Title | Demonstrate knowledge of GNSS, and carry out a geodetic control network survey, for geodetic surveying
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Level | 6
Credits | 8

Purpose
This unit standard is for people who are working, or who intend to work, in the surveying profession in a geodetic context.

People credited with this unit standard are able to demonstrate knowledge of a global navigational satellite system (GNSS) used for geodetic surveying; and plan, survey, and calculate a stand-alone traverse control network for geodetic surveying.

Classification | Surveying > Geodetic Surveying

Available grade | Achieved

Recommended entry information | Unit 23861, Explain height differences and carry out a levelling survey, for geodetic surveying.

Guidance Information

1. The following documentation must be complied with:
   *Accuracy Standards for Geodetic Surveys* (OSG Standard 1) Office of the Surveyor-General 2003, the current version available at [http://www.linz.govt.nz](http://www.linz.govt.nz);
   client specifications;
   job specifications.

2. Assessment against this unit standard excludes using GNSS for survey practice, which is covered in unit standard 23880, *Explain, and use, the Global Positioning System (GPS) for survey practice.*

3. Assessment against this unit standard must utilise the most current information available in this developing area of knowledge and practice. This information may be accessed from websites on the internet such as:
   International GNSS Service at [http://www.igs.org/](http://www.igs.org/);
   Land Information New Zealand in publications and fact sheets available from the Survey System, and Geodetic Information pages at [http://www.linz.govt.nz](http://www.linz.govt.nz);

4 Definitions

Geodetic convention refers to the principles and practices outlined in Bomford, G, Geodesy Fourth edition (Oxford: Oxford University Press, 1987) and in Land Information New Zealand (LINZ) publications and fact sheets, available from the survey system and geodetic information pages at http://www.linz.govt.nz. GNSS stands for global navigational satellite system, and refers to satellite based positioning systems such as GPS, GLONASS, and Galileo; Galileo refers to a European operated GNSS; GLONASS refers to a Soviet space-based navigation system; GPS refers to the United States NAVSTAR GPS or Navigation Signal Timing and Ranging Global Positioning System. Reduction refers to the process of taking numbers (usually measurements) and determining other quantities by calculation, eg angles can be reduced to bearings, staff readings can be reduced to levels, slope distances measurements can be reduced to plan distance measurements. Workplace procedures refer to documented procedures specific to an enterprise which set out the quality management requirements for the business practice and activities of that enterprise.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of a GNSS used for geodetic surveying.

Performance criteria

1.1 A GNSS is described in terms of its elements and function.

Range function – theory of operation, satellite constellation, measurement parameters, accuracy, quality factors, tests.

1.2 GNSS observables are defined in accordance with geodetic convention.

1.3 The limitations of GNSS technology for geodetic surveying are explained in terms of error sources and corrections.

Range sources – multipathing, broadcast ephemeris, precise ephemeris, elevation windows, obstructions; corrections – ionospheric, tropospheric, elevation windows, obstructions.

1.4 GNSS is described in terms of positioning methods for geodetic surveying.

Range methods – precise point, static, kinematic virtual reference station.
Outcome 2

Plan, survey, and calculate a stand-alone traverse control network for geodetic surveying.

Range  a network area of approximately ten square kilometres with at least six stations, including at least one cross tie (ie at least two traverse circuits) and with no line shorter than one kilometre.

Performance criteria

2.1 Requirements for a stand-alone traverse network are determined in accordance with job specifications and, where relevant, client specifications.

2.2 Equipment which meets the requirements of the survey is selected in accordance with workplace procedures.

Range equipment may include but is not limited to – theodolite, total station, electronic distance measuring equipment, GNSS.

2.3 The network is planned and surveyed in accordance with job specifications and manufacturer’s instructions.

Range planning includes but is not limited to – selection of sites, logistical plan for undertaking the survey; surveying includes but is not limited to – observation of horizontal angles, vertical angles, distances, GNSS baselines.

2.4 The reliability of the survey is verified, in accordance with job specifications and LINZ geodesic specifications.

Range includes but is not limited to – combining at least three GNSS baselines in a manufacturer supplied software adjustment tool.

2.5 The new network is oriented by observing bearings from the existing control point to other remote control points coordinated in the same system, and by GNSS observations in accordance with LINZ geodesic specifications.

Range one station in the network is an existing control point.

2.6 All observations are reduced and integrated into a single network using least-squares techniques. The accuracy of the adjusted network complies with LINZ geodesic specifications and client specifications.

2.7 Standard survey data is integrated with GNSS observations using manufacturer supplied software and field measurement information in accordance with geodetic convention and LINZ geodesic specifications.

2.8 The derived transformation is applied to new survey data to determine the coordinates in accordance with geodetic convention.
This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.

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Consent and Moderation Requirements (CMR) reference 0101