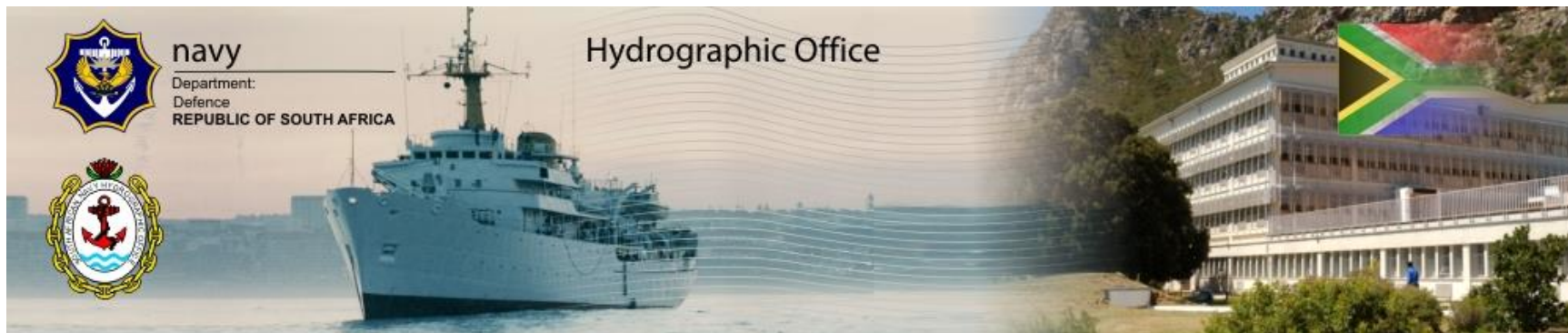




Coastal Reference Levels

South African National Geodesy Workshop

01 - 02 October 2026

Ms Ruth Farre (MSc. Cet. Nat. Sci.)

Superintendent Tidal Information: SA Navy Hydrographic Office



National Act Terminology

- The Maritime Zones Act, Act No. 15 of 1994, provides the following definitions in Section 1, namely:
 - Section 1(iv): *"low-water" means the mean height of low-water for a tidal cycle of 18.6 years.*
 - The IHO Dictionary defines
 - "2944: **low water (L.W.).** The lowest LEVEL reached at a place by the water surface in one OSCILLATION. Also called low tide".
 - "2949: **low water line.** See LOW WATER MARK" and "2951: **low water mark.** The intersection of the plane of LOW WATER with the SHORE. The line along a COAST, or BEACH, to which the SEA recedes at LOW WATER. Also called low water line"



National Act Terminology

- The National Environmental Management: Integrated Coastal Management Act, Act No. 24 of 2008, defines the low-water mark as:
 - *“the lowest line to which coastal waters recede during spring tides”*.
 - This is contradictory to the Maritime Zones Act.



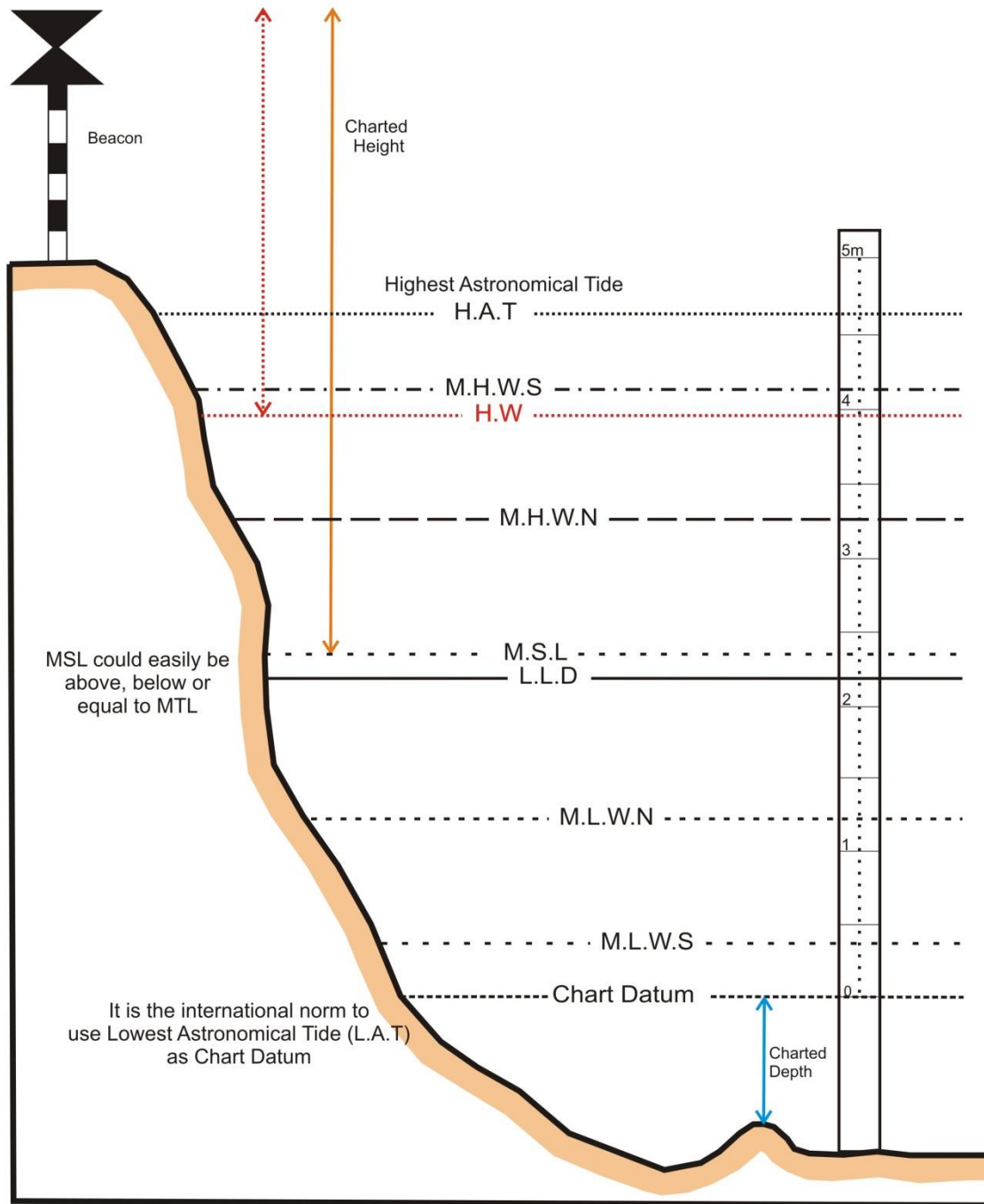
Mean Sea Level

- The average position of sea level across all tidal periods during a 19 year period.
 - Can be calculated over shorter periods.
 - Has a calculable value that is not zero.
 - Varies around the coastline, from location to location.
 - It is not a datum to which altitudes above sea level and depths below it are referred, that is LLD.
 - Is not the same as Land Leveling Datum or LLD Z_0



Hydrographic Zero

- The value of Lowest Astronomical Tide (LAT) is computed from 19 years' predictions.
 - LAT is the lowest level which can be predicted to occur under average meteorological conditions and under any combination of astronomical conditions over an 18,6 year period.
 - LAT is the hydrographic zero (Z_0) or Chart Datum
 - Varies around the coastline and is different at each port.



Tide Gauge Network





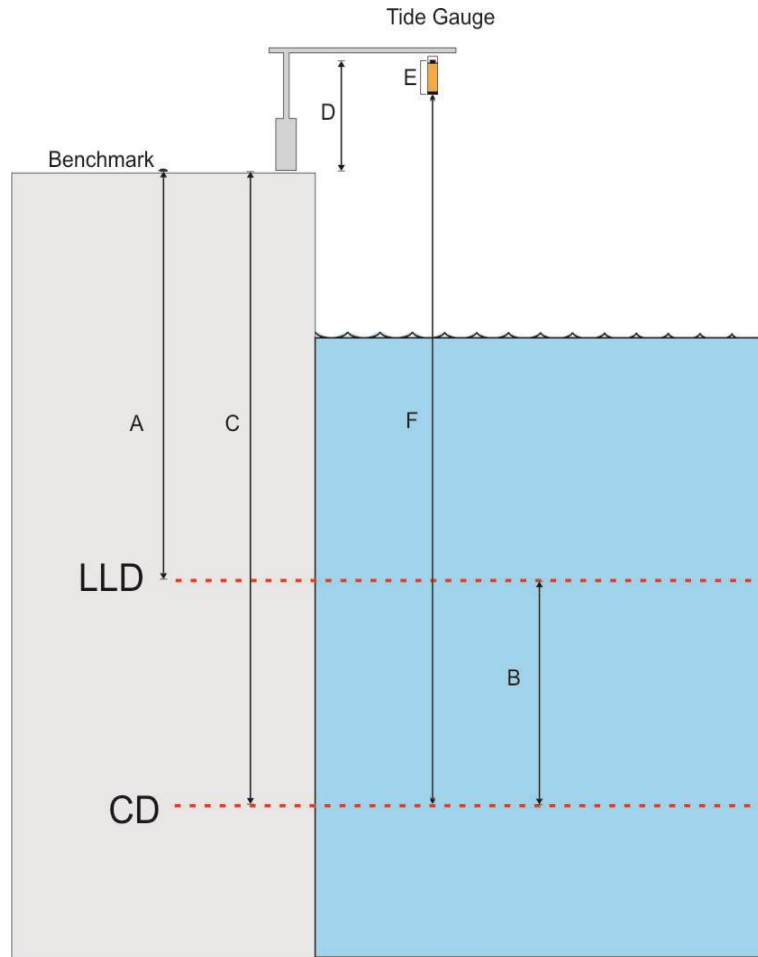
HEIGHTS OF CHART DATUM RELATIVE TO LAND LEVELLING DATUM IN SOUTH AFRICA AND NAMIBIA

Port	Up to 31 Dec 1978	1 Jan 1979 to 31 Dec 1997	1 Jan 1998 to 31 Dec 2002	1 Jan 2003 onwards
Walvis Bay	-0.913	-0.900	-0.966	-0.966
Lüderitz	-0.865*	-0.900	-0.935	-1.055
Port Nolloth	-0.718*	-0.900	-1.075	-0.925
Saldanha	-0.582	-0.900	-0.975	-0.865
Cape Town	-0.829	-0.900	-0.975	-0.825
Simon's Town	-0.651	-0.900	-1.003	-0.843
Hermanus	-0.619	-0.900	-0.978	-0.788
Mossel Bay	-0.761	-0.900	-1.163	-0.933
Knysna	-0.625	-0.900	-1.048	-0.788
Gqeberha (Port Elizabeth)	-0.838	-0.900	-1.026	-0.836
East London	-0.762	-0.900	-1.006	-0.716
Durban	-0.838	-0.900	-1.113	-0.913
Richards Bay	-0.900	-0.900	-1.205	-1.015

*In use until 1 January 1994.



Determining the Tide Gauge Zero



A = Height of a nearby benchmark above Land Levelling Datum (LLD)

B = Chart Datum (CD)/ LAT below LLD

D = Is now the difference in “ground height” between the benchmark and the top of the transducer (before installation this would be the height of the davit or structure)

E = The length of the transducer to the face

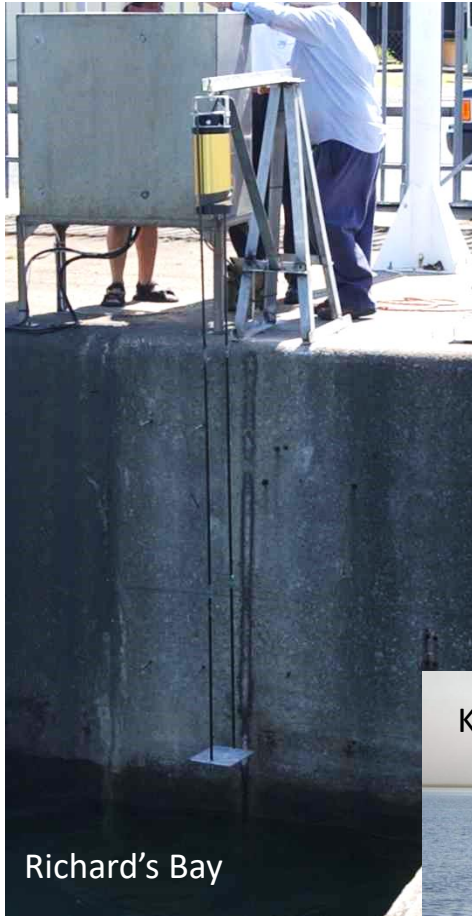
Thus **C = A + B** which is the Height of the benchmark above CD

So the temporary reference level or tide gauge zero could be calculated as being

$$C + D - E = F$$



Calibration Stirrups





Confirming the Tide Gauge Zero

<u>Tide G</u>	<u>Tide Gauge</u>
1.7383	0.6498
1.7383	0.6498
1.7384	0.6498
1.7383	0.6498
1.7383	0.6492
1.7382	0.6492
1.7382	0.6498
1.7382	0.6498
1.7383	0.6498
1.7386	0.6497
1.7383	0.6497
1.7383	0.6497
1.7384	0.6497
1.7383	0.6497

Difference= 1.0886

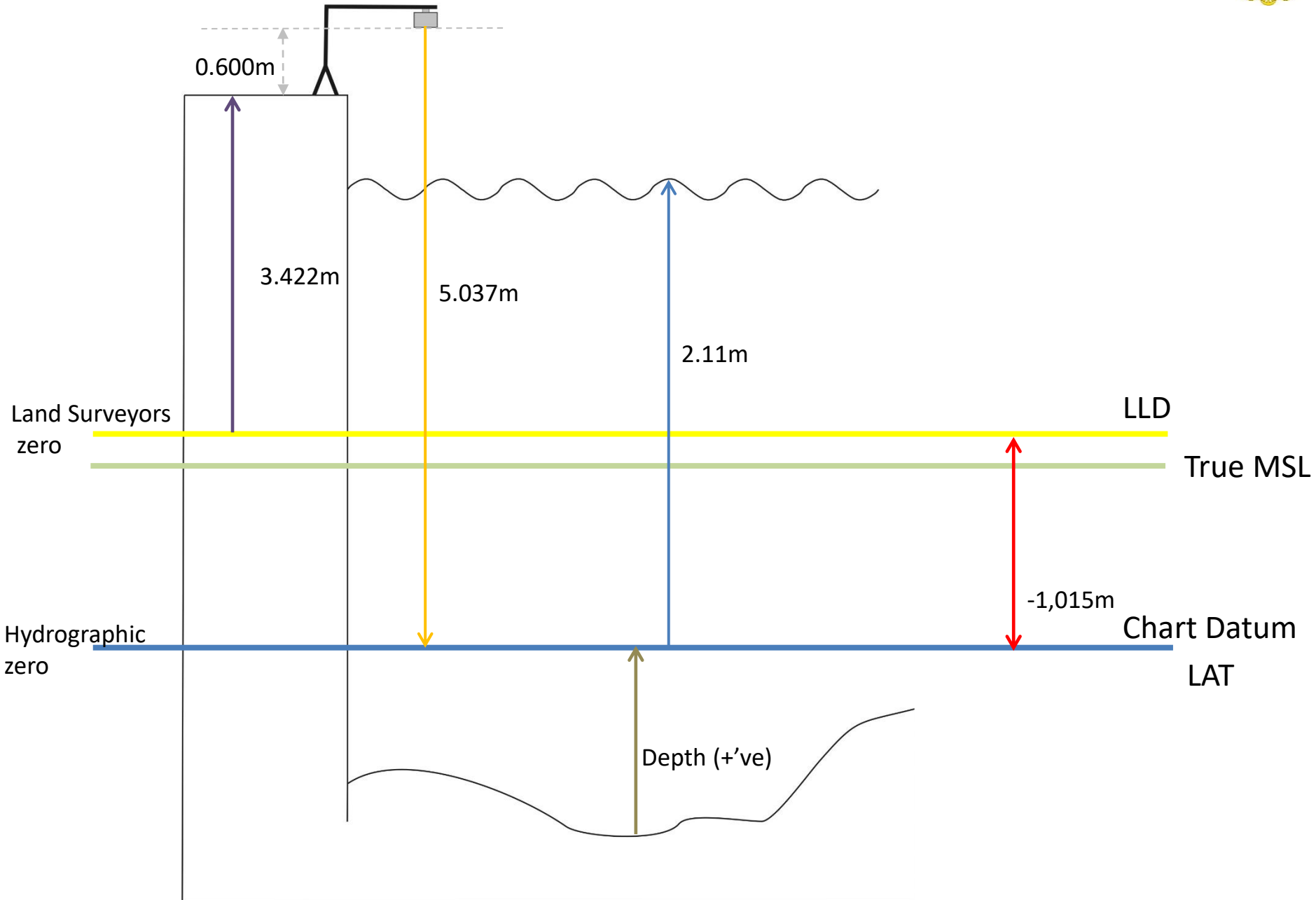


	<u>Tide G</u>
Height of Bmark above MSL	2.8120
Diff B/Box and Bmark	1.0836 (minus 5mm for calibration plate)
Less: to Tx Face	-0.1170
Thus ref face =	3.7786
new CD	0.9130
Height of ref face above CD	4.6916

- ∴ TG should read @ short stay = 2.0586m
 ≈ 2.059m
- ∴ TG should read @ long stay = 1.0586
 ≈ 1.059m

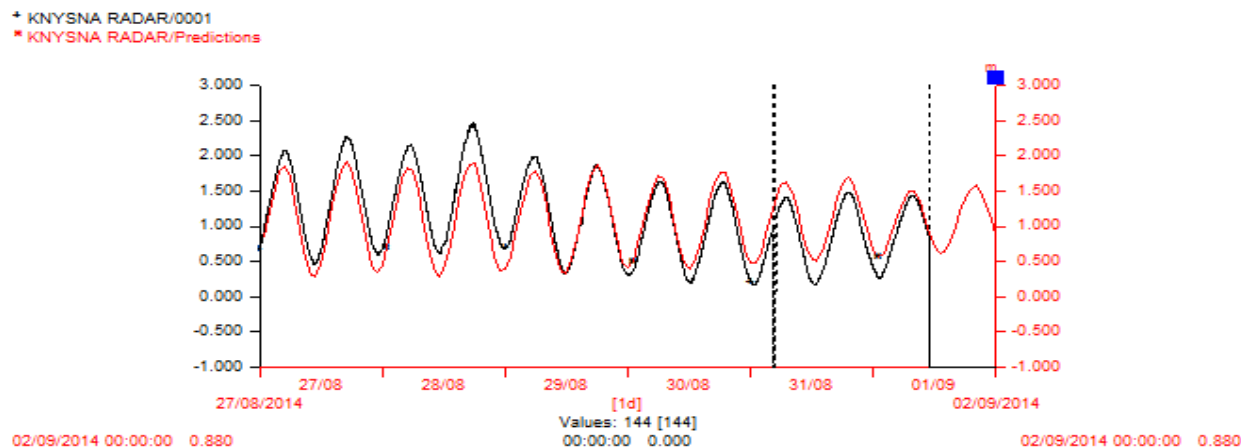


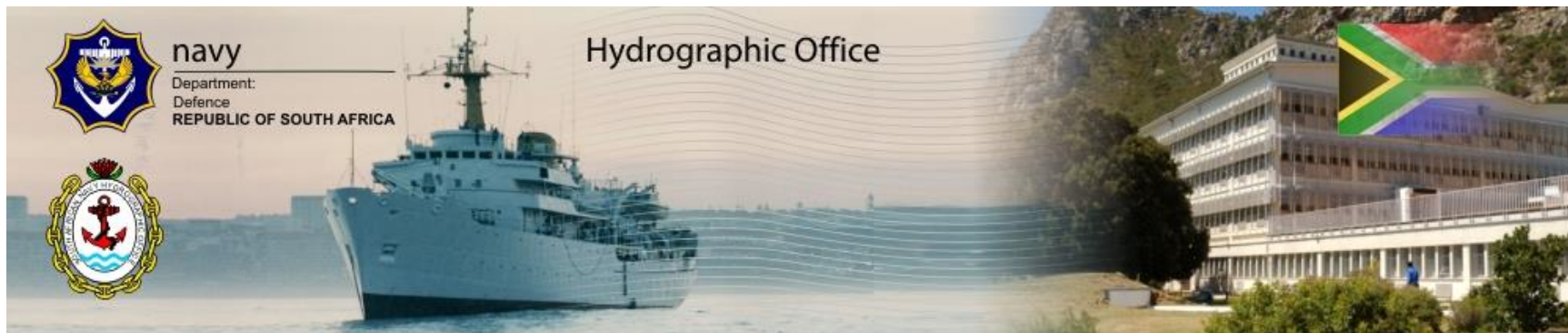
Richards Bay





- NB: meteorological conditions can cause considerable differences between predicted and actual tides
 - **Atmospheric pressure.** Variations of atmospheric pressure cause the level of the sea to change by approximately 1cm per millibar.
 - **Wind.** The effect of wind depends on the topography in question. In general strong onshore winds pile up the water and offshore winds will lower it.





Thank you.