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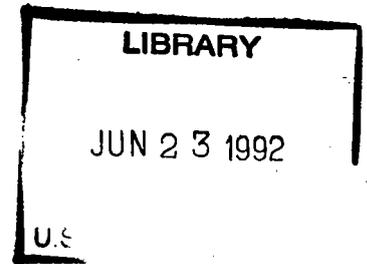
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Coast and Geodetic Survey

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Special Publication No. 313

PLANE COORDINATE PROJECTION TABLES  
MICHIGAN



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# **National Oceanic and Atmospheric Administration**

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## Foreword

The plane coordinate system used in this State is based on the transverse Mercator projection using a reduced scale for the central meridian of the zone. The tables in this publication are to be used for the conversion of geographic positions to plane coordinates or plane coordinates to geographic positions. The constants of the projection are listed with the tables.

The methods of computation have been designed for machine calculation. All of the functions that are required are given in this publication.

The formulas and sample computations which follow show the general methods for computing either type of coordinates.

### Plane coordinates from geographic positions

$$x = x' + 500,000$$

$$x' = H \cdot \Delta\lambda'' \pm a b$$

$$y = y_0 + V \left( \frac{\Delta\lambda''}{100} \right)^2 \pm c$$

Grid azimuth = geodetic azimuth -  $\Delta\alpha$  - second term

$$\Delta\alpha'' = \Delta\lambda'' \sin \phi + g$$

where

$y_0$ ,  $H$ ,  $V$ , and  $a$  are based on the latitude  
of the geographic position,

and

$b$ ,  $c$ , and  $g$  are based on  $\Delta\lambda''$ .

$$\Delta \lambda'' = \text{Central Meridian} - \lambda$$

and

$\Delta \alpha''$  is the convergence of the meridian at the station with respect to the Central Meridian.

The second term for the reduction of geodetic to grid azimuths may be neglected for most work. However, for lines five miles or more in length if the same degree of accuracy is desired as is obtained by geographic computations, this term should be evaluated and used.

$$\text{Second term} = \frac{(y_2 - y_1) (2x'_1 + x'_2)}{(6 \rho_0^2 \sin 1'')_g}$$

Geographic positions from plane coordinates

$$P (x'/10,000)^2 + d = V (\Delta \lambda''/100)^2 + c$$

$$y_0 = y - P (x'/10,000)^2 - d$$

Obtain the latitude from the table of  $y_0$ .

Use latitude to obtain H from the table.

$$x' = x - 500,000$$

$$\text{approximate } \Delta \lambda'' = x' \div H.$$

Determine a from latitude and b from approximate  $\Delta \lambda$

then

$$\Delta \lambda'' = (x' + a b) \div H$$

$$\Delta \alpha'' = Mx' - e$$

M is based on the y, and e on the x and y of the plane coordinates.

PLANE COORDINATES ON TRANSVERSE MERCATOR PROJECTION

(Condensed form for calculating-machine computation)

State Michigan Zone East Central meridian 83° 40' 00".000

Station	<u>Dury, 1932</u>	<u>Rouge, 1932</u>			
$\phi$	<u>41° 42' 16".344</u>	<u>42° 20' 34".621</u>			
$\lambda$	<u>84 36 42.832</u>	<u>83 15 11.381</u>			
$\Delta\lambda = \text{Central mer.} - \lambda$	<u>-0° 56' 42".832</u>	<u>+0° 24' 48".619</u>			
$\Delta\lambda''$	<u>-3,402.832</u>	<u>+1,488.619</u>			
$\left(\frac{\Delta\lambda''}{100}\right)^2$	<u>1,157.927</u>	<u>221.599</u>			
$H$	<u>75.852 238</u>	<u>75.097 079</u>			
$V$	<u>1.223491</u>	<u>1.226380</u>			
$a$	<u>-0.939</u>	<u>+1.438</u>	$b$	<u>-0.750</u>	<u>+1.145</u>
$x' = H \cdot \Delta\lambda \pm ab$	<u>-258,111.07</u>	<u>+111,790.08</u>			
$V \left(\frac{\Delta\lambda''}{100}\right)^2 \pm c$	<u>1,416.58</u>	<u>271.72</u>			
Tabular $y$	<u>74,526.50</u>	<u>307,155.91</u>			
$x$	<u>241,888.93</u>	<u>611,790.08</u>			
$y$	<u>75,943.08</u>	<u>307,427.63</u>			
$\Delta\alpha''$	<u>-2,263.99</u>	<u>+1,002.69</u>			
$\Delta\alpha$	<u>-0° 37' 44".0</u>	<u>+0° 16' 43".0</u>			
Geod. Az. to Az. Mk.	<u>219 08 42.7</u>	<u>203 38 50</u>			
Grid Az. to Az. Mk.	<u>219 46 27</u>	<u>203 22 07</u>			

$$x = x' + 500,000$$

$$y = \text{Tab. } y + V \left(\frac{\Delta\lambda''}{100}\right)^2 \pm c$$

$$\Delta\alpha'' = \Delta\lambda'' \sin \phi + g$$

$$\text{Grid Az.} = \text{Geod. Az.} - \Delta\alpha$$

$H$  and  $V = \text{Tab. } H$  and  $\text{Tab. } V$ .

When  $ab$  is  $\frac{-}{+}$ , decrease/increase  $H \cdot \Delta\lambda$  numerically.

$g$  increases  $\Delta\lambda'' \sin \phi$  numerically.

**GEODETIC POSITIONS FROM TRANSVERSE MERCATOR COORDINATES**  
(CALCULATING MACHINE COMPUTATION)

STATE - ZONE Michigan - East

Station Dury, 1932

X	241,888.93		Y	75,943.08
C	- 500,000.00		$P(\frac{X'}{10,000})^2 + d$	- 1,416.59
X'	- 258,111.07		$Y_0$	74,526.49
P	2.12622		Approx. $\Delta\lambda = X' \div H$	- 3,403"
d	+ 0.07		$\Delta\lambda = (X' \mp ab) \div H$	- 3,402.832"
H	75.852 238		$\Delta\lambda$	- 0° 56' 42.832"
a	b	- 0.939      + 1.438	Central Meridian	83 40 00.000
$\phi$	41° 42' 16.344"		$\lambda = \text{C.M.} - \Delta\lambda$	84° 36' 42.832"

Station Rouge, 1932

X	611,790.08		Y	307,427.63
C	- 500,000.00		$P(\frac{X'}{10,000})^2 + d$	- 271.71
X'	+ 111,790.08		$Y_0$	307,155.92
P	2.17406		Approx. $\Delta\lambda = X' \div H$	+ 1,489"
d	+ 0.02		$\Delta\lambda = (X' \mp ab) \div H$	+ 1,488.619"
H	75.097 079		$\Delta\lambda$	+ 0° 24' 48.619"
a	b	- 0.750      + 1.145	Central Meridian	83 40 00.000
$\phi$	42° 20' 34.621"		$\lambda = \text{C.M.} - \Delta\lambda$	83° 15' 11.381"

Station

X			Y	
C	-		$P(\frac{X'}{10,000})^2 + d$	-
X'			$Y_0$	
P			Approx. $\Delta\lambda = X' \div H$	"
d			$\Delta\lambda = (X' \mp ab) \div H$	"
H			$\Delta\lambda$	"
a	b		Central Meridian	
$\phi$			$\lambda = \text{C.M.} - \Delta\lambda$	"

Station

X			Y	
C	-		$P(\frac{X'}{10,000})^2 + d$	-
X'			$Y_0$	
P			Approx. $\Delta\lambda = X' \div H$	"
d			$\Delta\lambda = (X' \mp ab) \div H$	"
H			$\Delta\lambda$	"
a	b		Central Meridian	
$\phi$			$\lambda = \text{C.M.} - \Delta\lambda$	"

When ab is  $\frac{+}{-}$ , decrease/increase X' numerically

## Constants for Michigan

Constant	Zone		
	East	Central	West
Central Meridian	83° 40' 00" 000	85° 45' 00" 000	88° 45' 00" 000
log R	-248.2	-394.8	-394.8
Scale reduction (Central Meridian)	1 : 17,500	1 : 11,000	1 : 11,000
$\log \left( \frac{1}{6\rho_0^2} \right) g$	4.580 6152 -20	4.580 6446 -20	4.580 3959 -20
$\log \left( \frac{1}{6\rho_0^2 \sin 1''} \right) g$	9.895 0403 -20	9.895 0697 -20	9.894 8210 -20
$\left( \frac{1}{6\rho_0^2 \sin 1''} \right) g$	$0.7853 \times 10^{-10}$	$0.7854 \times 10^{-10}$	$0.7849 \times 10^{-10}$

TRANSVERSE MERCATOR PROJECTION  
MICHIGAN  
EAST ZONE

Lat.	y <sub>0</sub> feet	Δy <sub>0</sub> per second	H	ΔH per second	v	ΔV per second	a
41 30	0.00	101.209 83	76.092 186	325.25	1.222 436	1.47	-1.000
41 31	6 072.59	101.210 17	76.072 671	325.37	1.222 524	1.47	-.995
41 32	12 145.20	101.210 33	76.053 149	325.48	1.222 612	1.47	-.990
41 33	18 217.82	101.210 83	76.033 620	325.58	1.222 700	1.45	-.985
41 34	24 290.47	101.211 00	76.014 085	325.68	1.222 787	1.43	-.980
41 35	30 363.13	101.211 33	75.994 544	325.80	1.222 873	1.43	-.975
41 36	36 435.81	101.211 67	75.974 996	325.90	1.222 959	1.43	-.970
41 37	42 508.51	101.211 83	75.955 442	326.00	1.223 045	1.42	-.965
41 38	48 581.22	101.212 17	75.935 882	326.12	1.223 130	1.42	-.960
41 39	54 653.95	101.212 67	75.916 315	326.23	1.223 215	1.42	-.955
41 40	60 726.71	101.212 83	75.896 741	326.33	1.223 300	1.40	-.950
41 41	66 799.48	101.213 17	75.877 161	326.43	1.223 384	1.40	-.945
41 42	72 872.27	101.213 33	75.857 575	326.55	1.223 468	1.38	-.940
41 43	78 945.07	101.213 67	75.837 982	326.67	1.223 551	1.38	-.935
41 44	85 017.89	101.214 00	75.818 382	326.75	1.223 634	1.38	-.930
41 45	91 090.73	101.214 33	75.798 777	326.88	1.223 717	1.37	-.925
41 46	97 163.59	101.214 50	75.779 164	326.97	1.223 799	1.37	-.920
41 47	103 236.46	101.215 00	75.759 546	327.08	1.223 881	1.35	-.915
41 48	109 309.36	101.215 17	75.739 921	327.20	1.223 962	1.35	-.910
41 49	115 382.27	101.215 50	75.720 289	327.30	1.224 043	1.33	-.905
41 50	121 455.20	101.215 83	75.700 651	327.42	1.224 123	1.33	-.900
41 51	127 528.15	101.216 00	75.681 006	327.50	1.224 203	1.33	-.895
41 52	133 601.11	101.216 50	75.661 356	327.63	1.224 283	1.32	-.890
41 53	139 674.10	101.216 67	75.641 698	327.73	1.224 362	1.30	-.885
41 54	145 747.10	101.217 00	75.622 034	327.83	1.224 440	1.32	-.880
41 55	151 820.12	101.217 17	75.602 364	327.93	1.224 519	1.30	-.876
41 56	157 893.15	101.217 67	75.582 688	328.05	1.224 597	1.28	-.871
41 57	163 966.21	101.217 83	75.563 005	328.17	1.224 674	1.28	-.866
41 58	170 039.28	101.218 17	75.543 315	328.27	1.224 751	1.28	-.861
41 59	176 112.37	101.218 50	75.523 619	328.37	1.224 828	1.27	-.856
42 00	182 185.48		75.503 917		1.224 904		-.851

TRANSVERSE MERCATOR PROJECTION  
MICHIGAN  
EAST ZONE

Lat.	Y <sub>0</sub> feet	ΔY <sub>0</sub> per second	H	ΔH per second	V	ΔV per second	a
42 00	188 255.48	101.218 83	75.503 917	328.48	1.224 904	1.27	-.851
42 01	188 258.61	101.219 00	75.484 208	328.58	1.224 980	1.25	-.846
42 02	194 331.75	101.219 33	75.464 493	328.70	1.225 055	1.25	-.841
42 03	200 404.91	101.219 67	75.444 771	328.80	1.225 130	1.25	-.836
42 04	206 478.09	101.220 00	75.425 043	328.90	1.225 205	1.23	-.831
42 05	212 551.29	101.220 33	75.405 309	329.02	1.225 279	1.22	-.827
42 06	218 624.51	101.220 50	75.385 568	329.12	1.225 352	1.23	-.822
42 07	224 697.74	101.220 83	75.365 821	329.23	1.225 426	1.20	-.817
42 08	230 770.99	101.221 17	75.346 067	329.33	1.225 498	1.22	-.812
42 09	236 844.26	101.221 50	75.326 307	329.43	1.225 571	1.20	-.807
42 10	242 917.55	101.221 83	75.306 541	329.55	1.225 643	1.20	-.802
42 11	248 990.86	101.222 00	75.286 768	329.65	1.225 715	1.18	-.797
42 12	255 064.18	101.222 33	75.266 989	329.77	1.225 786	1.18	-.792
42 13	261 137.52	101.222 67	75.247 203	329.87	1.225 857	1.17	-.787
42 14	267 210.88	101.223 00	75.227 411	329.97	1.225 927	1.17	-.782
42 15	273 284.26	101.223 33	75.207 613	330.08	1.225 997	1.17	-.778
42 16	279 357.66	101.223 50	75.187 808	330.18	1.226 067	1.15	-.773
42 17	285 431.07	101.223 83	75.167 997	330.30	1.226 136	1.15	-.768
42 18	291 504.50	101.224 17	75.148 179	330.40	1.226 205	1.13	-.763
42 19	297 577.95	101.224 33	75.128 355	330.50	1.226 273	1.13	-.758
42 20	303 651.41	101.224 83	75.108 525	330.62	1.226 341	1.12	-.753
42 21	309 724.90	101.225 00	75.088 688	330.72	1.226 408	1.12	-.748
42 22	315 798.40	101.225 33	75.068 845	330.83	1.226 475	1.12	-.743
42 23	321 871.92	101.225 67	75.048 995	330.93	1.226 542	1.10	-.739
42 24	327 945.46	101.226 00	75.029 139	331.03	1.226 608	1.10	-.734
42 25	334 019.02	101.226 17	75.009 277	331.15	1.226 674	1.10	-.729
42 26	340 092.59	101.226 50	74.989 408	331.25	1.226 740	1.08	-.724
42 27	346 166.18	101.226 83	74.969 533	331.37	1.226 805	1.07	-.719
42 28	352 239.79	101.227 17	74.949 651	331.47	1.226 869	1.07	-.715
42 29	358 313.42	101.227 50	74.929 763	331.57	1.226 933	1.07	-.710
42 30	364 387.07	101.227 67	74.909 869	331.68	1.226 997	1.05	-.705
42 31	370 460.73	101.228 00	74.889 968	331.78	1.227 060	1.05	-.700
42 32	376 534.41	101.228 33	74.870 061	331.88	1.227 123	1.05	-.695
42 33	382 608.11	101.228 67	74.850 148	331.98	1.227 186	1.03	-.690
42 34	388 681.83	101.229 00	74.830 229	332.10	1.227 248	1.03	-.685
42 35	394 755.57	101.229 17	74.810 303	332.22	1.227 310	1.02	-.681
42 36	400 829.32	101.229 50	74.790 370	332.32	1.227 371	1.02	-.676
42 37	406 903.09	101.229 83	74.770 431	332.42	1.227 432	1.00	-.671
42 38	412 976.88	101.230 17	74.750 486	332.52	1.227 492	1.00	-.666
42 39	419 050.69	101.230 33	74.730 535	332.63	1.227 552	1.00	-.661
42 40	425 124.51	101.230 83	74.710 577	332.73	1.227 612	.98	-.656
42 41	431 198.36	101.231 00	74.690 613	332.85	1.227 671	.98	-.651
42 42	437 272.22	101.231 33	74.670 642	332.95	1.227 730	.97	-.647
42 43	443 346.10	101.231 50	74.650 665	333.05	1.227 788	.97	-.642
42 44	449 419.99	101.232 00	74.630 682	333.17	1.227 846	.97	-.637
42 45	455 493.91	101.232 17	74.610 692	333.27	1.227 904	.95	-.633
42 46	461 567.84	101.232 50	74.590 696	333.37	1.227 961	.93	-.628
42 47	467 641.79	101.232 83	74.570 694	333.48	1.228 017	.95	-.623
42 48	473 715.76	101.233 17	74.550 685	333.58	1.228 074	.93	-.618
42 49	479 789.75	101.233 33	74.530 670	333.68	1.228 130	.92	-.614
42 50	485 863.75	101.233 67	74.510 649	333.80	1.228 185	.92	-.609
42 51	491 937.77	101.234 00	74.490 621	333.90	1.228 240	.92	-.604
42 52	498 011.81	101.234 33	74.470 587	334.00	1.228 295	.90	-.599
42 53	504 085.87	101.234 67	74.450 547	334.12	1.228 349	.90	-.595
42 54	510 159.95	101.234 83	74.430 500	334.22	1.228 403	.88	-.590
42 55	516 234.04	101.235 17	74.410 447	334.32	1.228 456	.88	-.585
42 56	522 308.15	101.235 50	74.390 388	334.43	1.228 509	.88	-.580
42 57	528 382.28	101.235 83	74.370 322	334.53	1.228 562	.87	-.575
42 58	534 456.43	101.236 17	74.350 250	334.63	1.228 614	.87	-.571
42 59	540 530.60	101.236 33	74.330 172	334.75	1.228 666	.85	-.566
43 00	546 604.78		74.310 087		1.228 717		-.561

TRANSVERSE MERCATOR PROJECTION  
MICHIGAN  
EAST ZONE

Lat.	y. feet	$\Delta y$ per second	H	$\Delta H$ per second	v	$\Delta V$ per second	a
43 00	546 604.78	101.236 67	74.310 087	334.85	1.228 717	.85	-.561
43 01	552 678.98	101.237 00	74.289 996	334.95	1.228 768	.85	-.556
43 02	558 753.20	101.237 33	74.269 899	335.07	1.228 819	.83	-.552
43 03	564 827.44	101.237 67	74.249 795	335.17	1.228 869	.83	-.547
43 04	570 901.70	101.237 83	74.229 685	335.27	1.228 919	.82	-.542
43 05	576 975.97	101.238 17	74.209 569	335.38	1.228 968	.82	-.538
43 06	583 050.26	101.238 50	74.189 446	335.48	1.229 017	.80	-.533
43 07	589 124.57	101.238 83	74.169 317	335.58	1.229 065	.80	-.528
43 08	595 198.90	101.239 17	74.149 182	335.68	1.229 113	.80	-.523
43 09	601 273.25	101.239 33	74.129 041	335.80	1.229 161	.78	-.519
43 10	607 347.61	101.239 67	74.108 893	335.90	1.229 208	.78	-.514
43 11	613 421.99	101.240 00	74.088 739	336.00	1.229 255	.77	-.509
43 12	619 496.39	101.240 33	74.068 579	336.12	1.229 301	.77	-.505
43 13	625 570.81	101.240 67	74.048 412	336.22	1.229 347	.75	-.500
43 14	631 645.25	101.240 83	74.028 239	336.32	1.229 392	.75	-.496
43 15	637 719.70	101.241 17	74.008 060	336.43	1.229 437	.75	-.491
43 16	643 794.17	101.241 50	73.987 874	336.53	1.229 482	.73	-.486
43 17	649 868.66	101.241 83	73.967 682	336.63	1.229 526	.73	-.482
43 18	655 943.17	101.242 00	73.947 484	336.73	1.229 570	.72	-.477
43 19	662 017.69	101.242 50	73.927 280	336.85	1.229 613	.72	-.473
43 20	668 092.24	101.242 67	73.907 069	336.95	1.229 656	.72	-.468
43 21	674 166.80	101.243 00	73.886 852	337.07	1.229 699	.70	-.463
43 22	680 241.38	101.243 33	73.866 628	337.17	1.229 741	.68	-.459
43 23	686 315.98	101.243 50	73.846 398	337.27	1.229 782	.70	-.454
43 24	692 390.59	101.243 83	73.826 162	337.37	1.229 824	.68	-.450
43 25	698 465.22	101.244 17	73.805 920	337.48	1.229 865	.67	-.445
43 26	704 539.87	101.244 50	73.785 671	337.58	1.229 905	.67	-.440
43 27	710 614.54	101.244 83	73.765 416	337.68	1.229 945	.67	-.436
43 28	716 689.23	101.245 17	73.745 155	337.78	1.229 985	.65	-.431
43 29	722 763.94	101.245 33	73.724 888	337.90	1.230 024	.65	-.427
43 30	728 838.66	101.245 67	73.704 614	338.00	1.230 063	.65	-.422
43 31	734 913.40	101.246 00	73.684 334	338.10	1.230 102	.63	-.417
43 32	740 988.16	101.246 17	73.664 048	338.22	1.230 140	.62	-.413
43 33	747 062.93	101.246 67	73.643 755	338.32	1.230 177	.63	-.408
43 34	753 137.73	101.246 83	73.623 456	338.42	1.230 215	.60	-.404
43 35	759 212.54	101.247 17	73.603 151	338.52	1.230 251	.62	-.399
43 36	765 287.37	101.247 50	73.582 840	338.63	1.230 288	.60	-.394
43 37	771 362.22	101.247 83	73.562 522	338.73	1.230 324	.58	-.390
43 38	777 437.09	101.248 00	73.542 198	338.83	1.230 359	.58	-.385
43 39	783 511.97	101.248 33	73.521 868	338.93	1.230 394	.58	-.381
43 40	789 586.87	101.248 83	73.501 532	339.05	1.230 429	.57	-.376
43 41	795 661.80	101.249 00	73.481 189	339.13	1.230 463	.57	-.371
43 42	801 736.74	101.249 17	73.460 841	339.25	1.230 497	.55	-.367
43 43	807 811.69	101.249 67	73.440 486	339.37	1.230 530	.55	-.362
43 44	813 886.67	101.249 83	73.420 124	339.45	1.230 563	.55	-.358
43 45	819 961.66	101.250 17	73.399 757	339.57	1.230 596	.53	-.353
43 46	826 036.67	101.250 50	73.379 383	339.67	1.230 628	.52	-.348
43 47	832 111.70	101.250 83	73.359 003	339.77	1.230 659	.53	-.344
43 48	838 186.75	101.251 00	73.338 617	339.87	1.230 691	.52	-.339
43 49	844 261.81	101.251 33	73.318 225	339.98	1.230 722	.50	-.335
43 50	850 336.89	101.251 67	73.297 826	340.08	1.230 752	.50	-.330
43 51	856 411.99	101.252 00	73.277 421	340.18	1.230 782	.50	-.326
43 52	862 487.11	101.252 33	73.257 010	340.30	1.230 811	.48	-.321
43 53	868 562.25	101.252 50	73.236 592	340.38	1.230 841	.48	-.317
43 54	874 637.40	101.252 83	73.216 169	340.50	1.230 870	.48	-.312
43 55	880 712.57	101.253 17	73.195 739	340.60	1.230 899	.47	-.308
43 56	886 787.76	101.253 50	73.175 303	340.72	1.230 927	.47	-.303
43 57	892 862.97	101.253 83	73.154 860	340.80	1.230 955	.45	-.299
43 58	898 938.20	101.254 00	73.134 412	340.92	1.230 982	.45	-.294
43 59	905 013.44	101.254 33	73.113 957	341.02	1.231 009	.43	-.290
44 00	911 088.70		73.093 496		1.231 035		-.285

TRANSVERSE MERCATOR PROJECTION  
MICHIGAN  
EAST ZONE

Lat.	y <sub>0</sub> feet	Δy <sub>0</sub> per second	H	ΔH per second	V	ΔV per second	a
44 00	911 088.70	101.2554 67	73.093 496	341.12	1.231 035	.43	-.285
44 01	917 163.98	101.2555 00	73.073 029	341.23	1.231 061	.42	-.280
44 02	923 239.28	101.2555 33	73.052 555	341.33	1.231 086	.42	-.276
44 03	929 314.60	101.2555 67	73.032 075	341.43	1.231 111	.42	-.271
44 04	935 389.94	101.2555 83	73.011 589	341.53	1.231 136	.40	-.267
44 05	941 465.29	101.2556 17	72.991 097	341.63	1.231 160	.40	-.262
44 06	947 540.66	101.2556 50	72.970 599	341.75	1.231 184	.38	-.257
44 07	953 616.05	101.2556 67	72.950 094	341.85	1.231 207	.38	-.253
44 08	959 691.45	101.2557 17	72.929 583	341.95	1.231 230	.38	-.248
44 09	965 766.88	101.2557 33	72.909 066	342.05	1.231 253	.37	-.244
44 10	971 842.32	101.2557 67	72.888 543	342.15	1.231 275	.37	-.239
44 11	977 917.78	101.2558 00	72.868 014	342.27	1.231 297	.35	-.235
44 12	983 993.26	101.2558 33	72.847 478	342.37	1.231 318	.35	-.230
44 13	990 068.76	101.2558 50	72.826 936	342.47	1.231 339	.35	-.226
44 14	996 144.27	101.2558 83	72.806 388	342.57	1.231 360	.33	-.221
44 15	1 002 219.80	101.2559 17	72.785 834	342.68	1.231 380	.32	-.217
44 16	1 008 295.35	101.2559 50	72.765 273	342.77	1.231 399	.33	-.212
44 17	1 014 370.92	101.2559 83	72.744 707	342.88	1.231 419	.30	-.208
44 18	1 020 446.51	101.2560 00	72.724 134	342.98	1.231 437	.32	-.203
44 19	1 026 522.11	101.2560 33	72.703 555	343.08	1.231 456	.30	-.199
44 20	1 032 597.73	101.2560 67	72.682 970	343.18	1.231 474	.30	-.194
44 21	1 038 673.37	101.2561 00	72.662 379	343.30	1.231 492	.28	-.190
44 22	1 044 749.03	101.2561 33	72.641 781	343.40	1.231 509	.28	-.185
44 23	1 050 824.71	101.2561 50	72.621 177	343.50	1.231 526	.29	-.181
44 24	1 056 900.40	101.2561 83	72.600 567	343.60	1.231 542	.27	-.176
44 25	1 062 976.11	101.2562 17	72.579 951	343.70	1.231 558	.27	-.172
44 26	1 069 051.84	101.2562 50	72.559 329	343.82	1.231 574	.25	-.167
44 27	1 075 127.59	101.2562 83	72.538 700	343.90	1.231 589	.25	-.163
44 28	1 081 203.36	101.2563 00	72.518 066	344.02	1.231 604	.23	-.158
44 29	1 087 279.14	101.2563 50	72.497 425	344.12	1.231 618	.23	-.154
44 30	1 093 354.95	101.2563 67	72.476 778	344.22	1.231 632	.22	-.149
44 31	1 099 430.77	101.2564 00	72.456 125	344.33	1.231 645	.23	-.145
44 32	1 105 506.61	101.2564 17	72.435 465	344.42	1.231 659	.20	-.140
44 33	1 111 582.46	101.2564 67	72.414 800	344.53	1.231 671	.20	-.136
44 34	1 117 658.34	101.2564 83	72.394 128	344.63	1.231 683	.20	-.131
44 35	1 123 734.23	101.2565 17	72.373 450	344.73	1.231 695	.20	-.127
44 36	1 129 810.14	101.2565 50	72.352 766	344.83	1.231 707	.18	-.123
44 37	1 135 886.07	101.2565 67	72.332 076	344.93	1.231 718	.17	-.118
44 38	1 141 962.01	101.2566 17	72.311 380	345.03	1.231 728	.17	-.114
44 39	1 148 037.98	101.2566 33	72.290 678	345.15	1.231 738	.17	-.109
44 40	1 154 113.96	101.2566 67	72.269 969	345.25	1.231 748	.15	-.105
44 41	1 160 189.96	101.2567 00	72.249 254	345.35	1.231 757	.15	-.101
44 42	1 166 265.98	101.2567 33	72.228 533	345.45	1.231 766	.13	-.096
44 43	1 172 342.02	101.2567 50	72.207 806	345.55	1.231 774	.13	-.092
44 44	1 178 418.07	101.2567 83	72.187 073	345.65	1.231 782	.13	-.087
44 45	1 184 494.14	101.2568 17	72.166 334	345.77	1.231 790	.12	-.083
44 46	1 190 570.23	101.2568 50	72.145 588	345.85	1.231 797	.12	-.078
44 47	1 196 646.34	101.2568 83	72.124 837	345.97	1.231 804	.10	-.074
44 48	1 202 722.47	101.2569 00	72.104 079	346.07	1.231 810	.10	-.069
44 49	1 208 798.61	101.2569 33	72.083 315	346.17	1.231 816	.10	-.065
44 50	1 214 874.77	101.2569 67	72.062 545	346.27	1.231 822	.08	-.060
44 51	1 220 950.95	101.2570 00	72.041 769	346.38	1.231 827	.08	-.056
44 52	1 227 027.15	101.2570 33	72.020 986	346.47	1.231 832	.08	-.051
44 53	1 233 103.37	101.2570 50	72.000 198	346.58	1.231 837	.07	-.047
44 54	1 239 179.60	101.2570 83	71.979 403	346.67	1.231 841	.05	-.042
44 55	1 245 255.85	101.2571 17	71.958 603	346.78	1.231 844	.07	-.038
44 56	1 251 332.12	101.2571 50	71.937 796	346.88	1.231 848	.03	-.033
44 57	1 257 408.41	101.2571 83	71.916 983	346.98	1.231 850	.05	-.029
44 58	1 263 484.72	101.2572 17	71.896 164	347.10	1.231 853	.03	-.024
44 59	1 269 561.05	101.2572 33	71.875 338	347.18	1.231 855	.02	-.020
45 00	1 275 637.39		71.854 507		1.231 856		-.015

TRANSVERSE MERCATOR PROJECTION  
MICHIGAN  
EAST ZONE

Lat.	y. feet	$\Delta y$ . per second	H	$\Delta H$ per second	V	$\Delta V$ per second	a
45 00	1 275 637.39	101.272 67	71.854 507	347.30	1.231 856	.02	-.015
45 01	1 281 713.75	101.272 83	71.833 669	347.38	1.231 857	.00	-.011
45 02	1 287 790.12	101.273 33	71.812 826	347.50	1.231 857	.02	-.006
45 03	1 293 866.52	101.273 67	71.791 976	347.60	1.231 858	.02	-.002
45 04	1 299 942.94	101.273 83	71.771 120	347.70	1.231 857	.00	+.003
45 05	1 306 019.37	101.274 17	71.750 258	347.80	1.231 857	.02	.007
45 06	1 312 095.82	101.274 50	71.729 390	347.90	1.231 856	.03	.011
45 07	1 318 172.29	101.274 83	71.708 516	348.00	1.231 854	.03	.016
45 08	1 324 248.78	101.275 00	71.687 636	348.12	1.231 852	.03	.020
45 09	1 330 325.28	101.275 33	71.666 749	348.20	1.231 850	.05	.025
45 10	1 336 401.80	101.275 67	71.645 857	348.32	1.231 847	.05	.029
45 11	1 342 478.34	101.276 00	71.624 958	348.40	1.231 844	.07	.033
45 12	1 348 554.90	101.276 33	71.604 054	348.52	1.231 840	.07	.038
45 13	1 354 631.48	101.276 50	71.583 143	348.62	1.231 836	.07	.042
45 14	1 360 708.07	101.276 83	71.562 226	348.72	1.231 832	.08	.047
45 15	1 366 784.68	101.277 17	71.541 303	348.82	1.231 827	.08	.051
45 16	1 372 861.31	101.277 50	71.520 374	348.92	1.231 822	.10	.055
45 17	1 378 937.96	101.277 83	71.499 439	349.02	1.231 816	.10	.060
45 18	1 385 014.63	101.278 17	71.478 498	349.13	1.231 810	.10	.064
45 19	1 391 091.32	101.278 33	71.457 550	349.22	1.231 804	.12	.069
45 20	1 397 168.02	101.278 67	71.436 597	349.32	1.231 797	.12	.073
45 21	1 403 244.74	101.279 00	71.415 638	349.43	1.231 790	.13	.077
45 22	1 409 321.48	101.279 33	71.394 672	349.53	1.231 782	.13	.082
45 23	1 415 398.24	101.279 50	71.373 700	349.62	1.231 774	.15	.086
45 24	1 421 475.01	101.279 83	71.352 723	349.73	1.231 765	.15	.091
45 25	1 427 551.80	101.280 17	71.331 739	349.83	1.231 756	.15	.095
45 26	1 433 628.61	101.280 50	71.310 749	349.93	1.231 747	.17	.099
45 27	1 439 705.44	101.280 83	71.289 753	350.03	1.231 737	.17	.104
45 28	1 445 782.29	101.281 00	71.268 751	350.13	1.231 727	.18	.108
45 29	1 451 859.15	101.281 33	71.247 743	350.23	1.231 716	.18	.113
45 30	1 457 936.03	101.281 67	71.226 729	350.33	1.231 705	.20	.117
45 31	1 464 012.93	101.282 00	71.205 709	350.45	1.231 693	.18	.121
45 32	1 470 089.85	101.282 33	71.184 682	350.53	1.231 682	.22	.126
45 33	1 476 166.79	101.282 67	71.163 650	350.63	1.231 669	.22	.130
45 34	1 482 243.75	101.282 83	71.142 612	350.75	1.231 656	.22	.135
45 35	1 488 320.72	101.283 17	71.121 567	350.83	1.231 643	.22	.139
45 36	1 494 397.71	101.283 50	71.100 517	350.95	1.231 630	.23	.143
45 37	1 500 474.72	101.283 67	71.079 460	351.05	1.231 616	.25	.148
45 38	1 506 551.74	101.284 17	71.058 397	351.13	1.231 601	.25	.152
45 39	1 512 628.79	101.284 33	71.037 329	351.25	1.231 586	.25	.157
45 40	1 518 705.85	101.284 67	71.016 254	351.35	1.231 571	.27	.161
45 41	1 524 782.93	101.285 00	70.995 173	351.45	1.231 555	.27	.165
45 42	1 530 860.03	101.285 33	70.974 086	351.55	1.231 539	.27	.169
45 43	1 536 937.15	101.285 50	70.952 993	351.65	1.231 523	.28	.174
45 44	1 543 014.28	101.285 83	70.931 894	351.75	1.231 506	.30	.178
45 45	1 549 091.43	101.286 17	70.910 789	351.85	1.231 488	.30	.182
45 46	1 555 168.60	101.286 50	70.889 678	351.95	1.231 470	.30	.186
45 47	1 561 245.79	101.286 83	70.868 561	352.07	1.231 452	.30	.190
45 48	1 567 323.00	101.287 17	70.847 437	352.15	1.231 434	.33	.195
45 49	1 573 400.23	101.287 33	70.826 308	352.25	1.231 414	.32	.199
45 50	1 579 477.47	101.287 67	70.805 173	352.35	1.231 395	.33	.203
45 51	1 585 554.73	101.288 00	70.784 032	352.45	1.231 375	.33	.207
45 52	1 591 632.01	101.288 33	70.762 885	352.57	1.231 355	.35	.212
45 53	1 597 709.31	101.288 50	70.741 731	352.65	1.231 334	.35	.216
45 54	1 603 786.62	101.288 83	70.720 572	352.75	1.231 313	.37	.221
45 55	1 609 863.95	101.289 17	70.699 407	352.87	1.231 291	.37	.225
45 56	1 615 941.30	101.289 50	70.678 235	352.95	1.231 269	.37	.229
45 57	1 622 018.67	101.289 83	70.657 058	353.05	1.231 247	.38	.234
45 58	1 628 096.06	101.290 17	70.635 875	353.17	1.231 224	.38	.238
45 59	1 634 173.47	101.290 33	70.614 685	353.25	1.231 201	.40	.243
46 00	1 640 250.89		70.593 490		1.231 177		.247

TRANSVERSE MERCATOR PROJECTION  
MICHIGAN  
EAST ZONE

Lat.		y <sub>0</sub> feet	Δy <sub>0</sub> per second	H	ΔH per second	V	ΔV per second	a					
46 00	1	640	250.89	101.290	67	70.593	490	353.35	1.231	177	-	.40	.247
46 01	1	646	328.33	101.291	00	70.572	289	353.47	1.231	153	-	.42	.251
46 02	1	652	405.79	101.291	33	70.551	081	353.55	1.231	128	-	.42	.256
46 03	1	658	483.27	101.291	50	70.529	868	353.67	1.231	103	-	.42	.260
46 04	1	664	560.76	101.291	83	70.508	648	353.75	1.231	078	-	.43	.264
46 05	1	670	638.27	101.292	17	70.487	423	353.87	1.231	052	-	.43	.269
46 06	1	676	715.80	101.292	50	70.466	191	353.95	1.231	026	-	.45	.273
46 07	1	682	793.35	101.292	83	70.444	954	354.07	1.230	999	-	.45	.277
46 08	1	688	870.92	101.293	00	70.423	710	354.15	1.230	972	-	.45	.281
46 09	1	694	948.50	101.293	33	70.402	461	354.27	1.230	945	-	.47	.286
46 10	1	701	026.10	101.293	67	70.381	205	354.37	1.230	917	-	.47	.290
46 11	1	707	103.72	101.294	00	70.359	943	354.45	1.230	889	-	.48	.294
46 12	1	713	181.36	101.294	33	70.338	676	354.57	1.230	860	-	.48	.299
46 13	1	719	259.02	101.294	67	70.317	402	354.65	1.230	831	-	.48	.303
46 14	1	725	336.70	101.294	83	70.296	123	354.77	1.230	802	-	.50	.307
46 15	1	731	414.39	101.295	17	70.274	837	354.85	1.230	772	-	.52	.312
46 16	1	737	492.10	101.295	50	70.253	546	354.97	1.230	741	-	.50	.316
46 17	1	743	569.83	101.295	83	70.232	248	355.05	1.230	711	-	.52	.320
46 18	1	749	647.58	101.296	00	70.210	945	355.17	1.230	680	-	.53	.324
46 19	1	755	725.34	101.296	33	70.189	635	355.25	1.230	648	-	.53	.329
46 20	1	761	803.12	101.296	67	70.168	320	355.35	1.230	616	-	.53	.333
46 21	1	767	880.92	101.297	00	70.146	999	355.47	1.230	584	-	.55	.337
46 22	1	773	958.74	101.297	33	70.125	671	355.55	1.230	551	-	.55	.341
46 23	1	780	036.58	101.297	67	70.104	338	355.65	1.230	518	-	.57	.346
46 24	1	786	114.44	101.297	83	70.082	999	355.75	1.230	484	-	.57	.350
46 25	1	792	192.31	101.298	17	70.061	654	355.87	1.230	450	-	.58	.354
46 26	1	798	270.20	101.298	50	70.040	302	355.95	1.230	415	-	.58	.358
46 27	1	804	348.11	101.298	83	70.018	945	356.05	1.230	380	-	.58	.362
46 28	1	810	426.04	101.299	00	69.997	582	356.15	1.230	345	-	.60	.367
46 29	1	816	503.98	101.299	33	69.976	213	356.25	1.230	309	-	.60	.371
46 30	1	822	581.94	101.299	67	69.954	838	356.35	1.230	273	-	.62	.375
46 31	1	828	659.92	101.300	00	69.933	457	356.45	1.230	236	-	.62	.379
46 32	1	834	737.92	101.300	33	69.912	070	356.55	1.230	199	-	.62	.383
46 33	1	840	815.94	101.300	50	69.890	677	356.65	1.230	162	-	.63	.388
46 34	1	846	893.97	101.300	83	69.869	278	356.75	1.230	124	-	.63	.392
46 35	1	852	972.02	101.301	17	69.847	873	356.85	1.230	086	-	.65	.396
46 36	1	859	050.09	101.301	50	69.826	462	356.95	1.230	047	-	.65	.400
46 37	1	865	128.18	101.301	83	69.805	045	357.05	1.230	008	-	.67	.404
46 38	1	871	206.29	101.302	17	69.783	622	357.13	1.229	968	-	.67	.409
46 39	1	877	284.42	101.302	33	69.762	194	357.25	1.229	928	-	.67	.413
46 40	1	883	362.56	101.302	67	69.740	759	357.35	1.229	888	-	.68	.417
46 41	1	889	440.72	101.303	00	69.719	318	357.45	1.229	847	-	.68	.421
46 42	1	895	518.90	101.303	17	69.697	871	357.53	1.229	806	-	.68	.425
46 43	1	901	597.09	101.303	67	69.676	419	357.65	1.229	765	-	.70	.430
46 44	1	907	675.31	101.303	83	69.654	960	357.73	1.229	723	-	.72	.434
46 45	1	913	753.54	101.304	17	69.633	496	357.83	1.229	680	-	.72	.438
46 46	1	919	831.79	101.304	50	69.612	026	357.95	1.229	637	-	.72	.442
46 47	1	925	910.06	101.304	83	69.590	549	358.03	1.229	594	-	.72	.446
46 48	1	931	988.35	101.305	00	69.569	067	358.13	1.229	551	-	.75	.451
46 49	1	938	066.65	101.305	33	69.547	579	358.23	1.229	506	-	.73	.455
46 50	1	944	144.97	101.305	67	69.526	085	358.33	1.229	462	-	.75	.459
46 51	1	950	223.31	101.306	00	69.504	585	358.43	1.229	417	-	.75	.463
46 52	1	956	301.67	101.306	33	69.483	079	358.52	1.229	372	-	.77	.467
46 53	1	962	380.05	101.306	50	69.461	568	358.63	1.229	326	-	.77	.471
46 54	1	968	458.44	101.306	83	69.440	050	358.73	1.229	280	-	.78	.475
46 55	1	974	536.85	101.307	17	69.418	526	358.82	1.229	233	-	.78	.480
46 56	1	980	615.28	101.307	50	69.396	997	358.92	1.229	186	-	.78	.484
46 57	1	986	693.73	101.307	83	69.375	462	359.03	1.229	139	-	.80	.488
46 58	1	992	772.20	101.308	00	69.353	920	359.12	1.229	91	-	.80	.492
46 59	1	998	850.68	101.308	33	69.332	373	359.22	1.229	043	-	.82	.496
47 00	2	004	929.18			69.310	820		1.228	994			.500

TRANSVERSE MERCATOR PROJECTION  
MICHIGAN  
CENTRAL AND WEST ZONES

Lat.	y <sub>0</sub> feet		Δy <sub>0</sub> per second	H		ΔH per second	v	ΔV per second	a
41 30		0 00	101.206 50	76.089 616	325.25	1.222 395	1.47	-1.000	
41 31	6	072.39	101.206 67	76.070 101	325.35	1.222 483	1.47	-.995	
41 32	12	144.79	101.207 00	76.050 580	325.47	1.222 571	1.47	-.990	
41 33	18	217.21	101.207 33	76.031 052	325.57	1.222 659	1.45	-.985	
41 34	24	289.65	101.207 67	76.011 518	325.67	1.222 746	1.43	-.980	
41 35	30	362.11	101.207 83	75.991 978	325.78	1.222 832	1.43	-.975	
41 36	36	434.58	101.208 17	75.972 431	325.90	1.222 918	1.43	-.970	
41 37	42	507.07	101.208 50	75.952 877	326.00	1.223 004	1.42	-.965	
41 38	48	579.58	101.208 83	75.933 317	326.10	1.223 089	1.42	-.960	
41 39	54	652.11	101.209 17	75.913 751	326.22	1.223 174	1.42	-.955	
41 40	60	724.66	101.209 33	75.894 178	326.32	1.223 259	1.40	-.950	
41 41	66	797.22	101.209 67	75.874 599	326.43	1.223 343	1.40	-.945	
41 42	72	869.80	101.210 00	75.855 013	326.53	1.223 427	1.38	-.940	
41 43	78	942.40	101.210 33	75.835 421	326.65	1.223 510	1.38	-.935	
41 44	85	015.02	101.210 67	75.815 822	326.75	1.223 593	1.38	-.930	
41 45	91	087.66	101.210 83	75.796 217	326.85	1.223 676	1.37	-.925	
41 46	97	160.31	101.211 17	75.776 606	326.97	1.223 758	1.37	-.920	
41 47	103	232.98	101.211 50	75.756 988	327.08	1.223 840	1.35	-.915	
41 48	109	305.67	101.211 83	75.737 363	327.18	1.223 921	1.35	-.910	
41 49	115	378.38	101.212 00	75.717 732	327.28	1.224 002	1.33	-.905	
41 50	121	451.10	101.212 33	75.698 095	327.40	1.224 082	1.33	-.900	
41 51	127	523.84	101.212 67	75.678 451	327.50	1.224 162	1.33	-.895	
41 52	133	596.60	101.213 00	75.658 801	327.62	1.224 242	1.32	-.890	
41 53	139	669.38	101.213 33	75.639 144	327.72	1.224 321	1.30	-.885	
41 54	145	742.18	101.213 50	75.619 481	327.83	1.224 399	1.32	-.880	
41 55	151	814.99	101.213 83	75.599 811	327.93	1.224 478	1.30	-.876	
41 56	157	887.82	101.214 17	75.580 135	328.03	1.224 556	1.28	-.871	
41 57	163	960.67	101.214 50	75.560 453	328.15	1.224 633	1.28	-.866	
41 58	170	033.54	101.214 83	75.540 764	328.25	1.224 710	1.28	-.861	
41 59	176	106.43	101.215 00	75.521 069	328.37	1.224 787	1.27	-.856	
42 00	182	179.33		75.501 367		1.224 863		-.851	

TRANSVERSE MERCATOR PROJECTION  
MICHIGAN  
CENTRAL AND WEST ZONES

Lat.	y <sub>0</sub> feet		Δy <sub>0</sub> per second	H	ΔH per second	V	ΔV per second	a
42 00	182	179.33	101.215 33	75.501 367	328.47	1.224 863	1.27	-.851
42 01	188	252.25	101.215 67	75.481 659	328.58	1.224 939	1.25	-.846
42 02	194	325.19	101.216 00	75.461 944	328.68	1.225 014	1.25	-.841
42 03	200	398.15	101.216 17	75.442 223	328.78	1.225 089	1.25	-.836
42 04	206	471.12	101.216 50	75.422 496	328.90	1.225 164	1.23	-.831
42 05	212	544.11	101.216 83	75.402 762	329.00	1.225 238	1.22	-.827
42 06	218	617.12	101.217 17	75.383 022	329.10	1.225 311	1.23	-.822
42 07	224	690.15	101.217 50	75.363 276	329.22	1.225 385	1.20	-.817
42 08	230	763.20	101.217 83	75.343 523	329.32	1.225 457	1.22	-.812
42 09	236	836.27	101.218 00	75.323 764	329.43	1.225 530	1.20	-.807
42 10	242	909.35	101.218 33	75.303 998	329.53	1.225 602	1.20	-.802
42 11	248	982.45	101.218 67	75.284 226	329.63	1.225 674	1.18	-.797
42 12	255	1055.57	101.219 00	75.264 448	329.75	1.225 745	1.18	-.792
42 13	261	128.71	101.219 17	75.244 663	329.85	1.225 816	1.17	-.787
42 14	267	201.86	101.219 50	75.224 872	329.97	1.225 886	1.17	-.782
42 15	273	275.03	101.219 83	75.205 074	330.07	1.225 956	1.17	-.778
42 16	279	348.22	101.220 17	75.185 270	330.17	1.226 026	1.15	-.773
42 17	285	421.43	101.220 50	75.165 460	330.28	1.226 095	1.15	-.768
42 18	291	494.66	101.220 67	75.145 643	330.38	1.226 164	1.13	-.763
42 19	297	567.90	101.221 00	75.125 820	330.50	1.226 232	1.13	-.758
42 20	303	641.16	101.221 33	75.105 990	330.62	1.226 300	1.12	-.753
42 21	309	714.44	101.221 67	75.086 153	330.70	1.226 367	1.12	-.748
42 22	315	787.74	101.221 83	75.066 311	330.83	1.226 434	1.12	-.743
42 23	321	861.05	101.222 33	75.046 461	330.92	1.226 501	1.10	-.739
42 24	327	934.39	101.222 50	75.026 606	331.03	1.226 567	1.10	-.734
42 25	334	1007.74	101.222 83	75.006 744	331.15	1.226 633	1.10	-.729
42 26	340	1081.11	101.223 00	74.986 875	331.23	1.226 699	1.08	-.724
42 27	346	154.49	101.223 50	74.967 001	331.35	1.226 764	1.07	-.719
42 28	352	227.90	101.223 67	74.947 120	331.45	1.226 828	1.07	-.715
42 29	358	301.32	101.224 00	74.927 233	331.57	1.226 892	1.07	-.710
42 30	364	374.76	101.224 33	74.907 339	331.67	1.226 956	1.05	-.705
42 31	370	448.22	101.224 67	74.887 439	331.77	1.227 019	1.05	-.700
42 32	376	521.70	101.224 83	74.867 533	331.88	1.227 082	1.05	-.695
42 33	382	595.19	101.225 17	74.847 620	331.98	1.227 145	1.03	-.690
42 34	388	668.70	101.225 50	74.827 701	332.08	1.227 207	1.03	-.685
42 35	394	742.23	101.225 83	74.807 776	332.20	1.227 269	1.02	-.681
42 36	400	815.78	101.226 17	74.787 844	332.30	1.227 330	1.02	-.676
42 37	406	889.35	101.226 33	74.767 906	332.40	1.227 391	1.00	-.671
42 38	412	962.93	101.226 67	74.747 962	332.52	1.227 451	1.00	-.666
42 39	419	1036.53	101.227 00	74.728 011	332.62	1.227 511	1.00	-.661
42 40	425	110.15	101.227 33	74.708 054	332.73	1.227 571	.98	-.656
42 41	431	183.79	101.227 67	74.688 090	332.82	1.227 630	.98	-.651
42 42	437	257.45	101.227 83	74.668 121	332.95	1.227 689	.97	-.647
42 43	443	331.12	101.228 17	74.648 144	333.03	1.227 747	.97	-.642
42 44	449	404.81	101.228 50	74.628 162	333.15	1.227 805	.97	-.637
42 45	455	478.52	101.228 83	74.608 173	333.27	1.227 863	.95	-.633
42 46	461	552.25	101.229 17	74.588 177	333.35	1.227 920	.93	-.628
42 47	467	626.00	101.229 33	74.568 176	333.47	1.227 976	.95	-.623
42 48	473	699.76	101.229 67	74.548 168	333.57	1.228 033	.93	-.618
42 49	479	773.54	101.230 00	74.528 154	333.68	1.228 089	.92	-.614
42 50	485	847.34	101.230 33	74.508 133	333.78	1.228 144	.92	-.609
42 51	491	921.16	101.230 67	74.488 106	333.88	1.228 199	.92	-.604
42 52	497	995.00	101.230 83	74.468 073	334.00	1.228 254	.90	-.599
42 53	504	1068.85	101.231 17	74.448 033	334.10	1.228 308	.90	-.595
42 54	510	142.72	101.231 50	74.427 987	334.20	1.228 362	.88	-.590
42 55	516	216.61	101.231 83	74.407 935	334.32	1.228 415	.88	-.585
42 56	522	290.52	101.232 00	74.387 876	334.42	1.228 468	.88	-.580
42 57	528	364.44	101.232 33	74.367 811	334.52	1.228 521	.87	-.575
42 58	534	438.38	101.232 67	74.347 740	334.63	1.228 573	.87	-.571
42 59	540	512.34	101.233 00	74.327 662	334.73	1.228 625	.85	-.566
43 00	546	586.32		74.307 578		1.228 676		-.561

TRANSVERSE MERCATOR PROJECTION  
MICHIGAN  
CENTRAL AND WEST ZONES

Lat.	y <sub>0</sub> feet		Δy <sub>0</sub> per second		H		ΔH per second		V	ΔV per second	a
43 00	546	586.32	101.233	33	74.307	578	334.83	1.228	676	.85	-.561
43 01	552	660.32	101.233	67	74.287	488	334.95	1.228	727	.83	-.556
43 02	558	734.34	101.233	83	74.267	391	335.05	1.228	777	.83	-.552
43 03	564	808.37	101.234	17	74.247	288	335.17	1.228	827	.83	-.547
43 04	570	882.42	101.234	50	74.227	178	335.25	1.228	877	.82	-.542
43 05	576	956.49	101.234	83	74.207	063	335.37	1.228	926	.82	-.538
43 06	583	1030.58	101.235	00	74.186	941	335.48	1.228	975	.80	-.533
43 07	589	1104.68	101.235	33	74.166	812	335.57	1.229	1023	.80	-.528
43 08	595	1178.80	101.235	67	74.146	678	335.68	1.229	1071	.80	-.523
43 09	601	1252.94	101.236	00	74.126	537	335.78	1.229	1119	.78	-.519
43 10	607	1327.10	101.236	33	74.106	390	335.88	1.229	1166	.78	-.514
43 11	613	1401.28	101.236	50	74.086	237	336.00	1.229	1213	.77	-.509
43 12	619	1475.47	101.236	83	74.066	077	336.10	1.229	1259	.77	-.505
43 13	625	1549.68	101.237	17	74.045	911	336.20	1.229	1305	.75	-.500
43 14	631	1623.91	101.237	50	74.025	739	336.32	1.229	1350	.75	-.496
43 15	637	1698.16	101.237	83	74.005	560	336.40	1.229	1395	.75	-.491
43 16	643	1772.43	101.238	17	73.985	376	336.53	1.229	1440	.73	-.486
43 17	649	1846.72	101.238	33	73.965	184	336.62	1.229	1484	.73	-.482
43 18	655	1921.02	101.238	67	73.944	987	336.73	1.229	1528	.72	-.477
43 19	661	1995.34	101.239	00	73.924	783	336.83	1.229	1571	.72	-.473
43 20	668	2069.68	101.239	17	73.904	573	336.95	1.229	1614	.72	-.468
43 21	674	2144.03	101.239	50	73.884	356	337.03	1.229	1657	.70	-.463
43 22	680	2218.40	101.240	00	73.864	134	337.17	1.229	1699	.68	-.459
43 23	686	2292.80	101.240	17	73.843	904	337.25	1.229	1740	.70	-.454
43 24	692	2367.21	101.240	50	73.823	669	337.37	1.229	1782	.68	-.450
43 25	698	2441.64	101.240	67	73.803	427	337.47	1.229	1823	.67	-.445
43 26	704	2516.08	101.241	17	73.783	179	337.57	1.229	1863	.67	-.440
43 27	710	2590.55	101.241	33	73.762	925	337.67	1.229	1903	.67	-.436
43 28	716	2665.03	101.241	67	73.742	665	337.78	1.229	1943	.65	-.431
43 29	722	2739.53	101.242	00	73.722	398	337.88	1.229	1982	.65	-.427
43 30	728	2814.05	101.242	17	73.702	125	337.98	1.230	2021	.65	-.422
43 31	734	2888.58	101.242	50	73.681	846	338.10	1.230	2060	.63	-.417
43 32	740	2963.13	101.243	00	73.661	560	338.20	1.230	2098	.62	-.413
43 33	747	3037.71	101.243	17	73.641	268	338.30	1.230	2135	.63	-.408
43 34	753	3112.30	101.243	50	73.620	970	338.40	1.230	2173	.60	-.404
43 35	759	3186.91	101.243	67	73.600	666	338.52	1.230	2209	.62	-.399
43 36	765	3261.53	101.244	00	73.580	355	338.62	1.230	2246	.60	-.394
43 37	771	3336.17	101.244	33	73.560	038	338.72	1.230	2282	.58	-.390
43 38	777	410.83	101.244	67	73.539	715	338.82	1.230	2317	.58	-.385
43 39	783	485.51	101.245	00	73.519	386	338.93	1.230	2352	.58	-.381
43 40	789	560.21	101.245	33	73.499	050	339.03	1.230	2387	.57	-.376
43 41	795	634.93	101.245	50	73.478	708	339.13	1.230	2421	.57	-.371
43 42	801	709.66	101.245	83	73.458	360	339.23	1.230	2455	.55	-.367
43 43	807	784.41	101.246	17	73.438	006	339.35	1.230	2488	.55	-.362
43 44	813	859.18	101.246	50	73.417	645	339.43	1.230	2521	.55	-.358
43 45	819	933.97	101.246	83	73.397	279	339.57	1.230	2554	.53	-.353
43 46	826	1008.78	101.247	00	73.376	905	339.65	1.230	2586	.52	-.348
43 47	832	1083.60	101.247	33	73.356	526	339.75	1.230	2617	.53	-.344
43 48	838	1158.44	101.247	67	73.336	141	339.87	1.230	2649	.52	-.339
43 49	844	1233.30	101.248	00	73.315	749	339.97	1.230	2680	.50	-.335
43 50	850	1308.18	101.248	17	73.295	351	340.07	1.230	2710	.50	-.330
43 51	856	1383.07	101.248	50	73.274	947	340.18	1.230	2740	.50	-.326
43 52	862	1457.98	101.248	83	73.254	536	340.27	1.230	2770	.48	-.321
43 53	868	1532.91	101.249	17	73.234	120	340.38	1.230	2799	.48	-.317
43 54	874	1607.86	101.249	50	73.213	697	340.50	1.230	2828	.48	-.312
43 55	880	1682.83	101.249	83	73.193	267	340.58	1.230	2857	.47	-.308
43 56	886	1757.82	101.250	00	73.172	832	340.70	1.230	2885	.47	-.303
43 57	892	1832.82	101.250	33	73.152	390	340.80	1.230	2913	.45	-.299
43 58	898	1907.84	101.250	67	73.131	942	340.90	1.230	2940	.45	-.294
43 59	904	1982.88	101.251	00	73.111	488	341.00	1.230	2967	.43	-.290
44 00	911	2057.94			73.091	028		1.230	2993		-.285

TRANSVERSE MERCATOR PROJECTION  
MICHIGAN  
CENTRAL AND WEST ZONES

Lat.	y. feet		$\Delta y$ . per second	H		$\Delta H$ per second	V	$\Delta V$ per second	a		
44 00	911	057.94	101.251	33	73.091	028	341.12	1.230	993	.43	-.285
44 01	917	133.02	101.251	50	73.070	561	341.22	1.231	019	.42	-.280
44 02	923	208.11	101.251	83	73.050	088	341.32	1.231	044	.42	-.276
44 03	929	283.22	101.252	17	73.029	609	341.42	1.231	069	.42	-.271
44 04	935	358.35	101.252	50	73.009	124	341.52	1.231	094	.40	-.267
44 05	941	433.50	101.252	67	72.988	633	341.63	1.231	118	.40	-.262
44 06	947	508.66	101.253	17	72.968	135	341.73	1.231	142	.38	-.257
44 07	953	583.85	101.253	33	72.947	631	341.83	1.231	165	.38	-.253
44 08	959	659.05	101.253	67	72.927	121	341.93	1.231	188	.38	-.248
44 09	965	734.27	101.253	83	72.906	605	342.05	1.231	211	.37	-.244
44 10	971	809.50	101.254	33	72.886	082	342.15	1.231	233	.37	-.239
44 11	977	884.76	101.254	50	72.865	553	342.25	1.231	255	.35	-.235
44 12	983	960.03	101.254	83	72.845	018	342.35	1.231	277	.35	-.230
44 13	990	035.32	101.255	17	72.824	477	342.45	1.231	297	.35	-.226
44 14	996	110.63	101.255	50	72.803	930	342.57	1.231	318	.33	-.221
44 15	1 002	185.96	101.255	67	72.783	376	342.65	1.231	338	.32	-.217
44 16	1 008	261.30	101.256	17	72.762	817	342.77	1.231	357	.33	-.212
44 17	1 014	336.67	101.256	33	72.742	251	342.87	1.231	375	.30	-.208
44 18	1 020	412.05	101.256	67	72.721	679	342.98	1.231	395	.32	-.203
44 19	1 026	487.45	101.256	83	72.701	100	343.07	1.231	414	.30	-.199
44 20	1 032	562.86	101.257	33	72.680	516	343.18	1.231	432	.30	-.194
44 21	1 038	638.30	101.257	50	72.659	925	343.28	1.231	450	.28	-.190
44 22	1 044	713.75	101.257	83	72.639	328	343.38	1.231	467	.28	-.185
44 23	1 050	789.22	101.258	17	72.618	725	343.48	1.231	484	.27	-.181
44 24	1 056	864.71	101.258	50	72.598	116	343.58	1.231	500	.27	-.176
44 25	1 062	940.22	101.258	67	72.577	501	343.70	1.231	516	.27	-.172
44 26	1 069	015.74	101.259	00	72.556	879	343.80	1.231	532	.25	-.167
44 27	1 075	091.28	101.259	50	72.536	251	343.90	1.231	547	.25	-.163
44 28	1 081	166.85	101.259	67	72.515	617	344.00	1.231	562	.23	-.158
44 29	1 087	242.43	101.260	00	72.494	977	344.10	1.231	576	.23	-.154
44 30	1 093	318.03	101.260	17	72.474	331	344.22	1.231	590	.22	-.149
44 31	1 099	393.64	101.260	50	72.453	678	344.30	1.231	603	.23	-.145
44 32	1 105	469.27	101.260	83	72.433	020	344.42	1.231	617	.20	-.140
44 33	1 111	544.92	101.261	17	72.412	355	344.52	1.231	629	.20	-.136
44 34	1 117	620.59	101.261	50	72.391	684	344.62	1.231	641	.20	-.131
44 35	1 123	696.28	101.261	83	72.371	007	344.72	1.231	653	.20	-.127
44 36	1 129	771.99	101.262	00	72.350	324	344.83	1.231	665	.18	-.123
44 37	1 135	847.71	101.262	33	72.329	634	344.92	1.231	676	.17	-.118
44 38	1 141	923.45	101.262	67	72.308	939	345.03	1.231	686	.17	-.114
44 39	1 147	999.21	101.263	00	72.288	237	345.13	1.231	696	.17	-.109
44 40	1 154	074.99	101.263	17	72.267	529	345.23	1.231	706	.15	-.105
44 41	1 160	150.78	101.263	67	72.246	815	345.33	1.231	715	.15	-.101
44 42	1 166	226.60	101.263	83	72.226	095	345.45	1.231	724	.13	-.096
44 43	1 172	302.43	101.264	17	72.205	368	345.53	1.231	732	.13	-.092
44 44	1 178	378.28	101.264	33	72.184	636	345.65	1.231	740	.13	-.087
44 45	1 184	454.14	101.264	83	72.163	897	345.75	1.231	748	.12	-.083
44 46	1 190	530.03	101.265	00	72.143	152	345.83	1.231	755	.12	-.078
44 47	1 196	605.93	101.265	33	72.122	402	345.95	1.231	762	.10	-.074
44 48	1 202	681.85	101.265	67	72.101	645	346.07	1.231	768	.10	-.069
44 49	1 208	757.79	101.266	00	72.080	881	346.15	1.231	774	.10	-.065
44 50	1 214	833.75	101.266	33	72.060	112	346.27	1.231	780	.08	-.060
44 51	1 220	909.73	101.266	50	72.039	336	346.35	1.231	785	.08	-.056
44 52	1 226	985.72	101.266	83	72.018	555	346.47	1.231	790	.08	-.051
44 53	1 233	061.73	101.267	17	71.997	767	346.57	1.231	795	.07	-.047
44 54	1 239	137.76	101.267	50	71.976	973	346.67	1.231	799	.05	-.042
44 55	1 245	213.81	101.267	67	71.956	173	346.77	1.231	802	.07	-.038
44 56	1 251	289.87	101.268	00	71.935	367	346.87	1.231	806	.03	-.033
44 57	1 257	365.95	101.268	33	71.914	555	346.98	1.231	808	.05	-.029
44 58	1 263	442.05	101.268	67	71.893	736	347.07	1.231	811	.03	-.024
44 59	1 269	518.17	101.269	00	71.872	912	347.18	1.231	813	.02	-.020
45 00	1 275	594.31			71.852	081		1.231	814		-.015

TRANSVERSE MERCATOR PROJECTION  
MICHIGAN  
CENTRAL AND WEST ZONES

Lat.	y. feet	$\Delta y$ . per second	H	$\Delta H$ per second	V	$\Delta V$ per second	a				
45 00	1 275	594.31	101.269	33	71.852	081	347.28	1.231	814	.02	.015
45 01	1 281	670.47	101.269	50	71.831	244	347.38	1.231	815	.00	.011
45 02	1 287	746.64	101.269	83	71.810	401	347.48	1.231	815	+	.006
45 03	1 293	822.83	101.270	17	71.789	552	347.58	1.231	816	-	.002
45 04	1 299	899.04	101.270	50	71.768	697	347.68	1.231	815	-	.003
45 05	1 305	975.27	101.270	83	71.747	836	347.80	1.231	815	-	.007
45 06	1 312	1051.52	101.271	00	71.726	968	347.88	1.231	814	-	.011
45 07	1 318	127.78	101.271	33	71.706	095	348.00	1.231	812	-	.016
45 08	1 324	204.06	101.271	67	71.685	215	348.08	1.231	810	-	.020
45 09	1 330	280.36	101.272	00	71.664	330	348.20	1.231	808	-	.025
45 10	1 336	356.68	101.272	17	71.643	438	348.30	1.231	805	-	.029
45 11	1 342	433.01	101.272	50	71.622	540	348.40	1.231	802	-	.033
45 12	1 348	509.36	101.272	83	71.601	636	348.50	1.231	798	-	.038
45 13	1 354	585.73	101.273	17	71.580	726	348.60	1.231	794	-	.042
45 14	1 360	662.12	101.273	50	71.559	810	348.70	1.231	790	-	.047
45 15	1 366	738.53	101.273	83	71.538	888	348.82	1.231	785	-	.051
45 16	1 372	814.96	101.274	00	71.517	959	348.90	1.231	780	-	.055
45 17	1 378	891.40	101.274	33	71.497	025	349.02	1.231	774	-	.060
45 18	1 384	967.86	101.274	67	71.476	084	349.10	1.231	768	-	.064
45 19	1 391	044.34	101.275	00	71.455	138	349.22	1.231	762	-	.069
45 20	1 397	120.84	101.275	17	71.434	185	349.32	1.231	755	-	.073
45 21	1 403	197.35	101.275	67	71.413	226	349.42	1.231	748	-	.077
45 22	1 409	273.89	101.275	83	71.392	261	349.52	1.231	740	-	.082
45 23	1 415	350.44	101.276	17	71.371	290	349.62	1.231	732	-	.086
45 24	1 421	427.01	101.276	50	71.350	313	349.72	1.231	723	-	.091
45 25	1 427	503.60	101.276	67	71.329	330	349.82	1.231	714	-	.095
45 26	1 433	580.20	101.277	00	71.308	341	349.92	1.231	705	-	.099
45 27	1 439	656.82	101.277	50	71.287	346	350.02	1.231	695	-	.104
45 28	1 445	733.47	101.277	67	71.266	345	350.13	1.231	685	-	.108
45 29	1 451	810.13	101.277	83	71.245	337	350.22	1.231	674	-	.113
45 30	1 457	886.80	101.278	33	71.224	324	350.33	1.231	663	-	.117
45 31	1 463	963.50	101.278	50	71.203	304	350.42	1.231	651	-	.121
45 32	1 470	040.21	101.278	83	71.182	279	350.53	1.231	640	-	.126
45 33	1 476	116.94	101.279	17	71.161	247	350.62	1.231	627	-	.130
45 34	1 482	193.69	101.279	50	71.140	210	350.73	1.231	614	-	.135
45 35	1 488	270.46	101.279	83	71.119	166	350.83	1.231	601	-	.139
45 36	1 494	347.25	101.280	00	71.098	116	350.93	1.231	588	-	.143
45 37	1 500	424.05	101.280	33	71.077	060	351.03	1.231	574	-	.148
45 38	1 506	500.87	101.280	67	71.055	98	351.13	1.231	559	-	.152
45 39	1 512	577.71	101.281	00	71.034	930	351.23	1.231	544	-	.157
45 40	1 518	654.57	101.281	17	71.013	856	351.33	1.231	529	-	.161
45 41	1 524	731.44	101.281	67	70.992	776	351.45	1.231	513	-	.165
45 42	1 530	808.34	101.281	83	70.971	689	351.53	1.231	497	-	.169
45 43	1 536	885.25	101.282	17	70.950	597	351.63	1.231	481	-	.174
45 44	1 542	962.18	101.282	50	70.929	499	351.75	1.231	464	-	.178
45 45	1 549	039.13	101.282	67	70.908	394	351.83	1.231	446	-	.182
45 46	1 555	116.09	101.283	00	70.887	284	351.95	1.231	428	-	.186
45 47	1 561	193.07	101.283	33	70.866	167	352.03	1.231	410	-	.190
45 48	1 567	270.07	101.283	67	70.845	045	352.15	1.231	392	-	.195
45 49	1 573	347.09	101.284	00	70.823	916	352.23	1.231	372	-	.199
45 50	1 579	424.13	101.284	33	70.802	782	352.35	1.231	353	-	.203
45 51	1 585	501.19	101.284	50	70.781	641	352.43	1.231	333	-	.207
45 52	1 591	578.26	101.284	83	70.760	495	352.55	1.231	313	-	.212
45 53	1 597	655.35	101.285	17	70.739	342	352.63	1.231	292	-	.216
45 54	1 603	732.46	101.285	50	70.718	184	352.75	1.231	271	-	.221
45 55	1 609	809.59	101.285	83	70.697	019	352.83	1.231	249	-	.225
45 56	1 615	886.74	101.286	00	70.675	849	352.95	1.231	227	-	.229
45 57	1 621	963.90	101.286	33	70.654	672	353.05	1.231	205	-	.234
45 58	1 628	041.08	101.286	67	70.633	489	353.13	1.231	182	-	.238
45 59	1 634	118.28	101.287	00	70.612	301	353.25	1.231	159	-	.243
46 00	1 640	195.50			70.591	106		1.231	135		.247

TRANSVERSE MERCATOR PROJECTION  
MICHIGAN  
CENTRAL AND WEST ZONES

Lat.	y <sub>0</sub> feet		Δy <sub>0</sub> per second		H		ΔH per second		V		ΔV per second	a
46 00	1 640	195.50	101.287	33	70.591	106	353.35	1.231	135	-	.40	.247
46 01	1 646	272.74	101.287	50	70.569	905	353.45	1.231	111	-	.42	.251
46 02	1 652	349.99	101.287	83	70.548	698	353.53	1.231	086	-	.42	.256
46 03	1 658	427.26	101.288	17	70.527	486	353.65	1.231	061	-	.42	.260
46 04	1 664	504.55	101.288	50	70.506	267	353.75	1.231	036	-	.43	.264
46 05	1 670	581.86	101.288	67	70.485	042	353.85	1.231	010	-	.43	.269
46 06	1 676	659.18	101.289	17	70.463	811	353.95	1.230	984	-	.45	.273
46 07	1 682	736.53	101.289	33	70.442	574	354.03	1.230	957	-	.45	.277
46 08	1 688	813.89	101.289	67	70.421	332	354.15	1.230	930	-	.45	.281
46 09	1 694	891.27	101.290	00	70.400	083	354.25	1.230	903	-	.47	.286
46 10	1 700	968.67	101.290	17	70.378	828	354.35	1.230	875	-	.47	.290
46 11	1 707	046.08	101.290	50	70.357	567	354.45	1.230	847	-	.48	.294
46 12	1 713	123.51	101.290	83	70.336	300	354.55	1.230	818	-	.48	.299
46 13	1 719	200.96	101.291	17	70.315	027	354.65	1.230	789	-	.48	.303
46 14	1 725	278.43	101.291	50	70.293	748	354.73	1.230	760	-	.50	.307
46 15	1 731	355.92	101.291	83	70.272	464	354.85	1.230	730	-	.52	.312
46 16	1 737	433.43	101.292	00	70.251	173	354.95	1.230	699	-	.50	.316
46 17	1 743	510.95	101.292	33	70.229	876	355.05	1.230	669	-	.52	.320
46 18	1 749	588.49	101.292	67	70.208	573	355.13	1.230	638	-	.53	.324
46 19	1 755	666.05	101.293	00	70.187	265	355.25	1.230	606	-	.53	.329
46 20	1 761	743.63	101.293	33	70.165	950	355.33	1.230	574	-	.53	.333
46 21	1 767	821.23	101.293	50	70.144	630	355.45	1.230	542	-	.55	.337
46 22	1 773	898.84	101.293	83	70.123	303	355.53	1.230	509	-	.55	.341
46 23	1 779	976.47	101.294	17	70.101	971	355.65	1.230	476	-	.57	.346
46 24	1 786	054.12	101.294	50	70.080	632	355.73	1.230	442	-	.57	.350
46 25	1 792	131.79	101.294	67	70.059	288	355.85	1.230	408	-	.58	.354
46 26	1 798	209.47	101.295	17	70.037	937	355.93	1.230	373	-	.58	.358
46 27	1 804	287.18	101.295	33	70.016	581	356.03	1.230	338	-	.58	.362
46 28	1 810	364.90	101.295	67	69.995	219	356.15	1.230	303	-	.60	.367
46 29	1 816	442.64	101.296	00	69.973	850	356.23	1.230	267	-	.60	.371
46 30	1 822	520.40	101.296	17	69.952	476	356.33	1.230	231	-	.62	.375
46 31	1 828	598.17	101.296	50	69.931	096	356.45	1.230	194	-	.62	.379
46 32	1 834	675.96	101.296	83	69.909	709	356.53	1.230	157	-	.62	.383
46 33	1 840	753.77	101.297	17	69.888	317	356.63	1.230	120	-	.63	.388
46 34	1 846	831.60	101.297	50	69.866	919	356.75	1.230	082	-	.63	.392
46 35	1 852	909.45	101.297	83	69.845	514	356.83	1.230	044	-	.65	.396
46 36	1 858	987.32	101.298	00	69.824	104	356.93	1.230	005	-	.65	.400
46 37	1 865	065.20	101.298	33	69.802	688	357.03	1.229	966	-	.67	.404
46 38	1 871	143.10	101.298	67	69.781	266	357.13	1.229	926	-	.67	.409
46 39	1 877	221.02	101.299	00	69.759	838	357.23	1.229	886	-	.67	.413
46 40	1 883	298.96	101.299	33	69.738	404	357.33	1.229	846	-	.68	.417
46 41	1 889	376.92	101.299	50	69.716	964	357.43	1.229	805	-	.68	.421
46 42	1 895	454.89	101.299	83	69.695	518	357.53	1.229	764	-	.68	.425
46 43	1 901	532.88	101.300	17	69.674	066	357.63	1.229	723	-	.70	.430
46 44	1 907	610.89	101.300	50	69.652	608	357.73	1.229	681	-	.72	.434
46 45	1 913	688.92	101.300	67	69.631	144	357.82	1.229	638	-	.72	.438
46 46	1 919	766.96	101.301	00	69.609	675	357.93	1.229	595	-	.72	.442
46 47	1 925	845.02	101.301	33	69.588	199	358.02	1.229	552	-	.72	.446
46 48	1 931	923.10	101.301	67	69.566	718	358.13	1.229	509	-	.75	.451
46 49	1 938	001.20	101.302	00	69.545	230	358.22	1.229	464	-	.73	.455
46 50	1 944	079.32	101.302	33	69.523	737	358.32	1.229	420	-	.75	.459
46 51	1 950	157.46	101.302	50	69.502	238	358.42	1.229	375	-	.75	.463
46 52	1 956	235.61	101.302	83	69.480	733	358.52	1.229	330	-	.77	.467
46 53	1 962	313.78	101.303	17	69.459	222	358.62	1.229	284	-	.77	.471
46 54	1 968	391.97	101.303	50	69.437	705	358.72	1.229	238	-	.78	.475
46 55	1 974	470.18	101.303	67	69.416	182	358.82	1.229	191	-	.78	.480
46 56	1 980	548.40	101.304	00	69.394	653	358.92	1.229	144	-	.78	.484
46 57	1 986	626.64	101.304	33	69.373	118	359.00	1.229	097	-	.80	.488
46 58	1 992	704.90	101.304	67	69.351	578	359.12	1.229	049	-	.80	.492
46 59	1 998	783.18	101.305	00	69.330	031	359.20	1.229	001	-	.82	.496
47 00	2 004	861.48			69.308	479		1.228	952			.500

TRANSVERSE MERCATOR PROJECTION  
MICHIGAN  
CENTRAL AND WEST ZONES

Lat.		$y_0$ feet	$\Delta y_0$ per second	H	$\Delta H$ per second	V	$\Delta V$ per second	a
47 00	2	004 861.48	101.305 33	69.308 479	359.30	1.228 952 -	.82	.500
47 01	2	010 939.80	101.305 50	69.286 921	359.40	1.228 903 -	.82	.504
47 02	2	017 018.13	101.305 83	69.265 357	359.50	1.228 854 -	.83	.508
47 03	2	023 096.48	101.306 17	69.243 787	359.60	1.228 804 -	.85	.512
47 04	2	029 174.85	101.306 50	69.222 211	359.70	1.228 753 -	.83	.516
47 05	2	035 253.24	101.306 67	69.200 629	359.80	1.228 703 -	.85	.521
47 06	2	041 331.64	101.307 00	69.179 041	359.90	1.228 652 -	.87	.525
47 07	2	047 410.06	101.307 33	69.157 447	359.98	1.228 600 -	.87	.529
47 08	2	053 488.50	101.307 67	69.135 848	360.10	1.228 548 -	.87	.533
47 09	2	059 566.96	101.308 00	69.114 242	360.18	1.228 496 -	.88	.537
47 10	2	065 645.44	101.308 33	69.092 631	360.30	1.228 443 -	.88	.541
47 11	2	071 723.94	101.308 50	69.071 013	360.38	1.228 390 -	.90	.545
47 12	2	077 802.45	101.308 83	69.049 390	360.48	1.228 336 -	.90	.549
47 13	2	083 880.98	101.309 17	69.027 761	360.58	1.228 282 -	.90	.553
47 14	2	089 959.53	101.309 33	69.006 126	360.68	1.228 228 -	.92	.557
47 15	2	096 038.09	101.309 83	68.984 485	360.78	1.228 173 -	.93	.562
47 16	2	102 116.68	101.310 00	68.962 838	360.88	1.228 117 -	.92	.566
47 17	2	108 195.28	101.310 33	68.941 185	360.97	1.228 062 -	.93	.570
47 18	2	114 273.90	101.310 67	68.919 527	361.08	1.228 006 -	.95	.574
47 19	2	120 352.54	101.310 83	68.897 862	361.17	1.227 949 -	.95	.578
47 20	2	126 431.19	101.311 33	68.876 192	361.27	1.227 892 -	.95	.582
47 21	2	132 509.87	101.311 50	68.854 516	361.37	1.227 835 -	.97	.586
47 22	2	138 588.56	101.311 83	68.832 834	361.47	1.227 777 -	.97	.590
47 23	2	144 667.27	101.312 17	68.811 146	361.57	1.227 719 -	.98	.594
47 24	2	150 746.00	101.312 33	68.789 452	361.65	1.227 660 -	.98	.598
47 25	2	156 824.74	101.312 83	68.767 753	361.77	1.227 601 -	1.00	.603
47 26	2	162 903.51	101.313 00	68.746 047	361.85	1.227 541 -	1.00	.607
47 27	2	168 982.29	101.313 33	68.724 336	361.95	1.227 481 -	1.00	.611
47 28	2	175 061.09	101.313 67	68.702 619	362.05	1.227 421 -	1.02	.615
47 29	2	181 139.91	101.313 83	68.680 896	362.15	1.227 360 -	1.02	.619
47 30	2	187 218.74	101.314 33	68.659 167	362.25	1.227 299 -	1.03	.623
47 31	2	193 297.60	101.314 50	68.637 432	362.33	1.227 237 -	1.03	.627
47 32	2	199 376.47	101.314 83	68.615 692	362.43	1.227 175 -	1.03	.631
47 33	2	205 455.36	101.315 17	68.593 946	362.53	1.227 113 -	1.05	.635
47 34	2	211 534.27	101.315 33	68.572 194	362.63	1.227 050 -	1.05	.639
47 35	2	217 613.19	101.315 67	68.550 436	362.73	1.226 987 -	1.07	.643
47 36	2	223 692.13	101.316 00	68.528 672	362.83	1.226 923 -	1.07	.647
47 37	2	229 771.09	101.316 33	68.506 902	362.92	1.226 859 -	1.08	.651
47 38	2	235 850.07	101.316 67	68.485 127	363.03	1.226 794 -	1.08	.655
47 39	2	241 929.07	101.317 00	68.463 345	363.12	1.226 729 -	1.08	.659
47 40	2	248 008.09	101.317 17	68.441 558	363.22	1.226 664 -	1.10	.663
47 41	2	254 087.12	101.317 50	68.419 765	363.32	1.226 598 -	1.10	.667
47 42	2	260 166.17	101.317 83	68.397 966	363.42	1.226 532 -	1.10	.671
47 43	2	266 245.24	101.318 17	68.376 161	363.52	1.226 466 -	1.12	.675
47 44	2	272 324.33	101.318 33	68.354 350	363.60	1.226 399 -	1.12	.679
47 45	2	278 403.43	101.318 83	68.332 534	363.72	1.226 332 -	1.13	.684
47 46	2	284 482.56	101.319 00	68.310 711	363.80	1.226 264 -	1.13	.688
47 47	2	290 561.70	101.319 33	68.288 883	363.90	1.226 196 -	1.15	.692
47 48	2	296 640.86	101.319 50	68.267 049	363.98	1.226 127 -	1.15	.696
47 49	2	302 720.03	101.320 00	68.245 210	364.10	1.226 058 -	1.15	.700
47 50	2	308 799.23	101.320 17	68.223 364	364.20	1.225 989 -	1.17	.704
47 51	2	314 878.44	101.320 50	68.201 512	364.28	1.225 919 -	1.17	.708
47 52	2	320 957.67	101.320 83	68.179 655	364.38	1.225 849 -	1.18	.712
47 53	2	327 036.92	101.321 17	68.157 792	364.48	1.225 778 -	1.19	.716
47 54	2	333 116.19	101.321 33	68.135 923	364.58	1.225 707 -	1.20	.720
47 55	2	339 195.47	101.321 67	68.114 048	364.67	1.225 635 -	1.20	.724
47 56	2	345 274.77	101.322 00	68.092 168	364.78	1.225 563 -	1.20	.727
47 57	2	351 354.09	101.322 33	68.070 281	364.87	1.225 491 -	1.22	.731
47 58	2	357 433.43	101.322 67	68.048 389	364.95	1.225 418 -	1.22	.735
47 59	2	363 512.79	101.322 83	68.026 492	365.07	1.225 345 -	1.23	.739
48 00	2	369 592.16		68.004 588		1.225 271		.743

TRANSVERSE MERCATOR PROJECTION  
MICHIGAN  
CENTRAL AND WEST ZONES

Lat.	y <sub>0</sub> feet	Δy <sub>0</sub> per second	H	ΔH per second	V	ΔV per second	a
48 00	2 369 592.16	101.323 17	68.004 588	365.15	1.225 271 -	1.23	.743
48 01	2 375 671.55	101.323 50	67.982 679	365.25	1.225 197 -	1.23	.747
48 02	2 381 750.96	101.323 83	67.960 764	365.35	1.225 123 -	1.25	.751
48 03	2 387 830.39	101.324 17	67.938 843	365.45	1.225 048 -	1.27	.755
48 04	2 393 909.84	101.324 33	67.916 916	365.55	1.224 972 -	1.25	.759
48 05	2 399 989.30	101.324 67	67.894 983	365.63	1.224 897 -	1.27	.763
48 06	2 406 068.78	101.325 00	67.873 045	365.73	1.224 821 -	1.28	.767
48 07	2 412 148.28	101.325 33	67.851 101	365.83	1.224 744 -	1.28	.771
48 08	2 418 227.80	101.325 50	67.829 151	365.93	1.224 667 -	1.28	.775
48 09	2 424 307.33	101.325 83	67.807 195	366.02	1.224 590 -	1.30	.779
48 10	2 430 386.88	101.326 17	67.785 234	366.12	1.224 512 -	1.30	.783
48 11	2 436 466.45	101.326 50	67.763 267	366.22	1.224 434 -	1.32	.787
48 12	2 442 546.04	101.326 83	67.741 294	366.32	1.224 355 -	1.32	.791
48 13	2 448 625.65	101.327 17	67.719 315	366.42	1.224 276 -	1.32	.795
48 14	2 454 705.28	101.327 33	67.697 330	366.50	1.224 197 -	1.33	.799
48 15	2 460 784.92	101.327 67	67.675 340	366.60	1.224 117 -	1.35	.803
48 16	2 466 864.58	101.328 00	67.653 344	366.70	1.224 036 -	1.33	.807
48 17	2 472 944.26	101.328 33	67.631 342	366.80	1.223 956 -	1.35	.811
48 18	2 479 023.96	101.328 50	67.609 334	366.90	1.223 875 -	1.37	.815
48 19	2 485 103.67	101.328 83	67.587 320	366.98	1.223 793 -	1.37	.819
48 20	2 491 183.40		67.565 301		1.223 711		.823

## TRANSVERSE MERCATOR PROJECTION

## MICHIGAN

## All Zones

$\Delta \lambda''$	b	$\Delta b$	c	$\Delta \lambda''$	b	$\Delta b$	c
0	0.000	+0.085	0.000				
100	+0.085	+0.085	0.000	3100	+1.536	-0.026	-0.133
200	+0.170	+0.084	-0.001	3200	+1.510	-0.032	-0.135
300	+0.254	+0.084	-0.002	3300	+1.478	-0.039	-0.136
400	+0.338	+0.082	-0.003	3400	+1.439	-0.047	-0.135
500	+0.420	+0.082	-0.005	3500	+1.392	-0.055	-0.133
600	+0.502	+0.080	-0.007	3600	+1.337	-0.062	-0.131
700	+0.582	+0.079	-0.010	3700	+1.275	-0.071	-0.128
800	+0.661	+0.077	-0.014	3800	+1.204	-0.079	-0.124
900	+0.738	+0.075	-0.018	3900	+1.125	-0.088	-0.120
1000	+0.813	+0.073	-0.022	4000	+1.037	-0.096	-0.115
1100	+0.886	+0.070	-0.027	4100	+0.941	-0.106	-0.109
1200	+0.956	+0.068	-0.032	4200	+0.835	-0.115	-0.101
1300	+1.024	+0.065	-0.038	4300	+0.720	-0.124	-0.091
1400	+1.089	+0.063	-0.043	4400	+0.596	-0.134	-0.078
1500	+1.152	+0.057	-0.049	4500	+0.462	-0.144	-0.063
1600	+1.209	+0.054	-0.055	4600	+0.318	-0.154	-0.045
1700	+1.263	+0.051	-0.061	4700	+0.164	-0.164	-0.025
1800	+1.314	+0.047	-0.067	4800	0.000	-0.176	0.000
1900	+1.361	+0.043	-0.073	4900	-0.176	-0.186	+0.026
2000	+1.404	+0.039	-0.079	5000	-0.362	-0.197	+0.053
2100	+1.443	+0.034	-0.085	5100	-0.559	-0.208	+0.084
2200	+1.477	+0.029	-0.091	5200	-0.767	-0.220	+0.117
2300	+1.506	+0.024	-0.096	5300	-0.987	-0.232	+0.153
2400	+1.530	+0.018	-0.101	5400	-1.219	-0.243	+0.191
2500	+1.548	+0.014	-0.106	5500	-1.462	-0.256	+0.232
2600	+1.562	+0.007	-0.111	5600	-1.718	-0.268	+0.275
2700	+1.569	+0.001	-0.116	5700	-1.986	-0.281	+0.321
2800	+1.570	-0.005	-0.121	5800	-2.267	-0.293	+0.371
2900	+1.565	-0.011	-0.125	5900	-2.560	-0.307	+0.426
3000	+1.554	-0.018	-0.130	6000	-2.867		+0.487

$$F = 6.88 \times 10^{-13}$$

## TRANSVERSE MERCATOR PROJECTION

TABLE FOR  $g$ 

$$\Delta\alpha'' = \sin \phi (\Delta\lambda'') + g$$

Latitude	$\Delta\lambda''$						
	0''	1000''	2000''	3000''	4000''	5000''	6000''
24°	0!00	0!00	0!02	0!07	0!17	0!33	0!58
25	0	0	0.02	0.07	0.17	0.34	0.59
26°	0.00	0.00	0.02	0.08	0.18	0.35	0.60
27	0	0	0.02	0.08	0.18	0.35	0.61
28	0	0	0.02	0.08	0.18	0.36	0.62
29	0	0	0.02	0.08	0.19	0.37	0.63
30	0	0	0.02	0.08	0.19	0.37	0.64
31°	0.00	0.00	0.02	0.08	0.19	0.37	0.64
32	0	0	0.02	0.08	0.19	0.38	0.65
33	0	0	0.02	0.08	0.19	0.38	0.65
34	0	0	0.02	0.08	0.19	0.38	0.65
35	0	0	0.02	0.08	0.19	0.38	0.65
36°	0.00	0.00	0.02	0.08	0.19	0.38	0.65
37	0	0	0.02	0.08	0.19	0.38	0.65
38	0	0	0.02	0.08	0.19	0.38	0.65
39	0	0	0.02	0.08	0.19	0.37	0.64
40	0	0	0.02	0.08	0.19	0.37	0.64
41°	0.00	0.00	0.02	0.08	0.19	0.37	0.63
42	0	0	0.02	0.08	0.18	0.36	0.63
43	0	0	0.02	0.08	0.18	0.36	0.62
44	0	0	0.02	0.08	0.18	0.35	0.61
45	0	0	0.02	0.08	0.18	0.35	0.60
46°	0.00	0.00	0.02	0.07	0.17	0.34	0.59
47	0	0	0.02	0.07	0.17	0.33	0.58
48	0	0	0.02	0.07	0.17	0.33	0.56
49	0	0	0.02	0.07	0.16	0.32	0.55
50	0.00	0.00	0.02	0.07	0.16	0.31	0.54

$$g = \left[ \frac{C (\sin 1'') \cos^3 \phi}{2A^2} + F \right] (\Delta\lambda'')^3$$

A, C and F are position factors.

Y CORRECTION FOR COMPUTATION OF GEOGRAPHIC  
POSITIONS FROM PLANE COORDINATES  
TRANSVERSE MERCATOR PROJECTION, MICHIGAN-EAST ZONE

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$$P(x'/10,000)^2 + d = V(\Delta y/100)^2 + c$$

P taken out for y-coordinate  
d taken out for x'

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y	P	$\Delta P$	x'	d
0	2.11070	2043	0	0.00
100,000	2.13113	2059	50,000	0.00
200,000	2.15172	2078	100,000	+ 0.02
300,000	2.17250	2096	150,000	+ 0.03
400,000	2.19346	2114	200,000	+ 0.06
500,000	2.21460	2133	250,000	+ 0.07
600,000	2.23593	2151	300,000	+ 0.05
700,000	2.25744	2172	350,000	0.00
800,000	2.27916	2191	400,000	- 0.05
900,000	2.30107	2211		
1,000,000	2.32318	2233		
1,100,000	2.34551	2253		
1,200,000	2.36804	2274		
1,300,000	2.39078	2297		
1,400,000	2.41375	2318		
1,500,000	2.43693	2341		
1,600,000	2.46034	2364		
1,700,000	2.48398	2388		
1,800,000	2.50786	2412		
1,900,000	2.53198	2436		
2,000,000	2.55634			

**Y CORRECTION FOR COMPUTATION OF GEOGRAPHIC  
POSITIONS FROM PLANE COORDINATES  
TRANSVERSE MERCATOR PROJECTION, MICHIGAN-CENTRAL & WEST ZONES**

$$P(x'/10,000)^2 + d = V(\Delta y/100)^2 + c$$

P taken out for y-coordinate  
d taken out for x'

y	P	ΔP	x'	d
0	2.11075	2043	0	0.00
100,000	2.13118	2060	50,000	0.00
200,000	2.15178	2078	100,000	+ 0.02
300,000	2.17256	2095	150,000	+ 0.05
400,000	2.19351	2115	200,000	+ 0.07
500,000	2.21466	2132	250,000	+ 0.08
600,000	2.23598	2152	300,000	+ 0.07
700,000	2.25750	2172	350,000	+ 0.04
800,000	2.27922	2191	400,000	- 0.04
900,000	2.30113	2212	425,000	- 0.09
1,000,000	2.32325	2232		
1,100,000	2.34557	2253		
1,200,000	2.36810	2275		
1,300,000	2.39085	2297		
1,400,000	2.41382	2319		
1,500,000	2.43701	2341	2,000,000	2.55642
1,600,000	2.46042	2364	2,100,000	2.58103
1,700,000	2.48406	2388	2,200,000	2.60590
1,800,000	2.50794	2412	2,300,000	2.63103
1,900,000	2.53206	2436	2,400,000	2.65642

TRANSVERSE MERCATOR PROJECTION

Michigan

$$\Delta\alpha = Mx' - e$$

y	East zone		Central and west zones	
	M	$\Delta M$	M	$\Delta M$
0	0.008 7081	843	0.008 7084	843
100,000	0.008 7924	850	0.008 7927	850
200,000	0.008 8774	857	0.008 8777	857
300,000	0.008 9631	865	0.008 9634	865
400,000	0.009 0496	872	0.009 0499	873
500,000	0.009 1368	880	0.009 1372	880
600,000	0.009 2248	888	0.009 2252	888
700,000	0.009 3136	896	0.009 3140	896
800,000	0.009 4032	904	0.009 4036	904
900,000	0.009 4936	913	0.009 4940	912
1,000,000	0.009 5849	921	0.009 5852	921
1,100,000	0.009 6770	929	0.009 6773	930
1,200,000	0.009 7699	939	0.009 7703	938
1,300,000	0.009 8638	947	0.009 8641	948
1,400,000	0.009 9585	956	0.009 9589	956
1,500,000	0.010 0541	966	0.010 0545	966
1,600,000	0.010 1507	976	0.010 1511	976
1,700,000	0.010 2483	985	0.010 2487	985
1,800,000	0.010 3468	995	0.010 3472	995
1,900,000	0.010 4463	1005	0.010 4467	1005
2,000,000	0.010 5468		0.010 5472	1016
2,100,000			0.010 6488	1026
2,200,000			0.010 7514	1037
2,300,000			0.010 8551	1047
2,400,000			0.010 9598	

e

y \ x'	100,000	200,000	300,000	400,000
0	0.0	0.1	0.3	0.7
1,000,000	0.0	0.1	0.4	0.9
2,000,000	0.0	0.1	0.5	1.1

TRANSVERSE MERCATOR PROJECTION

MICHIGAN

East Zone

x' (feet)	Scale in units of 7th place of logs	Scale ex- pressed as a ratio	x' (feet)	Scale in units of 7th place of logs	Scale ex- pressed as a ratio
0	-248.2	0.9999428	175,000	- 96.3	0.9999778
5,000	-248.1	0.9999429	180,000	- 87.5	0.9999799
10,000	-247.7	0.9999430	185,000	- 78.5	0.9999819
15,000	-247.1	0.9999431	190,000	- 69.2	0.9999841
20,000	-246.2	0.9999433	195,000	- 59.6	0.9999863
25,000	-245.1	0.9999436	200,000	- 49.8	0.9999885
30,000	-243.7	0.9999439	205,000	- 39.8	0.9999908
35,000	-242.1	0.9999443	210,000	- 29.5	0.9999932
40,000	-240.3	0.9999447	215,000	- 19.0	0.9999956
45,000	-238.2	0.9999452	220,000	- 8.2	0.9999981
50,000	-235.8	0.9999457	225,000	+ 2.9	1.0000007
55,000	-233.2	0.9999463	230,000	+ 14.2	1.0000033
60,000	-230.3	0.9999470	235,000	+ 25.7	1.0000059
65,000	-227.2	0.9999477	240,000	+ 37.5	1.0000086
70,000	-223.9	0.9999484	245,000	+ 49.5	1.0000114
75,000	-220.3	0.9999493	250,000	+ 61.8	1.0000142
80,000	-216.5	0.9999501	255,000	+ 74.3	1.0000171
85,000	-212.4	0.9999511	260,000	+ 87.1	1.0000201
90,000	-208.0	0.9999521	265,000	+100.1	1.0000230
95,000	-203.4	0.9999532	270,000	+113.3	1.0000261
100,000	-198.6	0.9999543	275,000	+126.8	1.0000292
105,000	-193.5	0.9999554	280,000	+140.6	1.0000324
110,000	-188.2	0.9999567	285,000	+154.6	1.0000356
115,000	-182.6	0.9999580	290,000	+168.9	1.0000389
120,000	-176.8	0.9999593	295,000	+183.5	1.0000423
125,000	-170.7	0.9999607	300,000	+198.2	1.0000456
130,000	-164.4	0.9999621	305,000	+213.2	1.0000491
135,000	-157.8	0.9999637	310,000	+228.5	1.0000526
140,000	-151.0	0.9999652	315,000	+244.0	1.0000562
145,000	-143.9	0.9999669	320,000	+259.7	1.0000598
150,000	-136.6	0.9999685	325,000	+275.7	1.0000635
155,000	-129.0	0.9999703	330,000	+292.0	1.0000672
160,000	-121.2	0.9999721	335,000	+308.5	1.0000710
165,000	-113.2	0.9999739	340,000	+325.2	1.0000749
170,000	-104.9	0.9999758	345,000	+342.0	1.0000787

## TRANSVERSE MERCATOR PROJECTION

## MICHIGAN

## East Zone

x' (feet)	Scale in units of 7th place of logs	Scale ex- pressed as a ratio
350,000	+359.4	1.0000828
355,000	+376.9	1.0000868
360,000	+394.6	1.0000909
365,000	+412.6	1.0000950
370,000	+430.8	1.0000992
375,000	+449.3	1.0001035
380,000	+468.0	1.0001078
385,000	+487.0	1.0001121
390,000	+506.2	1.0001166
395,000	+525.7	1.0001210
400,000	+545.4	1.0001256
405,000	+565.3	1.0001302
410,000	+585.5	1.0001348
415,000	+606.0	1.0001395
420,000	+626.7	1.0001443
425,000	+647.7	1.0001491
430,000	+668.9	1.0001540
435,000	+690.4	1.0001590
440,000	+712.1	1.0001640
445,000	+734.0	1.0001690
450,000	+756.2	1.0001741

MICHIGAN

Central and West Zones

x' (feet)	Scale in units of 7th place of logs	Scale ex- pressed as a ratio	x' (feet)	Scale in units of 7th place of logs	Scale ex- pressed as a ratio
0	-394.8	0.9999091	175,000	-242.9	0.9999441
5,000	-394.7	0.9999091	180,000	-234.1	0.9999461
10,000	-394.3	0.9999092	185,000	-225.1	0.9999482
15,000	-393.7	0.9999093	190,000	-215.8	0.9999503
20,000	-392.8	0.9999096	195,000	-206.2	0.9999525
25,000	-391.7	0.9999098	200,000	-196.4	0.9999548
30,000	-390.3	0.9999101	205,000	-186.4	0.9999571
35,000	-388.7	0.9999105	210,000	-176.1	0.9999595
40,000	-386.9	0.9999109	215,000	-165.6	0.9999619
45,000	-384.8	0.9999114	220,000	-154.8	0.9999644
50,000	-382.4	0.9999119	225,000	-143.7	0.9999669
55,000	-379.8	0.9999125	230,000	-132.4	0.9999695
60,000	-376.9	0.9999132	235,000	-120.9	0.9999722
65,000	-373.8	0.9999139	240,000	-109.1	0.9999749
70,000	-370.5	0.9999147	245,000	- 97.1	0.9999776
75,000	-366.9	0.9999155	250,000	- 84.8	0.9999805
80,000	-363.1	0.9999164	255,000	- 72.3	0.9999834
85,000	-359.0	0.9999173	260,000	- 59.5	0.9999863
90,000	-354.6	0.9999184	265,000	- 46.5	0.9999893
95,000	-350.0	0.9999194	270,000	- 33.3	0.9999923
100,000	-345.2	0.9999205	275,000	- 19.8	0.9999954
105,000	-340.1	0.9999217	280,000	- 6.0	0.9999986
110,000	-334.8	0.9999229	285,000	+ 8.0	1.0000018
115,000	-329.2	0.9999242	290,000	+ 22.3	1.0000051
120,000	-323.4	0.9999255	295,000	+ 36.8	1.0000085
125,000	-317.3	0.9999269	300,000	+ 51.5	1.0000119
130,000	-311.0	0.9999284	305,000	+ 66.5	1.0000153
135,000	-304.4	0.9999299	310,000	+ 81.8	1.0000188
140,000	-297.6	0.9999315	315,000	+ 97.3	1.0000224
145,000	-290.5	0.9999331	320,000	+113.0	1.0000260
150,000	-283.2	0.9999348	325,000	+129.0	1.0000297
155,000	-275.6	0.9999365	330,000	+145.3	1.0000335
160,000	-267.8	0.9999383	335,000	+161.8	1.0000373
165,000	-259.8	0.9999402	340,000	+178.5	1.0000411
170,000	-251.5	0.9999421	345,000	+195.5	1.0000450

## TRANSVERSE MERCATOR PROJECTION

## MICHIGAN

## Central and West Zones

x' (feet)	Scale in units of 7th place of logs	Scale ex- pressed as a ratio
350,000	+212.7	1.0000489
355,000	+250.2	1.0000530
360,000	+247.9	1.0000571
365,000	+265.9	1.0000612
370,000	+284.1	1.0000654
375,000	+302.6	1.0000697
380,000	+321.3	1.0000740
385,000	+340.3	1.0000784
390,000	+359.5	1.0000828
395,000	+379.0	1.0000873
400,000	+398.7	1.0000918
405,000	+418.6	1.0000964
410,000	+438.8	1.0001010
415,000	+459.3	1.0001058
420,000	+480.0	1.0001105
425,000	+501.0	1.0001154
430,000	+522.2	1.0001202
435,000	+543.6	1.0001252
440,000	+565.3	1.0001302
445,000	+587.2	1.0001352
450,000	+609.4	1.0001403
455,000	+631.9	1.0001455
460,000	+654.6	1.0001508
465,000	+677.5	1.0001560
470,000	+700.7	1.0001613
475,000	+724.1	1.0001667

**CORRECTIONS TO NATURAL SCALE RATIOS\***  
(in units of the 7th decimal place)

For Lambert Projection				For Lambert or transverse Mercator Projection			
<u><math>\Delta\phi'</math> as argument</u>							
<u><math>\Delta\phi'</math></u>	<u>Corr'n</u> (Plus)	<u><math>\Delta\phi'</math></u>	<u>Corr'n</u> (Plus)	<u><math>\Delta y</math></u>	or	<u><math>\Delta x</math></u>	<u>Corr'n</u> (Plus)
1	0	31	34	10,000			0
2	0	32	36	20,000			0
3	0	33	38	30,000			1
4	1	34	40	40,000			2
5	1	35	43	50,000			2
6	1	36	45	60,000			3
7	2	37	48	70,000			5
8	2	38	51	80,000			6
9	3	39	53	90,000			8
10	4	40	56	100,000			10
11	4	41	59	110,000			11
12	5	42	62	120,000			14
13	6	43	65	130,000			16
14	7	44	68	140,000			19
15	8	45	71	150,000			21
16	9	46	74	160,000			24
17	10	47	77	170,000			27
18	11	48	81	180,000			31
19	13	49	84	190,000			34
20	14	50	88	200,000			38
21	15	51	91	210,000			42
22	17	52	95	220,000			46
23	19	53	98	230,000			50
24	20	54	102	240,000			55
25	22	55	106	250,000			59
26	24	56	110	260,000			64
27	26	57	114	270,000			69
28	27	58	118	280,000			74
29	29	59	122	290,000			80
30	32	60	126	300,000			86
				310,000			91
				320,000			97
				330,000			103
				340,000			110
				350,000			116

$\Delta\phi'$  is the difference in  
latitude in minutes  
of the ends of the line.

\*Scale ratio interpolated for mean latitude or mean  $x'$  of the ends of a line and corrected by the above table is a true mean value accurate to within one in the seventh decimal place.