15.10 Navigation Data

15.10.1 Moreton Bay Distance Tables

Moreton Bay Distance Tables

Via East Channel

	EB	E5	E3	E1	M7	M5	M4	M1	NW12	NW10	NW3	NW8	NW6	NW4	NW2	FWBY	BG
EB																	
E5	8.40																
E3	9.50	1.10															
E1	11.74	3.34	2.24														
M7	14.09	5.69	4.59	2.35													
M5	15.29	6.89	5.79	3.55	1.20												
M4	17.81	9.41	8.31	6.07	3.72	2.52											
M1	20.11	11.71	10.61	8.37	6.02	4.82	2.30										
NW12	22.46	14.06	12.96	10.72	8.37	7.17	4.65	2.35									
NW10	24.91	16.51	15.41	13.17	10.82	9.62	7.19	4.80	2.45								
NW3	27.41	19.01	17.91	15.67	13.32	12.12	9.60	7.30	4.95	2.50							
NW8	29.76	21.36	20.26	18.02	15.67	14.47	11.95	9.65	7.30	4.85	2.35						
NW6	32.21	23.81	22.71	20.47	18.12	16.92	14.40	12.10	9.75	7.30	48.0	2.45					
NW4	34.61	26.21	25.11	22.87	20.52	19.32	16.80	14.50	12.15	9.70	7.20	4.85	2.40				
NW2	36.32	27.92	26.82	24.58	22.23	21.03	18.51	16.21	13.86	11.41	8.91	6.56	4.11	1.71			
FWBY	38.52	30.12	29.02	26.78	24.43	23.23	20.71	18.41	16.06	13.61	11.11	8.76	6.31	3.91	2.20		
BG	44.52	35.12	35.02	32.78	32.78	29.23	26.71	24.41	22.06	19.61	17.11	14.76	12.31	9.91	8.20	6.00	

Via Main Channel

	EB	Rr/Ld	M8	M9	M7	M5
Rr/Ld	4.25					
M8	7.75	3.50				
M9	11.36	7.10	3.60			
M7	12.90	8.65	5.15	1.55		
M5	14.10	9.85	6.35	2.75	1.20	

Via East Knoll ByPass

	EB	Rr/Ld	M8	M9	EK2	M5
Rr/Ld	4.25					
M8	7.75	3.50				
M9	11.05	6.80	3.30			
EK2	12.15	7.90	4.40	1.10		
M5	13.25	9.00	5.50	2.20	1.10	

EB – BG via East Channel = 44.52
EB – BG via Main Channel = 43.33
EB – BG via East Knoll Bypass = 42.11

15.10.2 Moreton Bay steaming times

Leg	Distance	Speed in knots						
		8	10	12	14	16	18	20
PBG–FWBY	6	45	36	30	26	22	20	18
FWBY–NW2	2.2	17	13	11	9	8	7	6
NW2–NW4	1.71	13	10	9	7	6	6	5
NW4–NW6	2.4	18	14	12	10	9	8	7
NW6–NW8	2.45	18	15	12	10	9	8	7
NW8–NW3	2.35	18	14	12	10	9	8	7
NW3–NW10	2.50	19	15	13	11	9	8	8
NW10–NW12	2.45	18	15	12	11	9	8	7
NW Bypass	12.2	92	73	61	52	46	41	37
NW12–M1	2.35	18	14	12	10	9	8	7
M1–M4	2.30	17	14	12	10	9	8	7
Spitfire Bypass	4.37	33	26	22	19	16	15	13
M4–M5	2.52	19	15	13	11	9	8	8
M5–M7	1.20	9	7	6	5	5	4	4
M7–E1 (TLMA)	2.35	18	14	12	10	9	8	7
E1–E3	2.24	17	13	11	10	8	7	7
E3–E5	1.10	8	7	6	5	4	4	3
EAST E5–EB	8.82	66	53	44	38	33	29	26
M7–M9	1.55	11	9	8	7	6	5	5
M9–M8	3.60	27	22	18	15	14	12	11
M8–Rr/Ld	3.50	26	21	18	15	13	12	11
Rr/Ld–EB	4.40	33	26	22	19	17	15	13
M4–EK2	2.93	8	7	5	5	4	4	3
EK2–M9	1.10	8	7	5	5	4	4	3
Route 1 - PBG to EB via FWY (sth), NW, Spitfire, Main and East (Draft +10m)	47.44	$5^{h}55^{m}$	$4^{h}44^{m}$	$3^{h}57^{m}$	$3^{h}23^{m}$	$2^{h}57^{m}$	$2^{h}38^{m}$	$2^{h}22^{m}$
Route 2 - PBG to EB via FWY(nth), NW, Spitfire, Main and East (Draft 8-10m)	46.06	$5^{h}45^{m}$	$4^{h}36^{m}$	$3^{h}50^{m}$	$3^{h}17^{m}$	$2^{h}52^{m}$	$2^{h}33^{m}$	$2^{h}18^{m}$
Route 3 - PBG to EB via FWY(nth), NW Bypass, Spitfire Bypass and Main (Draft 5-8m)	43.25	$5^{h}24^{m}$	$4^{h}19^{m}$	$3^{h}36^{m}$	$3^{h}05^{m}$	$2^{h}42^{m}$	$2^{h}24^{m}$	$2^{h}10^{m}$
Route 5 - PBG to EB via FWY(nth), NW Bypass, Spitfire Bypass and East Knoll Bypass (Draft <5m)	42.01	$5^{h}15^{m}$	$4^{h}12^{m}$	$3^{h}30^{m}$	$3^{h}00^{m}$	$2^{h}37^{m}$	$2^{h}20^{m}$	$2^{h}06^{m}$

Table 28 – Moreton Bay steaming times

15.10.3 Pilotage – Brisbane River removal distances

The table below shows removal distances in nautical miles from Outer Bar Reach Entrance Beacons to berth/anchorage. Distances to BR^ anchorage to be taken from the Outer Bar Beacons to the actual anchorage position at the time

To calculate distances between berths, deduct smaller from larger figure.

Position	QSHIPS Code	Distance
Ship to Ship Transfer #2	STS2	5.30
Ship to Ship Transfer #1	STS1	4.80
Entrance Beacons	EB	0
Fisherman Island Pump Out	FIPO	2.84
Fishermans Island 12	FI12	3.25
Fishermans Island 11	FI11	3.43
Koopa Swing Basin	KSB	3.56
Fishermans Island 10	FI10	3.63
Fishermans Island 9	FI9	3.82
Fishermans Island 8	FI8	3.96
Fishermans Island 7	FI7	4.08
Fishermans Island 6	FI6	4.17
Fishermans Island 5	FI5	4.28
Fishermans Island 4	FI4	4.43
Fishermans Island 3	FI3	4.59
Fishermans Island 2	FI2	4.72
Fishermans Island 1	FI1	4.83
Fishermans Island Grain Terminal	FIGR	5.00
Brisbane Int Cruise Terminal	BICT	5.05
Fishermans Island Tanker	FITA	5.20
Port North Common User Berth 1	PNCUB1	5.30
Fisherman Island Swing Basin	FISB	5.30
Fishermans Island Coal	FIC	5.40
Fishermans Island GP Berth	FIGP	5.50
Brisbane Crew Change Berth	BCCB	5.67
Whyte Island Tug Base	WITB	6.40
Ampol Products	AMPR	6.60
Cement Australia	CAB	7.20
Cement Australia Swing Basin	CSB	7.20

Position	QSHIPS Code	Distance
Wagner	WAG	7.36
BP Bunker Berth	BPBB	7.73
BP Products	BPPR	7.90
Hemmant Barge Landing	HBL	8.10
Boral	BORL	8.20
Viva Energy	VIVA	8.20
Quantem Liquid Terminal	QLT	8.30
Aquarium Boat Passage	ABP	8.36
Brisbane Ship Lifts (The Yard)	BSL	8.38
SIMS Metal	SIMS	8.50
Incitec South	INCS	8.70
Pinkenba 1	PNK1	8.80
Pinkenba 2	PNK2	8.80
Pinkenba Swing Basin	PSB	8.80
Maritime Safety Queensland	MSQ	9.01
Queensport	QNPT	9.85
Pacific Tug Base	PTB	9.71
Bhagwan Marine Base	BMB	9.83
Holt Street	HOLT ST	9.85
Rivergate Marina	RYM	10.08
Queensland Bulk Terminal	QBT	10.63
Raptis	RAP	10.99
Austral (Brisbane Service Centre)	BSE	11.43
Hamilton Swing Basin	HSB	11.8
HMAS Moreton	BNWF	11.96
Riverside (Newstead)	RTB	14.4
Dockside Marine	DSM	16.6
Town Reach	CITY	18.14
SouthBank	CITY	19.06

Table 29 – Brisbane River removal distances

15.10.4 Passage Planning

Passage through Moreton Bay, from the Pilot Boarding Ground to the Entrance Beacons (Beacons BC1 and BC2), can take a number of different routes.

The available depth of water various across numerous channels, with a summary provided below.

Channel	Design Depth	North Entry	South Entry	Remarks
Fairway	15.0m	Fairway Beacon 26°48.8501'S 153°10.7759'E	NW Front Lead 26°51.5515'S 153°09.1943'E	Port Approaches
North West Channel	15.0m	NW Front Lead 26°51.5515'S 153°09.1943'E	Beacon NW12 27°02.4445'S 153°15.3421'E	Primary Deepwater Route
North West Bypass Channel	9.2m	NW Front Lead 26°51.5515'S 153°09.1943'E	Beacon NW12 27°02.4445'S 153°15.3421'E	Secondary Route Bypass channel for shallow draft vessels. Infrequently surveyed
Spitfire Channel	15.0m	Beacon NW12 27°02.4445'S 153°15.3421'E	Beacon M1 27°03.3352'S 153°18.0588'E	Primary Deepwater Route
Main Channel (Primary)	15.0m	Beacon M1 27°03.3352'S 153°18.0588'E	Beacon M7 27°08.3052'S 153°21.0775'E	Primary Deepwater Route
Spitfire Bypass Channel	12.0m	Beacon S1 27°02.9606'S 153°15.8825'E	Beacon M3 27°05.5706'S 153°18.7952'E	Secondary Route Bypass channel for shallow draft vessels. Infrequently surveyed
Main Channel (Secondary)	10.0m	Beacon M9 27°10.0092'S 153°19.8135'E	Beacon M8 27°12.0342'S 153°16.6618'E	Secondary Route Bypass channel for shallow draft vessels. Infrequently surveyed
East Knoll Bypass Channel	6.0m	Beacon M4-M6 (AIS) 27°06.0608'S 153°19.3414'E	Beacon M9 27°10.0092'S 153°19.8135'E	Secondary Route Bypass channel for shallow draft vessels. Infrequently surveyed
North East Channel	3.0m	Buoy NE2 26°57.0500'S 153°20.2250'E	Beacon M7 27°08.3052'S 153°21.0775'E	Entry with local knowledge only
East Channel	15.0m	Beacon M7 27°08.3052'S 153°21.0775'E	Beacon E5 27°13.8940'S 153°20.1438'E	Primary Deepwater Route

Brisbane Roads	14.7m	Beacon E5 27°13.8940'S 153°20.1438'E	Beacon BC1 27°18.6195'S 153°12.5493'E	Primary Deepwater Route

Table 30 – Passage Planning

The actual depth of channels can differ due to changes in the environmental conditions. Channels are regularly surveyed, though at different frequencies, depending on use. VTS can be contacted for the most up to date information or the Port of Brisbane for specific survey data.

It is the responsibility of the Master to ensure that the vessel is safe navigationally, including the use of the appropriate channels for their vessels draft.

15.10.5 Port Evacuation Guideline

15.10.5.1 Aim

It is acknowledged that every event is different including the weather, types of vessels alongside, berths occupied, available resources and time available. The aim of this document is to provide operational level guidance in planning the evacuation and subsequent recovery of Port of Brisbane to the Regional Harbour Master and wider port stakeholder network.

The purpose of any port evacuation is to protect safety of life, critical infrastructure and environment. This in turn will support ongoing wider community recovery operations following the event.

15.10.5.2 Limitations

These guidelines are solely focused on large vessel operations which require external support, such as towage and pilotage to safely conduct departures. It does not cover the evacuation of smaller domestic commercial vessels or recreational craft for which the master remains responsible.

15.10.5.3 Supported and Supporting Documents

This document was developed based on the historical experience gained across floods that have affected Port of Brisbane, operational procedures for the safe movement of vessels and limitations of critical infrastructure where available. This includes ongoing use of simulation, including dedicated sessions throughout 2022.

In the wider context of port activities, users are encouraged to review the Extreme Weather Event (EWE) plan (https://www.msq.qld.gov.au/safety/preparing-for-severe-weather) and their own procedures for vessel/terminal operations.

15.10.5.4 General Considerations – Information Sources

A variety of information sources are always available, which should be read collectively to provide a fused picture of how the overall event is likely to unfold, acknowledging the there is always a degree of uncertainty.

15.10.5.5 Bureau of Meteorology (BoM)

Maritime Safety Queensland (MSQ) and the wider Department of Transport and Main Roads (DTMR) maintain several key connection points with the BoM.

Forecasts and models are available at www.bom.gov.au.

There is a dedicated BoM forecaster available to the Regional Harbour Master at the State Disaster Coordination Centre (SDCC) to assist for bespoke forecast.

15.10.5.6 SEQWater

Once the flood operations centre is activated by SEQWater they will publish twice daily, both the outflow model data from the dam if releases are underway as well as a SITREP. These reports are received by VTS and forwarded on to the management team for review.

15.10.5.7 Queensland Disaster Management Arrangements

Whilst MSQ maintains a close relationship across all three levels of the QDMA, information can be sourced through both the Brisbane DDMG and the SDCC.

15.10.5.8 MSQ Sensor Suite

MSQ has a variety of sensors that can be accessed real-time as well as inputting into the wider port weather forecast targeting port operation through the Non-linear Channel Optimisation Software (NCOS).

- VTS Weather
- NCOS

Appendix A below and the PPISM for Brisbane detail the location of key weather sensors across the port.

15.10.5.9 Port Flood Models

With SEAPORT OPX, who developed NCOS, there is a series of flood simulations based on inflow rates covering a 12-hour tidal cycle. Animations are available across the upper, mid and lower port areas for spring and neap tides.

Simulation identifier	Total inflows upstream of tidal limit [m^3/s]	Total inflows into estuary [m^3/s]
Sim 1	0	0
Sim 2	500	750
Sim 3	1,000	1,500
Sim 4	2,000	3,000
Sim 5	3,000	4,500
Sim 6	4,000	6,000
Sim 7	5,000	7,500

Figure 3 NCOS Modelled Flows

The corresponding files for each simulation at the HW+4hr have been uploaded to SmartShip to assist manoeuvre testing and development.

15.10.5.10 Historical Assimilation of Simulations

Sim 7 – equates to conditions on 28 February 2022 (Peak of 2022 flood)

Sim 5 – equates to conditions on 3 March 2022 (resumption of limited movements at FI 2022 flood)

Sim 3&4 - equate to conditions on 17 May (May 2022 rain event and dam releases)

15.10.5.11 General Considerations – Decision Points

When deciding to evacuate the Port of Brisbane, either partially or completely, the following lists some key planning considerations which when assessed against the forecast will develop key decision points.

Port evacuation

- River flow now and over the next 24hrs, specific to berths and channels
- Overall weather considerations – refer PPM Section 15.8 for wind limits
- What ships are alongside – where, berth direction, swing basins, windage, draft
- Mooring arrangements and capacity of wharf infrastructure*

- Available resources – pilots, tugs, lines launches, mooring gangs
- Presence of debris
- Certainty of available survey data

Providing conditions and timeliness of forecasts allow, it is expected that the port evacuation will commence in preparation and prior to the onset of extreme weather.

Vessel arrivals are to cease (above / below Pelican Banks as appropriate) prior to, and in anticipation of commencing a port evacuation.

15.10.5.12 Notes on wharf infrastructure

- Wharf infrastructure is generally designed to meet AS1170 (2002) - Region B Cat 2. The newer wharves at Fisherman Island are built to withstand higher forces than some of the aging infrastructure located above Pelican Banks
- Designed maximum operational wind values (average) vary between 40 to 60 knots, combined with longitudinal current speeds of between 3 to 5 knots.
- These wharf design limits should not be relied upon as an evacuation threshold. Previous incidents demonstrate that a vessel's mooring system is more likely to fail before the wharf design limits are reached and the wharf design limits generally exceed the environmental limits for safe manoeuvring.

15.10.5.13 Current and wind Limitations

Flood current simulations have been conducted using a minimum of 25 knots of wind, from various unfavourable directions. Refer to PPM Section 15.8 for the standard operational wind limits.

Departures from AMPR have been simulated to the equivalent current in the NCOS model SIM 4 at HW + 4hrs

Departures from QBT have been simulated to the equivalent current in the NCOS model SIM 4 at HW + 4hrs

Departures from WAG have been simulated to the equivalent current in the NCOS model SIM 5 at HW + 4hrs

Swings at Pinkenba have been simulated to the equivalent current in the NCOS model SIM 5 at HW + 4hrs

Departures and Arrivals from FITA have been tested prior to the development of the NCOS models. Current limitations were developed in the simulator on a simplified current model equating to 3.5 knots, approximated to SIM 6 at HW + 4hrs

+300m Departures and swinging at Koopa have been tested prior to the development of the NCOS models. Current limitations were developed in the simulator on a simplified current model equating to 3.5 knots, approximated to SIM 7 at HW + 4hrs

15.10.5.14 Vessel Preparedness

As soon as practicable and if not already ordered as part of earlier preparations, each vessel being prepared for evacuation should be directed to prepare to get underway. This should include the following;

- Cease cargo operations, especially if loading.
- Bridge to be crewed and VHF channel 12 monitored

- Bring Main Engine online ready for manoeuvring including the likely use of increased speed and rapid engine orders. All auxiliary engines available for maximum power generation.
- Bow and Stern Thrusters, if fitted, ready for immediate use.
- Mooring lines to remain in place, with additional lines run if required, actively monitored and prepared for departure. Anchors ready for letting go, or recovery if deployed to the seabed.
- All pre-departure system checks complete
- Any defects reported to VTS via VHF and agent.

15.10.5.15 Sequence of Events

15.10.5.16 Above Pelican Banks

1. Cease Arrivals, Vessels secure cargo operations and prepare for departure.
2. Vessels at AMPR should be cleared first. This will reduce the risk of berth surge and potentially breakaway from passing vessels, which can be expected to pass at higher speeds, above normal operational limitation of 6 knots through the water, to maintain steerage.
3. Vessels above the Gateway Bridge (QBT) should follow in the second tranche to protect critical infrastructure, including the Gateway Bridge.
4. Vessels at Pinkenba and Incitec South should be in the third tranche, especially if there are vessels further downstream that require to swing as Pinkenba is the widest of the river swing basins.

a. As of January 2023, Incitec South is undergoing remediation. Removal of vessels from this berth should be considered in the second tranche unless an earlier opportunity presents.

5. Vessels at SIMS Metal downstream to Cement Australia would be in the final tranche.

15.10.5.17 Below Pelican Banks

1. Cease Arrivals, Vessels secure cargo operations and prepare for departure.
2. Vessel head-up that can only swing at either Koopa or Fisherman Island Swing Basin in particular tankers from Ports North 1 and Fisherman Island Tanker terminal to support future recovery operations.
3. Vessel subject to tidal windows which may also have high windage
4. +300m Container Ships if head down.
5. The final tranche would be all other vessels head-up or head down. Vessels head-up have previously remained at these berths in flood conditions with minimal movement providing moorings are adequate.

15.10.5.18 On-water Support Activities

In the event that the decision is made to evacuate, the following on-water activities may be considered;

- Utilising a smaller tug or workboat, positioned upstream of the movement to monitor debris and provide a level of protection whilst critical manoeuvres are underway;
- Inspection of the river from the target vessel downstream using MSQ workboat to locate debris already downstream as well as assessing approximate surface (freshes) currents; and
- If possible, consider the use of the deployable current meter if timing and resources are available.

15.10.5.19 Manoeuvring Considerations

A number of simulations have been conducted at SmartShip to develop manoeuvring envelopes in collaboration with Poseidon Sea Pilots and Svitzer. Outlined below is both general information as well as targeted manoeuvre information.

Note: These are not a replacement for the pilotage service providers own manoeuvring instructions within the Pilotage Operations Safety Management System but focused on supporting whole of port activities.

15.10.5.20 General Considerations

Additional tugs, beyond those allocated in the PPM, will be required. Bow and stern thruster replacement should be avoided due to the risk of debris.

- In general, three tugs are for most manoeuvres, including all above Pelican Banks;
- Smaller vessels, less than 300m and head down at Fisherman Island may only require two tugs; and
- For +300m container ships below and tankers Pelican Banks, four tugs should be assigned if swinging.

When positioning tugs simulation has proved that it is advantageous for vessels berthed head down to have the third tug lifting upstream whilst engine revolutions are built up.

That once clear of the berth either or both the tugs forward and aft may need to come in and push to hold the vessel whilst headway is increased.

Pilot assignment is critical. Where possible, a level 1 pilot who has undertaken flood simulations (either development or emergency drill training) should be assigned regardless of vessel class. A second assisting pilot, licensed for the class of vessel, should also be assigned.

Additional lines launches and mooring gang members should be considered to aid in a quicker let go operation.

15.10.5.21 Specific Berth and Swing Basin Information

Further information to support specific manoeuvres, based on simulation at SmartShip, is held by MSQ and Poseidon Sea Pilots;

- AMPR Departure;
- QBT Departure;
- Pinkenba Swing;
- Wagner Departure;
- +300m Container Ship Swing; and

- FITA Departure and Arrival.

15.10.5.22 Port Recovery

Outlined below are a number of key considerations when re-opening the port. A stakeholder working group will be brought together to assimilate information related to supply chain, port resourcing, environmental and hydrographic conditions to support informed decision making for prolonged events. This will initially consist of representatives from PBPL, Towage Operator, Pilot Service Provider and MSQ.

Wider stakeholder communication will be maintained through VTS to terminals and agents. This should include current and forecasted operational limitations, recovery priorities and environmental conditions.

15.10.5.23 Reopening of the port

The Pilotage area will not be re-opened until the RHM is satisfied that all risks have been assessed, and the Pilotage area is safe for vessels to re-enter or exit.

Brisbane VTS centre will coordinate the safe movement of vessels following the opening of the Pilotage area in accordance with normal practice. Berths will be re-opened and operations resumed when structural assessments by asset owners (if required) have been completed and wind and sea conditions are within operational limits.

RHM, in conjunction with PBPL and pilotage provider will decide how and when port will reopen. VTS will provide details to stakeholders.

15.10.5.24 Operational Limitations

Outlined below are some general considerations for developing operational limitations when reopening the port. Limitations may need to be applied separately across the three port zones, above the Gateway Bridge, below the Gateway Bridge to Pelican Banks and below Pelican Banks.

Risk	Controls
Floating Debris	Daylight operations Deployment of overwatch vessel upstream of movement Nil Bow/Stern Thruster tug replacement Tug escort in river and Entrance Channel
Strong Ebb Current	HU berth arrivals Swing and departure timed for mid-flood tide Passing vessels alongside as wide as possible Additional Tugs Nil Bow/Stern Thruster tug replacement Tug escort in river and Entrance Channel

Risk	Controls
Effects of interaction	Increase separation between passing vessels Increase separation distance between berthed vessels Increase UKC allowance at berth Avoid adjacent berthing ahead on mid ebb tide Warning vessels at adjacent berths – engines and thruster at immediate readiness, mooring stations manned Push up tug for berthed vessel when adjacent berthing ahead Advise terminals to consider risks to cargo operations
Unusual Currents	Additional Tugs Daylight operations Nil Bow/Stern Thruster tug replacement
Siltation	Utilise SUKC rules instead of NCOS Increase UKC allowances in river Post Flood survey of berths, channels and swing basins
Potential submerged debris	Nil Bow/Stern Thruster tug replacement Post Flood survey of berths, channels and swing basins Tug escort in river and Entrance Channel
Reduced Swing or Channel Basin Dimensions	Reduce LOA limitations Increase UKC allowances in river