

the power of
where
drives NZ's success



**Presented at the FIG Working Week 2016,
May 2-6, 2016 in Christchurch, New Zealand**



New Zealand Hydrography Risk Assessment

Stuart Caie | Senior Hydrographic Surveyor





Where's the risk?



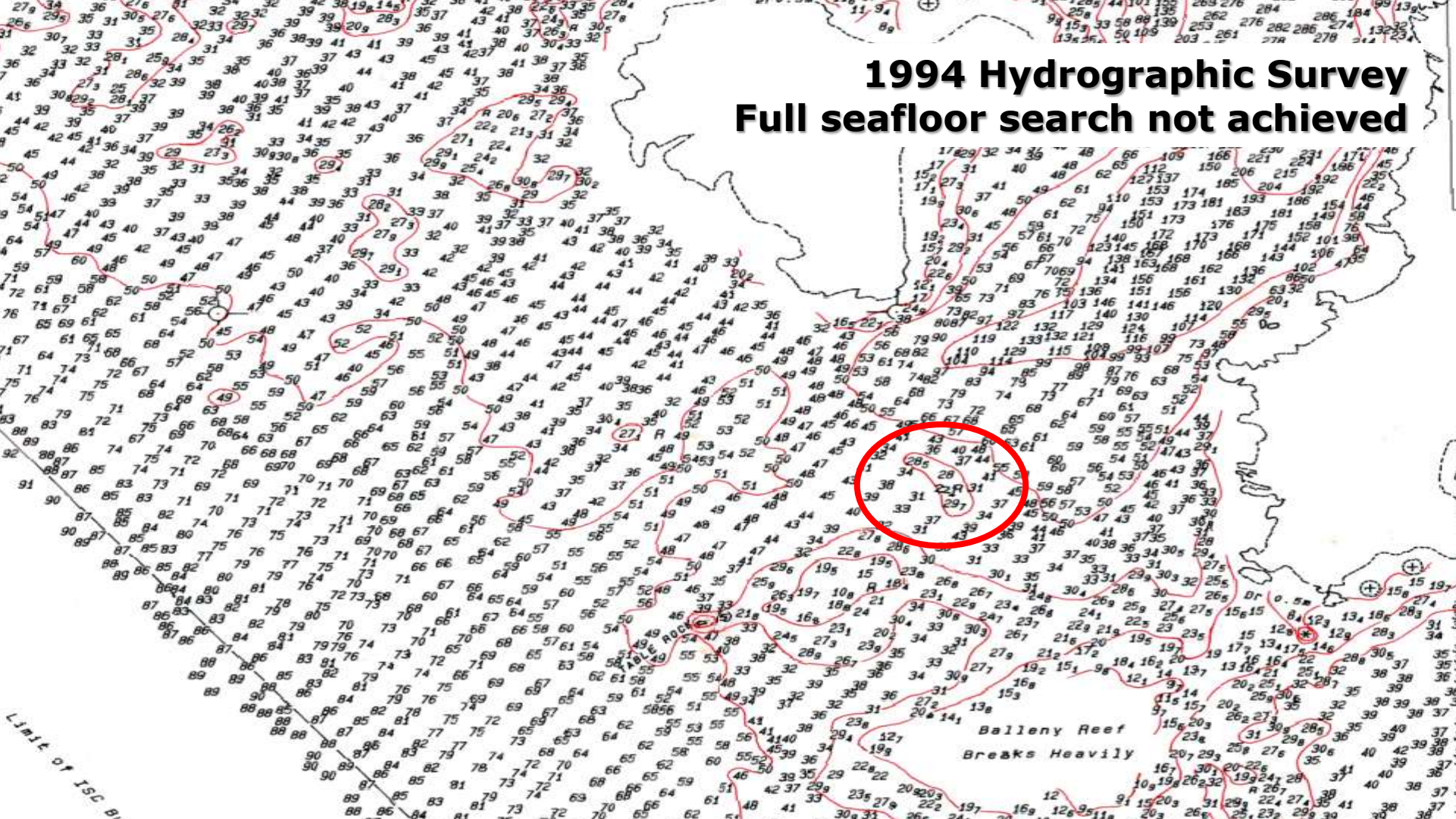
CHALKY OR
CLOUD INLET

What's the risk?

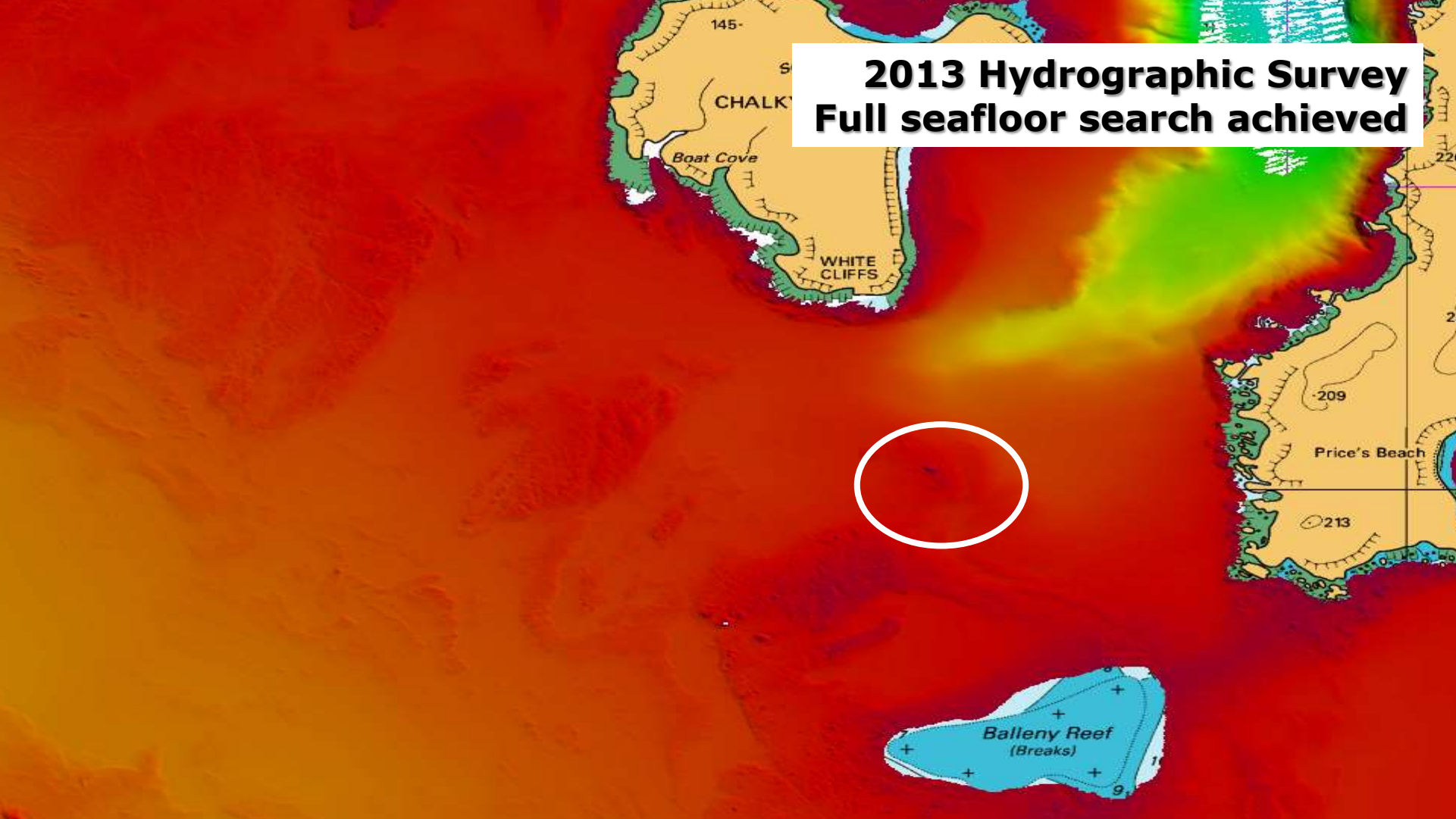
Table Rock (5)

Ballyny Reef
(Breaks)

1994 Hydrographic Survey Full seafloor search not achieved

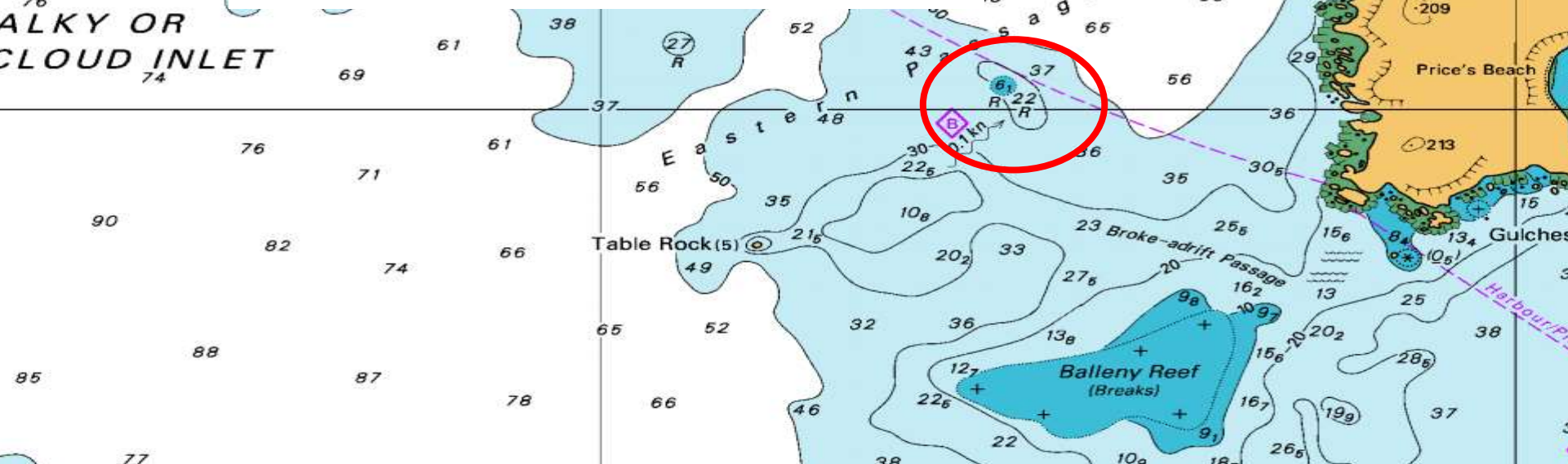


2013 Hydrographic Survey Full seafloor search achieved





6.1m rock identified
Chart updated by Notice to Mariners



Risk = Likelihood x Consequence

What is risk? No traffic = no risk

Project scope

- Evidence led, risk based assessment
- To identify areas of risk and prioritise charting improvements
- Berth to EEZ
- Analytical GIS based risk model
- AIS vessel traffic data (SOLAS and Domestic)
- Data gathering
- Likelihood layers: Metocean conditions, type of navigation, hazards
- Consequence layers: Environmental impact, cultural sensitivity, economic sensitivity
- Resultant risk presented as heat maps

A woman with long, wavy brown hair is leaning over a large, stainless steel thermal pot. She is holding the lid of the pot with her right hand and a white ceramic bowl with her left hand. She appears to be smelling the contents of the pot. The background is dark and out of focus.

What's at risk?

FY14/15

36.4 million tonnes exported
\$40.3 billion

Source: Ministry of Transport, 2015

FY14/15

32 ships

127 voyages

201,400 passengers

\$436mil generated

FY15/16

34 ships

135 voyages

267,800 passengers (+33%)

\$543mil estimated (+25%)

Source: Cruise New Zealand, 2015



Project outcomes

- Identify and classify areas of greatest risk to vessel traffic
- Which areas should be surveyed to most effectively **reduce risk** to shipping and **encourage economic expansion**?
- To identify and prioritise charting improvements
- Most effective use of available budget
- Develop 5 year rolling survey programme
- Work with others to coordinate NZ bathymetry collection
- Potential to collect other marine datasets (acoustic backscatter & water column data)

Between July 2014 & June 2015...

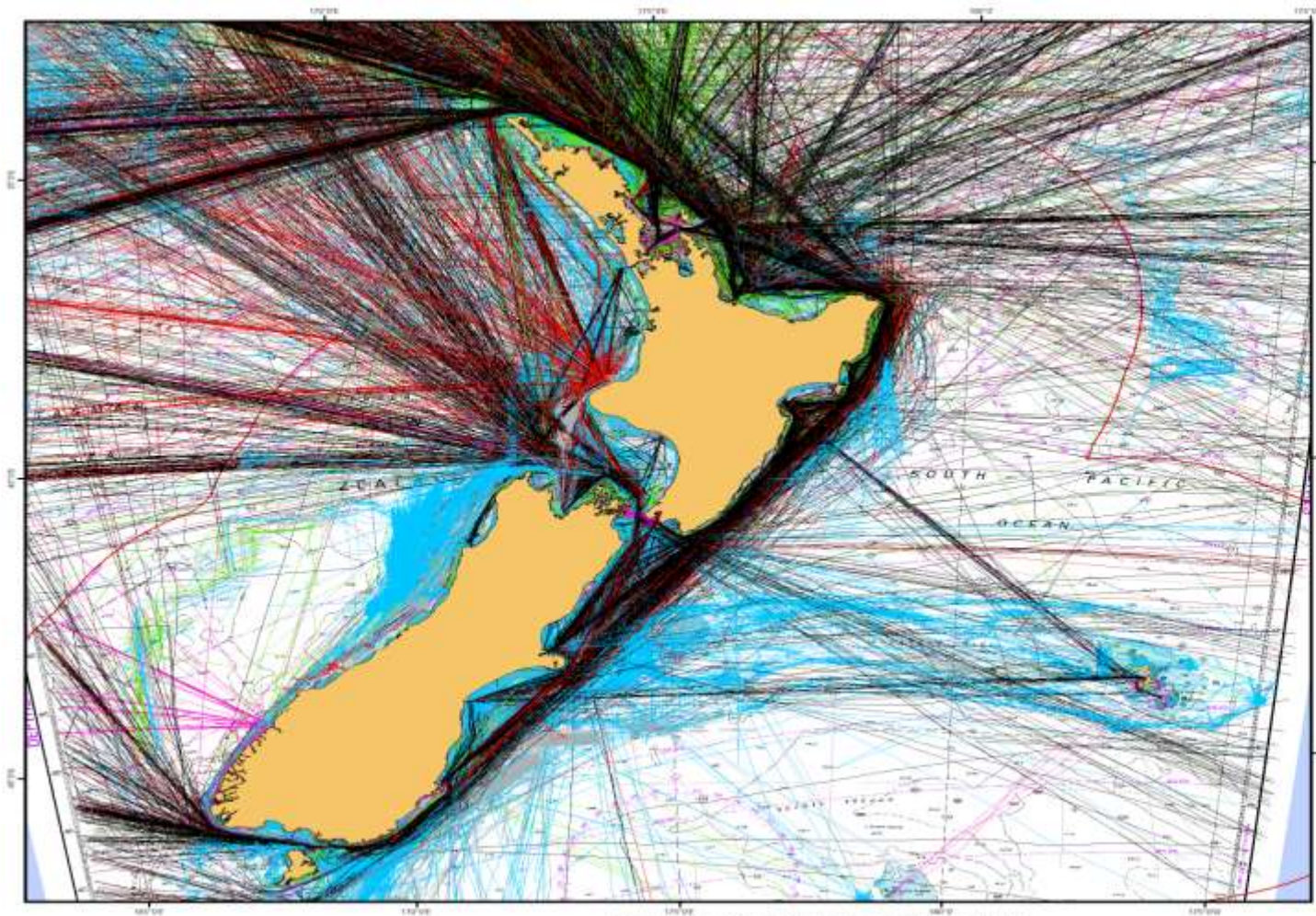
5,500,000 commuters used ferries in Auckland

1,400,000 passengers visited the Bay of Islands

1,350,000 passengers crossed Cook Strait

720,000 passengers cruised around Fiordland

325,000 passengers travelled between Diamond Harbour and Quail Island



NZHRA, Draft Vessel Tracks by Type.

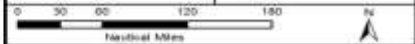


- Legend**
- Others/Unknown
 - Cargo
 - Fishing
 - Naval
 - Passenger
 - Recreational
 - Tanker
 - EEZ Extent

Project No. 15NZ236	Date 15/08/2015	Issue Number 001
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Author Andrew Reason	Checked by John Riding	Scale at A3 1:8,000,500
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Data Source Marico Marine and Kaitiaki Terrestrial AIS Data with EventID with satellite August 2014 to July 2015. 14600	Coordinate System: WGS 1984 UTM Zone 60S Projection, Transverse Mercator Datum: WGS 1984 Units: Meter
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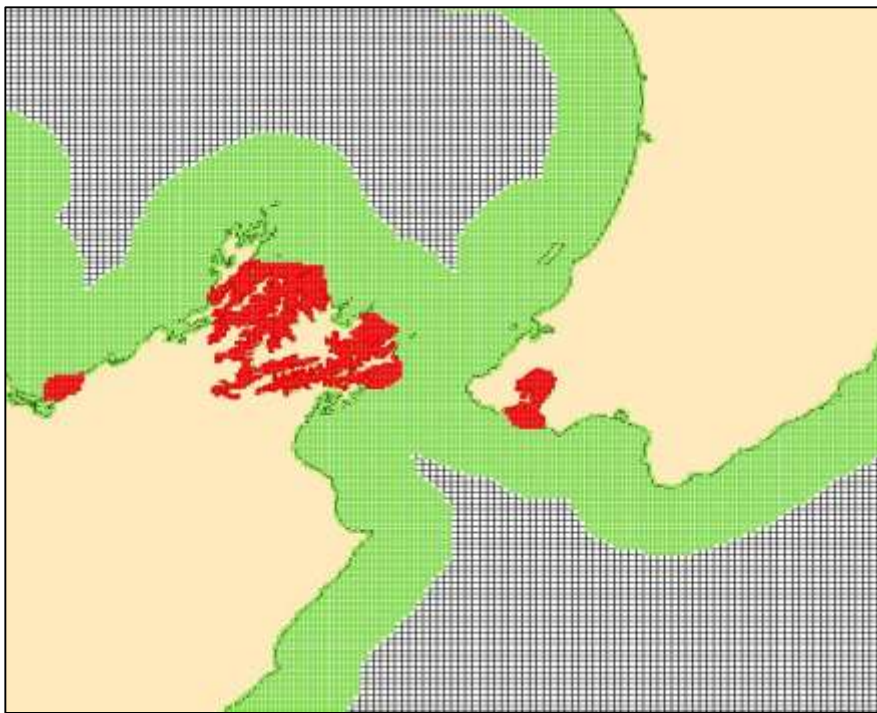
MARICO
MARITIME

NZ Hydrographic Risk Assessment



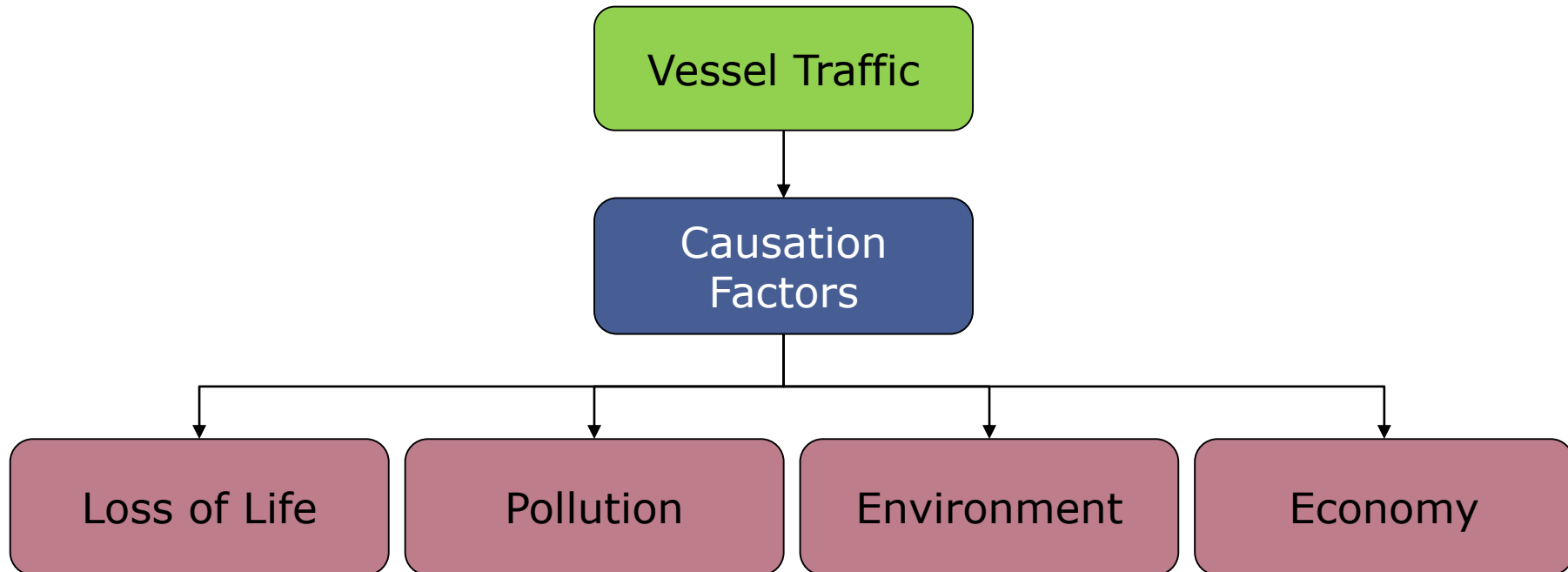
Figure Reference: 15NZ233_NZHRA_DRAFT_TracksType_v1_30150615

Risk model cell resolution



- Beyond 12NM – 2 Km
- Inside 12NM – 1Km
- Harbour Limits – 500m

Risk model (high level)

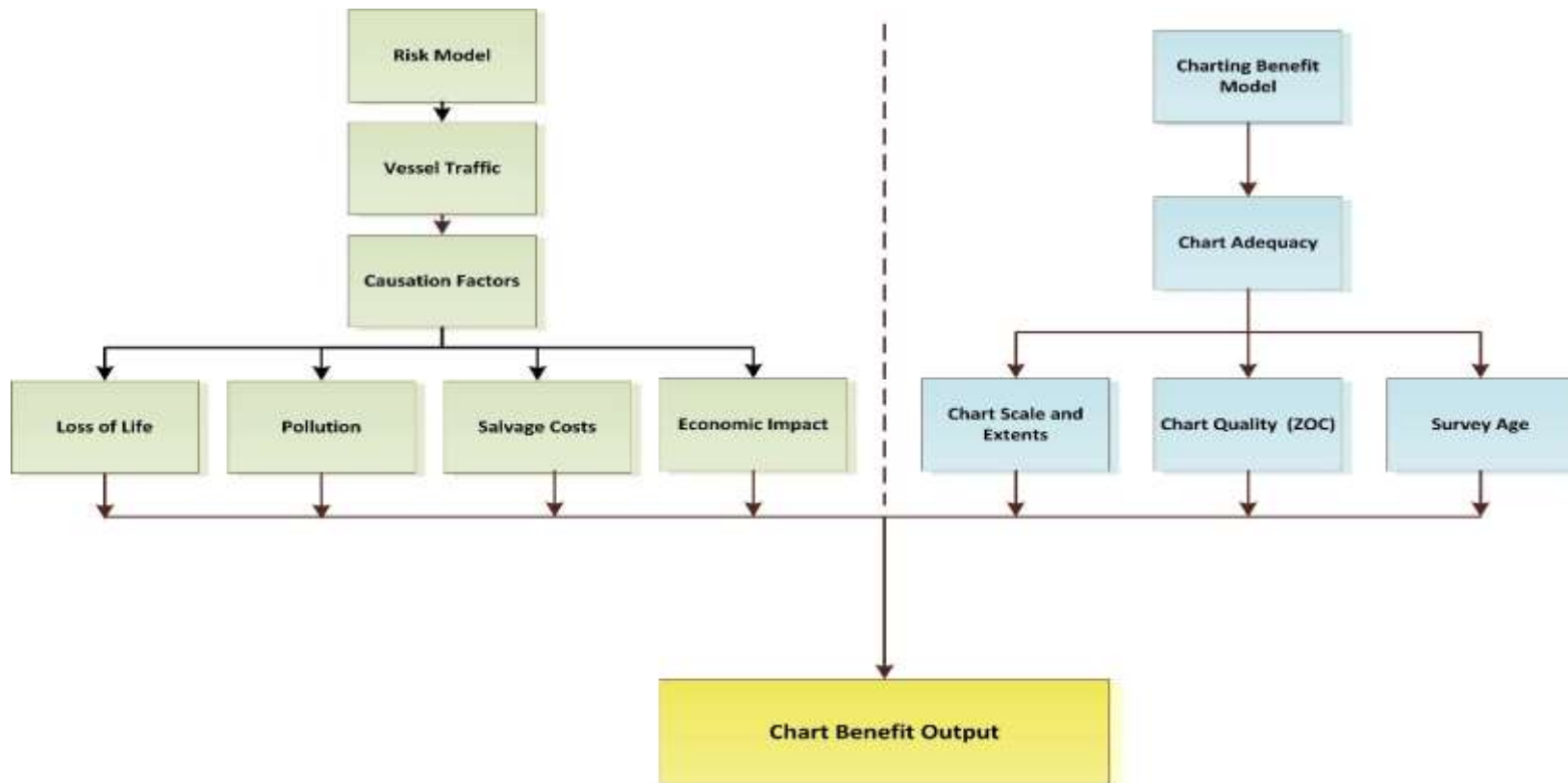


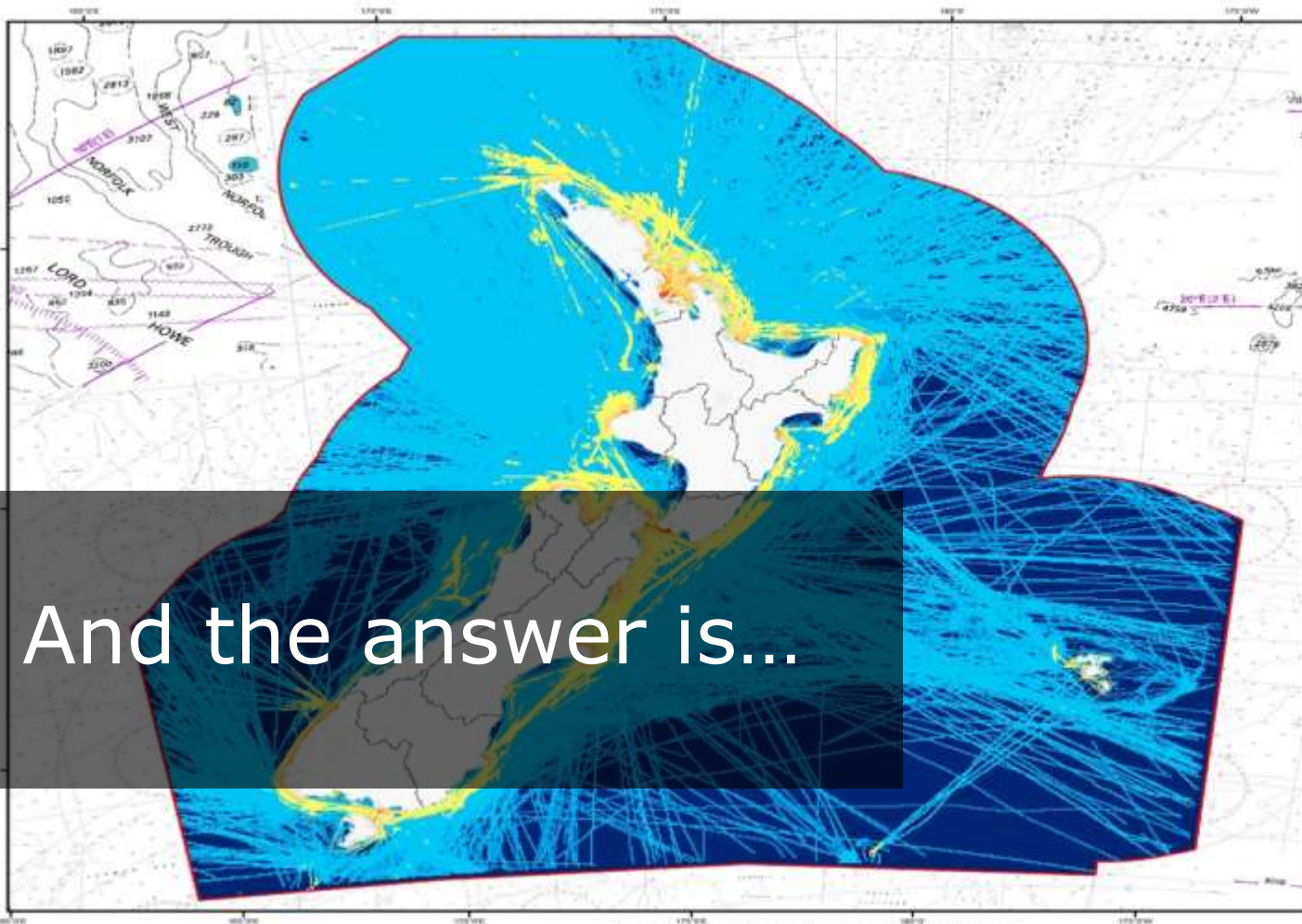
Risk model (detailed)



		0	1	2	3	4	5	Rating	Category Weighting	Model Weighting	Overall Weighting
		CONTINUOUS SCALES									
Traffic	Potential Loss of Life		Insignificant	Low	Moderate	High	Catastrophic		42.0%		25%
	Potential Oil Outflow		Insignificant	Low	Moderate	High	Catastrophic		38.0%		
	Vessel Damage + Salvage Costs		Insignificant	Low	Moderate	High	Catastrophic		5.0%		
	Economic Costs		Insignificant	Low	Moderate	High	Catastrophic		15.0%		
		LIKELIHOOD SCALES									
Causation Risk Criteria	Charting	Chart Quality	A	B	C	D	U	3			
		Survey Age	<5 years	5-10 years	10-20 years	20-30 years	>30 years	1	30.0%	15.00%	
		Chart Scale and Extents	Excellent	Good	Moderate	Poor	Unacceptable	2		10.00%	
	Route Characteristics	Navigational Complexity	Open Sea >10nm	Offshore Navigation (5-10nm)	Coastal Navigation (1-5nm)	Port Approaches	Constrained Navigation (<1nm)	3		8.75%	
		Depth of Water 15m Contour	>10nm	5-10nm	2.5-5nm	1.5-2.5nm	1-1.5nm	2	17.5%	5.83%	
		Traffic Density	Insignificant	Low	Moderate	High	Catastrophic	1		2.92%	
	MetOcean	Prevailing Wave/Wind	Sheltered at Most Times	Mainly Sheltered	Moderate Exposure	Mainly Exposed	Exposed on Most Days	3		5.83%	
		Open Sea Tides/Current	Open Sea 1-2kts				>5kts	3	17.5%	5.83%	25%
		Longwave/Surge	Very Unlikely	Unlikely	Occasional	Often Poor	Frequent	2		3.89%	
	Poor Visibility	Very Unlikely	Unlikely	Occasional	Often Poor	Frequent	1		1.94%		
	Navigational Hazards	Sea Mounts	>10nm	5-10nm	2.5-5nm	1.5-2.5nm	1-1.5nm	1		2.19%	
		Isolated Dangers - Rocks/Wrecks/etc.	>2.5nm	2.5-2nm	1.5-2	1-1.5nm	500m-1nm	2	17.5%	4.38%	
		Charted Tidal Hazards	>2.5nm	2.5-2nm	1.5-2	1-1.5nm	500m-1nm	2		4.38%	
	Mitigation	Breaking Reefs	>10nm	5-10nm	2.5-5nm	1.5-2.5nm	1-1.5nm	3		6.56%	
Harbour Risk Mitigation Resources			Available				2		4.00%		
Pilotage			Available				3	10.0%	6.00%		
Bathymetry	Dynamic Seabed - Estuarial		Insignificant	Low	Moderate	High	3		4.50%		
	Seismic/Volcanic Factors	>10nm	5-10nm	2.5-5nm	1.5-2.5nm	1-1.5nm	2	7.5%	3.00%		
		CONSEQUENCE SCALES									
Consequence Risk Criteria	Loss of Life	Response Complexity	100.0%	102.5%	105.0%	107.5%	110%	N/A	N/A		
	Property	Salvage Complexity	100.0%	102.5%	105.0%	107.5%	110%	N/A	N/A		
		Formal Reserves - World Heritage	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	3		17.65%
	Environmental Impact	Marine Reserves	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	2.5		14.71%
		Coastal (Sensitive Resources)	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	2		11.76%
		Wetland Resources	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	1.5		8.82%
		Aquaculture/Fishing Grounds/Shellfish	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	2	N/A	11.76%
		Harvest Sites	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	2		11.76%
		Tourism	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	2		11.76%
		Cultural (Iwi)/Treaty History Sites	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	2		11.76%
	Economic Impact	Recreational/Social Amenity	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	2		11.76%
		Port Access Channels	>2.5nm	2.5-2nm	1.5-2nm	1 to 1.5nm	500m to 1nm	<500m	3		24.00%
		Critical Infrastructure (Berths) - Economic Contribution	Absent	Very Low	Low	Moderate	High	Critical	1		8.00%
		Proximity to Sites of High Economic Contribution	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	2		16.00%
		Proximity to Sites of Moderate Economic Contribution	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	1	N/A	8.00%
		Proximity to Sites of Low Economic Contribution	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	0.5		4.00%
		Cruise Ship Stops	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	2		16.00%
Pipelines/Cables	>10nm	5-10nm	2.5-5nm	1.5-2.5nm	1-1.5nm	Within 1nm	3		24.00%		

Chart Benefit Analysis





And the answer is...

NZHRA, Risk Output, National Overview

Legend

- Insignificant
- Very Low
- Low
- Medium
- Moderate
- Heightened

Risk Output

Project No. 15NZ236	Date 16/03/2016	Issue Number 002
Author A. Riddington @ Privileges	Checked by John Redreg	Scale at A3 1:7,000,000
Data Source Risk Output NZ Canvas Basemap - Orasys -LINZ Data Service	Coordinate System: WGS 1984 UTM Zone 60S Projection: Transverse Mercator Datum: WGS 1984 Units: Metre	

0 37.5 75 150 225 450
Nautical Miles

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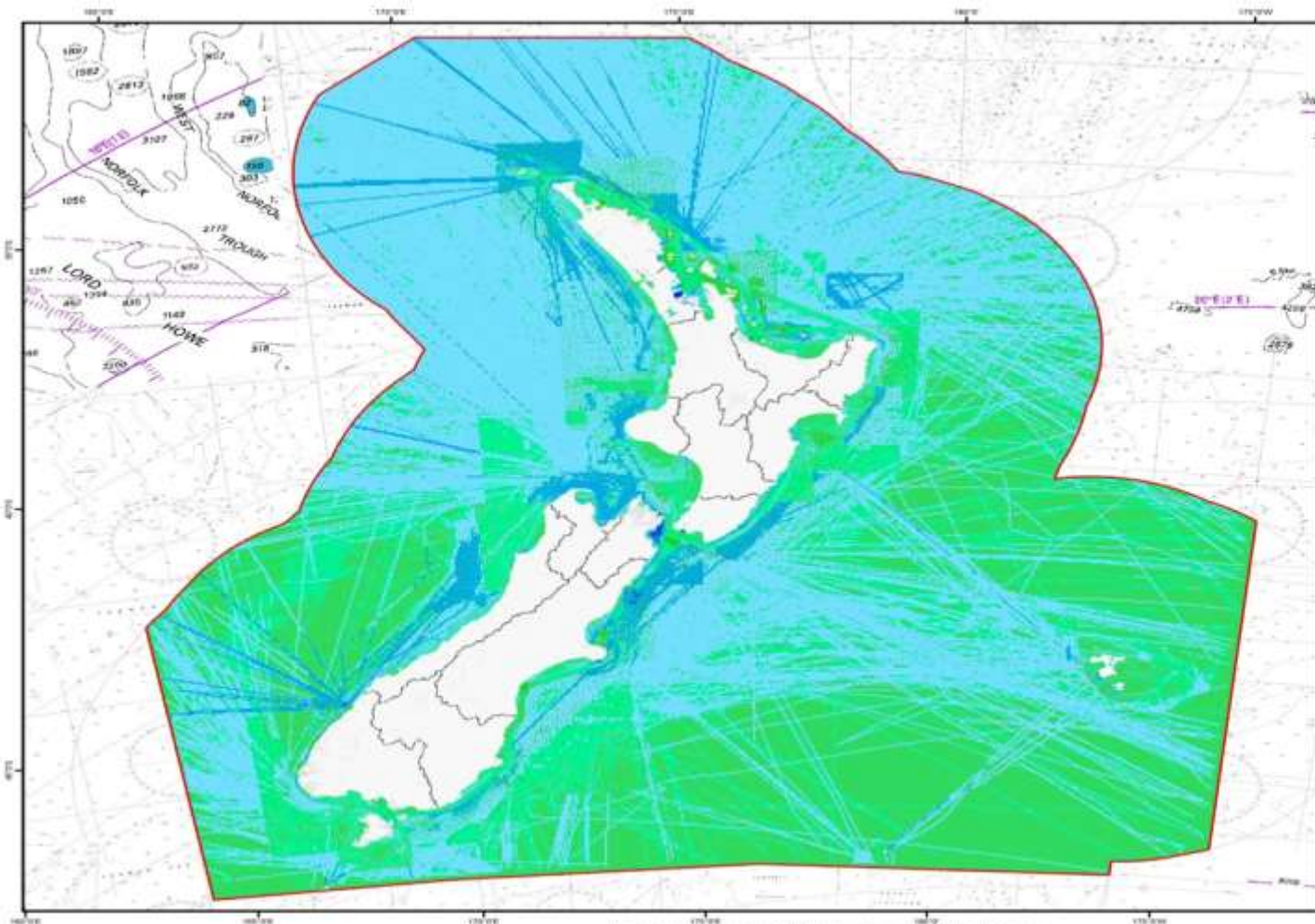
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United Kingdom
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NZ Hydrographic Risk Assessment

Land Information New Zealand
Toitū te Whenua

Figure Reference: 15NZ236_NZHRA_RiskOutput_20160308_Overview



NZHRA, Charting Benefit Output, National Overview



Legend

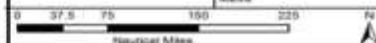



Charting
Benefit

Project No. 15N2326	Date 16/03/2016	Issue Number 002
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Author A. Rowson, D. Pringle	Checked by John Redgrove	Scale at A3 1:7,532,300
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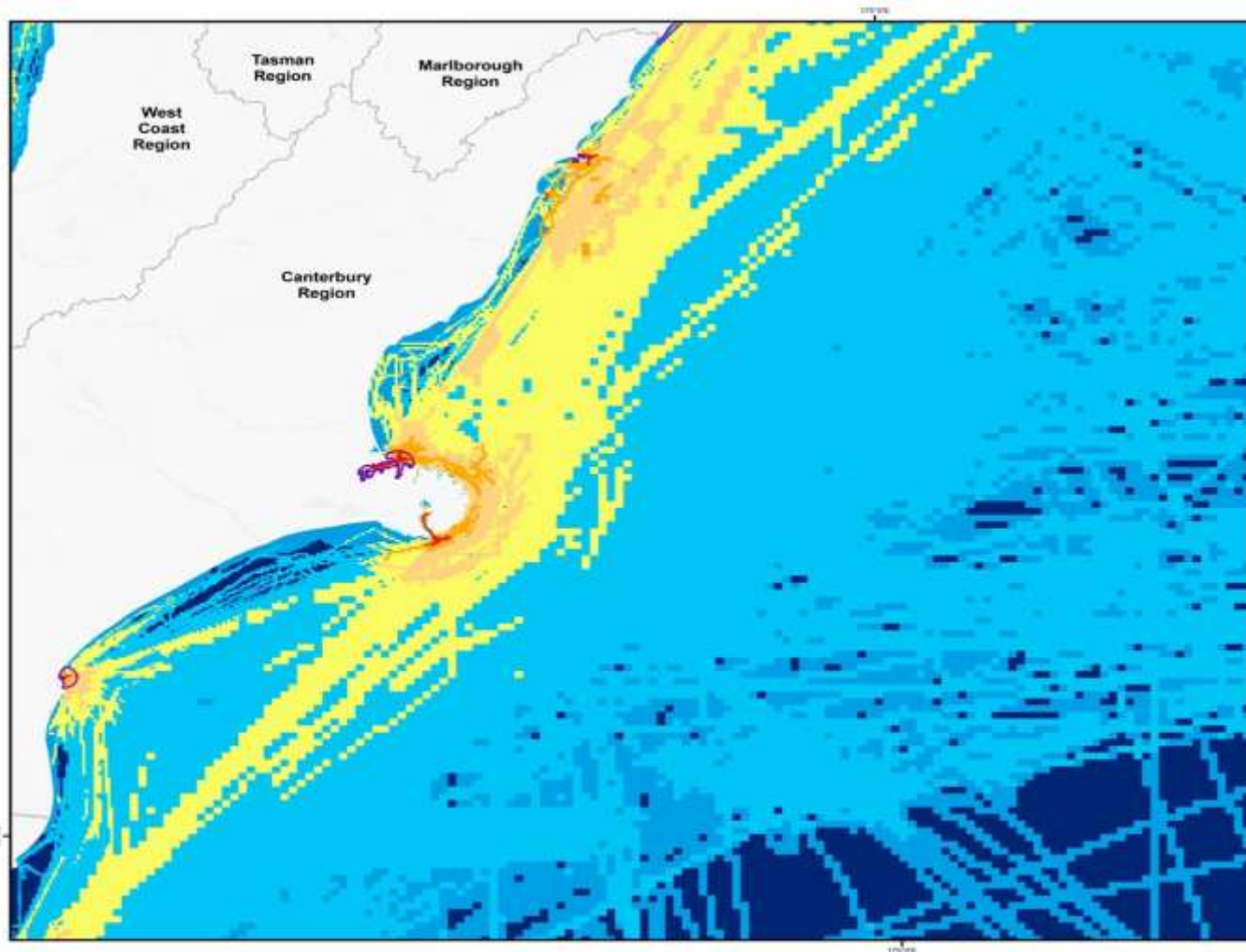
Data Source Charting Benefit Output NZ Canvas Basemap - Grayscale - LINZ Data Service	Coordinate System WGS 1984 UTM Zone 60S Projection: Transverse Mercator Datum: WGS 1984 Units: Metre
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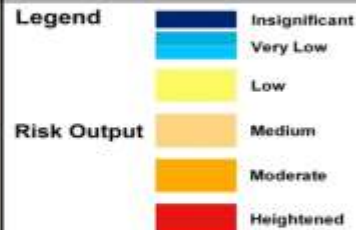
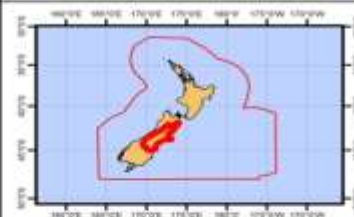
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NZ Hydrographic Risk Assessment





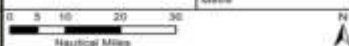
NZHRA, Risk Output, Canterbury Region



Project No. 15NZ236	Date 18/03/2018	Issue Number 002
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Author A. Rawson, G. Provisas	Checked By John Poding	Scale at A3 1:1,452,383
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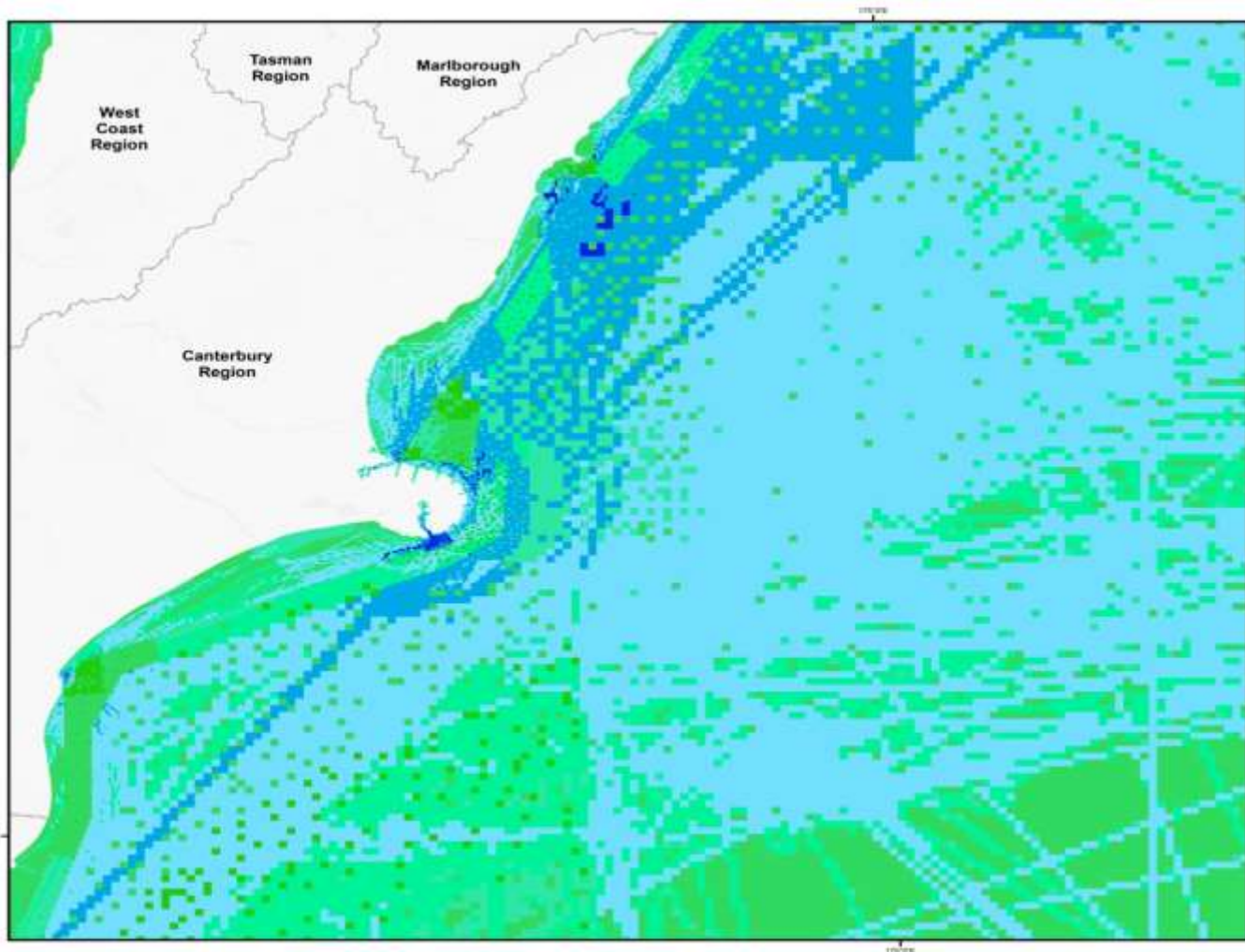
Data Source NZ Canvaas Basemap - Grayscale - LINZ Data Service	Coordinate System: WGS 1984 UTM Zone 60S Projection: Transverse Mercator Datum: WGS 1984 Units: Meter
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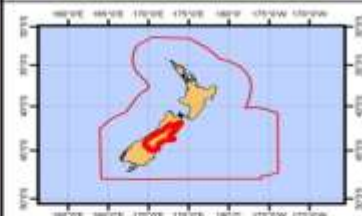
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NZ Hydrographic Risk Assessment





NZHRA, Charting Benefit Output, Canterbury Region

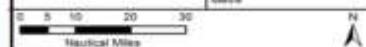


Legend



Project No. 15NZ226	Date 18/03/2016	Issue Number 002
Author A. Rawson, G. Privolesi	Checked by John Picking	Scale at A3 1:1,432,383

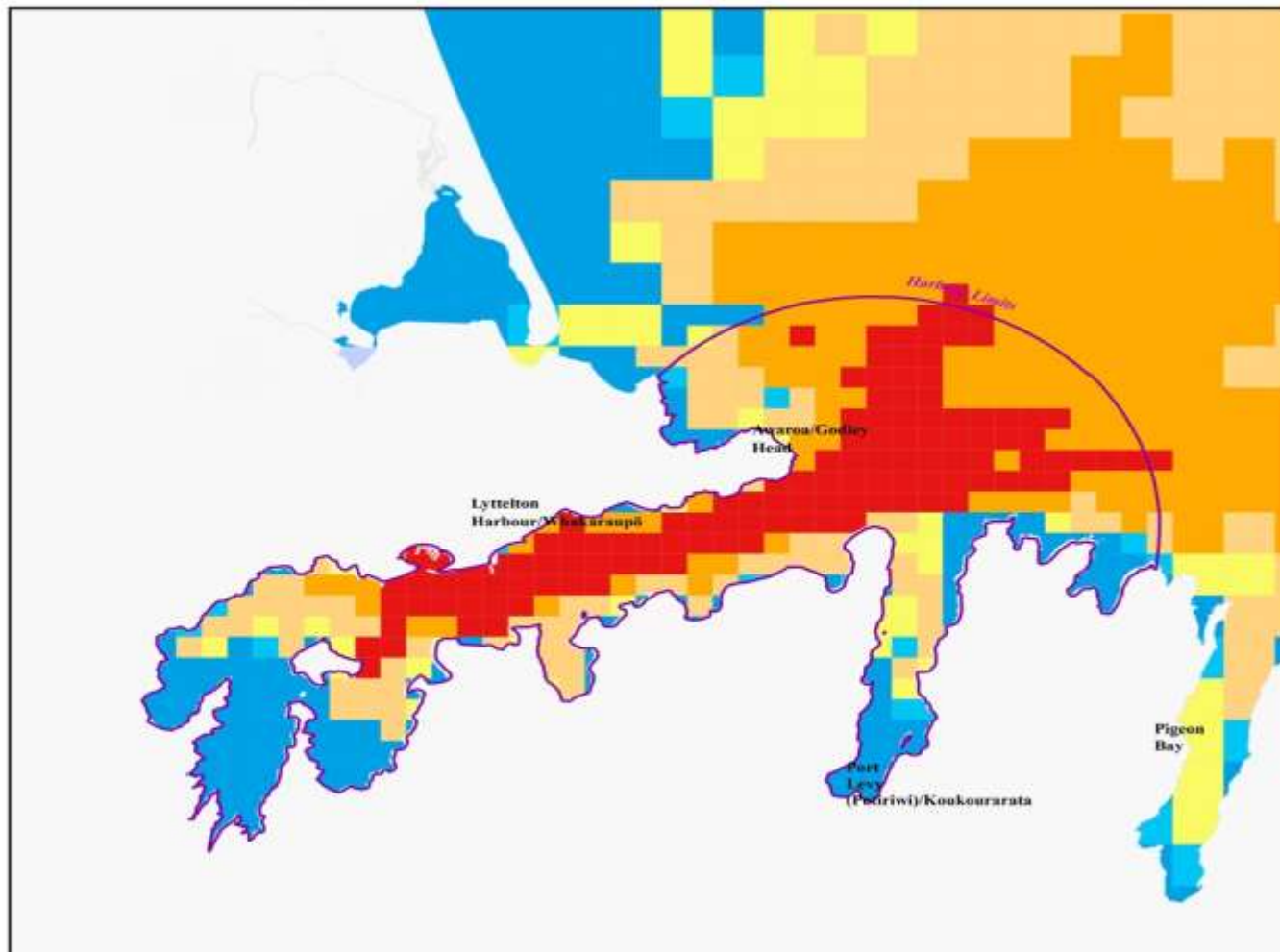
Data Source Charting Benefit Output NZ Canvax Basemap - Grayscale - LINZ Data Service	Coordinate System: WGS 1984 UTM Zone 60S Projection: Transverse Mercator Datum: WGS 1984 Units: Meter
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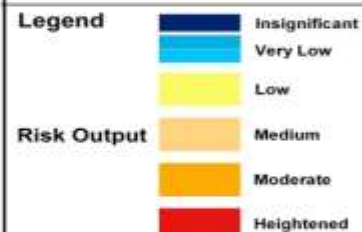
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NZ Hydrographic Risk Assessment



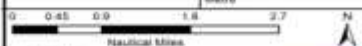


NZHRA, Risk Output, Lyttelton Harbour



Project No. 15NZ236	Date 18/05/2018	Issue Number 002
Author A. Rawson, G. Prividge	Checked by John Rilling	Scale at A3 1:81,799

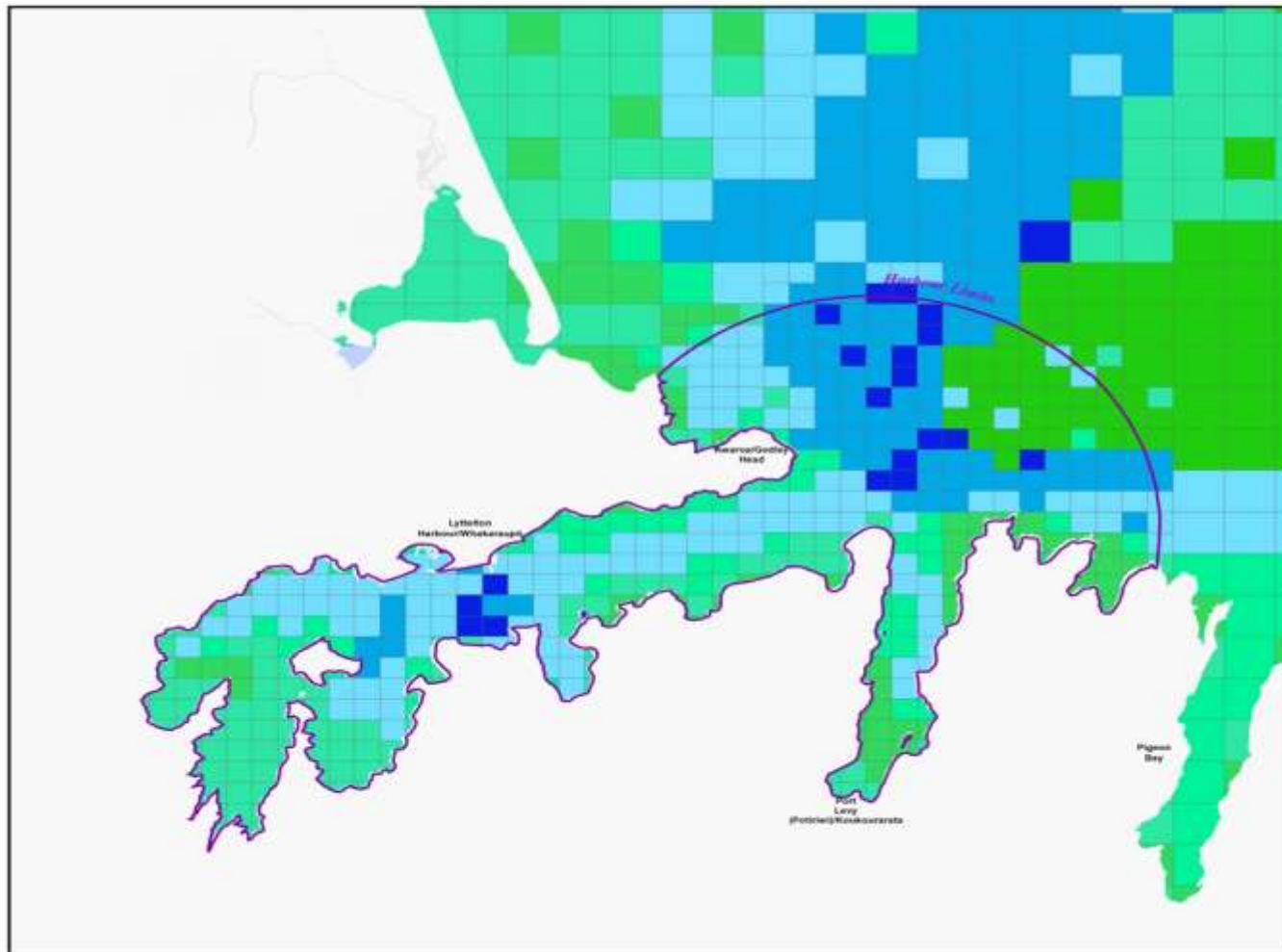
Data Source Risk Output NZ Coastal Basemap - Grayscale - LINZ Data Service	Coordinate System: WGS 1984 UTM Zone 60S Projection: Transverse Mercator Datum: WGS 1984 Units: Metre
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NZ Hydrographic Risk Assessment





NZHRA, Charting Benefit Output, Lyttelton Harbour



Legend



Project No. 15NZ236	Date 18/03/2018	Issue Number 003
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Author A. Rawson, G. Pirovella	Checked by John Rading	Scale at A3 1:81,790
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Data Source Charting Benefit Output NZ Canvass (Saverap) - Gridscale LINZ Data Service	Coordinate System WGS 1984 UTM Zone 60S Projection: Transverse Mercator Datum: WGS 1984 Units: Metre
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NZ Hydrographic Risk Assessment



Next steps

- Identify priorities for FY 16/17 survey programme
- May 2016 - Draft report
- June 2016 – Final report published
- Phase 3 - Collaborate with MNZ - Coastal Navigation Safety Review
- Engage with stakeholders & seek collaboration opportunities to collect fundamental datasets
- Develop 5 year rolling survey programme



Thank you &
any questions?

