# Vertical Datum Upgrade

## Changing the Way the District Measures Elevations…

**BIG CYPRESS BASIN BOARD MEETING**

**JULY 14, 2015**

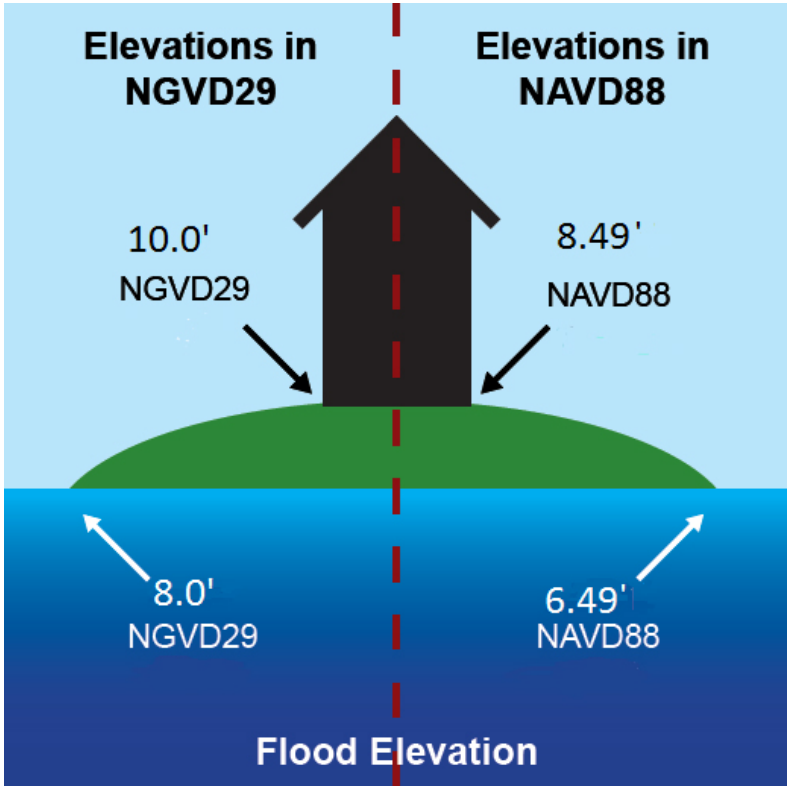
**GREG CANTELO**

**BUREAU CHIEF - INFRASTRUCTURE MANAGEMENT**



# Overview

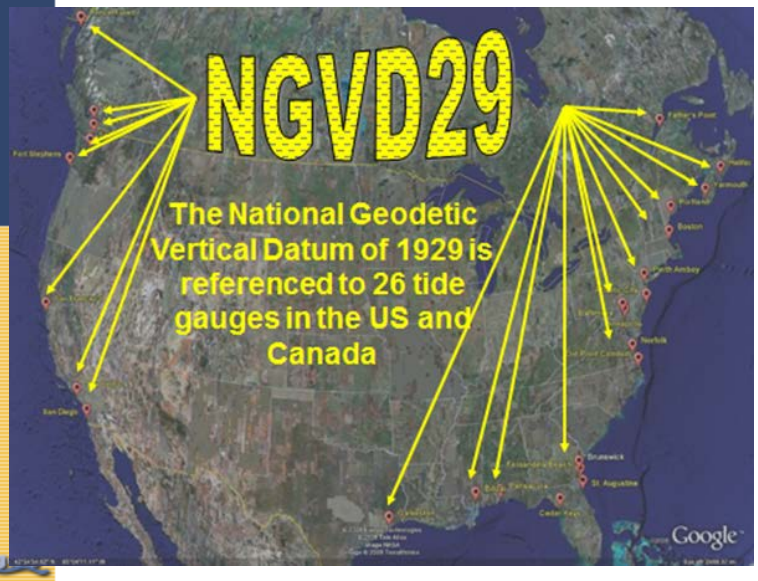
- NGVD 29 vs NAVD 88.
- **V**ertical **D**atum **U**pgrade **P**roject (**VDUP**) Background: Why is the District changing to NAVD 88?
- **VDUP**, What we have done…, What's left to do….

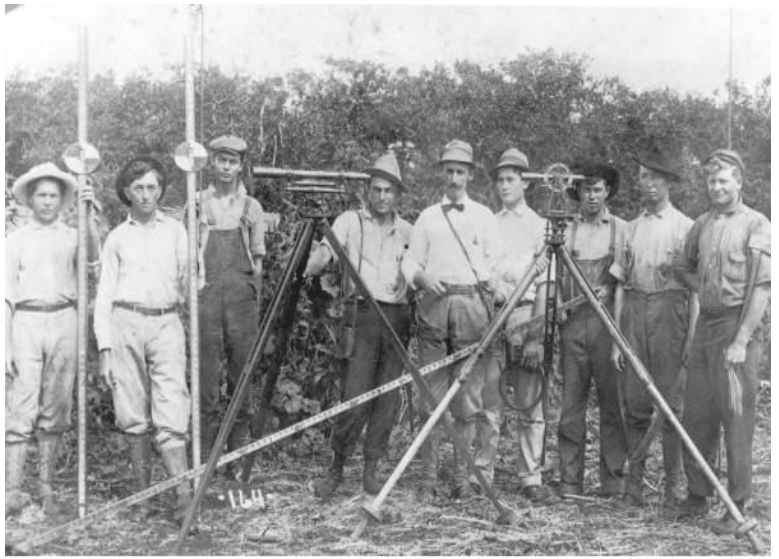


# NGVD 29 vs NAVD 88

## National Geodetic Vertical Datum of 1929 (NGVD 29)

- Based on mean sea level.
- Referenced to a network of 26 tidal gauges across North America.
- Found to be inaccurate due to currents, wind, temperature, topography of the sea bed, barometric pressures and salinity variations at each location.
- SFWMD currently operates in NGVD 29
- National Geodetic Survey (NGS) established a new system to correct the shortcomings of NGVD 29.



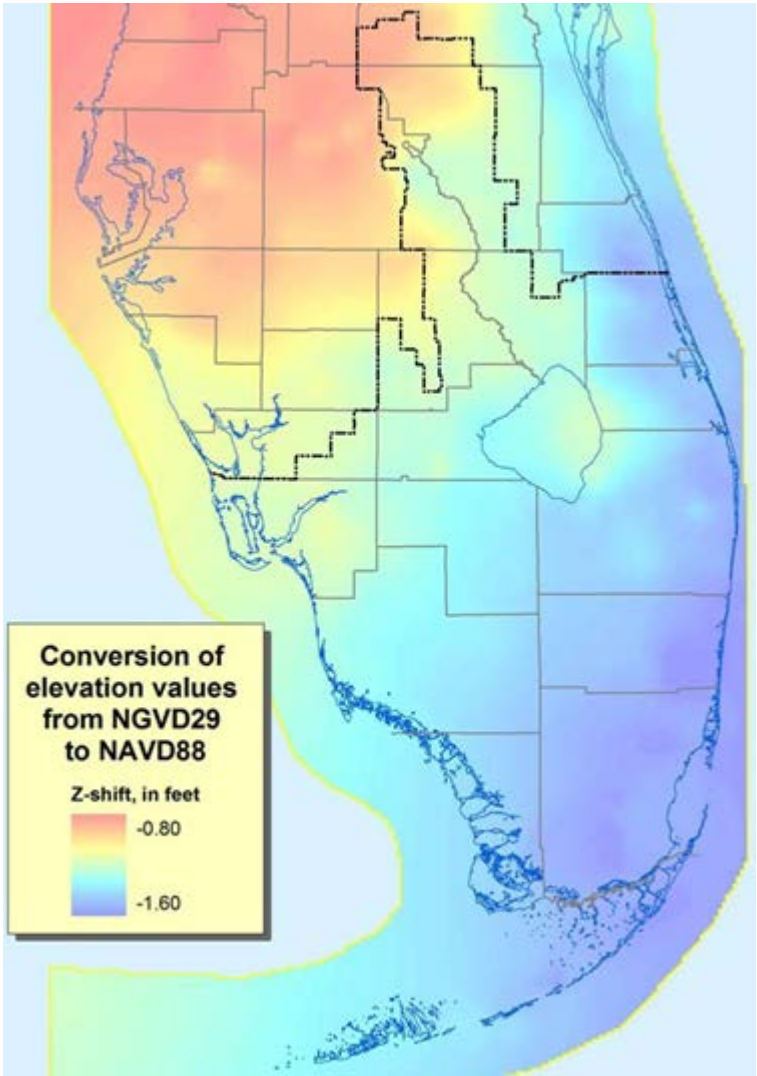
# NGVD 29 vs NAVD 88

## North American Vertical Datum of 1988 (NAVD 88)

- Established in 1991 based on a primary tidal bench mark at Father Point/Rimouski, Quebec, Canada.
- Corrects many problems with NGVD 29 and contains the best fit model for North America.


# VDUP Background: Why is the District changing to NAVD 88?

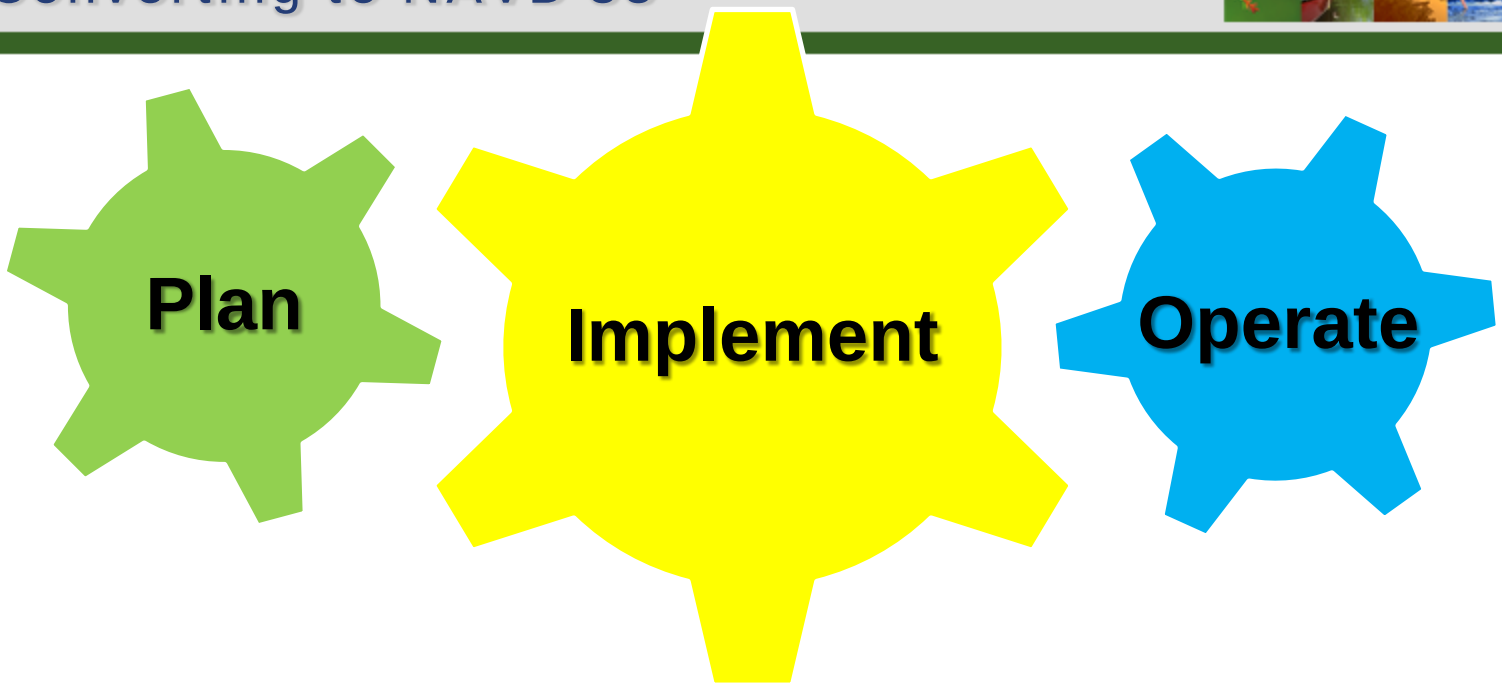
- Across the SFWMD, the datum shift ranges from -0.80 to -1.60 feet.
- New FEMA Flood Maps are referenced to NAVD 88.
- NGS no longer supports NGVD 29 survey control points.



# VDUP Background: Why is the District changing to NAVD 88?

- The SFWMD's mission requires **precise measurement of elevations** in water bodies connected to the water control system.
- **Federal Mandate effective June 24, 1993** affirmed NAVD 88 as the official civilian vertical datum for surveying and mapping.
- Mandate requires all Federal agencies **using or producing** vertical height information undertake an orderly transition to NAVD 88.
- In 2002 CERP, federally funded, required the SFWMD comply with the NAVD 88 transition

# VDUP Background: Converting to NAVD 88




- Planning study completed in 2006. Identified major components of the transition.
- Implementation started in 2006.
- The operation phase is planned to start in 2017.

# VDUP: Where we are and Where we are going

**Currently Surveys, Construction, Engineering and Design are in NAVD 88**

**In process - Install NAVD staff gauges, calibrate sites, and Update Databases, Hydrology Models, Water Regulation Schedules to Support NAVD 88**

**Operate the System in NAVD 88**

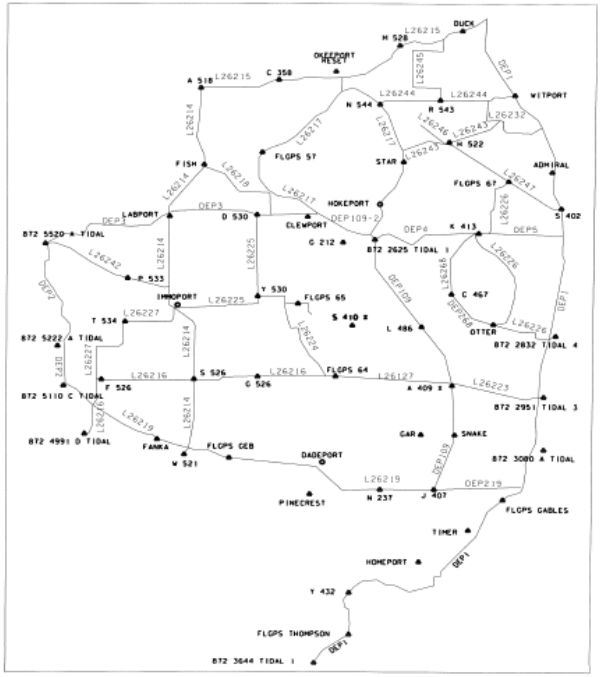
# VDUP: Where we are and Where we are going

GEODETIC VERTICAL CONTROL NETWORK

FINAL REPORT, OCTOBER 2003

US Army Corps of Engineers®
Jacksonville District

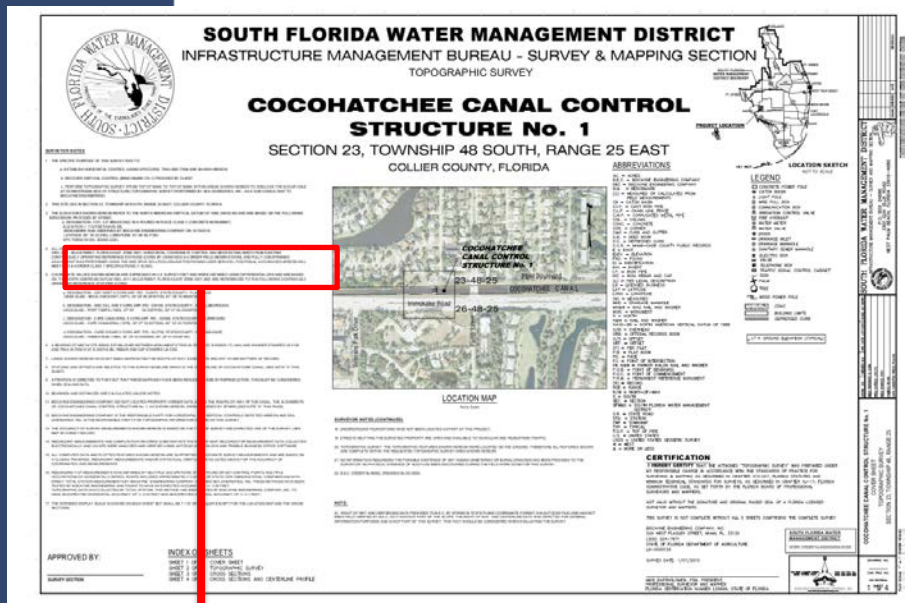
COMPREHENSIVE EVERGLADES RESTORATION PROGRAM
www.evergladesplan.org





- Completed the CERP Vertical Network in NAVD 88 to densify the Vertical Control monumentation.
- Subsequently all benchmarks are established in NAVD 88.
- All District surveys are in NAVD 88.

# VDUP: Where we are and Where we are going

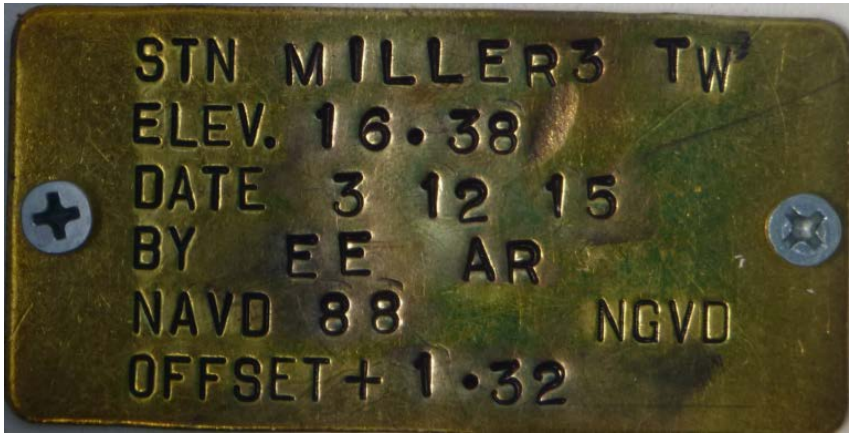

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
INFRASTRUCTURE MANAGEMENT BUREAU - SURVEY & MAPPING SECTION
TOPOGRAPHIC SURVEY

COCOHATCHEE CANAL CONTROL STRUCTURE No. 1

SECTION 23, TOWNSHIP 48 SOUTH, RANGE 25 EAST
COLLIER COUNTY, FLORIDA

LOCATION MAP

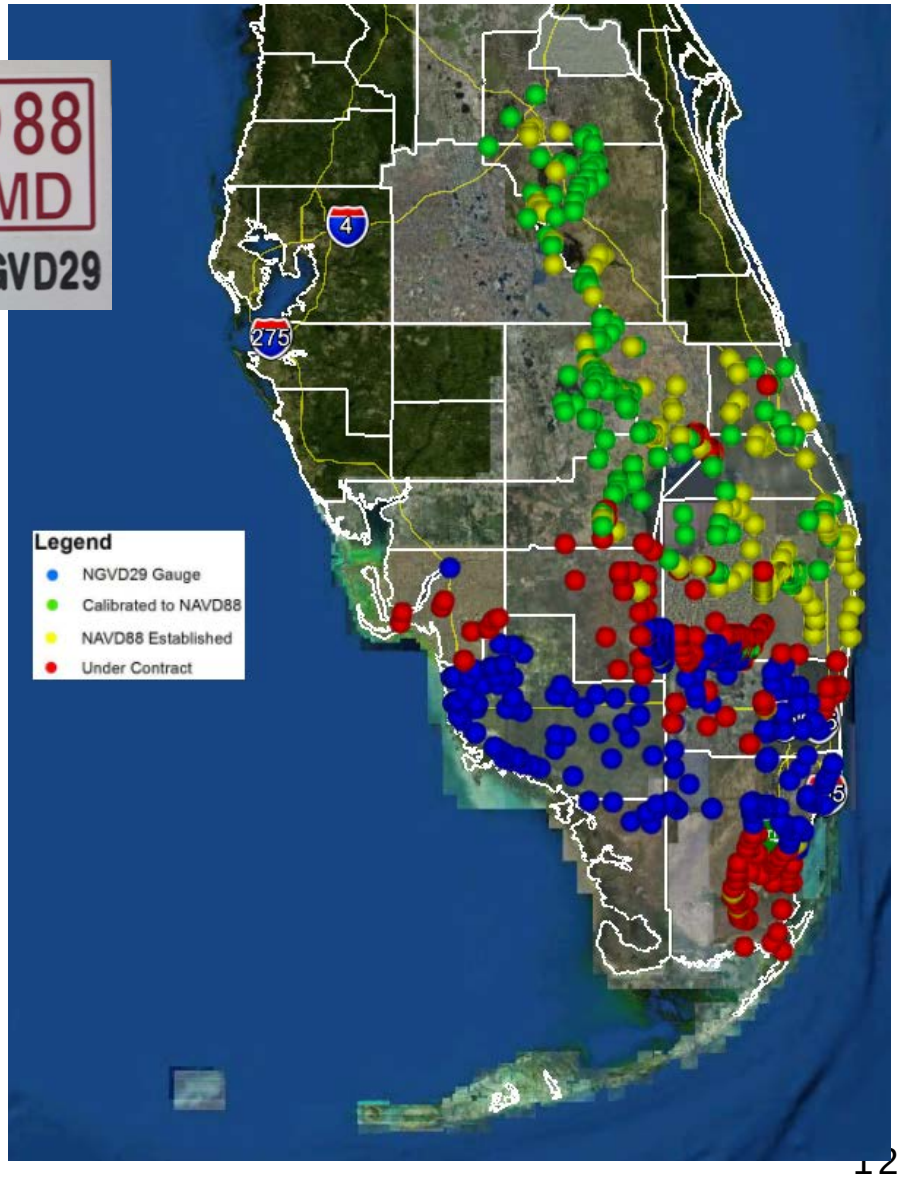
APPROVED BY:




3. THE ELEVATIONS SHOWN HEREON REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1988, (NAVD 88) AND ARE BASED ON THE FOLLOWING BENCHMARK PROVIDED BY SFWMD:
   a. DESIGNATION - CO1, 3.5" BRASS DISC IN A POURED IN PLACE CLASS C CONCRETE MONUMENT,
   ELEVATION = 7.52 FEET(NAVD-88),
   BENCHMARK WAS OBSERVED BY BISCAYNE ENGINEERING COMPANY ON 12/19/2014,
   LATITUDE: 26° 16' 22.5"(N), LONGITUDE: 81° 46' 46.7"(W)
   SPC 705658.551(N), 400680.42(E).

- Construction, Engineering and Designs are completed in NAVD 88.
- Offsets are provided to compare to historical data.
- CORPSCON with the CERP Vertical Network is used for offset determination.

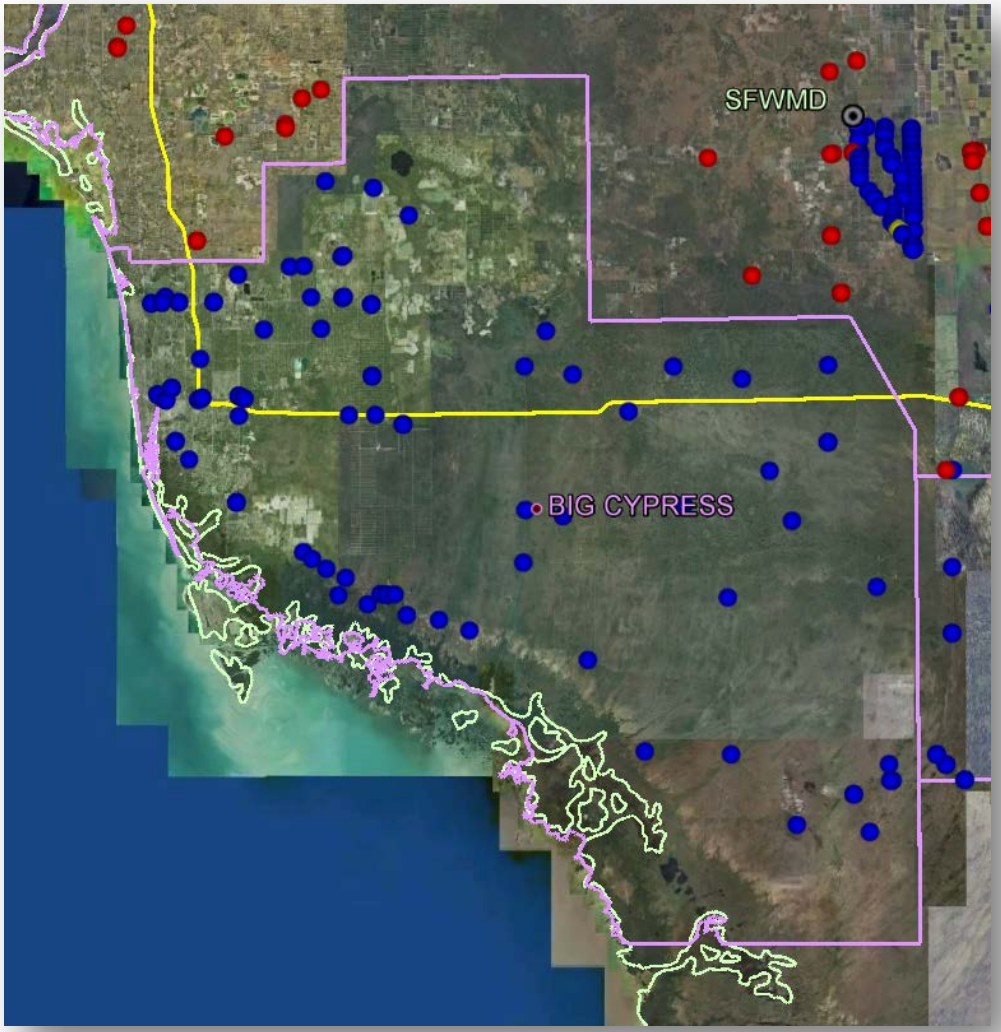
# VDUP: Where we are and Where we are going


- 770 NAVD 88 Staff Gauges installed by end of FY'15.
- Expected to complete the installations by 2017.
- SCADA Systems are being calibrated in NAVD 88.

# VDUP: Where we are and Where we are going

- Approximately 75 staff gauges to be replaced.
- Initial quantity based on stage stations in DBHYDRO
- Number to be refined based on field visits
- Costing based on $5.5K per staff gauge
- Requires approximately $413K of BCB funds in FY'17

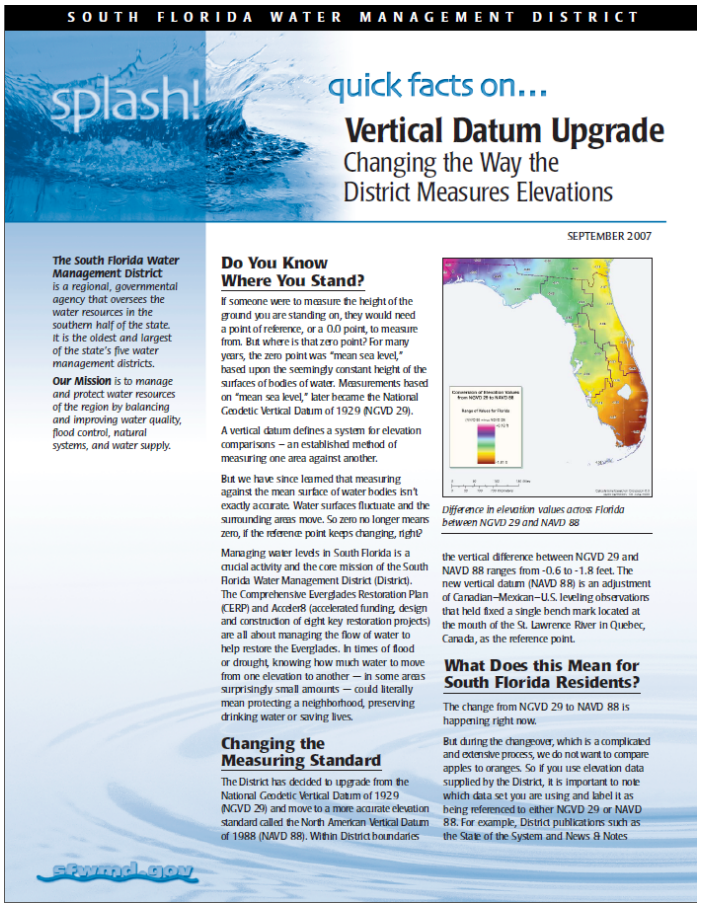


# VDUP: Where we are and Where we are going

- Migrate Operational Plans, Regulation Schedules, etc. to NAVD 88
- Update databases to support NAVD 88
- Update applications and models
- Increase Outreach
- Turn the “Switch” - Real Time Readings in NAVD 88
- Operate the System in NAVD 88

# VDUP: Where we are and Where we are going

- Partnering with Stakeholders, 298 Districts, US Army Corps, local and state agencies is key to the success of this transition.



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

splash!

quick facts on...

**Vertical Datum Upgrade**

Changing the Way the District Measures Elevations

SEPTEMBER 2007

***The South Florida Water Management District*** *is a regional, governmental agency that oversees the water resources in the southern half of the state. It is the oldest and largest of the state's five water management districts.*

***Our Mission*** *is to manage and protect water resources of the region by balancing and improving water quality, flood control, natural systems, and water supply.*

**Do You Know Where You Stand?**

If someone were to measure the height of the ground you are standing on, they would need a point of reference, or a 0.0 point, to measure from. But where is that zero point? For many years, the zero point was "mean sea level," based upon the seemingly constant height of the surfaces of bodies of water. Measurements based on "mean sea level," later became the National Geodetic Vertical Datum of 1929 (NGVD 29).

A vertical datum defines a system for elevation comparisons – an established method of measuring one area against another.

But we have since learned that measuring against the mean surface of water bodies isn't exactly accurate. Water surfaces fluctuate and the surrounding areas move. So zero no longer means zero, if the reference point keeps changing, right?

Managing water levels in South Florida is a crucial activity and the core mission of the South Florida Water Management District (District). The Comprehensive Everglades Restoration Plan (CERP) and Acceler8 (accelerated funding, design and construction of eight key restoration projects) are all about managing the flow of water to help restore the Everglades. In times of flood or drought, knowing how much water to move from one elevation to another — in some areas surprisingly small amounts — could literally mean protecting a neighborhood, preserving drinking water or saving lives.

**Changing the Measuring Standard**

The District has decided to upgrade from the National Geodetic Vertical Datum of 1929 (NGVD 29) and move to a more accurate elevation standard called the North American Vertical Datum of 1988 (NAVD 88). Within District boundaries



*Difference in elevation values across Florida between NGVD 29 and NAVD 88*

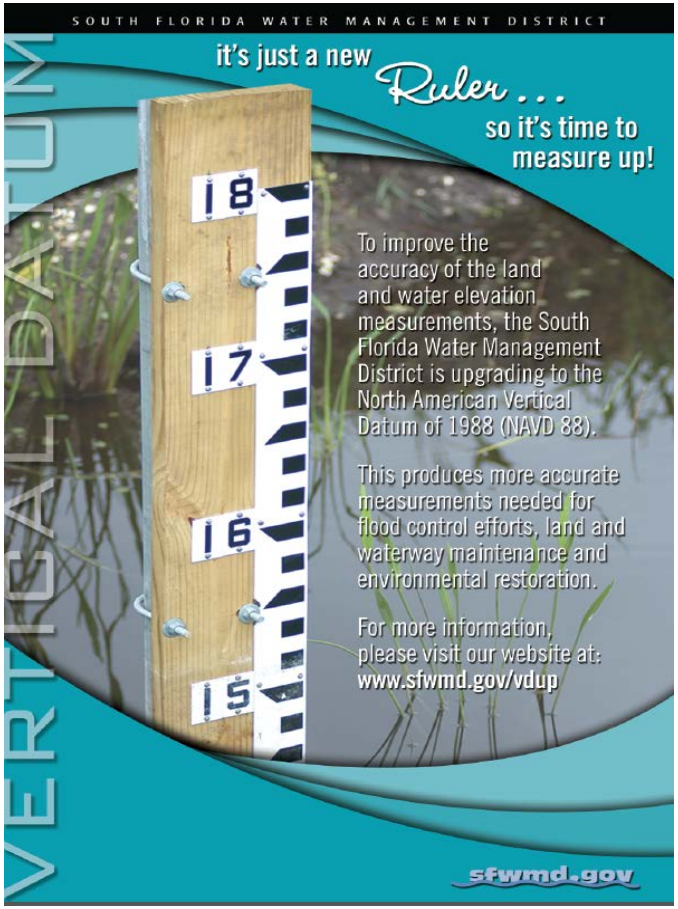
the vertical difference between NGVD 29 and NAVD 88 ranges from -0.6 to -1.8 feet. The new vertical datum (NAVD 88) is an adjustment of Canadian–Mexican–U.S. leveling observations that held fixed a single bench mark located at the mouth of the St. Lawrence River in Quebec, Canada, as the reference point.

**What Does this Mean for South Florida Residents?**

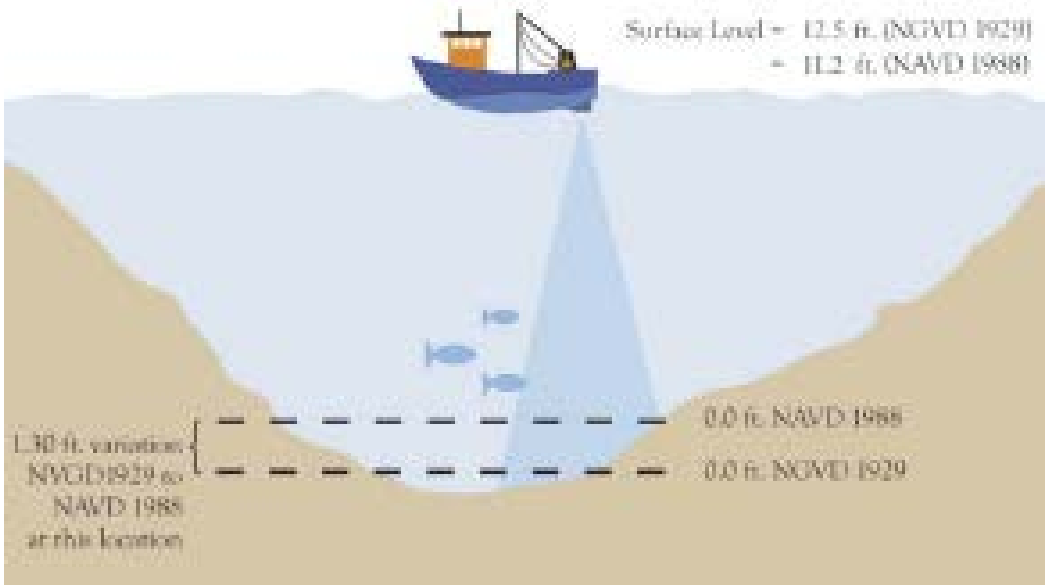
The change from NGVD 29 to NAVD 88 is happening right now.

But during the changeover, which is a complicated and extensive process, we do not want to compare apples to oranges. So if you use elevation data supplied by the District, it is important to note which data set you are using and label it as being referenced to either NGVD 29 or NAVD 88. For example, District publications such as the State of the System and News & Notes

sfwmd.gov



# Questions?




Water surface elevations, in NAVD 88 and NGVD 29

Water depth remains the same regardless of the datum. A boat floating on the surface with a depth sounder will report the same depth, whether using NAVD 88 or NGVD 29 values