

EXPLANATION



High-yield artesian aquifer (a)
Aquifer consists of 70-200 feet of fine to coarse sand. High initial yields may be obtained from boreholes, but flows should be restricted to conserve artesian head. Artesian flows up to 2500 gph (gallons per hour) can be maintained for at least 30 years if boreholes are spaced 5 miles apart. However, an average flow of 500 gph (that is 1000 gph if the borehole is used only during daylight hours) is adequate for cattle watering points. Larger flows suitable for town supplies or small irrigation schemes could be obtained from more widely spaced boreholes. For example, flows up to 5000 gph could be maintained from boreholes spaced 10 miles apart



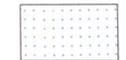
Moderate-yield artesian (b₁) and subartesian aquifer (b₂)
Aquifer consists of 20-70 feet of fine to coarse sand. Although free flows up to 10,000 gph can be obtained initially from boreholes, flows must be restricted to maintain artesian heads for the future. With average flows of 500 gph, boreholes spaced 5 miles apart will continue to flow for more than 30 years. If average flows of 1000 gph are desired, the boreholes would have to be spaced 10 miles apart. In the subartesian area near the limit of flowing boreholes, pumping should be restricted to the indicated amounts and boreholes similarly spaced to maintain flow in the artesian area



Low-yield artesian aquifer (c₁)
Aquifer consists of thin, fine to coarse sand which may be clayey or partly cemented. Because of the poor yield of the aquifer and low artesian head, flows should be restricted. Average flows of 100 gph can be maintained for 30 years from boreholes spaced 5 miles apart. Initial yields from boreholes may exceed 1000 gph, but will decline rapidly if boreholes are permitted to flow at maximum yield. No pumping from the artesian aquifer should be permitted within this area



Low-yield subartesian aquifer (c₂)
Aquifer consists of thin, fine to coarse sand which may be clayey or partly cemented. The yield of pumped boreholes is 100-1000 gph, locally up to 5000 gph. Pumping should not exceed 100 gph within 5 miles of flowing boreholes, but elsewhere no restrictions of yields is necessary



Aquifer missing or yields insignificant (d)
Aquifer consists of clayey or cemented sand only. The yield of boreholes in the principal aquifer is too low to justify their cost. Shallow wells or boreholes in upper zone provide the best source of water

Borehole penetrating middle zone



Borehole with recorder



Approximate boundary of availability area

Note: Approximate inner limit of recharge is where the upper zone water table and middle zone piezometric surface coincide. Approximate outer limit of recharge coincides with the approximate bedrock boundary

Base from Nigeria Government, 1963; D.O.S. (Geol.) 1136; Scale 1:500,000

MAP SHOWING AVAILABILITY OF ARTESIAN WATER IN MIDDLE ZONE, CHAD FORMATION
BORNU AND DIKWA EMIRATES, NORTHEASTERN NIGERIA

SCALE 1:1 000 000

