The Water Resources of The Bahamas

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The early sources of water supply

Natural sinkholes, karst features, and ponds.

The early sources of water supply cont'd

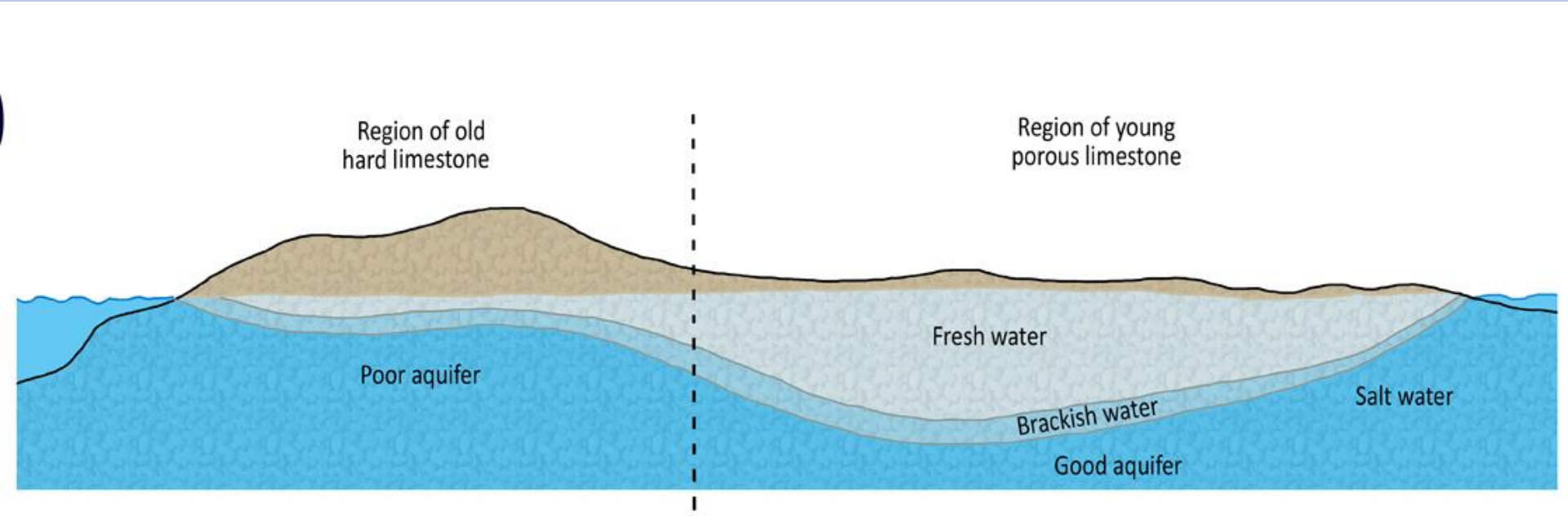
Rainwater collection - Public and private facilities common.

The early sources of water supply cont'd

Shallow dug wells - Common features of all old communities.

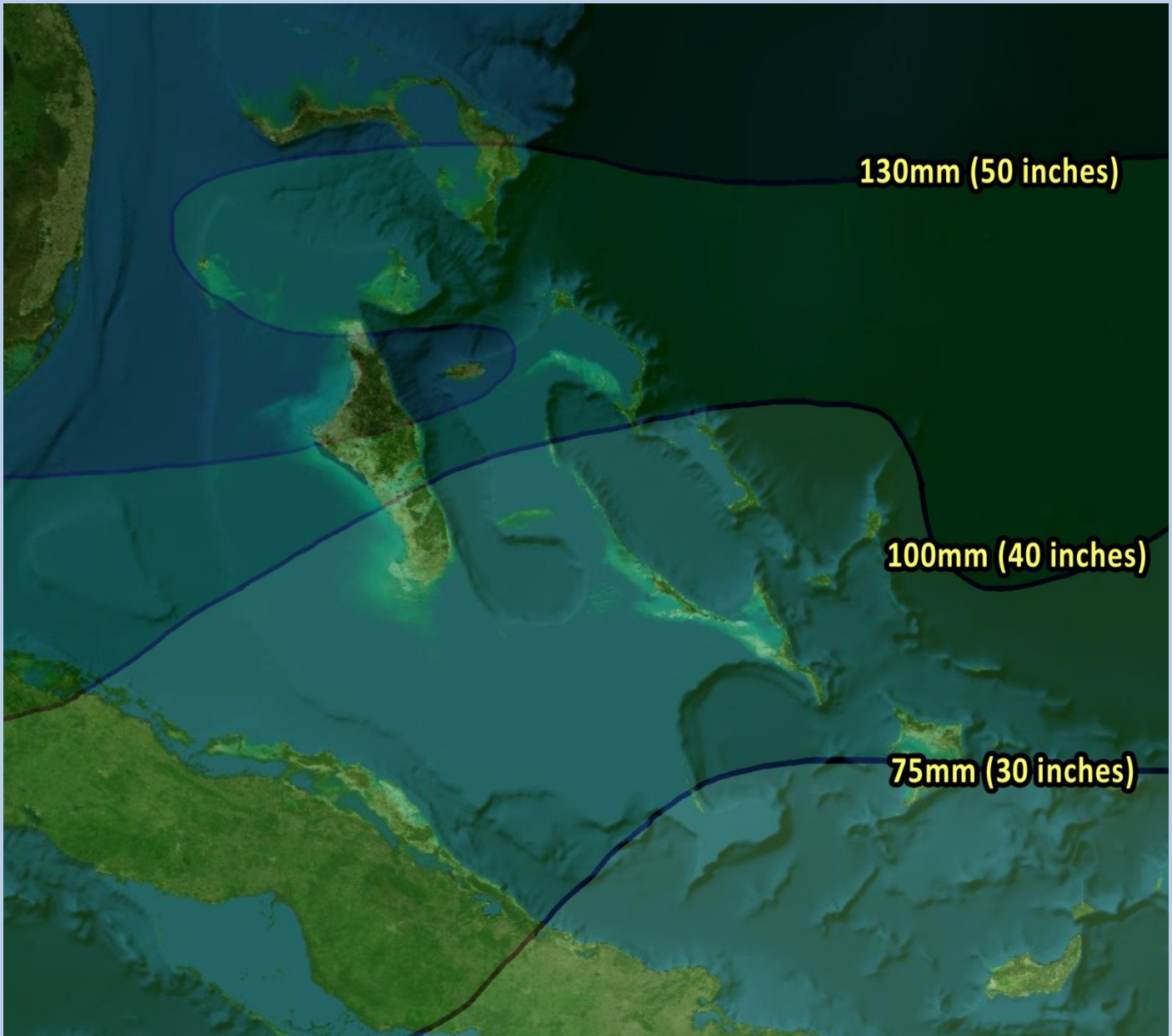
Natural resources exploited

Bahamian freshwater lens – Ghyben-Hertzberg Lens



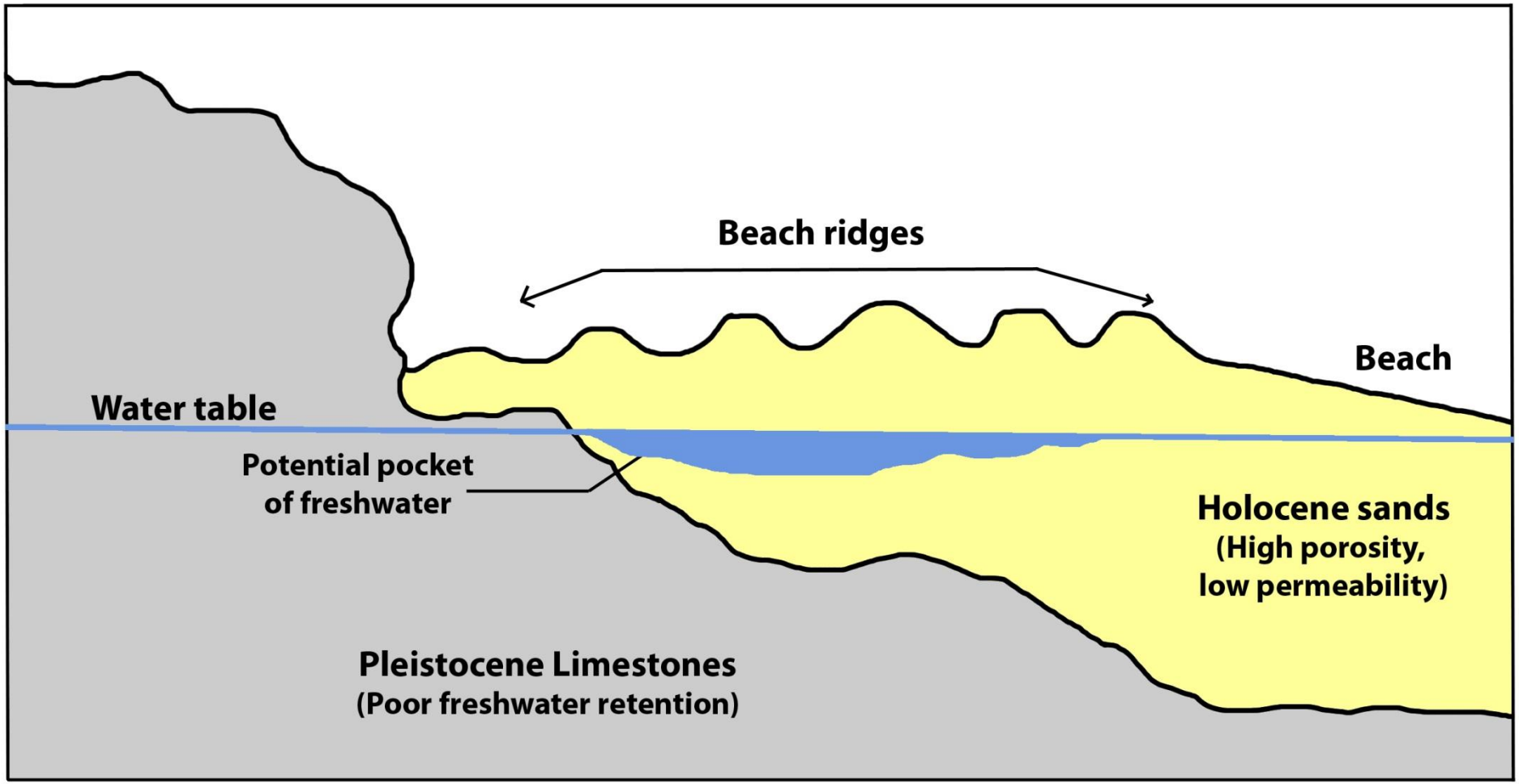
Natural resources exploited cont'd

Rainfall distribution across The Bahamas (1961-1990)

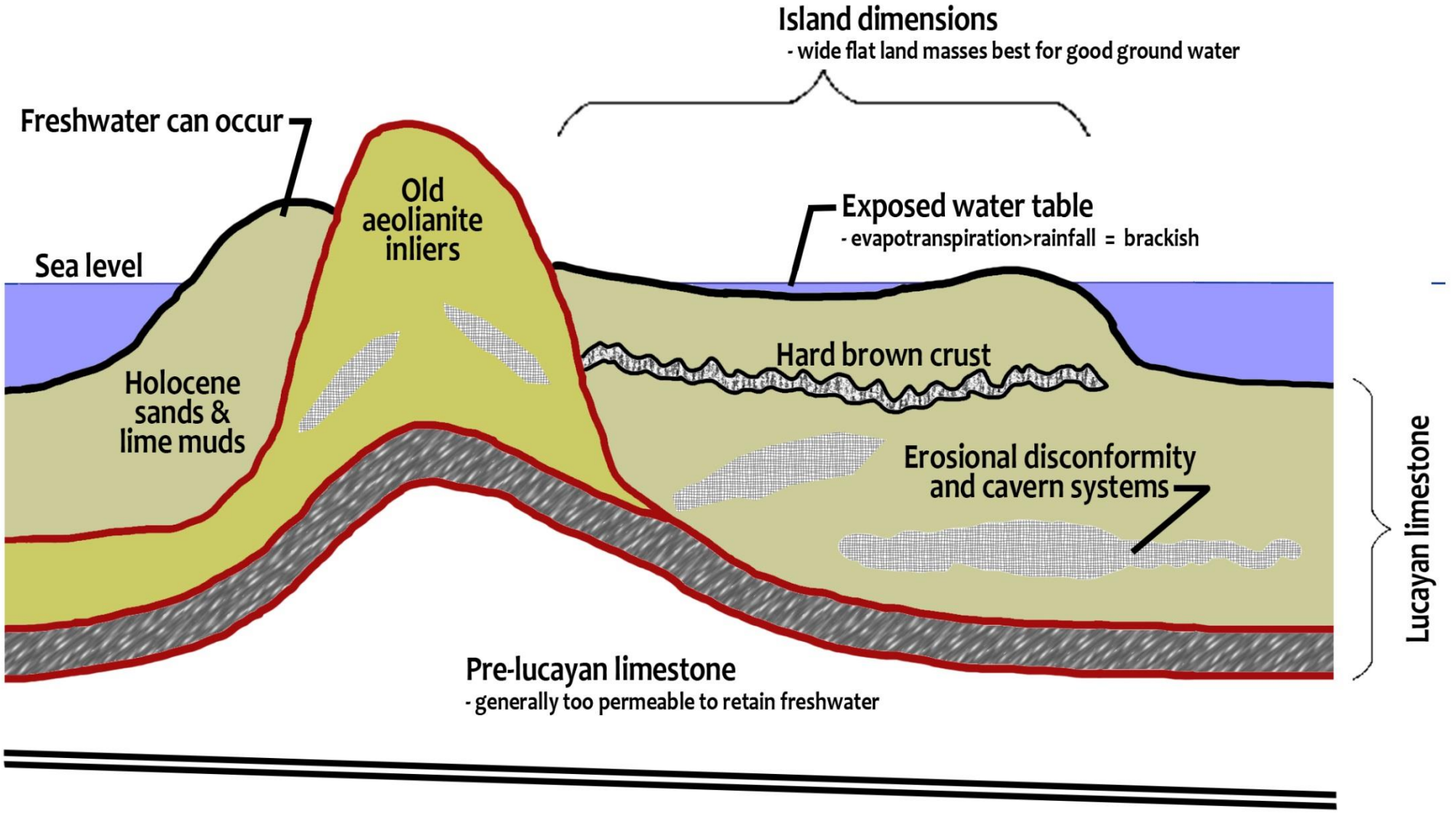


Natural resources exploited cont'd

Situation where a small pocket of freshwater can occur on a very small cay, or in an island with Holocene sands.



Geological controls of Freshwater Lens Development



Water resource investigations

Random well excavation

A technology applied for over 200 years. Often included locations where there was no hope of finding freshwater.

Localized Government and private development investigations

These were randomly carried out and generally did not include standard hydrological procedures or evaluations.

More significant studies

These did include standard hydrological procedures and the best examples include:

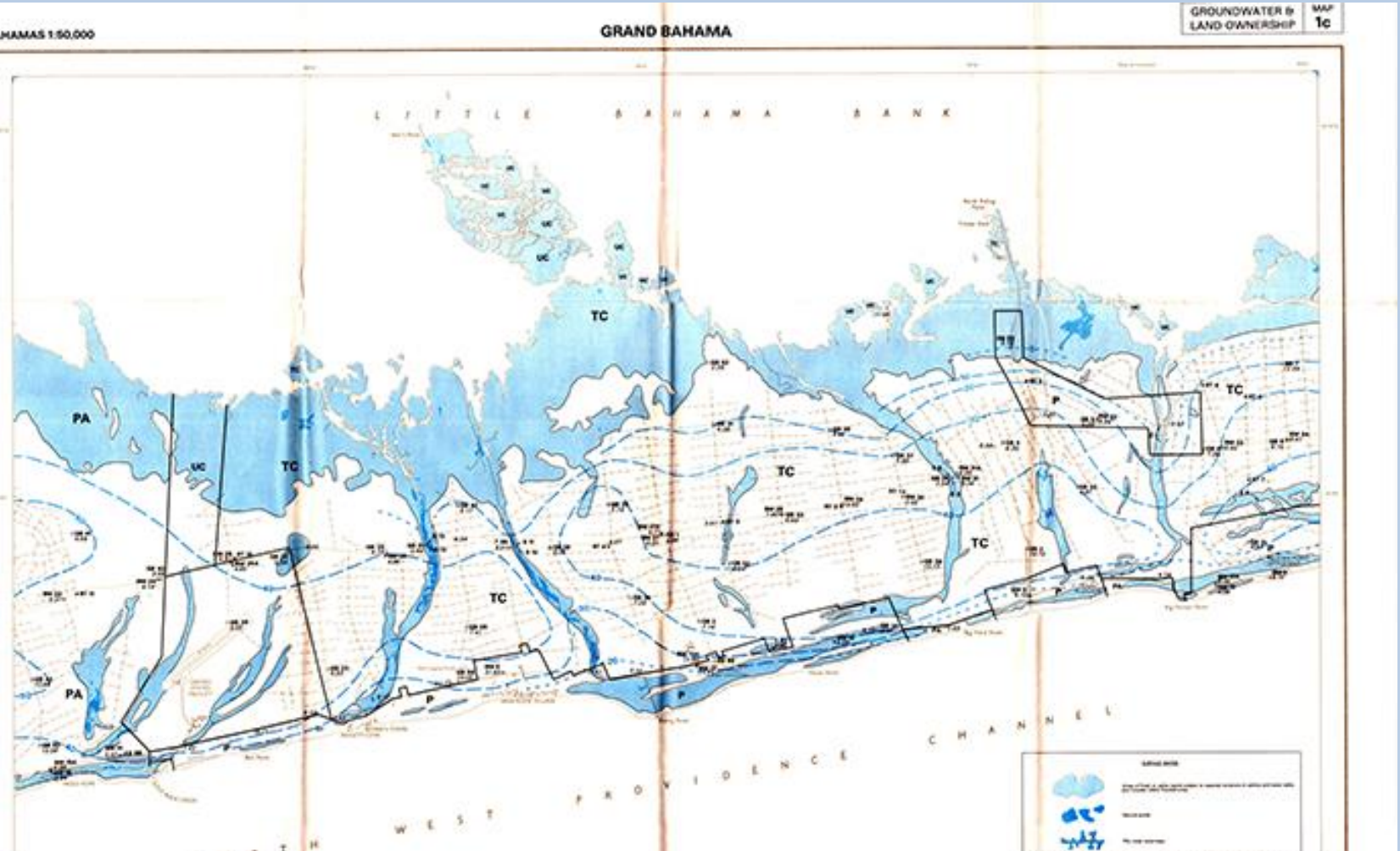
i. Klein, Hoy, and Sherwood's 1958 water resource studies in the vicinity of the U.S Air Force Bases in the Bahamas;

ii. Ebasco Services 1964 water study in New Providence, and

iii. Guyton and Associates 1966 water resource study in Abaco.

Water resource investigations cont'd

The Bahamas Land Resources Survey (BLRS) 1969 – 1975.
At the time this included a state-of-the-art hydrogeological study of all the major islands in the Bahamas.

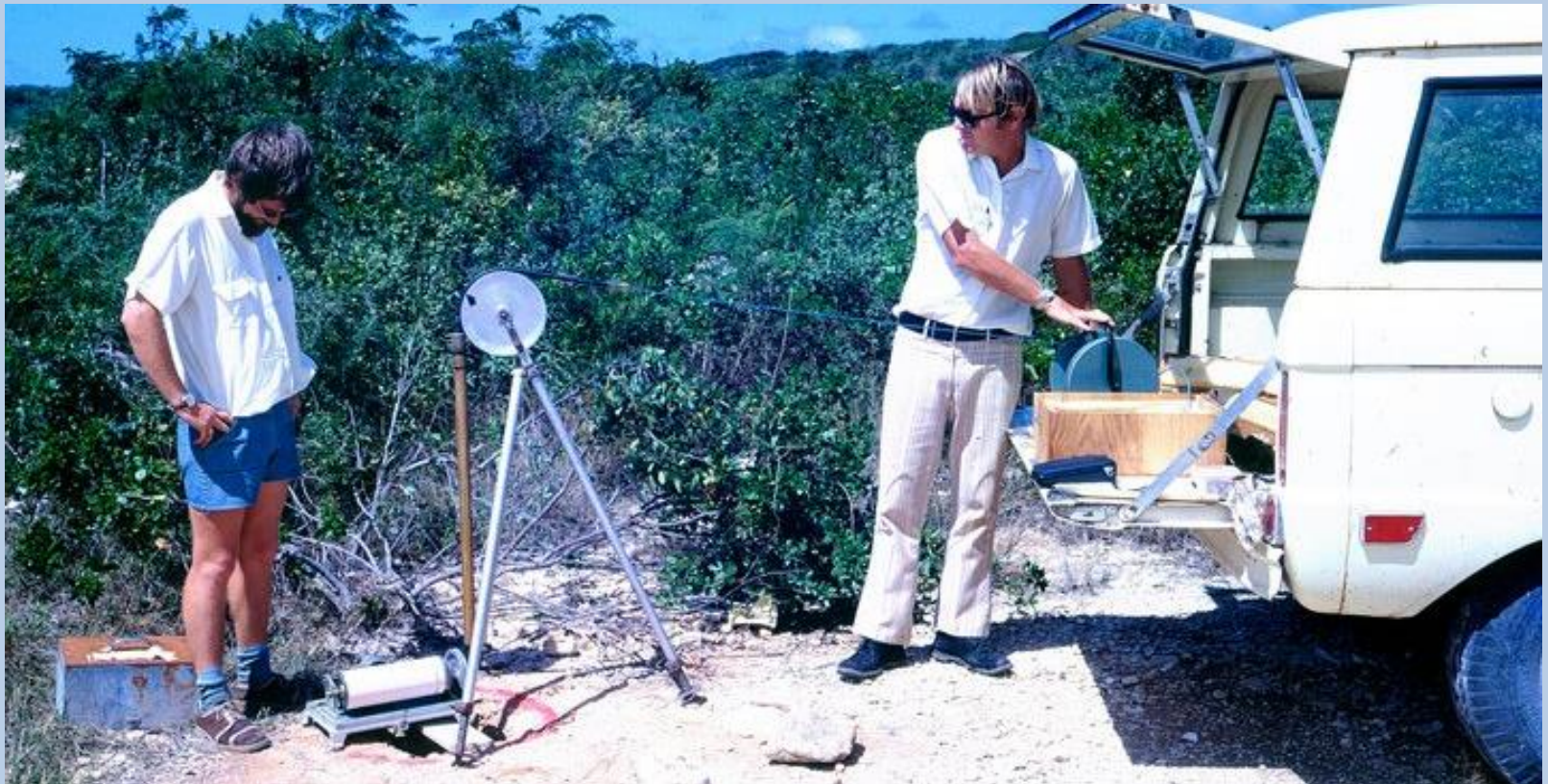


Example of maps produced

Water resource investigations cont'd

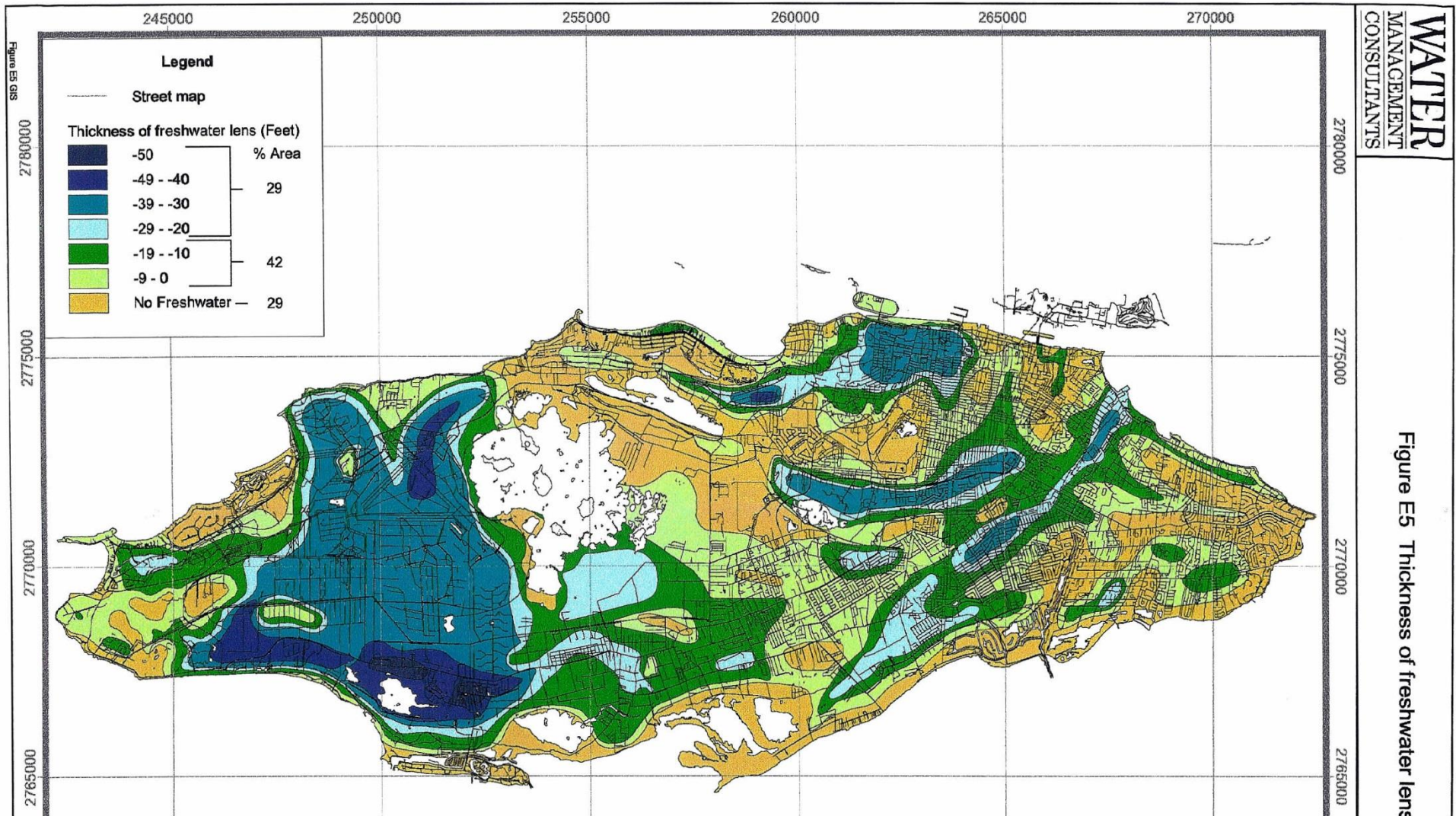
The Ministry of Works and the Water and Sewerage Corporation's water resource investigations of the islands and cays not covered by the BLRS

1975 and ongoing. Included San Salvador, South Bimini, South Andros, the Exuma Cays, Moores Island, and Rum Cay.



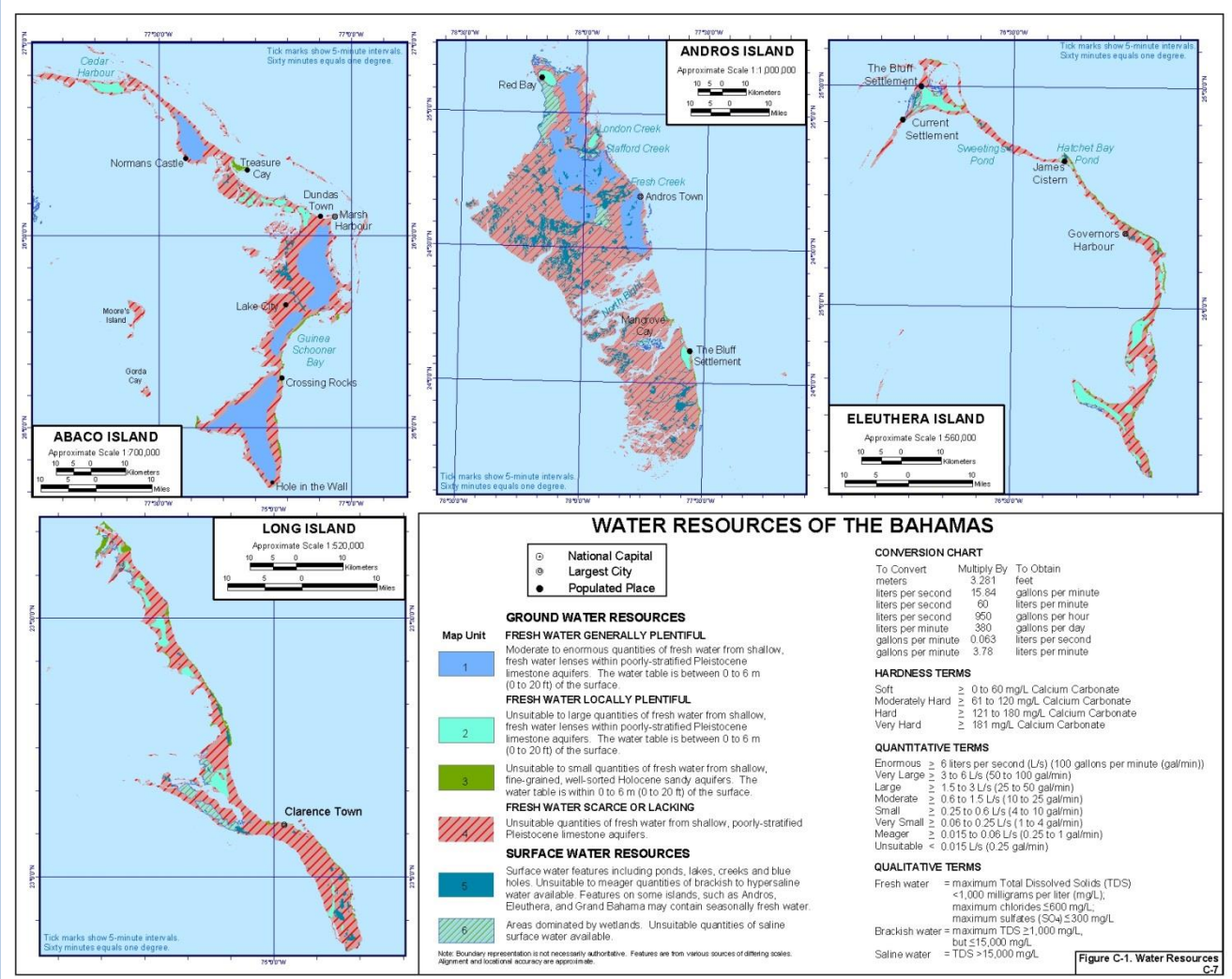
Water resource investigations cont'd

The UNDP/Bahamas Government Groundwater studies in New Providence. 1976 – 1984.



Water resource investigations cont'd

The U.S. Army Corp's of Engineers' 2004 Water Resources Assessment of the Bahamas.



Comparison of the water resources of the main islands

The Bahamas Land Resources Survey 1980

Acreage and volumes of freshwater comparing 13 Bahamian islands

ISLAND	FRESHWATER LENS ACREAGE	APPROX. VOL. OF WATER STORED IN THE LENS (IN M^3)	MAX. VOL. THAT COULD BE ABSTRACTED DAILY (GALLONS)
Abaco*	116,280	1,235,000,000	79,070,400
Acklins+	15,783	63,566,000	4,356,000
Andros*	338,585	4,307,000,000	209,922,700
Bimini**	395	1,218,000	169,850
Cat Island*	14,774	130,916,000	6,796,040
Crooked Island+	5,923	19,490,000	1,736,000
Eleuthera*	16,599	146,816,000	8,133,510
Exuma*	6,586	42,081,000	2,897,840
Grand Bahama*	147,884	1,543,000,000	93,166,920
Great Inagua+	3,571	7,964,000	857,040
Long Island+	9,301	26,231,000	2,883,310
Mayaguana+	2,340	5,772,000	645,840
New Providence*	17,503	120,448,000	9,626,650
TOTALS	695,524	7,649,502,000	424,262,100

Comparison of the water resources of the main islands cont'd

Comparison of water resources of land areas and populations.

Island	Lens Area / Total Land Area	Rating	Vol. of Water In M^3 (x1000) / Total Land Area	Rating	Water Available gpd / Population (1970)	Rating
Abaco	.28	4	2.97	3	12,162	2
Acklins	.167	5	.67	7	4,653	3
Andros	.367	2	4.67	1	23,733	1
Bimini	.068	10	.21	10	113	12
Cat Island	.154	6	1.36	5	2,557	5
Crooked Island	.1	8	.33	9	2,519	6
Eleuthera	.13	7	1.14	6	859	8
Exumas	.092	9	.58	8	769	10
Grand Bahama	.436	1	4.54	2	3,602	4
Great Inagua	.01	13	.02	13	772	9
Long Island	.032	12	.09	11	746	11
Mayaguana	.033	11	.08	12	1,111	7
New Providence	.34	3	2.35	4	94	13

Comparison of the water resources of the main islands cont'd

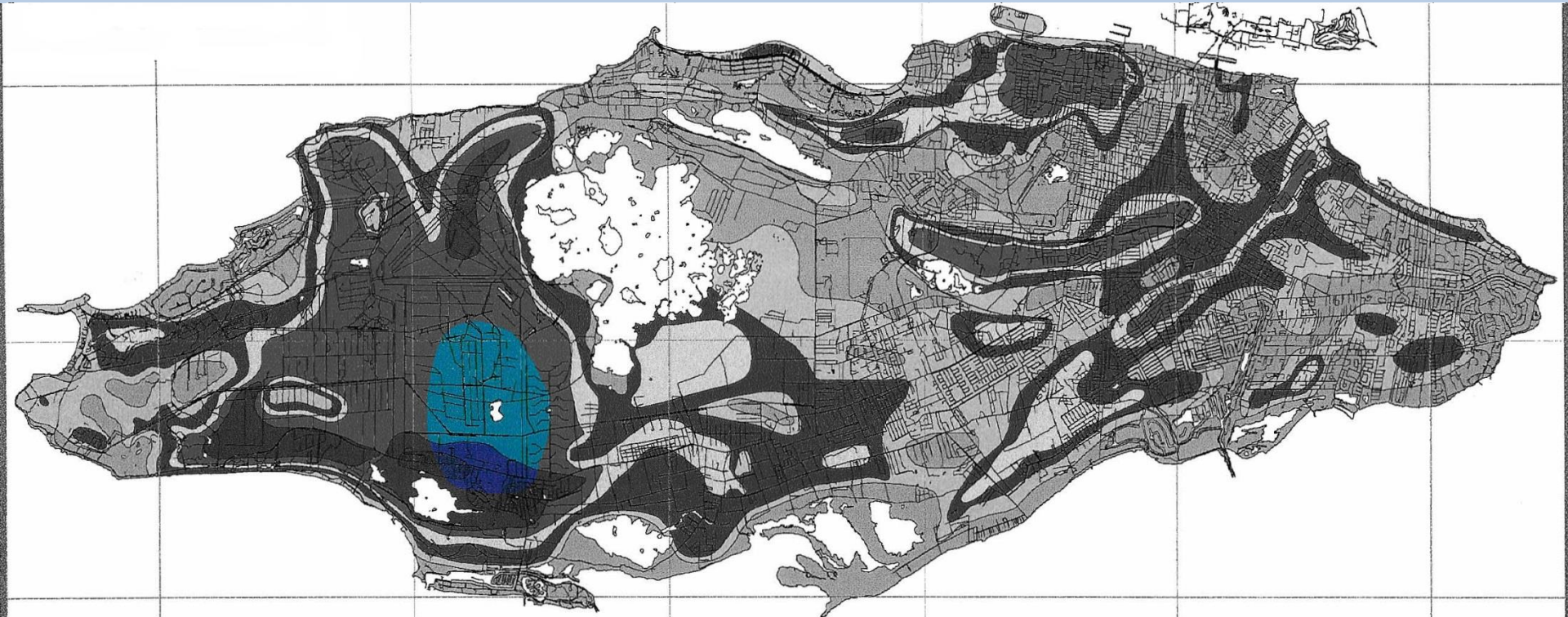
Name of Area	Max. Lens Thickness (ft)	Average Lens Thickness (ft)	Approx. Acreage Lens> 20 ft Thick	Approx. Vol. of water M^3 Assuming 20% porosity where lens > 20 ft
Blair and Pinewood Gardens	36	25	1,208	7,450,000
East of Sea Breeze	23	20	45	222,000
South Beach	24	20	893	4,406,000
Golden Gates	22	20	125	616,000
Blue Hills Ridge	37	25	1,010	6,229,000
Prospect to Grants Town	30	25	1,415	8,727,000
Cow Pen Road	25	20	100	493,000
South Lake Killarney	25	20	707	3,489,000
Western New Providence	50	30	12,000	88,816,000
		TOTAL	17,503	120,448,000

Data obtained for New Providence.

Historical record of resource utilization

New Providence

- Piping in NP started in 1928.
- First using Blue Hills wellfield, then Prospect , Perpalls, Windsor, and finally the wellfields known collectively as Southwest Wellfields.
- In New Providence desalinated sources of supply were first provided in 1960
- Water barged from Andros 1976 – 2011



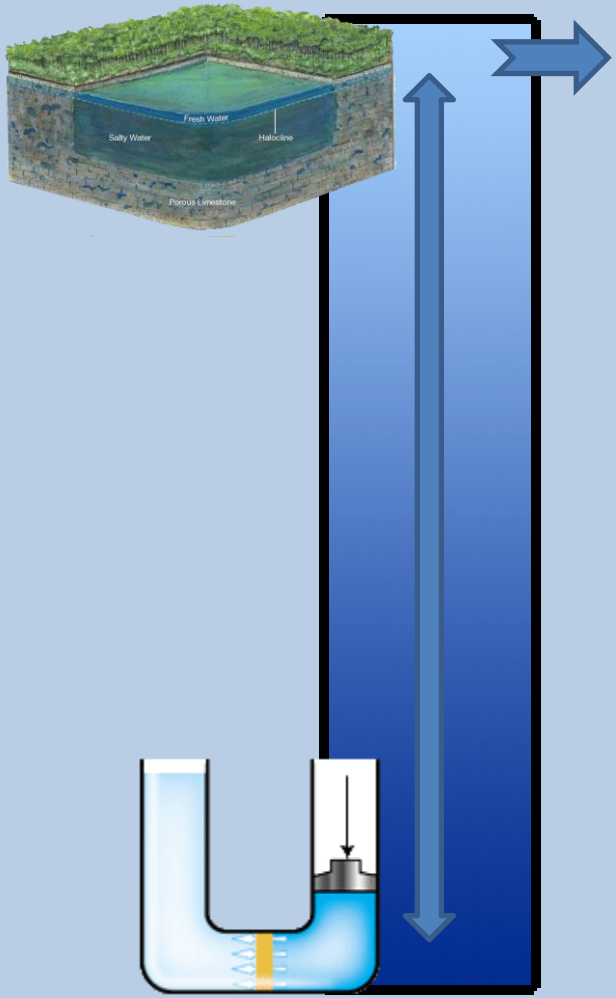
Historical record of resource utilization cont'd

The Family Islands

- Piped water supplies were first provided in Eleuthera, and then Exuma.
- By 1970 there were piped supplies in most of Eleuthera, and parts of Exuma, Abaco, Andros, Grand Bahama, Long Island, Acklins, Mayaguana, and Ragged Island.

The Present Situation

Reliance on ground water



Grand Bahama, Abaco and Andros.

Eleuthera, Acklins and Long Island.

Inagua, Bimini, Long Cay, San Salvador, the Exumas, Current Island, Moores Island, Sweetings Cay and Grand Cay.

Reliance on reverse osmosis

The Present Situation cont'd

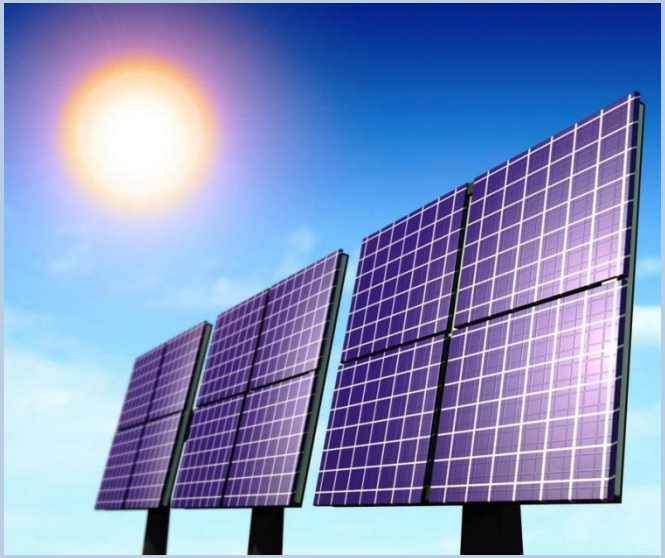
Islands or areas without piped water

All of Cat Island, much of Long Island, South Andros, Crooked Island, Rum Cay, and many of the Abaco cays.

The Present Situation cont'd

There is a trend towards Reverse Osmosis

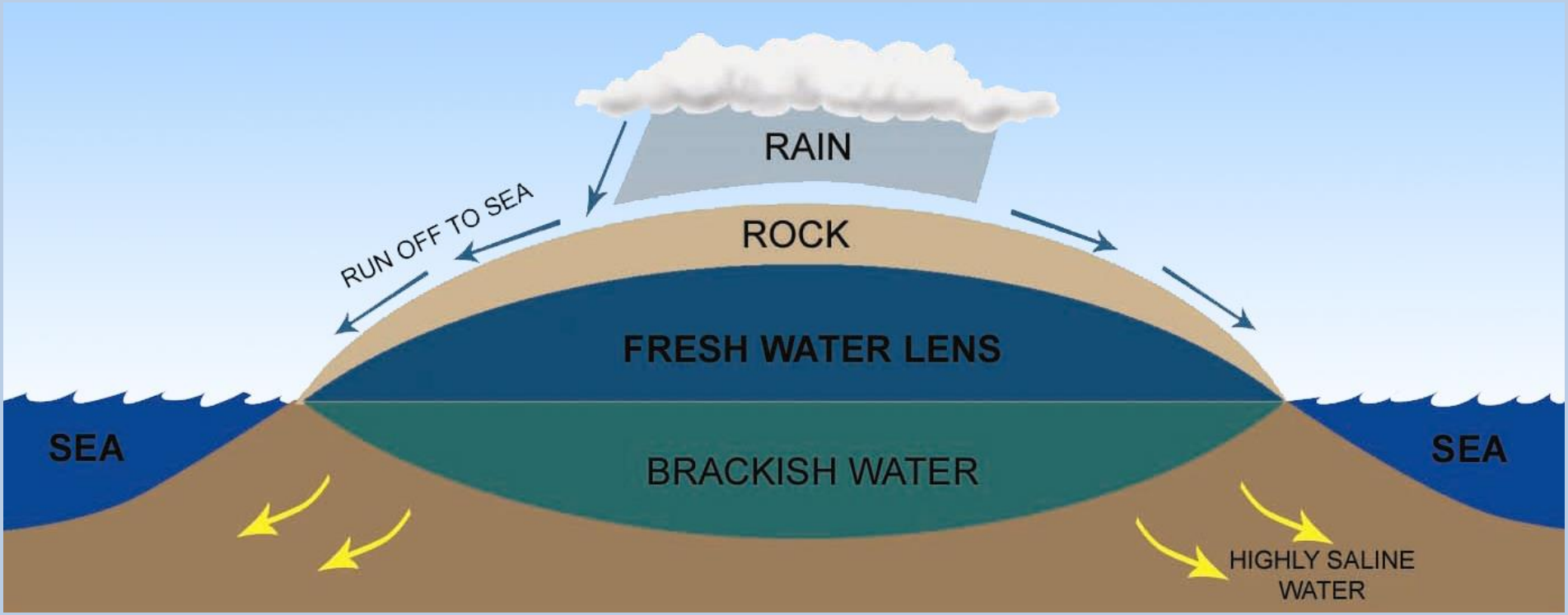
- Also known as desalination
- Requires a large amount of energy
- Renewable energy options should be applied in the water production process



The main water supply challenges

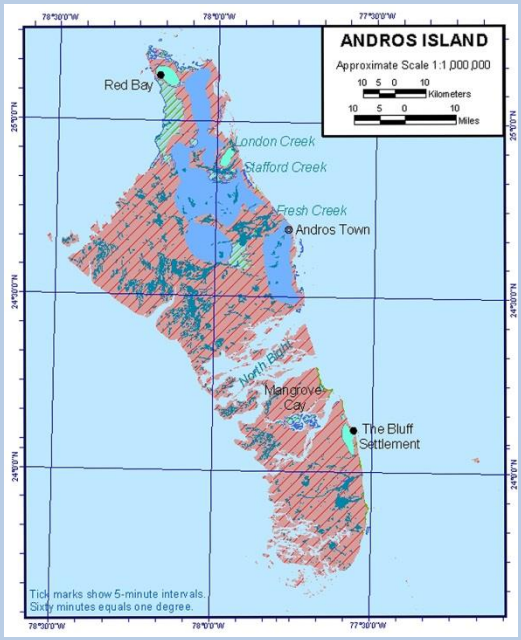
All freshwater in the Bahamas is groundwater

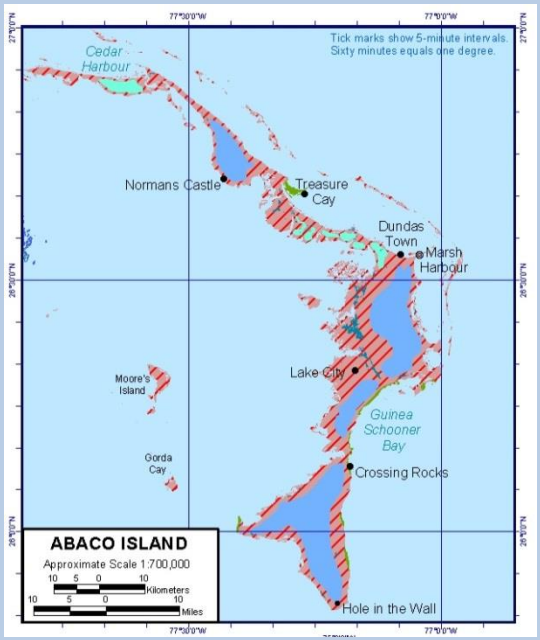
There are no rivers.

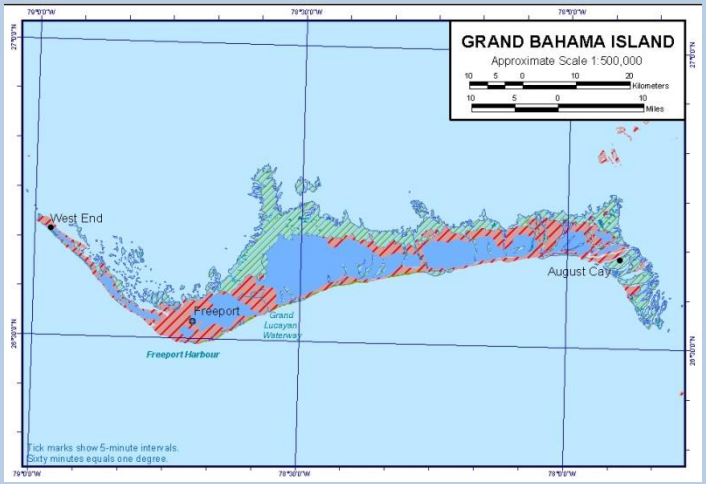


The main water supply challenges cont'd

Only three islands have significant water resources



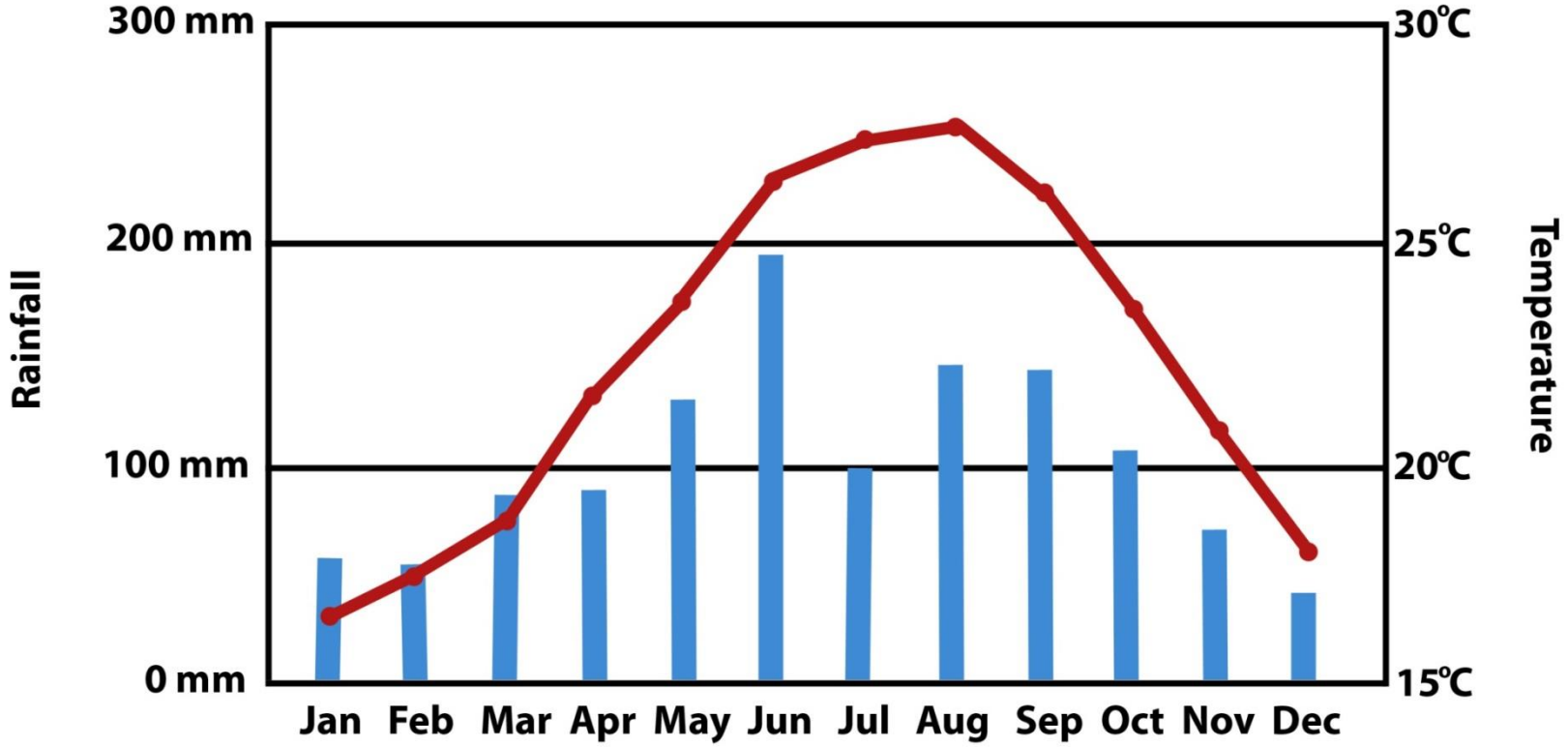




Some small islands and cays have no freshwater

The main water supply challenges cont'd

Rainfall varies across the Commonwealth and is very seasonal

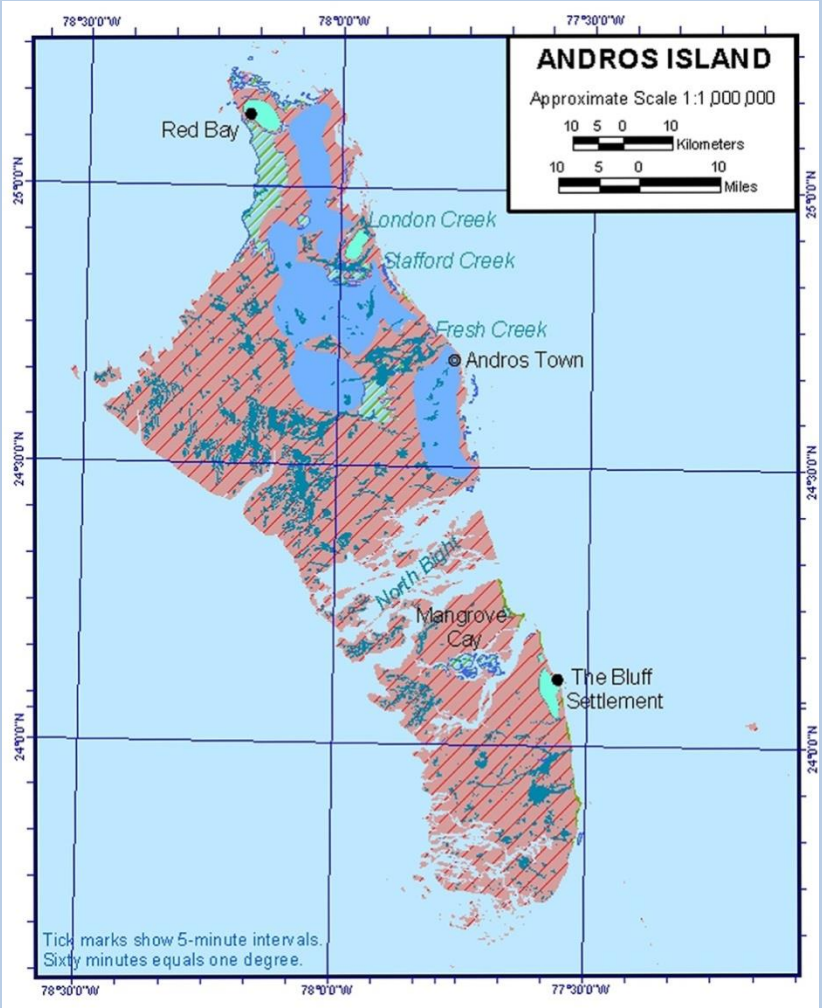


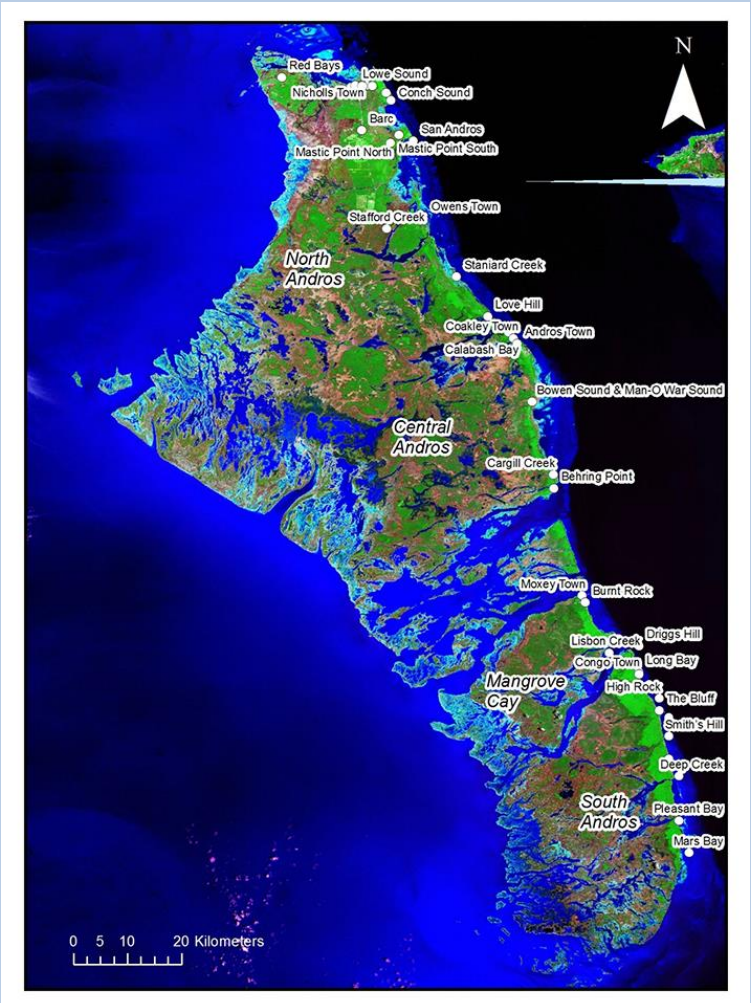
Average monthly rainfall and temperature for Great Exuma, Bahamas from 1990-2009

The main water supply challenges cont'd

Most communities are located away from the good resource areas

For example Andros.



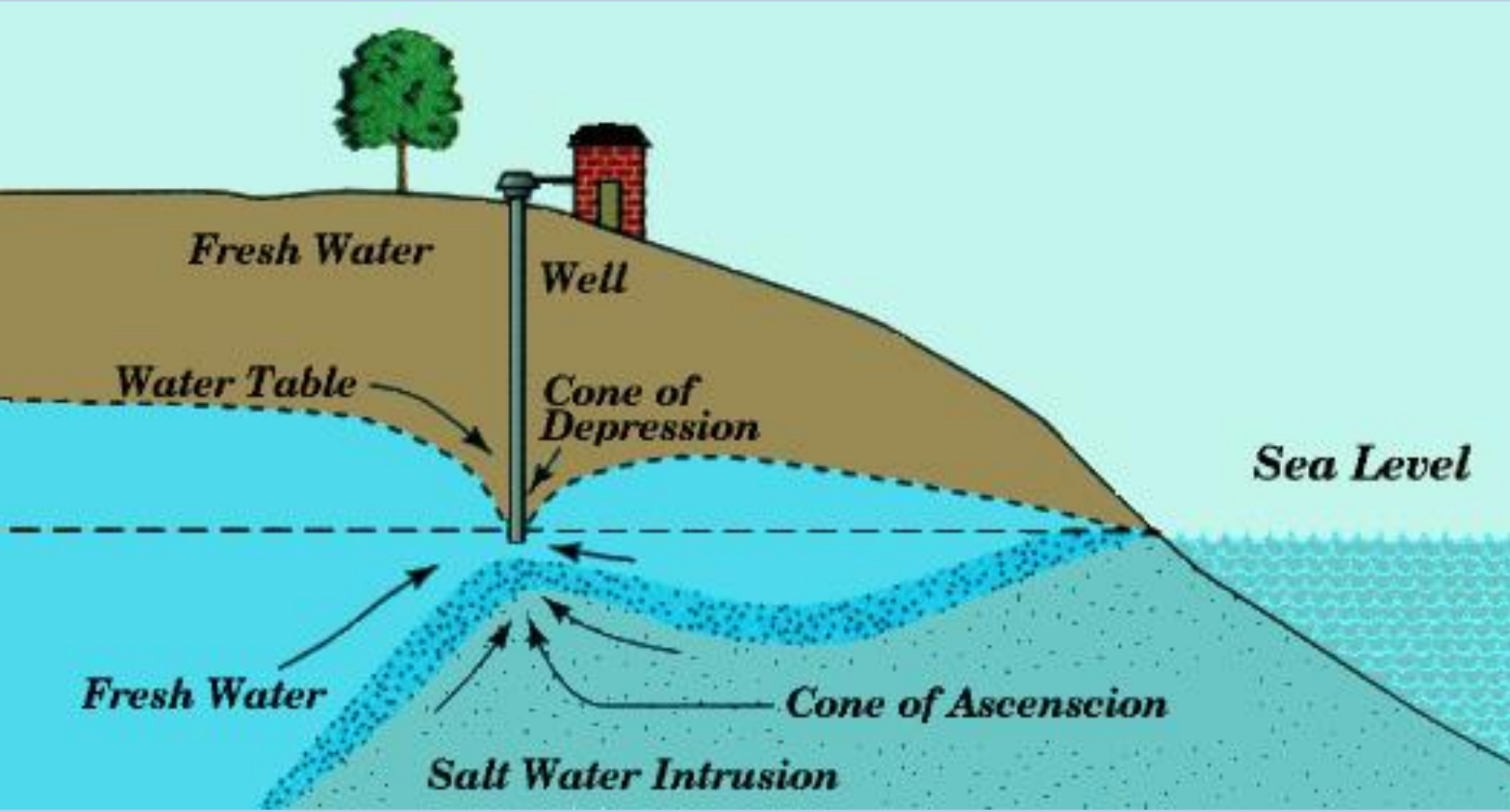


The main water supply challenges cont'd

Generally there is a need for high cost alternatives, like reverse osmosis

The vulnerability of Bahamian water resources

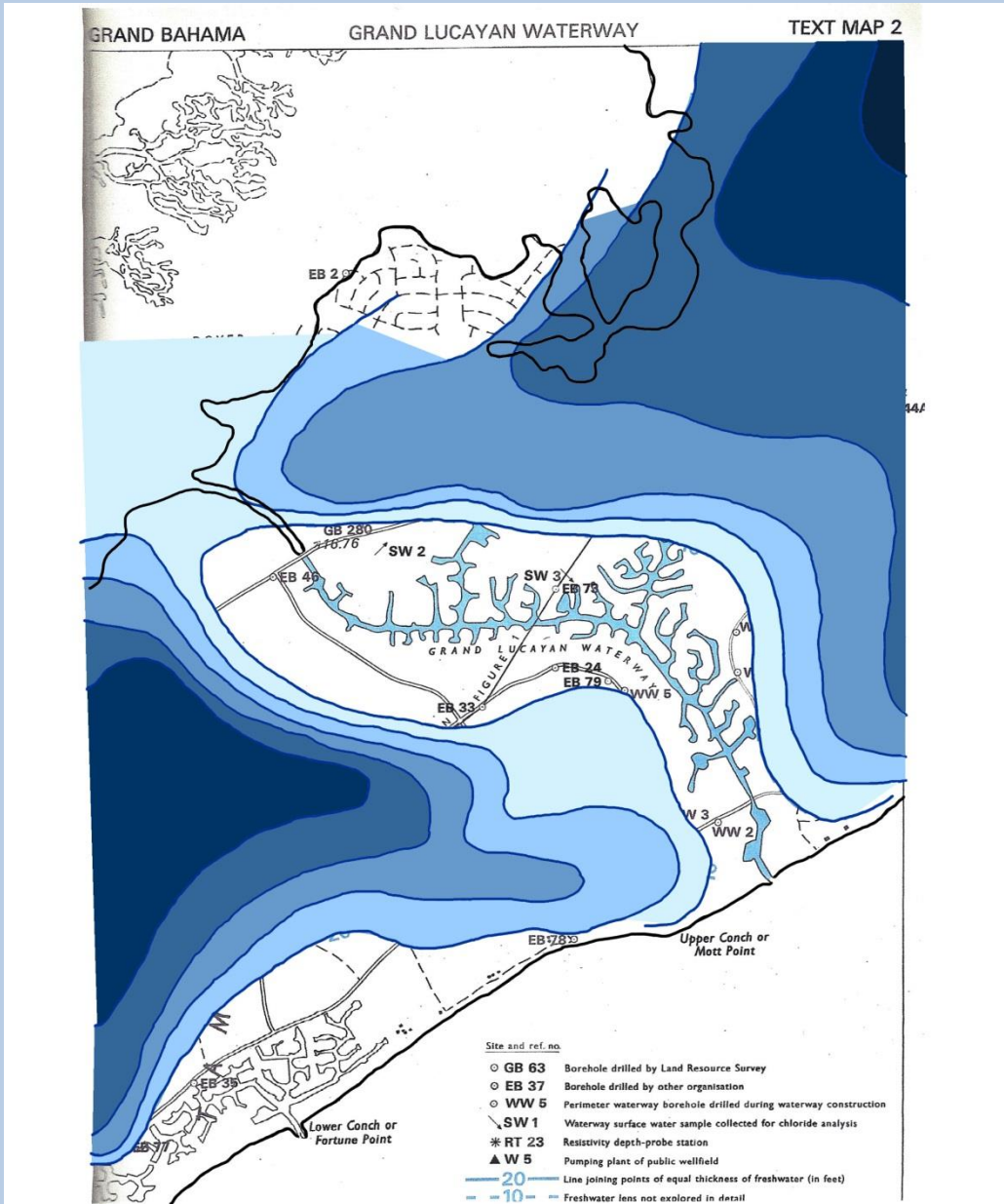
Ease of access and overexploitation - Saline intrusion



The vulnerability of Bahamian water resources cont'd

Easily destroyed by man's activities

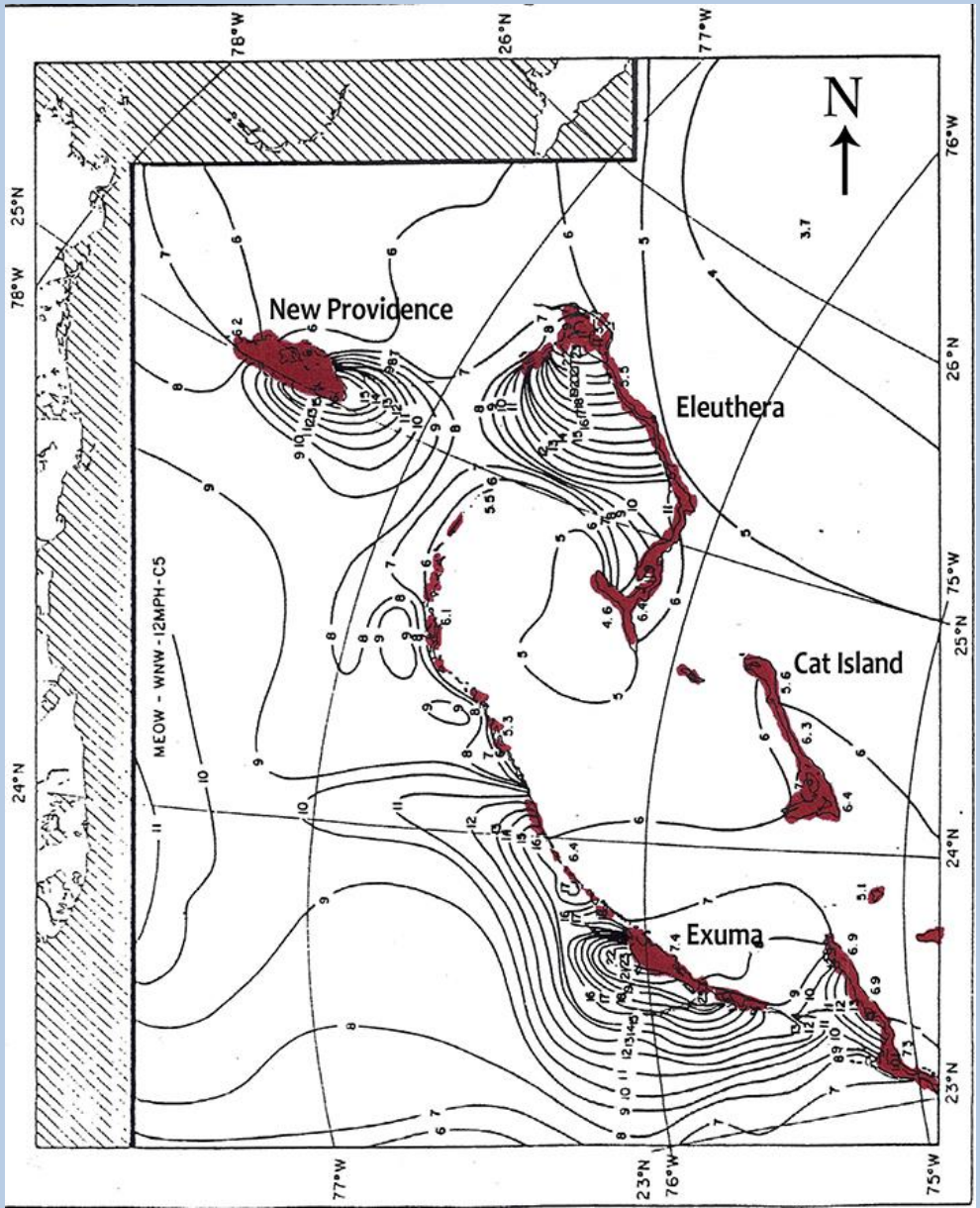
canals, borrow pits, and mining



The vulnerability of Bahamian water resources cont'd

Prone to inundation

Storm surges and sea level rise.



The vulnerability of Bahamian water resources cont'd

Prone to pollution

- Close water table
- Rock porosity and permeability
- Lack of soils
- Internal drainage
- Scarce disposal sites in island environment, and bad dumping habits
- Lack of mains sewerage
- Difficult and costly clean ups.

Planning for the future

What can we expect from climate change and the threat of rising sea levels?

Developing a National policy towards groundwater resources.

- Water resources need to be protected even when there is no plan in place to use them.
- The pros and cons needs careful evaluation whenever there is a development plan under consideration that will impact any water resources.

The need for new Legislation and Groundwater Regulations.

Education.

Any Questions?