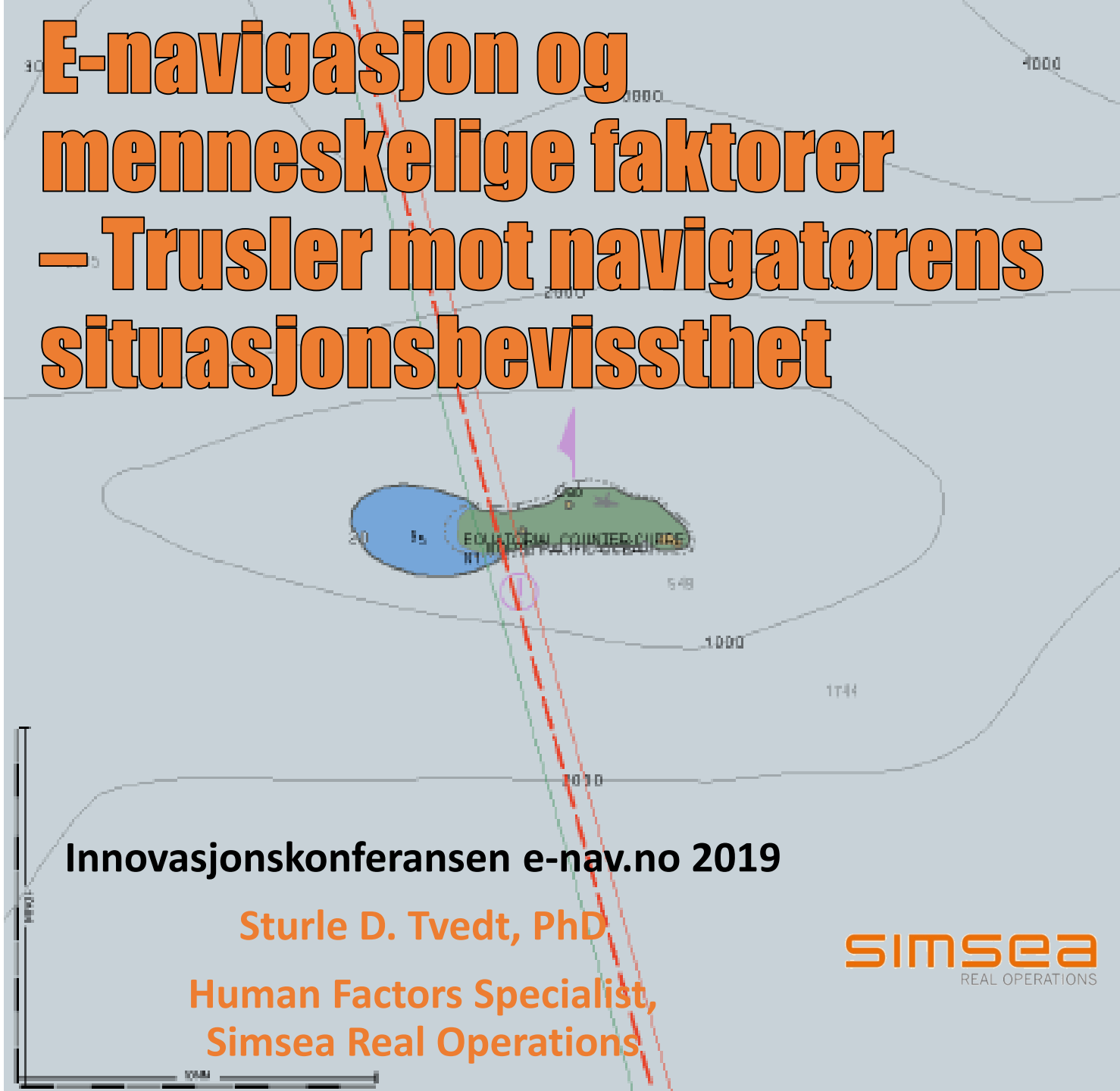


E-navigasjon og menneskelige faktorer

– Trusler mot navigatørens situasjonsbevissthet



Own Ship INFO [CCRPI]

HOG (GYRO)	270.2°
STM (LOG)	0.0 kn
COG (GPS)	023.4°
SOG (GPS)	0.0 kn

UTC 20 Jun 2017 05:24:56+00:00

POSN1	1°14.8543'N
DGPS1	
WGS-84	103°36.6784'E

Vector T 12 min
Depth (***)

Association	
Filter	Ring Sector
NotRDY	
Route	OK>201703B3
To WPT	007
DIST	2507.9 NM BRG 092.9°
CALC	Drift Route WPT
DEST	25 - 4266.7 NM
SPD	Actual 0.0 kn
TTG	
ETA	UTC

Chart INFO

<input checked="" type="checkbox"/> MOB	Other
Port List	1:200,000
Home	15.861 NM
Zoom Out	Free
Zoom In	North Up
Zoom Area	000.0°

Brilliance

PANEL	VID	TGT	Day2

Alarm List

Innovasjonskonferansen e-nav.no 2019

Sturle D. Tvedt, PhD

Human Factors Specialist,
Simsea Real Operations

simsea
REAL OPERATIONS

ECDIS vs papirkart til navigasjon



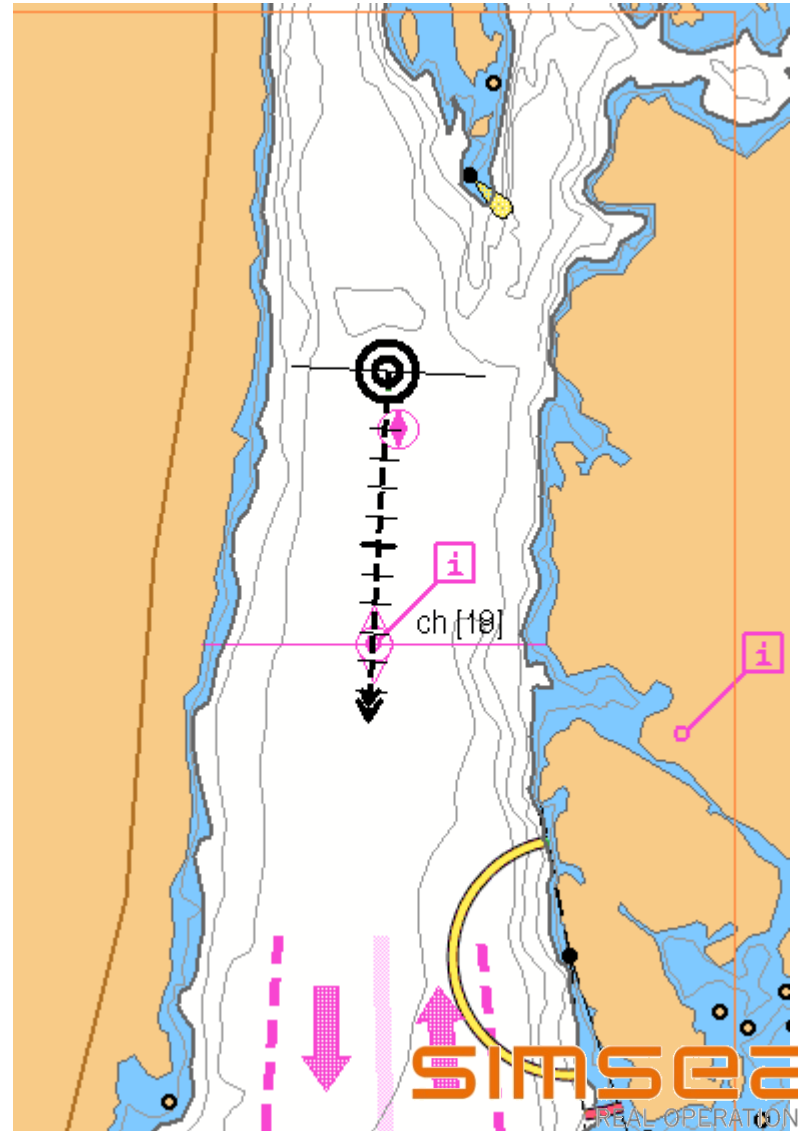
4 trusselområder:

Skala

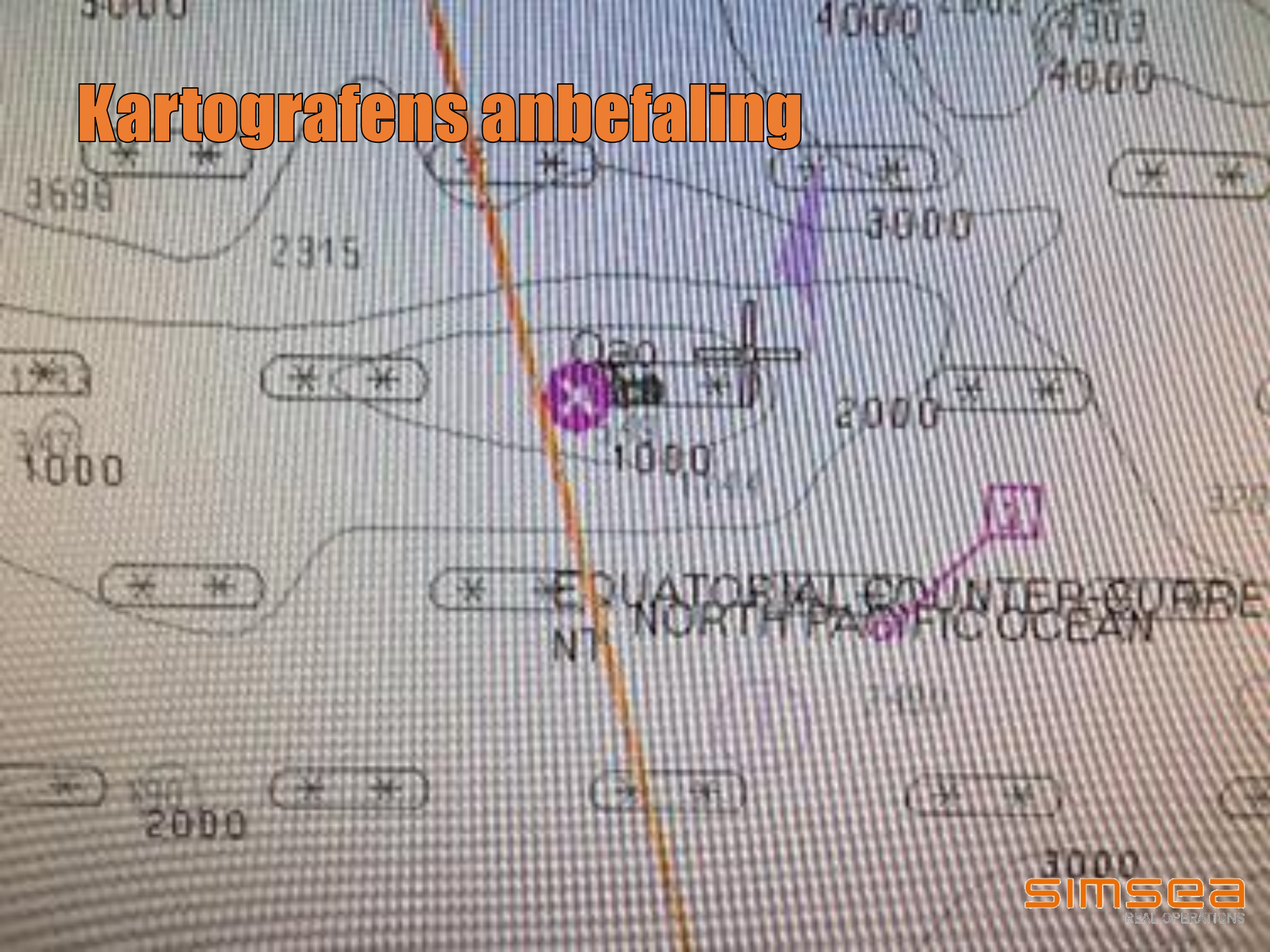
Symbolbruk

Kartkvalitet

Posisjonering



Kartografens anbefaling



Overskalering (zoom)



Hva innebærer zoom?

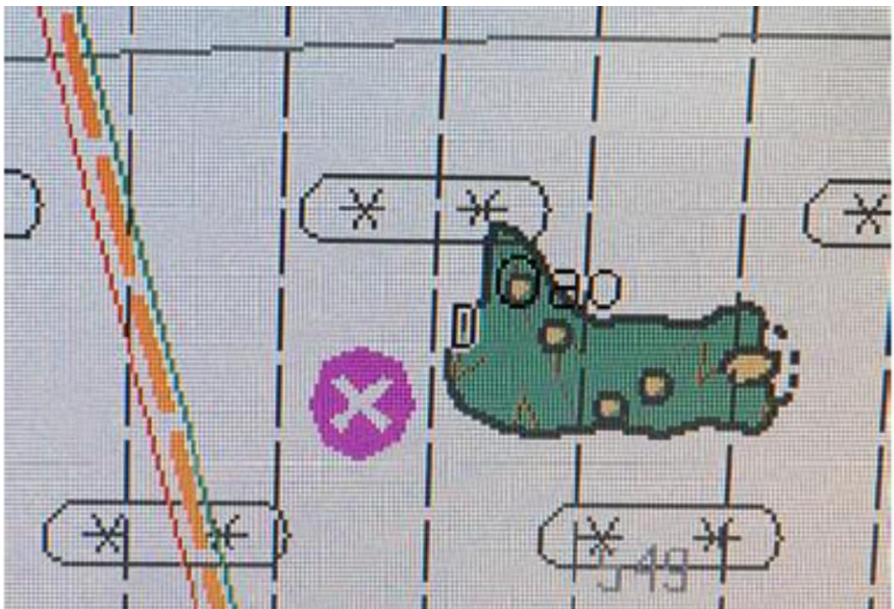
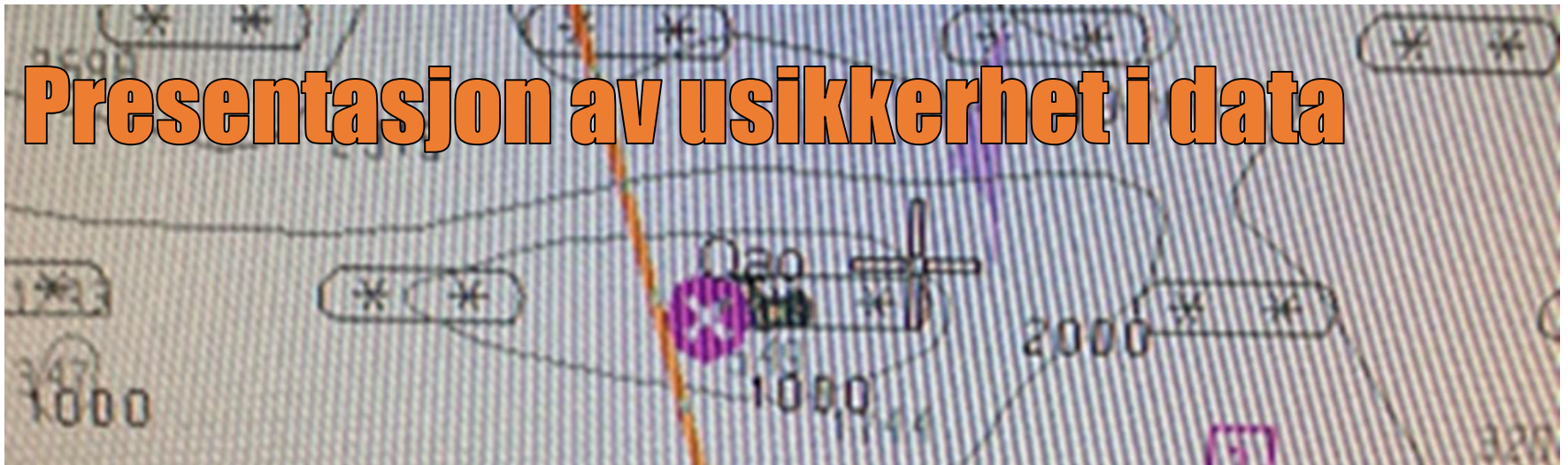


10x Optical Zoom



10x Digital Zoom

Presentasjon av usikkerhet i data

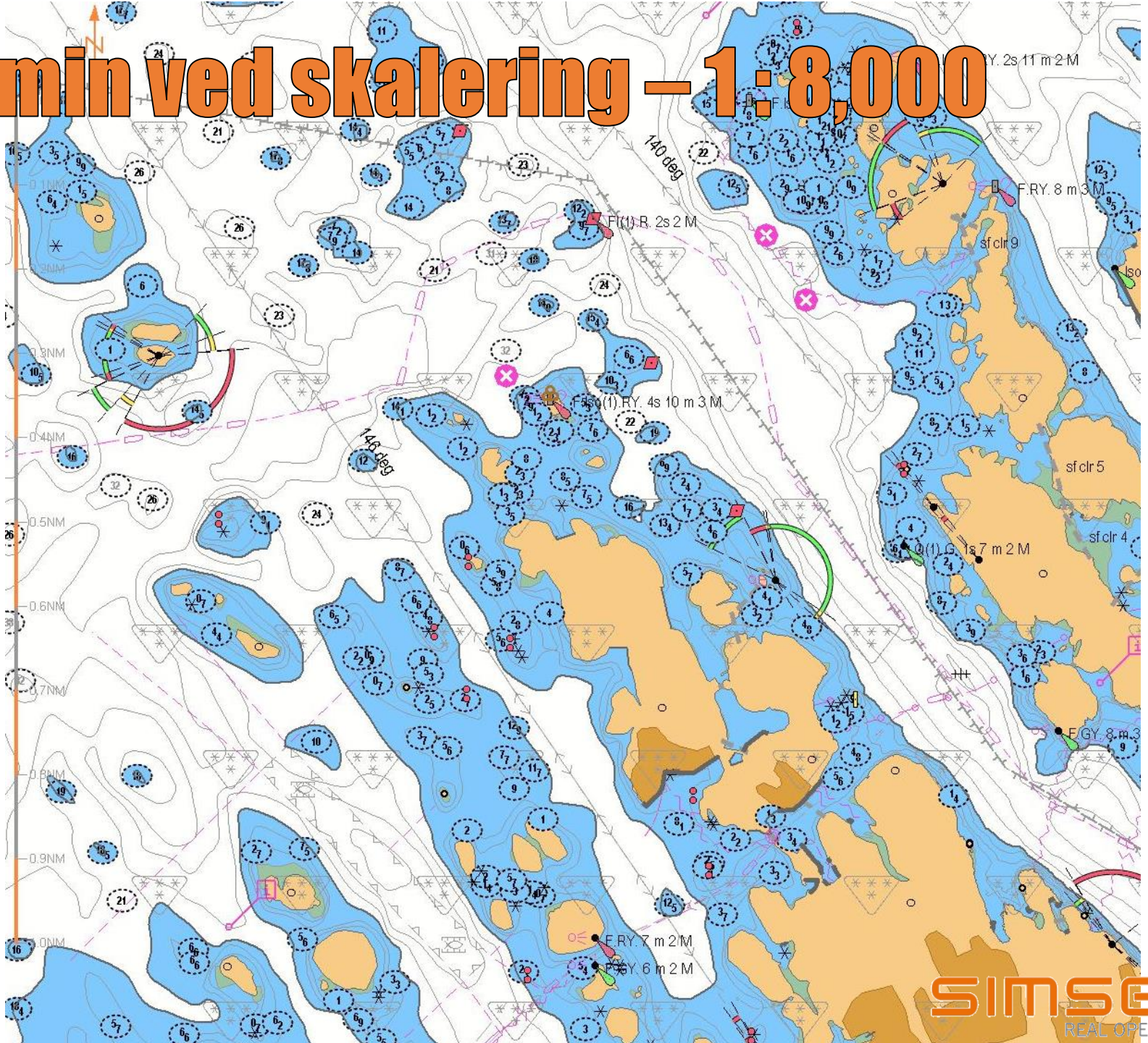


ECDIS presentasjon

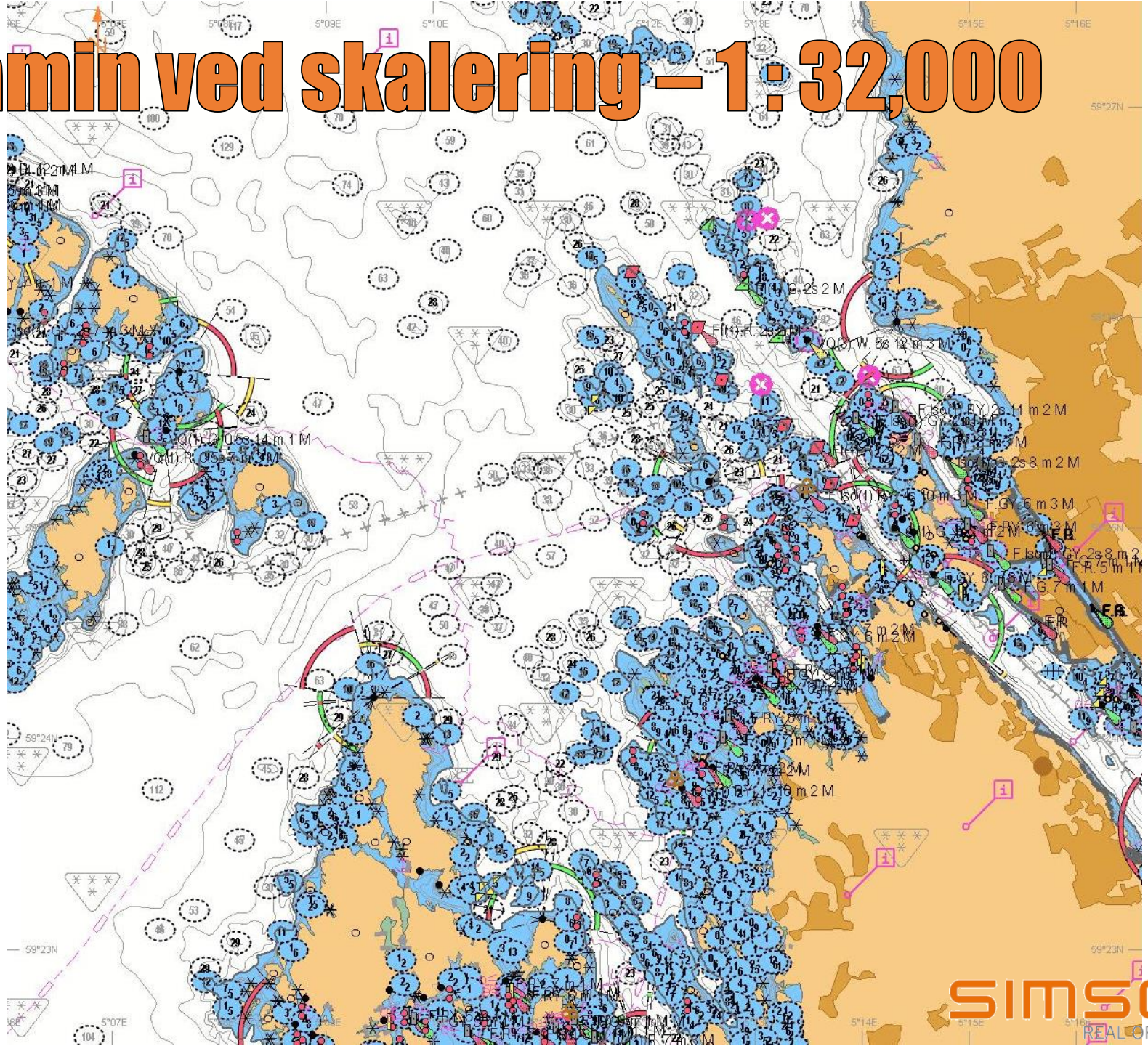


ÆRLIG presentasjon?

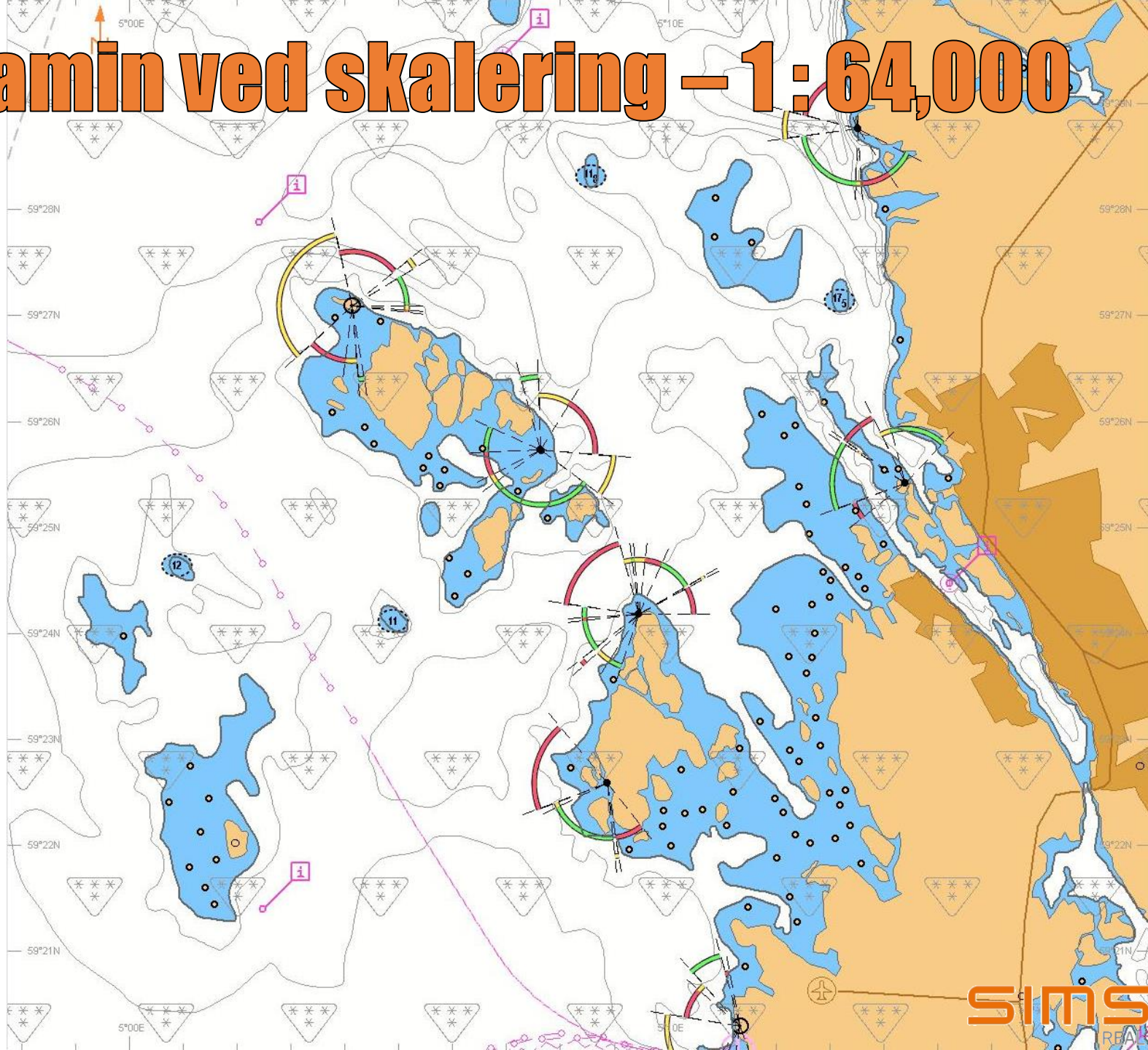
Scamin ved skalering – 1:8,000



Scamin ved skalering - 1:32,000



Scamin ved skalering – 1:64,000

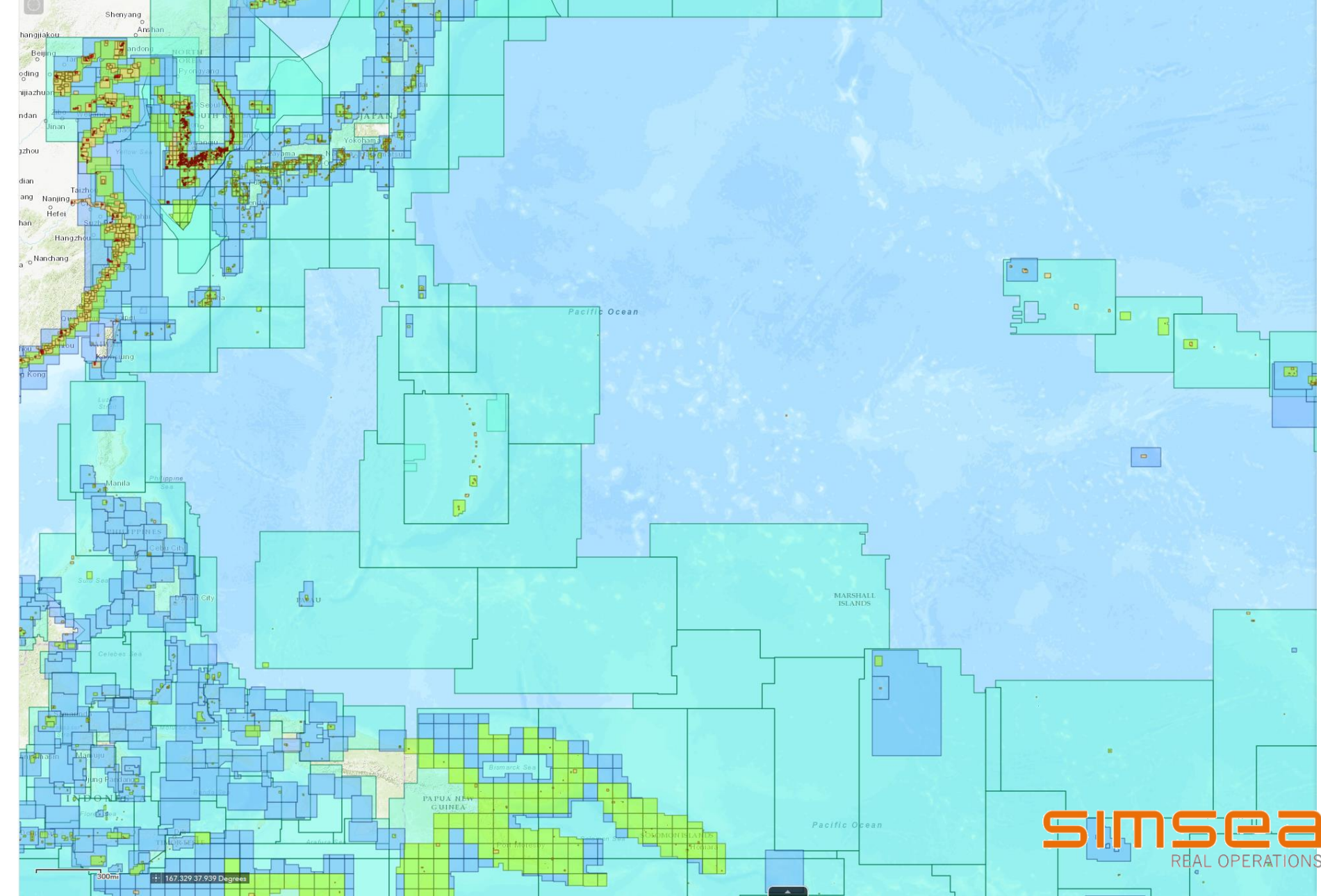


Korrekt bruk av kartskala

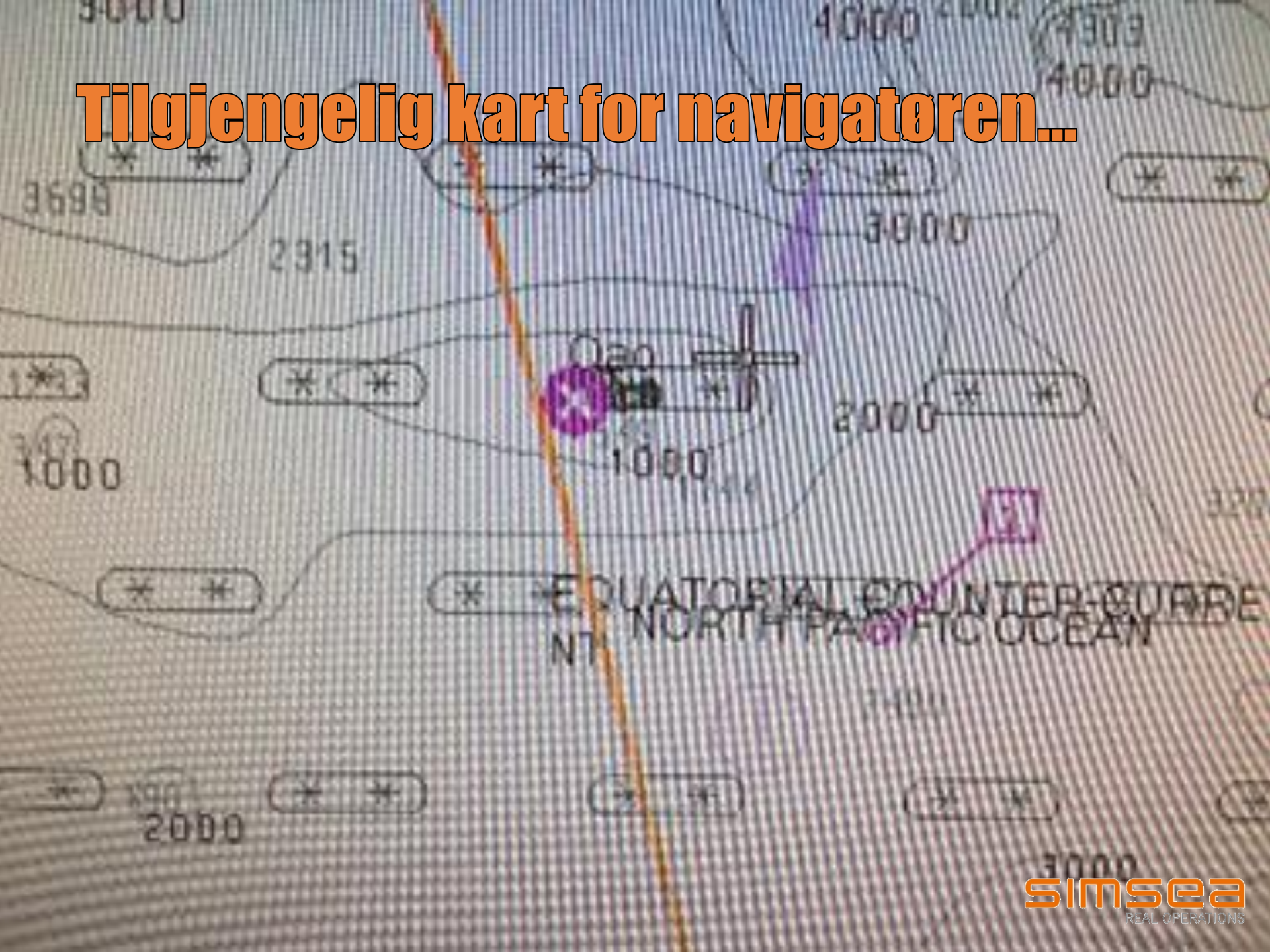
- hvilket kart burde navigtøren bruke?

Selectable range	Fitting scale on a 21» monitor 1280x1024 Resolution	Assigned Navigational purpose	Available ENC/Compilations scale on position to be loaded
200 NM	1:2,744,000	Overview	XX1xxxx.000 CS: 1:1,500,000
96 NM	1:1,320,000	General	XX2xxxx.000 CS: 1:850,000
48 NM	1:659,000		
24 NM	1:330,000	Coastal	XX3xxxx.000 CS: 1:150,000
12 NM	1:165,000		
6 NM	1:82,000	Approach	XX4xxxx.000 CS: 1:50,000
3 NM	1:41,000	Harbour	XX5xxxx.000 CS: 1:20,000
1.5 NM	1:21,000		
0.75 NM	1:10,500		XX5xxxx.000 CS: 1:20,000
0.5 NM	1:6,900		

Tilgjengelige kart i Stillehavet



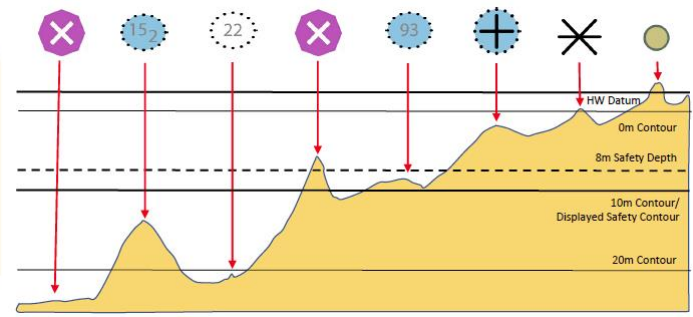
Tilgjengelig kart for navigatøren..



Symboler for vrak og hindringer

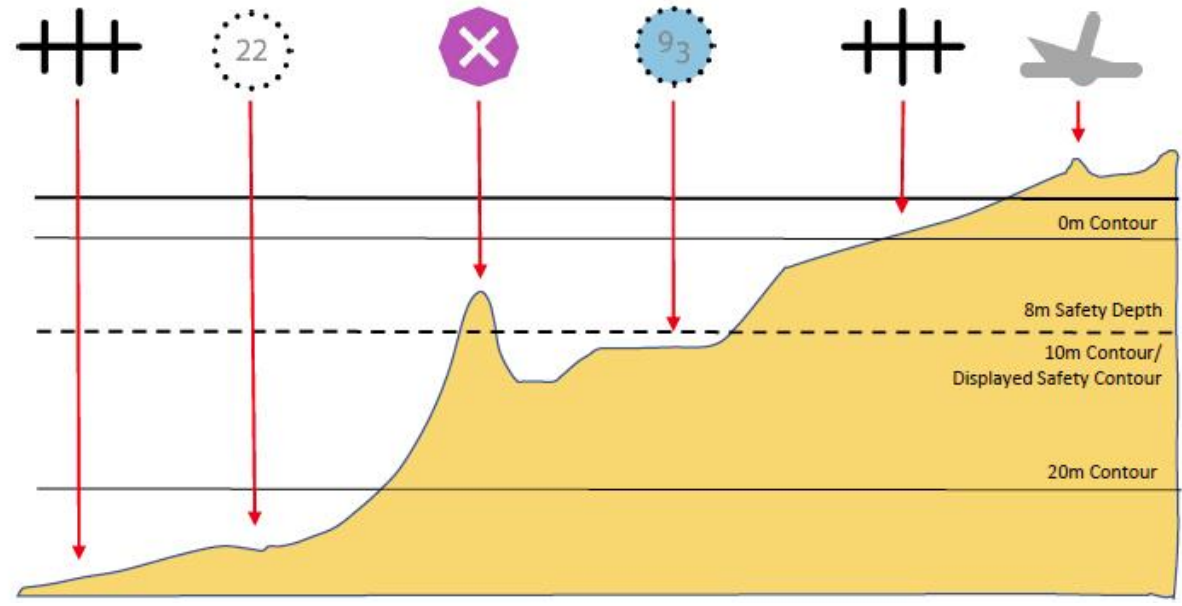
The diagram below (in full display mode) shows how the setting of the safety depth and the safety contour and the underlying depth of water relate to the symbol which is displayed. The display is set to 4 depth shades and the shallow water pattern is turned off and the safety depth and safety contour are set to the next deepest contour.

Underwater rock, depth unknown	Underwater rock, depth known, deeper than the safety contour	Underwater rock, depth known, deeper than the safety contour (deeper than 20m)	Underwater rock, depth known, shallower than the safety contour	Underwater rock, depth known, deeper than the safety depth (shallower than 20m)	Underwater rock, depth unknown	Rock awash or covers and uncovers	Rock (islet) which does not cover
--------------------------------	--	--	---	---	--------------------------------	-----------------------------------	-----------------------------------



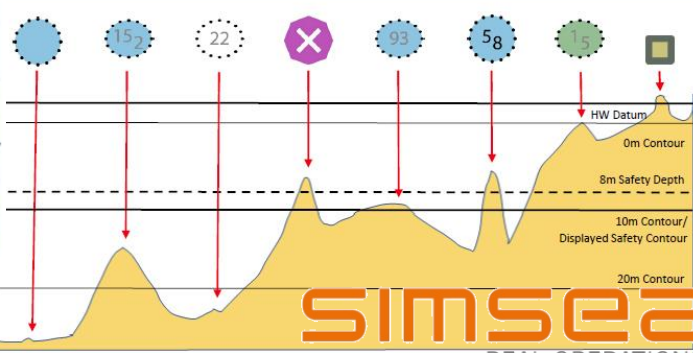
The diagram below (in full display mode) shows how the setting of the safety depth and the safety contour and the underlying depth of water relate to the symbol which is displayed. The display is set to 4 depth shades and isolated dangers in shallow water are turned off. The shallow water pattern is turned off and the safety depth and safety contour are set to 8 metres. The displayed safety contour has defaulted to the next deepest contour.

Non-dangerous wreck, depth unknown	Wreck, depth known, deeper than the safety contour (deeper than 20m)	Wreck, depth known, shallower than the safety contour (deeper than 20m)	Wreck, depth known, deeper than the safety contour (shallower than 20m)	Dangerous wreck, depth unknown, within the safety contour (shallower water)	Wreck showing any part of hull or superstructure at the level of Chart Datum safety contour (shallower water)
------------------------------------	--	---	---	---	---

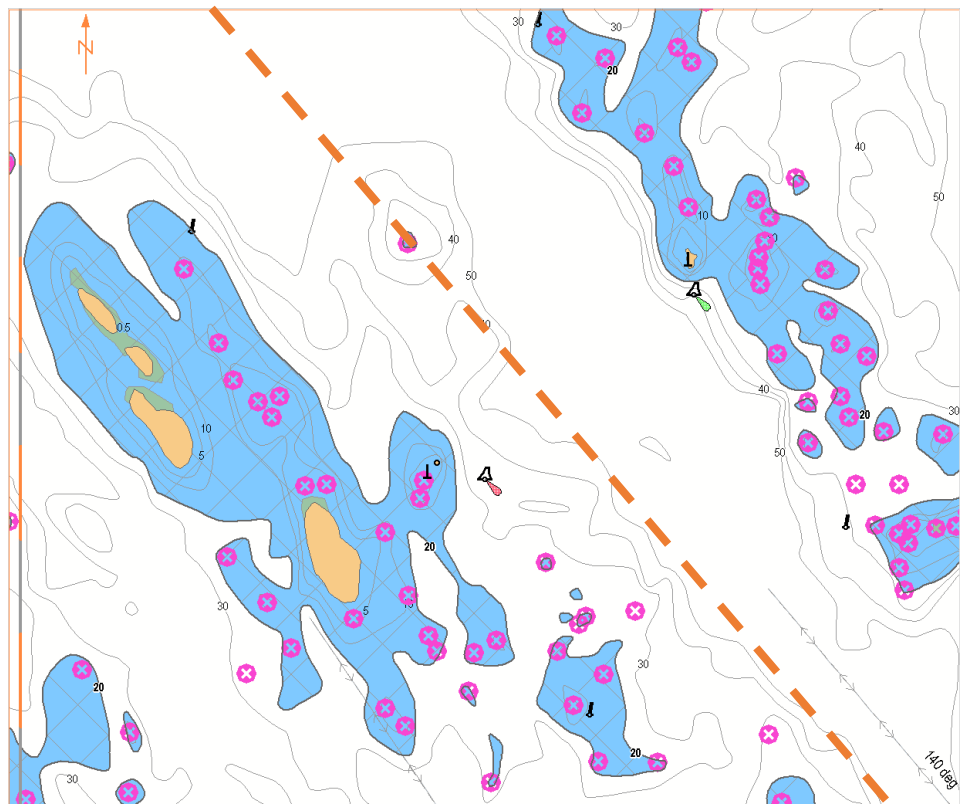
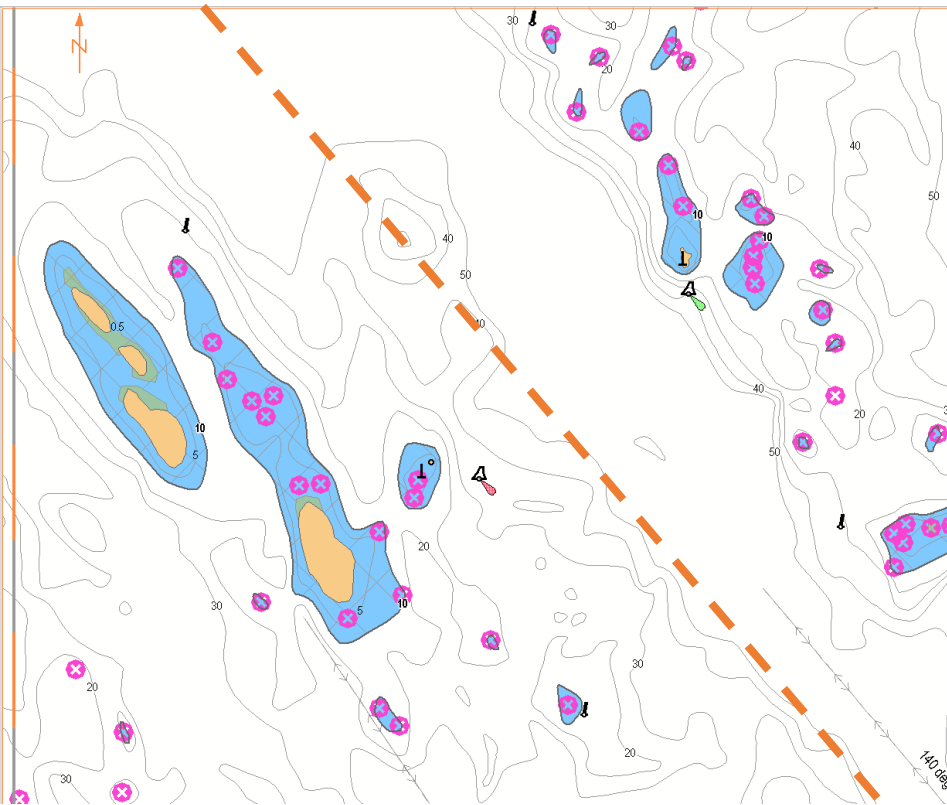


The diagram below (in full display mode) shows how the setting of the safety depth and the safety contour and the underlying depth of water relate to the symbol which is displayed. The display is set to 4 depth shades and isolated dangers in shallow water are turned off. The shallow water pattern is turned off and the safety depth and safety contour are set to 8 metres. The displayed safety contour has defaulted to the next deepest contour, 10 metres.

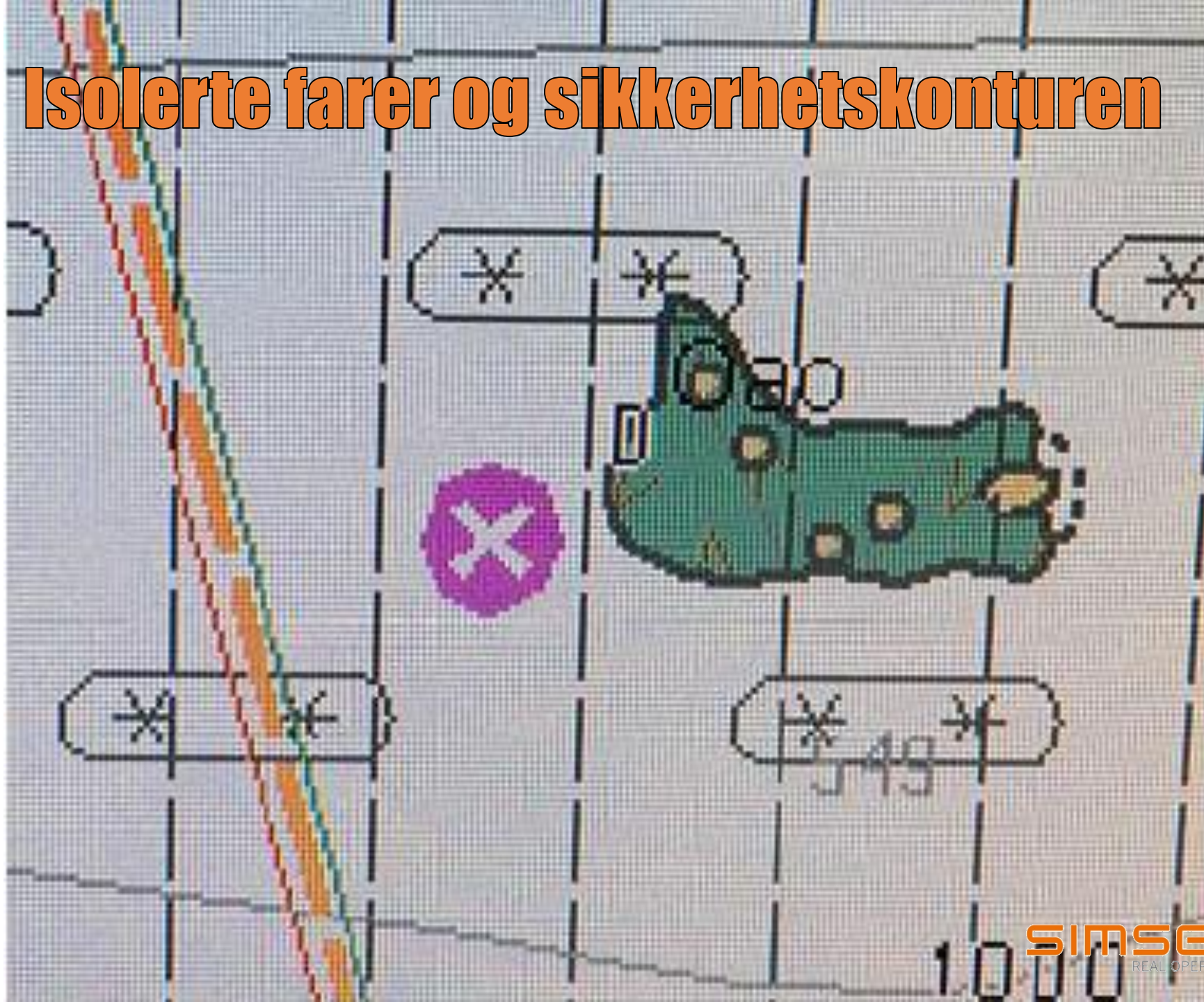
Obstruction, depth unknown, within the surrounding depth area, deeper than the safety contour	Obstruction, depth known, deeper than the safety contour	Obstruction, depth known, deeper than the safety contour (deeper than 20m)	Obstruction, depth known, shallower than the safety contour	Obstruction, depth known, shallower than the safety depth (shallower than 20m)	Obstruction, depth known, shallower than the safety depth	Obstruction, depth known, covers and uncovers	Obstruction, always dry
---	--	--	---	--	---	---	-------------------------



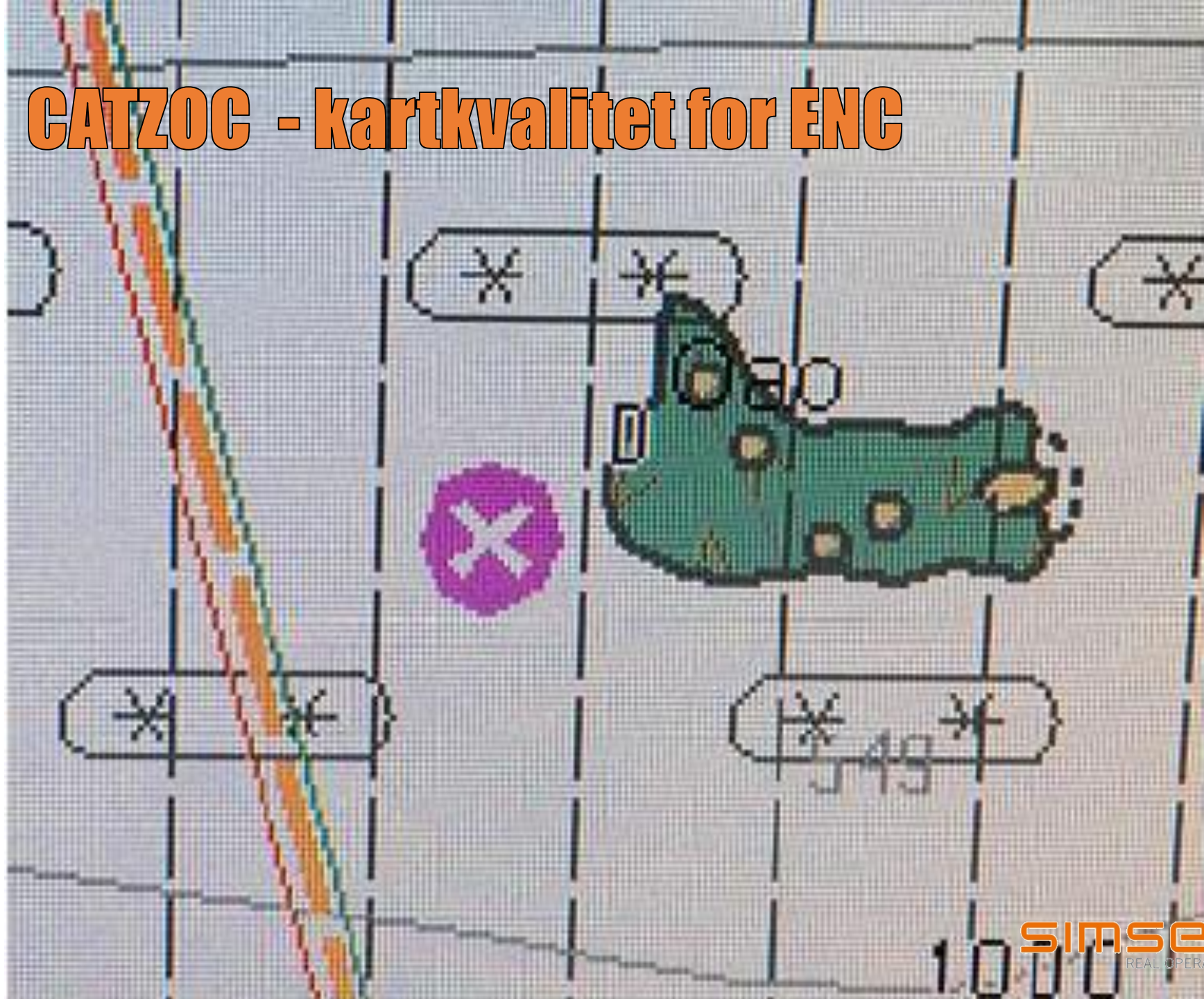
Isolerte farer og sikkerhetskonturen









Isolerte farer og sikkerhetskonturen



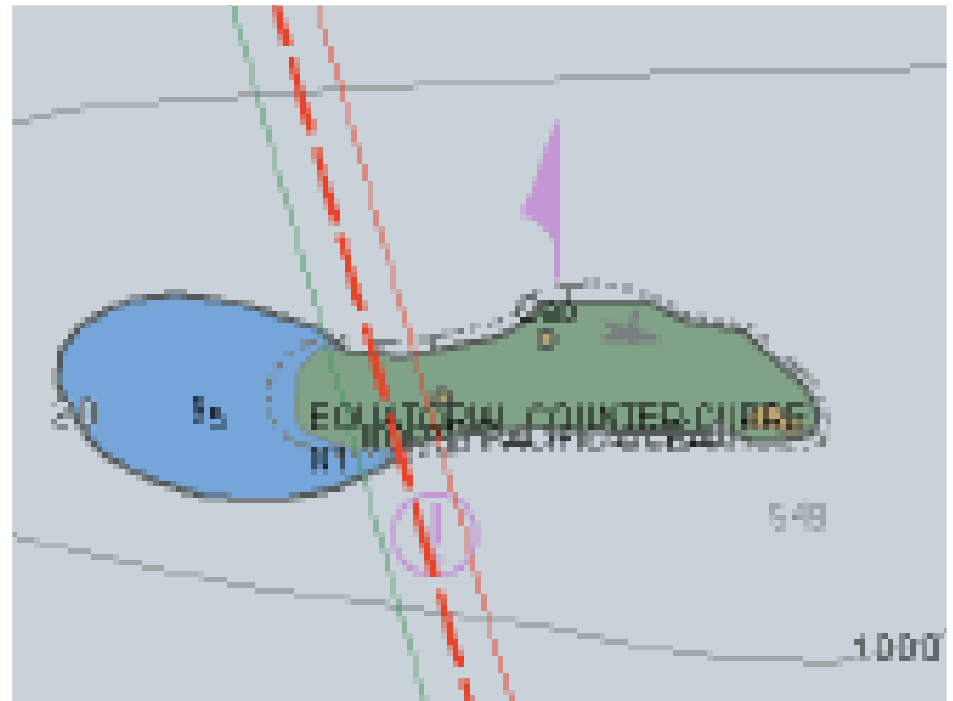
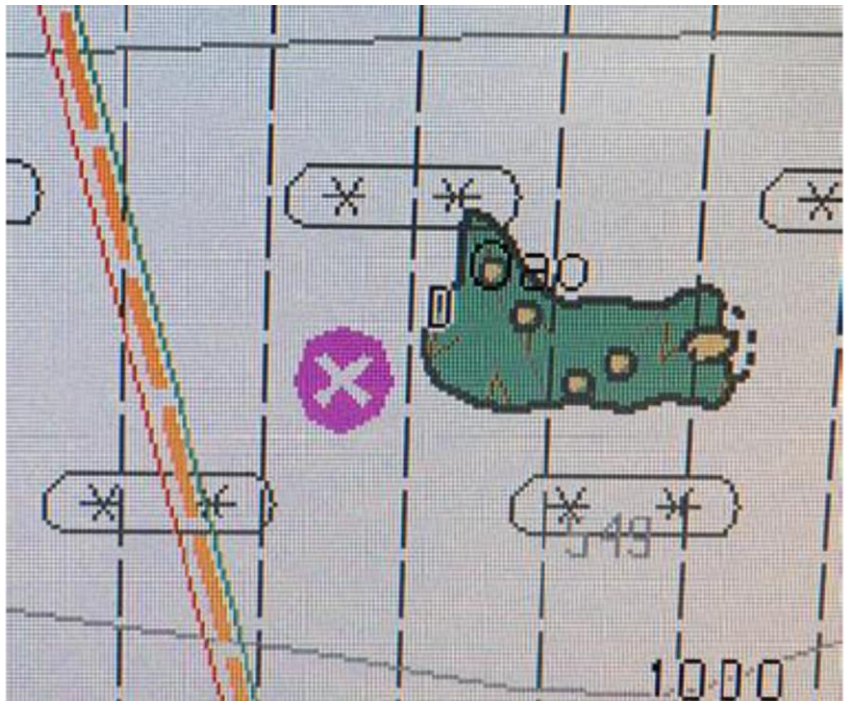
CATZOC - kartkvalitet for ENC



CATZOC - kartkvalitet for ENC

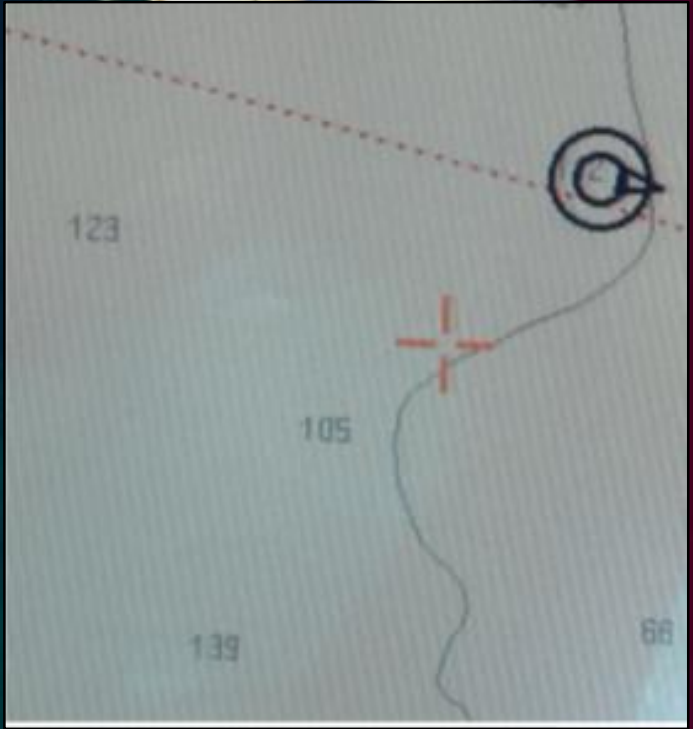
1	2	3		4	5	6
ZOC	Position Accuracy	Depth Accuracy		Seafloor Coverage	Typical Survey Characteristics	Symbol
A1	± 5 m	= 1.00 + 1% d		Full area search undertaken. All significant seafloor features detected and depths measured.	Controlled, systematic survey achieving position and depth accuracy less than ZOC A1 and using a modern survey echosounder and a sonar or mechanical sweep system.	
		Depth (m)	Accuracy (m)			
		10	± 0.6			
		30	± 0.8			
		100	± 1.5			
		1000	± 10.5			
A2	± 20 m	= 1.00 + 2% d		Full area search undertaken. All significant seafloor features detected and depths measured.	Controlled, systematic survey achieving position and depth accuracy less than ZOC A1 and using a modern survey echosounder and a sonar or mechanical sweep system.	
		Depth (m)	Accuracy (m)			
		10	± 1.2			
		30	± 1.6			
		100	± 3.0			
		1000	± 21.0			
B	± 50 m	= 1.00 + 2% d		Full area search not achieved; uncharted features, hazardous to surface navigation are not expected but may exist.	Controlled, systematic survey achieving similar depth but lesser position accuracies than ZOC A2, using a modern survey echosounder, but no sonar or mechanical sweep system.	
		Depth (m)	Accuracy (m)			
		10	± 1.2			
		30	± 1.6			
		100	± 3.0			
		1000	± 21.0			
C	± 500 m	= 2.00 + 5% d		Full area search not achieved, depth anomalies may be expected.	Low accuracy survey or data collected on an opportunity basis such as soundings on passage.	
		Depth (m)	Accuracy (m)			
		10	± 2.5			
		30	± 3.5			
		100	± 7.0			
		1000	± 52.0			
D	worse than ZOC C	Worse Than ZOC C		Full area search not achieved, large depth anomalies may be expected.	Poor quality data or data that cannot be quality assessed due to lack of information.	
U	Unassessed – The quality of the bathymetric data has yet to be assessed					

CATZOC - kartkvalitet for ENC

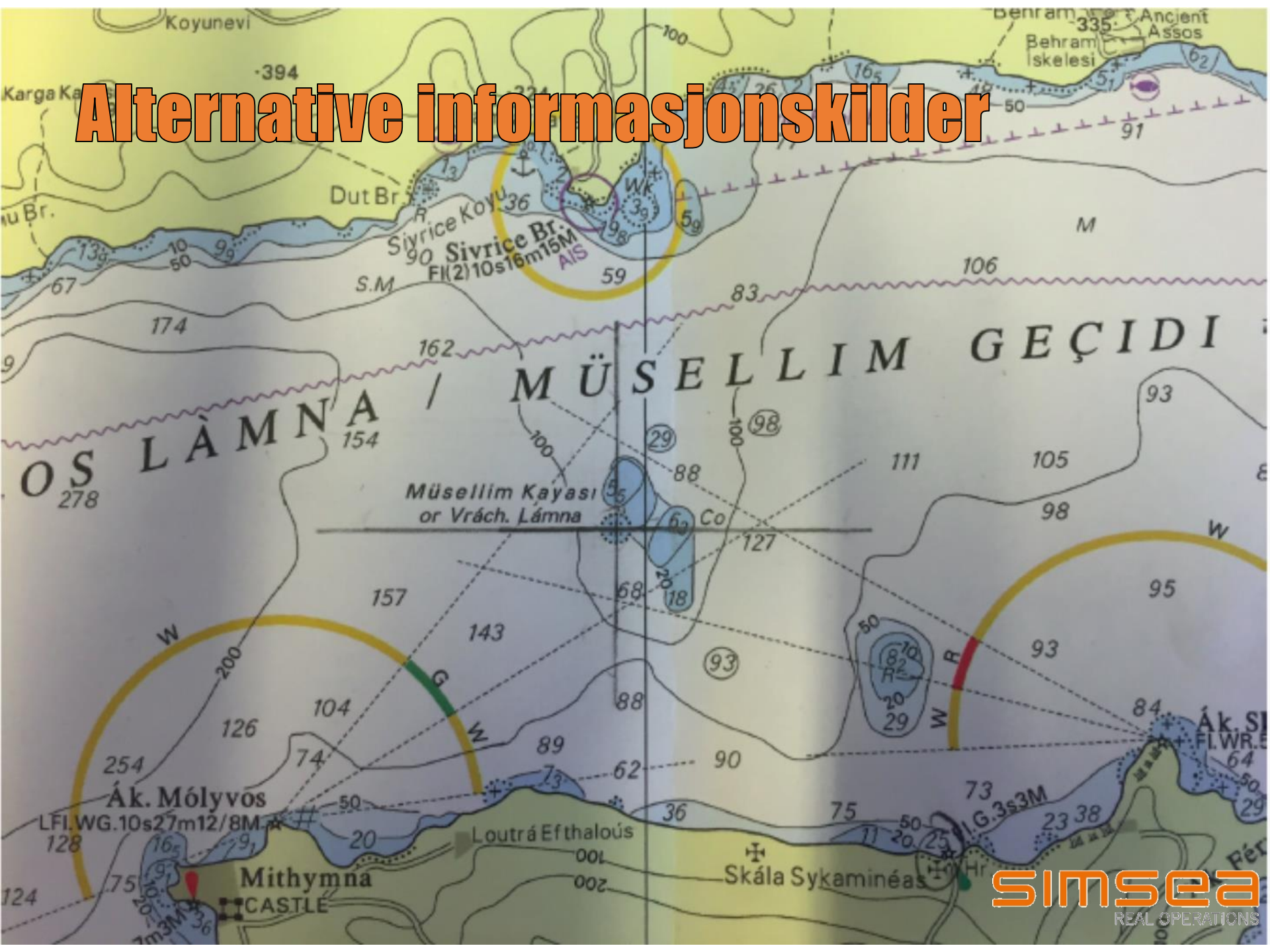


Alternative informasjonskilder

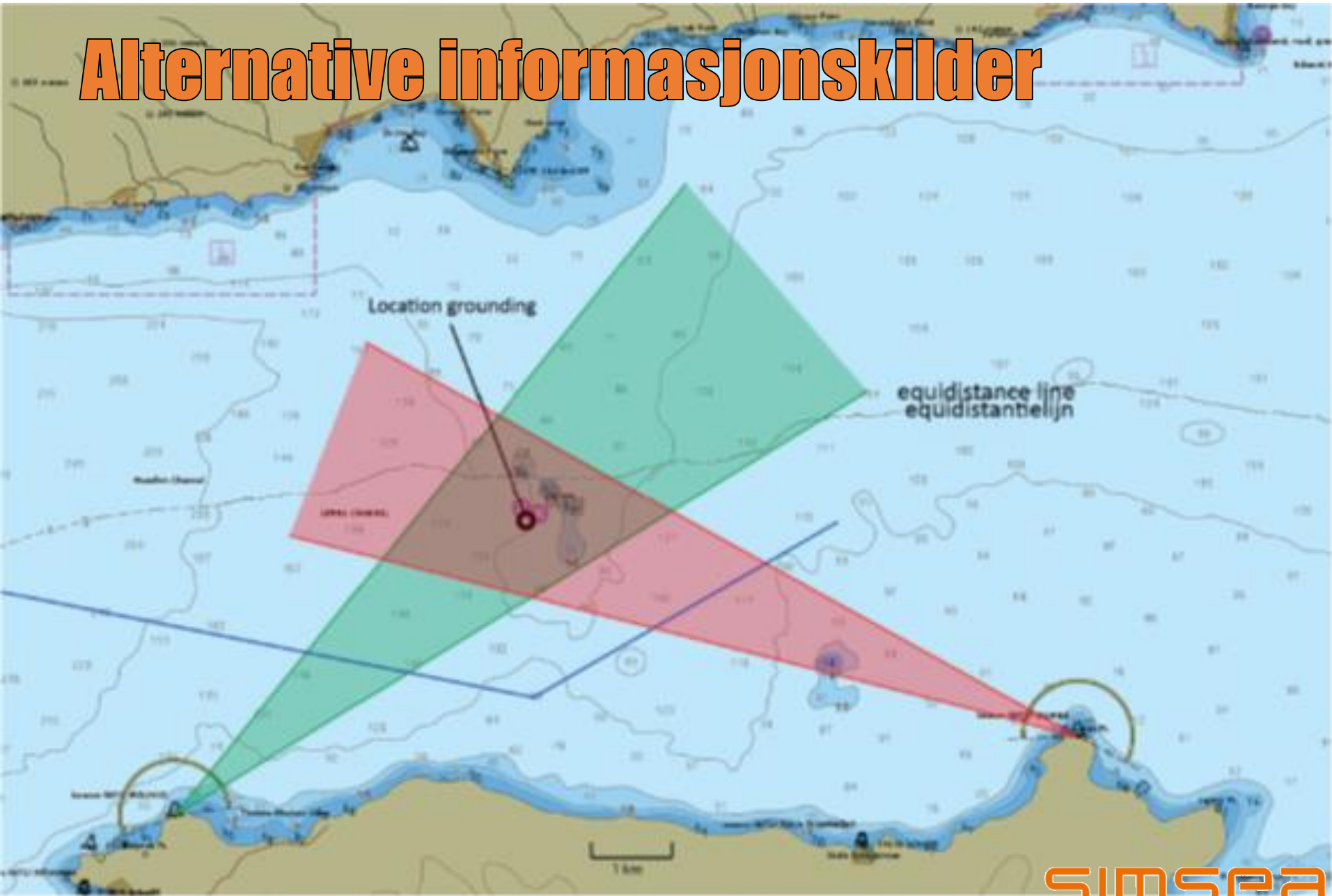




Alternative informasjonskilder



Alternative informasjonskilder



GPS posisjonering av eget fartøy

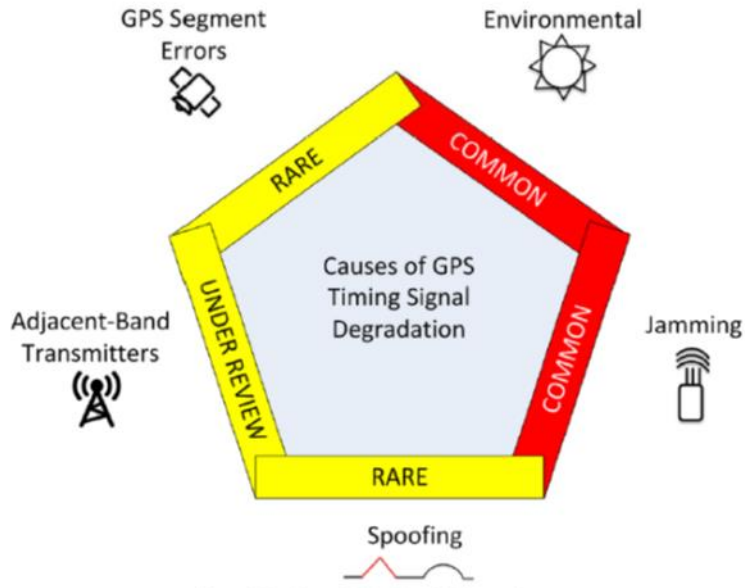
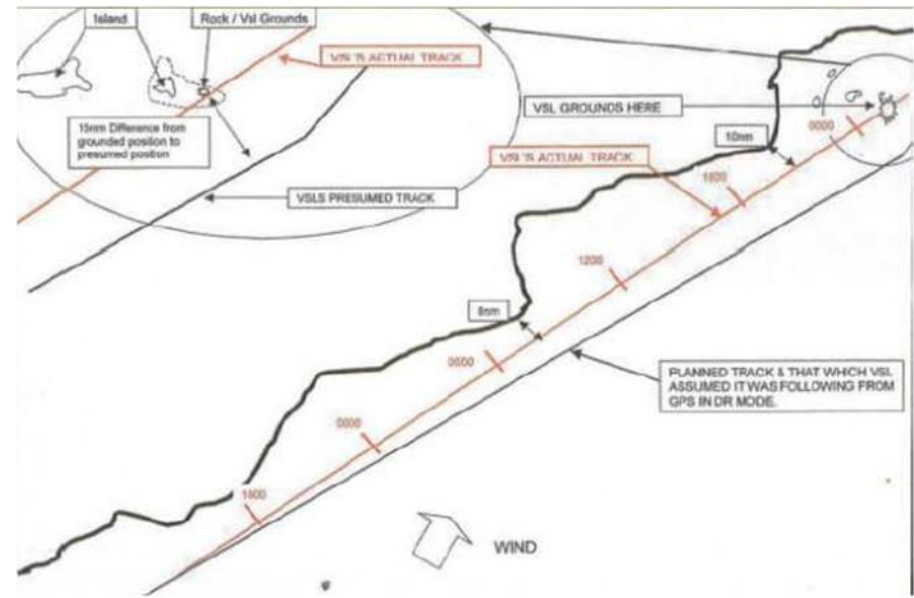
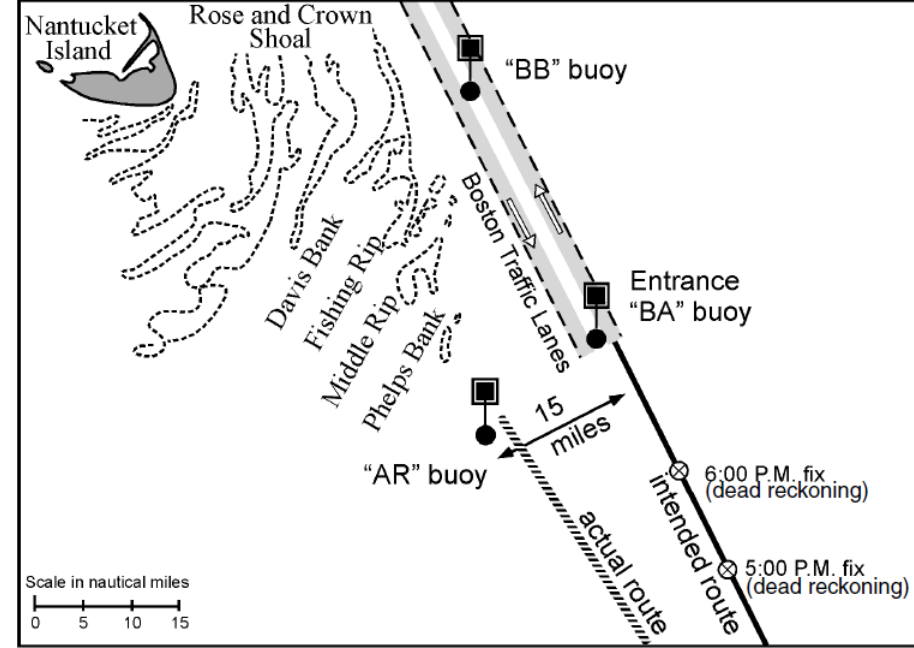
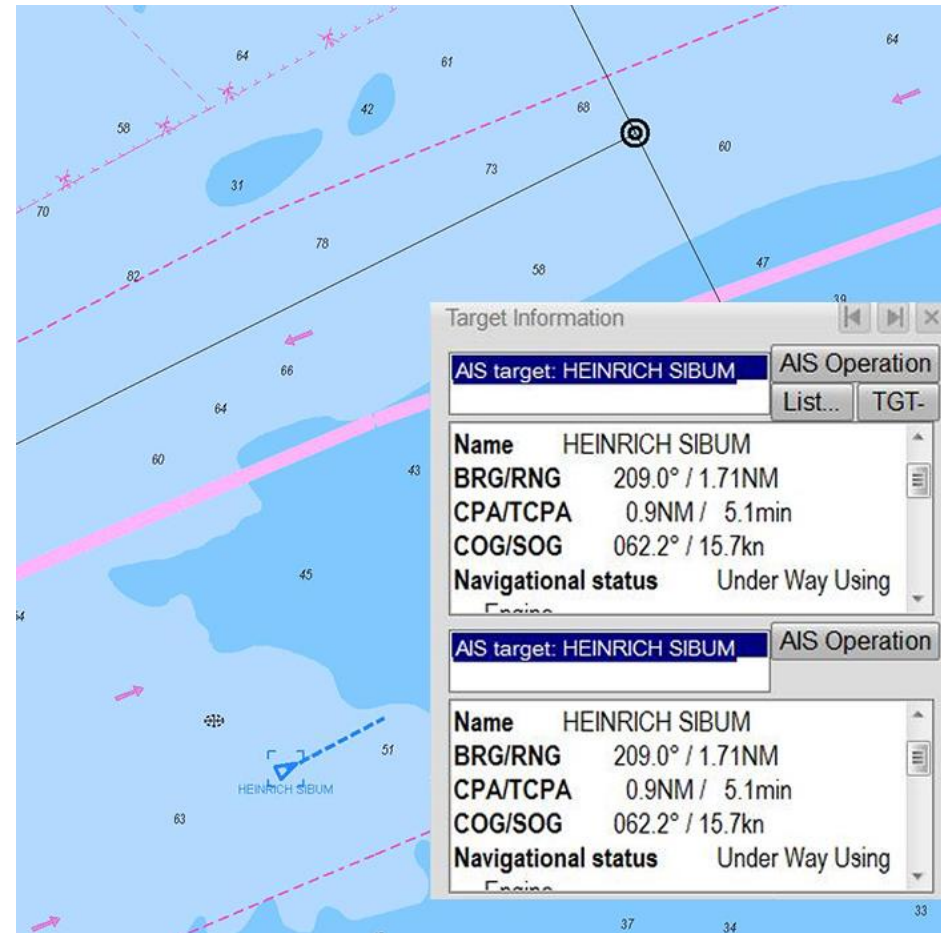
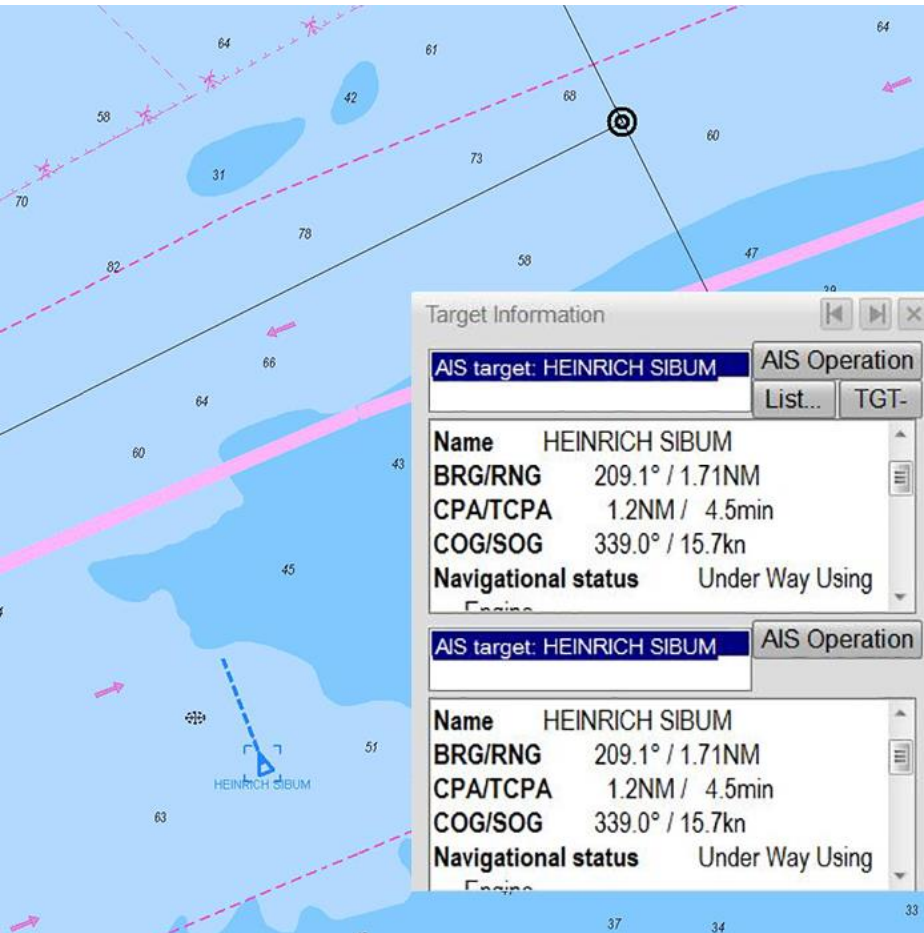
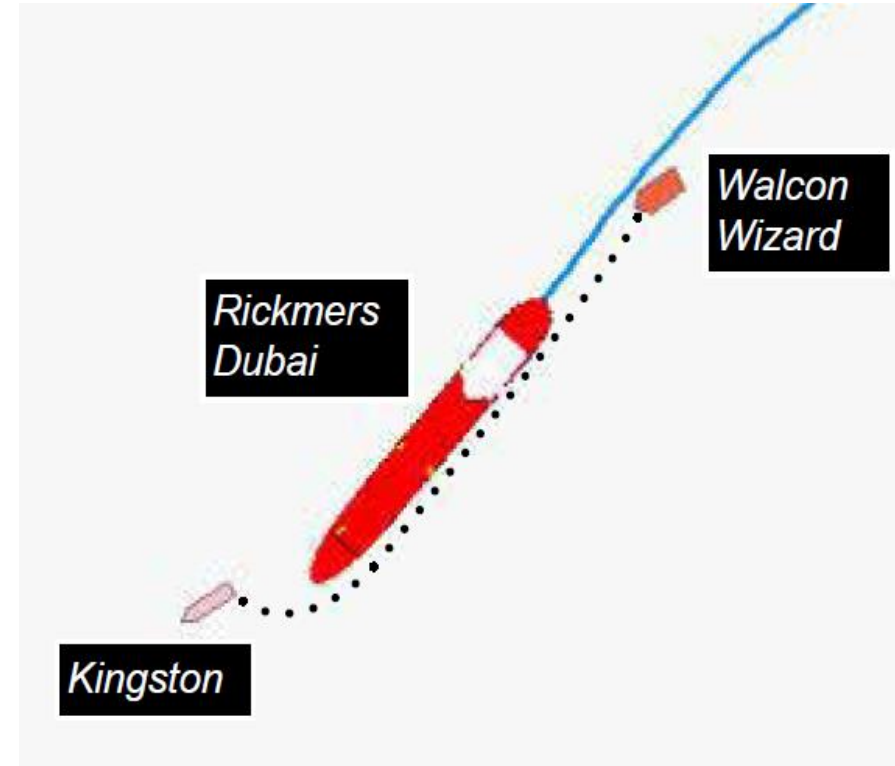
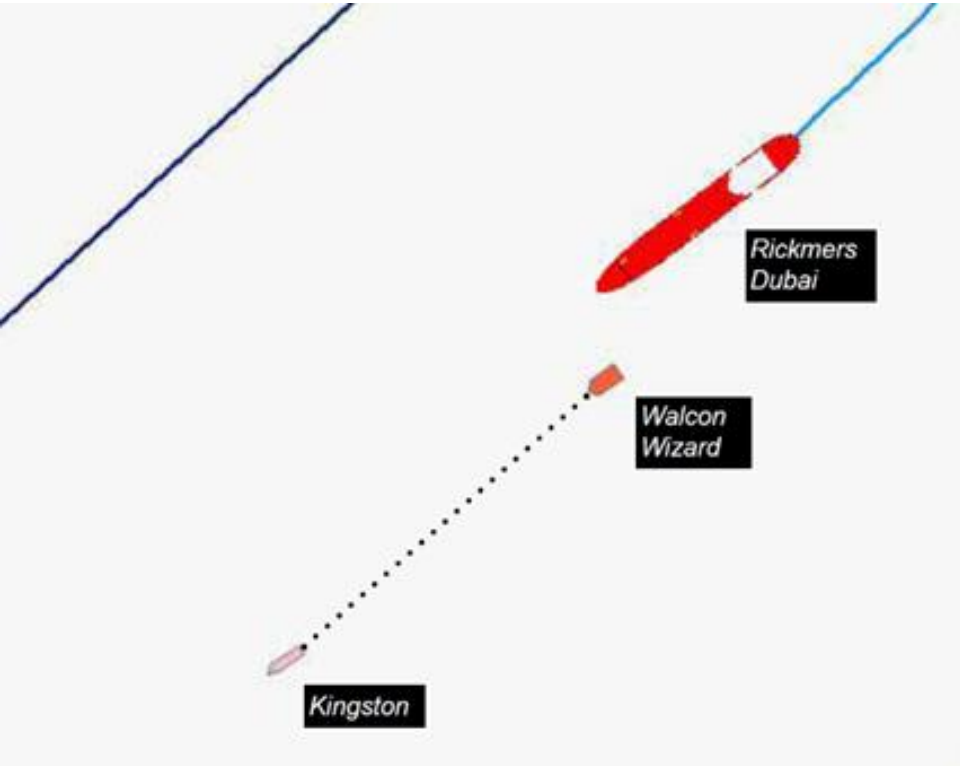


Figure 4.1 – Known GPS vulnerabilities to telecom

GPS og AIS posisjonering



GPS og AIS posisjonering



Takk for oppmerksomheten!

Kontakt meg på:

st@simsea.no / 40 04 85 74

SIMSEA
REAL OPERATIONS