



Federal Geodetic Control Subcommittee Update

Ronnie Taylor

Acting Director, National Geodetic Survey
Alternate Chair, Federal Geodetic Control Subcommittee

Federal Geographic Data Committee
Coordination Group Meeting
11 January 2011

The fgdc logo features a stylized globe with a network of green dots and lines representing data points and connections. The text "fgdc" is written in a large, bold, blue font, with "Federal Geographic Data Committee" in a smaller font below it.

Federal Geographic Data Committee

Overview

- Geodetic control:
overview & evolution
- FGDC interactions
- FGDC opportunities

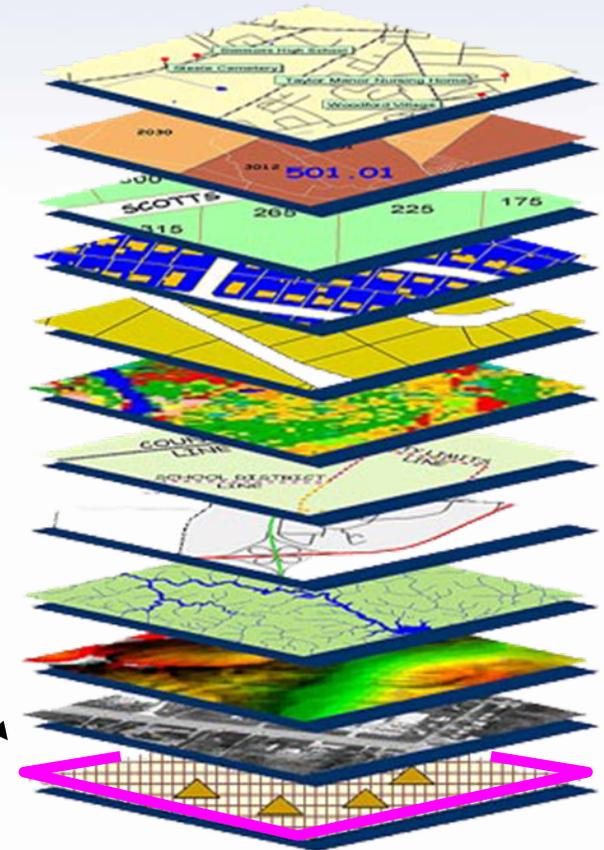
Coordination begins with good coordinates

Geodetic control is the foundation for all geospatial products.

Geodetic Control is the critical “basemap” layer for GIS applications



Source: Zurich-American Insurance Group



•Geodetic control: overview & evolution

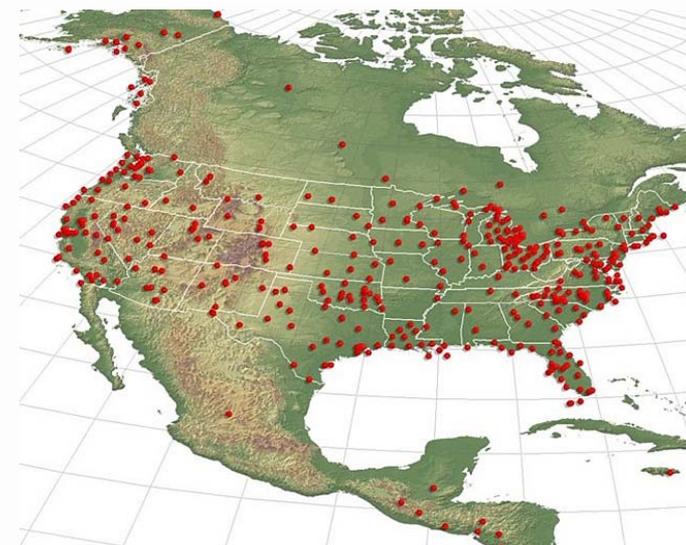
National Spatial Reference System (NSRS)

The NSRS is a consistent coordinate system that defines latitude, longitude, height, scale, gravity, and orientation throughout the United States.



One common datum for all FGDC products (yours too?)

Evolving from passive to active to real-time augmentations →

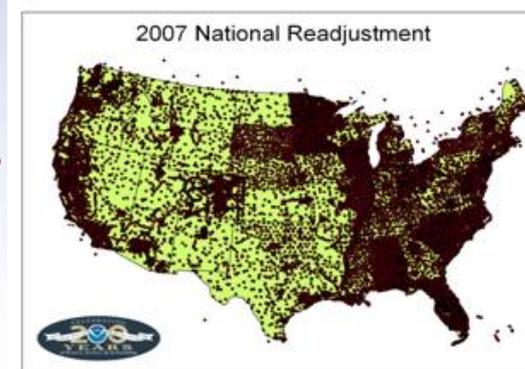


The NSRS has evolved



1 Million
Monuments
(Separate
Horizontal and
Vertical Systems) →

70,000
Passive Marks
(3-Dimensional)



Passive
Marks
(Limited
Knowledge of
Stability) →

1,500 CORS
(Time Dependent
System Possible;
4-Dimensional)

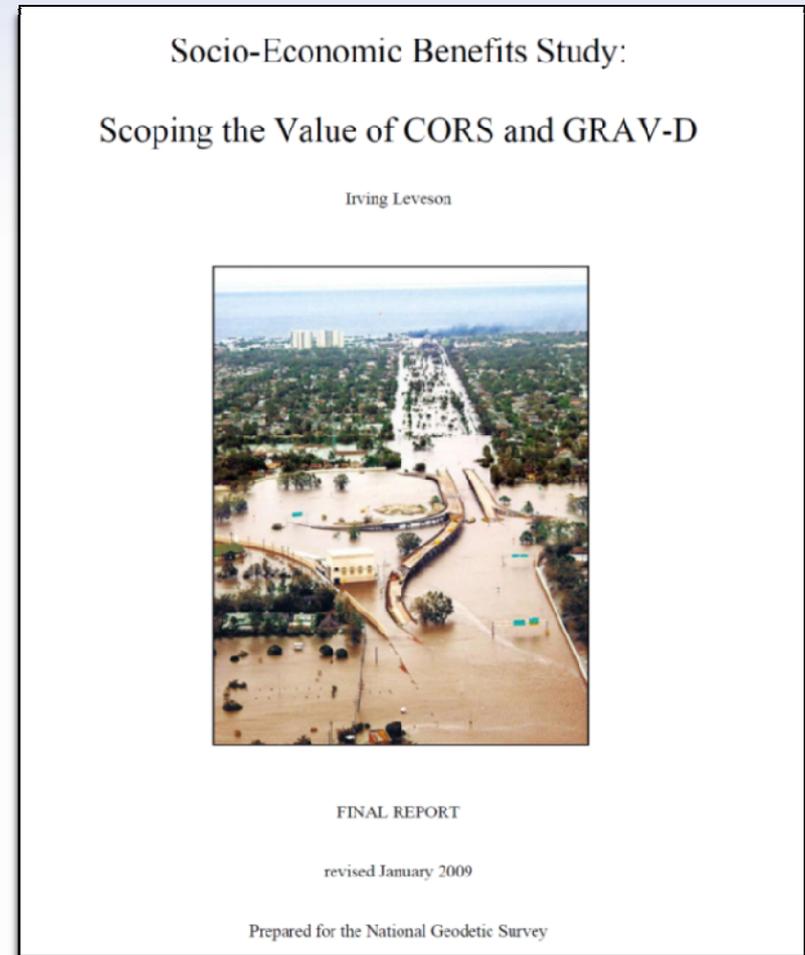


GPS CORS → GNSS CORS



Location, Location, and Elevation! NGS Positioning Products Worth Billions!

- Rolled-out to Congress June 15, 2009
- NSRS** worth **\$2.4 billion per year, \$22 billion over 15 years** at a discounted rate.
- CORS** worth **\$758 million per year; \$6.9 billion over 15 years** at a discounted rate.
- GRAV-D** worth **\$282 million per year; \$4.8 billion over 15 years** at a discounted rate, which includes \$2.2 billion for improved floodplain management.

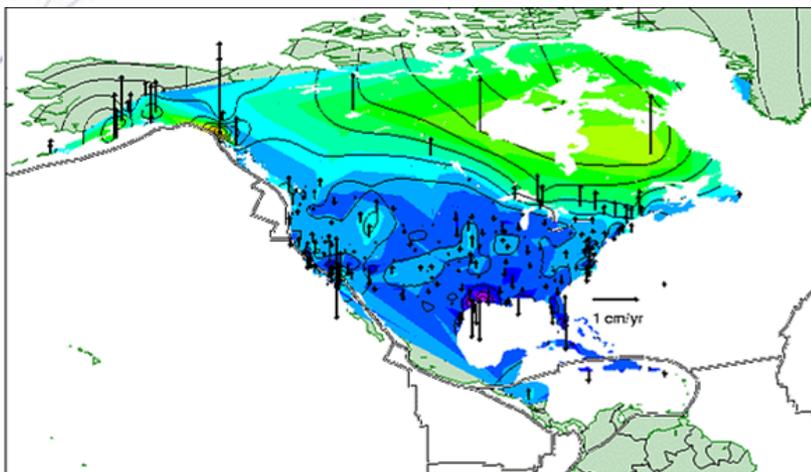


Everyone thinks they are a Geodesist

- GPS use has greatly increased
- traditional FGDC products now have multiple uses and scales
 - accuracy is addictive
- network accuracy or local accuracy?
 - what datum are YOU on?



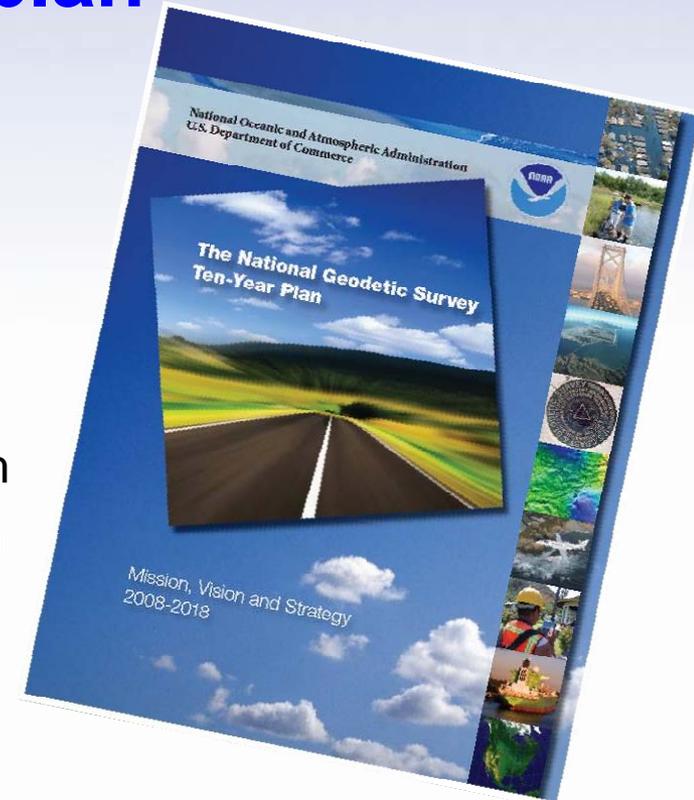
How accurate is the NSRS?



NAD83 vs WGS84 vs ITRF
NAVD88 vs gravimetric geoid
Crustal velocities
Passive networks are aging
(instability, accessibility, loss)

Geodetic Control is Evolving: the NGS 10 year plan

- Approved on 8 January 2008
- Refines mission, vision, and strategy for the future of NGS actions.
- **Emphasis is on building outside capacity.**
- Includes:
 - Modernize the Geometric (“Horizontal”) Datum
 - Modernize the Geopotential (“Vertical”) Datum
 - Migrate the Coastal Mapping Program Toward IOCM
 - Evolve Core Capabilities
 - Increase Agency Visibility



The plan is available on the National Geodetic Survey's home page:

<http://www.ngs.noaa.gov>

•Geodetic control: overview & evolution

Height Modernization

Accurate heights via GPS, along with traditional leveling, gravity, and modern remote sensing observations. Critical for:

- Dam, levee safety
- Evacuation planning
- Hazard mitigation
- Flood-plain mapping
- Subsidence monitoring
- Determining high-water marks



National Geodetic Survey Leveling Online Calculations User Service

LOCUS

[About NGS](#) | [Tools](#) | [Science and Education](#) | [Survey Project Information](#) | [Data Imagery](#)

Information

[Data Submittal](#)

[Project Proposal](#)

[Equipment Information](#)

[NGS Resources](#)

[FAQ](#)

Browse PC for HGZ file:

[Download a clean test file](#)
(Unzip the download file)

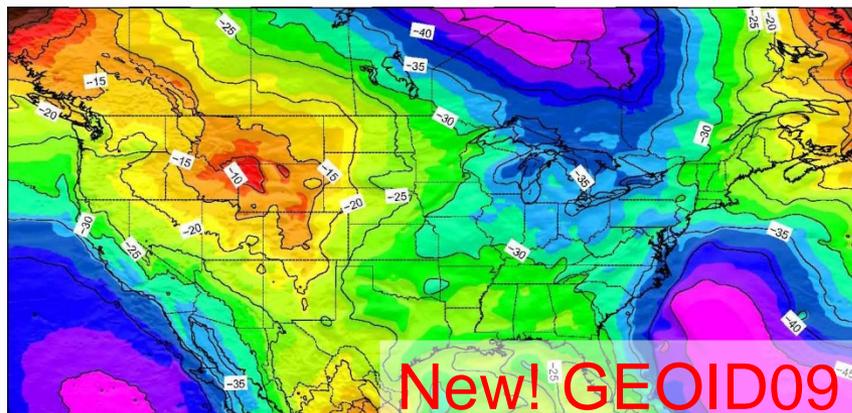
[Download an example error test file](#)
(Unzip the download file)

Information

LOCUS allows users to submit vertical control data, either from an optical instrument or a digital instrument, perform the necessary reductions, apply the necessary constraints, and compute elevations through a standard least squares adjustment process. Users interact with the adjustment process to arrive at the desired result and receive NAVD88 elevations for the control points in the project. The observation data and elevations ARE NOT saved by NGS, nor are they loaded into the NGSIDB.

LOCUS requires data be submitted in ASCII Vertical Bluebook (*.HGZ) format. The National Geodetic Survey endorses and supports the digital leveling software, [Transley](#), for editing, formatting, and checking Vertical Bluebook files.

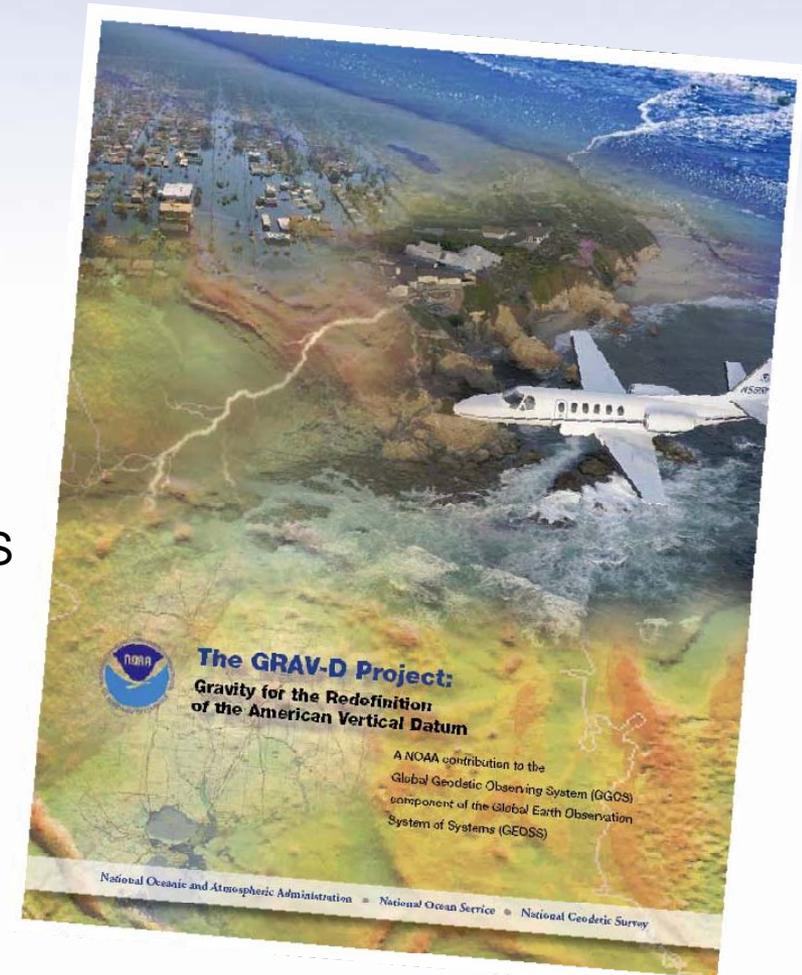
NOTE: If the intent is to submit the leveling data to NGS for evaluation, publishing of benchmarks, and loading into the NGSIDB, the [Project Proposal](#) form must be completed and submitted to NGS and the calibration data for the equipment must be loaded into the NGS equipment database by submitting an [Equipment Information Form](#).



The Future of Height Mod: GRAV-D

Gravity for the Redefinition of the American Vertical Datum

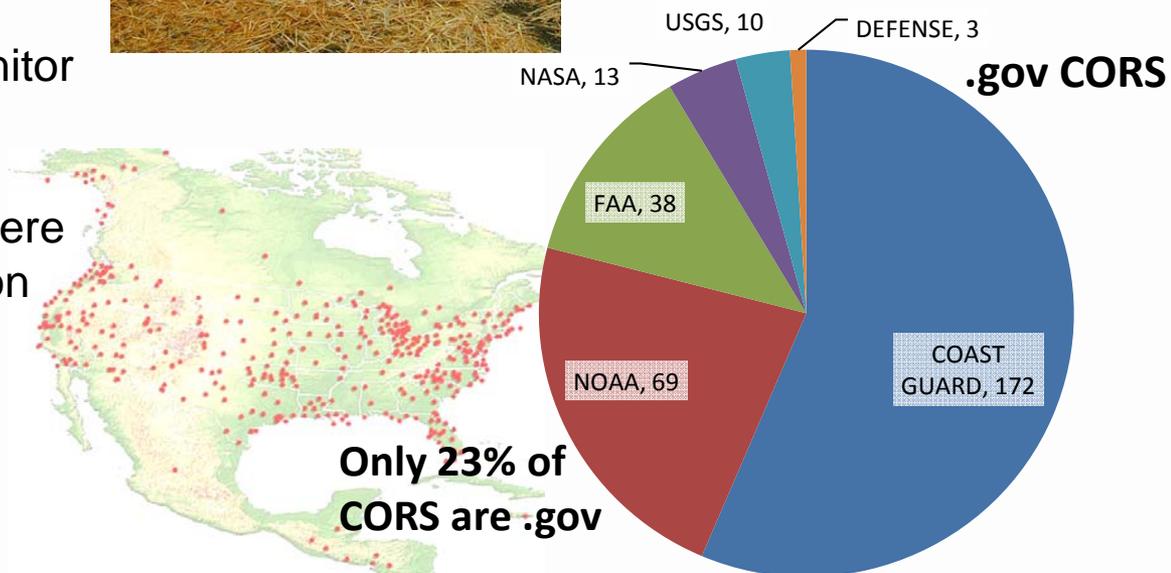
- GRAV-D
 - Airborne gravity survey (10 years)
 - Gravity monitoring into the future
 - Coastal areas surveyed first
 - All USA states and territories
 - www.ngs.noaa.gov/GRAV-D
- 2018-2022 Targets:
 - Orthometric heights (“elevations” on maps) good to 2 cm anywhere, anytime from GNSS technology
 - Height changes easily monitored using new vertical datum
- Gravity for the Nation’ benefits
 - **Imagery for the Nation**
 - **Lidar for the Nation**
 - **Elevation for the Nation**



FGDC members provide CORS

Continuously Operating Reference Stations (CORS)

- Continuous GPS data for post-processing augmentations.
- Provide accurate interface between land and ocean observing systems.
- CORS data are also used to monitor and predict the distribution of moisture in the atmosphere, improving our ability to predict severe weather events, and the distribution of electrons in the atmosphere, to determine space weather.
- A socioeconomic scoping study realized \$6.9 billion in socio-economic benefits over 15 years



•FGDC agency interactions

FGDC members use OPUS

Online Positioning User Service (OPUS)

- GPS data processed using NGS computers and software.
- Your position via e-mail
- 1-2 centimeters accuracy
- Over 1 million positions served
- Rapid-Static now uses 15 minutes of data versus 2-4 hours
- New publishing feature; **acceptable replacement for bluebook?**



OPUS: Online Positioning User Service



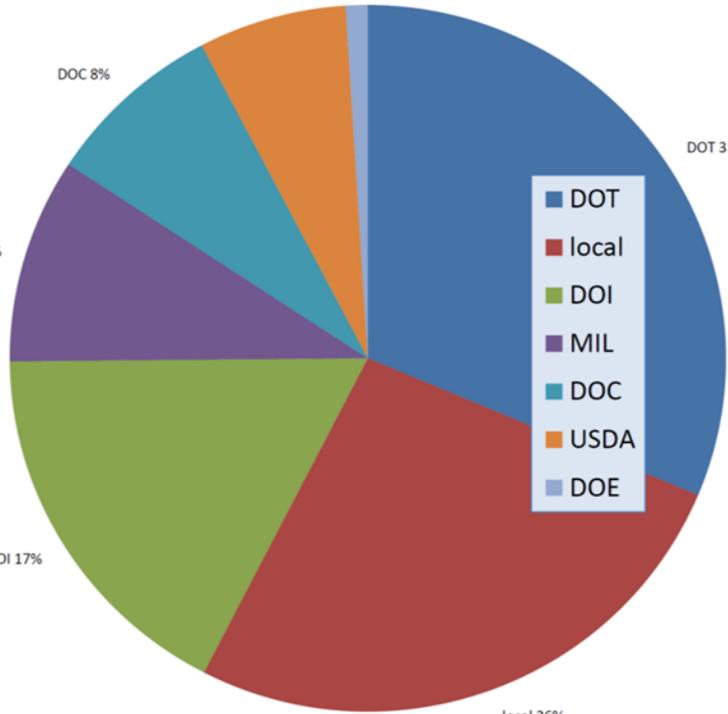
[upload](#)
[view](#)
[about](#)

compute an accurate position for your GPS data file

COMING: On 11/02, OPUS will begin using GEOID09 to compute orthometric height. The current GEOID model will be available via the [OPTIONS](#) page.

1. enter your [email address](#)
2. attach your [DATA file](#)
3. select your [antenna type](#)
4. add your [antenna height](#)
 meters

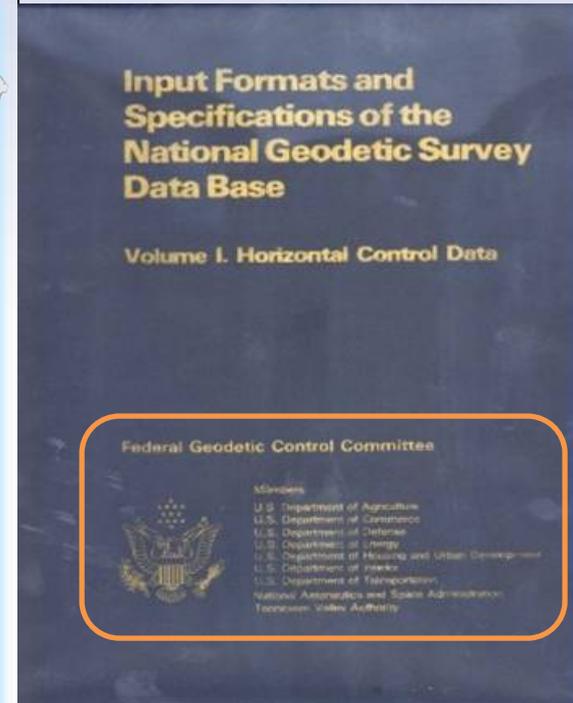
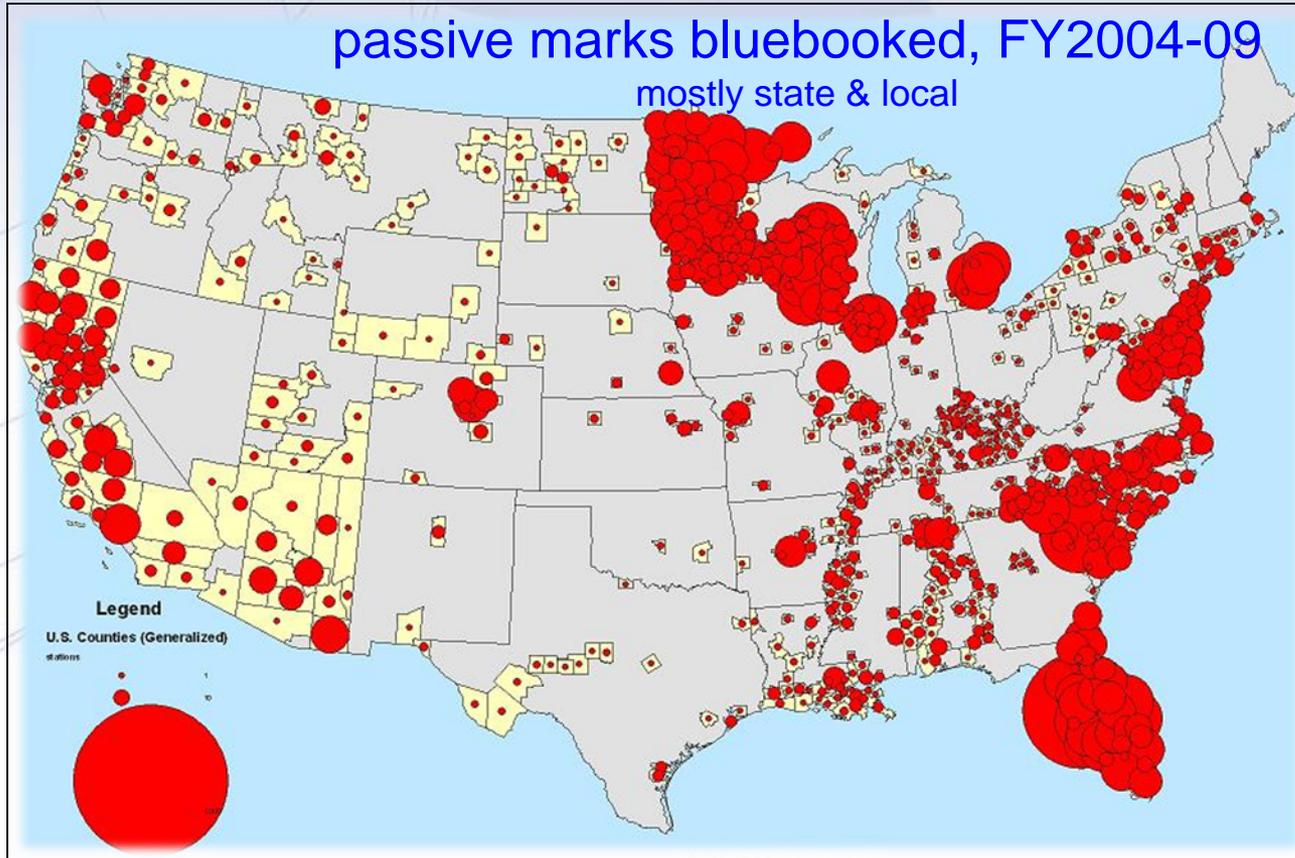
[NOAA privacy policy](#) You



Agency	Percentage
DOT	31%
local	26%
DOI	17%
MIL	10%
DOC	8%
USDA	7%
DOE	1%

•FGDC agency interactions

NGS Integrated Database

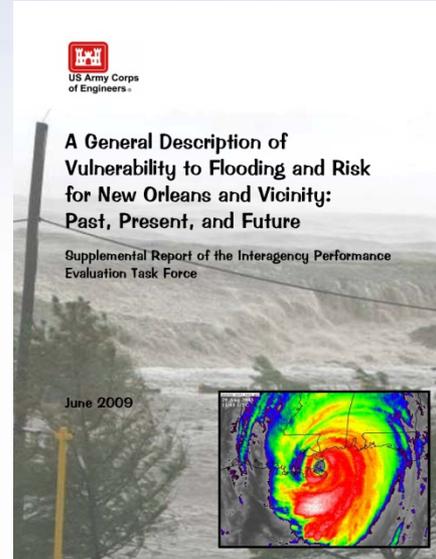


... time to improve passive control archiving and change how passive control is used!

•FGDC agency interactions

United States Army Corps of Engineers (USACE) Levee Inventory

- Working with the Army Corps to utilize a common datum (NAVD88) on all 12,000 miles of levees.
- Advocating the use of VDatum for accurate water levels and geodetic data.
- Writing procedures for obtaining heights at various accuracy needs.
- Developing training materials for Army Corps personnel.



SURVEY DATASHEET (Version 1.0)

ID: 888818
Designation: LOCUST
Sampling: LOCUST 2003
Stability: Measurements of questionable or unknown reliability
Setting: Set into or on top of metal pipe driven into ground
Description: The station is located on the right bank of the Rapahannock River on a small road right at the north of Wainwright Creek in Middleburg Co, VA. It is approximately 100 yards NE of the boat ramp at the north end of Mank Prang Rd, Rt 634. The monument is a 60" aluminum pipe with cap driven into the ground and is 2' above grade.
Observed: 2009-04-16T14:47:00Z
Source: CPUS - page 5 0909 08

Close-up View

REF. FRAME	(EPS) CHL	(SOURCE) DATA	(COMPUTED) USING	(UNITS)	(SEE) PROFILE	(DETAILS)
WAD_83(CO89M)	2002.0000	NAVD88	Computed using (GEODES)	m		

LAT: 37° 36' 37.39339" ± 0.010 m
LONG: 76° 37' 18.46927" ± 0.017 m
ELL HT: 34.237 ± 0.016 m
X: 1180539.845 ± 0.016 m
Y: 4819237.268 ± 0.013 m
Z: 3871253.886 ± 0.018 m
ORTHO HT: 0.977 ± 0.054 m

UTM 18 SPC 4502(VA.5)
NORTHING: 4163653.101m 1145383.160m
EASTING: 367154.857m 3676117.369m
CONVERGENCE: -0.91860960° 1.21074479°
POINT SCALE: 0.99981738 0.99995426
COMBINED FACTOR: 0.99982275 0.99995974

CONTRIBUTED BY
 robert.w.parker
 US Army Corps of Engineers

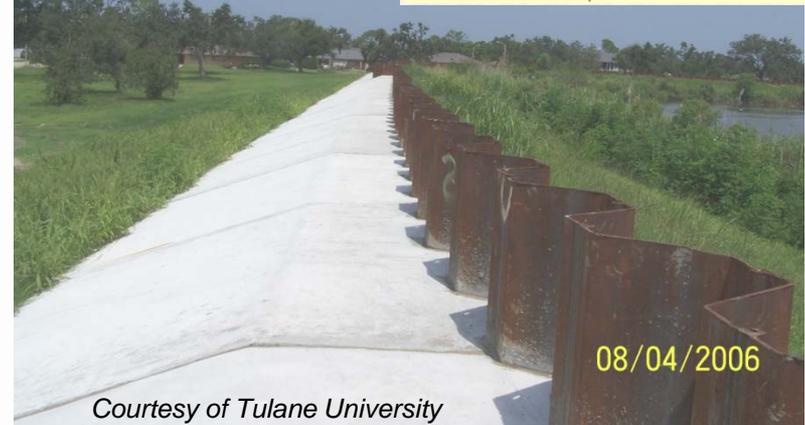
Horizon View

Map **Satellite** **Hybrid**

LOCUST 80
 Get direction: [To here](#) (nearest road)

Map data ©2009 OpenStreetMap contributors, Imagery ©2009 Google

The numerical values for this position solution have exceeded the quality control criteria of the National Geodetic Survey. The contributor has verified that the information submitted is accurate and complete.



Courtesy of Tulane University

Vertical Datum Transformation

File Mode

Latitude: 27.6071 Horiz. Datum: NAD 83, WGS, ITRF

West Longitude: 82.7636

Input Height: 164.1251 Input V-Datum: NAD 83 (86)

Output Height: 85.0000 Output V-Datum: NAVD 88

Meters Feet

Height Soundings

Convert Vertical Datum

IOCM – New Products and Tools Required by Ocean and Coastal Geospatial Data Users

- Interagency Working Group on Ocean and Coastal Mapping (IWG-OCM)
- Coordination of ocean and coastal mapping data and activities
- Partnerships for resource synergies
- Integrated products and services



Goal: Increase efficiency and improve coordination of many Federal mapping agencies.

Work Groups/Membership

Active:

Vertical Reference Systems

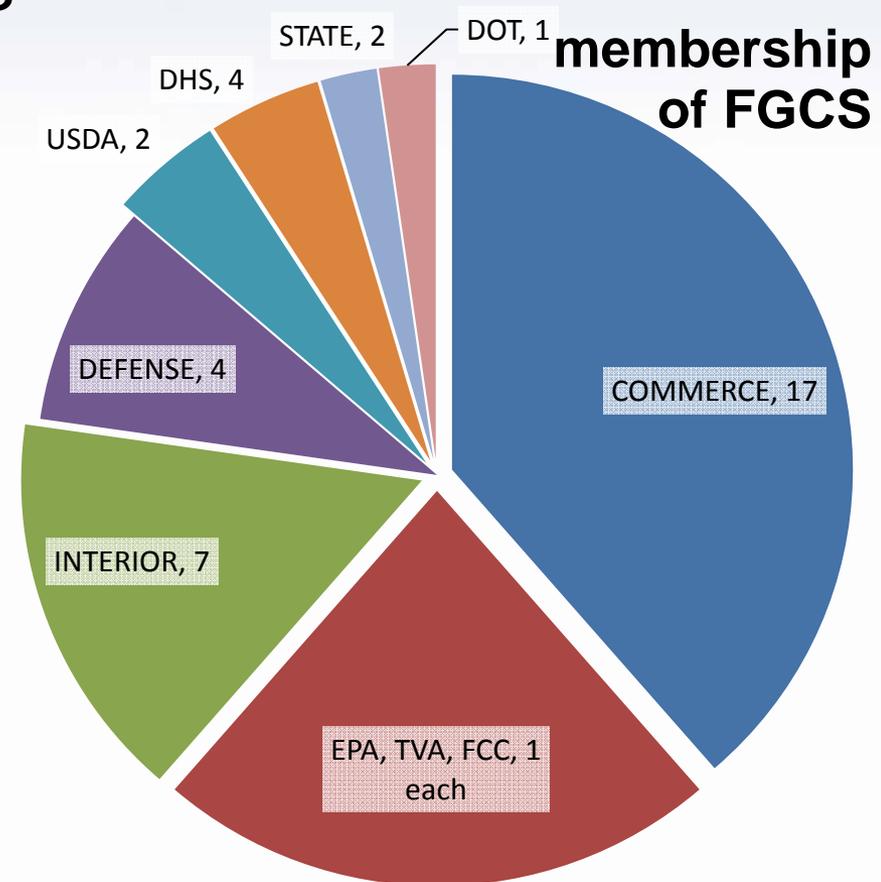
Dormant:

Fixed-Reference Stations

Instruments

Methodology

Spectrum



•Agency interactions

Opportunities for Cooperation

GRAV-D: aircraft, crew, expertise, and funding needed to collect aerial gravity data, to produce a new national vertical datum.

2022 DATUMS: preparing products & users for coordinate and height shifts.

PILOT PROJECTS: testing the impact of replacing the NAVD 88 and NAD 83 datums in NC.

BLUEBOOK: improving the bluebooking process to make it easier for our customers.

STANDARDS: include datum and accuracy tags in metadata.

IBC and IWBC: Canadian and Mexican borders.



• FGDC opportunities

Summary of Accomplishments

Held Federal Geospatial Summit in May 2010 to discuss plans to redefine datums.

Height Modernization:

- Survey Projects : IGLD, Southern Louisiana
- Pilot projects: NC/FEMA project
- Collaboration with USGS, USACE to update water gage datums
- Texas leveling and GPS to validate the geoid model

Project Managers for new Datums

Mark Eckl – Geopotential datum

mark.eckl@noaa.gov

301-713-3176 x117

Joe Evjen – Geometric datum

joe.evjen@noaa.gov

301-713-3194 x109

Summary of FY11 Actions Planned

Continue to engage our Federal partners and stakeholders into our planning process for the new datums

- Subcommittee meetings scheduled for tomorrow and again in July
- Reorganize our subcommittee work groups to align with our focus on the planning and implementation of the new datums

Engage our Federal partners and stakeholders in the definition of the issues related to moving from an NSRS defined by passive monuments to one based on real-time GNSS observations and the geoid

Share draft guidelines for Real-Time Networks (for input)

Submit user guidelines for Real-Time Networks for FGCS approval

Plan for 2012 Federal Geospatial Summit