

LAWS RELATING TO THE PUBLIC LAND SURVEY

The Continental Congress in 1785 passed a law that provided for the subdivision of public lands into townships six miles square. These townships were to be further subdivided into sections one mile square – 36 sections to the township.

The responsibility for surveying the public lands, known as "Public Domain", was given to the General Land Office in the Treasury Department. In 1910 the General Land Office was transferred to the Interior Department where it has remained.

Prior to 1910, independent contractors ran public land surveys, and the contracts were awarded through bidding. This system often resulted in very poor surveys. Regardless of the quality of the surveying, corners, once established, are legal and cannot be changed. Corners that become lost or obliterated are restored, as nearly as possible, to their original positions.

The unit of length in the original surveys was the 66-foot or Gunter's chain, divided into 100 links. This is a convenient unit since 10 square chains are equal to one acre. Area in acres is obtained from square chains by merely moving the decimal one place to the left.

GENERAL SCHEME OF SUBDIVISION

Since the first law was enacted in 1785, a few minor changes have been made from time to time, so surveys in various regions are not always entirely alike. The general principles, however, have remained unchanged.

The primary unit is the "Township" bounded by "Meridians" (true north-south lines) and "Latitudes" (true east-west lines) as nearly as possible 6 miles square. The township is divided into 36 secondary units called "Sections", as nearly as possible, 1 mile square.

Since true meridians converge toward the North Pole, (in this, the Northern Hemisphere) it is impossible to lay out a really square township or one containing 36 sections all of which are square.

All townships and sections are located with respect to a set of principal axes passing through an origin or "Initial Point". The lines that form the axes are a true meridian (north-south line) called a "Principal Meridian" and a true parallel of latitude (east-west line) called a "Base Line". See Figure No. 1.

Each Principal Meridian has been given a proper name to which all subdivisions measured from it are referred. In other words, the name of the principal meridian is a part of the legal description of any area measured from it.

The first principal meridian established was named the "First Principal Meridian", and from this meridian and its base line most of Ohio and Indiana was surveyed. The longitude of the First Principal Meridian is $84^{\circ} 48' 50''$ and the latitude of its base line is $41^{\circ} 00' 00''$. It was not practical to continue surveying indefinitely from this meridian partly because of rapid westward expansion. The "Second Principal Meridian" was established far in advance to the West and surveys from this meridian eventually joined those made from the First Principal Meridian.

This system of numerically naming meridians was continued through the "Sixth Principal Meridian". Parts of Utah were settled far in advance of the normal westward progression. It became desirable to commence surveying in the vicinity of Salt Lake City. Using astronomical instruments, the Mormon Pioneers established an initial point in the L.D.S. Temple Grounds near the present intersection of South Temple and Main Streets. The meridian through this point was named the "Salt Lake Meridian" and the base line is usually known as the "Salt Lake Base Line".

When settlement began in the Uinta Basin in northeastern Utah, both the Sixth Principal Meridian and the Salt Lake Meridian were too distant for practical orientation. The "Uinta Special Meridian" and "Base Line" were established with initial point near Hayden, Utah.

Surveys run from the Salt Lake and Uinta Special meridians eventually met east of Heber. The broken and irregular townships and sections resulting along the line of this union are confusing and difficult to describe.

ESTABLISHMENT OF GUIDE MERIDIANS AND STANDARD PARALLELS

The first step in starting a survey from a principal meridian and base line is to establish secondary axes at intervals of 24 miles north and south of the base line, and at intervals of 24 miles east and west of the principal meridian. The east-west lines thus established are called "Standard Parallels". The north-south lines are called "Guide Meridians". The standard parallels are continuous, but the guide meridians are broken at their junctions with the standard parallels. The reason for this is that guide meridians, being true meridians, converge, and at the end of 24 miles are somewhat less than 24 miles apart. Thus, standard parallels are also called "Correction Lines". See Figure No. 1.

The quadrangles formed by the establishment of guide meridians and standard parallels are not square. Their south, east and west sides are each 24 miles long, while the north sides are something less than 24 miles according to the convergence of meridians with the principal meridian. Standard parallels are numbered north or south of the base line. See Figure No. 1.

It should be noted that to this point all lines established are true geographical lines. All north-south lines are true meridians converging toward the pole.

ESTABLISHMENT OF TOWNSHIPS

The division of the quadrangles is accomplished by running true north-south lines (meridians) at intervals of 6 miles (measured along the south line of a quadrangle) called "Range Lines" and true east-west lines (latitudes) at intervals of 6 miles called "Township Lines". The range lines are continuous through each quadrangle but are broken at the standard parallels. The intersections of the three range lines and three township lines form 16 approximately square figures known as "Townships".

Due to convergence of meridians, townships are not true squares and they are not all the same size. The most northern townships in a quadrangle are the smallest – the most southern townships are the largest. See Figure No. 2.

A column of townships extending north and south is called a "Range". A row of townships extending east and west is called a "Tier".

Ranges are numbered east or west of the principle meridian. Tiers are numbered north or south of the base line.

A particular township that is in the 16th range east of the principle meridian and also in the 12th tier north of the base line is designated "Township 12 North of Range 16 East" or abbreviated "T12N, R16E".

It should again be noted that all lines established to this point are still true geographical lines with all north-south lines converging toward the pole.

THE DIVISION OF TOWNSHIPS INTO SECTIONS

Townships, being approximately 6 miles square and containing approximately 36 square miles, are now divided into 36 segments called "Sections". At this point in subdivision the rule of running all lines in true geographical direction with respect to convergence is abandoned.

Sections are numbered within a township from 1 to 36. Section No. 1 is in the northeast corner of the township. The most northern row is numbered east to west (1 to 6). The order is reversed for each row of Sections progressing south to Section No. 36 in the southeast corner of the township. See Figure No. 3.

A prescribed order of surveying section lines within each township is usually followed. The order of running these lines is indicated by small numbers on the section lines in Figure No. 3. The first line, the west section line of section 36, is run as nearly as possible parallel to the east range line of the township. All other north-south section lines are also run parallel to the east range line. Thus none of these lines are true meridians.

Lines 1 & 2 (see Figure No. 3) are run forward as tentative lines, with temporary corners established, until a tie is made with the previously established east range line. Any error of closure is noted and the lines are run in reverse direction, correcting for the error of closure, to establish permanent corners. Corners established at the corners of sections are called "Section Corners", and are indicated by metal or rock monuments. Similar monuments at midpoints between all section corners are also established and known as "Quarter Corners".

SUBDIVISION OF REGULAR SECTIONS

All sections within a township that are not along the north and west edges of the township are referred to as "Regular Sections". Regular sections contain as nearly as possible one square mile and are 1 mile, 80 chains, or 5280 feet on each side.

Straight lines are run between opposite quarter corners to establish four parcels called "Quarter Sections". The resulting quarter sections are referred to by their placement – (NE $\frac{1}{4}$, SE $\frac{1}{4}$, SW $\frac{1}{4}$, or NW $\frac{1}{4}$) – within a section. See Figure No. 4.

Quarter sections are further divided by establishing the midpoints on each of their sides. The midpoints are known as "Quarter-Quarter Corners" or "Sixteenth Corners". Straight lines running between opposite sixteenth corners divide quarter sections into four tracts called "Quarter-Quarter Sections" containing approximately 40 acres each.

For instance, dividing the northwest quarter of a regular section into quarter-quarter sections would yield the NE $\frac{1}{4}$ of the NW $\frac{1}{4}$, the SE $\frac{1}{4}$ of the NW $\frac{1}{4}$, the SW $\frac{1}{4}$ of the NW $\frac{1}{4}$, and, the NW $\frac{1}{4}$ of the NW $\frac{1}{4}$ of the section.

The same procedure is followed to obtain even smaller subdivisions.

SUBDIVISION OF IRREGULAR OR FRACTIONAL SECTIONS

"Irregular" or "Fractional Sections" are those sections on the north and west edges of a township. Their irregularity is due to the convergence of the meridians and to the accumulation of all sorts of surveying errors throughout the township. The north fractional sections – (sections 1, 2, 3, 4, and 5, excluding section 6) – are surveyed from the south exactly as normal sections through the south half of the sections and the south halves of the NE $\frac{1}{4}$ and NW $\frac{1}{4}$ of the sections. The north halves of the NE $\frac{1}{4}$ and NW $\frac{1}{4}$ sections are divided into 4 lots numbered 1 to 4 from east to west. Each of these lots contains something more or less than 40 acres – they resemble quarter-quarter sections but are always referred to as "Lots" and by proper number.

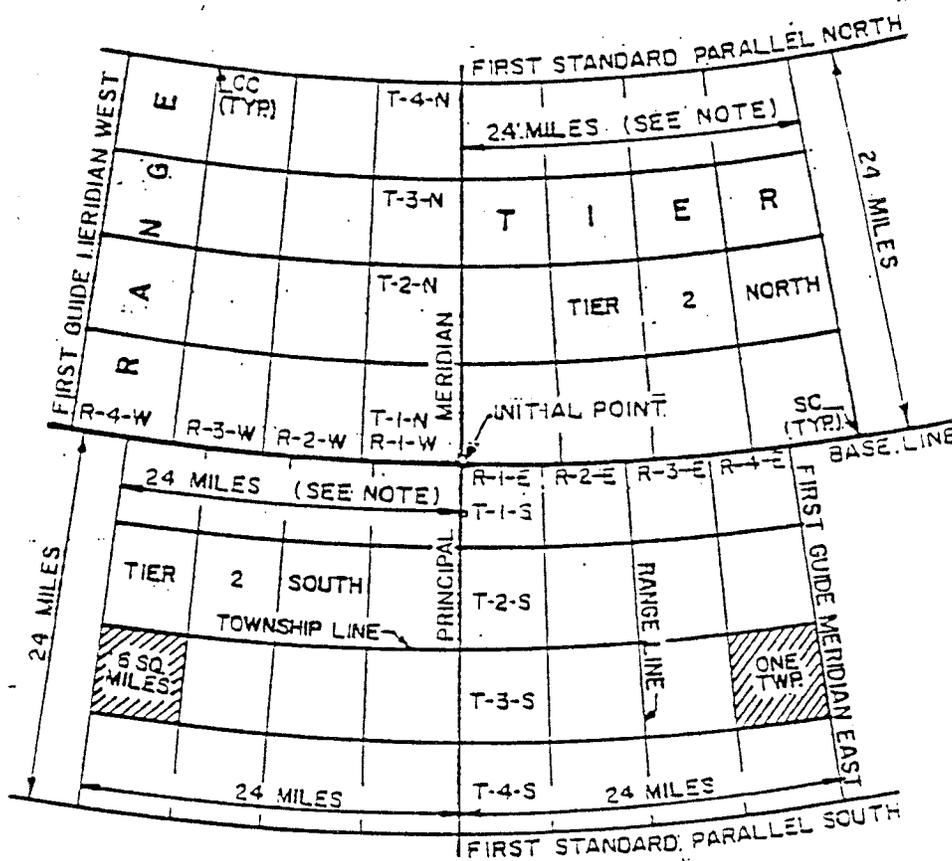
The sections bordering on the west side of a township (except section 6) are surveyed from normal sections. In other words the east half of each section and the east halves of the SW $\frac{1}{4}$ and the NW $\frac{1}{4}$ are surveyed to proper dimensions. The remaining strip down the west edge of the section is divided (with elongations of previously established lines) into 4 lots numbered 1 to 4 from north to south. Each of these lots is nearly always less than 40 acres since all of the discrepancy due to convergence is accumulated here.

Section 6 has fractional lots on the north and west sides. They are numbered 1 to 7 beginning in the NE corner of the section and continuing around in a counter-clockwise direction to the SW corner. See Figure No. 5.

Fractional lots are sometimes introduced into an otherwise normal section due to the existence of navigable water. Navigable waters cannot become the property of anyone so are excluded from the public land survey.

In subdividing a section containing such water, regular lines are run to their point of intersection with the "Mean High Water Line". At those points corners are established known as "Meander Corners". Lines roughly following the mean high water line are run connecting all the meander corners. These lines are called "Meander Lines".

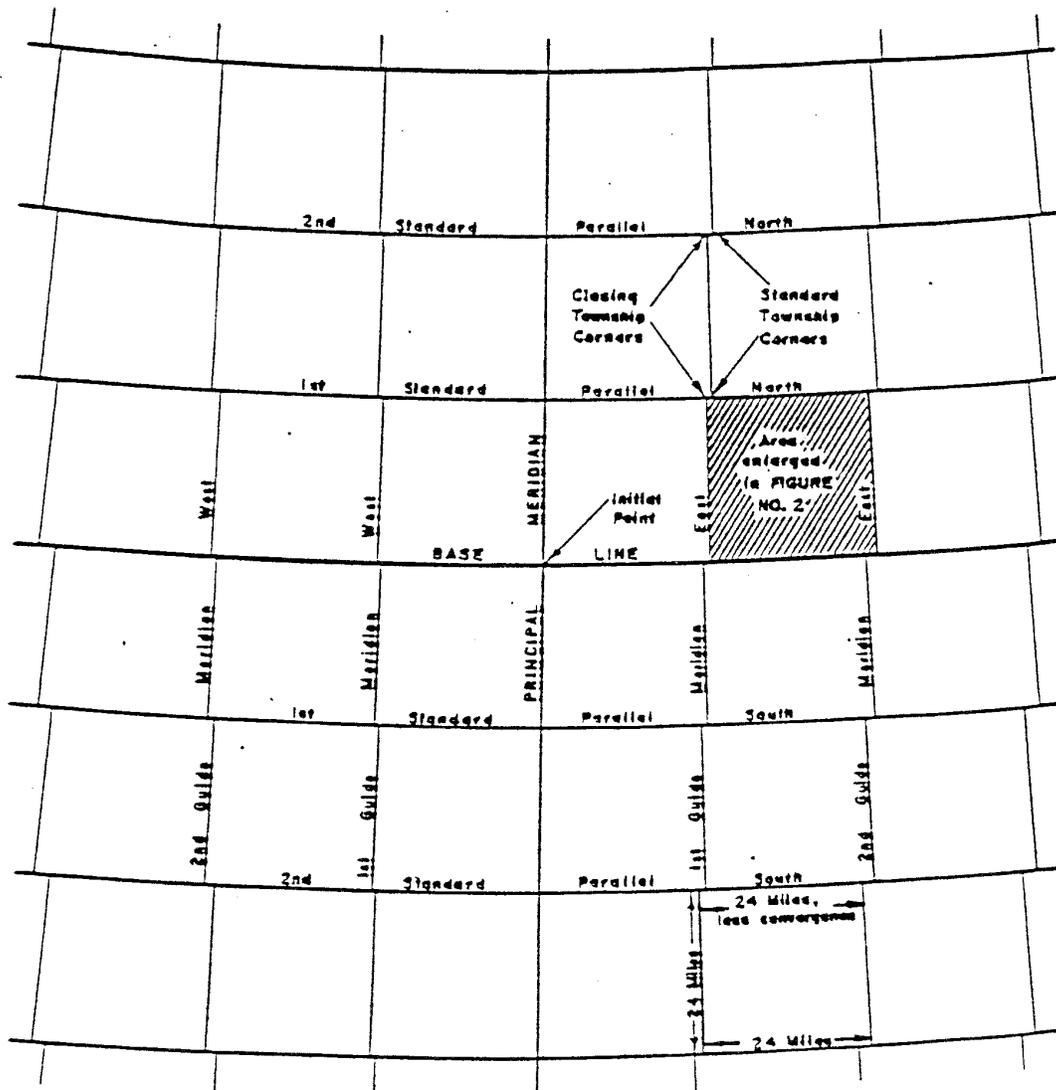
TYPICAL QUADRANGLE DETAIL



NOTE:

CONVERGENCY (THE ACT OF MOVING, TURNING OR BEING DIRECTED TOWARDS EACH OTHER) IS THE RESULTS OF THE GUIDE MERIDIANS BECAUSE THEY RUN DUE NORTH FROM THE BASE LINE OR STANDARD PARALLELS (TRUE PARALLEL OF LATITUDE) THAT RUN EAST/WEST AROUND THE EARTH, WHICH IS THE SHAPE OF A SPHERE.

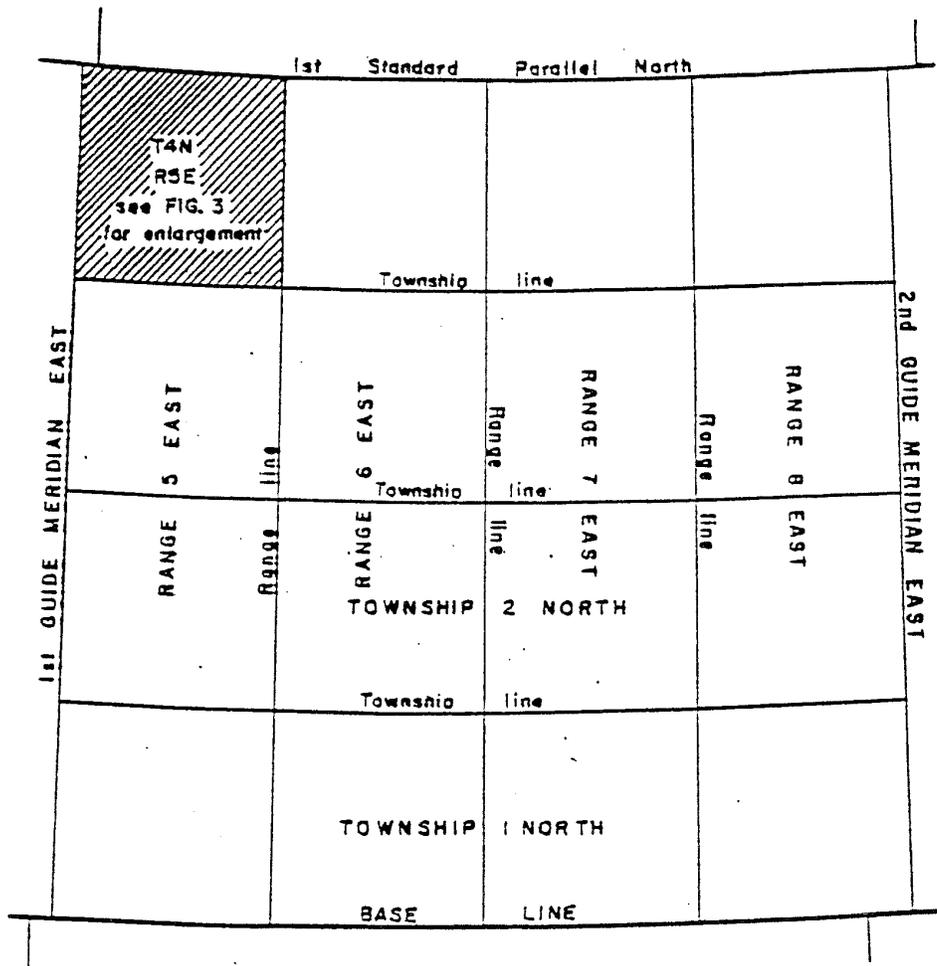
GUIDE MERIDIANS & STANDARD PARALLELS



All Meridians shown above theoretically run North and South.
All Parallels shown above theoretically run East and West.

FIGURE NO. 1

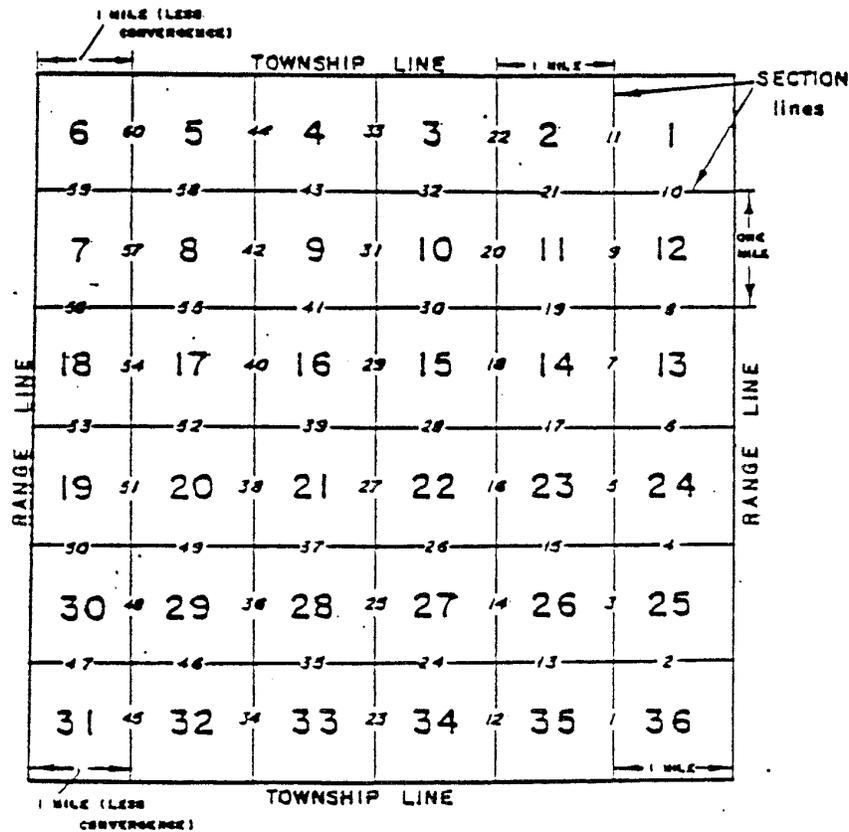
DIVISION INTO TOWNSHIPS



Range lines are true MERIDIANS. (They run North and South).
Township lines are true PARALLELS (They run East and West).

FIGURE NO. 2

THE DIVISION OF TOWNSHIP INTO SECTIONS



North-South Section lines are not necessarily meridians, but lines parallel to the East Range line.

East-West Section lines are true parallels of Latitude, and they are parallel to each other in a true East West direction.

Slanted numbers on lines indicate the order of surveying section lines.

FIGURE NO. 3



THE FOLLOWING DEPARTMENTS AT HOTCHKISS OFFER YOU THESE SERVICES:

CAMERA
 (FILM) NEGATIVES POSITIVES
 ENLARGEMENTS, REDUCTIONS, CLOTH
 REPRODUCIBLES, MURALS, PROOFS,
 PRINTS

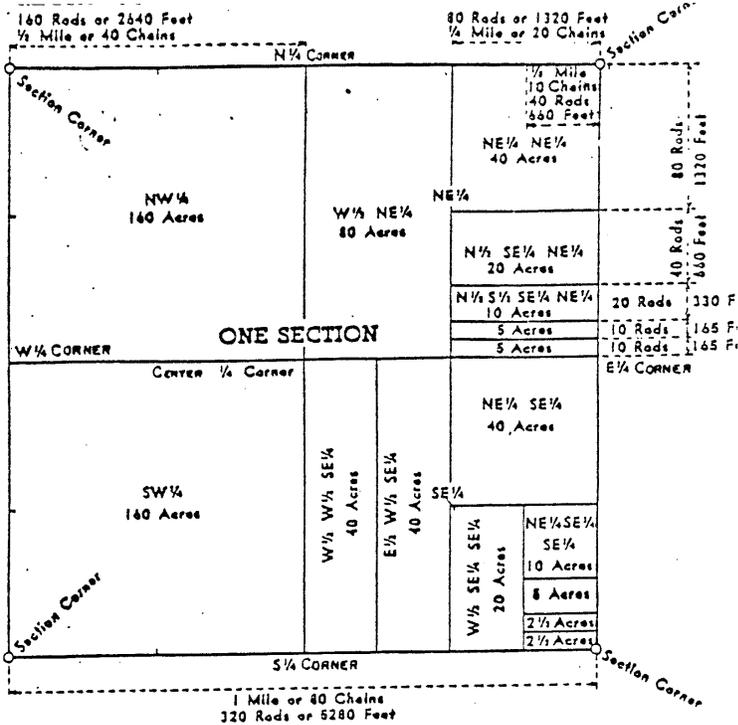
REPRODUCTION
 BLUE PRINTS, DIRECTS,
 SEPIAS, VAN DYKES, AUTOPOSITIVES,
 CLOTH PRINTS, PHOTOSTATS

MOUNTINGS
 CLOTH, DISKETS, BOARD,
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 PETROLEUM, POSTINGS, LAYOUTS,
 COMPILATIONS, COLORING

MAPS
 CITY, COUNTY, STATE, U. S.,
 GEOLOGICAL, PETROLEUM, BASE MAPS.

PICKUP and DELIVERY SERVICE



SCALE CONVERSIONS

SCALES	FT./INCH	MILES/INCH	ACRES/SQ. IN.
1:20,000	1,666.667	0.316	63.769
1:24,000	2,000.00	0.379	91.827
1:31,680	2,640.00	0.500	160.000
1:48,000	4,000.00	0.758	367.309
1:62,500	5,208.33	0.986	622.744
1:63,360	5,280.00	1.000	640.000
1:125,000	10,416.667	1.973	2,490.980
1:250,000	20,833.333	3.946	9,963.907
1:500,000	41,666.667	7.891	39,855.627
1:1,000,000	83,333.333	15.783	159,422.507

LINEAR MEASURE

- 1 Link = 7.92 inches
- 1 Rod = 16.5 ft. = 5.5 yds.
- 1 Chain = 66.0 ft.
- 1 Chain = 4 Rods
- 1 Chain = 100 Links
- 1 Furlong = 40 Rods
- 1 Mile = 8 Furlongs
- 1 Mile = 80 Chains
- 1 Mile = 320 Rods

SQUARE MEASURE

- 1 sq. yd. = 9 sq. ft.
- 1 sq. Rod = 30.25 sq. yds.
- 1 Acre = 10 sq. Chains
- 1 Acre = 160 sq. Rods
- 1 Acre = 43,560 sq. ft.
- 1 Acre = 208.71 x 208.71

SCALE CONVERSION FORMULAS

$$\begin{aligned}
 \text{FT./IN.} &= \frac{\text{SCALE}}{12} \\
 \text{MI./IN.} &= \frac{\text{SCALE}}{63,360} \\
 \text{IN./MI.} &= \frac{63,360}{\text{SCALE}} \\
 \text{METERS/IN.} &= \text{FT./IN.} \times 0.3048 \\
 \text{ACRES/SQ. IN.} &= \frac{(\text{SCALE})^2}{43,560 \times 144}
 \end{aligned}$$



U. S. A. ONE TOWNSHIP

