Colorado State Plane Coordinates 2022

PLSC Southern Chapter Meeting
July 17, 2019

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John Hunter

Colorado NGS Geodetic Coordinator

AGENDA

- Review of SPCS 2022 – Options for Colorado
- Communication and Outreach
- Coordinator Plan - Champions Needed
- Open Forum

REVIEW OF SPCS 2022

Up to Three Layers of Zones Allowed

Layer 1

State-Wide Projection

(Automatically Designed and Provided by the NGS)

Note

If Colorado opts for non-contiguous LDP's for Layer 2, a third layer is required that provides contiguous coverage of zones.

Layer 2 & Layer 3

Default Design (Provided by NGS)

Or

Projection with Distortion Criterion Down to 50ppm

(Provided by NGS)

Or

LDP's or Projections with Distortion Criterion less than 50ppm Can be Non-Contiguous

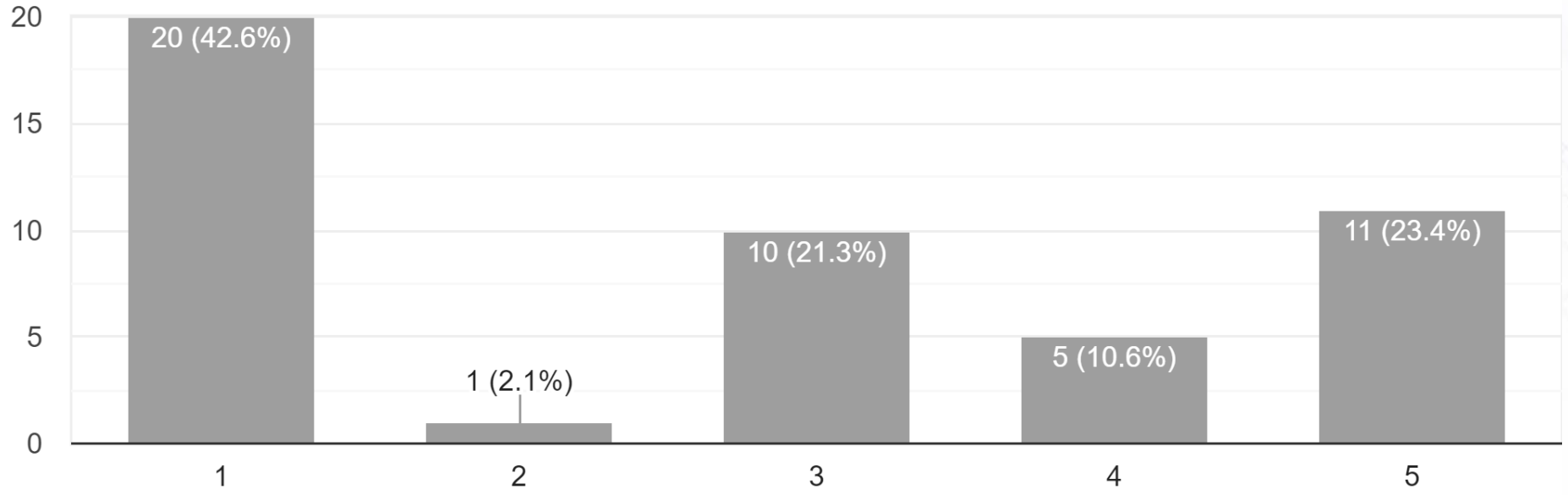
(Provided by Colorado)

FEEDBACK OPT1 2022

Layer 1 = Statewide Zone

Layer 2 = Low Distortion Projections

47 responses



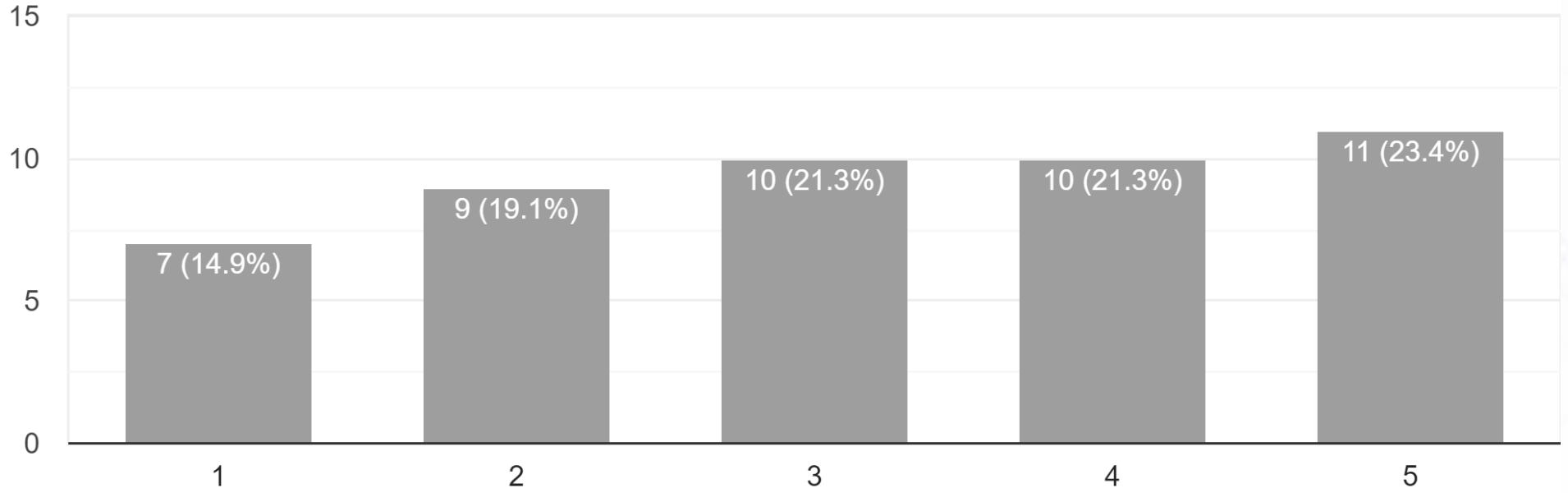
FEEDBACK OPT2 2022

Layer 1 = Statewide Zone

Layer 2 = Low Distortion P...

Layer 3 = Default Projection

47 responses



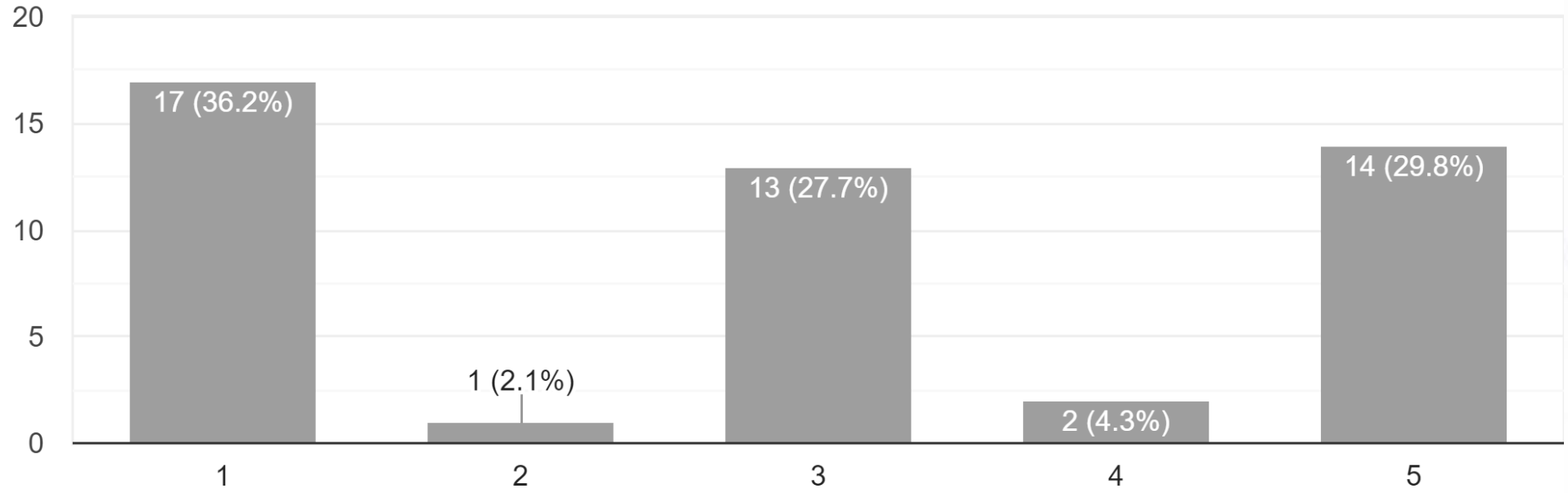
FEEDBACK OPT3 2022

Layer 1 = Statewide Zone

Layer 2 = Low Distortio...

Layer 3 = NGS 50ppm Projections

47 responses



COMMUNICATION AND OUTREACH

PLSC Chapter Presentations

- ~~April 25, 2019 Central Chapter~~
- ~~May 1, 2019 Northern Chapter~~
- ~~May 3, 2019 Western Chapter~~
- ~~June 27, 2019 Central Chapter~~
- July 16, 2019 Southwest Chapter
- July 17, 2019 Southern Chapter

Side Shots Articles

- November 2018, “The 2022 Modernization is Coming. Are You Ready?”
- Anticipated May 2019, “2022 Colorado State Plane Coordinates”

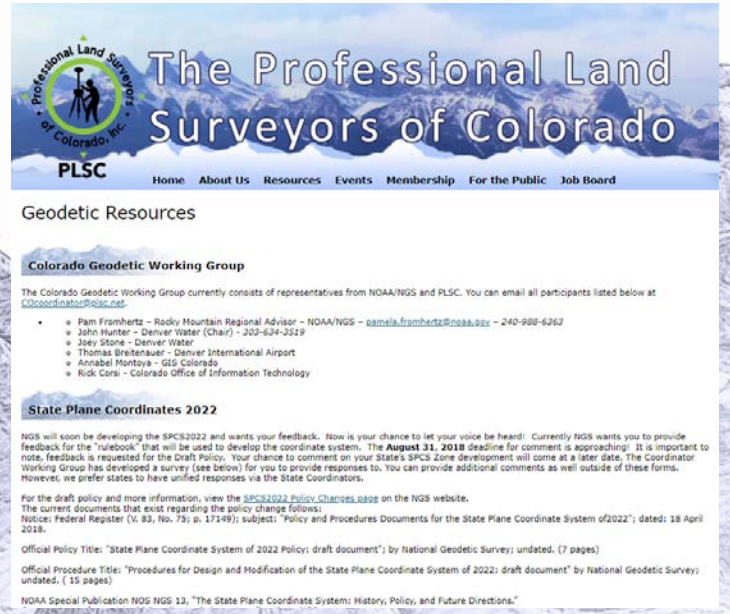
Provide Your Input For Colorado SPCS2022

- Online Survey
- PLSC Website
- Other Outreach Venues Such as Social Media

COORDINATOR PLAN

The Plan

- Communicate SPCS2022 and Soliciting Feedback Ends August 31, 2019
- Obtain Regional Champions From Each PLSC Chapter ASAP but before.
- Champions Communicate Preferences for Their Respective Areas by June 15th, 2019.
- Geodetic Coordinator and WG Will Compose a Plan for Colorado by August 31, 2019.
- Communicate Plan to Chapters and Geospatial Community by November 30, 2019.
- Submit Plan to NGS by January 15, 2020.
- Continue Work on LDP's – Design Submittals by March, 2020



[PLSC](https://www.plsc.net/geodetic_resources.php)

https://www.plsc.net/geodetic_resources.php

[Twitter](#)

@SPCS22Colorado

[LinkedIn](#)

@ John Hunter, PLS
Colorado NGS Geodetic Coordinator

[NGS Website](#)

THANK YOU

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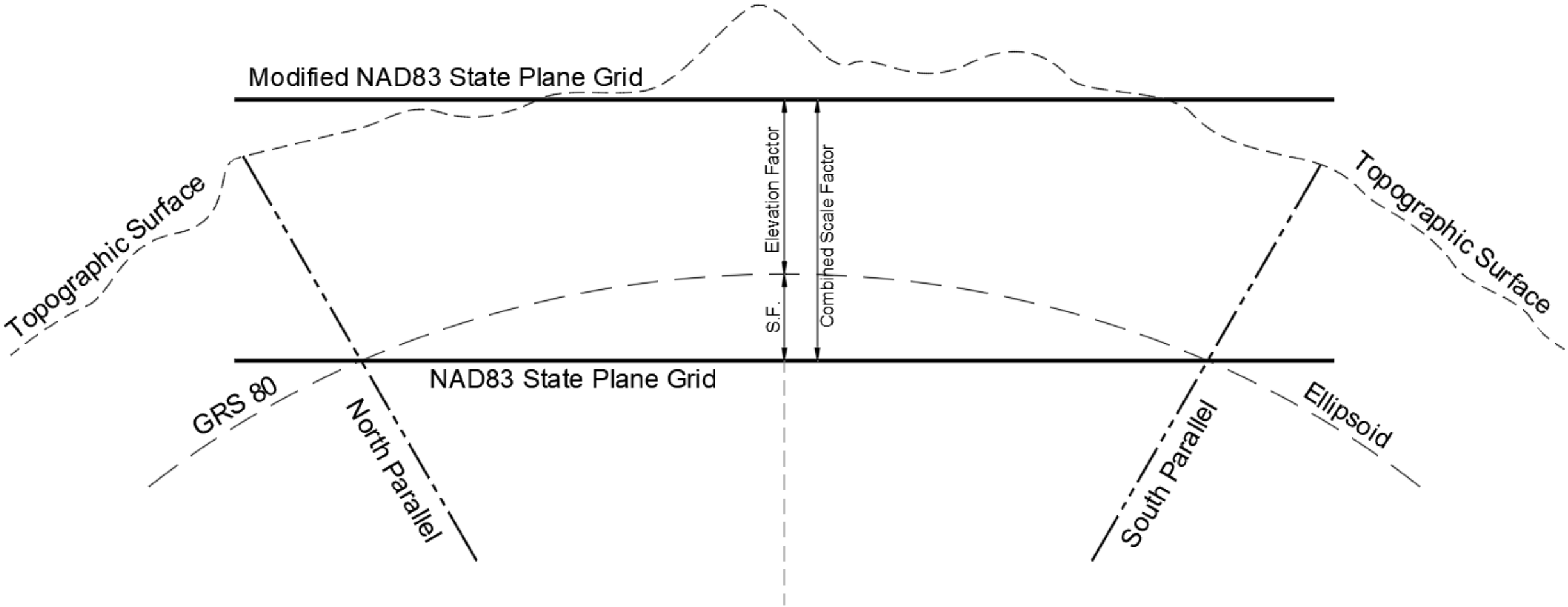
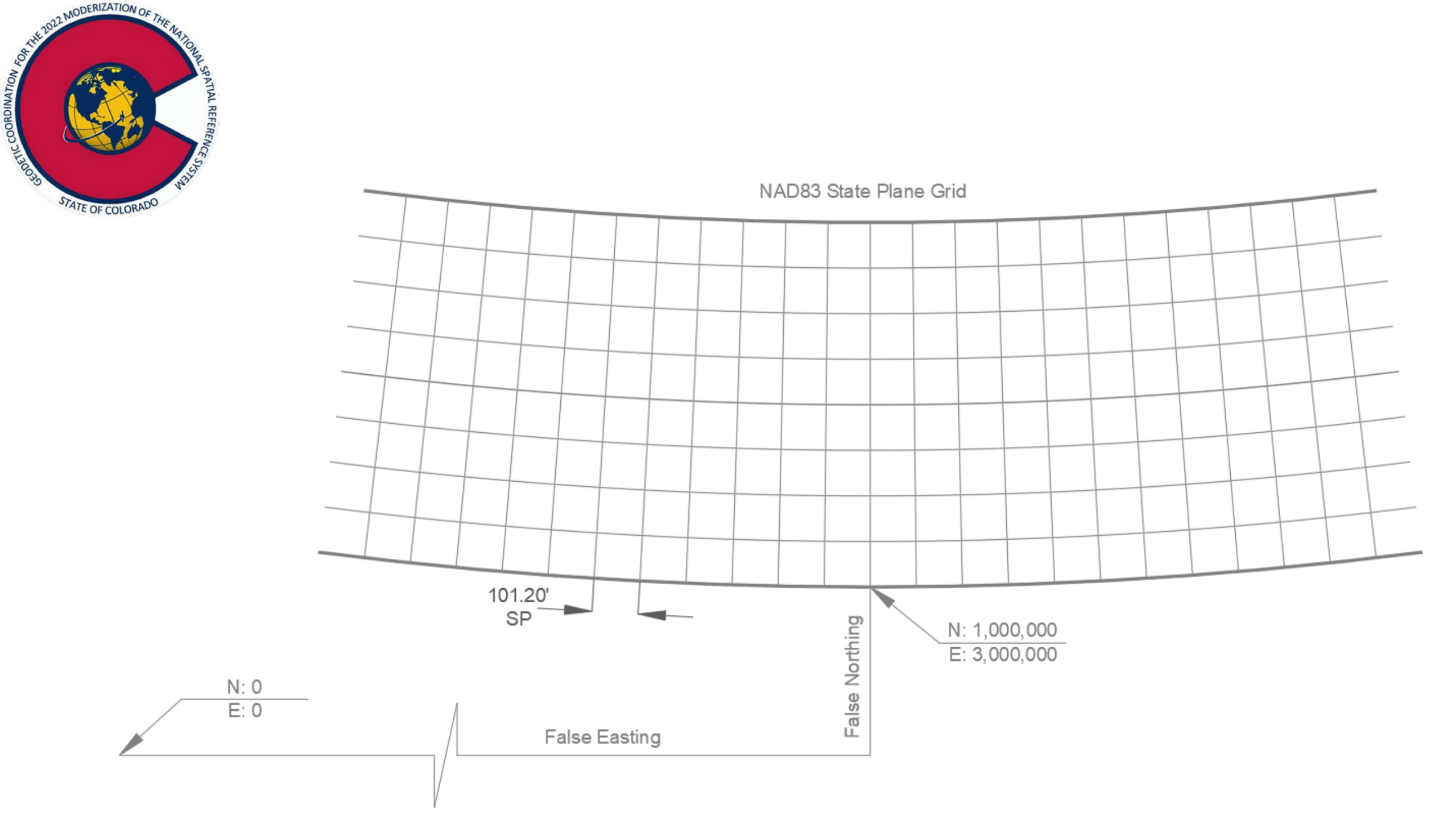
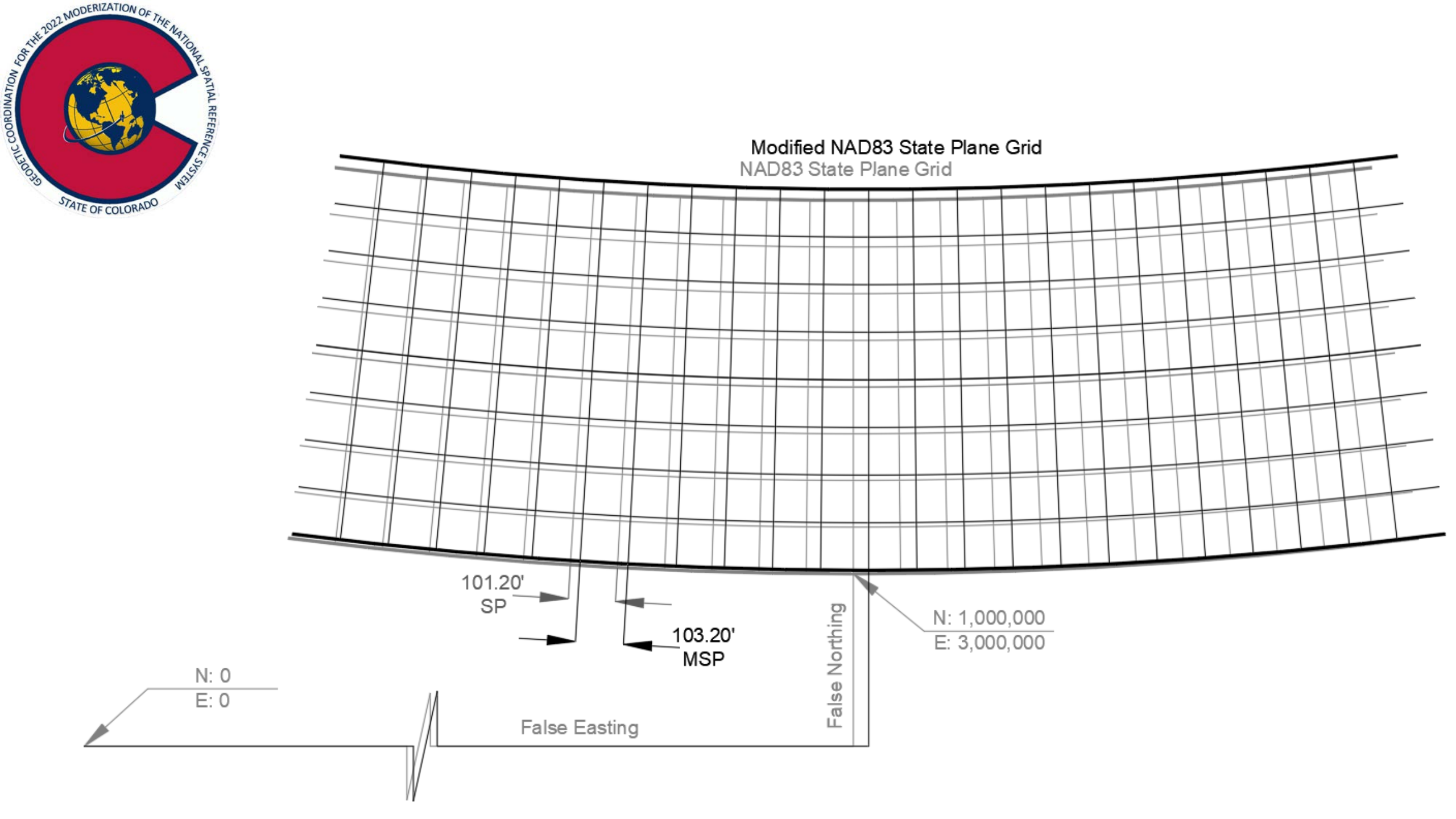
Federal Geographic Data Committee
Geospatial Positional Accuracy Standards
AEC Surveying and Mapping Standards
Closure Errors
Second-Order, Class I……..1:50,000
Second-Order, Class II……..1:20,000
Third-Order, Class I……..1:10,000
Third-Order, Class II……..1:5,000

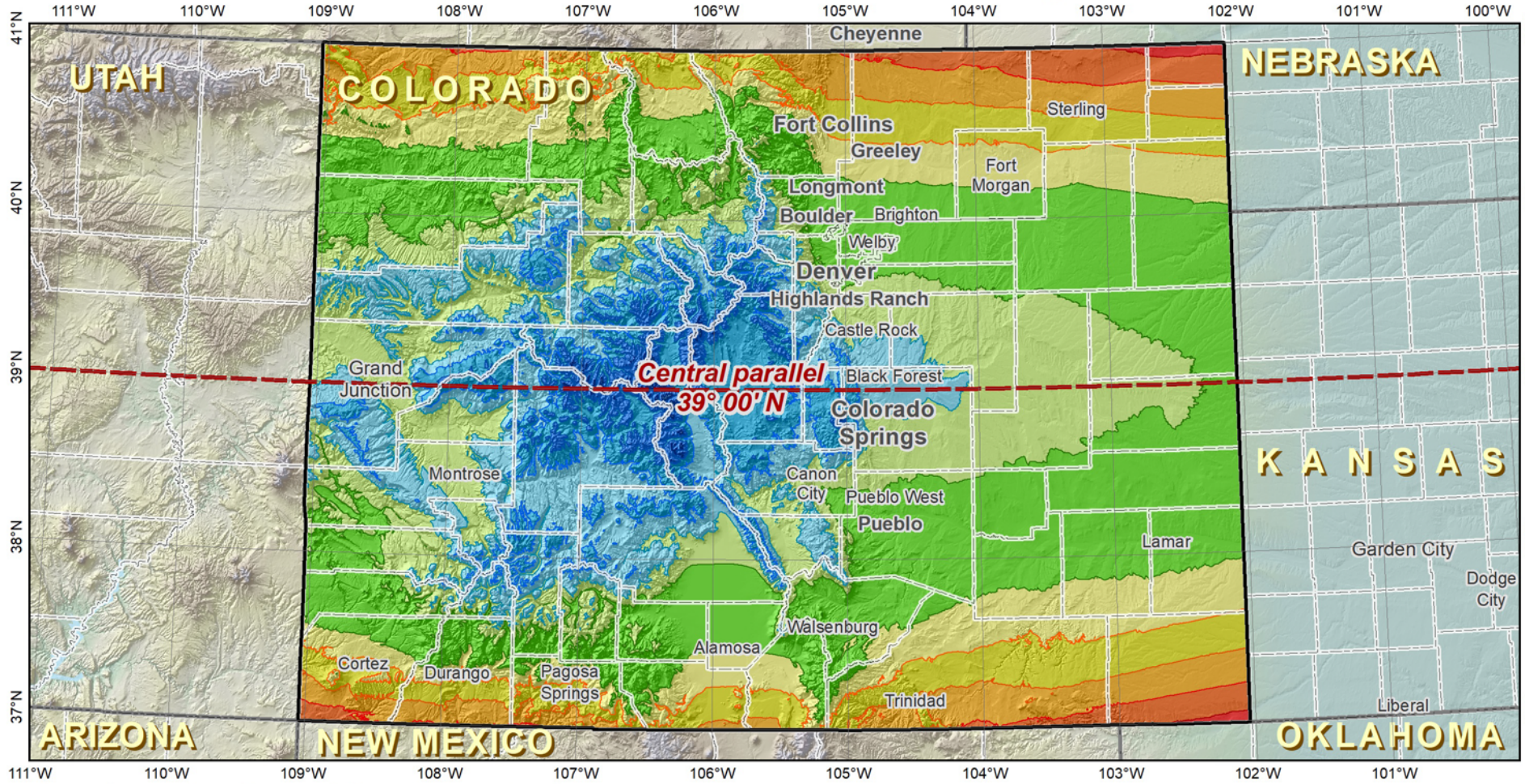
PPM	δ Distortion in Feet/Mile	Dimensionless Ratio	Comments
20 PPM	0.1 ft/mi	1:50,000	Common LDP Criterion
40 PPM	0.2 ft/mi	1:25,000	Max δ for LDP
50 PPM	0.3 ft/mi	1:20,000	Max δ for NGS Designs
100 PPM	***0.5 ft/mi***	***1:10,000***	***NAD83 Criterion (@Ellipsoid)***
200 PPM	1.1 ft/mi	1:5,000	Common δ under NAD83 @ ground
400 PPM	2.1 ft/mi	1:2,500	Common δ under NAD83 @ ground
		1:50,000 and up	Commonly Achieved Traverse Closures… (Plus Network Error)


Modified NAD83 State Plane Grid
Topographic Surface
Elevation Factor
Combined Scale Factor
S.F.
Topographic Surface
NAD83 State Plane Grid
GRS 80
North Parallel
South Parallel
Ellipsoid


GEODETIC COORDINATION FOR THE 2022 MODERIZATION OF THE NATIONAL SPATIAL REFERENCE SYSTEM
STATE OF COLORADO
NAD83 State Plane Grid
101.20'
SP
N: 1,000,000
E: 3,000,000
False Northing
N: 0
E: 0
False Easting


GEODETIC COORDINATION FOR THE 2022 MODERIZATION OF THE NATIONAL SPATIAL REFERENCE SYSTEM
STATE OF COLORADO
Modified NAD83 State Plane Grid
NAD83 State Plane Grid
101.20'
SP
103.20'
MSP
False Northing
N: 1,000,000
E: 3,000,000
N: 0
E: 0
False Easting

Preliminary SPCS2022 statewide zone design: Colorado



Lambert Conformal Conic projection

North American Terrestrial Reference Frame of 2022

Central parallel: 39° 00' N

Cen parallel scale: 1.000 1 (exact)

NOAA's National Geodetic Survey

Areas within ±400 ppm distortion (±2.11 ft per mile):

95% of entire zone

98% of all cities and towns

99.9% of population

Distortion values (ppm)

For entire zone:

Min = -577 Range = 1128

Max = +551 Mean = -22

Cities and towns:

Min = -420 Range = 963

Max = +543 Median = -59

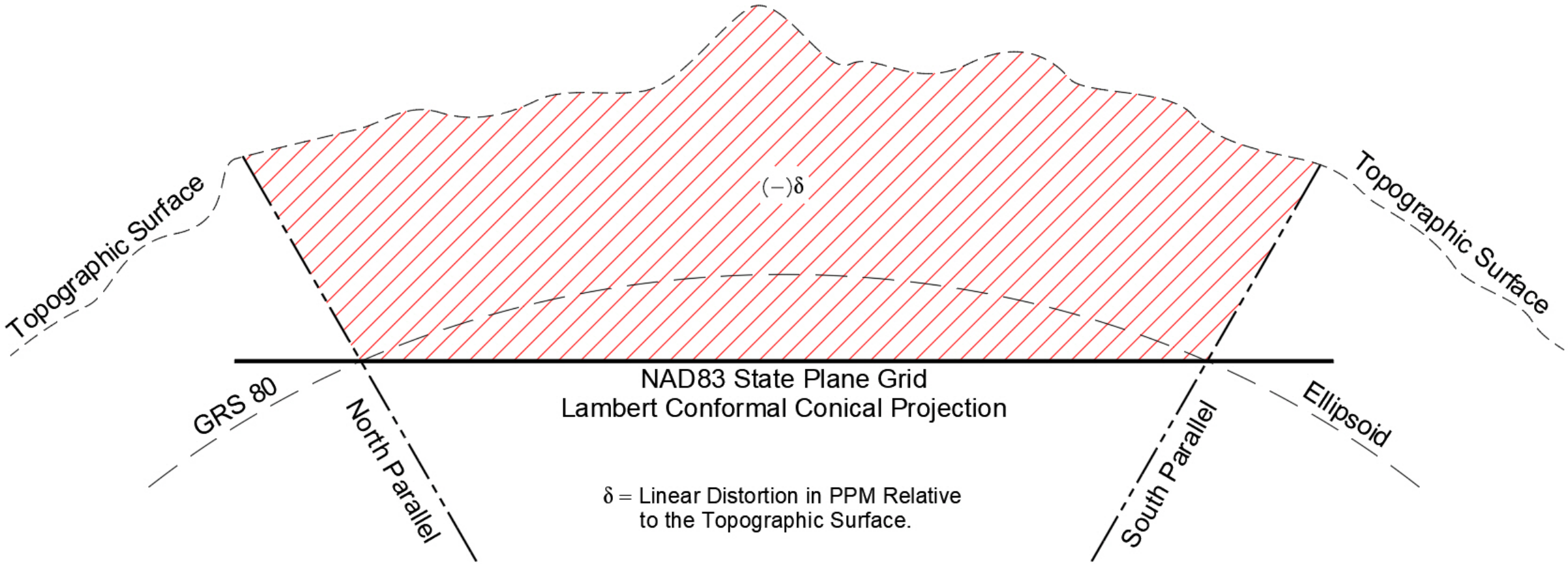
Mean = -46

(weighted by population)

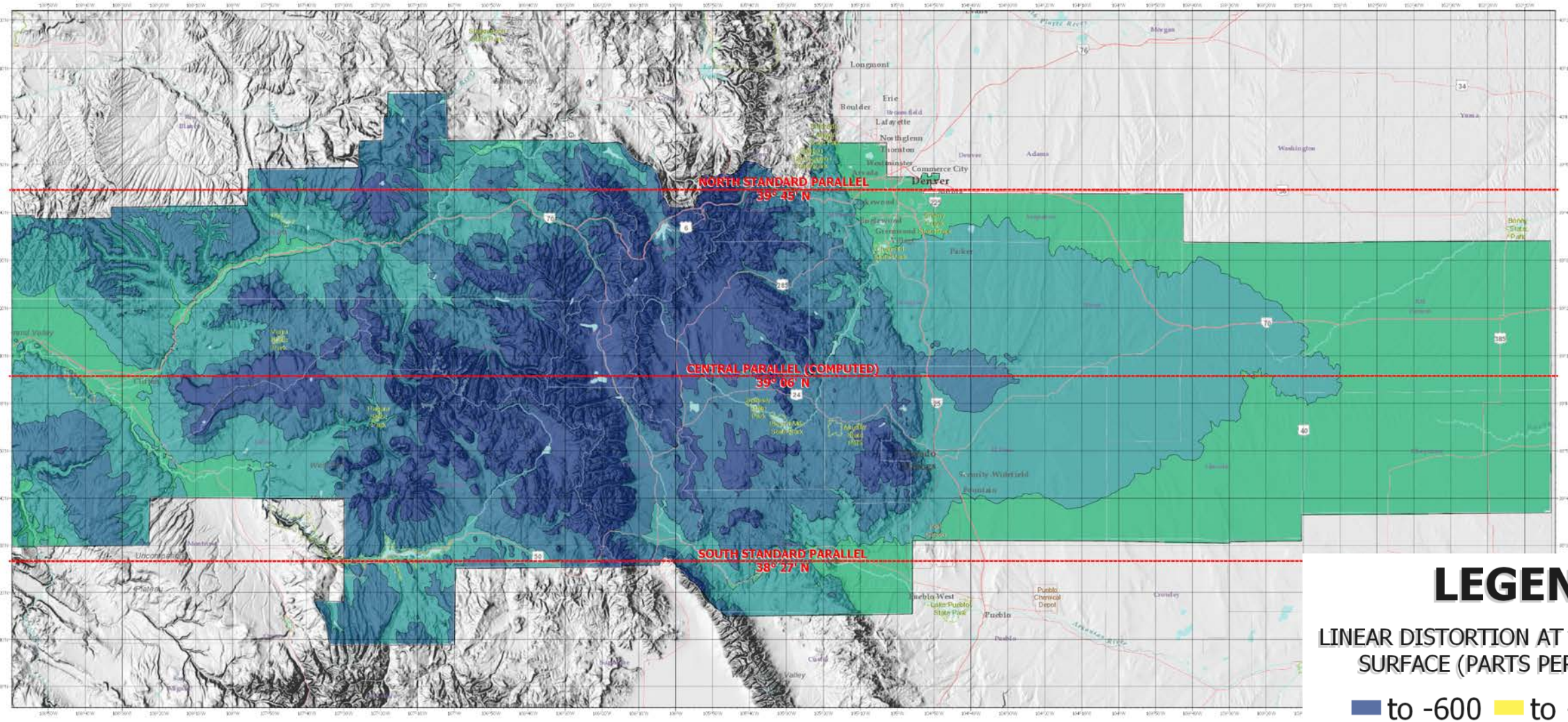
Linear distortion at topographic surface (parts per million)

< -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 50 100 150 200 250 km



Current State Plane



Colorado

CURRENT STATEPLANE COORDINATE SYSTEM CENTRAL ZONE DESIGN

PROJECTION

LAMBERT CONFORMAL CONIC PROJECTION
NORTH AMERICAN DATUM OF 1983
CENTRAL PARALLEL: 39° 06' N
CENTRAL PARALLEL SCALE: 0.9999359099...

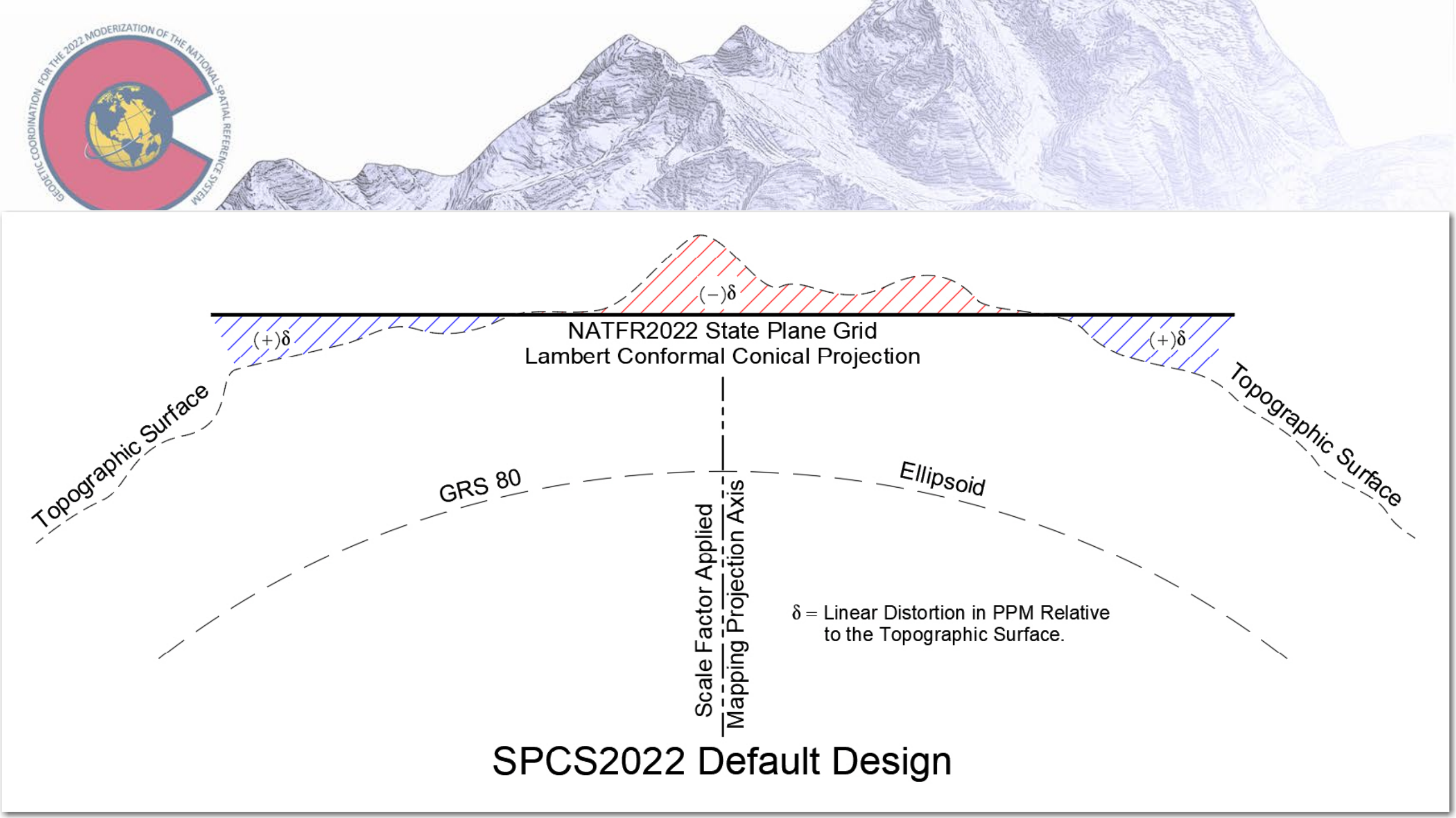
LINEAR DISTORTION

DISTORTION VALUES (PPM)
FOR THE ENTIRE ZONE:
MIN = -729 MAX = -207
MEDIAN = -377 MEAN = -392

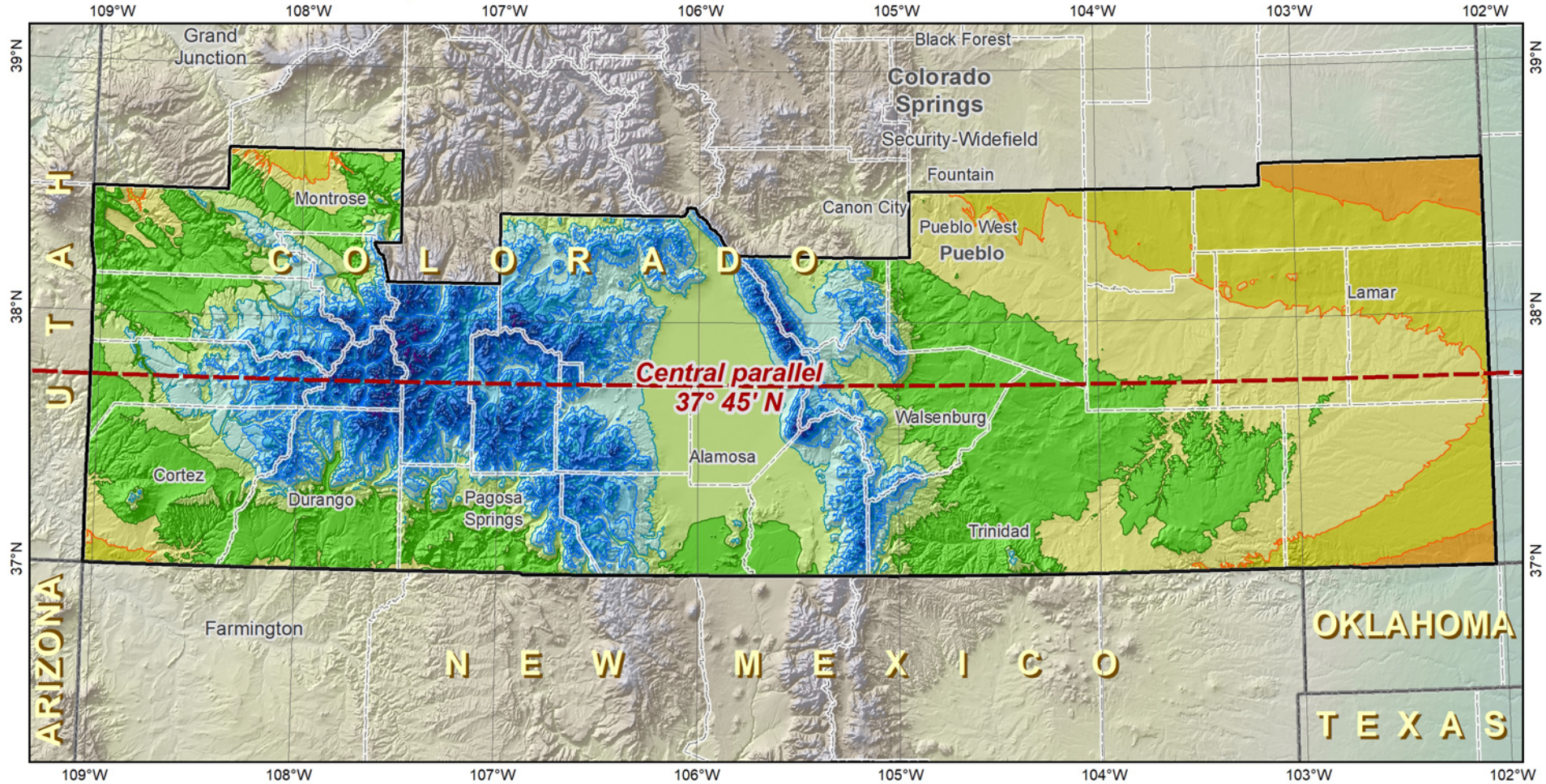
LEGEND

LINEAR DISTORTION AT TOPOGRAPHIC SURFACE (PARTS PER MILLION)

- to -600
- to -500
- to -400
- to -300
- to -200
- ±100
- to +200
- to +300
- to +400
- to +500
- to +600


GEODETIC COORDINATION FOR THE 2022 MODERIZATION OF THE NATIONAL SPATIAL REFERENCE SYSTEM
(−)δ
(+)δ
(+)δ
NATFR2022 State Plane Grid
Lambert Conformal Conical Projection
Topographic Surface
Topographic Surface
GRS 80
Ellipsoid
Scale Factor Applied
Mapping Projection Axis
δ = Linear Distortion in PPM Relative
to the Topographic Surface.
SPCS2022 Default Design

Preliminary SPCS2022 default design: Colorado South Zone



Lambert Conformal Conic projection

North American Terrestrial Reference Frame of 2022

Central parallel: 37° 45' N

Cen parallel scale: 1.000 27 (exact)

NOAA's National Geodetic Survey

Areas within ±100 ppm distortion (±0.53 ft per mile):

59% of entire zone

76% of all cities and towns

91% of population

Distortion values (ppm)

For entire zone:

Min = -389 Range = 589

Max = +200 Mean = -28

Cities and towns:

Min = -189 Range = 354

Max = +165 Median = -0.1

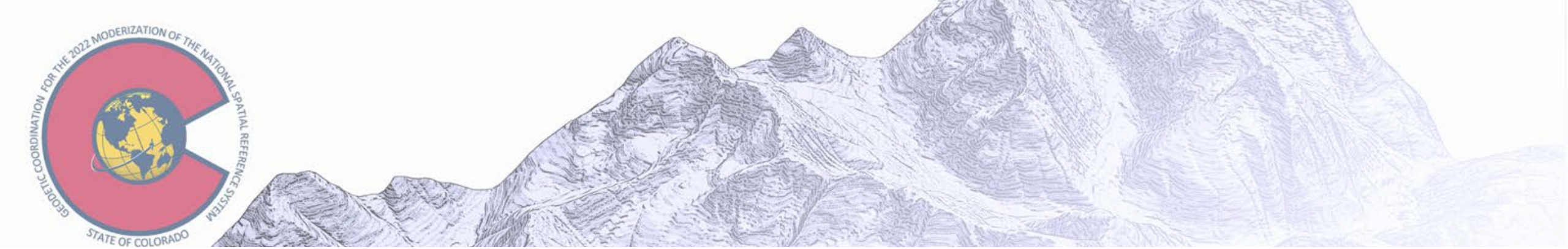
Mean = +50

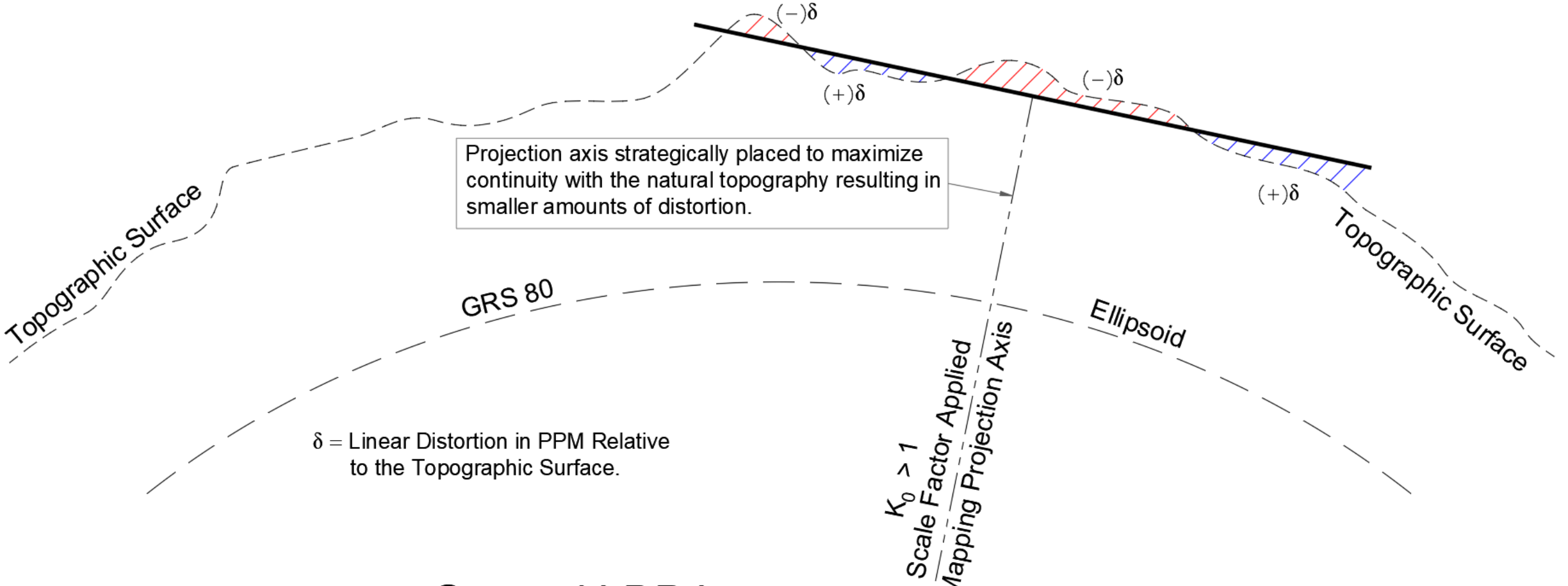
(weighted by population)

Linear distortion at topographic surface (parts per million)

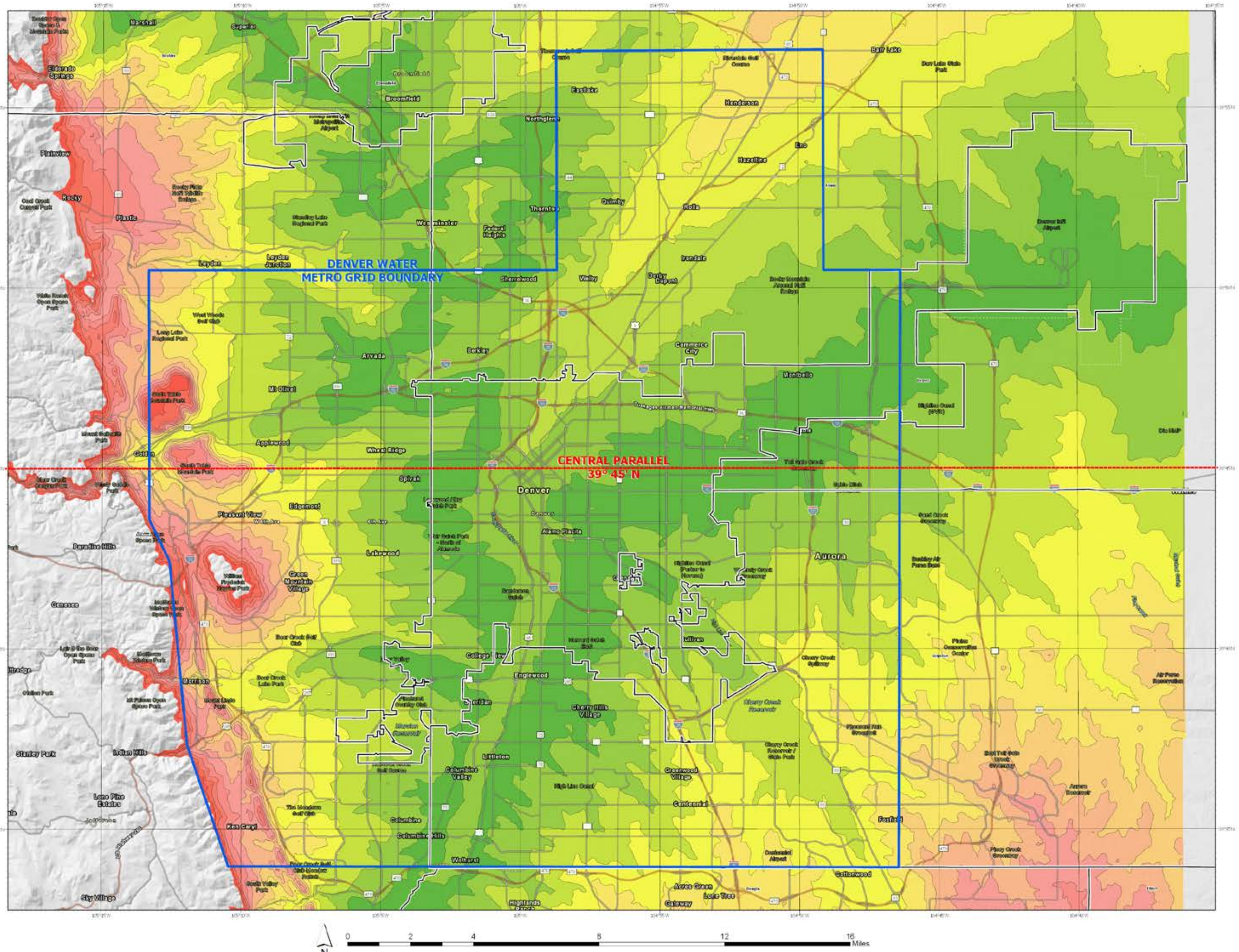
< -400	to -200	to +150
to -400	to -150	to +200
to -350	to -100	to +250
to -300	±50	to +300
to -250	to +100	> +300

0 50 100 150 200 km





General LDP Layout



Colorado

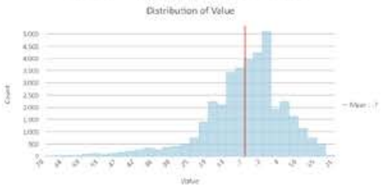
POTENTIAL METRO AREA LOW DISTORTION PROJECTION DESIGN

PROJECTION

LAMBERT CONFORMAL
CONIC PROJECTION
NORTH AMERICAN TERRESTRIAL
REFERENCE FRAME OF 2022
CENTRAL PARALLEL: 39° 45' N
CENTRAL PARALLEL SCALE: 1.00025 EXACT

LINEAR DISTORTION PARTS PER MILLION PPM

DENVER WATER METRO GRID:
MIN = -70 MAX = +21 RANGE = 78
MEAN = -7.17 STD DEV = 12.51



CITY AND COUNTY OF DENVER:
MIN = - 16 MAX = +8 RANGE = 24
MEAN = -1.71 STD DEV = 3.91

LEGEND

LINEAR DISTORTION AT TOPOGRAPHIC SURFACE (PARTS PER MILLION)

≤-55	≤-25	≤5	≤35
≤-50	≤-20	≤10	≤40
≤-45	≤-15	≤15	≤45
≤-40	≤-10	≤20	≤50
≤-35	≤-5	≤25	≤55
≤-30	≤0	≤30	