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LENGTH AND AREA EQUIVALENTS for interpreting wildland resource maps

Elliot L. Amidon Marilyn S. Whitfield

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While assembling data from wildland resource maps for computer processing, we needed numerous map-and-ground equivalents.^{1,2} Some of the common ratios were available from the literature.³ But because some equivalents were missing, we decided to compute all those required. The length and area equivalents for nine map scales are given in a series of tables (*tables 1-9*). The basic conversion factors used are stored in a Fortran program⁴ that was designed for easy modification rather than for speed. By modifying the program, the map user can compute equivalents for other scales.

All equivalents for a given map scale can fit on one page (see *table 1* for example). Each table has three sections: (1) map-to-ground equivalents, (2) buffer strip or road widths, and (3) variable cell dimensions.

The first section is self-explanatory except for the term "cell." This term refers to the grid cell printed by the Map Information Assembly and Display System (MIADS) for map data processing.⁵

The second section is for those map features, such as roads or buffer strips surrounding lakes, which are not drawn to scale. The area of these strips cannot be measured directly, but must be computed. For example, at a scale of 2 inches per mile, and a buffer width of 200 feet, 7 inches of reservoir perimeter on the map would represent 85 acres (*table 5*).

The third section gives the input cell dimensions required for a specified cell acreage. It also shows the scale of the printed output, for which cells always contain one-thirtieth of a square inch of paper. It is primarily useful for planning a map data collection system. For example, if the user's map data have a representative fraction of 1:250,000, and he wants 1,000 acres per cell, a grid must be drawn with a horizontal spacing of 0.347 inch and a

ABSTRACT: Map users must refer to an appropriate scale in interpreting wildland resource maps. Length and area equivalents for nine map scales commonly used have been computed. For each scale a 1-page table consists of map-to-ground equivalents, buffer strip or road widths, and cell dimensions required for a specified acreage. The conversion factors are stored in a Fortran program. It can be easily modified to compute equivalents for other map scales.

RETRIEVAL TERMS: map; map scale (ratios); map interpretation; map-to-ground equivalents.

OXFORD: US28.91:156.

vertical spacing of 0.289 inch. The output scale is 1:433,796 or about 6.8 miles to the inch. To obtain a new table of equivalents, simply reprocess with this nonstandard scale.

The method used to calculate variable cell dimensions deserves explanation. Assume that we are given an input map scale of 1 inch per mile (R.F. 1:63,360) and a requirement of 80 acres per output grid cell. The input grid cell dimensions which will satisfy these requirements are 0.387 inch and 0.323 inch. The three steps necessary to obtain this answer are:

Step 1:

Determine the representative fraction of the output grid cell (1/5 inch x 1/6 inch)...

$$\begin{aligned}\text{Constant} &= (\text{Sq.ft./ac.})(\text{Sq.in./ft.})(\text{No. cells/sq.in.}) \\ &= [43,560] [144] [30] \\ &= 188,179,200\end{aligned}$$

$$\begin{aligned}1 \text{ sq. in. on map} &= \text{Constant} \cdot \text{Output cell area} \\ &= 188,179,200 \cdot 80\end{aligned}$$

Extraction of roots

$$\begin{aligned}\text{Output R.F.} &= 1:\sqrt{188,179,200} \cdot \sqrt{80} \\ &= 1: 122,696.1124.\end{aligned}$$

Step 2:

Find the ground dimensions of the output grid cell...

$$1 \text{ acre} = 10 \text{ sq. chains}$$

$$h \cdot w = 800 \text{ sq. chains}$$

$$h = 5/6w$$

Substituting

$$5/6w \cdot w = 800$$

$$w^2 = 6/5(800)$$

$$= 960$$

$$w = 30.98386677 \text{ chains.}$$

Therefore,

$$h = 5/6w$$

$$= 25.81988898 \text{ chains}$$

Step 3:

Find, for the input scale selected, the input cell dimensions (in inches) equivalent to the ground dimensions in chains...

$$\text{Input width} = \frac{w \text{ in inches}}{\text{input scale}}$$

$$\text{Input height} = \frac{h \text{ in inches}}{\text{input scale}}$$

$$1 \text{ chain} = 66 \text{ feet} = 792 \text{ inches}$$

$$w = \frac{30.98387 \cdot 792}{63,360} = 0.38730 \text{ inch}$$

$$h = \frac{25.81988 \cdot 792}{63,360} = 0.32275 \text{ inch}$$

Notes

¹Hill, Miles R., and Amidon, Elliot L. *Inventorying National Forest resources...for planning-programing-budgeting system*. U.S.D.A. Forest Serv. Res. Note PSW-178, Pacific SW. Forest & Range Exp. Sta., Berkeley, Calif. 4 p., illus. 1968.

²Amidon, Elliot L., and Elsner, Gary H. *Delineating landscape view areas...a computer approach*. U.S.D.A. Forest Serv. Res. Note PSW-180, Pacific SW. Forest & Range Exp. Sta., Berkeley, Calif. 5 p. 1968.

³Munns, E. N.; Hoerner, Theresa G.; and Clements, V. A. *Converting factors and tables of equivalents used in forestry*. U.S.D.A. Misc. Publ. 225. 48 p. 1935, rev. 1949.

⁴Available upon request to Computer Services Librarian, Pacific Southwest Forest and Range Experiment Station, Box 245, Berkeley, California 94701. Ask for CONVRT.

⁵Amidon, Elliot L. *MIADS2—an alphanumeric map information assembly and display system for a large computer*. U.S. Forest Serv. Res. Paper PSW-38, Pacific SW. Forest & Range Exp. Sta., Berkeley, Calif. 12 p., illus. 1966.

The Authors

are assigned to forest economics studies, with emphasis on multiple-use problems, and headquartered in Berkeley, Calif. **ELLIOT L. AMIDON** earned B.S. (1954), in forest management at Colorado Agricultural and Mechanical College, and M.S. (1960) degrees, in agricultural economics at the University of California. He has been with the Berkeley staff since 1959. **MARILYN S. WHITFIELD**, a statistical clerk, joined the Station staff in 1962, after working for the U.S. Agricultural Marketing Service and the U.S. Army Corps of Engineers.

TABLE 1.—LENGTH AND AREA EQUIVALENTS FOR A MAP SCALE OF
8.000000 INCHES PER MILE
(1 TO 7920)

MAP-TO-GROUND EQUIVALENTS

THIS MAP DISTANCE

EQUALS THIS DISTANCE ON THE GROUND

ONE	MILES	YARDS	FEET	KILOMETERS
-INCH	.12500000-00	.22000000+03	.66000000+03	.20116800-00
-CENTIMETER	.49212597-01	.86614171+02	.25984252+03	.79200000-01
ONE CELL *				
-WIDTH	.25000000-01	.44000000+02	.13200000+03	.40233599-01
-HEIGHT	.20833334-01	.36666667+02	.11000000+03	.33527999-01
-DIAGONAL	.32542708-01	.57275164+02	.17182550+03	.52372410-01

THIS MAP AREA

EQUALS THIS AREA ON THE GROUND IN SQUARE

ONE SQUARE	-MILES	-YARDS	-FEET	-KILOMETERS
-INCH	.15625000-01	.48400000+05	.43560001+06	.40468564-01
-CENTIMETER	.24218798-02	.75020146+04	.67518133+05	.62726399-02
ONE CELL *	.52083333-03	.16133333+04	.14520000+05	.13489521-02

THIS MAP AREA

EQUALS THIS AREA ON THE GROUND

ONE SQUARE	ACRES	HECTARES
-INCH	.10000000+02	.40468564+01
-CENTIMETER	.15500030+01	.62726399-00
ONE CELL *	.33333334-00	.13489521-00

* CELL SIZE OF 1/5 BY 1/6 INCH

BUFFER STRIPS OR ROAD WIDTHS

THIS BUFFER WIDTH ON THE GROUND	EQUALS THIS WIDTH ON THE MAP (INCHES)	REPRESENTS, PER INCH ON THE MAP, THIS NO. OF ACRES
A. 50 FEET	.75757575-01	.75757575-00
B. 100 FEET	.15151515-00	.15151515+01
C. 200 FEET	.30303030-00	.30303030+01

VARIABLE CELL DIMENSIONS

ACREAGE	WIDTH INCHES	HEIGHT INCHES	AREA (SQ. IN.)	OUTPUT SCALE (INCHES PER MILE)	OUTPUT R.F. 1 TO
1.	.34641016-00	.28867513-00	.99999994-01	4.6188022	13717.84
5.	.77459664-00	.64549720-00	.49999996-00	2.0655911	30674.03
10.	.10954451+01	.91287090-00	.99999992-00	1.4605935	43379.63
20.	.15491933+01	.12909944+01	.19999998+01	1.0327956	61348.05
40.	.21908902+01	.18257418+01	.39999997+01	.7302968	86759.25
80.	.30983866+01	.25819888+01	.79999993+01	.5163978	122696.11
160.	.43817803+01	.36514836+01	.15999999+02	.3651484	173518.50
640.	.87635606+01	.73029672+01	.63999994+02	.1825742	347037.01
1000.	.10954451+02	.91287090+01	.99999992+02	.1460593	433796.26

TABLE 2.—LENGTH AND AREA EQUIVALENTS FOR A MAP SCALE OF
6.336000 INCHES PER MILE
(1 TO 10000)

MAP-TO-GROUND EQUIVALENTS

THIS MAP DISTANCE

EQUALS THIS DISTANCE ON THE GROUND

ONE	MILES	YARDS	FEET	KILOMETERS
-INCH	.15782829-00	.27777778+03	.83333333+03	.25400000-00
-CENTIMETER	.62137118-01	.10936133+03	.32808399+03	.99999999-01
ONE CELL *				
-WIDTH	.31565657-01	.55555554+02	.16666666+03	.50799999-01
-HEIGHT	.26304714-01	.46296296+02	.13888889+03	.42333333-01
-DIAGONAL	.41089277-01	.72317126+02	.21695138+03	.66126780-01

THIS MAP AREA

EQUALS THIS AREA ON THE GROUND IN SQUARE

ONE SQUARE	-MILES	-YARDS	-FEET	-KILOMETERS
-INCH	.24909767-01	.77160493+05	.69444444+06	.64515998-01
-CENTIMETER	.38610215-02	.11959900+05	.10763910+06	.99999999-02
ONE CELL *	.83032556-03	.25720164+04	.23148148+05	.21505333-02

THIS MAP AREA

EQUALS THIS AREA ON THE GROUND

ONE SQUARE	ACRES	HECTARES
-INCH	.15942251+02	.64515999+01
-CENTIMETER	.24710537+01	.99999999-00
ONE CELL *	.53140835-00	.21505333-00

* CELL SIZE OF 1/5 BY 1/6 INCH

BUFFER STRIPS OR ROAD WIDTHS

THIS BUFFER WIDTH ON THE GROUND	EQUALS THIS WIDTH ON THE MAP (INCHES)	REPRESENTS, PER INCH ON THE MAP, THIS NO. OF ACRES
A. 50 FEET	.59999999-01	.95653504-00
B. 100 FEET	.12000000+00	.19130701+01
C. 200 FEET	.24000000-00	.38261402+01

VARIABLE CELL DIMENSIONS

ACREAGE	INPUT GRID CELL WIDTH INCHES	HEIGHT INCHES	AREA (SQ. IN.)	OUTPUT SCALE (INCHES PER MILE)	OUTPUT R.F. 1 TO
1.	.27435684-00	.22863070-00	.62726305-01	4.6188022	13717.84
5.	.61348053-00	.51123378-00	.31363197-00	2.0655911	30674.03
10.	.86759249-00	.72299375-00	.62726394-00	1.4605935	43379.63
20.	.12269611+01	.10224676+01	.12545279+01	1.0327956	61348.05
40.	.17351850+01	.14459875+01	.25090558+01	.7302968	86759.25
80.	.24539221+01	.20449352+01	.50181115+01	.5163978	122696.11
160.	.34703699+01	.28919750+01	.10036223+02	.3651484	173518.50
640.	.69407399+01	.57839499+01	.40144892+02	.1825742	547037.01
1000.	.86759251+01	.72299375+01	.62726395+02	.1460593	433796.26

TABLE 3.--LENGTH AND AREA EQUIVALENTS FOR A MAP SCALE OF
4.0000001 INCHES PER MILE
(1 TO 15840)

MAP-TO-GROUND EQUIVALENTS

THIS MAP DISTANCE

EQUALS THIS DISTANCE ON THE GROUND

ONE	MILES	YARDS	FEET	KILOMETERS
- INCH	.25000000-00	.44000001+03	.13200000+04	.40233600-00
- CENTIMETER	.98425195-01	.17322835+03	.51968504+03	.15840000-00
ONE CELL *				
- WIDTH	.50000000-01	.88000000+02	.26400000+03	.80467199-01
- HEIGHT	.41666666-01	.73333333+02	.22000000+03	.67055999-01
- DIAGONAL	.65085415-01	.11455033+03	.34365099+03	.10474482+00

THIS MAP AREA

EQUALS THIS AREA ON THE GROUND IN SQUARE

ONE SQUARE	-MILES	-YARDS	-FEET	-KILOMETERS
- INCH	.62500000-01	.19360000+06	.17424000+07	.16187426-00
- CENTIMETER	.96875191-02	.3008058+05	.27007253+06	.25090560-01
ONE CELL *	.20833334-02	.64533333+04	.58080000+05	.53958084-02

THIS MAP AREA

EQUALS THIS AREA ON THE GROUND

ONE SQUARE	ACRES	HECTARES
- INCH	.40000000+02	.16187426+02
- CENTIMETER	.62000121+01	.25090560+01
ONE CELL *	.13333333+01	.53958084-00

* CELL SIZE OF 1/5 BY 1/6 INCH

BUFFER STRIPS OR ROAD WIDTHS

THIS BUFFER WIDTH ON THE GROUND	EQUALS THIS WIDTH ON THE MAP (INCHES)	REPRESENTS, PER INCH ON THE MAP, THIS NO. OF ACRES
A. 50 FEET	.37878788-01	.15151515+01
B. 100 FEET	.75757575-01	.30303030+01
C. 200 FEET	.15151515-00	.60606060+01

VARIABLE CELL DIMENSIONS

INPUT GRID CELL				OUTPUT SCALE	OUTPUT R.F.
ACREAGE	WIDTH	HEIGHT	AREA	(INCHES	1 TO
	INCHES		(SQ.IN.)	PER MILE)	
1.	.17320508-00	.14433756-00	.24999999-01	4.6188022	13717.84
5.	.38729832-00	.32274860-00	.12499999+00	2.0655911	30674.03
10.	.54772253-00	.45643545-00	.24999998-00	1.4605935	43379.63
20.	.77459664-00	.64549720-00	.49999996-00	1.0327956	61348.05
40.	.10954451+01	.91287090-00	.99999992-00	.7302968	86759.25
80.	.15491933+01	.12909944+01	.19999998+01	.5163978	122696.11
160.	.21908902+01	.18257418+01	.39999997+01	.3651484	173518.50
640.	.43817803+01	.36514836+01	.15999999+02	.1825742	347037.01
1000.	.54772253+01	.45643545+01	.24999998+02	.1460593	433796.26

TABLE 4.--LENGTH AND AREA EQUIVALENTS FOR A MAP SCALE OF
2.6400000 INCHES PER MILE
(1 TO 24000)

MAP-TO-GROUND EQUIVALENTS

THIS MAP DISTANCE

EQUALS THIS DISTANCE ON THE GROUND

ONE	MILES	YARDS	FEET	KILOMETERS
-INCH	.37878788-00	.66666666+03	.20000000+04	.60959999-00
-CENTIMETER	.14912909-00	.26246719+03	.78740157+03	.24000000-00
ONE CELL *				
-WIDTH	.75757574-01	.13333333+03	.40000000+03	.12192000+00
-HEIGHT	.63131312-01	.11111111+03	.33333334+03	.10160000+00
-DIAGONAL	.98614263-01	.17356110+03	.52068331+03	.15870427-00

THIS MAP AREA

EQUALS THIS AREA ON THE GROUND IN SQUARE

ONE SQUARE	-MILES	-YARDS	-FEET	-KILOMETERS
-INCH	.14348026-00	.44444445+06	.40000000+07	.37161215-00
-CENTIMETER	.22239484-01	.68889023+05	.62000123+06	.57599999-01
ONE CELL *	.47826752-02	.14814815+05	.13333333+06	.12387072-01

THIS MAP AREA

EQUALS THIS AREA ON THE GROUND

ONE SQUARE	ACRES	HECTARES
-INCH	.91827364+02	.37161215+02
-CENTIMETER	.14233269+02	.57599999+01
ONE CELL *	.30609121+01	.12387072+01

* CELL SIZE OF 1/5 BY 1/6 INCH

BUFFER STRIPS OR ROAD WIDTHS

THIS BUFFER WIDTH ON THE GROUND	EQUALS THIS WIDTH ON THE MAP (INCHES)	REPRESENTS, PER INCH ON THE MAP, THIS NO. OF ACRES
A. 50 FEET	.25000000-01	.22956841+01
B. 100 FEET	.50000000-01	.45913682+01
C. 200 FEET	.99999999-01	.91827364+01

VARIABLE CELL DIMENSIONS

ACREAGE	WIDTH INCHES	INPUT GRID CELL HEIGHT	AREA (SQ. IN.)	OUTPUT SCALE (INCHES PER MILE)	OUTPUT R.F. 1 TO
1.	.11431535+00	.95262790-01	.10889999-01	4.6188022	13717.84
5.	.25561689-00	.21301407-00	.54449994-01	2.0655911	30674.03
10.	.36149687-00	.30124740-00	.10889999+00	1.4605935	43379.63
20.	.51123378-00	.42602815-00	.21779998-00	1.0327956	61348.05
40.	.72299375-00	.60249479-00	.43559997-00	.7302968	86759.25
80.	.10224676+01	.85205629-00	.87119991-00	.5163978	122696.11
160.	.14459875+01	.12049896+01	.17423999+01	.3651484	173518.50
640.	.28919750+01	.24099792+01	.69695994+01	.1825742	347037.01
1000.	.36149687+01	.30124740+01	.10889999+02	.1460593	433796.26

TABLE 5.—LENGTH AND AREA EQUIVALENTS FOR A MAP SCALE OF
2.000000 INCHES PER MILE
(1 TO 31680)

MAP-TO-GROUND EQUIVALENTS

THIS MAP DISTANCE

EQUALS THIS DISTANCE ON THE GROUND

ONE	MILES	YARDS	FEET	KILOMETERS
- INCH	.50000000-00	.88000000+03	.26400000+04	.80467200-00
- CENTIMETER	.19685039-00	.34645669+03	.10393701+04	.31680000-00
ONE CELL *				
- WIDTH	.99999999-01	.17600000+03	.52800000+03	.16093440-00
- HEIGHT	.83333333-01	.14666667+03	.44000001+03	.13411200-00
- DIAGONAL	.13017083-00	.22910066+03	.68730198+03	.20948964-00

THIS MAP AREA

EQUALS THIS AREA ON THE GROUND IN SQUARE

ONE SQUARE	- MILES	- YARDS	- FEET	- KILOMETERS
- INCH	.25000000-00	.77440000+06	.69695999+07	.64749702-00
- CENTIMETER	.38750077-01	.12003223+06	.10802902+07	.10036224+00
ONE CELL *	.83333333-02	.25813334+05	.23232000+06	.21583234-01

THIS MAP AREA

EQUALS THIS AREA ON THE GROUND

ONE SQUARE	ACRES	HECTARES
- INCH	.16000000+03	.64749701+02
- CENTIMETER	.24800049+02	.10036224+02
ONE CELL *	.53333333+01	.21583234+01

* CELL SIZE OF 1/5 BY 1/6 INCH

BUFFER STRIPS OR ROAD WIDTHS

THIS BUFFER WIDTH
ON THE GROUND

EQUALS THIS WIDTH
ON THE MAP (INCHES)

REPRESENTS, PER INCH ON THE
MAP, THIS NO. OF ACRES

A. 50 FEET	.18939394-01	.30303030+01
B. 100 FEET	.37878788-01	.60606060+01
C. 200 FEET	.75757575-01	.12121212+02

VARIABLE CELL DIMENSIONS

INPUT GRID CELL				OUTPUT SCALE	OUTPUT R.F.
ACREAGE	WIDTH	HEIGHT	AREA	(INCHES	1 TO
	INCHES			PER MILE)	
			(SQ. IN.)		
1.	.86602537-01	.72168781-01	.62499996-02	4.6188022	13717.84
5.	.19364916-00	.16137430-00	.31249997-01	2.0655911	30674.03
10.	.27386127-00	.22821773-00	.62499995-01	1.4605935	43379.63
20.	.38729832-00	.32274860-00	.12499999+00	1.0327956	61348.05
40.	.54772253-00	.45643545-00	.24999998-00	.7302968	86759.25
80.	.77459664-00	.64549720-00	.49999996-00	.5163978	122696.11
160.	.10954451+01	.91287090-00	.99999992-00	.3651484	173518.50
640.	.21908902+01	.18257418+01	.39999997+01	.1825742	347037.01
1000.	.27386127+01	.22821773+01	.62499996+01	.1460593	433796.26

TABLE 6.--LENGTH AND AREA EQUIVALENTS FOR A MAP SCALE OF
1.0137600 INCHES PER MILE
(1 TO 62500)

MAP-TO-GROUND EQUIVALENTS

THIS MAP DISTANCE

EQUALS THIS DISTANCE ON THE GROUND

ONF	MILES	YARDS	FEET	KILOMETERS
-INCH	.98642676-00	.17361111+04	.52083333+04	.15875000+01
-CENTIMETER	.38835699-00	.68350831+03	.20505249+04	.62500000-00
ONE CELL *				
-WIDTH	.19728535-00	.34722222+03	.10416666+04	.31750000-00
-HEIGHT	.16440446-00	.28935185+03	.86805555+03	.26458333-00
-DIAGONAL	.25680798-00	.45198204+03	.13559461+04	.41329238-00

THIS MAP AREA

EQUALS THIS AREA ON THE GROUND IN SQUARE

ONE SQUARE	-MILES	-YARDS	-FEET	-KILOMETERS
-INCH	.97303776-00	.30140818+07	.27126736+08	.25201562+01
-CENTIMETER	.15082116-00	.46718359+06	.42046524+07	.39062500-00
ONE CELL *	.32434592-01	.10046939+06	.90422454+06	.84005205-01

THIS MAP AREA

EQUALS THIS AREA ON THE GROUND

ONE SQUARE	ACRES	HECTARES
-INCH	.62274417+03	.25201562+03
-CENTIMETER	.96525537+02	.39062500+02
ONE CELL *	.20758139+02	.84005205+01

* CELL SIZE OF 1/5 BY 1/6 INCH

BUFFER STRIPS OR ROAD WIDTHS

THIS BUFFER WIDTH
ON THE GROUND

EQUALS THIS WIDTH
ON THE MAP (INCHES)

REPRESENTS, PER INCH ON THE
MAP, THIS NO. OF ACRES

A. 50 FEET	.95999999-02	.59783440+01
B. 100 FEET	.19200000-01	.11956688+02
C. 200 FEET	.38400000-01	.23913376+02

VARIABLE CELL DIMENSIONS

ACREAGE	WIDTH INCHES	HEIGHT INCHES	AREA (SQ. IN.)	OUTPUT SCALE (INCHES PER MILE)	OUTPUT R.F. 1 TO
1.	.43897095-01	.36580912-01	.16057957-02	4.6188022	13717.84
5.	.98156886-01	.81797405-01	.80289785-02	2.0655911	30674.03
10.	.13881480-00	.11567900+00	.16057957-01	1.4605935	43379.63
20.	.19631378-00	.16359481-00	.32115914-01	1.0327956	61348.05
40.	.27762960-00	.23135800-00	.64231828-01	.7302968	86759.25
80.	.39262754-00	.32718962-00	.12846366-00	.5163978	122696.11
160.	.55525920-00	.46271600-00	.25692731-00	.3651484	173518.50
640.	.11105184+01	.92543200-00	.10277092+01	.1825742	347037.01
1000.	.13881480+01	.11567900+01	.16057957+01	.1460593	433796.26

TABLE 7.--LENGTH AND AREA EQUIVALENTS FOR A MAP SCALE OF
1.000000 INCHES PER MILE
(1 TO 63360)

MAP-TO-GROUND EQUIVALENTS

THIS MAP DISTANCE

EQUALS THIS DISTANCE ON THE GROUND

ONE	MILES	YARDS	FEET	KILOMETERS
-INCH	.10000000+01	.17600000+04	.52800000+04	.16093440+01
-CENTIMETER	.39370078-00	.69291338+03	.20787401+04	.63360000-00
ONE CELL *				
-WIDTH	.20000000-00	.35200000+03	.10560000+04	.32186880-00
-HEIGHT	.16666666-00	.29333334+03	.88000000+03	.26822400-00
-DIAGONAL	.26034166-00	.45820132+03	.13746040+04	.41897929-00

THIS MAP AREA

EQUALS THIS AREA ON THE GROUND IN SQUARE

ONE SQUARE	-MILES	-YARDS	-FEET	-KILOMETERS
-INCH	.10000000+01	.30976000+07	.27878400+08	.25899881+01
-CENTIMETER	.15500031-00	.48012894+06	.43211605+07	.40144896-00
ONE CELL *	.33333334-01	.10325333+06	.92928001+06	.86332936-01

THIS MAP AREA

EQUALS THIS AREA ON THE GROUND

ONE SQUARE	ACRES	HECTARES
-INCH	.64000000+03	.25899880+03
-CENTIMETER	.99200194+02	.40144895+02
ONE CELL *	.21333333+02	.86332935+01

* CELL SIZE OF 1/5 BY 1/6 INCH

BUFFER STRIPS OR ROAD WIDTHS

THIS BUFFER WIDTH ON THE GROUND	EQUALS THIS WIDTH ON THE MAP (INCHES)	REPRESENTS, PER INCH ON THE MAP, THIS NO. OF ACRES
A. 50 FEET	.94696969-02	.60606060+01
B. 100 FEET	.18939394-01	.12121212+02
C. 200 FEET	.37878788-01	.24242424+02

VARIABLE CELL DIMENSIONS

ACREAGE	INPUT GRID CELL WIDTH INCHES	HEIGHT	AREA (SQ. IN.)	OUTPUT SCALE (INCHES PER MILE)	OUTPUT R.F. 1 TO
1.	.43301269-01	.36084390-01	.15624999-02	4.6188022	13717.84
5.	.96824580-01	.80687149-01	.78124993-02	2.0655911	30674.03
10.	.13693064-00	.11410886+00	.15624999-01	1.4605935	43379.63
20.	.19364916-00	.16137430-00	.31249997-01	1.0327956	61348.05
40.	.27386127-00	.22821773-00	.62499995-01	.7302968	86759.25
80.	.38729832-00	.32274860-00	.12499999+00	.5163978	122696.11
160.	.54772253-00	.45643545-00	.24999998-00	.3651484	173518.50
640.	.10954451+01	.91287090-00	.99999992-00	.1825742	347037.01
1000.	.13693063+01	.11410886+01	.15624999+01	.1460593	433796.26

TABLE 8.—LENGTH AND AREA EQUIVALENTS FOR A MAP SCALE OF
.500000 INCHES PER MILE
(1 TO 126720)

MAP-TO-GROUND EQUIVALENTS

THIS MAP DISTANCE		EQUALS THIS DISTANCE ON THE GROUND			
ONE	MILES	YARDS	FEET	KILOMETERS	
- INCH	.2000000+01	.3520000+04	.1056000+05	.3218680+01	
- CENTIMETER	.78740156-00	.13858268+04	.41574803+04	.12672000+01	
ONE CELL *					
- WIDTH	.40000000-00	.70400000+03	.21120000+04	.64373759-00	
- HEIGHT	.33333334-00	.58666667+03	.17600000+04	.53644799-00	
- DIAGONAL	.52068332-00	.91640263+03	.27492079+04	.83795857-00	

THIS MAP AREA		EQUALS THIS AREA ON THE GROUND IN SQUARE			
ONE SQUARE	- MILES	- YARDS	- FEET	- KILOMETERS	
- INCH	.40000001+01	.12390400+08	.11151360+09	.10359952+02	
- CENTIMETER	.62000123-00	.19205157+07	.17284642+08	.16057958+01	
ONE CELL *	.13333333-00	.41301334+06	.37171200+07	.34533174-00	

THIS MAP AREA EQUALS THIS AREA ON THE GROUND

ONE SQUARE	ACRES	HECTARES
- INCH	.25600000+04	.10359953+04
- CENTIMETER	.39680078+03	.16057958+03
ONE CELL *	.85333332+02	.34533174+02

* CELL SIZE OF 1/5 BY 1/6 INCH

BUFFER STRIPS OR ROAD WIDTHS

THIS BUFFER WIDTH ON THE GROUND	EQUALS THIS WIDTH ON THE MAP (INCHES)	REPRESENTS, PER INCH ON THE MAP, THIS NO. OF ACRES
A. 50 FEET	.47348484-02	.12121212+02
B. 100 FEET	.94696969-02	.24242424+02
C. 200 FEET	.18939394-01	.48484848+02

VARIABLE CELL DIMENSIONS

INPUT GRID CELL			OUTPUT SCALE (INCHES PER MILE)	OUTPUT R.F. 1 TO
ACREAGE	WIDTH INCHES	HEIGHT INCHES		
1.	.21650635-01	.18042196-01	.39062498-03	13717.84
5.	.48412290-01	.40343574-01	.19531248-02	30674.03
10.	.68465316-01	.57054431-01	.39062497-02	43379.63
20.	.96824580-01	.80687149-01	.78124993-02	61348.05
40.	.13693064-00	.11410886+00	.15624999-01	86759.25
80.	.19364916-00	.16137430-00	.31249997-01	122696.11
160.	.27386127-00	.22821773-00	.62499995-01	173518.50
640.	.54772253-00	.45643545-00	.24999998-00	347037.01
1000.	.68465317-00	.57054431-00	.39062497-00	433796.26

TABLE 9.--LENGTH AND AREA EQUIVALENTS FOR A MAP SCALE OF
.2534400 INCHES PER MILE
(1 TO 250000)

MAP-TO-GROUND EQUIVALENTS

THIS MAP DISTANCE

EQUALS THIS DISTANCE ON THE GROUND

ONE	MILES	YARDS	FEET	KILOMETERS
-INCH	.39457071+01	.69444444+04	.20833334+05	.63499999+01
-CENTIMETER	.15534280+01	.27340332+04	.82020996+04	.25000000+01
ONE CELL *				
-WIDTH	.78914141-00	.13888889+04	.41666666+04	.12700000+01
-HEIGHT	.65761784-00	.11574074+04	.34722222+04	.10583333+01
-DIAGONAL	.10272319+01	.18079282+04	.54237845+04	.16531695+01

THIS MAP AREA

EQUALS THIS AREA ON THE GROUND IN SQUARE

ONE SQUARE	-MILES	-YARDS	-FEET	-KILOMETERS
-INCH	.15568604+02	.48225308+08	.43402778+09	.40322499+02
-CENTIMETER	.24131385+01	.74749374+07	.67274438+08	.62500000+01
ONE CELL *	.51895346-00	.16075103+07	.14467593+08	.13440833+01

THIS MAP AREA

EQUALS THIS AREA ON THE GROUND

ONE SQUARE	ACRES	HECTARES
-INCH	.99639066+04	.40322499+04
-CENTIMETER	.15444086+04	.62500000+03
ONE CELL *	.33213022+03	.13440832+03

* CELL SIZE OF 1/5 BY 1/6 INCH

BUFFER STRIPS OR ROAD WIDTHS

THIS BUFFER WIDTH
ON THE GROUND

EQUALS THIS WIDTH
ON THE MAP (INCHES)

REPRESENTS, PER INCH ON THE
MAP, THIS NO. OF ACRES

A. 50 FEET	.24000000-02	.23913376+02
B. 100 FEET	.48000000-02	.47826752+02
C. 200 FEET	.95999999-02	.95653504+02

VARIABLE CELL DIMENSIONS

ACREAGE	WIDTH INCHES	HEIGHT INCHES	AREA (SQ. IN.)	OUTPUT SCALE (INCHES PER MILE)	OUTPUT R.F. 1 TO
1.	.10974274-01	.91452279-02	.10036223-03	4.6188022	13717.84
5.	.24539222-01	.20449352-01	.50181115-03	2.0655911	30674.03
10.	.34703700-01	.28919750-01	.10036223-02	1.4605935	43379.63
20.	.49078443-01	.40898702-01	.20072446-02	1.0327956	61348.05
40.	.69407400-01	.57839499-01	.40144893-02	.7302968	86759.25
80.	.98156886-01	.81797405-01	.80289785-02	.5163978	122696.11
160.	.13881480-00	.11567900+00	.16057957-01	.3651484	173518.50
640.	.27762960-00	.23135800-00	.64231828-01	.1825742	347037.01
1000.	.34703700-00	.28919750-00	.10036223+00	.1460593	433796.26



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