GEOID MODELING:

Geoid modeling is a topic of current geodetic research and involves sophisticated mathematical techniques. A simplified explanation of the procedure is that gravity data from various sources are used to compute the shape of the geoid. The geoid shape (curved surface) is positioned above (or below) the reference ellipsoid according to more precisely known geoid heights at those stations having both accurate orthometric heights and ellopsoid heights. Two recent geoid programs available from the NGS are GEOID93 and GEOID96.

FROM THE "README" FILE ACCOMPANYING PROGRAM GEOID93:

The GEOID93 model was computed on January 26, 1993 using over 1.8 million terrestrial and ship gravity values. The method of computation uses a Fast Fourier Transform (FFT) technique to compute the detailed geoid structure, which is combined with an underlying OSU91A geopotential model. The result is a geoid height grid with a 3' X 3' spacing in latitude andlongitude, referred to the Geodetic Reference System 1980 (GRS 80) normal ellipsoid. By comparing the GEOID93 model with combined GPS and leveling, the GEOID93 has roughly a 10-cm accuracy (one sigma) over length scales of 100 km. Better accuracy is seen over shorter lengths. At transcontinental spacings the accuracy of GEOID93 will be governed by the accuracy of the underlying global geopotential model, OSU91A. In some locations of the country, long-wavelength errors in GEOID93 up to a 1 to 2 part-per-million level may occur. Because of better data quality and coverage, and better computational procedures, GEOID93 possesses better accuracy in mountains when compared to GEOID90.

FROM THE "README" FILE ACCOMPANYING PROGRAM GEOID96:

The GEOID96 model was computed on October 1, 1996 using over 1.8 million terrestrial and marine gravity values. The method of computation uses a Fast Fourier Transform (FFT) technique to compute the detailed geoid structure, which is then combined with an underlying EGM96 geopotential model. The result is a gravimetric geoid height grid with a 2' X 2' spacing in latitude and longitude (2' x 4' in Alaska), referred to the Geodetic Reference System 1980 (GRS 80) normal ellipsoid in an International Terrestrial Reference System 1994 (ITRF94) frame. Then, by means of NAD 83 GPS ellipsoidal heights on NAVD 88 benchmark data, plus known relationships between NAD 83 and the ITRF94 reference frames, a conversion is applied to generate the final GEOID96 geoid model. This conversion causes the GEOID96 model to be biased relative to a geocentric ellipsoid; but, this bias is deliberate. The GEOID96 model was developed to support direct conversion between NAD 83 GPS ellipsoidal heights and NAVD 88 orthometric heights.

