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The Arizona Geological Survey is not responsible for the accuracy of the records, information, or opinions that may be contained in the files. The Survey collects, catalogs, and archives data on mineral properties regardless of its views of the veracity or accuracy of those data.

December 15, 1961

Mr. A. R. Campbell
Phoenix Brick Yard
P.O. Box 768
Phoenix, Arizona

Dear Archie:

The following are my comments resulting from our inspections near San Manuel and Pantano on December 14, 1961.

SAN MANUEL DIATOMITE OPERATION

Two occurrences of diatomite of possible commercial value have been uncovered by scraping operations. One is a group of gently inclined beds exposed in the northwesterly part of the leased ground near the base of a hill. These are about 20 feet thick, and they rest upon pinkish clay, the contact being marked by discontinuous lenses of dense chalcedonic chert (silica nodules). Above them are layers of pinkish and greenish clay with a few interbeds of impure diatomite, this group having an aggregate thickness of about 75 feet. The 20-foot diatomite zone is made up of several beds separated by thin layers of clay which locally swell and become small lenses.

A second diatomite zone lies above the 75-foot clay zone. This is about 6 feet thick and has been exposed by scraping above the 20-foot zone. A second and more recently scraped area some 500 feet to the south also exposes a 6-foot zone of diatomite which may or may not be the same horizon.

It is presumed that the clay associated with the diatomite in this area is the ingredient causing trouble in brick-making and is the substance introducing the soluble salts. Consequently every effort should be made to quarry clean diatomite, and it appears that this can be better done from the 20-foot group of beds now exposed on the north near the base of the hill. Here and elsewhere it will be necessary to strip back the overlying clay as far as possible to expose a clean top, and then establish a quarry face with its base just above the horizon of the silica nodules. This pattern of work should be continued southerly as far as practicable.

Stripping and extraction of the upper 6-foot horizon may be desirable at a later date.

Because of the lenticular nature of some of the clay layers and progressive changes in the thickness of beds in this type of sedimentary deposit, some clay will always find its way into the quarried product, but it can be kept to a minimum by planning and careful work.

PANTANO CLAY OPERATION

The "6-2" pit and stockpile were inspected, and the occurrence was judged to be of substantial size and of much economic value. The abundance of gypsum in a clay that burns to give excellent products is a noteworthy feature of this occurrence.

The "5-6" pit area was inspected, from which a light-burning clay is obtained. It is difficult to evaluate this ground because of complicated structure and poor exposures due to a capping of caliche-cemented gravel. It is suggested that trenching by bulldozer along a systematic pattern or drilling on a close-spaced grid would give considerable helpful information.

An exposure of promising clay along the old highway near where it crosses the common side-line of claims 6 and 7 was inspected. Trenching of this occurrence followed by sampling and testing is recommended.

Yours very truly

E. N. Pennebaker

ENP:mc

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ARIZONA

GALIURO MOUNTAINS QUADRANGLE

15-MINUTE SERIES

(Holy Joe Peak) (Klondyke) (Jackson Mtn) (Mammoth) (Redington) (Tucson) (Winchester Mts) (Sierrita Bonita Ranch)

110°30' 400 000 FEET ARIZ. (EAST) R. 18 E. 25' R. 19 E. 20' R. 20 E. 1 000 000 FEET ARIZ. (CENTRAL) 110°15'

32°45' 640 000 FEET ARIZ. (CENTRAL)

630 000 FEET ARIZ. (EAST)

T. 8 S.

T. 9 S.

T. 10 S.

T. 11 S.

40'

35'

32°30'

1 035 000 YARDS

550 000 FEET ARIZ. (CENTRAL)

550 000 FEET ARIZ. (EAST)

470 000 FEET ARIZ. (EAST)

940 000 FEET ARIZ. (CENTRAL)

1 260 000 YARDS

Topography by Lee Morrison and J. Mark Holmes
Surveyed in 1938

INTERIOR-GEOLOGICAL SURVEY
WASHINGTON, D.C. 1956

SCALE 1:62500

1/2 0 1 2 3 4 MILES

3000 0 3000 6000 9000 12000 15000 18000 21000 FEET

.5 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 50 FEET
DATUM IS MEAN SEA LEVEL

APPROXIMATE MEAN DECLINATION, 1938
TRUE NORTH
MAGNETIC NORTH
14°

Polyconic projection. 1927 North American datum
5000 yard grid based on U.S. zone system F
10000-foot grids based on Arizona (East) and Arizona (Central) rectangular coordinate systems

GALIURO MTS., ARIZ.
N3230-W11015/15

1938

FOR SALE BY U.S. GEOLOGICAL SURVEY, FEDERAL CENTER, DENVER, COLORADO OR WASHINGTON 25, D.C.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

REDINGTON QUADRANGLE
ARIZONA
15 MINUTE SERIES (TOPOGRAPHIC)

(MAMMOTH)

(SIERRA BONITA RANCH)

(GALIURO MOUNTAINS)

(BELLOTA RANCH)

(WINCHESTER MOUNTAINS)

(RINCON VALLEY)

(HAPPY VALLEY)

(DRAGOON)

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography by planetable surveys 1942–43
Culture revision and field check 1957

Polyconic projection. 1927 North American datum
10,000-foot grid based on Arizona coordinate system, east and central zones
1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue

SCALE 1:62500

1 ½ 0 1 2 3 4 MILES
3000 0 3000 6000 9000 12000 15000 18000 21000 FEET
1 .5 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 50 FEET
DATUM IS MEAN SEA LEVEL

APPROXIMATE MEAN DECLINATION, 1957
TRUE NORTH 14° MAGNETIC NORTH

ROAD CLASSIFICATION
Light-duty ——— Unimproved dirt - - - - -

ARIZONA
QUADRANGLE LOCATION

REDINGTON, ARIZ.
N3215—W11015/15

1957

FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER 2, COLORADO OR WASHINGTON 25, D. C.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

INTERIOR-GEOLOGICAL SURVEY, WASHINGTON, D. C.-1958
1 010 000 FEET (CENTRAL) M R-3274

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

HAPPY VALLEY QUADRANGLE
ARIZONA
15 MINUTE SERIES (TOPOGRAPHIC)

(BELLOTA RANCH) (WINCHESTER MTS.)

110°30′ R. 18 E. 549000m E. 950 000 FEET (CENTRAL) 25′ R. 19 E. (REDINGTON) 20′ REDINGTON 18 MI. R. 20 E. 460 000 FEET (EAST) 110°15′

32°15′ 3567000m N. 450 000 FEET (CENTRAL) 450 000 FEET (EAST) T. 14 S. WILLCOX (U.S. 666 & ARIZ. 86) 28 MI.

10′ 5′

(RINCON VALLEY) (DRAGOON)

T. 15 S.

370 000 FEET (EAST) 370 000 FEET (CENTRAL) 3542000m N.

32°00′ 110°30′ R. 18 E. 400 000 FEET (EAST) MESCAL 14 MI. 25′ R. 19 E. (BENSON) 20′ 1 000 000 FEET (CENTRAL) R. 20 E. BENSON (U.S. 80) 4.6 MI. 569000m E. 32°00′ 110°15′

(EMPIRE MTS.) (ST. DAVID)

Mapped, edited, and published by the Geological Survey

Control by USGS, USCE, and USC&GS

Topography by planetable surveys 1940–1943
Culture revision and field check 1958

Polyconic projection. 1927 North American datum
10,000-foot grids based on Arizona coordinate system, east and central zones
1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue

Land lines unsurveyed in parts of T. 14 and 15 S.–R. 18 E.

SCALE 1:62500

1 0 1 2 3 4 MILES
3000 0 3000 6000 9000 12000 15000 18000 21000 FEET
1 5 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 50 FEET
DATUM IS MEAN SEA LEVEL

13½° TRUE NORTH MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 1958

ROAD CLASSIFICATION
Light-duty ——— Unimproved dirt - - - - -

ARIZONA
QUADRANGLE LOCATION

HAPPY VALLEY, ARIZ.
N3200—W11015/15

1958

FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER 2, COLORADO OR WASHINGTON 25, D. C.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

INTERIOR-GEOLOGICAL SURVEY, WASHINGTON, D. C.—1959
MR 6588

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

BENSON QUADRANGLE
ARIZONA
15 MINUTE SERIES (TOPOGRAPHIC)

(RINCON VALLEY) (DRAGOON) (HAPPY VALLEY) (EMPIRE MOUNTAINS) (ST. DAVID) (TOMBSTONE) (ELGIN) (FORT HUACHUCA)

110°30' 940 000 FEET (CENTRAL) 549000m E. R. 18 E. 25' R. 19 E. 20' R. 20 E. 470 000 FEET (EAST) 110°15'
32°00' 3540000m N. T. 16 S. 360 000 FEET (CENTRAL) 360 000 FEET (EAST) 32°00'
T. 17 S. 55' 50' T. 18 S. T. 19 S. 280 000 FEET (EAST) 280 000 FEET (CENTRAL) 31°45' 3513000m N. 31°45'
110°30' R. 18 E. 400 000 FEET (EAST) 25' R. 19 E. 20' R. 20 E. INTERIOR-GEOLOGICAL SURVEY, WASHINGTON, D. C.-1959-NS 1 010 000 FEET (CENTRAL) 570000m E. 110°15'
MR 7494

Pomerene
Gravel Pit
Chamiso
Double X Ranch
Mescal
Arrow
West Well
Miramonte
Fuel Tank
Gravel Pits
Lake Iris
Benson
(BM 3576)
Cem.
Benson Airport
BM 3586
Cemetery
Drive-in Theater
Swimming Pool
Water Tank
Whetstone Overpass
(UNDER CONSTRUCTION)
Whetstone
VABM 4164
Pima Co
Cochise Co
Canyon
Wakefield Spr
Crystal Well
Wakefield Canyon
Jay Six Ranch
Williams Ranch
Cornfield Canyon
Airway Beacon
Beacon Well
Haystack Mtn
Wildcat Well
Naegle Well
Sabin Camp
Cline's Well
Trask Well
Sabin Well
Dolphin Well
Canary Well
Springs
Cottonwood Canyon
Cottonwood Peak
VABM 6628
East Peak
Spring
Montosa Canyon
Coyote Spring
Guindani Spring
McGrew Spring
Ricketts Mine
Black Well
San Juan
BM 4013
BM 3981
Apache Spring
Willow Canyon
Lone Star Mine
Prospect
Dripping Spr
Willow Spr
Glenn Spr
Apache Peak
Lone Pine Saddle
French Joe Peak
French Joe Canyon
French Joe Spring
French Joe Camp
Wood Canyon
Shellenberger Canyon
Wild Cow Canyon
Wild Cow Spring
Death Trap Canyon
Death Trap Spring
Bear Canyon
Bear Spr
Simpson Spr
Mud Spr Canyon
Granite Peak
Mine
Dry Canyon
Water Tank
Mesquite Tank
Goat Spring
Corner Tanks
Sacaton Tank
Sacaton
White Tank
Wash
California Wash
BM 3963
BM 3917
Sheep Wash Canal
Pomerene Canal
San Pedro River Valley
Santa Rita Mountains
Rincon Mountains
Tucson Mountains
Empire Mountains
Saguaro National Forest
Coronado National Forest
Papago Indian Reservation boundary
Tucson 35 mi. / Ariz. 83 12 mi.
26 mi. to U.S. 666 / Willcox 34 mi.
St. David 2 mi. / Tombstone 19 mi.

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography from aerial photographs by ER-55 plotter
Aerial photographs taken 1955. Field check 1958

Polyconic projection. 1927 North American datum
10,000-foot grids based on Arizona coordinate system
east and central zones
1000-meter Universal Transverse Mercator grid ticks,
zone 12, shown in blue

Red tint indicates areas in which only landmark buildings are shown

Dashed land lines indicate approximate locations
Land lines unsurveyed in parts of T. 19 S.-R. 19 E.

Unchecked elevations are shown in brown

SCALE 1:62500

1 0 1 2 3 4 MILES
3000 0 3000 6000 9000 12000 15000 18000 21000 FEET
1.5 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

13°
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 1958

ROAD CLASSIFICATION

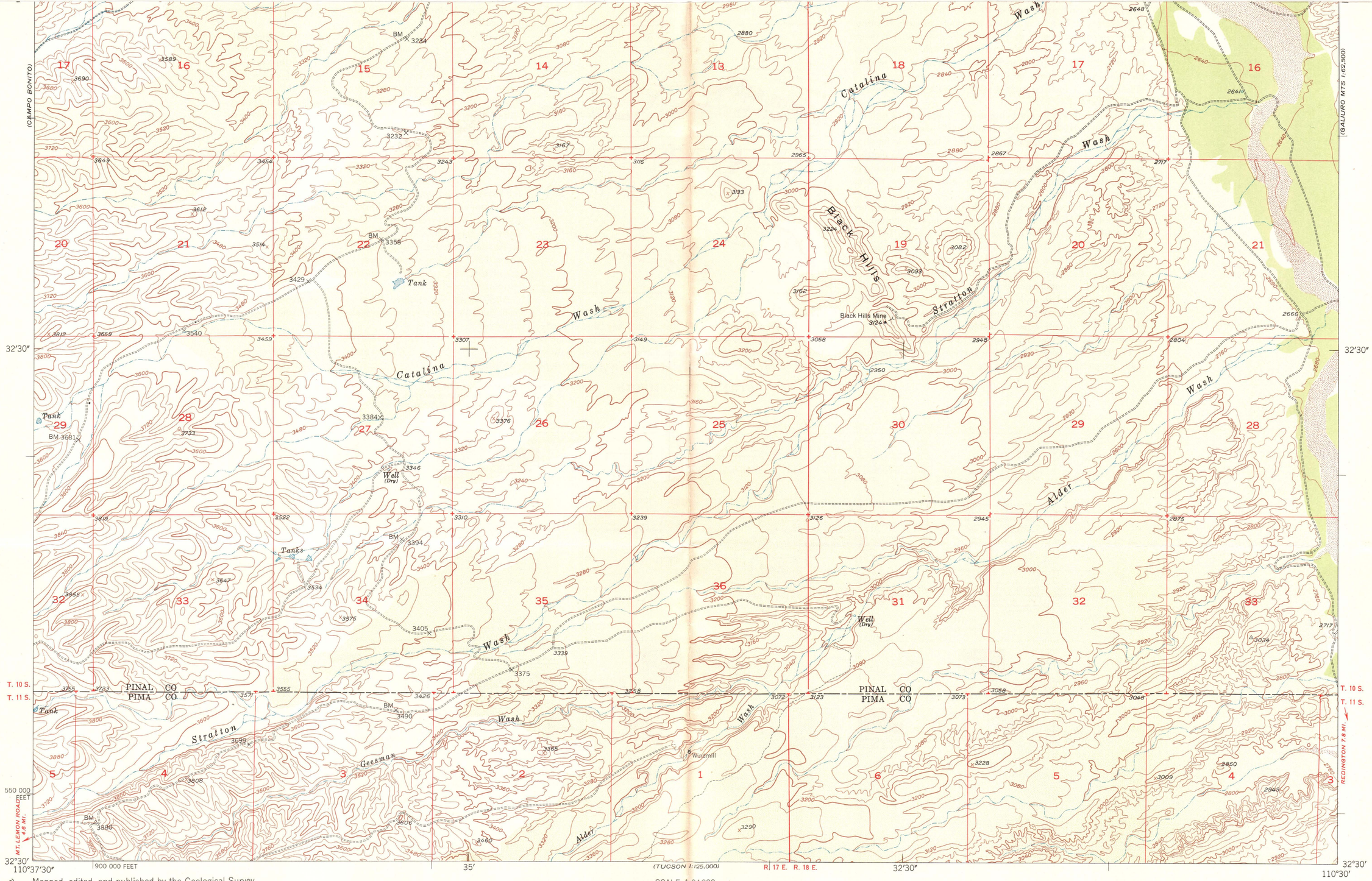
Heavy-duty	Light-duty
Medium-duty	Unimproved dirt
U.S. Route	State Route

ARIZONA
QUADRANGLE LOCATION

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER 25, COLORADO OR WASHINGTON 25, D. C.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

BENSON, ARIZ.
N3145—W11015/15

1958



Mapped, edited, and published by the Geological Survey

Control by USGS

Topography from aerial photographs by multiplex methods
Aerial photographs taken 1945. Field check 1948

Polyconic projection. 1927 North American datum
10,000-foot grid based on Arizona coordinate system, central zone

Dashed land lines indicate approximate location

14°
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 1948

SCALE 1:24000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, WASHINGTON 25, D. C.

WOODLAND
Woods-Brushwood
Scrub

ROAD CLASSIFICATION

HARD-SURFACE ALL WEATHER ROADS		DRY WEATHER ROADS	
Heavy-duty	4 LANE 6 LANE	Improved dirt	
Medium-duty	4 LANE 6 LANE	Unimproved dirt	
Loose-surface, graded, or narrow hard-surface			
(1) U. S. Route		(1) State Route	

PEPPERSAUCE WASH, ARIZ.

N3230-W11030/7.5

EDITION OF 1949

mile), with a contour interval of 10 to 100 feet.

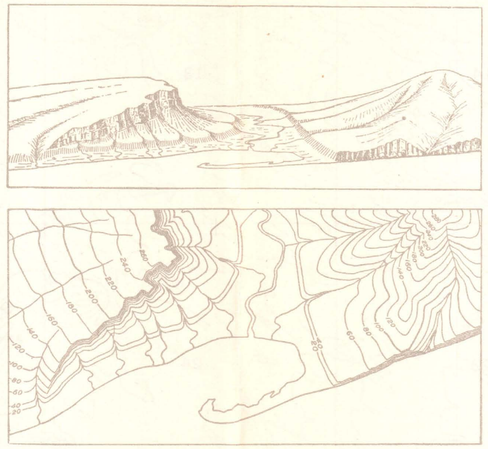
3. Surveys of areas in which the problems are of minor public importance, such as much of the mountain or desert region of Arizona or New Mexico, and the high mountain area of the northwest, are made with sufficient detail to be used in the publication of maps on a scale of $\frac{1}{125,000}$ (1 inch = nearly 2 miles) or $\frac{1}{250,000}$ (1 inch = nearly 4 miles), with a contour interval of 20 to 250 feet.

The aerial camera is now being used in mapping. From the information recorded on the photographs, planimetric maps, which show only drainage and culture, have been made for some areas in the United States. By the use of stereoscopic plotting apparatus, aerial photographs are utilized also in the making of the regular topographic maps, which show relief as well as drainage and culture.

A topographic survey of Alaska has been in progress since 1898, and nearly 44 percent of its area has now been mapped. About 15 percent of the Territory has been covered by maps on a scale of $\frac{1}{500,000}$ (1 inch = nearly 8 miles). For most of the remainder of the area surveyed the maps published are on a scale of $\frac{1}{250,000}$ (1 inch = nearly 4 miles). For some areas of particular economic importance, covering about 4,300 square miles, the maps published are on a scale of $\frac{1}{62,500}$ (1 inch = nearly 1 mile) or larger. In addition to the area covered by topographic maps, about 11,300 square miles of southeastern Alaska has been covered by planimetric maps on scales of $\frac{1}{125,000}$ and $\frac{1}{250,000}$.

The Hawaiian Islands have been surveyed, and the resulting maps are published on a scale of $\frac{1}{62,500}$.

and grade is shown in the figure below.



The sketch represents a river valley that lies between two hills. In the foreground is the sea, with a bay that is partly enclosed by a hooked sand bar. On each side of the valley is a terrace into which small streams have cut narrow gullies. The hill on the right has a rounded summit and gently slop-

them similar to the one on the other side of this sheet have been published.

Geologic maps of some of the areas shown on the topographic maps have been published in the form of folios. Each folio includes maps showing the topography, geology, underground structure, and mineral deposits of the area mapped, and several pages of descriptive text. The text explains the maps and describes the topographic and geologic features of the country and its mineral products. Two hundred twenty-five folios have been published.

Index maps of each State and of Alaska and Hawaii showing the areas covered by topographic maps and geologic folios published by the United States Geological Survey may be obtained free. Copies of the standard topographic maps may be obtained for 10 cents each; some special maps are sold at different prices. A discount of 40 percent is allowed on an order amounting to $5 or more at the retail price. The discount is allowed on an order for maps alone, either of one kind or in any assortment, or for maps together with geologic folios. The geologic folios are sold for 25 cents or more each, the price depending on the size of the folio. A circular describing the folios will be sent on request.

Applications for maps or folios should be accompanied by cash, draft, or money order (not postage stamps) and should be addressed to

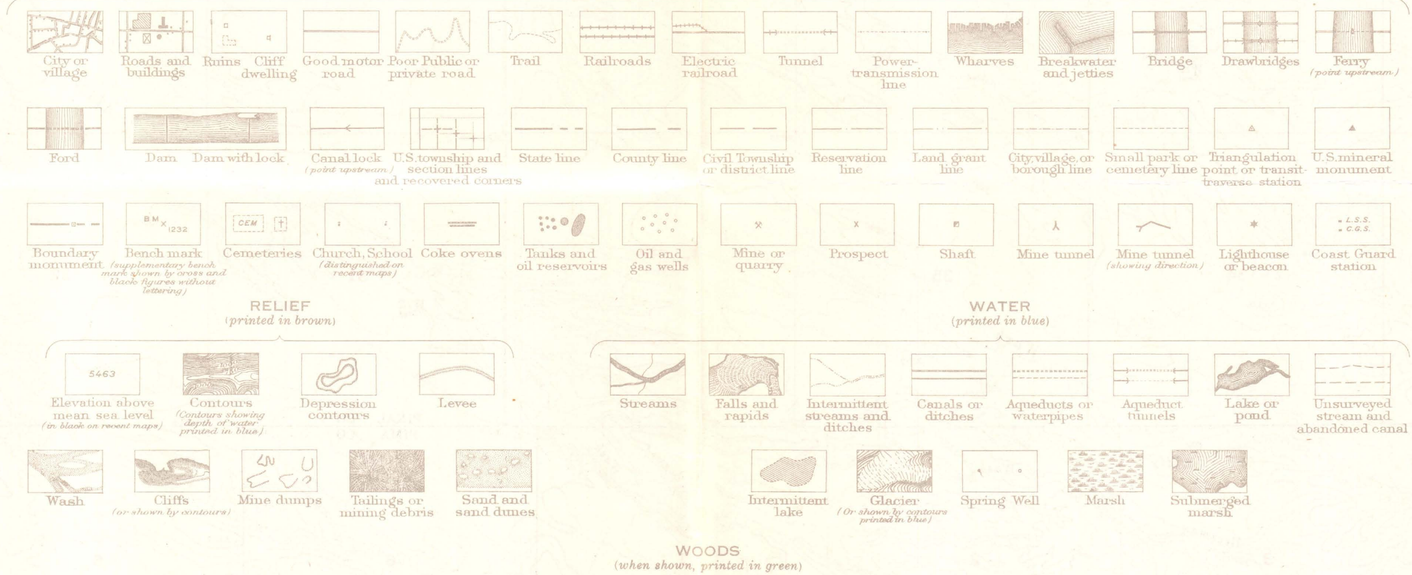
THE DIRECTOR,
United States Geological Survey,
Washington, D. C.

November 1937.

STANDARD SYMBOLS

NOTE:—Effective on and after October 1, 1946, the price of standard topographic quadrangle maps will be 20 cents each, with a discount of 20 percent on orders amounting to $10 or more at the retail rate.

CULTURE
(printed in black)



RELIEF
(printed in brown)

WATER
(printed in blue)

WOODS
(when shown, printed in green)

Mapped, edited, and published by the Geological Survey

Control by USGS

Topography from aerial photographs by multiplex methods
Aerial photographs taken 1945. Field check 1948

Polyconic projection. 1927 North American datum
10,000-foot grid based on Arizona coordinate system, central zone

Dashed land lines indicate approximate location

14°
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 1948

SCALE 1:24000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, WASHINGTON 25, D. C.

WOODLAND
Woods-Brushwood
Scrub

ROAD CLASSIFICATION

HARD-SURFACE ALL WEATHER ROADS		DRY WEATHER ROADS	
Heavy-duty	4 LANE 6 LANE	Improved dirt	
Medium-duty	4 LANE 6 LANE	Unimproved dirt	

Loose-surface, graded, or narrow hard-surface

U. S. Route State Route

PEPPERSAUCE WASH, ARIZ.

N3230-W11030/7.5

EDITION OF 1949

mile), with a contour interval of 10 to 100 feet.

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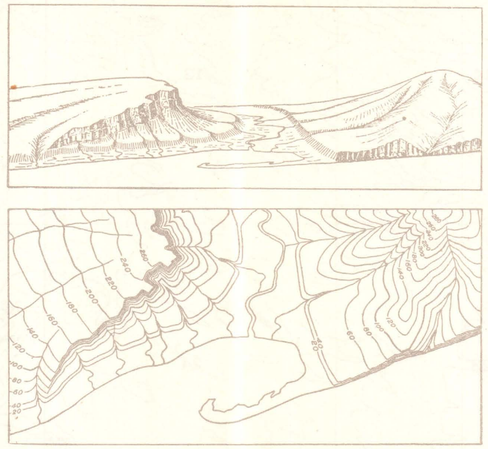
and grade is shown in the figure below.



The sketch represents a river valley that lies between two hills. In the foreground is the sea, with a bay that is partly enclosed by a hooked sand bar. On each side of the valley is a terrace into which small streams have cut narrow gullies. The hill on the right has a rounded summit and gently slop-

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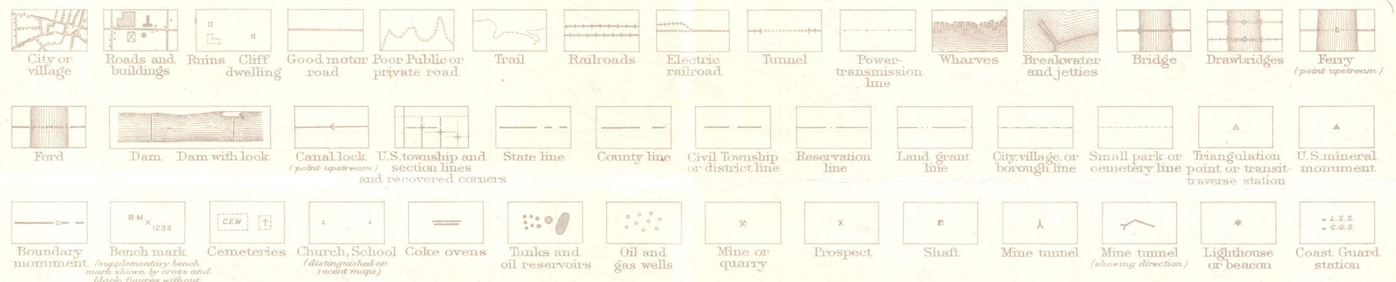
THE DIRECTOR,
United States Geological Survey,
Washington, D. C.

November 1937.

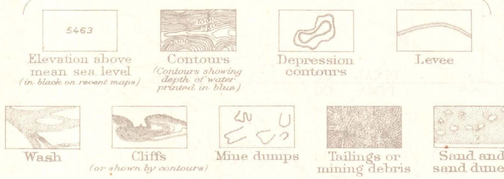
NOTE:—Effective on and after October 1, 1946, the price of standard topographic quadrangle maps will be 20 cents each, with a discount of 20 percent on orders amounting to $10 or more at the retail rate.

STANDARD SYMBOLS

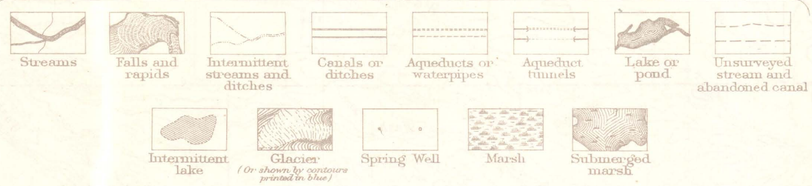
CULTURE
(printed in black)



RELIEF
(printed in brown)



WATER
(printed in blue)



WOODS
(when shown, printed in green)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

CLARK RANCH QUADRANGLE
ARIZONA—PINAL CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

THE TOPOGRAPHIC MAPS OF THE UNITED STATES

The United States Geological Survey is making a series of standard topographic maps to cover the United States. This work has been in progress since 1882, and the published maps cover more than 47 percent of the country, exclusive of outlying possessions.

The maps are published on sheets that measure about 16½ by 20 inches. Under the general plan adopted the country is divided into quadrangles bounded by parallels of latitude and meridians of longitude. These quadrangles are mapped on different scales, the scale selected for each map being that which is best adapted to general use in the development of the country, and consequently, though the standard maps are of nearly uniform size, the areas that they represent are of different sizes. On the lower margin of each map are printed graphic scales showing distances in feet, meters, miles, and kilometers. In addition, the scale of the map is shown by a fraction expressing a fixed ratio between linear measurements on the map and corresponding distances on the ground. For example, the scale $\frac{1}{62,500}$ means that 1 unit on the map (such as 1 inch, 1 foot, or 1 meter) represents 62,500 of the same units on the earth's surface.

Although some areas are surveyed and some maps are compiled and published on special scales for special purposes, the standard topographic surveys and the resulting maps have for many years been of three types, differentiated as follows:

1. Surveys of areas in which there are problems of great public importance—relating, for example, to mineral development, irrigation, or reclamation of swamp areas—are made with sufficient detail to be used in the publication of maps on a scale of $\frac{1}{31,680}$ (1 inch = one-half mile) or $\frac{1}{24,000}$ (1 inch = 2,000 feet), with a contour interval of 1 to 100 feet, according to the relief of the particular area mapped.

2. Surveys of areas in which there are problems of average public importance, such as most of the basin of the Mississippi and its tributaries, are made with sufficient detail to be used in the publication of maps on a scale of $\frac{1}{62,500}$ (1 inch = nearly 1 mile), with a contour interval of 10 to 100 feet.

3. Surveys of areas in which the problems are of minor public importance, such as much of the mountain or desert region of Arizona or New Mexico, and the high mountain area of the northwest, are made with sufficient detail to be used in the publication of maps on a scale of $\frac{1}{125,000}$ (1 inch = nearly 2 miles) or $\frac{1}{250,000}$ (1 inch = nearly 4 miles), with a contour interval of 20 to 250 feet.

The aerial camera is now being used in mapping. From the information recorded on the photographs, planimetric maps, which show only drainage and culture, have been made for some areas in the United States. By the use of stereoscopic plotting apparatus, aerial photographs are utilized also in the making of the regular topographic maps, which show relief as well as

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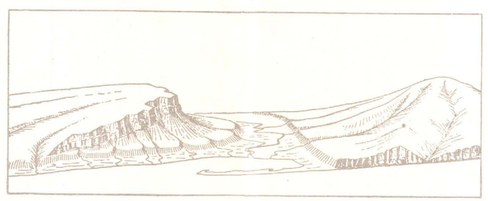
All the water features are represented in blue, the smaller streams and canals by single blue lines and the larger streams by double lines. The larger streams, lakes, and the sea are accentuated by blue water lining or blue tint. Intermittent streams—those whose beds are dry for a large part of the year—are shown by lines of blue dots and dashes.

Relief is shown by contour lines in brown, which on a few maps are supplemented by shading showing the effect of light thrown from the northwest across the area represented, for the purpose of giving the appearance of relief and thus aiding in the interpretation of the contour lines. A contour line represents an imaginary line on the ground (a contour) every part of which is at the same altitude above sea level. Such a line could be drawn at any altitude, but in practice only the contours at certain regular intervals of altitude are shown. The datum or zero of altitude of the Geological Survey maps is mean sea level. The 20-foot contour would be the shore line if the sea should rise 20 feet above mean sea level. Contour lines show the shape of the hills, mountains, and valleys, as well as their altitude. Successive contour lines that are far apart on the map indicate a gentle slope, lines that are close together indicate a steep slope, and lines that run together indicate a cliff.

The manner in which contour lines express altitude, form, and grade is shown in the figure below.



ing spurs separated by ravines. The spurs are truncated at their lower ends by a sea cliff. The hill at the left terminates abruptly at the valley in a steep scarp, from which it slopes gradually away and forms an inclined tableland that is traversed by a few shallow gullies. On the map each of these features is represented, directly beneath its position in the sketch, by contour lines.

The contour interval, or the vertical distance in feet between one contour and the next, is stated at the bottom of each map. This interval differs according to the topography of the area mapped: in a flat country it may be as small as 1 foot; in a mountainous region it may be as great as 250 feet. In order that the contours may be read more easily certain contour lines, every fourth or fifth, are made heavier than the others and are accompanied by figures showing altitude. The heights of many points—such as road intersections, summits, surfaces of lakes, and benchmarks—are also given on the map in figures, which show altitudes to the nearest foot only. More precise figures for the altitudes of benchmarks are given in the Geological Survey's bulletins on spirit leveling. The geodetic coordinates of triangulation and transit-traverse stations are also published in bulletins.

Lettering and the works of man are shown in black. Boundaries, such as those of a State, county, city, land grant, township, or reservation, are shown by continuous or broken lines of different kinds and weights. Public roads suitable for motor travel the greater part of the year are shown by solid double lines; poor public roads and private roads by dashed double lines; trails by dashed single lines. Additional public road classification if available is shown by red overprint.

Each quadrangle is designated by the name of a city, town, or prominent natural feature within it, and on the margins of the map are printed the names of adjoining quadrangles of which maps have been published. More than 4,100 quadrangles in the United States have been surveyed, and maps of them similar to the one on the other side of this sheet have been published.

Geologic maps of some of the areas shown on the topographic maps have been published in the form of folios. Each folio includes maps showing the topography, geology, underground structure, and mineral deposits of the area mapped, and several pages of descriptive text. The text explains the maps and describes the topographic and geologic features of the country and its mineral products. Two hundred twenty-five folios have been published.

Index maps of each State and of Alaska and Hawaii showing the areas covered by topographic maps and geologic folios published by the United States Geological Survey may be obtained

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

CLARK RANCH QUADRANGLE
ARIZONA—PINAL CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

THE TOPOGRAPHIC MAPS OF THE UNITED STATES

The United States Geological Survey is making a series of standard topographic maps to cover the United States. This work has been in progress since 1882, and the published maps cover more than 47 percent of the country, exclusive of outlying possessions.

The maps are published on sheets that measure about 16½ by 20 inches. Under the general plan adopted the country is divided into quadrangles bounded by parallels of latitude and meridians of longitude. These quadrangles are mapped on different scales, the scale selected for each map being that which is best adapted to general use in the development of the country, and consequently, though the standard maps are of nearly uniform size, the areas that they represent are of different sizes. On the lower margin of each map are printed graphic scales showing distances in feet, meters, miles, and kilometers. In addition, the scale of the map is shown by a fraction expressing a fixed ratio between linear measurements on the map and corresponding distances on the ground. For example, the scale $\frac{1}{62,500}$ means that 1 unit on the map (such as 1 inch, 1 foot, or 1 meter) represents 62,500 of the same units on the earth's surface.

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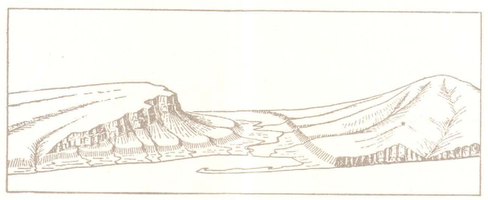

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American Diatomite, Inc (Superlite)
3701 W. Indian School
PHAP 8-4711

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

MAMMOTH QUADRANGLE
ARIZONA
15 MINUTE SERIES (TOPOGRAPHIC)

(WINKELMAN) (KLONDYKE)

110°45′ 40′ 35′ 110°30′ 32°45′ 32°30′

R. 16 E. R. 17 E. R. 18 E.

930 000 FEET

630 000 FEET

550 000 FEET

T. 8 S. T. 9 S. T. 10 S. T. 11 S.

WINKELMAN 19 MI (HOLY JOE PEAK)

COPPER CREEK MINE 1.2 MI

(WINKELMAN 1:125 000)

(GALIURO MTS)

TUCSON 93 MI
ORACLE 1 MI

ORACLE 1 MI

MT LEMON 15 MI.
TUCSON 44 MI.

R. 17 E.
MT LEMON ROAD 4.2 MI

YLE RANCH 5.4 MI.

REDINGTON 7.8 MI.

(TUCSON 1:125 000)

(REDINGTON)

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography from aerial photographs by multiplex methods
Aerial photographs taken 1945. Field check 1948

Polyconic projection. 1927 North American datum
10,000-foot grid based on Arizona coordinate system, central zone

Dashed land lines indicate approximate location

SCALE 1:62500

1 0 1 2 3 4 MILES

3000 0 3000 6000 9000 12000 15000 18000 21000 FEET

1 .5 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

14°
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 1948

ROAD CLASSIFICATION

Heavy-duty — 4 LANE | 6 LANE
Medium-duty — 4 LANE | 6 LANE
Light-duty
Unimproved dirt
U. S. Route
State Route

Maps of the Campo Bonito, Clark Ranch, Mammoth and Peppersauce Wash quadrangles, scale 1:24 000, covering this area are available.

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

FOR SALE BY U. S. GEOLOGICAL SURVEY, FEDERAL CENTER, DENVER, COLORADO OR WASHINGTON 25, D. C.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

MAMMOTH, ARIZ.
N3230—W11030/15

EDITION OF 1951

Phx
GSM
Lease

SAN MANUEL

DIATOMITE

1" = 1 mi.

C.I. = 40 FT.

MAMMOTH
QUAD.

E.N.D.

SAN PEDRO RIVER
Smelter Wash
Big Wash
Clark School
Clark Ranch
Clark Wash
Tank
Well (Dry)
Windmill
Windmill (Dry)
Artesian Well
Artesian Well (Warm)
Artesian Well (Hot)
Tanks
James Wash
Gust James Wash
Little Gust James Wash
Whitlock Wash
Peppersauce Wash
Sacaton Ranch
R17E
R18E
1" = 2,000 FT.
C-I = 40 FT.
Clay Sample
W½ SE¼ SE¼
PLANT
PG
T. 9 S.
T. 10 S.
600 000 FEET
590 000 FEET
40′
35′
32°37′30″
7.2 MI. TO MT. LEMON ROAD
ORACLE 10.8 MI. MT. LEMON ROAD 5.7 MI.
Y L E RANCH 5.4 MI.
S.M

SAN MANUEL
DIATOMITE

1" = 2,000 FT.

C-I- = 40 FT.

E.N.P.

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Although many areas are surveyed and many maps are compiled and published on special scales for special purposes, the standard topographic surveys and the resulting maps have in view seven lines of three requirements, as follows:

1. Maps of areas in which there are problems of great public importance—including the promotion of mineral development, irrigation, or reclamation of swamp lands—which call for sufficient detail to be used in the publication of maps on a scale of 1/62,500 (1 inch = nearly 1 mile) or 1/31,680 (1 inch = half a mile), with a contour interval of 5 or 10 feet, according to the relief of the particular area mapped.

2. Surveys of areas in which there are problems of great public importance, such as areas of the basin of the Mississippi and its tributaries, are made with sufficient detail to be used in the publication of maps on a scale of 1/125,000 (1 inch = nearly 2 miles), with a contour interval of 20 feet.

3. Surveys of areas in which there are problems of great public importance, such as areas of the basin of the Mississippi and its tributaries, are made with sufficient detail to be used in the publication of maps on a scale of 1/250,000 (1 inch = nearly 4 miles), with a contour interval of 50 feet.

A survey of Puerto Rico is in progress, and the publication of the published maps is on a scale of 1/20,000.

The features shown on topographic maps may be arranged in three groups—(1) water features, such as streams, lakes, swamps, and other bodies of water; (2) relief, including mountains, hills, valleys, and other features of the land surface; (3) culture (works of man), such as cities, towns, roads, railroads, and boundaries. The symbols used to represent these features are shown and explained on the maps. Particular attention is given to the culture features, as these are represented on no other maps, and additional features are represented on these special maps.

All the water features are represented in blue, the smaller streams and canals by single lines and the larger streams, lakes, and the sea by double lines. The larger streams are also accentuated by blue water lines, which in many cases show the low-water stages of the streams—those which hold water for a large part of the year—as shown by lines of blue dots.

Relief is shown by contour lines, which are a characteristic feature of topographic maps. These lines, which are a form unknown from the earliest maps, are for the purpose of giving the representation of the configuration of the surface—the interpretation of the contour lines. A contour line represents an imaginary line on the ground, every point of which is at the same elevation above or below the sea level. The shape of a mountain or hill is shown by a series of such lines, each representing a certain height above the sea level. The distance between the contour lines on the map indicates the character of the slope—whether gentle or steep. Where the lines are far apart the slope is gentle, and where they are near together the slope is steep. A system of contour lines shows not only the height of mountains and hills and the depth of valleys, but also the character of the surface—whether smooth or abrupt, whether the hills are long or short, steep or gentle, and whether the valleys are deep or shallow. Bodies of water are shown by contour lines, and the approximate depth of lakes is indicated by figures printed in the water areas.

The system of contour lines is shown on the sketch, which represents a river valley that has been [illegible] hills. In the foreground a [illegible] lies, with a bay that is nearly enclosed by a hooked sand [illegible]. On each side of the valley [illegible] a narrow inlet, which small [illegible] have cut across gullies. The hill on the right has a [illegible] summit and gently slop[illegible]

STANDARD CONVENTIONAL SYMBOLS

CULTURE

RELIEF

WATER

Maps showing the location of the area mapped and the index to adjoining maps will be sent free on application to the Director, United States Geological Survey, Washington, D. C.

Maps of any area mapped by the Survey will be sent on receipt of prices named in the following list. Postage must be added to the prices of maps sent by mail. Remittances should be made by money order (not postage stamps) and should be addressed to

THE DIRECTOR,
United States Geological Survey,
Washington, D. C.

November 1907.