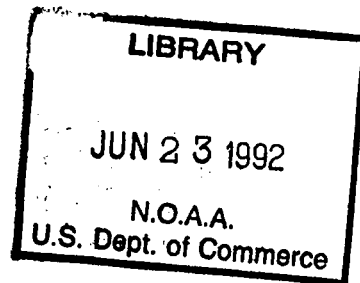


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# PLANE COORDINATE PROJECTION TABLES NEW JERSEY



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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

$$x = x' + 2,000,000$$

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

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

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.

$$x' = x - 2,000,000$$

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

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 of the plane coordinates.

PLANE COORDINATES ON TRANSVERSE MERCATOR PROJECTION  
(Condensed form for calculating-machine computation)

State New Jersey Zone      Central meridian 74° 40' 00".000

Station	<u>Lacey, 1932</u>	<u>Bevans, 1938</u>			
$\phi$	<u>39° 52' 02".095</u>	<u>41° 12' 07".401</u>			
$\lambda$	<u>74 13 55.737</u>	<u>74 51 24.058</u>			
$\Delta\lambda = \text{Central mer.} - \lambda$	<u>+ 0° 26' 04".263</u>	<u>- 0° 11' 24".058</u>			
$\Delta\lambda''$	<u>+ 1,564".263</u>	<u>- 684".058</u>			
$\left(\frac{\Delta\lambda''}{100}\right)^2$	<u>244.692</u>	<u>46.794</u>			
$H$	<u>77.974 527</u>	<u>76.442 142</u>			
$V$	<u>1.211 759</u>	<u>1.220 755</u>			
$a$	<u>-0.722</u>	<u>+1.616</u>	$b$	<u>-0.526</u>	<u>+0.804</u>
$x' = H \cdot \Delta\lambda \pm ab$	<u>+ 121,971.50</u>	<u>- 52,290.44</u>			
$V \left(\frac{\Delta\lambda''}{100}\right)^2 \pm c$	<u>296.47</u>	<u>57.12</u>			
Tabular $y$	<u>376,582.20</u>	<u>862,858.78</u>			
$x$	<u>2,121,971.50</u>	<u>1,947,709.56</u>			
$y$	<u>376,878.67</u>	<u>862,915.90</u>			
$\Delta\alpha''$	<u>+ 1,002".72</u>	<u>- 450".60</u>			
$\Delta\alpha$	<u>+ 0° 16' 42".7</u>	<u>- 0° 07' 30".6</u>			
Geod. Az. to Az. Mk.	<u>290 35 58.6</u>	<u>342 11 26.9</u>			
Grid Az. to Az. Mk.	<u>290 19 16</u>	<u>342 18 58</u>			

$$x = x' + 2,000,000$$

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

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

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

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

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

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

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GEODETIC POSITIONS FROM TRANSVERSE MERCATOR COORDINATES  
(CALCULATING MACHINE COMPUTATION)

STATE - ZONE New Jersey

Station Lacey, 1932

X	2,121,971.50		Y	376,878.67
C	- 2,000,000.00		$P(\frac{X'}{10,000})^2 + d$	- 296.47
X'	+ 121,971.50		$Y_0$	376,582.20
P	1.99273		Approx. $\Delta\lambda = X' \div H$	+ 1,564"
d	+ 0.01		$\Delta\lambda = (X' \mp ab) \div H$	+ 1,564".263
H	77.974 527		$\Delta\lambda$	+ 0° 26' 04".263
a	b	- 0.722   + 1.616	Central Meridian	74 40 00.000
$\phi$	39° 52' 02".095		$\lambda = \text{C.M.} - \Delta\lambda$	74° 13' 55".737

Station Bevans, 1938

X	1,947,709.56		Y	862,915.90
C	- 2,000,000.00		$P(\frac{X'}{10,000})^2 + d$	- 57.11
X'	- 52,290.44		$Y_0$	862,858.79
P	2.08876		Approx. $\Delta\lambda = X' \div H$	- 684"
d	0.00		$\Delta\lambda = (X' \mp ab) \div H$	- 684".058
H	76.442 142		$\Delta\lambda$	- 0° 11' 24".058
a	b	- 0.526   + 0.804	Central Meridian	74 40 00.000
$\phi$	41° 12' 07".401		$\lambda = \text{C.M.} - \Delta\lambda$	74° 51' 24".058

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 a b is  $\frac{+, \text{ decrease}}{-, \text{ increase}}$  X' numerically

Constants for New Jersey

Central Meridian	74° 40' 00".000
log R	-108.6
Scale reduction (Central Meridian)	1 : 40,000
$\log \left( \frac{1}{6\rho_0^2} \right) g$	4.581 0213 -20
$\log \left( \frac{1}{6\rho_0^2 \sin 1''} \right) g$	9.895 4464 -20
$\left( \frac{1}{6\rho_0^2 \sin 1''} \right) g$	0.7860 x 10 <sup>-10</sup>





TRANSVERSE MERCATOR PROJECTION  
NEW JERSEY

Lat.	$y_0$ feet	$\Delta y_0$ per second	H	$\Delta H$ per second	V	$\Delta V$ per second	a
38 50	0 00.00	101.165 83	79.132 322	307.65	1.202 982	2.56	-.881
38 51	6 069.95	101.166 17	79.113 863	307.76	1.203 136	2.56	-.878
38 52	12 139.92	101.166 33	79.095 397	307.88	1.203 290	2.55	-.876
38 53	18 209.90	101.166 67	79.076 924	308.00	1.203 443	2.55	-.873
38 54	24 279.90	101.167 00	79.058 444	308.10	1.203 596	2.53	-.871
38 55	30 349.92	101.167 33	79.039 958	308.21	1.203 748	2.53	-.868
38 56	36 419.96	101.167 50	79.021 465	308.33	1.203 900	2.53	-.865
38 57	42 490.01	101.167 83	79.002 965	308.43	1.204 052	2.51	-.863
38 58	48 560.08	101.168 17	78.984 459	308.55	1.204 203	2.51	-.860
38 59	54 630.17	101.168 50	78.965 946	308.66	1.204 354	2.50	-.858
39 00	60 700.28		78.947 426		1.204 504		-.855

TRANSVERSE MERCATOR PROJECTION  
NEW JERSEY

Lat.	$y_0$ feet	$\Delta y_0$ per second	H	$\Delta H$ per second	V	$\Delta V$ per second	a
39 00	60 700.28	101.168 83	78.947 426	308.78	1.204 504	2.50	-.855
39 01	66 770.41	101.169 00	78.928 899	308.88	1.204 654	2.48	-.853
39 02	72 840.55	101.169 33	78.910 366	309.00	1.204 803	2.48	-.850
39 03	78 910.71	101.169 67	78.891 826	309.11	1.204 952	2.48	-.848
39 04	84 980.89	101.170 00	78.873 279	309.21	1.205 101	2.46	-.845
39 05	91 051.09	101.170 17	78.854 726	309.35	1.205 249	2.46	-.843
39 06	97 121.30	101.170 50	78.836 165	309.43	1.205 397	2.45	-.840
39 07	103 191.53	101.170 83	78.817 599	309.56	1.205 544	2.45	-.838
39 08	109 261.78	101.171 17	78.799 025	309.66	1.205 691	2.45	-.835
39 09	115 332.05	101.171 33	78.780 445	309.78	1.205 838	2.43	-.833
39 10	121 402.33	101.171 67	78.761 858	309.90	1.205 984	2.43	-.830
39 11	127 472.63	101.172 00	78.743 264	310.00	1.206 130	2.41	-.827
39 12	133 542.95	101.172 33	78.724 664	310.11	1.206 275	2.41	-.825
39 13	139 613.29	101.172 50	78.706 057	310.23	1.206 420	2.40	-.822
39 14	145 683.64	101.172 83	78.687 443	310.33	1.206 564	2.41	-.820
39 15	151 754.01	101.173 17	78.668 823	310.45	1.206 709	2.38	-.817
39 16	157 824.40	101.173 50	78.650 196	310.56	1.206 852	2.40	-.814
39 17	163 894.81	101.173 83	78.631 562	310.66	1.206 996	2.36	-.812
39 18	169 965.24	101.174 00	78.612 922	310.78	1.207 138	2.38	-.809
39 19	176 035.68	101.174 33	78.594 275	310.90	1.207 281	2.36	-.807
39 20	182 106.14	101.174 67	78.575 621	311.00	1.207 423	2.36	-.804
39 21	188 176.62	101.174 83	78.556 961	311.13	1.207 565	2.35	-.802
39 22	194 247.11	101.175 33	78.538 293	311.21	1.207 706	2.35	-.799
39 23	200 317.63	101.175 50	78.519 620	311.35	1.207 847	2.35	-.797
39 24	206 388.16	101.175 83	78.500 939	311.45	1.207 988	2.33	-.794
39 25	212 458.71	101.176 17	78.482 252	311.55	1.208 128	2.31	-.792
39 26	218 529.28	101.176 33	78.463 559	311.68	1.208 267	2.33	-.789
39 27	224 599.86	101.176 67	78.444 858	311.78	1.208 407	2.31	-.787
39 28	230 670.46	101.177 00	78.426 151	311.90	1.208 546	2.30	-.784
39 29	236 741.08	101.177 33	78.407 437	312.00	1.208 684	2.30	-.782
39 30	242 811.72	101.177 67	78.388 717	312.11	1.208 822	2.30	-.779
39 31	248 882.38	101.177 83	78.369 990	312.23	1.208 960	2.28	-.776
39 32	254 953.05	101.178 17	78.351 256	312.33	1.209 097	2.26	-.774
39 33	261 023.74	101.178 50	78.332 516	312.45	1.209 233	2.28	-.771
39 34	267 094.45	101.178 83	78.313 769	312.56	1.209 370	2.26	-.769
39 35	273 165.18	101.179 00	78.295 015	312.66	1.209 506	2.25	-.766
39 36	279 235.92	101.179 33	78.276 255	312.78	1.209 641	2.25	-.763
39 37	285 306.68	101.179 67	78.257 488	312.90	1.209 776	2.25	-.761
39 38	291 377.46	101.180 00	78.238 714	313.00	1.209 911	2.23	-.758
39 39	297 448.26	101.180 17	78.219 934	313.11	1.210 045	2.23	-.756
39 40	303 519.07	101.180 50	78.201 147	313.21	1.210 179	2.23	-.753
39 41	309 589.90	101.180 83	78.182 354	313.35	1.210 313	2.21	-.750
39 42	315 660.75	101.181 17	78.163 553	313.43	1.210 446	2.21	-.748
39 43	321 731.62	101.181 33	78.144 747	313.56	1.210 579	2.20	-.745
39 44	327 802.50	101.181 67	78.125 933	313.66	1.210 711	2.20	-.743
39 45	333 873.40	101.182 00	78.107 113	313.78	1.210 843	2.18	-.740
39 46	339 944.32	101.182 33	78.088 286	313.88	1.210 974	2.18	-.737
39 47	346 015.26	101.182 67	78.069 453	314.00	1.211 105	2.18	-.735
39 48	352 086.22	101.182 83	78.050 613	314.11	1.211 236	2.16	-.732
39 49	358 157.19	101.183 17	78.031 766	314.21	1.211 366	2.16	-.730
39 50	364 228.18	101.183 50	78.012 913	314.33	1.211 496	2.15	-.727
39 51	370 299.19	101.183 83	77.994 053	314.45	1.211 625	2.15	-.725
39 52	376 370.22	101.184 00	77.975 186	314.56	1.211 754	2.15	-.722
39 53	382 441.26	101.184 33	77.956 312	314.66	1.211 883	2.13	-.720
39 54	388 512.32	101.184 67	77.937 432	314.76	1.212 011	2.13	-.717
39 55	394 583.40	101.184 83	77.918 546	314.88	1.212 139	2.11	-.715
39 56	400 654.49	101.185 17	77.899 653	315.00	1.212 266	2.11	-.712
39 57	406 725.60	101.185 50	77.880 753	315.10	1.212 393	2.10	-.710
39 58	412 796.73	101.185 83	77.861 847	315.21	1.212 519	2.10	-.707
39 59	418 867.88	101.186 17	77.842 934	315.33	1.212 645	2.10	-.705
40 00	424 939.05		77.824 014		1.212 771		-.702

TRANSVERSE MERCATOR PROJECTION  
NEW JERSEY

Lat.	y. feet	$\Delta y$ . per second	H	$\Delta H$ per second	V	$\Delta V$ per second	a
40 00	424 939.05	101.186 50	77.824 014	315.43	1.212 771	2.08	-.702
40 01	431 010.24	101.186 67	77.805 088	315.55	1.212 896	2.08	-.699
40 02	437 081.44	101.187 00	77.786 155	315.65	1.213 021	2.08	-.697
40 03	443 152.66	101.187 17	77.767 216	315.76	1.213 146	2.06	-.694
40 04	449 223.89	101.187 67	77.748 270	315.86	1.213 270	2.06	-.692
40 05	455 295.15	101.187 83	77.729 318	316.00	1.213 394	2.05	-.689
40 06	461 366.42	101.188 17	77.710 358	316.08	1.213 517	2.05	-.686
40 07	467 437.71	101.188 50	77.691 393	316.21	1.213 640	2.03	-.684
40 08	473 509.02	101.188 83	77.672 420	316.30	1.213 762	2.03	-.681
40 09	479 580.35	101.189 00	77.653 442	316.43	1.213 884	2.03	-.679
40 10	485 651.69	101.189 33	77.634 456	316.53	1.214 006	2.01	-.676
40 11	491 723.05	101.189 67	77.615 464	316.65	1.214 127	2.01	-.673
40 12	497 794.43	101.190 00	77.596 465	316.75	1.214 248	2.00	-.671
40 13	503 865.83	101.190 17	77.577 460	316.86	1.214 368	2.00	-.668
40 14	509 937.24	101.190 67	77.558 448	316.98	1.214 488	2.00	-.666
40 15	516 008.68	101.190 83	77.539 429	317.08	1.214 608	1.98	-.663
40 16	522 080.13	101.191 17	77.520 404	317.20	1.214 727	1.96	-.660
40 17	528 151.60	101.191 33	77.501 372	317.30	1.214 845	1.98	-.658
40 18	534 223.08	101.191 83	77.482 334	317.41	1.214 964	1.96	-.655
40 19	540 294.59	101.192 00	77.463 289	317.51	1.215 082	1.95	-.653
40 20	546 366.11	101.192 33	77.444 238	317.63	1.215 199	1.95	-.650
40 21	552 437.65	101.192 67	77.425 180	317.73	1.215 316	1.95	-.648
40 22	558 509.21	101.192 83	77.406 116	317.85	1.215 433	1.93	-.645
40 23	564 580.78	101.193 33	77.387 045	317.96	1.215 549	1.93	-.643
40 24	570 652.38	101.193 50	77.367 967	318.06	1.215 665	1.93	-.640
40 25	576 723.99	101.193 83	77.348 883	318.18	1.215 781	1.91	-.638
40 26	582 795.62	101.194 00	77.329 792	318.28	1.215 896	1.91	-.635
40 27	588 867.26	101.194 50	77.310 695	318.40	1.216 011	1.90	-.633
40 28	594 938.93	101.194 67	77.291 591	318.51	1.216 125	1.90	-.630
40 29	601 010.61	101.195 00	77.272 480	318.61	1.216 239	1.88	-.628
40 30	607 082.31	101.195 33	77.253 363	318.73	1.216 352	1.88	-.625
40 31	613 154.03	101.195 50	77.234 239	318.83	1.216 465	1.86	-.623
40 32	619 225.76	101.195 83	77.215 109	318.95	1.216 577	1.88	-.620
40 33	625 297.51	101.196 33	77.195 972	319.06	1.216 690	1.85	-.618
40 34	631 369.29	101.196 50	77.176 828	319.16	1.216 801	1.86	-.615
40 35	637 441.08	101.196 67	77.157 678	319.26	1.216 913	1.85	-.613
40 36	643 512.88	101.197 00	77.138 522	319.40	1.217 024	1.83	-.611
40 37	649 584.70	101.197 33	77.119 358	319.48	1.217 134	1.83	-.608
40 38	655 656.54	101.197 67	77.100 189	319.60	1.217 244	1.83	-.606
40 39	661 728.40	101.198 00	77.081 013	319.71	1.217 354	1.81	-.603
40 40	667 800.28	101.198 17	77.061 830	319.81	1.217 463	1.81	-.601
40 41	673 872.17	101.198 67	77.042 641	319.93	1.217 572	1.80	-.599
40 42	679 944.09	101.198 83	77.023 445	320.03	1.217 680	1.80	-.596
40 43	686 016.02	101.199 17	77.004 243	320.15	1.217 788	1.80	-.594
40 44	692 087.97	101.199 33	76.985 034	320.25	1.217 896	1.78	-.591
40 45	698 159.93	101.199 67	76.965 819	320.36	1.218 003	1.78	-.589
40 46	704 231.91	101.200 00	76.946 597	320.46	1.218 110	1.76	-.587
40 47	710 303.91	101.200 33	76.927 369	320.58	1.218 216	1.76	-.584
40 48	716 375.93	101.200 67	76.908 134	320.70	1.218 322	1.76	-.582
40 49	722 447.97	101.200 83	76.888 892	320.80	1.218 428	1.75	-.579
40 50	728 520.02	101.201 17	76.869 644	320.91	1.218 533	1.75	-.577
40 51	734 592.09	101.201 50	76.850 389	321.01	1.218 638	1.73	-.575
40 52	740 664.18	101.201 83	76.831 128	321.13	1.218 742	1.73	-.572
40 53	746 736.29	101.202 17	76.811 860	321.23	1.218 846	1.73	-.570
40 54	752 808.42	101.202 50	76.792 586	321.35	1.218 950	1.71	-.568
40 55	758 880.57	101.202 83	76.773 305	321.45	1.219 053	1.70	-.566
40 56	764 952.74	101.202 83	76.754 018	321.56	1.219 155	1.71	-.563
40 57	771 024.91	101.203 17	76.734 724	321.68	1.219 258	1.68	-.561
40 58	777 097.10	101.203 67	76.715 423	321.78	1.219 359	1.70	-.559
40 59	783 169.32	101.203 83	76.696 116	321.88	1.219 461	1.68	-.556
41 00	789 241.55		76.676 803		1.219 562		-.554

TRANSVERSE MERCATOR PROJECTION  
NEW JERSEY

Lat.	y <sub>0</sub> feet		Δy <sub>0</sub> per second		H		ΔH per second		v		ΔV per second		a
41 00	789	241.55	101.204	17	76.676	803	322.00	1.219	562	1.68	-	.554	
41 01	795	313.80	101.204	50	76.657	483	322.10	1.219	663	1.66	-	.552	
41 02	801	386.07	101.204	83	76.638	157	322.21	1.219	764	1.66	-	.549	
41 03	807	458.36	101.205	00	76.618	824	322.33	1.219	863	1.65	-	.547	
41 04	813	530.66	101.205	33	76.599	484	322.43	1.219	962	1.65	-	.545	
41 05	619	602.98	101.205	67	76.580	138	322.53	1.220	061	1.65	-	.543	
41 06	625	675.32	101.206	00	76.560	786	322.65	1.220	160	1.63	-	.540	
41 07	631	747.68	101.206	33	76.541	427	322.76	1.220	258	1.63	-	.538	
41 08	637	820.06	101.206	50	76.522	061	322.86	1.220	356	1.61	-	.536	
41 09	643	892.45	101.206	83	76.502	689	322.96	1.220	453	1.61	-	.533	
41 10	849	964.86	101.207	17	76.483	311	323.08	1.220	550	1.61	-	.531	
41 11	856	037.29	101.207	50	76.463	926	323.18	1.220	647	1.60	-	.529	
41 12	862	109.74	101.207	67	76.444	535	323.30	1.220	743	1.60	-	.526	
41 13	868	182.20	101.208	00	76.425	137	323.41	1.220	839	1.58	-	.524	
41 14	874	254.68	101.208	33	76.405	732	323.50	1.220	934	1.58	-	.522	
41 15	680	327.18	101.208	67	76.386	322	323.63	1.221	029	1.56	-	.520	
41 16	686	399.70	101.209	00	76.366	904	323.73	1.221	123	1.56	-	.517	
41 17	692	472.24	101.209	17	76.347	480	323.83	1.221	217	1.56	-	.515	
41 18	698	544.79	101.209	50	76.328	050	323.95	1.221	311	1.55	-	.513	
41 19	904	617.36	101.209	83	76.308	613	324.05	1.221	404	1.55	-	.510	
41 20	910	689.95	101.210	17	76.289	170	324.16	1.221	497	1.53	-	.508	
41 21	916	762.56	101.210	50	76.269	720	324.26	1.221	589	1.53	-	.506	
41 22	922	835.19	101.210	67	76.250	264	324.38	1.221	681	1.53	-	.504	
41 23	928	907.83	101.211	00	76.230	801	324.48	1.221	773	1.51	-	.501	
41 24	934	980.49	101.211	33	76.211	332	324.60	1.221	864	1.51	-	.499	
41 25	941	053.17	101.211	67	76.191	856	324.70	1.221	955	1.50	-	.497	
41 26	947	125.87	101.211	83	76.172	374	324.81	1.222	045	1.50	-	.495	
41 27	953	198.58	101.212	17	76.152	885	324.91	1.222	135	1.48	-	.493	
41 28	959	271.31	101.212	50	76.133	390	325.03	1.222	224	1.48	-	.490	
41 29	965	344.06	101.212	83	76.113	888	325.13	1.222	313	1.48	-	.488	
41 30	971	416.83			76.094	380		1.222	402		-	.486	

## TRANSVERSE MERCATOR PROJECTION

## New Jersey

$\Delta\lambda''$	b	$\Delta b$	c	$\Delta\lambda''$	b	$\Delta b$	c
0	0.000	+0.120	0.000	2600	+1.843	-0.038	-0.061
100	+0.120	+0.120	0.000	2700	+1.805	-0.051	-0.062
200	+0.240	+0.120	-0.001	2800	+1.754	-0.063	-0.062
300	+0.360	+0.119	-0.002	2900	+1.691	-0.077	-0.063
400	+0.479	+0.116	-0.003	3000	+1.614	-0.093	-0.062
500	+0.595	+0.115	-0.004	3100	+1.521	-0.107	-0.061
600	+0.710	+0.112	-0.006	3200	+1.414	-0.122	-0.059
700	+0.822	+0.109	-0.008	3300	+1.292	-0.136	-0.056
800	+0.931	+0.106	-0.010	3400	+1.156	-0.152	-0.052
900	+1.037	+0.102	-0.012	3500	+1.004	-0.167	-0.047
1000	+1.139	+0.097	-0.015	3600	+0.837	-0.184	-0.040
1100	+1.236	+0.093	-0.018	3700	+0.653	-0.200	-0.032
1200	+1.329	+0.087	-0.021	3800	+0.453	-0.218	-0.023
1300	+1.416	+0.081	-0.024	3900	+0.235	-0.235	-0.012
1400	+1.497	+0.075	-0.028	4000	0.000	-0.253	0.000
1500	+1.572	+0.068	-0.032	4100	-0.253	-0.272	+0.017
1600	+1.640	+0.061	-0.035	4200	-0.525	-0.291	+0.034
1700	+1.701	+0.053	-0.038	4300	-0.816	-0.311	+0.052
1800	+1.754	+0.045	-0.041	4400	-1.127	-0.331	+0.072
1900	+1.799	+0.036	-0.045	4500	-1.458	-0.351	+0.094
2000	+1.835	+0.027	-0.049	4600	-1.809	-0.372	+0.118
2100	+1.862	+0.017	-0.052	4700	-2.181	-0.394	+0.144
2200	+1.879	+0.007	-0.055	4800	-2.575	-0.415	+0.172
2300	+1.886	-0.002	-0.057	4900	-2.990	-0.438	+0.202
2400	+1.884	-0.015	-0.059	5000	-3.428		+0.234
2500	+1.869	-0.026	-0.060				

$$F = 7.36 \times 10^{-13}$$

## 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

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

A, C and F are position factors.

Y CORRECTION FOR COMPUTATION OF GEOGRAPHIC  
POSITIONS FROM PLANE COORDINATES  
TRANSVERSE MERCATOR PROJECTION, NEW JERSEY

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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	1.92077	1888	0	0.00
100,000	1.93965	1904	50,000	0.00
200,000	1.95869	1918	100,000	+ 0.01
300,000	1.97787	1933	150,000	+ 0.02
400,000	1.99720	1949	200,000	+ 0.02
500,000	2.01669	1964	250,000	+ 0.01
600,000	2.03633	1981	300,000	- 0.02
700,000	2.05614	1996		
800,000	2.07610	2013		
900,000	2.09623			



## TRANSVERSE MERCATOR PROJECTION

New Jersey

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

y	M	$\Delta M$
0	0.007 9242	779
100,000	0.008 0021	785
200,000	0.008 0806	791
300,000	0.008 1597	798
400,000	0.008 2395	804
500,000	0.008 3199	811
600,000	0.008 4010	817
700,000	0.008 4827	824
800,000	0.008 5651	830
900,000	0.008 6481	838
1,000,000	0.008 7319	

x'	e
100,000	0.0
200,000	0.1
300,000	0.3

## TRANSVERSE MERCATOR PROJECTION

## New Jersey

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	-108.6	0.9999750	175,000	+ 43.4	1.0000100
5,000	-108.5	0.9999750	180,000	+ 52.3	1.0000120
10,000	-108.1	0.9999751	185,000	+ 61.3	1.0000141
15,000	-107.5	0.9999752	190,000	+ 70.6	1.0000163
20,000	-106.6	0.9999755	195,000	+ 80.2	1.0000185
25,000	-105.5	0.9999757	200,000	+ 90.0	1.0000207
30,000	-104.1	0.9999760	205,000	+100.0	1.0000230
35,000	-102.5	0.9999764	210,000	+110.4	1.0000254
40,000	-100.7	0.9999768	215,000	+120.9	1.0000278
45,000	- 98.5	0.9999773	220,000	+131.7	1.0000303
50,000	- 96.2	0.9999778	225,000	+142.7	1.0000329
55,000	- 93.6	0.9999784	230,000	+154.0	1.0000355
60,000	- 90.7	0.9999791	235,000	+165.6	1.0000381
65,000	- 87.6	0.9999798	240,000	+177.4	1.0000408
70,000	- 84.3	0.9999806	245,000	+189.4	1.0000436
75,000	- 80.7	0.9999814	250,000	+201.7	1.0000464
80,000	- 76.8	0.9999823	255,000	+214.2	1.0000493
85,000	- 72.7	0.9999833	260,000	+227.0	1.0000523
90,000	- 68.4	0.9999843	265,000	+239.9	1.0000553
95,000	- 63.8	0.9999853	270,000	+253.3	1.0000583
100,000	- 59.0	0.9999864	275,000	+266.9	1.0000615
105,000	- 53.9	0.9999876	280,000	+280.6	1.0000646
110,000	- 48.5	0.9999888	285,000	+294.7	1.0000679
115,000	- 42.9	0.9999901	290,000	+308.9	1.0000711
120,000	- 37.1	0.9999915	295,000	+323.5	1.0000745
125,000	- 31.0	0.9999929	300,000	+338.2	1.0000779
130,000	- 24.7	0.9999943	305,000	+353.3	1.0000813
135,000	- 18.1	0.9999958	310,000	+368.5	1.0000848
140,000	- 11.3	0.9999974	315,000	+384.0	1.0000884
145,000	- 4.2	0.9999990	320,000	+399.8	1.0000921
150,000	+ 3.1	1.0000007	325,000	+415.8	1.0000957
155,000	+ 10.7	1.0000025	330,000	+432.1	1.0000995
160,000	+ 18.5	1.0000043	335,000	+448.6	1.0001033
165,000	+ 26.6	1.0000061	340,000	+465.3	1.0001071
170,000	+ 34.9	1.0000080	345,000	+482.3	1.0001111
			350,000	+499.6	1.0001150

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

For Lambert Projection				For Lambert or transverse Mercator Projection	
<u><math>\Delta\theta'</math> as argument</u>				<u><math>\Delta y</math></u> or <u><math>\Delta x</math></u>	<u>Corr'n</u> (Plus)
<u><math>\Delta\theta'</math></u>	<u>Corr'n</u> (Plus)	<u><math>\Delta\theta'</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

$\Delta\theta'$  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.