### Welcome and NGS Activities - Juliana Blackwell

Leadership Update

* Rachel Dempsey - DAA for Navigation, Observations and Positioning for NOS
* Dr Dan Gillins - Spatial Reference System Division Chief
* Dr Dan Roman - Senior Advisor for Geodesy
* Dr Shachak Peeri - Geoscience Research Division Chief
* NGS Director - Juliana will be retiring March 29, 2024. Brad Kearse will be acting director April 1, 2024

Geodesy Crisis and Community of Practice

* Lack of available trained geodesists poses a major risk to national security and economy. There have been a number of organizations that have been working to address this crisis like FGDC, AAGS.
* NGS, NGA, NASA, USGS and others are collaborating to develop a Geodesy Community of Practice
* The Federal Geodesy Community of Practice has had a number of meetings with two meetings coming up this year in DC (April) and Boulder (Fall 2024).
  + COP Working Groups and Themes on slides
  + Addressing the Geodesy Tradecraft is an FY24 priority - from K-12 to professional development

Geospatial Modeling Grants

* NGS awarded $4M in grant funding for projects that will directly address the nationwide deficiency of geodesists.
* Projects will develop tools and models to advance the modernization of the NSRS

Outreach Events

* GeoWeek (Feb 10-13)
* HSRP (March 5-7)
* NSTA Workshop (March 19-24)
* NSGIC Mid-Year (March 24-28)
* UESI NSRS Mod Mini-Session (June 2-4)

NGS Strategic Plan

* Currently working on an updated Strategic Plan that should be available by the end of the year.

### NSRS Modernization Efforts - Dr. Dru Smith

* Geometric Reference Frames and Vertical Datums will be replaced
* NSRS Modernization has been ongoing since 2007
* Will transition from NAD83 (2011/MA11/PA11) to NATRF/PATRF/CATRF/MATRF
* Recent Accomplishments/Deliverables
  + GRAV-D Done - after 16 years and new gravity to geoid team today
  + OPUS Projects update
    - Version 5.1: Bluebooking done for you and loads to the NGSIDB
  + New Least Squares adjustment software: done
    - LASER version 2.4.0 - support for all surveying measurements
  + M-PAGES software exists and can process any GNSS constellation with two frequencies
    - Can be accessed using beta OPUS <https://beta.ngs.noaa.gov/OPUS/>
  + LSA Adjustment Methodology Documented
    - Multi-Epoch Least-Squares Adjustment Problem
    - NGS Library
  + Alpha Site Launched <https://alpha.ngs.noaa.gov/>
    - SPCS2022 and NCAT first products up
    - These are incomplete and not expected to be the final
  + Data Delivery System
    - New “datasheets” for marks and stations have started to be designed
    - Slides showing some of the development CORS site and Datasheet pages
  + Reference Epoch Coordinates (RECs)
    - The Geometric and Orthometric REC projects are underway
    - Geometric epoch 2020.00 coordinates on 120,000 passive marks
    - NAPGD2022 epoch 2020.00 heights on 950,000 passive marks
  + SPROCCET: replacing HTDP
* Timeline
  + Rollout Schedule
    - NGS will roll out components of the modernized NSRS over time (2024-2025)
    - As each component is rolled out and it can be tested
    - Once the final component (likely VERTCON) is rolled out (likely 2025), testing will continue for at least 6 months
    - Once enough testing is done and all modernized NSRS components are rolled out there will be a FGCS vote.
  + Initial Rollout
    - NGS promised many things in the three blueprint documents
    - Not all can be built in timely manner so had to prioritize necessary items
    - Alpha, Beta, Live
      * NGS will use 3 different website URLs as we roll out modernized NSRS
        + Live: <https://www.ngs.noaa.gov> (<https://geodesy.noaa.gov>)

Complete products

* + - * + Beta: <https://beta.ngs.noaa.gov>

Products assumed to be complete and out for testing

Still may change as bugs are identified

* + - * + Alpha: <https://alpha.ngs.noaa.gov/>

Products known to not be complete and will be changing as developments continue

* + - Snapshot of the modernized NSRS at the end of initial rollout
      * Not everything promised in Blueprint documents will be built in time for initial rollout.
        + ITRF2020,
        + NSRSDB, new datasheets for marks and stations
        + RECs
        + OPUS-S will be GNSS
      * Not all products will be publicly available
        + SPROCCET
    - Rollout onto Beta graphic (see slides)
    - Testing into replacement
      * From late 2025 into sometime in 2026, all modernized NSRS components on Beta will go through testing and feedback
      * After FGCS vote, a few months of work remain
        + FGCS will issue FRN officially announcing the adoption of the modernized NSRS
        + The beta website may be wiped or submitted data

### Geodetic Control Theme Update - Dr. Dan Roman

* The Federal Geodetic Control Subcommittee is tied to the Geodetic Control Theme.
  + Theme focuses on the datasets while subcommittee is more for outreach and communication
* The Geodetic Control Theme is one of the National Geospatial Data Assets (NGDA)
  + Passive Control (Bench Marks)
  + NOAA CORS Network - active control
  + Airborne Gravity (GRAV-D)
  + Geoid Heights and DOVs
* Mission of the National Geodetic Survey
  + Is to define, maintain and provide access to the National Spatial Reference System (NSRS)
  + NGS provides a consistent coordinate system that defines latitude, longitude, height, scale, gravity and orientation
  + Current NSRS is realized at passive control marks and extends to them
  + The Modernized NSRS is realized through active control and exists everywhere
  + By definition the vertical will be the geoid minus the ellipsoid height
  + The modernized NSRS will be tied to ITRF2020
* Basis for Usage of the NSRS
  + Current NSRS - Passive Control - started in 1807
* Standards
  + Current NSRS (FGDC revoked by Geospatial Data Act of 2018 [GDA])
    - FGDC-STD-014.4-2008
    - FGCS Bluebook (1994)
    - ISO 19111:2003/07
  + Modernized NSRS
    - GDA passed in 2018
    - ISO 19161-1:2020 - Geodetic References
    - ISO 19111:2019 – Dynamic Frames
    - ISO 19135:2015 – Procedures for item registration
    - Ensuring Interoperability of geospatial data
* The Geodetic Measurement System => ITRS
  + WGS84 can be used for navigation but not positioning
* Organization of data and Interoperability
  + Anything that is a geospatial data asset is subject to the GDA
  + Geoplatform F.A.I.R. - Findable, Accessible, Interoperable, Reusable
  + 3 ways of securing interoperability
    - Converting Data Format
    - Building Integrated DB
    - Using Standard Data Model
* Closing Thoughts
  + The modernized NSRS will be closely aligned to the ITRS
    - 2015 UN resolution on Global Geodetic Reference Frame
    - 2023 UN-GGIM-Americas resolution
    - NSRS will be tied regionally to SIRGAS and globally to ITRS
  + Support for NSRS visibility in planning and policy documents
    - NSDI Strategic Plan, OMB Circular A-16 revision, Agency Strategic Plans
    - Geodetic Control is not just a NOAA dataset, it underpins all data

### NGS Research Plan - Dr. Shachak Peeri

* Overview - Situational awareness
* NSRS modernization - Short term research plans
  + Having cascading efforts from NSRS Modernization
    - Better orbit calculation
    - New ways to process GNSS
    - New M-PAGES Software
    - Enhanced OPUS Services
* NGS long-term research plans
  + Why should we care about developing and maintaining reference systems
    - Safe and efficient navigation - geodetic control
    - Risk reduction
      * Vertical Land Deformation - geohazard monitoring
      * Seafloor geodesy - help to define geohazards better knowing where the plates truly are
      * Space missions supporting geodesy
        + GRACE, SWOT, OPERA, ICESAT
      * Leveraging Legacy Datasets
        + Dynamic observation of geometric and geopotential surfaces
        + Change detection
    - Total water level
* Increase academic and industry engagements
  + Technology - aware of new systems and software
  + Capacity - Do we have knowledge and skill sets
  + Education – what is needed to train the next generation of geodesists

### State Plane Coordinate System 2022 Update - Dr. Michael Dennis

* Part of modernizing the NSRS
* Third generation ([1st 1930’s (SPCS 27), 2nd in 1908s (SPCS 83)]
* Same 3 conformal map projection types
* Same PSCS but different:
  + Based on new terrestrial reference frames
  + More zones (most designed by state stakeholders)
  + Designed to reduce linear distortion at topographic surface
* Lots of maps and charts (see slides)
* Alpha is not final and is preliminary but a great way to provide feedback.
* Walkthrough of the SPCS2022 Alpha Site <https://alpha.ngs.noaa.gov/SPCS/>
* SPCS2022 will be rolled out with the Modernized NSRS (likely 2025)

### National Park Service - GPS on Bench Marks efforts to prepare for NSRS Modernization - Neil Winn

* 2023 OPUS Share Photo Contest
* NPS got very excited about the GPS on Bench Marks effort
* NPS has now shared the most OPUS Shared Solutions in the Department of Interior
* There were many awards for the internal National Park Service effort including:
  + Best Scenery
  + Most challenging Setup
  + Most Professional Setup
  + Most Shared by an individual
* Please check out the slides for the nice photos

### Group Discussion

**Galen Scott:** What does modernization look like for your agencies?

**Neil Winn:** The ability to do high accuracy work is becoming more accessible to users in the field. Field users will be more reliant on software to do their work for them.

**Juliana Blackwell:** NGS has been communicating with industry software/hardware and asking what they will need to adopt the Modernized NSRS. The Alpha products are a direct result of requests from industry about what they would need. That is a big reason why the rollout is going to have so much testing.

**Dan Roman:** We are doing a lot of outreach and some additional outreach will be ION GNSS+ 2024 and AGU in December 2024 in DC.

**Galen Scott:** We developed a form for NSRS Modernization Check-In for Federal Agencies: <https://forms.gle/aryceKpzhEyjZWo58>

**Jeff Danielson:** Will VDatum be available in a standalone mode or will it be entirely replaced by the updated VERTCON?

**Dru Smith:** Currently NCAT and VDATUM both use the same engine for processing. In the future we are planning to make sure that they do use the same code base.

**Shachak Peeri:** VDATUM is currently at version 5 and is aligned with the same transformations. We are planning to also have them aligned in the future as well.

**Mike Michalski:** Not only are we changing all the geodetic datums we are also changing all the water level datums. IGLD will be updated as well as the National Tidal Datum Epoch. Once NGS updates all the geodetic datums the Center for Operational Oceanographic Products and Services (CO-OPS) will be updating the other datums.

**Dan Roman:** This is an example of how we work with our customers since CO-OPS owns the tidal datums but we coordinate with them.

**Larry Hothem:** Policy and Guidance for implementing the modernized NSRS is needed to help federal agencies prepare. Are there plans for having a senior level coordination meeting to help leadership know how to prepare and what needs to be done? Having someone like David Applegate the director of the USGS involved woul be great.

**Juliana Blackwell:** NGS has done a tremendous amount of outreach. Something that needs to be worked on is the Policy aspect that directs Federal Agencies that they should have their data aligned with the NSRS. We also need people involved and aware to help raise awareness that positions and heights will be changing once the NSRS is modernized.

**Andrew Archer:** He is with BOEM and in the preplanning stage. Is there a formal way to request a briefing for BOEM leadership.

**Juliana Blackwell:** Please reach out to any of us involved with FGCS to work and set up a briefing for your group or other groups like yours that are not up to speed. Also making sure we provide the right presentation for leadership so not so technical of an update.

**Dan Roman:** The key here is it is hard to push out and the key is making it policy so that agencies are directed to make the changes. This will often be working with the Department Chief Data Officers or Geospatial Information Officers. The Geospatial Data Act will also help set forth this policy and make sure that any strategic documents include language about geospatial data being tied and aligned with the NSRS.

**Larry Hothem:** The A-16 update will be very important. He feels that the FGDC has had some difficulty with interagency coordination as there has been transition. It would be great to have the FGDC helping this rather than having parallel efforts.

**Juliana Blackwell:** Yes there have been challenges with the transition of the FGDC since the FGCS used to report out to the FGDC Steering Committee but we have not reported out since.

**Dan Roman:** The FGDC leadership has been mostly filled but a major challenge is as you scroll down many agencies do not have representatives engaged with the FGDC. <https://www.fgdc.gov/organization/steering-committee/steering-committee-membership>

**Juliana Blackwell:** She notes there is a FGDC Steering Committee meeting coming up.

**Larry Hothem:** Mentions he can go try and talk with Josh Delmonico with FGDC

**Michael Dennis:** Excited that someone from BOEM is attending. NGS received a request from oil and gas companies (IOGP subcommittees) in the gulf to help design some zones for SPCS to help the migrate from old SPCS 27 zones. The IOGP has been trying to get in touch with BOEM to no avail, can he help?

**Andrew Archer:** Happy to help and we will put Michael and Andrew in touch. BOEM is also using Texas and Louisiana SPCS 27 zones.

**Mike Michalski:** Mike wanted to let people know if anyone has any question about the water level datums they can reach out to him.

**Larry Hothem:** Mentions that today was very informative and he recommends that FGCS should work to have another meeting in 6 months rather than waiting a year.

**Juliana Blackwell:** Agrees and will leave that to the next director or acting director.

**Dan Roman:** Mentions NGS has been engaging at a lot of the large conferences.

**Juliana Blackwell:** Mentions encouraging agency leadership to attend any NSRS Modernization outreach events when attending these large conferences. Juliana asks Larry if he has any PNT or standard updates?

**Larry Hothem:** Dan already covered most of them. Dan had mentioned the ION meeting in Baltimore that will be in the fall and will also have the Civil GNSS.

**Juliana Blackwell:** NGS did hire a Data Manager (Shawn Maddock) to help us have more resources towards data and standards.