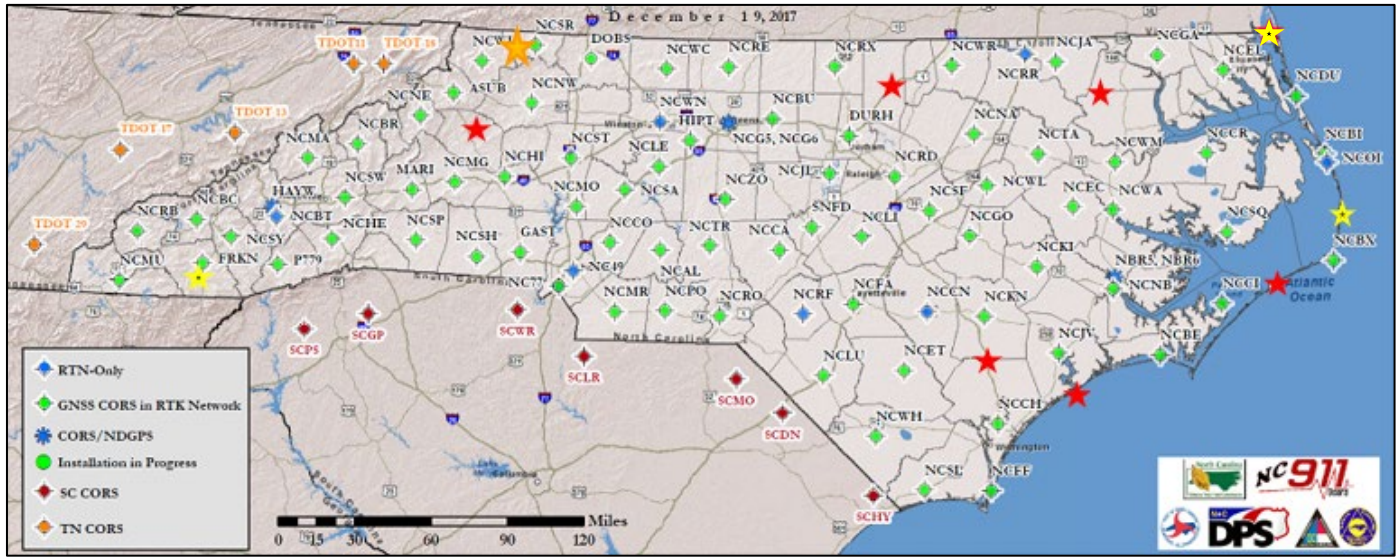
# North Carolina Geodetic Survey (NCGS): Positioning NC today and for the future!

## State Mapping Advisory Committee
## April 19, 2023

## Geodetic Control

# North Carolina (NC) Continuously Operating Reference Station (CORS) Network




Future CORS location = ★
CORS installed = ★
Earthquake CORS = ★

NCBT
NCBT BETHEL
Bethel, NC
USA

Site operated by:
NCGS

Coordinates

SiteLog
Photographs
Data Availability
Standard Files
Custom Files (UFCORS)

Time Series (short-term)
Time Series (long-term)
Google Map all CORS

Enter SiteID

CORS Home

# National Geodetic Survey - CORS

Description of photos

Pictures of equipment may not reflect equipment currently installed. Please see stationlog


View looking north


View looking west


Overall View


View looking east


View looking south

*No Photo Submitted*
View of roof surface


View mount attached to bldg


Monument reference mark

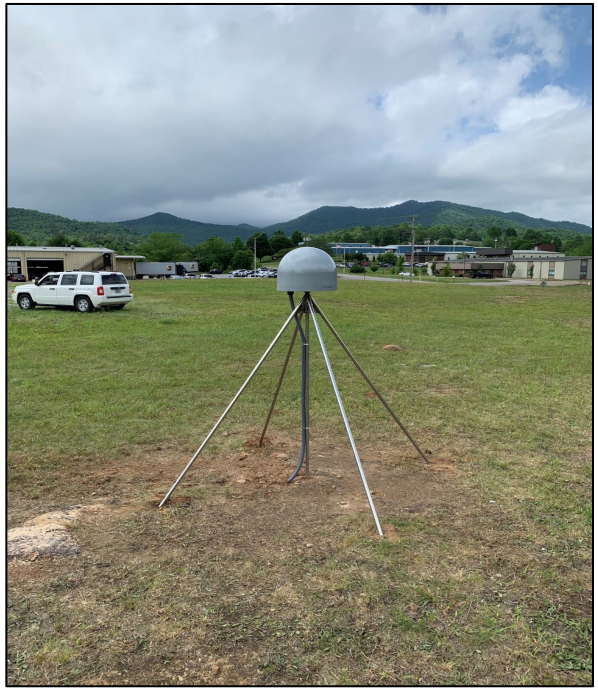

Antenna attached to monument


Antenna serial number


Receiver serial number


Receiver

# New CORS to replace FRKN



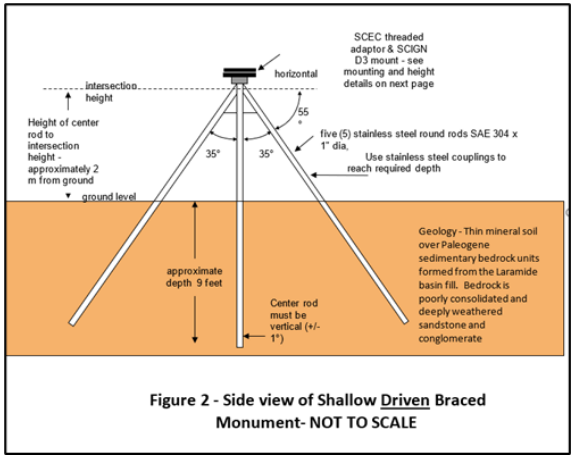



Figure 2 - Side view of Shallow Driven Braced Monument- NOT TO SCALE

SCEC = Southern California Earthquake Center
SAE = SAE International

Preliminary
Coming Soon

NCFR
NCFR FRANKLIN
Franklin, NC
USA

Site operated by:
NCGS

Enter SiteID

CORS Home

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*No Photo Submitted*
View mount attached to bldg


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Antenna attached to monument

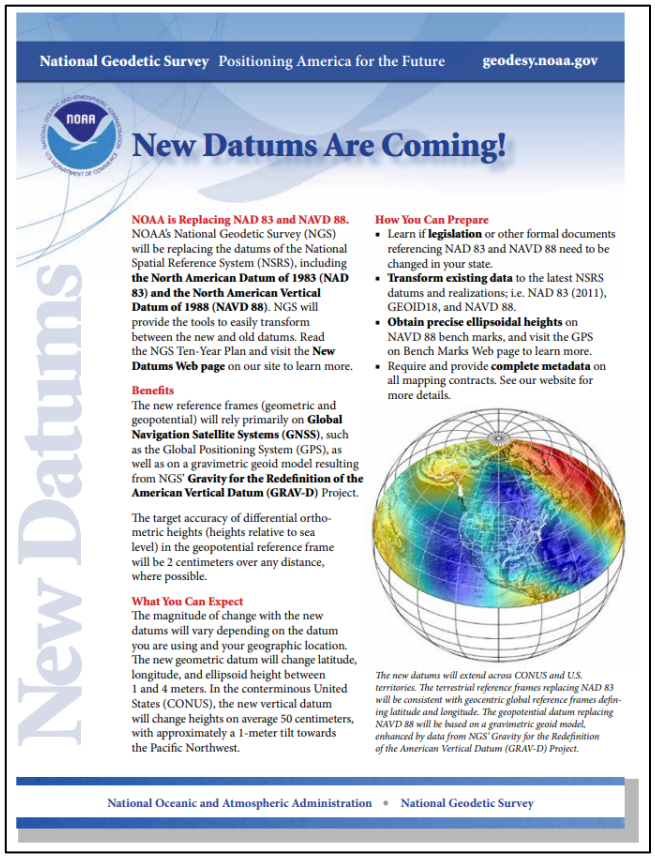

Antenna serial number


Receiver serial number


Receiver

# Sparta CORS

# New Datums are Coming!
# 2025



National Geodetic Survey Positioning America for the Future geodesy.noaa.gov

## New Datums Are Coming!

New Datums

**NOAA is Replacing NAD 83 and NAVD 88.** NOAA's National Geodetic Survey (NGS) will be replacing the datums of the National Spatial Reference System (NSRS), including **the North American Datum of 1983 (NAD 83) and the North American Vertical Datum of 1988 (NAVD 88)**. NGS will provide the tools to easily transform between the new and old datums. Read the NGS Ten-Year Plan and visit the **New Datums Web page** on our site to learn more.

**Benefits**

The new reference frames (geometric and geopotential) will rely primarily on **Global Navigation Satellite Systems (GNSS)**, such as the Global Positioning System (GPS), as well as on a gravimetric geoid model resulting from NGS' **Gravity for the Redefinition of the American Vertical Datum (GRAV-D)** Project.

The target accuracy of differential orthometric heights (heights relative to sea level) in the geopotential reference frame will be 2 centimeters over any distance, where possible.

**What You Can Expect**

The magnitude of change with the new datums will vary depending on the datum you are using and your geographic location. The new geometric datum will change latitude, longitude, and ellipsoid height between 1 and 4 meters. In the conterminous United States (CONUS), the new vertical datum will change heights on average 50 centimeters, with approximately a 1-meter tilt towards the Pacific Northwest.

**How You Can Prepare**

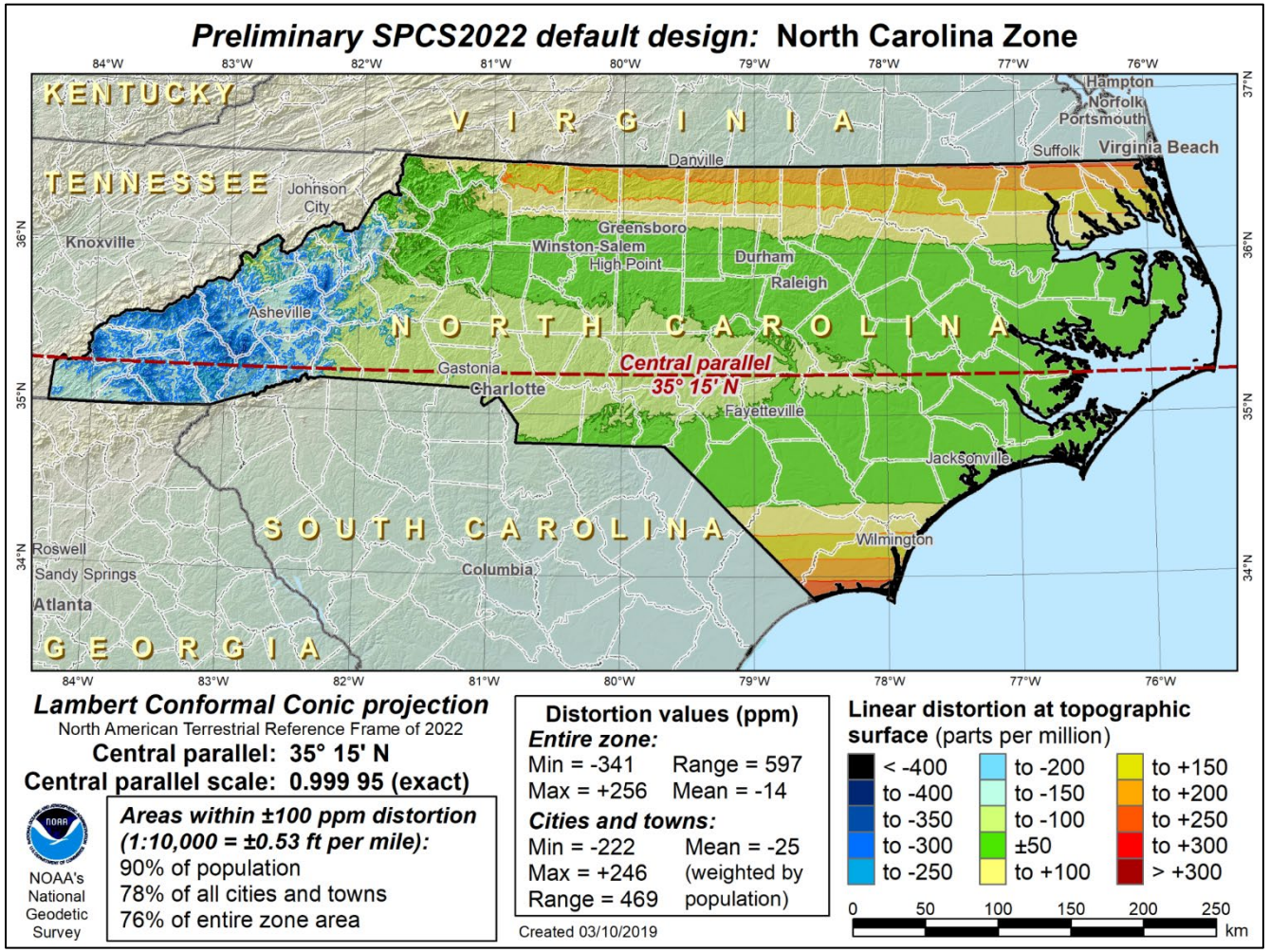
- Learn if **legislation** or other formal documents referencing NAD 83 and NAVD 88 need to be changed in your state.
- **Transform existing data** to the latest NSRS datums and realizations; i.e. NAD 83 (2011), GEOID18, and NAVD 88.
- **Obtain precise ellipsoidal heights** on NAVD 88 bench marks, and visit the GPS on Bench Marks Web page to learn more.
- Require and provide **complete metadata** on all mapping contracts. See our website for more details.



*The new datums will extend across CONUS and U.S. territories. The terrestrial reference frames replacing NAD 83 will be consistent with geocentric global reference frames defining latitude and longitude. The geopotential datum replacing NAVD 88 will be based on a gravimetric geoid model, enhanced by data from NGS' Gravity for the Redefinition of the American Vertical Datum (GRAV-D) Project.*

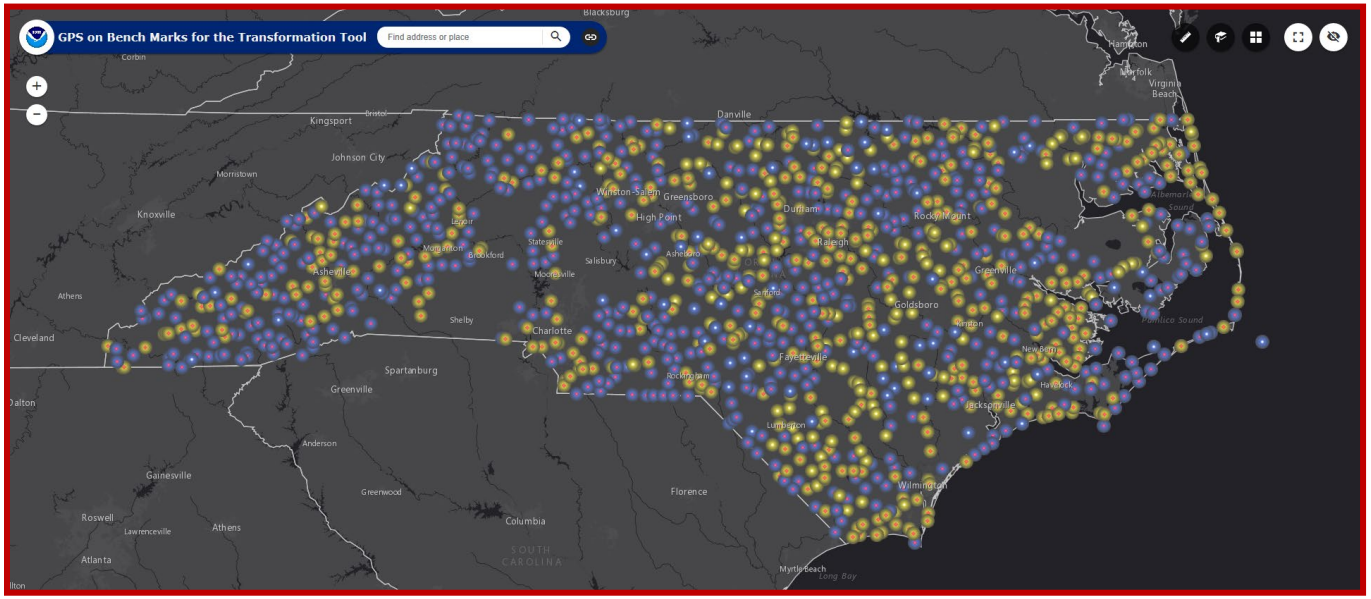
National Oceanic and Atmospheric Administration • National Geodetic Survey

Draft revisions to North Carolina General Statute 102 is being developed


Preliminary SPCS2022 default design: North Carolina Zone
KENTUCKY
VIRGINIA
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
Hampton
Norfolk
Portsmouth
Suffolk
Virginia Beach
Danville
Johnson City
Knoxville
Greensboro
Winston-Salem
High Point
Durham
Raleigh
Asheville
Gastonia
Charlotte
Central parallel
35° 15' N
Fayetteville
Jacksonville
Wilmington
Roswell
Sandy Springs
Atlanta
Columbia
84°W
83°W
82°W
81°W
80°W
79°W
78°W
77°W
76°W
37°N
36°N
35°N
34°N
Lambert Conformal Conic projection
North American Terrestrial Reference Frame of 2022
Central parallel: 35° 15' N
Central parallel scale: 0.999 95 (exact)
NOAA's National Geodetic Survey
Areas within ±100 ppm distortion (1:10,000 = ±0.53 ft per mile):
90% of population
78% of all cities and towns
76% of entire zone area
Distortion values (ppm)
Entire zone:
Min = -341
Range = 597
Max = +256
Mean = -14
Cities and towns:
Min = -222
Mean = -25
Max = +246
(weighted by
Range = 469
population)
Created 03/10/2019
Linear distortion at topographic surface (parts per million)
< -400
to -400
to -350
to -300
to -250
to -200
to -150
to -100
±50
to +100
to +150
to +200
to +250
to +300
> +300
0
50
100
150
200
250
km

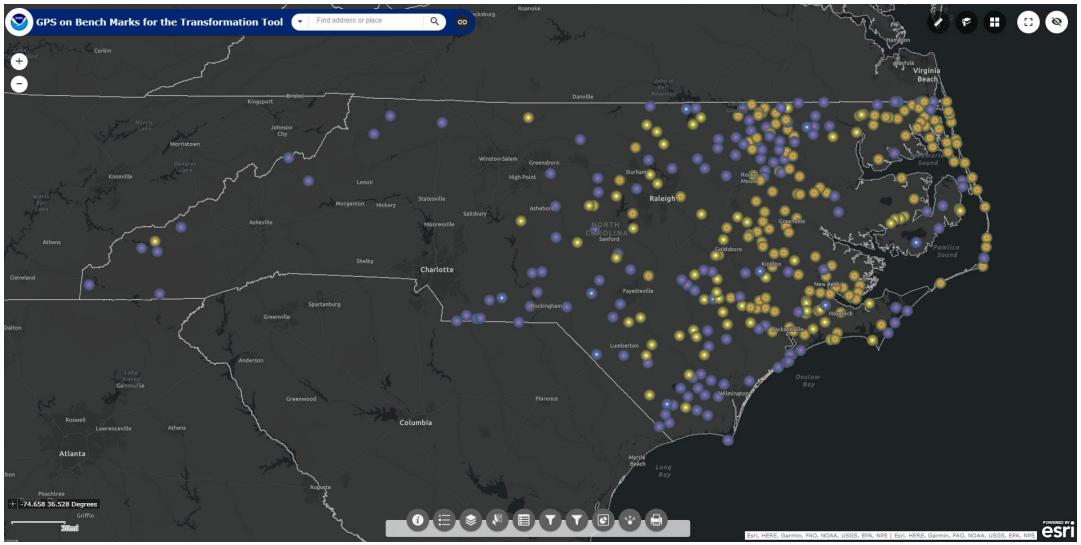
# National Geodetic Survey Global Positioning System (GPS) on Bench Marks 2020

- 2020
  - NGS has prepared a list of geodetic monuments that we review for possible GNSS data collection

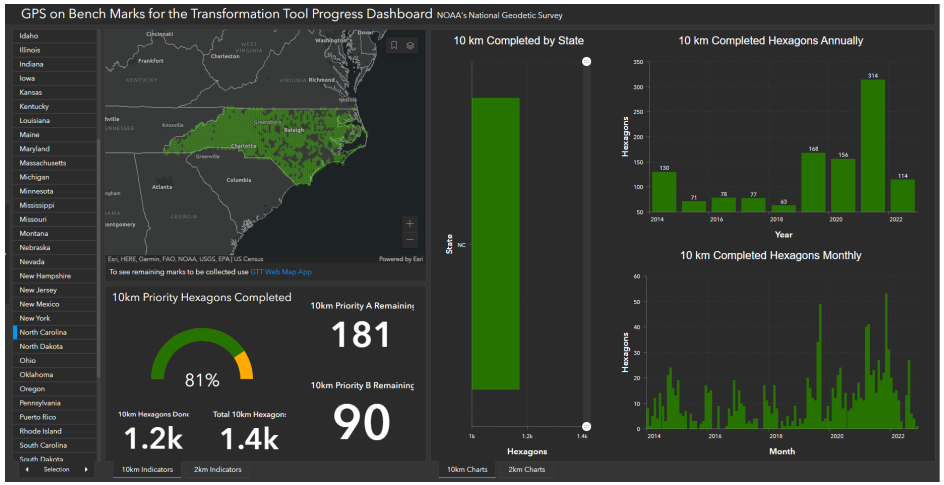


# National Geodetic Survey GPS on Bench Marks

- Status of 4/12/2023



# North Carolina's Progress Dashboard



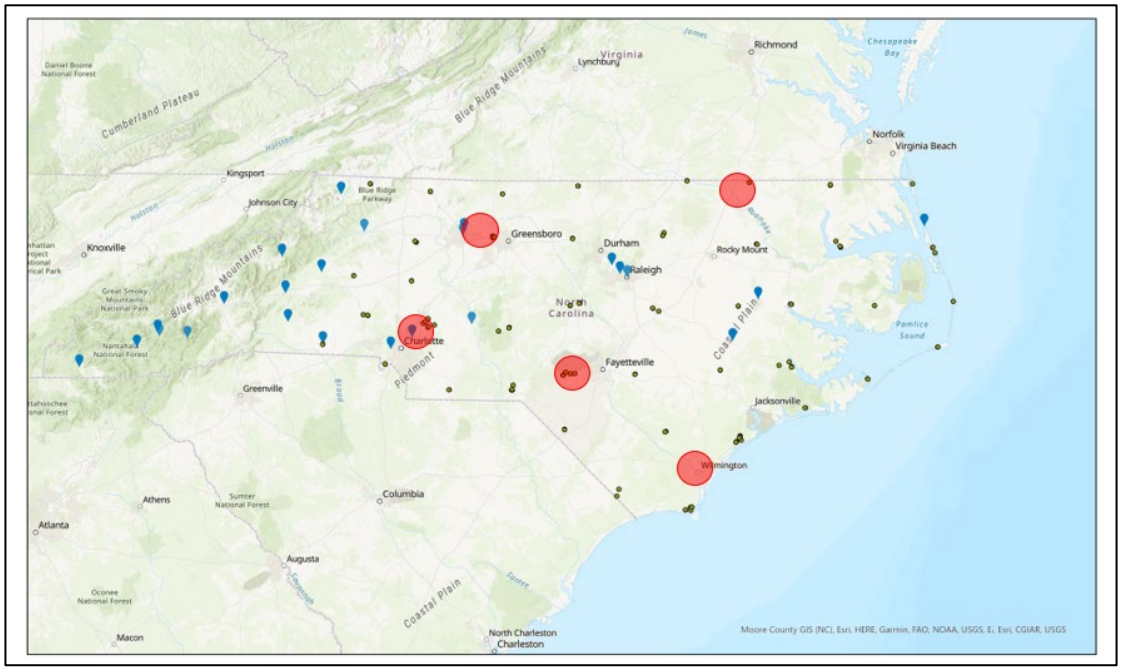

| 10 km Priority A Remaining |
|---|
| 21 |
| **10 Km Priority B Remaining** |
| 90 |

*** NOTICE: NGS has extended the December 31, 2022, cut-off date for GPS on Bench Mark submissions! The new cut-off date to submit GPS on Bench Mark data for use in the 2022 Transformation Tool is now September 30, 2023. ***

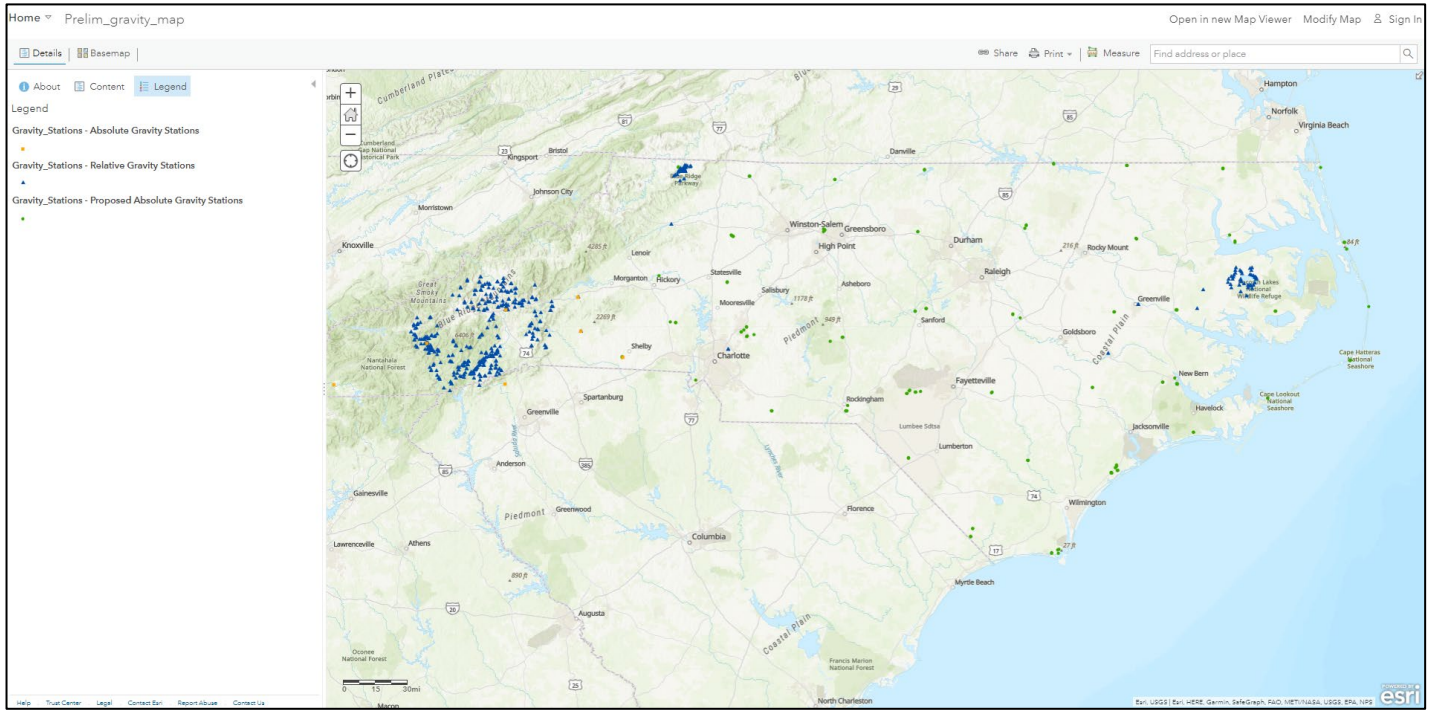
# Gravity Data Collection

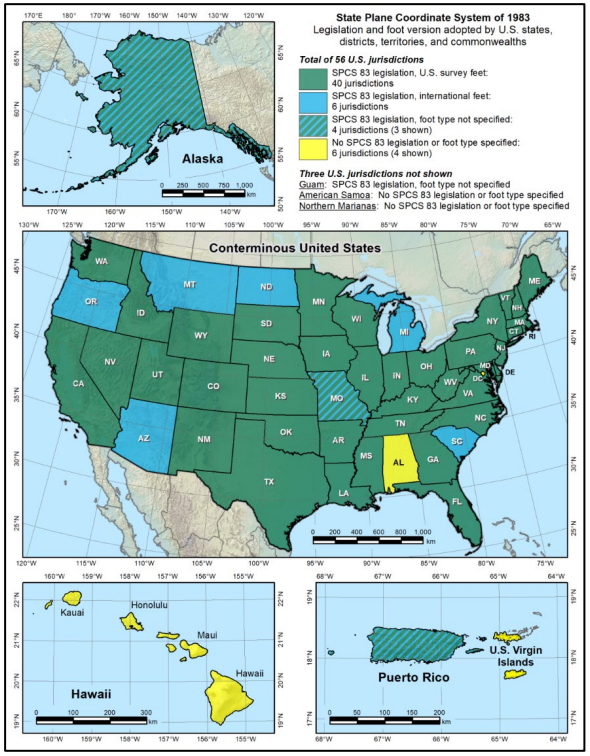
- New gravity marks established
  - Partnered with NGS to establish five (5) new absolute gravity stations in central and eastern North Carolina (NC)
    - Observations performed in August 2022
    - Partnering with National Geospatial Intelligence Agency (NGA) to obtain to two (2) relative gravity meters on loan

# Gravity Data Collection



# Gravity Data Collection






**The Retirement of the United States (U.S.) Survey Foot**

Now that we have stepped into a new year it is time to put an international foot forward. The U.S. survey foot was retired at the end of 2022 by the National Institute of Standards and Technology (NIST) and the international foot is stepping up to take its place. This is due in part to the modernization of the National Spatial Reference System (NSRS) and to provide national uniformity in measuring length.

In North Carolina, the U.S. survey foot is defined in North Carolina General Statute 102-1.1 as the conversion from meters, with one meter being equal to 39.37 inches or a little over 3.28 feet. North Carolina will continue to use the U.S. survey foot for surveying, mapping and other activities that utilize the current North Carolina State Plane Coordinate System until NOAA's National Oceanic Atmospheric Administration) National Geodetic Survey (NGS) publishes the 2022 datums in 2025. **The North Carolina Geodetic Survey recommends that the U.S. survey foot be used with the current horizontal (North American Datum of 1983/2011) and vertical (North American Vertical Datum of 1988) datums. The international foot will be used in North Carolina when the new datums are published by NGS in 2025.**

The U.S. survey foot was originally adopted in 1893 but was updated in 1959 by a difference of two parts per million shorter, or the equivalent of approximately 1/100 of a foot per mile. This change was adopted by several other nations and came to be known as the international foot, moving the world a tiny leap forward. Tiny unless you are measuring hundreds of miles or more or working in the State Plane Coordinate System, then that difference can be measured in feet and that impacts things such as mapping and surveying.

The NSRS standard unit of measurement is a meter, which is in line with the international foot and many applications in the United States have been using the international foot for a long time. However, the 1959 change allowed for a temporary use of the U.S. survey foot for geodetic surveying until the geodetic control networks of the United States could be adjusted. The readjustment was completed in 1986 but the U.S. survey foot continued to march on in most of the states. The intent of the Federal Register Notice to retire the U.S. survey foot by NIST and NGS is to finalize its departure into the history books and use the international foot in conjunction with the modernization of the NSRS in 2025.

Additional information concerning the retirement of the U.S. Survey Foot can be found at this link.

https://www.nist.gov/news-events/news/2023/01/new-years-eve-2023-marked-retirement-us-survey-foot