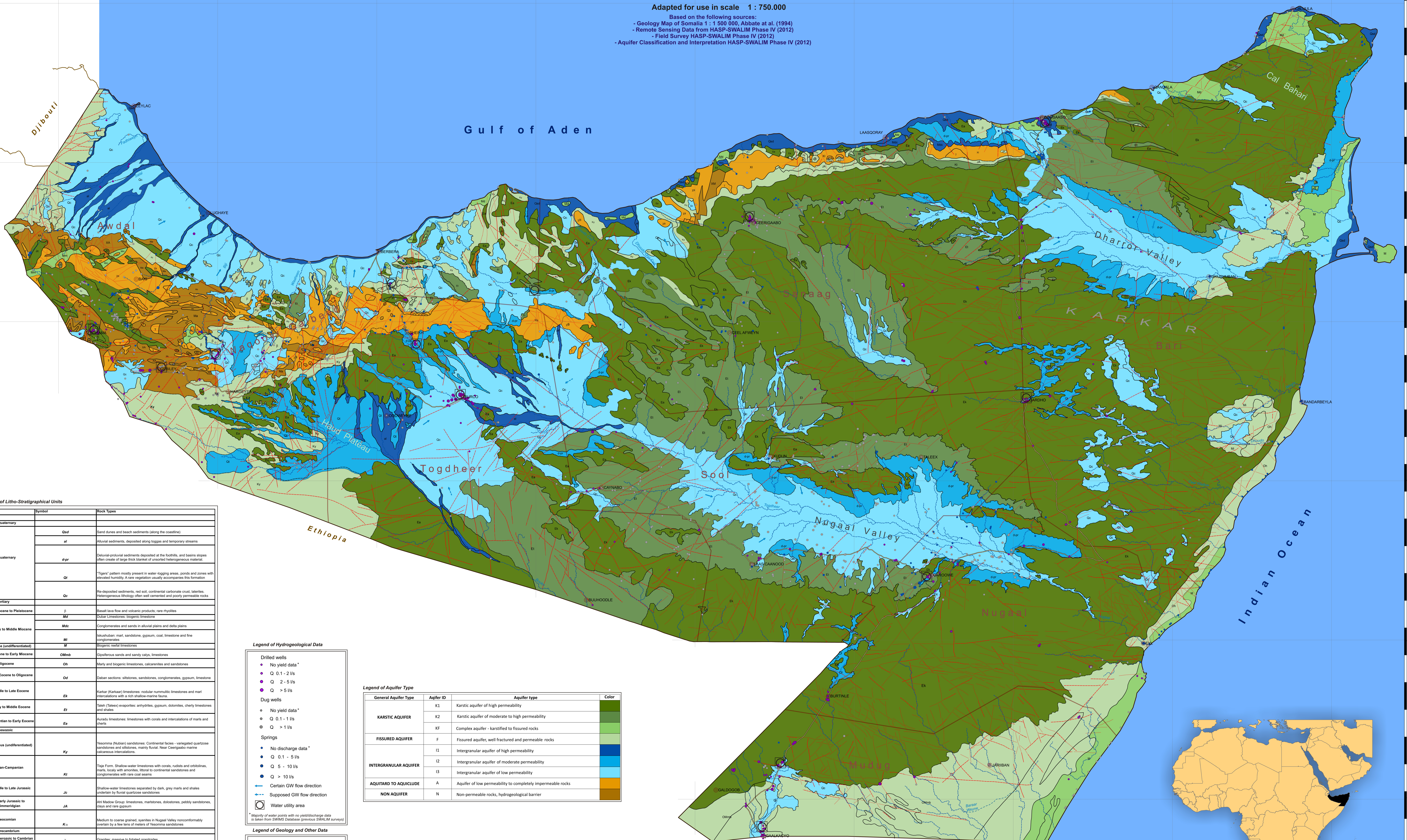


Annex I - REGIONAL HYDROGEOLOGICAL MAP OF SOMALILAND AND PUNTLAND

25 12.5 0 25 50 75 100 Kilometers

Adapted for use in scale 1 : 750.000

Based on the following sources:
 - Geology Map of Somalia 1 : 1 500 000, Abbate et al. (1994)
 - Remote Sensing Data from HASP-SWALIM Phase IV (2012)
 - Field Survey HASP-SWALIM Phase IV (2012)
 - Aquifer Classification and Interpretation HASP-SWALIM Phase IV (2012)



Legend of Litho-Stratigraphical Units

Symbol	Rock Types
Quaternary	
Qsd	Sand dunes and beach sediments (along the coastline)
al	Alluvial sediments, deposited along toggas and temporary streams
Qd-pr	Deluvial-proluvial sediments deposited at the foothills, and basins slopes often create of large thick blanket of unsorted heterogeneous material
Qt	"Tiger" pattern mostly present in water-logging areas, ponds and zones with elevated humidity. A rare vegetation usually accompanies this formation
Qc	Re-deposited sediments, red soil, continental carbonate crust, laterites. Heterogeneous lithology often well cemented and poorly permeable rocks
Tertiary	
Late Miocene to Pliocene	
pl	Basalt lava flow and volcanic products, rare mylonites
MG	Dubur Limestones, biogenic limestone
Early to Middle Miocene	
Mdc	Conglomerates and sands in alluvial plains and delta plains
Ml	Isakhubun: marl, sandstone, gypsum, coal, limestone and fine conglomerates
Mf	Biogenic nodular limestones
Oligocene to Early Miocene	
Qmb	Clayey sands and sandy clays, limestones
Oligocene	
Qm	Mary and biogenic limestones, calcarenites and sandstones
Middle Eocene to Oligocene	
Qd	Duban sections: siltstones, sandstones, conglomerates, gypsum, limestone
Middle to Late Eocene	
Ek	Karkar (Karkar) limestones: nodular nummulitic limestones and marl intercalations with a rich shallow-marine fauna
Early to Middle Eocene	
Et	Talin (Talin) evaporites: anhydrites, gypsum, dolomites, cherty limestones and shales
Maastrichtian to Early Eocene	
Ea	Auradu limestones: limestones with corals and intercalations of marls and shales
Mesozoic	
Cretaceous (undifferentiated)	
Ky	Yasomma (Yasomma) sandstones: Continental facies - variegated quartzose sandstones and siltstones, mainly fluvial. Near Cretaceous marine calcareous intercalations.
Aptian-Campanian	
Kf	Trip Form: Shallow-water limestones with corals, rudists and trilobites. Marls, locally with ammonites, littoral to continental sandstones and conglomerates with rare coal seams
Middle to Late Jurassic	
Jc	Shallow-water limestones separated by dark, grey marls and shales underlain by fluvial quartzose sandstones
Early Jurassic to Kimmeridgian	
JA	Alf Meadow Group: limestones, marlstones, dolomites, pebbly sandstones, clays and rare gypsum
Neocomian	
Kc	Medium to coarse grained, siltstones in Nugaal Valley nonconformably overlain by a few tens of meters of Yasomma sandstones
PreCambrian	
Late Proterozoic to Cambrian	
g	Granites, massive to foliated granitoids
Late Proterozoic	
Xf	Inda Ad Complex: low grade metacalcs, with interbedded pillow marbles
XW	Mejth Complex: gneiss metacalcs, with interbedded pillow metabasalts
XA	Abudhadir Complex: metapelites, with acids and basic metavolcanic
Xt	Siltstones and metagabbros
Xv	Granites
Mu	Marbles and related rocks
Mg	Biotope and/or amphibole schists
Mq	Quartz-feldspar schists and quartz-rich gneisses
Mu	Migmatites rich in amphibole and marble intercalations
z b	Gabi Bahar Complex: Migmatites rich in biotites and granitoid patches, minor gneisses including local granular rocks

Legend of Hydrogeological Data

- Drilled wells
 - No yield data *
 - Q 0.1 - 2 l/s
 - Q 2 - 5 l/s
 - Q > 5 l/s
 - Dug wells
 - No yield data *
 - Q 0.1 - 1 l/s
 - Q > 1 l/s
 - Springs
 - No discharge data *
 - Q 0.1 - 5 l/s
 - Q 5 - 10 l/s
 - Q > 10 l/s
 - Certain GW flow direction
 - Supposed GW flow direction
 - Water utility area
- *Majority of water points with no yield/discharge data is taken from SWAG Database (previous SWALIM surveys)

Legend of Geology and Other Data

- Geology
 - Certain geological boundary
 - Approximated geological boundary
 - Fault - certain
 - Fault - approximated
- Other data
 - Major road
 - Drainage network (Major Toggas)
 - District capitals
 - Regions

Legend of Aquifer Type

General Aquifer Type	Aquifer ID	Aquifer type	Color
KARSTIC AQUIFER	K1	Karstic aquifer of high permeability	Dark Green
	K2	Karstic aquifer of moderate to high permeability	Light Green
	Kf	Complex aquifer - karstified to fissured rocks	Yellow-Green
FISSURED AQUIFER	F	Fissured aquifer, well fractured and permeable rocks	Blue-Green
	I1	Intergranular aquifer of high permeability	Light Blue
	I2	Intergranular aquifer of moderate permeability	Medium Blue
INTERGRANULAR AQUIFER	I3	Intergranular aquifer of low permeability	Dark Blue
	A	Aquifer of low permeability to completely impermeable rocks	Orange
NON AQUIFER	N	Non-permeable rocks, hydrogeological barrier	Dark Orange

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 Map description: Map was created in ArcGIS 10.0 software.
 Map is a part of HGM02011SWALIM relational Data Base with all attributes

