

Update on NSRS Modernization and Federal Geodetic Control Coordination

Attendees

National Oceanic & Atmospheric Administration (NOAA)

National Geodetic Survey (NGS)

Center for Operational Oceanographic Products and Services (CO-OPS)

In Room

Juliana Blackwell – NOAA/NGS

Brad Kearse - NOAA/NGS

Dan Roman - NOAA/NGS

Michael Dennis - NOAA/NGS

Galen Scott - NOAA/NGS

Brian Shaw - NOAA/NGS

Webinar

Amanda Lowe – United States Geological Survey (USGS)

Andy Archer – Bureau of Ocean Energy Management (BOEM)

Barry Miller - USGS

Becci Anderson - USGS

Bill Stone - NOAA/NGS

Brett Howe - NOAA/NGS

Cindy Thatcher - USGS

Dana Caccamise - NOAA/NGS

Dan Determan - NOAA/NGS

Dennis Skidde – National Park Service (NPS)

Everett Hinkley – US Department of Agriculture (USDA)

Heidi Ogle - NPS

Jeff Jalbrzikowski - NOAA/NGS

Jeff Oyler - NOAA/CO-OPS

Joel Cusick - NPS

Karen Anderson - NPS

Liz Huselid - USGS

Lori Phillips - USGS

Mei-Ling Freeman - NOAA

Michael Fashoway – Montana State Library

Michael Shelley - NPS

Mike Michalski - NOAA/CO-OPS

Nathan Littlejohn - NOAA/NGS

Neil Winn - NPS

Nigel Shaw - NPS

Philip Rufe - USGS

Scott Martin – California Department of Transportation (CALTRANS)

Scott Thompson-Buchana - NPS

Tim Smith - NPS

GDA Update - Tony Lavoie, NOAA Geospatial Information Officer (GIO)

Objectives for the day

Build Awareness on the Geospatial Data Act (GDA)

Building the National Spatial Data Infrastructure (NSDI) is not a Federal only activity

More reflective of geospatial marketplace

US gov't is not the major funder as it was three decades ago

Increase cost accountability & performance management for Federal Gov

Builds on Government Accountability Office (GAO) 2013 -

Agencies can reduce duplication

Desire for Congressional involvement in the NSDI

GDA Core Objectives

Formalizes federal gov structures related to geospatial data

Provides policy and guidance to empower the use of geospatial data and technology

Facilitates broad cooperation between public and private sector

What is in the GDA

<See slide for bullets>

The Federal Geospatial Data Committee (FGDC) website has a good summary

FGDC had a 2 day meeting to work on determining an action plan for implementing the GDA. Many agencies that had not participated in many years were present. It was decided to create focus groups (Tiger Teams) to work on specific aspects of the GDA.

GDA Tiger Teams (had some delays from shutdown but meets regularly)

Governance & Organization

Data, Standards and Delivery

Covered Agencies and Reporting

Communications and Outreach

Office of Management and Budget (OMB) Implementation Guidance

OMB requested the FGDC to revise the OMB Circular A-16. This group delivered the update to OMB in July 2019 which mirrors the GDA structure.

FGDC and/or GeoPlatform will be used as a repository for additional GDA implementation resources

Expecting OMB to release the A-16 Revised in the near future

Even without OMB guidance it is expected federal agencies to begin reporting in FY20

Stewardship of Data

Requires the FGDC to designate for management by Federal agencies National Geospatial Data Asset (NGDA) data themes. Very much expect this to continue but the FGDC can consider making updates.

Current Approach vs GDA

- Consistent with Current Practices

 - Coordinated with themes

- GDA Changes

 - FGDC Lead Agencies will be at the agency level

 - Federal Geodetic Control Subcommittee (FGCS) will now have NOAA as lead

 - New reporting requirements

 - Annual Theme Implementation Performance Report

 - Comment on FGDC summaries of the Annual Reports

 - Contribute to biennial Congressional report

 - Publish maps and graphics showing extent and status of NGDA Themes

- Theme Reports/Plans/Audits

 - 12 specific reports for themes

Standards to Promote Interoperability

Requires the FGDC to use national and international standards. Establish and promulgate new standards if they do not already exist.

Current Approach vs GDA (see slides for details)

- Consistent with Current Practices

- GDA Changes

Implementation Status and Timeline

- Waiting on OMB to issue A-16 Revised

- Interagency Working Group meeting weekly - two priorities

 - GDA FY20-21 Roadmap

 - Phased Agency Implementation Guidance

 - GDA requires every two years to have the agency Attorney

 - General to perform an audit to make sure the agency is complying with the GDA

- National Geospatial Advisory Committee (NGAC) coordination

Overlaps with Federal Data Strategy and Evidence Act

Provide insights on GDA implementation approach

Identify impacts and opportunities for geodetic control community

- New governance structure may impact current FGCS structure

- Potential ramping up of requirements for planning and reporting

Leadership and best practice opportunities

- Expectation of broad engagement across all sectors

- Standards guidance - best practices

- Opportunities to communicate National Spatial Reference System (NSRS) modernization

Discussion

An initial priority is once we have a better understanding of the reporting mechanisms there will be a need for templates to be developed to help provide consistent reporting across the themes to feed up to the FGDC with their reporting requirements

Another priority is the Theme Reports and standard formats

There is a requirement to have an FGDC Annual Report due to Congress in October so this will need to be started in July

Dan Roman - There have been a number of laws or acts that have been passed. Is there an effort to look at more of the historic acts that provided authority?

Tony - There has been analysis providing a crosswalk across some of the other Acts and how to analyze them

Mechanisms for disseminating to other federal partners

NSRS Modernization Efforts - Dru Smith

Modernizing the NSRS is primarily 5 things

- Updating North American Datum of 1983 (NAD 83)

- Updating North American Vertical Datum of 1988 (NAVD 88)

- Reinventing Bluebooking

- Improving the Geodetic Toolkit

- Modernizing Surveying and Methodologies

Summary of big changes (from slides)

The old	The new
Existing meters-level systematic errors in geocenter and geoid	Alignment to ITRF and IHRF ensures reduction of systematic errors to cm level, globally
Different datums for every physical quantity (dynamic heights, orthometric heights, gravity, DoVs, etc)	The North American-Pacific Geopotential Datum of 2022
The only GNSS supported is GPS	New PAGES software will support all constellations
Lat/Lon/Ellipsoid Height are dominant coordinates	ECEF ITRF XYZ are dominant coordinates
H=h-N does not close	H=h-N closes by definition
Presuming the Caribbean plate is locked in movement with the North American Plate	The two plates will be treated as moving independently
Hybrid geoids ≠ Gravimetric geoids	No more hybrid geoids
Adjusting data in an NGS defined frame	Adjusting data in the ITRF, and then rotating into four NGS defined frames

<p>Assigning a coordinate to a point based upon decades of measurements, without accounting for vertical movements or considering that leveling and GNSS both inform the heights of points</p>	<p>Assigning coordinates to points at every epoch it has ever been surveyed by any kind of instrument, then using those time-dependent coordinates to estimate snapshots of the entire NSRS every 5 years, starting in 2020.00</p>
<p>Adjusting measurements to passive control</p>	<p>OPUS will allow users to perform adjustments any way they wish, but that adjustment won't go into the database. Rather, NGS will ingest their raw measurements in house, combine it with other surveys performed at the same time, and will adjust all that data solely to active control to become part of the NSRS</p>
<p>NGS Bluebooking and Adjustment software is done offline, using command line executables, FORTRAN code, and different approaches for GPS, leveling, gravity (and no support for DoVs or classical surveys)</p>	<p>"OPUS" being expanded to support the processing of all possible data types within a single project, online, with a simple "submit to NGS" button replacing "bluebooking"</p>
<p>Orthometric heights from leveling and/or Height Mod depending upon passive control network that is old, out of date (often by decades) and rapidly disappearing.</p>	<p>Users can adjust a leveling network within OPUS, but will only get <i>differential</i> heights. If they want <i>absolute</i> heights, they will be required to add GNSS to their leveling project according to new NGS specifications.</p>
<p>Mark Discovery means searching the NGS database, printing out datasheets, and hunting physically in the world</p>	<p>New smartphone-enabled, browser-independent mark discover/recovery tool with "find marks near me" functionality.</p>
<p>Mark Recovery done either through a poorly designed web page or WinDESC (which requires download, install, and only works on a PC). Both treat the users as highly trained expert surveyors.</p>	<p>New smartphone-enabled, browser-independent mark discover/recovery tool will allow for both expert users and amateur users. Descriptions can be long and tedious as before, or as simple as a photograph and lat/lon. Submission through a single button to NGS in general, and/or to existing user-specified projects.</p>
<p>A toolbox full of unintegrated FORTRAN-based executables which either don't run online or run in a clunky Pearl-wrapper around said executable.</p>	<p>A fully integrated toolkit (NCAT) with expanded wet datum capabilities (VDatum) run online (interactively or file upload/download), or downloadable to a users computer. Written in JAVA, so platform independent.</p>

Time dependent coordinates with 5 year snapshots

The new Terrestrial Reference Frames (**TRF) will attempt to model the deformation and rotation of the plates

There will be small local deformation in the central plains where things are static

You will see large local deformation in California where things are more dynamic

The most recent Experimental Geoid (xGEOID) has time dependency built into it if you want to see how much things are moving. <https://beta.ngs.noaa.gov/GEOID/xGEOID19/>

The preeminence of the International Terrestrial Reference Frame (ITRF), will build future system on most recent ITRF

EPP2022 - Euler Pole Parameters (a way for describing plate rotation)

Shifts (see slides from presentation)

Drift

Everything in the world moves

Coordinates will be associated with the actual date when collected

In the future people should ask:

“what is the coordinate at a location at a specific date?”

Velocities at all marks can be estimated

Rarely but most accurately is when a point was surveyed multiple times

More commonly but less accurately using a new tool called the Inter

Frame Velocity Model (IVFM2022)

Euler Poles and Plate Fixed

The frame will rotate with the plate helping make the coordinates over time look static

Alpha Products

Set a goal to have all alpha version of products by end of 2019

Partial success, but still working toward a mid 2020 goal

Slight delays with shutdown, complexity of NSRS

Socio Economic Benefits

NGS Gravity Program

Gravity Data Management

Collection of Gravity Data to Support Geoid Modeling

Primary benefit of the gravity program

Improvement of elevation accuracy

2009 study - GRAV-D worth \$522 million per year

2019 study - GRAV-D provides an average benefit about \$8.7B over 10 years

Benefit Determination (see slides)

This study works to estimate how this program compares to if there was no program.

If the adoption rate is much higher than expected it could provide \$33B over 10 years.

Open Discussion

Tim Smith

Tim would like to get a clear and concise letter/directive/briefing to use to hang their hat on for federal agencies using the NSRS. Particularly that currently all Federal Agencies should be using NAD 83 by law to help provide consistency especially building towards 2022. Especially with all the real time data collection and web mapping in "WGS 84 Web Mercator".

Juliana

Creating something to express how the NSRS is still important and useful to provide consistency for data sharing and collaboration.

Tim

Something as a kind of reminder to agency leadership that when agencies chose to publish data in WGS84 Web Mercator they are wrong. Many agencies don't fully understand what they are doing and causing issues for the future.

Juliana

NGS is hoping that the GDA will help to establish how important the A-16 Themes were as well as how there is a major need for making sure Federal Agencies use the NSRS for consistency. NGS is hoping that the GDA will firmly establish this since what was in A-16 is kind of in limbo at the moment.

Dan

The Themes as such are more about management. The GDA is more concerned about the management than adoption of the NSRS. The real importance of the NSRS is to have all data in the same system to minimize costs since working in many different systems costs money.

Tim

Currently there is a distinction between the Geographic Information Systems (GIS) community and the Geodetic community and how people use that as an excuse not to pay attention to datums or spatial accuracy. These two communities are linked and one and the same and we need to drive this point home to users so that they understand that.

Juliana

We will work on a plain language document that helps provide guidance to the surveying and GIS community of why the NSRS is useful and important

Neil Winn

Lack of geocentricity of current NSRS might be a reason for the geospatial community mixing things up.

Dan Roman

A lot of people don't know that they are collecting data in different systems and just believe that they are collecting in the same system as everyone else. In 2022 this will help alleviate this since WGS84, ITRF and NATRF2022 will all be within a small tolerance of each other (cms)

For precise positioning you do really need to be in an ITRF, you cannot get a precise position in WGS84.

Joel Cusick

Repeat observations

Dan

Repeat observations will help give local velocities since the IFVM will be coarse and built where CORS are and interpolated through the gaps

Nigel

Can you explain the Gravity Economic benefits in regular terms?

Galen

The largest benefit will be floodplain mapping improvements.

Dan

Whenever you think gravity you should be thinking heights and your relationships to bodies of water, ocean, lakes, rivers. This will greatly improve understanding your relationships to water and when there is different flooding the locations that will be impacted

Juliana

We are working closely with the USGS and the 3DEP program to help prepare for 2022 and gain significant benefits with the new geopotential datum and the high resolution data being collected today.

Dan

Wants to point out the tilt in NAVD88 in particular in the NW and how the heights are related to water. There are parts in the US that have heights that are off.

Brett

Flood plains are the single largest contributor to the economic benefits of the gravity program

Action Items

1. Share new A-16 Revised once it is put out
2. Work on a plain language letter to other federal agencies on the importance of using the NSRS
3. Brian and Galen will work to have names updated on the Member list.