Charter

for the

Illinois State Plane Coordinate System Committee

dated

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Approved by Committee May 13, 2019

Document Revision History

Date	Revision	Author
6/3/2019	Added Tollway members, added municipal contact, updated Tech committee members	JMH

This document is an attempt to draft a framework for the development of map projections to be utilized in the State of Illinois. Dual Zone projections (similar to current East and West Zones), Single Statewide Projection, Low Distortion Projections (LDP) and other updates will be discussed with the goal to have them ultimately adopted by the National Geodetic Survey (NGS) as coordinate system "layers" available and supported by the NGS.

BACKGROUND

In the fall of 2018, the City of Springfield began investigating the development of a LDP to facilitate accurate, consistent and repeatable coordinates for projects throughout the city. In the process of development the city contacted the Illinois NGS advisor for guidance on NGS's position on LDP's. The most important advice from NGS was to involve the Illinois Department of Transportation (IDOT), as NGS has historically relied on DOT's for geodetic issues and is typically partial to accepting systems or data developed and or acknowledged by DOT's. To that end, the city contacted IDOT District 6 and discussed the possibility of LDP development and use. This conversation led to a broader conversation with IDOT Central Office and included interested representatives from most other IDOT Districts throughout the state in late 2018. These conversations brought to light that District 8 had previously developed LDP's for the District and has been using them. Additionally IDOT expressed interest in pursuing development of LDP's for the entire State. To that end, IDOT organized a conference with NGS on February 5, 2019 in Springfield during their annual District Surveyors meeting. During this conference, NGS articulated their position and expectations for states that wish to make changes to existing projections including the development of LDP's and how these systems can been incorporated into the upcoming North American Terrestrial Reference Frame of 2022 (NATRF2022).

BUSINESS CASE

This topic of updates to State Plane Coordinate Systems (SPCS) throughout the United States is fueled by NGS 2022 SPCS Policy Changes. A deadline has been set by NGS of December 31, 2019 for States to communicate what their preference and/or plan is for updates to published projections that are acknowledged and supported by NGS. Additionally NGS has a deadline of December 31, 2020 for the States projection definitions to be completed. These deadlines for updates to SPCS have been set by NGS as a part of the transition to the 2022 Terrestrial Reference Frames.

Related to this are statute updates that may be required. Current statutes (**(765 ILCS 225/) Illinois Coordinate System Act**) reference the North American Datum of 1983 (NAD83) and the North American Datum of 1927 (NAD27). The North American Terrestrial Reference Frame of 2022 (NATRF2022) will replace NAD83. This change may need to be reflected in the statute.

This potential statute update may affect county GIS Administrators as they operate largely under State statute.

Given the deadlines set by NGS for changes to the State's coordinate systems, stakeholders throughout Illinois should initiate discussions concerning the matter and formally respond to NGS through a single unified voice. If this can not be accomplished by the State, NGS will implement changes to coordinate system projections in Illinois as they deem appropriate. This will ***not*** include development and implementation of LDP's for the State.

BENEFITS

Existing State Plane Coordinate Systems

NGS has plans to provide the State with updates to SPCS's that minimize distortion relative to the topographic surface versus the previously defined projections that based distortion relative to the ellipsoid surface. This will serve to reduce the magnitude of distortion present in the measurements made on the surface of the earth with respect to the reference frame. It is anticipated that Illinois will continue to have an East and a West Zone coordinate system with the same boundaries that currently exist.

Proposed Coordinate Systems

The process for updates to SPCS's developed by NGS is allowing for stakeholders to propose and develop coordinate systems that each State values. For Illinois there appears to be two types of systems that are of interest. The first is a Single Zone Statewide Projection and the second is a system of Statewide Low Distortion Projections.

Single Zone Statewide Projection

There is already a developed and published Illinois Single Zone Statewide Projection that was completed by Chris Pearson. This projection has been in use, but not officially recognized. This projection type is beneficial to many organizations that rely on and develop position data on features throughout the entire State.

Proposed Low Distortion Projection

This document is not intended to fully explain the development of LDP's. In general the purpose of an LDP is to minimize the distortion that is inherently present when converting from a spherical coordinate system (latitude, longitude, height) to a cartesian coordinate system (northing, easting, elevation).

Currently published projections such as IL State Plane East and West Zones have distortion magnitudes that are easily detectable by current survey technology. Typical methods to account

for these distortions are to either ignore them or compute a scale factor to attempt to make the distortion manageable. This scale factor application is commonly referred to as modified state plane. Both of these methods create issues for accuracy, repeatability, scalability and for accurate transformations between other datums.

LDP's attempt to minimize distortions to the point that they are either undetectable or insignificant and without the use of the scale factors associated with modified state plane. LDP's create a grid distance that is approximately equal to ground based distances.

Another benefit of LDP's is that they are defined and typically published projections that can be used to transform between datums. Data in a LDP can be transformed to other published datums and vice versa.

GOALS

The following goals have been developed regarding SPCS updates in Illinois:

1) To develop a single unified response by Illinois to the NGS concerning the States preferred SPCS changes by December 31, 2019.
2) To approve any changes made to existing SPCS's and to cause to be developed Single Zone and Low Distortion Projections by December 31, 2020.
3) To provide direction for Statutory changes required as a result of changes to the SPCS.

AUTHORITY

The Illinois Department of Transportation has assumed authority of this SPCS update process. First through the general recognition by NGS as the lead organization in the State for such geospatial issues, and second through the Departments Statewide Initiative to utilize model based systems for design and construction projects. The completion of the goals contained in this Charter are an essential element of effectively implementing this Statewide Initiative.

SCOPE

In order to accomplish these Goals the following process outline is defined:

1) Organize an Illinois SPCS Committee with members from the following stakeholder groups. It is intended that all stakeholders are represented by a delegate identified within the stakeholder list which has representation on the Illinois SPCS Committee.
    a) Illinois Department of Transportation
    b) Illinois Department of Natural Resources
    c) Prairie Research Institute
    d) Illinois Professional Land Surveyors Association
    e) Illinois GIS Association

f) College or Universities (with surveying or GIS curriculum)
g) County / Municipal Group
h) Illinois Tollway
i) National Geodetic Survey
j) National Society of Professional Surveyors

2) The Illinois SPCS Committee is to prepare submittals to NGS outlining the preferred changes to or development of the following projection types (these are referred to as "Layers"). It is anticipated that NGS will have a formal submittal application for this process in early 2019. This step only includes articulating the preferences of Illinois and does not include the actual development or finalization of the proposed changes. SPCS's to be considered by the committee are as follows:
    a) Existing 2 Zone State Plane Coordinates Systems
        i) East Zone
        ii) West Zone
    b) Proposed Single State Zone
    c) Proposed Low Distortion Projection Zone System

3) The Illinois SPCS Committee will respond to any questions or clarifications the NGS has about the SPCS submittal.

4) The Illinois SPCS Committee will identify the development group or groups for each of the proposed layers that are to be considered.
    a) Existing 2 Zone State Plane Coordinate System
        i) It is understood that NGS will develop the 2 Zone system if requested by Illinois.
    b) Proposed Single State Zone
        i) It is anticipated that the existing Single Zone Projection will be formally recognized, submitted and adopted by NGS.
    c) Proposed Low Distortion Projection Zone System
        i) It is anticipated that resources from the stakeholder groups will be organized into an Illinois SPCS Technical Subcommittee to undertake the development and verification of a Low Distortion Projection System for the State of Illinois.

5) The Illinois SPCS Committee will formally adopt the layers and provide proposed Statutory changes as needed.

6) The Illinois SPCS Committee will formally submit all SPCS changes to the NGS.

7) The Illinois SPCS Committee will disband after:
    a) Statutory changes if required have been adopted.
    b) SPCS changes have been adopted by NGS.

BY LAWS

1) The Illinois State Plane Coordinate System Committee shall consist of the following positions:
    a) One Chairman (1 vote)
    b) One Secretary (1 vote)
    c) Two Committee Members representing each of the following groups:
        i) Illinois Department of Transportation (2 votes)
        ii) Illinois Department of Natural Resources (2 votes)
        iii) Prairie Research Institute (2 votes)
        iv) Illinois Professional Land Surveyors Association (2 votes)
        v) Illinois GIS Association (2 votes)
        vi) University Group (2 votes)
        vii) County / Municipal Group (2 votes)
        viii) Illinois Tollway (2 votes)
        ix) Illinois SPCS Technical Subcommittee (1 vote)
    d) One Committee Advisor representing each of the following organizations:
        i) National Geodetic Survey (non-voting)
        ii) National Society of Professional Surveyors (non-voting)
2) All positions identified in 1) a through c are considered voting class members with 1 vote each.
3) The Chairman of the Illinois SPCS Committee shall be the last vote cast to decide any ties.
4) All decisions will be by a majority vote of the voting class members, when a majority of the voting class members are present.
5) Meetings will be set for the first Monday of the month at 9:00 am. Unless otherwise agreed upon.
6) Advisors shall be non-voting members.
7) Illinois SPCS Committee members are tasked with:
    a) Representation of their identified stakeholder group.
    b) Communication with NGS related to Illinois SPCS's.
    c) Initiation of legislative changes if required.
8) There shall be named an Illinois SPCS Technical Subcommittee established under the Illinois SPCS Committee.
    a) The Illinois SPCS Technical Subcommittee is tasked with the development and verification of proposed coordinate systems in Illinois.
    b) The Illinois SPCS Technical Subcommittee shall be considered as a voting class to the Illinois SPCS Committee
    c) The Illinois SPCS Technical Subcommittee shall be granted one vote.

RESOURCES

National Geodetic Survey (NGS)
https://www.ngs.noaa.gov/

NGS 2022 Terrestrial Reference Frames
https://www.ngs.noaa.gov/datums/newdatums/naming-convention.shtml#reference-frames

NGS 2022 SPCS Policy
https://www.ngs.noaa.gov/SPCS/draft-policy.shtml

Illinois Coordinate System Statute
http://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=2173&ChapterID=62&Print=True

Illinois Single Zone Projection
http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.122.4961&rep=rep1&type=pdf

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Recommendation for the Illinois Statewide Single Zone Projection

The GIS users that cover a state wide jurisdiction need a single zone projection for the state. This single zone projection is used for making state wide maps, analysis and to provide a common standard to store and manage data. Although modern GIS software is capable of "projection on the fly" to map data in different projections, many geoprocessing and analysis tasks cannot be performed correctly unless all the data is in a single projection using a Cartesian coordinate system of positive coordinate values. A Web Mercator projection has come into standard use for mapping world wide data. However, this projection has negative values for easting and has proven problematic with very large errors in measurement and scale in some GIS software uses.

The first state wide projection in common GIS use for Illinois was one defined for the pioneering ILLIMAP system from 1970. It met the needs at that time well but was not properly optimized for Illinois and was never officially recognized. In 2002 the NGS Geodetic advisor to Illinois, Dr. Christopher Pearson, published the definition of a new single zone projection for Illinois that was optimized for minimum combined scale factors. This was adopted as a standard by several state agencies but has never been officially recognized. Some agencies used this projection with units of meters and others with units of US feet. The projection parameters are shown in Table 1. It has successfully served those agencies without problem. The use of this projection was limited by not being listed on the menu of available projections in software and references.

2002 Minimum Combined Scale Factors Transverse Mercator Projection in use by some state agencies			
Parameter	Original Pearson	IEMA Decimal	IDNR Decimal – Survey Feet
Latitude of Origin	36º 40"	36.66666667	36.66666666666666
Central Meridian	89º 30"	-89.5	-89.5
Scale Factor	1 part in 6800 too small	0.999852941	0.9998529411767059
False Easting	1,000,000m	1000000	3280833.3333333
False Northing	1,200,000m	1200000	3937000.0
Units	meters	meters	"Foot_US",0.3048006096012192

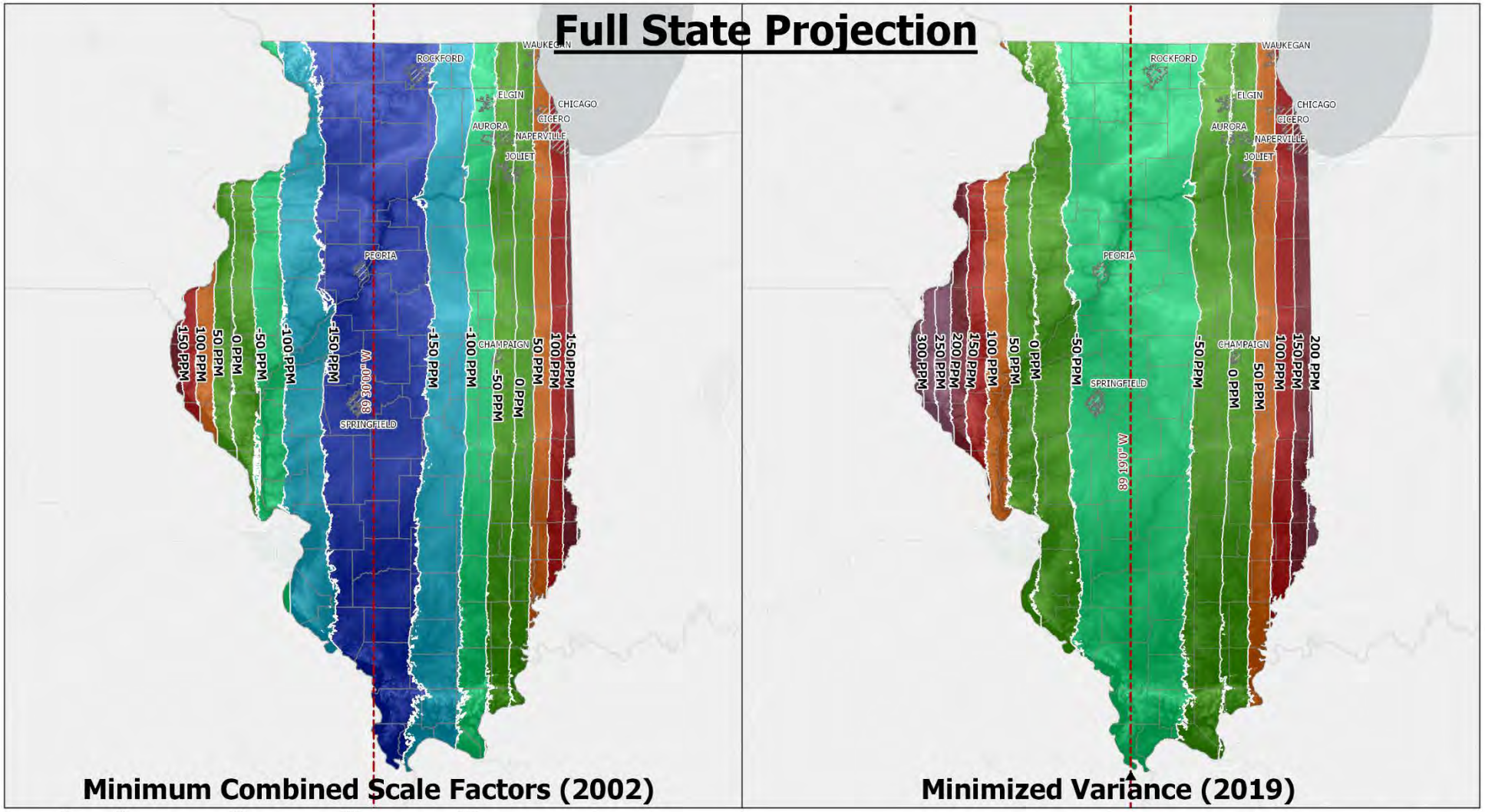
Table 1

With the call from NGS for new projections to support the coming 2022 datum, a new Illinois single zone projection was defined using modern methods for minimized variance. The parameters for the 2002 and latest 2019 singles zones and their liner distortion is shown in Figure 1. The 2002 projection on the left of Figure 1 has a lower maximum distortion. Compared to the 2002 projection, the 2019 projection on the right has a reduction of distortion in the center of Illinois, but greater distortion on the east and west edges. A calculated difference between the absolute distortion of the two projections is shown in Figure 2. The areas in blue of Figure 2 are where the 2002 projection has less distortion and those in red are where the 2019 projection has less distortion. The darker the shade, the greater the difference in distortion between the two projections.

Surveyors and the GIS specialists that work in jurisdictions smaller than the whole state will use the Low Distortion Projections rather than the Single Zone for most of their work. As stated earlier, the GIS users dealing with the whole state are the ones that most need the single zone projection. The important criteria for this group are that the projection be officially recognized, be available in the GIS software list of selectable projections and readily convert back and forth between the other common projections in use. For technical reasons, it also needs to use a cartesian coordinate system with the same units used for the x and y coordinates, constant unit lengths in both the x and y directions (unlike geographic longitude) and with all positive coordinates.

NGS will be recognizing a state-wide single zone projection for each state. They will design one for states that do not make their own recommendation. A single zone projection designed by NGS should meet the criteria listed above. Therefore, it looks certain that GIS Specialists with a state-wide jurisdiction will finally get an official single zone projection that meets their needs. However, it would be good to take this opportunity to try to select the best possible option for Illinois. It can be seen from Figures 1 and 2 that the shape of the state and differences in elevation cause considerable variation in the distribution of distortion values.

Full State Projection



Minimum Combined Scale Factors (2002)

Minimized Variance (2019)

0 30 60 120 180 240 Miles

Scale: 1:2,750,000 (When printed on 12" x 18" paper)

N

Min Scale Factors

Latitude of origin:	36 40'0" N
Central meridian:	89 30'0" W
Scale factor:	0.999853
Maximum absolute distortion:	212.2733
Area between -20 and 20 ppm:	7.2949%
Area between -100 and 100 ppm:	37.6876%
Area between -200 and 200:	99.9844%

Minimized Variance

Latitude of origin:	36 57'0" N
Central meridian:	89 19'0" W
Scale factor:	0.999943
Maximum absolute distortion:	355.8446
Area between -20 and 20 ppm:	13.2647%
Area between -100 and 100 ppm:	85.2804%
Area between -200 and 200:	97.4905%

Legend

Linear Distortion

- ≤ -150 PPM
- -100 to -150 PPM
- -50 to -100 PPM
- -50 to 50 PPM
- 50 to 100 PPM
- 100 to 150 PPM
- 150 to 200 PPM
- > 200 PPM

These maps visualize the distortion at locations throughout Illinois given two different full scale state projections. The projection represented by the map on the left was published by Dr. Christopher Pearson in 2002 while he was NGS's State Geodetic Advisor for Illinois and working at IDOT. He optimized it by minimizing the absolute values of the of the maximum and minimum combined scale factors for the land area. The second map projection was generated by minimizing the variance of the distortion over all the sampled points. Both projections are Transverse Mercator and both maps are displayed using their respective projections. Only municipalities with populations greater than 80,000 are plotted.

Figure 1. Distortion Comparison

IDOT - BDE

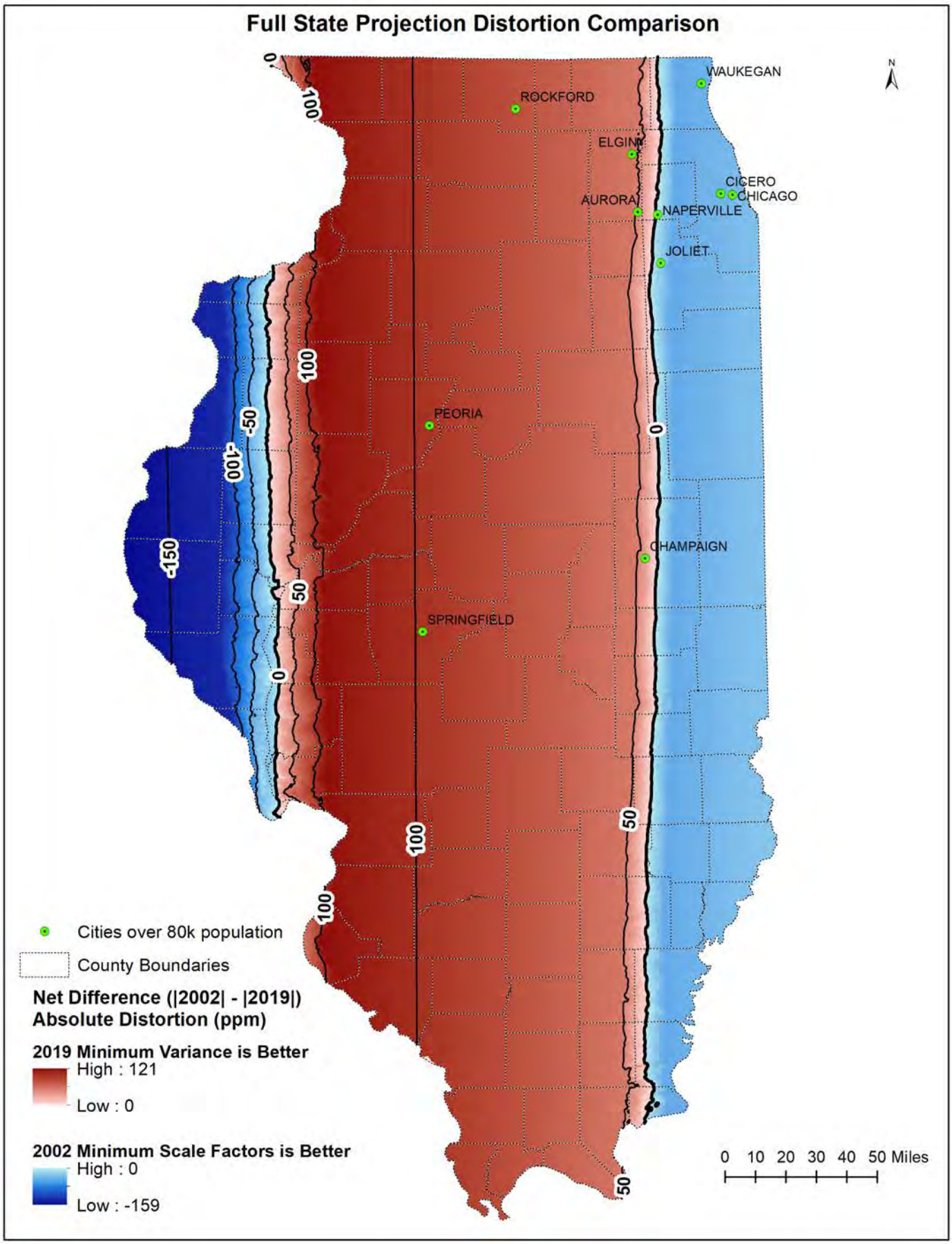

Full State Projection Distortion Comparison
WAUKEGAN
ROCKFORD
ELGIN
CICERO
CHICAGO
AURORA
NAPERVILLE
JOLIET
PEORIA
CHAMPAIGN
SPRINGFIELD
0
100
-50
-100
-150
50
Cities over 80k population
County Boundaries
Net Difference (|2002| - |2019|)
Absolute Distortion (ppm)
2019 Minimum Variance is Better
High : 121
Low : 0
2002 Minimum Scale Factors is Better
High : 0
Low : -159
0 10 20 30 40 50 Miles
N

Figure 2

It is prudent to explore possible Illinois specific tailored solutions which weigh the relative distortion variations across the state using Illinois geography and experience. Coordinate ranges can also be selected to avoid old and unofficial projection coordinate values that NGS staff would not be familiar with.

It is clear the new projection will not be one currently in use. There will be an all-new 2022 datum. US Survey Feet will now be obsolete and NGS wants International Feet to be used instead. NGS also mandates certain standards that are not compatible with existing parameters. A currently used projection can be adjusted to meet the new standards but would not be interchangeable with the old version.

Tables 2 and 3 list tweaked parameters of the two candidate projections shown in Figure 1. These tweaked versions should comply with NGS requirements.

Single Zone Candidate - 2002 Minimum Combined Scale Factor Projection Tweaked			
PARAMETER			NOTES
Projection Type	Transverse Mercator		The 2002 Min SF Projection type. IL has N-S major axis
Coordinate Units	International Feet		NGS required alternative to US Feet.
Latitude of Origin	25° 54' 0" N	25.90 decimal degrees	Based on the 2002 Min SF projection latitude of origin shifted south to eliminate the false northing. This will leave the entire zone above the greatest northing range (4,xxx,xxx) of the LDPs and with a minute value evenly divisible by 3.
Central Meridian	89° 30' 0" W	-89.50 decimal degrees	The 2002 Min SF Projection Central Meridian.
Scale Factor	0.999853		The 2002 Min SF Projection Scale Factor.
False Easting	381,000. m	1,250,000. int ft	NGS requests the false easting in meters with even 1,000s. This is good because meters are unambiguous, and the conversion factor is now simple (0.3048 m/ft). This figure was chosen because it is an even 1,000 meter value with an equivalent nice even foot value that avoids overlap with the old projection.

Table 2

Single Zone Candidate – 2019 Minimize Variance Projection Tweaked			
PARAMETER			NOTES
Projection Type	Transverse Mercator		The 2002 Min SF Projection type. IL has N-S major axis
Coordinate Units	International Feet		NGS required alternative to US Feet.
Latitude of Origin	25° 54' 0" N	25.90 decimal degrees	Based on the 2002 Min SF projection latitude of origin shifted south to eliminate the false northing. This will leave the entire zone above the greatest northing range (4,xxx,xxx) of the LDPs and with a minute value evenly divisible by 3.
Central Meridian	89° 21' 0" W	-89.35 decimal degrees	The 2019 Min Variance projection Central Meridian shifted to make the minutes evenly divisible by 3. Adding two minutes rather than reducing by 1 was chosen to move toward the 2002 projection central meridian and potentially have a reducing, rather than increasing, effect on the maximum distortion.
Scale Factor	0.999927		This was calculated based on direct proportion to the meridian shift relative to the 2002 Min SF Projection values of Central Meridian and Scale Factor. The change was made to prevent or minimize an increase in the distortion on the east edge due to the Central Meridian shift. The small change should also be in the direction of reducing the maximum distortion on the west edge of the state.
False Easting	381,000. m	1,250,000. int ft	NGS requests the false easting in meters with even 1,000s. This is good because meters are unambiguous, and the conversion factor is now simple (0.3048 m/ft). This figure was chosen because it is an even 1,000 meter value with an equivalent nice even foot value that avoids overlap with the old projection.

Table 3

Unlike the Low Distortion Projections (LDPs), reducing the distortion to the absolute minimum is not the overwhelmingly dominant factor. The reason for this is because when best accuracy was needed the State Plane projections were used instead and, in the future, the LDPs will be used. In over fifteen years of use the 2002 projection worked well even for detailed maps when precise measurements were not needed. Better accuracy would be a welcome bonus but would not necessarily be the deciding factor in selection of an alternative without consideration of other characteristics. The issue of minimum distortion is further complicated by the uneven distribution of distortion across the state.

Table 4, below, lists some comparisons between the projections.

Illinois Full State Single Zone Projection Candidate Comparison				
CRITERIA	2002 Minimum Scale Factors	2019 Minimized Variance		NOTES
Max Absolute Distortion	212.3 ppm	355.8 ppm	less is better	
Area Between -20 and 20 ppm	7.3%	13.3%	more is better	
Area Between -100 and 100 ppm	37.7%	85.3%	more is better	
Area Between -200 and 200 ppm	99.98%	97.49%	more is better	
Parcel Weighted Average Distortion	87.5 ppm	74.9 ppm	less is better	Parcels aggregated to county centroid and distortion sampled at county centroid. $\frac{\Sigma\ \lvert Distortion\rvert @Centroid\ *\_cnty\text{-}count}{\Sigma\ cnty\text{-}count}$
Population Weighted Average Distortion	89.9 ppm	83.9 ppm	less is better	Population is used as an indirect indicator of more expected detailed mapping/measuring activity in the proximity of the population. $\frac{\Sigma\ \lvert Distortion\rvert @Centroid\ *\ Block\ Pop}{\Sigma\ Block\ Pop}$ Census 2010 Block Population Data
Population Benefitting	7,668,345	5,162,287	more is better	The 2010 population that will experience less distortion with each projection. Population is used as an indirect indicator of more expected detailed mapping/measuring activity in the proximity of the population. Census 2010 Block Population Data is used
Population Weighted Average Benefit	38.9 ppm	72.5 ppm	more is better	$\frac{\Sigma\ (\lvert 2002\rvert - \lvert 2019\rvert)@Centroid\ *\ Blk\ Pop}{\Sigma\ Blk\ Pop}$ Census 2010 Block Population Data performed separately on each benefit area as per above
Area Benefitting	15,404.4 square miles	40,742.5 square miles	more is better	The respective area that benefits from that projection over the other one. (i.e. blue vs. red)
Relative Improvement Factor	599,231 ppm sq miles	2,953,831 ppm sq miles	more is better	(population weighted benefit) X (area benefitting)
Digital Unfriendly Parameters	36° 40' Latitude of Origin 36.66666666$\overline{6}$	89° 19' Central Meridian 89.31666666$\overline{6}$	addressed in the tweaked version of each	When parameters are defined in degrees and minutes, the conversion to decimal degrees can result in nonterminating decimals. This results in awkward reference and entry into systems that require units in decimal degrees. It can also lead to inconsistencies when these nonterminating decimals are rounded to different arbitrarily chosen numbers of decimal places.

Table 4

Some of the evaluation statistics listed in Table 4 utilize population. It is important to understand that population is being used as an indirect indicator of expected detailed mapping and analysis activity that will occur in the vicinity of the populated areas.

The 2002 projection has the strong merit of having successfully been used for more than fifteen years. It also has the lowest maximum distortion of the two, 212.3 ppm. These are the strongest arguments in favor of this projection. This projection also benefits a higher population than the other one. However, the average population weighted improvement is not large.

The 2019 projection benefits a lower population but a much larger area. It also provides a much greater improvement in distortion for the population it does benefit. A 72.5 ppm population weighted reduction in distortion for the area benefitting versus a 38.9 ppm reduction for the 2002 area benefitting. It has the lowest population weighted average distortion over the whole state of 83.9 ppm versus 89.9 ppm. It has the lowest parcel count weighted distortion over the whole state, 74.9 ppm versus 87.5 ppm. The worst aspect of the 2019 projection is its maximum distortion of 355.8 ppm.

A factor was developed to quantify the distortion merits of the two projections. It takes the population weighted improvement for the area benefitting and multiplies it times the area benefitting from the projection. This numerical quantification can be used to indicate the better projection regarding distortion as long as the maximum distortion for the projection is acceptable. Using this Relative Improvement Factor, the 2019 projection wins with an RIF value of 2,953,831 ppm-square-miles versus 599,231 ppm-square-miles for the 2002 projection. The maximum distortion of 355.8 ppm has not been tested but is believed to be adequate for use with the single zone projection.

Finally, there is an expert review by an authority familiar with Illinois. Figure 1 showing the parameters and distortion of the two projections was sent to Dr. Pearson, the former NGS Geodetic Advisor for Illinois that had defined the 2002 projection. He liked the new 2019 projection noting the improvement in the central part of the state, the fact it did not increase the distortion too much more in the Chicago/Cook County area and collar counties and that the increase in the west area was a reasonable price to pay to pay.

Therefore, it is recommended that a tweaked version of the new 2019 minimized variance projection be recommended to the NGS for the new Illinois Single Zone projection. The zone's recommended coordinate system is shown in relation to other projection zones in Figure 3.

A note regarding possible perceptions of this evaluation. In this largely academic discussion, it may give the impression of geographic winners and losers for each projection. This is not the correct way to think of it. For any given geographic area within the state, the LDPs will be available and used for any mapping or location work needing accuracy. Individuals will never experience any tangible negative effect from the choice of the state wide projection.

North American Terrestrial Reference Frame of 2022 Illinois Map Projections

This is a grid plot of coordinate ranges for a proposed Illinois 32-zone Low Distortion Projection system shown in the map on the right. The coordinate ranges have been assigned to indicate the 2-digit zone number. The "ones" place in the zone number is indicated by the truncated millions value of the Easting as shown in blue. The "tens" digit is indicated by the millions value in Northing as shown in red. In the case of Illinois Freeport Zone, the Easting will be in the 1,000,000 to 1,999,999 range for a zone number "ones" value of 1. The Northing will be a number falling in the range of 0 to 999,999 and has no millions. Therefore, the "tens" value of the zone number is indicated with a 0. This translates to a zone number of "01".

The common existing Illinois projection zones are plotted to show overlaps. LDP Zones 02 and 12 have an additional 300,000 false Easting to avoid overlapping the existing NAD83 State Plane West. Zone 10 was shifted 390,000 ft west and 350,000 ft north to avoid overlapping the NAD27 State Plane zones. Zone 22 was shifted 300,000 ft west and Zone 23 was shifted 300,000 ft east to avoid overlaps on the old ILLIMAP projection zone.

Zone Code 171021
ANSI Code for Illinois
Layer Number
Zone Number
Zone digit N/A for IL

Low Distortion Projections
Projection Type
Lambert Conformal Conic
Transverse Mercator
Single Zone
NATRF2022 Transverse Mercator

1710xx

LDP Zone Numbers

NATRF2022 SINGLE ZONE

UTM 16N meters

UTM 15N meters

NAD83 ILTM (Pearson)

NAD27 ILLIMAP

NAD27 SPE
NAD27 SPW

NAD83 SPE

NAD83 SPW

Olney 30
Carbondale 31
Metropolis 32
Jacksonville 20
Springfield 21
Charleston 22
Jerseyville 23
Carlinville 24
Taylorville 25
Effingham 26
Robinson 27
Belleville 28
Mount Vernon 29
Peoria 10
Eureka 11
Bloomington 12
Pontiac 13
Watseka 14
Quincy 15
Macomb 16
Lincoln 17
Decatur 18
Champaign 19
Freeport 01
Rockford 02
Aurora 03
Chicago 04
Moline 05
Sterling 06
Ottawa 07
Monmouth 08
Galesburg 09

NORTHING

EASTING

0 1,000,000 2,000,000 3,000,000 4,000,000 5,000,000 6,000,000 7,000,000 8,000,000 9,000,000 10,000,000

Disambiguous Coordinate Range System Proposed by Higginbotham

12/16/2019 - ISPCSC Coordinate Grid Map 12

IDNR OWR