NIGER

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B′

Makwa
Tulas
Arhakwa
Kafin Sarki
3067~3069
Kafin Chana
Tsanki
Tulun Dabaka
Sangela
Madamfara
Bagizza
Lama
Sarka
Galma
Yelda
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Gwambara
Bwai
Amugoro
Kaingiwa
Kaloye
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Gadanga
Gulma
Dalijam
Bude
Kunyu
Dugere
Ambursa
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2484
Kola
Kardi
Tilio
Zogirma
Bunza
3707
54
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3502
Gulumbe
Kashin Zama
Jega
Kimba
Alelu
Kubiri
Sanda
Maha
Maiyama
Agwada
Gwandi
Rano Sarki
Gijia
ARGUNGU
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Safia
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3058~3060
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Suti
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Tulki
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SOKOTO
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Mile 7
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Danzha
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Yabo
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Bulauyaki
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Sainyinan Yabo
Ardo
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Jaboci
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Kandaza
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Timbawal
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Yuluwa
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Gummi
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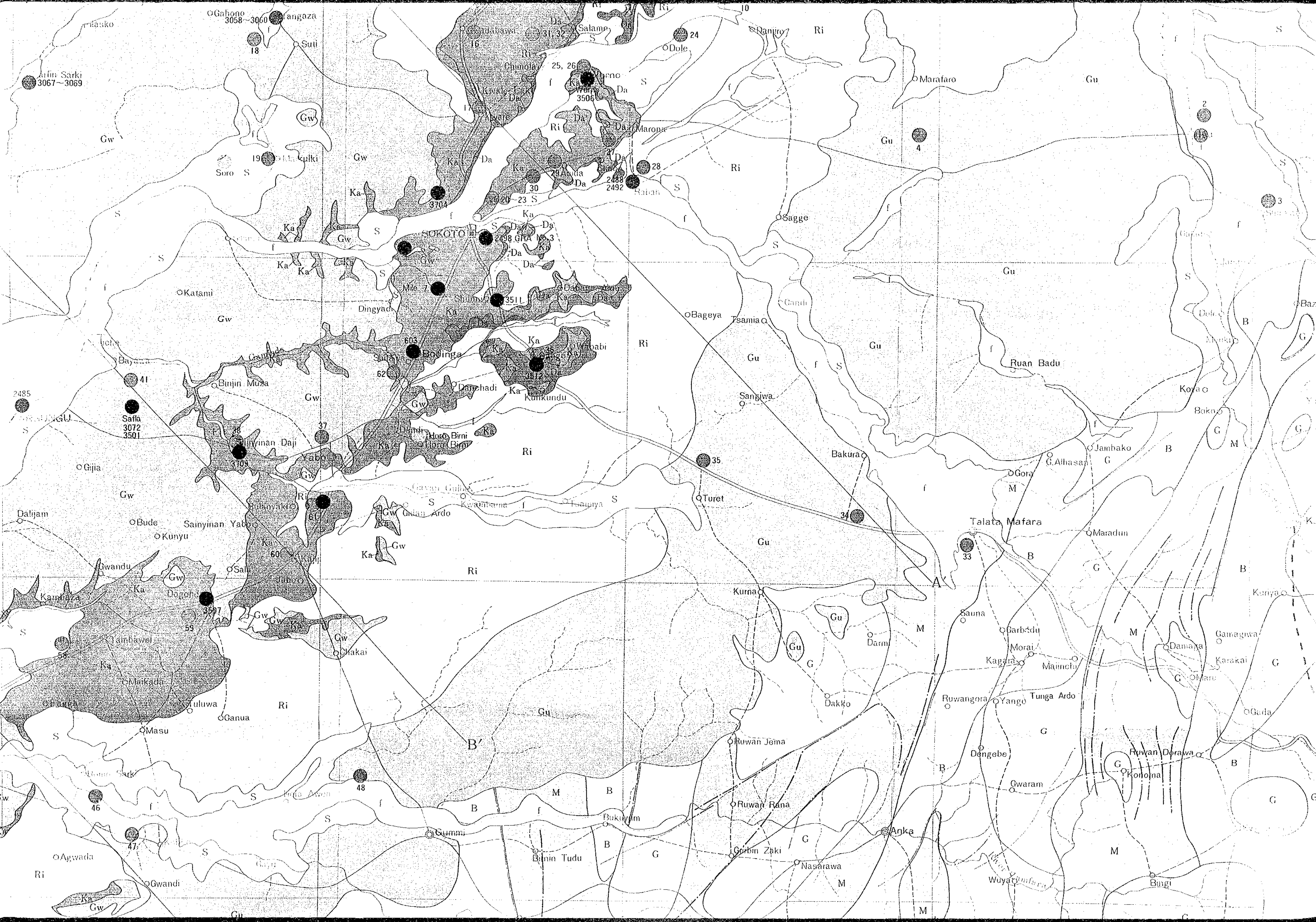

Gahono
3058~3060
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Katami
Dingyadi
Mile 7
Shuni
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Dabagi
Asari
Da
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Bodinga
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Wababi
Danchadi
Kunkundu
Binjin Muza
Bayawa
Jiche
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Safia
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ARGUNGU
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Sainyinan Yabo
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Kwambama
Gavan Gulbi
Tsamiya
Dalijam
Bude
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Tuluwa
Ganua
Masu
Chakai
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Agwada
Gwandi
Gu
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31, 32
Salame
Chunola
25, 26
Wurno
Wurno
3506
Kwalo Luka
17
Kwalo
Dan Marona
27
Achida
29
30
20~23
2488
2492
Rabah
28
24
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10
Danjiro
Ri
Sagge
Bageya
Tsamia
Sangiwa
35
Turet
Bakura
34
Marafaro
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2
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Dole
Ruan Badu
Kora
Boko
Jambako
G.Alhasan
Gora
Talata Mafara
33
A′
Maradun
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Kurna
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Dakko
Sauna
Garbadu
Morai
Kagara
Maiinchi
Ruwangora
Yango
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Dengebe
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Ruwan Jema
Ruwan Rana
Bukuyum
Birnin Tudu
Gurbin Zaki
Nasarawa
Anka
Wuya
Bingi
Damaga
Gamagwa
Karakai
Maru
Gada
Kunya
Ruwan Dorawa
Konoma

Marafaro
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Tsamia
Sangiwa
Ruan Badu
Bakura
Jambako
G.Alhasan
Gora
Koya
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Bazai
Kwashebawa
Dutsi
Yambuki
Yambuki
Kangara
Dauran
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Zuma
Kaura Namoda
Rigin Kura
Sabon Birni
Kuriya
Kasaura
Kanu
Kambarawa
Nassarawa
Bulawa
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Maradun
Sauna
Garbadu
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Kagara
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Tunga Ardo
Dangebe
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Konoma
Kyekunwaje
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Wanke
Dokau
GUSAU
Rawuya
Wohaka
Ruwan Bore
Kwatarkwashi
Mada
Yelwa
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Dakko
Ruwan Jema
Ruwan Rana
Gobin Zaki
Nasarawa
Anka
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Sabon
Table Ge
System
Series
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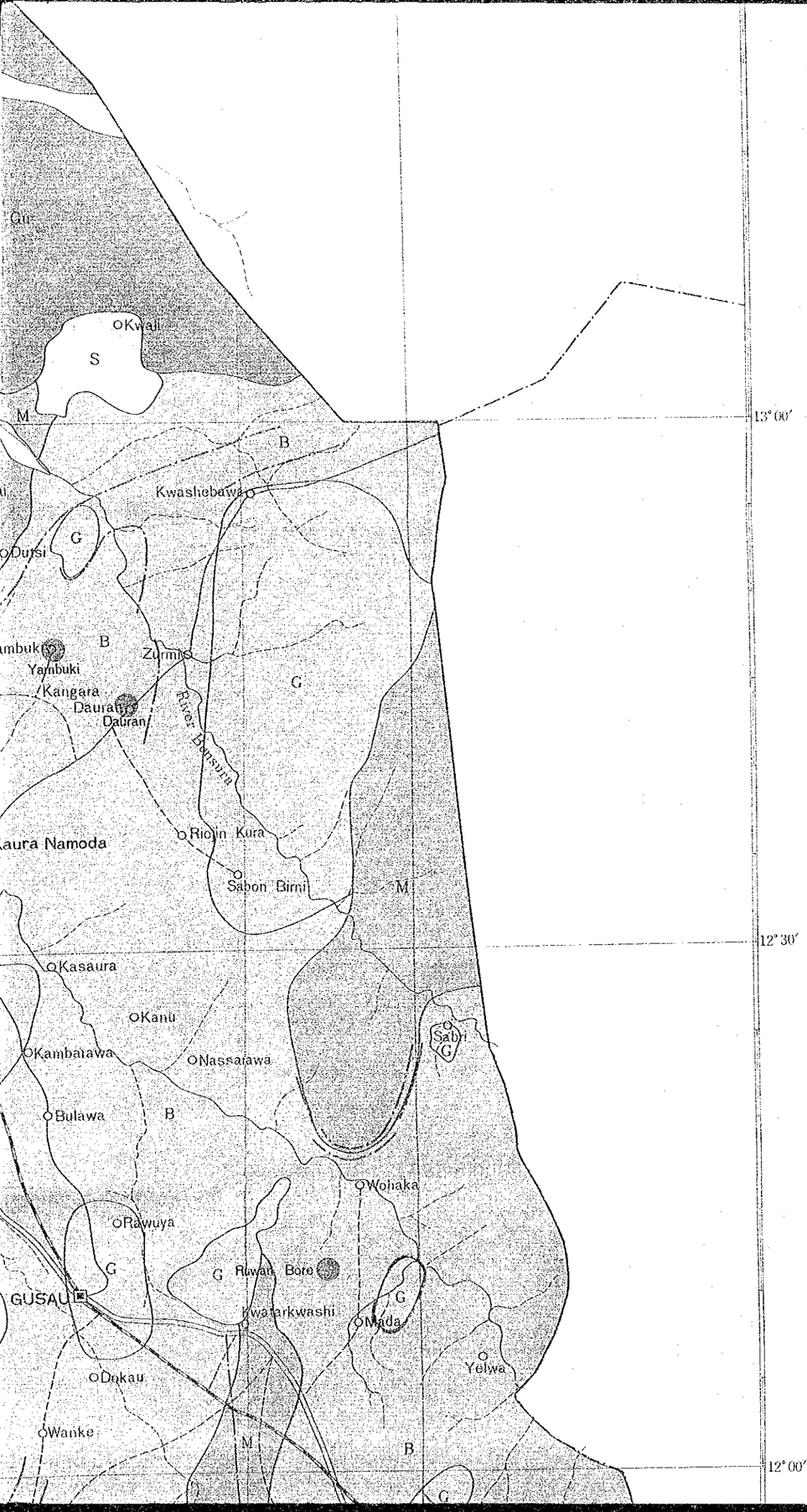


Te
- Dange formation

Cretaceous
- Ri — Rima group
- Gu — Gundumi formation and Illo formation

Basement Rock
- G — Older Granite
- M — Meta-sediment
- Q — Quartzite
- B — Undifferentiated Basement Complex

——·—— major lineament

● Exploratory Borehole drilled by JICA

● Exploratory Borehole drilled by USGS & GSN

● Existing Borehole used for simultaneous water level observation by JICA

A ——— A′
Line of Cross Section

Table Generalized Stratigraphic Section for the Sokoto Region (nomenclature after Parker, 1964)

System	Series	Group	Formation	Thickness (feet)	Lithologic Character	Aquifer Properties
Quaternary	Recent and Pleistocene			0 to 50	Unconsolidated silt and sand with some gravel in fadama (valley floor) of Sokoto and Rima Rivers and their larger tributaries.	Yields small to moderate supplies of potable water to shallow wells. May have potential for large yields by induced river infiltration.

12°30'

12°00'

11°30'

BIRNIN KEBBI

Kola

Ambursa

Kardi

Gulmare

Gulma

Diggi

Tillio

Zogirma

Elene

Kalgo

Jega

Kimba

Aleiro

Romo Sarki

Masu

Uluwa

Ganua

Chakai

Bunza

Maha

Kubin

Agwada

Kelbe

Gayu

Gwandi

River Zamfara

Illela Aweh

Gummi

Kamba

Shiko

Kwakwaba

Fatima

Dakingari

Giro

Libba

Kuka Kogo

Kuchi

Fokku

Kwawai

Dandi

Serlu

Aljenaari

Illo

Ziga

Lani

Kende

Rahaye

Tunga Illela

Bagudo

Gwamba

Tuga

Gendinni

Koko

Ratin Kiriya

Danindo

Marafa

Mahuta

Bajida

Tugan Giwa

Zaria

Besse

Yarhasine

Shanga

Kade

Samanage

River Niger

Keoje

Dabai

Kandu

Donko

Maga

Zuru

Ri

Gw

Gu

S

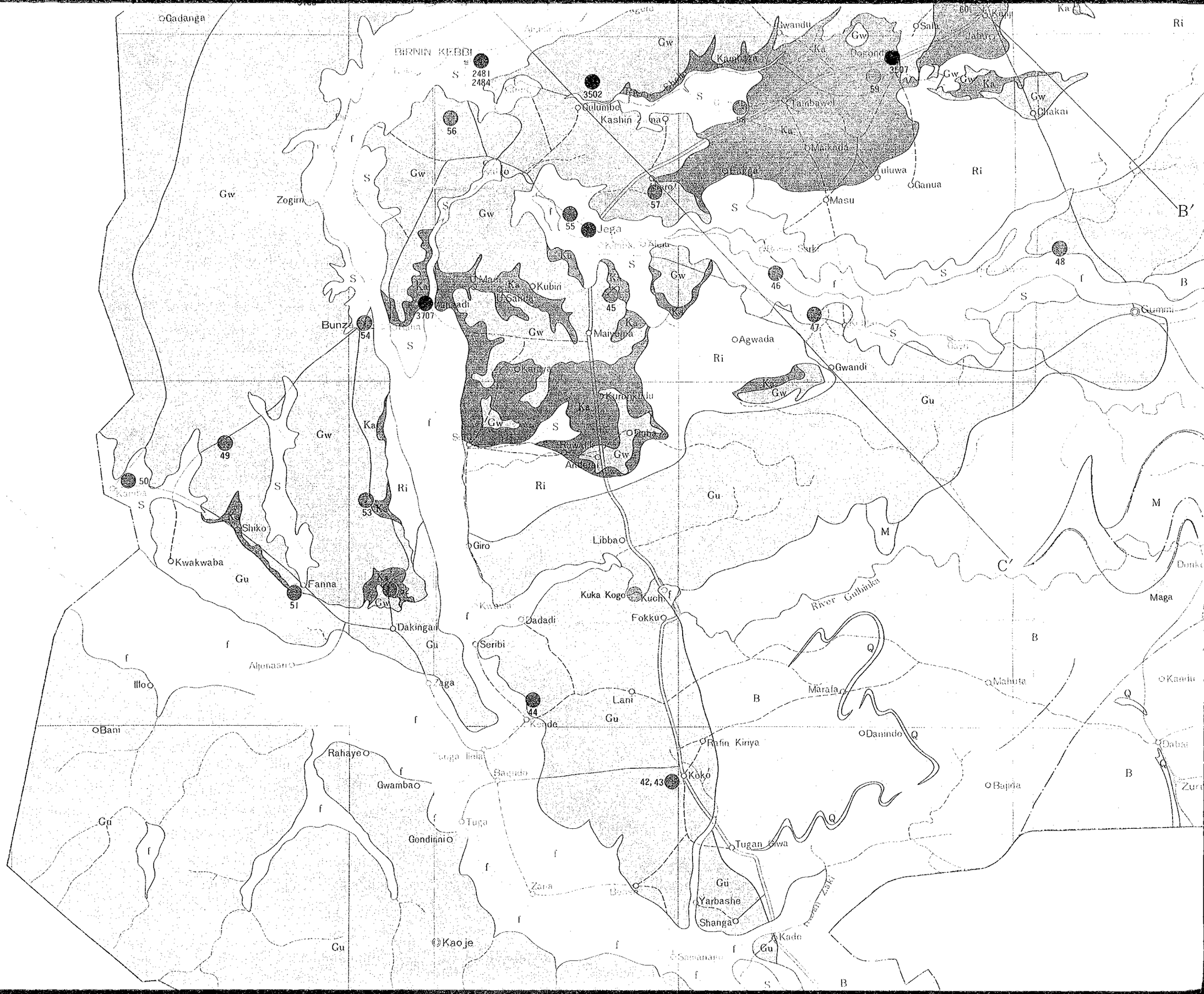
f

B

C

M

Q


Gadanga
BIRNIN KEBBI
2481
2484
3502
Gulumbe
Kashin Zama
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Zogirma
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Kwandu
Kamba
Dorondi
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Sala
Jabiro
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Tambawel
Maikada
Tuluwa
Ganua
Masu
Chakai
Jega
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Gunmi
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Agwada
Gwandi
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Bunza
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Maiyama
Kurondidu
Buba
Andarai
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Shiko
Kwakwaba
Fanna
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Giro
Libba
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Kuka Kogo
Kuchi
Fokku
Dadadi
Dakingari
Seribi
River Gulbinka
Maga
Illo
Aljenasaru
Bani
Rahaye
Gwamba
Gendinni
Tuga
Kaoje
44
Lani
Marafa
Mahuta
Kandu
Dabai
Rafin Kiriya
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Bapida
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Zara
Samanaru
Zuru


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Fanna
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Kara
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Kuka Kogo
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42, 43
Kaoje

Gwandu
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Donmu
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Janbawel
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Maikada
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Garbidu
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Ruwan Rana
Anka
Dengebe
Gwarata
B
Ruwan Dorawa
Konona
Kyekunwari
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Agwada
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Gwandi
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Bibin Tudu
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Gorbin Zaki
Nasarawa
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Woya
Bingi
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Daki Takwas
Adebka
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Bagega
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Keru
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Maga
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Gulbinka
Ragam
Banaga
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Marafa
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Daraga
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Mutumji
Ranko
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Wasagu
Tugan Gwa
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Yarbashe
Shanga
Kaiin
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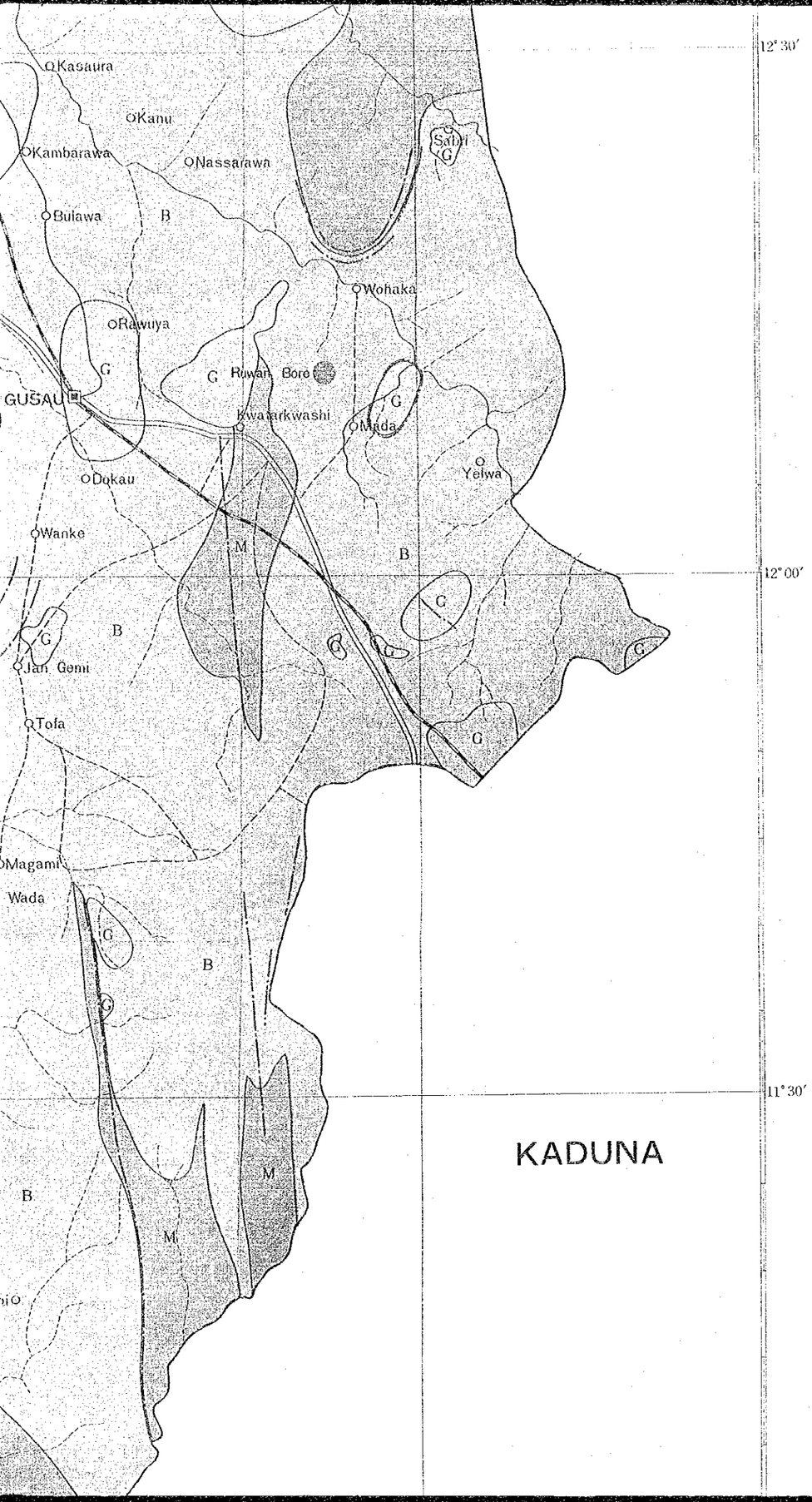
Karaun
Dan Sadau

Table General

System	Series	Group
Quaternary	Recent and Pleistocene	
Tertiary	Post Eocene and Eocene	
	Paleocene	Sokoto
Cretaceous	Upper Cretaceous (Maastrichtian)	Rima
	Lower Cretaceous	
Pre-Cretaceous		



A ——— A′

Line of Cross Section

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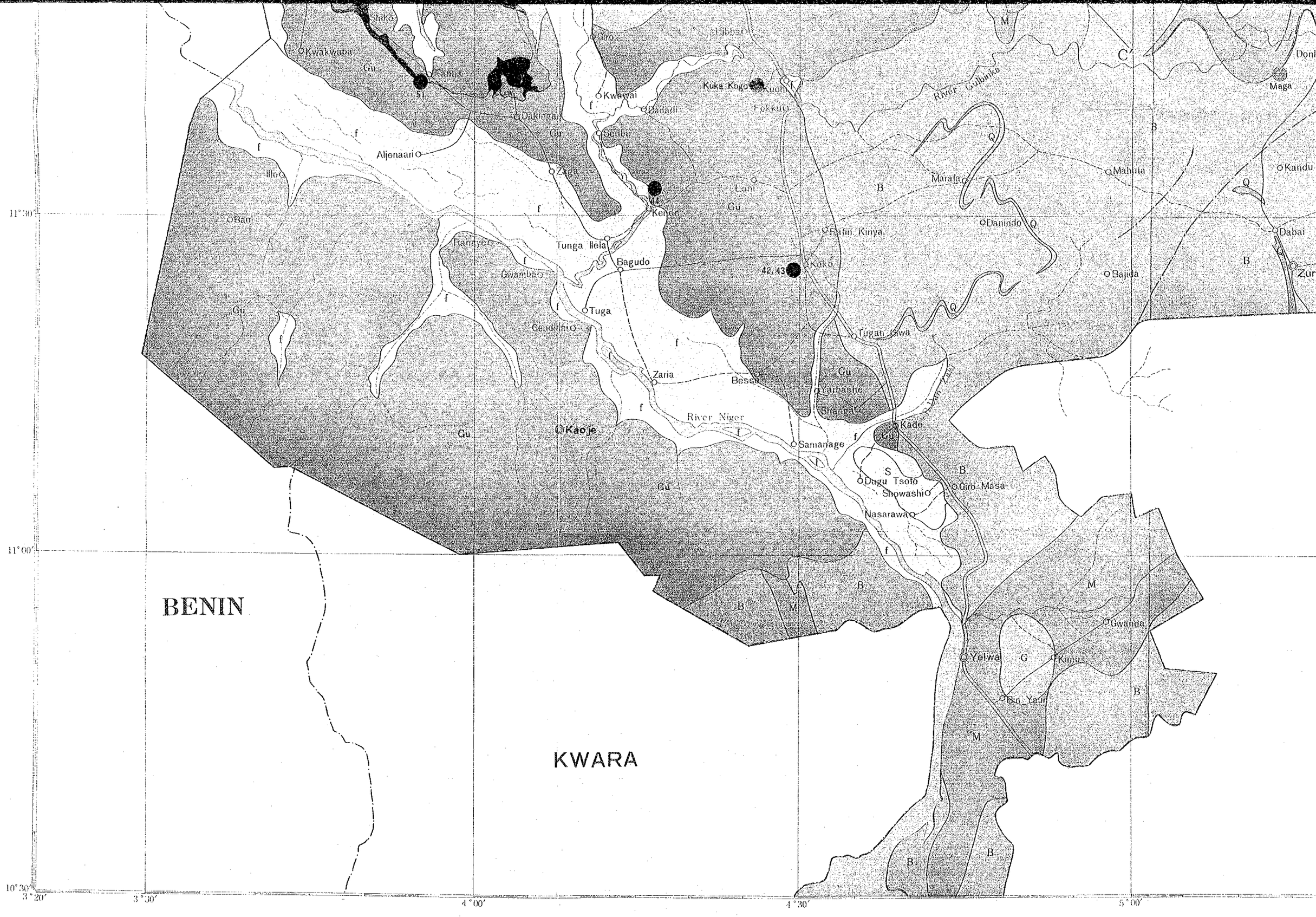
Quaternary	Recent and Pleistocene			0 to 50	Unconsolidated silt and sand with some gravel in fadama (valley floor) of Sokoto and Rima Rivers and their larger tributaries.	Yields small to moderate supplies of potable water to shallow wells. May have potential for large yields by induced river infiltration.
Tertiary	Post-Eocene and Eocene		Gwandu	0 to 1,000+	Semiconsolidated fine to coarse-grained sand and clay, with dark-colored clay shale.	Basal sand member yields moderate supplies of potable water to boreholes under artesian pressure. Upper member yields small to moderate supplies to wells and boreholes under water-table and subartesian conditions.
			Unconformity			
	Paleocene	Sokoto	Kalambaina	0 to 160+	Semiconsolidated clayey limestone and marl, with some mudstone and plastic shale.	Limestone yields small to moderate supplies of potable water to shallow wells and springs in the outcrop area. Formation is probably not productive at depth.
			Dange	0 to 140+	Semiconsolidated blue to grey, plastic shale, with phosphatic nodules and thin beds of limestone.	Yields little or no water to wells and boreholes. Forms confining bed for artesian water in underlying Wurno Formation.
Cretaceous	Upper Cretaceous (Maestrichtian)	Rima	Wurno	0 to 150+	Friable sandstone and sand inter-bedded with soft mudstone and shale.	Yields moderate supplies of potable water to boreholes under artesian pressure.
			Dukamaje	0 to 88	Dark-colored fossiliferous shale, with thin beds of limestone. Present only in northern part of the region.	Yields little or no water to wells and boreholes.
			Taloka	0 to 600+	Semiconsolidated fine to medium-grained sand, sandstone and shale, with lignite and mudstone.	Yields small to moderate supplies of potable water to boreholes. Under artesian pressure downdip.
			Unconformity (?)			
	Lower Cretaceous		Gundumi and Illo	0 to 1,000	Semiconsolidated fine to coerse-grained sand, with clay, sandy clay and conglomerate near the base.	Yields small to moderate supplies of potable unconfined water to wells on the outcrop area. Yields water under artesian pressure at depth.
			Unconformity			
Pre-Cretaceous			Basement Rock		Granite-gneiss, phyllite and quartzite.	Yields meager supplies of water to wells in outcrop area.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Aljenaari
Illo
Zaga
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Kende
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River Gulbinka
Maga
Mahuta
Kandu
Marafa
Danindo
Rafin Kinya
Dabai
Zur
Bajida
Bani
Hanayeo
Tunga Iiela
Bagudo
42, 43
Koko
Gwambao
Tuga
Gu
Gendaino
Tugan Gawa
Zaria
Besse
Gu
Yarbashe
Shappa
Kaoje
River Niger
Samanage
Kade
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Dugu Tsofo
Showashi
Giro-Masa
Nasarawa
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Yelwa
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Kiriu
Bin Yauri
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11°30′
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3°30′
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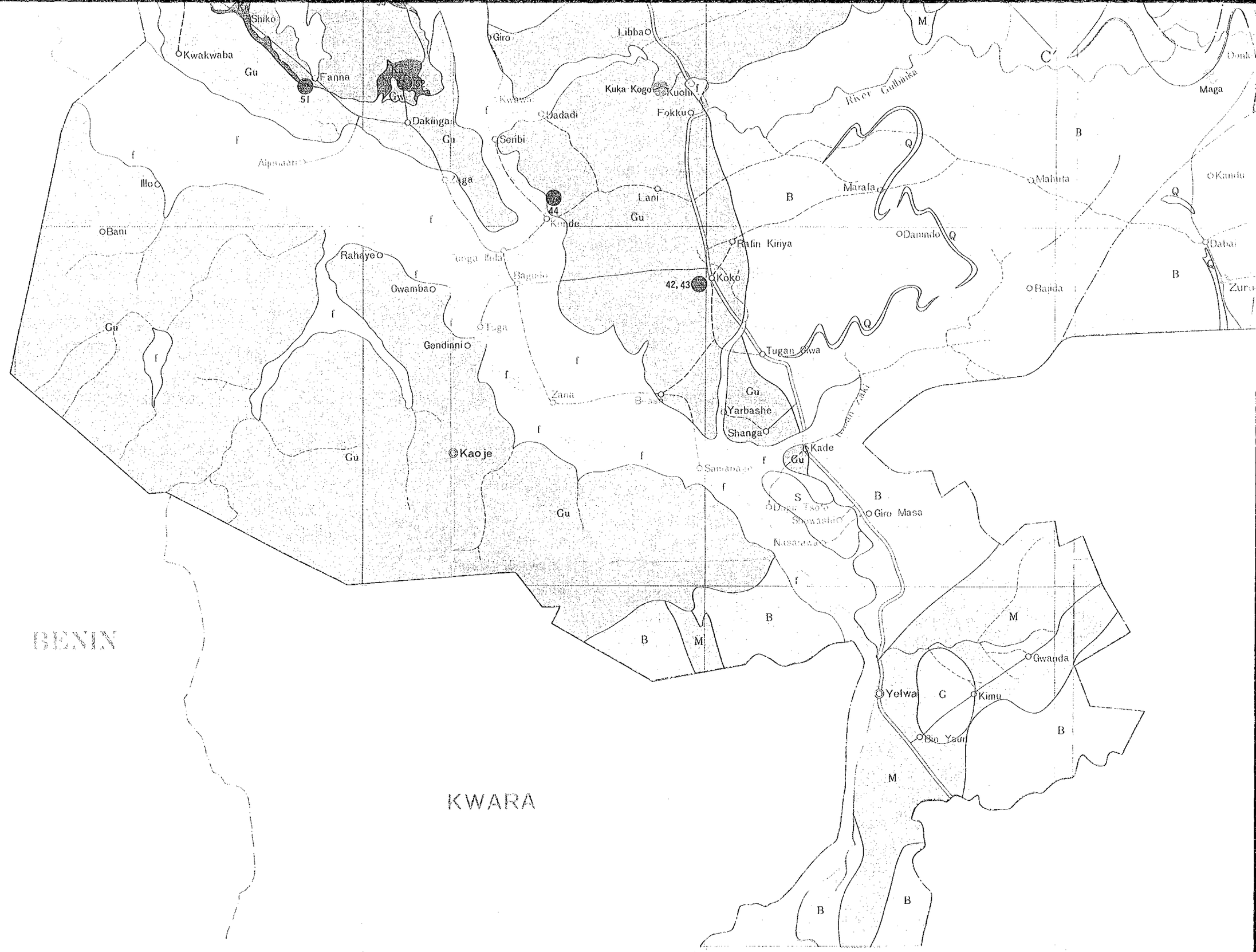
5°00′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Kimu
Bin Yauri
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BENIN
KWARA

River Gulbinka
Donko
Maga
Gulbinka
Ragam
Bawa
Banaga
Dan Guibi
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Marata
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Matankari
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Zuru
Ribah
Wasagu
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Tugan Giwa
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Karaun
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Dan Sadau
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Yamasha
Shanga
Kade
Samanage
Sakaba
Dugu Tsofo
Giro Masa
Showashi
Nasarawa
Qwanda
Yelwa
Kirnu
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NIGER
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