

SURVEY NOTE

GOLETA-NAPLES CONTROL NETWORK

DAN JAHNS, P.L.S. 4997 performed a survey in Santa Barbara County in August 2000. This survey utilized the Global Positioning System (GPS) to determine the positions of 8 points relative to the High Precision Geodetic Network (HPGN) for the purpose of publishing State Plane Coordinates. This survey conforms to the requirements of the California Public Resources Code which as of January 1, 2000 requires State Plane Coordinates be based on First Order Geodetic Control referenced to the California Spatial Reference System as defined therein.

PROJECT DATUMS & REFERENCE SYSTEMS: Horizontal positions and ellipsoid heights are referenced to the North American Datum of 1983, 1991.35 Epoch adjustment of the HPGN as published by the National Geodetic Survey (NGS). Stations in the National Spatial Reference System used to reference this survey follow: "HPGN D CA 05 AS" = #1991 in this survey located near Highway 101 and Turmpike Road and "HPGN D CA 05 AR" = #2980 in this survey located near Highway 101 and Dos Pueblos Canyon Road. All stations are classified First Order 1:100,000 (original survey held to 1:500,000).

Note, the 1991.35 adjustment superseded the 1984 adjustment of conventional observations introduced in 1986 as the NAD83 Datum. Other NGS triangulation stations exist in the vicinity published on the 1991.35 Epoch; however, these stations are not included in the California Spatial Reference System as defined in the Public Resources Code and do not qualify as a basis for First Order Geodetic Surveys. The position of the NGS triangulation station, "Naples RM" = #1927 included in this survey, illustrates the differences in the adjustments. The position of #1927 established by GPS relative to the HPGN was found to be 0.4' north and 0.1' west of it's published 1991.35 Epoch position, and 0.6' south and 0.8' west of the 1984 Epoch position. These differences are due to the improved accuracy of GPS methods and the HPGN reference system. Differences in epochs is due to the secular motion (about 0.1"/year) and episodic motion (earthquakes) of the Pacific Plate relative to the North American Plate.

FIELD SURVEYS: The field surveys occurred July 13, 2000 and August 16, 2000 under clear skies and warm temperatures. A receiver was set at #1991 as a base station while roving receivers occupied all points in the survey. The base receiver was moved to #2980 and all points were occupied a second time under a different satellite constellation. On August 16 points 173, 188, 191 and 195 were occupied a third time in pairs to obtain direct connections. The Continuously Operated Reference Station (CORS) located on the UCSB Campus was included in the post processing but not visited by this survey. The observations were downloaded from Scripps Institute and processed as an additional receiver in this survey.

EQUIPMENT, DATA COLLECTION & POST PROCESSING OF DATA: Three Leica System 300 Dual Frequency P-Code receivers with firmware version 3.65 were utilized to collect, process and store satellite signal data. The NAVSTAR GPS constellation consisted of 27 Block II operational satellites. The P-Code was encrypted and SA was off. Phase and code measurements on the L1 & L2 frequencies were collected every 10 seconds from 4-7 satellites above 15 degrees with Geometric Dilution of Precision varying generally 2-7. The length of the observation times were 10-20 minutes. RINEX data recorded at 30 second epochs was obtained via Internet access from the Scripps Institute in San Diego for the CORS at UCSB. Data was processed with a cutoff vertical angle of 15 degrees above the horizon using a computed ionospheric model and broadcast ephemeris. Baseline (vector) processing was performed with the Leica SKI v2.3 Software; Network adjustments were performed with Star*Net Pro v6.0. A total of 10 points were connected with 39 non-trivial vectors.

PROJECT ADJUSTMENTS: In a minimally constrained adjustment HPGN point #1991 was fixed to validate the integrity of the measurements and the position of HPGN station #2980 located 51,000 feet to the west. The resulting shifts in feet from calculated to record follow.

Point	Name	Latitude	Longitude	Ellipsoid Ht.
1991	HPGN D CA 05 AS	Fixed	Fixed	Fixed
2980	HPGN D CA 05 AR	S 0.12	E 0.04	Up 0.13

Horizontal loop closures of three to six legs average 1:1,000,000 and vary between 1:500,000 to 1:2,000,000+. Residuals in the vectors average less than 0.02 feet in latitude, 0.02 feet in longitude and 0.03 feet in height with a maximum of 0.03 feet in latitude and longitude and 0.13 feet in height for a 32,535 foot vector. In the final adjustment the network was constrained to all (2) HPGN stations to establish geodetic positions, ellipsoid heights and state plane coordinates.

PLANE COORDINATE PARAMETERS: Plane Coordinates are NAD 83, 1991.35 State Plane Zone Five. The average Scale Factor is 0.99993783. The Ellipsoid Height Reduction Factor, based on the average ellipsoid heights is 1.00000178. The average Combined Grid Factor is 0.99993961. Multiply the Combined Factor times ground distances to obtain grid distances. Grid bearings should be rotated by a Convergence Angle to obtain geodetic bearings.

ACCURACY: The Standard Deviations (68% level of confidence) of the horizontal coordinates resulting from the constrained adjustment are estimated at 0.011 to 0.018 feet in north & east and the ellipsoid heights at 0.024 to 0.035 feet relative to the HPGN. Baseline precision's (95% level of confidence) average 4 ppm for vectors greater than 1000 feet. Vectors varying between 500 and 56,000 feet in length and average 21,300 feet. The relative distance errors at the 95% level of confidence in the network vary from 0.02 to 0.05 feet and average 0.034 feet. A First Order survey per the FGCS requirements would allow one centimeter+10 ppm of a lines length which is equivalent to 1.4 centimeters for a 1000 meter line or 0.446 feet for 3281 foot line.

SURVEY NOTE

CARPINTERIA-SUMMERLAND CONTROL NETWORK

DAN JAHNS, P.L.S. 4997 performed a survey in Santa Barbara County in August 2000. This survey utilized the Global Positioning System (GPS) to determine the positions of 9 points relative to the High Precision Geodetic Network (HPGN) for the purpose of publishing State Plane Coordinates. This survey conforms to the requirements of the California Public Resources Code which as of January 1, 2000 requires State Plane Coordinates be based on First Order Geodetic Control referenced to the California Spatial Reference System as defined therein.

PROJECT DATUMS & REFERENCE SYSTEMS: Horizontal positions and ellipsoid heights are referenced to the North American Datum of 1983, 1991.35 Epoch adjustment of the HPGN as published by the National Geodetic Survey (NGS). Stations in the National Spatial Reference System used to reference this survey follow: "HPGN CA 05 01" = #13 in this survey located on Highway 101 west of Summerland and HPGN-D station "RINCON" = #1 in this survey located on Highway 101 at Bates Road. "RINCON" is classified First Order 1:100,000 (original survey held to 1:500,000) and "HPGN CA 05 01" is classified B Order 1:1,000,000. Note, "HPGN CA 05 01" has also been published on the 1995.00 Epoch and the 1998.5 Epoch. The 1991.35 Epoch was used for consistency with other surveys in Santa Barbara County, however, the 1998.50 ellipsoid height fit better and was held in the adjustment at #13.

Note, the 1991.35 adjustment superseded the 1984 adjustment of conventional observations introduced in 1986 as the NAD83 Datum. Other NGS triangulation stations exist in the vicinity published on the 1991.35 Epoch; however, these stations are not included in the California Spatial Reference System as defined in the Public Resources Code and do not qualify as a basis for First Order Geodetic Surveys.

FIELD SURVEYS: The field survey occurred August 16, 2000 under clear skies and warm temperatures. A receiver was set at #305 as a base station while two roving receivers occupied all points in the survey. The base receiver was moved to #714 and all points were occupied a second time under a different satellite constellation. Points #8, 9, 10 and 12 were occupied a third time to obtain direct connections. Six repeat baseline vectors were measured including 1-305 and 305-714.

EQUIPMENT, DATA COLLECTION & POST PROCESSING OF DATA: Three Leica System 300 Dual Frequency P-Code receivers with firmware version 3.65 were utilized to collect, process and store satellite signal data. The NAVSTAR GPS constellation consisted of 27 Block II operational satellites. The P-Code was encrypted and SA was off. Phase and code measurements on the L1 & L2 frequencies were collected every 10 seconds from 4-7 satellites above 15 degrees with Geometric Dilution of Precision varying 2-7. The length of the observation times were 10-15 minutes. Data was processed with a cutoff vertical angle of 15 degrees above the horizon using a computed ionospheric model and broadcast ephemeris. Baseline (vector) processing was performed with the Leica SKI v2.3 Software; Network adjustments were performed with Star*Net Pro v6.0. A total of 11 points were connected with 24 non-trivial vectors.

PROJECT ADJUSTMENTS: In a minimally constrained adjustment HPGN point #1 was fixed to validate the integrity of the measurements and the position of HPGN station #13 located 42,000 feet west-northwest. The resulting shifts in feet from calculated to record follow.

Point	Name	Latitude	Longitude	Ellipsoid Ht.
1	"RINCON"	Fixed	Fixed	Fixed (1991.35)
13	HPGN CA 05 01	N 0.04	E 0.00	Up 0.00 (1998.50)

Horizontal loop closures of three to six legs average 1:500,000 and vary between 1:173,000 to 1:1,100,000. Repeat baseline vectors agree between 1:350,000 and 1:2,180,000. Residuals in the vectors average 0.01 feet in latitude, 0.01 feet in longitude and 0.01 feet in height with a maximum of 0.02 feet in latitude and longitude and 0.04 feet in height. In the final adjustment the network was constrained to all (2) HPGN stations to establish geodetic positions, ellipsoid heights and state plane coordinates.

PLANE COORDINATE PARAMETERS: Plane Coordinates are NAD 83, 1991.35 State Plane Zone Five. The average Scale Factor is 0.99993949. The Ellipsoid Height Reduction Factor, based on the average ellipsoid heights is 0.99999812. The average Combined Grid Factor is 0.99993761. Multiply the Combined Factor times ground distances to obtain grid distances. Grid bearings should be rotated by a Convergence Angle to obtain geodetic bearings.

ACCURACY: The Standard Deviations (68% level of confidence) of the horizontal coordinates resulting from the constrained adjustment are estimated at 0.006 to 0.013 feet in north & east and the ellipsoid heights at 0.012 to 0.034 feet relative to the HPGN. Baseline precision's (95% level of confidence) average 4.5 ppm. Vectors varying between 1400 and 20,600 feet in length and average 6900 feet. The relative distance errors at the 95% level of confidence in the network vary from 0.01 to 0.024 feet and average 0.02 feet. A First Order survey per the FGCS requirements would allow one centimeter+10 ppm of a lines length which is equivalent to 1.4 centimeters for a 1000 meter line or 0.446 feet for 3281 foot line.

SURVEYORS STATEMENT

THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE LAND SURVEYORS ACT IN SEPTEMBER 2000.

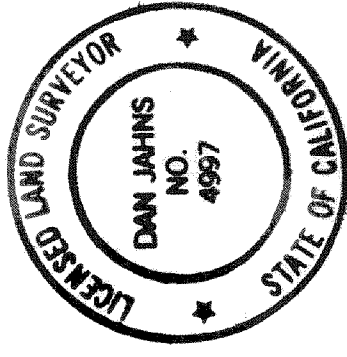
Dan Jahns

DAN JAHNS P.L.S. 4997

DATE

LICENSE EXPIRATION DATE: 12/31/01

MARCH 5, 2001



COUNTY SURVEYORS STATEMENT

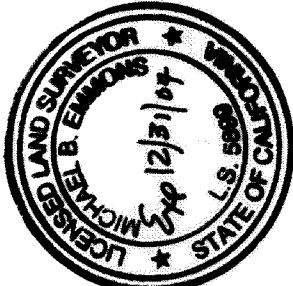
THIS MAP HAS BEEN EXAMINED IN ACCORDANCE WITH SECTION 8766 OF THE LAND SURVEYORS ACT THIS 31st DAY OF APRIL 2001.

Michael B. Emmmons

MICHAEL B. EMMMONS P.L.S. 5899

LICENSE EXPIRATION DATE:

SANTA BARBARA COUNTY SURVEYOR



RECORDERS CERTIFICATE

FILED THIS 3rd DAY OF April, 2001
AT 4:01 P.M. IN BOOK 170 OF RECORDS OF SURVEYS AT PAGE 78-82 AT THE REQUEST OF DAN JAHNS,
KENNETH A. PETTIT, COUNTY CLERK-RECORDER --
FEE \$16 ASSESSOR

BY *Arlene Brudde*
DEPUTY

RECORD OF SURVEY

OF A G.P.S. SURVEY CONTROL NETWORK
GOLETA / NAPLES AND CARPINTERIA / SUMMERLAND

COUNTY OF SANTA BARBARA
STATE OF CALIFORNIA

JANUARY 2001 SCALE: NONE

SURVEYING SERVICES
P.O. BOX 989

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