Flood Tool Analyst and Design
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• Enables users to visualize anticipated flooding effects on and around Langley AFB.

• Roads, bridges, water, and sewer systems can be damaged by coastal flooding. Users can use the Flood Tool to assess infrastructure vulnerabilities and associated environmental and economic issues to determine the necessary steps to protect these assets.
History
Coordinate Systems

• Geodetic Datum (Definition)
  1. A set of constants specifying the coordinate system used for geodetic control, i.e., for calculating the coordinates of points on the Earth.

  2. The datum, as defined in (1), together with the coordinate system and the set of all points and lines whose coordinates, lengths, and directions have been determined by measurement or calculation.
Coordinate Systems

• Geodetic Datum (Examples)

The North American Datum of 1927 (NAD27)

• A Horizontal Control Datum for the United States.
• Defined by the location and azimuth (on the Clarke spheroid of 1866) of a station at Meades Ranch in Kansas.

• The geoidal height at Meades Ranch was assumed to be zero.
Coordinate Systems

• Geodetic Datum (Examples)
  The North American Datum of 1983 (NAD83)
    • Horizontal control datum for the United States, Canada, Mexico, and Central America.
    • Based on a geocentric origin and GRS 80.
    • Designated the legal horizontal datum for the United States by the Federal government.

NAD83 (1986)
  • Based on the adjustment of 250,000 points including 600 satellite Doppler stations.
Coordinate Systems

• Geodetic Datum (Examples)
  NAD83 (HARN/HPGN)
    • High Accuracy Reference Network
    • A statewide or regional upgrade in accuracy of NAD 83 coordinates using GPS observations.
    • A-order stations 5 mm +/- 0.1 ppm
    • Always indicated with a year: NAD83 (1992)

NAD83 (CORS96)
  • Coordinates transformed from ITRF
  • best-fit 7-parameter between ITRF & HARN
Coordinate Systems

• Geodetic Datum (Examples)

WGS 84

• Geocentric, ECEF XYZ
• WGS 84, WGS 84 (G730), WGS 84 (G873)
• G873 used ITRF94 (epoch 1997.0) station coordinates for its adjustment.
• G873 is believed to agree with ITRF94 at 2 cm. (at the same epoch)
• Similar results for G1150
Coordinate Systems

- ECEF (Earth Centered, Earth Fixed)
Coordinate Systems

Why use polar coordinates?

– Convenient 2-D coordinates to approximate locations and directions on the surface.

– Third dimension describes changes in height. (approximately)
Vertical datum

- A vertical datum is used for measuring the elevations of points on the sea level. Vertical datums are either: tidal, based on sea levels; gravimetric, based on a geoid; or geodetic, based on the same ellipsoid models of the Earth used for computing horizontal datums.
- In common usage, elevations are often cited in height above sea level, although what “sea level” actually means is a more complex issue than might at first be thought: the height of the sea surface at any one place and time is a result of numerous effects, including waves, wind and currents, atmospheric pressure, tides, topography, and even differences in the strength of gravity due to the presence of mountains etc.
Tidal Datums

- **Orthometric datums**: those employ the Earth's gravity field as their datum. Any height referenced to the Earth's gravity field can be called as "geopotential heights";
- **Tidal datums**: those based on tidally-derived surfaces of high or low water. Tidal datums are local datums and are referenced to nearby monuments. Tidal datums are referenced to stages of the tide at a particular point. At a point we have tidal datums, such as Mean Low Water (MLW) and a Mean Lower Low Water (MLLW). Both are referencing a low water, but are computed differently due to the definitions of MLW and MLLW. There are many other different definitions of high, low and mean water used around the world.
- **Three-dimensional datums**: those are defined by using a reference ellipsoid and six geocentric parameters expressing origin, and orientation. Unlike a horizontal datum, a three dimensional datum provides the foundation for accurate determination of ellipsoidal heights. In VDatum, these 3-D datums are also considered as a type of vertical datum.

**MLLW**

The average of the lower low water height of each tidal day observed over the National Tidal Datum Epoch. For stations with shorter series, comparison of simultaneous observations with a control tide station is made in order to derive the equivalent datum of the National Tidal Datum Epoch.
Tidal Datums

**Tidal Levels and charted Data**

- MHHW (Mean Higher High Water)
- MHW (Mean High Water)
- MSL (Mean Sea Level)
- MLW (Mean Lower Low Water)
- MLLW (C.D. Chart Datum)

**Sea surface at any time**

- Height of tide
- Observed depth (Sounding)

**Charted features**

- Charted clearance, vertical
- Charted depth
- Charted heights

**Planas of reference are not exactly as shown below: for all charts. They are usually defined in notes under chart titles.**

**Tide gauge → T**

- Charted HW (coast) line
- Land survey datum

**Graph**

Alameda, San Francisco Bay, California

- Tue, 07/21/09 11:56 PM PDT
- Wed, 07/22/09 06:57 AM PDT 01:52 PM PDT 06:50 PM PDT

- Moonrise
- Moonset
- Sun rise
- Sun set

- 06:44 AM PDT 09:01 PM
Surveying
Data

Over 18,000 Unique Survey Point
Software

Trimble Business Center

Esri ArcMap

Esri ArcIMS
Aerial Imagery
Lidar

• a remote sensing technology that measures distance by illuminating a target with a laser and analyzing the reflected light. Although thought by some to be an acronym of Light Detection And Ranging, the term **lidar** was actually created as a portmanteau of "light" and "radar".
DEM

- a digital model or 3D representation of a terrain's surface
Layers

• Digital Elevation Model
• Buildings
• Sidewalks
• Roads
• Airfield Surface
• Aerial Imagery
How it works

Input
Storm Surge

GeoData

Run SQL query
Select Building < Predication

Run SQL query
Select Elevation < Prediction

Output
Map
5.5 Feet of Water
6.5 Feet of Water
7.5 Feet of Water
Questions?