California GIS Council Workgroup Report

Workgroup: State Plane Coordinate System Workgroup page*: Workgroup Chair: Nathaniel Roth	Report Date: December 9, 2021

*See the workgroup page for workgroup charter, members, contact information, and prior reports.

Requests for Council Action

No concrete action.

Status Update

- NGS Webinar on 12/9 11am on the 2022 SPCS: https://geodesy.noaa.gov/web/science_edu/webinar_series/state-plane-december-2021.shtml
- Updated preliminary State Plane Zones and distortion comparisons to the NAD83 based zones.
- Official implementation of the SPCS 2022 will be delayed. Likely to 2025, but consistent with precedent will continue to be referred to with the year 2022.
- The default option for the statewide zones, using population weighted parameters to reduce distortion in areas with greater population appears to be preferred option in California (no action needed).
- The State of Arizona has submitted parameters for a low distortion projection(LDP) zone covering the Lower Colorado River on behalf of multiple partners. California was consulted because it touches the State, but was not a participant. DWR responded on behalf of California stating that there was no objection to the LDP.
- Los Angeles County and the San Francisco Bay Area have submitted LDP parameters.

Legislative/Policy Update

None

Next Actions & Key dates

List next actions and key dates

Action	Key Date
Next workgroup meeting	TBD

Documents and Attachments

NGS SPCS: https://www.ngs.noaa.gov/SPCS/index.shtml
NGS SPCS 2022 webinar recordings:

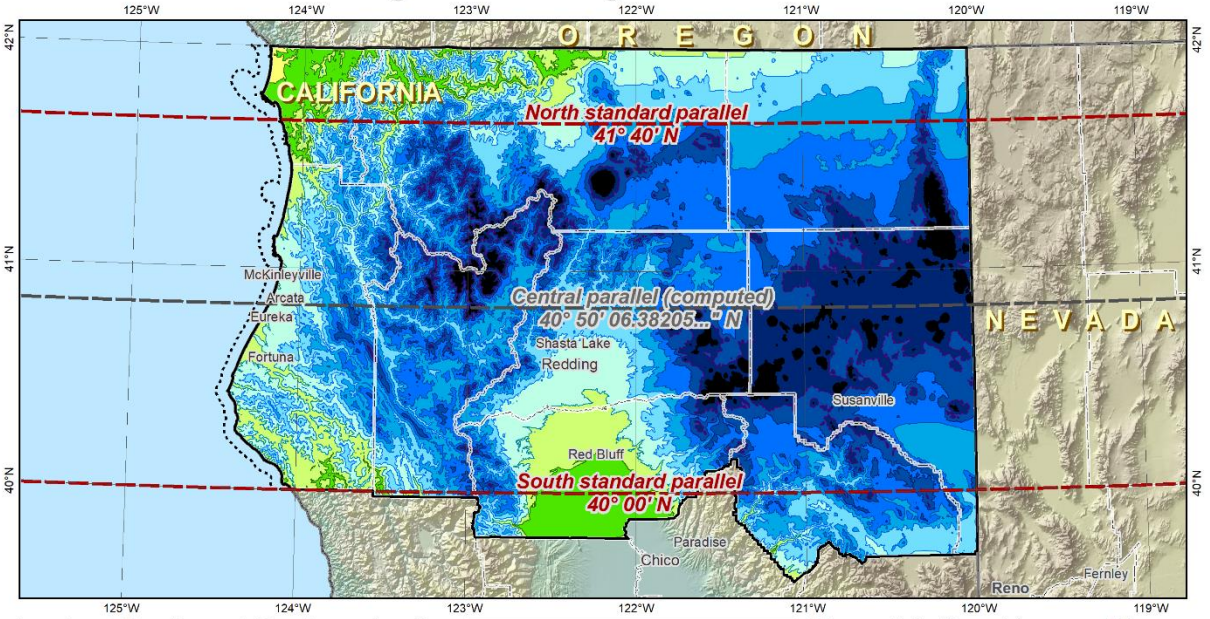
- https://geodesy.noaa.gov/web/science_edu/webinar_series/2021-webinars.shtml

Specific attention to the webinars from July 25, 2019, October 10, 2019, March 12, 2020, June 11, 2020, March 11, 2021, July 15, 2021
2021 Geospatial Summit materials and recordings are available: https://geodesy.noaa.gov/geospatial-summit/year-2021/presentations.shtml

Notes

None

Existing SPCS83 design: California Zone 1



Lambert Conformal Conic projection
North American Datum 1983
Central parallel: 40° 50' 06.3..." N
Central parallel scale: 0.999 894 637...

NOAA's National Geodetic Survey

Areas within ±150 ppm distortion (1:6,667 = ±0.79 ft per mile):
78% of population
52% of all cities and towns
24% of entire zone area

Distortion values (ppm)
Entire zone:
Min= -717 Range = 822
Max = +105 Mean = -225
Weighted mean = -121
(weighted by population)
Cities and towns:
Min = -355 Range = 434
Max = +79 Mean = -146

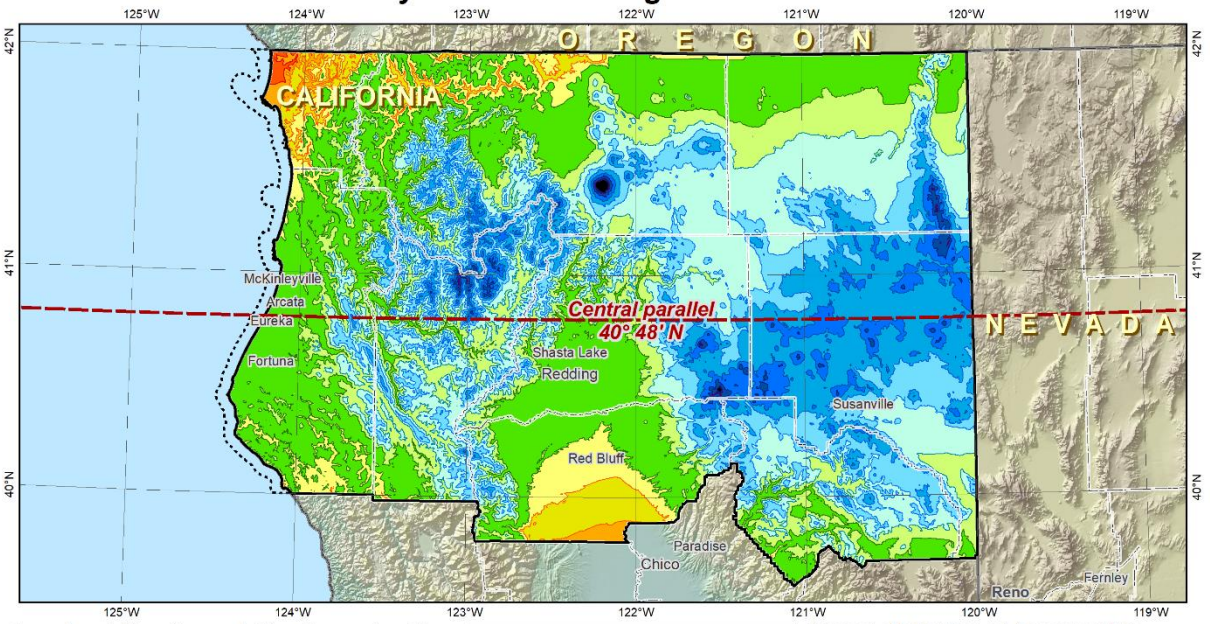
Linear distortion at topographic surface (parts per million)

< -400	to -200	to +150
to -400	to -150	to +200
to -350	to -100	to +250
to -300	±50	to +300
to -250	to +100	> +300

0 50 100 150 km

Created 9/21/2020 (Nagendra Paudel)

Preliminary SPCS2022 design: California Zone 1



Lambert Conformal Conic projection
North American Terrestrial Reference Frame of 2022
Central parallel: 40° 48' N
Central parallel scale: 1.000 03 (exact)

NOAA's National Geodetic Survey

Areas within ±150 ppm distortion (1:6,667 = ±0.79 ft per mile):
92% of population
93% of all cities and towns
70% of entire zone area

Distortion values (ppm)
Entire zone:
Min= -576 Range = 829
Max = +253 Mean = -89
Weighted mean = +13
(weighted by population)
Cities and towns:
Min = -220 Range = 446
Max = +226 Mean = -12

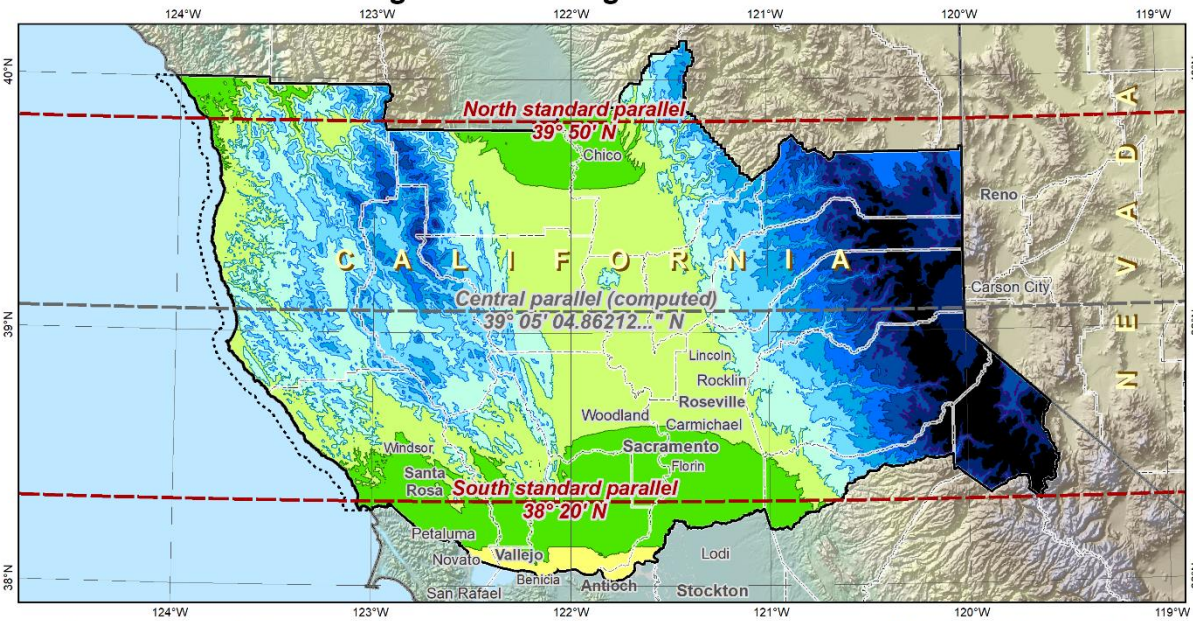
Linear distortion at topographic surface (parts per million)

< -400	to -200	to +150
to -400	to -150	to +200
to -350	to -100	to +250
to -300	±50	to +300
to -250	to +100	> +300

0 50 100 150 km

Created 9/21/2020 (Nagendra Paudel)

Existing SPCS83 design: California Zone 2



Lambert Conformal Conic projection
North American Datum 1983
Central parallel: 39° 05' 04.8..." N
Central parallel scale: 0.999 914 673...

NOAA's National Geodetic Survey

Areas within ±100 ppm distortion (1:10,000 = ±0.53 ft per mile):
86% of population
62% of all cities and towns
44% of entire zone area

Distortion values (ppm)
Entire zone:
Min= -579 Range = 670
Max = +91 Mean = -150
Weighted mean = -54
(weighted by population)
Cities and towns:
Min = -427 Range = 508
Max = +80 Mean = -102

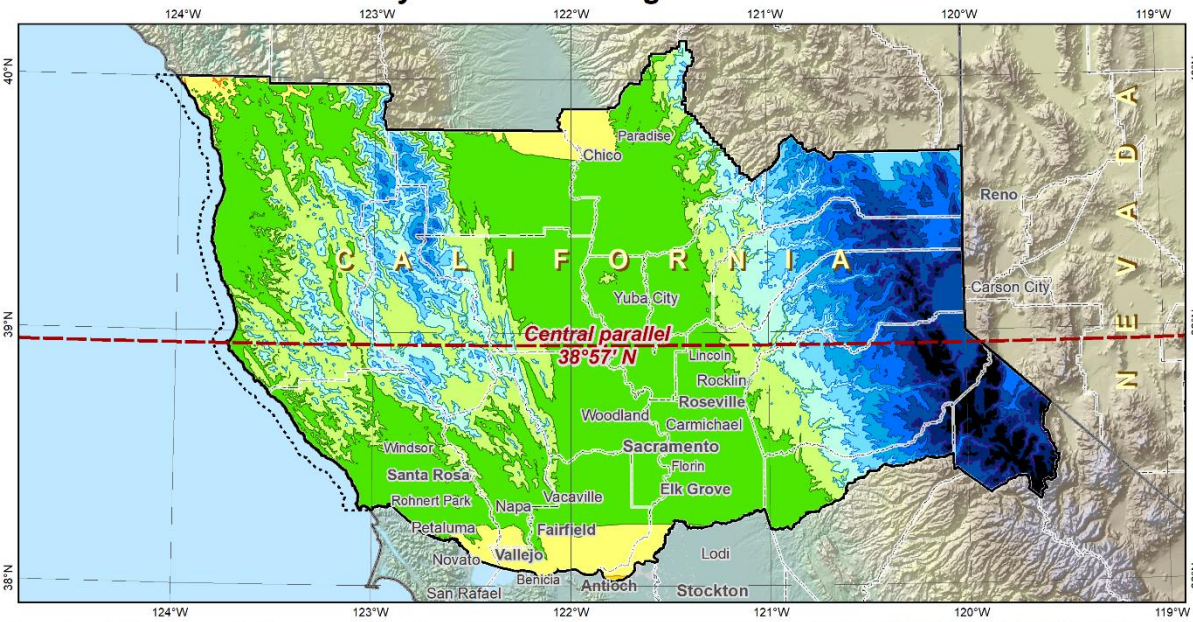
Linear distortion at topographic surface (parts per million)

< -400	to -200	to +150
to -400	to -150	to +200
to -350	to -100	to +250
to -300	±50	to +300
to -250	to +100	> +300

0 50 100 150 km

Created 9/16/2020 (Nagendra Paudel)

Preliminary SPCS2022 design: California Zone 2



Lambert Conformal Conic projection
North American Terrestrial Reference Frame of 2022
Central parallel: 38° 57' N
Central parallel scale: 0.999 97 (exact)

NOAA's National Geodetic Survey

Areas within ±100 ppm distortion (1:10,000 = ±0.53 ft per mile):
94% of population
79% of all cities and towns
65% of entire zone area

Distortion values (ppm)
Entire zone:
Min= -530 Range = 657
Max = +127 Mean = -92
Weighted mean = -13
(weighted by population)
Cities and towns:
Min = -385 Range = 481
Max = +96 Mean = -50

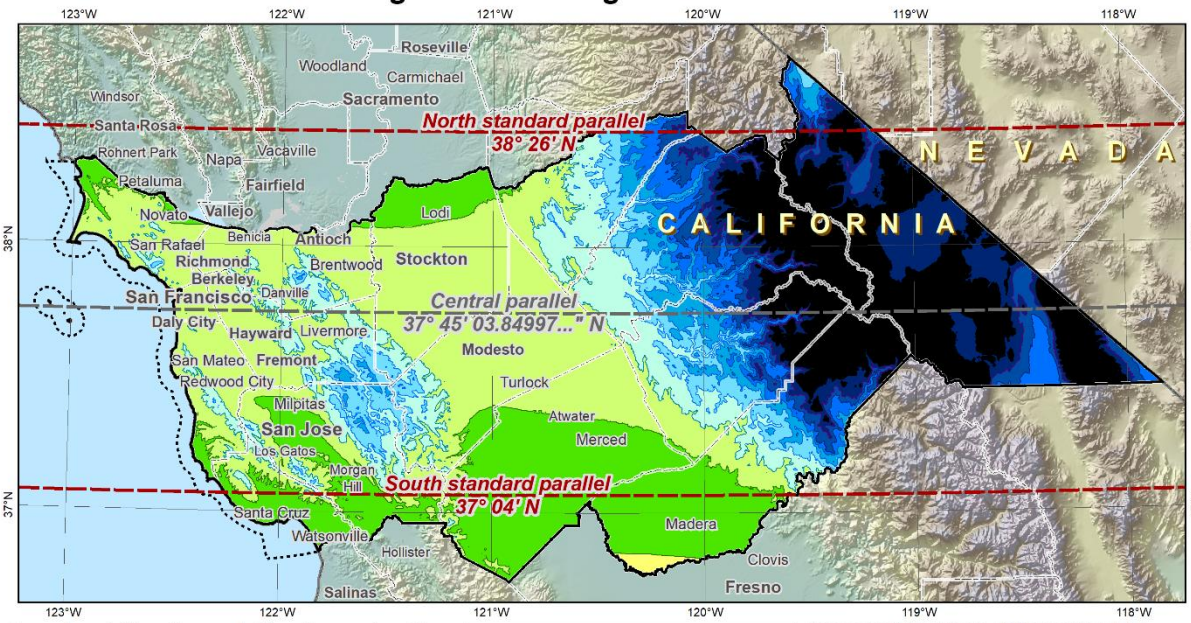
Linear distortion at topographic surface (parts per million)

< -400	to -200	to +150
to -400	to -150	to +200
to -350	to -100	to +250
to -300	±50	to +300
to -250	to +100	> +300

0 50 100 150 km

Created 9/16/2020 (Nagendra Paudel)

Existing SPCS83 design: California Zone 3



Lambert Conformal Conic projection
North American Datum of 1983
Central parallel: 37° 45' 03.8... "N
Central parallel scale: 0.999 929 179 ...

NOAA's National Geodetic Survey

Areas within ±50 ppm distortion (1:20,000 = ±0.26 ft per mile):
25% of population
23% of all cities and towns
19% of entire zone area

Distortion values (ppm)
Entire zone:
Min= -731 Range = 805
Max = +74 Mean = -178
Weighted mean = -61
(weighted by population)
Cities and towns:
Min = -442 Range = 482
Max = +40 Mean = -85

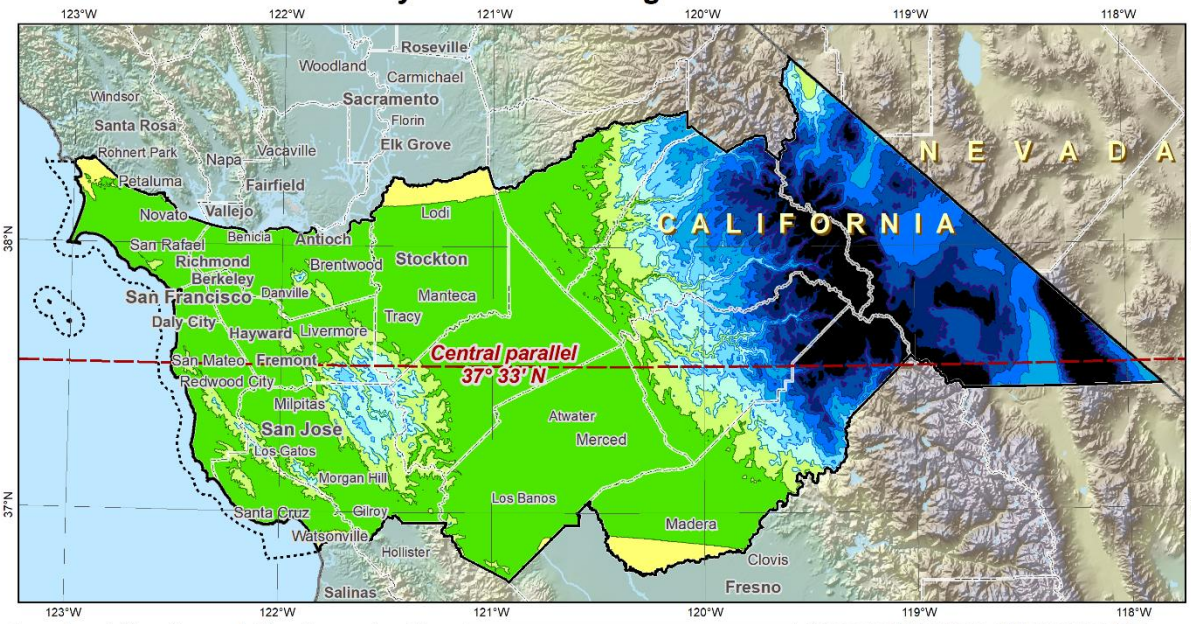
Linear distortion at topographic surface (parts per million)

< -400	to -200	to +150
to -400	to -150	to +200
to -350	to -100	to +250
to -300	±50	to +300
to -250	to +100	> +300

0 50 100 150 km

Created 9/24/2020 (Nagendra Paudel)

Preliminary SPCS2022 design: California Zone 3



Lambert Conformal Conic projection
North American Terrestrial Reference Frame of 2022
Central parallel: 37° 33' N
Central parallel scale: 0.999 99 (exact)

NOAA's National Geodetic Survey

Areas within ±50 ppm distortion (1:20,000 = ±0.26 ft per mile):
98% of population
81% of all cities and towns
51% of entire zone area

Distortion values (ppm)
Entire zone:
Min= -671 Range = 755
Max = +84 Mean = -117
Weighted mean = -2
(weighted by population)
Cities and towns:
Min = -381 Range = 447
Max = +66 Mean = -22

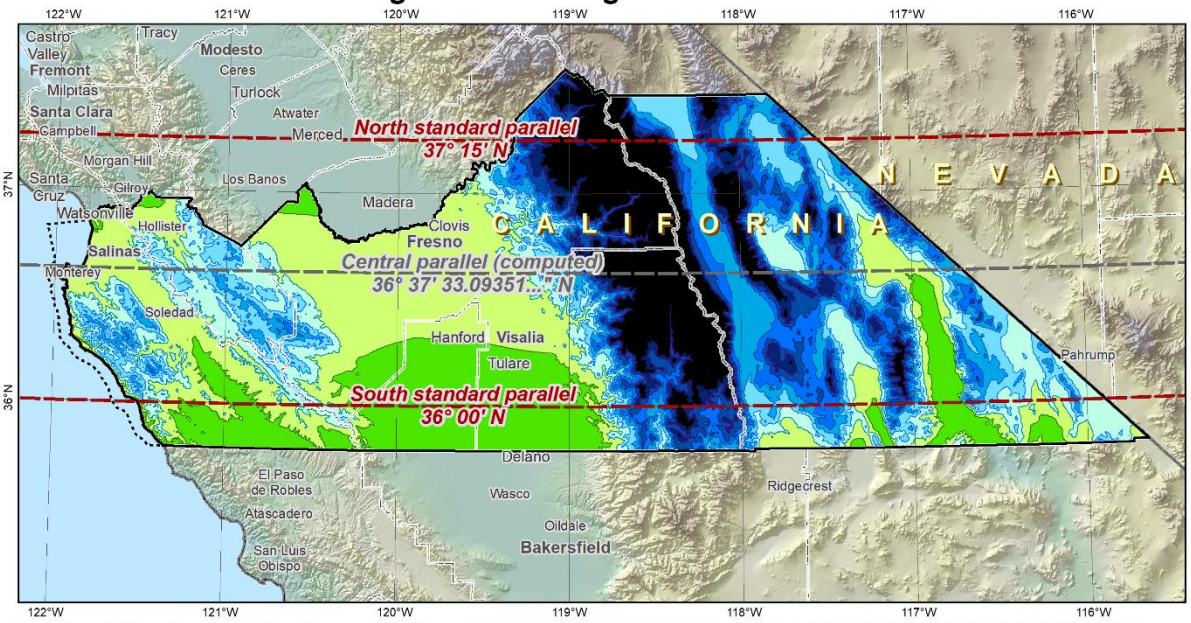
Linear distortion at topographic surface (parts per million)

< -400	to -200	to +150
to -400	to -150	to +200
to -350	to -100	to +250
to -300	±50	to +300
to -250	to +100	> +300

0 50 100 150 km

Created 9/22/2020 (Nagendra Paudel)

Existing SPCS83 design: California Zone 4



Lambert Conformal Conic projection
North American Datum of 1983
Central parallel: 36° 37' 33.1..." N
Central parallel scale: 0.999 940 762...

NOAA's National Geodetic Survey

Areas within ±75 ppm distortion (1:13,333 = ±0.40 ft per mile):
97% of population
75% of all cities and towns
32% of entire zone area

Distortion values (ppm)
Entire zone:
Min= -723 Range = 773
Max = +50 Mean = -184
Weighted mean = -60
(weighted by population)
Cities and towns:
Min = -383 Range = 408
Max = +25 Mean = -88

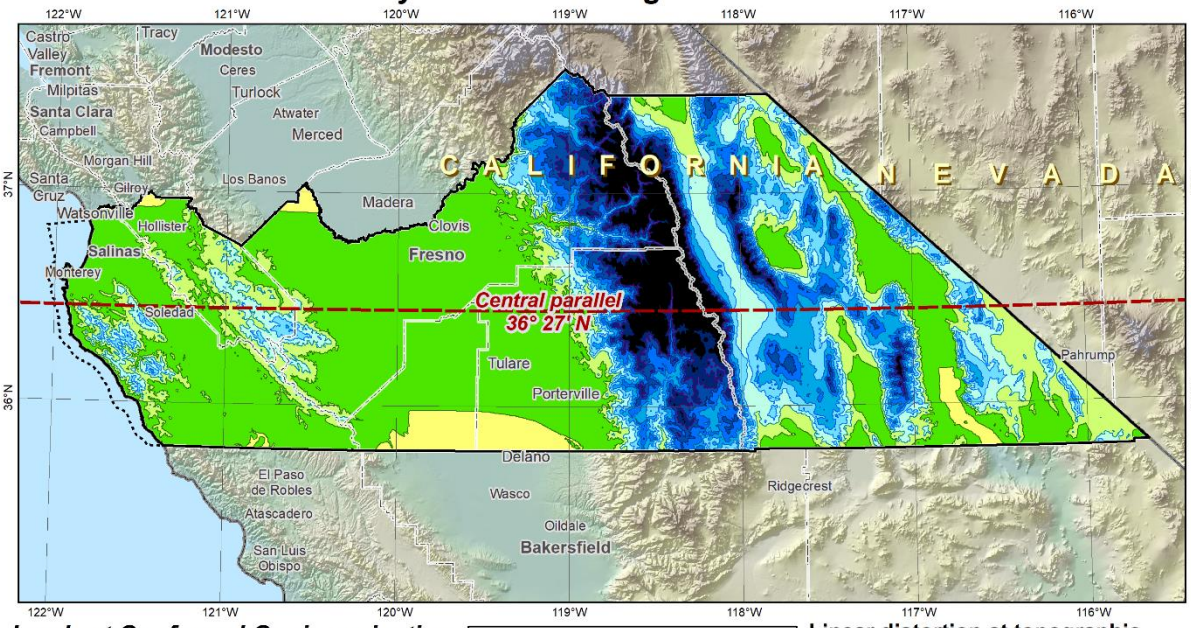
Linear distortion at topographic surface (parts per million)

< -400	to -200	to +150
to -400	to -150	to +200
to -350	to -100	to +250
to -300	±50	to +300
to -250	to +100	> +300

0 50 100 150 km

Created 10/9/2020 (Nagendra Paudel)

Preliminary SPCS2022 design: California Zone 4



Lambert Conformal Conic projection
North American Terrestrial Reference Frame of 2022
Central parallel: 36° 27' N
Central parallel scale: 1.000 02 (exact)

NOAA's National Geodetic Survey

Areas within ±75 ppm distortion (1:13,333 = ±0.40 ft per mile):
99% of population
82% of all cities and towns
52% of entire zone area

Distortion values (ppm)
Entire zone:
Min= -642 Range = 731
Max = +89 Mean = -109
Weighted mean = +21
(weighted by population)
Cities and towns:
Min = -308 Range = 375
Max = +67 Mean = -13

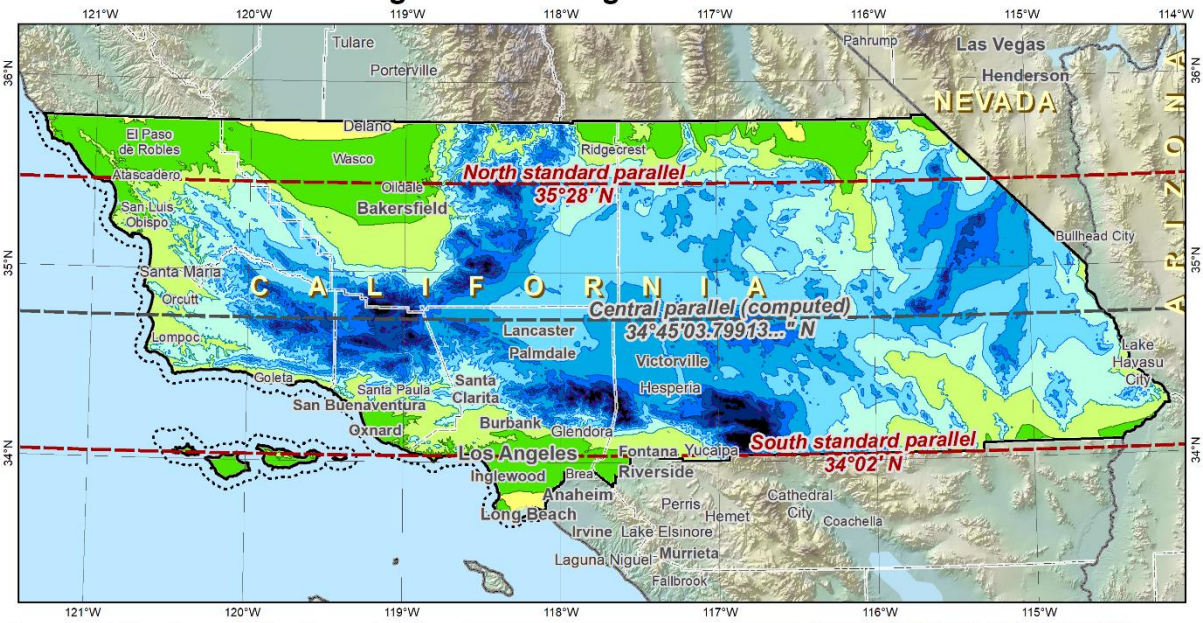
Linear distortion at topographic surface (parts per million)

< -400	to -200	to +150
to -400	to -150	to +200
to -350	to -100	to +250
to -300	±50	to +300
to -250	to +100	> +300

0 50 100 150 km

Created 10/9/2020 (Nagendra Paudel)

Existing SPCS83 design: California Zone 5



Lambert Conformal Conic projection
North American Datum of 1983
Central parallel: 34° 45' 03.8..."N
Central parallel scale: 0.999 922 127...

NOAA's National Geodetic Survey

Areas within ±150 ppm distortion (1:6,667 = ±0.79 ft per mile):
93% of population
78% of all cities and towns
49% of entire zone area

Distortion values (ppm)
Entire zone:
Min = -552 Range = 644
Max = +92 Mean = -145
Weighted mean = -31
(weighted by population)
Cities and towns:
Min = -365 Range = 438
Max = +73 Mean = -62

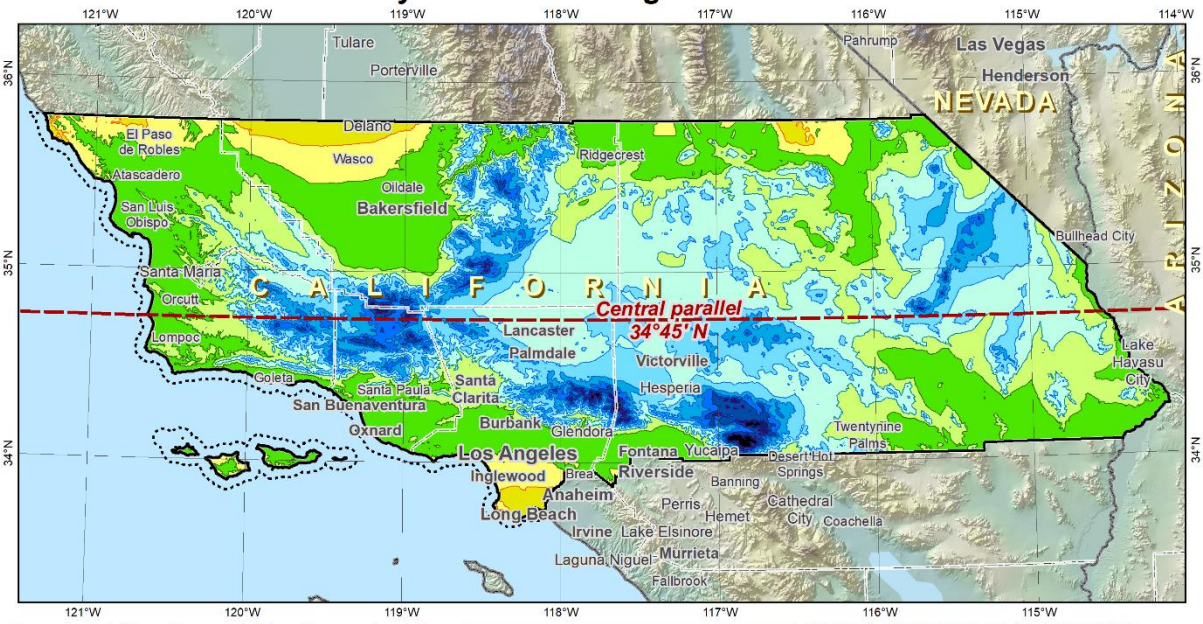
Linear distortion at topographic surface (parts per million)

< -400	to -200	to +150
to -400	to -150	to +200
to -350	to -100	to +250
to -300	±50	to +300
to -250	to +100	> +300

0 50 100 150 200 km

Created 5/17/2021 (Michael Dennis)

Preliminary SPCS2022 design: California Zone 5



Lambert Conformal Conic projection
North American Terrestrial Reference Frame of 2022
Central parallel: 34° 45' N
Central parallel scale: 0.999 98 (exact)

NOAA's National Geodetic Survey

Areas within ±150 ppm distortion (1:6,667 = ±0.79 ft per mile):
98% of population
90% of all cities and towns
78% of entire zone area

Distortion values (ppm)
Entire zone:
Min = -494 Range = 645
Max = +151 Mean = -87
Weighted mean = +19
(weighted by population)
Cities and towns:
Min = -308 Range = 438
Max = +130 Mean = -22

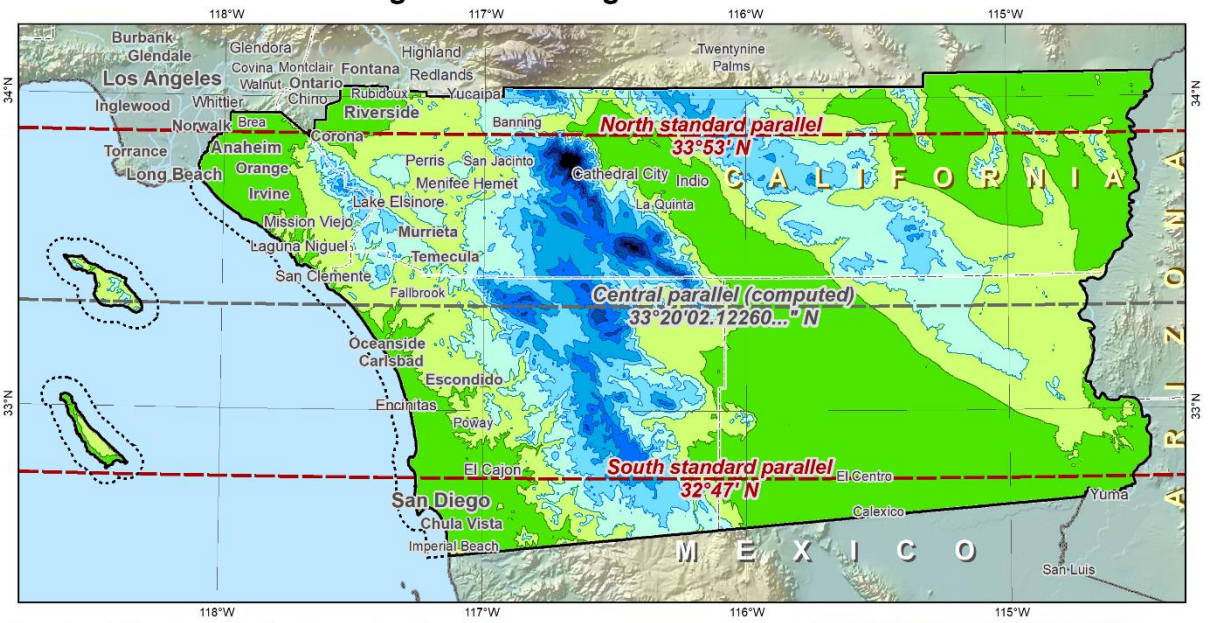
Linear distortion at topographic surface (parts per million)

< -400	to -200	to +150
to -400	to -150	to +200
to -350	to -100	to +250
to -300	±50	to +300
to -250	to +100	> +300

0 50 100 150 200 km

Created 5/17/2021 (Michael Dennis)

Existing SPCS83 design: California Zone 6



Lambert Conformal Conic projection
North American Datum of 1983
Central parallel: 33° 20' 02.1..." N
Central parallel scale: 0.999 954 142...

NOAA's National Geodetic Survey

Areas within ±50 ppm distortion (1:20,000 = ±0.26 ft per mile):
73% of population
66% of all cities and towns
40% of entire zone area

Distortion values (ppm)
Entire zone:
Min= -511 Range = 567
Max = +56 Mean = -83
Weighted mean = -32
(weighted by population)
Cities and towns:
Min = -311 Range = 355
Max = +44 Mean = -48

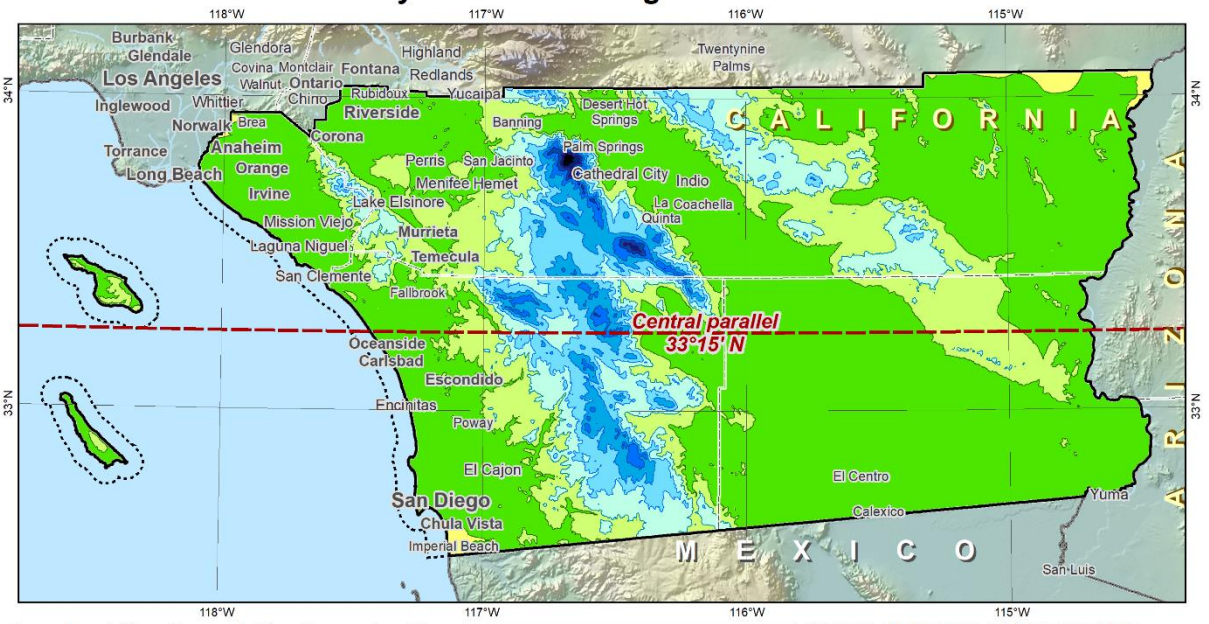
Linear distortion at topographic surface (parts per million)

< -400	to -200	to +150
to -400	to -150	to +200
to -350	to -100	to +250
to -300	±50	to +300
to -250	to +100	> +300

0 25 50 75 100 km

Created 11/13/2020 (Nagendra Paudel)

Preliminary SPCS2022 design: California Zone 6



Lambert Conformal Conic projection
North American Terrestrial Reference Frame of 2022
Central parallel: 33° 15' N
Central parallel scale: 0.999 99 (exact)

NOAA's National Geodetic Survey

Areas within ±50 ppm distortion (1:20,000 = ±0.26 ft per mile):
92% of population
87% of all cities and towns
62% of entire zone area

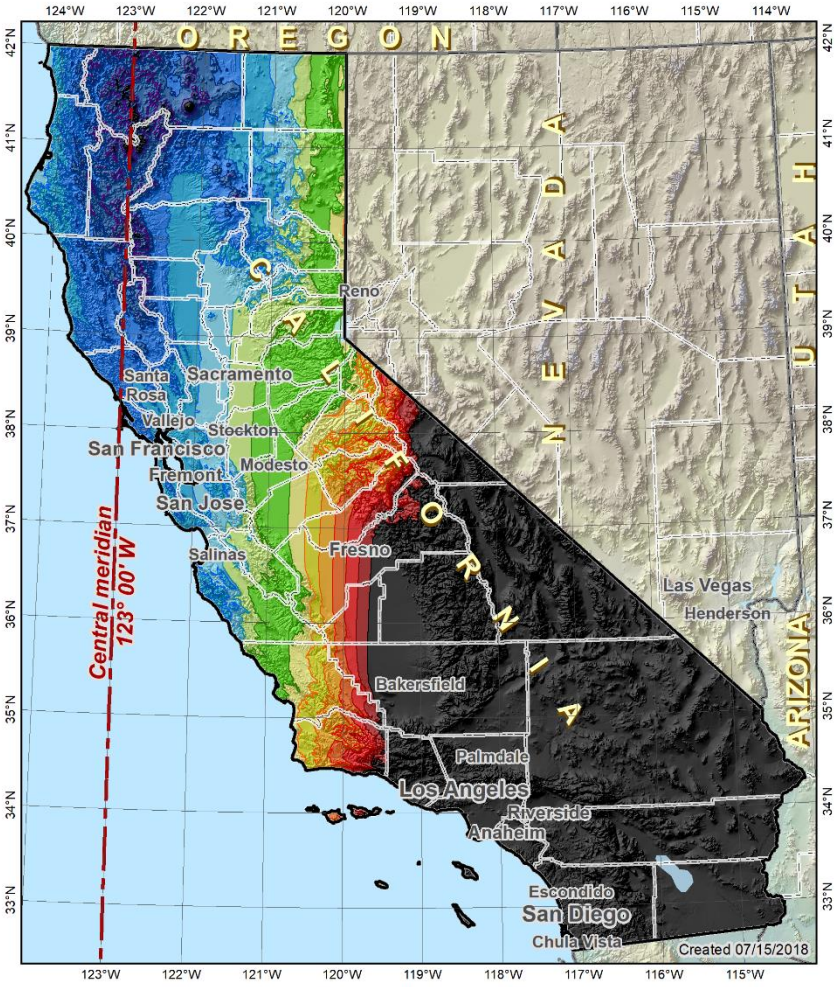
Distortion values (ppm)
Entire zone:
Min= -462 Range = 542
Max = +80 Mean = -45
Weighted mean = +7
(weighted by population)
Cities and towns:
Min = -270 Range = 331
Max = +62 Mean = -9

Linear distortion at topographic surface (parts per million)

< -400	to -200	to +150
to -400	to -150	to +200
to -350	to -100	to +250
to -300	±50	to +300
to -250	to +100	> +300

0 25 50 75 100 km

Created 11/13/2020 (Nagendra Paudel)



Existing UTM Zone 10 North used as statewide zone: California

NOAA's National Geodetic Survey

Transverse Mercator projection

North American Datum of 1983

Central meridian: 123° 00' W
Cen merid scale: 0.999 6 (exact)

Areas within ±400 ppm distortion (±2.11 ft per mile):
36% of entire zone
48% of all cities and towns
34% of population

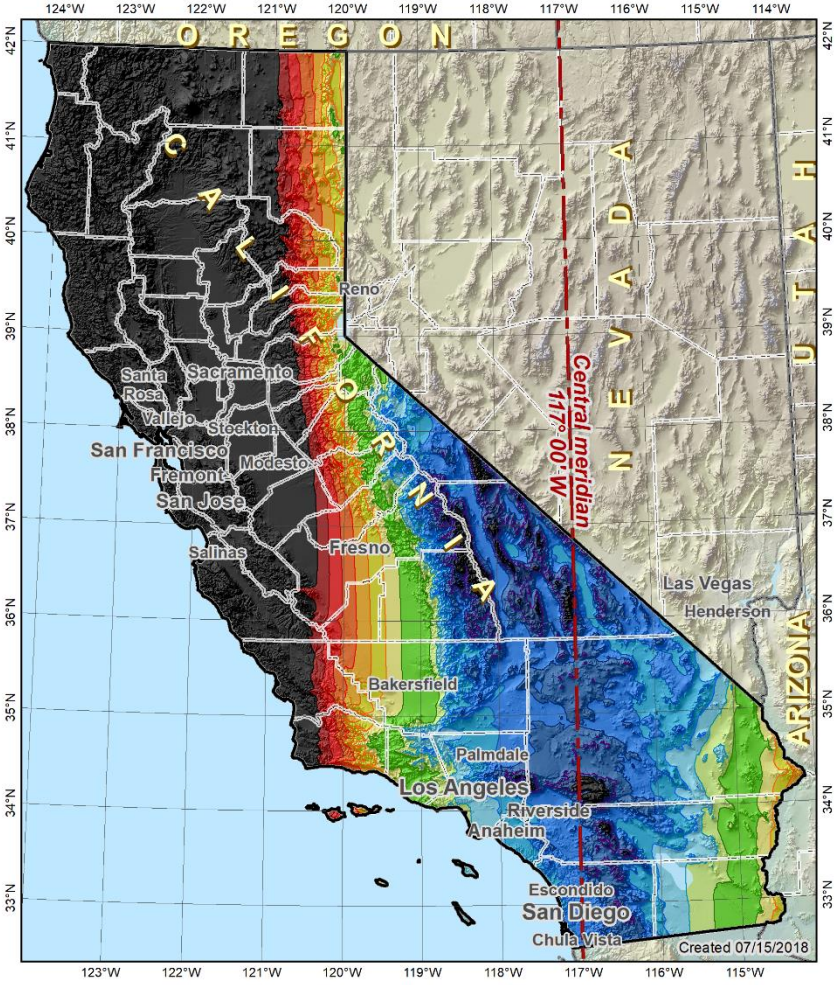
Distortion values (ppm)

Entire zone:	*Cities and towns:*
Min = -981	Min, Max = -543, +7597
Max = +7820	Range = 8140
Range = 8801	Median = +172
Mean = +1282	Mean = +1423 (weighted by population)

Linear distortion at topographic surface (parts per million)

< -700	to -300	to +400
to -700	to -200	to +500
to -600	±100	to +600
to -500	to +200	to +700
to -400	to +300	> +700

0 100 200 300 400 km



Existing UTM Zone 11 North used as statewide zone: California

NOAA's National Geodetic Survey

Transverse Mercator projection

North American Datum of 1983

Central meridian: 117° 00' W
Cen merid scale: 0.999 6 (exact)

Areas within ±400 ppm distortion (±2.11 ft per mile):
30% of entire zone
35% of all cities and towns
54% of population

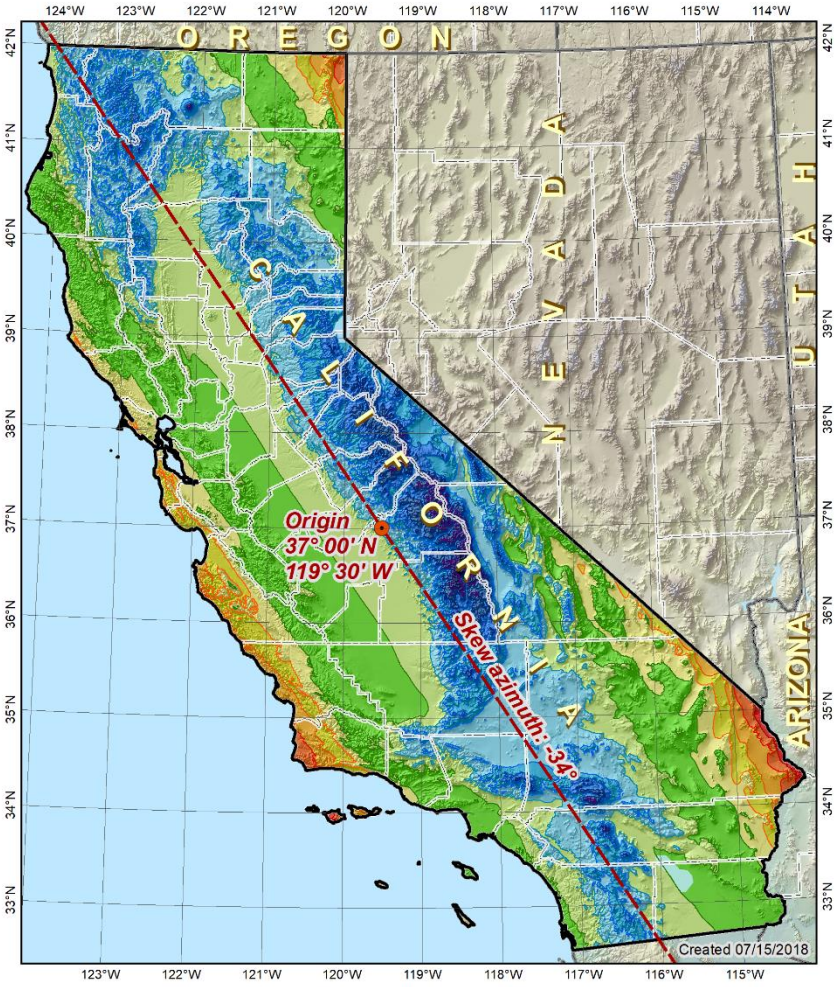
Distortion values (ppm)

Entire zone:	*Cities and towns:*
Min = -923	Min, Max = -726, +4324
Max = +4467	Range = 5050
Range = 5390	Median = +539
Mean = +666	Mean = +470 (weighted by population)

Linear distortion at topographic surface (parts per million)

< -700	to -300	to +400
to -700	to -200	to +500
to -600	±100	to +600
to -500	to +200	to +700
to -400	to +300	> +700

0 100 200 300 400 km



Preliminary SPCS2022 statewide zone design: California

NOAA's National Geodetic Survey

Oblique Mercator projection

North American Terrestrial Reference Frame of 2022

Origin latitude: 37° 00' N
Origin longitude: 119° 30' W
Skew axis scale: 0.999 85 (exact)
Skew azimuth: -34°

Areas within ±400 ppm distortion (±2.11 ft per mile):
92% of entire zone
98% of all cities and towns
99.7% of population

Distortion values (ppm)

Entire zone:	*Cities and towns:*
Min = -749	Min, Max = -474, +559
Max = +671	Range = 1032
Range = 1420	Median = -116
Mean = -134	Mean = -46 (weighted by population)

Linear distortion at topographic surface (parts per million)

< -700	to -300	to +400
to -700	to -200	to +500
to -600	±100	to +600
to -500	to +200	to +700
to -400	to +300	> +700

0 100 200 300 400 km