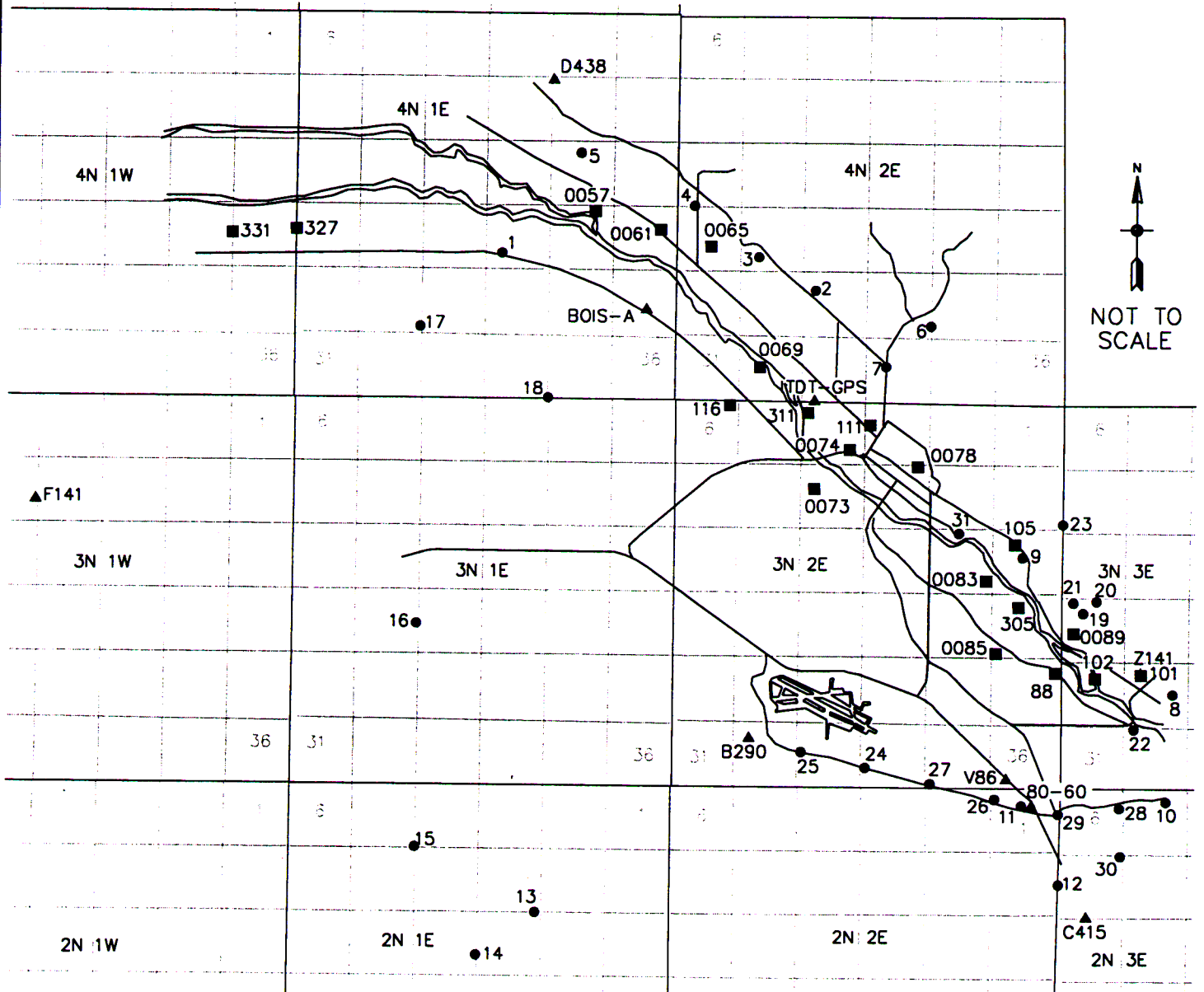


EXHIBIT MAP OF CITY OF BOISE GPS BENCHMARK SURVEY FOR U.S. ARMY CORPS OF ENGINEERS WALLA WALLA DISTRICT

WORK ORDER DACW 68-00-D-002
TASK ORDER 1



- ▲ N.G.S. MONUMENTS
- F.E.M.A. MONUMENTS
- NEW CITY OF BOISE BENCHMARKS



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US Army Corps
of Engineers



CITY OF BOISE GPS BENCH MARK SURVEY
CONTRACT NUMBER DACW68-00-D-0002, TASK ORDER 1
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PROJECT NARRATIVE:

Between 10/02/2000 and 10/14/2000 David Evans and Associates, Inc. (DEA) and Quadrant Consultants, Inc. collected field data for a GPS (Global Positioning System) survey in and around Boise City, Idaho. This survey is made at the request of the U.S. Army Corps of Engineers, Walla Walla District.

The surveyed network consists of 10 National Geodetic Survey (NGS) horizontal and vertical control stations, 20 existing FEMA monuments to be verified with this survey, and 31 key control monuments set by Boise City to be positioned by this project. The points are based horizontally on the North American Datum of 1983 (NAD 83). We held four horizontal control stations listed in the EQUINOX GPS HARN ADJUSTMENT SURVEY OF JUNE 1997. Two of those stations are NGS Order A (ITDT GPS) and Order B (P84 Reset) points. The Order A and B points and the EQUINOX SURVEY are based on a 1992 adjustment, NAD 83(92), of the North American Datum of 1983. The points in this survey are based vertically on the North American Vertical Datum of 1988 (NAVD 88). All of the NGS control points are 1st or 2nd order bench marks, eight of which were held in this survey.

The field data was planned for and collected using the following goals: (1) Create a network of closed loops with no loop containing more than 10 points. (2) Data to be collected with similar GPS receivers. We used three Trimble 4800 dual frequency receivers. (3) Receivers mounted on fixed height tripods. (4) The receivers set to log data at 15-second intervals and with a 15-degree mask. (5) GPS sessions scheduled for sufficient lengths and at times of good satellite availability. (6) Baselines measured twice.

Field data from daily sessions was checked into Trimble GPSurvey V2.35a software. Session files and field notes were checked for date, time, station occupation and tripod height. A total of 190 L1 fixed or iono free fixed baselines were processed.

Baseline vectors were imported into GeoLab V2.4d software for a series of simultaneous least squares adjustments. We used WGS 84 as the ellipsoid model and Geoid96 as the geoid model. An initial adjustment, minimally constrained at NGS station ITDT GPS, was run and showed good residuals. A second adjustment fixed elevations. We held NGS stations BOIS A, C 415, D 438, F 141, ITDT GPS, P84 Reset, V 86 and Z 141. NGS points B 290 and IDA 880 60 were used as elevation checks. We were about 2 cm lower than NGS record elevations at these two points. A final adjustment was run to produce NAD 83(92) positions and Idaho west zone state plane coordinates. In this adjustment we held the EQUINOX HARN points F 141, IDA 80 60, ITDT GPS and P84 Reset for horizontal positioning. A second final adjustment was run to produce horizontal coordinates on the Ada County GIS Datum. The accuracy of the adjusted points in both of the final adjustments is about +/-1 cm horizontal and +/-1.5 cm vertical at 95% confidence. The adjustment error budget allows for about +/-2 cm horizontal and +/-2.5 cm vertical accuracy at four of the points (13, 14, 15 and 28). However, adjusted baselines to these four points show very low residuals in the minimally constrained adjustment, and their residuals remained consistently low in the final adjustments.

