



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)

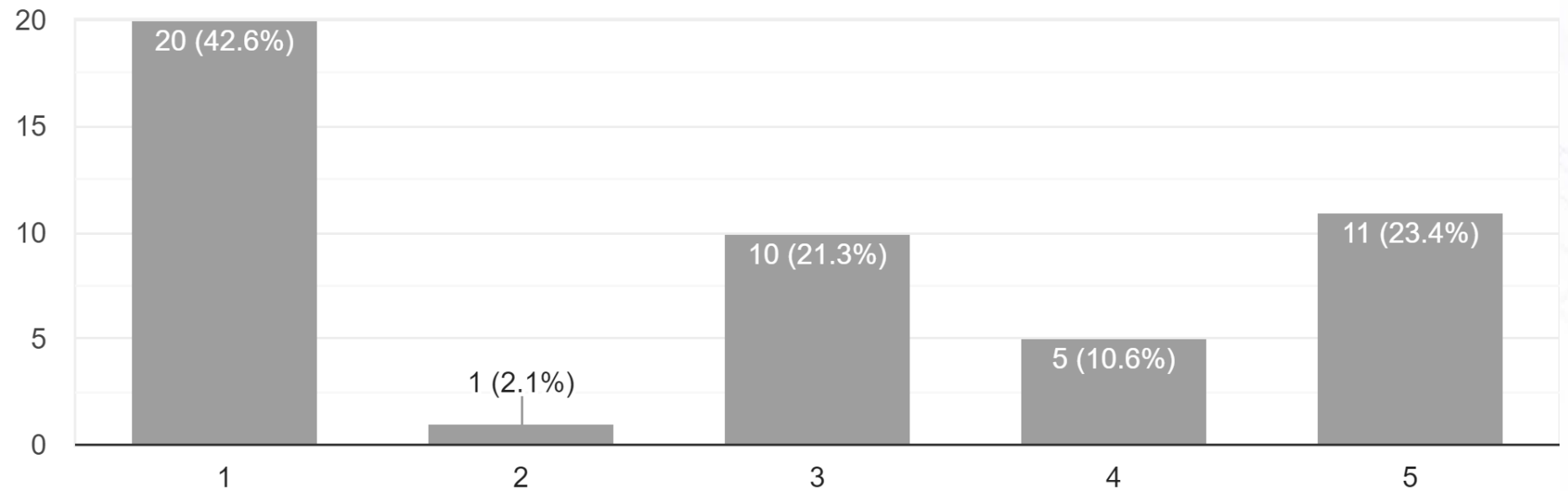


FEEDBACK OPT1 2022

Layer 1 = Statewide Zone

Layer 2 = Low Distortion Projections

47 responses





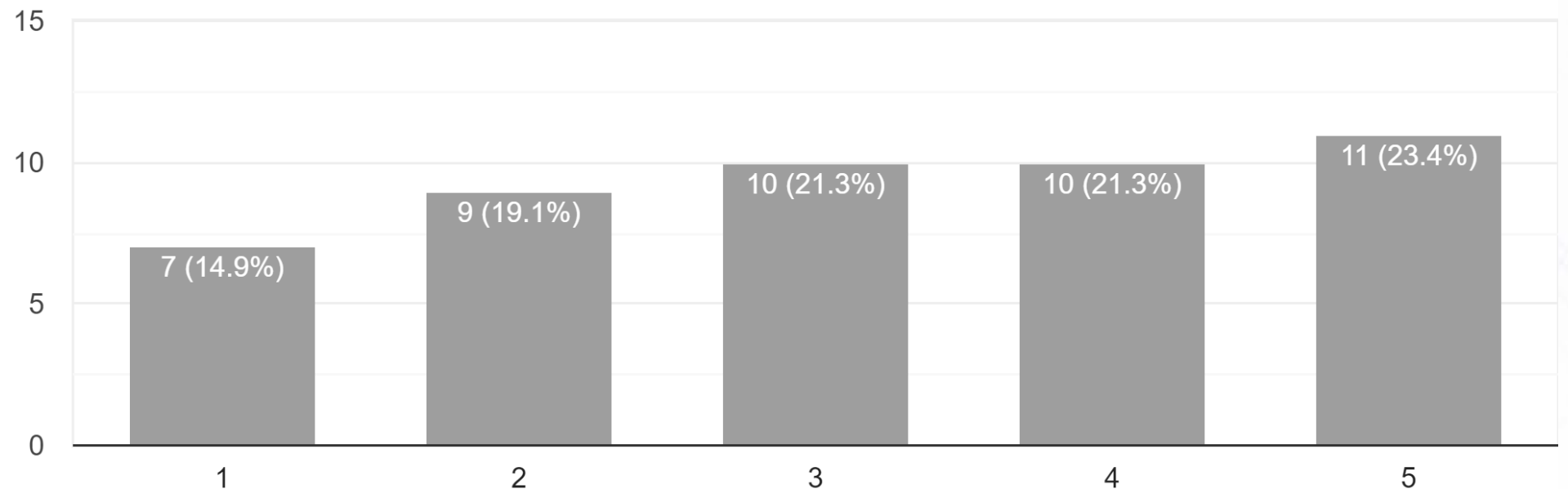
FEEDBACK OPT2 2022

Layer 1 = Statewide Zone

Layer 2 = Low Distortion P...

Layer 3 = Default Projection

47 responses





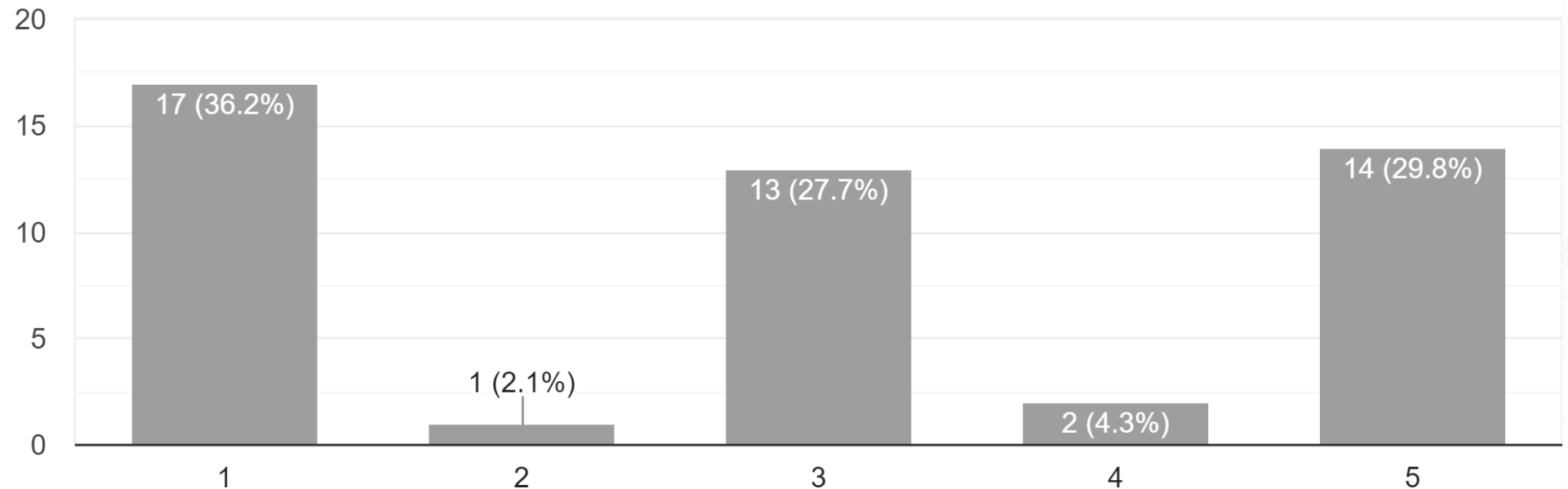
FEEDBACK OPT3 2022

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



 **The Professional Land Surveyors of Colorado**
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Geodetic Resources

Colorado Geodetic Working Group

The Colorado Geodetic Working Group currently consists of representatives from NOAA/NGS and PLSC. You can email all participants listed below at COGeodetic@PLSC.net.

- Pam Frommertz - Rocky Mountain Regional Advisor - NOAA/NGS - pamela.frommertz@noaa.gov - 240-908-6363
- John Hunter - Denver Water (Chair) - 303-534-3529
- Joey Stone - Denver Water
- Thomas Breitenhauer - Denver International Airport
- Annabel Montoya - GIS Colorado
- Rick Corsi - Colorado Office of Information Technology

State Plane Coordinates 2022

NGS will soon be developing the SPCS2022 and wants your feedback. Now is your chance to let your voice be heard! Currently NGS wants you to provide feedback for the "rulebook" that will be used to develop the coordinate system. The **August 31, 2018** deadline for comment is approaching! It is important to note, feedback is requested for the Draft Policy. Your chance to comment on your State's SPCS Zone development will come at a later date. The Coordinator Working Group has developed a survey (see below) for you to provide responses to. You can provide additional comments as well outside of these forms. However, we prefer states to have unified responses via the State Coordinators.

For the draft policy and more information, view the [SPCS2022 Policy Changes](https://www.ngs.noaa.gov/SPCS2022/Policy/Changes.aspx) page on the NGS website. The current documents that exist regarding the policy change follows:
Notice: Federal Register (V. 83, No. 75) p. 17149; subject: "Policy and Procedures Documents for the State Plane Coordinate System of 2022"; dated: 18 April 2018.

Official Policy Title: "State Plane Coordinate System of 2022 Policy: draft document"; by National Geodetic Survey; undated. (7 pages)
Official Procedure Title: "Procedures for Design and Modification of the State Plane Coordinate System of 2022: draft document" by National Geodetic Survey; undated. (15 pages)

NOAA Special Publication NGS NGS 13, "The State Plane Coordinate System: History, Policy, and Future Directions."

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

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

 **State Geodetic Coordinators**
National Geodetic Survey

NGS Home About NGS State & Emergency Tools Surveys Science & Education Search



The State Geodetic Coordinator is not employed by NGS and is assigned to a state government agency or university. The Coordinator serves as a liaison between the state and NGS. State Coordinators should have technical expertise in geodesy to make informed decisions about and provide guidance for geospatial activities that benefit from connecting to the NGS. The State Geodetic Coordinator is a primary point of contact for the state to the Regional Coordinator Advisor.

State Geodetic Coordinators [Back to Regional Advisors](#)

[NGS Website](#)



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@ John Hunter, PLS
Colorado NGS Geodetic
Coordinator

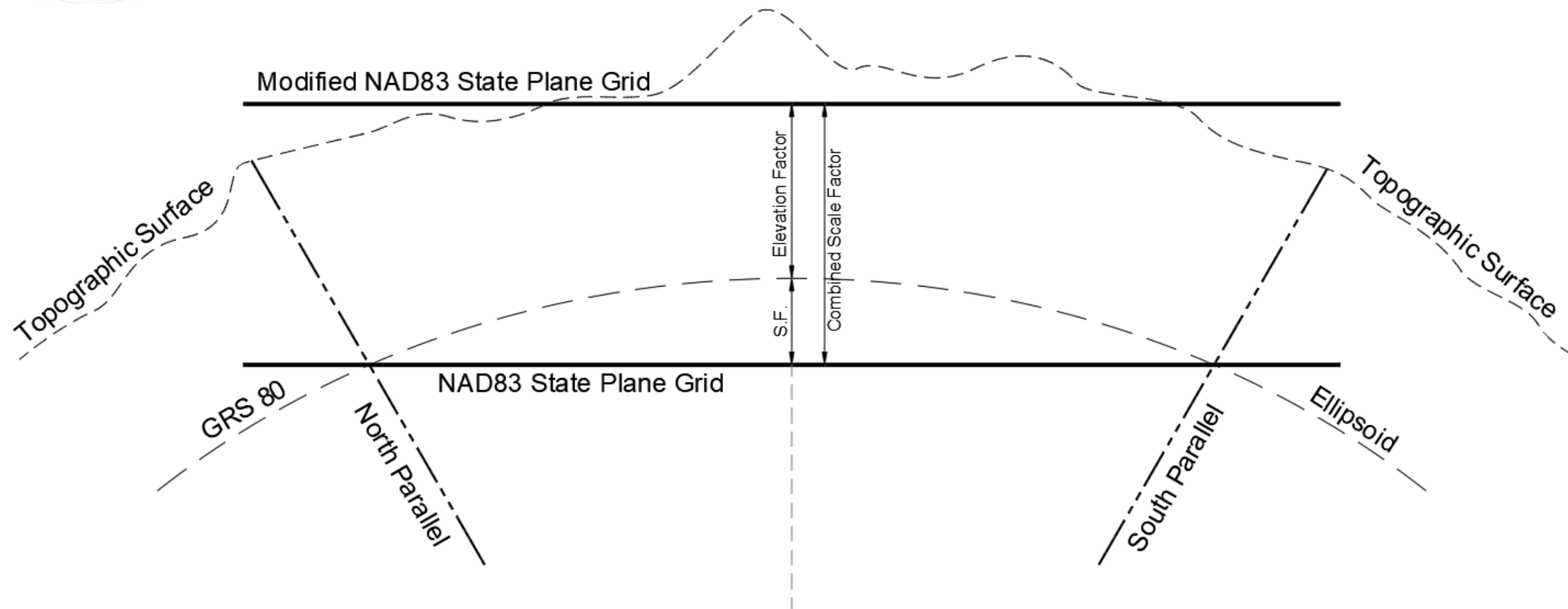
THANK YOU

NGS.Colorado@gmail.com



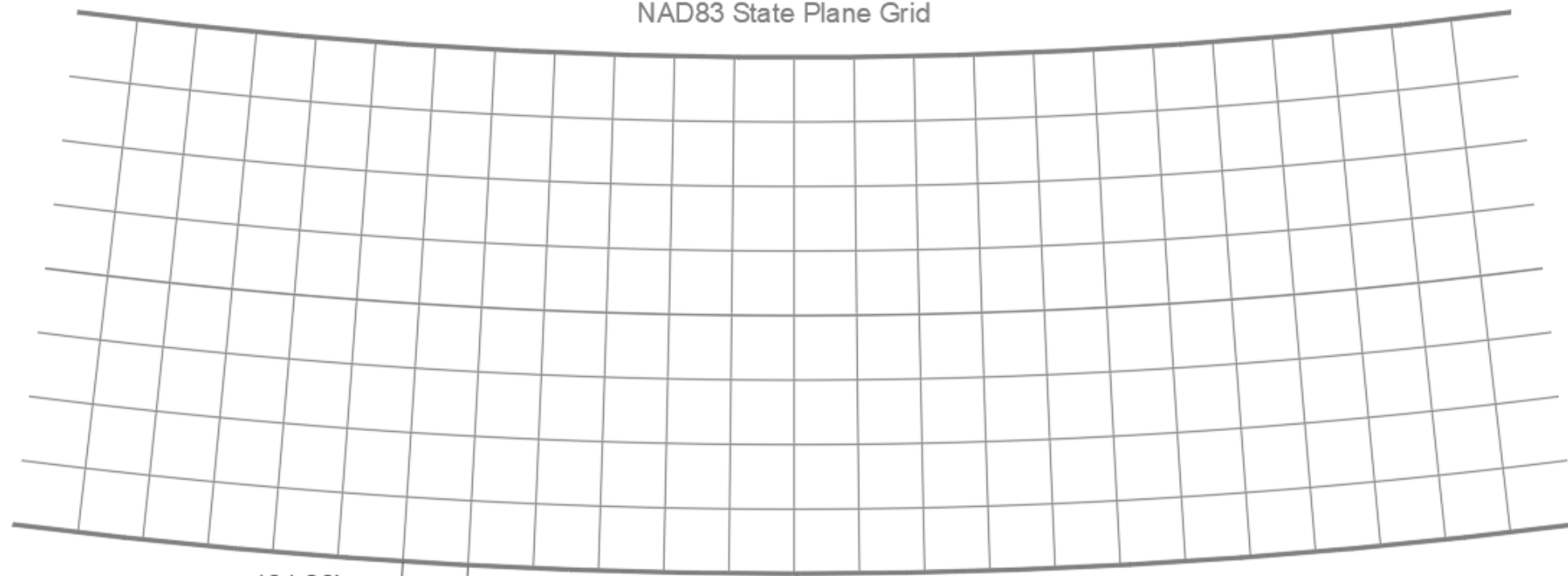
Federal Geographic Data Committee
Geospatial Positional Accuracy Standards
AEC Surveying and Mapping Standards
Closure Errors
Second-Order, Class I.....1:50,000
Second-Order, Class II.....1:20,000
Third-Order, Class I.....1:10,000
Third-Order, Class II.....1:5,000

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)





NAD83 State Plane Grid



101.20'
SP

N: 1,000,000
E: 3,000,000

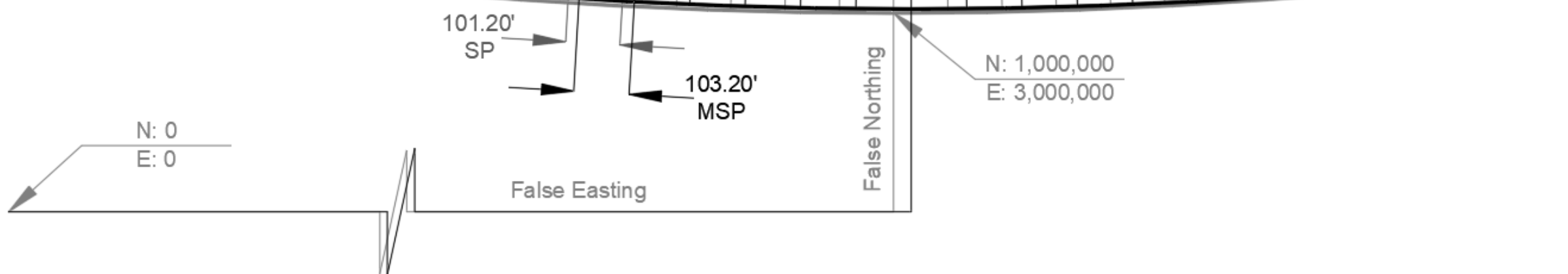
False Northing

False Easting

N: 0
E: 0

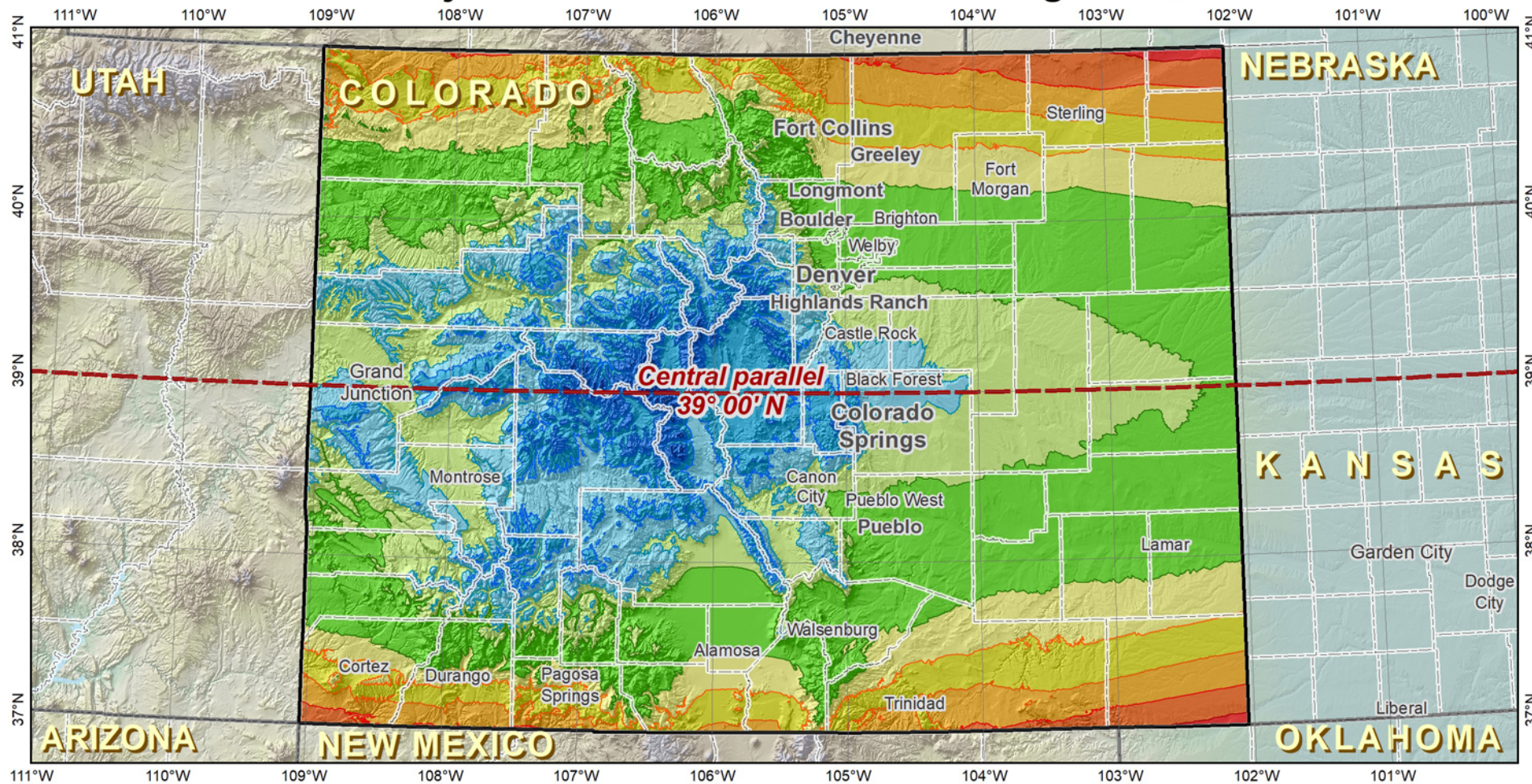


Modified NAD83 State Plane Grid
NAD83 State Plane Grid





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:

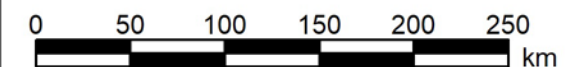
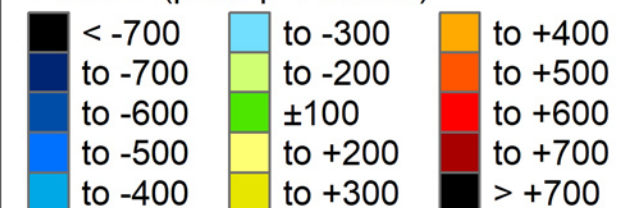
Min = -420 Range = 963

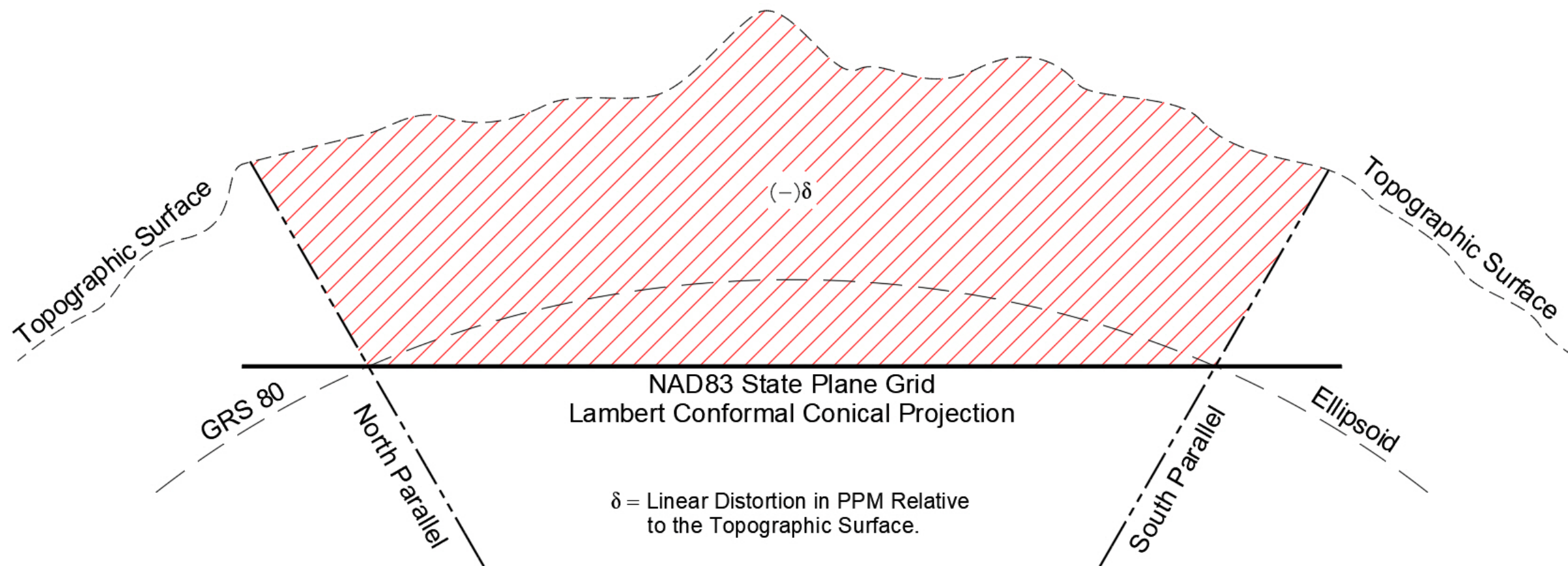
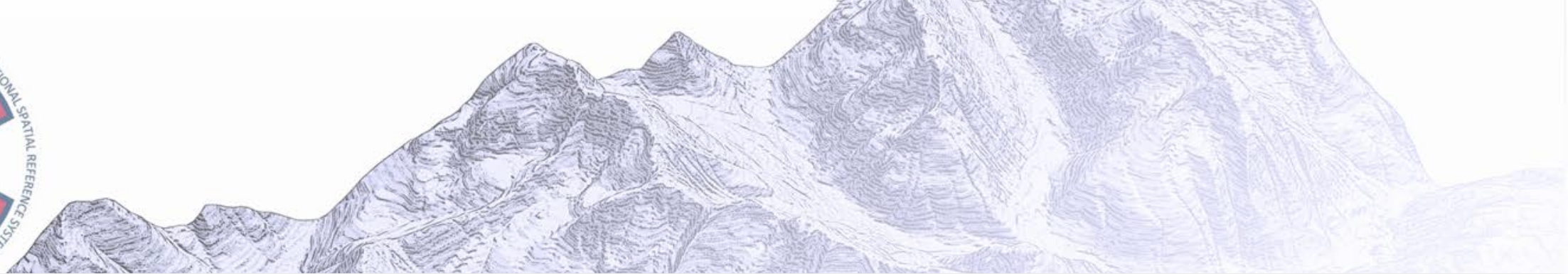
Max = +543 Median = -59

Mean = -46

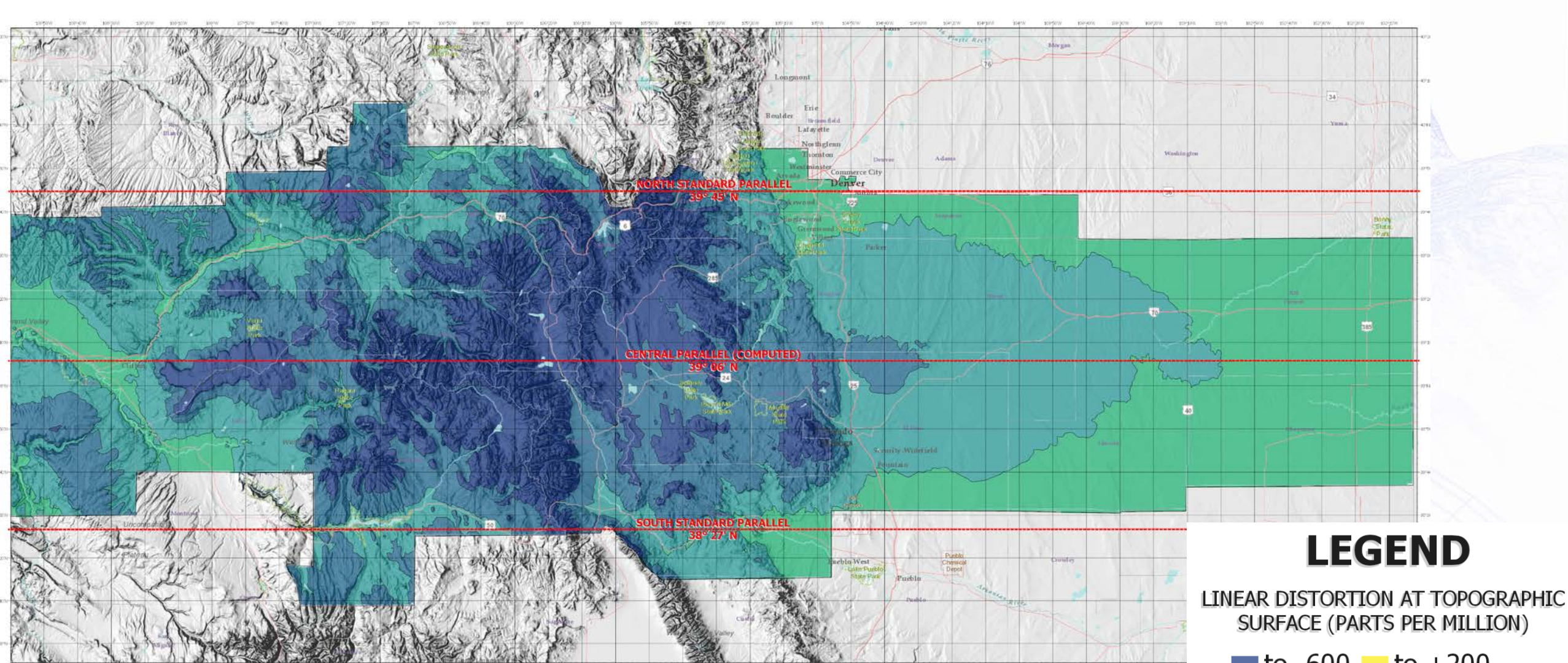
(weighted by population)

Linear distortion at topographic surface (parts per million)





Current State Plane



LEGEND

LINEAR DISTORTION AT TOPOGRAPHIC SURFACE (PARTS PER MILLION)

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

Colorado

**CURRENT
STATEPLANE
COORDINATE
SYSTEM CENTRAL
ZONE DESIGN**

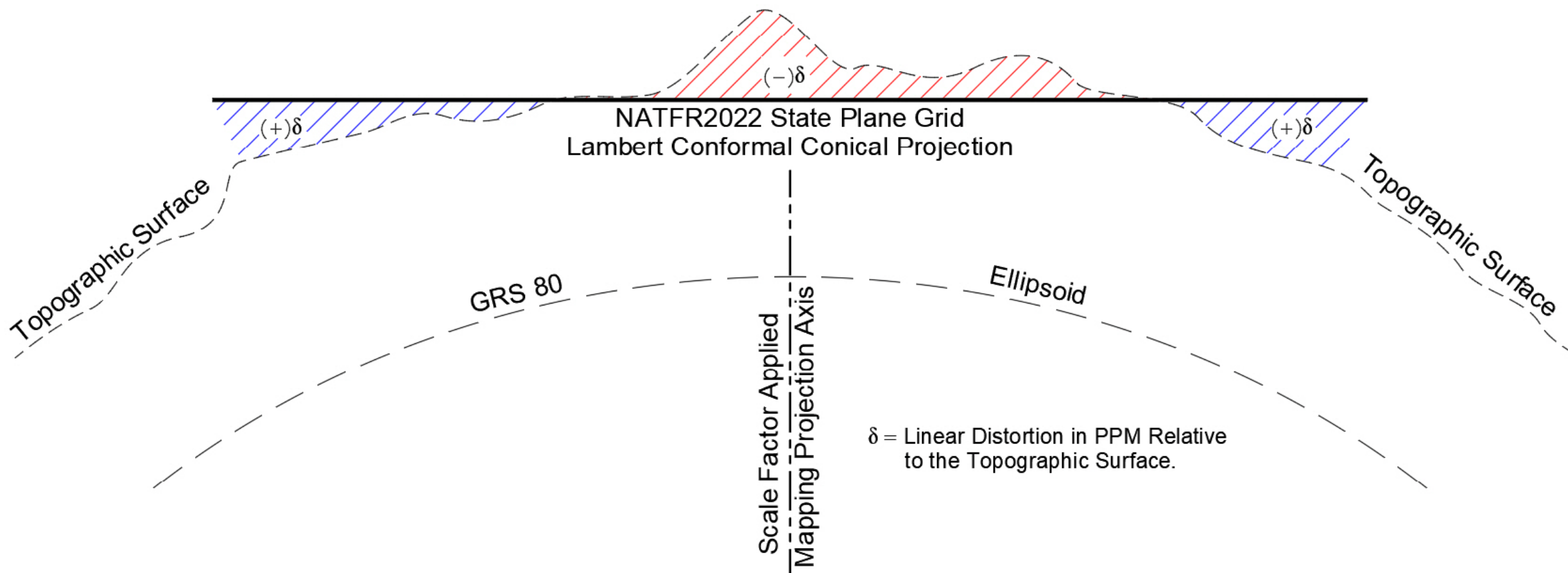
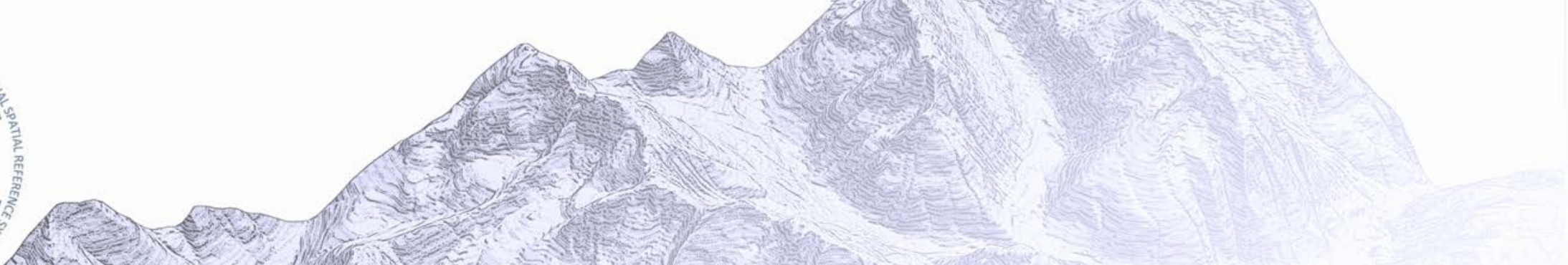


PROJECTION

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

LINEAR DISTORTION

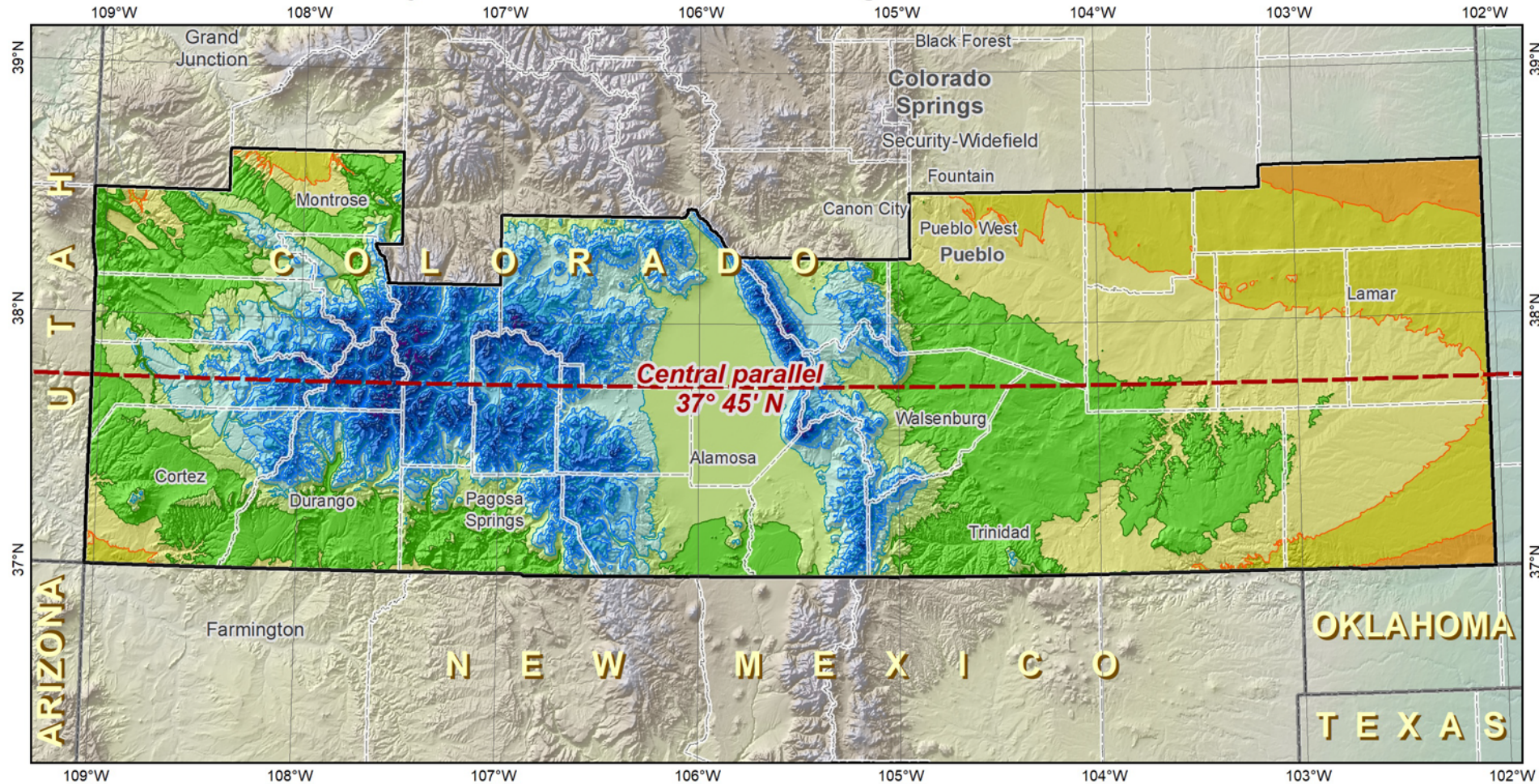
DISTORTION VALUES (PPM)
FOR THE ENTIRE ZONE:
MIN = -729 MAX = -207
MEDIAN = -377 MEAN = -392



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:

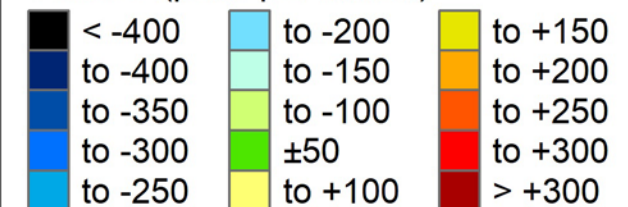
Min = -189 Range = 354

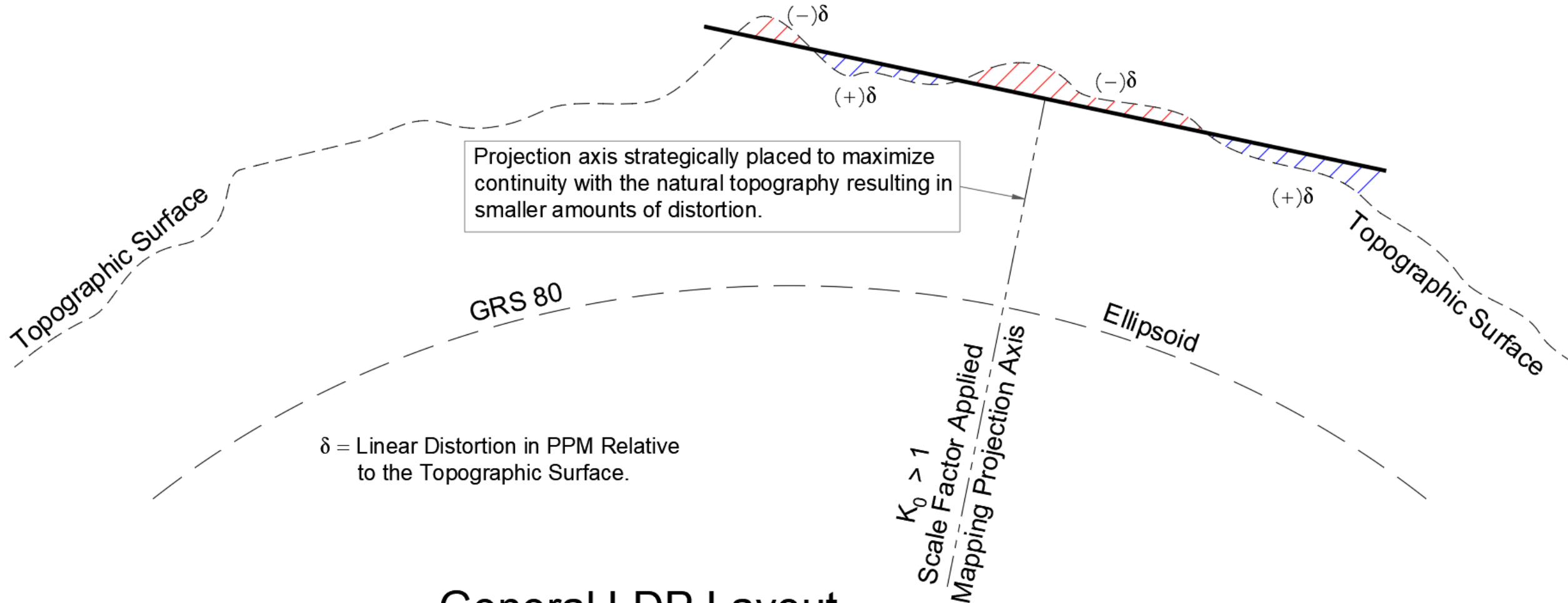
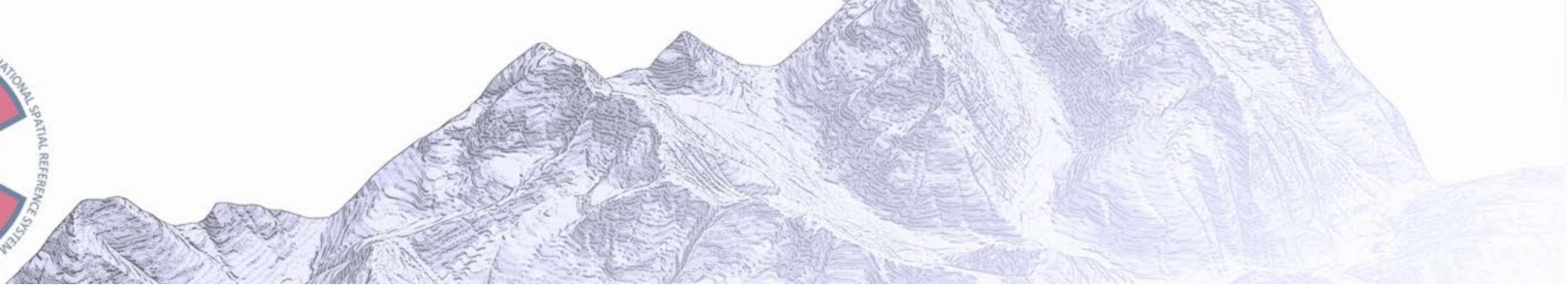
Max = +165 Median = -0.1

Mean = +50

(weighted by population)

Linear distortion at topographic surface (parts per million)





General LDP Layout

Colorado

POTENTIAL METRO AREA LOW DISTORTION PROJECTION DESIGN



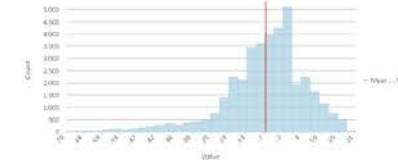
PROJECTION

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

Distribution of Value



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	

