Historical Review of the International Water-Resources Program of the U.S. Geological Survey 1940-70

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water resources of the entire country with particular reference to irrigation potentials in the alluvial deposits of the Sabi River Valley, in the Kalahari sands of the Gwaai region, and the artesian belt of the Sebungwe region. His 1960 report outlined a program of ground-water investigations, including test drilling and pilot development to be carried out under the guidance of a five-man staff of geologists and engineers in the Rhodesian Division of Irrigation and Lands with emphasis on ground-water extraction from alluvial deposits of the river valleys and from the Kalahari sands of the Gwaai region. This work has since been undertaken and completed.

The technical findings of Mr. Dennis' work were subsequently published in USGS Professional Paper 424–D, where he described the occurrence and availability of ground water and the hydraulics of the alluvial aquifer in the Sabi River Valley and in USGS Water-Supply Paper 1757–D, where he presented a reconnaissance-level description of groundwater conditions throughout the country.

References

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Dennis, P. E., and Hindson, L. L., 1964, Ground-water provinces of Southern Rhodesia: U.S. Geol. Survey Water-Supply Paper 1757–D, 15 p., 1 fig., 1 pl.

SENEGAL

The Third Assemblée Générale du Comité Inter-Africain d'Etudes Hidrauliques (CIEH) was held in Dakar, Senegal, January 5–9, 1965. In late 1964, US AID requested the USGS to provide the services of a French-speaking American hydrologist to attend the assembly meetings as U.S. observer and to prepare a report evaluating the proceedings. L. C. Dutcher, USGS hydrologist, was assigned to the mission. His report of February 1965 summarized the assembly proceedings, outlined the general structure of the agencies and organizations now making hydrologic studies for the CIEH and the several independent African states, discussed the general status of hydrology and hydrologic studies in that part of West Africa largely influenced by French technology, and raised several points for consideration by US AID concerning possible changes of emphasis in types of hydrologic studies then (1965) in progress in West Africa.

SUDAN

Sudan, the largest nation in Africa, has long been concerned with the need for appraisal, development, and management of its water resources as an essential basis for economic progress. In late 1954 the U.S. Technical Cooperation Administration was requested by the Geological Survey of Sudan (GSS) to provide the services of an experienced U.S. hydrogeologist to evaluate and to recommend areas favorable for pre-development ground-water investigation. H. A. Waite, USGS hydrogeologist, was assigned to the work, arriving in Al Khurtūm (Khartoum) in late February 1955. During the following 3 months and accompanied by representatives of the GSS, he completed 10,670 km of air travel and ground travel and ground-water reconnaissance including Mudīrīyat Kurdufān (Kordofan) and Darfur Provinces of central and western Sudan, near Jūbā in Al Mudīrīyah al Istiwāsīyah (Equatoria Province) of southern Sudan, and the Red Sea coast (fig. 33) near Sawākin (Suakin) and Būr Sūdān (Port Sudan) in Mudīrīat Kassata (Kassala Province). His report of May 1955 described the general hydrogeologic setting of Sudan and recommended a 2-year ground-water investigation of the semiarid agricultural and pastoral region in western Mudīnat Kurdufān and eastern Darfur Provinces. His recommendations included compilation and analysis of past hydrogeologic records, initiation of a system of observation wells, and areal hydrogeologic studies oriented toward ground-water development with the GSS as the principal counterpart agency. He further recommended that a USGS hydrogeologist be assigned to work with the GSS to guide the investigation and to train Sudanese personnel working on the project.

With the consent of the British and Egyptian Governments, Sudan achieved independence as a republic on January 1, 1956. In late 1960, the GSS

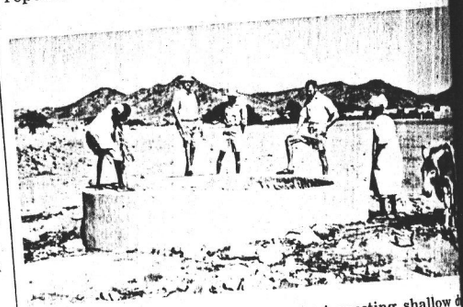

FIGURE 33.—Reconnaissance field party inspecting shallow d well tapping underflow in a wadi draining from the R Sea Hills in northeastern Sudan.

approached US AID/Khartoum with a request to begin a technical assistance project in hydrogeology based on Mr. Waite's recommendations. Responding to this request, the USGS assigned H. G. Rodis to the mission. Mr. Rodis arrived in Al Khurtūm in May 1961 and remained in Sudan until May 1963. Work completed during Mr. Rodis' stay included: (1) establishment at GSS headquarters in Al Khurtūm of a countrywide file of hydrogeologic data covering lithologic and electric well logs, water-quality analyses, ground-water levels, aquifer tests, and geophysical traverses, (2) organizing a Ground Water Section in the GSS and training a 15-man Sudanese professional and technician staff dedicated to ground-water investigations in Sudan, and (3) designing and directing of ground-water investigations in the Gash River delta (fig. 34) near Kassala, in the Juba region, and in Darfur Province, all of which were carried out by Sudanese hydrogeologists of the GSS. Mr. Rodis with the assistance of GSS colleagues also undertook and completed moderately intensive ground-water studies in Mudīrīyah Kurdufān (fig. 35). The studies included a province-wide inventory in 1962 of ground-water use and pumpage; construction of potentiometric maps of five discrete ground-water bodies in the Nubian and Umm Ruwaba Series; evaluation of the occurrence, movement, recharge, discharge, and chemical quality of water in these bodies; and a general design for further exploration and future development. The technical results of these studies were published in GSS Bulletins 12 and 14 and in USGS Professional Paper 475–B and Water-Supply Paper 1757–J.

Since Mr. Rodis' work the Government of Sudan has actively pursued ground-water exploration and development in Mudīrīyah Kurdufān, financed first with development loans from US AID and since June 1967 by other donors, including the UN/UNDP, the World Bank, and the Governments of Sweden and the USSR.

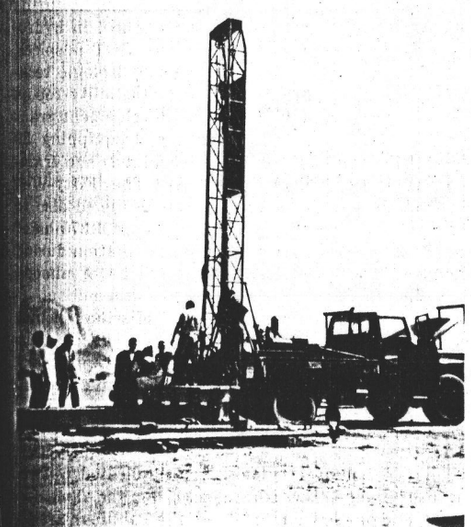

FIGURE 34.—H. G. Rodis, USGS hydrogeologist, and Sudanese hydrogeologists of Geological Survey of Sudan observing drilling operations at shallow test well put down in the subaerial delta of the Nahr al Qāsh (Gash River) near Kassalā. The alluvium is here about 23 m thick above bedrock and contains a basal water-bearing zone in sand and gravel about 7 m thick. Jabal Kassalā, a typical African inselberg in monolithic granite gneiss, forms the background on the left.

FIGURE 35.—Typical tebeldi tree in the "qoz" sand country between An Nahūd and Khuwayy (Khuwei) in central Mudirifat Kurdufān. This tree like many others in the region has been hollowed out to form a living tank for long-term storage of drinking water. Such storage is drawn upon in time of drought. Storage is replenished by lifting by hand line and bucket collected surface water which accumulates around the tree during rainy seasons.

References

Rodis, H. G., 1963, Availability of ground water in Kordofan Province, Sudan: Sudan Geol. Survey Bull. 12, 16 p.