

PASSAGE PLANNING IN THE ERA OF BIG DATA

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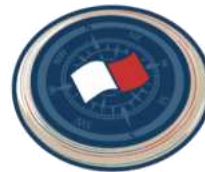
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- 4. Reconceptualising pilotage**
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AMPI: Who are we?

- Represent Marine Pilots in Australia
- Member of IMPA
- Continuous Professional Development Program
- Mentoring Program
- Peer Support Network
- Organise conferences and workshops
- Produce safe passage magazine
- Formulate Policy papers
- Lobbying regulators / politicians on behalf of pilots



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What is Big Data?

Big data refers to **massive, complex data sets that are rapidly generated and transmitted from a wide variety of sources**. Big data sets can be structured, semi-structured and unstructured, and they are **frequently analyzed to discover applicable patterns and insights about user and machine activity**. Big Data includes texts, audios, videos, and real-time information.

Big Data attributes:

- 1.Volume:** The huge amounts of data being stored.
- 2.Velocity:** The lightning speed at which data streams must be processed and analyzed.
- 3.Variety:** The different sources and forms from which data is collected, such as numbers, text, video, images, audio and text.



Big Data in pilotage

SYSTEMS APPROACH RESULTING IN:

1. MAXIMUM SITUATIONAL AWARENESS
2. ENHANCED MONITORING

No longer anonymous - unaccountable

Big Data in pilotage

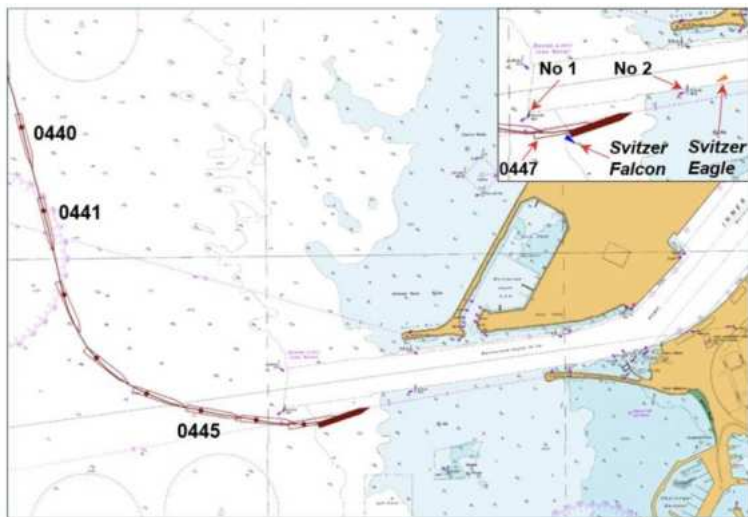
MAXIMUM SITUATIONAL AWARENESS

LEVEL 1: PERCEPTION OF THE ELEMENTS IN THE ENVIRONMENT

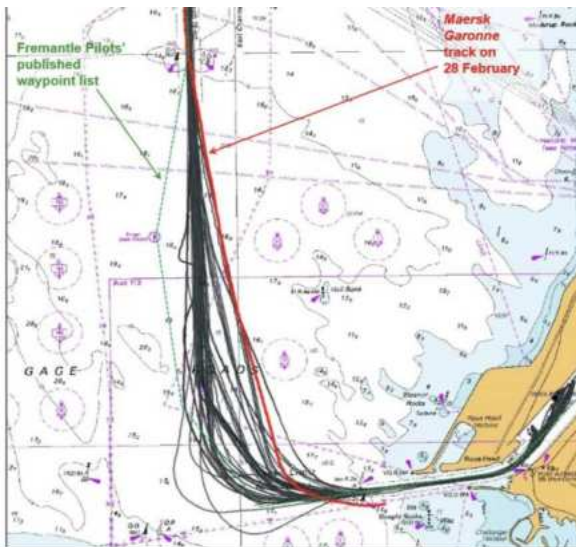
LEVEL 2: COMPREHENSION OF THE CURRENT SITUATION

LEVEL 3: PROJECTION OF FUTURE STATUS

Enhanced monitoring: accidents and big data



Source: Australian Hydrographic Service (annotated by ATSB)



Source: Australian Hydrographic Service (annotated by ATSB)

Recent accidents and big data



Big Data in pilotage:

How is big data applied to passage plans?

- Maximum situational awareness for pilot and bridge team
- Enables the planning and execution to be monitored in real time by stakeholders (shipping companies, terminals, pilotage companies and authorities)
- Ensures the pilotage act is conducted within established parameters ensuring safety, accountability, optimization, and overall improving safety, efficiency and profitability.
- Invaluable for debriefing, training and conducting incident investigation

Reconceptualisation of Marine Pilotage

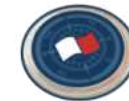
Big Data in pilotage: Passage planning

The ideal passage plan route:

Identifies critical elements	Vessel characteristics Under keel clearance Environmental conditions (wind, tide, visibility) Regulatory compliance Contingency planning
Determines safety parameters	UKC Speed Wind and tide parameters Pilotage parameters (ETAs, passing) Trim
Sharing of pilotage plans	Building a shared mental model Electronic MPX
Other considerations	Ship specifics Efficiency (Commercial) considerations



What is a port provided passage plan?



Hay Point - Australia



97 million tons of coal exported 2021-2022



APPROVED PLAN 68321.7 FOR NSU KEYSTONE

Calculated: 11Dec2022 0705 (3 hour forecast)
Transit Description: DBCT4 STBD SIDE TO (CHANNEL)

Sailing Draft: 17.95 m

Passage commencement window: 11Dec2022 1017 to 11Dec2022 1323

Commencement time: 11Dec2022 1030

Stage II Window: No Window



Vessel		Stability Data		Environmental Conditions	
IMO:	9641883	Draft F:	18.00 m	TIDES	
Type:	BULK CARRIER	Draft M:	18.00 m	HalfTide	1.89 m (-0.01m) 11/0700
MMSI:	431977000	Draft A:	18.00 m	Beacon2Tide	1.88 m (-0.03m) 11/0700
Call Sign:	7KBP	KM:	-	WAVES	
Beam:	50.05 m	KG:	13.63 m	DWRB	Sea 0.36 m, 3.7 s
LBP:	291.40 m	GMs:	-	11/0700	Swell 0.07 m, 7.7 s
LOA:	299.90 m	FSC:	-	BMA Miros	Sea 0.40 m, 4.0 s
DWT:	207,684 t	GMF:	7.56 m	11/0700	Swell 0.08 m, 11.8 s
Flag:	JAPAN	Displ:	231,911 t		
Summer Draft:	18.27 m	Water dens:	1.025 t/m ³		
		Cb:	0.862		

Window Open: 11Dec2022 1017

SLOW							AVERAGE							FAST									
UKC Limits	UKC	Time	Loc (nm)				UKC Limits	UKC	Time	Loc (nm)				UKC Limits	UKC	Time	Loc (nm)						
BC	0.25	0.71	1019	0.08			BC	0.25	0.71	1019	0.08			BC	0.25	0.71	1019	0.08					
MM	0.90	0.90	1019	0.08			MM	0.90	0.90	1019	0.08			MM	0.90	0.90	1019	0.08					
WP	ETA (AEST)	SOG (kn)	Depth (m)	Tide (m)	BC (m)	MM (m)	GR (m)	WP	ETA (AEST)	SOG (kn)	Depth (m)	Tide (m)	BC (m)	MM (m)	GR (m)	WP	ETA (AEST)	SOG (kn)	Depth (m)	Tide (m)	BC (m)	MM (m)	GR (m)
DBCT4	1017	1.0	14.77	4.53	1.18	1.38	1.25	DBCT4	1017	1.0	14.77	4.53	1.18	1.38	1.25	DBCT4	1017	1.0	14.77	4.53	1.18	1.38	1.25
Bcn1	1111	6.5	14.88	5.16	1.60	1.96	1.99	Bcn1	1105	7.5	14.88	5.10	1.43	1.80	1.93	Bcn1	1101	8.5	14.88	5.05	1.25	1.62	1.88
Bcn4	1132	6.5	14.97	5.33	1.81	2.18	2.26	Bcn4	1123	7.5	14.97	5.27	1.63	1.99	2.19	Bcn4	1117	8.5	14.97	5.21	1.42	1.79	2.13
Bcn2	1147	6.5	15.06	5.42	1.98	2.43	2.43	Bcn2	1136	7.5	15.06	5.36	1.79	2.24	2.36	Bcn2	1128	8.5	15.06	5.30	1.59	2.04	2.31
Sea	1155	6.5	15.00	5.46	1.96	2.42	2.41	Sea	1143	7.5	15.00	5.40	1.78	2.24	2.35	Sea	1134	8.5	15.00	5.34	1.57	2.04	2.29

Window Close: 11Dec2022 1323

SLOW							AVERAGE							FAST									
UKC Limits	UKC	Time	Loc (nm)				UKC Limits	UKC	Time	Loc (nm)				UKC Limits	UKC	Time	Loc (nm)						
BC	0.25	0.43	1459	7.96			BC	0.25	0.48	1448	7.96			BC	0.25	0.42	1439	7.96					
MM	0.90	0.91	1459	7.96			MM	0.90	0.94	1448	7.96			MM	0.90	0.90	1439	7.96					
WP	ETA (AEST)	SOG (kn)	Depth (m)	Tide (m)	BC (m)	MM (m)	GR (m)	WP	ETA (AEST)	SOG (kn)	Depth (m)	Tide (m)	BC (m)	MM (m)	GR (m)	WP	ETA (AEST)	SOG (kn)	Depth (m)	Tide (m)	BC (m)	MM (m)	GR (m)
DBCT4	1323	1.0	14.77	5.32	1.96	2.16	2.04	DBCT4	1323	1.0	14.77	5.32	1.96	2.16	2.04	DBCT4	1323	1.0	14.77	5.32	1.96	2.16	2.04
Bcn1	1417	6.5	14.88	4.75	1.16	1.53	1.58	Bcn1	1411	7.5	14.88	4.83	1.12	1.50	1.65	Bcn1	1407	8.5	14.88	4.88	1.04	1.42	1.71
Bcn4	1438	6.5	14.97	4.49	0.93	1.30	1.41	Bcn4	1429	7.5	14.97	4.60	0.91	1.29	1.52	Bcn4	1423	8.5	14.97	4.69	0.85	1.23	1.61
Bcn2	1453	6.5	15.06	4.29	0.80	1.27	1.30	Bcn2	1442	7.5	15.06	4.44	0.82	1.28	1.44	Bcn2	1434	8.5	15.06	4.55	0.78	1.24	1.55
Sea	1501	6.5	15.00	4.19	0.63	1.11	1.13	Sea	1449	7.5	15.00	4.35	0.67	1.15	1.29	Sea	1440	8.5	15.00	4.47	0.64	1.12	1.41

Passage Commencement: 11Dec2022 1030

SLOW							AVERAGE							FAST									
UKC Limits	UKC	Time	Loc (nm)				UKC Limits	UKC	Time	Loc (nm)				UKC Limits	UKC	Time	Loc (nm)						
BC	0.25	0.88	1032	0.08			BC	0.25	0.88	1032	0.08			BC	0.25	0.88	1032	0.08					
MM	0.90	1.07	1032	0.08			MM	0.90	1.07	1032	0.08			MM	0.90	1.07	1032	0.08					
WP	ETA (AEST)	SOG (kn)	Depth (m)	Tide (m)	BC (m)	MM (m)	GR (m)	WP	ETA (AEST)	SOG (kn)	Depth (m)	Tide (m)	BC (m)	MM (m)	GR (m)	WP	ETA (AEST)	SOG (kn)	Depth (m)	Tide (m)	BC (m)	MM (m)	GR (m)
DBCT4	1030	1.0	14.77	4.70	1.35	1.54	1.42	DBCT4	1030	1.0	14.77	4.70	1.35	1.54	1.42	DBCT4	1030	1.0	14.77	4.70	1.35	1.54	1.42
Bcn1	1124	6.5	14.88	5.27	1.71	2.08	2.10	Bcn1	1118	7.5	14.88	5.22	1.55	1.92	2.05	Bcn1	1114	8.5	14.88	5.18	1.38	1.75	2.01
Bcn4	1145	6.5	14.97	5.42	1.89	2.26	2.34	Bcn4	1136	7.5	14.97	5.36	1.72	2.09	2.28	Bcn4	1130	8.5	14.97	5.32	1.53	1.89	2.24
Bcn2	1200	6.5	15.06	5.48	2.03	2.49	2.49	Bcn2	1149	7.5	15.06	5.44	1.87	2.32	2.44	Bcn2	1141	8.5	15.06	5.39	1.68	2.13	2.40
Sea	1208	6.5	15.00	5.51	2.00	2.47	2.46	Sea	1156	7.5	15.00	5.47	1.84	2.31	2.42	Sea	1147	8.5	15.00	5.42	1.65	2.12	2.37



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Case Study : Hay Point, Australia

Heightened SA

1. Day visual
2. Night visual
3. Navigational aids (buoys – physical and virtual)
4. Radar
5. ECDIS
6. PPU

Case Study : Hay Point, Australia Heightened SA



Case Study : Hay Point, Australia Heightened SA



Case Study : Hay Point, Australia Heightened SA -augmented reality



Case Study : Hay Point, Australia

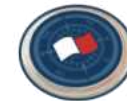
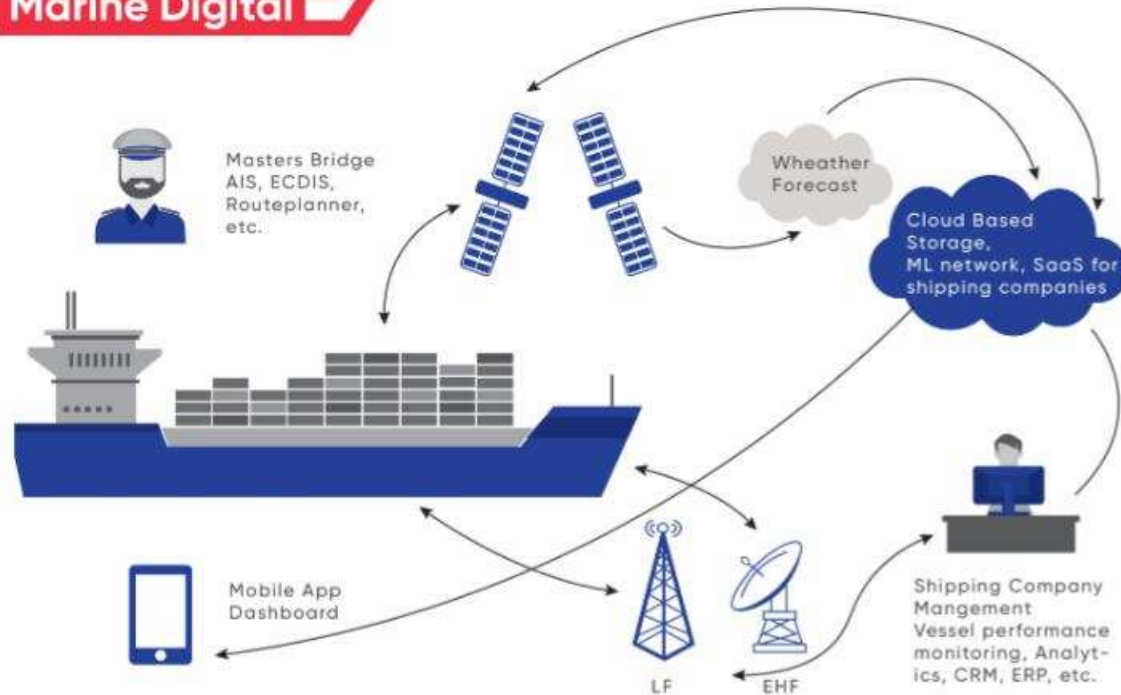
EM: the regulator (MSQ)



Case Study : Hay Point, Australia

EM: the shipowner

Marine Digital



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Case Study : Hay Point, Australia

EM: third parties



Challenges



Route Exchange

- RTZ Format – IEC 61174:2015
- S100 / S421 route exchange format
- Cyber Security
- Performance standards & manufacturer differences

Connectivity

Legal issues

Proprietary Data

Acknowledgements



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Captain Ravi Nijjer
Captain Ricky Rouse - AMPI
Captain Damian Laughlin – PPSP

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2023



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**MAXIMISING
SITUATIONAL
AWARENESS**

Crown Towers Hotel
Perth, Western Australia

1 - 5 October 2023

01.10.2023 - 05.10.2023

Perth, Australia