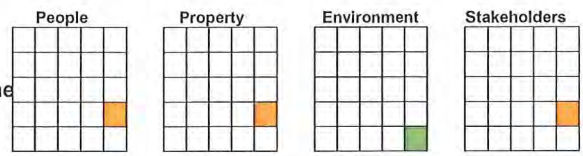
In Area G The channel is narrow channel and mainly used by small vessels (tugs and tows, fishing vessels and leisure craft). Tugs and tows are less manoeuvrable, particularly in high wind conditions.

More prominant buoys in the upper district have been lit; however the mooring buoys at Woolwich Ship Tier Lower and Tower Bridge Upper are although already lit are under review.

Risk Assessment

Ranked **21st of 117**

Most Likely Outcome



A glancing blow and, in most cases, the consequence to the buoy and the vessel would be minor. Minor Injuries likely if the vessel is small and travelling at high speed.

Worst Credible Outcome

The chain of the buoy fouling propeller(s) or rudder(s) and disabling the vessel (possibly leading to grounding).
Damage/destruction of buoy. Loss of Navigation Aid
Small vessels could sustain significant damage and major injuries and/or single fatalities.
Older design single compartment Class V could result in multiple fatalities

Risk Controls

Title	Owner	Type	Frequency	Consequence	Review Due
Pilotage Directions	Port of London Authority	PLA Legislation	High	Medium	18/12/2001
General Directions	Port of London Authority	PLA Legislation	High	Negligible	18/12/2001
Emergency Plans/Procedures	Port of London Authority	PLA Proc/Plans/Mans	Negligible	Medium	24/04/2002
BML - Local Knowledge Endorsement	Port of London Authority	Training/Education	Medium	Low	03/07/2002
River Byelaws	Port of London Authority	PLA Legislation	High	Negligible	18/07/2002
VTS Qualification/Authorisation	VTS Manager	Training/Education	High	Medium	21/08/2002
Buoyage (River)	Marine Services Manager	PLA Hardware Defence	Medium	Negligible	20/11/2002
VTS Manual	VTS Manager	PLA Proc/Plans/Mans	High	Medium	18/12/2002
Admiralty Charts	Vessel Operator	Lia/Advice River Users	High	Negligible	28/01/2003
ISM Code	External Body	National/Int Legislation	Medium	Medium	31/01/2003
PEC Examination/Experience	Vessel Operator	Training/Education	High	High	10/02/2003
Pilot Training/Experience	Marine Pilotage Manager	Training/Education	High	High	10/02/2003
Recreational Users Guide	Port of London Authority	Codes of Prac/Guid	Medium	Low	10/02/2003
River Works Licence	Port of London Authority	PLA Hardware Defence	Medium	Low	10/02/2003
VTS Navigational Broadcast	VTS Manager	Lia/Advice River Users	Medium	Medium	11/02/2003
VTS Procedures	VTS Manager	PLA Proc/Plans/Mans	High	Medium	11/02/2003
VTS Staff Training/Expertise	VTS Manager	Training/Education	Medium	Medium	17/03/2003
Passenger Vessel Code of Practice	Port of London Authority	Codes of Prac/Guid	Low	Low	14/05/2009
Harbour Master Review	Harbour Master	PLA Proc/Plans/Mans	Medium	Negligible	17/09/2009

12/09/2011 17:08:08 End of Hazard detail report

Plasma Hazard Detail Report

Hazard Detail

Hazard Title **Contact - Tug with jetty/other obstruction**

Reference 110

Accident Category Contact

Vessels Involved

Primary Tug : - All

Secondary

Review Date 01/09/2013

Areas Affected Sea Reach No 1 to Gravesend and Gravesend to Crayfordness and Crayfordness to London Bridge

Hazard Description

Hazard Detail Craft or Ship Towage Tug contacts vessel or obstruction when manoeuvring.

Possible Causes
Poor communication procedures between ship and tug.
Vessel swings too close to berth.
Vessel commences swing with excessive headway/sternway.
Vessel hampered by other traffic.
Adverse weather conditions, including restricted visibility.
Propulsion / steering failure.
Misjudgement by vessel or tug master.
Tugs line parting.
A Health and Safety accident on board could result in or contribute to causing a navigational incident.
Suitability of the tug for the task.

Remarks A particular example is when vessel swings off Coryton No.4 berth tug may contact berth or Mid Blyth Buoy. (Marico Risk Assessment 2003 - contact with berth mitigated by push/pull towage operations).

Risk Assessment

Ranked **86th of 117**

Most Likely Outcome

Delay in berthing. Tug temporarily unable to assist vessel. Minor/moderate damage to berth and/or tug. Possible injuries on tug. Pollution unlikely.

Worst Credible Outcome

Damage to tug buoy/jetty. Serious damage to tug. Serious injury. Pollution possible.

Risk Controls

Title	Owner	Type	Frequency	Consequence	Review Due
Tug Operator Procedures	External Body	Vessel/Facility Proc	Medium	Low	16/03/2002
Emergency Plans/Procedures	Port of London Authority	PLA Proc/Plans/Mans	Negligible	Medium	24/04/2002
BML - Local Knowledge Endorsement	Port of London Authority	Training/Education	Medium	Low	03/07/2002
ISM Code	External Body	National/Int Legislation	Medium	Medium	31/01/2003
PEC Examination/Experience	Vessel Operator	Training/Education	High	High	10/02/2003
Pilot Training/Experience	Marine Pilotage Manager	Training/Education	High	High	10/02/2003
Pilot Simulator Training	Marine Pilotage Manager	Training/Education	Medium	Medium	10/02/2003
VHF Communications	VTS Manager	PLA Hardware Defence	High	High	11/02/2003
VTS Navigational Broadcast	VTS Manager	Lia/Advice River Users	Medium	Medium	11/02/2003

National Inland Waterway Competency Standard	Maritime and Coastguard Agency	Training/Education	Low	Low	06/11/2003
PEC Training	Marine Pilotage Manager	Training/Education	High	High	21/11/2003
Oil Spill Contingency Plan	Harbour Master (SMS)	PLA Proc/Plans/Mans	Negligible	Medium	01/03/2006
Tug Master Training/Qualification	External Body	Training/Education	High	High	27/06/2006
Pilot/Tugmaster/VTS Training Group	Harbour Master (Lower)	Training/Education	Low	Low	28/09/2007
Local Navigation Certificate	Port of London Authority	Training/Education	High	Medium	25/09/2008

12/09/2011 17:09:23 End of Hazard detail report

Annex F

PLA's tow-specific risk assessments dated 28 July 2011, 8 August 2011 and 9 August 2011

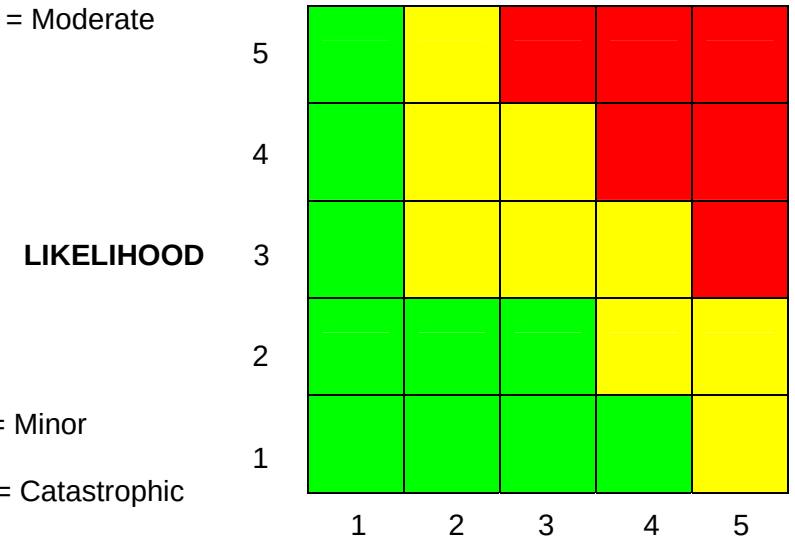
SKYLINE 19 RISK ASSESMENT 1st DRAFT 28/07/11

Likelihood 1= Very Low 2 = Low 3 = Moderate

4 = High 5 = Very High

Consequence 1 = Insignificant 2 = Minor

3 = Moderate 4 = Major 5 = Catastrophic



Risk Description	Initial Risk: Likeli-hood	Initial Risk: Conseq-uence	Initial Risk: Risk Factor	Mitigation Control Measure	Residual Risk: Likeli-hood	Residual Risk: Consequence	Residual Risk: Residual Risk	Control Actionee	Complete
Inbound									
Loss of control of tow									
flood tide	3	4	12	Change to ebbing tide	1	3	3	Meeting	20.07.11
Steven B towing	3	4	12	Stephen B push Chieftain tow	1	3	3	Meeting	20.07.11
Chieftain underpowered?	3	4	12	Licensing to evaluate	2	3	6	Towens	
Chieftain underpowered?	3	4	12	by practical evaluation previous day	1	3	3	Pilots	
				TOTAL	1	2	2		
Towline Parts									
	2	4	8	Visual inspection of lines on the day	1	4	4	Pilots	
				additional escort tug	2	3	6	Meeting	20.07.11
				Anchor to be placed at bow	1	2	2	Meeting	20.07.11
				Spare tow line rigged	1	1	1	New	
				TOTAL	1	1	1		

SKYLINE 19 RISK ASSESMENT 1st DRAFT 28/07/11

Blackout or loss of propulsion by 1 Tug									
	2	4	8	additional escort tug	2	2	4	Meeting	20.07.11
				Anchor to be placed at bow	1	2	2	Meeting	20.07.11
				TOTAL	1	1	1		
Strike of underside of bridge									
flood tide	3	5	15	Change to ebbing tide	3	4	12	Meeting	20.07.11
Passage plan	2	4	8	By pilots and contractor, HM review	1	4	4	All	
Calculate square plug round hole	2	4	8	Hydro review Westminster Bridge	1	4	4	Hydro	28.07.11
Reduced visibility	4	4	16	minimum 0.5 miles by pilots on day	1	1	1	Pilots	
Strong wind	3	4	12	to be evaluated by pilots on the day	1	4	4	Pilots	
Brow placed at port side of barge	3	4	12	place as close to centre as possible	2	3	6	Contractor	
spud leg at port side	4	5	20	remove spud leg	1	1	1	Contractor	
Non piloted vessel	3	4	12	2 bridge pilots to conduct passage	1	1	1	Regs	
Inexperienced masters and crew	3	4	12	BML with LKE & towing endorsement	1	2	2	Regs	
Crane restricting view	2	4	12	Crane to be at bow also provides platform for pilot and transit line	1	1	1	Meeting	28.07.11
				TOTAL	1	2	2		
Strike bridge abutment									
Passage plan	2	4	8	By pilots and contractor, HM review	1	4	4	All	
Non piloted vessel	3	4	12	2 bridge pilots to conduct passage	1	1	1	Regs	
Reduced visibility	4	4	16	minimum 0.5 miles	1	1	1	Pilots	
Strong wind	3	4	12	to be evaluated by pilots on the day	1	4	4		
flood tide	3	5	15	Change to ebbing tide	3	4	12	Meeting	20.07.11
				TOTAL	1	2	2		
Grounding									
Passage plan	2	4	8	By pilots and contractor, HM review	1	4	4	All	
squat in bridge arch Westminster	3	4	12	reduce both draft and air draft clearance by 1 metre	1	1	1	Contractor	28.07.11
Collision									
	2	2	4	Use of 2 pilots	1	1	1	Regs	
				Escort by Harbour Service Launch	1	2	2	Meeting	28.07.11
				Use of Iso phase lights					

SKYLINE 19 RISK ASSESMENT 1st DRAFT 28/07/11

Reduced visibility	4	4	16	TBNC minimum 0.5 miles Col regs and byelaws	1	1	1	Pilots
				TOTAL	1	1	1	
Stakeholders Interests	5	2	10	Notify Cory's Clippers, City Cruises, Liveltts Woods TRS by email of program	2	1	2	

NB For the out bound passage the risk and controls are the same except the tide will be flooding, increasing the consequence of the barge being stuck under a bridge. However the improved management of the tow BY navigating against the tide is considered to mitigate better against the risks overall THAN THE ISOLATED CONSEQUENCE.

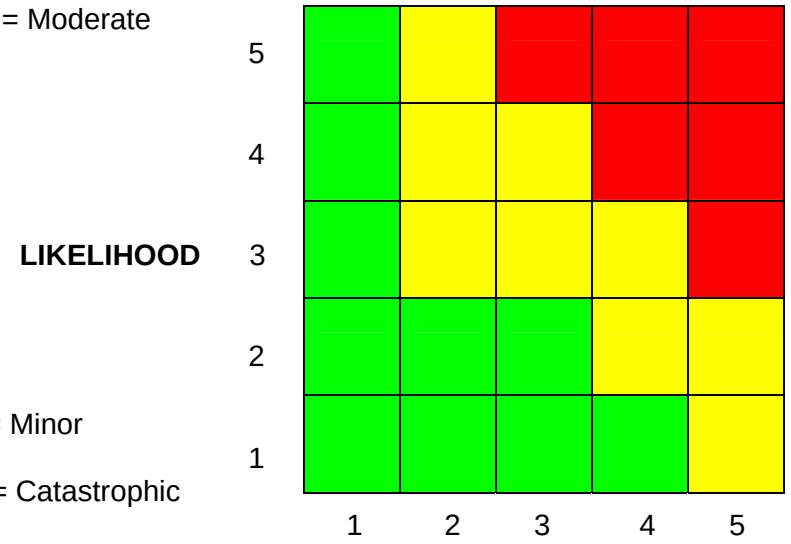
SKYLINE 19 RISK ASSESMENT 2nd DRAFT 08/08/11

Likelihood 1= Very Low 2 = Low 3 = Moderate

4 = High 5 = Very High

Consequence 1 = Insignificant 2 = Minor

3 = Moderate 4 = Major 5 = Catastrophic



Risk Description	Initial Risk: Likelihood	Initial Risk: Consequence	Initial Risk: Risk Factor	Mitigation Control Measure	Residual Risk: Likelihood	Residual Risk: Consequence	Residual Risk: Residual Risk	Control Actionee	Complete
Inbound									
Loss of control of tow									
flood tide	3	4	12	Change to ebbing tide	1	3	3	Meeting	20.07.11
Steven B towing	3	4	12	Stephen B push Chieftain tow	1	3	3	Meeting	20.07.11
Chieftain underpowered?	1	4	12	Licensing to evaluate – Evaluation by pilots, confirm good	1	3	6	Towens/ Pilots	08.08.11
Chieftain underpowered?	1	4	12	by practical evaluation previous day	1	3	3	Pilots	08.08.11
				TOTAL	1	2	2		
Towline Parts									
	1	4	8	Visual inspection of lines on the day	1	4	4	Pilots	09.08.11
				additional escort tug	2	3	6	Meeting	20.07.11
				Anchor to be placed at bow	1	2	2	Meeting	20.07.11
				Spare tow line ready	1	1	1	New	N/A
				TOTAL	1	1	1		

SKYLINE 19 RISK ASSESMENT 2nd DRAFT 08/08/11

Blackout or loss of propulsion by 1 Tug									
	2	4	8	additional escort tug	2	2	4	Meeting	20.07.11
				Anchor to be placed at bow	1	2	2	Meeting	20.07.11
				TOTAL	1	1	1		
Strike of underside of bridge									
flood tide	3	5	15	Change to ebbing tide	3	4	12	Meeting	20.07.11
Passage plan	2	4	8	By pilots and contractor, HM review	1	4	4	John Reid	08.08.11
Calculate square plug round hole	2	4	8	Hydro review Westminster Bridge	1	4	4	Hydro	28.07.11
Reduced visibility	4	4	16	minimum 0.5 miles by pilots on day	1	1	1	Pilots	09.08.11
Strong wind	3	4	12	to be evaluated by pilots on the day	1	4	4	Pilots	09.08.11
Brow placed at port side of barge	3	4	12	place as close to centre as possible	2	3	6	Contractor	07.08.11
~~spud leg at port side~~	4	5	20	remove spud leg	1	1	1	Contractor	08.08.11
Non piloted vessel	3	4	12	2 bridge pilots to conduct passage	1	1	1	Regs	09.08.11
Inexperienced masters and crew	3	4	12	BML with LKE & towing endorsement	1	2	2	Regs	09.08.11
Crane restricting view	2	4	12	Crane to be at bow also provides platform for pilot and transit line	1	1	1	Meeting	28.07.11
				TOTAL	1	2	2		
Strike bridge abutment									
Passage plan	2	4	8	By pilots and contractor, HM review	1	4	4	All	08.08.11
Non piloted vessel	3	4	12	2 bridge pilots to conduct passage	1	1	1	Regs	09.08.11
Reduced visibility	4	4	16	minimum 0.5 miles	1	1	1	Pilots	09.08.11
Strong wind	3	4	12	to be evaluated by pilots on the day	1	4	4		09.08.11
flood tide	3	5	15	Change to ebbing tide	3	4	12	Meeting	20.07.11
				TOTAL	1	2	2		
Grounding									
Passage plan	2	4	8	By pilots and contractor, HM review	1	4	4	John Reid	08.08.11
squat in bridge arch Westminster	3	4	12	reduce both draft and air draft clearance by 1 metre	1	1	1	Contractor	28.07.11
Collision									
	2	2	4	Use of 2 pilots	1	1	1	Regs	09.08.11
				Escort by Harbour Service Launch	1	2	2	Meeting	28.07.11

SKYLINE 19 RISK ASSESMENT 2nd DRAFT 08/08/11

				Use of Iso phase lights - SB						
				TBNC						
Reduced visibility	4	4	16	minimum 0.5 miles – N.B.	1	1	1	Pilots	09.08.11	
				Col regs and byelaws						
				TOTAL	1	1	1			
Stakeholders Interests	5	2	10	Notify Cory's Clippers, City Cruises, Liveltts Woods TRS by email of program	2	1	2	Livetts Launches	08.08.11	

NB For the out bound passage the risk and controls are the same except the tide will be flooding, increasing the consequence of the barge being stuck under a bridge. However the improved management of the tow BY navigating against the tide is considered to mitigate better against the risks overall THAN THE ISOLATED CONSEQUENCE.

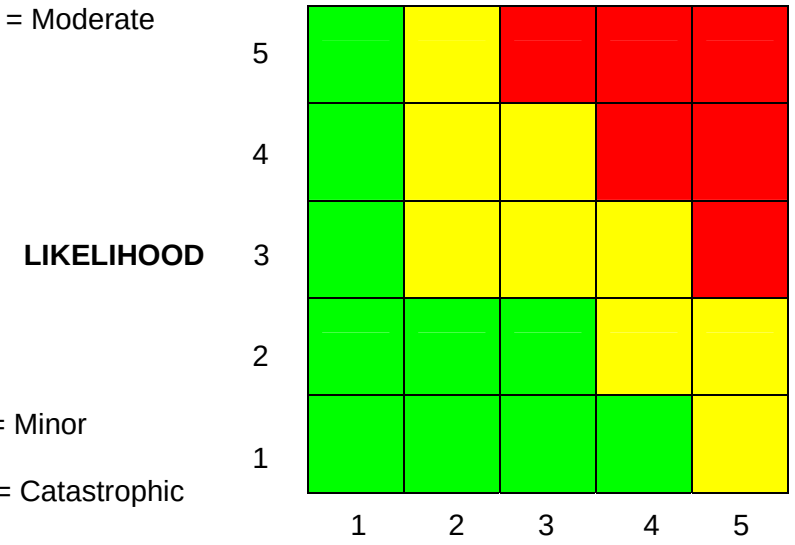
SKYLINE 19 RISK ASSESMENT FINAL 09/08/11

Likelihood 1= Very Low 2 = Low 3 = Moderate

4 = High 5 = Very High

Consequence 1 = Insignificant 2 = Minor

3 = Moderate 4 = Major 5 = Catastrophic



	Initial Risk				Residual Risk				
Risk Description	**Likeli-hood**	**Conseq-uence**	**Risk Factor**	**Mitigation Control Measure**	**Likeli-hood**	**Consequence**	**Residual Risk**	**Control Actionee**	**Complete**
Inbound									
Loss of control of tow									
flood tide	3	4	12	Change to ebbing tide	1	3	3	Meeting	20.07.11
Steven B towing	3	4	12	Stephen B push Chieftain tow	1	3	3	Meeting	20.07.11
Chieftain underpowered?	1	4	12	Licensing to evaluate – Evaluation by pilots, confirmed good by John Reid	1	3	6	Towens/ Pilots	08.08.11
Chieftain underpowered?	1	4	12	by practical evaluation previous day JR	1	3	3	Pilots	08.08.11
				TOTAL	1	2	2		
Towline Parts									
	1	4	8	Visual inspection of lines on the day	1	4	4	Pilots	09.08.11
				additional escort tug to be Horton	2	3	6	Meeting	20.07.11
				Anchor to be placed at bow	1	2	2	Meeting	20.07.11
				Spare tow line ready	1	1	1	Available	08.08.09
				TOTAL	1	1	1		

SKYLINE 19 RISK ASSESMENT FINAL 09/08/11

Blackout or loss of propulsion by 1 Tug									
	2	4	8	additional escort tug	2	2	4	Meeting	20.07.11
				Anchor to be placed at bow	1	2	2	Meeting	20.07.11
				TOTAL	1	1	1		
Strike of underside of bridge									
flood tide	3	5	15	Change to ebbing tide	3	4	12	Meeting	20.07.11
Passage plan	2	4	8	By pilots and contractor, HM review	1	4	4	John Reid	08.08.11
Calculate square plug round hole	2	4	8	Hydro review Westminster Bridge	1	4	4	Hydro	28.07.11
Reduced visibility	4	4	16	minimum 0.5 miles by pilots on day	1	1	1	Pilots	09.08.11
Strong wind	3	4	12	to be evaluated by pilots on the day	1	4	4	Pilots	09.08.11
Brow placed at port side of barge	3	4	12	place as close to centre as possible	2	3	6	Contractor	07.08.11
~~spud leg at port side~~	4	5	20	remove spud leg	1	1	1	Contractor	08.08.11
Non piloted vessel	3	4	12	2 bridge pilots to conduct passage	1	1	1	Regs	09.08.11
Inexperienced masters and crew	3	4	12	BML with LKE & towing endorsement	1	2	2	Regs	09.08.11
Crane restricting view	2	4	12	Crane to be at bow also provides platform for pilot and transit line	1	1	1	Meeting	28.07.11
				TOTAL	1	2	2		
Strike bridge abutment									
Passage plan	2	4	8	By pilots and contractor, HM review	1	4	4	All	08.08.11
Non piloted vessel	3	4	12	2 bridge pilots to conduct passage	1	1	1	Regs	09.08.11
Reduced visibility	4	4	16	minimum 0.5 miles	1	1	1	Pilots	09.08.11
Strong wind	3	4	12	to be evaluated by pilots on the day	1	4	4		09.08.11
flood tide	3	5	15	Change to ebbing tide	3	4	12	Meeting	20.07.11
				TOTAL	1	2	2		
Grounding									
Passage plan	2	4	8	By pilots and contractor, HM review	1	4	4	John Reid	08.08.11
squat in bridge arch Westminster	3	4	12	reduce both draft and air draft clearance by 0.4 metre	1	1	1	Contractor	08.08.09
				TOTAL	1	2	2		
Collision									

SKYLINE 19 RISK ASSESMENT FINAL 09/08/11

	2	2	4	Use of 2 pilots	1	1	1	Regs	09.08.11
				Escort by Harbour Service Launch	1	2	2	Meeting	28.07.11
				Use of Iso phase lights - SB					
				TBNC broadcasts to advise others	1	2	1		09.08.11
Reduced visibility	4	4	16	minimum 0.5 miles – N.B.	1	1	1	Pilots	09.08.11
				Col regs and byelaws					
				TOTAL	1	1	1		
Stakeholders Interests	5	2	10	Notify Cory's Clippers, City Cruises, Liveetts Woods TRS by email of program	2	1	2	Livetts Launches	08.08.11

NB For the out bound passage the risk and controls are the same except the tide will be flooding, increasing the consequence of the barge being stuck under a bridge. However the improved management of the tow BY navigating against the tide is considered to mitigate better against the risks overall THAN THE ISOLATED CONSEQUENCE.

Annex G

Chiefton's bollard pull calculations

MINIMUM BOLLARD PULL
REQUIREMENTS FOR THE CRANE BARGE SKYLINE 19

PARTICULARS OF VESSELS

Vessel Name	**SKYLINE 19**	**CHIEFTON**	**STEVEN B**
LOA	60	18	23.37
Beam	22	5.3	5.5
Depth	3.5	1.9	2.45
Displacement	2100 (Approx)		
GT		38	81
Engine HP		450	1200
Approximate Bollard Pull		4 – 4.5t	11 – 12t

Minimum Bollard Pull Requirement for SKYLINE 19 (based upon Sea & Coastal Tow calculations)

Scenario

SKYLINE 19 configured with the CHIEFTON engaged as the bow tug with the STEVEN B engaged as the stern tug.

Calculation

In undertaking this calculation the following assumptions were made:

- The displacement of the SKYLINE 19 was calculated to be 2100t using a Draught of 1.8m, Block Co-efficient of 0.9 and Water Density of 1.015
- The speed required for safe passage of the tow was 6 knots through the water
- The average depth of the exposed transverse section of the towed vessel was estimated at 4m. The calculation for a sea and coastal tow requires a single figure for this depth; on the basis that although overall air draught of the SKYLINE 19 was in the region of 7m, this did not extend across the whole of the bow of the vessel and so an average depth of 4m was taken
- The co-efficient (K) used to address the affect of sea and weather conditions (significant wave height, wind speed and current) was taken to be 1.5. This is the highest level that can be applied to sheltered water towing operations and is within the lower ranges of sheltered & exposed coastal tows.

The following formula was used to determine the required bollard pull for the SKYLINE 19

$$\text{Required BP} = \left[\frac{\Delta^{2/3} V^3}{120 \times 60} + (0.06\ B \times D_1) \right] \times K$$

Where:

BP = required bollard pull (tonnes)
Δ = full displacement of towed vessel (tonnes)
V = Tow speed (knots)
B = Breadth of towed vessel
D_1 = depth of the exposed transverse section of the towed vessel (m)
K = a factor that reflects potential weather and sea conditions

Sheltered Waters	– 0.5 – 1.5
Sheltered Coastal Waters	- 0.75 – 2.0
Exposed Coastal Tows	- 1.0 – 3.0

$$\text{Required BP} = \left[\frac{2100^{2/3}\ 6^3}{7200} + (0.06(22) \times 4.0) \right] \times 1.5$$

$$= \left[\frac{155.8 \times 216}{7200} + (1.32 \times 4.0) \right] \times 1.5$$

$$= \left[\frac{33652.8}{7200} + (5.28) \right] \times 1.5$$

$$= [\ 4.674 + (5.28)\ ] \times 1.5$$

$$= [\ 9.294\ ] \times 1.5$$

$$= 14.9\text{t}$$

By this calculation it is determined that a combined bollard pull shared between two towing vessels of 14.9t would achieve a speed through the water of 6 knots in the given conditions. The combined bollard pull of the CHIEFTON & STEVEN B is approximately 15 – 16.5t.

Annex H

MAIB's Safety Bulletin 2/2005 - Collisions and contacts between tugs and vessels under tow or escort in United Kingdom ports

MAIB SAFETY BULLETIN 2/2005

Collisions and contacts

between tugs and

vessels under tow or escort

in United Kingdom ports

MAIB SAFETY BULLETIN 2/2005

This document, containing safety lessons, has been produced for marine safety purposes only, on the basis of information available to date.

The Merchant Shipping (Accident Reporting and Investigation) Regulations 2005 provide for the Chief Inspector of Marine Accidents to make recommendations at any time during the course of an investigation if, in his opinion, it is necessary or desirable to do so.

A number of collisions between harbour tugs and the vessels they were assisting have been reported recently to the MAIB. Investigations have highlighted a number of safety issues shared by each of the collisions. It is these shared issues which prompted this Safety Bulletin.

Stephen Meyer
Chief Inspector of Marine Accidents

This bulletin is also available on our website: http://www.maib.gov.uk

Press Enquiries: 020 7944 3232/3387; out of hours: 020 7944 4292
Public Enquiries: 020 7944 3000
INTERNET ADDRESS FOR DFT PRESS NOTICES:
http://www.dft.gov.uk

BACKGROUND

During the first 4 months of 2005, the MAIB has been notified of three significant collisions involving harbour tugs. In the first incident, a tug running stern first ahead of a merchant vessel lost control, turned broadside across the bow of her charge and was holed beneath the waterline. In the second, a tug guiding the stern of a merchant vessel moving stern first lost control, struck the stern, and ended up with her tow line wrapped completely round her bridge superstructure. In the third incident, a tug attempting to pass a line to a merchant vessel underway lost control, ran in under the bow and struck the bulbous bow. Fortunately, in two cases the damage was reasonably minor; in the third, the tug had to be beached. No lives were lost, however the consequences could have been much worse.

The common theme to all three of the above incidents was that the tug master, although in each case quite experienced, was operating a tug with an unfamiliar propulsion system, and was attempting a manoeuvre with that system for the first time. The tug propulsion systems in the three incidents were not the same, however, each required a very different thought process on the part of the tug masters to manoeuvre the vessels effectively and safely when compared to the systems they were accustomed to. The key point is that, although the tug masters had a wealth of professional experience, they had received insufficient training and familiarisation with the systems they were using when the collisions occurred.

SAFETY LESSONS

MAIB strongly urges that:

- All tug operators review their training schemes, to ensure that tug masters receive comprehensive familiarisation training before taking control of a tug which is equipped with a significantly different propulsion system. Such training should incorporate instruction and validation on all manoeuvres that the tug master is likely to be tasked in the port.

- All harbour authorities, pilots and tug operators regularly review the capabilities and limitations of their harbour tugs and their crews, to ensure a common understanding of each tug's strengths and weaknesses. This should be supplemented for each towing task with a local appraisal of the intended operation to ensure the "tug to task" allocation is appropriate before the tow or move begins.

Annex I

PLA's Pilotage Department Operational Letter Issue No: OP/37/2011 dated 21 December 2011 – Wearing of Lifejackets

Pilotage Department OPERATIONAL LETTER

PORT OF LONDON AUTHORITY

Ref: CP Issue No.: OP/37/2011 Date: 21 December 2011

ALL PILOTS

WEARING OF LIFEJACKETS

Pilots are reminded that it is mandatory to wear approved lifejackets or Sea Safe coats at all times when on the open deck of PLA vessels, as well as any other vessels on which PLA staff may be working.

This requirement is contained in PLA Health and Safety Notice Number 2 of 2006, a copy of which is attached to this Operational Letter.

PILOTAGE OPERATIONS MANAGER

No. 2 of 2006
H&S Manual Ref: 5.2

PORT OF LONDON
AUTHORITY

HEALTH & SAFETY NOTICE

Issued to: All Staff

****

WEARING OF LIFEJACKETS

PLA Vessels and Areas adjacent to the River

Approved lifejackets are to be worn by PLA personnel at all times when on the deck of PLA vessels or when in PLA areas adjacent to the river outboard of safety rails (fog chains).

This rule also applies to any other vessels on which PLA staff may be working, and to visitors, contractors and trainees on PLA vessels or under PLA supervision.

An exception to the above rule can be made by local managers or vessel masters when no operational work is being carried out on deck, provided that the vessel is fitted with handrails or bulwarks all around of at least 1m high above the deck.

Where visitors embark or disembark by means of a gangway with 1m high handrails, or are provided with personal assistance by the crew, the requirement for lifejackets to be worn while boarding may be dispensed with at the vessel master's discretion.

When engaged in rowing, barge driving or other sporting or leisure pursuits in PLA vessels, approved lifejackets should be carried, and must be worn when instructed by the vessel's cox or master.

The vessel master or local manager may impose a stricter regime at any time or location to allow for local conditions. Once safely onboard and working within vessels' cabins or machinery spaces, personnel are allowed to remove their lifejackets.

Departmental Heads:

Please ensure a copy of this Notice is circulated to all appropriate staff who do not have access to a computer. This and any future Health & Safety Notices are also available on the Intranet (*See Health & Safety Home Page*)

[redacted]
Health & Safety Officer
6 December 2006

Annex J

MAIB Safety Flyer to tug operators and the ports industry

MAIB

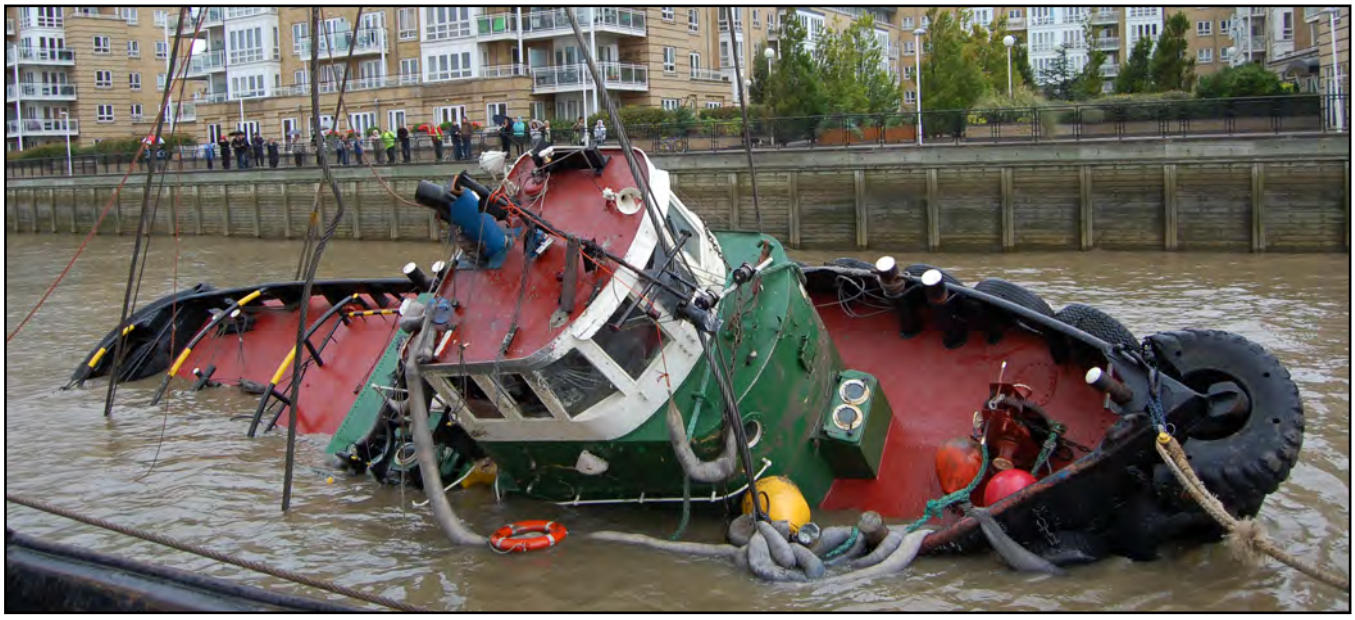
MARINE ACCIDENT INVESTIGATION BRANCH

FLYER TO TUG OPERATORS AND PORTS INDUSTRY

Fatal Accident - the risks associated with the combined push/pull towage configuration

On 12 August 2011, the tugs *Steven B* and *Chiefton* were connected to a 60m crane barge in a combined push/pull configuration. *Steven B* was secured aft with a combination of wires and ropes, making the tug and barge a composite unit. The distance between *Chiefton,* which was pulling, and the barge was 8.4 metres. There were two pilots positioned on the crane as the tow was navigated from St George Wharf towards Gravesend on the River Thames.

Chiefton's and *Steven B*'s engine powers were set at 95% and 70-75% respectively as the tow approached the eastern buoys of Greenwich Ship Tier, where it was set to the south by the flooding tidal stream. Port helm was applied by *Chiefton*'s skipper in an attempt to prevent the barge making contact with the northernmost buoy. The pilot then instructed him to pull to port and ordered starboard helm on *Steven B* in an unsuccessful attempt to "lift" the barge to port. The barge turned to starboard, hit the buoy and then collided with *Chiefton*, overrunning her and causing her to capsize and founder. The skipper and mate were rescued from the river but the engineer/deckhand, who was a non-swimmer and was not wearing a lifejacket, sadly drowned.



All those involved had wide experience of tug operations on the River Thames. However, virtually no one engaged in either the planning or execution of the tow had experience in the specific combined push/pull configuration used on the day, with pilots involved, downriver of Tower Bridge. No one had been formally nominated to be in overall charge. The towage plan focused on the difficult bridge transit phases and did not cover in detail the downriver tow.

Safety Lessons

Late and inappropriate action, coupled with *Chiefton*'s insufficient reserve of power and short tow ropes, made collision with the barge inevitable. This was largely due to inexperience of the tug configuration used. The following safety lessons should be carefully considered by harbour authorities and tug owners/operators for non-standard towage operations:

1. Planning should take into account the need for a contractor's method statement setting out the various contracted stages and responsibilities, a full passage plan, **relevant** experience and the need for a person to be in charge.

2. Tow-specific risk assessments should cross refer to those undertaken by the tug operators, harbour authorities (under the requirements of the Port Marine Safety Code) and contractors, and should be seamless.

3. The risk of the leading tug being overrun, in the push/pull configuration, in the event of propulsion or steering failures needs to be fully assessed. Where appropriate, consideration should be given to lengthening the tow to reduce the risk.

4. The tugs selected need to be fit for the task intended. Bollard pull should be appropriate for the **whole** operation and sufficient to provide a suitable reserve of power for emergency purposes.

5. Combined push/pull and craft towage should be included in a pilot's training.

6. Tug watertight integrity needs to be maintained to prevent downflooding leading to capsize.

This flyer and the MAIB's investigation report are posted on our website:
www.maib.gov.uk

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Marine Accident Investigation Branch
23 May 2012